# APPENDIX B

# Pavement Needs Calculations

This appendix contains an example of the pavement needs calculation. County X was selected, as it was a large county with both rural and urban elements. The following information was provided in the survey.

| | |
|---|---|
| **Pavement Area (sq. yd.):** | 24 million (major) & 13.4 million (local) |
| **Unpaved Roads:** | 100 centerline miles |
| **Average PCI:** | 78 (major), 73 (local) |
| **Scenario:** | Reach Best Management Practice (BMP) condition in 10 years |

The following steps describe the systematic process used to estimate the pavement needs for this scenario.

## Step 1: Determine the distribution of pavement area percentages in each of the four condition categories using Table B.1.

Again, recall that the survey questionnaire only asked agencies to provide their average PCI; however, they did not include the distribution of pavements in different conditions. As was explained in Chapter 3, 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 percentage 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. Most of the 128 agencies came from agencies came from the San Francisco Bay area, since MTC was able to provide this detailed breakdown readily. However, we also included data from rural agencies to ensure that we had a representative sample.

The condition categories are defined as:

- Category I (PCI from 70 to 100)
- Category II (PCI from 50 to 69)
- Category III (PCI from 25 to 49)
- Category IV (PCI from 0 to 24)

These categories were based on widely accepted industry standards as well as from the survey responses (see Figure B.1).

For each condition category, a best-fit curve was developed to calculate the pavement area percentages. Figures B.2 to B.5 present the graphs showing the best-fit curves and the actual data points from the 128 agencies. These curves were used to develop the pavement percentages in Table B.1 (PCI Distribution Table).


**Figure B.1 PCI Categories**

Since the average PCIs for most of the jurisdictions in California fall between 50 to 85, this portion of the table was used most frequently. Figure B.6 shows that the middle two quartiles of the PCIs from the surveys falls between 60 and 75.

In this step, we used the PCI distribution table (Table B.1) to look up the distribution of pavement areas in the four condition categories.

- The average PCI for County X's major roads is 78. From Table B.1, for a PCI of 78, the pavement areas in Condition Category I, II, III and IV are 79.0%, 15.10%, 4.9% and 1.0% of the total area of the major roads, respectively. This row is highlighted in yellow.

- The average PCI of County X's local roads is 73. From Table B.1, for a PCI of 73, the pavement areas in Condition Category I, II, III and IV are 69.2%, 18.6%, 9.7% and 2.5%, respectively. This row is highlighted in yellow.

**Table B.1 PCI Distribution Table**

| PCI | Pavement Area (%) | | | | |
|---|---|---|---|---|---|
| | Condition Category I (PCI: 70 to 100) | Condition Category II (PCI: 50 to 69) | Condition Category III (PCI: 25 to 49) | Condition Category IV (PCI: 0 to 24) | Total |
| 0 | 0.0 | 0.0 | 0.0 | 100.0 | 100.0 |
| 1 | 0.4 | 0.0 | 1.1 | 98.5 | 100.0 |
| 2 | 0.7 | 0.0 | 2.3 | 97.0 | 100.0 |
| 3 | 1.1 | 0.0 | 3.4 | 95.5 | 100.0 |
| 4 | 1.5 | 0.0 | 4.5 | 94.0 | 100.0 |
| 5 | 1.9 | 0.0 | 5.6 | 92.5 | 100.0 |
| 6 | 2.2 | 0.0 | 6.8 | 91.0 | 100.0 |
| 7 | 2.6 | 0.0 | 7.9 | 89.5 | 100.0 |
| 8 | 3.0 | 0.0 | 9.0 | 88.0 | 100.0 |
| 9 | 3.4 | 0.0 | 10.1 | 86.5 | 100.0 |
| 10 | 3.7 | 0.0 | 11.3 | 85.0 | 100.0 |
| 11 | 4.1 | 0.0 | 12.4 | 83.5 | 100.0 |
| 12 | 4.5 | 0.0 | 13.5 | 82.0 | 100.0 |
| 13 | 4.9 | 0.0 | 14.6 | 80.5 | 100.0 |
| 14 | 5.3 | 0.0 | 15.8 | 78.9 | 100.0 |
| 15 | 5.7 | 0.0 | 16.9 | 77.4 | 100.0 |
| 16 | 6.1 | 0.0 | 18.0 | 75.9 | 100.0 |
| 17 | 6.4 | 0.1 | 19.1 | 74.4 | 100.0 |
| 18 | 6.7 | 0.1 | 20.3 | 72.9 | 100.0 |
| 19 | 7.0 | 0.2 | 21.4 | 71.4 | 100.0 |
| 20 | 7.4 | 0.2 | 22.5 | 69.9 | 100.0 |
| 21 | 7.7 | 0.3 | 23.6 | 68.4 | 100.0 |
| 22 | 8.0 | 0.3 | 24.8 | 66.9 | 100.0 |
| 23 | 8.3 | 0.4 | 25.9 | 65.4 | 100.0 |
| 24 | 8.7 | 0.4 | 27.0 | 63.9 | 100.0 |
| 25 | 9.1 | 0.4 | 28.1 | 62.4 | 100.0 |
| 26 | 9.3 | 0.5 | 29.3 | 60.9 | 100.0 |
| 27 | 9.7 | 0.5 | 30.4 | 59.4 | 100.0 |

**Table B.1 PCI Distribution Table (cont'd)**

| PCI | Pavement Area (%) | | | | |
|---|---|---|---|---|---|
| | Condition Category I (PCI: 70 to 100) | Condition Category II (PCI: 50 to 69) | Condition Category III (PCI: 25 to 49) | Condition Category IV (PCI: 0 to 24) | Total |
| 28 | 10.0 | 0.6 | 31.5 | 57.9 | 100.0 |
| 29 | 10.4 | 0.6 | 32.6 | 56.4 | 100.0 |
| 30 | 10.6 | 0.7 | 33.8 | 54.9 | 100.0 |
| 31 | 11.5 | 2.1 | 33.5 | 52.9 | 100.0 |
| 32 | 12.4 | 3.4 | 33.3 | 50.9 | 100.0 |
| 33 | 13.3 | 4.7 | 33.0 | 49.0 | 100.0 |
| 34 | 14.1 | 6.0 | 32.8 | 47.1 | 100.0 |
| 35 | 15.1 | 7.2 | 32.5 | 45.2 | 100.0 |
| 36 | 16.0 | 8.4 | 32.2 | 43.4 | 100.0 |
| 37 | 17.1 | 9.5 | 31.8 | 41.6 | 100.0 |
| 38 | 18.1 | 10.6 | 31.5 | 39.8 | 100.0 |
| 39 | 19.1 | 11.6 | 31.2 | 38.1 | 100.0 |
| 40 | 20.2 | 12.6 | 30.8 | 36.4 | 100.0 |
| 41 | 21.2 | 13.6 | 30.4 | 34.8 | 100.0 |
| 42 | 22.3 | 14.5 | 30.0 | 33.2 | 100.0 |
| 43 | 23.5 | 15.3 | 29.6 | 31.6 | 100.0 |
| 44 | 24.6 | 16.1 | 29.2 | 30.1 | 100.0 |
| 45 | 25.9 | 16.8 | 28.7 | 28.6 | 100.0 |
| 46 | 27.1 | 17.5 | 28.2 | 27.2 | 100.0 |
| 47 | 28.2 | 18.2 | 27.8 | 25.8 | 100.0 |
| 48 | 29.5 | 18.8 | 27.3 | 24.4 | 100.0 |
| 49 | 30.7 | 19.4 | 26.8 | 23.1 | 100.0 |
| 50 | 32.1 | 19.9 | 26.2 | 21.8 | 100.0 |
| 51 | 33.5 | 20.3 | 25.7 | 20.5 | 100.0 |
| 52 | 34.8 | 20.8 | 25.1 | 19.3 | 100.0 |
| 53 | 36.3 | 21.1 | 24.5 | 18.1 | 100.0 |
| 54 | 37.5 | 21.5 | 24.0 | 17.0 | 100.0 |
| 55 | 39.1 | 21.7 | 23.3 | 15.9 | 100.0 |
| 56 | 40.5 | 22.0 | 22.7 | 14.8 | 100.0 |
| 57 | 42.0 | 22.1 | 22.1 | 13.8 | 100.0 |
| 58 | 43.5 | 22.3 | 21.4 | 12.8 | 100.0 |
| 59 | 45.0 | 22.4 | 20.8 | 11.8 | 100.0 |
| 60 | 46.6 | 22.4 | 20.1 | 10.9 | 100.0 |
| 61 | 48.1 | 22.4 | 19.4 | 10.1 | 100.0 |
| 62 | 49.9 | 22.3 | 18.6 | 9.2 | 100.0 |
| 63 | 51.5 | 22.2 | 17.9 | 8.4 | 100.0 |
| 64 | 53.0 | 22.1 | 17.2 | 7.7 | 100.0 |
| 65 | 54.8 | 21.9 | 16.4 | 6.9 | 100.0 |
| 66 | 56.5 | 21.7 | 15.6 | 6.2 | 100.0 |
| 67 | 58.2 | 21.4 | 14.8 | 5.6 | 100.0 |
| 68 | 60.0 | 21.0 | 14.0 | 5.0 | 100.0 |

**Table B.1 PCI Distribution Table (cont'd)**

| PCI | Pavement Area (%) | | | | |
|---|---|---|---|---|---|
| | Condition Category I (PCI: 70 to 100) | Condition Category II (PCI: 50 to 69) | Condition Category III (PCI: 25 to 49) | Condition Category IV (PCI: 0 to 24) | Total |
| 69 | 61.8 | 20.6 | 13.2 | 4.4 | 100.0 |
| 70 | 63.6 | 20.2 | 12.3 | 3.9 | 100.0 |
| 71 | 65.5 | 19.7 | 11.4 | 3.4 | 100.0 |
| 72 | 67.3 | 19.2 | 10.6 | 2.9 | 100.0 |
| 73 | 69.2 | 18.6 | 9.7 | 2.5 | 100.0 |
| 74 | 71.1 | 18.0 | 8.8 | 2.1 | 100.0 |
| 75 | 73.1 | 17.3 | 7.8 | 1.8 | 100.0 |
| 76 | 75.0 | 16.6 | 6.9 | 1.5 | 100.0 |
| 77 | 77.0 | 15.9 | 5.9 | 1.2 | 100.0 |
| 78 | 79.0 | 15.1 | 4.9 | 1.0 | 100.0 |
| 79 | 81.0 | 14.2 | 4.0 | 0.8 | 100.0 |
| 80 | 83.2 | 13.3 | 2.9 | 0.6 | 100.0 |
| 81 | 85.3 | 12.3 | 1.9 | 0.5 | 100.0 |
| 82 | 87.4 | 11.3 | 0.9 | 0.4 | 100.0 |
| 83 | 89.3 | 10.3 | 0.0 | 0.4 | 100.0 |
| 84 | 90.4 | 9.2 | 0.0 | 0.4 | 100.0 |
| 85 | 91.9 | 8.1 | 0.0 | 0.0 | 100.0 |
| 86 | 92.5 | 7.5 | 0.0 | 0.0 | 100.0 |
| 87 | 93.0 | 7.0 | 0.0 | 0.0 | 100.0 |
| 88 | 93.5 | 6.5 | 0.0 | 0.0 | 100.0 |
| 89 | 94.1 | 5.9 | 0.0 | 0.0 | 100.0 |
| 90 | 94.6 | 5.4 | 0.0 | 0.0 | 100.0 |
| 91 | 95.2 | 4.8 | 0.0 | 0.0 | 100.0 |
| 92 | 95.7 | 4.3 | 0.0 | 0.0 | 100.0 |
| 93 | 96.2 | 3.8 | 0.0 | 0.0 | 100.0 |
| 94 | 96.8 | 3.2 | 0.0 | 0.0 | 100.0 |
| 95 | 97.3 | 2.7 | 0.0 | 0.0 | 100.0 |
| 96 | 97.8 | 2.2 | 0.0 | 0.0 | 100.0 |
| 97 | 98.4 | 1.6 | 0.0 | 0.0 | 100.0 |
| 98 | 98.9 | 1.1 | 0.0 | 0.0 | 100.0 |
| 99 | 99.5 | 0.5 | 0.0 | 0.0 | 100.0 |
| 100 | 100.0 | 0.0 | 0.0 | 0.0 | 100.0 |

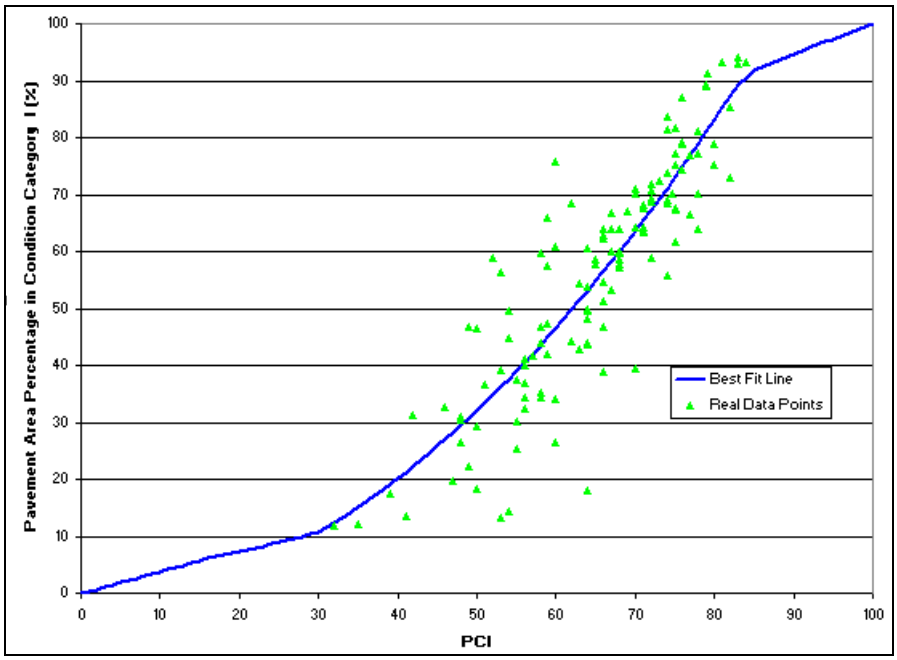


**Figure B.2 Pavement Area Distribution in Condition Category I**

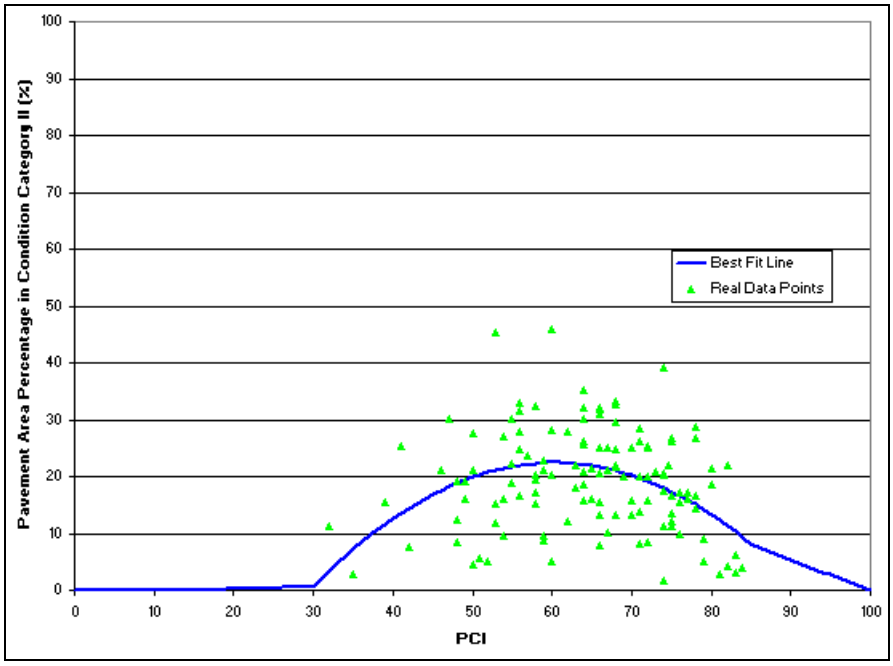


**Figure B.3 Pavement Area Distribution in Condition Category II**

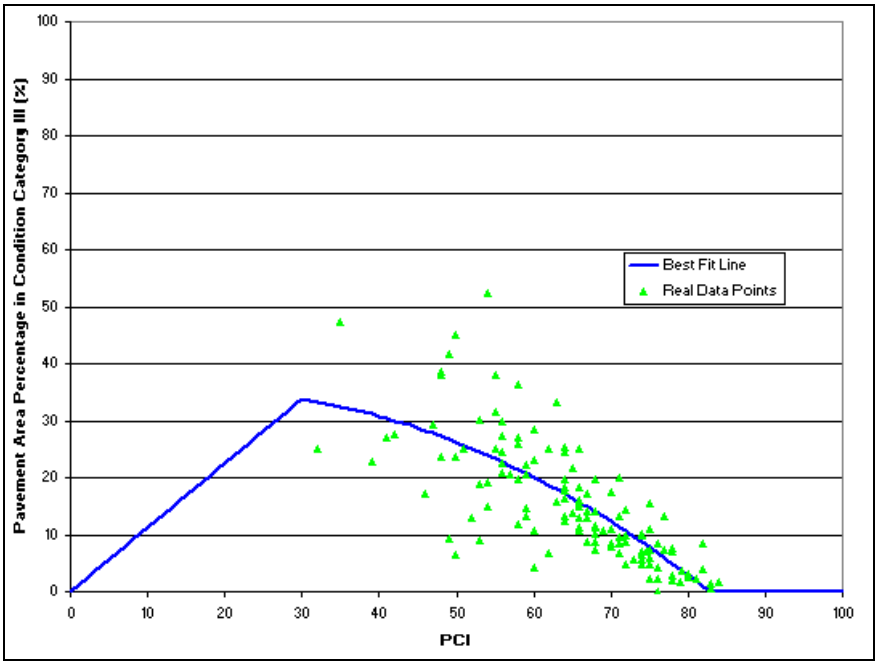


**Figure B.4 Pavement Area Distribution in Condition Category III**

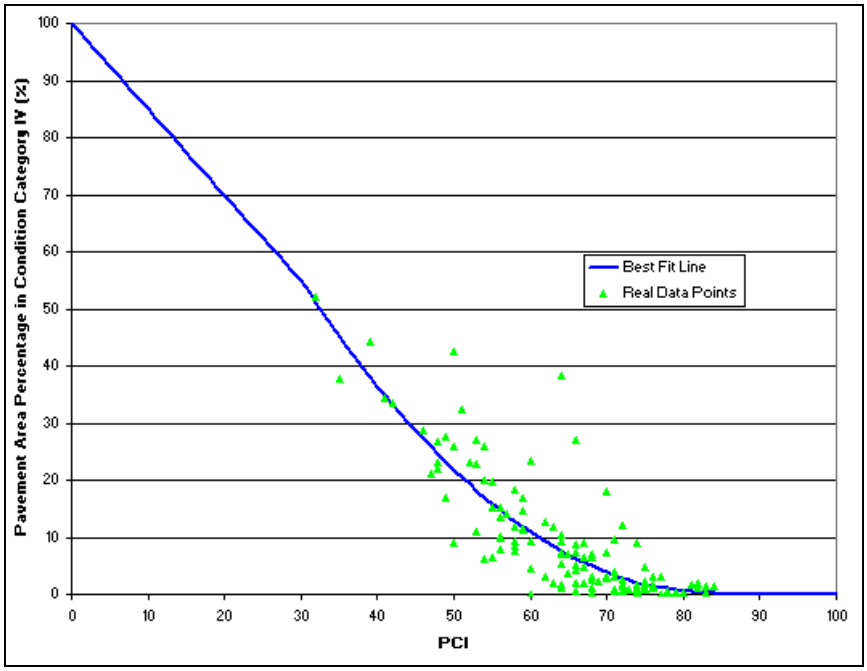


**Figure B.5 Pavement Area Distribution in Condition Category IV**

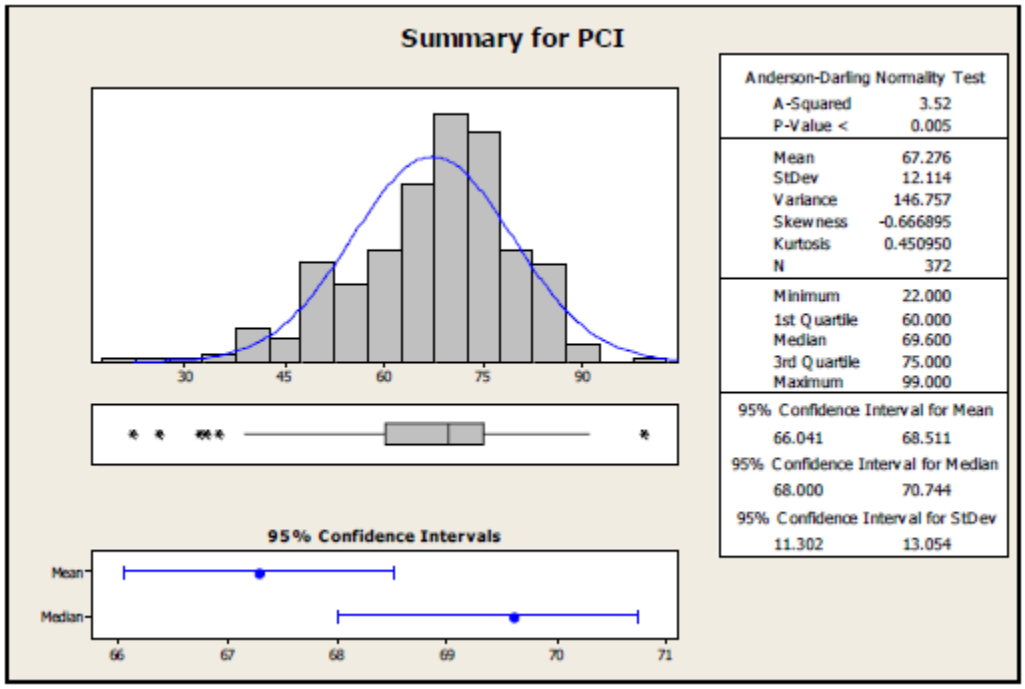


**Figure B.6 PCI Distribution for California Cities & Counties**

## Step 2: Calculate pavement areas and pavement area factors in each of the four condition categories for majors and locals.

Using the pavement area percentages determined in Step 1, Tables B.2 (major roads) and B.3 (local roads) illustrate the pavement area factor calculations used in this example.

**Table B.2 Pavement Area Factors(Major Roads)**

| (1) | (2) | (3) | (4) |
|---|---|---|---|
| Condition Category | Pavement Area % | Pavement Area (sq. yd.) [24,000,000 x Column (2)/100] | Pavement Area Factor [ Column (3)/10,000 ] |
| I | 79.0 | 18,960,000 | 1896.00 |
| II | 15.1 | 3,624,000 | 362.40 |
| III | 4.9 | 1,176,000 | 117.60 |
| IV | 1.0 | 240,000 | 24.00 |
| Total | 100 | 24,000,000 | 2,400.00 |

**Table B.3 Pavement Area Factors (Local Roads)**

| (1) | (2) | (3) | (4) |
|---|---|---|---|
| Condition Category | Pavement Area % | Pavement Area (sq. yd.) [13,400,000 x Column (2)/100] | Pavement Area Factor [ Column (3)/10,000 ] |
| I | 69.2 | 9,272,800 | 927.28 |
| II | 18.6 | 2,492,400 | 249.24 |
| III | 9.7 | 1,299,800 | 129.98 |
| IV | 2.5 | 335,000 | 33.50 |
| Total | 100 | 13,400,000 | 1,340.00 |

## Step 3: Look up benchmark results to determine pavement needs.

In order to determine the pavement needs for all the scenarios, benchmark databases were created to determine the needs for a standard 10,000 sq. yds. of pavements. Table B.4 summarizes the eight (8) benchmark databases that were created.

**Table B.4 Benchmark Databases**

| Database No. | Functional Class | Condition Category | PCI Range |
|---|---|---|---|
| 1 | Major | I | 70 – 100 |
| 2 | Major | II | 50 – 69 |
| 3 | Major | III | 25 – 49 |
| 4 | Major | IV | 0 – 24 |
| 5 | Local | I | 70 – 100 |
| 6 | Local | II | 50 – 69 |
| 7 | Local | III | 25 – 49 |
| 8 | Local | IV | 0 – 24 |

MTC's StreetSaver® program was used to determine the cost to reach the (BMP) goal in 10 years.

Each benchmark databases included the maintenance and rehabilitation (M&R) decision tree and costs discussed in Chapter 3. 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 that treatment. This is typically described as a decision tree.

Figure B.7 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 B.7 are generally accepted industry standards.

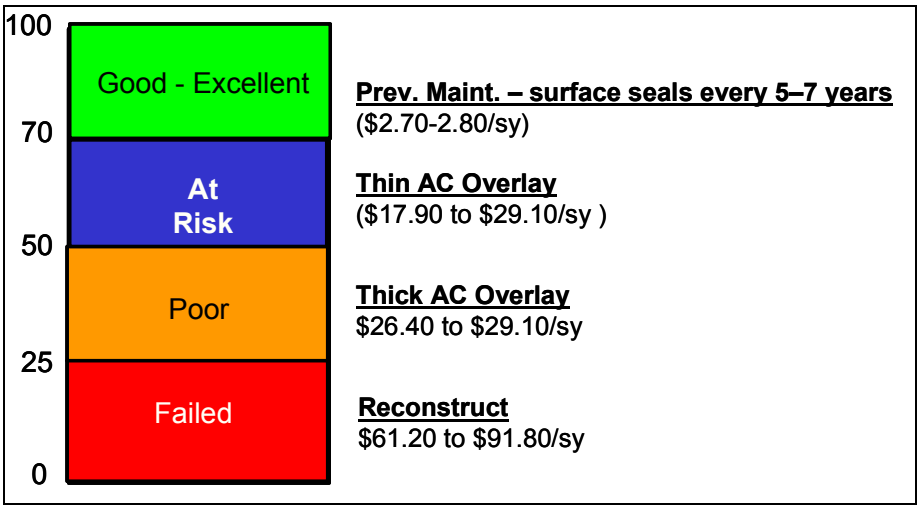


**Figure B.7 Final M&R Tree and Unit Costs**

Multiple treatments may occur within the analysis period. For example, if Main Street were reconstructed in 2012, typical treatments over the 10-year analysis period may include a slurry seal every 7 years in order 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 B.7 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.

In the development of the statewide needs estimate, benchmark templates were developed for the analysis that were used for the needs calculations for each agency. By utilizing the pavement area factors for each agency and the benchmark templates, their needs are determined. The calculations assume that the BMP goal is reached and the backlog eliminated within the analysis period i.e. 10 years.

Table B.5 contains the pavement needs and backlog results. Each column is further described below:

- Year: 1 to 10. The analysis period is 10 years.

- Major Roads/Local Roads: The analysis was separate for major roads and local roads and so are the results;
- Condition Category I/II/III/IV: The results are further presented under each of the four Condition Categories.
- Needs: Each year's pavement needs or required budget to meet the goal.
- Backlog: Each year's unmet pavement maintenance and rehabilitation.
- Total: The needs are summed for the 10 years.

The calculations are detailed in Tables B.6 (major roads) and B.7 (local roads). For each condition category:

From Table B.6, the total pavement needs of County X's major roads are:

**$156,078,720 + $145,866,000 + $89,286,624 + $22,354,560 = $413,585,904**

From Table B.7, the total pavement needs of County X's local roads are:

**$58,251,730 + $68,017,596 + $66,617,350 + $20,755,260 = $213,641,936**

## Step 4: Calculate needs of unpaved roads

It is estimated that unpaved road needs is $9,800 per centerline mile per year. This is the average unpaved road needs from the statewide online survey. Since there are 100 centerline miles of unpaved roads in County X:

**Unpaved road needs = $9,800/yr/mile x 10 years x 100 miles = $9,800,000**

## Step 5: Sum up paved and unpaved needs

| | |
|---|---|
| Paved needs for major roads: | $413,585,904 |
| Paved needs for local roads: | $213,641,936 |
| Unpaved road needs: | $ 9,800,000 |
| **TOTAL** | **$637,027,840** |

Figure B.8 below presents cumulative needs by year. It shows that in order to reach the BMP goal in ten years, approximately $64 million is needed per year for the next ten years.

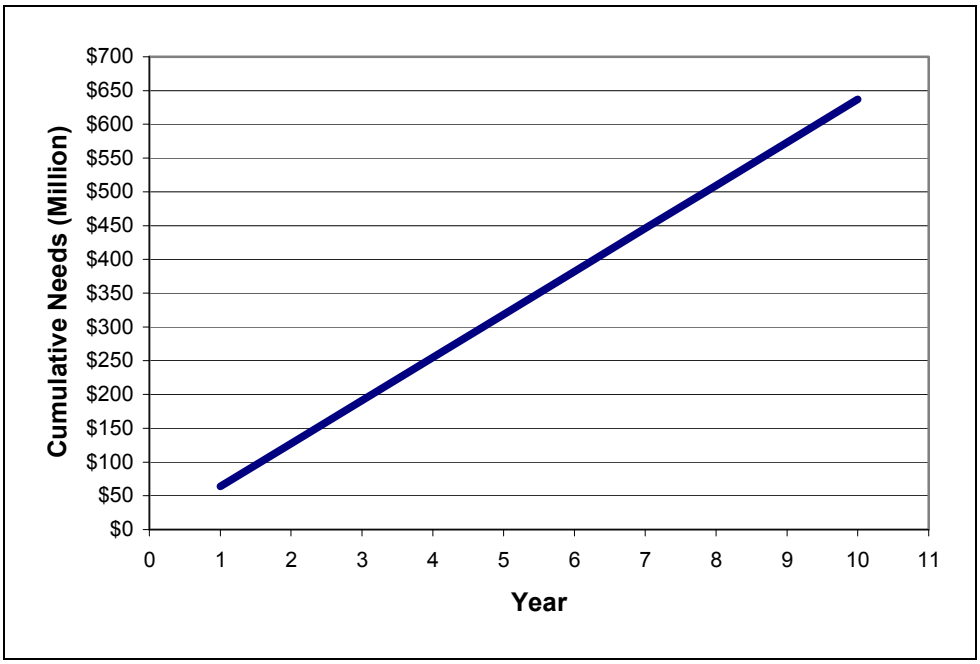


**Figure B.8 Cumulative Needs by Year**

## Table B.5 Benchmark Analysis Results: Reach the Best Management Practice (BMP) goal in 10 years

| Year | Major Roads | | | | | | | | Local Roads | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Condition Category I | | Condition Category II | | Condition Category III | | Condition Category IV | | Condition Category I | | Condition Category II | | Condition Category III | | Condition Category IV | |
| | Needs | Backlog | Needs | Backlog | Needs | Backlog | Needs | Backlog | Needs | Backlog | Needs | Backlog | Needs | Backlog | Needs | Backlog |
| 1 | $8,232 | $0 | $40,250 | $167,050 | $75,924 | $290,316 | $93,144 | $824,856 | $6,282 | $0 | $27,290 | $160,210 | $51,252 | $240,588 | $61,956 | $550,044 |
| 2 | $8,232 | $0 | $40,250 | $140,750 | $75,924 | $314,712 | $93,144 | $731,712 | $6,282 | $0 | $27,290 | $141,420 | $51,252 | $231,096 | $61,956 | $488,088 |
| 3 | $8,232 | $0 | $40,250 | $114,450 | $75,924 | $339,108 | $93,144 | $638,568 | $6,282 | $0 | $27,290 | $122,630 | $51,252 | $221,604 | $61,956 | $426,132 |
| 4 | $8,232 | $0 | $40,250 | $88,150 | $75,924 | $338,424 | $93,144 | $545,424 | $6,282 | $0 | $27,290 | $103,840 | $51,252 | $212,112 | $61,956 | $364,176 |
| 5 | $8,232 | $0 | $40,250 | $52,550 | $75,924 | $362,820 | $93,144 | $452,280 | $6,282 | $0 | $27,290 | $85,050 | $51,252 | $188,700 | $61,956 | $302,220 |
| 6 | $8,232 | $0 | $40,250 | $19,750 | $75,924 | $293,616 | $93,144 | $361,376 | $6,282 | $0 | $27,290 | $66,260 | $51,252 | $179,208 | $61,956 | $240,264 |
| 7 | $8,232 | $0 | $40,250 | $0 | $75,924 | $221,052 | $93,144 | $271,592 | $6,282 | $0 | $27,290 | $38,970 | $51,252 | $141,876 | $61,956 | $178,308 |
| 8 | $8,232 | $0 | $40,250 | $12,200 | $75,924 | $147,368 | $93,144 | $180,688 | $6,282 | $0 | $27,290 | $14,380 | $51,252 | $96,024 | $61,956 | $118,512 |
| 9 | $8,232 | $0 | $40,250 | $6,100 | $75,924 | $73,684 | $93,144 | $90,904 | $6,282 | $0 | $27,290 | $0 | $51,252 | $49,092 | $61,956 | $59,796 |
| 10 | $8,232 | $0 | $40,250 | $0 | $75,924 | $0 | $93,144 | $0 | $6,282 | $0 | $27,290 | $0 | $51,252 | $0 | $61,956 | $0 |
| Total | $82,320 | | $402,500 | | $759,240 | | $931,440 | | $62,820 | | $272,900 | | $512,520 | | $619,560 | |

## Table B.6 - Needs Calculation for County X (Major Roads)

| Year | Condition Category I | | | | | Condition Category II | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | |
| | Needs | Backlog | | Needs | Backlog | Needs | Backlog | | Needs | Backlog |
| 1 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $167,050 | 362.40 | $14,586,600 | $60,538,920 |
| 2 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $140,750 | 362.40 | $14,586,600 | $51,007,800 |
| 3 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $114,450 | 362.40 | $14,586,600 | $41,476,680 |
| 4 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $88,150 | 362.40 | $14,586,600 | $31,945,560 |
| 5 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $52,550 | 362.40 | $14,586,600 | $19,044,120 |
| 6 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $19,750 | 362.40 | $14,586,600 | $7,157,400 |
| 7 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $0 | 362.40 | $14,586,600 | $0 |
| 8 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $12,200 | 362.40 | $14,586,600 | $4,421,280 |
| 9 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $6,100 | 362.40 | $14,586,600 | $2,210,640 |
| 10 | $8,232 | $0 | 1896.00 | $15,607,872 | $0 | $40,250 | $0 | 362.40 | $14,586,600 | $0 |
| **Total** | | | | **$156,078,720** | | | | | **$145,866,000** | |

**Table B.6 - Needs Calculation for County X (Major Roads) (Continued)**

| Year | Condition Category III | | | | | Condition Category IV | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | |
| | Needs | Backlog | | Needs | Backlog | Needs | Backlog | | Needs | Backlog |
| 1 | $75,924 | $290,316 | 117.60 | $8,928,662 | $34,141,162 | $93,144 | $824,856 | 24.00 | $2,235,456 | $19,796,544 |
| 2 | $75,924 | $314,712 | 117.60 | $8,928,662 | $37,010,131 | $93,144 | $731,712 | 24.00 | $2,235,456 | $17,561,088 |
| 3 | $75,924 | $339,108 | 117.60 | $8,928,662 | $39,879,101 | $93,144 | $638,568 | 24.00 | $2,235,456 | $15,325,632 |
| 4 | $75,924 | $338,424 | 117.60 | $8,928,662 | $39,798,662 | $93,144 | $545,424 | 24.00 | $2,235,456 | $13,090,176 |
| 5 | $75,924 | $362,820 | 117.60 | $8,928,662 | $42,667,632 | $93,144 | $452,280 | 24.00 | $2,235,456 | $10,854,720 |
| 6 | $75,924 | $293,616 | 117.60 | $8,928,662 | $34,529,242 | $93,144 | $361,376 | 24.00 | $2,235,456 | $8,673,024 |
| 7 | $75,924 | $221,052 | 117.60 | $8,928,662 | $25,995,715 | $93,144 | $271,592 | 24.00 | $2,235,456 | $6,518,208 |
| 8 | $75,924 | $147,368 | 117.60 | $8,928,662 | $17,330,477 | $93,144 | $180,688 | 24.00 | $2,235,456 | $4,336,512 |
| 9 | $75,924 | $73,684 | 117.60 | $8,928,662 | $8,665,238 | $93,144 | $90,904 | 24.00 | $2,235,456 | $2,181,696 |
| 10 | $75,924 | $0 | 117.60 | $8,928,662 | $0 | $93,144 | $0 | 24.00 | $2,235,456 | $0 |
| **Total** | | | | **$89,286,624** | | | | | **$22,354,560** | |

**Table B.7 - Needs Calculation for County X (Local Roads)**

| Year | Condition Category I | | | | | Condition Category II | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | |
| | Needs | Backlog | | Needs | Backlog | Needs | Backlog | | Needs | Backlog |
| 1 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $160,210 | 249.24 | $6,801,760 | $39,930,740 |
| 2 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $141,420 | 249.24 | $6,801,760 | $35,247,521 |
| 3 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $122,630 | 249.24 | $6,801,760 | $30,564,301 |
| 4 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $103,840 | 249.24 | $6,801,760 | $25,881,082 |
| 5 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $85,050 | 249.24 | $6,801,760 | $21,197,862 |
| 6 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $66,260 | 249.24 | $6,801,760 | $16,514,642 |
| 7 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $38,970 | 249.24 | $6,801,760 | $9,712,883 |
| 8 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $14,380 | 249.24 | $6,801,760 | $3,584,071 |
| 9 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $0 | 249.24 | $6,801,760 | $0 |
| 10 | $6,282 | $0 | 927.28 | $5,825,173 | $0 | $27,290 | $0 | 249.24 | $6,801,760 | $0 |
| **Total** | | | | **$58,251,730** | | | | | **$68,017,596** | |

**Table B.7 - Needs Calculation for County X (Local Roads) (Continued)**

| Year | Condition Category III | | | | | Condition Category IV | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | | from Benchmark Results | | Area Factor | Actual (benchmark results x area factor) | |
| | Needs | Backlog | | Needs | Backlog | Needs | Backlog | | Needs | Backlog |
| 1 | $51,252 | $240,588 | 129.98 | $6,661,735 | $31,271,628 | $61,956 | $550,044 | 33.50 | $2,075,526 | $18,426,474 |
| 2 | $51,252 | $231,096 | 129.98 | $6,661,735 | $30,037,858 | $61,956 | $488,088 | 33.50 | $2,075,526 | $16,350,948 |
| 3 | $51,252 | $221,604 | 129.98 | $6,661,735 | $28,804,088 | $61,956 | $426,132 | 33.50 | $2,075,526 | $14,275,422 |
| 4 | $51,252 | $212,112 | 129.98 | $6,661,735 | $27,570,318 | $61,956 | $364,176 | 33.50 | $2,075,526 | $12,199,896 |
| 5 | $51,252 | $188,700 | 129.98 | $6,661,735 | $24,527,226 | $61,956 | $302,220 | 33.50 | $2,075,526 | $10,124,370 |
| 6 | $51,252 | $179,208 | 129.98 | $6,661,735 | $23,293,456 | $61,956 | $240,264 | 33.50 | $2,075,526 | $8,048,844 |
| 7 | $51,252 | $141,876 | 129.98 | $6,661,735 | $18,441,042 | $61,956 | $178,308 | 33.50 | $2,075,526 | $5,973,318 |
| 8 | $51,252 | $96,024 | 129.98 | $6,661,735 | $12,481,200 | $61,956 | $118,512 | 33.50 | $2,075,526 | $3,970,152 |
| 9 | $51,252 | $49,092 | 129.98 | $6,661,735 | $6,380,978 | $61,956 | $59,796 | 33.50 | $2,075,526 | $2,003,166 |
| 10 | $51,252 | $0 | 129.98 | $6,661,735 | $0 | $61,956 | $0 | 33.50 | $2,075,526 | $0 |
| **Total** | | | | **$66,617,350** | | | | | **$20,755,260** | |