

FINAL REPORT

UPDATE OF
PAVEMENT MANAGEMENT PROGRAM
(Citywide)

2017-2022



Submitted to:
City of South Gate, CA
May 22, 2017



May 22, 2017

Mr. Kenneth Tang
Senior Civil Engineer
City of South Gate
8650 California Avenue
South Gate, CA 90280

Subject: Final Report - Update of the Pavement Management Program

Dear Kenneth:

As part of the 2017 Update of the Pavement Management System for the City of South Gate, *Bucknam Infrastructure Group, Inc. (Bucknam)* is pleased to submit the Final Report for the City's pavement network.

The information contained in this report was used to develop the recommended improvement program for the pavement network. The report covers the following categories:

- **Executive Summary (Section I)**
- **Pavement Management Program Development and Reporting (Section II)**
- **Pavement Conditions For Each Segment in the Network (PCI Report – Section III)**
The Pavement Condition Index report shows the present condition of each street in the pavement network. In addition, the report shows the basic geometry of each street segment.
- **Forecast Maintenance Reports (Section IV)**
- **Recommended Maintenance and Repair Strategies**

The recommended maintenance and repair strategies were used to generate the Forecasted Maintenance Report and were based on our 2017 inspections.

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Additionally, we have assessed and incorporated unit cost and maintenance application practices/types with our strategies.

- **Projected Projects based on M&R Strategies**

The Forecasted Maintenance Report projects the street maintenance activities required for the next five years, broken down to show maintenance levels for Arterial, Collector and Local streets. The report included in Section V is broken down by fiscal year.

Our thorough analysis of previous and current South Gate PMP strategies enabled our staff to make proactive recommendations to the City's pavement CIP. All comments received from the City have been incorporated in the reports that follow. All of the City's issues and needs that were brought to our attention are included in the report. It has been a pleasure working with you and the City on updating your Pavement Management Program. We look forward to the continued success of this project and future teamwork with City staff.

Sincerely,

Bucknam Infrastructure Group, Inc.



Peter J. Bucknam
Project Manager
Infrastructure Management – GIS Services

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Acronym Listing

Asphalt Concrete (AC)
Asphalt Rubber Hot Mix (ARHM)
Capital Improvement Program (CIP)
Geographic Information System (GIS)
Government Accounting Standards Board Statement 34 (GASB 34)
Maintenance and Repair (M&R)
Master Plan of Arterial Highways (MPAH)
Los Angeles County MTA (METRO)
Portland Cement Concrete (PCC)
Pavement Condition Index (PCI)
Pavement Management Program (PMP)
Pavement Management System (PMS)

SECTION I

EXECUTIVE SUMMARY

2017 UPDATE OF PAVEMENT MANAGEMENT SYSTEM

This report reflects the continued dedication and proactive management of the City's Pavement Management Program (PMP); the last major update to the City's PMP was performed in 2014. As the City of South Gate continues to show limited growth with its population, demographics, infrastructure and maintenance needs, the street network has been running parallel as the system matures and capital street projects widen streets. The City of South Gate developed its PMP with the use of an automated database program. Today, the City is currently using the Army Corps of Engineers software, MicroPAVER, to manage the street network. This system is essential to the City in that it assists Public Works staff in capturing funding for its arterial street system as well as cost-effectively manages the local network through proactive maintenance and scheduling. Under this project, the City has incorporated the development of a unique Pavement Management – GIS layer that will assist the City in spatially analyzing pavement conditions and other attribute information that resides in the MicroPAVER database.

The South Gate PMS has been developed to assist City personnel by providing current data on the City's street network and to develop cost-effective maintenance strategies to maintain a desirable level of pavement performance on a network scale, while optimizing the expenditure of limited fiscal resources. The PMP efforts in 2017 consisted of analyzing the City's 2014 dataset for quality and usability. City staff also provided key information pertaining to the ongoing maintenance that has occurred throughout the City since 2014. In doing this, we were tasked to generate an updated Capital Improvement Program report that identified recommendations and deficiencies in the current operating and maintenance efforts put forth by the City.

For the 2017 project, our staff surveyed all arterial and collector routes to assist the City in complying with Los Angeles County MTA (METRO) PMP requirements as well as performed PCI deterioration analysis on all Local streets and analyzed historical maintenance operations.

Specifically, the program provides administrators and maintenance personnel with:

- *The present condition status of the pavement network (arterial, collector, and local streets), as a whole and of any grouping or individual component within the City;*
- *A ranked list of all streets, or segments of streets, by condition within the network;*
- *Rehabilitation/maintenance needs of each street segment by year;*
- *An optimized priority maintenance and rehabilitation program based on cost/benefit analysis and various levels of funding;*
- *Optimum annual budget levels for pavement maintenance for the current and the following five (5) years;*
- *Prediction of the future performance of the City's pavement network and each individual street section;*



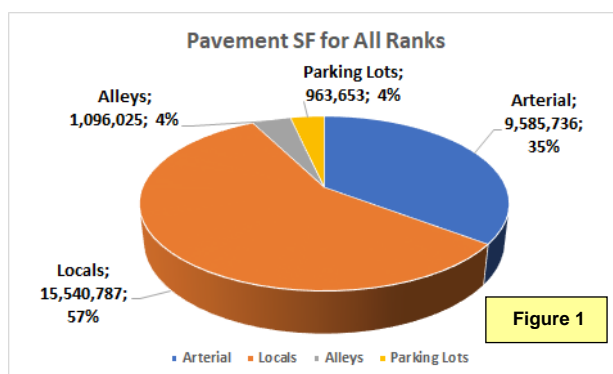
- Updated PMS data to assist the City with GASB 34 compliance; and
- Pavement condition data and analysis presented in **ArcGIS** that is compatible with City's existing GIS

Pavement is a dynamic structure where deterioration is constantly occurring; thus the pavement management system needs to be updated on a regular basis to reflect these changes in pavement conditions, pavement maintenance histories, and maintenance strategies based upon budgetary constraints. In our approach to develop the City's forecasted maintenance recommendations we worked with South Gate staff in identifying unit costs for all maintenance practices used on an annual basis (these not only included the material costs but contingency costs for design and ADA improvements, etc.). Currently, based upon the City's maintenance practices and their associated unit costs, the total replacement value of the South Gate pavement network is \$170,347,700. This value clearly indicates that the City's pavement network is the most valuable and essential asset to South Gate. The City's use of slurry seal, AC Overlay and R&R practices are typically applied at a five year, ten year and 25 year frequency respectively. These frequencies are typical but the City may see increases in deterioration rates due to environmental, load and high average daily traffic (ADT) volumes. For example, high ADT volumes along one of South Gate's arterial streets will increase deterioration rates for a previously applied AC Overlay compared to a small local street. These deterioration rates are monitored through frequent inspections and functional class deterioration analysis within the City's PMP database.

This report reflects our findings and recommendations for the PMP and the current state of the City's pavement network. Furthermore, we have recommended detailed funding and maintenance strategies for the arterial/collector and residential networks for next five (5) years.

CITY'S PAVEMENT NETWORK

Within the South Gate pavement management network there are approximately 34.1 section miles of Arterial/Collector streets (Master Plan of Arterial Highway-MPAH). The Arterial and Collector network consists of approximately 9,585,736 SF of pavement which consists of 402 pavement sections. The Local network consists of approx. 15,540,787 SF of pavement which consists of 796 pavement sections totaling in 91.4 section miles. The City maintains 11.5 miles of Alleys totaling 1,096,025 SF and over 3.4 miles of parking lots totaling 963,653 SF. Combined, the entire network consists of 140.2 section miles of streets, 1,256 pavement sections and 27,186,201 SF of pavement.



The City's pavement network is broken down into manageable groups that have similar characteristics, such as pavement rank, surface type and logical segmentation. Pavement segments are identified by their branch and section numbers. Pavement "branches" that have a common usage, such as Tweedy Blvd., defines a "branch" within MicroPAVER. Pavement "sections" are pavement segments within the defined branch that have consistent pavement rankings, construction/maintenance histories

and use. Representative inspection samples are then selected and visually surveyed to locate distress data. This data is used to calculate the pavement sections Pavement Condition Index (PCI) which includes distress type, extent of the distress and its severity.

The PCI is a condition rating that ranges from 100 (a new pavement section or recently overlaid or reconstructed) to 0 for a section that has structurally failed and deteriorated dramatically. Weighted average PCI of a given area/zone = pavement section PCI * its own area divided by the total square footage of the given area/zone. Table 1 summarizes the section conditions found within the City of South Gate pavement network by rank.

- **The weighted average PCI for the Arterial / Collector network is 61.5**
- **The weighted average PCI for the Local network is 46.1**

The weighted PCI value associated with the Arterial and Local routes shown through our survey analysis is timely in that it is showing that a large amount of preventative, slurry seal, and overlay work will be needed over the next several years to increase the level of condition (PCI) to a “preventative maintenance” state.

CURRENT CITYWIDE CONDITIONS (ARTERIALS AND LOCALS)

The overall condition of the City’s pavement network is “Fair” with a weighted average PCI of 51.6 based on the surface area of each segment. The weighted PCI for the City in FY 2013 was 48.0; based upon this study the PCI for South Gate has increased 3.6 points in four years. The distribution of the City’s overall pavement network is shown in Section III of this report (Condition Distribution).

Rank	Mileage	SF	2017 PCI	2014 PCI
Arterial	34.1	9,585,736	61.5	59.7
Locals	91.2	15,540,787	46.1	45.2
Citywide	125.3	25,126,523	51.6	48.0

Table 1 – Historical South Gate PCI Data (2013-2017)

For comparison, Bucknam performed pavement management studies for several other Los Angeles County local agencies and have included their weighted PCI values; El Segundo (63.4), Culver City (62.9), and Huntington Park (60.1).



Condition	PCI Range	Arterial	Local	Total	% of Network
Excellent	86-100	6.9	5.2	12.1	9.6%
Very Good	71-85	7.3	15.0	22.3	17.8%
Good	56-70	7.9	16.4	24.3	19.4%
Fair	41-55	3.8	10.5	14.3	11.4%
Poor	26-40	2.0	13.9	15.9	12.7%
Very Poor	11-25	5.4	24.6	30.0	23.9%
Failed	0-10	0.8	5.8	6.6	5.3%
		34.1	91.4	125.5	

Table 2 – Condition Distribution by Section Mileage for All Streets

As shown above, a large majority of segments are distributed through Good to Very Poor condition categories (67%, approximately 84.5 miles). These findings indicate that large amounts of preventative slurry maintenance and overlay/reconstruction capital improvements are still needed to be performed on the City’s network. These condition ranges are defined by the Army Corps of Engineers.

Currently, 32% of the Arterial network (approximately 10.9 miles) qualifies for potential slurry seal maintenance while 50% (approximately 17.0 miles) qualify for overlay/reconstruction. Within the next fiscal year, a proactive overlay maintenance program needs to be funded and implemented; at a minimum, this will maintain the citywide weighted PCI at its current conditions and will gradually increase the PCI to a higher condition level while reducing maintenance costs in fiscal years 2017 and beyond.

Local conditions continue to demonstrate very low overall PCI’s; currently, 23% of the Local network (21.4 miles) qualifies for potential slurry seal maintenance while 69% (approximately 64.8 miles) qualify for overlay/reconstruction. In general, the Arterial network is showing higher condition levels compared to the Local network; there are a handful of key overlay projects that should be proactively managed in the next few years of the Arterial & Local Streets CIP.

These findings are negative in that the amount of revenue needed to maintain the network is overbearing and detrimental to the system as a whole. In fact, in the budgetary reports that follow, we have found that the historical expenditure levels that the City has been applying to pavement maintenance will only “maintain” the conditions found today and will allow the network to decline again in the near future.

Therefore, immediate funding of a stronger overlay program should be the focus of the PMP for the next several years, especially for the Local network.

Furthermore, as large overlay and rehabilitation projects are considered for funding, the City should also consider using sub-grade R - Values, structural design, distress severities and extents as parameters for determining whether a pavement section that lies within the Fair to Poor condition range should be overlaid or reconstructed.

PCI conditions reflect “surface” conditions; additional sub-surface data such as coring data, R-Values and asphalt depths will provide City to with additional data to determine what maintenance/rehabilitation should be applied.



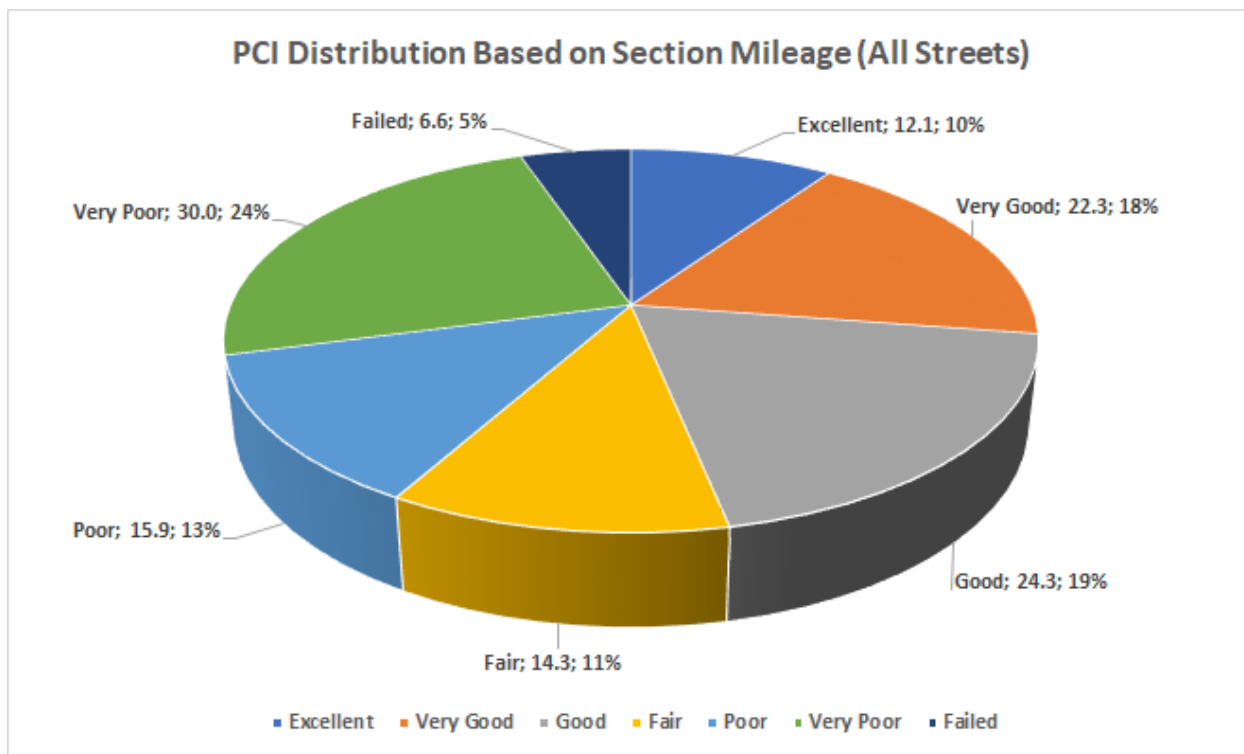


Figure 2 – PCI Distribution by Section Miles for All Streets

MAINTENANCE STRATEGY DEVELOPMENT

Based on the results of the condition survey and input from the City, pavement maintenance/rehabilitation strategies were developed. At the outset, the City and Bucknam staff identified a distribution of City maintenance funds that would be applied to the network over the next five years. This was based upon the desire to prevent the decrease in street conditions and not allow an increase in the maintenance backlog funds over the five-year program.

With this approach, Bucknam has recommended a “minimal level of service” which creates a major dividing line in determining pavement maintenance. Generally, within pavement management programs, a PCI range between 55 to 70 determines the threshold of when preventative or major overlay maintenance is activated. Based on the City’s weighted average PCI, condition distribution, maintenance practices, our team has identified a PCI of “65” as the minimum level of service. This means that any pavement section with a PCI greater than 65 will be recommended for preventative maintenance. This recommendation is indicated in Table 7, Section II.

Bucknam developed a multi-year Capital Improvement Program for the City based on the pavement records, yearly capital expenditures and the most recent 2017 inspections.

These recommendations and results are shown in Section II of this report where we have demonstrated what level of funding is necessary to improve the current weighted condition level of



51.6 to a level of 57 by FY 2022.

As shown in Figure 2, 28% of the City’s streets are in Excellent to Very Good condition. These sections will be targeted for “preventive” maintenance within our Capital Improvement Program (CIP) recommendations. The reasoning in doing this is to extend the life cycles of those “good” pavement sections which accrues capital saving to aggressively rehabilitate those pavement sections that are below the “minimal level of service”.

In order to achieve the most effective and optimum program for the City, certain strategies have been selected and/or analyzed. Below is a listing of the maintenance activities utilized in strategy development. Each activity is representative of the types of work that have been programmed as part of the long-term maintenance requirements of the City’s street network.

General Repairs-Stop Gap (Localized Maintenance*)

For this maintenance type, small localized surface treatments are utilized as “holding action” solutions (stop gaps) to delay the need for pavement structural strengthening. They typically include activities such as crack sealing, deep patching, skin patching, grinding and leveling.

Slurry Seals (Global Maintenance*)

Surface treatments applied to pavements with minimal surface distress to provide new wearing surfaces and extend pavement life. Generally consists of a mixture of conventional or latex-modified emulsified asphalt, well-graded fine aggregate, mineral filler and water placed over an existing AC surface.

Cape Seals (Global Maintenance*); PCI range – 35 to 60

This is an application of a single layer of asphalt binder to a road surface immediately followed by a single layer of cover aggregate (chips). The single layer chip seal is then followed with a slurry seal application; Conventional cape seal application life-cycles are averaging 6 to 7 years. For sections that have lower PCI’s in this range, leveling courses should be considered.

Overlays (Major Maintenance*)

AC Overlay – Placement of a layer of hot-mixed asphalt concrete over the existing pavement surface (may include pavement fabric). Grinding (milling) is performed prior to the overlay to reduce the total height of asphalt and assure alignment with existing gutter lines. This also includes “dig-outs” 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. A conventional overlay should be designed for a ten-year life.

Asphalt Rubber Hot-Mix Overlay - The ASTM definition is: Asphalt-Rubber is a blend of asphalt cement, reclaimed tire rubber and certain additives in which the rubber component is at least 15% by weight of the total blend and has reacted in the hot asphalt cement sufficiently to cause



swelling of the rubber particles. Specifically, using crumb rubber modified binders in pavement applications benefits local agencies in that cities find:

- Pavement resists cracking by being more flexible;
- Cost savings come from a longer life cycle (from Bucknam's experience typically 20% longer), decreased maintenance and the use of less material
- Improvement in skid resistance;
- Decreased noise; and
- It provides long-lasting color contrast for marking and striping

Reconstruction (Major Maintenance*)

Removal of the existing pavement section to a prescribed depth followed by the placement of a conventional flexible pavement section using a structural AC Hot Mix or AR Hot Mix or a full depth asphalt. Each classification of road has a typical design cross-section upon anticipation traffic loading.

*Localized, Global and Major maintenance activities are default terms used within the MicroPAVER pavement software. Specific pavement repair applications are placed within each maintenance activity in order to develop multi-year maintenance forecast recommendations.

ANNUAL BUDGET PROJECTIONS

Each scenario below considers the City’s currently funded 2017-2019 Arterial / Local overlay projects for Imperial Ave, Garfield Ave, Gardendale Street, Southern Ave, and Long Beach Blvd. The revenues shown outside the Funded Project column indicate the allocated and/or necessary funding to achieve each scenario’s goal.

The budgeting process was approached with the following in mind; generate three unique work programs for the next five (5) years based upon actual road pavement conditions in order to:

1. Demonstrate how the “actual” citywide pavement budget (\$11,500,000, over five years) performs against the existing 2017 conditions;
2. Demonstrate budget allocation for pavement maintenance performs is necessary to “maintain” today’s existing conditions until 2022
3. Identify the required citywide budget to reach a PCI level of 57 within five years

Based on current and future pavement maintenance needs, three annual work programs have been prepared and summarized below. Table 3 demonstrates how the City’s actual Public Works street budget performs against the existing 2017 conditions. Table 4 demonstrates what annual budget is necessary to “maintain” today’s conditions. Table 5 demonstrates the required budget that is needed to improve the citywide weighted average PCI to a level of 57 within five years (each scenario addresses arterial and local streets).

Plan Year	PCI Before	PCI After	Slurry Seal	Overlay / Recon	Annual Actual Total \$	Funded Projects
2017-18	51.6	52.6	\$397,500	\$1,895,800	\$2,293,300	\$2,800,000
2018-19	51.5	54.5	\$398,400	\$1,905,600	\$2,304,000	\$4,296,700
2019-20	53.4	54.6	\$392,100	\$1,938,700	\$2,330,800	\$826,000
2020-21	53.4	53.8	\$402,500	\$1,925,600	\$2,328,100	\$0
2021-22	52.9	54.2	\$396,900	\$1,926,800	\$2,323,700	\$0
			\$1,987,400	\$9,592,500	\$11,579,900	\$7,922,700

Table 3 – Citywide Projection Utilizing \$11.5 Million Five-Yr Budget (Actual)

Plan Year	PCI Before	PCI After	Slurry Seal	Overlay / Recon	Maintain PCI Total \$	Funded Projects
2017-18	51.6	52.1	\$397,500	\$1,533,500	\$1,931,000	\$2,800,000
2018-19	51.2	54.2	\$398,400	\$1,540,900	\$1,939,300	\$4,296,700
2019-20	53.4	54.1	\$392,100	\$1,614,600	\$2,006,700	\$826,000
2020-21	52.8	52.9	\$402,500	\$1,614,800	\$2,017,300	\$0
2021-22	51.5	51.8	\$396,900	\$1,614,300	\$2,011,200	\$0
			\$1,987,400	\$7,918,100	\$9,905,500	\$7,922,700

Table 4 – Citywide Projection Utilizing “Maintain” Budget



Plan Year	PCI Before	PCI After	Slurry Seal	Overlay / Recon	Increase PCI Total \$	Funded Projects
2017-18	51.6	55.1	\$397,500	\$2,918,500	\$3,316,000	\$2,800,000
2018-19	53.5	55.6	\$398,400	\$1,455,600	\$1,854,000	\$4,296,700
2019-20	54.2	56.0	\$392,100	\$2,971,100	\$3,363,200	\$826,000
2020-21	54.6	56.6	\$402,500	\$3,116,300	\$3,518,800	\$0
2021-22	55.2	57.5	\$396,900	\$3,155,400	\$3,552,300	\$0
			\$1,987,400	\$13,616,900	\$15,604,300	\$7,922,700

Table 5 – Five-Year Projection Demonstrating Required Budget to Reach PCI of 57

Additional detail and breakdown of budget projections are demonstrated in Section IV of this report.

All work program budgets generated are presented in terms of current 2017 dollars. All repair activities were based on distresses observed at the time of the field survey. These are recommendations and are to be used as “the best-case scenario” for improving the City of South Gate street network.

QUALITY CONTROL EFFORTS

As indicated in our scope of work, Bucknam performed numerous quality control checks in the field during survey efforts as well as specific site investigations requested by the City. Field check efforts were performed at the end of each week of survey.

This project included the survey of all streets; small area adjustments were made to the database as well as naming conventions corrections for a small handful of local streets. Clarification of the City’s Arterial / Collector was also performed to ensure that South Gate will be provided MTA with all essential Arterial / Collector data. These corrections were made to both the MicroPAVER database and the unique PMP-GIS layer.

Work History records for 2013 - 2016 street rehabilitations were entered into the database. These included slurry seal, overlay and reconstruction projects along:

Recent Work History - South Gate (2014-2017)					
Atlantic Ave	Cassina Ave	Karmont Ave	Otis St	Richlee Ave	State St
Ardmore Ave	Firestone Blvd	Mason St	Rayo Ave	Reona Ave	Willow Place
Burtis St	Glady St	McNerney Ave	Rheem Ave	San Vicente	



FINDINGS AND RECOMMENDATIONS

Arterials

2017 field inspections indicate that the Arterial street network is currently in “Fair” condition. At a minimum, to maintain this condition, it is critical that preventive maintenance and overlay activities are funded at the levels identified in Table 4 and the reports in Section IV to maintain a fair network weighted average PCI value.

Our arterial/collector findings for conditional data and recommendations for revenue expenditures are shown below:

- The Arterial/Collector network has a weighted PCI of 61.5;
- Currently, 32% of the arterial network (approx. 10.9 miles) qualify for slurry seal while 50% of the network (approx. 17.0 miles) qualify for overlay/reconstruction;
 - Future 2017-2019 Arterial projects along Imperial, Garfield and Long Beach will immediately improve upon the City’s Arterial PCI and accrued deferred maintenance;
- Arterial maintenance projects should focus on increasing the current weighted PCI of 61.5 to 70.0 the next five years (projects mentioned above will assist in reaching this goal);
- Develop a proactive fiscal and planned approach to identify arterial overlay projects based on the deterioration modeling within MicroPAVER;
- Proactively schedule and appropriate the necessary arterial revenues at the levels shown within the Section IV Forecasted Maintenance Report for a minimum of five years to generate the results identified within this report;
- Reassess/re-evaluate the arterial rehabilitation budget program every two years to improve on CIP forecasts for 2017-18 and beyond to ensure the results shown in Table 5;
- Perform pavement inspections on the arterial network every two years to build a solid planning model within MicroPAVER to track PCI deterioration;
- Demonstrated budget shown in Table 4 is ample to maintain the arterial weighted PCI of 77.1 through five years, however, the citywide deferred backlog remains at a high level (\$74.5 million to \$84.7 million) after five years; and
- Bucknam recommends that the City proactively budget pavement CIP projects and maintenance at the levels shown in Table 5 in order to improve upon the conditions found today.

Locals

2017 field inspections indicate that the Local street network is currently in “Fair” condition. At a minimum, to maintain this condition, it is critical that preventive maintenance and overlay activities are funded at the levels identified in Table 4 and the reports in Section IV to maintain a fair network weighted average PCI value.

Our Local findings for conditional data and recommendations for revenue expenditures are shown below:

- The Local network has a weighted PCI of 46.1;
- Currently, 23% of the Local network (approx. 21.4 miles) qualify for slurry seal while 69% of the network (approx. 64.8 miles) qualify for overlay/reconstruction;
 - Future 2017-2019 Arterial projects along Southern Avenue and the I-710 Frontage Rd will immediately improve upon the City’s Local PCI and accrued deferred maintenance;
- Local maintenance projects should focus on increasing the current weighted PCI of 46.1 to a level of 58.0 over the next five years;
- Local forecasted maintenance plan for maintenance should be followed as shown in Section IV reporting; a heavy overlay emphasis should be applied to the Local program due to the size of the network and its lower overall condition;
- Develop a proactive fiscal and planned approach to identify Local overlay projects based on the deterioration modeling within MicroPAVER;
- Increase Local revenues at the levels shown within the Section IV Forecasted Maintenance Report for a minimum of five years to generate the results identified within this report;
- Reassess/re-evaluate the Local rehabilitation budget program every two years to improve on budget forecasts for 2016-17 and beyond to ensure the results shown in Table 5;
- Perform pavement inspections on the Local network every three years to build a solid planning model within MicroPAVER to track PCI deterioration; and
- Demonstrated budgets shown in Tables 5 are ample enough to increase the Local weighted PCI; proactive funding needs to be implemented to see these results.

SECTION II

PAVEMENT MANAGEMENT SYSTEM / CAPITAL IMPROVEMENT PROGRAM

Bucknam Infrastructure Group, Inc. (Bucknam) performed the following services in accordance with the scope of services that was contracted with the City of South Gate. As a quick overview, the following tasks were performed to complete the work over the past several months:

2017 Pavement Management Work Efforts:

- Task 1:** Project Kickoff-Data Management
- Task 2:** Update of Maintenance Activities
- Task 3:** Pavement Condition Survey (approx. 35 miles)
- Task 4:** Budgetary Analysis and Capital Improvement Reports
- Task 5:** Executive Summary and Final CIP Reports
- Task 6:** Mapping of the Pavement Network

Pavement Management Update 2017

As a part of the 2017 update of the pavement management system, a major element of work was to complete a comprehensive assessment of the existing street network and PMS database within the City. This included assessing the City's existing 2013 MicroPAVER dataset, GIS, street naming conventions and work history information. From there, Bucknam worked with the City to confirm public and private street listings which set the foundation for accurate CIP reporting. All data was then updated into the City's MicroPAVER database.

Work history information was provided by the City in the form of completed bid documents, field notes, institutional knowledge, and previous dataset and Excel documents. This information was entered into the proper pavement segments that match the limits of those projects. From there, CIP pavement recommendations were performed (discussed and demonstrated below) where the pavement maintenance information the City provided (PMS material practices, unit costs, and capital budgets) were used to generate recommendations through the MicroPAVER system.

Table 6 demonstrates PCI ranges defaulted within MicroPAVER. Once a pavement inspection is complete, a PCI is calculated for each pavement section. Each PCI calculated falls within a defined PCI range category (Excellent, Poor, etc.). Furthermore, a weighted PCI was calculated for each functional class within the network (arterials and locals).

The PCI is a condition rating that ranges from 100 (a new pavement section or recently overlaid or reconstructed) to 0 for a section that has structurally failed and deteriorated dramatically. Weighted average PCI of a given area/zone = pavement section PCI multiplied by its own area divided by the total square footage of the given area/zone. This information can also be represented through MicroPAVER to show how much square footage or percentage of area falls within a PCI range category.



<u>PCI RANGE</u>	<u>CONDITION</u>
86-100	Excellent
71-85	Very Good
56-70	Good
41-55	Fair (South Gate Network 2016 = 51.6)
26-40	Poor
11-25	Very Poor
0-10	Failed

Table 6 - PCI Range

These condition ranges are defined by the Army Corps of Engineers and defaulted within the MicroPAVER software. The summary of all roads condition data and their representative PCI's can be seen in the Pavement Condition Report in Section III.

STRATEGY ASSIGNMENT TABLE

Once the appropriate activities from the above listings were selected by the City, a Maintenance Strategy Table was defined within the system that allocated the appropriate actions to the specific repair needs of the street. In defining the maintenance strategy list, emphasis was placed on defining pavement condition thresholds and using the PCI for the specific maintenance activities within these categories.

Strategy Assignment Table

All Streets		
PCI Range	Description	Unit Cost
<i>Varies by Activity</i>	Preventative, Stop Gap, Patching	<i>Varies by Activity</i>
60-85	Type II Slurry Seal	\$0.50/SF
60-85	Arterial Type II Slurry	\$0.70/SF
Minimum Level of Service		
35-60	Cape Seal	\$0.95/SF
20-60	AC Grind / Overlay (Local)	\$2.25/SF
20-60	AC Grind / Overlay (Arterial)	\$2.80/SF
20-60	ARHM Overlay (Arterial)	\$3.25/SF
0-20	AC Reconstruction	\$6.50/SF
0-20	PCC Reconstruction	\$10.50/SF
<i>25% Contingency included within All Unit Costs</i>		

Table 7- Strategy Assignments

The Strategy Assignments List, shown in Table 7, was developed to identify the most critical segments in each of the work programs (Arterial, Collector and Local).



Segment priorities were established by determining the range of PCI's requiring first attention based on the relative value of each segment's PCI, thus maximizing the annual maintenance budget. Also, distress quantity, area extent, type and severity were critical elements in the decision process for recommending maintenance. The assignment table is used as a guide within MicroPAVER to recommend maintenance, however, further assessment by City staff and/or outside parties can override maintenance recommendations. This can be done by reviewing and assessing distress extents and their weighted percentages.

Once the strategy assignments were set within the system, budgets and work assignments were generated for each work program on an annual basis. Using pavement deterioration curves for each type of pavement surface and class of road, both current year and future years' work requirements for each pavement segment within the City were determined. In forecasting the maintenance requirements in future years, the current PCI value is reduced annually for each pavement segment based on the MicroPAVER deterioration curves within the City's database.

Likewise, maintenance activities performed in a given year 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 anticipated life cycle.

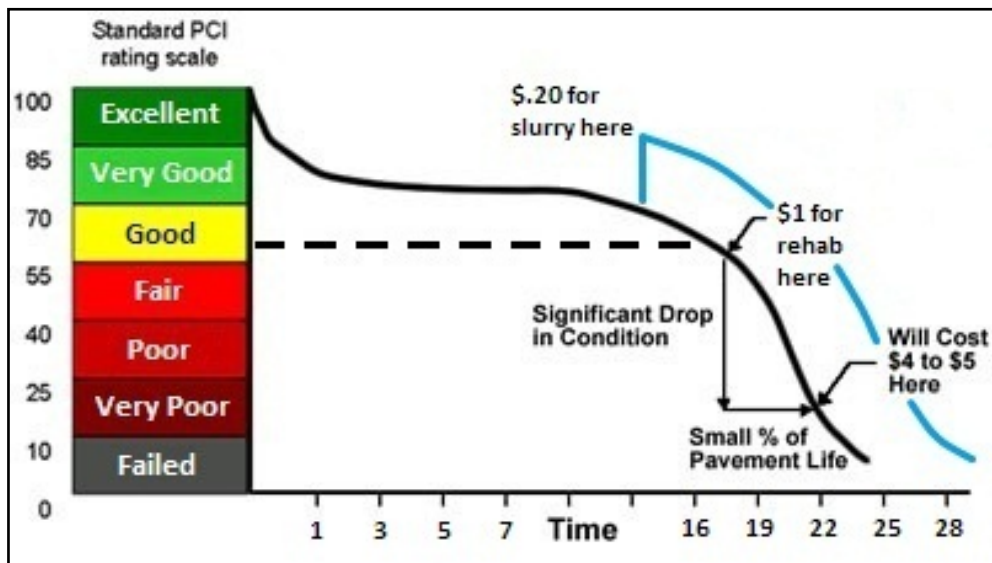


Figure 3 – Sample Pavement Life Cycle

MULTI-YEAR ANNUAL WORK PROGRAM PROJECTIONS

The goal of these projections is to assist City policy makers in utilizing the recommendations of the MicroPAVER system. By using the City of South Gate’s current budgets and maintenance practices the system will develop “section unique” improvements and strategies. Each segment will be tied to a specific fiscal year. As shown in the following pages, we have assessed the budgets that have been projected to meet the maintenance and rehabilitations needed to maximize the City’s return on investment. The budget forecasting goal for the City network focused on:

- ❖ Establishing a proactive multi-year Maintenance & Rehabilitation Program;
- ❖ Developing a preventive maintenance program; and
- ❖ Selecting the most cost-effective repairs based on City strategies

ACTUAL CITYWIDE BUDGET – A \$11.5 Million/five-yr budget was generated for the City to demonstrate how its existing Public Works M&R/CIP budget allocation would perform against the current citywide conditions.

FY	Current Funding Projections	Funded Projects
2017-18	\$2,300,000	\$2,800,000
2018-19	\$2,300,000	\$4,296,700
2019-20	\$2,300,000	\$826,000
2020-21	\$2,300,000	\$0
2021-22	\$2,300,000	\$0
	\$11,500,000	\$7,922,700

Table 8 – Annual Public Works PMP Budget

Note: Funded Project revenue sources are as follows:

- 2017-18 – Federal STPL + Local funds = \$2,800,000
- 2018-19 – Federal HSIP Cycle 7 Grant + ATP Cycle 2 Grant Funds + Local funds = \$4,296,700
- 2019-20 – ATP Cycle 3 Grant Funds + Local Matching = 826,000

MAINTAIN BUDGET – The Maintain budget was generated for the City to demonstrate what level of annual pavement CIP funding is necessary to maintain the current condition of 51.6.

RECOMMENDED BUDGET – This recommended budget was generated for the City to demonstrate the necessary funding required to increase the current weighted PCI level of 51.6 to 57 after five years.

Each scenario below considers the City’s currently funded 2017-2019 Arterial / Local overlay projects for Imperial Ave, Garfield Ave, Gardendale Street, Miller Way, Southern Ave, and Long Beach Blvd. The revenues shown outside the Funded Project column indicate the allocated and/or necessary funding to achieve each scenario’s goal.

A strong overlay emphasis was placed on the City’s Local network due to its lower overall PCI condition, recent and planned Arterial overlays and the size of the Local network compared to the Arterials.

**All multi-year budget projections include a 3% inflation rate for the term of the budget forecast.*



ARTERIAL-COLLECTOR / LOCAL BUDGET PROJECTIONS

The annual projected revenues shown below only account for the cost of pavement maintenance and rehabilitation activities.

A 25% contingency was applied to the pavement costs. Additional soft costs not included within the cost of pavement maintenance include:

- Right-of-way, curb & gutter, ADA ramp improvements;
- Utility improvements;
- Tree removals;

ACTUAL (\$11.5 Million, Five-Year) – The first key step in developing a proactive PMP is to model the City’s existing conditions against an “actual” annual budget. In doing this, PCI performance, deferred maintenance and pavement application uses are able to benchmarked and demonstrated in a positive or negative result. Bucknam utilized the City’s \$11.5 Million five-yr budget to establish a benchmark scenario for pavement funding; the City provided Bucknam with current 2017 unit costs for pavement maintenance applications currently being used by the City.

\$11.5 MILLION, FIVE-YR BUDGET PROGRAM

This budget program incorporates pavement sections that have a functional class of Arterial (A, C), Local (E).

Plan Year	PCI Before	PCI After	Slurry Seal	Overlay / Recon	Annual Actual Total \$	Funded Projects
2017-18	51.6	52.6	\$397,500	\$1,895,800	\$2,293,300	\$2,800,000
2018-19	51.5	54.5	\$398,400	\$1,905,600	\$2,304,000	\$4,296,700
2019-20	53.4	54.6	\$392,100	\$1,938,700	\$2,330,800	\$826,000
2020-21	53.4	53.8	\$402,500	\$1,925,600	\$2,328,100	\$0
2021-22	52.9	54.2	\$396,900	\$1,926,800	\$2,323,700	\$0
			\$1,987,400	\$9,592,500	\$11,579,900	\$7,922,700

Table 9 – Citywide Projection Utilizing \$11.5 Million/ Five-Yr Budget

By modeling the Funded Projects combined with the existing pavement conditions against the \$11.5 Million/five-yr funding, we have found that the positive results that occur are the weighted PCI for the entire network slightly increases from a level of 51.6 to a level of 54.2 after the five-year CIP (See Figure 4 below).

Additionally, the resulting deferred maintenance backlog decreases from \$74.6 million to a lower level of \$72.9 by year 2022) after the five-year program. This indicates that a \$11.5 million/five-yr pavement budget is ample enough to generate the desired results on the pavement network.

As shown, this projection model does meet the initial goal of maintaining or increasing the City’s pavement network PCI but the marginal decrease in overall deferred maintenance demonstrates that the 11.5 million investment is not sustainable in the long-term (i.e. 10-year CIP). In order for these scenarios to produce long-term return-on-investment a proactive and continued funding is necessary. On a biennial basis, the City should monitor the management of overlay deferred maintenance. The potential delay in projects and the resulting buildup of more overlay work in the five-year time frame is not a debt that City will want to continue to accumulate.

Through Bucknam’s analysis of the previous pavement database, work history dates and our experience with AC Overlay deterioration rates, it is important to point out that pavement sections that were overlaid in the early part of the 2000’s (FY’s 2002-2004) will need proper overlay maintenance approximately around fiscal year 2017-18 and beyond.



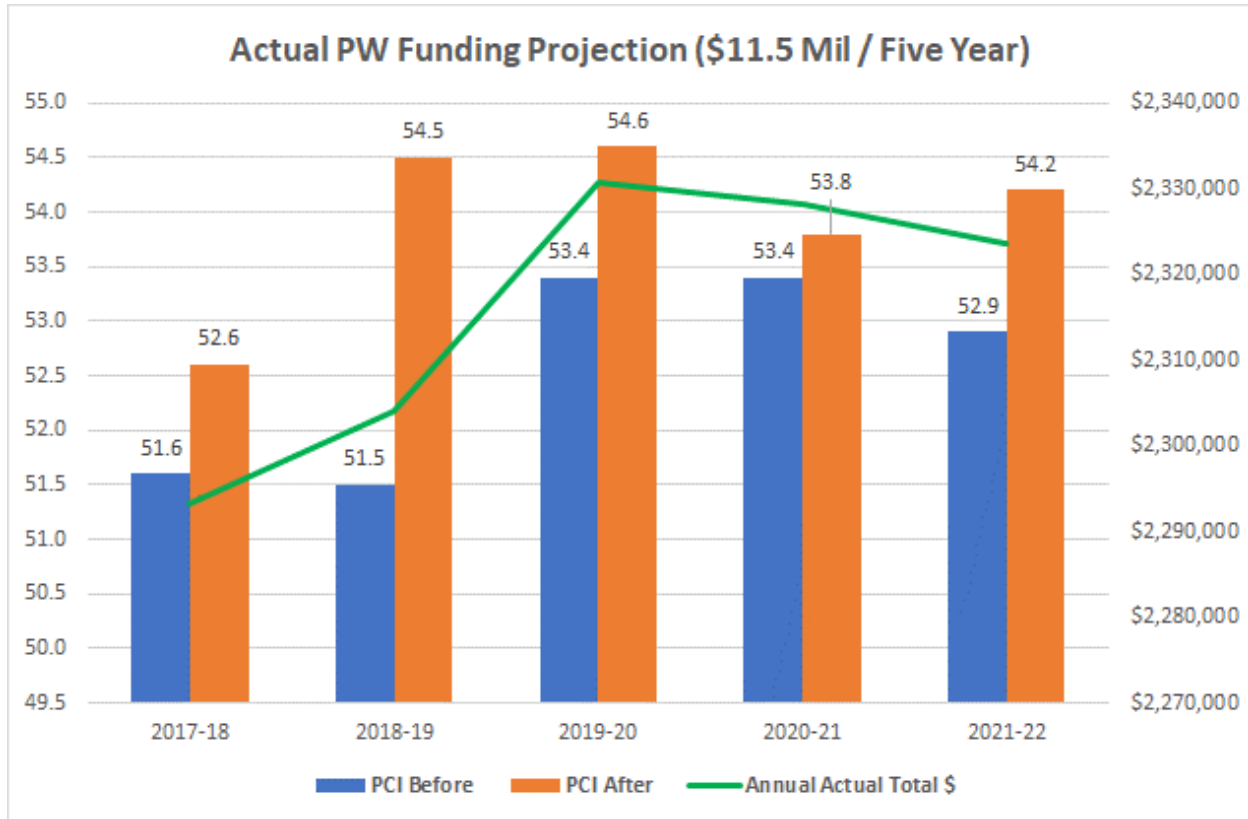


Figure 4 – Resulting Network PCI (\$11.5 Million/yr Budget)

The resulting “increase of the weighted PCI” shown above for the entire network demonstrates how applying adequate capital funds to specific areas of the network allows the City’s pavement to improve at a rate that is conducive to a successful PMP (i.e. proper/timely application of preventive maintenance and extension of section life-cycles through timely overlays). Again, if this scenario was extended to a 10-yr program the resulting PCI would be lower than today’s conditions. Additionally, even with an ample budget, the City should continue to implement localized maintenance (i.e. deep patching, leveling courses, crack sealing, etc.) prior to any major slurry seal and/or overlay maintenance. By performing stop gap measures to individual pavement sections the overall performance of the sections condition will improve over time and sustain itself longer than if no preventive maintenance was performed.

On the flip side, if limited annual funding is applied to the network over the next five years (i.e. citywide budget of \$1,500,000/yr) an additional drop in overall weighted PCI will occur and deferred maintenance/CIP projects will exceed \$90 million. Limited funding equals deferred projects which does not allow necessary overlay projects to be completed in a timely manner on the arterial, collector and local networks.

MAINTAIN – A common question from City staff is “what level of funding is necessary to maintain the asset?” Bucknam modeled this scenario against the conditions found through our recent field surveys. Several iterations were modeled and assessed for viability and a common-sense approach to South Gate’s pavement network

The resulting PCI conditions and maintenance distributions are shown below.

MAINTAIN BUDGET PROGRAM

Maintain Budget Program incorporates pavement sections that have a functional class of Arterial (A), Collector (C) and Locals (E).

Plan Year	PCI Before	PCI After	Slurry Seal	Overlay / Recon	Maintain PCI Total \$	Funded Projects
2017-18	51.6	52.1	\$397,500	\$1,533,500	\$1,931,000	\$2,800,000
2018-19	51.2	54.2	\$398,400	\$1,540,900	\$1,939,300	\$4,296,700
2019-20	53.4	54.1	\$392,100	\$1,614,600	\$2,006,700	\$826,000
2020-21	52.8	52.9	\$402,500	\$1,614,800	\$2,017,300	\$0
2021-22	51.5	51.8	\$396,900	\$1,614,300	\$2,011,200	\$0
			\$1,987,400	\$7,918,100	\$9,905,500	\$7,922,700

Table 10 – Citywide Projection Utilizing “Maintain” Budget

By modeling the Funded Projects combined with the existing pavement conditions utilizing the City’s current unit costs and cost projections, we have found that one positive and one negative result occurs over the five-year CIP. (See Figure 5 on the following page). First, the weighted PCI for the entire network does maintain itself (51.6 to 51.8) over the five-year period based upon a \$2,000,000/yr budget which is very close to the amount the City is projecting to utilize. This result is positive in that the PCI does not drop in the short-term, however as described below, the amount of deferred maintenance that accumulates on the network by FY 2018 is not something that City should consider.

The resulting deferred maintenance backlog shows that it remains at a high level (\$74.6 million to \$79.8 million) after the five years’ program which indicates that an annual \$1,981,000 budget is ample enough to sustain deferred maintenance on the pavement network until 2019 but the City will see an increase from 2020 to 2022 if this annual allocation is used for the next five years. Limited funding does not allow necessary overlay projects to be completed on the arterial, collector, and local networks; this in turn defers maintenance to latter years of the CIP thus increasing the costs of maintenance. This problem will continue to build upon itself unless an influx of overlay revenue is generated by the City.

DEFERRED MAINTENANCE

Delaying repairs on streets where pavement condition indicates a need creates deferred maintenance. Deferred maintenance includes pavement maintenance / rehabilitation that is needed across the entire network, but cannot be performed due to the lack of available funding and is pushed to the next budget cycle. The actual repairs that are being deferred are often referred to as a “backlog”. **As maintenance is deferred, the opportunity to apply life extending preventive pavement applications is lost and the ultimate cost of rehabilitation multiples.**



Note this projection model does not meet the initial goal of maintaining or increasing the City’s pavement network PCI; if this model is extended to FY 2023 the City would see a decrease in PCI and further increases in deferred maintenance. With today’s economic issues at the Federal, State and local levels; the City should continuously monitor the management of overlay deferred maintenance. The potential delay in projects and the resulting build up of more overlay work in the five-year time frame is not a debt that City will want to accept.

Through Bucknam analysis of the previous pavement database, work history dates and our experience with AC Overlay deterioration rates, it is important to point out that pavement sections that were overlaid in fiscal year 2004 will need proper overlay maintenance approximately around fiscal year 2017-18 and beyond.

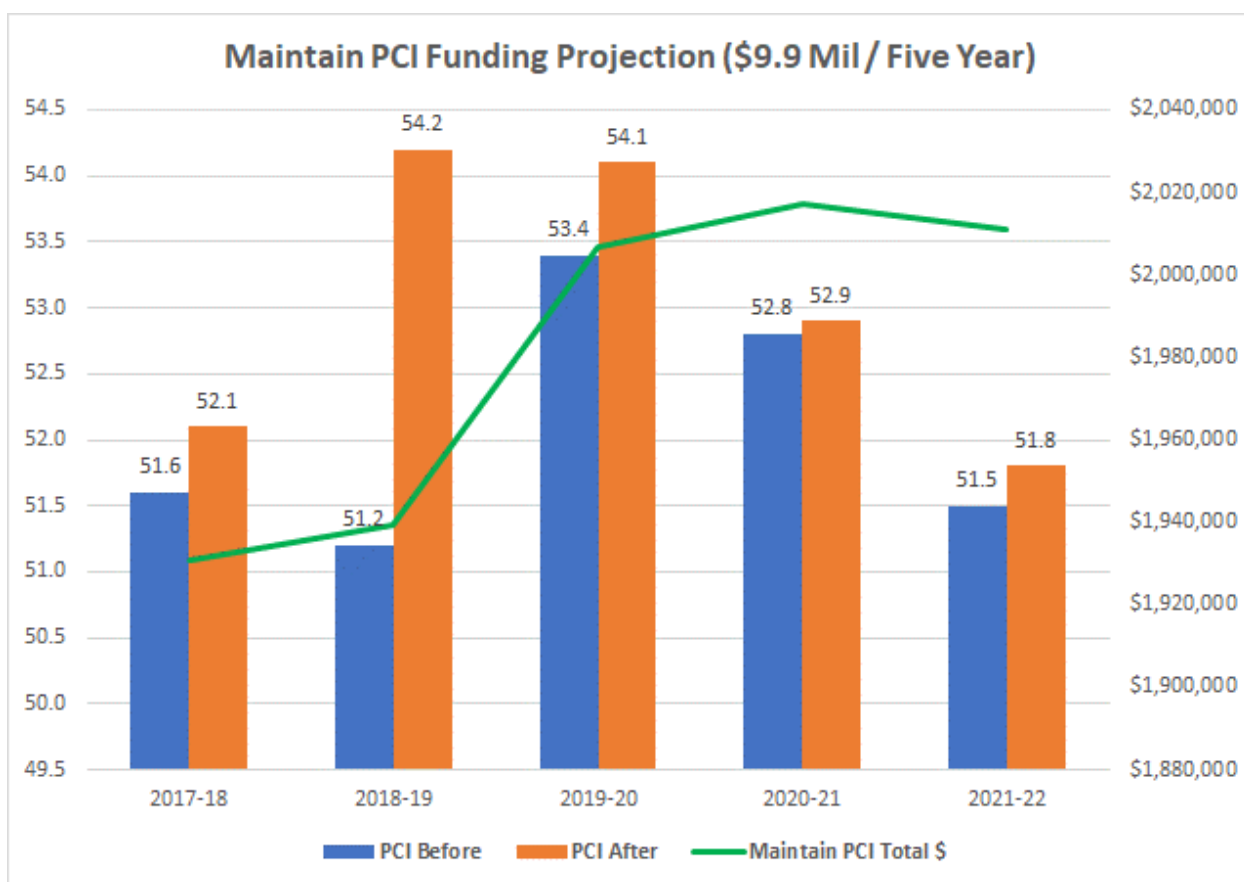


Figure 5 – Resulting Network PCI (Maintain Budget)

The resulting “sustaining of PCI” shown above for the entire network demonstrates how applying proper capital funds to the network is preventing the City’s pavement to deteriorate at a rate that is not conducive to a PMP success. Based on available funding or programmed funding identified by the City’s long-term CIP, there may be an opportunity to proactively schedule or appropriate funds to areas of the City that have been annually deferred due to high maintenance costs.

Additionally, the City should continue to implement local, stop gap maintenance (i.e. deep patching, crack sealing, etc.) prior to any major slurry seal or overlay maintenance. By performing stop gap measures to individual pavement sections the overall performance of the sections condition will increase and sustain itself longer than if no preventative maintenance was performed.

RECOMMENDED PROGRAM

With the City striving to show proactive CIP planning and maintenance across all City pavements, a recommended budget program was generated to show the greatest return on investment through the application of slurry seal, mill & cap, and alternative overlay maintenance. Our goal is to increase the network wide PCI level from 51.6 to 57.0 after five years.

Bucknam worked with the City’s Public Works staff to review previous methodologies and planned CIP schedules applied by the City. The City provided information on the current work schedules and yearly goals for asphalt application. With this scenario, our initial goal is to provide the City with a budgetary outlook and conditional impact report that can be used to create a solid capital overlay and preventative slurry seal maintenance program.

Again, we used the “Maintain” 5-yr PMP model (shown above) as a cornerstone for our modeling within the recommended program. Combining the previous reporting model with a realistic and achievable annual budget, we found positive results.

The Reach PCI 57 Budget Program incorporates pavement sections that have a functional class of Arterial (A), Collector (C) and Locals (E).

Plan Year	PCI Before	PCI After	Slurry Seal	Overlay / Recon	Increase PCI Total \$	Funded Projects
2017-18	51.6	55.1	\$397,500	\$2,918,500	\$3,316,000	\$2,800,000
2018-19	53.5	55.6	\$398,400	\$1,455,600	\$1,854,000	\$4,296,700
2019-20	54.2	56.0	\$392,100	\$2,971,100	\$3,363,200	\$826,000
2020-21	54.6	56.6	\$402,500	\$3,116,300	\$3,518,800	\$0
2021-22	55.2	57.5	\$396,900	\$3,155,400	\$3,552,300	\$0
			\$1,987,400	\$13,616,900	\$15,604,300	\$7,922,700

Table 11 – Five-Year Projection Demonstrating Required Budget to Reach PCI of 57

Referring to Table 11, it is noted that the weighted PCI increases at a consistent pace throughout the five-year projection. Furthermore, the annual deferred maintenance decreases from \$74.6 million to \$55.7 million after the five-year term if the City utilizes an annual average of \$3,120,900/yr for slurry, overlay, and reconstruction maintenance. We found average square footage breakdowns were consistent and well balanced; combined with the positive results found with the weighted PCI and deferred maintenance we recommended that this 5-yr maintenance schedule be followed.

We recommend that a stronger focus be placed on the Local network improvements since the Local network is almost twice as large in total square footage and has a lower weighted PCI than the arterials. We still recommend minor maintenance to the arterial network, i.e. localized patching,



slurry seal and the use of awarded SB1 funds. But again, with the Local network showing more negative results, a new focus for zoned area maintenance and proactive overlays should be implemented.

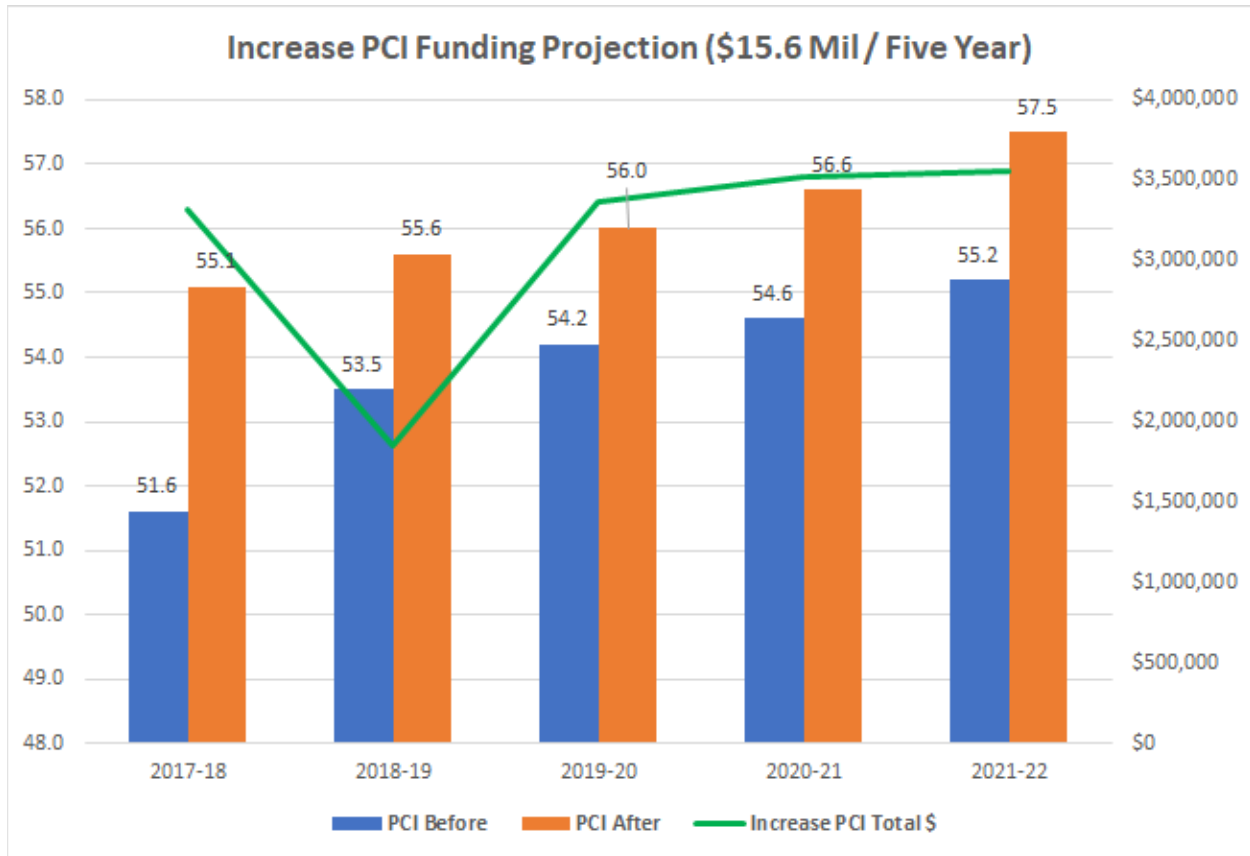


Figure 6 – Resulting Network PCI (Reach PCI 57 Budget)

As mentioned above, a local slurry/overlay maintenance “area” strategy should be established for several reasons. With the City applying a maintenance area methodology to the local network, four beneficial impacts occur:

- 1) Planned / Maintenance areas are addressed every five years which creates a dedicated project schedule for City staff and constituent inquiries;
- 2) Deferred overlay maintenance can be addressed in a more effective manner due to accrued revenues
- 3) A preventative maintenance strategy is more cost-effective in a long-term PMP rather than implementing a maintenance approach that addresses only the “worst-first” streets.
- 4) All maintenance alternatives are available due to the increased funding and focused maintenance within one zone per year.

On the negative side, if low weighted PCI values occur within a given zone, all streets within that zone may not be able to be addressed with maintenance when that zone is scheduled for maintenance. The deferred maintenance will have to be scheduled for maintenance in future years or simply will have to wait until the zone cycle repeats.

The Local maintenance model that has been developed under the Recommended budget can be used as a benchmark to monitor the City's annual budget allocations as the network continues to mature and age; the proper amount of funding for slurry seal and overlay maintenance needs to be the City's highest priority.

Additionally, it is recommended that the City continue to monitor the application of Mill & Cap as an asphalt application for the specific Local sections. Specific sections are now qualifying for maintenance that warrants a stronger application rather than a typical slurry seal. With a five to seven-year cycle in motion, it is essential to address Local sections that have PCI's less than 65 with the proper maintenance since crews will not be back within that area for five to six years.

PAVEMENT MANAGEMENT SYSTEM REPORTS

In addition to the annual budget scenario, this report contains a comprehensive and complementary assemblage of pavement management reports ranging from summary reports to annual maintenance and rehabilitation schedules (Forecasted Maintenance Report, Section IV). Collectively as well as individually, the 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 (recorded during 1999-2013, 2017 inspections, along with the action and repair costs, as presented within the reports are accurate within tolerable limits. 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.

NEXT STEPS

As with any infrastructure management software program, time investments need to be made by key Public Works staff to maintain the integrity of the data as well as the accuracy. Bucknam can perform training sessions in the use of the MicroPAVER system and demonstrate how to generate standard maintenance reports to assist City staff in developing yearly budgets, project level analysis, and CIP projections. This will be key to future staff management of the pavement program and reporting. City personnel need to maintain their commitment to the preventive maintenance system, while working toward reducing the City's present backlog of rehabilitation projects.

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. This typically includes surveying arterial / collectors every two years and Locals every three. One recommendation the City may consider keeping the program "managed" is:

- Survey half the arterials each year; and
- One-third of the locals each year

This will not only allow work to be scheduled based on the most current condition data available, but will provide City personnel with a means to monitor actual rates of pavement deterioration so appropriate modifications can be made to the system curves. To be compliant with the MTA requirements, the City must generate a triennial Arterial and Collector network pavement management report indicating condition ratings.

Bucknam will be supporting the City with staff level support to assist in the continuous updates with the MicroPAVER system. This will include work history updates, generating reports from the system, unit cost updates, and future inspections.

ALTERNATIVE PMP FINANCING OPTIONS

Through Bucknam experience with PMP financing and maintenance forecasting, we have been involved with numerous PMP projects that include alternative funding. With the City of South Gate PMP showing shortcomings in the amount of necessary funding to maintain today's conditions we have included below several examples and alternative to PMP funding:

- **Grants - State funding for alternative asphalt applications (i.e. Rubber Asphalt Concrete through the Cal Recycle Grant Program)** <http://www.calrecycle.ca.gov/Tires/Grants/default.htm#RAC>
- **Bond Measures** - Bonds maybe issued to fund the amount of the unpaid assessments. The bonds are secured by a pledge of the assessment installments. The amount of bonds issued equals the amount of the unpaid assessment plus additional bond issuances costs and establishment of a reserve. If the City Council determines that it is not convenient to collect the amount assessed in a single year, then the amount of the proposed assessment maybe collected in installments over a period of years. Property owners are given an opportunity to pay all or a portion of the amount assessed.
- **Special Assessments** – Through our experience, we have seen several local agencies perform Special Assessment Feasibility studies and eventually form Special Assessment Districts for the purpose of funding pavement improvements beyond the annual allocated City funding.

The purpose of a feasibility study for the formation of an assessment district within the City would provide insight as to how an assessment district would be formed within the City's boundaries. The analysis utilizes a common approach by comparing average daily trip miles among the different land uses and the average units per acre to obtain EDU rates. The EDU rates are then multiplied by the parcel's individual number of units or acres to establish the parcel's assessment amount.

The City's possible options in forming the street maintenance assessment district are set forth below. These options can be implemented in combination; however, it is highly recommended that the City establish communication with affected property owners as early as possible, prior to the City moving forward with the initial proceedings of district formation.

- **Conduct Outreach Efforts to Inform Property Owners**
It is recommended that the City hold informational sessions for affected property owners. Participation of residents in the process will build cooperation and trust and ensures the viability of the proposed assessment district. Input from residents is important in gaining understanding of the process and the reasons for levying the assessments. The City might also create a citizens' committee to disseminate information and express concerns to and from the residents and the City.
- **Public Opinion Survey**
In addition, it is recommended that a Public Opinion Survey be conducted to further gauge the



resident's interest or desire to participate in being assessed for street and pavement rehabilitation. Response from the survey would also guide the City in determining whether a Citywide or Phased Assessment District is warranted.

- **Form Assessment Districts in Phases**

The City may time the initial formation of separate assessment districts with the street improvement schedule of each zone as opposed to a one-time formation of a citywide assessment district. A zone's start date for street improvements would trigger the assessment for parcels in that particular zone. If each zone improvements were separately initiated on an annual basis, the assessment for the twelfth zone will begin in the twelfth year. The City has the option to accelerate the improvement schedule of each zone.

Through our review and assessment, several local agencies have successfully implemented Special Assessments for pavement improvements, see below:

A. City of San Clemente

The City of San Clemente's Citywide Street Improvement Program was adopted by City Council in July 1995 as Street Improvement Assessment District 95-1 (AD 95-1). The program was to restore approximately 60 miles (one-half) of the City's streets over a span of 18 years. The program is funded by a combination of various revenues from (1) Street Assessment District 95-1, which assesses all developed properties; (2) the General Fund; (3) the Gas Tax Fund. Water, sewer and storm drain funds pay for work done on underground facilities in conjunction with street work. The final assessment for AD 95-1 was collected in Fiscal Year 2010-11. In that year, only the maintenance portion of the assessment was collected (approximately \$45 per parcel), which was one-half the normal assessment amount. The final bond redemption, paid in September 2011, was paid for by the mandatory reserve funds held since the bonds were issued. AD 95-1 is expired and fully paid.

B. City of Elk Grove

Beginning with Zone No. 1 in 2003, the City of Elk Grove formed Street Maintenance Assessment District No. 1. The City of Elk Grove's Street Maintenance District No. 1 funds street maintenance costs associated with local, collector and arterial streets. The assessment amounts for developed property are prepared by the City annually. The City levies an assessment according to the Engineer's Reports prepared for Zone Nos. 1 to 5. The assessment formula uses EDU factors to establish assessment amounts per unit or acre.

C. City of La Habra Heights

The City of La Habra Heights established the Citywide Street Maintenance Assessment District No. 4 in 2007. The City of La Habra Heights levied the assessments for five years. The first levy of assessments occurred in Fiscal Year 2007-08 and the final levy for District No. 4 has been prepared for Fiscal Year 2011-12.

CONDITION DISTRIBUTION REPORT

This report graphically depicts the distribution of the pavement condition throughout the street network by area.

The condition scheme ranges from “Excellent” to “Failed”; with an “Excellent” condition corresponding to a pavement at the beginning of its life cycle, and a “Failed” condition representing a badly deteriorated pavement with virtually no remaining life.

The table below shows the general description for each pavement condition:

Condition Description – PCI Range - Description

- Excellent (86-100)** - Minor to low distress, no significant distress;
- Very Good (71-85)** - Little distress, with the exception of utility patches in good condition, or slight hairline cracks; may be slightly weathered;
- Good (56-70)** - Slight to moderately weathered, slight distress, possibly patching;
- Fair (41-55)** - Severely weathered or slight to moderate levels of distress, generally limited to patches and non-load-related cracking; ***(City of South Gate citywide weighted average PCI is 51.6);***
- Poor (26-40)** - Moderate to severe distresses including load-related types, such as alligator cracking;
- Very Poor (11-25)** - Severely distressed, large quantities of distortion or alligator cracking;
- Failed (0-10)** - Failure of the pavement, distress has surpassed tolerable rehabilitation limits.

CALCULATION OF PCI

In order to calculate a Pavement Condition Index (PCI) value within MicroPAVER, specific street section data needs to be inputted into MicroPAVER to define the survey limits, asphalt types, pavement age and metrics. Pavement “sections” are pavement segments within the defined branch that have consistent pavement street classifications, construction/maintenance histories and use. Representative inspection samples are then selected and visually surveyed to locate distress data. This data is used to calculate the pavement sections Pavement Condition Index (PCI) which includes distress type, extent of the distress and its severity.

The PCI is a condition rating that ranges from 100 (pavement section that is in perfect condition) to 0 for a section that has structurally failed and deteriorated dramatically. The PCI is calculated from three major data entries from our inspectors:

1. Distress Type (one of 20 AC or 19 PCC types); these include alligator cracking, bleeding, block cracking, corrugations, depressions, long/trans cracking, patch/utility cut, potholes, rutting, weathering, raveling, etc.
2. Distress Quantity (the square footage, length or count of a specific distress)
3. Distress Severity (the level of severity determined for each distress found; low, medium or high)

Distress	Description	Severity	Quantity	Units
1	ALLIGATOR	L	2,825.98	SqFt
1	ALLIGATOR	M	115	SqFt
1	ALLIGATOR	H	25	SqFt
3	BLOCK	L	12,432.9	SqFt
3	BLOCK	M	1,016.99	SqFt

Figure 7 – PCI Calculation Worksheet



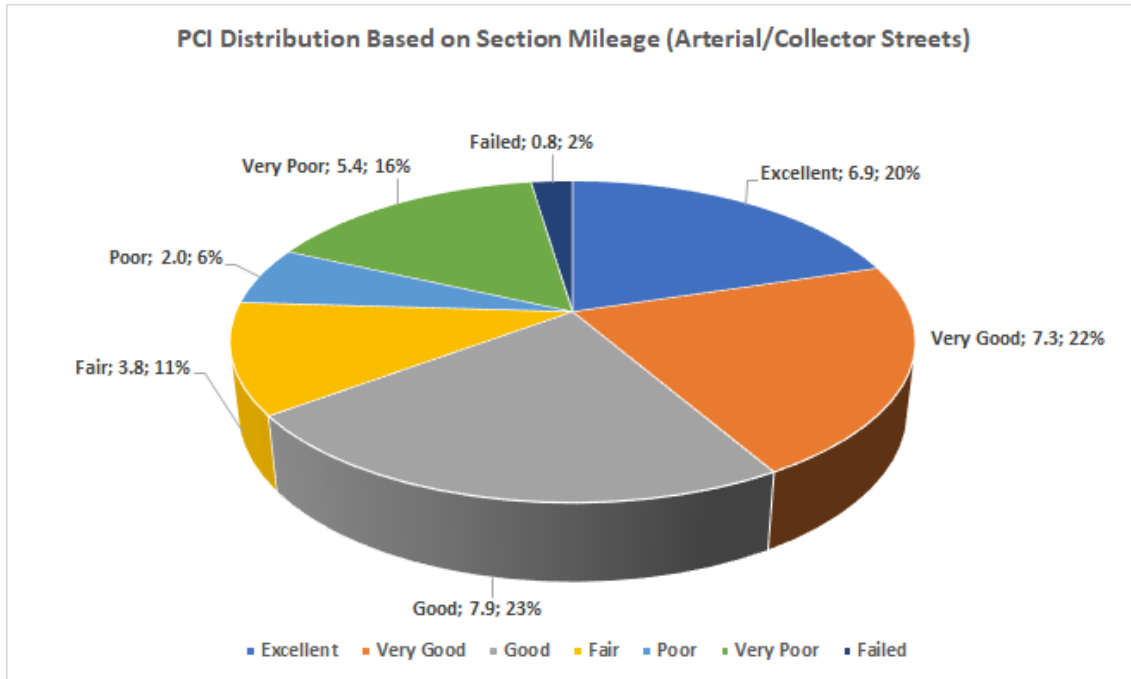


Figure 8 – Arterial Condition Distribution

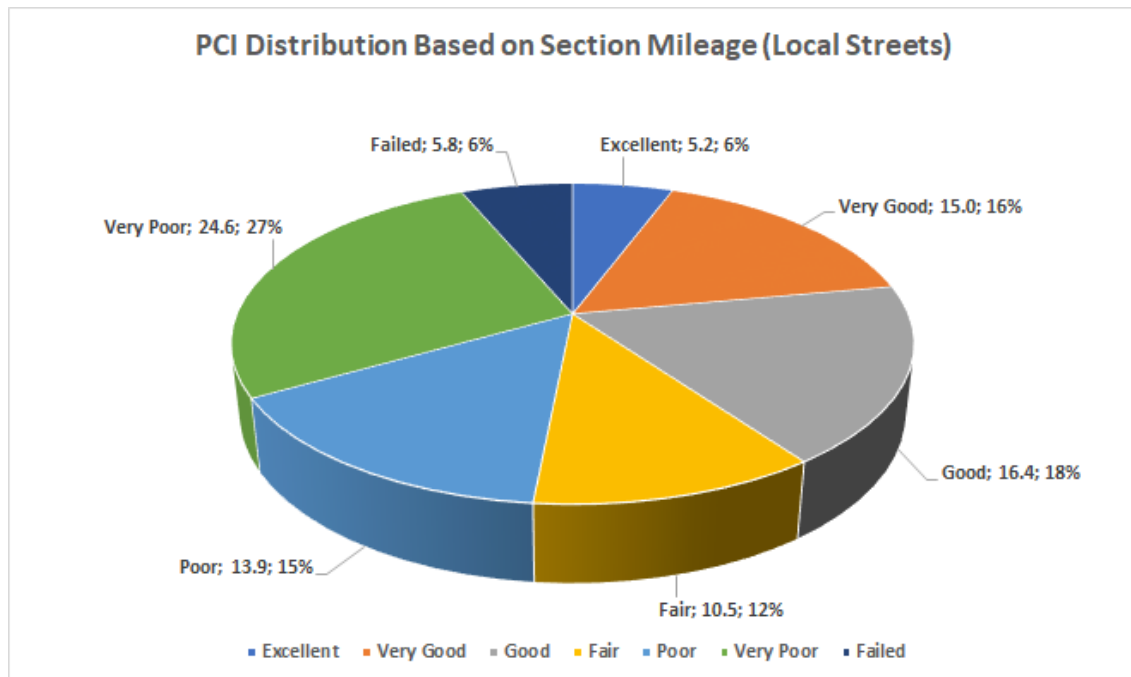


Figure 9 – Local Condition Distribution

SECTION III
CITYWIDE
PAVEMENT CONDITION INDEX REPORT

- A. PCI Map
- B. A to Z
- C. PCI Order

PAVEMENT CONDITION INDEX REPORT

Listed alphabetically by street name or PCI, this report provides the City with a listing of pertinent inventory and pavement condition data for each inventory unit within the City's pavement network. The Pavement Condition Index (PCI) Report notes the names, limits, classification, dimension, surface type, and lane configuration of each inventory unit.

Detailed descriptions of the information appearing on this report are presented below:

BRANCH NAME - The name of each inventory unit appears in this column. Generally, the inventory unit name is taken directly from a street sign; however, where no street signs are posted, the name appearing on the network map is noted instead.

A sample set of street name suffix abbreviation definitions is presented below:

AV - Avenue	CT - Court	CIR - Circle
DR - Drive	LN - Lane	RD - Road
ST - Street	WAY - Way	EB - East Bound
NB - North Bound	SB - South Bound	WB - West Bound

FROM - A description of the beginning limit of each inventory unit appears in this column. If the beginning limit exists between intersections, then the beginning limit description may be an address, post mile marker, or a distance from a known point of reference (e.g., "500' N/MAIN ST").

TO - A description of the ending limit of each inventory unit appears in this column. Like BEGIN limit, the END limit description may consist of a street name, an address, or a distance from a known point of reference. In the case of cul-de-sacs, or dead-ends, the END limit consists of an address, or a directional reference, such as "NORTH END," when no address is available.

RANK - The codes for the four functional classifications as the inventory unit appears in this column are represented below. Basically, units are classified according to traffic volume.

<u>CODE</u>	<u>DESCRIPTION</u>
A, C	Arterial, Collector
E	Local
N	Private

SURFACE TYPE - A code was assigned to each inventory unit to describe surface type.

<u>CODE</u>	<u>DESCRIPTION</u>
AC	Asphalt Concrete
PCC	Concrete

LENGTH - The length of the section within each branch.



UNITS - The unit of measurement for the section length, typically linear feet (LF).

AREA - The area of each section within a branch.

UNITS - The unit of measurement for the section area, typically square feet (SF).

PCI - Pavement Condition Indices were calculated for inventory units based on severity and extent of distress manifestations observed within the inventory unit. Ranging between 0 and 100, a PCI of "100" corresponds to a pavement at the beginning of its life cycle, while a PCI of "0" corresponds to a badly deteriorated pavement which is at or near the end of its life cycle.

PCI CLIMATE, LOAD AND OTHER – reflects “Section Extrapolated Distress”; these values are shown within the Sample Distresses tab within the PCI window. Distresses are aggregated based on the type and severity level. For random samples, distress quantities are adjusted to reflect the extrapolated value based on the sections total area. Extrapolated distress deducts are classified as resulting from Climate, Load and Other distresses. The Distress Classification portion of the tab shows the “percent” of extrapolated distress deduct belonging to Climate, Load and Other (these %’s are shown within the PCI reports herein). These values are beneficial in that they support the decision whether recommend slurry seal, overlay or reconstruction project for street sections.

INSPECTION DATE – Represents the most recent inspection date performed on a given sections. PCI shown is historical in value and may not indicate what “today’s” PCI is due to variance in time. Pavement deterioration calculations can be performed on a section(s) to demonstrate a deteriorated PCI based upon a new current date.

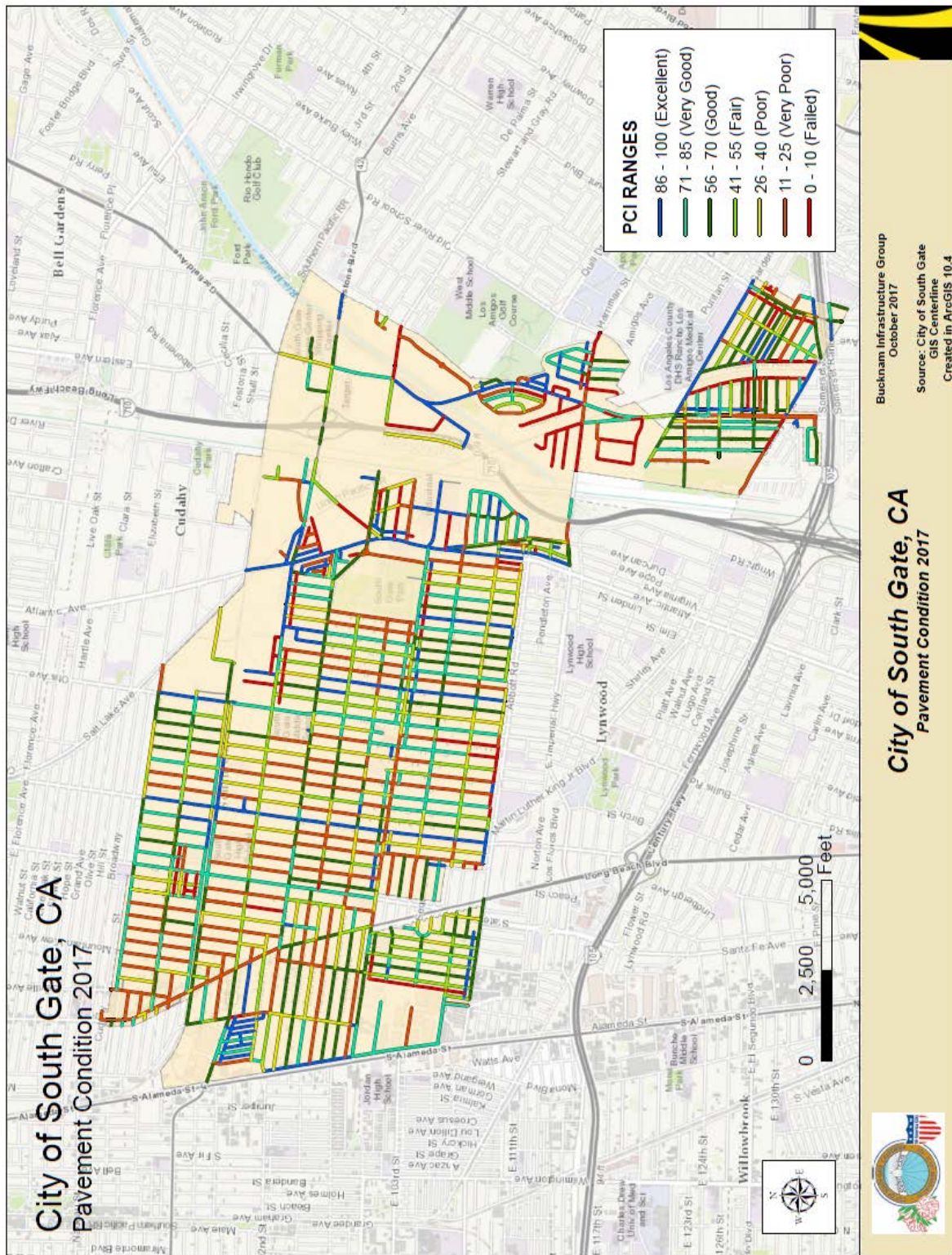


Figure 10 – South Gate PCI Map - 2017

SECTION IV
FORECASTED MAINTENANCE REPORT

A. Recommended Budget, Five Year Plan (2017-2022)

FORECASTED MAINTENANCE REPORT

Listed in chronological order by rank, plan year, then alphabetically by street name, this report presents the year and action corresponding to the next scheduled work activity for each segment within the pavement network.

RECOMMENDED BUDGET – This recommended budget was generated for the City to demonstrate the necessary funding required to increase the current weighted PCI level of 51.6 to 57 after five years.

We have sorted the following report by functional class (rank) for easy review (Arterial – Local, A to Z order).