RISE TO THE CHALLENGE

2023 PAVEMENT EVALUATION & MANAGEMENT PLAN

KCI

SUBMITTED TO City of Dunwoody Georgia

SUBMITTED BY KCI TECHNOLOGIES, INC.

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List of Acronyms

American Society for Testing Materials
(ASTM) 5
Digital Survey Vehicle
(DSV) 5
global positioning system
(GPS) 6
International Roughness Index
(IRI) 12
KCI Technologies Inc.
(KCI) 5
Laser Crack Measurement System
(LCMS) 5
maintenance and rehabilitation
(M&R) 5
Pavement Condition Index
(PCI) 5
Pavement Management System
(PMS) 5

Introduction

1.1 Background

The City of Dunwoody contracted KCI Technologies Inc. (KCI) to evaluate pavement conditions and update pavement management plans for City-owned roadways. This involved taking an inventory and assessing the roadway conditions of the entire network within the city limits to determine the best pavement maintenance plan that would bring the highest return on investment.

KCI evaluated 153.4 centerline miles of roadway using an automated Laser Crack Measurement System (LCMS) based on the American Society for Testing Materials (ASTM) D6433 Standard Practice for Roads and Parking Lots Pavement Condition Index (PCI) Survey methodology to determine PCI values for each section. KCI also implemented a Pavement Management System (PMS) with the Pavement Express™ platform, predicted future conditions, created budget scenarios, and proposed maintenance and rehabilitation (M&R) plans for the City of Dunwoody's roadway pavement network.

1.2 City's Existing Roadway Network

At the beginning of the project, KCI established an inventory and geodatabase of City-owned and maintained roadways with the cooperation of the City's staff. The City provided the street centerline geodatabase for KCI to update it with the required attributes for pavement data collection. About 153 centerline miles of roadway were identified under the City's jurisdiction.

Table 1. Summary of the City of Dunwoody's pavement network in May 2023.

Functional Class	Length (mi)	Number of Sections	% Pavement Network
Minor Arterial	21.3	271	13.9%
Major Collector	20.3	286	13.3%
Local	111.8	1142	72.9%

Pavement Condition Data Collection and Processing

1.3 Pavement Condition Data Collection

KCI collected geo-referenced images of the City of Dunwoody roadway network using the Digital Survey Vehicle (DSV) between May 26, 2023, and June 2, 2026. KCI's DSV equipped with the LCMS, shown in Figure 1, has the following features and captures images at 20-ft intervals:

- The LCMS-2 camera is a downward-facing laser array providing images used to evaluate data that conforms with ASTM D6433 protocols, which uses two 1-millimeter-pixel resolution line scan cameras to provide a customized digital condition rating system to collect user-defined severity/extent-based pavement distresses and rutting.
- The pavement distress type, density, severity, and extent are collected with the LCMS-2 and are used to calculate a PCI score between 0-100, representing the condition of 100% of the driven lanes.
- A Point Gray Ladybug 5+ 32MP 360-degree High-Definition camera is utilized for accurate ROW asset capture, extraction, and pavement QC/QA.
- A class 1 inertial profiler simultaneously captures dual-wheel path (left and right) IRI measurements to the hundredth inch, in accordance with AASHTO R48. The inertial profiler

meets the requirements and will operate in accordance with AASHTO Standards M 328, R 57-10, R 56-10, and R43M/R43-7.

- Linear distance measuring to within +/-0.5%, and Applanix POS/LV with DGPS (Provides accurate GPS coordinates for each subsystem)

Each image is linearly referenced with the DSV's onboard distance measuring instrument (DMI) and associated global positioning system (GPS) coordinates. For two-lane City highways, KCI collected images in a single direction. KCI collected pavement and right-of-way images from both directions for divided and roads with three or more lanes.

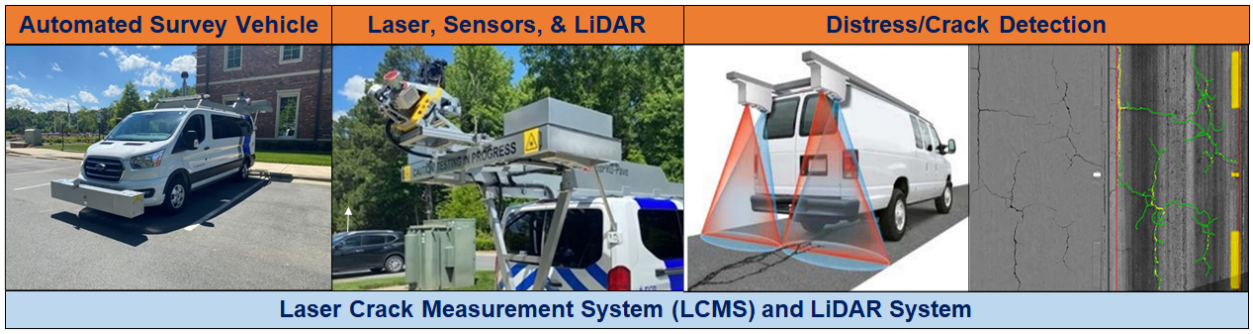

Figure 1. Laser Crack Measurement System for pavement condition assessment.

The LCMS captures enhanced right-of-way images using a right-of-way camera system. The images are used to assess the surface condition of the pavement in accordance with ASTM D6433 Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys.

1.4 Pavement Condition Index (PCI)

PCI is a pavement condition measurement index ranging from 0 to 100. This is an industry-standard defined in ASTM D6433. A newly constructed pavement will have a PCI of 100, whereas a failed pavement will have a PCI of 10 or less, as shown in Figure 2.

PCI Value	Pavement Rating
86 - 100	Good
71 - 85	Satisfactory
56 - 70	Fair
41 - 55	Poor
26 - 40	Very Poor
11 - 25	Serious
0 - 10	Failed

Figure 2. Pavement condition category based on the PCI values.

After the initial construction, pavement condition starts deteriorating with time due to traffic loads and volumes, climate, construction materials, and age. Common traffic load-related distresses include fatigue cracking, corner break, etc., whereas block cracking, longitudinal and transverse cracking, etc., are climate-related distresses. Typical concrete pavement distresses include transverse cracks, longitudinal cracks, random cracks, corner breaks, spalling, and faulting. A PCI survey allows users to compare all pavements on a standard scale and provides an index for monitoring pavement deterioration and treatment selection during the PMS analysis.

1.5 Field Pilot

KCI worked with the City staff to determine a pilot area of approximately 10 miles for deliverable review by City staff. The pilot allowed the KCI team to collect, process, and review condition data with City staff to confirm the accuracy of the data collection and interpretation protocols. The review of the condition data was hosted on August 10, 2023, by our project manager in the field, where he reviewed site conditions with City staff and received their feedback and incorporated them into the pavement data processing.

1.6 Pavement Condition Data Processing

After the City's review of the field pilot sections data, we processed the pavement conditions data using the AI pavement rating tool Road Technical Rating Intelligence Program (TRIP™). At this stage, major data processing tasks also occurred, such as generating right-of-way and pavement image streams; calculating profile, roughness and rutting; and detecting cracks, lane markings, man-made objects, and other distress. The automated crack analysis detected cracks that were then overlaid on the pavement images and offset to assist with the verification of the detected cracks. The severity levels were identified based on the defined limits (ASTM D6433) and verified for resolution through visual quality control checks of image files. The pavement distress (type, severity, and extent) data were loaded into Pavement Express™ pavement management software to calculate PCI values for each pavement section. Each section was rated based on the PCI scale of 0 to 100, where 0 represents a failed roadway condition, and 100 represents an excellent/new roadway condition.

An experienced pavement inspector performed quality control (QC) to confirm the distress and severity of the pavement condition data collected by the automated technology. This manual quality review was performed in accordance with the principles of the ASTM D6433 standard, using the LCMS pavement images gathered during the collection with the distresses superimposed and color-coded, such as what can be seen in the corresponding image.

Ten percent of the surveyed sections were subjected to field verification and an internal quality assurance survey by a surveyor. After completion of the PCI calculation, visual checks were performed to ensure that the PCI values were representative of the surveyed images. Sample pavement surface images with representative PCI values are shown in Figure 3. Larger size images have been included in Appendix A.

Figure 3. Pavement images with different PCI values.

1.7 Pavement Condition Assessment Analysis

After performing a condition inspection of the study area, the inspection data was imported into the Pavement Express™ software. Based on the pavement condition survey, the weighted average PCI of the City's pavement sections is 75 corresponding to "satisfactory" condition. KCI discussed the results of the PCI survey on September 5, 2023, with the City of Dunwoody staff. Table 2**Error! Reference source not found.** shows the pavement condition, area, percent area, and number of sections by pavement surface type.

Table 2. Summary of the City of Dunwoody's pavement condition.

Surface Type	Average PCI	Total Area, SqFt	Number of Sections
Asphalt	75.0	22,385,181	1692

Figure 4 shows the City's pavement area distribution based on 2023 pavement conditions. About 15% of the pavement network is in 'poor', 'very poor', and 'serious' condition. About 20% of the network is in 'fair' condition, whereas about 65% is in 'satisfactory' and 'good' condition.

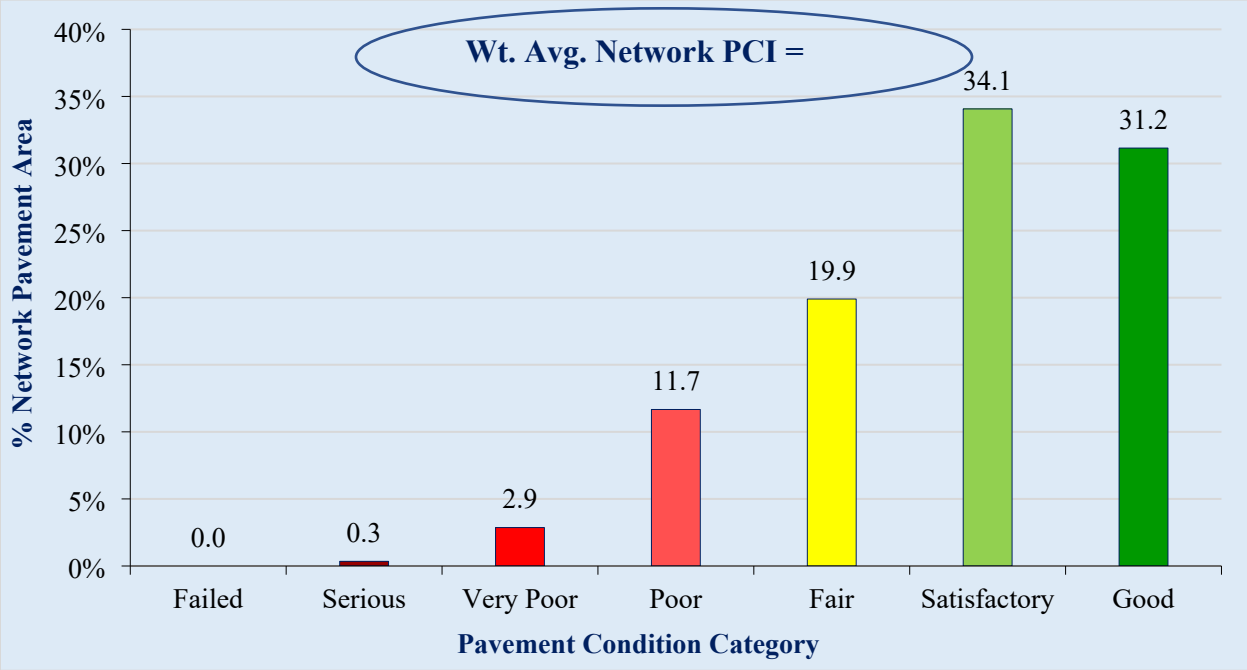

Figure 4. Distribution of the City's pavement area based on the pavement conditions.

Figure 5 shows the distribution of lane miles based on pavement conditions. About 53 lane miles of pavements are in 'poor', 'very poor', and 'serious' conditions with a PCI range of 11-55. At this condition level, pavement requires major rehabilitation, such as mill and inlay, reconstruction, etc. About 70 lane miles of pavement are in 'fair' condition with a PCI range of 56-70, requiring patching and preventive maintenance treatments such as chip seal, depending on the traffic level.

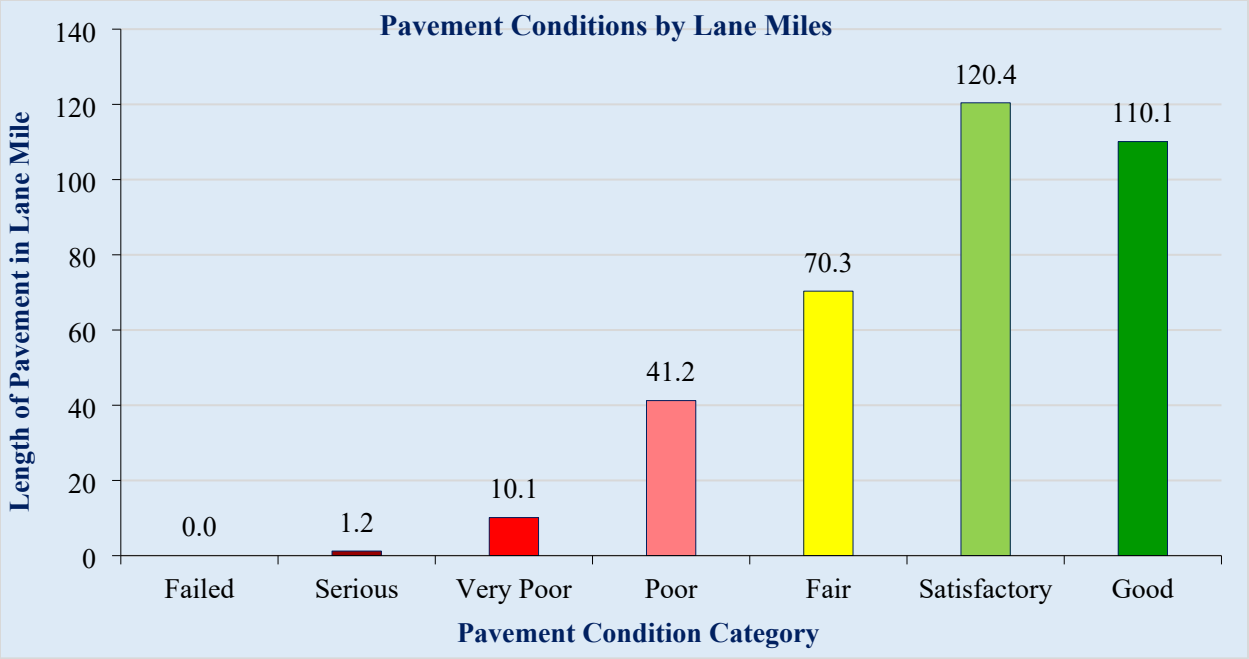

Figure 5. Distribution of the City's pavement lane miles based on the pavement conditions.

Figure 6 shows the City's streets' average pavement condition based on the City's functional classification (i.e., minor arterial, major collector, and residential). The minor arterial, major collector, and residential roadways are in 'satisfactory' condition, with average PCIs of 73.0, 73.3 and 75.9, respectively.

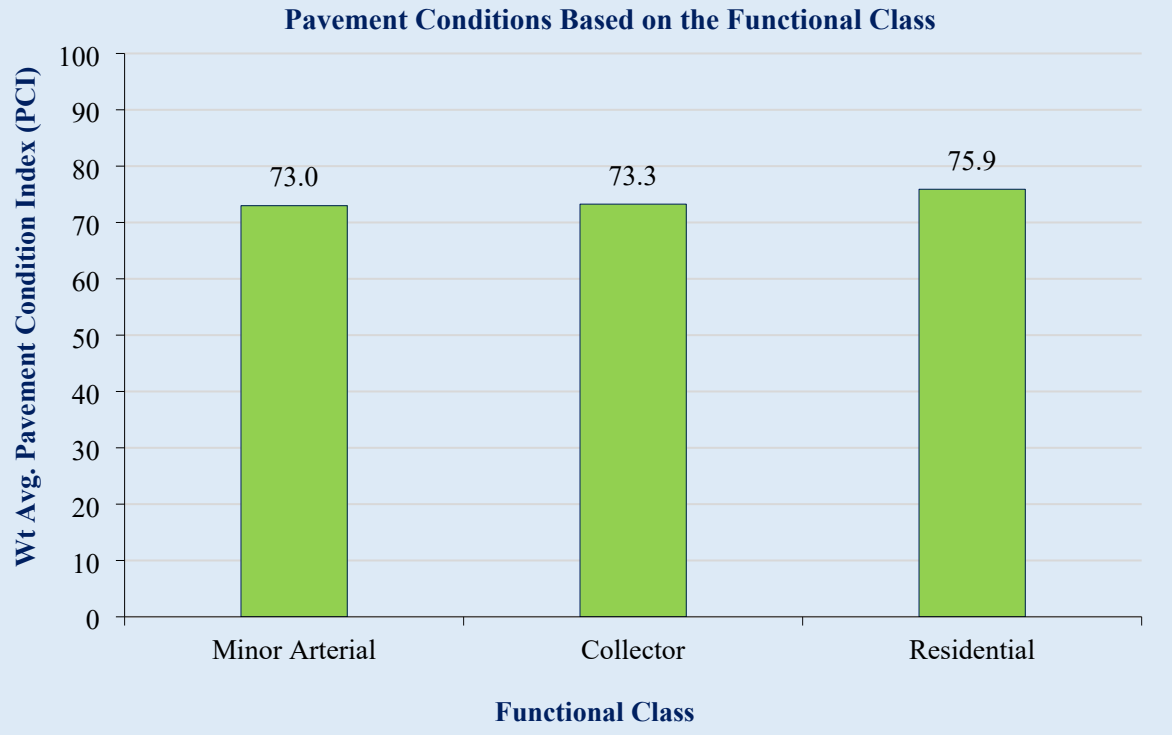

Figure 6. Average Pavement Condition Index based on functional class.

Figure 7 shows the detailed distribution of pavement conditions for minor arterial, major collector, and residential streets. The City has approximately 21 miles of minor arterial streets in its network. Of these, around 14% are in 'serious,' 'very poor', and 'poor' condition, while roughly 26% are in 'fair' condition. About 41% of the streets are in 'satisfactory' condition, and around 19%, are in 'good' condition.

The City's network includes approximately 20 miles of major collector streets. About 12% of these are in 'serious', 'very poor', or 'poor' condition, while roughly 25% are in 'fair' condition. Approximately 43% of the streets are in 'satisfactory' condition, and around 20%, are in 'good' condition.

The network includes approximately 111 miles of local/residential streets. About 16% of these are in 'serious', 'very poor', or 'poor' condition, while roughly 17% are in 'fair' condition. About 30% of the streets are in 'satisfactory' condition, and the majority, around 37%, are in 'good' condition.

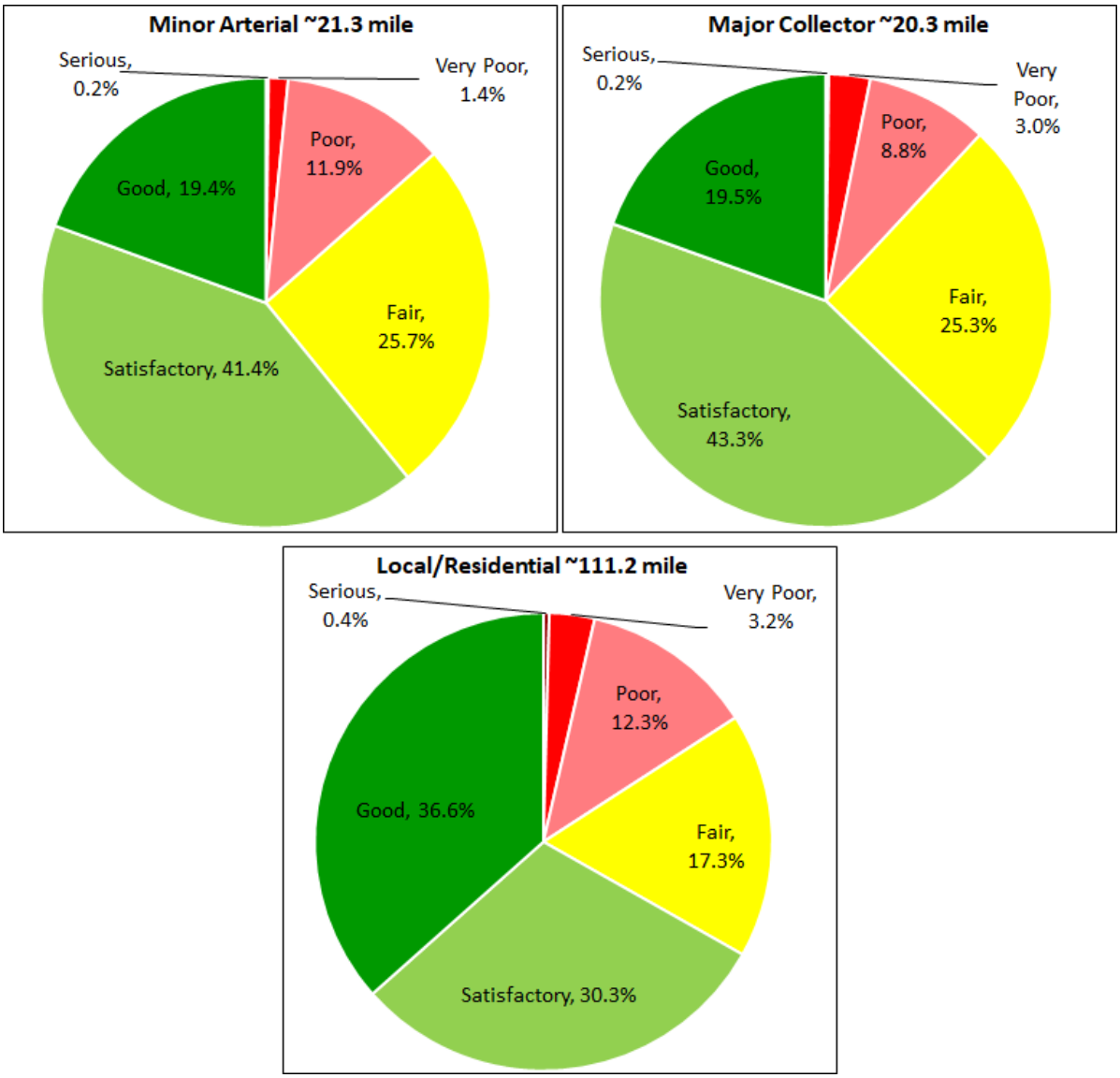

Figure 7. Pavement condition distribution of arterial and collector streets.

The GIS map with pavement conditions for individual segments is shown in Figure 8.

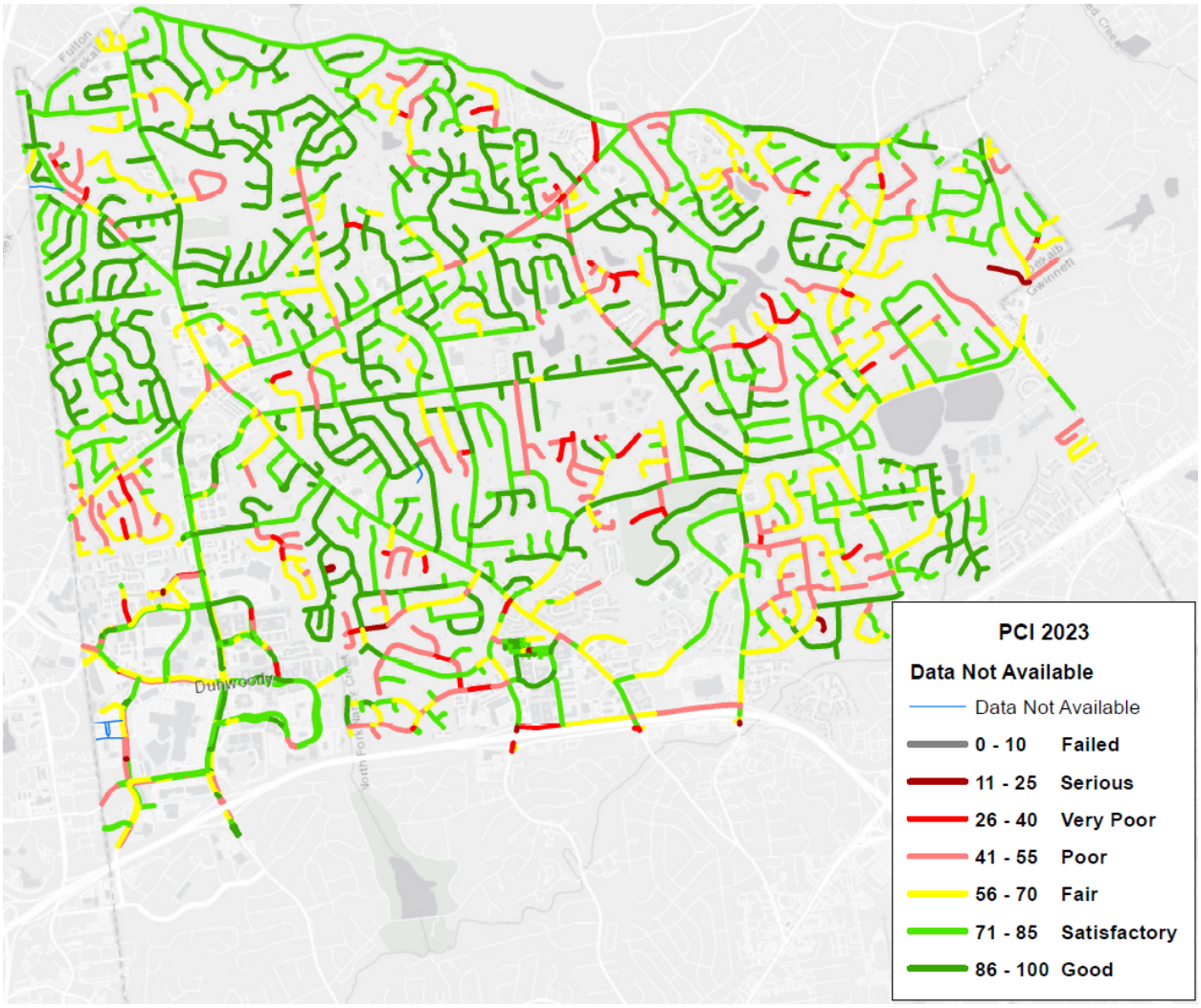

Figure 8. City's Pavement Condition Index (PCI) map based on the May 2023 survey.

The ride quality of street sections is measured using the International Roughness Index (IRI), which is a standard scale. The IRI measurement follows AASHTO R 43-07 and ASTM E950. The IRI indexes are obtained from longitudinal road profiles and processed at 52.8-foot intervals (0.010/mi) using a quarter-car model. KCI uses a three-laser surface profiling system with infrared lasers and a precision accelerometer to evaluate pavement smoothness. The reported values in the centerline are in units of inch/mile. It's important to note that IRI indexes may spike, leading to inaccurate data in sections of roads with slow speeds (below 20 mph).

The weighted average IRI value of the City network is 197.6 inch/mile, which indicates the network is in 'marginal' condition in terms of pavement roughness. The summary of the City's pavement roughness conditions is presented in Table 3. Notably, approximately 27% of the roads are classified as 'smooth,' while 65% and 8% are categorized as 'marginal' and 'rough,' respectively.

Table 3. Summary of City's pavement ride quality/roughness

Roughness Category	IRI Range	Centerline Miles
Smooth	<100	41.1
Marginal	100 - 250	100.0
Rough	>250	11.3

Figure 9 shows the City's pavement roughness categories based on the network area.

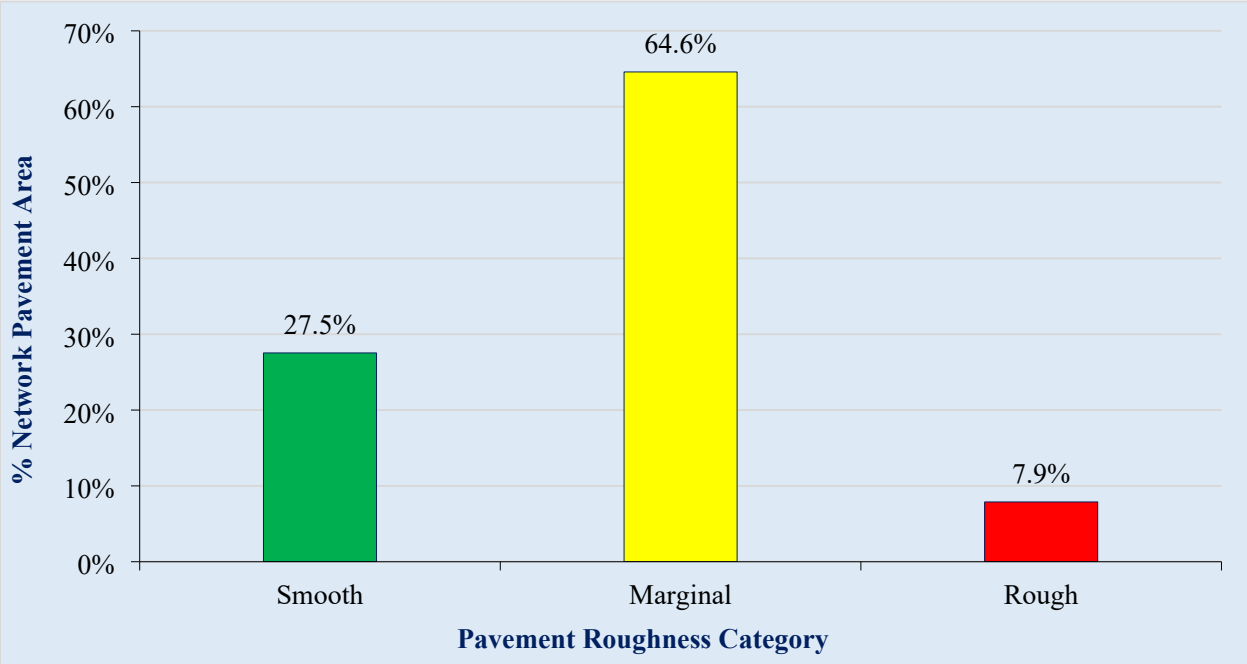

Figure 9. City's pavement ride quality/roughness conditions.

Figure 10 on the next page shows the City's pavement ride quality/roughness based on the May 2023 survey.

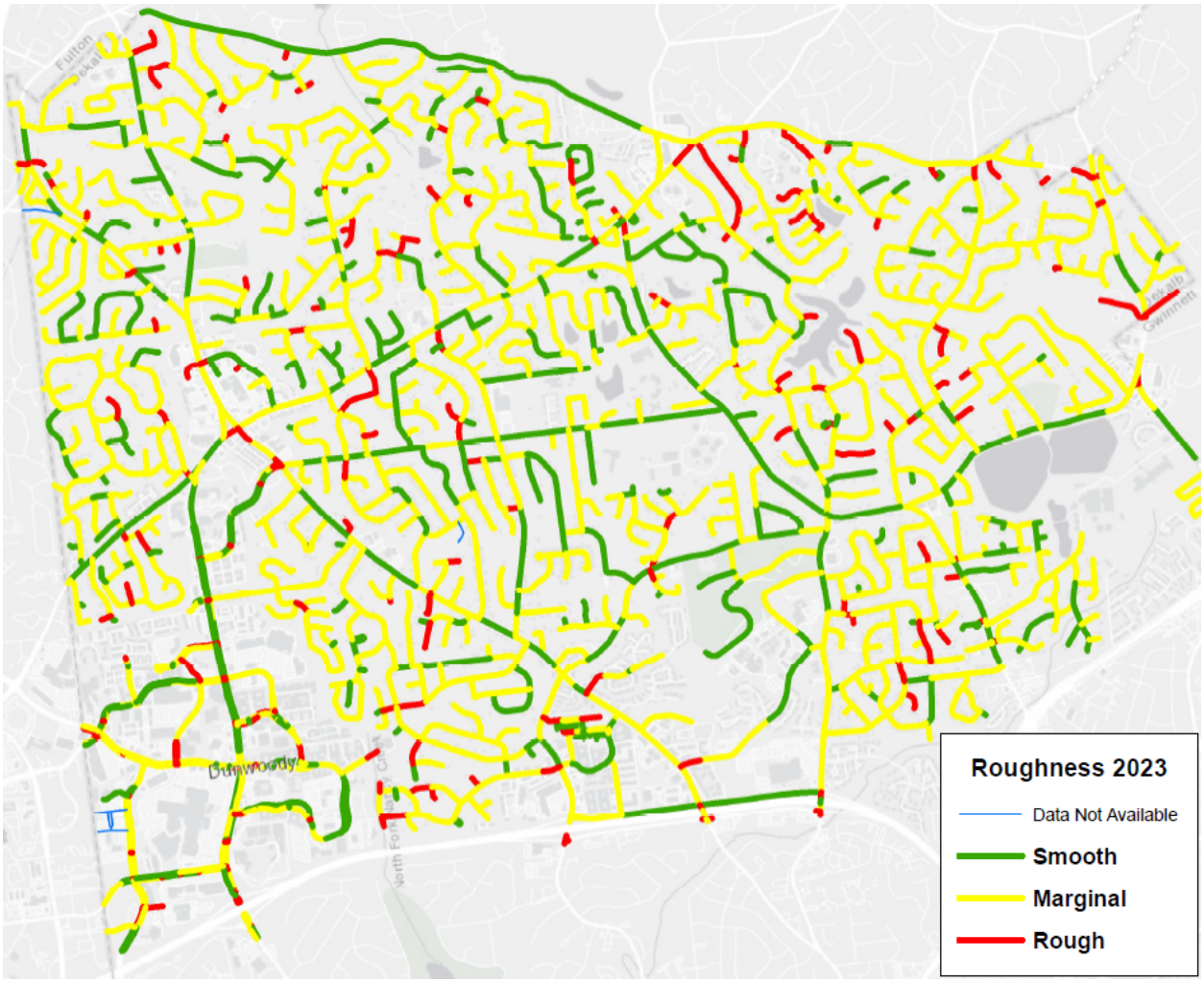

Figure 10. City's pavement ride quality/roughness conditions map based on the May 2023 survey.

Pavement Management Analysis

1.8 Pavement Management Software Overview

KCI used Pavement Express™ pavement management software to implement a PMS for the City of Dunwoody. Pavement Express is a pavement management system designed to help users effectively manage its pavement network. It stores, retrieves, and processes pavement-related condition and inventory data, allowing users to analyze the current condition, future performance, and expected financial needs of the network. Users are able to:

- View network inventory spatially and be able to see the different classifications and attributes of the network
- See and update the current condition survey
- Model various real-world scenarios that account for multiple constraints. For example, user can compare scenarios in which user maintains a specific level of service for different classes of roadway segments, pavement surface types, or a particular jurisdiction while adhering to a specified budget amount, either at the network level or broken down for each

constraint. Users can model all these constraints in a single scenario using the system's advanced optimization engine to produce a work plan with a set of treatments that achieve a defined objective

- Use the interactive dashboards and reports in Pavement Express to communicate the historical, current, and future state of your pavement network based on key performance measures that user designates or creates

1.9 Pavement Performance Models

A PMS is only useful for making decisions if performance models can be established, validated, and relied upon to forecast pavement conditions into the future. A pavement performance model is developed based on the date of construction for new pavement and the date of resurfacing for an overlay or mill and overlay, the types and thicknesses of pavement materials, the traffic level, and the pavement condition. The pavement performance model becomes more accurate with multiple pavement condition ratings as the model gets calibrated and adjusted to match the conditions in a pavement's life cycle.

The Performance Model Setup module in Pavement Express™ helps identify and group pavements of similar construction subjected to similar traffic, weather, and other factors affecting pavement performance. The pavement condition historical data are used to build a model that can accurately predict the future performance of a group of pavements with similar attributes.

Three pavement performance models were developed based on the asphalt-surfaced pavement owned and maintained by the City of Dunwoody. The pavement performance model for the City was developed based on the available age data. The reliability of the pavement performance model is expected to increase with future pavement inspection and age data. Figure 11 and Figure 12 show the pavement conditions deterioration model for arterial and collector streets of the City, respectively. The pavement conditions deterioration models for the residential streets are presented in Figure 13.

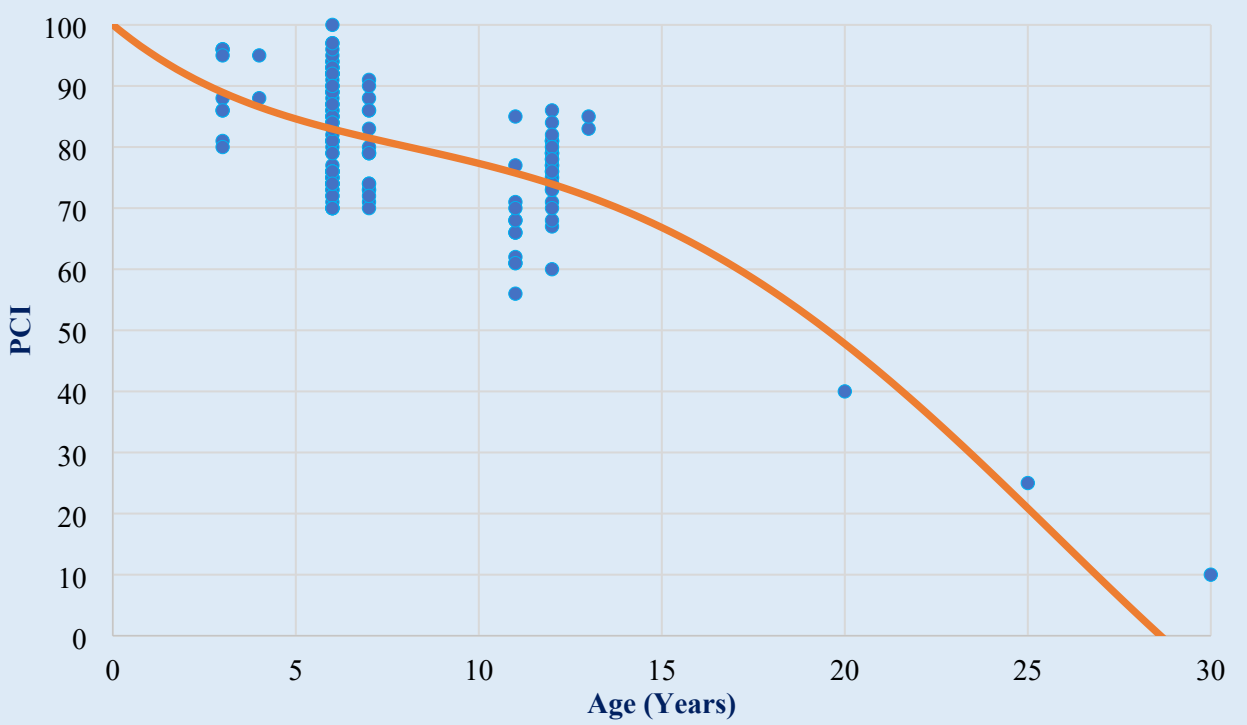

Figure 11. Pavement performance model for the east side of the City's arterial streets.

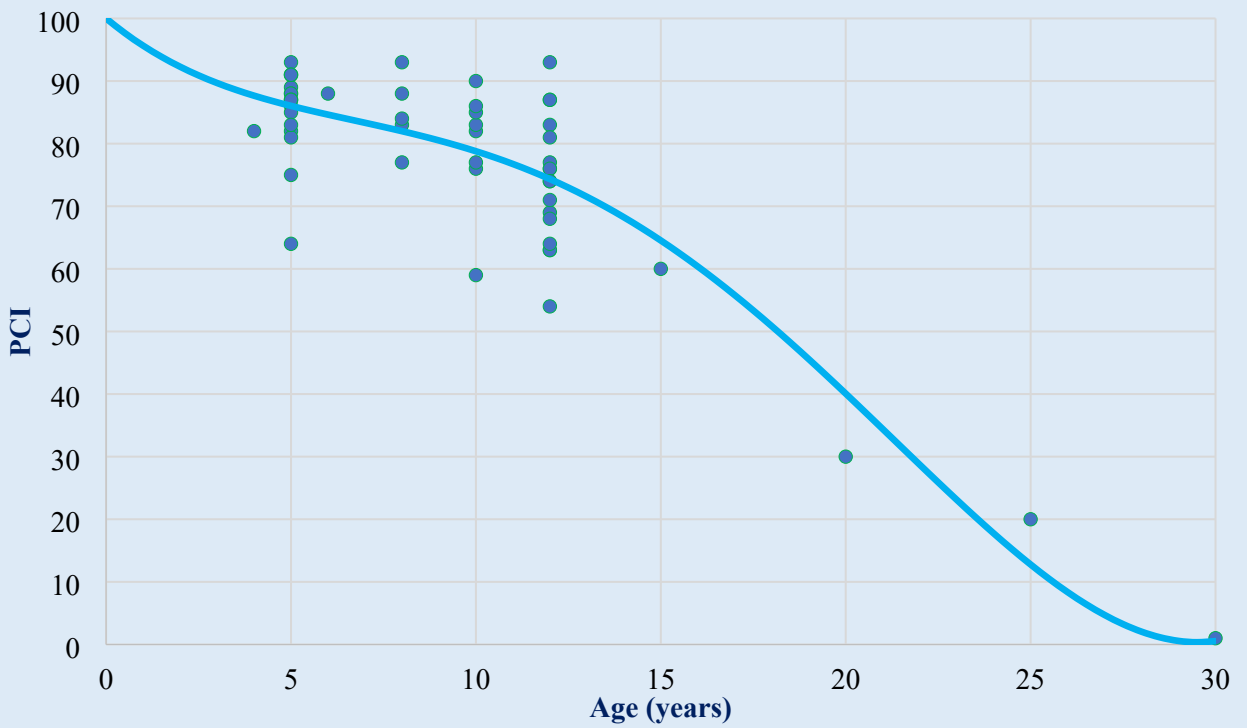

Figure 12. Pavement performance model for the west side of the City's collector streets.

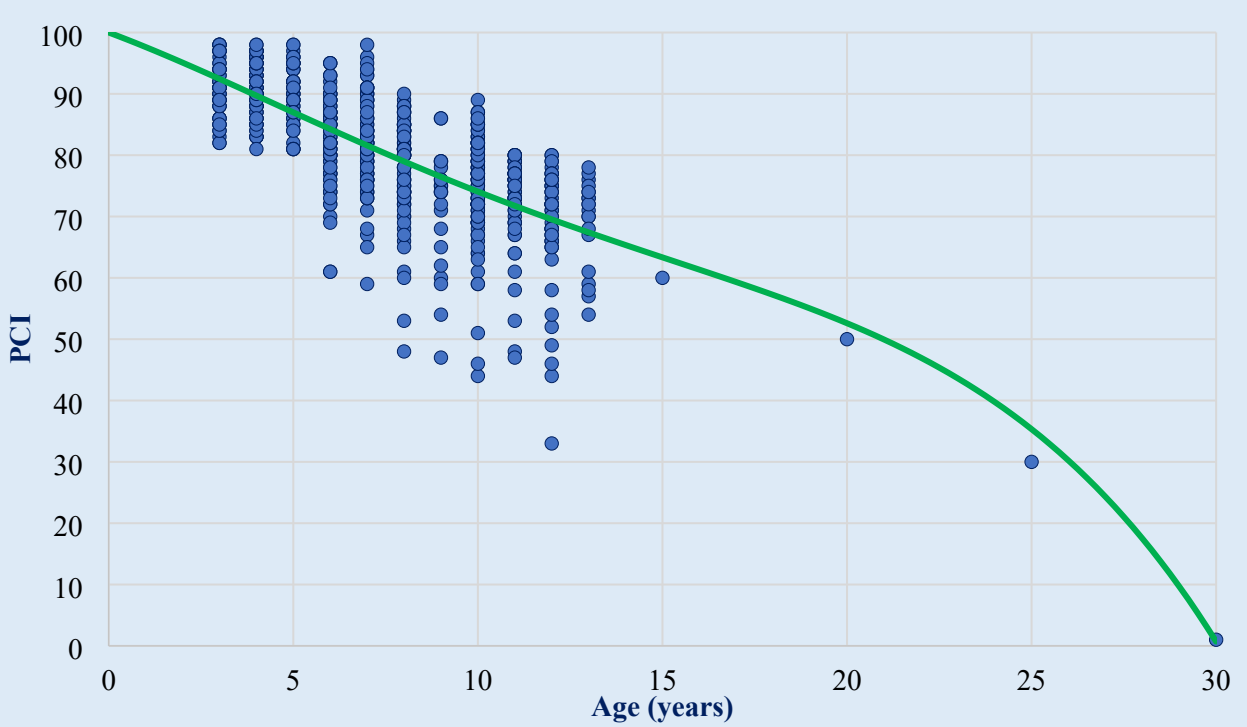

Figure 13. Pavement performance model for the east side of the City's local streets.

1.10 Treatment Decision Tree

Pavement Management refers to applying the right treatment to the right pavement, at just the right time for optimal roadway maintenance planning. Three types of maintenance and repair works are recommended for effectively maintaining the roadways and optimizing the budget.

- Preventive Maintenance: Crack sealing, patching, etc., to slow down the rate of deterioration
- Pavement Preservation: A proactive method to keep good roads good. It can be compared with changing engine oil periodically to keep it in good condition and extend service life. Microsurface and chip seals are widely used.
- Major Rehabilitation: Mill & inlay, full-depth reclamation, and reconstruction

KCI worked with the City staff to evaluate the current maintenance practices and recommended pavement treatment types based on pavement conditions and the functional class of the streets. Based on the pavement rehabilitation techniques currently used and discussion with the City, KCI developed a treatment decision tree that defines when a treatment will be performed based on PCI values and functional class. In Pavement Express™, critical PCI is defined as the PCI value at which the rate of PCI loss increases with time and the cost of applying localized preventive maintenance increases significantly. A critical PCI of 55 was chosen for the City's streets. The Decision Tree module is used to designate sections to receive specific M&R work, including:

- Localized Maintenance - Preventive/Routine Maintenance;
- Pavement Preservation
- Major Rehabilitation

Based on Figure 14, pavement sections with a PCI above the critical value of 55 are chosen for localized preventive treatments like crack sealing or patching. For pavement preservation, microsurfacing is recommended for streets with a PCI greater than or equal to 70 to preserve the pavements that are in satisfactory and good condition. Major M&R includes milling, patching and overlays of varying thickness, with a crack interlayer in some cases, or reconstruction for severely deteriorated streets. Notably, the final selection of pavement treatment should be determined based on the recent condition evaluation and existing distress.

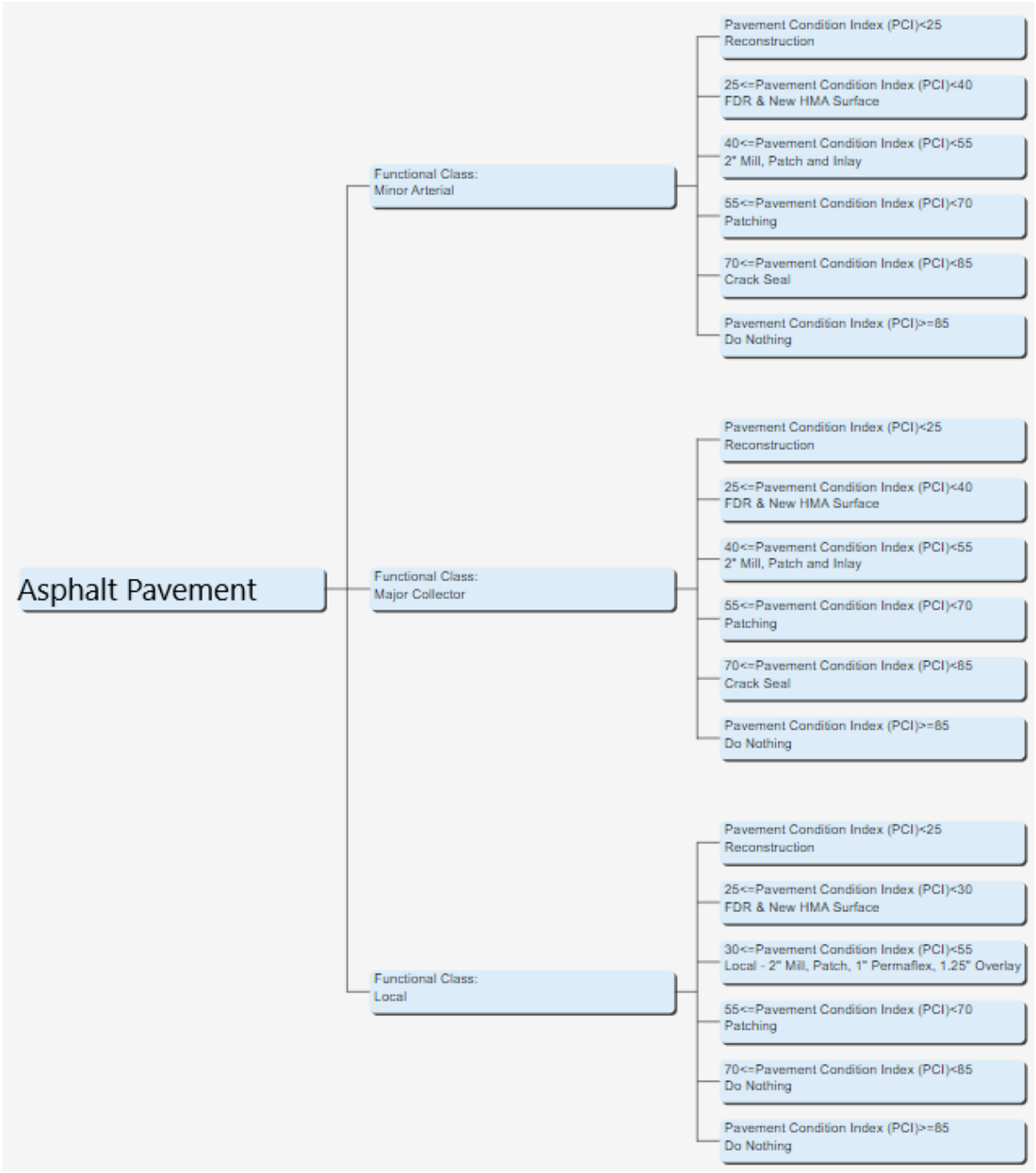

Figure 14. Pavement treatment selection decision tree.

1.11 Unit Costs

KCI determined the unit costs for most treatments listed in Table 4 based on information provided by the City. These costs were discussed with the City of Dunwoody staff. The unit costs used for *Pavement Express*™ analysis for 2024-2028 are shown in Table 4. The table also shows the change in PCI values and pavement age based on the treatment type. The unit costs can be updated based on the available unit price of materials and construction to run the PMS analysis in the future.

Table 4. Treatment unit costs.

Treatment Name	Unit Cost	Units	ΔPCI	Age
Crack Seal	$1.25	Ft	+5	+1
Patching	$3.20	Yd	+10	+1
Microsurface	$3.60	Yd	+10	+1
Level, 1.5" Overlay	$15.00	Yd	95	0
2" Mill, Patch and Inlay	$26.00	Yd	95	0
1" Mill, Patch, and 2" Overlay	$26.00	SqYd	95	0
Variable Edge Mill, Patch and 1.5" Overlay	$28.00	SqYd	95	0
1" Mill, Patch, Level, 2" Overlay	$28.00	SqYd	95	0
2" Mill, Patch, 1" Permaflex, 1.25" Overlay	$32.00	SqYd	95	0
Local - 2" Mill, Patch, 1" Permaflex, 1.25" Overlay	$32.00	SqYd	95	0
FDR & New HMA Surface	$35.00	SqYd	100	0
Reconstruction	$45.00	SqYd	100	0

1.12 Budget Scenario Analysis

Using the pavement deterioration model, treatment applicability, treatment type, and unit costs, we have developed the following five budgets and pavement conditions scenarios to evaluate where the 2023 budget level stands:

- Eliminate backlogs (Backlog means pavement with PCI value less than 55);
- Maintain 2023 condition (PCI = 75);
- Maintain 2023 funding level ($3.0M/year = $60K for Patching, $30K for Crack Seal, $2.91M for Rehabilitation and Reconstruction);
- Do nothing ($0/year).

The outcomes of the budget scenario analysis are presented in Figure *15*, illustrating the effect of different funding levels on the average pavement condition of the City's street network. Figure 15 indicates that the 2023 funding level ($2.91M/year for major rehabilitation) will decrease the average PCI value to 73.8 after five years. Moreover, the City would need to invest $3.6M/year on maintenance and rehabilitation to maintain the overall 2023 condition, i.e., PCI of 75. Allocating a budget t

o eliminate backlogs where no pavement is in poor condition (PCI<55) would result in an average PCI of 80.1 after two years, requiring an investment of $4.8M/year. Also, the City would need to invest $4.8M/year to achieve an average PCI of 80. Conversely, not spending funds on the maintenance and rehabilitation (M&R) program will deteriorate the network to an average PCI of 62.3 after five years.

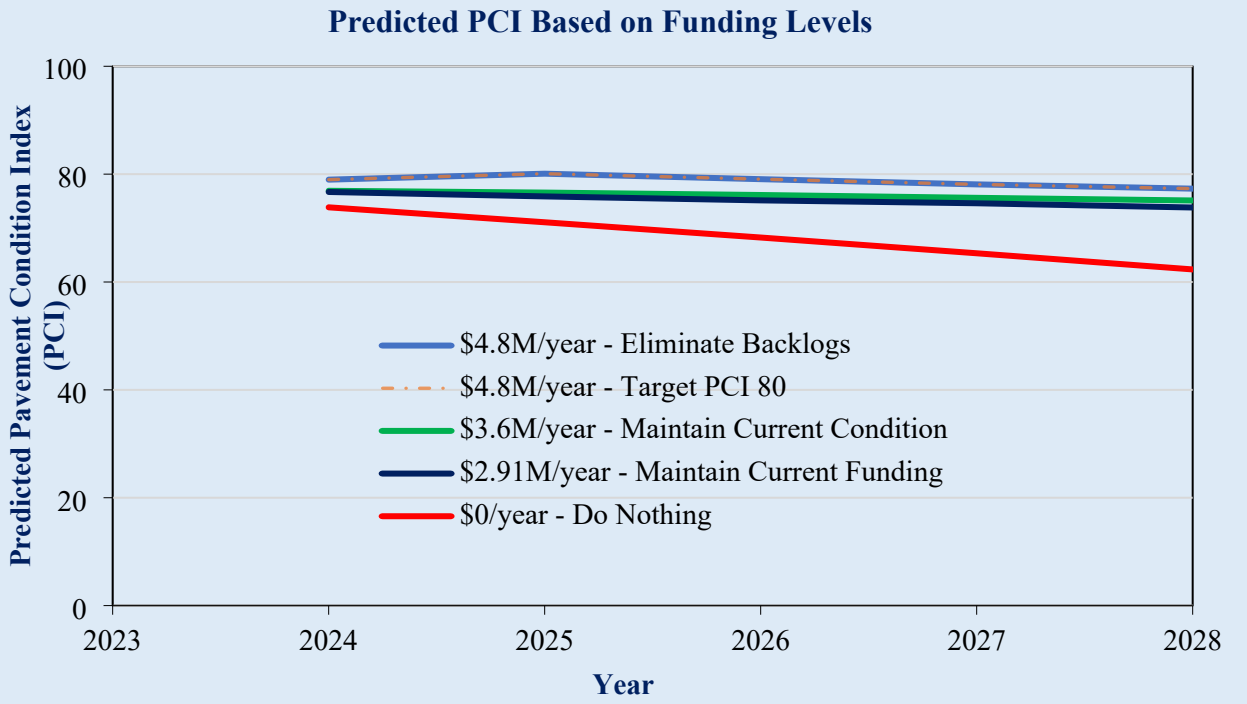

Figure 15. Effect of funding level on City's pavement conditions.

Figure 18 displays the total unfunded/remaining backlog budget per year based on the analyzed funding scenarios. The backlog is continuously growing due to insufficient funding, which fails to maintain 2023 conditions and eliminate backlogs. This implies that delaying maintenance and rehabilitation works will only lead to further deterioration of pavement conditions, ultimately resulting in more costly treatments.

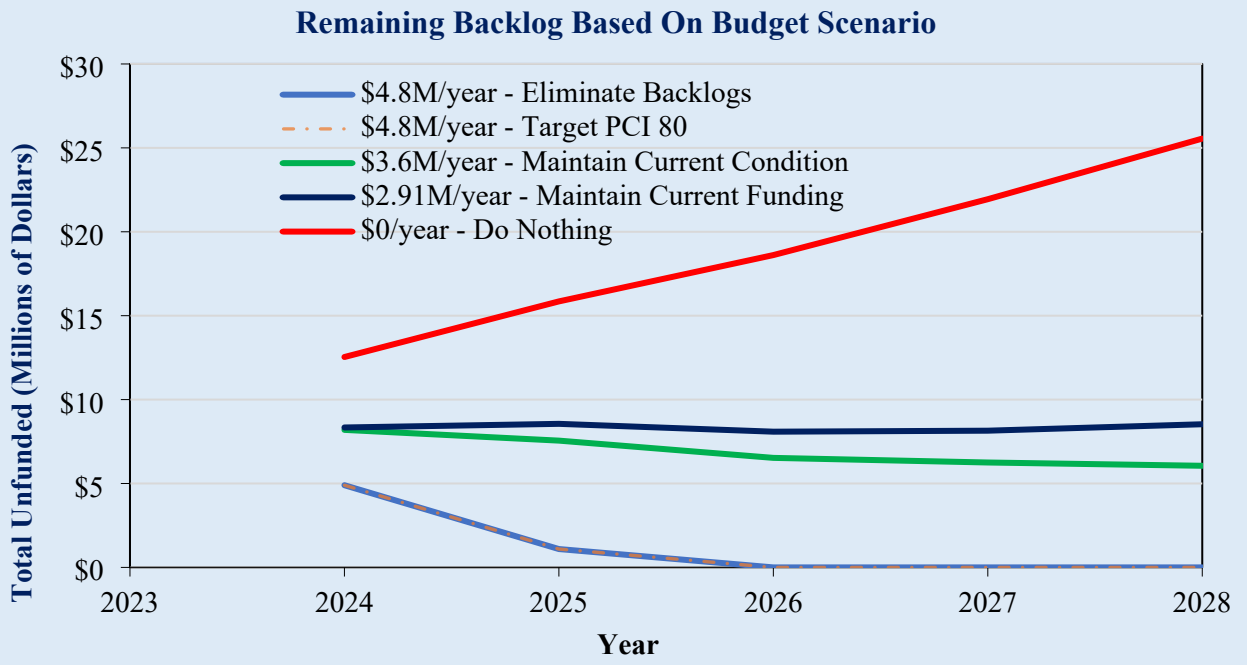

Figure 16. Total unfunded/remaining backlog per year based on budget scenarios.

Figure 17 shows the remaining backlogs in terms of lane miles of major rehabilitations required per year. Based on the 2023 funding, about 36 lane miles of pavements would be in poor or worse condition. To maintain the 2023 condition (PCI of 75), it will require $3.6M annually for the next five years, resulting in a backlog of 25.7 lane miles. However, if an annual investment of $4.8M is made, the backlog can be eliminated in five years, resulting in an average PCI of 80.1.

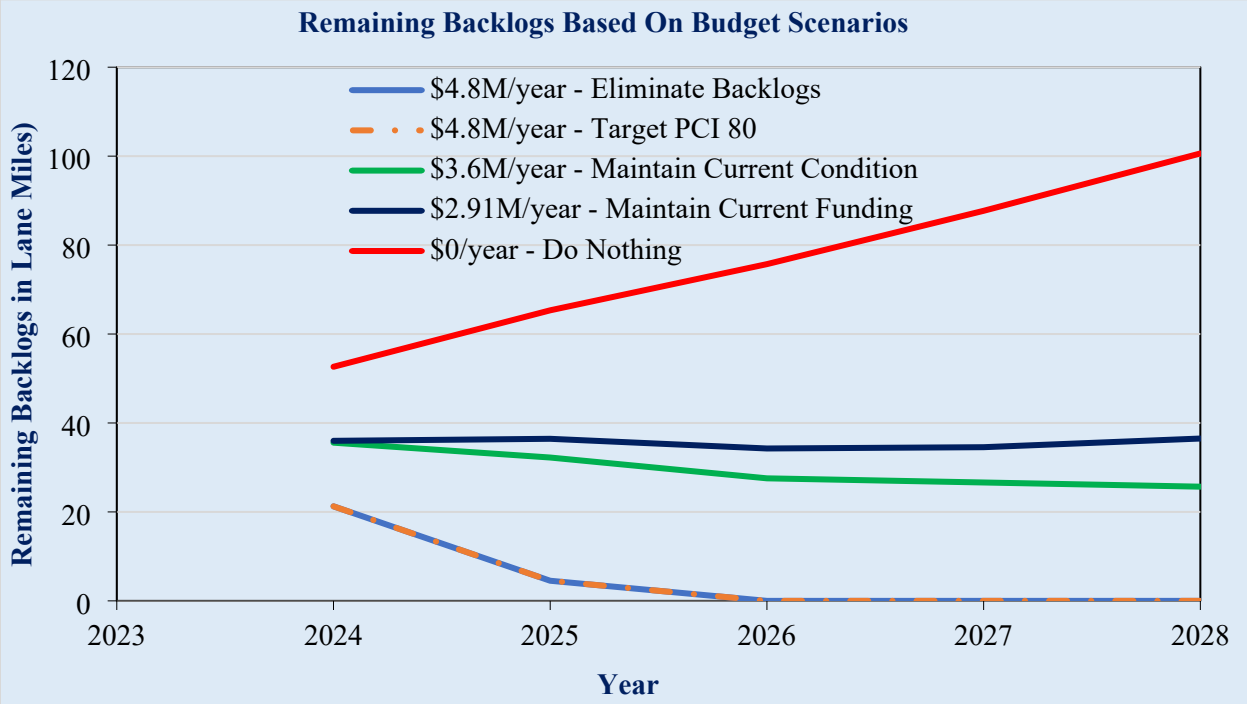

Figure 17. Remaining backlogs per year based on the budget scenarios.

In Table 5, we can find the total maintenance and rehabilitation costs for the projects that are selected over the five years in different funding scenarios, as well as the remaining backlogs that will still be present in 2028. It is worth noting that having a minimal backlog is acceptable in some cases, provided that the pavement section length is large enough to support a construction project and traffic closure for construction work is limited. For example, the City will need around $24 million worth of maintenance and rehabilitation works between 2024-2028 to eliminate the backlogs, and the remaining backlogs in 2028 are $0; therefore, the total 5-year costs are $24 million, resulting in a PCI value of 77.3. However, maintaining the 2023 fund ($2.91M/year) would cost $14.6 million over 5-year, and the remaining backlogs in 2028 would be $8.5M; therefore, the total 5-year costs would be $23.1M, resulting in a PCI value of 73.8. It should be noted that it is not the objective is not to eliminate backlogs because there will always a small amount of backlog due to uncertainty that comes with construction materials, weather conditions, and traffic loading.

Table 5. Total 5-year costs for various funding scenarios.

Funding Scenario	Costs over 5-Years (2024-2028)	Remaining M&R Backlogs in 2028[1]	Total 5-Year Costs[2]	Predicted PCI in 2028
Eliminate Backlogs ($4.8M/year)	$24.0 M	$.0 M	$24.0 M	80.1 in 2025, 77.3 in 2028
Target PCI 80 ($4.8M/year)	$24.0 M	$.0 M	$24.0 M	77.3
Maintain Current Condition ($3.6MK/year)	$17.9 M	$6.1 M	$24. M	75.1
Maintain Current Fund ($2.91M/year)	$14.6 M	$8.5 M	$23.1 M	73.8
Do Nothing ($0/year)	$0.0 M	$25.6 M	$25.6 M	62.3

1. 'M&R Backlogs' refers to the amount required to resurface/reconstruct all pavements at or below their critical PCI
2. 'Total 5-Year Costs' refers to the sum of 5-year *M&R* expenses and remaining backlogs at the end of the five years

Figure 18 shows the predicted number of miles to be resurfaced and resulting PCI values based on the funding and conditions scenarios. The City would need to resurface and reconstruct about 15 lane miles per year to maintain the 2023 conditions. To eliminate backlogs, the City would need to resurface and reconstruct approximately 20 lane miles annually. The City is currently (in 2023) resurfacing or reconstructing about 12.5 lane miles. The City is also applying crack seal and patching and maintaining the PCI value well above 70.

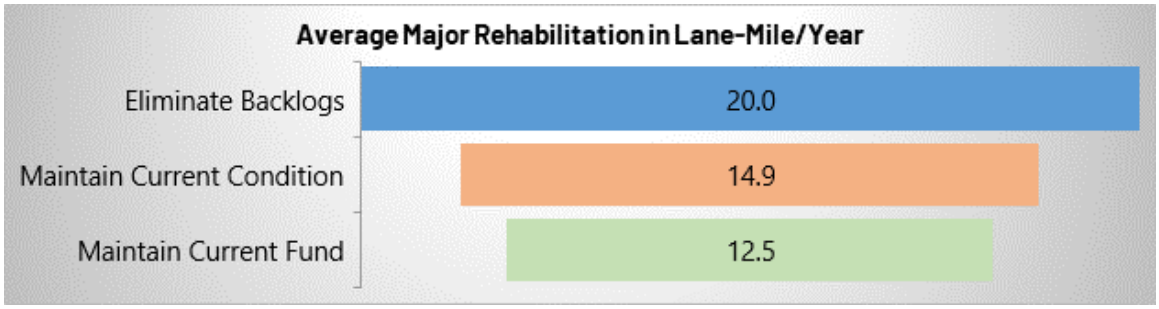

Figure 18. Predicted number of miles of pavement maintenance based on budget scenarios.

Figure 19 displays the distribution of the network condition in 2028. The figure suggests that pavements that are currently in good condition will shift towards satisfactory conditions, whereas pavements that are

currently in satisfactory condition will shift towards fair condition. As a result, the average PCI of the network will be 73.8, which is 1.2 points lower than the current PCI.

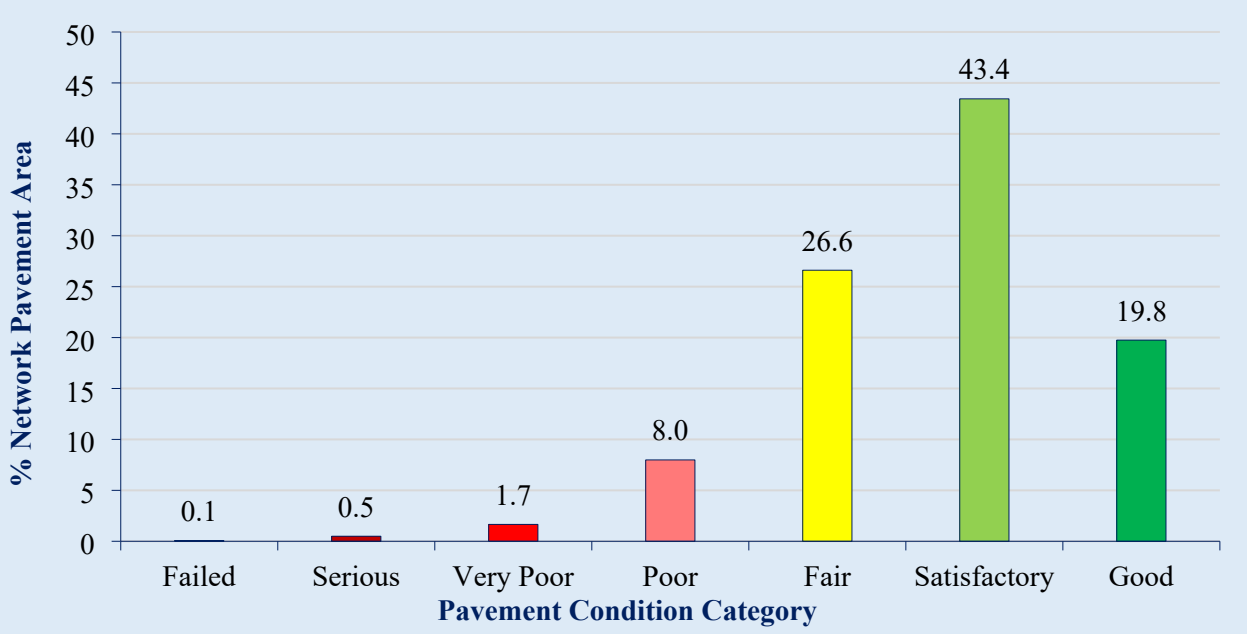

Figure 19. Predicted overall network condition distribution in 2028 based on the current funding.

Multi-Year M&R Plan Based on the 2023 Budget

1.13 Localized Distress Maintenance

A maintenance plan for localized distress involves calculating the cost and condition of immediate M&R implementation based on the most recent inspection year. The City applies both crack seal and patching on arterial and collector streets, but only patching on local roads for localized distress maintenance. Also, the City has allocated $60K for patching and $30K for crack sealing annually. Based on the treatment decision tree and budget optimization, the Pavement Exoress™ has selected pavement sections for localized distress maintenance. Appendix A provides the details of the localized distress maintenance plan based on the 2023 condition survey, while Table 6 shows the cost and pavement condition in 2023 as a result of the plan.

Table 6. Summary of the local distress maintenance plan (2024).

Year	Treatment	Length, mi	Number of Sections	Estimated Costs
2024	Patching	10.9	121	$ 59,960
2024	Crack Seal	4.2	55	$ 29,744

1.14 Major Rehabilitation

Figure 20 shows the predicted number of miles to undergo Major M&R such as mill & inlay and reconstruction and the resulting PCI values based on the 2023 budget ($2.91M/year).

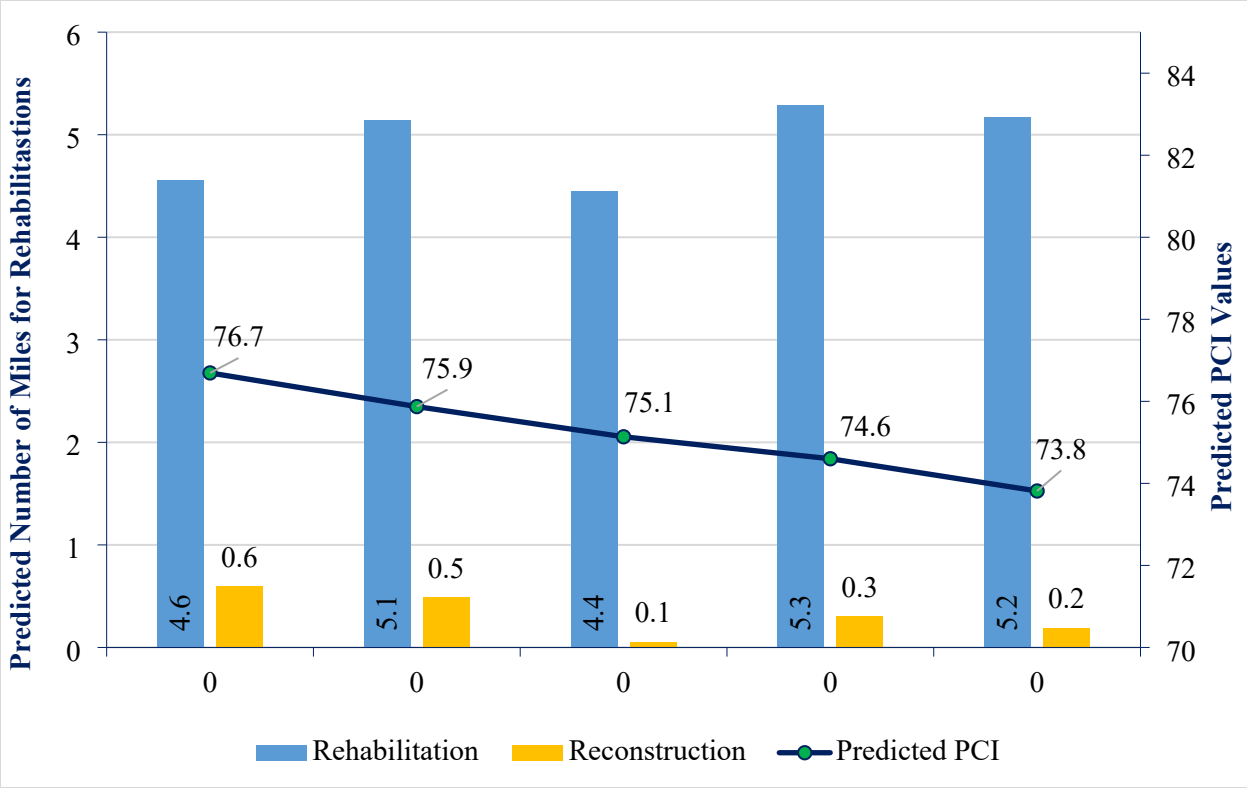

Figure 20. Predicted number of miles that can be resurfaced and resulting average PCI per year based on the 2023 budget.

The selected pavement sections for Major M&R are shown below in Figure 21.

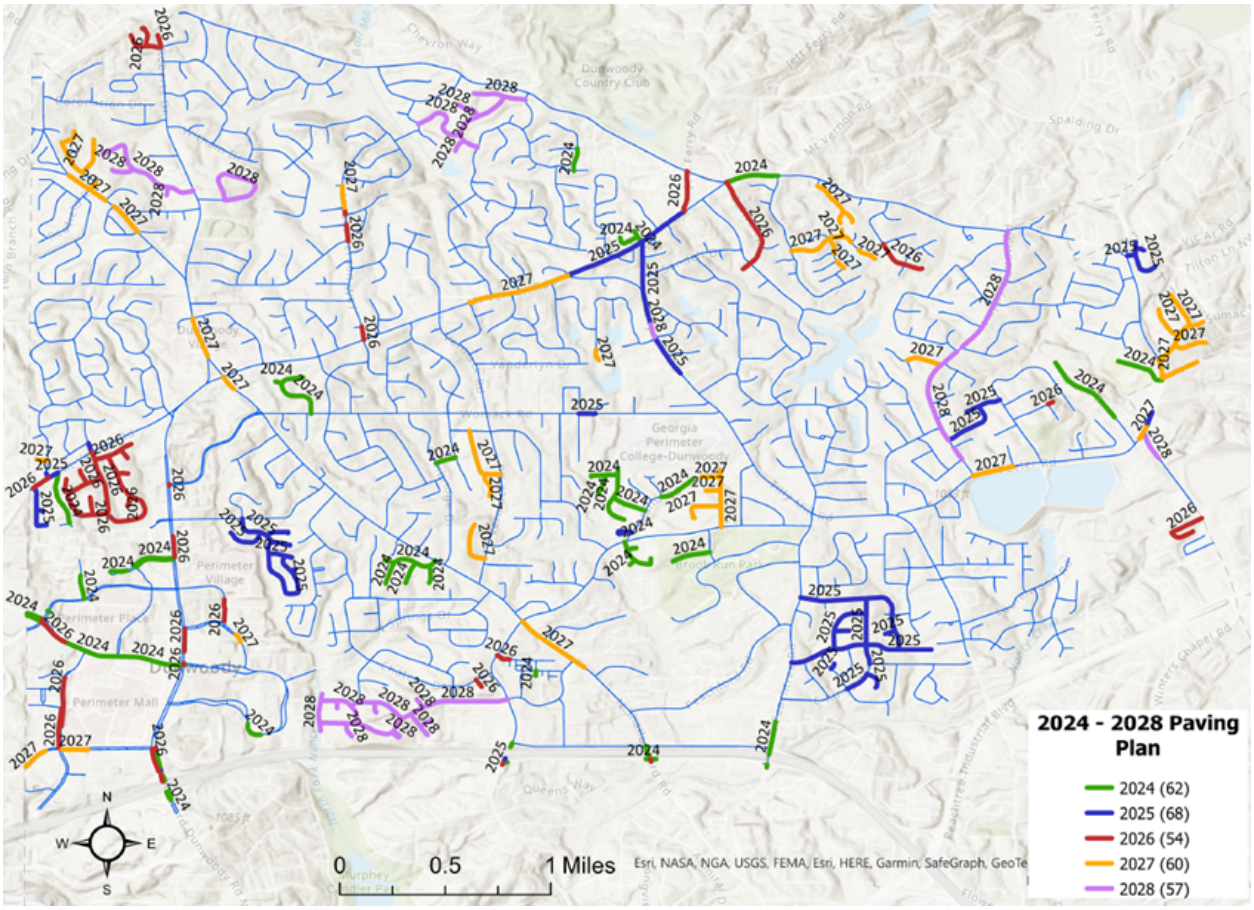

Figure 21. 5-Year Major M&R plan based on the 2023 budget.

Disclaimer: This pavement management report is intended to provide an overview of the 2023 condition and network-level management strategies based on the visual evaluation of surface distresses without including a comprehensive structural evaluation. Therefore, the precise pavement treatment should be determined based on the project-level analysis of the existing pavement conditions. The analyses presented herein are based on the information available during the assessment and may be subject to change over time.

Recommendations

1.15 Increase annual pavement maintenance and rehabilitation funds

In the City of Dunwoody, approximately 14.9% of the pavement (53 lane miles) is classified in 2023 as being in 'poor,' 'very poor', and 'serious,' conditions. Although the current annual fund ($3M/year) has been able to keep the overall condition above 70 and backlog at around 15%, it is recommended to increase the fund gradually to $4.0M/year to mitigate the challenges comes with increase materials and construction costs, inflation, and increased weight limit.

1.16 Develop a robust pavement preservation program

It is recommended that the City emphasize implementing pavement preservation measures by performing routine preventive maintenance of pavement sections categorized as 'fair,' 'satisfactory,' and 'good' condition. By undertaking preventive maintenance activities such as crack sealing, localized patching, and microsurfacing, the City can effectively prolong the lifespan of these pavement segments. This approach is cost-effective and contributes to maintaining the overall quality of the network.

1.17 Perform routine updates of the Pavement Express™ pavement management system

KCI recommends updating the *Pavement Express*™ pavement management system annually to record the Major M&R, stopgap and localized preventive maintenance activities, and pavement inventory changes (i.e., section split, new roads, jurisdictional changes, etc.). Based on the yearly updates of M&R activities, the City can perform M&R analysis with an updated funding level (if available), accounting for the previous year(s) actual projects.

1.18 Perform routine pavement condition survey

For the City, maintaining a pavement management system is an excellent initiative. It is recommended that the City establish a strategic plan to continue to perform pavement condition surveys on a two-to-three-year cycle to realize the most significant benefit from this holistic effort. There are many benefits of performing routine PCI surveys, including:

a) A survey provides the current condition of the pavement network and helps to determine the effectiveness of completed M&R activities performed in the last few years;
b) Pavement performance models would be more accurate in predicting future condition; and
c) Based on the survey, appropriate treatment and optimal funding allocation are possible to repair distressed pavement locations.

Conclusion

Pavements are the most valuable assets for any public agency. Investing in a pavement management program is rational; considering pavement management not only provides a consistent and rational management method to make decisions but also helps in the optimal use of funds and reduces pavement rehabilitation, resulting in extended pavement life and increased credibility with stakeholders. Based on the March 2023 survey, the City's average PCI value is 75, indicating the pavement network is in overall ‘satisfactory’ condition. About 14.9% of the pavement areas (53 lane miles) are in ‘poor’, ‘very poor’, and ‘serious’ conditions. It is recommended to increase the annual fund to offset the increase materials and construction costs and uncertainty in pavement performance, and additional damage incurred by the increase weight limit.

Appendix A

A.1 A Map with PCI Values and Pavement Condition Categories
A.2 List of Pavement Sections with 2023 PCI Values

PREPARED BY
KCI Technologies, Inc.
2160 Satellite Boulevard, Suite 130
Duluth, GA 30097