Chapter 3. 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.

3.1. Methodology

Since not all 536 cities and counties responded to 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.

3.1.1. Filling In the Gaps

Inventory

Figure 3.1 on the next page outlines the first steps in "filling in the gaps". Briefly, this process was to determine the total miles (both centerline and lane-miles) and pavement areas, as this would be crucial in estimating the pavement needs for an agency.

1. If no centerline miles are reported, then the centerline miles reported in the HPMS[2] report was used.

2. From the HPMS, the statewide centerline mile average indicated that 37% of the pavements were classified as major and 63% as local. These averages were also used to determine the functional class breakdown.

3. If no lane-miles were reported, then statewide averages from the HPMS report were used to arrive at this information.

    a. For counties, the statewide average was approximately 2.1 lane-miles per centerline mile for major roads, and 2 lane-miles per centerline mile for locals.

    b. For cities, the statewide average was approximately 3 lane-miles per centerline mile for major roads, and 1.9 lane-miles per centerline mile for locals.

4. If no pavement areas were reported, again, statewide averages from the HPMS report were used to determine this value. The average lane width was 15.9 feet per lane for major roads and 15 feet per lane for local roads.

Steps 1 through 3 were also part of validation checks discussed in Chapter 2. Table 3.1 summarizes the results for all the counties (cities included in counties) for both major and local streets and roads.

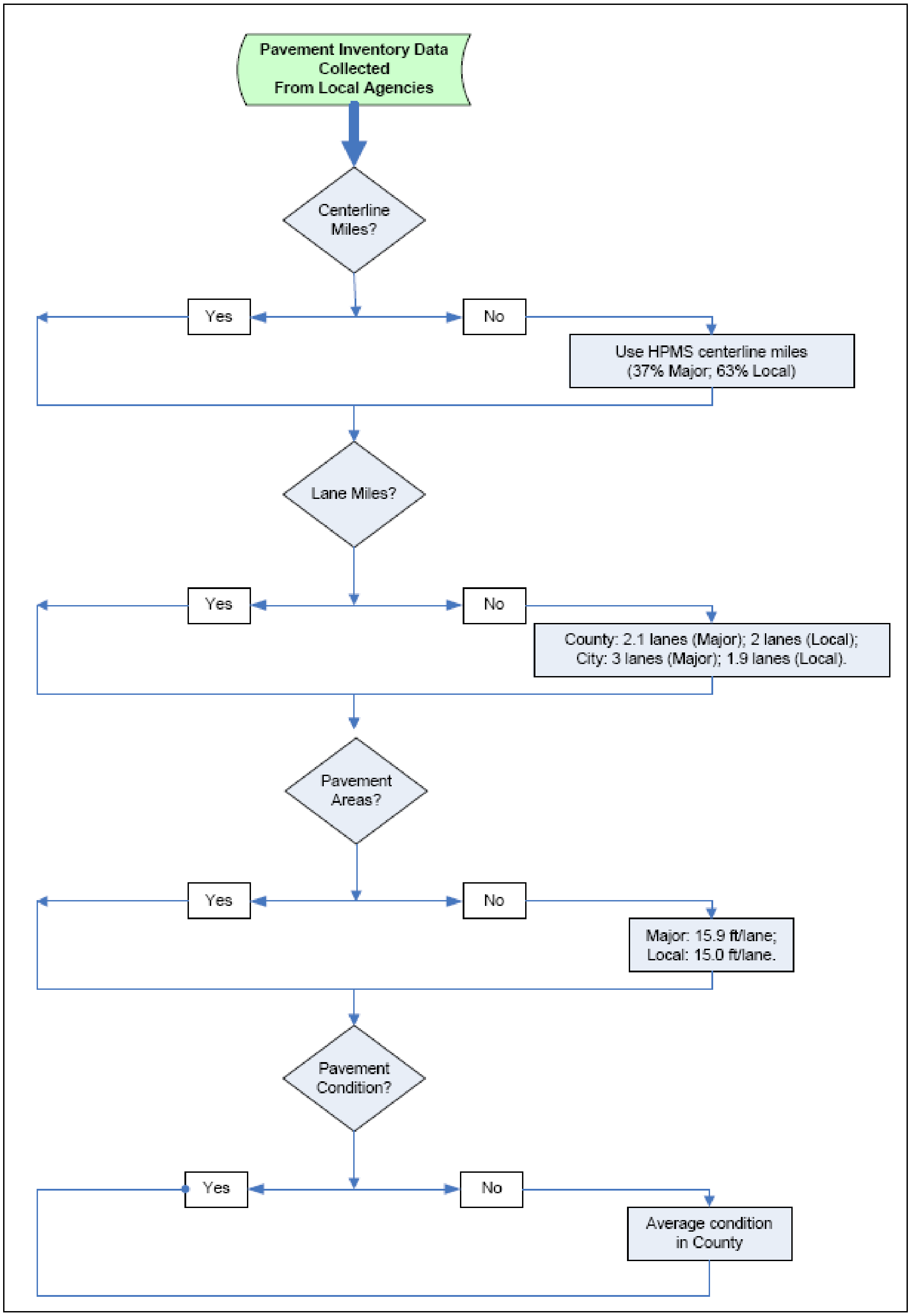

Figure 3.1 Flowchart to Estimate Pavement Inventory and Condition Data

Table 3.1 Summary of Inventory & Pavement Condition Data by County (Cities Incl.)

County*	Centerline Miles				Lane Miles				Current Average PCI**		
	All	Major	Local	Unpaved	All	Major	Local	Unpaved	All	Major	Local
Alameda County	3,473	1,279	2,194	0	7,933	3,716	4,217	0	66	66	66
Alpine County	135	38	15	82	270	75	30	164	40	40	40
Amador County	476	202	252	22	955	408	503	44	31	31	31
Butte County	1,783	522	986	274	3,684	1,195	1,943	545	70	72	68
Calaveras County	715	323	297	95	1,344	656	593	95	55	56	50
Colusa County	987	277	474	236	1,524	541	746	236	61	69	58
Contra Costa County	3,013	1,104	1,909	0	6,973	3,221	3,752	0	72	72	72
Del Norte County	334	79	146	109	675	178	290	207	70	70	70
El Dorado County	1,253	416	765	72	2,490	858	1,525	108	62	73	57
Fresno County	6,009	2,287	3,641	81	12,852	5,439	7,252	161	74	75	70
Glenn County	942	349	448	145	1,892	713	892	288	68	68	68
Humboldt County	1,477	526	225	725	2,972	1,153	441	1,377	61	55	73
Imperial County	2,994	1,244	1,743	6	6,088	2,610	3,468	11	74	74	74
Inyo County	1,684	208	353	1,124	2,933	435	363	2,136	75	75	74
Kern County	5,520	1,841	3,494	185	12,787	5,296	7,121	370	66	71	60
Kings County	1,328	425	833	70	2,796	962	1,694	140	63	70	59
Lake County	752	239	362	152	1,497	477	720	299	33	36	30
Lassen County	942	354	76	513	1,900	727	148	1,026	55	49	61
Los Angeles County	20,269	7,414	12,742	112	56,864	21,833	34,858	174	68	72	66
Madera County	1,827	567	1,195	66	3,652	1,185	2,354	113	48	58	43
Marin County	1,030	381	649	0	2,033	893	1,140	0	61	62	61
Mariposa County	560	207	353	0	1,142	435	706	0	53	53	53
Mendocino County	776	356	419	2	1,530	727	800	3	51	56	45
Merced County	2,229	822	1,244	163	4,710	1,828	2,556	326	57	64	54
Modoc County	1,515	394	631	490	3,041	800	1,260	980	42	52	32
Mono County	737	275	462	0	1,498	581	917	0	71	72	72
Monterey County	1,942	659	1,275	8	3,980	1,454	2,514	11	63	64	62
Napa County	739	273	466	0	1,500	635	865	0	53	53	53
Nevada County	771	285	338	148	1,564	595	673	296	72	70	74
Orange County	6,316	2,112	4,204	0	15,190	6,947	8,243	0	78	75	78
Placer County	1,989	559	1,370	60	4,099	1,262	2,717	120	79	79	79
Plumas County	700	233	259	208	1,407	474	516	416	71	71	71
Riverside County	7,114	2,555	4,243	316	15,583	6,638	8,321	624	71	71	72
Sacramento County	4,861	957	3,878	26	11,423	3,352	8,020	51	68	72	66
San Benito County	421	156	265	0	868	340	528	0	68	68	68
San Bernardino County	8,502	3,091	5,258	153	19,350	8,393	10,502	455	72	73	73
San Diego County	7,683	3,085	4,497	101	17,408	8,389	8,817	202	74	75	73
San Francisco County	855	316	539	0	2,044	983	1,061	0	62	62	62
San Joaquin County	3,318	1,204	2,095	19	7,040	2,899	4,102	39	70	69	69
San Luis Obispo Co	1,929	729	960	241	4,078	1,707	1,889	482	64	66	62
San Mateo County	1,826	676	1,151	0	3,889	1,806	2,082	0	69	69	69
Santa Barbara County	1,569	489	1,078	2	3,322	1,218	2,100	4	72	78	68
Santa Clara County	4,450	1,647	2,804	0	9,215	4,279	4,936	0	70	70	70
Santa Cruz County	883	400	483	0	1,837	884	953	0	52	56	48
Shasta County	1,694	1,109	354	231	3,501	2,361	702	438	64	62	74
Sierra County	499	182	106	211	1,001	368	211	423	73	73	73
Siskiyou County	1,516	557	463	497	3,066	1,154	919	993	57	61	51
Solano County	1,739	643	1,096	0	3,563	1,597	1,966	0	66	66	66

County*	Centerline Miles				Lane Miles				Current Average PCI**		
	All	Major	Local	Unpaved	All	Major	Local	Unpaved	All	Major	Local
Sonoma County	2,341	866	1,475	0	4,869	2,069	2,800	0	53	54	52
Stanislaus County	2,820	963	1,815	42	5,974	2,295	3,596	83	60	61	64
Sutter County	1,196	281	752	163	2,439	627	1,486	326	73	65	71
Tehama County	1,197	328	595	274	2,401	658	1,194	549	69	69	64
Trinity County	919	283	410	226	1,837	565	819	452	52	57	48
Tulare County	3,988	1,363	2,514	110	8,209	3,025	4,964	220	66	72	67
Tuolumne County	532	211	284	37	1,228	511	643	74	62	62	62
Ventura County	2,410	856	1,549	4	5,333	2,405	2,919	9	64	66	61
Yolo County	1,352	439	791	122	2,709	1,026	1,507	175	69	72	67
Yuba County	724	282	340	102	1,504	592	709	204	74	74	74
Total or Average	141,554	49,916	83,613	8,025	317,465	128,451	173,564	15,450	68	70	67

* All cities within county are included.
** Average PCI is weighted by pavement area.

Current Pavement Condition

Table 3.1 above includes the current pavement condition index (PCI) for each county (including cities). 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.

For those agencies that did not report any current pavement condition, the average current pavement condition in that county/region was used. These were obtained from those agencies that utilized a PMS. Cities were determined separately from counties, i.e. a city's condition was based only on the average condition of cities within the county, but the county was based on surrounding like counties.

The only exception to this rule was for some cities in Los Angeles County; due to the large size of the county and differences in the rural and urban regions, an individual city's pavement condition came from the cities in the same geographic area, e.g. San Fernando Valley or the coast.

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

From this table, we can see that the statewide weighted average PCI for all local streets and roads is 68, with major roads slightly better and local roads slightly worse. The PCI ranges from a high of 79 in Placer County to a low of 31 in Amador County. 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 31.

Another way of interpreting the PCI is to use condition categories to describe the PCI ranges. Figure 3.2 shows the most common thresholds – these were used in this study. 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

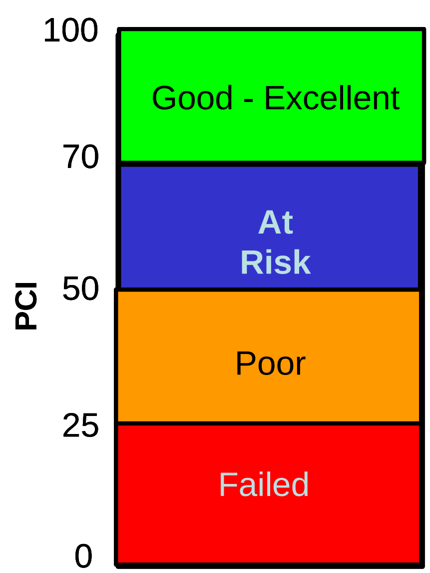

Figure 3.2 PCI Categories

indicating that they are held to lower condition standards.

The PCI can also be used as an indicator of the type of repair work that will be required. This is described in more detail in Section 3.1.3. To provide a sense of what the PCI values mean, Figures 3.3 to 3.7 are photographs of some pavements with different PCIs.

Figure 3.3 PCI = 98 (Excellent Condition)

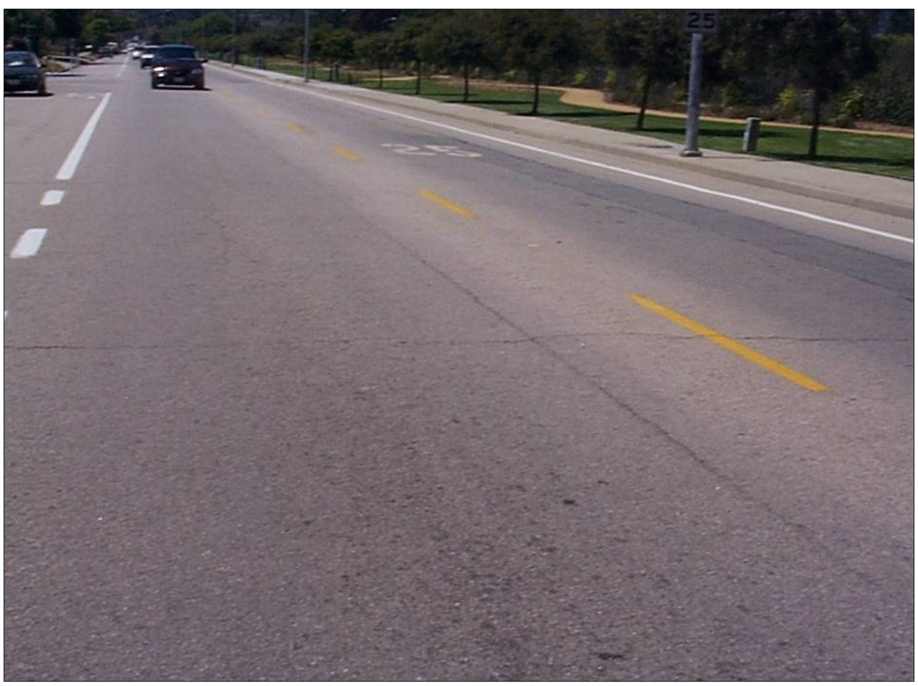

Figure 3.4 PCI = 82 (Good Condition)

Figure 3.5 PCI = 68 ("At Risk")

Figure 3.6 PCI = 40 (Poor Condition)

Figure 3.7 PCI <10 (Failed Condition)

3.1.2. What Does a PCI of 68 Mean?

An average pavement condition of 68 is not necessarily good news. While it seems just a couple of points shy of the “good/excellent” category, it has significant implications for the future. From the generalized pavement life cycle curve in Figure 3.8, a newly constructed pavement will have a PCI of 100. In the first five years of its life, there is a gradual and slow deterioration. As more time passes, this pavement deterioration begins to accelerate, until the steep part of the curve is reached at approximately 15 years (the exact timing will depend on the traffic volume, climate, pavement design, maintenance, etc).

From here, the pavement deterioration is very rapid – 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; they include saving the taxpayers’ dollars, less disruption to the traveling public as well as more environmental benefits.

Therefore, a PCI of 68 should be viewed with caution – it indicates that our local streets and roads are, as it were, poised on the edge of a cliff.

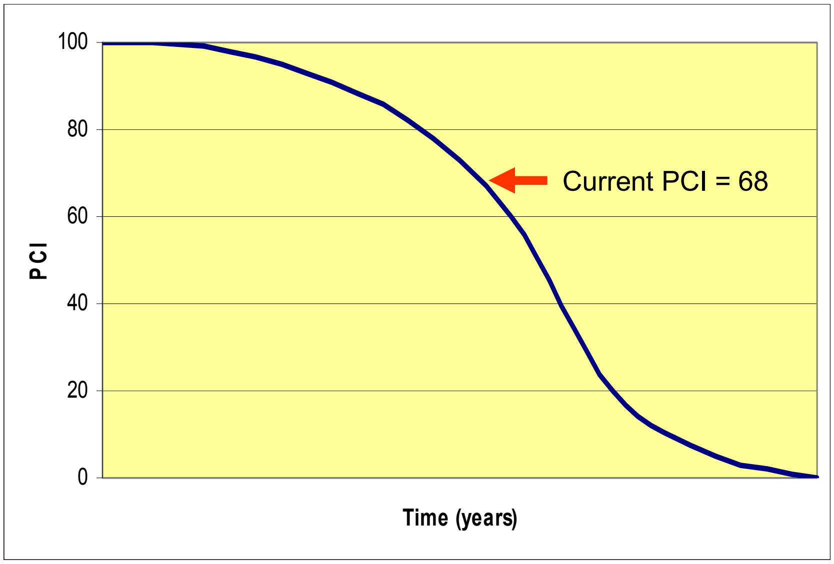

Figure 3.8 Generalized Pavement Life Cycle Curve

Figure 3.9 shows the distribution of pavement conditions by county. As can be seen, a majority of the counties in the state have pavement conditions that are either “At Risk” or in “Poor” condition. Some of the “green” counties are green due to recent population growth patterns. For example, San Bernardino County has experienced a significant increase in population growth that has resulted in an explosion of new subdivisions with new roads. Therefore, their pavement conditions are somewhat “skewed” due to the larger percentage of new roads with high PCIs. However, despite their color, none of the “green” counties have a PCI greater than 80; in fact, the majority are in the low 70’s, indicating that they will turn “blue” in a few years.

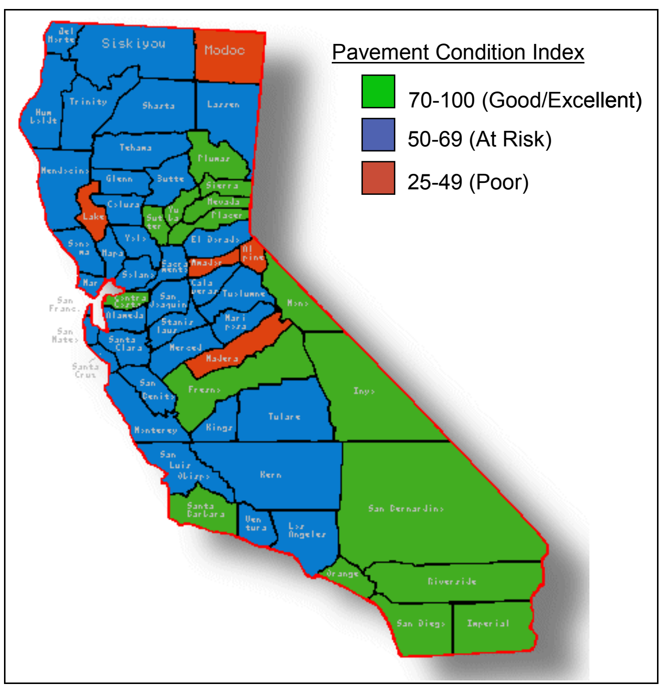

Figure 3.9 Average Pavement Condition by County

3.1.3. Needs Assessment Goal

To determine the pavement needs, we first need to define the goals that we would like to achieve. For instance, the funding required to achieve a PCI goal of 50 would be significantly less than that for say, a PCI of 75 since it would cost more to maintain pavements at a higher PCI. Of course, the tradeoff is that we end up with roads in "poor" condition that will cost more to improve and maintain in the long term.

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

In this study, the goal of the needs assessment is for all pavements to reach a condition where best management practices (BMP) can occur, i.e. where 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) will also be realized.

In short, the BMP goal is to reach a PCI in the low 80s and the elimination of the backlog of work. The deferred maintenance or "backlog" is defined as work that is needed, but is not funded.

For this goal to be effective, it should also be attainable within a specific timeframe. Although four funding scenarios were included in our analysis, only two are included in this report for brevity:

1. Funding required to achieve BMP in 10 years
2. Impacts of existing funding on PCI and backlog

The second scenario was to determine the impacts of the existing funding with respect to the pavement condition as well as the deferred maintenance or backlog.

To perform these analyses, MTC's StreetSaver® pavement management system program was used. This program was selected because the analytical engine was able to perform the required analyses, and the default pavement performance curves were based on data from California cities and counties.

Once the current PCI and analysis goal were determined, two additional pieces of information were needed to perform the needs assessment:

1. The types of **maintenance and rehabilitation treatments** that are assigned to a pavement section during the analysis period. For example, if Main Street had a PCI of 45, then the required treatment may be an overlay at a cost of $26/square yard.

2. **Performance models** to predict the future PCI of the pavement sections with and without treatment.

Sections 3.1.4 and 3.1.5 describe both of these processes in more detail.

3.1.4 Maintenance and Rehabilitation Decision Tree

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 3.10 summarizes the types of treatments and their costs in this study. Briefly, good to excellent pavements (PCI >70) are best suited for pavement preservation techniques, i.e. 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 PCI thresholds shown in Figure 3.10 are generally accepted industry standards.

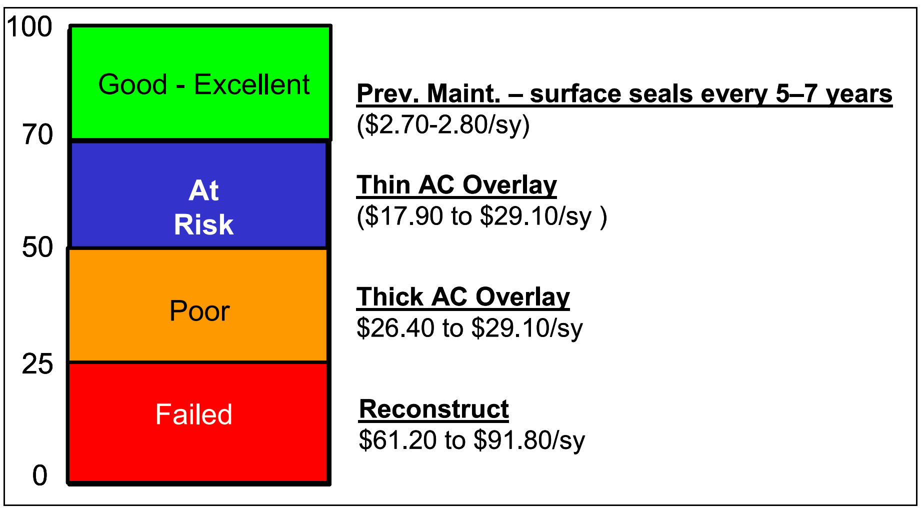

Figure 3.10 Final M&R Tree and Unit Costs

Multiple treatments may occur within the analysis period. For example, if Main Street were reconstructed in 2012, typical treatments over the analysis period may include a slurry seal every 5 years to preserve the pavement. Therefore, an accurate needs assessment must also include the cost of these seals in addition to the cost of reconstruction.

The unit costs shown in Figure 3.10 are statewide averages. The range in costs for each treatment is for the different functional classes of pavements, i.e. majors have a higher cost than locals.

Cost data from almost 50 agencies covering different climatic regions were examined. The intent was to determine if there was a regional difference in unit costs. From Figure 3.11, it can be seen that there were wide ranges in the costs for overlays and reconstruction, although there were no regional trends. The high end of an overlay could be as much as ten times more than the low end.

While it may make intuitive sense that unit costs should vary by geography or climate, the reality is that there are so many other factors that affect the cost, such as:

- Size of project
- Distance from hot mix plant/haul distances
- Asphalt prices
- Time of year

Even within the same county, there can be large variations in the unit cost for the same treatment. Only surface seals were fairly consistent in price. Therefore, we used the statewide averages for this study.

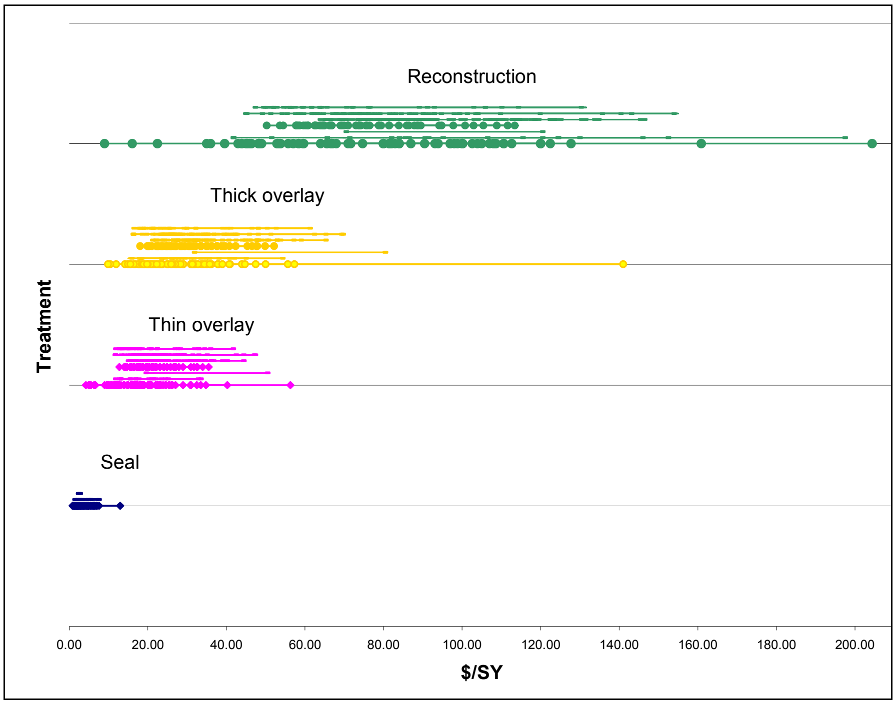

Figure 3.11 Range of Unit Costs for M&R Treatments

3.1.5 Pavement Performance (Prediction) Models

Since the analysis period is 10 years, the future condition of all the pavement sections have to be predicted or forecast. For example, if Main Street had a current PCI of 65 in 2008 and is to be overlaid in 2009, what will the PCI be in 2012? What if it was slurried in 2015?

To predict the future PCI, performance models were used. As was mentioned earlier, one of the reasons to use the StreetSaver® software was because the default performance models were developed using data from California cities and counties. Originally, it was the intent of this study to determine if regional prediction models could be developed, i.e. desert, mountains or coastal. However, raw performance data was not available so it was not possible to develop these curves. Therefore, the default StreetSaver® models were used.

The general form of the model is:

$$PCI = 100 - \rho / (\ln(\alpha/Age))^{(1/\beta)}$$

Where:

PCI = pavement condition index
α, β, ρ = regression coefficients depending on the functional class (major or local) and surface type of pavement (asphalt concrete, Portland cement concrete or surface treated only)
Age = age of pavement, years

The development of these performance equations can be found in the Technical Appendices of the StreetSaver® manual[8]. They included the analyses of thousands of data points from multiple cities and counties.

3.1.6 Escalation Factors

In addition, the use of an appropriate escalation factor for use in the analysis was examined. Table 3.2 summarizes the asphalt price index as well as the price for asphalt concrete every year since 1998. The average annual increase over the ten-year period is 7.1%.

However, subsequent discussions with other agencies and the Oversight Committee modified our decision to use constant 2008 dollars in our analyses. Therefore, an escalation factor was not used. Note too that the SHOPP as well as some Regional Transportation Plans also report their needs assessments in constant dollars.

[8] *Technical Appendices Describing the Development and Operation of the Bay Area Pavement Management System*, by Roger E. Smith, Texas A&M University, 1987.

Table 3.2 Price Index and Asphalt Concrete Unit Cost from 1998 (*ref. Caltrans*)

Year	Price Index		Asphalt Concrete		Average % of Change per Year (from 1998 to this year)
	Value	% of Change per Year (from 1998 to this year)	$/Ton	% of Change per Year (from 1998 to this year)	
1998	128.6		$38.78		
1999	139.2	8.2%	$40.14	3.5%	5.9%
2000	146.2	6.6%	$45.12	7.9%	7.2%
2001	154.1	6.2%	$43.89	4.2%	5.2%
2002	142.2	2.5%	$49.00	6.0%	4.3%
2003	148.6	2.9%	$48.35	4.5%	3.7%
2004	216.2	9.0%	$53.55	5.5%	7.3%
2005	268.3	11.1%	$75.72	10.0%	10.6%
2006	280.6	10.2%	$86.04	10.5%	10.4%
2007	261.1	8.2%	$85.48	9.2%	8.7%
2008	240.3	6.5%	$85.02	8.2%	7.3%
				Average	**7.1%**

3.1.7 Distribution of Pavement Areas by Condition Category

As an additional note, the responses to our survey provided us with only the average PCI. This did not offer any information on the distribution of PCIs within that particular network or database. For example, if City X reported an average PCI of 75, there was no corresponding information on what % of streets were actually 90, or 55 or 32. An infinite number of combinations were possible to arrive at an average of 75. This distribution was required to perform the needs analysis.

Therefore, we examined the distribution of PCIs for 128 agencies and arrived at Table B.1 in Appendix B – this appendix also contains a more detailed discussion of the development of the PCI distributions.

3.1.8 Unpaved Roads

The needs assessment for unpaved roads is much simpler – 74 agencies reported data on their unpaved road network, including their needs. This resulted in an average cost of $9,800 per centerline mile per year. Since StreetSaver®, like all pavement management software only analyzes paved roads, the average cost for unpaved roads from the survey was used for those agencies which did not report any funding needs.

An example of this calculation is also included in Appendix B.

3.1.9 Needs Calculations

The determination of pavement needs and backlog is based on four primary factors:

- 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 from (Figure 3.10) is 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.

The next step is to determine **when** this treatment is applied. In the case of the 10-year scenario, ten years is needed to achieve the goal; therefore, the appropriate treatments must be applied between Years 1 to 10.

However, the optimal time is when to get the "biggest bang for the buck". Therefore, a cost-benefit analysis is performed to determine the biggest bang. From Figure 3.12, when an overlay is applied, the PCI will improve to 100, and a new performance curve is determined. The "benefit" is the area under the curve, also known as the "effectiveness area".

This is divided by the equivalent uniform annual cost of the treatment and a weighting factor based on traffic volumes is then applied. The Weighted Effectiveness Ratio (WER) is calculated as follows:

$$WER = \frac{(Effectiveness\ Area\,/\,Year)}{EUAC\,/\,SY} * WF$$

where:
WER = Weighted effectiveness ratio
Effectiveness area = area under PCI curve shown in Figure 3.12
Year = years affected
WF = weighting factor based on traffic volumes (1.0 for major streets, 0.55 for local streets)
EUAC = equivalent uniform annual cost of treatment
SY = area of pavement section in sq. yards

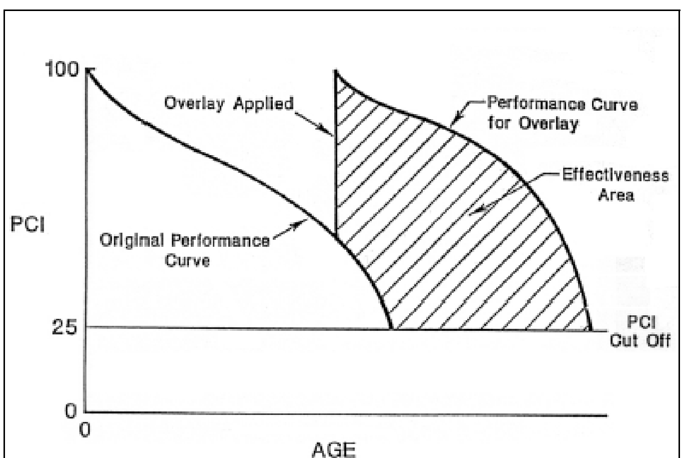

Figure 3.12 Calculation of Effectiveness Area[9]

The pavement sections are then prioritized by the WER, i.e. the sections with the highest WER will be selected for treatment first. This process is performed for all the sections in the database until the goals are achieved within the first ten years. The cost of all the treatments applied are then summed up annually.

The deferred maintenance or "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 and thereby result in a backlog of 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.

Appendix B contains an example of the needs calculations.

3.1.10 Results

The results are summarized in Table 3.3 and indicate that $67.6 billion is required to achieve the BMP goals in 10 years. Again, this is in constant 2008 dollars. Detailed results by County for each scenario are included in Appendix C. The results for the cities and counties within MTC's jurisdiction (i.e. within Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma Counties) were provided by MTC.

Table 3.3 Cumulative Pavement Needs (2008 $)

Cumulative Needs (2008 dollars)		
Year No.	Year	Reach BMP Goal in 10 Years
1	2009	$ 6,763,602,217
2	2010	$13,527,204,434
3	2011	$20,290,806,651
4	2012	$27,054,408,868
5	2013	$33,818,011,085
6	2014	$40,581,613,302
7	2015	$47,345,215,519
8	2016	$54,108,817,736
9	2017	$60,872,419,953
10	2018	$67,636,022,170

3.1.11 Funding to Maintain Network at BMP

Additional analyses were performed to determine the funding required to *maintain* the pavement network after the BMP goal was reached in 10 years. An iterative process was used to calculate the funding level required to maintain the pavement condition at this level for an additional 15 years (i.e. a total analysis period of 25 years was used to determine this).

This was determined to be $1.8 billion annually, which is not too far from the existing funding level of $1.59 billion (see next section). This much smaller funding level is because only pavement preservation policies are required to maintain the pavement network once it has been improved. These policies cost significantly less, as was described in Section 3.1.4.

3.2 Existing Funding Sources

The survey also asked agencies to provide both their revenue sources as well as pavement expenditures for FY 2006/07, FY 2007/08 as well as estimating an annual average for future years. Local agencies identified a myriad of sources of funds for their pavement expenditures, broadly categorized into federal, state or local. They included the following examples (this is by no means an exhaustive list):

Federal

- Regional Surface Transportation Program (RSTP)
- Congestion Mitigation & Air Quality Improvement (CMAQ)
- Emergency Relief
- High Risk Rural Roads (HR3)
- Safe Routes to School (SRTS)
- Transportation Enhancement Activities (TE)
- Community Development Block Grants (CDBG)

State

- Gas taxes
- Proposition 1B
- Proposition 42/AB 2928
- State Transportation Improvement Program (STIP)
- AB 2766 (vehicle surcharge)
- Bicycle Transportation Account (BTA)
- Safe Routes to School (SR2S)
- Transportation Development Act (TDA)

Local

- General funds
- Local sales taxes
- Developers fees
- Various assessment districts – lighting
- Redevelopment
- Traffic impact fees
- Traffic safety/circulation fees
- Utilities
- Transportation mitigation fees
- Parking and various permit fees

Table 3.4 summarizes the percentage of funding sources from the different categories for FY 2006/07 to FY 2007/08 as well as the estimated sources for future years. Note that Prop. 1B funds were a significant percentage of the total (10%), equaling the federal category, but this is only a one-time funding source. Transportation funding from the American Recovery and Reinvestment Act (ARRA) was also included below. However, it was estimated that only 40% of the $1.6 billion (i.e. $640 million) would be spent on local streets and roads, and that this would be available only in FY 2008/09.

More than one-third of pavement funding comes from local sources.

The more important item to note is that local funding sources come from many sources, and include a range of original fees. Local funding sources form a significant percentage of the total funding, more than one-third.

Table 3.4 Sources of Funding Sources

Funding Sources	Annual Funding		
	FY 2006/07 & 07/08	Estimated for FY 08/09	Estimated for FY 09/10 onwards
State	41.0%	40.5%	52.9%
State – Prop 1B only	10.0%	0%	0%
Federal with ARRA*	10.8%	35.9%	10.4%
Local	38.1%	23.6%	36.8%

*ARRA for cities and counties is assumed to be 40% of $1.6 billion (FY 08/09)

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

- Preventive maintenance, such as slurry seals
- Rehabilitation and reconstruction, such as overlays
- Other pavement related activities e.g. curb and gutters
- Operations and maintenance

Table 3.5 shows the breakdown in pavement expenditures for cities, counties and cities/counties combined. These were consistent within 1-2% points for all the years reported.

Table 3.5 Percentage of Pavement Expenditures

	Percentage of Pavement Expenditures			
	Preventive Maintenance	Rehabilitation & Reconstruction	Other Pavement Related	Operations & Maintenance
Counties	13%	42%	8%	37%
Cities	14%	60%	9%	17%
Cities & Counties combined	14%	52%	9%	26%

Encouragingly, approximately 13-14% of pavement expenditures are for preventive maintenance, which indicates that many agencies are cognizant of the need to preserve pavements. The main difference between counties and cities is the percent allocated to operations and maintenance. This is expected, since county networks tend to have different characteristics from city streets, thereby incurring a higher percentage of operations and maintenance costs.

Cities and Counties are estimated to spend $1.59 billion annually on pavements.

On average, anticipated pavement expenditures for the next ten years are expected to be $7,426/centerline-mile for counties and $15,173/centerline-mile for cities (not including operations and maintenance). These values were used to estimate the expenditures for those agencies that did not report this information. The resulting total pavement expenditures for all 536 cities and counties were therefore estimated to be $1.59 billion annually. This value is used in the analysis discussed below.

To put this funding level in perspective, $1.59 billion/year is less than 0.06% of the total investment in the pavement network, which is estimated to be $271 billion.

3.2.1. Impacts of Existing Funding

The second scenario estimates what the impacts will be on the pavement condition and backlog if the existing funding ($1.59 billion/year) stays constant. The results are shown in Figure 3.13.

Under the existing funding scenario, the blue line shows that the PCI will gradually decrease to 58 by 2018; more troubling, the red bars show that backlog will increase from $37 billion to almost $58 billion in 10 years.

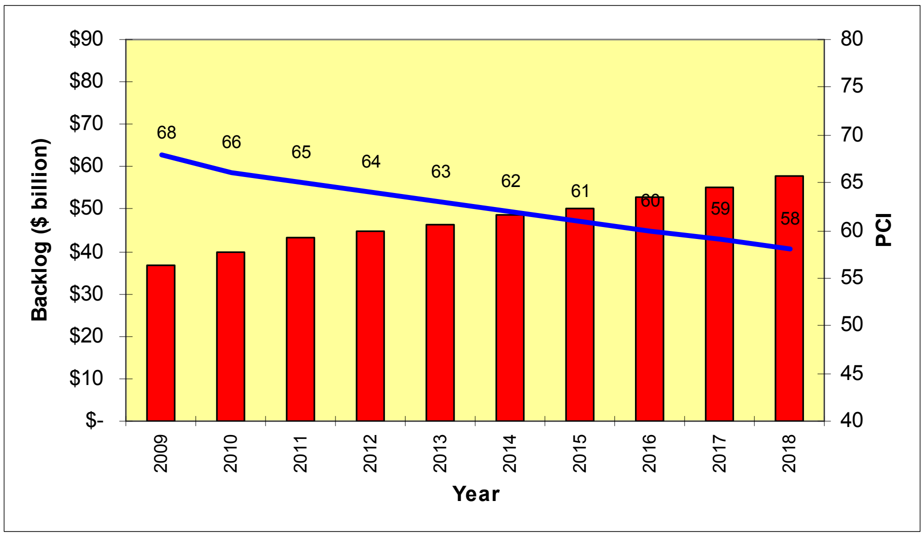

Figure 3.13 Impacts of Existing Funding on Pavement Condition and Backlog

3.3 Funding Shortfall

Given the needs results from Table 3.5 and the estimated available funding, it is a simple task to estimate the funding shortfall. Table 3.6 below shows this calculation – the shortfall is $51.7 billion. Clearly, the available funding is woefully inadequate in meeting BMP within the period analyzed.

Table 3.6 Shortfall Calculations (2008 dollars)

Scenario	10 Year Needs ($ billion)	Available Funding ($ billion)	Funding Shortfall ($ billion)
Achieve BMP Goal in 10 years	$ 67.6	$ 15.9	$ (51.7)