2015 State of the Pavement Report

California Department of Transportation
Division of Maintenance
Pavement Program
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Acknowledgments

This report is prepared by the California Department of Transportation, Division of Maintenance, Pavement Program, Office of Planning and Programming and Office of Pavement Management and Performance. It summarizes the 2015 pavement condition survey on the entire Caltrans network.

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The completed 2015 Pavement Condition Report can be downloaded from the Division of Maintenance intranet page:
URL: http://onramp.dot.ca.gov/hq/maint/pavement/planprogram.shtml

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EXECUTIVE SUMMARY

To effectively manage the pavement on the State Highway System (SHS), the California Department of Transportation (Caltrans) conducts a Pavement Condition Survey (PCS) on nearly 50,000 lane miles of pavement (265 state highways) which have a combined travel of 178 million vehicle miles. The 2015 PCS indicated that 41,756 lane miles (84 percent) of California's SHS are in good to fair condition.

Distressed lane miles are one of Caltrans' performance measures and falls under Goal 2: Stewardship and Efficiency. The goal is to reach 90 percent good to fair condition in the next 10 years.

Caltrans has invested in the Automated Pavement Condition Survey (APCS) which uses high definition images and lasers to measure every lane on the system. This data can be used to predict the future performance and will be used to track sustainability and pavement health. To maintain the health of the system, the PaveM software was developed. PaveM is the "State of the Art" technology that stores high definition photo imagery from APCS to analyze every mile of pavement. PaveM targets future repairs that provide the best value for the least amount of money. PaveM makes decisions based on a project optimization tool that uses pavement condition, pavement type, climate, and project history to propose the right repair treatment at the right time.

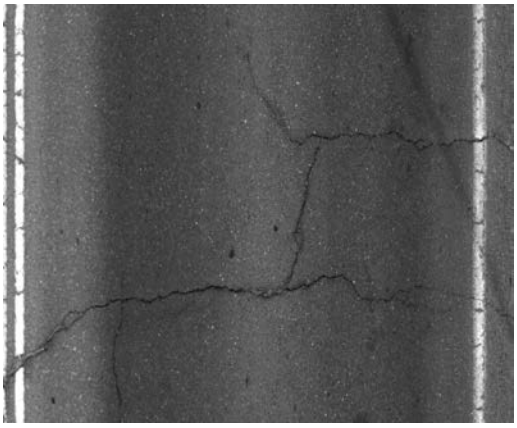
In the last four years, Caltrans delivered about $4.0 billion in pavement projects on almost 16,500 lane miles. The "2015 Ten-Year SHOPP Plan" anticipates pavement needs to be $2.0 billion per year over the next decade, although only $813 million per year is available.

By efficiently using preventive treatments, Caltrans can avoid more costly repairs in the future. For example, the projects awarded in fiscal year 2013-14 had preventive maintenance costs averaging $115,000 per lane mile, while major rehabilitation work was 8 times more expensive. Annual spending for preventive maintenance has been steady since 2008 and the National Highway System (NHS) routes with smooth ride has increased by about 14 percent since 2005. This improvement in ride quality on the NHS is due to more than seven thousand lane miles of capital pavement projects completed since 2005.

CHAPTER 1 – HIGHWAY CONDITION AND NEEDS

Using new technology, Caltrans has invested in the APCS which uses high definition images and lasers to measure every lane on the system. This data can predict the future network performance and will be used to track sustainability and pavement health. In the past, Caltrans conducted the PCS once a year to measure the changes in the pavement condition on the nearly 50,000 lane mile system. The PCS was a visual inspection conducted along the outside highway lanes in both directions using systematic sampling techniques. Condition assessments were made for the entire highway system based on those sample inspection. The 2015 PCS was started in June 2013 and completed in January 2015.

APCS pavement Data Collection



Example of High Definition Cracking Image

To maintain the health of the system, the PaveM software was developed. PaveM is the “State of the Art” technology that stores high definition photo imagery from APCS to analyze every mile of pavement. The APCS shows the downward pictures of the pavement cracking, (see above picture) the roadway photo log type pictures, and the square area or quantity of each pavement distress. This new technology will help predict the future condition and identify the necessary pavement preservation treatments. As the annual APCS is collected, better pavement performance prediction models will be implemented using climate data, traffic conditions and pavement types. PaveM will answer questions such as "Where should projects be built to achieve the best pavement performance levels?" or, "When should pavement preservation treatments be focused on priority routes to protect existing pavement investments?” In addition, APCS will increase worker safety, collect the data much faster.

PaveM targets future repairs that provide the best value for the least amount of money. PaveM makes decisions based on a project optimization tool that uses pavement condition, pavement type, climate, and project history to find the right repair treatment at the right time. First, every road condition is assigned the right treatment based on the decision trees for repairs. Then each repair is compared to each other and assigned a benefit. The benefits are put into

priority order based on available funding (financial constraints) and health of the pavement on the SHS (objective).

Next, PaveM uses APCS data to create life expectancy models for each type of pavement using the traffic, weather, and pavement thickness. These life expectancy models are critical to see into the future and predict the remaining life after the right treatment is applied. The life expectancy models can be updated after three cycles of APCS data are collected.

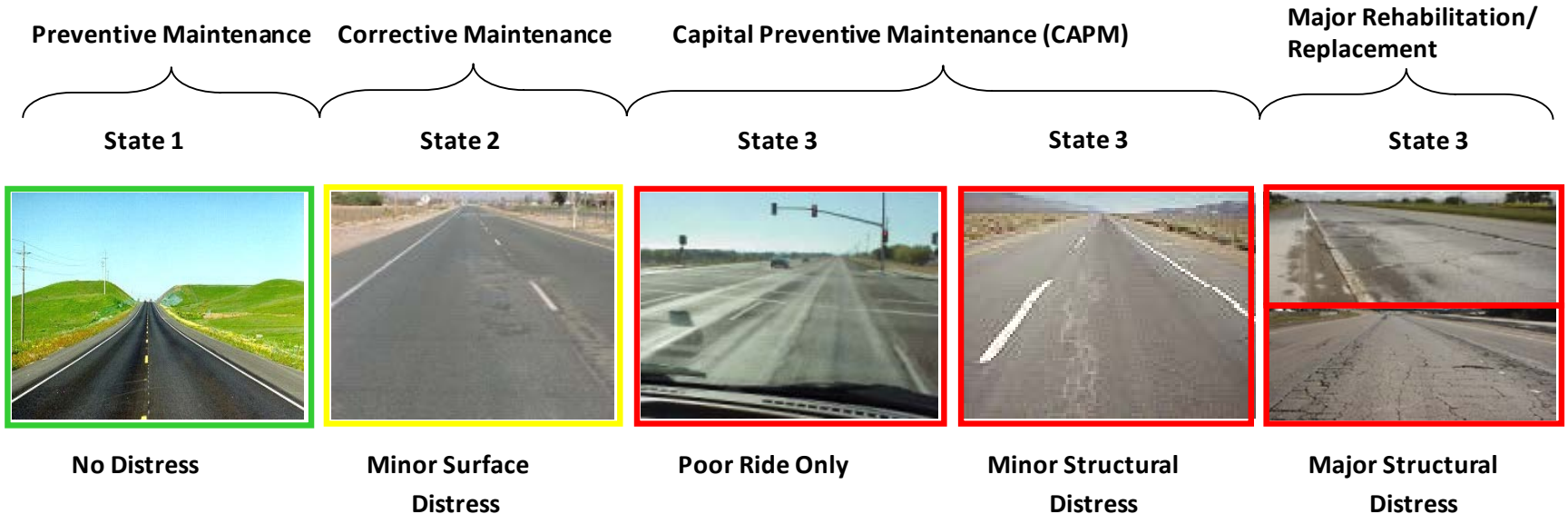
Finally, PaveM has been used to gain insight into the work history of the pavement project locations. The potential projects suggested by the districts were judged for effectiveness based on limits, previous work, road roughness and existing cracking.

To make the APCS data easy to understand, the pavement condition data has been mapped to three pavement condition states. As stated below and shown in Figure 1, the pavement condition states and pictures are color coded green, yellow and red, which correspond to good, fair and poor pavement conditions, respectively.

State 1: Green Pavement in good/excellent condition with no or few potholes or cracks. This pavement requires a preventive maintenance treatment.

State 2: Yellow Pavement is in fair condition with minor surface distress such as minor cracking, slab cracking, raveling and potholes. This pavement requires a corrective maintenance treatment.

State 3: Red Pavement includes major distress (pavement in poor condition with extensive cracks), minor distress (pavement in poor condition with significant cracks), and poor ride only. The repair treatment is a major rehabilitation, reconstruction, lane replacement, or a Capital Preventive Maintenance (CAPM) project.



State 1: Good/excellent condition with few potholes or cracks ⇨ Preventive maintenance project

State 2: Fair condition with minor cracking or slab cracking ⇨ Corrective maintenance project

State 3: Poor condition with significant to extensive cracks or poor ride only ⇨ CAPM , rehabilitation or reconstruction project

Figure 1. Pavement Condition States

The examination of the SHS begins with the green, yellow and red condition states broken down by the lane miles. Table 1 shows the lane miles based on the 2015 pavement condition compared to 2013 PCS and Tables 2 and 3 further break this comparison down by road class. The district breakdown by roadway class comparing the 2013 to 2015 PCS is shown in Appendix 4.

As shown in Table 1, the 2015 PCS identified 41,756 lane miles (84 percent) of California's SHS are in good to fair condition (green and yellow), and 7,889 lane miles (16 percent) are in poor condition (red). Compared to the 2013 PCS, pavement in good condition decreased 10 percent, pavement fair condition increased 24 percent and pavement in poor condition remained about the same.

Table 1. 2015 Pavement Condition (Lane Miles and Percentage)

Survey Year	Green	Yellow	Red	Total*	% Green	% Yellow	% Red
2013	29,534	12,364	7,820	49,720	59	25	16
2015	26,484	15,272	7,889	49,645	53	31	16

Table 2. 2013 Pavement Condition by Road Class

Pavement Condition	Class 1	Class 2	Class 3	Total*	Class 1	Class 2	Class 3
Green	18,385	8,258	2,891	29,534	62%	28%	10%
Yellow	5,081	5,069	2,214	12,364	41%	41%	18%
Red	2,549	3,469	1,803	7,820	33%	44%	23%
Total System Lane Miles*	26,015	16,797	6,907	49,720	52%	34%	14%

Table 3. 2015 Pavement Condition by Road Class

Pavement Condition	Class 1	Class 2	Class 3	Total*	Class 1	Class 2	Class 3
Green	17,036	7,224	2,224	26,484	64%	27%	8%
Yellow	6,347	6,083	2,842	15,272	42%	40%	19%
Red	2,631	3,453	1,805	7,889	33%	44%	23%
Total System Lane Miles*	26,014	16,760	6,871	49,645	52%	34%	14%

*Excludes bridges, ramps, and frontage roads. Totals may not add up due to rounding.

Using the 2013 and 2015 PCS, the health of each Caltrans district can be compared as shown below in Figure 2. Seven districts have improved, however, five have increased distressed lane miles. The most notable improvements in distressed lane mile reduction were made by Districts 3 and 7. Districts 4 and 11 saw the biggest increases in distressed lane miles.

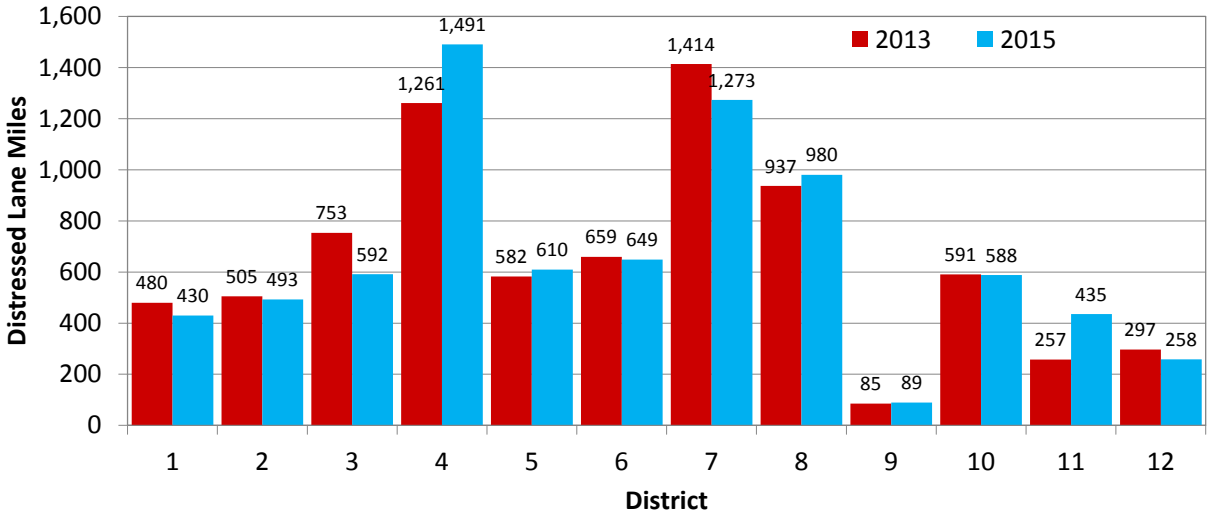


Figure 2. Distressed Lane Miles by District and Survey Year

Further analysis is shown in Appendix 2, which shows the 2013 and 2015 PCS where the districts are compared by green, yellow, and red lane miles. Most districts reduced their lane miles of red pavement; however, all districts increased their yellow lane miles and decreased their green lane miles.

CHAPTER 2 – VEHICLE MILES TRAVELED ON ROUGH/SMOOTH PAVEMENT

The Federal Highway Administration (FHWA) monitors the NHS health using the International Roughness Index (IRI) and Vehicle Miles Travelled (VMT). FHWA simplified the IRI or ride quality into "Good" or "Acceptable" in the 2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance – Report to Congress (FHWA, 2008). To be rated "Good," the IRI is below 95 inches per mile, and to be rated "Acceptable," the IRI is equal to or greater than 95 inches per mile but below or equal to 170 inches per mile.

Due to its multilane freeways, California has some of the highest VMTs in the nation. The percent VMT on rough riding pavement is shown on Figure 3. Annual spending for preventive maintenance has been steady since 2008 and the 2015 NHS routes with smooth ride have increased by about 14 percent since 2005.

For non NHS routes, the percent pavement with rough ride or "Poor" rating (IRI > 170 inches per mile) has decreased every survey since 2007. Interstate freeways have also decreased every year but NHS-non Interstate routes increased with the 2015 survey. This is mostly due to non NHS routes added to the NHS system under the funding and authorization bill MAP-21. The VMT on smooth riding or "Good" pavement is shown on Figure 4. As expected, Figure 6 shows the opposite of the rough pavement chart. This chart shows that the high-tech strategies and innovative treatments from the pavement rehabilitation projects decreased the percentage of IRI above 170 inches per mile, and at the same time improved lower IRI values as well.

In addition, the pavement health for each Caltrans District as measured by IRI is shown in Table 4. This table compares the 2013 to the 2015 PCS and shows lane miles and percentages by "Good," "Acceptable," and "Poor." Appendix 5 shows IRI by NHS routes.

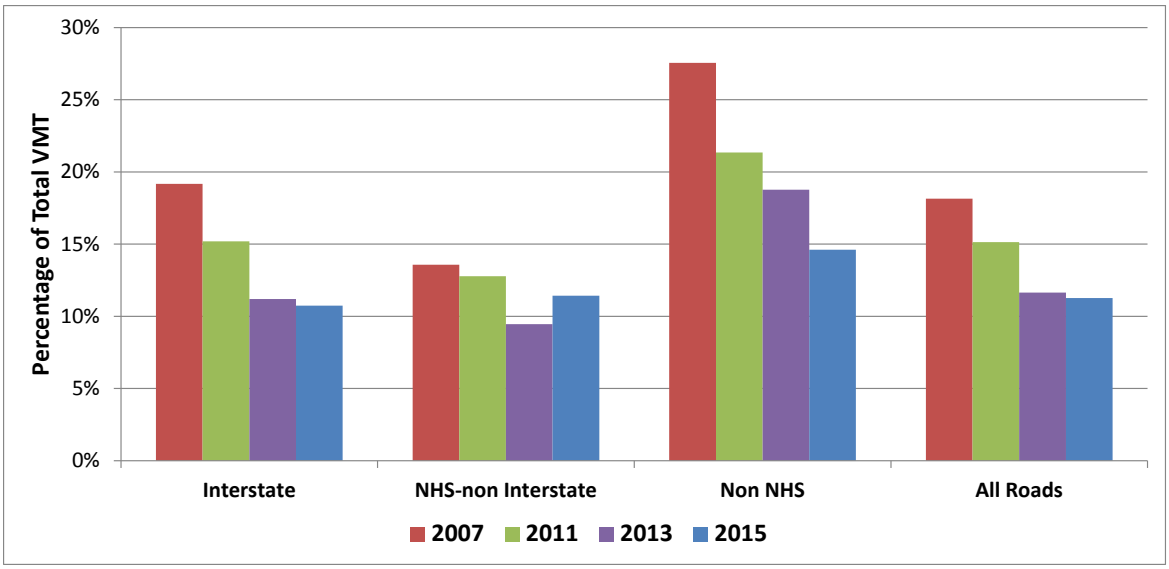


Figure 3. Poor Pavements by Total VMT (IRI > 170 inches per mile)

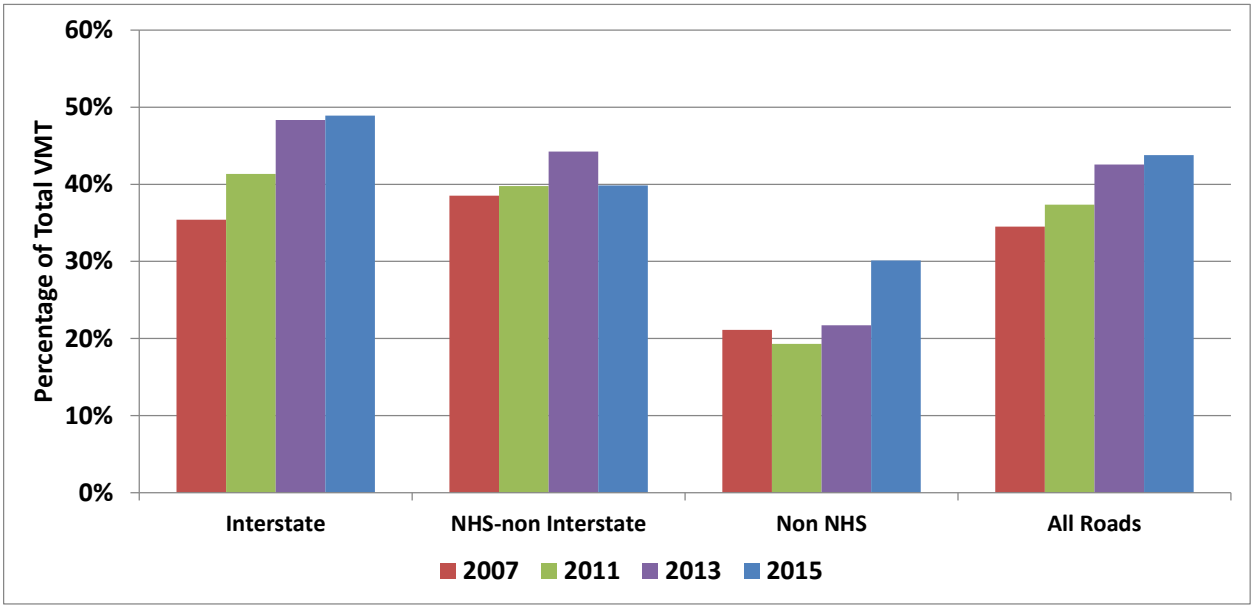


Figure 4. Good Pavements by Total VMT (IRI < 95 inches per mile)

Note: 2015 survey includes 4,000 additional lane miles added to the NHS.

Table 4. IRI Distribution by District

District	2013 PCR Lane Miles							2015 PCR Lane Miles						
	1-94		95-170		>170		TOTAL*	1-94		95-170		>170		TOTAL*
District 1	828	37%	997	44%	422	19%	2,246	821	36%	1,091	48%	341	15%	2,253
District 2	2,078	54%	1,523	39%	269	7%	3,871	2,119	56%	1,452	38%	241	6%	3,812
District 3	2,041	49%	1,657	40%	476	11%	4,174	2,342	55%	1,509	35%	427	10%	4,279
District 4	1,837	33%	2,643	47%	1,124	20%	5,604	1,779	32%	2,518	45%	1,328	24%	5,625
District 5	1,363	45%	1,336	44%	332	11%	3,031	872	40%	1,040	47%	284	13%	2,197
District 6	3,110	56%	2,182	39%	272	5%	5,564	3,148	56%	2,220	39%	256	5%	5,623
District 7	1,665	29%	2,849	50%	1,238	22%	5,753	1,735	30%	2,896	51%	1,081	19%	5,712
District 8	2,795	45%	2,956	47%	528	8%	6,279	2,716	44%	2,932	47%	546	9%	6,194
District 9	1,297	72%	449	25%	66	4%	1,811	1,381	78%	368	21%	28	2%	1,777
District 10	1,519	46%	1,485	45%	310	9%	3,314	1,692	50%	1,388	41%	301	9%	3,381
District 11	1,894	49%	1,844	48%	128	3%	3,866	1,725	45%	1,834	48%	257	7%	3,816
District 12	501	27%	1,069	58%	266	15%	1,835	429	24%	1,164	64%	227	12%	1,820
Total	20,927	44%	20,990	44%	5,432	11%	47,350	20,760	45%	20,412	44%	5,317	11%	46,490

*Excludes locations where IRI was not collected, bridges, and no MSL. Percentage is of district total.

CHAPTER 3 – PRIORITIZING PAVEMENT NEEDS

In order to recommend the right pavement treatment, the Pavement Condition Priority Matrix (Table 5) sets the priority value for each pavement lane mile on the SHS. This priority matrix uses the combination of ride quality or IRI, structural distress and Maintenance Service Level (MSL) to examine the pavement. The MSL describes the functions of the route within the state highway network and the volume of traffic it serves. For maintenance programming purposes, the SHS has been classified as MSL 1, 2, and 3. The definitions of each are described in the glossary.

The next step is to assign a "Priority Number' to show which pavement to show which pavement lane miles are in critical condition and which are in good shape. The choices for ride quality is poor or acceptable, the structural distress is major, minor, or none.

After the ride quality, structural distress and MSL are known, the value of each pavement lane mile is used to identify whether a pavement requires a maintenance, rehabilitation or CAPM treatment. The IRI and the cracking levels provide the "tipping point" where a pavement is in the red condition state as a CAPM project or rehabilitation project. For example, the IRI is categorized as poor ride and the structural distress is:

Major distress: priority number 1, 2, or 11 then rehabilitation is selected.
Minor distress: priority number 3, 4, or 12 then CAPM treatment is selected.
Poor ride only (no other distress): priority number 5 or 6 then CAPM is selected.

Major distress prioritizes the distressed pavement lane miles in critical condition for rehabilitation. They are remedied by treatments requiring extensive repairs that usually improve the pavement's structural condition. Those locations with minor distress are in satisfactory condition for CAPM work and use surface treatments. Pavement with acceptable ride and no distress with priority greater than 14 and less than 98 are addressed by maintenance projects. These lane miles are in basically good shape with minor surface distress, as shown on Figure 1 as the yellow state, and only require preventive and corrective maintenance work.

Table 5. Pavement Condition Priority Matrix

Ride Quality	Structural Distress	MSL 1	MSL 2	MSL 3
		Priority Number	Priority Number	Priority Number
Poor Ride	Major	1	2	11
	Minor	3	4	12
	None	5	6	12
Acceptable Ride	Major	7	8	13
	Minor	9	10	14
	None	31, 32, 33	31, 32, 33	31, 32, 33
	No Distress	98, 99	98, 99	98, 99

For pavements requiring only maintenance work, i.e., priority numbers greater than 14 and less than 98, various treatments are performed. A Major Maintenance Program Treatment Matrix is used to rate this category of pavement. Preventive and corrective maintenance treatments are based on the work group and distresses shown in Table 6.

The pavement is categorized into work groups based on the type of treatment recommended for the distresses observed. The work groups are the basis for the major maintenance budget and the Caltrans Districts target allocation of funds for major maintenance contracts. This process links budget modeling, allocations and pavement ratings together using actual data collected through the PCS.

Table 6. Major Maintenance Program Treatment Matrix

Maintenance Type	Work Group	Distress
Preventive	Premium Seal/Overlay	Low Alligator A, Low Alligator B (on High ADT Routes)
	Cracks – Crack Seal	Alligator A, Misc. Cracks
	Chip Seal/Slurry Seal	Alligator A, Low Alligator B (on Low ADT Routes), Miscellaneous Cracks
Corrective	Overlay	Patching, Alligator A, High Alligator B
	Mill & Resurface	Wheel Rutting, High Alligator A, Bleeding
	Slab Replacement	Slab Cracking
	Mill and Resurface (Shoulder)	Joint Depression, Open Cracks, Alligator A & B

When two pavement segments have identical priority values, determining the site that will receive project development and funding depends on factors such as traffic volume, project costs, and ongoing maintenance expenditures, as well as a detailed pavement condition comparison. The distribution of distressed lane miles is shown in Appendix 3.

CHAPTER 4 – COSTS, EXPENDITURES AND FUNDING

In the last four years, Caltrans delivered $4.0 billion in pavement projects on over 16,000 lane miles. However, these funds may not be available in the future and Caltrans is leveraging funding to do more with less. Table 7 summarizes the State Highway Operations and Protection Program (SHOPP) and maintenance (HM1) projects awarded from FY 2010/11 to FY 2013/14.

Between 2013 and 2015, Caltrans invested an additional $600 million beyond the funding identified in the 2013 Ten-Year SHOPP Plan, which included Proposition 1B and ARRA (Recovery Act) funds. Those funds were directed toward high priority pavement rehabilitation and traffic operations projects to improve the condition and efficiency of the SHS. The additional $600 million will rehabilitate 540 lane-miles of distressed pavement. The additional projects, made possible by the Proposition 1B bid savings and prior transportation fund loan repayment, are currently in design or under construction.

Table 7. Pavement Projects Awarded (Capital Cost Only) from FY 2010/11 to FY 2013/14

Type of Pavement Project	FY 2010/11		FY 2011/12		FY 2012/13		FY 2013/14		Total*	
	Million Dollars	Lane Miles	Million Dollars	Lane Miles	Million Dollars	Lane Miles	Million Dollars	Lane Miles	Million Dollars	Lane Miles
FUNDING										
Maint Total	$332	3,231	$273	2,432	$202	2,051	$188	1,639	$995	9,353
SHOPP										
CAPM	$553	2,323	$375	1,314	$198	546	$203	623	$1,329	4,806
Rehab	$472	833	$783	895	$158	222	$277	310	$1,690	2,260
SHOPP Total	$1,025	3,156	$1,158	2,209	$356	768	$480	933	$3,019	7,066
Maint & SHOPP Total	$1,357	6,387	$1,431	4,641	$558	2,819	$668	2,572	$4,014	16,419

*The dollars do not include support costs.

To predict future pavement distress, Caltrans keeps track of the projects awarded. Figure 5 is a summary of the 2013/14 CAPM and rehabilitation projects, which are in the SHOPP, and maintenance (HM1) projects awarded and lane miles constructed. Sixty-three percent of the total dollar amount was spent on NHS routes. Figure 6 shows the cost using a maintenance strategy for contracts awarded in the 2013/14 FY, whereas Figure 7 shows the cost using both rehabilitation and CAPM strategies for contracts awarded in the 2013/14 FY.

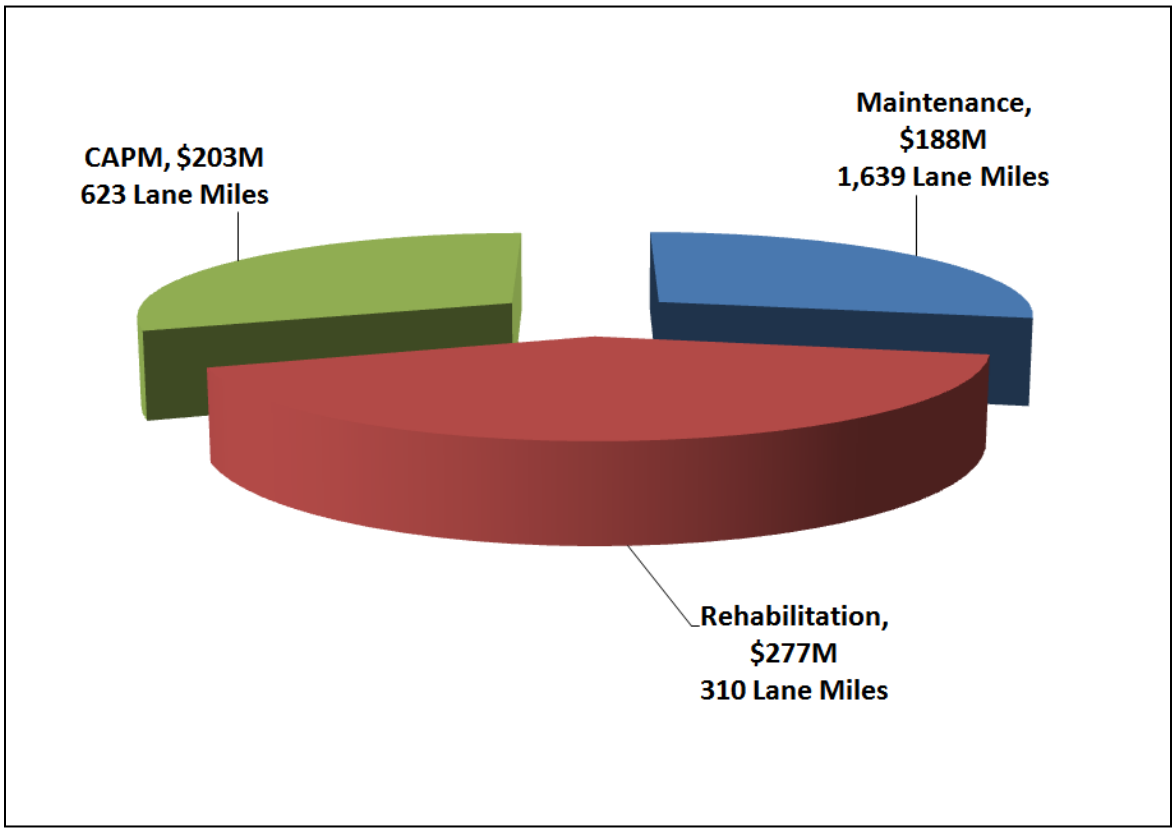


Figure 5. Accomplishments /Contracts Awarded – FY 2013/14

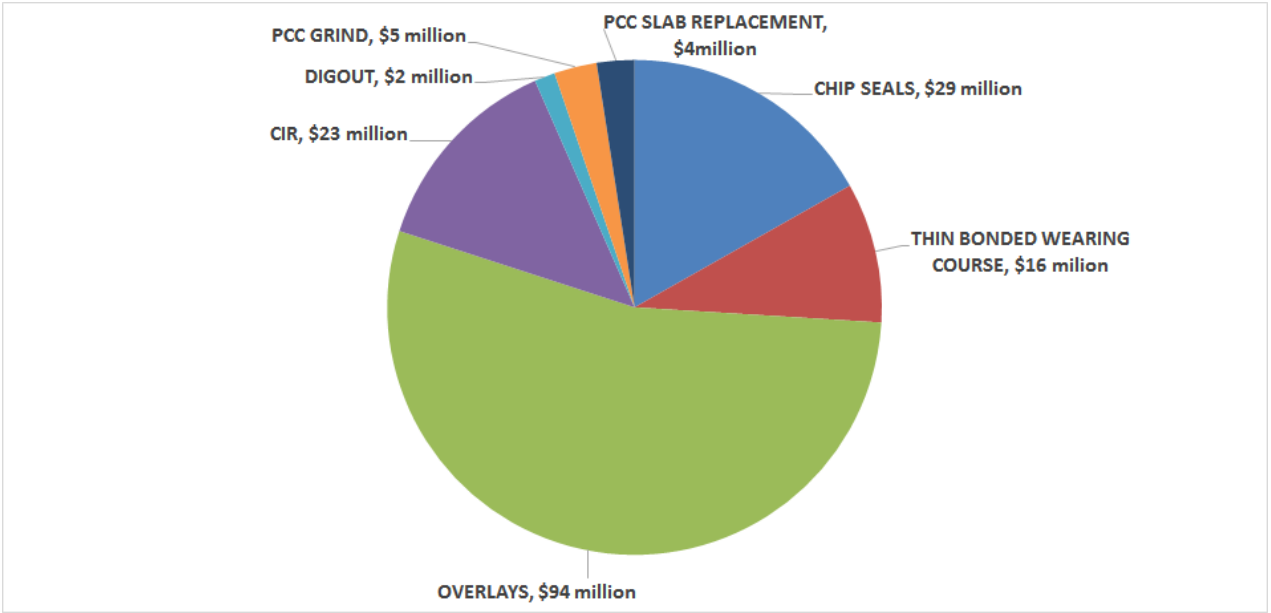


Figure 6. Maintenance (Preventive and Corrective) Projects by Strategy – FY 2013/14

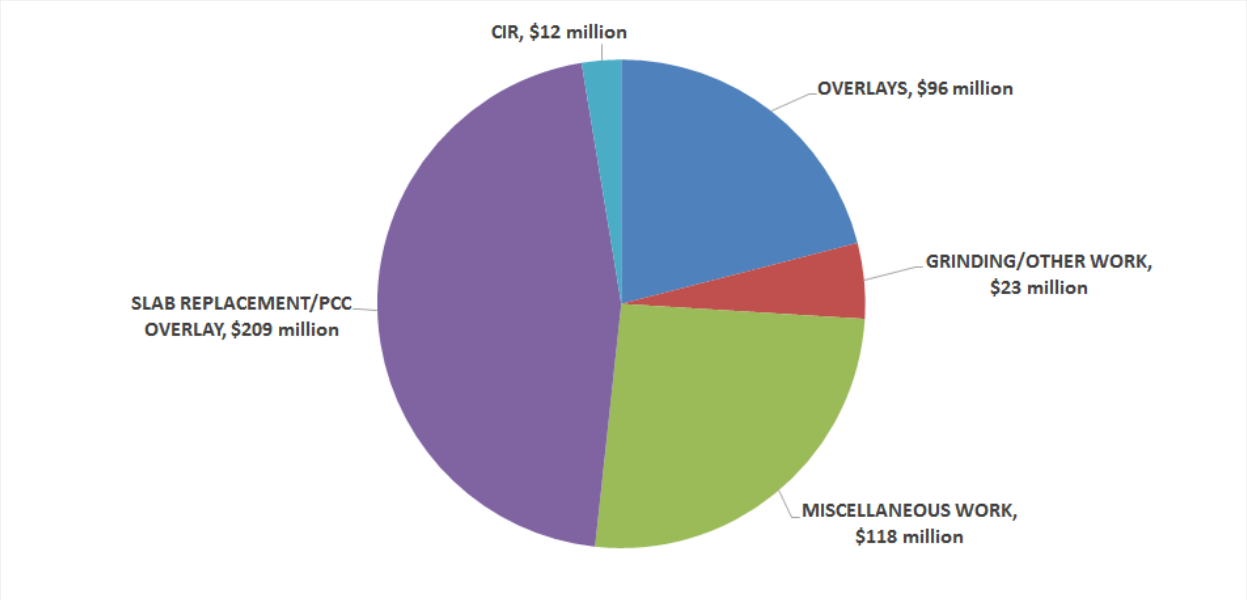


Figure 7. Rehabilitation and CAPM Projects by Strategy – FY 2013/14

There are about 37,000 lane miles of asphalt concrete pavement and 13,000 lane miles of concrete pavement on the SHS. The most widely used asphalt maintenance treatment was overlays at 54 percent. Chip seals accounted for 17 percent of the total maintenance funds. For concrete pavement, grinding and slab replacements accounted for 5 percent of the total funding. Figure 7 shows that the most widely used treatment for Rehabilitation and CAPM projects was slab replacement/PCC overlay which accounted for 46 percent of the total funding available. The next most widely used treatment was miscellaneous work which accounted for 26 percent of the total funding. Overlays accounted for 21 percent of the funding.

CHAPTER 5 – MAINTENANCE AND SHOPP FINANCIAL PLANS

Five-Year Maintenance Plan

Streets and Highways (S&H) Code section 164.6 requires Caltrans to prepare a Five-Year Maintenance Plan to address the maintenance needs of the State Highway System. The long-term goal is to reduce the current backlog of pavement needing preventive/corrective maintenance to 5,000 lane miles or 10 percent of the inventory. The annual pavement maintenance funding is $234 million with a treatment goal of 2,100 lane miles.

Ten-Year SHOPP Plan

Under the S&H Code section 164.6, Caltrans is required to prepare a Ten-Year SHOPP Plan for the rehabilitation and reconstruction of all state highways and set performance measures and goals. This plan is to be updated every two years. The 2015 Ten-Year SHOPP Plan statewide pavement performance goal is to reduce the total distressed lane miles for the system to 5,000 by FY 2024/25.

Due to the reduced deterioration rate, the estimated funding needed between the 2013 and 2015 Ten Year SHOPP plans were reduced from $3.3 billion to $2 billion per year. Each year, the "wear and tear" on the pavement accumulates. As construction projects are completed, the annual distressed lane miles are retired. The difference between the accumulated "wear and tear", and the newly constructed pavement projects is known as the 'deterioration rate." In 2013, the deterioration rate was assumed as 1.5 percent of the system lane miles. Based on PCS history, this deterioration rate was reduce to 0.75 percent.

Beginning in January 2015, the 2015 Ten-Year SHOPP Plan anticipated the pavement needs to be $2.0 billion per year over the next decade. Currently, only $813 million per year is available, i.e., only 41 cents of every dollar is actually available (Figure 8). Without increasing pavement funding and establishing an ongoing stable funding source, the distressed lane miles are predicted to increase from 16 percent today to 17 percent within the next ten years.

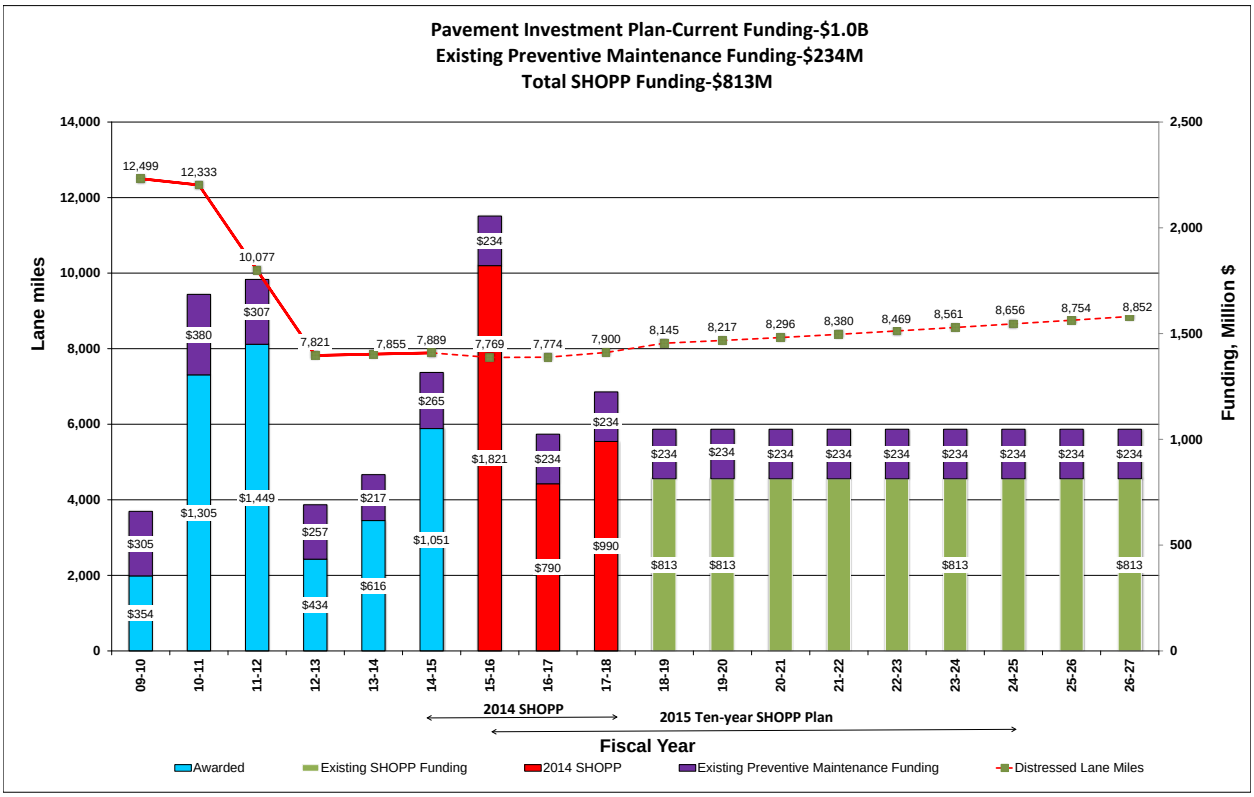


Figure 8. Funding

The blue bars (Fiscal Years 2009-10 to 2014-15) in Figure 8 represent past SHOPP project dollars awarded and the purple bars (top portion of all the columns) represent past and future HM1 dollars awarded. The red bars (Fiscal Years 2015-16 to 2017-18) are 2014 programmed SHOPP dollars and the green bars (Fiscal Years 2018-19 to 2026-27) represent existing 2015 Ten-Year SHOPP Plan fiscally constrained dollars. The red line represents the total number of distressed lane miles, historically and projected, as it relates to existing funding.

CHAPTER 6 – COST EFFECTIVENESS OF PAVEMENT STRATEGIES

By employing aggressive, quick and preventive treatments, Caltrans can avoid more costly treatments in the future. For example, preventive maintenance costs an average of $115,000 per lane mile, while major rehabilitation work is 8 times more expensive. Figure 9 shows that a preservation treatment should be applied before the pavement gets worse and a major rehabilitation or reconstruction project is needed to fix it.

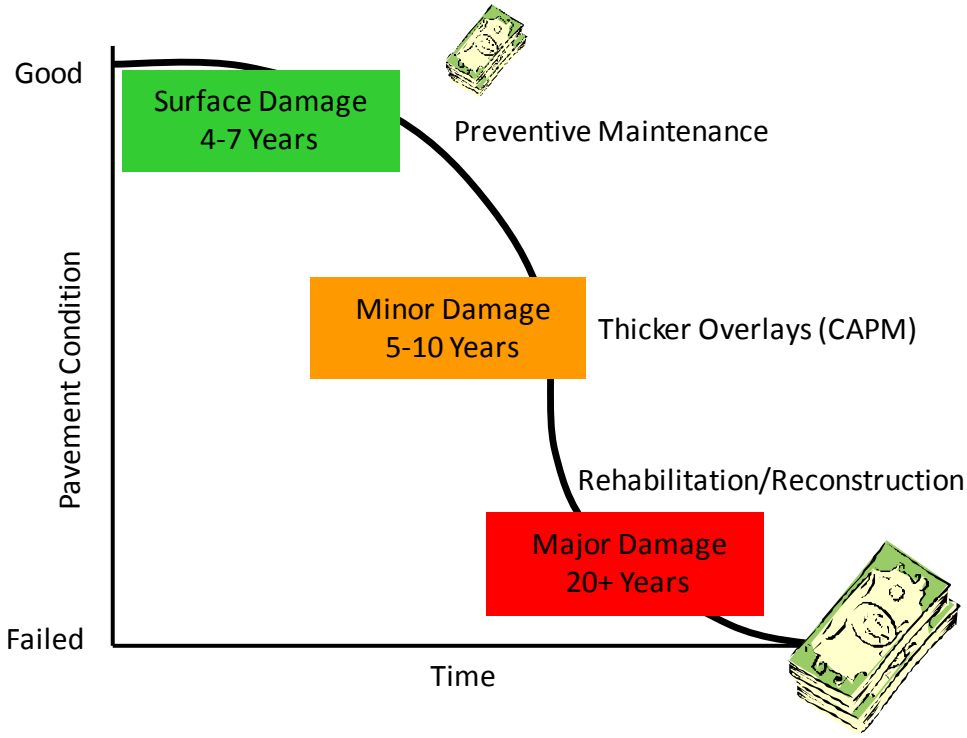


Figure 9. Cost Effectiveness of Pavement Strategies

Preventive maintenance treatments are applied to maintain "good" pavement in a state of good repair. Studies show that applying a preventive maintenance treatment to pavement in good condition extends the service life and minimizes the need for more costly pavement rehabilitation strategies. These preventive maintenance treatments can extend a pavement's service life four to seven years depending on the traffic volumes and environmental conditions. Awarded HM1 projects averaged $115,000 per lane mile in FY 2013/14.

CAPM projects can successfully restore pavement to an excellent condition and provide a service life of five to ten years. A CAPM strategy (pavement grinding, isolated slab replacements, or asphalt concrete overlays greater than 1.5 inches, but less than 2.5 inches) is typically performed on pavement with minor distress. Awarded CAPM projects averaged $326,000 per lane mile in FY 2013/14.

Pavement rehabilitation and reconstruction are the most expensive type of pavement project. They remove and replace the pavement structure rather than just the pavement surface. A roadway that is rehabilitated should provide twenty years or more of service life with relatively low maintenance expenditures. The costs for rehabilitation projects, including the upgrade of related facilities, awarded in FY 2013/14 averaged $894,000 per lane mile Table 8 summarizes the various treatments and Appendices 6 and 7 shows various contracted maintenance and rehabilitation treatments for the past five years.

Table 8. Average cost per lane mile for different pavement projects-2013-14

Strategy	Cost per Mile	Expected Service Life
Preventive Maintenance	$115,000	4-7 years
CAPM	$326,000	5-10 years
Rehabilitation	$894,000	20+ years

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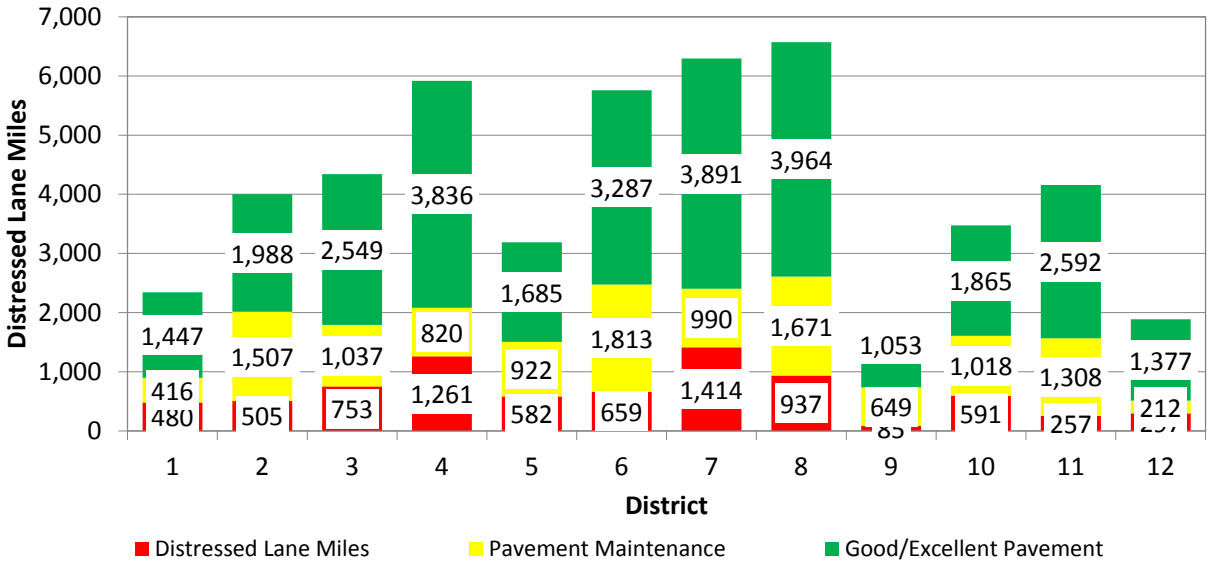
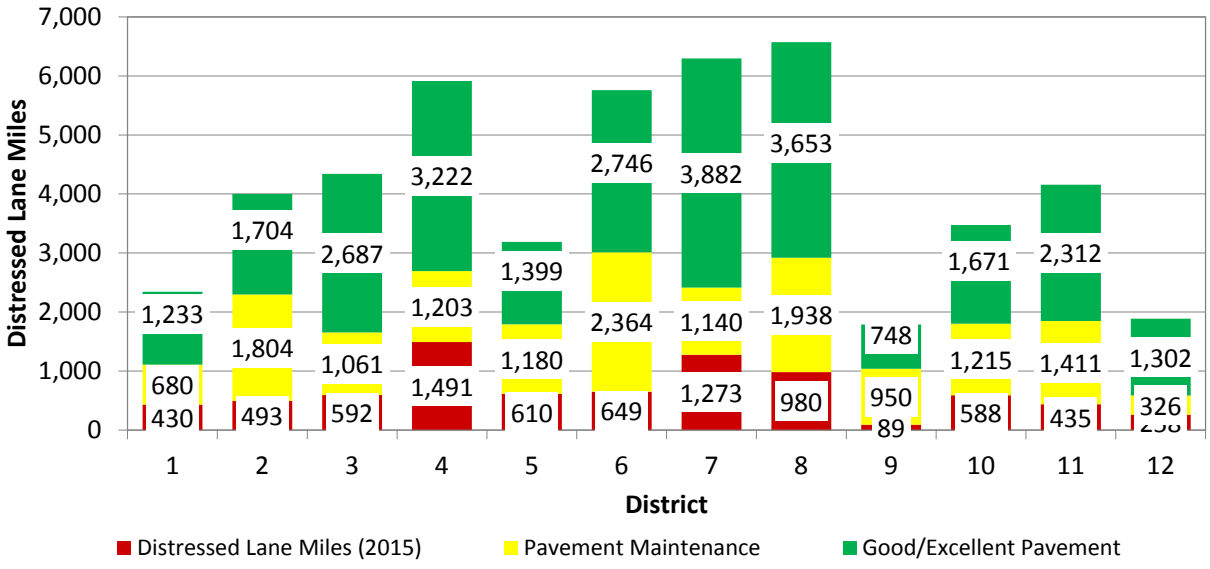
APPENDIX

Appendix 1 – Map of Caltrans Districts

Appendix 2 – Pavement Condition by District (2013 and 2015)



2013



2015

Appendix 3 – Centerline Miles, Lane Miles and Distressed Lane Miles in 2015

PRIORITY	Distressed Lane Miles	
Major Structural Distress	2,422	4.9%
Minor Structural Distress	2,841	6.0%
Poor Ride Quality Only	2,626	5.3%
No Distress/Minor Surface Damage	41,756	84%
TOTAL	49,645	100%

	Centerline Miles		Lane		Distressed Lane			Major Structural Distress		Minor Structural Distress		Poor Ride Quality	
MSL	Miles	Percent	Miles	Percent	Miles	Percent (Total Distressed LM)	Percent (Category Lane Miles)	Miles	Percent (Category Lane Miles)	Miles	Percent (Category Lane Miles)	Miles	Percent (Category Lane Miles)
1	5,966	40%	28,052	57%	2,999	38%	11%	1,044	4%	856	3%	1,099	4%
2	5,293	36%	14,084	28%	3,017	38%	21%	832	6%	658	5%	1,527	11%
3	3,547	24%	7,225	15%	1,873	24%	26%	546	8%	1,327	18%	0	0%
	14,806	100%	49,360	99%	7,889	100%	16%	2,422	5%	2,841	6%	2,626	5%
DISTRICT													
1	925	6%	2,341	5%	430	5%	18%	78	3%	209	9%	144	6%
2	1,719	12%	4,001	8%	493	6%	12%	216	5%	249	6%	28	1%
3	1,454	10%	4,339	9%	592	8%	14%	182	4%	261	6%	148	3%
4	1,346	9%	5,915	12%	1,491	19%	25%	233	4%	436	7%	821	14%
5	1,148	8%	3,189	6%	610	8%	19%	257	8%	260	8%	93	3%
6	2,012	14%	5,729	12%	649	8%	11%	294	5%	277	5%	78	1%
7	1,078	7%	6,257	13%	1,273	16%	20%	287	5%	399	6%	587	9%
8	1,848	12%	6,570	13%	980	12%	15%	416	6%	301	5%	264	4%
9	739	5%	1,787	4%	89	1%	5%	33	2%	56	3%	0	0%
10	1,307	9%	3,474	7%	588	7%	17%	286	8%	203	6%	99	3%
11	1,019	7%	4,158	8%	435	6%	10%	126	3%	144	3%	166	4%
12	268	2%	1,885	4%	258	3%	14%	14	1%	47	2%	197	10%
TOTAL	14,863	100%	49,645	100%	7,889	100%	16%	2,422	5%	2,841	6%	2,626	5%
ROAD TYPE													
Multi-Lane Divided	5,685	38%	30,731	62%	4,020	51%	13%	1,174	4%	1,042	3%	1,804	6%
Multi-Lane Undivided	396	3%	1,350	3%	237	3%	18%	89	7%	79	6%	68	5%
Two-Lane	8,782	59%	17,563	35%	3,632	46%	21%	1,158	7%	1,720	10%	754	4%
TOTAL	14,863	100%	49,645	100%	7,889	100%	51%	2,422	5%	2,841	6%	2,626	5%
CITY													
City	3,112	21%	17,850	36%	2,885	37%	16%	601	3%	776	4%	1,508	8%
Non-city	11,751	79%	31,795	64%	5,004	63%	16%	1,821	6%	2,065	6%	1,118	4%
TOTAL	14,863	100%	49,645	100%	7,889	100%	16%	2,422	5%	2,841	6%	2,626	5%
NATIONAL HIGHWAY SYSTEM													
NHS Interstate	2,372	16%	14,407	29%	1,490	19%	10%	473	3%	516	4%	705	5%
NHS non-Interstate	5,952	40%	21,684	44%	3,273	41%	15%	1,024	5%	776	4%	1,342	6%
Non-NHS roads	6,539	44%	13,554	27%	3,126	40%	23%	926	7%	1,550	11%	579	4%
TOTAL	14,863	100%	49,645	100%	7,889	100%	16%	2,422	5%	2,841	6%	2,626	5%
INTERMODAL CORRIDORS OF ECONOMIC SIGNIFICANCE (ICES)													
ICES	3,353	23%	18,376	37%	2,038	26%	11%	635	3%	620	3%	783	4%
Non-ICES roads	11,509	77%	31,269	63%	5,851	74%	19%	1,787	6%	2,221	7%	1,843	6%
TOTAL	14,863	100%	49,645	100%	7,889	100%	16%	2,422	5%	2,841	6%	2,626	5%
PAVEMENT TYPE													
Flexible	13,027	88%	36,947	74%	5,827	74%	16%	1,723	5%	2,184	6%	1,920	5%
Rigid	1,835	12%	12,698	26%	2,063	26%	16%	699	6%	657	5%	706	6%
TOTAL	14,863	100%	49,645	100%	7,889	100%	16%	2,422	5%	2,841	6%	2,626	5%

Distress	Priority Numbers
Major Structural Distress	1, 2, 7, 8, 11, 13
Minor Structural Distress	3, 4, 9, 10, 12, 14
Poor Ride Quality	5, 6

(Excludes bridges, ramps and frontage roads)

Lane miles are rounded to whole numbers.

Total lane miles for rigid and flexible pavement are estimated from pavement survey.

Appendix 4 – Distribution of Lane Miles by Roadway Class in 2013 and 2015

2013 PCR Lane Miles	Major Distress			Minor Distress			Poor Ride Only			Distressed LM			Maintenance			Good/Excellent			Total Lane Miles			% Total Distressed Lane Miles		
	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
District 1	9	24	43	11	21	180	20	132	41	40	176	264	207	109	99	815	447	185	1,063	732	548	2%	5%	15%
District 2	23	116	108	6	37	165	16	25	8	45	178	281	239	785	483	650	922	416	934	1,886	1,181	2%	5%	16%
District 3	65	158	85	21	116	152	39	93	24	126	367	261	334	493	210	1,332	989	228	1,792	1,848	699	5%	11%	14%
District 4	112	75	31	129	128	75	134	528	49	375	731	155	421	346	53	2,675	1,001	160	3,470	2,078	369	15%	21%	9%
District 5	61	69	87	18	98	152	5	74	18	84	241	257	278	401	242	807	731	147	1,170	1,374	646	3%	7%	14%
District 6	122	98	109	50	90	107	35	39	11	207	226	226	756	586	471	1,696	851	740	2,659	1,664	1,437	8%	7%	13%
District 7	273	136	5	273	100	30	301	241	55	847	477	90	621	334	35	2,956	813	122	4,424	1,624	247	33%	14%	5%
District 8	191	179	15	149	129	41	110	121	1	450	429	58	746	771	154	3,017	747	200	4,213	1,947	411	18%	12%	3%
District 9	1	5	1	1	23	54	0	0	0	2	28	55	258	207	184	616	264	173	876	499	411	0%	1%	3%
District 10	46	175	80	28	125	38	36	56	7	110	356	125	332	550	137	861	684	319	1,303	1,589	581	4%	10%	7%
District 11	43	43	8	27	49	11	16	50	11	85	142	30	726	437	145	1,930	462	200	2,741	1,041	375	3%	4%	2%
District 12	14	27	0	45	24		120	68	0	179	118	0	162	49	1	1,029	347	1	1,370	515	1	7%	3%	0%
Statewide	959	1,103	573	757	939	1,006	833	1,427	224	2,549	3,470	1,803	5,081	5,069	2,214	18,385	8,258	2,891	26,015	16,797	6,907	100%	100%	100%

2015 PCR Lane Miles	Major Distress			Minor Distress			Poor Ride Only			Distressed LM			Maintenance			Good/Excellent			Total Lane Miles			% Total Distressed Lane Miles		
	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
District 1	24	18	35	15	17	177	25	99	19	64	135	231	368	153	159	631	445	156	1,063	732	546	2%	4%	13%
District 2	20	89	107	8	73	169	3	18	7	31	180	282	303	938	563	600	768	336	934	1,886	1,181	1%	5%	16%
District 3	21	82	79	32	70	160	20	105	23	73	257	262	293	501	267	1,426	1,090	170	1,792	1,848	699	3%	7%	15%
District 4	86	123	25	166	169	101	241	530	51	493	822	176	580	531	92	2,398	725	98	3,470	2,078	366	19%	24%	10%
District 5	73	102	82	27	88	144	4	70	19	104	260	245	339	561	280	726	553	121	1,170	1,374	646	4%	8%	14%
District 6	127	62	105	39	109	129	27	36	15	193	207	249	1,035	692	637	1,431	764	522	2,659	1,664	1,407	7%	6%	14%
District 7	169	106	12	212	158	30	311	215	61	692	478	103	674	385	81	3,058	723	63	4,424	1,586	247	26%	14%	6%
District 8	243	155	17	132	128	42	141	121	2	516	403	62	979	825	134	2,718	719	216	4,212	1,947	411	20%	12%	3%
District 9	8	21	4	13	23	20	0	0	0	21	45	24	425	305	220	430	150	168	876	499	411	1%	1%	1%
District 10	58	177	51	27	121	55	27	64	8	111	363	115	405	614	195	787	613	272	1,303	1,589	581	4%	10%	6%
District 11	54	54	18	47	76	21	100	50	16	201	180	54	714	483	213	1,827	378	108	2,741	1,041	375	8%	5%	3%
District 12	6	8	0	28	18	0	98	100	0	132	126	0	232	94	0	1,006	295	0	1,370	515	0	5%	4%	0%
Statewide	890	997	535	745	1,051	1,045	997	1,407	222	2,631	3,456	1,803	6,347	6,083	2,841	17,035	7,221	2,228	26,014	16,760	6,871	100%	100%	100%

Appendix 5 – 2013 and 2015 IRI Distribution by National Highway System

2013 PCR-Lane Miles	TOTAL															
	NHS-Interstate				NHS-non Interstate				Non-NHS				Total			
	1-94	95-170	>170	TOTAL	1-94	95-170	>170	TOTAL	1-94	95-170	>170	TOTAL	1-94	95-170	>170	TOTAL
District 1	0	0	0	0	754	478	30	1,262	74	519	391	984	828	997	422	2,246
District 2	526	137	15	678	900	416	27	1,343	652	971	228	1,850	2,078	1,523	269	3,871
District 3	836	314	76	1,225	771	319	56	1,146	434	1,024	344	1,803	2,041	1,657	476	4,174
District 4	801	725	181	1,707	868	941	149	1,957	168	977	795	1,939	1,837	2,643	1,124	5,604
District 5	0	0	0	0	976	352	21	1,350	386	984	311	1,682	1,363	1,336	332	3,031
District 6	540	175	44	758	1,675	920	69	2,664	895	1,087	160	2,142	3,110	2,182	272	5,564
District 7	735	957	565	2,256	875	1,226	275	2,376	56	667	398	1,120	1,665	2,849	1,238	5,753
District 8	1,761	1,134	147	3,043	476	773	154	1,402	558	1,049	227	1,834	2,795	2,956	528	6,279
District 9	0	0	0	0	912	39	0	951	385	410	66	861	1,297	449	66	1,811
District 10	499	85	25	609	544	633	159	1,335	476	767	127	1,370	1,519	1,485	310	3,314
District 11	1,346	582	13	1,942	221	373	26	621	326	888	89	1,304	1,894	1,844	128	3,866
District 12	274	359	47	680	143	305	96	544	84	404	123	611	501	1,069	266	1,835
Total	7,318	4,468	1,113	12,900	9,115	6,775	1,061	16,950	4,493	9,747	3,258	17,499	20,927	20,990	5,432	47,349

2015 PCR-Lane Miles	TOTAL															
	NHS-Interstate				NHS-non Interstate				Non-NHS				Total			
	1-94	95-170	>170	TOTAL	1-94	95-170	>170	TOTAL	1-94	95-170	>170	TOTAL	1-94	95-170	>170	TOTAL
District 1	0	0	0	0	713	508	38	1,259	108	583	303	994	821	1,091	341	2,253
District 2	643	43	0	686	881	472	36	1,389	595	936	205	1,737	2,119	1,452	241	3,812
District 3	939	295	52	1,285	1,108	467	71	1,646	295	748	304	1,347	2,342	1,509	427	4,279
District 4	914	819	309	2,042	791	1,299	643	2,733	74	400	376	850	1,779	2,518	1,328	5,625
District 5	0	0	0	0	721	417	52	1,191	152	623	232	1,006	872	1,040	284	2,197
District 6	552	187	26	765	1,752	1,221	86	3,059	844	812	144	1,800	3,148	2,220	256	5,623
District 7	861	1,045	487	2,392	858	1,590	464	2,913	16	261	130	408	1,735	2,896	1,081	5,712
District 8	1,903	1,221	182	3,306	364	892	219	1,475	449	818	146	1,413	2,716	2,932	546	6,194
District 9	0	0	0	0	894	34	0	928	487	334	28	849	1,381	368	28	1,777
District 10	500	89	23	612	639	667	150	1,455	553	632	128	1,313	1,692	1,388	301	3,381
District 11	1,203	597	112	1,912	346	606	68	1,020	176	631	76	884	1,725	1,834	257	3,816
District 12	242	420	44	707	185	715	180	1,081	2	28	3	33	429	1,164	227	1,820
Total	7,756	4,716	1,235	13,706	9,252	8,890	2,008	20,149	3,752	6,807	2,074	12,633	20,760	20,412	5,317	46,489

*Excludes locations where IRI was not collected, bridges and no MSL.

Appendix 6 – Distressed Lane Miles by Priority Group

	2005			2007			2011			2013			2015		
District	Major Structural Distress	Minor Structural Distress	Poor Ride Quality	Major Structural Distress	Minor Structural Distress	Poor Ride Quality	Major Structural Distress	Minor Structural Distress	Poor Ride Quality	Major Structural Distress	Minor Structural Distress	Poor Ride Quality*	Major Structural Distress	Minor Structural Distress	Poor Ride Quality*
1	464	43	4	251	127	51	152	312	203	75	212	193	78	209	144
2	932	51	0	840	126	1	699	359	36	248	208	49	216	249	28
3	1,333	120	36	1,026	311	12	623	455	113	308	289	155	182	261	148
4	1,468	323	96	735	499	359	506	492	712	218	332	711	233	436	821
5	747	110	20	621	229	84	433	326	88	217	268	97	257	260	93
6	1,199	159	3	1,018	412	21	722	392	44	328	247	85	294	277	78
7	1,627	526	65	768	812	157	706	721	740	414	403	597	287	399	587
8	2,021	158	10	1,511	498	145	860	455	231	385	319	233	416	301	264
9	180	60	0	104	46	3	45	86	1	7	78	0	33	56	0
10	1,128	99	0	888	270	49	643	281	52	302	191	98	286	203	99
11	296	253	6	250	353	49	129	235	130	93	87	77	126	144	166
12	124	175	8	92	232	50	76	141	136	40	69	188	14	47	197
Totals	11,518	2,078	249	8,102	3,914	981	5,594	4,253	2,486	2,635	2,702	2,483	2,422	2,841	2,626

District Lane Miles by Pavement Condition Survey Year

	2005			2007			2011			2013			2015		
District	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System
1	2,330	511	22%	2,330	429	18%	2,345	667	28%	2,343	480	20%	2,341	430	18%
2	3,995	983	25%	3,995	967	24%	3,995	1,094	27%	4,001	505	13%	4,001	493	12%
3	4,307	1,489	35%	4,309	1,349	31%	4,314	1,190	28%	4,339	753	17%	4,339	592	14%
4	5,976	1,887	32%	5,950	1,594	27%	5,949	1,710	29%	5,917	1,261	21%	5,915	1,491	25%
5	3,187	877	28%	3,168	934	29%	3,174	847	27%	3,189	582	18%	3,189	610	19%
6	5,718	1,361	24%	5,755	1,451	25%	5,770	1,157	20%	5,759	659	11%	5,729	649	11%
7	6,269	2,219	35%	6,267	1,737	28%	6,274	2,167	35%	6,295	1,414	22%	6,257	1,273	20%
8	6,641	2,189	33%	6,568	2,153	33%	6,593	1,546	23%	6,571	937	14%	6,570	980	15%
9	1,777	240	14%	1,777	153	9%	1,777	132	7%	1,787	85	5%	1,787	89	5%
10	3,472	1,226	35%	3,466	1,206	35%	3,465	976	28%	3,474	591	17%	3,474	588	17%
11	3,937	556	14%	3,989	651	16%	3,972	494	12%	4,158	257	6%	4,158	435	10%
12	1,950	307	16%	1,903	374	20%	1,889	353	19%	1,886	297	16%	1,885	258	14%
Totals	49,561	13,845	28%	49,477	12,998	26%	49,518	12,333	25%	49,720	7,821	16%	49,645	7,889	16%

Statewide Pavement Needs by Survey Year and Priority Group

	2005			2007			2011			2013			2015		
Priority	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System
Major	11,518	83%	23%	8,102	62%	16%	5,594	45%	11%	2,635	34%	5%	2,422	31%	5%
Minor	2,078	15%	4%	3,914	30%	8%	4,253	34%	9%	2,702	35%	5%	2,841	36%	6%
Poor Ride	249	2%	1%	981	8%	2%	2,486	20%	5%	2,483	32%	5%	2,626	33%	5%
Total	13,845	100%	28%	12,998	100%	26%	12,333	100%	25%	7,821	100%	16%	7,889	100%	16%

Distress	Priority Numbers		Priority Numbers
Major Structural Distress	1, 2, 7, 8, 11, 13		1, 2, 7, 8, 11, 13
Poor Ride Qualilty	5, 6		5, 6

Lane miles are rounded to whole numbers.

Poor ride quality for 2007 is based on an IRI greater than 223 for asphalt pavement and 212 for concrete pavement.

Poor ride quality after 2007 is based on an IRI greater than 170.

Appendix 7 – Maintenance Cost and Usage (2011-2014)

Maintenance, Contracted	Average	10/11	11/12	12/13	13/14
Cost per Lane Mile, by Fiscal Year					
CHIP SEAL (AR)	$ 66,405	$ 54,220	$ 70,773	$ 54,184	$ 86,444
CHIP SEAL (PME)	$ 33,071	$ 32,538	$ 34,302	$ 26,052	$ 39,392
CHIP SEAL (PMA/PBA)	$ 60,749	N/A	N/A	N/A	$ 60,749
SLURRY SEAL	$ 33,958	$ 29,561	$ 32,960	$ 39,354	N/A
MICROSURFACING	$ 59,476	$ 46,458	$ 46,038	$ 89,858	$ 55,552
THIN BONDED WEARING COURSE	$ 112,140	$ 119,512	$ 132,700	$ 105,858	$ 90,489
HMA OVERLAY	$ 116,114	$ 106,680	$ 119,010	$ 93,134	$ 145,631
HMA OVERLAY-OPEN GRADED	$ 106,501	$ 120,154	$ 63,696	$ 135,653	N/A
RHMA OVERLAY	$ 108,106	$ 94,615	$ 122,365	$ 106,177	$ 109,266
RHMA OVERLAY-OPEN GRADED	$ 100,962	$ 113,821	$ 108,593	N/A	$ 80,472
MILL AND REPLACE WITH HMA OVERLAY	$ 132,351	$ 119,840	$ 147,527	$ 101,759	$ 160,277
MILL AND REPLACE WITH HMA OVERLAY-OPEN GRADED	$ 124,987	$ 132,502	$ 117,471	N/A	N/A
MILL AND REPLACE WITH RHMA OVERLAY	$ 111,228	$ 116,153	$ 105,363	$ 118,986	$ 104,412
MILL AND REPLACE WITH RHMA OVERLAY-OPEN GRADED	$ 79,350	$ 70,048	$ 88,652	N/A	N/A
IN-PLACE RECYCLING	$ 178,468	$ 169,084	$ 146,123	$ 190,255	$ 208,412
DIGOUT	$ 723,143	$ 2,143,571	$ 237,920	$ 216,232	$ 294,850
PCC GRIND	$ 86,162	$ 103,019	$ 91,645	$ 74,079	$ 75,903
PCC SLAB REPLACEMENT	$ 1,675,847	$ 1,696,386	$ 2,004,160	$ 1,242,636	$ 1,760,205
Lane Miles Treated, by Fiscal Year					
CHIP SEAL (AR)	201	104	274	196	232
CHIP SEAL (PME)	150	176	130	146	149
CHIP SEAL (PMA/PBA)	41	N/A	N/A	N/A	41
SLURRY SEAL	119	168	95	94	NA
MICROSURFACING	52	79	73	38	17
THIN BONDED WEARING COURSE	257	284	316	252	177
HMA OVERLAY	277	285	372	315	136
HMA OVERLAY-OPEN GRADED	72	107	51	58	NA
RHMA OVERLAY	453	624	375	449	363
RHMA OVERLAY-OPEN GRADED	59	104	54	N/A	18
MILL AND REPLACE WITH HMA OVERLAY	86	154	127	22	39
MILL AND REPLACE WITH HMA OVERLAY-OPEN GRADED	77	103	51	N/A	N/A
MILL AND REPLACE WITH RHMA OVERLAY	254	287	279	192	260
MILL AND REPLACE WITH RHMA OVERLAY-OPEN GRADED	35	42	27	N/A	N/A
IN-PLACE RECYCLING	123	175	58	145	112
DIGOUT	8	2	18	6	8
PCC GRIND	212	528	133	121	64
PCC SLAB REPLACEMENT	3	3	6	1	2
TOTAL-MAINT LANE MILES TREATED	2,330	3,225	2,440	2,037	1,620
TOTAL-OTHER MAINT LANE MILES	24	6	9	15	65
TOTAL-ALL MAINT LANE MILES	2,354	3,231	2,449	2,051	1,684

N/A - Not available or strategy not utilized

HMA-Hot Mixed Asphalt

RHMA-Rubberized Hot Mixed Asphalt

Appendix 8 – Rehabilitation Cost and Usage (2011-2014)

Rehabilitation, Contracted	Average	10/11	11/12	12/13	13/14
Cost per Lane Mile, by Fiscal Year					
HMA OVERLAY, CAPM	$ 260,087	$ 244,347	$ 264,898	$ 283,938	$ 247,164
RHMA OVERLAY, CAPM	$ 314,859	$ 218,013	$ 251,577	$ 426,477	$ 363,370
MILL AND REPLACE WITH HMA OVERLAY, CAPM	$ 251,602	$ 210,274	$ 263,271	$ 295,111	$ 237,751
MILL AND REPLACE WITH RHMA OVERLAY, CAPM	$ 264,128	$ 229,981	$ 232,908	N/A	$ 329,495
1. GRINDING/OTHER WORK, CAPM	$ 261,766	$ 245,163	$ 216,900	N/A	$ 323,234
2. MISCELLANEOUS WORK, CAPM	$ 759,745	$ 266,166	N/A	$ 1,530,333	$ 482,735
PCC OVERLAY/SLAB REPLACEMENT, CAPM	$ 668,521	N/A	$ 968,997	$ 663,129	$ 373,436
IN-PLACE RECYCLING, CAPM	$ 245,557	$ 271,904	$ 205,333	N/A	$ 259,435
3 HMA OVERLAY, REHAB	$ 591,772	$ 505,423	$ 547,840	N/A	$ 722,053
3 RHMA OVERLAY, REHAB	$ 469,109	$ 505,050	N/A	N/A	$ 433,168
MILL AND REPLACE WITH HMA OVERLAY, REHAB	$ 383,392	$ 288,149	$ 407,742	$ 430,908	$ 406,768
MILL AND REPLACE WITH RHMA OVERLAY, REHAB	$ 206,590	$ 214,181	N/A	$ 199,000	N/A
CRACK, SEAT AND OVERLAY, REHAB	$ 710,474	$ 440,718	$ 980,230	N/A	N/A
GRINDING/OTHER WORK, REHAB	$ 382,435	$ 575,443	$ 189,426	N/A	N/A
2. MISCELLANEOUS WORK, REHAB	$ 1,027,748	$ 1,089,520	$ 1,269,409	$ 515,062	$ 1,237,000
PCC OVERLAY/SLAB REPLACEMENT, REHAB	$ 1,268,165	$ 1,217,415	$ 1,085,448	$ 1,802,969	$ 966,828
IN-PLACE RECYCLING, REHAB	$ 345,287	$ 349,289	$ 341,286	N/A	N/A
Lane Miles Treated, by Fiscal Year					
HMA OVERLAY, CAPM	93	187	39	68	80
RHMA OVERLAY, CAPM	71	177	87	18	5
MILL AND REPLACE WITH HMA OVERLAY, CAPM	294	363	273	398	144
MILL AND REPLACE WITH RHMA OVERLAY, CAPM	175	340	125	N/A	59
1. GRINDING/OTHER WORK, CAPM	581	1,007	665	N/A	71
2. MISCELLANEOUS WORK, CAPM	109	209	N/A	15	102
PCC OVERLAY/SLAB REPLACEMENT, CAPM	86	N/A	95	47	117
IN-PLACE RECYCLING, CAPM	39	41	30	N/A	46
3 HMA OVERLAY, REHAB	130	226	147	N/A	19
3 RHMA OVERLAY, REHAB	26	20	N/A	N/A	32
MILL AND REPLACE WITH HMA OVERLAY, REHAB	67	103	101	31	32
MILL AND REPLACE WITH RHMA OVERLAY, REHAB	81	143	N/A	19	N/A
CRACK, SEAT AND OVERLAY, REHAB	137	39	235	N/A	N/A
GRINDING/OTHER WORK, REHAB	63	113	13	N/A	N/A
2. MISCELLANEOUS WORK, REHAB	89	137	18	145	56
PCC OVERLAY/SLAB REPLACEMENT, REHAB	152	44	367	26	171
IN-PLACE RECYCLING, REHAB	20	25	14	N/A	N/A
Subtotal, CAPM	1,201	2,323	1,314	546	623
Subtotal, REHABILITATION	569	851	895	221	310
TOTAL-CAPM/REHAB LANE MILES TREATED	1,770	3,173	2,208	766	933
TOTAL-OTHER SHOPP LANE MILES	1	0	0	2	0
TOTAL-ALL SHOPP LANE MILES	1,771	3,173	2,208	768	933
TOTAL-ALL CONTRACT LANE MILES	4,125	6,404	4,658	2,819	2,617

N/A - Not available or strategy not utilized
HMA-Hot Mixed Asphalt
RHMA-Rubberized Hot Mixed Asphalt

1. PCC GRIND is the dominate strategy, may also include isolated slab replacement
2. May include HOV lanes, drainage, or digouts
3. May include lane widening

DEFINITIONS/GLOSSARY

AADT (Annual Average Daily Traffic) – Average daily traffic over an entire year, estimated from a traffic sample collected over a one to seven day time period.

Alligator (Fatigue) cracking – Cracks in asphalt that are caused by repeated traffic loadings. The cracks indicate fatigue failure of the asphalt layer. When cracking is characterized by interconnected cracks, the cracking pattern resembles that of an alligator's skin.

Alligator A – A single or two parallel longitudinal cracks in the wheel path; cracks are not spalled or sealed; rutting or pumping is not evident.

Alligator B – An area of interconnected cracks in the wheel path forming a complete pattern; cracks may be slightly spalled; cracks may be sealed; rutting or pumping may exist.

Alligator C – An area of moderately or severely spalled interconnected cracks outside of the wheel path forming a complete pattern; cracks may be sealed.

APCS (Automated Pavement Condition Survey) – A pavement condition survey that consists of high speed collection using state-of the- art image capture equipment and automated collection of road roughness (IRI) using laser mounted sensors for use in analyzing the pavement distress.

BWC (Bonded Wearing Course) – It is also known as a Thin Bonded Wearing Course (Nova Chip). It is a polymer-modified emulsion typically used as a pavement preservation treatment.

CAPM (Capital Preventive Maintenance) – Use of heavy maintenance treatments such as intermediate thickness asphalt blankets (flexible pavements), or grinding the pavement surface (rigid pavements) to provide five to seven years of additional pavement life.

Centerline Mile – A mile of highway, without considering the number of lanes in the facility.

Chip Seal – A surface treatment in which the pavement is sprayed with asphalt (generally emulsified) and then immediately covered with aggregate and rolled with a pneumatic tire roller.

Corrective Maintenance – A planned treatment, intended to temporarily correct a specific pavement distress or delay future need to rehabilitate the pavement.

Crack, Seat, and Overlay – The existing pavement is cracked into small pieces that are rolled (seated) into the existing roadbed and overlaid with asphalt.

CRM (Crumb Rubber Modifier) – "Crumb rubber" means rubber granules derived from a waste

tire that are less than or equal to, one-quarter inch or six millimeters in size.

Faulting – Slabs of Portland Cement Concrete (PCC) that are tilted, causing a drop off of the departure end of one slab onto the leading edge of the next slab.

Five-Year Maintenance Plan – It is required by Streets and Highways Code section 164.6. A five-year plan that addresses the maintenance needs of the State Highway System is prepared each odd-numbered year, concurrent with the rehabilitation plan. The plan identifies only maintenance activities that, if not performed, could result in increased SHOPP costs in the future.

Flexible Pavement – Pavement constructed with asphalt concrete, also known as 'bituminous,' 'flexible'or 'black' pavement.

GPR (Ground Penetrating Radar) – It is a technology that produces an underground cross-sectional image of soils and subsurface features.

Grinding – Removal of irregularities in the surface of a pavement to improve ride quality, typically on rigid pavement.

HA22 (Highway Program Codes 201.120, 201.121 and 201.125) – The highway program(s) that funds long-term corrective strategies such as reconstruction or rehabilitation and capital preventive maintenance of pavements. HA22 program projects are an element of the four-year SHOPP.

HMA (Hot Mixed Asphalt) – Consist of sand, gravel, and a petroleum binder; also called 'bituminous,' 'flexible' or 'black' pavement.

HMA Overlay – Placement of asphalt layers and inner membranes over an existing roadway. Typically, 6 inches of asphalt are added.

HM1 – The highway program which funds Routine and Major Maintenance on the State highway network. HM1 programs are funded from Caltrans' annual operating budget.

ICES (Intermodal Corridors of Economic Significance) – It is California's primary goods movement system. ICES is an interconnected network of freight distribution routes within California that provides direct access among major highways, seaports, airports, rail yards and national and international markets.

IRI (International Roughness Index) – A standardized method of measuring the roughness of the pavement surface developed by the World Bank and expressed in inches per mile or centimeters per kilometer.

Lane Mile – A pavement measuring one mile long and one lane wide. A mile stretch of a two-lane road equals two lane miles. A segment of road one mile long and four lanes wide is four lane miles. This is the unit of measure used to develop the total cost of pavement projects.

Long-life pavement – A pavement intended to last 35 years or more between rehabilitation treatments.

Maintenance – Work either by contract or by State forces that preserves the riding qualities, safety characteristics, functional serviceability and structural integrity of the facilities that comprise the roadways on the State Highway System.

Maintenance Program – The program, within the California Department of Transportation, that is responsible for the preservation and keeping of rights of way, and each type of roadway, structure, safety convenience or device, planting, illumination equipment, and other facilities, in the safe and usable condition to which it has been improved or constructed.

Major Maintenance – Use of various types of surface treatments, such as thin blankets and chips seals, to extend the service life of a pavement, usually by four to seven years. These treatments keep the roadway in a safe, useable condition but do not include structural capacity improvement or reconstruction.

MSL (Maintenance Service Level) – For maintenance programming purposes, the State highway system has been classified as Class 1, 2, and 3 highways based on the MSL descriptive definitions:

> MSL 1 – Contains route segments in urban areas functionally classified as Interstate, Other Freeway/Expressway, or Other Principal Arterial. In rural areas, the MSL 1 designation contains route segments functionally classified as Interstate or Other Principal Arterial.
>
> MSL 2 – Contains route segments classified as an Other Freeway/Expressway or Other Principal Arterial not in MSL 1, and route segments functionally classified as minor arterials not in MSL 3.
>
> MSL 3 – Indicates a route or route segment with the lowest maintenance priority. Typically, MSL 3 contains route segments functionally classified as major or minor collectors and local roads with relatively low traffic volumes. Route segments where route continuity is necessary are also assigned MSL 3 designation.

NHS (National Highway System) – Includes five subsystems of roadways important to the nation's economy, defense, and mobility:

> Interstate – The Eisenhower Interstate System of highways retains its separate identity

within the NHS.

Other Principal Arterials – Highways in rural and urban areas that provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.

OGAC (Open Graded Asphalt Concrete) – It is also known as Open Graded Blanket. It is a surface layer of asphalt approximately 1 inch thick, containing few fine particles between the larger pieces of aggregate. This allows water to enter the voids and drain out through the edges of the pavement, reducing standing water on the pavement, and improving skid resistance in wet weather.

Pavement Preservation – According to the definition of the FHWA Pavement Preservation Expert Task Group, it is "a program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations."

Pavement Rehabilitation – According to the definition of the AASHTO Highway Subcommittee on Maintenance, it is "structural enhancements that extend the service life of an existing pavement and/or improve its load carrying capacity. Rehabilitation techniques include restoration treatments and structural overlays."

PCC (Portland Cement Concrete) Pavement – Pavement constructed with PCC, also known as 'concrete' or 'rigid' pavement.

PCS (Pavement Condition Survey) – A pavement survey of the State Highway System uses both manual sampling techniques for visual distress and automated collection of road roughness (IRI) using laser mounted sensors.

PLOS (Pavement Level of Service) – A needs-based scoring system, using data collected by the PCS to measure the pavement's condition with respect to maintenance target goals/priorities.

PME (Polymer Modified Emulsion) – A binder used in a seal coat or as a tack coat for construction.

Preventive Maintenance – According to the definition of the AASHTO Standing Committee on Highways in 1997, it is "a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity)."

Priority Number – A number assigned to a segment of pavement based on the combination of

ride quality, structural condition, and MSL.

Raveling – Wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of binder through weathering and aging.

RHMA (Rubberized Hot Mixed Asphalt) – Material produced for hot mix applications by mixing asphalt rubber or rubberized asphalt binder with graded aggregate. RHMA may be dense, gap, or open-graded.

Rigid pavement – Pavement constructed with Portland Cement Concrete (PCC), also known as 'concrete' or 'PCC' pavement.

Roadway Classification (Class 1, 2, 3) – For planning purposes, the State highway system has been classified as Class 1, 2, and 3 based on the following definitions:

Class 1 – Contains route segments classified as Interstate and other principal arterials, which are further subdivided as Goods, Truck, and the Strategic Highway Network (STRAHNET).
Class 2 – Contains route segments classified NHS and the Interregional Road System (IRRS).
Class 3 – All other routes not included in Class 1 and 2.

Roadway Preservation – The act of keeping the roadway and appurtenant facilities in the safe and usable condition to which it has been improved or constructed.

Roadway Preservation Program – The program, within the Department, that is responsible for preserving the State highway network.

Roadway Rehabilitation Program – The program, within the Department, that is responsible to rehabilitate roadways that ride rougher than established maximums and/or exhibit substantial structural distress. Work incidental to pavement rehabilitation or replacement of other highway appurtenances that are failing, worn out or functionally obsolete, such as drainage facilities, retaining walls, lighting, signal controllers, and fencing.

Routine Maintenance – According to the definition of the AASHTO Highway Subcommittee on Maintenance, it "consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service."

Rutting – A longitudinal surface depression in the wheel path caused by the consolidation or lateral movement of roadbed material under heavy loads.

Seal coat – A sealant applied uniformly to the entire pavement surface, usually with embedded sand or gravel 'chips,' primarily to prevent water infiltration, improve traction, and renew the pavement surface.

SHOPP (State Highway Operation and Protection Program) – It is required by Government Code section 14526.5. A four-year listing of projects proposed for constructing consistently with the goals and priorities in the latest plan. SHOPP projects are limited to capital improvements relative to maintenance, safety and rehabilitation of State highways and bridges that do not add new capacity lanes to the system.

SHS (State Highway System) – The entire system of highways maintained by the Department. For pavement management purposes, excludes bridge decks and ramps.

Slab – A unit of PCC pavement defined by surrounding joints.

Slurry Seal – A petroleum-based emulsion seal coat (with embedded fine aggregates) applied to the pavement surface.

Spalling – It occurs at joints or cracks when incompressible materials are confined in the opening. It also occurs where uniform slab support is lacking and there is vertical movement due to wheel load impact. It results in progressive widening of the joint or cracks, and ultimately, deterioration of aggregate interlock at the joint.

Ten Year State Highway Operation and Protection Program (SHOPP) Plan–It is required by Streets and Highways Code section 164.6. A ten-year state rehabilitation plan, prepared each odd-numbered year by the Department to identify rehabilitation needs and schedule in order to meet those needs and strategies for cost control and program efficiencies.

VMT (Vehicle Miles Traveled) – The length of a highway segment multiplied by the Annual Average Daily Traffic divided by the number of lanes.