

Long Range Plan



**Kent County
Road Commission**

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I. Introduction

1.0 Purpose

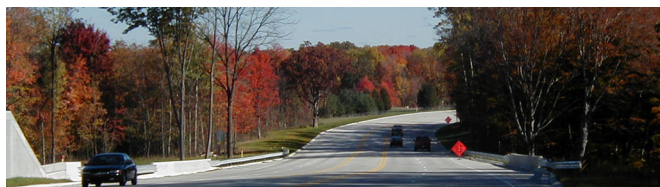
The Kent County Road Commission (KCRC) Long Range Plan (the Plan) provides a strategic blueprint for the effective investment of resources to preserve and improve the quality and safety of KCRC's road and bridge network. **Underscoring the Plan's objectives are KCRC's values, which define the organization's unwavering priorities:**

-  **Safety of the public and KCRC employees**
-  **High-quality service**
-  **Preservation of assets**
-  **Collaboration and coordination of efforts with stakeholders**
-  **Use of sound financial management to guide resource allocation**

Put into action, this data-driven Plan serves to bridge KCRC's mission of providing a safe, reliable and efficient transportation network with the organization's vision to have the premiere transportation network in Michigan.

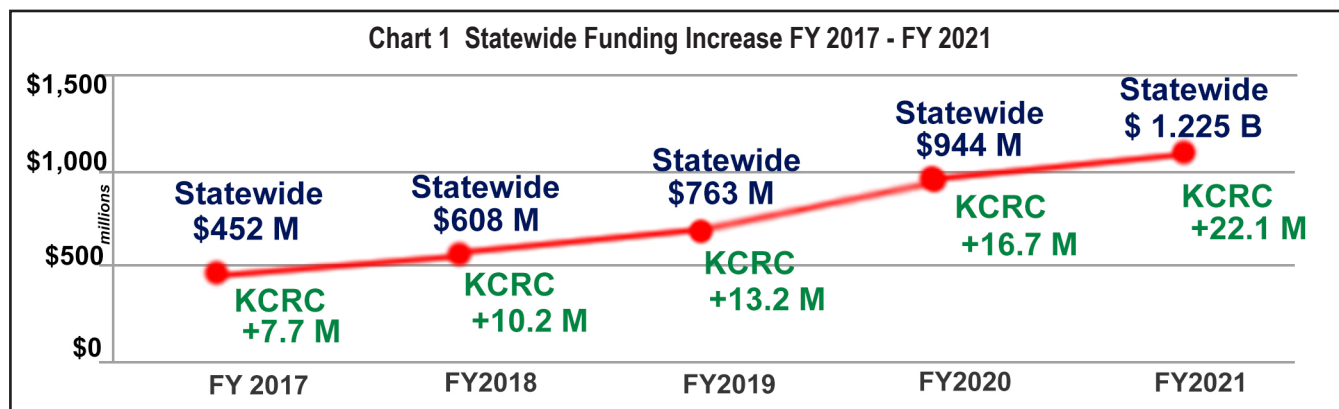
Because asset preservation and safety are cornerstones of the KCRC mission, the Plan is divided into two sections: Road and Bridges, and Traffic and Safety. Within these sections, KCRC conducts an analysis of present operations and assets, identifies specific objectives for the future and lists performance measures to monitor progress toward each defined goal.

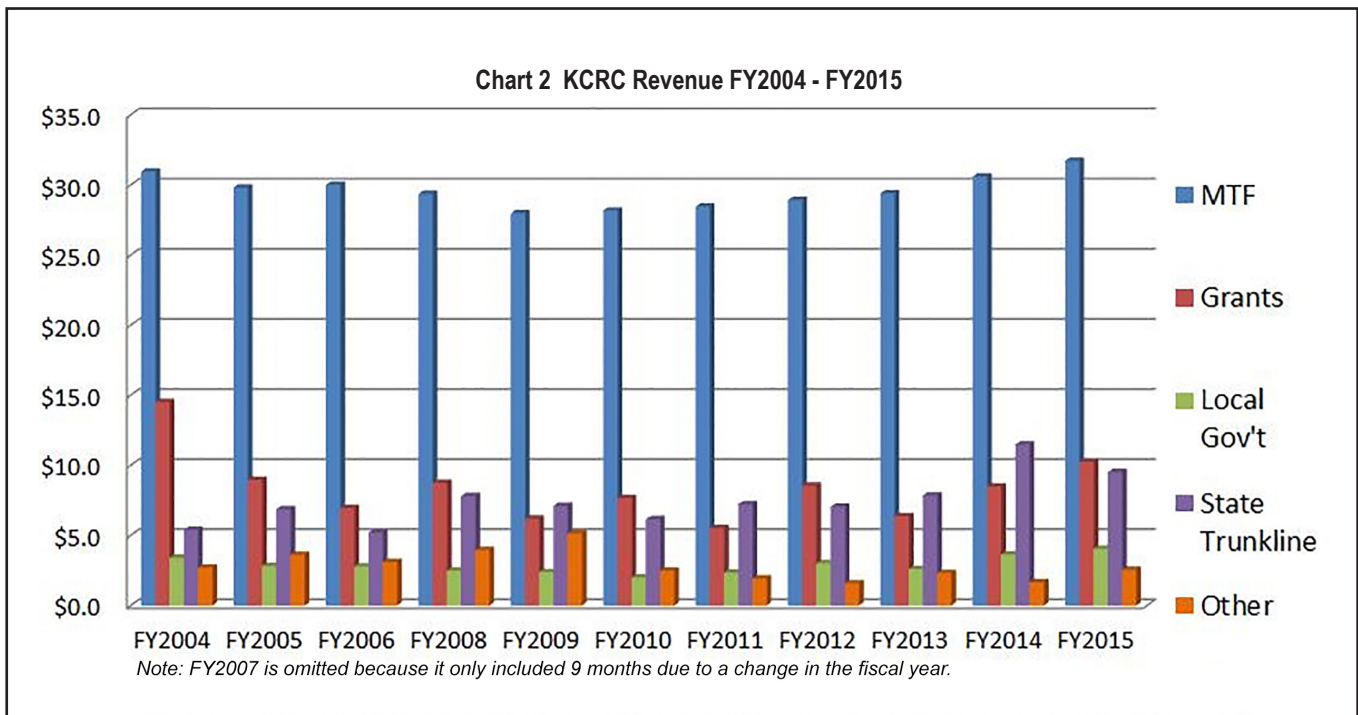
The Plan is network-wide, encompassing both KCRC's primary and local road systems. KCRC's primary roads are generally the county's longer distance, higher volume roadways that connect centers of population and employment and provide access to the state's highway network. Local roads, in contrast, are typically the shorter distance two-lane collector roads and residential streets.



2.0 Finance

On November 10, 2015, Michigan Governor Rick Snyder signed a seven-bill package to provide a long overdue increase to the state's investment in transportation. The package will be phased in over a five-year period, beginning in 2017, and is projected to provide a statewide annual increase to transportation funding of approximately \$1.2 billion when fully implemented in 2021. The increase will be distributed initially through the Michigan Transportation Fund (MTF), the largest revenue source for KCRC. By 2021 and thereafter, KCRC is projected to receive an additional \$22.1 million annually with this package (Chart 1).





MTF Funding

Over half of KCRC's 2016 Operating Revenue of \$60.3 million, comes from the MTF (Chart 2). KCRC's MTF revenues peaked in 2004 (\$31 million) and declined through 2009 (\$28 million). From 2009 to 2015, MTF revenue increased modestly at approximately 1.25% annually, but the modest increases were not enough to offset rising costs. Consequently, construction and preservation work were curtailed (Chart 2). While KCRC continued to implement innovative strategies to stretch resources, ultimately, funding fell short of what was needed to sustain roads in good condition. As a result, over the 10-year period, the primary road system declined from 18% of primary roads rated in poor condition in 2005 to 33% rated in poor condition in 2015.

With the implementation of the new funding package, KCRC seeks to double the annual investment in construction and preservation by 2021, moving from an annual investment in primary road improvements of \$10.4 million to approximately \$21 million. With this additional funding, KCRC can also provide additional resources to local roads to be matched by township contributions.

Funding Package - General Fund Contributions

The complete implementation of the new funding package is dependent upon annual appropriations by the Michigan Legislature from the State's General Fund, which totals \$600 million for fiscal year 2021. Legislative action is expected, but not certain. KCRC's Plan provides additional analysis to anticipate the consequences on system conditions should the Legislature fail to fully implement the funding package.



II. Roads and Bridges

Encompassing nearly 2,000 miles of roads and 172 bridges throughout 21 townships, the KCRC network is diverse. Its corridors include both paved (1,642.76 miles) and unpaved (317.09 miles) roadways, connecting agricultural and rural regions to highly-populated urban areas.

The safety and efficiency of KCRC's network requires the proper maintenance of roads, bridges and roadside assets. A thorough drainage system to divert storm water away from the roadway, for example, is just as important to a road's service life as the pavement placed on its surface. Therefore, this Plan includes analysis of assets residing on the road's traveled portion and beyond its edge. Section II, Roads and Bridges, provides analysis of the following: roads, bridges, culverts, and storm sewer system.

Pavement Management

If properly designed and maintained, the useful life of a road can last several decades. KCRC believes that the timely treatment of the road's surface with appropriate materials is critical to the road's long-term life. This is because the treated surface serves to protect the integrity of the road's multiple layers underneath it.

Unlike the "worst first" philosophy, which waits until a road surface fails before totally replacing it, a pavement preservation approach looks to make proactive treatments to the road surface, thus maintaining the surface in better condition and extending the road's life. This approach saves money over time. Therefore, KCRC's Plan incorporates a "mix of fixes" approach, combining different improvement and maintenance activities to address the varying needs of roads of different ages and condition. This approach is based on an objective assessment of conditions, which is then used to determine the appropriate fix for a given road. Where appropriate, KCRC uses pavement preservation treatments and routine maintenance to fix minor road deficiencies early so that a pavement's life can be extended in the most cost-effective way.

Routine Maintenance

There are certain activities within Routine Maintenance that directly impact KCRC's ability to extend the life of roadway assets. These activities prevent premature deterioration by addressing the negative impacts of environmental events like rain, snow, sleet and ice and include both road and roadside maintenance.



Road Maintenance includes activities on the surface of the road that address minor pavement defects caused by a combination of traffic and environmental effects. These activities can include:

- * **Crack sealing:** seals cracks in pavement with hot liquid rubberized asphalt material
- * **Pothole Patching:** provides a temporary fix to failures in pavement by filling hole with hot or cold mix asphalt
- * **Grading:** restores a gravel road's driving surface and drainage attributes



Roadside Maintenance is conducted outside of the road surface and includes:

- * **Culvert repair, drainage work, ditching and cutting berms:** improves how water travels off the road
- * **Tree trimming:** provides a clear zone for errant vehicles, improves sight distance, and improves winter driving conditions (by allowing sun to penetrate pavement)
- * **Vegetation control:** restricts brush and trees from encroaching onto the shoulders of the road and improves sight distance at intersection
- * **Guardrail repair:** restricts vehicles from straying into dangerous areas

3.0 Primary Roads

KCRC's primary roads are generally the county's longer distance, higher volume roadways that connect centers of population and employment and provide access to the State's highway network.

3.1 Inventory

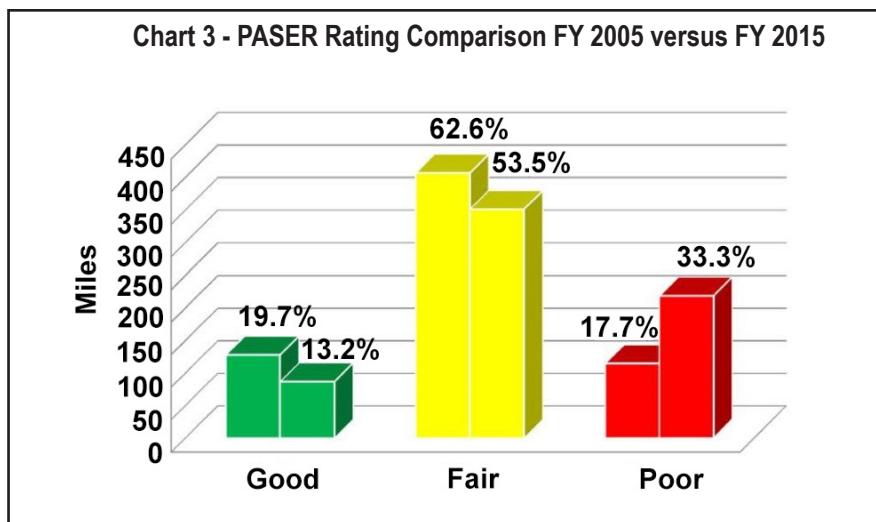
The 656.62 miles of KCRC primary roads are categorized as either "urban" (373.4 miles) or "rural" (283.27). Urban primary roads are those within the officially certified "Urbanized Area" boundary while rural primary roads are those outside this boundary.

Further differentiation comes when identifying Class A, "all-season" primary roads (168 miles). These roads are constructed to Class A, all-season standards and are not subject to weight restrictions, meaning that legal-load trucks may drive on them year round. Non all-season roads are subject to weight restrictions during the annual thaw period (late winter-early spring) to help prevent damage to the road.

3.2 Condition Assessment



KCRC primary roads are rated using Pavement Surface Evaluation and Rating System (PASER). The roads are rated on a 1 to 10 scale (Illustration 1), and the information is entered into RoadSoft, the asset inventory software program supported by the Center for Technology and Training at Michigan Technology University. This inventory allows KCRC to not only monitor the changing conditions of a particular road but also gauge the performance of surface treatments and other improvements, thus helping the organization make strategic decisions based on data-driven analysis.

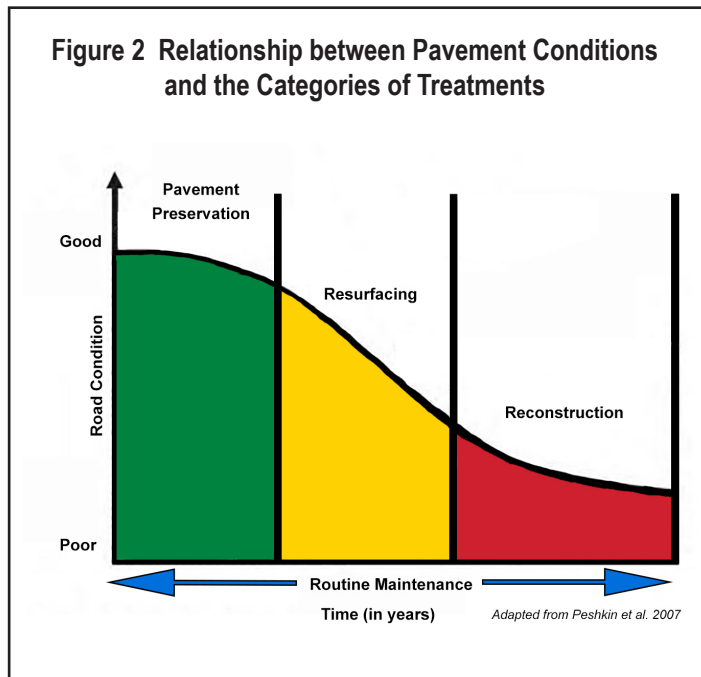


From 2005 to 2015, KCRC experienced a steady decline in its primary road ratings, due in large part to the reduction in services and road improvements caused by the combination of decreases in Michigan Transportation Fund (MTF) revenue and increases in costs. In 2005, 20% of KCRC's primary roads were rated in Good condition while 18% were rated "poor." By 2015, those percentages had shifted to 13% of KCRC primary roads rated in Good condition, 33% rated in Poor condition.

With the implementation of the new state funding package, KCRC seeks to double the annual investment in construction and preservation by 2021 to restore the condition of its primary roads and reflect the ratings achieved in 2005.

Road Improvement Strategy

KCRC uses the annual PASER ratings to identify and schedule appropriate road improvements, which generally fall within one of three categories: replacing a road's structure (reconstruction), rehabilitating a failing surface (resurfacing), or maintaining a pavement's good or fair condition (pavement preservation) (Figure 2).



Reconstruction, the costliest improvement category, is the replacement of the entire existing pavement structure with an equivalent or improved pavement structure. This is done if the road has deteriorated to the point where other rehabilitation options are not viable or when a structural change to the road is necessary. For instance, a left turn lane must be added to an existing two-lane road or an existing roadway must be reconstructed to all-season standard.

Resurfacing is the replacement of the existing, deteriorated surface layer of the road (and, in some cases, sub surface) with a new surface to extend the service life of the road and, in some cases, improve its load-carrying capacity. These treatments are less costly than total reconstruction but more costly than pavement preservation.

Pavement Preservation treatments are the least costly improvement and include the application of less than 1.5" of material over an existing surface to help keep water out of the pavement, prevent oxidation of the existing asphalt, and maintain good skid resistance. Pavement preservation is distinguished from resurfacing and reconstruction because it does not change the structural or load-carrying capacity of the pavement. Instead, preservation treatments are applied to roads in good or fair condition (5-10 PASER rating) to extend their service life and postpone or avoid the need for costlier treatments later. Pavement preservation treatments commonly used by KCRC are historically applied 5-7 years after a road has been paved or resurfaced and include:



Ultrathin Overlay: Placement of approximately $\frac{3}{4}$ " of hot asphalt over the existing surface, extending service life 3-5 years.



Micro-Surface: Existing pavement is covered with a thin application of durable, polymer-modified asphalt emulsion that restores a uniform black color and extends the service life 3-5 years.

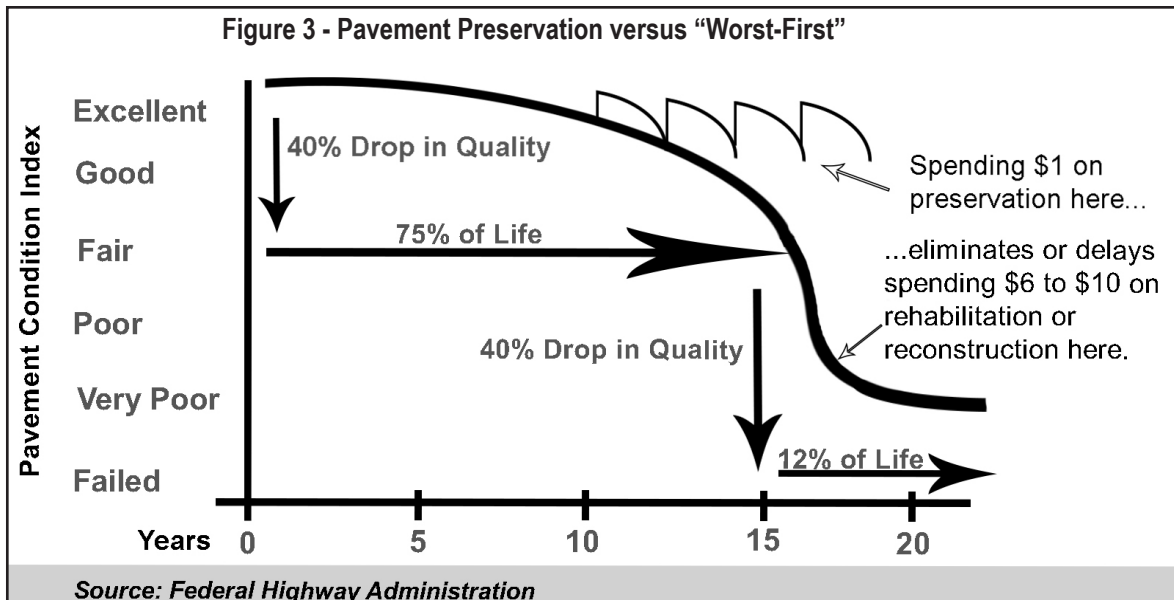


Chip Seal: the application of an asphalt emulsion with a cover aggregate, extending service life 5-7 years.



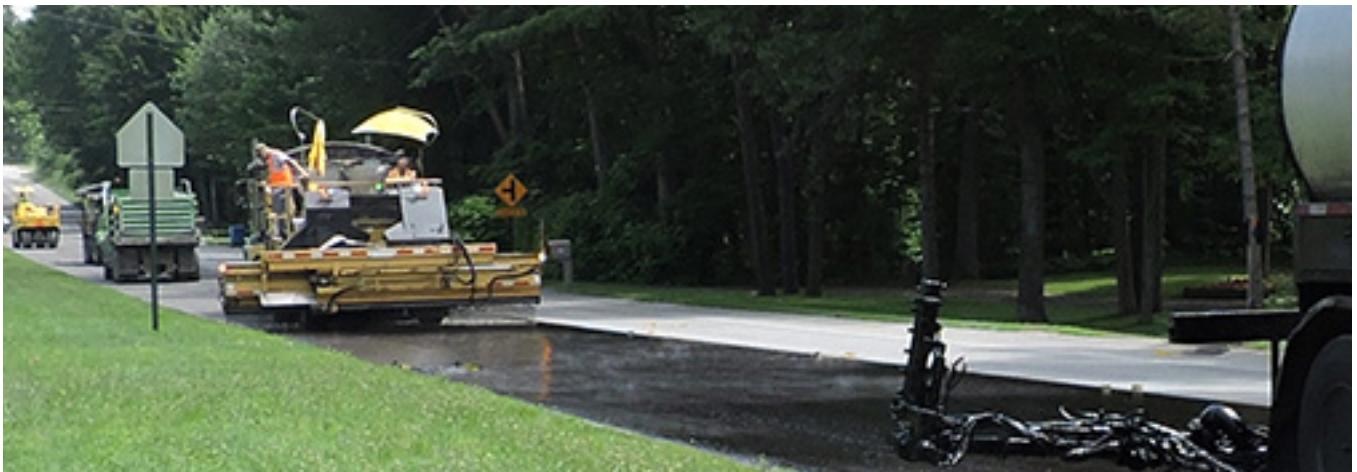
Cape Seal: A two-layered surface treatment that combines a chip seal (bottom layer) with a Micro Surface (top layer) to extend service life 5-7 years.

A more complete list and description of pavement preservation treatments is provided in Appendix B.



Acquisition of Chip Seal Equipment

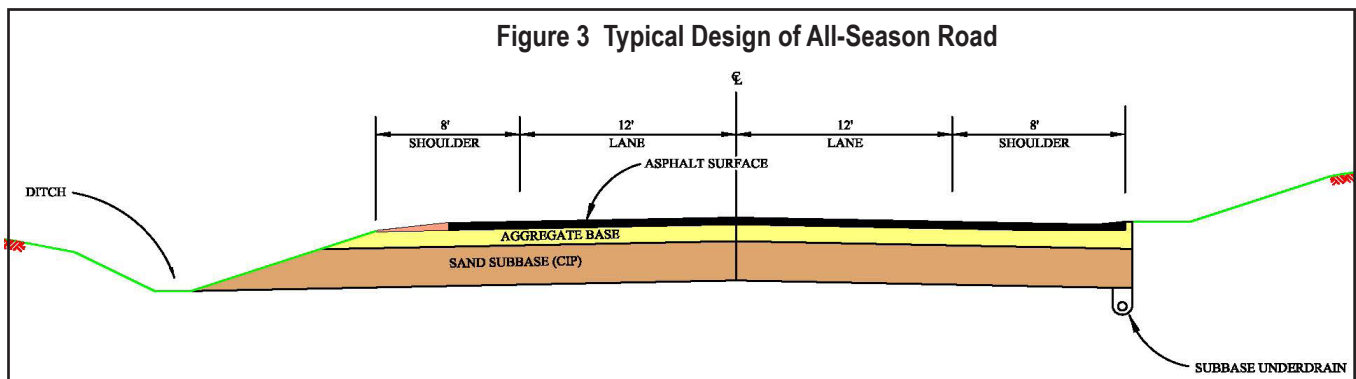
For many years, KCRC had conducted its chip seal program in collaboration with Barry and Muskegan County Road Commissions. However, the schedule of chip seal application was dependent upon the availability of the two other commissions' equipment. Therefore, to increase productivity (the number of miles improved per year), KCRC purchased its own chip seal equipment in 2016. Not only does this equipment increase KCRC's chip seal program capabilities, but it also allows KCRC to implement a new preservation strategy: chip sealing roads within three years of paving them to maximize the pavement life.



KCRC crew completing 2015 chip seal project on Jupiter Avenue

Economic Support Network

Seasonal weight restrictions impede economic activity by forcing commercial vehicles to haul reduced loads at reduced speeds. To address this, KCRC builds primary roads to all-season standards (Figure 3) when undertaking reconstruction and/or reexpansion projects and has introduced a strategic process to identify necessary connections where commercial activity and agricultural processing warrant the greatest demand. These links complement the existing state trunkline system while adding connecting roads with high commercial and agricultural traffic. The continued expansion of the all-season road network minimizes the disruption and inconveniences that result from seasonal weight restrictions. The Ten Year Improvement Plan (Appendix A) includes the addition of 30 miles of all season roadway.



3.3 / 3.4 Objectives and Performance Measures

Objective 1: Restore primary road conditions to 90% good/fair ratings by 2025

Performance Measures

KCRC will strive to complete numerous road improvements per year according to the lane mile target levels shown in Table 1. For example, the performance measure targets for 2017 are as follows:

- Reconstruct 18 miles of primary road
- Resurface 5 miles of primary road
- Preventive maintenance surface treatments on 144 miles of primary road

Explanation: The new transportation package will enable KCRC to reverse the deteriorating trend in the condition of its primary road system. With full implementation of the \$1.2 billion package, KCRC forecasts that this will translate to 90% good/fair PASER ratings by 2025. KCRC will employ a strategy that incorporates a “mix of fixes” approach, including pavement preservation treatments, resurfacing, reconstruction and essential routine maintenance. Combined, these actions will help restore failed roads to good or fair condition and then preserve these assets for years to come. This strategy is articulated in the *10-Year Primary Road Improvement Program* (Appendix A). The *Kent County Michigan Map* (Appendix C) illustrates the locations identified for major reconstruction (all-season and expansion), large culvert replacement, intersection enhancements, and bridge expansion. Please note that planned investment identified in the 10-Year Plan includes locations yet to be determined.

Table 1, below, represents the estimated lane miles of various pavement surface treatments needed between 2016 and 2025 to maximize our primary road pavement conditions. Based on the Roadsoft model, existing primary road pavement conditions, and the anticipated state funding increase, this combination of surface treatments (“mix of fixes”) over the next ten years should result in 90% of primary roads rated in good or fair condition.

Objective 2: Expand KCRC’s network of all-season roads

Performance Measures

- Expand *All-Season Network* by 3.0 miles per year

Miles of	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Reconstruction	14	18	19	20	22	24	25	27	26	25
Resurfacing	4	5	5	5	6	6	6	6	6	0
Preventive Maintenance	111	144	154	163	175	193	149	92	89	130

4.0 Local Roads

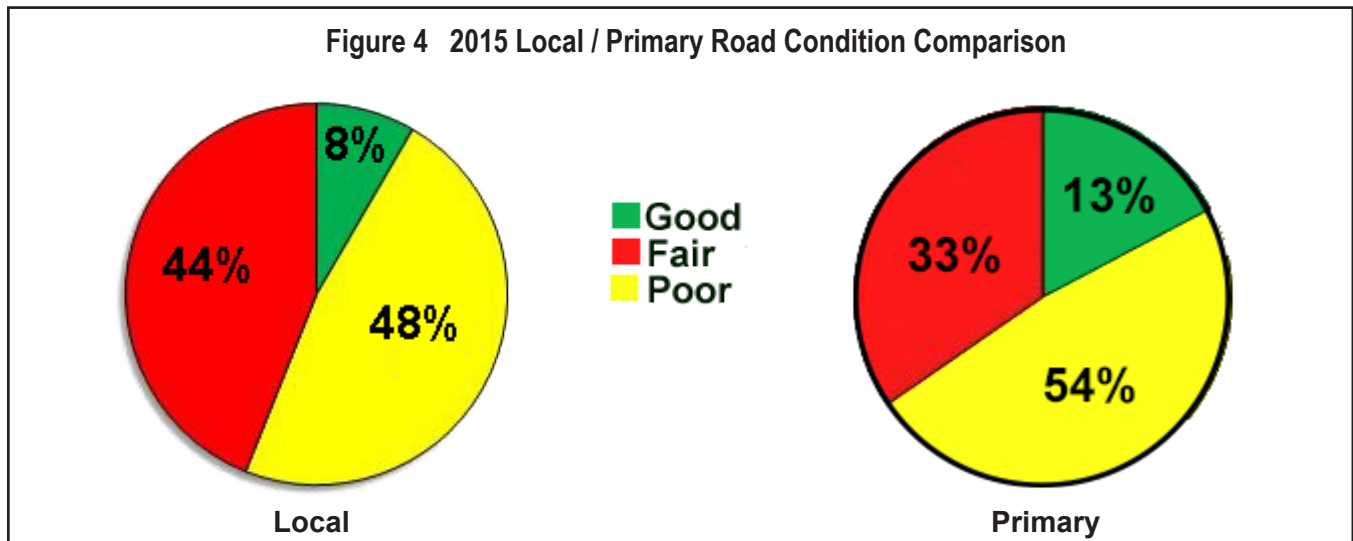
As described previously, local roads are typically shorter distance two-lane collector roads and residential streets.

4.1 Inventory

Totaling 1,303.23 miles, the local road system comprises 66% of KCRC's total road network. Like the primary roads, local roads are categorized as either "urban" (689.56 miles) or "rural" (613.97). There are 983.09 paved miles of local roads and 319.98 miles of gravel roads. Very few local roads are designated "all-season." This means that nearly all local roads are subject to weight restrictions during the annual thaw period (late winter-early spring) to help prevent damage to the road.

4.2 Condition Assessment

A comparison between the condition of primary and local road conditions shows that local roads are in worse shape: 56% of local roads are rated in good/fair condition compared to 67% of primary roads, and 44% of local roads are rated "poor" compared to 33% of primary roads (Figure 4).



Township Matching Program

The financing of KCRC's local roads is different from that of primary roads. KCRC maximizes the amount of MTF revenue it receives to the local road system in conformance to state law. A portion of this revenue is used to fund the Township Matching Program for major and minor construction through which KCRC and townships share the cost of projects using the ratios, below:

Construction:	45% KCRC	55% Township
Minor Construction:	50% KCRC	50% Township

KCRC works hard to communicate with its townships the needs of the local road system. This analysis combined with the financial incentive of the Township Matching Program has translated to an increase of investment in local roads by townships.

Seeking to provide townships with more scientific data to guide future investments, KCRC expanded annual PASER ratings to include all paved local roads in 2015. Prior to that, local roads were rated on a three-year cycle. Still in its infancy, the growth of annual local road ratings will provide townships with more data to track the benefits of applied treatments. Analysis of this information will support resource allocation and the planning, scheduling and selection of future local road improvements.

Local Road Improvement Strategy

KCRC's improvement strategy for local roads includes treatments for both paved and unpaved roads, focusing on preventive treatments that extend the service life of the road.

Paved Roads

The improvement strategy for paved roads is aligned with the Primary Road Improvement Strategy addressed in Section 3.2, with improvements generally falling within one of three categories: replacing a road's structure (reconstruction), rehabilitating a failing surface (resurfacing), or maintaining a pavement's good condition (pavement preservation).

Gravel Roads

For gravel roads, long-term improvements are broken down by:

Minor Construction: Involving more complex maintenance operations including the addition of gravel over the width and length of a section of roadway. Blast furnace slag may be used in place of gravel in selected locations where the water table is close to the road surface. Minor construction may also include ditching to restore drainage, replacement of culverts, improving enclosed drainage system and tree removal. In comparison, routine maintenance on unpaved roads includes grading and adding small amounts of gravel – spot graveling - where necessary.

Major Construction: Involves a total reconstruction of the road from gravel to pavement and is investigated at township request. KCRC must have adequate funding to meet the desire of townships to upgrade unpaved roads to paved due to the project's high cost: reconstructing 3.5 miles of unpaved road to paved currently costs approximately \$3.5 million, of which the township pays 55%.

4.3 / 4.4 Objectives and Performance Measures

Objective 1: Work with townships to improve condition of the local road system

Performance Measures

- Continue the annual PASER Ratings for local roads and share data with townships
- Continue local road matching program with townships maintaining current cost-sharing formulas

Explanation: Because of the new funding package, more funding will be available to the local road program, and KCRC will seek continued collaboration with the 21 townships it serves. These townships share financial responsibility for major and minor construction work and certain surface treatments on the local road system.

5.0 Bridges

The category “bridges” includes any structure having an overall span of 20 feet or greater; KCRC’s bridge lengths range from 20 to 1,250 feet. This inventory includes single culvert or multiple culverts that, collectively, are 20 feet or greater in length.

5.1 Inventory

KCRCs total inventory includes 172 bridges, of which 104 are culvert-type structures. The oldest bridge in KCRC’s system, the Fallasburg Covered Bridge over the Flat River in Vergennes Township, was built in 1871, predating the commission, itself, by 40 years. The system’s newest bridge, the 68th Street Bridge over Plaster Creek in Gaines Township, was built in 2011, equating to a 140-year difference between the construction of the system’s oldest and newest bridges.

5.2 Condition Assessment

Like roads, KCRC also rates its bridges, with inspections performed by in-house staff on a biennial basis. The staff uses the Michigan Bridge Inventory Rating System (MBIS), a scale from 1 to 10, to evaluate various bridge elements: the substructure, or foundation, and vertical supports; the superstructure, including the support beams, deck surface and railing; the channel and potential for scour; and the approach elements, including the approach pavement and guardrail.

Currently, 100% of KCRC’s 172 bridges are classified in good or fair condition. This is compared to the statewide average of 87% good/fair, which was compiled from 2015 ratings of bridges under both state and local jurisdiction throughout Michigan. KCRC’s positive rating can be attributed to its previous and ongoing commitment to bridge preservation, rehabilitation and replacement. From 1968 to 1977 and again from 1979 to 1988, KCRC, its townships and the County of Kent collectively funded two bridge replacement programs that resulted in the replacement of approximately 64 deficient bridges and culverts. Since 1989, local, state and federally funded projects have funded the replacement of 15 bridges; the construction of 5 new bridges; and the removal of 3 bridges.

KCRC invests approximately \$400,000 per year in bridge replacement, rehabilitation and preservation. This investment varies from year to year based on the addition of projects funded with State and Federal Local Bridge Funds.

Many of KCRC’s larger metal culverts were installed in the 1960’s and 1970’s and are nearing their design life. An additional investment of \$400,000 is needed annually to replace or rehabilitate 1-2 bridges per year.

5.3 / 5.4 Objectives and Performance Measures

Objective 1: Maintain 100% of bridges rated in “good” or “fair” condition, 0% “Structurally Deficient”

Performance Measures

- Allocate an additional investment of \$400,000 annually to replace or rehabilitate 1-2 bridges per year
- Replace 1-2 large culverts (20’ or greater) per year



The 108th Street Bridge (top); Three culverts that collectively span more than 20 feet are defined as a bridge (bottom).

6.0 Culverts

Culverts serve to convey water from one area to another, in most cases, from one side of the road to the other. Because of this function, they are integral to preserving KCRC's corridors.

6.1 Inventory

KCRC's culvert inventory includes single culvert or multiple culverts that, collectively, are less than 20 feet in length. Those that span 20 feet or greater are classified as "bridges."

KCRC maintains over 900 culverts, which carry drains and streams under roadways. These culverts range in size from 12" to 19'-6" across and are predominantly constructed out of concrete or metal.



Culvert

6.2 Condition Assessment

Culvert inspections are performed by KCRC staff on a five-year cycle. The Michigan Bridge Inventory Rating System (MBIS) is used to assess various culvert elements, including the culvert barrel and joints, slope protection, waterway opening, stream alignment, and roadway items like pavement and guardrail.

Concrete culverts have a design life of 75 years and metal culverts have a design life of 50 years. Culverts are replaced either due to structural condition, insufficient width or insufficient hydraulic (flow) capacity, and inspection ratings aid in determining culvert repair and replacement needs. The goal is to inspect culverts on a four (4)-year frequency.

Culvert maintenance and replacement are funded from one of two categories under the following budgets:

Structure Maintenance: \$200,000 annual budget
Drainage Work: \$1,400,000 annual budget

Based on culvert design life, KCRC targets an average of 15 culvert replacements per year. Due to size and site variations, replacement costs may vary from \$20,000 - \$200,000.

6.3 / 6.4 Objectives and Performance Measures

Objective 1: Preserve 900+ culvert inventory

Performance Measures

- Inspect culverts on a four (4)-year cycle
- Replace 15 (12" to 19.6") culverts per year



Crew installs new box culvert at Podunk Avenue.

7.0 Storm Sewer System

The KCRC storm sewer system includes a network of water collection structures and pipes, generally found under the roadway, that convey water from the surface of the roadway to the appropriate natural or man-made drainage outlet.

7.1 Inventory

KCRC's storm sewer system includes 391 miles of storm sewer, 6,266 manholes and 10,172 catch basins.

The location and construction information about the system of existing storm sewers is available on the area's Regional Geographic Information System (REGIS). As new platted and public streets are constructed, this information is added to the REGIS program.

7.2 Condition Assessment

In October 2014, KCRC was awarded a \$1 million Storm Water, Asset Management and Wastewater (SAW) state grant, which will fund 90% of a 3-year storm water asset management project. The project, which is targeted for completion in December 2017, includes the inspection and videotaping of the existing 260 miles of storm sewers built prior to 1994. The results of this project will provide KCRC with a more comprehensive understanding of the condition of these assets so that KCRC can plan for necessary upgrades and repairs.

7.3 / 7.4 Objectives and Performance Measures

Objective 1: Complete the storm water asset management project in 2017 and develop a plan to prioritize the needs of storm sewer system assets.

Performance Measures

- Complete storm water asset management project
- Develop a plan of prioritized needs

Objective 2: Determine the need to conduct similar studies for storm sewers built after 1994.



Storm sewer outlet (left); Video still showing debris restricting storm sewer (right)

III. Traffic and Safety

Proper traffic control is integral to the safe operation of motorized and non-motorized vehicles using KCRC's road and bridge network. KCRC proactively manages traffic operations to minimize vehicle crashes and maximize mobility. In Section III, Traffic and Safety, analysis is provided for the following: traffic control, traffic signals and signs, and guardrail. Together, these assets support KCRC's commitment to safety. Before addressing the assets, themselves, it is beneficial to examine the criteria used to determine their placement.

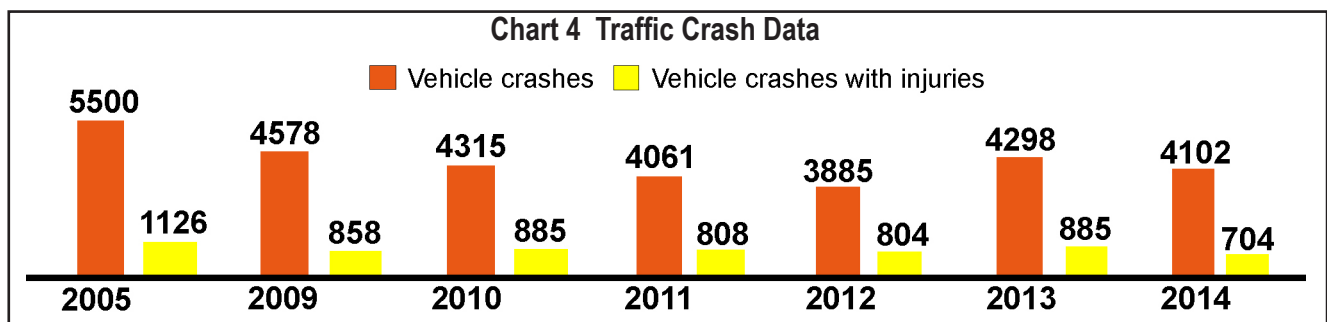
Traffic Data

Aligned with its commitment to safety, KCRC annually obtains traffic count information, monitors and investigates traffic crashes, and performs safety audits for road improvement projects. This information is used to identify if new traffic control or safety measures are needed or updates to current assets are required.

For all roads within the KCRC network, aside from subdivision streets, traffic counts are taken and reviewed on a three-year rotation. These counts are analyzed and compared to the designed capacity of the roadway. Capacity deficiencies (e.g. when traffic volume exceeds roadway capacity) are identified and improvement projects are developed based on these results. Traffic count and traffic crash data are also used to determine the placement of certain traffic control devices including traffic signals and all-way stops.

Traffic crash data is obtained from various sources and reviewed along with crash trends. Based on analysis of both the data and trends, safety improvement projects are developed.

Proposed road improvement projects undergo safety audits, which include a review of traffic crash history as well as roadway geometric features, including visibility issues, lane widths, curve layout, number of lanes, shoulder width, turn lanes. Safety improvements are added to these projects based on the findings.



Vehicle crashes and vehicle crashes with injuries are trending downward locally, statewide and nationally. Since 2005, the annual number of vehicle crashes has decreased by 1,398 and those with injuries have decreased by 422. These downward trends can be attributed to several factors including advanced road design, safer vehicles, increased safety awareness, and improved emergency medical services. Nationally, from 2005 to 2014, fatal accidents decreased 25% and personal injury accidents decreased 13%. The fatal accident rate in Kent County ranks in the lower one third of counties in Michigan.

KCRC continually monitors vehicle crashes and trends at both the intersection and network levels to assess overall performance and ensure proper traffic control signals, signs and other measures are in place. This information is used to identify areas for improvement, many of which are funded with federal safety grants.

8.0 Traffic Control: Signals and Signs

Traffic operations are managed in accordance with the U.S. Department of Transportation's Manual on Uniform Traffic Control Devices (MUTCD). The manual defines the standards used by traffic engineers nationwide to "install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel." The MUTCD contains nine traffic signal warrants that include vehicle and pedestrian volumes and crash experience criteria. Before installing a traffic signal, one of these warrants must be met. Similar warrants have been developed for the installation of all-way stops as well as other traffic control devices.

8.1 Inventory

Major assets to maintaining safe and efficient travel along Kent County roads are traffic signals and signs. Traffic signals are typically found at high volume intersections to promote the safe and orderly movement of traffic. Signs are essentially found on every corridor to convey direction and information to the motorists and those using non-motorized transportation. There are currently 110 traffic signals and approximately 26,000 signs within the KCRC network.

KCRC maintains computer database inventories of both traffic signals and signs. The traffic signal inventory tracks features including signal lamp type (incandescent or LED), signal span and wire design (box span or diagonal span). This information assists in the development of KCRC's signal upgrade schedule.

The traffic sign inventory identifies sign type, size, location, date of installation, face material, support type, and maintenance information. This inventory information is also used to schedule necessary upgrades.



8.2 Condition Assessment

Traffic signals and signs provide important information to drivers, both day and night. To be effective, visibility must be maintained. Based on a 20-year average signal life, KCRC should update five (5) signals per year at an estimated cost of \$80,000/ signal or \$440,000 investment per year.

Updated requirements from the Federal Highway Administration (FHWA) regarding retro reflectivity levels have had a significant impact on sign maintenance. By 2014, agencies that owned and maintained traffic control signs were to establish and implement a written traffic sign management or assessment plan designed to maintain sign retro reflectivity at or above minimum levels set by the FHWA. No specific deadline was set to address when agencies needed to reach full compliance. Rather, agencies needed to articulate in their management plans how they would transition or update signs to the maximum extent possible, given available resources.

KCRC signs are currently upgraded based on a variety of circumstances including widening, construction, new development, plats, and knock-downs. KCRC spends approximately \$420,000 per year on signs, replacements and upgrades, including:

- \$250,000 on upgrades
- \$40,000 on new signs
- \$30,000 on damaged signs
- \$40,000 to comply with new retro-reflectivity requirements
- \$60,000 on tree and brush trimming around signs



8.3 / 8.4 Objectives and Performance Measures

Objective 1: Maintain traffic control assets: signals and signs, consistent with state and federal regulations to the maximum extent possible with available resources

Performance Measures

- Upgrade 20% of traffic signals per year requiring LED lights, countdown pedestrian signals, and/or box span configurations
- Upgrade 20% of signs per year to comply with FHWA requirements and compliance until all signs are in compliance with the new FHWA requirements

9.0 Guardrail

Guardrail is installed as a safety measure, most often to restrict vehicles from straying into dangerous areas, typically fill slopes that have a drop steeper than one foot for every three feet in length. When considering whether or not to place guardrail, engineers must consider whether placing guardrail is more likely to reduce the severity of an impact as compared to the potential severity if the guardrail were not in place. Guardrail is a “last resort” safety measure when steep slopes cannot be eliminated due to environmental, right of way, or terrain constraints.

The introduction of guardrail dates back to the 1920’s, when wood posts began to be placed along the roadway shoulder to prevent vehicles from careening down a steep slope or into water. For the next twenty years, the design underwent improvements, with the addition of wooden planks, which were later replaced by two steel cables. After World War II, metal beam designs were implemented and in the early 1950’s, the “W” beam design – similar to what is used today - was unveiled.

Steel guardrail end treatments have also evolved over time. Initially, a curved “end shoe” was placed at both ends of a guardrail segment. In the mid 1960s, the concept of “turning down” or “burying the end” was introduced, where the rail is bent down and twisted 90 degrees to where it is anchored flat on the ground. In 1973, the Breakaway Cable Terminal (BCT) ending was adopted. However, the installation of the BCT was disallowed by Federal Highway Administration (FHWA) after December 31, 1995, and this began the development and use of various proprietary terminals that are classified as “flared terminals” or “tangent terminals”. Michigan adopted two flared guardrail end terminals, the Slotted Rail Terminal (SRT) and the Flared Energy Absorbing Terminal (FLEAT), and two tangent guardrail approach terminals, the “Extruder Terminal” (ET), and the “Sequential Kinking Terminal” (SKT).

9.1 Inventory

KCRC inventory encompasses 37 miles of steel guardrail with end treatments that include turn-down end, breakaway cable terminal (BCT), standard flared and standard tangent terminals.

Recently, the Michigan Department of Transportation (MDOT) has been installing cable tension railing within median areas along the Interstate Highway system. The primary purpose of this safety treatment is to prevent an errant vehicle from crossing the median into oncoming traffic. Cable tension railing has not been installed in KCRC’s network.

9.2 Condition Assessment

Guardrail is upgraded to meet current standards when damaged or associated with a road reconstruction, major resurfacing, bridge or culvert replacement project. A drivable slope is preferred to guardrail for both its increased safety benefits and reduction of maintenance costs. When practical, KCRC works with property owners to eliminate guardrail in fill areas after securing grading permission. This is only feasible where excess embankment or fill material is available.

9.3 / 9.4 Objectives and Performance Measures

Objective 1: Maintain safe conditions that restrict drivers from straying into dangerous areas.

Performance Measures

- Upgrade guardrail to meet current standards when damaged or associated with a road reconstruction, major resurfacing, bridge or culvert replacement project.
- Because a drivable slope is preferred to guardrail for both its increased safety benefits and reduction of maintenance costs, remove guardrail where excess embankment or fill material is available.

Figure 7 Guardrail Installation



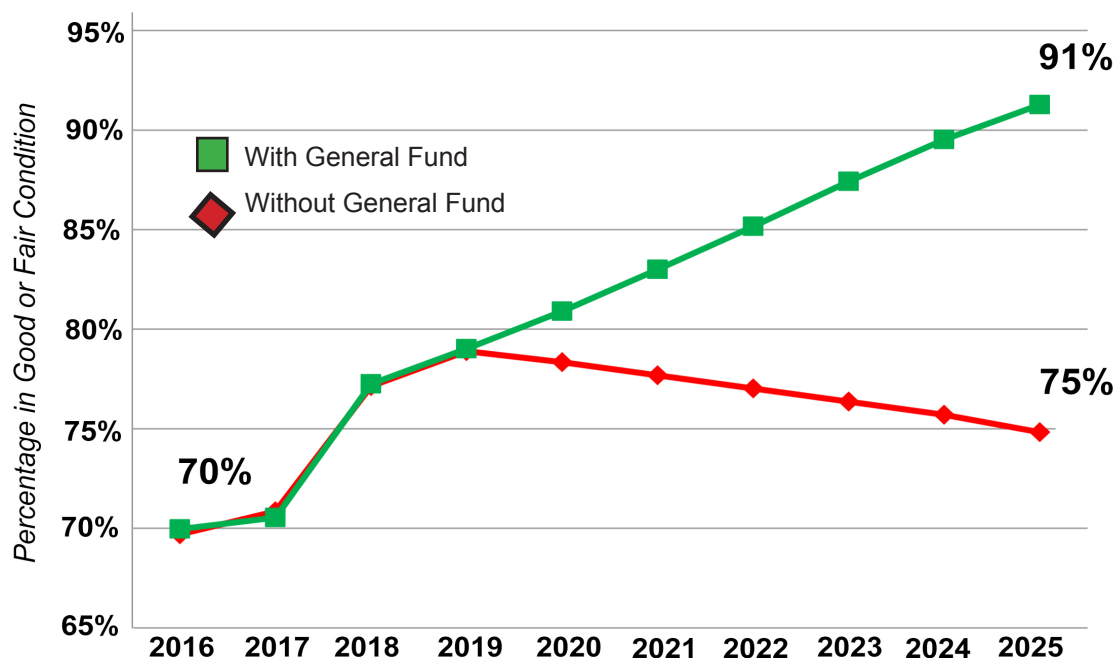
IV. Summary

The Long Range Plan provides a strategic blueprint from which KCRC can align resources to meet the objectives identified for each of its assets. To accomplish this, KCRC is dependent upon the stability of its major revenue sources. The road improvement plan outlined to improve conditions is particularly reliant upon the MTF and consistent Federal Aid.

Coupled with the full implementation of the state's recently enacted transportation funding package, KCRC can achieve, and stabilize, 90% of primary roads in Good/Fair condition. However, if the legislature does not fully implement this package, the annual increase in system conditions will instead shift to a downward trend.

At a time when industries are desperate for improved road conditions and an increase in the number of roads not subject to seasonal weight restrictions, KCRC is reliant on the full implementation of this package to accommodate economic development.

Chart 5 Projection of Primary Road Conditions



APPENDIX A

Kent County Road Commission

10 Year Plan for Primary Road Improvements

(UPDATED: February 2018)

The following 10 Year Plan for Primary Road Improvements identifies specific projects as well as planned investment levels (locations to be determined) in resurfacing, pavement preservation, bridge replacement and preservation, and intersection and safety projects.

Projects identified with grant dollars are partially funded with state or federal aid. Funding categories include, but are not limited to, STP Urban, Rural and Flex, EDCF (expansion projects), NHPP, CMAQ, Safety and Local Bridge. All grant funds identified after 2020 are subject to available fund levels, sources and GVMC committee approvals.

Note: The list of specific projects and various planned funding levels are subject to change depending on available funds and other factors.

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2018									
RECONSTRUCTION									
Expansion/All-Season									
10 Mile Rd.	Alpine Ave. to Pine Island Drive	2.0	Reconstruct to All-Season	2.0	466,000	1,534,000	STP-U		2,000,000
13 Mile Rd.	Peach Ridge Ave. to Fruit Ridge Ave.	1.0	Reconstruct to All-Season	2.0	410,486	789,514	STP-R		1,200,000
13 Mile Rd.	Kenowa Ave. to Fruit Ridge Ave.	1.0	Reconstruct to All-Season	2.0	394,696	805,304	STP-R		1,200,000
Knapp St.	The Grand River to West of Pettis	0.5	Reconstruct & Widen to 3 Lanes	3.0	160,000	640,000	STP-Flex		800,000
Knapp St.	Dunnigan Ave. to Grand River Dr.	2.0	Reconstruct & Widen to 3 Lanes	3.0	410,503	1,642,119	EDF-C		2,052,622
Spaulding	Ada to Cascade	0.5	Reconstruct/Widen	4.0	160,000			640,000	800,000
Full Depth Resurface									
10 Mile Rd.	US-131 to Meijer & Childsdale to River	0.4	Resurface	4.0	90,000	240,000	STP-U & CMAQ		330,000
REHABILITATION/RESURFACE									
Overlays	Various Locations	4.0	Resurface	2.2	1,040,000				1,040,000
PRESERVATION									
Surface Treatments	Various Locations	43.0	Sealcoat and Micro Surface	2.2	3,250,000				3,250,000
Thin Overlays		5.0		2.2	500,000				500,000
BRIDGES									
Alg #52	10 Mile Rd over Rogue River				150,000	380,000			530,000
Cal#9	Over Thornapple		Deck and Joint Repair		20,450	388,550			409,000
Preventive Maintenance	Various Locations		Repair / Maintain		600,000				600,000
INTERSECTIONS									
Spaulding Ave @ Cascade	From Cascade Rd. to 800 Ft South	0.15	Add Right Turn Lane		70,000	280,000	CMAQ		350,000
Wolverine Blvd. @ 11 Mile Rd.		0.00			100,000				
Pine Island Dr. @ Post Dr.		0.25			85,000	360,000	SAFETY		
Various Locations			Capacity / Safety Improvement		445,000				445,000
		59.8	Total		\$8,352,135	\$7,059,487			\$15,506,622

Notes: Expenditures are for construction costs only
This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:	STP-U (Surface Transportation Program - Urban)	STP-R (Surface Transportation Program - Rural)
	EDF-C (Economic Development Fund - Category C)	SAFETY (Federal Safety Program)
	CMAQ (Congestion Mitigation and Air Quality Program)	LBF (Local Bridge Fund)
	STP-Flex (Surface Transportation Program- Flexible)	NHPP (National Highway Performance Program)

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2019									
RECONSTRUCTION									
Expansion/All-Season									
100th St.	East of Eastern Ave. to Kalamazoo Ave.	0.8	All-Season	2.0	200,000	720,000	STP-U		920,000
Full Depth Resurface									
Kraft Ave.	36th St. to 28th St.	1.0	Resurface	5.0	215,000	785,000	STP-U		1,000,000
6 Mile Rd.	Walker Ave. to Alpine Ave.	2.0	Resurface	2.0	129,000	471,000	STP-U		600,000
7 Mile Rd.	Fruit Ridge Ave. to Bristol Ave.	3.0	Resurface	2.0	200,000	700,000	STP-R		900,000
Byron Center Ave.	92nd St. to 84th St.	1.0	Resurface	3.0	172,000	628,000	STP-U		800,000
Various		5.0	Resurface	2.2	2,000,000	800,000			2,800,000
REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
PRESERVATION									
Surface Treatments	Various Locations	82.0	Sealcoat and Micro Surface	2.2	4,000,000				4,000,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
BRIDGES									
Preventive Maintenance	Various Locations				800,000				800,000
INTERSECTIONS									
Patterson Ave & 44th St	750 Feet north and west	0.3	Dual Left Turn Lanes		150,000	600,000	CMAQ		750,000
Various Locations			Capacity / Safety Improvement		650,000				650,000
		115.1	Total		\$11,016,000	\$4,704,000			\$15,720,000

Notes: Expenditures are for construction costs only
This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:	STP-U (Surface Transportation Program - Urban)	STP-R (Surface Transportation Program - Rural)
	EDF-C (Economic Development Fund - Category C)	SAFETY (Federal Safety Program)
	CMAQ (Congestion Mitigation and Air Quality Program)	LBF (Local Bridge Fund)
	STP-Flex (Surface Transportation Program- Flexible)	NHPP (National Highway Performance Program)

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2020									
RECONSTRUCTION									
Expansion/All-Season									
84th St.	Division Ave. to Eastern Ave.	1.0	Reconstruct to 3 lanes	3.0	278,697	1,021,303	EDF-C		1,300,000
84th St.	Kalamazoo Ave. to Breton Ave.	1.0	All-Season	2.0	280,000	1,120,000	STP-U		1,400,000
68th St.	Cherry Valley Ave. to Thornapple Dr.	1.0	All-Season	2.0	1,250,000				1,250,000
Alden Nash Ave.	Segwun Ave to Grand River Dr	0.5	Reconstruct/Widen to 3 lanes	3.0	178,254	713,014	STP-Flex		891,268
Full Depth Resurface									
Fruit Ridge Ave.	4 Mile to 6 Mile	2.0	Resurface	2.0	900,000				900,000
Fruit Ridge Ave.	6 Mile Rd. to 10 Mile Rd.	4.0	Resurface	2.0	378,590	821,410	STP-R		1,200,000
Lamoreaux	Alpine to West River	1.8	Resurface	3.0	1,000,000				1,000,000
Leffingwell	City limits to Knapp St	0.5	Resurface	3.0	250,000				250,000
5 Mile	Sawkaw Dr. to East Beltline Ave	0.8	Resurface	3.0	800,000				800,000
REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
PRESERVATION									
Surface Treatments	Various Locations	82.0	Sealcoat and Micro Surface	2.2	4,050,000				4,050,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
BRIDGES									
Preventive Maintenance	Various Locations				750,000				750,000
INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		750,000				750,000
		114.6	Total		\$13,365,541	\$3,675,727			\$17,041,268

Notes: Expenditures are for construction costs only
This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:	STP-U (Surface Transportation Program - Urban)	STP-R (Surface Transportation Program - Rural)
	EDF-C (Economic Development Fund - Category C)	SAFETY (Federal Safety Program)
	CMAQ (Congestion Mitigation and Air Quality Program)	LBF (Local Bridge Fund)
	STP-Flex (Surface Transportation Program- Flexible)	NHPP (National Highway Performance Program)

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2021									
RECONSTRUCTION									
Expansion/All-Season									
100th St.	Kalamazoo Ave. to 1 Mile East	1.0	All-Season	2.0	350,000	850,000	STP-R		1,200,000
84th St.	Breton Ave. to Hanna Lake Ave.	1.0	All-Season	2.0	260,000	1,040,000	STP-U		1,300,000
68th St.	Thornapple River Dr. to Whitneyville Ave.	1.0	All-Season	2.0	1,400,000				1,400,000
Full Depth Resurface									
Crush & Shape	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
Mill & Fill	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
PRESERVATION									
Surface Treatments	Various Locations	86.0	Sealcoat and Micro Surface	2.2	4,300,000				4,300,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
BRIDGES									
Preventive Maintenance	Various Locations				950,000				950,000
INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		950,000				950,000
		125.2	Total		\$14,710,000	\$3,890,000			\$18,600,000

Notes: Expenditures are for construction costs only
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Grant Programs:	STP-U (Surface Transportation Program - Urban)	STP-R (Surface Transportation Program - Rural)
	EDF-C (Economic Development Fund - Category C)	SAFETY (Federal Safety Program)
	CMAQ (Congestion Mitigation and Air Quality Program)	LBF (Local Bridge Fund)
	STP-Flex (Surface Transportation Program- Flexible)	NHPP (National Highway Performance Program)

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2022									
RECONSTRUCTION									
<u>Expansion/All-Season</u>									
100th St.	1 Mile East of Kalamazoo Ave. to Hanna Lake Ave.	1.0	All-Season	2.0	400,000	850,000	STP-R		1,250,000
84th St.	Hanna Lake Ave. to East Paris Ave.	1.0	All-Season	2.0	260,000	1,040,000	STP-U		1,300,000
68th St.	Kraft to Cherry Valley	1.0	All-Season	2.0	1,500,000				1,500,000
 <u>Full Depth Resurface</u>									
Crush & Shape	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
Mill & Fill	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
 REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
 PRESERVATION									
Surface Treatments	Various Locations	86.0	Sealcoat and Micro Surface	2.2	4,300,000				4,300,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
 BRIDGES									
Preventive Maintenance	Various Locations				900,000				900,000
 INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		900,000				900,000
		125.2	Total		\$14,760,000	\$3,890,000			\$18,650,000

Notes:

Expenditures are for construction costs only

This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:

STP-U (Surface Transportation Program - Urban)

EDF-C (Economic Development Fund - Category C)

CMAQ (Congestion Mitigation and Air Quality Program)

STP-Flex (Surface Transportation Program- Flexible)

STP-R (Surface Transportation Program - Rural)

SAFETY (Federal Safety Program)

LBF (Local Bridge Fund)

NHPP (National Highway Performance Program)

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2023									
RECONSTRUCTION									
<u>Expansion/All-Season</u>									
100th St.	Hanna Lake Ave. to East Paris Ave.	1.0	All-Season	2.0	400,000	850,000	STP-R		1,250,000
84th St.	East Paris Ave. to Patterson Ave.	1.0	All-Season	2.0	270,000	1,080,000	STP-U		1,350,000
10 Mile Rd.	Pine Island to Algoma	2.0	All-Season	2.0	3,000,000				3,000,000
 <u>Full Depth Resurface</u>									
Crush & Shape	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
Mill & Fill	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
 REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
 PRESERVATION									
Surface Treatments	Various Locations	61.0	Sealcoat and Micro Surface	2.2	3,050,000				3,050,000
Thin Overlays		10.0		2.2	1,000,000				1,000,000
 BRIDGES									
Preventive Maintenance	Various Locations				800,000				800,000
 INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		800,000				800,000
		96.2	Total		\$14,320,000	\$11,710,000			\$18,250,000

Notes:

Expenditures are for construction costs only

This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:

STP-U (Surface Transportation Program - Urban)

EDF-C (Economic Development Fund - Category C)

CMAQ (Congestion Mitigation and Air Quality Program)

STP-Flex (Surface Transportation Program- Flexible)

STP-R (Surface Transportation Program - Rural)

SAFETY (Federal Safety Program)

LBF (Local Bridge Fund)

NHPP (National Highway Performance Program)

SOURCE OF FUNDS									
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2024									
RECONSTRUCTION									
Expansion/All-Season									
100th St.	East Paris Ave. to Patterson Ave.	1.0	All-Season	2.0	400,000	850,000	STP-R		1,250,000
Cascade Rd.	36th St. to Whitneyville Ave.	0.9	All-Season	3.0	400,000	1,600,000	STP-U		2,000,000
Wilson Ave.	76th St. to M-6	1.3	All-Season	2.0	1,750,000				1,750,000
Full Depth Resurface									
Crush & Shape	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
Mill & Fill	Various Locations	8.1	Resurface	2.2	2,000,000	1,000,000	STP-U		3,000,000
REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
PRESERVATION									
Surface Treatments	Various Locations	82.0	Sealcoat and Micro Surface	2.2	4,100,000				4,100,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
BRIDGES									
Preventive Maintenance	Various Locations				800,000				800,000
INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		800,000				800,000
		121.4	Total		\$14,750,000	\$4,450,000			\$19,200,000

Notes:

Expenditures are for construction costs only
This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:

STP-U (Surface Transportation Program - Urban)
EDF-C (Economic Development Fund - Category C)
CMAQ (Congestion Mitigation and Air Quality Program)
STP-Flex (Surface Transportation Program- Flexible)

STP-R (Surface Transportation Program - Rural)
SAFETY (Federal Safety Program)
LBF (Local Bridge Fund)
NHPP (National Highway Performance Program)

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2025									
RECONSTRUCTION									
<u>Expansion/All-Season</u>									
100th St.	Patterson Ave. to Kraft Ave.	1.0	All-Season	2.0	400,000	850,000	STP-R		1,250,000
84th St.	Patterson to Broadmoor (M-37)	1.8	All-Season	3.0	1,080,000	1,080,000	STP-U		2,000,000
 <u>Full Depth Resurface</u>									
Crush & Shape	Various Locations	8.1	Resurface	2.2	2,250,000	1,000,000	STP-U		3,250,000
Mill & Fill	Various Locations	8.1	Resurface	2.2	2,250,000	1,000,000	STP-U		3,250,000
 REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
 PRESERVATION									
Surface Treatments	Various Locations	82.0	Sealcoat and Micro Surface	2.2	4,100,000				4,100,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
 BRIDGES									
Preventive Maintenance	Various Locations				1,000,000				1,000,000
 INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		1,000,000				1,000,000
		121.0	Total		\$14,580,000	\$3,930,000			\$18,350,000

Notes:

Expenditures are for construction costs only

This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:

STP-U (Surface Transportation Program - Urban)

EDF-C (Economic Development Fund - Category C)

CMAQ (Congestion Mitigation and Air Quality Program)

STP-Flex (Surface Transportation Program- Flexible)

STP-R (Surface Transportation Program - Rural)

SAFETY (Federal Safety Program)

LBF (Local Bridge Fund)

NHPP (National Highway Performance Program)

SOURCE OF FUNDS									
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2026									
RECONSTRUCTION									
<u>Expansion/All-Season</u>									
Lincoln Lake Ave.	Belding Rd (M-44) to Strotheide	1.0	All-Season	2.0	400,000	850,000	STP-R		1,250,000
<u>Full Depth Resurface</u>									
Crush & Shape	Various Locations	8.1	Resurface	2.2	2,250,000	1,000,000	STP-U		3,250,000
Mill & Fill	Various Locations	8.1	Resurface	2.2	2,250,000	1,000,000	STP-U		3,250,000
REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
PRESERVATION									
Surface Treatments	Various Locations	82.0	Sealcoat and Micro Surface	2.2	4,100,000				4,100,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
BRIDGES									
Preventive Maintenance	Various Locations				1,000,000				1,000,000
INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		1,000,000				1,000,000
		119.2	Total		\$13,500,000	\$2,850,000			\$16,350,000

Notes: Expenditures are for construction costs only
This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:	STP-U (Surface Transportation Program - Urban)	STP-R (Surface Transportation Program - Rural)
	EDF-C (Economic Development Fund - Category C)	SAFETY (Federal Safety Program)
	CMAQ (Congestion Mitigation and Air Quality Program)	LBF (Local Bridge Fund)
	STP-Flex (Surface Transportation Program- Flexible)	NHPP (National Highway Performance Program)

					SOURCE OF FUNDS				
ROAD	LIMITS	MI.	IMPROVEMENT	LN.	KCRC	GRANT	PROGRAM	LOCAL	TOTAL
2027									
RECONSTRUCTION									
<u>Expansion/All-Season</u>									
Lincoln Lake Ave.	Strotheide to Heffron St	1.0	All-Season	2.0	400,000	850,000	STP-R		1,250,000
<u>Full Depth Resurface</u>									
Crush & Shape	Various Locations	8.1	Resurface	2.2	2,250,000	1,000,000	STP-U		3,250,000
Mill & Fill	Various Locations	8.1	Resurface	2.2	2,250,000	1,000,000	STP-U		3,250,000
REHABILITATION/RESURFACE									
Overlays	Various Locations	5.0	Resurface	2.2	1,000,000				1,000,000
PRESERVATION									
Surface Treatments	Various Locations	82.0	Sealcoat and Micro Surface	2.2	4,100,000				4,100,000
Thin Overlays		15.0		2.2	1,500,000				1,500,000
BRIDGES									
Preventive Maintenance	Various Locations				1,000,000				1,000,000
INTERSECTIONS									
Various Locations			Capacity / Safety Improvement		1,000,000				1,000,000
		119.2	Total		\$13,500,000	\$2,850,000			\$16,350,000

Notes:

Expenditures are for construction costs only

This document is prepared for planning and programming purposes, consequently projects are subject to change.

Grant Programs:

STP-U (Surface Transportation Program - Urban)

EDF-C (Economic Development Fund - Category C)

CMAQ (Congestion Mitigation and Air Quality Program)

STP-Flex (Surface Transportation Program- Flexible)

STP-R (Surface Transportation Program - Rural)

SAFETY (Federal Safety Program)

LBF (Local Bridge Fund)

NHPP (National Highway Performance Program)

Appendix B

Definitions of Preventive Maintenance Treatments

HMA Crack Treatment and Overband Crack Filling

This is a generalized treatment category including crack sealing, crack filling and crack repair. This crack seal treatment is used on all types of cracks. It involves using a hot air lance or compressed air to blow out the debris in the crack, then filling with a sealant. This class of treatments are intended to seal the cracks from water infiltration and incompressible material entering the pavement system.

Non Structural HMA Overlays:

Non-structural overlays are considered having an application thickness of 1.5 inches or less of hot mix asphalt (HMA) material; however, in certain cases the use of 2 inch overlays may be approved. Pre-approved cases include: the use of 2 inch overlays for crown correction, the use of superpave mixes that require 2 inch lifts, the use of a scratch course prior to a 1.5 inch overlay in areas where there is a concern with crack sealing materials, and where it is necessary to mill 2 inches to address distress (such as rutting). The use of 2 inch overlays are still the exception to the rule and the use of 2 inch of HMA in the preventive maintenance program for any reason other than the pre-approved reasons listed above will require approval from the MDOT Local Agency Staff Engineer, the MDOT Local Agency Engineer, and the MDOT Engineer of Design. Approval will be on a case by case basis. Preventive maintenance projects should not be applied to a roadway that has significant level of distress that should be addressed by a 3R or reconstruction type project.

Longitudinal HMA Wedge / Scratch Coat with Surface Treatment:

Longitudinal HMA Wedge / scratch coat with surface treatment consists of a paver placed HMA material to correct the cross section of the roadway often done on lower volume roads in combination with a chip seal but can also be used in combination with a micro-surface, ultra thin overlay, and conventional overlay. This is not to be used in small isolated areas as a pothole repair. This is to be used for the majority of the length of the project (using engineering judgment) so that the proper increase in ride quality can be achieved.

Chip Seal

A chip seal is the application of a asphalt emulsion with a cover aggregate. A chip seal will seal and or retard the oxidation of an existing pavement surface, improve skid resistance of the pavement surface, seal fine surface cracks in the pavement thus reducing the intrusion of water into the pavement structure, and will retard the raveling of aggregate from a weathered pavement surface. Chip seals may be constructed using a single or multiple layers of asphalt emulsion and aggregate cover. Chip seals may be applied in conjunction with crack sealing.

Micro-Surface

Micro-Surfacing is a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives placed on a paved surface. A single course micro-surfacing will retard oxidation and improve skid resistance in the pavement surface. A multiple course micro-surfacing is used to correct certain pavement surface deficiencies including severe rutting, minor surface profile irregularities, polished aggregate or low skid resistance and light to moderate raveling. Micro-surfacing is typically used on flexible or composite pavements and can perform under all traffic volumes

Cape Seal

A cape seal is a two layered surface treatment in which the first layer is comprised of a chip seal followed by a second layer of Micro surface. Alternately, some situations may require or allow for reversal of the first and second layers. A cape seal helps to retard reflective cracking by combining a rather flexible seal to the original pavement, provide a hard frictional riding surface, and to repair minor pavement profile deficiencies. It can be a cost effective method for treatment of 'higher' stressed pavement surfaces that would not be possible with a single surface of chip seal or micro surface treatment alone. It can be used on gravel surfaces to construct a paved roadway but it is typically used on flexible or composite pavements and can perform under all traffic volumes.

Flexible Interlayers

Similar to Cape Seal philosophy several pavement preservation tools are used as flexible interlayers under new hot mix paving layer(s). Flexible interlayers are frequently used with mill and fill applications to help retard or redirect vertical reflective cracking horizontally to increase the service life of the new pavement and/or to defer requirement for crack sealing.

Flexible Interlayer "A" (Single Chip Seal)

A single layer of chip seal using commonly approved asphalt emulsion, polymer modified or non-polymer modified, can be placed under a Micro Surfacing or Hot Mix Asphalt surface. This treatment is a crack inhibiting, waterproofing and sealing membrane. The single chip seal application helps extend the life of the subsequent overlay by delaying reflective cracking or "bottom up" cracking by dissipating crack propagation energy and deflecting most of the "top down" pavement strain from vehicle loading. It is typically used on highly distressed milled or unmilled surfaces and can perform under all traffic volumes. It may not perform as well as Flexible Interlayer "B" (SAMI) dependent on the polymer concentration in the emulsion.

Flexible Interlayer "B" (SAMI (Stress Absorbing Membrane Interlayer))

A combination of highly polymerized asphalt emulsion and quality crushed aggregate. Installed much like a Chip Seal. This treatment is a crack inhibiting, waterproofing and sealing membrane. An excellent bonding agent that acts as a flexible waterproofing membrane installed prior to either a Micro Surfacing or Hot Mix Asphalt. SAMI helps extend the life of the subsequent overlay by delaying reflective cracking or "bottom up" cracking by dissipating crack propagation energy and deflecting most of the "top down" pavement strain from vehicle loading. It is typically used on highly distressed milled or unmilled surfaces and can perform under all traffic volumes.

Scrub Seal

Scrub Seal is the application of a chip surface placed over polymer modified asphalt rejuvenating emulsion surface sealer. The asphalt emulsion surface sealer is a polymer modified rejuvenating emulsion that is scrubbed with a scrub broom device immediately following application of the emulsion by distributor. The scrub broom is used to force emulsion sealer into the existing surface and to distribute the rejuvenating emulsion sealer over variable road surface contours. Immediately after scrubbing the polymer modified asphalt rejuvenating emulsion it is covered with a surface aggregate.

Ultra Thin HMA Overlay

Ultra Thin HMA Overlay is a dense graded bituminous mixture which is applied to retard oxidation and improve skid resistance in the pavement surface.

Longitudinal Joint Repair

A process in which severely opened HMA or concrete joints are sealed by a chosen pre-treatment and/or then covered with a small width micro surfacing treatment to maintain a smooth ride quality while sealing the opened longitudinal joint and preventing further damage to the longitudinal joint from traffic and weather.

