City of Peoria

Public Works – Utilities

Streets Division

Pavement Management Update and Report

Executive Summary

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BACKGROUND

The City of Peoria has about 100 miles of arterial streets plus an additional 530 miles of residential roadways.

At a replacement cost that exceeds $1 million per mile, the city has roughly $750,000,000 invested in our paved roadway network. Management of this asset is the primary focus of the Streets Division.

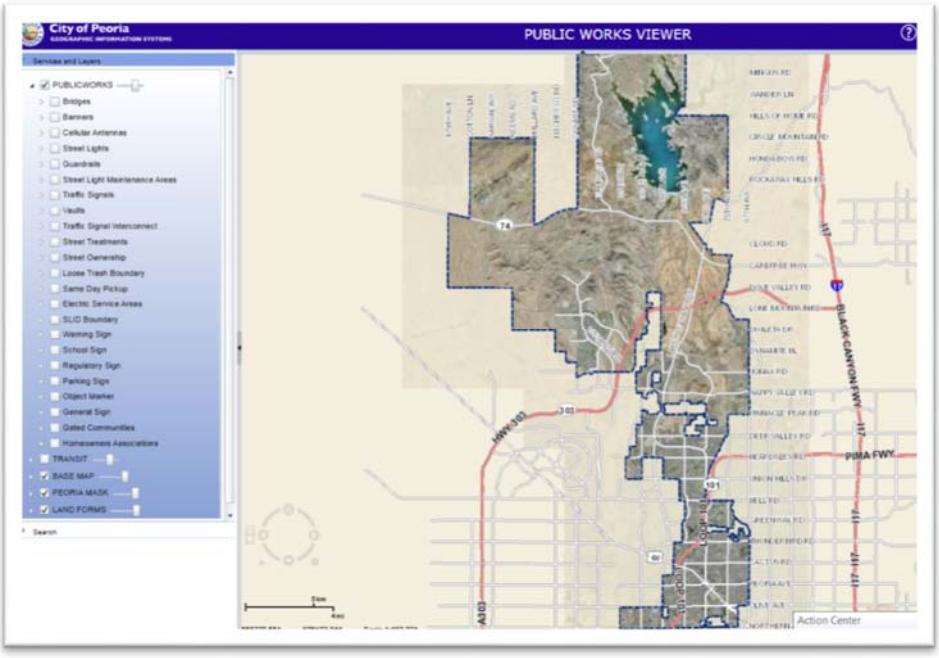
PAVEMENT MANAGEMENT is the comprehensive program of lifecycle maintenance for our city's streets. The objectives of pavement management include:

1) Maintain an accurate inventory of all Peoria roads;
2) Conduct routine inspection and assessment of conditions;
3) Record maintenance history;
4) Prioritize and scope projects for the best overall results; and,
5) Execute projects.

Inventory

In the current growth climate, maintaining an accurate inventory of all the streets in our network along with up-to-date condition ratings and historical maintenance data is vital to our operations.

Our pavement network is recorded on a Public Works layer in GIS that includes ownership, area, construction and maintenance data. New construction, annexation and intergovernmental agreements that affect maintenance responsibilities are added to the layer to keep the information current. This data is continually updated by the division with maintenance work and service history.



PAVEMENT CONDITION INDEXING

Historically, an inspector visually inspected each segment of pavement and assessed the conditions. This work was labor intensive, taking up to three years or more to complete the entire city. Over the course of three years, conditions could change considerably so such changes might affect prioritization. Additionally, the rating criteria was subject to the opinion of the inspector. Two inspectors might see the same segment differently and provide dissimilar ratings and the inspector's ability to rate the pavement was limited to surface conditions only.

In FY2017, the Streets Division commissioned a comprehensive pavement management study by Infrastructure Management Services, LLC (IMS) to assess the condition of Peoria's roadways and provide data to recommend pavement treatment strategies for our short, intermediate and long-term goals. The study collected information on roadway surface conditions, roughness evaluations, distress assessments and traffic classification surveys to determine impacts on all arterial and residential streets. In addition, structural analysis testing was conducted on all our arterial roads.

The specialized equipment of the IMS truck allows them to drive the entire city while collecting electronic data from the truck's complex system of cameras and lasers. The data is assessed for a multitude of conditions on every pavement segment in the city, then analyzed and collectively compiled to provide a Pavement Condition Index (PCI) for each segment of roadway and for the overall city network.

As a result of the Pavement Management study, all arterial and residential pavement conditions were assigned a PCI rating from 0 to 100 based on surface distress, roughness, and structural assessment.

The PCI of pavement is affected by a number of factors, including:

- Surface condition (roughness, cracking, etc.);
- Moisture intrusion and drainage (street profile, cross section, storm sewer);
- Sub-grade strength and conditions;
- Traffic characteristics and loading;
- Effects of exposure due to pavement age; and
- Prior maintenance (crack seal, potholes, patching, seal coats, micro seals, etc.).

Each of the rating factors contributes to the overall condition and lifecycle of the city's roads. Based upon the survey condition and our program results and goals, a pavement treatment schedule is determined.

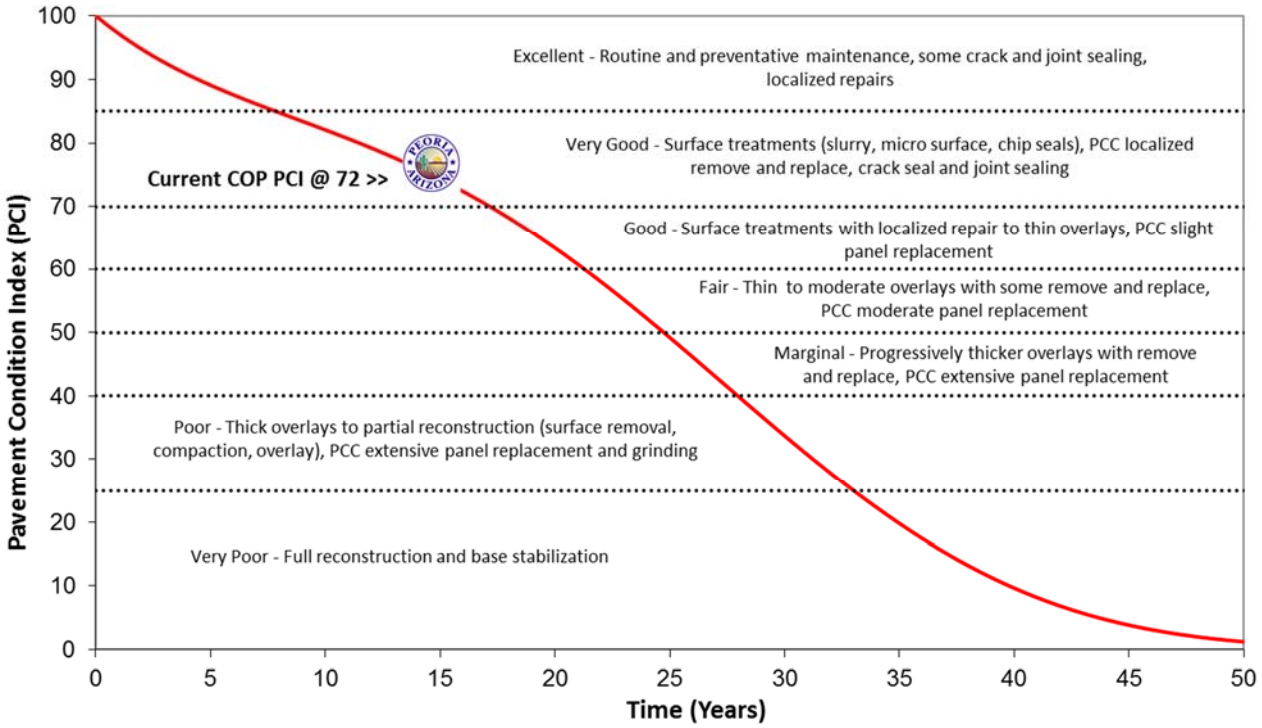
The prioritization of our projects, as recommended by the program must be validated annually by budgetary allocation and coordination with other agencies and city departments to ensure that conflicts are resolved and to ensure that we capitalize on coordination opportunities (such as implementing bike lanes with new surface treatments instead of obliterating old stripes). Additionally, we make every effort to avoid projects that may be in conflict with one another or those that may cause too much traffic or other disruption in the same area at the same time. We also work with event coordination and timing to facilitate traffic needs all while working to gain economy of scale through volume discounts for applying the same treatment in the vicinity.

Some of this coordination can be a challenge because most pavement work ideally takes place when outdoor temperatures range from about 60 degrees in the morning up to about 100 degrees in the heat of the day. In our climate, this means that most of our projects need to be scheduled in the spring or fall.

PAVEMENT MANAGEMENT = THE RIGHT TREATMENT AT THE RIGHT TIME

Like maintenance on a car, pavement will last longer and cost less over its lifecycle if it is well-maintained. When routine maintenance is deferred, repairs are likely to be needed sooner and the repairs will be more significant and costly. Without an adequate maintenance program, the network quality and corresponding PCI will drop much more quickly.

A good pavement management strategy emphasizes early, preventive maintenance treatments to protect and preserve the new conditions for as long as possible. Because there are so many factors that affect pavement condition over its lifecycle, age and a worst is first mentality are not valid criteria for the best long-term results.



Pavement Condition Index Examples and Prescribed Treatment

Recommended seal coat at approximately $20,000 per mile to preserve best condition (Recommended at 3 and approximately 8 years)

Requires crack seal and slurry or seal coat - At $25,000 per mile (Recommended every 8-12 years)

Requires repair, crack seal and slurry or seal coat - At $25,000 - $30,000 per mile (Recommended every 8-12 vears)

Requires repair, mill and overlay or micro seal at approximately $125,000 per mile (Recommended every 8-12 years)

Requires repair, mill and overlay at approximately $420,000 per mile - As needed every 25 years or more

Requires reconstruction at approximately $600,000 per mile

Pavement Treatment Descriptions

Pavement treatments range from thin seal coats of emulsion to removal of the surface or entire pavement structure. The costs of these treatments are proportionately more expensive so the best results over a lifecycle are realized when these treatments are applied at the right time.

Surface treatments include crack seal, seal coat, slurry and micro seals**.**

Crack seal is the least expensive, most effective maintenance that we do. Crack seal is a flexible latex product that is pumped into large cracks to help prevent water intrusion and damage to the subgrade. All streets can benefit from crack seal as soon as the cracks appear. Crack seal costs less than $1,000 per linear mile and in FY17, Peoria crack sealed 45 miles of cracks.

Seal coat and slurry seals are thin, surface treatments of oil emulsion and small aggregate rock that combine to reseal the pavement surface. This treatment extends the pavement life by minimizing the effects of sun and weather and re-establishing a wearing surface. Seal coat and slurry seals are typically applied to residential and collector streets. Ideally, these roads are treated within the first 5 years of construction to help maintain optimal conditions and they may be repeated several times over the lifecycle of a pavement segment. In FY17, we completed more than 30 miles of seal coat and slurry seals for a total cost of $713,000 but by the end of FY18, we will have completed nearly 90 miles of surface treatments!

Micro seals are denser with more aggregate and they are applied thicker than slurry and seal coats. Micro seals are an effective treatment for arterial roads and some residential collector roads with higher traffic volumes as they are an excellent treatment for residential roads that are in poor condition.

In FY17, we micro sealed approximately 9 miles of road for a little over $1 million. In FY18, we applied a micro seal on Lake Pleasant Parkway from Cibola Vista Drive to State Route 74.

Mill and Overlay/Surface Reconstruction

Mill and overlay or surface reconstruction includes removing from 1 to 5 inches of the existing pavement then replacing it with new asphalt. The new surface is constructed to restore the proper cross slope and provide a stronger roadway section. This process is typically less expensive than full reconstruction, it takes less time and is common on arterial roadways but may be applicable to some residential conditions as well. In most cases, the work will also be preceded by significant repairs where needed.

Full Reconstruction

Full reconstruction includes removal of the existing roadway and rebuilding the road from the sub-grade through the pavement surface. Sub-grade correction is usually required so we will also remove unsuitable materials, backfill with a new aggregate base and apply new asphalt pavement.

Full reconstruction is expensive, time consuming and inconvenient to the residents.

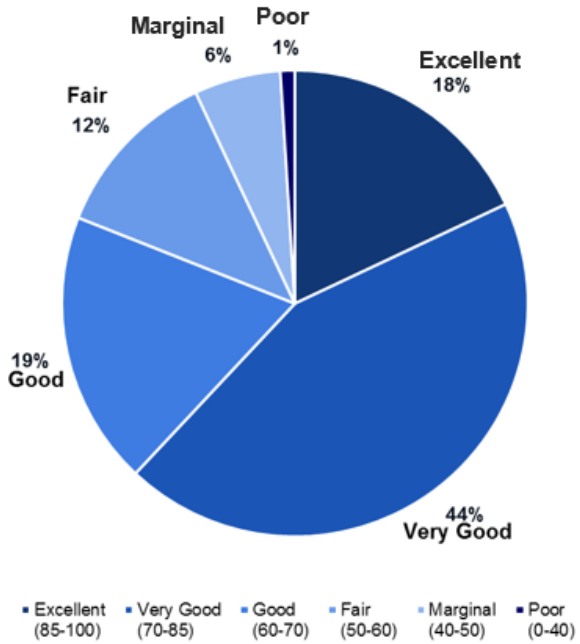
Compliance with current ADA standards for ramps and concrete repairs is required for micro seal, mill and overlay or reconstruction projects. In older neighborhoods, this work may be extensive as the ADA standards have changed significantly and in some recently serviced neighborhoods, the cost of this work has exceeded 35% of the total project costs.

IMS ROADWAY CONDITION, FINDINGS AND BUDGET-BASED FORECAST

IMS has provided the same service and report for other agencies around the country and locally including Glendale, Gilbert, Goodyear, Scottsdale, Tempe, and Chandler, so with our results we were able to benchmark our maintenance program, validate our strategies and gain a more global insight into planning future projects.

We learned that Peoria's average PCI of 72 is above the national average of other IMS clients and our backlog of very poor pavement is below the national average at less than 1%. This is an endorsement of our current program that indicates our strategies are working and our budgets are being effectively applied to the city's roads.

In FY18, our standard capital budgets were increased by nearly $3 million and additional projects were planned and executed. IMS predicted that the increased budget and our programmed FY18 work, once complete, would increase our PCI to 74.



IMS results indicated that the majority of our streets are in the good to excellent category with 80% rated with a PCI of 60 or better.

110 miles of our total street network can be considered in very good or excellent condition with a PCI score greater than 85. These streets are in like new condition and only require routine maintenance like crack seal and seal coats to preserve the condition. Nationwide, the amount of roadways falling into this category is about 15 percent, so at 18%, Peoria is above the national average.

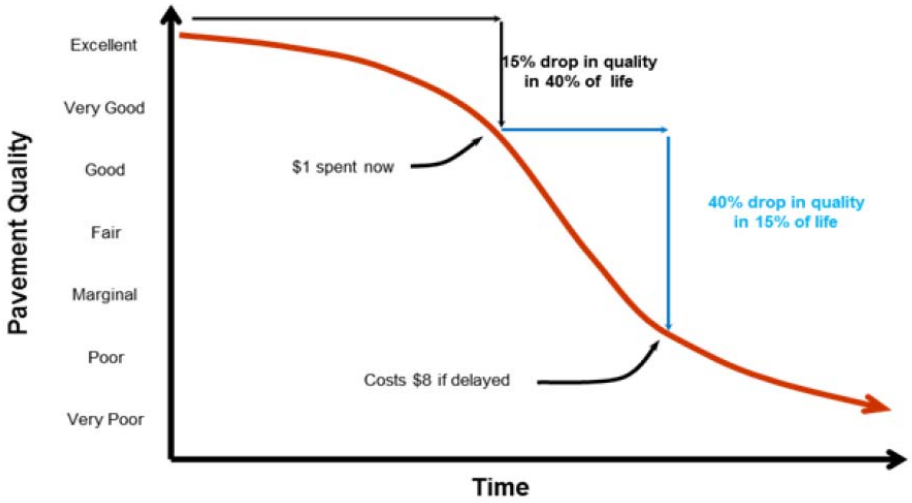
262 miles or 42% of our street network fall into the very good category from PCI 70-85. These are roads that benefit the most from preventative maintenance techniques such as localized repairs, slurry seals and micro seals. If left untreated, these roadways will deteriorate and the repairs and rehabilitation work will be considerably more extensive and costly.

125 miles or 20% of our streets are rated 60-70 PCI, good condition, and 89 miles or 14% of the network a PCI between 50-60, which is fair condition. Street conditions ranging from 50 to 70 PCI are candidates for rehabilitation including slurry and micro seals or mill and overlay.

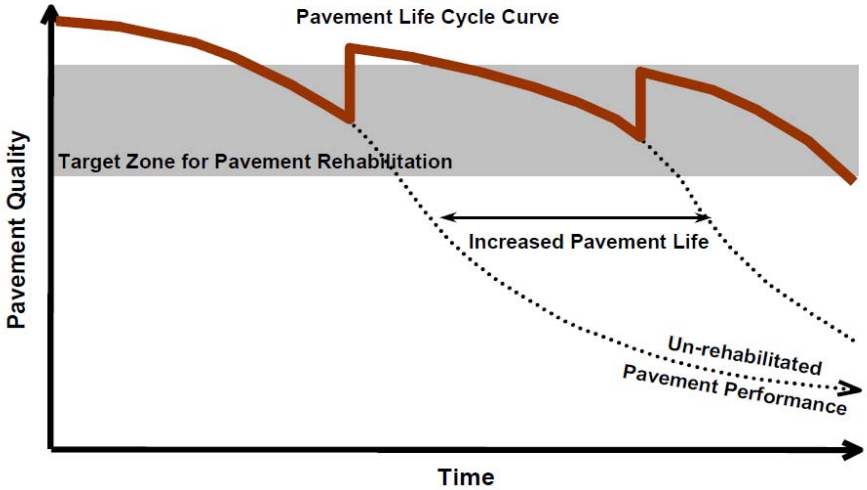
42 miles or 6% of our of the street network have a PCI from 0-40. These roads require progressively greater rehabilitation efforts and may be candidates for rehabilitation and reconstruction including micro seal, mill and overlay or full reconstruction.

ANNUAL FUNDING AND BUDGET ANALYSIS

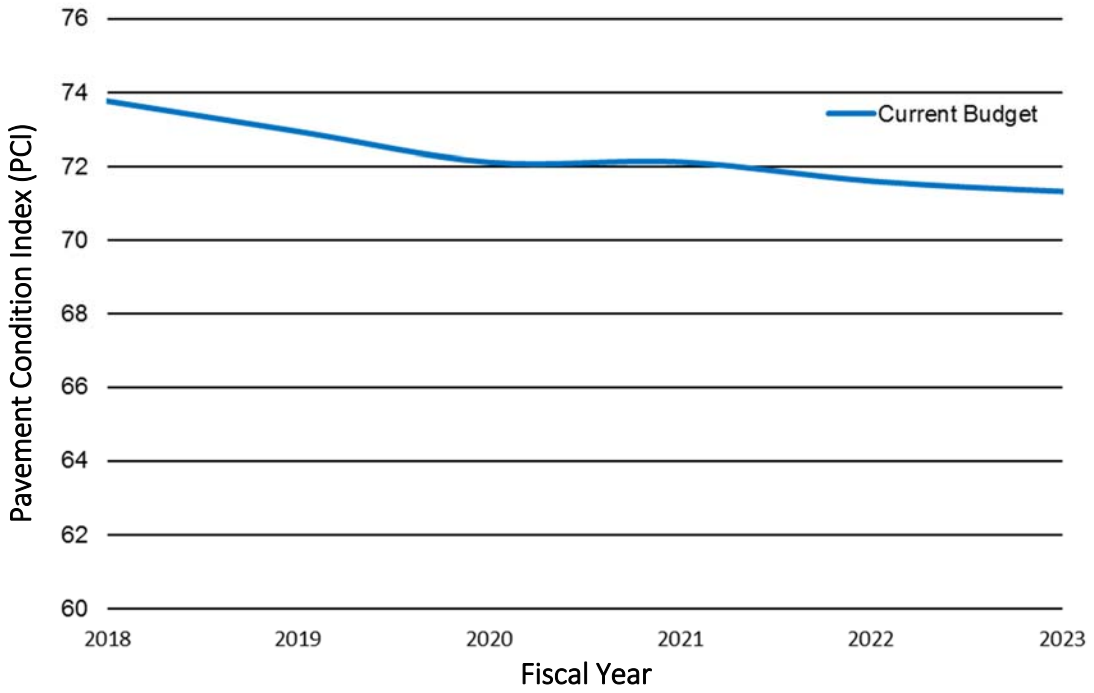
In order to maintain our streets in serviceable condition for as long as possible at the lowest cost, our program of maintenance includes emphasis on early treatments such as seal coats, slurry seals and micro seals. Streets that are treated or repaired when they are in a good condition will cost less over their lifetime than streets that are allowed to deteriorate to a poor condition. A $1 investment within the first 20 years or 40% lifespan is much more effective than deferring maintenance until more costly treatments or reconstruction are required just a few years later. For this reason, most maintenance is conducted within the first 20 years of a pavement's lifecycle and after that, most work will be limited to necessary repairs until the pavement is prioritized for reconstruction.



By prioritizing lifecycle maintenance, the pavement quality will be much better for a longer period of time.



In FY2018, our pavement management budgets were increased by approximtaly $3 million. With this extra money in FY2018, we were able to boost our PCI from 72 to 74 (estimate per IMS).



Our Capital Improvement Program budgets for pavement management include separate accounts for pavement preservation and rehabilitation. In FY18, we worked with the budget office to change some accounts from their previous descriptions based upon the type of roadway: arterial vs residential, to preservation and rehabilitation. This change allows the division to execute projects based upon type and adjacency to benefit from economies of scale instead of making such decisions based upon the roadway classification.

Our pavement management programs are funded by the Arizona Highway User Revenue Fund (HURF) and are subject to the state's revenue distribution formula. The budgets referenced represent construction costs directly related to project delivery. This includes pavement preservation and rehabilitation, sidewalk and ADA retrofits as well as certain indirect administrative costs including engineering design and construction administration services, contractual inspection and testing services, and internal costs for finance and engineering contract administration services as well as the Arts Fund contribution.

PROPOSED REHABILITATION PLANS

FY2018 plans are largely complete at this time. Of note:

- Nearly 18 arterial miles treated including Micro Seal on Castle Hot Springs, Christian Church Camp Road, New River Rd, Old Carefree Highway, Lake Pleasant PW, From Cibola Vista Dr to SR74;
- Micro Seal on 119th Ave, From Happy Valley PW to South-End, 97th Ave, From Olive to North-End, 88th Dr, From Grand Ave to Cholla St, 85th Ave, From Grand Ave to Peoria Ave, Cheryl Drive, From 75th Ave to 67th Ave, 69th Ave, From Peoria Ave to Mountain View Rd;

More than 72 residential miles as follows:

- Mill & Overlay in Township of Peoria, Cedarbrook, Monroe Park Estates, Alta Loma Wood Tract, Countryside Manor, Foxboro, Westgreen Estates;
- Slurry Seal in Terramar, Spinnaker Cove, Windmill Lot & Foxwood, Ventana Lakes Phase III, Westbrook Village;
- Seal Coat in Sun Air Estates III, IV, V, & VI, New River Ranch, Rio Estates, Suntown, Pioneer Village, Windwood, Braemar Unit, Legacy Place, Tierra Buena I & II, Arrowhead Shadows, Paseo Verde Estates, Tierra Norte 5, Heatherbrook, Lakeview Estates, Fairway Ridge, Cambridge Crossing, Country Meadows I, II, III & IV; and,
- Large Crack Repair on Olive Ave, from 83rd Ave to 89th Ave eastbound lane, 75th Ave, from Paradise Ln to Bell Rd, 77th Avenue, from Bell Road to EOP, Paradise Ln, From 75th Ave to 83rd Ave.

With the increase of funding this fiscal year, the Pavement Management Team anticipates the overall pavement network condition rating to increase from 72 to 74.

FY2019 anticipated plans:

- Micro Seal treatments on 91st Avenue, from Beardsley Road to Union Hills Drive, Terramar Boulevard, Desert Moon Way, Union Hills Drive, from 83rd Avenue to 93rd Alignment, 79th Avenue, from Thunderbird Road to Peoria Avenue;
- Mill & Overlay on 107th Avenue, from Pinnacle Peak Road to Beardsley Road, 91st Avenue, from Union Hills Drive to Bell Road, 75th Avenue, from Olive Avenue to Northern Avenue, 91st Avenue, from Cactus Road to Peoria Avenue; and
- Slurry Seal in Arrowhead Cove, Arrowhead Shores I & II, Calbrisa, New River Shores, Paradise Shores, Vistancia Phase I, II, & III

FIVE-YEAR PLAN (FY2020-2023)

The approach for developing the five-year rehabilitation plan involved prioritizing and selecting both arterial and residential streets for pavement improvements. The methodology used included assigning the appropriate pavement treatment to all street segments in the roadway network first, and then the critical streets having the highest cost of deferral were selected, followed by less critical streets having a lower incremental cost of deferral. For example, the cost of an arterial thick overlay is $31.50/yd2 increasing to $76.00/yd2 if deferred resulting in an incremental cost of $44.50/yd2, while the cost to defer a thin overlay to a moderate overlay is only $5.75/yd2. Thus, a critical thick overlay is assigned a higher priority (lower sequence) that a thin overlay. Under this approach, the streets were ranked from lowest to highest PCI after selecting the type of required pavement treatment or rehabilitation activity.

The effect of utilizing this methodology for the five-year plan is to develop the most cost effective rehabilitation strategy that maximizes pavement life. Maps attached indicate the planned projects by year. Based upon the current CIP budget, between FY2020 and FY2023, we will complete 190 miles of pavement treatments.

SUMMARY

As outlined in this pavement management analysis, the City's current PCI of 72 is generally considered "good" or "very good" and it is above the national average. This benchmark validates Peoria's overall program of pavement management from budget to project execution. The IMS survey results provide an objective insight to our total roadway network and every segment of Peoria pavement. The data results facilitate forecast modeling of our program based upon budget and/or goals, which helps to plan appropriate projects for the short, intermediate and long term. With this data, we can forecast our PCI based upon budget or recommend a budget based upon PCI as a goal.

Attachments:

Summary Maps of Rehabilitation Plans for FY2018, FY2019, and FY2020 – FY2023

Pavement Condition Index Spreadsheets