Sustainability Roadmap 2022-2023

Caltrans

Progress Report and Plan for Meeting
the Governor's Sustainability Goals

for California State Agencies

November 1, 2022

Caltrans

Gavin Newsom, Governor

Caltrans Roadmap

Sustainability Road Map 2022-2023

Caltrans

Primary Author(s)

Derek Longacre

Aleksandr Holm

Barby Valentine

Jeremy Matsuo

Deputy Director, Sustainability

Tony Dang

Director

Tony Tavares

Table of Contents

Executive Summary

The Governor's Sustainability Roadmap is both a progress report and an action plan for implementing sustainable practices within California's state government. "Sustainability" as defined by the roadmap includes acting across five target areas: adapting to the anticipated impacts from climate change, zero-emission vehicles (ZEVs), energy efficiency, water conservation, and green operations. At the California Department of Transportation (Caltrans), this emphasis on the sustainability of government operations complements Caltrans' unique mission as the owner and operator of the State Highway System (SHS): "Provide a safe and reliable transportation network that serves all people and respects the environment."

Caltrans has approximately 21,170 employees and a 2021-2022 budget of $17.3 billion. Caltrans designs and oversees highway construction, operates, and maintains the SHS, funds intercity passenger rail routes, and provides funding for local transportation projects. In addition, Caltrans owns and manages more than 50,000 lane-miles of pavement, 35,000 acres of irrigated landscape, 13,000 bridges, 205,000 culverts on California's highway system and owns more than 500 facilities across the state.

Caltrans owns and operates over 8 million square feet of building facilities that serve varying functions to support safe and efficient passenger and freight movement. The building facilities include office buildings, maintenance facilities, transportation management centers, equipment shops, laboratories, toll plazas, Safety Roadside Rest Areas (SRRA) (used by the public only, not occupied by state employees), and Commercial Vehicle Enforcement Facilities (CVEF) (occupied by the California Highway Patrol (CHP)).

The Sustainability Roadmap reports on several important milestones achieved by Caltrans while implementing Executive Orders (EOs) B-16-12, B-18-12, and the adaptation planning progress of EOs B-30-15, N-19-19, and N-82-20. The Caltrans Sustainability Office was created within the Director's Office in 2015 to oversee progress toward sustainability goals and to collaborate with other state agencies on issues including air quality, health, climate change adaptation, and resiliency.

Climate Change Adaptation

For over ten years, Caltrans has conducted in-depth analysis and research into the impacts that climate change will have on California's transportation system. Caltrans recently completed Climate Change Vulnerability Assessments for each district, analyzing the impact climate change will have on every mile of

the SHS. Following these assessments, Caltrans' districts developed Adaptation Priority Reports that will guide Caltrans in addressing the most adversely impacted segments of the SHS to assure our transportation network is resilient to climate change.

Zero Emission Vehicles

As the steward of the SHS, Caltrans serves an important and unique role in increasing ZEVs on California's roadways. In 2021, Caltrans released their ZEV Action Plan 2.0 that will turn Caltrans policies and plans into actions. These actions include transitioning the Caltrans fleet to ZEVs, increasing access to public charging on the Caltrans right of way, supporting the development and adoption of zero-emission freight, and transitioning to a 100% zero-emission intercity rail fleet by 2035. As of the time of this writing, Caltrans has already increased the amount of vehicle charging ports at our locations to more than 1,200, raising the bar for government agencies across the country.

Energy

Caltrans has the largest footprint of any entity in the state, and powering that infrastructure isn't something we take lightly. Through investments in onsite solar generation, participation in demand response programs, and energy efficiency projects, Caltrans has substantially reduced our reliance on grid-based energy. Some highlights of these accomplishments are below:

- Installation of Light-Emitting Diodes (LEDs)in all Caltrans maintenance facilities, Headquarters, District Offices, and along the SHS
- Completion of the San Francisco Oakland Bay Bridge Maintenance Complex, Caltrans' first Zero Net Energy pilot buildings
- Annual onsite power generation of more than 5 million kilowatt hours of renewable solar energy.

Water Efficiency and Conservation

We took extraordinary measures to meet the Administration's goal of cutting water use by 50 percent during the last period of drought. Some of these measures include repairing and modernizing irrigation systems along the highway, converting to efficient water fixtures in facilities, and using recycled water to irrigate highway landscaping. As a result of these measures, Caltrans reduced water use by 66 percent from 2010 to 2020.

As the state continues to face extreme drought, Caltrans is redoubling our efforts for water conservation. We are bringing back our drought "strike teams",

developing Drought Action Plans across the state, and further integrating water conservation into our design and operational standards.

Green Operations

Caltrans has reduced our operational greenhouse gas emissions by 29 percent in 2020 (compared to 2010 levels), exceeding the state's 20 percent target. We continue to look for opportunities to expand our use of environmentally friendly products in the projects we manage.

Moving Forward

The responsibility for incorporating sustainability into department practices, planning, and operations is shared throughout Caltrans. The 2020-2024 Caltrans Strategic Plan integrates sustainability principles across all goals, addressing people, planet, and prosperity comprehensively. Through the Caltrans Strategic Plan, strategies have been developed to strengthen our capabilities to recover from the impacts of climate change, reduce greenhouse gases from the transportation sector, maximize the social equity of our investments, and demonstrate leadership in climate action.

As part of this roadmap, Caltrans has created a list of action items to be taken over the next several years to continue our shift toward a more sustainable operation. These action items can be found in Appendix A of this document.

Through campaigns and public outreach such as "Clean California" and "Let's Change This to That," Caltrans is taking direct action to provide education, resources, and support to help beautify California and preserve its most precious resources.

Tony Tavares

Caltrans Director

CHAPTER 1 - CLIMATE CHANGE ADAPTATION

Executive Order B-30-15 directs State Agencies to integrate climate change into all planning and investment. Planning and investment can include the following:

- Infrastructure and capital outlay projects
- Grants
- Development of strategic and functional plans
- Permitting
- Purchasing and procurement
- Guidance development
- Regulatory activity
- Outreach and education

This Climate Change Adaptation chapter focuses on the first three of these activities, and follows the guidance created by the statewide Technical Advisory Group developed under EO B-30-15 to assist State Agencies to complete this task. Further, EO N-19-19 redoubles efforts to reduce GHG emissions and mitigate impacts of climate change while building a sustainable and inclusive economy by creating a Climate Investment Framework, reducing GHG associated with the transportation sector, and minimizing the state government's carbon footprint.

Caltrans has invested over 10 years of research and analysis into understanding the expected impacts of climate change on the State Highway System (SHS), facilities, and its employees. Following state and federal mandates, Caltrans has been progressively planning and adapting to future climate change risk factors.

Caltrans recently completed the 12 District Climate Change Vulnerability Assessments. These assessments analyzed, down to the 1/10th of a postmile, the impact climate change will have on the SHS in each of Caltrans' 12 districts. In these assessments, six climate stressors were studied:

- Changes in Temperature
- Changes in Precipitation
- Wildfire
- Sea Level Rise (SLR)
- Storm Surge
- Cliff Retreat

These assessments identified specific locations that may be impacted by each of these climate stressors. The result was a summary report, technical report, and ArcGIS online web map developed for each district. The Summary report provides an overview of the natural environment and transportation infrastructure and description of the interaction of the transportation system and identified stressors. The Technical Report describes the background on data used to develop reports and the Vulnerability Assessment methodology. Lastly, the ArcGIS online web map visualizes the finding of the assessments through display of the six climate stressors.

Following on the District Climate Change Vulnerability Assessments, Caltrans developed Adaptation Priority Reports. These reports prioritize the roadbed, bridges, large and small culverts within areas identified as vulnerable in the Vulnerability Assessments. The Adaptation Priority Reports also include a weighted matrix of exposure and consequence metrics to rank each asset, and as of March 2021, all 12 of the District Adaptation Priority Reports have been completed.

Additionally, the Climate Change Adaptation Strategy Report, completed in 2021, provides recommendations on integrating adaptation strategies into transportation investment decisions, including, but not limited to: programming, project development, maintenance, and operations.

This Adaptation chapter of the Sustainability Roadmap is a parallel, but methodologically different, complement to Caltrans' Vulnerability Assessments for the SHS. Based on guidance provided by the California Government Operations Agency, this Roadmap focuses on the vulnerability of buildings. Since the SHS has different design parameters than buildings, the scenarios and datasets displayed in this Roadmap are different than those used in the Vulnerability Assessments and Adaptation Priority Reports. A brief explanation of the data and considerations specific to the SHS are provided in "Understanding Climate Risk to the State Highway System" later in the chapter.

The combined results of this Roadmap, Caltrans' Climate Change Vulnerability Assessments, and the Adaptation Priority Reports provide the basis for a more holistic understanding of the impact climate change will have on Caltrans.

Climate Change Risks to Facilities

For all infrastructure, it is important to assess the risk that a changing climate poses to an asset or project (e.g., sea level rise or increasing daily temperatures). It is also important to recognize the impact that an infrastructure project has on

the surrounding community and the impacts on individual and community resilience (e.g., heat island impacts).

To determine how to consider climate change for a given project or plan or existing infrastructure, Caltrans considers the following screening questions in the early phases of the project development process.

1. What is the lifetime of the facility, planned project, or plan?
2. Could the facility, planned project, or plan be affected by changing average climate conditions or increases in extreme events over its lifetime? California is susceptible to many climate risks, with many locations at risk from multiple impacts; for example, wildfire and mudslides may occur in the same year. It's important to consider the possibility of single climate impacts, as well multiple, compounding events that may cause more conservative planning.
3. What are the consequences of that disruption? When answering this, consider how the project/site will be used in its useful lifetime.
4. Will that disruption affect vulnerable populations, critical natural systems, critical infrastructure, or other assets?
5. Will that disruption cause irreversible effects or pose an unacceptable risk to public health and safety?

Caltrans developed similar criteria in 2011 for incorporating SLR into the Caltrans' project development process for facilities on the SHS. The criteria direct Project Development Teams (PDT) to evaluate SLR for all facilities that are: 1) in a coastal zone or area vulnerable to SLR, 2) potentially impacted by SLR based on the values in the California Climate Action Team's interim guidance from 2011, and 3) has a design life beyond 2030. Where impacts based on this screening criteria are expected, a PDT must consider the following factors:

1. Alternative route availability
2. Anticipated travel delays
3. Goods movement and interstate commerce
4. Evacuations and emergency protocol
5. Public safety
6. Expenditure of public funds
7. Size and scope of project
8. Effect of incorporating SLR on non-state highway (interconnectivity issues with local streets and roads)
9. Environmental constraints (impact on Environmentally Sensitive Areas)

Caltrans is in the process of updating climate change guidance for all climate stressors and will establish a comprehensive set of metrics and questions that seek to integrate and enhance various methods in use.

Natural-Based Solutions to Protect Facilities

EO B-30-15 directs State agencies to prioritize the use of natural and green infrastructure solutions and EO N-82-20 requires State agencies to collaborate to protect and restore the State's biodiversity. Natural infrastructure is the "*preservation or restoration of ecological systems or the utilization of engineered systems that use ecological processes to increase resiliency to climate change, manage other environmental hazards, or both. This may include, but need not be limited to, flood plain and wetlands restoration or preservation, combining levees with restored natural systems to reduce flood risk, and urban tree planting to mitigate high heat days*" (Public Resource Code Section 71154(c)(3)). The use of nature-based solutions aligns Caltrans efforts towards meeting the requirements of both EOs.

Nature-based infrastructure solutions should be prioritized and fully considered when considering adaptation actions that can be taken for at-risk facilities and in planning for future facilities. Examples of natural infrastructure include urban tree planting to address high heat days and rainwater harvesting, bioswales, and downspout disconnection to address increased precipitation.

In general, potential strategies include adapting, protecting the facilities using natural/hybrid infrastructure, and if necessary, relocating buildings and realigning roadway segments that are at risk of inundation. Additionally, SB 1 dedicates $20 million to local and regional agencies for climate change adaptation planning. Caltrans developed the grant program guidance and evaluation criteria in consultation with an interagency working group. All three cycles of adaptation grant funding have been awarded.

In addition, Caltrans works with local and regional partners, including transportation planners, engineers, economists, and geomorphologists to develop and identify cost-effective solutions to protect transportation corridors while considering the natural environment. For example, Caltrans meets with each coastal district and the California Coastal Commission twice a year to align planning efforts, share information, and strategize transportation planning in coastal areas.

Understanding the Potential Impacts of Facilities on Communities

It is also important to recognize the impact that an infrastructure project has on the surrounding community and the impacts on individual and community resilience (e.g., heat island impacts).

Climate change disproportionately impacts vulnerable communities, with certain populations experiencing heightened risk and increased sensitivity to climate change and have less capacity to recover from changing average conditions and more frequent and severe extreme events. Several factors contribute to vulnerability, often in overlapping and synergistic ways. These can include several social and economic factors, and be determined by existing environmental, cultural, and institutional arrangements.

Vulnerable populations can include, but are not limited to, people living in poverty; people with underlying health conditions; incarcerated populations; linguistically or socially isolated individuals; communities with less access to healthcare or educational resources; or communities that have suffered historic exclusion or neglect. Caltrans has awarded three cycles of adaptation planning grants to help identify issues related to climate change across the state. Results from studies funded by these grants could identify needs of these communities.

While there is no single tool to identify vulnerable populations in an adaptation context, there are several state-wide, publicly available tools that when overlaid with climate projection data can help identify communities most at risk to a changing climate. Some of these tools, including a definition for vulnerable communities, are available in a resource guide developed by the Integrated Climate Adaptation and Resiliency Program in the Office of Planning and Research.

Caltrans works with local and regional planning agencies to maintain a coordinated effort for addressing climate issues. However, many of Caltrans' facilities, such as district offices and maintenance facilities, utilize these partnerships to provide coordination, assistance, and support for other agencies responding to climate-related events affecting the public health and safety of regional and local populations, and particularly vulnerable populations. For example, in District 11, Caltrans has worked on a joint effort with Cal Fire, the Coastal Commission, and local and county officials to advance preparations for wildfire resiliency, emergency response, and evacuation planning.

As the owner-operator of the SHS, Caltrans works with multiple key agencies during emergency response to climate-related events by coordinating the evacuation functions and routes of the transportation system. Caltrans also works extensively with the California Office of Emergency Services to provide

resources and personnel during catastrophic events, including the Safety Assessment Program, mission tasking, and Emergency Functions 1, 3, and 7 of the State of California Emergency Plan.

Understanding Climate Risk to Existing Facilities

Under a changing climate, daily and nightly average temperatures are expected to rise, leading to significant impact on state-owned properties. Facilities are projected to experience higher maximum temperatures and minimum temperatures, longer and more frequent extreme heat events, increased number of heating and cooling degree days. Additionally, California continues to experience enhanced vulnerability to wildfire, greater rates of precipitation, risk from cliff retreat, and exponential SLR in some locations.

The following sections identify Caltrans building facilities with the greatest projected exposure to these climate stressors. Based on guidance from the California Government Operations Agency, the analysis within this Adaptation Roadmap uses scenarios and datasets developed for the Fourth Climate Change Assessment, and extracted from the ArcGIS tools Cal-Adapt, CalEnviroScreen, and the Urban Heat Island Index.

Risk from Changing Extreme Temperatures:

Through the end of the century, temperatures are expected to increase. Facilities will experience higher maximum temperatures and increased minimum temperatures. Additionally, heatwaves will become more frequent and longer lasting, causing additional stress to infrastructure.

Climate change will also increase the number of extreme heat events across the State. Extreme events are likely to be experienced sooner than changes in average temperature, being a precursor to what will become the new standard by 2100. Currently, the number of historical extreme heat days was higher than the model projected, indicating that extreme heat could potentially have an even more drastic effect than anticipated in the coming century.

Table 1.1: Top 5-10 Facilities that Will Experience the Largest Increase in Extreme Heat Events

Facility Name	Extreme heat threshold (EHT) °F	Average # of days above EHT (1961-1990)	Average # of days above EHT (2031-2060)	Change from Historical to projected average # of days above EHT (2031-2060)	Avg. # days above EHT (2070-2099)	Change from historical to projected average # of days above EHT (2070-2099)	Increase in # of days above EHT by mid-century (2031-2060)	Increase in Avg. # days above EHT by end of century (2070-2099)
06 MF Lemon Cove	104.21	4.45	42.28	37.83	74.80	70.35	38	70
09 MF Death Valley	116.82	4.34	41.01	36.66	73.16	68.82	37	69
06 MF Pinehurst	91.17	4.45	40.36	35.91	70.59	66.15	36	66
08 MF Fawnskin	84.27	4.45	39.11	34.66	68.13	63.68	35	64
06 MF Pierpoint Springs/Camp Nelson	89.91	4.45	39.06	34.61	72.09	67.64	35	68
06 MF Visalia	103.35	4.45	37.30	32.85	69.62	65.17	33	65
06 MF Shaver Lake	90.51	4.45	37.10	32.66	69.08	64.63	33	65
Lodge Road Park and Ride	101.55	4.41	36.42	32.01	66.74	62.33	32	62
Auberry Park and Ride	101.55	4.41	36.42	32.01	66.74	62.33	32	62
06 MF Bodfish	98.60	4.45	36.23	31.78	63.97	59.53	32	60

Table 1.2 a: Top 5-10 Facilities Most Affected by Changing Temperature – Annual Mean Max. Temp

Facility Name	Historical Annual Mean Max. Temp. (1961 – 1990)	Annual Mean Max. Temp. (2031 – 2060)	Change from Historical to Annual Mean Max. Temp (2031-2060)	Annual Mean Max Temp. (2070-2099)	Change from Historical to Annual Mean Max. Temp (2070-2099)
02 MF Canby Sand Storage	62.54	67.925	5.385	72.965	10.425
02 MF Susanville	62.84	68.4625	5.6225	73.165	10.325
02 MF Alturas	63.34	68.9175	5.5775	73.66	10.32
02 MF Yreka	65.17	70.655	5.485	75.4475	10.2775
02 MF Weed Sand Storage	62.32	67.7075	5.3875	72.535	10.215
09 MF Bridgeport	60.82	66.46	5.64	70.93	10.11
03 MF El Dorado Sand/Salt Storage	57.12	62.905	5.785	67.16	10.04
09 Equip Shop Bishop	72.84	78.785	5.945	82.8725	10.0325
09 MF Bishop	72.84	78.785	5.945	82.8725	10.0325
09 DISTRICT OFFICE	72.84	78.785	5.945	82.8725	10.0325

Table 1.2 b: Top 5-10 Facilities Most Affected by Changing Temperature- Annual Mean Min Temp

Facility Name	Historical Annual Mean Min. Temp. (1961 – 1990)	Annual Mean Min. Temp. (2031 – 2060) °F	Change from Annual Mean Min. Temp (2031-2060)	Annual Mean Min. Temp. (2070-2099)°F	Change from Annual Mean Min. Temp (2070-2099)
09 MF Bridgeport	22.34	29.50	7.16	34.37	12.03
09 MF Sonora Junction	22.80	29.49	6.69	34.31	11.51
07 MF Valencia and North Region	46.77	54.24	7.47	58.27	11.50
09 MF Crestview	24.69	31.03	6.34	35.64	10.95
02 MF Termo Sand Storage	27.72	33.89	6.17	38.63	10.91

Facility Name	Historical Annual Mean Min. Temp. (1961 – 1990)	Annual Mean Min. Temp. (2031 – 2060) °F	Change from Annual Mean Min. Temp (2031-2060)	Annual Mean Min. Temp. (2070-2099)°F	Change from Annual Mean Min. Temp (2070-2099)
07 MF Newhall and North Region	46.55	53.15	6.60	57.26	10.71
09 MF Lee Vining	31.92	37.95	6.03	42.56	10.64
09 MF Minaret	23.27	29.34	6.07	33.87	10.60
02 MF Canby Sand Storage	30.41	35.93	5.52	40.94	10.53
08 MF Blythe	56.00	61.81	5.81	66.50	10.50

Heating and Cooling Degree Days

A heating degree day (HDD) is a measurement designed to quantify the demand for energy needed to heat a building. A larger quantity of heating degree days correlates to more energy needed to maintain a comfortable interior environment, thus, a larger output of GHG emissions. Similarly, cooling degree days (CDD) is a measurement designed to quantify the demand for energy needed to cool a building. A larger quantity of cooling degree days correlates to more energy needed to maintain a comfortable interior environment, thus, a larger output of GHG emissions. Typically, thresholds for both HDD's and CDD's is 65 degrees. For HDD's, the reference temperature (65 degrees) loosely represents an average daily temperature *above which* space heating is not needed. For CDD's, the reference temperature loosely represents an average daily temperature *below which* space cooling (e.g., air conditioning) is not needed.

Table 1.3: Top 5-10 Facilities that will be Most Impacted by Projected Changes in Heating and Cooling Degree Days (HDD/CDD)

Facility Name	Heating/Cooling Degree Days (1961-1990) (HDD/CDD)	Heating/Cooling Degree Days (2031-2060) (HDD/CDD)	Heating/Cooling Degree Days (2070-2099) (HDD/CDD)
09 MF Minaret	10229.51/0.9	7982.92/40.96	6719.52/159.75
10 MF Caples Lake	9588.39/3.87	7676.12/37.38	6515.09/106.83
02 MF Grass Lake	9264.72/13.82	7368.25/167.4	6186.61/489.74
03 MF Kingvale	8453.57/17.27	6653.79/159.56	5592.21/411.35
09 MF Crestview	8934.94/7.96	6723.81/149.92	5559.19/387.12

Facility Name	Heating/Cooling Degree Days (1961-1990) (HDD/CDD)	Heating/Cooling Degree Days (2031-2060) (HDD/CDD)	Heating/Cooling Degree Days (2070-2099) (HDD/CDD)
09 MF Conway Summit Sand Storage	8692.34/7.57	6553.36/167.68	5408.75/431.32
09 MF Sonora Junction	8868.26/6.78	6572.99/151.61	5380.07/418.51
03 MF Tahoe City	8254.65/16.03	6355.06/179.12	5288.52/477.6
02 MF Mineral	7955.44/37.55	6198.36/293.12	5264.56/687.38
03 MF Truckee	8177.56/35.21	6256.33/288.05	5232.35/637.53

With a warming climate, there will be fewer HDD and more CDD. This means there will be a heightened strain on our cooling and heating systems. With fewer HDD (days below 65 degrees) and more CDD (days above 65 degrees), air conditioning systems will be running more often and for extended periods of time during extreme heat events. This can lead to an increase in the number of GHG emissions released into the atmosphere. Facilities with a low number of HDD and a high number of CDD are the most vulnerable to being affected by heat events.

HDD and CDD is also reflective of many other stressors and their associated risk outlined throughout this chapter. For example, it reflects heightened temperatures, extreme heat and any hazards that are associated with hotter days and warmer nights. Also, HDD and CDD could be compared to wildfire probability as temperatures rise in especially fire-prone areas. Increased temperatures associated with these days could also reflect less precipitation and make regions more susceptible to drought or summer water shortages.

Implications for Department Buildings.

Extreme temperatures affect the efficient use of energy, water, and materials throughout a building's life cycle. Additionally, it could potentially affect the indoor and outdoor air quality, as well as state employee health and productivity during extreme heat events or loss of power.

Extreme heat could decrease a building's service life by degrading roofs and walls, stressing heating, ventilation, and air conditioning (HVAC) systems and insulation leading to more frequent facility maintenance and higher operational costs. Planning for rising temperatures must be incorporated into the design of future Caltrans buildings going forward. Buildings will require more insulation, more energy-efficient windows, and more powerful cooling systems, all of which produce a higher up-front cost for construction.

Extreme heat events could create unsafe working conditions and lead to negative health effects for employees and potentially create a loss of productivity. Side effects from extreme heat could include general discomfort, respiratory difficulties, heat cramps and exhaustion, and for field crews, the possibility of non-fatal heat stroke, and heat-related mortality.

Furthermore, additional energy and water use in buildings will result in an increase in air pollutants and GHG emissions, which may exacerbate climate-related extreme heat events. Extreme heat could also damage electrical infrastructure and HVAC equipment, increasing the possibility of premature or accelerated deterioration of equipment and a reduction of design safety factors. More widespread extreme heat events could also overload local power infrastructure, requiring utility companies to impose rolling brownouts or blackouts to avoid full power outages, which may reduce productivity and impact working conditions if offices lose power.

Caltrans' equipment shops face challenges from extreme heat because of the difficulty to cool these large, indoor spaces. They also host heat-generating activities, and many have evaporative cooling systems, which do not perform well in higher temperatures. This could result in temperatures rising above allowed limits in facilities where technicians repair and maintain equipment, creating possible heat-related illness and a loss of productivity. Extreme heat events could lead to unsafe conditions and affect employee health, which in turn would impact Caltrans' ability to maintain and repair California's roadways.

Adaptation Strategies

Preparing for changing climate conditions will require a multi-faceted approach to adaptation strategies. First, Caltrans will need to strengthen its preparedness for extreme heat events and higher average temperatures. Some adaptation strategies might be easily implemented, while others will require additional planning, consultation, and resources. Therefore, next steps will include discussions to identify adaptation strategies specific to at-risk facilities and to consider whether a strategy can be implemented using existing resources or if there will be additional costs associated with implementation. Specific strategies for buildings could include:

- Monitoring extreme heat at facilities throughout California.
- Installation of photovoltaic solar canopies to reduce urban heat islands created by parking lots.
- Planting native or drought tolerant shade plants at Caltrans facilities.
- Performing energy efficiency audits at Caltrans locations.

- Insulating buildings more effectively.
- Reviewing and improving use of air conditioning technologies and other indoor cooling strategies.
- Using cool roofing materials.
- Applying current Energy Star efficient systems.
- Creating design standards for construction of new buildings at optimal angles so that less direct sunlight enters at peak solar conditions; and
- When possible, incorporating passive cooling features, making windows operable and best designed to facilitate a cross breeze/ air flow through the building, and incorporating operable shades or awnings over windows.

Caltrans has already implemented ZNE guidelines for construction projects into working practice, and facilities are designed and built to exceed Title 24 standards. In 2022, Caltrans will begin performing energy efficiency audits at additional facilities and identifying opportunities to integrate the above-mentioned adaptation strategies.

Extreme heat days can cause cooling equipment failures in buildings, leading to an increase in heat-related illnesses and loss of productivity due to building closures. Building maintenance staff might be required to work extended hours to maintain and repair equipment to keep buildings at an acceptable temperature level. Extreme temperatures can cause buildings to deteriorate prematurely, shortening their service life, requiring more frequent maintenance and repair. Maintenance crews might be required to work at night to avoid heatstroke during extreme heat events. Additionally, increased temperatures and extreme heat days may cause wildfires to grow in scale and frequency.

Urban Heat Islands

Urban heat islands are areas with localized spikes in temperature, which impact human health, increase pollution, and increase energy demand. Urban heat islands occur during the hot summer months in areas with higher percentages of impervious surface and less vegetation. This is likely in areas with large parking lots, dense development, and lower tree density and shading. Urban heat islands can be mitigated (i.e., reduced) through tree planting and other greening measures, cool roofs (e.g., lighter roofing materials that reflect light), cooler pavements, and other measures. Reducing the urban heat island effect through smart growth principles can be planned into future Caltrans facilities by incorporating these measures.

The 316 Caltrans facilities referenced in Table 1.4 are most likely to have the greatest increase in heat due to urban heat island effects per day; all of which have large parking lots for operational use that contribute to greater heat.

Table 1.4: Facilities Located in Urban Heat Islands

Urban Heat Islands	
Facilities located in Urban Heat Island	316
Facilities not located in an Urban Heat Island	70

Adaptation Strategies

Urban greening and the use of green infrastructure could be utilized and expanded as part of cooling strategies whenever Caltrans constructs new buildings.

Potential strategies include:

- Planting trees throughout the property to lower air temperature
- Installing parking lot canopies with photovoltaic cells to reduce heat absorption and shade parked vehicles while collecting solar energy
- Studying the feasibility of green roofs, additional wall insulation, energy efficient windows, and heat-tolerant air conditioning materials
- Implementing cool roofs, or roofs of lighter color, which have a higher albedo and absorb less energy, reducing the urban heat island effect
- Installing cooler, permeable pavements. These pavements that are lighter in color can reduce energy absorbed and omitted while reducing strain on drainage through letting stormwater permeate through

Further studies are needed to develop a Caltrans facility energy plan for urban heat island effects at facilities. In addition, studies are also needed on the potential applicability of green roofs, additional wall insulation, energy-efficient windows, and heat-tolerant air conditioning materials.

Risks from Changes in Precipitation

The impacts of climate change on the amount of precipitation that California will receive in the future are slightly less certain than the impacts on temperature. However, it is expected that California will maintain its Mediterranean climate pattern (dry summers and wet winters), but more precipitation will fall as rain than as snow. It is also likely that extremes will intensify, both drought and heavy precipitation events. Larger rains can result in flooding but will also result in shifts in runoff timing (earlier) and runoff volumes (higher). It will also result in decreased snowpack.

Table 1.5: Top 5-10 Facilities that will be Most Impacted by Projected Changes in Precipitation

Facility Name	Annual Mean Max. Precip. (1961 – 1990) (in/yr)	Annual Mean Precip. (2031 – 2060) (in/yr)	Percent Change by mid-century	Annual Mean Precip. (2070 – 2099) (in/yr)	Percent change by end of century	Extreme Precip (1961-1990) (in/day)	Extreme Precip (2031-2060) (in/day)	Extreme Precip (2070-2090) (in/day)
SONORA JUNCTION MAINTENANCE FACILITY	21.12	27.69	31%	30.79	46%	5.83	8.57	8.52
INDEPENDENCE MAINTENANCE FACILITY	6.90	8.39	22%	9.88	43%	5.41	6.73	9.27
SUSANVILLE MAINTENANCE FACILITY	12.79	16.14	26%	17.75	39%	3.70	3.73	5.01
WEED SAND STORAGE	24.72	33.27	35%	34.27	39%	5.75	6.21	6.49
CRESPI PARK AND RIDE	22.70	28.80	27%	31.04	37%	4.76	5.24	6.75
BRIDGEPORT MAINTENANCE FACILITY	10.92	12.91	18%	14.90	36%	3.21	4.73	4.94
LOS GATOS SATELLITE	28.88	34.76	20%	39.23	36%	8.84	8.56	11.60
DESERT CENTER MAINTENANCE FACILITY	2.87	2.91	1%	3.87	35%	1.77	2.17	3.76
FAIRFIELD MAINTENANCE FACILITY	18.82	22.84	21%	25.33	35%	4.78	4.78	5.90
VICTORVILLE MAINTENANCE FACILITY	6.90	8.31	20%	9.26	34%	2.76	2.70	3.45

Implications for Department Buildings

Increased precipitation could severely damage Caltrans' buildings and lead to secondary problems. Changes in moisture levels can cause dimensional changes (such as swelling or shrinking) of building materials, which in turn can cause cracking and/or fissuring in polymer-based materials such as vinyl cladding, window frames, sealants, and gaskets. These moisture-related issues can lead to a reduction of design safety factors, more repairs and

maintenance, service disruptions, increased energy consumption from less insulated buildings due to compromised building structural integrity, risk for waterborne disease outbreaks from overloaded sewage systems and water treatment facilities, and increased liability because of premature aging or deterioration of the building.

Increased precipitation could include heavy rain events that would especially affect buildings. These events could cause structural building failures, undermined foundations, and collapse roofs. Regionally, Caltrans facilities in locally low-lying areas could experience inundation for extended periods of time, causing major structural damage and increased expenditure for repairs or replacement. Extreme precipitation could lead to higher levels of mold at these facilities, which would decrease productivity during abatement. The results from increased precipitation could require facility closures and/or prevent employees from entering specific buildings. In the future, Caltrans programs will need to request assistance from the Office of Hydraulics and Stormwater to identify buildings that are vulnerable to heavy rain events.

Heavy rain events also adversely affect equipment shop personnel. During floods, these employees would need to move heavy toolboxes and vehicles, reducing productivity and potentially causing injuries.

Heavy rain events will also affect traffic operations if they damage or close buildings. Heavy rain events could deteriorate highway roadways, causes erosion, and closes highways for maintenance. Without operational centers, planning for evacuations and alternative routes due to flooding would not be as easily conducted, therefore potentially putting the public at risk. Caltrans employees cannot respond to highway emergencies or provide essential maintenance and operation for the safety of the traveling public whenever these facilities become inoperable or inaccessible.

Regardless of the facility type, additional rainfall would strain existing pumping stations, potentially pushing them over capacity. Freeway pumping plant design criteria for storage and pumping could be exceeded by heavy rainfall and potentially flood the adjacent freeway they are supposed to protect.

In areas recently burned by wildfire, extreme precipitation will also increase the risk of debris flow, which could damage buildings, clog culverts and drains, and close roads. Surface erosion increases, often significantly, following wildfire due to loss of surface cover, canopy, and shallow soil damage due to fire heating. Soil burn severity generally indicates where increases may be most significant, topography and soil type also play significant roles in post-fire surface erosion.

In burn scar locations, as well as downstream of burn scars, the following should be considered:

- Monitor and maintain the intake drainage structures during and after large rain events.
- Clean out and maintain basins above the intakes.
- Prepare to treat water for increased dissolved organics.
- Develop an early warning system for potential flood events.
- Partnership with local and regional agencies to coordinate evacuation efforts and secondary effects.

Educate the public about post-fire debris flows and how rapidly they move. The public should be informed to be out of the way of potential flow paths before a storm impacts the area.

Existing early warning systems should be used and improved such that residents can be alerted to incoming storms, allowing enough time to safely vacate hazard areas. In areas where cellular reception is poor or non-existent, methods should be developed to effectively contact residents. For example, installation of temporary mobile cellular towers should be considered.

Adaptation Strategies

Caltrans will integrate adaptation measures on future infrastructure projects. The following factors will be considered when developing these measures:

- Criticality (how important are the buildings for achieving development objectives)
- Likelihood (are the buildings likely to be impacted by climate change and how soon)
- Consequences (how severely will the building infrastructure or operations be affected)
- Length of disruption to facility use (temporary or permanent)
- Resources available (can adaptation measures be incorporated into ongoing maintenance and renovation; are improvements required to retain use of the building)

The following strategies will be considered to reduce the impact from changing precipitation (including drought) to buildings:

- Enhanced monitoring of climate change effects, such as changes in precipitation through long-term rainfall tracking

- Developing and implementing an action plan to address climate change risks to Caltrans building facilities, statewide
- Begin to consider new facilities in locations with increased flood risk from sea level rise or heavy precipitation when possible
- Consider and implement materials that are more resilient to inundation
- Rainwater capture for irrigation of the facility
- Installation of dry wells or ensuring proper drainage and grading at building locations to manage or protect from increased runoff
- Using Energy Star efficient systems to replace the cooling effect of rainwater
- Relocating facility sites outside of potential high wind zones and/or above new flood levels or to higher ground within the sites
- Further improving wastewater recycling to create new potable water
- As needed, replacing water-intensive landscaping with native, drought-resistant plants that can be watered through drip irrigation causing less evaporation

Risks from Sea Level Rise

Increasing global temperatures are contributing to rising sea levels. Rising sea levels will result in inundation of coastal areas and increased flooding due to storm surges. The California Ocean Protection Council (OPC) has issued the State of California Sea-Level Rise Guidance (Guidance) for State agencies on what level of sea level rise projections to consider in planning.

The Guidance provides estimates of sea level rise for the California Coast for all active tide gauges based on a range of emission trajectories, which are based on the report, Rising Seas in California: An Update on Sea-Level Rise Science. These data provide projections for use in low, medium-high, and extreme risk aversion decisions. Current guidance from the CA Coastal Commission suggests using the medium-high risk aversion or extreme risk when assessing the vulnerability of critical infrastructure.

Geographical factors must be considered when considering the effect of SLR will have on Caltrans facilities. First, the amount of SLR plays a crucial role on the amount of land inundated. Second, terrain determines how much land will be covered from rising oceans. For example, low-lying areas will be affected by a smaller amount of SLR. Areas with steeper terrain directly abutting the ocean will suffer less from land inundation but will be more susceptible to erosion and cliff retreat caused by storm surges.

Throughout the end of the century, these areas will become the most susceptible to SLR:

- San Francisco Bay Area and Sacramento Delta region
- Coastal portions of Los Angeles, Orange, and San Diego Counties
- San Diego Bay Area
- Toll Plaza and bridge approaches

While SLR is inevitable, there are several ways Caltrans can help mitigate the effects it will have on Caltrans infrastructure, which vary in cost and complexity. As outlined in the 2018 update of the State of California Sea Level Rise Guidance, a five-step framework could be implemented into project development to enhance resiliency. These five steps are:

- Locating the nearest of the twelve statewide tidal gauges to a project location for the most accurate SLR predictions.
- Evaluating the lifespan of the intended project.
- Based off the chosen SLR model, analyzing the range of SLR for the intended site.
- Considering emission scenarios to better refine SLR predictions.
- Incorporating that data into project development to be proactive for future SLR.

For existing facilities and portions of the SHS that have a potential for SLR and storm surge, sea walls can be placed along the roadway affected. Green infrastructure projects can also be used, such as reclaiming wetlands, to add a buffer that would partially absorb storm surge.

Table 1.6 : All Facilities at Risk from Rising Sea Levels

Facility Name	Tide Chart Region	2050 Water Level (ft)	Exposed in 2050? (y/n)	2100 Water Level (ft)	Exposed at 2100? (y/n)
04 MF Manzanita	San Francisco	1-2'	Yes	3-5'	Yes
04 MF Redwood City	San Francisco	1-2'	Yes	3-5'	Yes
04 MF Foster City	San Francisco	1-2'	Yes	3-5'	Yes
04 MF South San Francisco	San Francisco	1-2'	No	3-5'	Yes

Facility Name	Tide Chart Region	2050 Water Level (ft)	Exposed in 2050? (y/n)	2100 Water Level (ft)	Exposed at 2100? (y/n)
04 MF San Mateo Paint Shop	San Francisco	1-2'	No	3-5'	Yes
04 MF Toll Bridge Region	San Francisco	1-2'	No	3-5'	Yes
07 MF Ventura	Santa Barbara	1'	No	2-3'	Yes

Risks from Wildfire

Wildfire is a serious hazard in California. Several studies have indicated that the risk of wildfire will increase with climate change. Importantly, we are already seeing more extreme wildfire seasons that are longer and with more extreme wildfires. By 2100, if greenhouse gas emissions continue to rise, one study found that the frequency of extreme wildfires would increase, and the average area burned statewide would increase by 77 percent.

Wildfire hazard is also a critical present issue. Five of California's six largest fires all occurred in 2020[1]. 2017 and 2018 previously set records as the most destructive fire seasons in California's history[2]. To contextualize how wildfire hazards already impact California's facilities, consider that 1 in 5 California children were affected by wildfire-related school closures during the 2018-2019 school year[3].

In identifying facilities most at risk, considerations should include location, fire risk in surrounding areas, required operations, impacts of current fire events, the impact of disruption, access to facility during disruptions/wildfires in surrounding areas, and criticality of the facility and/or its operations.

Table 1.7: Top 5-10 Facilities Most at risk to current wildfire threats

1 https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf

2 https://www.fire.ca.gov/incidents/2017/ ; https://www.fire.ca.gov/incidents/2018/

3 https://calmatters.org/projects/california-school-closures-wildfire-middletown-paradise-disaster-days/?

Facility Name	Fire Hazard Severity Zone (low, medium, high, very high)
Kingvale Maintenance Facility	Very High
Caples Lake Maintenance Facility	Very High*
Willow Creek Maintenance Facility	Very High
Platina Maintenance Facility	Very High
Mineral Maintenance Facility	Very High
Weaverville Maintenance Facility	Very High
Kyburz Maintenance Facility	Very High
Placerville Maintenance Facility	Very High
Chester Maintenance Facility	Very High
Manzanita Maintenance Facility	Very High

*Caples Lake Maintenance Facility was within the fire perimeter of the 2021 Caldor Fire

In total, 92 Caltrans facilities are susceptible to 'very high' fire risk, as outlined in the Facility Data Sheets provided by the Department of General Services (DGS). Other facilities may not be deemed within 'very high' fire risk areas but still are critical to Caltrans operations.

Table 1.8: Top 5-10 Facilities that will be Most Impacted by Projected Changes in Wildfire

Facility Name	Acres Burned (1961-1990)	Acres Burned (2031-2060)	Acres Burned (2070-2099)
01 MF Red Mountain Sand/Salt Storage	4.1	22.7	105.5
Cambridge Road Park and Ride	7.6	26.1	71.9
05 MF Willow Springs	7.6	26.1	71.9
Ralston Park and Ride	5.1	30.7	60.7
04 MF Redwood City	2.4	28.7	59.4
08 MF Keen Camp	14.6	27.4	55.3
07 MF Ojai	16.4	23.9	52.4
Verdugo Park and Ride	9.5	19.3	38.5
07 MF Santa Barbara	11.9	18.5	35.1
Geiger Ave. Park and Ride	8.5	17.5	31.3

Wildfire can affect facilities in many ways. Several factors need to be considered, such as type of facility, location, number of employees, and what is stored at the facility. For example, maintenance facilities store machinery that could be lost to fire but do not house many employees—lowering the risk of injury while potentially having a high replacement expenditure. Wildfires that move through highly populated areas have a much greater impact regarding loss of property and life.

Fire affects structural integrity depending on the construction method of the facility (wood vs. concrete). Smoke inhaled during wildfires can cause serious health issues regardless of facility type. Preventative measures, such as keeping air-duct filters clean so that dangerous particles are filtered out from entering the workplace, can be taken to alleviate some of these effects. If wildfire smoke becomes a serious problem, such as during the 2018 Camp Fire where particulate levels became hazardous, additional precautions may need to be enacted to ensure the safety of employees.

Several factors were considered when looking at wildfire threat, which include extreme heat days, average temperature, terrain (steepness), accessibility, relation to urban areas, cause of fire (man-made or natural), and wind. From those considerations, in addition to Cal-Adapt data, several districts have been highlighted where many of these factors are likely to play a role. For example, District 2 fell into the category of rural and arid, with limited access and possibility of high-wind events (especially from mountainous to valley locations).

Based off Cal-Adapt data, Districts 1, 3, and 5 will be the most impacted by wildfires through 2099. They had the highest positive change in hectares projected to burn out of all 12 Caltrans Districts. These districts are semi-rural, forested (or semi-forested) areas of California with warm temperatures, which all leads to higher fire risk.

It is important to remember that a reduction in hectares burned through 2100 does not necessarily correlate with a lower fire risk. Many of these districts (such as districts 2, 3, 6, and 10) have large, dry, mountainous regions that have been highlighted as some of the most fire-prone areas of the state. Also, ingress and egress play a role in wildfire risk, with rural areas having less access, making for more complicated evacuation procedures that need advanced coordination and planning. Limited access could extend the time needed for evacuations and adds potential for evacuation routes to be blocked by fire. This leads to increased danger to residents trying to evacuate and hinders access for emergency personnel trying to reach impacted areas. For this reason, it is suggested that buildings in these districts be included in the list of facilities that will be most impacted by wildfire. During such events, these district offices will be

Emergency Operations Center (EOC) for crews working on fires within these districts, making them a logical choice for most affected facilities.

Adaptation Strategies

Caltrans can take preventive measures to protect facilities from fire in the short- and long-term. Having a defensible buffer surrounding all facilities will decrease the probability of fire damage. In addition, preventive measures could be incorporated into the design of facilities. Implementing non- or low-combustible materials and requiring a sprinkler system can minimize damage. Additionally, implementing whole-building air filtration systems into the design of the building would improve air quality indoors during extreme air quality events caused by wildfire. Educating employees at facilities susceptible to fire risk will make them more prepared in case of an emergency event. To ensure safety of employees, having an evacuation plan in place could result in zero injuries.

The Caltrans Office of Vegetation and Wildfire Management is working with Cal Fire, the Coastal Commission, and other local government entities to host Wildfire Strategy Workshops to advance efforts for wildfire mitigation and preparation in the most risk adverse areas. Efforts included in these workshops include:

- Strategic coordinate projects to align with the goals of the Governor's Forest Management Task Force
- Mechanical and chemical vegetation management standards for highways in fire prone areas
- Identification of priority fuel reduction segments
- Aligning Caltrans efforts with community objectives and priorities
- Assuring adequate defensible space is maintained on highways to allow for evacuations, emergency access, and fire control lines

Understanding the Potential Impacts of Facilities on Communities

As described at the beginning of the chapter, impacts on communities must be considered for resilience planning for State assets and buildings.

Disadvantaged Communities

California is required to invest certain funding streams in disadvantaged communities (DACs). Many state programs that have DAC funding requirements use CalEnviroScreen, a tool that ranks census tracts based on a combination of social, economic, and environmental factors, to identify DACs. While it does not

capture all aspects of climate vulnerability, it is one tool that is available, and does include several relevant characteristics. Caltrans' facilities located in these communities can contribute or alleviate the vulnerability of these DACs through improving roadways, reducing pollution, and updating landscaping. Additionally, while scoring a community gives a strong indication of disadvantages it may face, factors not reflected in the scoring system such as physical isolation, countywide economic indicators, and a lack of competitiveness for discretionary funding are expected to impede the ability of rural communities to become sustainable and resilient.

Twenty-three percent (116 out of 503), of all Caltrans facilities in the State Property Inventory are located within the top 25 percent of CalEnviroScreen DACs. The facilities listed in Table 1.9 are in communities with a score at or above 90 percent. Caltrans is reviewing all facilities in communities with a score at or above 75 but not all are referenced in the table.

As the owner-operator of the SHS, Caltrans can improve upon its infrastructure to benefit mobility throughout the state. Utilizing multi-modal transportation options creates opportunity for all levels of income to commute to employment, medical care, and recreation.

Caltrans also recognizes that its buildings have an economic impact on DACs. Caltrans employs individuals for a wide range of positions and skill levels, providing career opportunities for people who have struggled to find work and/or live in DACs. Hiring locally can help build the local economy while potentially bring families out of poverty through employment.

Table 1.9: Facilities located in highest-scoring disadvantaged communities

Facility Name	CalEnviroScreen Score	Is it located in a disadvantaged community? Yes/No
Facility Name	**CalEnviroScreen Score**	**Is it located in a disadvantaged community? Yes/No**
08_OFF_DIST	96-100% (highest scores)	Yes
06 OFF_DIST	96-100% (highest scores)	Yes
07 MF (Central Bandini)	96-100% (highest scores)	Yes
08 EQUIP_SHOP 28101 (San Bernardino)	96-100% (highest scores)	Yes
08 MF (Magana Ortega)	96-100% (highest scores)	Yes
06 MF (Fresno and North Region)	96-100% (highest scores)	Yes
08 MF (San Bernardino)	96-100% (highest scores)	Yes
06 EQUIP_SHOP 26101 (Fresno)	96-100% (highest scores)	Yes
07 MF (Alameda)	96-100% (highest scores)	Yes
08 MF (Ontario)	96-100% (highest scores)	Yes
06 MF (Madera)	96-100% (highest scores)	Yes
06 MF (Mendota)	96-100% (highest scores)	Yes
06 MF (Fresno)	96-100% (highest scores)	Yes
10 MF_ELEC (Modesto)	96-100% (highest scores)	Yes
06 MF (West Avenue)	96-100% (highest scores)	Yes
07 MF (Artesia)	96-100% (highest scores)	Yes
11 MF (Chollas)	96-100% (highest scores)	Yes
07 MF (Doran)	96-100% (highest scores)	Yes
03 MF_SAT (Richards Boulevard)	96-100% (highest scores)	Yes
06 MAT_II	96-100% (highest scores)	Yes
10 OFF_DIST	91-95%	Yes
10 EQUIP_SHOP 30101 (Stockton)	91-95%	Yes
03 MF (Royal Oaks Warehouse)	91-95%	Yes
10 MF (Stockton)	91-95%	Yes
10 MF (Modesto)	91-95%	Yes
08 MF (Riverside)	91-95%	Yes

Facility Name	CalEnviroScreen Score	Is it located in a disadvantaged community? Yes/No
07 MF (Pomona)	91-95%	Yes
08 MF (Corona)	91-95%	Yes
07 MF (East Los Angeles)	91-95%	Yes
10 MF (Stockton 1690)	91-95%	Yes
06 MF (Porterville)	91-95%	Yes
06 MF (Wasco)	91-95%	Yes
07 MF (Humphrey)	91-95%	Yes
07 MF_ELEC (Metro)	91-95%	Yes
10 MAT_II	91-95%	Yes
HQ_OFF	86-90%	Yes
06 MF (Bakersfield)	86-90%	Yes
10 MF (Merced)	86-90%	Yes
11 MF (Santee)	86-90%	Yes
07 MF (Rosemead)	86-90%	Yes
10 MF (Lodi)	86-90%	Yes
06 MF (Delano)	86-90%	Yes
06 MF (Kettleman City)	86-90%	Yes
07 MF (Pacific Place)	86-90%	Yes
10 MF (Los Banos)	86-90%	Yes
07 MF_LAND (Apple)	86-90%	Yes
06 MF_SAT (Lost Hills)	86-90%	Yes
06 EQUIP_SUB 26201 (Bakersfield)	86-90%	Yes
07 EQUIP_SHOP 27101 (Sylmar)	81-85%	Yes
04 EQUIP_SHOP 24101 (San Leandro)	81-85%	Yes
04 MAT_III (Richmond)	81-85%	Yes
08 MF (Barstow)	81-85%	Yes
04 MF_TOLL (SFOBB)	81-85%	Yes
07 MF (Tarzana)	81-85%	Yes
03 MF (Northgate)	81-85%	Yes
03 MF (12th Street)	81-85%	Yes
06 MF (Bodfish)	81-85%	Yes
07 MF (Bellflower)	81-85%	Yes
07 MF (Middlebury)	81-85%	Yes

Facility Name	CalEnviroScreen Score	Is it located in a disadvantaged community? Yes/No
07 MF (Buena Vista)	81-85%	Yes
08 EQUIP_SUB 28201 (Barstow)	81-85%	Yes
04 MF_TOLL (Toll Bridge)	81-85%	Yes
04 EQUIP_SUB 24201 (Oakland)	81-85%	Yes
03 EQUIP_SHOP 23101 (Marysville)	76-80%	Yes
08 MF (Cajon)	76-80%	Yes
12 MF (Batavia)	76-80%	Yes
06 MF (Taft)	76-80%	Yes
07 MF (Foothill)	76-80%	Yes
08 MF (Essex)	76-80%	Yes
08 MF (Indio)	76-80%	Yes
07 MF (Long Beach)	76-80%	Yes
05 MF (Salinas)	76-80%	Yes
03 MF (Marysville)	76-80%	Yes
08 MF (Victorville)	76-80%	Yes
07 MF (North Hollywood)	76-80%	Yes
08 MF (Mountain Pass)	76-80%	Yes
08 MF (Lake Elsinore)	76-80%	Yes
08 MF (Blythe)	76-80%	Yes
07 MF (Ventura)	76-80%	Yes
08 MF (Hemet)	76-80%	Yes
12 MF (Stanton)	76-80%	Yes
10 MF (Patterson)	76-80%	Yes
07 MAT_III (Ventura)	76-80%	Yes
11 MF (Brawley)	76-80%	Yes
07 MF_ELEC (San Gabriel)	76-80%	Yes

Roadways Located in DACs

It's worth noting that approximately 20 percent of SHS lane miles are in DACs. Caltrans-maintained roadways connect communities throughout California, act as "Main Streets", provide access to all destination types, and serve as a major economic driver.

Although California's transportation system is associated with mobility and economic benefits, it unfortunately can also negatively impact the health of communities adjacent to the system. Therefore, Caltrans is engaged in multiple efforts to reduce the negative impacts from the transportation system by reducing or removing pollution associated with the system, reducing urban heat island effects with shade and functional green space, absorbing stormwater with green infrastructure, and increasing opportunities for active transportation. All these strategies support community health and resiliency.

Understanding Climate Risk to Planned Facilities

Newly constructed facilities will have the benefit of being designed with climate change resiliency in mind. Incorporating the most efficient energy management controls, lighting, and heating, cooling, and ventilations systems; optimizing building orientation; using resilient and renewable materials; implementing smart construction waste management; and locating the building, when possible, next to public transit and/or transportation corridors all can help make a building more environmentally friendly. This can also help the building obtain Leadership in Energy and Environmental Design (LEED) certification or become a Zero Net Energy building. Additionally, building location and findings from the Vulnerability Assessments, along with appropriate design characteristics, can be incorporated to mitigate specific climate stressors expected to impact the facility.

Table 1.10 a-g: Climate Risks to New Facilities

a.1: Annual Mean Max. Temperature

Facility Name	Historical Annual Mean Max. Temp. (1961 – 1990)	Annual Mean Max. Temp. (2031 – 2060)	Change from Historical to Annual Mean Max. Temp (2031-2060)	Annual Mean Max Temp. (2070-2099)	Change from Historical to Annual Mean Max. Temp (2070-2099)
09 MF (New Tehachapi)	67.54	72.825	5.285	76.4925	8.9525
08 MF (New Fontana MF)	76.67	81.7275	5.0575	85.345	8.675

a.2: Annual Mean Min. Temperature

Facility Name	Historical Annual Mean Min. Temp. (1961 – 1990)	Annual Mean Min. Temp. (2031 – 2060) °F	Change from Annual Mean Min. Temp (2031-2060)	Annual Mean Min. Temp. (2070-2099 °F	Change from Annual Mean Min. Temp (2070-2099)
09 MF (New Tehachapi)	41.63	46.505	4.875	50.62	8.99
08 MF (New Fontana MF)	49.69	54.3775	4.6875	58.39	8.7

b. Projected Changes in Precipitation

Facility Name	Annual Mean Maximum precipitation (1961-1990) (in/year)	Annual Mean precipitation (2031-2060) (in/year)	Extreme Precipitation (1961-1990) (in/day)	Extreme Precipitation (2031-2060) (in/day)
09 MF (New Tehachapi)	11.20866747	11.43491011	3.802725993	3.42924661
08 MF (New Fontana MF)	21.41142889	22.22420098	7.247514429	8.418687328

c. Projected Changes in Extreme Heat

Facility Name	Extreme heat threshold (EHT) °F	Average number of days above EHT (1961-1990)	Average number of days above EHT (2031-2060)	Increase in number of days above EHT
09 MF (New Tehachapi)	95	4	31	27
08 MF (New Fontana MF)	102	4	24	20

d. Projected Sea Level Rise

Facility Name	Area (California Coast, San Francisco Bay, Delta)	Sea Level Rise 0.0 m	Sea Level Rise 0.5 m	Sea Level Rise 1.0 m	Sea Level Rise 1.41 m
09 MF (New Tehachapi)	n/a	n/a	n/a	n/a	n/a
08 MF (New Fontana MF)	n/a	n/a	n/a	n/a	n/a

e. Wildfire Threat Risk

Facility Name	Current Fire Hazard Severity Zone (low, medium, high, very high)
09 MF (New Tehachapi)	Moderate
08 MF (New Fontana MF)	High

f. Projected Changes in Wildfire

Facility Name	Acres Burned (1961-1990)	Acres Burned (2031-2060)
09 MF (New Tehachapi)	5	5
08 MF (New Fontana MF)	7	7

g. Projected Changes in Heating and Cooling Degree Days

Facility Name	Heating/Cooling Degree Days (1961-1990) (HDD/CDD)	Heating/Cooling Degree Days (2031-2060) (HDD/CDD)
09 MF (New Tehachapi)	4436/631	3139/1408
08 MF (New Fontana MF)	2002/1438	1192/2521

Adaptation Strategies

The following measures for siting, design, and construction, and operational activities could be considered for implementation:

- Considering different building orientations that limits solar gain into the structure, reducing energy consumption

- Installing white roof membranes and/or roof-mounted solar panels that reduce heat generated from rooftops and reflect energy
- Using exterior shading devices on windows to reduce the need to cool buildings
- Minimizing the use of impervious paving materials on highways and in parking lots; designing all other hardscapes to be pervious; using white-colored concrete or micro- surfaced asphalt with lighter color seals
- Providing landscaping to shade facilities and parking lots
- Providing parking lot canopies with reflective colors and/or solar panels to help offset energy consumption
- Super-insulating the building envelope to reduce energy consumption

One possible strategy is to require all designs to contain a percentage of hardscape that does not contribute to the heat island effect. A policy would be needed to address increase project costs due to implementing these strategies and would need to be applied early in the project scoping phase to ensure hardscape and building designs can be properly selected and budgeted. Caltrans will assess additional measures to reduce risk exposure to planned Caltrans facilities associated with climate stressors.

Table 1.11: New Facilities and Disadvantaged Communities and Urban Heat Islands

Facility Name	Located in a Disadvantaged Community (yes/no)	Located in an urban heat island (yes/no)
09 MF (New Tehachapi)	No	No
08 MF (New Fontana MF)	No	Yes

Natural Infrastructure

EO B-30-15 also directs agencies to prioritize natural and green infrastructure solutions. Natural infrastructure is the "preservation or restoration of ecological systems or the utilization of engineered systems that use ecological processes to increase resiliency to climate change, manage other environmental hazards, or both. This may include, but need not be limited to, flood plain and wetlands restoration or preservation, combining levees with restored natural systems to reduce flood risk, and urban tree planting to mitigate high heat days" (Public Resource Code Section 71154(c)(3)).

The Water and Wastewater (W&WW) Branch (located within the Caltrans Division of Engineering Services (DES)) identifies natural and green infrastructure solutions in all Advanced Planning Studies (APS) prepared for projects. These project alternatives reduce environmental impacts by reducing water and

energy use, travel costs, greenhouse gases, etc. Some of the project alternatives include wetlands, anaerobic reactors, water recycling technology, low-impact water retention facilities, Supervisory Control and Data Acquisition (SCADA) Electrical Systems, ultra-low and waterless toilet fixtures, drip irrigation, and using potable and recycled water on drought tolerant landscaping.

Caltrans began implementing some of these strategies during the most recent drought. Caltrans developed new practices to save water at facilities through underground drip irrigation systems, advanced recycling of wastewater, and waterless urinals. All facilities that are responsible for washing Caltrans vehicles use "wash racks" where the wastewater is diverted and treated before being discharged to protect environment and surrounding communities.

Full Life Cycle Cost Accounting

EO B-30-15 directs State agencies to employ full life cycle cost accounting in all infrastructure investment. Lifecycle cost accounting includes:

- Considering initial investment costs, as well as lifetime operation and maintenance costs under changing climate conditions, including changing average conditions and increases in extreme events
- Applying non-market evaluation methods such as travel cost, avoided costs or contingent valuation to capture hard to quantify benefits and costs

Caltrans is implementing the following solutions to climate change issues into planning, design, maintenance, and operations into funding infrastructure throughout the state.

- Climate change stressors and extreme events that could shorten the lifetime of the asset
- Cost from implementing new strategies combatting climate change into existing facilities or designing them into future projects
- Needs in additional maintenance to upkeep an asset
- Functionality of machinery under new climate stressors

Caltrans DES uses life-cycle considerations in Caltrans facility design by utilizing enhanced material finish specifications or products that require less preventive maintenance. These additional steps increase initial costs but allow for longer maintenance intervals. Whether the steps consist of a more protective finish on structural steel, use of a waterproof sealer on masonry or concrete, or better paint quality for wood, they all contribute to a more sustainable building and future savings on maintenance costs.

Understanding Climate Risk to the State Highway System

While the greater part of this chapter focuses on buildings, this section highlights Caltrans risk and adaptation efforts to climate change along the SHS.

Risk from Increasing Temperatures

As part of Caltrans' ongoing Climate Change Vulnerability Assessments, Caltrans has analyzed and identified vulnerable segments of the SHS by reviewing projections of the seven-consecutive-day maximum temperatures for 30-year-average periods centered on the specific years of 2025, 2055, and 2085. These values were derived for each of the ten California Global Climate Models (GCMs), including the four required under Representative Carbon Pathway (RCP) 8.5, due to their use in select design mixes for asphalt. Caltrans highlighted the change in temperatures according to the median model across the state.

Implications for Roadways and Caltrans Right-of-Way

In general, increasing temperatures alone will not likely have a significant effect on roadway signs, post, guardrails, or performance. However, in locations where the range of temperature experienced may increase significantly, Caltrans pavement engineers might consider adjusting the material mix for roadway construction materials appropriate for each impacted location.

Changing temperatures will have a larger effect on the landscaping and vegetation within and near the right-of-way. As temperatures rise, existing landscaping will be more exposed to drought. Especially in drought-prone regions, Caltrans will continue to look for innovative and efficient roadside applications to conserve water and tolerate higher temperatures. Incorporating native species into landscaping could reduce water use because of their adaptation to an arid environment. Additionally, increasing temperatures and drought have made trees more susceptible to bark beetle infestation in certain areas of the state. Caltrans is one of five leading agencies for the state's Tree Mortality Taskforce which has already removed 107,000 dead trees, many of which are near the SHS, at a cost of $2,000 per tree. To prevent further cost and damage to the right-of-way and road, Caltrans is removing trees in the "strike zone" — the area in which a tree poses a risk to the roadway. Instead of replanting trees, maintenance crews are stabilizing these slopes by leaving the tree's root-ball and using emulsions to prevent slope deterioration.

More comprehensive analysis of temperature change on roadway and landscaping facilities is provided as part of Caltrans' Climate Change Vulnerability Assessments.

Risk from Extreme Heat Events

Pavement design and material choice is a critical part of project development. Caltrans analyzes temperature variations at project locations when designing pavement and choosing materials; Caltrans does this in part by using annual daily average minimum and average seven–consecutive-day maximum temperatures. An increase in pavement maintenance issues can create service interruptions on highways and lead to higher costs for Caltrans. Rising temperatures could lead to several design concerns, including fluctuating water saturations, varying ground conditions, and higher levels of pavement stress. Additionally, higher temperatures could cause expansion that deteriorates bridge joint seals, which could accelerate replacement schedules, and even affect the bridge superstructure. Therefore, Caltrans planners work with pavement engineers and testing labs to ensure that roadway design standards will continue to withstand larger daily variations in temperature.

An analysis of extreme heat impacts to roadways is not currently included as part of the Caltrans Climate Change Vulnerability Assessments. The increase in average high and low temperatures described in the previous section (Risk in Increasing Temperatures) are considered the primary metrics of concern regarding risks to roadways.

For roadway design, Caltrans will review its process for selecting asphalt binder. This material is chosen based primarily on temperature ranges at different locations. There are nine Caltrans pavement regions throughout the state to better accommodate varied climates. Caltrans will need to review its regional specifications to determine whether adjustments should be made to the design mix.

Extended periods of high temperatures will affect safety conditions for employees that work long hours outdoors, making heat-related illness of a higher concern. Right-of-way landscaping and vegetation will also have to survive longer periods of high temperatures and in turn could use a greater amount of water to maintain survival.

Wildfires associated with extreme heat are also a concern. Caltrans is evaluating the increased risk of wildfire associated with extreme heat and changes in vegetation due to changing weather patterns. Wildfire could pose a threat to Caltrans facilities throughout the state, and in catastrophic cases, displace workers for extended periods of time. Generally, facilities in rural, arid environments are expected to encounter the greatest threat to wildfire while facilities in the Central Valley, high desert, and desert (southeastern California) are expected to encounter the greatest impacts from extreme heat.

Mitigation Strategies

Caltrans has already taken steps to mitigate the effects of climate change in the highway right-of-way. Caltrans reduced water usage by 66 percent between 2010 and 20120 Additionally, Caltrans Division of Maintenance and Landscape Architecture Program continues to install drought-tolerant plants and water-efficient irrigation components, including smart irrigation controllers, to reduce the need for watering in the right-of-way.

Caltrans could also educate bicyclists and pedestrians about heat illness prevention and treatment. To provide shade on high-heat days, Caltrans will consider constructing shaded sidewalks and paths, as well as shelters at bus stops, along non-motorized facilities. Planting additional trees would also cool the local environment and mitigate the urban heat island effect. Where possible, open-grade asphalt, which is pervious, is used to increase water infiltration.

Risk from Wildfire

Wildfire has a direct impact on the SHS. Proper land management along the SHS right-of-way is crucial in mitigating the likelihood of wildfires igniting in fire-prone areas. The thinning of forested land buffering the roadways makes it so that there is less interaction between wildfire fuel (vegetation) and possible ignition sources. Additionally, if the land is burning, it gives a safer buffer of protection during evacuations and for emergency personnel. Besides reducing the risk of wildfire by thinning vegetation along the right-of-way, it also benefits the SHS in additional ways. It provides greater visibility through more light onto the roadway and provides less shade so that pavement dries out faster and melts ice more quickly in mountainous regions. These benefits all create a safer driving experience.

Wildfires have additional risk associated with them regarding the SHS. Burn zones leave vast areas of land unprotected from rain in the winter following the wildfire. This can lead to mudslides on to roadways, further damaging the SHS. Also, debris from wildfire can wash into and clog storm drains and culverts, potentially undermining the roadway. Clogged culverts also can cause roadway over washing during runoff events. Severe mudslides can close the SHS for extended periods of time. This could create a public safety risk if members of the public are isolated. Once the road is reopened, additional maintenance may need to be completed to bring the pavement back to optimal operational conditions.

Risks from Changes in Precipitation

Increased precipitation will significantly affect California's transportation assets in several ways including flooding, landslides, washouts, and structural damage. Culverts can be clogged by debris associated with heavy rainfall, causing water to inundate the highway or undermine the roadbed. Heavier snowstorms can cause delays and closures of roadways, putting the public at risk. In certain locations, entire sections of roads can be undermined and washed away, taking months to repair or replace, and cutting communities off from vital resources. Bridges can also experience increased riverine flooding and temporary inundation which could damage the roadbed or structure and require costly repairs. Also, bridge foundations could be at risk from erosion with extreme riverine flooding. Coastal and estuarine roadways could experience more frequent closures when flooding is combined with higher sea levels and storm surge. Caltrans experienced several of these effects in 2017 when the state experienced record-setting precipitation. Whether from heavy precipitation or SLR, roadway inundation will require floodwaters to be pumped out, which could strain pumps that are exceeding capacity.

Higher rates of precipitation can also lead to severe mudslides that temporarily close sections of the SHS. This is especially common in regions that recently experienced severe wildfires where the soil is unstable. Roads along steep slopes are prone to slip outs, while roads at the base of floodplains may experience washouts during heavy rainstorms.

Adaptation Strategies

Caltrans has several measures in place to mitigate impacts to highways and bridges from extreme precipitation. The Division of Maintenance's Scouring Prevention Program conducts scour evaluations of all state and local bridges to identify whether precipitation and flooding have eroded the support for the bridge. The Division of Maintenance also has a Culvert Inspection Program that maintains an inventory of those assets and assesses their physical condition.

Caltrans could develop adaptation strategies, including:

- Where downstream properties would not be impacted, resizing culverts in areas with expected higher precipitation based on climate change projections could expedite drainage
- Create upstream detention or retention facilities
- Design and construct debris control structures at the inlets of culverts to prevent clogging of culvert inlets

- Including green/natural infrastructure in designs that can reduce runoff affecting facilities, such as natural detention basins
- Realigning roadways away from steep slopes that are prone to slip outs
- Utilizing pervious pavement where reasonable depending on vehicle weight and traffic volume for increased drainage

Ongoing Evaluation

The Caltrans Climate Change Vulnerability Assessments analyze projected impacts from changing precipitation. Measurements used in these assessments focus on the percentage change in 100-year storm precipitation depth and intensity, since Caltrans often designs culverts and roadways to these specifications. The 100-year storm value has been analyzed for 30-year-average periods centered on the specific years of 2025, 2055, and 2085. This value was derived for each of the ten California GCMs, including the four required, using both RCP 4.5 and RCP 8.5. Caltrans highlighted the change in precipitation according to the median model HadGEM2-CC (Hadley Global Environment Model 2 - Carbon Cycle) but will further investigate methods for applying additional or different modeled outputs when evaluating the risk to projects.

Determining which roadways are at greatest risk from changing precipitation (specifically increased precipitation) will require further study since there is a range of analysis methods that may be useful and will require varying levels of input. Therefore, the timeline for implementation will be dependent on the analysis method selected. Caltrans planners and stormwater/hydraulic engineers are working together to develop methods for statewide assessment of at-risk assets and project design analysis.

Risks from Sea Level Rise

Caltrans is analyzing the expected impacts of sea level rise (SLR) on roadways across the state as part of the Caltrans Climate Change Vulnerability Assessments. Caltrans is using data extracted from the Coastal Storm Modeling System (CoSMoS) model to identify specific postmiles along the SHS exposed to sea level rise and storm surge at 0.25 meter increments up to 2 meters, and a high value of 5 meters. These outputs are being generated for the entire coastline. In low-lying areas, even a small increase in SLR could have a drastic effect on extended lengths of roadway that are situated just above sea level. Short term adaptation strategies include:

- Pumping out inundated portions of roadway
- Constructing sea walls to mitigate inundation
- Raising roadways out of low-lying areas

- Rerouting portions of the SHS that may be permanently inundated.

Along with SLR, storm surge will have a greater impact to susceptible areas through road surface damaged by debris during inundation and portions of the SHS being closed during these events.

Urban Heat Island

Caltrans has studied urban heat island effects in relation to different roadway materials and is continuing to investigate potential treatments that could help reduce urban heat island effect. Pavement materials of a lighter color have a higher albedo, which retains less energy from the sun, adding to a cooler surface and cooler air temperatures in the surrounding area.

Integrating Climate Change into Department Planning and Funding Programs

EO B-30-15 extends beyond Caltrans operational infrastructure to broader planning efforts such as corridor and system planning. In addition to the specific plans below, Caltrans uses the Office of System Planning to provide the basis for identifying current and future deficiencies on the SHS and identifies strategies and projects to address deficiencies and make improvements to meet Caltrans goals.

Table 1.12: Integration of Climate Change into Department Planning

Plan	Have you integrated climate?	If no, when will it be integrated?	If yes, how has it been integrated?
California Transportation Plan (CTP)	Yes	N/A	The Plan supports the state's climate goals and renewable energy goals, as described by CTP Goal 2, Policy 3: "Adapt the Transportation System to Reduce Impacts from Climate Change"
Caltrans Strategic Plan	Yes	N/A	Climate change adaptation strategies are woven into each of the 5 priorities of the Strategic Plan

Table 1.13: Engagement and Planning Processes

Plan	Does this plan consider impacts on vulnerable populations?	Does this plan include coordination with local and regional agencies?	Does this plan prioritize natural and green infrastructure?
Environmental Justice and Community Impact Assessments	Yes	Yes	Yes

Table 1.14: Climate Change in Funding Programs

Grant or funding program	Have you integrated climate change into program guidelines?	If no, when will it be integrated?	Does this plan consider impacts on vulnerable populations?	Does this program include coordination with local and regional agencies?
Clean California	No		Yes	Yes
Advanced Mitigation	Yes		Yes	Yes

Measuring and Tracking Progress

Changing climate conditions necessitate an adaptive management approach. An adaptive management approach is informed by tracking changing climate conditions and the performance of a plan or project. Building check points into a project or plan timeline can help to create a system for regular review and, if needed, adjustments.

Caltrans faces numerous challenges from climate change to both its buildings and the SHS, prompting development of procedures for tracking changing climate conditions at these facilities.

Buildings

Caltrans' buildings face flood risks from heavier precipitation and heat waves from increasing temperatures. Caltrans currently does not have a structured method for tracking changing climate conditions at facilities but will work to

establish and implement a tracking methodology. Caltrans has thermometers and rain gauges at most district offices and maintenance facilities that will create a baseline and help track changes through the end of the century at both a local and state-wide level.

Roadways

Regarding the highway system, Caltrans faces different challenges in each region. Coastal California faces rising sea levels and storm surge, while Central Valley and desert regions will be increasingly susceptible to higher average temperatures, extreme heat, and drought. Lastly, mountainous regions are at greatest risk from wildfires and landslides or mudslides when heavy precipitation follows a burn. Caltrans could compile data from emergency maintenance events on the state's roadways caused by weather and this data would help Caltrans create a baseline of climate impacts from which changes can be measured. The Caltrans Division of Transportation Planning is working with the Caltrans Divisions of Maintenance and Emergency Management to coordinate and improve existing reporting procedures for emergency maintenance projects to clearly identify when failures are caused by climate events on roads and highways. Additionally, the Caltrans Climate Change Vulnerability Assessments provide detailed data regarding the SHS by postmile and highlight areas that are being affected most by a changing climate.

Measuring Progress Toward Goals

In 2019, Caltrans completed all 12 Climate Change Vulnerability Assessments that establish a baseline of climate change effects on the SHS. Using the findings from the vulnerability Assessments, Caltrans Developed the Adaptation Priority Reports. These reports analyzed the SHS, Bridges, large and small culverts within vulnerable areas identified in the Vulnerability Assessments.

Flexibility and Adaptability in Long-Term Planning

Caltrans is working with climate scientists, multiple state agencies, and local and regional partners to develop new planning and design methods that will incorporate solutions to climate change. To build flexibility and adaptability into long-term planning, Caltrans must understand the probability and range of multiple future climate scenarios, and then make decisions accounting for the associated risks climate change poses to its facilities and the SHS. This requires close coordination between all stakeholders since decisions must incorporate the best estimates of climate change, costs, impact to communities, and impact of these decisions on the operation of the transportation system.

Integrating Climate Change into Infrastructure Investment

Caltrans is proactively addressing the issue of climate change both internally, through Director's Policies and externally by rigorously following state and federal legislation.

Internally, Director's Policy 30 (DP-30) on Climate Change was signed on June 22, 2012. It requires all Caltrans divisions and programs, as appropriate and feasible, to "incorporate climate change mitigation and adaptation considerations into all facets of operations, and [to] work to partner with local, State, federal entities, and other stakeholders as appropriate to coordinate climate change related activities."

Externally, EO-B-30-15 Directs state agencies to integrate climate change into all planning and investment, including accounting for current and future climate change conditions in infrastructure investment.

Caltrans is continuously reviewing the project development process to integrate climate change into each phase of project planning and delivery. The Caltrans Division of Transportation Planning has released guidance to identify each project's risk from climate change, and to the extent possible coordinate with existing local/regional vulnerability assessments and adaptation plans during the project scoping phase.

Identifying and Prioritizing Natural and Green Infrastructure Investment

Caltrans has partnered with non-profit organizations, research universities, and local and regional agencies on adaptation pilot projects to establish natural and green infrastructure designs that could reduce or eliminate expected climate impacts. Once effective methods and design solutions are identified, Caltrans will provide guidance to help project managers and external partners implement these options in their project scoping, design, and selection processes. Funding for adaptation strategies that emphasize green infrastructure will be a continuing challenge. Caltrans will work with governmental and non-governmental partners to identify funding sources for high-priority projects.

CHAPTER 2 – ZERO-EMISSION VEHICLES

Department Mission and Fleet

This Zero- Emission Vehicles (ZEV) Chapter demonstrates to the Governor and the public the progress Caltrans has made toward meeting the Governor's sustainability goals related to ZEVs. This report identifies successful accomplishments, ongoing efforts, outstanding challenges, and future efforts.

Transportation continues to be the largest source of greenhouse gas (GHG) emissions in California–with tailpipe emissions, oil extraction, and oil refining combined accounting for roughly 50 percent of all in-state emissions. To reduce emissions in the transportation sector, the Governor issued Executive Order N-79-20. The Executive Order set ZEV targets for California and called upon each state department to develop strategies to meet California's ZEV goals.

Caltrans ZEV Action Plan 2.0 guides Caltrans' ZEV-related policies and plans by identifying key actions to meet the State's ZEV targets. Establishing a Green Fleet is the first of the seven activity categories in the Plan. The activities within this category include the implementation of Caltrans workplace and fleet EV charging and the development and implementation of an updated Caltrans Fleet Acquisition Plan.

The establishment of a Green Fleet also includes replacing existing fossil fuel locomotives with those powered by renewable energy. Caltrans is currently developing strategies to transition to a 100% zero-emission intercity rail fleet by 2035.

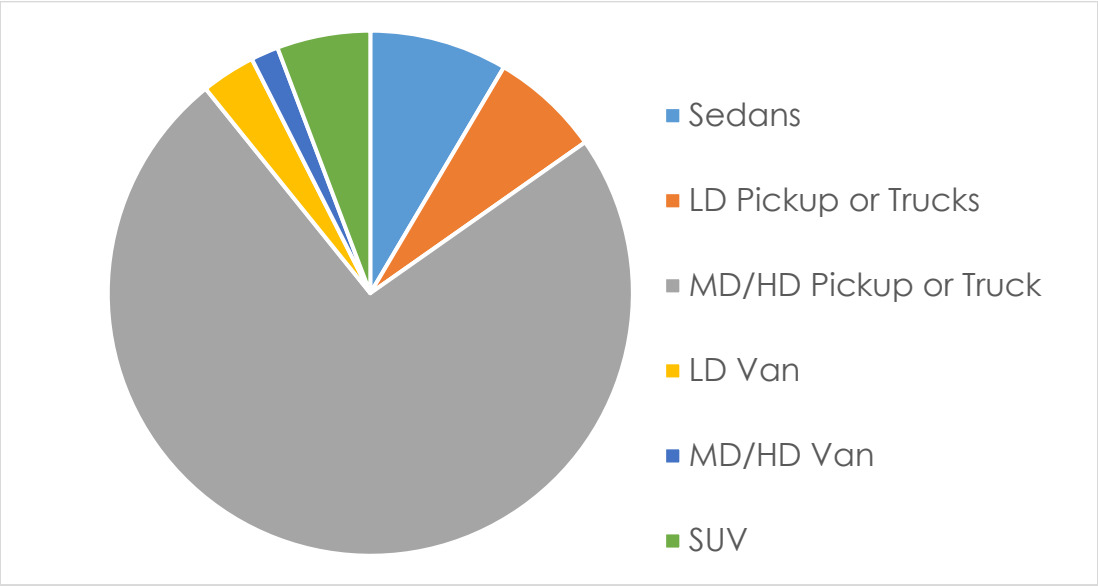
Caltrans is responsible for managing and maintaining the SHS transportation infrastructure and relies on the stability of its fleet to keep critical routes open for the millions who travel the system each day. Currently, Caltrans operates the largest and most diverse state fleet in California with more than 12,000 vehicles.

These vehicles include passenger vehicles which carry personnel to meetings with local agencies and to job sites for inspections; and medium- to heavy-duty vehicles whose operators are responsible for plowing snow-covered roads, repairing guardrails, providing barriers between field crews and live traffic, striping roadways to improve visibility, removing hazardous debris, and performing vegetation control.

Additionally, Caltrans owns 39 passenger rail locomotives that operate on Amtrak's Capitol Corridor, Pacific Surfliner, and San Joaquin routes. Despite the

COVID-19 Pandemic, in 2020 these locomotives transported 1.7 million passengers.

Graph 2.1: 2020 Composition of Vehicle Fleet



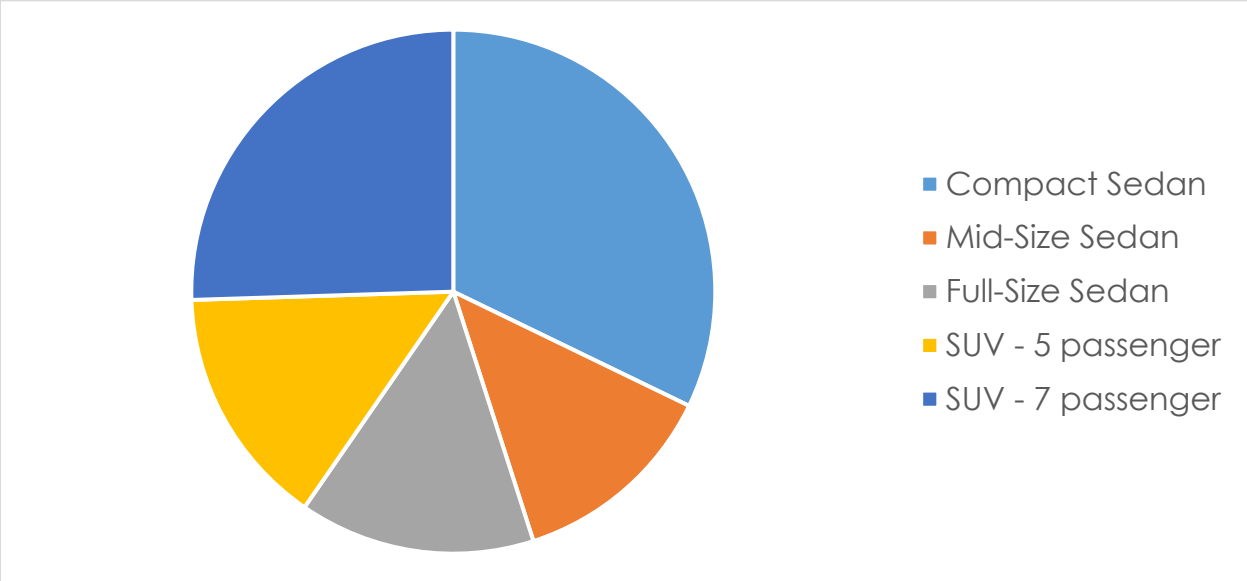
Light-Duty Fleet Vehicles

Of the more than 12,000 vehicles and pieces of equipment in Caltrans fleet, over 3,000 are light-duty vehicles. Caltrans light-duty fleet includes sedans, sport utility vehicles (SUVs), minivans, and pick-up trucks. The light-duty fleet is utilized to fulfill a variety of transportation needs. These vehicles transport employees between Caltrans facilities for meetings or to travel to local, regional, and state agencies to participate in planning, project, and administrative meetings. Light-duty vehicles are also used to deliver mail, small packages, and supplies between facilities. Prior to the COVID-19 pandemic, the vehicles were also used for multi-day trips to training seminars and conferences. The fleet's sedans and mini vans are generally used on paved roads and highways for trips that can vary from just a few miles to longer full day trips.

Caltrans light-duty pick-up trucks and SUVs are utilized on paved roads and highways, as well as on construction job sites and dirt roads with rough terrain. These vehicles are used by the surveying and environmental staff to transport equipment and sensitive sampling/testing equipment to rugged job sites. Resident engineers utilize these vehicles to monitor and inspect construction

progress and meet with contractors at job sites. Traffic Operations Divisions use the vehicles to perform technical traffic analyses and provide traffic design support for project delivery. The Division also uses its vehicles to monitor and manage the operation of lanes, traffic signals, highway signs and freeway cameras.

Graph 2.2: Composition of Light-Duty Vehicle Fleet



Caltrans has worked strenuously to increase fleet efficiency year after year. The average mileage per gallon (MPG) has steadily increased from 18.3 mpg in 2012 to 22.36 mpg in 2019. Caltrans MPG has become more efficient since the number of ZEVs and hybrids has grown from 175 in 2012 to 392 in 2020. Caltrans expects to see a continued decline in fuel consumption as its ZEV fleet expands.

Medium and Heavy-Duty Fleet Vehicles

The medium- and heavy-duty fleet is utilized primarily by the Division of Maintenance. The Division of Maintenance protects public safety and preserves California's SHS through routine maintenance and repair of the system. The Division of Maintenance also responds to emergencies and hazards caused by vehicular collisions, severe weather, and wildfires. The Division of Maintenance ensures travelers and goods reach their destination safely and efficiently.

Medium- to heavy-duty fleet vehicles include vehicles such as larger pick-up trucks, dump trucks, full size passenger vans, semi-trucks used to transport equipment, snowplows, sweepers, and various utility trucks. Many of the

medium- to heavy-duty vehicles are highly specialized, requiring Caltrans to design, fabricate, and assemble many of the vehicle components. Some of the vehicles are utilized on paved roads by maintenance crews who are performing weed and litter abatement or tree trimming. Other vehicles are utilized in the most adverse of conditions, such as keeping the roads clear during a snowstorm, removing mud and rocks from landslides, or clearing fallen trees after a wildfire.

In maintaining and repairing California's SHS, these vehicles can be driven just a few miles to transport a crew and materials to a job site where a guard rail is to be repaired. Or a dump truck with a plow attachment can be driven throughout the entire day in a remote area to clear the roadway of hazardous conditions.

Graph 2.3: Composition of Medium and Heavy-Duty Vehicle Fleet Subject to the ZEV First Purchasing Mandate

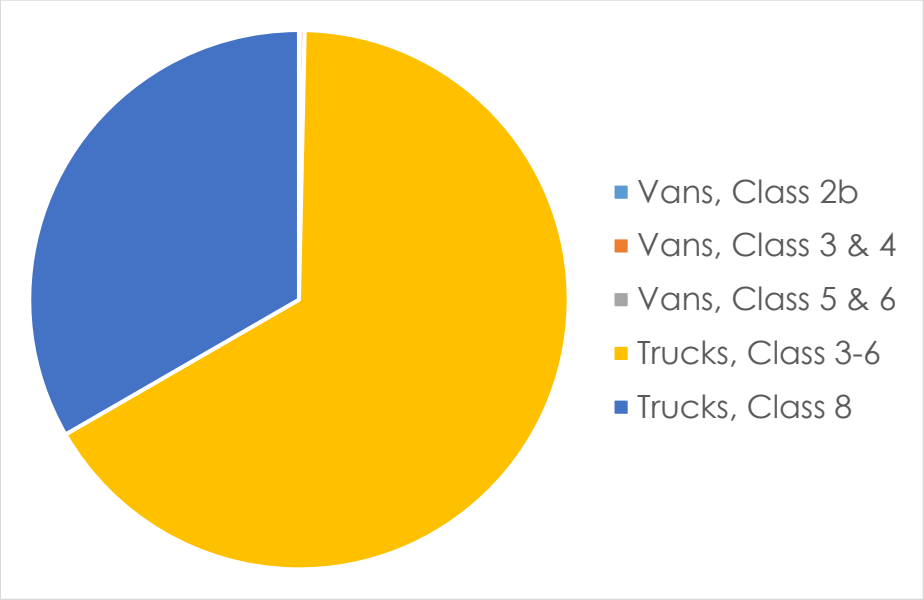


Table 2.1: Total Fuel Purchased in 2020

Fuel Type	Diesel	Gasoline	Renewable Diesel
Total Amount in Gallons	3,468,110	6,168,289	2,080,576

Incorporating ZEVs into the State Fleet

Pursuant to the Governor's Executive Order (EO) B-16-12, state departments are required to increase the number of ZEVs within their state fleet. As departments move towards this initiative, additional measures have been placed on the ZEV vehicle purchasing policy. Departments are advised, as of January 1, 2020, to purchase vehicles from authorized Original Equipment Manufacturers (OEMs) that have aligned with the California Air Resources Board (CARB). In addition, the state anticipates significant economic impacts from the COVID-19 pandemic which will result in a decrease in state revenues for fleet purchasing.

With these policies in place, departments should consider the most effective ways to incorporate ZEVs into their fleet.

Light-Duty ZEV Adoption

A widespread shift to ZEVs is essential for California to meet its GHG emission reduction goals. State departments are now required to incorporate and prioritize a larger number of light-duty ZEVs in their vehicle fleets. Starting in fiscal year (FY) 17/18 the percentage of new light-duty vehicles that must be ZEVs began increasing by 5 percent each year, reaching 25 percent in FY 19/20 and 50 percent in FY 24/25.

Caltrans was among the first state agencies to adopt ZEVs and build ZEV charging infrastructure. Many of the vehicles in Caltrans' light-duty fleet can be replaced at the end of the duty cycle with ZEVs currently on the market and available for purchase. Recent increases in mileage ranges allow for most light-duty Caltrans sedan trips to be completed in a battery electric vehicle. Battery electric sedans and crossovers will replace most motor pool vehicles and assigned passenger vehicles in the coming years. In addition to battery electric vehicles, Caltrans has purchased hydrogen fuel cell vehicles. Hydrogen fueling infrastructure continues to grow in California, providing more options for trip planning.

In the next few years, Caltrans will have additional vehicles to select from to meet the fleet needs. Caltrans is especially interested in the selection of electric pickup trucks coming to market in the next year or two. Currently, there are no ZEV replacements for light-duty trucks readily available for purchase. As the replacement of light-duty trucks has continued to be a challenge, Caltrans investigated possible solutions, such as replacing Caltrans' light-duty trucks with SUVs. However, in most cases it was more practical for Caltrans to replace aging light-duty trucks with more fuel-efficient models.

Caltrans continues to install electric vehicle infrastructure to support the use of these vehicles, allowing for start-point to end-point charging. A complete charging infrastructure must be in place to allow for the adoption of battery electric vehicles. These chargers, along with the Caltrans logo marked ZEVs, communicates the State's sustainability commitment to the traveling public.

Table 2.2: Light-Duty Vehicles in Department Fleet Currently Eligible for Replacement

	Sedans	Minivans	Pickups	SUVs, 5 passengers	SUVs, 7 passengers	Total
# Of vehicles eligible for replacement	509	99	441	223	247	1519

Table 2.3: Light-Duty ZEV Additions to the Department Fleet

Table Header Format	21/22	22/23	23/24	24/25	25/26
Battery Electric Vehicle	0	600	550	650	700
Plug-in Hybrid Vehicle	0	0	0	0	0
Fuel Cell Vehicle	0	0	0	0	0
Percent of total purchases	n/a	55%	58%	87%	78%
Required ZEV Percentage	35%	40%	45%	50%	50%
Total number of ZEVs in Fleet*	275	875	1425	2075	2775

Medium- and Heavy-Duty ZEV Adoption

Like the light-duty purchasing policy above, the adoption of MD/HD ZEVs is essential to meet GHG emission reduction goals. As of July 2020, State Administrative Manual (SAM) section 4121.9 requires state agencies to prioritize the purchasing of MD and HD ZEVs vehicles into their fleets. Additionally, beginning December 31, 2025, departments are required, per Assembly Bill (AB) 739, to replace 15 percent of vehicles with a gross weight rating of 19,000 pounds or more with ZEVs. This percentage will increase to 30 percent by December 31, 2030.

Vehicles over specified mileage and age thresholds are eligible for replacement. Caltrans currently has 1,770 MD/HD vehicles eligible for replacement in Classes 2B, 3, 4, 5, 6, and 8. The majority of these vehicles are trucks in classes 3-7 and 8. These trucks are utilized to maintain the SHS and transport equipment between job sites and maintenance facilities.

Currently ZEVs are available on statewide commodity contracts in Classes 2B, 3, 4, 5, 6, and 8; however, these vehicles are not readily available in adequate quantity to meet Caltrans needs. Caltrans faces several other challenges with replacing the medium- and heavy-fleet vehicles with ZEVs. First, ZEVs currently cost much more initially than diesel and gasoline-powered trucks. Caltrans has a finite amount of funds for equipment replacement each year and budgeting decisions must prioritize fleet replacements based on the greatest need. Secondly, Caltrans designs, fabricates, and assembles much of what becomes the final versions of medium- to heavy-duty fleet vehicles put into service. In many cases, Caltrans purchases only a rolling chassis from the manufacturer. The process from procurement to finished vehicle is complex and lengthy. Adding new vehicle configurations and body styles to this process will require a great amount of time and effort. Also, new skills may be required of those who design, manufacture, and inspect the ZEV vehicles.

Transitioning Caltrans medium to heavy-duty fleet to ZEVs will include preparing new electrical and mechanical design drawings and schematics. The equipment inspections for quality assurance and pre-delivery which are required prior to acceptance of new fleet vehicles will need to be updated. Once inspections are complete and equipment is received, shop production staff fabricate, build, assemble, and ready equipment for service, a process requiring strict scheduling. The current shop schedule for Caltrans Headquarters is booked two years out for fleet production. The specialized nature of the ZEV equipment will increase the workload, potentially pushing the timeline out further. Once at the service locations, additional training will need to be conducted with the equipment operators.

Table 2.4: MD/HD Vehicles in Department Fleet Currently Eligible for Replacement

Vehicle Class	Vans, Class 2b	Vans, Class 3 & 4	Vans, Class 5 & 6	Trucks, Class 3-6	Truck, Class 8	Total
# Of vehicles eligible for replacement	1	5	0	1174	590	1770

Table 2.5: M/HD ZEV Additions to the Department Fleet

Table Header Format	21/22	22/23	23/24	24/25	25/26
Battery Electric Vehicle	15	10	10	245	510
Plug-in Hybrid Vehicle	0	0	0	0	0
Fuel Cell Vehicle	0	0	0	0	0
Percent of total purchases	6%	2%	2%	45%	58%
Total number of ZEVs in Fleet	16	26	36	281	791

ZEV Take-home Vehicles

Vehicles authorized for home storage, per SAM Section 4109, are subject to all applicable ZEV purchasing policies. Caltrans primarily issues home storage permits to staff tasked with emergency response on the SHS, with the permit assigned to by user rather than vehicle. Due to the nature of the work performed on an emergency basis, the vehicles assigned have typically been pickup trucks or utility vehicles that did not have ZEVs available in their class.

With the increasing availability of light- to medium-duty trucks, Caltrans is beginning to incorporate these vehicles into their fleet. In the future, Caltrans will evaluate policies with control agency guidance cost reimbursement, such as home charging station installation or energy use for staff assigned a home storage permit for ZEVs.

Telematics Plan

In accordance with SAM section 4122, state departments are required to install telematics devices on all state fleet assets. Departments were required to install all telematics devices on light-duty vehicles by August 1, 2021 and are required to install telematics on all remaining assets by February 1, 2022. Additionally,

departments were to develop and issue a telematics policy specific to their needs by March 31, 2021.

Telematics is a method of managing fleet assets effectively. Using the Global Positioning System (GPS)and on-board diagnostics, telematics provides valuable information that often results in fuel savings and improved vehicle utilization. Telematics is especially important for verifying that plug-in hybrid vehicles are maximizing the use of electric fuel rather than gasoline. The rule requiring 50 percent of ZEVs purchased to be battery-electric vehicles (BEVs) is not in place for fleets making use of telematics for all ZEVs.

Following a telematics pilot, the Caltrans Executive Board approved the use of telematics devices for Caltrans' fleet. In June 2014, the California State Transportation Agency Secretary approved the use of telematics devices on all of Caltrans' fleet vehicles. Installing telematics in the Caltrans fleet has resulted in:

- Automated and accurate collection of fleet management data and reporting for most fleet assets (not compatible with ZEVs)
- Reduced fuel usage and accompanying GHG emissions
- Enhanced asset warranty management
- Reduced manual reporting and elimination of the web based CarTags system
- Deterrence of theft
- Reduced physical smog tests
- Improved overall fleet asset management

Caltrans continues to look for innovative ways to improve and expand the available data provided by telematics. Caltrans has used telematics devices on fleet vehicles since 2015. In 2021, Caltrans began changing all fleet telematics hardware to the DGS-mandated Geotab telematics devices. By the end of 2021, over 95 percent of the Caltrans fleet had operational Geotab telematics devices. Due to supply delays, Caltrans was unable to complete the remaining installations during 2021. Caltrans anticipates by mid-2022, all Caltrans' fleet will have Geotab telematics devices installed.

Caltrans policies were updated during the initial implementation of telematics devices in 2015.

Telematics data will collect data used to analyze fleet use and behaviors. Telematics data will play a role in the identification of ZEV feasible use cases. These use cases will include vehicles operational within the range limitations of

available ZEV vehicles with reasonable access to refueling/charging infrastructure.

Public Safety Exemption

Many of Caltrans highway maintenance vehicles meet the criteria for the public safety exemption for ZEV First purchasing. These vehicles are defined as emergency vehicles through California Vehicle Code §165 for their role in highway maintenance, towing, or repairing damaged lighting and electrical equipment. These vehicles are used to provide mutual aid to the CHP and other emergency responders in the event of a highway emergency.

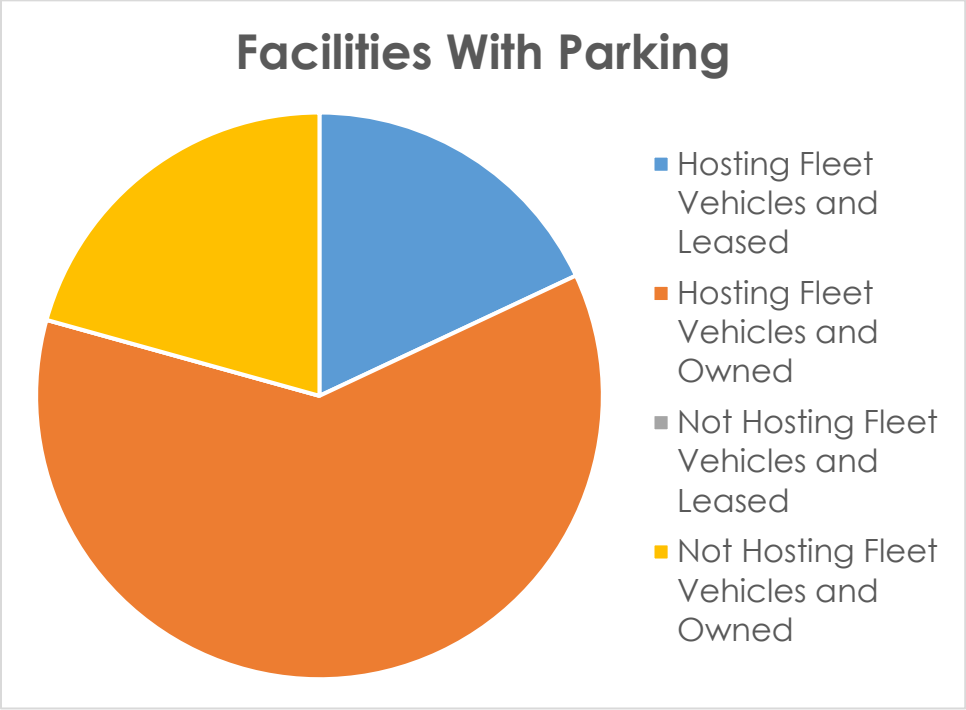
While many of these vehicles meet the public safety exemption criteria, Caltrans will still prioritize ZEV first purchasing where range limitations and charging infrastructure do not inhibit Caltrans' ability to provide timely emergency response.

Caltrans Parking Facilities

Caltrans owns, operates, and occupies many types of facilities. The most common types of Caltrans facilities include office buildings, equipment shops, maintenance facilities, material laboratories, and transportation management centers.

Caltrans parking facilities vary depending on facility use and configuration. Some parking facilities only host fleet vehicles, others host fleet and employee vehicles, and others host a mix of public, fleet, and employee parking spaces. Almost every Caltrans facility hosts some class of fleet vehicle ranging from light-duty sedans in the motor pool to trucks and specialty equipment utilized for maintenance of the SHS. Graph 2.4 shows a breakdown of Caltrans' facilities with parking lots.

Graph 2.4: Parking Facilities



Given the nature of Caltrans' fleet operations, the length of stay for visitors and employees vary from location to location. Several of Caltrans maintenance facilities use a combined fleet and employee parking lot, making the fleet chargers available during the day for employee use. Caltrans evaluates each location to maximize charging event opportunities and the use of state resources. The facility use and availability of existing utility infrastructure/power are major factors in the determination of the number of chargers that will be installed at a location, however, L2 chargers are prioritized to allow for more charging events.

Caltrans facilities and fleet vehicles are both very diverse. Caltrans facilities vary from salt and sand sheds used seasonally to multi-story offices complexes. The fleet vehicles include compact sedans, pickup trucks, highly specialized work trucks, and semi-trucks with trailers. Caltrans must evaluate each facility on almost a location-by-location basis, taking into consideration the estimates of future ZEV fleet purchases and a count of visitor and workplace parking spaces, to evaluate the number of chargers needed to meet future needs.

Vehicle technology will play a large role in the future of the charging infrastructure make up at a facility. For instance, vehicle manufacturer range options and faster charge times may change charger needs. Alternatively, the medium- and heavy-duty ZEV sector is not developed enough to know how the

impact of these large power requirements will affect the facility charging output capacity or the need for charging management solutions at a location.

The facilities with the most urgent need for EV charging are listed below.

Table 2.5: High Priority EVSE Projects

Facility Name	Total Parking Spaces	Existing L1 Charging Ports (2020)	Existing L2 Charging Ports (2020)	Existing L3 Charging Ports (2020)	Total Charging Ports (2020)	EV Charging Ports Needed by 2025
Nevada City Maint. Facility	48				0	6
Northgate Maint. Facility	39				0	6
Woodland Maintenance Facility	28				0	6
03 TMC (Communications)	176		3		3	36
05 District Office					0	12
Salinas Maintenance Facility	72				0	6
Kettleman Maintenance Facility	6		4		4	8
Visalia Maintenance Facility	103				0	6
Diamond Bar Maint. Facility	24				0	2
Silver Lake Maint. Facility	113				0	6
Lebec Maintenance Facility	25				0	3
Ventura Maint. Facility	100				0	3
08 District Office	831		6		6	24
Magna Ortega Maint. Facility	132				0	10
Crestview Maint. Facility	0				0	2
Lodi Special Crews Yard	69				0	4
Stockton Maint. Facility	77				0	3

Facility Name	Total Parking Spaces	Existing L1 Charging Ports (2020)	Existing L2 Charging Ports (2020)	Existing L3 Charging Ports (2020)	Total Charging Ports (2020)	EV Charging Ports Needed by 2025
Stockton Maint. Facility Bldg 11			4		4	12
11 TMC					0	14
Chula Vista Maint. Facility	48				0	3
Escondido Maint. Facility	67				0	4
HQ Equipment Shop					0	10
Sacramento Translab	226				0	11
Patterson	21				0	10
Total	**2205**	**0**	**17**	**0**	**17**	**207**

Outside Funding Sources for EV Infrastructure

Caltrans has aggressively pursued both State and non-State funding sources for workplace and fleet ZEV charging infrastructure installations. In 2019, Caltrans installed make-readies at 27 locations across the state which were funded through the NRG Energy (EVgo) settlement with the State of California, a 2012 settlement based on energy market manipulations resulting in overcharging for electrical power.

The construction of the make-readies was targeted to overlap with EV Connect installations to maximize funding opportunities. The Volkswagen (VW) Environmental Mitigation Trust provided nearly $423 million for California to mitigate the excess nitrogen oxide (NOx) emissions caused by VW's use of illegal emissions testing defeat devices in certain VW diesel vehicles. Through the Volkswagen settlement funding, EV Connect installed a total of 271 charging ports at 33 Caltrans sites in 2019. The EV Connect contract includes operation, maintenance, and data charging network service until December 31, 2026.

Caltrans has been working with DGS Office of Sustainability's Transportation Unit to obtain additional funding from the California Electric Vehicle Infrastructure Project (CALeVIP). CALeVIP provides incentives for EV charger installations and works with local partners to develop and implement projects that meet current and future regional EV needs. Through CALeVIP, Caltrans is poised to receive numerous charger incentive rebates that will be reinvested back into new Caltrans' EV charging projects in 2023 and beyond. There are also pending

charger incentives through the Sacramento Municipal Utility District (SMUD) for EV charging projects installed in Sacramento.

Caltrans continues to look for available funding opportunities. Currently, Caltrans has pending applications for additional funding through the VW Environmental Mitigation Trust, CALeVIP, and three local utilities. As the installations of electric vehicle chargers continue, Caltrans will submit applications for rebate programs and funding opportunities available throughout the State's new "Energize" EV infrastructure program.

Hydrogen Fueling Infrastructure

Caltrans has 37 hydrogen Fuel Cell Electric Vehicles (FCEVs) in the fleet and is currently fueling the FCEVs at public retail hydrogen fueling stations. There are 47 hydrogen stations operating in California with another 28 stations under construction and 127 in development. Most of the locations currently open and operating are in the Bay Area, Los Angeles County, and Orange County.

Caltrans is in discussions with a vendor to place a mobile Hydrogen fueler near the entrance to the Sylmar Equipment shop facility. The California Energy Commission, as well as Department of Energy, have indicated their support of this pilot project. The fueler will be available to Caltrans fleet vehicles and other publicly and privately owned vehicles.

Comprehensive Facility Site and Infrastructure Assessments

Site Assessments are performed to establish the cost and feasibility of installing needed EV infrastructure. The table below lists the facilities that have been evaluated with Site Assessments. Caltrans will continue to schedule site assessments with an emphasis on facilities in disadvantaged communities who can directly benefit from zero-emission vehicles in their neighborhoods through improved air quality and reduced noise.

To date, only a few of Caltrans facilities required significant upgrades to transformers and electric panels. However, Caltrans has found that some of the older and more remote maintenance facilities lack the available infrastructure to power Level 2 or DC Fast chargers that would be required for successfully transitioning to a ZEV fleet. Due to the nature of Caltrans emergency response for highway emergencies, it is imperative that charging limits downtime of any highway maintenance vehicle. Caltrans will continue to look for innovative ways to provide fast electric vehicle charging or hydrogen refueling to enable full transition to a zero-emission fleet at all Caltrans facilities. Caltrans will continue

to follow the developments in electric vehicle charging and hydrogen refueling technology to overcome the infrastructure challenges.

Table 2.6: Results of Site Assessments

Facility Name	L1 Chargers with Current Electrical System	L2 Chargers with Current Electrical System	Total cost for Project using Current Electrical System	L1 Chargers with Electrical System Upgrades	L2 Chargers with Electrical System Upgrades
Garberville MS		0			3
Crescent City Maintenance Facility		4	$ 87,580		
Susanville Maintenance Facility		5	$ 105,000		
Bracut Maintenance Facility		9	$ 173,600		
Ukiah Maintenance Facility		9	$ 117,796		
District 01 Office		15	$ 276,100		
District 02 Equipment Shop - Redding		0			9
Yreka Maintenance Facility		4	$ 124,300		
District 02 Regional Office - Redding		9	$ 168,200		
Roseville Maintenance Facility		2	$ 69,881		
Auburn Maintenance Facility		4	$ 89,865		
Chico North Maintenance (including Landscape)		4	$ 146,620		
CVIP - CHP (Donner Pass)		4	$ 48,056		
Nevada City Maintenance Facility		6	$ 139,801		
Northgate Maintenance Facility		6	$ 155,180		
Woodland Maintenance Facility		6	$ 144,020		
District 03 TMC (Communications)		34	$ 455,362		
Antioch Maintenance Facility		Not feasible	$ N/A		
Foster City Maintenance Facility		5	$ 115,000		

Facility Name	L1 Chargers with Current Electrical System	L2 Chargers with Current Electrical System	Total cost for Project using Current Electrical System	L1 Chargers with Electrical System Upgrades	L2 Chargers with Electrical System Upgrades
Rio Vista Maintenance Facility		4	$ 126,700		
District 04 Office		8	$ 105,900		
South San Jose Maintenance Facility		10	$ 192,500		
Santa Rosa Maintenance Facility		18	$ 200,000		
Buellton Maintenance Facility		1	$ 51,400		
King City Maintenance Facility		1	$ 51,400		
Santa Barbara Maintenance Facility		2	$ 106,500		
Santa Cruz Maintenance Facility		2	$ 83,700		
Santa Maria Maintenance Facility		2	$ 66,900		
Templeton Maintenance Facility		3	$ 93,200		
Salinas Maintenance Facility		6	$ 138,505		
District 05 Office		12	$ 229,500		
District 06 Office		4	$ 109,060		
Kettleman City Maint. Facility		4	$ 109,060		
Bakersfield Maint. Facility		7	$ 148,000		
Visalia Maintenance Facility		8	$ 151,980		
Altadena Maintenance Facility		Not Feasible	$ N/A		
Las Flores Maintenance Facility		1	$ 71,800		
North Hollywood Maintenance Facility		1	$ 65,800		
Diamond Bar Maintenance Facility		2	$ 68,100		
Lebec Maintenance Facility		3	$ 88,700		
Ventura Maintenance Facility		3	$ 78,800		

Facility Name	L1 Chargers with Current Electrical System	L2 Chargers with Current Electrical System	Total cost for Project using Current Electrical System	L1 Chargers with Electrical System Upgrades	L2 Chargers with Electrical System Upgrades
Silver Lake Maintenance Facility		7	$ 148,000		
District 07 Office		48	$ 1,025,503		
Banning Maintenance Facility		2	$ 59,700		
Indio Maintenance Facility		2	$ 62,100		
Barstow Maintenance Facility / Equipment Sub-Shop		7	$ 148,000		
Magna Ortega Maintenance Facility		10	$ 209,300		
Southern Regional Lab		10	$ 242,500		
District 08 Office		18	$ 300,900		
Tehachapi Maintenance Facility		Not feasible			
Death Valley Maintenance Facility		1	$ 50,200		
Bishop Maintenance Facility		2	$ 82,500		
Crestview Maintenance Facility		2	$ 71,700		
Sonora Junction Maintenance Facility		2	$ 60,900		
Independence Maintenance Facility		2	$ 81,300		
Inyokern Maintenance Facility		2	$ 71,700		
Lee Vining Maintenance Facility		2	$ 77,700		
McGee Maintenance Facility		2	$ 81,300		
Mojave Maintenance Facility		2	$ 65,700		
Shoshone Maintenance Facility		2	$ 74,100		
D9 Equipment Shop		4	$ 145,900		
09 District Office		5	$ 145,800		
Altaville Maintenance Facility		2	$ 75,300		

Facility Name	L1 Chargers with Current Electrical System	L2 Chargers with Current Electrical System	Total cost for Project using Current Electrical System	L1 Chargers with Electrical System Upgrades	L2 Chargers with Electrical System Upgrades
Altaville Region Office		2	$ 64,500		
Pine Grove Maintenance Facility		2	$ 81,300		
Sonora Maintenance Facility		3	$ 65480		
Chowchilla Truck Inspection Facility		4	$ 91,900		
Lodi Special Crews Yard		4	$ 90,700		
Patterson Maintenance Facility		6	$ 118,100		
North Stockton Paint Yard		8	$ 141,900		
Stockton Maintenance Facility		8	$ 277,095		
District 10 Office		33	$ 560,900		
Brawley Maintenance Facility		Not feasible	$ N/A		
Boulevard Maintenance Facility		2	$ 46,500		
Carlsbad Maintenance Facility		2	$ 44,300		
Descanso Maintenance Facility		2	$ 46,500		
El Centro Maintenance Facility		2	$ 44,900		
El Centro Shop		2	$ 46,300		
Imperial Avenue Maintenance Facility		2	$ 45,500		
Otay Maintenance Facility		2	$ 47,700		
Chula Vista Maintenance Facility		3	$ 46,520		
Escondido Maintenance Facility		4	$ 48,300		
District 11 TMC		14	$ 80,460		
Sacramento Translab - RSP		2	$ 12,160		
DPAC Warehouse		9	$ 239,653		
HQ Equipment Shop		9	$ 204,500		

Facility Name	L1 Chargers with Current Electrical System	L2 Chargers with Current Electrical System	Total cost for Project using Current Electrical System	L1 Chargers with Electrical System Upgrades	L2 Chargers with Electrical System Upgrades
Sacramento Translab - Main Building		11	$ 223,240		
Golden One/DOT TOT Lot		15	$ 254,000		
Total	**0**	**513**	**$11,006,402**	**0**	**12**

EVSE Construction Plan

DGS Office of Sustainability's Transportation Unit has functioned as Caltrans' project manager for the design, construction, and installation of Level 2 electric vehicle chargers for fleet and workplace use. The OS Transportation Unit works with engineering consultants, contractors, and vendors on the statewide contract to project manage and deliver completed EV charging projects at Caltrans facilities. The OS Transportation Unit oversees site assessments, design, bidding and contracting, project approvals, construction, installation, inspection, and close-out of these projects.

Sites for charging infrastructure were identified and prioritized by Caltrans' districts and the Division of Equipment. By the end of 2020, DGS had directed the installation and commission of 210 electric vehicle charging ports. By mid-2022, DGS plans to have another 345 installations completed.

Caltrans plans to continue to add electric vehicle charging ports to meet the needs of the workforce and the fleet. Due to the COVID-19 pandemic and an emphasis on teleworking, Caltrans is in the process of re-evaluating the distribution of chargers and the timeline for installations. The new distribution will likely place more emphasis on fleet charging for maintenance and construction vehicles and equipment. As electric vehicles and chargers are planned, priority will be given to maintenance facilities and other facilities within disadvantaged areas with poor air quality.

Caltrans plans to leverage the experience and expertise of DGS by continuing to utilize DGS as the project manager for not only Level 2 charging infrastructure, but also for DC Fast Chargers that will be utilized by medium- and heavy-duty vehicles. Caltrans and DGS have built a strong and successful working relationship, and Caltrans values this partnership.

EVSE Operation

During FY 22/23, Caltrans anticipates further developing processes and procedures for the operation and maintainence of fleet, workplace, and public electric vehicle charging infrastructure. All charging infrastructure will be "networked" to allow Caltrans to collect and report data regarding usage and energy. It is anticipated that a central database will be established that serves as an inventory and asset management tool, as well as a means to compile and calculate data. The database will be accessible to those responsible for the procurement, maintenance, and operation of the equipment, such as the Divisions of Equipment, Maintenance, Business Operations, and Caltrans Sustainability Office.

Currently, Caltrans' districts establish workplace charging policy and practices for the electric vehicle chargers installed at their facilities. This allows districts to use their discretion in setting charging time-limits based upon the demand for the chargers at the district. In urban facilities, for example, electric vehicle adoption tends to be higher. Therefore, written agreements with employees that outline charging time-limits, policies, and etiquette may be appropriate. At many rural facilities, where electric vehicle adoption is often lower, there may not be a need for formal employee policy implementation. As teleworking continues to be the norm for most Caltrans employees who work in an office environment, many urban district offices may find that formal policies are not necessary, although electric vehicle adoption continues to increase among Caltrans employees.

Currently Caltrans employees are not charged a fee for utilizing electric vehicle chargers at Caltrans owned and operated facilities. However, at offices and parking facilities owned and managed by DGS, Caltrans employees must comply with the electric vehicle charging terms and conditions established by DGS. DGS determines the fees and charging policies at those locations.

CHAPTER 3 - ENERGY

This Energy Report demonstrates to the Governor and the public the progress Caltrans has made toward meeting the state's sustainability goals related to energy. This report identifies successful accomplishments, ongoing efforts, and outstanding challenges.

Department Mission and Built Infrastructure

Caltrans' mission is to "provide a safe and reliable transportation network that serves all people and respects the environment." Sustainability, livability, and the economy are central to improving the quality of life in California. Caltrans 2020-2024 Strategic Plan integrates sustainability principles across all goals, addressing people, planet, and prosperity comprehensively as we implement the Plan's strategies. The Plan specifically outlines a goal to "Lead Climate Action" by reducing our environmental impact of the State's transportation network through reducing operational greenhouse gas emissions and strengthening the resiliency of the transportation system to withstand and recover from the worsening effects of climate change.

Caltrans has approximately 21,170 employees and a FY 20/22 budget of $17.3 billion. Caltrans designs and oversees highway construction, operates, and maintains the SHS, funds intercity passenger rail routes, and provides funding for local transportation projects. Caltrans owns and manages more than 50,000 lane-miles of pavement, 30,000 acres of irrigated landscape, 13,000 bridges, and 205,000 culverts on California's highway system, and owns more than 500 facilities across the state, including:

- 54 Commercial Vehicle Enforcement Facilities
- 26 Equipment shops
- 46 Fixed laboratories
- 377 Maintenance facilities
- 13 Office building locations
- 86 Safety Roadside Rest Areas (SRRAs)
- 13 Transportation Management Centers (TMCs)
- 7 Toll Plazas
- 3 Warehouses

In addition to Caltrans facilities footprint, there are more than 30,000 electricity meters statewide to support the operation of traffic signals, street lighting, communications equipment, tunnel ventilation, and other transportation related

infrastructure. To provide power to these meters, Caltrans relies primarily on grid provided power. Caltrans utilizes a combination of solar power, grid power, natural gas, and propane to provide energy to facilities.

Table 3.1 lists Caltrans total energy use by type for its primary building operations. It should be noted that CVEF, SRRA, and leased facility energy data is not included in this report due to the inability to access utility information.

Table 3.1: Total Purchased Energy 2020

Purchased Energy	2003 Baseline Quantity*		2020 Quantity		% Qty. Change
Electricity	47,352,356*	kWh	71,234,215	kWh	50%
Less EV Charging	-	kWh	(127,663)	kWh	-
Natural Gas	728,392	therms	1,021,717	therms	40%
Propane	-	gallons	-	gallons	-
Fuel Oil	-	gallons	-	gallons	-
Steam	-	pounds	10,763,712	pounds	-
Chilled H2O	-	kBtu	6,967,300	kBtu	-
TOTALS	**236,168,537***	**kBtu Site**	**363,383,761**	**kBtu Site**	**51%**

Source: Caltrans Energy Star Portfolio Manager and Enterprise Datalink

*The 2003 baseline does not include energy use from all facilities due to limited 2003 data availability when the baseline was established in 2010.

Table 3.2: Properties with Largest Energy Consumption

Building Name	Floor Area (ft^2)	Site Energy (kBTU)	Source Energy (kBTU)	Source EUI ($kBTU/ft^2$-yr)
07 OFF_DIST	957,702	42,818,591	117,604,019	164
04 OFF_DIST	711,000	31,561,427	86,652,469	165
08_OFF_DIST	237,714	27,221,010	76,279,658	324
07 TMC (Los Angeles Regional)	82,300	18,875,287	49,360,889	600
HQ_OFF	462,392	22,617,426	61,061,187	132
04 MF (Caldecott)*	1,616	28,241,847	88,961,819	55051
04 MF (Yerba Buena Island) *	912	276,785	871,872	956
08 TMC (Inland Empire)	43,000	13,560,681	39,220,325	912
03 MAT_I (Sacramento Translab)	289,923	15,390,178	32,249,352	196
03 TMC (Communications)	34,200	5,866,081	16,177,754	473
Total for Buildings in This Table	**2,820,759**	**206,429,314**	**568,439,343**	
Total for All Department Buildings	**8,002,825**	**980,322,914**	**959,052,997**	
% Of Totals	**35%**	**21%**	**59%**	

Source: Caltrans Energy Star Portfolio Manager.

*Meters for Caldecott and Yerba Buena Island Maintenance Facilities include lighting for tunnels and bridges that run 24 hours a day, 7 days a week.

Moving Toward Sustainability

Caltrans has made significant progress toward reducing energy use to meet the state's energy efficiency goals. While overall energy use shows an increase, it is a result of more comprehensive reporting than what was available in 2003. As shown in table 3.5 later in this chapter, Caltrans EUI has been reduced by nearly 17% since 2003. Caltrans continues to convert indoor lighting to LEDs at district offices and maintenance facilities, with a goal of converting all lights to LED by 2025. Outdoor lighting and much of the indoor lighting at maintenance facilities, district offices, and headquarters has already been upgraded to LEDs. Additionally, lighting infrastructure throughout the SHS has been converted to LED. Caltrans headquarters and district offices are some of Caltrans' largest buildings by square footage and consume large amounts of energy. In 2020, Caltrans produced more than 5 million kWh of on-site renewable energy.

Caltrans is in preliminary discussion to enter the State of California Energy Support Strategy (SOC ESS) that is offered by PG&E in 2022. If the agreement is executed, the program will support Caltrans in developing a departmental Energy Strategy. Caltrans expects this to be a key step toward maximizing

energy efficiency in our buildings and meeting the Zero Net Energy (ZNE) targets of EO B-18-12.

Facilities Planning

In 2017, Caltrans worked with a private contractor to perform Facility Condition Assessment (FCA) for five of its older state-owned district offices. The data gathered from the FCAs is being used to establish priorities for major facility repairs and replacements. In 2018, Caltrans developed a Long-Range Plan to address aging office building infrastructure, as shown in the list below:

- District 5 Office, San Luis Obispo
- District 6 Office, Fresno
- Headquarters Office, Sacramento
- District 10 Office, Stockton
- District 2 Office, Redding

For all replacement TRF infrastructure, Caltrans DES designs facilities to meet applicable Leadership in Energy and Environmental Design (LEED), Zero Net Energy (ZNE) standards, and American with Disabilities Act (ADA) requirements when adequate funding is available. For office building infrastructure, DBO partners with DGS for planning, design, and construction.

The following transportation related facilities are currently in planning, design, or construction and were listed in the 2020 SHOPP. Note that planned ZNE facilities are also listed in the ZNE section of this chapter.

- Equipment Shops
    - District 2, Yreka Maintenance Facility will construct a replacement 6,300 square foot resident mechanic facility.
- Laboratories
    - The district 1 Materials Laboratory (Lab) in Eureka will be funded for replacement in FY 20/21. This project will seismically retrofit and renovate the existing Eureka Materials Lab, built in 1954, which does not meet operational needs.
    - The District 4 Materials Lab Replacement project will be funded for project design in FY 21/22. This project will replace the existing, closed materials lab at a new location. The project is planned to achieve LEED Silver in the new construction category and is possible ZNE.

    - The District 9 Materials Lab Replacement project will construct a new laboratory at a new location. The facility will be constructed with on-site solar generation.

- Maintenance Facilities
    - The District 1 Maintenance Facility in Idlewild is funded for project design in FY 20/22. The project will replace the existing building, water supply system, and septic system.
    - District 3, Tahoe City Maintenance Facility project will demolish existing employee housing and construct a new dormitory building.
    - District 7, West Imperial Highway Maintenance Equipment Training Center (METC) project will construct a new building to replace the portable METC currently on site.
    - District 7, Culver City Maintenance Facility project will demolish two deteriorating buildings, construct one new building, and construct a wash rack.
    - District 7, Pacific Place Maintenance Facility project will demolish the existing crew building, remove a leased office trailer, and construct a new crew building.
    - District 8, Lake Elsinore Maintenance Facility project will construct a new maintenance facility at the existing location.
    - The District 8 Maintenance Facility in Fontana will be funded for project design in FY 20/22. This project will be located adjacent to the Southern Regional Laboratory and Inland Empire Transportation Management Center. The project is planned to achieve LEED Silver in the new construction category.
    - The District 9 Maintenance Facility Expansion project in Tehachapi has been proposed for funding in FY 20/21. The project will relocate the existing facility to a more suitable site in the Tehachapi area and includes new utilities, a crew and office building, mechanic facilities, a truck shed, and an upgraded electrical system will be constructed at the new site.
    - District 10, Caples Lake Maintenance Facility project will demolish and reconstruct a dormitory, sand shed structures, and rehabilitate a generator building.

Challenges

Caltrans has faced several challenges while working to meet the Governor's energy efficiency goals, such as:

- Lack of staff and financial resources to implement energy efficiency actions due to competing priorities, such as safety projects and repairing/replacing old infrastructure and equipment that have a minimal impact on energy use.
- LEED certification for TRFs is often out of reach due to building size, remote location, and the inability to acquire location-based LEED credits. Additionally, financial resources for commissioning and LEED certification have been left out of project budgets.
- Determining how to model renewable energy needs for new Caltrans buildings. By 2025, all new state buildings and 50 percent of existing buildings must be ZNE, however, Caltrans has several facilities that have process loads from industrial and/or mechanical work, making energy use sporadic and challenging to calculate renewable energy needs for ZNE.
- Issues with potential sites for solar installation. Caltrans has reviewed several sites, but these reviews discovered significant challenges including snow, low amounts of sunlight, tall trees surrounding the site, and roofs that were either too small or not strong enough to withstand the load of the solar panels. The original Clean Renewable Energy Bonds (CREBs) project included 93 sites, but after re-evaluation photovoltaic solar systems were installed at only 70 sites. The re-evaluation criteria considered the age, condition, and design of the roof, the long-term building retention, the structural integrity, and a cost-benefit analysis.

Zero Net Energy (ZNE)

State policies set forth the following milestones for state zero net energy buildings:

- 2017 – 100% of new construction, major renovations and build-to-suit leases beginning design after October 23, 2017, to be ZNE
- 2025 – 50% of total existing building area will be ZNE

Caltrans plans to meet these ZNE requirements through a combination of energy efficiency projects and solar power generation. To meet ZNE in facilities that do not have the physical space available for onsite energy generation, Caltrans is exploring potential agreements with utility providers to generate renewable

energy off-site to be allocated to Caltrans facilities portfolio. Additionally, Caltrans is studying the feasibility of adding to our renewable portfolio through the installation of solar in the Caltrans right of way. These installations would take place in areas such as Park and Rides, Safety Roadside Rest Areas, and in land adjacent to highways or interchanges. Power generated could be utilized for electric vehicle charging infrastructure, street lighting, traffic management systems, and to power facilities that support the SHS.

Challenges

Caltrans has encountered several challenges in meeting the ZNE goals required by EO B-18-12. Caltrans intends to certify 50% of our existing building area and new construction as ZNE in compliance with EO B-18-12. To achieve this, Caltrans will need to address and overcome the challenges outlined in this section.

ZNE for new construction:

- Many of Caltrans facilities are mixed use facilities that are utilized for maintenance and equipment crews. Much of the square footage in these facilities consists of automotive repair bays with roll up doors that are frequently open, creating difficulty in maintaining temperatures efficiently.
- These facilities also utilize intermittent process loads from painting equipment, welding equipment, air compressors, and other power tools. These process loads make it difficult to project ZNE calculations and solar generation needs.
- Caltrans has difficulty obtaining the funding necessary to incorporate ZNE design requirements into transportation related facilities. Most of Caltrans projects are funded through taxes derived from gas excise taxes and are intended for use on highway infrastructure projects. The limited funding that is allocated for transportation related facilities is prioritized to fund requisite equipment to perform mission critical work. Funding decisions prioritize the safety of Caltrans employees and the operation of the SHS.
- While DES leads delivery of TRF ZNE projects and guidance documents, it continues to be a challenge to find funding for the installation of photovoltaic systems on projects and the additional design hours required for the construction of ZNE building facilities, as the additional expenses have not been factored into the overall budget or schedule during the project initiation phase.

ZNE for Existing Facilities

- Caltrans is actively exploring paths to achieve 50% ZNE in our existing portfolio. In 2017, an assessment was performed to determine the ZNE

readiness of Caltrans facilities. At the time, it was found that Caltrans had 161 facilities ready for ZNE and 33 more "near-ready", however since that time the EUI targets for Caltrans maintenance facilities changed, as well as the ZNE "ready" status. Current calculations indicate that 77 of Caltrans existing facilities exceed the energy use intensity (EUI) goals and are considered "ZNE Ready"

- Like new ZNE construction, it continues to be a challenge to find funding for the additional design and maintenance needed to achieve ZNE goals for existing facilities. Often, funding for ZNE projects competes for funding required for deferred maintenance. To counter this, Caltrans is exploring different strategies to help us meet ZNE goals while meeting the needs of deferred maintenance by taking advantaged of on bill financing to finance energy efficiency projects.
- Caltrans is also exploring opportunities in both onsite and offsite Power Purchase Agreements (PPAs) to generate additional energy that can be allocated within our portfolio to meet ZNE targets at facilities within 15% of their EUI targets.
- Several SHS support facilities, such as the Webster Tube Maintenance Facility, share meters with toll booths, tunnel exhaust and lighting, bridge lighting, etc. To accurately report these facilities, meters would need to be split or sub metered to provide accurate usage data.

Caltrans has plans for the following planned facilities to be ZNE.

- District 5, San Luis Obispo Maintenance Facility and Lab project will construct a new maintenance facility and materials laboratory for a construction office by relocating from the existing facility location at 50 Higuera Street. This project is 96,183 square feet, includes on-site solar generation, and is planned to be LEED Silver and ZNE.
- District 6, West Avenue Maintenance Facility project will demolish two existing buildings and construct two new structures at the West Avenue Maintenance Station in Fresno. The new facility will be 12,960 square feet, planned ZNE, and will have on-site solar generation.

Table 3.3: Zero Net Energy Buildings

Status of ZNE Buildings	Number of Buildings	Floor Area (ft^2)	% Of Building Area
Buildings Completed and Verified	77	4,140,834	50%
Building in Design or Under Construction	2	109,143	1%
Building Proposed for Before 2025 (but not yet in design)	0	0	0%
Additional Exist. Bldg. Area within 15% of ZNE target EUI and have EE projects planned	0	0	0%
Totals for ZNE Buildings by 2025	79	4,249,977	51%
Totals for All Department Buildings by 2025	388	8,261,803	
% ZNE by 2025	20%	51%	

New Construction Exceeds Title 24 by 15%

All new state buildings and major renovations beginning design after July 1, 2012, must exceed the current California Code of Regulations (CCR) Title 24, energy requirements by 15% or more.

Title 24 is the minimum standard established in law for the design and construction of buildings and structures in California. State law mandates that local government enforce these regulations, or local ordinances with qualified reasonably necessary and generally more restrictive building standards than provided in the California Building Standards Code. Currently, Caltrans DES's goal is to exceed Title 24 by a minimum of 15 percent.

Table 3.4: New Construction Exceeding Title 24 by 15%

Buildings Exceeding Title 24 by 15%	Number of Buildings	Floor Area (ft^2)
Completed Since July 2012	11	155,884
Under Design or Construction	15	232,427
Proposed Before 2025	0	0

In April 2018, a memorandum was issued to all designers in Caltrans DES advising them of the requirements of EO B-18-12 and providing guidance on achieving the expected efficiency targets. Caltrans DES has created tools and calculators that assist design teams with implementation and incorporated ZNE into documents and checklists used in the planning process.

Caltrans has completed eleven buildings since 2012, with nine of the buildings exceeding Title 24 by 15% or more. The total square footage of the buildings exceeding Title 24 is equal to 155,884 square feet. Three of these buildings, the

San Francisco Oakland Bay Bridge (SFOBB) project, accounted for 98,272 square feet and performed at or near ZNE levels.

- The Phillip S. Raine SRRA exceeded Title 24 by 73%
- The Gaviota SRRA crew building exceeded Title 24 by 28%
- The Lee Vining crew building exceeded Title 24 by 15%
- The Mojave mechanics building exceeded Title 24 by 15%
- The West Sacramento crew building exceeded Title 24 by 33%
- The Richmond San Rafael maintenance facility exceeded Title 24 by 32%, or by 52.6% when the solar system is considered
- The SFOBB project exceeded Title 24 by 22-46% for each of its three phases

One facility, the Dunsmuir Grade CVEF, only exceeded Title 24 by 6.5%. The facility has large inspection bays that are heated. It is believed that the facility did not perform as designed because of the process loads associated with heating the inspection bays.

Caltrans has 15 projects programmed into the SHOPP that are expected to be funded and in design within the next five years. The projects include crew building replacements, dormitory replacements, new maintenance facilities, new labs, and new equipment shops. These buildings are all planned to exceed Title 24 by a minimum of 15% by design.

Reduce Grid-Based Energy Purchased by 20% by 2018

Executive Order B-18-12 requires state agencies to reduce grid-based energy purchased by 20% by 2018, compared with a 2003 baseline.

Table 3.5: Department-Wide Energy Trends

Year	Floor Area (ft²)	Total kBTU Consumption	Department Average EUI*
Baseline Year 2003	4,044,353	538,571,813	133
2013	8,252,789	745,532,586	90
2014	8,252,789	778,390,335	94
2015	8,252,789	866,807,559	105
2016	8,252,789	980,322,914	119
2017	8,254,405	937,953,934	114
2018	8,254,405	959,052,997	116
2019	8,254,405	959,615,404	116
2020	8,252,789	911,268,793	110
% Change 2003-2020	104%	69%	-17%

Source: Energy Star Portfolio Manager

*EUI data only reflects energy use in Caltrans facilities. Energy used for SHS lighting, traffic controls, and signals is not included in these totals.

There are numerous Management Memos and sections of the State Administrative Manual (SAM) that provide specific directions and support for this goal, including, but not limited to, the following:

- The Department of Technology's Basic Policy 4819.31, item 13 requires that agencies/state entities shall implement power management practices on all desktop and laptop computing devices, thin client devices, printers, copiers, scanners, and monitors. During hours of normal operation, devices which are not in use for 30 minutes shall automatically go into an energy-saving mode. Devices shall be shut down at the end of the normal business day.

  All Caltrans workstations and laptops have power management software installed. Caltrans uses a system called Verdiem that enables Caltrans employees to centrally control and reduce the energy used by personal computers. The system maximizes energy savings by placing machines into a lower power state without interfering with end-user productivity, desktop maintenance, or upgrades.

- Management Memo 14-07 "Standard Operating Procedures for Energy Management in State Buildings" and the associated Standard Operating Procedures:

- Many of Caltrans larger office facilities are equipped with Building Management Systems (BMS) automate lighting through pre-programmed schedules. For facilities not using a BMS, custodial or security staff are responsible for turning off lighting afterhours. Several facilities are also equipped with occupancy sensors, further ensuring that unoccupied spaced are not utilizing lighting outside of what is required as emergency lighting.
- Computers and printers are programmed to utilize energy saver mode when idle. Energy Star certified devices are prioritized when being procured.
- Outside of normal business hours, lighting and HVAC systems in district offices are programmed to turn off or run at a minimal level. For facilities without BMS, the packaged HVAC systems are controlled by a traditional programmable thermostat.
- All facilities with a BMS are programmed to have a 4-degree temperature swing (-2, +2). For facilities that are not on a BMS, the thermostat is typically programmed and locked so that temperatures can only be adjusted by maintenance of engineering staff.
- Caltrans is exploring the ability to install smart thermostats at facilities without a BMS. This will allow for advanced setup of heating and cooling schedules.
- The use of night flush cycles is common throughout Caltrans facilities and is used for a variety of purposes.
  - The District 1 office utilizes night flush cycles to cool the facility down with cool night air during the summer because the facility is not equipped with a cooling system.
  - Several facilities have economizers set to 100% outside air during cooler temperatures.
  - The use of the night flush cycle is often performed to use cool night air to lower building temperatures instead of using cooling systems.
  - Flush cycles are also utilized during renovations or carpet cleanings to provide additional ventilation for construction materials or detergents. This is done to ensure that staff have optimal indoor environmental quality.
- Caltrans facilities typically set their water temperature not to exceed 105 degrees Fahrenheit. Temperatures are typically regulated by a thermostat or through the boiler room.
  - The District 8 office in San Bernardino utilizes geothermal heating from the city.

        - Some Caltrans facilities have onsite cooking facilities that require a higher temperature of water for food preparation. These temperatures are programmed not to exceed 105 degrees Fahrenheit when the cafeteria is closed.
    - HVAC systems receive preventative maintenance regularly and are scheduled through either Integrated Work Management Systems (IWMS) or through regular scheduled visits with a contracted HVAC vendor.
    - Filters are being changed quarterly at minimum and use the highest level of MERV filter that the system can handle.
    - Incandescent light bulbs and any remaining magnetic fluorescent ballasts in fluorescent light fixtures are being replaced.
    - Most Caltrans office facilities have been converted to LED lighting. Some fixtures may still utilize magnetic ballasts with LED fixtures.
    - Facilities management or Caltrans Health and Safety conduct annual inspections of facilities to ensure compliance with personal device use in the workplace. This ensures that prohibited items are not utilized in Caltrans facilities.
    - Employees are not permitted to have personal space heaters unless they are provided through reasonable accommodation (RA). This is documented in the Caltrans Safety Manual. When an employee has an RA for a space heater, the request is reviewed, and the installation facilitated through Caltrans facilities management to ensure compliance.
    - Caltrans does not allow installation of new appliances or equipment in employee break rooms unless it is Energy Star approved. Purchases are reviewed by HQ and district facilities staff prior to procurement to ensure compliance.
    - Due to the COVID-19 pandemic and the resulting emergency telework, it has been difficult to replace employee-funded refrigerators because many staff are not actively utilizing them.
    - Caltrans does not currently include vending machines in its internal policies; however, they will be incorporated into future versions. Many of the vending machines located at Caltrans facilities are provided through the Department of Rehabilitation (DOR) and the contracts that supply them reside within DOR.
    - Caltrans' districts utilize annual facility inspections to ensure that coffee makers have automatic shutoffs. Additionally, signs are

posted in break rooms to remind employees to turn off and unplug appliances not in use.

- Custodial staff at Caltrans facilities regularly clean lunchrooms, kitchenettes, and breakrooms. This includes periodic cleaning of appliances.
- Caltrans does not currently have an annual email in place to remind educate employees on the importance of electrical loads. To create better awareness, the Caltrans Sustainability Office is incorporating a page on their intranet page to make resources available for each district to utilize in educating staff on electrical plug best practices. Several districts are implementing an annual email to district staff, particularly around the holidays. Furthermore, the Division of Business Operations is working on a guidance document to further address the topic.

- Management Memo 14-09 "Energy Efficiency in Data Centers and Server Rooms":

  All state-owned and leased data centers and server rooms greater than 200 square feet must be operated within the ASHRAE-TC 9.9, Class A1-A4 guidelines, including operating at temperatures between 73-81 degrees Fahrenheit.

Caltrans operates six data centers over 1000 square feet within district offices:

Table 3.6: Caltrans Data Centers Over 1000 Square Feet

Data Center Name	PUE	Temperature	Floor Area (ft^2)
District 3 Data Center	1.3	75	1,800
District 4 Data Center	n/a	75	3,000
District 7 Data Center	1.5	75	4,400
District 8 Data Center	n/a	75	1,792
District 11 Data Center	1.8	76	1,760
Headquarters Data Center	1.84	73	2,584
District 7 TMC	n/a	70	4,000
District 8 TMC	n/a	71 (+2)	1,145
District 11 TMC	n/a	70	2,000
District 12 TMC	n/a	70	2,079

All TMCs are maintained between 70- and 73-degrees Fahrenheit. However, Power Use Effectiveness (PUE) information for these sites is not currently available as they lack meters for measurement.

IT Standards for Energy Efficiency. Caltrans' purchases of network switches and routers meet the Energy Efficient Ethernet IEEE 802.3-2012 Section 6 standard. Caltrans also uses the Cisco Discovery Protocol (CDP) with attached Cisco devices, saving energy whenever the devices are inactive.

Additionally, the Division of Infrastructure Management Server and Storage Management Section has fully implemented virtualization. Server virtualization allows business to encapsulate the operating systems and applications normally residing on individual servers into unique, software-based Virtual Machines (VMs), many of which can reside on a single server. This dramatically increases the portability, efficiency, manageability, reliability, and end user accessibility of an organization's computing resources. It also dramatically lowers the energy consumption of a data center. The program that controls virtual machines is called a hypervisor. Caltrans' current virtualization hypervisor standards include VMware and Oracle Virtual Machine (OVM).

Caltrans' current practice ensures that all requests for any multi-tiered server/computer resource are virtualized. This includes web servers, application servers, and database servers. In some cases, a server or computing resource is not virtualized if a specific computer's memory requirement exceeds the virtual server's limit. Those specific server requests are addressed on a case-by-case basis; it is possible, in some instances, to accommodate these types of requests.

When compared against the 2003 baseline data, Caltrans has achieved a 17% reduction in average EUI for the department. Unfortunately, records for Caltrans full portfolio are not available to compare for an exact EUI reduction, however, it is believed that if they were, Caltrans would show a much larger EUI reduction.

Caltrans most successful effort toward energy efficiency has been through LED light conversion projects. Caltrans has replaced LED lights in all maintenance facilities, most district offices, and throughout much of the SHS.

Caltrans has reduced natural gas usage from 2,313,309 to 1,718,431 therms for a 26% reduction from 2011 to 2020. For department wide electricity usage that includes highway and building operations, Caltrans has reduced energy usage from 763,781,031 to 202,864,828 kWh, resulting in a 73% reduction in energy use from 2011 to 2020. When converted to kBTU's as a common unit of measure, the total reduction in energy from 2,837,351,777 to 864,017,893, a 69% total reduction in energy use.

Caltrans will continue working towards energy reduction and decarbonization of our facilities. Using a combination of energy efficiency projects, on and off-site solar generation, and energy management practices, Caltrans anticipates further reductions to our GHG emissions.

Table 3.7: Summary of Energy Projects Completed or In Progress

Year Funded	Estimated Energy Savings (kBTU/yr.)	Floor Area Retrofit (sq.ft.)	Percent of Department Floor Area
2015			
2016	19,473	117,690	1.47%
2017	15,380	80,013	1%
2018	26,249	81,116	1.01%
2019		71,064	.89%
2020			
2021		34,200	

In addition to the energy project savings reflected in Table 3.9, Caltrans has planned over 40 new energy efficiency projects with the potential to save an additional 1.4 million kBTUs over the next three years pending funding. The following energy efficiency projects are completed and/or projected:

- District 1:
    - Replacement of the district office HVAC system is pending funding
    - Planned replacement of automated lighting system at the District 1 Office
- District 2:

    - Replacement of windows and conversion of HVAC wall units to mini-split units at the District 2 Office
- District 3:
    - Planned replacement of District 3 TMC HVAC system
- District 4:
    - LED Lighting upgrades at 7 toll facilities in the district
    - Replacement of HVAC system at Richmond San Rafael Toll Facility
    - New windows at the Redwood City Maintenance Facility
    - Planned replacement of 7.5 million BTU boiler with high-efficiency 6 million BTU boiler at the District 4 Office in Oakland is expected to take place in 2022
        - Additionally, the cooling tower, air intake dampers, and chillers at district office are planned for the same time
    - Planned conversion of elevator from geared to hydraulic conveyance at the district office.
- District 6:
    - In March 2020, parking lot lighting was replaced with LED fixtures.
- District 7:
    - Installed motion sensors for lights at district office.
- District 8:
    - Planned replacement of LED lighting, boiler, and chiller at District 8 Office in San Bernardino
- District 9:
    - Installed motion sensors to control lighting in cubicles at the District 9 Office in Bishop
    - LED lights were installed at the Bishop Equipment Shop
    - Timers and motion sensors were installed on security lights at the district office.
    - Replacement of windows is being considered at the district office.
- District 11
    - There were solar installations at Brawley and El Centro maintenance facilities

Part of increasing energy efficiency at Caltrans includes conducting energy audits. Table 3.7 shows Caltrans' square footage that has undergone energy surveys that match the American Society of Heating, Refrigerating and Air-Condition (ASHRAE) standards. There have been no energy audits conducted at Caltrans facilities since 2018, in part due to the COVID-19 pandemic. Caltrans

anticipates additional energy audits to begin in early 2022 as limits on building access are to be lifted.

Table 3.8: Energy Surveys

Year	Total Department Floor Area (sq.ft.)	Energy Surveys Under Way (sq.ft.) Level 1	Energy Surveys Under Way (sq.ft.) Level 2	Percent of Department Floor Area Level 1	Percent of Department Floor Area Level 2
2015	8,261,803	0	1,391,028	0	17%
2016	8,261,803				
2017	8,263,419	0	4,651,090	0	56%
2018	8,263,419	0	3,431,582	0	42%
2019	8,263,419	0	0	0	0
2020	8,261,803	0	0	0	0

Demand Response

Executive Order B-18-12 directed all state Departments are to participate in available demand response programs (DRP) and to obtain financial incentives for reducing peak electrical loads when called upon, to the maximum extent cost-effective.

Caltrans operates in almost every utility service territory in the state. Three of the state's investor-owned utilities (IOUs) — Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E) — all offer variants of demand response programs.

Facilities Enrolled in Demand Response Programs

Table 3.8 displays all Caltrans facilities enrolled in DRPs. It is important to note that many Caltrans facilities are not eligible for the more advanced DRPs because they do not have an Energy Management Control System (EMCS), a prerequisite for participation. Additionally, demand response is only available for facilities with HVAC systems, which excludes the 80 SRRAs and 65 stand-alone sand and salt storage sheds.

The 33 CVEFs have utility accounts that are billed to and managed by CHP. Caltrans Sustainability Office recently began coordinating efforts for reporting Sustainability and documenting operational procedures. Caltrans' Sustainability Office will work with CHP to ensure demand response programs are considered for the CVEFs where minimum program qualifications are met.

Caltrans participates in ADR programs by default for eligible accounts, including several street lighting and traffic control system accounts. Only 262 of the approximate 386 Caltrans facility locations are eligible for advanced ADRs. As of October 2019, 63 Caltrans sites participate or are in the process of participating demand response. In 2022, the Caltrans Sustainability Office will issue additional guidance to district facility managers to encourage participation in these programs and assure that energy reductions are tracked.

Table 3.9: Demand Response

Demand Response Participation	Number of Buildings	Estimated Available Energy Reduction (kW)
Number of Buildings Participating in 2020	63	Unknown
Number of Buildings That Will Participate in 2022	262	Unknown
All Eligible Department Buildings (Totals)	262	
All Department Buildings (Percent)	100%	

Totals exclude SRRA and sand/salt sites, as they are not eligible because they do not have HVAC. CVEF sites are excluded because utility accounts for these locations are managed by CHP.

Renewable Energy

New or major renovated state buildings over 10,000 square feet must use clean, on-site power generation, and clean back-up power supplies, if economically feasible. Facilities with available open land must consider large scale distributed generation through various financing methods, including, but not limited to, third party power purchase agreements (PPAs).

Although there are no specific kW goals for renewable energy, renewable energy does count towards meeting: (1) Zero Net Energy goal for 2025 and (2) 20% grid-based energy use reduction that was expected by 2018.

Caltrans has a total of 73 facilities with onsite solar generation rated at approximately 3.6 mWh and generating an annual average of 5 million kWh. Of the facilities Caltrans has exceeding 10,000 ft^2, approximately 50% of these facilities have onsite solar generation. The DES has identified four sites with projects in design that will include solar installations. While many additional sites have been assessed, projects did not move forward due to building age and/or high installation costs that did not provide the desired return on investment.

Caltrans is prescreening additional facilities for potential DGS assessments to determine solar feasibility through a PPA. The Caltrans Sustainability Office has identified facilities that have the potential to generate several mWh of electricity if canopy and rooftop installation costs are found to be cost effective. Upon completion of assessments, each district would coordinate with the Sustainability Office and DGS to enter into power purchase agreements for their respective facilities.

In addition to onsite generation at Caltrans facilities, the department is exploring utilization of the Caltrans right-of-way for onsite generation through third parties. This could include SRRA facilities, park and rides, and land adjacent to the SHS. While the feasibility study is in its early stages, power generated at these locations could potentially be used to power public electric vehicle charging infrastructure and other Caltrans utilities while also generating excess power for the wholesale power market and advancing the GHG reductions of EO B-18-12.

Table 3.10: On-Site Renewable Energy

Status	Number of Sites	Capacity (kW)	Estimated Annual Power Generation (kWh)	Percent of Total Annual Department Power Use
On-Site Renewables in Operation or Construction	68	3,583	5,650,391	16.3%
On-Site Renewables Proposed	1	743	1,171,711	3.4%
On-Site Renewables Totals	68	4,326	6,822,102	19.6%
Department-Wide Energy Total	386		34,749,868	
Off-Site Renewable Totals	0	0	0	0.0%
Off-Site Renewables Planned	0	0	0	0.0%
Off-Site Renewables Combined Current & Planned	0	0	0	0.0%
Current Combined On-Site and Off-Site Renewable Energy	**68**	**3,583**	**5,650,391**	**16.3%**

Monitoring Based Commissioning (MBCx)

New and existing state buildings must incorporate Monitoring Based Commissioning (MBCx) to support cost effective and energy efficient building operations, using an Energy Management Control System (EMCS). State agencies managing state-owned buildings must pursue MBCx for all facilities over 5,000 square feet with EUIs exceeding thresholds described in Management Memo (MM) 15-04 .

MM 15-04 identifies the size and energy intensities that would require the implementation of MBCx and an energy management and control system (EMCS).

Caltrans has 21 buildings with an EMCS, but the new San Francisco Bay Bridge (SFOBB) Maintenance Complex is the only group of Caltrans facilities currently utilizing MBCx. This facility uses the Solar Log 1000 system to monitor solar production and consumption. Energy generation and consumption data is available online. The system at the SFOBB Phase 1 building allows remote viewing of the Photovoltaic system and energy usage at the main utility cabinet. The SFOBB Phase 2 building has an energy monitoring system installed that allows remote viewing of the energy usage of the various electrical panels metered, gas usage, and generated photovoltaic power.

Electronic metering systems at facilities while automatic, need periodic maintenance, software patches, resetting, etc. and are not practical for on-site staff to maintain unless they are a stationary engineer or other highly trained individual. As Caltrans increases its number of monitored facilities, keeping the electronic metering systems operation will require additional position authority for highly trained personnel or funding for maintenance agreements.

Most Caltrans maintenance facilities are simple facilities with packaged HVAC systems, swamp coolers, and no on-site engineering staff. While they meet the 5,000 square foot requirement for MBCx, the square footage of unconditioned storage spaces is often included in the total reported square footage. The Caltrans Sustainability Office has a proposed project to update ESPM to list details more accurately about Caltrans building information, including use types, allow us to better refine which requirements apply to individual buildings

Historically, the mechanical portions of Caltrans projects have not received adequate funding to incorporate items (energy recovery, hybrid systems, etc.) that lower the heating and cooling load costs. Funding for mechanical is usually for standard heating and cooling systems. In many spaces (storage bldgs., inspection bays, etc.) it is not possible to have HVAC system that meet T24 requirements due to bay doors opening and closing, EFs operating, etc. Moving forward, Caltrans will work on incorporating these items into project initiation phases and design standards so that required funding can be secured early in the project process.

The Caltrans Sustainability Office also intends to work with the appropriate facility managers to emphasize the importance of MBCx and identify paths to add MBCx to all required facilities. Currently, there are no planned MBCx projects at Caltrans.

Financing

State agencies are required to pursue all available financing and project delivery mechanisms to achieve these goals including, but not limited to state revolving loan funds, utility On-Bill Financing (OBF), Power Purchase Agreements (PPAs), GS $Mart, Energy Service Contractors (ESCOs), or other available programs

Caltrans has actively pursued using the DGS Solar PPA program. Caltrans installed a 1.1 megawatt/19-acre solar farm on the Transportation Management Center and Southern Regional Laboratory campus in Fontana under this program. Other Caltrans facilities have been accepted into the program but haven't yet moved past the acceptance phase. In the past, facility energy and water efficiency upgrades have used existing funding. Most water fixture upgrades were made during the drought when emergency funds were available. Caltrans programs will continue to explore financing programs as options for future efficiency upgrades.

According to the California Energy Commission's (CEC) website, a wide variety of public-purpose-funded energy efficiency programs are administered by the state's IOUs: PG&E, SCE, SoCal Gas, and SDG&E, and Southwest Gas Corporation (SWG). Programs offered by more than one IOU include:

- *Savings by Design (PG&E, SCE, SDG&E, SoCal Gas, and SMUD)*. This program offers building owners and their design teams a range of services, including design assistance, owner's incentives (up to $0.40 per annualized kWh and $1.00 per annualized therm savings), and design team incentives (up to $50,000, plus an extra $5,000 stipend for early collaboration). Owner Incentives include a separate 20 percent bonus for incorporating end-use monitoring and a 10 percent bonus for enhanced commissioning. The maximum total incentive per project is $150,000.
- *Statewide Customized Offering for Business (PG&E, SCE, SDG&E, SoCal Gas, and SWG)*. This program offers financial incentives (up to 50 percent of total project costs) for efficiency upgrades that may include lighting, air conditioning, refrigeration, motors, variable speed drives, and natural gas equipment, as well as controls, building shell retrofits and demand reduction measures. Incentives are based on fixed rates for actual energy savings (kWh and/or therms) and peak electric demand (kW) reduction achieved in the first year after implementation.
- *Prescriptive Rebates (PG&E, SCE, SDG&E, and SWG)*. The IOUs also offer prescriptive rebates for upgrading to more efficient lighting, HVAC, water heaters, food service equipment, refrigeration, motors, window film, insulation and other specific equipment and measures. Fuel switching,

and new construction projects do not qualify for these prescriptive programs.

- *Retro-Commissioning (PG&E, SCE, SDG&E, and SoCal Gas)*. This type of program offers no-cost diagnostic and engineering resources for identifying sub-optimal performance of equipment and building systems. The program also offers financial incentives (up to $0.08/kWh, $1.00/therm, and $100/on-peak kW saved) for implementing no- and low-cost measures that increase energy efficiency and occupant comfort through adjustments, minor repairs, or enhancements. Rates are based on the amount of energy savings and peak demand reduction. Customers may be able to use on-bill financing (see below) to help pay for retro-commissioning implementation costs.
- *On-Bill Financing (PG&E, SCE, SDG&E, and SoCal Gas)*. This type of program offers zero percent/no-fee loans of up to $250,000 (or $1 million under certain conditions) to government agencies for installing qualified energy-efficiency measures under specified utility incentive programs. Terms can last up to 10 years; loans are paid back on the monthly utility bill. In some cases, monthly energy savings may be equal to or greater than the monthly payment. Through this program, PG&E and SDG&E offer incentives for HVAC equipment tune-ups, maintenance, and equipment upgrades.

DGS works with state agencies to develop and implement energy savings projects by providing multiple financing programs:

- Solar Power Purchase Agreements (PPA): Under these agreements, the solar provider installs solar power systems using third-party financing, and then sells the renewable electricity generated by the solar panels at a competitive cost to the host facility and no up-front costs.
- Energy Savings Program: The DGS Energy Savings Program manages the development and implementation of energy savings projects in existing state facilities and assists state agencies in meeting energy reduction requirements. Through a team of construction professionals, skilled engineers, and quality contractors, they manage projects from conception through construction and are authorized to design and implement energy savings projects.
- GS $mart: Pronounced "G S Smart," GS $Mart is a financial marketplace is designed to facilitate installment or lease purchases and meets all requirements of a competitively bid process. All state and local government agencies who purchase goods and services are eligible for a GS $Mart low-interest loan.

CHAPTER 4 - WATER EFFICIENCY AND CONSERVATION

This Water Efficiency and Conservation report demonstrates to the Governor and the public the progress Caltrans has made toward meeting the state's goals related to water efficiency and conservation. This report identifies successful accomplishments, ongoing efforts, and outstanding challenges.

California experiences the most extreme variability in yearly precipitation in the nation. In 2015, California had record low statewide mountain snowpack of only 5 percent of average while 2012-14 were the three driest consecutive years of statewide precipitation in the historical record. The 2017 water year (October 1, 2016-September 30, 2017) surpassed the wettest year of record (1982-83) in the Sacramento River and San Joaquin River watersheds and close to becoming the wettest year in the Tulare Basin (set in 1968-69). These potential wide swings in precipitation from one year to the next show why California must be prepared for either flood or drought in any given year.

Therefore, using water more wisely is critical. The EOs and SAM sections listed in the previous section help demonstrate the connection between water and energy use, (the water-energy nexus), water and climate change, and water for landscaping. Further, the impact of water used by state agencies goes beyond the scope of these EOs, SAM sections, and DGS management memos as these documents do not address related issues such as water runoff from landscaping and the potential for water pollution or the benefits of water infiltration, soil health, and nutrient recycling. However, by using water planning, a well-crafted water plan will meet all state requirements and adds considerable value and benefits to the organization and surrounding communities.

Department Mission and Built Infrastructure

Caltrans' mission is to "provide a safe and reliable transportation network that serves all people and respects the environment." Sustainability, livability, and the economy are central to improving the quality of life in California. Caltrans 2020-2024 Strategic Plan integrates sustainability principles across all goals, addressing people, planet, and prosperity comprehensively as we implement the Plan's strategies. The Plan specifically outlines a goal to "Lead Climate Action" by reducing our environmental impact of the State's transportation network through reducing operational greenhouse gas emissions and strengthening the resiliency of the transportation system to withstand and recover from the worsening effects of climate change.

Caltrans has approximately 21,170 employees and a FY 20/22 budget of $17.3 billion. Caltrans designs and oversees highway construction, operates, and maintains the SHS, funds intercity passenger rail routes, and provides funding for local transportation projects. Caltrans owns and manages more than 50,000 lane-miles of pavement, 30,000 acres of irrigated landscape, 13,000 bridges, and 205,000 culverts on California's highway system. Caltrans is serviced by over 17,000 utility accounts throughout the state, providing water that is utilized at facilities and for irrigation of roadside landscape on the State Highway System.

Caltrans took extraordinary measures to meet the Administration's goal of cutting water use by 50 percent during the last period of drought. For example, Caltrans' Director authorized emergency funding for repairing and modernizing irrigations systems along the highway, and for replacing water fixtures in facilities to maximize efficiency. Caltrans also supported the "Save Our Water" campaign by using electronic highway message signs to raise awareness of the severe drought and encourage all Californians to conserve water. As a result of these measures, Caltrans reduced water use by 60 percent from 2010 to 2020.

Some of the measures taken since 2014 by Caltrans include:

- Eliminating carwashes except for those required for safety
- Eliminating turf at most facilities
- Installation of thousands of smart irrigation controllers on land irrigated by Caltrans
- Over 1,300 fixture replacements at hundreds of Caltrans facilities
- Postponing projects that included non-essential planting work irrigated with potable water

Table 4.1: 2020 Total Purchased Water

Purchased Water	Quantity	Cost ($/yr.)
Potable	2,831,236,165	$1,137,277.06
Recycled Water	384,784,410	$96,278.67
Totals	**3,216,020,575**	**$1,233,555.73**

Source: Caltrans Enterprise Datalink. Facility use and irrigation for the SHS are included in the totals. At this time, Table 4.1 does not include water sourced from wells.

Table 4.2: Properties with Largest Water Use Per Capita

Building Name	Area (ft^2)	# Of Building Occupants	Total 2020 Gallons	Total 2020 Irrigation in Gallons (if known)	Gallons per Capita
District 8 Office	235,714	1,231	28,216,900	n/a	22,922
District 7 Office	957,702	1,379	10,701,400	n/a	7,760
Redding Maintenance Station	46.507	59	8,340,600	n/a	141,366
Sacramento Translab	289,923	225	7,242,300	n/a	32,188
District 8 TMC	43,000	33	6,948,900	n/a	210,573
Total for Buildings in This Table	1,574,846	2,927	61,450,100		414,809
Total for All Department Buildings*	8,252,789	20,743	175,915,900		8,481
% Of Totals	19%	n/a	35%		

Source: Caltrans Energy Star Portfolio Manager database

*SRRA and CVEF square footage is not included since water use data is currently unavailable. Water used for irrigation of the SHS is not included in these totals.

Table 4.3: Properties with Largest Landscape Area

Building Name	Landscape Area (ft^2)
South San Jose Maintenance Station	64,900
District 8 Office – San Bernardino	45,802
Geyserville Maintenance Station	39,000
Fort Ross Maintenance Station	36,000
Tri-Bridge Yard (Benicia)	34,300
Gilroy Maintenance Station	28,600
Total Landscaping area for Buildings in This Table*	248,602
Total Landscaping for All Department Buildings*	Unknown
% Of Totals that is large landscape*	Unknown

Source: Distance measured in Google Maps for 2018 Sustainability Roadmap

*Total landscaping data for all department buildings is not available at this time and has been excluded. The Caltrans Sustainability Office will work to verify this data for the next roadmap reporting period.

As a steward of California's precious water resources, Caltrans actively manages, promotes, and implements water conservation practices within the

highway transportation system and associated facilities. Caltrans took extraordinary measures to reduce water use during the drought in 2014-2017.

Although the drought was declared over by Governor Brown in 2017, the conservation efforts at Caltrans continue to be included in everyday operations. Cost-effective and appropriate water conservation strategies are employed in the design, construction, operation, and maintenance of all facilities, including water conserving irrigation systems for highway planting and to the maximum extent practicable, the use of recycled water.

While Caltrans has been successful in meeting the Governor's water efficiency goals, Caltrans continues to pursue further water conservation efforts. The following challenges have been encountered and have limited Caltrans ability to make additional progress on water saving efforts:

- Lack of available recycled water to use for landscape irrigation at facilities. Caltrans is working with water providers to expand recycled water availability where possible.
- Inability to have in-house trained water management staff at facilities due to competing priority assignments.
- Information on water use is not available for facilities utilizing well water.
    - This could be remedied through a monitoring system that is cloud based, however, funding has not been identified to implement this strategy.

Table 4.4: Department Wide Facility Water Use Trends

Year	Total Occupancy /year*	Total Amount Used (Gallons/year)**	Percent Change From 2010 Baseline	Per capita Gallons per person
Baseline Year 2010	20,955	282,690,500		37
2013	19,576	298,494,800	6%	42
2016	19,044	179,818,400	-36%	26
2018	19,021	183,466,900	-35%	26
2019	20,758	228,604,500	-19%	30
2020	20,743	175,915,900	-38%	23
2022 Goal (15% reduction from 2020)		**149,528,515**		

Source: Caltrans Energy Star Portfolio Manager database

*Occupancy data is based on Caltrans position allocation for each budget year.

**Water usage data excludes water for irrigation of the SHS.

Caltrans has exceeded the 20 percent and 25 percent reduction goals for water use at state facilities by 13 percent for a total reduction of 38% from 2010 baseline numbers. In addition to the state's reduction goals, Caltrans set its own goal to reduce water use in facilities and on the SHS by 50 percent from a 2013 baseline that has resulted in an overall 60 percent reduction.

These reductions were achieved through drought-tolerant landscaping projects, reduced watering, fixture upgrades, and smart controllers utilizing emergency funding that was obtained during the 2014-2017 drought. Caltrans has made water efficiency a standard part of our design process to ensure good stewardship of water on all planned projects. The largest effort to conserve water occurred in response to the drought from 2014-2016 when the Caltrans Director authorized emergency funding to repair and replace water fixtures. In response, programs and districts replaced approximately 1,300 fixtures with more efficient hardware throughout the state. In the same period, the Caltrans Division of Maintenance established water managers in each district with a focus on reducing water use throughout the State Highway System.

Table 4.5: Total Facility Water Reductions Achieved

Total Water Use Compared to Baseline	Total Amount Used (gallons per year) *	Annual Gallons Per capita
20% Reduction Achieved	175,915,900	8,481
Totals	175,915,900	8,481
Department-Wide Reduction	106,774,600	5,010

Source: Caltrans Energy Star Portfolio Manager

*Data in table is for buildings only.

Caltrans has several water-saving initiatives that are underway across the state. Most notably, the Caltrans director issued an updated water conservation memo in December 2021 instructing Caltrans to take immediate measures to reduce water by 15 percent from 2020 levels. Specific actions to be taken include the following:

- Redirecting staff resources to participate on irrigation strike teams.
- Identify measures at facilities to reduce water use by 15 percent from 2020 levels
- Review of projects in "severe shortage areas" for possible postponement.
- Creating updated Drought Action Plans for each district with quarterly review and update periods.
- Upgrading or replacing existing irrigation controls to be compatible with 4G or higher cellular networks.
- Prohibiting the use of potable water for washing vehicles except to comply with health and safety requirements.
- Development of Drought Contingency Plans for all districts.
- Collaborating with partner agencies to expand access to recycled water for irrigation.

Caltrans intends to change all remaining water fixtures to more efficient hardware where feasible, evaluate potential water savings in future projects prior to installation, and conduct better documentation of projects for reporting and analysis purposes. The Division of Maintenance is actively working to repair and convert sprinkler systems on the SHS to smart irrigation controllers, allowing for remote programing and quicker response for water use reductions.

The Caltrans Office of Sustainability continues to work with programs in identifying ways to advance water-conserving activities and identify funding streams to complete projects.

Building Water Best Management Practices (BMPS)

General Water Management

Caltrans tracks monthly water usage through its Enterprise Datalink reporting system. Every water bill received is keyed into the system and tracks information from gallons used to cost. This information is available to Caltrans staff to analyze trends and usage to identify potential leaks or to target areas for improvement. The information is also uploaded to Energy Star Portfolio Manager annually.

Leak Detection and Repair

Caltrans facility staff check regularly for leaks on all water use fixtures. Leaky fixtures are repaired or replaced with new and more efficient models.

Kitchens

- Perform visual leak detection of all kitchen devices using water, including faucets, dishwashers, soda fountains, and any other applicable equipment
- Check all equipment water temperatures and flow rates against the manufacturer recommendations. Use the recommended minimum temperature and flow to maximize savings.
- Adjust ice machines to dispense less ice if waste is occurring
- Limit garbage disposal use by hand scraping food waste into appropriate waste receptacles prior to washing.
- Presoak utensils and dishes in basins of water, rather than in running water.
- Do not use running water to defrost food.
- Do not allow water to flow unnecessarily.

Laundry Facilities

- Run washers only when full to maximize capacity and reduce wasted water
- Replace old, inefficient appliances with Energy Star and Water Sense certified models

Table 4.6: Summary of Indoor Water Efficiency Projects Completed 2014-2020 or In Progress*

Year Completed	Water Saved (Gallons/yr.)	Number of Indoor Water Efficiency Projects Completed	Cost Savings per Year
2014	1,300,000		$20,000
2015	54,545		Unmetered Water*
2016	0		$18
2017	45,450		Unknown
2018	85,450		Unknown
2019			
2020			

Source: District Sustainability Representatives and Facility Managers

*Records of specific projects completed were not available to the Caltrans Sustainability Office at the time of reporting. Caltrans replaced over 1,800 fixtures since 2014, however, the exact time of replacement is unknown. Savings by project were not recorded.

District 7:

- District 7 completed installation of smart faucets in two restrooms at the district office as part of a pilot program

District 9:

- District 9 has replaced several fixtures with low flow fixtures at the district offices

In a recent survey, Caltrans District Facility Managers identified fixture replacement projects that can save approximately 374,000 gallons of water annually if funded and implemented.

Building Heating and Cooling Systems BMPs

- Steam traps and leaks are inspected, repaired, and replaced by Caltrans stationary engineers, DGS stationary engineers, or hired contractors.
- Leaks are repaired, and faulty steam traps are replaced as soon as possible.
- Boilers are tuned annually, or per the contract scope of work, by certified, trained boiler technicians. Each district maintains contracts specific to the buildings in their portfolio.

- Stationary engineering staff ensure central storage tanks and steam and condensate return piping have proper insulation.
- For both cooling towers and boilers, water treatment specialist services are obtained to prevent system scale and corrosion and to optimize cycles of concentration. Treatment programs include routine checks of boiler water chemistry.
- Condensate pumps are routinely inspected and maintained by stationary engineers.
- Both the water side and fire side of the boiler are regularly inspected by stationary engineers. If needed, the tube surfaces are cleaned to ensure optimal heat transfer thereby maximizing system energy efficiency.
- Boiler and cooling tower blowdown rates are adjusted to maintain total dissolved solids (TDS) at levels recommended by manufacturers' specifications at respective locations.
- Water-cooled air conditioning units are only utilized when spaces are occupied, typically in the morning or late afternoon at most sites.

The following three tables (Tables 4.7, 4.8, and 4.9) display additional details about completed or ongoing projects. However, these tables do not correspond to the data in Table 4.7 for a few reasons. Out of the three rounds of emergency funded projects during the 2014-2017 drought, many of the first round of projects were subjected to a time constraint that resulted in a failure to document potential water and cost savings. In addition, there were many activities that were suspended or reduced to save water during the drought, such as:

- Landscape watering on the highway system
- Vehicle washing
- Interior and exterior window washing at facilities
- Power-washing at facilities
- Irrigation of turf and annuals at facilities

Table 4.7: Summary of Boilers and Cooling Systems Projects Completed or In Progress*

Year Completed	Water Saved (Gallons/yr.)	Number of Systems with Water Efficiency Projects
2014	0	0
2015	Unknown	0
2016	211,951	4
2017	189,210	2
2018	543,144	1
2019	0	0
2020	Unknown	2

Source: District Sustainability Representatives and Facility Managers

This table does not include other projects where estimated potential savings was not recorded.

Table 4.8: Summary of Landscaping Hardware Water Efficiency Projects Completed or In Progress

Year Funded	Water Saved (Gallons/yr.)	Estimated Annual Cost Savings	Total Number of Projects per Year
2014	316,000	$3,100	2
2015	24,960	$130	3
2016	21,120	Unknown	2
2017	337,292	Unknown	1
2018	506,303	Unknown	1
2019	Unknown	Unknown	5
2020	Unknown	Unknown	5

*Source: District Sustainability Representatives and Facility Managers. Cost savings and total water savings were not available at the time of reporting.

District 4:

- Installed over 50 new smart irrigation controls on roadside landscape projects throughout the district
- Installation of landscape irrigated with recycled water at SFOBB Complex
- Installation of a recycled water truck fill station for street sweepers on I-280 at Sand Hill Road in Menlo Park

District 7:

- Installed over 800 smart controllers throughout the district between 2015 and 2020

- Added GIS technology to manage irrigated roadside assets

District 12:

- Project to convert and replace potable water meters for roadside irrigation with recycled water supply. Completion expected in 2022
- Installed on-site recycled water system at the Orange, San Juan Capistrano, and Costa Mesa locations
- Procurement of upgraded smart irrigation controllers for roadside irrigation is in progress with installations to begin in 2022. Will convert from 3g to 4g/5g cellular signal

Table 4.9: Summary of Living Landscaping Water Efficiency Projects Completed or In Progress

Year Funded	Water Saved (Gallons/yr.)	Landscape Area MWELO (ft2)	Climate Appropriate Landscape Area (ft2)
2014	0	0	0
2015	5,200	50	205
2016	10,500	150	225
2017	0	0	0
2018	20,000	250	250
2019	0	0	0
2020	TBD	3,000	3000

District 9:

- At the District Office the lawn was removed and replaced with drought tolerant landscaping at the building entry. Plans to complete additional landscape will commence in 2022.

Water Shortage Contingency Plans & Critical Groundwater Basins

Urban water suppliers are required to maintain Water Shortage Contingency Plans that are customized to local conditions. These plans include a staged response to water shortages and droughts lasting up to three years. When implementing the stages of the Water Shortage Contingency Plan, the water supplier will require increasingly stringent reductions in water use.

EO B-37-16 required DWR to strengthen the requirements for these Plans, including, among other proposed changes, the creation of common standards for each stage in the plan, and extending the drought planning from three to five years. For smaller water suppliers and rural communities not required to

maintain a Water Shortage Contingency Plan, DWR works with counties to facilitate improved drought planning.

State agencies are to be aware of their water suppliers' Water Shortage Contingency Plan and the potential impact each stage may have on their water use. State agencies are to have their own contingency plans in place for their building and landscaping water use to respond to any stage implemented by the water supplier.

The Sustainable Groundwater Management Act (SGMA) established a new structure for managing California's groundwater resources at a local level by local agencies. SGMA required, by June 30, 2017, the formation of locally controlled groundwater sustainability agencies (GSAs) in the State's high- and medium-priority groundwater basins and subbasins (basins). A GSA is responsible for developing and implementing a groundwater sustainability plan (GSP) to meet the sustainability goal of the basin to ensure that it is operated within its sustainable yield, without causing undesirable results. For those facilities located in critical groundwater basins, state agencies are to work with the local GSA plan.

Table 4.10: Number of Buildings with Urban Water Shortage Contingency Plans and in Critical Groundwater Basins

Number of Buildings with urban water shortage contingency plans.	Number of buildings in critical groundwater basins	Total Amount of water used by buildings in critical groundwater basins (Gallons)
Unavailable	35	27,246,900

At Caltrans, water conservation is always in effect. Although the number of buildings residing within areas subject to urban water shortage contingency plans is not currently available, Caltrans is in the process of developing a Drought Contingency Plan that will include this information. As Caltrans operates in nearly all water districts within California through buildings and highway irrigation, it is likely that Caltrans is served by all 384 urban water suppliers. Many of these urban water suppliers have contingency plans in place.

Building Inventories Summary

Table 4.11: Summary of Building Inventory Needs

Number of toilets to be replaced	Number of urinals to be replaced	Number of faucet aerators to be replaced	Number of showerheads to be replaced * Changing to 1.8 gallons in 2020	Number of clothes washers to be replaced	Number of garbage disposals to be replaced.	Number of pre-rinse valves to be replaced
1022	618	867	216	32	17	4

Source: Caltrans District Sustainability Representatives and District Facility Managers

Since 2017, Caltrans has replaced over 372 toilets, 652 aerators, and 16 shower heads in our facilities, statewide, utilizing emergency funding from the last drought cycle. Caltrans is working to identify funding sources for additional fixture replacement to increase our water savings at Caltrans facilities. It should be noted that some Caltrans facilities could not replace fixtures without major upgrades to plumbing infrastructure, and as a result, these fixtures will not be replaced until a major renovation is started. For new construction and major renovations, buildings are designed with fixtures that meet code-required water usage requirements.

Heating and Cooling Systems Inventories Summary

Table 4.12: Summary of Boilers and Cooling Systems Inventory*

Amount of Water Used for make-up (Gallons)	Number of flash tanks to purchase and install	Number of meters to purchase and install	Amount currently reused. (Gallons)	Remaining additional water suitable for other purposes (Gallons)
2547.5	0	5	0	0

Source: Caltrans District Sustainability Representatives and District Facility Managers

*Complete data for boilers and cooling systems was not available for reporting

Caltrans will further evaluate efficiency of boilers and cooling systems in upcoming facility assessments at district offices.

Irrigation Hardware Inventories Summary

At Caltrans, landscaping accounts for approximately 94 percent of the department's total water use. While landscaping serves critical functions, the accompanying irrigation hardware, if not properly installed and maintained, can contribute to water waste. By reviewing and inventorying all irrigation hardware, it is possible to achieve significant water savings.

While detailed information on irrigation hardware for Caltrans irrigated properties was not available at the time of reporting, Caltrans has identified several potential irrigation projects that can save an estimated 271 million gallons of water annually if they can be funded in the upcoming years. Projects identified include:

- Smart irrigation controller upgrades
- Repair and improvements to existing irrigation hardware throughout the SHS
- Booster pump replacements
- Conversion to drip irrigation systems

At the District 1 Eureka office building, landscape and irrigation improvements were completed through multi-staged projects. In 2017, the District 1 office completed the replacement of clay with appropriate topsoil, new mulch, water-efficient dripline and irrigation controllers, and native drought-resistant bee-friendly shrubs and plants. The total project cost was approximately $12,700. Landscape improvements and upgrades and irrigation improvements were completed in 2019.

Landscape Inventory

Far from being just an aesthetic or ornamental feature, landscaping plays a critical role around public buildings and facilities. From providing safety and security, to reducing local heat islands, suppressing dust, reducing water runoff, maintaining soil health, aiding in water filtration and nutrient recycling, landscaping around public buildings is essential. Further, landscaping in public places frequently surrounds historic places and public memorials as well as provides pleasant public gathering spaces. The health and proper maintenance of these landscapes is vital to the physical wellbeing of California's people and wildlife as well as its social, cultural, political, and historical life.

Additionally, the many vital ecosystem functions carried out by living public landscaping are critical in helping California meet its goals for greenhouse gas reduction, climate adaptation, and water and energy efficiency and water conservation.

Urban forests are vital to improve site conditions for occupants and visitors to buildings and the surrounding community. Large shade trees should be considered valuable infrastructure and given priority over other plants to maintain tree health. A voluntary urban forest plan is encouraged to assess individual trees and plan for additional tree plantings.

Caltrans maintains landscape at both facilities and throughout the state in rural, mountainous, and urban settings. Living landscape on the SHS not only has aesthetic purposes, but also important environmental benefits. Highway landscape is used for safety, environmental mitigation, stormwater pollution prevention, and erosion control. When selecting items for planting, Caltrans considers several of the following factors:

- Regionally appropriate, drought tolerant or native plant material
- Low maintenance plant material that limits need for pruning and time spent maintaining landscaping
- Mulch applications that discourage weed growth, reduce the need for herbicides, and conserve soil moisture
- Low fire spread risk for plants in wildfire prone areas

Caltrans has made efforts to reduce or eliminate irrigated turf at Caltrans facilities. All existing and proposed landscape projects are evaluated using MWELO criteria. Caltrans does not maintain any historic sites or memorials. Due to the nature of Caltrans work, landscape improvements are a part of our everyday work. Cost effective and appropriate water conservation strategies are employed in the design, construction, and maintenance of transportation facilities including "Smart" Irrigation Controllers, wood and gravel mulches, hardscape surfaces, and recycled water to the maximum extent possible. These strategies not only reduce water usage, but also reduce GHG emissions.

Living Landscape BMPs

- Prioritize and assign value to plants within a landscape.
- During drought or other water shortages, give trees and large shrubs highest priority for survival.
- Continue to water trees and shrubs as needed.
- Refresh mulch as needed. All bare soil must be covered by a minimum of 3 inches of mulch.

- Adjust the irrigation schedule for seasonal changes. Add the warmest month's irrigation schedule into smart irrigation controller programming
- Test irrigation system monthly to check for leaks and misalignment, and other malfunctions. Repair within 72 hours. Adjust irrigation systems as needed.
- Irrigate between 6pm and 6am. Watering window exemptions exist only with point-to-point irrigation systems.
- Prevent runoff! Avoid directing water to hardscapes such as parking lots, sidewalks, or other paved areas. Irrigation run time must be adjusted to prevent run-off conditions No irrigation water should ever be permitted to leave the site.
- Use WUCOLS to find plant water use requirements and only water landscapes according to the plant water needs.
- Plant species that are native and/or suitable for the local climate zone and ensure that plants are low water plants.
- When appropriate, consider bio-swales and other forms of rainwater capture, such as sidewalk stormwater planters, to keep water onsite and to promote groundwater recharge
- When planting new areas or replacing plants, add compost to the soil (entire planting areas, not just planting holes) at a rate indicated by a soil test.
- Trees and large shrubs are given highest priority for survival during drought or other water shortages. Trees and shrubs should continue to be watered as needed. Mulch is refreshed as needed. In a landscaped area, consider covering bare soil with a minimum of three inches of mulch.

Large landscape Water Use

Large landscape water use often represents a significant percentage of a facility's water use and significant water savings can often be achieved through better irrigation scheduling or improvements in irrigation hardware. As part of the Water Use Guidelines and Criteria, water uses for landscape areas over 20,000 sq. ft. shall use a smart irrigation controller with a water budget program.

A landscape water budget is the calculated irrigation requirement of a landscape based on landscape area, local climate factors, specific plant requirements and the irrigation system performance. The water budget establishes an efficient standard for the landscape area. The water budget programs use local weather measurements to adjust the irrigation schedule on a weekly, biweekly, or monthly basis. A dedicated landscape meter or an irrigation sub-meter is required to track the actual landscape water use. The actual water use is entered into the water budget program and the program compares the water use to an efficiency standard. A landscape water use tracking program will help improve irrigation scheduling and detect irrigation

system leaks. Landscape water budget management services in California are available by landscape associations and private vendors.

By reading the water meter and entering use data into the program database, the landscape water manager can monitor use and adjust the irrigation schedule to maintain the landscape at or below the water budget. A landscape water audit and needed repairs to the irrigation system are advised at initiation of the budget program to obtain optimum results. Costs for the program are the responsibility of the agency.

Data is obtained from both dedicated landscape meters and mixed-use meters; in which case a landscape sub-meter can provide the necessary data. If a dedicated meter or sub-meter is not available a winter / summer water use comparison can be used to estimate the summer irrigation demand and landscape water budget.

Landscape maintenance staff should attend an Environmental Protection Agency (EPA) WaterSense labeled training program. WaterSense labeled irrigation training programs include the Irrigation Association Certified Irrigation Auditor (CLIA), Certified Irrigation Contractor (CIC), Certified Irrigation Designer (CID), Sonoma Marin Water Saving Partnership Qualified Water Efficient Landscaper (QWEL)and the California Landscape Contractor Association 's Water Management Certification Program (WMCP). All listed EPA WaterSense labeled programs are available throughout California.

Water use baselines and targets do not have to be established separately for large landscapes. The large landscape water use should be included in the facilities baseline and target water use. If the landscape is served by a utility owned dedicated landscape account meter, the volume of water used should be added to the amount recorded by the utility meter serving the building. If the landscape water is sub-metered after it has gone through the mixed-use utility owned meter, it has already been accounted for in the total facility water use measurement.

Table 4.13: Summary of Large Landscape Inventory and Water Budget*

Number of Facility Sites/Locations with > 20,000 sq. ft. of Landscaping	Total Landscape Area all Facilities	Total Water Budget all Facilities	Total EPA WaterSense or Irrigation Association Certified Staff
10	284,400	725,753	6

Source: Google Maps, Caltrans District Sustainability Representatives, and District Facility Managers

*Data for all of Caltrans Large Landscape Inventory was not available at the time of reporting due to the sheer amount of landscape Caltrans maintains in the SHS. The Sustainability Office will work with District Water Managers to try to identify methods to capture this information in the future.

Table 4.14: Summary of Completed Living Landscaping Water Efficiency Projects

Total of all Facilities	Est Annual Water Savings (Gallons)	Est Annual Cost ($) Savings	Sum of MWELO Landscape installed (Sq. Ft.)	Sum of Climate Appropriate Landscape Installed (Sq. Ft.)
386	Unknown	Unknown	37,370	1066550

In a recent survey to identify potential water conservation projects, 22 projects were identified that have the potential to conserve over 37 million gallons of water if funding sources can be identified. The Caltrans Sustainability Office will work with District Facility and Water Managers to identify potential funding sources or alternatives to fund these projects.

Monitoring, Reporting and Compliance

Each state agency is responsible for monitoring water use and reporting baseline and annual water use for compliance with the water use reduction targets. Water use shall be measured at facilities that have meters and submeters.

Water use must be estimated at state facilities that do not have water meters. If not cost prohibitive, state agencies should prioritize water meter installations to obtain accurate measurement of water use. Baseline water use can be estimated based on water use ratings of fixtures and appliances at the site, the duration per use, amount of usage, and the number of occupants. The California Green Building Standards Code provides a baseline water use calculation table that will aid state agencies in developing their water use

estimates. Water use reductions can be estimated by comparing flow rates of replacement fixtures with old fixtures. For example, there will be a water use reduction of 3.72 gallons per flush (gpf) by replacing a 5-gpf toilet with a 1.28-gpf toilet. All estimates and assumptions of water use should be well documented.

Caltrans has integrated water metrics into its Enterprise Datalink reporting platform. When accounting receives invoices, they key the financial and usage information into the system, making it available to water managers as soon as the next day. The system allows users to run reports, track trends, and compare year-over-year usage statistics by cost center, location, district, and more. The system also differentiates between potable and recycled water, allowing Caltrans to track progress toward recycled water usage goals for landscape irrigation.

Highway Landscape Water Conservation

While the greater part of this Roadmap focuses on buildings, this section highlights Caltrans' water conserving efforts and accomplishments for highway landscaping. Approximately 86 percent of Caltrans' water consumption comes from the maintenance and preservation of highway landscaping. However, this consumption has considerably declined in recent years. Water usage trended up over 2017-2018, partly due to new acreage, but mostly due to the repair and activation of irrigation systems shut off during the drought or due to wire theft/ vandalism etc., from unsheltered encampments. With a renewed drought declaration, water use for irrigation has begun to trend down.

In 2016, Caltrans Director's set a goal for Caltrans to use 100 percent non-potable water in irrigation systems by 2036. As a result, Caltrans will see increases in non-potable water use as infrastructure projects to increase recycled water availability are completed.

Table 4.15: Caltrans Irrigation Consumption

Year	Landscaped acres	Recycled water usage (gallons)	Potable water usage (gallons)	Total (gallons)
2015	≈30,000	367,054,729	2,369,082,663	2,736,137,392
2016	≈30,000	316,591,685	2,300,036,754	2,616,628,439
2017*	31,395	399,188,723	2,681,821,346	3,081,010,069

Year	Landscaped acres	Recycled water usage (gallons)	Potable water usage (gallons)	Total (gallons)
2018*	31,488	429,558,172	3,168,927,237	3,598,485,408
2019	≈35,000	369,211,024	2,614,552,022	2,983,763,046
2020	≈35,000	359,109,819	2,421,132,152	2,780,241,970

Source: CT Enterprise Datalink

Future Water Conservation Projects

Going forward, Caltrans continues to address the following water conservation measures:

- Providing methods and updated irrigation systems to continue to meet our 50 percent water-use reduction (as compared to 2013 usage)
- Converting to 100 percent non-potable water use by 2036, and addressing the following issues:
    - Providing points of connection
    - Installing main and/or supply lines
    - Providing hydrants or standpipes for construction or maintenance activities
    - Installing remaining smart controllers to meet the goal of 100 percent implementation
    - Installing facilities or other equipment to efficiently manage and track water consumption
    - Repairing and protecting existing irrigation systems.
    - Incorporating compost into the soil to reduce storm water runoff and to hold water in the root zone
    - Spreading wood mulch or installing inert ground covers such as gravel to conserve soil moisture
    - Selecting regionally appropriate, drought-tolerant, and/or native plant material
    - Preserving established existing vegetation to the maximum extent possible

    - Replacing plant material lost due to the drought with an emphasis on restoring classified landscaped freeway areas

Since Caltrans does not have set-aside water conservation funds, this work will need to be included with ongoing transportation projects, SHOPP Roadside Rehabilitation (201.210), or District Minor programs. Where appropriate, water conservation needs should be included in current 10-Year SHOPP planning efforts. Needs could also be included with other work or as standalone projects. Asset management and inventory efforts should include water conservation needs, condition (Good/Fair/Poor), estimated improvement costs, and number of activity units.

District Landscape Architects, District SHOPP Coordinators, and Landscape Architecture Program SHOPP Advisors should be consulted for prioritizing needs for the SHS Management Plan (SHSMP) and developing standalone or multi-objective projects.

Continuing Water Conservation Requirements

California's climate varies throughout the state, with most of the population residing in temperate Mediterranean zones. Reoccurring drought will continue to be a part of the state's future. For this reason, the following water conservation requirements should always be in effect:

- Reducing potable water use by 50 percent compared to the 2013 baseline, per Caltrans "Water Conservation for Highway Projects" memo from February 6, 2014
- Compliance with the "Storm Water Management Plan Implementation and Model Water Efficient Landscape Ordinance" (MWELO) memo from October 23, 2013
- Compliance with Deputy Directive 13 ("Water Conservation") from September 1, 1993 (This document will be updated in 2022)
- Planting limited to native and non-native material appropriate for the project micro- climate so little or no water beyond natural rainfall is required for healthy survival
- Supplemental irrigation provided by non-potable water, unless not practical
- Inclusion of the Maximum Applied Water Allowance (MAWA) calculations for new and rehabilitated landscapes as project supplemental information

Despite the wet winter of 2016-2017 and declaration of the end of the California drought by Governor Jerry Brown on April 17, 2017, California has entered another historic drought with nearly 23 percent of the state in exceptional drought and 56 percent in extreme drought. Droughts are expected to persist

and increase in frequency within California due to climate change and warm winter temperatures. For that reason, the promotion and implementation of water conservation strategies continues to be a high priority at Caltrans.

Landscape Water Conservation Challenges

Caltrans has made significant steps in recent years to conserve water in its landscaped areas, and is pursuing opportunities to do more in the following areas:

- Using "smart" controllers for flow monitoring and reporting to their fullest extent
- Looking for ways to access recycled and non-potable water sources
- Working with recycled water purveyors to implement projects that meet capacity allocations, environmental health requirements, system testing, plan reviews, and use and permit fees, in addition to construction/installation practices and requirements
- Addressing declining and deteriorating irrigation infrastructure that reduces delivery efficiency
- Implementing MWELO and MAWA

CHAPTER 5 - GREEN OPERATIONS

Greenhouse Gas (GHG) Emissions from Internal Operations

State agencies are directed take actions to reduce entity-wide greenhouse gas emissions by at least 10 percent by 2015 and 20 percent by 2020, as measured against a 2010 baseline.

Caltrans has reduced entity wide GHG emissions from internal operations by 29% in 2020 compared to the 2010 baseline through various measures outlined below.

- **Energy Efficiency –** Caltrans has reduced total grid-based energy 61% at Caltrans facilities and along the SHS through various energy efficiency efforts, including LED lighting conversions and solar installations. As of 2019, Caltrans has installed 12,225 LED lights at district offices.

- **On-Site Renewable Energy –** Caltrans installed roof-mounted solar panels at 70 transportation facilities with a total capacity of 2.4 megawatts (MW) through Clean Renewable Energy Bonds (CREBs), as well as an installation of a ground mounted solar field with a capacity of 1.1 MW at the Southern Regional Laboratory in Fontana, CA. District 11 recently installed solar at the El Centro and Brawley maintenance facilities for an approximate combined total of 1 MW.

- **Purchased Renewable Energy –** Caltrans has participated in the following utility following programs that indirectly purchase power from renewable resources, such as wind, sun, and biomass:

    - SMUD's "Greenergy" program
    - San Diego Community Power's "PowerOn" and "Power100" programs
    - Clean Energy Alliance's "Clean Impact Plus" program

- **Fuel Efficient Vehicles –** Caltrans has utilized a variety of fuel efficient and zero emission vehicles for several years. The current fleet includes 84 non-plug-in hybrid vehicles, 154 plug-in hybrid electric vehicles, 65 battery-electric vehicles, and 36 hydrogen-powered vehicles. Additionally, Caltrans recently purchased their first hydrogen-fuel cell powered street sweeper to our fleet with purchase orders placed to add an additional 15 all electric street sweepers in 2022.

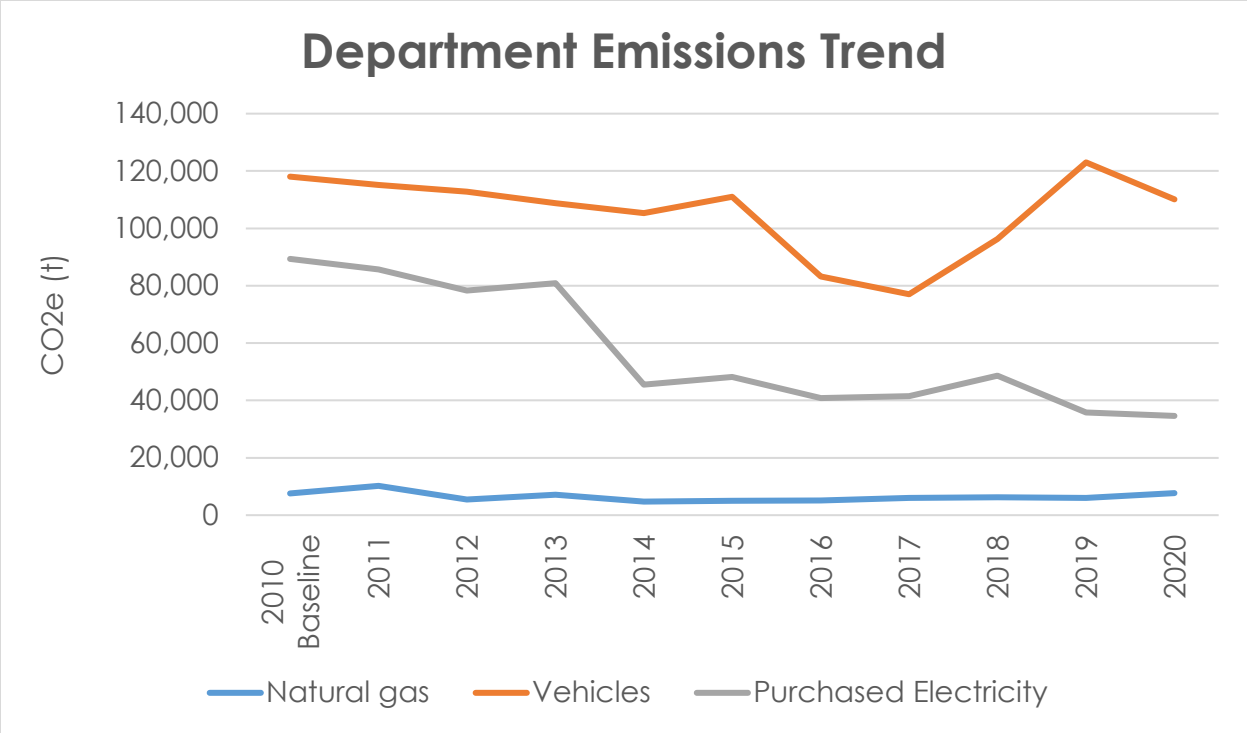
- **Biofuels –** Caltrans purchases bulk Renewable Diesel (RD) to be stored in tanks at maintenance facilities where weather conditions allow. In FY 2021, RD accounted for 44 percent of Caltrans total diesel purchases. Caltrans was able to utilize 100 percent RD in 4 out of 12 districts.

- **Mulch –** Caltrans uses mulch in landscape projects throughout the SHS, resulting in reduced GHG emissions in landscaping.

Table 5.1: GHG Emissions since 2010

Emissions Source	Natural gas	Vehicles	Purchased Electricity	Total
2010 Baseline	7,585	118,042	89,356	**214,983**
2011	10,223	115,118	85,725	**211,067**
2012	5,484	112,758	78,373	**196,615**
2013	7,179	108,810	80,841	**196,830**
2014	4,735	105,339	45,538	**155,612**
2015	5,003	110,997	48,172	**164,173**
2016	5,140	83,193	40,829	**128,444**
2017	5,999	77,040	41,467	**124,506**
2018	6,202	96,266	48,637	**151,105**
2019	6,023	123,002	35,767	**164,792**
2020	7,682	110,173	34,610	**152,465**
Percent Change Since Baseline	**1%**	**-7%**	**-61%**	**-29%**

Graph 5.1: GHG Emissions since 2010



Low Emitting Landscaping Equipment

State agencies are to use manual landscape and hardscape maintenance as much when safe to do so to reduce air pollution, dust, and noise. These measures are addressed in SAM section 1821.6.

Caltrans is working towards reducing emissions from landscape equipment by using manual equipment to perform landscaping tasks, where applicable, instead of using power equipment. As current gas-powered equipment becomes obsolete and non-functional, they are being replaced with more efficient models or battery powered. As part of Assembly Bill (AB) 1346 implementation, Caltrans will begin to identify and plan for replacement of gas-powered equipment with zero emission equipment (ZEE) for its maintenance crews. The move toward ZEE will require process changes and adoption of managed charging solutions to avoid high loads for charging during peak periods, as well as solutions for backup power and charging in the field.

Building Design and Construction

Executive Order (EO) B-18-12 requires that all new buildings, major renovation projects and build-to-suit leases over 10,000 square feet shall obtain LEED Silver certification or higher. All new buildings under 10,000 square feet shall meet

applicable CalGreen Tier 1 Measures. New buildings and major renovations greater than 5,000 square feet are also required to be commissioned after construction.

Early in the design process, Caltrans building designers ensure that mandatory LEED and CalGreen code requirements are incorporated into a project's scope. A LEED charrette is conducted early in the design phase (and sometimes in the planning phase) where sustainable elements are selected. Future projects should always include a LEED charrette in the planning phase of a project so the requirements for LEED can be included in the scope and budget of the project.

Caltrans has completed several buildings that meet these criteria. The Philip S. Raine Safety Roadside Rest Area in Tulare County achieved LEED Platinum in 2013. It also received the 2014 LEED Parade-Water Efficiency Award and the 2014 Green School/Government Award. Post-construction commissioning was performed on the new equipment to verify its working condition.

In 2016, a Caltrans District 5 leased building project (2889 S. Higuera Street, San Luis Obispo) achieved a Gold LEED rating. Post-construction commissioning was performed on the new equipment to verify its working condition. In addition, the Caltrans District 12 leased office building (1750 E. 4th Street, Santa Ana) achieved a Silver LEED rating. The San Francisco/Oakland Bay Bridge (SFOBB) Maintenance Building (Phase 1) and the SFOBB Warehouse (Phase 2), and SFOBB Training Center (Phase 3) were all designed to exceed LEED-Silver ratings. The facilities were all commissioned, however, LEED status was unable to be obtained due to resource limitations.

Table 5. 2: New Construction since July 1, 2012

Facility Name	LEED Certification Type & Level Achieved	Commissioning Performed (Y/N)
Phillip S. Raine SRRA (Tulare)	Platinum-NC	Y
Gaviota SRRA crew building DIST 5	N/A	Y
Lee Vining Maintenance Facility crew building District 9	N/A	Y
Mojave Maintenance Station mechanics' facility DIST 6	N/A	Y
Richmond San Rafael Bridge Maintenance Facility	N/A, Designed to Silver	Y
Dunsmuir Grade CVEF*	N/A	Y
SFOBB Maintenance Complex Maintenance Facility (Phase 1)	Gold-NC	Y
SFOBB Maintenance Complex Warehouse (Phase 2)	N/A, Designed to Silver/Gold	Y

Facility Name	LEED Certification Type & Level Achieved	Commissioning Performed (Y/N)
SFOBB Maintenance Complex Training Facility (Phase 3)	N/A, Designed to Silver/Gold	Y
District 5 Leased Office	Gold	Y
District 12 Leased Office	Silver	Y

State agencies shall implement mandatory measures and relevant and feasible voluntary measures of the California Green Building Standards Code (CALGreen), Part 11, related to indoor environmental quality (IEQ) that are in effect at the time of new construction or alteration and shall use adhesives, sealants, caulks, paints, coatings, and aerosol paints and coatings that meet the volatile organic chemical (VOC) content limits specified in CALGreen.

All new and remodeled buildings designed by Caltrans must and do comply with the mandatory Tier 1 CALGreen requirements since the implementation of the 2010 CALGreen Building Code. All projects have low VOC specifications included for paints, adhesives, flooring, etc. Once the low VOC specifications are included, the submittal approval process will ensure the facility has only approved products installed.

In March 2019, the Caltrans DES Office of Transportation Architecture, Electrical, Mechanical, and Wastewater (TAEMWW) created "Memo to Designers 6-4" which outlines steps for achieving Sustainable Building Project designs. a "Memo to Designers 6-4" provides guidelines for engineers and architects on how to integrate sustainable elements once projects are programmed.

Caltrans Office of Sustainability intends to support and coordinate with the DES Office of TAEMWW in advancing and enhancing the incorporation of LEED, CALGreen, and ZNE features into future Caltrans building projects.

LEED for Existing Buildings Operations and Maintenance

All State buildings over 50,000 square feet were required to complete LEED-Existing Buildings Operations and Maintenance (EBOM) certification by December 31, 2015 and meet an Energy Star rating of 75 to the maximum extent cost effective.

Caltrans operates four district offices that have achieved LEED EBOM certification.

1. Headquarters, Sacramento – LEED EB-Silver
2. District 1, Eureka – LEED Certified
3. District 4, Oakland – LEED EB-Gold
4. District 7, Los Angeles – LEED EB-Silver

Caltrans faced several barriers to achieving certification. While Caltrans employs many LEED-certified staff with Building Design and Construction expertise, there are no Caltrans staff with Building Operations and Maintenance certification. Caltrans uses contractors to perform our LEED certifications primarily through the Division of Business Operations. The complexity of the LEED-EBOM process and facilities' need for additional preparation before certification also contributes to Caltrans' challenges in attaining LEED EBOM certification for its facilities.

- The District 2 office does not have a high enough Energy Star rating to apply for LEED EBOM certification. Additional energy efficiency projects, such as window replacements, have been performed and Caltrans will revisit the rating once sufficient energy data has been accumulated.
- The office buildings for districts 6 and 10 are not eligible for LEED EBOM because they have more than one building on the water and/or electric meter. Submeter installations were considered but found to be cost prohibitive by triggering additional electrical distribution system changes
- Caltrans has several other facilities totaling 50,000 sq. ft.; however, these facilities are either campuses of several buildings sharing a single meter, or they have process loads that have made it challenging to achieve an Energy Star score of 75 to qualify. Caltrans will refine data in 2022 to better determine which buildings are LEED eligible.

Caltrans Office of Sustainability is planning a project in 2022 to improve reporting in the Energy Star Portfolio Manager (ESPM). This project will include a shift toward campus listings with parent/child relationships that will allow a more accurate calculation of energy use. This effort is expected to eliminate redundant ESPM listings where meters are shared and produce a better snapshot of the facilities that are eligible for an Energy Star rating and LEED EBOM certification in facilities over 50,000 sq. ft. with enough data to pursue LEED EBOM by 2025.

Additionally, Caltrans has partnered with the SOC ESS program through PG&E to assist in identifying energy efficiency projects that will increase our Energy Star

score. Caltrans intends to utilize the program generated Energy Action Plan to identify the best opportunities to pursue LEED EBOM where required and financially feasible.

Table 5.3: LEED for Existing Buildings and Operations

Number of Buildings over 50,000 sq. ft. and eligible for LEED EBOM	Number of Building over 50,000 sq. ft. that have achieved LEED EBOM	Percentage of buildings over 50,000 sq. ft. required to achieve LEED EBOM that have achieved it
23	3	13%

Source: USGBC LEED Database, Caltrans DES, and Division of Business Operations.

Indoor Environmental Quality

When accomplishing Alterations, Modifications, and Maintenance Repairs and when relevant and feasible, state agencies shall implement the mandatory and voluntary measures of the California Green Building Standards Code (CALGreen), Part 11, related to indoor environmental quality.

Indoor Environmental Quality must also be maintained using low emitting furnishings, cleaning products and cleaning procedures.

New Construction and Renovation

Caltrans has created low Volatile Organic Compound (VOC) specifications to ensure voluntary measures related to IEQ from CALGreen are implemented in all building projects.

Caltrans engineers verify that the mechanical systems meet air requirements during design and check it during construction on small projects. Caltrans has specification sections for an IEQ management plan and air filter changing requirements that may be included if needed. Outdoor airflow monitoring systems are rarely required or installed.

During the building design phase, Caltrans' mechanical engineers typically run EnergyPro software on the facility to check air requirements. After entering the building layout and HVAC unit information, the program will evaluate if standards from Title 24 have been met. If not, the program will give warnings on what features didn't comply (airflows, etc.). All HVAC systems get construction and system testing in the field by the mechanical designer and/or commissioning authority. Typically, computer-based preventative maintenance programs are not installed for HVAC units. Caltrans conducts system training and testing related to HVAC equipment for maintenance personnel.

The required daylighting (see the following section on HVAC operation) and lighting controls are addressed in new buildings according to Title 24. Direct line of sight to the outdoors is attempted for most occupied spaces, but only full documentation of the views is pursued for projects where Caltrans attempts to obtain LEED credits.

Furnishings

All furniture orders must be approved by the Caltrans Division Chief of Business Operations to ensure compliance with established guidelines and directives. The Caltrans Division of Procurement and Contracts (DPAC) does not process requests that do not meet the DGS' Purchasing Standard and Specifications. Caltrans must also consider if California Prison Industry Authority (CALPIA) has commodities and services that meet Caltrans' needs. A waiver must be obtained from CALPIA prior to purchasing items from commercial vendors. All Caltrans office furniture complies with either of the following standards:

- DGS' Purchasing Standard and Specifications
- ASHRAE Standard
- Caltrans follows the DGS Purchasing Standard and Specifications
- Technical Environmental Bid Specification 1-09-71-52 when acquisitions are made using:
    - Established DGS Leveraged Procurement Agreement (LPA) or Master Agreement (MA) contracts
    - CALPIA

Cleaning Products

DGS is responsible for the janitorial services at many Caltrans-owned facilities. DGS ensures all cleaning products meet the GS-37 or GS-52 Standards. If DGS does not provide custodial services, the work is performed either by Caltrans employed custodial staff or through a third-party contract. All Caltrans purchased cleaning products and procedures follow DGS Purchasing Standards and Specifications and meet the Green Seal Standard through DGS Leveraged Procurement Agreements (LPAs), DGS Master Agreement (MA) contracts, or purchases through CALPIA.

Caltrans DPAC maintains standardized scopes of work that district contract staff can utilize for their custodial needs. Currently, the contracts specify that the contract manager has approving authority for all cleaning products prior to their use, allowing for an opportunity to reject non-compliant products. To add additional compliance measures, the Caltrans Office of Sustainability will work with DPAC to add additional language specifying the use of GS-37 and GS-42 compliant products into the standardized scopes of work in 2022.

Cleaning Procedures

Caltrans primarily uses either DGS or Caltrans employed custodial staff for the cleaning of Caltrans owned office buildings. The cleaning procedures in these facilities follow SAM guidance. Maintenance and SRRA facilities are typically serviced by contracted custodial companies with a scope of work developed to ensure SAM requirements are met.

HVAC Operation

The operations and maintenance of HVAC systems at Caltrans facilities is done through DGS, Caltrans, a combination of the two, or a contracted third party. Types of HVAC systems vary by facility, ranging from swamp coolers, packaged units, and mini split units to large scale air handlers. Some facilities do not have conditioned air due to their sporadic use. In general, Caltrans facilities are operated under the following criteria:

- Economizers are positioned to provide no less than the required minimum outdoor air requirements, except when outdoor conditions do not permit. At Caltrans office buildings, this is typically 10-50%. This is verified through built-in flow sensors or through spot checks using handheld instruments.
- To assure the best possible indoor air quality, HVAC filters utilized are the highest MERV rating that each system will allow without producing strain on the system. Filters are changed in accordance with manufacturer specifications, typically at quarterly or 6-month intervals.
- Inspections are performed at least annually, documented, and the documentation is stored at the site.
- The highest level of MERV filter that the system can support is utilized.
- Facilities maintain duct inspection contracts that regularly inspect and clean ducts.
- Caltrans is implementing an Integrated Work Order Management System (IWMS) to assure maintenance intervals are not missed. So far, district's 1, 5, 6, and 8 are using the IWMS, with several locations scheduled for implementation in 2021/2022. DGS managed facilities utilize Maximo for their maintenance program.
- When technology and outdoor conditions allow, buildings run early morning purge cycles to bring in fresh air.

If DGS does not provide the operations and maintenance, Caltrans employees are responsible for ensuring the HVAC systems are properly maintained, inspected, and meet minimum outdoor requirements where possible. These actions are taken using Caltrans stationary engineering staff or service

contracts. Leased facilities operate HVAC systems in accordance with lease terms and the State Administrative Manual.

Many of Caltrans facilities are smaller maintenance facilities that utilize packaged systems that are not equipped with many of the features of larger HVAC systems, such as dampers, cooling towers, or building management software. These facilities are typically controlled with a traditional style thermostat.

Integrated Pest Management

Department staff and contracted pest management companies will follow an integrated pest management (IPM) strategy that focuses on long-term prevention of pest problems through monitoring for pest presence, improving sanitation, and using physical barriers and other nonchemical practices. If nonchemical practices are ineffective, Tier 3 pesticides may be used, progressing to Tier 2 and then Tier 1 if necessary.

Caltrans provides contract managers with standardized scopes of work for certain building and maintenance services. The Sustainability Office is currently working with the DPAC to rewrite the standardized scope of work template for pest contracts be IPM based and meet the requirements of Management Memo 15-06. The target for this action is Spring 2022, at which point contracts will have IPM implemented into them.

The Caltrans Office of Sustainability will work to ensure that facility contract managers are aware of the new updated template through email communication and through a link on the Sustainability Intranet page. It will also be a standing agenda item in Sustainability liaison meetings.

Table 5.4: Pest control contracts

Pest Control Contractor	IPM Specified (Y/N)
Strictly Commercial Pest Control (HQ)	Y
Accurate Termite and Pest Solutions (District 1)	N
Neighborly Pest Management (District 3)	N
A-Pro Pest Control (District 4)	N
Orkin Pest Control (District 6)	N
Cats USA Pest Control (District 7)	Y
Epic Pest Control and Landscape Services (District 8)	N
Dewey Pest Control (District 9)	N
Tom Cat Environmental (District 9)	N
AAI Pest Control (District 10)	N
Cartwright Termite and Pest Control Inc. (District 11)	Y
Epic Pest Control and Landscape Services (District 12)	Y

Waste and Recycling Programs

The California Integrated Waste Management Act (Assembly Bill 939, Sher, Chapter 1095, Statutes of 1989 as amended) established the solid waste management hierarchy. Source reduction is at the top of the state's waste management hierarchy; recycling and composting is next, followed last by environmentally safe disposal. California's Department of Resources Recycling and Recovery (CalRecycle) administers the state's recycling and waste management programs. State agencies must report their waste and recycling efforts by May 1 of each year covering activities conducted during the prior calendar year.

Pursuant to SB 1106 each state agency shall have at least one designated waste and recycle coordinator. The coordinator shall perform the duties imposed pursuant to this chapter using existing resources. The coordinator shall be responsible for implementing the integrated waste management plan and shall serve as a liaison to other state agencies and coordinators. In addition, each state agency is required to provide adequate receptacles, signage, and education and outreach to staff.

Caltrans has a total of 13 recycling coordinators that are tasked with implementation and reporting for each of their respective districts. Duties may vary by district, but the recycling coordinator typically resides within district administration and participates in the following tasks to support recycling efforts:

- Coordinate the setup of recycling and waste accounts for facilities located in their district.
- Provide bins, signage, and other support to site managers.
- Collect disposal and diversion tonnage from contract managers, maintenance crews, and waste collection services to report to CalRecycle annually.
- Delegates on site tasks to on site contacts to assure recycling programs are utilized at sites throughout their district.

Caltrans operates in almost every major municipality. Waste management contracts are facilitated at the district level because of the differences in requirements by local municipalities. Contracts are written and managed by district facility staff or maintenance staff, with reporting provided annually to the district's recycling coordinator for reporting.

In addition to District Recycling Coordinators, the Director's Office of Sustainability will establish a technical advisory committee (TAC) in 2022 to advance Caltrans actions on waste diversion. The committee will focus not only

on waste generated through Caltrans facilities, but also on assuring that waste generated through construction is tracked and reported. In addition to establishing the TAC, Caltrans is working to establish a Departmental Recycling Coordinator at the headquarters level to reform and oversee waste and recycling programs at Caltrans. The coordinator will communicate updates in waste and recycling requirements to staff in the department, coordinate with CalRecycle on departmental progress, and serve as the recycling subject matter expert for Caltrans.

Table 5.5: State Agency Reporting Center (SARC) Report on Total Waste per Capita

District	Per Capita Baseline	2019	2020	Total Waste 2019	Total Waste 2020	% Change from 2019/2020
HQ	1.10	.83	.45	623	338	-84.32%
1	97.70	1.37	6.19	168	855	80.35%
2	710.50	41.78	41.55	5,642	5,642	0.00%
3	149.5	148.43	75.92	49,492	25,148	-96.80%
4	56.40	.17	5.93	95	2,956	96.79%
5	67.20	16.86	14.92	3,400	2,700	-25.93%
6	27.50	10.99	8.85	2,636	1,949	-35.25%
7	321.30	303.93	121.58	133,287	76,105	-75.14%
8	361.60	332.72	23.62	90,233	6,404	-1309.01%
9	192.40	12.27	14.15	784	749	-4.67%
10	140.50	22.15	177.86	5,307	41,774	87.30%
11	673.30	105.32	89.50	22,162	20,629	-7.43%
12	74.80	75.12	49.58	11,186	7,745	-44.43%

Table 5.5 shows the amount of Caltrans waste taken to landfills in tons per year. These amounts reflect solid waste generated from construction projects, roadside cleanups, maintenance operations, and building facilities reported to CalRecycle annually in the State Agency Reporting Center (SARC) report. Caltrans experienced a larger than normal reduction in waste in 2020 due to the

COVID-19 pandemic. Caltrans was already below our baseline per-capita target prior to 2020, however, the pandemic has reduced our waste output substantially.

In the next three years, Caltrans expects our waste disposal rates to increase above 2020 numbers because of staff returning to the office. There is also an anticipated increase expected in conjunction with the Clean California Beautification Program, with a three-year effort focused on cleaning California's roadways, that will result in additional waste disposal generated by the public. In many cases, some of this waste may not be safe to divert due to contamination.

The Caltrans Office of Sustainability works with appropriate programs to identify key personnel within each division to determine the activity origin of the waste reported, how to measure the waste, and the best methods of tracking waste diverted from landfills. In the coming year, Caltrans will focus on refining reporting processes between the districts and ensuring all required waste streams are captured.

Recycling

Recycling is the practice of collecting and diverting materials from the waste stream for remanufacturing into new products, such as recycled-content paper. Stewardship programs help collect and recycle carpet, paint, pharmaceutical and sharps, and mattresses. AB 341, Mandatory Commercial Recycling (Chesbro, Chapter 476, Statutes of 2011) requires businesses and public entities that generate four cubic yards or more of commercial solid waste per week to arrange for recycling services under the goal of source reducing, recycling, or composting 75% of solid waste generated statewide.

Overall, Caltrans' districts are below the target in per capita disposal rate and have met their recycling goals on reducing waste to landfill. Waste produced in most of our office building facilities is diverted and recycled through municipal waste streams. This includes metal, wood pallets, paper, plastic, cardboard, and aluminum. Data for waste generated is tracked using reports provided by the haulers and then reported to the District Recycling Coordinator for reporting. Caltrans continues to refine our reporting processes and will provide additional training to ensure consistent reporting by each district.

Recycling efforts are also captured through a project's Construction and Maintenance report via form CEM-4401. This form identifies the type of material and activity, amount of waste taken to landfill, amount of waste diverted from landfill, and amount of waste generated and reused during the project. Many SHS projects collect and crush demolished concrete on site to be repurposed as

road base. Additionally, several districts have been successful in recycling asphalt.

Organics Recycling

State agencies must implement AB 1826 (Chesbro, Chapter 727, Statues of 2014). State agencies that generate 2 cubic yards or more of commercial solid waste (total trash, recyclables, and organics) per week shall arrange for organic waste recycling services.

Organic waste includes:

- Food waste
- Green waste
- Landscape and pruning waste
- Nonhazardous wood waste
- Food-soiled paper

The exemption under 42649.82 (e)(3)(E) related to businesses that generate one cubic yard or less of organic waste is no longer in effect. Furthermore, CalRecycle has extended the current AB 1826 rural exemption until December 31, 2026.

Effective January 1, 2022, state agencies must implement SB 1383 (Lara, Chapter 395, Statutes of 2016). State agencies are currently required to maintain mandatory commercial recycling and organic recycling programs, including ensuring that properly labeled recycling containers are available to collect bottles, cans, paper, cardboard, food waste, and other recyclable materials. SB 1383 builds upon these efforts by identifying non-local entities and expanding the definition of organic waste to include food scraps, landscape and pruning waste, organic textiles and carpets, lumber, wood, manure, biosolids, digestate, and sludges.

Under SB 1383, non-local entities include:

- Special districts
- Federal facilities
- Prisons
- State Park facilities
- Public universities and community colleges
- County fairgrounds
- State agencies

Caltrans organics recycling varies by district and what types of organics programs are available in each local jurisdiction. Caltrans holds several leased facilities which do not have organic recycling due to waste services being included in the lease and controlled by lessors. As leases are renewed, Caltrans will work with DGS and the lessors to integrate advanced recycling and waste diversion into leases. Some Caltrans state-owned facilities generate little to no organic waste on site due to staff work occurring primarily on the highway. In the coming year, the TAC will be tasked with reviewing the status at each facility, applying for location eligible waivers, identifying gaps in processes, and taking action to close the gaps in our waste diversion efforts. Typically, the following players are involved in our organics recycling efforts:

- Building Management – oversees program, ensures compliance, provides educational material to all staff annually – what is recyclable, and where to dispose.
- Custodial staff – separates recyclables as needed and dispenses in proper receptacles for recycling.
- Waste hauler – collects the project and has the product weighed and the results documented by waste management services (dump), ensures Recycling Coordinator receives the information for reporting.
- Recycling Coordinator – collects, analyzes, and prepares reports. Creates, maintains contracts and ensures contract compliance.
- Maintenance crews – Collect and divert waste from roadside landscaping to be recycled through municipal waste facilities or collection dumpsters at maintenance facilities.

Organics bin placement is different in each facility, but are typically located in break rooms, kitchenettes, and cafeterias. Custodial staff empty bins as needed, but a minimum of weekly. Educational signage is placed with the bins to illustrate to staff what should or shouldn't go in the organic's bins. Custodial staff and kitchen staff will monitor bins to ensure contaminated material is not included in recycling streams.

Caltrans has several facilities that do not currently have organics programs in place for food waste due to low waste generation. 312 of Caltrans facilities are maintenance facilities that are typically only occupied at the beginning and end of each day when crews start and end their workdays. Crews typically eat their meals in the field and waste is not produced or disposed of at the facility.

A few departmental highlights in the organic's category are:

- Caltrans District 4 Oakland office launched a Waste Reduction Program in June 2019 to add waste, recycling, and compost bins to all kitchenettes

and its building cafeteria. Monthly totals are supplied by the partner contractor of the program and will be evaluated once more data has been collected.
- District 8 San Bernardino maintains an organics recycling program through their local waste collection vendor.

Hazardous Waste Materials

Caltrans generates hazardous waste in through equipment shops, maintenance of the State Highway System, and laboratory operations. Typical types of hazardous waste produced by Caltrans include:

- Automotive waste, including oil, fluids, and tires
- Pressure treated lumber from highway operations
- Universal waste, including toner, light bulbs, batteries
- Lab waste, such as reagents and solvents
- Paint

District Hazmat Coordinators maintain hazardous materials disposal contracts to ensure that waste is properly disposed of. Dedicated storage areas are created at each generating site to ensure proper storage prior to disposal. E-waste is recycled or repurposed through donations or by utilizing CalPIA for e-waste pickups.

Material Exchange

These programs promote the exchange and reuse of unwanted or surplus materials from your agency. The exchange of surplus materials reduces the cost of materials/products for the receiving agency and results in the conservation of energy, raw resources, landfill space, including the reduction of greenhouse gas emissions, purchasing and disposal costs.

Caltrans coordinates with DGS when state materials, including workstations, desks, computers, monitors, copiers, and bookcases, are sent to surplus. Caltrans makes efforts to donate items not accepted by DGS to eligible nonprofit organizations that may distribute materials to local businesses or schools. Items that are not able to be donated are disposed of through appropriate process. Caltrans facilities utilize surplus property and furniture through the Property Control Program. Prior to ordering supplies, furniture, and other materials, Caltrans district offices first check with DGS to see if the items requested can be supplied through DGS. The Caltrans Branch of Property Control within DPAC

leads efforts to facilitate internal furniture reutilization within the districts and coordinates donation of materials to nonprofit entities.

Waste Prevention/Reuse

Caltrans widely encourages the use of email rather than printing and sending paper memos to reduce the use of paper. Use of office bulletin boards are encouraged to further save paper, as well as double-sided printing for documents. With the adaptation of telework in 2020, paper use at Caltrans has been reduced by nearly 70 percent. Computers, laptops, copiers, monitors, and other equipment is often transferred between Caltrans offices to be repurposed if it still has remaining useful life.

Training and Education

Pursuant to AB 2812 (Gordon, Chapter 530, Statutes of 2016), each state agency is required to provide adequate receptacles, signage, education, and staffing, and arrange for recycling services consistent with existing recycling requirements for each office building of the state agency or large state facility. The bill requires, at least once per year, each covered state agency and large state facility to review the adequacy and condition of receptacles for recyclable material and of associated signage, education, and staffing. Additionally, the bill requires each state agency to include in its existing Report to CalRecycle a summary of the state agency's compliance with the act.

Caltrans continues to promote the principle of "reduce, reuse, and recycle." For example, most documents are now electronically distributed and signed instead of printing, signing, and distributing hard copies. Copiers have double-sided capabilities, and all staff are encouraged to use this feature first.

Other methods of education and training include:

- Dedicated recycling staff in each district
- Signage (posters, signs, labels for recycling bins), dos and don'ts for workplace
- Web pages containing recycling resources on the Caltrans intranet page

In the fourth quarter of 2022, the Caltrans Sustainability Office will be launching an updated intranet site that contains additional resources on the requirements and expectations for recycling and reuse at Caltrans. The site will also provide resources such as signage, suggested products for food packaging, waste, and recycling receptacles, and more, with a goal of being a central resource for recycling information. Additional strategies, such as newsletters and other outreach, will be discussed by the Recycling TAC.

Foodservice Items

SB 1335 (Allen, Chapter 610, Statutes of 2018) requires food service facilities located in a state-owned facility, operating on, or acting as a concessionaire on state-owned property, or under contract to provide food service to a state agency to dispense prepared food using food service packaging that are reusable, recyclable, or compostable. CalRecycle approved proposed regulations December 31, 2020 to establish the process and criteria to determine what types of food service packaging are reusable, recyclable, or compostable. CalRecycle must also publish a list of food service packaging that meets these criteria within 90 days of the regulation going into effect. Food service facilities will only be allowed to purchase food service packaging from the approved list, which will be updated at least once every five years.

Caltrans has foodservice facilities in some district offices and winter operational sites. These facilities provide foodservice to staff using Caltrans cooks or contracted vendors. Caltrans is in the process of reviewing its foodservice operations at facilities to meet the requirements of SB 1335. As guidance is developed, Caltrans will incorporate into contract renewals and purchasing processes.

Environmentally Preferable Purchasing

State agencies are required to purchase and use environmentally preferable products (EPP) that have a reduced effect on human health and the environment when compared with competing goods that serve the same purpose.

Additionally, the State Agency Buy Recycled Campaign (SABRC) is a joint effort between CalRecycle and the Department of General Services (DGS) to implement state laws requiring state agencies and the Legislature to purchase recycled-content products (RCP) and track those purchases. Both state agency and its contractors must be track purchases that fall under eleven product categories. Click here for the current product categories. It complements the intent of the Integrated Waste Management Act (AB 939, Sher, Chapter 1095, Statutes of 1989, and Public Resources Code 4000 et al), which was enacted to reduce the amount of waste going to California's landfills. An annual report detailing state agencies' annual RCP purchase is due to CalRecycle by October 31 of each year.

Pursuant to Public Contract Code Sections 12203 and 12211 (AB 2675, Lowenthal. State agency: public contracts), effective January 1, 2020, this bill requires each state agency to ensure that at least 75 percent of the total purchases under the reportable categories contain recycled-content products

meeting the minimum percentage content, except for paint, antifreeze, and tires which would remain at the 50 percent requirement. Click here for current SABRC compliance percentages

Reducing Impacts

The environmental impact of the goods purchased by Caltrans is often larger than the impact of our own department operations. Caltrans is committed to reducing the environmental impact of our goods and services we purchase.

Caltrans' Construction Standard Specifications include guidance on the composition of materials to be used in construction projects. The specifications require Caltrans to consider environmentally friendly treatments and materials with recycled content to the extent feasible.

The Buy Clean California Act (BCCA) was established by Public Contract Code Sections 3500-3505 and requires the establishment of acceptable global warming potential of select construction materials. Caltrans is one of eight departments identified to implement BCCA procurement standards into their procurement processes. In compliance with the BCCA, Caltrans will begin collecting Environmental Product Declarations (EPD) for materials used in construction projects to quantify the global warming potential of those items used in our transportation system in July 2022. Four of the major building materials identified for BCCA and EPD are carbon steel rebar, structural steel, flat glass, and mineral wool board insulation. These materials have been tracked on 7 pilot projects over the last few years. Additionally, the department has begun to pilot 3 additional high impact materials including concrete, asphalt, and aggregate in preparation for amended legislation.

Rubberized asphalt concrete (RAC) is a is a road paving material made by blending ground-up recycled tires with asphalt to produce a binder which is then mixed with conventional aggregate materials. Districts 8 and 12 have installed over 1200 lane miles combined of RAC since 2019.

In April 2019, Caltrans DPAC enhanced service contract checklists by requiring contract and procurement solicitation documents for service contracts to include language regarding the requirement for a Postconsumer-Content Certification (CalRecycle 74) to be submitted by contractors and vendors. The CalRecycle 74 is required for verification of all products purchased within each of the SABRC categories.

DPAC requires acquisitions of commodities to be made through the established DGS LPA or MA contracts or through CALPIA whenever possible.

- Paint (i.e., master painter's institute certified paint and recycled paint)
- The EPP field is required when entering a contract, purchase order (PO), or CAL-Card PO in Advantage, Caltrans' financial management system. Additionally, the Recycled Content field is required, and includes paint as one of the 11 SABRC product categories.
- IT goods (energy star rated: computers, monitors and televisions DGS-52161505 Purchasing Standard or meet current specifications of statewide contracts)
- IT goods are purchased using LPAs, which have already been vetted through the Department of General Services. On the rare occasion that IT goods are purchased outside an LPA, the exemption process listed in the LPA is followed.
- Janitorial supplies, paper products (i.e., SABRC compliant and DGS_141117A Purchasing Standard Compliant)
- The EPP field is required when entering a contract, PO, or CAL-Card PO in Advantage. Additionally, the Recycled Content field is required, and includes paper products as one of the 11 SABRC product categories.
- Desk Lamps (DGS-391115-A Purchasing Standard compliant) Office equipment (i.e., EPEAT compliant and EnergyStar rated printers, copiers and DGS_432121A Purchasing Standard compliant for high-end multifunctional devices)
- Paper products (i.e., Forest Stewardship Council certified, SABRC compliant copy paper, DGS-441200-A Purchasing Standard compliant)
- The EPP field is required when entering a contract, PO, or CAL-Card PO in Advantage. Additionally, the Recycled Content field is required, and includes paper products as one of the 11 SABRC product categories.
- Remanufactured toner cartridges (available from PIA and statewide contract ID/Number: 1-15-75-61)
- Caltrans prioritizes the purchase of SABRC compliant toners from the statewide LPA when feasible.

Measure and Report Progress

As a deferred department, Caltrans does not conduct transactions in the State Contracting and Procurement Registration System (SCPRS); instead, it uploads information from Advantage into the SCPRS. Caltrans incorporated an EPP field into its financial management system (Association Management Solutions (AMS) Advantage) in March 2019 and issued policy which mandates staff population of the field in the system. Caltrans has now been able to generate the SABRC report from AMS Advantage for two reporting periods, beginning in FY 19/20.

Caltrans is committed to increasing the procurement of recycled products across all SABRC categories. In partnership with CalRecycle, Caltrans provided SABRC training to its statewide SABRC Liaisons in January 2019. Caltrans will provide future trainings, e.g., annual web training in partnership with CalRecycle.

Caltrans spent a total of $7,602,650,292 on procurements in FY 20/21. Of that amount, $124,397,714 was spent on SABRC reportable items, with $115,466,637 of that being SABRC compliant. When considering total dollars spent, 92.82% of SABRC reportable purchases were SABRC compliant.

Table 5.5: State Agency Buy Recycled Campaign FY 19/20 Performance

Product Category	SABRC Reportable Dollars	SABRC Compliant Dollars	% SABRC Compliant
Antifreeze	$685,854	$656,416	95.71%
Compost and Mulch	$306,986	$293,055	95.46%
Glass Products	$180,219	$153,040	84.92%
Lubricating Oils	$856,306	$606,490	70.83%
Paint	$1,220,516	$81,993	6.72%
Paper Products	$1,164,079	$818,297	70.30%
Plastic Products	$2,964,090	$2,357,511	79.54%
Printing and Writing Paper	$624,606	$597,433	95.65%
Metal Products	$112,607,106	$109,219,963	96.99%
Tire Derived Products	$251,983	$146,944	58.32%
Tires	$3,535,969	$535,495	15.14%

Caltrans SABRC report was deficient in five categories, meaning that the percent compliant was less than 50 percent or 75 percent, dependent on the threshold for each respective category:

- Lubricating Oils – Several purchases were mis-categorized as lubricating oils but were oils intended for different use. These oils are specialty in nature and not available with recycled content. Additionally, several of Caltrans mobile equipment assets require full-synthetic oil that is not available as re-refined. Additional training will be provided to buyers to clarify which products should be recorded in this category.
- Paint – Many purchases in this category were made from mandatory statewide contract, #1-17-80-03B, that does not provide recycled options. Additionally, several automotive paints were miscategorized in this product category. Past guidance from CalRecycle indicated those products should not be recorded in this category. Additional training will

be provided to buyers to clarify which products should be recorded in this category

- Paper Products – A Portion of purchases in this category did not meet post-consumer recycled content (PCRC) requirements due to buyers attempting to balance the need to prioritize small businesses and to mitigate costs during the COVID-19 purchasing restrictions. To correct this, Caltrans will prioritize SABRC minimums for PCRC over cost on future purchases.
- Tire Derived Products – Many purchases in this category were miscategorized and should not have been in this category. Additional training will be provided to buyers to clarify which products should be recorded in this category.
- Tires – Many of the tires purchased in this category were for studded snow tires. Retreaded tired are not available for this category. Caltrans has a limited number of vehicles eligible for retreaded tired and those that are eligible are insufficient to meet the 50 percent goal.

The Green Buyer website tracks and offers transparency in agencies performance for buying EPP goods. EPP goods are those identified as EPP when entered in SCPRS. These goods are available from statewide contracts or complaint with DGS Purchasing Standards or SABRC. EPP goods are categorized by UNSPSC and compared with goods of the same category to establish the percent EPP spend as reported in SCPRS. EPP goods are found on DGS Buying Green website.

Table 5.6: Commodities categories with the greatest Potential to Green

Commodity	2020 Total Spend ($)	2020 Percent EPP Spend (%)	EPP Target (%)
Paint	$1,220,516	6.72%	50%
Tires	$3,535,969	15.14%	50%
Tire Derived Products	$251,983	58.32%	75%
Paper Products	$1,164,079	70.30%	75%
Lubricating Oils	$856,306	70.83%	75%

Sustainability Development and Education

EPP information is included in at least four (4) eLearning training modules developed by the DPAC, including, but not limited to:

- Non-IT Procurement and CAL-Card Overview
- Buyer Responsibilities

- CAL-Card Holder Training
- CAL-Card Manager Training

Buyer Responsibilities is required annually for all Caltrans buyers (biennially for CAL-Card Holders and CAL-Card Managers). The training includes sections on ethical and sustainable purchasing practices.

DPAC Policy Bulletin 19-03 was distributed to all Caltrans staff on March 14, 2019, to communicate a new mandatory field in Advantage, Caltrans' financial management system. Per the bulletin, a selection of "yes" or "no" in the EPP field is required before a contract, purchase order (PO), or CAL-Card PO can be processed in Advantage. The requestor must select "yes" from the EPP field if any of the following apply:

- The acquisition uses a green statewide contract
- Any DGS purchasing standards are incorporated into the purchase
- The product is compliant with the SABRC
- The purchase includes a manufacturer take-back or recycling program
- The product has a trusted third-party environmental certification

Additionally, DPAC partners with the CalRecycle to provide annual training to the Caltrans SABRC Liaisons.

DPAC Policy Bulletin 19-07 was distributed to all Caltrans staff on December 26, 2019, to communicate changes to the SABRC requirements, which increased the requirement to ensure at least 50 percent of reportable purchases are recycled products to 75% for 8 of the 11 SABRC product categories.

Caltrans does not currently have a dedicated sustainable purchasing group within DPAC. EPP is a shared responsibility among all buyers and Caltrans has incorporated EPP training into several required trainings for all buyers. To increase Caltrans impact in sustainable purchasing, DES formed a committee focused on environmental product declarations that will reduce GHG through the good procured for Caltrans projects.

Total Number of Employees Assigned as Buyers: **Approximately 500**

Caltrans does not currently track California Procurement and Contracting Academy (CalPCA) EPP training at the enterprise level due to the training being external and classified as "non-mandatory". In 2020, 42 buyers completed EPP training. Prior to 2020, DGS records indicate an additional 15 Caltrans employees had completed CalPCA EPP training. All Caltrans buyers complete the DPAC "Buyer Responsibilities" training on an annual basis and the training includes EPP.

Table 5.7: Buyers who have completed EPP Training

CalHR Classification	Total Number of Buyers	Percent Completing EPP Training**	Commitment to have buyers complete EPP training (%)
Unknown*	1254	100%	100%

*Caltrans does not have a current listing of buyers by classification available.
**EPP training recorded for the purposes of this chart is the EPP portion of the Buyer Responsibility course.

Location Efficiency

Location efficiency refers to the effect of a facility's location on travel behavior and the environmental, health and community impacts of that travel behavior including emissions from vehicles. Locating department facilities in location efficient areas reduces air emissions from state employees and users of the facilities, contributes to the revitalization of California's downtowns and town centers, helps the department compete for a future workforce that prefers walkable, bikeable and transit-accessible worksites and aligns department operations with California's planning priorities.

Caltrans goal is that the average location efficiency score for all applicable new leases be 10% higher than our average as of Jan 1, 2017. There are some cases, such as the placement of resident engineer or construction offices, where a location's efficiency is determined based on proximity to a project. Caltrans transportation related facilities (TRF's), typically state-owned, are located with the intent of reducing response time to highway incidents, lowering vehicle miles travelled, or being in proximity to the transportation asset they support, such as toll bridges. The location of TRF's is determined by the district in which the facility will reside.

Caltrans Division of Business Operations (DBO) works with the DGS Real Estate Services Division (RESD)to locate new office space when it is needed. DBO will work with RESD to perform a site search and select a location that resides in the market needed and has an acceptable smart location score. In alignment with EO B-18-12, Caltrans is working on consolidation of office space where possible, ultimately reducing our portfolio of leased office space.

Table 5.8: Smart Location Score for new Leases

Facility name	Smart Location Calculator Score
Cerritos Field Office	79
Gateway Oaks Office	73

Palmdale Field Office	82
Average	78
Baseline	73.18
% Change from Baseline	5.69%

Caltrans newest facility, the Palmdale Field Office, achieved a Smart Location Score that is 12.05% greater than the baseline of 73.18. The Gateway Oaks Office lease has a lower score than the baseline, but the site was selected so that it resided in the same complex as existing Caltrans office space. The Cerritos Field Office was already in lease negotiations at the time the baseline was established; however, it exceeds the baseline by 7.95%.

Table 5.9: Lowest Smart Location Score Leases

Facility name	Smart Location Calculator Score
Mare Island Resident Engineer Office	38
Thousand Oaks Resident Engineer Office	46
Barstow Resident Engineer Office	46
Fortuna Construction Lab	55
Freeway Blvd. Resident Engineer Office	60

Caltrans lowest locaton efficieny scores are either modular buildings that are leased and located at maintenance yards. These locations are not listed in Table 5.9 because they are a leased portable building rather than a leased location. The modular buildings are used as office facilities to support maintenance activities in the field and must reside at locations that are located based on the area of the State Highway System they serve. Caltrans lowest location efficiency scores for leased locations are construction and engineering field offices that were aleady in existence prior to the utilization of the scoring system.

Appendix A – Action Plan

Climate Change Adaptation

Action Item	Participating Caltrans Divisions
Update climate change guidance for all climate stressors and establish metrics to integrate and enhance methods for climate adaptation	Div. of Transportation Planning
Perform energy efficiency audits and integrate climate change adaptation strategies into actions	Office of Sustainability Division of Business Operations Division of Maintenance Division of Traffic Operations

Zero-Emission Vehicles

Action Item	Participating Caltrans Divisions
Departmental consideration of solar to power EV charging infrastructure	Office of Sustainability Division of Engineering Services Division of Business Operations
Determine strategy for where to best host ZEV vehicles and EV infrastructure	Office of Sustainability Division of Equipment Division of Maintenance All Districts
Develop standards for vehicle configurations and modifications for new ZEV vehicle types. Create training programs to complement new standards.	Division of Equipment
Evaluate home storage permit policies and revise to adapt to ZEVs.	Division of Equipment
Complete Geotab Telematics installations	Division of Equipment

Energy

Action Item	Participating Caltrans Divisions
Develop Energy Strategy with PG&E SOC-ESS program to help guide department's priorities for energy efficiency	Office of Sustainability Division of Maintenance Division of Business Operations Division of Equipment Division of Traffic Operations
Identify funding sources or internal expertise for commissioning and LEED certification of facilities	Office of Sustainability Division of Engineering Services Division of Business Operations

Integrate incorporation of solar installation into design process and checklists for all facilities by either self-install or PPA. Assure that requirements of onsite generation and ZNE are known by districts at the onset of a project so that funding will be allocated	Office of Sustainability Division of Engineering Services
Identify facilities in portfolio for solar installations that are best suited for over-production. Utilize energy to offset ZEV charging and to increase renewable portfolio and offset facilities that cannot have onsite generation	Office of Sustainability Division of Engineering Services Maintenance Division of Equipment Division of Business Operations All Districts
Create annual email reminder to educate employees on electrical load safety	Division of Business Operations All Districts
Obtain sub-meters for TMC's to measure PUE	Traffic Operations Information Technology
Increase participation in Demand Response programs for eligible locations within each district. Establish guidance for tracking energy savings obtained through participation	Office of Sustainability Division of Business Operations All Districts
Exploration of solar installations in the Caltrans Right of Way to power facilities, electric vehicle chargers, and generate additional clean energy for California's grid	Office of Sustainability Project Delivery Div. of Research, Innovation, and System Information Division of Right of Way
Expand use of EMCS and Implement MBCx within eligible facilities	Office of Sustainability Division of Maintenance Traffic Operations Division of Business Operations Division of Equipment
Obtain meter information for SRRA and CVEF facility types	Office of Sustainability Division of Maintenance
Enhance reporting capability of propane usage at facilities	Office of Sustainability Division of Accounting

Water Efficiency and Conservation

Action Item	Participating Caltrans Divisions
Expand water metering to include facilities that use well water	Office of Sustainability Division of Maintenance Division of Design
Obtain landscape data for Caltrans facilities Statewide and build into ESPM	Office of Sustainability All Districts Division of Maintenance
Create Drought Action Plans for each Caltrans district and update quarterly to reflect changes in drought status	Division of Maintenance Division of Design All Districts
Collaborate to fund essential upgrades and replacements of existing irrigation controllers to 4G or higher cellular capable units.	Division of Maintenance
Identify funding sources for water conservation projects to further conserve water at Caltrans	Division of Maintenance
Develop Drought Contingency Plan and assure it is tied to regional contingency plans.	Division of Design Division of Maintenance
Work with water providers to expand additional recycled water sources to Caltrans right of way.	All Districts Division of Landscape Architecture
Evaluate efficiency of boilers and cooling systems at District Offices	Division of Business Operations

Green Operations

Action Item	Participating Caltrans Divisions
Incorporate advanced waste diversion specifications into design process to assure adequate waste sorting space is available in all facilities	Office of Sustainability Division of Engineering Services Division of Business Operations
Update standardized scope of work for pest management contracts to ensure it follows Integrated Pest Management Practices	Office of Sustainability Division of Procurement and Contracts
Establish Recycling TAC for Caltrans to be led by Sustainability. TAC to include all District Recycling Coordinators and will address waste mitigation, diversion, and recycling practices. TAC will also address training and Departmental standards for waste management.	Office of Sustainability Division of Design Division of Business Operations All Districts
Each district will be tasked with applying for SB 1383 waivers for facilities that meet the criteria for either the de minimis standard or other jurisdictional exemptions. Sustainability will assist in providing guidance for determination of these exemptions.	Office of Sustainability Division of Business Operations All Districts
Launch "recycling" page on Caltrans intranet to provide tools and resources to staff and recycling coordinators for waste management and diversion	Office of Sustainability
Establish process to assure leases integrate waste diversion in compliance with current recycling regulations	Division of Business Operations All Districts
Establish regular maintenance and service of HVAC systems to ensure HVAC efficiency and IEQ.	Office of Sustainability Division of Maintenance Division of Equipment Division of Business Operations Division of Engineering Services

Appendix B – Sustainability Leadership

Caltrans Deputy Director for Sustainability Tony Dang reports to Caltrans Chief Deputy Director Michael Keever and Director Tony Tavares.

The following positions report to the Deputy Director for Sustainability, Tony Dang:

- Assistant Deputy Director, Transportation Electrification (C.E.A.), Jimmy O'Dea
- Sustainability Initiatives Manager (Supervising Transportation Planner), Barbara Marquez
- Sustainability Advisor (C.E.A.), Eric Sundquist

The following persons report to the Sustainability Initiatives Manager:

- Resource Manager (Staff Services Manager I), Vacant.
- Sustainable Operations Manager (Staff Services Manager II), Derek Longacre.
- Senior Planner, Complete Streets (Senior Transportation Planner), Anika Jesi

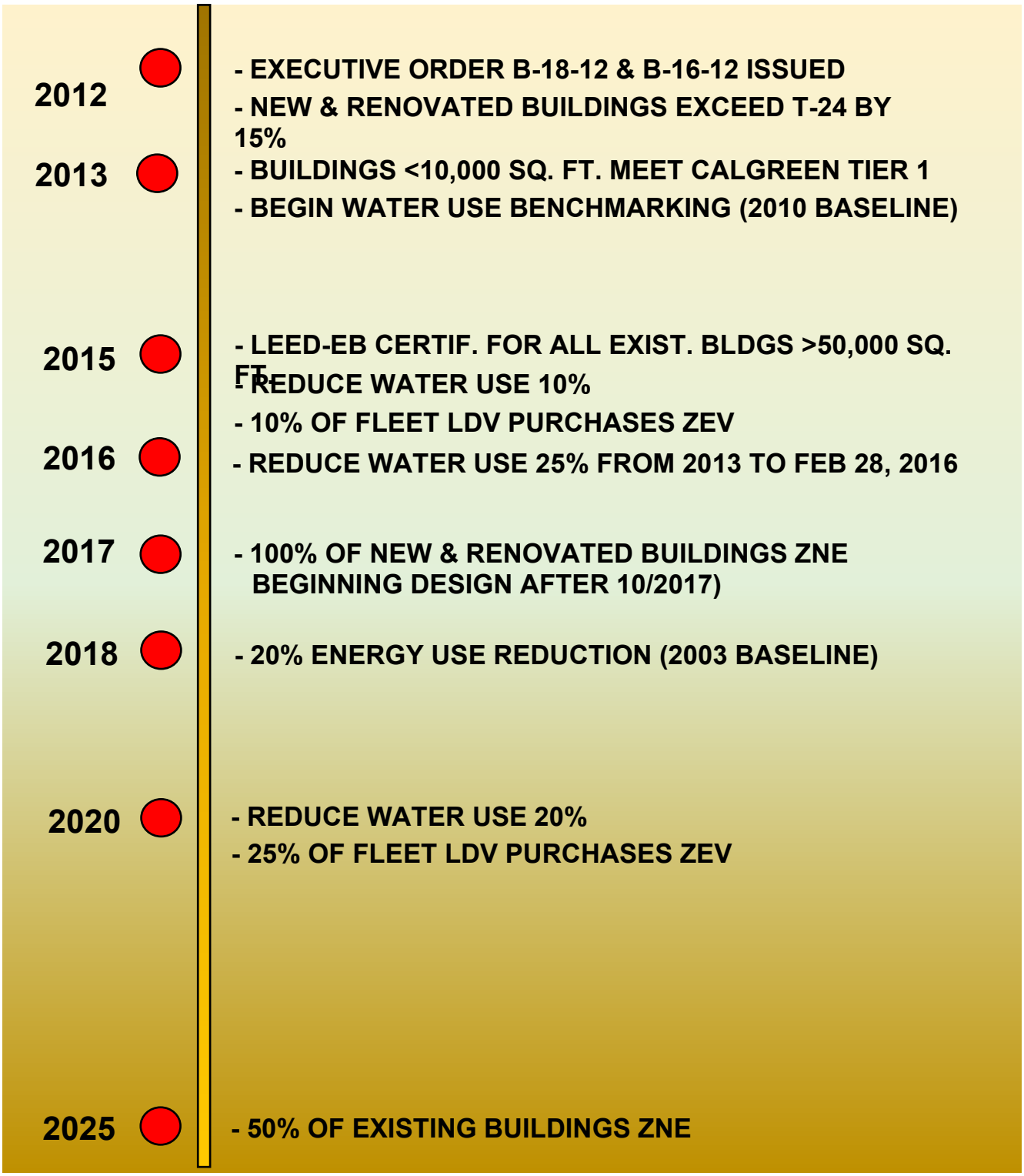
The following persons report to the Assistant Deputy Director, Transportation Electrification:

- Zero Emission Vehicles Hub Manager (Senior Transportation Planner), Vacant

The following persons report to the Sustainability Advisor:

- VMT Program Manager (Supervising Transportation Planner), Chris Kuzak

Appendix C - Sustainability Milestones



Appendix D – Acronyms

Customize to include organizations and acronyms within your specific department

AB	Assembly Bill
ADR	Automated Demand Response
AMB	Asset Management Branch (at DGS)
BMP	Best management practices
CA	California
CALGREEN	California Green Building Code (Title 24, Part 11)
CEC	California Energy Commission
DGS	Department of General Services
DWR	Department of Water Resources
EHT	Extreme heat threshold
EMS	Energy management system (aka EMCS)
EMCS	Energy management control system (aka EMS)
EO	Executive Order
EPP	Environmentally preferable purchasing
ESCO	Energy service company

ESPM	Energy Star Portfolio Manager
ETS	Enterprise Technology Solutions (a division at DGS)
EUI	Energy use intensity (source kBTU/sq. ft.)
EVSE	Electric vehicle supply equipment (charging equipment)
FMD	Facilities Management Division (a division at DGS)
GCM	Global circulation model
GHG	Greenhouse gas
GHGe	Greenhouse gas emissions
GSP	Groundwater Sustainability Plan
IEQ	Indoor environmental quality
kBTU	Thousand British thermal units (unit of energy)
LCM	The Landscape Coefficient Method
LEED	Leadership in Energy and Environmental Design
MAWA	Maximum applied water allowance
MM	Management Memo
MWELO	Model Water Efficient Landscape Ordinance
OBAS	Office of Business and Acquisition Services (at DGS)
OBF	On-bill financing

OFAM	Office of Fleet and Asset Management (at DGS)
OS	Office of Sustainability (at DGS)
PMDB	Project Management and Development Branch (at DGS)
PPA	Power purchase agreement
PUE	Power usage effectiveness
RCP	Representative Concentration Pathway
SABRC	State Agency Buy Recycled Campaign
SAM	State Administrative Manual
SB	Senate Bill
SCM	State Contracting Manual
SGA	Sustainable groundwater agency
SGMA	Sustainable Groundwater Management Act
WMC	Water management coordinator
WUCOLS	Water Use Classifications of Landscape Species
ZEV	Zero-emission vehicle
ZNE	Zero net energy

Appendix E - Glossary

Backflow - is the undesirable reversal of the flow of water or mixtures of water and other undesirable substances from any source (such as used water, industrial fluids, gasses, or any substance other than the intended potable water) into the distribution pipes of the potable water system.

Back flow prevention device – a device that prevents contaminants from entering the potable water system in the event of back pressure or back siphonage.

Blowdown - is the periodic or continuous removal of water from a boiler to remove accumulated dissolved solids and/or sludge. Proper control of blowdown is critical to boiler operation. Insufficient blowdown may lead to deposits or carryover. Excessive blowdown wastes water, energy, and chemicals.

Compost – Compost is the product resulting from the controlled biological decomposition of organic material from a feedstock into a stable, humus-like product that has many environmental benefits. Composting is a natural process that is managed to optimize the conditions for decomposing microbes to thrive. This generally involves providing air and moisture, and achieving sufficient temperatures to ensure weed seeds, invasive pests, and pathogens are destroyed. A wide range of material (feedstock) may be composted, such as yard trimmings, wood chips, vegetable scraps, paper products, manures and biosolids. Compost may be applied to the top of the soil or incorporated into the soil (tilling).

Critical overdraft - a condition in which significantly more water has been taken out of a groundwater basin than has been put in, either by natural recharge or by recharging basins. Critical overdraft leads to various undesirable conditions such as ground subsidence and saltwater intrusion.

CVEF – Commercial Vehicle Enforcement Facility. A facility owned by Caltrans and operated by the California Highway Patrol to enforce commercial vehicle activities

Ecosystem services - are the direct and indirect contributions of ecosystems to human well-being. They support directly or indirectly our survival and quality of life. Ecosystem services can be categorized in four main types:

- Provisioning services are the products obtained from ecosystems such as food, fresh water, wood, fiber, genetic resources, and medicines.

- Regulating services are the benefits obtained from the regulation of ecosystem processes such as climate regulation, natural hazard regulation, water purification and waste management, pollination, or pest control.

- Habitat services provide living places for all species and maintain the viability of gene-pools.

- Cultural services include non-material benefits such as spiritual enrichment, intellectual development, recreation, and aesthetic values.

Grass cycling -refers to an aerobic (requires air) method of handling grass clippings by leaving them on the lawn when mowing. Because grass consists largely of water (80% or more), contains little lignin and has high nitrogen content, grass clippings easily break down during an aerobic process. Grass cycling returns the decomposed clippings to the soil within one to two weeks acting primarily as a fertilizer supplement and, to a much smaller degree, mulch. Grass cycling can provide 15 to 20% or more of a lawn's yearly nitrogen requirements

Hydrozone – is a portion of a landscaped area having plants with similar water needs that are served by one irrigation valve or set of valves with the same schedule.

Kilowatt-hour – a unit of energy equal to one kilowatt of power sustained for one hours or 3,600 kilojoules

Landscape Coefficient Method (LCM) describes a method of estimating irrigation needs of landscape plantings in California. It is intended as a guide for landscape professionals.

Landscape water budget - is the calculated irrigation requirement of a landscape based on landscape area, local climate factors, specific plant requirements and the irrigation system performance.

MF – Maintenance Facility

Model Water Efficient Landscape Ordinance (MWELO) - The Water Conservation in Landscaping Act was signed into law on September 29, 1990. The premise was that landscape design, installation, and maintenance can and should be water efficient. Some of the provisions specified in the statute included plant selection and groupings of plants based on water needs and climatic, geological or topographical conditions, efficient irrigation systems, practices that foster long term water conservation and routine repair and maintenance of irrigation systems. DWR adopted the Model Ordinance in June of 1992. One element of the Model Ordinance was a landscape water budget. In the water budget approach, a Maximum Applied Water Allowance (MAWA) was established based on the landscape area and the climate where the landscape is located. The latest update to MWELO was in 2015. MWELO applies to all state agencies' landscaping.

Mulch – Mulch is a layer of material applied on top of soil. Examples of material that can be used as mulch include wood chips, grass clippings, leaves, straw, cardboard, newspaper, rocks, and even shredded tires. Benefits of applying mulch include reducing erosion and weeds and increasing water retention and soil vitality. Whenever possible, look for mulch that has been through a sanitization process to kill weed seeds and pests.

Sprinkler system backflow prevention devices – are devices to prevent contaminants from entering water supplies. These devices connect to the sprinkler system and are an important safety feature. They are required by the California Plumbing Code.

SRRA– Safety Roadside Rest Area.

Submeter- a metering device installed to measure water use in a specific area or for a specific purpose. Also known as dedicated meters, landscape submeters are effective for separating landscape water use from interior water use, evaluating the landscape water budget and for leak detection within the irrigation system.

Trickle flow – A device that allows users to reduce flow to a trickle while using soap and shampoo. When the device is switched off, the flow is reinstated with the temperature and pressure resumes to previous settings.

Therm– is a unit of heat energy equal to 100,000 British Thermal Units.

Water Budget - A landscape water budget is the calculated irrigation requirement of a landscape based on landscape area, local climate factors, specific plant requirements and the irrigation system performance.

Water-energy nexus - Water and energy are often managed separately despite the important links between the two. 12 percent of California's energy use is related to water use with nearly 10 percent being used at the end water use. Water is used in the production of nearly every major energy source. Likewise, energy is used in multiple ways and at multiple steps in water delivery and treatment systems as well as wastewater collection and treatment.

Water Shortage Contingency Plans - each urban water purveyor serving more than 3,000 connections or 3,000 acre-feet of water annually must have an Urban Water Shortage Contingency Plan (Water Shortage Plan) which details how a community would react to a reduction in water supply of up to 50% for droughts lasting up to three years.

Appendix F – Department Stakeholders

Climate Change Adaptation

Understanding Climate Risk at Existing Facilities
Marlon Flournoy, Division Chief, Transportation Planning Sergio Aceves, Division Chief, Maintenance Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment

Understanding Climate Risk at Planned Facilities
Marlon Flournoy, Division Chief Tom Ostrom, Division Chief, Engineering Services

Integrating Climate Change into Department Planning and Funding Programs
Marlon Flournoy, Division Chief Michael Johnson, State Asset Management Engineer, Division of Asset Management

Measuring and Tracking Progress
Marlon Flournoy, Division Chief, Transportation Planning Dee Lam, Division Chief, Local Assistance Sergio Aceves, Division Chief, Maintenance

Zero Emission Vehicles

Incorporating ZEVs Into the Department Fleet
Jimmy O'Dea, Assistant Deputy Director for Transportation Electrification, Director's Office of Sustainability Robert Myers, Division Chief, Equipment

Telematics
Robert Myers, Division Chief, Equipment

Outside Funding Sources for ZEV Infrastructure
Jimmy O'Dea, Assistant Deputy Director for Transportation Electrification, Director's Office of Sustainability

Hydrogen Fueling Infrastructure
Jimmy O'Dea, Assistant Deputy Director for Transportation Electrification, Director's Office of Sustainability Lisa Kunzman, Chief, Office of Fleet and Asset Management and Quality Assurance, Division of Equipment

Comprehensive Facility Site and Infrastructure Assessments
Jimmy O'Dea, Assistant Deputy Director for Transportation Electrification, Director's Office of Sustainability Lisa Kunzman, Chief, Office of Fleet and Asset Management and Quality Assurance, Division of Equipment

EVSE Construction Plan
Jimmy O'Dea, Assistant Deputy Director for Transportation Electrification, Director's Office of Sustainability Robert Myers, Division Chief, Equipment Sergio Aceves, Division Chief, Maintenance

EVSE Operation
Jimmy O'Dea, Assistant Deputy Director for Transportation Electrification, Director's Office of Sustainability Robert Myers, Division Chief, Equipment Sergio Aceves, Division Chief, Maintenance

Energy

Zero Net Energy (ZNE)
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance Tom Ostrom, Division Chief, Engineering Services
Matthew Brady, District 1 Director Dave Moore, District 2 Director Amarjeet Benipal, District 3 Director Dina El-Tawansy, District 4 Director Tim Gubbins, District 5 Director Diana Gomez, District 6 Director Gloria Roberts, Acting District 7 Director Diane Morales, Acting District 8 Director

Ryan Dermody, District 9 Director
Dennis Agar, District 10 Director
Gustavo Dallarda, District 11 Director
Ryan Chamberlain, District 12 Director

New Construction Exceeds Title 24 by 15%

Tom Ostrom, Division Chief, Engineering

Reduce Grid-Based Energy Purchased by 20% by 2018

Shannon Similai, Division Chief, Business Operations
Robert Myers, Division Chief, Equipment
David Man, Acting Division Chief, Traffic Operations
Sergio Aceves, Division Chief, Maintenance
Tom Ostrom, Division Chief, Engineering Services
Mike Nguyen, Division Chief, Infrastructure Management Division
Matthew Brady, District 1 Director
Dave Moore, District 2 Director
Amarjeet Benipal, District 3 Director
Dina El-Tawansy, District 4 Director
Tim Gubbins, District 5 Director
Diana Gomez, District 6 Director
Gloria Roberts, Acting District 7 Director
Diane Morales, Acting District 8 Director
Ryan Dermody, District 9 Director
Dennis Agar, District 10 Director
Gustavo Dallarda, District 11 Director
Ryan Chamberlain, District 12 Director

Server Room Energy Use

Mike Nguyen, Infrastructure Management Division Chief

Demand Response
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance Tom Ostrom, Division Chief, Engineering Services Derek Longacre, Sustainable Operations Manager, Director's Office of Sustainability

Renewable Energy
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance Tom Ostrom, Division Chief, Engineering Services Derek Longacre, Sustainable Operations Manager, Director's Office of Sustainability

Monitoring Based Commissioning (MBCx)
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance Tom Ostrom, Division Chief, Engineering Services

Financing
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Water Efficiency and Conservation

Indoor Water Efficiency Projects In Progress First initiative
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Boilers and Cooling Systems Projects In Progress
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Landscaping Hardware Water Efficiency Projects In Progress
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance Elbert Cox, Division Chief, Design

Living Landscaping Water Efficiency Projects In Progress
Sergio Aceves, Division Chief Lisa Worthington, Acting Office Chief, Vegetation and Wildfire Management Office, Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Elbert Cox, Division Chief, Design

Buildings with Urban Water Shortage Contingency Plans In Progress
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Green Operations

Greenhouse Gas Emissions
Marlon Flournoy, Division Chief, Transportation Planning Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Building Design and Construction
Tom Ostrom, Division Chief, Engineering Services Matthew Brady, District 1 Director Dave Moore, District 2 Director Amarjeet Benipal, District 3 Director Dina El-Tawansy, District 4 Director Tim Gubbins, District 5 Director Diana Gomez, District 6 Director Gloria Roberts, Acting District 7 Director Diane Morales, Acting District 8 Director Ryan Dermody, District 9 Director Dennis Agar, District 10 Director Gustavo Dallarda, District 11 Director Ryan Chamberlain, District 12 Director

LEED for Existing Buildings Operations and Maintenance
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Indoor Environmental Quality
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Integrated Pest Management
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance

Waste Management and Recycling
Shannon Similai, Division Chief, Business Operations Robert Myers, Division Chief, Equipment David Man, Acting Division Chief, Traffic Operations Sergio Aceves, Division Chief, Maintenance Derek Longacre, Sustainable Ops Manager, Director's Office of Sustainability

Environmentally Preferable Purchasing
David Prizmich, Division Chief, Procurement and Contracts

Location Efficiency
Shannon Similai, Division Chief, Business Operations Matthew Brady, District 1 Director Dave Moore, District 2 Director Amarjeet Benipal, District 3 Director Dina El-Tawansy, District 4 Director Tim Gubbins, District 5 Director Diana Gomez, District 6 Director Gloria Roberts, Acting District 7 Director Diane Morales, Acting District 8 Director Ryan Dermody, District 9 Director Dennis Agar, District 10 Director Gustavo Dallarda, District 11 Director Ryan Chamberlain, District 12 Director

Appendix G – Sustainability Requirements & Goals

Governor Edmund G. Brown Jr. directed California state agencies to demonstrate sustainable operations and to lead the way by implementing sustainability policies set by the state. Additionally, enacted legislation includes sustainability-related requirements of state facilities and operations. Specific references and background on executive orders, legislation, management memos and other requirements or actions are included in five general chapters within this roadmap, as follows:

Climate change adaptation

Zero-emission vehicles

Energy

Water efficiency and conservation

Green operations

These general sustainability initiatives include the following:

- GHG emissions reductions
- Climate change adaptation
- Building energy efficiency and conservation
- Indoor environmental quality (IEQ)
- Water efficiency and conservation
- Monitoring-based Building Commissioning (MBCx)
- Environmentally preferable purchasing (EPP)
- Financing for sustainability
- Zero-emission vehicle (ZEV) fleet purchases
- Electric vehicle charging infrastructure
- Monitoring and executive oversight
- Zero Net Energy (ZNE)

Appendix H – Sustainability Background References

The following executive orders, Management Memos, legislative actions, resources, and guidance documents provide the sustainability criteria, requirements, and targets tracked and reported herein.

Executive Orders

The governor issued the following executive order relevant to chapters of this roadmap:

- **Executive Order B-16-12**

  EO B-16-12 directs state agencies to integrate zero-emission vehicles (ZEVs) into the state vehicle fleet. It also directs state agencies to develop the infrastructure to support increased public and private sector use of ZEVs. Specifically, it directs state agencies replacing fleet vehicles to replace at least 10 percent with ZEVs, and by 2020 to ensure at least 25 percent of replacement fleet vehicles are ZEVs.
- **Executive Order B-18-12**

  EO B-18-12 and the companion *Green Building Action Plan* require state agencies to reduce the environmental impacts of state operations by reducing greenhouse gas emissions, managing energy and water use, improving indoor air quality, generating on-site renewable energy when feasible, implementing environmentally preferable purchasing, and developing the infrastructure for electric vehicle charging stations at state facilities. The Green Building Action Plan also established two oversight groups – the staff-level Sustainability Working Group and the executive-level Sustainability Task Force – to ensure these measures are met. Agencies annually report current energy and water use into the Energy Star Portfolio Manager (ESPM).
- **Executive Order B-29-15**

  EO B-29-15 directs state agencies to take actions in response to the ongoing drought and to the state of emergency due to severe drought conditions proclaimed on January 17, 2014. Governor Brown directed numerous state agencies to develop new programs and regulations to mitigate the effects of the drought and required increased enforcement of water waste statewide. Agencies were instructed to reduce potable urban water use by 25 percent between 2013 and February 28, 2016.
- **Executive Order B-30-15**

In 2015, the governor issued EO B-30-15, which declared climate change to be a "threat to the well-being, public health, natural resources, economy and environment of California." It established a new interim statewide GHG emission reduction target of 40 percent below 1990 levels by 2030 and reaffirms California's intent to reduce GHG emissions to 80 percent below 1990 levels by 2050. To support these goals, this order requires numerous state agencies to develop plans and programs to reduce emissions. It also directs state agencies to take climate change into account in their planning and investment decisions and employ life-cycle cost accounting to evaluate and compare infrastructure investments and alternatives. State agencies are directed to prioritize investments that both build climate preparedness and reduce GHG emissions; prioritize natural infrastructure; and protect the state's most vulnerable populations.

- **Executive Order B-37-16**

  EO B-37-16 builds on what were formerly temporary statewide emergency water restrictions to establish longer-term water conservation measures, including permanent monthly water use reporting; new permanent water use standards in California communities; and bans on clearly wasteful practices such as hosing off sidewalks, driveways, and other hardscapes. The EO focuses on using water more wisely and eliminating water waste by taking actions to minimize water system leaks. The California Department of Water Resources (DWR) estimates that leaks in water district distribution systems siphon away more than 700,000 acre-feet of water a year in California – enough to supply 1.4 million homes for a year.

  The EO further strengthens local drought resilience and looks to improve agricultural water use efficiency and drought planning. State agencies are to cooperate with urban water management plans, which include plans for droughts lasting for at least five years by assuring that the water efficiency and conservation plan has drought contingency actions.

State Administrative Manual & Management Memos

The following section of the State Administrative Manual (SAM), and associated Management Memos (MMs) currently impose sustainability requirements on the department under the governor's executive authority:

- **SAM Chapter 1800**: Energy and Sustainability
- **MM 14-02:** Water Efficiency and Conservation
- **MM 14-05**: Indoor Environmental Quality: New, Renovated, And Existing Buildings

- **MM 14-07**: Standard Operating Procedures for Energy Management in State Buildings
- **MM 14-09**: Energy Efficiency in Data Centers and Server Rooms
- **MM 15-03**: Minimum Fuel Economy Standards Policy
- **MM 15-04**: Energy Use Reduction for New, Existing, and Leased Buildings
- **MM 15-06**: State Buildings and Grounds Maintenance and Operation
- **MM 15-07**: Diesel, Biodiesel, and Renewable Hydrocarbon Diesel Bulk Fuel Purchases
- **MM 16-07**: Zero-Emission Vehicle Purchasing and EVSE Infrastructure Requirements
- **MM 17-04**: Zero Net Energy for New and Existing State Buildings

Legislative Actions

Several pieces of legislation were signed in 2015-16 that codified several elements of the executive orders, or provided further requirements included in the policies. These include the following:

- **Assembly Bill (AB) 1482** (Gordon, 2015): Requires that the California Natural Resources Agency (CNRA) update the state's adaptation strategy safeguarding California every three years. Directs state agencies to promote climate adaptation in planning decisions and ensure that state investments consider climate change impacts, as well as the use of natural systems and natural infrastructure. (Public Resources Code Section 71153)
- **Senate Bill (SB) 246** (Wieckowski, 2015): Established the Integrated Climate Adaptation and Resiliency Program within the Governor's Office of Planning and Research to coordinate regional and local efforts with state climate adaptation strategies to adapt to the impacts of climate change. (Public Resources Code Section 71354)
- **AB 2800** (Quirk, 2016): Requires state agencies to take the current and future impacts of climate change into planning, designing, building, operating, maintaining, and investing in state infrastructure. CNRA will establish a Climate-Safe Infrastructure Working Group to determine how to integrate climate change impacts into state infrastructure engineering. (Public Resources Code Section 71155)
- **Assembly Bill (AB) 4**: Passed in 1989. The State Agency Buy Recycled Campaign (SABRC) statutes are in Public Contract Code Section 12153-12217. The intent of SABRC is to stimulate markets for materials diverted by California local government and agencies. It requires state agencies to purchase enough recycled-content products to meet annual targets, report on purchases of recycled and nonrecycled products, and submit plans for meeting the annual goals for purchasing recycled-content products.
- **AB 32 Scoping Plan**: The scoping plan assumes widespread electrification of the transportation sector as a critical component of every scenario that leads to the mandated 40 percent reduction in GHG by 2030 and 80 percent reduction by 2015.
- **AB 2583** (Blumenfield 2012) **Public Resources Code §25722.8**: Statute requires reducing consumption of petroleum products by the state fleet compared to a 2003 baseline. Mandates a 10 percent reduction or displacement by Jan. 1, 2012 and a 20 percent reduction or displacement by Jan. 1, 2020.

- **AB 75** – Implement an integrated waste management program and achieve 50 percent disposal reduction target. State Agencies report annually on waste management program

- **SB 1106** – Have at least one designated waste management coordinator. Report annually on how your designated waste and recycling coordinator meets the requirement.

- **AB 2812** - Provide adequate receptacles, signage, education, staffing, and arrange for recycling services. Report annually on how each of these is being implemented

- **AB 341** – Implement mandatory commercial recycling program (if meet threshold). Report annually on recycling program

- **AB 1826** – Implement mandatory commercial organics recycling program (if meet threshold). Report annually on organics recycling program

- **SB 1383** - 50 percent reduction in the level of the statewide disposal of organic waste from the 2014 level by 2020, a 75 percent reduction by 2025, and 20 percent of currently disposed edible food is recovered for human consumption by 2025.
    - Agencies already in compliance with AB 1826 may need to further expand their organic waste recycling service to comply with the new requirements
    - Jan. 1, 2024, Tier 2 Commercial Edible food Generators will be required to donate edible food to a recovery organization.

- **SB 1335** - requires food service facilities located in a state-owned facility, a concessionaire on state-owned property, or under contract to dispense prepared food using reusable, recyclable, or compostable. food service packaging

Action Plan

- **2016 Zero-Emission Vehicle Action Plan**

  The plan establishes a goal to provide electric vehicle charging to 5 percent of state-owned parking spaces by 2022. It also advances the ZEV procurement target to 50 percent of light-duty vehicles by 2025.

State Resources and Guidance Documents

California has invested significant resources in understanding the risks of climate change, water efficiency, strategic growth, and state actions available to respond to and reduce these risks. These include the following:

- **Safeguarding California**: The state's climate adaptation strategy organized by sector. Each sector identifies risks from climate change and actions to reduce those risks.
- **Safeguarding California Implementation Action Plans**: Directed under EO B-30-15, the Implementation Action Plans outline the steps that will be taken in each sector to reduce risks from climate change.
- **Planning and Investing for a Resilient California**: Prepared under direction of EO B-30-15, this document provides a framework for state agencies to integrate climate change into planning and investment, including guidance on data selection and analytical approach.
- **California's Climate Change Assessments**: California has completed three comprehensive assessments of climate change impacts on California. Each assessment has included development of projections of climate impacts on a scale that is relevant to state planning (i.e., downscaled climate projections). These data are available through **Cal-Adapt**, an online data visualization and access tool.
- **Water Use Reduction Guidelines and Criteria**: Issued by the California Department of Water Resources February 28, 2013, pursuant to Executive Order B-18-12. Each applicable agency was required to take actions to reduce water use in facilities and landscapes that are operated by the state, including owned, funded, or leased facilities. State-operated facilities are defined as facilities where the agency has direct control of the buildings' function, maintenance, and repair. For leased facilities, the Green Building Action Plan directed at that time that new and renegotiated leases include provisions for water conservation, reporting water use, and installation of sub-meters to the extent possible and economically feasible.
- **Strategic Growth Council (SGC) Resolution on Location Efficiency**: Location efficiency refers to the greenhouse gas emissions arising from the transportation choices of employees and visitors to a building as determined by the Smart Location Calculator. Adopted on December 6, 2016, the resolution directs members of the SGC to achieve a 10 percent improvement in the Smart Location Score of new leases compared to the average score of leased facilities in 2016.

Table G-1: Background References and Applicable Roadmap Chapters

Background Reference	Climate Adaptation	ZEV	Energy	Water	Green Operation
Executive Orders:					
EO B-16-12		X			X
EO B-18-12		X	X	X	X
EO B-29-15				X	
EO B-30-15	X	X	X		X
EO B-37-16				X	
Management Memos					
MM 14-02				X	
MM 14-05			X		X
MM 14-07			X		X
MM 14-09			X		
MM 15-03		X	X		
MM 15-04			X		X
MM 15-06			X	X	X
MM 15-07		X			
MM 16-07		X			
MM 17-04			X		
Legislative Actions					
SB 246	X				
SB 2800	X				

SB 1106					X
SB 1383					X
AB 4					X
AB 32		X			X
AB 75					X
AB 341					X
AB 1826					X
AB 2812					X
AB 1482	X				
Action Plans					
2016 ZEV Action Plan		X			
State Resources and Guidance Documents					
Cal-Adapt	X				
California's Climate Change Assessments	X				
Public Resources Code §25722.8		X			
Planning and Investing for a Resilient California	X				
Safeguarding California	X				
Safeguarding CA Implementation Action Plan	X				
Sustainable Groundwater Management Act of 2014				X	

Appendix I - List of Tables & Graphs

Appendix J – Effect of Climate Change Risk Factors on Caltrans Facilities

Figure 1.1: Percentile of Urban Heat Island Index Threat to Caltrans Facilities

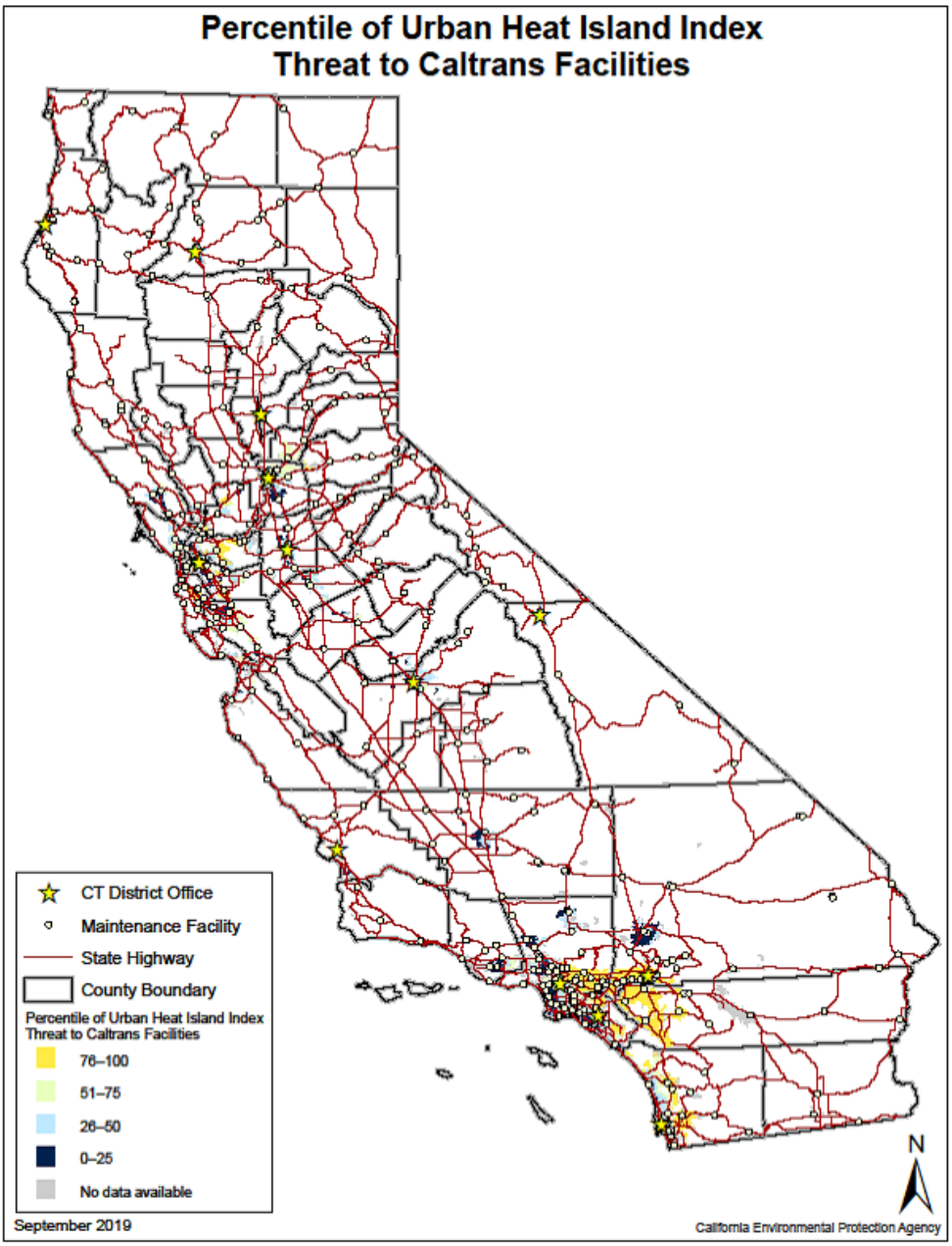


Figure 1.2: 7 Day Maximum Temperature Increase-2025 Threat to Caltrans Facilities

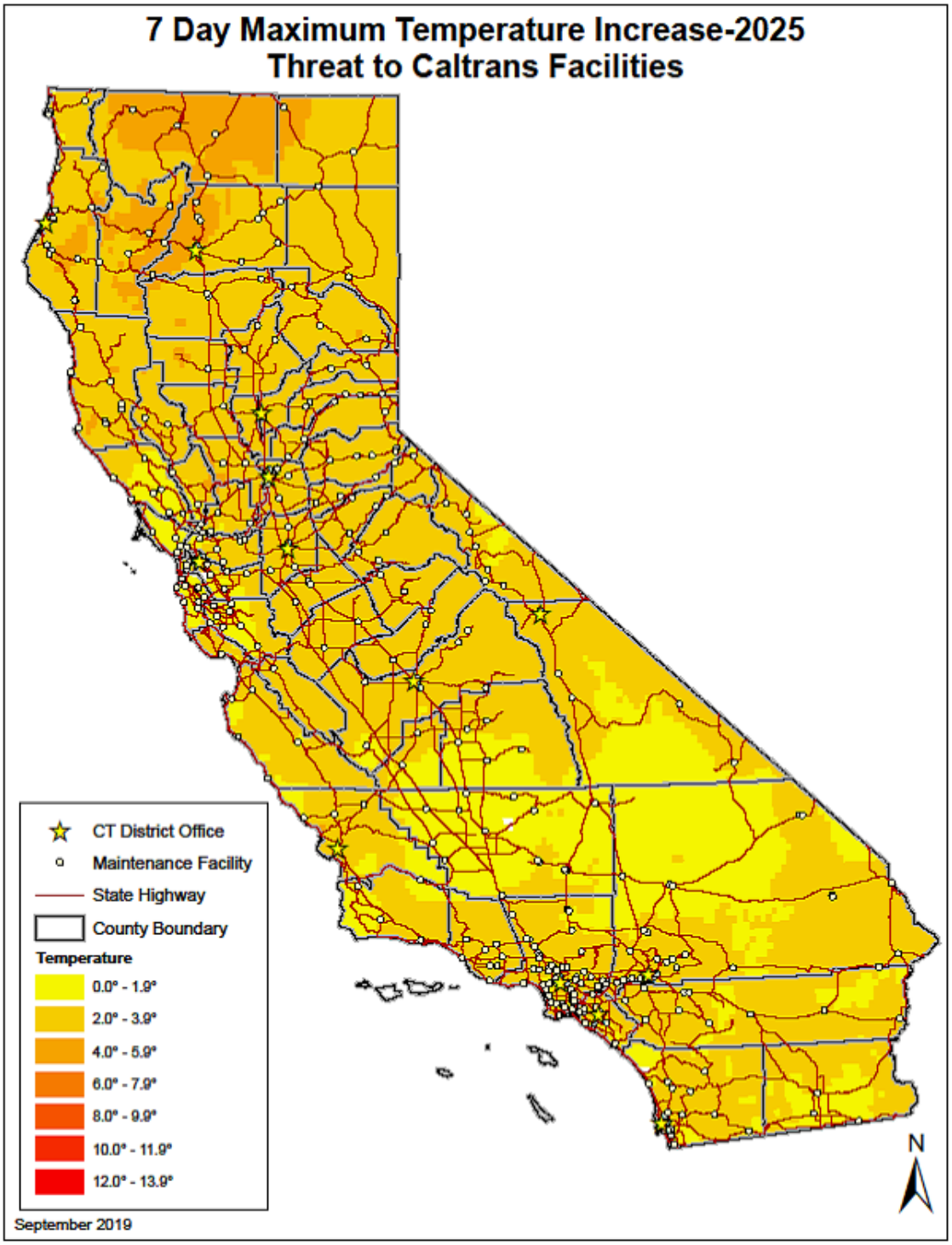


Figure 1.3: Change in 100-Year Precipitation Depth-2025 Threat to Caltrans Facilities

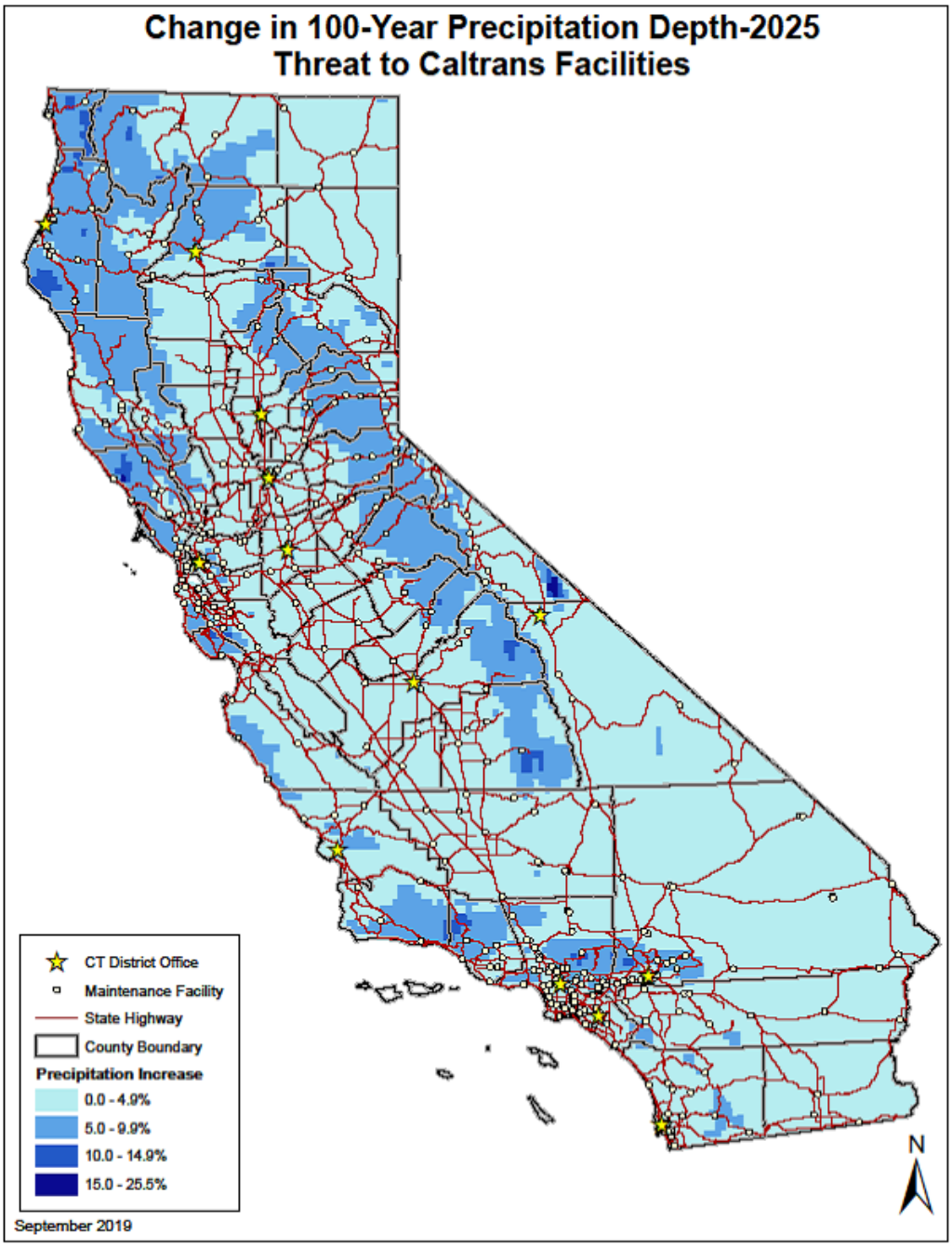


Figure 1.4: .5 Meter Sea Level Rise Threat to Caltrans Facilities

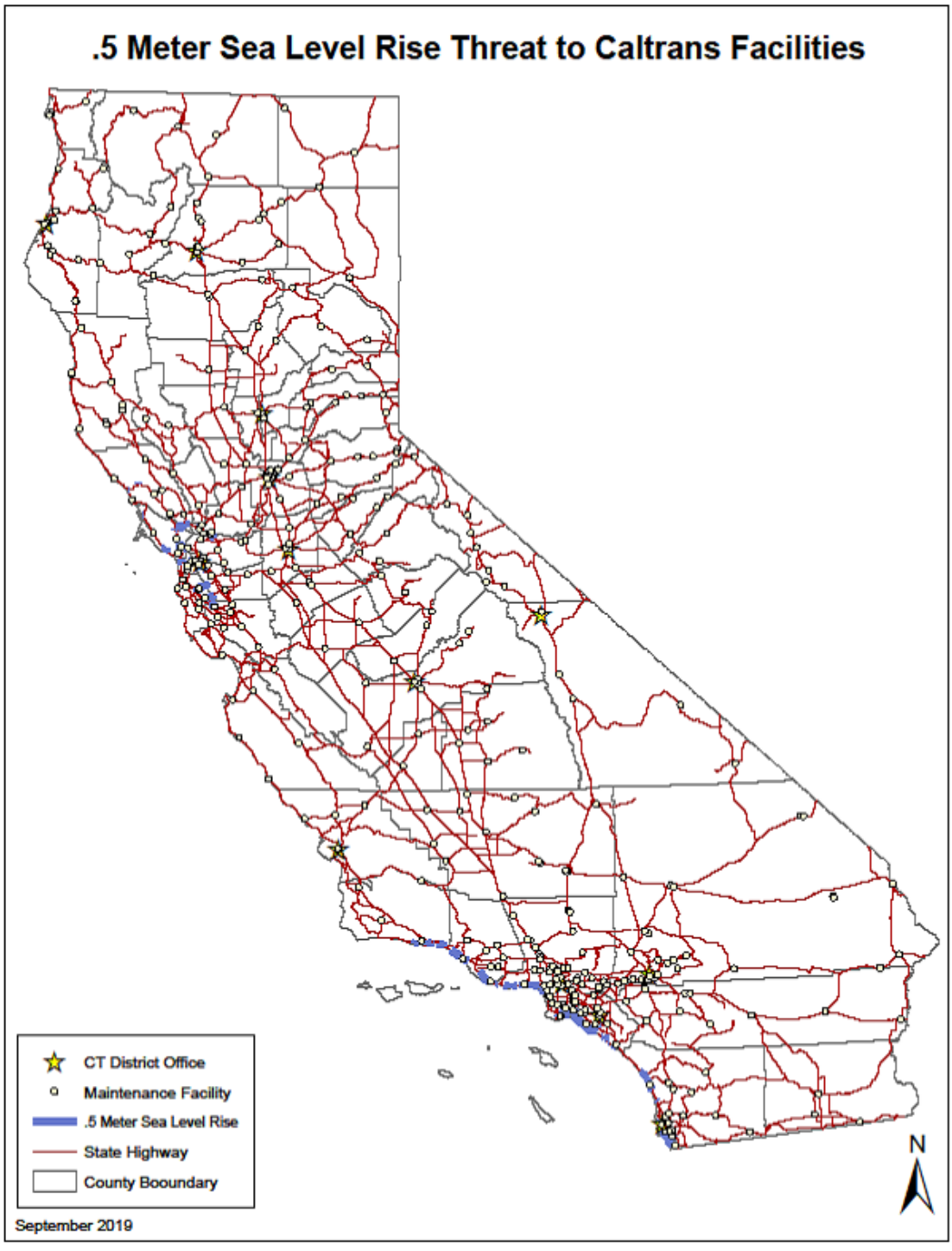


Figure 1.5: Wildfire Threat to Caltrans Facilities 2019

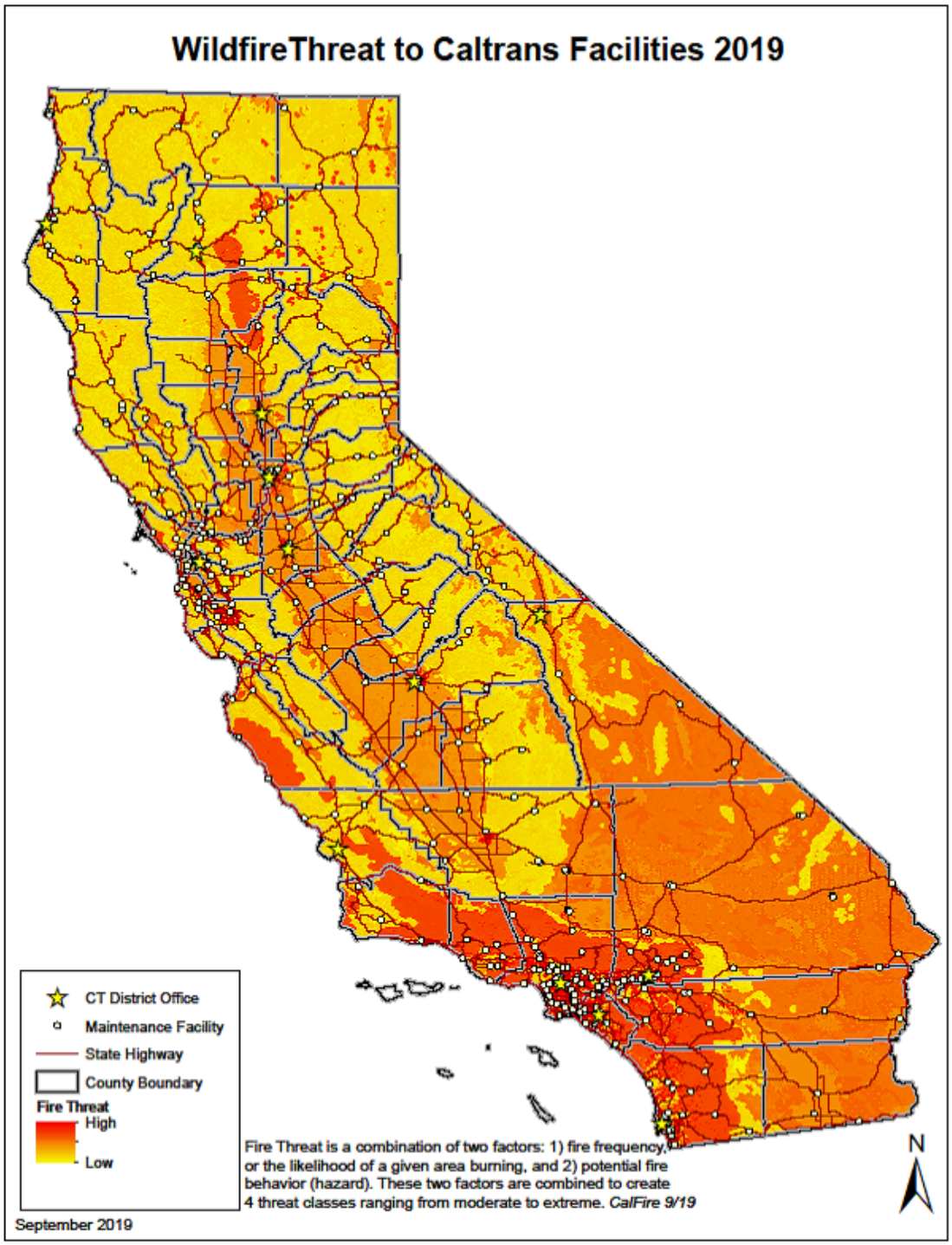


Figure 1.6: .5 Meter Storm Surge Threat to Caltrans Facilities