



INFRASTRUCTURE COMMITTEE

DATE: February 9, 2018

TO: Infrastructure Committee/City Manager

FROM: Maria Fierner, Public Works Director
By: Robin Bartlett, Division Manager/District Engineer

SUBJECT: Presentation of the Pavement Management System Update

EXECUTIVE SUMMARY

Results of the latest pavement condition survey reveals that the City's streets have an average Pavement Condition Index (PCI) of 78. Analysis indicates that at current funding levels and with the current pavement management strategy, the City's pavement condition will continue to deteriorate notably over the next ten years. City staff and the City's pavement consultant, Pavement Engineering, Inc. (PEI) have analyzed the current pavement condition, past practices, future strategies for pavement management, and the available funding, and are presenting recommendations to optimize the use of Pavement Management Funds going forward. The results of this analysis will be provided in a presentation to the Committee. The key recommendation is to maximize the use of a "critical point" strategy to get the most life out of a given pavement prior to it requiring a more substantial and costly rehabilitation treatments.

RECOMMENDED ACTION

Staff recommends that the Infrastructure Committee review the Pavement Management System Update Report and presentation and provide comments to staff.

BACKGROUND/DISCUSSION

Pavement Condition Index (PCI)

There are many reasons why cities and counties need a Pavement Management Program (PMP). Dr. Roger Smith of Texas A&M University summarized many of these reasons in a report for the Federal Highway Administration, including the following:

- All road surfaces deteriorate over time due to traffic and environment;
- Cities and counties typically have many streets and roads that need repair and insufficient funds to perform these repairs; and
- The need for a Program to manage the streets and roads in their jurisdiction.

The City uses a PMP to assist with prioritizing streets to include in maintenance and rehabilitation projects. As part of this Program, the City is required to regularly inventory the condition of the streets and assign each a rating from 0 to 100. This rating is referred to as the Pavement Condition Index (PCI).

PCI was developed by the U.S. Army Corp of Engineers during World War II and later was standardized by the American Society for Testing and Materials (ASTM). PCI is an objective and rational, although not perfectly precise, basis for determining pavement condition and establishing maintenance priorities. The method is based on a visual survey of various types of distresses in a pavement on selected parts of a given street. The result of the Survey is a numerical value between 0 and 100, with 0 representing the worst possible condition and 100 representing the best possible condition. PCI is a budgeting and planning tool, not a design tool.

The City utilizes an independent engineering consultant to perform the Pavement Condition Survey every two years to determine the condition of all pavement sections throughout the City. City staff then utilizes the Metropolitan Transportation Commission’s Pavement Management System (MTC-PMS), software StreetSaver to help prepare a Five-Year Pavement Management Plan, which identifies likely repair locations and types. The StreetSaver software incorporates data gathered from most agencies in the Bay Area as well as many other agencies in other locations. As such, it provides a powerful tool for predicting pavement life and treatment costs. In October 2016, staff applied for a grant through the Pavement Management Technical Assistance Program (P-TAP) Round 18. The City received Surface Transportation Program (STP) funding in the amount of \$57,600. With this grant amount, plus the City's local matching funds in the amount of \$14,400, MTC and City staff jointly retained Pavement Engineering, Inc. (PEI) to perform the 2017 Pavement Condition Survey of the City’s roadways. As part of the Survey, an updated PCI was assigned to each pavement section. The overall average PCI was calculated based on the updated Survey of each street section and considering MTC’s recent minor adjustments to the PCI assessment methodology.

Current Conditions

The current condition of the City’s streets is summarized below:

Total centerline miles	239.7
Total lane miles	497.7
Total pavement area	42.4 million square feet
Parking Lot area	1.1 million square feet
System Replacement value	\$653.8 million
Current Average PCI	78
Current Average PCI Arterials	79
Current Average PCI Collectors	79
Current Average PCI Local Streets	78

Historical Conditions and Approach

The City has maintained a high overall average PCI for many years. Since the creation of the current data base maintained in StreetSaver in 2005, the City's PCI has ranged from a low of 70 to a high of 81. This is significantly better than most cities in the Bay Area. The City has maintained good pavement through a combination of factors that include: 1) a relatively young age of the City and many of its streets; 2) a significant level of funding that has ranged from expenditures of between \$1.5M and \$9M from various funding sources, with an average of approximately \$4M.

During that same time, the City's network of streets has grown from a little less than 32 million square feet to almost 43 million square feet. Approximately 20 percent of the City's streets are less than 10 years old, not including streets that were repaired during the last 10 years. This high percentage of relatively new streets has had two major effects on the City's pavement management system: 1) the new streets contribute to a high average PCI by virtue of their age, while 2) requiring limited maintenance effort, thus freeing pavement maintenance money for use on the older streets. Because a substantial portion of the pavement management funds are derived from return to source Gas Tax/ Measure J Funds, both of which are based on population, the new developments provide an instant PCI boost while effectively subsidizing pavement management in the older areas for their first 5 to 10 years of life.

For the recent past, the City's pavement management strategy has been based primarily on a process of dividing the City into areas and paving one or two such areas per year as funds permit. Arterials are essentially treated as separate areas. In addition, low PCI streets were identified and scheduled for maintenance within each 5-Year Program. Low PCI streets have been defined as follows:

Arterials	PCI less than 50
Collectors	PCI less than 45
Local Streets	PCI less than 35

The areas were treated on a worst first basis based on the average PCI within each treatment area.

In addition, some small streets or sections of streets with special problems, or which are deteriorating more rapidly than allows them to be incorporated into the planned repair cycle, have been treated with the Stop Gap Repair Program. This Program also includes pothole repairs, patching, and crack sealing.

This system has been generally effective and incorporates a number of advantages: 1) it is easily explained to the public on the basis of worst first; 2) it is predictable; 3) by working in areas it is relatively efficient for designers to manage, isolates disruption, and reduces costs for contractors and thereby improves the bids received by the City; and 4) it incorporates the rationale that streets that were built at the same time and are subject to similar environments and loads will age similarly and, therefore, areas will tend to have similar treatments thus further simplifying design and reducing construction costs. However, it also has disadvantages, as explained below.

Disadvantages of the Current System

The current system has been quite effective. However, it incorporates certain features, which coupled with other factors result in a prediction that the overall City's pavement condition will decline more rapidly than it would otherwise, despite increasing projected expenditures. It is currently predicted that if a worst first approach is used, the City's PCI will decline to 71 within five years and to 63 in 10 years, assuming current projections of funding that incorporates SB-1.

The primary factors that are resulting in this trend are:

1. As pavements have aged, the condition of streets within a given pavement area has diverged resulting in multiple different treatments being used within a given treatment area, thus increasing costs.
2. Treatment by area means that some streets are treated that still have some useful life before deteriorating to the critical point at which the next most expensive treatment option is required. This is inherently inefficient.
3. As newer streets age, they require funding for preventative maintenance. Preventative maintenance is the most cost-effective set of treatments to keep pavements in good condition. With such large areas of relatively new streets, an entirely separate program is required. This was recognized with the creation of CIP 5578, Annual Pavement Preventative Maintenance; however, this Project has never been funded. Only one extensive preventative treatment was conducted in large areas of Gale 1 under CIP 5536 in 2015.

In addition to issues associated with the current Program, in the last few years, paving construction projects have experienced an increase in unit costs due to a variety of factors. The largest is an increase in neighboring agencies' annual paving maintenance budgets, in part due to the passing of a Measure related to Property Tax Bonds. The result has been a sudden increase in demand for paving contractors, concrete, utility adjustments, striping subcontractors, and materials and supplies from the same pool of contractors and vendors that endured the financial crisis of 2007-2008.

Another important factor that affects the cost of paving construction projects is the 2014 Federal regulations related to Americans with Disabilities Act curb ramps. With very few exceptions, any pavement treatment is considered by the U.S. Department of Justice and the U.S. Department of Transportation as resurfacing. Resurfacing is an alteration that triggers the requirement to add curb ramps if it involves work on a street or roadway spanning from one intersection to another, and includes overlays of additional material to the road surface, with or without milling. Examples include, but are not limited to the following treatments or their equivalents: addition of a new layer of asphalt; reconstruction; concrete pavement rehabilitation and reconstruction; open-graded surface course; micro-surfacing and thin lift overlays; cape seals; and in-place asphalt recycling. The result of this regulation is an average increase to paving construction project costs of 20 to 25 percent.

Differences from the Last 5-Year Review

In May of 2017, staff made a presentation to the Finance Committee regarding the state of the pavement and the predicted pavement performance for the next five years. At that time, the PCI was estimated to be 80 and was predicted to be 81 in the fall of 2017 with a reasonable likelihood that the pavement would remain at or near 80 in the near future. As evidenced by the discussion above, there have been substantial changes in this prediction. Major factors for this change include:

1. No bids were received for the 2017 Pavement Management Project, which resulted in less work being done. The work that was done was for the low PCI streets, which are the least cost-effective with regard to changes in overall system PCI.
2. Increases in costs have been incorporated into the estimates used by StreetSaver to predict the number of streets that can be treated.
3. The May estimate was made during early discussions of the impact of SB-1 on the financing of the streets. At the time of the estimate, it was assumed that the Maintenance of Effort requirement would result in the use of \$500,000 per year in General Fund money for pavement management. It is now anticipated that no General Fund money will be required and it has been assumed that no General Fund money will be used.
4. The extensive network of newer streets particularly in the Dougherty Valley, are at a sensitive critical point where on-going aging is rapidly triggering increases in maintenance costs.

Proposed New System

City staff and PEI have analyzed the City's pavement system to address the City's needs in the most cost-effective way. This has resulted in recommendations to modify the current approach. Key recommendations for the new approach include:

1. Maximizing the use of a "critical point" strategy to get the most life out of a given pavement prior to it requiring more substantial and costly rehabilitation treatment;
2. Continuing to use a modified "pave by areas" approach to help contain costs, but with larger areas and with only select streets subject to treatment;
3. Combining critical point analysis and identifying select "low PCI" street and "contingency streets" to address those streets in worst condition or with special problems;
4. Undertaking an extensive preventative maintenance program on newer streets, predominantly within the Dougherty Valley, that are approaching the critical point at which point low cost preventative maintenance treatments will no longer be effective.
5. Consider changing the low PCI criteria for residential streets from the current score of 35 to 30 or even 25. Streets with these low PCIs are already generally past their last critical point requiring major treatment or reconstruction. Therefore, delaying treatment will maximize the cost-effectiveness in terms of dollars spent per year of useful life, provided that the conditions on any given street remain safe and do not require undue amounts of

Stop Gap treatment. Preliminary analysis indicates that residential streets with a PCI of less than 30 can be treated within five years at the cost of approximately \$500,000 per year while maintaining the overall average PCI as described below.

In addition, staff will consider additional tools to improve cost effectiveness such as:

- getting separate bids for asphalt concrete (AC) and preventative (treatment);
- minimizing concrete work done as subcontractor work to the paving contractors and combining it with sidewalk projects;
- moving streets previously done with the Stop Gap Program into the Pavement Management Project as “contingency” streets;
- improving coordination between Public Services and Engineering staff to improve efficient provisions of in-house Stop Gap work (pothole repair, crack sealing, and minor patching);
- evaluating paving technologies that have not been used in the City to determine if they can provide better solutions; and
- evaluating other aspects of the Program to further reduce costs.

If a “critical point” approach is used, it is estimated that the City’s PCI will be maintained at about 75 over the next five years and drop to about 71 in 10 years. This is a substantial improvement over the estimates generated using the current approach. However, it should be noted that the need to pave some low PCI streets outside of the critical point method will result in some loss of efficiency.

The pavement condition can be further enhanced with the addition of new funds. Staff will continue to look for grants and other funding opportunities. In addition, staff will discuss the implementation of a Refuse Vehicle Impact Fee (RVIF) with the Finance Committee. This Fee could result in the addition of \$1.5M annually and would have a notable improvement of the pavement condition outlook.

A summary of preliminary estimates of the long-term PCI is presented below:

PMP Approach	Year 2023	Year 2028
Worst First (similar to current)	70	63
Critical Point Current Funding	75	71
Critical Point with RVIF	76	73

The actual PCIs are expected to be slightly lower due to less than optimal expenditure of funds for low PCI streets and other problem streets, but will also be increased by any use of grant funds that have not yet been identified.

Details of the Program and what streets would be completed when will be presented in a future report to the Infrastructure Committee.

FISCAL ANALYSIS

Changing strategies will have no direct fiscal impact but may result in a more cost-effective utilization of current funds.

STEPS FOLLOWING APPROVAL

1. Staff will incorporate comments received from the Infrastructure Committee on the Pavement Management System Update. Based on these comments, staff will prepare an update to the Five-Year Pavement Management Plan and return to the Infrastructure Committee in March 2018 for additional comments.
2. Staff will present a report to the Finance Committee regarding possible implementation of a Refuse Vehicle Impact Fee.
3. Staff will incorporate comments and make a presentation to the City Council, if requested.