2020 "State of the Streets"

Final Report

Prepared for:

Village of Merrionette Park, Illinois &
Chicago Metropolitan Agency for Planning

Prepared by:

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ACRONYMS

Acronym	Definition
AC	Asphalt concrete pavement
APC	Asphalt concrete overlay on Portland cement concrete pavement
ASTM	American Society for Testing and Materials
BR	Brick pavement
CIP	Capital Improvement Plan
CMAP	Chicago Metropolitan Agency for Planning
CSU	Colorado State University
FT	Foot
G&AI	Gorrondona and Associates, Inc.
GIS	Geographic information system
GR	Gravel pavement
IRI	International Roughness Index
K	Thousand
L&T	Longitudinal and transverse cracking
LCD	Last construction date
M	Million
M&R	Maintenance and rehabilitation
P	Primary rank pavement
PAVER	PAVER Pavement Management System
PCC	Portland cement concrete pavement
PCI	Pavement Condition Index
PMP	Pavement management program
PMS	Pavement management system
S	Secondary rank pavement section
SF	Square feet
SU	Sample unit
SY	Square yard
T	Tertiary rank pavement section

1 EXECUTIVE SUMMARY

1.1 History

In October of 2020, the Chicago Metropolitan Agency for Planning (CMAP) retained the services of Gorrondona and Associates, Inc. (G&AI) to implement a pavement management system for the Village of Merrionette Park that will enable the Village to manage its roadway network in a more proactive, cost-effective, and sustainable way. To accomplish this objective, G&AI: 1) assessed the condition of the Village's roadways, 2) implemented and customized a pavement management system for the Village, and 3) developed near- and long-term pavement maintenance and rehabilitation (M&R) recommendations for the Village's roadways.

During the fall of 2019 and the spring of 2020, G&AI's state-of-the-art PathRunner pavement condition data collection system (shown in Figure 1) was deployed to capture continuous, high-resolution pavement cracking, rutting, and roughness data of the Village's roads. Collected data were entered into the PAVER Pavement Management System (PAVER), and baseline pavement condition scores were determined for each roadway.

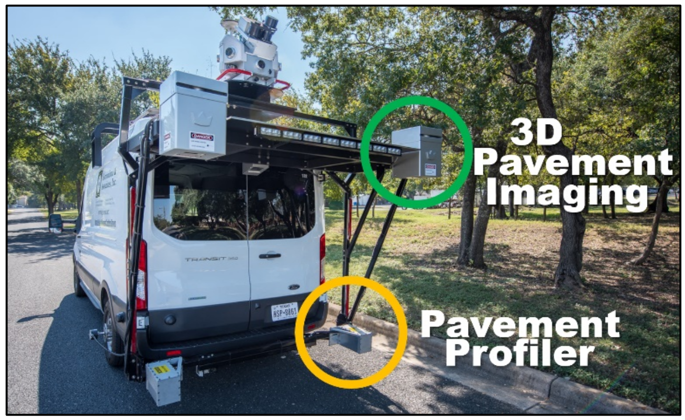


Figure 1. PathRunner pavement condition data collection system.

In July of 2020, preliminary results of the condition survey were presented to the Village. G&AI has since worked with the Village to collect additional pavement M&R records and M&R unit cost data with which to calibrate PAVER so that it is specific to the Village.

The collected pavement condition data along with both the historical M&R data and unit prices provided by the Village were used to develop network-level M&R recommendations presented herein for the Village's consideration.

1.2 PAVER Pavement Management System

PAVER stores two primary "measures" of pavement condition. The most obvious measure of pavement condition is the **International Roughness Index (IRI)**, which describes the rideability (i.e., smoothness) of the roadway as experienced by the driver.

The second measure of pavement condition is the **Pavement Condition Index (PCI)**, which provides an indication of both the structural integrity and surface operational condition of the roadway. PAVER uses PCI values to determine the most cost-effective level of M&R likely needed. PAVER prioritizes funding for life-extending, lower-cost preventive maintenance activities (e.g., crack sealing, slurry seals, and localized patching) above more costly funding of last resort major M&R activities, such as resurfacing and reconstruction. This prioritization in the PAVER algorithm seeks a proactive and cost-effective approach to pavement management with the avoidance of – unless necessary – more costly reactive practices.

In addition to routinely collected IRI and PCI data, PAVER stores pavement inventory information, historical M&R records, and M&R unit cost data. The system uses this information to predict future pavement conditions and identify network-level deterioration trends and M&R needs over time. It will also allow the Village to evaluate if present M&R methods are performing as expected.

1.3 Purpose and scope

The purpose of this project is to implement a comprehensive pavement management system for the Village's roadways. The scope of this project includes all roadways managed by the Village, which total approximately 3.9 centerline miles. This pavement management system will serve as a primary tool to assist the Village in more efficiently allocating its pavement M&R funding.

To this end, G&AI:

1. Developed an inventory of the Village's roadways in PAVER. The PAVER inventory contains pavement surface type, functional classification, M&R unit costs, and historical M&R data. *Note: Inventory development is a one-time effort that can be used by the Village if PAVER is retained, only requiring updates to address changes to the Village's roadway network and changes in M&R unit costs.*
2. Performed a pavement condition survey of the Village's roadways. This survey was used to determine PCI and IRI values for analysis purposes and will serve as an initial baseline of roadway conditions.
3. Used the condition survey with the developed PAVER inventory to determine the impact of different funding levels on the Village's roadways and identify potential network-level pavement M&R needs.

1.4 Results

Pavement Condition Index (PCI) and **International Roughness Index (IRI)** values were determined for each roadway. PCI values provide an indication of both the structural integrity and surface operational condition of a pavement. PCI values range from 0 (a failed pavement) to 100 (a pavement in excellent condition). Table 1 shows the categories chosen to represent the Village's PCI assessment criteria, which includes typical pavement distresses and levels of M&R needed within each category.

Table 1. Village's pavement condition categories.

Category	Typical Distresses and Typical Level of M&R Needed	PCI Range
Good	Longitudinal and transverse cracking and weathering of surface **Preventive maintenance:** *Crack sealing and surface treatments*	86-100
Satisfactory	More extensive longitudinal and transverse cracking and weathering of surface **Preventive maintenance:** *Crack sealing and surface treatments*	71-85
Fair	Extensive longitudinal and transverse cracking, early stage alligator (fatigue) cracking, early stage rutting, and weathering of surface **Global preventive maintenance and localized repairs:** *Localized surface and/or full-depth patching, surface treatments, and thin overlays*	56-70
Poor	More extensive and severe longitudinal and transverse cracking, alligator (fatigue) cracking, rutting, and weathering of surface **Major rehabilitation:** *Localized full-depth patching, mill and overlays, and traditional overlays*	41-55
Very Poor	More extensive and more severe longitudinal and transverse cracking, alligator (fatigue) cracking, rutting, weathering of surface, potholes **Major rehabilitation:** *Full-depth patching, mill and overlays, traditional overlays, and reconstruction*	26-40
Serious	Extensive and severe failure of pavement surface **Major rehabilitation:** *Reconstruction*	11-25
Failed	Complete failure of pavement surface **Major rehabilitation:** *Reconstruction*	0-10

At the time of G&AI's inspection, the Village's pavements were found to have an average PCI of 44, indicating that the Village's roadways are in overall "poor" condition.

IRI values measure the roughness (vertical displacement over a fixed interval reported in inches per mile) of a roadway pavement:

- IRI values less than 200 inches/mile indicate "smooth" pavement.
- IRI values between 200 and 400 inches/mile indicate a "marginally rough" pavement.
- IRI values greater than 400 inches/mile indicate "rough" pavement.

The Village's roadways were found to have an average IRI value of 336 inches/mile, which indicates overall "marginally rough" pavement.

Following this executive summary, Map 1 shows PCI categories for each roadway. Roadways that were planned for resurfacing or reconstruction in 2020 (i.e., after the field inspection was performed) were assigned an assumed PCI value of 100. All other PCI values shown on Map 1 reflect the conditions of the roadways at the time of the field inspection. Map 2 shows IRI categories for each roadway at the time of inspection. IRI values reflect a physical measurement of roughness. Consequently, IRI values were not adjusted for roadways that were planned for resurfacing or reconstruction in 2020.

The causes of pavement deterioration as quantified by the PCI may be divided into three general categories:

- Vehicle load related.
- Climate/durability related.
- Other (construction defects and material issues).

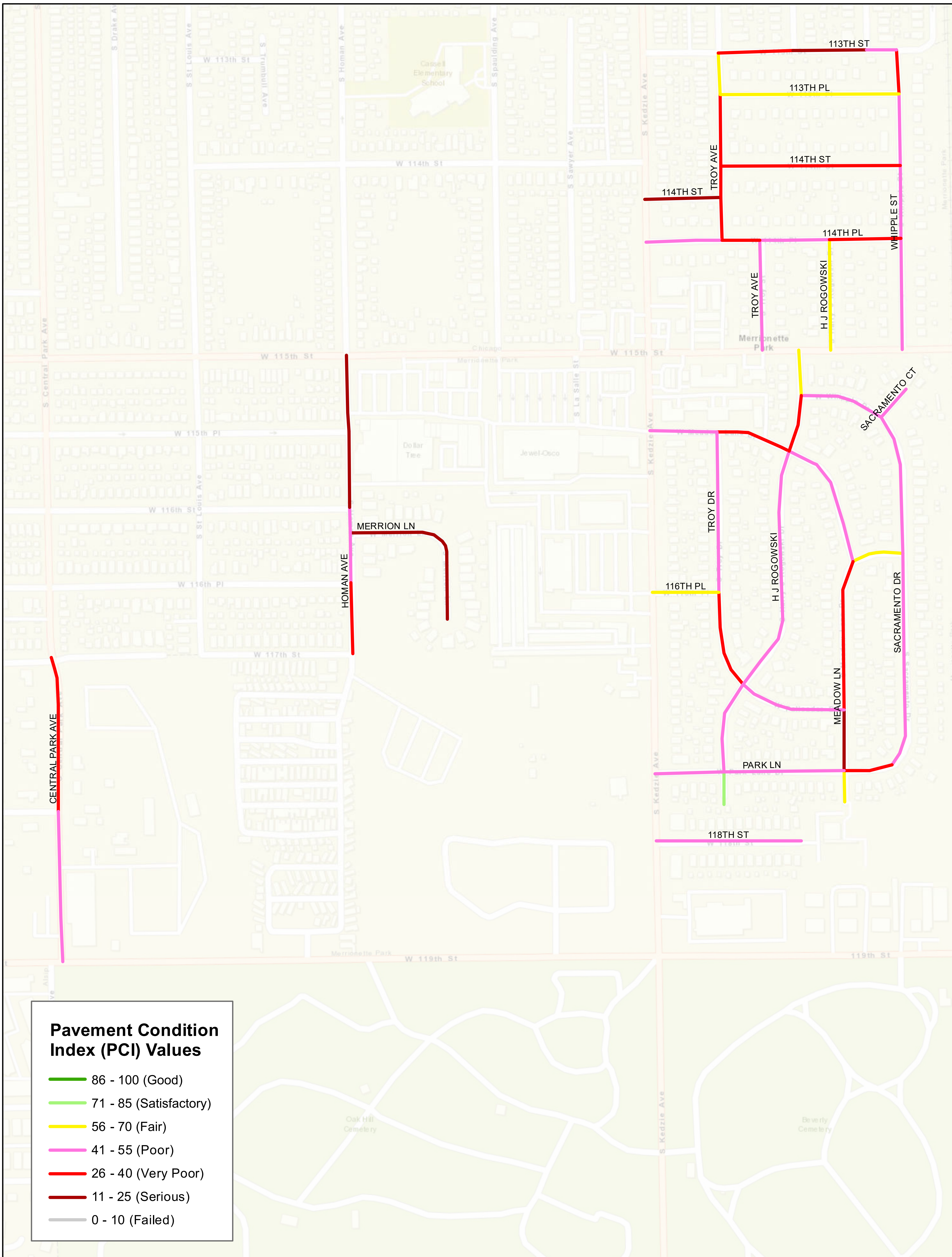
The deterioration observed on the Village's pavements at the time of inspection was caused by a mixture of vehicle load- and climate-related distresses. Vehicle load-related distresses, including alligator cracking and rutting, were pronounced on many of the Village's roadways and contributed most to lower PCI values. Significant climate-related distresses, including block cracking and weathering, were also observed on the Village's roadways.

1.5 Recommendations

For the Village to get the most return on their investment from PAVER, the system must be considered a living entity. The Village should:

1. Implement pavement preservation techniques to cost-effectively extend the life of its roadways.
2. Determine when resurfacing is no longer a cost-effective option and reconstruction is needed.
3. Annually update M&R activities performed on Village roadways in the PAVER database.
4. Annually update M&R unit costs (or whenever economic conditions cause changes in unit prices).
5. Commit future funding to the routine collection of pavement condition data (all roadways should be inspected on a two- to three-year cycle).
6. Use collected pavement condition data to assess the performance of the roadways and applied M&R activities.

With such attention, PAVER will become a repository of accurate, up-to-date data and the primary tool that the Village uses for more cost-effectively programming M&R funding.



N

Feet

0 350 700

Map 1:
Pavement Condition Index (PCI) Values

Merrionette Park, Illinois

Pavement Management Program

Gorrondona & Associates, Inc.

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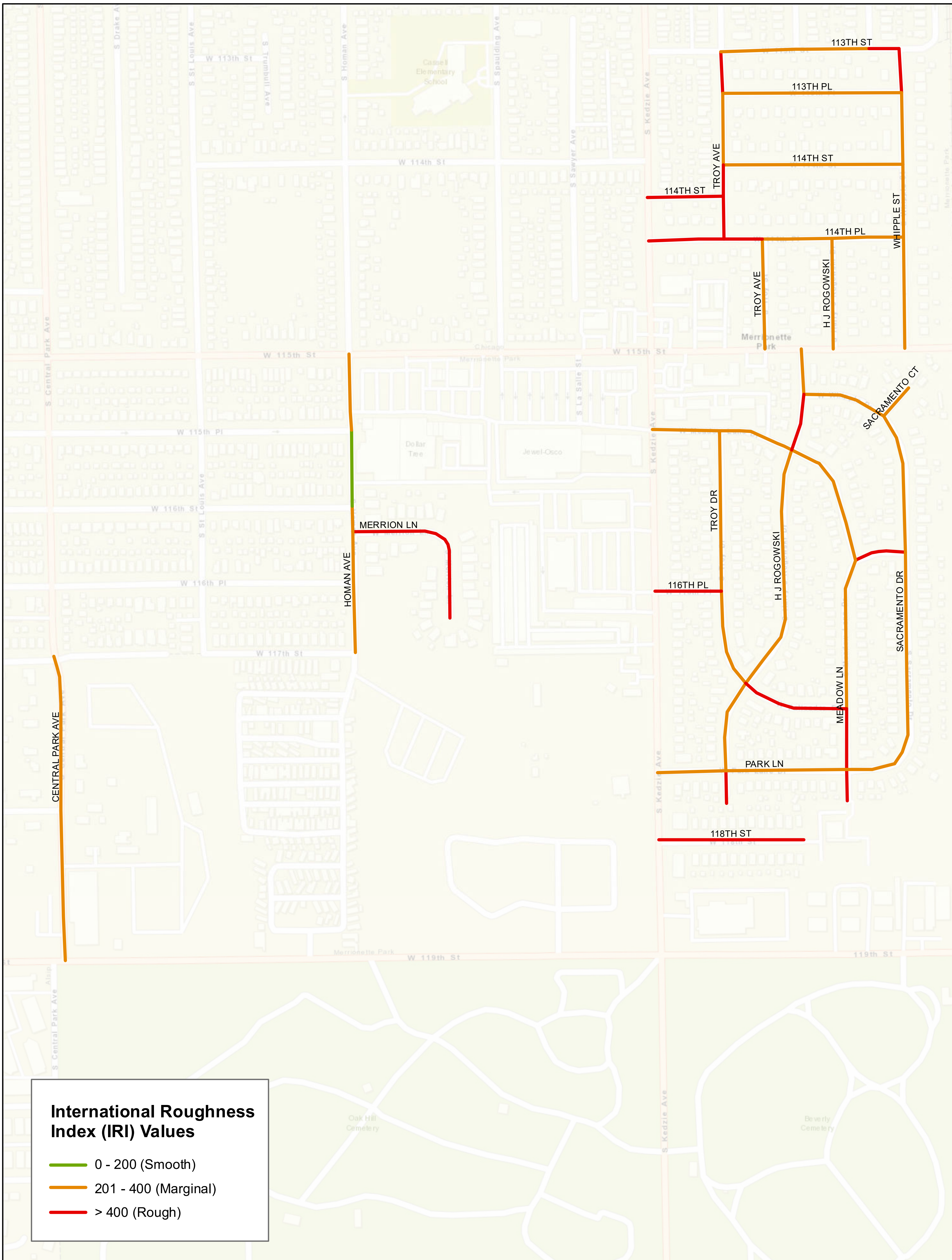

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Feet
0 350 700

Map 2:
International Roughness Index (IRI) Values

Merrionette Park, Illinois

Pavement Management Program

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2 INTRODUCTION

2.1 Foreword

This section of the report expands on the Executive Summary and provides the reader with information pertaining to the creation and implementation of this pavement management system for the Village.

At the core of a modern pavement management system is a geocentric database that contains pavement inventory and condition information. Combined with up-to-date M&R unit cost data, calibrated deterioration models, and owner-specific M&R practices, this information is used by analysis tools in the pavement management system to predict future pavement conditions, develop multi-year M&R plans, and forecast anticipated funding needs.

This section provides a conceptual overview of pavement management and follows with the benefits and costs of implementing a pavement management system. Implementation of the Village's pavement management system is detailed in Sections 3, 4 and 5. This section closes with an overview of effective preventive maintenance strategies that should be considered by the Village.

2.2 Background, scope, and objectives

The Chicago Metropolitan Agency for Planning (CMAP) retained the services of Gorrondona and Associates, Inc. (G&AI) to assess the existing condition of the roadways maintained by the Village. The primary objectives of this project are to implement a comprehensive and Village-wide pavement management system, perform a network-level pavement condition survey, and identify future pavement M&R needs.

The project will provide the Village with a better understanding of the current condition of its roadways and network-level recommendations for future M&R based on the results of the pavement condition survey. Moving forward, the pavement management system will continue to serve as a repository for pavement condition data, historical M&R records, and pavement condition deterioration trends.

PAVER was implemented for the Village, and a state-of-the-art PathRunner pavement condition data collection system was deployed to capture continuous, high-resolution pavement cracking, rutting, and roughness data of the Village's roadways.

G&AI has since developed the PAVER inventory database and worked with the Village to collect additional pavement M&R records and M&R unit cost data with which to calibrate the PAVER database so that it is Village specific. These M&R records and M&R unit costs, along with the collected pavement condition data, have been used to identify present network-level M&R needs.

2.3 Project tasks

To successfully accomplish the objectives of this project, G&AI performed the following tasks, which are covered in greater detail in Sections 3, 4, and 5 of this report, respectively:

1. Pavement management system implementation
   G&AI developed an inventory of the Village’s roadway pavements and implemented PAVER.
2. Pavement condition survey
   G&AI performed a network-level pavement condition survey on the roadway pavements using a state-of-the-art pavement imaging and profiling data collection system. The pavement condition survey was performed in the fall of 2019 and spring of 2020.
3. M&R analyses
   G&AI reviewed the collected condition data and determined the impact of several funding scenarios on the Village’s roadways and identified potential pavement M&R needs using PAVER.

The 3D pavement imaging and profiling technology used to assess the condition of the Village’s roadway pavements is the most comprehensive available. This technology has evolved rapidly over the past several years, and it is now used across the United States by more than half of the state DOTs. Unlike the inherently subjective windshield pavement condition surveys of years past, high resolution cracking, rutting, and roughness condition data were captured continuously for each of the Village’s roadways surveyed.

The collected data were then analyzed using a hybrid methodology that incorporates both automated crack detection and classification along with manual quality control. This approach yields a complete set of pavement condition data that may be used for both network-level (high-level budgeting) multi-year M&R planning as well as project-level (estimating M&R quantities) analyses. The collected data were then entered into and analyzed using PAVER. Continuously developed by the US Army Corps of Engineers, PAVER is a sophisticated, non-proprietary system widely used by municipal agencies across the United States and around the world.

2.4 Conceptual overview of pavement management

The use of a pavement management system is intended to provide municipal agencies with a systematic process for cost-effectively managing their pavement network, which may include roadways, parking lots, and alleys. The American Public Works Association (APWA) defines pavement management in the following way:

> *Pavement management is a systematic method for routinely collecting, storing, and retrieving the kind of decision-making information needed to make maximum use of limited maintenance (and construction) dollars.*

Combined with local knowledge and practical judgment, the recommendations from a pavement management system may be used to help make better pavement M&R decisions.

At the core of a pavement management system is the method for assessing pavement condition. The most widely used method for assessing pavement condition is the Pavement Condition Index (PCI), which is industry standard practice and defined in ASTM D6433. The PCI method outlines a process for more objectively assessing the condition of a pavement based on visual observations and measurements that take place during a field inspection. These observations and measurements are then distilled into a PCI value that ranges between 0 and 100. A PCI value of 0 indicates a failed pavement, and a PCI value of 100 indicates a pavement in good condition.

PCI values help determine the level of M&R needed to cost-effectively maintain or rehabilitate the pavement. These values may also be used to prioritize roadway improvements for the purpose of developing strategic capital improvements programs. When a pavement is in good condition, preventive maintenance can be applied to extend the life of the pavement. However, once a pavement falls below critical condition, preventive maintenance may no longer be cost effective, and more significant and perhaps more costly rehabilitation strategies should be considered.

The “Critical PCI” value for a pavement is the PCI value below which cost-effective preventive maintenance is no longer a viable option, and more significant rehabilitation and sometimes reconstruction may be necessary. As shown in Figure 2, the primary objective of pavement management is to preserve pavements in good condition above the Critical PCI with less costly preventive M&R rather than allow them to deteriorate below the Critical PCI, resulting in the need for more costly major M&R (rehabilitation or reconstruction).

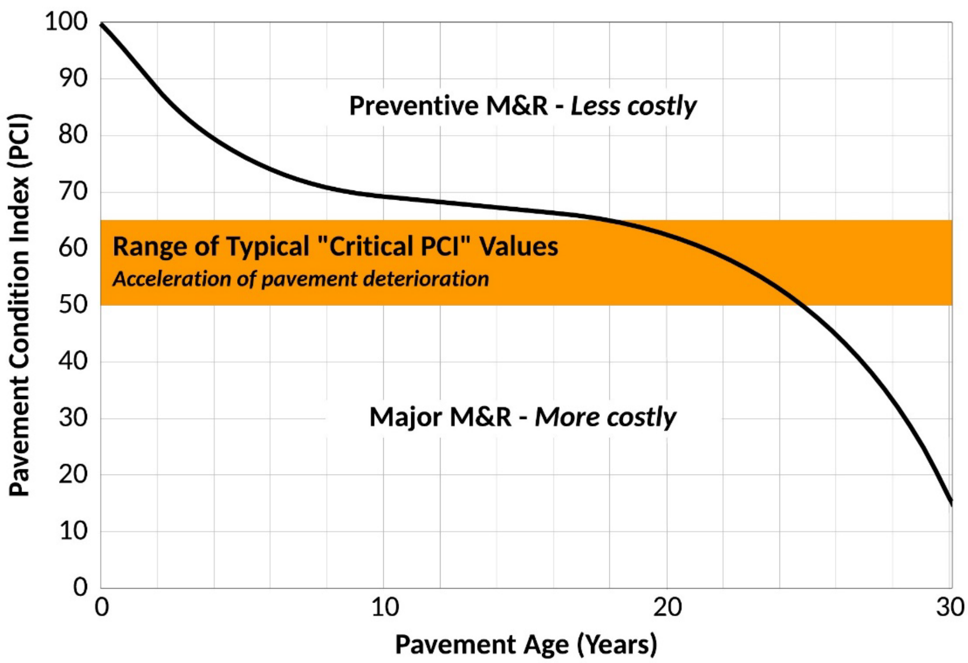


Figure 2. Example of the correct timing of preventive and major M&R relative to the Critical PCI.

The Critical PCI value is determined based on the repeated measurement of pavement condition over time as well as agency-specific M&R policies. Critical PCI values typically range between 50 and 65 (as shown in Figure 2) because the acceleration of pavement deterioration, and subsequent need for more costly M&R, typically occurs then. Setting a higher Critical PCI value simply results in pavements being recommended for major M&R earlier. Some agencies set higher Critical PCI values for their arterial roadways than for their local roadways to ensure that the roadways most heavily traveled (and often at higher speeds) are maintained to a higher standard.

PAVER’s default Critical PCI value of 55 has been used for the Village’s roadways. The Village may change this value as more condition data and historical M&R data are captured and the deterioration rates of the Village’s roadways are better understood. Typically, two to three PCI inspections are needed to converge on acceptable Critical PCI values. The Village may choose to set Critical PCI values for each functional classification of roadway based on desired policy goals.

When the appropriate preventive maintenance treatments (e.g., crack sealing, seal coats, and patching) are undertaken at the correct times during a pavement’s service life, these relatively inexpensive preventive M&R treatments can extend the service life of the pavement, as shown in Figure 3.

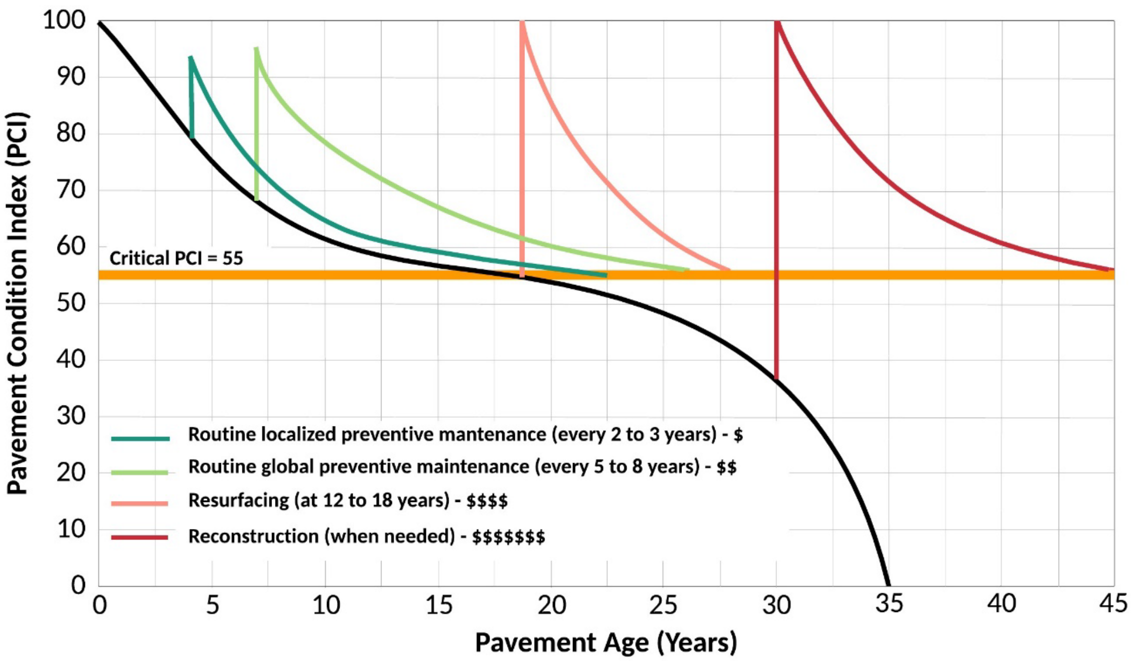


Figure 3. Example of the increasing prices and decreasing benefits of M&R.

It is important to note that the IRI, which provides a useful measure of pavement smoothness, does not correlate well to the level of M&R needed to correct smoothness issues. Consequently, IRI values are not considered when forecasting future M&R needs. Instead, IRI values are used in pavement management systems to identify pavements requiring a special inspection, or they may be used in conjunction with PCI values when prioritizing M&R projects.

As pavement management concepts have gained traction, computer-based pavement management systems have been developed to assist agencies in more optimally managing their pavements. Pavement management systems currently rely on a detailed pavement inventory, routine pavement condition assessments, pavement performance modeling, and sophisticated analysis tools that can forecast future pavement condition and estimate future M&R needs and costs.

2.5 Benefits and costs of implementing a pavement management system

Pavement management systems provide:

- A centralized location for storing pavement condition and inventory data, including construction, maintenance, and rehabilitation records.
- Decision-making support tools for:
    - ✓ Evaluating maintenance and rehabilitation alternatives.
    - ✓ Analyzing the consequences of alternative funding levels on pavement conditions.

  - ✓ Improved scheduling and coordination of pavement M&R projects and other infrastructure projects.
- Analysis tools for evaluating the effectiveness of historical methods of rehabilitation.
- Reporting tools for distilling complex data and justifying funding needs to elected officials.

The benefits of implementing and maintaining a pavement management system improve over time as more data are entered into the system. The costs associated with maintaining a pavement management system include:

- Pavement inventory data collection and routine updates (typically performed annually following the end of the paving season).
- Routine pavement condition data collection (arterials and collectors are typically surveyed every other year and local roadways are surveyed on a three-year cycle).
- Evaluating pavement performance and developing M&R plans (typically performed annually following the end of the paving season – or following a condition survey – to determine candidate roadways for the next paving season).
- Software acquisition, installation, system maintenance, and updates.
- Staff training, as needed.

To ensure the success of a pavement management system, agencies should develop a plan for staffing, maintaining, and funding the system appropriately.

2.6 Incorporating pavement preservation strategies

The implementation of a pavement management system has the added benefit of assisting agencies in determining which pavements may be candidates for preventive maintenance. The use of preventive maintenance early in the life of a pavement, before any significant deterioration, has been demonstrated to be a cost-effective way to extend a pavement's service life.

In the Federal Highway Administration (FHWA) publication, Pavement Preservation, A Road Map to the Future, preventive maintenance is defined as:

> *"…the planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity)."*

The FHWA adds that preventive maintenance:

> *"…is typically applied to pavements in good condition having significant remaining service life. As a major component of pavement preservation, preventive maintenance is a strategy of extending the service life by applying cost-effective treatments to the surface or near-surface of structurally sound pavements."*

The following preventive maintenance treatments have been demonstrated to be effective when applied at the right time during a pavement's service life:

- Crack sealing, crack filling, and joint sealing of flexible and rigid pavements
- Patching and edge repairs
- Chip seals, fog seals, and slurry seals
- Micro-surfacing
- Thin "functional" and "maintenance" overlay projects

Too frequently these activities are incorrectly applied as "stop-gap" or "cosmetic" treatments for pavements in poor condition rather than as true preservation activities. Preventive maintenance strategies should be applied to pavements that are in relatively good condition, and the activities should be planned and applied systematically following either the resurfacing or reconstruction of a pavement. The following FHWA website provides additional information for pavement preservation: https://www.fhwa.dot.gov/pavement/preservation/.

2.7 Summary

This section provided the reader with background information pertaining to the creation and implementation of the non-proprietary PAVER system for the Village. The section provided a conceptual overview of pavement management and discussed:

1. The benefits the Village will see from the implementation of the pavement management system.
2. The costs expected to be incurred with the maintenance of the system.
3. The additional functionality beyond the obvious support the system can provide by objectively assisting the Village in optimizing the allocation of its M&R funding.

Implementation of the Village's pavement management system is detailed in Sections 3, 4, and 5. This section closed with an overview of effective preventive maintenance strategies that should be considered by the Village moving forward.

3 PAVEMENT MANAGEMENT SYSTEM IMPLEMENTATION

3.1 Foreword

This section discusses the first task of this project: Implementing a pavement management system. One of the CMAP’s primary desires was to have a non-proprietary pavement management system for participating agencies. This section provides an overview of PAVER, a brief description of the modules available to the Village in PAVER, and insight into the PAVER database development. *(Note: The information presented in the section may be supplemented by the PAVER User Manual, which is available as a navigable PDF file in the PAVER software.)*

3.2 Objective

The objective of this task was to implement a pavement management system for the Village’s roadway pavements. G&AI implemented PAVER, which is developed and continually updated by the US Army Corps of Engineers. This task required developing an inventory of the Village’s roadway pavements and collecting current pavement condition data and entering it in PAVER.

3.3 PAVER Pavement Management System overview

PAVER assists agencies in determining when, where, and what level of pavement M&R is required and approximately how much it will cost. The system provides a suite of pavement management tools, or “modules”, that will help the Village with the following tasks:

- Developing and organizing their pavement inventory.
- Assessing the current condition of their pavements.
- Developing models to predict future pavement conditions.
- Reporting on past and future pavement performance.
- Developing scenarios for M&R based on either funding or pavement condition goals.
- Planning M&R projects.

PAVER modules include:

- Inventory
- M&R history
- Inspection
- Prediction modeling
- Condition analysis
- M&R planning
- Project planning
- Reporting

A brief description of these modules is presented in the following sub-sections.

Note: Upon request by the municipality, a one-year PAVER license shall be purchased by CMAP for the municipality from Colorado State University (CSU). The PAVER license does not expire. However, after the first year, the municipality will be responsible for purchasing software updates and technical support, if desired. Current pricing for PAVER may be found at: www.paver.colostate.edu.

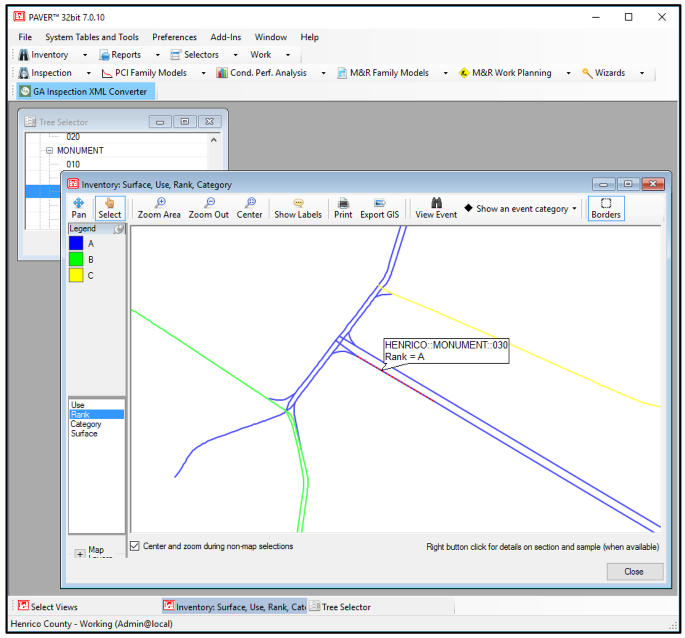


Figure 4. Example roadway functional classifications (ranks) stored in the Inventory module.

3.3.1 Inventory and maintenance and rehabilitation (M&R) history modules

The PAVER **Inventory** and **M&R History** modules, shown in Figure 4 and Figure 5, are based on a hierarchical structure composed of networks (groups of roadways managed with one source of funding), branches (specific roadways), and sections. Sections are the smallest area for which conditions are reported and M&R activities recommended. Sections typically conform to existing GIS segmentation and are commonly defined from intersection to intersection by default.

One network is defined for the Village and each roadway is a branch. Pavement sections are defined within each branch following the Village’s existing GIS segmentation in the Illinois Roadway Information System (IRIS). This structure allows the Village to easily organize their inventory and historical M&R data and provides a simple and efficient way for rolling-up data to higher levels of the pavement hierarchy. The Village provided G&AI with historical M&R records, and this information was entered in PAVER.

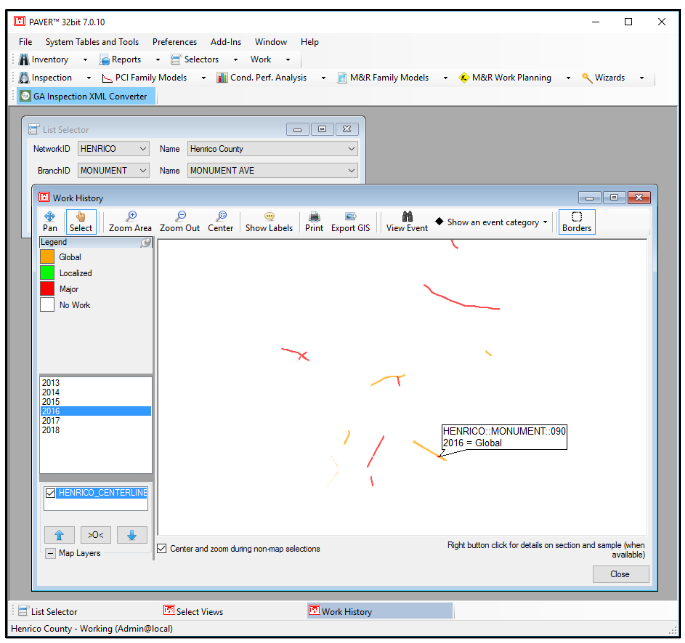


Figure 5. Example historical M&R records stored in the M&R History module.

3.3.2 Inspection module

PAVER uses the PCI as the primary measure of pavement condition. The **Inspection** module, shown in Figure 6, enables agencies to store raw pavement condition survey data and then calculate PCI values. IRI values are also stored in the **Inspection** module.

3.3.3 Prediction modeling module

The **Prediction Modeling** module in PAVER enables the user to group pavements of similar construction that are subjected to similar traffic, weather, and any other factors affecting pavement performance into “families.” Historical pavement condition data are used to build models that can be used to predict future pavement performance. The **Prediction Modeling** module is a hands-on module and prediction models should be updated by the Village following each condition survey. If historical pavement condition data are not available, PAVER provides default pavement prediction curves (shown in Figure 7) and allows the user to develop site specific prediction models.

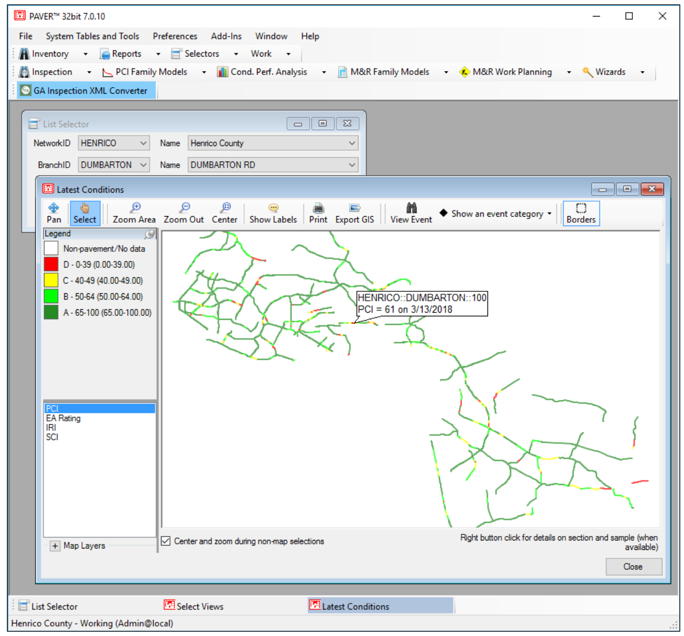


Figure 6. Example PCI values in the Inspection module.

3.3.4 Condition analysis module

The Condition Analysis module allows the Village to view the condition of the entire pavement network or any subset of the network over time. The module reports past conditions based on interpolated values between historical condition data, and it reports projected conditions based on the application of prediction models developed using the **Prediction Modeling** module.

3.3.5 M&R planning module

The **M&R Planning** module can determine the consequence of a predetermined funding level on pavement conditions and estimate the resulting backlog of major work. This information assists in determining funding requirements to meet specific Village pavement condition goals. These capabilities will enable the Village to develop more optimal M&R programs based on available resources and to justify M&R needs.

3.3.6 Reporting module

Each previously described module of PAVER can generate various reports that will assist the Village in analyzing, interpreting, and presenting pavement data. In addition to module-specific reports, PAVER also comes equipped with several "canned" reports, which include:

- GIS reports – *Internal/external reporting of inventory and condition data*
- Summary Charts – *Simple graphs and data tables of inventory and inspection data*
- Inspection Reports – *Summary of collected pavement condition data*
- Work History – *Summary of historical maintenance, repair, and rehabilitation data*
- Branch Listing – *Summary of overall pavement inventory data*

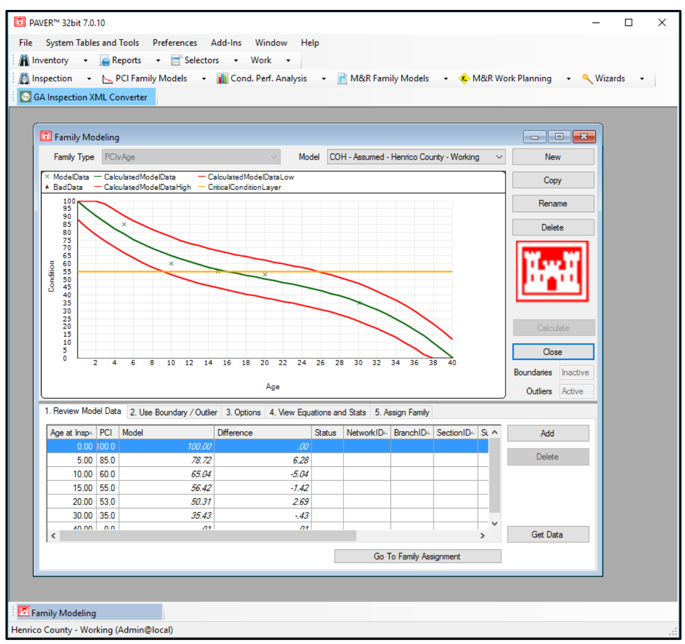


Figure 7. Example deterioration trend developed using the Prediction Modeling module.

- Branch Condition – *Summary of overall pavement condition data*
- Section Condition – *Summary of individual section data*

PAVER can generate on-the-fly “user-defined” reports, which can be tailored to meet the Village’s specific reporting needs. PAVER’s user-defined reporting capability enables the user to extract any data stored in the system and export it to a GIS shapefile, spreadsheet, or text file.

3.4 Summary

This section discussed the first task of this project: Implementing a pavement management system. This section provided an overview of the non-proprietary PAVER system, a brief description of the modules available to the Village in PAVER, and insight into the PAVER database development. The Village’s PAVER database has been developed to include specific and relevant data pertaining to the Village’s roadway pavement network. PAVER’s suite of analysis and planning tools will enable the Village to more effectively manage its roadway pavement network.

4 PAVEMENT INVENTORY

4.1 Foreword

This section describes the Village's roadway pavement inventory as it exists in PAVER. The data sources used in developing the inventory are discussed in this section, and summary data are presented.

4.2 Objective

The objective of this task was to develop a comprehensive inventory of the Village's roadway pavements for inclusion in PAVER. The roadway pavement inventory provides the underlying data on which analysis and reporting is performed with PAVER. In addition, the inventory provides the framework in which all routinely collected pavement condition data and historical work data are stored.

Moving forward, the Village should update the pavement inventory in PAVER to reflect the addition, realignment, widening, and/or removal of roadways managed by the Village. Typically, these types of changes are infrequent and may be done annually or prior to performing any analysis or reporting tasks with PAVER.

4.3 PAVER inventory development

The Village's PAVER inventory was based on the IRIS GIS provided by CMAP. Relevant pavement data available in the IRIS GIS were supplemented with aerial imagery and field observations and entered in the Village's PAVER database. These data included: number of lanes, pavement surface type, approximate roadway width, and from/to intersections for each pavement section.

Roadways were also assigned "ranks" (i.e., priorities) of primary (P), secondary (S), and tertiary (T). Federal aid eligible roads were assigned the rank of primary, since these tend to be the more heavily trafficked roadways. Residential roads were assigned the rank of secondary, and unpaved roadways and roadways in industrial zones were assigned the rank of tertiary. Based on these definitions, it was determined that the Village only has secondary pavements.

A shapefile generated from the Village's GIS was linked to the PAVER database. This enables the Village to conveniently navigate the roadways within PAVER and generate a variety of map-based inventory and condition reports in PAVER. Historical M&R records provided by the Village were entered in the PAVER database as well as unit cost data.

4.4 Inventory summary

The Village's roadway network consists of approximately 3.9 centerline miles of predominantly asphalt surfaced, two-lane roadways. Table 2 shows the distribution of the Village's roadway network in mileage and area by pavement rank, and Table 3 shows the distribution by pavement surface type.

Table 2. Roadway summary data by pavement rank.

Rank	Centerline Miles	Lane Miles	Area (SY)
Secondary, S	3.9	7.8	61,411
Total	**3.9**	**7.8**	**61,411**

Table 3. Roadway summary data by pavement surface type.

Surface Type	Centerline Miles	Lane Miles	Area (SY)
Asphalt, AC	3.9	7.8	61,411
Total	**3.9**	**7.8**	**61,411**

Appendix A maps A-1 and A-2 present pavement rank and surface type data graphically.

5 PAVEMENT CONDITION INSPECTION

5.1 Foreword

This section discusses the second task of this project: Performing a comprehensive pavement condition survey of the Village's roadways. The condition survey included the collection of high-resolution pavement imagery and profile measurements using a state-of-the-art PathRunner pavement condition survey system. The collected data were analyzed and PCI and IRI values were calculated for each of the Village's roadways surveyed. This section describes the pavement condition survey system, the data collection methodology, how the collected data were analyzed, and a discussion of field observations. It concludes with several examples of pavement conditions from the Village's roadways.

5.2 Objective

The objective of the pavement condition survey is to assess the existing structural integrity and surface operational condition of the Village's roadways. The survey provides a comprehensive snapshot of pavement conditions at the time of data collection.

Moving forward, the Village should perform pavement condition surveys on a routine basis to objectively monitor pavement performance, determine near-term M&R needs, evaluate the effectiveness of M&R activities, develop pavement deterioration trends, and forecast near- and long-term pavement M&R needs.

5.3 Pavement condition data acquisition

G&AI deployed a state-of-the-art PathRunner pavement data collection system to capture high-resolution pavement imagery and surface data necessary to assess the condition of the Village's roadways. The PathRunner system is shown in Figure 8.

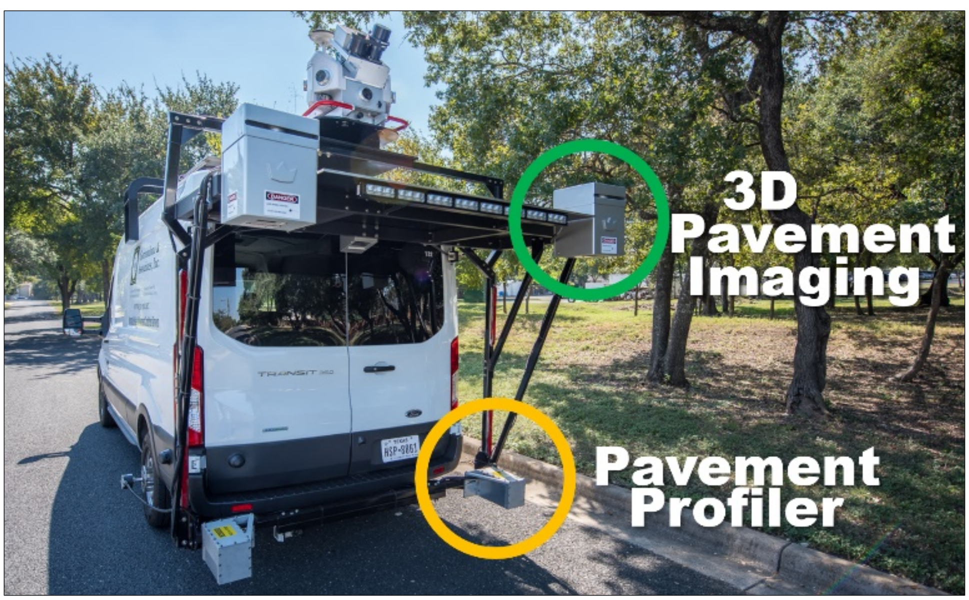


Figure 8. PathRunner pavement condition data collection system.

The PathRunner was driven on all roadways within the Village. By agreement with CMAP, only a single lane of two-lane roadways was collected and the outermost lanes in both directions of four-lane and greater roadways were collected. Based on G&AI's experience, contiguous lanes are usually of similar character, and this inspection approach was deemed to be cost effective for the Village while still providing sufficiently detailed information to assess existing pavement conditions. The PathRunner system continuously collected the following data for each roadway:

- High-resolution 2D and 3D pavement images for evaluating pavement distresses and determining Pavement Condition Index (PCI) values.
- Transverse profiles to measure rutting.
- Longitudinal profiles to calculate International Roughness Index (IRI) values.
- High-resolution, forward-facing, right-of-way images for manual review of all data.

These data were processed using automated tools verified by manual review to assess pavement conditions, and the results were entered in the Village's PAVER database.

5.4 Pavement Condition Index (PCI) method

The pavement condition survey was performed following the PCI method. The PCI method is based on a set of definitions and procedures for measuring pavement distress types, severities, and quantities during a field inspection. This information is then distilled into a PCI value, which provides an indication of the structural integrity and surface operational condition (roughness) for a pavement section. The PCI method is widely used and provides a significantly more objective and repeatable method for assessing pavement condition than inherently subjective windshield surveys commonly used in the past.

The Village's roadway network consists primarily of asphalt pavements with only a few concrete and gravel roadways. During a PCI inspection, several distress types are identified and evaluated for asphalt pavements, as shown in Table 4. The severity and quantity of each observed distress is recorded, and these data are then input into the PCI algorithm to calculate a PCI value, as shown in Figure 9.

Table 4. Asphalt and concrete pavement distress types.

Asphalt Pavement Distresses	
Distress	**Cause**
Alligator Cracking	Load
Bleeding	Other
Block Cracking	Climate/Durability
Bumps and Sags	Other
Corrugation	Other
Depression	Other
Edge Cracking	Load
Joint Reflection Cracking	Climate/Durability
Lane/Shoulder Drop-Off	Other
Longitudinal and Transverse Cracking	Climate/Durability
Patching and Utility Cut Patching	Other
Polished Aggregate	Other
Pothole	Load
Railroad Crossing	Other
Rutting	Load
Shoving	Other
Slippage Cracking	Other
Swell	Other
Raveling	Climate/Durability
Weathering	Climate/Durability

Concrete Pavement Distresses	
Distress	**Cause**
Blowup/Buckling	Climate/Durability
Corner Break	Load
Divided Slab	Load
Durability ("D") Cracking	Climate/Durability
Faulting	Other
Joint Seal Damage	Climate/Durability
Lane/Shoulder Drop-Off	Other
Linear Cracking	Load
Patching, Large and Utility Cuts	Other
Patching, Small	Other
Polished Aggregate	Other
Popouts	Other
Pumping	Other
Punchout	Load
Railroad Crossing	Other
Scaling, Map Cracking, and Crazing	Other
Shrinkage Cracks	Climate/Durability
Spalling, Corner	Climate/Durability
Spalling, Joint	Climate/Durability

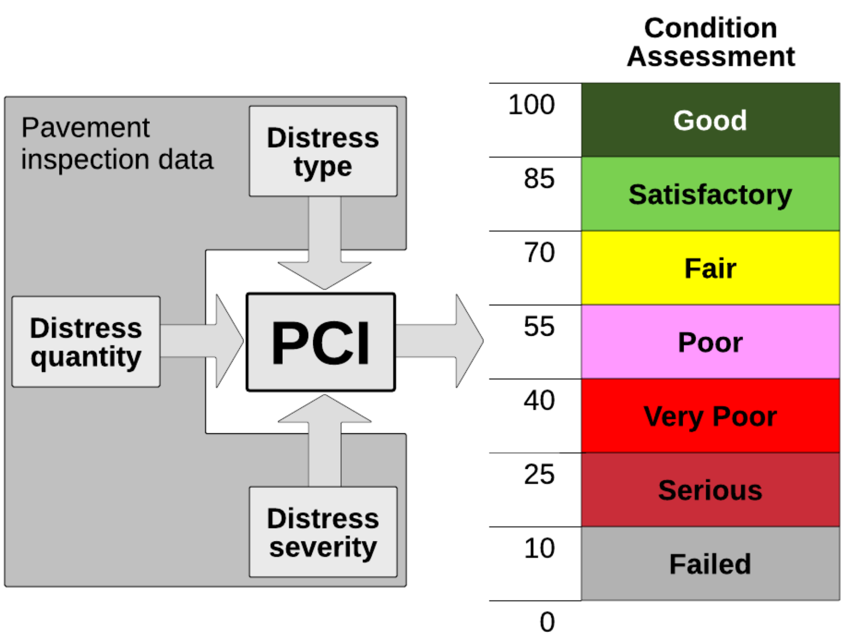


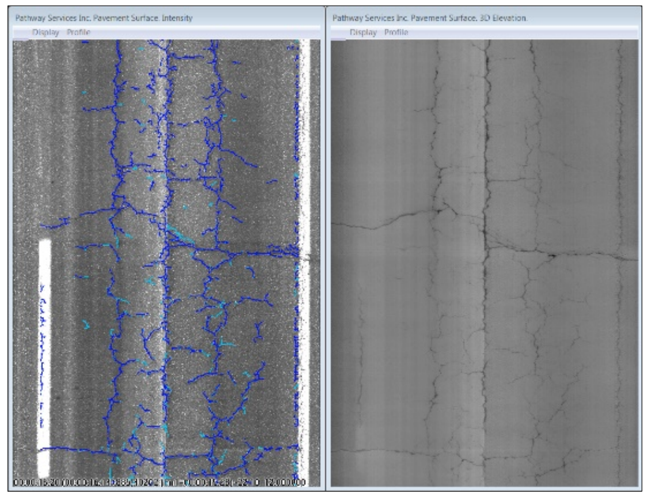
Figure 9. PCI inputs and the Village's assessment scale.

If properly designed and constructed, a new pavement begins its service life with a PCI of 100. Because of distress caused by vehicle loads, environmental factors, and aging, a pavement deteriorates over time. For each combination of distress type, severity level, and quantity observed during the inspection, points are deducted from the initial value of 100, thereby decreasing the PCI. When multiple distresses are present, the "deduct values" are modified such that the impact of multiple distresses is not unnecessarily compounded. Due to the complexity of the PCI algorithm, PCI values are typically computed using a pavement management software package, such as PAVER. It is important to note that the PCI method does not directly measure the load carrying capacity or the rideability of a pavement. Structural testing combined with coring is needed to determine permissible pavement loadings.

5.5 Pavement Condition Index (PCI) data interpretation

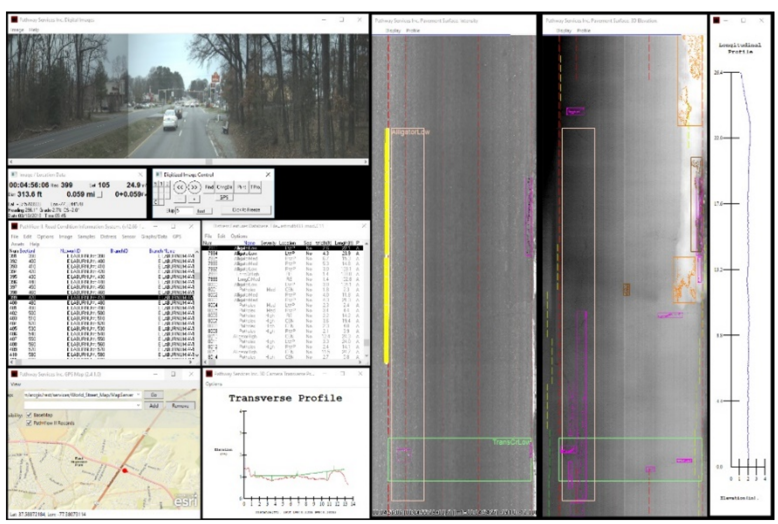
The PathRunner system captures 2D and 3D images of the roadway surface from which pavement surface distresses are evaluated. During the data collection effort, G&AI extracted pavement distress data from georeferenced digital images and rutting measurements from transverse profile measurement to determine PCI values. This process involves four distinct steps:

1. **AutoCrack Software** – This software detects cracking in the pavement imagery.
2. **AutoClass Software** – This software classifies the type of cracking detected.
3. **Manual image rating** – G&AI's team of trained and experienced raters review the imagery and identify any distress types that the automated crack detection and classification software did not observe or incorrectly identified. Performing this manual image rating is considered the Quality Control (QC) review assuring detailed accuracy and completeness of the ratings.
4. **Quality Assurance (QA) rating** – An independent team of G&AI's raters and project engineers perform a systematic QA review of the rated data to ensure proper evaluation of the collected imagery prior to import into PAVER.



Steps 1 and 2: ***Initial Automated Crack Detection and Rutting Analyses***

The QC and QA ratings are the most important steps in the project. G&AI uses the PathView software for evaluating distresses using both automated algorithms and manual supplemental rating. All QC/QA is performed by highly trained and experienced engineers and technicians using PathView. The same software system has been used for more than 25 state DOTs and several municipal agency pavement condition survey projects and is a well proven review tool.



Steps 3 and 4: ***Manual Rating and QC/QA of Pavements using PathView***

In addition to capturing 2D and 3D imagery from which pavement surface distresses are evaluated, the PathRunner system also captures high-resolution longitudinal and transverse profiles of the roadway surface at 2mm intervals. The longitudinal profile data are analyzed to determine the IRI values, or the "roughness" of the roadway, and the transverse profiles are used to measure rutting.

5.6 Existing pavement conditions and field observations

The collected pavement survey data were used to calculate a PCI value for each pavement section in the Village. Table 5 shows the pavement condition assessment criteria used to analyze the pavement network.

Table 5. Village's pavement condition categories.

Category	Typical Distresses and Typical Level of M&R Needed	PCI Range
Good	Longitudinal and transverse cracking and weathering of surface **Preventive maintenance:** *Crack sealing and surface treatments*	86-100
Satisfactory	More extensive longitudinal and transverse cracking and weathering of surface **Preventive maintenance:** *Crack sealing and surface treatments*	71-85
Fair	Extensive longitudinal and transverse cracking, early stage alligator (fatigue) cracking, early stage rutting, and weathering of surface **Global preventive maintenance and localized repairs:** *Localized surface and/or full-depth patching, surface treatments, and thin overlays*	56-70
Poor	More extensive and severe longitudinal and transverse cracking, alligator (fatigue) cracking, rutting, and weathering of surface **Major rehabilitation:** *Localized full-depth patching, mill and overlays, and traditional overlays*	41-55
Very Poor	More extensive and more severe longitudinal and transverse cracking, alligator (fatigue) cracking, rutting, weathering of surface, potholes **Major rehabilitation:** *Full-depth patching, mill and overlays, traditional overlays, and reconstruction*	26-40
Serious	Extensive and severe failure of pavement surface **Major rehabilitation:** *Reconstruction*	11-25
Failed	Complete failure of pavement surface **Major rehabilitation:** *Reconstruction*	0-10

At the time of G&AI's inspection, the Village's pavements were found to be in overall "poor" condition and have an average PCI of 44. The condition distribution of the Village's pavements at the time of inspection is shown in Figure 10, and detailed condition maps can be found in Appendix A.

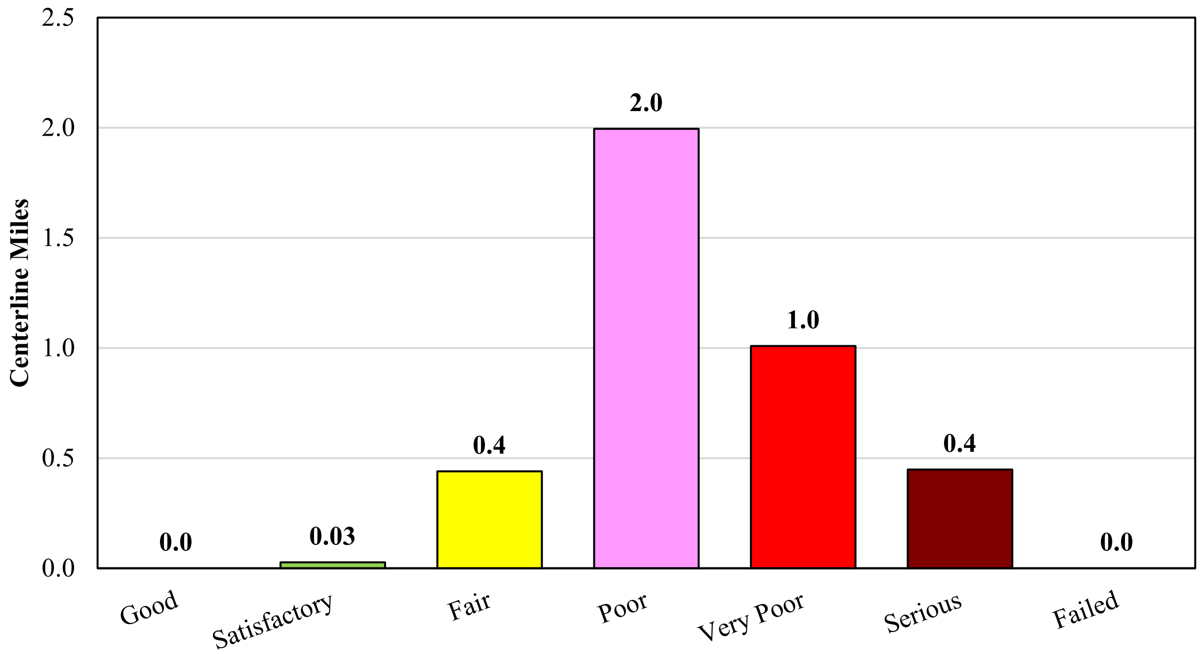


Figure 10. Village's roadway pavement condition distribution by PCI category.

Pavement condition data summarized by pavement ranks and surface types are presented in the following two tables, respectively.

Table 6. Roadway summary condition data by pavement rank.

Rank	Centerline Miles	Lane Miles	Area (SY)	PCI	IRI
Secondary, S	3.9	7.8	61,411	44	336
Total	**3.9**	**7.8**	**61,411**	**44**	**336**

Table 7. Roadway summary condition data by pavement surface type.

Surface Type	Centerline Miles	Lane Miles	Area (SY)	PCI	IRI
Asphalt, AC	3.9	7.8	61,411	44	336
Total	**3.9**	**7.8**	**61,411**	**44**	**336**

The causes of pavement deterioration as quantified by the PCI may be divided into three general categories:

- Vehicle load related.
- Climate/durability related.
- Other (construction defects and material issues).

Pavement deterioration and ultimate failure is a complex process that often involves a combination of several deterioration mechanisms working together. The deterioration observed on the Village's pavements was caused primarily by a mixture of load- and climate-related distresses. Vehicle load-related distresses, including alligator cracking and rutting, were pronounced on many of the Village’s roadways and accounted for most of the distress negatively impacting overall roadway conditions. In addition, climate-related distresses, including longitudinal and transverse cracking and block cracking, were found across the Village’s pavement inventory.

In practice, visually observed pavement distresses collected during a network-level condition survey are used to determine the likely mechanism(s) contributing to the deterioration of a roadway. However, prior to developing a specific M&R strategy, the root cause of pavement deterioration should be determined. Determining the root cause of pavement deterioration may be accomplished through an appropriate combination of traffic load analyses, drainage investigations, structural testing, coring, and material testing.

For example, vehicle load-related distresses such as alligator cracking may be addressed through load analyses and material testing. Contributing root causes may range from the roadway consistently exposed to loads in excess of its design loading to the pavement section having simply reached the end of its design life. Climate/durability-related distresses, such as transverse cracking, may result from a combination of freeze/thaw cycling and oxidation (embrittlement) of the asphalt layer. The cause(s) of “other” distresses may be determined through a combination of coring, boring, and material testing.

In addition to PCI values, IRI values were determined for each of the Village’s roadways. IRI values, reported in inches per mile, describe the amount of roughness in both wheel paths over a given length of pavement. The IRI is a standard measure of roughness used worldwide. The Village’s IRI assessment scale is shown in Table 8.

Table 8: Village’s IRI assessment criteria.

Category	IRI Value
Smooth	0-200
Marginal	201-400
Rough	>401

At the time of G&AI’s inspection, the Village’s pavements were found to be in overall “marginally rough” condition, with an average IRI of 336. Detailed condition maps can be found in Appendix A.

It is worth noting that IRI and PCI values do not necessarily correlate with one another. A roadway can ride well yet still be structurally deficient and in need of major M&R, and vice versa. For example, asphalt-surfaced roadways supported by structurally adequate base (e.g., crushed rock) and subgrade (e.g., existing soil) layers may exhibit extensive cracking in the asphalt surface layer due to fatigue failure of the asphalt. In situations such as these, removal of the existing asphalt layer and replacement with a thicker layer may be enough to rehabilitate the pavement. Conversely, a roadway that rides poorly may be structurally adequate and may only require minimal rehabilitation. Poor construction practices may unfortunately lead to roughness being “built into” an otherwise structurally adequate roadway at the time of construction. Roadways exhibiting this type of roughness may require grinding and/or an additional surface course to remedy the issue.

5.7 Example pavement conditions through the Village

Figure 11 illustrates a variety of pavement conditions observed throughout the Village during the pavement condition survey. The figure includes PCI and IRI values for each pavement section along with observed distress types and recommended M&R.

	Location + History	PCI *(IRI)*	Recommended M&R Activity (Typical)
	H. J. Rogowski *(Section 10)* *Last resurfacing date 2007*	72 *(549)*	Preventive maintenance *Seal cracks as well as paving lane joint and joints between pavement and curb and gutter + surface treatment.*
	116th Pl. *(Section 10)* *Last resurfacing date 2007*	58 *(426)*	Preventive maintenance *Seal cracks as well as paving lane joint and joints between pavement and curb and gutter + surface treatment.*
	Meadow Ln. *(Section 50)* *Last resurfacing date 2007*	49 *(354)*	Major M&R *Localized structural patching + cold mill and overlay.*
	Troy Ave. *(Section 20)* *Last resurfacing date 2000*	28 *(523)*	Major M&R *Localized structural patching + cold mill and overlay or reconstruction*
	114th St. *(Section 10)* *Last resurfacing date 2000*	25 *(615)*	Major M&R *Reconstruction*

	Merrion Ln. *(Section 10)* *Last resurfacing date 1986*	24 *(493)*	Major M&R *Reconstruction*

Figure 11. Pavement conditions observed during PCI inspection.

A distress observed on some of the Village’s pavements was unsealed paving lane seams (cracks), as shown in several of the photos above. If left unsealed, paving lane seams can deteriorate rapidly and significantly reduce the life of the pavement. By sealing paving lane seams immediately following paving and routinely resealing them, this type of deterioration may be minimized or prevented.

5.8 Summary

This section presented an overview of the methodology used to perform the 2019/2020 pavement condition survey and the results of the survey. A state-of-the-art PathRunner pavement condition survey system was deployed to collect pavement imagery and profile data on the Village’s roadways. The collected data were analyzed, and PCI values and IRI values were determined for each of the roadways surveyed. The Village’s roadways were found to be in overall “poor” condition with an average PCI of 44. Furthermore, the Village’s roadways were found to be in overall “marginally rough” condition, with an average IRI of 336 inches/mile.

6 MAINTENANCE AND REHABILITATION FUNDING ANALYSES

6.1 Foreword

This section discusses the third task of this project: M&R needs analyses. This section discusses the results of the analyses performed for the Village's consideration, assumptions which shaped the analyses, and results of the analyses. The recommendations of these analyses are provided in this section and in Appendixes A through D.

6.2 Objective

The M&R Planning module in PAVER provides *raw recommendations* of when and where pavement M&R activities are needed and approximately how much they will cost. The Village should use these raw recommendations to develop programmatic M&R plans for the Village's roadway network. These programmatic plans may be generated based on anticipated annual funding or with the goal of maintaining or achieving a desired pavement condition.

For the Village's roadways, two preliminary M&R analyses were performed:

- A series of **ten-year analyses** was performed to determine the impact of several funding levels on overall roadway conditions. The analyses included:
  - Assessing the impact of the Village's existing funding level.
  - Determining the annual funding level needed to maintain the Village's existing overall average roadway condition.
  - Determining the annual funding level needed to modestly increase the Village's overall average roadway condition to approximately 65.
  - Determining the annual funding level needed to eliminate the Village's major M&R backlog over a ten-year period.
- A **one-year analysis** was performed to identify pavements that may benefit from preventive maintenance activities, such as crack sealing or localized patching. Only pavements with a PCI of 65 or better were considered in this analysis.

The purpose of these analyses is to determine the appropriate funding level needed to manage the Village's roadways and provide general recommendations that will assist the Village in developing and evolving its M&R program. Additional analyses may be performed to assess either the impact of anticipated funding levels or to determine the funding levels needed to achieve a desired overall, network-average condition.

6.3 Assumptions

The M&R analyses were based on the results of the fall of 2019 and spring of 2020 Pavement Condition Index (PCI) survey and the pavement inventory and historical work records provided by the Village and stored in the Village's PAVER database. The following assumptions were made in our analyses.

- Pavements considered candidates for preventive maintenance were determined based on their overall PCI values and the distresses observed on the pavement at the time of inspection. Pavements with PCI values of 65 or better were considered candidates for preventive maintenance.
- Recommended preventive maintenance policies for asphalt and concrete pavements are shown in Appendix C Tables C-1 and C-2, respectively. The policy tables show what type of repair activity should be applied to each distress type and severity combination. Table D-3

presents estimated unit costs for the maintenance activities recommended in tables D-1 and D-2.

- A pavement deterioration rate of roughly seven points per year was used based on the performance of the Village's resurfaced roads, which equates to a pavement life between resurfacings of approximately six years. This deterioration rate will be refined as more historical work records are entered in PAVER and more PCI inspection data become available over time.
- A Critical PCI value (the PCI value below which a pavement is considered a candidate for major M&R) of 55 was assumed for all pavement sections. Pavements at or below the Critical PCI during the ten-year analysis period triggered major M&R recommendations. *(Note: A PCI value of 55 has been initially chosen for all the Village's roadways as this numerical value straddles the "Fair" to "Poor" condition categories in the Village's PCI scale. Performing major M&R on pavements that are closer to a PCI of 55, rather than waiting for these pavements to deteriorate further is generally more cost effective.)*
- Unit costs used in these analyses were based on bid tabs provided by the Village and by costs reported by nearby municipalities.
  - ✓ Asphalt resurfacing ranged from approximately $1.50 to more than $5.00 a square foot depending roadway condition (i.e., lower PCI values may result in more patching and thicker resurfacing). Reconstruction was set at $6.50 a square foot.
  - ✓ Concrete slab replacement costs ranged from $5.00 to $15.00 a square foot depending on roadway condition (i.e., lower PCI values result in more slab replacement). Reconstruction was set at $20.00 a square foot.
- All analyses began in the fall of 2020 (November 1 start date), and an inflation rate of 3% was assumed.

6.4 Results

The results of the PAVER M&R analyses are shown in the following two figures. Figure 12 illustrates the estimated ten-year change in pavement condition resulting from the analyzed funding scenarios, and Figure 13 depicts the estimated change in the Village's major M&R backlog for each funding scenario.

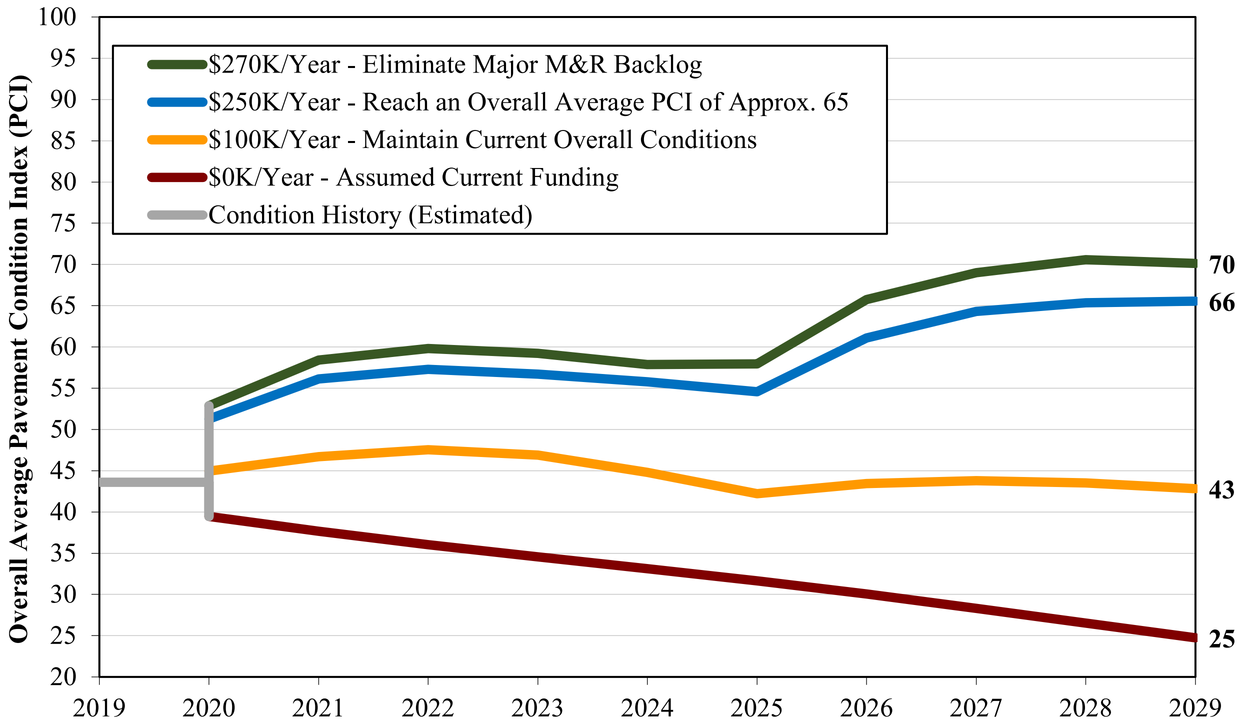


Figure 12: Impact of funding levels on overall pavement conditions by year.

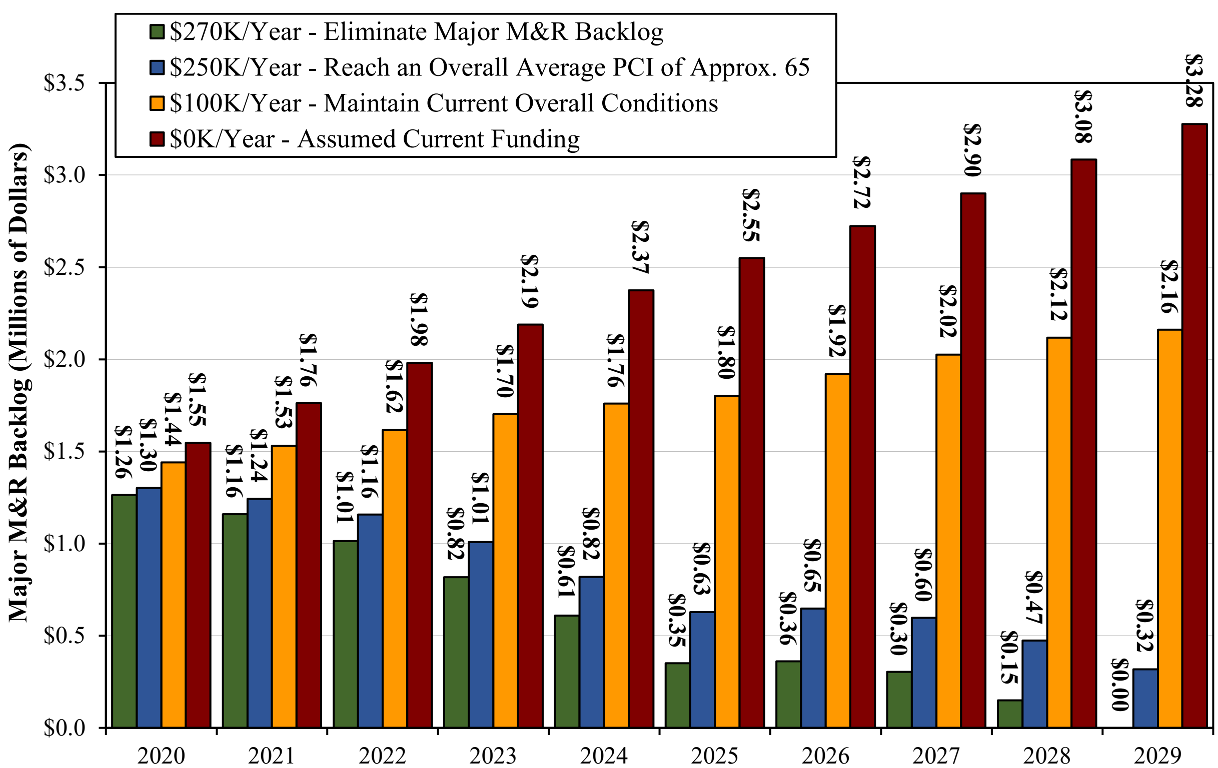


Figure 13: Impact of funding levels on major M&R backlog by year.

The consequences of the annual funding scenarios are shown in Table 9. This table illustrates the concept of "total cost." By treating both the total annual M&R expenditures and the remaining major M&R backlog at the end of the ten-year period as costs to the Village, the benefit of increasing annual funding – which results in a smaller major M&R backlog – is clearly illustrated. Consequently, eliminating the major M&R backlog over a ten-year period results in the lowest total cost to the Village.

Table 9. Estimated Ten-year Pavement M&R Costs

Funding Scenario	Total Ten-Year M&R Costs (2020-2029)	Remaining M&R Backlog[1)] (2029)	Total Ten-year Cost[2)]	Projected PCI (2029)
$0M/YR (Assumed Current Funding)	$0.0M	$3.3M	$3.3M	25
Maintain Existing Overall Average Conditions ($100K/YR)	$1.0M	$2.2M	$3.2M	43
Increase Overall Average PCI to Approximately 65 ($250K/YR)	$2.5M	$0.3M	$2.8M	66
Backlog Elimination ($270K/YR)	$2.7M	$0.0M	$2.7M	70

1) "M&R Backlog" equals the lump-sum cost to resurface/reconstruct all pavements at or below their critical PCI value.
2) "Total ten-year cost" equals the sum of the ten-year major M&R expenditures plus the remaining major M&R backlog at the end of the ten-year analysis period.

Appendix A map A-5 presents major M&R recommendations over the upcoming ten years given an unlimited budget. The map shows which roadways are recommended each year by PAVER. These recommendations do not consider geographic proximity. Consequently, these recommendations should be grouped into practical projects during the Village's planning process.

Map A-6 shows all roads that are candidates for preventive maintenance, such as crack sealing and localized patching. While crack sealing can be an effective treatment for preserving roadways in good condition, its utility diminishes when applied to roadways that are already in poor condition or are exhibiting signs of structural failure.

Appendix B presents tabular data showing the estimated cost to repair each of the roads recommended for major M&R over the next ten years assuming unlimited funding. *The costs presented in Appendix B should be considered rough estimates only and should not be considered engineering estimates.* These costs are based on a simple relationship between predicted PCI value and typical level of major M&R. Unit costs used in developing these relationships were based on bid tabs provided by the Village and by costs reported by neighboring municipalities.

Appendix D presents tabular data showing one-year estimated costs to apply preventive maintenance to each of the candidate roadways (i.e., roadways with PCI values of 65 or better). The total one-year preventive maintenance cost is estimated to be approximately $7,000, as shown in Table 10. *The estimated costs presented in Appendix D should be considered rough estimates based on the assumed unit costs only and should not be considered engineering estimates.*

Table 10. Preventive Maintenance Summary

Maintenance Type	Quantity	Units	Est. Cost
Crack Sealing - AC	547	FT	$547
Patching - AC Deep	574	SF	$6,315
		Total:	**$6,862**

7 SUMMARY AND RECOMMENDATIONS

7.1 Summary

A pavement condition survey was performed in the fall of 2019 and spring of 2020 on the Village’s roadways. The results of the survey provide a snapshot of roadway conditions at the time of the survey. PAVER was implemented for the Village’s roadways and was populated with collected pavement condition data and available M&R history data provided by the Village.

For the Village to get the most return on investment out of PAVER, the system must be considered a living entity and be updated regularly with M&R activities as they are performed, M&R unit cost data, and routinely collected pavement condition data. With such attention, PAVER becomes a repository of accurate, up-to-date data and can aid the Village in more cost-effectively programming M&R funding and objectively analyzing the true cost-effectiveness of presently employed M&R activities.

Ten-year M&R funding analyses were performed on the Village’s roadways using PAVER to: 1) evaluate the adequacy of the Village’s existing funding level, 2) estimate the funding level needed to maintain the Village’s existing roadway conditions, 3) estimate the funding level needed to modestly raise the overall condition of the Village’s roadways, and 4) estimate the funding level needed to eliminate the Village’s backlog of major M&R.

It was determined that the Village’s existing funding level for major M&R is inadequate to maintain the current condition of the Village’s roadway pavements. To maintain existing conditions, an increase in funding will be needed.

Based on this initial set of PCI data collection and analysis on the Village’s roadways, G&AI respectfully offers the following broad recommendations.

7.2 Recommendations

7.2.1 Implement pavement preservation techniques

As discussed in Section 2.6, preventive maintenance activities, such as crack sealing, localized patching, and surface treatments, can cost-effectively extend the life of a pavement. The Village should incorporate these strategies into its M&R planning.

The Village does not appear to have an active crack sealing program for its roadways. Moisture penetrates unsealed cracks and compromises the base structure of the pavement. Freeze/thaw cycling exacerbates the damage. Sealing cracks on roadways that are in relatively good condition is a simple, cost-effective method for pavement preservation. Crack sealing is a preventive maintenance activity and should not be applied on roadways that require major M&R.

Furthermore, the Village should focus on applying routine preventive maintenance to newly resurfaced or reconstructed roadways. It was observed that some paving lane seams throughout the Village had not been sealed. Like crack sealing, sealing the paving lane seams is a simple method for pavement preservation, and it may be included in construction specifications.

7.2.2 Determine when pavements should be reconstructed rather than resurfaced

As the Village’s asphalt-surfaced pavements age and are resurfaced multiple times, the performance of successive resurfacing projects will diminish. These “diminishing returns” occur because the sublayers of the pavement (the pavement structure below the asphalt surface) continue to deteriorate due to moisture infiltration, freeze-thaw damage, and damage due to vehicular loading. The M&R history and performance of resurfaced roadways should be closely tracked to determine the optimal number of resurfacing projects that may be performed prior to reconstructing the pavement.

7.2.3 Perform regular pavement condition inspections – every three years

To capitalize on the pavement condition survey and better track the condition of its pavements, the Village should continue to perform PCI surveys on a regular, three-year cycle. Doing so will enable the Village to:

1. Better track the deterioration of its pavements over time,
2. Identify pavement deterioration trends and use these trends to better predict future pavement conditions and then strategically apply M&R funding, and
3. Assess and track the effectiveness of its pavement preservation and major M&R activities.

The deterioration trends developed for this project were based on only one set of inspection data. Additional inspection data will help validate these trends and will improve forecasts, which may impact forecasted pavement conditions and recommended future M&R funding needs.

7.2.4 Routinely update PAVER

PAVER should be updated annually following the paving season to capture major M&R activities, routine maintenance activities, and pavement inventory changes (new roadways, jurisdictional changes, realignments). PAVER relies on updated inventory and work history data in order to generate meaningful recommendations.

7.2.5 Increase funding for pavement M&R

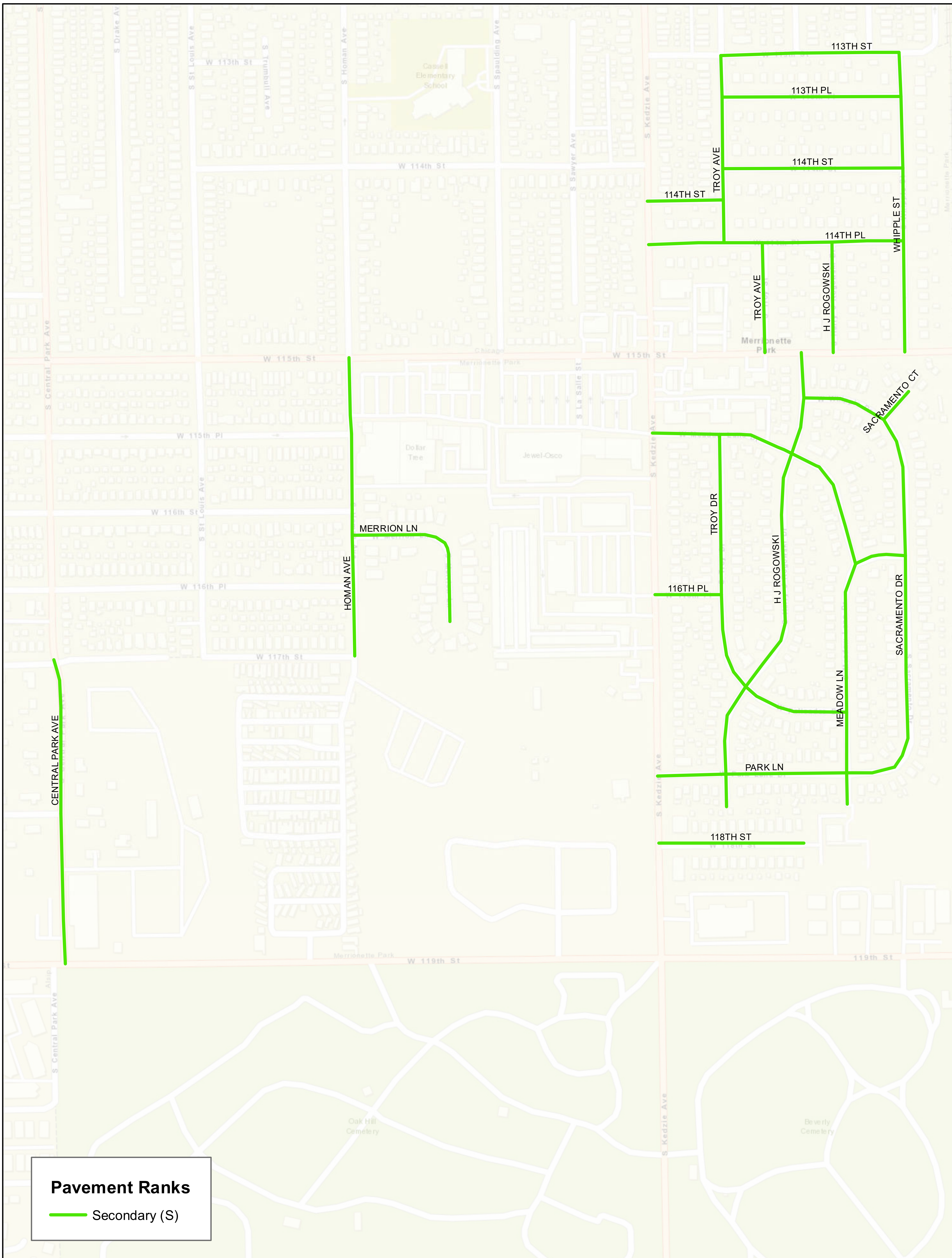
Based on the results of the pavement condition survey and forecasts of future pavement condition, the Village's current level of funding is inadequate to maintain the overall current condition of the Village's roadways. Managing a pavement network at an overall average PCI between 70 and 80 is more cost effective since funding is spent on less costly preventive maintenance and preservation activities rather than more expensive major M&R. As the Village moves forward, it is recommended that additional funding be allocated for M&R to improve the overall condition of the roadways so that they may be managed more cost-effectively.

7.2.6 Prioritize existing M&R funding to maximize shared benefit

Currently, the Village's roadway M&R funding needs exceed available funding. The Village should focus major M&R activities on its most trafficked roadways. Doing so will maximize the overall shared benefit of the funds spent.

APPENDIX A – PAVEMENT INVENTORY, CONDITION, AND RECOMMENDED M&R MAPS

Map A-1: Pavement Ranks
Map A-2: Pavement Surface Types
Map A-3: Pavement Condition Index (PCI) values
Map A-4: International Roughness Index (IRI) values
Map A-5: Ten-year major M&R recommendations – *Recommendations assuming current funding*
Map A-6: Ten-year major M&R recommendations – *Recommendations assuming unlimited funding*
Map A-7: Pavement preservation candidates – *Current recommendations*



Feet

0 350 700

Map A-1:
Pavement Ranks

Merrionette Park, Illinois

Pavement Management Program

Gorrondona & Associates, Inc.

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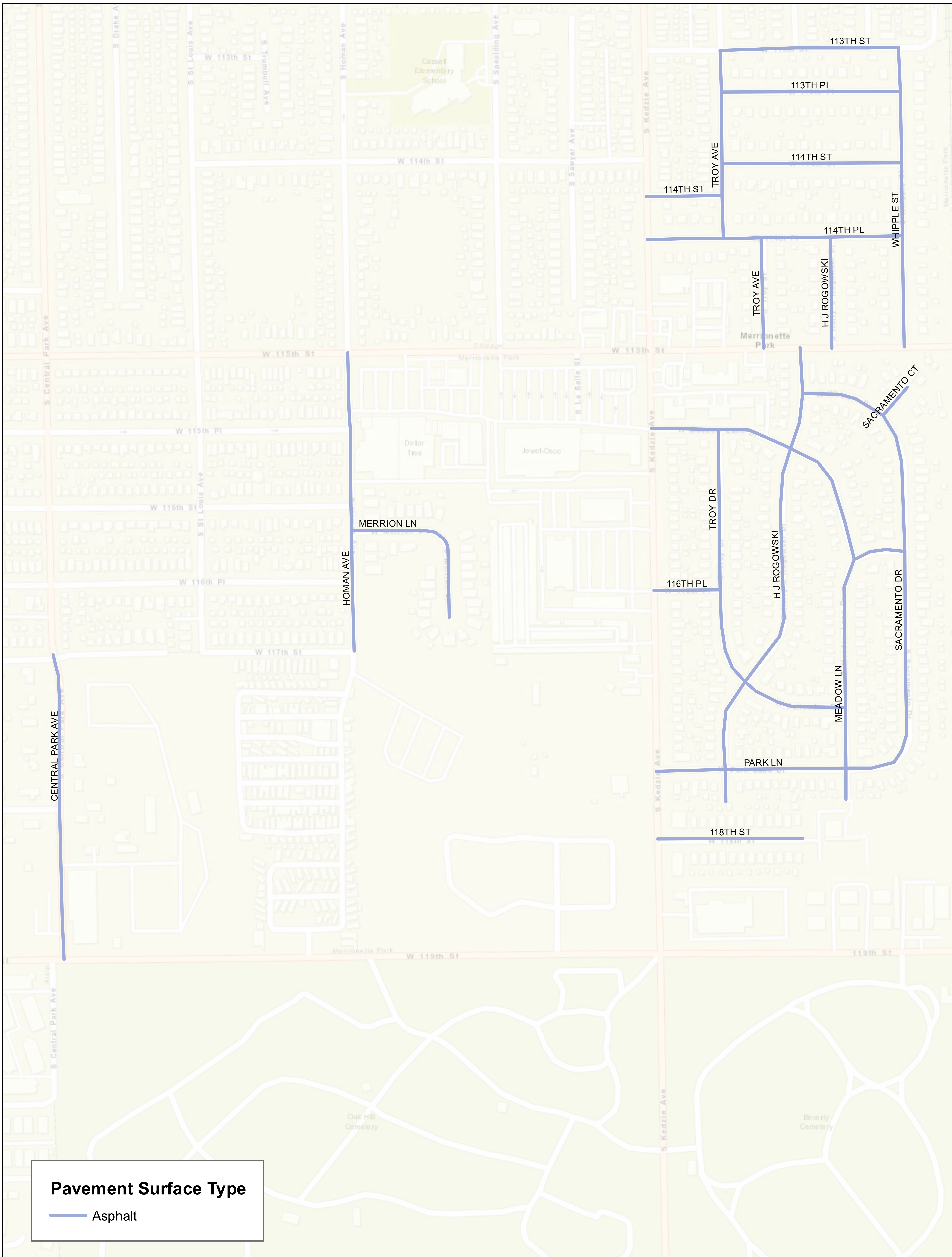

Feet

0 350 700

Map A-2:
Pavement Surface Types

Merrionette Park, Illinois

Pavement Management Program

Gorrondona & Associates, Inc.

Urban GIS
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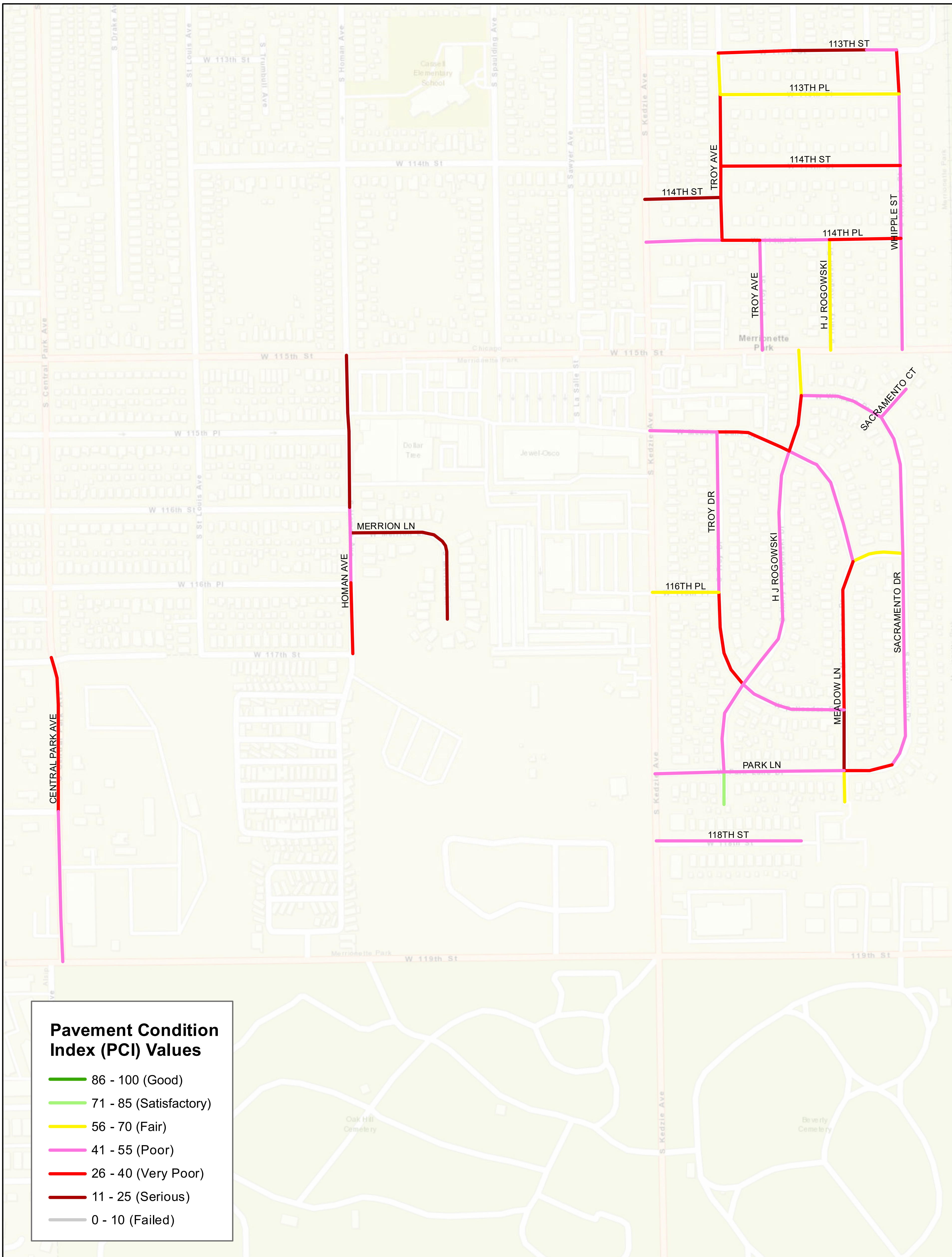

Feet
0 350 700

Map A-3:
Pavement Condition Index (PCI) Values

Merrionette Park, Illinois

Pavement Management Program

Gorrondona & Associates, Inc.

Urban GIS
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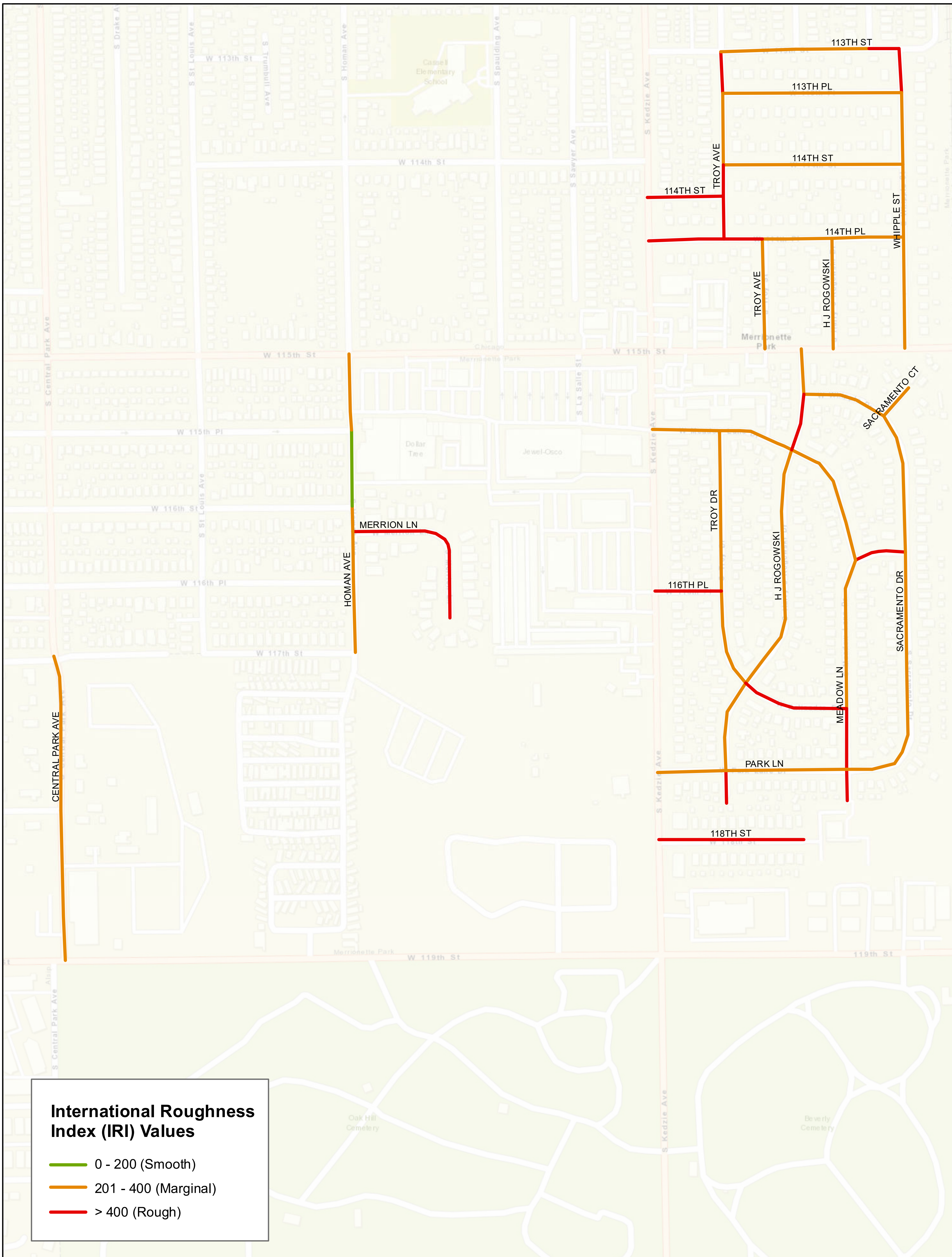

N

Feet

0 350 700

Map A-4:
International Roughness Index (IRI) Values

Merrionette Park, Illinois

Pavement Management Program

Gorrondona & Associates, Inc.

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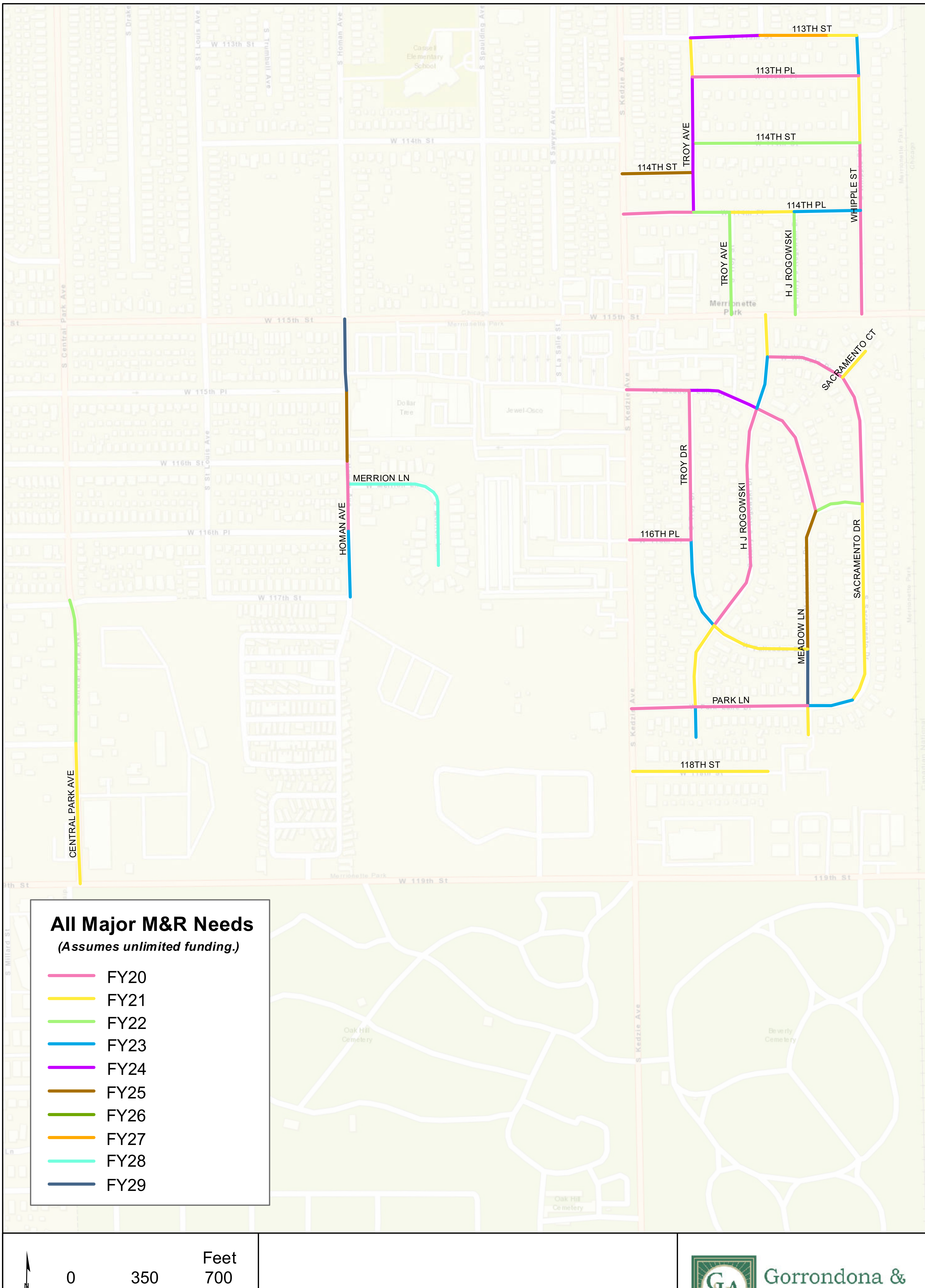

Map A-5:
All Major M&R Needs
(Assumes unlimited funding.)

Merrionette Park, Illinois

Pavement Management Program

Gorrondona & Associates, Inc.

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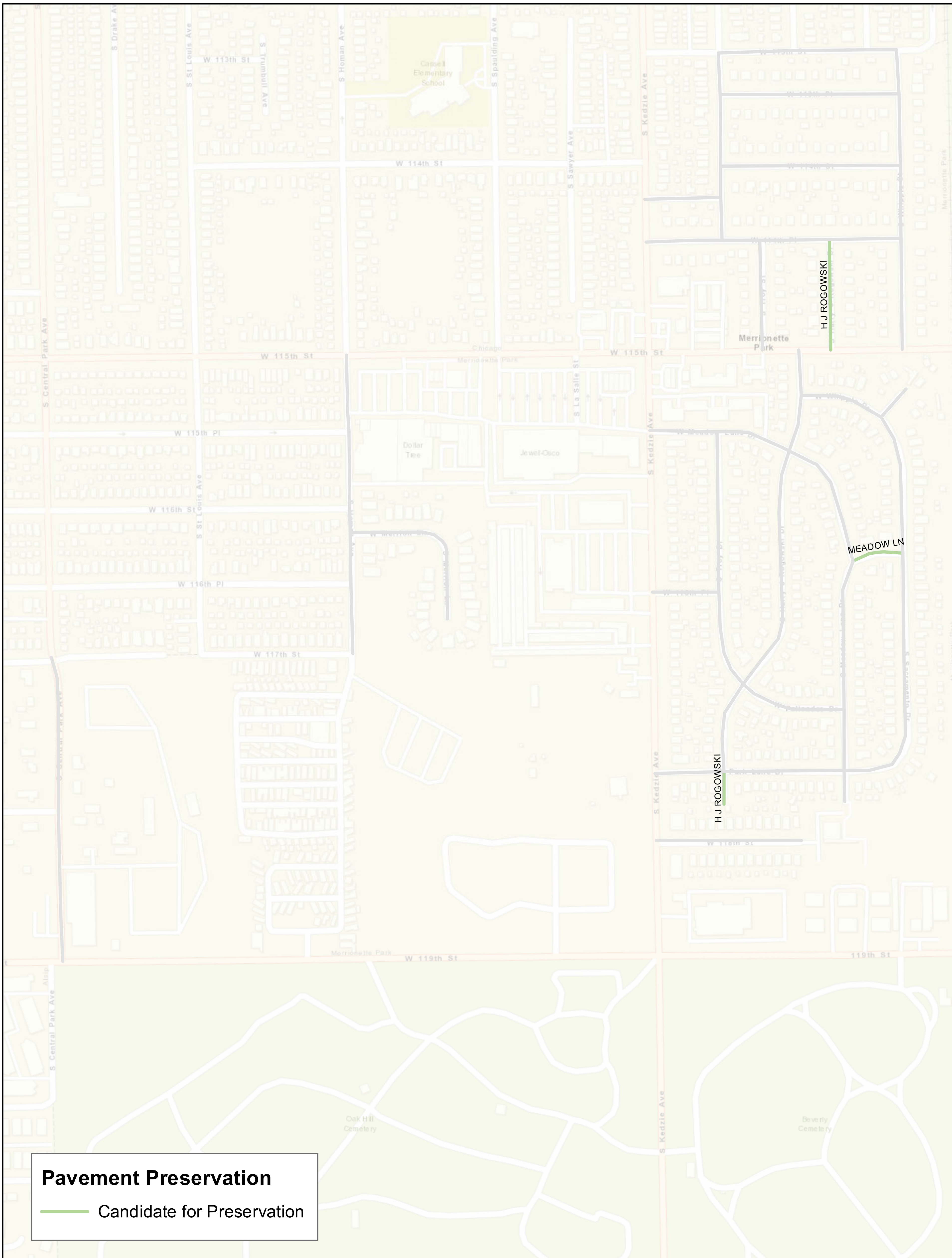

Feet
0 350 700

Map A-6:
Pavement Preservation
Candidates

Merrionette Park, Illinois

Pavement Management Program

Gorrondona & Associates, Inc.

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APPENDIX B – TABULATED TEN-YEAR MAJOR M&R RECOMMENDATIONS AND ESTIMATED COSTS – *ASSUMING UNLIMITED FUNDING*

Pavement ID	Road Name	From	To	Area	PCI	Year	Cost
MTPK::113TH PL::10	113TH PLACE	TROY AVENUE	WHIPPLE STREET	20,499	53	2020	$26,341
MTPK::114TH PL::10	114TH PLACE	KEDZIE AVENUE	TROY AVENUE	8,673	52	2020	$11,633
MTPK::116TH PL::10	116TH PLACE	KEDZIE AVENUE	TROY DRIVE	7,614	54	2020	$8,909
MTPK::H J RGWSK::30	H J ROGOWSKI	PALISADE DRIVE	MEADOW LANE	28,289	47	2020	$51,182
MTPK::HMN AV::20	HOMAN AVENUE	116TH PLACE	MERRION LANE	7,317	50	2020	$11,030
MTPK::HMN AV::30	HOMAN AVENUE	MERRION LANE	116TH STREET	3,672	52	2020	$4,925
MTPK::MDW LN::50	MEADOW LANE	H J ROGOWSKI	MEADOW LANE	15,538	48	2020	$26,544
MTPK::MDW LN::70	MEADOW LANE	KEDZIE AVENUE	TROY DRIVE	7,686	51	2020	$11,157
MTPK::PRK LN::10	PARK LANE	KEDZIE AVENUE	H J ROGOWSKI	7,874	51	2020	$11,429
MTPK::PRK LN::20	PARK LANE	H J ROGOWSKI	MEADOW LANE	13,831	51	2020	$20,077
MTPK::SCRMNT DR::20	SACRAMENTO DRIVE	MEADOW LANE	SACRAMENTO COURT	16,071	50	2020	$24,225
MTPK::SCRMNT DR::30	SACRAMENTO DRIVE	SACRAMENTO COURT	H J ROGOWSKI	9,785	47	2020	$17,282
MTPK::TRY DR::20	TROY DRIVE	116TH PLACE	MEADOW LANE	18,393	48	2020	$31,422
MTPK::WHPPL ST::10	WHIPPLE STREET	115TH STREET	114TH PLACE	12,730	52	2020	$17,074
MTPK::WHPPL ST::20	WHIPPLE STREET	114TH PLACE	114TH STREET	8,347	52	2020	$11,195
MTPK::113TH ST::30	113TH STREET	WHIPPLE STREET	WHIPPLE STREET	3,452	47	2021	$6,436
MTPK::114TH PL::30	114TH PLACE	TROY AVENUE	H J ROGOWSKI	7,978	37	2021	$27,465
MTPK::118TH ST::10	118TH STREET	KEDZIE AVENUE	END	16,653	47	2021	$31,050
MTPK::CTL PK AVE::10	CENTRAL PARK AVENUE	119TH STREET	118TH STREET	19,897	39	2021	$56,666
MTPK::H J RGWSK::20	H J ROGOWSKI	PARK LANE	PALISADE DRIVE	10,722	41	2021	$26,527
MTPK::H J RGWSK::50	H J ROGOWSKI	SACRAMENTO DRIVE	115TH STREET	5,242	53	2021	$7,047
MTPK::MDW LN::10	MEADOW LANE	PARK LANE	END	3,571	53	2021	$4,641
MTPK::PLSD DR::10	PALISADE DRIVE	MEADOW LANE	H J ROGOWSKI	12,308	47	2021	$22,949
MTPK::SCRMNT CT::10	SACRAMENTO COURT	SACRAMENTO DRIVE	END	4,271	38	2021	$13,627
MTPK::SCRMNT DR::10	SACRAMENTO DRIVE	PARK LANE	MEADOW LANE	24,569	43	2021	$54,968
MTPK::TRY AVE::40	TROY AVENUE	113TH PLACE	113TH STREET	4,798	52	2021	$6,661
MTPK::WHPPL ST::30	WHIPPLE STREET	114TH STREET	113TH PLACE	8,201	37	2021	$28,235
MTPK::114TH PL::20	114TH PLACE	TROY AVENUE	TROY AVENUE	4,373	33	2022	$20,044
MTPK::114TH ST::20	114TH STREET	TROY AVENUE	WHIPPLE STREET	20,579	33	2022	$94,315
MTPK::CTL PK AVE::20	CENTRAL PARK AVENUE	118TH STREET	117TH STREET	20,459	33	2022	$93,768
MTPK::H J RGWSK::60	H J ROGOWSKI	115TH STREET	114TH PLACE	12,711	55	2022	$15,505
MTPK::MDW LN::40	MEADOW LANE	MEADOW LANE	SACRAMENTO DRIVE	5,979	52	2022	$8,408
MTPK::TRY AVE::10	TROY AVENUE	115TH STREET	114TH PLACE	12,619	33	2022	$55,289
MTPK::114TH PL::40	114TH PLACE	H J ROGOWSKI	WHIPPLE STREET	8,176	29	2023	$46,116
MTPK::H J RGWSK::10	H J ROGOWSKI	PARK LANE	END	3,717	52	2023	$5,368
MTPK::H J RGWSK::40	H J ROGOWSKI	MEADOW LANE	SACRAMENTO DRIVE	6,528	27	2023	$38,961
MTPK::HMN AV::10	HOMAN AVENUE	117TH STREET	116TH PLACE	10,287	29	2023	$58,029
MTPK::PRK LN::30	PARK LANE	MEADOW LANE	SACRAMENTO DRIVE	5,565	30	2023	$29,796
MTPK::TRY DR::10	TROY DRIVE	H J ROGOWSKI	116TH PLACE	11,276	28	2023	$65,456
MTPK::WHPPL ST::40	WHIPPLE STREET	113TH PLACE	113TH STREET	5,044	29	2023	$28,450
MTPK::113TH ST::10	113TH STREET	TROY AVENUE	ALBANY AVENUE	8,536	22	2024	$60,157
MTPK::MDW LN::60	MEADOW LANE	TROY DRIVE	H J ROGOWSKI	8,770	21	2024	$63,289
MTPK::TRY AVE::20	TROY AVENUE	114TH PLACE	114TH STREET	4,900	17	2024	$35,852
MTPK::TRY AVE::25	TROY AVENUE	114TH STREET	114TH STREET	3,634	16	2024	$26,588
MTPK::TRY AVE::30	TROY AVENUE	114TH STREET	113TH PLACE	8,171	21	2024	$58,970
MTPK::114TH ST::10	114TH STREET	KEDZIE AVENUE	TROY AVENUE	8,739	11	2025	$65,855
MTPK::HMN AV::40	HOMAN AVENUE	116TH STREET	115TH PLACE	11,050	10	2025	$83,270
MTPK::MDW LN::30	MEADOW LANE	MEADOW LANE	PALISADE DRIVE	17,151	16	2025	$129,250
MTPK::113TH PL::10	113TH PLACE	TROY AVENUE	WHIPPLE STREET	20,499	55	2026	$28,255
MTPK::114TH PL::10	114TH PLACE	KEDZIE AVENUE	TROY AVENUE	8,673	55	2026	$11,954
MTPK::116TH PL::10	116TH PLACE	KEDZIE AVENUE	TROY DRIVE	7,614	55	2026	$10,494
MTPK::H J RGWSK::30	H J ROGOWSKI	PALISADE DRIVE	MEADOW LANE	28,289	55	2026	$38,991
MTPK::HMN AV::20	HOMAN AVENUE	116TH PLACE	MERRION LANE	7,317	55	2026	$10,086
MTPK::HMN AV::30	HOMAN AVENUE	MERRION LANE	116TH STREET	3,672	55	2026	$5,061
MTPK::MDW LN::50	MEADOW LANE	H J ROGOWSKI	MEADOW LANE	15,538	55	2026	$21,417
MTPK::MDW LN::70	MEADOW LANE	KEDZIE AVENUE	TROY DRIVE	7,686	55	2026	$10,594
MTPK::PRK LN::10	PARK LANE	KEDZIE AVENUE	H J ROGOWSKI	7,874	55	2026	$10,853
MTPK::PRK LN::20	PARK LANE	H J ROGOWSKI	MEADOW LANE	13,831	55	2026	$19,064

Pavement ID	Road Name	From	To	Area	PCI	Year	Cost
MTPK::SCRMNT DR::20	SACRAMENTO DRIVE	MEADOW LANE	SACRAMENTO COURT	16,071	55	2026	$22,151
MTPK::SCRMNT DR::30	SACRAMENTO DRIVE	SACRAMENTO COURT	H J ROGOWSKI	9,785	55	2026	$13,486
MTPK::TRY DR::20	TROY DRIVE	116TH PLACE	MEADOW LANE	18,393	55	2026	$25,352
MTPK::WHPPL ST::10	WHIPPLE STREET	115TH STREET	114TH PLACE	12,730	55	2026	$17,547
MTPK::WHPPL ST::20	WHIPPLE STREET	114TH PLACE	114TH STREET	8,347	55	2026	$11,505
MTPK::113TH ST::20	113TH STREET	ALBANY AVENUE	WHIPPLE STREET	8,445	6	2027	$67,512
MTPK::113TH ST::30	113TH STREET	WHIPPLE STREET	WHIPPLE STREET	3,452	55	2027	$4,901
MTPK::114TH PL::30	114TH PLACE	TROY AVENUE	H J ROGOWSKI	7,978	55	2027	$11,326
MTPK::118TH ST::10	118TH STREET	KEDZIE AVENUE	END	16,653	55	2027	$23,642
MTPK::CTL PK AVE::10	CENTRAL PARK AVENUE	119TH STREET	118TH STREET	19,897	55	2027	$28,247
MTPK::H J RGWSK::20	H J ROGOWSKI	PARK LANE	PALISADE DRIVE	10,722	55	2027	$15,221
MTPK::H J RGWSK::50	H J ROGOWSKI	SACRAMENTO DRIVE	115TH STREET	5,242	55	2027	$7,441
MTPK::MDW LN::10	MEADOW LANE	PARK LANE	END	3,571	55	2027	$5,070
MTPK::PLSD DR::10	PALISADE DRIVE	MEADOW LANE	H J ROGOWSKI	12,308	55	2027	$17,473
MTPK::SCRMNT CT::10	SACRAMENTO COURT	SACRAMENTO DRIVE	END	4,271	55	2027	$6,064
MTPK::SCRMNT DR::10	SACRAMENTO DRIVE	PARK LANE	MEADOW LANE	24,569	55	2027	$34,880
MTPK::TRY AVE::40	TROY AVENUE	113TH PLACE	113TH STREET	4,798	55	2027	$6,811
MTPK::WHPPL ST::30	WHIPPLE STREET	114TH STREET	113TH PLACE	8,201	55	2027	$11,643
MTPK::114TH PL::20	114TH PLACE	TROY AVENUE	TROY AVENUE	4,373	55	2028	$6,399
MTPK::114TH ST::20	114TH STREET	TROY AVENUE	WHIPPLE STREET	20,579	55	2028	$30,111
MTPK::CTL PK AVE::20	CENTRAL PARK AVENUE	118TH STREET	117TH STREET	20,459	55	2028	$29,937
MTPK::H J RGWSK::60	H J ROGOWSKI	115TH STREET	114TH PLACE	12,711	55	2028	$18,599
MTPK::MDW LN::40	MEADOW LANE	MEADOW LANE	SACRAMENTO DRIVE	5,979	55	2028	$8,749
MTPK::MRRN LN::10	MERRION LANE	HOMAN AVENUE	END	19,932	3	2028	$164,133
MTPK::TRY AVE::10	TROY AVENUE	115TH STREET	114TH PLACE	12,619	55	2028	$18,464
MTPK::114TH PL::40	114TH PLACE	H J ROGOWSKI	WHIPPLE STREET	8,176	55	2029	$12,322
MTPK::H J RGWSK::10	H J ROGOWSKI	PARK LANE	END	3,717	55	2029	$5,602
MTPK::H J RGWSK::40	H J ROGOWSKI	MEADOW LANE	SACRAMENTO DRIVE	6,528	55	2029	$9,838
MTPK::HMN AV::10	HOMAN AVENUE	117TH STREET	116TH PLACE	10,287	55	2029	$15,504
MTPK::HMN AV::50	HOMAN AVENUE	115TH PLACE	115TH STREET	11,101	0	2029	$94,156
MTPK::MDW LN::20	MEADOW LANE	PALISADE DRIVE	PARK LANE	6,976	0	2029	$59,170
MTPK::PRK LN::30	PARK LANE	MEADOW LANE	SACRAMENTO DRIVE	5,565	55	2029	$8,387
MTPK::TRY DR::10	TROY DRIVE	H J ROGOWSKI	116TH PLACE	11,276	55	2029	$16,995
MTPK::WHPPL ST::40	WHIPPLE STREET	113TH PLACE	113TH STREET	5,044	55	2029	$7,602

APPENDIX C – PAVEMENT MAINTENANCE POLICIES AND UNIT COSTS

Table C-1. Recommended Asphalt Pavement Maintenance Policy.

Pavement Distress	Severity	Recommended Maintenance Type	Units
Alligator Cracking	Low	Crack Sealing	FT
Alligator Cracking	Medium	Patching - AC Deep	SF
Alligator Cracking	High	Patching - AC Deep	SF
Block Cracking	Low	Crack Sealing - AC	FT
Block Cracking	Medium	Crack Sealing - AC	FT
Block Cracking	High	Patching - AC Shallow	SF
Bumps and Sags	Medium	Patching - AC Shallow	SF
Bumps and Sags	High	Patching - AC Deep	SF
Corrugation	Medium	Patching - AC Shallow	SF
Corrugation	High	Patching - AC Deep	SF
Depressions	Medium	Patching - AC Deep	SF
Depressions	High	Patching - AC Deep	SF
Edge Cracking	Low	Crack Sealing - AC	FT
Edge Cracking	Medium	Crack Sealing - AC	FT
Edge Cracking	High	Patching - AC Shallow	SF
Joint Reflection Cracking	Low	Crack Sealing - AC	FT
Joint Reflection Cracking	Medium	Crack Sealing - AC	FT
Joint Reflection Cracking	High	Patching - AC Shallow	SF
Lane/Shoulder Dropoff	Medium	Shoulder leveling	FT
Lane/Shoulder Dropoff	High	Shoulder leveling	FT
Long. and Trans. Cracking	Low	Crack Sealing - AC	FT
Long. and Trans. Cracking	Medium	Crack Sealing - AC	FT
Long. and Trans. Cracking	High	Patching - AC Shallow	SF
Patching and Utility Cuts	High	Patching - AC Deep	SF
Potholes	Low	Patching - AC Deep	SF
Potholes	Medium	Patching - AC Deep	SF
Potholes	High	Patching - AC Deep	SF
Rutting	Medium	Patching - AC Shallow	SF
Rutting	High	Patching - AC Deep	SF
Shoving	Medium	Grinding (Localized)	FT
Shoving	High	Grinding (Localized)	FT
Slippage Cracking	Low	Crack Sealing - AC	FT
Slippage Cracking	Medium	Patching - AC Shallow	SF
Slippage Cracking	High	Patching - AC Shallow	SF

Table C-2. Recommended Concrete Pavement Maintenance Policy.

Pavement Distress	Severity	Recommended Maintenance Type	Units
Blow ups	Medium	Patching - PCC Full Depth	SF
Blow ups	High	Patching - PCC Full Depth	SF
Corner Breaks	Low	Crack Sealing - PCC	FT
Corner Breaks	Medium	Patching - PCC Full Depth	FT
Corner Breaks	High	Patching - PCC Full Depth	SF
Divided (Shattered) Slabs	Low	Crack Sealing - PCC	FT
Divided (Shattered) Slabs	Medium	Slab Replacement - PCC	SF
Divided (Shattered) Slabs	High	Slab Replacement - PCC	SF
Durability (D) Cracking	Medium	Patching - PCC Full Depth	SF
Durability (D) Cracking	High	Slab Replacement - PCC	SF
Faulting	Medium	Grinding (Localized)	FT
Faulting	High	Grinding (Localized)	FT
Joint Seal Damage	Medium	Joint Seal (Localized)	FT
Joint Seal Damage	High	Joint Seal (Localized)	FT
Lane/Shoulder Dropoff	Medium	Shoulder leveling	FT
Lane/Shoulder Dropoff	High	Shoulder leveling	FT
Linear Cracking	Low	Crack Sealing - PCC	FT
Linear Cracking	Medium	Crack Sealing - PCC	FT
Linear Cracking	High	Patching - PCC Partial Depth	SF
Patches, Large	High	Patching - PCC Full Depth	SF
Patches, Small	High	Patching - PCC Partial Depth	SF
Punchouts	Medium	Patching - PCC Full Depth	SF
Punchouts	High	Slab Replacement - PCC	SF
Scaling	High	Slab Replacement - PCC	SF
Corner Spalls	Medium	Patching - PCC Partial Depth	SF
Corner Spalls	High	Patching - PCC Partial Depth	SF
Joint Spalls	Medium	Patching - PCC Partial Depth	SF
Joint Spalls	High	Patching - PCC Partial Depth	SF

Table C-3. Estimate Unit Cost for Maintenance Activities.

Maintenance Type	Est. Unit Cost	Units
Crack Sealing - AC	$1.00	FT
Joint Seal - Silicon	$2.75	FT
Crack Sealing - PCC	$1.50	FT
Grinding (Localized)	$4.00	FT
Joint Seal (Localized)	$1.50	FT
Patching - AC Deep	$11.00	SF
Patching - AC Leveling	$1.20	SF
Patching - AC Shallow	$5.50	SF
Patching - PCC Full Depth	$30.00	SF
Patching - PCC Partial Depth	$7.00	SF
Shoulder leveling	$1.20	FT
Slab Replacement - PCC	$20.00	SF

APPENDIX D – TABULATED PREVENTIVE MAINTENANCE RECOMMENDATIONS

Pavement ID	Road Name	From	To	Area	Distress Type	Density	Maint. Activity	Cost
MTPK::H J RGWSK::10	H J ROGOWSKI	PARK LANE	END	3,717	ALLIGATOR CR	0.6%	Crack Sealing - AC	$14
MTPK::H J RGWSK::10	H J ROGOWSKI	PARK LANE	END	3,717	L & T CR	0.7%	Crack Sealing - AC	$26
MTPK::H J RGWSK::10	H J ROGOWSKI	PARK LANE	END	3,717	ALLIGATOR CR	1.2%	Patching - AC Deep	$810
MTPK::H J RGWSK::60	H J ROGOWSKI	115TH STREET	114TH PLACE	12,711	ALLIGATOR CR	0.8%	Crack Sealing - AC	$43
MTPK::H J RGWSK::60	H J ROGOWSKI	115TH STREET	114TH PLACE	12,711	L & T CR	0.3%	Crack Sealing - AC	$43
MTPK::H J RGWSK::60	H J ROGOWSKI	115TH STREET	114TH PLACE	12,711	L & T CR	1.7%	Crack Sealing - AC	$216
MTPK::H J RGWSK::60	H J ROGOWSKI	115TH STREET	114TH PLACE	12,711	ALLIGATOR CR	2.1%	Patching - AC Deep	$3,700
MTPK::MDW LN::40	MEADOW LANE	MEADOW LANE	SACRAMENTO DRIVE	5,979	L & T CR	3.1%	Crack Sealing - AC	$184
MTPK::MDW LN::40	MEADOW LANE	MEADOW LANE	SACRAMENTO DRIVE	5,979	L & T CR	0.4%	Crack Sealing - AC	$21
MTPK::MDW LN::40	MEADOW LANE	MEADOW LANE	SACRAMENTO DRIVE	5,979	ALLIGATOR CR	2.0%	Patching - AC Deep	$1,805

APPENDIX E – PAVEMENT INVENTORY AND CONDITION TABULAR DATA

Pavement ID	Road Name	From	To	Surface	Rank	Length (FT)	Width (FT)	Area (SF)	PCI	IRI
MTPK::113TH PL::10	113TH PLACE	TROY AVENUE	WHIPPLE STREET	Asphalt	S	788	26	20,499	56	286
MTPK::113TH ST::10	113TH STREET	TROY AVENUE	ALBANY AVENUE	Asphalt	S	328	26	8,536	33	348
MTPK::113TH ST::20	113TH STREET	ALBANY AVENUE	WHIPPLE STREET	Asphalt	S	325	26	8,445	24	277
MTPK::113TH ST::30	113TH STREET	WHIPPLE STREET	WHIPPLE STREET	Asphalt	S	133	26	3,452	47	627
MTPK::114TH PL::10	114TH PLACE	KEDZIE AVENUE	TROY AVENUE	Asphalt	S	334	26	8,673	55	414
MTPK::114TH PL::20	114TH PLACE	TROY AVENUE	TROY AVENUE	Asphalt	S	168	26	4,373	40	501
MTPK::114TH PL::30	114TH PLACE	TROY AVENUE	H J ROGOWSKI	Asphalt	S	307	26	7,978	42	308
MTPK::114TH PL::40	114TH PLACE	H J ROGOWSKI	WHIPPLE STREET	Asphalt	S	314	26	8,176	38	330
MTPK::114TH ST::10	114TH STREET	KEDZIE AVENUE	TROY AVENUE	Asphalt	S	336	26	8,739	25	615
MTPK::114TH ST::20	114TH STREET	TROY AVENUE	WHIPPLE STREET	Asphalt	S	791	26	20,579	40	275
MTPK::116TH PL::10	116TH PLACE	KEDZIE AVENUE	TROY DRIVE	Asphalt	S	293	26	7,614	58	426
MTPK::118TH ST::10	118TH STREET	KEDZIE AVENUE	END	Asphalt	S	640	26	16,653	47	431
MTPK::CTL PK AVE::10	CENTRAL PARK AVENUE	119TH STREET	118TH STREET	Asphalt	S	663	30	19,897	44	353
MTPK::CTL PK AVE::20	CENTRAL PARK AVENUE	118TH STREET	117TH STREET	Asphalt	S	682	30	20,459	40	316
MTPK::H J RGWSK::10	H J ROGOWSKI	PARK LANE	END	Asphalt	S	143	26	3,717	72	549
MTPK::H J RGWSK::20	H J ROGOWSKI	PARK LANE	PALISADE DRIVE	Asphalt	S	412	26	10,722	45	349
MTPK::H J RGWSK::30	H J ROGOWSKI	PALISADE DRIVE	MEADOW LANE	Asphalt	S	1,088	26	28,289	47	231
MTPK::H J RGWSK::40	H J ROGOWSKI	MEADOW LANE	SACRAMENTO DRIVE	Asphalt	S	251	26	6,528	36	443
MTPK::H J RGWSK::50	H J ROGOWSKI	SACRAMENTO DRIVE	115TH STREET	Asphalt	S	202	26	5,242	60	283
MTPK::H J RGWSK::60	H J ROGOWSKI	115TH STREET	114TH PLACE	Asphalt	S	489	26	12,711	70	291
MTPK::HMN AV::10	HOMAN AVENUE	117TH STREET	116TH PLACE	Asphalt	S	312	33	10,287	38	242
MTPK::HMN AV::20	HOMAN AVENUE	116TH PLACE	MERRION LANE	Asphalt	S	222	33	7,317	52	211
MTPK::HMN AV::30	HOMAN AVENUE	MERRION LANE	116TH STREET	Asphalt	S	111	33	3,672	55	230
MTPK::HMN AV::40	HOMAN AVENUE	116TH STREET	115TH PLACE	Asphalt	S	335	33	11,050	24	184
MTPK::HMN AV::50	HOMAN AVENUE	115TH PLACE	115TH STREET	Asphalt	S	336	33	11,101	21	397
MTPK::MDW LN::10	MEADOW LANE	PARK LANE	END	Asphalt	S	137	26	3,571	61	599
MTPK::MDW LN::20	MEADOW LANE	PALISADE DRIVE	PARK LANE	Asphalt	S	268	26	6,976	20	532
MTPK::MDW LN::30	MEADOW LANE	MEADOW LANE	PALISADE DRIVE	Asphalt	S	660	26	17,151	30	326
MTPK::MDW LN::40	MEADOW LANE	MEADOW LANE	SACRAMENTO DRIVE	Asphalt	S	230	26	5,979	65	483
MTPK::MDW LN::50	MEADOW LANE	H J ROGOWSKI	MEADOW LANE	Asphalt	S	598	26	15,538	49	354
MTPK::MDW LN::60	MEADOW LANE	TROY DRIVE	H J ROGOWSKI	Asphalt	S	337	26	8,770	32	311
MTPK::MDW LN::70	MEADOW LANE	KEDZIE AVENUE	TROY DRIVE	Asphalt	S	296	26	7,686	53	266
MTPK::MRRN LN::10	MERRION LANE	HOMAN AVENUE	END	Asphalt	S	767	26	19,932	24	493
MTPK::PLSD DR::10	PALISADE DRIVE	MEADOW LANE	H J ROGOWSKI	Asphalt	S	473	26	12,308	47	410
MTPK::PRK LN::10	PARK LANE	KEDZIE AVENUE	H J ROGOWSKI	Asphalt	S	303	26	7,874	53	372
MTPK::PRK LN::20	PARK LANE	H J ROGOWSKI	MEADOW LANE	Asphalt	S	532	26	13,831	53	309
MTPK::PRK LN::30	PARK LANE	MEADOW LANE	SACRAMENTO DRIVE	Asphalt	S	214	26	5,565	40	290
MTPK::SCRMNT CT::10	SACRAMENTO COURT	SACRAMENTO DRIVE	END	Asphalt	S	164	26	4,271	43	205
MTPK::SCRMNT DR::10	SACRAMENTO DRIVE	PARK LANE	MEADOW LANE	Asphalt	S	945	26	24,569	46	313
MTPK::SCRMNT DR::20	SACRAMENTO DRIVE	MEADOW LANE	SACRAMENTO COURT	Asphalt	S	618	26	16,071	52	282
MTPK::SCRMNT DR::30	SACRAMENTO DRIVE	SACRAMENTO COURT	H J ROGOWSKI	Asphalt	S	376	26	9,785	48	312
MTPK::TRY AVE::10	TROY AVENUE	115TH STREET	114TH PLACE	Asphalt	S	485	26	12,619	41	230
MTPK::TRY AVE::20	TROY AVENUE	114TH PLACE	114TH STREET	Asphalt	S	188	26	4,900	28	523

Pavement ID	Road Name	From	To	Surface	Rank	Length (FT)	Width (FT)	Area (SF)	PCI	IRI
MTPK::TRY AVE::25	TROY AVENUE	114TH STREET	114TH STREET	Asphalt	S	140	26	3,634	27	474
MTPK::TRY AVE::30	TROY AVENUE	114TH STREET	113TH PLACE	Asphalt	S	314	26	8,171	32	316
MTPK::TRY AVE::40	TROY AVENUE	113TH PLACE	113TH STREET	Asphalt	S	185	26	4,798	59	535
MTPK::TRY DR::10	TROY DRIVE	H J ROGOWSKI	116TH PLACE	Asphalt	S	434	26	11,276	37	268
MTPK::TRY DR::20	TROY DRIVE	116TH PLACE	MEADOW LANE	Asphalt	S	707	26	18,393	49	289
MTPK::WHPPL ST::10	WHIPPLE STREET	115TH STREET	114TH PLACE	Asphalt	S	490	26	12,730	55	247
MTPK::WHPPL ST::20	WHIPPLE STREET	114TH PLACE	114TH STREET	Asphalt	S	321	26	8,347	55	302
MTPK::WHPPL ST::30	WHIPPLE STREET	114TH STREET	113TH PLACE	Asphalt	S	315	26	8,201	42	228
MTPK::WHPPL ST::40	WHIPPLE STREET	113TH PLACE	113TH STREET	Asphalt	S	194	26	5,044	38	425