City of Arts & Innovation

Mobility & Infrastructure Committee Memorandum

TO: **MOBILITY & INFRASTRUCTURE COMMITTEE** **DATE: SEPTEMBER 8, 2022**

FROM: **PUBLIC WORKS DEPARTMENT** **WARDS: ALL**

SUBJECT: **UPDATE ON THE PAVEMENT MANAGEMENT PROGRAM**

ISSUE:

Receive an update on the Pavement Management Program.

RECOMMENDATION:

That the Mobility & Infrastructure Committee receive and file an update on the Pavement Management Program.

BACKGROUND:

Pavement management is the process of assessing, prioritizing, and preserving or rehabilitating pavements through a logical system that attempts to use available funds in the most cost-effective manner possible. It is generally an iterative process that grows in accuracy as more data becomes available to better refine prediction models.

On December 20, 2016, City Council approved a professional consultant services agreement with IMS Infrastructure Management Services (IMS) to conduct a citywide pavement network survey to evaluate the existing destresses and to provide a baseline Pavement Condition Index (PCI) for all streets. The results of this work indicated the following:

- The average PCI score for the City's street network scored a 61 out of 100
- 13.2% of City streets scored in "Excellent" condition (PCIs between 85 and 100)
- 12.7% of City streets scored in "Very Poor" and "Poor" condition (PCIs between 0 and 40)
- $24 million recommended maintenance budget to maintain the average network score of 61

On October 6, 2020, City Council approved another professional consultant services agreement with IMS to complete partial network surveys over a five-year period to provide better modeling data including pavement treatment and budget strategy recommendations. The partial network surveys would consist of evaluating arterial streets on a three-year cycle, collector streets on a four-year cycle, and local streets/alleys on a five-year cycle.

Since the inception of the City's Measure Z sales tax funding program, City Council subsequently increased funding significantly for street maintenance in subsequent years to support the

Pavement Management Program (PMP). With these Measure Z funds and the additional gas tax revenues allocated to the City through the State's Senate Bill 1 Road Repair and Accountability Act of 2017 to support road maintenance for local streets networks, the PMP budget for FY 2022/23 has reached the recommended budget of $24 million.

DISCUSSION:

The Committee requested a PMP update and further information relating to the selection of pavement treatment types, the construction contractor selection process, and the expected pavement life cycles.

Figure "1" below illustrates that pavements typically start deteriorating rapidly once they reach a specific threshold.

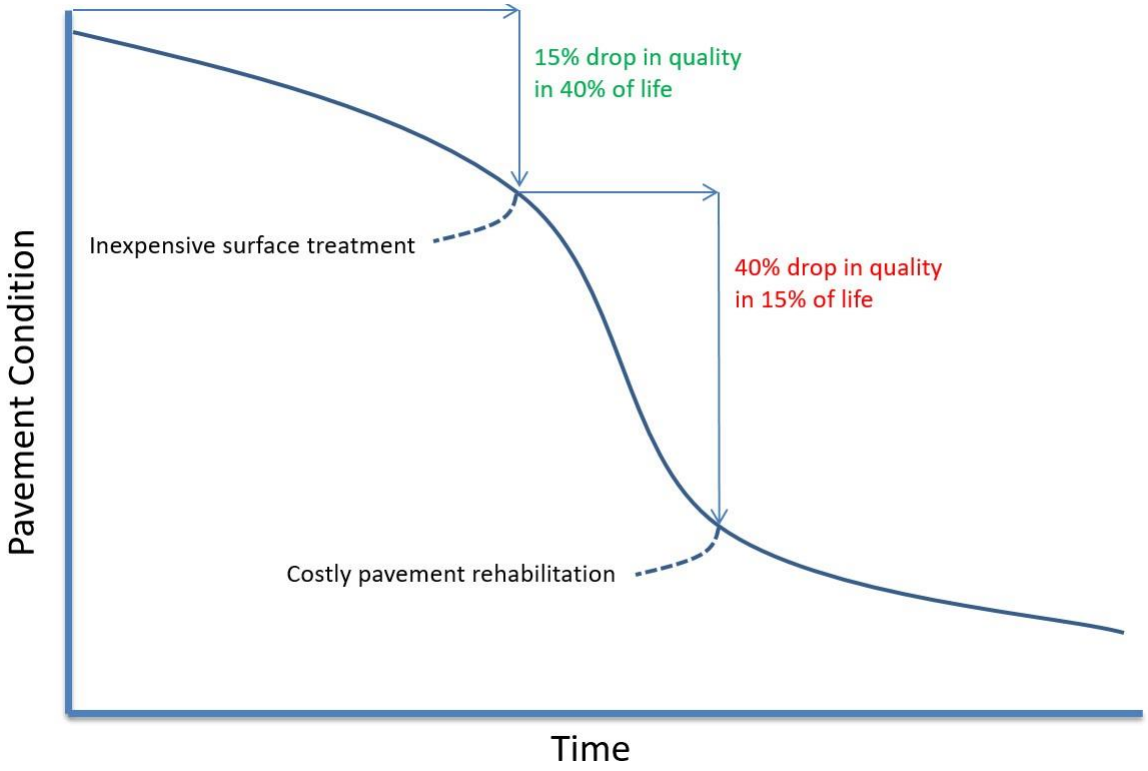

Figure 1 - Pavement Deterioration and Life Cycle Costs

A nominal investment in cheaper surface treatments at 40% lifespan is much more cost-effective than deferring maintenance until heavier overlays or possibly reconstruction is required just a few years later. Streets that are repaired while in good condition will have an extended lifetime and will cost less over their lifetime than those left to deteriorate to a poor condition. Without an adequate routine pavement maintenance program, streets will require more frequent reconstruction, thereby requiring significantly greater funding.

The types of rehabilitation activities that the City chooses to deploy can have a significant effect on the longevity of a pavement. Depending on the PCI zone for the pavement, a detailed rehabilitation strategy set needs to be formed. Maintenance activities typically include Preventative Maintenance, Overlays, and Reconstruction. Popular examples of cost-effective Preventative Maintenance activities include Crack Sealing, Patching, and Slurry Seals.

Pavement overlays help maintain and repair the surface integrity, which can slow deterioration and extend the life of a pavement. The outcome of this exercise is the long-term cost savings and an increase in network-level pavement quality over time. Figure "2" illustrates the concept of extending pavement life through the application of timely maintenance activities.

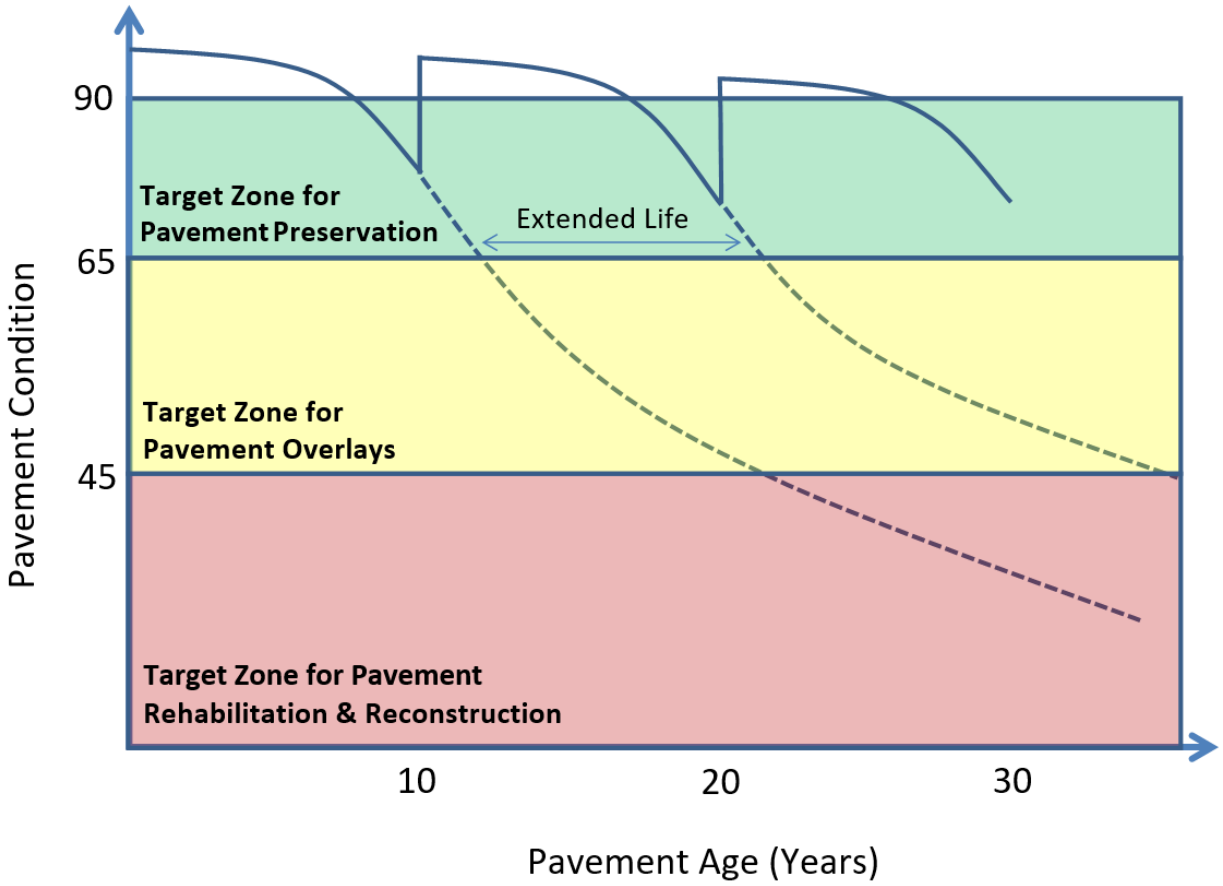

Figure 2 - Pavement Life Cycle Curve

PCI values provide an indication of the surface conditions and structural integrity of a pavement. The 0 to 100 PCI range is commonly divided into various categories using descriptive terms. Divisions between the terms are not fixed but are meant to reflect common perceptions of pavement conditions. Figure "3" below summarizes the City's PCI assessment ranges and the corresponding typical pavement distresses and maintenance needs within each range.

Category	Typical Distresses and M&R Recommendations	PCI Range
Excellent	Like new condition – little to no maintenance required Monitor condition or preventive maintenance.	(85-100]
Very Good	Minor cracking, raveling, and other non-load associated distresses Routine or preventive maintenance. *E.g., Crack sealing, surface treatment*	(70-85]

Good	Minor to moderate cracking and low severity load associated distresses such as alligator cracking and rutting. Surface treatments with localized repairs and overlays *E.g., Surface treatments, localized surface patching, thin overlay*	(60-70]
Fair	More extensive and severe longitudinal and transverse cracking, as well as moderate severity load associated distresses Localized repairs or major rehabilitation. *E.g., Localized surface and/or full-depth patching, overlays*	(50-60]
Marginal	Localized high-severity alligator cracking, and rutting. Major rehabilitation. *E.g., Localized full-depth patching, mill and overlay, traditional overlay*	(40-50]
Poor	A greater extent of severe alligator cracking and rutting Major rehabilitation. *E.g., More extensive full-depth patching, mill and overlay, traditional overlay*	(25-40]
Very Poor	Extensive and severe alligator cracking, more extensive and deeper rutting, and potholes. Major rehabilitation. *E.g., Full-depth reclamation, reconstruction*	[0-25]

Figure 3 - Pavement Life Cycle Curve

A number of parameters must be determined or assumed to properly design or evaluate a street pavement. Good designs, followed by good construction practices with a proper inspection/observation program, are critical to realize the full performance potential. A couple of key parameters include the traffic volume, specifically for large trucks, and the existing subgrade condition.

Designs that improve the foundation will extend the pavement life, improve the level of service throughout the life of the pavement, and provide more economical rehabilitation strategies at the end of the pavement's life. However, the initial cost to construct the pavement will be higher than placing the pavement on natural subgrade, the overall life cycle costs will be greatly improved.

Streets throughout the City consist of pavement that was constructed on natural subgrade as well as on a crushed aggregate base material. Street cores are often obtained when completing projects and our findings have indicated that many of the streets are under-designed considering the amount of traffic they receive.

The first cycle of partial network surveys was completed in March 2021 and IMS prepared an updated study in July 2022. Unfortunately, due to the PMP funding deficiencies some of the key metrics declined. The following are the general results:

- The average PCI score for the City's street network scored a 58 out of 100
- 12.0% of City streets scored in "Excellent" condition (PCIs between 85 and 100)
- 23.7% of City streets scored in "Very Poor" and "Poor" condition (PCIs between 0 and 40)
- $31.54 million recommended maintenance budget to maintain an average network score of 59

Figure "4" below is the summary of pavement conditions throughout the City.

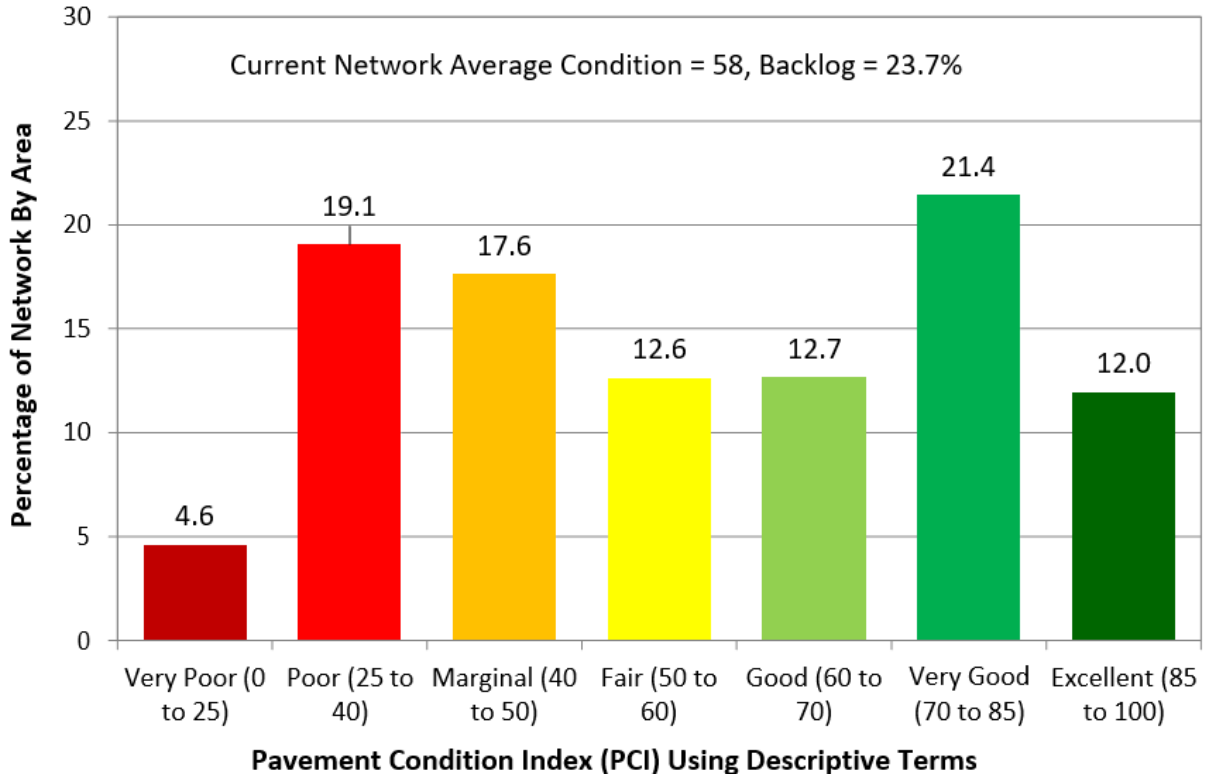

Figure 4 – Pavement Condition Overview

Although an insufficient budget contributes to the lowering of the average network PCI, there are many factors that can contribute to the premature failing of asphalt surfaces which accelerates the PCI decline. Southern California, including the City of Riverside, is car-centric and residents and visitors rely heavily of vehicles as their primary mode of transportation. Additionally, the City is located adjacent to some heavily traveled freeways in all directions across the City. Unfortunately, the City experiences a lot of "cut-through" truck traffic. In recent years, the City has adopted "4 or More Axle" restrictions on some arterial roads experiencing heavy cut-through truck traffic. The axle-restrictions facilitate enforcement as officers can review a truck's manifest to determine if they are utilizing the most direct route to reach their destination. The Public Works Department is also considering extending the paving moratorium from three to five years and update our trenching repair details to better protect our roadways.

Pavements are engineered to carry truck traffic during the pavement design life. Truck traffic, which includes transit vehicles, trucks, and truck-trailer vehicles is the primary factor affecting pavement design life. The City has a developed Traffic Index Map which is a calculated factor assigned to the City streets that equates to the estimated single axle truck loads anticipated over the pavement design life. Pavement designs utilize the Traffic Index along with the subgrade analysis to determine the required pavement section for a particular street. Therefore, changes to the truck loading and subgrade stability can affect the life of a pavement.

The City has determined the current Traffic Index Map is outdated and no longer accurately represents the truck data for the City. As previously indicated, street core samples collected for projects indicate many of our streets are under-designed. The City of Riverside is an old city and the original designs of its streets do not meet current standards. We also have old utility water lines that have potential for leaking and can affect the subgrade integrity. These may all be contributing factors towards our pavement treatments not providing the expected longevity.

The following is a summary of the various pavement treatments the City utilizes and their typical uses:

- Slurry Seal: This application is a mixture of water, asphalt emulsion, aggregate (very small, crushed rock), and additives. This material is generally applied to streets in good condition as a preservation treatment and typically applied to local streets.
- Dense Graded Asphalt Concrete: This application is a mixture of aggregates with an asphalt cement binder which is a highly viscous liquid form of petroleum that acts as a glue. This material is used on all streets either as thin overlay, thick overlay, or full reconstruction.
- Asphalt Rubber Hot Mix: This application is a hot-mixed asphalt pavement containing crumb rubber. The crumb rubber serves as a “modifier” of the liquid asphalt. Its addition gives the liquid asphalt greater viscosity (resistance to flow) and improves other properties which resist reflective cracking and rutting, and prolong pavement life. This material is typically used on arterial roadways as it also provides quieter ambient noise.
- Cold In-Place Recycling: This application involves a milling machine with a paver mixer. The milling machine breaks and pulverizes a section of an existing layer of asphalt which is crushed and screened to the proper size. Recycling agents are mixed in to rejuvenate the material, it is then emulsified, placed back, and picked up by the paver which spreads and recompacts it. This process is utilized on arterials only with thick existing asphalt sections.
- Full-Depth Reclamation: This application involves the pulverization of the existing asphalt pavement in-place to utilize as a base material. A new asphalt surface is then applied on the newly reconstructed base material. The City typically utilizes this process in areas with high moisture contents as drying additives can be included in the process.
- Fiber Reinforced Asphalt Concrete: This application applies a polymer fiber reinforcement to conventional asphalt to increase strength and durability including crack resistance, high temperature stability, and to resist premature cracking and rutting.
- Asphalt Rubber Aggregate Membrane: This application consists of mixing 3/8-inch aggregate rock with a rubberized liquid material comprised of scrap tires and other additives. The membrane resists reflective cracking and water intrusion. This is a cost-effective alternative for reconstruction and other conventional strategies. The City is utilizing this product extensively as it benefits our budget deficiencies.
- 100% Recycled Hot Mix Asphalt: This product is manufactured with 100% recycled asphalt material generated from waste collected from construction projects. It utilizes the traditional mix methodology with modifications to account for the high volume of recycled materials. The product provides a benefit to the environment but is relatively new to the City and is being utilized on a limited basis for longevity observation.

Many construction contractors in Southern California can provide these treatments on City projects. Contractors are selected to construct projects following the City's Formal Procurement Procedures as identified in City's Purchasing Resolution. A Notice Inviting Bids is issued with the general description of the construction services sought for procurement. City policy requires that construction projects be awarded to the lowest responsive bidder. Some agencies may follow different procedures which may include following a scoring type system based on qualifications criteria or giving higher scores to contractors located within the jurisdiction. These systems will likely lead to higher construction costs.

The City awards paving contracts to the lowest responsive bidder. The City can consider modifying our contract award process by implementing a scoring system that considers a contractor's experience, past performance, their proximity to the City of Riverside, and other qualifying factors to award projects to responsible and professional contractors. After selecting the top contractor/company, the Public Works Department would open their bid and negotiate the contract price if it exceeds the Engineer's Estimate. If an agreement cannot be reached with the top contractor, the City would open the bid of the next highest scored company until an agreement is reached with a qualified and highly rated company. This process would ensure the City is provided with exceptional service while supporting bids that are within a reasonable range of the Engineer's Estimate. Modifying the award process from the lowest responsive bidder to a scoring system would require staff to invest more time scoring the bids and may cause some companies to contest the contract awards if they do not agree with staff's scores or were unable to negotiate a price for the contract. Further, the City would likely not always secure the lowest prices for the paving work and thus would have less funds to address the wide array of paving needs.

Typically, construction companies that produce their own asphalt with plants closer to the City have an advantage over construction companies further from the City due to the lower mobilization costs associated with transporting the material to the job site. Additionally, asphalt must maintain specific temperatures at the time material is placed at the job site, therefore longer transport times can hinder some construction companies from bidding on projects. Because of these reasons, many of the same contractors consistently bid on City paving projects.

The collection of pavement surveys is a relatively new tool for the City and is a crucial part of a successful PMP. As previously indicated, it is an iterative process that grows in accuracy as more data is collected and the recommended annual maintenance budget has increased by $7.5 million since 2018. With the rising inflationary rates, it will continually be a challenge to keep up with the pavement maintenance needs.

The Public Works Department continues to explore practical and feasible ways to extend the useful life of roads slowing the decreasing network PCI. Some options may include focusing on maintaining roads in the "Marginal" PCI range to prevent excessive growth in the City's backlog of streets in the "Poor" and "Very Poor" PCI range; increase the preservation treatment on roads in the "Good" PCI range; extend the pavement moratorium from three to five years; adopt a utility trench cut fee to increase funding; and consider concrete approaches in heavy truck traveled locations.

STRATEGIC PLAN ALIGNMENT:

This item contributes to Strategic Priority 6 – Infrastructure, Mobility & Connectivity and the following goals:

Goal 6.1 – Provide, expand and ensure equitable access to sustainable modes of transportation that connect people to opportunities such as employment, education, healthcare, and community amenities.

Goal 6.2 – Maintain, protect and improve assets and infrastructure within the City's built environment to ensure enhance reliability, resiliency, sustainability, and facilitate connectivity.

Goal 6.4 – Incorporate Smart City strategies into the planning and development of local infrastructure projects.

This item aligns with each of the five Cross-Cutting Threads:

1. **Community Trust** – The PMP better protects the roadway network, and the pavement strategies assist in increasing the pavement life.

2. **Equity** - The rehabilitation of City streets benefits all residents and their quality of life

3. **Fiscal Responsibility** - Extending the pavement life is essential for providing the most cost-effective manner for maintaining City streets.

4. **Innovation** - The recommendation is neutral towards this cross-cutting thread.

5. **Sustainability & Resiliency** - Extending the pavement life will better protect the roadway network thus improving the quality, structure, and resiliency of our streets.

FISCAL IMPACT:

There is no fiscal impact associated with this report.

Prepared by:	Gilbert M. Hernandez, Public Works Director
Certified as to availability of funds:	Edward Enriquez, Interim Assistant City Manager/Chief Financial Officer/City Treasurer
Approved by:	Kris Martinez, Assistant City Manager
Approved as to form:	Phaedra A. Norton, City Attorney

Attachment: Presentation