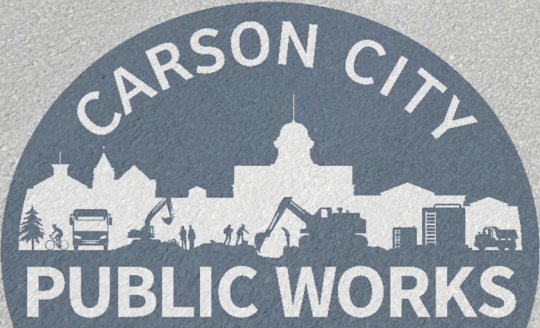# CARSON CITY PAVEMENT MANAGEMENT PLAN

Fiscal Year 2024-2028
Approved May 2023

Executive Summary

Staff has developed this Pavement Management Plan (Plan) for Fiscal Year 2024-2028, which formalizes and establishes an efficient and effective strategy for preserving and maintaining the City's 285 centerline miles of paved roadway. The Plan establishes five performance districts within the City and a five-year rotating schedule to streamline work efforts. The Plan provides a predictable use of roadway funding while maintaining flexibility for unplanned City projects and "match" for grant funding opportunities, as needed.

The five Performance Districts ensure transparency, ensure an equitable distribution of funding, and target cost-saving strategies. The Plan identifies current conditions and establishes performance measures to monitor pavement conditions over time. The 2022 overall pavement condition within Carson City is rated Fair, with a pavement condition index (PCI) rating of 62 out of a 100-point scale.

This Plan establishes a process to share and track the City's pavement conditions. Using the Pavement Condition Index (PCI) rating, the City will be able to set targets for improving pavement conditions at a city-wide level and for different transportation facilities, including regional and local roadways. Target setting will help staff and decision makers annually evaluate the allocation of resources for maintaining pavement infrastructure. Pavement Condition Index (PCI) is the most commonly used metric nationwide for assessing pavement conditions. PCI documents the type, severity, and extent of pavement distress and ranks conditions on a scale from 0-100, 0 being the worst pavement condition and 100 being the best pavement condition.

The table below identifies the five performance districts and their 2022 pavement condition.

Pavement Condition Index (PCI) Rating by Performance Districts						
Performance Districts	**District 1 (Red)**	**District 2 (Purple)**	**District 3 (Light Green)**	**District 4 (Orange)**	**District 5 (Blue)**	**City-wide Average**
Pavement Condition	Fair (PCI 61)	Fair (PCI 63)	Fair (PCI 64)	Fair (PCI 61)	Fair (PCI 62)	Fair (PCI 62)

The Plan establishes a five-year Capital Improvement Cycle within an annual budget and project selection process to select, design, and construct pavement projects, for one district per year on a City-wide, rotating five-year cycle. The Plan identifies project evaluation criteria to prioritize projects consistently and transparently. Each district is illustrated with maps in Appendix C.

A large percentage of the Carson City Regional Transportation Commission (RTC) funding will be programmed to implement the Pavement Management Plan, and a small percentage will remain unencumbered to maintain a level of responsiveness for unforeseen needs and to capitalize on funding opportunities as they become available.

Table of Contents

Introduction

This Pavement Management Plan sets out a defined strategy and process for Carson City Public Works. The Plan is a living document to be followed and updated by an interdisciplinary team, comprised of a construction inspector, engineer, and planner. The purpose of this Plan is to consistently and efficiently evaluate, select, design, and implement pavement projects annually.

This Plan designates five Performance Districts. The performance districts and annual schedule were developed to streamline delivery of pavement projects. Use of performance districts facilitates more efficient and effective pavement condition monitoring over time and prompt identification of immediate maintenance and rehabilitation needs. Centerline miles and pavement conditions by facility type, such as regional and local roadways, were considered to create districts with balanced needs. Political boundaries were reviewed to ensure that a performance district was not contained within a single political boundary. Project limits may extend across performance district boundaries if determined by engineering judgment.

District specific maps with more detail are illustrated in Appendix C.
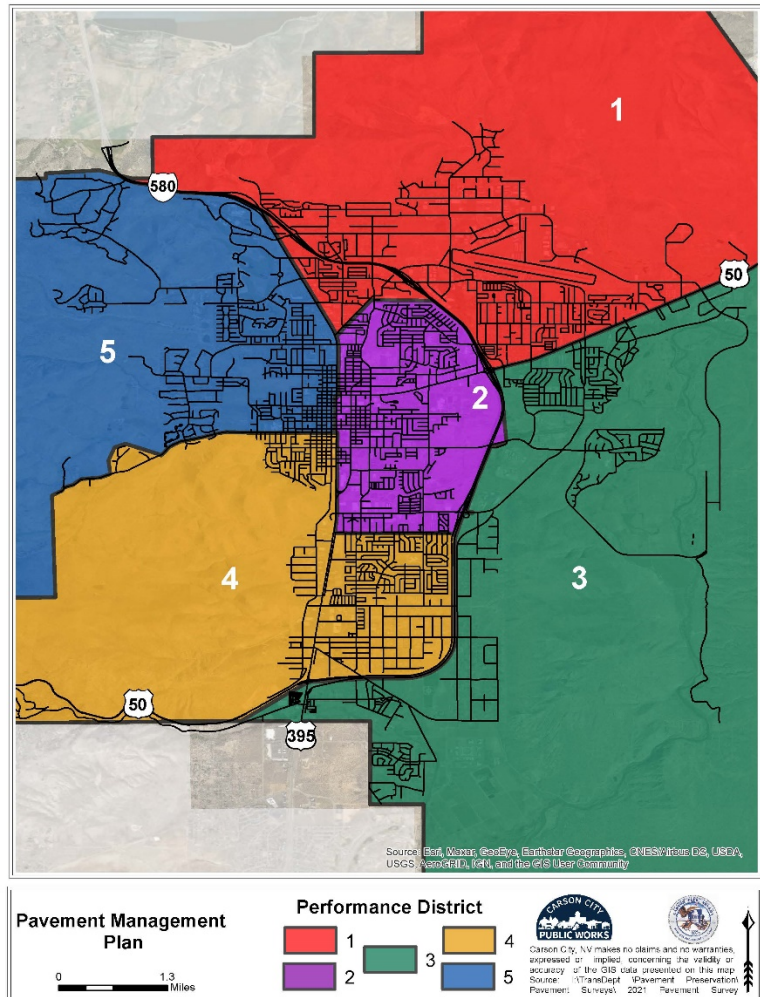
Roadway Functional Classification Explained

The functional classification of roadways defines the role of each individual facility within the larger City-wide roadway network. Functional classification carries with it requirements and expectations for roadway design, including: speed, capacity, structural section, width, multi-modal accessibility, and relationship to existing and future land use development. Federal legislation continues to use functional classification in determining eligibility for funding under the Federal-aid program. There are three official roadway functional classifications:

➢ Arterial Roadways - provide service for trips of moderate length, serve geographic areas that are smaller than their higher classified roadways (Freeways, Interstates) and offer connectivity to the large, regional roadway network. In an urban context, arterials provide inter- and intra-community continuity. These roads are eligible to receive federal funding.

- Collector Roadways - serve a critical role in the roadway network by gathering traffic from local roads and funneling them to the arterial network. These roads are eligible to receive federal funding.
- Local Roadways - account for the largest percentage of roadway in terms of mileage. These neighborhood streets are not intended for use in long-distance travel, except at the origin or destination end of the trip. These roads are not eligible to receive federal funding.

click on map

A current Functional Classification Map is available on the Nevada Department of Transportation website at: https://www.nevadadot.com/doing-business/about-ndot/ndot-divisions/planning/roadway-systems/functional-classification-maps/carson-city

This Plan establishes a process to share and track the City's pavement conditions. This aligns with the City's asset management initiative of the Carson City FY 2022-2026 Strategic Plan and the goals listed in the 2050 Regional Transportation Plan. Annual reporting will assist decision makers in priority based budgeting. Using the PCI rating, the City will be able to set targets for improving pavement conditions. Target setting will help staff and decision makers evaluate the allocation of resources for maintaining pavement infrastructure.

2022 Performance Districts Characteristics						
Characteristics	District 1 (Red)	District 2 (Purple)	District 3 (Light Green)	District 4 (Orange)	District 5 (Blue)	City-wide
Weighted PCI Average	Fair (PCI 61)	Fair (PCI 63)	Fair (PCI 64)	Fair (PCI 61)	Fair (PCI 62)	Fair (PCI 62)
Total Centerline Miles	57	51	63	57	57	285
Regional Road Centerline Miles	16	14	18	16	16	80
Local Road Centerline Miles	41	37	45	41	41	205

By focusing on pavement condition, the PCI rating allows staff to target the most effective time to perform pavement preservation treatments. Pavement preservation treatments are the most efficient use of the City's limited resources because the treatments are typically low cost and preserve past investment in infrastructure.   As a result, this Plan proposes pavement condition targets that align with the most effective time to perform preservation treatments.

- PCI Rating Target for Regional Roads – 75 and above
- PCI Rating Target for Local Roads – 70 and above

Pavement Condition Index (PCI)									
Facility Type		**Average Estimated PCI**							
		2015	2016	2017*	2018	2019	2020	2021	2022*
Performance District 1 Red	Regional Roads	68	67	67	66	66	62	56	69
	Local Roads	63	63	62	60	56	52	48	57
	All Roads	65	65	64	62	59	55	51	61
Performance District 2 Purple	Regional Roads	69	60	69	72	70	71	68	80
	Local Roads	66	69	62	60	58	54	49	53
	All Roads	67	64	65	65	62	60	56	63
Performance District 3 Light Green	Regional Roads	71	51	78	74	74	71	68	77
	Local Roads	64	60	63	57	57	54	51	58
	All Roads	63	55	70	62	62	59	56	64
Performance District 4 Orange	Regional Roads	75	73	68	64	62	75	69	79
	Local Roads	67	64	58	56	52	49	45	51
	All Roads	71	69	63	59	56	58	53	61
Performance District 5 Blue	Regional Roads	67	67	65	63	62	58	5.3	65
	Local Roads	68	69	65	64	61	57	52	60
	All Roads	68	68	65	64	61	57	52	62
City-wide	Regional Roads	69	68	68	68	67	67	63	74
	Local Roads	64	63	62	59	57	53	49	56
	All Roads	66	65	65	62	60	58	54	62

*Completed Pavement Survey

Approach to Funding

The Plan's approach to funding provides a predictable use of roadway funding while maintaining flexibility for unplanned City projects and "match" for grant funding opportunities, as needed. Currently, two City budgets fund the maintenance and capital improvements for the City's transportation network. The two budgets are the Street Maintenance fund and the Regional Transportation Commission (RTC) fund. These budgets are primarily funded by the Carson City share of federal, state, and local fuel taxes, a portion of the City's sales tax, and from grant awards.
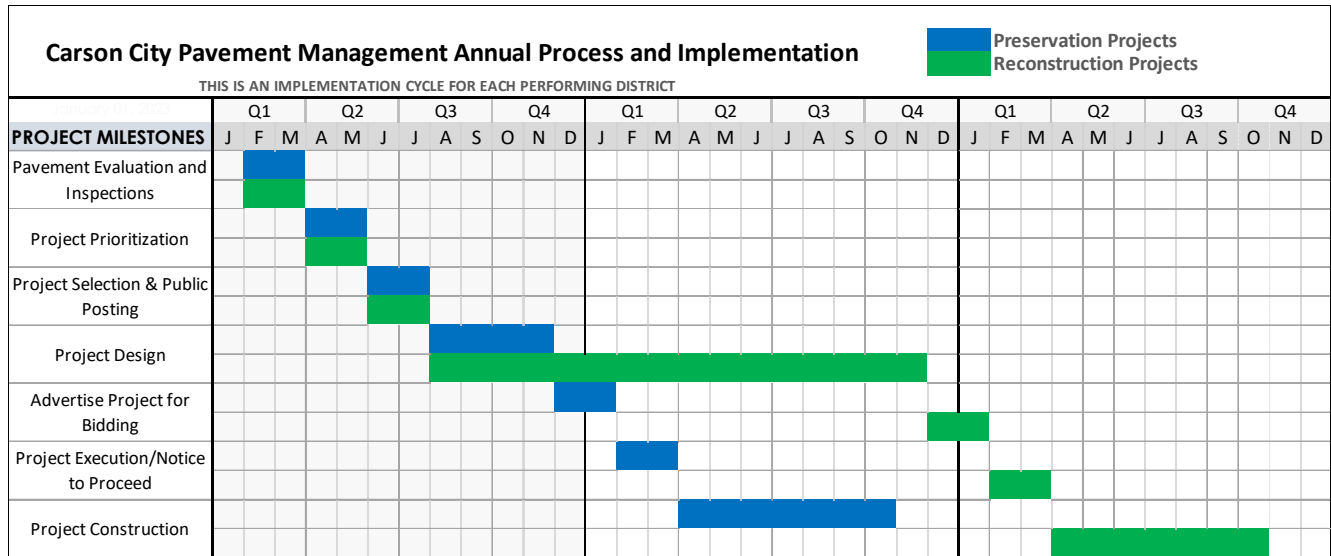
The Pavement Management Plan establishes a Five-Year Capital Improvement Cycle, funded through the Transportation Infrastructure account in the RTC budget. At least eighty percent (80%) of the funding will be used to implement the strategies outlined in this Pavement Management Plan and will follow the annual performance district cycle. The remaining funds in this account will be used for unplanned City-wide improvements and match for grant opportunities. At this time, funding from the RTC budget is directed toward City owned arterial and collector roadways as these roads carry the majority of the traffic volume in Carson City. Street Maintenance funding will continue to be used for maintenance activities, such as crack filling, street repair, street sweeping, snow plowing, and the maintenance of signs, signals, sidewalks, shoulders and striping City-wide on all roadway classifications. Where possible, funding may be pooled for efficiency of design and construction resources and to prevent duplicative work in the same general area.

If supplemental funds are allocated within the five-year cycle, either as a one-time allocation or as an increase to the overall budgeted Transportation Infrastructure fund, efforts will be made to distribute funding across each performance district in accordance with the project prioritization and cost saving strategies outlined in this plan. Any additional funding will be used in the allocated fiscal year and staff

will document how and where funding is used. This allows for and encourages future funding opportunities into this five-year Plan.

Process and Implementation Schedule (1 District/Year)

Carson City Pavement Management Annual Process and Implementation													Preservation Projects													
THIS IS AN IMPLEMENTATION CYCLE FOR EACH PERFORMING DISTRICT													Reconstruction Projects													

The chart below shows a Gantt-style implementation schedule with quarters Q1–Q4 across three years (months J F M A M J J A S O N D).

PROJECT MILESTONES	Q1 J F M	Q2 A M J	Q3 J A S	Q4 O N D	Q1 J F M	Q2 A M J	Q3 J A S	Q4 O N D	Q1 J F M	Q2 A M J	Q3 J A S	Q4 O N D
Pavement Evaluation and Inspections	■ Preservation / Reconstruction											
Project Prioritization		■										
Project Selection & Public Posting			■									
Project Design			■	Reconstruction (extends)								
Advertise Project for Bidding				■					■			
Project Execution/Notice to Proceed					■				■			
Project Construction						■	■			■	■	

The performance districts and annual schedules were developed to streamline the delivery of pavement projects. Below are the anticipated benefits from the implementation of the Pavement Management Plan.

Pavement Evaluation and Inspection

Pavement evaluations and inspections will be conducted annually on a performance district prior to the evaluation and selection of projects to gather an accurate assessment of the current condition of all roads within a performance district. Staff can use this evaluation to determine which roadways are eligible for different types of maintenance or rehabilitation treatments. City staff conduct on-site visits to determine the types of treatment required, which are then matched with the PCI ratings in the City's pavement asset management software, PAVER. This software, developed by the U.S. Army Corps of Engineers, uses a PCI scale to assess the current and anticipated deterioration rates of the asphalt pavement. The PCI is calculated using established standards and methodologies by measuring the type, extent, and severity of pavement surface distresses and the smoothness of the road. Measuring and tracking the PCI helps to evaluate the rate of pavement deterioration and allows staff to develop an appropriate preventive maintenance strategy for the roadway. Additional and more detailed inspections or surveys may need to be completed periodically with consultant support to maintain an accurate city-wide PCI rating.

Depending on the available funding, staff may use sub-sets of the performance districts to further narrow groups of roadways considering factors such as work history, sustainability of 'at-risk' infrastructure, alignment with other regional plans, travel demands and regional significance, and efficiency of transportation funding resources.

Reliance on these evaluation factors and PCI inspections plays a critical role in performance-based asset management and facilitates a feasible approach for continuous maintenance of the City's transportation infrastructure condition database.

Project Prioritization

Data Collection
Staff work to collect city-wide pavement condition data that is then used in the pavement analysis software, PAVER. This data is collected through a variety of means, including field inspections and surveys, which provide information on the type, extent, and severity of pavement surface distresses. The data is then entered into the GIS system, which allows for the analysis and mapping of pavement conditions throughout the city.
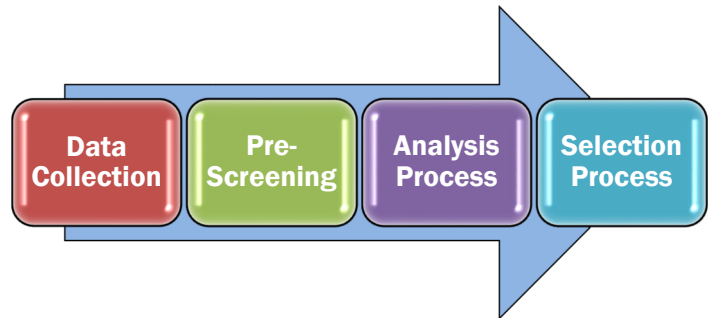
Pre-Screening
Pre-screening analyzes pavement condition, work history, and treatment type to identify the best candidates for further evaluation. During pre-screening, pavement condition is evaluated based on the PCI rating, which indicates the relative condition of the roadway. The City uses the following PCI ranges to categorize the relative condition of a roadway: 86 to 100 is Good; 71 to 85 is Satisfactory; 56 to 70 is Fair; 41 to 55 is Poor; 26 to 40 is Very Poor; 11 to 25 is Serious; and less than 11 is Failed. Work history is also considered, including any previous maintenance or repairs that have been done on the roadway. Treatment type is another important factor, as certain treatments may be more effective than others depending on the condition of the roadway.

Analysis Process
Once road segments have been identified through the pre-screening process, a detailed analysis process begins. This analysis involves evaluation of each road segment, taking into account a range of factors, including:
- Roadway Functional Classification
- Preventive and Corrective Maintenance Schedule (per industry standards)
- Safety Needs/Targets
- ADA Accessibility
- Multimodal Opportunities
- Traffic Volume
- Constructability and Construction Efficiencies– Dig once approach
- Utility Improvement Coordination
- Funding Eligibility and Availability of Federal Competitive/Discretionary Grant Funding

During the analysis process, staff use data and modeling tools to evaluate different parameters and determine the most effective approach for each road segment. This may involve considering factors such as the cost-effectiveness of different treatments, the expected lifespan of each treatment, constructability in terms of size and scale, and the potential impact on traffic flow, pedestrian access, and safety.

The following PCI ranges are used to help determine the appropriate pavement treatment:
- Preventative Maintenance – Eligible for all road conditions
  - Filling potholes, crack sealing, and pavement patching.
- Surface Preservation – Eligible at PCI of 65 or greater
  - Surface treatments methods such as slurry and micro surfacing, chip sealing and crack treatment meant to seal and preserve the street.
- Surface Rehabilitation – Eligible at PCI between 41 and 65
  - Cold mill and overlay to prolong the life of fair condition roads with adequate structural base and subgrade and complete reconstruction implementing repairs to slow further street decay and make incremental improvements for ADA compliance.
- Reconstruction – Eligible at PCI less than 40
  - Complete roadway reconstruction to replace failed roads with full depth structural section and associated ADA updates.

Preventative maintenance and surface preservation projects are a high priority of this Plan. When streets begin to fail, they fail quickly and the costs to repair them increase dramatically. Focusing on maintaining streets in good condition provides the most efficient use of the City's limited resources.

To capitalize on opportunities for construction cost savings, large projects with a particular type of pavement treatment within a consolidated geographic area (sub-district) are likely to be recommended over smaller dispersed projects in which the City would have multiple contractors. This approach reduces mobilization costs and capitalizes on economies of scale.
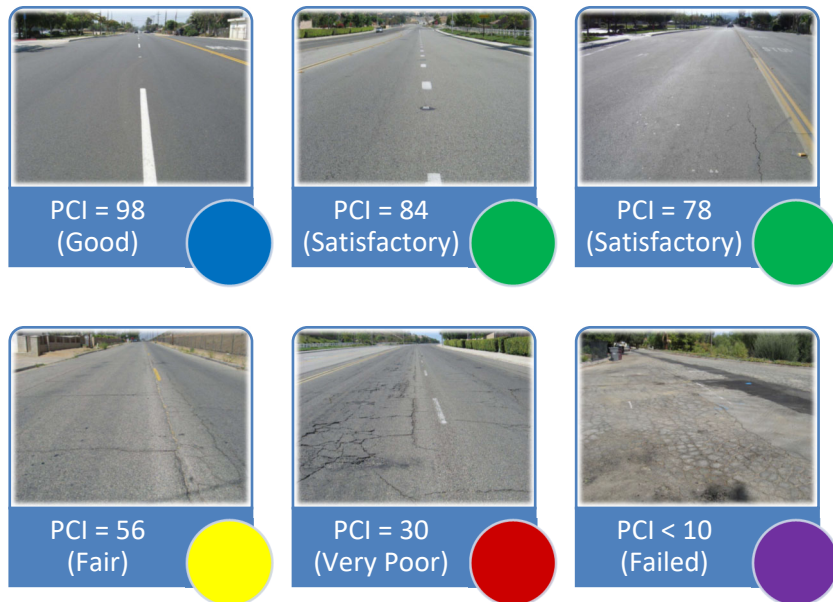

Proper Maintenance Saves You Money!
Pavements deteriorate with time if not maintained.
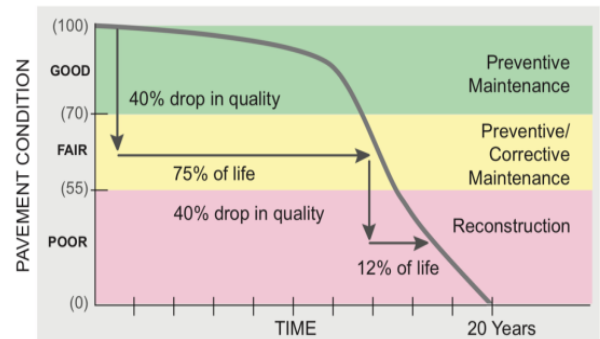
Pavement not treated at the right time, costs 4-5 times as much to fix later!

Visualizing Pavement Condition Index Rating

PCI = 98 (Good)

PCI = 84 (Satisfactory)

PCI = 78 (Satisfactory)

PCI = 56 (Fair)

PCI = 30 (Very Poor)

PCI < 10 (Failed)

Project Selection & Public Posting

In June or July of each year, projects will be presented to the Carson City Regional Transportation Commission (RTC) for approval. Selected projects will be based on the project evaluation factors discussed in the previous section alongside consideration of available funding. A dedicated webpage will provide information on the annual process.

Project Design

Project design begins after the Carson City RTC selects and approves the annual pavement projects. The length of time required to design is very dependent on the type of project. Preventative maintenance projects typically have a shorter design phase compared to a reconstruction project, however, even maintenance projects can necessitate a comprehensive design because each project requires staff evaluation of potential opportunities to upgrade outdated utilities or make other facility improvements to address issues such as ADA accessibility, Complete Streets, poor street design, or failing storm drainage infrastructure. To ensure that projects are completed within a reasonable time frame, consultants may be utilized to provide additional support to staff in the completion of various project components, such as design. This additional assistance can help ensure that the project is executed efficiently and effectively while adhering to all relevant standards and regulations.

Advertise Project(s) for Bidding

Once the design phase is complete, construction projects will be advertised for private construction firms to submit proposals consistent with Carson City purchasing and contract policies. Cost proposals fluctuate with market conditions. If cost proposals are above estimates, projects may need to be scaled down or the number of projects reduced.

Project Execution/Notice to Proceed

Once cost proposals are accepted, City staff will procure for the construction services through a contract, in accordance with the City's Purchasing and Contracts Policies and Procedures. After contract execution, staff will update the webpage with a final list of projects.

Project Construction

Once a contract is executed, construction can begin. The actual start date will depend on a variety of factors, but mainly contractor availability and weather. Residences and businesses abutting the construction area will be notified prior to construction activity.
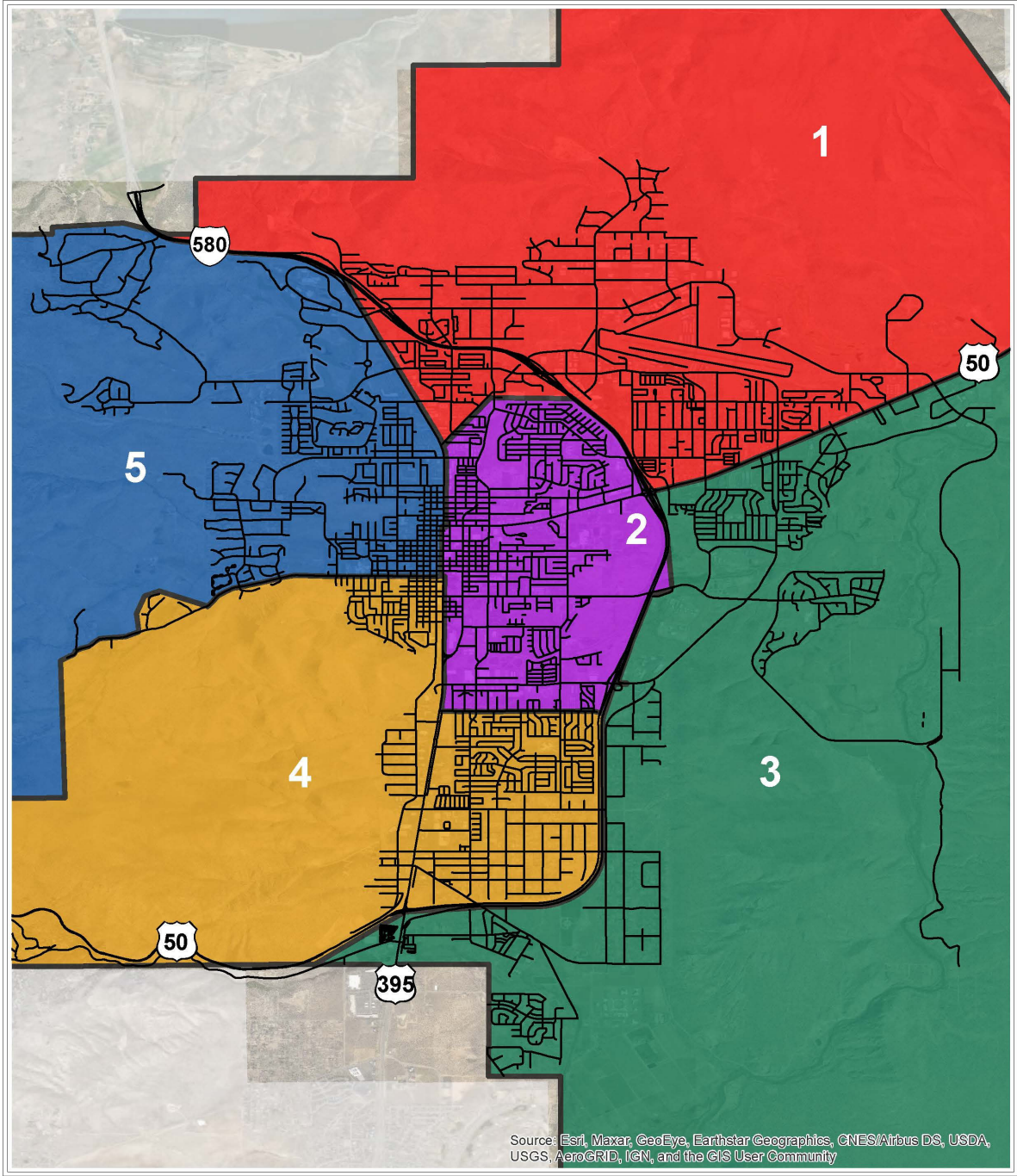
Appendix B – Annual Performance Report Card

Annual Performance Report Card 2022				
District 1	**Road Centerline Miles**	**Current PCI**	**% Change From Previous**	**Target PCI Range**
Regional Roads	16	69	3%	75
Local Roads	41	57	-7%	70
All Roads	57	61	-4%	n/a
District 2	**Road Centerline Miles**	**Current PCI**	**% Change From Previous**	**Target PCI Range**
Regional Roads	14	80	9%	75
Local Roads	37	53	-18%	70
All Roads	51	63	-7%	n/a
District 3	**Road Centerline Miles**	**Current PCI**	**% Change From Previous**	**Target PCI Range**
Regional Roads	18	77	6%	75
Local Roads	45	58	1%	70
All Roads	63	64	3%	n/a
District 4	**Road Centerline Miles**	**Current PCI**	**% Change From Previous**	**Target PCI Range**
Regional Roads	16	79	28%	75
Local Roads	41	51	-13%	70
All Roads	57	61	2%	n/a
District 5	**Road Centerline Miles**	**Current PCI**	**% Change From Previous**	**Target PCI Range**
Regional Roads	16	65	2%	75
Local Roads	41	60	-10%	70
All Roads	57	62	-6%	n/a
City-wide	**Paved Centerline Miles**	**Current PCI**	**% Change From Previous**	**Target PCI Range**
Regional Roads	80	74	10%	75
Local Roads	205	56	-9%	70
All Roads	285	62	-2%	n/a

Appendix C – Performance District Maps

Performance District

🟥 1	🟩 3	🟨 4
🟪 2		🟦 5

Pavement Management Plan

0 — 1.3 Miles

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
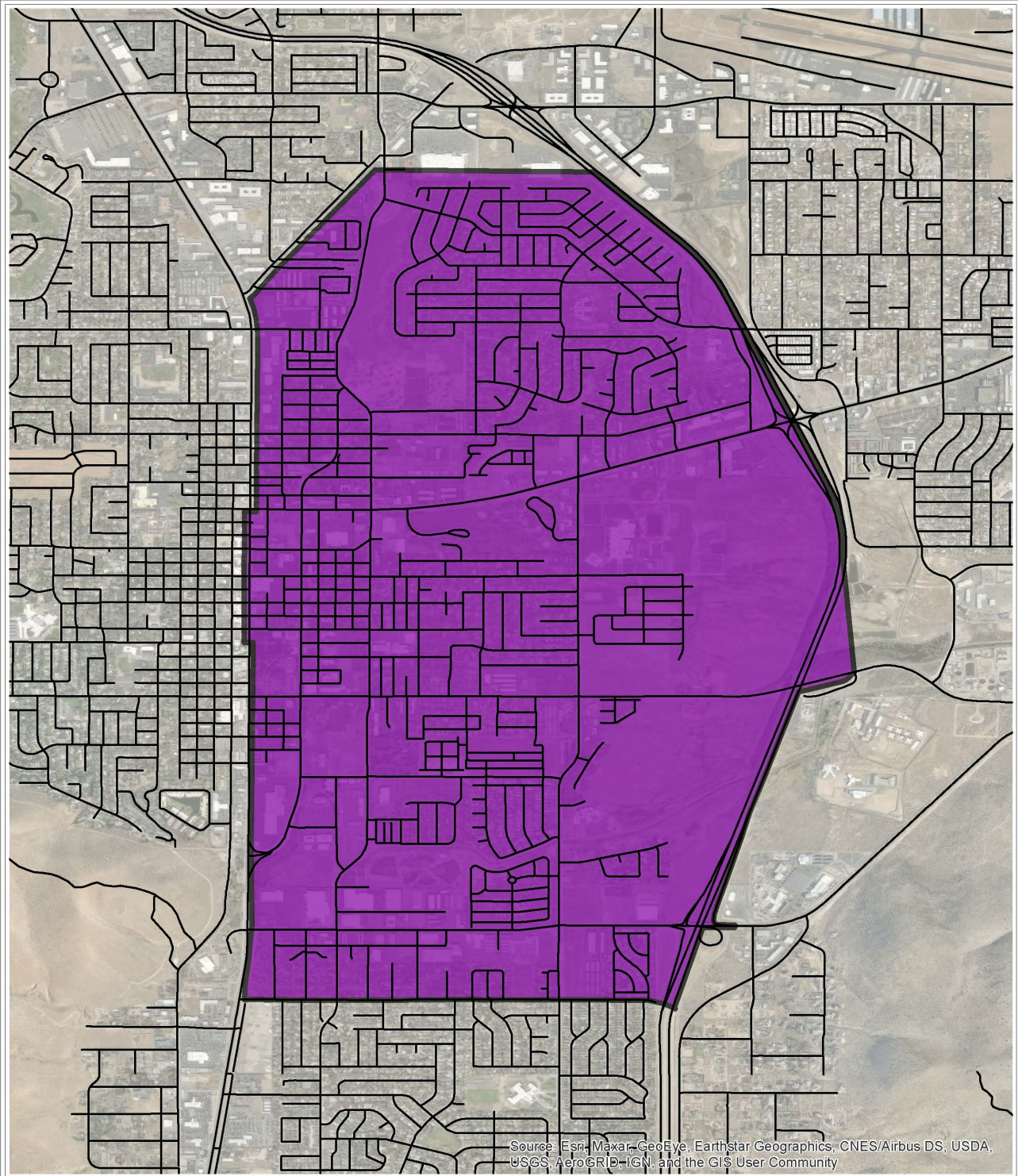
CARSON CITY PUBLIC WORKS

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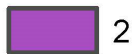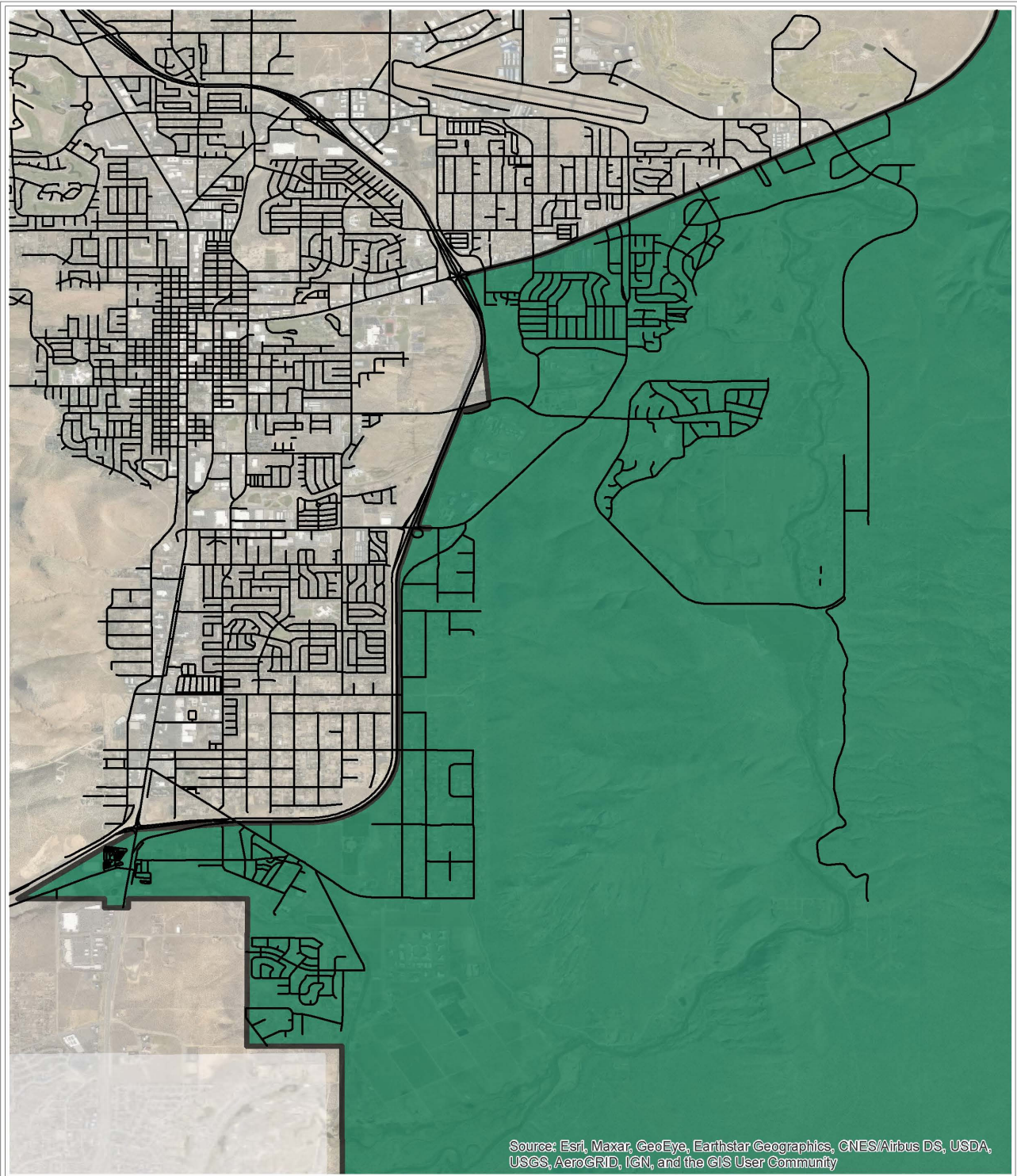
Pavement Management Plan

0 — 1.1 Miles

Performance District

CARSON CITY PUBLIC WORKS

■ 1

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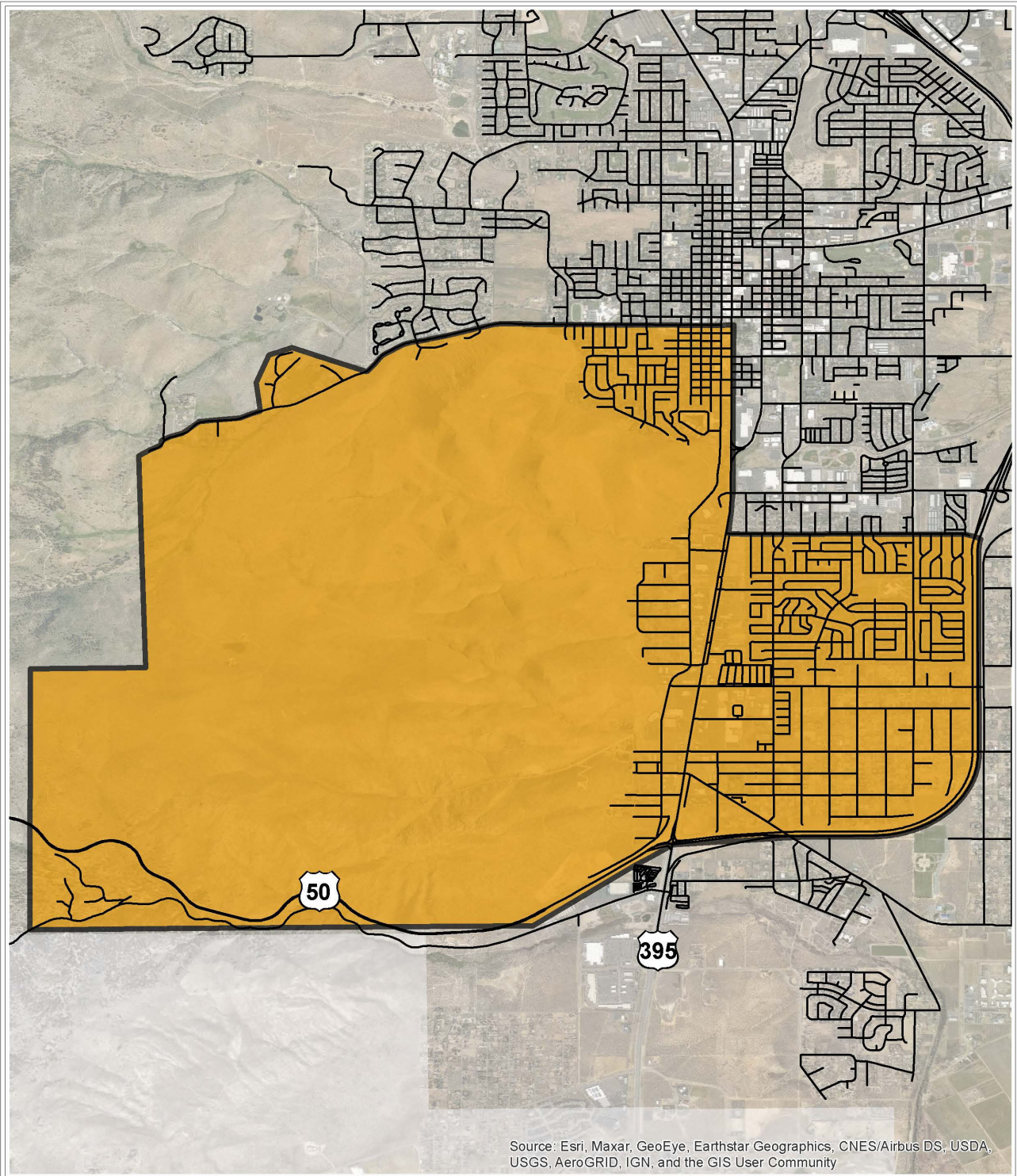
Pavement Management Plan

0   0.5
Miles

Performance District

☐ 2

CARSON CITY
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Pavement Management Plan

0   1
Miles

Performance District

3

CARSON CITY
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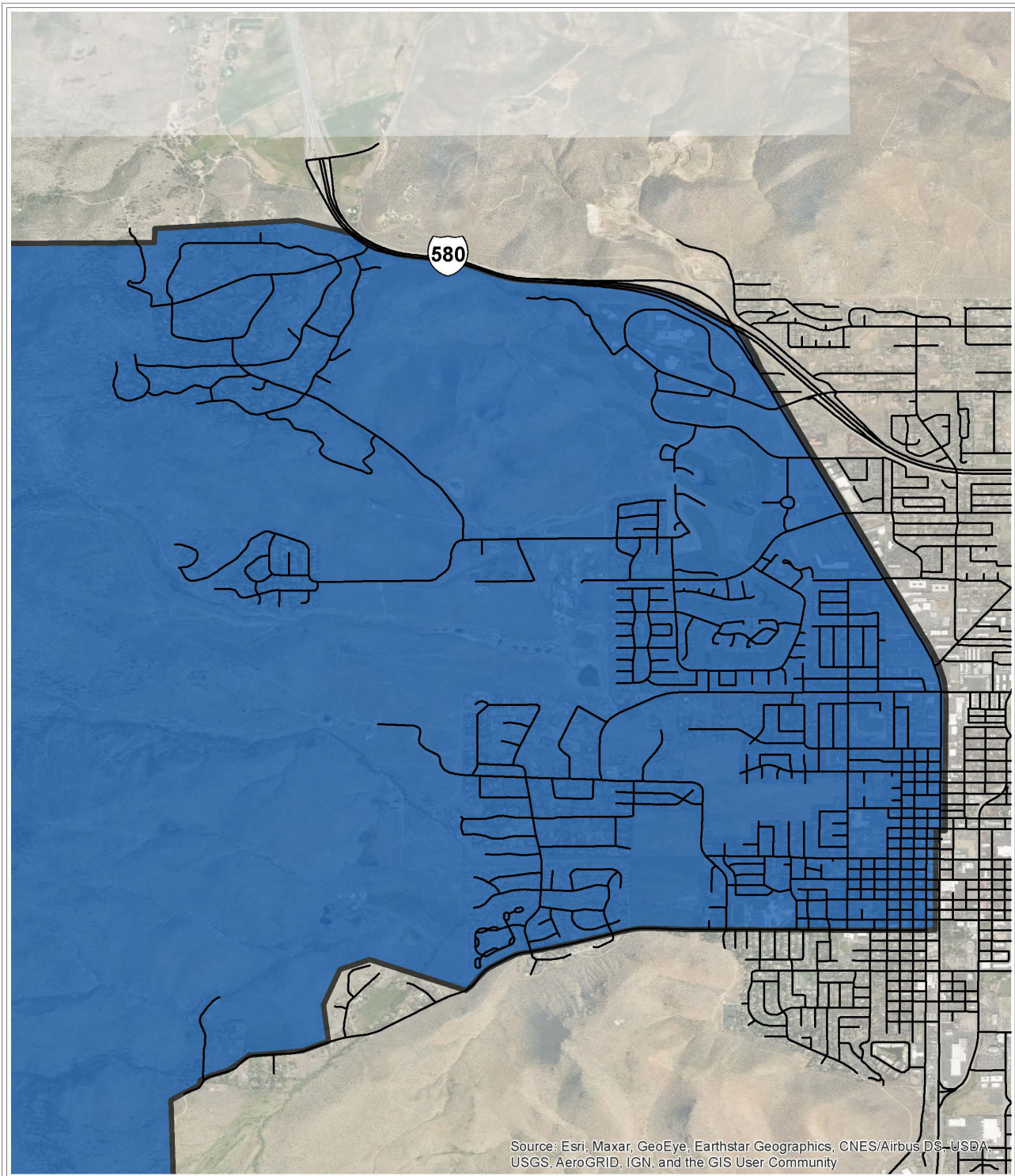Source: I:\TransDept \Pavement Preservation\ Pavement Surveys\ 2021 Pavement Survey

Pavement Management Plan

0   0.9
Miles

Performance District

4

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Pavement Management Plan

0 — 0.7 Miles

Performance District

▮ 5

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