

## **EXECUTIVE SUMMARY**

The City of Carpinteria currently maintains approximately 28 centerline miles representing 5,466,457 square feet of pavement. This represents an asset with a replacement value of approximately \$68,422,000 as calculated by StreetSaver®.

Pavement Engineering Inc. (PEI) updated the Pavement Management Program (PMP) for the City of Carpinteria using the Metropolitan Transportation Commission's (MTC) StreetSaver® program. The purpose of a PMP program is to track inventory, store work history and furnish estimated budgets to optimize funding that create the most positive condition impact on the entire pavement system.

## **INTRODUCTION**

A Pavement Management Program (PMP) has several distinctive uses as a budgeting and inventory tool, while also providing a record of pavement condition. The primary use of any PMP is a budgeting tool. Treatment costs are typically developed utilizing recently bid projects by the participating agency so that budgets reflect historical costs for the area. As an inventory tool, the PMP provides a quick and easy reference on pavement areas and usages. As a pavement condition record, it provides age, load-related, non-load related and climate related pavement condition and deterioration information. The PMP utilizes pavement deterioration curves, based on nationwide research, which allows the program to predict a pavement's future condition.

A PMP system is not capable of providing detailed engineering designs for a street. The PMP instead helps the user to identify potential repair and maintenance candidate streets. Further investigation, or project level analysis, of these candidate streets is suggested to optimize the City's pavement management dollars. Project level pavement analysis and engineering is an essential feature of future pavement maintenance and rehabilitation projects. Project level engineering examines the pavements in significantly more detail than the visual evaluation required for the PMP system and provides optimization of the design given all of the peculiar constraints of the project streets.

While updating the PMP for the City of Carpinteria, PEI had four primary goals. These are as follows:

- I. Provide an accurate and complete inventory of the City's pavements and condition.
- II. Identify and quantify maintenance and rehabilitation needs and costs for the street system.
- III. Develop candidate streets lists based on various future budget scenarios.
- IV. Provide on-going training and assistance.

**WORK PERFORMED**

Pavement Distress Survey and Database Update

For this update, PEI performed inspections on all city maintained streets. Field inspections were completed by April 2013.

PEI measured the following distress types as part of our review: Alligator Cracking (Fatigue), Block Cracking, Distortions, Longitudinal & Transverse Cracking, Patching & Utility Cut Patching, Rutting / Depressions, and Weathering & Raveling. All of the collected data was entered into the City's MTC StreetSaver® PMS database.

As part of our field review, all of the streets were measured to confirm lengths and widths. Lengths were measured using a vehicle mounted, electronic measuring vice and widths were measured using a hand held measuring wheel. Measurement discrepancies were tabulated and reviewed with the City to determine if corrections were needed, as part of our update.

PEI performed a QC check on our work. The QC check consisted of performing a field review of any street segment where the PCI showed a decrease of 10 or more PCI points or an increase of 5 or more PCI points when compared to the last inspected PCI for the same road segment. Segments that met this criteria were visually reviewed to determine if the StreetSaver® calculated PCI was representative of the observed overall pavement condition for that road segment. Variations found were re-inspected and the street's PCI was re-calculated.

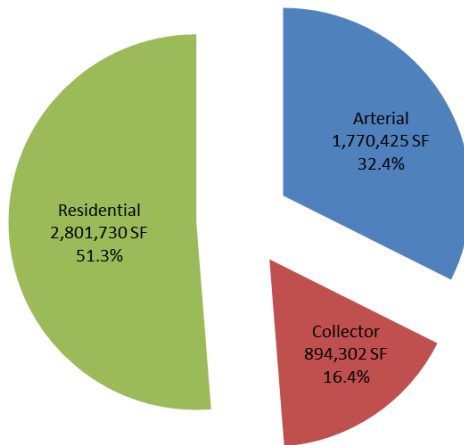
**FINDINGS**

The updated PMP showed that the City's overall weighted PCI is 67. The breakdown by functional classification is as follows:

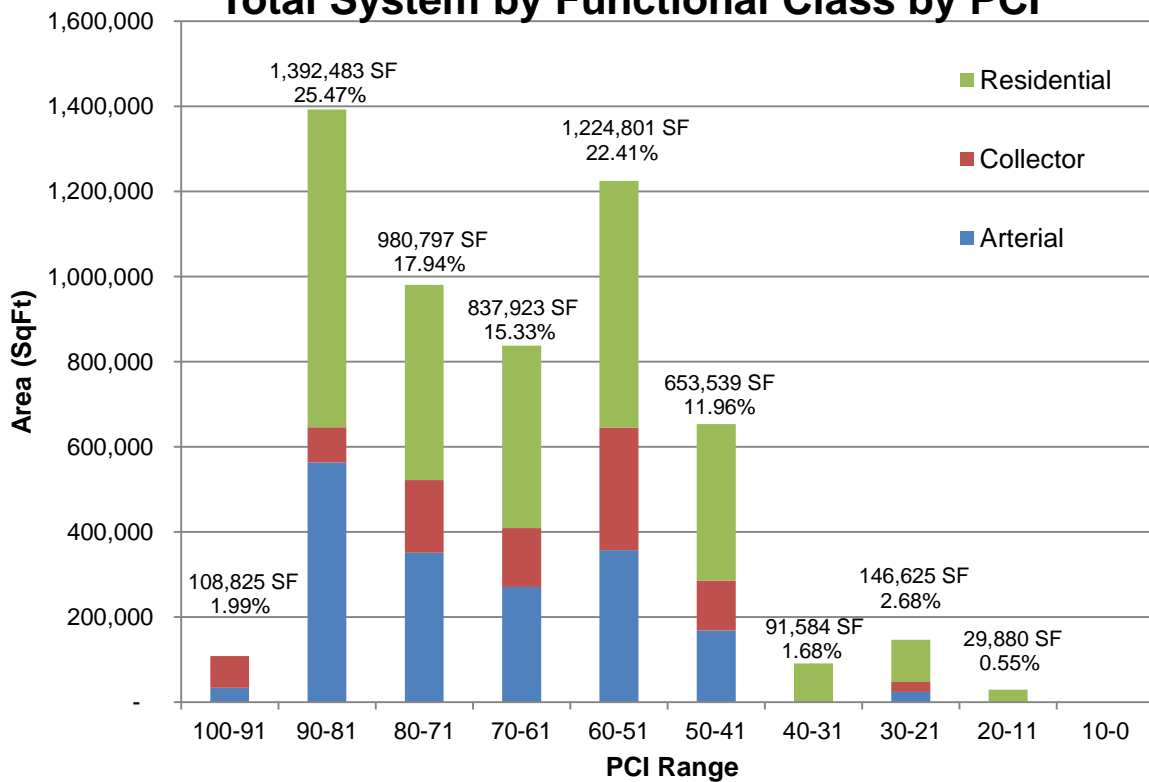
<b>Street Classification</b>	<b>Centerline Miles</b>	<b>Area (Square Feet)</b>	<b>Percent of System</b>	<b>Average PCI</b>
Arterials	7.29	1,770,425	32.4%	70
Collectors	4.71	894,302	16.4%	66
Residentials	15.87	2,801,730	51.0%	65
Total	27.87	5,466,457	100%	67

To illustrate the breakdown of the classifications, the following pie chart shows the percentage of each Functional Classification and the bar chart indicates Function Classification by PCI ranges.

**Total System by Functional Class**



**Total System by Functional Class by PCI**



The breakdown by PCI point range is indicated below:

<b>Condition</b>	<b>PCI Range</b>	<b>Percent of System</b>
Excellent	100 - 91	1.99%
Good	90 - 71	43.42%
Fair	70 - 51	37.73%
Poor	50 - 31	13.63%
Failed	30 - 0	3.23%

The analysis shows that 81.1% of the City's pavement is in good to fair condition. Details of each street segment are provided in “**Reference Reports**”.

## **BUDGET ANALYSIS**

StreetSaver® assigns a treatment action and estimated cost to each street segment based on the pavement's current PCI. For this update, several scenarios were analyzed. The findings of the various scenarios are summarized below:

### **Unconstrained or Needs Budget**

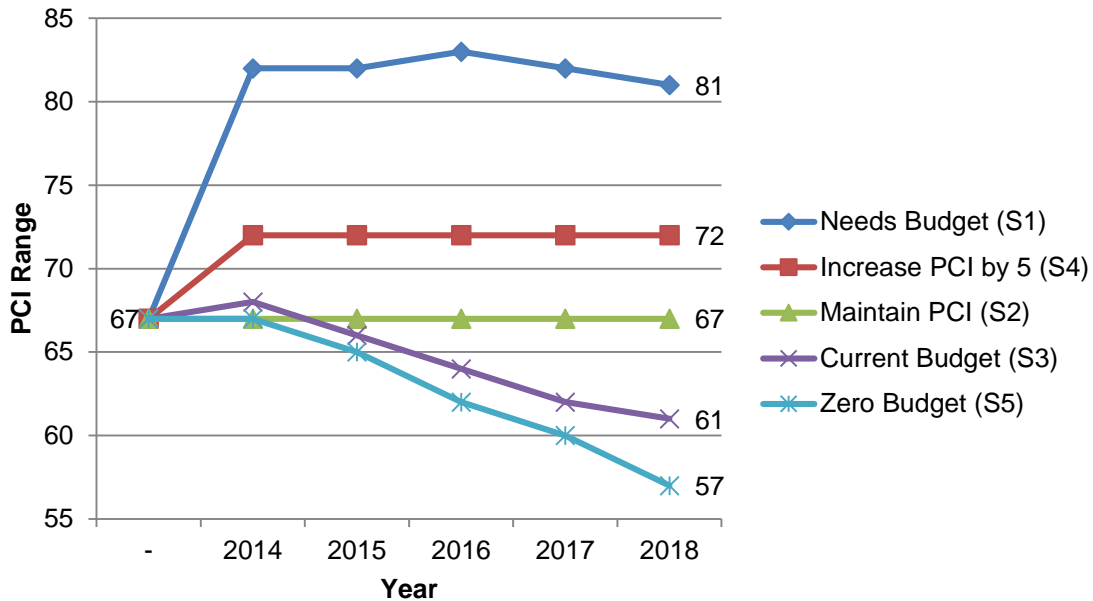
As an initial starting point, it is always helpful to calculate the overall needs of the entire system. For the “Needs” analysis, the PMP computes the next recommended treatment for each street segment, the year the treatment would be applied and the estimated cost of the treatment. The total “Needs” cost for 5 years is \$12,894,283 and \$18,975,794 for 10 years. Spending this amount of money would bring the total system to a PCI of 81 over the next 5 years and 10 years respectively. We have found that this level of funding is typically far beyond available resources.

To gain a more realistic analysis of impact on various levels of funding, additional budget scenarios have been prepared. These include:

- 1) Amount of funds needed to maintain current PCI,
- 2) Impact of the current funding amount,
- 3) Budget needed to increase the overall PCI level by 5 points and
- 4) What happens if zero dollars are spent on the City's street system.

For each of these scenarios, 5 and 10-year projections were performed. Graphical representations for each scenario are shown below.

## 5 Year Projection

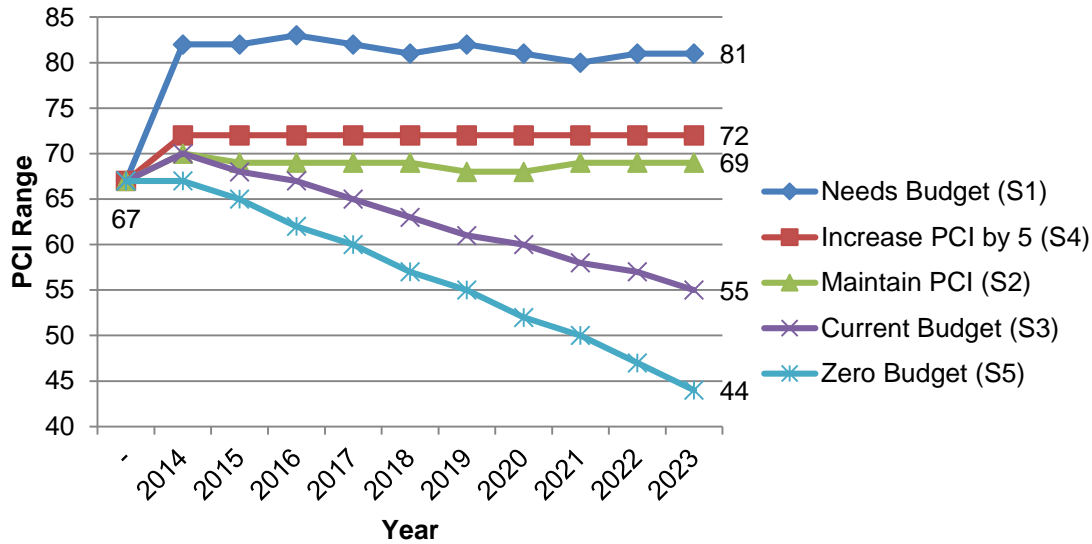


A brief summary of the 5-year scenarios are as follows:

- Scenario 1 (S1): Represents the budget required based on the “Needs” of the system. Assumes all pavements are treated at their optimum timing. (Approximately - \$12.9M/yr; increases the PCI from 67 to 81).
- Scenario 2 (S2): Amount of funding to maintain current PCI of 67 - \$900,000/yr
- Scenario 3 (S3): Impact of the current funding amount (averaging around \$300,000/yr) - Using 5% of the money for preventative maintenance, the current PCI would decline from 67 to 61, a 6 point overall drop.
- Scenario 4 (S4): Budget to increase overall PCI level by 5 points - \$1,400,000/yr (raises the PCI from 67 to 72).
- Scenario 5 (S5): Represents the impact to the PCI if Zero dollars are spent.

The full reports for the various budget scenarios can be found in “**Appendix B**” of this report. Below is a graph that illustrates the five scenarios for a 10-year projection.

## 10 Year Projection

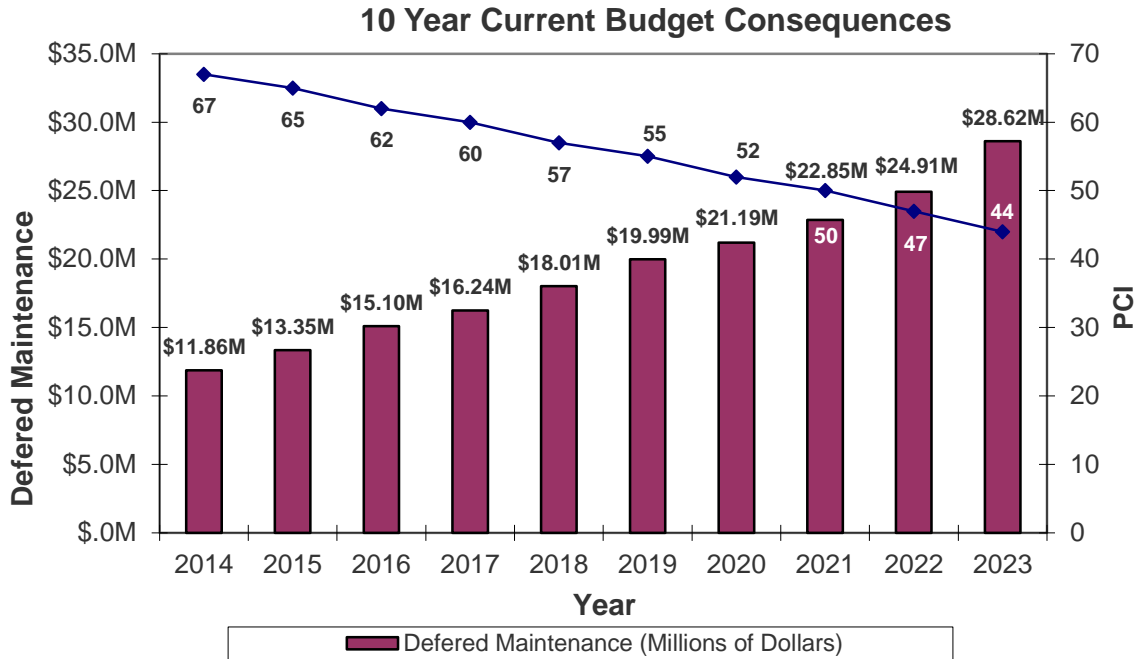


A brief summary of the 10-year scenarios are as follows:

- Scenario 1 (S1):** Represents the budget required based on the “Needs” of the system. Assumes all pavements are treated at their optimum timing. (Approximately - \$19M/yr; increases the PCI from 67 to 81).
- Scenario 2 (S2):** Amount to maintain current PCI of 67 - \$1.2M/yr
- Scenario 3 (S3):** Impact of current funding amount (averaging around \$300,000/yr) - Using 5% of the money for PM, the current PCI would decline from 67 to 55, a 12 point overall drop.
- Scenario 4 (S4):** Budget to increase overall PCI level by 5 points - \$1.4M/yr would raise the PCI from 67 to 72.
- Scenario 5 (S5):** Represents the impact to the PCI if Zero dollars are spent

The full reports for the various budget scenarios can be found in “**Appendix B**” of this report.

The following graph illustrates the consequences of the City's overall weighted PCI based on the current funding.



Annual Pavement Maintenance / Rehabilitation Program Development

At the City's request, PEI ran additional scenarios. The intent of the scenarios was to develop potential candidate streets for maintenance and rehabilitation based on various budgets. The budgets used were 1) Spending \$10 million over 5 years (\$2 million per year), 2) \$100k for one year, 3) \$200k for one year and 4) \$500k for one year. To assist the City with their decisions, PEI has provided a street list and map for each scenario.

**CONCLUSIONS AND RECOMMENDATIONS**

This Executive Summary has provided a review of the 2013 PMP Update work performed by PEI. PEI inspected and QC'd all of the road segments in the City. The overall average PCI for the City is 67. 81.1% of the City's pavement is in good to fair condition.

To maintain the system at its current overall PCI of 67, the City will need to expend \$900,000 annually.

Maintaining the current funding level of \$300,000 average annually, will result in a system PCI loss of 6 points in 5 years, and 12 points in 10 years, resulting in an overall rating of fair.



It should be noted, that the City's arterials and collectors are in better condition than the residential streets. The arterials have an average weighted PCI of 70 and the collectors have a weighted PCI of 66. This is the preferable way an agency's street system should look. The arterials should be in the best condition as they are what carry the bulk of the traffic and loading.

The City of Carpinteria's street system is in a position that requires attention. Over the next few years approximately one-third of its street system will be dropping from a Good condition to Fair condition if the pavement's needs are not addressed. This drop means the difference between spending "pennies per square foot" compared to "dollars per square foot."

To move forward, it is recommended that the City carefully evaluate the overall annual budget that they want to commit to pavement maintenance and rehabilitation projects. The City of Carpinteria will have to set priorities for each functional classification and perhaps certain streets within each classification. In addition, they should focus a portion of their street budget to performing preventative maintenance treatments on their pavements. The more limited the budget, the more important it is to perform pavement maintenance to protect the existing good pavements rather than rehabilitate older pavements.

The investment in the pavement management program will assist the City in its efforts to monitor treatments and track their effectiveness. This feedback will assist the City in setting priorities and treatment policies for their pavements in the future. It is suggested that the City update its pavement management program on a regular basis. PEI recommends that the entire system be reviewed every three years. As the City maintains and updates the pavement management program, the program will become a more valuable tool to the City in their efforts to maximize performance and minimize the funding for pavements.