TABLE OF CONTENTS

EXECUTIVE SUMMARY

In the November of 2015, Harris & Associates updated the Pavement Management Program (PMP) for Sonoma. Pavement condition evaluations were performed on all streets (approximately 34 centerline miles) except those that received major treatment since 2013. The PMP provides a management tool to inventory street pavement, assess pavement condition, record historical maintenance, forecast budget needs, and view impacts of funding on City-wide pavement condition over time.

The PMP is also a software-based tool for analyzing pavement conditions and recommending rehabilitation strategies based on funding levels. The software focuses on providing cost effective recommendations that enhance the overall system Pavement Condition Index (PCI). In general, asphalt pavement deteriorates over time by both traffic loading and weathering. The Metropolitan Transportation Commission (MTC) software recommends that about 27% of the budget be put to preventive maintenance treatments such as crack sealing, slurry seals, or thin overlays. The remaining budget is programmed for more expensive asphalt overlays and reconstruction. Why is preventive maintenance important? Preventive maintenance treatments sustain a street's PCI at a high level and at relatively low cost. Preventive maintenance treatments can be applied to many streets (large pavement area) with a positive effect of raising the system PCI for a fraction of the cost to asphalt overlay one street (small pavement area).

The City currently uses the Metropolitan Transportation Commission's (MTC) Pavement Management System StreetSaver® online version. The City uses the software to help make cost-effective decisions related to the road network, maximizing the City's return on investment from available maintenance and rehabilitation funds; generating a prioritized plan; and identifying specific areas in need of maintenance and rehabilitation.

- **Pavement mileage & replacement value**

  The City has approximately 34 miles of paved streets, divided into 300 pavement management segments. Following is the breakdown of Sonoma's street pavement mileage grouped by functional class:

Table 1

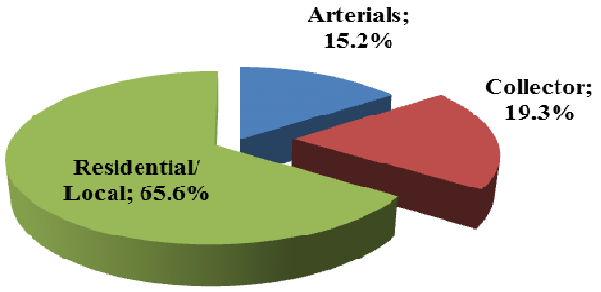
Sonoma's Streets By Functional Class			
Classification	**Total Sections**	**Total Center Line Miles**	**Total Lane Miles**
Arterials	34	5.13	10.81
Collector	48	6.51	13.02
Residential/Local	218	22.15	44.36
Totals	**300**	**33.79**	**68.28**

It is important to consider the overall investment the City has in its pavements. The unit cost for a very poor condition category (consisting of moderate base failure repair, removal of existing surface, and pavement overlay to reconstruction) is from $76.00 - $94.00 per square yard. The

cost to reconstruct all streets (Full replacement of the pavement, base, and structure of the streets) is over $55 million.

Figure 1

Percentage of Network (Total Centerline Miles)



Network Replacement Cost

Printed: 12/21/2015

Functional Class	Surface Type	Lane Miles	Unit Cost/ Square Foot	Pavement Area/ Square Feet	Cost To Replace (in thousands)
Arterial	AC	4.4	$10.44	461,035	$4,815
	AC/AC	6.4	$10.44	599,437	$6,261
Collector	AC	9.5	$10.44	840,280	$8,776
	AC/AC	3.5	$10.44	339,937	$3,550
Residential/Local	AC	34.5	$8.44	2,928,508	$24,729
	AC/AC	9.6	$8.44	856,518	$7,233
	ST	0.2	$8.44	9,712	$82
	Grand Total:	68.2		6,035,427	$55,447

- **Condition of Sonoma's Street Asphalt Pavement**

The PCI is an overall measure of the condition of the road surface based on a scale of zero (0) (failed) to one hundred (100) (excellent). The chart below relates PCI ranges to general pavement condition definitions.

PCI Ranges

PCI RANGE	CONDITION
90 - 100	Excellent
70 - 89	Very Good
50 - 69	Fair
25 - 49	Poor
0 - 24	Very Poor/Failed

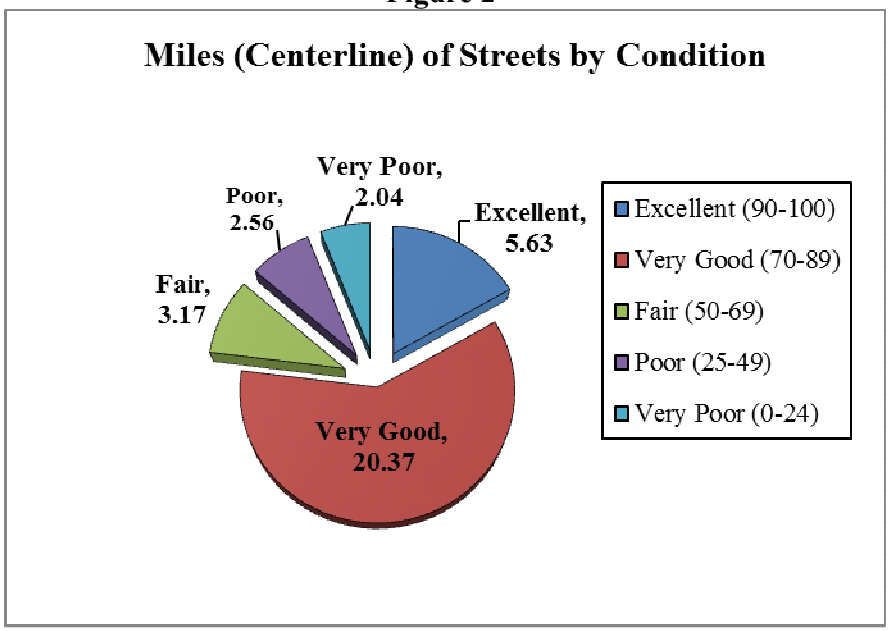
The City's average Pavement Condition Index (PCI) is 75 on a 100-point scale, with 100 being a new street. PCIs for the City's pavement network are based on a visual distress rating system‡. The overall condition of Sonoma's street pavement is in the range of MTC's designation "Very Good". The 2003 MTC State of Repair report states, "Approximately 75 percent of a pavement's serviceable life has been expended by the time its PCI rating falls to 60." Sonoma's average PCI condition value by street classification is as follows:

Table 2

PCI By Functional Class	
Classification	**2015 PCI***
Arterial	81
Collector	79
Residential/Local	72
TOTAL SYSTEM	**75**

The following figure 2 shows the City's total pavement mileage by condition.

Figure 2



‡Note: PCI weighted by area.
*Calculated by an algorithm developed by the Army Corps of Engineers.

Figure 3 is a PCI comparison of local agencies in Sonoma County.

Figure 3. Local Jurisdiction PCI Comparison

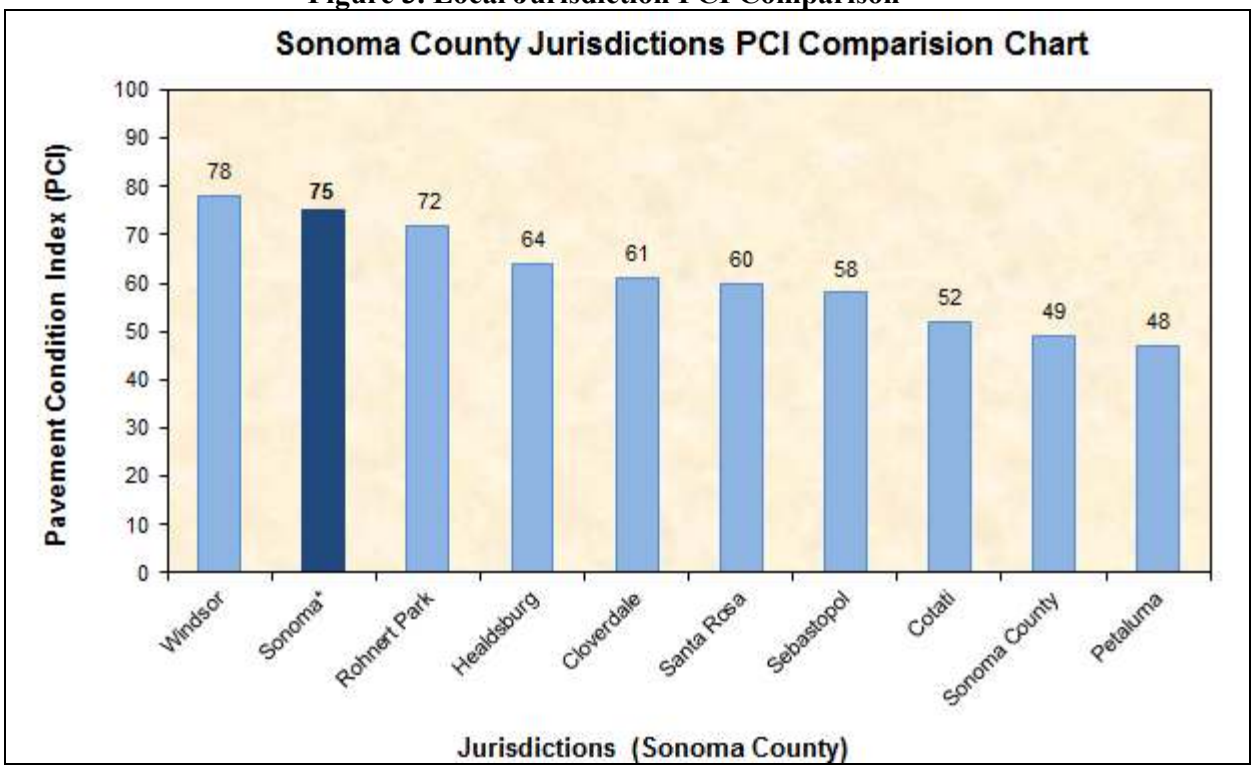


Table 3 describes the condition categories, their equivalent PCI range, and typical prescribed maintenance treatments:

The maintenance strategy described below is based on PCI scores and the corresponding condition category. Streets with PCI scores over 90 are considered to be in excellent condition and require no treatment. Streets with scores from 70 to 89 are considered "Very Good", but may require cracks to be sealed. Streets with scores from 50 to 69 are considered "Fair", but may require a 2" AC overlay w/ Material or microsurfacing and scrub seal. Streets with scores from 25 to 49 are considered "Poor" and generally require a, 2" - 3"mill and AC overlay w/ Material . Streets with scores 24 and below are "Very Poor" and are in need of a surface or structure reconstruct (AC).

Table 3

Sonoma's Maintenance Treatments		
Condition	**PCI Range**	**Typical Maintenance Treatment**
Excellent	90-100	Do Nothing.
Very Good	70-89	Seal Cracks, Slurry Seal, Thin AC Overlay 2" w/ Fabric
Fair	50-69	Crack Seal+Slurry Seal Type II, Edge Grind 2" Overlay w/ Fabric
Poor	25-49	3" Overlay w/ Fabric + 33% Digout
Very Poor	0-24	Reconstruct Structure

*Table 3 created by Harris & Associates based on feedback from the City.

In the present condition, about 6 miles in the "Excellent" category, 20 miles in the "Very Good" category, about 3 miles in the "Good" category, about 3 miles in the "Poor" category, and about 2 miles in the "Very Poor" category.

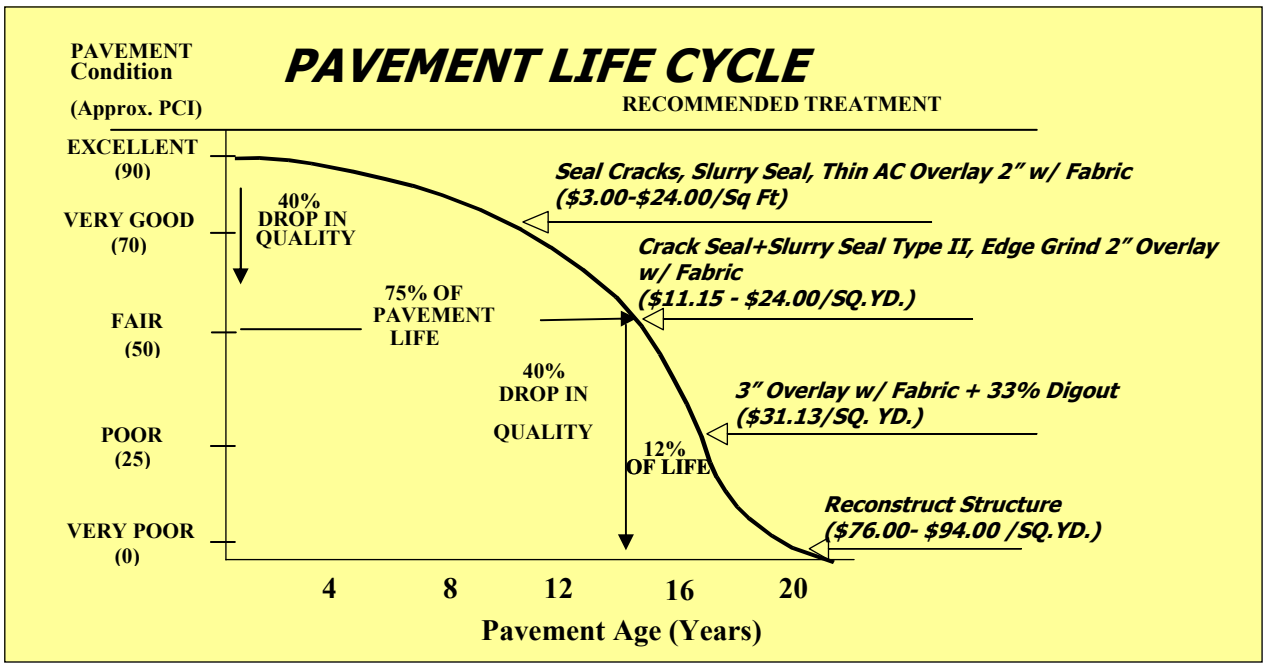
- **Budget Analysis**

Following the treatment strategy described in the table below and an inflation rate of 3%, the MTC PMP software generates a Budget Needs analysis. The Budget Needs analysis projects the total budget needed to bring the City's pavement system to a condition where most pavement sections require only minor preventive maintenance (i.e., PCI = 70 or higher). The following chart illustrates the cost effectiveness of keeping the pavement condition index above 70 for a typical street.

Table 4

Sonoma's Budget Needs Analysis						
Year	**2016**	**2017**	**2018**	**2019**	**2020**	**Totals**
PCI Treated	83	83	83	84	84	N/A
PCI Untreated	75	73	71	69	67	N/A
Preventative Maintenance	1.989	.097	.185	.384	.285	2.942
Rehab ($M)	3.337	1.059	1.254	1.385	.967	8.004
Total Needs ($M)	5.326	1.157	1.439	1.770	1.252	10.946

Figure 4



The current PCI is reduced annually based on this deterioration curve. Maintenance activities increase the PCI value as they are applied to the segment. The overall program is dynamic in that each strategy consists of a cyclic series of actions that simulates the pavement's anticipated life cycle. As shown in the above picture, a typical pavement section will deteriorate approximately 40% in the first 75% of its lifespan. However, that same pavement section, if untreated, will experience another 40% reduction in overall quality in only the next 12% of lifespan, effectively deteriorating an equivalent amount in only one-sixth (1/6) the time. As a result of this continued deterioration, the quantity and cost of the maintenance activities needed to rehabilitate the pavement will increase in both scope and costs. In other words, it is not simply "pay today or pay tomorrow", but rather a "pay today or pay more tomorrow" proposition. Overall pavement maintenance cost is reduced by the timely application of crack sealing, slurry seals and pavement overlays before the subgrade fails and requires a total pavement reconstruction.

To reach that level of minor preventive maintenance* in five (5) years, the Budget Needs analysis determined a total need of approximately $10.9 million for the years 2016-2020. See section IV-A for the Needs - Projected PCI/Cost Summary.

The Budget Needs Average is defined as the cumulative budget needs over the course of the analysis period ($10.9 million) divided by the number of years in the analysis period (5 years). For this study, the Budget Needs Average is $2.2 million per year. After the Budget Needs have been calculated, Budget Scenarios are run to determine the funding levels required to maintain and/or improve the current PCI level and generate a list of street maintenance for the next five (5) years. The software analyzes each pavement section and picks specific maintenance to maximize the improvement of the entire pavement system. Maintenance treatments are allocated to as many streets as the annual budget will allow. The budget scenarios tested were calculated utilizing a 27% fixed preventative-maintenance-split, 3% interest, and 3% inflation values.

For Sonoma, the following five annual budget scenarios were generated with 27% of the annual budget applied towards preventative maintenance, except for the Expected Annual Budget with a 25% of the annual budget applied for preventative maintenance:

1. $0 – No Funds (Do Nothing)
2. $500K – Expected Annual Budget w/ 25% PM
3. $900K Maintain PCI of 75
4. $1.6M Five Point Increase in PCI
5. $2.2M – Budget Needs Average

The MTC PMP software recommends spending 27% of the budget toward preventive maintenance because it is the optimum level according to the specific conditions of the City's system. This means that 27% of the annual budget is spent on crack seal, slurry seal, and thin overlays while the remainder of the budget is spent on overlays and reconstruction. These budgets do not account for stopgap maintenance repairs, such as emergency pothole repair.

- **Budget Analysis Results**

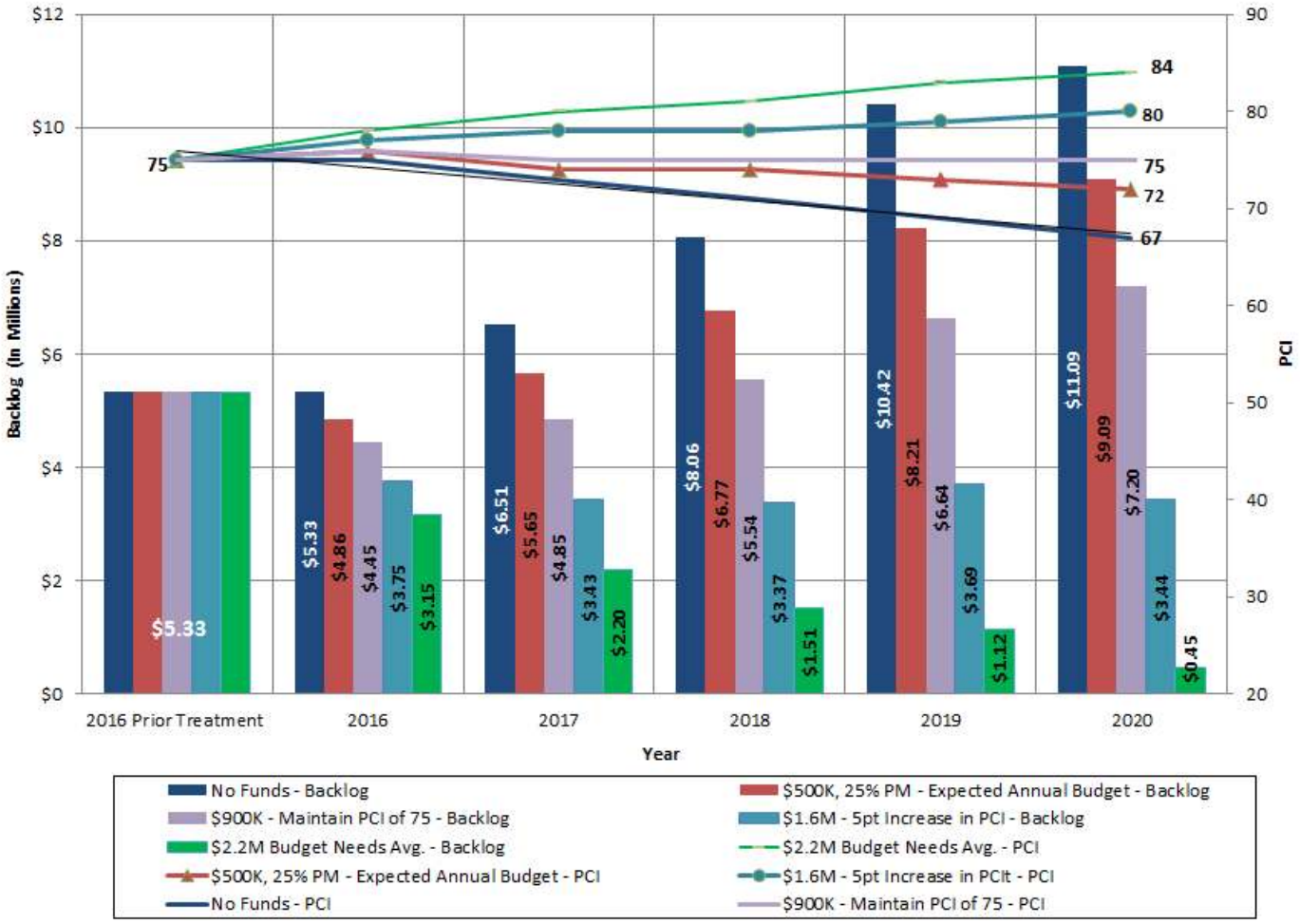
After the MTC PMP software analyzes the pavement system according to the specified annual budget over a period of five (5) years, trends are evident in the PCI and Deferred Maintenance backlog (the amount of necessary reconstruction and overlays not performed each year due to

budget constraints). An increase in deferred maintenance shows that necessary rehabilitation is not being performed. The total deferred maintenance in 2016 before any suggested maintenance is around $5 million. The following figure shows the impacts of the City's overall PCI and backlog for the 5 generated scenarios:

Deferred maintenance consists of pavement maintenance and that is needed, but it cannot be performed due to lack of funding. Shrinking budget has forced many agencies to differ much needed street maintenance. By differing maintenance not only does the frequency of resident complaints about the Condition of the network increase, but the cost to repair these streets rises as well. It is cost effective to keep pavement about a certain PCI because the cost to maintain the high PCI is less, than to bring a road segment with a low PCI to a high PCI.

** Preventive maintenance is a schedule of planned maintenance actions aimed at the prevention of failure of streets. These actions are designed to detect, preclude, or mitigate degradation of a streets segment. The goal of a preventive maintenance approach is to minimize degradation and thus sustain or extend the useful life of the street.*

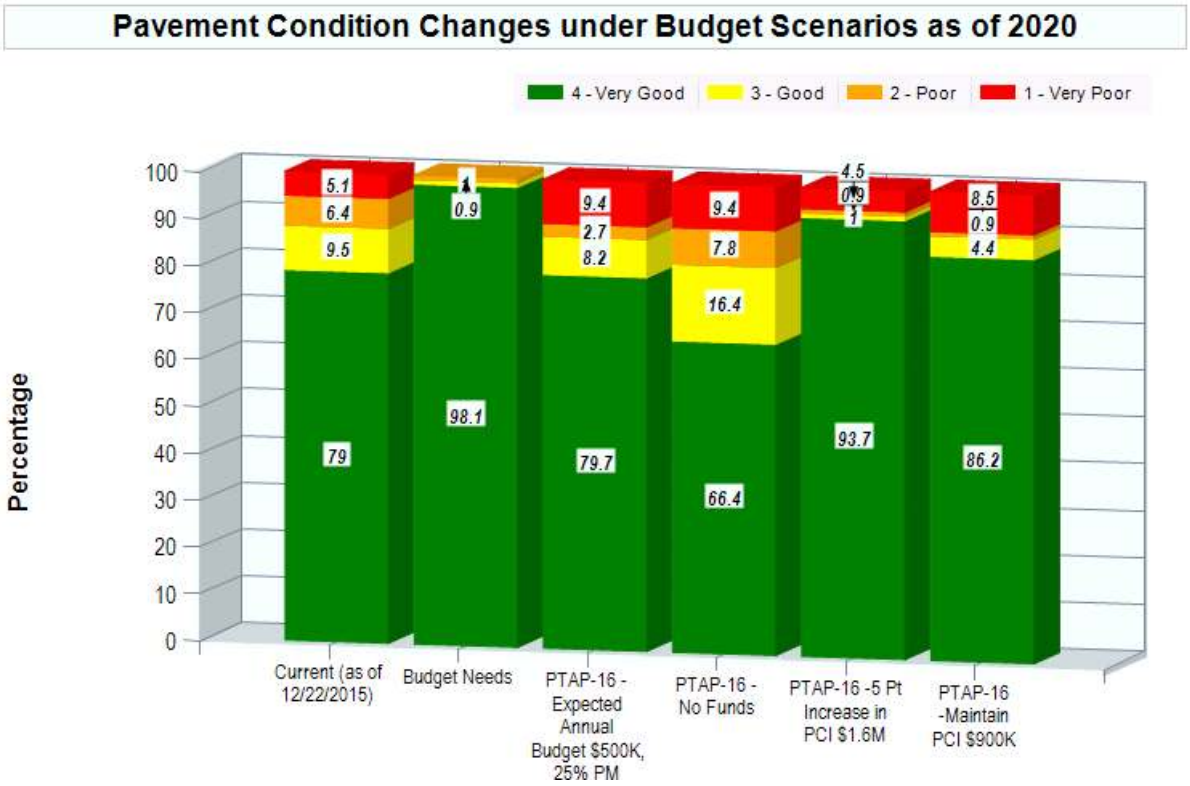
Figure 5



27% preventative maintenance was applied to all scenarios, except the Expected Annual Budget scenario in which 25% preventative maintenance was applied.

The Figure 6 and 7 contrasts the pavement changes under the analyzed budget scenarios. The percentage of the roads in the "*Poor"* and "*Very Poor"* condition categories must be monitored as these represent the greatest liability to the City in regards to expense and serviceability off this really costly public asset.

Figure 6



The following PCI values reflect the average PCI and deferred maintenance after suggested treatments are applied.

- $0 No Funds.
  PCI Trend: Decreases from 75 PCI in 2016 to 67 PCI in 2020.
  Deferred Maintenance Trend: Increases from $5.3 million in 2016 to $11.1 million in 2020.

- $500K Expected Annual Budget with 25% Preventative Maintenance
  PCI Trend: Decreases from a 75 PCI in 2016 to a 72 PCI in 2020.
  Deferred Maintenance Trend: Increases from $5.3 million in 2016 to $9.1 million in 2020.

- $900K Maintain PCI of 75 *PCI Trend*: From a 75 PCI in 2016 to a 75 PCI in 2020.
  Deferred Maintenance Trend: Increases from $5.3 million in 2016 to $7.2 million in 2020.

- $1.6M Five Point Increase in PCI
  PCI Trend: Increases from a 75 PCI in 2016 to an 80 PCI in 2020.
  Deferred Maintenance Trend: Decreases from $5.3 million in 2016 to $3.4 million in 2020.

- $2.2M - Budget Needs Average
  PCI Trend: Increases from a 75 PCI in 2016 to 84 PCI in 2020.
  Deferred Maintenance Trend: Decreases from $5.3 million in 2016 to $447 thousand in 2020.

Scenario charts (Figures 7 and 8) showing the impact of the five budgets on street condition and deferred maintenance backlog over five (5) year period is shown on the following pages and in Sections IV-B and IV-C. The Cost Summary Reports, which provide information on pavement funding distribution by pavement condition, and the Network Condition Summary Reports, which project pavement condition trends, can be found in Section IV-D.

♦ **Recommendations**

Harris & Associates recommends the Agency raise their annual budget to a minimum of $1 million. Spending this budget will begin an increasing trend in overall pavement condition while slowing the growth of the deferred maintenance backlog. At this budget level, the overall PCI will increase from a 75 PCI in 2016 to a 76 after treatments are applied in 2020.

The City should utilize cost effective treatments where appropriate, such as slurry seals and crack seal and continue to evaluate emerging cost effective techniques like rubberized chip seals, thin-bonded wearing courses and rubberized overlays. Maintenance and rehabilitation performed annually must also be recorded in the MTC PMP software. The software allows the City to track the performance of past treatment strategies to determine their effectiveness.

Harris & Associates commends the City for its active participation in the pavement management program and also recommends that the City continue to maintain its pavement management program to be eligible for grants and state gas tax funding. All arterials and collector routes should be re-inspected every two years and all residential streets every five years. The costs for the re-inspection should be included in the annual pavement management budget.

The City should also perform annual database updates that include:
- Review and update decision trees (maintenance activities and unit costs);
- Consider establishing districts within City limits for maintenance planning and utilizing the StreetSaver user defined fields within the section description;
- Update the road network when streets are annexed or newly constructed; and
- Enter in Maintenance and Rehabilitation activities.

Sonoma's overall street system is currently in the range of MTC's "Very Good" condition category. To help maintain and improve the current condition, certain projects have been recommended within the context of this program. Annual work programs for the expected annual budgets can be found in Section IV-E. The report provides detailed listings of suggested

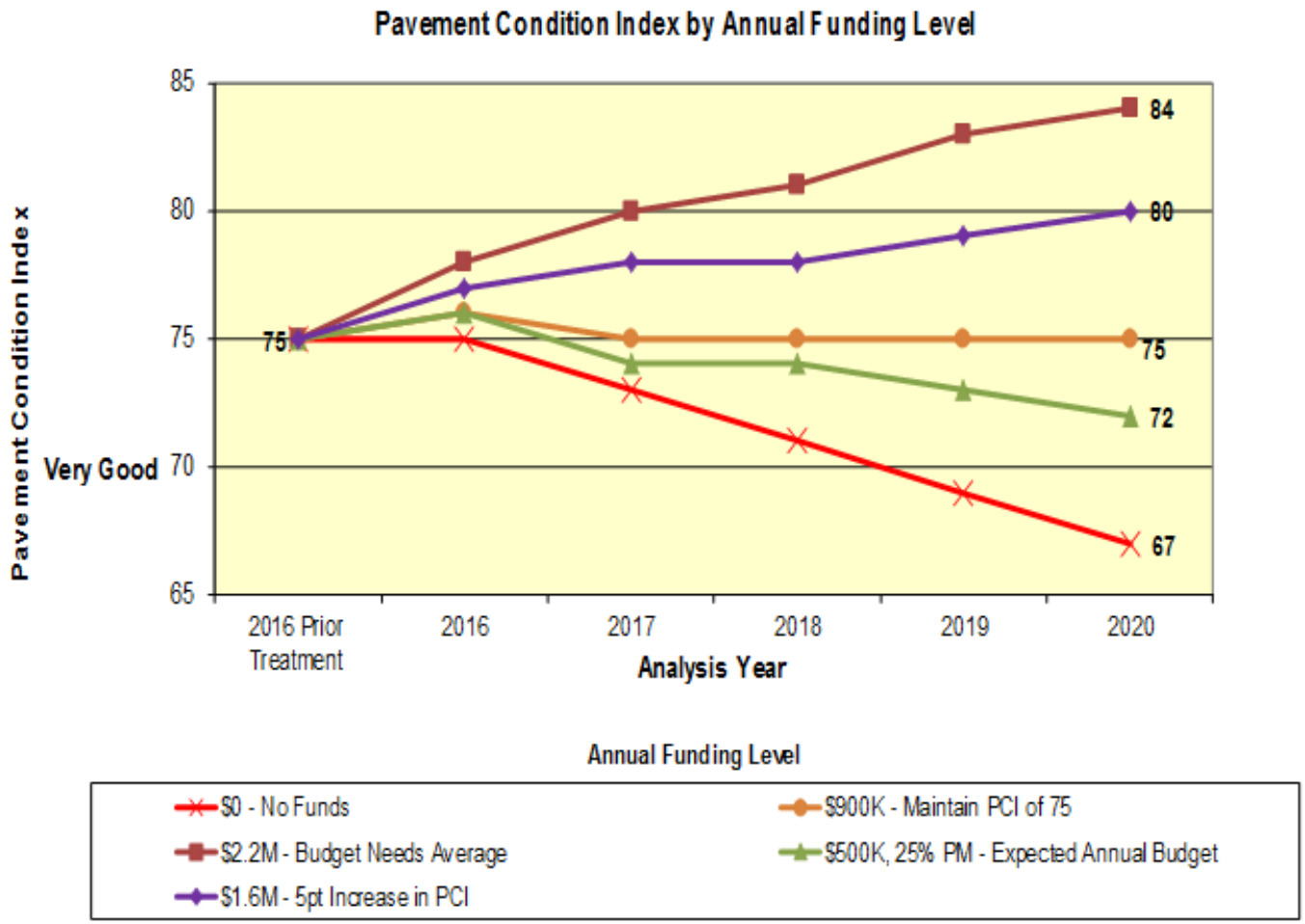
maintenance projects for Sonoma based on the overall PMP suggested needs funding and base annual budgets. The report also provides a first step in identifying segments to be repaired under Sonoma's annual work programs.

The City should update the City's Finance Department with any changes or adjustments that have been made to the City's road network and subsystems (roads assets and pavement subsystems that have been acquired through annexation, deletion, etc.) for GASB-34 compliance.

The City should continue utilizing the StreetSaver Online GIS module or in-house GIS to better manage roads within City limits. The GIS technology is very useful to spatially view tabular reports that are derived from the pavement management system, such as scenarios, identification of maintenance and rehabilitation, planning, maintenance and rehabilitation history, pavement condition index, etc. The tool is very useful for exporting information out to current GIS and AutoCAD projects.

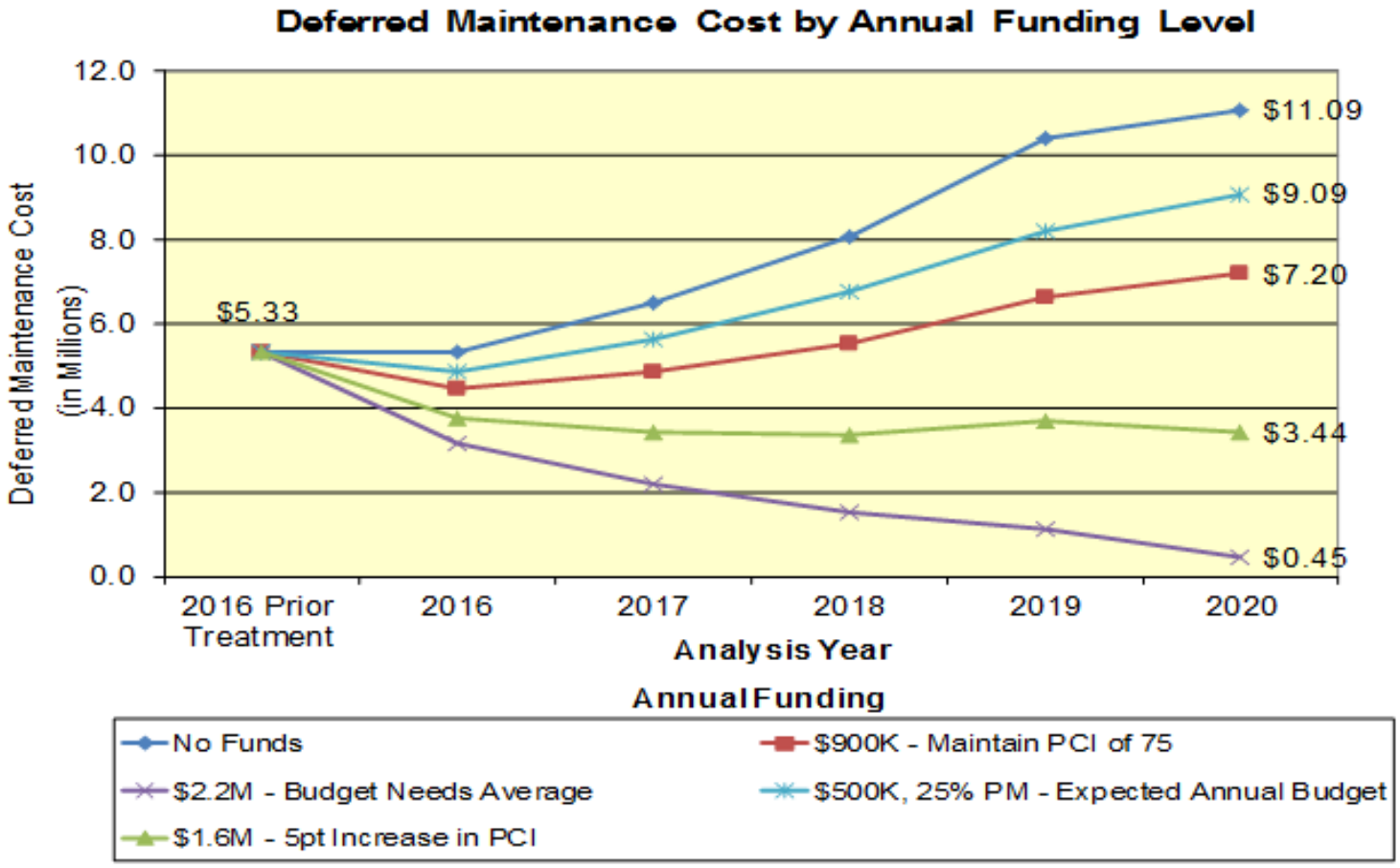
Although these project listings are recommendations generated by the PMP, they are for planning purposes only and are not intended to replace sound engineering judgment. Final project recommendations should be weighed against the actual approach the City wishes to utilize in scheduling the workloads for contracting purposes. Once a street segment is identified for repair, a closer site inspection and detailed project repair scope is required.

Figure 7



27% preventative maintenance was applied to all scenarios, except the Expected Annual Budget scenario in which 25% preventative maintenance was applied

Figure 8



27% preventative maintenance was applied to all scenarios, except the Expected Annual Budget scenario in which 25% preventative maintenance was applied

SECTION I
INTRODUCTION

NEED FOR A PAVEMENT MANAGEMENT PROGRAM

Pavement Management Program assists the City by providing current inspection data used to evaluate current pavement condition. This helps to maintain a City-defined desirable level of pavement performance while optimizing the expenditure of limited fiscal resources. A PMP system is also often required to obtain state and federal funds.

Specifically, the program provides administrators and maintenance personnel with:

- A current inventory of all public roadways
- The current pavement condition for all public roadways
- A project listing of all pavement needing maintenance, rehabilitation, or replacement
- The most cost effective level of maintenance or repair appropriate at the time of the inspection
- A forecast of budget needs for maintenance, rehabilitation, or replacement of deficient pavement sections for a five (5) year Capital Improvement Program, at various alternative overall condition levels

LIMITS OF STUDY

It must be recognized that this report is limited to the existing pavement repairs. It does not include existing deficiencies for right-of-way concrete sidewalks, curb & gutter, drainage, trees, bus pads and non-structural improvements such as decorative crosswalks, medians, lighting and street furniture. Costs for these right-of-way repairs and improvements throughout the City would easily exceed the deferred maintenance costs (the cost of crucial maintenance work not performed in a specific year) identified in this report and can be identified and estimated separately in future reports.

The following recommendations generated by the Pavement Management Program are for planning purposes only. The resulting general recommendations are not intended to replace sound engineering judgment, which should dictate specific needs for an individual project. Maintenance and rehabilitation projects should be based on a combination of the system's recommendations weighed against the City's preferences, budget constraints, and other contributing factors. In addition, further refinements may be warranted from an engineering staff review of the pavement condition. For example, a particular pavement section may require treatment earlier (or later) than the rest of the roads in its localized area.

THE PAVEMENT SYSTEM

The entire pavement system within Sonoma is composed of approximately 34 miles of paved surfaces and is divided into 300 pavement management segments. To assist in planning maintenance needs, the City's streets were grouped by functional class (arterial, collector, and residential). The table below shows the City's pavement mileage by functional class.

Table 5

Sonoma's Streets By Functional Class			
Classification	**Total Sections**	**Total Center Line Miles**	**Total Lane Miles**
Arterials	34	5.13	10.81
Collector	48	6.51	13.02
Residential/Local	218	22.15	44.36
Totals	**300**	**33.79**	**68.28**

The entire pavement system has a current reconstruction value of over $152 million. The current system reconstruction value (consisting of moderate base failure repair, removal of existing surface, and pavement overlay) by functional class is as follows:

Table 6
System Reconstruction Value

Network Replacement Cost

Printed: 12/21/2015

Functional Class	Surface Type	Lane Miles	Unit Cost/ Square Foot	Pavement Area/ Square Feet	Cost To Replace (in thousands)
Arterial	AC	4.4	$10.44	461,035	$4,815
	AC/AC	6.4	$10.44	599,437	$6,261
Collector	AC	9.5	$10.44	840,280	$8,776
	AC/AC	3.5	$10.44	339,937	$3,550
Residential/Local	AC	34.5	$8.44	2,928,508	$24,729
	AC/AC	9.6	$8.44	856,518	$7,233
	ST	0.2	$8.44	9,712	$82
	Grand Total:	68.2		6,035,427	$55,447

Table 6 provides network replacement cost sorted by Functional Class first and then by Surface Type. For each combination of Functional Class and Surface Type, the number of Lane Miles, Unit Cost (sq. ft.), Pavement Area (sq. ft.), and the Cost to Replace (in thousands) is reported. The replacement cost is based on the Category V ("Very Poor") treatment cost provided in the Decision Tree for each functional class and surface type combination. Grand Totals are provided at the bottom of applicable columns.

CURRENT PAVEMENT CONDITION

A visual survey of approximately 34 miles of the City's streets was conducted to assess the existing surface condition of each individual pavement segment. Upon completion of this survey, a Pavement Condition Index (PCI) was calculated for each segment to reflect the overall pavement condition. Ranging between 0 and 100, a PCI of 0 would correspond to a badly deteriorated pavement with virtually no remaining life. A PCI of 100 would correspond to a new pavement or pavement with no observed distresses.

Table I – 7 relates PCI ranges to pavement condition definitions and gives a general description for each pavement condition.

Table 7

PCI Breakdown Descriptions		
PCI Range	**Condition**	**Description**
90-100	Excellent	Little or no distress.
70-89	Very Good	Little or no distress, with the exception of utility patches in good condition, or minor to moderate hairline cracks; typically lightly weathered.
50-69	Fair	Light to moderate weathering, light load-related base failure, moderate linear cracking.
25-40	Poor	Moderate to severe weathering, moderate levels of base failure, moderate to heavy linear cracking.
0-24	Very Poor	Extensive weathering, moderate to heavy base failure, failed patches, extensive network of moderate to heavy linear cracking.

The overall condition of Sonoma's road network rests in the "Very Good" range with an average PCI of 75.

MAINTENANCE STRATEGY DEVELOPMENT

Based on the results of the condition survey and on input from the City, pavement maintenance/rehabilitation strategies were developed. A standard agreement at the outset was to identify the City's maintenance work program for the next five (5) years, showing resource alternatives that affect the maintenance backlog and increase the overall condition of the pavement system.

Certain strategies are recommended for the most cost-effective work program. A listing of the maintenance activities utilized in the strategy development is presented in Section II. Each activity represents the type of work that has been recommended for the long-term maintenance recommendations of the City's streets.

ANNUAL BUDGET PROJECTIONS

The budgeting process was approached with the following in mind: generate a work program for the next five (5) years based upon actual road pavement conditions and determine the funding levels

required to maintain and/or improve the current level (PCI) of overall condition.

Based on current and projected pavement maintenance needs, annual work program alternatives have been prepared. A detailed work program for the City's expected annual budget at can be found in Section IV-E of this report.

SECTION II
METHODOLOGY

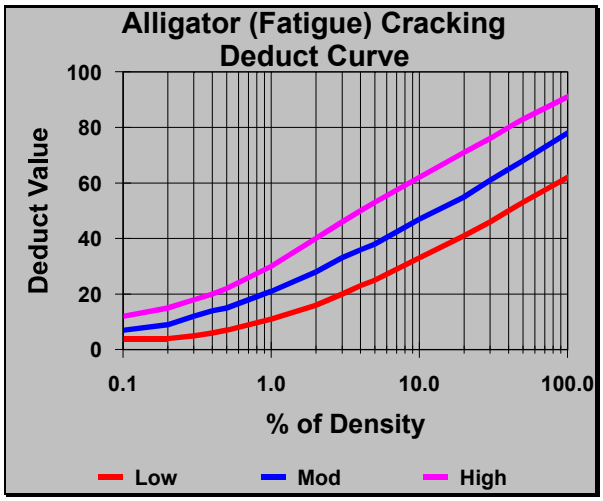
The following section provides a description of the methodology and rationale utilized in determining the recommended actions identified in this report.

Field Survey

For this inspection update, approximately 34 miles of paved streets in Sonoma's system were re-inspected. Data, including distress types and quantities, segment length and width, etc. were collected for all inspected roads. Using a combination of City street maps and laptop computers to collect field information, a field crew visually surveyed each of these streets. Data was categorized by street and "pavement" segment. Pavement segment limits were identified by determining the logical maintenance practices that would apply to each street and may vary from street to street, i.e. intersection to intersection, change in pavement width, drainage conditions, crown of the roadway, etc. All of the inspection data was entered into the MTC pavement management software (Streetsaver® Online Version 9.0)

After the data entry procedures were completed, a distress rating was calculated for each segment. The distress rating is calculated using MTC developed algorithms. The algorithm assigns each pavement section a score of 100 then deducts point values based on the pavement distresses found within the section weighted by the quantity of each distress. The algorithm assigns deduct values based on the severity (see figure below) and the density of each distress.

Figure II -1



The algorithm weighs the total deduct value within a section and calculates a total distress rating between 0 (failed) and 100 (excellent).

The PCI is an overall measure of the condition of the road surface based on a scale of zero (0) (failed) to one hundred (100) (excellent). Table II – 1 relates PCI ranges to general pavement condition definitions.

PCI Ranges
Table II – 1

PCI RANGE	CONDITION
90 - 100	Excellent
70 - 89	Very Good
50 - 69	Fair
25 - 49	Poor
0 - 24	Very Poor/Failed

The summary of all road condition data and the representative PCI's is located in the Pavement Condition Index Report in Section III.

Once the PCI has been established for a pavement section, budget analyses and workload predictions commence. Predictions of future pavement performance are based on a pavement deterioration curve developed by MTC. As a pavement ages, the system predicts the PCI of the pavement based on the deterioration curve.

MAINTENANCE STRATEGY ASSIGNMENTS

The PCI is used by the system to schedule maintenance activities for each pavement segment. The MTC PMP software recommends a specific maintenance activity based on the PCI and budget constraints. Harris & Associates and the City have selected a series of maintenance activities to apply to the pavement network. The unit costs for each maintenance activity account for various construction costs including labor materials, 15% for design, 10% for construction inspection and 10% for contingency. Definitions of each maintenance activity per category are defined as follows:

1. Crack Seals - A surface treatment generally utilized to prevent entry of water or other non compressible substances into the pavement.
Crack seals are used to fill individual pavement cracks to prevent entry of water or other non-compressible substances such as sand, dirt, rocks or weeds. Crack sealant is typically used on early stage longitudinal cracks, transverse cracks and reflection cracks. It is placed over the existing pavement surface and is typically applied by the City at four (4) year intervals. The typical cost for crack sealing is $3.00 per linear foot.

2. Slurry Seals - A surface treatment generally utilized to provide new wearing surfaces and prevent water penetration of the pavement surface, thereby extending pavement life.
Slurry seals are surface treatments applied to pavements with minimal surface distress to provide new wearing surfaces and extend pavement life. A slurry seal generally consists of a mixture of conventional or latex-modified emulsified asphalt, well-graded fine aggregate, mineral filler and water. It is placed over the existing pavement surface and is typically applied at eight (8) year intervals. This type of treatment was estimated by the City to cost $8.15 per square yard for slurry seal, or $11.15 per square yard for crack seal + Type II slurry seal.

3. Overlays - The application of treatments that are more cost-effective alternatives to reconstruction of the entire pavement surfaces, but provide the required structural support.

An asphalt layer is placed over the existing pavement surface. Cold planing is typically performed prior to the overlay to provide a level surface for the overlay, reduce excessive crowning, and assure alignment with existing gutter line. This typically includes base repair and crack sealing prior to the application of an overlay. This treatment provides a new wearing surface and increased structural strength to the pavement section. An overlay is typically designed for a ten to fifteen (10-15) year life. This type of treatment was estimated by the City to cost $24.00 - $31.13 per square yard depending on the thickness of the overlay and the functional class of the street.

4. Reconstruction – The removal and replacement of either the pavement surface only or both the pavement and base.

Sonoma's typical cost for reconstruction is $76.00-$94.00 per square yard. After a reconstruction, the pavement segment is again considered new with a full life extension (typically 28 years).

MAINTENANCE DECISIONS

Once the City selected the appropriate maintenance activities and unit cost used by the jurisdiction, the "Maintenance Decision Tree" (a Streetsaver phrase that list all the treatments and corresponding unit costs, found in Section V) is updated. This decision tree assigns appropriate treatments by the specific needs of the streets.

The decision tree lists costs associated with treatments on specific types of pavement according to the jurisdiction. StreetSaver® uses a decision tree to model the decision- making process that agencies follow to select a maintenance or rehabilitation strategy. The decision tree contains "branches" for each functional classification, surface type, and condition category. Jurisdictions can outline their M&R strategy, choosing a treatment for each branch.

Once the decisions were set within the system, budgets and work assignments were generated for each work program on an annual basis. Using the MTC recommended pavement deterioration curve for each pavement surface type and functional class, both current and future work requirements for each pavement segment within the City were determined.

PAVEMENT MANAGEMENT PROGRAM REPORTS

This report contains a comprehensive assemblage of pavement management reports ranging from summary reports to annual maintenance and rehabilitation schedules. These reports represent reasonable projections of pavement maintenance needs and performance based on visual condition assessments, unit cost estimates, and pavement deterioration models.

It is important to note that pavement segment dimensions and surface area, along with the action and repair costs (as presented in the reports), are accurate within tolerable limits to general project costs

on average. This is noteworthy due to the "implied" accuracy of reporting length and width to the nearest foot, surface area to the nearest square foot, and action and repair unit costs and project estimates to the nearest penny and dollar, respectively, which will vary with each project.

SYSTEM MAINTENANCE

It is recommended that the City continue developing annual maintenance plans while also working towards reducing the City's present backlog of rehabilitation projects.

In order to ensure that report outputs are accurate and credible, it is essential that the integrity of all data files be maintained. This will require performing all necessary updates when changes are made to scheduling scenarios, unit cost information, historical data, etc. In addition, the entire pavement network will have to be re-inventoried at regular intervals, as noted earlier in this report. This will not only allow work to be scheduled based on the most current condition data available, but it will also provide City personnel with a means to monitor actual rates of pavement deterioration.

SECTION III

PAVEMENT CONDITION INDEX (PCI) REPORT / REMAINING SERVICE LIFE (RSL) REPORT

SECTION IV
BUDGET ANALYSIS REPORTS

A. Budget Needs Report - Five Year

B. Average PCI by Annual Funding Chart

C. Deferred Maintenance Cost Trend by Annual Funding Chart

D. Budget Scenario Cost and Network Summaries

E. Expected Annual Budget - $500K w/ 25% PM

SECTION V
BACKUP DATA

A. Section Description Inventory Report

B. Inventory of Applied Maintenance

C. Maintenance Treatment Decision Trees