Chapter 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 537 cities and counties responded to the survey, a methodology had to be developed to estimate the needs of the missing agencies. The following paragraphs describe in detail the methodology that was used in the study.

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 inventory data were provided, then the 2008 data was used.
- If the inventory data provided was incomplete, Table 2.1 is 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 2010 survey.

This differs slightly from the 2008 study in that averages are based on the data submitted from the agencies themselves instead of from the Highway Performance Monitoring System (HPMS) report[2].

Table 2.1 Assumptions Used to Populate Missing Inventory Data

Functional Class	Average Number of Lanes	Average Lane Width (ft)
Urban Major Roads	2.7	15.1
Urban Residential/Local Roads	2.1	14.9
Rural Major Roads	2.0	13.4
Rural Residential/Local Roads	2.0	11.9
Unpaved Roads	1.8	11.5

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 2008 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. This differs from the approach in 2008 when we actually had to assume that the pavement condition would be similar to geographically close agencies.

The 2010 survey 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 class(es), the same PCI would be used for all functional classes.
- If no pavement condition data were provided at all:
    - 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 deterioration rate is based on the performance curves developed by MTC from California cities/counties' data.

2.1.2 Pavement Needs Assessment Goal

The same needs assessment goal from the 2008 study was used in the 2010 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.

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

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[3], which may be downloaded at www.SaveCaliforniaStreets.org.

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. 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.

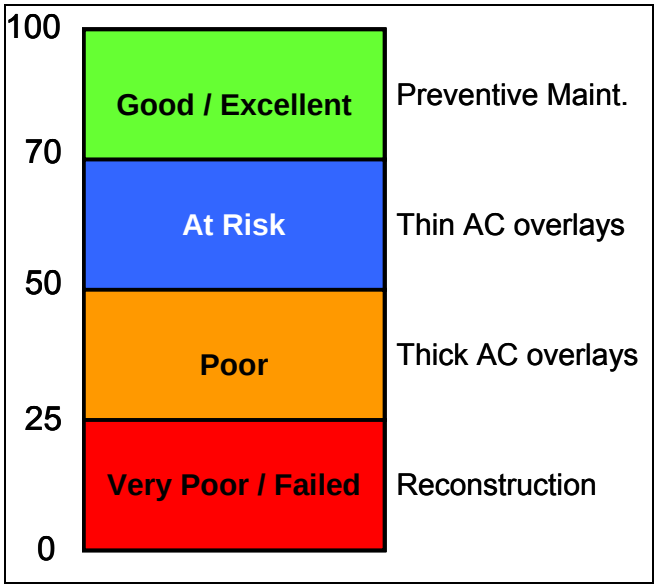

Figure 2.1 PCI Thresholds & Treatments Assigned

Unit cost data from 260 agencies were summarized and averaged for the reasons previously described in the 2008 study (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	$4.30	$19.80	$29.10	$91.80
Local Roads	$4.20	$17.90	$26.40	$61.20

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 two 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.

Conversely, the cost for overlays and reconstruction have actually declined since 2008 by approximately 5 percent for overlays, and as much as 30 percent for reconstruction. This is reflected in the Asphalt Price Index[5] tracked by Caltrans (see Figure 2.2), which shows more than a 10-fold increase from 2000 to 2008, but then a drop of almost 50 percent in 2009.

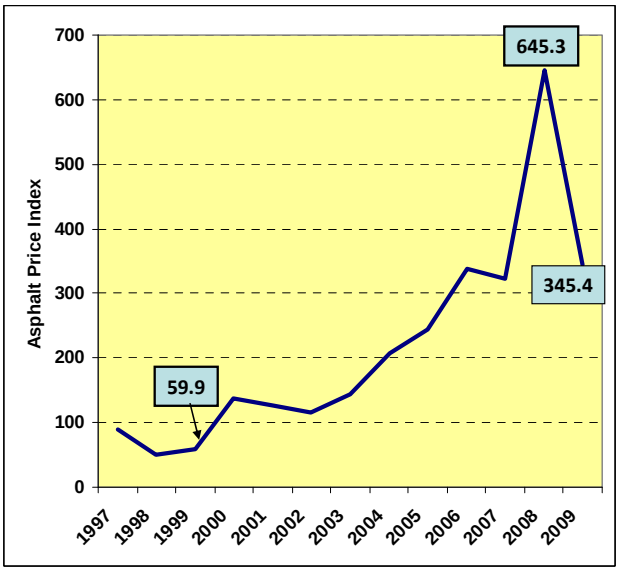

Figure 2.2 Caltrans Asphalt Price index[5] (1997-2009)

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

Nonetheless, a brief review of the Consumer Price Index (CPI) for urban areas for the two-year period from July 2008 to July 2010 indicates a small decline of 0.6 percent; therefore, the financial analysis in this chapter can be directly compared with the 2008 study.

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

2.2. Average Network Condition

Based on the results of the surveys, the current (2010) pavement condition statewide is 66, a drop of approximately 2 points from 2008, when it was estimated at 68. 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.

From this table, we can see that the statewide ***weighted average*** PCI for all local streets and roads is 66, with major roads slightly better (68) and local roads slightly worse (65). The PCI ranges from a high of 77 in Placer County to a low of 31 in Lake 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 Lake County may well have pavement sections that have a PCI of 100, although the average is 31.

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.

As was discussed in the 2008 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 2.3 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.

The factors that are causing this rapid deterioration in pavement condition include:

- More traffic and heavier vehicles
- More transit and more frequent bus trips
- 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 2.4 shows the distribution of pavement conditions by county for both 2008 and 2010. 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. For 2010, this is 62 percent and 5 percent of the state's local streets and roads, respectively. Further, there has been an increase in the "blue" and "red" counties from 2008. 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 years.

2/3 of California's local streets and roads have a PCI less than 70.

As a final note, the 2008 study predicted what the 2010 PCI would be given the expected funding (approximately $1.59 billion/year). The PCI was predicted to be 66, which is exactly where we are today.

Table 2.3 Summary of Inventory & Pavement Condition Data by County (Cities Included)

County*	Centerline Miles				Lane Miles				Current Average PCI**		
	All	Major	Local	Unpaved	All	Major	Local	Unpaved	All	Major	Local
Alameda County	3,394	1,262	2,132	0	7,841	3,586	4,255	0	67	70	65
Alpine County	135	38	15	82	270	75	30	164	45	50	30
Amador County	476	202	252	22	955	408	503	44	34	37	31
Butte County	1,782	530	978	274	3,643	1,203	1,932	508	67	72	65
Calaveras County	715	323	297	95	1,344	656	593	95	53	55	50
Colusa County	987	277	474	236	1,524	541	746	236	60	67	56
Contra Costa County	3,236	923	2,307	6	6,716	2,186	4,515	14	70	71	69
Del Norte County	334	79	146	109	675	178	290	207	68	68	68
El Dorado County	1,251	416	760	75	2,480	841	1,531	108	58	68	53
Fresno County	6,087	1,570	4,432	85	12,951	3,949	8,833	169	70	75	68
Glenn County	950	363	444	143	1,899	731	885	284	68	71	65
Humboldt County	1,484	715	591	178	2,968	1,491	1,178	300	56	53	59
Imperial County	2,994	1,244	1,743	6	6,088	2,610	3,468	11	72	72	73
Inyo County	1,142	61	465	616	2,158	122	928	1,108	57	64	56
Kern County	5,051	1,687	3,158	206	11,698	4,795	6,495	407	63	70	58
Kings County	1,328	425	833	70	2,796	962	1,694	140	62	69	58
Lake County	1,067	239	677	152	2,123	477	1,347	299	31	36	29
Lassen County	429	354	76	0	875	727	148	0	69	68	69
Los Angeles County	21,035	7,387	13,461	188	48,535	19,697	28,473	366	67	67	66
Madera County	1,822	564	1,193	66	3,680	1,151	2,416	113	48	58	43
Marin County	1,016	279	736	1	2,090	632	1,457	1	61	65	58
Mariposa County	1,122	176	542	404	561	88	271	202	44	64	38
Mendocino County	775	356	417	2	1,519	719	797	3	49	54	43
Merced County	2,330	868	1,299	163	4,954	1,967	2,661	326	58	65	53
Modoc County	1,515	394	631	490	3,041	800	1,260	980	40	52	32
Mono County	233	137	96	0	465	280	184	0	68	74	59
Monterey County	1,834	1,283	543	8	4,187	3,125	1,051	11	45	39	60
Napa County	718	223	494	1	1,504	502	1,001	1	60	66	57
Nevada County	764	278	338	148	1,550	581	673	296	71	69	74
Orange County	6,187	1,982	4,205	0	16,025	6,935	9,090	0	76	76	77
Placer County	2,012	503	1,449	60	4,183	1,173	2,890	120	77	80	75
Plumas County	704	220	271	212	1,409	442	543	424	66	70	62
Riverside County	7,332	2,656	4,626	49	16,328	6,818	9,416	94	72	74	71
Sacramento County	4,968	1,414	3,529	26	10,936	3,763	7,122	51	66	69	65
San Benito County	411	231	149	31	833	476	295	62	66	67	65
San Bernardino Co	8,667	3,243	4,717	707	20,139	9,057	9,619	1,463	70	70	70
San Diego County	7,676	4,068	3,507	101	18,743	10,806	7,735	202	69	69	70
San Francisco	912	325	587	0	2,061	937	1,124	0	63	59	65
San Joaquin County	3,402	1,033	2,350	19	7,159	2,500	4,620	39	70	72	70
San Luis Obispo Co	1,939	715	984	241	4,078	1,707	1,889	482	64	65	63
San Mateo County	1,872	579	1,278	15	3,909	1,349	2,531	29	70	73	68
Santa Barbara Co	1,597	594	988	15	3,391	1,410	1,951	30	70	73	68

County*	Centerline Miles				Lane Miles				Current Average PCI**		
	All	Major	Local	Unpaved	All	Major	Local	Unpaved	All	Major	Local
Santa Clara County	4,114	1,221	2,894	0	9,317	3,508	5,810	0	69	72	67
Santa Cruz County	871	185	686	0	1,812	454	1,358	0	48	60	43
Shasta County	1,722	669	817	236	3,547	1,470	1,628	449	67	76	58
Sierra County	499	182	106	211	1,001	368	211	423	71	71	71
Siskiyou County	1,495	535	463	497	3,005	1,088	924	993	57	62	52
Solano County	1,688	548	1,021	118	3,566	1,276	2,053	236	66	73	62
Sonoma County	2,350	723	1,627	0	4,901	1,643	3,258	0	50	62	42
Stanislaus County	2,694	867	1,785	42	5,912	2,289	3,540	83	51	53	49
Sutter County	1,029	279	587	163	2,106	624	1,156	326	56	59	54
Tehama County	1,197	328	595	275	2,401	658	1,194	549	65	69	63
Trinity County	916	286	406	223	1,608	572	813	223	50	55	46
Tulare County	3,957	947	2,896	113	8,181	2,218	5,738	225	68	70	67
Tuolumne County	532	211	284	37	1,228	511	643	74	62	62	62
Ventura County	2,416	764	1,647	4	5,297	2,063	3,225	9	66	67	65
Yolo County	1,346	431	793	122	2,611	939	1,498	175	67	70	64
Yuba County	724	282	340	102	1,504	592	708	204	56	55	57
Total or Average	**141,235**	**48,675**	**85,117**	**7,443**	**308,279**	**122,723**	**172,196**	**13,361**	**66**	**68**	**65**

* All cities within a county are included.

** Average PCI is weighted by pavement area.

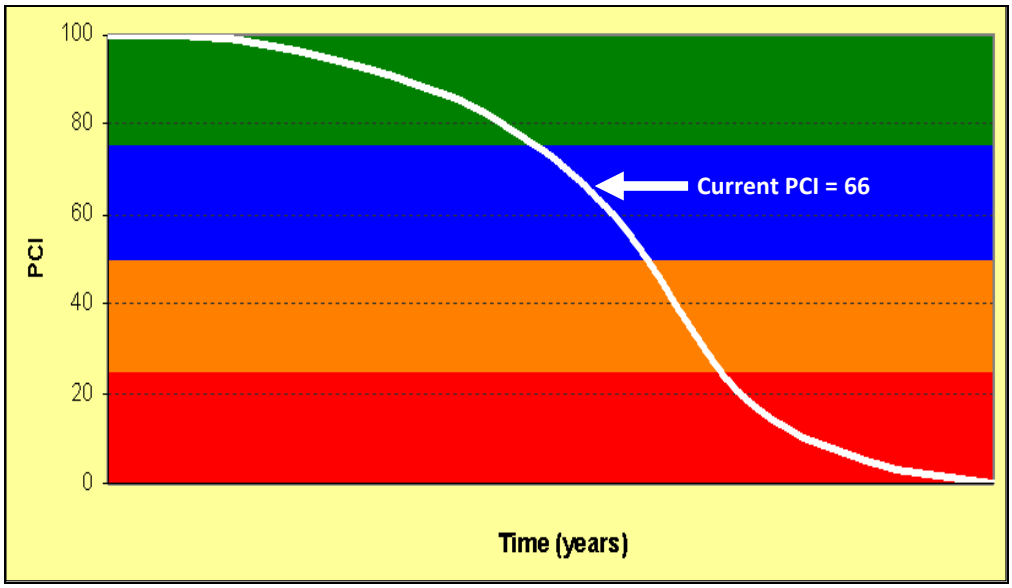

Figure 2.3 Generalized Pavement Life Cycle Curve

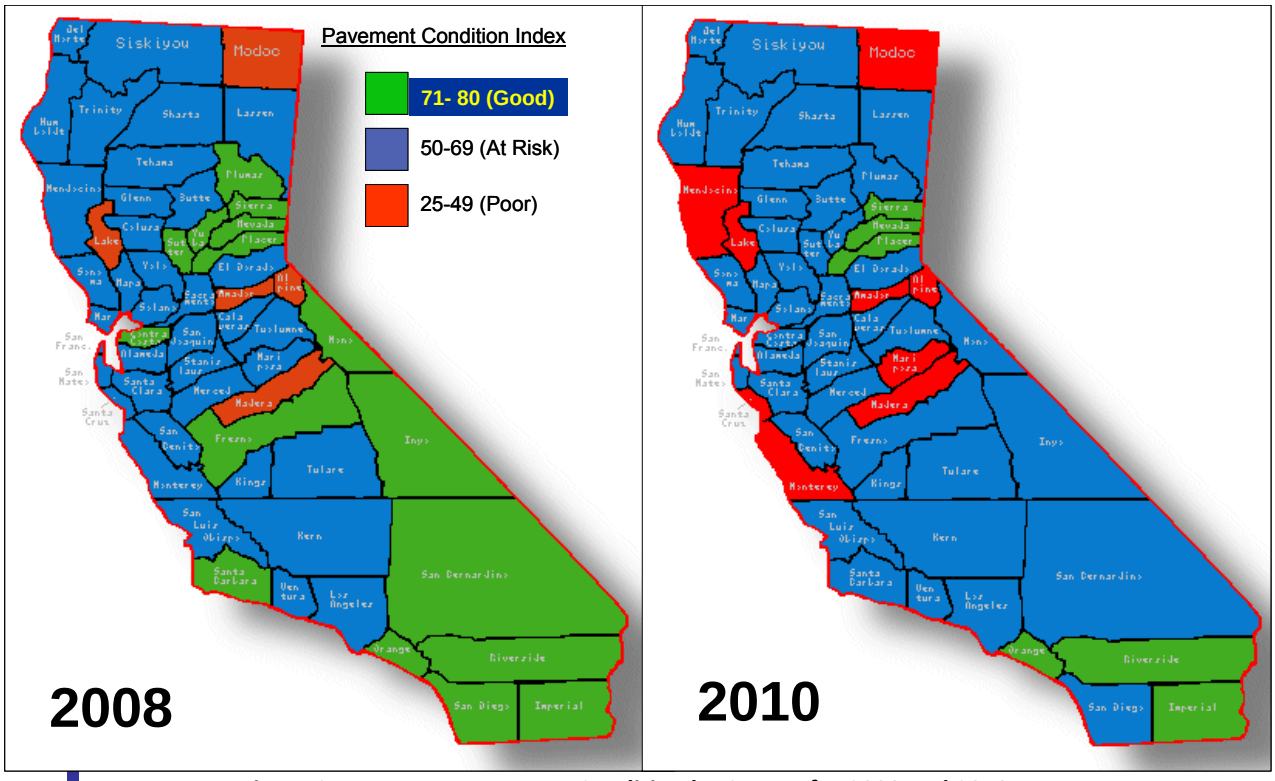

Figure 2.4 Average Pavement Condition by County for 2008 and 2010

2.3 Unpaved Roads

The needs assessment for unpaved roads is much simpler – 87 agencies reported data for a total unpaved road network of 7,443 centerline miles. The average cost of maintenance is $9,800 per centerline mile per year. Any pavement management software like StreetSaver® only analyzes paved roads, so 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 needs of $729.4 million for 10 years.

2.4 Pavement Needs

The determination of pavement needs and unfunded backlog was 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 2.4 and indicate that $70.5 billion is required to achieve the BMP goals in 10 years. Again, this is in constant 2010 dollars. Detailed results by county for each scenario are included in Appendix B.

Table 2.4 Cumulative Pavement Needs

Cumulative Needs (2010 dollars)		
Year No.	**Year**	**Reach BMP Goal in 10 Years ($Billion)**
1	2011	$7.2
2	2012	$14.1
3	2013	$21.2
4	2014	$28.2
5	2015	$35.3
6	2016	$42.3
7	2017	$49.4
8	2018	$56.4
9	2019	$63.5
10	2020	$70.5

In 2008, the total 10-year need was $67.6 billion, so this is an increase of $2.9 billion or approximately 4.3 percent. Since the CPI between July 2008 and July 2010 was almost zero, these two values, for all intents and purposes, are comparable.

Pavement needs have increased to $70.5 billion.

The increase in needs may be attributable to two reasons:

- The overall pavement condition has decreased, from 68 to 66
- Some treatments have increased in costs.