

PAVEMENT CONDITION REPORT

June 2020

Prepared by -
Street Transportation Department, City of Phoenix



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1. EXECUTIVE SUMMARY

Phoenix is the fifth largest city in the US, with approximately 5,000 linear miles of street network covering more than 500 square miles.

Paving, maintaining and improving this vast network requires substantial funding and planning, and the dedication of hundreds of skilled professionals, including Street Maintenance staff members, inspectors, construction crews, and contractors.

Previously, Phoenix streets were improved on average on a 60-year cycle. In the summer of 2018, however, extensive discussion regarding the importance of improving Phoenix's street network resulted in the Phoenix City Council's allocation of additional funding to accelerate pavement improvements.

This report documents existing conditions, budget considerations, and the various pavement treatments utilized. The methodology used to collect data, prioritize projects, and schedule improvement projects is outlined as well.

Pavement Management Leadership

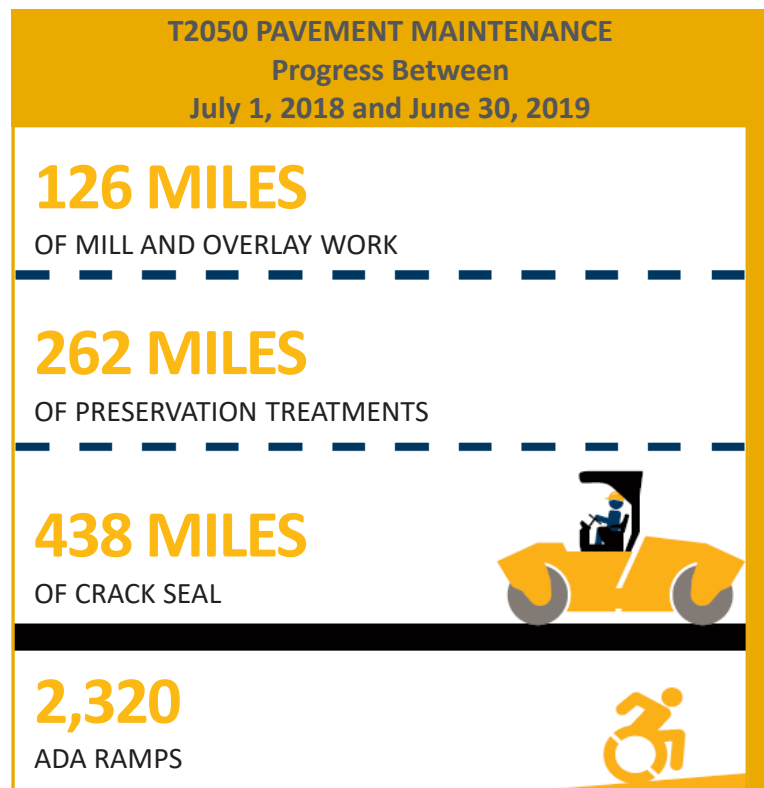
*Kini Knudson,
Street Transportation Director*

*Mark Glock,
Deputy Street Transportation
Director*

*Rubben Lolly,
Special Projects Administrator*

*Ryan Stevens,
Civil Engineer III*

*For additional information
visit Phoenix.gov/streets.*



2. OVERVIEW

Every one of Phoenix’s 1.6 million residents relies on city streets – not to mention the nearly 5 million people who work and play in the greater Phoenix area – for vital services. The transportation network is designed to provide for the safe, efficient, and convenient movement of people and goods in the city to improve the quality of life in Phoenix.

BACKGROUND

Phoenix has a comprehensive roadway network of approximately 5,000 miles of pavement, or 16,000 lane miles. The street network is categorized into two sub-networks consisting of arterial and major collector streets (typically the major north/south and east/west transportation corridors spaced one mile apart), and local streets and minor collectors (streets usually in residential areas and the ½-mile streets between the arterials).

Each year, the Phoenix City Council approves a five-year pavement maintenance program. The program balances current pavement conditions, appropriate types of pavement treatments, and budget allocations.

Prior to 2016, the goal of the Street Transportation Department was to touch every street once in 30 years, and about \$16 million was allocated for pavement maintenance per year. These funds come from the Highway User Revenue Fund (HURF) and additional dedicated funding sources.

McDowell Road - 48th St to 52nd St



Kini Knudson
Street Transportation
Director



“The Street Transportation Department installed 290 major street miles of pavement in 2019 – a city record that tripled work completed in previous years. This accomplishment is due to the Council-approved \$200 million advance from Transportation 2050 street program revenue, and the ability of our staff to quickly and efficiently respond to this tremendous, unprecedented opportunity.”

Mark Glock
 Deputy Director, Street
 Maintenance Division

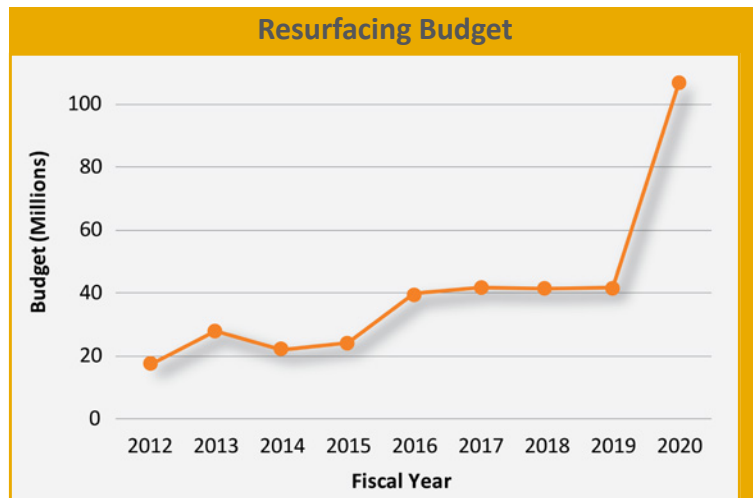
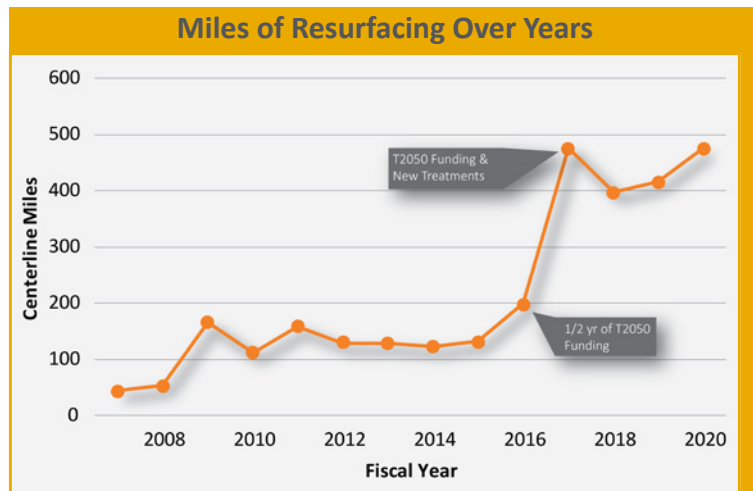


“Our pavement maintenance team includes 15 city staff members and 10 full-time consultants (nine inspectors and one engineer-in-training). However, nearly the entire Street Transportation Department family works in conjunction with the pavement team to install sidewalks, ADA-compliant ramps, curbs, bicycle lanes, striping, traffic signals, street signs, and streetlights, as well as work in the material lab, surveying, planning and engineering services, right of way and utility coordination and support from public engagement coordinators.”

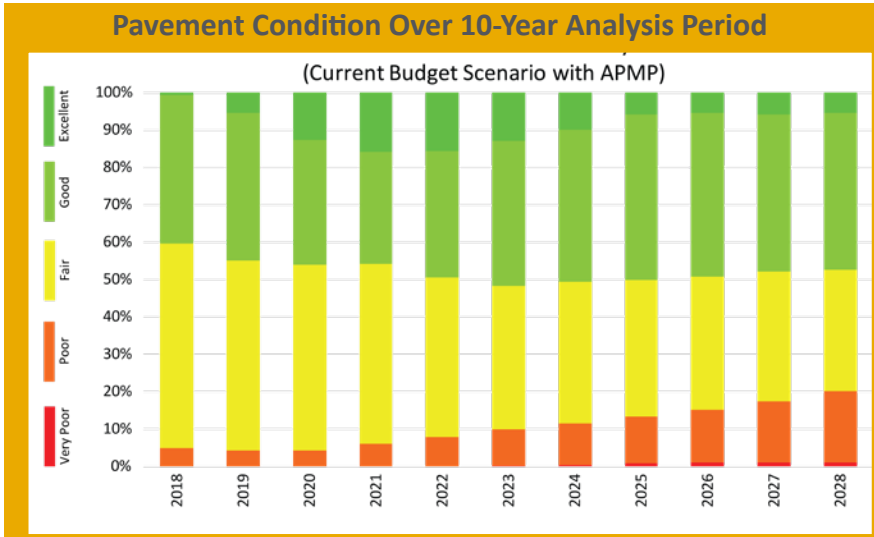
3. BUDGET AND CHANGE

In the last four years, two changes have impacted the budget and allowed for a more robust street maintenance program.

Collection of the voter-approved [Transportation 2050](#), or T2050, sales tax began on Jan. 1, 2016. The tax provides a 0.3 percent increase in the transaction privilege and use tax rate (for a total of 0.7 percent over the 35-year period ending in 2050) to fund citywide transportation projects. Of these funds, 13.8 percent is allocated to the construction and maintenance of city streets. In fiscal year 2019, for example, T2050 funding added approximately \$33 million to the Street Transportation Department budget – of which \$26 million was allocated to major street maintenance and transportation projects.



Another significant funding change occurred on Oct. 3, 2018. After extensive hearings and public meetings, the City Council authorized an advance of \$200 million, borrowing against future T2050 streets funding. The resulting Accelerated Pavement Maintenance Program (APMP) essentially increased the annual funding for arterial and major collector streets maintenance by 300 percent for the following five years. While APMP ends in 2023, T2050 sales tax revenues continue through 2050.



The influx of T2050 funding, authorization to advance funds by the City Council, and the evolution of lower-cost, high quality pavement preservation methods have significantly increased how often pavement maintenance occurs on city streets. Currently, the Street Transportation Department expects to treat each street every 10-12 years.

Budget and Treatment Miles					
	2020	2021	2022	2023	2024
Budget (Millions of Dollars)					
T2050	\$14.5	\$16.3	\$17.1	\$18.1	\$19.8
HURF*	\$27.2	\$32	\$30.5	\$34.1	\$38.2
BOND	\$65	\$75	\$50	-	-
Treatment Miles					
T2050	38.22	46.15	40.52	43.48	35.69
HURF*	170.31	46.15	153.13	176.01	211.54

* Highway User Revenue Fund
Note: Table shows projected budget and planned treatment miles for FY 2021 - FY 2024

2019 Paving Season Accomplishments

Phoenix's 2019 street paving season will go on record as the biggest ever to be accomplished featuring more than 250 miles of newly paved streets. Due largely to the Council-approved \$200 million financing of Transportation 2050 street program revenues, the city tripled the number of arterial and major street miles that were paved this year.

Below: On Dec. 3, 2019, Mayor Kate Gallego, City Council members, and project team members participated in a media event to celebrate 2019 paving season accomplishments.



Is assessing pavement conditions once every two years often enough?

Yes. Pavement condition generally does not change drastically within a two-year period, so this frequency is sufficient to observe changes. Additionally, staff may make field visits if there are concerns or complaints.

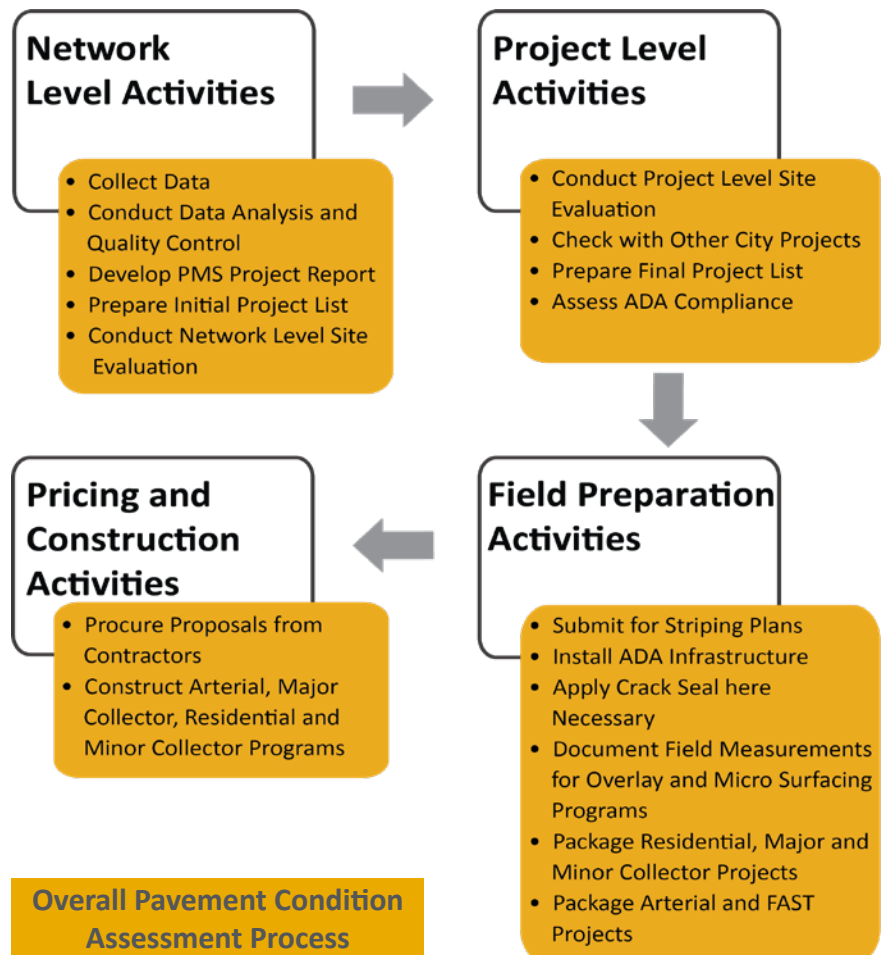
Why is there so much paving during the summer?

Colder weather is not conducive to paving because lower temperatures and winter conditions affect the quality and long-term performance of the pavement. Mill and overlay can be installed March to October, and microsurfacing and other treatments from March to May and August to November. From December through February, the department prepares for the upcoming paving season by addressing curbs and gutters, repairing sidewalks, sealing cracks in the asphalt and installing wheelchair accessible ramps.

4. PAVEMENT CONDITION ASSESSMENT PROCESS

The primary consideration for selecting streets for pavement maintenance is through a thorough data collection process to objectively measure the pavement condition. Phoenix assesses the entire pavement network every two years.

For analysis and program purposes, the network is divided into two sub-networks – major and arterial streets, and local and minor collectors. A condition assessment is conducted on all arterial, major and minor collector streets, as well as nearly all local streets. Data collection and processing occurs on a nearly continual basis, resulting in the two-year timeframe needed to complete the assessment.



DATA COLLECTION AND PROCESSING

The condition assessment is a fully automated process utilizing a specially equipped van, the Automated Road Analyzer (ARAN) 9000, associated distress extraction software, and the Pavement Management System, Deighton Total Infrastructure Management Software (dTIMS).

For major and arterial streets, staff members drive the ARAN 9000 Van both directions on a street. For streets with two lanes in the same direction, the right lane is driven. For streets with three lanes in the same direction, the second lane from the right is driven. Intersections are inspected for the appropriate treatment when an adjacent road segment receives a pavement treatment. Local and minor collector streets are driven in one direction.

ARAN 9000 Van (exterior)



ARAN 9000 Van (interior showing equipment)



Data Reliability

The ARAN 9000 Van hardware and software are calibrated by driving the calibration road, Buckeye Road between 16th Street and 7th Avenue, each week during data collection cycle. New data is compared to previous data to confirm the reliability of the results. If there is a significant discrepancy in the new data, the van's International Roughness Index (IRI) lasers will be recalibrated.

Resident Input

Residents can let the pavement team know about roadway issues by email (pavement@phoenix.gov), phone (602-262-6441), or through the city's website (phoenix.gov/atyourservice). Notifications about potholes and street emergencies are directed to the dispatch team, and recommendations about streets in need of repair are noted and inspected for unanticipated deterioration.

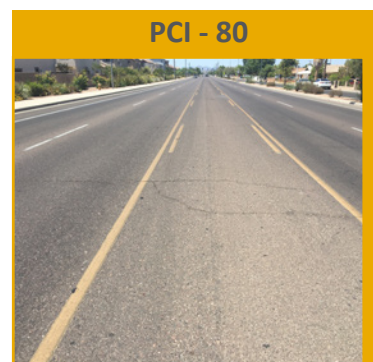
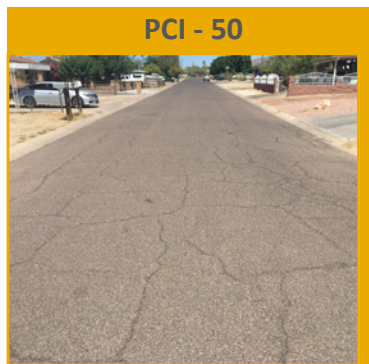
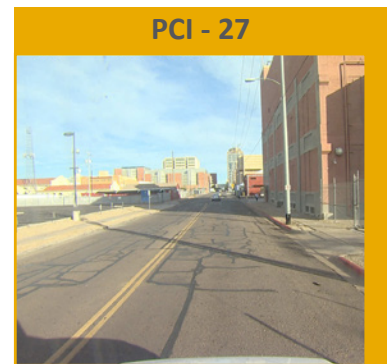
PCI Criteria Chart

Excellent	90-100
Good	70-89
Fair	45-69
Poor	20-44
Very Poor	0-19

PAVEMENT CONDITION INDEX

Data are then analyzed to determine the Pavement Condition Index (PCI), which is a composite rating of the pavement’s structural, environmental, and roughness conditions. Streets in excellent condition are assigned a value of 100 and streets in drastic need of replacement are given a value of 0.

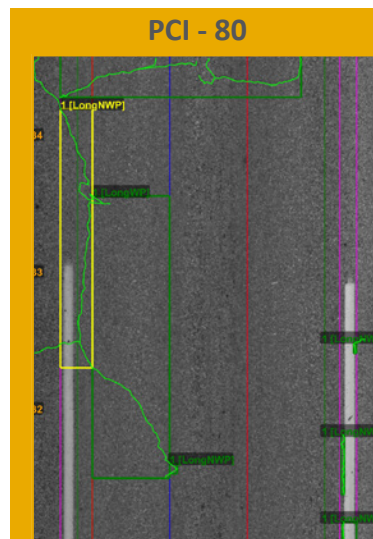
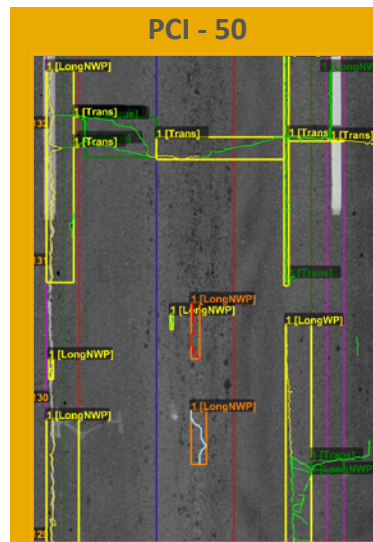
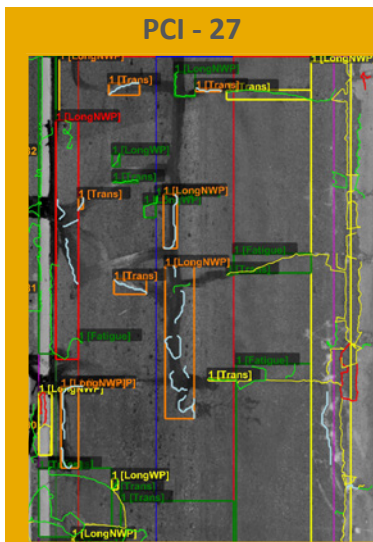
Pavement begins with a rating of 100 and points are deducted from that pavement section value based on current pavement conditions. Point values are deducted for low, moderate, or high severity of alligator cracking, longitudinal wheel path cracking, longitudinal non wheel path cracking, transverse cracking, and roughness.



The data collected using the ARAN 9000 Van is processed to produce crack maps. These maps indicate the severity and types of pavement damage. In the examples below, green lines indicate low severity, yellow lines indicate moderate severity, and orange/red lines indicate high severity. The cracks are classified as alligator/fatigue, longitudinal wheel path, longitudinal non wheel path, and transverse cracks. The white lines on the maps indicate seal crack.

Crack types are weighted differently to calculate the pavement PCI. Alligator/fatigue crack is weighted heavier because it is more destructive and affects the structural integrity of the road. Longitudinal wheel path, longitudinal non wheel path, and transverse cracking are caused by environmental factors, such as heat and temperature change, and are weighted lower.

Pavement Program Work Sites



What is the CIP?

Phoenix's Capital Improvement Plan, or CIP, is a five-year plan that identifies capital projects and purchases, provides a planning schedule, and identifies financing options for twenty-one city programs – including libraries, public transit, solid waste disposal, water, and street transportation.

STREET PROJECT PRIORITIZATION

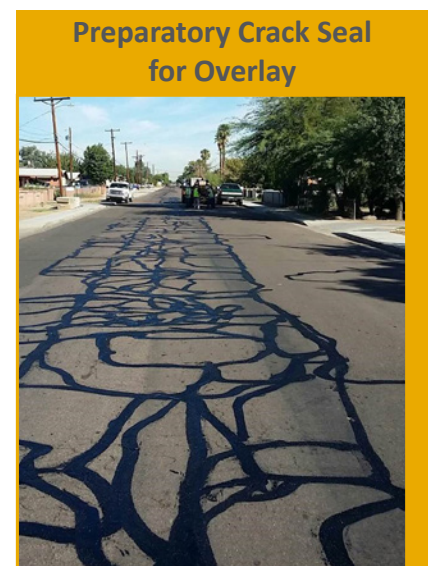
The initial street project list is generated through the Pavement Management System (PMS). This software application analyzes the PCI, annual average daily traffic volumes, and the cost/benefit ratio.

In preparing the project list, the cost/benefit ratio is important because it compares the cost of the anticipated treatment recommended today to the long-term benefit of that treatment. Because lower-cost treatments can be used earlier in the street's lifecycle, significant degradation is avoided. The result is improved pavement conditions and the extension of pavement life.

The PMS provides 10 years of potential projects grouped in one-year increments. Staff members review the project list for conflicts with utility work (private and public) and coordinate with the city's Capital Improvement Plan (CIP).

Each potential project site is evaluated in the field before it is added to the final project list. The review confirms or negates the PMS recommendation and provides the opportunity to check for specific conditions that may affect the planned treatment. Additionally, each year the project list may be updated based on new information collected.

Before a street receives pavement treatment, crack seal is applied if needed. For streets that will undergo mill and overlay or microsurfacing work, curb ramps are inspected and brought into compliance with current ADA requirements, and any other needed concrete work occurs.



6. PAVEMENT TREATMENTS

Phoenix uses many pavement treatment types to preserve the life of its streets. These treatments include mill and overlay, fractured aggregate surface treatment (FAST), micro surface, slurry seal, sealcoat – including polymer modified masterseal (PMM) and tire rubber modified surface seal (TRMSS) –, fog seal, and crack seal.

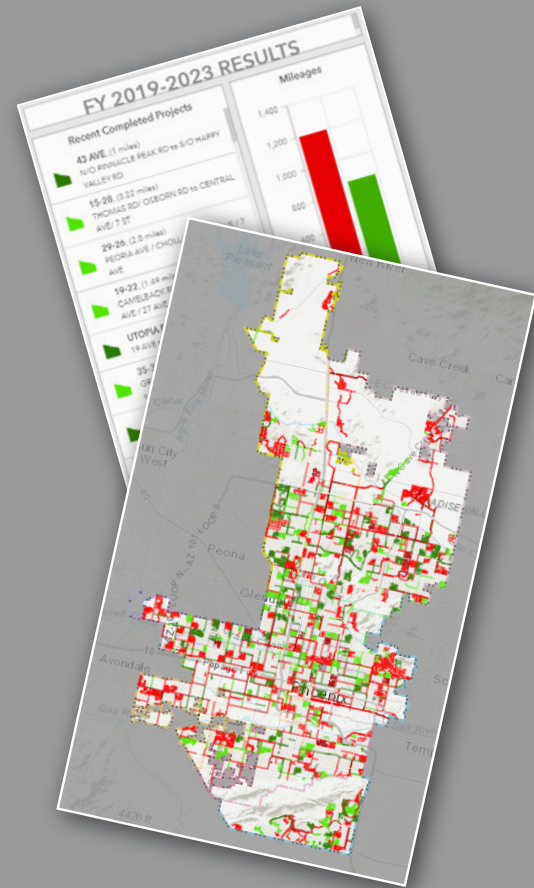
**“TREAT THE RIGHT ROAD,
WITH THE RIGHT TREATMENT,
AT THE RIGHT TIME”**

The dTIMS analyzes the pavement data and assigns a treatment type based on the current pavement condition and available budget. The triggers that help determine the pavement treatment type include the extent and severity of alligator cracking, longitudinal wheel path cracking, longitudinal non wheel path cracking, transverse cracking, and roughness. Guidelines showing assessment categories and options for pavement treatments generally utilized are noted below. All projects undergo field inspection to verify that the recommended treatment is appropriateness.

Pavement Treatment Guidelines	
Fog Seal	Excellent Good
Sealcoat	Good
Slurry Seal/ Microsurfacing	Good Fair
FAST	Fair Poor
Overlay	Fair Poor
Replace	Very Poor

Pavement Treatment Dashboard

To see when and where Phoenix will be paving through 2023, visit the interactive dashboard at phoenix.gov/PavementProgram. Select “treatments dashboard,” then either click on the magnifying glass to enter an address or zoom in to the map.



How long do roads last?

Today, roads are expected to last about 35 years. Improvements in pavement treatment technology – including improved sealcoat products and processes – aid in providing cost-effective treatments to maximize a road’s lifetime.

Pavement Preservation PMM



Before



After

Additional inspections occur following pavement treatments. For example, the final step in mill and overlay work includes raising utilities, service access covers, street monuments, and striping the roadway.

Street Network and Treatment Types					
	2020	2021	2022	2023	2024
Arterial and Major Treatment Miles					
Overlay	57.55	46.92	51.57	33.75	13.5
Microsurfacing	6.42	6	4.47	2.73	11.12
FAST	-	-	-	0.54	1.07
Fog Seal	36	48.44	43.6	42.43	11.07
Sub-Total	99.97	101.36	99.64	79.45	36.76
<i>Total Arterial and Major Collector Street Mileage = 839 miles</i>					
<i>Average for 10-year Treatment Cycle = 83.9 miles</i>					
	2020	2021	2022	2023	2024
Local and Minor Treatment Miles					
Overlay	212.52	11.27	1.48	2.28	65.96
Slurry Seal	72.59	68.13	61.10	71.77	78.45
FAST	20.93	19.90	12.64	11.67	14.10
Microsurfacing	-	-	-	-	8.41
Fog Seal	69.81	65.34	71.84	87.75	43.55
Sub-Total	375.85	164.63	147.06	173.47	210.47
<i>Total Minor Collector and Local Street Mileage = 4,032 miles</i>					
<i>Average for 10-year Treatment Cycle = 403.2 miles</i>					

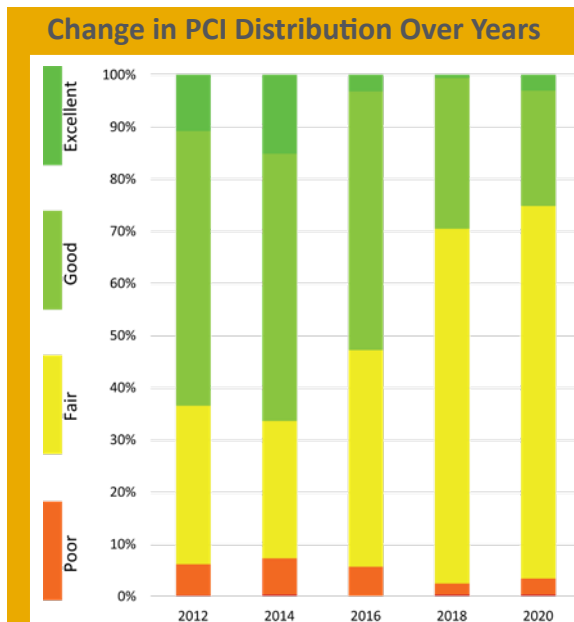
Note: Table shows planned treatment miles for FY 2021 - FY 2024

7. CURRENT PAVEMENT CONDITIONS

Phoenix’s current PCI is 69.9. This number represents the average of the conditions on all streets – including local and arterial – with some streets in the “poor” and “fair” range and others in the “good” and “excellent” range.

While the Phoenix network as a whole is nearing the good range, it is apparent that work is needed in certain segments, and ongoing improvements will continue to boost the overall rating. It can be observed that the excellent category has increased, and there continue to be no streets in the “very poor” category.

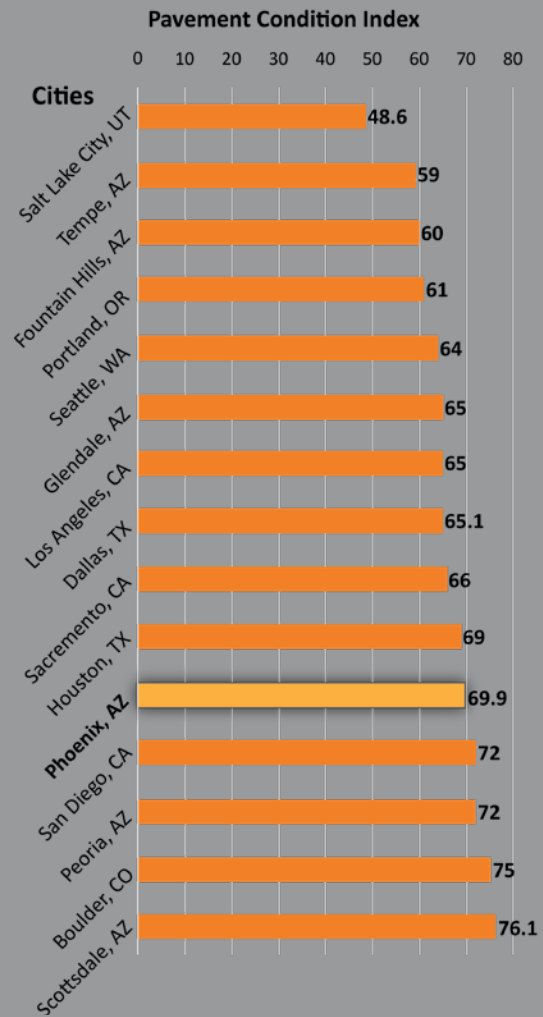
However, the proportion of streets in good condition is on a downward trend, and the fair category has grown. This can be attributed to the lag in process. From the time data is collected, approximately one year is spent processing the data. Projects must then be prioritized and scheduled, and the improvements implemented. Lastly, the data on the improved roads must be collected and reported.



Improvements to PCI ratings on the arterial and major collector network are expected soon. The results from the influx of funding in 2018, and the subsequent work able to occur from 2019 to 2023, will emerge in PCI ratings beginning in 2021.

Current PCI

Phoenix’s PCI of 69.9 compares favorably with other similar cities.



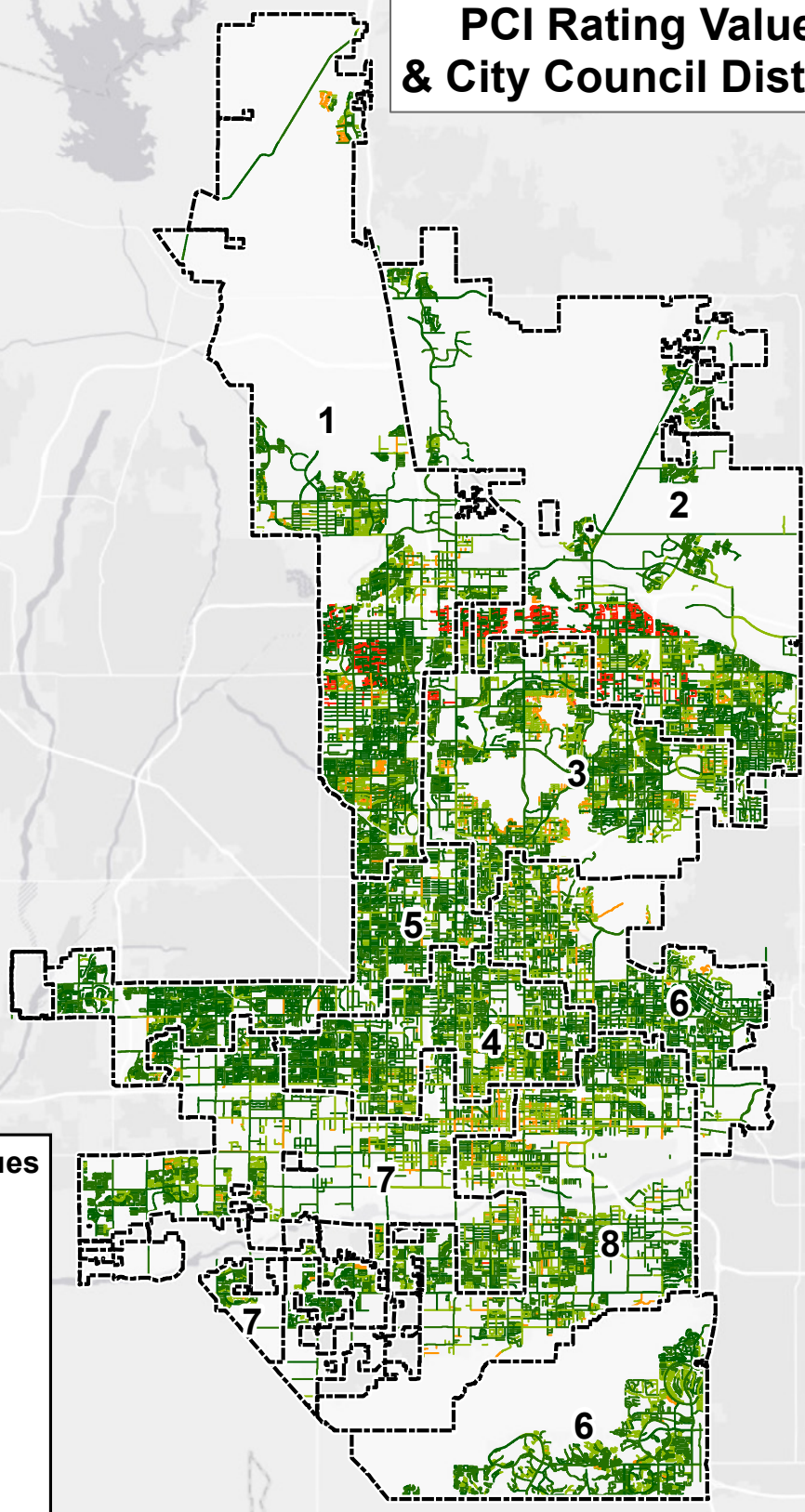
APPENDIX

Maps Showing PCI Rating Values:

- [PCI Rating Values and City Council Districts \(Citywide\)](#)
- [PCI Rating Values City Council District 1, North Section](#)
- [PCI Rating Values City Council District 1, South Section](#)
- [PCI Rating Values City Council District 2](#)
- [PCI Rating Values City Council District 3](#)
- [PCI Rating Values City Council District 4](#)
- [PCI Rating Values City Council District 5](#)
- [PCI Rating Values City Council District 6, North Section](#)
- [PCI Rating Values City Council District 6, South Section](#)
- [PCI Rating Values City Council District 7](#)
- [PCI Rating Values City Council District 8](#)

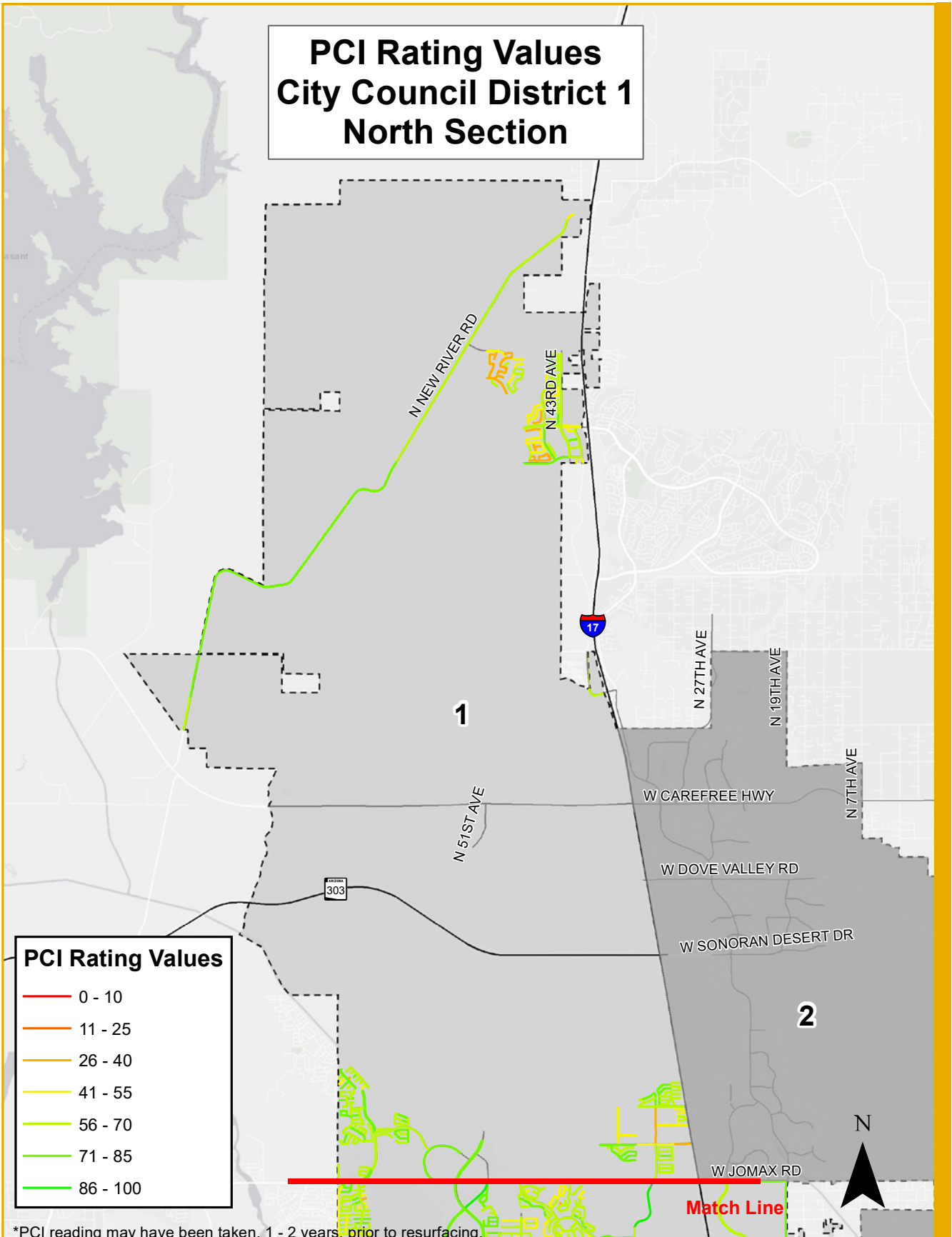
PCI Rating Values & City Council Districts

PCI Rating Values	
Condition Index	
	0 - 10
	11 - 25
	26 - 40
	41 - 55
	56 - 70
	71 - 85
	86 - 100



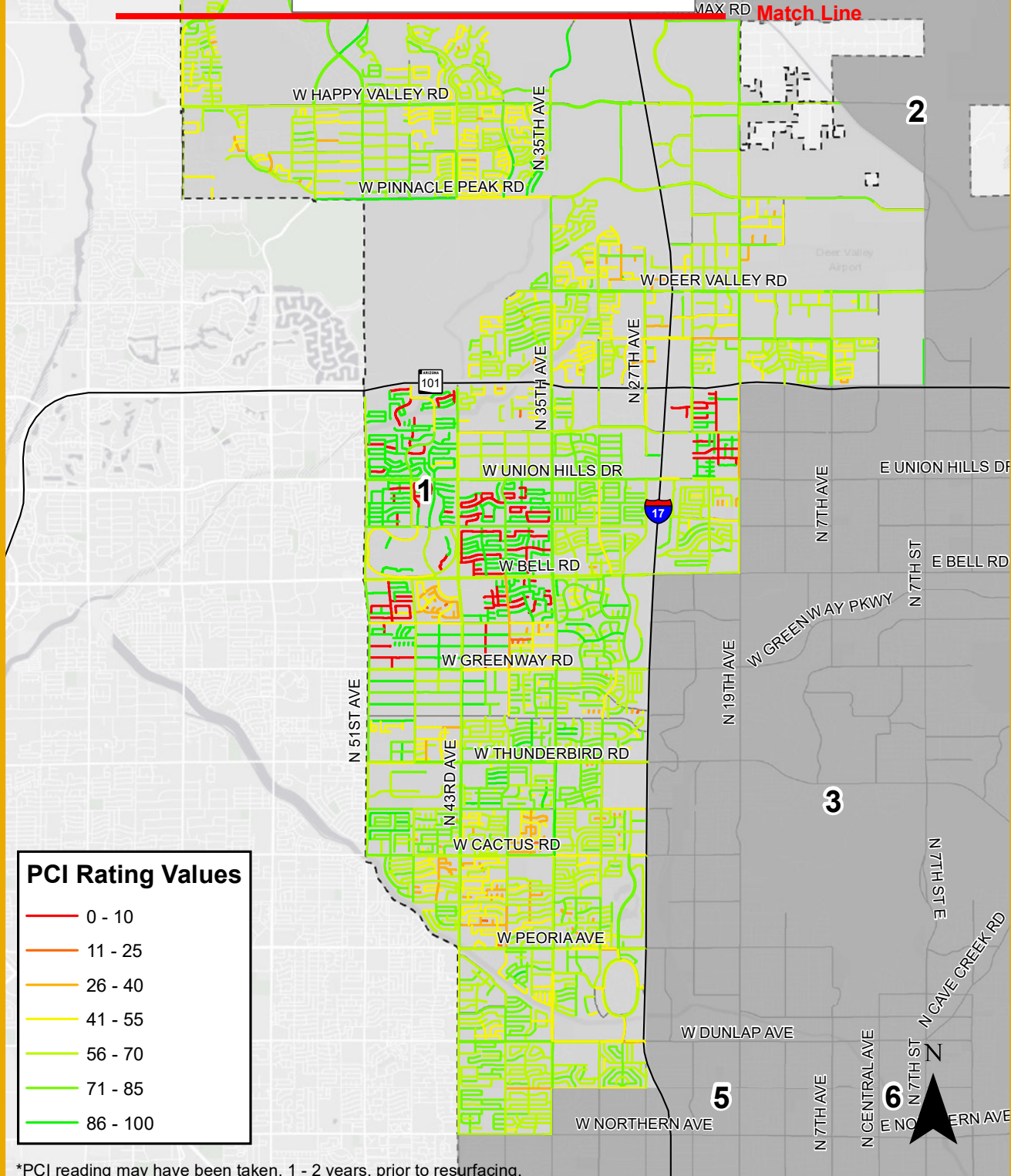
*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

PCI Rating Values City Council District 1 North Section



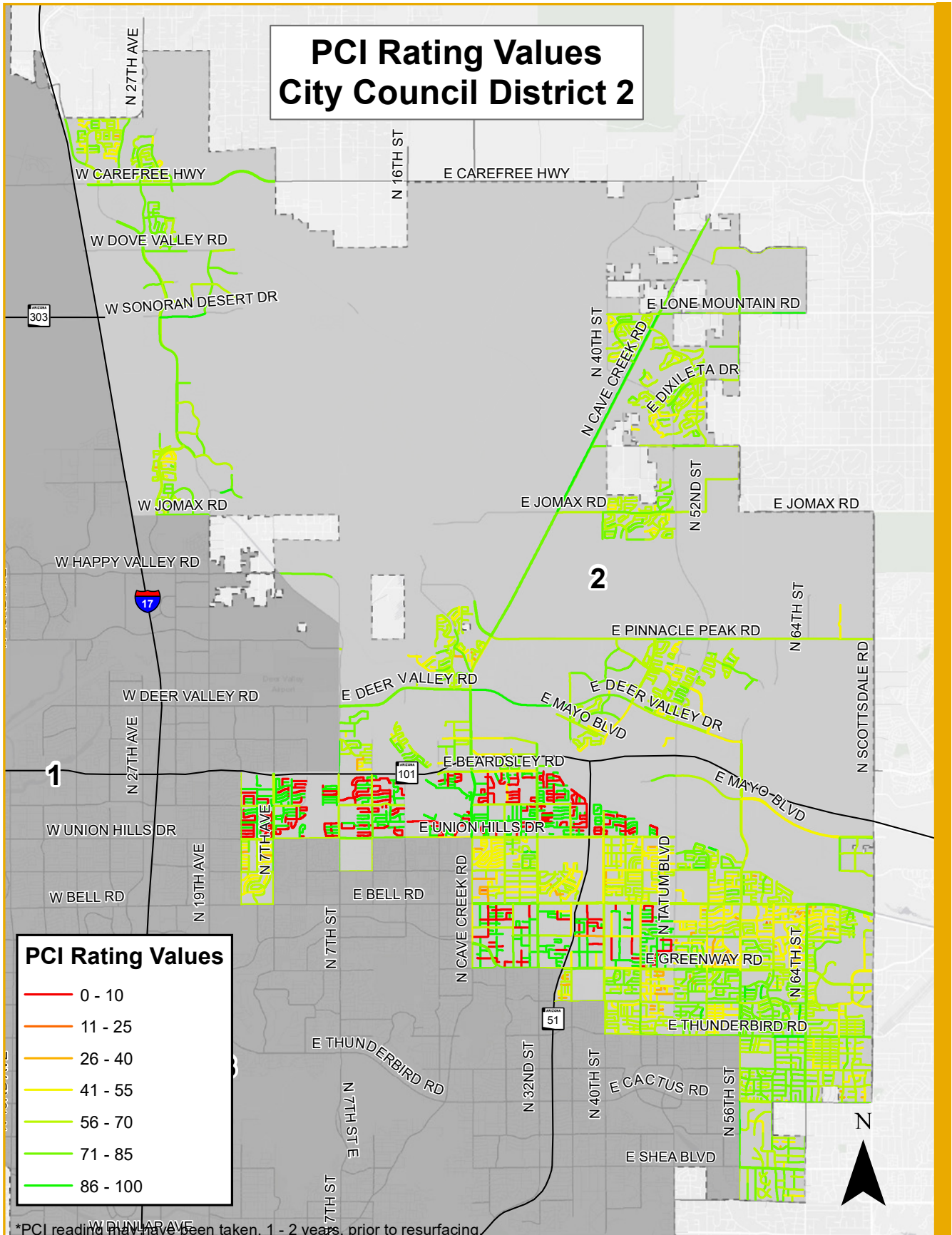
*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

PCI Rating Values City Council District 1 South Section



*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

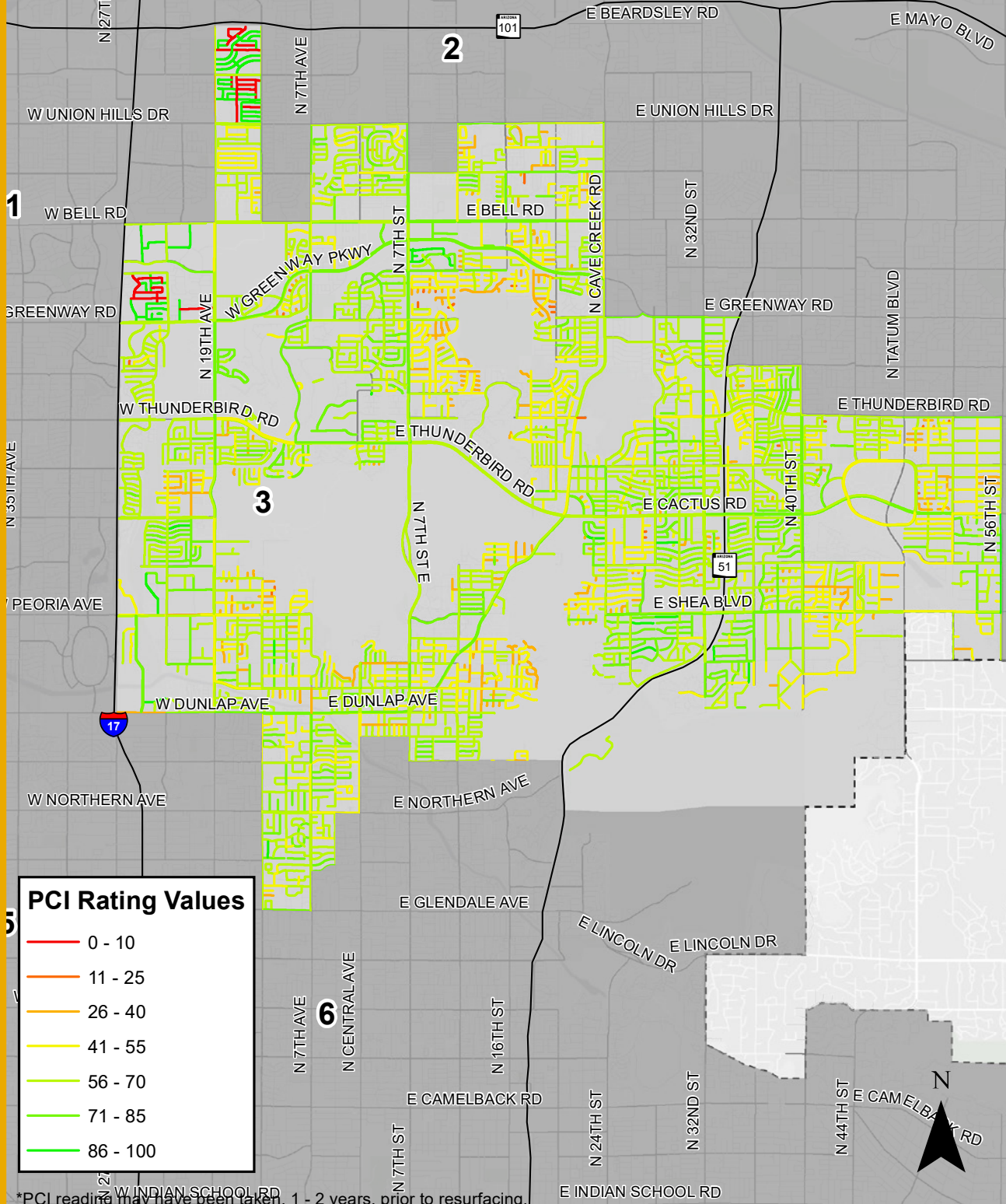
PCI Rating Values City Council District 2



Red	0 - 10
Orange	11 - 25
Yellow	26 - 40
Light Green	41 - 55
Medium Green	56 - 70
Dark Green	71 - 85
Lightest Green	86 - 100

*PCI readings may have been taken, 1 - 2 years, prior to resurfacing

PCI Rating Values City Council District 3

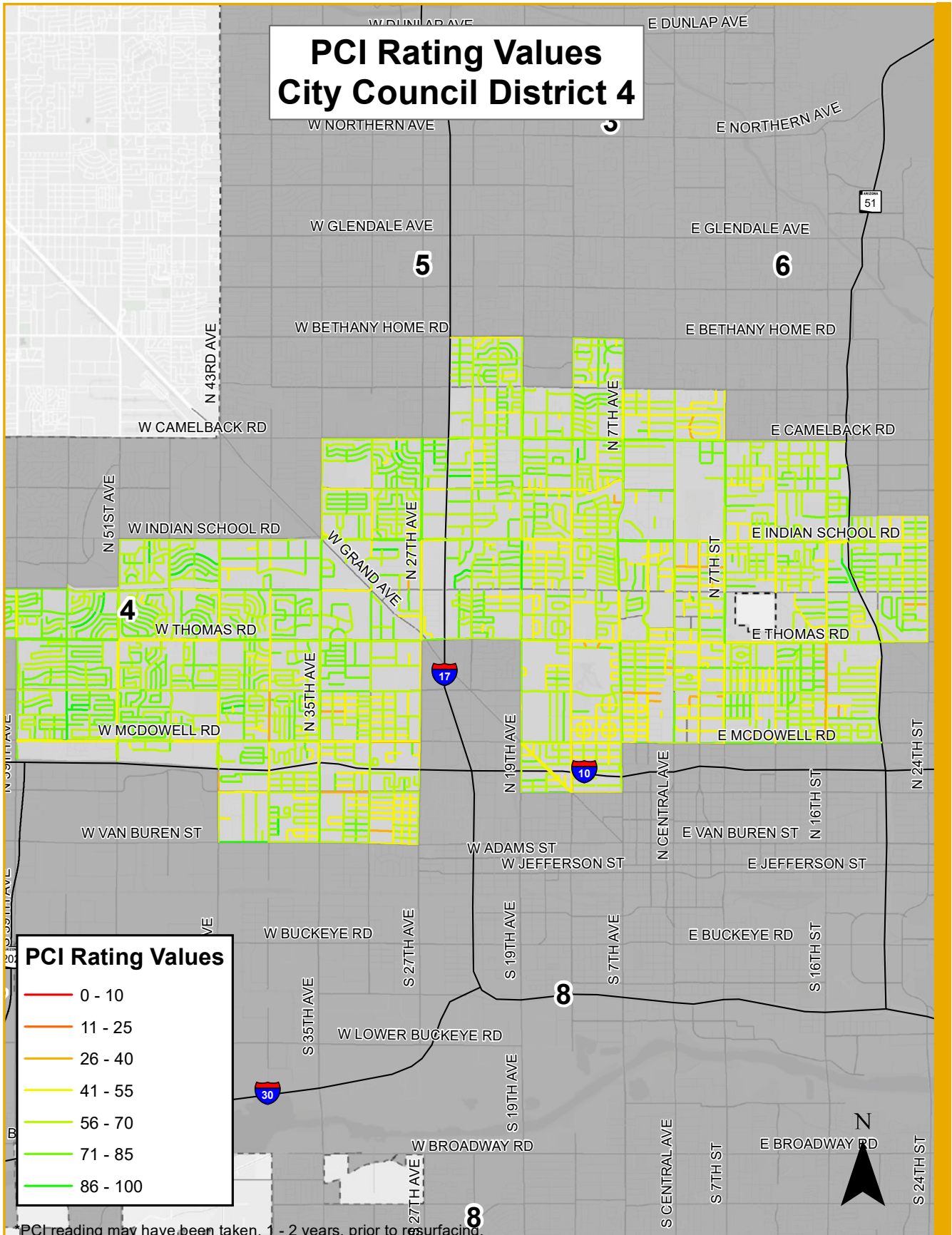


PCI Rating Values

Red	0 - 10
Orange	11 - 25
Yellow	26 - 40
Light Green	41 - 55
Medium Green	56 - 70
Dark Green	71 - 85
Lightest Green	86 - 100

*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

PCI Rating Values City Council District 4

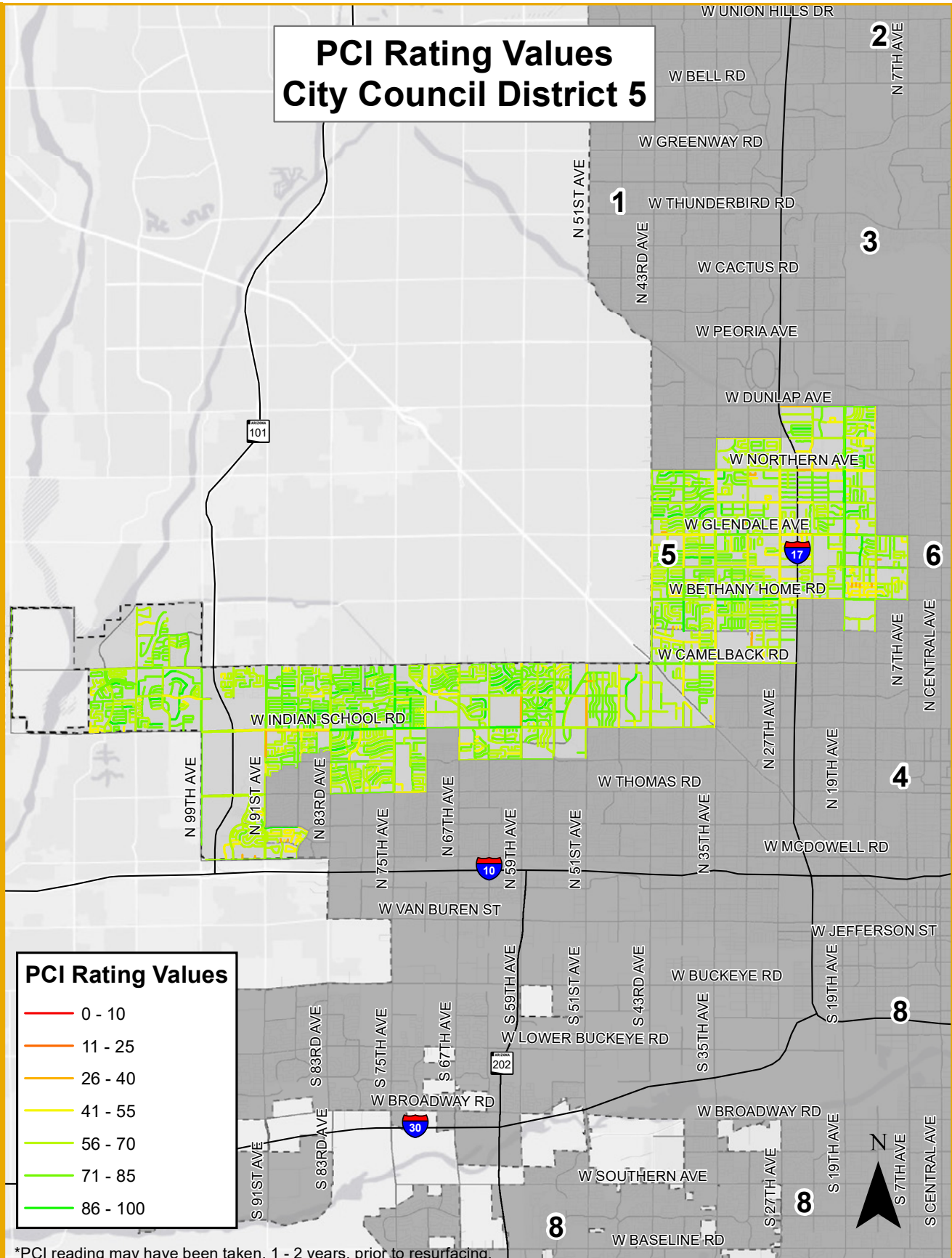


PCI Rating Values

- 0 - 10
- 11 - 25
- 26 - 40
- 41 - 55
- 56 - 70
- 71 - 85
- 86 - 100

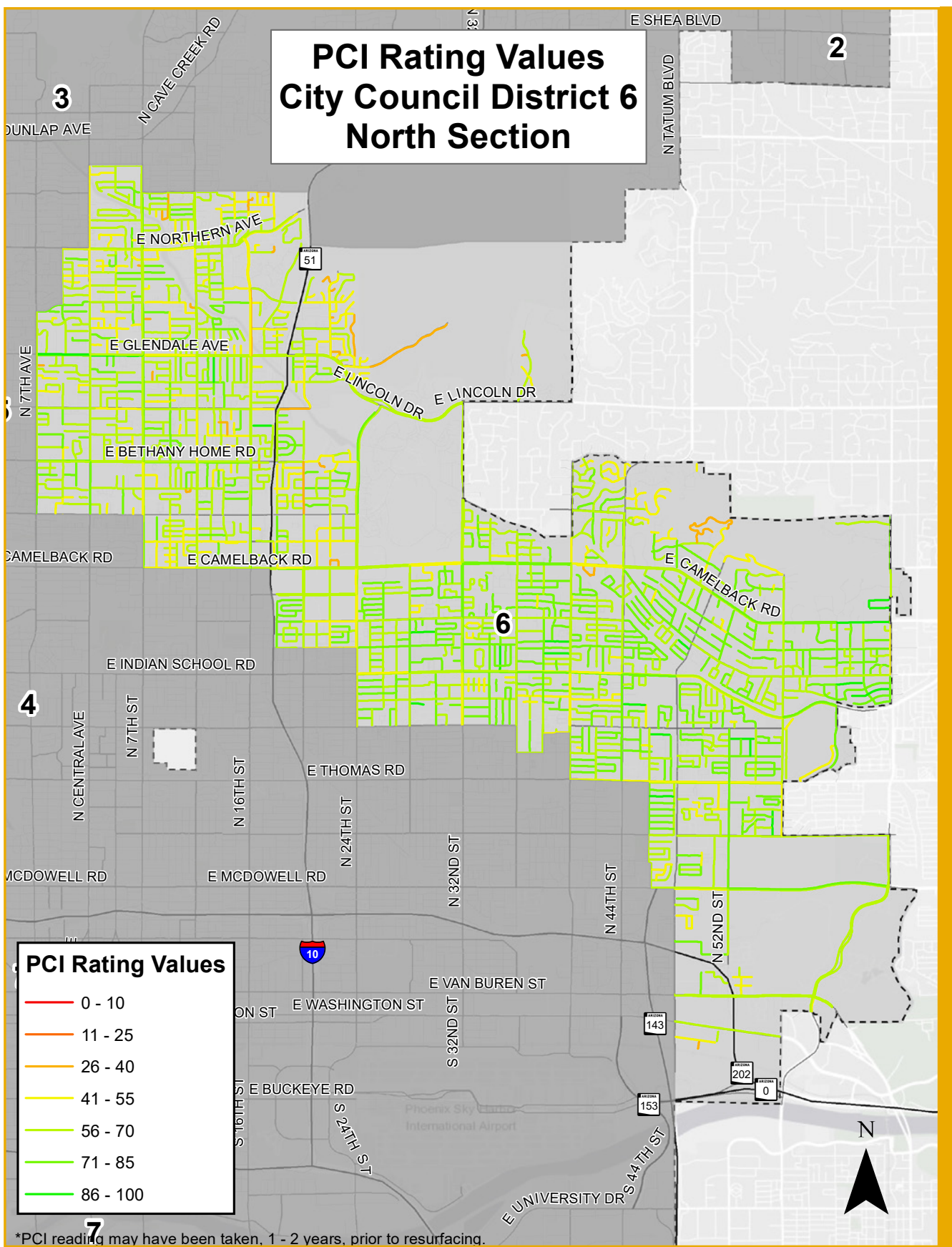
*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

PCI Rating Values City Council District 5

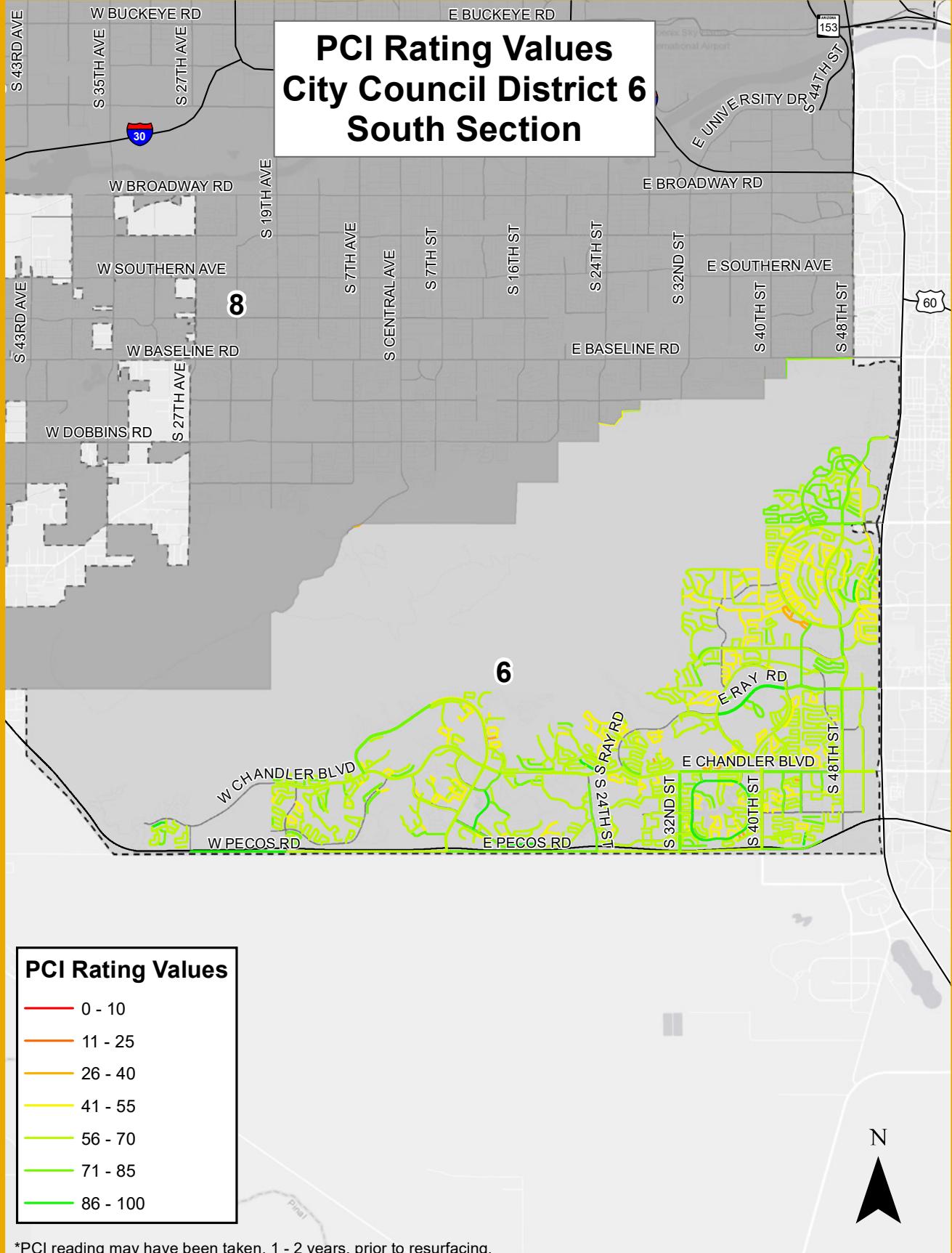


*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

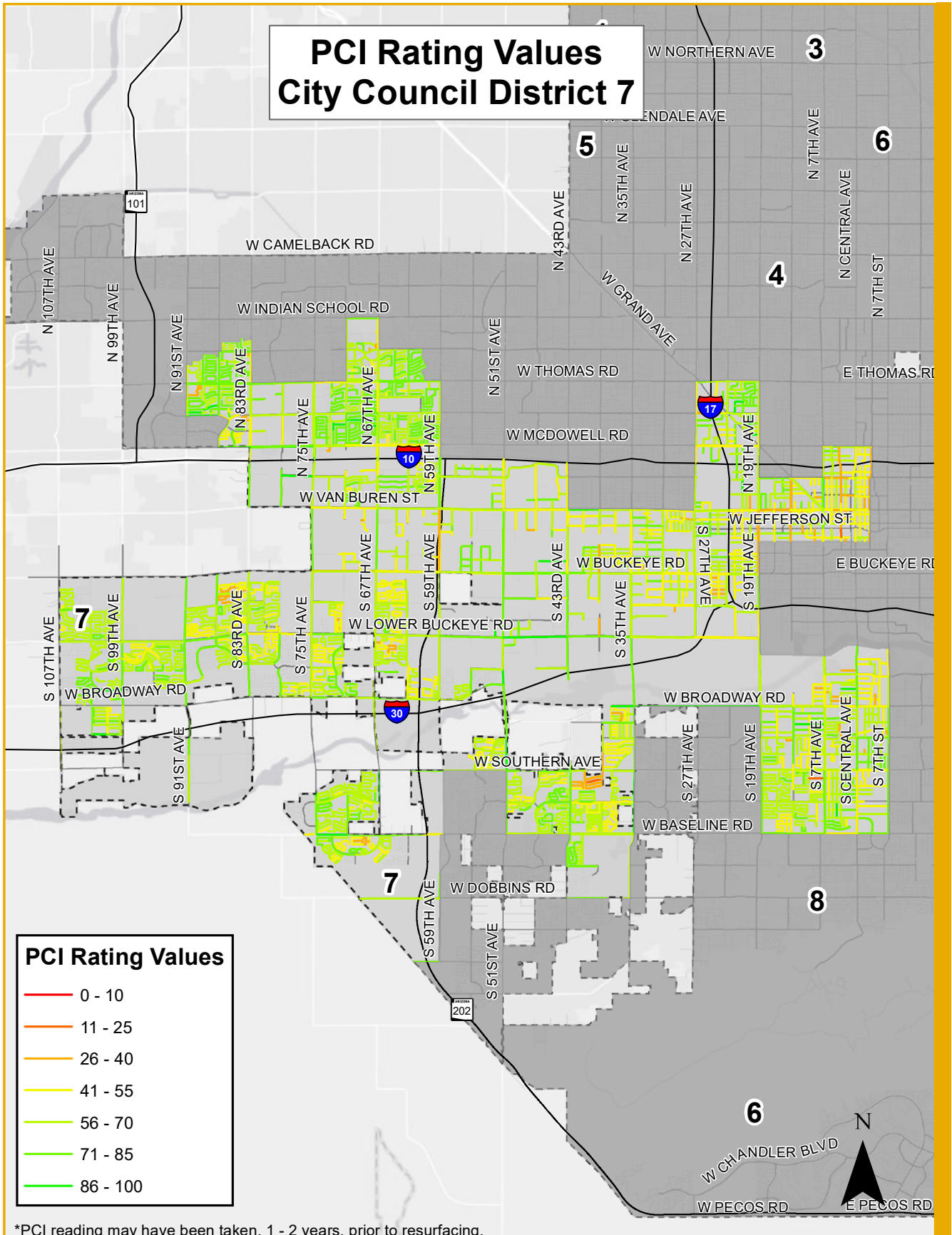
PCI Rating Values City Council District 6 North Section



PCI Rating Values City Council District 6 South Section



PCI Rating Values City Council District 7

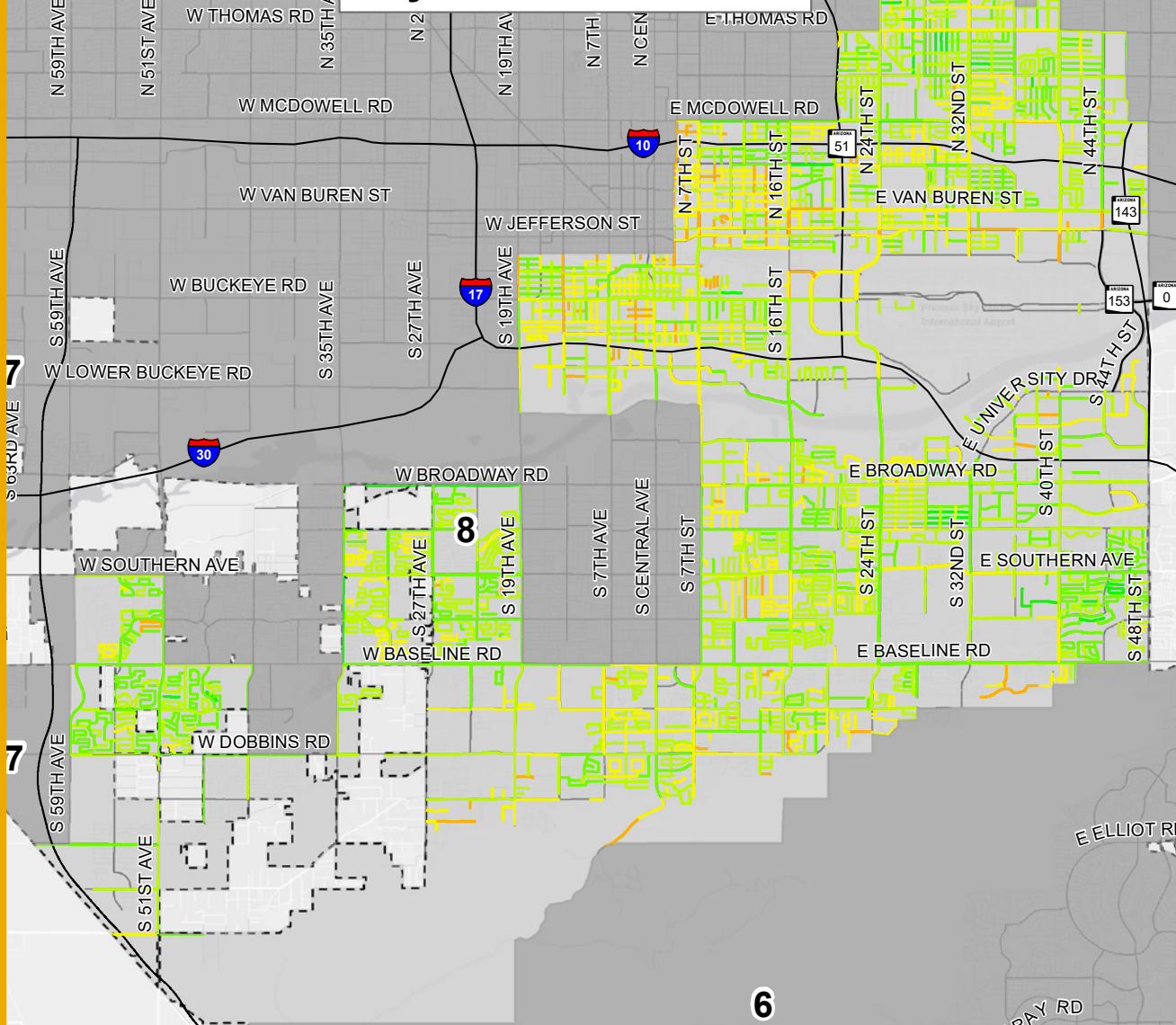


PCI Rating Values

- 0 - 10
- 11 - 25
- 26 - 40
- 41 - 55
- 56 - 70
- 71 - 85
- 86 - 100

*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

PCI Rating Values City Council District 8



PCI Rating Values	
—	0 - 10
—	11 - 25
—	26 - 40
—	41 - 55
—	56 - 70
—	71 - 85
—	86 - 100

*PCI reading may have been taken, 1 - 2 years, prior to resurfacing.

