2011 TEN-YEAR STATE HIGHWAY OPERATION AND PROTECTION PROGRAM PLAN

Fiscal Years 2012–2013 Through 2021–2022

Prepared by the

California Department of Transportation
Business, Transportation and Housing Agency

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EXECUTIVE SUMMARY

The California Department of Transportation (Caltrans) is responsible for maintaining and operating the approximately 50,000 lane-mile State Highway System (SHS), the backbone of California's transportation system. Caltrans monitors the condition and operational performance of the SHS through periodic inspections, traffic studies, and system analysis. Caltrans uses information obtained through these activities to prepare the Ten-Year State Highway Operation and Protection Program Plan (SHOPP Plan) as required by Streets and Highways Code section 164.6. The SHOPP Plan provides input for the funding distribution in the State Transportation Improvement Program (STIP) fund estimate.

Streets and Highways Code section 164.6 requires the SHOPP Plan to include identified needs for a ten-year period based on quantifiable accomplishments and a cost estimate for at least the first five years.

The total ten-year goal-constrained need for the rehabilitation and operation of the SHS is $74 billion for the period from FY 2012–2013 through FY 2021–2022. This is the current cost estimate for capital construction, right-of-way acquisition, and project development and construction engineering support. This estimate does not include expected future increases in construction costs caused by escalation.

		2011 TEN-YEAR SHOPP GOAL-CONSTRAINED NEEDS			
	Inventory	**Average Annual Capital Cost ($ Million)**	**Average Annual Support Cost ($ Million)**	**Total Average Annual Cost ($ Million)**	**Performance Goal**
Major Damage Restoration	N/A	250.0	96.3	346.3	Restore damage within 180 days
Collision Reduction	N/A	320.0	160.0	516.8	Reduce collision trend by 10 percent
	N/A	26.1	10.7		Reduce roadside worker fatalities to zero
Mandates	N/A	474.0	208.0	682.0	Comply with laws and regulations
Mobility Improvement	N/A	260.0	121.0	381.0	Reduce daily vehicle hours of delay (DVHD) by 10 percent
Minor Program	N/A	90.0	60.0	150.0	N/A
Bridge	12,559 bridges	824.3	362.1	1,186.4	Reduce to 3 percent of bridges distressed (400 bridges)
Roadway	49,477 lane miles	2,546.0	771.5	3,317.5	Reduce to 10 percent of system distressed (5,000 lane miles)
Roadside	29,183 acres	230.8	114.2	484.0	Reduce to 20 percent of acres distressed (6,000 acres) and mandate compliance at 220 locations
	87 rest areas	93.1	45.9		Implement immediate safety and mandate needs at all existing locations and address capacity needs for safety
Facility Improvement	444 facilities	111.5	55.7	167.2	Rehabilitate 25 facilities
Support for Development of Planning Documents			170.3	170.3	
TOTAL		5,225.8	2,175.7	7,401.5	

As the roadways and bridges on the SHS age and near the end of their service lives, the demands of vehicle and truck traffic are accelerating the deterioration of these assets. Compounding this deterioration is the deferment, due to lack of funding, of necessary rehabilitation and restoration work to restore the transportation infrastructure to good operating conditions. The increased demands and deferred rehabilitation and restoration result in lower operational performance, higher user operating costs (additional vehicle repair costs, increased fuel consumption, increased tire wear, and accelerated vehicle depreciation), and ultimately higher overall long-term costs when needed repairs to the highway are eventually undertaken. In addition, the ever-increasing cost of meeting legal, statutory, and regulatory mandates is a significant contributor to the ten-year needs.

The sole funding source for the SHOPP is the State Highway Account (SHA), funded primarily through excise taxes on gasoline and diesel fuel. SHA funding is declining as a result of reduced fuel consumption, funding shortfalls in the Federal Highway Trust Fund, and redirection of funding for highway maintenance.

Projected SHA funding available for the SHOPP is $1.8 billion a year, which is 24 percent of the estimated need. Because funding is insufficient to preserve and maintain the existing transportation infrastructure, Caltrans will focus available resources on the most critical categories of projects in the SHOPP (safety, bridge, and pavement preservation). Even with this focus, the SHS will continue to deteriorate. For example, the percentage of lane miles of highway pavement in a distressed condition, which is pavement with significant rutting, cracking, potholes, or other signs of deterioration, is projected to increase from 26 percent to 40 percent during the next ten years. In addition, few improvements to maintenance facilities, repairs to safety roadside rest areas, and mobility improvements will be made.

In the absence of new revenue sources, the condition of the transportation system will continue to deteriorate, affecting Caltrans' ability to improve mobility across California.

I. OVERVIEW OF THE SHOPP

BACKGROUND AND PURPOSE OF THE SHOPP

Caltrans develops and manages the State Highway Operation and Protection Program (SHOPP) as authorized in Government Code section 14526.5 and Streets and Highways Code section 164.6 (see Appendices A and B for full text of both sections). The purpose of the SHOPP is to maintain and preserve the investment in the State Highway System (SHS) and its supporting infrastructure. Projects in the SHOPP are limited to capital improvements relative to maintenance, safety, and rehabilitation of State highways and bridges, capital improvements that do not add a new traffic lane to the system.

THE CALIFORNIA STATE HIGHWAY SYSTEM

The California SHS includes nearly 50,000 lane miles of pavement, 12,559 bridges, 205,000 culverts and drainage facilities, 87 roadside rest areas, and 29,183 acres of roadside landscaping. Also included in the transportation infrastructure are the additional support facilities, including maintenance stations, equipment shops, and transportation materials laboratories and testing facilities. Much of this system was built in the 1950s, 1960s, and early 1970s to serve California's growing population and economy. Many of the transportation infrastructure assets are reaching the end of their service lives and are at an age where deterioration is accelerating at a faster rate than in previous decades. The photographs contained in Appendix D display examples of some deficiencies on the SHS.

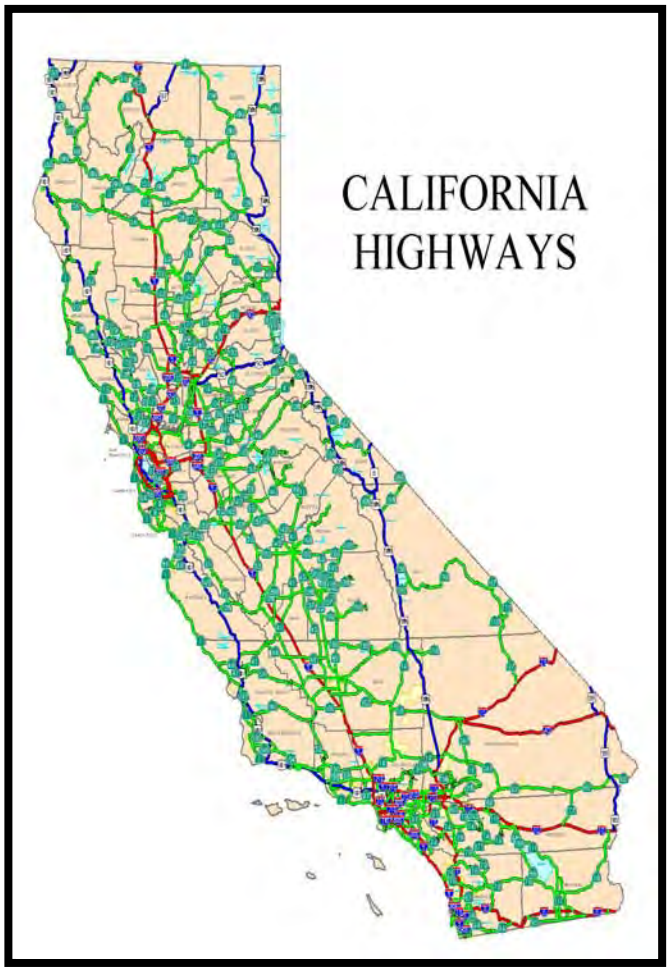

Figure 1. The California State Highway System

OPERATIONAL DEMANDS

The demands placed upon the transportation infrastructure continue to increase at a steady pace. In the decade between 1995 and 2005, annual vehicle miles traveled increased 20 percent. The increasing travel combined with the advanced age of the transportation system is causing a faster rate of pavement and bridge deterioration, new vehicle collision concentration locations, and increasing hours of traffic congestion. The growth in vehicle miles traveled also increases the use of roadside elements, such as safety roadside rest areas and vista points. Shown below in Figure 2 is a chart depicting the increase in annual vehicle miles traveled as compared with the investment in the SHS.

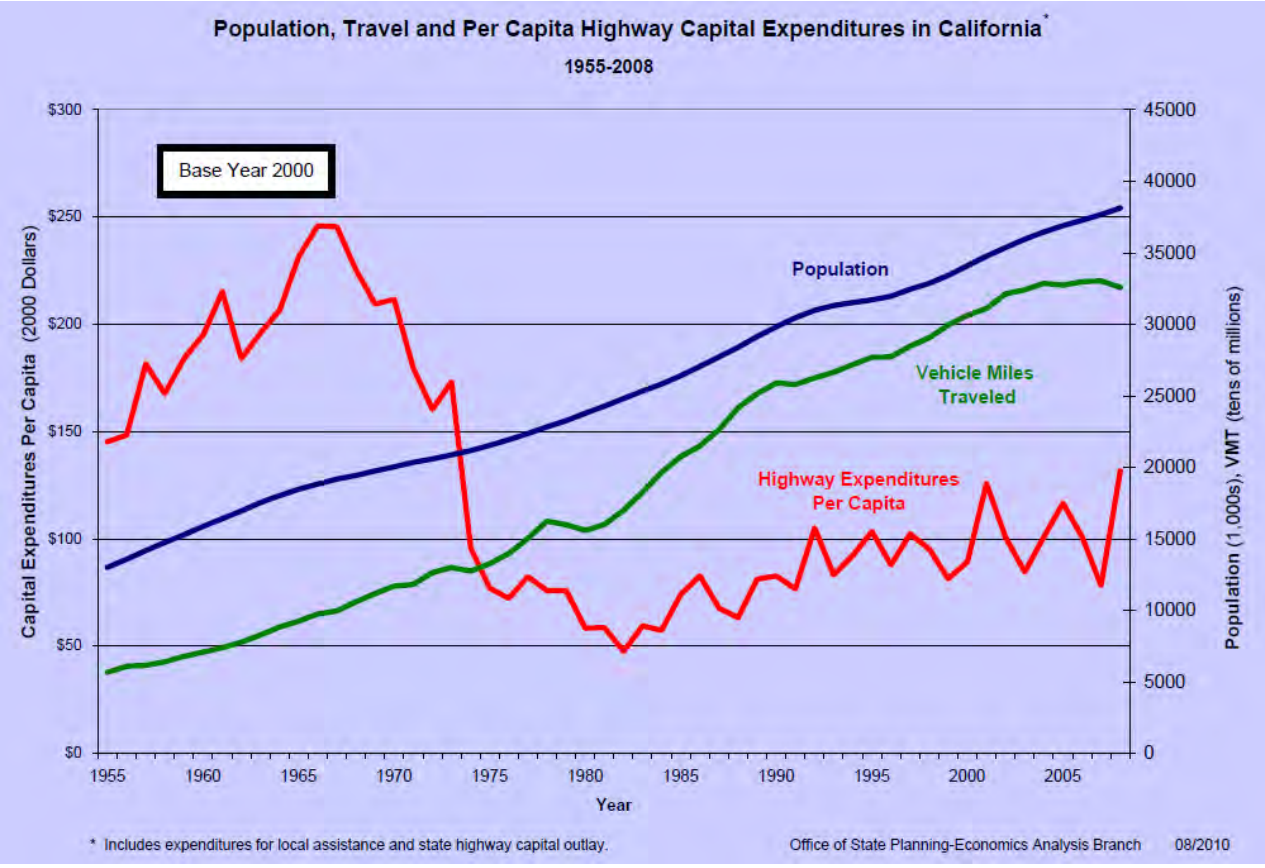

Figure 2. Population, Travel, and Per Capita Highway Capital Expenditures in California

Increased goods movement and the resulting increase in truck traffic are also expected to continue. The Federal Highway Administration, Office of Freight Management, projects the tons of freight moved on California highways in 2035 will more than double over 2002 volumes,

increasing from 971 million tons in 2002 to 2,179 million tons in 2035.[1] Much of the growth will occur in urban areas and on the fifty-year-old Interstate Highway System. This growth will continue to increase the rate of pavement deterioration and wear on bridges.

STRUCTURE OF THE SHOPP

The SHOPP has eight categories: (1) major damage restoration, (2) collision reduction, (3) legal and regulatory mandates, (4) mobility improvement, (5) bridge preservation, (6) roadway preservation, (7) roadside preservation, and (8) facility improvement.

These eight categories compose two major groupings, those that relate to its operational performance (major damage restoration, collision reduction, legal and regulatory mandates, and mobility improvement) and those that relate to the condition of the transportation system (bridge preservation, roadway preservation, roadside preservation, and facility improvement).

OPERATIONAL PERFORMANCE

Caltrans continually measures and evaluates the operational performance of the transportation system.

Major Damage Restoration. The goal of the major damage restoration category is to respond to earthquakes, floods, fires, and other emergencies to restore the roadway to essential traffic within 180 days after major damage and full restoration to predisaster conditions within three years. Major damage restoration projects resulting from a federally declared disaster are eligible for federal reimbursement.

As expected, the level of major damage restoration varies annually in response to human-caused and natural disasters. In general, as the SHS ages, the impact of damaging events and the cost to restore the affected SHS to predamage condition continue to increase.

Collision Reduction. The goal of the collision reduction category is to reduce the number and severity of fatal and injury collisions and reduce roadside worker fatalities to zero.

In the ten-year period from 1999 to 2008, the fatality rate on State highways decreased by 20 percent. For the same period, the fatality rate on freeways decreased by 17 percent and the fatality rate on nonfreeways decreased by 20 percent. The collision reduction improvements implemented through the SHOPP have contributed significantly to these reductions. An analysis of completed projects in the collision reduction category shows a 22.4 percent reduction of fatal

[1] "Freight Analysis Framework," Office of Freight Management and Operations, Federal Highway Administration, U.S. Department of Transportation, April 2002.

collisions and a 14.1 percent reduction of injury collisions, with fatalities reduced by 20.1 percent and injuries reduced by 18.5 percent.[2]

Seventy-one Caltrans employee fatalities have occurred since 1970: 44 percent involved workers on foot, on the shoulder, or within 30 feet of vehicle traffic.

Legal and Regulatory Mandates. The goal of the legal and regulatory mandates category is to comply with State and federal laws and regulations, such as the Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 et seq.) and evolving stormwater requirements, the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), the Americans with Disabilities Act (ADA) of 1990 (P.L. 101–336 [July 26, 1990], as amended by P.L. 110–325 [September 25, 2008]), and various hazardous waste remediation regulations.

Caltrans' stormwater discharges are subject to a permit issued under the Federal Water Pollution Control Act and pursuant to separate authority under the Porter-Cologne Water Quality Control Act (including regional water quality control board basin plans), various water board orders, and other legal mandates. In addition, Caltrans' stormwater systems are now also subject to the total maximum daily load requirements (TMDLs) of the Federal Water Pollution Control Act. The State Water Resources Control Board defines TMDLs as actions necessary to restore clean water.

Section 303(d) of the Federal Water Pollution Control Act requires states to identify waters that do not meet water quality standards after applying effluent limits for point sources. Subsequently, the total maximum daily load of the impairments was to be established and regulated through specific waste allocations to dischargers. These enforceable pollutant-specific waste load restrictions require municipal stormwater dischargers, such as Caltrans, to reduce the pollutant loads to specific levels by certain milestone dates.

Transportation facilities historically have been designed and constructed to collect, convey, and discharge stormwater run-off rapidly and efficiently for safety and for the protection of property. Thus, the majority of the SHS was designed and built without water quality treatment devices for stormwater. These systems now require retrofitting to accommodate the newly approved requirements for TMDLs.

Based on the current section 303(d) list with over 1,883 water body/pollutant combinations, the State Water Resources Control Board estimates over 400 TMDLs are needed. Caltrans is a named stakeholder for 38 adopted TMDLs and increasingly will be subject to additional TMDL regulations as they are completed around the State. The TMDLs cover over 60 percent of the State.

[2] "2009–2010 Highway Safety Improvement Program Annual Report," California Department of Transportation, Business, Transportation and Housing Agency, August 2010.

In addition, the California Ocean Plan, enforceable under the Porter-Cologne Water Quality Control Act, prohibits the discharge of wastes into Areas of Special Biological Significance (ASBS). Caltrans has approximately 200 discharge points—the most of any discharger—along 60 miles of the SHS within ten of these such areas along the State's coastline.

Another significant legal requirement is retrofitting and updating the SHS to comply with ADA regulations. Much of the cost of updating the SHS to enhance accessibility to persons with disabilities will be borne by the SHOPP.

Mobility Improvement. The goal of the mobility improvement category is to reduce congestion on and restore productivity of the SHS. Mobility improvements include operational improvements, transportation management systems, and commercial vehicle enforcement facilities and weigh-in-motion systems.

Mobility improvements focus on reducing vehicle delay on the SHS. Daily vehicle hours of delay (DVHD) are defined as the travel time (in hours) to cover a given distance under congested conditions as compared to the travel time at 35 miles per hour. This indicator of congestion continues to increase. As shown below in Figure 3, California's urban freeway recurrent congestion increased 4 percent from 560,362 DVHD in 2006 to 581,674 DVHD in 2007.[3]

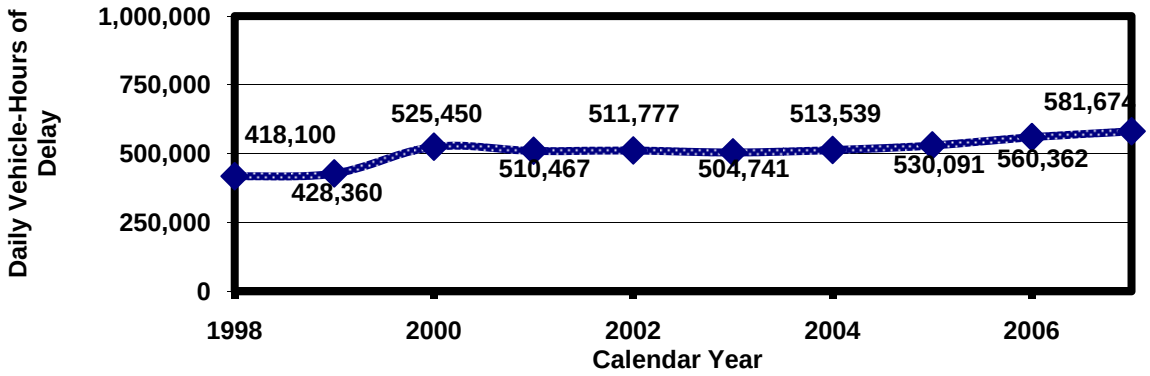

Figure 3. Daily Vehicle-Hours of Delay

[3] "2007 State Highway Congestion Monitoring Program Annual Data Compilation," California Department of Transportation, Business, Transportation and Housing Agency, June 2008.

As stated in the adopted 2010 State Transportation Improvement Program (STIP) Guidelines, operational improvements that do not expand the design capacity of the transportation system and are intended to address spot congestion are eligible for SHOPP funding. Regions may nominate these types of projects in their own Regional Transportation Improvement Programs (RTIPs) if timely implementation through the SHOPP is not possible.

SYSTEM CONDITION

Caltrans continually measures and evaluates the condition of the transportation system.

Bridge Preservation. The goal of the bridge preservation category is to preserve all bridges on the SHS in a safe and economic manner so that no bridge failures will occur.

The SHS contains 12,559 bridges. The median age of these bridges is 43 years. Many of these bridges are reaching the end of their service life and are in need of rehabilitation and reconstruction.

Eight percent (1,064) of the bridges on the SHS are in distressed condition and in need of rehabilitation. Distressed condition is defined as a bridge with an identified replacement, rehabilitation, scour, or seismic need that must be addressed to keep it functional and safe. The trend over the last five years is a net increase in the number of distressed bridges.

Roadway Preservation. The goal of the roadway preservation category is to keep distressed roadway lane miles at a steady managed state. The historic goal of Caltrans has been to reduce the number of distressed lane miles of pavement to 5,000, or approximately 10 percent of the total system.

The percentage of distressed lane miles (those with poor structural condition or poor ride quality) is an indicator of the condition of the pavement on the SHS. Pavement distress is commonly associated with significant rutting, cracking, potholes, or other signs of deterioration. The 2007 Pavement Condition Survey reports 41 percent (20,424 lane miles) of the SHS are in excellent condition, 32 percent (16,055 lane miles) require pavement maintenance, and 26 percent (12,998 lane miles) are distressed and require rehabilitation and reconstruction work.[4]

Roadside Preservation. The goal of the roadside preservation category is to reduce the long-term maintenance costs of roadside infrastructure, improve worker and traveler safety, reduce deficient landscaping, comply with regulatory and legal mandates, and improve operations and accessibility at safety roadside rest areas and vista points.

[4] "2007 State of the Pavement," California Department of Transportation, August 2008, page 4.

Approximately 60 percent of the highway planting and irrigation inventory has deteriorated beyond the ability of maintenance forces to correct, resulting both in recurrent maintenance activities requiring excessive duration and frequency of maintenance worker exposure to traffic and in vegetation that no longer performs as viable stormwater control. The number of distressed areas of landscaping has increased from 12,000 to 17,000 acres in the past five years. In addition, 70 percent of the safety roadside rest areas have water quality, capacity, or operational deficiencies.

Facility Improvement. The goal of the facility improvement category is to address worker safety, comply with ADA and California Division of Occupational Safety and Health (Cal/OSHA) regulations, and improve operational efficiency. The facility improvement category includes projects for improvements at equipment facilities, maintenance facilities, office buildings, and transportation materials laboratories and testing facilities.

II. TEN-YEAR COSTS AND PERFORMANCE OUTCOMES

GOAL-CONSTRAINED AND FINANCIALLY-CONSTRAINED PLAN COST ESTIMATES

The total ten-year, goal-constrained need for the rehabilitation and operation of the SHS is $74 billion for FY 2012–2013 through FY 2021–2022. This amount represents the current cost estimate for capital construction, right-of-way acquisition, and project development and construction engineering support. This estimate does not include expected future increases in construction costs.

The sole funding source for the SHOPP is the State Highway Account (SHA), funded primarily through excise taxes on gasoline and diesel fuel. SHA funding is declining as a result of reduced fuel consumption, funding shortfalls in the Federal Highway Trust Fund, and redirection of funding for highway maintenance.

The following two tables present a summary of the total ten-year funding needs to achieve SHOPP goals and summarize Caltrans' constrained annual funding plan based on forecasted SHA funding. Table 1, titled 2011 Ten-Year Goal-Constrained Needs Plan, presents Caltrans' estimated cost of rehabilitation needs to achieve acceptable performance goals. This estimate is required by Streets and Highways Code section 164.6.

Table 2, titled 2011 Ten-Year Financially-Constrained Needs Plan, presents the estimated performance based on the anticipated funding available during the ten-year timeframe for the 2011 SHOPP Plan.

Table 1

2011 TEN-YEAR GOAL-CONSTRAINED NEEDS PLAN

(Annual Estimates in 2010 Dollars)

Category	Annual Cost ($ Millions)			Annual Performance Units
	Capital	Support	Total	
Emergency Damage Repair	126.0	40.3	166.3	TBD locations
Permanent Restoration	88.0	42.0	130.0	TBD locations
Roadway Protective Betterment	36.0	14.0	50.0	70 locations
MAJOR DAMAGE RESTORATION	**250.0**	**96.3**	**346.3**	
Safety Improvements	200.0	100.0	300.0	390 fatal and injury collisions reduced
Collision Severity Reduction	120.0	60.0	180.0	216 fatal and injury collisions reduced
Roadside Safety Improvements	26.1	10.7	36.8	450 locations
COLLISION REDUCTION	**346.1**	**170.7**	**516.8**	

Table 1 (cont.)

2011 TEN-YEAR GOAL-CONSTRAINED NEEDS PLAN

(Annual Estimates in 2010 Dollars)

Category	Annual Cost ($ Millions)			Annual Performance Units
	Capital	Support	Total	
Relinquishments	12.0	3.9	15.9	12 centerline miles
Railroad At-Grade Crossings	1.0	---	1.0	1 location
Hazardous Waste Mitigation	1.0	0.1	1.1	1 location
Stormwater	245.0	123.0	368.0	3,591 acres treated
ADA Curb Ramp	15.0	6.0	21.0	6,000 curb ramps
ADA Pedestrian Infrastructure	200.0	75.0	275.0	1,080 components
MANDATES	**474.0**	**208.0**	**682.0**	
Operational Improvements	140.0	54.0	194.0	20,000 DVHD reduced
Transportation Management Systems	35.0	21.0	56.0	451 new elements
	27.0	16.2	43.2	322 replacement
Commercial Vehicle Enforcement Facilities and Weigh-in-Motion Systems	17.0	8.6	25.6	2 new locations
	41.0	21.2	62.2	22 rehabilitation
MOBILITY IMPROVEMENT	**260.0**	**121.0**	**381.0**	
Minor Program	**90.0**	**60.0**	**150.0**	**TBD**
SUBTOTAL OPERATIONAL PERFORMANCE	**1,420.1**	**656.0**	**2,076.1**	
Bridge Rehabilitation	176.0	79.2	255.2	51 bridges
Bridge Preventive Program	30.3	10.8	41.1	166 bridges
Bridge Scour Mitigation	16.0	7.2	23.2	11 bridges
Bridge Rail Replacement/Upgrade	320.0	138.0	458.0	40,000 feet
Bridge Seismic Restoration	270.0	121.5	391.5	98 bridges
Permit Requirements for Bridges	12.0	5.4	17.4	7 bridges
BRIDGE	**824.3**	**362.1**	**1,186.4**	
Roadway Rehabilitation*	2,205.0	661.5	2,866.5	5,300 lane miles
Drainage System Restoration	260.0	82.0	342.0	2,255 culverts
Signs and Lighting Rehabilitation	81.0	28.0	109.0	2,575 signs
ROADWAY	**2,546.0**	**771.5**	**3,317.5**	
Roadside Protection and Restoration	24.8	11.2	36.0	58 locations
Highway Planting Rehabilitation	206.0	103.0	309.0	1,720 acres
Roadside Rest Area Rehabilitation	35.5	11.7	47.2	7 locations
New Safety Roadside Rest Areas	57.6	34.2	91.8	4 locations
ROADSIDE	**323.9**	**160.1**	**484.0**	
Equipment Facilities	6.5	2.6	9.1	2 facilities
Maintenance Facilities	82.5	42.5	125.0	22 facilities
Office Buildings	18.5	9.0	27.5	5 facilities in 10 years
Materials Labs and Testing Facilities	4.0	1.6	5.6	4 facilities in 10 years
FACILITY IMPROVEMENT	**111.5**	**55.7**	**167.2**	
SUBTOTAL SYSTEM CONDITION	**3,805.7**	**1,349.4**	**5,155.1**	
Support for Development of Planning Documents		**170.3**	**170.3**	
TOTAL ANNUAL NEED	**5,225.8**	**2,175.7**	**7,401.5**	

* All pavement programs are grouped into one line item because at this time Caltrans does not have the data to separate the programs.

Table 2

2011 TEN-YEAR FINANCIALLY-CONSTRAINED NEEDS PLAN

(Annual Estimates in 2010 Dollars)

Category	Annual Cost ($ Millions)			Annual Performance Units
	Capital	Support	Total	
Emergency Damage Repair	50.0	16.2	66.2	TBD locations
Permanent Restoration	50.0	23.5	73.5	TBD locations
Roadway Protective Betterment	10.4	3.9	14.3	2 locations
MAJOR DAMAGE RESTORATION	**110.4**	**43.6**	**154.0**	
Safety Improvements	200.0	100.0	300.0	390 fatal and injury collisions reduced
Collision Severity Reduction	49.7	24.9	74.6	90 fatal and injury collisions reduced
Roadside Safety Improvements	2.7	1.1	3.9	84 locations
COLLISION REDUCTION	**252.4**	**126.0**	**378.5**	
Relinquishments	12.0	3.9	15.9	12 centerline miles
Railroad At-Grade Crossings	1.0	---	1.0	1 location
Hazardous Waste Mitigation	1.0	0.1	1.1	1 location
Stormwater	91.7	46.0	137.7	1,800 acres treated
ADA Curb Ramp	7.7	3.2	10.9	3,100 curb ramps
ADA Pedestrian Infrastructure	15.0	6.3	21.3	85 components
MANDATES	**128.4**	**59.5**	**187.9**	
Operational Improvements	17.0	7.5	24.6	4,050 DVHD reduced
Transportation Management Systems	---	---	---	--- new elements
	22.3	13.4	35.7	266 replacement
Commercial Vehicle Enforcement Facilities and Weigh-in-Motion Systems	---	---	---	--- new locations
	5.0	2.5	7.5	3 rehabilitation
MOBILITY IMPROVEMENT	**44.3**	**23.4**	**67.8**	
Minor Program	**90.0**	**60.0**	**150.0**	**TBD**
SUBTOTAL OPERATIONAL PERFORMANCE	**625.5**	**312.5**	**938.2**	
Bridge Rehabilitation	139.4	53.0	192.4	81 bridges
Bridge Preventive Program	30.3	10.8	41.1	166 bridges
Bridge Scour Mitigation	8.5	3.8	12.3	9 bridges
Bridge Rail Replacement/Upgrade	16.6	7.0	23.6	1,129 feet
Bridge Seismic Restoration	57.7	21.9	79.6	24 bridges
Permit Requirements for Bridges	6.8	2.6	9.4	4 bridges
BRIDGE	**259.3**	**99.1**	**358.4**	
Roadway Rehabilitation*	310.7	95.0	405.7	750 lane miles
Drainage System Restoration	7.1	4.2	11.3	90 culverts
Signs and Lighting Rehabilitation	0.2	0.1	0.3	7 signs
ROADWAY	**318.0**	**99.3**	**417.3**	
Roadside Protection and Restoration	0.7	0.2	0.9	6 locations
Highway Planting Rehabilitation	1.4	0.6	2.0	25 acres
Roadside Rest Area Rehabilitation	7.6	3.6	11.2	7 locations
New Safety Roadside Rest Areas	0.9	0.3	1.2	1 location in 10 years
ROADSIDE	**10.6**	**4.7**	**15.3**	

Table 2 (cont.)

2011 TEN-YEAR FINANCIALLY-CONSTRAINED NEEDS PLAN

(Annual Estimates in 2010 Dollars)

Category	Annual Cost ($ Millions)			Annual Performance Units
	Capital	Support	Total	
Equipment Facilities	---	---	---	0 facilities in 10 years
Maintenance Facilities	3.9	1.4	5.2	16 facilities in 10 years
Office Buildings	---	---	---	0 facilities in 10 years
Materials Labs and Testing Facilities	1.0	0.4	1.4	1 facility in 10 years
FACILITY IMPROVEMENT	**4.9**	**1.8**	**6.6**	
SUBTOTAL SYSTEM CONDITION	**592.8**	**204.9**	**797.6**	
Support for Development of Planning Documents		**34.8**	**34.8**	
TOTAL ANNUAL NEED	**1,218.3**	**552.2**	**1,770.6**	

* All pavement programs are grouped into one line item because at this time Caltrans does not have the data to separate the programs.

TRENDS FOR SHOPP FUNDING

During the past four SHOPP programming cycles, the identified needs continued to grow while the available funding remained flat. Figure 4 displays the trend in the annual value of needs defined in prior ten-year plans versus the annual value of SHOPP projects in past programming cycles. The increase in value of the ten-year need is a symptom of the increased age of the infrastructure, increased usage, deferment of needed rehabilitation, and increased cost of meeting legal and regulatory mandates. The gap between the needs and available funding continues to widen.

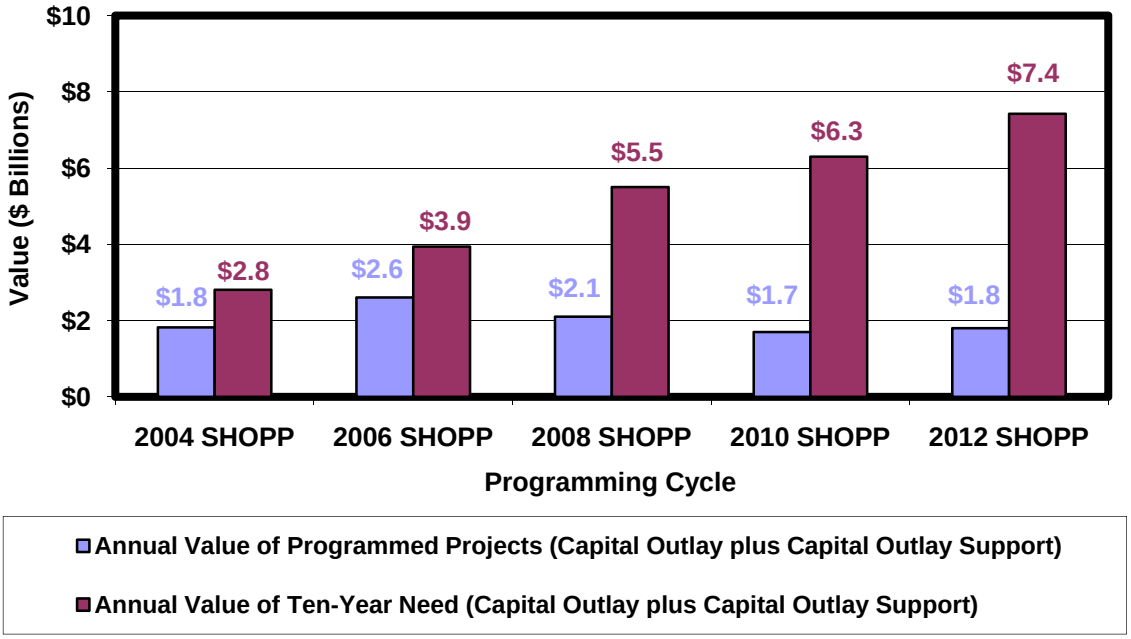

Figure 4. Comparison of Needs vs. Programmed SHOPP

The functional life of the SHS is greatly affected by the ability to perform timely restoration work. The consequence of deferring necessary rehabilitation and restoration is a degraded system condition. This deferment results in lower operational performance, higher user operating costs (additional vehicle repair costs, increased fuel consumption, increased tire wear, and accelerated vehicle depreciation), and ultimately higher overall long-term costs when needed repairs to the highway are eventually undertaken.

Furthermore, increasing construction costs reduce buying power of the limited SHOPP funding. The Highway Construction Cost Index between 1981 and 2009 is shown on the chart in Figure 5. This index is a measure of the cost of key materials needed for highway and bridge construction over time. Highway construction costs increased at predictable and steady rates between 1980 and 2000. From 2003 to 2007, construction costs escalated at rapid and unforeseen rates. Although costs have recently declined from peak levels in 2006 and 2007, they still are significantly above levels experienced in 2003. Escalating construction costs reduce buying power and further limit the ability of the SHOPP to effectively maintain and preserve the investment in the SHS.

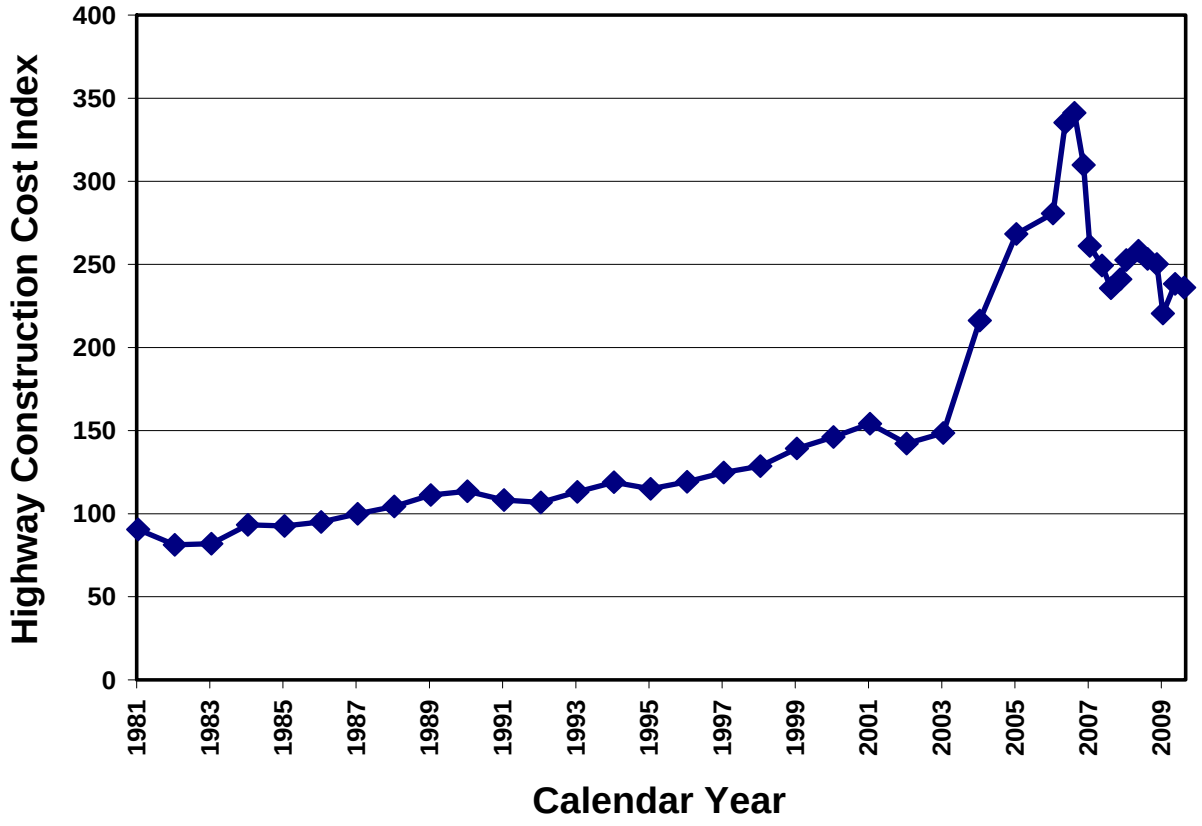

Figure 5. Highway Construction Cost Index

In the ten-year horizon, the available SHA funding for the SHOPP is not expected to grow. With the passage of time, the buying power of the available funding will decline as a result of cost escalation. The result of this condition is that a larger percentage of the funding will be directed to meet major damage restoration, collision reduction, and regulatory mandates, leaving a corresponding smaller percentage available for pavement, bridge, mobility, roadside, facility, and minor program needs. This condition is illustrated in Figure 6.

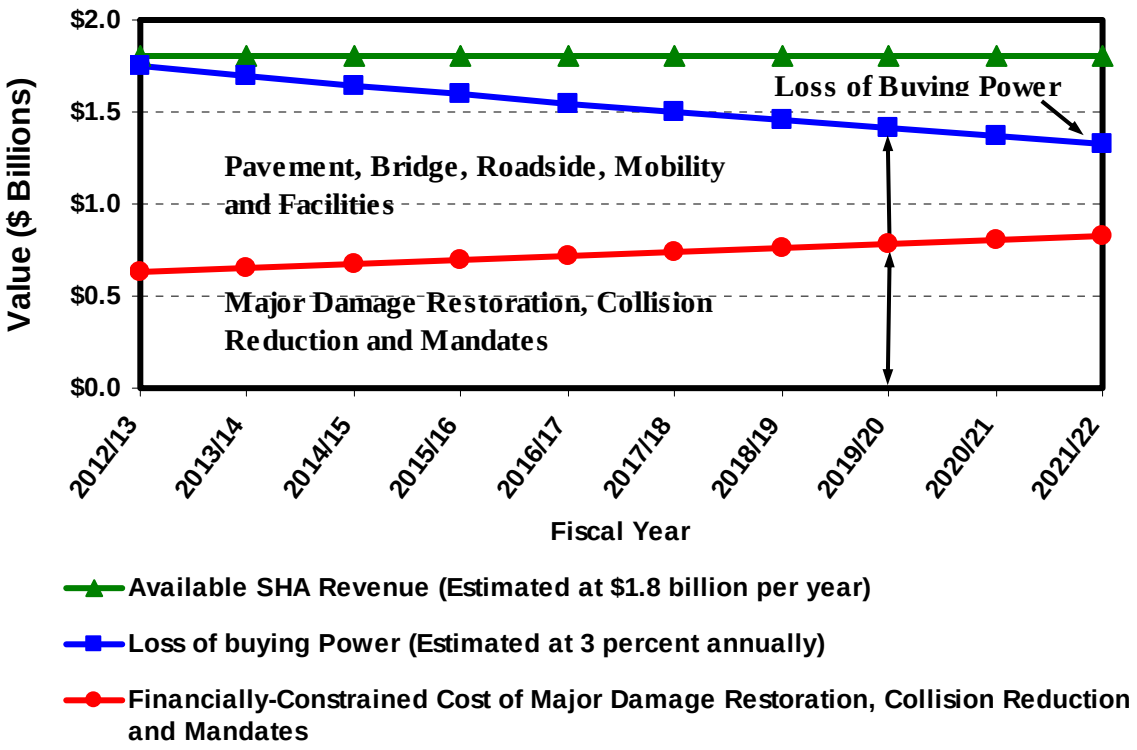

Figure 6. Impact of Cost Escalation on the SHOPP

CONSEQUENCES OF CONSTRAINED FUNDING

Following is a description of the consequences of the funding limitation on each category of the SHOPP.

Major Damage Restoration. Need $346 million a year; $154 million a year available.

This funding is used to respond to emergencies and other sudden, unforeseen infrastructure needs. The need of $346 million a year is based on average expenditures over the last ten years (excluding major disasters, which are assumed to qualify for federal aid).

The following are major consequences of the funding shortfall:

- Delays to construction of programmed projects in other SHOPP categories if additional emergency response funding is needed.
- Increases in the need for emergency repairs as SHOPP funding decreases.

Collision Reduction. Need $517 million a year; $379 million a year available.

Collision reduction programs are intended to reduce the numbers and severity of collisions that occur on the SHS. The safety improvement projects are selected based on collision history and a cost-benefit analysis that compares the associated savings of reduced collisions with the project cost. Typical projects include signal installation, curve improvements, median barrier installation, run-off-road-type collision reduction, traffic safety device installation within the clear recovery zone, wet pavement improvements, and worker safety improvement projects.

With the available funding, immediate safety projects will be addressed. However, because of the shortfall in funding, nearly 58 percent of collision severity reduction projects to address run-off-road potential or upgrade existing safety features will be delayed. When applying the same percent reduction in the performance measure for these projects, there is a missed opportunity to reduce more than 120 fatal and injury collisions, which is equivalent to $113 million a year in collision costs.[5]

If grant funding through the Hazard Elimination Program are applied, there is the ability to add approximately $25 million a year. However, the funds can apply only to capital construction, which leaves the responsibility of the support costs to be funded through the SHOPP. The program as a whole still will be affected by the shortfall in funding, delaying more than 38 percent of the collision severity reduction projects. This is a missed opportunity

[5] Collision costs used by Caltrans are based on the Comprehensive Cost Method, accounting for the monetary effects of collisions and the effects of collision on a person's whole life (loss of production, quality of life, etc.).

to reduce more than 80 fatal and injury collisions, which is equivalent to $77 million a year in collision costs.

In addition, 73 percent (3,660 locations) of worker safety improvements will not be completed, which continues the exposure of maintenance workers to traffic in those locations and increases the risk of fatal or injury collisions.

Legal and Regulatory Mandates. Need $682 million a year; $188 million a year available.

The mandates programs comply with various State and federal court orders, laws, and regulations for stormwater, ADA compliance, and relinquishment of redundant SHS segments to local agencies.

The funding shortfall ultimately delays compliance with the Federal Water Pollution Control Act and other laws, resulting in the risk of enforcement actions and potential State and federal court orders. Failure to meet the federal requirements most likely will yield an enforcement action, which will require compliance and levy penalties typically at three times the cost of initial compliance. Additionally, the loss of credibility with regulatory agencies causes further delay to deliver projects and increases in costs to deliver projects. The current plan funds only 50 percent of the known TMDLs needs and none of the needs for ASBS. Penalties for violating the Federal Water Pollution Control Act can include both fines of up to $50,000 a day for each violation and imprisonment.

Currently Caltrans is facing the following legal challenges:

- Cease and Desist Order No. 2001–198, California Department of Transportation, San Joaquin Hills Transportation Corridor (SR–73), affecting District 12 in Orange County.

- State Water Resources Control Board letter of October 18, 2004, to the California Department of Transportation to cease and desist stormwater discharges into ASBS. An exception was applied to the State Board on May 31, 2006.

- The July 25, 1996, stipulation issued by the U.S. District Court, Central District of California, to Civil Action No. 93–6073 ER(JRx), affecting District 7 in Los Angeles, the largest metropolitan area within California.

- Consent Decree, United States of America vs. California Department of Transportation, Case No. 96–1440–IEG and Case No. 97–0037–IEG, affecting District 11 in San Diego, which is another of the larger metropolitan areas in California.

At the constrained funding level for ADA improvements, Caltrans commits only to the minimum required funding level for the 2010 ADA lawsuit settlement. If funding levels are further reduced for ADA needs, Caltrans will be in violation of the 2010 settlement agreement and will face additional lawsuits and liability.

Mobility Improvements. Need $381 million a year; $68 million a year available.

The mobility improvement programs reduce congestion on the SHS by constructing auxiliary lanes, widening shoulders, and building commercial vehicle enforcement facilities and weigh-in-motion systems. These programs also enhance the existing transportation system by providing traveler information and managing traffic flow through signalization projects, ramp metering, changeable message signs, highway advisory radio, and detection stations.

The following are major consequences of the funding shortfall:

- Increases in the total recurrent and nonrecurrent daily vehicle hours of delay (DVHD) from an estimated 712,300 DVHD in 2009 to an estimated 880,300 DVHD by 2019.
- Requires Caltrans to convince local and regional agencies to fund high-benefit operational improvements on the SHS.
- Delays in construction of weigh-in-motion systems, negatively affecting federal requirement to report annual weigh-in-motion information.
- Closes commercial vehicle enforcement facilities as a result of mold damage, leaking roofs, inoperable heating systems, and failed septic systems, which will adversely affect workplace conditions for California Highway Patrol personnel.

Although only a small percentage of the mobility needs can be funded, other funding opportunities exist for these projects outside the SHOPP. The majority of mobility needs originate in high-density population centers and result from land-use planning decisions. Opportunities include local and measure funding in addition to the State Transportation Improvement Program (STIP). As stated in section 13 of the adopted 2010 STIP Guidelines, these types of projects may be nominated for inclusion in the STIP if timely implementation through the SHOPP is not possible.

Minor Program. Need $150 million a year; $150 million a year available.

The minor program funding is used to respond to critical low-cost SHOPP needs in all areas. The minor program is an annual allocation for projects with construction contract values under $1 million. The minor program most recently has been used for modest investments for underfunded programs, including mobility improvements, pavement preservation, and drainage improvements.

Bridge Preservation. Need $1,186 million a year; $358 million a year available.

The bridge programs preserve 12,559 of the State highway bridges. The available funding in the SHOPP is insufficient to address the deterioration of the bridge inventory caused by structural aging and the effects of increasing traffic or to address seismic and scour vulnerability.

Major consequence of the funding shortfall will result in bridge rehabilitation or replacement needs increase from 1,060 bridges to 1,225 bridges (15 percent) over the ten-year period.

Roadway Preservation. Need $3,318 million a year; $417 million a year available.

The roadway programs preserve the 49,477 lane miles of State highways and 205,000 drainage culverts.

The following are major consequences of the funding shortfall:

- Twenty-six percent (one out of every four lane miles) of pavement on the SHS has deteriorated to the point where it needs to be reconstructed to get it back into acceptable condition.

- Increased cost to the traveling motorist. Motorists pay twice for poor pavement conditions, first for the additional vehicle maintenance and operating costs resulting from driving on pavement in poor condition and a second time for the higher costs to reconstruct highly degraded pavement.

- Increased risk of highway closures caused by culvert collapse.

Roadside Preservation. Need $484 million a year; $15 million a year available.

The roadside programs address worker and motorist safety, environmental commitments, and mandates for approximately 221,000 acres of roadsides, 29,183 acres of highway planting, and 87 safety roadside rest areas. Roadside SHOPP programs were significantly changed in 2003 to focus primarily on worker safety issues. It is not an aesthetics improvement program. Caltrans will not be able to address commitments to roadside safety and stewardship because of the funding shortfall. Between 1972 and 2009, 84 percent of Caltrans employee fatalities involved maintenance employees and 35 percent of maintenance injuries involved roadside tasks.

The following are major consequences of the funding shortfall:

- Delays completion of 3,280 locations needing worker safety improvements, which continues the exposure of highway maintenance workers to traffic in those locations and thereby increases the risk of fatal and injury collisions.

- Increases the number and duration of maintenance tasks on 16,600 acres of highway planting, resulting in increased worker exposure to traffic.

- Increases exposure to regulatory agency compliance fines and third-party lawsuits.
- Increases highway life-cycle and recurring maintenance costs caused by delays in the relinquishment of environmental mitigation sites to resource agencies.
- Delays reduction of fatal and injury collisions caused by drowsy and distracted driving by not adding 5,000 car and long-vehicle parking spaces to the rest area system.
- Increases the potential for roadside fires that may spread to adjacent wildlands and urban areas.
- Reduces Caltrans' ability to implement roadside design strategies to comply with herbicide reduction goals.

Facility Improvements. Need $167 million a year; $7 million a year available.

The facility improvement programs preserve the 444 buildings that support the operations and maintenance of the SHS.

The following are major consequences of the funding shortfall:

- Increases the possibility of litigation and public agency citations for code violations in office buildings, materials laboratories and testing facilities, and equipment shops.
- Increases response times during winter operations because of delayed repairs to salt and sand storage facilities.

III. OTHER REQUIREMENTS

PROCESS IMPROVEMENTS

Caltrans continues to define and implement process improvements to expedite the delivery and enhance the management of projects and programs. Some of these improvements already have been implemented, yielding positive results.

Programming SHOPP Capital Outlay Support. Beginning with the 2008 SHOPP, capital outlay support is a programmed element of each SHOPP project. Capital outlay support is programmed for each phase of the project (environmental, design, right-of-way, and construction). Programming capital outlay support enhances the ability to manage the entire project budget to maximize the anticipated project outcomes.

Reinvestment Opportunities. During recent years, Caltrans directed available SHA resources to fund additional SHOPP projects from future fiscal years whenever possible. These resources were derived primarily from savings as construction contracts were awarded for less than the amount originally programmed. In FY 2007–2008, because of the available savings, 36 projects originally planned for FY 2008–2009 and FY 2009–2010 worth an aggregate $234 million were allocated earlier than programmed.

RELATIONSHIP TO OTHER INITIATIVES

Five-Year Maintenance Plan. Streets and Highways Code section 164.6 also requires Caltrans to prepare a five-year maintenance plan that addresses the maintenance needs of the SHS. Together, the 2011 Ten-Year SHOPP Plan and the 2011 Five-Year Maintenance Plan attempt to balance resources between SHOPP and maintenance activities in order to achieve identified milestones and goals at the lowest possible long-term total cost.

Preventive maintenance is the most cost-effective means of protecting the State's infrastructure investment. As implemented, the Maintenance Plan prevents the deterioration and extends the life of the roadway, bridge, and drainage infrastructure that is in fair or good condition. The average cost for a SHOPP roadway rehabilitation project to treat one lane mile of minor pavement damage is $402,000 while the average cost for preventive maintenance is $67,000 a lane mile. Thus, preventive maintenance results in a cost-benefit ratio of about 6:1. Similarly, the benefit ratio for structures is 12:1 ($720,000 for minor damage rehabilitation versus $60,000 for preventive maintenance), and 5:1 for drainage ($115,000 for minor damage versus $27,000 for preventive maintenance). Preventive costs are a combination of State forces and contract work.

Investing in preventive maintenance while the asset is in good to fair condition avoids future SHOPP costs for rehabilitation. Table 3 summarizes the cost-benefit ratios for preventive maintenance of roadway, structural, and drainage elements of the SHS.

Table 3

COMPARISON OF PREVENTIVE MAINTENANCE VERSUS REHABILITATION COSTS*

	Cost of Rehabilitation	Cost of Preventive Maintenance	Unit of Measure	Cost-Benefit Ratio
Roadway	$402,000	$67,000	Lane mile	6:1
Structural	$720,000	$60,000	Bridge	12:1
Drainage	$115,000	$27,000	Culvert	5:1

* Costs reported above are capital construction costs only.

The annual baseline funding for the 2011 Maintenance Plan is $412.1 million. This level of investment is projected to produce future SHOPP cost avoidance of approximately $3.1 billion: $1.4 billion for pavement, $1.6 billion for bridges, and $115 million for drainage. The 2011 Maintenance Plan implements this recommendation by including $234 million of roadway projects to preserve 2,700 lane miles of pavement annually, $155 million of bridge projects to preserve 689 bridges annually, and $23 million of drainage projects to preserve 174 culverts annually.[6]

The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006. On November 7, 2006, California voters passed Proposition 1B, the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 (Gov Code, § 8879.20 et seq.).

The bond act created the Highway Safety, Rehabilitation, and Preservation Account and made available $500 million for allocation by the California Transportation Commission for the purposes of the SHOPP as described in Government Code section 14526.5. A portfolio of pavement rehabilitation, vehicle detection, and operational improvement projects was selected by Caltrans and presented to the commission in June 2007. The majority of these projects currently are under construction.

Grant Anticipation Revenue Vehicles Bond Financing. Grant Anticipation Revenue Vehicle (GARVEE) bonds are used in the SHOPP to finance large rehabilitation and reconstruction projects that would not be afforded otherwise by the available SHA funding. GARVEE bonds are not new money. These bonds are a financing tool to change the timing of funding to maximize the economic benefit. This technique is advantageous when the benefits of early financing, such as reduced maintenance, reduced user-delay, and reduced construction costs, outweigh the costs of bond administration and debt service. Bond financing of projects today also avoids future construction cost escalation.

[6] "2011 Five-Year Maintenance Plan," California Department of Transportation, January 2011.

By policy and statute, the State may issue GARVEE bonds for up to a maximum of 15 percent of annual federal transportation funds deposited into the SHA in the State Transportation Fund for any consecutive 12-month period within the preceding 24 months. Debt service for GARVEE bonds on SHOPP projects will become a liability for the SHA. The California state treasurer's analyses for 2010 reports a bond financing capacity ranging from a low of $3.52 billion to a high of $3.73 billion.7 Factors affecting the bond financing capacity include maturity structures, interest rates, and receipts from the Federal Highway Trust Fund.

Although bond financing allows significant infrastructure projects to be delivered to construction early, bond debt service limits future flexibility.

The California Transportation Commission approved a portfolio of GARVEE-financed SHOPP projects totaling $1.71 billion in the 2010 SHOPP approved on February 24, 2010.[8]

American Reinvestment and Recovery Act of 2009. In February 2009, President Barack Obama signed the American Reinvestment and Recovery Act of 2009 (ARRA) (P.L. 111–5, February 17, 2009, Stat. 115) that provided funding for transportation infrastructure as a means of stimulating the nation's severe economic decline. This one-time influx of funding provided the ability to fully fund all SHOPP projects planned for delivery in FY 2008–2009.

On March 11, 2009, Caltrans presented and California Transportation Commission approved a portfolio of 57 SHOPP and highway maintenance projects with an estimated construction value of $626 million.[9] All ARRA-funded projects either are currently in or have already completed construction.

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[7] "Analyses of GARVEE Bonding Capacity 2010," State Treasurer Bill Lockyer, April 2010.

[8] "2010 State Highway Operation and Protection Program," California Department of Transportation, February 2010.

[9] Financial Allocation of American Recovery and Reinvestment Act of 2009 (ARRA) Funds, California Transportation Commission, March 11–12, 2009, Agenda Item 78.

IV. CONCLUSION

As the roadways and bridges on the SHS age and near the end of their service lives, the demands of vehicle and truck traffic is accelerating the deterioration of these assets. Compounding this deterioration is the deferment, due to lack of funding, of necessary rehabilitation and restoration work to restore the transportation infrastructure to good operating conditions. The increased demands and deferred rehabilitation and restoration result in lower operational performance, higher user operating costs (additional vehicle repair costs, increased fuel consumption, increased tire wear, and accelerated vehicle depreciation), and ultimately higher overall long-term costs when needed repairs to the highway are eventually undertaken. In addition, the ever-increasing cost of meeting legal, statutory, and regulatory mandates is a significant contributor to the ten-year needs.

The total ten-year goal-constrained need for the rehabilitation and operation of the SHS is $74 billion for the period from FY 2012–2013 through FY 2021–2022. This is the current cost estimate for capital construction, right-of-way acquisition, and project development and construction engineering support. This estimate does not include expected future increases in construction costs caused by escalation.

Projected SHA funding available for the SHOPP is $1.8 billion a year, which is 24 percent of the estimated need. Because funding is insufficient to preserve and maintain the existing State transportation infrastructure, Caltrans will focus available resources on the most critical categories of projects in the SHOPP (safety, bridge, and pavement preservation). Even with this focus, the SHS will continue to deteriorate. For example, distressed pavement will grow from 26 percent to 40 percent of the SHS during the next ten years. In addition, few new improvements to office facilities, repairs to safety roadside rest areas, and mobility improvements will be made.

In the absence of new revenue sources, the condition of the transportation system will continue to deteriorate, affecting Caltrans' ability to improve mobility across California.

APPENDIX A

GOVERNMENT CODE SECTION 14526.5

14526.5 (a) The department shall prepare a state highway operation and protection program for the expenditure of transportation funds for major capital improvements that are necessary to preserve and protect the state highway system. Projects included in the program shall be limited to capital improvements relative to maintenance, safety, and rehabilitation of state highways and bridges which do not add a new traffic lane to the system.

(b) The program shall include projects which are expected to be advertised prior to July 1 of the year following submission of the program, but which have not yet been funded. The program shall include those projects for which construction is to begin within four fiscal years, starting July 1 of the year following the year the program is submitted.

(c) The program shall be submitted to the commission not later than January 31 of each even-numbered year. Prior to submitting the plan, the department shall make a draft of its proposed program available to transportation planning agencies for review and comment and shall include the comments in its submittal to the commission.

(d) The commission may review the program relative to its overall adequacy, level of annual funding needed to implement the program, and the impact of those expenditures on the state transportation improvement program. The commission shall approve and submit the program to the Legislature and the Governor not later than April 1 of each even-numbered year.

(e) Expenditures for these projects shall not be subject to Sections 188 and 188.8 of the Streets and Highways Code.

APPENDIX B

STREETS AND HIGHWAYS CODE SECTION 164.6

164.6.(a) The department shall prepare a 10-year state rehabilitation plan for the rehabilitation and reconstruction, or the combination thereof, by the State Highway Operation and Protection Program, of all state highways and bridges owned by the state. The plan shall identify all rehabilitation needs for the 10-year period beginning on July 1, 1998, and ending on June 30, 2008, and shall include a schedule of improvements to complete all needed rehabilitation during the life of the plan not later than June 30, 2008. The plan shall be updated every two years beginning in 2000. The plan shall include specific milestones and quantifiable accomplishments, such as miles of highways to be repaved and number of bridges to be retrofitted. The plan shall contain strategies to control cost and improve the efficiency of the program, and include a cost estimate for at least the first five years of the program.

(b) The department shall prepare a five-year maintenance plan that addresses the maintenance needs of the state highway system. The plan shall be updated every two years, concurrent with the rehabilitation plan described in subdivision (a). The maintenance plan shall include only maintenance activities that, if the activities were not performed, could result in increased State Highway Operation and Protection Program costs in the future. These activities may include roadway, structural, and drainage maintenance. The maintenance plan shall identify any existing backlog in these maintenance activities and shall recommend a strategy, specific activities, and an associated funding level to reduce or prevent any backlog during the plan's five-year period. The maintenance plan shall include specific goals and quantifiable accomplishments, such as lane-miles of highway to be repaved and the number of bridge decks to be sealed. The maintenance plan shall contain strategies to control cost and improve the efficiency of these maintenance activities, and include a cost estimate for the five years of the plan.

(c) The rehabilitation plan and the maintenance plan shall attempt to balance resources between State Highway Operation and Protection Program activities and maintenance activities in order to achieve identified milestones and goals at the lowest possible long-term total cost. If the maintenance plan recommends increases in maintenance spending, it shall identify projected future State Highway Operation and Protection Program costs that would be avoided by increasing maintenance spending. The department's maintenance division shall develop a budget model that allows it to achieve the requirements of this subdivision.

(d) The rehabilitation plan shall be submitted to the commission for review and comments not later than January 31 of each odd-numbered year, and shall be transmitted to the Governor and the Legislature not later than May 1 of each odd-numbered year. The maintenance plan shall be transmitted to the Governor, the Legislature, and the commission not later than January 31 of each odd-numbered year.

(e) The rehabilitation plan and the maintenance plan shall be the basis for the department's budget request and for the adoption of fund estimates pursuant to Section 163.

APPENDIX C

DESCRIPTION OF THE ELEMENTS IN EACH SHOPP CATEGORY

MAJOR DAMAGE RESTORATION CATEGORY

The major damage restoration category has three elements: emergency opening, permanent restoration, and roadway protective betterments.

Emergency Opening. The primary purpose of this element is to reopen facilities damaged by and protect facilities imminently threatened by natural disasters, catastrophes, or events, such as storms, floods, fires, earthquakes, tsunamis (tidal waves), or volcanic action. Responses to human-caused disasters, such as large-scale civil unrest, explosions, and acts of war or terrorism, are also included.

Typical improvements include:

- Emergency road openings to temporary or permanent levels of traffic.
- Debris removal and demolition.
- Construction or operation of detours.
- Earthwork, blasting, or replacement of rock to protect facilities from additional damage or to remove an imminent threat.
- Repair or replacement of drainage facilities needed to forestall immediate threat of additional washout or erosion and replacement of traffic safety devices (guardrails, signals, etc.) lost as a result of catastrophic damage.

It is expected that emergency opening projects will restore the roadway to essential traffic within 180 days of the damage incident.

Typically, emergency opening projects are allocated under Commission Resolution G–00–11, authorizing Caltrans to allocate funds for emergency projects.

Permanent Restoration. The primary purpose of this element is to restore facilities to their predamage condition after the emergency opening phase is complete. To be considered as permanent restoration, the project must be tied to an identifiable event.

Typical improvements include:

- Final grading and earthwork.
- Full restoration of roadway and all appurtenances to predamage condition.
- Construction of permanent geotechnical, structural, and drainage fixtures.
- New alignments when the existing damaged alignment is no longer feasible.

It is expected permanent restoration projects will achieve construction completion within three years of the damaging incident.

Roadway Protective Betterments. The primary purpose of this element is to protect facilities from anticipated future catastrophic damage from natural events (storms, floods, landslides, etc.) or human-caused events.

Typical improvements include:

- Rock slope protection.
- Rock fall prevention (rock nets, etc.).
- Stabilization trenches.
- Slope corrections.
- Pumps and pumping stations at depressed sections.
- Retaining walls and soil nailing.
- Security improvements (capital improvements only).

COLLISION REDUCTION CATEGORY

The collision reduction category has three elements: safety improvements, collision severity reduction, and roadside safety improvements.

Safety Improvements. The primary purpose of this element is to reduce the number or severity of collisions on the existing SHS. Project identification is based on the calculation of a Safety Index (SI).

Projects may be spot locations where collision history indicates a pattern susceptible to correction by a safety improvement.

Typical improvements include:

- Traffic signals (school zone signals included).
- Wet pavement corrections.
- Curve corrections.
- Shoulder widening.
- Left turn channelization.

This element also includes projects that meet the warrant for study program criteria and, following an analysis, that have been determined to improve safety by the installation of median barrier, soft barrier, or other safety improvement to address cross-median- or crossover-type collisions.

Collision Severity Reduction. The primary purpose of this element is to upgrade existing highway safety features within the clear recovery area of the roadbed that will lead to reduced collisions and severity of collisions.

Typical improvements include:

- Installation of new guardrail end treatments and crash cushions.
- Installation of rumble strips, glare screen, rock fall mitigation, and overcrossing pedestrian fencing.
- Clean Up the Roadside Environment (CURE) projects. CURE project goals are to remove, relocate, make breakaway, or shield objects within the clear recovery zone.

The intent of this element is the proactive in enhancement of safety on the SHS. As such, this element is not subject to an SI analysis. Projects are prioritized based on the projected collision severity reduction benefits.

Roadside Safety Improvements. The primary purpose of this element is to reduce the frequency and duration of highway workers' exposure to traffic by providing features to reduce recurrent maintenance activities and safe access.

Typical improvements include:

- Relocating and clustering existing facilities to safe work locations.
- Minor pavement for areas beyond the gore, slopes adjacent to bridge structures, low-visibility areas, road edge, and narrow areas.
- Vegetation control treatment under guardrail.
- Inert materials for slopes and low-visibility areas.
- Access gates, staircases, trails for light-duty vehicles, and maintenance vehicle pullouts.

LEGAL AND REGULATORY MANDATES CATEGORY

The legal and regulatory mandates category has four elements: relinquishments, stormwater mitigation, ADA curb ramps, and ADA pedestrian infrastructure.

Relinquishments. The primary purpose of this element is to provide funding for Legislative relinquishments of State highways to local agencies, relinquishments considered to be in the best interest of the State.

Stormwater Mitigation. The primary purpose of this element is to ensure that Caltrans' stormwater discharges to California and federal waters meet applicable water quality standards, construct stormwater mitigation projects that arise from judicial and regulatory orders, and implement improvements that comply with Caltrans' National Pollution Discharge Elimination System permits.

ADA Curb Ramps. The primary purpose of this element is to construct curb ramps at existing crosswalks and other defined pedestrian pathways to make the path of travel accessible. It should be noted that Caltrans' actions to upgrade facilities consistent with ADA regulations are not limited to this funding category. Compliance with ADA regulations is incorporated into Caltrans' design standards.

ADA Pedestrian Infrastructure. The primary purpose of this element is to provide improvements to existing pedestrian infrastructure to make the path of travel accessible and comply with ADA regulations on all Caltrans-owned highways. Pedestrian infrastructure includes sidewalks, crosswalks, pedestrian bridges and tunnels, and pedestrian/traffic signals that facilitate the movement of pedestrians. This infrastructure also includes pedestrian pathways to Caltrans-owned facilities, such as vista points and park-and-ride lots.

MOBILITY IMPROVEMENT CATEGORY

The mobility improvement category has three elements: operational improvements, transportation management systems, and commercial vehicle enforcement facilities and weigh-in-motion systems.

Operational Improvements. The primary purpose of this element is to improve traffic flow on existing State highways by reducing congestion and operational deficiencies at spot locations. As stated in section 13 of the adopted 2006 State Transportation Improvement Program (STIP) Guidelines, State highway operational improvements that do not expand the design capacity of the transportation system and are intended to address spot congestion are eligible for the SHOPP.

Typical improvements include:

- Interchange modifications (but not to accommodate traffic volumes that are significantly larger than for what the existing facilities were designed).
- Ramp modifications (acceleration-deceleration/weaving).
- Auxiliary lanes for merging or weaving between adjacent interchanges.
- Curve corrections and alignment improvement.
- Signals and intersection improvements.
- Two-way left-turn lanes.
- Channelization.
- Turnouts.
- Shoulder widening.

Transportation Management Systems. The primary purpose of this element is to improve traffic flow on existing State highways by addressing system-wide nonrecurrent congestion through system management techniques.

Transportation management systems facilitate the real-time management of the SHS by providing vehicle collision and incident detection, verification, response, and clearance. These systems provide SHS status information to travelers.

Typical improvements include:

- Traffic sensors.
- Changeable message signs.
- Closed-circuit television cameras.
- Ramp meters.
- Communications systems and highway advisory radio.
- Traffic signal interconnect projects.
- Traffic Management Centers, including necessary computer software and hardware.

Commercial Vehicle Enforcement Facilities and Weigh-in-Motion Systems. The primary purpose of this element is to provide for commercial vehicle enforcement facilities (commonly called weigh stations) and weigh-in-motion systems.

The weigh stations are needed to support the Commercial Vehicle Enforcement Plan. Truck safety, size, and weight regulations are enforced by the California Highway Patrol, reducing truck-related collisions or incidents and protecting State highways from premature damage.

The weigh-in-motion systems provide data for federally required data systems and special studies, design and maintenance strategies, size and weight policies, enforcement and planning strategies, and traffic and truck volume publications.

BRIDGE PRESERVATION CATEGORY

The bridge preservation category has six elements: bridge rehabilitation, bridge preventive program, bridge scour mitigation, bridge rail replacement and upgrade, bridge seismic restoration, and transportation permit requirements for bridges.

Bridge Rehabilitation. The primary purpose of this element is to restore or replace structures when, due to deterioration or other causes, they become inadequate. Emphasis is placed on bridges with the most urgent needs and the highest cost-benefit ratios.

Included is work to meet standards as required under ADA and Cal/OSHA regulations and work required to restore or replace appurtenances attached to structures for use in maintenance, such as inspection walkways, movable scaffolds, and air and water service lines.

Major transportation structures include bridges, tunnels, tubes, drainage pumping plants, marine fenders, ferryboats, and the mechanical and electrical machinery associated therewith.

It is recognized that when bridges are replaced or rehabilitated it is sometimes appropriate to make some geometric and structural improvements. Therefore, approved improvements may be considered as part of a restoration or replacement project, but the original need for the project must have been to restore or replace structures.

Bridge Preventive Program. The primary purpose of this program is to perform timely actions to delay major rehabilitation of structures. Projects funded by this program may include deck treatments, deck joints and seal repair/replacement, painting, and other preventive work.

This program is authorized under the 2007 Five-Year Maintenance Plan as an annual reservation under the 2008 SHOPP beginning July 1, 2008.

Bridge Scour Mitigation. The primary purpose of this element is to mitigate or replace bridges that are vulnerable to collapse from erosion of channel or streambeds beneath bridge foundations.

This element may also include any monitoring projects that are necessary to collect data that will show when the bridge becomes scour critical and requires further action.

Bridge Rail Replacement and Upgrade. The primary purpose of this element is to bring all noncrashworthy bridge rails up to current federal standards.

Bridge Seismic Restoration. The primary purpose of this element is to repair seismic deficiencies of existing bridges not identified in the Seismic Retrofit Phase I Program and bridges where site conditions have changed since the retrofit program.

Transportation Permit Requirements for Bridges. The primary purpose of this element is to upgrade low and weak bridges to allow safe and efficient movement of oversized or overweight vehicles and loads on major State highways.

ROADWAY PRESERVATION CATEGORY

The roadway preservation category has four elements: roadway rehabilitation, pavement rehabilitation, long-life pavement rehabilitation, and drainage system restoration.

The historic goal of Caltrans has been to reduce the number of distressed lane miles of pavement to 5,000, or approximately 10 percent of the total system.

Roadway Rehabilitation. The primary purpose of this element is to rehabilitate roadways that ride rougher than established maximums or exhibit substantial structural problems. Work incidental to pavement rehabilitation or replacement of other highway appurtenances that are failing, worn out, or functionally obsolete, such as drainage facilities, retaining walls, lighting, signal controllers, and fencing, may be included.

A roadway or appurtenance that is rehabilitated under this task should normally provide ten years or more of service life with relatively low maintenance expenditures. Rehabilitation, with its provision of extending the service life of the facility, is distinct from maintenance, which simply repairs or preserves the facility in a safe and usable condition.

Roadway rehabilitation projects must qualify for rehabilitation on the basis of existing Pavement Management System criteria.

Pavement Rehabilitation. The primary purpose of this element is to provide corrective maintenance for pavement under Capital Preventive Maintenance guidelines. This task may be used to correct pavement distress as an intermediate fix until the full roadway rehabilitation project may be delivered. The expected life of a Capital Preventive Maintenance project is five to seven years.

Pavement rehabilitation projects must qualify on the basis of existing Pavement Management System guidelines. Traffic safety and other operational improvements will not be added to pavement preservation work. Other work (geometric corrections, widening, etc.) is typically not added to a pavement rehabilitation project.

Long-Life Pavement Rehabilitation. The primary purpose of this element is to implement long-life pavement rehabilitation corridors on roadways where the average daily traffic is greater than 150,000 vehicles and the average daily truck traffic is greater than 50,000 vehicles.

Long-life pavement rehabilitation extends the pavement service life to at least twice the conventional rehabilitation project life. Other roadway improvements, such as signing and lighting upgrades, traffic safety, and operational improvements, may be added to this work if justified by vehicle collision statistics or required by federal standards to qualify the project for federal funding. The expected life of a long-life pavement is 20 to 40 years.

Drainage System Restoration. The primary purpose of this element is to provide for the replacement or in-place rehabilitation of culverts and highway drainage systems that have lost serviceability because of age, wear, or degradation. Upgrades or modifications of culverts and highway drainage systems to increase flow or improve drainage alignment are included. Projects to abandon culverts are also included.

ROADSIDE PRESERVATION CATEGORY

The roadside preservation category has four elements: roadside protection and restoration, highway planting rehabilitation, safety roadside rest area rehabilitation, and new safety roadside rest areas.

Roadside Protection and Restoration. The primary purpose of this element is to comply with mandates, reduce highway facility life-cycle costs, and improve worker safety.

Typical improvements include:

- Fish and wildlife preservation and protection.
- Experimental or new features, treatments, and practices.
- Historical markers and information systems, such as logo signs.
- Elimination of qualifying junkyards.
- Nonconforming outdoor advertising sign removal.
- Roadside ecological viewing areas.
- Scenic enhancements.

- Compliance with Surface Mining and Reclamation Act of 1975 (Pub. Resources Code, § 2710 et seq.) regulations.
- Rehabilitation of vista points.
- Relinquishment of environmental mitigation sites.

Highway Planting Rehabilitation. The primary purpose of this element is to provide for replacement, restoration, and rehabilitation of existing highway plantings to an economically maintainable state following damage by weather, acts of nature, or deterioration.

This element also provides for erosion control to comply with Caltrans' National Pollution Discharge Elimination System permit requirements, design of safety features for worker safety, and improvements for roadside appearance and coordination with community character.

Safety Roadside Rest Area Rehabilitation. The primary purpose of this element is to correct deficiencies and restore existing safety roadside rest areas to a safe and healthy condition.

Typical improvements include:

- Operational improvements.
- Capacity expansion (parking and comfort stations).
- Existing comfort station or other structural element rehabilitation or replacement.
- Facility upgrades to comply with health and safety codes and ADA and Cal/OSHA regulations.
- Maintenance facilities, crew rooms, and office space for California Highway Patrol personnel.
- Sewage system, water supply, and electrical system upgrades.
- Ramp upgrades to current design standards.
- Relocation of existing safety roadside rest areas.
- Auxiliary facility construction where expansion and upgrading an existing site is not feasible.

New Safety Roadside Rest Areas. The primary purpose of this element is to provide for new, conveniently spaced safety roadside rest areas as an integral part of the SHS where the traveler may stop, rest, relax, obtain travel information, and return to the highway more alert and driving safely.

Partnerships and joint development of safety roadside rest areas with the private sector or public agencies are included.

All land, structures, landscaping, utilities, and other facilities, such as restrooms, office and storage space, tables, drinking fountains, telephones, motorist information, and trash receptacles, are included.

FACILITY IMPROVEMENT CATEGORY

The goal of the facility improvement category is to address worker safety, comply with ADA and Cal/OSHA regulations, and improve operational efficiency. The facility improvement category has four elements: equipment facilities, maintenance facilities, office buildings, and materials laboratories and testing facilities.

Equipment Facilities. The primary purpose of this element is to provide facilities needed for the support of the Division of Equipment's operations.

Typical improvements include:

- Resident mechanic facilities in maintenance stations, whether stand-alone or contiguous to a maintenance structure district shop's subshops.
- Headquarters shop.
- Equipment storage areas.

At maintenance stations and district facilities, mechanics repair and maintain Caltrans' fleet of equipment, such as trucks, pickups, loaders, and snowplows.

At the Headquarters location, in addition to repairs, the facility is primarily devoted to the fabrication of new replacement equipment for the fleet.

Maintenance Facilities. The primary purpose of this element is to provide facilities needed for the support of the Division of Maintenance's operations.

Typical improvements include:

- Rehabilitation of existing maintenance stations and construction of new ones.
- Installation of new fuel tanks and replacement of existing fuel tanks as part of a larger rehabilitation contract.

Office Buildings. The primary purpose of this element is to provide facilities needed for the support of State transportation activities, including all district and Headquarters office buildings.

Materials Laboratories and Testing Facilities. The primary purpose of this element is to provide facilities needed to conduct specialized laboratory, field-testing, and inspection services for all phases of transportation engineering work involving materials and manufactured products.

APPENDIX D

EXAMPLE PHOTOGRAPHS

EMERGENCY RESPONSE

Heavy rainfall in January 2010 caused extensive damage to highways throughout California. A large landslide damaged State Route 96 near Eureka.

The Station Fire ravaged the Los Angeles County landscape late summer 2009, causing damage along State Route 2. The area took a second hit from storms in January 2010.

COLLISION REDUCTION

This picture shows a location in need of metal beam guardrail, which reduces the number and severity of run-off-road-type collisions.

This is an example of an older and obsolete crash cushion on a State highway. It does not meet current crash-test guidelines and needs to be upgraded to a State-approved crash cushion to ensure proper performance in the event of a collision.

LEGAL AND REGULATORY MANDATES

Slopes along this section of highway have repeatedly eroded, resulting in sediment deposits in the Tuolumne River, affecting the quality of State waters. Although maintenance forces have attempted to repair and stabilize the slopes, erosion continues with significant rainfall. Stormwater mitigation projects are needed to reduce maintenance efforts and ensure compliance with the National Pollutant Discharge Elimination System permit.

This photograph demonstrates the condition of pedestrian walkway facilities along a State highway. This not only is a problem for pedestrians in general but also is a barrier for those pedestrians with accessibility limitations.

MOBILITY IMPROVEMENTS

These are two bottleneck locations on Interstate 405 in Irvine. The platoon of vehicles merging onto the freeway is causing bottlenecks, which in turn cause delay on the mainline. The cumulative effect of multiple bottlenecks along a freeway segment can cause considerable delay in the corridor. Similar effects are being experienced in several freeway corridors across the State.

Commercial Vehicle Inspection

Weigh stations help the California Highway Patrol efficiently conduct commercial vehicle inspections and weight enforcement to reduce pavement damage and enhance traffic safety. The pavement at this weigh station located on Interstate 5 near Santa Nella is in a severe state of disrepair. Similar conditions can be found at other weigh stations.

The sign at this weigh station located on Interstate 5 near Castaic has deteriorated and is in need of replacement.

BRIDGE PRESERVATION

A seven-foot-long hole opened up in the concrete deck of the bridge on Interstate 5 in San Diego County at the Oceanside Boulevard structure in February 2009.

The concrete in the Temple Street overcrossing structure has become severely deteriorated, leading to corrosion of the underlying reinforcing steel.

ROADWAY PRESERVATION

This is an example of severe corner cracking of Portland cement concrete pavement caused by loss of base support, heavy loading, and severe pumping. Maintenance forces have patched the failed pavement to keep the lane in service.

This is an example of severe fatigue cracking, also known as alligator cracking, on hot-mix asphalt concrete pavement. Maintenance forces have sealed the cracks to extend the service life of the pavement.

ROADSIDE PRESERVATION

Worker Safety

These photographs demonstrate the current condition of many roadside areas adjacent to ramp gores. Paving these areas will eliminate the need for maintenance workers to be on foot to control weeds and pick up trash and debris. Paving with a contrasting material improves driver safety by visually noting that these areas are not traffic lanes. Eliminating or relocating signage in these areas contributes to reducing worker exposure to traffic.

Highway Planting Rehabilitation

Deteriorated landscapes increase the risk of erosion and roadside fires spreading to urban areas. Exposed soundwalls require regular graffiti removal, and weed-covered slopes require vegetation management to minimize the threat of fire, both requiring maintenance workers to be exposed to traffic.

Safety Roadside Rest Areas

These photographs indicate the result of inadequate truck parking spaces at safety roadside rest areas. Parking lots are full beyond capacity, forcing truck drivers to park along ramp and mainline shoulders, causing safety concerns. Inadequate stopping opportunities result in human waste and other biohazards dumped along the roadside. Increased incidences of closure, caused by drinking and sewage water quality being out of compliance with water quality mandates, exacerbate the problem.

FACILITY IMPROVEMENTS

Maintenance facilities throughout the State are outdated and in need of modernization.