Director's Message

With the passage of the Road Repair and Accountability Act of 2017 this spring, Caltrans embarks on a decade-long task of smoothing our highways, strengthening our bridges, improving our traffic management systems and providing Californians with the full range of travel options.

Commonly known as SB-1, the funding and oversight package lays out specific performance targets for pavement, culverts and bridges, as well as the sensors, cameras, signals and electronic signs that make up our transportation management systems.

To meet those goals by 2027, Caltrans will replace or repair at least:

- 17,000 lane miles of pavement
- 55,000 culverts and drains
- 7,700 sensors, signals and signs
- 500 bridges

When we are done, 98 percent of the pavement on the state highway system will be in good or fair condition; 90 percent of our 200,000 culverts also will be in good or fair condition, as will 90 percent of our transportation management elements.

We will conduct our business in a fully transparent manner, detailing our progress to the public. The *Mile Marker* will continue its vital role as a window into our operations and tracker of performance metrics as it has since 2014. It will continue to ensure our efforts are transparent and that we are accountable for our actions.

This prudent investment will end a period of deterioration and decay in which our system's needs exceeded our resources, leaving an enormous backlog of delayed maintenance.

Over the course of the decade, lawmakers are dedicating $54 billion to the care and upkeep of the complex transportation network that serves the state's 39 million residents and its $2.5 trillion economy.

This prudent investment will end a period of deterioration and decay in which our system's needs exceeded our resources, leaving an enormous backlog of delayed maintenance for key assets.

The revenue will begin phasing in later this year. In the meantime, we will accelerate our maintenance activities and speed the delivery of restoration projects. We are ramping up for the largest sustained effort to improve our system in generations.

This is an enormous challenge and let me assure you, the people of Caltrans will rise to it. MM

Malcolm Dougherty, *Director of Caltrans*

Cover: *Crews use rapid-set concrete in 2015 to repair a section of Interstate 710 in the City of Commerce that was badly damaged when a gasoline tanker overturned and caught fire. No one was injured. Caltrans crews respond daily to emergency maintenance requests such as this, but now, with the passage of the Road Repair and Accountability Act of 2017, will have the means to focus on improving the condition of pavement, bridges, culverts and network of signals, signs and sensors throughout the state highway system.*

Caltrans Mile**Markers**

Performance Goals

Safety and Health

Provide a safe transportation system for workers and users, and promote health through active transportation and reduced pollution in communities.

Fatalities	2013	2014	Goal
Auto Fatalities per 100 Million Miles	0.67	0.71	Less than 0.5
Pedestrian Fatalities	257	227* | -11.7%	Reduce 10% Annually
Bicycle Fatalities	30	16* | -46.7%	Reduce 10% Annually

Programmed vs. Allocated Active Transportation Funds to Date			
	Fiscal Year	% of Programmed Funds Allocated	Goal
First Call for Projects	2014-15	99%	100%
	2015-16	63%	
Second Call for Projects	2016-17	42%	100%
	2017-18	N/A	
	2018-19	N/A	

Other Safety and Health Markers	Previous Reporting	Most Recent	Goal
Percentage of Active Transportation Projects Awarded Within Six Months	82.5% | 2016-17, Q2	**82%** | 2016-17, Q3	100%
Employee Work-Related Injuries/Illnesses per 200,000 Hours Worked ‡	6.35 | 2016-17, Q2	**5.76** | 2016-17, Q3	5.45
Number of Injuries For Autos, Bicycles and Pedestrian Modes of Travel	77,222 | 2013	**74,490** | -3.5% | 2014*	Reduce 5% Annually
Worker Fatalities in Work Zones	2 | 2016	**0** | 2017	0 Per Calendar Year

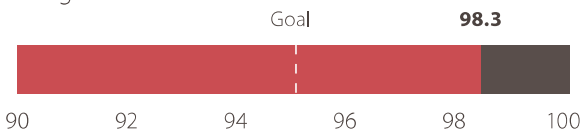
* *An average of the most recent five years of collision data up to 2014.*

‡ *Includes Cal/OSHA reportable and non-reportable injuries/illnesses. Incident rate represents 12 months of data for each quarter.*

Stewardship and Efficiency

Money counts. Responsibly manage California s transportation related assets.

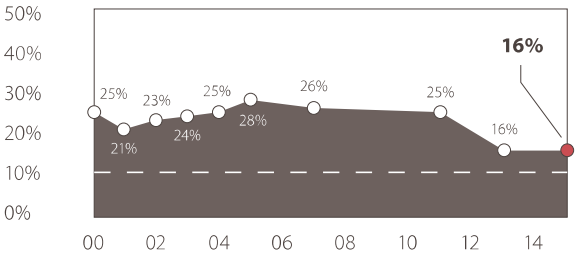
Bridge Health Index **



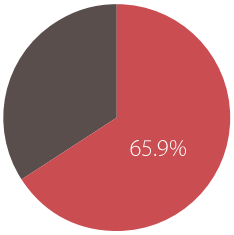
Goal	2014-15	2015-16
Better than 95 rating by 2020	97.4	**98.3**

Pavement Health Index **

Goal: less than 10% distressed by FY 2024-25

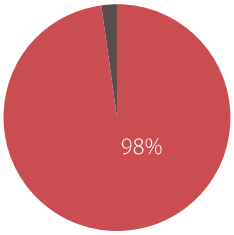


Percentage of Intelligent Transportation Systems in Working Order **



Goal	90% by 2020
Oct-Dec. 2016	66.9%
Jan.-Mar. 2017	**65.9%**

Planned Projects Delivered in Fiscal Year



Goal	100%
2014-15	98%
2015-16	**98%**

*** This data was compiled using a measurement that is expected to be replaced by a new rating system.*

Information Technology Projects	2016 17, Q2	2016 17, Q3	Goal
Advantage System Analysis Uptime	99.51%	**99.35%**	99% by 2020
Network Analysis Uptime	98.56%	**99.62%**	99.5% by 6/30/18
Response to Employee IT Requests Within Two Hours	38.2%	**38.90%**	40% by 6/30/18

Annual Percentage of Research Projects With Implementable Solutions	2015 16 (first reporting)	2016 17 Goal	2020 Goal
Caltrans Research	**50%**	55%	75%
University Transportation Centers (UTC) Research	**20%**	24%	40%
National Cooperative Research	**10%**	12%	20%

Caltrans Mile**Markers**

Performance Goals

Stewardship and Efficiency

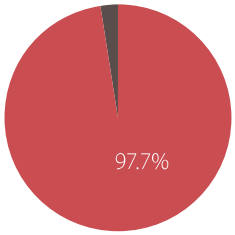
Money counts. Responsibly manage California s transportation related assets.

Encroachment Permits Approved or Denied Within 30 Days *

2020 Goal	95%
2016-17, Q2	78%
2016-17, Q3	**77%**

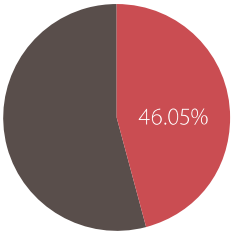
* *District 6 will show results of LEAN 6 Sigma Pilot Project in May, 2017.*

Percentage of Online Single-Trip Permit Requests Handled in Less Than Two Hours



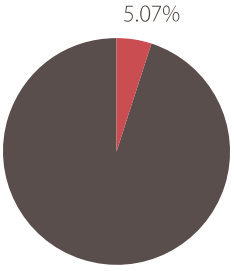
2020 Goal	90%
2016-17, Q2	99.8%
2016-17, Q3	**97.7%**

Contract and Procurement Dollars Awarded to Small Businesses Annually



2020 Goal	25%
2014-15	25%
2015-16	**46.05%**

Contract and Procurement Dollars Awarded to Disabled Veteran Business Enterprises Annually



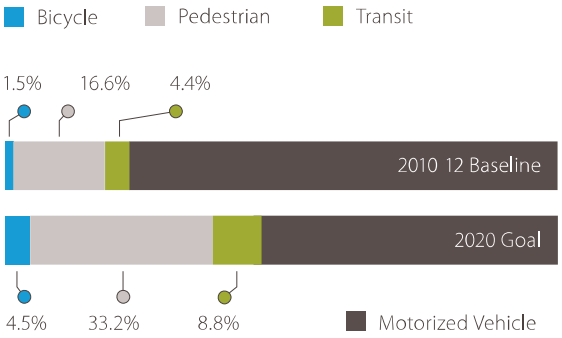
2020 Goal	5%
2014-15	5%
2015-16	**5.07%**

Other Stewardship and Efficiency Markers	Previous Reporting	Most Recent Reporting	Goal
Federal Funds Used in Year of Availability (Annually)	100%	**100%** | 2015-16	100%
Americans with Disabilities Act (ADA) Expenditures Programmed (Annually)	No Previous	**$39.8 Millon** | 2015-16	$35 Million
Number of Lane Miles of State Highway System Relinquished (Annually)	0 Lane Miles | 2014-15	**52.85 Lane Miles** | 2015-16	50 Lane Miles

Sustainability, Livability and Economy

Make long lasting, smart mobility decisions that improve the environment, support a vibrant economy, and build communities, not sprawl.

Percentage of Trips



Vehicle Miles Traveled Per Capita, Statewide Average

Goal	By 2020, 15% lower than 2010 baseline
2010 Baseline	8,779
2014	**8,639 | -1.6%**

Greenhouse Gas Emissions from Caltrans Operations *(in metric tons)*

Goal	By 2020, 15% lower than 2010 baseline
2010 Baseline	217,485
2016	**129,168 | -40.6%**

System Performance

Utilize leadership, collaboration and strategic partnerships to develop an integrated transportation system that provides reliable and accessible mobility for travelers.

Complete Streets Implementation	Previous Reporting	Most Recent Reporting	Goal
Percentage of Projects That Include Complete Streets Features	33% | 2015 (Baseline)	**27%** | 2016	68% by 2020
Number of Complete Streets Features on State Highway System	1,264 | 2015 (Baseline)	**1,543** | 2016	1,613 by 2020
Percentage of Fully Implemented High-Focus Action Items From Action Plan 2.0	36% | 2015 (Baseline)	**50%** | 2016	100% by 2018

Other System Performance Markers	Previous Reporting	Most Recent Reporting	2020 Goal
Accurate Reporting of Traveler Information (Travel Times, Construction Activity, Incidents, and Adverse Weather)	93.7% | 2014-15	**94.0%** | 2015-16	85%
Provide Real-Time Multimodal System Information Available to the Public (Number of Corridors)	3 | 2016-17, Q2	**3** | 2016-17, Q3	50%
Completed Corridor Implementation Plans	3 | 2016-17, Q2	**4** | 2016-17, Q3	3
Number of Corridors With Integrated Corridor Management Implementation	2 | 2016-17, Q2	**2** | 2016-17, Q3	5

Caltrans Mile**Markers**

Performance Goals

System Performance

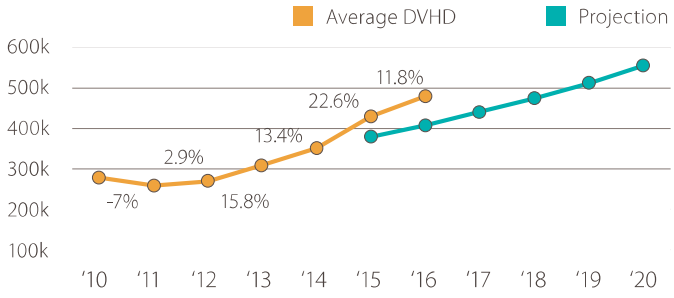
Utilize leadership, collaboration and strategic partnerships to develop an integrated transportation system that provides reliable and accessible mobility for travelers.

Travel Time Reliability

R Reliable **M** Moderately Reliable **U** Unreliable

	Baseline	2016 17 (Q2)	2016 17 (Q3)	2020 Goal
Highway 57	**U**	**U**	**M**	One-tier improvement from baseline
I-110	**M**	**R**	**R**	
I-80	**U**	**M**	**U**	
I-210	**M**	**M**	**M**	

Average Growth in Daily Vehicle Hours of Delay (DVHD) vs. Projection



Goal	Reduce to an 8% rate of growth by 2020

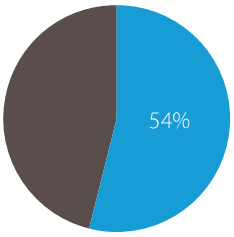
Average All Stations On Time Performance for Intercity Rail	2016 17, Q2	2016 17, Q3	Goal
Capitol Corridor	93.2%	**88.9%**	90%
Pacific Surfliner	85.9%	**70.5%**	90%
San Joaquin	83.9%	**66.4%**	90%
End Station On Time Performance for Intercity Rail	**2016 17, Q2**	**2016 17, Q3**	**Goal**
Capitol Corridor	90.0%	**92.3%**	90%
Pacific Surfliner	76.2%	**82.7%**	90%
San Joaquin	82.5%	**72.7%**	90%

Daily Vehicle Hours of Delay (Top Four Integrated Corridors)	2016 17, Q2 (Year Over Year)	2016 17, Q3 (Year Over Year)	Goal
Highway 57	-20.50%	**-13.81%**	Less Than 6% Increase Annually
I-110	1.65%	**-1.66%**	Less Than 6% Increase Annually
I-80	8.57%	**3.74%**	Less Than 6% Increase Annually
I-210	10.23%	**14.23%**	Less Than 6% Increase Annually

Organizational Excellence

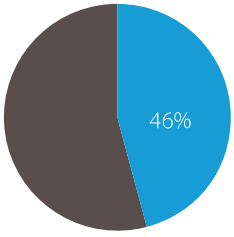
Be a national leader in delivering quality service through excellent employee performance, public communication and accountability.

Stakeholders Who Gave Positive Feedback About the *Mile Marker* in Annual Survey



Goal	5% annual improvement from 2015 baseline
2015	External 43%, Internal 37%
2016	**External: 54% Internal: 49%**

Stakeholders Who Feel That Department Communication, Professionalism, and Service Levels Have Improved



Goal	5% annual improvement from 2015 baseline
2015	External 36% Internal 32%
2016	**External: 46% Internal 37%**

Other Organizational Excellence Markers	2015	2016	Goal
Employees Who Indicate That They Work in a Positive Environment	50%	**57%**	5% annual increase
Abusive Conduct Prevention Trainings Provided Per Year	37%	**81%**	100% every 2 years
Caltrans Employees Who Agree That Employees Are Encouraged to Try New Ideas	40%	**47%**	75% 2016 goal, then achieve and maintain through 2020
External Survey Respondents Who Said Caltrans Doing a Good or Excellent Job in Meeting Their Needs	40%	**61%**	75%
Caltrans Employees Who Rate Caltrans Management as Open and Honest in Communications	44%	**51%**	5% annual increase
Mile Marker Publications Produced on Quarterly Schedule	4	**4**	4
Positive Responses to Ethics Questions on Employee Survey	79%	**81%**	5% annual increase
Increase in the Number of Partners Who Agree or Strongly Agree That Caltrans is a Collaborative Partner	40%	**50%**	75% 2016 goal, then maintain or improve through 2020
Increase in Employees Serving on Research and Policy Committees to Further National Engagement	38	**44**	7% increase for 2016, then maintain or improve through 2020
Documented LEAN 6 Sigma Process Improvements (Cumulative)	19	**36**	30 internal improvements by 2016 with 15 each subsequent year
Number of Caltrans Employees Trained as LEAN 6 Sigma Green Belts	13	**14**	Train 10 yearly
Eligible Employees Who Have Completed Leadership and Development Training Programs, per Fiscal Year	53% | 2016-17, Q2	**54%** | 2016-17, Q3	85% by 2015 with a 2.5% annual increase to 90% in 2017

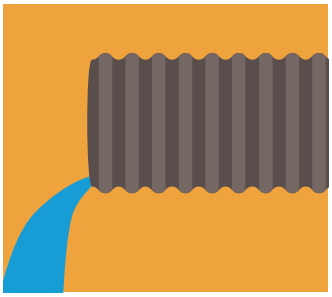
SB 1: Road Repair & Accountability Act of 2017

At A Glance

Road Repairs

By 2027, Caltrans will repair or replace:

17,000
Miles of Pavement



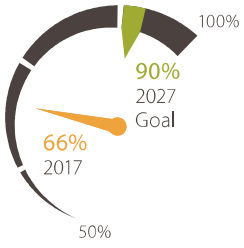
55,000
Culverts and Drains

7,700
Signals, Signs and Sensors

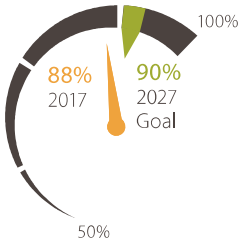
500
Bridges

Performance Targets

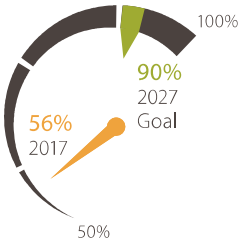
98%
Pavement in Good/Fair Condition



90%
Traffic Management Systems in Good Condition



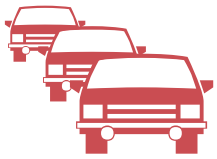
90%
Drains/Culverts in Good/Fair Condition



90%
Rating on Pavement Maintenance

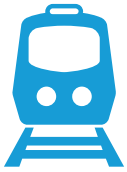
Fix
500 Bridges

Additional Transportation Investments*



$2.5 billion
Congestion Relief

$3 billion
Trade Corridor Improvements



$7.5 billion
Improved Transit/ Rail Travel

$1 billion
Pedestrian and Cyclist Safety Projects

** Over a 10-year period*

Revenue

Taxes	Fees	Savings
Gasoline excise tax: +12¢/gallon **Diesel excise tax:** +20¢/gallon **Diesel sales tax:** +4% *(Starting November 2017)*	**Transportation improvement fee:** $25 to $175 based on vehicle value. *(January 2018)* **Zero-emissions fee:** $100/yr. *(2020)*	Caltrans saves $100 million/year through efficiency measures

Accountability

Inspector General

- Independent Authority
- Annual Audit
- Appointed by Governor

California Transportation Commission

- Transparent Oversight
- Public Hearings

SB 1: Road Repair and Accountability Act of 2017

New Law Overview

California's transportation system is about to undergo an historic era of improvement, and Caltrans will be at the forefront. The passage of the Road Repair and Accountability Act of 2017 provides a new and badly needed infusion of money into the state's vast transportation network that has reached the crisis stage of deterioration.

The new law, created by Senate Bill 1, approved by a two-thirds majority of the Legislature and signed by Gov. Edmund G. Brown Jr. in April, will do much to reverse that decay. It is the most far-reaching and significant transportation funding legislation in decades, projected to raise a total of $54 billion through 2027, divided equally between state and local governments.

Caltrans will receive the bulk of the $26 billion state share over the 10-year period. Of that, $19 billion has been dedicated to the state's most pressing transportation problem – fixing the interlocking system of roads, bridges, culverts, traffic devices, and other critically important components.

The Road Repair and Accountability Act outlines a plan for Caltrans and other transportation agencies to fix and upgrade their systems. It lays down a series of performance measures to gauge progress, and builds in program oversight safeguards and financial accountability. See accompanying stories for more details.

The work will be funded by a combination of higher gas and diesel taxes at the pump, and new road improvement fees assessed on vehicles at the time of registration. This also includes a special fee on zero-emission vehicles (starting in 2020).

The revenue comes at a critical time. Proposition 1B, the transportation bond program approved by California voters in 2006, is winding down, and most of the $19.9 billion it raised have been allocated to projects up and down the state.

The Road Repair and Accountability Act is expected to go a long way toward fixing and maintaining the crumbling state highway system.

The new law will more than double that financial commitment to state and local transportation systems, and, unlike Prop. 1B, focuses on rehabilitation and maintenance of existing roads.

Although Caltrans has worked hard to maintain its transportation assets, it hasn't had the resources to keep

up with wear on an aging system used daily by millions of cars and trucks. The toll from last winter's storms, now topping $1 billion, showed how vulnerable California's state highway network had become, and the future looked grim. According to estimates, the state would fall $59 billion short of being able to maintain its highway system in adequate condition over the next 10 years had funding remained unchanged.

The law's passage has changed that dire forecast. Instead of staring into a highway funding abyss, Caltrans is now gearing up for an era of improvements. Maintenance crews will be especially active after the new state budget takes effect on July 1, looking to fix immediate problems such as potholes and crumbling roadway concrete, as well as pavement projects for sections of bumpy road. Guidelines for larger projects funded by the State Highway Operation and Protection Program (SHOPP) will be determined by Caltrans and the California Transportation Commission (CTC) in a series of public meetings this summer.

The new law will bring other positive changes. It will require Caltrans and other agencies adopt a more holistic and environmentally sensitive approach to the projects they undertake. Money is being provided to incorporate mitigation measures earlier in the project delivery process, encourage pedestrian and bicycle modes of travel, and make infrastructure improvements to accommodate emerging automotive technologies such as autonomous cars, or zero-emission vehicle charging stations.

Businesses that transport goods and services around the state on smoother and less congested roads should see a bottom line benefit thanks to steadier travel time and less wear on equipment.

The act also should stabilize transportation funding for the foreseeable future, giving more certainty to project planning and budgeting. Fuel taxes and new fees will be indexed for inflation, and lawmakers restored a previous formula used to calculate fuel excise taxes that should smooth out funding fluctuations.

Improving the condition of the state's road system is expected to provide an overall boost for the state's economy as well. Businesses that transport goods and services around the state on smoother and less congested roads should see a bottom line benefit thanks to steadier travel time and less wear on equipment.

And with 10 years of major road maintenance and projects on the horizon, the Road Repair and Accountability Act of 2017 promises to be a major job-creator. Every $1 billion spent on infrastructure projects creates more than 13,000 jobs, according to federal government estimates, so the $54 billion spent over the life of the law is shaping up as a jobs bonanza for the state. MM

Allocations

The Road Repair and Accountability Act of 2017 is expected to raise a total of $54 billion over the next decade to address a daunting backlog of transportation system repairs and upgrades, while ensuring a cleaner and more sustainable travel network for the future.

Caltrans and other state agencies are due to receive roughly half of that amount, $26 billion. The other half will go to local roads, transit agencies and an expansion of the state's growing network of pedestrian and cycle routes. The money from the new law — passed as Senate Bill 1 — will start flowing when increased fuel taxes take effect Nov. 1.

At the heart of the law is the creation of a Road Maintenance and Rehabilitation Account (RMRA) that embodies Caltrans' "fix it first' philosophy. That account will provide the lion's share of the funding to tackle deferred maintenance needs on the state highway system and the local road system.

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Here are the major revenue distributions expected through the RMRA (all amounts are annual):

$1.5 billion: State Highway Maintenance and Rehabilitation

The goal is to raise 98 percent of California's highway surfaces to either "good" or "fair" condition, and ensure that 90 percent of traffic management systems such as signals, signs and sensors are in working order by 2027.

$400 million: State Bridge and Culvert Repair/Maintenance

Caltrans maintains more than 13,100 bridges in the state, and has committed to fixing at least 500 of the spans in need during the next 10 years. Culverts are a vital, but largely unseen part of the state highway system, channeling flood water and watercourses beneath roads. Of the estimated 205,000 culverts in California, Caltrans must bring at least 90 percent of them up to good or fair condition — about 55,000 based on department inspections.

$200 million: State-Local Partnership Program

The money will be used as matching funds for local entities to make their own extra investment in transportation. These funds will support the efforts of cities and counties with voter-approved transportation tax measures.

$100 million: Active Transportation Program (ATP)

The ATP was originally created by the Legislature to encourage walking and biking. The California Transportation Commission (CTC) now distributes about $120 million yearly to cities, counties and regional transportation agencies — acting on suggestions from citizens and advocacy groups — to build or convert more bike paths, crosswalks and sidewalks. The extra $100 million will represent an 83 percent boost in funding for the ATP.

The new law also requires Caltrans to distribute money to other specified transportation-related services. The Freeway Service Patrol that assists stranded motorists on the most congested freeways will see $25 million more yearly (see accompanying story); $25 million will go for local planning grants; two state universities will split $7 million to do transportation-related research; and $5 million each year is set aside for workforce training programs.

The goal is to raise 98 percent of California's highway surfaces to either "good" or "fair" condition, and ensure that 90 percent of traffic management systems such as signals, signs and sensors are in working order by 2027.

The Act also creates a pair of major new programs aimed at relieving overstressed parts of the state transportation system. The CTC will be given $250 million yearly to fund and oversee a Congested Corridors Program, with the goal of providing travelers on crowded highways more transportation choices beyond expanding overall highway capacity.

At the same time, a Trade Corridor Enhancement Program will be established for freight-related transportation projects. The program is scheduled to receive $300 million annually from increased diesel fuel excise taxes.

In addition, the Road Repair and Accountability Act will fund other existing transportation programs, create new ones, or designate responsibilities that will affect Caltrans:

- Caltrans' State Highway Operation and Protection Program (SHOPP) will receive a one-time infusion of $225 million as part of a $706 million repayment for an earlier loan made to the state General Fund during the state's fiscal crisis ($256 million will go to a rail/transit capital improvement program; $225 million to cities and counties for local roads, and $20 million for local use in climate change adaption planning).
- Caltrans will be required to generate $100 million yearly in efficiency measures that will be applied toward repair and maintenance of the state highway system, and report to the CTC.
- Transit agencies throughout the state are slated to receive about $775 million in new funding yearly to boost service or capital projects. Depending on the program, the law requires certain transit agencies to submit proposed projects to Caltrans, and undergo performance audits to verify expenditures. MM

Source: *Caltrans Division of Budgets*

Performance Targets

The Road Repair and Accountability Act of 2017 requires Caltrans to show significant improvement in the condition of the state highway system over the next decade, and relies on the federal "good-fair-poor" rating system to measure results.

The new law sets specific performance targets for pavement; culverts; bridges; and the sensors, ramp meters, signals and electronic signs that make up the California's traffic management system.

For pavement — the highway system's most-noticeable feature — the law lays out an expectation that no more than 2 percent should be rated poor by 2027. Reaching that goal will require work on an estimated 17,000 lane miles.

For the highway system's water-channeling culverts, which protect roadbeds from erosion and surrounding areas from flooding, SB-1 requires that by 2027 not less than 90 percent of them be in good or fair condition. Caltrans estimates that will require work on 55,000 culverts.

Similarly, 90 percent of transportation management systems are to be in good or fair condition after 10 years of effort, which is expected to involve installation or repair of 7,700 signals, signs, sensors and cameras.

Determining precisely what work needs to be done and in what order will involve implementation of an Asset Management System required by state and federal law and will will promote efficiency and reduce costs. Caltrans already has begun adopting asset management practices, and is moving toward full implementation by 2020. The 2017 State Highway System Management Plan (SHSMP) — revised to reflect the new resources and performance goals in SB-1, is a significant step toward a complete Asset Management System.

The SHSMP integrates maintenance, rehabilitation and highway operations into a single management plan that meets targets while fully aligning with Caltrans' Strategic Management Plan. It also takes into account factors such as funding for the Americans with Disabilities Act (ADA), system performance and environmental stewardship. For more on Caltrans' SHSMP, visit the December 2016 issue of the *Mile Marker.* MM

Source: *Michael B. Johnson, State Asset Management Engineer*

A Caltrans Maintenance crew repairs pavement on State Route 113 near Davis in Yolo County. The Road Repair and Accountability Act makes Caltrans responsible for upgrading an estimated 17,000 miles of pavement along the state highway system to good or fair condition by 2027.

Caltrans photos by Scott Lorenzo

Maintenance workers seal cracks on State Route 113 near Davis in Yolo County. Crews all over California will be even busier in the next decade as they bring the state highway system's pavement — as well as bridges, culverts and the Transportation Management System — up to national standards.

Maintenance

Although new revenue from the Road Repair and Accountability Act of 2017 will not start to flow until November, Caltrans Maintenance Division will accelerate its activities with pavement and striping when the fiscal year begins July 1.

Many more projects will be lined up in the years ahead, on top of the daily unplanned maintenance responsibilities.

The department is at the start of a massive statewide effort to repair California's infrastructure with funding from the Road Repair and Accountability Act (Senate Bill 1). The funding and oversight package passed through the Legislature in April on a two-thirds supermajority vote, and was signed by Gov. Edmund G. Brown, Jr.

It is expected to generate $54 billion over the next decade, with $19 billion of that directed to address deferred maintenance on the state highway system. The goal is to raise 98 percent of California's highway pavement to either "good" or "fair" condition.

Similar expectations have been set for culverts, bridges and transportation management system elements *(see story, page 13)*.

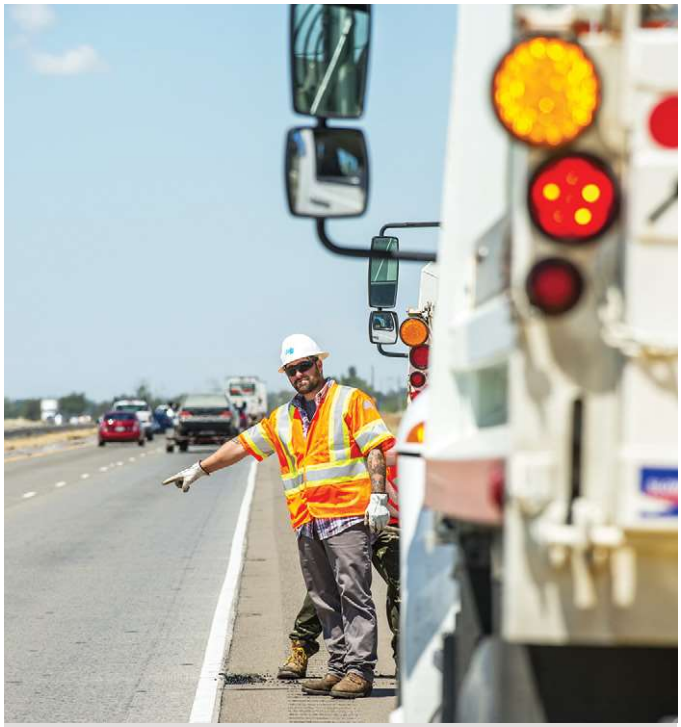
The key to success will be making repairs faster than the state highway system can deteriorate. A more robust Maintenance Division will tend to a significantly larger workload. But many of the more complex, time-consuming projects will be assigned to contractors who can free up Caltrans crews for a larger number of projects.

The first three or four years are expected to involve more field maintenance projects than SHOPP projects. This shift from smaller projects to larger, more complex and expensive projects aligns well with the expected rate of revenue growth produced through SB-1 *(see the SB-1 funding story, page 11)*.

Recognizing that the state highway system will continue to experience wear and tear from the usual sources, such as weather and vehicle traffic, the Maintenance Division has established guidelines intended to keep repair costs relatively low by getting to maintenance needs quickly.

Maintenance, while responsible for all roads on the state highway system, will give proportional attention to interstates and interregional highways, which carry the bulk of the state's freight traffic. To illustrate this need, consider that one heavily loaded semi-truck can do as much damage as 800 single-occupant vehicles, and that some interstates experience 100,000 truck trips daily.

The new legislation also directs Caltrans to improve the state's trade corridors — the state's major interstates. Beginning July 1, Maintenance will begin improving the pavement on those corridors — including



Maintenance workers keep an eye out for traffic. Safety will continue to be the top priority as repairs are made throughout California.

Interstates 5, 10, 15, 80) — as well as restriping them, replacing the 4-inch white traffic stripes with 6-inch stripes for better visibility at night and rainy conditions *(See story on page 17)*.

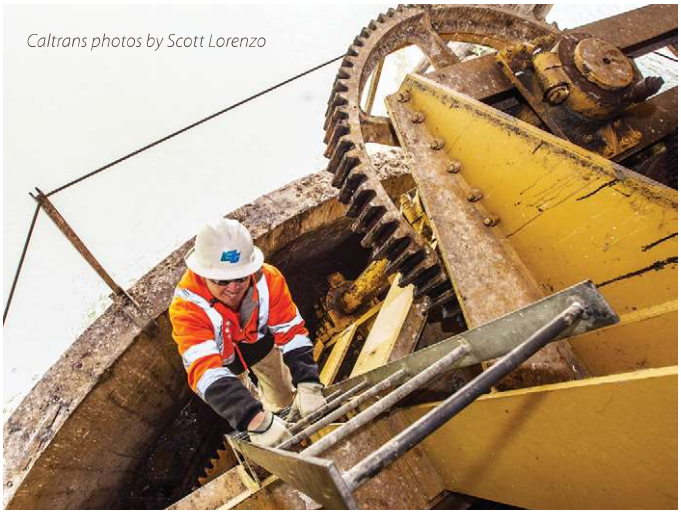
The division also has many maintenance service requests for litter and debris cleanup to catch up to. It is looking to increase agreements with other partners such as the Department of Corrections and Rehabilitation, the Adopt-A-Highway Program, and certain counties such as San Diego, Los Angeles and Santa Clara, as well as state entities.

Half of the funding generated by SB-1 is designated for local jurisdictions, so local roads will be improved also. MM

Maintenance, while responsible for all roads on the state highway system, will give proportional attention to interstates and interregional highways, which carry the bulk of the state's freight traffic.

Source: *Caltrans Division of Maintenance*

Caltrans photos by Scott Lorenzo



Caltrans maintenance crews keep the equipment humming as they repair pavement and guardrails along State Route 113 near Davis in Yolo County.

Accountability

To guarantee the wise use of its multibillion-dollar investment in California's transportation infrastructure, the Road Repair and Accountability Act of 2017 has established an Inspector General within the new Independent Office of Audits and Investigations with broad oversight of the Department of Transportation and all other agencies or organizations that receive SB-1 transportation funds.

The inspector general will be appointed by the governor and confirmed by the California state Senate for a six-year term. The law shields the inspector general from political pressure by specifying she or he may not be removed from office "except for good cause."

The inspector general's office will decide if state and federal transportation funds are being used "efficiently, effectively, economically, and in compliance with appli-

Accountability, continued on page 18

Road Striping Getting a Makeover: Wider, Brighter and More Durable

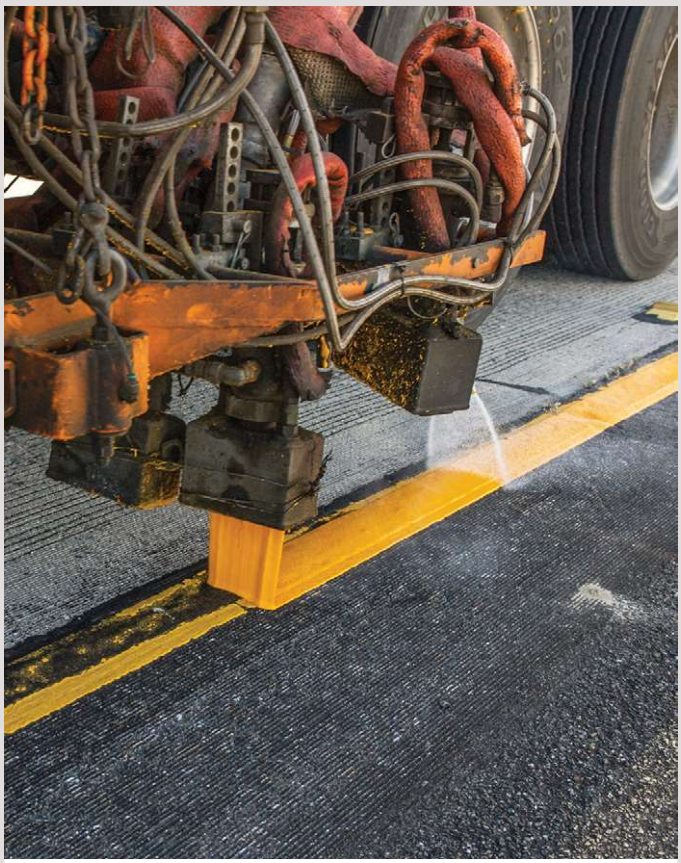
Beginning in July, road repairs that require restriping will replace the 4-inch-wide stripes with 6-inch stripes. This change applies to all edge lines (the ones that mark the side of the road), lane lines and center lines (the double-yellow ones that divide oncoming traffic on roads not separated by a median).

Meanwhile, in the next few years, all of the state's 13,350 lane miles that make up the freight corridors — Interstates 5, 10, 15 and 80 and portions of State Route 99 and U.S. Highway 101 as well as some smaller connector routes — will be restriped, regardless if it's part of a repair. It is expected that all 50,000-plus lane miles of the state highway system will be restriped within a decade.

The new stripes, whether they're made of paint, tape or thermal plastic, should make it easier for an aging population to see lane demarcations. Because the new generation of striping takes up more surface, it's expected to last longer and be more durable.

Stripes come in three forms: paint, tape and enhanced thermal plastic, which is melted to at least 350 degrees before being applied directly to the pavement. Tiny reflective beads are then embedded into the paint or plastic for added visibility when headlights shine on them.

Source: *Caltrans Office of Traffic Engineering*



A new layer of thermal plastic is laid down as part of a restriping project. Tiny glass beads are then sprayed on to increase reflectivity.

Accountability, continued from page 17

cable state and federal requirements." It will report its findings annually to the governor, the Legislature and the Transportation Commission (CTC), and will summarize its findings for the public.

The Act, which is expected to generate $54 billion over 10 years, also broadens CTC oversight of Caltrans' fix-it-first spending plan (the State Highways Operations and Protection Program), and requires that the plan be examined during public hearings in northern and southern California. MM

Source: *Senate Bill 1, Road Repair and Accountability Act, signed into law April 28, 2017*

Photo by David Monniaux | CC BY SA 3.0, via Wikimedia Commons

New Law Gives Lift to Stranded Motorist Service on Urban Freeways

A program that dispatches a fleet of tow trucks during the work week to quickly remove disabled or stranded vehicles from congested urban freeways throughout California will soon receive an additional $25 million a year in funds generated by the Road Repair and Accountability Act. Current funding is about $40 million.

The Freeway Service Patrol (FSP) is a joint program provided by Caltrans, the California Highway Patrol (CHP) and local transportation agencies.

The Freeway Service Patrol has more than 350 tow trucks — including this one operated by Henry Gomez of A&B Towing in Orange County — patrolling urban freeways around the state to remove disabled vehicles.

Over 350 tow trucks keep watch on more than 1,750 miles of freeways. The trucks' drivers are trained, certified and supervised by the CHP. The operation directly assisted more than 680,000 stranded motorists in 2016, helping Caltrans meet its mobility goals by keeping traffic — and the California economy — moving.

Rapid removal of freeway obstructions also reduces fuel consumption and minimizes automobile emissions by reducing the time vehicles spend idling in stopped traffic.

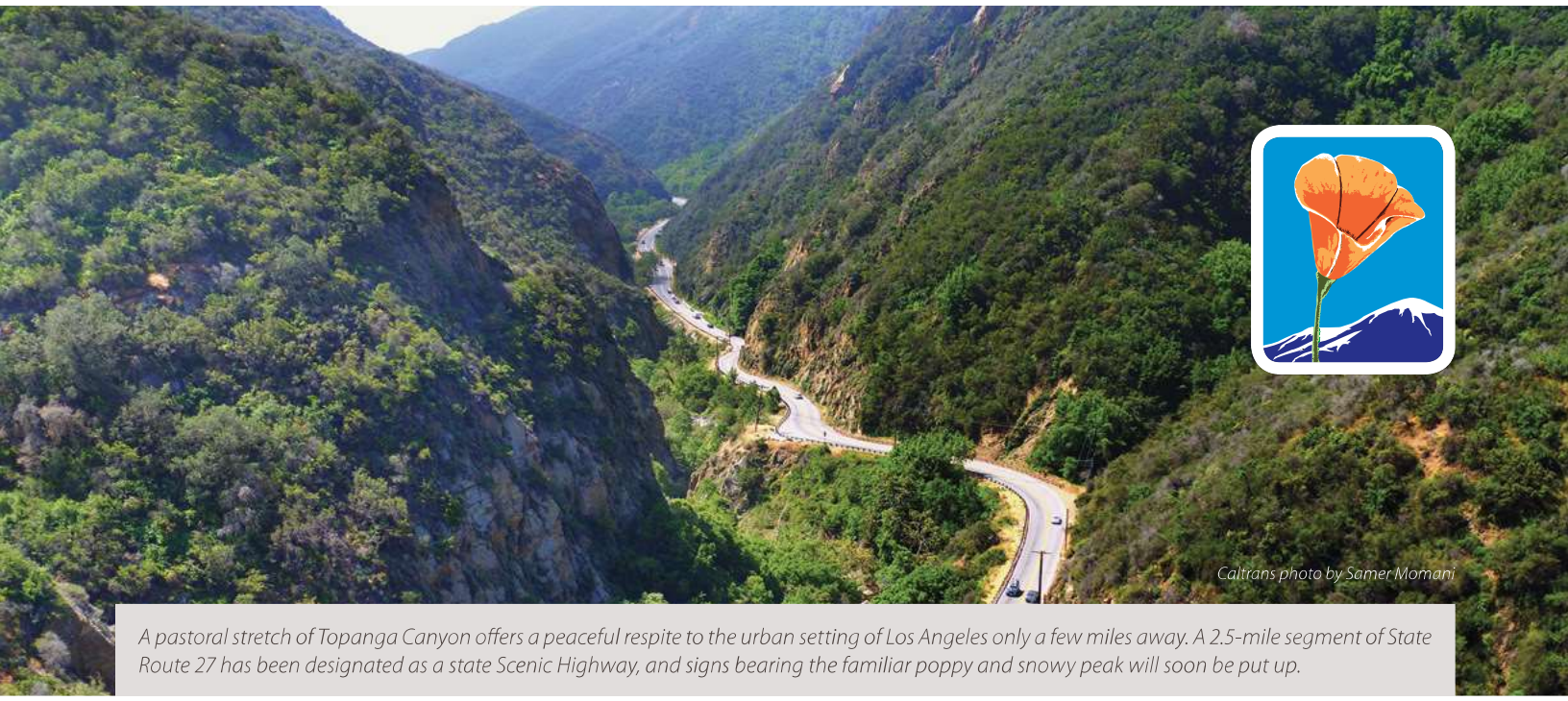
The FSP provides service to motorists at no cost. All costs of operating the program are provided through state and local public funding allocations. State funding is apportioned to each FSP program through a funding formula based upon population, miles of freeway in the region, and a measurement of congestion. The local transportation agencies match the state funding allocation with a minimum of 25 percent of local funds.

The FSP operates in 23 urban counties: El Dorado, Fresno, Los Angeles, Monterey, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, Santa Barbara, Santa Cruz, Yolo and the nine counties of the San Francisco Bay Area.

Source: *California Highway Patrol, Caltrans Division of Traffic Operations*

L.A. Canyon is New Scenic Highways Star

Topanga Corridor Now Part of Caltrans Program That Protects State's Unique Byways



A pastoral stretch of Topanga Canyon offers a peaceful respite to the urban setting of Los Angeles only a few miles away. A 2.5-mile segment of State Route 27 has been designated as a state Scenic Highway, and signs bearing the familiar poppy and snowy peak will soon be put up.

California's newest officially designated State Scenic Highway winds through a rugged, steep-sided canyon past majestic oaks, only minutes away from one of the nation's largest urban population centers.

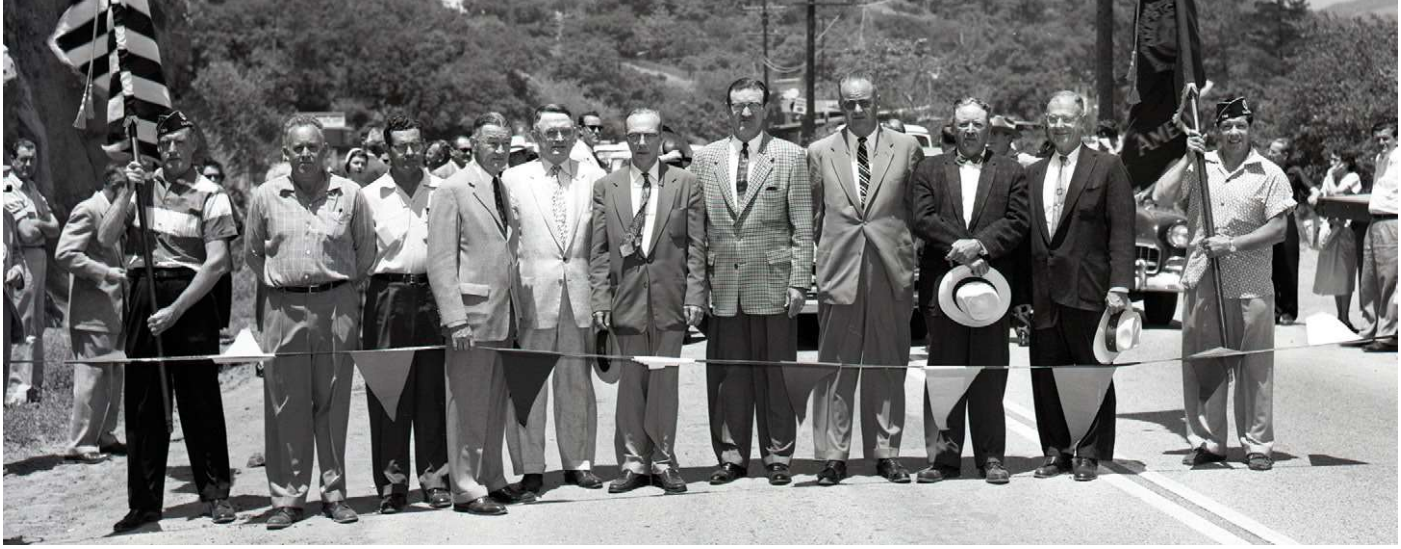
Topanga Canyon State Scenic Highway, a 2.5-mile segment of State Route 27, runs through the county and city of Los Angeles in the Santa Monica Mountains National Recreation Area near the Pacific coast.

"L.A. is very urban but there are a lot of rural spots as well," said Glen Levstik, Caltrans District 7 coordinator of scenic highways. "Here it's obvious, with trees, mountains, hills and natural beauty."

Travelers on Topanga Canyon State Scenic Highway enjoy views of massive ancient rock formations and coastal valleys with a diversity of plants and wildlife, including bobcats and mountain lions. State Route 27 cuts through lower Topanga Canyon parallel to Topanga Creek, the last free-running stream from the crest of the Santa Monica Mountains to the sea.

To protect and enhance the natural beauty of California highway corridors, the state Legislature created the State Scenic Highway Program in 1963. The first Scenic Highway designation was awarded in 1965 for a 72.3-mile segment of State Route 1 in Monterey County.

Many highway corridors are eligible for Scenic Highway status, but receiving an official designation requires the local government to apply to Caltrans for approval and adopt a Corridor Protection Program. The local governing body must develop and implement measures that strictly limit development and control outdoor advertising along the scenic corridor.



At top, the conclusion of a major reconstruction project along a section of Topanga Canyon brought together officials and members of the community in 1956. ***Above left****, an earlier construction project took place in the 1920s to make the passage between the San Fernando Valley and ocean a safer one. Today,* ***above right****, State Route 27 retains its bucolic charm for travelers and residents of the canyon.*

In California, 70 segments of 42 state highways have official recognition as a State Scenic Highway. In addition, following the same program requirements that apply to state routes, eight segments of seven county roads in California have obtained state recognition as an officially designated County Scenic Highway. Two of those county roads are located near the new Topanga Canyon State Scenic Highway in Los Angeles County.

Other recent California recipients of official recognition as a State Scenic Highway are:

- The Gaviota Coast State Scenic Highway, a 21-mile section of U.S. Highway 101 in Santa Barbara County featuring spectacular views of the Pacific Ocean, grassy rolling hills and the Santa Ynez Mountains.
- A 3.5-mile segment of State Route 52 in San Diego adjacent to Mission Trails Regional Park, crossing an impressive open-space system that preserves San Diego's diverse natural history.

Approval for Topanga Canyon State Scenic Highway was granted March 22, 2017. It was the first in Los Angeles County since 1971, when a 55-mile segment of State Route 2 from La Cañada Flintridge to San Bernardino County received official scenic status.

Topanga Canyon State Scenic Highway falls within two municipal jurisdictions — the county and the city of Los Angeles. Both local governments requested the scenic designation to work in concert with their goals of conserving the unique natural setting.

The city segment is in Topanga State Park, one of the world's largest wildlands in the boundaries of a major city.

Formerly a county road, Topanga Canyon Boulevard became part of the state highway system in 1933. Efforts were made over many years to draw attention to its scenic importance, with renewed emphasis after the state significantly improved the route through lower Topanga Canyon in the 1950s.

The Scenic Highway designation reflects strong support by area residents and local government, including a written proposal and a detailed visual assessment of the route.

The Scenic Highway designation reflects strong support by area residents and local government, including a written proposal and a detailed visual assessment of the route. The city and the county formally endorsed the application to Caltrans.

State Route 27 spans 20 miles from its southern end at State Route 1 (Pacific Coast Highway) to its northern limit at State Route 118 in Chatsworth near the northwest corner of the San Fernando Valley. The section approved for scenic status lies approximately a mile from the coast.

Nearby residents in the unincorporated community of Topanga applauded the new state recognition, which will be marked with distinctive highway signs.

"We have always seen Topanga Canyon Boulevard as our Main Street that just happens to run through some of the most spectacular scenery in the Santa Monica Mountains," said Roger Pugliese, chairman of the Topanga Association for A Scenic Community.

"The Topanga community is honored and delighted that California's Department of Transportation has recognized the largely unspoiled beauty of lower Topanga Canyon Boulevard and has designated most of it as a Scenic Highway," said John J. Waller, a board member of the Topanga Town Council.

The scenic designation is "the greatest of gifts," said Joseph Rosendo, past president of the Topanga Chamber of Commerce. "As an organization, a community and individuals we are prepared to do all that is necessary to maintain our Scenic Highway distinction and to work with Caltrans to continue to protect, preserve and improve one of California's natural resources."

A dedication ceremony for inclusion of the Topanga Canyon section in the State Scenic Highways program is set for June 16 at the Theatricum Botanicum in the community of Topanga. MM

Source: *Michael Comeaux, Public Information Officer, District 7*

Topanga Canyon, traversing the Santa Monica Mountains, is home to a diverse range of trees, plants and wildlife.

State Route 27 in the 1950s looked much like the route today, other than the vehicles on it. It spans 20 miles in total.

Big Sur Span Is Down, But Not for Long

Using an Accelerated Construction Strategy, New Bridge Is Expected to Open in Fall

The loss of the Pfeiffer Canyon Bridge this winter left the Big Sur community facing tremendous hardships and denied sightseers easy access to one of the world's most striking sea coasts and majestic forests.

So it's up to Caltrans, with the involvement of other agencies, to replace the Highway 1 lifeline to the Big Sur area as safely and quickly as possible. Because of the cooperation of those involved in the project — and Caltrans' use of an innovative construction method to replace the bridge — one of California's premier tourist destinations and major travel corridors should be mostly accessible by early fall.

A massive landslide during an especially rainy February buckled the 50-year-old bridge, rendering it impassable. About a month later, demolition crews finished what nature started and brought down the crippled span. Highway 1 continues to be closed from Pfeiffer Canyon south to Limekiln State Park, and from Gorda to Ragged Point due to continued slides — including the devastating Mud Creek avalanche of rocks and dirt that buried the highway.

After consultations with various parties, Caltrans decided to employ a method known as Accelerated Bridge Construction to haul in and assemble a replacement bridge that is expected to be open to traffic by late September.

The 315-foot bridge will be constructed using 15 steel girders and once completed, will extend 100 feet above the canyon floor. Importantly, the new bridge will not include any support columns, which were part of the original structure built in 1967. The elimination of columns will prevent this bridge from being damaged by future landslides.

Given the length of the bridge and other physical limitations of the steep canyon, a different type of span likely would have added another year to the construction schedule and created more traffic disruptions. The accelerated design process also shaved years off the normal delivery time for a bridge replacement project.

The new Pfeiffer Canyon Bridge in Big Sur, as shown in this depiction, is being rebuilt with steel girders that will span 310 feet across the canyon without need for support towers, eliminating the fear of damage from a landslide such as the one that crippled the bridge in February.

The steel girders for the new $24 million bridge — each 63 feet long and weighing 56 tons — are being fabricated in Vallejo, then moved to another plant near Stockton for painting in batches of three. Once painted, they will be shipped to the Pfeiffer Canyon site just north of Big Sur, with the last three expected to arrive in late July or early August.

The new bridge will be moved across the canyon using a time-saving 'incremental launching' method that doesn't require construction of multiple temporary towers in the unstable canyon. The entire steel girder portion of the bridge superstructure will be assembled on a roller bed located on the approach roadway on the north side of the canyon. Five 63-foot-long girder sections will be bolted together to create a single 315-foot girder. Three lines of girders will be set across from each other, connected by steel cross frames.

A single temporary tower with a roller assembly will be constructed near the center of the canyon. The steel girders will then be pulled across the can-

yon (from north to south) using a cable winch on the south side of the canyon. Workers will construct a large trestle extending part-way across the canyon to allow a large crane to pick and place the last girder segments on the far side of the canyon.

The accelerated bridge construction strategy improves travel mobility by reducing congestion, lengthy detours and traffic delays typically associated with bridge construction. Fewer project days also means less inconvenience for travelers. There's also cost savings realized from less traffic and construction management, project administration, environmental mitigation and possible right-of-way requirements.

The 2016-17 winter was by far the wettest in Big Sur in decades with highway damage the worst since 1998. But Caltrans engineers, geologists, project managers, contractors and fabricators are working smart and hard to rebuild this vital structure over scenic but rugged Pfeiffer Canyon. MM

Source: *Susana Cruz, Public Information Officer, District 5; Transportation Engineer Brian Fuller, District 5 Design; Senior Bridge Engineer Kevin Harper; Caltrans Project Delivery Quarterly, spring 2017*

Crews demolished the Pfeiffer Canyon Bridge in March following torrential rains in February that damaged the span. Its replacement is expected to open in mid to late September, using 15 steel girders being constructed in Vallejo, bottom right. Each girder is 63 feet long and weighs 56 tons. They will be connected on site, then rolled into place across the canyon using strategically placed winches and cables.

Winter Storms Exact Historic Roads Toll

Caltrans/Local Damage Estimate: $1.4 Billion and Still Climbing From 2017's Deluge

Roadways along the coast and in the Sierra Nevada, such as this one at Bridal Veil Falls on State Route 50, were pummeled by winter storms through April. This road washout happened in February, and repairs won't likely be done until September because of difficult conditions at the site.

The winter storms that brought an end to California's drought also caused an estimated $1.4 billion in damage to state and local roadways since January, according to Caltrans figures, ranking the 2017 winter as the most expensive in department history.

For Caltrans, weather-related costs soared to an estimated $1 billion by the end of May — roughly four times what was budgeted for emergency repairs for the fiscal year. Local entities reported $400 million in storm-related damage to roadway systems under their control.

The relentless procession of storms in 2017 took their toll on almost all elements of the state highway system. Storm damage included roadway flooding, mud slides, rock slides, avalanches, road washouts, slipouts (undermined roadways), gaping potholes and other pavement damage, and a high-profile bridge failure that cut off travel through one of California's most scenic and storied state parks.

Many of those weather-related incidents, such as the Pfeiffer Canyon Bridge closure in Big Sur, or numerous rock and mud slides that blocked Highway 50 through the Sierra Nevada, were classified as emergencies that required immediate action. There were 288 "director's order" projects this winter that authorized the hiring of contractors to quickly begin work, sometimes in a matter of hours, depending on the scope of the emergency.

Altogether, Caltrans' 12 regional districts reported 424 weather-damaged sites that each required at least $5,000 in repairs.

Caltrans is spending $757.7 million on emergency projects — beyond the $246.3 million budgeted for permanent restoration projects through the State Highway Operation and Protection Program (SHOPP). Other non storm-related SHOPP projects may be deferred as a result.

Caltrans is seeking reimbursement from the federal government for the massive repair bill left by the 2017 storms, but it's uncertain how much the state will receive. The Federal Highway Administration allocates about $100 million annually toward storm damage for the entire United States, and any additional appropriation requires congressional approval.

The 2017 winter season also put the department's staff to the test. Many in the Maintenance division worked around the clock to keep the roads clear and open, particularly in the mountain and foothill areas inundated with record amounts of rain and snow. Staffing costs for those emergency duties was $3 million, Caltrans statistics show.

Northern and Central California roadways absorbed the heaviest damage this winter. Six of the seven counties requiring $50 million or more in road-related repairs are in the north part of the state, with Los Angeles County incurring the most serious damage in the south. Marin County was the hardest hit of all 58 California counties, with $104 million in estimated damage, followed by Mendocino ($94.6 million), Monterey ($83.7 million), Santa Clara ($79.1 million), San Mateo ($68 million), Humboldt ($62 million), and Los Angeles ($60.4 million).

Caltrans' districts along the coast typically sustain the costliest road damage during heavy winters, contending with floods that inundate low-lying sections near sea level and cleaning up after slides in the mountainous areas inland.

Highway 99, in southern Sacramento County, was inundated earlier this year. Caltrans District 3, which takes in Sacramento and a swath of the Sierra, absorbed $129.6 million in weather-related damage.

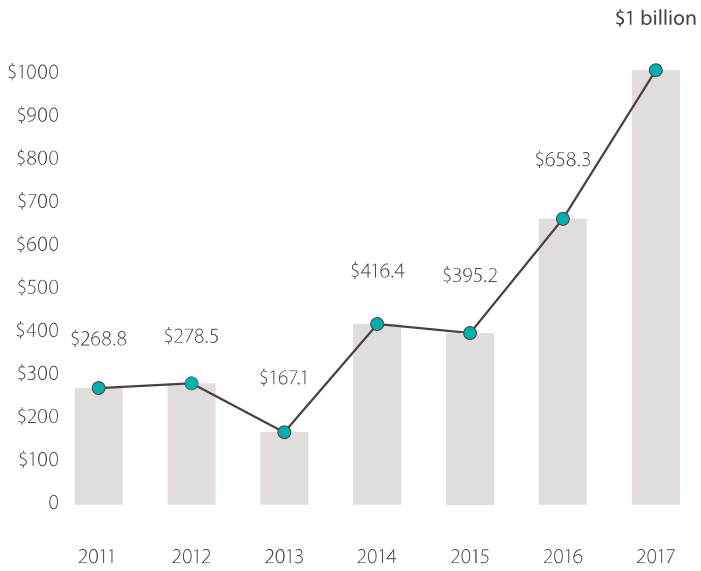
The deluge of 2017 proved no exception. Caltrans District 4, made up of Bay Area counties, posted the highest winter costs for 2017 at $376.3 million, followed by District 1 (North Coast, $183.2 million), District 3 (Sacramento-Sierra, $129.6 million), District 5 (Central Coast, $120.9 million), and District 7 (Los Angeles, $87.3 million).

In the Sierra, Caltrans District 3 crews fought a virtually nonstop battle all winter to keep open Interstate 80 and Highway 50. The critically important commercial and tourist routes were besieged by a series of rock and mud slides at lower elevations and record-breaking snowfall over the passes.

In a related development, Caltrans also is monitoring the impact of meltoff from the massive snowpack upon exposed mountain roads, particularly around the Lake Tahoe area. MM

California Storm Damage Costs

(in millions $)



Source: *Tony Tavares, Chief, Division of Maintenance; Gerald Kracher, Major Damage Engineer, Division of Maintenance*

Miles of Data Support Caltrans' Future

Huge Volume of Information Paves the Way for Department's Ambitious Repair Program

Caltrans photo by Scott Lorenzo

Caltrans stores much of its data in a server farm in the Sacramento area, while districts throughout the state preserve additional data specific to their region. The need is real. Technology used to create 3-D images of the state highway system, for example, produce quadrillions of bytes.

As Caltrans embarks on the most ambitious repair program in decades, it does so armed with an unprecedented amount of data about California's 50,000 lane miles of pavement.

Caltrans has gathered more raw data in a single, system-wide laser-scan survey than the Hubble Space Telescope sent home during its first 20 years in space. To say the department gathers data on an astronomical scale is no exaggeration.

The vehicle-mounted scanners of the Mobile Terrestrial Laser Scanning (MTLS) generate about 25 gigabytes of data for each mile they survey. Scanning about 15,000 centerline miles takes up 375 terabytes. The Hubble, by comparison, collected about 45 terabytes in its first two decades.

All that data will provide an intricate picture of the repair and rehabilitation needed to achieve the goals of the Road Repair and Accountability Act of 2017, which was created by Senate Bill 1.

Here is a short list of Caltrans partnerships and programs that also generate vast caches of data:

LiDAR

Laser scanning or Light Detection And Ranging (LiDAR) systems use lasers to take three-dimensional measurements of structures on the state highway system. Unlike simple text that takes up very little computer storage space, the 3-D images generated by LiDAR can produce petabytes of data (one petabyte is 1 quadrillion bytes, or 10^{15} — more than four times the data in the U.S. Library of Congress, according to McKinsey & Co.).

PaveM

Caltrans has invested in the Automated Pavement Condition Survey, which assesses the roadway system by using lasers and high-definition images. This data helps predict future pavement performance,

and tracks sustainability and pavement health. PaveM identifies future repairs that provide the best value, taking into account pavement condition, type, climate and project history.

Waze

In 2016, Caltrans entered a partnership with Waze, an online traffic application owned by Google, to receive anonymous traffic and incident report data collected from Waze users (called Wazers). This data, in turn, will be fed into Caltrans' QuickMap system to provide real-time travel information on California's roadways. Waze receives Caltrans' road condition data, construction and road closure information. Once the information sharing is more fully in place, Waze and Caltrans expect to generate more data and provide a thorough overview of road conditions, allowing drivers to better plan commutes and trips. Once implemented, the partnership is expected to help Caltrans locate potholes, mark travel times and receive real-time information on road hazards and incidents. Once implemented, Caltrans expects to receive thousands of these 'markers' a day on average statewide.

GPS

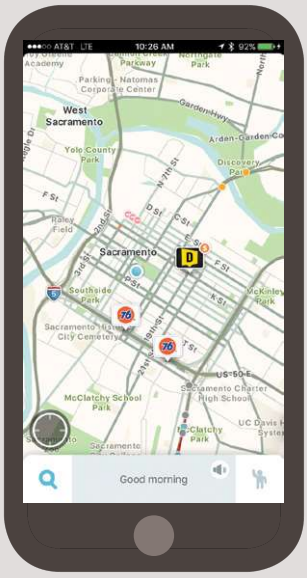
All vehicles in the Caltrans fleet are monitored by a global positioning system via a cloud-based interface. The live tracking data enhances safety, security and lawsuit liability defense. The data provides at-a-glance information for Caltrans managers.

A Major Traffic Incident

Even a single major traffic incident can generate enormous amounts of data. Investigators typically log law enforcement issues, design of the roadway, construction history and maintenance, traffic conditions, weather conditions, speed factors, number of vehicles and past incident records for that location. MM

Source: Multiple Caltrans divisions

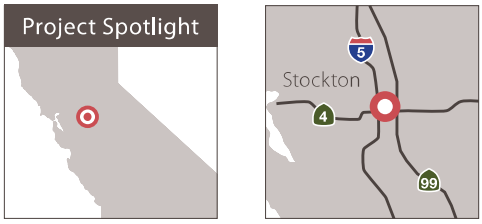
Waze App



A partnership with Waze is expected in the future to help Caltrans locate potholes, mark travel times and receive real-time information on road hazards and incidents.

Caltrans photo by Galen Ramos

The vehicle-mounted scanners of the Mobile Terrestrial Laser Scanning (MTLS) generate about 25 gigabytes of data for each mile they survey. Each $1.2 million MTLS uses seven cameras to record roadway features such as cracks, ruts and potholes in minute detail.



Stockton Freeway Network Strengthened

Coordinating I-5, SR-99 and SR-4 Projects Was Not Easy, but Benefits Are Many

Photo courtesy of Viewpoint Aerial Photography

An aerial photo gives a birds-eye view of a key section of the Stockton freeway grid. The northbound and southbound lanes of Interstate 5 take a vertical path over the top of State Route 4, the Crosstown Freeway, that cuts through the center of the city, connecting with State Route 99 to the east.

In Stockton, a half-billion dollars of infrastructure investment means wider, smoother freeways, better pedestrian options, quieter neighborhoods and reduced truck traffic on city streets.

Delivered as a quartet of projects over a three-year period, the $547 million of improvements include the county's first High Occupancy Vehicle lanes, improved interchanges and stretches of sound wall on both sides of busy Interstate 5.

A new 2,870-foot bridge on State Route 4 now gives trucks direct access to the Port of Stockton, which reduces goods-movement delay and keep big rigs off city streets. Workers also laid thousands of feet of new sidewalk, and expanded eight miles of State Route 99 from four lanes to six.

San Joaquin County's largest city resides between two of California's major north-south trade corridors, with SR-99 on its east and I-5 on its western flank. State Route 4, the Crosstown Freeway, connects the two.

Caltrans' local partner, the San Joaquin Council of Governments, combined a variety of funding sources — Proposition 1B, local Measure K half-cent transportation improvement tax, and State Highway Operation and Protection and Program (SHOPP) funds — to move these projects forward.

The Stockton region experienced a growth spurt in the years leading up to these projects. Traffic volumes grew from 110,000 average daily vehicle trips in 2008 to 132,000 in 2014. With the completion of these projects in 2016, commuter and freight traffic flow more freely.

Those improvements, however, did not come without challenges for motorists, residents and businesses. Lanes were shifted, freeways closed and everyday commutes were disrupted. The entire process lasted nearly a year longer than planned. But the I-5 project brought positive conclusion to what had been an ongoing community issue. For several years, residents and community leaders had been

lobbying for a sound wall on I-5 adjacent to an elementary school. As part of this project, Caltrans constructed and dedicated the sound wall to the school, which will improve safety as well as cut noise levels from the nearby highway.

Work on I-5 was delayed when an eight-mile stretch of new roadway had to be removed and replaced because of a design flaw in the flange beams that support the concrete roadway.

State Route 99, sometimes called the "Ag Highway" is a critical route for agricultural products and motorists. The $214.5 million South Stockton Widening project, along with the newly completed Manteca Widening project, vastly improved travel conditions on that stretch of SR-99. The eight-mile project was the largest in the history of Caltran's District 10. It widened SR-99 from four to six lanes, removed and replaced existing interchanges, and provided thousands of linear feet of sidewalk and shoulders that demonstrate Caltrans' commitment to pedestrian and bicycle travel.

Local streets, meanwhile, benefitted from reduced traffic rerouting and congestion. Through the design team's efforts, Caltrans was able to accelerate the construction schedule and save an estimated $31 million.

District 10's extensive outreach campaign kept the public informed during setbacks that included roadway flooding and unanticipated difficulties when removing existing concrete.

When completed in December 2016, the region showed an overall improvement of travel times on the highway and local roads. That reduction in travel times reduced vehicle emissions and improved the reliability of goods and freight distribution along the Central Valley.

The SR-4 Crosstown Freeway cuts east and west through Stockton, linking SR-99 and I-5. From the sky, it is the center line of a giant "H." It received two unique upgrades. The first, the Crosstown Extension, allowed direct access by large freight trucks to the Port of Stockton. Before the 2,870-foot long bridge was complete, it was an all-too-common sight to see 18-wheelers rolling through residential neighborhoods.

The other project, affectionately called the "Big Fix," strung together several smaller projects that included bridge rehabilitation, installation of automated warning systems, and a maintenance make-over.

In a bold move that provided additional safety to workers and saved money, the Big Fix project contractor proposed and was granted a VECP (Value Engineering Change Proposal) to close entire lanes for 10 weekends, a move that saved $350,000. A vigorous outreach campaign was conducted about the closures, detours, or delay times, and the project was completed four months ahead of schedule.

Source: *Greg Lawson, Public Information Officer, Caltrans District 10*

The State Route 4 "Crosstown Extension" project, seen here before its opening, now allows freight trucks to access the Port of Stockton.

Work crews perform a bridge joint replacement as part of the SR 4 "Big Fix" that made various improvements to the trade corridor.

Partnering Program Yields Big Benefits

Study Finds Resolving Potential Conflicts Prior to Construction Lowers Claims

Caltrans and contractors used the Partnering Program to reconstruct a portion of State Route 89 in El Dorado County, north of South Lake Tahoe. The project came in almost $2 million under budget and 39 days ahead of schedule despite work taking place on a highly traveled roadway.

Construction projects that used Caltrans' Partnering Program experienced fewer delays and post-construction claims, independent researchers found. As a result, fewer projects ended up in arbitration.

Caltrans contracted with the University of California, Davis, to analyze hundreds of construction projects that were completed during a six-year period. Many of the projects used an outside facilitator and partnering best practices to mitigate disputes. Projects that employed the partnering process were compared with those that did not.

Each project in the program had a budget of at least $10 million and construction schedule of 100 days or longer — the threshold established in 2008, two years after the study period began.

The U.C. Davis report, finalized in January, shows that more was spent on contract change orders in general for partnered projects than for non-partnered projects (see table, next page). These change orders are seen as a reflection of a collaborative partnering environment in which the team worked together during the project to resolve issues before the construction contract was accepted.

The Partnering Program helps Caltrans meet the stewardship and efficiency goals outlined in the

In its effort to efficiently deliver projects and services on time and on budget, Caltrans aims to deliver 100 percent of its planned projects to construction for each fiscal year.

2015-2020 Strategic Management Plan. In its effort to efficiently deliver projects and services on time and on budget, Caltrans aims to deliver 100 percent of its planned projects for each fiscal year. The department delivered 98 percent of its projects in 2015-16.

Researchers studied 274 projects completed between 2006 and 2012. Of those studied, 192 employed Partnering Program techniques and 82 did not.

Caltrans developed its partnering program in the early 1990s, but has employed it more robustly since 2006. Since that time, participation in the program involving major projects has risen from 58 percent in 2006 to 87 percent in 2012 — the final year of the study, chosen to ensure that all projects in the study had reached completion.

Partnering Results in Lower Claims

	Partnered	Non-partnered
Average Total Claims Value	$0.78 Million	$1.03 Million
Average Total CCO Value	$6.1 Million	$3.2 Million
Average Budget Growth	7.9%	9.2%
Average Schedule Growth	7.6%	11.1%

Projects that were included in the Caltrans Partnering Program incurred claims that were, on average, considerably less than non-partnered programs. Some of that success is attributed to construction change orders (CCOs) that are worked out during construction rather than after the project is completed.

Source: Caltrans Division of Construction

Keys to Partnering

The "Field Guide to Partnering on Caltrans Construction Projects" lays out a step-by-step process that involves an outside facilitator, a partnering charter, a dispute resolution plan and a closeout plan, along with follow-up meetings and monthly surveys. The close-out plan includes a workshop and lessons-learned survey at the end of the project.

Throughout the process, a Caltrans resident engineer and project manager are responsible for leading the partnering effort and are accountable for a project's day-to-day operations. They are considered the key to partnering success.

Top Partnering Projects

Each year project teams are recognized, at the Caltrans Excellence in Partnering Awards Ceremony, for using partnering and its best practices to finish projects safely, on time and within budget. In 2016, Caltrans recognized 13 qualified projects. Of those, nine had zero lost-time accidents; nine came within or under budget for a total of $18 million in savings for the 13 projects; 13 were completed on time or early (saving a combined 75 days); and 10 incurred no claims. In the previous year, 14 projects that had a combined savings of $21 million and 299 days saved were recognized, with 10 projects experiencing no time lost due to accidents over a period of 5,200-plus working days.

One such project was the reconstruction of a portion of State Route 89 in El Dorado County, north of South Lake Tahoe. The project had its share of challenges, with work taking place on a highly traveled roadway with limited workspace, but it was completed for $11.8 million, almost $2 million under budget, and took 211 days — 39 days ahead of schedule.

The partnering team included Caltrans, Diablo Contractors, Inc., property owners, Lahontan Regional Water Quality Control Board, Tahoe Regional Planning Agency, California Highway Patrol, California State Parks, U.S. Forest Service and other local agencies. The partnering program noted that construction partners resolved issues "at the lowest level" and coordinated efforts with other ongoing nearby highway construction projects, reducing the impact to the public by developing strategic road

closures and staging locations. No claims were filed against the project.

Room for Improvement

Caltrans encourages, but does not require, that projects valued between $1 million and $10 million incorporate the partnering program "even if a professional facilitator is not used." Likewise, the U.C. Davis report suggests many projects smaller than those required to participate would benefit from partnering, because some may be more complex than more costly projects that are larger but more straightforward.

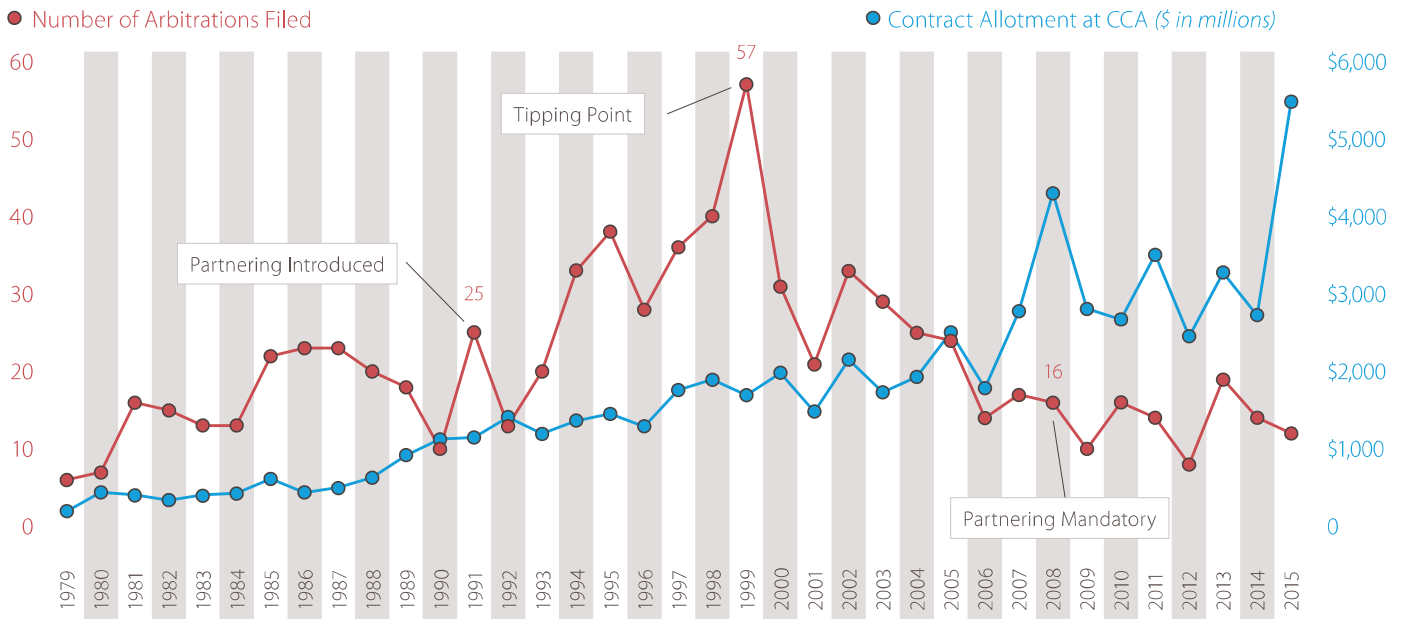
The report's authors note that not all partnering activities are equally useful — or even used in the field. "Kick-off and follow-up meetings were perceived as the most worthwhile activities to engage in, while skills training, monthly surveys, and close-out meetings were perceived to have little utility in maintaining a smoothly running project," the report said.

As a result, the independent report recommends two major changes: basing participation on project complexity and traffic patterns rather than cost or the number of projected days, and removing some of the partnering program's training elements. Caltrans has shared the report with its industry partners and is evaluating the report recommendations to further improve the partnering program.

Caltrans encourages, but does not require, that projects valued between $1 million and $10 million incorporate the partnering program "even if a professional facilitator is not used."

Source: *Ken Solak, Caltrans Division of Construction, HQ Partnering Program Manager; University of California, Davis, "Effects of Collaborative Partnering on Major Capital Projects"*

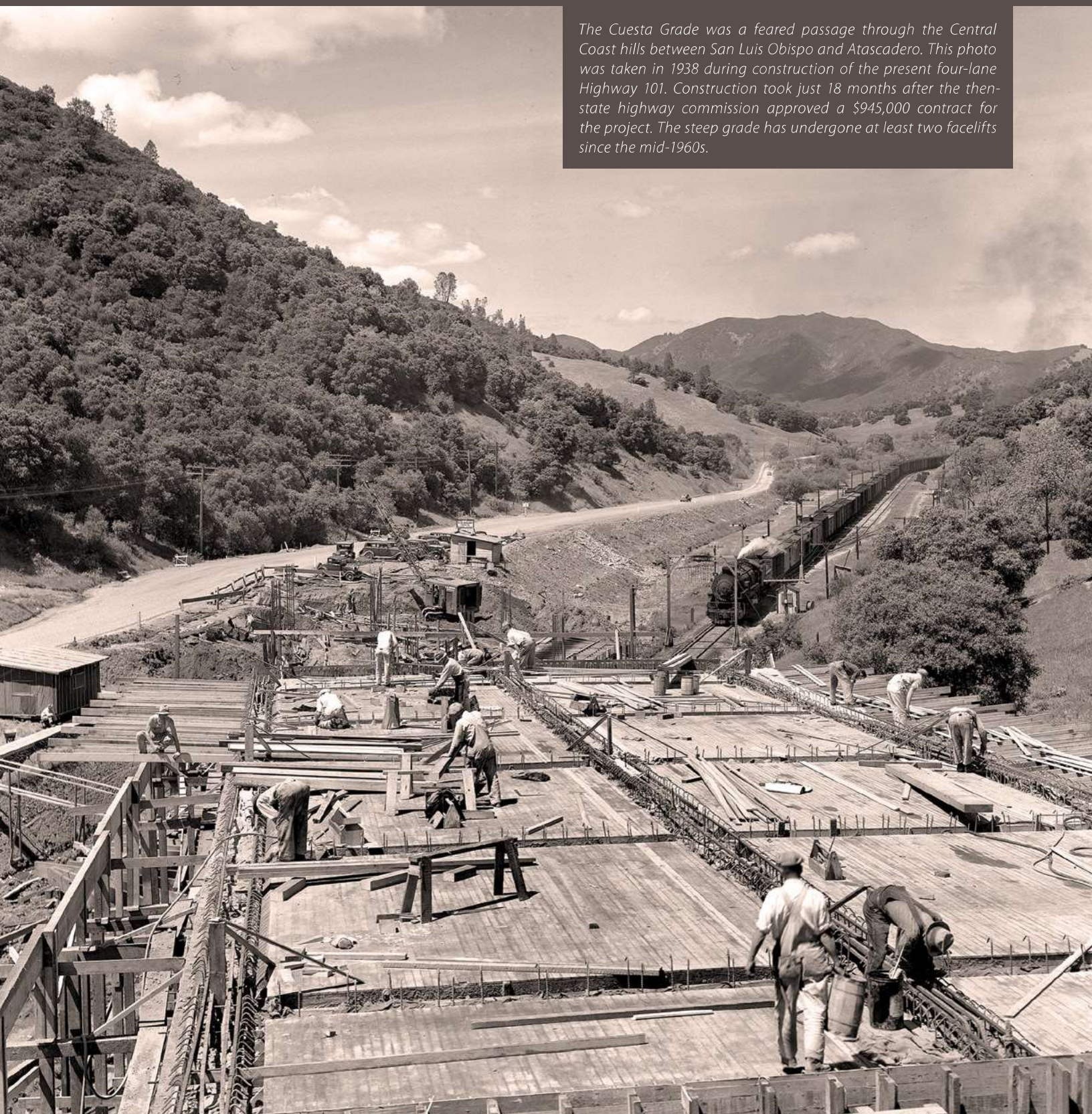
Caltrans Arbitration Filing History



The Caltrans Partnering Program measures much of its success by looking at the decrease in the number of construction projects that end up in contract disputes (settled through arbitration) despite an increase in contract allotments.

Source: *Caltrans Division of Construction*

From the Archives



The Cuesta Grade was a feared passage through the Central Coast hills between San Luis Obispo and Atascadero. This photo was taken in 1938 during construction of the present four-lane Highway 101. Construction took just 18 months after the then-state highway commission approved a $945,000 contract for the project. The steep grade has undergone at least two facelifts since the mid-1960s.