REPORT CARD FOR LOS ANGELES COUNTY INFRASTRUCTURE

2012

A Citizen's Guide

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ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

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Message from the Committee Chair

It is with great pride that I present the 2012 American Society of Civil Engineers Infrastructure Report Card. For the past years the Metropolitan

Los Angeles Branch has been developing the 2012 Report Card for Los Angles County's Infrastructure. The ASCE Report Card represents one of the most visible and usable contributions our organization offers to the general public and elected policy makers at all levels of governance. This year's effort is no different than the past and comes with a renewed sense of urgency given the dire economic conditions that face our region and the continued need for maintenance and upgrading of the critical infrastructure our community relies upon to live and work on a daily basis.

Over 50 individuals representing public and private sectors have spent countless hours carefully reviewing and assessing the condition of ten different infrastructure categories, including bridges, dams, flood control, drinking water, ports, solid waste, streets & highways, transit, urban run-off and wastewater systems. Grades for these ten categories range from B+ to D- with a cumulative average grade of C. Estimates of annual investments needed to maintain and appropriately expand our infrastructure are in the tens of billions of dollars.

Best Wishes,

Andy Duong

Andy Duong, P.E., M. ASCE
Chair, 2012 ASCE Los Angeles County Infrastructure Report Card Committee
Past-President, ASCE, Metropolitan Los Angeles Branch

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What is Infrastructure?

infrastructure [in-fruh-struhk-cher] – noun: *the fundamental facilities and systems serving a country, city, or area, as transportation and communication systems, power plants, and schools.*

Infrastructure refers to the fundamental systems that support our community civilization. It encompasses all the basic, underlying facilities we rely on to conduct our daily business, raise our families and pursue our dreams. It includes the roadway network that allows you to drive to work and the grocery store, the underground pipes that bring fresh water to your kitchen and take waste water away from your bathroom. It includes the hydroelectric dam that generates electricity, reservoirs and pumps that provide drinkable water, and sewage treatment plants that treat wastewater.

Our economy depends on infrastructure to provide power for factories to transport goods and services, and via telecomm cables to transmit information to banks and customers. Our health depends on having clean, potable water to drink and underground pipes to take human and industrial waste away to be treated and safely disposed. Lastly, our safety depends on infrastructure to withstand storms and natural events, keeping our homes safe from flooding and other damage.

Why Should You Be Interested in Infrastructure?

All of these infrastructure systems need to be built, maintained and upgraded on a continuous basis for our community to thrive. Infrastructure system failures can cause disruptions to our daily lives, trigger slow-downs in economic activity, or even be the cause of injury and death. For example, a bridge failure on a major highway could cause widespread traffic jams, disrupt access to hospitals, and result in fatal injury during its collapse.

We need to take care of our cities, by maintaining our roads, upgrading storm water and sewer systems to meet growing populations, and having regularly evaluated and maintained systems. These investments result in long term savings and positive growth, benefiting our present community for generations to come.

What is This Report Card?

This report card is an assessment of the existing condition of infrastructure in Los Angeles County.

Infrastructure is designed and maintained by engineers. Our community relies on these systems to function and to make our daily lives better.

This report card gauges Los Angeles' infrastructure status as of 2012. It compiles the work of over 50 individuals representing public and private sectors who have spent countless hours carefully reviewing and assessing the condition of ten different infrastructure categories. This assessment included review of reports on existing physical conditions, as well as review of public agency plans and attendance to meetings and workgroups. The result of this team effort is presented in this document for each infrastructure category.

ASCE's Mission : *Provide essential value to our members and partners, advance civil engineering, and serve the public good.*

In addition to a written evaluation, a letter grade has been determined for each category. **Grades for these ten categories range from B+ to D- with a cumulative average grade of C**. A complete discussion of each infrastructure category and its grade is found in the body of this report.

Why Didn't Los Angeles Earn Any A's?

While we can all agree that these systems are critical to our city, we do not agree on the cost to invest in them. These systems serve millions of people. They are large and they are complex. Maintaining our roadways in peak condition, upgrading our bridges, and replacing an aging sewer system will cost a lot of money. Infrastructure costs are usually paid for by tax revenues and fees. These revenue sources do not keep pace with the upgrading and maintenance expenses these systems require. To compound matters, the recession of 2008-2009 drained many public coffers and caused substantial reductions in tax revenues. In short, our infrastructure was already in great need of attention and the recent economic crisis escalated the problem. Due to these factors, it is impossible for infrastructure to be at high level. As a result, these systems receive an average grade of C showing an increase in investment is required.

How Much Does it Cost?

Estimates of annual investments needed to maintain and appropriately expand our infrastructure are in the tens of billions of dollars. There are many sources of investments. User fees, issuance of public bond measures, property and development taxes are not common. These decisions must be made by politicians and policy makers with public support. Infrastructure issues impacts all of us, regardless of political affiliation, level of education or socio-economic status. This Report Card can be utilized by politicians and policy makers to make informed choices and used by the public to advocate for investment in the critical infrastructure that keeps our county thriving.

How Can You Help?

Call your local city council or county commissioners. Ask for continuous and timely maintenance of these systems. Join a local planning commissions or boards. Inform your friends, family and neighbors. Help them understand the far-reaching implications of infrastructure. As you learn more about these facilities, think long-term. These systems are large in scale and require long- term solutions.

There are also things you can do in your daily life. Reduce your water usage to ease demands on our water systems. Take mass transit to reduce your impact on transportation systems. Make an effort to recycle and reduce the demands on our solid waste systems.

Report Card Summary

Bridges: C

There are 3,552 bridges in Los Angeles County. Each bridge is inspected every few years. In accordance with National Bridge Inspection Standards, each bridge received an evaluation and a letter grade; 1,581 received a grade of C or lower, indicating over 44% of study area bridges are structurally deficient or functionally obsolete. Bringing all Los Angeles County bridges out of these substandard conditions, by upgrades or replacements, is estimated to cost $11.9 billion. Recommendations include support of increased funding for the Federal Highway Bridge Program and continued funding for the Bridge Preventative Maintenance Program.

Dams: B-

Los Angeles County has 95 dams, which were evaluated with respect to facility condition, capacity to meet demands and facility age versus useful life. All dams were given a letter grade with respect to these factors and an overall grade of B- was assigned. Many of these dams are over 50 years old and nearing the end of their useful lives, and many require substantial maintenance, rehabilitation or major upgrades in the coming years. Costs for this work are estimated to exceed $200 million. Recommendations include supporting additional State and Federal funding for required seismic rehabilitation and upgrades to major dams in Los Angeles County to restore or increase their flood control and water conservation capabilities and funding to keep the County's dams in good operating condition.

Drinking Water: C

Many separate water systems, from relatively small to very large, serve the 10 million residents within Los Angeles County. These various systems were evaluated and then graded with respect to three major factors: condition (C-), capacity (B) and operations (B-). While capacity and operations both received B grades, the condition of the systems received a C-, primarily due to the age of many of these systems and their need for replacement in the near future. Recommendations include replacement or rehabilitation of deteriorated systems, identification and implementation of measures to improve water system reliability, implementation of additional water conservation measures, increased use of recycled water, and increases in public and private investment in water supply and distribution systems.

Flood Control: B+

The Los Angeles County Flood Control District (LACFCD) and the cities within Los Angeles County have constructed a comprehensive and effective flood control system to protect citizens and property from flood damage. Since age is the primary factor determining condition and effectiveness of flood control systems, the age of the systems provided the baseline for grading, with newer systems getting a higher grade. The overall grade was determined to be a B+. It was estimated that an annual investment of $48 million is needed to keep Los Angeles County's flood control systems operating in good condition. Recommendations included support for funding to keep these systems in good condition and to expand the view of flood control to include improving water quality and reducing pollution.

Ports: B

The Port of Long Beach and Port of Los Angeles represent the fifth busiest shipping terminal complex in the world. An infrastructure assessment of the entire Harbor District consisted of evaluating eight different components of the Ports' infrastructure, including wharves, railroads, roadways, utilities, channels and berths, container terminals, other marine terminals, and gantry cranes. The overall grade for the San Pedro Bay Ports based on an equal input of each of the eight components is B. The Ports are looking to continue major improvements with a projected total investment of $3.5 billion over the next five years.

Solid Waste: B+

In 2011, the County disposed of an average of 28,000 tons of solid waste per day and in 2009, jurisdictions countywide collectively achieved a recycling/reuse diversion rate of 55%. The economy, recycling and conversion technologies have resulted in steady declines in solid waste disposal since 2006. However, challenges do remain. Diminishing in-County landfill capacities, increasing disposal demands over the long term due to economic and population growth, and public opposition towards establishing new facilities. The overall grade for Solid Waste Management is B+. It is estimated that over $450 million per year for the next five years is needed to operate and maintain the solid waste management infrastructure.

Streets & Highways: C-

The assessment of Los Angeles County streets and highways consisted of evaluations of pavement condition and traffic congestion. Pavement condition was evaluated on pavement segment ratings for 2.65 billion square feet of street and highway pavement, and a final grade of C+ was derived. Traffic congestion was scored according to freeway and arterial level-of-service, a measure of actual traffic volume with respect to roadway capacity, and a final grade of D was derived. The final grade is based on a 50%-50% split, resulting in a grade of C-. Over $3 billion of investments are needed in the next five years to address just pavement condition alone, and billions more to relieve traffic congestion and address constantly increasing traffic demands.

Transit: C

Over 536 million fixed route transit trips are taken each year with 72% of the trips provided by Metro, 26% of the trips are provided by municipal operators, and 2% of the trips are local provided by the local cities' fixed route services. While transit services have made improvements of the past few years, and both facilities and operations received high marks, funding for continued service is facing the effects of the economic crisis that will likely result in service cuts, fare increases, and erosion of current levels of service. Thus the transit final grade is a C. The Metro 2009 Long Range Plan estimates that over $18 billion is required to fund regional Metro and Municipal Transit improvement priorities annually, and recommendations include support for expanding transit funding at all levels of governance.

Urban Runoff: D

Most water pollution comes from the untreated water that flows off rooftops, pavement, streets and parking lots directly into our waterways, bays and beaches. Runoff contains numerous pollutants, including industrial solvents, paints, infectious bacteria, oxygen-choking pesticides and fertilizers, motor oil, trash and even toxic heavy metals such as lead, mercury, chromium and arsenic. Four pollutants are used as indicators for water quality: nutrients, bacteria, metals, and trash. The criteria for assessing water quality is based on: 1) results of water quality improvements relative to water quality standards, and 2) implementation of water quality improvement efforts. The composite Los Angeles County Watershed Grade is D. There is debate on the exact amount needed to achieve water quality compliance; estimates range widely from $4 billion to $17 billion for the next 5 years.

Wastewater: B+

The existing Wastewater Collection and Treatment System is comprised of three main components: the gravity flow collection system (primary and secondary sewers), sewage pump stations, and wastewater treatment plants (both large and small). The sewer collection system has a combined overall condition rating of B. The pump stations have a combined overall condition rating of B. The combined condition rating for wastewater treatment plants is a B+. Thus the overall grade for the wastewater system is a B. The estimated five-year operation and maintenance budget for the wastewater system is $1.9 billion. Necessary capital improvement costs over the next five years are estimated to be $2.8 billion.

BRIDGES C

2005 C

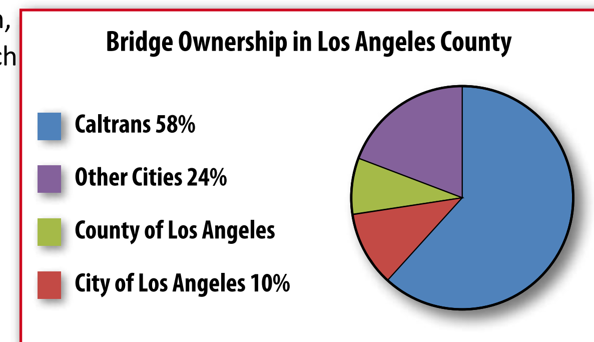
2002 C

There are 3,552 bridges in Los Angeles County. These include bridges owned and/or maintained by Caltrans, City of Los Angeles, County of Los Angeles and 72 other cities. Caltrans has 2,086 bridges; City of Los Angeles has 345 bridges; County of Los Angeles has 285; other cities have 812; Department of Water Resources has 11 bridges; and Los Angeles World Airports has 13 bridges. Pedestrian and Railroad bridges were not included in this report.

Assessment of Existing Bridges

The condition of bridges within Los Angeles County was determined by inspections and ratings according to the National Bridge Inspection Standards established by the Federal Highway Administration (FHWA). Federal regulations require bridges meeting these standards be inspected every two years.

Federal funds for bridge improvements are available based on the Sufficiency Rating (SR). The SR is an overall condition score that combines a number of factors including condition, traffic, and geometry which ranges from 0 to 100. A score of 100 is considered the best. The SR score for each bridge was matched to a letter grade and were averaged to obtain a cumulative score for all bridges. Railroad and pedestrian bridges are not included in this report because they are not eligible for federal bridge improvement funds and do not receive SR ratings.



Other items required for Highway Bridge Program (HBP) funding eligibility by FHWA are the Structurally Deficient (SD) and Functionally Obsolete (FO) designations. A bridge is rated SD when a major structural component of the bridge (i.e. deck, superstructure, or substructure) is in poor or worse condition. An FO rating is usually a result of an older bridge design which no longer meets current standards. These bridges are not necessarily unsafe, but may not accommodate current traffic volumes or meet current geometric design and weight standards. The SD and FO designations were used to help estimate the type and cost of improvements needed.

Final Grade

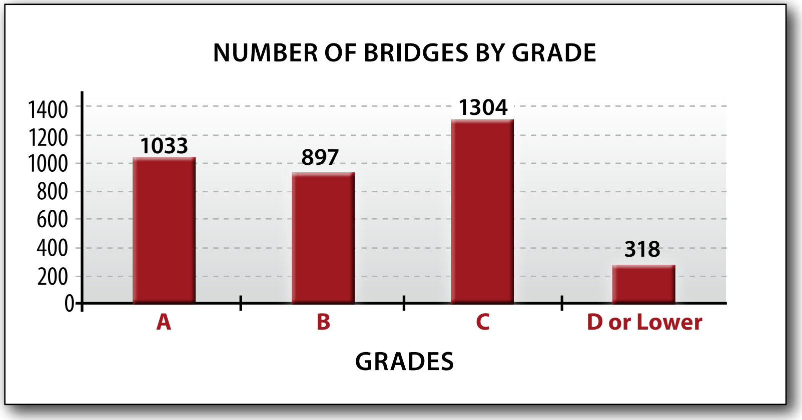
Based on the condition data available, our bridges rate a C.

Investment Needs

After the collapse of the I-35W Bridge over the Mississippi River in Minnesota on August 1, 2007, there has been an increased interest by elected officials at the Federal, State, and local levels to better understand the current condition and replacement/repair costs of bridges throughout the United States. The safety of in-service bridges is ensured through ongoing inspection and maintenance efforts, however, there remains an overwhelming need for funding to replace or rehabilitate bridges that are nearing the end of their service life.

Federal funding has been provided for bridge maintenance through the Bridge Prevention Maintenance Program (BPMP). The goals of the BPMP include correcting minor structural deficiencies early in the bridge life cycle to prevent the need for more costly improvements later, extending the service life of existing bridges, and making efficient use of limited resources.

The work needed to improve the condition of the bridges with lower SR's includes upgrading older safety rail, adding lanes to bridges (widening) and replacing major parts or entire bridges. The estimated investment costs were based on recent cost analysis for bridge work performed by the County of Los Angeles. The total infrastructure investment needed for all bridges within Los Angeles County is estimated to be $11.9 billion.



Recommendations

- Support increased funding of the Federal Highway Bridge Program (HBP)
- Support modification to HBP regulations to increase eligibility for bridge projects that enhance regional traffic flow
- Support reactivation of HBP funding for bridge safety rail replacements
- Support funding of the Bridge Preventative Maintenance Program

Sources

- California Department of Transportation (Caltrans)
- County of Los Angeles, Department of Public Works
- City of Los Angeles, Bureau of Engineering

DAMS B-

2005 B- 2002 B-

There are 95 facilities in Los Angeles County classified as dams by the California Department of Water Resources, Division of Safety of Dams (DSOD). These facilities are maintained and operated by various owners and are located throughout the County. Many serve a vital role as part of the county's flood control system, holding back storm runoff and capturing sediment washed from the hillsides. Other facilities provide water conservation or storage to meet water supply needs. The facilities consist of concrete and earth embankment dams in natural canyons and debris basins in natural streams, as well as reinforced concrete tanks. DSOD is the jurisdictional state agency responsible for dam safety for 89 of these facilities, while 6 are owned and operated under the jurisdiction of the United States Army Corps of Engineers (USACE).

Assessment of Existing Dams

A committee comprised of dam engineers from DSOD, Los Angeles County Department of Public Works, Metropolitan Water District of Southern California and the USACE rated the dams in Los Angeles County based on three factors: 1) **Facility Condition** which includes physical condition of the dam, amount of deferred maintenance, frequency of dam inspections, condition of monitoring instrumentation, and identification of any unsafe conditions at the dam; 2) **Facility Age Versus Useful Life** which rates the facility based on its age, whether or not it has received significant rehabilitation, and if it meets relevant standards for its current use; and 3) **Capacity to Meet Current and Projected Demands** which addresses whether or not the facility meets its original purpose and function and if it can withstand anticipated physical demands such as forces from floods and earthquakes.

Facility condition and capacity to meet current and projected demands are considered the most important factors related to the safety of a dam. These factors were weighted equally, while the Facility Age Versus Useful Life Factor was given half the weight in determining an overall rating.

Final Grade

The overall grade for the 95 dams in Los Angeles County is B-. This grade is considered to reflect the current condition of dams in Los Angeles County, however, the detailed inspections and analysis that determined the score were performed in 2010. There is continued decline in the condition of many dams even though investments have been made in dam maintenance and rehabilitations since 2005.

Investment Needs

Many of the dams in Los Angeles County are over 50 years old and their auxiliary components, such as inlet/outlet works' mechanical and electrical components, are nearing the end of their useful lives. This is illustrated by a grade of C for Facility Age Versus Useful Life. In order to keep the existing dams in safe operating condition, annual investment is needed. The annual operation and maintenance cost for dams in Los Angeles County is in excess of $50 million. Additionally, the cost of necessary sediment removal from reservoirs, seismic rehabilitation and major upgrades to dams in Los Angeles County is over $20 million for the next five years. Without these investments, the structural and functional condition of these facilities will deteriorate, and flood protections and water conservation for the general public may be jeopardized.

Recommendations

- Support continued funding to keep the County's dams in good operating condition
- Support additional state and federal funding through grants or other programs for required seismic rehabilitation and upgrades to major dams in Los Angeles County

Sources

- Army Corps of Engineers, Los Angeles District
- California Department of Water Resources, Division of Safety of Dams
- County of Los Angeles Department of Public Works
- Metropolitan Water District of Southern California
- City of Los Angeles, Bureau of Engineering

Drinking Water

C

2005 C+

2002 C-

The drinking water system in Los Angeles County serves 10 million residents and numerous municipal systems, water districts, and private water companies. Two-thirds of the County's water is imported from the Colorado River and Northern California. Ensuring a safe, reliable water supply for all residents is of the utmost importance to maintain our current lifestyle and protect public health.

Assessment of Existing Systems

The County's drinking water system was assessed based on an evaluation of three major factors: 1) **condition**, 2) **capacity**, and 3) **operations**.

The condition of the drinking water facilities is rated C-. An assessment of the condition of over 11,000 miles of water mains indicates that many of the County's pipelines have reached the end of their useful life and require replacement. As these pipelines continue to age, leaks develop more frequently and the reliability of the water service to the County's residents is adversely affected. Smaller water agencies with limited resources are impacted most severely; however, the challenge is evident countywide.

The capacity of the County's water system is rated B. The capacity factor includes an evaluation of the sufficiency of water supplies, reliability of water supplies, and the capacity of water system facilities. Among the challenges is providing a reliable supply of water to the County's residents during times of drought or following a natural disaster such as an earthquake. Recent concerns with the ecological health of the Sacramento-San Joaquin Bay Delta, from which a majority of the County's water supply is received, will continue to require water agencies to seek alternative sources for the water supply.

The operations of the County's water system is rated B-. The operations factor consists of an assessment of water quality, water-use efficiency, and utilization of recycled water. Many new water-use efficiency programs and policies have been implemented throughout the County, supporting a change in attitude towards the value of water. However, additional conservation measures are needed to improve the reliability of the County's water supply. Also, a substantial increase in the amount of recycled water used in the County is necessary to offset potable water demands.

Final Grade

Overall, the County's drinking water system is rated C after weighting factors for the system condition, capacity, and operations.

Investment Needs

Systematic and timely investments in the range of $3.7 billion within the next five years are needed for constructing water projects including appropriating funding for rehabilitation and replacement of the aging infrastructure. Water agencies in Los Angeles County have the ultimate responsibility for keeping the drinking water reliable and safe adhering to regulatory health standards and making necessary improvements.

Recommendations

- Replace or rehabilitate deteriorated water system facilities before service interruptions begin to affect the reliability of the system
- Identify and implement measures to improve the sufficiency and reliability of the water systems, particularly to prepare for drought and/or natural disaster
- Implement additional water conservation measures and support a positive attitude towards the value of water
- Increase the amount of recycled water used to offset potable water demands
- Support public and private investment to maintain a safe, reliable water supply and distribution system

Sources

- Assessment data survey provided by City of Inglewood, City of El Monte, City of Burbank, Palmdale Water District, City of La Verne, City of Lynwood, City of Manhattan Beach, City of Whittier, Los Angeles Department of Water & Power, Central Basin Municipal Water District, Orchard Dale Water District, City of Glendora, Newhall County Water District, Castaic Lake Water Agency, Los Angeles County Waterworks District, City of Industry, Las Virgenes Municipal Water District, City of South Pasadena, City of Covina and Kinneola Irrigation District

Flood Control

B+ | 2005 B | 2002 B

The Los Angeles County Flood Control District (LACFCD) and the cities within Los Angeles County have constructed a comprehensive and effective flood control system to protect citizens and property from flood damage. The system includes dams, open channels, debris basins, underground storm drains, and water conservation facilities. The Los Angeles County Flood Control District (LACFCD) and the cities within Los Angeles County have constructed a comprehensive and effective flood control system to protect citizens and property from flood damage. Since age is the primary factor determining conditions and effectiveness of flood control systems, the age of the systems provided the baseline for grading, with newer systems getting a higher grade. The overall grade was determined to be a B+. This Report Card update provides a condition assessment for the County's channels and storm drain systems using data from the LACFCD only.

Assessment of Existing Flood Control Facilities

Age is the primary factor affecting the condition of flood control facilities. LACFCD Maintenance Databases were used to obtain the ages of channels and storm drains. A scoring system was applied to the 3,454 miles of channels and storm drains. An A was given to facilities built in the last 20 years, a B if built 20 to 50 years ago, a C if built 50 to 80 years ago, a D if built 80 to 100 years ago, and an F for facilities built over 100 years ago. The average grade given is a B.

The federal government designates flood hazard areas as Flood Zone A and requires property owners to carry mandatory flood insurance. Throughout the County, Flood Zone A areas make up about 5 percent (205 square miles). The federal government and local jurisdictions are also conducting additional flood hazard studies which may affect the flood zones in the coming years.

With such a small area subject to mandatory flood insurance and minimal drainage complaints, the effectiveness of the flood control system is rated A.

Final Grade

Applying an equal weight to each of these conditions, the overall grade for the flood control infrastructure for Los Angeles County is a B+.

Investment Needs

In order to keep the flood control facilities of the Los Angeles County Flood Control District (LACFCD) in good operating condition, an estimated additional investment of approximately $48 million annually is required. Without this needed investment, the County's flood control system will deteriorate and flood protection for the general public will be jeopardized.

Recommendations

- Support additional funding to keep the County's flood control infrastructure in good operating condition
- Continue to expand the view of flood control to include improving water quality and reducing pollution
- Support local agencies in their efforts to obtain additional funding to deal with the unfunded water quality mandates

Sources

- LACFCD Maintenance Management System (MMS) utilized by the County of Los Angeles Department of Public Works
- Flood insurance information was provided by County of Los Angeles Department of Public Works, Watershed Management Division
- Flood Zone A area, Federal Emergency Management Agency's Flood Insurance Rate Maps

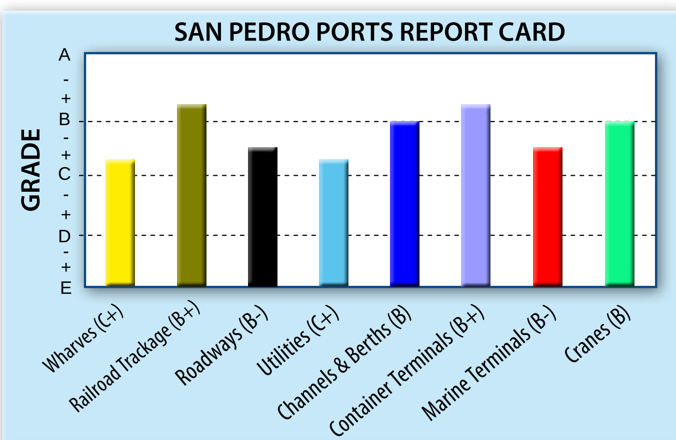
Ports

B (2005: B, 2002: B)

The San Pedro Bay Ports (Ports) consist of the Port of Long Beach and Port of Los Angeles, which represent the fifth busiest shipping terminal complex in the world. The Ports have conducted an infrastructure assessment of the entire Harbor District using existing records. The assessment consisted of evaluating eight different components of the Ports' infrastructure, including wharves, railroads, roadways, utilities, channels and berths, container terminals, other marine terminals, and gantry cranes. Together they provide the basis for the efficient operation of the Ports' system. To ensure a consistent process to grade the components, a scoring system was jointly developed by the two Ports.

Assessment of Existing Ports

The Ports and their infrastructure have an important role in the movement and supply of our nation's goods and materials. Overall, infrastructure in the Ports is in good condition. To maintain current levels of service, the regular assessment and upgrade of the Ports' infrastructure is vital to facilitate the exchange of cargo from water to land via rail or truck and visa versa. It is equally vital to ensure an on-going maintenance program and continued



redevelopment for the reliable movement of cargo. This extends outside of the Harbor District through connecting infrastructure such as the Alameda Corridor for trains or truck routes like the I-710 and I-110 freeways.

The scoring system was generally based on the age of the facilities as compared to their useful life or the physical condition of the facilities. A letter grade A was given for the more recently constructed improvements, and an F would be given when the useful life was exceeded. The useful lives utilized were: container wharves, 50 years; other wharves, 75 years; railroad trackage, 50 years; utilities, 50 years; and cranes 30 years. The results from the "levels of service" analysis were factored into the scoring for roadways; water depth and sufficient terminal acreage were factored into the channels and berths, container terminal, and other marine terminals components. Roadway conditions are based on vehicular levels of service.

Final Grade

The overall grade for the San Pedro Bay Ports based on an equal input of each of the eight components is B.

Investment Needs

Handling more than 40% of the nation's waterborne cargo, the San Pedro Bay Ports have experienced an average increase in cargo of 7% each year since the mid-1980's, reduced only by the 2008-09 recession. As we come out of this recession, it is anticipated that the 7% yearly increase in cargo will continue. In 2011, a total of 14.0 million twenty-foot equivalent units (TEUs) were handled at the Ports. It is projected that by 2015, a total number of 17 million TEUs will be handled by the Ports. In addition to containerized cargo, the Ports also handle breakbulk, dry bulk, and liquid bulk cargo, automobiles, as well as cruise ship and ferry passengers

The Ports are looking to continue major improvements with a projected total investment of $3.5 billion over the next five years. A major portion of these investments is for terminal developments and for environmental and security improvements. Although a large portion of the funding for these improvements comes from revenue generated by the shipping companies, there is a need for state and federal assistance in the amount of $1.2 billion for a portion of the infrastructure related improvements and most notably for assistance with needed roadway, rail, bridge, environmental, and security projects. $130 million has already been invested in clean air, water quality, and security related projects in the past year. It is equally important that the adjoining roadways, freeways, bridges, and railways in the surrounding region also receive improvements for the efficient movement of goods through this global gateway.

Recommendations

Support federal and state funding for the following San Pedro Bay Ports infrastructure items over the next five years. These items have received similar funding in the past and continue to require outside state and/or federal funding.

The Bridges amount, shown on the table below, includes funding for the replacement of the Gerald Desmond Bridge. Wharf Cold Ironing, or refers to the Ports' shore-to-ship electrical power programs. This will enable ships to turn off their own power and plug into land based power, which drastically reduces emission of pollutants into the region's air.

CATEGORY	FEDERAL/STATE SHARE	5 YEAR TOTAL
Dredging	$120 million	$170 million
Roadways	$60 million	$70 million
Wharf Cold Ironing	$80 million	$320 million
Bridges	$400 million	$715 million
Railroads	$140 million	$420 million
Security	$100 million	$110 million
Marine & Waterfront Development	$200 million	$1,380 million
Environmental Steward	$100 million	$320 million
Total:	**$1.2 billion**	**$3.5 billion**

Sources

- Port of Los Angeles Five Year Cash Expenditure CIP, January 2010
- Port of Los Angeles Handbook, 2009
- Port of Long Beach 2009 Strategic Plan, Annual Report and Facilities Guide
- Ports of Long Beach/Los Angeles Transportation Study, June 2001 / San Pedro Bay Rail Study, 2006
- Marine Transportation System, Southern California Freight Movement Infrastructure Needs Summary, 2002
- Ports of Los Angeles Baseline Transportation Study, April 2004. Port of Los Angeles Rail Synopsis, July 2004
- Port of Long Beach Pavement Management System, June 2011

Solid Waste

B+ | 2005: B+ | 2002: A-

The County of Los Angeles has the largest and most complex solid waste management system in California. It is comprised of 89 jurisdictions, each responsible for managing its own waste stream and reducing its disposal rate. In 2011, the County disposed of an average of 28,000 tons of solid waste per day. Considering the average disposal rate is anticipated to increase to 41,600 tons per day by 2024, both conventional and innovative approaches are being explored to effectively manage solid waste in the County.

Assessment of the Current Solid Waste Management System

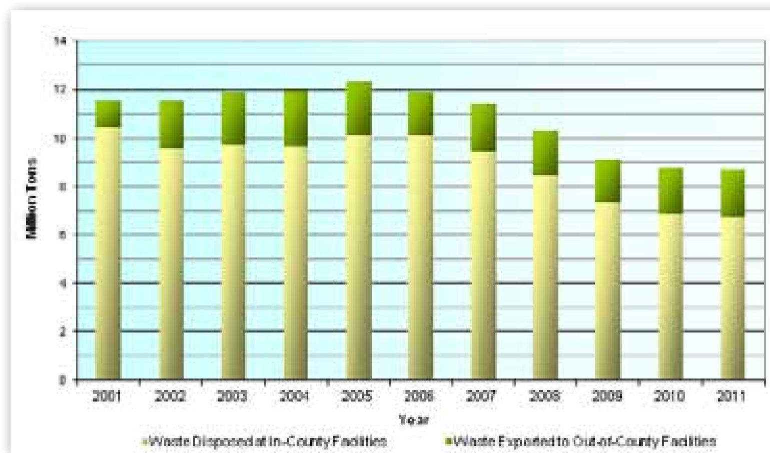
The County has a robust solid waste management infrastructure consisting of an extensive network of public and private operations. Solid waste is collected by more than 100 permitted waste collectors. After much of the recyclable and reusable materials are extracted from the waste stream either by source separation or through materials recovery facilities, the residual waste is disposed of at 7 major and 4 small municipal solid waste landfills, and 2 waste-to-energy facilities within the County. About 20% of the residual solid waste is exported to out-of-County landfills for disposal.

In 2011, the County secured an additional 12 million tons of disposal capacity by granting a 30-year permit to the Lancaster Landfill located in the Antelope Valley. To further ensure long-term disposal capacity, the Los Angeles County Sanitation Districts are developing a waste-by-rail system to transport refuse by trains to the Mesquite Regional Landfill in Imperial County in preparation for the closure of one of the nation's largest landfills, Puente Hills Landfill, in October 2013. While the system is anticipated to be completed in 2013, as an integral component of the County's overall waste management system, it may not be utilized until after 2014, contingent upon factors such as market costs for disposal and transportation, as well as the viability of local landfills.

Additionally, accomplishments such as the County's extensive household hazardous waste and electronic waste collection program, transition towards cleaner fuel collection vehicles, and widespread recycling and waste reduction outreach are cumulatively reflective of the County's efforts towards sustainable waste management practices.

Despite these achievements there are many challenges impacting the solid waste management industry, such as:

- The closure of the Puente Hills Landfill on November 1, 2013, will affect the County's disposal capacity as well as green waste management opportunities
- City and County jurisdictions striving to maintain the state mandated diversion rate will likely face higher tipping fees due to transporting green materials to out-of-county facilities
- Diminishing in-County landfill capacities, increasing disposal demands over the long term due to economic and population growth and public opposition towards establishing new facilities
- Increasing mergers among small and large haulers causing a growing trend towards transporting waste to privately owned landfills for economic benefit, even when hauling distances are greater



HISTORICAL DISPOSAL TREND FOR LOS ANGELES COUNTY FROM 2001-2011

- Recent economic downtown weakening consumer demand for recyclable materials and slowing the construction industry and manufacturing of goods. As a result, the rate of solid waste generated by businesses and the public has decreased dramatically since 2006.

Recycling and Reuse

Los Angeles County has been on the forefront of innovation and environmental stewardship for many years. In 2009, jurisdictions countywide collectively achieved a diversion rate of 55%, exceeding the state mandate of 50%. As a result of implementing a variety of waste reduction, composting, and recycling programs, such as 3-cart curbside collection programs, it is estimated that nearly 11 million tons of solid waste were diverted in 2011 from landfill disposal in the County. Addionally, the per capita disposal rate was reduced from 2,400 lbs/person/year in the late 1990s to 1,700 lbs/person/year in 2011.

The state legislature has routinely considered bills to raise the state diversion mandate above the current 50%. The most recent attempt was Assembly Bill 341, enacted in 2011. AB 341 established a state policy goal that at least 75% of solid waste generated must be source reduced, recycled, or composted by year 2020, and further requires commercial and public entities as well as multifamily residential dwellings to arrange for recycling services starting July 1, 2012. As a result, each jurisdiction began implementing its own commercial recycling program requiring high-quality waste collection and recycling services.

The County continues to support the development of local markets for remanufacturing recyclables and expanding markets for recycled products. As part of this effort, recycling market development zones continue to expand countywide to include additional cities. One of the salient issues is resulted in the County's reliance on foreign markets. This was particularly evident in light of the recent decline in the overseas market value of recyclable materials. With the impending closures of local landfills, recently enacted mandatory commercial recycling, and the potential for the state to increase the mandatory diversion rate for jurisdictions, developing stronger statewide and local markets for recyclables is even more critical.

The County is currently in negotiations with the Paint Stewardship Organization to implement a paint recovery program as a result of the enactment of AB 1343 in 2010, which requires paint manufacturers to develop and implement a program to collect transport, and process post consumer paint. The County actively supports legislative initiatives that shift the burden of products end-of-life management from local governments to manufacturers and at the same time encouraging the marketplace to develop products with minimal toxic impacts in a cost-effective manner.

Conversion Technologies and Other Alternatives to Landfills

Conversion technologies are processes capable of converting post-recycled residual solid waste into useful products and clean, renewable energy. Various thermal, chemical and/or biological conversion technologies operate successfully in over 28 countries. Management of solid waste through these technologies, rather than through landfill disposal, would decrease net air pollutant emissions and greenhouse gases; utilize materials that are otherwise not recyclable or reusable; produce renewable energy and green fuels; reduce dependence on foreign oil; and preserve landfill capacities and fossil fuels while complementing California's recycling infrastructure and complying with strict environmental safeguards.

The County of Los Angeles Department of Public Works, the Los Angeles County Integrated Waste Management Task Force, the City of Los Angeles, the County Sanitation Districts, numerous other cities within the County, and other stakeholders are collaborating to evaluate and develop conversion technologies in Southern California. After several years of extensive study and evaluation of such technologies, these agencies are moving forward to develop demonstration and commercial-scale facilities in the region. Such facilities could be the first of their kind in the country, and will pave the way for additional projects by assessing the logistical and economic feasibility of such facilities, and compiling data to help formulate public policies for such developments in the future. Projects are also being pursued by the cities of Glendale and San Jose, the County of Santa Barbara, and the Salinas Valley Solid Waste Authority.

Currently, there are two waste-to-energy facilities in the County that transform refuse into electricity through a combustion processes. Several jurisdictions in the County rely on the diversion credit from these facilities to comply with the state's waste reduction mandate. The City of Los Angeles is evaluating 2 short-listed proposals for the development of a commercial scale waste-to-energy facility capable of processing up to 1,000 tons per day of municipal solid waste

Final Grade

The overall grade for Solid Waste Management is B+.

Investment Needs

It is estimated that over $450 million per year for the next five years is needed to operate and maintain the solid waste management infrastructure including implementing the recommendations below. Additional investments would be necessary for new and replacement projects.

Recommendations

- Providing resources to enhance source reduction and recycling programs in both the residential and commercial sectors including public education
- Pursuing legislation that would place responsibility on producers/ manufacturers to manage products at the end of their useful life
- Developing additional facilities at strategic locations for processing green waste and commingled materials to recover more recyclables, organics and/or food waste
- Stimulating local markets for recyclable materials
- Developing alternative waste management technology facilities, such as conversion technologies, by supporting policies, providing resources, and facilitating coordination among stakeholders
- Supporting efforts to increase capacities at transfer stations and landfills

Sources

- County of Los Angeles Department of Public Works
- County Sanitation Districts of Los Angeles County
- City of Los Angeles Bureau of Sanitation
- City of Burbank
- HDR Engineering, Inc.

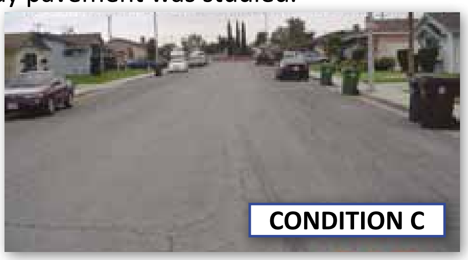
Streets & Highways

C- | 2005 **B-** | 2002 **B-**

The assessment of Los Angeles County streets and highways consisted of pavement condition and traffic congestion. The pavement condition component was scored based on maintenance records from Caltrans, the County of Los Angeles, and all cities within the County of Los Angeles. Traffic congestion was scored based on capacity data from various cities within County of Los Angeles (Covina, Downey, Palmdale, Pasadena, Pomona, and Torrance), Caltrans, the City of Los Angeles, and the County of Los Angeles.

Assessment of Streets and Highways

The County of Los Angeles, the City of Long Beach, and the City of Los Angeles use computerized pavement management systems to rate pavement inventories. Individual pavement segments are rated on a scale of Very Good to Poor. Grades of A through F were assigned based on pavement segment ratings. Caltrans uses pavement distress to rate its pavement with no distress equivalent to grade A and major distress equivalent to grade F. A total of 2.65 billion square feet of street and highway pavement was studied.



Roads in fair condition with moderate cracking or surface deterioration

Given the existing funding levels, Los Angeles County's streets and roads can be expected to deteriorate rapidly within the next 10 years. In addition, costs of any deferred maintenance will only continue to grow.

To maintain the existing transportation network, we will need $195 million per year for next five years. Caltrans needs $250 million per year to maintain its roadway network to existing conditions.

Traffic Congestion

Roads in poor condition with extensive cracking, patching, or other visible deterioration

Traffic congestion was scored on freeway and arterial Level of Service (LOS) data compiled from various cities within the County of Los Angeles (Covina, Downey, Palmdale, Pasadena, Pomona, and Torrance), Caltrans, and the City of Los Angeles, and the County of Los Angeles. Freeway LOS is a ratio of vehicles counted over capacity. Arterial LOS uses a ratio of vehicles counted over intersection capacity. LOS data for freeways and arterials was measured during both AM and PM peak traffic conditions. The study includes 83 arterial monitoring stations and 81 freeway monitoring stations.

Letter grades assigned to LOS scores are based on an A to F grading scale. The combined freeway and arterial grade is D.

Data showed that half of the freeway system operates at the most congested levels in the morning and afternoon rush hours. Many freeway segments experience congestion in both directions during these times, an unfortunate expansion of the traditional suburb-to-downtown commute pattern. Similarly, 40% of arterial intersections in the morning rush hour and 50% of the intersections in the afternoon rush hour operate at these diminished LOS levels.

Final Grade

In general, pavement condition and traffic congestion are equally important when considering the overall grade for streets and highways. The final grade is based 50% on pavement condition and 50% on traffic congestion for a grade of C-.

Investment Needs

An investment of approximately $195 million is required to maintain the existing conditions and approximately $430 million is required to improve the conditions of roadway pavement to an acceptable state of repair. State highways and freeways require an additional $2.5 billion in roadway conditioning and maintenance over the next five years.

Without this additional maintenance, the overall condition of pavement in Los Angeles County will continue to decline each year. This decline would result in increases in vehicle repair costs, traffic delays, fuel consumption, and vehicle emissions.

In order to relieve congestion, the MTA estimates that approximately $300 billion is required to invest in Los Angeles County's transportation system through 2040. The thirty-year plan will focus on improving arterial traffic flow by implementing capital improvements and better use of advanced technology. Additionally, the Southern California Association of Governments (SCAG) estimates that traffic on local streets is projected to increase 30% by 2030. There are many likely reasons, including continued growth in population and jobs, spillover from increasing freeway congestion, and more goods movement-related truck traffic. Without additional investments, peak hour speeds and the efficiency of the roadway network will continue to decline.

Recommendations

To improve LA County Streets and Highways, ASCE recommends the public to :

- Endorse both the state and Los Angeles County MTA Consensus Principles for Re-authorization of the Federal Transportation Equity Act for the 21st Century (MAP-21) as they relate to highway programs
- Support Increase Congestion Mitigation and Air Quality Improvement (CMAQ) funding and Surface Transportation Program (STP), and HOPP funding for Los Angeles County without adversely impacting other transportation funding programs
- Endorse development and implementation of improvements to in crease arterial and freeway system capacity and efficiency
- Endorse the Los Angeles County Mobility-21 resolutions that seek additional revenues to meet Los Angeles County's street and high way needs

Sources

- Caltrans, California Department of Transportation
- City of Covina
- City of Downey
- City of Los Angeles
- City of Palmdale
- City of Pasadena
- City of Pomona
- City of Torrance
- Los Angeles County Department of Public Works, Road Maintenance Division
- 2010 Metropolitan Transportation Authority (MTA) Traffic Management Program Report

TRANSIT C

2005 C+ 2002 C+

Los Angeles County is a highly urbanized county consisting of over 4,000 square miles with 88 local cities and large unincorporated areas, and a population of over 10 million. Public transportation includes rail services, buses, and paratransit. Metro link rail provides service on 7 routes with 55 stations in the counties of Los Angeles, Orange Riverside, San Bernardino, Ventura and Northern San Diego. The Los Angeles County Metropolitan Transportation Authority operates 6 rail and subway lines providing transportation to downtown from outlying areas.

Assessment of Transit System

Metro is the predominant regional transportation operator with over 200 bus routes. In addition, there are 16 municipal operators that provide local and regional transportation in various jurisdictions throughout the County. Over 80 local cities operate a third tier of fixed route services and paratransit services within their communities that link to the regional transit systems, often targeted to meet the needs of the transit dependent senior, disabled and general public within their communities. Access Services, Inc. (ASI) operates American Disabilities Act (ADA) paratransit services for all eligible Los Angeles County residents.

Over 536 million fixed route transit trips are taken each year with 72% of the trips provided by Metro, 26% of the trips are provided by municipal operators, and 2% of the trips are local provided by the local cities' fixed route services.

	TRIPS	PERCENTAGE
Subtotal	525,000,000	98%
Local Cities	11,200,000	2%
Total Fixed Route	**536,200,000**	
Metrolink	11,789,086	
Metro Rail	63,700,000	

Transportation Mode Grades:

Rail: MetrolinK: B
Rail: Metro Rail: B+
Metro and Municipal Transit: B+
Local Fixed Route Transit & Paratransit: B
ADA Regional Paratransit: B+
Transportation Funding Sources: D

- State funding shortfalls have caused significant impacts to service
- Local sales tax transportation funding shortfalls force reductions in service levels
- Traffic continues to worsen, which slows buses, effecting on-time performance
- To maintain headways of two years ago, trips are added to compensate for delays due to traffic
- Operating budgets continue to grow due to these reductions in travel time speeds
- The increase in fuel costs will continue to prohibit growth and improvements in service

Final Grade

The final grade for the transit system in Los Angeles County is C.

Investment Needs

Overall, Transit services have improved over the past seven years. However, there is a fiscal transportation funding crisis that is expected to continue, which will result in service cuts, fare increases, and erosion of current levels of service.

Transit infrastructure for Los Angeles County is underfunded. The Metro 2009 Long Range Plan estimates that over $18 billion is required to fund regional Metro and Municipal Transit improvement priorities annually. Investment needs reported from the Infrastructure Survey indicates a minimum investment need of $600 million for transit capital, transit technology and operating expenses over the next few years.

Recommendations

- Funding transit projects and programs identified in the Los Angeles County MTA's Long-Range Transportation Plan and increase funding for new systems and expansions, buses and bus facilities, transit capital and preventative maintenance, and paratransit capital needs for services provided by regional, municipal, county and Local governmental agencies
- Funding transit programs and continue the expansion of Rapid Bus Routes
- Continuing to incorporate Rapid Bus amenities, Limited Stop Operations and enhanced Transit Stations throughout the County
- Continuing to develop and fund programs to increase Los Angeles' awareness of immediate transit needs and long-term benefits including improved air quality, greater access and the greater economy of transit use
- Continuing to develop consistent and reliable sources of funding for public transportation in California and in Los Angeles County
- Protecting existing state and federal transportation funding sources

Sources

- Updated Metro Long Range Transportation Plan for Los Angeles County
- Access Services Paratransit Annual Statistics 2009
- Metro Los Angeles County NTD Reporting 2008 and 2009
- Recent Los Angeles County Infrastructure Surveys
- Recent City of Los Angeles Transportation Profile
- SCRRA (Metrolink) FY 2011 NTD Report

Urban Run-off

D — 2005: D — 2002: D

Rivers, lakes, creeks, streams, beaches and coastal waters in the Los Angeles area have been found to be contaminated with toxins and health-threatening pollutants. Contamination is a threat to humans and wildlife. Most water pollution comes from the untreated water that flows off rooftops, pavement, streets and parking lots directly into our waterways, bays and beaches. Runoff contains numerous pollutants, including industrial solvents, paints, infectious bacteria, oxygen-choking pesticides and fertilizers, motor oil, trash and even toxic heavy metals such as lead, mercury, chromium and arsenic.

Background

Water Quality Standards (WQS) are the foundation of the water quality-based pollution control program mandated by the national Clean Water Act. Water Quality Standards define the goals for a waterbody by designating its uses, setting criteria to protect those uses, and establishing provisions to protect waterbodies from pollutants.

The Clean Water Act requires states, territories, and authorized tribes to develop lists of waters that are too polluted or otherwise degraded to meet the water quality standards.

The law requires that each jurisdiction establish "priority rankings" for the listed waters and include Total Maximum Daily Loads (TMDLs). TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.

Assessment of Urban Run-off

The methodology involves a watershed-by-watershed assessment with a region-wide grade being the composite of all watershed evaluations. **Four pollutants are used as indicators for water quality, each of which is weighted equally. These indicator pollutants are nutrients, bacteria, metals, and trash.**

The criteria for assessing each watershed are based on: 1) Results of water quality improvements relative to water quality standards, and 2) Implementation of water quality improvement efforts. For 2012, an A or B would only be awarded if implementation efforts are successful enough to reflect significant improvement in water quality, leading to compliance with WQS and TMDLs. A grade of C or D indicates efforts are underway, and there is some water quality improvement, but final objectives have not been met. An F indicates not only poor water quality, but also failure to initiate significant water quality improvement efforts.

It is important to note that there are areas with no TMDLs for pollutants and, thus, no action is being taken which means that poor grades result. Generally, municipalities do not take action until a TMDL is established since the TMDL describes the final guidelines that direct how to begin the clean up for the pollutant.

The following summarizes the general guidelines used for each watershed evaluation. For purposes of this report card, dry-weather (typically non-rainy season runoff) and wet-weather (rainy season runoff) conditions were combined.

For each watershed and parameter, grades were established and weighted (equally) for a composite total. An academic scale of A=4, B=3 C=2, D=1, D=0 was adopted for numerical weighting and development of a Watershed Grade Point Average.

Final Grade

The composite Los Angeles County Watershed Grade is D for the region.

Investment Needs

There is significant debate on what implementation costs and investments are required to meet water quality objectives. The latest estimate puts the compliance cost at between $4 billion and $30 billion over the next 5 years. However the actual cost to comply depends on the scope and extent of the actions municipalities will be required to take to meet the water quality objectives

Trends

Although the overall grade remained unchanged from the previous version of the Infrastructure Report Card, it must be recognized that there are a number of positive trends. The public recognizes the importance and value of clean creeks and beaches. The overwhelming passage of the City of Los Angeles' Measure O ($500 million general obligation bond) in 2004 and in the City of Santa Monica, passage of a special clean beaches and ocean fee in November 2006, indicates a willingness to make investments that will improve the quality of the living environment. Agencies within the Santa Monica Bay completed and began implementing wet and dry-weather Bacterial TMDL Implementation Plans, which are integrated, iterative, and adaptive in nature. Other jurisdictions are working together on other implementation plans to address specific TMDLs. Also, the Los Angeles County Flood Control District is spearheading an initiative in cooperation with cities and many stakeholders to initiate a local funding source through imposing a parcel fee that would provide a sustained funding to implement local and regional projects that improve water quality.

Many cities, as well as the unincorporated County, are implementing projects that would prevent trash from entering the water ways. They are also building projects that divert runoff to sanitation treatment plants and keep from ending up at the beach. Projects have been built that actually kill bacteria prior to being discharged into water ways. Other creative projects have been built, and new ones are being considered that harvest runoff and allow it to percolate into the ground, or be used for non-potable purposes. The former process is a natural way to treat runoff and provide the added benefit of increasing the supply of groundwater for later use as potable water. Using rain water for non-potable purposes avoids the use of limited potable water.

Cities are also beginning to address marine debris reduction through the installation of full-capture devices to meet the planned 2010 Trash TMDL for Santa Monica Bay.

These good municipal examples demonstrate working together and being creative to try to address a problem that affects all communities and the health of our natural systems.

Recommendations

- Continue research to identify attainable goals and strategies that are based on sound science
- Continue the collaborative efforts by municipalities to implement cost-effective improvement solutions
- Seek stable and long-term funding to implement cost-effective solutions that result in measurable improvements to urban and stormwater runoff quality
- Continue education and outreach efforts to communities on the benefits of improving urban and stormwater runoff quality

Sources

- County of Los Angeles Department of Public Works
- Devinny, Joseph, Sheldon Kamieniecki, and Michael Stenstrom. (Devinny et. al.) 2004. Alternative Approaches to Stormwater Quality Control. Prepared for the Los Angeles Regional Water Quality Control Board. USC Center for Sustainable Cities
- California State University, Sacramento (CSUS). 2005. NPDES Storm water Cost Survey. Prepared for California State Water Resources Control Board. Office of Water Programs CSU Sacramento, January
- Gordon, Peter, John Kuprenas, Jiin-Jen Lee, James E. Moore, Harry Richardson, Christopher Williamson. (Gordon et. al.) 2002. An Economic Impact Evaluation of Proposed Storm Water Treatment for Los Angeles County. School of Engineering and School of Policy, Planning, and Development. University of Southern California, November
- California Department of Transportation (Caltrans) 1998. Financial and Economic Impacts of Storm Water Treatment, Los Angeles County NPDES Permit Area. Presented to California Department of Transportation Environmental Program Report I.D. #CTSWRT-98-72, November

WASTEWATER B+

2005 B 2002 B

The Los Angeles County wastewater collection and treatment system consists of numerous separate systems ranging in size from very small to very large. The City of Los Angeles operates and maintains 6,531 miles of primary and secondary sewers, 52 pump stations, and 4 major wastewater treatment plants. The Los Angeles County Department of Public Works, on behalf of the County Consolidated Sewer Maintenance District, operates and maintains 4,600 miles of secondary sewers, 153 pump stations, and 4 wastewater treatment plants. The County Sanitation Districts of Los Angeles County operates and maintains 1,320 miles of primary and secondary sewers, 51 pump stations, and 12 major wastewater treatment plants. Included in this year's survey is assessment information from 18 smaller municipal systems encompassing 2,622 miles of primary and secondary sewers and 52 pump stations.

Assessment of Current Wastewater Collection and Treatment System

The existing Wastewater Collection and Treatment System is comprised of three main components: the gravity flow collection system, sewage pump stations, and wastewater treatment plants.

Collection System

The collection system consists of 1,679 miles of primary sewers (16 inches in diameter and larger) and 13,394 miles of secondary sewers (less than 16 inches in diameter). The collection system was rated using an A through F grading system. Sewers in excellent condition, with no cracks, tight-fitting joints, and sufficient capacity to accommodate future growth and wet weather flows were rated an A. Sewers that had collapsed conditions and were in need of immediate repair were rated F.

The sewer collection system in the County has a combined overall condition rating of B+. The overall weighted average score for the collection system is 3.45 on a scale of 1 to 4. This overall rating was calculated using the linear footage of the collection system as the basis of the weighted average formula. However, 13.4 percent of the collection system, which represents 2,020 miles of sewers, has reached a point where repairs and rehabilitation are needed to keep the system functioning properly. In comparison with the previous report, there has been a decrease in the miles of deficient sewers primarily due to the number of cities which responded to the solicitation for information. In 2010, 22 cities representing 6,015 miles of sewers provided relevant information, as compared to the 18 cities representing only 2,622 miles of sewers which responded for this report.

Pump Stations

There are 308 pump stations within the wastewater collection system. The pump stations were rated using an A through F grading scale. Pump stations in excellent condition, with sufficient capacity for future wet-weather flows received an A grade. Pump Stations in a very deteriorated condition, not meeting design standards, and lacking capacity for dry weather flows received an F grade.

The pump stations in the County have a combined overall condition rating of B. The overall weighted average score for the pump stations is 3.00 on a scale of 1 to 4. This overall rating was calculated using the number of pump station units as the basis of the weighted average formula. However, 28.5 percent of the pump stations require significant improvements to restore capacity or upgrade deteriorated conditions to keep the stations functioning properly. Over the next five years all D or less rated pump stations should be rehabilitated. In comparison with the 2005 Report Card, there has been a decrease in the number of deficient pump stations. This difference can be attributed to the re-evaluation of previous assessment criteria which provided a more realistic evaluation of the health and sustainability of these facilities.

Treatment Plants

Wastewater collected throughout the County is treated at one of 20 treatment plants. The treatment plants were rated using an A through D grading system. Treatment plants that had sufficient capacity to meet current and future wet weather flows, required only routine maintenance, and were in full permit compliance received an A grade. Plants that had capacity for only dry weather flows, required extensive maintenance and improvements, and could not consistently meet all permit requirements received a D.

The combined condition rating for the wastewater treatment plants is a B+. The overall weighted average score is 3.58 on a scale of 1 to 4. This overall rating was calculated using the daily average flow of each treatment plant as the basis of the weighted average formula. However, ever changing regulatory requirements, such as greenhouse gas emissions, will require modifications to the existing wastewater treatment plants, even those receiving a high grade of B or better.

Final Grade

Applying an equal weight to each of these conditions, the overall grade for the wastewater system is a B+ with an overall rating of 3.45, which compares quite favorably to the national average grade of D- recently given by ASCE in its Report Card for America's Infrastructure.

Investment Needs

The estimated five-year operation and maintenance budget for the wastewater system is $1.9 billion. In addition to this, all condition C and D components should be upgraded, rehabilitated, or replaced. The necessary capital improvement costs, which include added security measures, to accomplish this goal over the next five years are estimated to be $2.8 billion.

Recommendations

To maintain and improve LA County's Wastewater Treatment Infrastructure, we recommend the public :

- Support funding for an accelerated capital improvement program to protect public health and safety
- Support funding for closed circuit television inspection of the collection system to determine the structural integrity

Sources

- The Consolidated Sewer Maintenance District's Maintenance Management System and other databases utilized by the County of Los Angeles Department of Public Works
- City of Los Angeles Infrastructure Assessment Reports
- County Sanitation Districts of Los Angeles County Sewerage and Office Engineering Departments
- Survey Information obtained from the Cities of Bell, Cerritos, El Monte, El Segundo, Gardena, Hermosa Beach, Inglewood, Lancaster, Los Angeles, Monrovia, Palmdale, Pasadena, Pomona, Redondo Beach, San Marino, South Gate, South Pasadena, Vernon, West Hollywood, and Whittier

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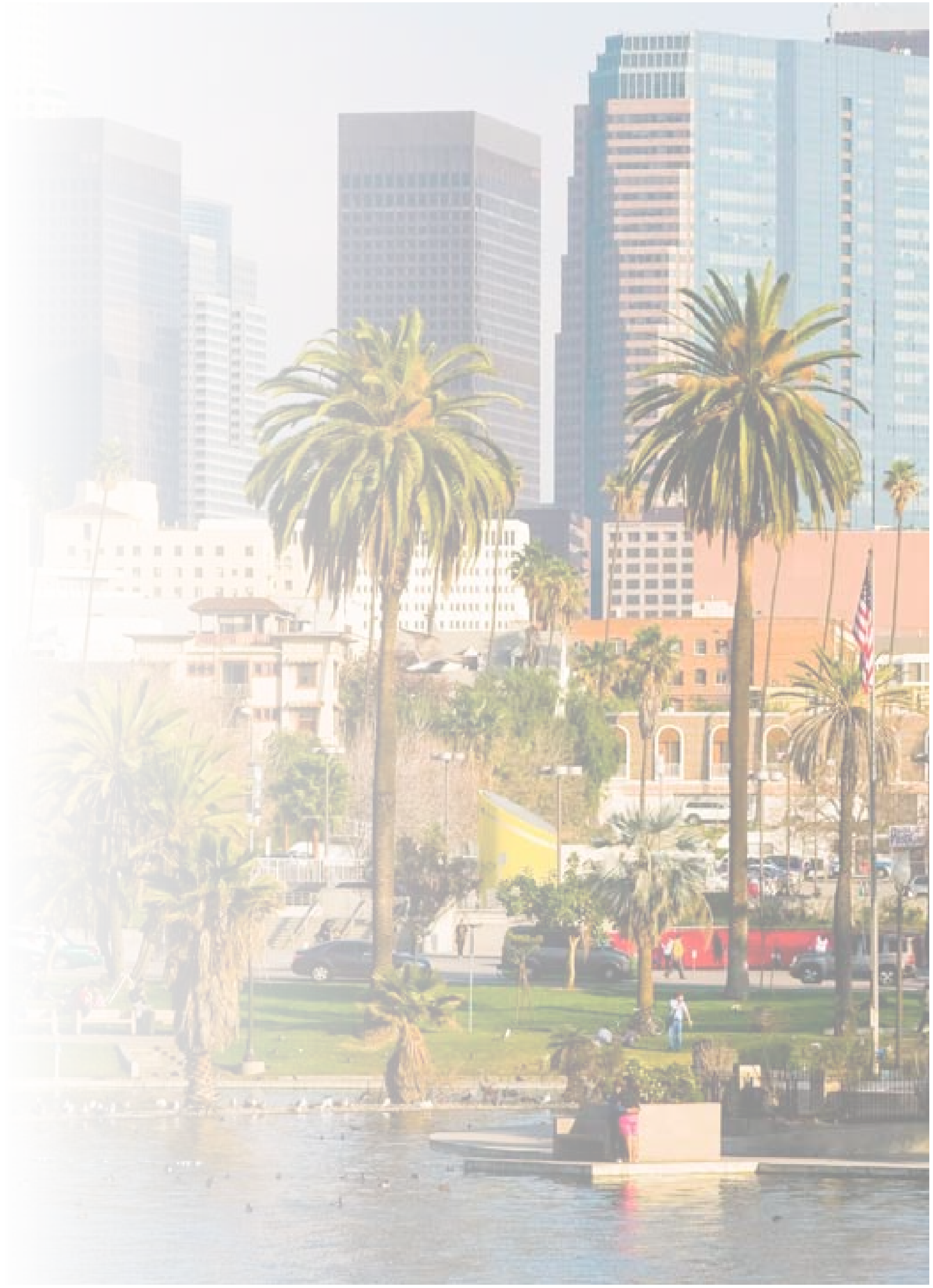

Final Report

January 2013

California Statewide Local Streets and Roads Needs Assessment

CSAC

LEAGUE OF CALIFORNIA CITIES

RTPA RCTF

California Statewide Local Streets and Roads Needs Assessment

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January 2013

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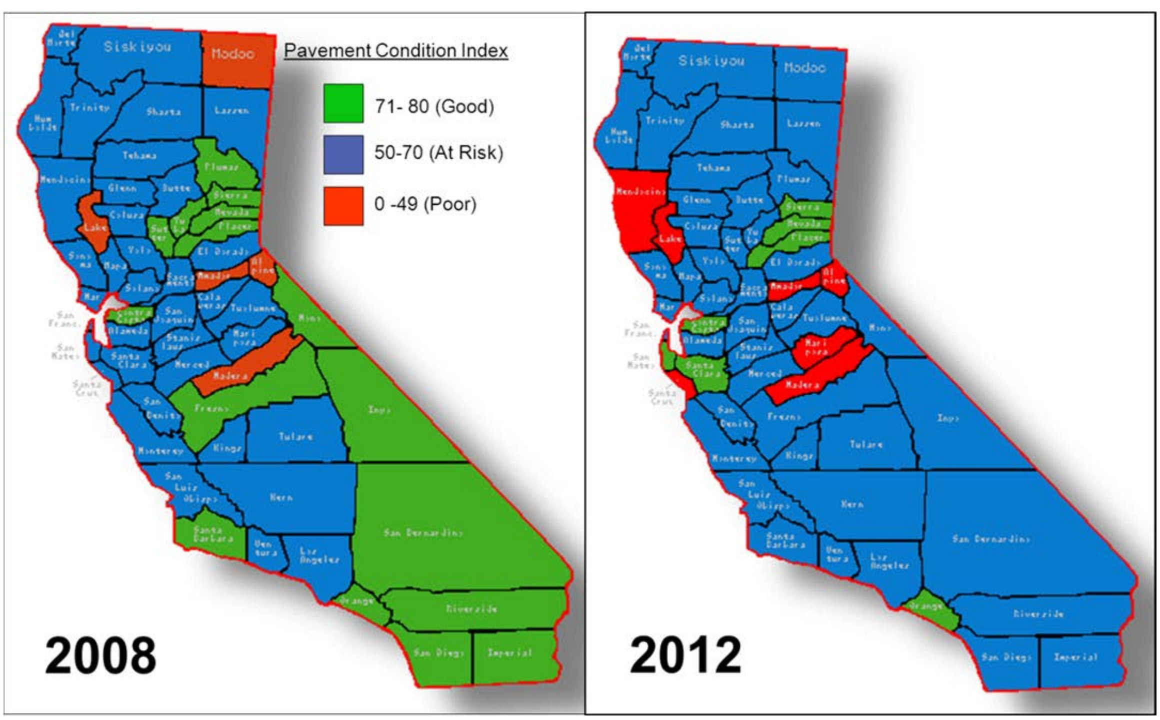
Abstract

California's local streets and roads system is in crisis, driving state and local governments to a decision point: either pay now to update communities' deteriorating thoroughfares, or pay much more later to replace them.

Due to an aging infrastructure, rising construction costs and budget constraints, the state's local road network is falling into disrepair at an alarming rate. With heavier vehicles, increasing traffic and the need to accommodate alternative modes of transportation—including buses, bicyclists, pedestrians, the disabled and school children—the demands on California's streets and roads are growing. At the same time, a growing percentage of streets and roads are in poor condition and in need of repair.

Cities and counties own and maintain 81 percent of California's roads, and these byways are the underpinning of California's statewide transportation network. From the moment we open our front door in the morning to drive to work, bike to school, walk to the bus station, or buy groceries, we are dependent upon our local streets and roads. Emergency responders and law enforcement rely on the network to save lives and keep us safe. It's hard to think of a single aspect of daily life that doesn't involve a local road.

The results of the *2012 California Statewide Local Streets and Roads Needs Assessment* show that there has been a steady downward trend in the pavement condition since 2008. The majority of California's counties now have an average pavement condition rating that is considered "at risk" (see maps below). Projections indicate that In 10 years, 25 percent of California's streets and roads will be in the "failed" category.



The state system encompasses bridges and safety and traffic components such as traffic signals, traffic signs, storm drains, sidewalks, and curbs and gutters. Public safety concerns intensify the urgency for state and local decision makers to come up with answers – and funding - for maintenance and repair.

This report shows that there is a funding shortfall of more than $82 billion over the next 10 years to bring the system up-to-date. The current funding level for the local system is $2.5 billion a year. Just maintaining the status quo for pavements will require an investment of an additional $1.9 billion a year. But that still doesn't resolve the issue that as California grows, its road system is aging and deteriorating rapidly.

Lack of any investment will undoubtedly result in higher costs to all users of the state's transportation system. Cars, bikes, school buses, and utility and emergency vehicles will find it more and more challenging to arrive at their destinations safely and reliably. If bridges fail or are closed for safety reasons, communities will be affected by long detours and delays. Water quality standards will be compromised. The ability to meet clean air standards becomes more difficult as expensive rehabilitation and reconstruction treatments are required.

The 2012 Assessment focuses on the transportation needs, but solutions must come from state and local governments, the Legislature, and the people of California. There's no question that new sources of revenue must be found. The cost to make our local streets and roads safe and reliable should be shared by everyone who uses and benefits from them, whether from the north or south, urban, suburban, or rural areas. Given that new technologies (e.g. hybrids and electric vehicles) continue to improve the efficiency of many types of transportation methods, transportation users must be open to new alternative funding mechanisms.

The bottom line is, Californians will have to work together to secure sustainable revenues to prevent our local streets and roads system from collapse.

The conclusions from this study are inescapable. Given existing funding levels available to cities and counties for maintaining their local systems, the condition of California's local streets and roads will continue to decline in the next 10 years. Unless this crisis is addressed, costs to maintain the local system will only continue to grow, while the safety, quality and reliability of California's local transportation network deteriorates.

We cannot afford to delay action. By investing in the state's local street and road system now, we can avert disaster and strengthen California's transportation future.

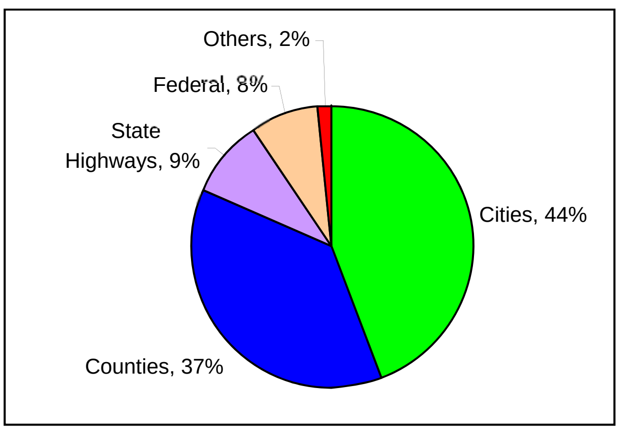
Executive Summary

California's local street and road system continues to be in crisis.

Every trip begins on a city street or county road. Whether traveling by bicycle, bus, rail, truck or family automobile, Californians need a reliable and well-maintained local street and road system. However, these are challenging times on many levels. Funding is at risk, and there is a significant focus on climate change and building sustainable communities, and the need for multi-modal opportunities on the local system has never been more essential. Every component of California's transportation system is critical to provide a seamless, interconnected system that supports the traveling public and economic vitality throughout the state. Sustainable communities cannot function without a well-maintained local street and road system.

The first comprehensive statewide study of California's local street and road system in 2008 provided critical analysis and information on the local transportation network's condition and funding needs. This 2012 needs assessment provides another look at this vital component of the state's transportation system and finds further deterioration and a growing funding shortfall.

As before, the objectives were to report the condition of the local system and provide the overall funding picture for California's local street and road transportation network. We needed answers to some important questions. What are the current pavement conditions of local streets and roads? What will it cost to repair all streets and roads? What are the needs for the essential components to a functioning system? How much is the funding shortfall? What are the solutions?



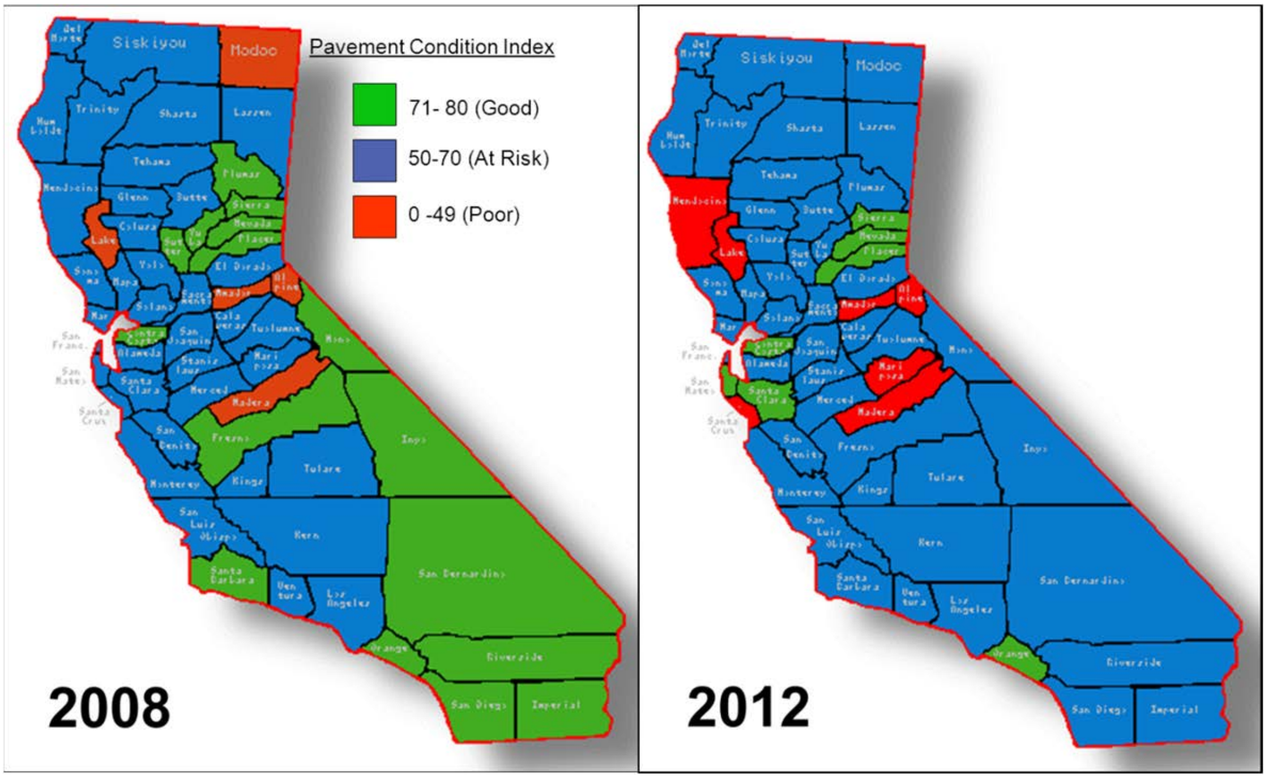
As owners of 81 percent of the state's roads, cities and counties found that the 2008 study was of critical importance for several reasons. While federal and state governments' regularly assess their system needs, no such data existed for the local component of the state's transportation network. Historically, statewide transportation funding investment decisions have been made without recognition of the particular requirements of the local system, and without local pavement condition data. Thus, this biennial assessment provides a critical piece in providing policy makers with a more complete picture of our transportation system funding needs.

The goal is to use the findings of this report to continue to educate policymakers at all levels of government about the infrastructure investments needed to provide California with a seamless, multi-modal transportation system. The findings of this study provide a credible and defensible analysis to support a dedicated, stable funding source for maintaining the local system at an optimum level. It also provides the rationale for the most effective and efficient investment of public funds, potentially saving taxpayers from paying significantly more to fix local streets and roads into the future.

This update surveyed all of California's 58 counties and 482 cities in 2012. The information collected captured data from more than 98 percent of the state's local streets and roads! This level of participation exemplifies the interest at the local level to provide comprehensive and defensible data in hopes of tackling this growing problem.

Pavements

The results show that California's local streets and roads are moving ever closer to the edge of a cliff. On a scale of zero (failed) to 100 (excellent), the statewide average pavement condition index (PCI) has deteriorated from 68 in 2008 to 66 ("at risk" category) in 2012. If current funding remains the same, the statewide condition is projected to deteriorate to a PCI of 53 by 2022. Even more critical, the unfunded backlog will increase from $40.4 billion to $66 billion. The maps illustrate the pavement deterioration that has resulted in each county since 2008.



To spend the taxpayer's money cost-effectively, it makes more sense to preserve and maintain our roads in good condition than to let them deteriorate, since deteriorated roads are more expensive to repair in the future. Consistent with that approach, the costs developed in this study are based on achieving a roadway pavement condition of what the industry calls Best Management Practices (BMPs). This condition represents improving the pavement condition to a level where roads need preventative maintenance treatments (i.e., slurry seals, chip seals, thin overlays). These treatments have the least impact on the public's mobility and commerce, and are more environmentally friendly than the next level of construction that would be required (i.e., rehabilitation and reconstruction).

The importance of this approach is significant. As roadway pavement conditions deteriorate, the cost to repair them increases exponentially. For example, it costs twelve times less to maintain a BMP pavement compared to a pavement that is at the end of its service life. Even a modest resurfacing is four times more expensive than maintenance of a pavement in the BMP condition. At a time when counties and cities are on fixed budgets, employing maintenance practices consistent with BMP results in treating four to twelve times more road area. By bringing the roads to BMP conditions, cities and counties will be able to maintain streets and roads at the most cost-effective level. It is a goal that is not only optimal, but also necessary.

Multiple funding scenarios were investigated to determine the impacts different funding levels would have on the condition of the roads. Five different scenarios were analyzed to determine the level of improvements achieved in ten years. The funding scenarios were as follows:

1. Existing funding levels of $1.33 billion/year – this is the current funding level available to cities and counties.
2. Additional $1 billion/year – this assumes an additional $1 billion is available through a yet to be determined revenue source.
3. Funding to maintain existing conditions ($3.23 billion/year) – this is the funding level required to maintain the pavement conditions at its current PCI of 66.
4. Efficiency measures to add $882 million/year – this assumes that new technologies to repair pavements may be implemented and which is estimated to save $882 million/year.
5. Funding required to achieve best management practices ($7.23 billion/year) – the optimal scenario is to bring all pavements into a state of good repair so that best management practices can prevail. After this, it will only require $2.4 billion a year to maintain the pavements at that level.

Three key performance measures were used to evaluate the impacts of each scenario and the results are summarized in the table below:

1. Pavement condition index
2. Percent of pavements in both good and failed condition
3. Cost savings achieved by not deferring repairs to a later date

Scenarios	Annual Budget ($B)	PCI in 2022	Condition Category	% Pavements in Failed Condition	% Pavements in Good Condition	Cost Savings* ($B)
1. Existing Funding	$1.33	53	At Risk	25%	46%	-
2A. No bond	$2.33	60	At Risk	23%	68%	$26
2B. Bond	$4.23/$1.33	63	At Risk	21%	71%	$34
3. Maintain PCI = 66	$3.23	66	At Risk	20%	78%	$44
4. Efficiency Savings	$4.11	71	Good	16%	83%	$59
5. Best Mgmt. Practices	$7.23	84	Excellent	0%	100%	$108

* Cost savings are compared to Scenario 1.

Essential Components

The transportation network also includes essential safety and traffic components such as curb ramps, sidewalks, storm drains, streetlights and signals. These components require $30.5 billion over the next 10 years, and an estimated shortfall of $21.8 billion.

Bridges

Local bridges are also an integral part of the local streets and roads infrastructure. There are 11,863 local bridges, and approximately $4.3 billion is needed to replace or rehabilitate them. There is an estimated shortfall of $1.3 billion.

Total Funding Shortfall

The table below shows the total funding shortfall of $82.2 billion over the next 10 years. For comparison, the 2008 and 2010 results are also included.

Summary of 10 Year Needs and Shortfall for 2008 through 2012($Billion)

Transportation Asset	Needs ($B)		2012		
	2008	2010	Needs	Funding	Shortfall
Pavement	$67.6	$70.5	$72.4	$13.3	$(59.1)
Essential Components	$32.1	$29.0	$30.5	$8.7	$(21.8)
Bridges	N/A	$3.3	$4.3	$3.0	$(1.3)
Totals	$99.7	$102.8	$107.2	$25.1	$(82.2)

What are the Solutions?

To bring the state's local street and road system to a best management practice level where the taxpayer's money can be spent cost effectively; we will need approximately $59.1 billion of additional funding for pavements alone and a total of $82.2 billion for a functioning transportation system over the next 10 years. The sooner this is accomplished, the less funding will be required in the future (only $2.4 billion/year will be needed to maintain the pavements after that).

If cities and counties do not get additional funding, the results will be disastrous for local streets and roads, and ultimately the entire transportation network, as all modes are interrelated. The fact that more than twice the current funding level is needed just to maintain the current conditions is alarming.

To bring the local system back into a cost-effective condition, thereby preserving the public's $189 billion pavement investment and stopping further costly deterioration, $8.2 billion annually in new funds are needed to stop the further decline and deterioration of the local street and road system. This is equivalent to a 56-cent per gallon gas tax increase.

The conclusions from this study are inescapable. Given existing funding levels available to cities and counties for maintaining the local system, California's local streets and roads will continue to deteriorate rapidly within the next 10 years. Unless this condition is addressed, costs to maintain the local system will only continue to grow, while the quality of California's local transportation network deteriorates.

It is imperative that cities and counties receive a stable and dedicated revenue stream for cost effective maintenance of the local system to avoid this crisis.

1. Introduction

California's 58 counties and 482 cities[1] own and maintain over 143,000 centerline-miles of local streets and roads[2]. This is an impressive 81 percent of the state's total publicly maintained centerline miles (see Figure 1.1 below). Conservatively, this network is valued at over $189 billion.

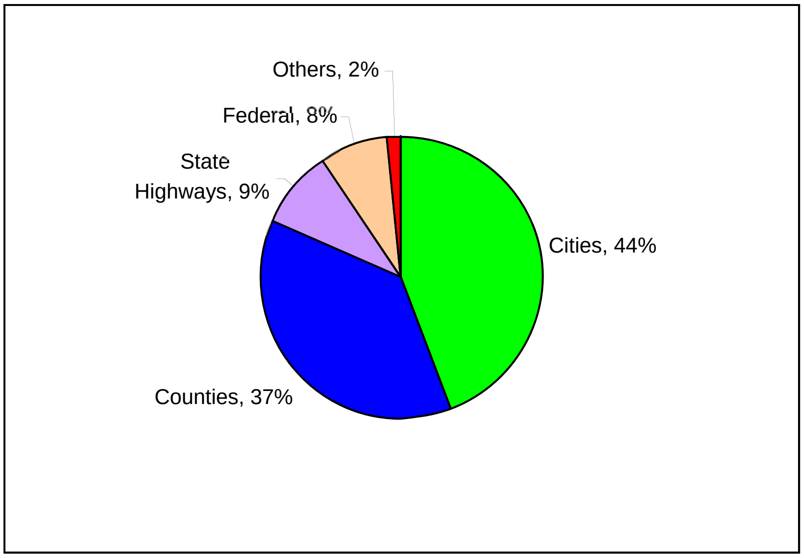


Figure 0.1 Breakdown of Maintained Road Centerline Miles by Agency[2]

Because lane-miles are more commonly used in pavement management analyses (the costs derived are based on areas, and lane-miles are a more accurate depiction of pavement areas), Table 1.1 shows the breakdown of lane-miles for local streets and roads by functional classification, as well as for unpaved roads. Major streets or roads are those that are classified as arterials or collectors, and local streets or roads are those that are classified as residentials and alleys. Unpaved roads are defined as those that have either dirt or gravel surfaces.

In addition, streets and roads are separated into urban and rural classifications. The distinction between urban and rural roads is defined by the U.S. Census Bureau: rural areas have population centers less than 5,000, or are areas with a population density below 1,000 persons per square mile. Urban areas have population centers with more than 5,000 people. However, an urbanized or rural area may or may not contain an incorporated city and the urban boundary does not necessarily follow city corporation lines. Ultimately, however, the decision to determine the miles in either category was left to the individual city or county.

[1] Four new Cities, Wildomar, Menifee, Eastvale and Jurupa Valley were incorporated after the original 2008 study. The first two were included in the 2010 updates, and all were included in the 2012 assessment. Note too that San Francisco is traditionally counted as both a city and a county, but for purposes of analysis, their data have been included as a city only.

[2] *2011 California Public Road Data – Statistical Information Derived from the Highway Performance Monitoring System*, State of California Department of Transportation, Division of Transportation System Information, October 2012. The total miles come from a combination of this reference and survey results.

Table 0.1 Breakdowns of Functional Classification & Unpaved Roads[2]

Lane-miles by Functional Class						
	Urban		Rural		Unpaved	Total
	Major	Local	Major	Local		
Cities	75,419	100,830	1,645	2,239	1,003	181,135
Counties	20,597	29,166	26,412	38,771	16,626	131,572
Totals	96,017	129,996	28,056	41,010	17,629	312,708
Note: San Francisco is included as a city only.						

From Table 1.1, it can be seen almost 77 percent of the total paved lane miles are in urban areas, with the remaining 23 percent in rural areas. It should also come as no surprise that more than 94 percent of rural roads belong to the counties. Conversely, 78 percent of urban roads belong to the cities. Finally, unpaved roads comprise approximately 5.6 percent of the total network, and over 94 percent of this belongs to the counties.

1.1 Study Objectives

In 2008, a study was conducted to assess the statewide needs for the local streets and roads network and the final report released in October 2009[3]. The intent of the 2008 study was to determine the funding required to maintain the local streets and roads system for the next 10 years, so that the information could be reported to the State Legislature and the California Transportation Commission (CTC), as well as other stakeholders.

The specific objectives of the 2008 study were summarized as a series of questions:

- What are the conditions of local streets and roads?
- What will it cost to bring them up to an acceptable condition?
- How much will it cost to maintain them in an acceptable condition for the next 10 years?
- Similarly, what are the needs for other essential components, such as safety, traffic and regulatory items?
- Is there a funding shortfall? If so, how much is it?
- What are the impacts of different funding scenarios?

[3] *California Statewide Local Streets & Roads Needs Assessment*, by Nichols Consulting Engineers, Chtd., October 2009.

In 2010, an update was performed and the objectives were essentially the same, with the addition of the last bullet to address different funding allocations. This was a result of the difficulties that the state faced with the state budget, where a potential deficit of more than $25 billion was projected for FY 2010-11.

This report is the culmination of the 2012 update, and in addition to addressing the same objectives above, also includes a discussion on funding scenarios for approximately 12,000 local bridges.

Finally, since the development of the pavement methodology to answer these questions was well documented in the 2008 study (in Appendix B), they have not been included in this 2012 update. Copies of both the 2008 and 2010 reports are available on www.SaveCaliforniaStreets.org.

1.2 Study Assumptions

As before, there were some important assumptions that were made during the analyses of the data received from cities and counties. Most are consistent with those used in the Caltrans 2011 State Highway Operation and Protection Program (SHOPP)[4]. The assumptions include (see Table 1.2):

- The analysis period used in this study is 10 years, which is consistent with the SHOPP.
- All numbers reported in this study are in constant 2012 dollars – this is consistent with the SHOPP.
- The pavement condition goal was to reach a condition where best management practices (BMP) can occur. This translates to a PCI in the low 80s (on a scale of 0 to 100, where zero is failed and 100 is excellent). Caltrans SHOPP defines performance goals quite differently, i.e., the goal is to reduce the percentage of distressed highways from 28 percent to 10 percent. This is further discussed in Section 4.6.
- It is assumed that no new streets or roads are added within the analysis period. In addition, capital improvement or expansion projects are not included, e.g. realignments, widening, grade separations etc. This is consistent with the SHOPP.
- The inclusion of safety, traffic and regulatory components of the roadway system such as sidewalks, ADA ramps, storm drains, etc. is consistent with the SHOPP. Bicycle and pedestrian facilities are also included.
- A detailed bridge needs assessment was included in this study, including the needs and the results of various funding scenarios.

1.3 Study Sponsors

This study was sponsored by the cities and counties of California and managed by the Metropolitan Transportation Commission (MTC). The Oversight Committee is composed of representatives from the following:

- League of California Cities (League)
- California State Association of Counties (CSAC)
- County Engineers Association of California (CEAC)
- California Regional Transportation Planning Agencies (RTPA)

[4] *Ten Year State Highway Operation & Protection Plan (FY 2012/13 to 2021/22)*, Caltrans, January 2011.

- California Rural Counties Task Force (RCTF)
- Metropolitan Transportation Commission (MTC)
- County of Los Angeles, Department of Public Works

Table 0.2 Summary of Assumptions Used in 2012 Study and SHOPP

Assumptions	2010 Study Update	Caltrans SHOPP
Analysis Period	10 years	10 years
Cost Basis	2012 dollars	2011 dollars
Goals	Best management practices (PCI = low 80's)	% of distressed pavements < 10%
Total Scenarios Evaluated	5	1
Capital Improvement Projects	No	Only related to operational improvement
Essential Components	Yes	Yes
Bridges	Yes	Yes

2. Pavement Needs Assessment

In this chapter, the methodology and assumptions used for the pavement needs assessment are discussed, and the results of our analyses presented. The data collection efforts are described in more detail in Appendix A.

2.1 Methodology and Assumptions

Since not all 540 cities and counties responded to the survey, a methodology had to be developed to estimate the pavement needs of the missing agencies. The following paragraphs describe in detail the methodology that was used in the study (note that this is consistent with the 2008 and 2010 studies).

2.1.1 Filling In the Gaps

Inventory Data

Briefly, this process was to determine the total miles (both centerline and lane-miles) and pavement areas, as this is crucial in estimating the pavement needs for an agency. Missing inventory data were populated based on the following rules:

- If no updated inventory data were provided, then the 2010 or 2008 survey data were used.
- If the inventory data provided was incomplete, Table 2.1 was used to populate the missing information. The average number of lanes and average lane width are summarized from agencies who submitted complete inventory data in the 2012 survey.

Table 2.1 Assumptions Used to Populate Missing Inventory Data

Functional Class	Average Number of Lanes	Average Lane Width (ft.)
Urban Major Roads	2.8	15.5
Urban Residential/Local Roads	2.1	15.5
Rural Major Roads	2	13.2
Rural Residential/Local Roads	2	11.7
Unpaved Roads	1.8	11.4

Pavement Condition Data

To assist those agencies who had no pavement condition data, the online survey provided a table with the average pavement condition index (PCI) collected in the 2010 study. They were then encouraged to look at the data from neighboring cities or counties to make their best estimate of the pavement condition in their agency.

The 2010 and 2012 surveys also asked for condition data for different functional classifications, and additional rules were developed to populate the missing data:

- If the PCI is provided for one but not the other functional classes, the same PCI was used for all functional classes.
- If no pavement condition data were provided in 2010 and 2012:
  - San Francisco Bay area agencies – data from the Metropolitan Transportation Commission (MTC) were used.
  - For all other agencies, their 2008 PCI was used, but we assumed a drop of 2 points. This drop is based on the PCI trend of the agencies that provided data in all three 2008, 2010 and 2012 surveys.

2.1.2 Pavement Needs Assessment Goal

The same needs assessment goal from the 2008 and 2010 studies were used in the 2012 update. To reiterate, the goal is for pavements to reach a condition where best management practices (BMP) can occur, so that only the most cost-effective pavement preservation treatments are needed. Other benefits such as a reduced impact to the public in terms of delays and environment (dust, noise, energy usage) would also be realized.

In short, the BMP goal is to reach a PCI in the low 80s and the elimination of the unfunded backlog. The deferred maintenance or "unfunded backlog" is defined as work that is needed, but is not funded. To perform these analyses, MTC's StreetSaver® pavement management system program was used. This program was selected because the analytical modules were able to perform the required analyses, and the default pavement performance curves were based on data from California cities and counties. This is described in detail in Appendix B of the 2008 report, which may be downloaded at www.SaveCaliforniaStreets.org.

Our goal is to bring streets and roads to a condition where best management practices (BMP) can occur.

2.1.3 Maintenance and Rehabilitation Treatment Types and Costs

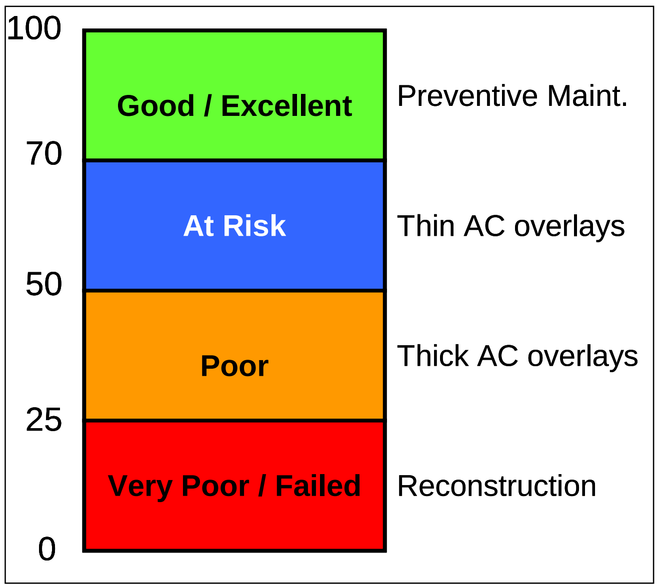
Assigning the appropriate maintenance and rehabilitation (M&R) treatment is a critical component of the needs assessment. It is important to know both the ***type*** of treatment, as well as ***when*** to apply it. This is typically described as a decision tree.

Figure 2.1 summarizes the types of treatments assigned in this study. Briefly, good to excellent pavements (PCI >70) are best suited for pavement preservation techniques, (e.g., preventive maintenance treatments such as chip seals or slurry seals). These are usually applied at intervals of five to seven years depending on the traffic volumes.

As pavements deteriorate, treatments that address structural adequacy are required. Between a PCI of 25 to 69, asphalt concrete (AC) overlays are usually applied at varying thicknesses. This may be accompanied by milling or recycling techniques.

Finally, when the pavement has failed (PCI<25), reconstruction is typically required. Note that if a pavement section has a PCI between 90 and 100, no treatment is applied. The descriptions used for each category are typical of most agencies, although there are many variations on this theme. For example, it is not unusual for local streets to have slightly lower thresholds indicating that they are held to lower condition standards. The PCI thresholds shown in Figure 2.1 are generally accepted industry standards.

Figure 2.1 PCI Thresholds & Treatments Assigned



Unit cost data from 211 agencies were summarized and averaged for the analysis (see Table 2.2). The range in costs for each treatment is for the different functional classes of pavements, i.e., major roads have a higher cost than local roads.

Table 2.2 Unit Costs Used for Different Treatments & Road Classifications

Classification	Unit Costs ($/square yard)			
	Preventive Maintenance	Thin AC Overlay	Thick AC Overlay	Reconstruction
Major Roads	$4.85	$18.82	$29.73	$68.48
Local Roads	$4.61	$18.04	$28.44	$60.31

It should be noted that the costs for preventive maintenance treatments (e.g., seals) increased significantly from 2008. This is attributed to the higher demand for seals in the past four years. There could be two reasons for this:

- The economic climate has forced many agencies to use less expensive treatments such as seals, when compared to overlays or reconstruction; and/or
- More agencies understand the advantages and cost-effectiveness of seals, and therefore their use is more widespread.

Interestingly, the cost for overlays and reconstruction actually declined in 2010 by approximately 5 percent for overlays, and as much as 30 percent for reconstruction. However, costs in 2012 showed small increases. Figures 2.2 and 2.3 illustrate the trends in the unit costs since 2008 for preventive maintenance and thin overlays, respectively.

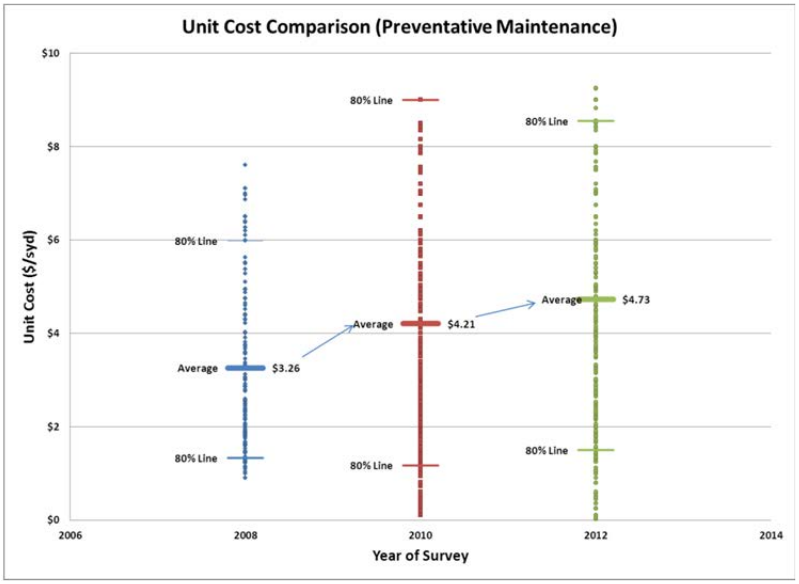


Figure 2.2 Unit Price Trends for Preventive Maintenance Treatments

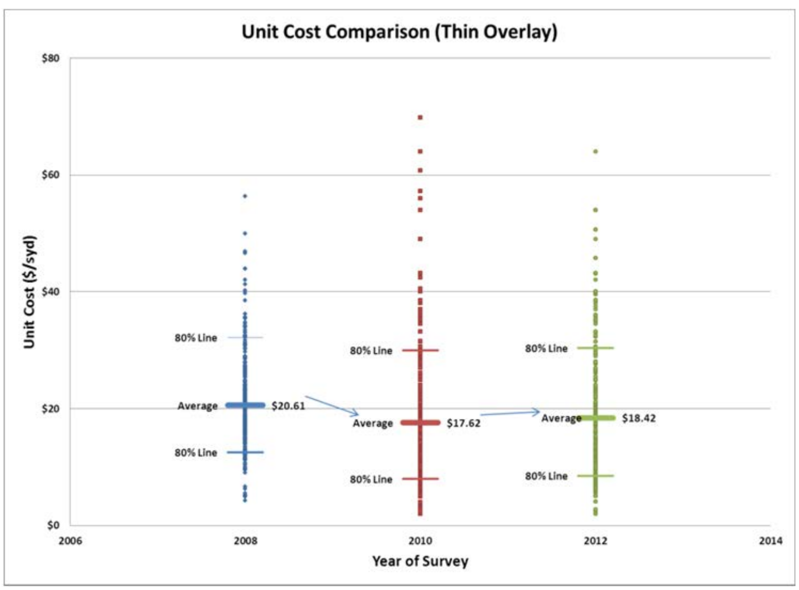


Figure 2.3 Unit Price Trends for Thin Overlays

These trends are reflected in the Asphalt Price Index[5] tracked by Caltrans (see Figure 2.4), which shows more than a 10-fold increase from 2000 to 2008, but then a drop of almost 50 percent in 2009 followed by increases in 2011 and 2012.

5 http://www.dot.ca.gov/hq/esc/oe/asphalt_index/astable.html

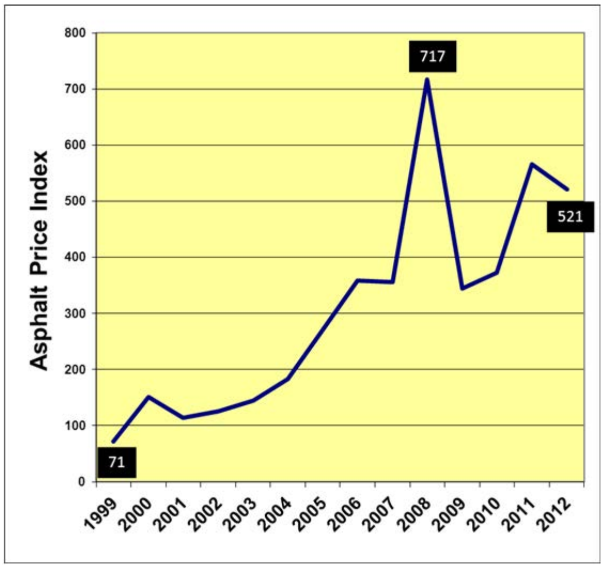


Figure 2.4 Caltrans Asphalt Price Index5

However, there is no expectation that the cost of road construction during the worst recession since the Great Depression will stay at this level for the next 10 years. Rather, most agencies have the opinion that this is a temporary situation. Given the volatility of crude petroleum prices in recent years, *it was decided that the 2008 unit costs for overlays and reconstruction would be used in this analysis.*

Finally, it should be noted that only asphalt concrete roads were considered in this analysis. The percentage of Portland cement concrete pavements was so small (less than 0.5 percent of the total network), that it was deemed not significant for this report.

2.1.4 Escalation Factors

As with the 2008 and 2010 studies, no escalation factors were used in this analysis. All numbers are in constant 2012 dollars, and this is consistent with the SHOPP as well as many Regional Transportation Plans (RTPs).

2.2 Average Network Condition

The average pavement condition index for streets and roads statewide dropped from 68 to 66. This rating is considered to be in the "at risk" category.

Based on the results of the surveys, the current (as of May 2012) pavement condition statewide is 66, a drop of approximately 2 points from 2008, when it was estimated to be 68. The average for Cities is 68 and that for Counties is 62. Table 2.3 includes the current pavement condition index (PCI) for each county (includes cities within the County). Again, this is based on a scale of 0 (failed) to 100 (excellent). This is weighted by the pavement area, i.e., longer roads have more weight than short roads when calculating the average PCI.

Table 2.3 Summary of PCI Data by County (including Cities) for 2008-2012

County (Cities Included)	Center Line Miles	Lane Miles	Area (sq. yd.)	Average Weighted PCI* 2008	2010	2012
Alameda County	3,534	7,982	81,700,384	66	67	68
Alpine County	135	270	2,029,409	40	45	45
Amador County	476	955	6,428,601	31	34	33
Butte County	1,782	3,643	32,578,860	70	67	65
Calaveras County	718	1,344	9,054,592	55	53	51
Colusa County	987	1,524	12,503,304	61	60	60
Contra Costa County	3,346	7,060	63,674,361	72	70	71
Del Norte County	334	675	5,545,540	70	68	64
El Dorado County	1,253	2,508	21,671,673	62	58	63
Fresno County	5,973	12,702	106,961,163	74	70	69
Glenn County	950	1,899	14,089,812	68	68	68
Humboldt County	1,476	2,931	24,138,809	61	56	64
Imperial County	3,000	6,087	45,427,410	74	72	57
Inyo County	1,134	1,652	13,789,051	75	57	60
Kern County	5,026	11,648	103,132,477	66	63	64
Kings County	1,328	2,796	20,026,009	63	62	62
Lake County	753	1,497	10,199,540	33	31	40
Lassen County	429	875	6,406,058	55	69	66
Los Angeles County	21,375	49,879	458,903,871	68	67	66
Madera County	1,822	3,680	23,490,290	48	48	47
Marin County	1,021	2,059	18,077,971	61	61	61
Mariposa County	1,122	561	3,949,440	53	44	44
Mendocino County	1,125	2,255	16,097,768	51	49	37
Merced County	2,330	4,954	37,182,870	57	58	58
Modoc County	1,512	3,034	18,066,419	42	40	56
Mono County	727	1,453	10,071,369	71	68	66
Monterey County	1,779	3,726	33,593,823	63	45	50
Napa County	716	1,489	12,453,529	53	60	59
Nevada County	798	1,617	10,438,504	72	71	72
Orange County	6,501	17,012	146,008,901	78	76	77
Placer County	1,983	4,192	34,161,920	79	77	71
Plumas County	704	1,409	11,409,902	71	66	66

County (Cities Included)	Center Line Miles	Lane Miles	Area (sq. yd.)	Average Weighted PCI* 2008	2010	2012
Riverside County	7,113	15,888	143,854,509	71	72	70
Sacramento County	5,042	11,264	95,668,492	68	66	64
San Benito County	411	833	5,547,794	68	66	66
San Bernardino County	8,823	20,554	171,322,286	72	70	70
San Diego County	8,134	20,258	179,755,199	74	69	67
San Francisco County	940	2,134	21,123,238	62	63	65
San Joaquin County	3,371	7,114	61,240,026	70	70	67
San Luis Obispo Co.	1,967	4,070	32,279,689	64	64	63
San Mateo County	1,872	3,912	33,486,613	69	70	71
Santa Barbara County	1,569	3,294	29,610,551	72	70	67
Santa Clara County	4,162	9,381	90,432,429	70	69	73
Santa Cruz County	856	1,752	13,764,053	52	48	48
Shasta County	1,687	3,479	26,243,076	64	67	57
Sierra County	499	1,001	8,010,229	73	71	71
Siskiyou County	1,495	3,005	20,340,302	57	57	57
Solano County	1,715	3,623	29,162,226	66	66	67
Sonoma County	2,373	4,960	39,517,285	53	50	50
Stanislaus County	2,718	5,899	47,866,381	60	51	52
Sutter County	1,029	2,106	15,865,482	73	56	56
Tehama County	1,197	2,401	15,834,143	69	65	65
Trinity County	916	1,608	12,529,435	52	50	50
Tulare County	3,957	8,181	60,632,842	66	68	68
Tuolumne County	533	1,229	16,984,138	62	62	62
Ventura County	2,440	5,353	47,701,134	64	66	69
Yolo County	1,400	2,538	21,752,974	69	67	63
Yuba County	724	1,504	12,862,583	74	56	56
TOTALS	143,092	312,708	2,666,650,735	68	66	66

* PCI is weighted by area.

From this table, we can see that the statewide ***weighted average*** PCI for all local streets and roads is 66. The PCI ranges from a high of 77 in Orange County to a low of 33 in Amador County. Again, it should be emphasized that the PCI reported above is only the ***weighted average*** for each county and ***includes*** the cities within the county. This means that Amador County may well have pavement sections that have a PCI of 100, although the average is 33.

The average PCI trend since 2008 tends to be downward, although some counties do show small improvements. This could be attributed to the better data collection (the quality of the pavement data collected in 2012 is significantly better than in 2008), better use of pavement preservation treatments, or the availability of additional funds such as local sales taxes or bonds.

In addition, Table 2.4 indicates that major streets or roads are in better condition than local roads. In fact, rural local roads have a significantly lower PCI of 56 than urban locals (PCI = 66).

Table 2.4 Average 2012 PCI by Type of Road

Type	Average 2012 PCI	
	Major	Local
Urban Streets	69	66
Rural Roads	66	56

As was discussed in the 2010 study, an average pavement condition of 66 is not especially good news. While it seems just a couple of points shy of the "good/excellent" category, it has significant implications for the future. Figure 2.5 illustrates the rapid pavement deterioration at this point in the pavement life cycle; if repairs are delayed by just a few years, the costs of the proper treatment may increase significantly, as much as ten times. The financial advantages of maintaining pavements in good condition are many, including saving the taxpayers' dollars with less disruption to the traveling public, as well as environmental benefits.

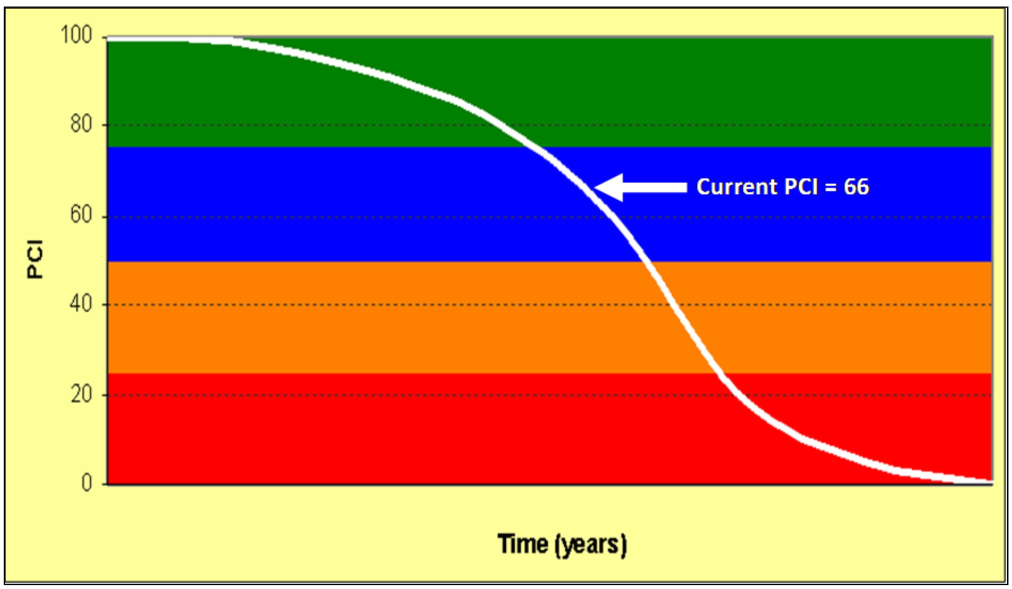


Figure 2.5 Generalized Pavement Life Cycle Curve

The factors that cause this rapid deterioration in pavement condition include:

- More traffic and heavier vehicles
- More transit and more frequent bus trips, including heavier buses
- Heavier and more garbage collection trucks (recycling and green waste trucks are new weekly additions to the traditional single garbage truck)
- More street sweeping for National Pollutant Discharge Elimination System (NPDES) requirements
- More freight and delivery trucks when the economy is thriving

Therefore, a PCI of 66 should be viewed with caution – it indicates that our local streets and roads are, as it were, poised on the edge of a cliff. Figure 2.6 is an example of a local street with an average condition of 66.

Figure 2.6 Example of Local Street with PCI = 66

Figure 2.7 shows the distribution of pavement conditions by county for both 2008 and 2012. As can be seen, a majority of the counties in the state have pavement conditions that are either "At Risk" (blue) or in "Poor" (red) condition. There has been an increase in the "blue" and "red" counties from 2008. Of the 58 counties, 49 are either "At Risk" or in "Poor" condition.

Only 56% of California's local streets and roads are in good condition.

Finally, despite their color, none of the "green" counties have a PCI greater than 77; in fact, the majority are in the low 70's, indicating that they will turn "blue" in a few year unless there are significant improvements in funding.

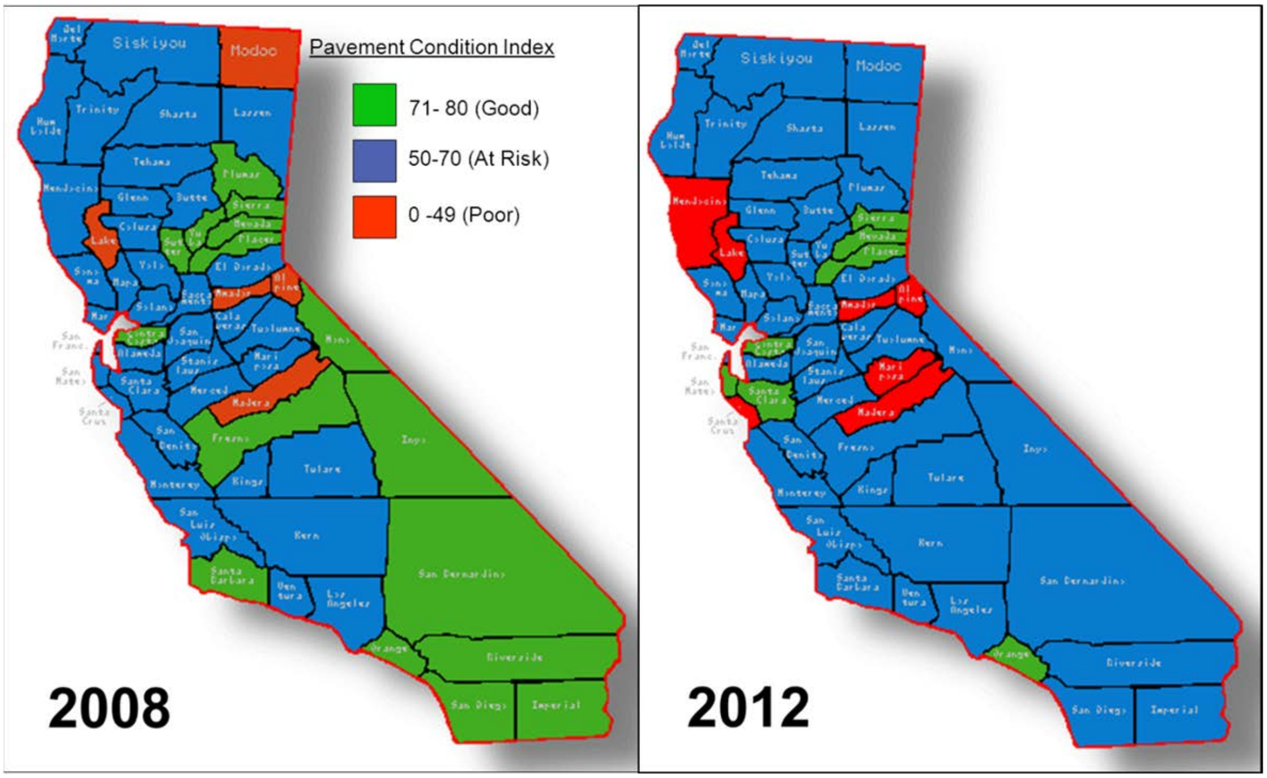


Figure 2.7 Average PCI by County for 2008 and 2012

2.3 Sustainable Pavement Practices

A new section on sustainable pavement practices was added to the survey in 2012. Cities and counties were asked what for information on any sustainable pavement practices they employed and the estimated cost savings, if any. The types of sustainable practices that were mentioned included:

- Reclaimed asphalt pavement (RAP)
- Cold-in-place recycling (CIR)
- Full depth reclamation (FDR)
- Pavement preservation strategies
- Warm mix asphalt
- Porous/pervious pavements
- Rubberized asphalt concrete (RAC)

Some sustainable pavement strategies may have cost savings up to 36%.

The responses were very encouraging; over 300 agencies responded with some information on the types of sustainable practices. Table 2.5 summarizes these responses; CIR, FDR and pavement preservation stratgies were reported to have the highest cost savings when compared with conventional treatments, in the order of 35 percent, 30 percent and 36 percent, respectively. Other sustainable treatments incurred additional costs, particularly rubberized AC (18 percent). The responses for warm mix asphalt and porous/pervious pavements were insufficient to draw any conlusions.

Table 2.5 Summary of Responses on Sustainable Pavement Strategies

Sustainable Pavement Strategies	No. of Agencies			Average % Savings	Average % Additional costs
	No. of Responses	Savings	Add'l Costs		
Recycled AC Pavement	66	28	5	-7%	-
Cold in place recycling	40	18	3	-35%	-
Full depth reclamation	61	16	5	-30%	-
Pavement preservation	145	33	18	-36%	-
Warm mix AC*	31	4	4	-	-
Rubberized AC	133	12	46	-	18%
Porous/pervious pavements*	14		5	-	-

* Insufficient data

The most common reasons cited for using sustainable practices were:

- Cost savings or cost effective
- Environmental benefits e.g. greenhouse gas reduction, reduces energy consumption, uses less natural resources, reduces landfills, reuses existing pavement materials, recycles tires etc. (Note that every lane-mile that is recycled in-place is equivalent to removing approximately 11 cars off the road.)
- Extends pavement life
- Positive community benefits e.g., quieter pavements

Every lane-mile that is recycled in-place is the equivalent of removing 11 cars off the road.

The most common reasons cited for not using sustainable practices were:

- Additional costs (mostly related to rubberized AC) or higher up-front costs
- More inspections required from agency staff
- Uncertainty over pavement performance
- Lack of experienced contractors to bid on projects
- Not all streets are good candidates for these treatments e.g. limited right of way

The fact that 60 percent of the cities and counties in California reported using some form of sustainable pavement practices was very encouraging, particularly when one considers the potential cost savings involved. This is clearly evidence of local agencies using newer technologies to "stretch the dollar".

2.4 Complete Streets

Similarly, a new section on"Complete Streets" was included in the survey. A complete streets policy ensures that transportation planners and engineers consistently design and operate the entire roadway with all users in mind - including bicyclists, public transportation vehicles and riders, and pedestrians of all ages and abilities. For purposes of this study, the focus is on bicycle and pedestrian facilities. Figure 2.8 is an example of a street that considers alternative modes of transportation i.e. pedestrians, bicyclists, buses and drivers, as well as curb ramps that are in compliance with the American Disabilities Act (ADA).

Figure 2.8 Example of Complete Streets Element

There were 267 responses to this section; 52 indicated that they had a complete streets policy, 152 indicated they had none, and 63 indicated they did not know. A few indicated that although they did not have a policy in place, there were plans to implement one in the near future, or that elements of a complete streets approach were considered in design regardless of any policy direction. Of the respondents who did have a policy in place, they indicated that the following elements were included:

- Bicycle facilities
- Pedestrian facilities
- Traffic signs
- Curb ramps
- Landscaping
- Medians
- Street lighting

On average, the respondents also indicated that 35 percent of their street and road network were eligible for including some of the above elements, and that the median additional costs were $50 per square yard. However, there was a large range in the cost data provided ($2/sy to $726/sy), so caution is required before using any of these costs.

Complete streets may have very different applications in a rural road vs. an urban street. Many rural roads are long, in remote areas and may have as little as 50 vehicles a day, with no pedestrians or bicyclists. Obviously, these will not be candidates for a complete street approach. The typical examples tend to be focused on urban roads, where the population density can support multiple modes of transportation.

2.5 Unfunded Mandates

A new section on "Unfunded Mandates" was also included in the survey. There were three primary unfunded mandates that cities and counties have to comply with:

1. American Disabilities Act of 1990 (ADA)
2. National Pollutant Discharge Elimination System (NPDES)
3. Traffic sign retroreflectivity

There were 135 responses on ADA, 127 on NPDES and 117 on traffic sign retroreflectivity. Of the respondents, they identified $1.45 billion in needs and only $782 million in funding, or approximately 54 percent (see Table 2.6). However, since many of the agencies did not track these costs separately, the data provided were identified as "guesses" or "informed estimates".

Table 2.6 Unfunded Mandates (Needs and Funding)

Unfunded Mandates	Needs ($M)	Funding ($M)	Shortfall ($M)
ADA	$529	$179	$(350)
NPDES	$816	$546	$(270)
Traffic Signs	$103	$58	$(45)
Totals	$1,447	$782	$(665)

2.6 Unpaved Roads

The needs assessment for unpaved roads is much simpler – 98 agencies reported data for a total unpaved road network of 9,841 centerline miles. The average cost of maintenance is $9,800 per centerline mile per year. Since pavement management software like StreetSaver® only analyzes paved roads, the average cost for unpaved roads from the survey was used for those agencies that did not report any funding needs.

This results in a total 10-year need of $964.4 million for the next 10 years.

2.7 Pavement Needs

The determination of pavement needs and unfunded backlog were described in detail in the 2008 report (see Appendix B[3] of 2008 report) and is therefore not duplicated here, but to briefly summarize, it requires four main elements for the analysis:

- Existing condition, i.e., PCI
- Appropriate treatment(s) to be applied from decision tree and unit costs
- Performance models
- Funding available during analysis period

The calculation of the pavement needs is conceptually quite simple. Once the PCI of a pavement section is known, a treatment and unit cost can be applied. This is performed for all sections within the 10-year analysis period. A section may receive multiple treatments within this time period, e.g., Walnut Avenue may be overlaid in Year 1, and then slurried in Year 5 and again in Year 10.

As before, the deferred maintenance or "unfunded backlog" is defined as work that is needed, but is not funded. It is possible to fully fund ***all*** the needs in the first year, thereby reducing the backlog to zero. However, the funding constraint for the scenario is to achieve our BMP goal within 10 years. Assuming a constant annual funding level for each scenario, the backlog will gradually decrease to zero by the end of year 10.

The results are summarized in Table 2.7 and indicate that $72.4 billion is required to achieve the BMP goals in 10 years. Again, this is in constant 2012 dollars. Detailed results by county are included in Appendix B.

Table 2.7 Cumulative Pavement Needs

Cumulative Needs (2012 dollars)		
Year No.	Year	Reach BMP Goal in 10 Years ($ Billion)
1	2013	$7.2
2	2014	$14.5
3	2015	$21.7
4	2016	$29.0
5	2017	$36.2
6	2018	$43.5
7	2019	$50.7
8	2020	$58.0
9	2021	$65.2
10	2022	$72.4

Pavement needs have increased to $72.4 billion.

In 2010, the total 10-year need was $70.5 billion, so this is an increase of $1.9 billion or approximately 2.7 percent.

3. Essential Components' Needs Assessment

The analyses for the essential components (i.e., safety, traffic and regulatory elements) are quite different from those for the pavements. In 2008, a regression equation was developed to determine first the replacement costs, and from that, the ten year needs were calculated. For 2012, the regression equation was re-evaluated and a minor adjustments made, which are discussed in more detail below.

3.1 Data Collection

A total of 341 survey responses were received compared to 188 in 2008 and 296 in 2010. This was a significant improvement. To recap, agencies were asked to provide specific information on the inventory and replacement costs for the following twelve asset categories:

Asset Category	Essential Components
1	Storm Drains
2	Curb and gutter
3	Sidewalk (public)
4	Curb ramps
5	Traffic signals
6	Street Lights
7	Sounds Walls/Retaining walls
8	Traffic signs
9	Other elements e.g. manholes, inlets, culverts, pump stations etc.
10	NPDES (addressed through the case studies)
11	Other ADA compliance needs
12	Other physical assets or expenditures

In the 2008 analysis, only the first eight categories were included because we had little or no data on the last four categories. In the 2010 update, significantly more data on the last four categories were received, so our approach was modified to address them. Essentially, we used the model from 2008 to determine the needs of the first eight categories, and then added the needs of the remaining four categories as a percentage.

3.2 Model Verification

The regression model developed in 2008 for the replacement cost of the **first eight categories** was:

$$\ln Cost = 17.9 + 0.00189\ Total\ Miles - 2.09\ Type\_Rural + 0.682\ Climate\_Central$$

where:

Cost = total replacement cost, dollars

Total miles = total centerline miles of roads or streets
Type_Rural = indicator variable and is equal to 1 if agency is rural, 0 otherwise
Climate_Central = indicator variable and is equal to 1 if agency is along the central coast, south coast or inland valley

As part of the calculations, we first wanted to verify that the model was still valid. The first step was to compare the "actual" replacement costs reported by the survey responses to that "predicted" by the model. The results are shown below in Figure 3.1, where the cumulative replacement cost is plotted against the centerline miles for each agency. The blue portion indicates the actual replacement costs reported from the survey, and the tan line is the predicted costs. As can be seen, the "predicted" costs begin to deviate significantly from the "actual" costs when the size of an agency approaches 1900 centerline miles. In other words, the model provides a reasonable prediction as long as the agency has less than 1900 miles.

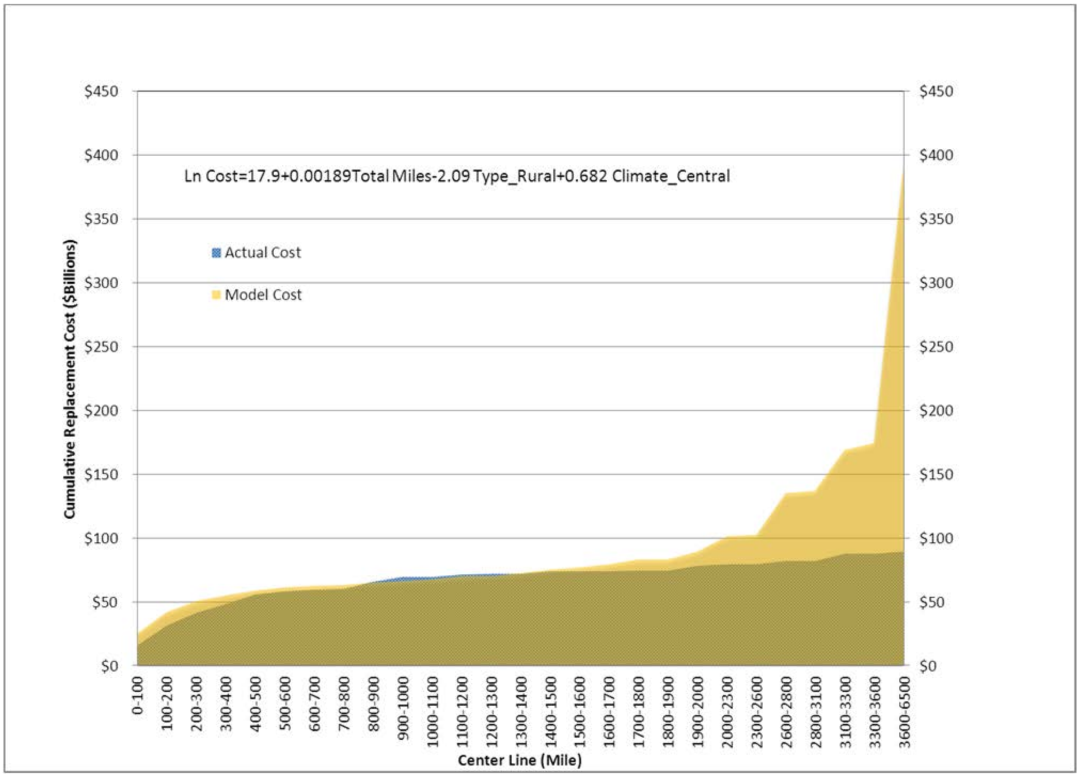


Figure 3.1 Comparisons of Actual and Predicted Replacement Costs (2008 Model)

When we consider that the original data set used to develop the model was limited (less than 60 agencies), this was not surprising. Therefore, the 2012 data was used to derive an improved model. The new regression equation is:

$$\text{Ln Cost}=15.0+0.726\ \text{Total Miles}^{1/3} - 0.00268\ \text{Total Miles} -2.13\ \text{Type\_Rural} + 0.329\ \text{Climate\_Central} + 3.5\ \text{Large}$$

Note that a new variable is added, for large agencies with network greater than 1900 miles. Using this model, Figure 3.2 shows the comparisons between "actual" and "predicted" replacement costs. As can be seen, the predicted costs for the large agencies now closely match the actual costs. The R^2 was 0.51, which is an improvement over the 2008 model.

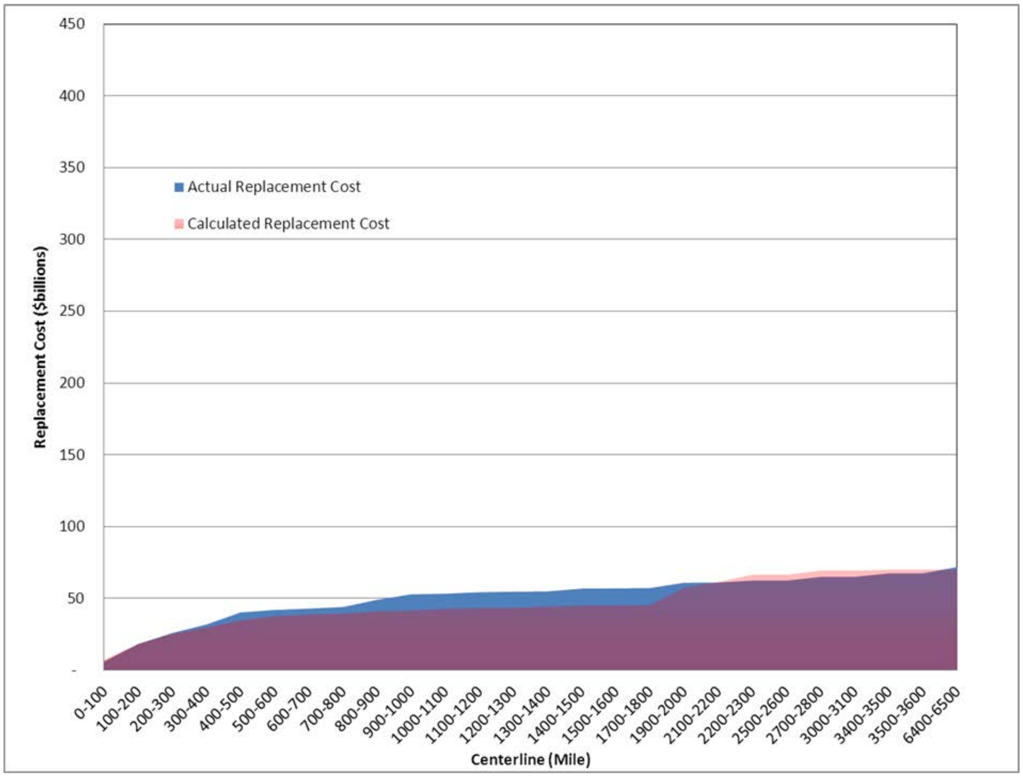


Figure 3.2 Comparisons of Actual and Predicted Replacement Costs (2012 Model)

3.3 Determination of Essential Components' Needs

The revised or new regression model estimates the total replacement cost for only the first eight categories. To estimate the needs, this cost needs to be converted to an annual amount based on the estimated service life of the different non-pavement assets. This procedure was described in detail in Appendix D of the 2008 report and has not been duplicated here.

The 10-year needs figure was estimated to be $30.5 billion, which is an increase from the $29.1 billion reported in 2010.

The funding needs for essential components is $30.5 billion.

4. Funding Analyses

4.1 Pavement Revenue Sources

The online survey also asked agencies to provide both their revenue sources and pavement expenditures for FY 2011-12, FY 2012-13, as well as estimating an annual average for future years. Only 238 agencies responded with financial data this year, compared to 300 in 2010, and only 137 in 2008. Although it was a disappointment to see this decrease in responses, nonetheless, valuable data were gathered.

As before, cities and counties identified a myriad of sources of funds for their pavement expenditures, broadly categorized into federal, state, or local. For local funds alone, more than a hundred different sources were identified. They included the following examples (this is by no means an exhaustive list):

Federal Funding Sources

- American Recovery and Reinvestment Act (ARRA)Stimulus Funds
- Community Development Block Grants (CDBG)
- Congestion Mitigation & Air Quality Improvement (CMAQ)
- Forest Reserve
- Hazard Elimination Safety (HES)
- High Risk Rural Roads (HR3)
- Highway Safety Improvement Program (HSIP)
- Regional Surface Transportation Program (RSTP)
- Safe Routes to School (SRTS)
- Transportation Enhancement Activities (TEA)
- Others such as emergency relief

State Funding Sources

- Bicycle Transportation Account (BTA)
- Gas taxes (Highway User Tax Account or HUTA)
- Proposition 1B
- Proposition 42/AB 2928
- State Transportation Improvement Program (STIP)
- AB 2766 (vehicle surcharge)
- Safe Routes to School (SR2S)
- AB 1546 Vehicle License Fees (VLF)
- CalRecycle grants
- State Local Partnership Program (SLPP)
- State Water Resource Control Board
- Traffic Congestion Relief (TCRP)
- Transportation Development Act (TDA)

- Traffic Safety Fund
- Transportation Uniform Mitigation Fee (TUMF)

Local Funding Sources

- Development Impact Fees
- General funds
- Local sales taxes
- Various assessment districts – lighting
- Redevelopment
- Traffic impact fees
- Traffic safety/circulation fees
- Utilities
- Transportation mitigation fees
- Parking and various permit fees
- Flood Control Districts
- Enterprise Funds (solid waste and water)
- Investment earnings
- Parcel taxes

Table 4.1 summarizes the total pavement funding available as well as by the percentage of funding sources from the different categories for FY 2008-09 to FY 2011-12 and the estimated funds available for future years. The breakdown is similar to the results from the 2010 study.

Table 4.1 Funding Sources for Pavements

	2008/09	2009/10	2010/11	2011/12	Future
Pavement Funding ($M)	$1,453	$1,571	$1,557	$1,530	$1,331
Federal	10%	23%	18%	16%	10%
State	62%	49%	53%	53%	59%
Local	28%	27%	29%	30%	31%

Cities and counties receive almost 60% of their funding from the State.

As before, the important item to note is that cities and counties do not rely heavily on federal funds, with the exception of ARRA in FY 2009/10 and 2010/11. Rather, state and local funds typically make up almost 90 percent of pavement funding, with state funds as the predominant source at 59 percent.

The Highway User Tax Account (HUTA), more commonly known as the gas tax, is by far the single largest funding source for cities and counties. Table 4.2 shows an increasing dependence on a declining revenue source. Part of this is due to declining gas consumption because of more gas-efficient and electric vehicles, and partly this is also due to the additional responsibilities for most cities and counties e.g. compliance with the American Disabilities Act (ADA) in the form or curb ramps and sidewalk, which reduces the amount of funding available for pavements.

Table 4.2 Gas Tax Trends for Pavements

	2008/09	2009/10	2010/11	2011/12	Future
Total Gas Tax ($M)	$1,115	$911	$861	$907	$1,071
% of State funding	66%	69%	75%	78%	91%
% of total funding	41%	34%	40%	41%	53%

Traditionally, cities and some counties have been able to rely on the General Fund for pavement funding. However, as Table 4.3 illustrates, the number of agencies who receive General Funds is markedly declining. Given the economic climate, it is expected that this trend will continue in the near future.

Table 4.3 General Fund for Pavement Funding

	2008/09	2009/10	2010/11	2011/12	Future
Total General Fund ($M)	$201	$120	$175	$168	$109
# of agencies	132	62	77	72	40
% of local funding	27%	16%	28%	25%	17%
% of total funding	7%	4%	8%	8%	5%

Of final interest is the trend in local sales tax measures that have passed. Table 4.4 shows an increasing reliance on the revenues from this source. Although it was only 10 percent of total pavement revenues in the previous two years, that is expected to jump to 16 percent beginning in FY 2012-13.

Table 4.4 Local Sales Tax Trends

	2008/09	2009/10	2010/11	2011/12	Future
Total Sales Tax ($M)	$285	$258	$256	$279	$316
% of local funding	38%	35%	41%	42%	51%
% of total funding	10%	10%	12%	13%	16%

4.2 Pavement Expenditures

The survey also asked for a breakdown of pavement expenditures in four categories:

- Preventive maintenance, such as slurry seals
- Rehabilitation and reconstruction, such as overlays
- Other pavement related activities such as curbs and gutters
- Operations and maintenance

Table 4.5 shows the breakdown in extrapolated pavement expenditures for cities, counties and cities/counties combined. These were consistent for all the years reported. Encouragingly, approximately 17 percent of future pavement expenditures are for preventive maintenance, which indicates that many agencies are cognizant of the need to preserve pavements. One category, “Operations and maintenance” are expenditures that are related to the pavements, such as filling potholes, sealing cracks, street sweeping etc. This category is expected to grow in the future due to new regulatory requirements such as street sweeping to comply with NPDES requirements, tree trimming, complying with new traffic sign retroreflectivity standards, upgrading curb ramps in compliance with the American Disabilities Act (ADA) etc.

Table 4.5 Breakdown of Pavement Expenditures ($M)

Repair Type	2008/09	2009/10	2010/11	2011/12	Future
Preventive maintenance	$394	$375	$273	$273	$234
Rehabilitation & reconstruction	$1,224	$1,400	$817	$794	$542
Other	$200	$172	$84	$82	$78
Operations & maintenance	$573	$543	$383	$381	$477
Totals	$2,391	$2,489	$1,557	$1,530	$1,331

Cities and counties are estimated to spend $1.33 billion annually on pavements. This is only 0.7% of the total invested in the pavement network.

On average, anticipated pavement expenditures for the next ten years are expected to be **$5,711/lane-mile for counties** and **$7,400/lane-mile for cities.** The resulting total pavement expenditures for all 540 cities and counties were therefore estimated to be $1.331 billion annually. To put this funding level in perspective, $1.33 billion/year is only 0.7 percent of the total investment in the pavement network, which is estimated to be $189 billion.

4.3 Essential Components' Revenue Sources

Similarly to the analysis in Section 4.1, the revenue sources for the essential components is shown in Table 4.6 below. Again, federal funds have a small contribution to the cities and counties, in the order of 16 percent. However, unlike pavements, local sources now account for almost 50 percent of total funding, with state sources only accounting for 37 percent.

Table 4.6 Funding Sources for Essential Components ($M)

Funding type	2010/11	2011/12	Future
Funding Available ($M)	$885	$903	$873
Federal	16%	16%	16%
State	31%	31%	37%
Local	53%	53%	47%

Since local revenues form the majority of the funding, Table 4.7 explores the four main funding sources: general funds, development fund, local sales taxes and other. In the last category are mostly stormwater, sanitary, NPDES related sources. Again, the overall trend shows significantly declining revenues.

Table 4.7 Local Revenue Sources for Essential Components ($M)

Funding type	2010/11	2011/12	Future
Sales Tax	$53	$54	$38
General Fund	$49	$58	$13
Development Impact Fees	$16	$18	$3
Other	$117	$120	$77
Totals	$235	$250	$132

4.4 Essential Components' Expenditures

Table 4.8 details the expenditures by category. Storm drains and traffic signals are the largest components. As was noted in previous tables, expenditures are projected to decline in future years.

Table 4.8 Breakdown of Expenditures for Essential Components

Essential Components	Annual Expenditures ($M)			% of total
	2010/11	2011/12	Future	
Storm Drains	$224	$243	$202	23%
Curb and Gutter	$44	$47	$54	6%
Sidewalk (public)	$118	$117	$65	7%
Other Pedestrian Facilities	$12	$13	$13	2%
Class 1 Bicycle Path	$14	$25	$16	2%
Other Bicycle Facilities	$16	$13	$12	1%
Curb Ramps	$51	$51	$33	4%
Traffic Signals	$232	$240	$180	21%
Street Lights	$104	$108	$131	15%
Sound/Retaining Walls	$9	$8	$9	1%
Traffic Signs	$54	$54	$71	8%
Other	$62	$82	$87	10%
Totals	$940	$1,001	$874	100%

Cities and counties are estimated to spend almost $874 million annually on essential components.

On average, anticipated expenditures for essential components over the next ten years are expected to be $1,682/lane-mile for counties and $3,418/lane-mile for cities. The resulting total expenditures for all 540 cities and counties were therefore estimated to be $874 million annually.

4.5 Funding Shortfalls

One of the primary objectives of this study was to determine if a funding shortfall existed for the next ten years, and if so, what that shortfall was. Chapters 2 and 3 described the analysis to determine the funding needs for both the pavement and essential components, respectively. The preceding sections of this chapter analyzed the revenues and expenditures as well.

Table 4.9 summarizes the results of all the preceding analyses and determines the funding shortfall to be $80.9 billion. This does not include any NPDES costs, since it was not possible to determine what these statewide impacts were.

Table 4.9 Summary of 10 Year Needs & Shortfall (2012 $ Billion)

Transportation Asset	Needs ($B)			Funding ($B)	2012 Shortfall
	2008	2010	2012		
Pavement	$67.6	$70.5	$72.4	$13.3	$(59.1)
Essential Components	$32.1	$29.0	$30.5	$8.7	$(21.8)
Totals	$99.7	$99.5	$102.9	$22.1	$(80.9)

In the 2010 study, the funding shortfall identified was $78.6 billion, so this is an increase of $2.3 billion, or approximately 3 percent.

The shortfall for local streets and roads is estimated at $80.9 billion!

4.6 Pavement Funding Scenarios

Since 2008, California, together with the rest of the nation, has faced severe economic challenges, with reductions in revenues, multi-billion deficits and a high unemployment rate. This has impacted transportation funding accordingly, with reductions in gas taxes, the loss of redevelopment funds and a general decrease in sales taxes as well as contributions from the General Fund. Although Proposition 30 (which recently passed in the November 2012 General Election) is expected to stabilize state funding, the funding outlook for local streets and roads continues to be grim. The preceding sections describe a general declining trend in funding, yet the needs continue to increase.

Over the past four years, the results of the 2008 study have helped educate policy makers and prevented severe cuts to road funding. To further assist policy makers on how potential cuts will affect pavement conditions, this update included the results of five different funding scenarios with variations:

1. Existing funding
2. Passage of a voter's initiative that adds $1 billion annually
    a. No bond
    b. Assumes bond so that funding is available in first five years
3. Funding to maintain current pavement condition at PCI = 66
4. Efficiency Cost Savings
5. Achieve best management practices (BMP) in ten years

Scenario 1: Existing Funding ($1.33 billion/year)

In this scenario, the most cost-effective treatments are funded first, and these are typically preventive maintenance or preservation strategies, such as seals. This approach generally treats a larger percent of pavement network resulting in optimizing the use of limited funds. Therefore, at the existing funding level of $1.33 billion/year, the pavement condition is expected to deteriorate to 53 by 2022, and the unfunded backlog will increase by more than 50 percent to $66 billion. Again, these are in constant 2012 dollars. Figure 4.1 graphically illustrates these two trends.

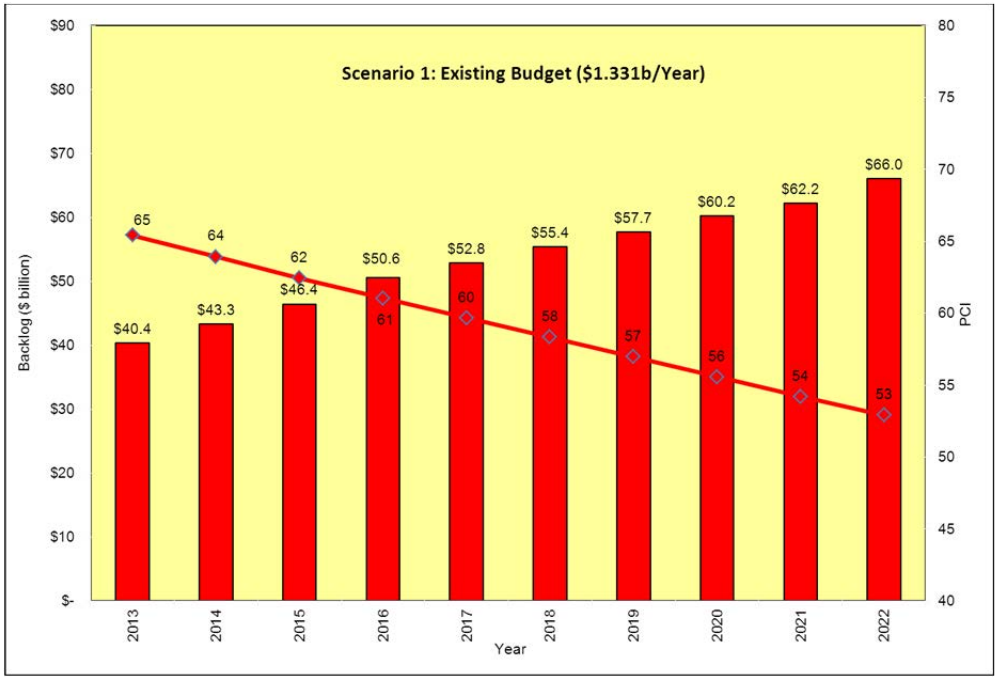


Figure 4.1 Results of Scenario 1: Existing Budget ($1.33 billion/year)

Scenario 2: Passage of Voter's Initiative (Adds $1 billion/year)

There are current discussions among various stakeholders about putting a measure on the ballot in the near future to raise additional transportation revenues. One such group is Transportation California, which is a coalition of various industry and labor groups interested in maintaining and improving the state's transportation infrastructure. Although no specific strategies have been finalized, it was assumed that up to $1 billion/year would be available to local streets and roads for the purposes of this study. Two variations were assumed:

a. The total funding available will be $2.33 billion/year i.e. the existing $1.33 billion/year plus an additional $1 billion/year.
b. The additional $1 billion/year would be used to issue bonds, so that the money could be "front-loaded" into the first five years. After removing the expenses of issuing the bond, it was assumed that an additional $2.9 billion/year would be available in the first five years, and then the funding level reverts to $1.33 billion/year.

In Scenario 2A, the funding level is $2.33 billion/year. The pavement condition is expected to deteriorate to 60 by 2022. The unfunded backlog will increase to $50 billion (see Figure 4.2).

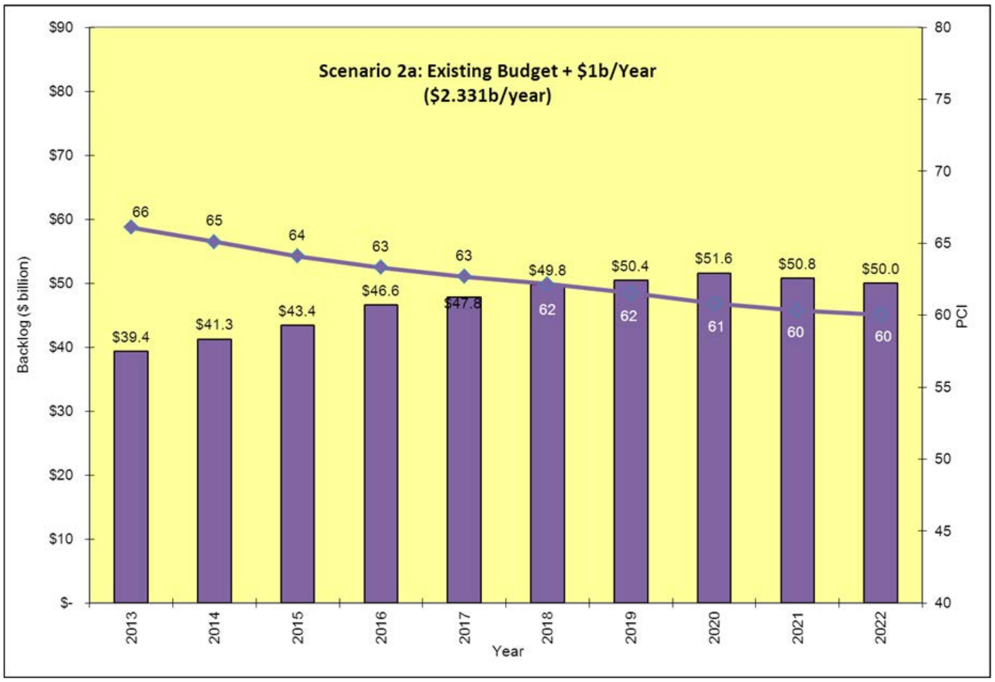


Figure 4.2 Results of Scenario 2A ($2.33 billion/year)

In Scenario 2B, the funding level is $4.23 billion/year for the first five years, and then it reverts to $1.33billion/year for the next five years. This is clearly an improvement over Scenario 2A. The PCI actually increases slightly to 69 in the first five years before dropping to 63 by 2022. In addition, the unfunded backlog is only $45.5 billion by 2022 (see Figure 4.3).

Scenario 3: Maintain PCI at 66 ($3.228 billion/year)

In order to maintain the pavement condition and unfunded backlog at existing conditions (i.e., PCI = 66) an annual funding level of $3.228 billion is required (see Figure 4.4). This funding level is almost 2½ times the current funding level of $1.33 billion/year.

Scenario 4: Efficiency Cost Savings Scenario ($4.11 billion/year)

In this scenario, it was assumed that cost savings could be achieved if cities and counties were to employ recycling techniques as part of their rehabilitation and reconstruction treatments. Examples of such techniques include cold-in-place recycling (CIR), and full-depth reclamation (FDR), where cost savings over conventional techniques range from 25% to 30%. It was assumed that half the streets and roads would be eligible for these cost savings (not all streets are eligible for various reasons such as shallow utilities, geometric factors, inadequate pavement sections etc.). This results in an additional $882 million/year available for use on additional streets and roads.

Scenario 3 was used as the baseline i.e. add $882 million to $3.228 billion, which results in $4.11 billion/year. The results are shown in Figure 4.5 and they are significant; the PCI increases to 71 by 2022, and the unfunded backlog drops to $30.2 billion. This is the first scenario where we can see improvements to the local streets and roads system.

An additional benefit to using CIR or FDR technologies is that it can result in the equivalent of as many as 34,000 cars removed from roads!

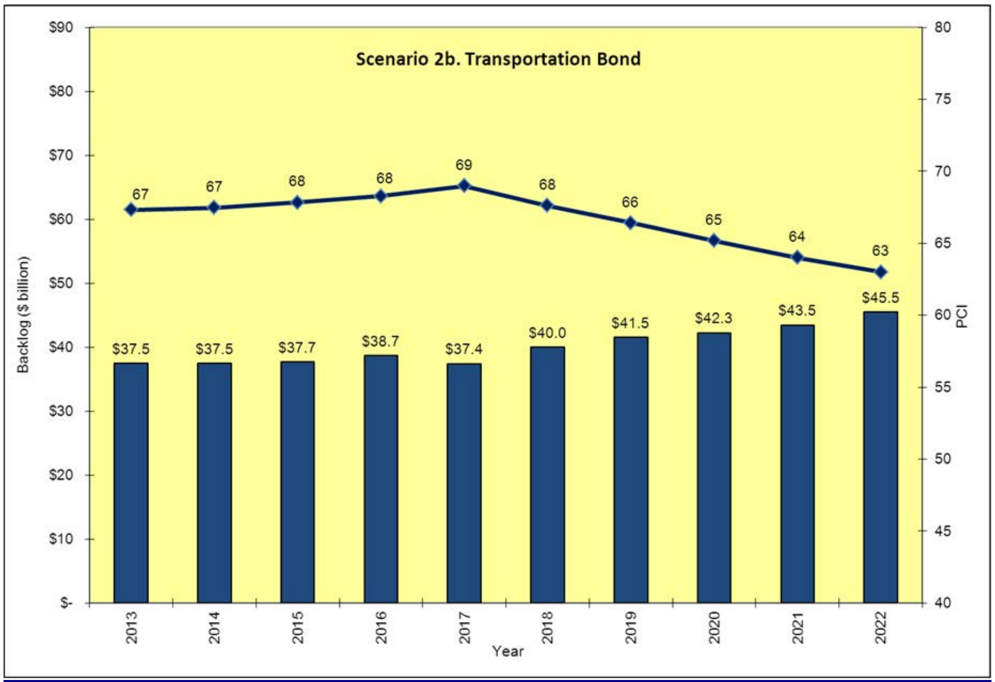


Figure 4.3 Results of Scenario 2B ($4.23billion/year for first five years)

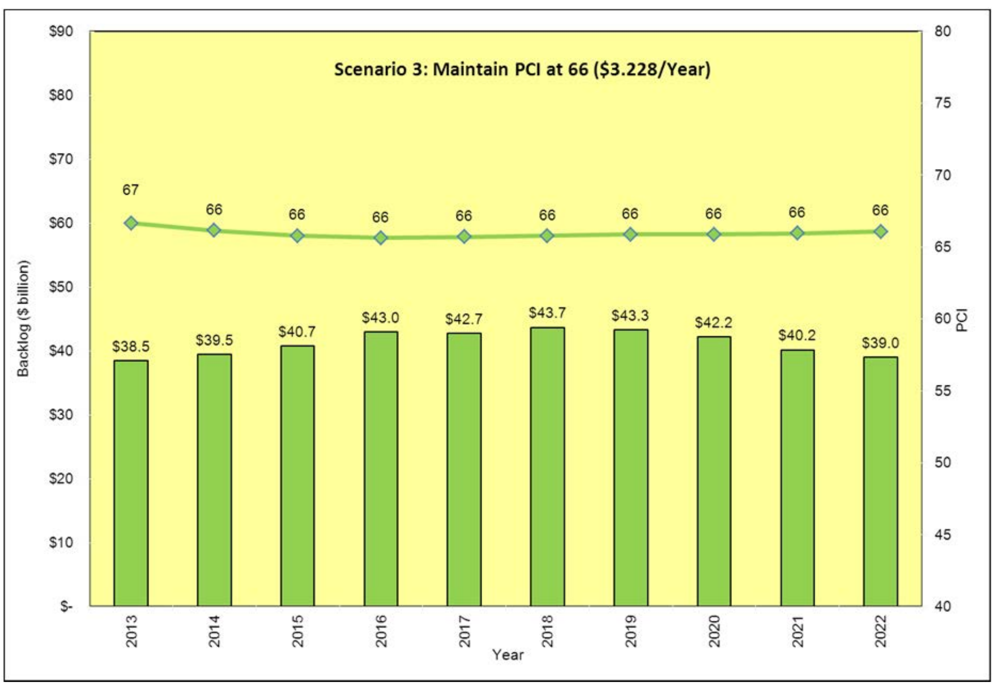


Figure 4.4 Results of Scenario 3 (Maintain PCI = 66; $3.228b billion/year)

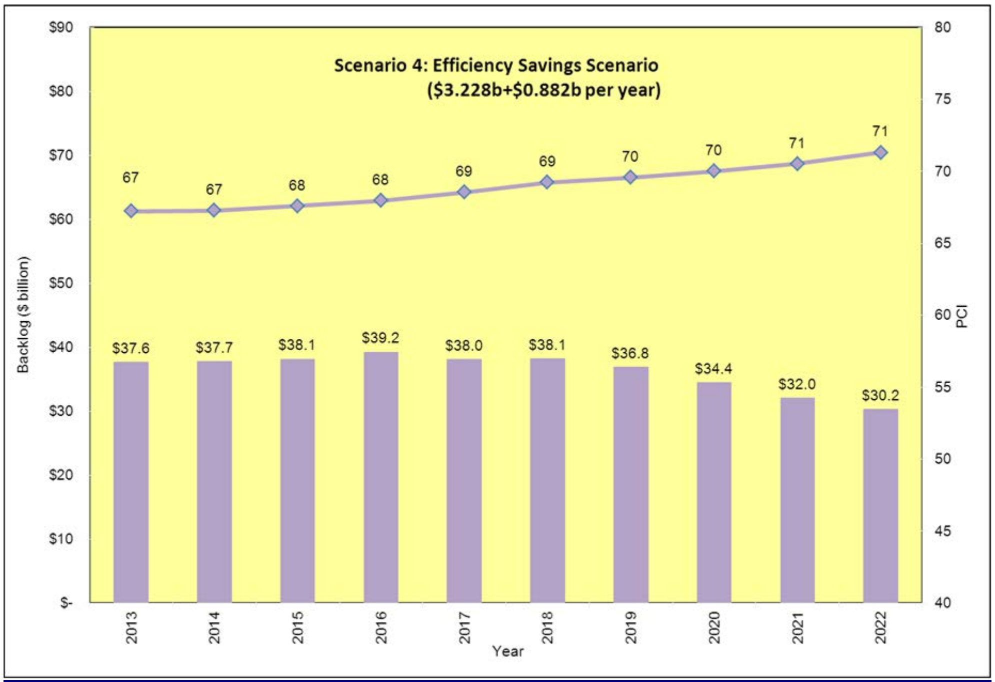


Figure 4.5 Results of Scenario 4 (Efficiency Cost Savings - $4.11 billion/year)

Scenario 5: Reach Best Management Practices ($7.244 billion/year)

One of the objectives of this study was to determine what funding level would be required to reach a pavement condition where best management practices can be applied. This occurs when the PCI reaches an optimal level in the low to mid 80's, and the unfunded backlog has been eliminated.

For this scenario, $7.244 billion/year is required to achieve this level (see Figure 4.6). The PCI will reach 84 by 2022 and the unfunded backlog is eliminated. Once eliminated, the cost of maintenance thereafter is significantly lower, requiring approximately $2.4 billion a year.

Other Perfomance Measures

Although both PCI and the unfunded backlog are common performance measure for cities and counties, there are others that may be used. One such measure is the percentage of pavement area in different condition categories. Table 4.10 illustrates the breakdown in pavement area for each funding scenario.

A quarter of California's streets will be in failed condition by 2022 under existing funding levels.

The biggest factor that jumps out is that the percentage of pavements in failed condition today is estimated to be approximately 6.6 percent; however, under Scenarios 1 to 3, this will grow to between 20.1 and 25.3 percent by 2022. Or to be blunt, a quarter of local streets and roads will be considered "failed" by 2022 under existing funding levels. The photos are examples of "failed" local streets.

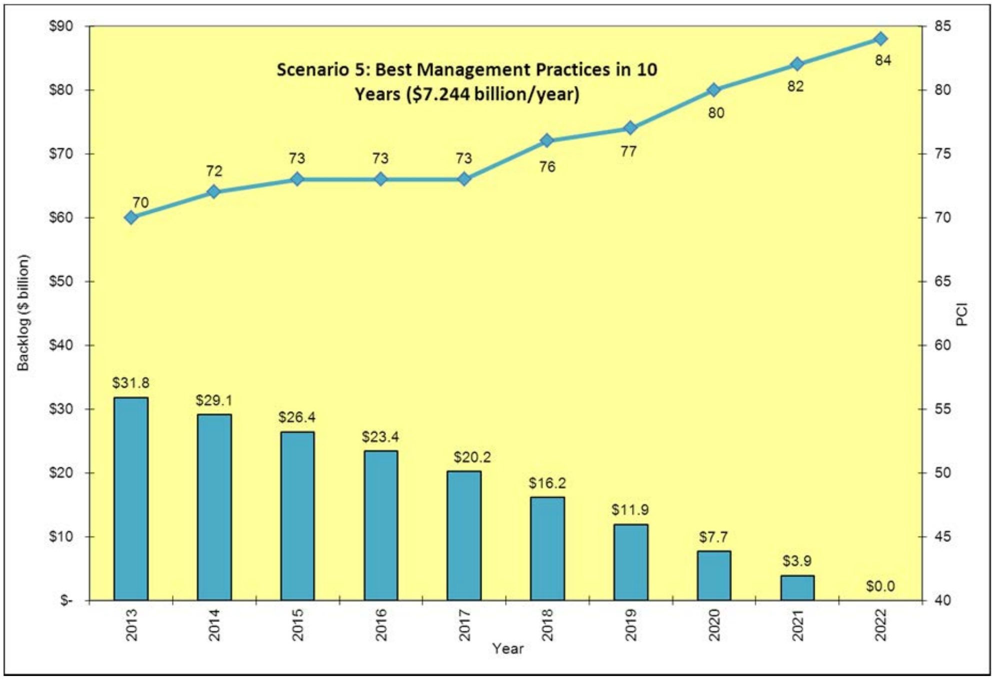


Figure 4.6 Results of Scenario 5 (BMP in 10 years - $7.244 billion/year)

Table 4.10 Percent of Area by Condition Category in 2022 for Each Scenario

Condition Category	Current Breakdown (2012)	Scenario 1: Existing Budget ($1.33b/yr)	Scenario 2A: No Bond ($2.33b/yr)	Scenario 2B: Transportation Bond ($4.23b/yr for 5 yrs then $1.33b/yr for 5 yrs)	Scenario 3: Maintain PCI at 66 ($3.23b/yr)	Scenario 4: Efficiency Cost Savings ($4.11b/yr)	Scenario 5: BMP in 10 Years ($7.24b/yr)
PCI 70-100 (Good to Excellent)	56.0%	45.8%	67.8%	70.7%	78.0%	83.2%	100.0%
PCI 50-69 (At Risk)	21.6%	16.8%	1.4%	3.9%	0.0%	0.0%	0.0%
PCI 25-49 (Poor)	15.8%	12.1%	8.0%	4.3%	1.9%	0.5%	0.0%
PCI 0-24 (Failed)	6.6%	25.3%	22.8%	21.1%	20.1%	16.3%	0.0%
Totals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Another trend of note is that while Scenario 3 maintains the existing condition and unfunded backlog, there is still a significant growth in the percentage of pavements that are “failed” (from 6.6 percent to 20.1 percent). The good news is that the preservation strategies will also dramatically improve the percent of pavements in the “good to excellent” category from 56 percent to 78 percent.

Finally, a short note on the definitions of a "distressed highway." As was mentioned in Chapter 1, Caltrans has a goal of reducing the percentage of distressed highways from the current level of 25 percent to 10 percent. Distressed highways in this definition are those highways that require capital preventive maintenance and rehabilitation. When applied to a local street or road, this includes all the streets in the "At Risk" category and below. Applying the Caltrans definition would mean that currently, 44 percent of local streets and roads are "distressed". Clearly, the definitions used by Caltrans are applicable for highways but not for local streets and roads; this is only logical since the types of facilities are so different.

Another performance measure is the cost savings that may be realized from the additional investment in each funding scenario. This is simply the savings achieved by NOT deferring repairs to a later date. An annual escalation of 5% was used, which includes increases in both material, labor and equipment costs. Table 4.11 summarizes different performance measures for each funding scenario.

Table 4.11 Summary of Performance Measures for Each Scenario

Scenarios	Annual Budget ($B)	PCI in 2022	Condition Category	% Pavements in Failed Condition	% Pavements in Good Condition	Cost Savings* ($B)
Current Conditions	N/A	66	At Risk	6.6%	56%	N/A
1. Existing Funding	$1.33	53	At Risk	25%	46%	-
2A. No bond	$2.33	60	At Risk	23%	68%	$26
2B. Bond	$4.23/$1.33	63	At Risk	21%	71%	$34
3. Maintain PCI = 66	$3.23	66	At Risk	20%	78%	$44
4. Efficiency Savings	$4.11	71	Good	16%	83%	$59
5. Best Mgmt. Practices	$7.23	84	Excellent	0%	100%	$108

* Annual escalation of 5% and cost savings are compared to Scenario 1.

4.7 How Did We Get Here?

For those who do not work with tranportation issues every day, it can be difficult to understand how California cities and counties have reached this situation. Yet the factors that have led us here can be quickly summarized as:

- The population of California was approximately 30 million in 1990; it is now approximately 38 million, an increase of almost 27 percent. Attendant with that increase in population are increases in traffic, housing and new roads.
- There are many new regulations which have increased the responsibilities of cities and counties, such as ADA, NPDES and new traffic sign retroreflectivity standards.
- The public demands a higher quality of life e.g. complete streets policies.
- Cities and counties need to consider, build and maintain a transportion system that has multiple transportation modes e.g. bicycles, pedestrians.
- The cost of road repairs and construction has steadily increased, and is significantly more than inflation. In the last 15 years, paving costs have increased more than eight-fold.
- Despite all the additional challenges described above, the gas tax has not increased in over 20 years. This may not be immediately obvious to the driving public, since they only notice higher prices at the pump.

Since the gas tax is the primary funding source for transportation, this has meant that cities and counties are relying on a diminshing revenue source for a transportation system that is aging and deteriorating rapidly, and which continues to shoulder additional demands from the public.

4.8 Summary

From the results of the surveys as well as the funding scenarios, it is apparent that:

- Total funding for pavements is projected to decrease to $1.33 billion annually over the next ten years. Of this, 59 percent will come from state funds (almost all gas tax), 10 percent from federal sources, and the remainder from local sources (mostly sales taxes).
- Total funding for essential components is projected to slightly decrease to $874 million annually. The majority of the funding comes from local sources (47%) with the state contributing approximately 37%.
- Given the existing funding levels, the total funding shortfall for pavements and essential components is a staggering $80.9 billion over the next ten years!
- Under the existing funding for pavements ($1.33 billion/year), it is projected that the statewide PCI will decrease from 66 to 53 and the unfunded backlog will increase to $66 billion. In addition, a quarter of the pavement network will be in "failed' condition by 2022.
- In Scenarios 2A and 2B, we can see the significant impacts from "front-loading" repairs. The effects of bonding against the additional $1 billion revenue stream not only results in a better pavement condition, but also cost savings of $8 billion. Nonetheless, overall, the funding is still inadequate to maintain the existing pavement condition.

- In order to maintain the existing pavement condition (Scenario 3), it will require a funding level of $3.23 billion/year, more than twice the existing level. This would dramatically improve the percentage of pavements in the "good to excellent" category from 56 percent to 78 percent. Unfortunately, the percentage of pavements in the "failed" category also grows from 6.6 percent to 20 percent.
- Scenario 4 projects that an estimated $822 million annually could be achieved through changes in rehabilitation and reconstruction techniques, and if these could be added to Scenario 3, the results are very encouraging. Overall, the PCI will improve to 71, the percentage of failed pavements is 16 percent, and cost savings of $59 billion are achieved.
- Any additional investments in the pavement network will result in substantial cost savings ranging from $26 to $108 billion. On average, this represents cost savings of $2 for every additional $1 invested.

Every additional dollar invested will result in cost savings of almost $2.

5. Bridge Needs and Funding Analysis

Bridges are an integral part of the transportation system, and therefore a study such as this one would be incomplete without a discussion of their needs. The catastrophic nature of a bridge failure is exemplified by the collapse of the I-35W bridge in Minneapolis during rush hour in August 2007. Thirteen people were killed and 145 injured. Failures in local bridges can also have significant consequences. Many rural bridges provide the only access to homes and communities, and if a bridge collapses, access to help is limited or not available. In other cases, detours of more than four hours may be necessary.

For this update, both Quincy Engineering (QE) and Spy Pond Partners (SPP) collaborated to provide the analysis to determine both the ten year bridge needs and funding analysis, respectively. Copies of their reports, with a more detailed discussion of the methodologies used, are available at www.SaveCaliforniaStreets.org.

A total of 11,863 local agency bridges in California were inventoried in the 2012 National Bridge Inventory (NBI) Database. Local agency bridges are defined as bridges that are owned by local agencies such as counties and cities. Other owners such as the State, Bay Area Rapid Transit, private, railroad and federal bridges were not considered as local agency bridges for this study.

Figure 5.1 below represents a breakdown of local bridge count by county. Most counties (including city bridges within the county) have a few hundred bridges, averaging about 200 bridges per county. In general, the larger populated counties have a significantly higher number of bridges than the lower populated counties. Los Angeles County has the most locally owned bridges, with over 1400 bridges.

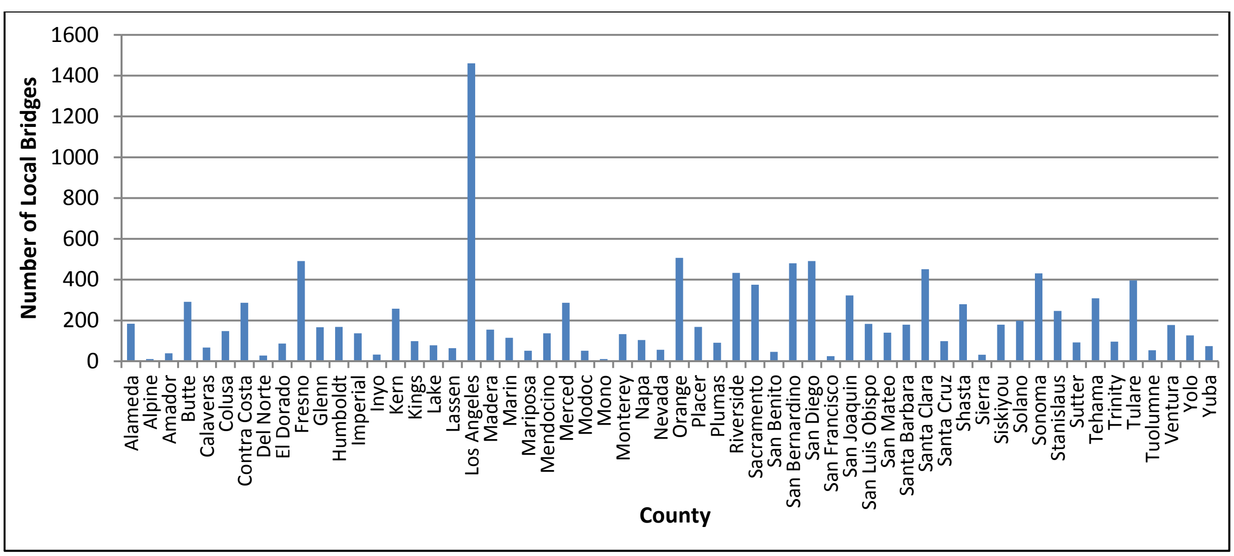


Figure 5.1 Number of Local Bridges by County (includes Cities within County)

Figure 5.2 illustrates the age distribution of all the statewide local bridges. The largest age group are bridges 40 years or older, followed by bridges that are 50 years or older. As bridges age, the need for rehabilitation becomes greater. As with streets and roads, it is more cost effective to maintain bridges in good condition than it is to allow those bridges to deteriorate at a faster rate and require replacement sooner. Figure 5.2 also shows that there are a significant number of bridges that are over 80 years old (most bridges are designed to last 50 years). Most of those bridges are at the end of their life and will require replacement soon.

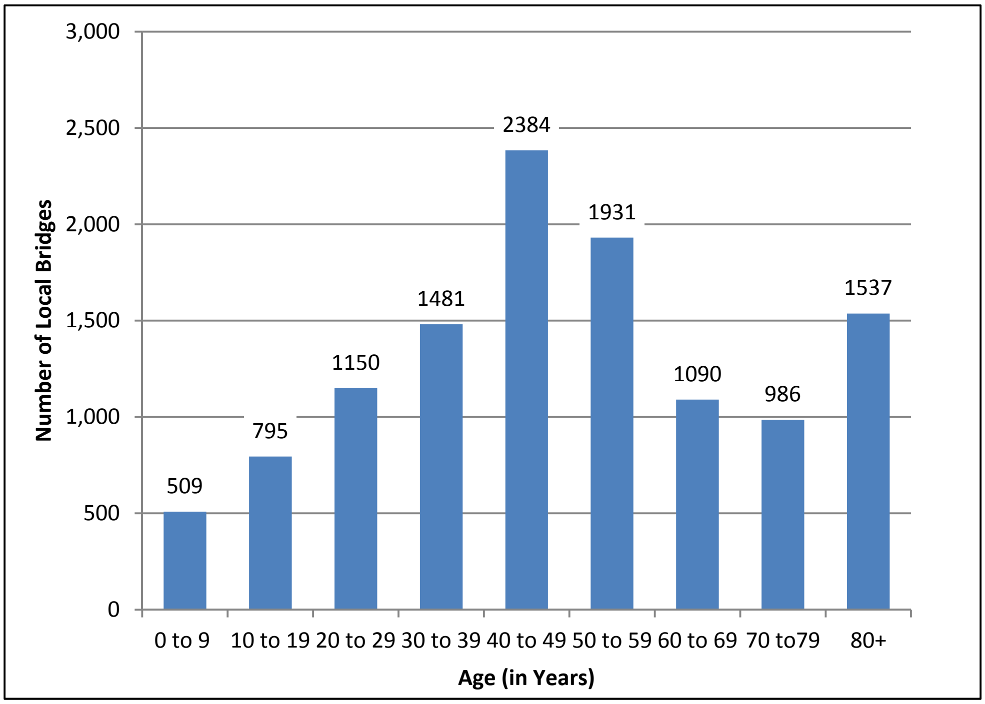


Figure 5.2 Age Distribution of Local Bridges

Of the 11,863 local agency bridges, 6,285 bridges are considered "on-system" and 5,584 are "off-system". "On-system" bridges are listed in the National Highway System or are bridges with the following functional classifications:

- Urban Principal Arterial – Interstate
- Urban Principal Arterial – Other Freeways or Expressways
- Urban Other Principal Arterial
- Urban Minor Arterial
- Urban Collector
- Rural Principal Arterial – Interstate
- Rural Principal Arterial – Other
- Rural Major Arterial
- Rural Major Collector

Off-system bridges are bridges that are not on the National Highway System and have the following functional classifications:

- Urban Local
- Rural Minor Collector
- Rural Local

5.1 Survey Results

The results of the statewide survey showed that 49 of 58 counties (84%) responded to the survey, and 128 of 482 cities (27%) responded to the survey. While the percentage of cities participating was low, it should be noted that many of the smaller cities do not own and maintain their own bridges.

Figure 5.3 below compares some of the data received from the survey with NBI data provided by Caltrans. As can be seen, there are some variations between the bridge counts provided. There could be several explanations for the variations, such as:

- New bridges may have been constructed or old bridges demolished due to old age, and such changes may not have been captured in either of the databases
- Respondent may not have understood the definition of NBI versus non-NBI bridges, and thereby provided inaccurate information.

Although there is some inconsistency, the overall differences are within acceptable limits. However, for the purpose of this study, the analysis was performed using the NBI data provided by Caltrans.

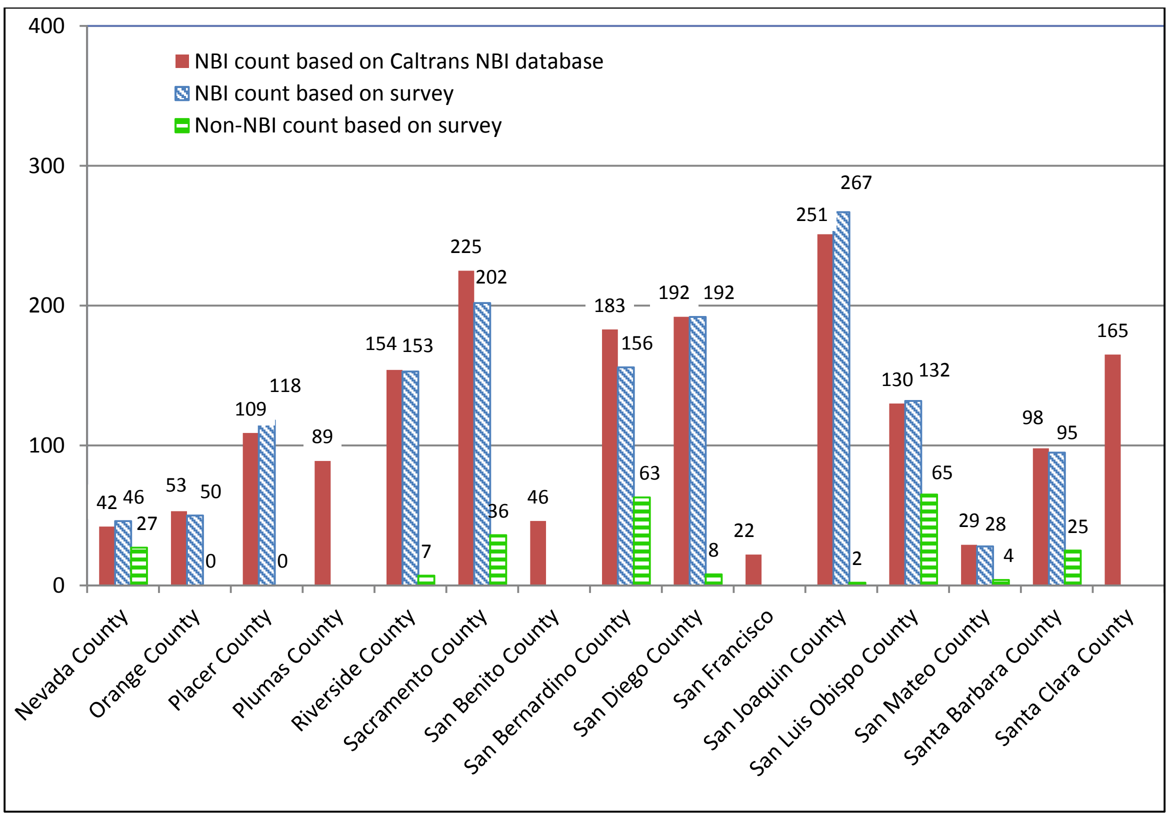


Figure 5.3 Selected Local County Owned Bridge Count (Excluding cities owned bridges)

5.2 Needs Assessment

The needs assessment for bridges has three primary categories: Replacement, Rehabilitation, and Seismic Retrofit to follow the Federal Highway Administration Highway Bridge Replacement and Rehabilitation Program and the Caltrans

Seismic Retrofit funding eligibilities. For the purpose of this study's terminology, rehabilitation is separated into three sub-categories:

- Bridge deck rehabilitation and deck replacement (deck improvement)
- Bridge strengthening
- Bridge widening

The bridge deck is the component that takes the most wear-and-tear from the impact of daily vehicular traffic, and is the most common bridge rehabilitation. Therefore, it contributes to the majority of bridge rehabilitation cost projects in California. Figure 5.4 below shows an example of deck rehabilitation with methacrylate resin treatment.

Figure 5.4 Bridge Deck Rehabilitation With Methacrylate Resin Treatment

The three sub-rehabilitation needs are estimated to capture all preservation needs such as deck joint replacement, bearing pad replacement, painting, etc. Preservation works are typically performed concurrently with a bridge rehabilitation job. For instance, painting is performed at the same time a steel structure is strengthened to minimize impact and save cost. Another example is when a bridge deck is replaced, bridge joints are replaced at the same time. Also, during a bridge widening, concrete barriers are replaced and updated to new standards. In this study, all preservation needs are accounted for in the bridge deck rehabilitation-and-replacement, bridge strengthening, and bridge widening needs category (the three rehabilitation categories).

5.2.1 Replacement and Rehabilitation Eligibility

The Federal Highway Administration Highway Bridge Replacement and Rehabilitation Program funding eligibility requirements (FHWA HBRRP 23 CFR 650.409) was used as the basis to determine which bridges have needs for replacement or rehabilitation.

According to FHWA, the National Bridge Inventory is used for preparing the selection list of bridges both on and off Federal-aid highways. Bridges that are considered structurally deficient or functionally obsolete and with a sufficiency rating of 80 or less is used for the selection list. Those bridges appearing on the list with a sufficiency rating of less than 50 are eligible for replacement while those with a sufficiency rating of 80 or less are eligible for rehabilitation. To be classified as structurally deficient, a bridge must have a length equal to or greater than 20 feet and not been constructed or had major reconstruction within the past 10 years. The definitions are listed below:

- A bridge is defined as eligible for replacement if the Sufficiency Rating is less than 50 *and* the bridge is structurally deficient or functionally obsolete (SR<50 & bridge is SD or FO).
- A bridge is defined as eligible for rehabilitation if the Sufficiency Rating is greater than or equal to 50 but less than or equal to 80 *and* the bridge is structurally deficient or functionally obsolete (50≤SR ≤ 80 & bridge is SD or FO).

In order to be considered for either the Structurally Deficient (SD) or Functionally Obsolete (FO) classification, a bridge must also meet the following guidelines:

1. Structurally Deficient (SD)
    a. Condition rating of 4 or less for deck, superstructures, substructures, culvert and retaining Walls, or
    b. Appraisal rating of 2 or less for structural condition or waterway adequacy.
2. Functionally Obsolete (FO)
    a. An appraisal rating of 3 or less for deck geometry, under-clearances or approach roadway alignment, or
    b. An appraisal rating of 3 for structural condition or waterway adequacy

Figures 5.5 to 5.8 illustrate examples of structurally deficient and functionally obsolete bridges.

Figure 5.5 Structurally Deficient – Low Deck & Superstructure Condition Rating

Figure 5.6 Structurally Deficient – Low Superstructure & Substructures Condition Rating

Figure 5.7 Structurally Deficient – Low Substructures Condition Rating & Low Waterway Adequacy

Figure 5.8 Functionally Obsolete – Low Approach Roadway Alignment Appraisal Rating

Of the 11,863 bridges, 1,887 bridges are Structurally Deficient (16%), and 1,796 bridges are Functionally Obsolete (15%). Of the total, 950 bridges are eligible for replacement (8%), and 1,891 bridges are eligible for rehabilitation (16%).

5.2.2 Bridge Replacement

Of the 950 bridges eligible for replacement, 33 were removed from the needs assessment because they already have secured funding in place or construction was imminent. Two large bridges were also excluded from this study.

1. *Golden Gate-San Francisco Bay Bridge (*Bridge #27 0052), is owned by a local toll authority and is not considered a local bridge.
2. *Los Angeles River Bridge on Sixth Street (*Bridge #53C1880), owned by the City of Los Angeles is already programmed and federally obligated for $229.5 million dollars for construction and $104.6 million dollars for right-of-way. Therefore, this bridge was removed from this assessment.

Figure 5.9 shows the average bridge replacement unit cost (dollars per square foot) of all the bridges that are assessed to require replacement. This cost is based on site characteristics and includes the new bridge and bridge removal costs. It does not include approach roadway and other bridge replacement project costs.

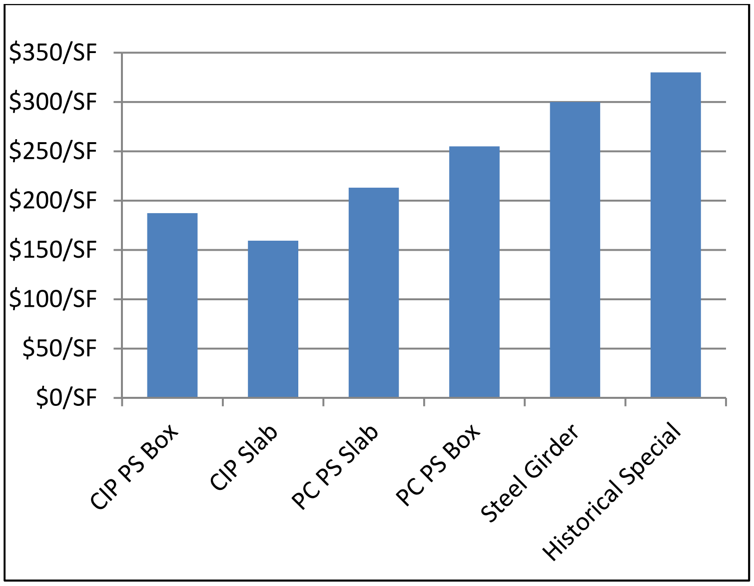


Figure 5.9 Average Bridge Replacement Unit Cost ($/SF)

Figure 5.10 below shows the different components of the bridge replacement associated cost. In addition to the cost of replacing the bridge, the other associated costs include costs for roadway approaches, right-of-way, design engineering and environmental, construction mobilization, construction contingency, and construction management. The cost of the bridge itself is only about 40% of the total bridge replacement project cost.

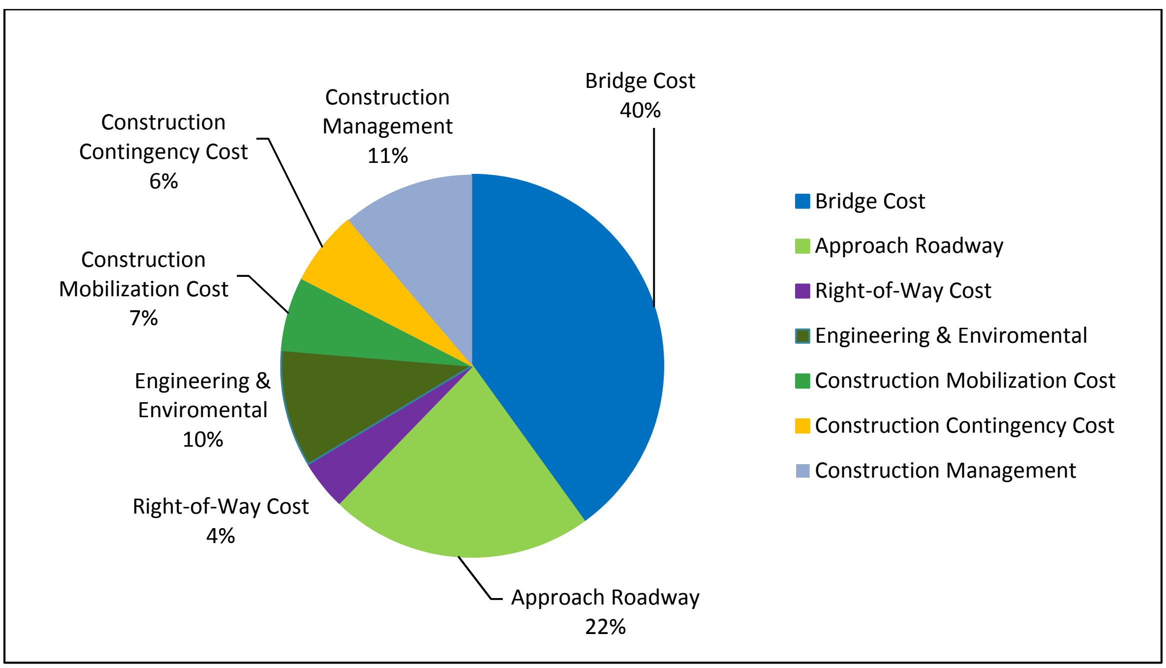


Figure 5.10 Total Bridge Replacement Associated Costs

5.2.3 Bridge Rehabilitation

As mentioned previously, rehabilitation is categorized into the following three categories:

1. Bridge deck rehabilitation and deck replacement (deck improvement)
2. Bridge strengthening, and
3. Bridge widening

Bridge deck rehabilitation is the most common bridge rehabilitation, and contributes to the majority of the bridge rehabilitation costs in California. Because it accounts for the majority of bridge rehabilitation cost, a refined assessment of the unit cost of bridge decks was required. A unit cost of $10/sf for deck rehabilitation and $100/sf for deck replacement was used. The unit prices are based on Caltrans and Quincy Engineering's historical design and construction support data. The unit cost is conservatively estimated to include common preservation needs such as rehabilitation of expansion joints and bridge bearings.

Of the 1,891 bridges eligible for rehabilitation, approximately 548 bridges require deck rehabilitation and 133 bridges require deck replacement.

Figure 5.11 is an example of a bridge deck that requires replacement. Figure 5.12 shows a bridge expansion bearing replacement during deck widening project.

Figure 5.11 Bridge Deck Requiring Replacement

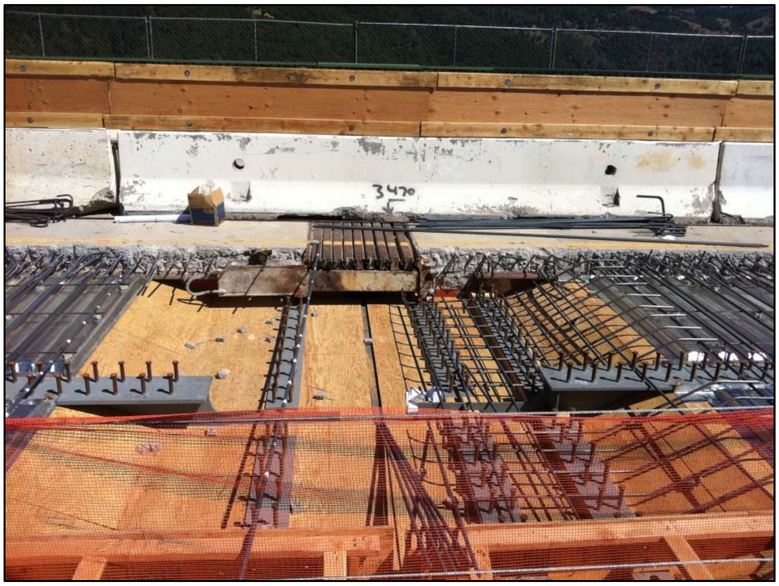


Figure 5.12 Bridge Expansion Bearing Replacement During Deck Widening

5.2.4 Bridge Strengthening

Bridge strengthening project costs vary widely depending on individual projects. For example, to strengthen an older steel bridge built before 1970, lead abatement and environmental mitigation will be required. Depending on the amount of work involved in bridge strengthening, the cost of lead abatement can vary from a local containment to a full bridge containment system which tends to be very costly.

The cost associated with bridge strengthening was obtained from bridge improvement data within the NBI database. To scale the improvement needs to 2012 dollars, a Construction Cost Index was used. This methodology was considered to be more accurate because local bridge inspectors and agencies have more site specific information on a project by project basis.

.

Using the rehabilitation criteria (50≤SR ≤ 80 & bridge is SD), it was estimated that approximately 495 bridges required bridge strengthening. The weighted average cost per area is $150/sf.

5.2.5 Bridge Widening

Similarly to bridge strengthening, bridge widening costs are highly dependent on specific project needs. Figure 5.13 illustrates the bridge widening cost distribution over all the local agency bridges. Most bridges that require widening are located in Los Angeles County. This is because the Average Daily Traffic (ADT) count is high in comparison to the traveling capacity of the existing bridge. The LA county bridges also have a higher project cost due to site specific variables such as higher right-of-way acquisition costs and construction limitations due to congested conditions. From the NBI data, there are approximately 154 bridges that require widening.

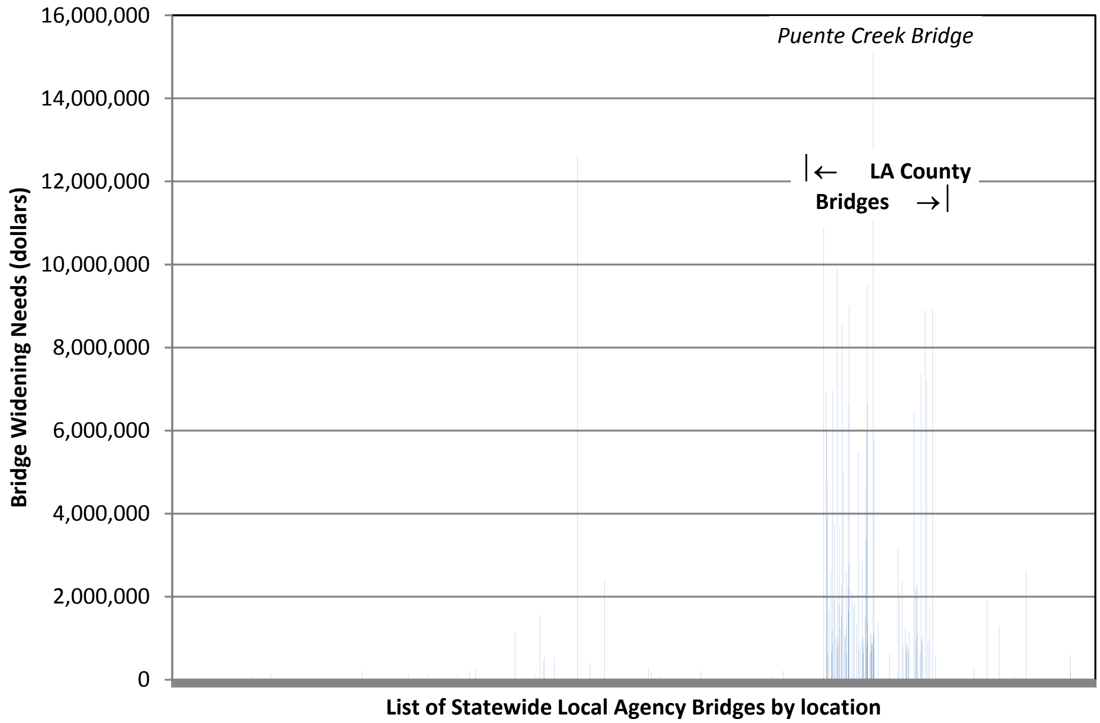


Figure 5.13 Distribution of Bridge Widening Projects

5.2.6 Bridge Seismic Retrofit

Seismic retrofit need is also project specific with costs varying greatly between individual projects. The Caltrans Local Bridge Seismic Retrofit Program (LBSRP) list provides remaining projects that are eligible for LBSRA Funds. The total seismic requested federal Highway Bridge Program (HBP) funds requested was used to determine the total seismic needs.

5.2.7 Non-NBI Bridges

Non-NBI Bridges are non-vehicular bridges or vehicular bridges less than 20 feet long. While a bridge maybe considered non-NBI due to its limited length or because of its pedestrian and/or bicycle designation, these bridges are still of significant importance to our communities. For instance, there are many local short vehicular bridges (less than 20 feet) that provide the only access for fire trucks in case of emergencies. The need for non-NBI bridges should not be neglected.

Unlike NBI bridges, non-NBI bridges do not have a state or national database that documents these bridges. Therefore, the survey information was the only source available. As was noted previously, 49 counties out of 58 counties (84%) responded to the survey, and 128 cities out of 482 cities (27%) responded to the survey. However, only 41 counties and 95 cities responded to questions about the non-NBI bridges.

Therefore, a method of approximation had to be developed to estimate the non-NBI bridge counts. Briefly, the methodology to estimate the missing or unknown county bridge data was to consider geography, adjacent county data, and population. For instance, based on the 2010 United States Census, Sutter County, Yuba County, and Nevada County have similar population size. Based on geography, the three counties have similar rivers characteristics. Since bridge survey data is available for Sutter and Nevada County, Yuba County's missing data can be estimated similar to that of Sutter and Nevada County's.

The method to estimate city non-NBI bridges was based on available data from adjacent cities. However, not all cities within a county are similar; some cities have larger population than smaller cities. This method assumes that cities within a county had a similar bridge to population ratio. Within a given county, the geographical characteristics of its land and rivers are assumed to be similar. Therefore, the number of bridges per population should be similar.

Based on the assumptions above, the total number of non-NBI bridges was estimated to be approximately 3,500. Of these, approximately 30 percent were assumed to be non-vehicular bridges (extrapolated survey data). The percentage of non-NBI bridges assumed to require rehabilitation or replacement were assumed to be similar to those for the NBI bridges. The unit costs for vehicular bridges were also assumed to be the same as for the NBI bridges, while those for non-vehicular bridges were $200/sf for replacement, and $10/sf for rehabilitation. With the assumptions above, the non-NBI bridge needs are estimated to range from $30 to $60 million.

5.2.8 Summary of Local Bridge Needs

The total statewide local agency bridge needs is estimated to be $4.3 billion over the next ten years. The breakdowns are as follows:

- Bridge replacement needs are approximately $2.6 billion.
- Bridge deck rehabilitation and deck replacement costs are approximately $420 million.
- Bridge structural strengthening requires approximately $530 million.
- Bridge widening requires approximately $420 million (widening projects are to bring bridges up to current width standards, and are not for adding capacity i.e. adding lanes)
- Bridge seismic retrofit needs are approximately $320 million.
- Non-NBI bridge needs are estimated at $30 to $60 million.

The total statewide local bridge needs are estimated at $4.3 billion over the next ten years.

Appendix D contains a summary of the bridge needs by County.

5.3 Funding Analysis

The funding analysis considered maintenance, repair, rehabilitation actions required to preserve existing structures. Also, it included needs to perform seismic retrofits, strengthen bridges, raise bridges to increase vertical clearance, and widen bridges (without adding lanes) to address clearance or safety issues. Bridge replacement was considered in the analysis when it was projected to be more cost effective than preservation or functional improvement, or when other actions were deemed to be infeasible. The analysis did not consider costs associated with adding lanes to existing structures to relieve congestion.

To develop the projections, the FHWA's National Bridge Investment Analysis System (NBIAS)[6] was used. FHWA uses NBIAS to develop its biannual Conditions and Performance Report[7]. NBIAS has a modeling approach similar to that of the AASHTO Pontis Bridge Management System (BMS) which is used by Caltrans for managing its bridges. However, NBIAS requires only publically-available NBI data to run, in contrast to Pontis, which requires detailed element data that are not part of the NBI. (Note that the 3500 non-NBI bridges were not therefore included in this analysis. However, their needs are less than 1.5% of the total, so was not considered to be significant.)

Though NBIAS is populated with default costs, deterioration models, and other parameters, it is important to calibrate the system results so that they provide as realistic a projection as possible. The costs in NBIAS were calibrated using data provided by Quincy Engineers. Consequently, the calculation of initial needs corresponds to that developed independently by Quincy Engineers. Further, seismic retrofit needs, which are not modeled by NBIAS, were calculated by Quincy Engineers. The deterioration models used in the system were originally developed by Caltrans, and are included in NBIAS, along with models from other states. A set of calibration runs was performed in NBIAS to confirm the deterioration models, using 2001 data to compare results predicted for 2011 using different deterioration models with actual conditions observed in 2011 based on NBI data.

The results obtained from NBIAS provide a projection of bridge investment needs over time for different budget assumptions. Investment needs are funds that should be invested to minimize bridge costs over time and address economically-justified functional improvements. To the extent that projected funds are insufficient for addressing all needs, the system simulates what investments will occur with an objective of maximizing benefits given an available budget. The system also predicts what new needs may arise considering deterioration and traffic growth, and projects a range of different physical measures of bridge condition.

5.3.1 Projected Statewide Bridge Conditions and Needs

Table 5.1 presents the summary results for the statewide analysis. The table shows results for annual budgets from $0 to $600 million. For each budget level shown the table shows results by year for 10 years for the following measures:

- Needs: investment need as of the beginning of the year, shown in billions of dollars. The projections include costs for replacement, functional improvement, rehabilitation, minor preservation activities, and seismic retrofits.
- Cumulative Work Done: total spending over time, shown in billions of dollars. Typically this measure increases by the budgeted amount each year, but in some cases may increase by less than the budgeted amount if no needs remain to be met, or if during the program simulation the available budget was less than the cost of the next recommended action.
- Average Health Index: average calculated from predicted element conditions, where a value of 75 or less for an individual bridge generally indicates the bridge is in fair or poor condition (in need of rehabilitation) and a value of 90 or greater for an individual bridges indicates the bridge is in good condition.
- Average Sufficiency Rating: average rating calculated based on FHWA definitions. Unlike Health Index Sufficiency Rating includes adjustments for functional characteristics of a bridge.

[6] Cambridge Systematics, Inc. *NBIAS 3.3 Technical Manual.* Technical Report prepared for FHWA. 2007.

[7] FHWA and FTA. *2010 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance*. Report to the United States Congress. 2012.

- **Percent Structurally Deficient:** percent of bridges classified as Structurally Deficient based on FHWA definitions, weighted by deck area.

Table 5.1 Summary Bridge Funding Analysis (2013 to 2022)

	Value by Year										
Description	**Base**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Annual Budget: $0M											
Needs ($B)		4.4	4.9	5.6	6.1	6.6	7.3	8.0	8.9	10.0	11.2
Cumulative Work Done ($B)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Avg. Health Index	91.44	90.54	89.64	88.73	87.82	86.91	85.99	85.07	84.15	83.22	82.30
Avg. Sufficiency Rating	82.45	81.60	80.60	79.69	78.76	77.91	76.44	74.35	71.81	69.49	67.16
% Structurally Deficient	20.72	25.52	29.32	33.30	37.11	41.75	47.55	53.66	59.57	63.55	67.13
Annual Budget: $100M											
Needs ($B)		4.4	4.8	5.4	5.8	6.2	6.7	7.2	7.9	8.7	9.8
Cumulative Work Done ($B)		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Avg. Health Index	91.44	90.58	89.72	88.88	88.03	87.21	86.38	85.57	84.74	83.97	83.17
Avg. Sufficiency Rating	82.45	81.68	80.76	79.99	79.18	78.47	77.21	75.36	73.07	70.98	68.89
% Structurally Deficient	20.72	25.39	28.98	32.68	36.20	40.38	45.57	51.14	56.58	60.32	63.64
Annual Budget: $200M											
Needs ($B)		4.4	4.7	5.1	5.4	5.7	6.1	6.4	6.7	7.2	7.9
Cumulative Work Done ($B)		0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
Avg. Health Index	91.44	90.63	89.83	89.08	88.36	87.75	87.18	86.64	86.05	85.47	84.94
Avg. Sufficiency Rating	82.45	81.78	80.99	80.32	79.70	79.20	78.21	76.83	74.93	73.15	71.33
% Structurally Deficient	20.72	25.14	28.71	31.81	34.54	37.82	41.49	44.98	48.95	52.20	54.55
Annual Budget: $300M											
Needs ($B)		4.4	4.6	4.8	5.0	5.1	5.4	5.5	5.5	5.6	6.0
Cumulative Work Done ($B)		0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0
Avg. Health Index	91.44	90.70	89.98	89.40	88.88	88.52	88.22	88.17	87.98	88.06	88.23
Avg. Sufficiency Rating	82.45	81.92	81.20	80.73	80.29	79.96	79.40	78.64	77.27	76.32	75.62
% Structurally Deficient	20.72	25.04	28.18	30.34	32.17	33.00	34.46	35.76	37.42	37.30	37.19
Annual Budget: $400M											
Needs ($B)		4.4	4.5	4.6	4.6	4.7	4.5	4.5	4.3	4.1	3.9
Cumulative Work Done ($B)		0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0
Avg. Health Index	91.44	90.74	90.14	89.78	89.59	89.69	90.13	91.00	92.06	93.25	93.94
Avg. Sufficiency Rating	82.45	81.99	81.41	81.14	80.94	81.07	81.00	80.96	80.97	81.32	81.23
% Structurally Deficient	20.72	24.91	27.65	28.04	27.46	26.06	24.80	24.00	22.46	18.75	18.87
Annual Budget: $500M											
Needs ($B)		4.4	4.4	4.4	4.3	4.1	3.9	3.6	3.2	2.9	2.6
Cumulative Work Done ($B)		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Avg. Health Index	91.44	90.78	90.33	90.27	90.68	91.65	93.21	94.57	94.71	94.77	94.79
Avg. Sufficiency Rating	82.45	82.08	81.64	81.56	81.76	82.28	82.85	83.26	83.15	83.00	82.76
% Structurally Deficient	20.72	24.83	26.76	24.85	22.11	18.60	16.29	13.69	13.85	14.68	15.34
Annual Budget: $600M											
Needs ($B)		4.4	4.3	4.1	3.9	3.5	3.1	2.7	2.2	1.8	1.5
Cumulative Work Done ($B)		0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0
Avg. Health Index	91.44	90.84	90.67	91.04	92.54	84.71	95.08	95.15	95.18	95.19	95.23
Avg. Sufficiency Rating	82.45	82.17	81.93	82.19	82.78	83.63	84.01	84.20	84.15	84.05	83.95
% Structurally Deficient	20.72	24.59	24.63	20.79	15.87	13.23	11.47	11.31	11.79	12.87	13.29

Note that the current level of spending is approximately $300 million/year. Figure 5.14 shows total bridge needs over time and Figures 5.15, 5.16 and 5.17 show the average Health Index, average Sufficiency Rating, and percent Structurally Deficient, respectively. Additional detailed results from NBIAS are included Spypond's report available at www.SaveCaliforniaStreets.org.

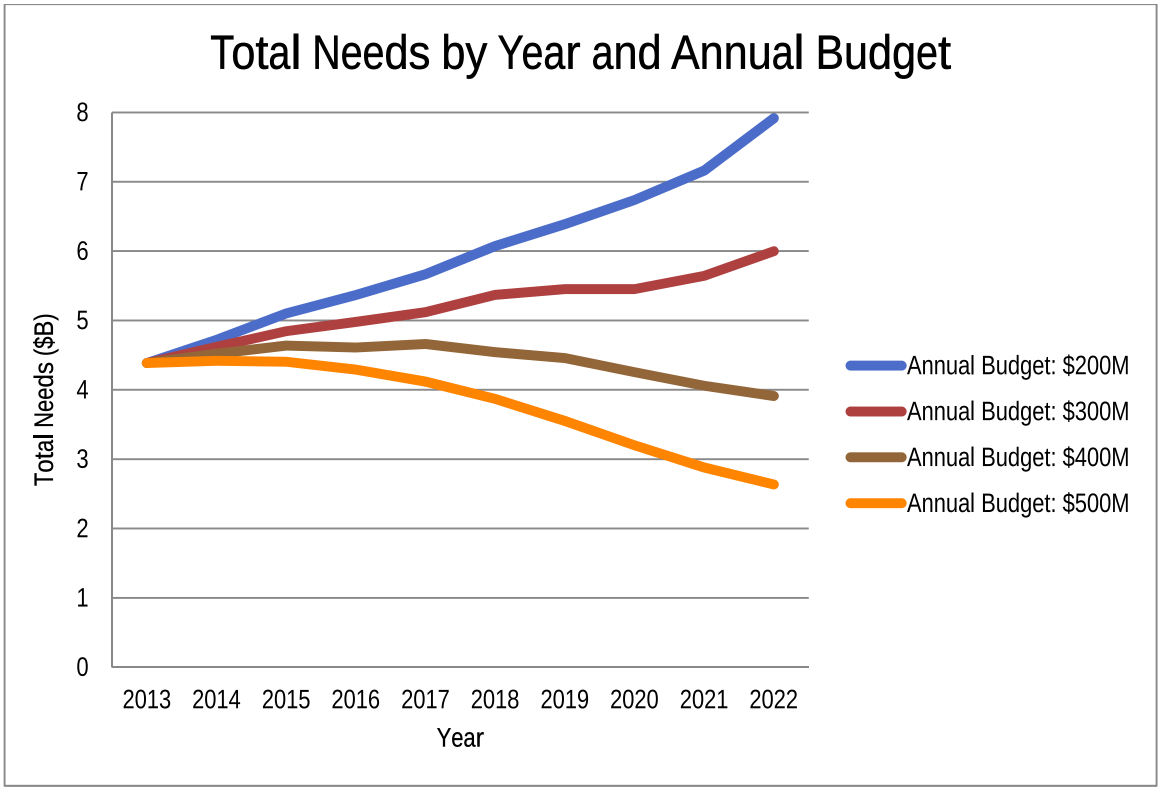


Figure 5.14 Projected Local Bridge Needs (2013-2022)

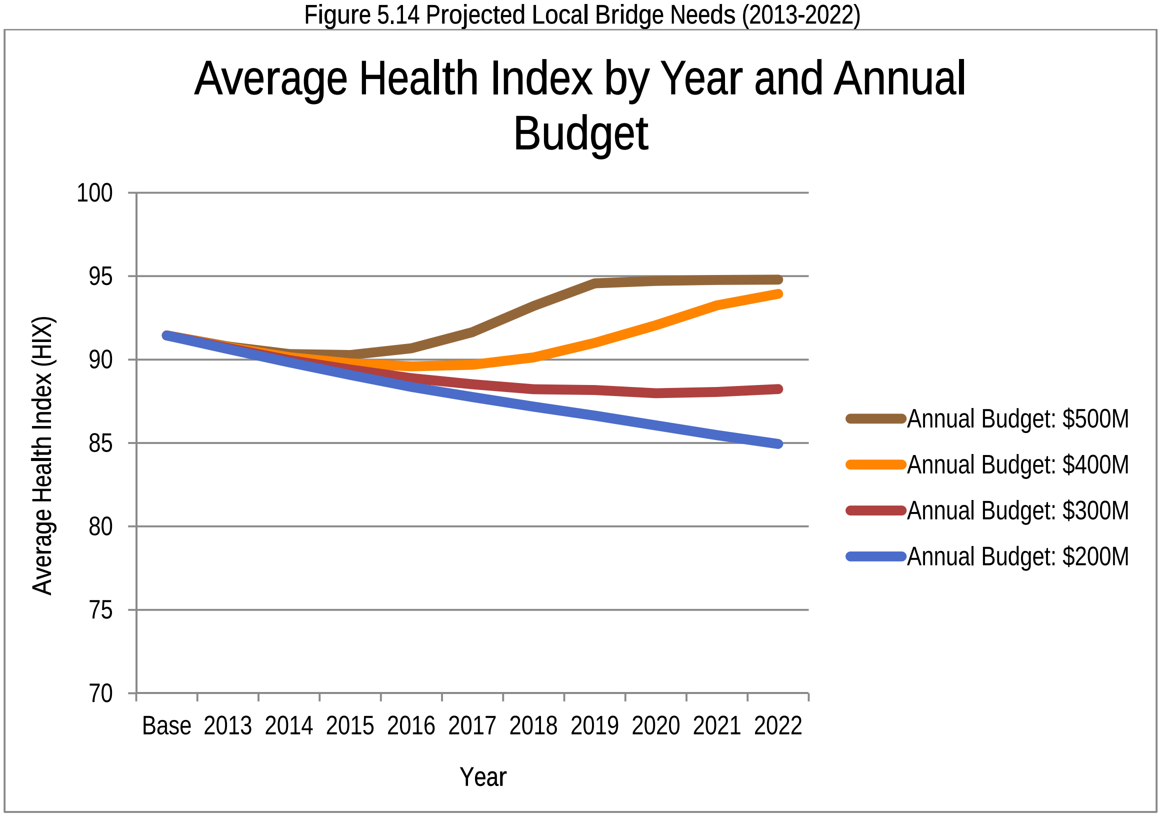


Figure 5.15 Projected Health Index (2013-2022)

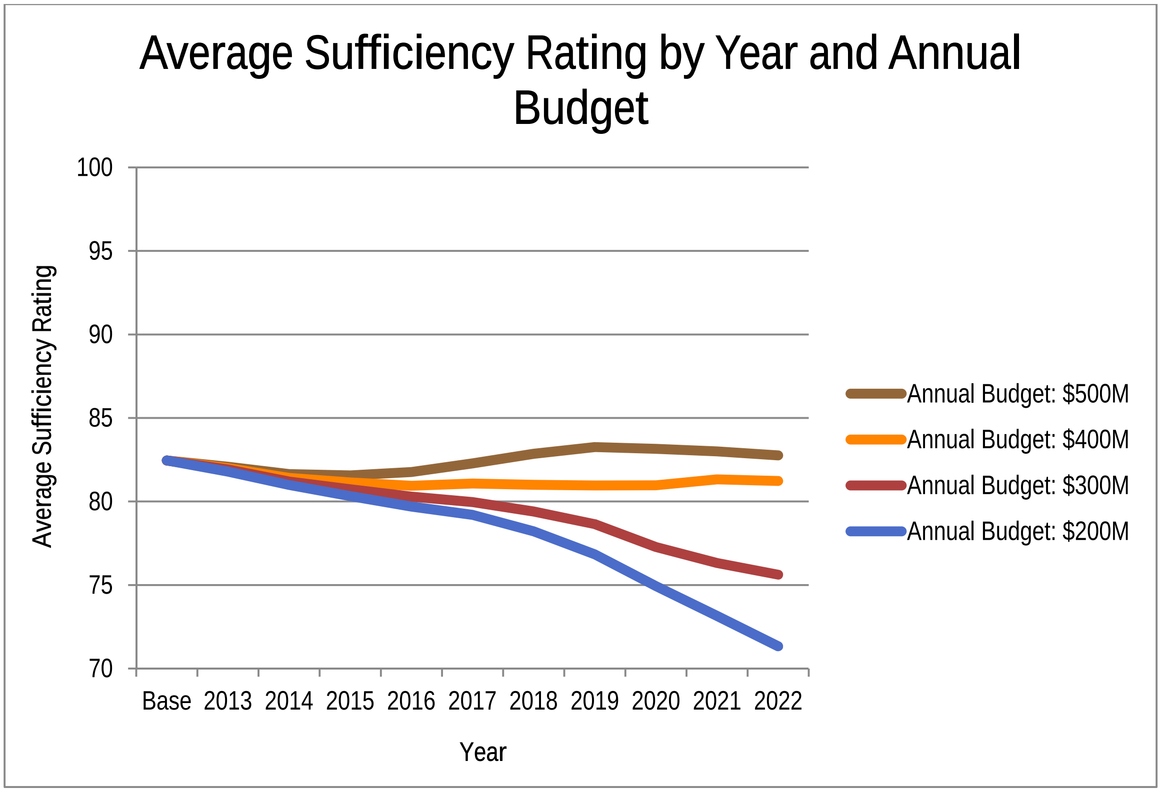


Figure 5.16 Projected Sufficiency Rating (2013-2022)

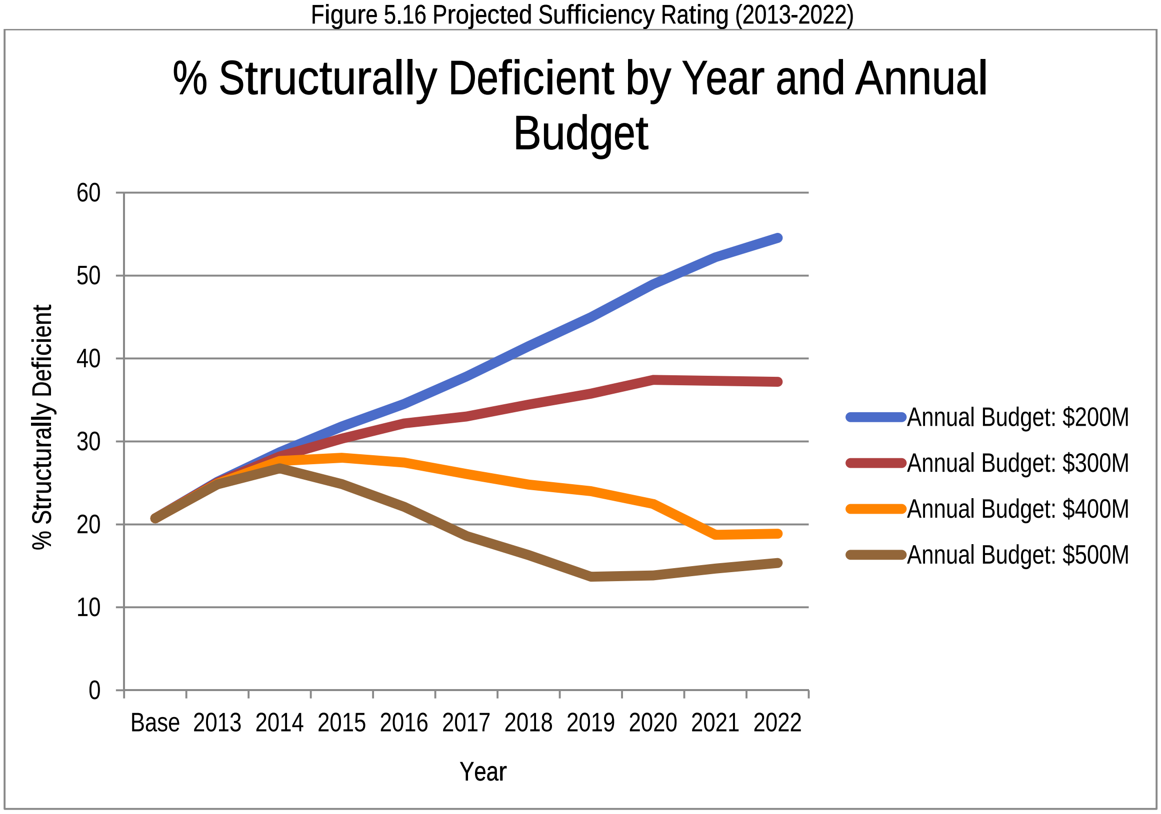


Figure 5.17 Projected Percent Structurally Deficient (2013-2022)

5.4 Summary

The total estimated needs for the local bridges is estimated to be $4.3 billion, which includes rehabilitation, replacement and seismic retrofit costs. Currently, it is estimated that only $300 million a year is available for bridge repairs. However, with the passage of MAP-21 and the elimination of the Highway Bridge Program (HBP), it is still unknown what the future levels of funding will be.

The funding analysis shows that an annual budget of $377 million is required to maintain the level of investment needed over a 10-year period for California's local bridges. Somewhat less money would be required to maintain an average Health Index equal to the current value, while somewhat more would be required to maintain conditions measured using Sufficiency Rating. For percent of bridges classified as Structurally Deficient the analysis suggests that $390 million would be required annually to maintain conditions statewide.

An additional $90 million/year is needed to ensure that no more than 20% of the state's bridges are structurally deficient.

While the analysis shows the funds required to achieve a given target condition, it does not recommend a specific level of funding. Given the investment needs in NBIAS are based on consideration of what work is economically justified, ideally a bridge owner would address all needs rather for their bridge inventory, rather than simply maintaining conditions. However, doing this in the short term would require a substantial increase in budget and is not practical in this case. Another approach to setting a target level of investment is to base the investment level on a specific target condition. There are several issues with this approach in the case of California's local bridges. First, it is difficult to summarize conditions using an average Health Index or Sufficiency Rating, as an average may mask the extent of bridges in very poor condition requiring immediate attention. An average is a good measure for illustrating trends, but less useful for characterizing the distribution of conditions.

The percent of bridges classified as Structurally Deficient is a better measure than an average condition index for illustrating bridges in poor condition. However, some caution is needed in interpreting this measure. The calculation of Structurally Deficient classification is based upon the condition ratings defined in NBI. In California, unlike other states, these ratings are not explicitly captured. Instead, they are calculated based on element-level data using an algorithm developed by FHWA. The impact of this approach is that counts of Structurally Deficient bridges for California bridges tend to be high compared to other states, but this is based more upon the inspection approach than actual differences in condition[8].

In the absence of a better alternative, it is recommended that level of investment needed be used as the best measure for use in establishing target investment levels for California's local bridges. Absent budget constraints, an organization seeking to maximize economic efficiency would address all investment needs. Considering budget constraints, a reasonable goal is to at least keep needs from increasing by addressing new investment needs as they arise, if not to lower the backlog of needs over time. Even with the goal of gradually lowering needs, however, one faces a situation in which needed work is being deferred, potentially increasing the work that must be performed on a given bridge.

8 Spy Pond Partners, LLC and Arora and Associates, Inc. NCHRP 20-24(37)E: *Measuring Performance Among State DOTs, Sharing Best Practices - Comparative Analysis of Bridge Condition.* Technical report prepared for NCHRP Project 20-24-37(E). 2010.

6. Conclusions

The results of this study continue to be sobering. It is clear that California's local streets and roads network are not just at risk; they are on the edge of a cliff with an average PCI of 66. With this pavement condition and the existing funding climate, there is a clear downward trend projected for the next ten years.

By 2022, with the current funding of $1.33 billion/year, the pavement condition index will continue to deteriorate to 53. Even more critically, the backlog will increase from $40.4 billion to $66 billion. This is assuming that construction costs do not outstrip the anticipated revenues. It also does not include any additional costs due to new roads/streets that will be added. Further, it is estimated that a quarter of California's local streets and roads will be in "failed" condition.

Table 6.1 summarizes the results from Chapters 3, 4 and 5. The total funding needs over the next 10 years is $107.2 billion, and the resulting shortfall is $59.1 billion for pavements, $21.8 billion for essential components and $1.3 billion for bridges. The total shortfall is $82.2 billion over the next 10 years.

Table 6.1 Summary of 10-Year Needs and Shortfall Calculations (2012 $ Billion)

Transportation Asset	Needs ($B)		2012		
	2008	2010	Needs	Funding	Shortfall
Pavement	$67.6	$70.5	$72.4	$13.3	$(59.1)
Essential Components	$32.1	$29.0	$30.5	$8.7	$(21.8)
Bridges	-	$3.3	$4.3	$3.0	$(1.3)
Totals	$99.7	$102.8	$107.2	$25.1	$(82.2)

The conclusions that can be drawn from this study are inescapable. Given existing funding levels, California's local streets and roads can be expected to deteriorate rapidly within the next 10 years. In addition, the costs of any deferred maintenance will only continue to grow. The additional funding scenarios analyzed also serve to emphasize this point. The ability to bond against new revenue streams (Scenario 2) will have an immediate and significant impact.

To bring the transportation network to a level where best management practices can occur will require more than four times the existing level of funding. For pavements, that will require an increase of at least $59.1 billion. However, once this has been achieved, it will only require $2.3 billion/year after that to maintain the pavement network.

For essential components, it will require $21.8 billion to address the ten year needs, and for bridges, it will require an additional $1.3 billion for a total of $82.2 billion.

To just maintain the existing pavement condition at 66 will require $3.23 billion/year, more than double the existing funding level of $1.33 billion.

To put the shortfall in perspective, $82.2 billion over 10 years translates to an additional 56 cents per gallon at the pump (based on an estimated 14.7 billion gallons of fuel purchased in California in 2011) [9]. For the average driver (10,000 miles a year driving a 20 mpg vehicle, this translates to an average of 76 cents a day.

[9] http://www.boe.ca.gov/sptaxprog/spftrpts.htm

APPENDIX A

Data Collection

This appendix describes in detail the data collection efforts for this update. The goal was to ensure participation by all 58 Counties and 482 Cities.

A.1 Outreach Efforts

As with the 2008 and 2010 studies, significant efforts were made to reach all 540 agencies in April-May 2012. This included letters sent out by the League and CSAC, followed up by emails and phone calls from Nichols Consulting Engineers, Chtd. (NCE). The contact database had over 2,100 contacts for all the cities and counties. This was compiled from a variety of sources including contacts from the 2008 and 2010 studies, the memberships of both CSAC and the League, the email listserv for the Regional Transportation Agencies (RTPA) and NCE's contacts.

The contacts included Public Works staff (Directors of Public Works, City Engineers or engineers responsible for pavement/asset management), Directors of Finance, City Managers, County Administrative Officers, RTPAs (Regional Transportation Planning Agencies), and MPOs (Metropolitan Planning Agencies).

Over 2,100 contact letters were mailed out in early April 2012 (see Exhibit A-1) with instructions on how to access the online survey and a fact sheet explaining the project. The deadline for responding to the survey was May 15, 2012, but this was later extended to June 2012, as there were numerous requests from agencies for more time to respond.

A.2 Project Website

The website at www.SaveCaliforniaStreets.org (see Figure A.1) was originally designed and developed for the 2008 study. This was subsequently modified to accommodate the 2012 update. The intent of this website was to act as both an information resource on this study and as a repository of related reports that might be of interest to cities and counties. More importantly, it was a portal to the online survey that is described in Section A.3.

The domain name was registered for five years (expiring February 27, 2013) and can be used for future updates after this study is completed. The Metropolitan Transportation Commission (MTC) currently hosts the website.

A.3 Online Survey Questionnaire

A survey questionnaire was prepared and finalized in early April 2012, and a blank example included in Exhibit A-1. Briefly, it included a request for the following information:

1. Contact name and information for both pavements and financial data
2. Streets and pavements data
3. Safety, traffic, and regulatory components data
4. Bridges
5. Unfunded mandates
6. Funding and expenditure data

Figure A.1 Home Page of www.SaveCaliforniaStreets.org Website

Like the 2010 study, no hardcopy surveys were available to the cities and counties, thus requiring all data entry to be made online. The online survey made data aggregation much simpler and faster. A custom database was also designed and developed for this update to overcome the limitations of the previous survey. Also, multiple validation fields were added to prevent some of the data entry errors that were discovered in the 2008 study, thus mitigating the significant effort in follow-up calls as well as extensive validation checks.

A.4 Results of Data Collection

98% of the state's local streets and roads are included in this study.

Figure A.2 Responses to Survey

A total of 361 agencies responded to the survey, which was a decrease from the 399 agencies in 2010. Nonetheless, when these were added to those agencies who responded in 2008 and 2010 (but not 2012), this represented more than 98 percent of the total centerline miles of local streets and roads in the state (see Figure A.2). It also represented 98 percent of the state's population.

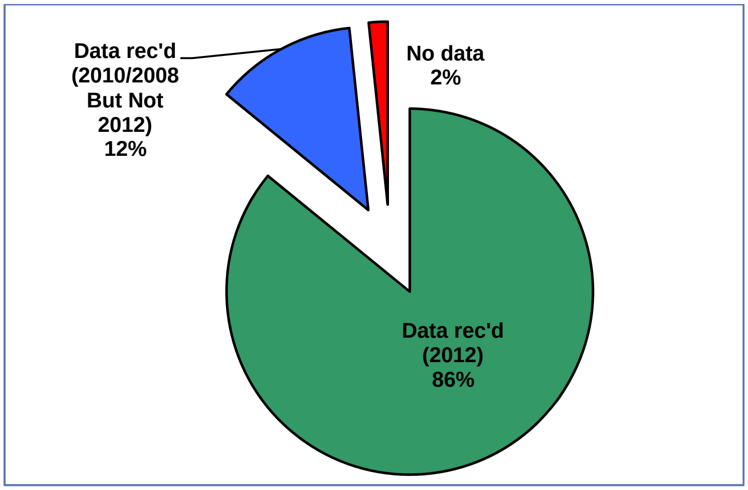


Figure A.2 Responses to Survey (% centerline miles)

In general, fewer agencies responded but with more information in various data categories (see Table A.1). Of particular importance was the number of agencies who responded with data on the safety, traffic and regulatory components. Of the missing 39 agencies, 35 had less than 100 centerline miles, and 34 had populations less than 50,000. Many had limited resources in terms of staff time to respond to the survey.

Table A.1 Number of Agencies Responding by Data Type

Data Type	2008	2010	2012
Pavement data	314	344	273
Unit costs	50*	260	211
Sustainable practices	-	-	280
Complete streets	-	-	269
Safety, Traffic & Regulatory	188	296	341
Bridges	-	-	177
Unfunded Mandates	-	-	220
Financial	137	300	238

* from NCE's database

A.4.1 Are Data Representative?

Throughout the data collection phase, it was important to ensure that the data received were representative in nature. This was critical for the analyses – as with the 2008 and 2010 studies, the criterion used was network size.

The distribution of responses with respect to network size is shown in Figure A.3. Small agencies are those that have less than 100 centerline miles; medium between 101 to 300 miles, and large agencies have more than 300 miles. Figure A.3 shows all the agencies who responded in 2012 (green), those who responded in 2008/2010 but not 2012 (blue) and the ones who have never responded in red. Clearly, the bulk of the agencies who did not respond had less than 100 miles of pavement network (small cities), but we still had 227 responses (87%) in this category, so our confidence in the responses were validated.

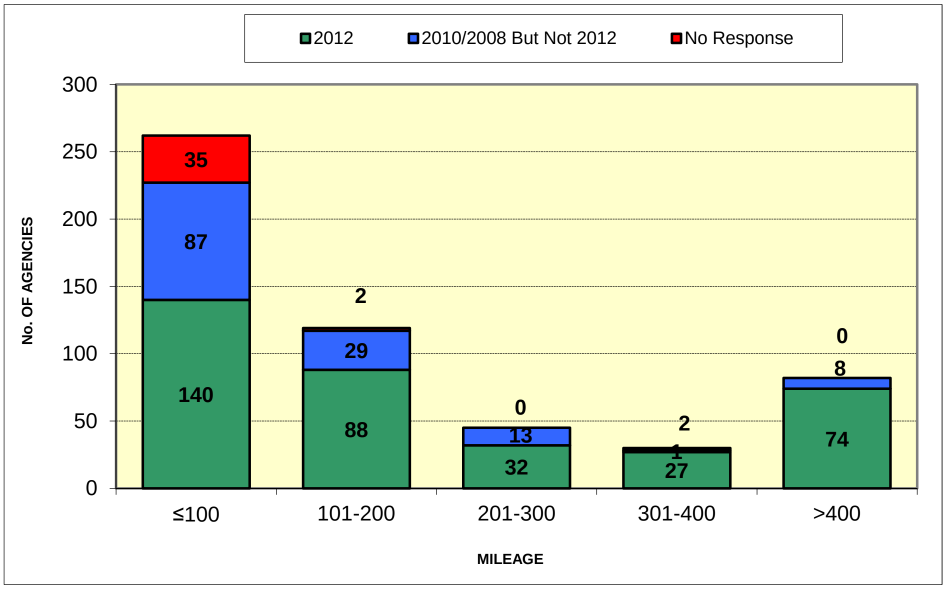


Figure A.3 Distribution of Agency Responses by Network Size (centerline miles)

An important point to note too is that small agencies account for a very small percentage of the state's pavement network. There are 262 cities with less than 100 centerline miles of streets, and 159 cities with less than 50 centerline miles of streets. However, they comprise only 8.2 percent and 2.9 percent of the total miles in the state, respectively. Their impact on the statewide needs is consequently minimal.

A.4.2 PMS Software

Due to the widespread use of a PMS, the quality of the pavement data received contributed immensely to the validity of this study's results.

The survey responses showed that 82 percent of the responding agencies had a pavement management system (PMS) in place (see Figure A.4). The StreetSaver® (39%) and MicroPAVER (24%) software programs are the two main ones in the state, not surprising given their roots in the public domain and reasonable costs. StreetSaver® was developed and supported by the Metropolitan Transportation Commission (MTC) and MicroPAVER supported by the American Public Works Association (APWA).

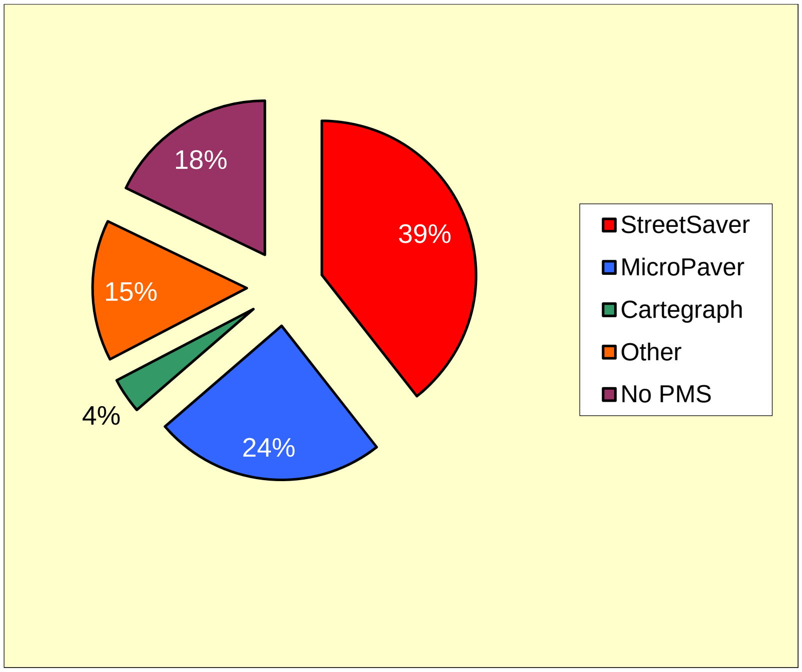


Figure A.4 PMS Software Used from Survey Responses

A.5 Summary

Overall, the number and quality of the survey responses received again exceeded expectations and more than met the needs of this study. To obtain data on more than 98 percent of the state's local streets and roads network was a remarkable achievement. That 82 percent of agencies that responded also had some pavement management system in place removed many obstacles in the technical analyses. In particular, the consistency in the pavement conditions reported contributed enormously to the validity of the study.

EXHIBIT 1

Contact Letter, Fact Sheet & Survey Questionnaire

April 2, 2012

SUBJECT: 2012 CALIFORNIA STATEWIDE LOCAL STREETS AND ROADS NEEDS ASSESSMENT

To Whom It May Concern:

Your help in responding to our survey in 2010 made a difference! We are asking for your help again in updating the information you provided two years ago.

As you may know, the Fiscal Year 2010-11 Statewide Needs Assessment Report identified a funding shortfall of over $79 billion for local streets and roads pavement and non-pavement needs. The report assisted CSAC and League staff to advocate against, and avoid what could have been devastating cuts to local transportation funding, over several state budget cycles (a copy of the final report is available at www.SaveCaliforniaStreets.org).

In addition to deterring negative policies and budget decisions, we will be using the findings of this assessment to emphasize the importance of *increasing* funding for maintenance of our local streets and roads. Towards this goal, this year's needs assessment will include the development of a marketing plan to help us better communicate the findings to legislators and the public.

As in the past, this project is being funded through contributions from stakeholders. Regional Transportation Planning Agencies have been asked to sponsor fifty percent of the cost of the 2012 assessment and the update in 2014, with cities and counties sharing equally in the remaining cost. It is essential that each agency contribute toward this project in order to demonstrate how critical this issue is to sustaining our state's transportation infrastructure.

An ongoing effort is needed to update the local streets and roads needs on a regular, consistent basis, much like the State does in preparing the State Highway Operation and Protection Program (SHOPP). Nichols Consulting Engineers, Chtd. (NCE), will assist us in performing the 2012 update of the Statewide Needs Assessment.

YOU CAN MAKE A DIFFERENCE!

We need your immediate assistance on the following items:

1. To ensure a widespread dissemination of this request, this letter has been sent to the City Manager/County Administrative Officer, Public Works Director, City/County Engineer, and Finance Director. We recognize that the data may come from multiple sources, so we ask your agency to coordinate among yourselves to ensure that the most recent and accurate information is entered. Please provide NCE with your agency's contact information if you

are not the appropriate contact. This person(s) should be able to provide all the information requested in the survey. We need information on two main areas:

a. Technical – pavement and safety, regulatory and traffic needs.

b. Financial – projected funding revenues/expenditures.

2. Fill out the online survey at www.SaveCaliforniaStreets.org. Instructions for filling out the survey are enclosed. Your agency's login and password are:

Login:
Password:

It is essential that we have this data no later than May 15, 2012. Should you have any questions, please do not hesitate to contact:

Ms. Margot Yapp, P.E.
Vice President/Project Manager
Nichols Consulting Engineers, Chtd.
501 Canal Blvd, Suite I
Pt. Richmond, CA 94804
(510) 215-3620
myapp@ncenet.com

We appreciate your help in providing this information.

Very truly yours,

Daniel Woldesenbet, President
County Engineers Association of California
Director of Public Works
County of Alameda

Randy Breault, President
Public Works Officers Department
League of California Cities
Director of Public Works/City Engineer
City of Brisbane

Enclosures: Fact Sheet
Instructions for Online Survey

CALIFORNIA STATEWIDE NEEDS ASSESSMENT PROJECT

WWW.SAVECALIFORNIASTREETS.ORG

FACT SHEET

Why are we updating the 2010 study?

Transportation funding for Cities and Counties are still at risk.

The 2010 statewide needs study identified a funding shortfall of over $70 billion for local streets and roads (the final report is available on the www.SaveCaliforniaStreets.org website). This information was used to help protect gas tax funds in FY 2010/11.

However, the current budget discussions between the Governor and the Legislature make it clear that the prospect of having our already insufficient local road funds reallocated to address the state's budget woes is a very real concern. This update will help us once again with our efforts to protect our transportation funds. An additional goal for this assessment is to promote the augmentation of funding for local street and road maintenance.

Why is this update important?

Performing a needs assessment biennially is important to provide updated information to maintain and obtain transportation funding, similar to what Caltrans does. Hopefully, the information from this study will embed into the decision makers minds the importance of maintaining sufficient transportation funding for local streets and roads. Additionally, we need to make it clear what the detrimental consequences are for deferring or reducing local street and road funds. This study is the only comprehensive and systematic statewide approach to quantify local streets and roads needs.

How can Cities and Counties help?

Your help in 2010 made a difference, and we need your input again!

Please go to www.SaveCaliforniaStreets.org and login to our online survey to provide updates in the following categories:

- Contact Person from your Agency
- Recent Pavement condition data
- Safety, traffic, and regulatory data
- Funding/expenditure projections

There are a few new items that were not included in the 2010 survey (such as complete streets and bridges) that have been added to the survey and need your input. We are anxious to begin the study so please provide us with the contact person who is responsible for both the technical and funding information in your agency. We will be in touch with them soon to obtain this information. The deadline for responding to this survey is May 15th, 2012.

FACT SHEET

Who is sponsoring this project?

Many cities and counties contributed funding to this study. The agencies listed below have accepted the leadership responsibility for completing this study on behalf of the cities and counties in California.

- California State Association of Counties (CSAC)
- League of California Cities (League)
- County Engineers Association of California (CEAC)
- County of Los Angeles
- California Regional Transportation Planning Agencies (RTPA)
- Metropolitan Transportation Commission (MTC)
- California Rural Counties Task Force (RCTF)

The Oversight Committee is composed of representatives from each organization, with the Metropolitan Transportation Commission acting as the Project Manager. Nichols Consulting Engineers, Chtd. (NCE) is the consultant who will be performing the update.

Who should I contact for more information?

Margot Yapp, Vice President
Nichols Consulting Engineers, Chtd.
501 Canal Blvd, Suite I
Pt. Richmond, CA 94804
(510) 215-3620

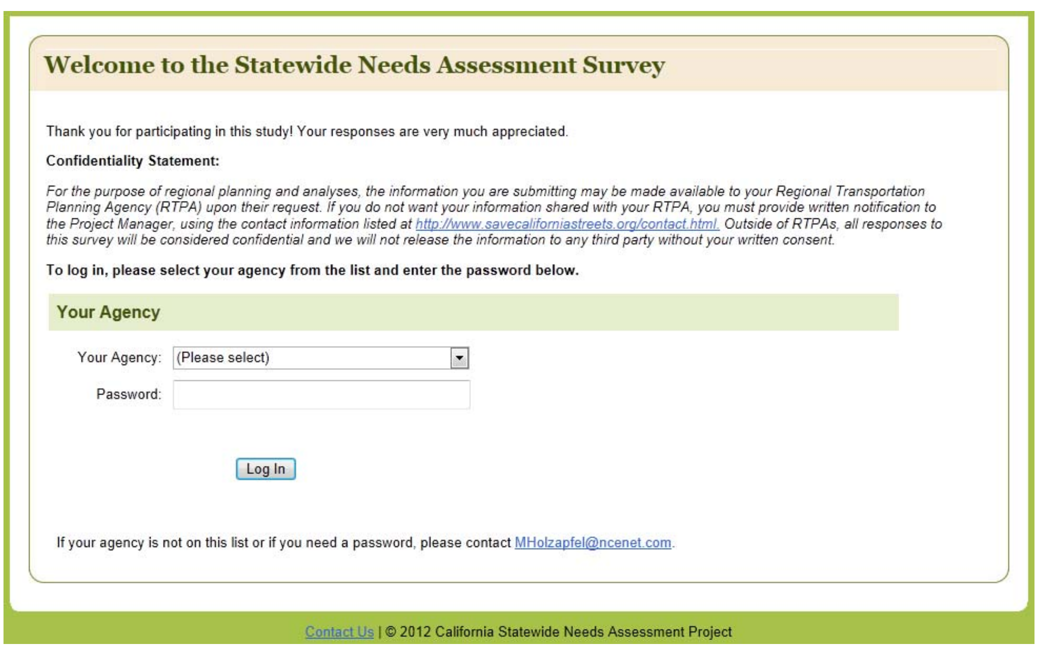
Theresa Romell, Senior Planner
Project Manager
Metropolitan Transportation Commission
(510) 817-5772

Greg Kelley, Assistant Deputy Director
County of Los Angeles
Dept of Public Works
(626) 458-4911

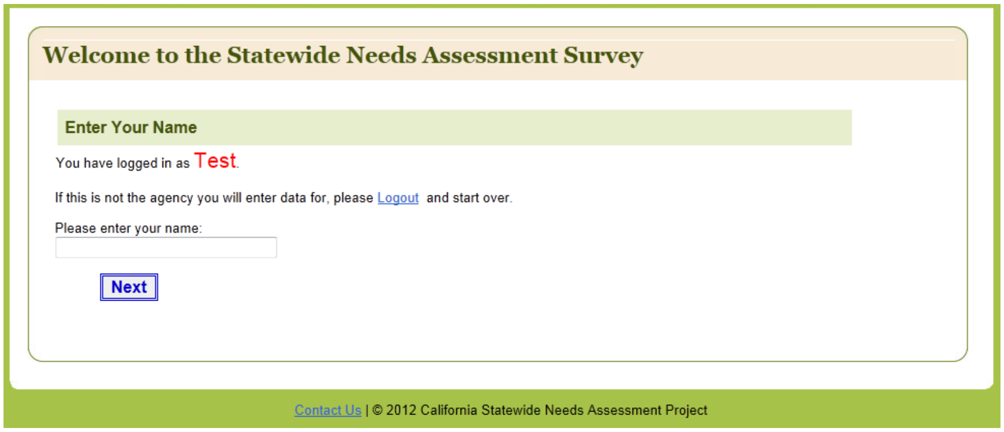
Instructions for Online Survey

Step 1. Go to http://www.savecaliforniastreets.org. Click on the button that says “Click here to participate”.

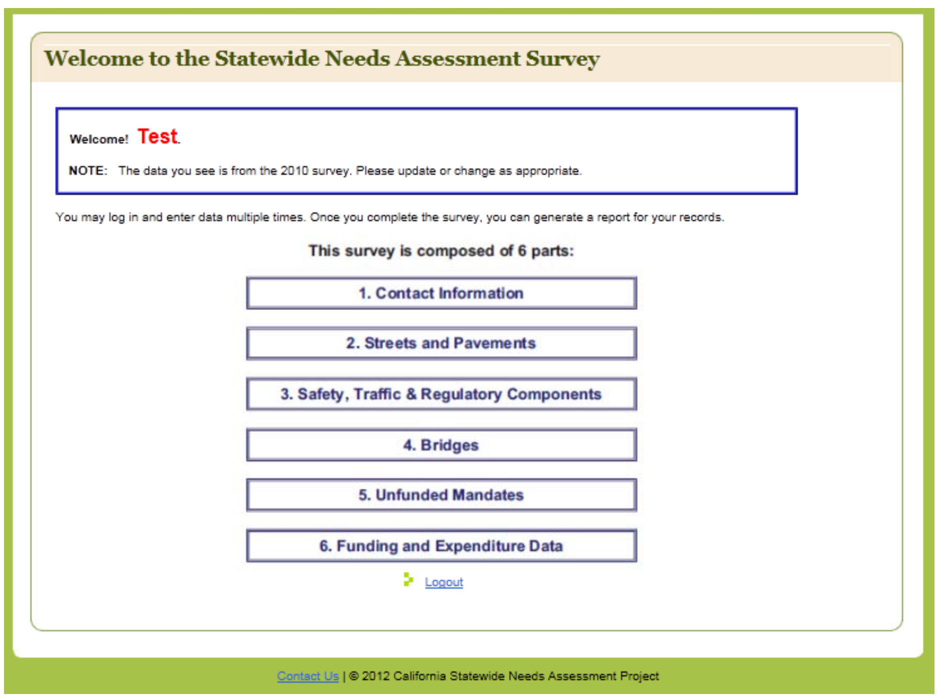
Step 2. On the login page, select the name of your agency from the dropdown list. If you responded to the 2010 survey, the information you entered at that time will be shown so that you can update it. You will need your agency’s login and password which was mailed to you. If you do not have this information, please contact Melissa Holzapfel at (510) 215-3620 or at mholzapfel@ncenet.com.



Step 3. Enter your name, then click “Next” to the main survey page.



Step 4. There are six (6) parts in this survey (see image below). Click on each button to enter the relevant information.



Step 5. Once data entry is complete, you can view and print your entry by clicking on the “Print a copy for your records” button. If there are no more changes, select “Yes” on the “Are you ready to submit the survey as final?” question.

Step 6. Click on “Logout” button when done.

THANK YOU FOR YOUR PARTICIPATION!

Statewide Needs Assessment Survey Report

1. CONTACT INFORMATION

Contact Type	Salutation	Name	Title	Department	Address Line 1	Address Line 2	City	Zip Code	Email	Phone
Main Contact Person										
Alternative Contact Person										
Contact Person for Financial Data										
Alternative Contact Person for Financial Data										

2. STREETS AND PAVEMENTS

2.1 Pavement Management System and Pavement Distress Survey Procedures

1. Does your agency use Pavement Management System (PMS) software?
(Go to Question 1a if "Yes"; Go to Question 1b if "No".)

1a. Select your agency's Pavement Management System (PMS) software:

Enter your agency's PMS software name (if "Other" is selected above):

1b. Select the reason your agency does not use a PMS:

Enter the reason your agency does not use a PMS (if "Other" is selected above):

2. What pavement distresses do you collect for AC (Asphalt Concrete)? If you collect distresses that are not listed below, please enter in the "Other AC Distresses" box.

1) Alligator Cracking No
2) Block Cracking No
3) Distortions No
4) Long. & Trans. Cracking No
5) Patch & Util. Cut Patch No
6) Rutting/Depression No
7) Weathering & Raveling No

Other AC distresses your agency collects, if any:

---

3. Does your agency have PCC (Portland Cement Concrete) pavements?

If yes, what pavement distresses do you collect for PCC? If you collect distresses that are not listed below, please enter in the "Other PCC Distresses" box.

1) Corner Break No
2) Divided Slab No
3) Faulting No
4) Linear Cracking No
5) Patching & Utility Cuts No
6) Scaling/Map Cracking/Crazing No
7) Spalling No

Other PCC distresses your agency collects, if any:

---

4. What other condition data do you collect?

Deflection N/A
Ride Quality N/A
Friction N/A
Drainage N/A
Structure/Core N/A
Complaints N/A
Pavement Age N/A

Other condition data your agency collects, if any:

---

5. What is the scale of the pavement condition index/rating used (e.g. 0-100, A-F)?
Lowest possible rating(e.g. 0)

Highest possible rating(e.g. 100)

6. Any notes you would like to add regarding your pavement distress survey procedures (e.g. collected by consultant, in-house, frequency of collection, etc.), or any comments/notes you have regarding any portion of this survey/your data:

2.2 Sustainable Pavement Practices

1. What sustainable pavement practices does your agency utilize?

Sustainable Pavement Practice	Does your agency utilize?	Unit Cost ($/sy)	Additional Costs or Savings	Percentage of Additional Costs or Savings
Reclaimed Asphalt Pavement (RAP)				%
Cold In-place Recycling (CIR) Pavements				%
Warm Mix Asphalt				%
Porous/Pervious Pavements				%
Full Depth Reclamation (FDR)				%
Rubberized Asphalt Concrete (RAC)				%
Pavement Preservation Strategies				%

Other Sustainable Pavement Practices your agency is utilizing (indicate additional costs or savings):

2. What are the estimated total cost savings resulting from sustainable pavement practices, if any? (Enter savings as % of total pavement treatment costs)

%

3. Will you continue applying sustainable pavement practices?

4. What do you like about sustainable pavement practices?

5. What do you dislike about sustainable pavement practices?

6. Other comments regarding sustainable pavement practices:

2.3 Inventory and condition Information

Functional Class/Road Type	Year of Last Inspection	Pavement Condition Rating (Weighted Average)	Center Line Miles	Lane Miles	Area(sq. yd.)	PCC (as % of the area)
Urban Major Roads						
Urban Residential/Local Roads						
Rural Major Roads						
Rural Residential/Local Roads						
Unpaved Roads						0.00

2.4. Pavement treatment unit costs

Urban Major Roads:

Pavement Treatment	PCI Range	Unit Cost ($/sq. yd.)
Do Nothing	90 - 100	$0.00
Preventive Maintenance (e.g. slurry, chip seal, cape seal)	70 - 89	
Thin overlay (e.g. less than or equal to 2 inches)	50 - 69	
Thick overlay (e.g. more than 2 inches)	25 - 49	
Reconstruction (e.g. remove & replace)	0 - 24	

Urban Residential/Local Roads:

Pavement Treatment	PCI Range	Unit Cost ($/sq. yd.)
Do Nothing	90 - 100	$0.00
Preventive Maintenance (e.g. slurry, chip seal, cape seal)	70 - 89	
Thin overlay (e.g. less than or equal to 2 inches)	50 - 69	
Thick overlay (e.g. more than 2 inches)	25 - 49	
Reconstruction (e.g. remove & replace)	0 - 24	

Rural Major Roads:

Pavement Treatment	PCI Range	Unit Cost ($/sq. yd.)
Do Nothing	90 - 100	$0.00
Preventive Maintenance (e.g. slurry, chip seal, cape seal)	70 - 89	
Thin overlay (e.g. less than or equal to 2 inches)	50 - 69	
Thick overlay (e.g. more than 2 inches)	25 - 49	

Reconstruction (e.g. remove & replace)	0 - 24	

Rural Residential/Local Roads:

Pavement Treatment	PCI Range	Unit Cost ($/sq. yd.)
Do Nothing	90 - 100	$0.00
Preventive Maintenance (e.g. slurry, chip seal, cape seal)	70 - 89	
Thin overlay (e.g. less than or equal to 2 inches)	50 - 69	
Thick overlay (e.g. more than 2 inches)	25 - 49	
Reconstruction (e.g. remove & replace)	0 - 24	$23.00

2.5 Complete Streets Policy

1. Has your agency adopted a "Complete Streets Policy"?
   If your answer is "No" or "Don't know", skip this session.

2. What complete streets elements are included or assumed in the policy? Check all that apply.

   - Bicycle facilities ☐
   - Pedestrian facilities ☐
   - Landscaping ☐
   - Medians ☐
   - Lighting ☐
   - Roundabouts ☐
   - Traffic Calming e.g. reducing lane widths ☐
   - Signs ☐
   - Curb Ramps ☐

   Comments/Additional items: ______________________

3. What percentage of roads are candidates to become a Complete Street? (e.g. enter 10 for 10%)
   [ ] %

4. What is the estimated average incremental costs to provide Complete Street enhancements ($/sq. yd)?
   $[ ]/sq. yd

5. Other comments or notes you would like to add regarding Complete Streets: ______________________

3. SAFETY, TRAFFIC AND REGULATORY COMPONENTS

Category	Inventory (Quantity)	Unit	Total Replacement Cost	Accuracy
Storm Drains - pipelines		mile		
Other elements e.g. manholes, inlets, culverts, pump stations etc		ea		
Curb and gutter		ft		
Pedestrian facilities: Sidewalk (public)		sq. ft.		
Other pedestrian facilities, e.g. over-crossings		ea		
* Bicycle facilities: Class I bicycle path		mile		
Other bicycle facilities		ea		
Curb ramps		ea		
Traffic signals		ea		
Street Lights		ea		
Sounds Walls/Retaining walls		sq. ft.		
Traffic signs		ea		
Other physical assets or expenditures that constitute >5% of total non-pavement asset costs e.g. heavy equipment, corporation yards etc. Note: Do NOT include bridges (handled separately)		ea		

4. BRIDGE DATA

4.1 Local Agency Owned/Maintained Bridges (LAB’s)

1. Total Number of LAB’s within / not within the National Bridge Inventory (NBI):

Number of LAB's within the NBI	Number of LAB's NOT within the NBI

2. Number of LAB’s by maintenance expenditures in last two years:

	Maintenance Expenditures per Bridge in Last Two Years		
	None	<$1000/Bridge	>=$1000/Bridge
Number of LAB's			

3. Number of LAB’s posted for live load restriction:

4. Has Agency developed a Scour Mitigation Plan of Action (POA) for LAB’s?

5. If so, number of LAB’s that the Agency has completed Scour Mitigation POA’s over last 5 years:

6. Has Agency submitted Bridge Preventative Maintenance Program (BPMP) Plan to Caltrans for review / approval?

4.2 Short Span Vehicular Bridges (SSB’s)

1. Total Number of SSB’s

4.3. Non-Vehicular Bridges (NVB’s)

1. Total Number of NVB’s

2. Number of NVB’s by Maintenance Expenditures in last two years

	Maintenance Expenditures per Bridge in Last Two Years		
	None	<$1000/Bridge	>=$1000/Bridge
Number of NVB's			

4.4 Low Water Crossings (LWC’s)

Total Number of LWC’s	Number of LWC’s replaced over last 5 years	Total Number of LWC’s that should be replaced with bridges

5. UNFUNDED MANDATES

Does your agency have unfunded mandates such as Americans with Disabilities Act (ADA), NPDES(National Pollutant Discharge Elimination System) requirements or Traffic Sign Retroreflectivity?

If you answer "Yes" above, please fill out the table. Otherwise, skip this section.

Are you willing to be contacted if we have follow-up questions regarding "Unfunded Mandates"?

Additional comments regarding "Unfunded Mandates":

Mandate	Do you track costs separately?	Estimated 10-Year Needs	Estimated 10-Year Needs	Accuracy
ADA				
NPDES				
Traffic Sign Retroreflectivity				

6. FUNDING AND EXPENDITURE DATA

6.1 Actual/Estimated Revenues for Pavement-related Activities

(No data has been entered)

6.2 Actual/Estimated Revenues for Safety, Traffic & Regulatory Components

(No data has been entered)

6.3 Expenditures on Pavements

Name	Amount (FY2010/11)	Amount (FY 2011/12)	Annual Average (FY2012/13 to 2021/22)
Preventive Maintenance e.g. crack seals, slurry seals etc			
Rehabilitation & reconstruction e.g. overlays			
Other (pavement related)			
Other Operations & Maintenance e.g. vegetation, cleaning ditches, sweeping etc			

Of the totals reported above, what percentages are due to "Sustainable Pavement Practices" and "Complete Streets Policy"? Enter in table below.

Name	% of Amount (FY 2010/11) Total	% of Amount (FY 2011/12) Total	% of Annual Average (FY 2012/13 to 2021/22) Total
Sustainable Pavement			

Practices			
Complete Streets Policy			

6.4 Expenditures on Safety, Traffic & Regulatory Components

Name	Amout (FY2010/11)	Amount (FY2011/12)	Annual Average (FY2012/13 to 2021/22)
Storm Drains - pipelines			
Other elements e.g. manholes, inlets, culverts, pump stations etc			
Curb and gutter			
Pedestrian facilities: Sidewalk (public)			
Other pedestrian facilities, e.g. over-crossings			
* Bicycle facilities: Class I bicycle path			
Other bicycle facilities			
Curb ramps			
Traffic signals			
Street Lights			
Sounds Walls/Retaining walls			
Traffic signs			
Other physical assets or expenditures that constitute >5% of total non-pavement asset costs e.g. heavy equipment, corporation yards etc. Note: Do NOT include bridges (handled separately)			

Of the above total expenditures, what percentages are due to a "Complete Streets Policy"?

Name	% of Amount (FY 2010/11) Total	% of Amount (FY 2011/12) Total	% of Annual Average (FY 2012/13 to 2021/22) Total
Complete Streets Policy			

6.5 Bridge Needs, Funding and Expenditures

1. Bridge maintenance expenditures:

Bridge Type	Total maintenance expenditures over last 2 years
Local Agency Owned/Maintained Bridges (LAB's)	

Non-vehicular Bridges (NVB's)	

2. If your agency has developed a Scour Mitigation Plan of Action (POA) for LAB's, provide total project costs of Scour Mitigation POA's over last 5 years:

3. If you agency has submitted Bridge Preventative Maintenance Program (BPMP) Plan to Caltrans, provide cost of developing the BPMP Plan:

4. Please provide your estimated bridge needs and available funding for the next ten (10) years:

Activity	Anticipated funding needs in the next 10 years	Available funding currently identified in the next 10 years
Bridge Maintenance		
Bridge Rehabilitation		
Bridge Replacement		

6.6 Financial Questions

1. What are innovative ways that your agency is doing to "stretch" the dollar?

2. Are there new revenues sources that your agency is considering?

3. Is there a county wide sales tax for transportation?

4. Is there a city wide sales tax for transportation?

5. If there is a city/county wide sales tax for transportation, describe how it is used (e.g. local match for highways, local streets & roads only, transit, etc).

APPENDIX B

Pavement Needs by County

Table B.1 Pavement Needs by County* (2012 $M Dollars)

County (Cities included)	Center Line Miles	Lane Miles	Area (sq. yd.)	2012 PCI	10 Year Needs (2012 $M)
Alameda County	3,534.16	7,981.96	81,700,384	68	$ 2,108
Alpine County	135.00	270.00	2,029,409	45	$ 60
Amador County	475.80	954.95	6,428,601	33	$ 383
Butte County	1,782.10	3,642.99	32,578,860	65	$ 828
Calaveras County	718.28	1,344.19	9,054,592	51	$ 372
Colusa County	986.70	1,523.51	12,503,304	60	$ 333
Contra Costa County	3,346.14	7,059.50	63,674,361	71	$ 1,464
Del Norte County	334.35	674.74	5,545,540	64	$ 135
El Dorado County	1,252.70	2,508.40	21,671,673	63	$ 635
Fresno County	5,972.88	12,702.32	106,961,163	69	$ 2,519
Glenn County	950.10	1,899.40	14,089,812	68	$ 350
Humboldt County	1,476.25	2,931.29	24,138,809	64	$ 687
Imperial County	2,999.96	6,086.66	45,427,410	57	$ 1,236
Inyo County	1,134.20	1,651.50	13,789,051	60	$ 328
Kern County	5,026.42	11,648.11	103,132,477	64	$ 2,927
Kings County	1,328.00	2,795.72	20,026,009	62	$ 600
Lake County	752.75	1,497.37	10,199,540	40	$ 450
Lassen County	429.31	874.60	6,406,058	66	$ 208
Los Angeles County	21,374.97	49,878.61	458,903,871	66	$ 12,531
Madera County	1,822.44	3,680.41	23,490,290	47	$ 1,019
Marin County	1,020.68	2,059.35	18,077,971	61	$ 551
Mariposa County	1,122.00	561.00	3,949,440	44	$ 150
Mendocino County	1,124.71	2,255.29	16,097,768	37	$ 617
Merced County	2,330.00	4,954.00	37,182,870	58	$ 1,224
Modoc County	1,511.58	3,034.24	18,066,419	56	$ 483
Mono County	727.38	1,453.39	10,071,369	66	$ 148
Monterey County	1,779.37	3,725.91	33,593,823	50	$ 1,388
Napa County	716.14	1,489.35	12,453,529	59	$ 410
Nevada County	798.01	1,617.30	10,438,504	72	$ 219
Orange County	6,501.06	17,011.98	146,008,901	77	$ 2,771
Placer County	1,983.49	4,192.32	34,161,920	71	$ 733
Plumas County	703.90	1,408.60	11,409,902	66	$ 214
Riverside County	7,112.65	15,887.53	143,854,509	70	$ 3,419

County (Cities included)	Center Line Miles	Lane Miles	Area (sq. yd.)	2012 PCI	10 Year Needs (2012 $M)
Sacramento County	5,041.96	11,263.99	95,668,492	64	$ 2,728
San Benito County	410.70	832.97	5,547,794	66	$ 160
San Bernardino County	8,822.82	20,553.99	171,322,286	70	$ 4,006
San Diego County	8,134.08	20,258.27	179,755,199	67	$ 5,314
San Francisco County	939.64	2,133.62	21,123,238	65	$ 610
San Joaquin County	3,370.60	7,113.91	61,240,026	67	$ 1,586
San Luis Obispo County	1,967.03	4,070.03	32,279,689	63	$ 944
San Mateo County	1,872.39	3,912.39	33,486,613	71	$ 769
Santa Barbara County	1,568.63	3,293.66	29,610,551	67	$ 814
Santa Clara County	4,161.97	9,380.88	90,432,429	73	$ 1,860
Santa Cruz County	855.67	1,751.53	13,764,053	48	$ 573
Shasta County	1,686.97	3,479.08	26,243,076	57	$ 861
Sierra County	499.23	1,000.91	8,010,229	71	$ 155
Siskiyou County	1,494.88	3,004.80	20,340,302	57	$ 605
Solano County	1,714.96	3,623.43	29,162,226	67	$ 742
Sonoma County	2,372.70	4,959.65	39,517,285	50	$ 1,634
Stanislaus County	2,718.05	5,898.62	47,866,381	52	$ 1,946
Sutter County	1,028.81	2,105.53	15,865,482	56	$ 507
Tehama County	1,197.49	2,400.88	15,834,143	65	$ 402
Trinity County	915.78	1,608.07	12,529,435	50	$ 455
Tulare County	3,956.82	8,180.79	60,632,842	68	$ 1,496
Tuolumne County	532.50	1,228.95	16,984,138	62	$ 508
Ventura County	2,440.39	5,352.55	47,701,134	69	$ 1,190
Yolo County	1,400.29	2,538.48	21,752,974	63	$ 622
Yuba County	724.40	1,504.26	12,862,583	56	$ 454
California	143,092	312,708	2,666,650,735	66	$72,443

* Includes Cities within County

APPENDIX C

Essential Component Needs by County

Table C.1 Summary of Essential Component Needs by County

County	10 year Needs ($M)
Alameda	$ 2,617
Alpine	$ 4
Amador	$ 2
Butte	$ 116
Calaveras	$ 7
Colusa	$ 21
Contra Costa	$ 1,098
Del Norte	$ 36
El Dorado	$ 61
Fresno	$ 242
Glenn	$ 24
Humboldt	$ 174
Imperial	$ 108
Inyo	$ 8
Kern	$ 563
Kings	$ 115
Lake	$ 33
Lassen	$ 15
Los Angeles	$ 6,210
Madera	$ 104
Marin	$ 298
Mariposa	$ 6
Mendocino	$ 109
Merced	$ 136
Modoc	$ 3
Mono	$ 14
Monterey	$ 459
Napa	$ 188
Nevada	$ 22

County	10 year Needs ($M)
Orange	$ 1,943
Placer	$ 421
Plumas	$ 31
Riverside	$ 1,456
Sacramento	$ 1,364
San Benito	$ 16
San Bernardino	$ 1,210
San Diego	$ 2,249
San Francisco	$ 1,380
San Joaquin	$ 728
San Luis Obispo	$ 239
San Mateo	$ 827
Santa Barbara	$ 308
Santa Clara	$ 1,536
Santa Cruz	$ 141
Shasta	$ 204
Sierra	$ 12
Siskiyou	$ 16
Solano	$ 544
Sonoma	$ 852
Stanislaus	$ 645
Sutter	$ 260
Tehama	$ 11
Trinity	$ 10
Tulare	$ 309
Tuolumne	$ 59
Ventura	$ 635
Yolo	$ 263
Yuba	$ 25
Totals	**$ 30,485**

* Includes cities within County

APPENDIX D

Bridge Needs By County

Estimated Local Agency Needs Summary					
	Number of Bridges	Average Sufficiency Rating, SR	Structures with SR ≤ 80	Structures with SR ≤ 50	Total Bridge Need
County Name	EA		EA	EA	$ Million
Alameda	183	83	55	9	$120 M
Alpine	11	75	5	1	$1 M
Amador	39	66	19	9	$7 M
Butte	291	74	97	46	$82 M
Calaveras	67	76	27	9	$11 M
Colusa	148	86	27	11	$11 M
Contra Costa	287	83	83	15	$118 M
Del Norte	28	78	11	3	$12 M
El Dorado	87	66	45	17	$39 M
Fresno	491	81	156	34	$72 M
Glenn	167	76	58	22	$56 M
Humboldt	168	71	64	31	$119 M
Imperial	137	77	49	16	$18 M
Inyo	33	78	12	2	$3 M
Kern	258	87	57	4	$19 M
Kings	99	89	22	1	$4 M
Lake	78	73	28	13	$19 M
Lassen	64	78	24	6	$8 M
Los Angeles	1,456	85	451	28	$1,239 M
Madera	155	84	30	16	$38 M
Marin	112	74	44	16	$31 M
Mariposa	52	68	24	11	$16 M
Mendocino	137	74	55	20	$58 M
Merced	287	80	109	19	$27 M
Modoc	50	86	9	2	$1 M
Mono	11	80	3	1	$1 M
Monterey	133	69	52	31	$175 M
Napa	104	72	37	19	$35 M
Nevada	56	72	14	13	$26 M

Estimated Local Agency Needs Summary (continued from previous page)					
	Number of Bridges	Average Sufficiency Rating, SR	Structures with SR ≤ 80	Structures with SR ≤ 50	Total Bridge Need
County Name	EA		EA	EA	$ Million
Orange	507	84	179	13	$71 M
Placer	168	77	51	25	$29 M
Plumas	91	70	41	16	$34 M
Riverside	429	86	119	10	$71 M
Sacramento	375	84	86	21	$168 M
San Benito	46	76	14	7	$7 M
San Bernardino	480	76	109	91	$243 M
San Diego	491	87	106	12	$95 M
San Francisco	23	73	12	3	$23 M
San Joaquin	323	85	78	14	$75 M
San Luis Obispo	183	76	83	17	$37 M
San Mateo	140	78	62	12	$36 M
Santa Barbara	178	80	47	21	$54 M
Santa Clara	447	78	118	64	$204 M
Santa Cruz	99	68	40	23	$57 M
Shasta	280	80	97	22	$66 M
Sierra	32	72	11	7	$13 M
Siskiyou	179	82	31	18	$32 M
Solano	199	87	41	7	$24 M
Sonoma	431	77	154	52	$150 M
Stanislaus	247	78	116	14	$81 M
Sutter	92	81	41	3	$3 M
Tehama	309	74	91	56	$136 M
Trinity	96	77	32	12	$24 M
Tulare	396	83	133	9	$29 M
Tuolumne	54	67	25	11	$10 M
Ventura	178	82	58	10	$81 M
Yolo	127	76	41	20	$27 M
Yuba	74	70	24	17	$30 M

APPENDIX A

LOS ANGELES METRO AREA

COST TO LOS ANGELES MOTORISTS OF INADEQUATE ROADS

TRIP estimates that Los Angeles roadways that lack some desirable safety features, have inadequate capacity to meet travel demands or have poor pavement conditions, cost the average Los Angeles driver $2,462 annually in the cost of traffic crashes, additional vehicle operating costs and congestion-related delays.

- Driving on roads in need of repair costs the average motorist in the Los Angeles area $746 annually in extra vehicle operating costs. These costs include accelerated vehicle depreciation, additional repair costs and increased fuel consumption and tire wear.

- Traffic congestion in the Los Angeles area costs the average motorist in the region $1,480 annually in lost time and wasted fuel.

- Traffic accidents and fatalities in which roadway characteristics were likely a contributing factor cost each Los Angeles area driver an average of $236 annually, including medical costs, lost economic and household productivity, property damage and travel delays.

ROAD CONDITIONS

Among all large cities (500,000 population or greater), the Los Angeles urban area has the highest percentage of pavements in poor condition in the nation. Nearly two-thirds of the area's major roads are rated in poor condition.

- A total of 92 percent of major roads in the Los Angeles area are in poor or mediocre condition, costing area drivers nearly $750 each year in extra vehicle operating costs.

- Sixty-four percent of major roads in the Los Angeles urban area are rated in poor condition, the highest percentage in the nation among cities with at least 500,000 population. An additional 28 percent of the area's major roads are in mediocre condition. This includes Interstates, highways, connecting urban arterials, and key urban streets that are maintained by state, county or municipal governments.

- Roads rated in poor condition often have significant rutting, potholes or other visible signs of deterioration. Roads in poor condition typically need to be resurfaced or reconstructed. Roads rated in mediocre condition show signs of significant wear and may also have some visible pavement distress. Most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition.

- Just three percent of major roads in the Los Angeles area are in good condition. A desirable goal for state and local organizations responsible for road maintenance is to keep 75 percent of major roads in good condition.

- The following is a list of the most deteriorated sections of state roadways in the Los Angeles area, which are not scheduled for repair through the end of 2009.

Chart 1. Most deteriorated sections of state roadways in the Los Angeles metro area.

Rank	Route	From	To	Miles	ADT
1	Route 5	Route 39 (Beach Blvd.), Buena Park	LA County Line, Buena Park	1.5	221,000
2	Highland Ave.	Route 2 / Santa Monica Blvd., LA	Franklin Ave., LA	1.3	52,000
3	Santa Monica Blvd./Alvarado St.	La Brea Ave. to Route 101, LA	Glendale Blvd., LA	3	64,477
4	Santa Monica Blvd.	Centinela Ave., LA	Route 405, LA	1.4	68,000
5	Venice Blvd.	Route 1, LA	Sawtelle Blvd., LA	2.1	39,000
6	Route 1	Third St., Hermosa Beach	Fiji Way, Marina del Rey	9.9	57,006
7	Route 405	Studebaker Rd., near Orange Co. Line, Long Beach	Rinaldi St., near Route 118, LA	47.6	262,000
8	Route 5	Whittier Blvd., LA	Glendale Blvd., LA	6.5	238,000
9	Route 405	Route 22, Seal Beach	Los Angeles County Line, Seal Beach	3.2	327,111
10	Route 47	Gaffey St., LA	End of the Schuyler Heim Bridge near Rt 103, LA	4.2	51,461
11	Route 164	Garvey Ave., South El Monte	Marshall St., Rosemead	1.1	47,032
13	Route 10	Baldwin Ave., El Monte	Route 605, Baldwin Park	3.1	235,000
14	Route 39	Adams Ave., Huntington Beach	Heil Ave., Huntington Beach	3.7	46,268
15	Route 55	Finley Ave., Newport Beach	19th St., Costa Mesa	2.1	43,000
16	Route 90	Harbor Blvd. (Route 72), Fullerton	Valencia Ave. (Route 142), Brea	4.8	46,321
18	Route 1	E. Anaheim St., Long Beach	Route 107, Torrance	13.3	29,000
19	Route 91	Los Angeles County Line, La Palma	Imperial Highway (Route 90), Anaheim	12.6	236,000
20	Route 710	Imperial Highway, Lynwood	Valley Blvd., Alhambra	10.8	234,000
21	Route 110	9th St. and Gaffey St., LA	Route 1, LA	4.1	49,291
22	Route 10	Route 710, East LA	Del Mar Ave., San Gabriel	4.8	236,000

Source: Caltrans response to TRIP survey. (ADT = Average Daily Traffic)

BRIDGE CONDITIONS

Approximately one third of bridges and overpasses in the Los Angeles area are structurally deficient or functionally obsolete.

- Nine percent (362) of the 4,217 bridges in the Los Angeles area are rated as structurally deficient, showing significant deterioration to decks and other major components.

- Twenty-seven percent (1,118) of the 4,217 bridges in the Los Angeles area are functionally obsolete. These bridges no longer meet modern design standards for safety features such as lane widths or alignment with connecting roads or are no longer adequate for the volume of traffic being carried.

- Bridge deficiencies have an impact on mobility and safety. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid these bridges. Narrow bridge lanes, inadequate clearances and poorly aligned bridge approaches reduce traffic safety. Redirected trips lengthen travel time, waste fuel and reduce the efficiency of the local economy.

- The following is a list of the most structurally deficient bridges in the Los Angeles area, carrying at least 5,000 vehicles per day. Bridges are assigned an overall sufficiency rating between one and 100, with deficient bridges receiving a lower score. Individual components of the bridge, including the deck, super-structure and sub-structure are also assigned a rating between one and nine, with a lower score indicating a greater level of deficiency.

Chart 2. Bridges in the Los Angeles metro area with the lowest sufficiency rating.

Rank	Route	City	Route or feature intersected	Daily Traffic	Year built	Sufficiency Rating	Deck Rating	Super-structure Rating	Sub-structure Rating
1	SANTA ANITA AVE	El Monte	RIO HONDO	30,700	1959	21.1	4	3	7
2	Route 1	Los Angeles	Texaco Overhead	33,000	1967	22	6	7	2
3	GARVEY AVE	Monterey Park	MABEL AVE	25,570	1934	25.6	3	5	6
4	VALENCIA BLVD	Los Angeles	SANTA CLARA RIVER	29,145	1928	26.7	6	5	7
5	CALIFORNIA INCLINE	Santa Monica	PACIFIC COAST HWY	9,920	1930	34.1	6	5	4
6	HELLMAN AVE	Rosemead	ALHAMBRA WASH	5,200	1936	35.1	7	3	7
7	OCEAN BLVD	Long Beach	ENT. CHANNEL, SPTCO	59,670	1968	43	3	4	7
8	Route 10	Los Angeles	Santa Monica Viaduct "C"	304,000	1959	45	3	5	7
9	Route 1	Santa Monica	Main Street Overcrossing*	13,500	1926	45.3	6	6	7
10	HARBOR BLVD	Fullerton	BREA CREEK CHANNEL	35,000	1930	45.7	4	5	7
11	Route 10	Los Angeles	Santa Monica Viaduct "F"	304,000	1959	46	3	5	7
12	SLAUSON AVE	Bell	LA RIVER	33,400	1942	47	3	5	7
13	GARVEY AVE	Rosemead	RIO HONDO	22,400	1936	47.3	4	5	7
14	Route 710	Commerce	East Yard Overhead	240,000	1954/1967	48	2	5	7
15	FIRESTONE BLVD	Downey	SAN GABRIEL RIVER	53,600	1934	48.9	1	6	7
16	Route 60	Los Angeles	Eastbound 60/5 Separation	95,000	1965	49	4	4	7
17	VALLEY BLVD	El Monte	RIO HONDO	19,800	1956	49.1	5	3	7
18	CERRITOS AVE	Azusa	BIG DALTON WASH	20,300	1961	49.7	7	3	7
19	HOLLY ST	Pasadena	ARROYO BL & ARROYO	7,236	1925	50.3	4	5	6
20	AZUSA LANE	Azusa	LITTLE DALTON WASH	8,300	1970	50.6	6	3	6
21	Route 1	Long Beach	Route 1/103 Separation	31,900	1948	52.1	4	5	7
22	Route 1	Los Angeles	Wilmington Overhead	31,900	1936	52.4	3	5	7
23	WILLOW ST	Long Beach	LOS CERITOS DRAIN	20,900	1954	53.5	4	5	7
24	ANAHEIM STREET	Long Beach	LONG BEACH FREEWAY	30,300	1954	53.6	4	4	7
25	ALAMEDA ST	Compton	COMPTON CREEK	10,000	1937	54	4	5	6

Source: Caltrans response to TRIP survey.

<u>CONGESTION</u>

Among all large cities (500,000 population or greater), the Los Angeles urban area suffers the highest level of **traffic congestion in the country. This level of congestion is a growing burden, hampering mobility for individuals and businesses and impeding the region's economic development.**

- In 2007, 81 percent of urban highways in the Los Angeles metro area were congested, carrying traffic volumes that result in significant rush hour delays.

- The average Los Angeles driver loses 70 hours per year due to traffic congestion – the highest rate in the nation according to the Texas Transportation Institute's (TTI) 2009 Annual Urban Mobility Report.

TRAFFIC SAFETY

Improving safety features on Los Angeles' roads and highways would likely result in a decrease in traffic fatalities in the state.

- In 2008, 874 people were killed in traffic accidents in the Los Angeles metro area.
- Los Angeles' fatality rate per 100,000 population was 6.8 in 2008. This was lower than the statewide average of 9.3 fatalities per 100,000 population.
- Where appropriate, highway improvements can reduce traffic fatalities and accidents while improving traffic flow to help relieve congestion. Such improvements include removing or shielding obstacles; adding or improving medians; adding rumble strips, wider lanes, wider and paved shoulders; upgrading roads from two lanes to four lanes; and better road markings and traffic signals.

PUBLIC TRANSIT

Public transit use continues to increase in the Los Angeles area and plays an important role in providing mobility in the region.

- Public transit provided 2.9 billion passenger miles of travel in the Los Angeles urban area in 2007, an increase of 16 percent since 2002.
- In 2007 the average age of buses in the Los Angeles area was 7.8 years, an increase from 2002, when the average age was 4.9 years. The Federal Transit Administration recommends that buses be replaced after 12 years.
- In 2007 the average age of passenger rail cars in the Los Angeles urban area was 12.2 years, an increase from 2002, when the average age was 7.5 years. The Federal Transit Administration recommends that passenger rail cars be replaced after 35 years.

FUTURE MOBILITY IN CALIFORNIA

The Condition, Use and Funding of California's Roads, Bridges and Transit System

DECEMBER, 2009

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Founded in 1971, TRIP ® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on highway transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with an efficient and safe highway transportation network.

Executive Summary

California's extensive system of roads, highways, bridges and public transit is the backbone that supports the state's economy. California's surface transportation system needs to provide safe and efficient commutes to work and school, visits with family and friends, and trips to tourist and recreation attractions while simultaneously providing businesses with reliable access for customers, suppliers and employees. With an unemployment rate of 12.5 percent – the fourth highest in the nation - and with the state's population continuing to grow, California must improve its system of roads, highways, bridges and public transit to foster economic growth, avoid business relocations, and ensure the safe, reliable mobility needed to improve the quality of life for all Californians.

As California looks to rebound from the current economic downturn, the state will need to enhance its surface transportation system by improving the physical condition of its transportation network and enhancing the system's ability to provide efficient and reliable mobility for residents, visitors and businesses. Making needed improvements to California's roads, highways, bridges and transit could provide a significant boost to the state's economy by creating jobs and stimulating long-term economic growth as a result of enhanced mobility and access.

California faces enormous challenges in addressing its transportation needs. Urban road conditions are among the roughest in the nation. The state faces crippling traffic congestion, which threatens to impede economic activity and diminish quality of life. The state's public transportation systems are also in disrepair and must be modernized and expanded.

While the needs of the state's highway and transit systems continue to grow, the amount of revenue to address these needs is expected to remain limited, leading to significant challenges in providing a smooth, efficient and well-maintained system of roads, bridges and transit. Despite recent gains in transportation funding, the state still faces an annual highway transportation funding shortfall of approximately $4 billion. This is in addition to the $6.9 billion annual shortfall in funds needed to improve and expand the state's public transit system.

As the state lacks adequate funding to improve physical conditions and traffic congestion worsens, meeting California's need to modernize and maintain its system of roads, bridges and public transit will require a significant boost in local, state and federal funding.

Approved in February 2009, one aim of the American Recovery and Reinvestment Act is to stimulate the economy and provide a significant, short-term boost in transportation funding. California's estimated $3.6 billion in stimulus funding will allow the state to make some needed rehabilitation and improvements to its road, bridge and public transit systems, but this one-time funding boost will not allow the state to proceed with numerous projects needed to modernize its surface transportation system. Even with the aid of stimulus funding, the state will still face a sizeable, on-going transportation funding shortfall.

This report examines the use, condition and funding of California's roads and bridges as well as its public transportation system. Also included in the report are individualized analyses for California's six largest metropolitan areas. These areas are the Los Angeles urban area (which encompasses Los Angeles County and Orange County), Riverside and San Bernardino, Sacramento, San Diego, San Jose, and the San Francisco–Oakland area. These individualized reports cover each respective city and the surrounding metropolitan area and contain regional data on road and bridge conditions, congestion, transit use, transit system conditions and traffic safety, as well as lists of each area's most deteriorated roads and bridges. These regional assessments are included as Appendices A through F in the report. All data used in the report is the latest available.

California faces an estimated annual transportation funding shortfall of $10.9 billion to improve the state's roads, bridges and public transportation systems. The state's residents incur a significant cost as a result of roads and highways being congested, deteriorated or lacking some desirable safety features. A failure to eliminate or reduce the state's transportation funding shortfall will likely increase these costs incurred by Californians.

- According to Caltrans' 2007 Ten-Year Highway Operation and Protection Plan, approximately $5.5 billion will be needed annually from 2009 to 2018 to operate and rehabilitate the state highway system, a total of $55 billion over 10 years. However, based on funding projections and the current economic climate, only $1.5 billion will be available each year during that time, leaving a shortfall of $40 billion from 2009 to 2018, or $4 billion each year.

- California faces a transit funding shortfall of approximately $6.9 billion per year. While $1.7 billion in funding annually will be available, the state would need approximately $8.6 billion each year to improve the current conditions and service on its public transportation network.

- TRIP estimates that California's roadways that lack desirable some safety features, have inadequate capacity to meet travel demands or have poor pavement conditions cost the state's drivers approximately $40 billion annually in the form of traffic crashes, additional vehicle operating costs and congestion-related delays.

- Approved in February 2009, the American Recovery and Reinvestment Act offers a significant, short-term boost in transportation funding in California by providing $2.57 billion for road and bridge improvements and $1.07 billion for the state's public transit system. However, this funding is not sufficient to allow the state to proceed with many needed long-term projects that will improve safety, relieve congestion, enhance economic productivity and rehabilitate the state's roadway and transit system.

- Numerous projects needed to maintain and expand the current transportation system will not be able to move forward without a significant, long-term boost in funding at the local, state or federal level.

- Making needed repairs to the state's transportation system can help boost California's economy. A 2007 analysis by the Federal Highway Administration found that every $1 billion invested in highway construction would support approximately 27,800 jobs, including approximately 9,500 in the construction sector, approximately 4,300 jobs in industries supporting the construction sector, and approximately 14,000 other jobs induced in non-construction related sectors of the economy.

- California's unemployment rate reached 12.5 percent in October 2009, a significant increase since October 2009, when the state's unemployment rate was 5.7 percent.

- California's funding shortfall has been exacerbated by the escalation of the cost of transportation improvements due to rapid increases in the price of key materials needed for highway and bridge construction. The average cost of materials used for highway construction – including asphalt, concrete, steel, lumber and diesel – increased by 33 percent over the five-year period from October 2004 to October 2009.

Increases in the state's population and rate of vehicle travel have placed additional stress on California's roadways and transit systems, lead to rising congestion and additional deterioration. Traffic congestion in California is a growing burden in key urban areas and threatens to impede the state's economic development.

- Vehicle travel on California's major highways increased by 22 percent from 1990 to 2008 – jumping from 259 billion vehicle miles traveled (VMT) in 1990 to 315 billion VMT in 2008. Vehicle travel in California is expected to increase by another 20 percent by 2025, reaching approximately 378 billion VMT.

- California's population reached approximately 36.8 million in 2008, an increase of 24 percent and nearly seven million people since 1990. California's population is expected to increase to 49.2 million by 2030, an increase of approximately 12.4 million people.

- From 1990 to 2008, California's gross domestic product (GDP), a measure of the state's economic output, increased by 42 percent, when adjusted for inflation.
- Congestion on California's urban highways is growing as a result of increases in vehicle travel and population. In 2007, 68 percent of California's urban highways were congested, carrying traffic volumes that result in significant rush hour delay.
- The statewide cost of traffic congestion in lost time and wasted fuel is approximately $18.7 billion annually.

California has the second highest share of roads in poor condition in the nation. Driving on rough roads costs the state's motorists nearly $600 per year in extra vehicle operating costs – a total of $13.5 billion statewide.

- In 2007, 35 percent of major roads in California were rated in poor condition, the second highest share in the nation, behind only New Jersey. Another 31 percent of the state's major roads were rated in mediocre condition. Major roads include the state's Interstates, freeways and arterials.
- Roads rated in poor condition often have significant rutting, potholes or other visible signs of deterioration and typically need to be resurfaced or reconstructed. Roads rated in mediocre condition show signs of significant wear and may also have some visible pavement distress. Most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition.
- Roads in need of repair cost each California motorist an average of $590 annually in extra vehicle operating costs – the second highest amount in the nation and significantly higher than the national average of $335. Driving on roads in need of repair costs the state's motorists a total of $13.5 billion each year. These costs include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear.
- The functional life of California's roads is greatly affected by the state's ability to perform timely maintenance and upgrades to ensure that structures last as long as possible. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.
- Among all major urban areas in the nation with a population of 500,000 or more, six of the top 10 cities with the roughest pavement conditions are in California.
- This report contains information on pavement conditions in California's major metropolitan areas, including Los Angeles, Riverside and San Bernardino, Sacramento, San Diego, San Jose, and the San Francisco-Oakland area. Also included is a list of the sections of roadway in each of these urban areas that are most deteriorated and in need of repair. These regional assessments can be found in Appendices A through F of the report.

Twenty-nine percent of California's bridges and overpasses show significant deterioration or do not meet current design standards. This includes all bridges that are 20 feet or more in length and are maintained by state, local and federal agencies.

- Thirteen percent of California's bridges were structurally deficient in 2008. A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Structurally deficient bridges are often posted for lower weight or closed to traffic, restricting or redirecting commercial trucks and other larger vehicles including emergency service vehicles.
- Sixteen percent of California's bridges were functionally obsolete in 2008. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes and shoulders, inadequate clearances or poor alignment.
- The report contains a list of needed bridge rehabilitation and replacement projects across the state that currently lack adequate funding to proceed.
- This report contains information on bridge conditions in California's major cities, including the urban area containing Los Angeles, Long Beach and Santa Ana, the Riverside and San Bernardino urban area, Sacramento, San Diego, San Jose, and the San Francisco-Oakland area. Also included in the report is a list of bridges in each of these areas that are most deteriorated and in need of repair. These regional assessments can be found in Appendices A through F of the report.

California's rural traffic fatality rate is three times greater than the fatality rate on all other roads in the state. Improving safety features on California's roads and highways would likely result in a decrease in traffic fatalities in the state. Roadway design is an important factor in approximately one-third of all fatal and serious traffic accidents.

- Between 2004 and 2008, 20,122 people were killed in traffic accidents in California, an average of 4,024 fatalities per year.
- California's traffic fatality rate was 1.09 fatalities per 100 million vehicle miles of travel in 2008.
- The traffic fatality rate in 2008 on California's non-Interstate rural roads was 2.79 traffic fatalities per 100 million vehicle miles of travel, which is more than three times higher than the traffic fatality rate of .84 on all other roads and highways in the state.
- Several factors are associated with vehicle accidents that result in fatalities, including driver behavior, vehicle design and roadway characteristics.
- TRIP estimates that roadway characteristics, such as lane widths, lighting, signage and the presence or absence of guardrails, paved shoulders, traffic lights, rumble strips, obstacle barriers, turn lanes, median barriers and pedestrian or bicycle facilities, are likely a contributing factor in approximately one-third of all fatal and serious traffic crashes.

- Where appropriate, highway improvements can reduce traffic fatalities and accidents while improving traffic flow to help relieve congestion. Such improvements include removing or shielding obstacles; adding or improving medians; adding rumble strips, wider lanes, wider and paved shoulders; upgrading roads from two lanes to four lanes; and better road markings and traffic signals.

- The Federal Highway Administration has found that every $100 million spent on needed highway safety improvements will result in 145 fewer traffic fatalities over a 10-year period.

- The cost of serious traffic crashes in California in 2008, in which roadway characteristics were a contributing factor, was approximately $7.6 billion. The costs of serious crashes include lost productivity, lost earnings, medical costs and emergency services.

The efficiency of California's transportation system, particularly its highways, is critical to the health of the state's economy. Businesses are increasingly reliant on an efficient and reliable transportation system to move products and services. A key component in business efficiency and success is the level and ease of access to customers, markets, materials and workers.

- Approximately $924 billion in goods are shipped annually from sites in California and another $894 billion in goods are shipped annually to sites in California, mostly by commercial trucks on the state's highways.
- Sixty-eight percent of the goods shipped annually from sites in California are carried by trucks and another 19 percent are carried by courier services, which use trucks for part of the deliveries. Similarly, 69 percent of the goods shipped to sites in California are carried by trucks and another 15 percent are carried by courier services.
- Commercial trucking in California is projected to increase 28 percent by 2020.
- Increasingly, companies are looking at the quality of a region's transportation system when deciding where to relocate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient transportation system.
- Businesses have responded to improved communications and greater competition by moving from a push-style distribution system, which relies on low-cost movement of bulk commodities and large-scale warehousing, to a pull-style distribution system, which relies on smaller, more strategic and time-sensitive movement of goods.

All data used in the report is the latest available. Sources of information for this report include the U.S. Department of Transportation (USDOT), Caltrans, the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the National Surface Transportation Policy and Revenue Study Commission (NSTPRSC), the U.S. Census Bureau, the National Highway Traffic Safety Administration (NHTSA), the Reason Foundation and the Texas Transportation Institute (TTI).

Introduction

California's system of roads, highways, bridges and public transportation needs to provide the state's residents and visitors with a high level of mobility. As the backbone of the Golden State's surface transportation system, roads, bridges and public transit play a central role in the state's diverse economy and must enable residents and visitors to go to work, visit family and friends, move goods to market, and frequent tourist attractions.

California faces significant challenges in repairing and maintaining its deteriorated system of roads, bridges and public transportation. The modernization of California's surface transportation network is crucial to providing a smooth and efficient transportation system, while improving the economic livelihood of the state and accommodating future growth. As travel on California's surface transportation system becomes more efficient and the physical condition of the system improves, personal and commercial productivity will increase, boosting economic development statewide.

California currently faces a combined annual highway and transit funding shortfall of $10.9 billion. Without a significant commitment to transportation funding at the state and federal level, many needed projects and improvements can not move forward, jeopardizing California's future mobility and potential for economic development. Even with the added funding the state will receive through the federal economic stimulus package, many key projects remain unfunded at current transportation investment levels.

This report examines the condition, use and funding of California's roads, bridges and public transit systems, as well as the state's ability to meet future mobility and traffic safety needs. In addition to statewide data, this report contains regional analyses for California's six largest urban areas (which includes the cities and surrounding areas). These areas are Los

Angeles, Riverside - San Bernardino, Sacramento, San Diego, San Jose, and the San Francisco – Oakland area. For each of these urban areas, appendices A through F contain road and bridge condition data, lists of the most deteriorated roads and bridges, traffic safety data and information about the condition of various public transportation systems.

Sources of information for this report include the U.S. Department of Transportation (USDOT), Caltrans, the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the U.S. Census Bureau, the National Highway Traffic Safety Administration (NHTSA), the Reason Foundation and the Texas Transportation Institute (TTI). All data is the latest available.

Population, Vehicle Travel and Congestion in California

California's population reached approximately 36.8 million in 2008, an increase of 24 percent and nearly seven million people since 1990. The state's population is expected to increase to 49.2 million by 2030, an increase of approximately 12.4 million people.[1]

From 1990 to 2008, annual vehicle miles of travel (VMT) in the state increased by 22 percent, from approximately 259 billion annual VMT to 315 billion VMT. [2] Based on travel and population trends, TRIP estimates that vehicle travel in California will increase by another 20 percent by 2025, reaching approximately 378 billion VMT.[3]

California also has experienced significant economic growth since 1990. From 1990 to 2008, California's gross domestic product (GDP), a measure of the state's economic output, increased by 42 percent, when adjusted for inflation.[4]

Traffic congestion in California is a growing burden in key urban areas and threatens to impede the state's economic development. Congestion on California's urban highways is growing as a result of increases in vehicle travel and population.

In 2007, 68 percent of California's urban roads and highways were congested, carrying traffic volumes that result in significant rush hour delays.[5] Highways that carry high levels of traffic are also more vulnerable to experiencing significant traffic delays as a result of accidents or other incidents. The statewide cost of traffic congestion in lost time and wasted fuel is approximately $18.7 billion annually.[6]

Because of increases in the state's population and the rate of travel of its residents, the demands being placed on California's roads and highways far exceed their current capacity. It is critical that California develop and maintain a modern transportation system that can accommodate future growth in population, vehicle travel and economic development.

Condition of California's Roads

Two-thirds of California's roads are in poor or mediocre condition. In 2007, 35 percent of major roads in California were rated in poor condition – the second highest share in the nation.[7] Another 31 percent of the state's major roads were rated in mediocre condition.[8] Major roads include the state's Interstates, freeways and arterials. (MTC)

Chart 1. States with the highest share of major roads rated in poor condition (2007).

STATE	Percent Poor
New Jersey	46
California	35
Rhode Island	32
Hawaii	27
Maryland	26

Source: TRIP analysis of Federal Highway Administration data

Pavement conditions on the state's major urban roadways are particularly rough. Among all major urban areas in the nation with a population of 500,000 or more, six of the top 10 cities with the roughest pavement conditions are in California.

Chart 2. Top ten U.S. cities (>500,000 population) with highest percentage of pavement in poor condition.

CITY	Percent Poor
Los Angeles	64%
San Jose	61%
San Francisco-Oakland	61%
Honolulu	61%
Concord	54%
New York - Newark	54%
San Diego	53%
New Orleans	49%
Tulsa	47%
Palm Springs-Indio	47%

Source: TRIP analysis of Federal Highway Administration data

A desirable goal for state and local organizations that are responsible for road maintenance is to keep 75 percent of major roads in good condition.[9] In California, 18 percent of the state's major roads were in good condition in 2007.[10]

Roads rated in poor condition often have significant rutting, potholes or other visible signs of deterioration and typically need to be resurfaced or reconstructed. Roads rated in mediocre condition show signs of significant wear and may also have some visible pavement distress. Most pavements in mediocre condition can be repaired by resurfacing, but some may need more extensive reconstruction to return them to good condition.

Pavement failure is caused by a combination of factors, including traffic, moisture and climate, the materials used and the quality of construction. Moisture often works its way into road surfaces and the materials that form the road's foundation. Road surfaces at intersections are even more prone to deterioration because the slow-moving or standing loads occurring at these sites subject the pavement to higher levels of stress.

The functional life of California's roads is greatly affected by the state's ability to perform timely maintenance and upgrades to ensure that structures last as long as possible. Because reconstructing roads costs approximately four times more than resurfacing them, it is critical that roads are fixed before they require major repairs.[11]

In addition to documenting statewide pavement conditions, Appendices A through F of this report also contain separate breakdowns and information on pavement conditions in California's major cities, including the Los Angeles urban area (which includes Los Angeles County and Orange County), the Riverside and San Bernardino urban area, Sacramento, San Diego, San Jose, and the San Francisco – Oakland area. Also included is a list of the sections of roadway in each urban area that are most deteriorated and in need of repair.

The Cost to Motorists of Roads in Inadequate Condition

TRIP has calculated the additional cost to motorists of driving on roads in poor or unacceptable condition. When roads are in poor condition, which may include potholes, rutting or rough surfaces, the cost to operate and maintain a vehicle increases. These additional vehicle operating costs include accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear. TRIP estimates that additional vehicle operating costs borne by California motorists as a result of poor road conditions is $13.5 billion annually, or $590 per motorist.[12] This is the second highest cost in the nation and significantly higher than the national average of $335.[13]

Additional vehicle operating costs have been calculated in the Highway Development and Management Model (HDM), which is recognized by the U.S. Department of Transportation and more than 100 other countries as the definitive analysis of the impact of road conditions on vehicle operating costs. The HDM report is based on numerous studies that have measured the impact of various factors, including road conditions, on vehicle operating costs.[14]

The HDM study found that road deterioration increases ownership, repair, fuel and tire costs. The report found that deteriorated roads accelerate the pace of depreciation of vehicles and the need for repairs because the stress on the vehicle increases in proportion to the level of roughness of the pavement surface. Similarly, tire wear and fuel consumption increase as roads deteriorate since there is less efficient transfer of power to the drive train and additional friction between the road and the tires.

TRIP's additional vehicle operating cost estimate is based on taking the average number of miles driven annually by a region's driver, calculating current vehicle operating costs based on AAA's 2008 vehicle operating costs and then using the HDM model to estimate the additional vehicle operating costs paid by drivers as a result of substandard roads.[15] Additional research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored into TRIP's vehicle operating cost methodology.

Bridge Conditions in California

California's bridges and overpasses form key links in the state's highway system, providing communities and individuals access to employment, schools, shopping and medical facilities, as well as facilitating commerce and access for emergency vehicles. But the state's bridges and overpasses are aging and deteriorating and a significant number are in need of repair or replacement.

In 2008, 29 percent of California's 24,112 bridges (20 feet or longer) were rated either structurally deficient or functionally obsolete.[16] Thirteen percent of the state's bridges were rated structurally deficient and 16 percent were rated as functionally obsolete.[17]

Chart 3. Bridge Conditions in California, 2008.

BRIDGE CONDITION	NUMBER OF BRIDGES	PERCENT DEFICIENT
Structurally Deficient	3,199	13%
Functionally Obsolete	3,795	16%
Total Bridges Deficient or Obsolete	6,994	29%

Source: Federal Highway Administration, National Bridge Inventory

A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are structurally deficient may be posted for lower weight limits or closed if their condition warrants such action. Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid posted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.

Appendices A through F of this report contain information on bridge conditions in California's major urban areas (which include the city and surrounding areas). These areas are Los Angeles, Riverside and San Bernardino, Sacramento, San Diego, San Jose, and the San Francisco–Oakland area. Also included are lists of bridges in each area that are most deteriorated and in need of repair.

Traffic Safety in California

A total of 20,122 people were killed in motor vehicle crashes in California from 2004 through 2008, an average of 4,024 fatalities per year.[18] In 2008, the number of people killed in motor vehicle crashes dropped to 3,434, the lowest number in 54 years.[19]

California's traffic fatality rate was 1.09 fatalities per 100 million vehicle miles of travel in 2008. The national average of fatalities per 100 million vehicle miles of travel is 1.27, the lowest rate recorded since data collection of these figures was initiated in 1933 by the California Highway Patrol.[20]

California's rural, non-Interstate roads have a fatality rate approximately three times higher than all other roads in the state. The traffic fatality rate in 2008 on California's non-Interstate rural roads was 2.79 traffic fatalities per 100 million vehicle miles of travel.[21] The traffic fatality rate per 100 million vehicle miles of travel on all other roads and highways in the state was .84 in 2008.[22]

Chart 7. Traffic fatalities in California from 2004 – 2008.

Year	*Fatalities*
2004	4,120
2005	4,333
2006	4,240
2007	3,995
2008	3,434
Total	**20,122**

Source: National Highway Traffic Safety Administration

Three major factors are associated with fatal vehicle accidents: the vehicle, the driver and the roadway. TRIP estimates that roadway characteristics, such as lane widths, lighting, signage and the presence or absence of guardrails, paved shoulders, traffic lights, rumble strips, obstacle barriers, turn lanes, median barriers and pedestrian or bicycle facilities, are likely a contributing factor in approximately one-third of all fatal and serious traffic crashes.

Improving safety on California's roadways can be achieved through further improvements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and a variety of improvements in roadway safety features.

The severity of serious traffic crashes could be reduced through roadway improvements such as adding turn lanes, removing or shielding obstacles, adding or improving medians, widening lanes, adding side or center rumble strips, widening and paving shoulders, improving intersection layout, and providing better road markings and upgrading or installing traffic signals where appropriate.

Roads with poor geometry, with insufficient clear distances, without turn lanes, inadequate shoulders for the posted speed limits, or poorly laid out intersections or interchanges, pose greater risks to motorists, pedestrians and bicyclists.

Traffic accidents and fatalities in which roadway characteristics were a contributing factor cost Californians approximately $7.6 billion annually, including medical costs, lost economic and household productivity, property damage and travel delays.[23] Roadway characteristic-related safety costs are estimated at $325 annually per California driver.[24]

The following chart shows the correlation between specific needed road improvements and the reduction of fatal accident rates nationally.[25]

Chart 8. Reduction in fatal accident rates after roadway improvements nationally.

Type of Improvement	Reduction in Fatal Accident Rates after Improvements
New Traffic Signals	53%
Turning Lanes and Traffic Signalization	47%
Widen or Modify Bridge	49%
Construct Median for Traffic Separation	73%
Realign Roadway	66%
Remove Roadside Obstacles	66%
Widen or Improve Shoulder	22%

Source: TRIP analysis of U.S. Department of Transportation data

Importance of Transportation to Economic Growth

California relies on an efficient transportation system to support economic development in the state. Reliable transportation access is critical to the health of California's diverse industries, including manufacturing, technology, entertainment, agriculture and tourism.

The new culture of business demands that a region have well-maintained and efficient roads, highways and bridges if it wants to remain economically competitive. The advent of modern national and global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement. Consequently, the quality of a region's transportation system has become a key component in a business's ability to compete locally, nationally and internationally.

Businesses have responded to improved communications and the greater necessity to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management, and by accepting customer orders through the Internet. The result of these changes has been a significant improvement in logistics efficiency as businesses move away from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. These improvements have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

Highways are vitally important to continued economic development in the Golden State. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads. As international trade continues to grow, modern and efficient highways are critical around California's border crossings and major distribution centers, as well as the ports of Los Angeles, Long Beach, Oakland, San Francisco and Stockton.

An analysis of commodity transport by the U.S. Bureau of Transportation Statistics (BTS) and U.S. Census Bureau underscored the economic importance of California's road system. The BTS report found $924 billion in goods are shipped annually from sites in California and another $894 billion in goods are shipped to sites in California, mostly by commercial trucks on the state's highways.[26] Sixty-eight percent of the goods shipped annually from sites in California are carried by trucks and another 19 percent are carried by courier services, which use trucks for part of the deliveries. Similarly, 69 percent of the goods shipped to sites in California are carried by trucks and another 15 percent are carried by courier services.[27]

Trucking is a crucial part of California's economy, as commercial trucks move goods from sites across the state to markets inside and outside the state. Commercial truck travel in the state is expected to increase significantly over the next two decades. Based on federal projections, TRIP estimates that commercial trucking will increase by 28 percent in California between 2009 and 2020.[28]

Transportation Funding in California

California faces an annual estimated surface transportation funding shortfall of $10.9 billion.[29] Numerous road, bridge and public transportation system projects needed to maintain and expand the current transportation system will not be able to move forward without a significant, long-term boost in funding at the state or federal level.

According to Caltrans' 2007 Ten-Year Highway Operation and Protection Plan, approximately $5.5 billion will be needed annually from 2009 to 2018 to operate and rehabilitate the state highway system, a total of $55 billion over 10 years. However, based on funding projections and the current economic climate, only $1.5 billion will be available each year during that time, leaving a total shortfall of $40 billion from 2009 to 2018, or approximately $4 billion per year.[30]

In addition to the significant gap in highway transportation needs, California faces a transit funding shortfall of approximately $6.9 billion per year. While $1.7 billion in annual funding will be available, the state would need approximately $8.6 billion each year to improve the current conditions and service on its public transportation network.[31]

Approved in February 2009, the American Recovery and Reinvestment Act will offer a significant, short-term boost in transportation funding in California by providing $2.57 billion for road and bridge improvements and $1.07 billion for the state's public transit system.[32] However, this funding will not be sufficient to allow the state to proceed with needed long-term projects that will improve safety, reduce congestion and expand capacity.

Without a significant, long-term increase in transportation funding, road and bridge conditions will continue to deteriorate, congestion will worsen, and the condition of the state's public transportation system will decline.

California's funding shortfall has been exacerbated by the escalation of the cost of transportation improvements due to increases in the price of key materials needed for highway and bridge construction. While construction materials costs have stabilized somewhat during the current recession, the average cost of materials used for highway construction – including asphalt, concrete, steel, lumber and diesel – increased by 33 percent over the five-year period from October 2004 to October 2009.[33]

Making needed repairs to the state's transportation system can help boost California's economy. A 2007 analysis by the Federal Highway Administration found that every $1 billion invested in highway construction would support approximately 27,800 jobs, including approximately 9,500 in the construction sector, approximately 4,300 jobs in industries supporting the construction sector, and approximately 14,000 other jobs induced in non-construction related sectors of the economy.[34]

Conclusion

California faces a significant challenge in the need to modernize and improve its highway and transit system. The state's system of roads, highways, bridges and public transit play a central role in the Golden State's economy. Meeting California's goals for sound economic growth, a high standard of living and strong economic progress will require the state to build and maintain a modern highway and public transit system.

Making needed improvements to California's surface transportation system could also provide a significant boost to the state's economy by creating jobs in the short term and stimulating long-term economic growth as a result of enhanced mobility and access.

The federal stimulus package has provided a helpful down payment for the improvement of California's transportation system. However, without a substantial, long term boost in local, state or federal highway funding, numerous projects to improve the condition and expand the capacity of California's roads, bridges and highways will not be able to proceed, hampering the state’s ability to improve the condition of its surface transportation system and to enhance economic development opportunities in the state.

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Endnotes

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ROUGH ROADS AHEAD

FIX THEM NOW OR PAY FOR IT LATER

AASHTO
The Voice of Transportation

TRIP
a national transportation research group

What's Wrong with Our Roads?

Killer potholes. In a flash they can dislodge a hubcap, shred a tire, or even worse, cause a driver to lose control of a car. But they can also be a symptom of a much deeper problem —deteriorating pavement that takes much more to repair than a simple patch.

As fundamental as our transportation system is to our daily lives, our highways and bridges are aging, under-funded, and inadequate to meet the demands we place upon them today, much less in the future. And across America motorists are paying the price.

For state departments of transportation, preserving the condition and performance of the transportation system we have built is the top priority.

In Pennsylvania, for example, work will begin later this year on more than 240 projects to repair and improve 608 miles of highway and 399 bridges. The projects will be financed with $1 billion in federal economic-stimulus money combined with about $2 billion in federal and state funds. This represents the most the Pennsylvania Transportation Department has ever committed to construction in a single year.

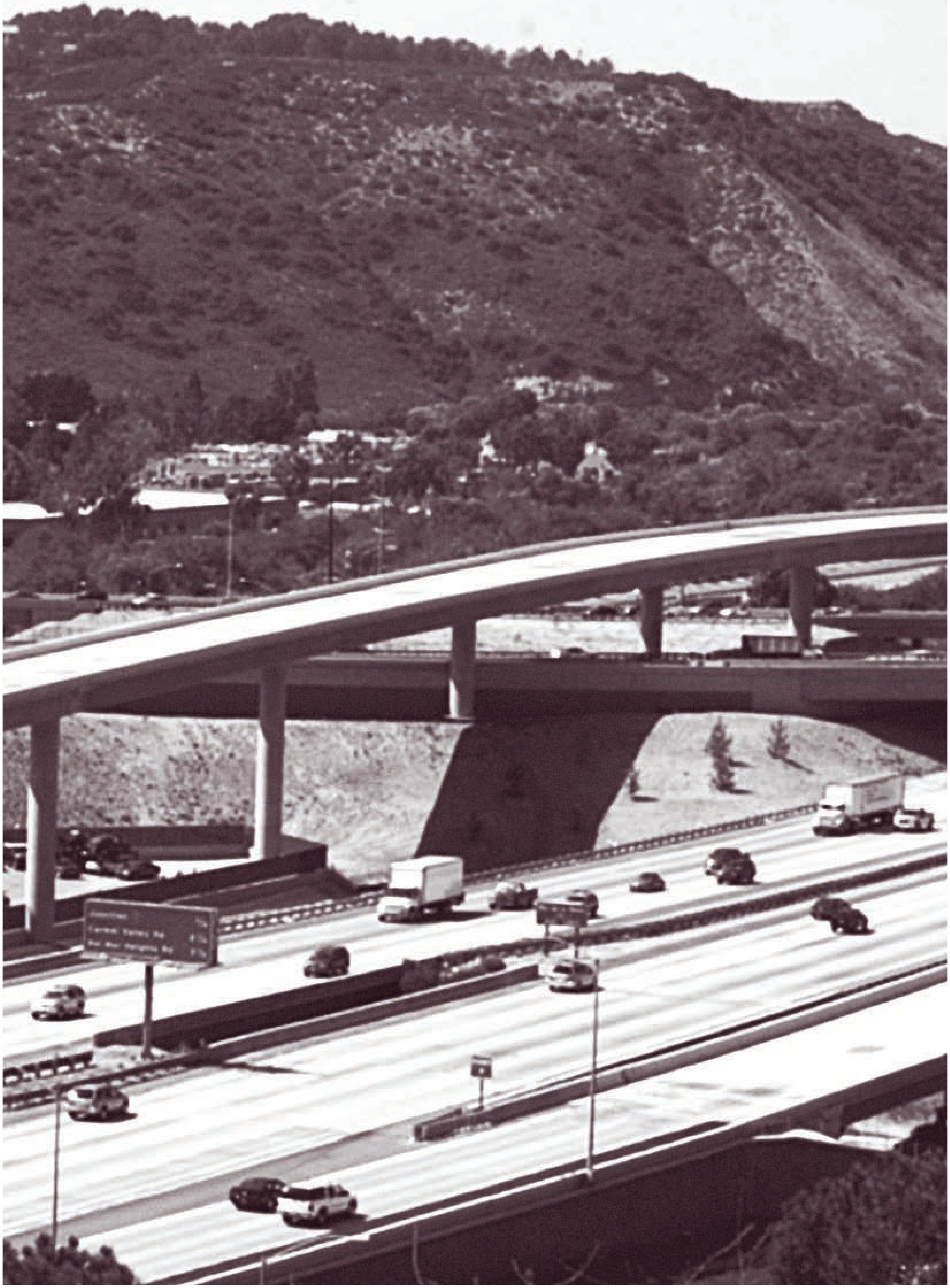
New technology, materials, and procedures are helping extend the life of our highways and bridges. States are also spending "smart" by making the investments needed to keep a road in good repair, rather than paying more later to address greater deterioration.

But the needs are enormous and poor-quality pavement is reflected in the increased operating costs that motorists must pay.

This report, developed by AASHTO in conjunction with TRIP, a national transportation research group, documents the preservation needs of the nation's highways and the solutions that can be applied. As we look to the next authorization of federal-aid surface transportation programs, rebuilding and improving our nation's core transportation infrastructure must be a fundamental goal.

Allen D. Biehler

Allen D. Biehler
Secretary, Pennsylvania Department of Transportation
President, AASHTO



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Rough Roads Ahead, Fix Them Now or Pay for It Later, is a joint product of AASHTO, the American Association of State Highway and Transportation Officials, and TRIP.

AASHTO is the "Voice of Transportation" representing State Departments of Transportation in all 50 states, the District of Columbia, and Puerto Rico. A nonprofit, nonpartisan association, AASHTO serves as a catalyst for excellence in transportation. TRIP is a national highway research group based in Washington, DC.

These associations gratefully acknowledge the work of Christine Becker of Christine Becker Associates, and Frank Moretti, Director of Policy and Research, TRIP, for their efforts in developing this report. Thanks, too, to the Federal Highway Administration and the many state DOTs who contributed their information and photographs for this report.

Cover photo: Valerie Sinco

Executive Summary

ROUGH ROADS AHEAD: SAVING AMERICA'S HIGHWAYS

America's $1.75 trillion public highway system is in jeopardy. Years of wear and tear, unrelenting traffic, an explosion of heavy trucks, deferred maintenance, harsh weather conditions, and soaring construction costs have taken their toll on America's roads.

While the American Reinvestment and Recovery Act of 2009 will provide $27 billion for highway projects, that money will barely make a dent in highway maintenance, preservation, and reconstruction needs. The recent AASHTO *Bottom Line* report documented the need for all levels of government to invest $166 billion each year in highways and bridges. More than half of that amount would be needed for system preservation.

Saving America's highways demands more than short-term stimulus funds and quick fixes based on available funding. It will require a greater and smarter investment of transportation dollars to ensure a new and better transportation program.

A Snapshot of Rough Roads

- Only half of the nation's major roads are in good condition.
- One in four urban roads is in poor condition.
- Major urban centers have the roughest roads—some with more than 60 percent of roads in poor condition.
- Rural roads are in better condition than urban roads. In 2007, 60 percent of rural roads were in good condition.
- Overall, 72 percent of the Interstate Highway System is in good condition. But age, weather conditions, and burgeoning traffic—particularly multi-axle trucks—are eroding ride quality. In eight states, 20 percent of the Interstate highways were rated as mediocre or poor.

ROUGH ROADS LEAD TO HIGHER COSTS

Only half of the nation's major roads are in good condition, based on an analysis of recent Federal Highway Administration data. The situation is worse in high traffic, urban areas where one in four roads is in poor condition. In some major urban centers, more than 60 percent of roads are in poor condition.

The American public pays for poor road conditions twice—first through additional vehicle operating costs and then in higher repair and reconstruction costs. For the average driver, rough roads add $335 annually to typical vehicle operating costs. In urban areas with high concentrations of rough roads, extra vehicle operating costs can be as high as $746 annually.

Sustaining deteriorating roads costs significantly more over time than regularly maintaining a road in good condition. Costs per lane mile for reconstruction after 25 years can be more than three times the costs of preservation treatments over the same 25-year period.

CHALLENGES FACING AMERICA'S HIGHWAYS

Unrelenting traffic is tough on roads. Traffic growth has far outpaced highway construction, particularly in major metropolitan areas. The number of miles driven in this country jumped more than 41 percent from 1990 to 2007—from 2.1 trillion miles in 1990 to 3 trillion in 2007. Nearly 66 percent of that driving passed over urban roads, which are showing the most wear and tear. In some parts of the county, dramatic population growth

Courtesy of Missouri Department of Transportation.

has occurred without much of an increase in road capacity, placing enormous pressure on roads that, in many cases, were built 50 years ago.

Soaring construction costs during the past five years are straining state and local budgets. By the summer of 2008, asphalt prices were up 70 percent, concrete 36 percent, and steel 105 percent. Diesel fuel, used to operate heavy construction equipment, soared 305 percent, including a 63 percent jump in one year. Over time, these higher costs have eroded states' purchasing power on construction projects. In the past few months, however, the economic recession appears to have moderated some of these costs. In fact, many bids for stimulus projects are coming in below engineers' estimates.

The explosion of freight truck traffic is punishing aging highways. The Interstate system is bearing the brunt of truck traffic and showing the impact. Today, on average, every mile of Interstate highway sees 10,500 trucks a day. More than 80 percent of freight tonnage moving across the United States is carried by trucks driving on the 50-year-old Interstate system.

> "Managing a highway system is like playing chess. You have to look at the whole board, the whole system, not just the next move. Sure we do reactive things, but our best strategy is when we look down the road eight years or more, look at every section of road, and budget to keep those roads in good condition."
>
> —Gary Ridley, Director, Oklahoma Department of Transportation

Investment has not kept up with maintenance and preservation needs. Delayed and deferred maintenance leads to higher repair and reconstruction costs—pay me now or pay me more, lots more, later. Michigan DOT Director Kirk L. Steudle said, "It is important to slow the rate of decline in the good road so that it stays in good shape rather than slipping into fair or poor condition." Spending $1 to keep a road in good condition prevents spending $7 to reconstruct it once it has fallen into poor condition, he added. But soaring construction costs, tight budgets, and increasing needs make it hard for states to sustain preservation programs. That is why most states are using their stimulus funds to make up for lost time from deferred maintenance and preservation.

HIGHWAY MAINTENANCE NEEDS EXCEED AVAILABLE FUNDS

Keeping good roads in good condition is the most cost-effective way to save America's highways. But the needs are high and the available funding limited. For example:

- **Oregon** needs $200 million annually over the next 10 years to maintain roads at the current levels. It has $130 million available annually.

- **Texas** needs $73 billion during the next 22 years to maintain current conditions. The Department is spending $900 million per year and losing ground.

- **Rhode Island** needs $640 million annually to preserve its highway system and has only $354 million available each year.

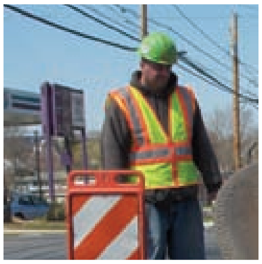
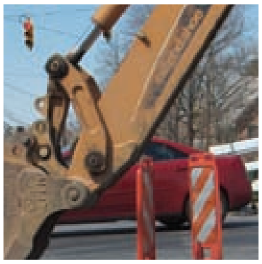
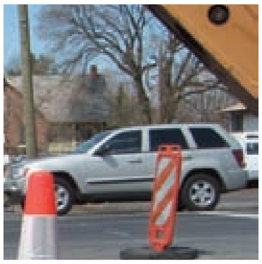
Stimulus funds will fill in some of the gaps.

- **Oregon** will use half of its $224 million of stimulus funds for pavement resurfacing and preservation projects.

- **Texas** is spending $800 million in stimulus funds to stabilize pavement and bridge conditions for the next few years.

- **Rhode Island** will use its $137 million primarily for preservation and maintenance projects. The extra funds provide about 5 percent of the projected shortfall in preservation funds over the next 10 years.

- **South Dakota's** stimulus allocation will provide about one year's worth of preservation funding to help with the backlog of needs.

Courtesy of Pennsylvania DOT.

STRATEGIES FOR SAVING AMERICA'S HIGHWAYS

Use the best materials throughout the life of a road. From filling a pothole to reconstructing a major highway, using materials designed to meet specific climate and traffic conditions will extend the service life of a road and reduce costs over the long run. Research into new materials, constant monitoring of pavement conditions, and matching materials to traffic and weather conditions all contribute to long-term durability of a road.

Keep good roads good. Maintaining a road in good condition is easier and less expensive than repairing one in poor condition. Achieving that goal involves a carefully planned and consistently funded pavement preservation program that makes proactive improvements in good roads to keep them good. "You can spend too much time and money chasing after potholes while watching the system fall farther and farther behind," said Pennsylvania DOT Secretary Allen Biehler.

Create a multi-modal freight strategy. Ensuring that roads can handle the projected growth in freight-bearing trucks involves more than building sturdier roads. It will require a commitment to a multi-modal freight strategy that may include (1) building a network of dedicated truck lanes; (2) expanding rail capacity to sustain its share of freight movement; (3) fixing bottlenecks and reducing congestion in metropolitan areas; (4) improving conditions from ports and distribution centers to the Interstate and rail systems; and (5) a funding model that includes freight-related user fees to implement the strategy.

View highways as public assets to be managed rather than projects to be fixed. Asset management is a comprehensive approach to ensuring the most cost-effective return on investments for operating, maintaining, upgrading, and expanding transportation systems. It starts from the assumption that the nearly 4 million miles of public roads are a valuable national asset, essential to the vitality of the American economy.

Invest to save America's highways. When the Interstate system was first designed in the 1940s, lines were put on a map to describe the vision for a country connected by a network of limited access highways. "Planners said this is what we want it to look like. Now let's figure out how to pay for it," said Oklahoma DOT Director Ridley. "Now we work in the reverse. We say here's how much money we have, and let's decide what we want to do with that. That approach doesn't produce the best decisions." Rebuilding for the future requires a national commitment to significant and sustained investment in transportation infrastructure based on a vision of what we want our transportation system to look like in the 21st century and beyond.

It is time for a greater and smarter investment of transportation dollars to ensure a new and better transportation program.

Are we there yet? No—but we can be.

> "We as stewards of the transportation system have no choice but to drive home the message that maintaining an acceptable condition for our highways—preserving the system—is vital to our country's future."
>
> —Allen D. Biehler, AASHTO President;
> Secretary, Pennsylvania Department of Transportation

Highways to Everywhere

A well-connected highway system, maintained in good condition, is critical to the nation's economy. With a current value of $1.75 trillion, preserving the system of roads and highways so they last for generations and meet changing needs should be a top priority for all levels of government. Even with continued growth in public transit, enhanced rail services, and a national commitment to reduce greenhouse gas emissions from vehicles, roads remain a vital component of the system that moves people and goods throughout the country.

Roads are essential to everyday life.

- Nearly 24 million children—55 percent of the country's kindergarten through high school population—ride 450,000 school buses 180 days per year.
- Every year, 50,000 ambulances make 60 million trips—that is an average of 164,000 trips per day.
- A fire department responds in one or more vehicles to a fire alarm in the United States every 20 seconds.
- Trucks in the United States carry 32 million tons of goods valued at $25 billion every day.
- The country's 240 million registered vehicles travel more than 2.9 trillion miles annually.

Those vehicles, and the people who drive and ride in them, rely on the nation's nearly 4 million miles of public roads—from Interstate highways to neighborhood streets—to get somewhere to do something.

Highways are a backbone of American life, connecting people, goods, and services. But many roads, particularly in metropolitan areas and population growth centers, are in poor condition. Years of wear and tear, unrelenting traffic, an explosion of heavy trucks, weather conditions, and delayed maintenance because of tight budgets and soaring construction costs have taken their toll on America's roads.

Despite the recent downturn in travel in 2008, the number of miles driven on the nation's roadways has increased 41 percent from 1990 to 2007. Large commercial truck traffic, which places significant stress on pavements, has increased 50 percent during the same time frame.

In some parts of the country, dramatic population growth with minimal capacity expansion has placed enormous pressure on highways. For example, in Utah, between 1990 and 2007, population grew by 47 percent and miles driven by 71 percent—but highway capacity grew by only 4 percent.[1]

Transportation officials across the country are focusing on how to preserve and protect their part of this national asset by building smarter, investing in systematic maintenance programs, and using new technologies to produce longer-lasting roads.

This report examines the condition of America's roads and what it will take to save them.

THE NATION'S HIGHWAYS BY THE NUMBERS

Total miles of public roads—3,967,159

Total miles of roads by ownership

- Federal—128,378 miles (3.2 percent)
- State—783,643 miles (19.8 percent)
- Local—3,055,138 miles (77 percent)

Total miles of rural and urban roads

- Rural - 2,939,042 (74 percent)
- Urban - 1,028,107 (26 percent)

Total Interstate Highway miles—47,000

Annual miles driven in cars and trucks—2.9 trillion

Percent of miles driven on urban roads—65.6 percent

Tons of freight moved on America's highways annually—15 billion

Early History of United States Road Building

1625 Earliest known paved American road—Pemaquid, Maine

1795 First engineered American road—Philadelphia to Lancaster toll turnpike

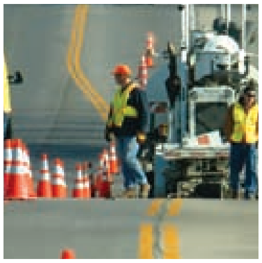
1823 First macadam road constructed in America—Maryland

1872 First asphalt paved roads in North America—Pennsylvania Avenue in Washington, DC, and Fifth Avenue in New York, NY

1893 First rural brick road—Ohio

1906 First bituminous macadam road—Rhode Island

Hammond Surface Streets,
Hammond, Indiana



Courtesy of Missouri DOT.

PennDOT workers power wash a bridge structure. Keeping the expansion areas and joints of bridges free of debris and salt accumulation from winter services is a critical maintenance function.

Courtesy of Pennsylvania DOT.

Chapter 1

Rough Roads—Facing the Facts

Potholes are the poster child for rough roads. They are a nuisance, a source of wear and tear on vehicle suspensions and tires, and a safety risk. They can also be indicators of serious road deterioration.

The traveling public values smooth roads. In addition to ride quality, smooth roads improve fuel efficiency, reduce vehicle wear and tear, improve driver safety, and last longer. But how smooth a road needs to be to keep the public happy can vary widely.

The Missouri Department of Transportation (MoDOT) relied on public opinion to shape its Smooth Roads Initiative. Key elements of the Missouri Smooth Roads Initiative were:

- SMOOTHER—pavements were resurfaced, where needed.
- SAFER—striping and delineation improvements were made at all sites in the program.
- SOONER—the entire program for improving 2,300 miles of roadway was completed in only two years.

MoDOT Director Pete K. Rahn said citizen input helped set priorities for transportation investments. "For example, we thought mowing all rights of ways regularly was very important. The citizens told us it wasn't a high priority for them," Rahn said.

Nearly 900 citizens participated in a series of road rallies to help the state determine how rough was too rough. Citizens rode in vans with a moderator who tracked their comments as they assessed ride quality along the way.

"What we thought was a rough ride sometimes wasn't," Rahn said. "We plan to use a second round of van assessments for our continuing smoothness program."

The program was launched after voters passed an initiative by a 4 to 1 margin to fund improvements in the state's highway system. Phase I improved 2,300 highway miles that account for 60 percent of all traffic on the state system, producing an 18 percent increase in Interstate smoothness over a two-year period. Phase II—Better Roads, Brighter Future—is addressing the remainder of the state's 5,600-mile major highway system. The goal is to bring 85 percent of Missouri's major highway system up to good condition.

> "A pothole is like a tooth cavity. Left untreated it gets more decayed, more painful, takes more time and money to care for, and sometimes you end up having to urgently call in a specialist. But like cavities, potholes can be prevented."
>
> "The Fine Art of Pothology: Preventing and Repairing Potholes"
>
> *Better Roads*, March 2009

RATING YOUR RIDE

States generally use the International Roughness Index (IRI) to rate road conditions. Those ratings are used to monitor pavement performance and schedule maintenance and rehabilitation plans. Roads with low IRI ratings are the smoothest. Roads with higher IRI ratings are likely to have cracked or broken pavements and may show significant distress in their underlying foundations.

To get a national perspective on road conditions, the Federal Highway Administration (FHWA) collects data from states annually and summarizes ride conditions using four categories—good, fair, mediocre, and poor. The categories are based partly on a study that measured driver reactions to various road conditions.(2)

Here's what the most recent data shows:

- Only half of the nation's major roads—Interstates, freeways, and other major routes—are in good condition. Unfortunately, 13 percent are in poor condition.
- Rural roads are smoother and in better condition than urban roads. In 2007, 61 percent of rural roadways were in good condition.
- Overall, 72 percent of the Interstate Highway System is rated in good condition. But, age, weather conditions, and burgeoning traffic are eroding ride quality in many states. In eight states, more than 20 percent of the Interstate highways were rated as mediocre or poor.
- One in four urban roads—which carry the brunt of national traffic—are in poor condition.
- Road conditions in urban areas actually improved between 2002 and 2006, but declined in 2007, when 26 percent were reported in poor condition. Factors that may have contributed to a higher percentage of rough roads include aging of urban roads, unrelenting traffic, heavier trucks carrying freight loads, and deferred or delayed maintenance because of tight budgets and soaring construction costs.(3)
- Major urban centers have the roughest roads—more than 60 percent of the roads in the Los Angeles, San Jose, San Francisco-Oakland, and Honolulu areas provide a poor-quality ride.(4)

Pavement Conditions of Urban and Rural Arterial Highways in 2007

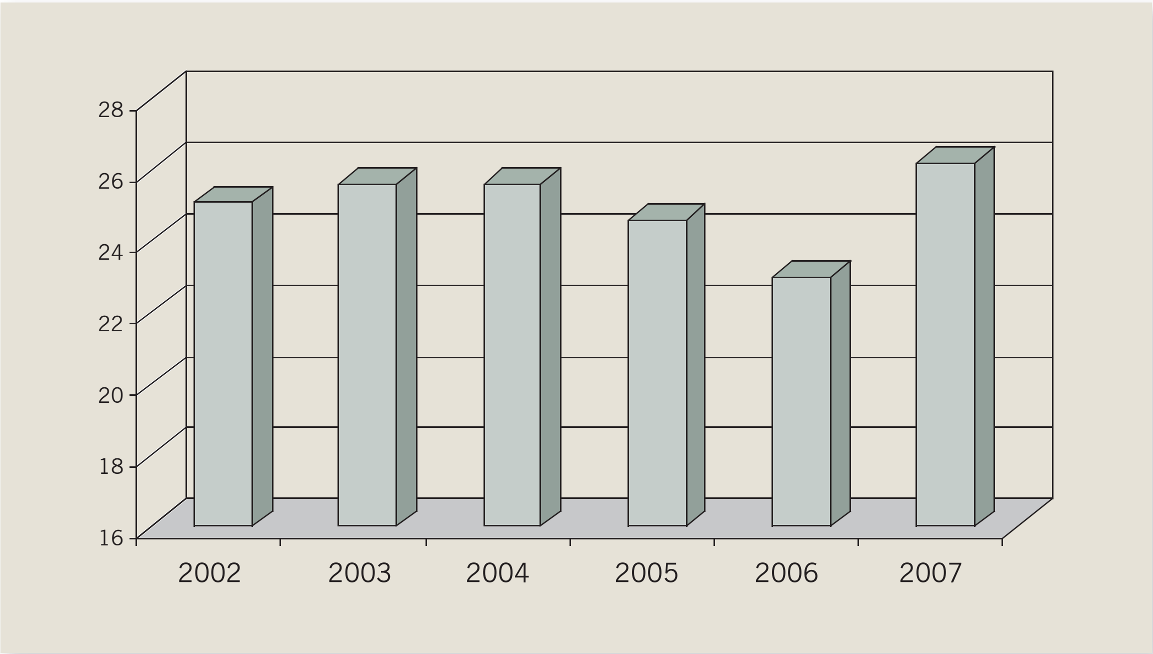
	Rural	Urban	All Major Roads
Poor	4%	26%	13%
Mediocre	15%	27%	20%
Fair	20%	11%	16%
Good	61%	36%	51%

Source: TRIP analysis of FHWA data.

URBAN ROADS MOST TRAVELED

The condition of the nation's major urban roadways is of particular concern to the nation's motorists because these roads and highways are the most heavily traveled in the nation. In 2007, 66 percent of the nation's vehicle travel was carried by its urban roads and highways.[5]

Percentage of Major Urban Roads with Pavements in Poor Condition, 2002 to 2007



Source: TRIP analysis of Federal Highway Administration data.

Although road deterioration is often accelerated by freeze-thaw cycles found most often in the nation's northern states, the urban areas with the highest share of poor pavement conditions in the nation actually include urban areas from a variety of regions.

Urban areas (population 500,000 or more) with highest share of roads in poor condition, 2007

Includes state, city, and county arterial networks in cities and surrounding suburbs

Urban Area	Pct. Poor
Los Angeles	64
San Jose	61
San Francisco - Oakland	61
Honolulu	61
Concord, CA	54
New York - Newark	54
San Diego	53
New Orleans	49
Tulsa	47
Palm Springs - Indio, CA	47
Riverside - San Bernardino, CA	44
Baltimore	44
Sacramento	44
Omaha	41
Oklahoma City	41
San Antonio	38
Mission Viejo, CA	37
Albuquerque	36
Philadelphia	36
Detroit	36

Source: TRIP analysis of Federal Highway Administration data.

Road conditions for urban areas with populations of 500,000 or greater can be found in appendix A. Road condition data for urban areas with populations from 250,000 to 499,000 can be found in appendix B.

Courtesy of National Concrete Pavement Technology Center.

THE COST OF ROUGH ROADS

The American public pays for poor pavement conditions twice—first through additional vehicle operating costs, and then in higher costs to restore pavement to good condition.

Driving on rough roads accelerates vehicle depreciation, reduces fuel efficiency, and damages tires and suspension. TRIP estimates that for the average driver, rough roads add $335 annually to typical vehicle operating costs. In urban areas with high concentrations of rough roads, extra vehicle operating costs are as high as $746.[6] Generally, larger vehicles have a greater increase in operating costs due to rough roads.

This cost estimate is developed using a model that factors in average number of miles driven annually and AAA's 2008 vehicle operating cost data.[7] Research on the impact of road conditions on fuel consumption by the Texas Transportation Institute (TTI) is also factored into the methodology.[8]

Urban Areas with Highest Additional Vehicle Operating Costs Due to Rough Roads, 2007

Includes cities and surrounding suburbs with populations of 500,000 or more

Urban Area	Additional Costs
Los Angeles	$746
San Jose	$732
San Francisco - Oakland	$705
Tulsa	$703
Honolulu	$688
San Diego	$664
Concord, CA	$656
New York - Newark	$638
Riverside - San Bernardino, CA	$632
Oklahoma City	$631
Sacramento	$622
New Orleans	$622
Palm Springs - Indio, CA	$608
Omaha	$592
Baltimore	$589
Albuquerque	$576
Mission Viejo, CA	$571
San Antonio	$529
Detroit	$525
Philadelphia	$525

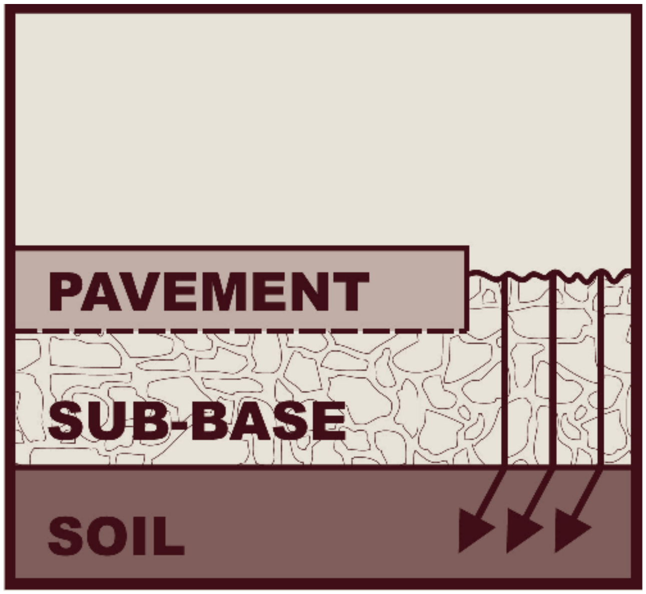
Source: TRIP analysis based on Federal Highway Administration data.

A STITCH IN TIME

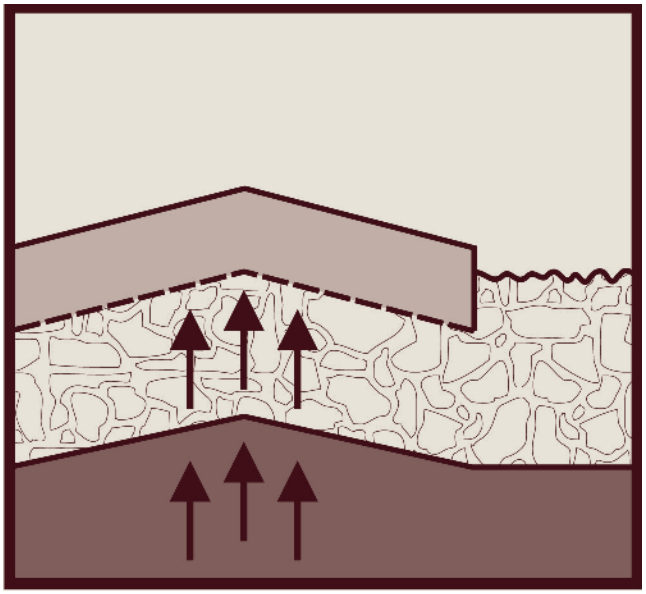
Age, weather, moisture, traffic, heavy trucks, and delayed maintenance cause roads to deteriorate. Old roads eventually wear out—particularly ones that were built 50 or more years ago with less sophisticated construction materials and lower traffic expectations. Moisture, freezing, thawing, and poor drainage also contribute to cracks, ruts, potholes, and foundation deterioration.

Potholes form when moisture from rain or snow works its way into road surfaces and the foundation bed, creating openings and cracks in the pavement that gradually grow larger as traffic passes over the surface. Road surfaces at intersections are especially vulnerable, since slow-moving, stopping, or starting traffic—particularly heavier vehicles—causes higher levels of pavement stress.

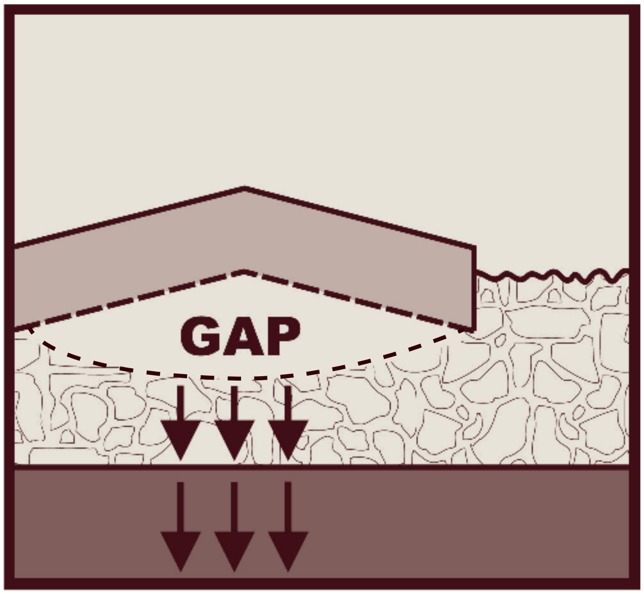
BIRTH OF A POTHOLE



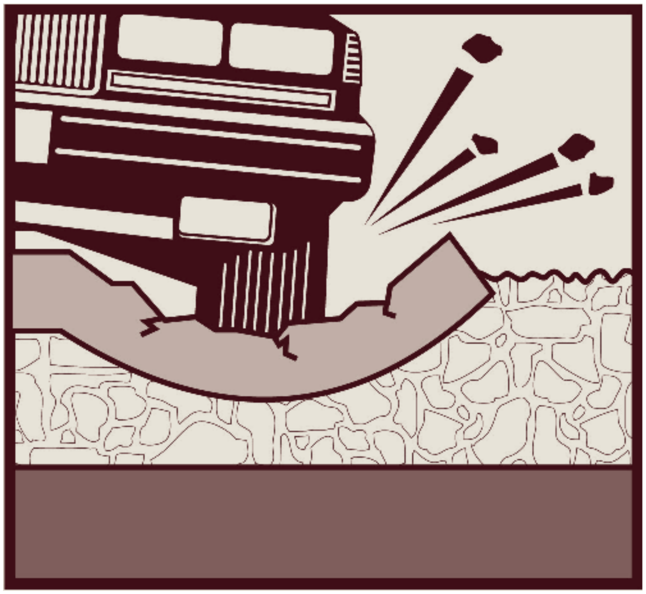
Potholes begin after rain or snow seeps into cracks and down into the soil below the road surface. The soil turns into mud and with no support, a hole can form under the pavement.



Repeated freezing and thawing or heavy traffic causes the ground to expand, pushing the pavement up.



As temperatures rise, the ground returns to a normal level but the pavement often remains raised. This creates a gap, or hollow space between the pavement and the ground below it.



When vehicles drive over this cavity, the pavement surface cracks and falls into the hollow space, leading to the birth of another pothole.

Courtesy of Michigan Department of Transportation.

Roads have five life cycle stages from initial design to disintegration and failure. Actions taken at each stage can affect the long-term durability of the road as well as maintenance and preservation costs. Higher quality investments earlier in the life of the road will save money over the long run because maintaining a road in good condition is less expensive than repairing or rebuilding one in poor condition.[9]

Reconstructing a road that has reached Stage 5 costs significantly more than preserving a road at Stage 3.

Life Cycle of a Road

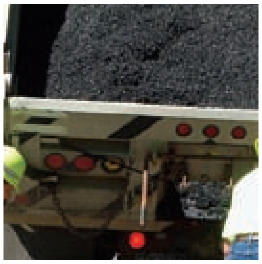
1. **Design**—This stage deals with dimensions, type of materials, thickness of base and top surfaces, and the drainage system. Investments made at the design stage affect the long-term durability of the pavement surface. If, however, sufficient funding is not available to upgrade the design, the road starts out and stays mediocre.

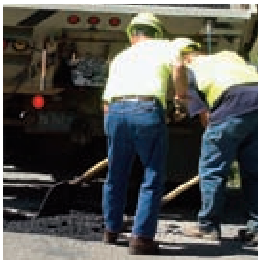
2. **Construction**—A high-quality construction process produces a longer-lasting pavement surface.

3. **Initial Deterioration**—During the first few years of use, the road surface starts to experience some initial deterioration caused by traffic volume, rain, snow, solar radiation, and temperature changes. At this stage, the road appears in good condition, providing a smooth ride. Preservation strategies during Stage 3 will sustain the smooth ride, preserve the foundation, extend the life, and reduce the need for costly reconstruction later on.

4. **Visible Deterioration**—At Stage 4, visible signs of distress such as potholes and cracking occur. Repairs made at this stage using overlays and milling to eliminate ruts will restore a smooth ride and extend the life of the road.

5. **Disintegration and Failure**—Roads not maintained at Stage 3 and repaired at Stage 4, eventually will fail and need costly reconstruction. Once a road's foundation disintegrates, surface repairs have an increasingly short life.





Courtesy of Pennsylvania DOT

HOW ARE PAVEMENT CONDITIONS RATED?

Every year the Federal Highway Administration (FHWA) gathers data on the condition of the nation's major roads, including those maintained by federal, state, or local governments. This report presents the conditions on all arterial routes, including Interstates and limited-access freeways, as well as other major streets and routes within and between urban areas. Most of these routes have at least four lanes, although some key two-lane urban and rural roads, classified as "arterial routes" are included.

RATING YOUR RIDE

States use the International Roughness Index (IRI) to rate road conditions, although some also rate by the Present Serviceability Rating (PSR). The FHWA compiles these data to create an assessment of pavement conditions, rating the roads as poor, mediocre, fair, or good.

The FHWA findings are based partly on a study that measured driver reactions to various road conditions to determine what level of road roughness was unacceptable to most drivers.(10)

Drivers on roads rated as poor are likely to notice that they are driving on a rougher surface, which puts more stress on their vehicles. Roads rated as poor may have cracked or broken pavements. These roads often show significant signs of pavement wear and deterioration and may also have significant distress in their underlying foundation. Road or highway surfaces rated poor provide an unacceptable ride quality and are in need of resurfacing and some need to be reconstructed to correct problems in the underlying surface.

Roads rated as being in either mediocre or fair condition may also show some signs of deterioration and may be noticeably inferior to those of new pavements, but can still be improved to good condition with cost-effective resurfacing or other surface treatments, which will extend the roads' service life.

The FHWA has found that a road surface with an IRI rating below 95 provides a good ride quality and is in good condition; a road surface with an IRI from 95 to 119 provides an acceptable ride quality and is in fair condition; a road surface with an IRI from 120 to 170 provides an acceptable ride quality and is in mediocre condition; and a road with an IRI above 170 provides an unacceptable ride quality and is in poor condition.(11)

> "There is a point in the life of a road where you spend more money for less result. It is like a homeowner who knows he needs a new roof, but keeps patching it to save money. You end up spending way more money patching than it would take to install a new roof—or build a new highway."
>
> —Pete K. Rahn, Director, Missouri Department of Transportation

Pavement Conditions by State, 2007

Includes all Arterial Routes, including Interstates, freeways, and major urban routes

State	Percentage			
	Poor	Mediocre	Fair	Good
Alabama	4	12	11	73
Alaska	18	28	26	28
Arizona	7	14	12	68
Arkansas	9	23	30	38
California	35	31	16	18
Colorado	8	24	24	44
Connecticut	14	33	18	34
Delaware	10	17	29	44
Florida	2	11	10	76
Georgia	0	4	3	92
Hawaii	27	44	19	10
Idaho	11	14	18	57
Illinois	14	20	20	46
Indiana	11	18	15	56
Iowa	18	23	18	41
Kansas	10	5	9	75
Kentucky	3	16	26	55
Louisiana	22	22	17	38
Maine	10	19	17	54
Maryland	26	18	14	42
Massachusetts	18	23	12	47
Michigan	18	19	12	51
Minnesota	10	22	22	47
Mississippi	17	23	18	42
Missouri	16	18	27	39
Montana	3	8	13	76
Nebraska	7	17	14	62
Nevada	5	8	6	81
New Hampshire	13	14	13	60
New Jersey	46	32	13	10
New Mexico	10	12	15	64
New York	22	24	18	35
North Carolina	9	18	24	49
North Dakota	5	20	18	57
Ohio	8	17	16	59
Oklahoma	21	19	20	40
Oregon	4	14	20	62
Pennsylvania	15	29	23	33
Rhode Island	32	36	15	18
South Carolina	7	21	21	51
South Dakota	15	19	15	51
Tennessee	6	11	12	71
Texas	11	21	27	41
Utah	4	25	20	51
Vermont	15	25	15	45
Virginia	6	17	31	46
Washington	11	22	14	53
West Virginia	8	29	21	42
Wisconsin	9	21	17	53
Wyoming	4	14	27	55
U.S. Average	**13%**	**20%**	**16%**	**51%**

Source: TRIP analysis based on Federal Highway Administration data

Additional Vehicle Operating Costs Due to Rough Roads, by State, 2007

State	Additional Costs
Alabama	$162
Alaska	$324
Arizona	$207
Arkansas	$302
California	$590
Colorado	$292
Connecticut	$313
Delaware	$282
Florida	$126
Georgia	$44
Hawaii	$503
Idaho	$318
Illinois	$297
Indiana	$242
Iowa	$383
Kansas	$318
Kentucky	$187
Louisiana	$388
Maine	$250
Maryland	$425
Massachusetts	$301
Michigan	$370
Minnesota	$347
Mississippi	$394
Missouri	$410
Montana	$195
Nebraska	$278
Nevada	$227
New Hampshire	$250
New Jersey	$596
New Mexico	$279
New York	$405
North Carolina	$251
North Dakota	$238
Ohio	$209
Oklahoma	$457
Oregon	$166
Pennsylvania	$346
Rhode Island	$473
South Carolina	$262
South Dakota	$319
Tennessee	$180
Texas	$336
Utah	$176
Vermont	$308
Virginia	$249
Washington	$266
West Virginia	$280
Wisconsin	$281
Wyoming	$230
United States	$335

Source: TRIP

Courtesy of Mississippi DOT.

PennDOT workers engage in crack sealing to keep moisture from penetrating beneath the road surface. In Pennsylvania, which has a vigorous freeze-thaw cycle each winter, keeping moisture out of the area beneath road surfaces is a critical maintenance step.

Courtesy of Pennsylvania DOT.

Chapter 2

Investing to Save America's Highways

Building for the future requires a national commitment to significant and sustained investment in transportation infrastructure.

"In the end, everything ties back to money, and we need to invest enough to preserve this important asset," said Oklahoma DOT Director Gary Ridley.

But the needs are high:

- The **Oregon DOT** needs $200 million per year to maintain current performance levels over the next 10 years compared with a current investment level of $130 million.

- The **Texas DOT** estimates that $73 billion will be required during the next 22 years to maintain current conditions. Today, the department is spending $900 million per year and losing ground. Officials say each one percent drop in good or better pavement condition is another 1,900 lane miles to fix and an additional $760 million in needs.

- The **Rhode Island DOT** needs $639.5 million annually to preserve its highway system. The state has only $354 million available each year to meet the need—leaving an annual funding gap of $285 million.

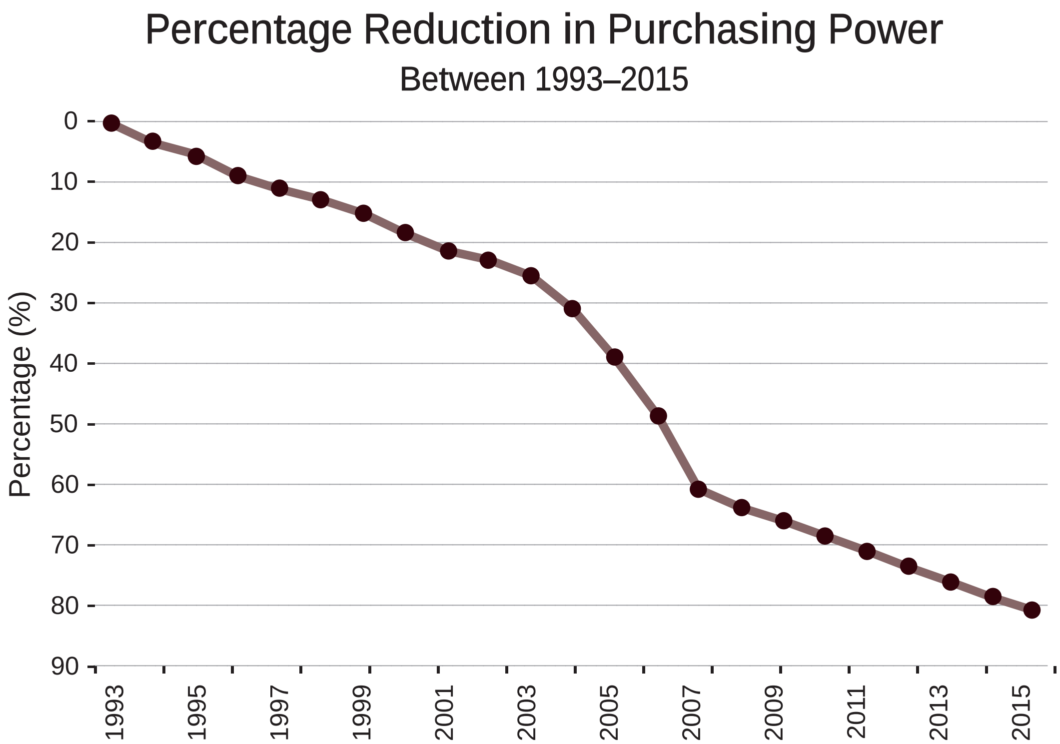
- **Alabama** needs an immediate investment of $1.4 billion to bring about 4,000 miles of deficient roadways to an adequate performance level. For Interstates, 70 miles must be resurfaced each year to maintain current levels at a cost of $140 million per year. The FY 2009 Interstate maintenance appropriation is $120 million.

- The **Pennsylvania DOT** pegs its need at $2.19 billion per year to maintain the entire state highway system at desired preservation cycles. That estimate does not include the current backlog of substandard pavements.

> "Envision a future with more transportation choices and efficiency than ever before. The stranglehold of congestion will be loosened by driving shorter distances, riding transit, and better utilizing our highways. Strategic investment in new lanes, new corridors, and new capacity for all modes will remove bottlenecks and connect America and the world."
>
> *Transportation: Invest in Our Future*
>
> American Association of State Highway and Transportation Officials, 2007

- The **Nebraska Department of Roads** estimates it will need $270 million annually to preserve its highway system. Faced with declining revenue and growing needs, NDOR decided to make asset preservation its top priority to keep roads and bridges at current performance levels. No funding will be allocated to capital improvements until all preservation needs have been met.

Soaring construction costs during the past five years are further straining highway investment budgets. Asphalt prices are up 70 percent; concrete 36 percent; steel 105 percent; and diesel fuel, which is used to operate heavy construction equipment, soared by 305 percent including a 63 percent jump in one year.[12] While price trends have leveled as a result of the economic downturn, overall the purchasing power of a transportation dollar will have declined by 80 percent from 1993 to 2015.



THE BOTTOM LINE FOR INVESTMENT

Research conducted for the American Association of State Highway and Transportation Officials (AASHTO) concludes that the average requirement for ***all*** capital investments for highways and bridges is $166 billion ***annually*** through 2015. Other recent national studies commissioned by Congress project annual investment needs of similar magnitude, ranging from $130 billion to $240 billion though 2020. These levels are significantly higher than the $78 billion invested in highway capital improvements by all levels of government in 2006. According to the 2006 *Conditions and Performance Report* by the U.S. Department of Transportation, some 52 percent (or $36.4 billion) of transportation capital spending by all levels of government in 2004 was dedicated to system rehabilitation.

STIMULUS PROVIDES SHORT-TERM RELIEF

Inadequate levels of transportation funding have resulted in an immense backlog of "ready-to-go" but unfunded projects in the states. A December 2008 AASHTO survey identified more than 5,000 projects valued at $64 billion that states could have underway within 180 days.

In February 2009, President Barack Obama signed the American Reinvestment and Recovery Act of 2009 that provided $48 billion for transportation infrastructure as a means of stimulating the nation's severe economic decline. Of that amount, $27.5 billion was made available for highway projects.

"Because of the need to push money into the economy through job creation, states have applied a good share of their funding for the backlog of preservation needs," said AASHTO Executive Director John Horsley. "Resurfacing projects, for example, extend the life of highways, and can be implemented very quickly to benefit many areas of a state," he explained.

The **South Dakota DOT** said the stimulus money will provide about one year's worth of preservation funding to help with its backlog of needs. "Although this helps in the short-term, it is not a long-term solution," said South Dakota DOT Director of Planning and Engineering Joel M. Jundt.

Virtually all of the **Rhode Island DOT's** $137 million in economic recovery funding is devoted to preservation and maintenance projects—resurfacing, bridge rehabilitation, striping, guardrail, and traffic projects. The extra funds represent about 50 percent of the state's funding shortfall for 2009—or about five percent of the shortfall for the next 10 years.

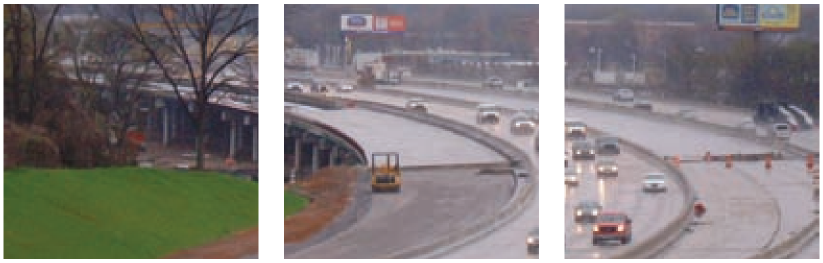
The **Idaho DOT** is using its stimulus allocation to pay for projects that would not be possible without extra federal funding. The projects include major highway widening, bridge replacement/relocation/realignment, and pavement restoration.

The $431 million that the **Maryland DOT** received will help offset some of the $1.3 billion cut from the state's highway capital program. The funds will be used primarily to keep roads in the best shape possible until the economy and federal and state revenues recover.

The **Alabama DOT** will spend $225 million on system preservation projects on non-Interstate routes, $70 million for an Interstate reconstruction project, and $8 million for bridge replacement and widening.

The **Texas DOT** is using a significant part of its stimulus funds to get its pavement preservation program back on track after three years of losing ground. Overall, pavement conditions in Texas were improving when the state spent $1.7 billion per year for rehabilitation and maintenance. Today, Texas spends about $900 million per year and has not been able to keep up with needed investments. Eight hundred million dollars in stimulus funds will help Texas stabilize pavement and bridge conditions for the next few years.

> "Resurfacing projects extend the life of highways, and can be implemented very quickly to benefit many areas of a state."
>
> —John Horsley, Executive Director, AASHTO



Courtesy of Alabama DOT.

Quick action by the Florida DOT and FHWA enabled replacement of the I-10 Escambia Bay Bridge on an accelerated schedule after it was destroyed in a 2004 hurricane.

Courtesy of Florida DOT.

Chapter 3

The Interstate System—An Aging Economic Engine

The Interstate Highway System has made a dramatic difference in how people and goods move across the country. The 47,000-mile system saves time, money, and lives, and has played a critical role in improving business productivity.

Construction of the Interstate system created jobs and produced new roads that expanded mobility for Americans. More importantly, the Interstate system helped create and continues to sustain the economy that has grown during the last 50 years.

"The initial investment in jobs during construction of the Interstate is far overshadowed by the economy that grew over the past 50 years as a direct result of that construction," said Gary Ridley, Director, Oklahoma Department of Transportation. "That's why preserving this asset is essential to our economic future."

TRAFFIC AND TRUCKS CAUSE WEAR AND TEAR

Although most Interstate highways today provide a good quality ride, the system is showing its age largely because of dramatic growth in car and truck traffic.

The 47,000 miles of Interstate highway represent only one percent of total highway mileage in the United States, but carry 24 percent of all traffic. Traffic growth during the past 50 plus years has far outpaced any growth projections made during the initial planning stages.

Much of the increase is due to truck traffic. On average, every mile of the Interstate system sees 10,500 trucks a day. By 2035, that number is expected to double, increasing to 22,700 trucks a day for each mile of Interstate highway.[13]

The surge in truck traffic on Interstate highways and its impact on traffic and road conditions are major factors in assessing the future of the Interstate Highway System. When construction began in the 1950s, the U.S. econ-

> "Our unity as a nation is sustained by free communication of thought and by easy transportation of people and goods. The ceaseless flow of information throughout the Republic is matched by individual and commercial movement over a vast system of interconnected highways crisscrossing the country and joining at our national borders with friendly neighbors to the north and south."
>
> —President Dwight D. Eisenhower, February 1955

Interstates Save Time, Money, and Lives

Interstates:

- Reduce total U.S. motor fuel consumption by 9.7 billion gallons annually
- Save Americans more than $320 billion annually and more than $1,100 per person in time and fuel
- Reduce the cost of transporting goods, which saves about $380 billion annually and $1,300 per person in consumer costs
- Save the average person 70 hours of time annually
- Are twice as safe as travel on other roadways because of safety features that include a minimum of four lanes, gentler curves, paved shoulders, median barriers, and rumble strips

Source: *The Interstate Highway System Saving Lives, Time, and Money* *TRIP, June 2006*

omy was largely self-contained. That has changed dramatically. The percentage of GDP represented by foreign trade increased from 13 percent in 1990 to 26 percent in 2000, and is expected to hit 35 percent in 2020. More than 80 percent of freight tonnage is generally carried by trucks driving on the Interstate Highway System.

Traffic growth during the past 50 years has been so great that most of the expansion capacity planned when the Interstate system was built has been used up. As a result, what was once wide open roadway is now increasingly congested.

Bottlenecks caused by stretched-to-the-limits Interstate interchanges delay commerce, cost consumers time and money, and further erode the Interstate network. In some parts of the country, the leaps in productivity and mobility that were hallmarks of the Interstate for much of its 50-year life are disappearing.

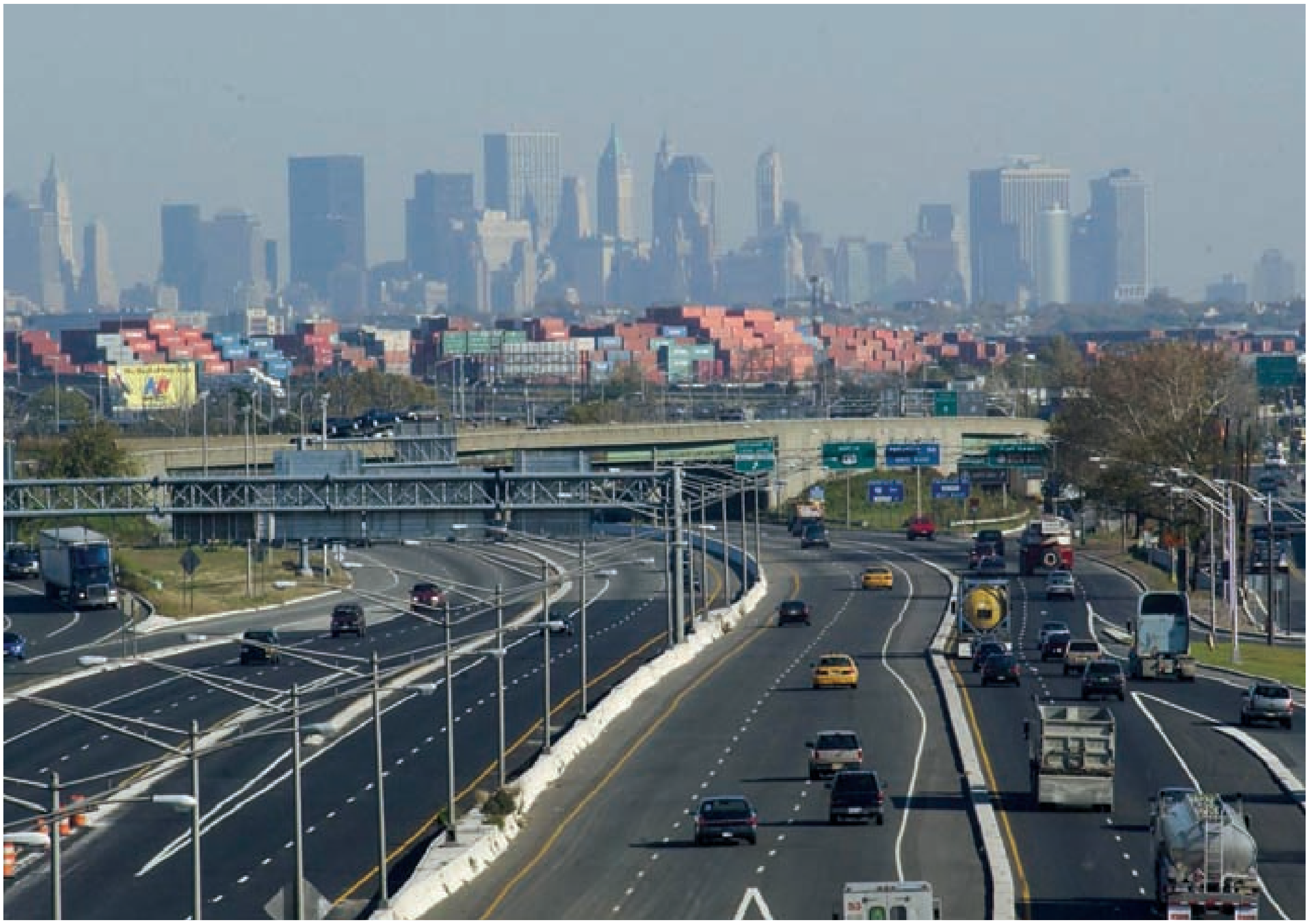
Interstate interchanges in metropolitan areas show the strain of traffic loads most dramatically. For example, the Marquette Interchange in Milwaukee, Wisconsin, was built in 1968 for $33 million to carry 155,000 vehicles per day. It was carrying 300,000 vehicles per day before construction began on a new interchange at a projected cost of $810 million.

Completed three months early in August 2008, the project is expected to be $10 million under budget. The Wisconsin DOT rebuilt the Marquette Interchange to include bridges with a life-span of 75 years. The project illustrates not only the cost of a major interchange reconstruction, but also the need to both preserve and renew such structures to meet traffic needs today and into the future.

Yet another example of a major Interstate replacement project is the Woodrow Wilson Bridge on Interstate 95 just south of Washington, DC. By the year 2000, the 45-year-old bridge had become a notorious bottleneck, carrying more than 200,000 vehicles a day, when it was built to accommodate only 75,000 vehicles a day. The new Woodrow Wilson Bridge was completed in 2008 at a cost of $2.5 billion, and was delivered on time and on budget. The new structure expands the bridge from 6 lanes to 12, two of which will be reserved for use by transit. Its new capacity of 300,000 vehicles a day is expected to accommodate traffic growth for many years to come.

INVESTING IN THE INTERSTATE'S FUTURE

States manage the Interstate Highway System, and they invest significant resources and research into preserving and restoring these critical highways. But they can't do it alone. In 1956, the idea of a federally defined,



Truck lanes on the New Jersey Turnpike just outside of New York City. *Courtesy of New Jersey DOT.*

built, and owned system was rejected in favor of the federal–state partnership that evolved and strengthened over 50 years.

Continuing to invest in restoring, rebuilding, and expanding the Interstate system is an important component of a **comprehensive highway preservation strategy** for the 21st Century.

- **Bridges**: The Interstate system has more than 55,000 bridges, many of which are reaching 40 to 50 years of age. Bridges and other structures of this age usually require substantial rehabilitation, and in another 20 to 30 years, require replacement.

- **Pavement**: The Interstates have approximately 210,000 lane-miles of pavement. As these pavement structures reach 40 and 50 years of life, major portions will need to have their foundations completely reconstructed.

- **Interchanges**: The Interstate system has almost 15,000 interchanges, and many do not meet current operational standards, creating bottlenecks or safety problems. Some of the most significant congestion on the system occurs at major interchanges not designed to carry the volumes of traffic that currently use them. Future traffic will only exacerbate these problems.

Lane expansion as part of rehabilitation is needed to improve freight logistics, reduce urban congestion, catch up to population growth centers, and connect growing metropolitan regions.

Absent significant expansion in the Interstate system, increased traffic, particularly in metropolitan areas, and dramatic growth in freight volumes will lead to more congestion and more wear and tear. Consistent pavement preservation strategies, carefully monitored performance measurements, and technological advancements can only do so much on roadways that are stretched far beyond capacity.

To obtain a clearer picture of coming investment requirements**, AASHTO has recommended** that the U.S. DOT and state DOTs jointly undertake two comprehensive needs assessments of the Interstate Highway System:

- To identify the costs of rebuilding or replacing the existing bridges, pavement foundations, and interchanges; and

- To identify long-term, system-wide expansion needs.

STATES FOCUS ON INTERSTATES

Preserving and reconstructing Interstate highway mileage is a top priority in every state.

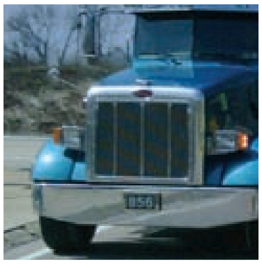
Missouri DOT Director Pete K. Rahn said there is a "huge need" to reconstruct much of his state's Interstate system. In Missouri, reconstruction of Interstate 70, a major cross-country route, is projected to cost $3.4 billion, and Interstate 44, another national corridor, will cost $4 billion to rebuild. "We're holding them together with bailing wire and bubble gum through overlays and other repairs," Rahn said. "But we get less and less life out of rehabilitation treatments because the foundation needs to be rebuilt. An initial overlay might produce seven years of smooth rides, but after a while, potholes, cracks, and rutting will appear within three years."

The **Pennsylvania DOT** has 128 miles, or 10 percent, of its Interstate system in need of major rehabilitation and reconstruction. Funding is in place to complete work on 77 of those miles.

The **Iowa DOT** has several major Interstate rehabilitation and reconstruction programs underway including:

- A $45 million project to grade, pave, and construct 10 new bridges along with roadway improvements on the Interstate 35-80-235 system interchange near Des Moines. The three-year project, which is nearing completion, will improve overall interchange traffic operations and meet existing and expected short-term traffic growth. The state went with a less costly short-term solution because funds were not available for total reconstruction.

- Addition of one lane in each direction to a 7.3-mile segment of Interstate 80 along with replacement of the entire original 46-year-old pavement at a cost of $96.5 million.



Courtesy of Pennsylvania DOT.

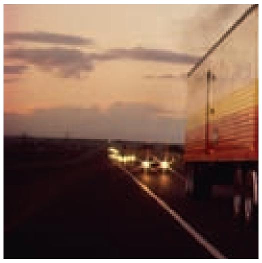
The **Oregon DOT** is rehabilitating nine miles of pavement on a segment of Interstate 84 in the eastern part of the state. The section was originally built in the 1960s and has been resurfaced three times to address damage from increased traffic and environmental conditions.

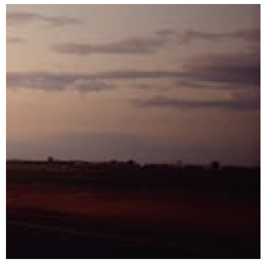
Because truck traffic generally uses the slow lane in this rural part of Oregon, the $27 million project will reconstruct that lane—which is in poor condition—with new concrete pavement, and resurface the existing fast lanes with asphalt pavement. This "black and white" pavement type has been successfully used in three other locations in Oregon.

The **Nebraska Department of Roads** is working on a six-lane reconstruction of Interstate 80 between Omaha and Grand Island, the state's two largest cities, which serves thousands of travelers daily. Upgrading from four to six lanes will improve safety and ease congestion in the state's fastest growing corridor. The $37 million project will be completed in mid-2011. This project is one component in a needed—but unfunded—reconstruction of the entire length of I-80 in Nebraska at projected cost of $100 million per year.

The Woodrow Wilson Bridge has successfully eased traffic on a major East Coast bottleneck. *Courtesy of Eye Construction, Inc.*

> "The Interstate System will never be finished because America will never be finished."
>
> —Francis C. "Frank" Turner, Federal Highway Administrator, 1969–1972
> *Richmond Times-Dispatch*, August 19, 1996





A truck on the warm-mix test track at the National Center for Asphalt Technology.

Courtesy of National Asphalt Pavement Association/ Asphalt Pavement Alliance.

Chapter 4

Trucks and Highways—Working Together to Move Freight

Trucking is the backbone of the nation's freight transportation system—transporting virtually everything we eat, drink, or buy. And trucks drive on highways, streets, and roads. Nearly 80 percent of the 15 billion tons in goods transported through the nation's freight system in 2005 was carried on trucks. Freight tonnage moved in the United States is projected to nearly double over the next 30 years with trucks taking 84 percent of the growth.(14)

With this expected growth, creating a low-cost, efficient, and reliable freight system becomes increasingly critical to the country's economic health. And preserving the highway network is a vital piece of the long-term freight strategy for the nation.

But major challenges lie ahead:

- Increasing traffic congestion is costing the freight transportation network nearly $8 billion per year. Higher transportation costs mean higher consumer prices.

- Increased truck traffic contributes to wear and tear on highways. Pavement damage is related to a truck's axle loads rather than the total truck weight. A truck with more axles will have less weight per axle and, therefore, create less pavement damage.

Highways and trucks need to coexist successfully for the good of America's economy. To achieve that goal, a comprehensive action agenda to meet the country's freight needs is essential, including:

- Fixing freight bottlenecks;

- Maintaining durable highway surfaces; and

- Improving access to ports, airports, and distribution centers.

> "From any perspective the freight transportation challenge is formidable. Meeting it will require resolve and resources. Not meeting it will be a major national failure."
>
> —Larry L. "Butch" Brown, Executive Director, Mississippi Department of Transportation

FREIGHT BOTTLENECKS COST CONSUMERS

Bottlenecks occur when traffic routinely backs up because volumes exceed capacity of the roadway. The worst bottlenecks are at or near freeway-to-freeway interchanges.

Freight bottlenecks are found on highways that serve major international gateways such as the Ports of Los Angeles and Long Beach, California, at major domestic freight hubs such as Chicago, and in major urban areas where transcontinental freight lanes intersect congested urban freight routes.

Traffic congestion means increased travel times, increased costs, and less reliable pick up and delivery times for truck operators. Freight bottlenecks cause nearly 250 million truck hours of delay annually, costing direct users about $7.8 billion.[15] To make up for traffic delays, shippers add more trucks, which, in turn, creates more congestion. Eventually these increased costs of doing business are passed on to consumers.

BUILDING MORE DURABLE PAVEMENTS TO SUPPORT TRUCK TRAFFIC

Research into developing pavement materials and construction practices to provide more durable road surfaces that can tolerate increased traffic loads—including trucks—is part of the solution. Examples of advanced research include the use of geosynthetic reinforced soil, warm mix asphalt, polymer-based asphalt binders, and admixtures to improve the strength and workability of Portland cement concrete.

Terry Button has been driving the roads in his trucks for more than 29 years. An independent trucker based in Rushville, NY, Button drives up and down the East Coast delivering hay to dealers and suppliers. Button, who serves on the Board of Directors for the Owner Operator Independent Drivers Association, said the repercussions of rough roads are devastating for truckers.

Smooth pavement not only affects his bottom line, it also means a safer ride. "Smooth rides are critical for truckers. It's easier on the equipment, easier on your health. Because with all the bumps, things wear out faster, air ride suspension hangers come off, ball joints wear out. Some night you might be going around a curve and something snaps, and your safety is at risk."

Button said he sees rough roads in every state. "Road smoothness varies greatly—sometimes county to county. We have to make this a priority for this country. If we don't have good transportation, we can't get food to market, and there's nothing more important than that."

DEDICATED TRUCK LANES

Many states are looking at adding truck-only lanes to their Interstates to reduce congestion, improve safety, and move goods faster. Separating trucks from regular automobile traffic can improve highways and reduce truck-caused wear and tear on other roadways. The only completely separated truck lanes that currently exist are a 30-mile segment of the New Jersey Turnpike. California and Texas also have short segments of truck-only lanes.

The biggest obstacle to broad use of truck-only lanes is cost. For example, one state study estimated that constructing a new truck-only lane alongside an existing rural Interstate highway would cost approximately $2.5 million per lane-mile, plus land and acquisition costs.[16] The FHWA estimates that the cost of new highway lane miles ranges from $1.6 million to $3.1 million in rural areas and $2.4 million to $6.9 million in urban areas. The truck-only price tag raises red flags when states look at long lists of reconstruction and expansion needs at a time when highway construction funds are limited. As a result, higher fuel taxes, user fees, and tolls are options that states have considered to pay for dedicated truck lanes.

Courtesy of California DOT.

COMMERCE CORRIDORS FOR EFFICIENT FREIGHT MOVEMENT

Exclusive truck lanes at the state level are a subset of a bigger strategy needed to move freight more efficiently and preserve the nation's highways. Other elements being recommended by many groups, including AASHTO are: fix highway truck bottlenecks, improve intermodal access to ports and distribution centers, fund international gateways, and add capacity to priority trade corridors including a national network of truck-only lanes.

The program would be funded by freight-related user fees outside the Highway Trust Fund, with the federal government providing coordination and the states and Metropolitan Planning Organizations (MPOs) overseeing the planning.

Courtesy of Pennsylvania DOT.

PennDOT workers lay replacement drainage pipe as part of a road maintenance project. Proper drainage for streams that cross beneath roads is a critical maintenance step.

Courtesy of Pennsylvania DOT.

Chapter 5

Managing Highways as an Investment

With an estimated value of $1.75 trillion, highways, streets, and roads are an asset to be managed and preserved rather than a project to be built or fixed. Managing this valuable asset depends on:

- An investment in pavement preservation;
- An organizational commitment to asset management;
- Advancements in materials, maintenance techniques, and technology; and
- Sustained financial investment.

PAY ME NOW OR PAY ME LOTS MORE LATER

Good roads cost less. That is why pavement preservation is such an important part of asset management. The goal is to extend the service life of roads ***before*** they need major rehabilitation or replacement.

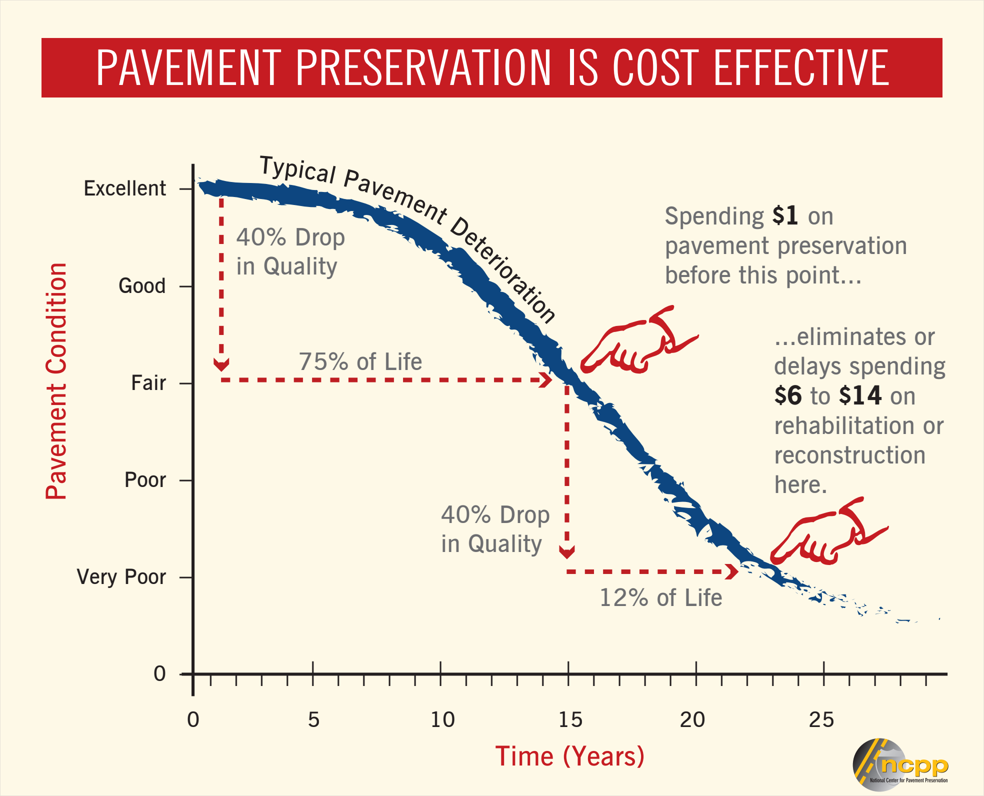
Maintaining a road in good condition is easier and less expensive than repairing one in poor condition. Costs per lane mile for reconstruction after 25 years can be more than three times the cost of preservation treatments over the same 25 years and can extend the expected service life of the road for another 18 years.

Timing is everything in pavement preservation. If rehabilitation is done too early, pavement life is wasted. If it is done too late, the road may require additional costly repair work.

Pennsylvania DOT Secretary Allen D. Biehler said the decision to use a large portion of highway funds for system preservation is one of the biggest challenges facing transportation leaders today.

"We as transportation stewards of the system have no choice but to drive home the message that maintaining an acceptable condition for our highways—preserving the system—is vital to our country's future," Biehler said.

> "There is no more fundamental transportation capital investment than system preservation—keeping existing infrastructure in good condition. If preservation investment is deferred, costs increase dramatically, leading to the saying 'pay me now or pay me more—lots more—later'."
>
> —Washington Department of Transportation 2007–2026 Highway System Plan



Source: National Center for Pavement Preservation.

"Our focus is fix it first—paying attention to basic day-to-day practices that help us be more successful. Otherwise, you can spend too much time and money chasing after potholes while watching the system fall farther and farther behind."

In Pennsylvania, less than 10 percent of the transportation budget is currently dedicated to expansion—compared with more than 20 percent in recent years.

The **Oregon DOT** has a chip-seal preservation program to treat about 780 lane miles of highway at a cost of $7 million per year. The program complements the department's $125 million preservation program, which resurfaces about 1,000 lane miles during the same period. The chip-seal program lowers the annual cost to maintain good pavement by increasing the time between higher-cost resurfacing treatments. Over the long-term, the preservation strategy will save $16 million per year in resurfacing costs.

The **Nebraska Department of Roads** recently implemented a Pavement Optimization Program (POP) to manage its highway network and allocate funds to keep the system at its current performance level. POP uses current pavement conditions, pavement deterioration rates, and cost/benefit ratios to develop budget scenarios to ensure effective allocation of funds. The department uses two recently purchased pathway profilers to collect data about the severity and extent of pavement distress to assist in making investment decisions.

The **Michigan DOT** uses a network pavement strategy that provides a "mix of fixes" to extend the life of the road. The three types of fixes are: reconstruction and rehabilitation; capital preventive maintenance; and reactive maintenance. Decisions about which fix to use are based on an assessment of the current pavement conditions and a projection of the number of years before it will require reconstruction or rehabilitation using a measure known as *remaining service life* (RSL).

Tight budgets force creative strategies for sustaining pavement preservation plans. In **Washington State**, the DOT has identified the need for $1.7 billion in concrete pavement restoration—but less than $20 million per year has been budgeted. To compensate for reduced funding, WSDOT uses a triage strategy—investing first in pavements whose life can be greatly extended if treated immediately, and deferring work on pavements that need complete replacement. The strategy improves and extends the life of the greatest number of lane miles with available funds. Despite budget constraints and soaring construction costs, pavement conditions have continued to improve over the years.

Shifting from Worst-First to Best-First Investments

How do you sell the idea that spending money on a road that looks to be in good condition is a better idea than spending it on one that is bumpy, rutted, rough, and obviously in need of repair? Very carefully, says Michigan DOT Director Kirk L. Steudle, who believes the shift from worst-first to best-first is a good strategy for long-term asset management.

"It is important to slow the rate of decline in the good road so that it stays good rather than slipping into fair or poor condition." Steudle added that spending $1 to keep a road in good condition prevents spending $7 to reconstruct it once it has fallen into poor condition.

Michigan always works on a five-year horizon in its pavement preservation program so, he said, it is important to show where plans to fix that poor road fit into the schedule.

"It is easy to fall into the worst-first strategy, particularly when money is tight," he said. "But that's when staying focused on keeping good roads good and minimizing the amount of deterioration is even more important."

MANAGING TRANSPORTATION ASSETS

Asset management is a strategic approach to managing infrastructure. It focuses on maintaining the condition and performance of ***public assets*** using business and engineering practices to allocate resources based on reliable information and well-defined objectives.

> "The highway system is owned by the public. Our daily focus is on preserving this asset that the public has entrusted to us. In many cases, we're not doing as good a job as we could."
>
> —Gary Ridley, Director, Oklahoma Department of Transportation

"Asset management is a very broad concept that focuses on getting the best return on the investment we put into our transportation system," said Kirk T. Steudle, Director of the Michigan Department of Transportation and Chair of the AASHTO Subcommittee on Asset Management. "It isn't a computer software program, finance and accounting practices, or a pavement preservation program. Asset management includes all that and more.

"We need to focus on operating, maintaining, upgrading, and expanding the entire asset with which we are entrusted in the most cost-effective and efficient way possible," Steudle said.

The **Michigan DOT** Asset Management program encompasses all the physical transportation assets in the state, including more than 9,700 miles of road, 5,679 bridges, 450,000 signs, 4,025 traffic lights, 8 million linear feet of guardrails, 83 rest areas, 13 travel information centers, 85 roadside parks, 27 scenic turnouts, and more. The program is built around five major functions: policy goals and objectives, information and data collection, planning and programming; program delivery, and monitoring and reporting.

Steudle said the program begins with setting a broad policy about the current condition of the asset and then setting a goal for where you want that asset to be within a specific time frame. For Michigan, the goal was to increase the condition of all its roads and highways, moving from 65 percent of state roads in good condition in 1997 to 90 percent in 2007. Pavement preservation was the primary tool for achieving that goal.

The department met its 90 percent goal and improved to 92 percent in 2008. A similar goal-driven asset management process is now underway for the state's bridges.

Michigan has a statewide Transportation Asset Management Council, which brings together all the agencies in the state that have jurisdiction over roads. Its purpose is to broaden the use of transportation asset management throughout the state and ensure that groups are working together, sharing methodology, collecting the same data, and speaking the same language.

Other state DOTs are developing asset management programs as well.

The **Washington State DOT** relies on data collection, analysis, and innovative reporting methods to manage its transportation assets, which include 20,000 lane miles of state roads and 3,000 bridges. The department uses data not only to assess project costs and benefits, but also to analyze tradeoffs in allocating limited funds between preservation and improvement programs and between highway construction and highway maintenance.

The department's *Measures, Markers, and Milestones* report is a critical part of the system, linking performance measures to overall strategic objectives. The state's efforts to communicate its performance led to public support for two funding increases—a five-cent gas tax increase in 2003 and a nine-cent gas tax increase in 2005.

The **Utah DOT,** which manages 6,000 miles of highway, uses dTIMS CT software to support its asset management, bridge management, and pavement management systems. These systems help the department identify the most efficient use of funding based on the current condition of the asset and available funding for preserving it. Because of recent funding limitations, however, the asset management model recommends work that has to be done instead of the work that should be done.

Courtesy of the National Asphalt Pavement Association/Asphalt Pavement Alliance.

TOOLS FOR SUCCESSFUL PAVEMENT PRESERVATION

Successful pavement preservation requires reliable tools for monitoring pavement conditions and the best materials to get the longest life from the roads. A number of different types of sealers and rejuvenators are available based on the existing pavement type and the problem being solved. The most common treatments include chip seals, slurry seals, fog seals, micro-surfacing, thin hot mix asphalt overlays, crack sealing, and joint sealing—all designed to maintain or improve pavement condition and extend its life.

The **Washington State DOT's** Materials Lab identified these tools for pavement preservation:

- **Dowel-bar retrofits** installed in aging concrete to improve smoothness and longevity and help traffic flow smoothly from one concrete slab to the next. State officials believe the technique could add 10–15 years to 30-year-old concrete highways.

- **Pavement recycling** using reclaimed asphalt from older, failed pavements and blending it into a new asphalt mix.

- **Warm-mix asphalt** using chemical additives that allow construction at lower temperatures resulting in lower emissions and improved construction.

- **Bonded concrete overlays** on an existing asphalt pavement to add structure and provide a longer-lasting surface. **Ultra-thin white topping** using a two-to-four inch thick layer of concrete over an existing asphalt road can be installed fairly quickly with minimal traffic disruption.

Reliable equipment to assess and monitor the condition of pavements is as important as the materials used.

The **Michigan DOT** has used ground-penetrating radar to assess conditions that could affect pavement life, such as locating sink holes, and mapping technology to help assess remaining service life on pavements. A laptop computer along with a GPS receiver are used to track road locations on a region map and quickly gather data about the previous service life rating, historic data on the road segment, and previous fix types.

The **Maryland DOT** uses an automatic road analyzer to collect information on roughness, rutting, and cracking as well as a skid truck to collect friction data. The data is fed into the pavement management system to identify targets for both pavement preservation and rehabilitation fixes.

Last summer, the **Oregon DOT** began assessing pavement conditions on a portion of the network using a vehicle equipped with a profiler to measure roughness and scanning lasers to measure rutting. All of the data was collected in a single pass of one vehicle at normal speeds.

Rhode Island uses an automated distress survey to assess pavement conditions and calculate crack density that helps define the appropriate preventive maintenance treatment. In addition, the RIDOT pavement management team selects 100-foot-long monitoring sections representing all of the different treatments, stress levels, and traffic volumes to visually assess effectiveness of the preservation strategy.

The **Minnesota DOT** evaluates its 14,000 miles of highway annually using a van equipped with lasers to measure the smoothness of pavement and cameras to help engineers evaluate the quality of the pavement. The state uses three indicators to report and quantify pavement conditions—*ride quality index,* which measures pavement roughness; *surface rating,* which measures pavement distress; and a *pavement quality index*.

Pothole Killer Streamlines Repairs

Dealing with potholes is part of a pavement preservation strategy. Generally quick fixes to deal with urgent needs—like a really big pothole on a major commuter route—may be needed. But quick fixes rarely last.

Pavement that is maintained in good condition and is designed for the traffic that uses it will usually remain pothole free—even during the toughest freeze and thaw cycles. Like any pavement repair processes, good materials installed properly will produce the best results.

One quick-fix approach that does produce longer-term results is the "Pothole Killer," an all-in-one vehicle that can repair up to 100 potholes a day with only one driver. A traditional four-person pothole crew can patch about 10–15 potholes a day. The Pothole Killer uses a three-step process—it blows the pothole clean of all debris, sprays a special fast dry asphalt emulsion into the hole, and then applies an asphalt aggregate mix on top. The entire process takes about six minutes.

Some cities and states lease rather than purchase the equipment to reduce the capital cost.

Courtesy of Patch Management Pothole Killers.

BUILDING FASTER, CHEAPER, SAFER

Construction strategies that speed up building projects without compromising quality can reduce traffic disruption, control labor costs, and minimize costs to commercial traffic.

Research shows that the traveling public is demanding increased mobility while showing less tolerance for construction delays and construction-related congestion.

Action strategies to build faster, cheaper, and more safely include:

- Innovative traffic management systems including full road closures to expand available work time;
- Accelerated construction management techniques to minimize construction time while enhancing quality and safety for major multi-phase projects; and
- Use of materials that reduce project schedules.

The **Indiana DOT**'s Hyperfix Project in 2003 provides an example of a successful fast-track Interstate renovation. The project involved reconstruction of two heavily traveled Interstates in Indianapolis. The highways carried 175,000 vehicles daily—compared with a design capacity of 61,000. Because of the magnitude of the reconstruction and expected traffic delays, the project team decided to close the highway completely and use a fast-track, round-the-clock construction plan.

The project was completed between two major races at the Indianapolis Speedway, which regularly draws 250,000 participants who use these highways. Work was completed in 55 days—30 days ahead of schedule, saving taxpayers an estimated $1 million in lost wages and lost productivity for each day that traditional construction would have added. Special commuter buses and parking lots were used to keep traffic moving without turning alternative routes into parking lots.

Keys to success included early planning, collaboration among local, state, and federal agencies, and community support. A series of community meetings were held well before construction began to ensure that everyone understood the plans and alternate commuter options. As a result, the public was prepared for traffic impacts long before blasting, drilling, milling, and paving began.

The team wrapped the public face of the entire project around a catchy brand name: Hyperfix. The name so captured the imagination of stakeholders that it became part of local language and lore with advertising billboards and radio talk shows proclaiming the need to "Hypermow" the lawn or "Hyperfix" one's thermostat. One citizen actually was inspired to write a song that celebrated the project's advances in words and music.(17)

The **Missouri DOT** challenges project engineers to use non-traditional project design methods to develop efficient solutions for today's needs. DOT officials say practical design is rooted in the principle that building a series of good, not great, projects will result in a great system. It maximizes the value of a project by ensuring that it is the correct solution for its surroundings.(18)

Before practical design, most projects followed strict guidelines based on road classification type and traffic volume. Now designers look at projects on a case-by-case basis with a goal of building to meet basic needs, rather than the highest standards. State officials estimate the new approach to design has saved taxpayers $400 million in its first two years.

GET IN, GET OUT, STAY OUT

Routine maintenance alone cannot sustain highways that have been in service for nearly 50 years. In many cases, pavement foundations need to be rebuilt to deal with the impacts of age and to modernize roads to meet current conditions.

Longer-lasting materials can make a big difference in the life of a road.

For example:

- Asphalt perpetual pavements can be designed and built to last longer than 50 years without requiring major structural rehabilitation or reconstruction. Longer-lasting asphalt pavement mixes combine smoothness and safety advantages of traditional asphalt with an advanced, multi-layer paving design that extends the life of a roadway with routine maintenance.[19]

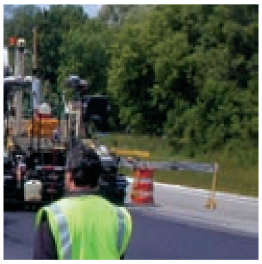
- Superpave gives highway engineers and contractors tools to design and construct asphalt pavements that meet specific climate and traffic conditions. Although it has been in use since the 1990s, current research focuses on measuring resistance to ruts and cracks to come up with even longer-lasting mixes.

- Stone matrix asphalt, which is also called Gap-Grade Superpave, is a new mix that can be used to reduce splash and spray and may have some value in noise reduction. Its main advantage is its durability, providing a long-lasting pavement surface.

- Fast-track concrete pavement produces the strength benefits of traditional concrete with a much shorter preparation time—making it possible to be ready for opening in 12 hours or less after laying. Generally fast-track concrete provides good durability because it has a relatively low water content, which improves strength and decreases salt permeability which, in turn, contributes to deterioration.

- Roller-compacted concrete, another drier mix, can be installed using asphalt paving equipment and compacted with rollers. It has the strength to withstand heavy loads and can resist freeze-thaw cycles.[20]





Courtesy of National Pavement Association/Asphalt Pavement Alliance.

Chapter 6

Rebuilding for the Future

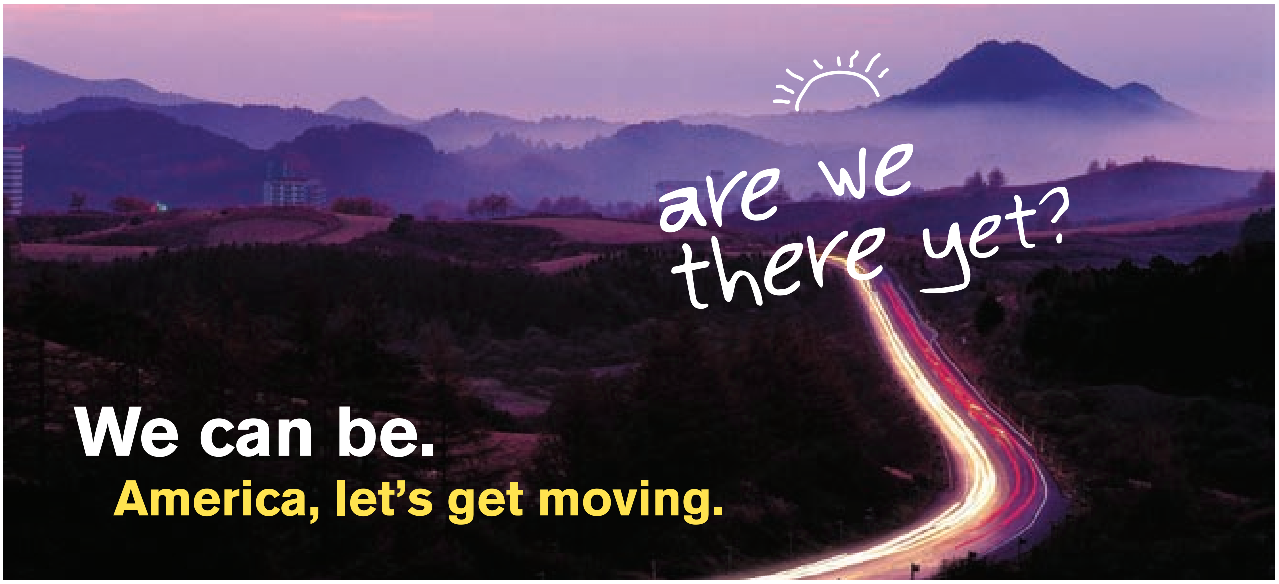
ARE WE THERE YET?

No—but we can be.

Improved management strategies, a focus on preserving essential public assets, better, longer-lasting materials, new approaches to building highways faster, cheaper, and sooner all will help get us there. But it does come down to money. It is time for a greater and smarter investment of transportation dollars to ensure a new and better transportation program.

Pennsylvania DOT Secretary and AASHTO President Allen D. Biehler said getting there also involves thinking differently about highways, land use, and our way of life.

“We need to maintain and preserve our highway system first and then begin to think about other influences at work—global warming, greenhouse gas emissions, where we live and work—that affect traffic congestion and our quality of life,” Biehler said.



> “As fundamental as it is to our future, our current transportation system is aging, underfunded, and inadequate to meet the demands of tomorrow. States stand ready to meet the challenges with projects that create jobs and bring hope to communities—projects that not only preserve what we already have but expand our horizons...”
>
> —Allen D. Biehler, AASHTO President;
> Secretary, Pennsylvania Department of Transportation

Appendices

Appendix A—Pavement Conditions on State, City, and County Arterial Networks, 2007

Urban areas with populations of 500,000 and above, including cities and surrounding suburbs

Urban Area	Poor	Mediocre	Fair	Good
Akron	12%	18%	22%	48%
Albany	14%	34%	19%	33%
Albuquerque	36%	27%	13%	24%
Allentown-Bethlehem, PA	15%	35%	24%	26%
Atlanta	1%	9%	5%	85%
Austin	20%	17%	24%	39%
Bakersfield	5%	38%	33%	23%
Baltimore	44%	26%	11%	19%
Birmingham	17%	30%	10%	43%
Boston	22%	20%	8%	50%
Bridgeport-Stamford, CT	15%	27%	17%	41%
Buffalo	12%	19%	22%	47%
Charlotte	10%	17%	27%	46%
Chicago	18%	28%	15%	39%
Cincinnati	11%	26%	16%	46%
Cleveland	15%	25%	12%	48%
Colorado Springs	12%	29%	25%	34%
Columbus, OH	4%	17%	19%	60%
Concord	54%	19%	17%	9%
Dallas-Fort Worth	29%	39%	17%	15%
Dayton	8%	12%	18%	62%
Denver-Aurora	18%	27%	17%	38%
Detroit	36%	33%	7%	24%
El Paso	19%	30%	30%	21%
Fresno	28%	35%	14%	23%
Grand Rapids	23%	27%	14%	35%
Hartford	19%	33%	17%	30%
Honolulu	61%	27%	6%	6%
Houston	29%	26%	17%	28%
Indianapolis	26%	21%	7%	46%
Jacksonville, FL	2%	16%	13%	69%
Kansas City	31%	17%	14%	38%
Lancaster-Palmdale, CA	13%	40%	24%	23%
Las Vegas	10%	26%	19%	46%
Los Angeles	64%	28%	5%	3%
Louisville	14%	37%	21%	29%
Memphis	27%	23%	15%	34%
Miami	5%	19%	15%	62%
Milwaukee	25%	29%	18%	28%
Minneapolis-St. Paul	22%	30%	18%	30%
Mission Viejo, CA	37%	47%	5%	11%
Nashville	6%	18%	13%	62%
New Haven-Meridian, CT	12%	31%	14%	44%
New Orleans	49%	19%	16%	16%
New York-Newark	54%	28%	10%	8%
Oklahoma City	41%	24%	12%	23%
Omaha	41%	36%	12%	11%
Orlando	7%	13%	13%	68%
Palm Springs-Indio, CA	47%	28%	10%	15%
Philadelphia	36%	36%	17%	12%
Phoenix	10%	16%	14%	60%
Pittsburgh	26%	32%	23%	20%
Portland	9%	17%	17%	58%
Poughkeepsie-Newburgh, NY	9%	39%	36%	16%
Providence	28%	30%	13%	28%
Raleigh	19%	26%	23%	32%
Richmond	14%	35%	28%	24%
Riverside-San Bernardino, CA	44%	44%	7%	4%
Rochester	19%	15%	35%	32%
Sacramento	44%	44%	4%	8%
Salt Lake City	5%	20%	17%	58%
San Antonio	38%	19%	15%	28%
San Diego	53%	31%	6%	10%
San Francisco-Oakland	61%	22%	4%	13%
San Jose	61%	29%	8%	2%
Sarasota-Bradenton, FL	1%	22%	18%	59%
Seattle	21%	21%	13%	45%
Springfield, MA	14%	46%	9%	31%
St. Louis	10%	22%	20%	48%
Tampa-St. Petersburg	3%	16%	15%	67%
Toledo	17%	15%	13%	55%
Tucson	23%	47%	15%	14%
Tulsa	47%	29%	8%	16%
Virginia Beach	23%	28%	21%	28%
Washington, DC, MD, and VA Suburbs	31%	30%	13%	27%

Source: TRIP analysis of Federal Highway Administration data.

Appendix B—Pavement Conditions on State, City, and County Arterial Networks, 2007

Urban areas with populations of 250,000–499,000, including cities and surrounding suburbs

Urban Area	Poor	Mediocre	Fair	Good
Anchorage	14%	37%	14%	35%
Ann Arbor	20%	28%	12%	40%
Antioch, CA	58%	13%	9%	21%
Asheville, NC	22%	21%	27%	30%
Augusta, GA	2%	14%	14%	70%
Barnstable Town, MA	7%	20%	14%	59%
Baton Rouge	37%	23%	21%	18%
Boise	44%	28%	8%	20%
Canton, OH	13%	17%	21%	49%
Cape Coral, FL	2%	34%	9%	55%
Charleston-North Charleston	11%	31%	19%	39%
Chattanooga	6%	25%	14%	55%
Columbia, SC	26%	21%	19%	34%
Corpus Christi, TX	36%	19%	16%	29%
Davenport, IA	36%	19%	18%	28%
Daytona Beach	4%	21%	8%	66%
Denton-Lewisville, TX	17%	45%	22%	16%
Des Moines	39%	18%	18%	25%
Durham, NC	20%	33%	11%	36%
Eugene, OR	5%	12%	13%	70%
Fayetteville, NC	3%	23%	21%	52%
Flint	27%	22%	13%	37%
Fort Wayne	34%	9%	9%	48%
Greensboro, NC	22%	15%	17%	46%
Greenville, SC	20%	32%	19%	29%
Harrisburg	11%	32%	25%	32%
Hemet, CA	44%	53%	1%	2%
Hickory, NC	18%	20%	21%	41%
Jackson, MS	34%	41%	14%	12%
Kissimmee, FL	0%	9%	9%	82%
Knoxville	9%	8%	22%	62%
Lancaster, PA	20%	33%	26%	21%
Lansing	16%	22%	14%	49%
Lexington, KY	7%	45%	9%	39%
Little Rock	26%	34%	17%	23%
Lorain-Elyria, OH	7%	14%	28%	50%
Madison, WI	31%	29%	19%	20%
McAllen, TX	6%	18%	23%	54%
Mobile	15%	14%	17%	55%
Modesto, CA	34%	39%	17%	10%
Naples, FL	0%	31%	7%	63%
Ogden-Layton, UT	4%	14%	17%	65%
Oxnard-Ventura, CA	36%	45%	11%	8%
Palm Bay-Melbourne, FL	11%	14%	7%	67%
Pensacola, FL	1%	15%	26%	58%
Port St. Lucie, FL	2%	27%	10%	61%
Provo-Orem, UT	1%	40%	5%	55%
Reading, PA	18%	44%	24%	14%
Reno	40%	17%	7%	36%
Santa Rosa, CA	52%	39%	8%	1%
Scranton-Wilkes-Barre, PA	26%	40%	20%	13%
Shreveport	35%	40%	12%	13%
South Bend, IN	25%	29%	11%	34%
Spokane	31%	16%	9%	43%
Stockton	42%	34%	8%	16%
Syracuse	16%	14%	20%	50%
Temecula-Murrieta, CA	35%	53%	7%	5%
Trenton, NJ	49%	27%	15%	9%
Victorville-Hesperia, CA	37%	36%	15%	11%
Wichita	42%	21%	5%	32%
Winston-Salem	8%	30%	38%	24%
Worcester, MA	31%	32%	11%	26%
Youngstown, OH	9%	23%	26%	41%

Source: TRIP analysis of Federal Highway Administration.

Appendix C—Additional Vehicle Operating Costs Due to Rough Roads, 2007 *

Urban areas with populations of 500,000 and above, including cities and surrounding suburbs

Urban Area	Cost in Dollars
Akron	$249
Albany	$315
Albuquerque	$576
Allentown-Bethlehem, PA	$340
Atlanta	$68
Austin	$346
Bakersfield	$280
Baltimore	$589
Birmingham	$344
Boston	$320
Bridgeport-Stamford, CT	$290
Buffalo	$248
Charlotte	$247
Chicago	$333
Cincinnati	$261
Cleveland	$290
Colorado Springs	$300
Columbus, OH	$156
Concord	$656
Dallas-Fort Worth	$512
Dayton	$182
Denver-Aurora	$339
Detroit	$525
El Paso	$401
Fresno	$461
Grand Rapids	$394
Hartford	$352
Honolulu	$688
Houston	$463
Indianapolis	$400
Jacksonville, FL	$123
Kansas City	$457
Lancaster-Palmdale, CA	$350
Las Vegas	$246
Los Angeles	$746
Louisville	$355
Memphis	$436
Miami	$165
Milwaukee	$425
Minneapolis-St. Paul	$431
Mission Viejo, CA	$571
Nashville	$185
New Haven-Meridian, CT	$263
New Orleans	$622
New York-Newark	$638
Oklahoma City	$631
Omaha	$592
Orlando	$162
Palm Springs-Indio, CA	$608
Philadelphia	$525
Phoenix	$217
Pittsburgh	$430
Portland	$199
Poughkeepsie-Newburgh, NY	$307
Providence	$418
Raleigh	$372
Richmond	$354
Riverside-San Bernardino, CA	$632
Rochester	$318
Sacramento	$622
Salt Lake City	$187
San Antonio	$529
San Diego	$664
San Francisco-Oakland	$705
San Jose	$732
Sarasota-Bradenton, FL	$146
Seattle	$326
Springfield, MA	$339
St. Louis	$258
Tampa-St. Petersburg	$137
Toledo	$275
Tucson	$473
Tulsa	$703
Virginia Beach	$417
Washington, DC, MD, and VA Suburbs	$458

Source: TRIP.

* AAA reports that the average cost for a motorist traveling 15,000 miles per year is $8,100, although costs vary depending on the vehicle and location.

Appendix D—Additional Vehicle Operating Costs Due to Rough Roads, 2007 *

Urban areas with populations of 250,000–499,000, including cities and surrounding suburbs

Urban Area	Cost in Dollars
Anchorage	$304
Ann Arbor	$359
Antioch, CA	$652
Asheville, NC	$390
Augusta, GA	$124
Barnstable Town, MA	$178
Baton Rouge	$534
Boise	$597
Canton, OH	$256
Cape Coral, FL	$183
Charleston-North Charleston	$301
Chattanooga	$214
Columbia, SC	$424
Corpus Christi, TX	$509
Davenport, IA	$495
Daytona Beach	$156
Denton-Lewisville, TX	$424
Des Moines	$524
Durham, NC	$392
Eugene, OR	$130
Fayetteville, NC	$186
Flint	$413
Fort Wayne	$445
Greensboro, NC	$347
Greenville, SC	$401
Harrisburg	$288
Hemet, CA	$650
Hickory, NC	$340
Jackson	$638
Kissimmee, FL	$61
Knoxville	$182
Lancaster, PA	$384
Lansing	$298
Lexington, KY	$294
Little Rock	$462
Lorain-Elyria, OH	$200
Madison	$486
McAllen, TX	$196
Mobile	$272
Modesto, CA	$538
Naples, FL	$147
Ogden-Layton, UT	$150
Oxnard-Ventura, CA	$560
Palm Bay-Melbourne, FL	$205
Pensacola, FL	$134
Port St. Lucie, FL	$162
Provo-Orem, UT	$196
Reading, PA	$399
Reno	$497
Santa Rosa, CA	$684
Scranton-Wilkes-Barre, PA	$458
Shreveport	$552
South Bend, IN	$431
Spokane	$396
Stockton	$580
Syracuse	$260
Temecula-Murrieta, CA	$571
Trenton, NJ	$620
Victorville-Hesperia, CA	$552
Wichita	$540
Winston-Salem	$300
Worcester, MA	$450
Youngstown, OH	$253

Source: TRIP.

* AAA reports that the average cost for a motorist traveling 15,000 miles per year is $8,100, although costs vary depending on the vehicle and location.

Endnotes

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Publication Code: RRA-1

ISBN 978-1-56051-443-5

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Washington DC 20001