AGENDA
Committee on Public Services
Monday, August 31, 2020 @ 4:00 p.m.

https://us02web.zoom.us/j/89974932368; ID 899 7493 2368; Dial In: (312) 626 6799
Email comments prior to the meeting to sherrie.boak@lansingmi.gov

Council Member Dunbar, Chair
Council Member Spitzley, Vice Chair
Council Member Spadafore, Member

1) **Call to Order**

2) **Public Comment on Agenda Items**

3) **Minutes**
   - August 25, 2020

4) **Discussion/Action:**

   A. RESOLUTION – Acceptance of Pavement Asset Management Plan

   B. RESOLUTION – Traffic Control No. 20-07; Install Stop Signs' High Street and Cesar Chavez Avenue Intersection

5) **Adjourn**

Executive Order 2020-4, Governor Whitmer declared a statewide State of Emergency due to the spread of the novel coronavirus (COVID-19). To mitigate the spread of COVID-19 and to provide essential protections to vulnerable Michiganders and this State's health care system and other critical infrastructure, it is crucial that all Michiganders take steps to-limit in-person contact, particularly in the context of large groups. Therefore, the above meetings will be conducted via audio/video conference.

The meetings are being held electronically in accordance with the Open Meetings Act in an effort to protect the health and safety of the public. Members of the public wishing to participate in the meeting may do so by logging into or calling into the meetings using the website or phone number above, and meeting ID provided. Michigan Executive Order 2020-154 provides temporary authorization of remote participation in public meetings and hearings.

Persons with disabilities who need an accommodation to fully participate in these meetings should contact the City Council Office at 517-483-4177 (TTY 711) 24 hour notice may be needed for certain accommodations. An attempt will be made to grant all reasonable accommodation requests.

MINUTES
Committee on Public Service
Tuesday, August 25, 2020 @ 4:00 p.m.
Via Zoom https://us02web.zoom.us/j/81633315842; ID: 816 3331 5842; Dial In: (312) 626 6799

CALL TO ORDER
The meeting was called to order at 4:01 p.m. by Council Member Dunbar.

ROLL CALL-via remote audio/video
Council Member Dunbar, Chair
Council Member Spitzley, Vice Chair – arrived at 4:13 p.m.
Council Member Spadafore, Member

OTHERS PRESENT
Renee Richmond, Council Administrative Assistant
Andy Kilpatrick, Public Service Dept.
Michelle Smalley, Administrative Assistant Public Service Dept.
Greg Venker, Assistant City Attorney – arrived at the end of the meeting
Nicholas Montry, Public Service Dept.

Minutes
MOTION BY COUNCIL MEMBER DUNBAR TO APPROVE THE MINUTES FROM JULY 29, 2020 AS PRESENTED. MOTION CARRIED 2-0.

Discussion
RESOLUTION – Special Assessment; Snow & Ice Removal Assessment Winter 2019-2020; 500 E. Oakland Avenue
Council Member Dunbar asked Mr. Kilpatrick to explain the policy regarding the Snow & Ice Assessment, and after the brief overview Ms. Smalley informed the Committee that the notification period is 24 hours after they are posted. Mr. Montry introduced himself and stated he was available if they had any questions. Council Member Dunbar stated there were no public comments made at the Council Public Hearing. The Committee did receive two email appeals, one from 500 E. Oakland and one from 1112 Kelsey. The Committee reviewed the email appeals.

500 E. Oakland
MOTION BY COUNCIL MEMBER SPADAFORE TO DENY THE APPEAL FOR 500 E. OAKLAND ON THE SNOW AND ICE ASSESSMENT WINTER ROLL FOR 2019/2020.
Council Member Dunbar read the appeal which stated there were tenants at the time and are no longer renting so they cannot collect on the charge. Council Member Dunbar asked if anyone from Public Service had reached out to the property owners, and Mr. Kilpatrick stated

Public Service received the appeal from Ms. Boak, Council Office Manager on August 24th and believes his staff did speak to someone from the property.

ROLL CALL VOTE, MOTION TO DENY CARRIED 2-0.

1112 Kelsey Avenue

Council Member Dunbar ask Public Service representatives for details on their practices when someone purchases a property and there is no lien, no assessments and no outstanding issues because of delay in the City processing. It was noted the appeal document noted there were no outstanding notices or assessments. Mr. Kilpatrick and Council Member Dunbar both agreed there were no attachment to the email response to dispute the assessment.

MOTION BY COUNCIL MEMBER SPADAFORE TO DENY THE APPEAL FOR THE SPECIAL ASSESSMENT FOR SNOW & ICE REMOVAL WINTER 2019-2020 FOR 1112 KELSEY AVENUE. ROLL CALL VOTE, MOTION TO DENY CARRIED 2-0.

MOTION BY COUNCIL MEMBER SPADAFORE TO APPROVE THE RESOLUTION FOR THE SPECIAL ASSESSMENT FOR THE SNOW AND ICE ASSESSMENT FOR WINTER 2019/2020 AS PRESENTED. ROLL CALL VOTE, MOTION CARRIED 2-0.

Council Member Spitzley arrived at 4:13 p.m.

RESOLUTION – Special Assessment; Glenburne Commons, Trash & Grass Abatement, Roll #GM-2020

4307 Courtland

Council Member Dunbar noted she did not have any public comments from the Council public hearing. It was also noted the author of the email appeal was not present in this ZOOM meeting. She lastly noted that the email made it appear the owner was not familiar with the assessment and why the residents were paying. Council Member Dunbar then briefly outlined the history of the assessment for the Committee and public present, explaining the area that is maintained by the City contractors because it had become a nuisance and the Glenburne Commons Association was not currently set up to maintain it and pay for it, therefore the City assisted them setting up this annual assessment.

MOTION BY COUNCIL MEMBER SPADAFORE TO DENY THE APPEAL FOR 4307 COURTLAND FOR THE SPECIAL ASSESSMENT; GLENBURNE COMMONS, TRASH & GRASS ABATEMENT, ROLL #GM-2020. ROLL CALL VOTE, MOTION TO DENY CARRIED 3-0.

4333 MacDougal Circle

Council Member Dunbar reviewed the email appeal noted the resident obtained the property in April and requested to be removed as the assessment doesn't apply. Mr. Kilpatrick confirmed this does get assessed to the property and he suggested possible assistance from Bob Rose to have a history of the Glenburne Commons property mailed to the current residents. Councilmember Spitzley suggested possibly sending out an overview and history along with the notice. Mr. Kilpatrick offered to start to work with the OCA on the appropriate paperwork.

MOTION BY COUNCIL MEMBER SPADAFORE TO DENY THE APPEAL FOR 4333 MACDOUGAL CIRCLE FOR THE SPECIAL ASSESSMENT; GLENBURNE COMMONS, TRASH & GRASS ABATEMENT, ROLL #GM-2020. ROLL CALL VOTE, MOTION TO DENY CARRIED 3-0.

MOTION BY COUNCIL MEMBER SPADAFORE TO APPROVE THE RESOLUTION FOR THE SPECIAL ASSESSMENT FOR GLENBURNE COMMONS TRASH AND GRASS ABATEMENT, ROLL #GM-2020 AS PRESENTED. ROLL CALL VOTE, MOTION CARRIED 3-0.

DISCUSSION – Fiscal Year 2021/2022 Budget Priorities

Council Member Spadafore stated that he would be presenting to COW a discussion to change the format of the document. Council Member Dunbar stated the Committee on Public Service will review at their meeting on Tuesday, September 8, 2020.

Mr. Venker arrived into the meeting asking if they needed any assistance from the OCA regarding a legal history on Glenburne Commons assessment, and Council Member Dunbar stated there was nothing presented.

Public Comment

No public comment at this time.

ADJOURN

The meeting was adjourned at 4:29 p.m.
Submitted by Renee Richmond,
Recording Secretary
Lansing City Council
Approved: _____

City of Lansing
2020 Pavement
Asset Management Plan

Andy Schor, Mayor

This is a plan describing the City of Lansing's roadway assets and conditions.

Prepared by:
Ann M. Parry, P.E.
Engineer
Ann.parry@lansingmi.gov, 517-483-4454

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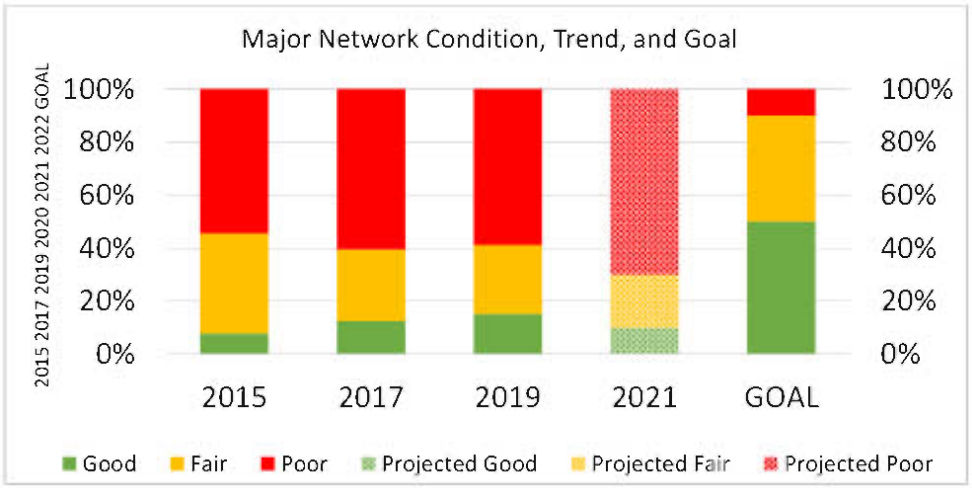
EXECUTIVE SUMMARY

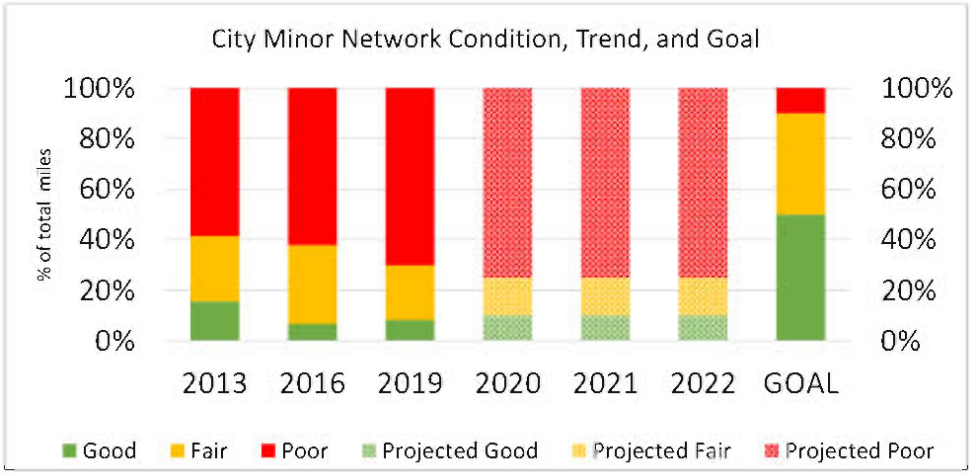
As conduits for commerce and connections to vital services, roads are among the most important assets in any community along with other assets like bridges, culverts, traffic signs, traffic signals, and utilities that support and affect roads. The City of Lansing's (COL) roads, other transportation assets and support systems are also some of the most valuable and extensive public assets—all of which are paid for with taxes collected from ordinary citizens and businesses. The cost of building and maintaining roads, their importance to society, and the investment made by taxpayers all place a high level of responsibility on local agencies to plan, build and maintain the road network in an efficient and effective manner. This asset management plan (AMP) is intended to report on how the COL is meeting its obligations to maintain the public assets for which it is responsible.

This plan overviews the COL's road assets and conditions, and explains how COL works to maintain and improve the overall condition of those assets. These explanations can help answer the following questions:

- What kinds of road assets the COL has in its jurisdiction, who owns them, and the different options for maintaining these assets.
- What tools and processes the COL uses to track and manage road assets and funds.
- What condition the COL's road assets are in compared to statewide averages.
- Why some road assets are in better condition than others and the path to maintaining and improving road asset conditions through proper planning and maintenance.
- How agency transportation assets are funded and where those funds come from.
- How funds are used and the costs incurred during the COL's road assets' normal life cycle.
- What condition the COL can expect its road assets if those assets continue to be funded at the current funding levels
- How changes in funding levels can affect the overall condition of all of the COL's road assets.

The COL owns and/or manages 413.808 centerline miles of roads. This road network can be divided into the city major network, the city minor network, the unpaved road network and the National Highway System (NHS) network based on the different factors these roads have that influence asset management decisions. A summary of the COL's historical and current network conditions, projected trends and goals for city major minor networks can be seen in the following graphs:





An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of the COL's obligations towards meeting these requirements. This asset management plan also helps demonstrate the COL's responsible use of public funds by providing elected and appointed officials as well as the general public with inventory and condition information of the COL's road assets. The AMP also provides taxpayers with the information that they need to make informed decisions about investing in its essential transportation infrastructure.

INTRODUCTION

Asset management is defined by Public Act 325 of 2018 as "an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals." In other words, asset management is a process that uses data to manage and track assets, like roads and bridges, in a cost-effective manner using a combination of engineering and business principles. This process is endorsed by leaders in municipal planning and transportation infrastructure, including the Michigan Municipal League (MML), County Road Association of Michigan, the Michigan Department of Transportation (MDOT) and the Federal Highway Administration (FHWA). The COL is supported in its use of asset management principles and processes by the Michigan Transportation Asset Management Council (TAMC), formed by the State of Michigan.

Asset management, in the context of this plan, ensures that public funds are spent as effectively as possible to maximize the condition of the road network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial challenges of managing road infrastructure with a limited budget.

The COL has adopted an "asset management" business process to overcome the challenges presented by having limited financial, staffing, and other resources while needing to meet road users' expectations. COL is responsible for maintaining and operating over 413.808 centerline miles of roads.

This plan outlines how the COL determines its strategy to maintain and upgrade road asset condition given agency goals, priorities of its road users and resources provided. An updated plan is to be released approximately every two years to reflect changes in road conditions, finances and priorities.

Questions regarding the use or content of this plan should be directed to Ann M. Parry, PE, at 124 W. Michigan Avenue 7th Floor, Lansing, MI 48933 or at 517-483-4454 and/or ann.parry@lansingmi.gov.

A copy of this plan can be accessed on the COL's website at www.lansingmi.gov/streets. Key terms used in this plan are defined in COL's comprehensive transportation asset management plan (also known as the "compliance plan") used for compliance with PA 325 or 2018.

Knowing the basic features of the asset classes themselves is a crucial starting point to understanding the rationale behind an asset management approach. The following primer provides an introduction to pavements.

Pavement Primer

Roads come in two basic forms—paved and unpaved. Paved roads have hard surfaces. These hard surfaces can be constructed from asphalt, concrete, composite (asphalt and concrete), sealcoat and brick-and-block materials. On the other hand, unpaved roads have no hard surfaces. Examples of these surfaces are gravel and unimproved earth.

The decision to pave with a particular material as well as the decision to leave a road unpaved allows road-owning agencies to tailor a road to a particular purpose, environment and budget. Thus, selecting a pavement type or leaving a road unpaved depends upon purpose, available materials and budget. Each choice represents a trade-off between budget and costs for construction and maintenance.

Maintenance enables the road to fulfill its particular purpose. To achieve the maximum service for a pavement or an unpaved road, continual monitoring of a road's pavement condition is essential for choosing the right time to apply the right fix in the right place.

Here is a brief overview of the different types of pavements, how condition is assessed and treatment options that can lengthen a road's service life.

Surfacing

Pavement type is influenced by several different factors, such as cost of construction, cost of maintenance, frequency of maintenance and type of maintenance. These factors can have benefits affecting asset life and road user experience.

Paved Surfacing

Typical benefits and trade-offs for hard surface types include:

- **Concrete Pavement:** Concrete pavement, which is sometimes called a rigid pavement, is durable and lasts a long time when properly constructed and maintained. Concrete pavement can have longer service periods between maintenance activities, which can help reduce maintenance-related traffic disruptions. However, concrete pavements have a high initial cost and can be challenging to rehabilitate and maintain at the end of their service life. A typical concrete pavement design life will provide service for 30 years before major rehabilitation is necessary.
- **Hot-Mix Asphalt Pavement (HMA):** HMA pavement, sometimes known as asphalt or flexible pavement, is currently less expensive to construct than concrete pavement (this is, in some part due to the closer link between HMA material costs and oil prices that HMA pavements have in

comparison with other pavement types). However, they require frequent maintenance activities to maximize their service life. A typical HMA pavement design life will provide service for 18 years before major rehabilitation is necessary. The vast majority of local-agency-owned pavements are HMA pavements.

- **Composite Pavement:** Composite pavement is a combination of concrete and asphalt layers. Typically, composite pavements are old concrete pavements exhibiting ride-related issues that were overlaid by several inches of HMA in order to gain more service life from the pavement before the need for reconstruction. Converting a concrete pavement to a composite pavement is typically used as a "holding pattern" treatment to maintain the road in usable condition until reconstruction funds become available.
- **Sealcoat Pavement:** Sealcoat pavement is a gravel road that has been sealed with a thin asphalt binder coating that has stone chips spread on top (not to be confused with a chip seal treatment over HMA pavement). This type of a pavement relies on the gravel layer to provide structure to support traffic, and the asphalt binder coating and stone chips shed water and eliminate the need for maintenance grading. Nonetheless, sealcoat pavement does require additional maintenance steps that asphalt and gravel do not require. While sealcoat pavement does not last as long as HMA pavement, it provides a low-cost alternative for lightly-trafficked areas and competes with asphalt for ride quality when properly constructed and maintained. Sealcoat pavement can provide service for ten or more years before the surface layer deteriorates and needs to be replaced.

Unpaved Surfacing

Typical benefits and tradeoffs for non-hard surfacing include:

- **Gravel:** Gravel is a low-cost, easy-to-maintain road surface made from layers of soil and aggregate (gravel). However, there are several potential drawbacks such as dust, mud and ride smoothness when maintenance is delayed or traffic volume exceeds design expectations. Gravel roads require frequent low-cost maintenance activities. Gravel can be very cost effective for lower-volume, lower-speed roads. In the right conditions, a properly constructed and maintained gravel road can provide a service life comparable to an HMA pavement and can be significantly less expensive than the other pavement types.

Pavement Condition

Besides traffic congestion, pavement condition is what road users typically notice most about the quality of the roads that they regularly use—the better the pavement condition, the more satisfied users are with the service provided by the roadwork performed by road-owning agencies. Pavement condition is also a major factor in determining the most cost-effective treatment—that is, routine maintenance, capital preventive maintenance, or structural improvement—for a given section of pavement. As pavements age, they transition between "windows" of opportunity when a specific type of treatment can be applied to gain an increase in quality and extension of service life. Routine maintenance is day-to-day, regularly-scheduled and low-cost activity applied to "good" roads to prevent water or debris damage. Capital

preventive maintenance (CPM) is a planned set of cost-effective treatments for "fair" roads that corrects pavement defects, slows further deterioration and maintains the functional condition without increasing structural capacity. COL uses pavement condition and age to anticipate when a specific section of pavement will be a potential candidate for preventive maintenance. More detail on this topic is included in the *Pavement Treatment* section of this primer.

Pavement condition data is also important because it allows road owners to evaluate the benefits of preventive maintenance projects. This data helps road owners to identify the most cost-effective use of road construction and maintenance dollars. Further, historic pavement condition data can enable road owners to predict future road conditions based on budget constraints and to determine if a road network's condition will improve, stay the same, or degrade at the current or planned investment level. This analysis can help determine how much additional funding is necessary to meet a network's condition improvement goals.

Paved Road Condition Rating System

COL is committed to monitoring the condition of its road network and using pavement condition data to drive cost-effective decision-making and preservation of valuable road assets. COL uses the Pavement Surface Evaluation and Rating (PASER) system to assess its paved roads. PASER was developed by the University of Wisconsin Transportation Information Center to provide a simple, efficient and consistent method for evaluating road condition through visual inspection. The widely-used PASER system has specific criteria for assessing asphalt, concrete, sealcoat and brick-and-block pavements. Information regarding the PASER system and PASER manuals may be found on the TAMC website at: http://www.michigan.gov/tamc/0,7308,7-356-82158_82627---,00.html.

The TAMC has adopted the PASER system for measuring statewide pavement conditions in Michigan for asphalt, concrete, composite, sealcoat and brick-and-block paved roads. Broad use of the PASER system means that data collected at COL is consistent with data collected statewide. PASER data is collected when trained inspectors in a slow-moving vehicle use GPS-enabled data collection software provided to road-owning agencies at no cost to them. The method does not require extensive training or specialized equipment, and data can be collected rapidly, which minimizes the expense for collecting and maintaining this data.

The PASER system rates surface condition using a 1-10 scale. The scale reads as follows: 10 is a brand new road with no defects that can be treated with routine maintenance, 5 is a road with distresses but is structurally sound that can be treated with preventive maintenance, and 1 is a road with extensive surface and structural distresses that is in need of total reconstruction.

Roads with lower PASER scores generally require costlier treatments to restore their quality than roads with higher PASER scores. The cost effectiveness of treatments generally decreases as the PASER number decreases. In other words, as a road deteriorates, it costs more dollars per mile to fix it, and the dollars spent are less efficient in increasing the road's service life. Nationwide experience and asset management principles tell us that a road that has deteriorated to a PASER 4 or less will cost more to improve, and the dollars spent will be less efficient. Understanding this cost principle helps to draw meaning from the current PASER condition assessment.

The TAMC has developed statewide definitions of road condition by creating three simplified condition categories—"good," "fair" and "poor"—that represent bin ranges of PASER scores having similar contexts with regard to maintenance and/or reconstruction. The definitions of these rating conditions are:

- "Good" roads, according to the TAMC, have PASER scores of 8, 9, or 10. Roads in this category have very few, if any, defects and only require minimal maintenance; they may be kept in this category longer using CPM. These roads may include those that have been recently seal coated or newly constructed. Figure 1 illustrates an example of a road in this category.
- "Fair" roads, according to the TAMC, have PASER scores of 5, 6, or 7. Roads in this category still show good structural support, but their surface is starting to deteriorate. Figure 1 illustrates two road examples in this category. CPM can be cost effective for maintaining the road's "fair" condition or even raising it to "good" condition before the structural integrity of the pavement has been severely impacted. CPM treatments can be compared to shingles on a roof of a house; while the shingles add no structural value, they protect the house from structural damage by maintaining the protective function of a roof covering.
- "Poor" roads, according to the TAMC, have PASER scores of 1, 2, 3, or 4. These roads exhibit evidence that the underlying structure is failing, such as alligator cracking and rutting. These roads must be rehabilitated with treatments like a heavy overlay, crush and shape, or total reconstruction. Figure 1 illustrates a road in this category.

Figure 1 *Top image, right*– PASER 8 road that is considered "good" by the TAMC exhibit only minor defects. *Second image, right*– PASER 5 road that is considered "fair" by the TAMC Exhibiting structural soundness but could benefit from CPM. *Third image, right*– PASER 6 road that is considered "fair" by the TAMC. *Bottom image, right*– PASER 2 road that is considered "poor" by the TAMC exhibiting significant structural distress.

The TAMC's good, fair and poor categories are based solely on the above definitions. Therefore, caution should be exercised when comparing other condition assessments with these categories because other condition assessments may have "good," "fair," or "poor" designations similar to the TAMC condition

categories but with a potentially different definition. Often, other condition assessment systems define the "good," "fair" and "poor" categories differently, thus rendering the data of little use for cross-system comparison. The TAMC's definitions provide a statewide standard for all of Michigan's road-owning agencies to use for comparison purposes.

PASER data is collected 100 percent every two years on all federal-aid-eligible roads in Michigan. The TAMC dictates and funds the required training and the format for this collection, and it shares the data both regionally and statewide. In addition, COL collects 50 percent of its paved non-federal-aid-eligible network annually using its own staff and resources.

Unpaved Road Condition Rating System (IBR System™)

The condition of unpaved roads can be rapidly changing, which makes it difficult to obtain a consistent surface condition rating over the course of weeks or even days. The PASER system works well on most paved roads, which have a relatively-stable surface condition over several months, but it is difficult to adapt to unpaved roads. To address the need for a reliable condition assessment system for unpaved roads, the TAMC adopted the Inventory Based Rating (IBR) System™; COL also uses the IBR System™ for rating its unpaved roads. Information about the IBR System™ can be found at http://ctt.mtu.edu/inventory-based-rating-system.

Figure 2: *Top*– Road with IBR number of 1 road that has poor surface width, poor drainage adequacy, and poor structural adequacy. *Middle*– Road IBR number of 7 that has fair surface width, fair drainage adequacy, and fair structural adequacy *Bottom*– Road with IBR number of 9 road that has good surface width, good drainage adequacy, and good structural adequacy

The IBR System™ gathers reliable condition assessment data for unpaved roads by evaluating three features—surface width, drainage adequacy and structural adequacy—in comparison to a baseline, or generally considered "good" road. These three assessments come together to generate an overall 1-10 IBR number. A high IBR number reflects a road with wide surface width, good drainage and a well-designed, well-constructed base. On the contrary, a low IBR number reflects a narrow road with no ditches and little gravel. A good, fair, or poor assessment of each feature is not an endorsement or indictment of a road's suitability for use, but simply provides context on how these road elements compare to a baseline condition.

Figure 2 illustrates the range over which features may be assessed. The top example in Figure 2 shows an unpaved road with a narrow surface width, little or no drainage and very little gravel thickness. Using the IBR System™, these assessments would yield an IBR number of "1" for this road. The middle example in Figure 2 shows a road with fair surface width, fair drainage adequacy and fair structural adequacy. These assessments would yield an IBR number of "7" for this road. The bottom

example in Figure 2 shows a road with good surface width, good drainage adequacy and good structural adequacy. These assessments would yield an IBR number of "9" for this road.

Unpaved roads are constructed and used differently throughout Michigan. A narrow, unpaved road with no ditches and very little gravel (low IBR number) may be perfectly acceptable in a short, terminal end of the road network such as on a road segment that ends at a lake or serves a limited number of unoccupied private properties. However, high-volume unpaved roads that serve agricultural or other industrial activities with heavy trucks and equipment will require wide surface width, good drainage and a well-designed and well-constructed base structure (high IBR number). The location and purpose of an unpaved road determines how the road must be constructed and maintained; a road does not need to be upgraded just because it has a low IBR number. The IBR numbers are not an endorsement or indictment of the road's suitability for use but rather an indication of a road's capabilities to support different traffic volumes and types in all weather.

The COL has 5.9 miles of unpaved streets; all are city minor streets. This section is included for information purposes. This Asset Management Plan will mainly focus on the paved street network.

Pavement Treatments

Selection of repair treatments for roads aims to balance costs, benefits and road life expectancy. All pavements are damaged by water, traffic weight, freeze/thaw cycles and sunlight. Each of the following treatments and strategies—reconstruction, structural improvements, capital preventive maintenance and others used by COL—counters at least one of these pavement-damaging forces.

Reconstruction

Pavement reconstruction treats failing or failed pavements by completely removing the old pavement and base and constructing an entirely new road (Figure 3). Every pavement has to eventually be reconstructed, which is usually done as a last resort after more cost-effective treatments are done, or if the road requires significant changes to road geometry, base or buried utilities. Compared to the other treatments, which are all improvements of the existing road, reconstruction is the most extensive rehabilitation of the roadway and therefore, also the most expensive per mile and disruptive to regular traffic patterns. Reconstructed pavement will subsequently require one or more of the previous maintenance treatments to maximize

Figure 3 Examples of reconstruction treatments—(left) reconstructing a road and (right) road prepared for full-depth repair

service life and performance. A reconstructed road lasts approximately 15 years and costs $555,000 per lane mile. The following descriptions outline the main reconstruction treatments used by COL.

Full-depth Concrete Repair

A full-depth concrete repair removes sections of damaged concrete pavement and replaces it with new concrete of the same dimensions (Figure 3). It is usually performed on isolated and deteriorated joint locations or entire slabs that are much further deteriorated than adjacent slabs. The purpose is to restore the riding surface, delay water infiltration, restore load transfer from one slab to the next and eliminate the need to perform costly, temporary patching. This repair lasts approximately 12 years and typically costs $100,000 per mile.

Structural Improvement

Roads requiring structural improvements exhibit alligator cracking and rutting and are rated poor in the TAMC scale. Road rutting is evidence that the underlying structure is beginning to fail and it must be rehabilitated with a structural treatment. Examples of structural improvement treatments include HMA overlay with or without milling and crush and shape (Figure 4). The following descriptions outline the main structural improvement treatments used by COL.

Figure 4 Examples of structural improvement treatments—(from left) HMA overlay on an unmilled pavement, milling asphalt pavement, and pulverization of a road during a crush-and-shape project.

Hot-mix Asphalt (HMA) Overlay with/without Milling

An HMA overlay is a layer of new asphalt (liquid asphalt and stones) placed on an existing pavement (Figure 4). Depending on the overlay thickness, this treatment can add significant structural strength. This treatment also creates a new wearing surface for traffic and seals the pavement from water, debris and sunlight damage. An HMA overlay lasts approximately five to ten years and costs $283,0000 per lane mile. The top layer of severely damaged pavement can be removed by milling, a technique that helps prevent structural problems from being quickly reflected up to the new surface. Milling is also done to keep roads at the same height of curb and gutter that is not being raised or reinstalled in the project. Milling adds $10,000 per lane mile to the HMA overlay cost.

Crush and Shape

During a crush and shape treatment, the existing pavement and base are pulverized. The road surface is then reshaped and excess material is removed (Figure 4). A new wearing surface (HMA) is added. This treatment is usually done on city minor streets. Crush and shape treatments last approximately 12 years and cost $335,000 per lane mile.

Capital Preventive Maintenance

Capital preventive maintenance (CPM) addresses pavement problems of fair-rated roads before the structural integrity of the pavement has been severely impacted. CPM is a planned set of cost-effective treatments applied to an existing roadway that slows further deterioration and maintains or improves the functional condition of the system without significantly increasing the structural capacity. Examples of such treatments include crack seal, fog seal, chip seal, slurry seal and microsurface (Figure 5). The purpose of the following CPM treatment is to protect the pavement structure, slow the rate of deterioration and/or correct pavement surface deficiencies. The following descriptions outline the main CPM treatments used by COL:

Figure 5 Examples of capital preventive maintenance treatments—(from left) crack seal, fog seal, chip seal, and slurry seal/microsurface.

Crack Seal

Water that infiltrates the pavement surface softens the pavement structure and allows traffic loads to cause more damage to the pavement than in normal dry conditions. Crack sealing helps prevent water infiltration by sealing cracks in the pavement with asphalt sealant (Figure 5). COL seals pavement cracks early in the life of the pavement to keep it as best and long functioning as possible. Crack sealing lasts approximately two years and costs $5,400 per lane mile. Even though it does not last very long compared to other treatments, it does not cost very much compared to other treatments. This makes it a very cost effective treatment when the COL evaluates crack filling costs per year of the treatment's life.

Fog Seal

Fog sealing sprays a liquid asphalt coating onto the entire pavement surface to fill hairline cracks and prevent damage from sunlight (Figure 5). Fog seals are best for good to very good pavements and last approximately two years at a cost of $3,000 per lane mile.

Chip Seal

A chip seal, also known as a sealcoat, is a two-part treatment. First, a liquid asphalt is sprayed onto an old pavement surface. Then, a single layer of small stone chips is spread onto the layer of wet liquid asphalt (Figure 5). The liquid asphalt seals the pavement from water and debris and holds the stone chips in place, providing a new wearing surface for traffic that can correct friction problems and help prevent further surface deterioration. Chip seals are best applied to pavements that are not exhibiting problems with strength since their purpose is to help preserve such strength. These treatments last approximately five years and cost $22,000 per lane mile.

Partial-Depth Concrete Repair

A partial-depth concrete repair involves removing spalled (i.e., fragmented) or delaminated (i.e., separated into layers) areas of concrete pavement, usually near joints and cracks, and replacing such areas with new concrete (Figure 6). This is done to provide a new wearing surface in isolated areas to slow down water infiltration and to help delay further freeze/thaw damage. This repair lasts approximately five years and typically costs $20,000 per mile.

Figure 6: Examples of capital preventive maintenance treatments, cont'd—(from left) concrete road prepared for partial-depth repair, gravel road undergoing maintenance grading, and gravel road receiving dust control application (dust control photo courtesy of Weld County, Colorado, weldgov.com).

Innovative Treatments

Innovative treatments are newer, unique and non-standard treatments that provide ways of treating pavements using established engineering principles in new and cost-effective ways. COL strives to be innovative with its pavement treatments by looking for ways to prevent pavement damage and save taxpayer dollars.

Chip and Fog

In the past few years, the City of Lansing has tried different treatments from those that they have considered in the past. A chip seal would not normally be considered for an urban setting, because it leaves behind loose stones that may end up in the storm sewer system, and the rough surface left by the chip seal is not desirable for residents who are walking or biking on the street. The City has combined two preventive treatments—chip seal and fog seal—to create a "chip and fog" treatment, which has exhibited good results. The chip and fog treatment is applied to streets in the 5-7 PASER range. It is expected to last seven years and costs about $25,000 per lane mile.

Mastic Crack Seal

The City's street maintenance crews have started using a mastic crack seal material. The material is used to fill substantial cracks that would not be able to be filled with normal crack seal material. This is used in select locations, because the material and labor costs are higher than crack seal. It is expected to last three years and costs about $7,000 per lane mile.

Maintenance

Maintenance is the most cost-effective strategy for managing road infrastructure and prevents good and fair roads from reaching the poor category, which require costly rehabilitation and reconstruction treatments to create a year of service life. It is most effective to spend money on routine maintenance and CPM treatments, first; then, when all maintenance project candidates are treated, reconstruction and rehabilitation can be performed as money is available. This strategy is called a "mix-of-fixes" approach to managing pavements.

1. PAVEMENT ASSETS

Building a mile of new road can cost over one million dollars due to the large volume of materials and equipment that are necessary. The high cost of constructing road assets underlines the critical nature of properly managing and maintaining the investments made in this vital infrastructure. The specific needs of every mile of road within an agency's overall road network is a complex assessment, especially when considering rapidly changing conditions and the varying requisites of road users; understanding each road-mile's needs is an essential duty of the road-owning agency.

In Michigan, many different governmental units (or agencies) own and maintain roads, so it can be difficult for the public to understand who is responsible for items such as planning and funding construction projects, [patching] repairs, traffic control, safety and winter maintenance for any given road. MDOT is responsible for state trunkline roads, which are typically named with "M," "I," or "US" designations regardless of their geographic location in Michigan. Cities and villages are typically responsible for all public roads within their geographic boundary with the exception of the previously mentioned state trunkline roads managed by MDOT. County road commissions (or departments) are typically responsible for all public roads within the county's geographic boundary, with the exception of those managed by cities, villages and MDOT.

In cases where non-trunkline roads fall along jurisdictional borders, local and intergovernmental agreements dictate ownership and maintenance responsibility. Quite frequently, roads owned by one agency may be maintained by another agency because of geographic features that make it more cost effective for a neighboring agency to maintain the road instead of the actual road owner. Other times, road-owning agencies may mutually agree to coordinate maintenance activities in order to create economies of scale and to take advantage of those efficiencies.

The COL is responsible for a total of 413.808 centerline of public roads, as shown in Figure 7.

Figure 7: Map showing location of COL's paved roads (i.e., those managed by COL) and their current condition for paved roads with green for good (i.e., PASER 10, 9, 8), yellow for fair (i.e., PASER 7, 6, 5), and red for poor (i.e., PASER 4, 3, 2, 1), as well as the location of COL's unpaved roads in blue

Inventory

Michigan Public Act 51 of 1951 (PA 51), which defines how funds from the Michigan Transportation Fund (MTF) are distributed and spent by road-owning agencies, classifies roads owned by the COL as either city major or city minor roads. State statute prioritizes expenditures on the city major road network.

Figure 8 illustrates the percentage of roads owned by COL that are classified as city major and city minor roads.

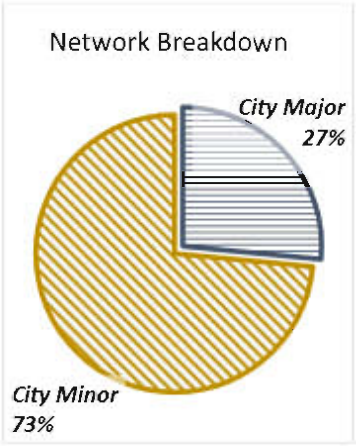


Figure 8: Percentage of city major and city minor roads for COL.

The COL manages 13.239 miles of roads that are part of the National Highway System (NHS)—roads that are critical to the nation's economy, defense and mobility—and monitors and maintains their condition. The NHS is subject to special rules and regulations and has its own performance metrics dictated by the FHWA. While most NHS roads in Michigan are managed by MDOT, COL manages a percentage of those roads located in its jurisdiction, as shown in Figure 9.

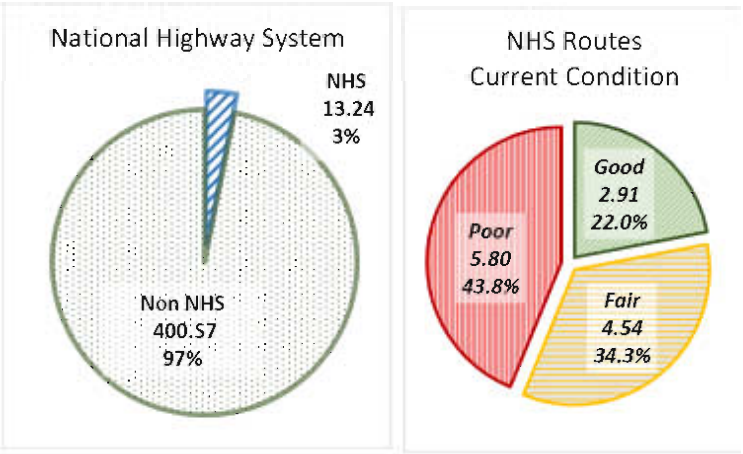


Figure 9 Miles of roads managed by COL that are part of the National Highway System and condition

COL also owns and manages 5.953 miles of unpaved roads.

Types

The COL has multiple types of pavemeuts in its jurisdiction, including asphalt, concrete and brick/block. The COL also has unpaved roads (i.e, gravel and/or earth). Factors influencing pavement type includes cost of construction, cost of maintenance, frequency of maintenance, type of maintenance, asset life and road user experience. More information on pavement types is available in the *Introduction's Pavement Primer.*

Figure 10 illustrates the percentage of various pavement types that the COL has in its network.

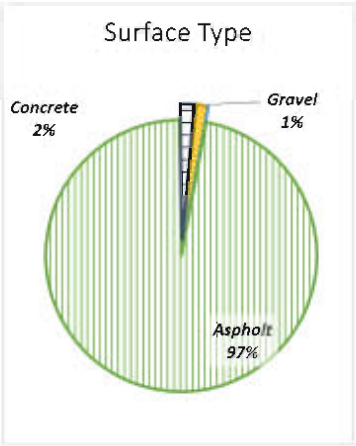


Figure 10: Pavement type by percentage maintained by COL

Locations

Locations and sizes of each asset can be found in the COL's Roadsoft database. For more detail, please refer to the agency contact listed in the *Introduction* of this pavement asset management plan.

Condition

The road characteristic that road users most readily notice is pavement condition. Pavement condition is a major factor in determining the most cost-effective treatment—that is, routine maintenance, capital preventive maintenance, or structural improvement—for a given section of pavement. The COL uses pavement condition and age to anticipate when a specific section of pavement will be a potential candidate for preventive maintenance. Pavement condition data enables the COL to evaluate the benefits of preventive maintenance projects and to identify the most cost-effective use of road construction and maintenance dollars. Historic pavement condition data can be used to predict future road conditions based on budget constraints, as well as to determine if a road network's condition will improve, stay the same, or degrade at the current or planned investment level. This analysis helps to determine how much

additional funding is necessary to meet a network's condition improvement goals. More detail on this topic is included in the *Introduction's Pavement Primer*.

Paved Roads

The COL is committed to monitoring the condition of its road network and using pavement condition data to drive cost-effective decision-making and preservation of valuable road assets. The COL uses the Pavement Surface Evaluation and Rating (PASER) system, which has been adopted by the TAMC for measuring statewide pavement conditions, to assess its paved roads. The PASER system provides a simple, efficient and consistent method for evaluating road condition through visual inspection. More information regarding the PASER system can be found in the *Introduction's Pavement Primer*.

The COL collects 100 percent of its PASER data every two years on all federal-aid-eligible roads in Michigan. In addition, the COL collects 50 percent of its paved non-federal-aid-eligible network using its own staff and resources.

The COL's 2019 paved city major road network has 13 percent of roads in the TAMC good condition category, 25 percent in fair and 62 percent in poor (Figure 11A). The paved city minor road network has 8 percent in good, 20 percent in fair and 72 percent in poor (Figure 11B).

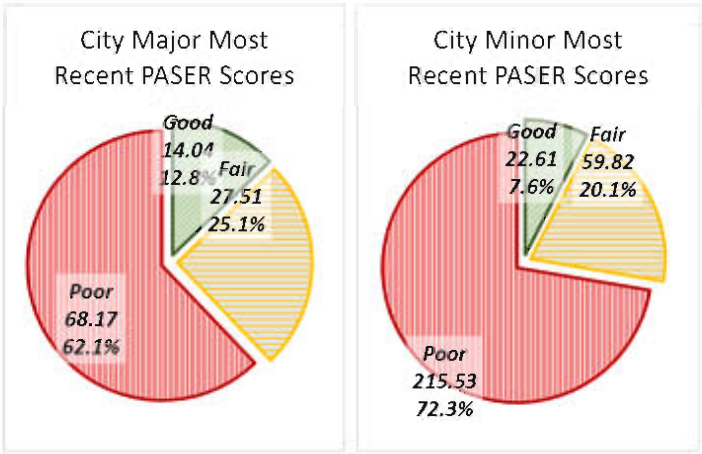


Figure 11 (A) Left COL paved city major road network conditions by percentage of good, fair, or poor, and (B) Right paved city minor road network conditions by percentage of good, fair, or poor

In comparison, the statewide paved city major road network has 20 percent of roads in the TAMC good condition category, 40 percent in fair and 40 percent in poor (Figure 12A). The statewide paved city minor road network has 19 percent in good, 38 percent in fair and 49 percent in poor (Figure 12B). Figure 11A and Figure 12A, in comparison, show that the COL's paved city major road network is worse than similarly-classified roads in the rest of the state. Figure 11B and Figure 12B show that the COL's paved city minor road network is also worse than similarly-classified roads in the rest of the state. Other road

condition graphs can be viewed on the TAMC pavement condition dashboard at: http://www.mcgi.state.mi.us/mitrp/Data/PaserDashboard.aspx.

Figure 12: (A) Left: Statewide paved city major road network conditions by percentage of good, fair, or poor, and (B) Right paved city minor road network conditions by percentage of good, fair, or poor

Many of Michigan's roadways are in rural areas, which means that agencies are able to spread their funding further than in urban areas. Many rural roads have low traffic volumes, which causes less deterioration of the roads. They also generally do not have to contend with other utilities within the roadway, which can deteriorate roads with utility repair cuts. Rural areas also do not generally have to deal with sidewalk crossings, which can devour budget dollars in a roadway project. The COL is an urban area with high traffic roads, many utilities and an extensive sidewalk network that must be updated to current standards—all of which contribute to road decay and funding shortages.

Figure 13 and **Error! Reference source not found.** show the number of miles for the COL's roads with PASER scores expressed in TAMC definition categories for the paved city major road network (Figure 13) and the paved city minor road network (**Error! Reference source not found.**). The COL considers road miles on the transition line between good and fair (PASER 8). The COL considers the transition line between fair and poor (PASER 5) as representing parts of the road network where there is a risk of losing the opportunity to apply less expensive treatments that gain significant improvements in service life.

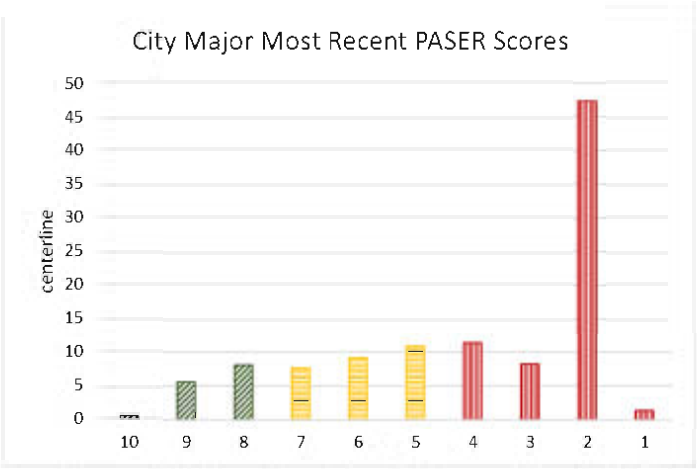


Figure 13: COL paved city major road network conditions. Bar graph colors correspond to good/fair/poor TAMC designations.

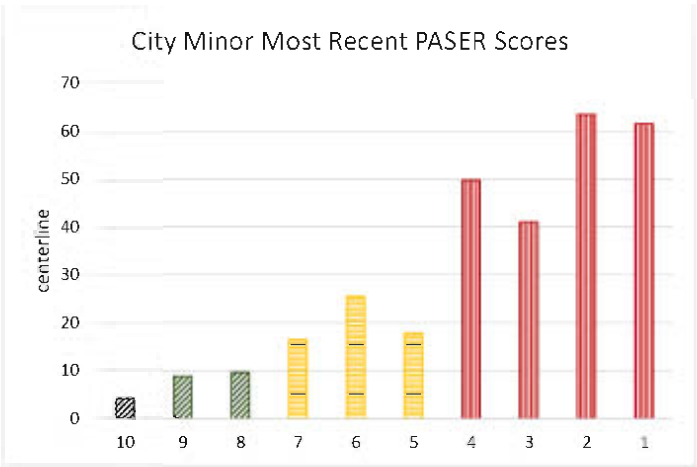


Figure 14 COL paved city minor network condition by PASER rating. Bar graph colors correspond to good/fair/poor TAMC designations

Figure 15 provides a map illustrating the geographic location of paved roads and their respective PASER condition. An online version of the most recent PASER data is located at https://www.mcgi.state.mi.us/tamcMap/.

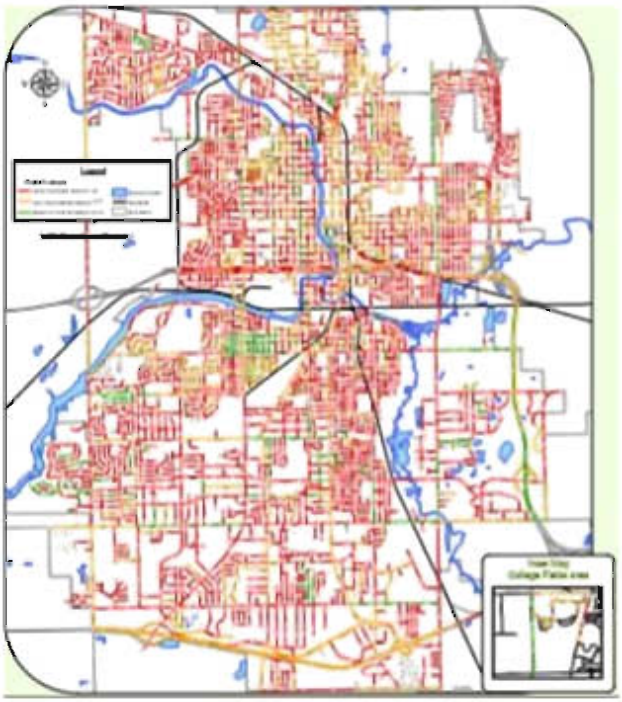


Figure 15 Map of the current paved road condition in good (PASER 10, 9, 8) shown in green, fair (PASER 7, 6, 5) shown in yellow, and poor (PASER 4, 3, 2, 1) shown in red. Only Roads owned by COL are shown

Historically, the overall quality of the COL's paved city major roads have been decreasing, as exhibited in Figure 16. The decrease in overall condition of the COL's paved city major road system can be observed in Figure 28 by noting the increase in roads that are in poor condition. Between 2011 and 2015, the percentage of roads in poor condition increased dramatically, from 24% of the network to 60% of the network. This indicates an increasing number of roads that will require costly reconstruction or rehabilitation. The percentage has remained stable since 2015, which may indicate that the road conditions have reached the maximum percentage of poor condition that the system will reach with the current funding. The percentage of fair roads decreased during this same period, indicating the window of opportunity for preventive maintenance projects. This class of roads requires attention before they transition into costlier reconstruct projects.

Comparing the COL's paved city major road condition trends illustrated in Figure 16 with overall statewide condition trends for similarly-classified roads, which are illustrated in Figure 17, shows a different trend locally in comparison to the rest of the state. The COL roads are declining at a faster rate than the average for the rest of the state.

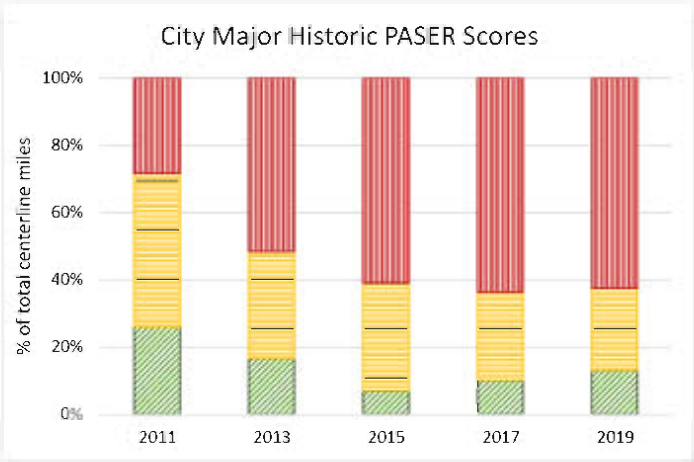


Figure 16: Historical COL paved city major road network condition trend

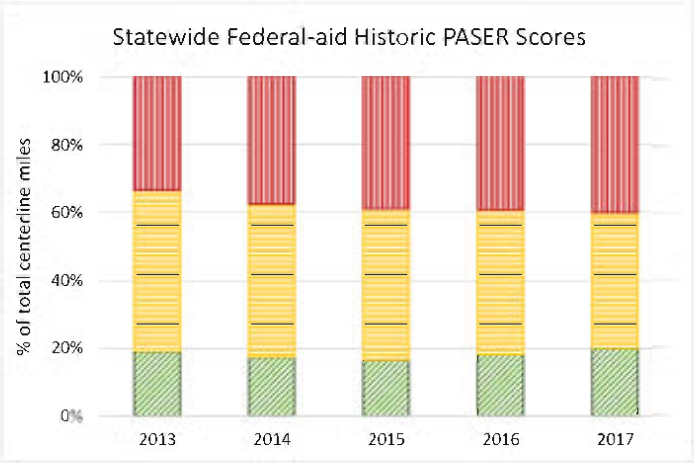


Figure 17: Historical statewide city major road network condition trend

Historically, the overall quality of the COL's paved city minor roads have been decreasing more than the paved city major road network because they lack a source of state and federal funding, and therefore, must be supported locally. Figure 18 illustrates the condition of the paved city minor road network in the COL while Figure 19 illustrates these conditions statewide.

Comparing the COL's paved city minor road condition trends illustrated in Figure 18 with overall statewide condition trends for all paved city minor roads illustrated in Figure 19 indicates a different trend locally than the rest of the state. The statewide trend shows an improvement in city minor street conditions, where the COL streets seem to be in stable condition, although with a greater percentage of streets in poor condition. The year-to-year variation in the paved city minor road network is likely due to the fact that only a portion of the network is collected each year, both locally and statewide. This variation is likely a result of reporting bias since a representative sample of roads is not collected each year statewide.

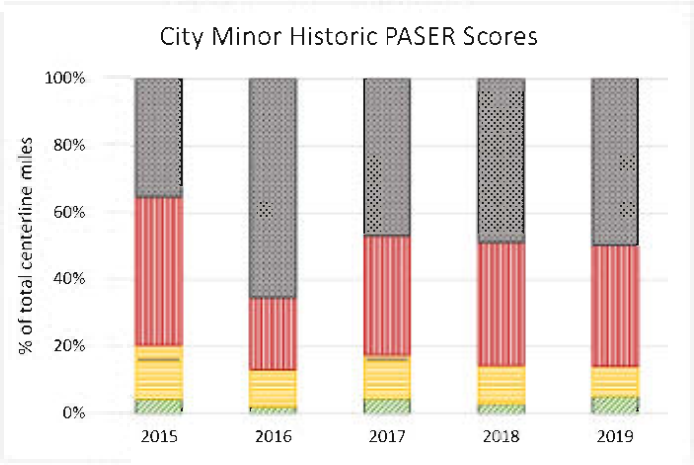


Figure 18: Historical COL paved city minor road network condition trend. The gray represents the streets not rated in a given year.

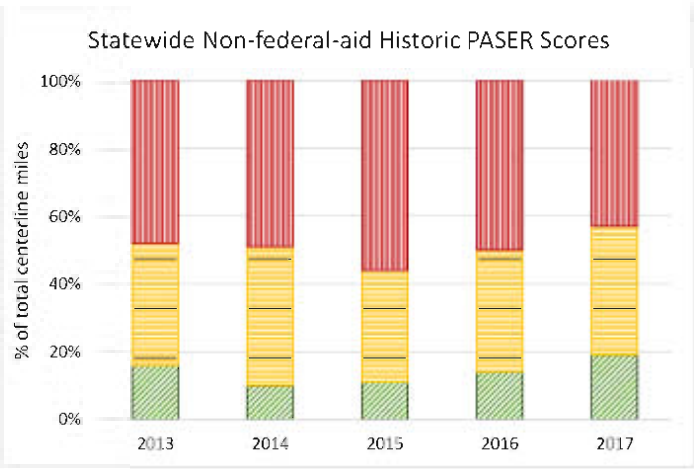


Figure 19: Historical statewide paved city minor road network condition trend

Unpaved Roads

The condition of unpaved roads can be rapidly changing, which makes it difficult to obtain a consistent surface condition rating over the course of weeks or even days. The TAMC adopted the Inventory Based Rating (IBR) System™ for rating unpaved roads, which the COL uses. More information regarding the IBR System™ can be found in *Introduction's Pavement Primer.*

The COL's nearly six miles of unpaved streets are all city minor streets. They consist of short segments of streets, roughly a block or two long, located throughout the City. Historically, the City has assessed property owners for street improvements, like stormsewer and curb and gutter. Much of the City was built by those who developed the area and then turned it over to the City at the time of completion. At one time, the City had a goal and program to pave all of the gravel streets. The funding was from the City's general fund, which has not been set aside since approximately 2007. An economic recession and opposition from residents to assess paving streets contributed to the loss of funding set aside to pave gravel streets. Since then, the City has only paved gravel streets with a valid petition from the affected property owners.

Many gravel street segments are difficult for our city crews to adequately maintain. The Engineering Department works with City Operations and Maintenance (O&M) to create solutions for problem areas. A few areas have had some spot drainage improvements to help with maintaining the street.

Figure 20 shows the percentage of unpaved roads in each IBR number ranges of 10, 9, and 8; 7, 6, and 5; and 4, 3, 2, and 1, for all roads.

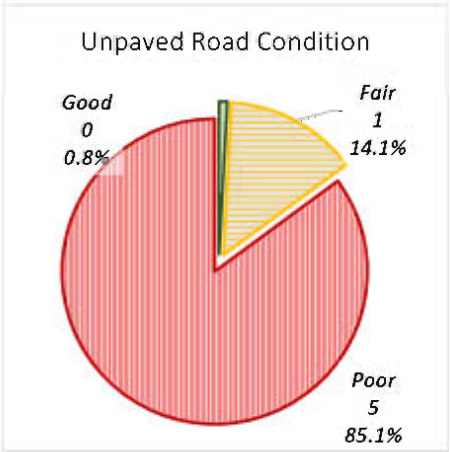


Figure 20 COL's unpaved road network condition by percentage of roads with IBR numbers of 10, 9, and 8, roads with IBR numbers of 7, 6, and 5, and IBR numbers of 4, 3, 2, and 1.

Goals

Goals help set expectations for how pavement conditions will change in the fumre. Pavement condition changes are influenced by water infiltration, soil conditions, sunlight exposure, traffic loading and repair work performed. The COL is not able to control any of these factors fully due to seasonal weather changes, traffic pattern changes and its limited budget. In spite of the uncontrollable variables, it is still important to set realistic network condition goals that efficiently use budget resources to build and maintain roads meeting taxpayer expectations. An assessment of the progress toward these goals is provided in the *1. Pavement Assets*: *Gap Analysis* section of this plan.

Goals for Paved City Major Roads

The overall goal for the COL's paved city major road network is to maintain or improve road conditions network-wide at 2019 levels. The baseline condition for this goal is illustrated in Figure 21. The ultimate goal for the system, with adequate resources, is shown below.

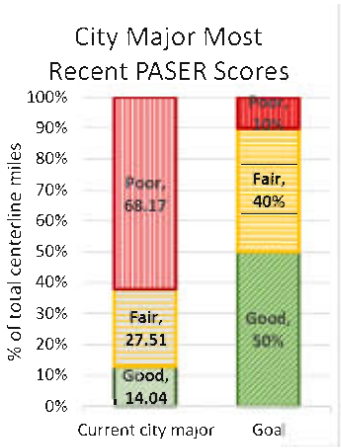


Figure 21: COL's 2019 city major road network condition by percentage of good/fair/poor

The COL's network-level pavement condition strategy for paved city major roads is:

1. Prevent its good and fair (PASER 10 - 5) paved city major from becoming poor (PASER 4 - 1).
2. Keep the percentage of paved city major roads in the poor category from growing.

Goals for Paved City Minor Roads

The overall goal for the COL's paved city minor road network is to maintain or improve road conditions network-wide at 2019 levels. The baseline condition for this goal is illustrated in Figure 22. The ultimate goal for the system, with adequate resources, is shown below.

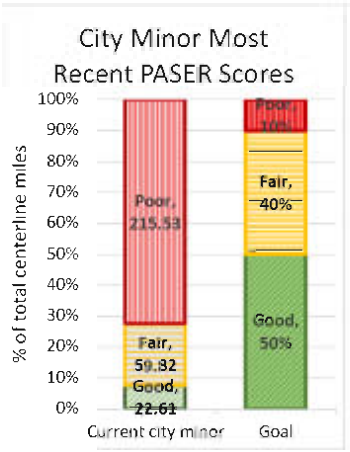


Figure 22 COL 2019 paved city minor road network condition by percentage of good/fair/poor

The COL's network-level pavement condition strategy for paved city minor roads is:

1. Prevent its good and fair (PASER 10 - 5) paved city minor roads from becoming poor (PASER 4 - 1).
2. Keep the percentage of paved city minor roads in the poor category from growing.

Modelled Trends

Roads age and deteriorate just like any other asset. All pavements are damaged by water, traffic weight, freeze/thaw cycles, sunlight and traffic weight. To offset natural deterioration and normal wear-and-tear on the road, the COL must complete treatment projects that either protect and/or add life to its pavements. The year-end condition of the whole network depends upon changes or preservation of individual road section condition that preservation treatments have affected.

The COL uses many types of repair treatments for its roads, each selected to balance costs, benefits and road life expectancy. When agency trends are modeled, any gap between goals and accomplishable work becomes evident. Financial resources influence how much work can be accomplished across the network

within agency budget and what treatments and strategies can be afforded. A full discussion of the COL's financial resources can be found in the *5. Financial Resources* section.

Treatments and strategies that counter pavement-damaging forces include reconstruction, structural improvement, capital preventive maintenance, innovative treatments and maintenance. For a complete discussion on the pavement treatment tools, refer to the *1. Introduction*'s *Pavement Primer*.

Correlating with each PASER score are specific types of treatments best performed either to protect the pavement (CPM) or to add strength back into the pavement (structural improvement) (Table 1). MDOT provides guidance regarding when a specific pavement may be a candidate for a particular treatment. These identified PASER scores "trigger" the timing of projects appropriately to direct the right pavement fix at the right time, thereby, providing the best chance for a successful project. The information provided in Table 1 is a guide for identifying potential projects; however, this table should not be the sole criteria for pavement treatment selection. Other information such as future development, traffic volume, utility projects and budget play a role in project selection. This table should not be a substitute for engineering judgement.

Another factor for roads in the COL is the Combined Sewer Overflow (CSO) separation program. Streets are generally reconstructed when the combined sewers are separated in the area. Sometimes, streets are in very poor condition and cannot wait until CSO construction before receiving some kind of maintenance. Such streets are evaluated based on when the CSO construction is expected and are treated based upon the years of road life needed until reconstruction.

When choosing candidates for street projects, the City also tries to balance the funding between the four City Counsel Wards within the City.

Table 1: Service Life Extension (in Years) for Pavement Types Gained by Fix Type[1]

	Life Extension (in years)*			
Fix Type	Flexible	Composite	Rigid	PASER
HMA crack treatment	1-3	1-3	N/A	6-7
Overband crack filling	1-2	1-2	N/A	6-7
One course non-structural HMA overlay	5-7	4-7	N/A	4-5****
Mill and one course non-structural HMA overlay	5-7	4-7	N/A	3-5
Single course chip seal	3-6	N/A	N/A	5-7†
Double chip seal	4-7	3-6	N/A	5-7†
Single course microsurface	3-5	**	N/A	5-6
Multiple course microsurface	4-6	**	N/A	4-6****
Ultra-thin HMA overlay	3-6	3-6	N/A	4-6****
Paver placed surface seal	4-6	**	N/A	5-7
Full-depth concrete repair	N/A	N/A	3-10	4-5***
Concrete joint resealing	N/A	N/A	1-3	5-8
Concrete spall repair	N/A	N/A	1-3	5-7
Concrete crack sealing	N/A	N/A	1-3	4-7
Diamond grinding	N/A	N/A	3-5	4-6
Dowel bar retrofit	N/A	N/A	2-3	3-5***
Longitudinal HMA wedge/scratch coat with surface treatment	3-7	N/A	N/A	3-5****
Flexible patching	**	**	N/A	N/A
Mastic joint repair	1-3	1-3	N/A	4-7
Cape seal	4-7	4-7	N/A	4-7
Flexible interlayer "A"	4-7	4-7	N/A	4-7
Flexible interlayer "B" (SAMI)	4-7	4-7	N/A	3-7
Flexible interlayer "C"	4-7	4-7	N/A	3-7
Fiber reinforced flexible membrane	4-7	4-7	N/A	3-7
Fog seal	**	**	N/A	7-10
GSB 88	**	**	N/A	7-10
Mastic surface treatment	**	**	N/A	7-10
Scrub seal	**	**	N/A	4-8

* The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

** Data is not available to quantify the life extension.

*** The concrete slabs must be in fair to good condition.

**** Can be used on a pavement with a PASER equal to 3 when the sole reason for rating is rutting or severe raveling of the surface asphalt layer.

† For PASER 4 or less providing structural soundness exists and that additional pre-treatment will be required for example, wedging, bar seals, spot double chip seals, injection spray patching or other pre-treatments.

[1] Part of Appendix D-1 from *MDOT Local Agency Programs Guidelines for Geometrics on Local Agency Projects* 2017 Edition Approved Preventive Maintenance Treatments

NCPP Network Quick Check to Forecast Future Trends

The National Center for Pavement Preservation (NCPP) has developed an analysis method that gives an overall indicator of likely future road network condition trends. An example of this method along with a description is included as *Appendix D.*

The NCPP Quick Check works under the premise that a one-mile road segment loses one year of life each year that it is not treated with a maintenance, rehabilitation, or reconstruction project. For example, a 100-mile network loses 100 mile-years worth of life each year that it is not treated. Construction and maintenance projects add life to a road network, offsetting the steady yearly loss. For example, an overlay project that is expected to last 10 years and constructed on 5 miles of pavement will add 10-years x 5 miles = 50 mile-years of improvement, which is about half the value lost in one year on the example 100-mile network. In order for the network to remain stable, an agency would need to complete projects every year that offset all of the mile-years of loss. For this example, that would be 100 mile-years.

All Paved City Roads

Table 2 illustrates the calculations for the NCPP Quick Check method of the COL's paved city major road network for the years 2015- 2019. Results from the NCPP Quick Check for the paved city street network indicate that the average volume of work that the COL has been able to afford over the last five years has fallen far short and is not keeping up with the natural deterioration of the road network due to age and use. This number is an average of 699.38 out of an average of 928 lane miles, or 75% deficiency. **In other words, the COL's annual input into road projects is only 25% of the lane miles needed to just keep the roads from further deterioration.** Continuing the current treatment volume on this network will result in an ongoing 75% deficit of mile-years of project benefit to stabilize this trend and maintain current conditions.

Table 2			Life Extension	Total
		Lane	Per Mile	Life Extension
Project/Treatment	Miles	Miles	(Years)	(lane-mile-years)
Major Streets				
Reconstruct	0.848	2.69	15	40.35
Crush and Shape	0.504	1.008	12	12.096
Mill and Fill, 3.5 inches	8.241	26.608	10	266.08
Mill and Fill, 2 inches	3.477	8.402	7	58.814
Mill and Fill, 1.5 inches	0.393	1.416	7	9.912
Mastic Crack Seal	1.366	5.265	3	15.795
Spray Patch	3.908	12.564	2	25.128
Crack Seal	17.311	60.262	2	120.524
Local (Minor) Streets				
Reconstruct	5.105	10.23	15	153.45
Crush and Shape	3.05	6.52	12	78.24
Mill and Fill, 3.5 inches	3.969	8.128	10	81.28
Mill and Fill, 2 inches	1.254	2.508	10	25.08
Overlay, 1.5 inches	7.114	14.908	7	104.356
Chip and Fog Seal	3.628	7.256	7	50.792
Crack Seal	24.963	50.59	2	101.18
				1143.077
				228.6154
Average Total Street System Lane Miles		928	Average Yearly Loss Lane Miles	699.38

The NCPP analysis of the COL's planned projects from its currently-available budget does not allow the COL to reach its pavement condition goal given the projects planned for the next three years. The goal for the City street system is an Average PASER rating of 7. In order to achieve that goal within 10 years, the City estimates that the annual street system needs are more than **$36 million**. Each year that this funding level is not achieved, the overall condition of the street system decreases.

Demonstration Areas

The City of Lansing, after many years of declining street conditions and inadequate funding available, decided to demonstrate what could happen when a street program has adequate funding.

Two areas of the City were chosen as demonstration project areas. The current street conditions within these areas are representative of typical residential areas in the City with corresponding local street conditions. A 10-year improvement program has been devised for these areas that is intended to raise the overall condition of the streets to acceptable levels. The City has committed to providing adequate funding for these two areas over the next ten years. The City is now in the second year of the pilot demonstration. More information on the Pilot Demonstration Areas is available in *Appendix E.*

Planned Projects

The COL tries to plan construction and maintenance projects a few years in advance. A multi-year planning threshold is required due to the time necessary to plan, design and finance construction and maintenance projects on the paved city major road network. This includes planning and programming requirements from state and federal agencies that must be met prior to starting a project and can include:

- Studies on environmental and archeological impacts
- Review of construction and design documents and plans
- Documentation of rights-of-way ownership
- Planning and permitting for stormwater discharges
- Other regulatory and administrative requirements

Per PA 499 of 2002 (later amended by PA 199 of 2007), road projects for the upcoming three years are required to be reported annually to the TAMC. Planned projects represent the best estimate of future activity; however, changes in design, funding and permitting may require the COL to alter initial plans.

The *1. Pavement Assets*: *Modelled Trends* section of this plan provides a detailed analysis of the impact of the proposed projects on their respective road networks.

For 2020-2022, the COL plans to do the following projects:

Paved City Major Projects

The COL is currently planning the construction and maintenance projects listed in *Appendix A* for the paved city major road network. The City spends approximately $3,000,000 per year on construction and maintenance projects on the major streets network.

Paved City Minor Projects

The COL's list of possible construction and maintenance projects for the paved city minor road network can be found in *Appendix B*. The COL spend approx. $3,000,000 on paving and maintenance projects each year.

Unpaved City Streets

A list of unpaved COL streets is in *Appendix C.* The City does not have a program for gravel streets. Paving of gravel streets is done on a case-by-case basis and is usually initiated by the residents of the street through a petition signed by more than 50 percent of the property owners. A portion of the costs are assessed to the affected property owners, which usually totals to about 30 % of the total construction cost. In writing, there are no planned projects on unpaved streets.

More detailed information on these projects can be found in *Appendix A-C.*

Gap Analysis

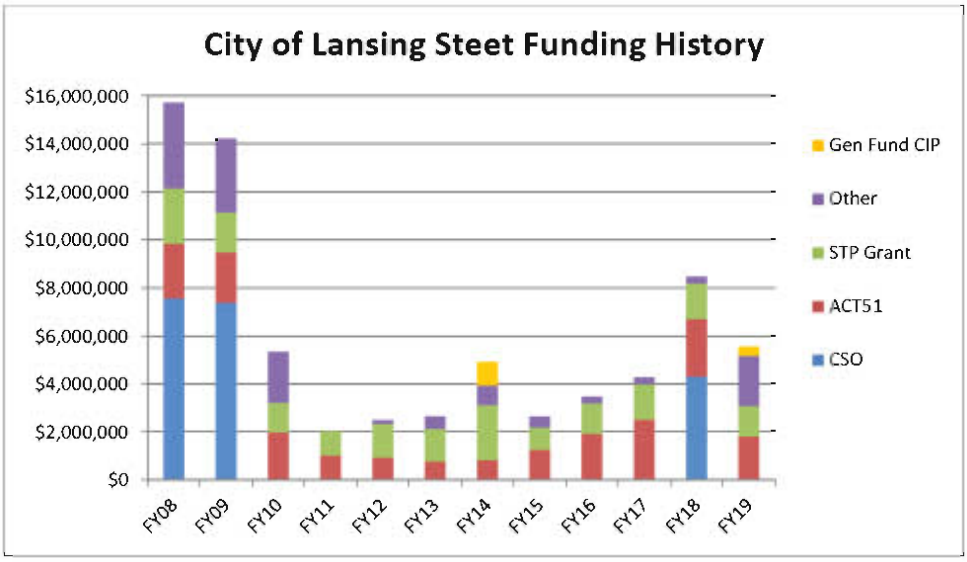
The current funding levels that the COL receives are not sufficient to meet the goals for the paved city major road network, the paved city minor road network and the unpaved road network. However, the COL believes that the overall condition of this network can be maintained or improved with additional funding for construction and maintenance. The City is dedicated to preventive maintenance projects on the good and fair streets to extend the life and deter deterioration. The remaining budget is spent on improving the streets and then maintaining them. The City may see an increase in overall system condition at some time in the future. The network is currently deteriorating at a faster rate than the effort the City can afford to put into the network, as shown in Table 2 above.

2. FINANCIAL RESOURCES

Public entities must balance the quality and extent of services they can provide with the tax resources provided by citizens and businesses, all while maximizing how efficiently funds are used. The COL will overview its general expenditures and financial resources currently devoted to pavement maintenance and construction. This financial information is not intended to be a full financial disclosure or a formal report. Michigan agencies are required to submit an Act 51 Report to the Michigan Department of Transportation each year; this is a full financial report that outlines revenues and expenditures. This report can be obtained by request submitted to the City's agency contact (listed in this plan).

The COL had a total budget for pavement asset management of $5,570,000 in 2019. While insufficient funding levels continue, the Asset Management Plan will help the City better understand and communicate the consequences of continued under-funding. Likewise, it will enable the City to apply the funds that are available in a manner that is most beneficial for the overall condition of the street system. The estimated annual street system needs are more than **$36 million**. Each year that the funding level is not achieved, the overall condition of the street system decreases. The chart below indicates the recent funding history associated with the street program.

The City's CSO projects provided substantial funding for reconstruction of city streets within the project areas until the program was disrupted for several years. The CSO program restarted in 2018. The lowest amount of road funding was in 2011, due to budget cuts during a recession. Funding has remained lower than pre-2011 Levels. A voted millage passed in recent years for street paving. It adds about $2 million for use on residential streets.



City Street Network

The COL has historically spent $1.5 to $2 million annually on pavement-related major street projects. Over the next three years, the COL plans to spend approximately $3,000,000 or more on city major-network projects consisting of, but not limited to, reconstruction, overlay, culvert replacement and preventive maintenance. Spending on projects depends on revenue from Michigan Transportation Fund (MTF), millage and federal/state programs.

City Minor Network

The COL has historically spent a portion of the annual streets budget on pavement-related projects. Over the next three years, the COL plans to spend $6,000,000 or more on city minor-network projects consisting of, but not limited to reconstruction, overlay, and preventive maintenance. Spending on projects depends on revenue from Michigan Transportation Fund (MTF), millage, and federal/state programs.

3. RISK OF FAILURE ANALYSIS

Transportation infrastructure is designed to be resilient. The system of interconnecting roads and bridges maintained by the COL provides road users with multiple alternate options in the event of an unplanned disruption of one part of the system. There may be, however, key links in a transportation system that may cause significant inconvenience to users if unexpectedly closed to traffic. The following types of situations may be considered critical points of a system:

- **Geographic Divides:** Geographic divides are areas where a geographic feature (river, lake, mountain or limited access road) limits crossing points of the feature.
- **Emergency Alternate Routes for High-Volume Roads:** These are roads that are routinely used as alternate routes for high volume roads or roads that are included in an emergency response plan.
- **Limited Access Areas:** Limited access areas are roads that serve remote or limited access areas that result in long detours if closed.
- **Main Access to Key Commercial Districts:** These are areas where large number or large size business will be significantly impacted if a road is unavailable.

The City of Lansing has no critical assets considered key links based on the above criteria. There are multiple alternate options to navigate the City in the event a road is closed.

4. COORDINATION WITH OTHER ENTITIES

An asset management plan provides a significant value for infrastructure owners because it serves as a platform to engage other infrastructure owners using the same shared right of way space. The COL communicates with both public and private infrastructure owners to coordinate work in the following ways:

- The City of Lansing holds quarterly meetings with the major utilities to discuss and coordinate projects. This includes Consumers Energy, who supplies the gas for the City. Consumers has ongoing infrastructure upgrade projects through the City, as well as any upgrading needed ahead of planned city projects. With the quarterly meetings and close communication, the City is able to coordinate projects.
- The City also holds quarterly utility meetings with the Lansing Board of Water and Light (BWL), who maintains the drinking water, electricity and steam lines in the City. The BWL often partners with the City on projects to perform any necessary upgrades to their systems in conjunction with city projects. The BWL performs system upgrade projects independently as well, with efforts coordinated with the City to ensure traffic detours do not excessively impede traffic flow.
- The biggest coordination efforts between the utilities and the City is the City's Combined Sewer Overflow (CSO) separation program. Projects are planned years in advance and all infrastructure is updated at once. The streets within the project areas are generally reconstructed when the sewers are replaced. By upgrading the infrastructure all at once, the City does not anticipate major construction needs in an area again for at least 20 years.
- The City also has good working relationships with surrounding community and county agencies. If a project impacts a nearby agency, the City tries to alert them so that any necessary coordination can take place. The City maintains a map of all planned projects on their website, which includes any utility or MDOT projects within the area as well.

APPENDIX A: PAVED CITY MAJOR STREET PLANNED PROJECTS

Year	Treatment	Street	From	To	Length	Lanes	Life	Lane Mile Years Added
2020	Crack Seal	E Michigan Ave	Holmes St	Kipling Blvd	0.923	5	2	9.23
		Clippert St	Kalamazoo	Saginaw	0.731	2	2	2.924
		N Pennsylvania A	Michigan	E Shiawassee St	0.248	5	2	2.48
		S Clemens Ave	W I 496	Kalamazoo	0.36	2	2	1.44
		S Washington Ave	Moores River	Main	0.656	3	2	3.936
		Turner St	Clinton St	North	0.178	2	2	0.712
		Aurelius Rd	Luwanna	Jolly	0.694	3	2	4.164
		E Cavanaugh Rd	Stabler	Cedar	0.244	2	2	0.976
		E Holmes Rd	Washington	Cedar	0.917	3	2	5.502
		E Jolly Rd	Pennsylvania	Collins	2.014	3	2	12.084
		Keystone Ave	Pennsylvania	Executive	0.198	2	2	0.792
		W Holmes Rd	Pleasant Grove	Express Ct	0.41	3	2	2.46
		W Holmes Rd	Express Ct	M L King, Jr Blvd	0.347	5	2	3.47
		W Holmes Rd	M L King, Jr Blvd	Washington	0.151	4	2	1.208
		S Washington Ave	Holmes	Greenlawn	0.622	3	2	3.732
		W Jolly Rd	Waverly	MLK Jr Blvd	1.781	3	2	10.686
		N MLK Jr Blvd	W Ionia St	Oakland	0.454	4	2	3.632
		N MLK Jr Blvd	Oakland	Bridge over Grand River	0.911	3	2	5.466
		N Pine St	W Madison St	Willow	0.451	2	2	1.804
		N Pine St	Ottawa	Shiawassee	0.181	3	2	1.086
		N Walnut St	Saginaw	Oakland	0.179	3	2	1.074
		S Grand Ave	Saint Joseph	Kalamazoo	0.253	3	2	1.518
		S Pine St	Saint Joseph	Allegan	0.429	3	2	2.574
		W Willow St	City/Twp Line	Comfort	0.372	3	2	2.232
		W Willow St	Comfort	Linwood	0.352	2	2	1.408
2020	Chip and Fog Seal	Turner	Randolph	Sheridan	0.669	2	7	9.366
		Haag Rd	Miller	MLK	0.567	2	7	7.938
		Victor Ave	Pleasant Grove	Pattengill	0.516	2	7	7.224
		Mt Hope	Newcastle	Pleasant Grove	0.692	3	7	14.532
		Holmes	Waverly	Pleasant Grove	1.063	3	7	22.323
		Northrup	Washington	Cedar	0.775	2	7	10.85
		Dunckel	Collins	Jolly	1.164	4	7	32.592
		Cavanaugh	Dunckel	Aurelius	0.596	2	7	8.344
2020	Mill and Resurface, 3.5 inch	Aurelius Rd.	Miller Rd.	Jolly Rd.	0.95	2	10	19
		Jolly Road	ML King Blvd.	Ora St.	0.657	3	10	19.71

			Delta River Dr.	Waverly Rd.	Grand River Ave.	1.264	2	10	25.28
	2020	Contract Millage paving, 2" M&F	Lake Lansing	Larch	East	0.077	3	7	1.617
	2020	Reconstruct	Forest Rd.	Stoneleigh	400 ft W/Alliance	0.588	2	15	17.64
			Enterprise	Aurelius Rd	Keystone Ave.	0.497	2	15	14.91
	2021	Reconstruct	Aurelius	Mt. Hope	Malcolm X	0.832	2	15	24.96
			Grand River	Willow	Grand River	0.343	3	15	15.435
	2021	Millage Paving, 2" M&F	Greenlawn	Cedar	Lyons	0.311	2	7	4.354
	2021	Mill and Resurface 3.5 inch	Kalamazoo	Holmes St.	Mifflin	0.908	3	10	27.24
	2021	Mill and Resurface 4.5 inch	Jolly Rd.	Cedar St.	Pennsylvania Ave.	0.503	4	10	20.12
	2022	Reconstruct	Waverly Road	Jolly	Holmes	1	3	15	45
	Future	Reconstruct	Pennsylvania	Health Care Ct.	Mt. Hope	0.512	4	15	30.72
			Pennsylvania	Mt Hope	Fayette	0.416	4	15	24.96
		Mill and Resurface 3.5 inch	Cavanaugh	Cedar	Pennsylvania	0.507	1	10	5.07
			Pleasant Grove	Holmes	Jolly	1.002	1	10	10.02

APPENDIX B: PAVED CITY MINOR STREET PLANNED PROJECTS

Year	Treatment	Street	From	To	Length	Lanes	Life	Lane Mile Years
2020	Crack Seal	Armstrong Rd	Granger	Glenwood	0.06	2	2	0.24
		Ash St	Cedar	Larch	0.097	2	2	0.388
		Ballard St	Porter	Grand River	0.125	2	2	0.5
		Bates St	East	7th	0.108	2	2	0.432
		Beaver St	Center	East End	0.088	2	2	0.352
		Bement St	Hosmer	Heald	0.054	2	2	0.216
		Congress St	West End	East End	0.11	2	2	0.44
		Creston Ave	Randolph	Harris	0.075	2	2	0.3
		Donora St	Mount Hope	Baker	0.315	2	2	1.26
		Elvin Ct	Jerome	North End	0.125	2	2	0.5
		Eureka St	Rosamond St	Clifford St	0.057	2	2	0.228
		Farrand St	Porter	Grand River	0.129	2	2	0.516
		Francis Ave	Michigan	Vine	0.164	2	2	0.656
		Gary Ave	Mosley	Thomas	0.085	2	2	0.34
		Hayford Ave	Saginaw	Grand River	0.165	2	2	0.66
		Hickory St	Euclid	Holmes	0.387	2	2	1.548
		Hill St	Prospect	South End	0.053	2	2	0.212
		Horton St	Jerome	North End	0.128	2	2	0.512
		Hosmer St	Prospect	Michigan	0.166	2	2	0.664
		Hosmer St	E St Joseph	Euclid	0.188	2	2	0.752
		Hunt St	Chilson	Howe	0.073	2	2	0.292
		Jerome St	N Hosmer St	N 8th St	0.079	2	2	0.316
		Kipling Blvd	Lasalle Blvd	Lasalle Gdns	0.08	2	2	0.32
		Larch St	Liberty	North	0.198	2	2	0.792
		Lasalle Blvd	Kipling	East End	0.127	2	2	0.508
		Lasalle Blvd	Fernwood	Saginaw	0.169	2	2	0.676
		Lasalle Gdns	Kipling	Howard	0.203	2	2	0.812
		Lee Blvd	Midvale	Howard	0.082	2	2	0.328
		Lyons Ave	Pacific	Baker	0.554	2	2	2.216
		Maple St	Larch	Center	0.18	2	2	0.72
		Maryland Ave	Grand River	Congress	0.074	2	2	0.296
		Maryland Ave	Saginaw	May	0.094	2	2	0.376
		Museum Dr	Michigan	South End	0.314	2	2	1.256
		Northampton Way	Montego	Meadowcroft	0.094	2	2	0.376
		Oak St	New York	Massachusetts	0.065	2	2	0.26
		Ohio Ave	Taft	Oak	0.115	2	2	0.46
		Pearl St	Center	East End	0.089	2	2	0.356

			Perkins St	Dakin St	Lathrop St	0.113	2	2	0.452
			Pershing Dr	Harding	Lindbergh Dr	0.189	2	2	0.756
			Porter St	West End	Case	0.08	2	2	0.32
			Rheamount Ave	Lake Lansing	North End	0.176	2	2	0.704
			Strathmore Rd	Washington (N)	Washington (S)	0.458	2	2	1.832
			Vermont Ave	Taft St	North	0.218	2	2	0.872
			Winston Ave	Mosley	Gier	0.145	2	2	0.58
			Callihan Ct	Provincial House	South End	0.083	2	2	0.332
			Cooper Rd	Fisher	Willoughby	0.36	2	2	1.44
			Devonshire Ave	Maplehill Ave	Pennway	0.065	2	2	0.26
			Devonshire Ave	Pacific Ave	Mount Hope	0.253	2	2	1.012
			Donald St	Cox	Potter	0.08	2	2	0.32
			Glendale Ave	Southgate	Parkway	0.092	2	2	0.368
			Harding Ave	Pershing Dr	Sunnyside Ave	0.147	2	2	0.588
			Hunter Blvd	Cedar	Ridgewood	0.138	2	2	0.552
			Kessler Dr	Vans	North End	0.061	2	2	0.244
			Lindbergh Dr	Pennsylvania	Shubel Ave	0.149	2	2	0.596
			Maplehill Ave	Rosemont	Wildwood	0.083	2	2	0.332
			Pennway Dr	Alpha	Devonshire	0.058	2	2	0.232
			Pinewood Ave	Laurie	Kessler	0.056	2	2	0.224
			Reo Rd	MLK Jr Blvd	Burchfield	0.22	2	2	0.88
			Richard Rd	Willoughby	Dadson	0.22	2	2	0.88
			Rosemont St	Maplehill	Hunter	0.127	2	2	0.508
			Shubel Ave	Pershing Dr	Parkdale	0.096	2	2	0.384
			Sunnyside Ave	Elmore	Mount Hope	0.086	2	2	0.344
			Vernon Ave	Wildwood	Southgate	0.127	2	2	0.508
			Wayne St	Aurelius	East End	0.221	2	2	0.884
			Atlanta Pl	Ronald	Reo	0.057	2	2	0.228
			Attwood Dr	Manor Dr	Washington	0.257	2	2	1.028
			Balmoral Dr	Glenburne Blvd	Glenburne Blvd	0.311	2	2	1.244
			Bayview Dr	Windward Dr	Woodcreek Ln	0.207	2	2	0.828
			Bliesener St	Pleasant Grove	Pheasant	0.177	2	2	0.708
			Catalpa Dr	Penrose Dr	Swanee	0.056	2	2	0.224
			Georgetown Blvd	Haag Rd	East End	0.33	2	2	1.32
			Georgetown Blvd	W Edgewood Blvd	Balfour	0.58	2	2	2.32
			Granary Ln	Old Farm Ln	North End	0.057	2	2	0.228
			Granary Ln	Old Farm Ln	South End	0.096	2	2	0.384
			Ingham St	Jolly	Reo Rd	0.251	2	2	1.004
			Jerree St	Stillwell	Barclay	0.055	2	2	0.22

			Joshua St	Cameo	South End	0.104	2	2	0.416
			Lochmoor Dr	Clayborn	Brighton	0.2	2	2	0.8
			Midwood St	Wise	Renee	0.261	2	2	1.044
			Picardy St	Miller	Bliesener	0.085	2	2	0.34
			Ronald St	Atlanta	Wainwright	0.116	2	2	0.464
			Stratford Ave	Hepfer	Churchill	0.263	2	2	1.052
			Victor Ave	Deerfield	Pleasant Grove	0.494	2	2	1.976
			Wainwright Ave	Risdale	Hillcrest	0.251	2	2	1.004
			Woodcreek Ln	Blue River Dr	Bayview Dr	0.242	2	2	0.968
			Bell St	Turner	West End	0.085	2	2	0.34
			Bluff St	Sycamore	Pine	0.091	2	2	0.364
			Chestnut St	Ottawa	Ionia	0.091	2	2	0.364
			Chicago Ave	Saginaw	Daleford	0.252	2	2	1.008
			Cypress St	Christopher	Emerson	0.062	2	2	0.248
			Frederick Ave	Northdale	Turner	0.208	2	2	0.832
			Genesee St	Butler	Pine	0.233	2	2	0.932
			Greenoak Ave	Downey	Windsor	0.057	2	2	0.228
			Hillsdale St	S Jenison Ave	MLK Jr Blvd	0.16	2	2	0.64
			Howe Ave	West End	Turner	0.27	2	2	1.08
			Huron St	Lenawee	Kalamazoo	0.09	2	2	0.36
			Hylewood Ave	Northdale	Turner	0.212	2	2	0.848
			Lenawee St	Jenison	East End	0.215	2	2	0.86
			Madison St	Sycamore	Pine	0.091	2	2	0.364
			Maple St	State	N Walnut St	0.287	2	2	1.148
			Northdale Rd	Frederick	Sheridan	0.122	2	2	0.488
			Northwest Ave	Delta River	Lafayette	0.181	2	2	0.724
			Osband Ave	Gordon	Lenore	0.131	2	2	0.524
			Park Ave	Alsdorf	Moores River	0.124	2	2	0.496
			Pattengill Ave	Lenore	Moores River	0.534	2	2	2.136
			Paul Ave	Lafayette	Wilson	0.137	2	2	0.548
			Pettis St	Blair	Moores River	0.084	2	2	0.336
			Pingree St	Boston	Corbett	0.051	2	2	0.204
			Princeton Ave	Saginaw	Daleford	0.254	2	2	1.016
			Pulaski St	Birch	MLK Jr Blvd	0.104	2	2	0.416
			Quentin Ave	Berkeley	Barnes	0.14	2	2	0.56
			Rulison St	Hillsdale	Lenawee	0.091	2	2	0.364
			S Cambridge Rd	Cambridge	Nottingham	0.304	2	2	1.216
			Seymour Ave	Ottawa	Shiawassee	0.182	2	2	0.728
			Smith Ave	Coleman	Bradley	0.237	2	2	0.948

			Stirling Ave	Cooper	Lenore	0.05	2	2	0.2
			Sycamore St	Saginaw	Brook	0.294	2	2	1.176
			Thomas St	Curtis	Turner	0.103	2	2	0.412
			Wellington Rd	Loraine	Gordon Ave	0.149	2	2	0.596
			Westchester Rd	Cambridge	Cambridge	0.34	2	2	1.36
			Wisconsin Ave	Saginaw	Daleford	0.251	2	2	1.004
	2020	Chip and Fog Seal	S Fairview Ave	Hopkins	Tulane	0.563	2	7	7.882
			Tulane Dr	Northhampton	Bolley	0.584	2	7	8.176
			Chester Rd	Tulane	City limits	0.478	2	7	6.692
			Creston Ave	Randolph	Sheridan	0.669	2	7	9.366
			Howe Ave	Creston	Turner	0.201	2	7	2.814
			Jackson St	Creston	Turner	0.192	2	7	2.688
			Randolph	Creston	Turner	0.13	2	7	1.82
			Haverhill Dr	Haag	Ashley	0.378	2	7	5.292
			Ashley	Haag	Northrup	0.278	2	7	3.892
			Winterset	Haverhill	Miller	0.145	2	7	2.03
			Gordon Ave	MLK	Fairfax	0.664	2	7	9.296
			Fairfax Rd	Cooper	Victor	0.306	2	7	4.284
			Loraine Ave	Fairfax	Marion	0.557	2	7	7.798
			Rundle Ave	Chatham	Pattengill	0.395	2	7	5.53
	2020	Crush and Shape	Reo	Ballard	Pleasant Grove	0.436	2	12	10.464
			Beaujardin	Dunckel	Oakbrook	0.518	2	12	12.432
			Massachusetts	Grand River	North	0.299	2	12	7.176
			Massachusetts	Whyte	David	0.116	2	12	2.784
			Sheffield	W of Bayview	Seaway	0.392	2	12	9.408
			Windward	Waverly	Bayview	0.135	2	12	3.24
			Old Farm Lane	Waverly	Dead End	0.096	2	12	2.304
			Hamelon	Aurelius	Scarborough	0.278	2	12	6.672
			Scarborough	Hamelon	Robinson	0.096	2	12	2.304
	2020	O&M Millage Paving	Loa	MLK	Atlas	0.247	2	7	3.458
		2 inch M&F	Shepard	Michigan	Kalamazoo	0.251	2	7	3.514
			Hillsdale	Cherry	River	0.114	2	7	1.596
			McPherson	Lenawee	Kalamazoo	0.132	2	7	1.848
			Valencia	MLK	Kennedy	0.191	2	7	2.674
			Herbert	Baker	Mt Hope	0.327	2	7	4.578
			Eastlawn	Cavanaugh	Hazelwood	0.171	2	7	2.394

			Birch	Hammond	Edward	0.059	2	7	0.826
			Dexter	Pennsylvania	Cedar Brook	0.271	2	7	3.794
			Rose Court	MLK	Dead End	0.043	2	7	0.602
			Capitol	Willow	Cesar Chavez	0.09	2	7	1.26
			N. Washington	Willow	Cesar Chavez	0.091	2	7	1.274
			Irvington	Aurelius	dead end	0.259	2	7	3.626
	2020	Contract Millage Paving	Carson	Aurelius	Reno	0.1	2	7	1.4
		2 inch M&F	Fairmont	Aurelius	Reno	0.1	2	7	1.4
			Reno	Carson	Fairmont	0.049	2	7	0.686
			Marcus	Clemens	Hayford	0.187	2	7	2.618
			Fairview	Elizabeth	Harton	0.117	2	7	1.638
			Ronald	Anson	Stilwell	0.227	2	7	3.178
			Chestnut	Kalamazoo	St Joseph	0.248	2	7	3.472
	2020	Reconstruction	Enterprise Dr.	Keystone Ave.	Dead End	0.151	2	15	4.53
	2021	Chip and Fog Seal	Chester	Mayfair	Tulane	0.32	2	7	4.48
			Elizabeth	Clifford	Clemens	0.362	2	7	5.068
			Holmes St	Dead end	E Main	0.312	2	7	4.368
			Maplewood	Willard	Rockford	0.377	2	7	5.278
			N Fairview	E Michigan	Saginaw	0.504	2	7	7.056
			N Foster Ave	E Michigan	E Saginaw	0.502	2	7	7.028
			New York Ave	Grand River	Oak	0.195	2	7	2.73
			Riley	Cedar	Dead End	0.376	2	7	5.264
			Rockford	Forest	Maplewood	0.105	2	7	1.47
			Armstrong	Joshua	Pennsylvania	0.242	2	7	3.388
			Conrad	Orchard	Richwood	0.065	2	7	0.91
			Grant	Hamilton	Willard	0.156	2	7	2.184
			Louisa	Joshua	Pennsylvania	0.244	2	7	3.416
			Lyons	Hamilton	Greenlawn	0.268	2	7	3.752
			Mason	Stabler	Cedar	0.241	2	7	3.374
			Richwood	Conrad	Louisa	0.265	2	7	3.71
			Stabler	Cavanaugh	Holmes	0.497	2	7	6.958
			Stafford	Jolly	Graham	0.445	2	7	6.23
	2021	Millage Paving	Woodview	Hampden	Wellesley	0.13	2	7	1.82
		2 inch M&F	Denver	Everett	Lyons	0.542	2	7	7.588

			Frederick	E. End	Dead End	0.559	2	7	7.826
			Regent	Malcolm X	Perkins	0.233	2	7	3.262
			Amherst	Delta River	Wilson	0.216	2	7	3.024
			Arcadia	Amherst	Wilson	0.181	2	7	2.534
			Pino	Arcadia	Amherst	0.071	2	7	0.994
	2021	Reconstruction	Fairway Lane	Shelter Lane	Hillgate Way	0.327	2	15	9.81
			Stonewood Drive	Hillgate Way	Coolidge Road	0.189	2	15	5.67
			Melody Lane	Holiday Drive	Coolidge Road	0.151	2	15	4.53
			Shelter Lane	Holiday Drive	Stonewood Drive	0.201	2	15	6.03
			Holiday Drive	Shelter Lane	East End	0.12	2	15	3.6
			Clippert Street	Fairway Lane	Road Bend	0.037	2	15	1.11
			Fairway Court	Fairway Lane	West End	0.104	2	15	3.12
			Hillgate Way	Fairway Lane	Shelter Lane	0.177	2	15	5.31
			Hillgate Circle	Hillgate Way	East End	0.025	2	15	0.75
			Devonshire	Cavanaugh	Jolly	0.496	2	15	14.88
			Alpha	Cavanaugh	Jolly	0.495	2	15	14.85
	2022	Chip and Fog Seal	Dunlap	Pleasant Grove	Maloney	0.106	2	7	1.484
			Georgetown	Edgewood	Dead End	1.26	2	7	17.64
			Haag	Georgetown	Miller	0.39	2	7	5.46
			Hughes	Pathway	Dead End	0.789	2	7	11.046
			Stillwell	Karen	Hepfer	0.44	2	7	6.16
			Wainwright	Jolly	Reo	0.251	2	7	3.514
			Wexford	Jolly	Dead End	0.425	2	7	5.95
			Comfort	Saginaw	Willow	0.504	2	7	7.056
			Hillsdale	West	MLK	0.256	2	7	3.584
			Lansing	Willow	Dead End	0.425	2	7	5.95
			Pattengill	Gordon	Mt Hope	0.214	2	7	2.996
			Sunset	Willow	Melvin	0.535	2	7	7.49
			Tecumseh River	Waverly	Grand River	1.728	2	7	24.192
	2022	Reconstruct	Pattengill	Victor	Gordon	0.263	2	15	7.89
			Marion	Victor	Lenore	0.425	2	15	12.75
			Cooper	Pattengill	MLKing	0.23	2	15	6.9

			Poxon	Pattengill	MLKing	0.231	2	15	6.93
			Gordon	Pattengill	MLKing	0.231	2	15	6.93
			Woodbine	Pattengill	MLKing	0.23	2	15	6.9
			Kelsey	Pattengill	MLKing	0.231	2	15	6.93
			Loraine	Pattengill	MLKing	0.232	2	15	6.96
			Rundle	Pattengill	MLKing	0.234	2	15	7.02
			Victor	Pattengill	MLKing	0.245	2	15	7.35
	Each Year	Millage Paving	Streets Chosen from a list of Candidates			2	2	7	28
		2 inch M&F							

APPENDIX C: UNPAVED STREETS

			Gravel Streets		
		Street	From	To	Length
		Harton St	Fairview	Magnolia	0.063
		Harton St	Magnolia	Hayford	0.062
		Elizabeth St	Hayford	S Foster Ave	0.063
		Elizabeth St	S Foster Ave	Francis	0.061
		Summerville Ave	Pavement change	Daleford	0.05
		Leonard Ct	Madison	Oakland	0.083
		Edison Ave	Alpha	Pennsylvania	0.066
		Kenwood Ave	Dead End or Start	Donora	0.022
		Kenwood Ave	Pennsylvania	Alpha St	0.067
		Kenwood Ave	Alpha St	Dead End or Start	0.042
		McKim Ave	Dead End or Start	Donora	0.02
		Cady Ct	Pennsylvania Ave	Dead End or Start	0.035
		Tecumseh River Rd	Biltmore	Attribute Change	0.023
		Windsor St	Greenoak	Tecumseh Ave	0.079
		Windsor St	Tecumseh Ave	Mildred	0.094
		Chilson Ave	Dead End or Start	[Surface Segment Split]	0.138
		E Howe Ave	Dead End or Start	[Surface Segment Split]	0.015
		Stockman Ct	Grand River	Dead End or Start	0.072
		W Frederick Ave	Dead End or Start	Northdale	0.045
		W Paulson St	Felt	Dead End or Start	0.093
		E Harris St	Dead End or Start	Creston	0.056
		Garland St		Orchard Glen	0.039
		8th Ave	Dead End or Start	Gier	0.017
		N Washington Ave	Reasoner	Russell	0.076
		Kaplin St	Sunset	Dead End or Start	0.087
		Redwood St	Glenrose	Roselawn Ave	0.043
		Redwood St	Roselawn Ave	Robertson	0.051
		Muskegon Ave	Comfort	Glenrose	0.184
		Muskegon Ave	Glenrose	Robertson	0.092
		Glenrose Ave	Muskegon	Attribute Change	0.035
		Cross St	Knollwood	Christopher	0.061
		Cypress St	Knollwood	Christopher	0.061
		Glenn St	Martin Luther King Jr	Princeton	0.065
		S Grand Ave	Hazel	Dead End or Start	0.03
		Platt St	Elm	E Hazel St	0.093
		Fauna Ave	Deerfield	Catherine	0.067
		Fauna Ave	Catherine	Ingham St	0.094
		Fauna Ave	Ingham St	Viking	0.08
		Fayette St	Dead End or Start	Ada	0.035
		Elmore St	Dead End or Start	Devonshire	0.019
		Elmore St	Clifton	Sunnyside	0.051
		Garfield St	Greenlawn	Lincoln	0.059
		E Willard Ave	Ruth	Aurelius	0.166
		Ruth Ave	Willard	Hoyt Ave	0.273

		Ruth Ave	Hoyt Ave	Dead End or Start	0.073
		Hoyt Ave	Aurelius	Ruth	0.164
		Ruth Ave	Dead End or Start	Rex	0.126
		Ruth Ave	Irvington	Holmes	0.175
		Stirling Ave	Loa	Dunlap St	0.062
		Stirling Ave	Dunlap St	Dead End or Start	0.027
		Atlas Ave	Dunlap	Dead End or Start	0.026
		Starr Ave	Reo	Dead End or Start	0.093
		Hughes Rd	Reo	Dead End or Start	0.052
		Marion Ave	Hillcrest	Pompton	0.088
		Eaton Ct	Martin Luther King Jr	Dead End or Start	0.056
		Kennedy Dr	Selfridge	Valencia	0.071
		Kennedy Dr	Valencia	Hughes Rd	0.072
		Kennedy Dr	Hughes Rd	Haag	0.074
		Taffy Pkwy	Hughes	Haag	0.176
		Southgate Ave	Vernon	Parkway	0.029
		Boettcher Ct	Jolly	Dead End or Start	0.074
		Irene St	Aurelius	Dead End or Start	0.141
		Worden St	Aurelius	Dead End or Start	0.111
		Balzer St	Ferley	Dead End or Start	0.048
		Southbrook Ave	Miller	Dead End or Start	0.087
		Daft St	Dead End or Start	Victoria	0.015
		Labelle St	Labelle	Kenbrook Rd	0.049
		Labelle St	Kenbrook Rd	Grovenburg	0.068
		Kenbrook Rd	Labelle	Annetta Rd	0.07
		Kenbrook Rd	Annetta Rd	Martin Luther King Jr	0.126
		W Willow St	Washington	Dead End or Start	0.034
		W Fairfield Ave	Felt	Dead End or Start	0.111
		Newark Ave	Martin Luther King Jr	Dead End or Start	0.052
		E Holmes Rd	Holmes	Dead End or Start	0.054
		Annetta Rd	Kenbrook	Dead End or Start	0.059
		Emily Ave		Cavanaugh	0.059
		Lawler Ct	Chestnut	Dead End or Start	0.052
		Taylor St	Attribute Change	Randolph	0.036
				Total Miles	5.637

APPENDIX D

A Quick Check of Your Highway Network Health

By Larry Galehouse, Director, National Center for Pavement Preservation
and
Jim Sorenson, Team Leader, FHWA Office of Asset Management

Historically, many highway agency managers and administrators have tended to view their highway systems as simply a collection of projects. By viewing the network in this manner, there is a certain comfort derived from the ability to match pavement actions with their physical/functional needs. However, by only focusing on projects, opportunities for strategically managing entire road networks and asset needs are overlooked. While the "bottom up" approach is analytically possible, managing networks this way can be a daunting prospect. Instead, road agency administrators have tackled the network problem from the "top down" by allocating budgets and resources based on historical estimates of need. Implicit in this approach, is a belief that the allocated resources will be wisely used and prove adequate to achieve desirable network service levels.

Using a quick checkup tool, road agency managers and administrators can assess the needs of their network and other highway assets and determine the adequacy of their resource allocation effort. A quick checkup is readily available and can be usefully applied with minimum calculations.

It is essential to know whether present and planned program actions (reconstruction, rehabilitation, and preservation) will produce a net improvement in the condition of the network. However, before the effects of any planned actions on the highway network can be analyzed, some basic concepts should be considered.

Assume every lane-mile segment of road in the network was rated by the number of years remaining until the end of life (terminal condition). Remember that terminal condition does not mean a failed road. Rather, it is the level of deterioration that management has set as a minimum operating condition for that road or network. Consider the rated result of the current network condition as shown in Figure 1.

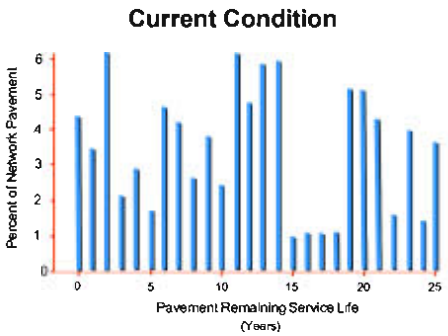


Figure 1 – Current Condition

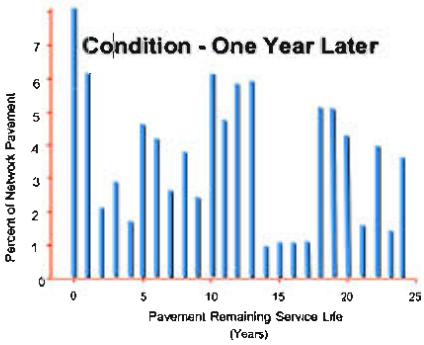


Figure 2 – Condition 1-Year Later

If no improvements are made for one year, then the number of years remaining until the end of life will decrease by one year for each road segment, except for those stacked at zero. The zero- stack will increase significantly because it maintains its previous balance and also becomes the recipient of those roads having previously been stacked with one year remaining. Thus, the entire network will age one year to the condition shown in Figure 2, with the net lane-miles in the zero stack raised from 4% to 8% of the network.

Some highway agencies still subscribe to the old practice of assigning their highest priorities to the reconstruction or rehabilitation of the worst roads. This practice of "worst first", i.e., continually addressing only those roads in the zero-stack, is a proven death spiral strategy because reconstruction and rehabilitation are the most expensive ways to maintain or restore serviceability. Rarely does sufficient funding exist to sustain such a strategy.

The measurable loss of pavement life can be thought of as the network's total lane-miles multiplied by 1 year, i.e., lane-mile-years. Consider the following quantitative illustration. Suppose your agency's highway network consisted of 4,356 lane-miles. Figure 3 shows that without intervention, it will lose 4,356 lane-mile-years per year.

Agency Highway Network = 4,356 lane miles

Each year the network will lose

4,356 lane-mile-years

Figure 3 – Network Lane Miles

To offset this amount of deterioration over the entire network, the agency would need to annually perform a quantity of work equal to the total number of lane-mile-years lost just to maintain the status quo. Performing work which produces fewer than 4,356 lane-mile-years would lessen the natural decline of the overall network, but still fall short of maintaining the

status quo. However, if the agency produces more than 4,356 lane-mile-years, it will improve the network.

In the following example, an agency can easily identify the effect of an annual program consisting of reconstruction, rehabilitation, and preservation projects on its network. This assessment involves knowing the only two components for reconstruction and rehabilitation projects: lane-miles and design life of each project fix. Figure 4 displays the agency's programmed activities for reconstruction and Figure 5 displays it for rehabilitation.

Reconstruction Evaluation

Projects this Year = 2

Project	Design Life	Lane Miles	Lane Mile Years	Lane Mile Cost	Total Cost
No 1	25 yrs	22	550	$463,425	$10,195,350
No 2	30 yrs	18	540	$556,110	$10,009,980
	Total	=	1,090		$20,205,330

Figure 4 - Reconstruction

Rehabilitation Evaluation

Projects this Year = 3

Project	Design Life	Lane Miles	Lane Mile Years	Lane Mile Cost	Total Cost
No 10	18 yrs	22	396	$263,268	$5,791,896
No 11	15 yrs	28	420	$219,390	$6,142,920
No 12	12 yrs	32	384	$115,848	$3,707,136
	Total	=	1,200		$15,641,952

Figure 5 – Rehabilitation

When evaluating pavement preservation treatments in this analysis, it is appropriate to think in terms of "extended life" rather than design life. The term design life, as used in the reconstruction and rehabilitation tables, relates better to the new pavement's structural adequacy to handle repetitive loadings and environmental factors. This is not the goal of pavement preservation. Each type of treatment/repair has unique benefits that should be targeted to the specific mode of pavement deterioration. This means that life extension depends on factors such as type and severity of distress, traffic volume, environment, etc. Figure 6 exhibits the agency's programmed activities for preservation.

Preservation Evaluation

Project	Life Extension	Lane Miles	Lane Mile Years	Lane Mile Cost	Total Cost
No. 101	2 yrs	12	24	$2,562	$30,744
No. 102	3 yrs	22	66	$7,743	$170,346
No. 103	5 yrs	26	130	$13,980	$363,480
No. 104	7 yrs	16	112	$29,750	$476,000
No. 105	10 yrs	8	80	$54,410	$435,280
	Total	=	**412**		$1,475,850

Figure 6 – Preservation

To satisfy the needs of its highway network, the agency must accomplish 4,356 lane-mile-years of work per year. The agency's program will derive 1,090 lane-mile-years from reconstruction, 1,200 lane-mile-years from rehabilitation, and 412 lane-mile-years from pavement preservation, for a total of 2,702 lane-mile-years. Thus, these programmed activities fall short of the minimum required to maintain the status quo, and hence would contribute to a net loss in network pavement condition of 1,653 lane-mile-years. The agency's programmed tally is shown in Figure 7.

Network Trend

Programmed Activity	Lane-Mile-Years	Total Cost
Reconstruction	1,090	$20,205,330
Rehabilitation	1,200	$15,641,952
Preservation	412	$1,475,850
Total	**2,702**	**$37,323,132**
Network Needs (Loss)	(-) 4,356	
Deficit =	**- 1,654**	

Figure 7 – Programmed Tally

This exercise can be performed for any pavement network to benchmark its current trend. Using this approach, it is possible to see how various long-term strategies could be devised and evaluated against a policy objective related to total-network condition.

Once the pavement network is benchmarked, an opportunity exists to correct any shortcomings in the programmed tally. A decision must first be made whether to improve the network condition or just to maintain the status quo. This is a management decision and system goal.

Continuing with the previous example, a strategy will be proposed to prevent further network deterioration until additional funding is secured.

The first step is to modify the reconstruction and rehabilitation (R&R) programs. An agonizing decision must be made about which projects to defer, eliminate, or phase differently with multi- year activity. In Figure 8, reductions are made in the R&R programs to recover funds for less costly treatments in the pavement preservation program. The result of this decision recovered slightly over $6 million.

Program Modification

Programmed Activity	Lane-Mile-Years	Cost Savings
Reconstruction *31 lane miles* ~~(40 lane-miles)~~	*820* ~~(1,099)~~	$5,004,990
Rehabilitation *77 lane miles* ~~(82 lane-miles)~~	*1,125* ~~(1,200)~~	$1,096,950
Pavement Preservation (84 lane-miles)	(412)	0
Total =	*2,357* (2,702)	$6,101,940

Figure 8 – Revised R & R Programs

Modifying the reconstruction and rehabilitation programs has reduced the number of lane-mile- years added to the network from 2,702 to 2,357 lane-mile-years. However, using less costly treatments elsewhere in the network to address roads in better condition will increase the number of lane-mile-years added to the network. A palette of pavement preservation treatments, or mix of fixes, is available to address the network needs at a much lower cost than traditional methods.

Preservation treatments are only suitable if the right treatment is used on the right road at the right time. In Figure 9, the added treatments used include concrete joint resealing, thin hot-mix asphalt (HMA) overlay (≤ 1.5"), microsurfacing, chip seal, and crack seal. By knowing the cost per lane-mile and the treatment life-extension, it is possible to create a new strategy (costing $36,781,144) that satisfies the network need. In this example, the agency saved in excess of $500,000 from traditional methods (costing $37,323,132), while erasing the 1,653 lane-mile-year deficit produced by the initial program tally. Network Strategy

Programmed Activity		Lane Mile Years	Total Cost
Reconstruction	(31 lane-miles)	820	$15,200,340
Rehabilitation	(77 lane-miles)	1,125	$14,545,002
Pavement Preservation	(84 lane-miles)	412	$1,475,850
Concrete Resealing	(4 years x 31 lane-miles)	124	$979,600
Thin HMA Overlay	(10 years x 16 lane-miles)	160	$870,560
Microsurfacing	(7 years x 44 lane-miles)	308	$1,309,000
Chip Seal	(5 years x 79 lane-miles)	395	$1,104,420
Crack Seal	(2 years x 506 lane-miles)	1,012	$1,296,372
	Total =	4,356	$36,781,144

Figure 9 – New Program Tally

In a real-world situation, the highway agency would program its budget to achieve the greatest impact on its network condition. Funds allocated for reconstruction and rehabilitation projects must be viewed as investments in the infrastructure. Conversely, funds directed for preservation projects must be regarded as protecting and preserving past infrastructure investments.

Integrating reconstruction, rehabilitation, and preservation in the proper proportions will substantially improve network conditions for the taxpayer while safeguarding the highway investment.

APPENDIX E: CITY OF LANSING PILOT AREAS

City of Lansing

Asset Management Plan

Demonstration Areas

2019

Forward

The City of Lansing (COL) is responsible for maintaining and operating over 413 miles of roads. Building a new road can cost well over a million dollars per mile due to the large volume of materials and equipment that are necessary. The high cost of road assets underlines the critical nature of properly managing and maintaining the investments made in this vital infrastructure. Understanding the specific needs of every mile of road is a challenge given the size of our road network, its rapidly changing conditions, and the varying needs of road users. Prioritizing the use of the limited resources that the COL has while meeting user expectations also presents a challenge. To overcome these challenges, the COL uses a business process called asset management.

Asset management is defined by Public Act 499 of 2002 as *"An ongoing process of mointoining, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment".* In other words, asset management is a process that uses data to cost effectively manage and track roadway assets using a combination of engineering and business principles.

Asset management ensures that public funds are spent as effectively as possible to maximize the condition of the road network. Asset management also provides a transparent decision making process that allows the public to understand the technical and financial challenges of managing road infrastructure with a limited budget.

The City of Lansing, after many years of declining street conditions and inadequate funding available, decided to demonstrate what could happen when a street program has adequate funding.

Two areas of the City have been chosen as demonstration projects. The current street conditions within these areas are representative of typical residential areas in the City with corresponding local street conditions. A 10-year improvement program has been devised for these areas that is intended to raise the overall condition of the streets to acceptable levels. The City has committed to providing adequate funding for these two areas over the next ten years.

Inventory of Assets

The City of Lansing is responsible for approximately 413 miles of public streets.

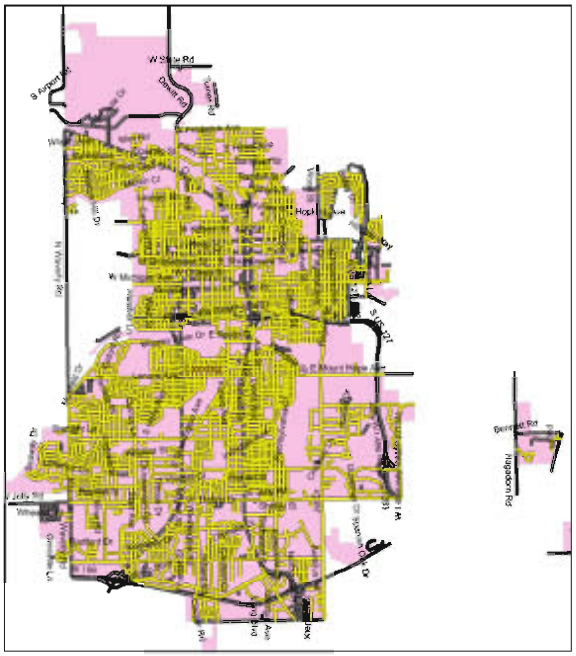


Figure 1 – Streets that are the responsibility of the City of Lansing

These streets can be broken down by their legal classification as City Major or City Minor streets. You can think of road systems as tree-like branched systems, with the larger parts of the road network emphasizing mobility closer to the "trunk" and the roads nearer to the "leaves" intended to provide property access. City Major streets tend to be the higher traffic roads or the larger tree branches, with City Minor streets being the smaller branches, such as in neighborhoods.

The City is responsible for approximately 108 miles of major streets and 305 miles of local streets.

Pavement Condition

Like many communities, the condition of the street network in Lansing has been steadily declining for several years. This decline has been measured and documented with pavement condition data collected over several years using the **PA**vement **S**urface **E**valuation **R**ating system. The PASER rating system is summarized below.

PASER = **PA**vement **S**urface **E**valuation and **R**ating

The PASER condition data is entered into asset management software (Roadsoft) which allows for collecting, storing and analyzing our street network condition data. The City endeavors to keep the data current and rates all City streets every two years. The message the data reveals is that the poor condition of Lansing's street network is a result of years of a severely underfunded street program.

The 2018 condition of the City local streets is an average PASER of 3.02. The average PASER of all City streets in 2018 was 3.17. The following graphic shows the street rating distribution.

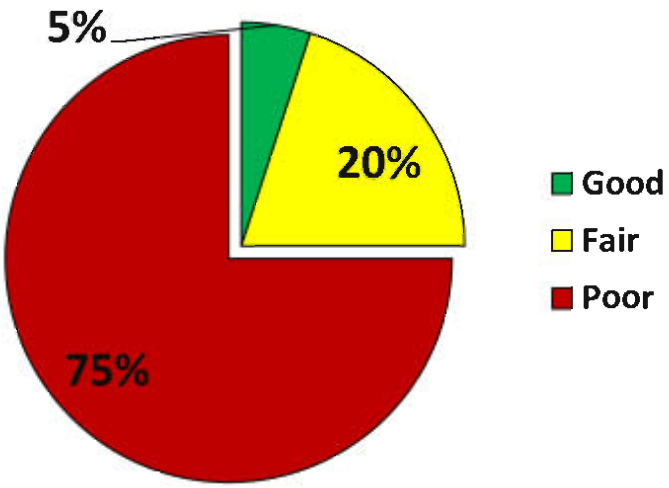


Figure 2 – 2018 Citywide Street Conditions

The Historical Average PASER rating trend shown the steadily declining condition of the City Streets.

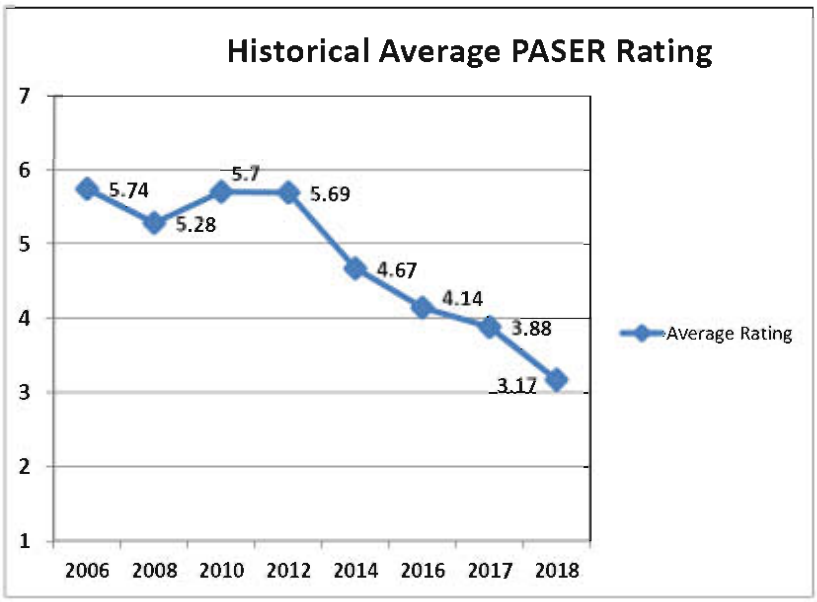


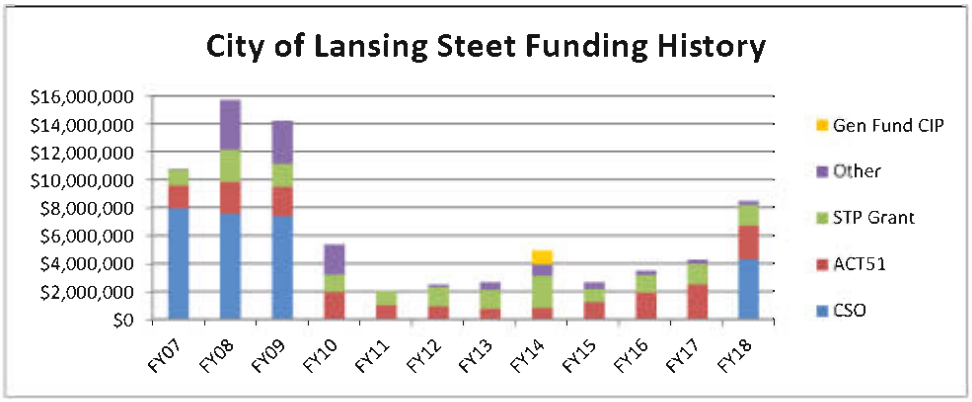
Figure 3 – Historical Average PASER Rating – all City Streets

The goal for the City street system is an Average PASER rating of 7. In order to achieve that goal within 10 years, we estimate that the annual street system needs are more than **$36 mil**lion. Each year that this funding level is not achieved the overall condition of the street system decreases.

Funding

The City of Lansing Street funding has been grossly below what is needed to maintain the system for several years. While insufficient funding levels continue, the Asset Management Plan will help us better understand and communicate the consequences of continued under-funding as well as enable us to apply the funds that are available in a manner that is most beneficial for the overall condition of the street system. The chart below indicates the recent funding history associated with the street program.

Figure 4 – Street Funding History



In order to improve and maintain the street system, a reliable and sustainable funding source must be established. In using two areas of the City as Demonstration Projects for ten years, and providing adequate funding to reach the system condition goals, we want to show what could be done City-wide with adequate funding.

Pavement Treatment Tools

The COL uses many types of repair treatments for our roads, each selected to balance costs, benefits, and road life expectancy. All pavements are damaged by water, traffic weight,

freeze/thaw cycles, and sunlight. Each of the following treatments and strategies counters at least one of these pavement damaging forces.

Capital Preventive Maintenance

Capital preventive maintenance (CPM) addresses pavement problems of fair-rated roads before the structural integrity of the pavement has been severely impacted. CPM is a planned set of cost-effective treatments applied to an existing roadway that slows further deterioration and that maintains or improves the functional condition of the system without significantly increasing the structural capacity. The purpose of the following CPM treatments is to protect the pavement structure, slow the rate of deterioration, and/or correct pavement surface deficiencies.

Crack Fill

Water that infiltrates the pavement surface softens the pavement structure and allows traffic loads to cause more damage to the pavement than in normal dry conditions. Crack filling helps prevent water infiltration by sealing cracks in the pavement with asphalt sealant. We seal pavement cracks early in the life of the pavement to keep it functioning as strong as it can and for as long as it can.

Spray Patch

A spray patch treatment is similar to a crack seal, but is used in areas where the crack has widened and needs material to be added.

Cape Seal

A cape seal is a chip seal covered with a micro surface. A chip seal is a two-part treatment that starts with liquid asphalt sprayed onto the old pavement surface followed by a single layer of small stone chips spread onto the wet liquid asphalt layer. The liquid asphalt seals the pavement from water and debris and holds the stone chips in place. The main ingredients of a micro-surface treatment are modified liquid asphalt, small stones, water, and portland cement. A micro-surfacing can be used for filling pavement ruts. The final treatment thickness is usually less than a half an inch, so it does not add any amount of strength to the pavement and only protects the pavement's existing strength. The purpose of a micro-surface treatment is to seal the pavement from sunlight and water damage and needs to be done before cracks are too wide and too numerous.

Hot Mix Asphalt (HMA) Overlay

An HMA overlay with or without milling in a single layer of 2 inches or less is a Capital Preventive Maintenance Treatment that is used. The surface is milled and the HMA layer replaced or an HMA layer is placed directly over the existing roadway. The City has been using a 1.5 inch overlay on some of the worst City streets as a stopgap measure.

Structural Improvement

Roads requiring structural improvements exhibit alligator cracking and rutting and rated poor in the PASER scale. The underlying road structure is beginning to fail and can no longer be treated with Capital Preventive Maintenance Treatments

Mill and HMA Overlay

A Mill and HMA overlay treatment is a removal of the top layer of pavement and replacement of the removed layer with a new HMA layer. Depending on the overlay thickness, this treatment that can add significant structural strength. This treatment also creates a new wearing surface for traffic and seals the pavement from water, debris, and sunlight damage.

Severely damaged pavement can be removed by the milling, which helps prevent structural problems from being quickly reflected in the new surface. Milling is also done to keep roads at the same height of curb and gutter that is not being raised or reinstalled in the project. This treatment is used on streets that the base does not appear to be failing, or is done with some spot base repairs.

Crush and Shape

During a crush and shape treatment the existing pavement and base is pulverized and then the road surface is reshaped to correct imperfections in the road's profile. A new HMA leveling course and wearing surface are placed over the pulverized base. This treatment is usually done on local streets with curbs in good to fair condition.

Reconstruction

Pavement reconstruction involves a complete removal of the old pavement and base and construction of an entirely new road. This is the most costly treatment and every pavement has to eventually be reconstructed, and it is usually done as a last resort after more cost effective treatments are done first, or if significant changes to road geometry, base, or buried utilities are required. Compared to the other treatments, which are all improvements of the existing road, reconstruction is the most extensive rehabilitation of the roadway, and are therefore also the most expensive per mile and most disruptive to regular traffic patterns. Reconstructed pavement will eventually require one or more of the previous maintenance treatments to maximize service life and performance.

Demonstration Area Specifics

Our goal for the two demonstration areas are to achieve an average PASER rating of 7 at the end of 10 years. The areas are representative of typical Lansing neighborhoods. The Roadsoft software program was used to help project the funding needed in each area in order to achieve our goal. Roadsoft was also used to help determine candidate projects within the demonstration areas for the next 10 years. The result are in an appendix at the end of this document. The document will be updated each year to help keep our goals on track.

The ultimate goal of this project is to demonstrate that with sufficient dedicated funding levels, using asset management principles, Lansing's entire street network can similarly be improved

and properly maintained. Asset management principles from the pilot project will also demonstrate that once targeted condition levels are obtained, it is much less costly to preserve and maintain the street network.

Other Possible Benefits to Improved Streets

We also plan to track other possible intangible benefits of improved streets to compare how improved streets may affect other areas, such as:

- Property Values
- Number of vacant houses
- Crime statistics

This information will be gathered for both demonstration areas.

Demonstration Area #1 – West of Waverly

There are 8.4 miles of local streets located within Eaton County, west of Waverly Road. This area spurred the idea for demonstration areas, since it receives the benefit from a street millage passed by Eaton County in 2014, amounting to $115,000 of annual funding. This dedicated source of funding is added to City funding to reach $350,000 annually for the 10 year demonstration.

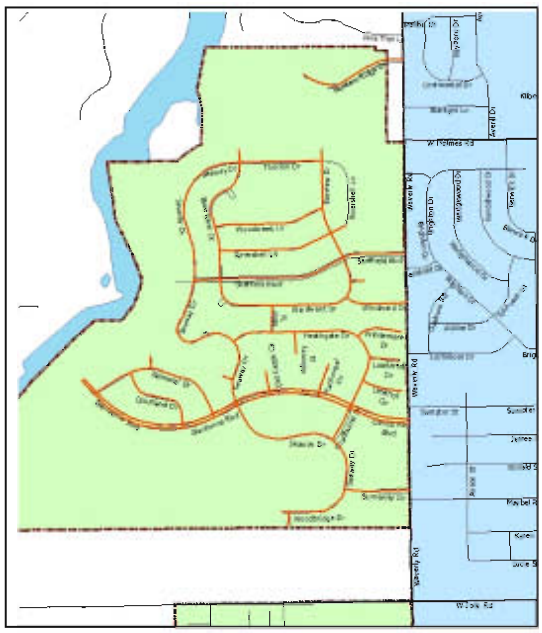


Figure 5 –

City of Lansing streets located within Eaton County

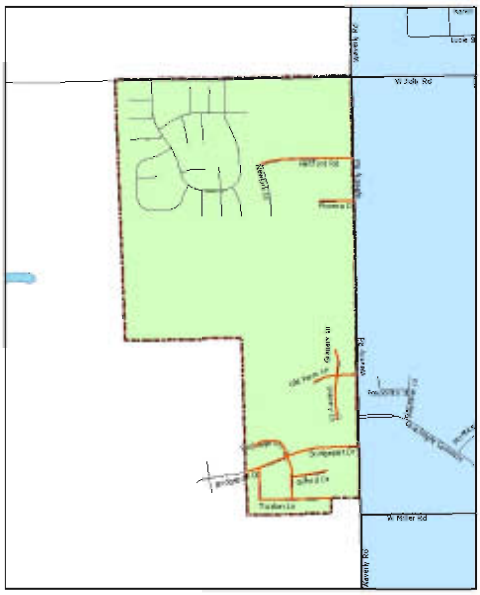


Figure 5 – City of Lansing Streets located within Eaton County

There are two areas of streets located north and South of Jolly Road. This comprises a total of 8.4 miles of streets.

Current Street Condition

The average PASER for demonstration area #1 was 3.38 (Poor) in 2018. Figure 6 shows the distribution of the conditions.

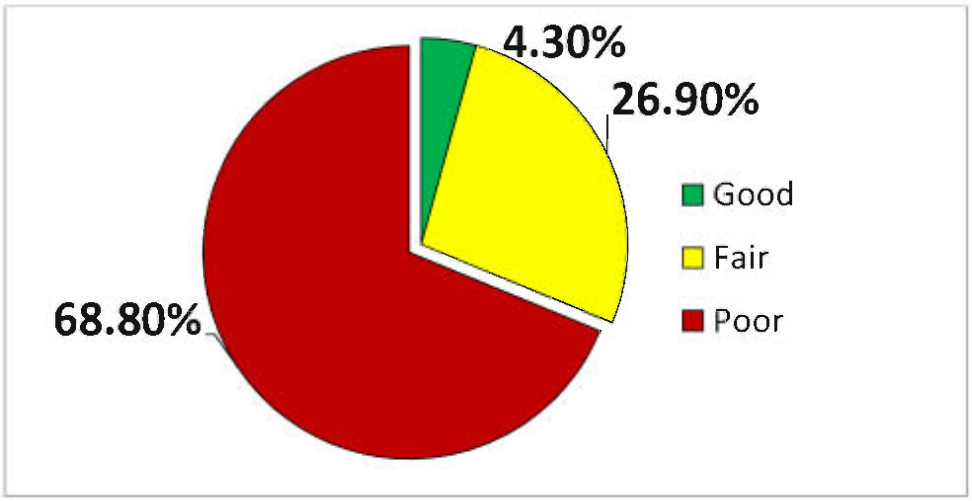


Figure 6 – 2018 Street Condition in Demonstration Area #1

Using Asset Management, we predict the average PASER for the same area will be 7 in 10 years with adequate funding.

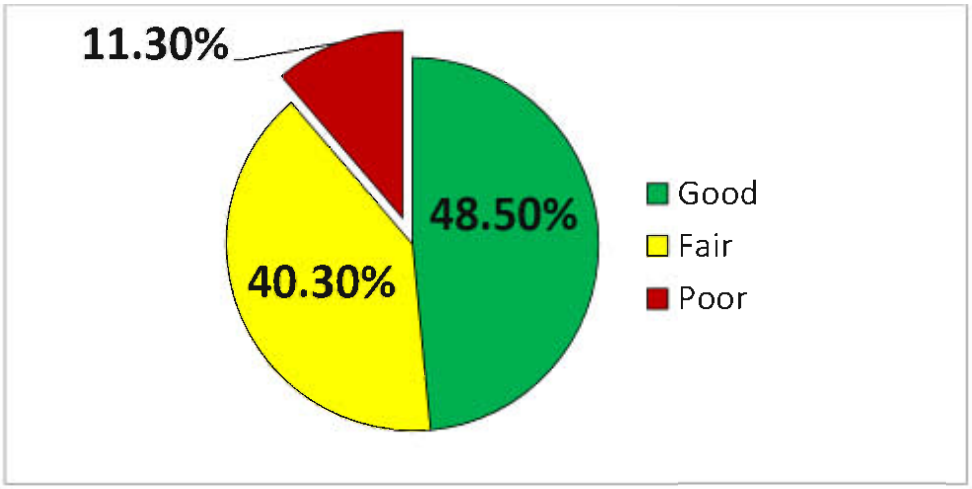


Figure 7 – Projected 10-year Street Conditions in Demonstration Area #1

Demonstration Area #2 – East of Aurelius Road, South of Forest Road

There are 5.8 miles of local streets located within Demonstration Area #2. Roadsoft was used to determine the funding needed to achieve street improvements to reach our goal of an average PASER of 7 in 10 years. A total of $325,000 was determined to be need and will be used in this area annually to help achieve our goal.

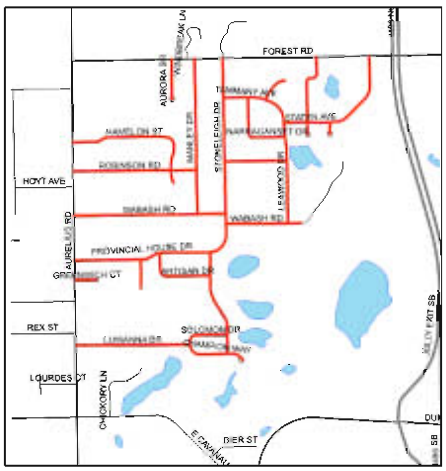


Figure 8 – Demonstration Area #2 – 5.8 Miles

Current Street Condition

The average PASER for demonstration area #2 was 2.08 (Poor) in 2018. Figure 9 shows the distribution of the conditions.

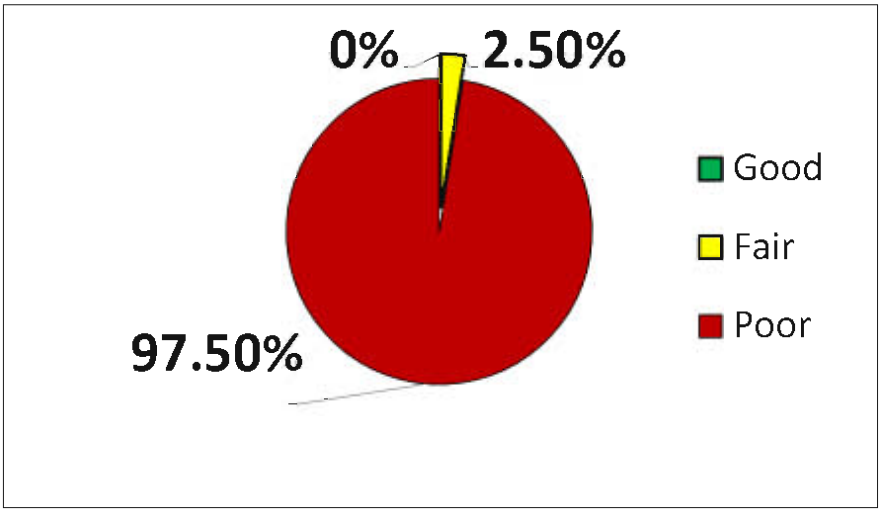


Figure 9 – 2018 Street Condition in Demonstration Area #2

Using Asset Management, we predict the average PASER for the same area will be 7 in 10 years with adequate funding.

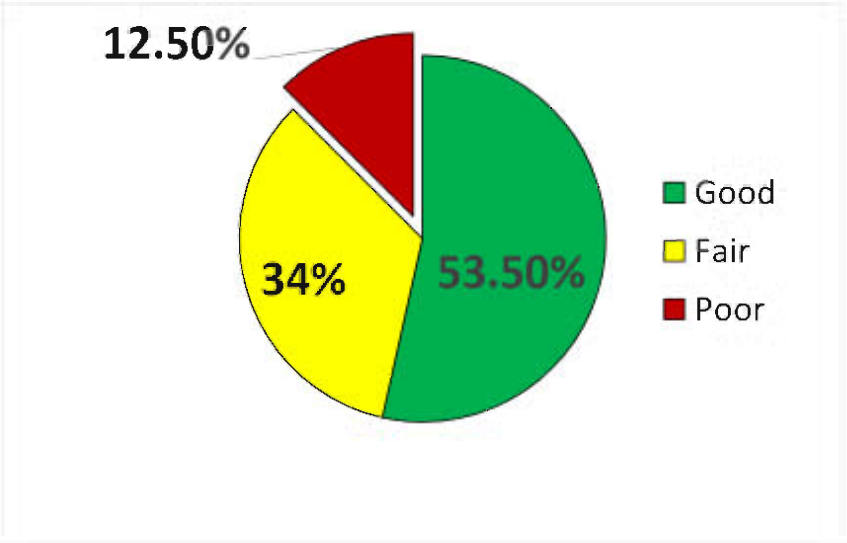
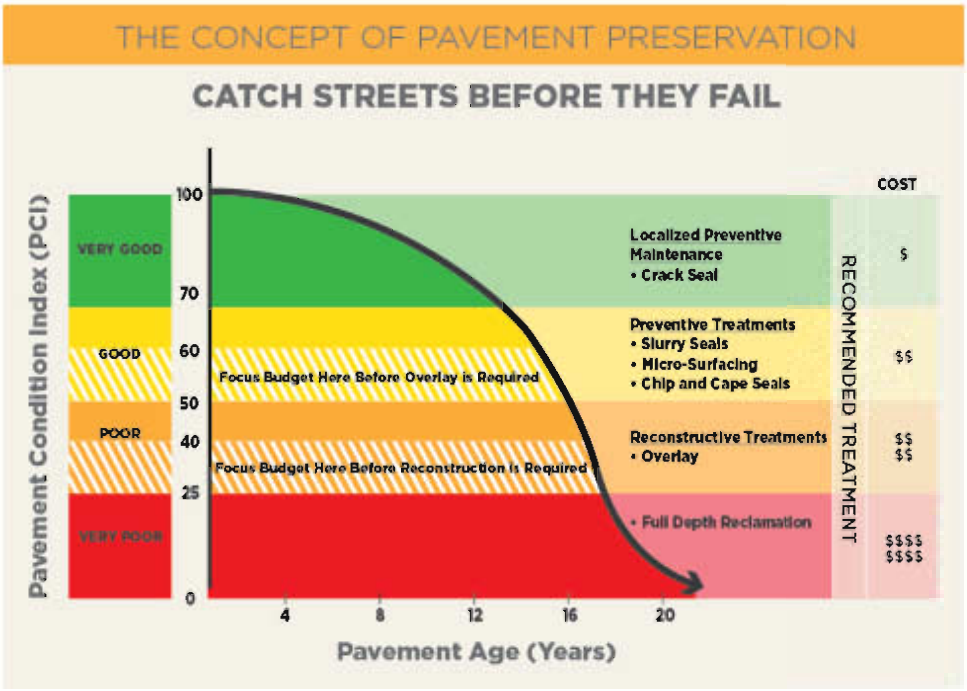


Figure 10 – Projected 10-year Street Conditions in Demonstration Area #2

Maintaining Improved Streets

Once streets are improved, by applying principles of asset management, we predict that maintaining the streets into the future would require about half of the funding needed to improve the streets. Asset Management means applying the "right fix at the right time", like the use of CPM treatments to prevent deterioration of the streets. The following graphic (from the City of Elk Grove, California) shows a typical pavement deterioration curve (condition vs. time) and possible treatments to apply at the correct time. This also shows the relative costs of each area of treatment, showing that preserving a pavement in fair condition is less costly than waiting until the pavement is in poor condition.



Appendix 1

Demonstration Area #1

10-Year Comprehensive Strategy, $350K Annually

Projects By Year – 10 Years

Strategy Comprehensive Report

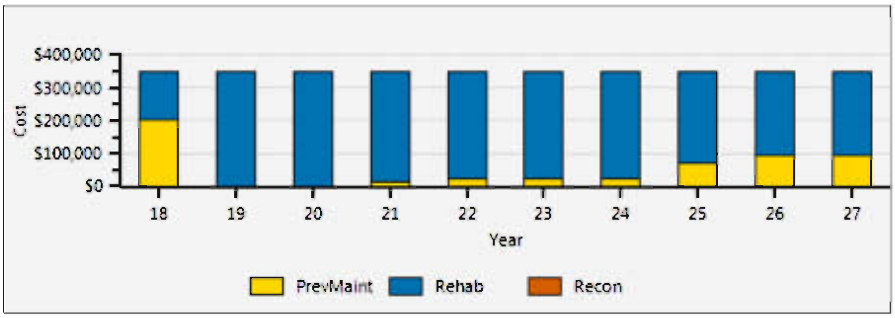
350K Demonstration Area

Base Year	2018
Percent Inflation	0.03
Number of Years	10
Optimized	Yes
Current Filter	Eaton County - Lansing Jurisdiction

Subtype	Treatment	Trigger	Reset	Cost/Ln Mile	Budget	Lane Miles	Year
Asphalt-Standard	RH (SI) CRSH Crush & Reshape	1 - 4	9	$335,573.33			
					$148,156	0 442	2018
					$350,007	1 043	2019
					$350,012	1 042	2020
					$334,297	0 995	2021
					$324,284	0 965	2022
					$324,281	0 965	2023
					$324,277	0 965	2024
					$278,102	0 827	2025
					$254,168	0 756	2026
					$254,144	0 755	2027
	PM (CPM) CKS Crack Seal	6 - 7	7	$6,071 59			
					$12,374	2 038	2021
					$46,181	7 597	2025
	PM (CPM) CPS - Cape Seal	4 - 6	9	$50,336 00			
					$201,847	4 010	2018
					$3,325	0 066	2021
					$25,702	0 510	2022
					$25,710	0 510	2023
					$25,718	0 510	2024
					$25,725	0 510	2025
					$95,818	1 899	2026
					$95,846	1 899	2027

Strategy Comprehensive Report

Cost Distribution

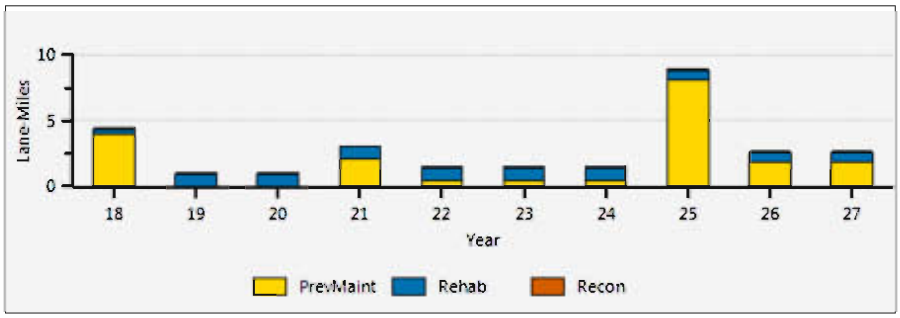


350K Demonstration Area

Maintenance Type	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Prev Maint	$201,847	$0	$0	$15,699	$25,702	$25,710	$25 718	$71 907	$95,818	$95,846
Rehab	$148,156	$350 007	$350 012	$334,297	$324,284	$324,281	$324 277	$278 102	$254,168	$254,144
Recon	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$350,003	$350 007	$350 012	$349,998	$349,986	$349,991	$349,995	$350,009	$349,986	$349,990

Strategy Comprehensive Report

Maintenance Performed

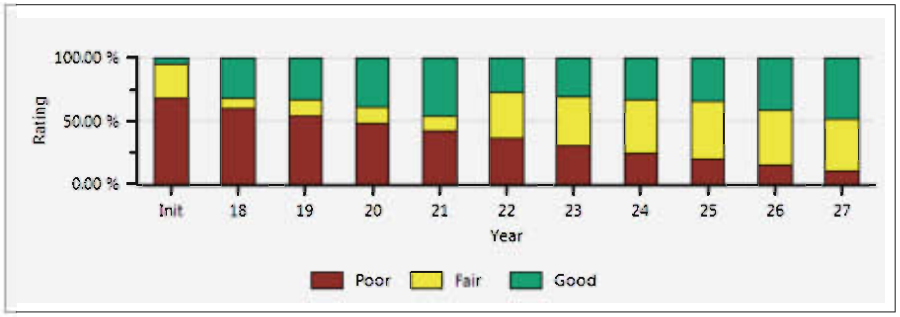


350K Demonstration Area

Maintenance Type in Lane Miles	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Prev Maint	4 010	0 000	0 000	2 104	0 510	0 510	0 510	8 107	1 899	1 899
Rehab	0 442	1 043	1 042	0 995	0 965	0 965	0 965	0 827	0 756	0 755
Recon	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
Total	4 452	1 043	1 042	3 099	1 475	1 475	1 475	8 934	2 655	2 654

Strategy Comprehensive Report

Rating Distribution



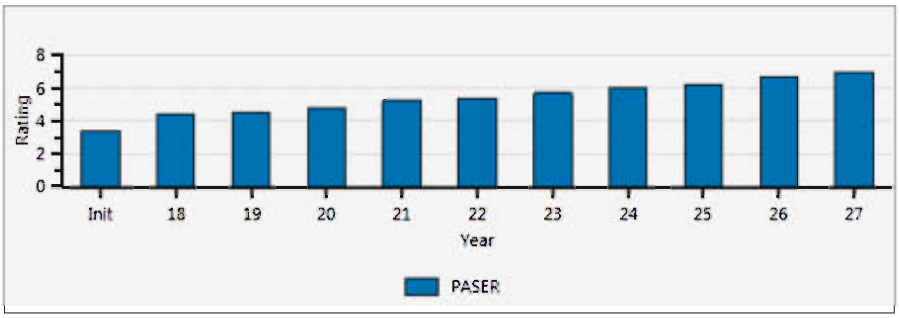
350K Demonstration Area

Initial Values

Lane Miles	%	Rating	2018		2019		2020		2021		2022		2023		2024		2025		2026		2027	
0.782	4.7	Good	5 234	31 2	5 559	33 2	6 537	39 0	7 598	45 3	4 621	27 6	5 053	30 2	5 486	32 7	5 762	34 4	6 942	41 4	8 121	48 5
4.512	26.9	Fair	1 386	8 3	2 104	12 6	2 168	12 9	2 104	12 6	6 046	36 1	6 579	39 3	7 111	42 4	7 661	45 7	7 237	43 2	6 813	40 7
11.466	68.4	Poor	10 141	60 5	9 093	54 3	8 055	48 1	7 060	42 1	6 095	36 4	5 130	30 6	4 165	24 9	3 338	19 9	2 583	15 4	1 828	10 9
16.760	100 0	Total																				

Strategy Comprehensive Report

PASER Distribution

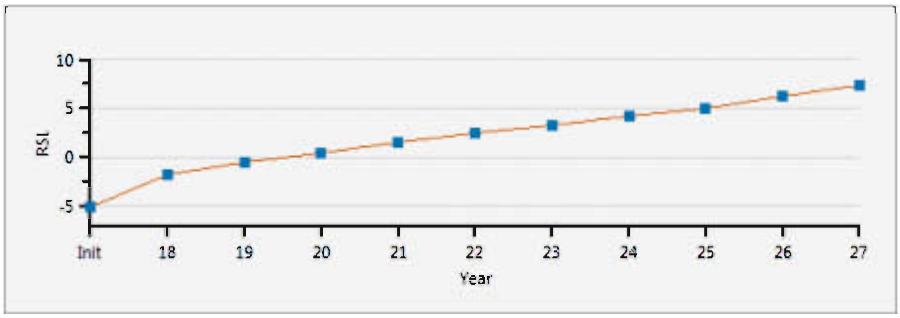


350K Demonstration Area

Initial Value											
Lane Miles	PASER	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
0 000	10	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	9	4 452	1 043	1 042	1 061	1 475	1 475	1 475	1 337	2 655	2 654
0 782	8	0 782	4 516	5 495	6 537	3 146	3 578	4 011	4 425	4 287	5 467
1 386	7	1 386	2 104	2 168	2 104	6 046	6 579	7 047	7 661	7 237	6 813
2 636	6	0 000	0 000	0 000	0 000	0 000	0 000	0 064	0 000	0 000	0 000
0 000	5	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	4	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
2 636	3	2 636	1 366	0 120	0 000	0 000	0 000	0 000	0 000	0 000	0 000
3 390	2	3 390	3 868	4 302	4 348	3 278	2 636	1 366	0 120	0 000	0 000
4 556	1	4 115	3 864	3 633	2 712	2 817	2 494	2 799	3 218	2 583	1 828
3 395	Average	4 465	4 531	4 839	5 249	5 378	5 710	6 002	6 236	6 643	6 989

Strategy Comprehensive Report

RSL Distribution



350K Demonstration Area

Initial Value

Lane Miles	RSL	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
0 000	13	4 452	1 043	1 042	1 061	1 475	1 475	1 475	1 337	2 655	2 654
0 000	12	0 000	4 452	1 043	1 042	1 061	1 475	1 475	1 475	1 337	2 655
0 064	11	0 064	0 000	4 452	1 043	1 042	1 061	1 475	1 475	1 475	1 337
0 718	10	0 718	0 064	0 000	4 452	1 043	1 042	1 061	1 475	1 475	1 475
1 320	9	1 320	0 718	0 064	0 510	4 452	1 043	1 042	1 964	1 475	1 475
0 066	8	0 066	1 320	0 718	0 574	0 510	4 452	1 043	1 899	1 964	1 475
0 000	7	0 000	0 066	1 320	0 510	0 574	0 510	4 452	1 899	1 899	1 964
0 000	6	0 000	0 000	0 066	0 510	0 510	0 574	0 510	1 899	1 899	1 899
2 506	5	0 000	0 000	0 000	0 000	0 000	0 000	0 064	0 000	0 000	0 000
0 630	4	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	3	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	2	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 590	1	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 118	0	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 302	-1	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 576	-2	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 120	-3	0 120	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
1 246	-4	1 246	0 120	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
1 270	-5	1 270	1 246	0 120	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 642	-6	0 642	1 270	1 246	0 120	0 000	0 000	0 000	0 000	0 000	0 000
1 070	-7	1 070	0 642	1 270	1 246	0 120	0 000	0 000	0 000	0 000	0 000
0 074	-8	0 074	1 070	0 642	1 270	1 246	0 120	0 000	0 000	0 000	0 000
0 812	-9	0 812	0 074	1 070	0 642	1 270	1 246	0 120	0 000	0 000	0 000
0 792	-10	0 792	0 812	0 074	1 070	0 642	1 270	1 246	0 120	0 000	0 000
0 250	-11	0 250	0 792	0 812	0 074	1 070	0 642	1 270	1 246	0 120	0 000

Strategy Comprehensive Report

0 194	**-12**	0 194	0 250	0 792	0 812	0 074	1 070	0 642	1 270	1 246	0 120
0 308	**-13**	0 308	0 194	0 250	0 792	0 812	0 074	0 887	0 642	1 217	1 246
0 352	**-14**	0 352	0 308	0 194	0 250	0 792	0 708	0 000	0 060	0 000	0 462
0 146	**-15**	0 146	0 352	0 308	0 194	0 069	0 000	0 000	0 000	0 000	0 000
0 492	**-16**	0 492	0 146	0 352	0 308	0 000	0 000	0 000	0 000	0 000	0 000
1 136	**-17**	1 136	0 492	0 146	0 282	0 000	0 000	0 000	0 000	0 000	0 000
0 172	**-18**	0 172	1 136	0 492	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 058	**-19**	0 058	0 172	0 287	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	**-20**	0 000	0 022	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	**-21**	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
1 448	**-22**	1 007	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
-5 126	Average	-1 815	-0 581	0 422	1 494	2 448	3 301	4 130	5 028	6 152	7 275

Project Planner Summarized Projects By Year Report

Lansing (CityVillage)

Report Module: Planner Evaluation
Today's Date: Wednesday, July 22, 2020

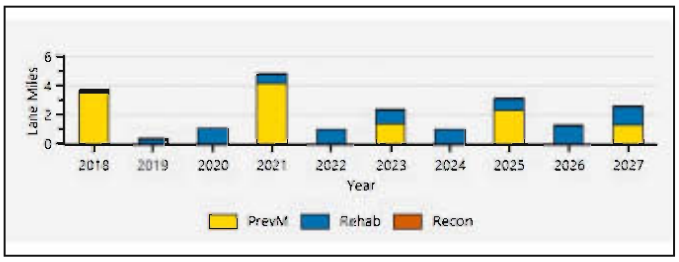
wow 10 year plan

Last Modified: 7/22/2020
Percent Inflation: 0.03
Number of Years: 10
Strategy/Filter Name: 350K Demo - WOW FS
Strategy Filter: Eaton County - Lansing Jurisdiction
Plan Memo:

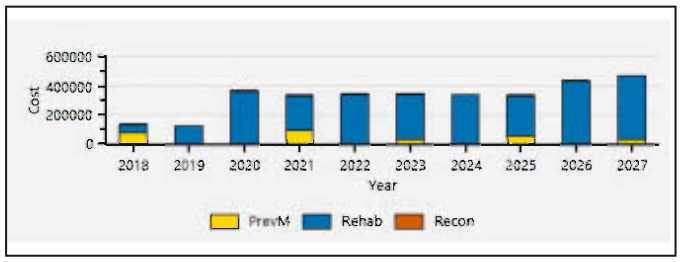
Project Planner Summarized Projects By Year Report

wow 10 year plan

Type of Maintenance Performed - Lane Miles



Type of Maintenance Performed - Cost



Project Planner Summarized Projects By Year Report

wow 10 year plan

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
2018								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Seaway Dr	0 086	0 172	$57,719
		PM (CPM)	FGS - Fog Seal	9	Glenburne Blvd	1 542	3 084	$69,657
		PM (CPM)	FGS - Fog Seal	9	Heathgate Dr	0 088	0 176	$3,975
		PM (CPM)	FGS - Fog Seal	9	Seaway Dr	0.117	0 234	$5,285
		PM (CPM)	FGS - Fog Seal	9	Courtland Dr	0 009	0 018	$407
		PM (CPM)	FGS - Fog Seal	9	Old Castle Cir	0 009	0 018	$407
		PM (CPM)	FGS - Fog Seal	9	Balmoral Dr	0 014	0 028	$632
		PM (CPM)	FGS - Fog Seal	9	Macdougal Cir	0 008	0 016	$361
				Year 2018 Totals:		**1.873**	**3.746**	**$138,443**
2019								
		RH (SI)	CRSH Crush & Reshape	9	Windward Dr	0 135	0 270	$90,632
		RH (SI)	CRSH Crush & Reshape	9	Old Farm Ln	0 052	0 104	$34,910
				Year 2019 Totals:		**0.187**	**0.374**	**$125,542**
2020								
		RH (SI)	CRSH Crush & Reshape	9	Dumfries Cir	0 023	0 046	$15,446
		RH (SI)	CRSH Crush & Reshape	9	Seaway Dr	0.311	0 622	$208,852
		RH (SI)	CRSH Crush & Reshape	9	Phoenix Dr	0 073	0 146	$49,023
		RH (SI)	CRSH Crush & Reshape	9	Old Farm Ln	0 044	0 088	$29,548
		RH (SI)	CRSH Crush & Reshape	9	Bridgeport Dr	0 096	0 192	$64,469
				Year 2020 Totals:		**0.547**	**1.094**	**$357,338**
2021								
		RH (SI)	CRSH Crush & Reshape	9	Hartford Rd	0 201	0 402	$135,022
		RH (SI)	CRSH Crush & Reshape	9	Bridgeport Dr	0 159	0 318	$106,808
		PM (CPM)	FGS - Fog Seal	9	Windward Dr	0 135	0 270	$6,104

Project Planner Summarized Projects By Year Report

wow 10 year plan

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
		PM (CPM)	FGS - Fog Seal	9	Seaway Dr	0 397	0 794	$17,950
		PM (CPM)	FGS - Fog Seal	9	Old Farm Ln	0 096	0 192	$4,341
		PM (CPM)	FGS - Fog Seal	9	Granary Ln	0 152	0 304	$6,873
		PM (CPM)	FGS - Fog Seal	9	Rockingham Dr	0 096	0 192	$4,341
		PM (CPM)	FGS - Fog Seal	9	Phoenix Dr	0 073	0 146	$3,301
		PM (CPM)	FGS - Fog Seal	9	Balmoral Dr	0.311	0 622	$14,062
		PM (CPM)	FGS - Fog Seal	9	Woodcreek Ln	0 242	0 484	$10,942
		PM (CPM)	FGS - Fog Seal	9	Bayview Dr	0 207	0 414	$9,359
		PM (CPM)	FGS - Fog Seal	9	Dumfries Cir	0 023	0 046	$1,040
		PM (CPM)	FGS - Fog Seal	9	Bridgeport Dr	0 096	0 192	$4,341
		PM (CPM)	FGS - Fog Seal	9	Roscommon Dr	0 032	0 064	$1,447
		PM (CPM)	FGS - Fog Seal	9	Teller Trl	0 058	0.116	$2,622
		PM (CPM)	FGS - Fog Seal	9	Burneway Dr	0 142	0 284	$6,420
				Year 2021 Totals:		**2.420**	**4.840**	**$334,971**
2022								
		RH (SI)	CRSH Crush & Reshape	9	Courtland Dr	0 180	0 360	$120,951
		RH (SI)	CRSH Crush & Reshape	9	Bayview Dr	0 126	0 252	$84,666
		RH (SI)	CRSH Crush & Reshape	9	Heathgate Dr	0 163	0 326	$109,528
		RH (SI)	CRSH Crush & Reshape	9	Old Castle Cir	0 043	0 086	$28,894
				Year 2022 Totals:		**0.512**	**1.024**	**$344,040**
2023								
		RH (SI)	CRSH Crush & Reshape	9	Hunters Ridge Dr	0 237	0 474	$159,300
		RH (SI)	CRSH Crush & Reshape	9	Truxton Ln	0 159	0 318	$106,872
		RH (SI)	CRSH Crush & Reshape	9	Grenville Ln	0 069	0 138	$46,379
		PM (CPM)	FGS - Fog Seal	9	Hartford Rd	0 201	0 402	$9,093
		PM (CPM)	FGS - Fog Seal	9	Bridgeport Dr	0 159	0 318	$7,193
		PM (CPM)	FGS - Fog Seal	9	Courtland Dr	0 180	0 360	$8,143
		PM (CPM)	FGS - Fog Seal	9	Old Castle Cir	0 043	0 086	$1,945

Project Planner Summarized Projects By Year Report

wow 10 year plan

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
		PM (CPM)	FGS - Fog Seal	9	Bayview Dr	0 126	0 252	$5,700
				Year 2023 Totals:		**1.174**	**2.348**	**$344,628**
2024								
		RH (SI)	CRSH Crush & Reshape	9	Gilford Cir	0 079	0 158	$53,116
		RH (SI)	CRSH Crush & Reshape	9	Woodbridge Dr	0 145	0 290	$97,492
		RH (SI)	CRSH Crush & Reshape	9	Rockingham Dr	0 097	0 194	$65,218
		RH (SI)	CRSH Crush & Reshape	9	Limerick Cir	0 088	0 176	$59,167
		RH (SI)	CRSH Crush & Reshape	9	Windemere Dr	0 100	0 200	$67,236
				Year 2024 Totals:		**0.509**	**1.018**	**$342,229**
2025								
		RH (SI)	CRSH Crush & Reshape	9	Rivershell Ln	0 248	0 496	$166,794
		RH (SI)	CRSH Crush & Reshape	9	Seaway Dr	0 177	0 354	$119,043
		PM (CPM)	FGS - Fog Seal	9	Hunters Ridge Dr	0 237	0 474	$10,729
		PM (CPM)	FGS - Fog Seal	9	Grenville Ln	0 069	0 138	$3,124
		PM (CPM)	FGS - Fog Seal	9	Truxton Ln	0 159	0 318	$7,198
		PM (CPM)	FGS - Fog Seal	9	Windemere Dr	0 100	0 200	$4,527
		PM (CPM)	FGS - Fog Seal	9	Limerick Cir	0 088	0 176	$3,984
		PM (CPM)	FGS - Fog Seal	9	Heathgate Dr	0 163	0 326	$7,379
		PM (CPM)	FGS - Fog Seal	9	Woodbridge Dr	0 145	0 290	$6,564
		PM (CPM)	FGS - Fog Seal	9	Gilford Cir	0 079	0 158	$3,576
		PM (CPM)	FGS - Fog Seal	9	Rockingham Dr	0 097	0 194	$4,391
				Year 2025 Totals:		**1.562**	**3.124**	**$337,307**
2026								
		RH (SI)	CRSH Crush & Reshape	9	Lochinver Cir	0 026	0 052	$17,492
		RH (SI)	CRSH Crush & Reshape	9	Seaway Dr	0 246	0 492	$165,499
		RH (SI)	CRSH Crush & Reshape	9	Silver Bay Ln	0 031	0 062	$20,856

Project Planner Summarized Projects By Year Report

wow 10 year plan

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
		RH (SI)	CRSH Crush & Reshape	9	Lauderhill Cir	0 066	0 132	$44,402
		RH (SI)	CRSH Crush & Reshape	9	Healthgate Dr	0 279	0 558	$187,700
				Year 2026 Totals:		**0.648**	**1.296**	**$435,948**
2027								
		RH (SI)	CRSH Crush & Reshape	9	Seaway Dr	0 338	0 676	$227,461
		RH (SI)	CRSH Crush & Reshape	9	Windward Dr	0 320	0 640	$215,347
		PM (CPM)	FGS - Fog Seal	9	Healthgate Dr	0 279	0 558	$12,637
		PM (CPM)	FGS - Fog Seal	9	Seaway Dr	0 246	0 492	$11,143
		PM (CPM)	FGS - Fog Seal	9	Lochinver Cir	0 026	0 052	$1,178
		PM (CPM)	FGS - Fog Seal	9	Silver Bay Ln	0 031	0 062	$1,404
		PM (CPM)	FGS - Fog Seal	9	Lauderhill Cir	0 066	0 132	$2,989
				Year 2027 Totals:		**1.306**	**2.612**	**$472,160**
				Report Totals:		**10.738**	**21.476**	**$3,242,605**

Appendix 2

Demonstration Area #2

10-Year Comprehensive Strategy, $325K Annually

Projects By Year – 10 Years

Strategy Comprehensive Report

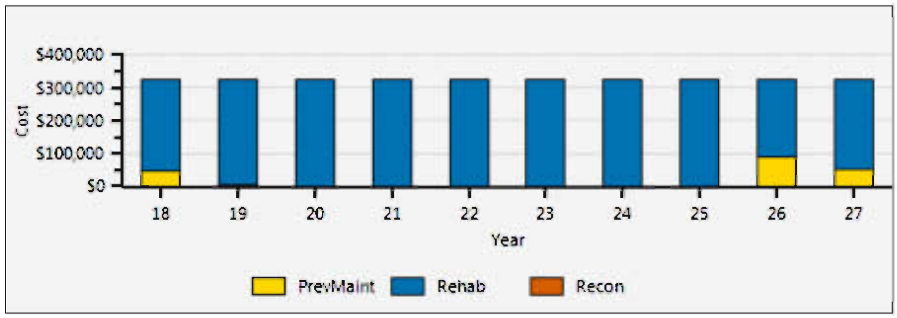
Aur-Forest Area 325K 10 Yrs

Base Year	2018
Percent Inflation	0.03
Number of Years	10
Optimized	Yes
Current Filter	Demo Area

Subtype	Treatment	Trigger	Reset	Cost/Ln Mile	Budget	Lane Miles	Year
Asphalt-Standard	RH (SI) CRSH Crush & Reshape	1 - 4	9	$335,573.33			
					$278,593	0 830	2018
					$322,113	0 960	2019
					$322,814	0 961	2020
					$323,347	0 963	2021
					$324,083	0 965	2022
					$324,079	0 964	2023
					$324,109	0 964	2024
					$324,105	0 964	2025
					$237,619	0 706	2026
					$274,433	0 816	2027
	PM (CPM) CKS Crack Seal	6 - 7	7	$6,066 13			
					$1,007	0 166	2018
					$765	0 126	2019
					$583	0 096	2020
					$437	0 072	2021
	PM (CPM) CPS - Cape Seal	4 - 6	9	$50,336.00			
					$45,403	0 902	2018
					$2,115	0 042	2019
					$1,612	0 032	2020
					$1,209	0 024	2021
					$907	0 018	2022
					$907	0 018	2023
					$908	0 018	2024
					$908	0 018	2025
					$87,391	1 732	2026
					$50,573	1 002	2027

Strategy Comprehensive Report

Cost Distribution

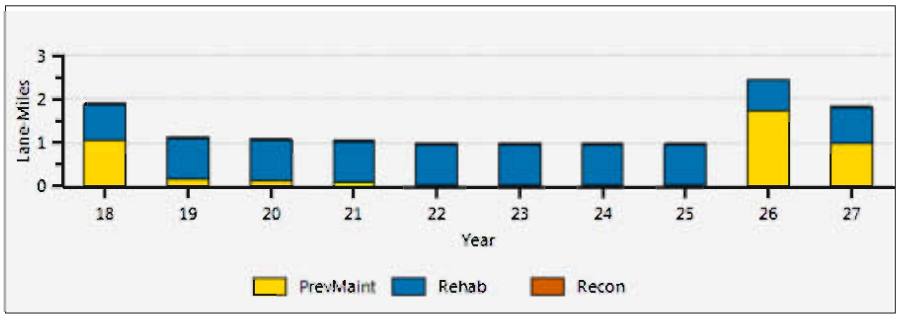


Aur-Forest Area 325K 10 Yrs

Maintenance Type	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Prev Maint	$46,410	$2 879	$2 194	$1,646	$907	$907	$908	$908	$87,391	$50,573
Rehab	$278,593	$322 113	$322 814	$323,347	$324,083	$324,079	$324 109	$324 105	$237,619	$274,433
Recon	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$325,003	$324,992	$325,008	$324,993	$324,990	$324,986	$325 017	$325 013	$325,010	$325,006

Strategy Comprehensive Report

Maintenance Performed

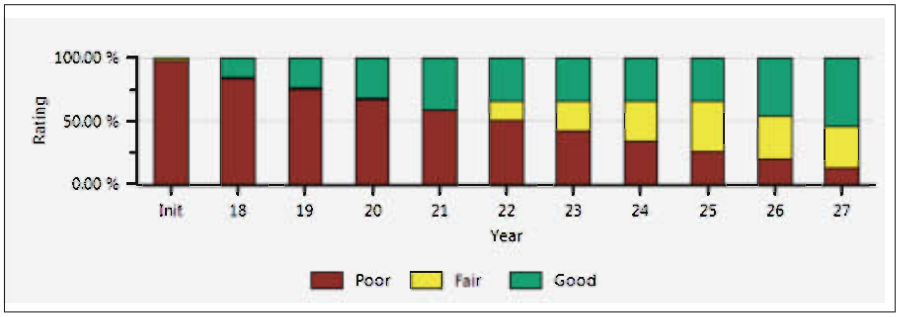


Aur-Forest Area 325K 10 Yrs

Maintenance Type in Lane Miles	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Prev Maint	1.068	0.168	0.128	0.096	0.018	0.018	0.018	0.018	1.732	1.002
Rehab	0.330	0.960	0.961	0.963	0.965	0.964	0.964	0.964	0.706	0.316
Recon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	1.398	1.128	1.089	1.059	0.983	0.982	0.982	0.982	2.438	1.318

Strategy Comprehensive Report

Rating Distribution



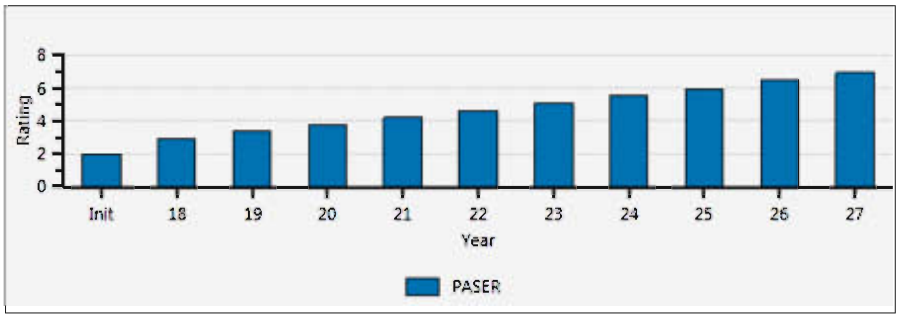
Aur-Forest Area 325K 10 Yrs

Initial Values

Lane Miles	%	Rating	2018		2019		2020		2021		2022		2023		2024		2025		2026		2027	
0.000	0.0	Good	1.732	14.9	2.734	23.6	3.727	32.1	4.714	40.6	3.965	34.2	3.945	34.0	3.934	33.9	3.929	33.8	5.384	46.4	6.220	53.6
0.296	2.6	Fair	0.168	1.5	0.128	1.1	0.096	0.8	0.072	0.6	1.786	15.4	2.770	23.9	3.745	32.3	4.714	40.6	3.965	34.2	3.945	34.0
11.310	97.5	Poor	9.708	83.6	8.748	75.4	7.787	67.1	6.824	58.8	5.860	50.5	4.895	42.2	3.931	33.9	2.967	25.6	2.261	19.5	1.445	12.5
11.606	100.0	Total																				

Strategy Comprehensive Report

PASER Distribution



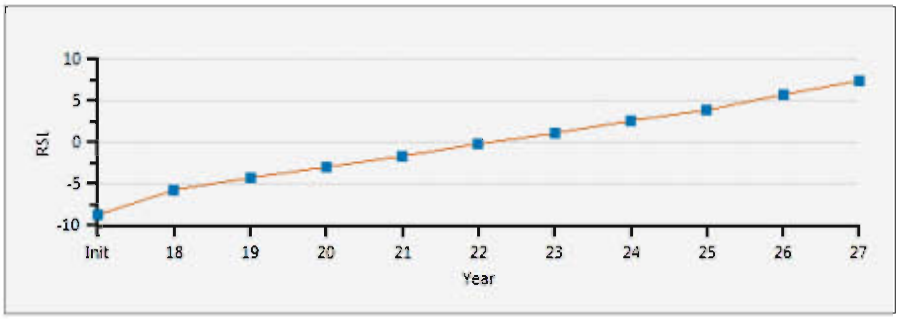
Aur-Forest Area 325K 10 Yrs

Initial Value

Lane Miles	PASER	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
0 000	10	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	9	1 732	1 002	0 993	0 987	0 983	0 982	0 982	0 982	2 438	1 818
0 000	8	0 000	1 732	2 734	3 727	2 982	2 963	2 952	2 947	2 946	4 402
0 168	7	0 168	0 128	0 096	0 072	1 786	2 770	3 745	4 714	3 965	3 945
0 000	6	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 130	5	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 772	4	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
2 476	3	2 476	1 902	0 898	0 000	0 000	0 000	0 000	0 000	0 000	0 000
2 966	2	2 966	2 740	2 210	2 830	2 476	2 476	1 902	0 898	0 000	0 000
5 096	1	4 266	4 106	4 679	3 994	3 384	2 419	2 029	2 069	2 261	1 445
2 012	Average	2 963	3 364	3 727	4 208	4 611	5 108	5 556	5 967	6 505	6 945

Strategy Comprehensive Report

RSL Distribution



Aur-Forest Area 325K 10 Yrs

Initial Value

Lane Miles	RSL	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
0 000	13	1 732	1 002	0 993	0 987	0 983	0 982	0 982	0 982	2 438	1 818
0 000	12	0 000	1 732	1 002	0 993	0 987	0 983	0 982	0 982	0 982	2 438
0 000	11	0 000	0 000	1 732	1 002	0 993	0 987	0 983	0 982	0 982	0 982
0 000	10	0 000	0 000	0 000	1 732	1 002	0 993	0 987	0 983	0 982	0 982
0 000	9	0 042	0 032	0 024	0 018	1 732	1 002	0 993	0 987	0 983	0 982
0 000	8	0 042	0 032	0 024	0 018	0 018	1 732	1 002	0 993	0 987	0 983
0 000	7	0 042	0 032	0 024	0 018	0 018	0 018	1 732	1 002	0 993	0 987
0 166	6	0 042	0 032	0 024	0 018	0 018	0 018	0 018	1 732	1 002	0 993
0 000	5	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	4	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	3	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	2	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 130	1	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 276	0	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 406	-1	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	-2	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 898	-3	0 898	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
1 004	-4	1 004	0 898	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 574	-5	0 574	1 004	0 898	0 000	0 000	0 000	0 000	0 000	0 000	0 000
0 000	-6	0 000	0 574	1 004	0 898	0 000	0 000	0 000	0 000	0 000	0 000
0 354	-7	0 354	0 000	0 574	1 004	0 898	0 000	0 000	0 000	0 000	0 000
0 278	-8	0 278	0 354	0 000	0 574	1 004	0 898	0 000	0 000	0 000	0 000
1 534	-9	1 534	0 278	0 354	0 000	0 574	1 004	0 898	0 000	0 000	0 000
0 800	-10	0 800	1 534	0 278	0 354	0 000	0 574	1 004	0 898	0 000	0 000
0 898	-11	0 898	0 800	1 534	0 278	0 354	0 000	0 574	1 004	0 898	0 000

Strategy Comprehensive Report

1 426	**-12**	1 426	0 898	0 800	1 534	0 278	0 354	0 000	0 574	1 004	0 398
0 874	**-13**	0 874	1 426	0 898	0 800	1 534	0 278	0 354	0 000	0 359	0 547
1 254	**-14**	1 068	0 874	1 426	0 898	0 800	1 534	0 278	0 354	0 000	0 000
0 044	**-15**	0 000	0 108	0 021	0 484	0 418	0 253	0 823	0 137	0 000	0 000
-8 758	Average	-5 653	-4 301	-2 947	-1 604	-0 223	1 151	2 510	3 918	5 789	7 337

Project Planner Summarized Projects By Year Report

Lansing (CityVillage)

Report Module: Planner Evaluation
Today's Date: Wednesday, April 24, 2019

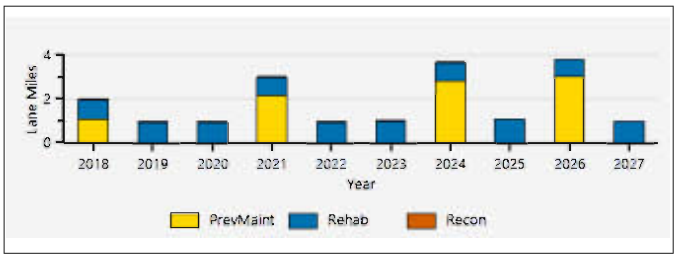
ForRelius 10 yr 4-24-19

Last Modified: 4/24/2019
Percent Inflation: 0.03
Number of Years: 10
Strategy/Filter Name: Aur-Forest Area 325K 10 Yrs
Strategy Filter: Demo Area
Plan Memo:

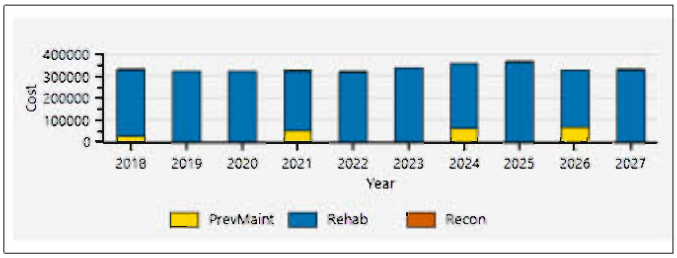
Project Planner Summarized Projects By Year Report

ForRelius 10 yr 4-24-19

Type of Maintenance Performed - Lane Miles



Type of Maintenance Performed - Cost



Project Planner Summarized Projects By Year Report

ForRelius 10 yr 4-24-19

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
2018								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Tammany Ave	0.069	0.138	$46,309
		RH (SI)	CRSH Crush & Reshape	9	Canarsie Dr	0.112	0.224	$75,168
		RH (SI)	CRSH Crush & Reshape	9	Narraganset Dr	0.097	0.194	$65,101
		RH (SI)	CRSH Crush & Reshape	9	Stoneleigh Dr	0.180	0.360	$120,806
		PM (CPM)	FGS - Fog Seal	9	Provincial House Dr	0.187	0.374	$8,447
		PM (CPM)	FGS - Fog Seal	9	Cailihan Ct	0.083	0.166	$3,749
		PM (CPM)	FGS - Fog Seal	9	Artisan Dr	0.199	0.398	$8,989
		PM (CPM)	FGS - Fog Seal	9	Stoneleigh Dr	0.065	0.130	$2,936
				Year 2018 Totals:		0.992	1.984	$331,508
2019								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Hamelon St	0.278	0.556	$186,635
		RH (SI)	CRSH Crush & Reshape	9	Scarborough Rd	0.135	0.270	$90,632
		RH (SI)	CRSH Crush & Reshape	9	Robinson Rd	0.072	0.144	$48,337
				Year 2019 Totals:		0.485	0.970	$325,604
2020								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Robinson Rd	0.276	0.552	$185,348
		RH (SI)	CRSH Crush & Reshape	9	Trudy Ln	0.206	0.412	$138,339
				Year 2020 Totals:		0.482	0.964	$323,687

Project Planner Summarized Projects By Year Report

ForRelius 10 yr 4-24-19

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
2021								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Staten Ave	0.379	0.758	$254,594
		RH (SI)	CRSH Crush & Reshape	9	Trudy Ln	0.036	0.072	$24,183
		PM (CPM)	FGS - Fog Seal	9	Tammany Ave	0.119	0.238	$5,380
		PM (CPM)	FGS - Fog Seal	9	Narraganset Dr	0.097	0.194	$4,386
		PM (CPM)	FGS - Fog Seal	9	Robinson Rd	0.348	0.696	$15,734
		PM (CPM)	FGS - Fog Seal	9	Hamelon St	0.278	0.556	$12,569
		PM (CPM)	FGS - Fog Seal	9	Scarborough Rd	0.135	0.270	$6,104
		PM (CPM)	FGS - Fog Seal	9	Canarsie Dr	0.112	0.224	$5,064
				Year 2021 Totals:		1.504	3.008	$328,015
2022								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Stoneleigh Dr	0.233	0.466	$156,565
		RH (SI)	CRSH Crush & Reshape	9	Solomon Dr	0.125	0.250	$83,994
		RH (SI)	CRSH Crush & Reshape	9	Champion Way	0.121	0.242	$81,306
				Year 2022 Totals:		0.479	0.958	$321,865
2023								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Wabash Rd	0.349	0.698	$234,582
		RH (SI)	CRSH Crush & Reshape	9	Greenwich Ct	0.067	0.134	$45,034
		RH (SI)	CRSH Crush & Reshape	9	Champion Way	0.052	0.104	$34,952
		RH (SI)	CRSH Crush & Reshape	9	Truman Cir	0.036	0.072	$24,198
				Year 2023 Totals:		0.504	1.008	$338,766

Project Planner Summarized Projects By Year Report

ForRelius 10 yr 4-24-19

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
2024								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Manley Dr	0.440	0.880	$295,836
		PM (CPM)	FGS - Fog Seal	9	Stoneleigh Dr	0.233	0.466	$10,544
		PM (CPM)	FGS - Fog Seal	9	Solomon Dr	0.125	0.250	$5,657
		PM (CPM)	FGS - Fog Seal	9	Champion Way	0.173	0.346	$7,829
		PM (CPM)	FGS - Fog Seal	9	Wabash Rd	0.349	0.698	$15,794
		PM (CPM)	FGS - Fog Seal	9	Greenwich Ct	0.067	0.134	$3,032
		PM (CPM)	FGS - Fog Seal	9	Staten Ave	0.379	0.758	$17,152
		PM (CPM)	FGS - Fog Seal	9	Trudy Ln	0.036	0.072	$1,629
		PM (CPM)	FGS - Fog Seal	9	Truman Cir	0.036	0.072	$1,629
				Year 2024 Totals:		1.838	3.676	$359,103
2025								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Wabash Rd	0.079	0.158	$53,132
		RH (SI)	CRSH Crush & Reshape	9	Stoneleigh Dr	0.467	0.934	$314,084
				Year 2025 Totals:		0.546	1.092	$367,216
2026								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Provincial House Dr	0.198	0.396	$133,206
		RH (SI)	CRSH Crush & Reshape	9	Stoneleigh Dr	0.105	0.210	$70,640
		RH (SI)	CRSH Crush & Reshape	9	Geert Ct	0.083	0.166	$55,839
		PM (CPM)	FGS - Fog Seal	9	Wabash Rd	0.079	0.158	$3,577
		PM (CPM)	FGS - Fog Seal	9	Stoneleigh Dr	0.532	1.064	$24,090
		PM (CPM)	FGS - Fog Seal	9	Manley Dr	0.440	0.880	$19,924
		PM (CPM)	FGS - Fog Seal	9	Provincial House Dr	0.187	0.374	$8,468
		PM (CPM)	FGS - Fog Seal	9	Callihan Ct	0.083	0.166	$3,758
		PM (CPM)	FGS - Fog Seal	9	Artisan Dr	0.199	0.398	$9,011
				Year 2026 Totals:		1.906	3.812	$328,513

Project Planner Summarized Projects By Year Report

ForRelius 10 yr 4-24-19

Year	SubType	Maint. Type	Treatment	Reset	Road Name	Length	Lane Length	Surface Cost
2027								
	Asphalt-Standard	RH (SI)	CRSH Crush & Reshape	9	Tammany Ave	0.090	0.180	$60,566
		RH (SI)	CRSH Crush & Reshape	9	Leawood Dr	0.284	0.568	$191,121
		RH (SI)	CRSH Crush & Reshape	9	Aurora Dr	0.119	0.238	$80,082
				Year 2027 Totals:		0.493	0.986	$331,770
				Report Totals:		9.229	18.458	$3,356,046

APPENDIX F: MEETING MINUTES VERIFYING PLAN ACCEPTANCE BY GOVERNING BODY

BY THE COMMITTEE ON PUBLIC SERVICE
RESOLVED BY THE CITY COUNCIL OF THE CITY OF LANSING

Acceptance of Pavement Asset Management Plan

WHEREAS, Michigan Public Act 325 of 2018 requires local road agencies to develop and submit an asset management plan to the Transportation Asset Management Council (TAMC) including an asset inventory, performance goals, risk of failure analysis, anticipated revenues and expenses and performance outcomes to be submitted to TAMC; and

WHEREAS, local road agencies responsible for 100 or more certified miles of road, based on the 2017 PA 51 Mileage Certification, including all 83 Michigan counties and 39 Michigan cities are required to submit their completed asset management plans in designated phases beginning October 1, 2020; and

WHEREAS, The City of Lansing has a deadline of October 1, 2020 to submit a Pavement Asset Management Plan to the TAMC; and

WHEREAS, the City of Lansing Public Service Department has completed a Pavement Asset Management Plan containing the required information; and

WHEREAS, the TAMC requires a resolution accepting the Asset Management Plan.

NOW, THEREFORE, BE IT RESOLVED that the City Council hereby accepts the 2020 Pavement Asset Management Plan; and

BE IT FINALLY RESOLVED that a copy of this resolution be added to the Pavement Asset Management Plan before submittal to the TAMC.

RESOLUTION #2020-

BY THE COMMITTEE ON PUBLIC SERVICES
RESOLVED BY THE CITY COUNCIL OF THE CITY OF LANSING

WHEREAS, the Engineering Division of the Public Service Department Has conducted a Traffic Signal Removal/Upgrade Study at the intersection of Cesar E. Chavez Avenue and High Street to determine if the traffic volumes currently meet the Michigan Manual of Uniform of Traffic Control Devices (MMUTCD) Traffic Signal Warrants;

WHEREAS, the Traffic Signal Removal/Upgrade Study was conducted as part of an overall evaluation of the Traffic Signal System to determine if the signal should be modernized or removed as a result of recent traffic volume reductions;

WHEREAS, the Engineering Division's study determined the existing traffic volumes at the intersection of Cesar E. Chavez Avenue and High Street do not meet current MMUTCD Traffic Signal Warrants;

WHEREAS, field observations determined the placement of the traffic signal in flash on Cesar E. Chavez Avenue at High Street would improve traffic operations at the intersection;

WHEREAS, The Engineering Division has received no complaints from businesses or residents since the signal was placed in flash on May 6, 2019;

WHEREAS, there have been no reported accidents at this intersection since the signal was placed in flash;

WHEREAS, Based on the observations and no public concern, the City of Lansing's Transportation Section recommends the permanent removal of the traffic signals with stop signs installed on High Street requiring all High Street traffic to stop prior to entering the intersection at Cesar E. Chavez Avenue;

WHEREAS, the Public Service Board has reviewed and voted unanimously to recommend the removal of traffic signals and the installation of stop signs on High Street at the Cesar E Chavez Avenue and High Street intersection;

WHEREAS, the draft minutes for the Public Service Board containing their review of this matter are on file with the City Clerk's office;

WHEREAS, the Mayor concurs with the recommendation of the Engineering Division;

WHEREAS, the Committee on Public Safety reviewed the report and concurs with the recommendation of the Administration;

NOW, THEREFORE, BE IT RESOLVED, that the Lansing City Council approves Traffic Control Order No. 20-07, thereby authorizing the Transportation Engineer to install stop signs on High Street at the High Street and Cesar E. Chavez Avenue intersection;

BE IT FINALLY RESOLVED that Traffic Control Order No. 20-07 shall become effective when signed by the Transportation Engineer and filed with the City Clerk and the appropriate signs are installed.