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2023 State Highway System Management Plan

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Caltrans

Prepared by the California Department of Transportation in accordance with Streets and Highways Code 164.6

June 1, 2023

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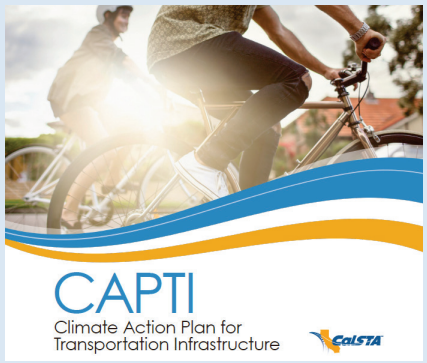
Executive Summary

State Highway System Management Plan

The 2023 State Highway System Management Plan (SHSMP) presents a performance driven and integrated management plan for California's State Highway System (SHS). SHS needs, investments, and resulting performance projections for the 10-year period spanning July 2023 – June 2033 are presented in this Plan. The SHSMP is organized to align with the California Department of Transportation (Caltrans) Strategic Plan and the Climate Action Plan for Transportation Infrastructure (CAPTI).

About the SHSMP

The *State Highway System Management Plan (SHSMP)* integrates the maintenance, rehabilitation, and operation of the State Highway System (SHS) into a single plan and enables Caltrans to meet state and federal asset management requirements, while aligning transportation investments with priority state climate, health, and social equity goals. The plan maintains its focus on a "fix-it-first" approach to meet defined condition targets, while placing an even stronger emphasis on creating a climate resilient transportation system that reduces greenhouse gas emissions, thereby reducing risk to state transportation assets in alignment with the *Climate Action Plan for Transportation Infrastructure (CAPTI)*.



CAPTI is a holistic framework and statement of intent for aligning state transportation infrastructure investments with state climate, health, and social equity goals, built on the foundation of the "fix-it-first" approach established in SB1.

The SHSMP serves as a logical extension to the *California Transportation Asset Management Plan (TAMP)*, establishing asset classes, performance measures and targets pursuant to California Senate Bill (SB) 486 as adopted by the California Transportation Commission. It identifies from broader state and local transportation goals the elements applicable to the SHS and operationalizes these in an executable 10-year plan. Moreover, the 2023 SHSMP builds on the performance driven framework from prior plans, and further strengthens integration with the TAMP, the *Caltrans Strategic Plan*, and CAPTI.

The SHSMP is founded on core principles of asset management, applying an objective, data-driven, analytical approach to inform transportation investments based on measured conditions, performance objectives, and targets. With the introduction of the first SHSMP in 2017, siloed, single asset focused funding strategies of the past were replaced. This improved practice continues to evolve in the current plan, providing the flexibility at the regional level to leverage available funding to address multiple performance objectives within a single project. This performance management methodology allows Caltrans to integrate multi-modal transportation options into traditional rehabilitation work to provide a cost-effective way to expand mode choice and reduce transportation related emissions.

The 2023 SHSMP refines and expands the asset management framework, introducing a new performance objective to maintain and enhance mobility hub facilities that support and encourage shifts to other transportation modes and provide equitable access for all to transportation services. This plan also expands the scope of the fish passage objective to now encompass both fish and wildlife connectivity needs. These new performance objectives expand the maturity of asset management in Caltrans and move the SHSMP toward a comprehensive and equitable transportation plan for all Californians.

The SHSMP presents an unconstrained need, meaning it includes potential needs on the SHS, regardless of funding source and availability, and a fiscally constrained investment plan. This plan is reviewed in the context of other infrastructure needs and available state and federal funding. This plan also reflects expected outcomes from the significant increase in federal funding opportunities through the *Infrastructure*

Investment and Jobs Act (IIJA), Bipartisan Infrastructure Law (BIL), signed into law in late 2021. These federal funds are in addition to the prior increase in state transportation funding through SB 1, the Road Repair and Accountability Act of 2017. This funding plays a crucial role in ensuring California's transportation needs can be met.

The Infrastructure Investment and Jobs Act includes provisions related to federal-aid highway, transit, highway safety, motor carrier, research, hazardous materials, and rail programs. It also includes federal policy direction and funding in the areas of climate action, zero-emission vehicle deployment, social equity, goods movement and multi-modal transportation investment.

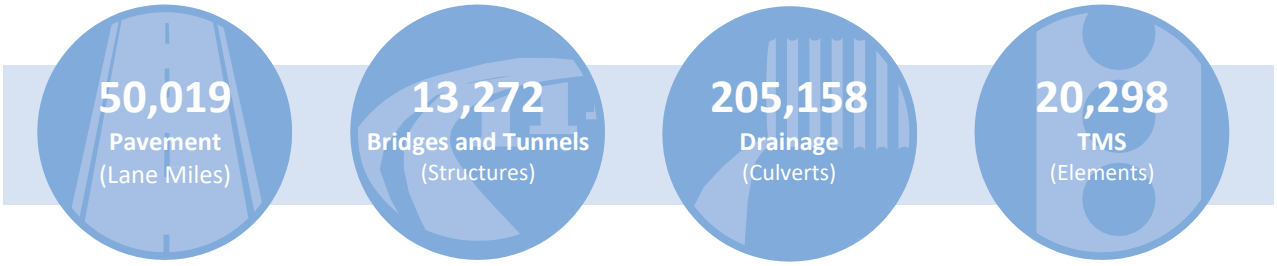
State and Federal Requirements

Under California statutes, Caltrans is the state agency responsible for planning, developing, maintaining, and operating the legislatively designated SHS and a variety of supporting infrastructure. The SHSMP satisfies the requirements of the Streets and Highway Code section 164.6 for a 10-Year State Highway Operation and Protection Program (SHOPP) Plan and a 5-Year Maintenance Plan.

Assembly Bill (AB) 515 amended California Government Code Section 164.6 to require Caltrans to prepare a State Highway System Management Plan. The SHSMP is also consistent with the asset management requirements in IIJA and federal Performance Management (PM) regulations.

Highway Infrastructure Assets on California's State Highway System

The SHS includes a wide variety of physical assets, including the four primary asset classes – Pavement, Bridges and Tunnels, Drainage, and Transportation Management Systems (TMS).



Notes:

- The pavement quantity reflects the total surveyed lane miles and does not include collection gaps from road closures, detours, and construction zones.
- The drainage quantity represents culverts inspected to date only.

Inventory and Conditions for State Highway System Assets

A breakdown of the baseline SHS inventory and conditions for primary and supplementary assets is presented in Table A. These quantities represent the most current and best available information at the time of report preparation.

Table A. Existing SHS Inventory and Baseline Conditions for Primary and Supplementary Assets

Existing SHS Inventory and Baseline Conditions					
Performance Objective	**Inventory**	**Good**	**Fair**	**Poor**	
Primary Asset Classes					
Pavement[1]	**50,019** Lane Miles	**53.2%**	**45.5%**	**1.3%**	
Bridges and Tunnels	**253,638,040** Square Feet	**49.3%**	**46.9%**	**3.8%**	
Drainage[2]	**20,033,247** Linear Feet	**74.2%**	**16.2%**	**9.6%**	
Transportation Management Systems	**20,298** Each	**77.8%**	**N/A**	**22.2%**	
Supplementary Asset Classes					
Complete Streets	**8,423,470** Linear Feet	**64.9%**	**14.5%**	**20.6%**	
Drainage Pump Plants	**290** Each	**13.5%**	**36.2%**	**50.3%**	
Highway Lighting	**104,810** Each	**37.3%**	**14.6%**	**48.1%**	
Office Buildings	**2,669,524** Square Feet	**40.1%**	**32.3%**	**27.6%**	
Overhead Sign Structures	**18,006** Each	**58.7%**	**34.7%**	**6.6%**	
Safety Roadside Rest Areas	**86** Locations	**30.2%**	**41.9%**	**27.9%**	
Transportation Related Facilities	**4,665,081** Square Feet	**24.4%**	**15.3%**	**60.3%**	
Weigh-In-Motion Scales	**159** Stations	**35.2%**	**57.9%**	**6.9%**	

Notes:

[1]The pavement inventory reflects the total surveyed lane-miles and does not include collection gaps from road closures, detours, and construction zones.

[2]The drainage quantity represents culverts inspected to date only.

Performance Management

The SHSMP includes a Needs Assessment to achieve the established performance targets and an Investment Plan to guide SHS and related infrastructure management. The Needs Assessment is an aggregation of numerous analyses that fully defines our existing inventory or deficiency, condition or performance targets, existing pipeline of work, a gap analysis, and cost estimate to close the gaps. Collectively, these steps are referred to as "Performance Management" and are a requirement of IIJA.

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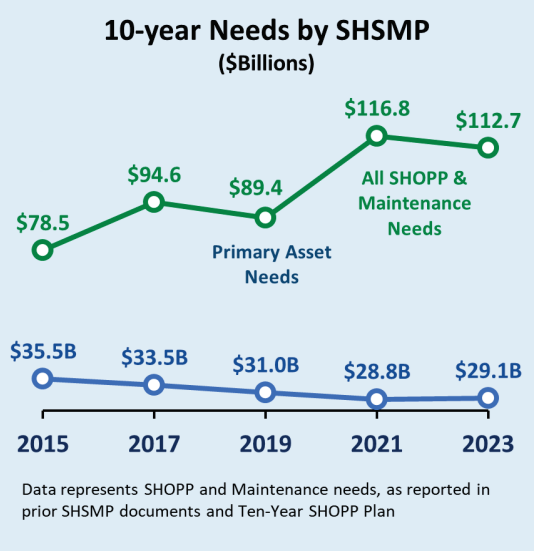
2023 Plan Changes

The 2023 SHSMP introduces a new Mobility Hubs objective. These are specialized parking facilities designed to facilitate and encourage use of high-occupancy modes such as carpools, vanpools, buses, and rail transit, as well as active transportation modes instead of vehicle modes. Mobility Hubs are intended to lead to modal shifts and equitable access to reduce auto-dependency and greenhouse gas (GHG) emissions. In addition, this plan broadens the scope of the former fish passage objective to address Fish and Wildlife Connectivity in an effort to remediate barriers to fish and wildlife migration pathways at locations impeded by infrastructure along SHS. Fish and wildlife migration barriers hinder recovery for threatened and endangered species listed under the California Endangered Species Act (CESA) and the Federal Endangered Species Act (FESA), while also introducing hazards to travelers due to animal vehicle collisions. The SHSMP also expands the former sea level rise objective to the Climate Adaptation and Resilience objective to include coastal cliff retreat. This coastal threat has claimed a number of highway and rail segments over the past several years.

Managing SHS Needs

The 10-year Needs Assessment identifies a total need of $112.7 billion, $76.3 billion in historically reported plan components, $29.8 billion in new additions since the 2019 SHSMP, and $6.5 billion in major maintenance and field maintenance crews. These needs represent the costs to maintain the existing assets on the SHS, expand the bicycle and pedestrian infrastructure, mitigate for potential sea level rise, and remove transportation induced wildlife barriers (Table B).



The total estimated SHOPP and Maintenance need is lower than the prior SHSMP but remains relatively level in comparison to the plan-over-plan trend from earlier plans. While the needs in this Plan reflect significant increases due to new and expanded objectives, rising costs of construction, and refinements in asset inventory data, they are largely offset by reductions from adjustments to Supplementary Asset performance targets and a fundamental adjustment to the basis for estimating costs of achieving proactive safety outcomes.

The needs identified for the Primary Assets – Pavement, Bridges and Tunnels, Drainage, TMS – have generally been decreasing and leveling out due to sustained investments. The range of needs represented in the SHSMP are extensive, and available funding will address roughly half of these needs.

Investment Plan

The SHSMP presents a fiscally constrained allocation of available funding for the maintenance, rehabilitation, and operation of the SHS and is presented in the SHSMP as the Investment Plan. The Investment Plan focuses available funding on the Primary and Supplementary assets following our "fix-it-first" commitment to achieve the SB1 performance targets, while simultaneously increasing our investment in bicycle and pedestrian infrastructure, facilities that encourage multi-modal transportation options, and climate adaptation and resilience. These investments work towards achieving climate goals while promoting equity in transportation system access.

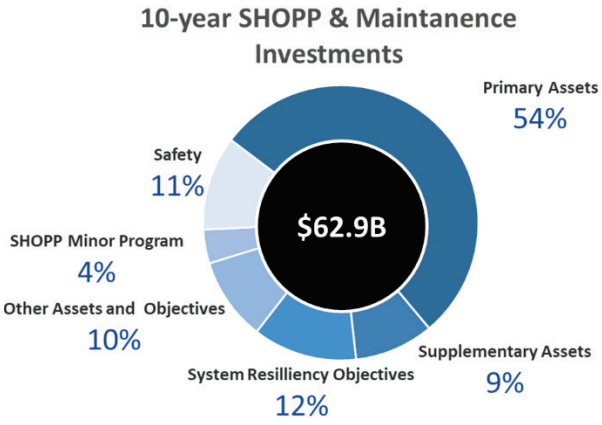
The SHSMP Investment Plan considers factors such as existing conditions, system performance, pipeline of projects, legislative and legal mandates, consequences of inaction, climate change, and environmental stewardship to arrive at the proposed allocation of funding. These factors are systematically evaluated through a trade-off analysis, balancing multiple competing priorities, and acknowledging that no one combination of investments will fully address all the identified needs for the SHS. A breakdown of SHOPP and Maintenance needs and recommended investments for the 10-year period are shown in Table B.

Table B. 10-Year Needs Assessment and Investment Plan

10-Year Needs Assessment and Investment Plan			
Program	**10-Year Needs ($B)**	**10-Year Investment ($B)**	**Annual Unfunded Need ($B/yr)**
Maintenance Program	$6.5	$6.5	$0.0
SHOPP Historically Reported Objectives[1]	$76.3	$51.2	$2.5
SHOPP New Objectives[2]	$29.8	$5.1	$2.5
Total	**$112.7**	**$62.9**	**$5.0**

Notes
[1]Includes SHOPP Major and Minor needs
[2]Includes new objectives introduced since the 2019 SHSMP – Mobility Hubs, Complete Streets, Fish and Wildlife Connectivity, Climate Adaptation and Resilience.

The total investment in the SHOPP and Maintenance programs over the next ten years is estimated at $62.9 billion. Close to half of the investment will be directed to maintain and rehabilitate existing Primary Assets – Pavement, Bridges and Tunnels, Drainage, and TMS. Significant investments are planned for Supplementary Assets, including the construction of new bike and pedestrian infrastructure, as well as in climate adaptation and resilience.



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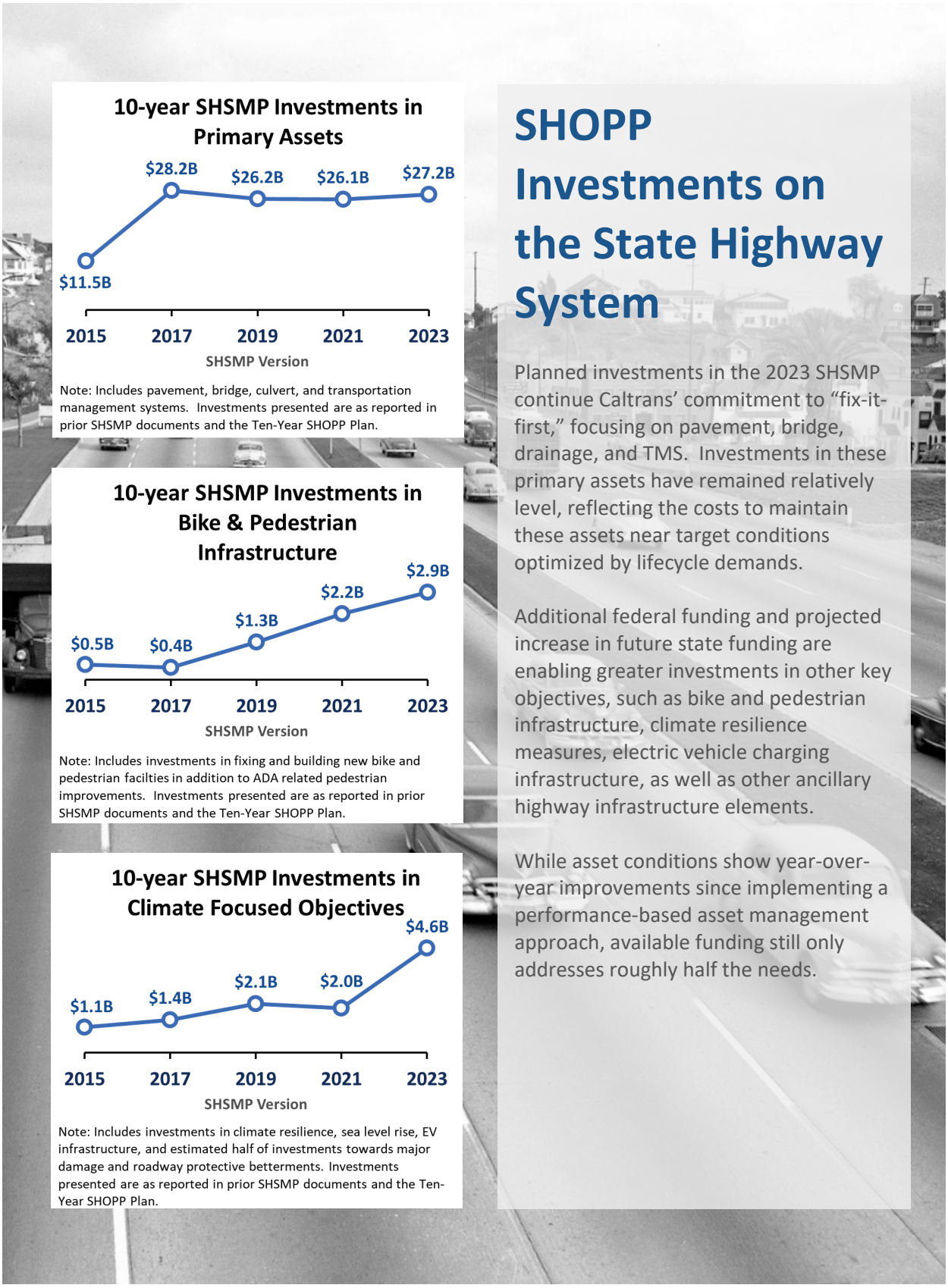


Note: Includes pavement, bridge, culvert, and transportation management systems. Investments presented are as reported in prior SHSMP documents and the Ten-Year SHOPP Plan.

Note: Includes investments in fixing and building new bike and pedestrian facilties in addition to ADA related pedestrian improvements. Investments presented are as reported in prior SHSMP documents and the Ten-Year SHOPP Plan.

Note: Includes investments in climate resilience, sea level rise, EV infrastructure, and estimated half of investments towards major damage and roadway protective betterments. Investments presented are as reported in prior SHSMP documents and the Ten-Year SHOPP Plan.

SHOPP Investments on the State Highway System

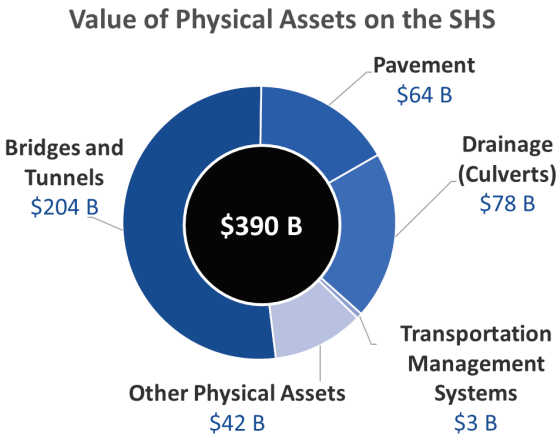
Planned investments in the 2023 SHSMP continue Caltrans' commitment to "fix-it-first," focusing on pavement, bridge, drainage, and TMS. Investments in these primary assets have remained relatively level, reflecting the costs to maintain these assets near target conditions optimized by lifecycle demands.

Additional federal funding and projected increase in future state funding are enabling greater investments in other key objectives, such as bike and pedestrian infrastructure, climate resilience measures, electric vehicle charging infrastructure, as well as other ancillary highway infrastructure elements.

While asset conditions show year-over-year improvements since implementing a performance-based asset management approach, available funding still only addresses roughly half the needs.

Value of Physical Assets on the SHS

Investments in the SHS over time have created a highway network with an estimated replacement cost of $390 billion. A breakdown of the major system component replacement values is shown here, where the replacement value is calculated using the inventory quantity multiplied by the unit replacement cost.



Projected 10-Year Performance Accomplishments

Considering the projected funding, anticipated deterioration of assets, and increasing operational demands over the next ten years, Caltrans expects to make significant progress towards targets in maintenance and rehabilitation work and operational improvements. Table C highlights combined expected accomplishments from the Maintenance and SHOPP programs for the four primary asset classes. This table quantifies project-level outputs expected across the spectrum of treatments by condition category. Quantities have been rounded for presentation.

Table C. Estimated 10-Year Performance Accomplishments (2023-2033)

Estimated 10-Year Performance Accomplishments (2023-2033)			
Asset Class	**Good Condition (Preventive Maintenance)**	**Fair Condition (Maintenance and SHOPP)**	**Poor Condition (Maintenance and SHOPP)**
Pavement	11,612 Lane Miles	28,911 Lane Miles	866 Lane Miles
Bridges and Tunnels	118.2 million Square Feet	79.0 million Square Feet	13.5 million Square Feet
Drainage (Culverts)	-	1.7 million Linear Feet	1.0 million Linear Feet
TMS	800,000 Maintenance Checks/Repairs	-	7,640 Replacements 2,999 New Elements

The available funding is adequate to meet SB 1 targets for the primary assets. However, available funding is not adequate to meet all of the broader identified needs, requiring constraint in some objectives. Consequently, the planned investments in supplementary asset classes are at levels below what is necessary to achieve the Desired State of Repair (DSOR). Improved asset management strategies and a focus on project delivery will result in visible improvement to the transportation system in California over time. Significant work has been done to implement new programs and expand our asset management breadth that will allow Caltrans to continue making progress toward improving the State Highway System in California.

Projected 10-Year Conditions

The condition of the four Primary assets is expected to continue to improve over the ten-year plan period. Caltrans is on track to meet the SB 1 targets by 2027, as summarized in Table D. The condition-based targets for pavement, culverts, and TMS are aligned with targets set forth in the TAMP, as shown in Table E. By meeting TAMP targets for these three objectives, Caltrans will surpass SB 1 targets. Condition targets under both SB 1 and the TAMP are expected to be maintained through 2033.

SB 1 includes a performance requirement to fix not less than an additional 500 bridges over a 10-year period ending in 2027, as presented in Table D. Projects that improve the condition of the bridge to a better condition, mitigate seismic or scour vulnerabilities, or address operational limitations are counted towards this goal. Prior to the passage of SB 1, Caltrans was fixing an average of 114 bridges per year. For the purpose of counting towards the additional 500 bridges which should be fixed, Caltrans is reporting only those in excess of the baseline of 114 bridges.

Table D. SB 1 Targets for 2027

SB 1 Targets for 2027	
Asset Class	**SB 1 Target**
Pavement	98% Good or Fair Condition 90% level of service (LOS) achieved for maintenance of potholes, spalls, and cracks
Bridges	Fix an additional 500 bridges
Culverts	90% Good or Fair Condition
TMS	90% Good Condition

Table E lists the targets established in the TAMP and provides comments on projected conditions for the four primary asset classes at the end of the Plan period relative to baseline conditions.

Table E. Transportation Asset Management Plan 10-year Targets

TAMP 10-year Targets					
Asset Class		**Good**	**Fair**	**Poor**	**Projected 10-Year Condition Relative to Baseline**
Pavement	Class 1	60%	39%	1%	Pavement conditions are expected to further improve for all pavement classes, reaching performance targets and maintaining those levels over the plan period.
	Class 2	55%	43%	2%	
	Class 3	45%	53%	2%	
Bridges and Tunnels		48.5%	50%	1.5%	Continued improvement in bridge conditions is expected over the plan period. Work underway on several large bridge projects and an initiative currently underway to address bridges with fair and poor condition decks will be critical in meeting targets.
Culverts		70%	20%	10%	Culvert conditions are currently meeting targets and are expected to remain relatively steady over the plan period.
TMS		90%	N/A	10%	TMS is expected to show significant improvement in conditions earlier in the plan period as a result of a focused effort on fixing poor TMS in the near term.

Optimizing Investments in California's Transportation Infrastructure

The 2023 SHSMP carries forward the major paradigm shift initiated with the initial SHSMP to a performance driven asset management framework, further strengthening Caltrans' investment decision-making capabilities to optimize the needs of the SHS with available funding. These changes collectively improve the management of the SHS, focus activities on performance in alignment with the *Caltrans 2020-24 Strategic Plan* and CAPTI, and provide structure and transparency to improve the management of our assets.

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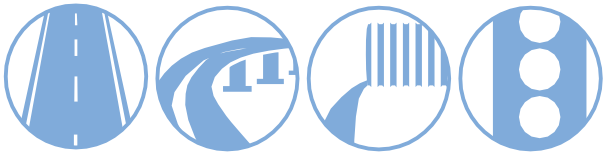


1 Introduction

The 2023 State Highway System Management Plan (SHSMP) presents a performance-based framework that guides decision-making and priorities for maintenance, preservation, rehabilitation, and reconstruction investments on the State Highway System (SHS).

It continues the same framework initially established in the 2017 SHSMP, which replaced a legacy asset-based funding approach. The SHSMP performance-based approach represents a fundamental change in how Caltrans spends transportation funds for major capital improvements necessary to preserve and protect the SHS.

The SHSMP spans a 10-year period from July 2023 through June 2033 and provides Caltrans with flexibility in achieving multiple objectives within a single project. This framework allows Caltrans to optimize integration of multimodal transportation options into traditional rehabilitation work to provide a cost-effective way to expand mode choice and reduce transportation-related emissions. It enables Caltrans to make well-informed investment decisions, balance competing priorities, evaluate long-term performance outcomes, promote transparency, and communicate to stakeholders the value of investments in transportation infrastructure.

Furthermore, Caltrans has been actively improving asset management methods, tools, and data that underpins analyses for performance projections and investment decision-making presented in this plan. The department has a major technology development project underway for a new Transportation Asset Management System (TAMS). This enterprise system will integrate data from existing asset inventories, financial systems, and project management systems to enable Caltrans to focus investments to maximize the longevity of infrastructure assets on the SHS, improve safety, and achieve performance targets. These efforts reflect an overall maturation in Caltrans' asset management.

1.1 Overview

The SHSMP applies a performance management framework to the SHS, integrates maintenance and rehabilitation activities, and aligns investments with the *Caltrans Strategic Plan 2020-2024*[1] and the *Climate Action Plan for Transportation Infrastructure (CAPTI)*[2]. The SHSMP defines the inventory and condition of assets, establishes condition targets, determines the magnitude of condition gaps, develops cost estimates to close the gaps, and defines a constrained investment plan for the State Highway Operation and Protection Program (SHOPP) and the Maintenance Program.

The SHSMP addresses a majority of the asset management requirements from the *2022 California Transportation Asset Management Plan (TAMP)*[3]. The SHSMP goes beyond the TAMP requirements to implement a performance-driven approach for the SHOPP and the Maintenance Program. All project planning, initiated after July 2017, is based on SHSMP performance objectives. This ensures that projects that begin the planning process will collectively accomplish enough work to achieve the performance targets established by Senate Bill (SB) 1, Road Repair and Accountability Act[4]. The SHSMP addresses key requirements set forth in state and federal statutes.

1.2 Making Progress

Initially established in 2017 with the introduction of the first *State Highway System Management Plan*[5], Caltrans made structural changes to how funding is distributed within SHOPP programs. The silo-based funding approach that had been in place for decades was replaced with a performance-driven allocation methodology. This methodology facilitates more comprehensive project solutions by combining numerous assets into a corridor-type project. It provides the opportunity to develop projects that minimize negative impacts to users with economies of scale for traffic control and environmental costs. This revamped structure of the SHOPP has led to earlier collaboration with local partners and opportunities to find mutually beneficial project opportunities to avoid potentially overlapping work, enhance efficiency, and maximize the effectiveness of available funding.

[1] Caltrans, "Caltrans 2020-24 Strategic Plan", 2021, https://dot.ca.gov/-/media/dot-media/programs/risk-strategic-management/documents/sp-2020-16p-web-a11y.pdf
[2] CalSTA, "Climate Action Plan for Transportation Infrastructure (CAPTI)," 2021, https://calsta.ca.gov/subject-areas/climate-action-plan
[3] Caltrans, "2022 California Transportation Asset Management Plan", https://dot.ca.gov/programs/asset-management/california-transportation-asset-management-plan
[4] Senator Beall, "Road Repair and Accountability Act of 2017", (Senate Bill 1), 2017, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1
[5] Caltrans, State Highway System Management Plan, https://dot.ca.gov/programs/asset-management/state-highway-system-plan

The SHSMP implemented fundamental changes in the way Caltrans manages available funding by focusing on measured condition and performance objectives. Under the provisions of the SHSMP, performance and funding targets are provided to each Caltrans district, empowering them to combine performance accomplishments together in cost-effective projects that are less disruptive and better align with local partners' work. The SHSMP methodology allows Caltrans to better integrate multimodal transportation options into traditional rehabilitation work to provide a cost-effective way to expand mode choice and reduce transportation-related emissions.

The SHSMP provides unprecedented transparency in the presentation of the current conditions and performance of the system, project stream, deterioration rates, repair costs, and targets used to develop the Needs Assessment in Chapter 2. The 10-year Investment Plan, in Chapter 4, clearly shows where available funds are being invested and the expected condition and performance outcomes of those investments.

Caltrans has integrated SHOPP and Maintenance Program investment decisions for pavement, bridges, drainage (culverts), and Transportation Management System (TMS) units to realize efficiencies in the combination of these resources. These four asset classes represent a significant portion of the SHS maintenance and rehabilitation investments in California. The California Transportation Commission (Commission) adopted these four as focus areas, in the ongoing implementation of asset management. The integrated presentation provides a clear understanding of how these funding programs work together to bring a continuum of asset management throughout their life cycle.

1.3 Federal, State, and Departmental Requirements

The SHSMP implements key requirements set forth in State and Federal statutes, organizing activities and performance in a framework aligned with Caltrans' strategic objectives. It applies principles of performance management (Figure 1-1) for each asset class to develop optimum performance need for the asset subject and then further define the expected performance targets. Total needs of individual asset classes as well as that of the highway system reflect contributions of both the SHOPP and Maintenance Program to asset condition and overall system performance.

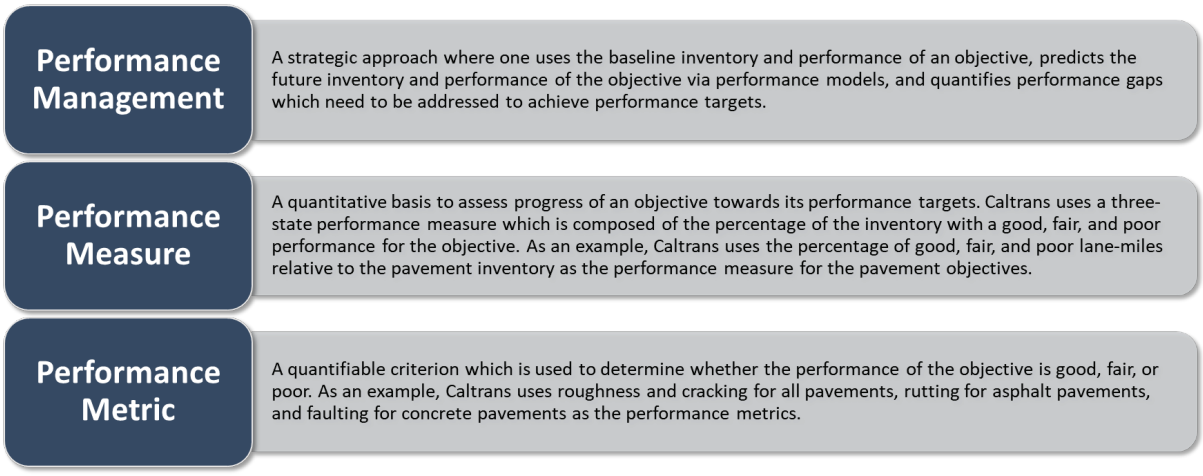


Figure 1-1. Performance Management Definitions

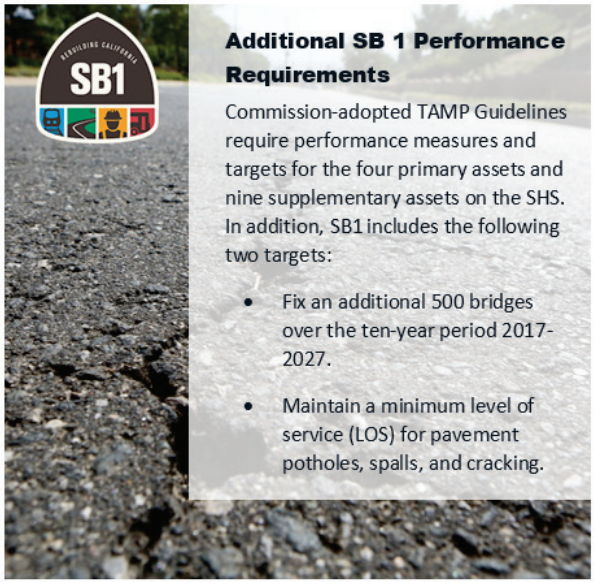
Federal Requirements

The federal *Infrastructure Investment and Jobs Act (IIJA)*[6]*, Bipartisan Infrastructure Law (BIL),* and federal *Performance Management (PM)* regulations outline federal asset management requirements that are addressed in the SHSMP. MAP-21, the *Moving Ahead for Progress in the 21st Century Act*, requires states to adopt national asset management performance measures to establish nationwide consistency for pavement and bridge condition reporting. These performance measures use a condition scale (good, fair, and poor) to quantify pavement lane miles or bridge deck area condition. The Automated Pavement Condition Survey (APCS) and bridge Element Level Inspection (ELI) data incorporate these condition assessment requirements into Caltrans' practice.

State Requirements

The 2023 SHSMP is an integrated management plan that defines specific quantifiable accomplishments, goals, objectives, costs, and performance measures and targets as required by the California Streets and Highway Code (SHC), Section 164.6[7], for the SHOPP 10-Year Plan and the 5-Year Maintenance Plan. The SHC requires Caltrans to update this plan every two years. These requirements were amended to combine these two plans under Assembly Bill (AB) 515[8].

Under California statutes Caltrans is the state agency responsible for planning, developing, maintaining, and operating the legislatively designated SHS and its variety of supporting infrastructure (highway maintenance stations, safety roadside rest areas, and drainage facilities, among others). Similarly, the SHC assigns various state highway funding and project approval responsibilities to the Commission. Together and in partnership with a wide variety of local, regional, and federal transportation oversight agencies, the private sector, Caltrans, and the Commission, direct highway system preservation activities and projects to support a robust asset management approach as required by SB 486[9].



Departmental Requirements

The SHSMP organizes key activity areas and objectives into categories that generally align with the *Caltrans 2020-24 Strategic Plan* as well as the *Climate Action Plan for Transportation Infrastructure (CAPTI)*. This ensures that Caltrans continues to meet the transportation needs for all Californians, maintaining the focus on "fix-it-first," while working towards climate, health, and social equity goals. This structure provides

[6] Infrastructure Investment and Jobs Act (IIJA), https://www.congress.gov/bill/117th-congress/house-bill/3684/text
[7] California Streets and Highway Code, Section 164.6, 2017, https://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=201720180AB515
[8] Assemblyman Frazier, Assembly Bill 515, 2017, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB515
[9] Senator DeSaulnier, Senate Bill 486, 2014, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB486

clarity on the specific strategic goals Caltrans is working to accomplish, along with transparency of the level of needs and investments in each of the strategic areas.

1.4 The California State Highway System

Caltrans is the state agency responsible for planning, developing, maintaining, and operating the legislatively designated SHS. The SHS includes a wide variety of physical assets. Highway infrastructure assets, within state highway boundaries, include over 50,000 lane miles of assessed pavement; over 13,000 bridges and tunnels; over 205,000 culverts; and over 20,000 TMS assets. The most significant assets on the SHS, in terms of their cost and extent, are pavement and bridges. However, many other assets are needed to support mobility and improve safety. In many cases, replacement or rehabilitation of roads and bridges includes replacement or upgrades to other supplementary assets as depicted in Figure 1-2. For instance, the cost of reconstructing or replacing a bridge includes the cost of guardrail; and pavement projects often include upgrades to associated traffic and safety assets. Where applicable, costs associated with these supplementary assets are included in the cost of maintaining pavement and bridges.

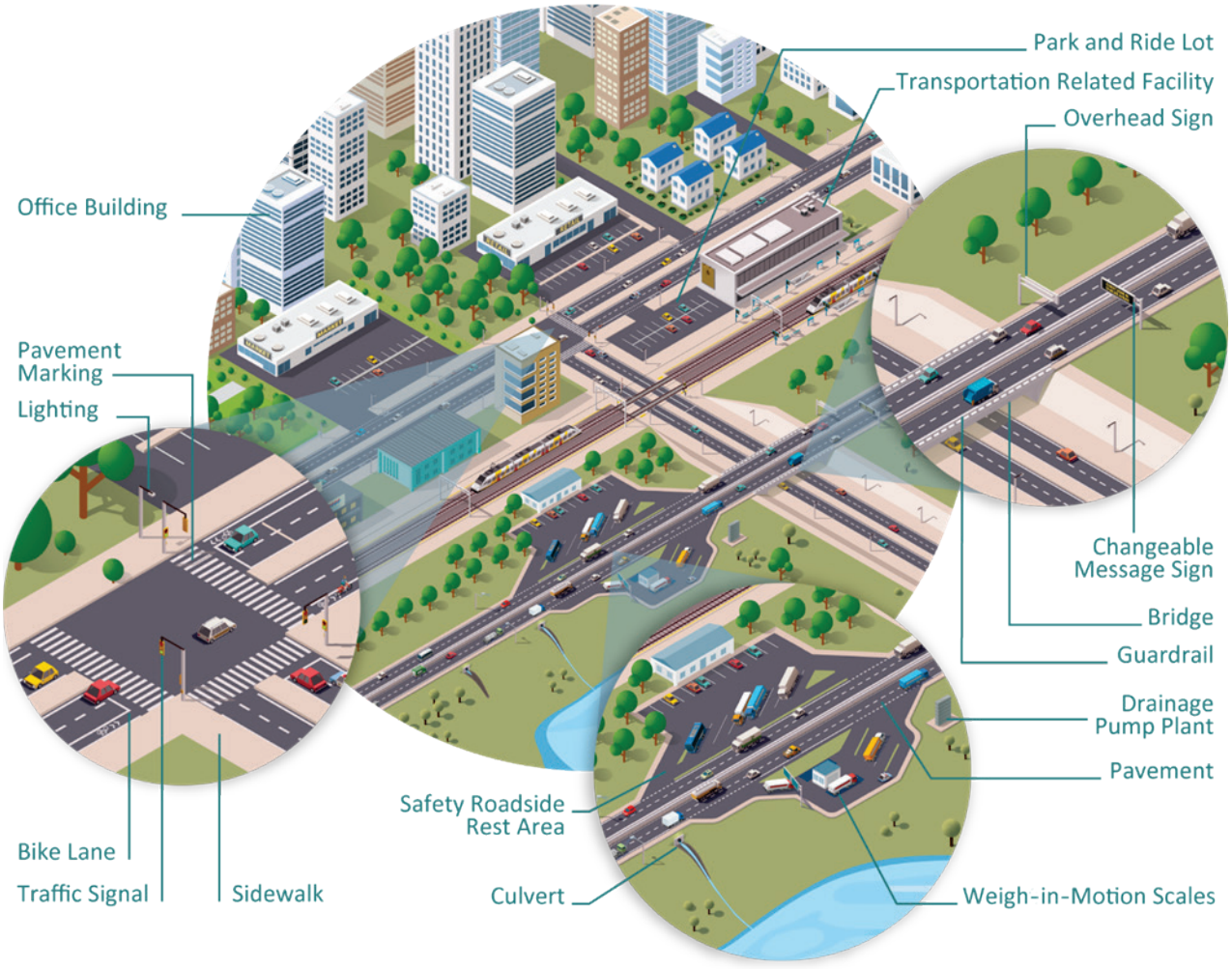


Figure 1-2. Typical Highway Assets

Additional support facilities, such as maintenance stations, equipment shops, and transportation materials laboratories and testing facilities, are also included as SHS assets. Many system components, built in the 1950s, 1960s, and early 1970s, have either reached or are reaching the end of their service life. Asset deterioration is accelerating at a faster rate than in previous decades, because of age and change in traffic demands, often requiring extensive rehabilitation and even full reconstruction. The vast extent of the SHS is illustrated in Figure 1-3.

Figure 1-3. State Highway System

1.5 Strategies for Maintaining the State Highway System

Caltrans strives to preserve the condition of the SHS in the most economical means possible through carefully planned preservation strategies (i.e., preventive maintenance, corrective maintenance, and minor rehabilitation) and rehabilitation or replacement when necessary. Caltrans manages the SHS condition by performing the right treatment at the right time through a combination of three approaches: Field Maintenance Crews, Major Maintenance projects, and SHOPP projects. Each approach plays a key role in the overall management and preservation of the SHS, as shown in Figure 1-4.

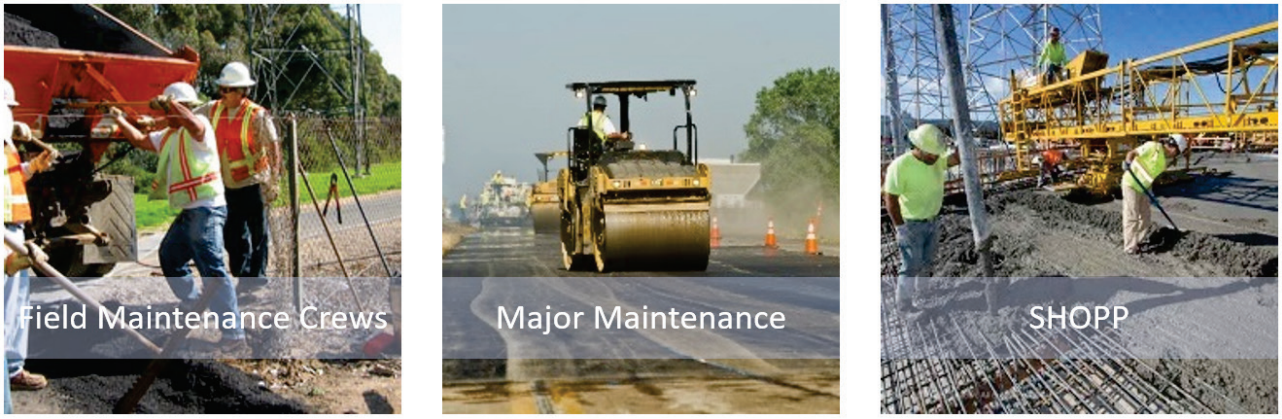


Figure 1-4. Approaches to Maintain the State Highway System

Field Maintenance Crews

Caltrans Field Maintenance Crews regularly address the day-to-day demands of the SHS. These field activities are the first line of defense in Caltrans' SHS maintenance and are reactionary in nature. The Field Maintenance Crews collectively perform many aspects of ongoing maintenance of highways and assets on the SHS. Crews address minor maintenance, repairs, and preservation work. This typically includes pothole repair, crack sealing, cleaning of drains, servicing lighting and signs, structural painting, minor facility repairs, irrigation repairs, and more. Crews also provide rapid response to repair minor accident damage.

Preventive maintenance is applied to assets in good condition and some fair condition assets when appropriate, with the goal of maintaining their condition. For example, a bridge preventive maintenance activity is the painting of steel structures. Field maintenance strategies serve as important tools for extending asset service life in a cost-effective manner.

Major Maintenance Projects

Highway Maintenance (HM) projects help prolong the life of existing infrastructure. These projects include preventive and corrective maintenance strategies that exceed the scope of what Field Maintenance Crews typically manage. Corrective maintenance typically applies to assets in fair condition; however, it can also be applied to some assets in poor condition, with the goal of maintaining serviceability and/or restoration to good condition. Since deterioration (which is the degradation of materials over time) can accelerate the longer the asset is in fair condition, the timely application of corrective maintenance can often prevent the need for more costly treatments in the future. Treatments can vary in levels of effectiveness and time intervals between applications.

Caltrans executes HM projects through individual contracts. HM work, designed to extend the life of physical assets, delays rehabilitation or replacement of assets, and is performed on pavement, bridges, culverts, facilities, TMS, and more. HM projects, which may be preventive or corrective in nature, include thin pavement overlays, deck crack sealing, polyester concrete overlays, bridge joint seals, and culvert repairs. This category of projects repairs but generally does not upgrade or replace facilities.

SHOPP Projects

When field maintenance and more extensive HM project activities are no longer cost-effective or viable, Caltrans considers asset rehabilitation or replacement. Rehabilitation or replacement, which can apply to assets in both fair and poor condition, is typically funded through the SHOPP. SHOPP projects are more complex capital construction projects that typically use private construction contractors obtained through a competitive bidding process. These projects, which may involve complex upgrades, overhaul infrastructure nearing the end of its lifespan. They may involve extensive planning and design, environmental permitting and right-of-way acquisition. Rehabilitation and replacement activities are performed on pavement, bridges, culverts, buildings, overhead signs, lights, roadside elements, Safety Roadside Rest Areas (SRRA), and more. The SHOPP invests available funds to implement safety improvements, rehabilitate or replace physical assets, improve the operation of the highways, improve system resiliency, and mitigate transportation-related environmental impacts. The SHOPP includes 33 Performance Objectives as described in this document. The Commission has direct responsibility to adopt SHOPP projects and to approve all scope, schedule, and costs changes to adopted projects. Furthermore, the Commission sets asset performance targets to ensure SHOPP investments are achieving desired statewide transportation outcomes.

Additional Strategies

In addition to SHOPP and Maintenance Programs, there are other funding programs that address additional SHS needs. Beyond Asset Management's objective of taking care of existing SHS assets, there are SHS needs for upgrading and expanding facilities to accommodate increased freight movement, broader economic growth, population increases, new transportation technologies, and evolving land use patterns. These needs go beyond the scope of SHOPP and Maintenance Programs and are instead addressed through a variety of other funding programs, such as IIJA, the State Transportation Improvement Program (STIP), state transportation bond programs, local transportation tax measures, and other funding programs. These programs all invest in the SHS, as well as in local roads, and they sometimes address SHS preservation needs at the same time. As projects are developed and constructed through these other funding programs, it is essential the project development process incorporates life cycle and asset management considerations.

Projects should be as efficient and cost-effective as possible to maintain, preserve, and when the time comes, rehabilitate assets on the SHS.

Each of these programs plays key roles and works together in the overall management of the SHS. Using the three-pronged approach to asset preservation, Caltrans can make timely repairs at the right time to extend the useful life of the assets at the lowest possible long-term cost and to delay future rehabilitation and replacement activities.

Benefits of Preventive Maintenance

The combination of these three approaches allows Caltrans to effectively preserve the highway infrastructure in the most cost-effective manner. Caltrans Field Maintenance Crews carry out work to address minor needs before they grow into major and more expensive repairs. HM contracts are initiated to carry out work at the right time to extend the useful life of assets at the lowest possible long-term cost and to delay future rehabilitation or replacement activities to ensure maximum operability. And finally, SHOPP capital improvement projects are used to invest in major asset rehabilitation or replacement projects when the end of an asset's useful life has been reached. This tiered approach maximizes transportation preservation investments.

Preventive maintenance is the most cost-effective means of protecting the State's infrastructure investment; these activities focus on keeping good condition assets in good condition. Caltrans recommends strategies to slow deterioration and extend pavement, bridge, and drainage life in fair or good condition. Figure 1-5 presents the benefits of preventive maintenance.

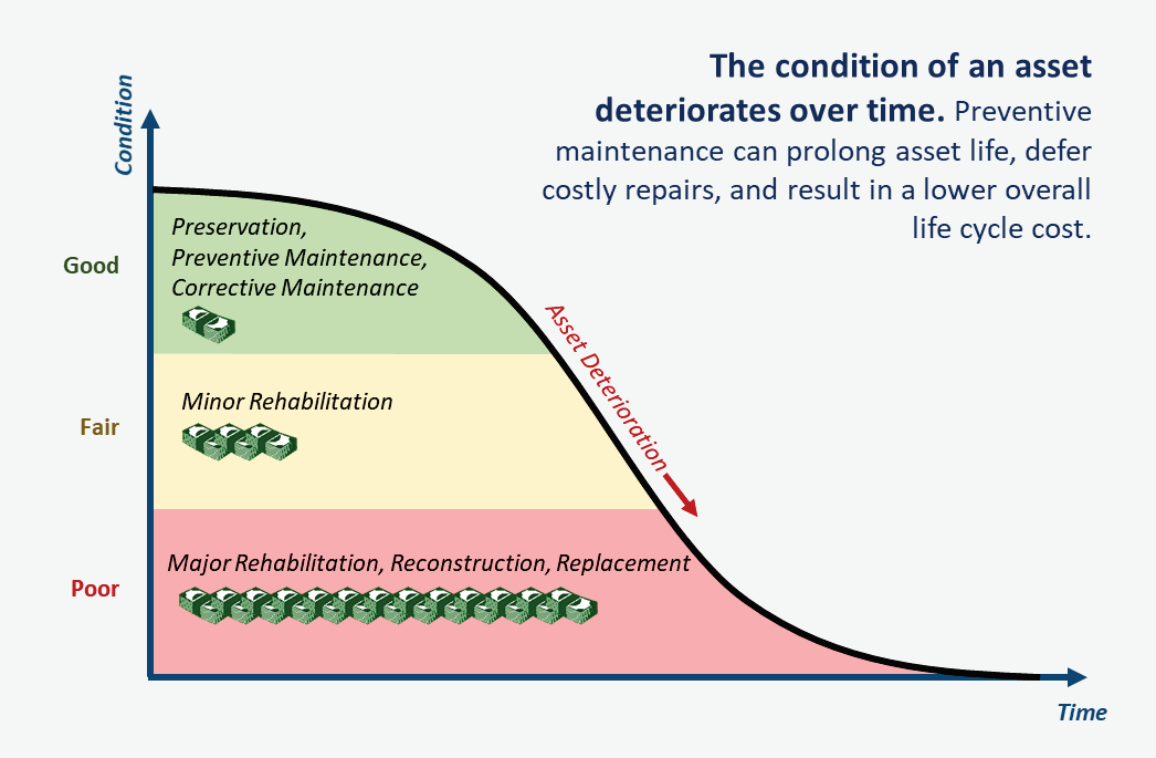


Figure 1-5. Benefits of Preventive Maintenance

1.6 Performance-Based Asset Management Approach

The SHSMP is built from a performance-based asset management approach comprised of several key analysis steps. These steps define the inventory and condition of assets, establish condition targets, determine the magnitude of condition gaps, develop cost estimates to close the gaps, and define a constrained investment plan. This analytical process is organized into the three major steps shown below. The following chapters present each of these steps in greater detail. Additional chapters cover Program Objectives, Life Cycle Planning, and Risk Management.

Performance-Based Asset Management Approach

Needs Assessment

Conduct a performance management analysis to determine the total needs, unconstrained by funding. Estimate the costs necessary to close all condition and performance gaps.

Revenue and Financial Projections

Determine funding and resources available over the 10-year SHSMP period.

Investment Plan and Performance Outcomes

Define how available funding is recommended to be allocated, prioritize where available resources should be focused to keep highways functioning with constrained funding. Estimate the performance metrics anticipated to be achieved, given the defined Investment Plan.

1.7 Equity in Transportation Investments

Equity is achieved when everyone has access to what they need to thrive, no matter their race, socioeconomic status, identity, where they live, or how they travel. Caltrans implements these core principles of equity in transportation investments. In the SHSMP investment levels are established ensuring that maintenance, preservation, rehabilitation, and reconstruction investments are directed on highway infrastructure where the needs are the greatest. At a network level these investments are intended to benefit all transportation system users across all communities. At the project level, each of the twelve Caltrans Districts collaborate with partner agencies and communities to make project level decisions that consider the needs and modes of all transportation system users, recognizing that some communities will require additional resources. Caltrans prioritizes projects that improve access for and provide meaningful benefits to underserved communities. The combination of the SHSMP's statewide strategies with District project-level considerations helps advance the department's goal to eliminate barriers that will lead to more equitable transportation for all Californians.

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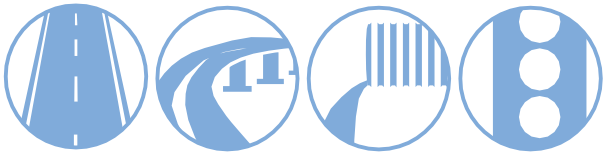

2 Needs Assessment

The California Streets and Highway Code (SHC) requires the development of a State Highway System (SHS) Needs Assessment to define program areas and costs associated with achieving condition and performance targets.

The Needs Assessment provides an overall picture of the SHS total needs and is not constrained by currently available funding. The majority of the SHS needs is determined through a gap analysis completed as part of the performance management implementation. As asset management practices mature within Caltrans, we are able to capture additional transportation system needs. The 2023 SHSMP incorporates new needs for mobility hubs and wildlife connectivity, never before presented in the plan.

The Needs Assessment is the first in a series of steps in a performance management analysis framework. In this context, "needs" can be defined as the gap in performance between the current condition (i.e., distribution of good, fair, and poor condition) and a future Desired State of Repair (DSOR) condition. The SHSMP defines needs over a 10-year period, spanning July 2023 through June 2033. These needs are addressed through a combination of SHOPP capital investment projects, Highway Maintenance projects, and work carried out by Caltrans Field Maintenance Crews.

The total needs to be addressed through maintenance and rehabilitation work are determined through a gap analysis. Preventive maintenance needs are also considered in the gap analysis. These are associated with activities that focus on keeping good condition assets in good condition for as long as possible.

2.1 Needs Assessment Approach

The Needs Assessment approach comprises of a series of five key steps, as described in Figure 2-1. This process begins by establishing an inventory of assets, determining current and future projected conditions, calculating gaps relative to performance targets, and concluding with the calculation of the total cost in closing the gap.

Figure 2-1. Steps to Carry Out the Needs Assessment

While this approach is readily applied to performance objectives associated with physical assets and their state of repair, the same approach is applied to the other performance objectives that focus on needs beyond the condition of physical assets. (Note, the gap analysis for pavement assets is carried out using a more rigorous condition modelling approach in a dedicated pavement management system.)

STEP 1 – Asset Inventory

Establish an asset inventory or deficiency level.

The inventory comprises the count or quantity of individual assets or deficiencies, reported in units of measure appropriate to the asset type. Caltrans quantifies pavement inventory by lane miles, bridges by square feet of deck area, drainage in linear feet, and TMS by each unit.

STEP 2 – Baseline and Projected Condition

Establish the baseline and projected future condition of each objective.

For each asset in the inventory, the condition is determined for the baseline (or current) condition as well as a projected future condition at the end of the 10-year Plan period. The future condition at the end of the 10-year Plan period is typically projected for two scenarios: (1) future condition in the absence of any project, which is also known as a do-nothing or free-fall scenario, and (2) future condition with only pipelined projects. The three condition descriptors used are good, fair, and poor. Criteria for determining asset condition are unique to the type of asset.

STEP 3 – Target Condition

Establish targets to achieve desired state of repair.

Caltrans establishes performance targets that represent the desired condition (good, fair, poor) of the asset inventory at the end of the performance plan period. A combination of federal and state statutes (MAP-21,

SB 1), Commission guidelines, and Caltrans practices guide the target setting process. The targets are documented in the TAMP and the SHSMP and approved by the Commission.

STEP 4 – Performance Gaps

Perform a gap analysis between projected and performance targets.

Caltrans performs a gap analysis to quantify the difference between the projected condition with pipelined projects and the target DSOR condition at the end of the 10-year Plan period. Pipelined projects are projects programmed in the current SHOPP or Project Initiation Document (PID) Workload, or other work underway resulting in a change in condition from the baseline. The resulting condition change is factored into the analysis in the fiscal year in which the project contract is ready to list (RTL).

STEP 5 – Cost to Close Performance Gaps

Estimate the cost to close performance gaps.

From the fair and poor gap quantities, the cost associated with closing these gaps can be calculated using the unit costs associated with poor and fair treatment strategies. Figure 2-2 summarizes the gap analysis steps and illustrates an example where the projected condition for both poor and fair assets will fall short of targets.

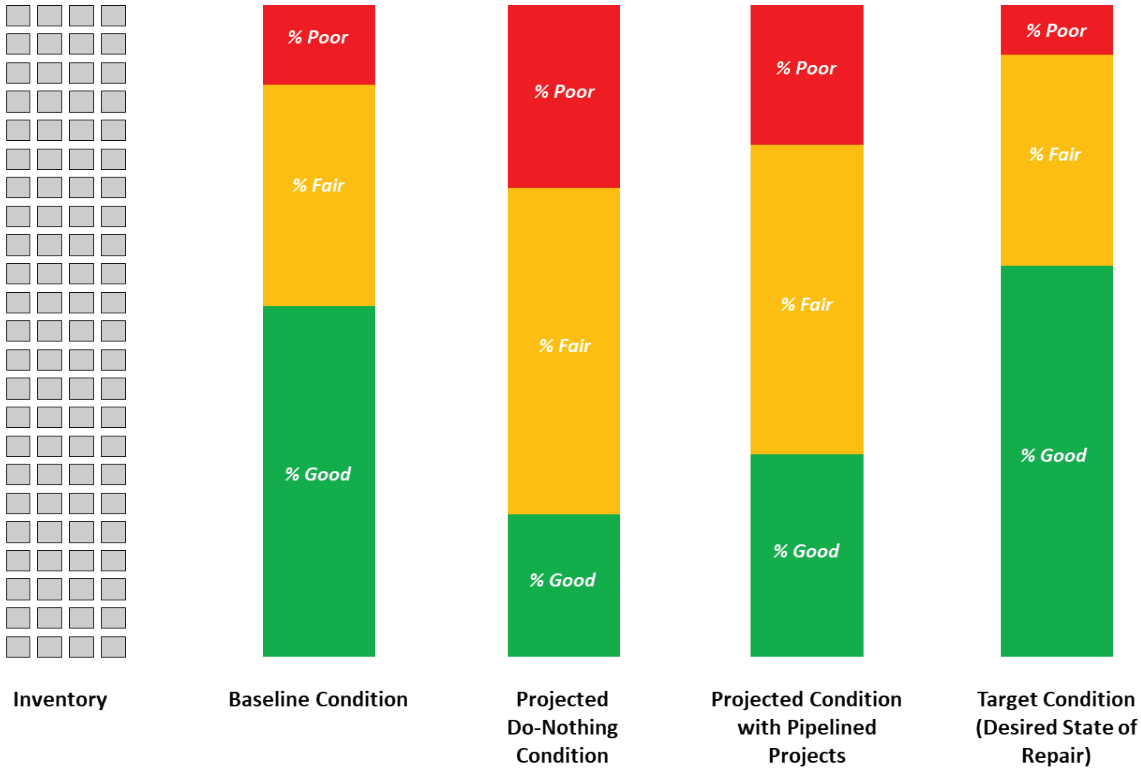

Figure 2-2. Gap Analysis

2.2 Performance Management Framework

Performance objectives are established to quantify and measure the most significant elements of work that Caltrans addresses through SHOPP and maintenance activities. These elements are important because of their relative asset valuation, strategic priority, or statutory or legal mandate. The performance objectives address the needs of physical highway infrastructure assets (e.g., pavement, bridges), deficiencies (e.g., safety, ADA, storm water mitigation), as well as unplanned needs (e.g., emergency response).

Caltrans builds the Needs Assessment analysis upon a strategic framework of 33 Performance Objectives organized by the type of objective and the primary goal based on the *Caltrans 2020-24 Strategic Plan* (Figure 2-4). Objectives are aligned with the *Climate Action Plan for Transportation Infrastructure (CAPTI)* (Figure 2-5). The alignment of the SHSMP with these two plans (Figure 2-3) ensure that future Caltrans projects will deliver outcomes focused on safety, stewardship and efficiency, climate action, multimodal networks, equity, and livability, while maintaining a fix-it-first approach. The categorization of performance objectives by strategic goal and performance management model type is summarized in Table 2-1. Chapter 5 of this Plan provides detailed discussion of each Performance Objective.

Figure 2-3. Caltrans Strategic Plan Initiatives and CAPTI Framework

Figure 2-4. Caltrans Strategic Plan Goals

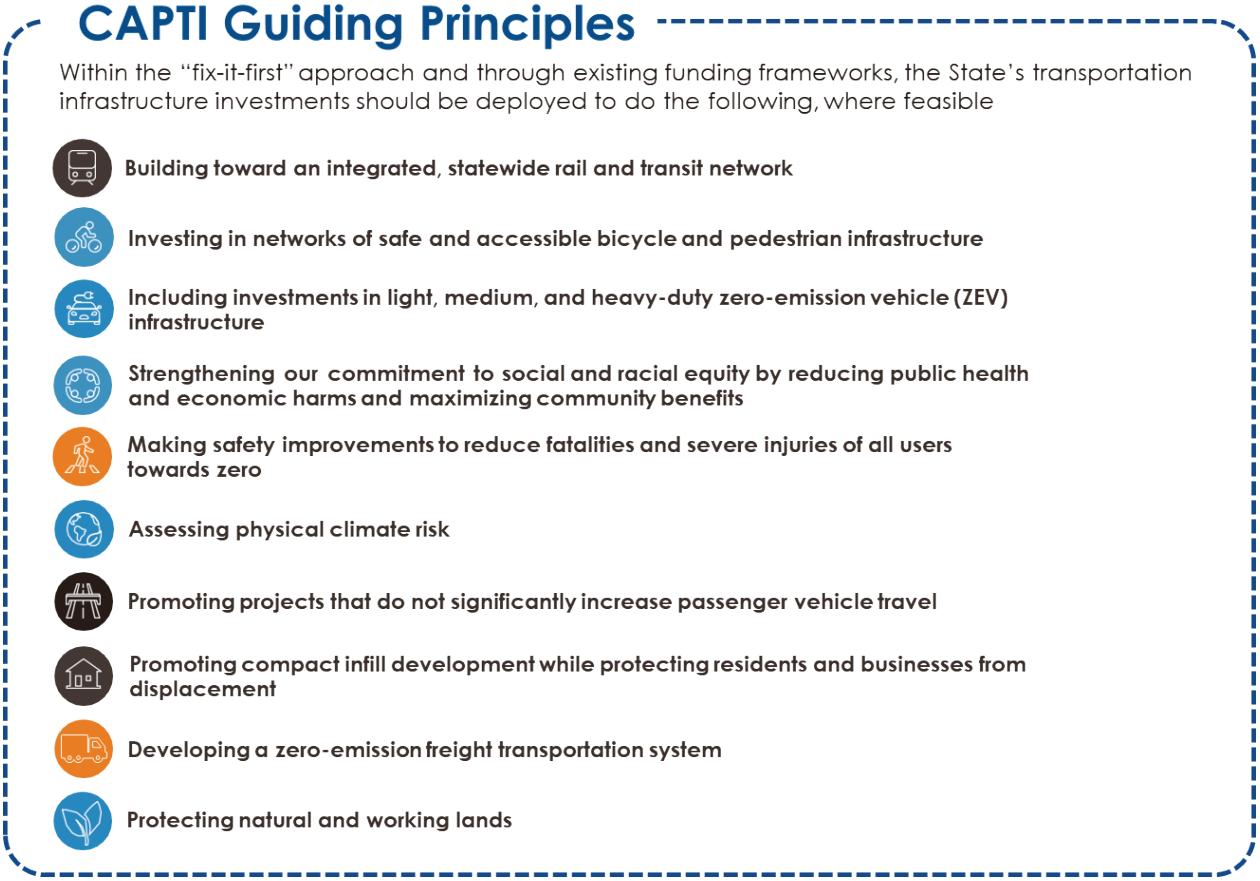

Figure 2-5. CAPTI Guiding Principles

Table 2-1. Framework for Categorizing SHS Needs

SHSMP Objectives by Performance Management Model Type and Strategic Goal								
Performance Objective	Performance Management Model			Caltrans Strategic Plan Goal				
	Physical Asset	Deficiency	Reservation	Safety First	Multimodal Network	Stewardship and Efficiency	Climate Action	Equity and Livability
Safety								
Proactive Safety		●		●				
Reactive Safety			●	●				
Primary Assets								
Pavement (All Classes)	●					●		
Bridge and Tunnel Health	●					●		
Drainage Restoration	●					●		
Transportation Management Systems	●					●		
Supplementary Assets								
Complete Streets	●							●
Drainage Pump Plants	●					●		
Lighting Rehabilitation	●					●		
Office Buildings	●					●		
Overhead Sign Structures Rehabilitation	●					●		
Safety Roadside Rest Area Rehab	●					●		
Transportation Related Facilities	●					●		
Weigh-In-Motion Scales	●					●		
System Resiliency Objectives								
Bridge Scour Mitigation		●				●		
Bridge Seismic Restoration		●				●		
Major Damage (Emergency Restoration)			●			●		
Major Damage (Permanent Restoration)			●			●		
Protective Betterments		●				●		
Climate Adaptation and Resilience		●					●	
Other Assets and Objectives								
ADA Pedestrian Infrastructure		●						●
Bridge Goods Movement Upgrades	●					●		
Commercial Vehicle Enforcement Facilities	●					●		
Fish and Wildlife Connectivity*		●				●		
Operational Improvements (including Managed Lanes)		●			●			
Mobility Hubs*	●				●			
Relinquishments			●			●		
Roadside Rehabilitation	●					●		
Sign Panel Replacement	●					●		
Storm Water Mitigation		●				●		
Transportation Management System Structures	●					●		

Performance Management Models

The SHSMP defines three performance management models that support the development of future need projections over the 10-year Plan period:

- Physical Asset Model
- Deficiency Model
- Reservation Model

The Physical Asset Model defines the methods and parameters needed to characterize how the condition of a physical asset, such as a bridge, will degrade over time. The Deficiency Model is used to measure progress towards addressing elements or locations identified through statutory, legal, or strategic goal-driven requirements. To anticipate work likely needed because of natural disaster and other unplanned events that impact the SHS, Caltrans uses the Reservation Model. While many of the performance objectives are related to physical highway infrastructure assets and can be characterized using a physical asset model, two additional models are needed to characterize unique circumstances. Further explanation of how these models apply to the Performance Objective is presented in Chapter 5.

Physical Asset Model

The *Physical Asset Model* is founded on the principle of deterioration. Deterioration is the physical degradation of an asset due to a combination of factors, including age, construction materials, environment, accidental damage, and traffic load. A set of deterioration rates (good-to-fair and fair-to-poor) are determined for each asset type to account for expected future projected conditions. Deterioration rates, expressed as an annual percentage rate, are used to quantify the proportion of the asset inventory that will degrade from good-to-fair and fair-to-poor condition states. The analysis has both a system preservation (fair-to-good) and rehabilitation/replacement (poor-to-good) goal to ensure a balanced management approach. Figure 2-6 illustrates the cycle of physical asset deterioration and improvements.

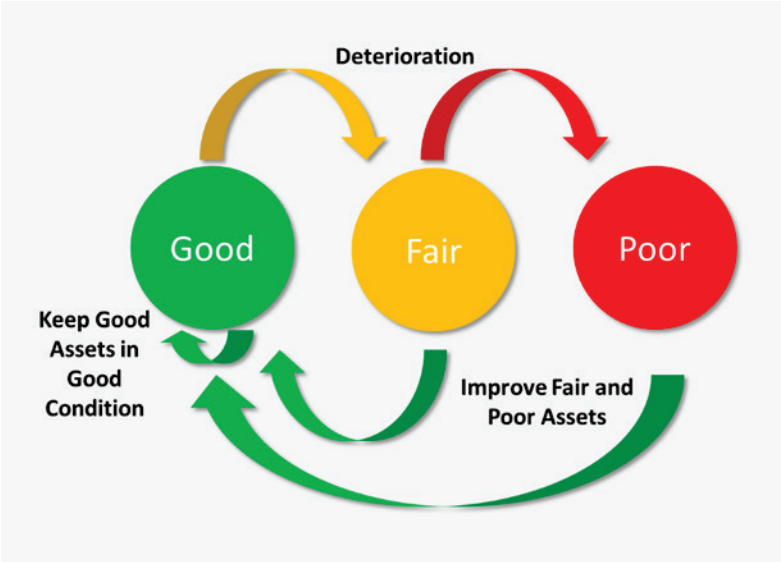

Figure 2-6. Deterioration and Improvement Cycle for Physical Assets

Deficiency Model

The *Deficiency Model* is applied to objectives where work is needed to improve or correct issues on highway infrastructure assets identified through state or federal mandates, legal settlements, updated design codes and engineering practices, or similar motivating factors. Examples include mitigating environmental impacts from storm water, enhancing worker safety through modification of roadside elements, and

modifying or adding elements to comply with Americans with Disabilities Act (ADA) requirements. These needs do not have a condition breakdown like the physical assets; they are either deficient or not. A gap analysis between the current deficiency and the target is conducted similarly to the physical asset model. Cost estimates to address this need are calculated similarly to the asset model. Where a deficiency exists, it is designated as poor, while deficiencies that have been addressed are designated as good. The fair designation is not applicable in the deficiency model.

Reservation Model

The *Reservation Model* is applied to unanticipated or unplanned needs, primarily emergency response activities. Objectives using the reservation model cannot be predicted in terms of the quantity or location of need as location and scope of needs are not known until an event such as a flood or landslide occurs. To effectively manage the SHS, Caltrans establishes a financial reservation to meet these needs when they arise. Reservations do not have an identified inventory, condition, or target. The reservation levels are established based on historical demand in the respective areas.

2.3 Addressing State Highway System Needs

Caltrans uses a combination of three strategies to maintain the SHS: SHOPP, Major Maintenance, and Field Maintenance Crews. These strategies are applied in combination to cover the range of maintenance activities including corrective and preventive maintenance, rehabilitation, and replacement. Table 2-2 summarizes these strategies and their focus, which are described further in this Section.

Table 2-2. Strategies to Address the State Highway System Needs

SHOPP and Maintenance Strategies				
Strategy	**Type of Work**			**Condition Focus**
	Replacement	**Rehabilitation**	**Corrective and Preventive Maintenance**	
SHOPP	●	●		Poor or Fair Assets
Major Maintenance			●	Poor or Fair Assets
Field Maintenance Crews			●	Fair or Good Assets

Work under these three strategies is limited to activities that are consistent with state laws that govern the use of SHOPP or Maintenance funds. Generally, these laws require available funding to be expended on the safety, maintenance, rehabilitation and operation of the existing system. System expansion is not permitted through the SHOPP or Maintenance Programs.

2.4 SHOPP Needs Assessment

SHOPP needs are determined through performance management gap analysis. Assets in poor and fair condition are the primary focus of the SHOPP. The SHOPP uses capital improvement projects for rehabilitation and replacement of highway infrastructure assets. In addition, SHOPP projects address needs identified through deficiency and reservation models. The SHOPP also addresses the needs of the Minor Program and PIDs in project planning phases.

Projects currently programmed in the 2022 SHOPP or in the 2024 Project Initiation Document (PID) Workload are referred to as "pipelined" projects. Figure 2-7 shows how the pipelined projects and the remaining performance gap are aligned within the ten years of the Plan. The costs of the pipelined projects in the SHOPP in the first five years of the plan can be determined with reasonably high confidence, as these projects have either been programmed or their costs have undergone reviews through the PID process. By contrast, the costs of the needed projects in the last five years have a greater range of uncertainty. The cost of this work is estimated by multiplying the quantity of performance units by the average unit cost associated with poor-to-good or fair-to-good treatments.

Figure 2-7. Pipeline Projects and Remaining Performance Gap

Table 2-3 summarizes the total cost associated with addressing fair and poor gaps through the SHOPP. This cost estimate is based on a combination of the cost of programmed and committed projects in the first 5 years of the 10-year Plan period, plus the projects needed to close performance gaps in the last five years of the 10-year Plan period.

2.5 Maintenance Needs Assessment

The California Streets and Highways Code requires that the Maintenance Needs Assessment include only program activities, "that if not performed, could result in increased SHOPP costs in the future." Maintenance needs are identified through the performance management gap analysis for fair and poor condition asset classes under pavement, bridge and tunnel health, drainage restoration, and TMS. The needs from the gap analysis are then added to the preventive maintenance needs associated with activities primarily focused on good condition assets.

Table 2-3 summarizes the SHOPP and maintenance needs for the four primary asset classes, and also includes costs associated with inspection forces, Field Maintenance Crews, and Major Maintenance. Chapter 5 includes a more extensive discussion of these assets.

Appendix C presents the 5-year Maintenance Investment Plan and identifies projected future State Highway Operation and Protection Program costs that would be avoided by increasing maintenance spending.

2.6 Summary of SHOPP and Maintenance Needs

A summary of SHOPP and Maintenance needs for the 10-year Plan period are presented the Table 2-3. The total 10-year needs account for the impacts from asset deterioration.

The table presents new performance objectives introduced in this SHSMP, namely Mobility Hubs and the expansion of the former Fish Passage objective to the new Fish and Wildlife Connectivity objective. Additional changes in this SHSMP include the combining Water and Wastewater at SRRA objective into the Safety Roadside Rest Area (SRRA) Rehabilitation objective, and the combining of Complete Streets (Build New) and Complete Streets (Fix Existing) objectives into a single Complete Streets objective.

Table 2-3. Summary of 10-Year SHOPP and Maintenance Needs

10-Year SHOPP and Maintenance Needs							
Performance Objectives		SHOPP ($M)			Maintenance ($M)		Strategic Goal
		Pipeline	Gap	Total 10-yr	Major Maintenance	Field Maintenance Crews	
Safety		**$2,518**	**$5,432**	**$7,950**			
Proactive Safety		$1,303	$3,832	$5,134			Safety
Reactive Safety		$1,215	$1,600	$2,815			Safety
Primary Assets		**$12,253**	**$16,803**	**$29,056**	**$5,094**	**$1,454**	
Pavement	Class1	$4,196	$7,710	$11,906	$3,328	$160	Stewardship
	Class2	$3,003	$2,695	$5,698			Stewardship
	Class3	$335	$675	$1,010			Stewardship
Bridge and Tunnel Health		$1,890	$4,309	$6,199	$1,386	$740	Stewardship
Drainage Restoration		$1,907	$1,297	$3,204	$300	$286	Stewardship
Transportation Management Systems		$923	$116	$1,039	$80	$267	Stewardship
Supplementary Assets		**$2,251**	**$19,877**	**$22,128**			
Complete Streets		$798	$13,109	$13,907			Equity-Livability
Drainage Pump Plants		$123	$113	$236			Stewardship
Lighting Rehabilitation		$157	$901	$1,058			Stewardship
Office Buildings		$5	$1,126	$1,131			Stewardship
Overhead Sign Structures Rehabilitation		$187	$326	$513			Stewardship
Safety Roadside Rest Area (SRRA) Rehabilitation		$320	$692	$1,013			Stewardship
Transportation Related Facilities		$594	$3,372	$3,965			Stewardship
Weigh-In-Motion Scales		$66	$238	$304			Stewardship

10-Year SHOPP and Maintenance Needs						
Performance Objectives	SHOPP ($M)			Maintenance ($M)		Strategic Goal
	Pipeline	Gap	Total 10-yr	Major Maintenance	Field Maintenance Crews	
System Resiliency Objectives	**$1,545**	**$19,733**	**$21,278**			
Bridge Scour Mitigation	$586	$443	$1,029			Stewardship
Bridge Seismic Restoration	$265	$527	$792			Stewardship
Major Damage (Emergency Restoration)	-	$2,388	$2,388			Stewardship
Major Damage (Permanent Restoration)	$584	$700	$1,284			Stewardship
Protective Betterments	$109	$1,018	$1,127			Stewardship
Climate Adaptation and Resilience	-	$14,657	$14,657			Climate
Other Assets and Objectives	**$2,320**	**$20,897**	**$23,217**			
ADA Pedestrian Infrastructure	$275	$762	$1,037			Equity-Livability
Bridge Goods Movement Upgrades	$527	9,125	$9,652			Stewardship
Commercial Vehicle Enforcement Facilities	$86	$227	$314			Stewardship
Fish and Wildlife Connectivity*	$69	$821	$890			Stewardship
Operational Improvements (including Managed Lanes)	$213	$2,249	$2,463			Multimodal
Mobility Hubs*	-	$390	$390			Multimodal
Relinquishments	$51	$55	$106			Stewardship
Roadside Rehabilitation	$101	$3,681	$3,782			Stewardship
Sign Panel Replacement	$134	$841	$975			Stewardship
Storm Water Mitigation	$350	$2,664	$3,013			Stewardship
Transportation Management System Structures	$513	$82	$595			Stewardship
Needs Assessment Totals: All Objectives	**$20,887**	**$85,241**	**$106,128**	**$6,548**		
SHOPP Major Program: Historically Reported Objectives	$20,019	$53,764	$73,679			
SHOPP Major Program: New Objectives	$868	$28,976	$29,844			
SHOPP Minor Program	-	$2,500	$2,500			
Major Maintenance and Field Maintenance Crews				$6,548		

Table 2-3 Notes:

- The Sub-totals and totals presented in the table may not sum up due to rounding.
- Cost estimates shown in the Pipelined Projects column are based on the best available scope of projects in planning and design and may be subject to change.
- Pavement maintenance costs associated with Field Maintenance Crews work are for crack sealing.

- Drainage maintenance costs include State Field Maintenance Crews for assessments, maintenance, repairs, and associated equipment/materials.
- TMS field maintenance crews carry out preventive maintenance checks to keep TMS units functional.
- The Maintenance columns in this table reflect the total available funds for the four primary assets. The Maintenance costs in Appendix B, however, reflect the costs associated with only fair to good and poor to good activities and do not include good to good costs.
- New objectives added to the Needs Assessment in the 2023 SHSMP are indicated by asterisk (*) in the table.

A summary of 10-year SHOPP needs by strategic goal and objective category is presented in Figure 2-8.

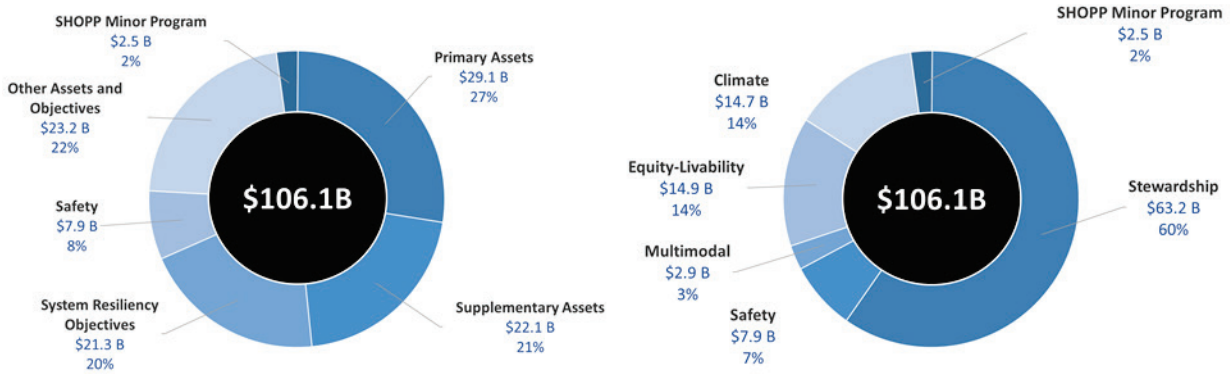

Figure 2-8. 10-Year Major SHOPP Needs by Objective Category (left) and Strategic Goal (right)

2.7 Addressing Needs through Other Programs

While Table 2-3 summarizes the total needs associated with achieving the defined condition and performance targets associated with the existing SHS, there are SHS needs addressed through programs outside of the SHOPP, Major Maintenance, and Field Maintenance Crews. These needs, which fall outside the scope of maintenance and preservation activities, are identified through the STIP, Active Transportation Program, Local Partnership Program, Solutions for Congested Corridors Program, Trade Corridor Enhancement Program, Transit and Intercity Rail Capital Program, and the Self-Help Counties Coalition. Other transportation system improvement needs are identified by Regional Transportation Planning Agencies and Caltrans in regional and interregional improvement plans funded through the state and local transportation funding sources. Given the distributed sources of funding, it is difficult to place a specific dollar figure on the value of needs being addressed by these sources. A significant portion of these funds will likely be focused on the SHS. The Commission will approve these projects on an annual basis, therefore, specific dollar figures for the SHS cannot be determined over the SHSMP 10-year planning horizon. Where data is available, condition improvements and related performance gains resulting from work through these other programs are quantified and reflected through the SHSMP analyses in the pipeline, as described earlier in this chapter.

National Electric Vehicle Infrastructure Formula Program

IIJA established the National Electric Vehicle Infrastructure Formula Program (NEVI)[10] which is expected to bring approximately $375 million to California to provide funding to strategically deploy electric vehicle (EV) charging infrastructure and to establish an interconnected network to facilitate data collection, access, and reliability. NEVI provides a significant increase in funding towards California's EV infrastructure needs, both on the SHS and in cities and counties. *California's Deployment Plan for the National Electric Vehicle Infrastructure Program*[11], published in August 2022, cites NEVI as one major funding component of an anticipated $3 billion, five-year program to deploy 250,000 public and shared private electric vehicle chargers by 2025.

Caltrans has initiated efforts to apply $10 million in NEVI program funding to expand EV charging at Caltrans maintenance stations, equipment shops, and other transportation related facilities throughout the state. This anticipated work will be reflected in investments in the Transportation Related Facility objective in the SHOPP, as detailed further in Table 4-2 in Chapter 4. Most of the NEVI investment off the SHS will be administered through the California Energy Commission (CEC).

[10] National Electric Vehicle Infrastructure Formula Program, https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nevi_formula_program.cfm

[11] California's Deployment Plan for the National Electric Vehicle Infrastructure Program, August 2022, http://rebuildingca.ca.gov/static/2022-ca-nevi-deployment-plan-a11y-8acc5dc59e4a797c873f28e1bfb74805.pdf


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3 Revenue and Financial Projections

California's transportation funding for the SHS is derived from a variety of sources. The majority of state and federal transportation funding is collected through fuel taxes. Revenues flow into a set of transportation-related accounts for California. The recent passage of the *Infrastructure Investment and Jobs Act (IIJA), Bipartisan Infrastructure Law (BIL)*, has added over $4 billion of new federal funding through 2026.

At the state level the major accounts related to asset management are the State Highway Account (SHA), Road Maintenance and Rehabilitation Account (RMRA) and seven Federal Funding Programs. These accounts are used to fund maintenance, operations, and capital projects including asset management-related activities. SHOPP and HM jointly fund maintenance, preservation, rehabilitation, and replacement projects, and all are intended to maintain or improve asset condition. The SHSMP Financial Plan connects Caltrans' objectives and targets to investment strategies and project delivery programs. The Financial Plan summarizes both current and future funding sources and uses and outlines the financial constraints under which Caltrans operates. Achieving the targets will depend on future revenues available for maintenance, repair, rehabilitation, and replacement of assets.

3.1 State Highway System Funding

The Federal Highway Trust Fund (Trust Fund), Federal General Fund, SHA, and RMRA are the main funding sources for the SHOPP and the STIP. For a comprehensive overview of transportation funding and programming in California, refer to Caltrans' annual report *Transportation Funding in California (2021)*[12].

Federal funding is provided through the Federal Highway Administration (FHWA) from federal fuel taxes and the general fund. Each state collects a federal excise tax of 18.4 cents per gallon of gasoline, and 24.4 cents per gallon of diesel fuel, and remits the revenue to the federal government for deposit into the Trust Fund. Funding is then provided to states for highway and mass transportation (transit) programs. Federal transportation acts outline the uses and distribution of these resources. In addition to federal fuel taxes, both the SHOPP and the Maintenance Programs receive a portion of their funding from a state excise tax on fuels, which is approximately 51 cents per gallon.[13]

3.2 SHOPP Funding

The SHSMP requires a 10-year funding projection for the SHOPP. It represents the best available revenue estimate at the time of SHSMP development. This estimated funding prepared by the Division of Budgets utilizes similar assumptions used for the State Transportation Improvement Program Fund Estimate (STIP FE) in determining expected annual SHOPP capacity and should align closely to the 2024 STIP FE once finalized. The 10-year funding available for SHOPP projects is estimated to be between $61 and $64 billion. This is exclusive of approximately $618 million for Project Initiation Document (PID) Program support and $6.5 billion for Maintenance Program activities over the 10-year plan period for pavement, bridges, drainage, and transportation management systems elements.

Figure 3-1 provides the projected annual SHOPP target funding capacity for the next 10 years. The funding projection presents a range of funding assuming the federal general funding continues after 2026 and one where it is discontinued.

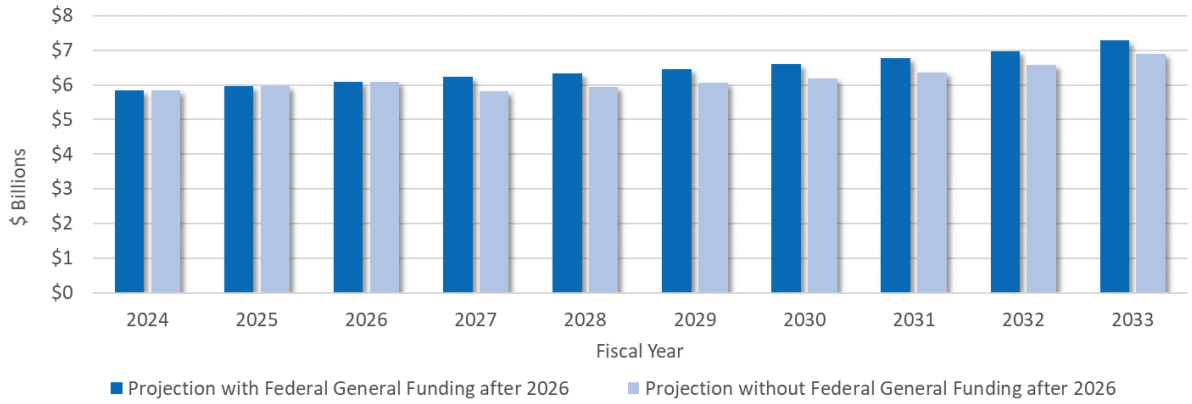


Figure 3-1. 10-Year Annual SHOPP Target Capacity

[12] Caltrans, Transportation Funding in California (2021), https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/data-analytics-services/transportation-economics/transportation-funding-in-ca
[13] California Department of Tax and Fee Administration, https://www.cdtfa.ca.gov/taxes-and-fees/sales-tax-rates-for-fuels.htm

Challenges to SHOPP Funding

Various risks exist that may impact the forecasted program capacity for the SHOPP and STIP, including:

Fuel Consumption: Higher pump prices have reduced consumption of fuel to near pandemic lows. While the near-term impacts have been reflected in the 10-year funding projection used in the SHSMP, the longer-term impacts of the ongoing war, pandemic and fuel supply concerns on revenues are less certain and will need to be reassessed.

Federal Highway Act: On November 6, 2021, the Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act - IIJA), a once-in-a-generation investment in our nation's infrastructure and competitiveness. The IIJA is projected to provide California with authorization for $27.5 billion for state and local transportation infrastructure for federal fiscal years 2022 to 2026. IIJA includes funding for electric vehicle infrastructure, climate resiliency, infrastructure condition, carbon reduction, safety and more. Funding for IIJA comes from both the Federal Highway Trust Fund and the Federal General Fund. The General Fund portion is subject to continuing appropriations from Congress. The funding projections for the SHSMP include a range of funding depending on whether the General Funds continue after 2026.

Corporate Average Fuel Economy (CAFE) Standards: In 2012, the National Highway Traffic Safety Administration and the Environmental Protection Agency (EPA) issued a joint final rule, establishing new standards to regulate model year 2017 through 2021 passenger cars and light trucks. The United States Department of Transportation is finalizing revised fuel economy standards for passenger cars and light trucks for model years (MYs) 2024-2025 that increase at a rate of 8 percent per year and increase at a rate of 10 percent per year for model year 2026 vehicles. The new standards' intent is to continue to improve vehicle fuel economy and reduce greenhouse gas emissions. The CAFE standards will continue to reduce fuel consumption relied upon for transportation infrastructure funding.

Recently Enacted Climate Legislation: In September 2022, Governor Gavin Newsom signed sweeping climate legislation that requires a 100% electric grid by 2045 and 90% by 2035 (SB 1020 Laird[14]). The legislation also enacted Carbon Neutrality (AB 1279 Muratsuchi) that requires California to be carbon neutral by 2045 and sets an 85% emission reduction target as part of the goal. These laws and others continue to move California away from fossil fuels. As the fuel shift occurs, the gas tax revenue used for transportation infrastructure will face pressure accelerating the need for the state to explore an alternative transportation tax structure to maintain appropriate transportation revenue levels.

[14] Senate Bill 1020, Clean Energy, Jobs, and Affordability Act of 2022, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB1020

Cost Escalation

The SHSMP incorporates escalated project cost estimates to account for expected cost increases in future year projects. These cost increases result from a combination of inflationary factors, as well as supply and demand of materials and services. The cost to address SHS needs depends highly on cost escalation percentages used. For SHSMP capital project cost projections, an annual cost escalation rate of 3.2 percent is used. This escalation rate was established as the basis for calculations in the *2020 State Transportation Improvement Program Fund Estimate*[15], adopted by the Commission in August 2021, and is used in all current Caltrans project development cost projection calculations.

While this escalation rate is used in the calculations in the SHSMP, the historical trend of the Price Index for Selected California Construction Items[16], as shown in Figure 3-2, indicates that construction costs may soon be outpacing the escalation rate. If this trend continues, adjustments will need to be made in future plans.

Escalation is applied only to future needs because the costs for projects that are programmed in the current SHOPP or are in Transportation Planning's work plan already include escalation. In the calculations presented in the Needs Assessment and Investment Plan chapters, costs are escalated to eight and a half years into the 10-year Plan period which is assumed to the midpoint of the construction period for anticipated project work in the last five years.

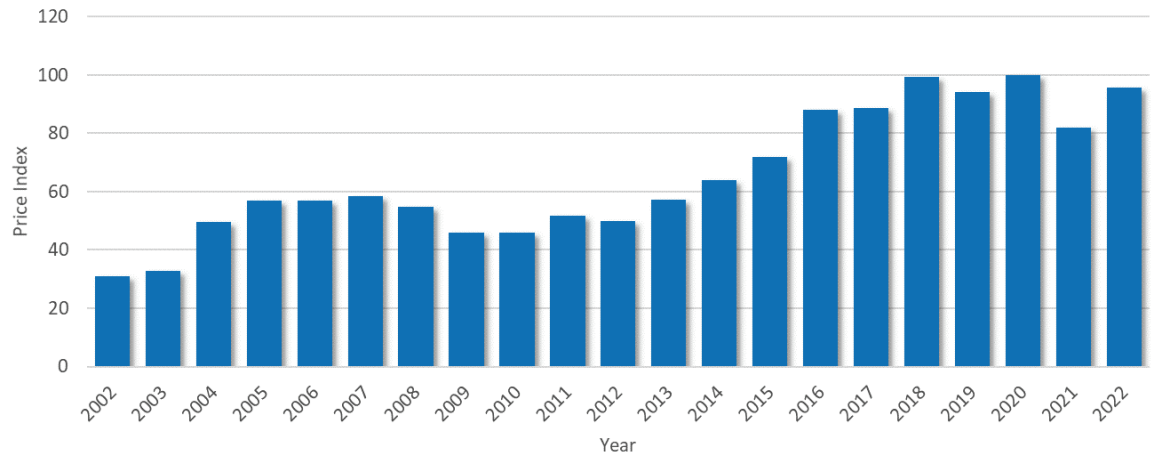


Figure 3-2. Annual Cost Escalation Rate Based on 20-year Price Index

[15] Caltrans, 2020 State Transportation Improvement Program Fund Estimate, https://dot.ca.gov/-/media/dot-media/programs/budgets/documents/2020-stip-fe-book-final-ada-with-cover-v2.pdf

[16] Caltrans, Price Index for Selected California Construction Items, http://ppmoe.dot.ca.gov/des/oe/docs/CCI.pdf

3.3 Maintenance Funding

The Maintenance Program budget comprises Major Maintenance and Field Maintenance Crews. Major Maintenance includes preventive and corrective maintenance activities achieved through HM projects. Field Maintenance Crews are state forces that focus on addressing minor maintenance, repairs, and preservation work.

Major Maintenance

HM projects are selected by evaluating the asset condition at a route-specific level. This approach is needs-based and considers several key factors, including asset age, climate and geographic location, Average Daily Traffic, and projected deterioration. HM projects provide great value and extend the service life of assets at the lowest possible long-term cost.

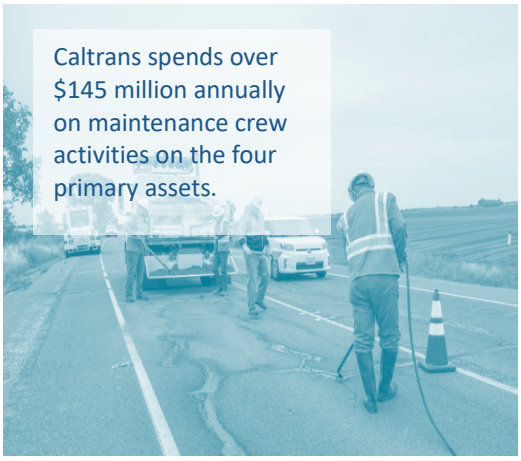
Highway Maintenance project selection balances the short-term needs of the system, long-term goals and available resources. HM projects, which extend the service life of assets, are the primary SHOPP cost avoidance mechanism in the Maintenance Program.

The SHS needs are assessed in a systematic manner (e.g., using the pavement management system) which includes analysis of these highway deficiencies and their potential solutions. Program advisors review proposed projects and coordinate with districts to select those which maximize maintenance investments.

The estimated HM funding for the SHSMP for the four primary asset classes is over $509 million per year.

Field Maintenance Crews (State Forces)

The Maintenance Program has examined its practices on how it allocates resources for field maintenance activities. This is especially valuable given the present and expected future funding, which could place considerable constraints on maintaining the system.



Development under way to improve these practices will be shaped by considering Level of Service (LOS), condition of assets, and performance while balancing mandated activities and historic demands on maintenance resources (snow, emergency response, customer service requests, etc.) with a commitment to system preservation.

The estimated funding for Caltrans Field Maintenance Crews for the four primary asset classes is over $145 million per year.

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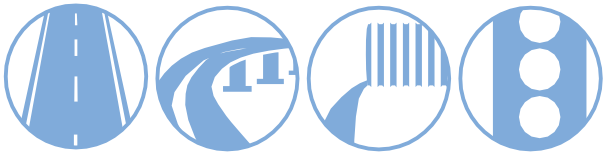

4 Ten-Year Investment Plan & Performance Outcomes

Over the 10-year SHSMP period, analysis shows the total cost of needs for maintaining the SHS exceed available funding and resources.

Key assets such as pavement, bridge, drainage, and TMS are maintained to achieve target performance levels established through the TAMP, and investment trade-off decisions are made for other SHS assets and objectives.

The Investment Plan considers how Caltrans will achieve strategic alignment with safety, multimodal, stewardship, climate, and equity and livability objectives through the allocation of available funding.

4.1 Investment Strategies

Investment strategies put forth in the TAMP and CAPTI define the guiding principles that influence overall investment decision-making. Caltrans uses these strategies in combination with Maintenance program-specific strategies to achieve performance targets. Generating an asset management investment strategy involves assessing various funding scenarios designed to achieve and sustain a desired state of repair and deliver the program efficiently. These strategies incorporate asset modeling, treatments, and impacts, as well as risks and financial constraints.

Many factors influence the magnitude of investments made towards maintaining the SHS. In some cases, investment levels are governed by law or the outcome of court settlements. In other cases, investments are dictated by terms of permits or policy-driven requirements for expenditures on specific activities. Beyond these requirements, consequences of not funding certain objectives are a major consideration. Investment decisions are informed by evaluating various investment scenarios that consider long-term life cycle costs, risk, and performance.

The SHSMP ensures that short and long-term resource allocation decisions are based on data and analysis, including consideration of engineering, life cycle cost, and risk analysis, with investment strategies being developed to best manage assets with limited funding available and anticipated future funding. The five primary strategies, adapted from the TAMP, used to guide SHOPP and Maintenance investment decision-making, are presented in Table 4-1.

Table 4-1. SHOPP and Maintenance Investment Strategies

Investment Strategies	
Strategy	**Description**
Fix-It-First	• Prioritize maintenance, rehabilitation, and safety improvements over capacity expansion. • Focus on the right treatment at the right time to preserve or improve condition at optimum time and cost.
Leverage Investments	• Support the full range of Caltrans strategic goals. • Make progress towards multiple goal areas with each SHOPP investment. • Employ innovative and emerging technologies to realize efficiencies in design, construction, and maintenance activities.
Focus on Selected Asset Classes	• Focus on the most important assets on the SHS, as measured by vehicle-miles traveled and by asset value. • Pavement, bridge, drainage, and TMS assets represent a significant portion of SHS maintenance and rehabilitation investments.
Address Environmental Stewardship Priorities	• Reduce environmental impacts through sustainable treatment strategies. • Reduce impacts to air and water quality through best management practices.
Integrate All Transportation Modes for All Users	• Design accessible transportation infrastructure to support all modes for all users and address ADA requirements. • Ensure investments make progress towards broad transportation goals. • Include enhancements to pedestrian, bicycle, and transit infrastructure in multi-objective projects to leverage more efficiency.

Each of the five strategies play a vital role in establishing statewide investments to achieve SHSMP performance targets. For example, Caltrans is continuously striving to identify and adopt innovative and emerging technologies to realize efficiencies in design, construction, and maintenance activities. Caltrans invests approximately $25 million annually in research[17] with outcomes and products that have the potential to improve SHOPP and Maintenance practices (e.g., construction materials, treatment strategies, information technologies, etc.), leveraging available funds, and reducing life cycle costs.

[17] Caltrans, Annual Research Program Highlights, https://dot.ca.gov/programs/research-innovation-system-information/annual-reports

Underlying the investment strategies are performance targets and projections, life cycle planning, risk management analysis, and anticipated funding and cost of future work. The performance gap analysis, informed by life cycle planning, helps define the SHS investment needs. Life cycle plans use the estimated cost of future work to establish network level strategies for managing assets. Available funding is a constraint for performance modeling, allowing Caltrans to predict future scenarios more accurately. Risk management tempers the analysis, adjusting potential outcomes based on positive and negative risks. While these asset management processes help to inform investment planning, it is these strategies that make the technical details meaningful at a network level and help communicate the message of preserving asset condition and making progress towards the goals in the *Caltrans 2020-24 Strategic Plan*.

CAPTI introduces ten guiding principles that inform the investments presented here in the SHSMP. These guiding principles drive investments to reduce Californians' dependence on driving, increase multimodal options for all communities, and equitably meet the state's climate goals. These programs collectively focus on prioritizing transportation investments that align with the ten guiding principles (Figure 2-5) while maintaining a continued commitment to a "fix-it-first" approach to our transportation system.

4.2 SHOPP Investment Plan

The SHOPP Investment Plan, presented in Table 4-2, establishes funding levels for each performance objective. Funding levels for each performance objective are established through trade-off analysis, which considers the investment strategies, Caltrans strategic goals, performance targets, statutory and funding constraints, and transportation priorities. The resulting investment allocation across objectives represents an optimal balance of these factors, while assuring key performance targets are met.

The investment level in each performance objective is determined by many factors. These factors include prior programmed work, current condition, judicial or legislatively mandated funding levels, consequences of inaction, past investment levels, growth in needs, and preservation needs versus rehabilitation consideration. Investment level establishment also considers the investment's impact on the system, existing pipeline of work, expected deterioration rates, and expected growth in inventory. Reservation objectives, in particular, consider historic investment levels and changing needs to inform future resource demands. With investment levels established for each performance objective at the statewide level, a comprehensive SHOPP Investment Plan is developed that sets performance targets and funding constraints for each of Caltrans' 12 districts. The SHOPP Investment Plan development process is shown in Figure 4-1.

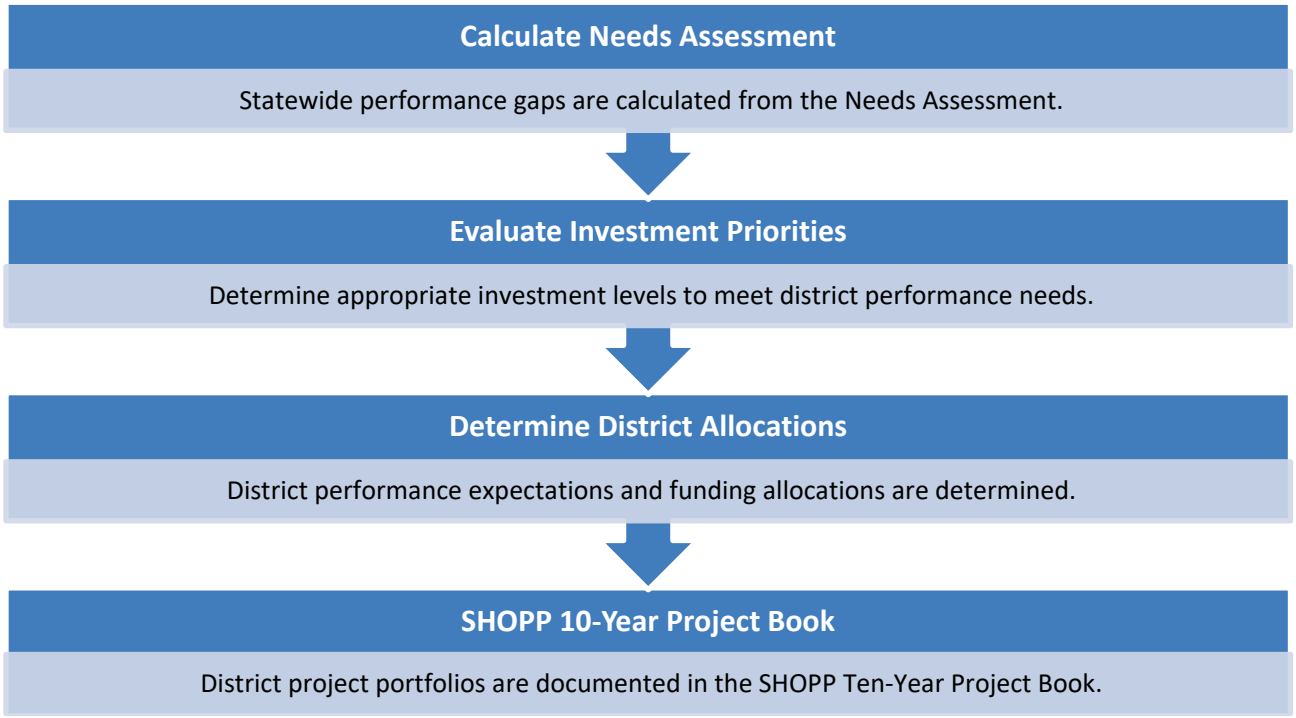

Figure 4-1. Development of the SHOPP Investment Plan

Investment levels for each objective are converted to performance expectations and proportioned out to each of the Caltrans districts. District-level funding is based on outstanding performance gaps, independent of historic district funding levels. District-level funding for each performance objective is calculated using the investment level for the performance objective and the calculated performance gap in each district. Headquarters formalizes the 10-year performance expectations and associated funding allocations with each of the districts. Caltrans districts then use this information to develop multi-year project portfolios that collectively address the performance expectations within given funding constraints. The funding need for each asset type is calculated using average statewide unit costs but vary significantly through various regions and asset types. It is expected that through a combination of multi-objective project planning and SB 1 requirements[18] to improve efficiencies in environmental and design processes, the districts can deliver on performances expectations and meet transportation system needs. These district project portfolios are updated to continually balance performance and available funding and are published in the SHOPP 10-Year Project Book on the Caltrans Asset Management website[19]. District-proposed projects advance through formal planning processes for programming in the SHOPP. This approach ensures that the project portfolios proposed in future SHOPP cycles are consistent with statewide goals and objectives and align with TAMP and SHSMP targets.

[18] SB1 Annual Efficiencies Report, 2018-19, https://dot.ca.gov/-/media/dot-media/programs/sb1/documents/sb1-annual-efficiencies-report-2018-19-final.pdf

[19] Caltrans, SHOPP Ten-Year Project Book, https://dot.ca.gov/programs/asset-management

4.3 Maintenance Investment Plan

The Maintenance Investment Plan represents the funding and resources needed to support preventive maintenance activities for the four primary asset classes under pavement, bridge and tunnel health, drainage restoration, and TMS, and assure that the 10-year TAMP performance targets can be achieved efficiently. These investments are applied across the two preventive maintenance focused strategies: Major Maintenance and Field Maintenance Crews. Investment levels are established for each of the four assets with an overarching goal to maintain good assets in good condition, while addressing fair condition assets where effective. The 5-Year Maintenance Investment Plan including SHOPP avoidance is shown in Appendix C.

Table 4-2 presents Major Maintenance and Field Maintenance Crews funding levels for the four primary assets. It is important to note investments in these four areas represent only a portion of Caltrans' overall maintenance investment and activities. Maintenance resources are applied to many of the other performance objectives listed in Table 4-2. Furthermore, Maintenance addresses several other activities (e.g., guardrail repair and graffiti removal) not listed in Table 4-2.

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4.4 Summary of SHOPP and Maintenance Investment Plans

Table 4-2 presents the funding associated with the performance objectives for the combined SHOPP and Maintenance Investment Plans. Over $2 billion of the total $4.5 billion in IIJA funding is shown in the table in the column, "Expected IIJA Pipeline." This represents the portion of investments from IIJA that is expected to result in performance towards closing SHSMP specific performance gaps.

Table 4-2. 10-Year SHOPP and Maintenance Investment Plan

10-Year SHOPP and Maintenance Investment Plan									
Objectives		SHOPP Investment ($M)				Maintenance Investment ($M)		Amount of Performance Gap Funded	Strategic Goal
		Pipeline	Expected IIJA Pipeline	Gap Funding	Total 10-yr	Major Maintenance	Field Maintenance Crews		
Safety		**$2,518**	**$426**	**$4,010**	**$6,954**				
Proactive Safety		$1,303	$426	$2,410	$4,139			66%	Safety
Reactive Safety		$1,215	$0	$1,600	$2,815			100%	Safety
Primary Assets		**$12,253**	**$0**	**$14,917**	**$27,170**	**$5,093**	**$1,454**		
Pavement	Class 1	$4,196	$0	$7,710	$11,906	$3,328	$160	100%	Stewardship
	Class 2	$3,003	$0	$2,695	$5,698			100%	Stewardship
	Class 3	$335	$0	$675	$1,010			100%	Stewardship
Bridge and Tunnel Health		$1,890	$0	$2,424	$4,314	$1,386	$740	56%	Stewardship
Drainage Restoration		$1,907	$0	$1,297	$3,204	$300	$286	100%	Stewardship
Transportation Management Systems		$923	$0	$116	$1,039	$80	$267	100%	Stewardship

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10-Year SHOPP and Maintenance Investment Plan								
Objectives	SHOPP Investment ($M)				Maintenance Investment ($M)		Amount of Performance Gap Funded	Strategic Goal
	Pipeline	Expected IIJA Pipeline	Gap Funding	Total 10-yr	Major Maintenance	Field Maintenance Crews		
Supplementary Assets	**$2,251**	**$110**	**$3,498**	**$5,858**				
Complete Streets	$798	$100	$1,407	$2,305			11%	Equity-Livability
Drainage Pump Plants	$123	$0	$107	$230			95%	Stewardship
Lighting Rehabilitation	$157	$0	$189	$346			21%	Stewardship
Office Buildings	$5	$0	$0	$5			0%	Stewardship
Overhead Sign Structures Rehabilitation	$187	$0	$204	$391			63%	Stewardship
Safety Roadside Rest Area (SRRA) Rehabilitation	$320	$0	$314	$634			45%	Stewardship
Transportation Related Facilities	$594	$10	$1,211	$1,814			36%	Stewardship
Weigh-In-Motion Scales	$66	$0	$66	$132			28%	Stewardship
System Resiliency Objectives	**$1,545**	**$492**	**$5,663**	**$7,699**				
Bridge Scour Mitigation	$586	$0	$443	$1,029			100%	Stewardship
Bridge Seismic Restoration	$265	$0	$279	$544			53%	Stewardship
Major Damage (Emergency Restoration)	$0	$0	$2,388	$2,388			100%	Stewardship
Major Damage (Permanent Restoration)	$584	$0	$700	$1,284			100%	Stewardship
Protective Betterments	$109	$0	$109	$218			11%	Stewardship

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10-Year SHOPP and Maintenance Investment Plan								
Objectives	SHOPP Investment ($M)				Maintenance Investment ($M)		Amount of Performance Gap Funded	Strategic Goal
	Pipeline	Expected IIJA Pipeline	Gap Funding	Total 10-yr	Major Maintenance	Field Maintenance Crews		
Climate Adaptation and Resilience	$0	$492	$1,744	$2,236			12%	Climate
Other Assets and Objectives	**$2,320**	**$1,026**	**$2,822**	**$6,168**				
ADA Pedestrian Infrastructure	$275	$0	$350	$626			46%	Equity-Livability
Bridge Goods Movement Upgrades	$527	$0	$0	$527			0%	Stewardship
Commercial Vehicle Enforcement Facilities	$86	$0	$94	$180			41%	Stewardship
Fish and Wildlife Connectivity*	$69	$200	$277	$547			58%	Stewardship
Operational Improvements (including Managed Lanes)	$213	$277	$760	$1,240			26%	Multimodal
Mobility Hubs*	$0	$0	$50	$50			13%	Multimodal
Relinquishments	$51	$0	$55	$106			100%	Stewardship
Roadside Rehabilitation	$101	$0	$188	$289			5%	Stewardship
Sign Panel Replacement	$134	$0	$46	$180			6%	Stewardship
Storm Water Mitigation	$350	$559	$940	$1,849			56%	Stewardship
Transportation Management System Structures	$513	$0	$42	$555			51%	Stewardship

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10-Year SHOPP and Maintenance Investment Plan								
Objectives	SHOPP Investment ($M)				Maintenance Investment ($M)		Amount of Performance Gap Funded	Strategic Goal
	Pipeline	Expected IIJA Pipeline	Gap Funding	Total 10-yr	Major Maintenance	Field Maintenance Crews		
Investment Plan Totals	**$20,887**	**$2,054**	**$33,389**	**$56,330**	**$6,548**			
SHOPP Major Program: Historically Reported Objectives	$20,019	$1,262	$27,411	$48,692				
SHOPP Major Program: New Objectives	$868	$792	$3,478	$5,138				
SHOPP Minor Program			$2,500	$2,500				
Major Maintenance and Field Maintenance Crews					$6,548			

Table 4-2 Notes:

- The total SHOPP Investment Plan differs from the Fund Estimate as a result of various adjustments. The Sub-totals and totals presented in the table may not sum up due to rounding.
- Cost estimates shown in the Pipelined Projects column are based on the best available scope of projects in planning and design and may be subject to change.
- The "Amount of Performance Gap Funded" for Bridge and Tunnel Health is less than 100%, as the investment is limited to currently identified poor or fair assets where specific treatments can be developed in projects.
- Safety Roadside Rest Area (SRRA) Rehabilitation includes Water and Wastewater Treatment at SRRA objective reported in prior SHSMPs.
- Complete Streets includes Complete Streets (Fix Existing) and Complete Streets (Build New) reported in prior SHSMPs.
- New objectives added to the Needs Assessment in the 2023 SHSMP are indicated by asterisk (*) in the table.

A summary of 5-year Major SHOPP gap investments by objective category, and strategic goal is presented in Figure 4-2.

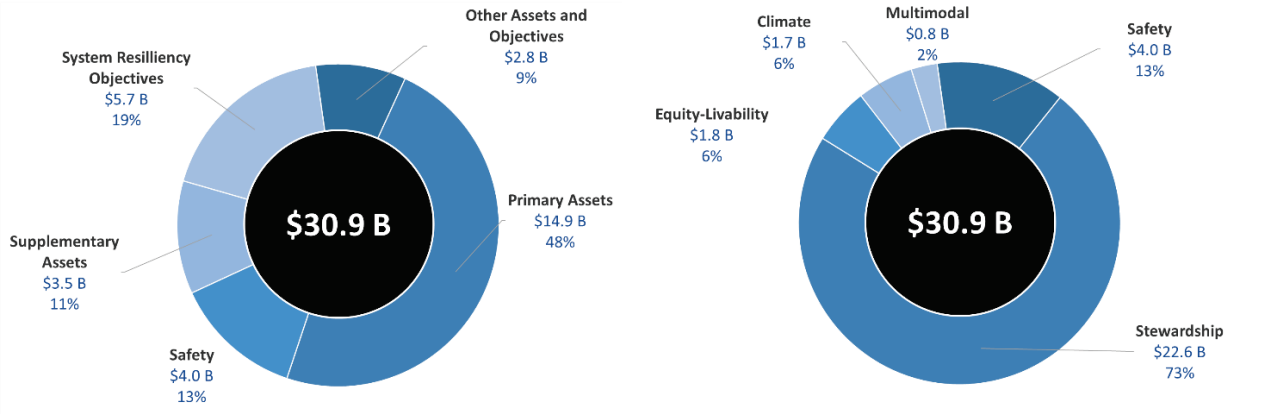

Figure 4-2. 5-Year Major SHOPP Gap Investments by Objective Category (left) and Strategic Goal (right)

4.5 Performance Outcomes

The Investment Plan allocates available funding to specific transportation objectives. The recommended level of investment in each objective area determines the corresponding accomplishments that can be expected for the investment. Investments may be defined for good, fair and poor condition assets depending on the objectives of the funding programs. Having specific investments addressing physical assets at all levels helps to minimize long-term cost by avoiding a worst first asset management approach. Table 4-3 details the specific quantity and units of performance expected from each of the funding programs.

Quantities presented in Table 4-3 summarize SHOPP and Maintenance performance accomplishments, combining both pipelined project work and planned work. The pipelined work accounts for all work that results in a change to performance relative to the baseline and may also include work completed prior to the 10-year plan period. Maintenance Program activities focus on preventive strategies, keeping good condition assets in good condition.

Table 4-3. Projected 10-Year SHOPP and Maintenance Accomplishments at Recommended Investment Levels

Proposed SHOPP and Maintenance Performance Accomplishments								
Objectives		Unit	SHOPP			Maintenance		
			New	Fair	Poor	Good	Fair	Poor
Safety								
Proactive Safety		Annual Fatal and Serious Injury Collisions	-	-	405			
Reactive Safety								
Primary Assets								
Pavement	Class 1	Lane Miles	-	11,077	363	11,612	9,901	168
	Class 2	Lane Miles	-	6,822	269			
	Class 3	Lane Miles	-	1,110	67			
Bridge and Tunnel Health		Square Feet	-	14,312,338	7,312,857	118,240,444	64,733,088	6,170,765
Drainage Restoration		Linear Feet	158,127	466,027	575,870	-	1,202,683	459,853
Transportation Management Systems		Each	2,999	-	6,241	800,000	-	1,399
Supplementary Assets								
Complete Streets		Linear Feet	4,180,502	25,114	1,674,478			
Drainage Pump Plants		Locations	1	10	143			
Lighting Rehabilitation		Each	1,652	1	13,981			
Office Buildings		Square Feet	-	-	-			
Overhead Sign Structure Rehabilitation		Each	20	330	1,017			

Proposed SHOPP and Maintenance Performance Accomplishments							
Objectives	Unit	SHOPP			Maintenance		
		New	Fair	Poor	Good	Fair	Poor
Safety Roadside Rest Area (SRRA) Rehabilitation	Locations	-	3	24			
Transportation Related Facilities	Square Feet	347,644	7,248	945,595			
Weigh-In-Motion Scales	Stations	5	42	10			
System Resiliency Objectives							
Bridge Scour Mitigation	Square Feet	-	1,096,406	2,089,344			
Bridge Seismic Restoration	Square Feet	-	-	4,519,024			
Major Damage (Emergency Restoration)	-	-	-	-			
Major Damage (Permanent Restoration)	-	-	-	-			
Protective Betterments	Locations	-	-	15			
Climate Adaptation and Resilience	Deficiency Units	-	-	16			
Other Assets and Objectives							
ADA Pedestrian Infrastructure	Deficient Elements	8,210	-	34,243			
Bridge Goods Movement Upgrades	Square Feet	-	1,552,770	808,266			
Commercial Vehicle Enforcement Facilities	Square Feet	23,030	21,570	62,100			
Fish and Wildlife Connectivity*	Locations	-	-	43			
Operational Improvements	Daily Person Hours of Delay	-	-	65,540			
Mobility Hubs*	Locations	-	1	15			
Relinquishments	Center Line Miles	-	-	-			
Roadside Rehabilitation	Acres	6	0	2,165			
Sign Panel Replacement	Each	340	-	20,587			
Storm Water Mitigation	Compliance Unit	-	-	20,517			
Transportation Management System Structures	Each	2,999	-	164			

4.6 Aligning Investments with Performance Targets

A balanced investment plan was developed to assure that projected funding over the next ten years is aligned to the work needed to achieve performance targets. The TAMP and SB 1 established 10-year performance targets for the four primary asset classes (Pavement, Bridge, Drainage, and Transportation Management Systems) and several supplementary asset classes (Complete Streets, Drainage Pump Plants, Highway Lighting, Office Buildings, Overhead Sign Structures, Roadside Rest Facilities, Transportation Related Facilities, Weigh-In-Motion Scales). SB 1 requires specific targets to be achieved by 2027.

Current baseline and projected asset conditions in fiscal years 2026/27 and 2032/33 are presented in Table 4-4 for the primary and supplementary assets. Condition is presented in the tables in percentages of good, fair, and poor, at three points in time. For purposes of investment planning over the 10-year period, condition improvements are estimated in the fiscal year in which the projects are advertised for construction, typically within months of the Ready-to-List (RTL) project delivery milestone date. This approach differs from the annual performance benchmarks reporting, where the measure used is the condition improvement anticipated at the Expected Construction Work Complete (ECWC) date. This is the date when the traveling public would recognize the improvements resulting from the project.

Table 4-4. Projected Conditions in Fiscal Years 2026/27 and 2032/33

Projected Conditions in Fiscal Years 2026/27 and 2032/33 (Based on Expected Project RTL)													
Objectives		Baseline Condition			RTL FY 2026/27			RTL FY 2032/33			Performance Targets		
		Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
Primary Assets													
Pavement	Class 1	61.3%	37.4%	1.3%	65.4%	34.0%	0.7%	60.9%	38.0%	1.0%	60.0%	39.0%	1.0%
	Class 2	44.4%	54.4%	1.2%	57.5%	41.9%	0.6%	56.4%	42.8%	0.9%	55.0%	43.0%	2.0%
	Class 3	41.3%	57.1%	1.6%	46.7%	52.4%	0.9%	51.4%	48.1%	0.5%	45.0%	53.0%	2.0%
Bridge and Tunnel Health		49.3%	46.9%	3.8%	54.1%	44.3%	1.6%	49.4%	49.1%	1.5%	48.5%	50.0%	1.5%
Drainage Restoration		74.2%	16.2%	9.6%	74.5%	17.3%	8.1%	72.0%	20.0%	8.0%	70.0%	20.0%	10.0%
Transportation Management Systems		77.8%	-	22.2%	96.7%	-	3.3%	90.0%	-	10.0%	90.0%	-	10.0%
Supplementary Assets													
Complete Streets		64.9%	14.5%	20.6%	74.4%	16.0%	9.6%	79.4%	18.1%	2.5%	69.0%	29.0%	2.0%
Drainage Pump Plants		13.4%	36.2%	50.3%	36.3%	30.5%	33.2%	62.3%	27.1%	10.7%	50.0%	40.0%	10.0%
Lighting Rehabilitation		37.3%	14.6%	48.1%	36.6%	16.8%	46.6%	31.0%	20.5%	48.5%	45.0%	30.0%	25.0%
Office Buildings		40.1%	32.3%	27.6%	24.1%	47.9%	28.0%	0.0%	71.3%	28.7%	50.0%	40.0%	10.0%
Overhead Sign Structures Rehabilitation		58.7%	34.7%	6.6%	53.7%	36.7%	9.6%	43.0%	42.4%	14.6%	40.0%	45.0%	15.0%
Safety Roadside Rest Area (SRRA) Rehabilitation		30.2%	41.9%	27.9%	34.0%	34.2%	31.9%	36.1%	27.9%	36.0%	30.0%	45.0%	25.0%
Transportation Related Facilities		24.4%	15.3%	60.3%	29.8%	15.8%	54.4%	37.3%	18.3%	44.4%	40.0%	40.0%	20.0%
Weigh-In-Motion Scales		35.2%	57.9%	6.9%	34.9%	45.1%	20.0%	35.8%	27.3%	37.0%	40.0%	50.0%	10.0%

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5 Programs & Performance Objectives

The California Transportation Commission (Commission) adopted four primary asset classes in accordance with California Government Code (CGC)[20]. The four asset classes – pavements, bridges, culverts, and TMS – were selected because they represent a significant portion of California's annual transportation investments. Assets are also selected in part because of federal legislation which prioritizes safety, pavements, bridges, and those assets related to system performance. In total, the 2023 SHSMP identifies 33 Program Objectives, including those which continue from the prior SHSMP.

This Chapter presents these Performance Objectives organized by Caltrans strategic goal as detailed earlier in Table 2-1. Many of these objectives cross over multiple program areas and goals, while aligning with the investment principles of CAPTI. Three different performance models are used to analyze needs and set performance targets: *Physical Asset*, *Deficiency*, and *Reservation*. The key parameters for both Physical Assets and Deficiency Performance Models are shown below. Additional details for each Program Objective can be found in Appendix B, Performance Management Summary Sheets.

- Overview
- Performance Metrics
- Inventory and Condition/Inventory of Deficiencies
- Performance Targets
- Other Performance Management Parameters
- Typical Treatments

[20] California Government Code Section 14526.5, http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=14526.5.&lawCode=GOV

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5.1 Safety First

Goal: Safety First

Caltrans has a vision of zero road fatalities and serious injuries by 2050. The vision will be achieved through adoption of the Safe System[21] approach. The Safe System Approach (SSA) aims to eliminate fatal and serious injuries for all road users through a holistic view of the road system. Engineered safety activities improve the safety of the transportation system for all road users and all modes of transportation. Caltrans' ongoing commitment to transportation safety requires continual monitoring of the SHS for changing conditions or use patterns that would necessitate engineered safety solutions. As these situations are identified, improvements are carried out through both the SHOPP and the Maintenance Programs as appropriate for the specific circumstances.

Caltrans' strategic goal of "Safety First" focuses on several key initiatives:

- Leverage proven practices
- Accelerate advanced technology
- Lead safety culture change
- Partner on traffic safety legislation and enforcement
- Increase collaboration with external organizations to identify and implement best practices, technology, and lessons learned
- Advance delivery of safety enhancements in, and that are responsive to, the priorities of underserved communities
- Eliminate employee fatalities and serious injuries "in the line of duty"

Safety is a top priority and integrated across all program objectives. Safety work activities may include:

- Installation of center dividing barriers, guardrails, and rumble strips
- Upgrading bridge rails to meet current standards
- Protection for bicyclists and pedestrians through protected bicycle lanes and pedestrian signals
- Installing signals
- Geometric changes to the roadway
- Construction of bicycle and pedestrian facilities such as sidewalks, crosswalks, and bike lanes
- Worker safety strategies that reduce worker exposure to traffic, including maintenance vehicle pullouts, vegetation control beneath existing guardrail, paving narrow areas, paving beyond the gore, constructing maintenance vehicle access trails, and installing walk and drive access gates

[21] FHWA Safe System Approach, https://highways.dot.gov/safety/zero-deaths#:~:text=There%20are%20six%20principles%20that,proactive%2C%20and%20redundancy%20is%20crucial.

- Worker safety strategies that reduce and ease the cleanup of graffiti, including planting vines on walls, and applying anti-graffiti treatments

Caltrans measures progress towards our goal of zero fatal and serious injury by 2050 by reducing the number of fatal and serious injury collisions, consistent with the federal Safety Performance Management rule. It is estimated the State will reduce fatalities by three percent and serious injuries by one and a half percent annually over the next 10 years.

The SHSMP addresses the safety goal through two objectives, Proactive Safety and Reactive Safety, focusing on reducing the number of fatal and serious injury collisions. Two separate objectives were necessary for 10-year strategic investment planning purposes.

Proactive Safety projects implement countermeasures to reduce the likelihood of future traffic collisions. These projects can be a part of a systemic safety effort or alternatively target spot locations where existing highway infrastructure could be enhanced and made safer for travelers. Applying improvements systemically across an entire corridor or network allows Caltrans to proactively address locations that have not had crash concentrations in the past but have similar features as those currently experiencing high levels of crashes. In addition, even though a spot location improvement may be based on historical crash information, making improvements based on countermeasures with proven crash reduction factors at their highest crash locations can proactively reduce the likelihood of future crashes.

Performance targets and associated funding allocations for the Proactive Safety objective are determined for each of the districts in proportion to each district's share of locations where crash history or potential is higher and safety improvements are possible. This investment approach considers historic traffic and collision data in addition to physical roadway attributes.

Reactive Safety funding is held in a statewide SHOPP funding reservation and used to initiate safety projects as needs arise. The primary intent of the reservation is to address urgent traffic safety issues on the system through the implementation of targeted countermeasures. These needs are typically associated with recent crashes or specific crash concentrations triggering safety investigations. The allocation of reactive safety funding amongst the districts is managed to address these safety needs while also insuring regional equity across the investments.

Caltrans has adopted a safety investment approach to shift a greater proportion of the investment towards Proactive Safety.

Table 5-1 summarizes the key details of the two safety objectives.

Table 5-1. Proactive and Reactive Safety Strategies

"Safety First" Objectives		
	Proactive Safety	**Reactive Safety**
Performance Measure	Reduction in fatal and serious injury collisions	Reduction in fatal and serious injury collisions
Performance Management Model	Deficiency Model	Reservation Model
SHOPP Investment Split	60%	40%
Focus	Systemic Safety Improvements: Address locations that may not have crash concentrations in the past, but have similar features as those currently experiencing high levels of crashes	Triggered Safety Improvements at Locations: Address locations with recent crashes or specific crash concentrations triggering safety investigations

Both Proactive and Reactive Safety projects are evaluated by the extent to which fatal and serious injury collisions are reduced. The effectiveness of safety-related infrastructure improvements implemented in projects, referred to as countermeasures, are assessed through analyses using Crash Modification Factors (CMF), Crash Reduction Factors (CRF), and other information specific to each countermeasure type.

Proactive Safety

Safety First

Overview

Caltrans develops proactive safety projects in the SHOPP under the State Highway Safety Improvement Program (HSIP), a core Federal-aid program with the purpose to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. These improvement types are proactive, often part of larger systemic improvement effort, with a goal of reducing the potential and the severity of traffic collisions. These projects differ from reactive safety projects where collision history is a required criterion. These projects must be consistent with *California's Strategic Highway Safety Plan (SHSP)*[22]. Projects are implemented to create a "forgiving quality" for the roadsides. The idea of creating safer roadsides for highway maintenance workers and highway travelers, and design for safety concepts have been incorporated in the Caltrans HDM.

A key program goal is to keep the vehicles on the road. However, should a vehicle leave the road, it is desirable to provide an area clear of fixed objects adjacent to the roadway for a recovery zone. Where practical Caltrans removes, relocates, makes breakaway, shields or delineates fixed objects along the roadside. These projects may also include systemic proactive pedestrian, roadside worker, and wrong-way driving improvement monitoring programs which identify, and address pedestrian, worker, and wrong-way driving-related locations based on a data-driven safety analysis.

[22] 2020-2024 California Strategic Highway Safety Plan (SHSP), https://dot.ca.gov/programs/safety-programs/shsp#:~:text=What%20Is%20the%20Strategic%20Highway,injuries%20on%20all%20public%20roads.

Caltrans' influence on reducing fatalities and serious injuries is focused on improving infrastructure. Typical countermeasures in SHOPP projects include improving highway geometry, enhancing roadway surface friction, applying roadway shoulder treatment, installing or upgrading guardrail and crash cushions, installing rumble strips, providing enhanced shoulder or in-lane delineation and markings for sharp curves, rock fall mitigation, improving pedestrian safety at intersections, and signing and striping enhancement to prevent wrong way collisions. SHOPP projects may also include other countermeasures, such as:

- Adding, upgrading, modifying, or removing intersection controls
- Installing cable or other types of median and roadside barriers
- Clear zone improvements
- Horizontal curve signs
- Installing or improving lighting
- Installing or improving pavement markings or delineation
- Installing or improving signing
- Pavement and shoulder widening
- Safety Edge
- Rehabilitating traffic control devices
- Wrong way driving treatments
- Leading Pedestrian Signal (LPI)
- Bicycle lane, glare screen
- Installing pedestrian signals, pedestrian hybrid beacons, and pedestrian overcrossings
- Installing truck escape ramps
- Left turn channelization
- End treatment

Caltrans implements countermeasures aligned with those of FHWA's Proven Safety Countermeasures initiative (PSCi)[23], a collection of 28 countermeasures and strategies effective in reducing roadway fatalities and serious injuries on our Nation's highways.

Improving Safety for Workers on the Roadside

Caltrans 2020-2024 Strategic Plan commits to the elimination of employee fatalities and serious injuries in the line of duty. Roadside safety improvements strive to meet this goal by minimizing the frequency and duration of highway worker exposure to traffic. Improving highway worker safety also improves safety for travelers on the SHS by eliminating collision hazards. Collectively, the goals of reducing worker exposure are summarized here, referred to as "SAFER":

- Site - Improve safety by locating features in safe locations.
- Accessible - Provide safe worker access to the roadside and highway features.
- Facilitate - Accommodate mechanized maintenance activities and understand equipment constraints.
- Eliminate - Implement design decisions that eliminate the maintenance activity and the need for workers on foot adjacent to the travel way.
- Relocate - Minimize the need for recurrent damage repair by relocating equipment and irrigation systems out of the clear recovery zone and away from traffic.

Over 25,000 locations have been identified statewide as candidates for worker safety improvements. These improvements are achieved through the SHOPP as well as in Major Maintenance projects where roadside safety concepts are always considered for inclusion.

Treatment strategies may include access gates in right of way fence, light duty maintenance vehicle trails, shoulder widening/turnouts, maintenance vehicle pullouts and barriers improvements. Other strategies that reduce, or eliminate, maintenance worker exposure, include paving beyond the gore, vegetation control to minimize herbicide use and erosion, vegetation control beneath guardrail, preserving sign visibility, maintaining sight distance requirements, and minimizing unauthorized access to the highway right

[23] FHWA Proven Safety Countermeasures, https://highways.dot.gov/safety/proven-safety-countermeasures

of way. Additionally, these projects may also include miscellaneous types of work to improve worker safety by reducing opportunities for the graffiti of facilities and equipment.

Improving and Replacing Bridge Rail

Bridge rails serve an important safety function, both on the bridge and at the approaches, redirecting errant vehicles and protecting the traveling public. Bridge rails are assessed based on federal crash standards for crashworthiness for posted roadway speeds. Bridge rails that do not meet the standards are improved or replaced.

There are over 13,000 bridges on the SHS with over 8.7 million linear feet of bridge rail. Bridge rail inventory data is recorded and/or updated during biennial routine bridge inspections. All bridges on the SHS are included in the inventory with the exception of the Bay Area Toll Authority and Golden Gate Transportation District bridges and bridges built and maintained under Public Private Partnerships.

The SHOPP funds projects that primarily address replacement or upgrade of bridge rails by treatments that meet current roadside safety hardware device standards, as described in the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH). Other types of bridge rail upgrade projects could require bridge widening to meet current shoulder width standards, as described in the *Caltrans Highway Design Manual (HDM)*[24].

In some cases, widening a bridge deck to meet current shoulder standards or widening the existing sidewalk to meet current ADA standards or Complete Streets criteria may also require additional superstructure and substructure modifications which are much costlier to build. There are some scenarios in which existing rail is included in bridge structural wall elements (e.g., masonry arch culverts), and upgrading the railing requires a full bridge replacement project.

[24] Caltrans, Highway Design Manual, 7th Edition July 2, 2020, https://dot.ca.gov/programs/design/manual-highway-design-manual-hdm

Performance Metrics

The condition designations for the Proactive Safety objective are based on a deficiency model. A deficiency that still exists is designated as poor, while deficiencies that have been addressed through safety countermeasures are designated as good. The fair designation does not apply in the deficiency model.

Inventory of Deficiencies

Between 2018 and 2021 there were 1,500 average annual fatal collisions and 5,065 average annual serious injury collisions for a total of 6,565 total annual average fatal and serious injury collisions reported on the SHS.

Performance Targets

Per federal regulations [Title 23 United States Code (USC) 148 (c)(2)[25] and Title 23 Code for Regulations (CFR) 490.211 (c)(2)[26]] Caltrans is required to set annual safety performance targets through processes outlined by a Federal Performance Management Regulation[27] and demonstrate actions and progress toward meeting those targets to receive federal funds from the Highway Safety Improvement Program (HSIP). The Federal Highway Administration (FHWA) Highway Safety Improvement Program Final Rules prescribe requirements for safety projects, including a direct linkage between the data-driven priorities established in the SHSP and the identification, development, and implementation of the safety projects.

The California and national strategic goals are to achieve zero fatalities and serious injuries on public roads by 2050, an accomplishment that will engage the shared responsibilities of all transportation stakeholders in a Safe System paradigm outlined in the 2020-2024 California Strategic Highway Safety Plan, the 2020-2024 Caltrans Strategic Plan, and the CAPTI issued in 2021. The SHSMP establishes 10-year targets and investments that work towards this aspirational goal. At a project level, Caltrans is implementing business processes that incorporate crash modification factors to measure the overall project-level accomplishments against these targets.

Other Performance Management Parameters

Several other parameters are required in performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP and potentially maintenance and other contributions.

Unit costs for Proactive Safety are based on an analysis of historical cost data composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction includes work associated with the construction of safety improvement elements, traffic handling, mobilization, supplemental work, and contingencies.

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[25] Title 23 United States Code (USC) 148 (c)(2), https://www.govinfo.gov/content/pkg/USCODE-2020-title23/pdf/USCODE-2020-title23-chap1-sec148.pdf

[26] Title 23 Code for Regulations (CFR) 490.211 (c)(2)], https://www.govinfo.gov/content/pkg/USCODE-2020-title23/pdf/USCODE-2020-title23-chap1-sec148.pdf

[27] Safety Performance Management, FHWA, https://safety.fhwa.dot.gov/hsip/spm/

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Reactive Safety

Safety First

Overview

Reactive safety has been an important component of the SHOPP as a responsive strategy of reducing the number of fatal and serious injury collisions. This objective is set up under a reservation model, where funding is set aside over the ten-year plan period and allocated to districts as needed in response to urgent safety needs.

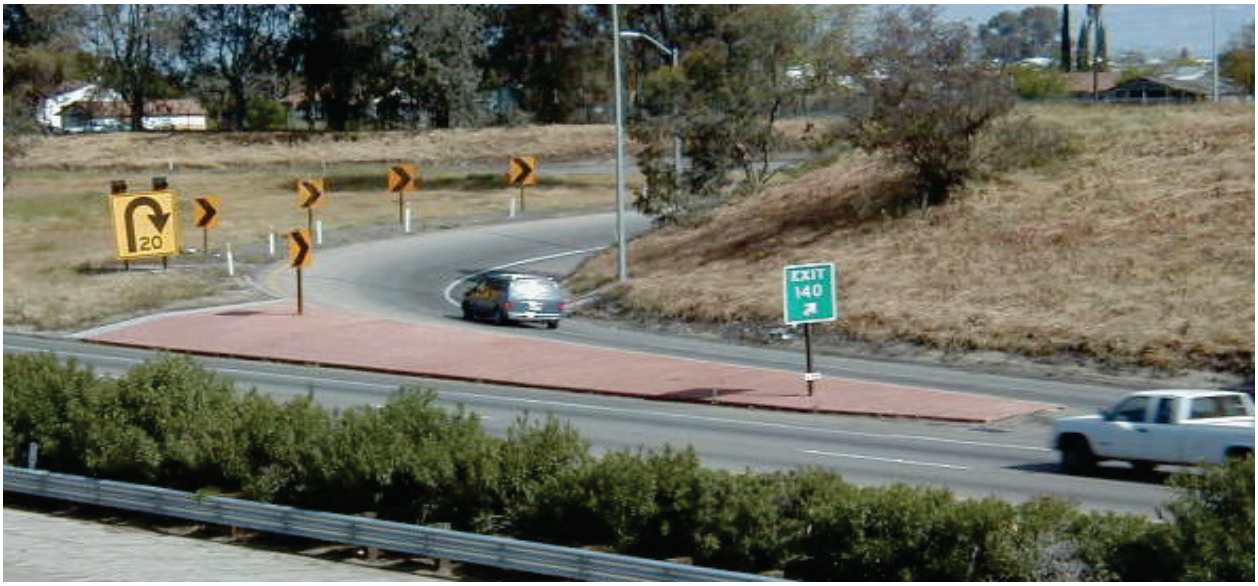
Safety Improvement (triggered safety) projects within the Highway Safety Improvement Program (HSIP)[28] are Caltrans' highest priority, and all efforts are made to expedite programming and delivery. When a safety improvement project is recommended, the project is evaluated for SHOPP eligibility based on collision history and the degree to which the improvement reduces the number and/or severity of collisions.

HSIP eligible projects must address a *Strategic Highway Safety Plan (SHSP)*[29] priority, be identified through a data-driven process, and contribute to a reduction in fatalities and serious injuries.

Two different methodologies are used to qualify locations for Safety Improvements in the SHOPP: 1) Traffic Safety Index and 2) Monitoring Programs. Triggered safety improvements must meet Federal HSIP eligibility criteria. In addition, under the HSIP, annual targets are required to track safety progress. For further information regarding methodologies or eligibility requirements, refer to the Caltrans HSIP website.

[28] Caltrans, HSIP website; https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/highway-safety-improvement-program

[29] Caltrans, 2020–2024 California Strategic Highway Safety Plan (SHSP), https://dot.ca.gov/programs/safety-programs/shsp



Typical Treatments

Field Maintenance Crews work daily to preserve the safety of our roadways. Typical treatments to improve safety through maintenance include repainting or adding wrong-way pavement arrows, reorienting, relocating, or adding wrong-way sign packages, modifying trailblazing freeway entrance packages, placing edge lines and pavement markers, and upgrading signs with high intensity reflective sheeting.

The SHOPP funds safety projects that include treatments such as new and modification of traffic signals, roundabouts and wet improvement treatments such as high friction surface and open-graded asphalt concrete surface treatments. Other treatment strategies may also include improving highway geometry, applying roadway shoulder treatments, installing/upgrading guardrail and crash cushions, bicycle and pedestrian safety improvements, and installing rumble strips. SHOPP also funds projects providing enhanced shoulder or in-lane delineation and markings for sharp curves, and projects that address multi-lane cross-median, cross-centerline, wrong-way and roadway departure collisions.

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5.2 Stewardship & Efficiency

Goal: Strengthen Stewardship and Drive Efficiency

Stewardship activities are carried out primarily to minimize long-term costs of ownership of physical assets. These activities generally maintain or improve the asset's condition which often improves system reliability and safety at the same time. Stewardship needs continue to increase as the transportation system demand grows and the infrastructure ages. Failure to perform timely stewardship investments in the transportation system increases long-term costs of ownership, reduces the system reliability and safety, and will ultimately take even greater investments to restore the condition in the future.

Caltrans' stewardship strategic goal focuses on several key initiatives:

- Standardize and modernize our equipment, facilities, technology, and supporting work practices
- Enhance asset management and decision support tools
- Develop and implement a methodology to allocate resources to support strategic priorities
- Promote and implement innovative and creative solutions
- Enhance diversity, equity, and inclusion for contracting and procurement

Stewardship activities may include:

- Rehabilitation or replacement of pavements, bridges, culverts, buildings, etc.
- Maintaining pavement, bridges, and culverts
- Applying protective coatings, protection systems, or overlays
- Maintenance and rehabilitation of pedestrian and bicycle facilities
- Maintenance and rehabilitation of Roadside Rest Area facilities
- Performing maintenance on state-owned office buildings, maintenance stations, equipment shops, transportation management centers, and labs
- Maintaining and replacing signs and lighting
- Emergency restoration of damaged infrastructure

DRAFT for Review

Bridge and Tunnel Health

Primary Asset

Overview

Bridges and tunnels are critical components of California's infrastructure and provide safe and efficient movement of people, goods, and services. They provide road network connectivity, allow pedestrian access, span water bodies and other natural features, pass through mountains, and span rail lines and other highways or local facilities.

New bridges are designed with an expected design life of 75 years, and in practice, many bridges remain in service for much longer. However, bridges and tunnels require periodic maintenance to rehabilitate or replace individual components (such as bridge decks) subject to deterioration resulting in a shorter life than the bridge itself. The most cost-efficient way to maintain a bridge or tunnel's structural integrity is through timely preservation work prior to the occurrence of significant deterioration. If preservation work on a bridge is deferred, the deterioration may accelerate to the point where more costly repairs are needed. In extreme cases deteriorated conditions may require restricting the loads the bridge can carry or closing the bridge until needed repairs are complete – which can mean costly delays and/or detours for the traveling public. Thus, maintaining bridges in good condition pays off–resulting in the lowest long-term costs both to transportation agencies and road users. Bridges and tunnels in good condition allow access to essential services and have a positive impact on the economy.

The focus of the Bridge and Tunnel Health objective is to identify and address structural needs of bridges and tunnels on the SHS to maintain their structural integrity. With the implementation of MAP-21 requirements, the bridge health performance measure for bridge health is based on the total deck area, and for tunnel health is based on the total structure's liner area, both rated in good, fair, or poor condition.

Caltrans reports bridge and tunnel asset condition data annually to FHWA as part of the National Bridge Inventory (NBI), an FHWA database that includes data on all bridges and culverts longer than 20 feet on the nation's public roads, and as part of the National Tunnel Inventory (NTI) for all tunnel assets. Bridges with a span shorter than 20 feet are not included in NBI submittals. Caltrans' SHSMP bridge and tunnel inventory also includes railroad and pedestrian bridges and is therefore larger than the NBI inventory which does not include these additional bridges.

Performance Metrics

Caltrans and local agencies follow FHWA NBI and NTI standards for inspecting all California bridges and tunnels. Inventory condition data is based on the most recent Bridge Inspection Reports (bridge and tunnel inspections are typically scheduled every two years) that document condition states of each individual structural element per these federal guidelines. The condition state of appropriate individual elements is then mathematically converted to a condition state (good, fair, or poor) of three categories for bridges (deck, superstructure, and substructure) and a single condition state for either tunnels or culverts. Good, fair, and poor NBI ratings for bridge condition are shown in Figure 5-1. A calculated value of 7 or greater is classified as being in good condition; 5 or 6 is classified as being in fair condition; and 4 or less is classified as being in poor condition. A bridge in poor condition is considered structurally deficient (SD) by federal guidelines. Thus, if any major component is classified as being in poor condition, the bridge will be considered SD. Being classified as SD does not imply a bridge is unsafe, just that deficiencies have been identified that require maintenance, rehabilitation, or replacement. A graphical depiction of the three bridge components is shown in Figure 5-2.

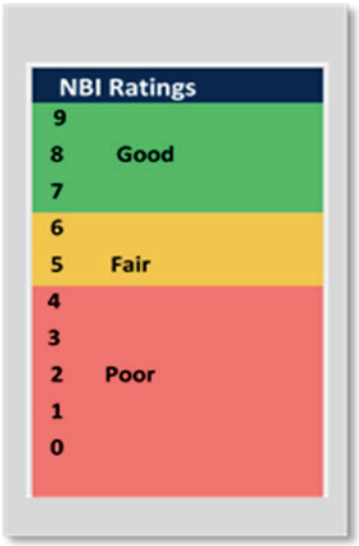


Figure 5-1. NBI Ratings for Bridge Condition

As a bridge is assigned a condition state for the deck, superstructure, and substructure individually, the lowest of the three ratings determines the overall rating of the bridge. Caltrans maintains all data in the Structures Maintenance and Investigations (SM&I) bridge management system databases. Table 5-2 and Table 5-3 describe the performance metrics that define the criteria for determining condition for good, fair, and poor Bridge and Tunnel Health.

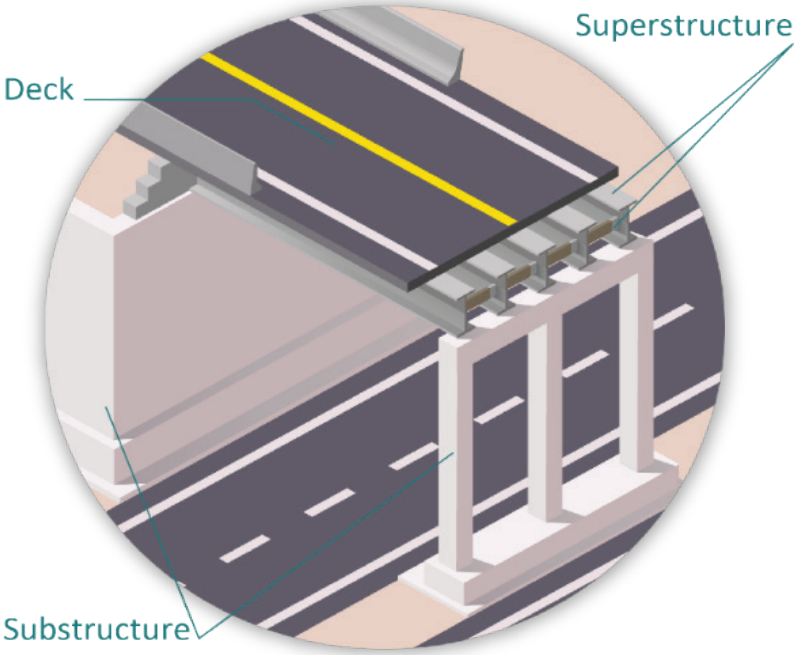


Figure 5-2. NBI Ratings for Bridge Condition and Bridge Components

Table 5-2. Bridge Health Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	Deck, superstructure, and substructure ratings are all Good, or the culvert rating is Good
Fair	The lowest of the three ratings for deck, superstructure, and substructure is Fair, or the culvert rating is Fair
Poor	The lowest of the three ratings for deck, superstructure, and substructure is Poor, or the culvert rating is Poor

Table 5-3. Tunnel Health Performance Metrics

Performance Metrics	
Condition	**Metrics**
Good	Less than 20% of the elements are classified as deteriorated
Fair	More than 20% of the elements are classified with minor deterioration
Poor	More than 20% of the elements are classified with significant deterioration

Inventory and Conditions

Caltrans is currently responsible for the maintenance of 13,217 SHS bridges totaling over 248 million square feet of bridge deck area. These bridges are an average of 50 years old which typically results in increasing maintenance needs. Caltrans also maintains 55 tunnels totaling approximately 5 million square feet of liner area. The tunnel liner area is calculated using the surface area of the liner supporting the mountain or roadway above the driving surface.

All SHS bridges and tunnels are included in the inventory, except for Bay Area Toll Authority and Golden Gate Transportation District bridges, and bridges built and maintained under Public Private Partnerships.

In addition to condition classification, maintenance needs are also identified and documented during regular, routine bridge and tunnel inspections, and when applicable, during specialty investigations which include hydraulic, underwater, and fracture critical inspections. These Bridge Inspection Reports document the needs as work recommendations in addition to coding changes to the individual structural elements. The inventory and conditions of Bridge and Tunnel Health, as of March 2022, are presented in Table 5-4.

Table 5-4. Bridge and Tunnel Health Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Bridge and Tunnel Health (square feet)	**253,638,040**	**49.3%**	**46.9%**	**3.8%**	

Performance Targets

Table 5-5 presents the asset performance targets for Bridge and Tunnel Health, including a revision to the fair target to 50%, approved by the California Transportation Commission in March 2021. The poor target remains unchanged, as established in the TAMP.

Table 5-5. Bridge and Tunnel Health Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Bridge and Tunnel Health (square feet)	**48.5%**	**50.0%**	**1.5%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital, and support unit costs, SHOPP, and potentially maintenance and other contributions.

On an annual basis, a percentage of bridge assets in good condition deteriorates to fair condition, while a percentage of assets in fair condition deteriorates to poor. The deterioration rates for bridges are based on the life cycle of the asset.

Unit costs for bridge health are based on an analysis of historical cost data composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes the structure costs and an applied factor to account for associated roadway items, traffic handling, mobilization, supplemental work, and contingencies. It is assumed that all fair assets require preservation or rehabilitation, addressed through a combination of HM Program and SHOPP projects. Those addressed under the HM program are typically preservation activities, while those addressed under the SHOPP typically require more significant rehabilitation. In addition, it is assumed 75 percent of the poor assets would require rehabilitation while the remaining 25 percent would require replacement of the existing structure.

Typical Treatments

Bridge maintenance treatments include repairs that require immediate attention and other minor maintenance, including joint repairs, spalls, and paint needs, as well as deck overlays and repairs. When minor defects are not addressed quickly and efficiently, the resulting damage often requires major structural rehabilitation or replacement which not only costs more than preventive maintenance, but can cause significant long-term disruptions to the traveling public. As the bridge inventory increases and continues to age, preventive maintenance strategies are imperative to maintain or improve the structural condition of the inventory and slow the growth of major rehabilitation needs.

The first stage of preventive maintenance is the work performed by bridge Maintenance Field Crews to address minor maintenance repairs that require immediate attention. Bridge preventive maintenance needs beyond the scope of bridge Maintenance Field Crews are combined into maintenance projects completed by contractors. Bridges that have damage or deterioration that can be addressed through preventive maintenance activities, which include bridges in good condition and a portion of the bridges in fair condition, are funded through the Major Maintenance projects or through the SHOPP.

Bridges that have deteriorated structurally or have been damaged by other causes, which include bridges in poor condition and a portion of the bridges in fair condition, are addressed with SHOPP-funded major rehabilitation or replacement activities. When bridges require major rehabilitation or replacement, it is sometimes appropriate to make additional geometric or structural improvements. Such improvements are permissible, however, the primary purpose for the work and treatment strategies shall be to address the condition of the bridge's structural elements.

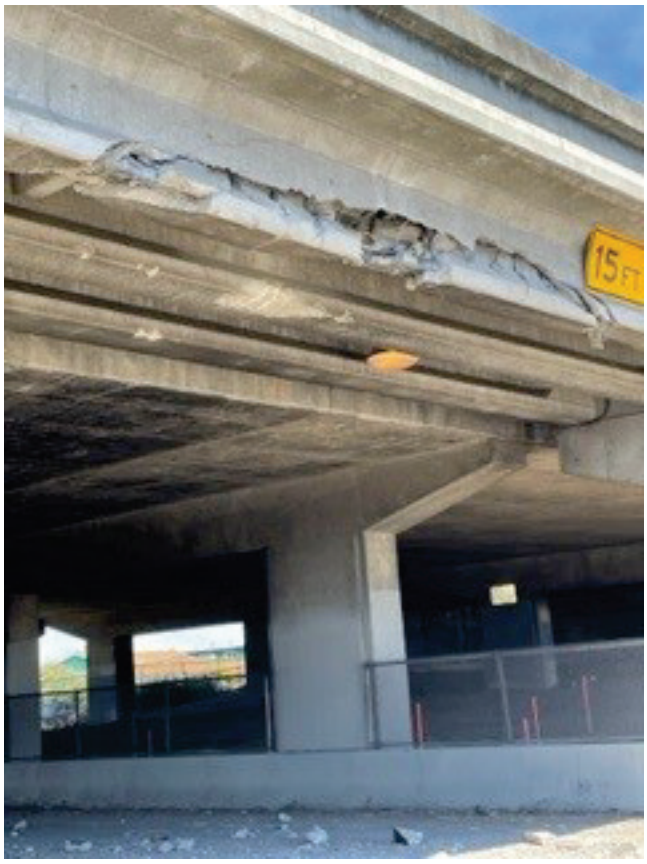
Since the implementation of the 2017 SHSMP, the federally mandated Tunnel Inspection Program has been fully implemented and the complete tunnel inventory has been identified and inspected for condition assessments. Based on the current tunnel inventory conditions, it is assumed that tunnel health maintenance needs will typically be preventive maintenance strategies to address minor deterioration.

DRAFT for Review

Bridge Goods Movement Upgrades

Other Assets and Objectives

Overview



The Bridge Goods Movement Upgrades objective is to identify and address geometric restrictions to permit vehicle traffic on the SHS. Bridge Goods Movement Upgrades address restrictions from reduced vertical clearance as established in the Caltrans HDM, and load capacity restrictions as identified by state guidelines. The emphasis of this objective is to address poor condition bridges impacting Interstate mainline traffic.

Performance Metrics

The condition designations for Bridge Goods Movement Upgrades are determined through assessments of a bridge's two possible restrictions to goods movement: vertical clearance (VC) and permit vehicle rating based on load capacity. Each bridge is analyzed for these individual criteria.

The rating of good, fair, and poor for vertical clearance is determined based on conformance with HDM standards for the functional classifications of the roadway beneath the structure. The rating of good, fair, and poor for permit vehicle rating is a function of load capacity restrictions on the structure as identified in state guidelines. Once classified for the two individual aspects (VC and permit vehicle rating), the overall rating for the bridge is assigned by the lower of the two individual ratings. Table 5-6 describes the performance metrics for determining condition for good, fair, and poor Bridge Goods Movement Upgrades.

Table 5-6. Bridge Goods Movement Upgrades Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Both VC and permit condition ratings are Good**
Fair	**The lowest of the VC or Permit rating is Fair**
Poor	**The lowest of the VC or Permit rating is Poor**

Inventory and Conditions

The Bridge Goods Movement Upgrade inventory data are based on both VC and permit vehicle capacity restrictions. Vertical clearance restrictions are documented and/or updated during biennial routine bridge inspections. The minimum VC and the classification of the roadway beneath the structure are entered in SM&I's bridge management system using the SMART database. In addition, all bridges are periodically analyzed for permit vehicle load capacity per federal guidelines through a load rating summary of the structure, performed by SM&I's Load Rating Unit. All bridges on the SHS are included in the inventory except for Bay Area Toll Authority and Golden Gate Transportation District bridges and bridges built and maintained under Public Private Partnerships. The inventory and conditions for Bridge Goods Movement Upgrades, as of March 2022, are presented in Table 5-7.

Table 5-7. Bridge Goods Movement Upgrades Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Bridge Goods Movement Upgrades (square feet)	**248,757,933**	**79.5%**	**8.1%**	**12.4%**	

Performance Targets

Table 5-8 presents the statewide asset performance targets for Bridge Goods Movement Upgrades.

Table 5-8. Bridge Goods Movement Upgrades Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Bridge Goods Movement Upgrades (square feet)	**75.0%**	**15.0%**	**10.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Bridge Goods Movement Upgrades conditions do not follow a deterioration model. New needs are identified based on changes in legislation regarding allowable permit vehicles or changes in design standards for VC. For example, if California bridges are required to accommodate heavier truck loads to comply with rules imposed by the federal government, the needs under this objective would increase. Currently, heavier trucks are allowed only through the issuance of a permit. Should these trucks become legal loads and be allowed to travel without restriction on the SHS, the load carrying capacity of California bridges will be decreased and bridge needs to strengthen or replace bridges will be greatly increased.

Unit costs for the Bridge Goods Movement Upgrades are based on an analysis of historical data composed of the capital construction and support costs. Support costs are associated with engineering and/or oversight work to design and construct the project. The Capital construction cost includes the structure costs and an applied factor to account for associated roadway items, traffic handling, mobilization, supplemental work, and contingencies. It is assumed that all fair deficiencies would require rehabilitation, and half of the poor deficiencies would require rehabilitation, while the other half would require replacement of the existing structure.

Typical Treatments

The SHOPP funds projects and treatments that either improve VC or improve the load capacity of the bridge. Fair condition bridge restrictions for VC indicate that the elevation of the existing structure is typically within six inches of the vertical clearance standards in the HDM and may restrict larger vehicles traveling under the structure. Fair condition bridge restrictions for load capacity indicates that five and seven axle vehicles have no restrictions when traveling over the structure while larger vehicles are impacted.

Poor condition bridge restrictions for VC indicate that the elevation of the existing structure is typically posted with identified reduced VC signage. Poor condition bridge restrictions for load capacity indicates that all permit vehicles have some level of restriction when traveling over the structure. Typical treatments and the work to address these restrictions require either rehabilitation or replacement of the structures. Rehabilitation for VC restrictions typically requires a lowering of the roadway beneath the structure or a raising of the deck and superstructure of the bridge above the roadway. Rehabilitation for load capacity restrictions typically requires bridge strengthening to handle the increased loading.

DRAFT for Review

Bridge Scour Mitigation

System Resiliency Objective

Overview

The Bridge Scour Mitigation objective is to prevent catastrophic failure from natural disasters, such as floods and storm events. Bridge Scour Mitigation addresses bridges over water where bridge foundations have been determined to be unstable for potential assessed or calculated scour conditions (scour critical) per federal guidelines.

Only bridges with foundations within a waterway are reviewed for scour vulnerability. Those bridges that are calculated or assessed to be scour critical under the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges manual are addressed under this objective

Performance Metrics

Bridges are assessed for scour with the following criteria: an NBI rating of 7, 8, or 9 is classified as good where foundations are determined to be stable for assessed or calculated scour conditions or scour countermeasures have been installed; a rating of 4, 5, or T is classified as fair where foundations are determined to be stable for calculated scour conditions; a rating of 6 or U is classified as fair until the bridge is evaluated for scour or for a bridge with unknown foundation, respectively, and a rating of 0, 1, 2, or 3 is classified as poor where foundations are determined to be unstable for calculated scour conditions (i.e. bridge is scour critical). As only poor bridges are considered vulnerable (unstable) for scour, the scour vulnerability conditions are shown in a deficiency model.

Inventory of Deficiencies

The Bridge Scour Mitigation inventory data include the total deck area (square footage) of bridges that have been assessed to be unstable for scour (scour critical or poor). Caltrans performs scour analyses for all bridges that cross over waterways. These analyses are completed to evaluate whether a bridge is unstable for potential assessed or calculated scour conditions (scour critical) per federal guidelines. A scour critical bridge is one with abutment or pier foundations which are rated as unstable due to (1) observed scour at the bridge site or (2) a scour potential as determined from a scour evaluation study. When bridges are assessed for scour, the findings are documented with a Specialty Investigation Bridge Inspection Report. Any recommended work to protect for scour is documented within the report. If the bridge is assessed to be unstable for scour, a Scour Plan of Corrective Action is also documented. All bridges on the SHS are included in this inventory except for Bay Area Toll Authority and Golden Gate Transportation District bridges and bridges built and maintained under Public Private Partnerships. Only bridges that have been assessed as scour critical (poor) are included in this inventory. As of March 2022, the Bridge Scour Mitigation deficiency is 2,142,777 sq ft.

Performance Targets

Ideally, the goal of the Bridge Scour Mitigation objective would be to address all identified scour critical (poor) bridges. Due to the dynamic nature of identification of scour critical bridges (major flooding or storm events) and the time required for the project delivery process, it is not realistic to assume that at the end of the 10-year cycle all scour critical bridges would be addressed. The Bridge Scour Mitigation target is to reduce scour critical bridges to 10 percent of the projected 10-year scour critical need. Table 5-9 presents the statewide asset performance targets for Bridge Scour Mitigation.

Table 5-9. Bridge Scour Mitigation Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Bridge Scour Mitigation (square feet)	**90.0%**	**N/A**	**10.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Projected Needs for bridge scour mitigation are estimated based on historical trends but may increase with major storm events that occur within the next 10 years. Scour typically has no deterioration model, because it is not possible to control either the weather or the migration of streams and channels.

Unit costs for the Bridge Scour Mitigation objective are based on an analysis of historical data composed of the capital construction and support costs. Support costs are those associated with engineering and/or oversight work to design and construct the project. The estimated capital construction cost includes the structure costs and an applied factor to account for associated roadway items, traffic handling, mobilization, supplemental work, and contingencies. It is assumed that half the identified deficiencies would require rehabilitation and the other half would require replacement of the existing structure.

Typical Treatments

The SHOPP funds projects that may include various treatments such as bridge scour improvements from rehabilitation measures (such as rock slope protection of the channel walls and/or floors) to extensive foundation rehabilitations (which may include modifying or adding foundation elements such as piles, pier walls or footings) or could include projects that require full bridge replacement. Many factors play a role in addressing scour vulnerabilities such as the health condition of the structure or possible seismic vulnerabilities of the substructure as they may be subject to liquefaction in a seismic event.

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Bridge Seismic Restoration

System Resiliency Objective

Overview

The focus of the Bridge Seismic Restoration objective is to mitigate catastrophic bridge failures from seismic events (earthquakes). Bridge Seismic Restoration addresses bridges assessed to be vulnerable to potential seismic activity through screening processes implemented by Caltrans. Periodic rescreening of state bridges is conducted to assess the structures for seismic vulnerabilities using the most current seismic criteria. The most recent rescreening was completed in 2020.

Performance Metrics

Bridges are assessed for seismic vulnerability based on the screenings performed by the Offices of Earthquake Engineering Analysis and Research (OEEAR) and Geotechnical Services (OGS). If a bridge is assessed to have potential seismic vulnerabilities, the bridge is classified as poor. If there is no potential vulnerability, the bridge is classified as good. The fair designation is not used. As only poor bridges are considered vulnerable for seismic events, seismic vulnerability conditions are shown in a deficiency model.

Inventory of Deficiencies

The bridge seismic restoration inventory data include the total deck area (square footage) of bridges assessed to be vulnerable to seismic events. These assessments are conducted for ground motion and seismic movement. For bridges with foundations in or near a waterway, the potential for soil liquefaction is also analyzed. Those that are found to have a potential vulnerability for seismic activity combined with potential ground shaking are identified and classified as a potential need. All SHS bridges are included in this inventory except for Bay Area Toll Authority, Golden Gate Transportation District bridges, and bridges

built and maintained under Public Private Partnerships. Only bridges that have been assessed with a potential seismic vulnerability (poor) are included in this inventory. OEEAR and OGS are continually rescreening and evaluating bridges for their potential vulnerabilities to seismic events based on the most current seismic criteria. Based on the most recent seismic screening, a new seismic priority list was developed in 2020. In an effort to focus on the highest priority seismic work first, a financially constrained prioritized list was developed resulting in a reduction of the total seismic need identified in the SHSMP. As seismic work is completed, this financially constrained list will be amended to incorporate lower priority identified seismic needs. As of March 2022, the Bridge Seismic Restoration deficiency is 7,650,030 sq ft.

Performance Targets

Ideally, the goal of the Bridge Seismic Restoration objective is to address all seismically vulnerable (poor) bridges identified in the preliminary screening process. The screening process is a preliminary review of bridges that may be seismically vulnerable based on the element configuration of the structure and the surrounding soil prior to detailed seismic analyses being completed. Because bridges identified in the screening process may be found to not require seismic restoration during detailed seismic analysis, and due to the length of the time required for the project delivery process, it is not realistic to assume that at the end of the 10-year cycle all currently identified seismically vulnerable bridges would be addressed. Therefore, the Bridge Seismic Restoration target is to reduce seismically vulnerable bridges to 30 percent of the projected 10-year seismic need. In an effort to reduce the number of potentially seismically vulnerable bridges that drop out of the project development process once a detailed analysis is performed, and to better estimate retrofit costs, the top 100 bridges on the seismic priority list were evaluated at pre-strategy meetings. These meetings developed the most likely retrofit alternative as well as a more refined cost estimate for use during APS or PIR Cost Estimate development. Table 5-10 presents the statewide asset performance targets for bridge seismic restoration.

Table 5-10. Bridge Seismic Restoration Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Bridge Seismic Restoration (square feet)	**70.0%**	**N/A**	**30.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Unit costs for Bridge Seismic Restoration are based on an analysis of historical cost data composed of the capital construction and support costs. Support costs are those associated with engineering and/or oversight work to design and construct the project. The estimated capital construction cost includes the structure costs and an applied factor to account for associated roadway items, traffic handling, mobilization, supplemental work, and contingencies. Historical trends of previously delivered projects, including the previously completed Tier I and Tier II retrofit programs, are used to estimate these costs. It is assumed that 80% of the identified deficiencies would require rehabilitation and the other 20% would require replacement of the existing structure.

Typical Treatments

The SHOPP funds projects that address bridges found to be vulnerable to seismic events. The retrofit treatments can vary from rehabilitation measures, such as catcher blocks or retrofit of the substructure or superstructure of the structure, to full bridge replacement. Many factors play a role in addressing seismic vulnerabilities, such as the health condition of the structure, assessed scour vulnerability, and proximity to substantial fault lines.

DRAFT for Review

Commercial Vehicle Enforcement Facilities

Other Assets and Objectives

Overview

The Commercial Vehicle Enforcement Facilities (CVEF), commonly called Weigh Stations, are owned by Caltrans and operated by CHP. CHP monitors and inspects trucks using the SHS to ensure that they are operating safely, licensed properly, and conform to legal size and weight, which ensures that bridge and pavement assets are not damaged prematurely by overweight trucks. The presence of CVEFs helps in preserving state infrastructure, improving truck operations, and enhancing the safety of the traveling public. Caltrans and CHP work cooperatively to ensure that all facilities are in good operational condition for truck enforcement efforts.

Performance Metrics

Table 5-11 describes the performance metrics for determining condition for good, fair, and poor for CVEF.

Table 5-11. Commercial Vehicle Enforcement Facilities Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	• Facility is either new or recently completed with major rehabilitation • Has no known building or pavement issues • Facility is in good operational condition • Meets most functional needs of the CHP
Fair	• Requires minor building modification • Requires minor upgrades in pavement, inspection bay, or technology • Some known building or pavement issues that can be fixed via building maintenance • Still meets most of the functional needs of the CHP
Poor	• Requires major building rehabilitation • Location needs upgrade in classification • Functionally obsolete • Facility needs technology expansion to meet CHP operations

Inventory and Conditions

There are 54 CVEF stations in California ranging from Class A to Class D.

- **Class A –** are located at strategic ports of entry into the State and have independent CHP command identity and normally operate 24 hours per day, 7 days per week. There are five class A CVEF in the State.
- **Class B-** are located along major highway routes and have an independent CHP command identity and may operate 24 hours per day, 7 days per week. There are fifteen Class B CVEF.
- **Class C-** are located at strategic points on major highway routes and may operate 24 hours per day, 5 or 7 days per week, predicated upon variable factors such as the average daily truck traffic and peak commercial traffic hours. There are fifteen Class C CVEF statewide.
- **Class D-** are located at strategic points on major and secondary highway routes and operational hours are based on such factors as: the average daily truck traffic, peak truck traffic hours, and seasonal needs. There are nineteen CVEF of this class.

The condition of CVEFs is based on the age of the facility, recently completed projects, field inspections by Caltrans Maintenance Staff and District Program Advisors. Additional information is also gathered from survey information from CHP commanders at each facility, Google map, and photo observations. The inventory and conditions of Commercial Vehicle Enforcement Facilities, as of June 2022, are presented in Table 5-12.

Table 5-12. Commercial Vehicle Enforcement Facilities Inventory and Condition

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Commercial Vehicle Enforcement Facilities (square feet)	**311,175**	**30.7%**	**46.7%**	**22.6%**	

Performance Targets

Table 5-13 presents the statewide asset performance targets for CVEFs.

Table 5-13. Commercial Vehicle Enforcement Facilities Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Commercial Vehicle Enforcement Facilities (square feet)	**30.0%**	**50.0%**	**20.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, and potentially maintenance and other contributions.

The deterioration rate for CVEF is based on the age/life cycle of the building, pavement, landscape, and other inspection equipment at the CVEF station. Specifically, on an annual basis, a percentage of the CVEFs that is in good condition deteriorates to fair condition, and a percentage of the CVEFs in fair condition deteriorates to poor condition. SHOPP projects primarily address CVEF in poor or fair condition and restore the condition of the asset. Maintenance primarily focuses on maintaining CVEF in good condition as well as addressing facilities in fair condition.

Unit cost for CVEF is based on an analysis of historical cost data composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with the construction of commercial vehicle enforcement stations including traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

The Inventory of Needs Report specifies the Inter Agency Agreement (IAA) and is the mechanism for joint operations pertaining to maintenance of the CVEFs. The IAA establishes the responsibility for specified repairs and maintenance at these facilities. Items specific to building interiors such as plumbing repair, water quality testing, and minor roof and flooring repair are procured by CHP. IAA maintenance funds can be used to reimburse the CHP for such expenses. Additionally, Caltrans Field Maintenance Crews may be dispatched on an as-needed basis to address general items such as building exteriors or minor site work on the property.

Projects designed to construct new CVEFs, to relocate existing CVEFs for more efficient operations, and to upgrade/rehab existing CVEFs are all treatments funded in the SHOPP. Major rehab includes the upgrade of the CVEF classification, expanding the building structure for administration offices or inspection bays, or upgrading technology to improve truck operations. The CVEF projects as prioritized by the 2019 Inventory of Need have been incorporated into SHOPP projects and are in various phases of project development.

Additionally, some CVEF improvements and treatments strategies, such as pavement rehab, ADA, landscape and drainage correction, signing and striping, weight scale replacement, and other electrical or electronic elements, are funded and completed through Minor SHOPP projects. Also, some CVEF improvements are included in pavement projects or other multi-objective type projects in the SHOPP.

DRAFT for Review

Drainage Pump Plants

Supplementary Asset

Overview

Drainage Pump Plants' primary objective is to replace or rehabilitate in-place drainage pump plants and related elements that have lost serviceability because of age, wear, or degradation, and for reduction of long-term maintenance costs. Upgrades or modifications of the drainage pump plants are included; however, the priority is addressing the poor condition pump plants. The criteria used to define the performance target is intended to eliminate from the inventory all known poor condition pump plants to ensure efficient operations of the facility.

Performance Metrics

The condition of drainage pump assets is based on the service life of the asset, which is estimated at 50 years. It is also based on the engineering inspector's assessment of the failure or defects found on the pump plants and the level of mechanical and electrical failures or deficiencies. Each attribute or element of the pump plant is scored, and an overall health score is assigned on a scale of 0 to 100. Table 5-14 describes the performance metrics for determining condition for good, fair, and poor Drainage Pump Plants.

Table 5-14. Drainage Pump Plants Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Overall health score between 80 to 100**
Fair	**Overall health score between 50 to 79**
Poor	**Overall health score between 0 to 49**

Inventory and Conditions

Drainage Pump Plants, which include the facility structure, pumps, electrical, mechanical, plumbing, and appurtenances, are an integral part of the SHS. The inventory of Drainage Pump Plants, as of May 2022, are presented in Table 5-15.

Table 5-15. Drainage Pump Plants Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Drainage Pump Plants (location)	**290**	**13.5%**	**36.2%**	**50.3%**	

Performance Targets

Table 5-16 presents the statewide asset performance targets for Drainage Pump Plants. Target conditions across all Supplementary Asset classes, including Drainage Pump Plants, were proposed for revision and approved by the California Transportation Commission in the December 2021 meeting[30].

Table 5-16. Drainage Pump Plants Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Drainage Pump Plants (location)	**50.0%**	**40.0%**	**10.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital, and support unit costs, SHOPP, and potentially maintenance and other contributions.

The deterioration rates for Drainage Pump Plants are based on the service life of the asset, pump, and controller types. Specifically, on an annual basis, a percentage of assets in good condition deteriorate to fair condition, while a percentage of assets in fair condition deteriorate to poor. Failure of pumping equipment and controls may cause roadway flooding which could result in unacceptable consequences and property damage.

Unit costs for Drainage Pump Plants are based on an analysis of historical data comprised of the capital construction and support cost. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with the construction of drainage pump plants, traffic handling, mobilization, supplemental work, and contingencies.

[30] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

Typical Treatments

Field Maintenance Crews address the good or fair pump plants with significant remaining service life. Some typical examples of work treatments done by Field Maintenance Crews are to inspect drainage pump plants and perform minor maintenance work, including cleaning and minor repairing, especially before the seasonal rains begin.

Major Maintenance projects include any work that maintains the SHS pump plants to a safe and useable condition; it does not include reconstruction, major structural deficiencies or other improvements. These projects primarily deal with preventive and corrective maintenance and preservation strategies to maintain the pump plants in good and fair condition. These projects usually do not require additional permanent right of way, change hydraulic capacity, or involve environmental consequences greater than those addressed in a categorical exemption. Some typical treatments in Major Maintenance projects for Drainage Pump Plants include cleaning to remove excessive debris build-up in the drainage pump building and stairwells, and repair of drainage pump electrical and mechanical deficiencies. Typical projects have a two fiscal year cycle for project development, project design, and construction.

SHOPP projects primarily address rehabilitative and replacement remedial work to correct a specific condition, such as restoring drainage pumps from poor to good condition. The priority is on pumps in poor condition. Rehabilitation and replacement of Drainage Pump Plants are typical types of projects. These projects restore the drainage system, repair structural deficiencies in the building housing the drainage pumps, and may involve improving the inlet and outlet flow, storage and collection basins.

DRAFT for Review

Drainage Restoration

Primary Asset

Overview

The primary objective of Drainage Restoration is to provide for the replacement or in-place rehabilitation of culverts and other highway drainage system elements that have lost serviceability because of age, wear, or degradation. Drainage Restoration addresses culverts, inlets, outlets, headwalls, endwalls, junction boxes and other major drainage system elements. The other drainage objective is Drainage Pump Plants. Typical culvert work includes upgrades or modifications of culverts and other highway drainage system elements to increase flow or improve drainage alignment, with the priority of addressing the poor condition culverts. Projects to abandon culverts are also included. The criterion used to define the Drainage Restoration performance target was to minimize all known poor condition culverts from the inventory. The target was set using Commission and Caltrans' program management guidance and engineering judgment.

If a culvert becomes clogged, deteriorates, or fails because of rust or other factors, and no longer conveys water away from the highway, water may then flood the highway or erode highway foundations or adjacent slopes resulting in road washouts and closures. Culverts require periodic maintenance to avoid costly replacement and possible future catastrophic failure. The repairs of catastrophic events are far more expensive than providing adequate funding to maintain and upgrade culverts. Caltrans uses a proactive inspection program to measure the drainage systems' health, prioritize potential culvert projects based on several factors including condition, cost, hydraulic capacity, and traveler delay. The program tracks maintenance work accomplishments and delivery schedules.

Performance Metrics

The health condition assessment of Drainage Restoration assets is based on a visual inspection of five attributes: waterway adequacy, joints, materials, shape, and culvert alignment. Each attribute is scored, and culvert condition is calculated using a weighted average of attribute scores. Table 5-17 describes the performance metrics for determining condition for good, fair, and poor Drainage Restoration.

Table 5-17. Drainage Restoration Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Overall health score between 80 to 100**
Fair	**Overall health score between 50 to 79**
Poor	**Overall health score between 0 to 49**

Inventory and Condition

The SHS includes a vast network of culverts that drain rainwater, drainage channels, streams, and rivers away from highways in a controlled manner. A typical culvert is a 12 to 60-inch diameter (or width) pipe or box culvert. Any culvert with structure length that spans 20 feet or longer is classified as a bridge and recorded on the NBI. A diagram showing typical drainage details is presented in Figure 5-3.

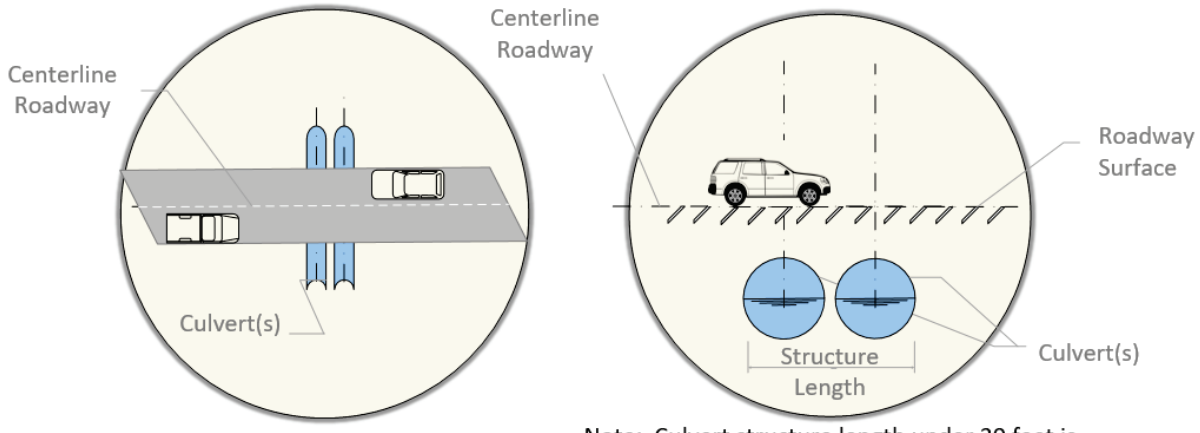


Figure 5-3. Typical Drainage Details

Caltrans continues to build its culvert inventory. To date 205,158 culverts totaling over 20.0 million linear feet have been inventoried and fully inspected. The SHSMP is a 10-year forward-looking document that needs to consider the known inventory today plus the additional inventory that is expected to be added in the next 10 years through inspections and new construction. The anticipated growth in the inventory is expected to be over 3.0 million linear feet, and efforts are underway to complete the inventory and condition assessment by the end of 2023. In the past fiscal year, over 25,000 culverts (over 2 million linear feet) were inspected. Inspection production rates are dependent on many factors, including accessibility, right-of-way constraints, environmental permits, multi-year mitigation permits, and traffic considerations. Caltrans has increased the number of inspections for the purpose of condition assessments to meet the 2023 goal.

The known inventory and conditions of Drainage Restoration, as of July 2022, are presented in Table 5-18. For reporting drainage inventory and conditions in this plan, only inspected drainage assets with known conditions are considered. The drainage inventory and conditions used to calculate 10-year needs are based on the projected additional inventory using estimated culvert lengths with conditions assumed to be in the same proportion as observed within each district. An average culvert length of 98.8 linear feet is assumed for locations where the actual culvert length still needs to be verified.

Table 5-18. Drainage Restoration Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Drainage Restoration Total of Known and Projected Inventory (linear feet)	**22,425,840**	**74.3%**	**16.1%**	**9.6%**	
Drainage Restoration Known Condition (linear feet)	20,033,247	74.2%	16.2%	9.6%	
Drainage Restoration Projected Additional Inventory (linear feet)	2,392,593	74.8%	15.6%	9.6%	
Drainage Restoration Known inventory that is outside the re-inspection cycle (linear feet)	**5,467,832**	**70.8%**	**19.7%**	**9.5%**	

Table 5-18 Notes:

- Quantity and conditions cited under "Known Condition" include:
  - Culverts that have been inspected and condition assigned based on procedures defined through the Culvert Inspection Program.
  - Culverts that have been replaced/rehabilitated and condition designated as good based on Estimated Construction Work Complete (ECWC) at time of inventory reporting.

- Quantity and conditions cited under "Projected Inventory" include:
  - Culverts that have been cleaned and are pending re-inspection.
  - Culverts that have not yet been inspected and inventoried.
- Quantity and conditions cited under "Total of Known and Projected Inventory" are used to support 10-year needs and investment requirements. The condition breakdown is estimated using district-specific historic distributions of Good, Fair and Poor known condition culverts applied to the projected inventory.
- Quantity and conditions cited under "Known inventory that is outside the re-inspections cycle" include:
  - Culverts that were inspected 10 years prior to August 2022

Performance Targets

Table 5-19 presents the statewide asset performance targets for Drainage Restoration, including a revision to the fair target to 20%, as approved by the California Transportation Commission in March 2021. The poor target remains unchanged, as established in the TAMP.

Table 5-19. Drainage Restoration Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Drainage Restoration (linear feet)	**70.0%**	**20.0%**	**10.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Until the remaining SHS culvert assessments have been completed, historical assessment rates and anticipated deterioration rates create an annual increase of approximately 373,000 linear feet (3,978 culverts) in the fair category and an annual increase of approximately 229,000 linear feet (2,468 culverts) in the poor category. Remaining assessments are scheduled to be completed by the end of 2023.

Deterioration rates for culverts are based on the asset's service life. Specifically, on an annual basis a percentage of assets in good condition deteriorates to fair, while a percentage of assets in fair condition deteriorates to poor.

Unit costs for Drainage Restoration are based on an analysis of historical cost data composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with construction of drainage system elements, traffic handling, mobilization, supplemental work and contingencies.

Typical Treatments

Field Maintenance Crews focus on minor maintenance work which may include treatment strategies of cleaning and minor repairing of culverts. In particular, field maintenance crews are involved in the cleaning of clogged culverts where the only known deficiency of the culvert is waterway adequacy. Thus, cleaning may result in the condition of some of these culverts changing from fair or poor to good, pending a culvert re-inspection. After cleaning, the condition of the culvert will be designated as "pending inspection" until a re-inspection is carried out. The work done by Field Maintenance Crews work is also preventive maintenance, addressing good or fair culverts which have significant service life remaining.

Major Maintenance projects include any work that maintains SHS drainage systems to a safe and useable condition; it does not include reconstruction, major structural deficiencies or other improvements. These projects primarily deal with treatment strategies such as preventive and corrective maintenance and preservation strategies to maintain the drainage system in good and fair condition. HM projects usually do not require additional permanent right of way, change hydraulic capacity or involve environmental consequences greater than those addressed in a categorical exemption. The types of projects and treatments used in Major Maintenance include the repair of culverts, such as repairing damaged end treatments, inverts or connections, ramming, or lining the culverts. They may also include erosion and scour issues, installing debris protection systems, and cleaning to remove excessive debris build-up and improve capacity. Typical projects have a two FY cycle for project development, project design, and construction.

SHOPP projects primarily address rehabilitative and replacement work and restore culverts from fair or poor to good condition. Treatments are similar to Major Maintenance but are typically much larger in scope and may involve right-of-way and have environmental issues. SHOPP projects also involve the addition of new culverts and the extension of existing culverts.

DRAFT for Review

Fish and Wildlife Connectivity

Other Assets and Objectives

Overview

The goal of the Fish and Wildlife Connectivity objective is to remediate barriers to fish and wildlife migration pathways at locations impeded by infrastructure along the SHS. Fish and wildlife migration barriers hinder recovery for threatened and endangered species listed under the California Endangered Species Act (CESA) and the Federal Endangered Species Act (FESA), while also introducing hazards to travelers due to animal vehicle collisions.

Fish barriers occur at locations where highways cross streams, rivers, and waterways through culverts and under bridges. As of August 2022, approximately 747 barriers to habitat have been identified on the SHS, with the highest priority locations supporting endangered Coho Salmon, Chinook Salmon, and Steelhead Trout. Migration pathways for threatened and endangered wildlife (amphibians, reptile, mammals) include streams, creeks, rivers, desert washes, migration flats, and draws that intersect with the SHS. As of September 2022, 45 priority wildlife connectivity culvert and bridge barriers have been identified that block threatened and endangered wildlife on the SHS, many of which overlap with animal-vehicle collision areas.

Barriers to both fish and wildlife often co-exist at crossing locations, creating opportunities to benefit multiple species. As projects are carried out to rehabilitate and/or replace aging culverts and bridges, innovative infrastructure solutions can serve to remediate both fish and wildlife barriers.

State and Federal mandates provide direction for the department on the assessment, identification, and remediation of fish and wildlife barriers on the SHS.

Streets and Highways Code, Section 156 (SB 857)[31], Kuehl, Chapter 589, Statutes of 2005), prohibits the new construction or continued maintenance (service life extension) or other upgrades of SHS culverts, bridges, or other in-channel barriers to upstream or downstream habitat for salmon and steelhead. Caltrans is required to assess road-stream crossings, prioritize barriers, and prepares an annual legislative report[32] for the status of progress to fund and remediate fish barriers. The code requires Caltrans to report completed assessments of potential fish passage barriers, completed remediations of priority fish passage barriers, planned and current funding of priority barriers, and to construct all new projects in a way that does not pose or create a barrier to fish passage for any life cycle of salmon or steelhead.

Assembly Bill 2344 (AB-2344)[33] requires partnerships with the California Department of Fish and Wildlife, other state, federal, and local partners, and the public to identify and remediate priority barriers to habitat for threatened and endangered wildlife species. Increasing permeability for species will further reduce animal vehicle collisions. To meet the new legislative requirements, Caltrans has engaged partners to identify priority barriers that block access to high-quality habitat and is further required to report assessments, identified barriers, and priority barriers, and to remediate barriers at identified priority locations where projects impair wildlife connectivity.

[31] SB 857 (2006), codified into Streets and Highways Code, https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=SHC&division=1.&title=&part=&chapter=1.&article=3.5.
[32] 2020 Fish Passage Annual Legislative Report, October 2021, https://dot.ca.gov/-/media/dot-media/programs/legislative-affairs/documents/fish_passage_report_2020-final-a11y.pdf
[33] Assembly Bill No. 2344, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB2344

Performance Metrics

The condition designations for fish and wildlife connectivity priorities are based on barrier assessments and habitat evaluation, which identify locations where highway infrastructure features (e.g., culverts, bridges, check dams, fill prisms, etc.) create barriers to fish passage or wildlife connectivity. Fish passage priority barriers are identified by Caltrans in coordination with other state, federal, and local partners, including the participants in the Fish Passage Advisory Committees and reported to Legislature annually. Similarly, wildlife connectivity barriers are identified through coordination with partners.

Locations where fish passage or wildlife connectivity barriers have been identified are designated as poor, while locations where deficiencies have been addressed (i.e., barriers have been remediated) are designated as good. A fair designation does not apply in the deficiency model.

Inventory of Deficiencies

As of August 2022, 108 priority fish passage barrier locations have been identified. Of the 108 locations, 15 are currently in the project pipeline, 21 have been identified for future planned projects, while the remaining are currently unplanned. All 108 priority locations have been reported (previously or currently) as priority barrier locations to Legislature. An additional 639 potential identified barrier locations across the state are being investigated by Districts and partners in the Fish Passage Advisory Committees (FishPAC)[34], to verify habitat suitability and to nominate and rank future priority locations.

As of September 2022, 45 priority wildlife barrier locations have been identified. All 45 locations are being reported as priority barrier locations and are not in currently planned or programmed projects. This inventory is anticipated to increase as additional assessments and studies are completed. Most of the open space areas adjacent to the State Highway System have not been studied or assessed for wildlife connectivity barriers. Like fish passage, it will take several years to identify and conduct statewide assessments to complete the inventory. Districts and their state, federal and local partners will continue to work together on assessments, studies, and other investigations to verify wildlife connectivity needs, to nominate priority barrier locations, and further collaborate to prioritize locations.

Performance Targets

In the 16 years since SB 857, Caltrans has partially or fully remediated 60 fish passage barriers on the SHS, improving access to approximately 910 miles of previously blocked habitat. At a rate of 3.75 remediation locations per year, the current identified total SHS barriers (747) would take close to 200 years to remediate. For a 50-year target, approximately 15 locations would need to be remediated annually. Table 5-20 shows the percentage of priority fish passage locations (82) that have a transportation maintenance or replacement need (67) or are already in the project pipeline (15), relative to the total number of identified priority fish passage barrier locations (108).

A limited number of wildlife connectivity remediation projects have been completed on the State Highway System. Over the next 5 to 10 years, assessments for impacted species are anticipated to identify several hundred barriers to wildlife. Depending on the total number of future identified barriers, performance targets will need to be reassessed. Table 5-20 shows the percentage of wildlife connectivity barrier

[34] California Fish Passage Advisory Committee, https://www.cafishpac.org/

locations that have a transportation maintenance or replacement need (18) relative to the total number of identified wildlife connectivity barrier locations (45).

Table 5-20 presents statewide asset performance targets based on the combination of priority fish passage and wildlife connectivity barriers with a transportation maintenance or replacement need.

Table 5-20. Fish and Wildlife Connectivity Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Fish and Wildlife Connectivity (Locations)	**65.4%**	**N/A**	**34.6%**	
Fish Passage Priority Barriers (Locations)	75.9%	N/A	24.1%	
Wildlife Connectivity Barriers (Locations)	40.0%	N/A	60.0%	

Other Performance Management Parameters

The unit costs for both fish and wildlife connectivity solutions were developed, considering historically employed remediation strategies, current best practices, and infrastructure solutions that benefit both fish and wildlife species. Where feasible, construction of full-span bridge and culvert strategies provide the most effective long-term solution. Four standard fish passage design solutions and respective average costs were used as the basis for the unit cost evaluation. Three standard wildlife connectivity solutions and respective average costs were used as the basis for the unit cost estimates. These solutions are primarily addressed through SHOPP Major projects, due to the scope and costs of the work. SHOPP project cost data from previous fish and wildlife connectivity projects were used as a basis, as well as Division of Engineering Services (DES) Structures preliminary estimates for accelerated bridge construction (ABC) pre-designed small bridges.

Typical Treatments

For fish passage, SHOPP projects include full-span small and large bridges, bottomless culverts, and long-term hydraulic solutions. For wildlife connectivity, SHOPP projects include pre-designed ABC bridges and viaducts, and bottomless RCB culvert solutions. These solutions include bridges and culverts that span the bankfull channel width and don't impede flow or natural stream processes, or existing migration feature.

Pre-designed ABC small bridges can be modified for site specific conditions to include length, skew, foundation type, rail, abutment type and depth. Identified foundations are either drilled or driven deep-water piles that avoid scour mitigation risk and require minimal rock slope protection to preclude flanking. Finally, long-term, full-span solutions reduce field maintenance related to under-sized culverts and bridges due to reduced scour risk and improved openness which reduces debris and sediment build up over time and allows for natural sediment transport.

These long-term, full-span solutions not only provide fish and wildlife connectivity, but also reduce field maintenance related to under-sized culverts and bridges, reduced scour risk, and reduce debris and sediment build up over time. Dry connectivity locations for terrestrial only connectivity priorities, low scour risk or non-hydraulic locations, can implement embedded Reinforced Concreate Boxes (RCB) or consider shallow slab foundations.

DRAFT for Review

Lighting Rehabilitation

Supplementary Asset

Overview

The Lighting Rehabilitation objective includes rehabilitation and replacement of roadway lighting systems (poles, foundations, luminaires, etc.) that have damage or deteriorated conditions because of aging, weather or other factors. Roadway lighting systems include streetlights, lights underneath overpasses, and lights in tunnels.

Lighting systems need to be updated to current technology and/or structural requirements to prevent structural failure, improve operational reliability, and reduce the use of electricity. Caltrans has converted significant portions of the SHS to Light-Emitting Diode (LED) lighting, and we continue to look at adaptive lighting solutions to further reduce power demand. The primary factor for this activity is asset age, since many of the points of deterioration are directly associated with system age. As lighting systems age, metal fatigue can set in, corrosion weakens the pole or base bolts, and wire can deteriorate to the point of insulation failure which will cause electrical failure.

Performance Metrics

The lighting systems' condition is primarily based on age. Age is calculated based on the original installation date of the lighting system. The replacement of the light by LED for tunnel or soffit lighting will change its condition to good. However, only replacing the lights by LED alone for other lighting systems is not considered as overall condition rating upgrade. Table 5-21 describes the performance metrics for determining condition for good, fair, and poor Lighting Rehabilitation.

Table 5-21. Lighting Rehabilitation Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Age of lighting system < 30 years**
Fair	**30 years ≤ Age of lighting system < 40 years**
Poor	**Age of lighting system ≥ 40 years**

Inventory and Condition

The SHS lighting systems' inventory is maintained in Caltrans Integrated Maintenance Management System (IMMS) and updated quarterly based on project accomplishments. Inventory and conditions for Lighting Rehabilitation, as of 2022, are presented in Table 5-22.

Table 5-22. Lighting Rehabilitation Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Lighting Rehabilitation (each)	**104,810**	**37.3%**	**14.6%**	**48.1%**	

Performance Targets

Table 5-23 presents the asset performance targets for Lighting Rehabilitation. Target conditions across all Supplementary Asset classes, including Lighting Rehabilitation, were proposed for revision and approved by the California Transportation Commission in the December 2021 meeting.[35]

Table 5-23. Lighting Rehabilitation Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Lighting Rehabilitation (each)	**45.0%**	**30.0%**	**25.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Deterioration rates for lighting are based on the service life of the asset. Specifically, on an annual basis a percentage of assets in good condition deteriorates to fair condition, while a percentage of assets in fair condition deteriorates to poor.

Unit costs are based on an analysis of historical cost data composed of capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The capital construction cost includes work associated with the construction, traffic handling, mobilization, supplemental work and contingencies.

In addition, lighting rehabilitation unit cost is based on two factors, highway lighting, and tunnel/soffit lighting. The highway lighting unit cost is calculated using an estimator tool employed by the electrical designers. The tunnel and soffit cost were based on a PID estimate for a tunnel lighting system in District 4. These were weighted together based on the performance gap quantities.

[35] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

Typical Treatments

Maintenance work, either with Field Maintenance Crews or Major Maintenance projects, is limited to treatment strategies such as re-lamping or replacing luminaires when they fail or when scheduled for mass replacement (end of life of the luminaire or lamp, but infrastructure is still in acceptable condition). Field Maintenance Crews may also replace individual poles that get damaged by others, but these repairs would not include upgrading the pole to current standard.

SHOPP projects include treatment strategies that completely rehabilitate and replace the existing lighting asset to current standards. For pole mounted roadway lighting, work would include replacing the foundation, pole, luminaire, and associated electrical wire. It may include underground components such as electrical conduit if it is not usable. For tunnel and soffit lighting, work would include replacement of the existing luminaire and electrical wire. Tunnel lighting control systems would also be upgraded by SHOPP. New control systems are needed to properly control new lighting technology such as LED and to make the system as efficient as possible.

DRAFT for Review

Major Damage

System Resiliency Objective

Overview

The Major Damage Restoration objectives were established in the 2017 SHSMP as a Reservation Model performance objective. Major Damage consists of Emergency Restoration and Permanent Restoration. These components are identified as separate SHOPP funding programs with distinct objectives.

A Director's Order is a formal document that grants legal authority by state Public Contract Code 10122 to set aside normal procedures for the advertising, bidding, and awarding of construction contracts because of an emergency or an urgent situation that is assessed as in the best interest of the state. This type of work may be eligible for federal assistance by either FHWA or Federal Emergency Management Agency (FEMA) depending on the significance of the incurred cost and Governor's Proclamation or President's Declaration.

From an asset management perspective, the condition of the state highway assets damaged in a catastrophic event may deteriorate drastically. However, following Caltrans emergency response, the conditions may go from poor, fair, or even good to the desired good condition. In the case of a Permanent Restoration response, it is expected that the conditions of the restored assets become good.

Emergency Restoration

The Emergency Restoration objective includes emergency repair of assets damaged or imminently threatened by natural or human-caused events. Qualifying repairs include those needed to restore essential travel. To be considered, the work is typically tied to an identifiable natural event such as a storm, flood, fire, earthquake, tsunami, or volcanic action. Human-caused events such as vehicle collisions,

explosions, civil unrest and acts of war or terrorism are included. Repair to current design standards is allowed. The level of repairs needed varies depending on the situation. Funding needs are estimated in real-time when the event(s) occur, based on the damage experienced and cost of repair. The goal is to repair 100 percent of damaged assets as soon as possible.

Permanent Restoration

The Permanent Restoration objective includes permanent repair and restoration of assets to pre-emergency condition and either follows or runs concurrently with the emergency restoration phase. Restoration to current design standards is allowed and may include elements of betterments. These projects go through the project development process and are mitigated in more depth than typical Emergency Restoration projects. However, they can be expedited into construction when the immediacy of an emergency arises during the design phase. The funding needs are more detailed and accurate compared to an Emergency Restoration project.

Typical Treatments

Field Maintenance Crews may respond as necessary to assist in clearing the roadway and providing for essential traffic after a natural or human-made emergency event. In some cases, Major Maintenance projects are also used. Emergency Restoration projects typically include any work or treatment that allows the roadway to open to essential traffic. This work may include earthwork, demolition, drainage, flood protection, or other major structural work or treatment. Any disaster-generated debris removal work is also allowed. In Permanent Restoration, projects are handled similarly to any other competitively bid and awarded contract. Typical work involves the reconstruction or replacement of the transportation facility.

DRAFT for Review

Office Buildings

Supplementary Asset

Overview

The Office Buildings objective includes major rehabilitation and/or replacement projects for Caltrans Office Buildings. The Administration Program, Division of Business Operations, is responsible for Caltrans Statewide Office Buildings (District and Headquarters). Some projects require external approvals, including from the State Transportation Agency, Department of General Services, Department of Finance, and the Legislature. The Division of Business Operations must be consulted for all SHOPP related projects for Office Buildings. As office building infrastructure deteriorates or becomes obsolete, the SHOPP objective may include major repair or replacement projects to address the facility operational and useful life issues. Projects may include those that improve building conditions or address critical infrastructure deficiencies, such as fire, life safety, seismic, code, or building system deficiencies. In light of COVID-19, projects will reflect Caltrans' shift towards telework, the modified use of workstations, and the reevaluation of space needs.

Performance Metrics

The inventory of Office Buildings in good condition remains fundamentally unchanged since the last SHSMP. If an office building is damaged, the damaged location is considered to be in poor condition and will require restoration or replacement. The goal is to award construction contracts within three years of damaging events for all known needs.

Table 5-24 describes the performance metrics that define the criteria for determining good, fair, and poor Office Building condition.

Table 5-24. Office Building Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	Fixed buildings 25 years old or less, modular buildings 10 years old or less and • All major building components (including, but not limited to conveyance, plumbing, HVAC, and fire protection) are functioning and efficient. Minor improvement or superficial repairs are addressed through routine maintenance. • No known structural issues (including, but not limited to substructure, shell, and interiors).
Fair	Fixed buildings between 26 and 50 years old, modular buildings between 11 and 20 years old and/or • Major building components are functioning but may not be efficient. Repairs may be needed but functioning as intended under maintenance. • Structural issues, if any, may show signs of minor wear.
Poor	Greater than 50 years for fixed buildings, greater than 20 years for modular buildings, and/or • Major building components have defects affecting function. • Structural issues are in visibly poor condition and should be replaced rather than repaired. They have exceeded their useful life and warrant structural review.

Inventory and Conditions

There are 10 primary Office Buildings in Caltrans' portfolio, including district and headquarters Office Buildings that are Caltrans owned and operated. Leased locations and Department of General Services owned locations are not included. Caltrans owns approximately 2.7 million square feet of Office Buildings. The inventory and conditions for Office Buildings, as of 2022, are presented in Table 5-25.

Table 5-25. Office Buildings Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Office Buildings (square feet)	**2,669,524**	**40.1%**	**32.3%**	**27.6%**	

Performance Targets

Table 5-26 presents the statewide asset performance targets for Office Buildings. Target conditions across all Supplementary Asset classes, including Office Buildings, were proposed for revision and approved by the California Transportation Commission in the December 2021 meeting[36].

Table 5-26. Office Buildings Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Office Buildings (square feet)	**50.0%**	**40.0%**	**10.0%**	

[36] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and, potentially, maintenance and other contributions.

Deterioration rates for Office Buildings are based on a combination of the asset's age, building component function, and structural condition. A percentage of assets in good condition may deteriorate to fair condition, while a percentage of assets in fair condition may deteriorate to poor. SHOPP projects primarily address assets in poor condition and restore the condition of the asset through rehabilitation or replacement. Maintenance activities focus on maintaining assets to be safe and functional for Caltrans employees, regardless of asset condition.

Unit costs for Office Buildings are based on estimates from the Department of General Services, which must be consulted for Office Building renovation and replacement projects. The unit costs are inclusive of both capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with the construction of Office Buildings, traffic handling, mobilization, supplemental work and contingencies. The replacement unit cost presented in Appendix B is subject to change in a future SHSMP based on revisions from the Department of General Services (DGS). Additionally, the square footages of any potential Office Building replacements would need to be determined. Replacement Office Buildings could be significantly larger than the existing ones especially if leases are terminated and the employees based there are moved to the new buildings. Larger replacement Office Buildings would greatly increase the gap cost in Appendix B.

Typical Treatments

The SHOPP may fund treatment strategies for Office Buildings that need major rehabilitation and/or replacement and that have deteriorated conditions or critical infrastructure deficiencies, such as fire, life safety, seismic, code, or other building deficiencies. Additionally, Government Code and State policy requires Department of Finance and Department of General Services approval and oversight for Office Building renovation and replacement projects. Reconstruction of Office Buildings is not completed by Field Maintenance Crews or by Major Maintenance projects.

DRAFT for Review

Overhead Sign Structures Rehabilitation

Supplementary Asset

Overview

The Overhead Sign Structure Rehabilitation objective includes replacing and upgrading overhead sign structures, which support overhead sign panels, that have damaged or have deteriorated due to aging, weather, or other factors. Overhead sign structures in the inventory generally fall into one of the following categories: Truss, Tubular, Box Beam, Closed Truss, Bridge Mounted, and Lightweight.

These structures are susceptible to corrosion, metal fatigue, and are exacerbated by the age of the structure. Many older structures were designed to previous standards and are at risk of failure because of metal fatigue from constant vibration.

Performance Metrics

The condition of Overhead Sign Structure assets is based on visual inspection of the structural elements classified as Good, Fair, or Poor. These elements include foundations, anchor bolts, base plates, column supports, arm/chord members and connection, etc. These conditions are not only based on inspections, but also on recommendations from Caltrans Division of Engineering Services on what types of structures are no longer acceptable and warrant replacement. Table 5-27 describes the performance metrics for determining condition for good, fair, and poor Overhead Sign Structure Rehabilitation.

Table 5-27. Overhead Sign Structures Rehabilitation Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Elements in new or like-new condition with no significant deficiencies.**
Fair	**Structures requiring minor repairs of the structural members or some degree of cleaning and painting.**
Poor	**Structures requiring removal/replacement or major on-site repair of the structural members. In addition, structure types that are known to be deficient such as box beam and tapered pole type of structures.**

Inventory and Condition

The inventory and condition survey of overhead sign structures is conducted by Structure Maintenance & Investigations from Caltrans Division of Maintenance. The latest inventory data is based on inspections that were conducted up to December of 2021. The inventory includes all overhead sign structures within the SHS right-of-way.

The inventory and conditions of Overhead Sign Structure Rehabilitation, based on the most recent inspection cycle, are presented in Table 5-28.

Table 5-28. Overhead Sign Structures Rehabilitation Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Overhead Sign Structures Rehabilitation (each)	**18,006**	**58.7%**	**34.7%**	**6.6%**	

Performance Targets

Table 5-29 presents the statewide asset performance targets for Overhead Sign Structure Rehabilitation. Target conditions across all Supplementary Asset classes, including Overhead Sign Structures, were proposed for revision and approved by the California Transportation Commission in the December 2021 meeting[37].

Table 5-29. Overhead Sign Structures Rehabilitation Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Overhead Sign Structures Rehabilitation (each)	**40.0%**	**45.0%**	**15.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Due to the overhead sign structures' condition criteria modifications, deterioration is based on the structures' expected design life. With this as the basis for deterioration, we expect to see a four percent annual deterioration from Good to Fair, and a four percent deterioration from Fair to Poor. This is consistent with general observations that deteriorating rates are expected to accelerate as these structures become older.

Unit costs are based on an analysis of historical cost data composed of capital construction and support costs. There is a wide variability in the cost of an overhead sign structure. It depends on many factors including the number of sign panels it is intended to support, and if it is attached to a bridge. Support costs are those associated with engineering and oversight

[37] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

work to design and construct the project. The estimated capital construction cost includes work associated with the construction, traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

Typical SHOPP treatment will include upgrading or reconstructing existing overhead sign structures to meet current design standards. Reconstruction of these structures is not completed by either field maintenance crews or by Major Maintenance projects.

DRAFT for Review

Pavement (Class 1, 2, and 3)

Primary Asset

Overview

Pavement is designed to support anticipated traffic loads and provide a safe and smooth driving surface. Keeping pavements in good condition lengthens its life, enhances safety, helps reduce user's operating costs, and reduces vehicle emissions. Rough roads cause more wear and tear on vehicles, increasing user costs, environmental impacts, and in some cases hindering mobility.

The SHS consists of two pavement surface types: asphalt and concrete. Types of asphalt pavements include pavement surfaced with conventional Hot Mix Asphalt (either open-graded or dense-graded), Rubberized Hot Mix Asphalt (either open-graded or gap-graded), chip seal, slurry seal, bonded wearing course, or other asphaltic materials. Concrete pavement types include Jointed Plain Concrete Pavement (JPCP), Continuously Reinforced Concrete Pavement (CRCP), and Precast Panel Concrete Pavement (PPCP).

Performance Metrics

Caltrans collects pavement condition data through APCS[38]. APCS data is collected by vans equipped with high-definition cameras and lasers to capture roadway and pavement images. An equipped profiler measures pavement contours and distresses for both NHS and SHS routes. Caltrans began this data collection effort as a pilot in 2011 and currently has data for 2015, 2016, 2018, 2019, 2020, and 2021. Caltrans reports pavement condition data to the Highway Performance Monitoring System (HPMS)[39], a national database maintained by FHWA.

Figure 5-4. Examples of Pavement Conditions

Pavement condition is assessed based on the final rule of the Federal MAP-21 performance measures as of January 2017. Fatigue Cracking, Rutting, and International Roughness Index (IRI) metrics are used to assess the condition of asphalt pavement; while transverse cracking, faulting and IRI metrics are used to assess the condition of JPCP. For CRCP, longitudinal cracking, punchouts, spalling, or other visible defects are considered instead of transverse cracking. For each of these metrics, FHWA has established thresholds as shown in Figure 5-4. For each tenth-mile long section, condition is rated good if all three metrics for this section are rated good; poor if two or more metrics are rated poor; and fair, otherwise. Lane miles in good, fair, and poor condition are tabulated for all sections to determine the overall percentage of pavement in good, fair, and poor condition. Caltrans uses additional metrics, beyond federal requirements, to assess pavement condition. For asphalt pavement, MAP-21 assessment does not include notable distresses such block cracking, longitudinal cracking, transverse cracking, potholes, bleeding, and raveling. For concrete pavement, MAP-21 assessment does not include notable distresses such as corner cracking and 3rd stage cracking. Table 5-30 describes MAP-21 performance metrics for determining condition for good, fair, and poor pavement.

[38] Automated Pavement Condition Survey (APCS), https://dot.ca.gov/programs/maintenance/pavement/pavement-management
[39] Highway Performance Monitoring System (HPMS), https://www.fhwa.dot.gov/policyinformation/hpms.cfm

Table 5-30. Pavement Performance Metrics

Performance Metrics			
Metrics	**Good**	**Fair**	**Poor**
IRI (inches/mile) all pavement types	**<95**	**95-170**	**>170**
Cracking (%)			
Asphalt	<5	5-20	>20
Jointed Concrete	<5	5-15	>15
Continuously Reinforced Concrete	<5	5-10	>10
Rutting (inches) asphalt only	**<0.20**	**0.20-0.40**	**>0.40**
Faulting (inches) JPCP only	**<0.10**	**0.10-0.15**	**>0.15**

Inventory and Condition

The SHS includes 50,019 lane miles of assessed pavements, based on APCS data collected from May 2021 to January 2022, following Caltrans' 2019 Linear Referencing System. Bridge decks and approach slabs are not included in the pavement inventory. SHS Pavements is associated with one of three primary classes, based on the functional classification of the roadway to which they belong. Throughout the SHSMP a shortened naming convention (e.g., "Pavement Class 1") is used in lieu of the full descriptive phrase (e.g., "Pavement on Roadway Class 1"). Figure 5-5 describes these primary classes.

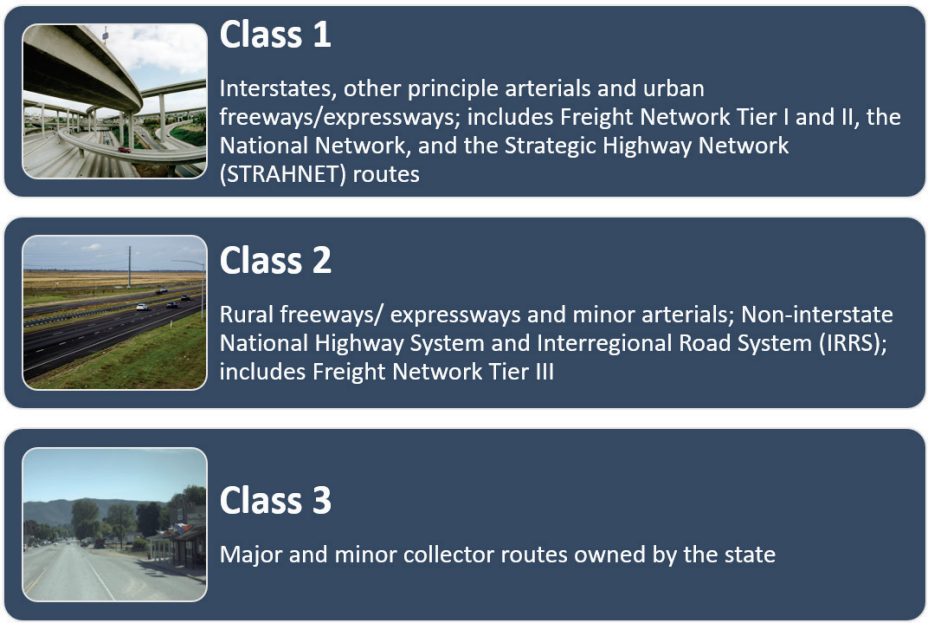


Figure 5-5. Pavement Classifications

The number of surveyed lane miles of pavement may vary between successive years due to accessibility. Fluctuations in the surveyed lanes miles may be attributed to lane closures due to active construction, weather-related safety issues, traffic accident, as well as lane relinquishments.

Caltrans strives to effectively manage the SHS pavement with the most cost-effective strategies over the long term. To maintain the system health, Caltrans has invested in Ground Penetrating Radar (GPR) and APCS and developed the Pavement Management System (PaveM). APCS data, along with GPR data, can be used to assess pavement condition and predict future performance. PaveM stores APCS data and can analyze pavement performance for every mile of roadway pavement. PaveM uses pavement condition, climate, traffic loading, and pavement history to recommend potential treatment locations and levels of investment considering performance and budgetary constraints.

Pavement condition changes over time because of construction activities, traffic loading, and environmental factors, such as aging and changes in temperature and moisture. These changes are captured over time as new data become available. The pavement inventory and conditions, as of 2021, are presented in Table 5-31.

Table 5-31. Pavement Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Pavement Class					
Total	**50,019**	**53.2%**	**45.5%**	**1.3%**	
Class 1 (lane miles)	**27,150**	**61.3%**	**37.4%**	**1.3%**	
Class 2 (lane miles)	**16,276**	**44.4%**	**54.4%**	**1.2%**	
Class 3 (lane miles)	**6,593**	**41.3%**	**57.1%**	**1.6%**	

Performance Targets

Table 5-32 presents the statewide asset performance targets for each Pavement class.

Table 5-32. Pavement Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Pavement Class				
Class 1 (lane miles)	**60.0%**	**39.0%**	**1.0%**	
Class 2 (lane miles)	**55.0%**	**43.0%**	**2.0%**	
Class 3 (lane miles)	**45.0%**	**53.0%**	**2.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

On an annual basis, a percentage of pavement assets in good condition naturally deteriorate to fair condition, while a smaller percentage of assets in fair condition deteriorates to poor. The term "deterioration" is generally used to refer to the loss of either the structural or functional qualities of the pavement that are often manifested as surface distresses or degradation of ride comfort and skid resistance. The design life of a pavement treatment is the time duration between construction and the time each performance metric (e.g., cracking, IRI, etc.) reaches a pre-selected performance threshold. Therefore, for a given pavement treatment there are a number of performance life spans; each depending on the performance being tracked in the analysis. PaveM utilizes performance modeling to project future pavement condition. Performance models are a function of pavement material, prior work, age, climate, truck traffic levels, treatment strategies, and investment levels.

Unit costs used to allocate funds for pavement repairs are composed of analyzed capital construction cost and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The capital construction cost is based on PaveM recommended treatments. This cost includes work associated with the construction of pavement, traffic management plans, stage construction, traffic handling and detours, mobilization, supplemental and state furnished work, contingencies, and other related costs typical encountered in pavement work. These related costs may include some earthwork, drainage, and landscape; traffic signing and striping such as striping, markings, delineators, signs, barricades, traffic control systems, changeable message signs, crash cushions, guard rails, and barriers;

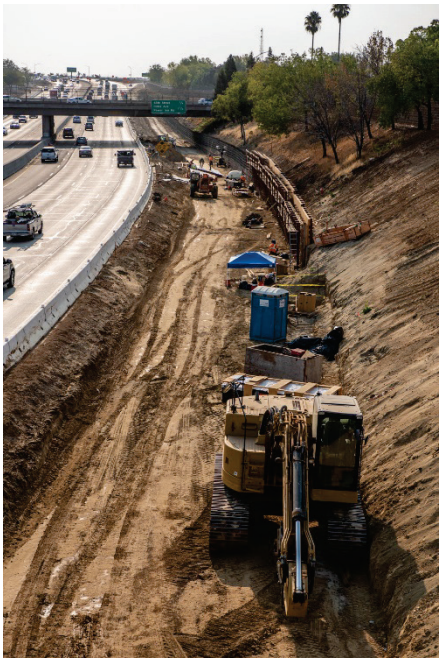
Americans with Disabilities Act (ADA) items such as curb ramps; curb and gutter items; and medians and islands.

Typical Treatments

Caltrans' Maintenance Program strives to use maintenance resources effectively to slow down pavement deterioration and maintain the SHS at the lowest possible long-term cost. The SHSMP uses preservation strategies on pavement conditions which benefit from this philosophy. PaveM is used to identify the right locations and times to perform pavement preservation to minimize future costs in the SHOPP (SHOPP avoidance). Pavement identified in fair condition may be targeted for no action or various preservation, corrective, or rehabilitation strategies.

Field Maintenance Crews perform treatment strategies such as crack sealing, digouts, pothole fixes, and spall repairs. Caltrans conducts an annual LOS evaluation to assess maintenance needs along the SHS. LOS is another way Caltrans measures pavement health or condition.

Major Maintenance projects are used to meet longer-term SHS maintenance needs. Preventive maintenance treatments include seal coats and thin overlays for asphalt pavements, or joint seal installation, grinding, and individual slab replacement for concrete pavements. Corrective maintenance treatments include dig-outs, cold in-place recycling, grinding, and individual slab replacements. By efficiently using these treatments, Caltrans can avoid more costly repairs in the future.



Capital Preventive Maintenance (CAPM) projects involve lower cost minor rehabilitation strategies for pavements that exhibit surface wear because of weather, aging, and traffic. CAPM-level projects typically have limited or minor structural damage that is more than what can be cost effectively addressed with Major Maintenance but less than needed for major pavement rehabilitation. CAPM strategies are intended to extend project service life for 5-15 years. CAPM strategies typically include pavement grinding to improve smoothness, individual slab replacements, and medium overlays. CAPM projects target primarily pavement work (thus are less expensive than a rehabilitation project) but can include safety/maintenance upgrades such as guardrails, worker safety, sign panels, striping, ADA curb ramps, and other items which do not require widening or realigning the roadway. CAPM projects are generally more costly than Major Maintenance projects and often require a longer lead-time to prepare the projects, due to the inclusion of other work.

The SHOPP funds treatment strategies such as rehabilitation projects that include major rehabilitation and replacement of pavement with significant structural distress (damage impacting the underlying layers of pavement) because of repeated loading and wear from trucks along with impacts from weather and aging of the pavement. A rehabilitated roadway should provide at least 20-40 years of service life with relatively low maintenance expenditures. Rehabilitation strategies include lane replacements, full depth recycling, and thick overlays.

When pavement requires major rehabilitation or replacement, it may be appropriate to include other work items to make operational and performance improvements, such as guardrail modifications, pedestrian and bicycle improvements, storm water or other environmental enhancements, shoulder improvements, and other valued transportation enhancements. These projects may require expensive environmental and cultural resource mitigation and longer development time.

Relinquishments

Other Assets and Objectives

Overview

The Relinquishment objective was established in the 2017 SHSMP as a Reservation Model performance objective. California SHC, Sections 73 and 73.5 defines the Commission's role and authority to relinquish a state highway. There are three types of relinquishments:

- Deletion of a state highway by legislative enactment.
- Superseding the existing state highway by relocation.
- Agreement with a local agency to accept a collateral facility that is not part of the main traveled way constructed by a state highway project.

The primary purpose is to relinquish state highway routes or portions of a route that no longer serve regional and statewide transportation needs. Relinquishments funded through the SHOPP are "in the best interest of the State." Additional benefits include:

- Eliminates the need for state encroachment permits, resulting in cost savings to the taxpayer.
- Reduction of ongoing state maintenance costs.
- Reduction in state tort liability.
- Decrease in incident response efforts.
- Decrease competition for capital funds for regional and statewide improvements.

Legislative relinquishments may require negotiation between Caltrans and a local agency. The associated cost to relinquish shall be based on a benefit-cost analysis using a 10-year analysis period, assumed interest rate based on the escalation rate used in the STIP, and appropriate costs and benefits specific to the portion of the state highway considered for relinquishment.

DRAFT for Review

Roadside Rehabilitation

Other Assets and Objectives

Overview

The Roadside Rehabilitation objective is to reduce the long-term cost of maintaining 32,000 acres of highway planting and related roadside infrastructure due to damage from extreme weather, acts of nature, or deterioration. This objective is met through the replacement, restoration, and rehabilitation of existing highway planting – bringing roadside planting to an established condition that requires minimal ongoing maintenance.

The Roadside Rehabilitation objective includes:

- Helping to integrate the highway facility with the adjacent community and surrounding environs in alignment with Caltrans Strategic Goal to "Advance Equity and Livability in All Communities".

- In alignment with Caltrans Strategic Goal to "Lead Climate Action":
  - Planting trees to reduce urban heat island effect.
  - Rehabilitate street trees and green streets on conventional highways.
  - Planting vegetation to support pollinator habitat
  - Maintaining irrigation systems to meet the following water conservation commitments and goals:
    - 2014 commitment to a 50% reduction in water use (against a 2013 baseline).
    - 2016 Goal (per Caltrans Continuing Drought Efforts 2016 Memorandum) to convert all irrigation systems to non-potable water sources by 2036.
    - 2021 Goal (per Executive Order N-10-21) to reduce an additional 15% in water use (against a 2020 baseline).

- Maintaining existing "Classified Landscaped Freeway[40]." A classified landscaped freeway is a section of freeway with ornamental vegetation planting that meets the criteria established by the California Code of Regulations, Outdoor Advertising Regulations, Title 4, Division 6. These activities limit the locations available for billboards and reduce potential driver distractions in alignment with the Caltrans Strategic Goal for "Safety".

Performance Metrics

Roadside rehabilitation condition is determined from criteria unique to Irrigated Roadside Rehabilitation areas and Non-Irrigated Roadside Rehabilitation areas. Table 5-33 describes the performance metrics that define the criteria for determining good, fair, and poor Roadside Rehabilitation condition. While the performance criteria and general condition of roadside areas has not changed significantly since the previous SHSMP, the score range has been extended from 0-3 to 0-100 to align with the conventional academic scoring criteria to communicate condition more clearly.

Table 5-33. Roadside Rehabilitation Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Total score ≥80**
Fair	**Total score ≥67 and ≤79**
Poor	**Total score ≤66**

Irrigated Roadside Rehabilitation Areas

For Irrigated Roadside Rehabilitation areas, the asset condition is determined from visual inspections and professional judgment that considers five factors:

1. Water Source – source of water: recycled, well water, non-potable.
2. Irrigation Efficiency – presence of smart irrigation controller, overall operational condition of irrigation system.
3. Plant Health and Longevity – general health of plant material.
4. Tree Canopy - percentage of canopy covering the roadside area.
5. Ground Plane - percentage of ground cover, shrub cover, and inert material (mulch) covering the ground.

Each of these criteria is evaluated and the roadside is assigned a condition rating. For additional detail on calculating the performance measure score, contact the Landscape Architecture Program.

[40] Classified Landscaped Freeway, https://dot.ca.gov/programs/design/lap-landscape-architecture-and-community-livability/lap-liv-b-classified-landscaped-freeways#:~:text=A%20classified%20landscaped%20freeway%20is,regulation%20of%20outdoor%20advertising%20displays.

Non-Irrigated Roadside Rehabilitation Areas

For Non-Irrigated Roadside Rehabilitation areas, the asset condition is determined from visual inspections and expert judgment that considers three factors:

1. Plant Health and Longevity – general health and drought tolerance of plant material
2. Tree Canopy - percentage of canopy covering the roadside planting area.
3. Ground Plane - percentage of ground cover, shrub, and inert material (mulch) covering the ground.

Each of these criteria is evaluated and the roadside is assigned a condition based on the total of these evaluations. For additional detail on calculating the performance measure score, contact the Landscape Architecture Program.

Inventory and Conditions

The inventory of Roadside Rehabilitation areas is surveyed by Caltrans districts, compiled by the Caltrans Landscape Architecture Program, and updated every two years. The inventory includes existing highway planting in all classified and non-classified landscaped freeways. The inventory and conditions of Roadside Rehabilitation, as of May 2022, are presented in Table 5-34.

Table 5-34. Roadside Rehabilitation Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	Inventory	Good	Fair	Poor	
Roadside Rehabilitation (acres)	**32,006**	**9.2%**	**20.2%**	**70.6%**	

Performance Targets

Table 5-35 presents the statewide asset performance targets for Roadside Rehabilitation.

Table 5-35. Roadside Rehabilitation Performance Targets

Desired State of Repair				
Objective (unit of measure)	Good	Fair	Poor	
Roadside Rehabilitation (acres)	**60.0%**	**30.0%**	**10.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, potential maintenance, and other contributions.

The future condition of roadside rehabilitation assets is projected using the effective annual deterioration rate as of 2023 SHSMP, which was based on the service life of the asset.

Unit costs for roadside rehabilitation are based on an analysis of historical cost data composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The capital construction cost includes work associated with the construction, traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

Field Maintenance Crews provide maintenance operations limited to those activities or treatments necessary to maintain a healthy roadside planting. These activities include minor repairs necessary to keep the irrigation system functioning.

Major Maintenance funds treatments related to the preservation of roadside elements to maintain and protect the overall integrity of the adjacent properties and the environment. These maintenance projects address specific items of concern for maintenance that need immediate attention and that, if not performed, could result in increased preservation needs requiring SHOPP funding in the future.

The SHOPP Roadside Rehabilitation program funds projects that include treatment strategies for the replacement, restoration, and rehabilitation of existing highway planting to preserve or improve the functional aspects of the planting. Typical projects include strategies for water conservation, achieved by; upgrading or replacing irrigation facilities; replacing planting to native or drought tolerant plant materials, and conversion to a non-potable water source.

DRAFT for Review

Protective Betterments

System Resiliency Objective

Overview

Protective Betterments (PB) objective refers to the Department's proactive approach to avert emergencies through the identification of existing vulnerabilities along highways and to reduce risk to the existing SHS assets.

Protective Betterments improve the overall condition of the SHS by correcting reoccurring deficiencies and mitigate the loss or impairment of life, health, property, or essential public services by:

- Installing new protective features within the SHS, or
- Modifying the existing function or character of the SHS asset to reduce or eliminate damages by natural or human-made events.

Performance Metrics

Protective Betterment is based on a deficiency model. Locations where a deficiency exists are designated as poor, while locations with deficiencies that have been addressed are designated as good. The fair designation does not apply in the deficiency model.

Inventory of Deficiencies

In 2018, the districts assessed and identified vulnerable roadway locations that could be reinforced for protection against failure during natural extreme events. Although deficiencies are being addressed through various projects, new vulnerable locations, discovered during the most recent highway system assessment with a focus on repeatedly damaged facilities, were added to the count of overall deficient locations. As of 2022, a total of 115 locations of Protective Betterments have been identified.

Performance Targets

The goal of the Protective Betterment objective is to address all identified vulnerable locations in the roadway system. However, due to the dynamic nature of natural events that often expose more vulnerable locations or the discovery of new, vulnerable locations, it is not realistic to assume that at the end of the 10-year cycle all vulnerabilities would be addressed.

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Unit costs are based on an analysis of historical data composed of capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimate capital construction cost includes work associated with the construction, traffic handling, mobilization, supplemental work and contingencies.

Typical Treatments

Protective Betterment protects infrastructure at vulnerable locations to reduce risk of roadway closures during anticipated natural events (storms, floods, landslides, etc.) or human-caused events. Typical SHOPP-funded treatments or projects may include protecting rock slopes, preventing rock fall, stabilizing slopes and trenches, improving retaining walls, improving pumping stations at depressed sections, and security improvements.

DRAFT for Review

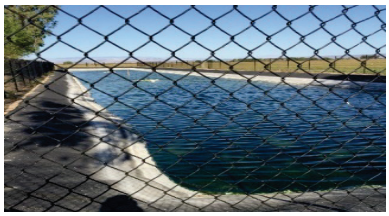
Safety Roadside Rest Area Rehabilitation

Supplementary Asset

Overview

The Safety Roadside Rest Area (SRRA) system is a safety component of the SHS which provides facilities to improve safety for the traveling public by allowing travelers to safely stop, rest, manage their travel needs and return to the highway more alert. California law states that SRRAs "should be provided so that, in combination with other stopping facilities, there shall be facilities available at intervals of approximately one-half hour's normal driving time."

The SRRA Rehabilitation objective is to reduce long-term maintenance costs by restoring facilities to a more maintainable condition, correcting deficiencies to comply with regulatory mandates, and improve comfort station capacity and site functionality at the 86 active SRRA locations in the SHS.



This objective includes addressing the following needs:

- Structure Improvements
  - Comfort Station reconstruction (teardown and rebuild)
  - Comfort Station renovation (restoration of existing structures)
  - Comfort Station capacity expansion
  - Auxiliary building reconstruction/renovation
  - Associated building utilities (electrical, sewer, water)
- Site Improvements, may include:
  - Shade Structures
  - Planting and inert materials.
  - Pedestrian circulation (sidewalks, trails, pedestrian core areas)
  - Misc. site furnishings (trash/recycling receptacles, bike racks, benches, etc.)
  - Pet Areas
  - Signage (traffic, pedestrian and way finding)
  - Traveler information displays and interpretive panels
  - Maintenance access roads/trails
- Utilities/Facilities
  - Irrigation system
  - Lighting (pedestrian, parking lot, and ramp)
  - Utility modifications resulting from building and site work (electrical, sewer, water). Potable water system
  - Wastewater system
- Compliance with regulatory mandates
  - ADA
  - Water Quality mandates and Regional Water Quality Control Board (RWQCB) regulations
  - California Division of Occupational Safety and Health (Cal/OSHA) regulations
  - California Green Building Standards Code (CALGreen)

Potable water is provided at most SRRAs from surface, ground, or municipal sources. Wastewater generated as SRRAs is typically treated onsite using one or a combination of (but not limited to); septic tank, leach field, sewer ponds, seepage pit, constructed wetlands, or an advanced treatment system. In some cases, the wastewater generated at a SRRA is captured and disposed of through self-contained units or diverted off-site through a municipal sewer connection. All SRRA facilities must comply with RWQCB and ADA requirements.

This objective does not address parking lot rehabilitation and/or expansion including ramp modifications that may be necessary to meet design standards. A paved parking area is a primary component of a SRRA facility. Keeping these paved parking areas in good condition lengthens its life, enhances safety, helps reduce user's operating costs. Rough pavements cause more wear and tear on vehicles, increasing user costs and in some cases hindering mobility. Performance metrics used for assessing the pavement condition will be developed in coordination with the Pavement program. Additionally, this objective does not include the needs associated with Vista Point rehabilitation and/or parking and Park & Ride facility rehabilitation.

Performance Metrics

The SRRA Rehabilitation assets' condition is determined considering facility age and additional technical input from District and Design and DES staff. Age is estimated from the original, reconstruction, or restoration date. Age-based rating alone is too simplistic to accurately assess the condition of each SRRA. For instance, intensity of use, local climatic conditions, as well as maintenance practices within each district impact the deterioration rate of the facility. In addition, achieving RWQCB compliance may require additional capital investment in water and wastewater treatment facilities.

Historically, the Safety Roadside Rest Area Rehabilitation and Water and Wastewater Treatment at Safety Roadside Rest Area performance objectives have been inventoried, rated, and constructed separately. The 2023 SHSMP combine the two objectives.

Table 5-36, Table 5-37, and Table 5-38 describe the basic performance metrics for determining condition for good, fair, poor for the two original objectives along with the approach for combining into one final asset condition describes the basic performance metrics for determining condition for good, fair, and poor Safety Roadside Rest Areas.

Table 5-36. Standalone Safety Roadside Rest Area Rehabilitation Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Age of building since reconstruction < 20 years (including additional criteria)**
Fair	**20 years ≤ Age of building since reconstruction < 30 years or Age of building since renovation < 20 years.**
Poor	**Age of building since reconstruction ≥ 30 years or Age of building since renovation ≥ 20 years**

Table 5-37. Safety Roadside Rest Area Rehabilitation Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	Age of water and wastewater treatment since reconstruction < 20 years + technical input
Fair	Age of facility since reconstruction ≥20 years < 30 years + technical input
Poor	Age of facility since reconstruction ≥ 30 years + technical input

Table 5-38. Safety Roadside Rest Area Rehabilitation Performance Metrics

Safety Roadside Rest Area Rehabilitation Performance Metrics		
Standalone Safety Roadside Rest Area Rehabilitation Condition	**Standalone Water and Wastewater Treatment Condition**	**Combine Condition**
Good	Good	Good
Good	Fair	Good
Good	Poor	Fair
Fair	Good	Fair
Fair	Fair	Fair
Fair	Poor	Fair
Poor	Good	Poor
Poor	Fair	Poor
Poor	Poor	Poor

Inventory and Conditions

The Landscape Architecture Program developed the inventory and condition assessment of SRRAs on the SHS. The inventory of SRRAs is consistent with little to no fluctuation in the number of SRRAs from one year to the next. The inventory condition ratings will be updated by each of the districts with input from the Landscape Architecture Program, DES, and District maintenance staff. Due to the complexity of the SRRAs, it is anticipated that the condition rating criteria and weighting of those criteria will be re-evaluated with each SHSMP cycle. This may result in the modification of the criteria and weights as well as the overall condition ratings for each SRRA with each future SHSMP development.

The inventory and conditions of Safety Roadside Rest Area Rehabilitation, as of 2022, are presented in Table 5-39.

Table 5-39. Safety Roadside Rest Area Rehabilitation Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Safety Roadside Rest Area Rehabilitation (locations)	**86**	**30.2%**	**41.9%**	**27.9%**	

Performance Targets

Table 5-40 presents the statewide asset performance targets for Safety Roadside Rest Area Rehabilitation. Target conditions across all Supplementary Asset classes, including Safety Roadside Rest Areas, were proposed for revision and approved by the California Transportation Commission in the December 2021 meeting.[41]

Table 5-40. Safety Roadside Rest Area Rehabilitation Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Safety Roadside Rest Area Rehabilitation (locations)	**30.0%**	**45.0%**	**25.0%**	

[41] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These include deterioration rates, capital, and support unit costs, and other SHOPP and maintenance project contributions.

The condition of SRRA assets in the future is projected using the effective annual deterioration rate as of 2023 SHSMP, which was primarily based on the service life of the asset.

Unit costs for SRRAs are based on an analysis of historical cost data composed of the capital construction and support costs.

Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with the construction of SRRA, traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

Field Maintenance Crews provide maintenance operations limited to those activities or treatments necessary to maintain safe and functioning SRRA facilities. Maintenance funded projects are used for projects related to the preservation, maintenance, and protection of the overall integrity of the SRRA facilities. These are minor projects that address specific items of concern for maintenance that need immediate attention and that, if not performed, could result in increased preservation needs requiring SHOPP funding in the future.

The SHOPP funded projects will reconstruct or renovate the existing poor or fair condition SRRA facilities. SHOPP funded projects as SRRA facilities with a condition rating of poor will typically be a full SRRA reconstruction and include comfort station reconstruction (teardown and rebuild), comfort station capacity expansion, auxiliary building reconstruction, Water and Wastewater Treatment reconstruction, reconstruction of other sitework as needed. SHOPP funded projects at SRRA facilities with a condition rating of fair is intended preserve and extend the functional life of the SRRA. These projects will typically include comfort station repair or renovation (restoration of existing structures), auxiliary building repair or renovation, Water and Wastewater Treatment repair or reconstruction, repair of other sitework as needed.

When the existing SRRA facilities cannot be kept open, in an operational and maintainable condition, to meet the needs of the traveling public at its current location, the SRRA may be relocated. This objective will fund the relocation of an existing facility.

DRAFT for Review

Sign Panel Replacement

Other Assets and Objectives

Overview

The Sign Panel Replacement objective is to replace all large overhead and roadside signs to meet federal requirements on retro reflectivity reducing the need for overhead sign lighting. Federal requirements for retro reflectivity are in place to ensure signs are visible at night and in inclement weather. The goal is to replace all signs with high-performance ASTM Type XI retroreflective sheeting. This type of retroreflective sheeting will increase sign service life 15 to 20 years and subsequently reduces annual replacement needs. Removal of the catwalks should assist to reduce the potential for graffiti and the need for graffiti mitigation. In addition, the elimination of overhead sign lighting will reduce Caltrans' maintenance and utility costs and contribute to Caltrans' goal for reduced greenhouse gas (GHG) footprint.

Performance Metrics

Sign panel asset condition is based on whether the sign panel has been replaced with high-performance ASTM Type XI retroreflective sheeting. Table 5-41 describes the performance metrics for determining good and poor Sign Panel Replacement.

Table 5-41. Sign Panel Replacement Performance Metrics

Performance Metrics	
Condition	**Metrics**
Good	**Sign panel has high-performance Type XI retroreflective sheeting less than 20 years old.**
Fair	**N/A**
Poor	**Sign panel does not have high-performance Type XI retroreflective sheeting or has high-performance retroreflective sheeting 20 years of age or older.**

Inventory and Conditions

The inventory of large sign panels in the SHS is maintained in Caltrans Integrated Maintenance Management System (IMMS). The number of sign panels is updated periodically and manually entered by district supervisors in IMMS. Sign panels include overhead, roadside two-post, and ground mounted sign panels. The inventory excludes one-post sign panels which are typically small and relatively inexpensive. The inventory and conditions for Sign Panel Replacement, as of 2022, are presented in Table 5-42.

Table 5-42. Sign Panel Replacement Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Sign Panel Replacement (each)	**87,131**	**13.4%**	**N/A**	**86.6%**	

Performance Targets

Caltrans has established a goal to replace all signs with the current standard for high-performance retroreflective sheeting or high-performance ASTM Type XI retroreflective sheeting. Table 5-43 presents the statewide asset performance targets for Sign Panel Replacement.

Table 5-43. Sign Panel Replacement Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Sign Panel Replacement (each)	**100.0%**		**0.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

The deterioration rates for sign panel are based on the service life of the asset once it is replaced with high-performance ASTM Type XI retroreflective sheeting. Specifically, on an annual basis a percentage of assets in good condition deteriorates to fair condition, while a percentage of assets in fair condition deteriorates to poor. It is anticipated that the service life of a sign with a new high-performance ASTM Type XI retroreflective sheeting will have an extended life of 15 to 20 years.

Unit costs are composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The capital construction cost includes work associated with the construction of sign panel replacement, traffic handling, mobilization, supplemental work, and contingencies. Separate average unit costs were calculated for overhead panels and two-post roadside panels.

Typical Treatments

In addition to large signs (overhead and roadside two-post, ground mounted sign panels), Caltrans owns nearly 500,000 small signs (one post signs; stop signs, speed limit signs, route shield signs, etc.), which are difficult to locate and track. Any of these signs can be maintained by Caltrans Field Maintenance Crews or funded by the SHOPP. Replacement of large signs is primarily completed through the SHOPP. Field Maintenance Crews replace and update small signs on a continuous basis.

DRAFT for Review

Storm Water Mitigation

Other Assets and Objectives

Overview

The Storm Water Mitigation objective ensures that Caltrans storm water discharges to waters of the State and waters of the United States meet the applicable water quality standards, through construction of control measures to meet the current National Pollutant Discharge Elimination System (NPDES) Permit requirements and other state and federal laws, such as the Porter-Cologne Water Quality Control Act, the Clean Water Act and evolving storm water requirements. On June 22, 2022, the State Water Board adopted the Caltrans NPDES Permit with more stringent regulations to address Total Maximum Daily Loads (TMDLs) from stormwater run-off from Caltrans right of way as compared with the previous permit (2012 NPDES Permit). In addition, the State Water Board adopted a Time Schedule Order (TSO) that requires Caltrans to be in compliance with TMDLs by December 31, 2034, with interim compliance milestones. The 2022 NPDES Permit also requires Caltrans to comply with the Statewide Trash Mandate by December 2, 2030, along with interim compliance milestones.

Performance Metrics

The condition designations for storm water mitigation are based on a deficiency model. Locations where a deficiency still exists as identified by the NPDES Permit are designated as poor, while locations with deficiencies that have been addressed are designated as good. The fair designation does not apply in the deficiency model.

Inventory of Deficiencies

Currently, Storm Water Mitigation is mandated by the NPDES Permit, TSO, and other applicable Water Boards' orders to address two categories of inventory:

- Total Maximum Daily Loads (TMDL) as well as Areas of Special Biological Significance (ASBS),
- Significant Trash Generating Areas (STGA)
    - Statewide within Caltrans ROW other than the Bay Area and the existing trash TMDLs in District 7, and
    - District 4 trash treatment area mandated by the Cease-and-Desist Order (CDO) No. R2-2019-0007 and amended by 2021 Order Number R2-2021-0030.

Total Maximum Daily Load (TMDL)

Section 303(d) of the federal Clean Water Act requires states (Regional Water Quality Control Boards and State Water Board in the State of California) to develop TMDLs for impaired waterbodies. A TMDL is a written plan adopted by a Regional Water Quality Control Board, and approved by the:

- State Water Board,
- United States Environmental Protection Agency (USEPA), and
- California Office of Administrative Law (OAL).

The TMDL Plan describes how an impaired water body will meet water quality standards. It contains a measurable feature to describe attainment of the water quality standard(s), a description of required actions to remove the impairment, and an allocation of responsibility among dischargers to act in the form of actions or water quality conditions for which each discharger is responsible. The 2022 Caltrans NPDES Permit and TSO require Caltrans to comply with 65 TMDLs where Caltrans is named a stakeholder in the TMDL.

Mandated by the 2012 permit, Caltrans used to report the progress of improving water quality in TMDL watersheds with the Compliance Unit mechanism. Under the 2022 permit, Caltrans is required to demonstrate that stormwater discharge from its right-of-way will meet individual water quality objectives for each of those 65 TMDLs. To meet the 2022 Permit compliance requirements consistently, Caltrans has revised the inventory of acres that need to address TMDL pollutant load reductions. The beginning inventory is 15,213 acres. The NPDES Permit and TSO require submittal of an initial TMDL Compliance Plan by June 22, 2023, and then yearly updates thereafter to State Water Board for approval. As Caltrans TMDL Compliance Plans are subject to the State Water Board approval, it is anticipated that Caltrans TMDL inventory may need to be adjusted in future State Highway Operation and Protection Program (SHOPP) cycles.

Failure to comply with pollutant load reductions could result in NPDES permit non-compliance and increased project delivery costs, including penalties. Caltrans can comply with TMDL interim and final milestones by:

- Multiple objective projects that incorporate storm water Treatment Best Management Practices (TBMPs)
- SHOPP Financial Contribution Only (FCO) projects
- Projects that incorporate Stand-alone TBMPs

- Post-construction treatment in TMDL Watersheds
- Projects in TMDL watersheds that place open-graded friction course (OGFC) pavement
- Cooperative implementation with local agencies
- Other pollution reduction practices necessary to comply with TMDLs

Significant Trash Generating Areas (STGA)

On April 7, 2015, the State Water Resource Control Board (SWRCB) adopted statewide Trash Control Provisions (Trash Provisions) by amending the Water Quality Control Plan for the Ocean Waters of California to Control Trash and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California. Based on the Trash Provisions and the California Water Code Section 13383, the State Water Board issued a Trash Control Order (Order) to Caltrans on June 2, 2017, requiring Caltrans to initiate compliance efforts to meet the Trash Provisions.

Per the Order, Caltrans submitted a Statewide Trash Implementation Plan dated April 12, 2019, to the State Water Board. The Statewide Trash Implementation Plan outlines the specific locations of STGAs within Caltrans right-of-way and provides an overview of Caltrans' plan for demonstration of compliance with the Trash Provisions. Caltrans identified a total of 16,645 acres of STGAs. As the 2022 Permit requires Caltrans to update the STGAs based on future reassessment, the current inventory of 16,645 acres may need adjustments.

Caltrans 2022 NPDES Permit incorporates 2015 Trash Provisions and require Caltrans to comply with:

- First Milestone: By December 2, 2025, Caltrans shall achieve full capture system equivalency at 35 percent or more of the 16,446 acres of Significant Trash Generating Areas identified in its April 12, 2019, Statewide Trash Implementation Plan submitted to the State Water Board.
- Second Milestone: By December 2, 2028, Caltrans shall achieve full capture system equivalency at 70 percent or more of the following:
    - The 16,446 acres identified in Caltrans April 12, 2019, Statewide Trash Implementation Plan submitted to the State Water Board, plus
    - The acres identified as STGAs in its Revised Trash Assessment Map required to be completed after submission of Revised Trash Assessment Methodology by January 1, 2023.
- Final Milestone: By December 2, 2030, Caltrans shall achieve full capture system equivalency at 100 percent of the acres identified as STGAs in the Revised Trash Assessment Map.

Caltrans estimates that fifty percent (50%) of the total acres of the 16,446 acres can be addressed through trash capture projects. Caltrans estimates that it will not be feasible to install trash capture devices at all STGAs due to cost concerns, right-of-way constraints, design considerations, and safety concerns associated with the maintenance of trash capture BMPs.

As described above Caltrans is required to submit a revised Trash Assessment Methodology for State Water Board approval and revise the Trash Assessment Map using approved methodology. It is anticipated that Caltrans STGA inventory may need adjustments in the next SHOPP cycle.

To meet compliance milestones, districts shall start putting more emphasis on Trash Control projects in current SHOPP cycle.

District 4 Cease and Desist Order (CDO)

On February 13, 2019, the San Francisco Bay Regional Water Quality Control Board (RWQCB-R2) issued a Cease-and-Desist Order (CDO) No. R2-2019-0007 as amended by Order R2-2021-0030 in 2021. The district 4 CDO requires Caltrans to implement structural and non-structural trash controls to meet full trash capture equivalency in CDO mandated areas no later than the following benchmark acreages and dates:

- 2,000 acres or more by June 30, 2020
- 4,000 acres or more by June 30, 2022
- 6,000 acres or more by June 30, 2024
- 8,800 acres or more by June 30, 2026
- All additional STGAs identified by visual assessments conducted in 2021, 2025, and 2029 by December 2, 2030

Performance Targets

The goal of the Storm Water Mitigation objective is to address the remaining deficiencies:

- 12,186 TMDL acres including deficient acres for ASBS
- 9,142 acres of STGAs statewide including District 4

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital, and support unit costs, SHOPP, and potentially maintenance and other contributions.

The requirements of the storm water regulations are dynamic in nature. The cost of delivering storm water improvements can vary significantly, so performance is planned to be achieved through a cost-effective mix of multi-objective asset management projects, FCO projects, and stand-alone BMP retrofit projects.

Storm water quality improvements can also be constructed economically by addressing this deficiency as a satellite need to an anchor project belonging to a major asset category.

Typical Treatments

In consultation with the SWRCB, Caltrans uses the following methods to address TMDL pollutant load reduction and trash control requirements:

- Caltrans SHOPP projects (storm water mitigation stand-alone and multi-objective projects)
- Caltrans SHOPP storm water FCO projects (in partnership with local agencies)
- Caltrans SHOPP projects, that include post-construction storm water BMPs; and pavement projects placing OGFC in TMDL watersheds
- Other Non-SHOPP projects that pursue partnerships with local agencies
- Non-structural controls which require enhanced litter removal to meet visual assessment standards

Caltrans prioritizes its storm water related activities and addresses TMDLs and STGAs through implementation of source control measures, TBMPs, and other pollutant reduction activities. Caltrans will use asset management principles and multi-objective decision analysis during project planning and programming to optimize the achievement of acres treated through the SHOPP program. Caltrans will continue to collaborate with the State Water Board and Regional Water Quality Control Boards to achieve maximum water quality benefit economically and efficiently.

DRAFT for Review

Transportation Management Systems

Primary Asset

Overview

A Transportation Management System (TMS) is a vast connected system of electrical/electronic field elements and advanced vehicle detection technologies that work together to reduce highway user delay, enable optimization of traffic flow, provide traveler information and safety alerts, collect information on traffic behavior and contribute to the reduction of greenhouse gas emissions. These TMS units are an integral part of the SHS, performing critical functions that keep people, vehicles, and goods moving.

TMS unit types include several different TMS field units defined further in the Inventory and Condition Section, but also include the associated communications infrastructure and central system servers and software that support their operation and connection to the district Transportation Management Centers (TMC). TMS units such as traffic signals and ramp meters control the flow of traffic on the SHS to optimize efficiency. Central and communications systems that connect to TMS units enable system operators to detect highway incidents and dispatch assistance or provide information about detours to minimize congestion related to incidents. FHWA estimates that these incidents account for approximately one-third of delay on any highway system. In addition to providing real-time data for system operators and travelers, TMS units also provide historical data to help system planners and engineers forecast and plan transportation projects.

The existing inventory of TMS units represents a significant historical investment by Caltrans and its partners. Many of these units are over ten years old and are approaching the end of their expected life cycles. They will require replacement in the next five to ten years.

TMS units are also collectively referred to nationally as Intelligent Transportation Systems (ITS). For the purposes of asset management, performance targets focus on the nine core types of TMS units. In addition, there are several types of central system software and communications systems (including leased lines, dedicated fiber, and microwave links) that are required to manage the TMS units remotely. While not currently explicitly enumerated as core TMS units, these systems are integral to remotely managing and

monitoring TMS units and are often included as part of TMS projects or separate projects altogether. Furthermore, as newer technologies become available and are deployed to support connected and automated vehicles in the TMS infrastructure, the number and types of TMS units are expected to continue to grow.

Caltrans works diligently to keep TMS units functioning as intended. In addition to performing preventive maintenance checks, per Chapter K of the *Caltrans Maintenance Manual, Volume 1*[42], Caltrans has developed active monitoring and regular functional check programs to maintain and continuously improve the TMS up-time health.

Performance Metrics

For asset management purposes, TMS units are categorized as being in either good or poor condition. The condition of a TMS unit is based on the unit being within its expected life cycle and its functional availability. A TMS unit is functionally available if it doesn't have chronic downtime issues as determined by the District Maintenance and Traffic Operations staff.

Table 5-44 describes the performance metrics for determining good and poor Transportation Management Systems. Table 5-45 presents a matrix for all combinations of life cycle and functional availability and relationship to good and poor condition designations.

Table 5-44. Transportation Management Systems Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Within expected life cycle and consistent functional availability**
Fair	**N/A**
Poor	**Beyond expected life cycle or is not meeting functional availability because of chronic down time**

Table 5-45. Transportation Management Systems Unit Condition

Unit Condition				
Criteria	**Good**	**Poor**		
Is the Unit within Life Cycle?	**Yes**	**No**	**Yes**	**No**
Is the Unit consistently functionally available?	**Yes**	**Yes**	**No**	**No**

[42] Caltrans Maintenance Manual, Chapter K, Volume 1, https://dot.ca.gov/-/media/dot-media/programs/maintenance/documents/27-chpt-k-july-2014-a11y.pdf

Inventory and Conditions

There are over 20,000 TMS units on the SHS. The nine core types of TMS units include:

- Traffic signals
- Freeway ramp meters
- Changeable message signs
- Extinguishable message signs
- Closed circuit televisions
- Traffic monitoring detection stations
- Traffic census stations
- Roadway weather information systems
- Highway advisory radios

In the future, TMS units such as central systems, connected and automated vehicle (CAV) systems, broadband telecommunication systems, and newer TMS unit technologies may be included, expanding the list of core TMS units. As TMS technologies are improved, the need for broadband along the SHS will increase and broadband will be expanded to cover the strategic corridors. Newer technologies such as off-pavement detection or multi-function TMS such as cameras that provide both high-definition video, detection data, and video analytics will require more bandwidth, as they capture and send more data back to the TMCs and remote data management servers. As adaptive traffic signal and freeway ramp metering methods are adopted and deployed, the bandwidth will need to be supported by broadband technologies. The inventory and conditions for TMS, as of June 2022, are presented in Table 5-46.

Table 5-46. Transportation Management Systems Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Transportation Management Systems (each)	**20,298**	**77.8%**	**N/A**	**22.2%**	

Performance Targets

Table 5-47 presents the statewide asset performance targets for TMS.

Table 5-47. Transportation Management Systems Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Transportation Management Systems (each)	**90.0%**	**N/A**	**10.0%**	

Caltrans has established two targets to bring 90 percent TMS units to good condition:

1. TMS Life Cycle Health – 90 percent within expected life cycle
2. TMS Up-time Health – 90 percent TMS units functional

For Caltrans to meet these targets, a collaborative effort between Caltrans Division of Traffic Operations and the Division of Maintenance is required. Traffic Operations is focusing on the Life Cycle Health target and Maintenance is focusing on the Up-time Health target.

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially Major Maintenance (HM) and other maintenance treatments.

By the end of 2033, approximately a over 11,000 TMS will have gone beyond their life cycles and deteriorated to poor condition. The Life Cycle Health is based on the life cycle of the technological components of a TMS (i.e., camera, controller, other electronics) and because of the electronic nature of the components, condition can go from good to poor quickly. As such, there is no intermediate condition. Technological life cycles may be affected by industry obsolesce, changes in standards, geographical location, and environmental factors.

The deterioration rate of a TMS unit is based on the service life of the unit as compared to either the original installation date, technology refresh date, or the most recent life cycle replacement date. SHOPP life cycle replacement projects primarily address TMS units in Poor Life Cycle Health condition and restore the Life Cycle Health condition of the unit. Maintenance primarily focuses on keeping the TMS units functional and prolonging the TMS service life. The functional availability of a TMS unit is an indicator of its condition. A TMS unit that does not meet the functional availability criteria is flagged as chronic, an indicator of poor health, and may need an early life cycle replacement through a SHOPP or HM project.

Unit costs are based on an analysis of historical cost data composed of the communication, capital construction, and support costs. Communication costs are those associated with providing communication for the TMS. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with TMS such as traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

Field Maintenance Crews perform preventive maintenance on a regular basis to maintain the up-time health of the system, and to achieve maximum service life of the TMS Units. The entire TMS inventory requires, on an average, over 80,000 preventive maintenance checks and repairs annually to maintain a goal LOS of 100 for Traffic Signals and 90 for all other TMS units. Maintenance checks for traffic signals take priority over other TMS units, ensuring safety of the traveling public. Maintenance uses a combination of treatments by Field Maintenance Crews and 'as needed' service contracts to maintain TMS units. Field Maintenance addresses preventive maintenance checks and repairs. As needed maintenance service contracts (TOSNET) are used to enhance Field Maintenance Electrical Crews response for the repairs and preventive maintenance of the field units as well as the communication infrastructure. The electrical crews use the TOSNET contract when they do not have the expertise or the personnel to respond in a timely manner, exercising their first right of refusal. The repairs could include the maintenance of wireless communication systems, fiber optic cables, copper cable, and communications hubs. Without active monitoring, preventive maintenance, and regular functional checks, TMS units may not function properly, may decline to poor condition sooner, and may not provide reliable data to the TMCs or be able to provide accurate and reliable information to the motoring public.

The SHOPP or HM programs address units which are at the end of life, obsolete, or otherwise non-functional because of chronic operational issues. These projects could include treatments that address system failures, systemic repairs, replacements, or upgrades. The SHOPP typically addresses units needing complete replacement while the HM program focuses on repair/replacements needed at the subcomponent level to keep the units functional. HM treatments may sometimes result in changing the condition of a unit from 'Poor' to 'Good'. The goal is to bring 90 percent of TMS units in good condition by end of year 2027.

DRAFT for Review

Transportation Management System Structures

Other Assets and Objectives

Overview

Transportation Management Systems (TMS) infrastructure are the physical structure support components which the TMS may typically be mounted on. These units may include the steel pole, mast arms, foundation, pull boxes, conduit, or other non-technology components of a TMS. TMS units are an integral part of the SHS, performing critical functions that keep people, vehicles, and goods moving.

The existing inventory of TMS units represents a significant historical investment by Caltrans and its partners. A number of these TMS Structures are over forty years old and approaching the end of their fifty year expected life cycles. They will require replacement in the next five to ten years.

Performance Metrics

For asset management purposes, TMS Structure components are categorized as being in either good or poor condition. The condition of the structure components of a TMS unit is based on the unit being within its expected life cycle. Table 5-48 describes the performance metrics for determining good and poor Transportation Management System Structures.

Table 5-48. Transportation Management System Structures Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Within expected life cycle of 50 years**
Fair	**N/A**
Poor	**Beyond expected life cycle**

Table 5-49 further illustrates the criteria for determining good and poor condition.

Table 5-49. Transportation Management System Structures Unit Condition

Unit Condition		
Criteria	**Good**	**Poor**
Is the Unit within Life Cycle?	**Yes**	**No**

Inventory and Conditions

The inventory and conditions for TMS structure components, as of June 2022, are presented in Table 5-50.

Table 5-50. Transportation Management Systems Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Transportation Management System Structures (each)	**20,298**	**96.3%**	**N/A**	**3.7%**	

Performance Targets

Table 5-51 presents the statewide asset performance targets for TMS Structures.

Table 5-51. Transportation Management System Structures Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Transportation Management System Structures (each)	**90.0%**	**N/A**	**10.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

By the end of 2033, over 1,000 TMS Structures will have gone beyond their expected life cycles and deteriorated to poor condition. Structural components life cycles may be affected by changes in standards, geographical location, and environmental factors.

The deterioration rate of a structural component of a TMS Structures unit is based on the expected service life of the unit as compared to either the original installation date or the most recent life cycle replacement date. SHOPP life cycle replacement projects primarily address TMS Structures units in Poor Life Cycle Health condition and restore the Life Cycle Health condition of the unit. Although not common, structural issues can affect the functional availability of a TMS Structures unit. As an example, structural components that are frequently getting damaged by vehicular impacts (knockdown) may be an indicator that the TMS Structures unit is installed at a bad location, and as a result, may not be able to consistently perform its function.

Unit costs are based on an analysis of historical cost data composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with TMS Structures such as traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

Field Maintenance Crews perform preventive maintenance on a regular basis to maintain up-time health of the system and to achieve a maximum service life of the TMS Units. The entire TMS inventory requires, on an average, over 80,000 preventive maintenance checks and repairs annually to maintain a goal LOS of 100 for Traffic Signals and 90 for all other TMS units. Maintenance treatments for structural issues mostly involve maintaining the structures to prevent premature deterioration, such as minor painting to slow corrosion. Maintenance check activities include monitoring the structures for signs of deterioration and reporting to appropriate engineering units if significant issues are noticed. Maintenance will also replace structural components if damaged by vehicular impacts (knockdowns).

The SHOPP typically addresses units which are at the end of life, flagged by Maintenance in poor condition due to environmental factors, or installed at a location frequently damaged by travelling vehicles. These projects could include treatments that address system failures, systemic repairs, replacements, or upgrades.

DRAFT for Review

Transportation Related Facilities

Supplementary Asset

Overview

The Transportation Related Facilities (TRF) objective includes correcting building and site deficiencies associated with worker safety, Cal/OSHA and ADA, as well as improve operational efficiency at equipment shops, maintenance facilities, transportation management centers and transportation material and testing laboratories. The goal is to have only 20% TRFs in poor condition.

Performance Metrics

The condition of TRF is based on the age of the building. Table 5-52 describes the performance metrics for determining condition for good, fair, and poor TRFs.

Table 5-52. Transportation Related Facilities Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Buildings less than or equal to 20 years old**
Fair	**Buildings between 20 and 40 years old**
Poor	**Buildings greater than 40 years old**

Inventory and Conditions

Caltrans owns over 4 million square feet of Transportation Related Facilities. This also entails office trailers and modular buildings that are greater than 950 square feet. Leased Locations are excluded. Although TRF condition is based on building age for this SHSMP, a Facility Condition Index (FCI) tool has been developed by a consultant to provide a more comprehensive approach for assessing facility conditions. The FCI tool is based on industry standards for prioritizing maintenance planning and budgeting for facility conditions. The FCI tool is currently being reviewed for approval for statewide implementation. The inventory and conditions of Transportation Related Facilities, as of June 2022, are presented in Table 5-53.

Table 5-53. Transportation Related Facilities Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Transportation Related Facilities (square feet)	**4,665,081**	**24.4%**	**15.3%**	**60.3%**	

Performance Targets

Table 5-54 presents the statewide asset performance targets for Transportation Related Facilities. Target conditions across all Supplementary Asset classes, including Transportation Related Facilities, were proposed for revision and approved by the California Transportation Commission in the December 2021 meeting[43].

Table 5-54. Transportation Related Facilities Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Transportation Related Facilities (square feet)	**40.0%**	**40.0%**	**20.0%**	

[43] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, maintenance and potentially other contributions.

Deterioration rates for TRF are based on the age of the asset. Specifically, on an annual basis a percentage of assets in good condition deteriorates to fair condition, while a percentage of assets in fair condition deteriorates to poor. SHOPP projects primarily address assets in poor condition and restore the condition of the asset, while maintenance focuses on maintaining assets in good condition as well as addressing assets in fair condition.

Unit costs for TRFs are based on the average costs of past programmed SHOPP projects to design and construct TRFs, which include the engineering and oversight work and the construction capital costs to build the facilities.

Typical Treatments

Major Maintenance projects are used for the repair and replacement of defective, obsolete, or worn-out building components, or site features, at Transportation Related Facilities. Proposed projects target building infrastructure that enables or enhances program delivery. Such projects include treatment strategies that repair and replace lighting, heating ventilation and air conditioning and cooling, utilities (sewer, water, electrical), reroofing, and remodeling of interior space to increase efficiency.

Typical SHOPP projects include treatment strategies to rehabilitate, restore, and replace existing facilities, or the construction of new facilities to current design standards that provide a safe and functional working environment to meet operational needs.

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Weigh-In-Motion Scales

Supplementary Asset

Overview

Weigh-In-Motion (WIM) Scales are devices installed in the SHS pavement to weigh and classify vehicles as they travel at highway speeds. These systems can calculate the gross vehicle weight of any car or truck, the speed, and measure the individual axle weights and spacing to determine vehicle classifications. This information is used to fulfill federal mandates and to determine enforcement needs. It is also used to collect data needed to calculate bridge and pavement conditions, to better perform safety analysis, and to meet the special operational needs of trucks. WIM data is processed, validated, and disseminated to other Caltrans areas that utilize the data such as HPMS, Highway Cost Allocation Studies (HCAS), Structures, Transportation System Network (TSN) and Pavement Analysis and Vehicle Enforcement Strategic Information (PAVES-IT).

Performance Metrics

The WIM Scales' condition is based on the age of WIM, equipment functionality, and semi-annual onsite field maintenance inspections. Based on historical data, a typical California WIM life cycle is 25 years. WIM stations older than 25 years are generally considered in poor condition and planned for replacement, as functional reliability becomes a more prominent factor. Additionally, any WIM stations that are less than 25 years but are functionally unreliable are also considered in poor condition. However, WIM's that are older than 25 years but are functionally reliable are considered in fair condition. Per FHWA WIM pocket guide, the life expectancy of WIM scales are approximately 10 years. Any WIM that are less than 10 years old are considered in good condition.

Table 5-55 describes the performance metrics for determining condition for good, fair, and poor WIM Scales.

Table 5-55. Weigh-In-Motion Scales Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	• **WIM is less than or equal to 10 years old AND** • **WIM is functional**
Fair	• **WIM is older than 10 years AND** • **WIM is functional**
Poor	• **WIM is not functionally reliable**

Inventory and Conditions

Currently, there are 159 WIM Scales located over 635 lanes on the mainline SHS. A typical WIM Scale is comprised of various instrumentation, such as associated concrete pavement, piezoelectric sensors, electronics, poles, mast arms, conduits, and controller cabinets. The mainline scales consist of 107 sites that are considered as "Data" WIMs, 30 sites considered as "Bypass" WIMs, 8 sites considered as both "Data" and "Bypass" WIMs and 14 "In-station" WIMs located at Commercial Vehicle Enforcement Facilities (CVEF) used by CHP that are neither "Data" or "Bypass." In the prior SHSMP assessments, the inventory did not account for existing or newly constructed In-station WIM Scales.

The condition of WIM Scales is based on the age of the WIM, equipment functionality, and semi-annual onsite field maintenance inspections. Based on historical data, a typical California WIM life cycle is 25 years. WIM stations older than 25 years are generally considered in poor condition and planned for replacement, as functional reliability becomes a prominent factor. Furthermore, WIM's older than 25 years are considered in fair condition if they are functionally reliable. The inventory and conditions of WIM Scales, as of 2022, are presented in Table 5-56.

Table 5-56. Weigh-In-Motion Scales Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Weigh-In Motion Scales (stations)	**159**	**35.2%**	**57.9%**	**6.9%**	

Performance Targets

Table 5-57 provides the statewide asset performance targets for WIM Scales. Target conditions across all Supplementary Asset classes, including Weigh-In-Motion Scales, were proposed for revision and approved by the California Transportation Commission in the December 2021 meeting[44].

Table 5-57. Weigh-In-Motion Scales Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Weigh-In-Motion Scales (stations)	**40.0%**	**50.0%**	**10.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

The deterioration rate for WIM Scales is based on the asset's service life. Specifically, on an annual basis, a percentage of assets in good condition deteriorate to fair condition while a percentage of assets in fair condition deteriorate to poor. SHOPP projects primarily replace assets in poor condition, while maintenance focuses on maintaining assets in good condition as well addressing assets in fair condition.

The unit cost for WIM Scales is based on an analysis of historical data composed of the capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction includes work associated with the average construction cost of a four lane WIM Scale project that includes traffic handling, mobilization, supplemental work, and contingencies.

[44] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

Typical Treatments

Typical WIM Scale maintenance treatments are routinely performed by a WIM maintenance service contract. However, Field Maintenance Crews may be needed to assist with issues such as pull-box repairs, cabinet replacements, communication line work, and other minor repairs.

The SHOPP funds projects designed to build new WIM Scales or to reconstruct existing poor condition sites. Typical treatments include rehabilitating existing WIM systems with minor concrete to improve smoothness and surface crack corrections, or to improve the non-standard pavement roadway length of the WIM. In addition, some WIM installations are handled as Minor A projects funded by SHOPP reservations.

DRAFT for Review

5.3 Climate Action

Goal: Lead Climate Action

Caltrans' climate change efforts have continued to advance with development and implementation of the Climate Action Plan for Transportation Infrastructure (CAPTI), which lays out ongoing and new initiatives to achieve the state's climate goals. This plan provides a vision for how future state and federal transportation investments can be prioritized to meet climate goals for a more resilient transportation system that is sustainable, equitable, and healthy for every Californian. CAPTI is:

This strategic goal focuses the department's efforts to:

- A holistic framework and statement of intent for aligning state transportation infrastructure investments with state climate, health, and social equity goals built on the foundation of the fix-it-first approach established in SB 1.
- A suite of ongoing and needed changes to state transportation planning, project scoping, programming and mitigation activities to align with the CAPTI investment framework.
- A living document that can adapt, pivot, and modify approaches and actions as needed.
- A structure to monitor and evaluate progress of the transportation sectors efforts to align with state climate, health, and equity goals.

Key efforts undertaken and planned by Caltrans are highlighted below with additional information on the policies and orders associated with this endeavor.

Numerous executive orders and legislative bills have been passed to reduce emissions statewide. Standards to reduce GHG emissions were initially established under AB 32 – California's Global Warming Solutions Act of 2006, which sets the GHG emission target to 1990 levels by 2020. Additional legislation was passed in 2016, SB 32, which established GHG emission reduction targets of 40 percent below 1990 levels by 2030. SB 32 was preceded by Executive Order (EO) B-30-15[45], which also mandated state agencies "take climate change into account in their planning and investment decisions and employ full life cycle accounting to evaluate and compare infrastructure investments and alternatives."

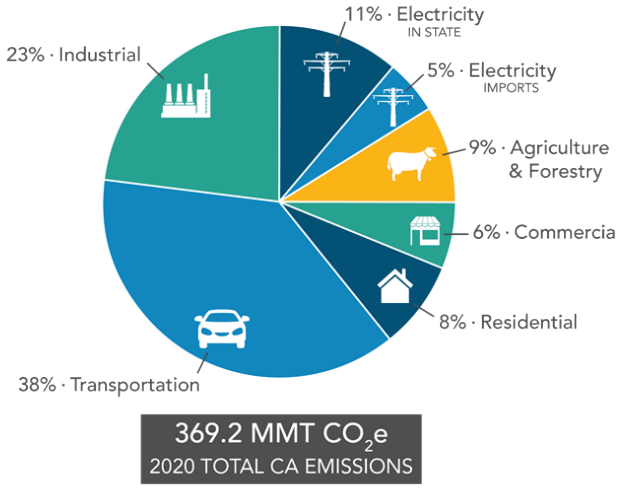


Figure 5-6. California's greenhouse gas emissions in 2020 broken out by economic sector, California Air Resources Board

In September 2019, Governor Newsom signed Executive Order N 19-19 calling on state agencies to redouble "efforts to reduce greenhouse gas emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy" for California. The Executive Order called on the Transportation Agency to leverage more than $5 billion in discretionary state transportation funds to reduce GHG emissions in the transportation sector and adapt to climate change. The Executive Order directs CalSTA to align transportation spending with the State's Climate Change Scoping Plan where feasible; direct investments to strategically support smart growth to increase infill housing production; reduce congestion through strategies that encourage a reduction in driving and invest further in walking, biking, and transit; and ensure that overall transportation costs for low-income Californians do not increase as a result of these policies.

Zero Emission Vehicles (ZEV)

Executive Order N-79-20 set new statewide goals for phasing out gasoline-powered cars and trucks in California. Under the Order, 100% of in-state sales of new passenger cars and trucks sold are to be zero-emission by 2035; 100% of in-state sales of medium- and heavy-duty trucks and bus sold and operated are to be zero-emission by 2045, but only where feasible; and 100% of off-road vehicles and equipment sales are to be zero-emission by 2035 where feasible. The Governor also directed the California Air Resources Board ("CARB") and other state agencies to develop regulations or take other steps within existing authority to achieve these goals. The Order builds on a series of emission reduction legislation and executive orders in recent years intended to drastically reduce greenhouse gas ("GHG") emissions from sources within the state. For example, in 2016, Senate Bill 32 set a statewide target to reduce GHG emissions to 40% below 1990 levels by 2030. The 100 Percent Clean Energy Act of 2018 set a statewide target that all retail sales of electricity in California come from eligible renewable energy and zero-carbon resources by 2045. Executive Order B55-18, also issued in 2018, set a statewide target to achieve carbon neutrality no later than 2045.

[45] Governor's Office, Executive Order B-30-15, 2015, https://www.ca.gov/archive/gov39/2015/04/29/news18938/

In October 2016, Governor Brown released its updated ZEV Action Plan, setting new strategies and targets to help accelerate the adoption of zero-emission technologies in California. Consistent with the Governor's ZEV Action Plan, Caltrans programmed 14 projects in the 2018 SHOPP that included a component to install publicly accessible, fast-charging DC stations for electric vehicles at 40 Caltrans-owned locations. These projects, which include work unrelated to ZEV, have a total cost of $54.7 million.

Implementation of EO N-79-20 requires multi-agency and non-state agency efforts to meet the goals and objectives of the program. Caltrans released the ZEV Action Plan 2.0 in March 2021 submitted to the Governor's Office of Business and Economic Development (GO-Biz) on an annual basis that guides Caltrans ZEV-related policies and plans. This plan has seven key categories of implementation, with a major component being the conversion of Caltrans fleet to zero emission vehicles, addressing key gaps in ZEV fueling networks and integrating complete streets consistent with the Mode Share Action Plan 2.0.

In August 2022, a new Assistant Deputy Director for Transportation Electrification joined the Department to set new direction on reducing greenhouse gas emissions from the transportation sector to accelerate the deployment of zero-emission vehicles and charging infrastructure and to champion the transition to zero-emission transit, rail and freight systems.

IIJA funding is expected to support the installation of EV charging stations statewide at Caltrans maintenance and equipment shop facilities.

Climate Adaptation and Resilience

Overview

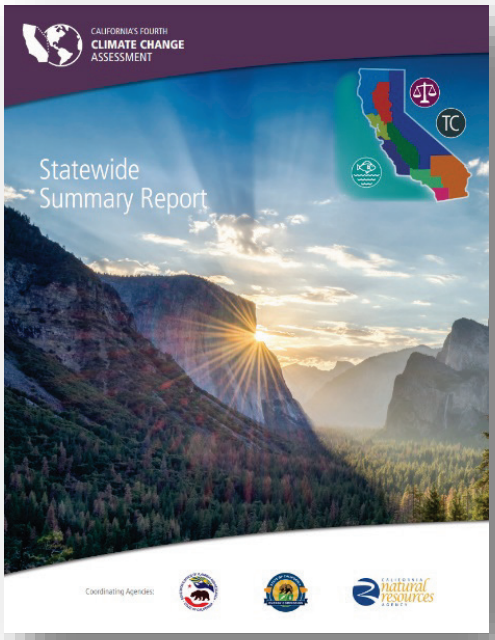
Reducing GHG emissions is only one part of the overall approach to addressing climate change. Caltrans must plan for the effects of climate change on the state's transportation infrastructure and strengthen or protect the facilities from damage. Climate change is already leading to increased variability in precipitation, rising temperatures, rising sea levels, variability in storm surges and their intensity, and in the frequency and intensity of wildfires. Flooding and erosion can damage or wash out roads; longer periods of intense heat can buckle pavement and railroad tracks; storm surges combined with a rising sea level can inundate highways. Wildfire can directly burn facilities and indirectly cause damage when rain falls on denuded slopes that landslide after a fire. Effects will vary by location and may, in the most extreme cases, require that a facility be relocated or redesigned. Accordingly, Caltrans must consider these types of climate stressors in how highways are planned, designed, built, operated, and maintained, to ensure overall resilience of the transportation system to climate impacts.

There are a broad range of federal and state policies, guidance, tools, regulations, and Executive Orders that drive State DOT transportation investments, planning, and project considerations related to climate change, risks, and system resilience. A comprehensive listing can be found on the Caltrans Air Quality and Climate Change website[46].

The Climate Action Plan for Transportation Infrastructure (CAPTI) outlines a holistic framework that aligns the state's transportation infrastructure investments with the state's climate, health, and social equity goals, while also maintaining the commitment made in Senate Bill (SB) 1 to a fix-it-first approach to transportation. The Infrastructure Investment and Jobs Act (IIJA) of 2021 established the Promoting Resilient Operations for Transformative, Efficient, and Cost Saving Transportation (PROTECT) formula funding program to help make surface transportation more resilient to natural hazards, including climate change impacts. In California, Senate Bill (SB)198 established two programs to oversee the state's implementation of PROTECT funds: the State Transportation Infrastructure Climate Adaptation Program and the Local Transportation Infrastructure Project Program. The State Transportation Infrastructure Climate Adaptation Program oversees State system PROTECT funds through the SHOPP and adds additional requirements around consideration of climate risk and alignment with State of California adaptation planning guidance. The Local Transportation Infrastructure Climate Adaptation Project Program will be administered by the California Transportation Commission, and it includes the local/regional PROTECT funds.

[46] Caltrans Air Quality and Climate Change website, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change

California's Fourth Climate Change Assessment[47] from 2018 represents the state's effort to "translate the state of climate science into useful information for action." It provides information that will help decision makers across sectors and at state, regional, and local scales protect and build the resilience of the state's people, infrastructure, natural systems, working lands, and waters. The Fourth Assessment reports that if no measures are taken to reduce GHG emissions by 2021 or sooner, projected increases in average annual maximum daily temperatures will have impacts on agriculture, energy demand, natural systems, and public health; significant declines in water supply; an increase in average area burned by wildfire; and large-scale erosion of beaches and inundation of residential and commercial buildings and transportation infrastructure due to sea level rise. Miles of coastal highways vulnerable to flooding are expected to increase more than three-fold by 2100. The Fourth Assessment's findings highlight the need for proactive action to address these current and future impacts of climate change.



Caltrans Adaptation and Resilience Planning and Implementation

Caltrans completed climate change vulnerability assessments in 2019[48] to identify segments of the State Highway System vulnerable to climate change effects of precipitation, temperature, wildfire, storm surge, and sea level rise. The climate change data in the Caltrans Vulnerability Assessments were developed in coordination with climate change scientists and experts at federal, state, and regional organizations at the forefront of climate science. The findings of the Vulnerability Assessments guide analysis of at-risk assets and development of District Adaptation Priority Reports[49] as a tool to inform capital programming decisions to address identified risks. Caltrans is launching an update to the Vulnerability Assessments this winter in 2023 to keep pace with the latest climate science, and to broaden analysis to include transit and rail, as well as development of risk metrics to assist with Caltrans districts' ability to prioritize at-risk assets for project development.

Caltrans is continuously developing guidance to inform the integration of climate risk assessment and adaptation strategies from early planning throughout project scoping and development. For example, released in *2022 Corridor Planning Guidance: Climate Change Emphasis Area Guide*[50] provides guidance for transportation corridor planning with respect to climate change. Building on the 2019 Vulnerability

[47] California's Fourth Climate Change Assessment, 2018, https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf
[48] 2019 Climate Change Vulnerability Assessments, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2019-climate-change-vulnerability-assessments
[49] 2020 Adaptation Priorities Reports, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2020-adaptation-priorities-reports
[50] Climate Change Emphasis Area Guidance for Corridor Planning, 2022, https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/cc-ea-guide-for-corridor-planning-march2022-a11y.pdf

Assessments and forthcoming update, climate change planners in each district will develop Adaptation Project Prioritization Assessments that will inform evaluation of adaptation needs in subsequent SHSMPs.

Climate Adaptation and Resilience in the SHSMP

The SHSMP addresses the primary climate impacts posing risks to Caltrans' infrastructure: changes in temperature, changes in precipitation, wildfire risk, and sea level rise. These impacts affect the State's transportation system differently and require a variety of strategies to increase resilience to these risks. Consideration of potential risks related to changes in temperature, precipitation, and wildfire must be integrated into all projects, which can be evaluated using tools such as the Caltrans Vulnerability Assessments and Adaptation Priority Reports.

Caltrans is pursuing adaptation strategies in implementing FHWA PROTECT funds to SHOPP projects. These projects include adding shade trees and shelters for extreme heat to support transit and active transportation, rock slope stabilization, and filling gaps for wildfire resilience not addressed in the Maintenance Division, amongst other strategies.

For sea level rise, Caltrans must pursue a combination of the above along with standalone projects to adapt the system to sea level rise and coastal stressors. Caltrans' understanding of exposure and adaptation measures that are required for the transportation system will need to consider options that relate to the short, medium, and long term—as well as how individual assets relate to one another in providing corridor, or network level, transportation over time. The 2021 SHSMP provided the first consideration of sea level rise as a performance objective; this 2023 SHSMP advances incremental improvements to the characterization of sea level rise exposure as well as the investment need for the overall inventory of deficient assets out to 2100 and the near-term considerations for the 10-year plan horizon. In future SHSMPs, characterizing statewide sea level rise resilience will include an inventory of exposure and tracking adaptation progress that reflects individual, standalone projects where infrastructure is threatened with repeated instances of flooding or disruption, as well as how District priorities relate and contribute to overall statewide resilience over time.

Changes in Temperature

California is expected to see increased in annual average maximum temperatures throughout the 21st century compared to historical baseline averages[51]. In addition, the state is expected to experience more frequent and intense prolonged heatwaves. Higher temperatures can cause pavement to soften and expand, leading to premature rutting and potholes, particularly in high-traffic areas, and can place stress on bridge joints. Heat waves can also have impacts to human health and may limit construction activities, particularly in areas with high humidity. Development of projects need to consider the potential for increased temperatures to affect materials selection, landscaping options and drive consideration for potential solutions to provide relief from extreme temperatures in proposed active transportation/ complete streets projects. Project activities may include increasing shade tree cover and providing transit shelters to reduce heat impacts.

[51] Climate Change Impacts Across California, https://lao.ca.gov/Publications/Report/4575

Changes in Precipitation

California has historically experienced varying ranges of annual snowfall and rain totals. Variations of storm events that can cause heavy winter precipitation can exacerbate potential for increased flooding and associated structural damage (landslides, erosion, and washouts) to transportation assets. Future climate projections also indicate that the variance between wet and dry years may become more extreme, leading to more dry years and heavier storm events (Caltrans Vulnerability Assessment Statewide Summary). Though specific information regarding exact precipitation changes and potential adaptation solutions are still being refined, consideration is needed for this potential for infrastructure damage. Potential solutions may include, but are not limited to, evaluation of culvert size to withstand potential for future increased precipitation events, possible changes to roadway profile that may reduce risk of flooding, and whether rock slope protection would provide protection from associated flood related impacts.

Wildfire Risk

State highway assets are located within natural settings that are under intensifying climate stress, particularly from wildfire and post-fire changes in watershed condition. Assets within moderate to severe CalFire designated Fire Hazard Severity Zones (FHSZ) are vulnerable to frequent damage from wildfire, which increases when high fuel loading is not managed or maintained along highways, particularly in wildland-urban-interface areas (WUI) where urban development transitions to open space. Climate adaptation action and planning by initiating landscape (forest and vegetation) management and maintenance for roadside resilience ensures the users of the state highways system and assets are better protected from wildfire impacts, resulting in long term reduction in threat.

In addition to the vulnerability assessments and adaptation priority reports, Caltrans prepared the 2020 *Caltrans Wildfire Vulnerability Highway Assessment*[52], providing a comprehensive assessment of the vulnerability and risk of wildfire to Caltrans-owned state highways with maps and other products. The analysis considers a variety of factors contributing to wildfire and its spread and uses data sets from CAL FIRE, US Department of Agriculture, US Census Bureau, and Caltrans that identified a total of 2,671 centerline miles that could benefit from fuel load reduction and create defensible space along Caltrans highway rights-of-way.

Caltrans is addressing the threats from wildfires through a combination of initiatives. The Roadside Fire Fuels Reduction effort[53] is a major Caltrans maintenance program initiative that aims to create defensible space near highways to reduce fire danger. Defensible space is a buffer created between infrastructure assets and the surrounding vegetation. This space helps to slow down or stop the spread of wildfire and protects infrastructure from associated heat related impacts. This work can include selectively removing hazardous trees and fire fuels, replacing existing landscaping with fire resistant plants, and extending areas beyond existing assets by removing dead vegetation, trimming of trees and brush and by mowing down grass.

Additionally, projects may consider efforts to improve wildfire resilience through the consideration of materials selection within project scope. This includes activities such as replacing wood posts for metal beam guardrail with metal posts, consideration of metal culvert replacement instead of plastic lining in fire prone areas and potential for use of concrete weed barrier to enhance vegetation management activities.

Sea Level Rise

Adaptation to Sea Level Rise was introduced as a new performance objective in the 2021 SHSMP, implementing findings and recommendations from the *2019 Caltrans Climate Change Vulnerability Assessment*[54] reports and the sea level rise and storm surge data sets underlying these analyses. Those reports used the latest advances from the scientific community available at that time in projecting how much sea levels may rise, impacts of inundation, erosion, and storm surge on the highway infrastructure, quantification of risk tolerance, and overall strategies to inform transportation decision making. Since finalizing the 2021 SHSMP, the *2020 Caltrans Adaptation Priorities Reports*[55] have been finalized, providing an analysis of risk and consequence for potentially exposed assets on the State Highway System from climate stressors for each Caltrans District.

Sea level rise represents a long-term threat to the transportation system near all coastal areas including the external coastline, the San Francisco Bay, Suisun Marsh, and Sacramento-San Joaquin Delta. The Delta is and will continue to experience not only sea level rise, but also more extreme inflows from the Sacramento, San Joaquin and Cosumnes river watersheds—these combined hydrodynamic impacts from riverine and oceanic

[52] 2020 Caltrans Wildfire Vulnerability Highway Assessment, https://dot.ca.gov/-/media/dot-media/programs/maintenance/documents/roadside-fire-fuels/executive-summary---caltrans-method-for-prioritizing-fuel-load-reduction-projects-040620-a11y.pdf

[53] Roadside Fire Fuels Reduction, https://dot.ca.gov/programs/maintenance/roadside-fire-fuels

[54] 2019 Climate Change Vulnerability Assessments, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2019-climate-change-vulnerability-assessments

[55] 2020 Adaptation Priorities Reports, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2020-adaptation-priorities-reports

forces will increase overall water levels throughout the Delta and Suisun Marsh through which several highways are located and anticipated to be at risk.

Already, impacts from sea level rise have disrupted the transportation system as roadways are flooded or undermined and eroded from wave action—and going forward, as seas continue to rise—these stressors will worsen and impact all aspects of California's coastal economies—including tourism, agriculture, and coastal dependent industries—as well as the quality of life enjoyed by our residents.

As climate change and rising seas affect our transportation system, these events will disrupt the daily lives of Californians, upset coastal economies, risk public safety, contribute to losses of ecosystems that provide habitat for rare and endangered species, and impede public access and recreation in these coastal areas. The effects of thermal expansion of ocean water combined with glacial and ice sheet melting is leading to higher sea levels around the world. California has an extensive coastline, with state highway facilities providing much of the access to the coastal areas. Sea level rise will exacerbate the flooding that could occur in these areas during regular tidal or storm events. For Caltrans, this means that many of its coastal roads, bridges, and supporting facilities could face risk of inundation or damage in the future.

Sea level rise projections as characterized in the 2018 *State Sea Level Rise Guidance* by the Ocean Protection Council[56] are derived from combinations of two primary factors, specifically:

- Emissions Scenarios: Scenarios are developed for projected future CO2 levels, ranging from a high estimate (RCP 8.5) consistent with a future in which there are no significant global efforts to limit or reduce emissions, to a low estimate (RCP 2.6) which is a stringent emissions reduction scenario that assumes that global greenhouse gas emissions will be significantly curtailed.
- Risk Tolerance Scenarios: A suite of discreet probabilistic scenarios (e.g., "5% probability sea level rise meets or exceeds…") and a single deterministic worst-case scenario (H++) that covers the range from low risk aversion to extreme risk aversion.

These sea level rise projections are presented in the *State of California Sea Level Rise Guidance, 2018 Update*[57] which provides statistical ranges of sea level rise for future years based on the latest science

[56] State of California Sea-Level Rise Guidance, 2018 Update, https://opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf
[57] State of California Sea-Level Rise Guidance, 2018 Update, https://opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf

outlined in Ocean Protection Council's 2017 report, *Rising Seas in California*[58]. Figure 5-7 shows an example of projections of sea level rise for San Francisco, considering the combinations of risk and emissions factors.

While there is no one prescribed value for sea level rise projections that are applicable to all infrastructure or assets for use across the State of California, given the long life and high dollar investments made in the transportation network, several ranges of sea level rise projections need to be evaluated when making investment decisions. Ocean Protection Council suggests the following in the 2018 guidance: "for high consequence projects with a design life beyond 2050 that have little to no adaptive capacity, would be irreversibly destroyed or significantly costly to relocate/repair, or would have considerable public health, public safety or environmental impacts should this level of sea-level rise occur, the H++ extreme scenario should be included in planning and adaptation strategies (e.g. coastal power plant)."

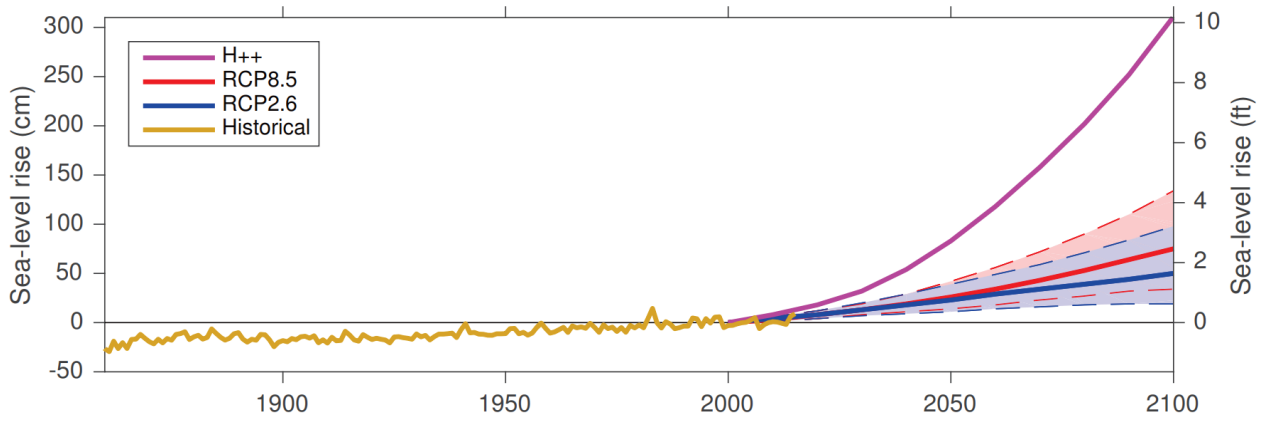


Figure 5-7. Projected Sea Level Rise in San Francisco for range of emissions and risk parameters

[58] Rising Seas in California: An update on Sea-Level Rise Science, April 2017, https://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf

Adaptation Strategies for Sea Level Rise

Inundation is the most immediately recognizable impact to roadways. When water levels rise above the surface of the roadways, they become impassable. Storm surge can add to inundation, raising water levels and introducing surge forces. Increased wave action can exacerbate cliff retreat potentially resulting in collapse of cliff face along roadway stretches. The roadways can also be affected well before the water level rises above the roadway surface. As the water table rises, pavement subgrade materials can degrade causing increased maintenance costs and shortened service life. Drainage systems can become ineffective, exacerbating water damage. Other ancillary roadway assets can be damaged from inundation, such as traffic detection systems, underground communications systems, signs, signals, roadside rest areas, embankments, guardrails, walls, landscaping, etc.

Bridges and large culverts are vulnerable to impacts of sea level rise and storm surge. Rising groundwater can saturate bridge foundation systems, leading to loss of stability, corrosion, and other material erosion. Inundated foundations in waterway crossings can accelerate scour at bridge foundations. Bridge approaches (where the roadway transitions to the bridge deck) can become exposed to storm surge and damage. Surge and wave effects can damage various bridge components (e.g., rails, bearings). These impacts can all lead to a bridge being unavailable for use. Furthermore, rising sea levels can impair ship passage in key freight waterways.

Four broad categories of adaptation strategies are available to adapt roadway and bridge to potential sea level rise impacts (defend, accommodate, retreat or changes in policies or practices). Table 5-58 provides general description of the types of activities that would fall withing the broad adaptation categories.

Table 5-58. Roadway and Bridge Adaptation Strategies

Approach	Adaptation Option	Considered in Analysis?
Defend	Provide major structural protection	**Yes**
	Provide protection at existing elevations/locations	**Yes**
	Utilize nature-based solutions to protect assets like vegetated dunes, cobble berms, marsh sills, tidal benches, oyster reefs, and eelgrass beds	No
Accommodate	Elevate the infrastructure above the impact zone	**Yes**
	Enhance drainage to minimize closure time and/or deterioration levels	No
Retreat	Abandon infrastructure	No
	Relocate infrastructure or realign highway outside of exposed areas	**Yes**
	Temporarily restrict use of infrastructure	No
Changes in policies or practices	Increase the infrastructure's maintenance and inspection interval and continue to monitor/evaluate	No
	Modify land use and development policies to account for future impacts	No
	Develop a detailed detour plan for assets susceptible to temporary flooding	No

Development of Cost Estimates for Sea-Level Rise Adaptation

Estimating the costs of adapting the highway system to sea level rise is extremely challenging due to the range of scientific and cost factors that compound uncertainties at every step in the calculations. The leading environmental models to predict sea level rise can have a large range of expected impacts to the highway system due primarily to inundation, storm surge and cliff retreat. The strategies to adapt the state highway system to increase resilience and minimize risks from sea level rise also cover a broad range of costs and can be very different depending on several site-specific variables, including, but not limited to, the type of infrastructure, the surrounding terrain, environmental, and community concerns.

For the purposes of developing a general concept of statewide costs to adapt to sea level rise threat, preliminary estimates were developed using a scenario-based exposure risk evaluation. This evaluation considered impacts to two primary highway assets – roadways and bridges. These highway assets are expected to be subjected to the damaging effects of climate change and sea level rise resulting in coastal flooding, inundation, storm surge, erosion, landslides, and cliff failures. The adaptation options considered were generally those that entail protecting, reconstructing, or relocating existing roadways and bridges. These strategies include constructing levees or walls to protect the existing highway infrastructure, elevating roadways on fill or constructing causeways to accommodate rising water levels, reconstructing bridges vulnerable to inundation and storm surge impacts, or relocating roadways to higher ground away from the water line.

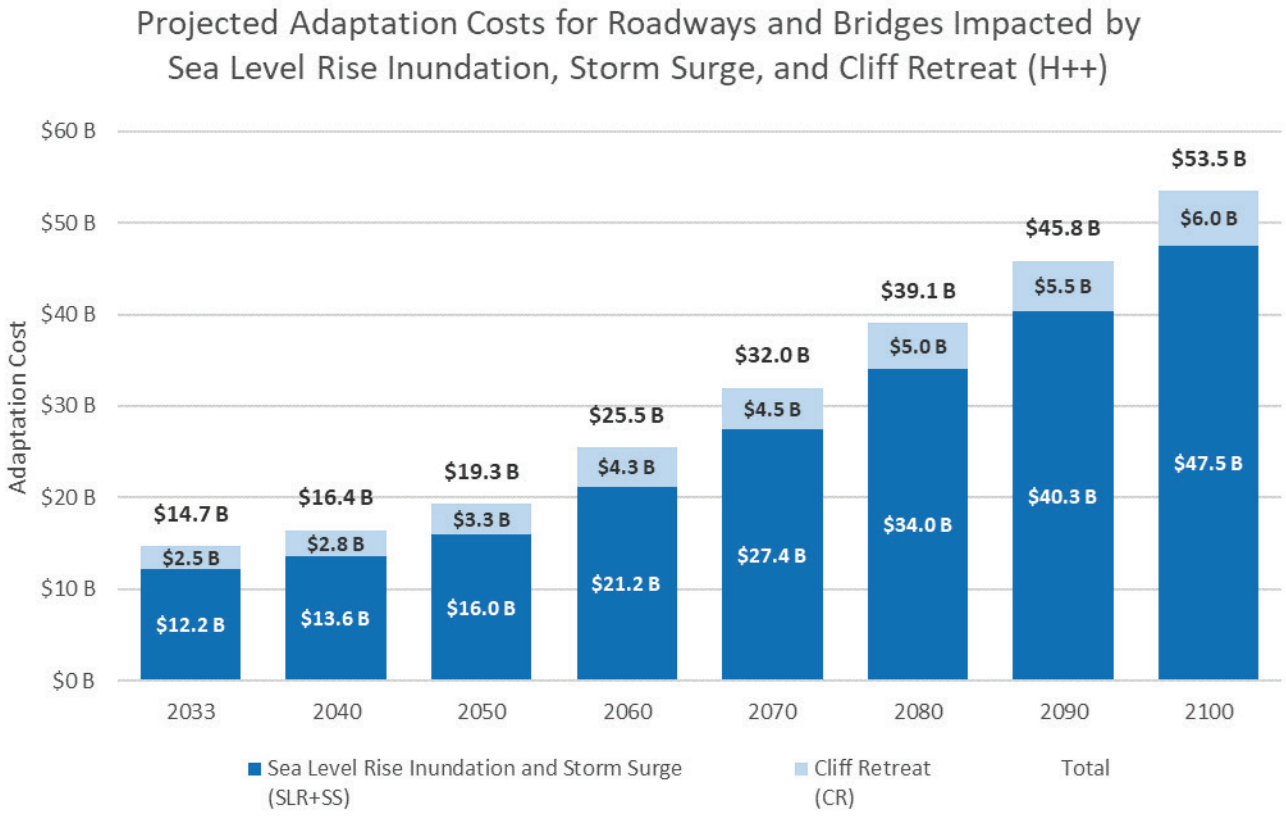
For the 2023 SHSMP, the adaptation cost estimates were developed by considering the mix of potential engineering solutions based on an initial planning assessment of feasible strategies for the locations identified in the vulnerability studies for the San Francisco Bay Area as a representative location. Note that the selection of adaptation options only applies to this preliminary estimate for the purposes of the SHSMP; Caltrans encourages all projects to consider the full suite of adaptation options in project development, with a focus on nature-based solutions to support state goals. Ancillary costs, such as right of way acquisition, planning, comprehensive environmental mitigation costs, have been included in this initial coarse analysis.

For the purposes of identifying the magnitude of statewide sea level rise adaptation needs, estimates were developed using the projections of sea level rise and storm surge according to the worst-case scenario (per statewide sea level rise guidance) by decade out to 2100 and are presented in Figure 5-8. Additional costs were estimated to include the potential risk of cliff retreat that could be associated with sea level rise impacts.

These costs include capital construction costs, support, contingency, environmental mitigation, and escalation to the midpoint of construction assuming the work would be carried out in the 2023-2033 ten-year plan period. An important limitation to these cost estimates is that additional project planning and feasibility scoping, right of way acquisition costs, maintenance expenses, and other related requirements may increase estimates substantially. Adaptation costs were interpolated for 2033 and projected to be $14.7 billion representing the extreme (H++) risk aversion scenario. Adaptation costs for 2100 are projected to be as much as $53.5 billion. These estimated costs would be incurred if policies and avoidance strategies are unable to mitigate the need for engineered solutions to protect critical transportation assets.

Given that the cost estimates carry large uncertainties that are difficult to quantify, the costs presented here should be viewed as "rough order of magnitude" estimates. As the science evolves, realized emission reductions, and more site-specific adaptation studies are carried out by Caltrans, the cost estimates will continue to improve and reflect the best available information. Future costs estimates will consider a more complete evaluation of exposure including groundwater emergence, additional assets like culverts, and a broader range of strategies—including nature-based solutions—for a more comprehensive reflection of total adaptation costs as an improved understanding of project-level adaptation costs additional analysis is undertaken.

Figure 5-8. Projected Adaptation Costs for Roadways and Bridges Impacted by Sea Level Rise Inundation, Storm Surge, and Cliff Retreat (H++)



Performance Management Framework for Sea Level Rise

The Climate Adaptation and Resilience objective in this SHSMP quantifies roadways and bridges impacted by sea level rise inundation, storm surge, and cliff retreat. This is supported by a high-level, rough order of magnitude estimate for the overall potential impact on state asset inventory out to 2100 with a focus on near term investment potential for the 2023 SHSMP. The estimated costs of impacts to assets out to 2033 are expressed in both dollar cost and units. Adaptation costs were developed from a combination of roadway centerline miles and square feet of bridge deck area. The measurement unit is the equivalent to the estimated cost to adapt one centerline mile of roadway ($82 million per centerline mile) or an equivalent of 46,000 square feet of bridges ($1,792 per square foot of deck area). A total of 140 units of roadways and bridges were estimated statewide for adaptation based on their geospatial location relative to projected areas of impact through 2033 with additional estimates of potential impacts through 2100.

Resources to Address Sea Level Rise

Addressing sea level rise issues during all phases of Caltrans project development is necessary to arrive at more resilient projects and safe and reliable transportation outcomes. Caltrans works closely with agencies like the California Coastal Commission and the San Francisco Bay Conservation and Development Commission, as well as and other local and regional agencies to ensure that Caltrans projects effectively address sea level rise vulnerabilities while avoiding, minimizing, and mitigating impacts to environmental and coastal resources. Projects addressing sea level rise are often in sensitive environmental areas and require consideration of environmental and local interests in the proposed solution.

To assist Caltrans Transportation Planners, Project Managers, Environmental Planners, Engineers, and other staff working on projects and plans in the Coastal Zone, Caltrans set up a website[59] providing an orientation and a comprehensive collection of resources on sea level rise. The website contains resources on how to incorporate appropriate adaptation strategies—including nature-based adaptation strategies—to avoid or minimize and mitigate impacts on coastal resources, including public access, recreation, marine and terrestrial resources, and visual resources; ensure safety and stability of infrastructure; and maintain transportation services to communities that are responsive to shifting community needs over time. In addition, this webpage provides information on current Coastal Zone permitting requirements for sea level rise in relationship to the Caltrans project delivery process; updates across companion Caltrans resources including the Standard Environmental Reference (SER) Forms and Templates; and additional technical guidance, including the California Coastal Commission's *2018 Sea Level Rise Policy Guidance*[60].

[59] Sea Level Rise and the Transportation System in the Coastal Zone, Caltrans website, https://dot.ca.gov/programs/environmental-analysis/coastal-program/coastal-act-policy-resource-information/coastal-hazards/sea-level-rise

[60] Sea Level Rise Policy Guidance: Interpretative Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits, California Coastal Commission, 2018, https://documents.coastal.ca.gov/assets/slr/guidance/2018/0_Full_2018AdoptedSLRGuidanceUpdate.pdf

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5.4 Equity & Livability

Goal: Advance Equity and Livability in All Communities

Caltrans proactively engages with affected community groups with a focus on those in disadvantaged and under-served communities so that their transportation related needs and concerns are addressed. By Caltrans recognizing disparities and addressing them in transportation investments and new projects, vibrant and livable places are developed for all Californians.

This strategic goal focuses the department's efforts to:

- Avoid, and work to address, transportation-related disparities in underserved communities on all new projects.
- Plan and design transportation facilities to support vibrant livable places, with a focus on addressing the needs and concerns of underserved communities.
- Collaborate with transportation agencies and partners to make equity and inclusion central in funding decisions.

Efforts to advance racial and social equity and environmental justice in Caltrans has begun in earnest. In the last couple of years, Caltrans has participated in a Government Alliance on Race and Equity (GARE) that focuses on increasing awareness of race and equity issues within organizations and giving them tools and resources to advance equity solutions. In addition, the *Race and Equity Action Plan (REAP)*[61] was developed, focusing on improving communications through training and resources for staff, initiating pilot projects for equity focused solutions in areas where data can be collected and tracked over time, and institutionalizing changes by creating an equity policy and an internal structure to support the needed work.

Caltrans works towards advancing equity and livability goals through activities in the SHOPP and Major Maintenance under the Americans with Disabilities Act (ADA) Pedestrian Infrastructure and Complete Streets performance objectives. These objectives shape transportation investment decisions to ensure that the SHS is accessible, safe, and efficient for all users, in particular disadvantaged and under-served communities, across an integrated multimodal transportation system that includes vehicle, bike, and pedestrian facilities.

[61] Caltrans Race and Equity Action Plan (REAP), https://dot.ca.gov/-/media/dot-media/programs/sustainability/documents/2019_12_11-race_and_equity_actionplan-a11y.pdf

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Americans with Disabilities Act Pedestrian Infrastructure

Supplementary Asset

Overview

The goal of the Americans with Disabilities Act (ADA) Pedestrian Infrastructure objective is to provide improvements to existing pedestrian infrastructure to make the path of travel safe and accessible in compliance with ADA regulations on the SHS. Pedestrian facilities include sidewalks, crosswalks, curb ramps, pedestrian overcrossings and under crossings, park and ride lots, driveways, accessible parking lots and accessible pedestrian signals. While the ADA pedestrian objective is mandated by state and federal law, Caltrans has additional requirements to implement ADA improvements as part of a settlement agreement, the Californians for Disability Rights, Inc. v. California Department of Transportation (2010), Case No.: C 06 5125[62]. This settlement agreement requires that a total of $1.1 billion be spent over a 30-year period beginning in FY 2010/11, with annual spending increasing from $25 million the first five FYs to $45 million the last five FYs. For each year the required amount is not met, the remaining balance rolls over to the next FY year towards the following types of activities:

- Project development and construction costs (including staffing costs) associated with the covered program access improvements.
- Establish and maintain accessibility grievance procedures, which includes processing other access requests.
- ADA-related improvements addressing grievances should be prioritized and delivered as early as possible, in accordance with 49 CFR 27.13, to provide access and equal opportunity to the disabled community.

[62] Californians for Disability Rights, Inc. v. California Department of Transportation (2010), Case No.: C 06 5125, https://dot.ca.gov/-/media/dot-media/programs/civil-rights/documents/settlement-agreement-a11y.pdf

Performance Metrics

The condition designations for ADA Pedestrian Infrastructure elements are based on a deficiency model. Elements where a deficiency still exists are designated as poor, while elements with deficiencies that have been addressed are designated as good. The fair designation does not apply in the deficiency model.

Inventory of Deficiencies

Caltrans implemented the ADA Pedestrian Infrastructure program in July 2010 and determined there were 206,922 non-compliant elements/barriers within pedestrian facilities statewide. Since then, additional deficiencies have been identified and upgraded, bringing the total statewide count of deficient elements to 180,892. Since 2010, through the end of fiscal year 2020/21, Caltrans has upgraded curb ramps, sidewalks, accessible pedestrian signals, and park and ride lots through various ADA and non-ADA projects along with CAPM. The total accomplishments statewide are compiled from ADA program annual reports[63]. Based on these reports, about 19% of the deficient elements have been addressed as of fiscal year 2020/21.

Performance Targets

The ADA pedestrian infrastructure objective must meet the annual statewide expenditure amount (ranging between $25 million - $45 million) required by the court settlement ruling from FY 2010-11 with expected contribution of each District defined below. Except for the allowance of limited costs ($8.75 million total) associated with CAPM projects, costs associated with new construction and those associated with alterations of pedestrian facilities or park and ride lots undertaken for purposes other than ADA access improvements do not count towards the annual expenditure amount. In addition, projects originally programmed as stand-alone ADA infrastructure improvements combined during project delivery for multi-asset construction are exempt from counting towards the settlement agreement. Table 5-59 presents the statewide asset performance targets for ADA Pedestrian Infrastructure.

Table 5-59. Americans with Disabilities Act Pedestrian Infrastructure Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Americans with Disabilities Act Pedestrian Infrastructure (deficient elements)	**25.0%**	**N/A**	**75.0%**	

In addition to establishing a deficiency model for improving ADA infrastructure, a performance monitoring program has been established to ensure that the ADA settlement agreement is reached. This program requires expected annual spending of stand-alone ADA infrastructure projects for each Caltrans District. This is based on an analysis of actual expenditures and estimated expenditures of currently programmed

[63] Caltrans, ADA Annual Reports, https://dot.ca.gov/programs/civil-rights/ada-infrastructure-program

and planned stand-alone ADA infrastructure projects. An expected contribution from each District is included in the Table 5-60.

Table 5-60. Annual District-level Investments in Standalone ADA Projects

ADA Monitoring Program	
District	Settlement Agreement Expected Contribution (S)
1	$1,400,000
2	$1,400,000
3	$2,800,000
4	$7,700,000
5	$2,100,000
6	$2,100,000
7	$5,600,000
8	$2,800,000
9	$1,400,000
10	$2,100,000
11	$2,800,000
12	$2,800,000
Total	$35,000,000

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions.

Three primary elements, curb ramps, sidewalks, and accessible pedestrian signals (APS) were used as the basis for the unit price determination. These are the elements predominantly addressed through SHOPP projects. SHOPP project cost data are analyzed to establish average statewide unit costs. A weighted average was then calculated based on proportion of these deficient elements. The unit cost associated with sidewalk was based on an average length of 30 feet per element and considers that approximately 10 percent of the sidewalks can have a higher unit cost. The unit cost is composed of capital construction and support costs. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with the construction, traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

SHOPP projects include treatment strategies that correct ADA-related deficiencies with installation and upgrade of curb ramps, sidewalks, driveways, and other pedestrian infrastructure. These fixes include, but not limited to, correcting cross slope, running slope or gutter slope, installing detectable warning surfaces, correcting grade breaks, removing obstructions, or removing abrupt level changes, lowering pedestrian push buttons, upgrading marker lines for crosswalks, straightening curbs or defining edges, fixing transitions, gaps or clear width. ADA projects specifically address these deficient elements, but other work by SHOPP projects and Field Maintenance Crews would include upgrading ADA issues.

The ADA work achieved by Field Maintenance Crews includes marking pavement and installing sign identification for accessible parking spaces, lowering pedestrian push buttons, installing handrails and removing abrupt transitions or filling in gaps in sidewalk.

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Complete Streets

Other Assets and Objectives

Overview

A Complete Street is a transportation facility that is planned, designed, constructed, operated, and maintained to provide safe mobility for all users, including bicyclists, pedestrians, and transit riders. Complete Streets shifts the focus of transportation policy from vehicle movement as the primary goal toward the movement of people.

Complete Streets are comprised of pedestrian, bicycle, and transit facilities that vary depending on location, facility, and local context. Complete street facilities are needed both along and across the SHS, and can include conventional highways, main streets, shoulders, and bridges, as well as crossings at freeway on-and-off ramps, over-and-under crossings, transit stops, and in some cases, off-system roads. Approximately 30,000 linear miles of the SHS are accessible to bicyclists and pedestrians and require a variety of complete street facilities to meet Caltrans's goal of providing a comfortable, convenient, and connected network for all users.

It has been a long-term goal of the Department to establish targets for Complete Streets to be able to strategically allocate funding for the development of new bicycle and pedestrian facilities on the SHS. Beginning with the 2018 SHOPP, Caltrans initiated a more robust data analysis of Complete Streets features, tracking 45 elements, 10 multi-objective activities, and 13 ADA activities. Caltrans also required project managers to indicate whether Complete Streets features were feasible on each project.

With the adoption in 2021 of Director's Policy 37 (DP-37) 'Complete Streets', all transportation projects funded or overseen by Caltrans will provide comfortable, convenient, and connected complete streets in locations with current and/or future pedestrian, bicycle, or transit needs, unless an exception is documented and approved.

Complete streets maximize the use of the existing right-of-way by prioritizing space-efficient forms of mobility, such as walking and biking, while also facilitating goods movement in a manner with the least environmental and social impacts. Complete streets shift the focus of transportation planning and project development from vehicle movement as the primary goal to the movement of people and goods.

Performance Metrics

The condition assessment of existing complete streets assets was based on inventory collected as part of the *Caltrans Active Transportation (CAT) Plans*[64]. Caltrans developed 12 CAT Plans that identify the locations of walking and biking needs across and along the SHS in each district.

Each CAT Plan worked through public engagement to identify gaps or needs in the complete streets network and combined those needs with the Active Transportation Asset Inventory Pilot (ATAIP) data that identified existing Caltrans complete streets facilities. These needs were prioritized based on goals set forth in the *2017 Toward an Active California State Bicycle and Pedestrian Plan: Mobility, Safety, Equity, and Preservation*[65].

The location-based needs identified in the CAT plans directly inform the needs to fix existing facilities and to build new complete streets facilities. New and existing multimodal facilities identified in the CAT Plans include linear facilities providing movement along the SHS, (specifically, sidewalks and Class I, Class II, Class II buffered, and Class IV bikeways), as well as facilities that address the need to cross the SHS (which can include a variety of crosswalks).

Some limitations to the ATAIP data-collection process are that it does not include on/off-ramps, over/under-crossings, facilities that are not visible using aerial imagery (including some Class I bikeway if not immediately adjacent to the roadway), variable shoulder data and accuracy (available in TSN), and an inventory collection and condition assessment that has not been updated since the pilot was performed in

[64] Caltrans Active Transportation (CAT) Plans: https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/active-transportation-and-complete-streets/caltrans-active-transportation-plans/

[65] 2017 Toward an Active California State Bicycle and Pedestrian Plan: Mobility, Safety, Equity, and Preservation, https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0020350-activeca-final-plan-2017-05-18-a11y.pdf

Fall of 2018. In the 2023 SHSMP, the data set has been augmented to include on/off-ramps and over/undercrossing based on the geospatial needs of the CAT Plans.

Table 5-61 describes the performance metrics for determining condition of good, fair, and poor Complete Streets for bikeways, sidewalks, and crosswalks.

Table 5-61. Complete Streets Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Pavement markings and/or colorized treatment show little to no visible wear and are 75- 100% present. Pavement or concrete surface is smooth, free of potholes, and has uniform pavement edges.**
Fair	**Pavement markings and/or colorized treatment show typical wear but is still 50-75% present. Pavement or concrete surface shows some roughness and is not completely uniform, but few to no potholes or irregularities are present.**
Poor	**Pavement markings and/or colorized treatment is less than 50% present. Pavement or concrete surface has major imperfections or irregularities including utility covers not to grade, potholes, etc.**

Inventory and Condition

The SHS is accessible to bicyclists and pedestrians unless explicitly prohibited by signage or other access-control methods. Roughly 30,000 miles of the SHS permit bicyclists and/or pedestrians. Of this, 411 miles of existing bikeways, 1,025 miles of existing sidewalks and 159 miles of existing crosswalks have been identified. Condition data was collected as part of the ATAIP effort by each District utilizing Google Earth, GIS, and other imagery, and was brought into the CAT Plans database.

Table 5-62 below details the total linear feet of Complete Streets for bikeways, sidewalks, and crosswalks in Good, Fair and Poor condition, as reported in the District CAT Plans.

The total estimated bicycle and pedestrian needs for all Districts, based on CAT Plan data analysis, is 22,182,946 linear feet. This includes needs for constructing new bikeways, sidewalks, and crosswalks.

Table 5-62. Complete Streets Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Complete Streets Existing Inventory (linear feet)	**8,423,470**	**64.9%**	**14.5%**	**20.6%**	
Complete Streets New Assets Needed (linear feet)	**22,182,946**	**N/A**	**N/A**	**N/A**	**N/A**
Complete Streets Total of Existing Inventory and New Assets (linear feet)	**30,606,416**	**N/A**	**N/A**	**N/A**	**N/A**

Performance Targets

Performance targets for Complete Streets (referred to as "Bicycle and Pedestrian Infrastructure") were proposed and approved by the California Transportation Commission in the December 2021 meeting[66]. Furthermore, Complete Streets was formally established as a Supplementary Asset Class. Table 5-63 presents the statewide asset performance targets for Complete Streets specific to the desired state of repair of existing assets.

Table 5-63. Complete Streets (Fix Existing) Performance Targets (Desired State of Repair)

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Complete Streets (Fix Existing) (linear feet)	**69.0%**	**29.0%**	**2.0%**	

[66] Adoption Of Revised Supplemental Asset Classes and Performance Targets for the State Highway System, Resolution G-21-72, Amending Resolution G-18-07, https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2021/2021-12/21-4-28-a11y.pdf

For new assets, the performance targets are specific to the development of new sidewalks, crosswalks, and bikeways where a facility does not currently exist, as well the re-classification of an asset to a preferred facility (i.e., a Class III shared facility upgraded to a Class II bike lane, or a standard crosswalk reconstructed as a high-visibility crosswalk).

New Asset Performance Targets includes the following types of asset improvements:

- New Sidewalk developed where one does not currently exist. Widening or repair of an existing sidewalk should not be counted as development of a new asset.
- New Crosswalk striped in an area without an existing marked crossing (midblock or intersection), or existing standard crosswalk upgraded to a high-visibility crossing. Targets for crosswalks are specific to striping, but additional crossing enhancements, such as pedestrian beacons, are encouraged where needed.
- New Bikeways include the development of new Class I, Class II, Class II buffered, or Class IV facilities, or the re-classification of an existing bikeway to a preferred facility (i.e., conversion of Class III to Class II, or Class II to Class IV). A Class III bikeway is not considered a new complete streets element meeting performance target.
- Downgrading a facility to a less-preferred alternative (i.e., Class II to Class III) is not considered a new complete streets element.

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital, and support unit costs, SHOPP, and potentially maintenance and other contributions.

Unit costs for Complete Streets are based on an analysis of historical data comprised of the capital construction and support costs and were calculated using an inventory and needs weighted approach. Support costs are those associated with engineering and oversight work to design and construct the project. The estimated capital construction cost includes work associated with the construction of fixing existing and building new complete streets, traffic handling, mobilization, supplemental work, and contingencies.

Typical Treatments

In the Complete Streets objective, Fair to Good improvements normally include routine maintenance work such as sweeping, re-striping, and minor repairs. Poor to Good improvements normally include major rehabilitative and replacement work to bring existing Complete Streets to a state of good repair.

Typical treatments for Fair to Good and Poor to Good would include re-striping of bikeways and crosswalks, sidewalk widening, curb and curb ramp repairs. However, it could also include installation of conflict-zone markings on existing bikeways, installation of bikeway signage, and pavement repairs.

The Complete Streets objective also includes the development of any new sidewalks, bikeways or crosswalks. This includes construction of new facilities or improvement and re-classification of existing facilities.

New sidewalks will typically include concrete paving of a width suitable to serve the local context with buffer zones and frontage zones, as well as accessible curb ramps. Additional amenities supporting

multimodal users, including bike parking, bus bulbs, curb extensions, benches and furnishings, lighting, and landscaping may be considered for inclusion in the development of new complete streets sidewalks.

New bike facilities will include Class I bikeways, Class II and Class II buffered bikeways, and Class IV separated bikeways and appropriate related bikeway amenities.

New crosswalks are intended to include crosswalk markings. Crosswalk enhancements may be considered for inclusion as well.

These needs identified in the Complete Streets objective are intended to support the development of transportation facilities that provide comfortable and convenient mobility and improve accessibility and connectivity to essential community destinations. With a holistic view of the elements that contribute to a complete street, the objective should support the planning, design, construction, and maintenance of facilities that serve all users, regardless of whether they are travelling as pedestrians, bicyclists, public transportation riders, or drivers

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5.5 Multimodal Network

Goal: Enhance and Connect the Multimodal Transportation Network

A connected and efficient multimodal transportation network maximizes use of the existing system while diversifying mode choice for users, providing more reliable travel times, and minimizing delay associated with congestion. As available funding programs for the maintenance, rehabilitation and replacement of transportation assets prohibit the expansion of the highway system lanes, the state's priorities have shifted away from adding new highway lanes to making the most efficient use of the existing system and diversifying mode choice.

This strategic goal focuses the department's efforts to:

- Use operational strategies and incentives to reduce vehicle miles traveled (VMT) through increased high occupancy modes, active transportation, and other Transportation Demand Management (TDM) methods.
- Improve network operations and invest in networks for walking, cycling, transit, and multimodal trips.
- Better utilize technology and data to create a seamless multimodal travel experience and improve travel demand management.
- Optimize and expand equitable pricing.

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Operational Improvements

Other Assets and Objectives

Overview

The Operational Improvement objective includes projects which reduce highway user delay by delivering improvements that alleviate localized congestion on the SHS. Projects tend to be low-cost, high benefit investments for a corridor. Delay is typically calculated by summing the amount of time vehicles spend below 60 mph on monitored freeway sections of the SHS.

In addition to the typical low-cost operational improvements such as adding an auxiliary lane to improve weaving operations, there is a full set of system management and operational strategies to maintain and even restore the performance of the existing transportation system before extra capacity is needed. This set of strategies is called the Transportation System Management and Operations (TSMO) as defined by the Federal Highway Administration (FHWA). TSMO focuses on getting the most performance out of the transportation facilities we already have. TSMO strategies may include, but not limited to work zone management, traffic incident management, special event management, road weather management, transit management, freight management, traffic signal coordination, traveler information, ramp management, congestion pricing, active transportation and demand management, integrated corridor management, access management, improved bicycle and pedestrian crossings, connected and automated vehicle deployment. TSMO strategies deliver system improvement not only in terms of delay reduction, but also in terms of safety, reliability, and sustainability benefits.

Performance Metrics

Historically, Daily Vehicle Hours of Delay (DVHD) has been used as the performance measure in the State Highway System Management Plan (SHSMP) for the Operational Improvement Program. However, with the implementation of SB 743 and the Climate Action Plan for Transportation Infrastructure (CAPTI), the DVHD measure, with its focus on vehicular traffic only, lost its policy responsiveness. Therefore, a new performance measure, Daily Person Hours of Delay (DPHD), has been introduced in 2023 SHSMP.

DPHD supports the Caltrans goal to enhance and connect the multimodal transportation network aligning with the current Caltrans Strategic Plan. DPHD represents a shift of focus from vehicular-based to person-based performance. Caltrans will continue work in identifying appropriate metrics to ultimately move away from delay as an operational measure to better align with CAPTI.

The average number of occupants in motor vehicles (including the driver) is called Average Vehicle Occupancy (AVO). The DVHD is multiplied by the AVO to estimate the Daily Person Hours of Delay (DPHD). Operational Improvements use a deficiency model and a performance metric of Daily Person Hours of Delay (DPHD). A deficiency of DPHD that still exists and has not improved is designated Poor, while DPHD that have been improved are designated Good. The fair designation does not apply in the deficiency model.

Inventory of Deficiencies

The current transportation system deficiency or need, in terms of DVHD, for the nine districts that have automated detection on freeway portions of the SHS reporting to Caltrans' Performance Measurement System (PeMS) is based on data reported in the fourth quarter Mobility Performance Report (MPR) of 2021. The method for measuring transportation system deficiency or need using PeMS represents delay only on freeway portions of the SHS where automated detection has been installed. This method excludes delay

occurring on conventional highway facilities and on freeway segments where automated freeway detection has not been installed.

The deficiency is presented in terms of DVHD: the average weekday amount of time vehicles spends below 60 mph on the SHS. DVHD is further broken down by vehicle speed under two operating conditions. The first condition is delay that occurs over 35 mph and under 60 mph. Under this condition, while vehicles are delayed and operating at slower than 60 mph speeds; traffic flow is generally constant, with few rapid fluctuations in speed. The second condition is severe delay, or delay that occurs at or under 35 mph. Severe delay occurs when there is greater demand than available capacity, and is characterized by frequent fluctuations in vehicle speeds, including 0 mph or stop conditions. This roadway condition is colloquially referred to as "stop-and-go" traffic. The sum of both conditions is the total DVHD under 60 mph.

The current transportation system deficiency or need for the three districts (Districts 1, 2 and 9) that do not have automated detection on the SHS, is estimated using a comparative analysis for existing rural PeMS detection in District 3 to estimate delay and rural VMT (Vehicle Miles Traveled) to correlate travel characteristics between District 3 and Districts 1,2 and 9.

The baseline operational improvement needs expressed in terms of DPHD as of May 2022, are presented in Table 5-64. The projected total need estimated to the midpoint of the last 5-years of the 10-year plan factors in a compounding annual growth rate of 10.5% based on the analysis of historical data trends from PeMS. The SHOPP is expected to address a quarter of the total performance gap.

Table 5-64. Operational Improvements (DPHD) Inventory of Deficiencies

Inventory of Deficiencies					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Total Operational Improvements (DPHD)	**1,549,893**	**0.0%**	**N/A**	**100.0%**	
Delay under 60 mph and over 35 mph (DPHD)	939,802	0.0%	N/A	60.6%	
Severe delay under 35 mph (DPHD)	610,091	0.0%	N/A	39.4%	

Performance Targets

Caltrans has established a goal to improve the deficient condition (DVHD hours) by 10 percent, or approximately one percent annually over 10-years. Table 5-65 presents the statewide asset performance targets for Operational Improvements.

Table 5-65. Operational Improvements Performance Targets

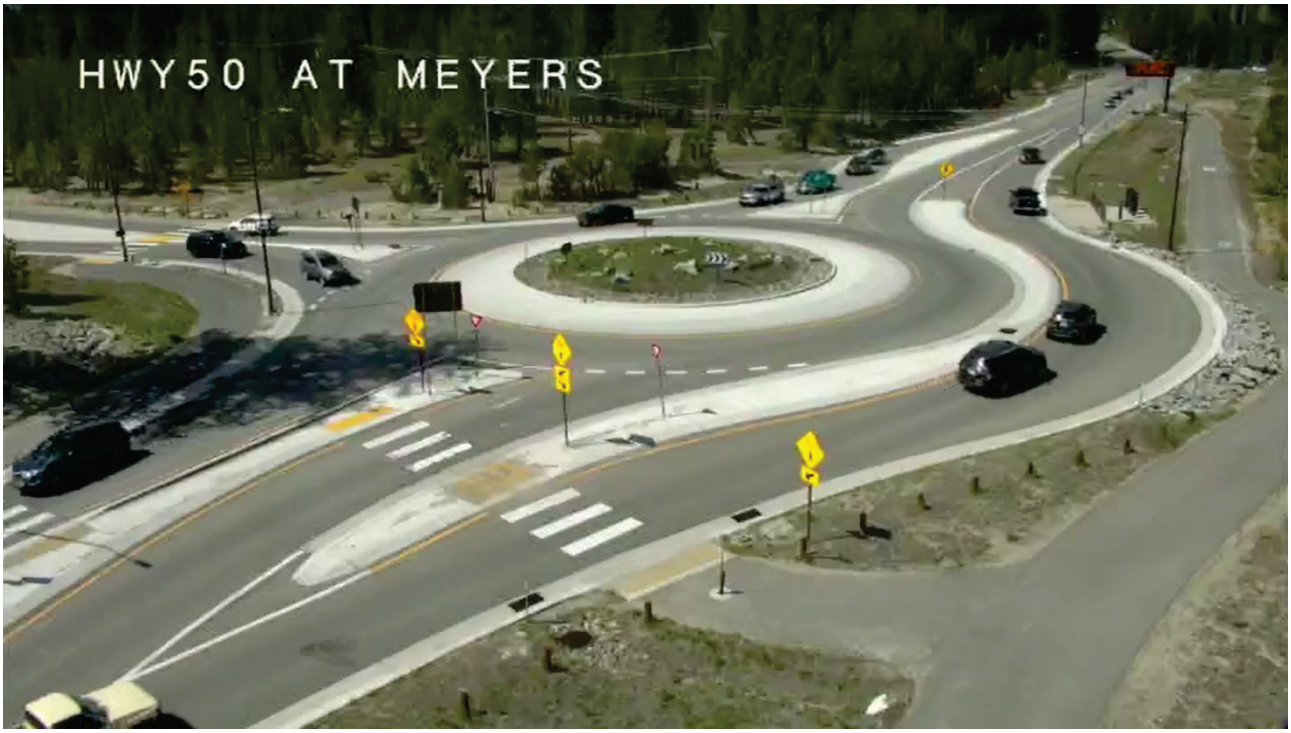
Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Operational Improvements (DPHD)	**10.0%**	**N/A**	**90.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include key performance measure deterioration rates, capital and support unit costs, SHOPP, and potentially maintenance and other contributions. Operational improvements are based on existing data and estimated project improvements resulting from traffic analyses and engineering judgment. During times of economic growth, demand on the State's transportation system typically increases, while during times of economic decline, demand on the State's transportation system decreases. California's economy has experienced growth over the past several years, excluding COVID pandemic period, and an analysis of existing traffic data indicates that annual growth rate of 10.5% in terms of DVHD on the State Freeway System. The unit cost estimate is based on the capital costs of the SHOPP Operational Improvement projects programmed in the 10-year project book. To capture the unit cost more accurately, considerations were given on type of various treatments of the projects and associated performance measure contribution to each type of treatments. This cost includes work for the construction of operational improvements, traffic handling, mobilization, supplemental work, and contingencies.

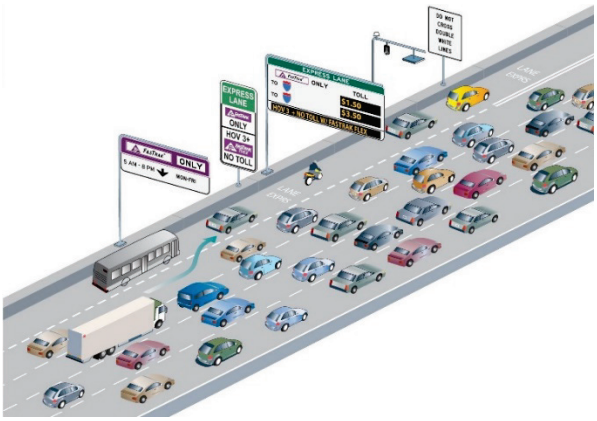
Typical Treatments

Operational Improvement projects improve transportation system performance on the SHS by reducing delay and operational deficiencies and improve the reliability and efficiency of people and goods movement. Reduced congestion and delay improve safety, the environment and livability and facilitate economic development. The SHOPP funds projects to accomplish these goals through typical treatments such as traffic monitoring system improvement, ramp metering, traffic management and control strategies such as signal coordination, auxiliary lane construction, roundabout construction, widening of on/off-ramps or shoulders, improvements of lane/shoulder/turning radius dimensions for trucks, installation or extension of acceleration or turn lanes, and alteration of High Occupancy Vehicle (HOV) lane access configuration. With the fast development and deployment of Connected and Autonomous Vehicle (CAV) and Vehicle-to-Everything (V2X) technologies, transportation system performance may see unprecedented improvement when these technologies become typical treatments in the future.



In addition, Caltrans uses managed lanes on the State Highway System as a sustainable transportation system management strategy. Managed lanes are used to promote carpooling and transit usage, improve travel time reliability, reduce greenhouse gas emissions, and maximize the efficiency of a freeway by increasing person and vehicle throughput while reducing congestion and delay.

A managed lane is an exclusive or preferential use lane that is managed proactively in response to changing conditions in order to achieve improved efficiency and performance. This can include a high occupancy vehicle (HOV) lane, a high occupancy/toll (HOT) lane, an express toll lane (ETL) where all vehicles must pay a toll to access this lane, or a tolled managed lane, such as a HOT lane or an ETL, referred to as an "express lane."



Managed lanes use operational strategies such as access control, vehicle eligibility, and tolling, or a combination thereof. These strategies are determined based on factors such as safety, regional and interregional consistency, impacts on freeway performance, enforcement needs, environmental considerations, and community support. Strategies may be adjusted to meet required performance standards or to address other managed lane or freeway performance issues.

With new funding available through the federal Infrastructure Investment and Jobs Act (IIJA), project development opportunities are being pursued under the current SHOPP.

Mobility Hubs

Other Assets and Objectives

Overview

Mobility Hubs (previously known as Park and Ride facilities) are specialized parking facilities typically located on major commute corridors in suburban and urbanized areas. They are designed to allow commuters to transfer from low-occupancy modes such as personal cars with only the driver to high-occupancy modes such as carpools, vanpools, buses, and rail transit. As Mobility Hubs, they can also facilitate and encourage use of transit and active transportation modes instead of vehicle modes. Mobility Hubs are intended to support and encourage modal shifts and equitable access while reducing auto-dependency and associated greenhouse gas (GHG) emissions.

Historically, as Park and Ride facilities, Mobility Hubs were designed and built to encourage ridesharing via carpools and vanpools. Many were constructed with minimal amenities or active transportation access. Only few have transit bus stop to the facility. Given the critical need to reduce congestion, vehicle-miles traveled (VMT), and GHG, the Caltrans travel demand management (TDM) [67] strategy is to encourage greater use of transit, active transportation, and emergent modes of travel such as bike share and other micro-mobility, in addition to carpools and vanpools. Most of the current Park and Ride facilities, however, are not equipped to be anything more than park and ride lots. Moreover, many are in poor physical condition due to the lack of resources to maintain them sufficiently.

[67] California Statewide Travel Demand Model, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/data-analytics-services/statewide-modeling/california-statewide-travel-demand-model

Transforming these facilities into Mobility Hubs shifts their role to provide integral connections between local communities and residents, facilitating walkability and allowing people to access multiple modes including rail and bus transit, micro-transit, bicycles, micro-mobility options, in addition to High Occupancy Vehicles (HOV). Mobility Hubs that will be effective as part of the multimodal network, improving network operations and utilizing technology and data for seamless multimodal travel experience.

Not all Mobility Hub facilities are alike. This is because they were previously Park and Ride facilities, constructed and developed for carpooling. Some are ideally (for multimodal integration) located as an integral part of transit or active transportation networks while others are more conducive to commuter ridesharing. Mobility Hubs are therefore categorized into two types: Multimodal Mobility Hubs and Commuter Rideshare Mobility Hubs. There are 300 Caltrans Park and Ride facilities. Of the 300 total facilities, the focus of the Mobility Hubs is on the 222 state-owned and operated facilities.

Multimodal Mobility Hubs are facilities that are adjacent to or are within walking distance to commuter transit or have direct active transportation access to Tier 1 Caltrans Active Transportation Plan (CAT) Plan routes. High Transit Multimodal Mobility Hubs are those that support high-frequency transit and have active transportation access. Low Transit Multimodal Mobility Hubs are those that supports mostly local transit with some active transportation components. Of the 222 state-owned and operated facilities, there are 115 Multimodal Mobility Hubs.

Commuter Rideshare Mobility Hubs are facilities that primarily supports carpooling and have limited or no access to transit or active transportation facilities. Commuter Rideshare Mobility Hubs support managed lanes on the adjacent highway with an opportunity to increase ridesharing or simply support adjacent state highway for ridesharing. Of the 222 state-owned and operated facilities, there are 107 Commuter Rideshare Mobility Hubs.

Performance Metrics

The Mobility Hub facilities' performance metric is based on the multimodal usability measure that considers the physical condition of a Mobility Hub, available multimodal amenities, and the multimodal connectivity through a composite index. Multimodal usability represents the collective Mobility Hub attributes that can lead to an increase in mode shift from single occupant vehicles (SOVs) to other modes. For Mobility Hub facilities to reduce VMT and GHG, increased mode shift, from SOVs to carpools and other modes such as transit and active transportation, must occur. A Mobility Hub facility's performance depends on its usefulness or useability as multimodal network facility. The overall Usability score is based on the individual Level of Service (LOS) scores of the three core elements (physical condition, multimodal amenities, and multimodal connectivity). These three categories are each scored on a scale from 0-100. 0 is the lowest score, indicating a poor condition with the highest treatment needs. 100 is the highest score with no treatment needed. Table 5-66 describes the performance metrics that define the criteria for determining condition for good, fair, and poor Mobility Hubs.

Table 5-66. Mobility Hubs Performance Metrics

Performance Metrics	
Condition	**Criteria**
Good	**Usability score ≥75**
Fair	**Usability score ≥50 and <75**
Poor	**Usability score <50**

The Multimodal Usability LOS is weighted differently for Multimodal Mobility Hubs and Commuter Rideshare Mobility Hubs, because the Multimodal Mobility Hubs are more dependent on the critical amenities and multimodal connectivity as compared to the Commuter Rideshare Mobility Hubs that are more dependent on the core elements physical condition (since multimodal options are limited for these facilities).

For Multimodal Mobility Hubs, the Multimodal Usability score is weighted 30% physical condition, 30% multimodal amenities, and 40% connectivity.

For Commuter Rideshare Mobility Hubs, the Multimodal Usability score is weighted 80% physical condition, 10% multimodal amenities, and 10% multimodal connectivity.

Inventory and Conditions

As described in the Category and Classification of Mobility Hubs section, the Mobility Hub facilities are categorized into two types:

- Multimodal Mobility Hubs facilities (115)
- Commuter Rideshare Mobility Hub facilities (107)

For the 115 Multimodal Mobility Hubs and 107 Commuter Rideshare Mobility Hubs owned and operated by Caltrans, their Multimodal Usability measurements are summarized in Table 5-67.

Table 5-67. Mobility Hubs Inventory and Conditions

Inventory and Conditions					
Objective (unit of measure)	**Inventory**	**Good**	**Fair**	**Poor**	
Mobility Hubs (locations)	**222**	**1.8%**	**50.0%**	**48.2%**	

Performance Targets

Table 5-68 presents the statewide asset performance targets for Mobility Hubs.

Table 5-68. Mobility Hubs Performance Targets

Desired State of Repair				
Objective (unit of measure)	**Good**	**Fair**	**Poor**	
Mobility Hubs (locations)	**35.0%**	**45.0%**	**20.0%**	

Other Performance Management Parameters

Several other parameters are required in the performance management analysis. These may include deterioration rates, capital, and support unit costs, SHOPP, potential maintenance, and other contributions.

The condition of Mobility Hub facilities assets in the future is projected using the effective annual deterioration rate as of the 2023 SHSMP inventory, which was primarily based on the service life of each asset and element.

Planning level unit costs for the Mobility Hub facilities are based on an analysis of historical cost data composed of the capital construction and support costs. Variation in capital costs is related to the physical size of a facility and the types and number of assets. Specific unit costs for new infrastructure and each new asset were developed and applied to the quantities for each facility.

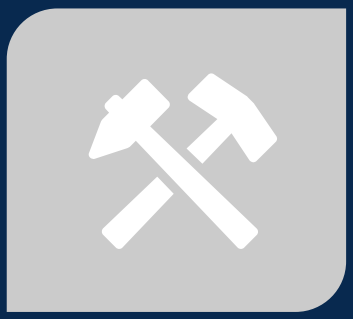
Typical Treatments

Field Maintenance Crews provide maintenance operations limited to those activities or treatments necessary to maintain safe and functioning Mobility Hub facilities. Maintenance funded projects are used for projects related to the preservation, maintenance, and protection of the overall integrity of the Mobility Hub facilities. These minor projects that address specific items of concern for maintenance that need immediate attention (such as pavement repairs, asset damage/malfunction, etc.) and that, if not performed, could result in increased preservation needs requiring SHOPP funding in the future.

The SHOPP Mobility Hubs program funds projects that include treatment strategies for the replacement, restoration, and rehabilitation of existing Mobility Hub physical assets, amenities, and connectivity features. Typical projects will include improving poor condition facility features such as pavement, lighting, drainage, fencing, and security. Projects will also include the addition or restoration of multimodal amenities based on the facility type. For example, this may include the addition of electric vehicle (EV) chargers or the repair of bus shelters. The last category of work for a Mobility Hub project is the connection of the facility to the multimodal network by adding pedestrian pathways, improving pedestrian scale lighting, or adding dedicated bicycle connecting facilities to name a few examples.

Source: Metropolitan Transportation Commission

5.6 Cross-Cutting



Goal: Achieve multiple strategic goals

While the primary focus of the SHSMP is to maintain the condition and safety of the SHS, Caltrans also considers other key cross-cutting focus areas identified throughout Caltrans policies and guidance and includes them in appropriate projects carried out through the Program Objectives. These cross-cutting focus areas are considered and included at the project level, where feasible, and help Caltrans achieve broader strategic goals. Cross-cutting focus areas include:

- Advance Mitigation
- Environmental Stewardship
- Freight Mobility

DRAFT for Review

Advance Mitigation

Cross Cutting

Overview

"Advance Mitigation" in its broadest sense refers to performing compensatory mitigation in anticipation of and prior to incurring the environmental effects of an action. Specific to Caltrans, this means addressing the potential environmental impacts very early in the planning process before transportation projects are programmed for delivery.

Advance Mitigation, funded by the Advance Mitigation Account established by SB 1, is eligible for use by SHOPP projects if they fully reimburse the Advance Mitigation Program. The SB 1 program manages mitigation efforts that include developing stand-alone compensatory mitigation projects that help to ensure the right type and quantity of environmental mitigation are available for future transportation projects, in advance of funding those projects. Programming new stand-alone advance mitigation projects may be allowed to provide for early implementation of anticipated mitigation requirements associated with SHOPP transportation projects.

Currently, the statutory requirement for compensatory mitigation due to unavoidable impacts to jurisdictional resources can significantly increase the uncertainty related to a project's scope, schedule, and cost. However, having available mitigation reserves in place reduces the risk to a transportation project's cost and schedule, and reduces project delays.

The means to implement advance mitigation includes, but is not limited to:

- Conservation or mitigation banks (either by creating new banks or through bulk credit purchases from existing banks).
- In-lieu fee programs (either by creating new in-lieu fee programs or through bulk credit purchases from existing in-lieu fee programs).
- Contributions/fees to Habitat Conservation Plans or Natural Communities Conservation Plans.
- Identified activities in Regional Conservation Investment Strategies that yield Mitigation Credit Agreements or permittee responsible mitigation (i.e., mitigation on public or private lands including restoration property acquisitions and transfers with conservation easements or deed restrictions).

Planning for the advance mitigation goal is based on the acreage of estimated potential compensatory mitigation need for the future transportation projects in the SHSMP. The estimated need is informed by long range plans and mitigation needs assessments. The magnitude of the need is dependent on project delivery mitigation requirements that can use credits developed through this program.

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Environmental Stewardship

Cross Cutting

Overview

Caltrans facilitates transportation for the people of California while striving to minimize the environmental harm and integrating the transportation system into California's environment. Caltrans seeks opportunities to incorporate environmental enhancements into its roadway improvement projects. Such opportunities may include, but are not limited to, green infrastructure; remediating fish or wildlife barriers; or historic architectural elements to bridges. Many environmental resources and laws are considered during the project delivery process. However, Caltrans is striving to consider environmental factors earlier in the project planning and nomination processes through more informed decision making and earlier coordination with state and federal resource agencies. Several cross-cutting objectives in the environmental stewardship category would benefit from early, multidisciplinary consideration before projects are scoped and programmed.

Caltrans also strives to avoid environmental impacts by considering the natural environment during project planning. Examples of good environmental stewardship include siting projects to avoid and minimize impacts to environmental resources, avoiding wetlands, sites with hazardous waste or contamination issues, threatened and endangered species, cultural sites, historic architectural elements to bridges, tribal lands, and others. Caltrans recommends including environmental planners on all project planning teams to facilitate the identification of environmental features along a corridor and recommend strategies to avoid these resources while implementing planned projects.

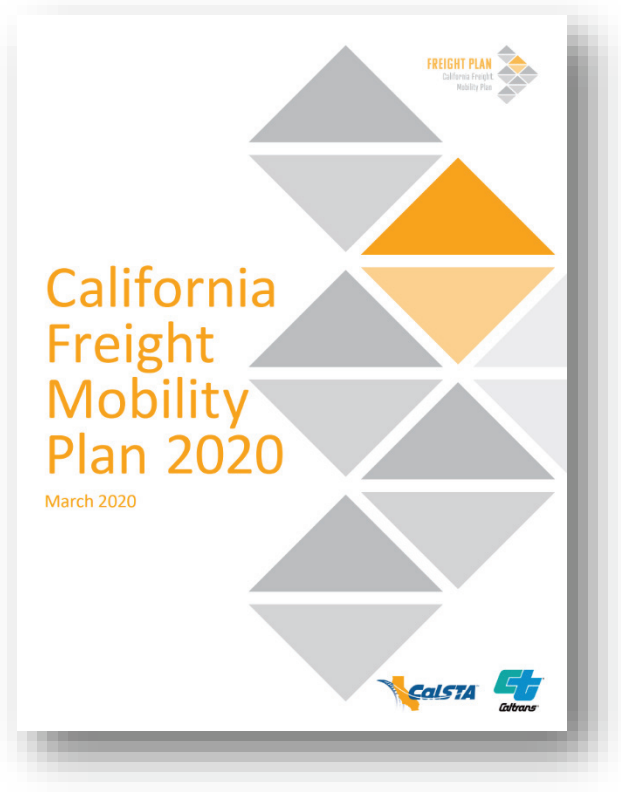
Freight

Cross Cutting

Overview

Caltrans uses a variety of programs to improve freight mobility. Several SHSMP objectives address freight needs, for example improving vertical clearance of bridges, building truck climbing lanes, and reducing wear and tear on truck components through pavement improvements. Freight is a critical component of the global, national, and state economies.

California's freight transportation system is the most advanced, environmentally friendly, and multimodal in the nation. This impressive goods movement system provides communities with their most vital necessities including food, medicine, and inputs for manufacturing in a timely, efficient manner. Improvements focusing on efficiency and reliability in the freight industry will continue to positively impact the economy and California's communities. In an effort to further strengthen these impressive ranks, and remain a national leader, California is working towards more efficiency, less-pollution, and higher-capacity in its freight facilities, equipment, and operations.



California's freight transportation vision is reflected in the *California Freight Mobility Plan (CFMP)*[68] completed in 2020. The CFMP is a comprehensive plan that governs the immediate and long-range planning activities and capital investments by the state with respect to freight movement. The Freight Mobility Plan 2020 Goals are presented in Table 5-69.

[68] Caltrans, California Freight Mobility Plan, 2020, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/sustainable-freight-planning/cfmp-2020

Table 5-69. Freight Mobility Plan 2020 Goals

California Freight Mobility Plan 2020 Goals	
Goal	**Description**
Multimodal Mobility	Strategic investments to maintain, enhance, and modernize the multimodal freight transportation system to optimize integrated network efficiency, improve travel time reliability, and to achieve congestion reduction.
Economic Prosperity	Grow the economic competitiveness of California's freight sector through increased system efficiency, productivity, and workforce preparation.
Environmental Stewardship	Support strategies that reduce, avoid, and/or mitigate adverse environmental impacts from the freight transportation system.
Healthy Communities	Enhance community health and well-being by mitigating the negative impacts of the goods movement system across California's communities.
Safety and Resiliency	Reduce freight-related deaths/injuries and improve system resilience by addressing infrastructure vulnerabilities associated with security threats, effects of climate change impacts, and natural disasters.
Asset Management	Maintain and preserve infrastructure assets using cost beneficial treatment as indicated in the State Highway System Management Plan (SHSMP), per the federal Infrastructure Investment and Jobs Act (IIJA), Bipartisan Infrastructure Law (BIL), California Streets and Highway Code §164.6, Caltrans Director's Policy 35 Transportation Asset Management (DP35), and other applicable state and federal statutes and regulations.
Connectivity and Accessibility	Provide transportation choices and improve system connectivity for all freight modes.

In collaboration with various State, regional and local partners, public and private sectors, and the members of the California Freight Advisory Committee (CFAC), Caltrans is currently developing the *2023 California Freight Mobility Plan (CFMP)* to provide a long-term vision for California's freight future. The CFMP will align State freight plans with requirements set forth under the 2021 Infrastructure Investment and Jobs Act, which requires each state that receives funding under the National Highway Freight Program to develop a State Freight Plan every four years.

Complementing the CFMP is the interagency *California Sustainable Freight Action Plan (CSFAP)*[69] published in July 2016. The CSFAP includes a long-term 2050 vision and guiding principles for California's future freight transport system along with targets for 2030. The objectives of the plan are laid out in Governor's Executive Order B-32-15, which seeks to improve freight efficiency, transition to zero-emission technologies, and increase competitiveness of California's freight system. California freight transport system's transition to zero emission technologies is essential to support the state's economic development in coming decades, while reducing harmful pollution that impacts many California communities.

[69]California Sustainable Freight Action Plan, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/sustainable-freight-planning/csfap

In collaboration with CalSTA, Caltrans established the California Freight Advisory Committee (CFAC) in response to guidance provided in MAP-21. The CFAC consists of cross-section representatives from public and private sectors freight stakeholders, including representatives of ports, shippers, carriers, freight-related associations, the freight industry workforce, Caltrans, and local governments. The CFAC is a platform for freight industry leaders to share and provide input for local, regional, state, and national freight initiatives.

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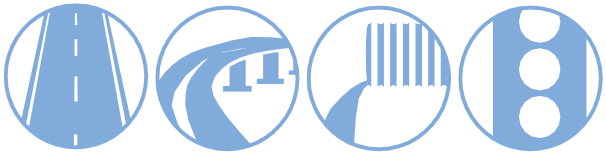


6 Life Cycle Planning Strategies

The basis of Life Cycle Planning (LCP) is doing the right treatment at the right time, while minimizing cost. LCP is the process to estimate the cost of an asset over its whole life while preserving or improving condition at optimum time and cost. Cost effective investment strategies consider the whole life cycle of an asset and are critical in managing transportation assets across the entire transportation system.

In the development of performance and risk-based asset management plans, LCP guides the development of investment strategies by using asset condition data, deterioration rates, and treatment options to determine the most cost-effective approach to achieve the Desired State of Repair (DSOR) and sustain Caltrans investment in transportation assets. LCP is critical for achieving the lowest practical cost for improving and preserving the transportation system.

6.1 Life Cycle Planning

One of the core principles of asset management is making investment decisions that consider the full life cycle and associated costs of an asset or system of assets. Transportation asset management involves developing life cycle plans of individual assets as an implementation strategy for life cycle planning (LCP) which includes evaluating multiple assets and its impact to system-wide performance. An LCP is a strategy for managing an asset over its life to achieve a target level of performance while minimizing life cycle costs.

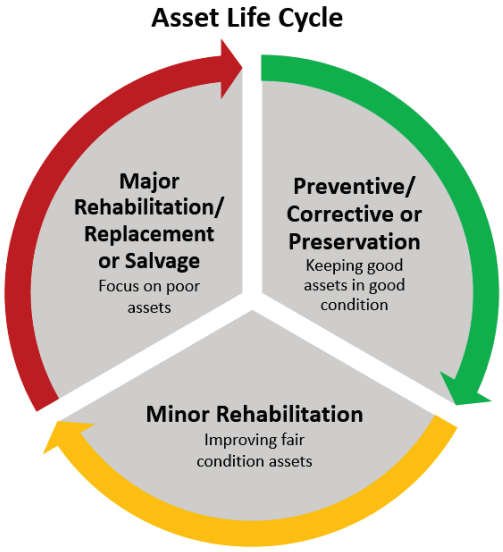


Figure 6-1. Asset Life Cycle

Life Cycle Planning vs. Life Cycle Cost Analysis

LCP focuses on general network-level asset management strategies, that is, the best sequence of maintenance and rehabilitation treatments for a given asset type. Figure 6-1 describes Caltrans' Asset Life Cycle, which begins with the asset's initial construction through maintenance, preservation, repair, rehabilitation, reconstruction, replacement, or removal. Figure 6-2 provides a more detailed look at LCP for pavements. Life cycle cost analysis (LCCA) complements LCP. LCCA is a technique for comparing cost alternatives over the life cycle of a project, allowing agencies to minimize life cycle cost while maintaining or even extending the life of the asset. FHWA defines life cycle cost as "the cost of managing an asset class or asset sub-group for its whole life, from initial construction to its replacements."[70] LCCA can be used for project level decisions to select the design option that minimizes the initial and discounted future agency, user, and other relevant costs over an analysis time period. The basic principle underlying both LCP and LCCA is fundamental to asset management: timely investments in an asset can result in improved condition and lower cost over the life cycle.

Typical Asphalt Pavement Life Cycle Planning Treatments to Extend the Life of Assets

Primary Asset	Preservation	Minor Rehabilitation	Major Rehabilitation or Replacement
• Pavements	• Seal Coat • Crack Seal • Dig-out	• Capital Preventive Maintenance • Medium Overlay	• Thick Overlay • Full Depth Reclamation • New Construction

Figure 6-2. Typical Asphalt Pavement Life Cycle Planning Treatments

[70] Asset Management Plan Definitions. 23 CFR § 515.5. October 24, 2016, https://www.federalregister.gov/documents/2016/10/24/2016-25117/asset-management-plans-and-periodic-evaluations-of-facilities-repeatedly-requiring-repair-and

Life Cycle Planning Modeling

LCP should be based on a good understanding of the costs and life spans of different types of treatments. It involves use of predictive models for how assets will deteriorate depending on the different types of treatments selected. Ideally, these models are developed based on several years of data on effectiveness and longevity of the applied treatments and the resulting measured condition.

In practice, LCP models are typically based on a combination of data and expert judgment. Asset management stakeholders throughout Caltrans have been working to compile and continually improve the primary data elements needed for a network level LCP process for many of the assets in this SHSMP, including deterioration models, work types, treatment options, unit costs, performance targets, and strategies for minimizing life cycle costs and achieving performance targets.

Factors to Consider in Life Cycle Planning

LCP is intended to inform decision making in order to achieve asset performance targets. District Performance Plans, as described in Section 4.2, guide districts to achieve target expectations within the budget constraints. They articulate how districts will incorporate life cycle planning to minimize long term costs of asset ownership and document the decision-making process relative to less expensive short-term repairs versus more expensive long-term fixes. In addition, Life Cycle Plans would be developed by Program Managers in HQ that would lay out sound policies to assist districts in minimizing the life cycle cost of their assets. Furthering this effort, LCCA would be ideally implemented across all performance objectives to improve upon the procedures already in place.

In developing an LCP, the following should be considered:

- How is the life cycle cost of an asset impacted by using more frequent maintenance activities over the asset's life span versus doing a full rehabilitation at optimum time?
- What is the remaining service life (RSL) of a bridge and when should the RSL be considered for replacing a bridge due to sea level rise?
- Is there redundancy built into the transportation system? Are there regions and routes that need to have systematic treatments to maintain an assets' condition over the typical and standard treatments due to safety, climate change or other risks?
- Are we making the right investment decision to rehabilitate all lanes of a highway irrespective of their condition instead of lane-by-lane treatments based on their condition? What about the strategies that could be implemented to reduce cost?
- What impacts and risks can be identified at the corridor and network level that would provide for better asset management and life cycle decisions?

Early identification of changes in traffic demand, environmental conditions including extreme weather events, climate change, and seismic activity are also important aspects of any LCP. The Caltrans Vulnerability Assessments[71] provided an evaluation of the asset's risk to these types of exposures. Figure 6-3, presents a figure showing how planning and designing for uncertainties are impacted by asset life spans. In the case of

[71] 2019 Climate Change Vulnerability Assessments, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2019-climate-change-vulnerability-assessments

pavements, it also shows that climate change could affect pavement climate zones influencing pavement design and treatment decisions.

Figure 6-3. Pavement Climate Zone Uncertainties

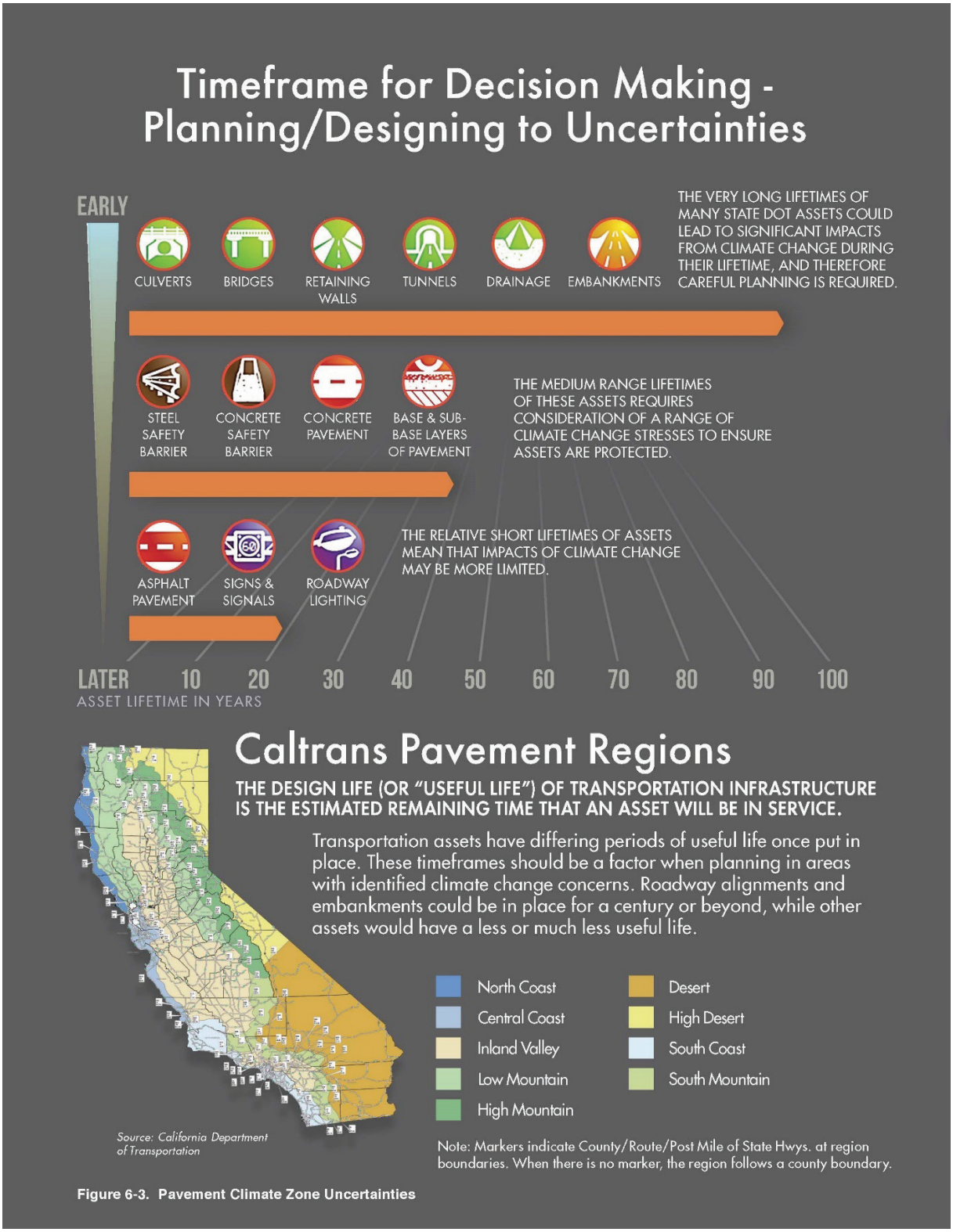


Figure 6-3. Pavement Climate Zone Uncertainties

Life Cycle Planning Maturity

The results of a Caltrans completed self-assessment of LCP maturity for the California TAMP are shown in Figure 6-4. Caltrans has been able to improve the maturity of LCP by requiring District Performance Plans and by identifying additional strategies, such as development of Program LCPs and the use of LCCA for all performance objectives. The primary elements of the LCP Maturity Model are described below:

LEVEL 1

Single Asset Based Needs include the inventory and condition assessment of a single asset over the useful life of the asset, considering the cost of the treatment and deterioration that occurs over time.

LEVEL 2

Project Level LCCA includes performing a project-level LCCA compliant with environmental, economic, and legislative requirements that considers treatments evaluated over an analysis period, taking into account traffic and user costs. A strong LCCA policy would be strategically implemented across all assets and programs.

LEVEL 3

Corridor LCP includes elements of Level 2, but includes a strong LCP Policy that will focus on improving and preserving major corridors and Strategic Highway Network (STRAHNET) routes. Investment strategies are considered for long-term asset investment needs and maximize performance with constrained funding. At this level, multi-asset investment decisions are incorporated, and performance gaps are eliminated. Internal and external stakeholders are emphasized. Reducing the annual cost of preservation through more research and innovated practices is prevalent and risk sharing is stressed between public and private sector.

LEVEL 4

Network Level LCP includes Level 2 and 3 elements, considering long-term focus on improving and preserving the system and network conditions achieved through different levels of funding where conditions are optimized with multi-asset investment. Improvements to policy through research and partnerships are emphasized.

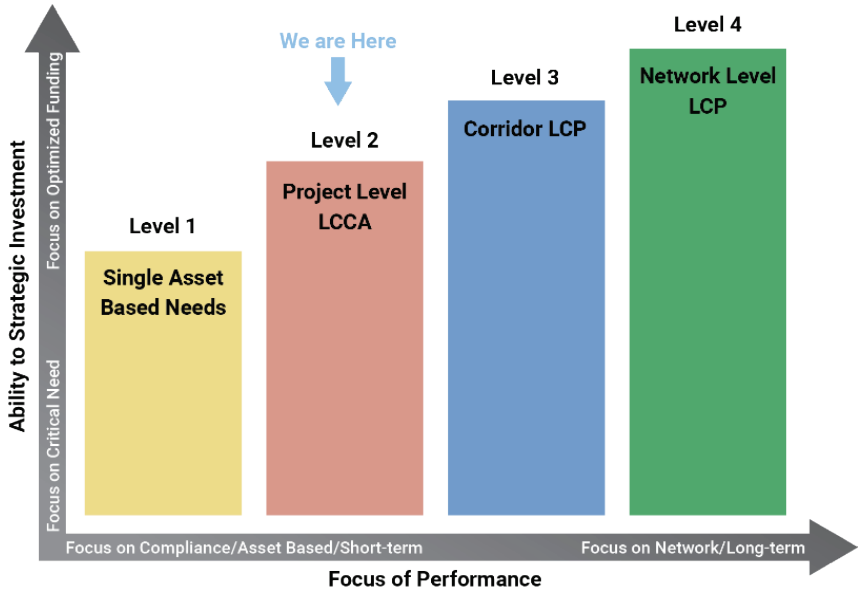


Figure 6-4. Life Cycle Planning Maturity Model

6.2 Cost Effectiveness

California Government Code requires Caltrans to identify strategies to control costs associated with the SHS maintenance. Figure 6-5 identifies a number of strategies being used in the SHOPP or the Maintenance Program for each asset class:

Pavements

Improve effectiveness of pavement projects through detailed selection of project limits and treatment combinations.

Perform life cycle cost analysis in design.

Use appropriate 3 to 20-year cycle of preservation treatments.

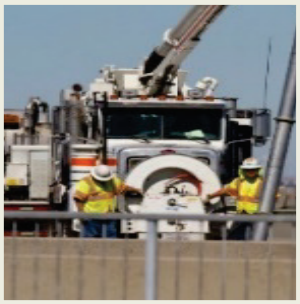
Recycled materials to reduce the impact on new materials and the environment while maintaining the same or better performance.

Bridges

Select new materials that last longer and are easier to apply.

Establish policies to ensure that new projects are built with cost-effective and easily maintained elements.

Implement accelerated bridge construction (ABC) techniques where appropriate to minimize the impact of the construction on the traveling public.



Culverts

Use remote controlled cameras and equipment for culvert inspections to reduce worker exposure.

Clean ditches and culverts on an annual basis to prolong the service life of the culverts.

Use trenchless culvert replacement and lining techniques to help minimize disruptions to the ground surface and the infrastructure above it.

Transportation Management Systems

Execute on-call service contracts to supplement state forces which help to minimize administrative costs.

Implement Trouble Ticket system to ensure problems are reported as expeditiously as possible, and minimizes inaccurate trouble reporting, and duplication of efforts.

Figure 6-5. Cost Effective Strategies Used in the SHOPP and Maintenance Programs for Maintaining the SHS

6.3 Incorporating Life Cycle Planning into Asset Management Practices

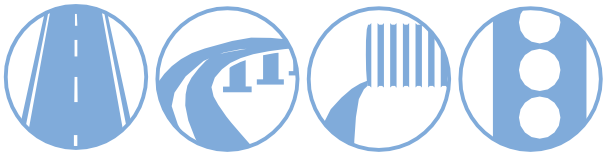
An overall framework was established for collecting the major components and building blocks for a more comprehensive cost-effective approach in the management of transportation assets at the network level. This framework aligns with both federal asset management guidelines on life cycle planning and the Commission requirement to define the life spans of a project included in the SHOPP. Looking forward, it will be utilized for development of the upcoming enterprise Transportation Asset Management System (TAMS) for optimizing the scope and delivery of projects.

These building blocks include the treatments or type of work to maintain and improve condition of the assets, unit costs of the treatments and their life spans, and the amount of work that is being accomplished through different funding streams. In working across multiple objectives of the SHSMP, the following example of the building blocks for life cycle planning were collected as shown in Table 6-1.

Table 6-1. Example of the building blocks for life cycle planning

Drainage Restoration SHOPP and Maintenance Unit Costs by Treatment/Work Type for Inland Valley Region										
	SHOPP				Maintenance				Service Life (Years)	
Treatment/Work Type	Poor Split	Fair Split	Unit Cost/LF	Percent Used	Poor Split	Fair Split	Unit Cost/LF	Percent Used	Min	Max
Replace or Install Culvert	58%	42%	$1,610	85%	68%	32%	$1,033	83%	50	60
Cure-in-Place Culvert Liner	59%	41%	$1,159	12%	69%	32%	$603	11%	40	50
Slip Line Culvert	100%	0%	$1,159	4%	$0	78%	$613	6%	40	50

In a current white paper produced by FHWA's Asset Management Expert Task Group on life cycle planning, agencies should consider a continuous improvement process to maximize the benefits of life cycle planning. For example, during each SHSMP cycle, review of the treatment selections, timing of treatments, allocation of funds, and the delivery of projects should be reviewed to slow down deterioration and prevent a worst-first approach to the preservation of assets. Focusing not only on short-term conditions but forecasting to understand whether current plans will result in long-term performance and conditions to achieve agency objectives and performance goals.



7 Risk Management

Risk management strengthens life cycle planning and asset management by explicitly recognizing that any objective faces uncertainty. Furthermore, identifying strategies to reduce either uncertainty or its effects will lead to better decision making. Being proactive rather than reactive in managing risk, and avoiding "management by crisis," helps Caltrans to best use available resources to address, minimize, and respond to risk thereby increasing public trust.

7.1 Major Transportation System Risks

Caltrans manages a variety of risks such as enterprise risks, information technology risks, emergency and safety risks, but in developing asset management plans, only certain risks are associated with asset and system performance management. The following risks were identified as part of an initial risk register for the 2018 TAMP.

Asset and System Performance Risks

- Consistency and reliability of state and federal revenues over the plan period
- Construction inflation which can increase costs and reduce buying power
- Reliable project delivery
- Natural events such as floods, fires, and earthquakes, and the negative impacts of climate change
- Lack of asset management maturity
- Changing priorities that drive investment and project decision making
- Incomplete inventory and condition assessment of assets
- Availability and quality of data, models, and information

A risk register is a simple spreadsheet or matrix that summarizes an organization's risks, shows how they are analyzed, and records how they will be managed. This assessment helps to prioritize which of these risks can be mitigated through risk mitigation strategies. A risk assessment model, as shown in Figure 7-1, can be used to determine which risks require more consideration, based on a combination of the likelihood and impact.

	Likelihood Rating				
Aggregate Impact (actions across all impact types)	**Rare**	**Unlikely**	**Possible**	**Likely**	**Very Likely**
Very Significant	M	M	H	VH	VH
Major	L	M	M	H	VH
Moderate	L	M	M	M	H
Minor	L	L	L	M	M
Insignificant	L	L	L	L	M
L: Low; M: Medium; H: High; VH: Very High					

Figure 7-1. Risk Assessment Model

Prioritizing Caltrans' risks also includes reviewing the likelihood and significance of the risks and groups the risks into low, medium, high, and very high categories, similar to Figure 7-1, which is based on the National Cooperative Highway Research Project 08-93, "Managing Risk Across the Enterprise: A Guidebook for State Departments of Transportation"[72].

[72] National Cooperative Highway Research Project 08-93, "Managing Risk Across the Enterprise: A Guidebook for State Departments of Transportation", 2016, http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3635

A significant challenge for Caltrans is the uncertainty of changing climate and rising seas that pose numerous risks to the transportation network. These impacts along with others could have a cascading effect, including increased erosion rates, exacerbated bridge scour, intensified and enlarged geo-hazards, expanded areas vulnerable to flooding, and impacts due to wildfires. The costs associated with these risks have the potential to consume a constrained transportation budget through significant mitigation, relocation, resilience, and reconstruction costs and therefore need to be included in asset management policies and process.

7.2 Incorporating Risk into Asset Management Practices

Caltrans has completed vulnerability assessments for all 12 Districts. These reports identify vulnerabilities and assess the impacts and risk to the SHS[73] related to climate change. The vulnerability assessment process proposed in these reports is presented in Figure 7-2. It was developed to help guide future planning and programming processes. It outlines actions to be taken to achieve long-term highway system resiliency.

[73] 2019 Climate Change Vulnerability Assessments, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2019-climate-change-vulnerability-assessments

Figure 7-2. Vulnerability Assessment Process

Building from the vulnerability assessments, the Division of Transportation Planning led the development of statewide follow up studies, producing the 2020 Caltrans Adaptation Priorities Reports[74] for each of the districts. These studies are a follow up to the vulnerability assessments and considered the implications of the impacts on Caltrans and the traveling public, so that facilities with the greatest potential risk receive the highest priority for adaptation.

The SHSMP has been expanded to capture risks and vulnerabilities associated with sea level rise. While this is a significant step forward to strengthen consideration of risks in asset management practices, there remains a need for a systematic approach to prioritize various statewide risks and vulnerabilities across multiple assets for the selection of projects and for investment planning purposes. A Caltrans-sponsored research project[75] was completed in 2021 put forth a recommended approach for a comprehensive risk scoring methodology in order to rank all statewide assets and asset vulnerabilities using a normalized risk score. Caltrans is working to further test and implement the application of this approach to inform project and planning decisions.

Federal regulation 23 CFR part 667 requires State DOTs to perform periodic evaluations of facilities repeatedly requiring repair and reconstruction due to emergency events and consider alternatives to partially or fully mitigate the root cause of the damage. The Protective Betterment objective is improved under this plan to align with this federal rule and focus on the location of assets repeatedly damaged and to scope projects to mitigate the risk of recurring damage. Recent guidelines for the program have been developed that provide further details on eligible work and a method for the Districts to prioritize protective betterment projects.

[74] 2020 Adaptation Priorities Reports, https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2020-adaptation-priorities-reports
[75] Statewide Risk Scale Across Multiple Assets/Vulnerabilities, 2021, Caltrans Research Report CA21-3725, https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/final-reports/task_3725-a11y.pdf

Moving forward, asset management practices will continue to adapt and more fully incorporate risk and life cycle planning methods. As availability and quality of data become available, and models and analysis methods mature, an improved risk-based asset management process will be achieved.

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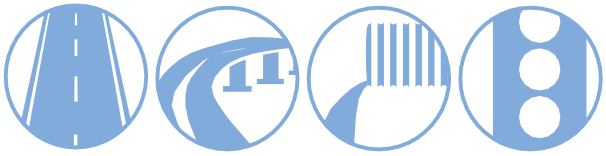


8 Conclusion

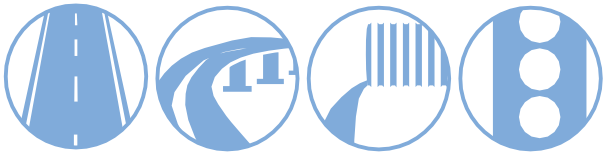
The SHSMP presents a performance driven and integrated management plan for the SHS that considers needs, investments, and resulting performance projections for the 10-year period spanning July 2023 – June 2033. The SHSMP builds from the Caltrans 2020-24 Strategic Plan to align California's investments in transportation infrastructure with strategic goals, while aligning transportation investments with priority state climate, health, and social equity goals. In alignment with CAPTI, the plan maintains its focus on a "fix-it-first" approach to meet defined condition targets, while placing an even stronger emphasis on creating a climate resilient transportation system that reduces greenhouse gas emissions, thereby reducing risk to state transportation assets. Finally, the plan expands upon a framework introduced in 2017 and strengthens integration with the 2022 California TAMP.

The SHSMP implements a performance-based asset management approach comprised of several key analysis steps. These steps include defining the inventory and condition of assets, establishing condition targets, determining the magnitude of condition gaps, developing cost estimates to close the gaps to determine needs, and producing a constrained investment plan.

The Needs Assessment provides a comprehensive picture of the total needs on the SHS, unconstrained by currently available funding. The majority of the SHS needs is determined through a gap analysis, considering projected asset condition, project work underway, and performance targets. The 10-year Major and Minor SHOPP need for the 2023 SHSMP is estimated at $106.1 billion, including $76.3 billion for the historically reported objectives and $29.8 billion for the new introduced objectives (Complete Streets, Climate Adaptation and Resilience, Fish and Wildlife Connectivity, and Mobility Hubs). Maintenance needs constitute $6.5 billion over the 10-year Plan period. Combined, the total SHOPP and Maintenance 10-year needs are estimated to be $112.7 billion.

The SHSMP presents an Investment Plan that defines the distribution of available funding from the SHA, the RMRA through SB 1, and the IIJA. These accounts are used to fund maintenance, operations, and capital projects including asset management-related activities. The SHOPP and the HM jointly fund maintenance, preservation, rehabilitation, and replacement projects; all are intended to maintain or improve asset condition. The SHOPP is the single largest funding source available to address rehabilitation needs on the SHS. The SHOPP Investment Plan, including the Minor Program, is approximately $56.3 billion over the 10-year Plan period.

Maintenance and SHOPP funds are committed to the “fix-it-first” approach – this is comprised of the treatments and strategies that extend the service life of existing assets. In the SHSMP, over 70 percent of available SHOPP funding is focused on stewardship and fixing the existing transportation system. The SHSMP fully implements the performance management requirements of MAP-21 and the Infrastructure Investment and Jobs Act (IIJA), Bipartisan Infrastructure Law (BIL). This strategic way of looking at performance-based infrastructure management has resulted in a plan that is consistent in approach across assets and deficiencies in addition to being fully transparent in its analysis. The performance management approach implemented in this plan supports the ongoing implementation of Transportation Asset Management in California. Together, these pieces along with others are building the structure for sound asset management of the State Highway System in California.



Appendices

Appendix A: Statutory Requirements

The State Highway System Management Plan incorporates guidance from many sources. The Appendix includes summaries or links to the most influential guiding documents for preparing the SHSMP. It lists federal and state legislation, including Senate Bills 1 and 486, and the Commission TAMP Guidelines and Actions which directed the state specific aspects of the Plan.

Americans with Disabilities Act (ADA)

Governs accessibility services and facility requirements for individuals with disabilities.

42 U.S.C. Section 12101 et seq.
http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section12101&num=0&edition=prelim

California Endangered Species Act (CESA)

Protects and preserves all native species threatened by extinction or experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation.

Fish and Game Code sections 2050-2068
http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=FGC&division=3.&title=&part=&chapter=1.5.&article=1

California Coastal Act

The Coastal Act includes specific policies that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works.

Public Resources Code Section 30000-30900
https://www.coastal.ca.gov/coastact.pdf

California Environmental Quality Act (CEQA)

CEQA requires state and local agencies to identify the significant environmental impacts associated with their activities and to mitigate those impacts.

Public Resources Code Section 21000-21177
http://leginfo.legislature.ca.gov/faces/codes_displayexpandedbranch.xhtml?tocCode=PRC&division=13.&title=&part=&chapter=&article=

California Ocean Plan

The California Ocean Plan contains standards that protect the beneficial uses of California's marine waters through establishing water quality objectives and implementation provisions in statewide water quality control plans and polices.

https://www.waterboards.ca.gov/water_issues/programs/ocean/

Capital Improvement Projects

Amends California Government Code section 14526.5 to include capital improvement projects relative to the operation of state highways and bridges.

Assembly Bill 2289, Chapter 76, Statutes of 2016
http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB2289

California Transportation Commission: Interim SHOPP Guidelines, Resolutions, and Delegations

The guidelines, resolutions, and delegations describe the policy, standards, criteria and procedures for the development, adoption, and management of the SHOPP by the Commission. This includes requirements for the SHSMP and TAMP.

State Highway Operation and Protection Program Guidelines (June 2020)
https://catc.ca.gov/programs/state-highway-operation-and-protection-program

Transportation Asset Management Plan, Guidelines and Performance Measures
https://catc.ca.gov/programs/state-highway-operation-and-protection-program

Climate Action Plan for Transportation Infrastructure (CAPTI)

The Climate Action Plan for Transportation Infrastructure (CAPTI) details how the state recommends investing billions of discretionary transportation dollars annually to aggressively combat and adapt to climate change while supporting public health, safety and equity.

Climate Action Plan for Transportation Infrastructure (CAPTI)
https://calsta.ca.gov/subject-areas/climate-action-plan

Federal Comprehensive Environmental Response Compensation and Liability Act (CERCLA)

Governs hazardous waste site cleanup resulting from accidents, spills, and other emergency releases of pollutants and contaminants into the environment.

42 U.S.C. Section 9601 et seq.
http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section9601&num=0&edition=prelim

Federal Endangered Species Act

Governs conservation of threatened and endangered ecosystems that species of fish, wildlife, and plants depend.

16 U.S.C. Section 1531 et seq.
http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title16-section1531&num=0&edition=prelim

Federal Water Pollution Control Act (Clean Water Act)

Governs surface water pollution as enforced by the Environmental Protection Agency (EPA).

33 U.S.C. Section 1251
http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title33-section1251&num=0&edition=prelim

Fish and Wildlife Protection and Conservation

Requires written notification when an activity/project may substantially divert or obstruct the natural flow of any river, stream, or lake.

Fish and Game Code Section 1602
http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=1602.&lawCode=FGC

Fish Passage

Senate Bill 857 requires Caltrans to prepare an annual report to the Legislature regarding fish passage. Caltrans is tasked with locating, assessing, and remediating fish passage barriers. SB 857 adds Article 3.5 (commencing with Section 156) to Chapter 1 of Division 1 of, the Streets and Highways Code, relating to fish passages. Transportation projects will be assessed for fish passage barriers and designed to remediate barriers or not create new barriers to fish on the SHS.

Senate Bill 857, Chapter 589, Statutes of 2005
http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060SB857

Highway Users Tax Account (HUTA)

Explains fuel tax revenue uses and establishes county apportionment amounts in accordance with various tax laws.

Streets and Highways Code sections 2104-2108
http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=SHC&division=3.&title=&part=&chapter=3.&article=

Infrastructure Investment and Jobs Act (IIJA)

IJJA also referred to as the Bipartisan Infrastructure Law (BIL), includes provisions related to Federal aid supporting highway, transit, safety, motor carrier, research, hazardous materials, and rail programs of the U.S. Department of Transportation (U.S. DOT).

Public Law 117-58
https://www.congress.gov/bill/117th-congress/house-bill/3684

Moving Ahead for Progress in the 21st Century Act (MAP-21)

MAP-21 authorizes the federal surface transportation programs for highways, highway safety, and transit and provides funding of over $105 billion for the federal fiscal years 2013 and 2014. It covers a variety of transportation related issues including financing, state and metropolitan transportation planning, congestion relief, improved safety, expedited project delivery, consolidation of federal programs, goods movement, and transportation related research and studies.

Public Law 112-141
https://www.govinfo.gov/content/pkg/PLAW-112publ141/html/PLAW-112publ141.htm

National Pollutant Discharge Elimination System (NPDES)

Governs construction and maintenance activities that impact storm water quality.

33 U.S.C. Section 1342
http://uscode.house.gov/view.xhtml?req=(title:33%20section:1342%20edition:prelim)%20OR%20(granuleid:USC-prelim-title33-section1342)&f=treesort&edition=prelim&num=0&jumpTo=true

Pavement and Bridge Performance Management

The Pavement and Bridge Performance Management Final Rule was established to implement MAP-21 and IIJA performance management requirements.

23 Code of Federal Regulations Part 490
https://www.federalregister.gov/documents/2017/01/18/2017-00681/national-performance-management-measures-assessing-performance-of-the-national-highway-system

Railroad Crossings

Outlines construction practices surrounding railroad crossings, including policy development by CTC in consultation with Caltrans.

Public Utilities Code sections 1201-1220
http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PUC&division=1.&title=&part=1.&chapter=6.&article=

Railway-Highway Crossings

Requires states to make safety improvements at public railroad-highway crossings and submit an annual progress report to FHWA.

23 U.S.C. Section 130
https://uscode.house.gov/view.xhtml?req=(title:23%20U.S.C.%20%20section:130%20edition:prelim)%20OR%20(granuleid:USC-prelim-title23%20U.S.C.%20-section130)&f=treesort&edition=prelim&num=0&jumpTo=true

Resource Conservation and Recovery Act (RCRA)

Governs hazardous and non-hazardous solid waste management.

42 U.S.C. Section 6901 et seq.
http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section6901&num=0&edition=prelim

Road Repair and Accountability Act of 2017

SB 1 provides the first significant, stable, and on-going increase in state transportation funding in more than two decades.

Senate Bill 1, Chapter 5, Statutes of 2017
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1

Safety Roadside Rest Areas

Streets and Highways Code Section 218 requires the Commission and Caltrans to plan, design, and construct safety roadside rest areas outside the state park system units. In addition, Caltrans must maintain safety roadside rest areas on the State Highway System.

Streets and Highways Code Section 218 et seq.
http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=SHC&division=1.&title=&part=&chapter=1.&article=7

State Highway Operation and Protection Program (SHOPP)

The State Highway Operation and Protection Program (SHOPP) is a four-year document of projects that is adopted by the California Transportation Commission (Commission). California Government Code requires Caltrans to prepare a state highway operation and protection program in accordance with SHOPP Guidelines and submit to the Commission for adoption no later than January 31 of each even-numbered year.

California Government Code Section 14526.5
http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=14526.5.&lawCode=GOV

SHOPP Guidelines
https://catc.ca.gov/-/media/ctc-media/documents/programs/shopp/guidelines/2022-shopp-guidelines-a11y.pdf

State Highway System Management Plan (SHSMP)

The State Highway System Management Plan (SHSMP) presents a performance driven and integrated management plan for the State Highway System (SHS) in California.

Streets and Highways Code Section 164.6 requires Caltrans to prepare a 10-year state rehabilitation plan and a five-year maintenance plan that addresses rehabilitation and maintenance needs of the state highway system.

Assembly Bill 515
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB515

Streets and Highways Code Section 164.6
http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=164.6.&lawCode=SHC

Statewide Potable Urban Water Usage Reduction

Requires State Water Resources Control Board (SWRCB) to reduce statewide water usage by 25 percent.

Executive Order B-29-15
https://www.ca.gov/archive/gov39/wp-content/uploads/2017/09/4.1.15_Executive_Order.pdf

Surface Mining and Reclamation Act of 1975 (SMARA)

SMARA establishes surface mining and reclamation policy to regulate surface mining operations to minimize adverse environmental impacts and ensure reclaimed mined lands are in a usable condition.

Public Resources Code Section 2710 et. seq.
http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PRC&division=2.&title=&part=&chapter=9.&article=1

Transportation Asset Management Plan (TAMP)

The Transportation Asset Management Plan (TAMP) Final Rule establishes the processes State departments of transportation must use to develop a TAMP. Each state is required to develop a risk-based TAMP for the National Highway System (NHS) to improve or preserve the assets' condition and the performance of the system in accordance with Moving Ahead for Progress in the 21st Century (MAP-21) § 1106(a), codified as 23 U.S.C. 119 (e) and (t).

Senate Bill 486 requires that Caltrans in consultation with the California Transportation Commission prepare a robust asset management plan to guide the selection of projects in the State Highway Operation and Protection Program (SHOPP).

23 Code of Federal Regulations Part 515
https://www.federalregister.gov/documents/2016/10/24/2016-25117/asset-management-plans-and-periodic-evaluations-of-facilities-repeatedly-requiring-repair-and

Senate Bill 486, Section 6, Statutes of 2014
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB486

23 Code of Federal Regulations Part 119
https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title23-section119&num=0&edition=prelim

Appendix B: Performance Management Summary Sheets

The Performance Management Summary Sheets included in Appendix B summarize the inventory and conditions, deterioration rates, pipelined work, desired state of repair targets, unit costs to address needs, statewide cost, and district-level breakdowns for each of the 33 Performance Objectives identified in the 2023 SHSMP. Table B-1 identifies the page number in which each Summary Sheet is in the appendix. The Summary Sheets are separated into sections (A-K). Table B-2 provides a description for each section.

Table B-1. Performance Management Summary Sheets – Page Numbers

Performance Management Summary Sheets – Page Numbers	
Performance Objectives	**Page Number**
Safety (Safety First)	
Proactive Safety	B-5
Reactive Safety	B-6
Stewardship (Strengthen Stewardship and Drive Efficiency)	
Bridge and Tunnel Health	B-7
Bridge Goods Movement Upgrades	B-8
Bridge Scour Mitigation	B-9
Bridge Seismic Restoration	B-10
Commercial Vehicle Enforcement Facilities	B-11
Drainage Pump Plants	B-12
Drainage Restoration	B-13
Fish and Wildlife Connectivity	B-14
Lighting Rehabilitation	B-15
Major Damage (Emergency Restoration)	B-16
Major Damage (Permanent Restoration)	B-17
Office Buildings	B-18
Overhead Sign Structures Rehabilitation	B-19
Pavement Class 1	B-20
Pavement Class 2	B-21
Pavement Class 3	B-22
Relinquishments	B-23
Roadside Rehabilitation	B-24
Protective Betterments	B-25
Safety Roadside Rest Area (SRRA) Rehabilitation	B-26
Sign Panel Replacement	B-27
Storm Water Mitigation	B-28

Performance Management Summary Sheets – Page Numbers	
Performance Objectives	**Page Number**
Transportation Management Systems	B-29
Transportation Management System Structures	B-30
Transportation Related Facilities	B-31
Weigh-In-Motion Scales	B-32
Climate (Lead Climate Action)	
Climate Adaptation and Resilience (Sea Level Rise)	B-33
Equity/Livability (Advance Equity and Livability in All Communities)	
ADA Pedestrian Infrastructure	B-34
Complete Streets	B-35
Multimodal (Enhance and Connect the Multimodal Transportation Network)	
Operational Improvements (including Managed Lanes)	B-36
Mobility Hubs	B-37

Table B-2. Performance Management Summary Sheets – Legend

Performance Management Summary Sheets - Legend
Description
(A) Baseline Inventory The total quantity of physical assets or asset/performance deficiencies at the start of the 10-year Plan period.
(B) Projected Inventory The total quantity of physical assets or asset/performance deficiencies expected at the end of the 10-year Plan period, resulting from the addition of new assets from the pipeline.
(C) Baseline Performance The breakdown of the Baseline Inventory (A) by quantity and percentage in terms of good, fair, and poor performance measures. Asset/performance deficiencies are reported as poor.
(D) Desired State of Repair (DSOR) Target Performance The fiscally unconstrained performance target, with a breakdown of the Projected Inventory (B) inventory by quantity and percentage in terms of good, fair, and poor performance measures.
(E) Effective Deterioration The effective deterioration of a physical asset in a 10-year do-nothing scenario is presented as an average annual rate. The "Into Fair" average annual rate represents the percentage of the Baseline Performance (C) good-condition assets which deteriorate into a fair condition per year. The "Into Poor" average annual rate represents the percentage of the Baseline Performance (C) fair condition assets which deteriorate into a poor condition per year. The "10-Year Deterioration" column represents the sum of the annual deteriorations using a simple, non-compound rate calculation.
(F) Projected Performance The projected future condition of a physical asset in a 10-year do-nothing scenario is determined using the Baseline Performance (C) and adding/subtracting the Effective Deterioration (E).
(G) Pipelined Projects Performance Committed projects which improve the condition of physical assets or remove asset/performance deficiencies, and their accomplishments are not reflected in the baseline performance, regardless of fund source. The performance of pipelined projects is quantified by performance measures (fair, poor, new) and fund source or maintenance strategy.
(H) Performance Gap The difference between the Projected Performance (F) and the DSOR Target Performance (D), subtracting the Pipelined Projects Performance (G) and excluding negative district-level gaps in the District Breakdown (K). A fair, poor, or new gap in each district is the estimated work which should be accomplished in addition to the pipelined projects to ensure that the district will reach the statewide DSOR target performance at the end of the 10-year Plan period.

Performance Management Summary Sheets - Legend
Description
(I) Average Un-escalated Capital Unit Cost and Support Ratio These costs are presented by performance measures (fair, poor, new) and maintenance strategy (SHOPP, HM). These are un-escalated, present value costs. Capital unit costs include material, labor, mobilization, traffic control, contingency (5%), supplemental work, right of way, state-furnished material and labor, and any other construction costs. Support costs include Project Approval and Environmental Documentation (PA&ED), Plan, Specification and Estimate (PS&E), right of way support, and construction support costs. Do not use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.
(J) Estimated SHOPP and Maintenance Costs for 10 Years The 10-year total of SHOPP and Maintenance needs in the SHSMP is summarized in this section. This total includes both the cost of the unfunded pipelined projects (in the first five-years) and the performance gap for the SHOPP (last five-years) and Maintenance (all 10-years). The cost of unfunded pipelined SHOPP projects consists of: the total (escalated capital and support) cost of programmed SHOPP projects with an Ready to List (RTL) FY 2023/24, 2024/25, and 2025/26; the total (escalated capital and support) cost of SHOPP projects in the SHOPP Ten-Year Project Book with an RTL FY 2026/27 and 2027/28, and the PA&ED cost of long lead projects with an RTL FY within the SHSMP. The cost of unfunded pipelined Maintenance work is typically zero, because Maintenance allocations are determined annually.
(K) District Breakdown This section presents a district-level breakdown of inventory, gaps, total (capital and support) unit costs, and performance gap costs. The performance gap costs include the costs to address the gap through the SHOPP, Maintenance, and other programs.

Note: A negative gap in a district indicates that the projected future performance of this objective in the district, after accounting for the accomplishments of pipelined projects, will surpass the statewide DSOR target performance at the end of the Plan.

Proactive Safety

(A) Baseline Inventory	
6,565	Annual Fatal & Serious Injury Collisions

(B) Projected Inventory (in 2033)	
6,565	Annual Fatal & Serious Injury Collisions

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	6,565	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	484	7.4%
Fair	N/A	N/A
Poor	6,081	92.6%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	6,565	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	98
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**98**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	386	77/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**386**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$4,900,000	55.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$1,302,794,704
	5-Year Performance Gap	$3,831,609,652
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$5,134,404,355**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	211	N/A	N/A	N/A	N/A	12	N/A	N/A	$9,926,707	$115,447,603
D2	206	N/A	N/A	N/A	N/A	11	N/A	N/A	$9,926,707	$106,612,834
D3	597	N/A	N/A	N/A	N/A	36	N/A	N/A	$9,926,707	$359,446,062
D4	1,055	N/A	N/A	N/A	N/A	47	N/A	N/A	$9,926,707	$469,930,311
D5	337	N/A	N/A	N/A	N/A	21	N/A	N/A	$9,926,707	$207,368,910
D6	498	N/A	N/A	N/A	N/A	33	N/A	N/A	$9,926,707	$331,452,748
D7	1,200	N/A	N/A	N/A	N/A	66	N/A	N/A	$9,926,707	$654,368,528
D8	998	N/A	N/A	N/A	N/A	66	N/A	N/A	$9,926,707	$655,063,398
D9	78	N/A	N/A	N/A	N/A	6	N/A	N/A	$9,926,707	$57,177,833
D10	515	N/A	N/A	N/A	N/A	32	N/A	N/A	$9,926,707	$316,463,421
D11	553	N/A	N/A	N/A	N/A	37	N/A	N/A	$9,926,707	$371,556,645
D12	318	N/A	N/A	N/A	N/A	19	N/A	N/A	$9,926,707	$186,721,359
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**6,565**	**N/A**	**N/A**	**N/A**	**N/A**	**386**	**N/A**	**N/A**	**N/A**	**$3,831,609,652**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Reactive Safety

(A) Baseline Inventory	
N/A	N/A

(B) Projected Inventory (in 2033)	
N/A	N/A

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$1,215,358,700
	5-Year Performance Gap	$1,600,000,000
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$2,815,358,700**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Bridge and Tunnel Health

(A) Baseline Inventory	
253,638,040	Square Foot

(B) Projected Inventory (in 2033)	
253,638,040	Square Foot

(C) Baseline Performance		
Good	125,109,310	49.3%
Fair	118,941,568	46.9%
Poor	9,587,162	3.8%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	123,014,449	48.5%
Fair	126,819,020	50.0%
Poor	3,804,571	1.5%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario		
	Average Annual Rate	10-Year Deterioration
Into Fair	5.0%	62,554,655
Into Poor	0.7%	8,325,910

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	62,554,655	24.7%
Fair	173,170,313	68.3%
Poor	17,913,072	7.1%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	7,930,183
	Maintenance through 2022/23	12,786,863
	Other (STIP, Local, etc.)	358,601
	Total	**21,075,647**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	5,432,116
	Maintenance through 2022/23	2,220,588
	Other (STIP, Local, etc.)	11,841
	Total	**7,664,545**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	4,018,991	803,798/year
	Maintenance for 10 Years	22,774,280	2,277,428/year
	Other	0	N/A
	Total	**26,793,271**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	2,899,781	579,956/year
	Maintenance for 10 Years	3,544,177	354,418/year
	Other	0	N/A
	Total	**6,443,956**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$273	35.0%
	Maintenance	$22	43.0%
Fix Poor to Good	SHOPP	$447	40.0%
	Maintenance	$31	43.0%
Add New	SHOPP	$573	40.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$1,889,724,100
	5-Year Performance Gap	$4,309,327,940
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$1,022,603,422
	Total	**$7,221,655,462**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	5,934,470	$1,049	$6,225,429,842	N/A	872,882	145,148	$1,049	$104	$397	$147,995,507
D2	5,879,356	$1,049	$6,167,613,670	N/A	1,039,842	164,164	$1,049	$104	$397	$172,831,761
D3	22,609,409	$1,049	$23,717,920,808	N/A	3,294,043	697,062	$1,049	$104	$397	$617,751,780
D4	55,369,408	$1,049	$58,084,102,690	N/A	7,864,018	2,315,023	$1,049	$104	$397	$1,733,096,834
D5	7,711,248	$1,049	$8,089,321,105	N/A	268,201	258,269	$1,049	$104	$397	$130,268,812
D6	11,255,849	$1,049	$11,807,709,578	N/A	818,351	283,745	$1,049	$104	$397	$197,350,900
D7	64,986,821	$1,049	$68,173,045,745	N/A	4,040,500	507,050	$1,049	$104	$397	$619,646,190
D8	22,746,090	$1,049	$23,861,303,111	N/A	2,571,965	488,660	$1,049	$104	$397	$460,270,914
D9	955,892	$1,049	$1,002,758,221	N/A	118,305	5,690	$1,049	$104	$397	$14,509,931
D10	9,908,900	$1,049	$10,394,721,308	N/A	1,391,555	483,378	$1,049	$104	$397	$335,934,925
D11	26,236,453	$1,049	$27,522,794,361	N/A	1,795,165	573,943	$1,049	$104	$397	$413,672,534
D12	20,044,144	$1,049	$21,026,883,987	N/A	2,718,444	521,824	$1,049	$104	$397	$488,601,273
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**253,638,040**	**N/A**	**$266,073,604,426**	**N/A**	**26,793,271**	**6,443,956**	**N/A**	**N/A**	**N/A**	**$5,331,931,362**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Bridge Goods Movement Upgrades

(A) Baseline Inventory	
248,757,933	Square Foot

(B) Projected Inventory (in 2033)	
248,757,933	Square Foot

(C) Baseline Performance		
Good	197,730,051	79.5%
Fair	20,100,303	8.1%
Poor	30,927,579	12.4%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	186,568,451	75.0%
Fair	37,313,690	15.0%
Poor	24,875,792	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	0.0%	0
Into Poor	0.0%	0

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	197,730,051	79.5%
Fair	20,100,303	8.1%
Poor	30,927,579	12.4%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	1,552,770
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	26,016
	Total	**1,578,786**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	1,083,413
	Maintenance through 2022/23	9,795
	Other (STIP, Local, etc.)	96,769
	Total	**1,189,977**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	0	0/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**0**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	9,653,426	1,930,685/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**9,653,426**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$211	40.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$517	40.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$526,503,756
	5-Year Performance Gap	$9,125,177,821
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$9,651,681,578**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	5,782,081	N/A	N/A	N/A	(553,350)	(113,549)	N/A	$386	$945	$0
D2	5,774,884	N/A	N/A	N/A	(508,447)	(345,804)	N/A	$386	$945	$0
D3	22,550,714	N/A	N/A	N/A	(1,072,085)	536,010	N/A	$386	$945	$506,678,827
D4	52,546,462	N/A	N/A	N/A	(3,067,403)	4,085,077	N/A	$386	$945	$3,861,536,209
D5	7,684,078	N/A	N/A	N/A	(507,921)	44,882	N/A	$386	$945	$42,425,998
D6	11,255,849	N/A	N/A	N/A	(1,002,491)	331,997	N/A	$386	$945	$313,829,687
D7	63,933,743	N/A	N/A	N/A	(4,051,266)	4,655,460	N/A	$386	$945	$4,400,707,100
D8	22,702,489	N/A	N/A	N/A	(2,438,698)	(1,723,301)	N/A	$386	$945	$0
D9	955,892	N/A	N/A	N/A	(123,460)	(68,991)	N/A	$386	$945	$0
D10	9,908,900	N/A	N/A	N/A	(746,144)	(402,878)	N/A	$386	$945	$0
D11	25,916,737	N/A	N/A	N/A	(2,406,817)	(897,592)	N/A	$386	$945	$0
D12	19,746,104	N/A	N/A	N/A	(2,038,944)	(1,239,501)	N/A	$386	$945	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**248,757,933**	**N/A**	**N/A**	**N/A**	**0**	**9,653,426**	**N/A**	**N/A**	**N/A**	**$9,125,177,821**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Bridge Scour Mitigation

(A) Baseline Inventory	
2,142,777	Square Foot

(B) Projected Inventory (in 2033)	
2,142,777	Square Foot

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	2,142,777	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	1,928,499	90.0%
Fair	N/A	N/A
Poor	214,278	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	2,142,777	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	1,643,375
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**1,643,375**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	349,766	69,953/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**349,766**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$664	46.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$586,308,456
	5-Year Performance Gap	$442,908,740
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$1,029,217,196**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	156,044	N/A	N/A	N/A	N/A	51,671	N/A	N/A	$1,266	$65,430,995
D2	53,691	N/A	N/A	N/A	N/A	2,510	N/A	N/A	$1,266	$3,178,413
D3	661,346	N/A	N/A	N/A	N/A	(55,446)	N/A	N/A	$1,266	$0
D4	214,717	N/A	N/A	N/A	N/A	130,159	N/A	N/A	$1,266	$164,820,362
D5	144,764	N/A	N/A	N/A	N/A	25,931	N/A	N/A	$1,266	$32,836,429
D6	67,587	N/A	N/A	N/A	N/A	60,828	N/A	N/A	$1,266	$77,026,506
D7	96,747	N/A	N/A	N/A	N/A	(2,635)	N/A	N/A	$1,266	$0
D8	678,174	N/A	N/A	N/A	N/A	75,923	N/A	N/A	$1,266	$96,141,307
D9	4,101	N/A	N/A	N/A	N/A	2,744	N/A	N/A	$1,266	$3,474,728
D10	4,327	N/A	N/A	N/A	N/A	(433)	N/A	N/A	$1,266	$0
D11	0	N/A	N/A	N/A	N/A	-	N/A	N/A	$1,266	$0
D12	61,279	N/A	N/A	N/A	N/A	(6,128)	N/A	N/A	$1,266	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**2,142,777**	**N/A**	**N/A**	**N/A**	**N/A**	**349,766**	**N/A**	**N/A**	**N/A**	**$442,908,740**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Bridge Seismic Restoration

(A) Baseline Inventory	
7,650,030	Square Foot

(B) Projected Inventory (in 2033)	
7,650,030	Square Foot

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	7,650,030	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	5,355,021	70.0%
Fair	N/A	N/A
Poor	2,295,009	30.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	7,650,030	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	3,271,724
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	121,634
	Total	**3,393,358**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	2,090,349	418,070/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**2,090,349**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$131	47.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$265,314,735
	5-Year Performance Gap	$527,124,103
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$792,438,838**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	704,947	N/A	N/A	N/A	N/A	263,332	N/A	N/A	$252	$66,404,531
D2	459,296	N/A	N/A	N/A	N/A	64,669	N/A	N/A	$252	$16,307,606
D3	416,530	N/A	N/A	N/A	N/A	(38,913)	N/A	N/A	$252	$0
D4	2,760,991	N/A	N/A	N/A	N/A	1,007,797	N/A	N/A	$252	$254,136,553
D5	272,394	N/A	N/A	N/A	N/A	(9,825)	N/A	N/A	$252	$0
D6	16,975	N/A	N/A	N/A	N/A	(4,662)	N/A	N/A	$252	$0
D7	1,547,908	N/A	N/A	N/A	N/A	347,378	N/A	N/A	$252	$87,598,442
D8	743,797	N/A	N/A	N/A	N/A	241,130	N/A	N/A	$252	$60,805,844
D9	0	N/A	N/A	N/A	N/A	-	N/A	N/A	$252	$0
D10	346,051	N/A	N/A	N/A	N/A	(34,107)	N/A	N/A	$252	$0
D11	243,879	N/A	N/A	N/A	N/A	166,043	N/A	N/A	$252	$41,871,126
D12	137,262	N/A	N/A	N/A	N/A	(41,179)	N/A	N/A	$252	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**7,650,030**	**N/A**	**N/A**	**N/A**	**N/A**	**2,090,349**	**N/A**	**N/A**	**N/A**	**$527,124,103**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Commercial Vehicle Enforcement Facilities

(A) Baseline Inventory	
311,175	Square Foot

(B) Projected Inventory (in 2033)	
358,005	Square Foot

(C) Baseline Performance		
Good	95,410	30.7%
Fair	145,465	46.7%
Poor	70,300	22.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	107,402	30.0%
Fair	179,003	50.0%
Poor	71,601	20.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario		
	Average Annual Rate	10-Year Deterioration
Into Fair	12.5%	95,410
Into Poor	4.6%	66,187

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	0	0.0%
Fair	174,688	56.1%
Poor	136,487	43.9%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	14,600
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**14,600**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	54,250
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	8,200
	Total	**62,450**
Add New	All SHOPP, Maintenance or Others	46,830

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	18,410	3,682/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**18,410**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	17,690	3,538/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**35,402**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$2,537	75.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$2,977	75.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$2,977	75.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$86,496,406
	5-Year Performance Gap	$227,315,632
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$313,812,038**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	900	$6,810	$6,129,150	N/A	(248)	238	$6,810	$5,804	$6,810	$1,620,820
D2	39,518	$6,810	$269,124,162	N/A	15,391	(7,904)	$6,810	$5,804	$6,810	$89,322,798
D3	13,850	$6,810	$94,320,807	N/A	514	3,441	$6,810	$5,804	$6,810	$26,416,820
D4	105,350	$6,810	$717,451,046	N/A	(2,423)	2,028	$6,810	$5,804	$6,810	$13,811,018
D5	0	$6,810	$0	N/A	-	-	$6,810	$5,804	$6,810	$0
D6	11,000	$6,810	$74,911,832	N/A	495	2,805	$6,810	$5,804	$6,810	$21,975,286
D7	23,202	$6,810	$158,009,484	N/A	(9,831)	(4,640)	$6,810	$5,804	$6,810	$0
D8	59,780	$6,810	$407,111,756	N/A	(3,377)	2,511	$6,810	$5,804	$6,810	$17,100,328
D9	4,350	$6,810	$29,624,224	N/A	130	1,175	$6,810	$5,804	$6,810	$8,756,410
D10	13,020	$6,810	$88,668,368	N/A	(6,336)	(1,958)	$6,810	$5,804	$6,810	$0
D11	83,275	$6,810	$567,116,619	N/A	(15,110)	5,492	$6,810	$5,804	$6,810	$37,401,435
D12	3,760	$6,810	$25,606,226	N/A	1,880	(752)	$6,810	$5,804	$6,810	$10,910,718
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**358,005**	**N/A**	**$2,438,073,676**	**N/A**	**18,410**	**17,690**	**N/A**	**N/A**	**N/A**	**$227,315,632**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Drainage Pump Plants

(A) Baseline Inventory	
290	Location

(B) Projected Inventory (in 2033)	
291	Location

(C) Baseline Performance		
Good	39	13.5%
Fair	105	36.2%
Poor	146	50.3%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	146	50.0%
Fair	116	40.0%
Poor	29	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	3.0%	12
Into Poor	2.7%	28

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	27	9.4%
Fair	89	30.6%
Poor	174	60.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	10
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**10**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	68
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**68**
Add New	All SHOPP, Maintenance or Others	1

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	3	1/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**3**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	78	16/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**78**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$275,670	54.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$711,156	54.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$5,627,750	54.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$123,116,094
	5-Year Performance Gap	$113,314,314
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$236,430,408**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	0	$11,327,471	$0	N/A	-	-	$11,327,471	$554,865	$1,431,407	$0
D2	0	$11,327,471	$0	N/A	-	-	$11,327,471	$554,865	$1,431,407	$0
D3	42	$11,327,471	$475,753,766	N/A	(11)	14	$11,327,471	$554,865	$1,431,407	$20,039,693
D4	68	$11,327,471	$770,268,002	N/A	(5)	20	$11,327,471	$554,865	$1,431,407	$28,628,133
D5	10	$11,327,471	$113,274,706	N/A	-	1	$11,327,471	$554,865	$1,431,407	$1,431,407
D6	76	$11,327,471	$860,887,767	N/A	(11)	26	$11,327,471	$554,865	$1,431,407	$37,216,573
D7	53	$11,327,471	$600,355,943	N/A	(7)	12	$11,327,471	$554,865	$1,431,407	$17,176,880
D8	2	$11,327,471	$22,654,941	N/A	-	-	$11,327,471	$554,865	$1,431,407	$0
D9	0	$11,327,471	$0	N/A	-	-	$11,327,471	$554,865	$1,431,407	$0
D10	22	$11,327,471	$249,204,354	N/A	(6)	1	$11,327,471	$554,865	$1,431,407	$1,431,407
D11	5	$11,327,471	$56,637,353	N/A	2	1	$11,327,471	$554,865	$1,431,407	$2,541,137
D12	13	$11,327,471	$147,257,118	N/A	1	3	$11,327,471	$554,865	$1,431,407	$4,849,085
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**291**	**N/A**	**$3,296,293,951**	**N/A**	**3**	**78**	**N/A**	**N/A**	**N/A**	**$113,314,314**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Drainage Restoration

(A) Baseline Inventory	
20,033,247	Linear Foot

(B) Projected Inventory (in 2033)	
22,798,202	Linear Foot

(C) Baseline Performance		
Good	14,872,283	74.2%
Fair	3,247,688	16.2%
Poor	1,913,277	9.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	15,958,741	70.0%
Fair	4,559,640	20.0%
Poor	2,279,820	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	2.0%	3,332,459
Into Poor	2.0%	724,167

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	13,702,200	60.1%
Fair	6,229,128	27.3%
Poor	2,866,874	12.6%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	245,363
	Maintenance through 2022/23	27,245
	Other (STIP, Local, etc.)	778
	Total	**273,386**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	440,316
	Maintenance through 2022/23	33,590
	Other (STIP, Local, etc.)	1,451
	Total	**475,357**
Add New	All SHOPP, Maintenance or Others	372,362

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	220,664	44,133/year
	Maintenance for 10 Years**	1,175,438	117,544/year
	Other	0	N/A
	Total	**1,396,102**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	135,554	27,111/year
	Maintenance for 10 Years	426,263	42,626/year
	Other	0	N/A
	Total	**561,817**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$1,565	54.0%
	Maintenance**	$121	43.6%
Fix Poor to Good	SHOPP	$2,208	54.0%
	Maintenance	$178	57.3%
Add New	SHOPP	$2,208	54.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$1,906,649,466
	5-Year Performance Gap	$1,297,438,322
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$377,379,299
	Total	**$3,581,467,087**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	1,181,990	$4,444	$5,252,425,289	N/A	145,121	118,687	$4,444	$668	$1,320	$253,683,915
D2	1,498,086	$4,444	$6,657,060,634	N/A	219,489	164,171	$4,444	$668	$1,320	$363,437,218
D3	2,145,187	$4,444	$9,532,591,454	N/A	112,798	130,994	$4,444	$668	$1,320	$248,328,453
D4	1,724,119	$4,444	$7,661,487,107	N/A	165,821	(14,362)	$4,444	$668	N/A	$110,829,811
D5	1,805,092	$4,444	$8,021,310,723	N/A	124,638	39,213	$4,444	$668	$1,320	$135,072,246
D6	2,028,546	$4,444	$9,014,275,822	N/A	234,999	106,496	$4,444	$668	$1,320	$297,659,703
D7	3,558,693	$4,444	$15,813,808,556	N/A	64,981	(103,137)	$4,444	$668	N/A	$43,432,437
D8	2,893,130	$4,444	$12,856,238,637	N/A	41,150	(200,570)	$4,444	$668	N/A	$27,503,423
D9	501,953	$4,444	$2,230,533,433	N/A	5,461	(33,506)	$4,444	$668	N/A	$3,649,546
D10	1,076,121	$4,444	$4,781,972,949	N/A	76,491	2,256	$4,444	$668	$1,320	$54,101,714
D11	2,686,146	$4,444	$11,936,458,479	N/A	135,295	(54,729)	$4,444	$668	N/A	$90,426,603
D12	1,699,138	$4,444	$7,550,479,890	N/A	69,858	(43,817)	$4,444	$668	N/A	$46,692,553
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**22,798,202**	**N/A**	**$101,308,642,972**	**N/A**	**1,396,102**	**561,817**	**N/A**	**N/A**	**N/A**	**$1,674,817,621**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.
(**) The maintenance unit cost, support ratio, and performance gap represent the contributions of both Major Maintenance and Field Maintenance Crews.

Fish and Wildlife Connectivity

(A) Baseline Inventory	
153	Location

(B) Projected Inventory (in 2033)	
153	Location

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	153	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	100	65.4%
Fair	N/A	N/A
Poor	53	34.6%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	153	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	13
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	2
	Total	**15**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	85	17/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**85**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$4,078,748	100.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$69,431,579
	5-Year Performance Gap	$820,965,802
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$890,397,382**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	34	N/A	N/A	N/A	N/A	24	N/A	N/A	$10,661,894	$255,885,445
D2	18	N/A	N/A	N/A	N/A	9	N/A	N/A	$10,661,894	$95,957,042
D3	4	N/A	N/A	N/A	N/A	3	N/A	N/A	$10,661,894	$31,985,681
D4	29	N/A	N/A	N/A	N/A	16	N/A	N/A	$10,661,894	$170,590,297
D5	34	N/A	N/A	N/A	N/A	20	N/A	N/A	$6,397,136	$127,942,722
D6	1	N/A	N/A	N/A	N/A	-	N/A	N/A	$10,661,894	$0
D7	12	N/A	N/A	N/A	N/A	4	N/A	N/A	$10,661,894	$42,647,574
D8	9	N/A	N/A	N/A	N/A	3	N/A	N/A	$10,661,894	$31,985,681
D9	4	N/A	N/A	N/A	N/A	2	N/A	N/A	$10,661,894	$21,323,787
D10	3	N/A	N/A	N/A	N/A	1	N/A	N/A	$10,661,894	$10,661,894
D11	1	N/A	N/A	N/A	N/A	1	N/A	N/A	$10,661,894	$10,661,894
D12	4	N/A	N/A	N/A	N/A	2	N/A	N/A	$10,661,894	$21,323,787
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**153**	**N/A**	**N/A**	**N/A**	**N/A**	**85**	**N/A**	**N/A**	**N/A**	**$820,965,802**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Lighting Rehabilitation

(A) Baseline Inventory	
104,810	Each

(B) Projected Inventory (in 2033)	
106,671	Each

(C) Baseline Performance		
Good	39,048	37.3%
Fair	15,298	14.6%
Poor	50,464	48.1%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	48,002	45.0%
Fair	32,001	30.0%
Poor	26,668	25.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario		
	Average Annual Rate	10-Year Deterioration
Into Fair	5.6%	21,853
Into Poor	10.0%	15,298

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	17,195	16.4%
Fair	21,853	20.9%
Poor	65,762	62.7%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	1
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	4
	Total	**5**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	7,305
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	7
	Total	**7,312**
Add New	All SHOPP, Maintenance or Others	1,861

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	99	20/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**99**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	31,784	6,357/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**31,784**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$15,777	37.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$15,777	37.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$15,777	37.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$157,240,297
	5-Year Performance Gap	$900,720,105
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$1,057,960,402**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	1,523	$28,251	$43,025,961	0	(316)	421	$28,251	$28,251	$28,251	$11,893,585
D2	2,339	$28,251	$66,078,610	0	(228)	554	$28,251	$28,251	$28,251	$15,650,941
D3	7,526	$28,251	$212,615,485	0	(932)	1,594	$28,251	$28,251	$28,251	$45,031,768
D4	26,593	$28,251	$751,273,398	0	(659)	9,136	$28,251	$28,251	$28,251	$258,099,265
D5	3,266	$28,251	$92,267,097	0	(438)	999	$28,251	$28,251	$28,251	$28,222,544
D6	6,296	$28,251	$177,867,007	0	99	1,009	$28,251	$28,251	$28,251	$31,301,881
D7	27,217	$28,251	$768,901,895	0	(5,210)	10,993	$28,251	$28,251	$28,251	$310,560,992
D8	8,844	$28,251	$249,850,033	0	(858)	793	$28,251	$28,251	$28,251	$22,402,881
D9	505	$28,251	$14,266,652	0	(2)	85	$28,251	$28,251	$28,251	$2,401,318
D10	4,230	$28,251	$119,500,864	0	(812)	541	$28,251	$28,251	$28,251	$15,283,680
D11	9,417	$28,251	$266,037,739	0	(749)	2,129	$28,251	$28,251	$28,251	$60,145,943
D12	8,915	$28,251	$251,855,840	0	(50)	3,530	$28,251	$28,251	$28,251	$99,725,307
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**106,671**	**N/A**	**$3,013,540,581**	**0**	**99**	**31,784**	**N/A**	**N/A**	**N/A**	**$900,720,105**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Major Damage (Emergency Restoration)

(A) Baseline Inventory	
N/A	N/A

(B) Projected Inventory (in 2033)	
N/A	N/A

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$0
	5-Year Performance Gap	$2,388,000,000
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$2,388,000,000**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Major Damage (Permanent Restoration)

(A) Baseline Inventory	
N/A	N/A

(B) Projected Inventory (in 2033)	
N/A	N/A

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$583,867,000
	5-Year Performance Gap	$700,000,000
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$1,283,867,000**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Office Buildings

(A) Baseline Inventory	
2,669,524	Square Foot

(B) Projected Inventory (in 2033)	
2,669,524	Square Foot

(C) Baseline Performance		
Good	1,071,640	40.1%
Fair	861,851	32.3%
Poor	736,033	27.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	1,334,762	50.0%
Fair	1,067,810	40.0%
Poor	266,952	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	10.0%	1,071,640
Into Poor	0.4%	31,051

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	0	0.0%
Fair	1,902,440	71.3%
Poor	767,084	28.7%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	0
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**0**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	0
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**0**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	1,125,538	225,108/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**1,125,538**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	680,353	136,071/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**680,353**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$5	29.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$1,256	0.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$1,256	0.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$4,538,000
	5-Year Performance Gap	$1,126,355,267
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$1,130,893,267**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	91,456	$1,642	$150,134,074	N/A	44,218	1,510	$1,642	$8	$1,642	$2,851,580
D2	55,581	$1,642	$91,241,711	N/A	(22,232)	50,023	$1,642	$8	$1,642	$82,117,704
D3	0	$1,642	$0	N/A	-	-	$1,642	$8	$1,642	$0
D4	750,000	$1,642	$1,231,199,215	N/A	450,000	(75,000)	$1,642	$8	$1,642	$3,793,584
D5	41,700	$1,642	$68,454,676	N/A	(16,680)	37,530	$1,642	$8	$1,642	$61,609,209
D6	64,374	$1,642	$105,676,291	N/A	(25,750)	57,937	$1,642	$8	$1,642	$95,109,319
D7	716,200	$1,642	$1,175,713,170	N/A	429,720	(71,620)	$1,642	$8	$1,642	$3,622,619
D8	336,000	$1,642	$551,577,248	N/A	201,600	(33,600)	$1,642	$8	$1,642	$1,699,525
D9	37,545	$1,642	$61,633,833	N/A	(15,018)	33,791	$1,642	$8	$1,642	$55,471,270
D10	90,804	$1,642	$149,063,751	N/A	(36,322)	81,724	$1,642	$8	$1,642	$134,158,033
D11	0	$1,642	$0	N/A	-	-	$1,642	$8	$1,642	$0
D12	0	$1,642	$0	N/A	-	-	$1,642	$8	$1,642	$0
HQ	485,864	$1,642	$797,593,834	N/A	(174,906)	417,838	$1,642	$8	$1,642	$685,922,423
Statewide Totals	**2,669,524**	**N/A**	**$4,382,287,803**	**N/A**	**1,125,538**	**680,353**	**N/A**	**N/A**	**N/A**	**$1,126,355,267**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Overhead Sign Structures Rehabilitation

(A) Baseline Inventory	
18,006	Each

(B) Projected Inventory (in 2033)	
18,033	Each

(C) Baseline Performance		
Good	10,568	58.7%
Fair	6,241	34.7%
Poor	1,197	6.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	7,213	40.0%
Fair	8,115	45.0%
Poor	2,705	15.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	4.0%	4,227
Into Poor	4.0%	2,496

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	6,341	35.2%
Fair	7,972	44.3%
Poor	3,693	20.5%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	330
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	3
	Total	**333**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	486
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	39
	Total	**525**
Add New	All SHOPP, Maintenance or Others	27

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	83	17/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**83**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	766	153/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**766**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$214,200	37.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$214,200	37.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$214,200	37.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$187,457,858
	5-Year Performance Gap	$325,630,556
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$513,088,414**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	81	$383,546	$31,067,226	N/A	11	19	$383,546	$383,546	$383,546	$11,506,380
D2	206	$383,546	$79,010,477	N/A	9	9	$383,546	$383,546	$383,546	$6,903,828
D3	1,533	$383,546	$587,976,022	N/A	(145)	(108)	$383,546	$383,546	$383,546	$0
D4	3,406	$383,546	$1,306,357,684	N/A	(98)	402	$383,546	$383,546	$383,546	$154,185,493
D5	298	$383,546	$114,296,709	N/A	(16)	40	$383,546	$383,546	$383,546	$15,341,840
D6	1,203	$383,546	$461,405,841	N/A	58	199	$383,546	$383,546	$383,546	$98,571,323
D7	4,763	$383,546	$1,826,829,610	N/A	(202)	80	$383,546	$383,546	$383,546	$30,683,680
D8	1,899	$383,546	$728,353,859	N/A	(18)	(69)	$383,546	$383,546	$383,546	$0
D9	12	$383,546	$4,602,552	N/A	(1)	(2)	$383,546	$383,546	$383,546	$0
D10	597	$383,546	$228,976,963	N/A	5	17	$383,546	$383,546	$383,546	$8,438,012
D11	2,369	$383,546	$908,620,480	N/A	(72)	(62)	$383,546	$383,546	$383,546	$0
D12	1,666	$383,546	$638,987,640	N/A	(7)	(62)	$383,546	$383,546	$383,546	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**18,033**	**N/A**	**$6,916,485**	**N/A**	**83**	**766**	**N/A**	**N/A**	**N/A**	**$325,630,556**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Pavement Class 1

(A) Baseline Inventory	
27,150	Lane Mile

(B) Projected Inventory (in 2033)	
27,150	Lane Mile

(C) Baseline Performance		
Good	16,645	61.3%
Fair	10,157	37.4%
Poor	348	1.3%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	16,290	60.0%
Fair	10,588	39.0%
Poor	271	1.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	8.3%	13,891
Into Poor	1.2%	1,185

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	2,754	10.1%
Fair	22,864	84.2%
Poor	1,533	5.6%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	5,698
	Maintenance through 2022/23	566
	Other (STIP, Local, etc.)	9
	Total	**6,273**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	248
	Maintenance through 2022/23	15
	Other (STIP, Local, etc.)	0
	Total	**263**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	5,379	1,076/year
	Maintenance for 10 Years	901	90/year
	Other	0	N/A
	Total	**6,280**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	115	23/year
	Maintenance for 10 Years	1	0/year
	Other	0	N/A
	Total	**116**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$848,438	22.0%
	Maintenance	$130,173	18.0%
Fix Poor to Good	SHOPP	$2,362,257	22.0%
	Maintenance	$130,173	18.0%
Add New	SHOPP	$1,100,000	22.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$4,195,873,490
	5-Year Performance Gap	$7,710,285,450
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$162,184,396
	Total	**$12,068,343,336**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	1,041	$1,754,001	$1,826,369,774	N/A	471	7	$1,754,001	$842,107	$2,064,601	$411,084,459
D2	1,009	$1,754,001	$1,769,917,238	N/A	330	0	$1,754,001	$976,964	N/A	$322,398,169
D3	1,799	$1,754,001	$3,155,599,415	N/A	408	4	$1,754,001	$1,056,305	$3,734,008	$445,908,384
D4	3,772	$1,754,001	$6,615,498,783	N/A	839	20	$1,754,001	$920,768	$4,882,508	$870,174,181
D5	1,231	$1,754,001	$2,159,163,481	N/A	431	1	$1,754,001	$819,177	$1,138,581	$354,203,783
D6	2,114	$1,754,001	$3,708,736,043	N/A	503	3	$1,754,001	$1,188,306	$2,033,461	$603,818,277
D7	4,539	$1,754,001	$7,961,705,404	N/A	647	63	$1,754,001	$2,041,987	$4,076,818	$1,578,004,839
D8	4,697	$1,754,001	$8,238,427,193	N/A	659	5	$1,754,001	$1,263,159	$2,113,484	$842,988,934
D9	1,491	$1,754,001	$2,615,028,452	N/A	730	0	$1,754,001	$776,607	N/A	$566,922,790
D10	1,260	$1,754,001	$2,209,240,222	N/A	495	0	$1,754,001	$1,555,403	N/A	$769,924,677
D11	2,696	$1,754,001	$4,728,405,480	N/A	531	10	$1,754,001	$1,299,040	$2,045,935	$710,249,598
D12	1,501	$1,754,001	$2,632,924,529	N/A	236	3	$1,754,001	$1,633,821	$3,736,694	$396,791,754
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**27,150**	**N/A**	**$47,621,016,012**	**N/A**	**6,280**	**116**	**N/A**	**N/A**	**N/A**	**$7,872,469,845**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Pavement Class 2

(A) Baseline Inventory	
16,276	Lane Mile

(B) Projected Inventory (in 2033)	
16,276	Lane Mile

(C) Baseline Performance		
Good	7,224	44.4%
Fair	8,860	54.4%
Poor	192	1.2%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	8,952	55.0%
Fair	6,999	43.0%
Poor	326	2.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	9.0%	6,524
Into Poor	1.5%	1,317

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	700	4.3%
Fair	14,067	86.4%
Poor	1,509	9.3%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	4,193
	Maintenance through 2022/23	861
	Other (STIP, Local, etc.)	10
	Total	**5,064**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	158
	Maintenance through 2022/23	17
	Other (STIP, Local, etc.)	0
	Total	**175**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	2,629	526/year
	Maintenance for 10 Years	1,185	119/year
	Other	0	N/A
	Total	**3,814**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	111	22/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**111**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$608,965	22.0%
	Maintenance	$110,581	18.0%
Fix Poor to Good	SHOPP	$803,213	22.0%
	Maintenance	$110,581	18.0%
Add New	SHOPP	$1,000,000	22.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$3,002,803,789
	5-Year Performance Gap	$2,694,986,100
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$181,000,405
	Total	**$5,878,790,294**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	730	$1,594,547	$1,163,883,594	N/A	65	0	$1,594,547	$516,526	N/A	$33,574,208
D2	1,785	$1,594,547	$2,846,685,321	N/A	381	0	$1,594,547	$680,000	N/A	$259,079,863
D3	1,851	$1,594,547	$2,951,198,293	N/A	338	5	$1,594,547	$771,973	$1,524,375	$268,548,659
D4	2,019	$1,594,547	$3,218,689,889	N/A	339	14	$1,594,547	$713,382	$1,436,738	$261,950,807
D5	1,266	$1,594,547	$2,018,050,398	N/A	410	30	$1,594,547	$607,123	$924,601	$276,658,322
D6	1,684	$1,594,547	$2,685,674,368	N/A	386	10	$1,594,547	$861,629	$1,161,081	$344,199,474
D7	1,423	$1,594,547	$2,268,783,308	N/A	266	4	$1,594,547	$760,026	$1,919,668	$209,845,616
D8	1,710	$1,594,547	$2,727,374,954	N/A	417	18	$1,594,547	$695,276	$1,610,581	$318,920,458
D9	593	$1,594,547	$945,704,950	N/A	162	0	$1,594,547	$591,025	N/A	$95,746,118
D10	1,644	$1,594,547	$2,621,259,463	N/A	469	24	$1,594,547	$787,371	$1,053,970	$394,572,113
D11	1,030	$1,594,547	$1,643,009,813	N/A	383	6	$1,594,547	$731,140	$2,185,835	$293,141,660
D12	541	$1,594,547	$862,021,542	N/A	198	0	$1,594,547	$604,794	N/A	$119,749,207
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**16,276**	**N/A**	**$25,952,335,894**	**N/A**	**3,814**	**111**	**N/A**	**N/A**	**N/A**	**$2,875,986,505**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Pavement Class 3

(A) Baseline Inventory	
6,593	Lane Mile

(B) Projected Inventory (in 2033)	
6,593	Lane Mile

(C) Baseline Performance		
Good	2,724	41.3%
Fair	3,765	57.1%
Poor	104	1.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	2,967	45.0%
Fair	3,494	53.0%
Poor	132	2.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	9.6%	2,607
Into Poor	1.5%	553

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	117	1.77%
Fair	5,820	88.26%
Poor	657	9.97%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	539
	Maintenance through 2022/23	708
	Other (STIP, Local, etc.)	0
	Total	**1,247**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	37
	Maintenance through 2022/23	25
	Other (STIP, Local, etc.)	0
	Total	**62**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	571	114/year
	Maintenance for 10 Years	1,696	170/year
	Other	0	N/A
	Total	**2,267**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	30	6/year
	Maintenance for 10 Years	65	7/year
	Other	0	N/A
	Total	**95**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$689,236	22.0%
	Maintenance	$156,795	18.0%
Fix Poor to Good	SHOPP	$991,681	22.0%
	Maintenance	$156,795	18.0%
Add New	SHOPP	$1,000,000	22.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$334,828,150
	5-Year Performance Gap	$674,978,705
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$381,393,192
	Total	**$1,391,200,047**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	524	$1,594,547	$835,124,728	N/A	143	4	$1,594,547	$523,955	$216,578	$75,791,908
D2	1,149	$1,594,547	$1,832,644,475	N/A	208	17	$1,594,547	$473,123	$216,578	$102,091,482
D3	690	$1,594,547	$1,099,707,870	N/A	200	13	$1,594,547	$356,370	$1,034,625	$84,724,034
D4	362	$1,594,547	$577,850,987	N/A	295	4	$1,594,547	$521,925	$216,578	$154,834,258
D5	596	$1,594,547	$950,981,306	N/A	168	24	$1,594,547	$335,984	$535,463	$69,296,391
D6	1,387	$1,594,547	$2,211,658,671	N/A	401	9	$1,594,547	$650,057	$1,231,108	$271,752,753
D7	230	$1,594,547	$366,401,331	N/A	162	4	$1,594,547	$280,222	$216,578	$46,262,213
D8	322	$1,594,547	$513,517,404	N/A	180	8	$1,594,547	$367,784	$216,578	$67,933,667
D9	373	$1,594,547	$594,748,399	N/A	180	-	$1,594,547	$322,084	N/A	$57,975,084
D10	586	$1,594,547	$934,756,792	N/A	124	8	$1,594,547	$225,044	$503,051	$31,929,868
D11	374	$1,594,547	$595,985,767	N/A	206	4	$1,594,547	$396,521	$3,024,246	$93,780,239
D12	0	$1,594,547	$0	N/A	-	-	$1,594,547	N/A	N/A	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**6,712**	**N/A**	**$10,513,377,730**	**N/A**	**2,267**	**95**	**N/A**	**N/A**	**N/A**	**$1,056,371,897**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Relinquishments

(A) Baseline Inventory	
N/A	N/A

(B) Projected Inventory (in 2033)	
N/A	N/A

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	N/A	N/A

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$51,378,000
	5-Year Performance Gap	$55,000,000
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$106,378,000**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Roadside Rehabilitation

(A) Baseline Inventory	
32,006	Acre

(B) Projected Inventory (in 2033)	
32,030	Acre

(C) Baseline Performance		
Good	2,950	9.2%
Fair	6,466	20.2%
Poor	22,590	70.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	19,218	60.0%
Fair	9,609	30.0%
Poor	3,203	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	2.9%	861
Into Poor	5.8%	3,770

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	2,089	6.5%
Fair	3,558	11.1%
Poor	26,360	82.4%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	0
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**0**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	1,039
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	58
	Total	**1,098**
Add New	All SHOPP, Maintenance or Others	24

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	13	3/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**13**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	22,059	4,412/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**22,059**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$86,209	48.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$86,209	48.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$86,209	48.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$100,908,176
	5-Year Performance Gap	$3,680,734,101
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$3,781,642,277**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	904	$166,760	$150,675,676	N/A	(42)	557	$166,760	$166,760	$166,760	$92,885,506
D2	429	$166,760	$71,463,962	N/A	11	242	$166,760	$166,760	$166,760	$42,190,365
D3	1,379	$166,760	$229,911,114	N/A	2	537	$166,760	$166,760	$166,760	$89,883,820
D4	5,405	$166,760	$901,292,925	N/A	(1,545)	4,550	$166,760	$166,760	$166,760	$758,759,522
D5	715	$166,760	$119,259,875	N/A	(52)	244	$166,760	$166,760	$166,760	$40,689,522
D6	1,628	$166,760	$271,435,019	N/A	(472)	1,448	$166,760	$166,760	$166,760	$241,468,964
D7	7,293	$166,760	$1,216,224,969	N/A	(1,491)	4,837	$166,760	$166,760	$166,760	$806,619,737
D8	3,491	$166,760	$582,102,546	N/A	(805)	2,702	$166,760	$166,760	$166,760	$450,586,424
D9	0	$166,760	$0	N/A	-	-	$166,760	$166,760	$166,760	$0
D10	349	$166,760	$58,276,623	N/A	(90)	262	$166,760	$166,760	$166,760	$43,691,208
D11	8,363	$166,760	$1,394,561,298	N/A	(1,327)	6,002	$166,760	$166,760	$166,760	$1,000,895,527
D12	2,075	$166,760	$346,081,523	N/A	(242)	678	$166,760	$166,760	$166,760	$113,063,507
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**32,030**	**N/A**	**$5,341,285,531**	**N/A**	**13**	**22,059**	**N/A**	**N/A**	**N/A**	**$3,680,734,101**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Protective Betterments

(A) Baseline Inventory	
115	Location

(B) Projected Inventory (in 2033)	
115	Location

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	115	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	115	100.0%
Fair	N/A	N/A
Poor	0	0.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	115	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	3
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**3**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	112	22/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**112**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$5,040,000	38.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$109,350,274
	5-Year Performance Gap	$1,018,134,309
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$1,127,484,583**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	32	N/A	N/A	N/A	N/A	31	N/A	N/A	$9,090,485	$281,805,032
D2	16	N/A	N/A	N/A	N/A	15	N/A	N/A	$9,090,485	$136,357,274
D3	6	N/A	N/A	N/A	N/A	6	N/A	N/A	$9,090,485	$54,542,909
D4	9	N/A	N/A	N/A	N/A	9	N/A	N/A	$9,090,485	$81,814,364
D5	12	N/A	N/A	N/A	N/A	12	N/A	N/A	$9,090,485	$109,085,819
D6	3	N/A	N/A	N/A	N/A	3	N/A	N/A	$9,090,485	$27,271,455
D7	8	N/A	N/A	N/A	N/A	7	N/A	N/A	$9,090,485	$63,633,394
D8	2	N/A	N/A	N/A	N/A	2	N/A	N/A	$9,090,485	$18,180,970
D9	11	N/A	N/A	N/A	N/A	11	N/A	N/A	$9,090,485	$99,995,334
D10	5	N/A	N/A	N/A	N/A	5	N/A	N/A	$9,090,485	$45,452,425
D11	0	N/A	N/A	N/A	N/A	-	N/A	N/A	$9,090,485	$0
D12	11	N/A	N/A	N/A	N/A	11	N/A	N/A	$9,090,485	$99,995,334
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**115**	**N/A**	**N/A**	**N/A**	**N/A**	**112**	**N/A**	**N/A**	**N/A**	**$1,018,134,309**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Safety Roadside Rest Area (SRRA) Rehabilitation

(A) Baseline Inventory	
86	Location

(B) Projected Inventory (in 2033)	
86	Location

(C) Baseline Performance		
Good	26	30.2%
Fair	36	41.9%
Poor	24	27.9%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	25	30.0%
Fair	39	45.0%
Poor	22	25.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	8.5%	22
Into Poor	8.6%	31

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	4	4.7%
Fair	27	31.4%
Poor	55	64.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	3
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**3**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	13
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**13**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	4	1/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**4**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	22	4/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**22**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$6,183,905	99.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$10,972,760	99.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$20,247,536	43.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$320,475,035
	5-Year Performance Gap	$692,204,923
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$1,012,679,958**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	6	$37,843,008	$227,058,045	N/A	(3)	4	$37,843,008	$16,083,972	$28,539,502	$114,158,006
D2	20	$37,843,008	$756,860,151	N/A	(5)	8	$37,843,008	$16,083,972	$28,539,502	$228,316,012
D3	11	$37,843,008	$416,273,083	N/A	(1)	2	$37,843,008	$16,083,972	$28,539,502	$57,079,003
D4	3	$37,843,008	$113,529,023	N/A	2	(1)	$37,843,008	$16,083,972	$28,539,502	$32,167,944
D5	5	$37,843,008	$189,215,038	N/A	1	1	$37,843,008	$16,083,972	$28,539,502	$44,623,474
D6	9	$37,843,008	$340,587,068	N/A	-	2	$37,843,008	$16,083,972	$28,539,502	$57,079,003
D7	0	$37,843,008	$0	N/A	-	-	$37,843,008	$16,083,972	$28,539,502	$0
D8	15	$37,843,008	$567,645,113	N/A	(7)	1	$37,843,008	$16,083,972	$28,539,502	$28,539,502
D9	5	$37,843,008	$189,215,038	N/A	-	2	$37,843,008	$16,083,972	$28,539,502	$57,079,003
D10	6	$37,843,008	$227,058,045	N/A	(3)	1	$37,843,008	$16,083,972	$28,539,502	$28,539,502
D11	6	$37,843,008	$227,058,045	N/A	1	1	$37,843,008	$16,083,972	$28,539,502	$44,623,474
D12	0	$37,843,008	$0	N/A	-	-	$37,843,008	$16,083,972	$28,539,502	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**86**	**N/A**	**$3,254,498,648**	**N/A**	**4**	**22**	**N/A**	**N/A**	**N/A**	**$692,204,923**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Sign Panel Replacement

(A) Baseline Inventory	
87,131	Each

(B) Projected Inventory (in 2033)	
87,787	Each

(C) Baseline Performance		
Good	11,667	13.4%
Fair	0	0.0%
Poor	75,464	86.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	87,787	100.0%
Fair		
Poor	0	0.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	6.7%	7,782
Into Poor	20.0%	0

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	3,885	4.5%
Fair	7,782	8.9%
Poor	75,464	86.6%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	0
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**0**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	17,429
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	631
	Total	**18,060**
Add New	All SHOPP, Maintenance or Others	656

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	0	0/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**0**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	57,404	11,481/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**57,404**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$8,243	36.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$8,243	36.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$8,243	36.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$133,510,709
	5-Year Performance Gap	$841,041,541
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$974,552,250**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	4,222	$14,651	$61,857,665	N/A	(4,121)	801	$14,651	$14,651	$14,651	$11,735,668
D2	7,418	$14,651	$108,683,126	N/A	(7,076)	5,541	$14,651	$14,651	$14,651	$81,182,691
D3	6,887	$14,651	$100,903,301	N/A	(6,291)	5,237	$14,651	$14,651	$14,651	$76,728,704
D4	13,895	$14,651	$203,579,406	N/A	(12,662)	11,685	$14,651	$14,651	$14,651	$171,200,098
D5	4,569	$14,651	$66,941,656	N/A	(3,466)	2,401	$14,651	$14,651	$14,651	$35,177,701
D6	7,257	$14,651	$106,324,271	N/A	(6,348)	3,991	$14,651	$14,651	$14,651	$58,473,221
D7	17,353	$14,651	$254,243,500	N/A	(15,960)	9,780	$14,651	$14,651	$14,651	$143,289,427
D8	8,539	$14,651	$125,107,200	N/A	(7,851)	6,792	$14,651	$14,651	$14,651	$99,511,430
D9	1,512	$14,651	$22,152,721	N/A	(1,468)	1,135	$14,651	$14,651	$14,651	$16,629,192
D10	4,712	$14,651	$69,036,787	N/A	(4,400)	2,638	$14,651	$14,651	$14,651	$38,650,052
D11	7,514	$14,651	$110,089,648	N/A	(6,948)	4,953	$14,651	$14,651	$14,651	$72,567,744
D12	3,909	$14,651	$57,271,817	N/A	(3,415)	2,450	$14,651	$14,651	$14,651	$35,895,613
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**87,787**	**N/A**	**$1,286,191,097**	**N/A**	**0**	**57,404**	**N/A**	**N/A**	**N/A**	**$841,041,541**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Storm Water Mitigation

(A) Baseline Inventory	
26,484	Acre

(B) Projected Inventory (in 2033)	
26,484	Acre

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	26,484	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	26,484	100.0%
Fair	N/A	N/A
Poor	0	0.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	26,484	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	5,342
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	1
	Total	**5,343**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	21,328	4,266/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**21,328**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$65,897	45.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$349,646,000
	5-Year Performance Gap	$2,663,556,755
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$3,013,202,755**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	2,565	N/A	N/A	N/A	N/A	2,441	N/A	N/A	$135,633	$331,079,347
D2	1,490	N/A	N/A	N/A	N/A	1,183	N/A	N/A	$135,633	$160,453,448
D3	971	N/A	N/A	N/A	N/A	909	N/A	N/A	$110,560	$100,498,794
D4	5,377	N/A	N/A	N/A	N/A	3,538	N/A	N/A	$125,690	$444,691,049
D5	376	N/A	N/A	N/A	N/A	286	N/A	N/A	$110,560	$31,620,082
D6	73	N/A	N/A	N/A	N/A	73	N/A	N/A	$110,560	$8,070,860
D7	8,958	N/A	N/A	N/A	N/A	6,936	N/A	N/A	$132,213	$917,029,195
D8	2,309	N/A	N/A	N/A	N/A	1,937	N/A	N/A	$110,560	$214,154,195
D9	0	N/A	N/A	N/A	N/A	0	N/A	N/A	$0	$0
D10	394	N/A	N/A	N/A	N/A	344	N/A	N/A	$110,560	$38,032,547
D11	1,916	N/A	N/A	N/A	N/A	1,916	N/A	N/A	$110,560	$211,832,441
D12	2,055	N/A	N/A	N/A	N/A	1,765	N/A	N/A	$116,768	$206,094,797
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**26,484**	**N/A**	**N/A**	**N/A**	**N/A**	**21,328**	**N/A**	**N/A**	**N/A**	**$2,663,556,755**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Transportation Management Systems

(A) Baseline Inventory	
20,298	Each

(B) Projected Inventory (in 2033)	
23,571	Each

(C) Baseline Performance		
Good	15,792	77.8%
Fair	N/A	N/A
Poor	4,506	22.2%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	21,214	90.0%
Fair	N/A	N/A
Poor	2,357	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	3.7%	5,861

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	9,931	48.9%
Fair	N/A	N/A
Poor	10,367	51.1%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	5,436
	Maintenance through 2022/23	307
	Other (STIP, Local, etc.)	64
	Total	**5,807**
Add New	All SHOPP, Maintenance or Others	3,273

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	804	161/year
	Maintenance for 10 Years	1,400	140/year
	Other	0	N/A
	Total	**2,204**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$78,995	39.0%
	Maintenance	$30,000	35.0%
Add New	SHOPP	$78,995	39.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$923,485,104
	5-Year Performance Gap	$115,527,609
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$66,324,078
	Total	**$1,105,336,792**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	316	$143,513	$45,349,968	N/A	N/A	123	$143,513	N/A	$82,568	$10,155,905
D2	447	$143,513	$64,150,114	N/A	N/A	59	$143,513	N/A	$83,244	$4,911,380
D3	1,687	$143,513	$242,105,686	N/A	N/A	106	$143,513	N/A	$82,767	$8,773,339
D4	5,747	$143,513	$824,766,673	N/A	N/A	226	$143,513	N/A	$82,278	$18,594,811
D5	942	$143,513	$135,188,830	N/A	N/A	133	$143,513	N/A	$82,815	$11,014,405
D6	1,449	$143,513	$207,949,697	N/A	N/A	295	$143,513	N/A	$82,592	$24,364,691
D7	4,065	$143,513	$583,378,550	N/A	N/A	186	$143,513	N/A	$82,543	$15,353,022
D8	2,235	$143,513	$320,750,568	N/A	N/A	270	$143,513	N/A	$82,291	$22,218,442
D9	264	$143,513	$37,887,315	N/A	N/A	55	$143,513	N/A	$82,355	$4,529,538
D10	1,684	$143,513	$241,675,148	N/A	N/A	213	$143,513	N/A	$82,601	$17,594,087
D11	2,325	$143,513	$333,666,698	N/A	N/A	513	$143,513	N/A	$82,440	$42,291,923
D12	2,410	$143,513	$345,865,266	N/A	N/A	25	$143,513	N/A	$82,006	$2,050,144
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**23,571**	**N/A**	**$3,382,734,512**	**0**	**N/A**	**2,204**	**N/A**	**N/A**	**N/A**	**$181,851,688**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Transportation Management System Structures

(A) Baseline Inventory	
20,298	Each

(B) Projected Inventory (in 2033)	
23,571	Each

(C) Baseline Performance		
Good	19,550	96.3%
Fair	N/A	N/A
Poor	748	3.7%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	21,214	90.0%
Fair	N/A	N/A
Poor	2,357	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	0.6%	1,118

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	18,432	90.8%
Fair	N/A	N/A
Poor	1,866	9.2%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	99
	Maintenance through 2022/23	2
	Other (STIP, Local, etc.)	3
	Total	**104**
Add New	All SHOPP, Maintenance or Others	3,273

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	128	26/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**128**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$351,722	39.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$351,722	39.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$513,437,125
	5-Year Performance Gap	$81,790,205
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$595,227,330**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	316	$638,986	$201,919,570	N/A	N/A	15	$638,986	N/A	$638,986	$9,584,790
D2	447	$638,986	$285,626,733	N/A	N/A	(35)	$638,986	N/A	$638,986	$0
D3	1,687	$638,986	$1,077,969,347	N/A	N/A	31	$638,986	N/A	$638,986	$19,808,565
D4	5,747	$638,986	$3,672,252,424	N/A	N/A	(276)	$638,986	N/A	$638,986	$0
D5	942	$638,986	$601,924,793	N/A	N/A	(37)	$638,986	N/A	$638,986	$0
D6	1,449	$638,986	$925,890,684	N/A	N/A	(3)	$638,986	N/A	$638,986	$0
D7	4,065	$638,986	$2,597,478,007	N/A	N/A	54	$638,986	N/A	$638,986	$34,505,243
D8	2,235	$638,986	$1,428,133,664	N/A	N/A	28	$638,986	N/A	$638,986	$17,891,607
D9	264	$638,986	$168,692,299	N/A	N/A	(25)	$638,986	N/A	$638,986	$0
D10	1,684	$638,986	$1,076,052,390	N/A	N/A	(33)	$638,986	N/A	$638,986	$0
D11	2,325	$638,986	$1,485,642,402	N/A	N/A	(112)	$638,986	N/A	$638,986	$0
D12	2,410	$638,986	$1,539,956,211	N/A	N/A	(202)	$638,986	N/A	$638,986	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**23,571**	**N/A**	**$15,061,538,524**	**N/A**	**N/A**	**128**	**N/A**	**N/A**	**N/A**	**$81,790,205**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Transportation Related Facilities

(A) Baseline Inventory	
4,665,081	Square Foot

(B) Projected Inventory (in 2033)	
5,012,725	Square Foot

(C) Baseline Performance		
Good	1,137,422	24.4%
Fair	713,702	15.3%
Poor	2,813,957	60.3%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	2,005,090	40.0%
Fair	2,005,090	40.0%
Poor	1,002,545	20.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	5.0%	568,711
Into Poor	5.0%	356,851

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	568,711	12.2%
Fair	925,562	19.8%
Poor	3,170,808	68.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	7,248
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**7,248**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	243,939
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**243,939**
Add New	All SHOPP, Maintenance or Others	347,644

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	8,675	1,735/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**8,675**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	1,945,368	389,074/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**1,945,368**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$742	78.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$742	78.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$742	78.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$593,515,840
	5-Year Performance Gap	$3,371,875,536
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$3,965,391,375**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	192,770	$1,726	$332,641,834	N/A	(69,920)	124,378	$1,726	$1,726	$1,726	$214,625,336
D2	543,447	$1,726	$937,766,285	N/A	(82,777)	245,513	$1,726	$1,726	$1,726	$423,654,586
D3	604,797	$1,726	$1,043,631,183	N/A	(181,665)	344,285	$1,726	$1,726	$1,726	$594,094,484
D4	754,859	$1,726	$1,302,576,553	N/A	(180,356)	248,378	$1,726	$1,726	$1,726	$428,598,399
D5	331,339	$1,726	$571,755,006	N/A	(119,328)	113,400	$1,726	$1,726	$1,726	$195,681,818
D6	261,445	$1,726	$451,146,674	N/A	(64,568)	115,380	$1,726	$1,726	$1,726	$199,098,484
D7	548,585	$1,726	$946,632,362	N/A	(53,782)	118,955	$1,726	$1,726	$1,726	$205,267,466
D8	382,815	$1,726	$660,581,437	N/A	(62,269)	109,206	$1,726	$1,726	$1,726	$188,444,696
D9	263,235	$1,726	$454,235,478	N/A	(28,925)	17,310	$1,726	$1,726	$1,726	$29,869,949
D10	302,796	$1,726	$522,501,513	N/A	(100,727)	149,704	$1,726	$1,726	$1,726	$258,327,609
D11	256,268	$1,726	$442,213,298	N/A	(55,683)	135,948	$1,726	$1,726	$1,726	$234,590,403
D12	243,973	$1,726	$420,997,179	N/A	8,675	(21,044)	$1,726	$1,726	$1,726	$14,969,486
HQ	326,396	$1,726	$563,225,419	N/A	(95,452)	222,911	$1,726	$1,726	$1,726	$384,652,819
Statewide Totals	**5,012,725**	**N/A**	**$8,649,904,221**	**N/A**	**8,675**	**1,945,368**	**N/A**	**N/A**	**N/A**	**$3,371,875,536**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Weigh-In-Motion Scales

(A) Baseline Inventory	
159	Station

(B) Projected Inventory (in 2033)	
165	Station

(C) Baseline Performance		
Good	56	35.2%
Fair	92	57.9%
Poor	11	6.9%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	65	40.0%
Fair	83	50.0%
Poor	17	10.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	10.0%	56
Into Poor	6.5%	60

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	0	0.0%
Fair	88	55.3%
Poor	71	44.7%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	20
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	1
	Total	**21**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	3
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**3**
Add New	All SHOPP, Maintenance or Others	6

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	9	2/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**9**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	51	10/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**51**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$708,016	75.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$1,915,918	75.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$1,915,918	75.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$66,056,872
	5-Year Performance Gap	$238,067,101
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$304,123,973**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	3	$4,382,203	$13,146,609	N/A	(2)	2	$4,382,203	$1,619,416	$4,382,203	$8,764,406
D2	8	$4,382,203	$35,057,624	N/A	1	2	$4,382,203	$1,619,416	$4,382,203	$10,383,822
D3	12	$4,382,203	$52,586,436	N/A	3	2	$4,382,203	$1,619,416	$4,382,203	$13,622,655
D4	37	$4,382,203	$162,141,512	N/A	4	8	$4,382,203	$1,619,416	$4,382,203	$41,535,290
D5	4	$4,382,203	$17,528,812	N/A	-	1	$4,382,203	$1,619,416	$4,382,203	$4,382,203
D6	7	$4,382,203	$30,675,421	N/A	(2)	3	$4,382,203	$1,619,416	$4,382,203	$13,146,609
D7	27	$4,382,203	$118,319,481	N/A	(3)	5	$4,382,203	$1,619,416	$4,382,203	$21,911,015
D8	26	$4,382,203	$113,937,278	N/A	1	6	$4,382,203	$1,619,416	$4,382,203	$27,912,634
D9	2	$4,382,203	$8,764,406	N/A	(2)	1	$4,382,203	$1,619,416	$4,382,203	$4,382,203
D10	12	$4,382,203	$52,586,436	N/A	(3)	7	$4,382,203	$1,619,416	$4,382,203	$30,675,421
D11	19	$4,382,203	$83,261,857	N/A	(8)	11	$4,382,203	$1,619,416	$4,382,203	$48,204,233
D12	8	$4,382,203	$35,057,624	N/A	(6)	3	$4,382,203	$1,619,416	$4,382,203	$13,146,609
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**165**	**N/A**	**$723,063,498**	**N/A**	**9**	**51**	**N/A**	**N/A**	**N/A**	**$238,067,101**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Climate Adaptation and Resilience (Sea Level Rise)

(A) Baseline Inventory	
137	Deficiency Unit

(B) Projected Inventory (in 2033)	
137	Deficiency Unit

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	137	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	137	100.0%
Fair	N/A	N/A
Poor	0	0.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	137	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	0
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**0**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	137	27/year
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**137**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescaped Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$82,000,000	0.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$0
	5-Year Performance Gap	$14,656,762,790
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$14,656,762,790**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	17	N/A	N/A	N/A	N/A	17	N/A	N/A	107,174,454	$1,768,957
D2	0	N/A	N/A	N/A	N/A	0	N/A	N/A	107,174,454	$0
D3	0	N/A	N/A	N/A	N/A	0	N/A	N/A	107,174,454	$0
D4	98	N/A	N/A	N/A	N/A	98	N/A	N/A	107,174,454	$10,546,255
D5	8	N/A	N/A	N/A	N/A	8	N/A	N/A	107,174,454	$864,976
D6	0	N/A	N/A	N/A	N/A	0	N/A	N/A	107,174,454	$0
D7	7	N/A	N/A	N/A	N/A	7	N/A	N/A	107,174,454	$723,624
D8	0	N/A	N/A	N/A	N/A	0	N/A	N/A	107,174,454	$0
D9	0	N/A	N/A	N/A	N/A	0	N/A	N/A	107,174,454	$0
D10	0	N/A	N/A	N/A	N/A	0	N/A	N/A	107,174,454	$0
D11	5	N/A	N/A	N/A	N/A	5	N/A	N/A	107,174,454	$496,644
D12	2	N/A	N/A	N/A	N/A	2	N/A	N/A	107,174,454	$256,306
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**137**	**N/A**	**N/A**	**N/A**	**N/A**	**137**	**N/A**	**N/A**	**N/A**	**$14,656,762,790**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

ADA Pedestrian Infrastructure

(A) Baseline Inventory	
180,892	Deficient Elements

(B) Projected Inventory (in 2033)	
180,892	Deficient Elements

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	180,892	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	45,223	25.0%
Fair	N/A	N/A
Poor	135,669	75.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	180,892	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	24,648
	Maintenance through 2022/23	12
	Other (STIP, Local, etc.)	149
	Total	**24,809**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	20,861	4,172/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**20,861**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$14,480	93.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$275,370,000
	5-Year Performance Gap	$761,966,752
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$1,037,336,752**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	4,397	N/A	N/A	N/A	N/A	(275)	N/A	N/A	$36,526	$0
D2	5,852	N/A	N/A	N/A	N/A	(6)	N/A	N/A	$36,526	$0
D3	13,441	N/A	N/A	N/A	N/A	1,703	N/A	N/A	$36,526	$62,203,604
D4	47,031	N/A	N/A	N/A	N/A	6,622	N/A	N/A	$36,526	$241,874,495
D5	10,411	N/A	N/A	N/A	N/A	922	N/A	N/A	$36,526	$33,676,878
D6	15,288	N/A	N/A	N/A	N/A	2,964	N/A	N/A	$36,526	$108,262,761
D7	35,477	N/A	N/A	N/A	N/A	3,269	N/A	N/A	$36,526	$119,403,160
D8	17,052	N/A	N/A	N/A	N/A	2,258	N/A	N/A	$36,526	$82,475,477
D9	1,396	N/A	N/A	N/A	N/A	(166)	N/A	N/A	$36,526	$0
D10	9,873	N/A	N/A	N/A	N/A	22	N/A	N/A	$36,526	$803,570
D11	9,628	N/A	N/A	N/A	N/A	1,281	N/A	N/A	$36,526	$46,789,675
D12	11,046	N/A	N/A	N/A	N/A	1,820	N/A	N/A	$36,526	$66,477,134
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**180,892**	**N/A**	**N/A**	**N/A**	**N/A**	**20,861**	**N/A**	**N/A**	**N/A**	**$761,966,752**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Complete Streets

(A) Baseline Inventory	
8,423,470	Linear Foot (Existing)
22,182,946	Linear Foot (Build New)

(B) Projected Inventory (in 2033)	
11,023,351	Linear Foot

(C) Baseline Performance		
Good	5,466,491	64.9%
Fair	1,220,205	14.5%
Poor	1,736,774	20.6%

(D) Desired State of Repair (DSOR) Target Performance		
Good	7,606,112	69.0%
Fair	3,196,772	29.0%
Poor	220,467	2.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	2.6%	1,421,288
Into Poor	2.2%	268,445

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	4,045,203	48.0%
Fair	2,373,048	28.2%
Poor	2,005,219	23.8%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	25,114
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**25,114**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	889,061
	Maintenance through 2022/23	276
	Other (STIP, Local, etc.)	11,562
	Total	**900,899**
Add New	All SHOPP, Maintenance or Others	2,599,881

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	0	0/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**0**	**0/year**
Fix Poor to Good	SHOPP for the Last 5 Years	886,085	177,217/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**886,085**	**N/A**
Add New	SHOPP for the Last 5 Years	19,583,064	3,916,613/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$117	38.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$133	38.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$365	38.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$798,380,589
	5-Year Performance Gap	$13,108,657,475
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$13,907,038,063**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	380,983	$659	$250,886,306	1,836,996	(14,814)	4,934	$351	$211	$240	$646,106,263
D2	631,157	$659	$415,631,795	1,560,029	(67,724)	52,562	$285	$211	$240	$456,591,352
D3	823,388	$659	$542,220,450	2,624,750	(33,093)	178,992	$490	$211	$240	$1,327,997,109
D4	2,317,471	$659	$1,526,109,401	1,395,041	(61,832)	145,919	$972	$211	$240	$1,391,673,681
D5	683,772	$659	$450,280,015	1,519,478	(26,675)	(461)	$449	$211	$240	$681,700,949
D6	885,547	$659	$583,153,620	1,150,059	(48,161)	7,848	$811	$211	$240	$934,538,380
D7	1,854,998	$659	$1,221,560,005	1,122,242	(105,722)	133,274	$1,626	$211	$240	$1,856,293,883
D8	1,224,365	$659	$806,273,277	2,914,954	(215,213)	73,397	$431	$211	$240	$1,275,314,083
D9	260,816	$659	$171,753,497	731,932	(16,660)	(1,772)	$333	$211	$240	$243,926,157
D10	693,939	$659	$456,975,225	2,493,083	(31,173)	13,642	$460	$211	$240	$1,150,003,351
D11	633,798	$659	$417,370,956	1,667,882	(141,504)	268,227	$1,230	$211	$240	$2,116,365,016
D12	633,117	$659	$416,922,501	566,618	(86,266)	7,290	$1,811	$211	$240	$1,028,147,252
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**11,023,351**	**N/A**	**$7,259,137,048**	**19,583,064**	**0**	**886,085**	**N/A**	**N/A**	**N/A**	**$13,108,657,475**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Operational Improvements

(A) Baseline Inventory	
1,549,893	Daily Person Hours of Delay

(B) Projected Inventory (in 2033)	
3,277,319	Daily Person Hours of Delay

(C) Baseline Performance		
Good	N/A	N/A
Fair	N/A	N/A
Poor	1,549,893	100.0%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	327,730	10.0%
Fair	N/A	N/A
Poor	2,949,589	90.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	N/A	N/A
Into Poor	N/A	N/A

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	N/A	N/A
Fair	N/A	N/A
Poor	3,277,319	100.0%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	N/A
	Maintenance through 2022/23	N/A
	Other (STIP, Local, etc.)	N/A
	Total	**N/A**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	48,739
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	182,631
	Total	**231,371**
Add New	All SHOPP, Maintenance or Others	N/A

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	N/A	N/A
	Maintenance for 10 Years	N/A	N/A
	Other	N/A	N/A
	Total	**N/A**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	63,752	12,750/year
	Maintenance for 10 Years	0	0/year
	Other	191,251	N/A
	Total	**255,003**	**N/A**
Add New	SHOPP for the Last 5 Years	N/A	N/A

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	N/A	N/A
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$17,388	38.0%
	Maintenance	N/A	N/A
Add New	SHOPP	N/A	N/A

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$213,411,000
	5-Year Performance Gap	$1,999,401,247
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$2,212,812,247**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	2,316	N/A	N/A	N/A	N/A	42	N/A	N/A	$31,362	$1,317,211
D2	3,161	N/A	N/A	N/A	N/A	79	N/A	N/A	$31,362	$2,477,612
D3	125,616	N/A	N/A	N/A	N/A	2,775	N/A	N/A	$31,362	$87,030,030
D4	589,247	N/A	N/A	N/A	N/A	13,812	N/A	N/A	$31,362	$433,174,332
D5	41,628	N/A	N/A	N/A	N/A	1,030	N/A	N/A	$31,362	$32,303,038
D6	80,438	N/A	N/A	N/A	N/A	1,301	N/A	N/A	$31,362	$40,802,187
D7	1,333,339	N/A	N/A	N/A	N/A	29,508	N/A	N/A	$31,362	$925,434,998
D8	461,687	N/A	N/A	N/A	N/A	9,130	N/A	N/A	$31,362	$286,336,639
D9	936	N/A	N/A	N/A	N/A	23	N/A	N/A	$31,362	$721,330
D10	104,159	N/A	N/A	N/A	N/A	(49)	N/A	N/A	$31,362	$0
D11	283,370	N/A	N/A	N/A	N/A	6,052	N/A	N/A	$31,362	$189,803,870
D12	251,423	N/A	N/A	N/A	N/A	(39,613)	N/A	N/A	$31,362	$0
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**3,277,319**	**N/A**	**N/A**	**N/A**	**N/A**	**63,752**	**N/A**	**N/A**	**N/A**	**$1,999,401,247**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

Mobility Hubs

(A) Baseline Inventory	
222	Location

(B) Projected Inventory (in 2033)	
222	Location

(C) Baseline Performance		
Good	4	1.8%
Fair	111	50.0%
Poor	107	48.2%

(D) Desired State of Repair (DSOR) Target Performance		
Good or New	78	35.0%
Fair	100	45.0%
Poor	44	20.0%

(E) Effective Deterioration (by 2033) - Do Nothing Scenario	Average Annual Rate	10-Year Deterioration
Into Fair	10.0%	4
Into Poor	6.4%	71

(F) Projected Performance (in 2033) - Do Nothing Scenario		
Good	0	0.0%
Fair	44	19.8%
Poor	178	80.2%

(G) Pipelined Projects Performance		
Fix Fair to Good	Any SHOPP or 2024 PID Workload	1
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**1**
Fix Poor to Good or Fair	Any SHOPP or 2024 PID Workload	0
	Maintenance through 2022/23	0
	Other (STIP, Local, etc.)	0
	Total	**0**
Add New	All SHOPP, Maintenance or Others	0

(H) Performance Gap			
Fix Fair to Good	SHOPP for the Last 5 Years	0	0/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**0**	**N/A**
Fix Poor to Good	SHOPP for the Last 5 Years	134	27/year
	Maintenance for 10 Years	0	0/year
	Other	0	N/A
	Total	**0**	**N/A**
Add New	SHOPP for the Last 5 Years	0	0/year

(I) Average Unescalated Capital Unit Cost and Support Ratio*			
Fix Fair to Good	SHOPP	$1,216,927	80.0%
	Maintenance	N/A	N/A
Fix Poor to Good	SHOPP	$1,236,674	80.0%
	Maintenance	N/A	N/A
Add New	SHOPP	$1,236,674	80.0%

(J) Estimated SHOPP and Maintenance Costs for 10 Years		
SHOPP	Unfunded Pipelined Projects	$0
	5-Year Performance Gap	$389,861,230
Maintenance	Unfunded Pipelined Work	$0
	10-Year Performance Gap	$0
	Total	**$389,861,230**

(K) District Breakdown

District	Projected Inventory	Replacement Total Unit Cost*	Asset Valuation	SHOPP & Maint Performance Gap			Average of Escalated SHOPP & Maint Total Unit Costs			SHOPP & Maint Gap Cost
				New	Fair	Poor	New	Fair	Poor	
D1	6	$2,909,412	$17,456,473	N/A	-	2	$2,909,412	$2,862,954	$2,909,412	$5,818,824
D2	9	$2,909,412	$26,184,709	N/A	(4)	7	$2,909,412	$2,862,954	$2,909,412	$20,365,885
D3	30	$2,909,412	$87,282,365	N/A	(6)	16	$2,909,412	$2,862,954	$2,909,412	$46,550,595
D4	49	$2,909,412	$142,561,196	N/A	(13)	30	$2,909,412	$2,862,954	$2,909,412	$87,282,365
D5	11	$2,909,412	$32,003,534	N/A	(5)	9	$2,909,412	$2,862,954	$2,909,412	$26,184,709
D6	12	$2,909,412	$34,912,946	N/A	(3)	8	$2,909,412	$2,862,954	$2,909,412	$23,275,297
D7	48	$2,909,412	$139,651,784	N/A	(14)	30	$2,909,412	$2,862,954	$2,909,412	$87,282,365
D8	16	$2,909,412	$46,550,595	N/A	(4)	10	$2,909,412	$2,862,954	$2,909,412	$29,094,122
D9	0	$2,909,412	$0	N/A	-	0	$2,909,412	$2,862,954	$2,909,412	$0
D10	3	$2,909,412	$8,728,236	N/A	-	1	$2,909,412	$2,862,954	$2,909,412	$2,909,412
D11	32	$2,909,412	$93,101,189	N/A	(6)	17	$2,909,412	$2,862,954	$2,909,412	$49,460,007
D12	6	$2,909,412	$17,456,473	N/A	(2)	4	$2,909,412	$2,862,954	$2,909,412	$11,637,649
HQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Statewide Totals	**222**	**N/A**	**$645,889,500**	**0**	**0**	**134**	**N/A**	**N/A**	**N/A**	**$389,861,230**

(*) DO NOT use these unit costs or support ratios for planning or project-level estimates. They represent a multi-year, programmatic-level average which includes numerous possible treatments.

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Appendix C: 5-Year Maintenance Investment Plan

State statute requires the State Highway System Management Plan (SHSMP) include a 5-year Maintenance Investment Plan. To comply with state statutes, annual funding levels from the 10-Year Maintenance Investment Plan shown in Chapter 4 were used. A SHOPP cost avoidance analysis was performed and supports the funding levels identified in the 5-year Maintenance Investment Plan for the four primary asset classes under pavement, bridge and tunnel health, drainage restoration, and TMS. The analysis considers the historic investments in preventive maintenance and the degree to which those investments reduce the need for more costly capital improvements through the SHOPP. The 10-year Maintenance Investment Plan in Chapter 4 is the recommended Plan for achieving performance targets.

"The State Highway System Management Plan … shall identify projected future State Highway Operation and Protection Program costs that would be avoided by increasing maintenance spending."

California Streets and Highways Code, Section 164.6(c), updated by AB 515

Table C-1. 5-Year Maintenance Investments for SHOPP Cost Avoidance

5-Year Maintenance Investments for SHOPP Cost Avoidance				
Objectives	**Major Maintenance ($M)**	**Field Maintenance Crews ($M)**	**Total ($M)**	**SHOPP Cost Avoidance ($M)**
Pavement	$1,664	$80	$1,744	$5,231
Bridge and Tunnel Health	$693	$370	$1,063	$12,759
Drainage Restoration	$150	$143	$293	$1,172
Transportation Management Systems	$40	$134	$174	-
Total	**$2,547**	**$727**	**$3,274**	-

Table C-1 Notes:

- The estimated SHOPP Cost Avoidance is calculated using cost projection ratios (3:1 pavement, 12:1 bridge, and 4:1 drainage) supported by analyses by the Caltrans Programs and applied in prior 5-year Maintenance Plans. These ratios generally consider preservation treatments costs relative to rehabilitation costs.
- The 5-year costs shown for Major Maintenance and Field Maintenance are calculated as half of the 10-year costs presented in Table 4-2.

Appendix D: Summary of Feedback

California Transportation Commission

To be determined

Table D-1. Responses to California Transportation Commission Comments

Responses to California Transportation Commission Comments	
Comment	**Response**

Public Review Comments

To be determined

Table D-2. Responses to Public Review Comments

Responses to Public Comments			
Organization	**Section**	**Comment**	**Response**

Appendix E: Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AB	Assembly Bill
ABC	Accelerated Bridge Construction
ADA	Americans with Disabilities Act
APCS	Automated Pavement Condition Survey
APS	Accessible Pedestrian Signals
ASBS	Areas of Special Biological Significance
ASTM	American Society for Testing and Materials
ATAIP	Active Transportation Asset Inventory Pilot data
ATP	Active Transportation Plan
AVO	Average Vehicle Occupancy
BIL	Bipartisan Infrastructure Law
BMP	Best Management Practices
CAFE	Corporate Average Fuel Economy
Cal/OSHA	California Division of Occupational Safety and Health
CALGreen	California Green Building Standards
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CAPM	Capital Preventive Maintenance
CAPTI	Climate Action Plan for Transportation Infrastructure
CARB	California Air Resources Board
CAT	Caltrans Active Transportation Plan
CAV	Connected and Automated Vehicle
CDO	Cease and Desist Order
CEC	California Energy Commission
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CERCLA	Federal Comprehensive Environmental Response Compensation and Liability Act
CFAC	California Freight Advisory Committee
CFMP	California Freight Mobility Plan
CGC	California Government Code
CHP	California Highway Patrol

Commission	California Transportation Commission
CMF	Crash Modification Factor
CRCP	Continuously Reinforced Concrete Pavement
CRF	Crash Reduction Factor
CSFAP	California Sustainable Freight Action Plan
CTC	California Transportation Commission
CU	Compliance Unit
CVEF	Commercial Vehicle Enforcement Facilities
DES	Division of Engineering Services
DGS	Department of General Services
DP-35	Caltrans Director Policy 35 Transportation Asset Management
DP-37	Director's Policy 37
DPHD	Daily Person Hours of Delay
DSOR	Desired State of Repair
DVHD	Daily Vehicle Hours of Delay
ECWC	Expected Construction Work Complete
ELI	Element Level Inspection
EO	Executive Order
EPA	Environmental Protection Agency
ETL	Express Toll Lane
EV	Electric Vehicle
FCI	Facility Condition Index
FCO	Financial Contribution Only
FE	Fund Estimate
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act (FESA)
FHWA	Federal Highway Administration
FIP	Freight Investment Plan
FishPAC	Fish Passage Advisory Committees
FHSZ	Fire Hazard Severity Zones
FY	Fiscal Year
GARE	Government Alliance on Race and Equity
GHG	Greenhouse Gas
Go-Biz	Governor's Office of Business and Economic Development

GPR	Ground Penetration Radar
HCAS	Highway Cost Allocation Studies
HDM	Caltrans Highway Design Manual
HM	Highway Maintenance
HOT	High Occupancy/Toll Lane
HOV	High Occupancy Vehicle
HPMS	Highway Performance Monitoring System
HSIP	Highway Safety Improvement Program
HUTA	Highway Users Tax Account
IAA	Inter-Agency Agreement
ICM	Integrated Corridor Management
IIJA	Infrastructure Investment and Jobs Act
IMMS	Integrated Maintenance Management System
IRI	International Roughness Index
ITS	Intelligent Transportation Systems
JPCP	Jointed Plain Concrete Pavement
LCCA	Life Cycle Cost Analysis
LCP	Life Cycle Planning
LED	Light-Emitting Diode
LOS	Level of Service
LPI	Leading Pedestrian Signal
Maint.	Maintenance
Mgmt	Management
MAP-21	Moving Ahead for Progress in the 21st Century Act
MASH	Manual for Assessing Safety Hardware
MBP	Mobility Performance Report
MPO	Metropolitan Planning Organization
MPR	Mobility Performance Report
MY	Model Years
NBI	National Bridge Inventory
NEVI	National Electric Vehicle Infrastructure Formula Program (NEVI)
NHFP	National Highway Freight Program
NHS	National Highway System
NPDES	National Pollution Discharge Elimination System

NTI	National Tunnel Inventory
OAL	California Office of Administrative Law
OEEAR	Offices of Earthquake Engineering Analysis and Research
OGFC	Open Graded Friction Course
OGS	Geotechnical Services
Order	Trash Control Order
OTS	California Office of Traffic Safety
PA&ED	Project Approval and Environmental Documentation
PaveM	Pavement Management System
PAVES-IT	Pavement Analysis and Vehicle Enforcement Strategic Information
PB	Protective Betterments
PeMS	Performance Measurement System
PID	Project Initiation Document
PM	Performance Management
PPCP	Precast Panel Concrete Pavement
PROTECT	Promoting Resilient Operations for Transformative, Efficient, and Cost Saving Transportation
PS&E	Plan, Specification and Estimate
RCB	Reinforced Concreate Boxes
REAP	Race and Equity Action Plan
RTL	Ready to List
RMRA	Road Maintenance and Rehabilitation Account
RMRP	Road Maintenance and Rehabilitation Program
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SD	Structurally Deficient
SER	Standard Environmental Reference
SHA	State Highway Account
SHC	Streets and Highway Code
SHOPP	State Highway Operation and Protection Plan
SHS	State Highway System
SHSMP	State Highway System Management Plan
SHSP	Strategic Highway Safety Plan
SM&I	Structures Maintenance and Investigations

SMART	Structures Maintenance Automated Report Transmittal
SMARA	Surface Mining and Reclamation Act of 1975
SOV	Single Occupant Vehicle
SRRA	Safety Roadside Rest Area
SSA	Safe System Approach
STGA	Significant Trash Generating Areas
STIP	State Transportation Improvement Program
STIP FE	State Transportation Improvement Program Fund Estimate
STRAHNET	Strategic Highway Network
SWRCB	State Water Resources Control Board
TAMP	California Transportation Asset Management Plan
TAMS	Transportation Asset Management System
TBMP	Treatment Best Management Practices
TCEP	Trade Corridor Enhancement Program
TDM	Transportation Demand Management
TMC	Transportation Management Center
TMDL	Total Maximum Daily Load
TMS	Transportation Management System
TOSNET	Traffic Operations Systems Network
TSN	Transportation System Network
Trash Provisions	Trash Control Provisions
TRF	Transportation Related Facility
Trust Fund	Federal Highway Trust Fund
TSMO	Transportation System Management and Operations
TSO	Time Schedule Order
RCRA	Resource Conservation and Recovery Act
USEPA	United States Environmental Protection Agency
VC	Vertical Clearance
VMT	Vehicle Miles Traveled
V2X	Vehicle-To-Everything technologies
WIM	Weigh-In-Motion
WUI	Wildland-Urban-Interface areas
ZEV	Zero-Emission Vehicles

Acknowledgements

DRAFT for Review

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