Transportation Asset Management Council
Bridge Committee Meeting Agenda
Thursday, July 25, 2019 2:00 PM
Aeronautics Building- 2nd Floor Commission Room
2700 Port Lansing Road
Lansing, Michigan

Meeting Telephone Conference Line: 1-877-336-1828 Access Code: 8553654#

1. **Welcome - Call to Order – Introduction**

2. **Public Comments on Non-Agenda Items**

3. **Additions or Deletions of Agenda Items**

4. **Consent Agenda** ***(Action Item)***
   4.1. Approval of the 4-25-19 Meeting Minutes ***(Attachment 1)***

5. **Update Items**
   5.1. Draft TAMC Asset Management Plan Template – *Belknap/Colling* ***(Action - Attachment 2)***
   5.2. Draft Work Program Review for Bridge Committee Goals/Objectives – *Belknap* ***(Action - Attachment 3)***
   5.3. TAMC Culvert Pilot Project
      5.3.1. Culvert Subgroup Update – *Belknap*
      5.3.2. Incorporating Culvert Data from Other Sources into TAMC IMAP-IRT ***(Attachment 4)***
      5.3.3. Training and Activities for Michigan Technological University & Center for Shared Solutions FY2020 TAMC Budgets and Work Programs
   5.4. 2019 TAMC Annual Report Update – *Jennett*
   5.5. Need for August and/or September TAMC Bridge Committee Meetings ***(Action)***

6. **Public Comments**

7. **Member Comments**

8. **Adjournment:**

Next Meeting Date: To be Determined
Remaining Scheduled Meetings for 2019: November 21 – 2:00 PM

Committee Members: Chair: Rebecca Curtis, MDOT - Vice Chair: Keith Cooper, MDOT
Christopher Bolt, MAC - Al Halbeisen, ACEC - Wayne Harrall, CRA
Brian Vilmont, Subject Matter Expert - Brad Wieferich, MDOT

MINUTES
TRANSPORTATION ASSET MANAGEMENT COUNCIL
BRIDGE COMMITTEE MEETING
April 25, 2019 at 2:00 p.m.
Aeronautics Building, 2nd Floor, Commission Conference Room
2700 Port Lansing Road
Lansing, Michigan

**** Frequently Used Acronyms List attached.**

Committee Member:

Christopher Bolt, MAC
Rebecca Curtis, MDOT – Chair
Wayne Harrall, KCRC, via Telephone
Brad Wieferich, MDOT
Keith Cooper, MDOT – Vice-Chair
Al Halbeisen, OHM Advisors
Brian Vilmont, Prein & Newhof

Support Staff:

Roger Belknap, MDOT, via Telephone
Cheryl Granger, CSS, via Telephone
Bill McEntee, CRA, via Telephone
Gloria Strong, MDOT
Tim Colling, MTU, via Telephone
Polly Kent, MDOT
Craig Newell, MDOT

Members Absent:

None

Public Present:

None

1. Welcome - Call-To-Order - Introductions:

The meeting was called-to-order at 2:04 p.m. Everyone was welcomed to the meeting. P. Kent introduced Craig Newell as her replacement as the MDOT, Asset Management and Planning Division Administrator, due to her retirement on April 30, 2019.

2. Public Comments on Non-Agenda Items:

None

3. Additions or Deletions of Agenda Items:

None

4. Consent Agenda (Action Item):

4.1. - Approval of the March 21, 2019 Meeting Minutes (Attachment 1)

Motion: A. Halbeisen made a motion to approve the March 21, 2019 meeting minutes with the addition of under #7, adding the word "antidote;" K. Cooper seconded the seconded the motion. The motion was approved by all members present with the amendments.

5. Update Items:

5.1. - 2018 Michigan Roads and Bridges Annual Report – R. Curtis/ R. Belknap

R Belknap shared with the Committee changes to the bridge and culvert elements for the 2018 Roads and Bridges Annual Report. The Committee made a few formatting changes and requested changes to the graphics. Dave Jennett will work with MDOT Graphics Design Division to add the new graphics to the report.

5.1.1. – Bridge Condition Reporting – R. Curtis

R. Curtis reviewed the Bridge Conditions on pages 27 – 41 of the draft annual report with the Committee. The Committee made several changes as noted by R. Belknap and P. Kent. The Committee would like the entire paragraph regarding Transportation Performance Measures (TPM) removed from the report.

Action Item: R. Belknap and P. Kent will give the changes from the Committee to D. Jennett to correct in the annual report.

5.2. – Data Requests – R. Belknap

5.2.1. – Southeast Michigan Council of Governments (Attachment 2) – R. Belknap

An email was received on March 26, 2019, from SEMCOG requesting an annual snapshot of the statewide bridge database. They want to make sure they have data that is consistence with what's on their website and what's on our dashboards. Because of how the software displays the data in the dashboards, it would require TAMC to do several searches and they would end up sending SEMCOG several searches instead of just one data search. The data SEMCOG is requesting is not available in one area nor in the format they want and would require a lot of effort for support staff to fulfill their request. MDOT has snapshots in their database but TAMC snapshots will not help. R. Curtis could send them the reports that MDOT does, it will only give the data and not in the format they requested by item numbers and names. TAMC is not set up to store the type of data that SEMCOG is requesting. MDOT has this data in a submittal file that they send to Federal Highway Administration. R. Curtis will contact SEMCOG and offer them the National Bridge Inventory (NBI) files, which are now readily available and contains the majority of the information they are requesting. In future, SEMCOG can get this information directly from the NBI annually, if desired.

Action Item: R. Curtis will contact SEMCOG and direct them to the NBI files to get the data that they have requested.

5.2.2. – Detroit Free Press

The Detroit Free Press will be running a series of articles on Michigan bridges. They have requested a list of Michigan bridges by investment breakdown by agency and ownership. The first release in the series will go out after the annual report, which is released on May 2, 2019.

5.3. – Work Program: Target Costs/Priorities by April – P. Kent (Attachment 3)
P. Kent reviewed the work program that was shared with the Committee. She will add a Bridge and Pavement Data Warehouse to the list of tasks to be reviewed at the Strategic Planning Session in June. R. Belknap will use the work program that P. Kent has provided and add the new priority tasks and forwarded tasks onto a new work program broke out by each TAMC Committee. Each task will show what support staff (MTU, CSS, or both) will assist with the effort, as well as the budget necessary to complete the task. If there are other tasks that need to be added to the work program for the Strategic Planning Session, they must be sent to R. Belknap and P. Kent by end of April.

5.4. – TAMC Culvert Pilot Project – R. Belknap (Attachment 4)
T. Colling and C. Gilbertson submitted a white paper regarding the Culvert Pilot Project, "Suggested Next Steps for Culvert Asset Management," dated April 24, 2019, that will be used to create the online resource and program. It is an outline of all the steps for culvert data collection and training with cost estimates. They are also including the Water Asset Management Council (WAMC) in these efforts. WAMC is currently creating their template, which relates to the storm water collection systems. B. Vilmont will bring this up at the next WAMC meeting. R. Belknap shared a draft Culvert Pilot dashboard and interactive map example that he created.

There is currently a TAMC (Roadsoft) rating system, a 1991 National Rating System, and MDOT rating system. AASHTO is also developing their own rating system that is more in-line to the bridge rating system. As long as there is a different crosswalk between all of these different systems, we could use these. A subgroup may need to be created to see how these systems mesh together. TAMC needs to decide what reporting metric they want to report on. Just poor? Or, good, fair, poor? TAMC needs to collect data that will be useful to agencies, such as how many culverts agencies currently have, what condition are they in, and the culvert replacement or repair costs. The subgroup will include the TAMC Bridge and Data Committees, who will be tasked to determine what data should be collected and how it will be housed in Roadsoft and the IRT. MTU's white paper will be used for guidance, as it has a complete breakdown of important information from the 2018 Culvert Pilot Program. The Committee requested R. Belknap send an email to the Bridge and Data Committee chairs requesting names of who will be part of the Culvert Subgroup, and also contact WAMC to make them aware of this effort. MTU and CSS will also need to be involved in the subgroup.

Public Act 325 mandates that local road agencies with 100 miles or more of certified roadway must submit an asset management plan, and part of that plan must provide culvert information to TAMC. The subgroup will be tasked with determining what TAMC should request agencies supply to them regarding their culverts. In past culvert discussions, the Michigan Department of Natural Resources (DNR) informed TAMC Bridge Committee that they house a culvert database, and they would be willing to share that database information with TAMC. Data sharing with DNR will encourage collaboration and save

money. TAMC may want to use some or all of the same fields that DNR is using. C. Gilbertson will follow up with DNR regarding sharing culvert data. Other agencies such as, county drain offices and private agencies may also have culvert data that they may be willing to share with TAMC. Joanna Johnson, TAMC Chair, will be holding a conference call with TAMC committee chairs to discuss the June 5, 2019 Strategic Planning Session. R. Curtis will inform the chair of the culvert subgroup and data sharing efforts at that time.

Action Item: R. Belknap will send an email to Bridge and Data Committee chairs requesting names for the Culvert Subgroup. He will also contact WAMC to make them aware of this effort.

Action Item: C. Gilbertson will follow up with DNR regarding sharing culvert data.

Action Item: R. Curtis will inform J. Johnson of the Culvert Subgroup and data sharing efforts with DNR and other agencies at the next Strategic Planning Session telephone conference with TAMC Committee chairs.

6. Public Comments:
None

7. Member Comments:
None

8. Adjournment:
A motion was made by A. Halbeisen to adjourn the meeting; B. Wieferich seconded the motion. The motion was approved by all members present. The meeting adjourned at 4:13 p.m. The next meeting will be held July 25, 2019, at 2:00 p.m., MDOT Aeronautics Building, 2nd Floor Commission Conference Room, Lansing.

TAMC FREQUENTLY USED ACRONYMS:

AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
ACE	ADMINISTRATION, COMMUNICATION, AND EDUCATION (TAMC COMMITTEE)
ACT-51	PUBLIC ACT 51 OF 1951-DEFINITION: A CLASSIFICATION SYTEM DESIGNED TO DISTRIBUTE MICHIGAN'S ACT 51 FUNDS. A ROADWAY MUST BE CLASSIFIED ON THE ACT 51 LIST TO RECEIVE STATE MONEY.
ADA	ADULTS WITH DISABILITIES ACT
ADARS	ACT 51 DISTRIBUTION AND REPORTING SYSTEM
BTP	BUREAU OF TRANSPORTATION PLANNING (MDOT)
CFM	COUNCIL ON FUTURE MOBILITY
CPM	CAPITAL PREVENTATIVE MAINTENANCE

CRA	COUNTY ROAD ASSOCIATION (OF MICHIGAN)
CSD	CONTRACT SERVICES DIVISION (MDOT)
CSS	CENTER FOR SHARED SOLUTIONS
DI	DISTRESS INDEX
ESC	EXTENDED SERVICE LIFE
FAST	FIXING AMERICA'S SURFACE TRANSPORTATION ACT
FHWA	FEDERAL HIGHWAY ADMINISTRATION
FOD	FINANCIAL OPERATIONS DIVISION (MDOT)
FY	FISCAL YEAR
GLS REGION V	GENESEE-LAPEER-SHIAWASSEE REGION V PLANNING AND DEVELOPMENT COMMISSION
GVMC	GRAND VALLEY METRO COUNCIL
HPMS	HIGHWAY PERFORMANCE MONITORING SYSTEM
IBR	INVENTORY BASED RATING
IRI	INTERNATIONAL ROUGHNESS INDEX
IRT	INVESTMENT REPORTING TOOL
KATS	KALAMAZOO AREA TRANSPORTATION STUDY
KCRC	KENT COUNTY ROAD COMMISSION
LDC	LAPTOP DATA COLLECTORS
LTAP	LOCAL TECHNICAL ASSISTANCE PROGRAM
MAC	MICHIGAN ASSOCIATION OF COUNTIES
MAP-21	MOVING AHEAD FOR PROGRESS IN THE 21ST CENTURY (ACT)
MAR	MICHIGAN ASSOCIATION OF REGIONS
MDOT	MICHIGAN DEPARTMENT OF TRANSPORTATION
MDTMB	MICHIGAN DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
MIC	MICHIGAN INFRASTRUCTURE COMMISSION
MITA	MICHIGAN INFRASTRUCTURE AND TRANSPORTATION ASSOCIATION
MML	MICHIGAN MUNICIPAL LEAGUE

MPO	METROPOLITAN PLANNING ORGANIZATION
MTA	MICHIGAN TOWNSHIPS ASSOCIATION
MTF	MICHIGAN TRANSPORTATION FUNDS
MTPA	MICHIGAN TRANSPORTATION PLANNING ASSOCIATION
MTU	MICHIGAN TECHNOLOGICAL UNIVERSITY
NBI	NATIONAL BRIDGE INVENTORY
NBIS	NATIONAL BRIDGE INSPECTION STANDARDS
NFA	NON-FEDERAL AID
NFC	NATIONAL FUNCTIONAL CLASSIFICATION
NHS	NATIONAL HIGHWAY SYSTEM
PASER	PAVEMENT SURFACE EVALUATION AND RATING
PNFA	PAVED NON-FEDERAL AID
PWA	PUBLIC WORKS ASSOCIATION
QA/QC	QUALITY ASSURANCE/QUALITY CONTROL
RBI	ROAD BASED INVENTORY
RCKC	ROAD COMMISSION OF KALAMAZOO COUNTY
ROW	RIGHT-OF-WAY
RPA	REGIONAL PLANNING AGENCY
RPO	REGIONAL PLANNING ORGANIZATION
SEMCOG	SOUTHEAST MICHIGAN COUNCIL OF GOVERNMENTS
STC	STATE TRANSPORTATION COMMISSION
STP	STATE TRANSPORTATION PROGRAM
TAMC	TRANSPORTATION ASSET MANAGEMENT COUNCIL
TAMCSD	TRANSPORTATION ASSET MANAGEMENT COUNCIL SUPPORT DIVISION
TAMP	TRANSPORTATION ASSET MANAGEMENT PLAN
TPM	TRANSPORTATION PERFORMANCE MEASURES
UWP	UNIFIED WORK PROGRAM

Instructions for Use of This Template

Read instructions thoroughly before proceeding

1. Everything must be saved in the same folder to work properly.
2. Complete eight Roadsoft exports outlined in the instructions document first. All Roadsoft files must be saved as described in the export instructions.
3. Complete steps in the Excel workbook to create the graphs to fill this template.
4. Complete autofill information from Excel into this template.
5. Once information is transferred, edit/delete information from this template. DO NOT remove information prior to the transfer from Excel process.

Common checks that agencies need to do before finalizing the template

1. Insert cover logo in the picture placeholder by selecting the image in the center of the placeholder. Change color bar by selecting it; then select the Format ribbon and a color from the Shape Fill options in the Shape Styles group. Change color of Cover and Heading 1 styles by selecting Home ribbon, the expansion arrow in the lower right of the style group, the drop-down arrow at the right end of the style's name, and "Modify…" from the drop-down menu.
2. Search for autofill contextual errors or missed auto-fills. You may scroll to each of these using F11 on your keyboard; alternatively, you can find them by searching for orange text or doing a Find for: <# .
3. Remove all optional sections, which are placed in content controls. Instructions highlighted in blue precede or follow the content controls. Accept and modify suggested content by right-clicking anywhere in the control and selecting "Remove Control" from the drop-down menu; remove suggested content by selecting the handle in the upper left and striking the Delete key on your keyboard.
4. Remove/address comments. Search for comments and verify comments are addressed.
5. Update Table of Contents and Table of Figures. Create Table of Tables at end of document and cut/paste it in the current example location.

Updating in future years

1. Complete the required Roadsoft exports as before and complete the steps in the excel document.
2. An original template must be saved or requested from CTT with the link data.
3. Once an original template is available then the transfer can be completed from Excel to the Word template.

t Plan

A plan describing the <#AGENCY>'s roadway assets and conditions

Prepared by:
Author
Author's title
Contact information

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EXECUTIVE SUMMARY

As conduits for commerce and connections to vital services, roads and bridges are some of the most important assets in any community, and other assets like culverts, traffic signs, traffic signals, and utilities support and affect roads and bridges. The <#AGENCY>'s roads, bridges, 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 these assets, their importance to society, and the investment made by taxpayers all place a high level of responsibility on local agencies to efficiently and effectively plan, build, and maintain roads, bridges, and support assets. This asset management plan is intended to report on how <#AGENCY> is meeting its obligations to maintain the public assets for which it is responsible.

This plan gives an overview of <#AGENCY>'s assets and condition, and explains how <#AGENCY> works to maintain and improve the overall condition of our assets. These explanations can help answer the following questions:

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

An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of <#AGENCY>'s obligations towards meeting these requirements but, the plan is intended to be much more than this agency's required reporting. This asset management plan helps demonstrate <#AGENCY>'s responsible use of public funds by providing elected and appointed officials as well as the general public with inventory and condition information of <#AGENCY>'s assets, and gives taxpayers the information they need to make informed decisions about investing in our essential transportation infrastructure.

DEFINITIONS

Alligator cracking: Cracking of the surface layer of an asphalt pavement that creates a pattern of interconnected cracks resembling an alligator hide. This is often due to overloading a pavement, sub-base failure, or poor drainage.[1]

Asset management: A process that uses data to manage and track road assets in a cost-effective manner using a combination of engineering and business principles. Public Act 325 of 2018 provides a legal definition: "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".[2]

Biennial inspection: Inspection of an agency's bridges every other year, which happens in accordance with National Bridge Inspection Standards and Michigan Department of Transportation requirements.

Bridge inspection program: A program implemented by a local agency to inspect the bridges within their jurisdiction systematically in order to ensure proper functioning and structural soundness.

Capital preventative maintenance: A planned set of cost-effective treatments to address pavement problems of fair-rated roads before the structural integrity of the pavement has been severely impacted. These treatments aim to slow deterioration and to maintain or improve the functional condition of the system without significantly increasing the structural capacity.

Chip seal: An asphalt pavement treatment method consisting of, first, spraying liquid asphalt onto the old pavement surface and, then, a single layer of small stone chips spread onto the wet asphalt layer.

Composite pavement: A pavement consisting of concrete and asphalt layers. Typically, composite pavements are old concrete pavements that were overlaid with HMA in order to gain more service life.

Concrete joint resealing: Resealing the joints of a concrete pavement with a flexible sealant to prevent moisture and debris from entering the joints. When debris becomes lodged inside a joint, it inhibits proper movement of the pavement and leads to joint deterioration and spalling.

Concrete pavement: Also known as rigid pavement, a pavement made from layers of portland concrete cement. Concrete pavement has a high initial cost to build but is a durable pavement that has an average service life of 30 years and typically does not require as much periodic maintenance as HMA.

Cost per lane mile: Associated cost of construction, measured on a per lane, per mile basis. Also see *lane-mile segment*.

Crack and seat: A concrete pavement treatment method that involves breaking old concrete pavement into small chunks and leaving the broken pavement in place to provide a base for a new surface. This provides a new wear surface that resists water infiltration and helps prevent damaged concrete from reflecting up to the new surface.

Crack seal: A pavement treatment method for both asphalt and concrete pavements that fills cracks with asphalt materials, which seals out water and debris and slows down the deterioration of the pavement. Crack seal may encompass the term "crack filling".

[1] https://en.wikipedia.org/wiki/Crocodile_cracking
[2] Inventory-based Rating System for Gravel Roads: Training Manual

Crush and shape: An asphalt pavement treatment method that involves pulverizing the existing asphalt pavement and base and then reshaping the road surface to correct imperfections in the road's profile. Often, a layer of gravel is added along with a new wearing surface such as an HMA overlay or chip seal.

Crust: A very tightly compacted surface on an unpaved road that sheds water with ease but takes time to be created.

Culvert: A pipe or structure used under a roadway that allows cross-road drainage while still allow traffic to pass without being impeded; culverts span a maximum of 20 feet (6.1 meters).[3]

Dowel bar retrofit repair: A concrete pavement treatment method that involves cutting slots in a cracked concrete slab, inserting steel bars into the slots, and placing concrete to cover the new bars and fill the slots. It aims to reinforce cracks in a concrete pavement.

Dust control: A gravel road surface treatment method that involves spraying chloride or other chemicals on the gravel surface to reduce dust loss, aggregate loss, and maintenance. This is a relatively short-term fix that helps create a crusted surface.

Expansion joint: Joints in a bridge that allow for slight expansion and contraction changes in response to temperature. Expansion joints prevent the build up of excessive pressure, which can cause structural damage to the bridge.

Federal Highway Administration: Also known as FHWA, this is an agency within the U.S. Department of Transportation that supports state and local governments in the design, construction, and maintenance of the nation's highway system.[4]

Federal-aid network: Portion of road network that is comprised of federal-aid routes. According to Title 23 of the United States Code, federal-aid-eligible roads are "highways on the federal-aid highways systems and all other public roads not classified as local roads or rural minor collectors".[5] Roads that are part of the federal-aid network are eligible for federal gas-tax monies.

FHWA: See *Federal Highway Administration*.

Flexible pavement: See *hot-mix asphalt pavement*.

Fog seal: An asphalt pavement treatment method that involves spraying a liquid asphalt coating onto the entire pavement surface to fill hairline cracks and prevent damage from sunlight and oxidation. This method works best for good to very good pavements.

Full-depth concrete repair: A concrete pavement treatment method that involves removing sections of damaged concrete pavement and replacing it with new concrete of the same dimensions in order 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.

Geographic divides: Areas where a geographic feature (e.g., river, lake, mountain) limits crossing points of the feature.

[3] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual
[4] Federal Highway Administration webpage https://www.fhwa.dot.gov/
[5] Inventory-based Rating System for Gravel Roads: Training Manual

Grants: Competitive funding gained through an application process and targeted at a specific project type to accomplish a specific purpose. Grants can be provided both on the federal and state level and often make up part of the funds that a transportation agency receives.

Gravel surfacing: A low-cost, easy-to-maintain road surface made from aggregate and fines.

HMA: See *hot-mix asphalt pavement*.

Hot-mix asphalt overlay: Also known as HMA overlay, this a surface treatment that involves layering new asphalt over an existing pavement, either asphalt or concrete. It creates a new wearing surface for traffic and to seal the pavement from water, debris, and sunlight damage, and it often adds significant structural strength.

Hot-mix asphalt pavement: Also known as HMA pavement, this type of asphalt creates a flexible pavement composed of aggregates, asphalt binder, and air voids. HMA is heated for placement and compaction at high temperatures.[6] HMA is less expensive to construct than concrete pavement, however it requires frequent maintenance activities and generally lasts 18 years before major rehabilitation is necessary. HMA makes up the vast majority of local-agency-owned pavements.

IBR: See *IBR element*, *IBR number*, and/or *Inventory-based Rating System™*.

IBR element: A feature used in the IBR System™ for assessing the condition of roads. The system relies on assessing three elements: surface width, drainage adequacy, and structural adequacy.[7]

IBR number: The 1-10 rating determined from assessments of the weighted IBR elements. The weighting relates each element to the intensity road work needed to improve or enhance the IBR element category.[8]

Interstate highway system: The road system owned and operated by each state consisting of routes that cross between states, make travel easier and faster. The interstate roads are denoted by the prefix "I" or "U.S." and then a number, where odd routes run north-south and even routes run east-west. Examples are I-75 or U.S. 2.[9]

Inventory-based Rating System™: Also known as the IBR System™, a rating system designed to assess the capabilities of gravel and unpaved roads to support intended traffic volumes and types year round. It assesses roads based on how three IBR elements, or features—surface width, drainage adequacy, and structural adequacy—compare to a baseline, or "good", road.[10]

Jurisdictional borders: Borders between two road-owning-agency jurisdictions, or where the roads owned by one agency turn into roads owned by another agency. Examples of jurisdictional borders are township or county lines.

Lane-mile segment: A segment of road that is measured by multiplying the centerline miles of a roadway by the number of lanes present.

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[6] Paving Class Glossary (definitions that I wrote for Pete. My source for that document was reference books)
[7] Inventory-based Rating System for Gravel Roads: Training Manual
[8] Inventory-based Rating System for Gravel Roads: Training Manual
[9] https://www.fhwa.dot.gov/interstate/faq.cfm#question3
[10] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual

Lane-mile-years: A network's total lane-miles multiplied by one year; a method to quantify the measurable loss of pavement life.

Limited access areas: Areas—typically remote areas—serviced by few or seasonal roads that require long detours routes if servicing roads are closed.

Main access to key commercial districts: Areas where large number or large size business will be significantly impacted if a road is unavailable.

Maintenance grading: A surface treatment method for unpaved roads that involves re-grading the road to remove isolated potholes, washboarding, and ruts, and then restoring the compacted crust layer.

MDOT: See *Michigan Department of Transportation*.

MDOT's Local Bridge Program Call for Projects: A call for project proposals for replacement, rehabilitation, and/or preventive maintenance of local bridges that, if granted, receives bridge funding from the Michigan Department of Transportation. The Call for Projects is made by the Local Bridge Program.

Michigan Department of Transportation: Also known as MDOT, this is the state of Michigan's department of transportation, which oversees roads and bridges owned by the state or federal government in Michigan.

Michigan Public Act 51 of 1951: Also known as PA 51, this is a Michigan legislative act that served as the foundation for establishing a road funding structure by creating transportation funding distribution methods and means. It has been amended many times.[11]

Michigan Public Act 325 of 2018: Also known as PA 325, this legislation modified PA 51 of 1951 in regards to asset management in Michigan, specifically 1) re-designating the TAMC under Michigan Infrastructure Council (MIC); 2) promoting and overseeing the implementation of recommendations from the regional infrastructure asset management pilot program; 3) requiring local road three-year asset management plans beginning October 1, 2020; 4) adding asset classes that impact system performance, safety or risk management, including culverts and signals; 5) allowing MDOT to withhold funds if no asset management plan submitted; and 6) prohibiting shifting finds from a country primary to a county local, or from a city major to a city minor if no progress toward achieving the condition goals described in its asset plan.[12]

Michigan Public Act 499 of 2002: Also known as PA 499, this legislation requires road projects for the upcoming three years to be reported to the TAMC.

Michigan Transportation Asset Management Council: Also known as the TAMC, a council comprised of professionals from county road commissions, cities, a county commissioner, a township official, regional and metropolitan planning organizations, and state transportation department personnel. The council reports directly to the Michigan Infrastructure Council.[13] The TAMC provides resources and support to Michigan's road-owning agencies, and serves as a liaison in data collection requirements between agencies and the state.

[11] Inventory-based Rating System for Gravel Roads: Training Manual
[12] Inventory-based Rating System for Gravel Roads: Training Manual
[13] Inventory-based Rating System for Gravel Roads: Training Manual

Michigan Transportation Fund: Also known as MTF, this is a source of transportation funding supported by vehicle registration fees and the state's per-gallon gas tax.

Microsurface treatment: An asphalt pavement treatment method that involves applying modified liquid asphalt, small stones, water, and portland cement for the purpose of protecting a pavement from damage caused by water and sunlight.

Mill and hot-mix asphalt overlay: Also known as a mill and HMA overlay, this is a surface treatment that involves the removal of the top layer of pavement by milling and the replacement of the removed layer with a new HMA layer.

Mix-of-fixes: A strategy of maintaining roads and bridges that includes generally prioritizes the spending of money on routine maintenance and capital preventive maintenance treatments to impede deterioration and then, as money is available, performing reconstruction and rehabilitation.

MTF: See *Michigan Transportation Fund*.

National Bridge Inspection Standards: Also known as NBIS, standards created by the Federal Highway Administration to locate and evaluate existing bridge deficiencies in the federal-aid highway system to ensure the safety of the traveling public. The standards define the proper safety for inspection and evaluation of all highway bridges.[14]

National Center for Pavement Preservation: Also known as the NCPP, a center that offers education, research, and outreach in current and innovative pavement preservation practices. This collaborative effort of government, industry, and academia entities was established at Michigan State University.

National highway system: Also known as NHS, this is a network of roads that includes the interstate highway system and other major roads managed by state and local agencies that serve major airports, marine, rail, pipelines, truck terminals, railway stations, military bases, and other strategic facilities.

NBIS: See *National Bridge Inspection Standards*.

NCPP: See *National Center for Pavement Preservation*.

NCPP Quick Check: A system created by the National Center for Pavement Preservation that 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.

Non-trunkline: A local road intended to be used over short distances but not recommended for long-distance travel.

Other funds: Expenditures for equipment, capital outlay, debt principal payment, interest expense, contributions to adjacent governmental units, principal, interest and bank fees, and miscellaneous for cities and villages.

PA: See *Michigan Public Act 51*, *Michigan Public Act 325*, and/or *Michigan Public Act 499*.

Partial-depth concrete repair: A concrete pavement treatment method that involves removing spalled or delaminated areas of concrete pavement, usually near joints and cracks, and replacing with new concrete.

[14] https://www.fhwa.dot.gov/bridge/nbis/

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.

PASER: See *Pavement Surface Evaluation and Rating system*.

Pavement reconstruction: A complete removal of the old pavement and base and construction of an entirely new road. This is the most expensive rehabilitation of the roadway and also the most disruptive to traffic patterns.

Pavement Surface Evaluation and Rating system: Also known as the PASER system, the PASER system rates surface condition on a 1-10 scale, where 10 is a brand new road with no defects, 5 is a road with distress but that is structurally sound and requires only preventative maintenance, and 1 is a road with extensive surface and structural distresses that is in need of total reconstruction. This system provides a simple, efficient, and consistent method for evaluating the condition of paved roads.[15]

Pothole: A defect in a road that is a localized depression, causing vehicles to jolt down and up when a tire passes over it.[16]

Preventive maintenance: Planned treatments to an existing asset to prevent deterioration and maintain functional condition. This can be a more effective use of funds than the costly alternative of major rehabilitation or replacement.

Proactive preventive maintenance: Also known as PPM, a method of performing capital preventive maintenance treatments very early in a pavement's life, often before it exhibits signs of pavement defect.

Public Act 51: See *Michigan Public Act 51 of 1951*

Public Act 325: See *Michigan Public Act 325 of 2018*

Public Act 499: See *Michigan Public Act 499 of 2002*

Reconstruction and rehabilitation programs: Programs intended to reconstruct and rehabilitate a road.

Restricted load postings: A restriction enacted on a bridge structure when is incapable of transporting loads above a certain weight.

Rights-of-way ownership: The owning of the right-of-way, which is the land over which a road or bridge travels. In order to build a road, road agencies must own the right-of-way or get permission to build on it.

Rigid pavement: See *concrete pavement*.

Road infrastructure: An agency's road network and assets necessary to make it function, such as traffic signage and ditches.

Road: The area consisting of the roadway (i.e., the travelled way or the portion of the road on which vehicles are intended to drive), shoulders, ditches, and areas of the right of way containing signage.[17]

Roadsoft: An asset management software suit that enables agencies to manage road and bridge related infrastructure. The software provides tools for collecting, storing, and analyzing data associated with

[15] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual
[16] Inventory-based Rating System for Gravel Roads: Training Manual
[17] Inventory-based Rating System for Gravel Roads: Training Manual

transportation infrastructure. Built on an optimum combination of database engine and GIS mapping tools, Roadsoft provides a quick, smooth user experience and almost unlimited data handling capabilities.[18]

Ruts/rutting: Deformation of a road that usually forms as a permanent depression concentrated under the wheel path parallel to the direction of travel.[19], [20]

Scheduled maintenance: Low-cost, day-to-day activities applied to bridges on a scheduled basis that mitigates deterioration.[21]

Sealcoat pavement: A gravel road that has been sealed with a thin asphalt binder coating that has stone chips spread on top.

Service life: Time from when a road or treatment is first constructed to when it reaches a point where the distresses present change from age-related to structural-related (also known as the critical distress point).[22]

Slurry seal: An asphalt pavement treatment method that involves applying liquid asphalt, small stones, water, and portland cement in a very thin layer with the purpose of protecting an existing pavement from being damaged by water and sunlight.

Structural improvement: Pavement treatment that adds strength to the pavement. Roads requiring structural improvement exhibit alligator cracking and rutting and are considered poor on the TAMC scale.

Subsurface infrastructure: Infrastructure maintained by local agencies that reside underground, for example, drinking water distribution systems, wastewater collection systems, and storm sewer systems.

TAMC: See *Michigan Transportation Asset Management Council*.

TAMC pavement condition dashboard: Website for viewing graphs of pavement and bridge conditions, traffic and miles travelled, safety statistics, maintenance activities, and financial data for Michigan's cities and villages, counties, and regions, as well as the state of Michigan.

TAMC's good/fair/poor condition classes: Classification of road conditions defined by the Michigan Transportation Asset Management Council based on bin ranges of PASER scores and similarities in defects and treatment options. Good roads have PASER scores of 8, 9, or 10, have very few defects, and require minimal maintenance. Fair roads have PASER scores of 5, 6, or 7, have good structural support but a deteriorating surface, and can be maintained with CPM treatments. Poor roads have PASER scores of 1, 2, 3, or 4, exhibit evidence that the underlying structure is failing, such as alligator cracking and rutting. These roads must be rehabilitated with treatments like heavy overlay, crush and shape, or total reconstruction.

Tax millages: Local tax implemented to supplement an agency's budget, such as road funding.

[18] Inventory-based Rating System for Gravel Roads: Training Manual
[19] Paving Class Glossary
[20] Inventory-based Rating System for Gravel Roads: Training Manual
[21] Inventory-based Rating System for Gravel Roads: Training Manual
[22] Inventory-based Rating System for Gravel Roads: Training Manual

Thin hot-mix asphalt overlay: Application of a thin layer of hot-mix asphalt on an existing road to re-seal the road and protect it from damage caused by water. This also improves the ride quality and provides a smoother, uniform appearance that improves visibility of pavement markings.[23]

Transportation infrastructure: All of the elements that work together to make the surface transportation system function including roads, bridges, culverts, traffic signals, and signage.

Trigger: When a PASER score gives insight to the preferred timeline of a project for applying the correct treatment at the correct time.

Trunkline abbreviations: The prefixes *M-*, *I-*, and *US* indicate roads in Michigan that are part of the state trunkline system, the Interstate system, and the US Highway system. These roads consist of anything from 10-lane urban freeways to two-lane rural highways and even one non-motorized highway; they cover 9,668 centerline miles. Most of the roads are maintained by MDOT.

Trunkline bridges: Bridge present on a trunkline road, which typically connects cities or other strategic places and is the recommended rout for long-distance travel.[24]

Trunkline maintenance funds: Expenditures under a maintenance agreement with MDOT for maintenance activities performed on MDOT trunkline routes.

Trunkline: Major road that typically connects cities or other strategic places and is the recommended route for long-distance travel.[25]

Washboarding: Ripples in the road surface that are perpendicular to the direction of travel.[26]

Wedge/patch sealcoat treatment: An asphalt pavement treatment method that involves correcting the damage frequently found at the edge of a pavement by installing a narrow, 2- to 6-foot-wide wedge along the entire outside edge of a lane and layering with HMA. This extends the life of an HMA pavement or chip seal overlay by adding strength to significantly settled areas of the pavement.

Worst-first strategy: Asset management strategy that treats only the problems, often addressing the worst problems first, and ignoring preventive maintenance. This strategy is the opposite of the "mix of fixes" strategy. An example of a worst-first approach would be purchasing a new automobile, never changing the oil, and waiting till the engine fails at 50,000 miles to address any deterioration of the car.

LIST OF ACRONYMS

CPM: capital preventive maintenance

FHWA: Federal Highway Administration

HMA: hot-mix asphalt

I: trunkline abbreviation for routes on the Interstate system

[23] [second sentence] http://www.kentcountyroads.net/road-work/road-treatments/ultra-thin-overlay
[24] https://en.wikipedia.org/wiki/Trunk_road
[25] https://en.wikipedia.org/wiki/Trunk_road
[26] Inventory-based Rating System for Gravel Roads: Training Manual

IBR: Inventory-based Rating

M: trunkline abbreviation for Michigan state highways

MDOT: Michigan Department of Transportation

MTF: Michigan Transportation Fund

NBIS: National Bridge Inspection Standards

NCPP: National Center for Pavement Preservation

NHS: National Highway System

PA 51: Michigan Public Act 51 of 1951

PASER: Pavement Surface Evaluation and Rating

R&R: reconstruction and rehabilitation programs

TAMC: (Michigan) Transportation Asset Management Council

US: trunkline abbreviation for routes on the US Highway system

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, County Road Association of Michigan, the Michigan Department of Transportation (MDOT), and the Federal Highway Administration (FHWA). <#AGENCYSHORT> 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 <#AGENCY> (<#AGENCYSHORT>) 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. <#AGENCYSHORT> is responsible for maintaining and operating over <#MILES> <#MILETYPE> of roads. And, it is responsible for maintaining and operating <##OFBRIDGES> of bridges. It is also responsible for <##OFCULVERTS> of culverts, <##OFSIGNS> of traffic signs, and <##OF SIGNALS> of signals.

This plan outlines how <#AGENCYSHORT> determines its strategy to maintain and upgrade asset condition given agency goals, priorities of its road users, and resources provided. An updated plan is to be released approximately every <#YOUR CONTENT HERE: Enter number of years> years to reflect changes in road conditions, finances, and priorities.

Questions regarding the use or content of this plan should be directed to:

Insert contact info

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 four primers provide an introduction to pavements, bridges, culverts, and traffic signals.

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, materials available, 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 tradeoffs 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 pavements:** 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 it would need 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 have 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 and does not last as long as HMA pavement, but 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, low-cost activity applied to "good" roads to prevent water or debris intrusion. 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. The <#AGENCYSHORT> 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

The <#AGENCYSHORT> is committed to monitoring the condition of our road network and using pavement condition data to drive cost-effective decision-making and preservation of valuable road assets. The <#AGENCYSHORT> uses the Pavement Surface Evaluation and Rating (PASER) system to assess our 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 the <#AGENCYSHORT> is consistent with data collected statewide. PASER data is collected using trained inspectors in a slow-moving vehicle using 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 where 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 the 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 are 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 PPM. 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. **Error! Reference source not found.** 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 likened 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.

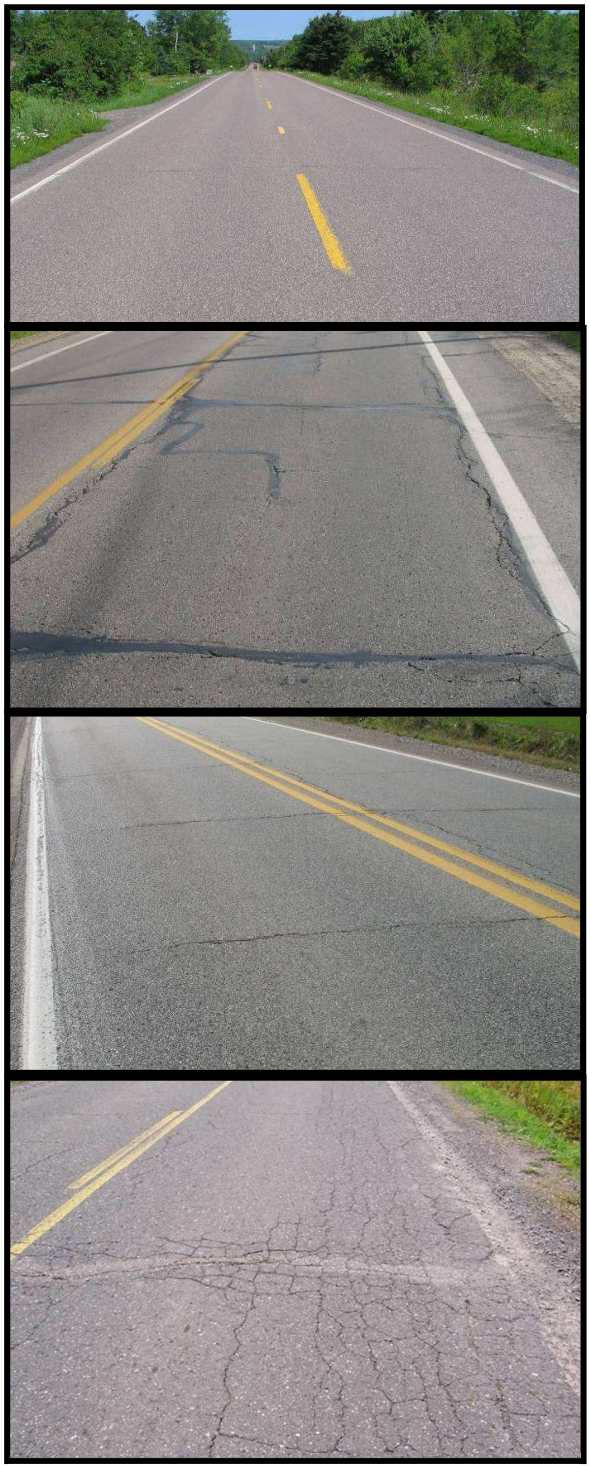


Figure 1: *Top image, right*– PASER 8 road that is considered "good" by the TAMC exhibit only minor defects. *Second image, right*– PASER 5 road that is considered "fair" by the TAMC. Exhibiting structural soundness but could benefit from CPM. *Third image, right*– PASER 6 road that is considered "fair" 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 definitions, above. 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 may not share the same 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% 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 regionally and statewide. In addition, <#AGENCYSHORT> collects <#YOUR CONTENT HERE: Insert the percentage appropriate to your agency's circumstance using ##% format.> of our paved non-federal-aid-eligible network using our own staff and resources.

<#YOUR CONTENT HERE: If you collect unpaved road condition data with the IBR System™, use and modify this content by right-clicking the content control and then "Remove Control". Otherwise, select the control handle and use your Delete key.>

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™, and the <#AGENCYSHORT> also uses the IBR System™ for rating our 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 road 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 and well-constructed base, whereas 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, for example, 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). Where the unpaved road is and

how it is used determines how the road must be constructed and maintained: just because a road has a low IBR number does not necessarily mean that it needs to be upgraded. The IBR number 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.

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 <#AGENCYSHORT>—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 and it 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 most disruptive to regular traffic patterns. Reconstructed pavement will subsequently require one or more of the previous maintenance treatments to maximize service life and performance. A reconstructed road lasts approximately 15 years and costs $250,000 per lane mile. The following descriptions outline the main reconstruction treatments used by <#AGENCYSHORT>.

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

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 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 twelve years and typically costs $100,000 per mile.

Ditching (for Unpaved Roads)

Water needs to drain away from any roadway to delay softening of the pavement structure, and proper drainage is critical for unpaved roads where there is no hard surface on top to stop water infiltration into the road surface and base. To improve drainage, new ditches are dug or old ones are cleaned out. Unpaved roads typically need to be re-ditched every 15 years at a cost of $10,000 per mile.

Gravel Overlay (for Unpaved Roads)

Unpaved roads will exhibit gravel loss over time due to traffic, wind, and rain. Gravel on an unpaved road provides a wear surface and contributes to the structure of the entire road. Unpaved roads typically need to be overlaid with four inches of new gravel every 15 years at a cost of $25,000 per mile.

<#YOUR CONTENT HERE: Discuss the innovative treatments that apply to your agency. Use/modify applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

Structural Improvement

Roads requiring structural improvements exhibit alligator cracking and rutting and rated poor in the TAMC scale. Road rutting is evidence that the underlying structure is beginning to fail and it must be either 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 <#AGENCYSHORT>.

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.

<#YOUR CONTENT HERE: Discuss the pavement treatment tools that apply to your agency. Use/modify applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

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 $50,000 to $100,000 per lane mile. The top layer of severely damaged pavement can be removed by the 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 and then the road surface is reshaped to correct imperfections in the road's profile (Figure 4). An additional layer of gravel is often added along with a new wearing surface such as an HMA overlay or chip seal. Additional gravel and an HMA overlay give an increase in the pavements structural capacity. This treatment is usually done on rural roads with severe structural distress; Adding gravel and a wearing surface makes it more prohibitive for urban roads if the curb and gutter is not raised up. Crush and shape treatments last approximately 14 years and cost $150,000 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 that 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 treatments 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 <#AGENCYSHORT>.

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

<#YOUR CONTENT HERE: Discuss the pavement treatment tools that apply to your agency. Use/modify applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

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). 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. Crack sealing lasts approximately two years and costs $4,000 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 we look at what 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 $1,000 per lane mile.

Chip Seal

A chip seal, also known as a sealcoat, 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 (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 helping to prevent further surface deterioration. Chip seals are best applied to pavements that are not exhibiting problems with strength, and their purpose is to help preserve that strength. These treatments last approximately five years and cost $12,000 per lane mile.

Slurry Seal/Microsurface

A slurry seal or microsurface's purpose is to protect existing pavement from being damaged by water and sunlight. The primary ingredients are liquid asphalt (slurry seal) or modified liquid asphalt (microsurface), small stones, water and portland cement applied in a very thin (less than a half an inch) layer (Figure 5). The main difference between a slurry seal and a microsurface is the modified liquid asphalt used in microsurfacing provides different curing and durability properties, which allows microsurfacing to be used for filling pavement ruts. Since the application is very thin, these treatments do not add any strength to the pavement and only serves to protect the pavement's existing strength by sealing the pavement from sunlight and water damage. These treatments work best when applied before cracks are too wide and too numerous. A slurry seal treatment lasts approximately four years and costs $20,000 per lane mile, while a microsurface treatment tends to last for seven years and costs $25,000 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 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.

Maintenance Grading (for Unpaved Roads)

Maintenance grading involves regrading an unpaved road to remove isolated potholes, washboarding, and ruts then restoring the compacted crust layer (Figure 6). Crust on an unpaved road is a very tightly compacted surface that sheds water with ease but takes time to be created, so destroying a crusted surface

with maintenance grading requires a plan to restore the crust. Maintenance grading often needs to be performed three to five times per year and each grading costs $300 per mile.

Dust Control (for Unpaved Roads)

Dust control typically involves spraying chloride or other chemicals on a gravel surface to reduce dust loss, aggregate loss, and maintenance (Figure 6). This is a relatively short-term fix that helps create a crusted surface. Chlorides work by attracting moisture from the air and existing gravel. This fix is not effective if the surface is too dry or heavy rain is imminent, so timing is very important. Dust control is done two to four times per year and each application costs $700 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

<#YOUR CONTENT HERE: Detail the innovative treatments that your agency is employing. For example, this content may read like this: Our agency strives to be innovative with our pavement treatments by looking for ways to prevent pavement damage and save taxpayer dollars. One such innovation is undersealing, which was performed on a test section on Main Street in 2016. This treatment consists of chip seal that then has an HMA overlay applied. This treatment has been shown by the Minnesota Department of Transportation to delay old pavement cracks from reflecting up into new HMA overlays. We hope to gain favorable results from this trial on our roads and use this treatment as another one of our pavement preservation best practices.>

Bridge Primer

Bridge Types

Bridges are structures that span 20 feet (6.1 meters) or more over water or other thoroughfares. If culverts are placed side by side to form a span of 20 feet or more, then this culvert system would be defined as a bridge.

Bridge types classify based on two features: design and material.

The most basic bridge designs are beam bridges and slab bridges. A **girder**, or beam, **bridge** is one that has beam(s) across a span supported by the abutments and any intermediate piers, while a **slab bridge** is a concrete slab supported by the abutments and, if necessary, piers (Figure 7). These bridges can extend across one or multiple spans.

Similarly, **arch bridges**, whose name derives from its shape, extend across a span and rest on abutments (Figure 7). Beam and arch bridges function differently, however, when it comes to load transfer.

Trusses are a support structure that is created when structural members are connected at joints to form interconnected triangles. Structural members may consist of steel tubes or angles, and joints are the steel plates connecting members together. When a bridge consists of a truss superstructure as part of its load-transfer mechanism, it is called a **truss bridge**. Trusses can be seen in use on the Sault Sainte Marie International Bridge (Figure 7).

Another common bridge design in Michigan is the three-sided pre-cast box or arch bridge (Figure 8).

Figure 8: Example of a three-sided box bridge spanning 20 feet or more.

Figure 7: Examples of bridge types in Michigan

Michigan is also home to several unique bridge designs. A **suspension bridge** hangs the load-bearing deck from suspension cables, like the Mackinac Bridge (Figure 9). Other unique designs include the **movable bridge** used for the Portage Lake Lift Bridge and the historic **covered bridge** used for such bridges as the Holz Brücke wooden bridge in Frankenmuth (Figure 9).

Figure 9: Examples of unique bridge types found in Michigan

Adding another layer of complexity to bridge typing is the primary construction materials used (**Error! Reference source not found.**). Bridges are generally constructed from concrete, steel, pre-stressed concrete, or timber. Some historical bridges in Michigan are constructed from masonry and occasionally bridges may employ aluminum components.

Figure 10: Examples of common bridge construction materials used in Michigan

Bridge Condition

Michigan inspectors rate bridge condition on a 0-9 scale known as the National Bridge Inventory (NBI) Rating Scale. Elements of the bridge's superstructure, deck, and substructure receive a 9 if they are in excellent condition down to a 0 if they are in failed condition. A complete guide for Michigan bridge condition rating according to the NBI can be found at https://www.michigan.gov/documents/mdot/MDOT_BIR_Ratings_Guide_367482_7.pdf.

Bridge Treatments

Replacement

Different levels of replacement can be performed on a bridge structure. The most extensive is total replacement, which removes the entire bridge before re-building a bridge at the same location. Total replacement is done when the cost of rehabilitation exceeds the cost of replacement or when there are no counter-measures available to fix its condition. Partial replacements can include superstructure replacement, deck replacement, and substructure replacement (Figure 11). Superstructure replacement – removes and rebuilds the main structural components of the bridge and deck. Deck replacement either fully or partially removes and rebuilds the deck, or riding surface, of the bridge. Substructure replacement removes and rebuilds the system supporting the bridge's superstructure. This is commonly done when there are existing open cracks, signs of differential settlement, presence of active movement, or when the bridge is scour critical with no counter-measures available. In all cases, replacement is chosen when the cost of rehabilitation exceeds the replacement cost. Replacement is generally the most expensive of the treatment options.

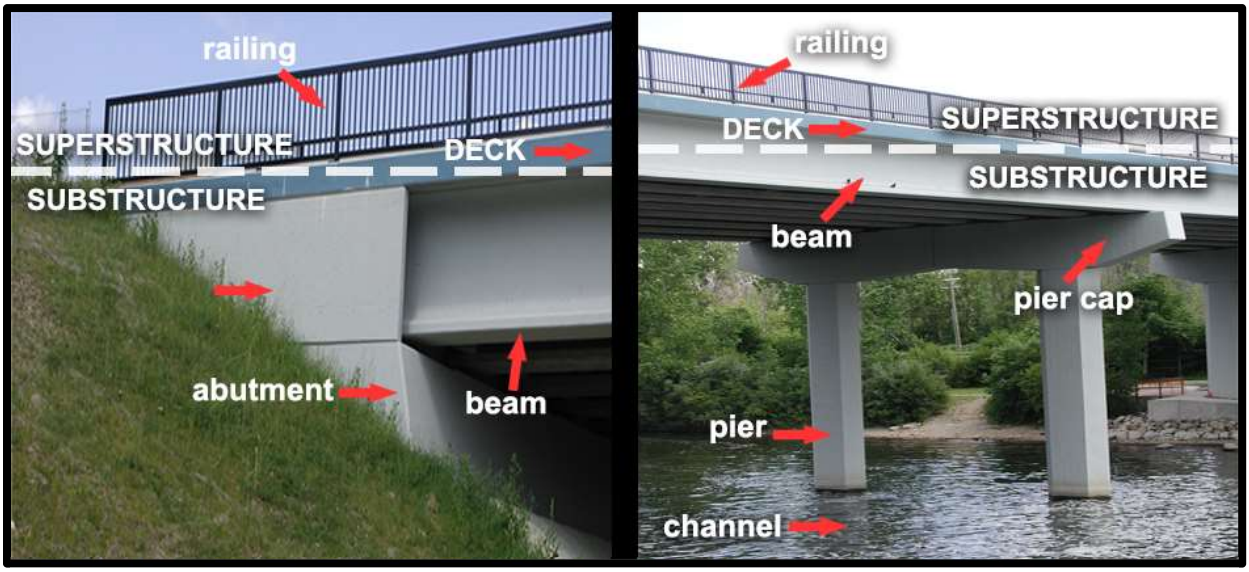


Figure 11: Diagram of basic elements of a bridge

Rehabilitation

Unlike replacing the entire structure, rehabilitation involves repairs or replacements that improve the existing condition and extend the service life provided by the structure and the riding surface. Most often, rehabilitation options are associated with bridges that have degraded beyond what can be fixed with general maintenance. While typically more expensive than general maintenance, rehabilitation treatments may be more cost-effective than replacing the entire structure.

Deck overlay

A concrete deck overlay involves paving over the riding surface of the bridge with new material to extend the life of the deck (Figure 11). Typically, this is done when the NBI deck rating is less than 5 for the surface and greater than 4 for the underneath portion of the deck.

Railing retrofit/replacement

A railing retrofit or replacement either reinforces the existing railing or replaces it entirely (Figure 11). This rehabilitation is driven by a need for safety improvements, if the NBI deck rating is greater than 5, or when an NBI railing or barrier rating less than 5.

Beam repair and pin-and-hanger replacement

Beam repair on a bridge involves repairing either the steel or concrete beams in order to correct damage that impairs beam strength (Figure 11). In the case of steel beams, it is also done if there is 25 percent or more of section loss in an area of the beam that affects load-carrying capacity. In the case of concrete beams, it is also done if there is 50 percent or more spalling (i.e., fragmenting) at the ends of beams. A pin-and-hanger assembly may join two steel beams (Figure 12). Replacing the pin-and-hanger assembly is done when there excessive section loss around the pin and hanger, severe pack rust, out-of-plane distortion, or an NBI rating of 4 or lower.

Figure 12: Pin-and-hanger assembly (left) and bearing (right, shown by arrow)

Substructure concrete patching and repair

Patching and repairing the main structure supporting the bridge is essential to keep a bridge in service. These rehabilitation efforts are done in response to an inspector's work recommendation, when the abutments or piers have an NBI rating of 5 or 4, or if spalling and delamination (i.e., separation into layers) affect less than 30 percent of the bridge surface.

Wing wall repair/replacement

The wing wall of a bridge structure helps maintain the ground contour and slope at the opposite ends of the bridge (Figure 13). When a bridge's wing wall develops open cracks, has signs of differential settlement or active movement, or has an NBI rating of 4 or less, the wall will need repair or replacement.

Drainage culvert repair/replacement

When the bridge's drainage culvert develops cracks, has deformation, shows signs of movement or differential settlement, or has an NBI rating of 4 or less, the culvert will need repair or replacement.

Figure 13: Diagram of basic elements of a bridge, cont'd

Preventive Maintenance

Preventive maintenance is those activities or treatments that extend the service life of a bridge in a cost-effective manner. AASHTO defines preventive maintenance as "a planned strategy of cost-effective treatment to an existing roadway system and its appurtenances that preserves the system, retards future deterioration and maintains or improves the functional condition of the system without increasing structural capacity".

Deck repairs

Deck repairs include three common techniques: HMA overlay cap without membrane, concrete patching, and joint repair/replacement. Overlaying a bridge deck with an HMA cap without membrane serves as a temporary holdover, typically within five years of performing rehabilitation or repair, that improves ride quality. Markers that indicate the need for this type of maintenance include an NBI rating for both deck surface and deck bottom of 3 or less. Another type of preventive maintenance involves patching the concrete on the bridge deck. This is done in response to an inspector's work recommendation or when the deck surface has an NBI rating of 5, 6, or 7 with minor delamination and spalling. When doing an overlay of a bridge deck, repair or replacement of the expansion joint may accompany it. The expansion joint occurs where two sections of bridge deck come together. The joint allows for expansion or contraction of the deck pavement in response to temperature. Generally, this type of replacement is precipitated by an NBI rating for the joint of 4 or less or by significant leaking from the joint.

Steel bearing repair/replacement

Rather than sitting directly on the piers, a bridge deck is separated from the piers by bearings (Figure 12). Bearings allow for a certain degree of movement due to temperature or other forces. Repairing or replacing the bearings is considered preventive maintenance. An NBI rating for girders and deck of 5 or higher and an NBI rating for bearings of 4 or lower identifies candidates for this maintenance activity.

Painting

Re-painting a bridge structure can either be done in totality or in part. Total re-painting is done in response to an inspector's work recommendation or when the NBI rating for paint condition is 3 or less.

Partial re-painting can either consist of zone re-painting, which is a preventive maintenance technique, or spot re-painting, which is scheduled maintenance (see below). Zone re-painting, on the other hand, is done when less than 15 percent of the paint in a smaller area, or zone, has failed while the rest of the bridge is in good or fair condition. It is also done if the paint condition has an NBI rating of 5 or 4.

Channel improvements

Occasionally, it is necessary to make improvements to the waterway that flows underneath the bridge. Such channel improvements are driven by an inspector's work recommendation or to remove vegetation, debris, or sediment from the channel and banks (Figure 11).

Scour countermeasures

The act of filling scour holes to prevent further damage to a structure. This is done when a structure is categorized as scour critical and is not scheduled for replacement or when NBI comments in abutment and pier ratings indicate the presence of scour holes.

Scheduled Maintenance

Scheduled maintenance is those activities or treatments that are regularly scheduled and intend to maintain serviceability while reducing the rate of deterioration.

Superstructure washing

Washing the superstructure, or the main structure supporting the bridge, typically occurs in response to an inspector's work recommendation or when salt-contaminated dirt and debris collected on the superstructure is causing corrosion or deterioration by trapping moisture.

Deck repairs/replacement

A bridge deck's structure is typically concrete and may have an asphalt wearing surface on top. Repairing or replacing the bridge deck's asphalt wearing surface is an effective scheduled maintenance technique that can be recommended by an inspector or should be done when the asphalt wearing surface is in poor condition. In order to repair minor delamination and spalling of concrete decks, minor concrete patching may be used. Typically, an inspector will recommend this technique. Cracks or open joints in a pavement surface can also clog with debris, which lessens the ability of the deck to expand and contract properly and, under traffic weight, will cause the pavement to deteriorate. Therefore, sealing the cracks and joints of the bridge deck's asphalt surface may be recommended upon inspection and is advisable when the surface is in good or fair condition and the cracks only extend to the surface of the underlying slab or sub course. Sealing cracks and joints of a deck's concrete surface is done when concrete is in good or fair condition, when cracks extend to the reinforcement inside the pavement, or in response to an inspector's work recommendation.

Drainage system cleanout/repair

Keeping a bridge's drainage system clean and in good working order allows the bridge to shed water effectively. This is important for the bridge to achieve its maximum service life. Occasionally, it is necessary to clean or repair the drainage system. Signs that a drainage system needs cleaning or repair include clogs and broken, deteriorated, or damaged drainage elements.

Guardrail repair/replacement

A guardrail is a safety feature on many roads and bridges that prevents or minimizes the effects of lane departure incidents (Figure 13). Keeping bridge guardrails in good condition is important. Repair or replacement of bridge guardrail should be done when a guardrail is missing or damaged, or when it needs a safety improvement.

Approaches repaving

A bridge's approach is the transition area between the roadway leading up to and away from the bridge and the bridge deck. Repaving the approach areas is a scheduled maintenance effort done in response to an inspector's work recommendation or when the asphalt surface is in poor condition.

Timber repairs

If a bridge has timber components, those components are susceptible to rot and insect-related damage. To keep a bridge with timber components functional, it is important to repair any damaged timbers. Timber repair should be done when there is extensive rot or insect-related damage, or when the timber members have an NBI rating of 4 or less.

Spot painting

Another form of partial bridge painting is spot painting. This scheduled maintenance technique involves painting a small portion of a bridge. Generally, this is done in response to an inspector's work recommendation and is used for zinc-based paint systems only.

Slope repair/reinforcement

The terrain on either side of the bridge that slopes down toward the channel is called the slope. At times, it is necessary to repair the slope. Situations that call for slope repair include when the slope is degraded, when the slope has significant areas of distress or failure, when the slope has settled, or if the slope has an NBI rating of 5 or less. Other times, it is necessary to reinforce the slope. Reinforcement can be added by installing Riprap, which is a side-slope covering made of stones. Riprap protects the stability of side slopes of channel banks when erosion threatens the surface (Figure 13).

Vegetation control and debris removal

Keeping the area around a bridge structure free of vegetation and debris safeguards the bridge structure from these potentially damaging forces. Removing or restricting vegetation around bridges prevents damage to the structure. Vegetation control is done in response to an inspector's work recommendation or when vegetation traps moisture on structural elements or is growing from joints or cracks. Debris in the water channel or in the bridge can also cause damage to the structure. Removing this debris is typically done in response to an inspector's work recommendation or when vegetation, debris, or sediment accumulates on the structure or channel.

Miscellaneous repairs

These are uncategorized repairs in response to an inspector's work recommendation.

Culvert Primer

Culverts are structures that lie underneath roads, enabling water to flow from one side of the roadway to the other (Figure 14). The important distinguishing factor between a culvert and a bridge is the size. Culverts are considered anything under 20 feet while bridges, according to the Federal Highway Administration, are 20 feet or more. While similar in function to storm sewers, culverts differ from storm sewers in that culverts are open on both ends, are constructed as straight-line conduits, and lack intermediate drainage structures like manholes and catch basins (Figure 14). Culverts are critical to the service life of a road because of the important role they play in keeping the pavement layers well drained and free from the forces of water building up on one side of the roadway.

Figure 14: Culverts allow water to pass under the roadway (left), they are straight-line conduits with no immediate drainage structures (middle), and they come in various materials (left: metal; middle and right: concrete) and shapes (left: arch; middle: round; right: box).

Culvert Types

Michigan conducted its first pilot data collection on local agency culverts in the state in 2018. Of almost 50,000 culverts, the material type used for constructing culverts ranged from (in order of predominance) corrugated steel pipe, concrete, plastic, aluminum, and masonry/tile, to timber materials (Figure 14). The shapes of the culverts were (in order of predominance) circular, pipe arch, arch, rectangular, horizontal ellipse, or box (Figure 14). Of almost 36,000 culverts, the diameter for the majority of culverts ranged from less than 12 inches to 24 inches; a portion, however, ranged from 30 inches to more than 48 inches.

Culvert Condition

Several culvert condition assessment practices exist. The FHWA has an evaluation method in their 1986 *Culvert Inspection Manual*. In conjunction with descriptions and details in the Ohio Department of Transportation's 2017 *Culvert Inspection Manual* and Wisconsin DOT's *Bridge Inspection Field Manual*, the FHWA method served as the method for evaluating Michigan culverts in the pilot. Full detail on the condition assessment system used in the Michigan culvert pilot data collection can be found in Appendix G of the report (https://www.michigan.gov/documents/tamc/TAMC_2018_Culvert_Pilot_Report_Complete_634795_7.pdf).

The Michigan culvert pilot data collection used a 1 through 10 rating system, where 10 is considered a new culvert with no deterioration or distress and 1 is considered total failure. Each of the different culvert material types requires the assessment of features unique to that material type, including structural deterioration, invert deterioration, section deformation, blockage(s) and scour. Corrugated metal pipe, concrete pipe, plastic pipe, and masonry culverts require an additional assessment of joints and seams. Slab abutment culverts require an additional assessment of the concrete abutment and the masonry abutment. Assessment of timber culverts only relied on blockage(s) and scour. The assessments come together to generate a condition rating categories of good (rated as 10, 9, or 8), fair (rated as 7 or 6), poor (rated as 5 or 4), or failed (rated as 3, 2, or 1).

Culvert Treatments

The *MDOT Drainage Manual* addresses culvert design and treatments. Of most importance to the longevity of culverts is regular cleaning to prevent clogs. More-extensive treatments may include re-positioning the pipe to improve its grade and lining a culvert to achieve more service life after structural deterioration has begun.

Traffic Signals Primer

Types

Traffic signals communicate a vast array of messaging that can also be grouped into basic categories. Traffic signal categories include case signs (e.g., keep right/left, no right/left turn, reversible lanes), controllers (e.g., flashers), detection (e.g., cameras, push buttons), electrical devices (e.g., clocks, crossing gates), flashing beacons, interconnects (e.g., DSL, fire station, phone line, radio), pedestrian heads (e.g., hand-man), and traffic heads (Figure 15). Poles and spans support traffic signals.

Figure 15: Examples of traffic signals

Condition

Traffic signal assessment considers the functioning of basic tests on a pass/fail basis. These tests include battery backup testing, components testing, conflict monitor testing, radio testing, and underground detection.

Treatments

Traffic signals are maintained in accordance with the *Michigan Manual on Uniform Traffic Control Devices*. Maintenance of traffic signals includes regular maintenance of all components, cleaning and servicing to prevent undue failures, immediate maintenance in the case of emergency calls, and provision of stand-by equipment. Timing changes are restricted to authorized personnel only.

1. PAVEMENT ASSETS

Building a mile of new road can cost over $1 million 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 take advantage of those efficiencies.

The <#AGENCYSHORT> is responsible for <#MILES> <#MILETYPE> of public roads, as shown in Figure 16. An inventory of these miles divides them into different network classes based on funding priorities identified at the state level.

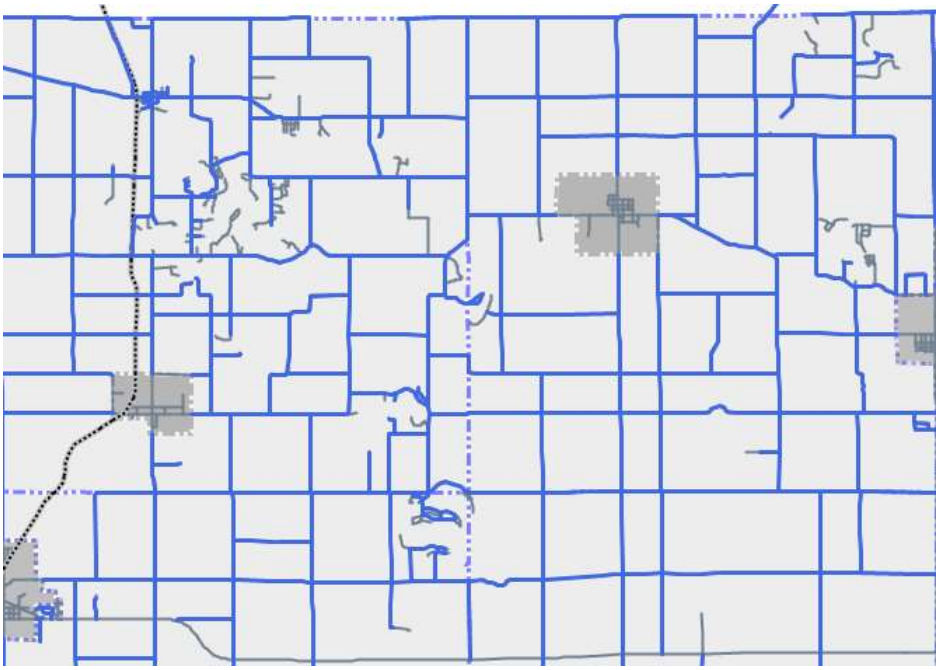


Figure 16: Highlighted roads are managed by the <#AGENCYSHORT>

Inventory

Michigan Public Act 51 of 1951 (PA 51), which defines how funds from the Michigan Transportation Fund (MTF) are distributed to and spent by road-owning agencies, classifies roads owned by <#AGENCYSHORT> as either <#NETWORK1> or <#NETWORK2> roads. State statute prioritizes expenditures on the <#NETWORK1> road system.

<#YOUR CONTENT HERE: The following paragraph is used by county agencies only. Use and modify this content by right-clicking the content control and then "Remove Control". Otherwise, select the control handle and use your Delete key.>

Of the <#MILES> <#MILETYPE> of public roads owned and/or managed by <#AGENCYSHORT>, <#ROADCLASS1> <#ROADCLASS2> <#ROADCLASS3>

Figure 17 illustrates the percentage of roads owned by the <#AGENCYSHORT> that are classified as <#NETWORK1> and <#NETWORK2> roads. Figure 18 illustrates this breakdown of these road networks by township boundary within <#JURISDICTION>. <#YOUR CONTENT HERE: The preceding sentence is used by county agencies only. Use and modify this content by right-clicking the content control and then "Remove Control". Otherwise, select the control handle and use your Delete key.>

Figure 17: Percentage of <#NETWORK1> and <#NETWORK2> roads for the <#AGENCYSHORT>.

Figure 18: <#NETWORK1> and <#NETWORK2> roads by township for <#JURISDICTION>.

<#AGENCYSHORT> manages roads that are part of the National Highway System (NHS)—in other words, those 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, <#AGENCYSHORT> manages a percentage of those roads located in its jurisdiction, as shown in Figure 19.

Figure 19: Miles of roads managed by <#AGENCYSHORT> that are part of the National Highway System and condition.

Types

The <#AGENCYSHORT> has multiple types of pavements in its jurisdiction, including <#YOURCONTENTHERE: concrete, hot-mix asphalt (HMA), composite, and sealcoat; it also has unpaved, or gravel, roads>. Factors influencing pavement type include 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 20 illustrates the percentage of various pavement types that the <#AGENCYSHORT> has in its network. <#YOUR CONTENT HERE: The following sentence is used by county agencies only. Use and modify this content by right-clicking the content control and then "Remove Control". Otherwise, select the control handle and use your Delete key.> Figure 21 shows the pavement type by Township boundary for <#JURISDICTION>>.

Figure 20: Pavement type by percentage maintained by the <#AGENCYSHORT> Undefined pavements have not been inventoried in<#AGENCYSHORT>'s asset management system to date, but will be included as data becomes available.

Figure 21: Pavement type by township within <#JURISDICTION> Undefined pavements have not been inventoried in <#AGENCYSHORT>'s asset management system to date, but will be included as data becomes available.

Locations

Locations and sizes of each asset can be found in <#AGENCYSHORT>'s Roadsoft database. For more detail, please contact:

Insert contact info

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 <#AGENCYSHORT> 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 <#AGENCYSHORT> 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 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 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 <#AGENCYSHORT> is committed to monitoring the condition of our road network and using pavement condition data to drive cost-effective decision-making and preservation of valuable road assets. The <#AGENCYSHORT> uses the Pavement Surface Evaluation and Rating (PASER) system, which has been adopted by the TAMC for measuring statewide pavement conditions, to assess our 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.

<#AGENCYSHORT> collects 100% of its PASER data every two years on all federal-aid-eligible roads in Michigan. In addition, <#AGENCYSHORT> collects <#YOUR CONTENT HERE: Insert the percentage appropriate to your agency's circumstance using ##% format.> of our paved non-federal-aid-eligible network using our own staff and resources.

<#AGENCYSHORT>'s <#YEAR> paved <#NETWORK1> road network and paved <#NETWORK2> road network have <#YOUR CONTENT HERE: percent> percent roads in the TAMC's good/fair/poor condition classes (Figure 22).

Figure 22: <#AGENCYSHORT> paved <#NETWORK1> road network and paved <#NETWORK2> road network conditions by percentage of good, fair, or poor

In comparison, the statewide paved <#NETWORK1> road network and statewide paved <#NETWORK2> road network have <#YOUR CONTENT HERE: percent> percent roads in the TAMC's good/fair/poor condition categories (Figure 23). Comparing Figure 22 and Figure 23 shows that <#AGENCYSHORT>'s road network is <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **better**, **worse**, **the same**> 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 23: State wide <#NETWORK1> and paved <#NETWORK2> road network conditions by percentage of good, fair, or poor

<#YOUR CONTENT HERE: Explain why your network conditions differ from the rest of the state, and justify the current conditions. Highlight factors that may be at work, such as climate, soils, traffic volume, trucks, budget, and practices.>

Figure 24 and Figure 25 show the number of miles for <#AGENCYSHORT>'s roads with PASER scores expressed in TAMC definition categories for the paved <#NETWORK1> road network (Figure 24) and the paved <#NETWORK2> road network (Figure 25). <#AGENCYSHORT> considers road miles on the transition line between good and fair (PASER 8) and 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 24: <#AGENCYSHORT> paved <#NETWORK1> road network conditions. Bar graph colors correspond to good/fair/poor TAMC designations.

Figure 25: <#AGENCYSHORT> paved <#NETWORK2> network condition by PASER rating. Bar graph colors correspond to good/fair/poor TAMC designations.

Figure 26 illustrates <#AGENCYSHORT>'s entire paved road network divided by township into the TAMC good/fair/poor designations.

Figure 27 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 26: Number of miles of paved road in each township divided in categories of good (PASER 10, 9, 8), fair (PASER 7, 6, 5), and poor (PASER 4, 3, 2, 1).

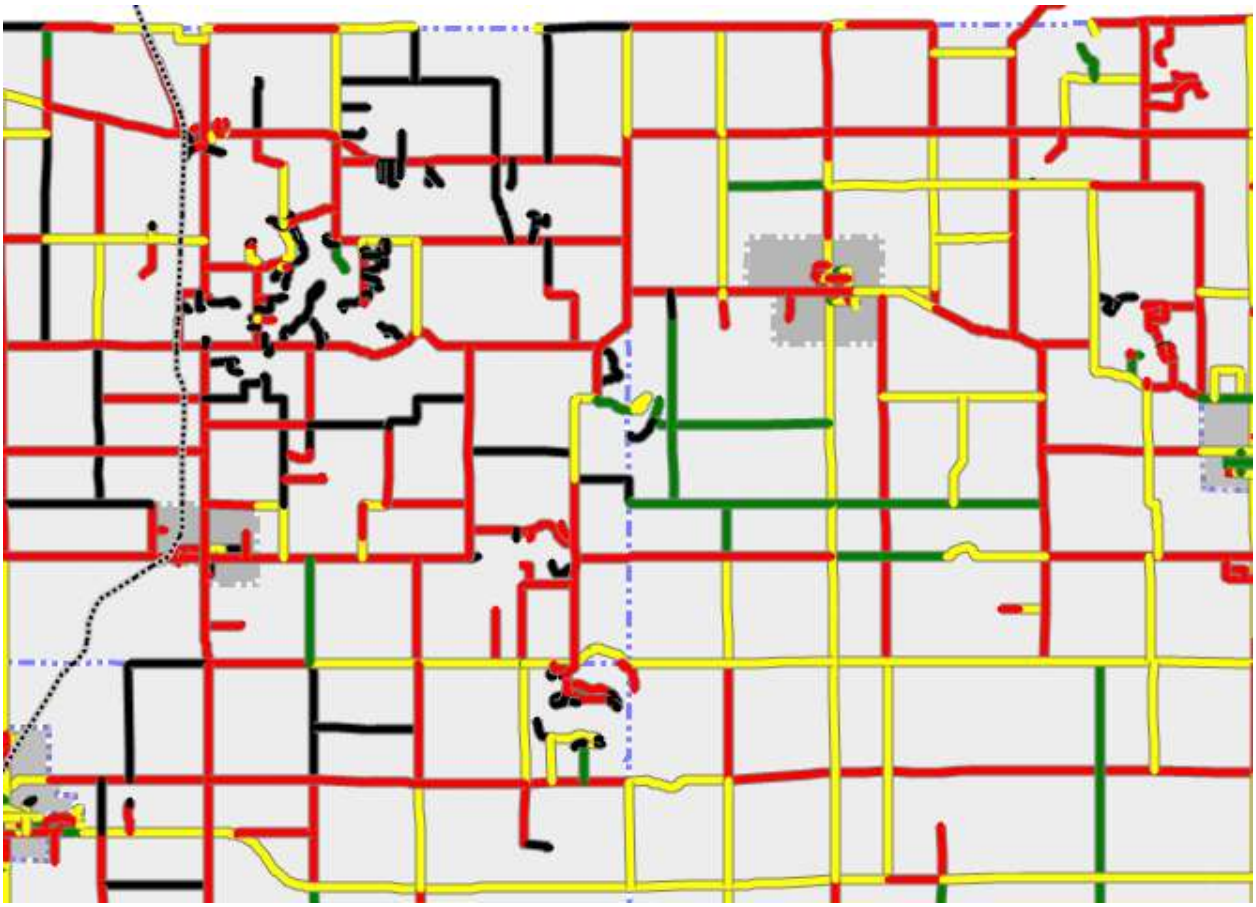


Figure 27: Map of the current paved road condition in good (PASER 10, 9, 8) shown in green, fair (PASER 7, 6, 5) shown in yellow, and poor (PASER 4, 3, 2, 1) shown in red. Only Roads owned by <#AGENCYSHORT> are shown.

<#YOUR CONTENT HERE: Explain the distribution of your roads along the PASER spectrum. Where is your agency in terms of meeting condition goals or user's needs, or where is there a risk of not meeting those goals or needs? What is your agency doing or what would you like to do to offset these risks? Is your agency happy with the network distribution? Is there a specific part detailed on this network map that concerns you? Tell the story of your data and what it means to your agency as the road owner.>

<#YOUR CONTENT HERE: If you collect unpaved road condition data with the IBR System™, use and modify this content by right-clicking the content control and then "Remove Control". Otherwise, select the control handle and use your Delete key.>

Historically, the overall quality of <#AGENCYSHORT>'s paved <#NETWORK1> roads have been <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **decreasing**, **increasing**, **staying the same**>, as can be observed in Figure 28. <#YOUR CONTENT HERE: Explain how conditions have changed over the years as shown in the chart>

Comparing <#AGENCYSHORT>'s <#NETWORK1> road condition trends illustrated in Figure 28 with overall statewide condition trends for all paved <#NETWORK1> roads, which are illustrated in Figure

29, shows a <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **similar**, **different**> trend locally as in the rest of the state.

<#YOUR CONTENT HERE: If your network condition has been decreasing, you may wish to include some explanation of that trend here. An example of this discussion is: The decrease in overall condition of our paved <#NETWORK1> road system can be observed in Figure 28 by noting the increase in roads in poor condition. Between 2010 and 2016 the percentage of roads in poor condition doubled, from 10% of the network to 20% of the network. This indicates an increasing number of roads that will require costly reconstruction or rehabilitation. The percentage of fair roads increased slightly during this same period, increasing from 50% to 70%. This indicates that there is a growing backlog of preventive maintenance projects that have not been addressed with the current budget. This class of roads requires attention before they transition into costlier reconstruct projects. During this time the number of maintenance, reconstruction, and rehabilitation projects were steady, indicating that funding levels are not sufficient to support the current paved <#NETWORK1> road network in its current state.>

Figure 28: Historical <#AGENCYSHORT> paved <#NETWORK1>road network condition trend

Figure 29: Historical statewide <#NETWORK1>road network condition trend

Historically, the overall quality of <#AGENCYSHORT>'s paved <#NETWORK2> roads have been <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **the same**, **much worse**, **better**> than the <#NETWORK1> road network because they lack a source of state and federal funding and therefore must be supported locally. Figure 30 illustrates the condition of the paved <#NETWORK2> road network in <#AGENCYSHORT> while Figure 31 illustrates these conditions statewide.

Comparing <#AGENCYSHORT>'s <#NETWORK2> road condition trends illustrated in Figure 30 with overall statewide condition trends for all paved <#NETWORK2> roads illustrated in Figure 31 indicates a <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **similar**, **different**> trend locally as in the rest of the state. <#YOUR CONTENT HERE: Verify that the following statement is appropriate for your agency's plan and reflects your agency's procedures (to retain the sample text, select it and then select Ctrl +Shift +F9): The year-to-year variation in the paved <#NETWORK2> 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.

Figure 30: Historical <#AGENCYSHORT> paved <#NETWORK2> road network condition trend

Figure 31: Historical statewide paved <#NETWORK2> 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, and <#AGENCYSHORT> uses the IBR System™ for rating our unpaved roads. More information regarding the IBR System™ can be found in Introduction's Pavement Primer.

<#YOUR CONTENT HERE: Explain how unpaved roads are used in your network.> Are they commonly short terminal ends of the system? Or, do they form a grid network that serves as access to agricultural industries? What criteria do you use to determine whether an unpaved road should be paved?>

Figure 32 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 33 illustrates the miles of unpaved roads in IBR number ranges of 10, 9, and 8; 7, 6, and 5; and 4, 3, 2, and 1, for each township.

Figure 32: <#AGENCYSHORT>'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.

Figure 33: Number of miles of unpaved road in each township divided in categories of roads with IBR numbers of 10, 9, and 8; IBR numbers of 7, 6, and 5; and IBR numbers of 4, 3, 2, and 1.

Figure 35, Figure 36, and Figure 52 are maps illustrating the geographic location of unpaved roads and the assessment of the IBR elements, respectively: surface width, drainage adequecy, and structural adequecy.

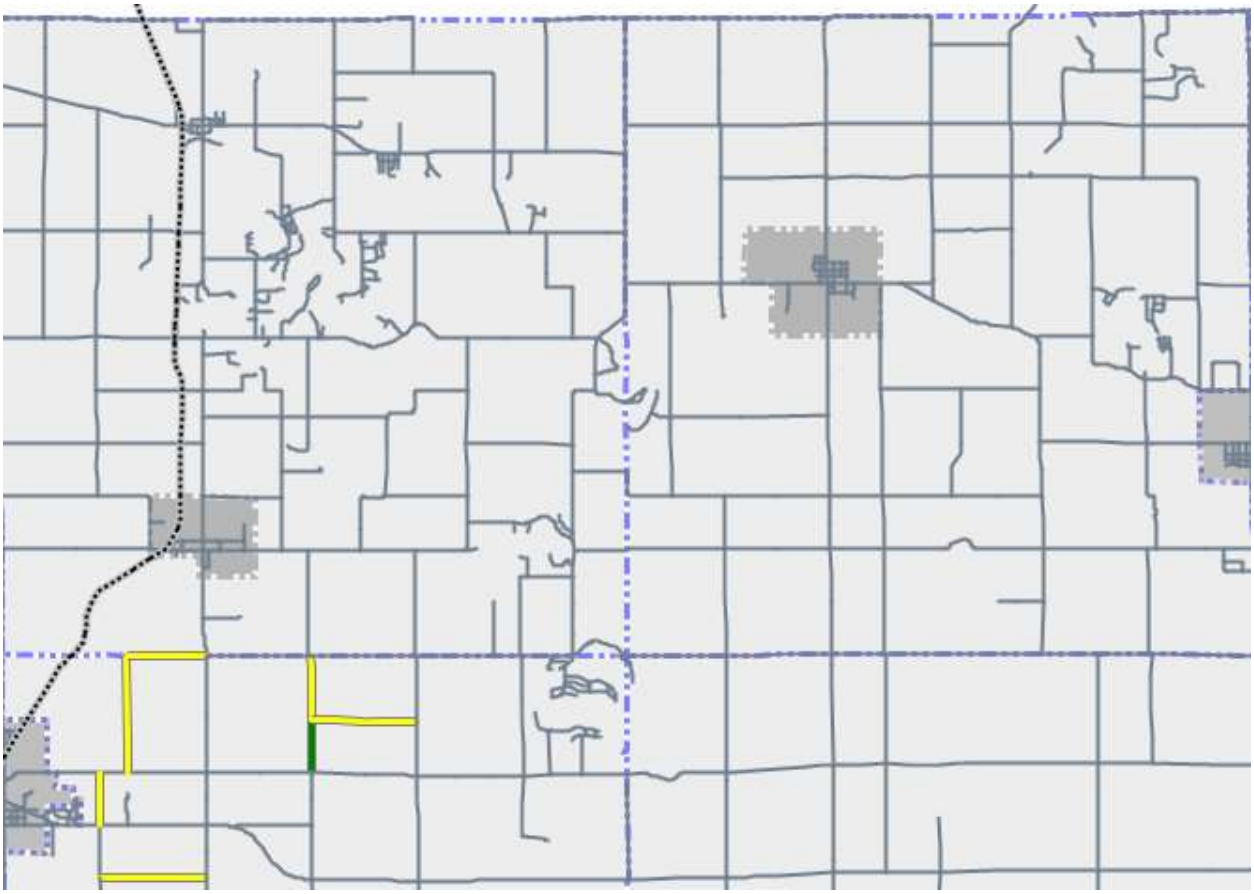


Figure 34: Map of the current IBR for surface width with good (22’ and greater) shown in green, fair (16’ to 21’) shown in orange, and poor (15’ or less) shown in red. Only unpaved roads owned by <#AGENCYSHORT> are shown.

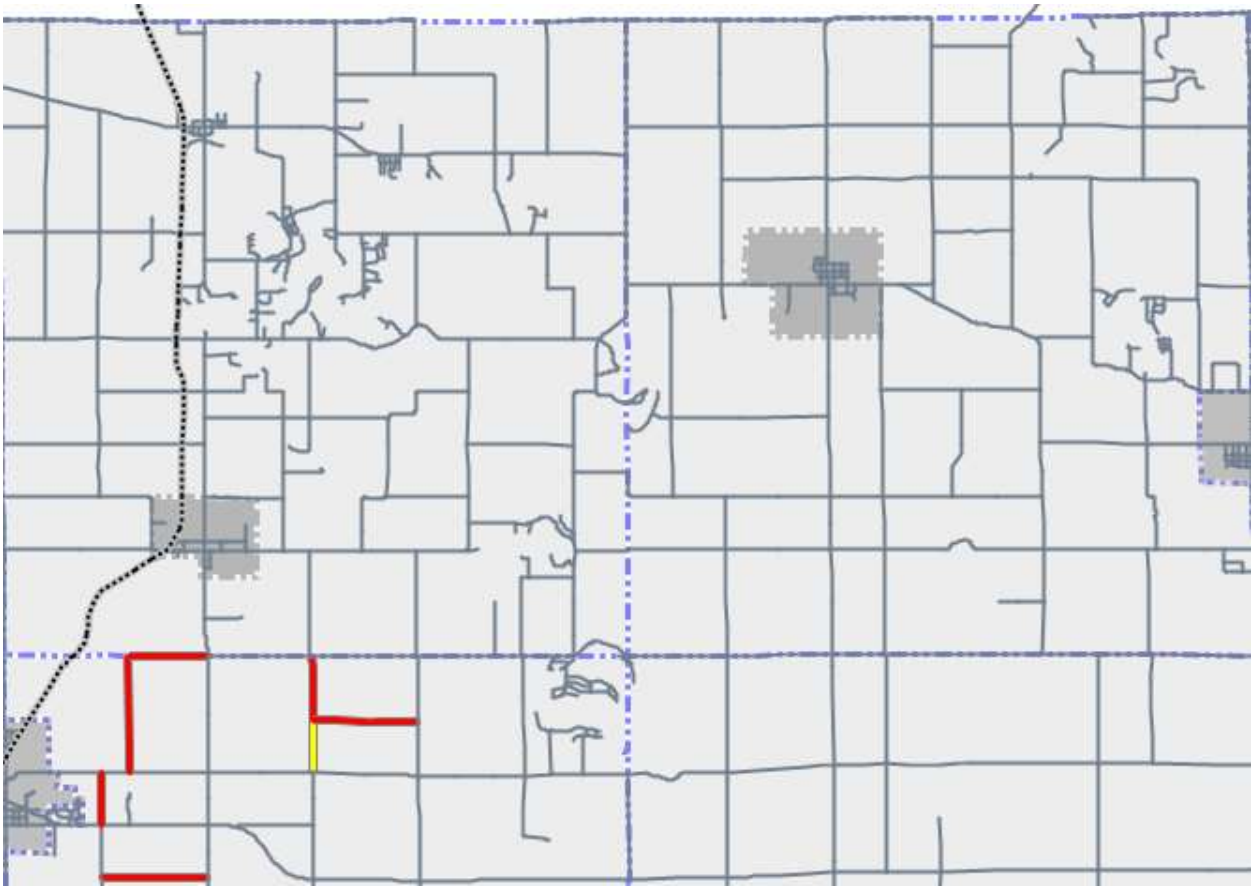


Figure 35: Map of the current IBR for drainage adequacy with good (2’ or more) shown in green, fair (0.5’ to less than 2’) shown in orange, and poor (less than 0.5’) shown in red. Only unpaved roads owned by <#AGENCYSHORT> are shown.

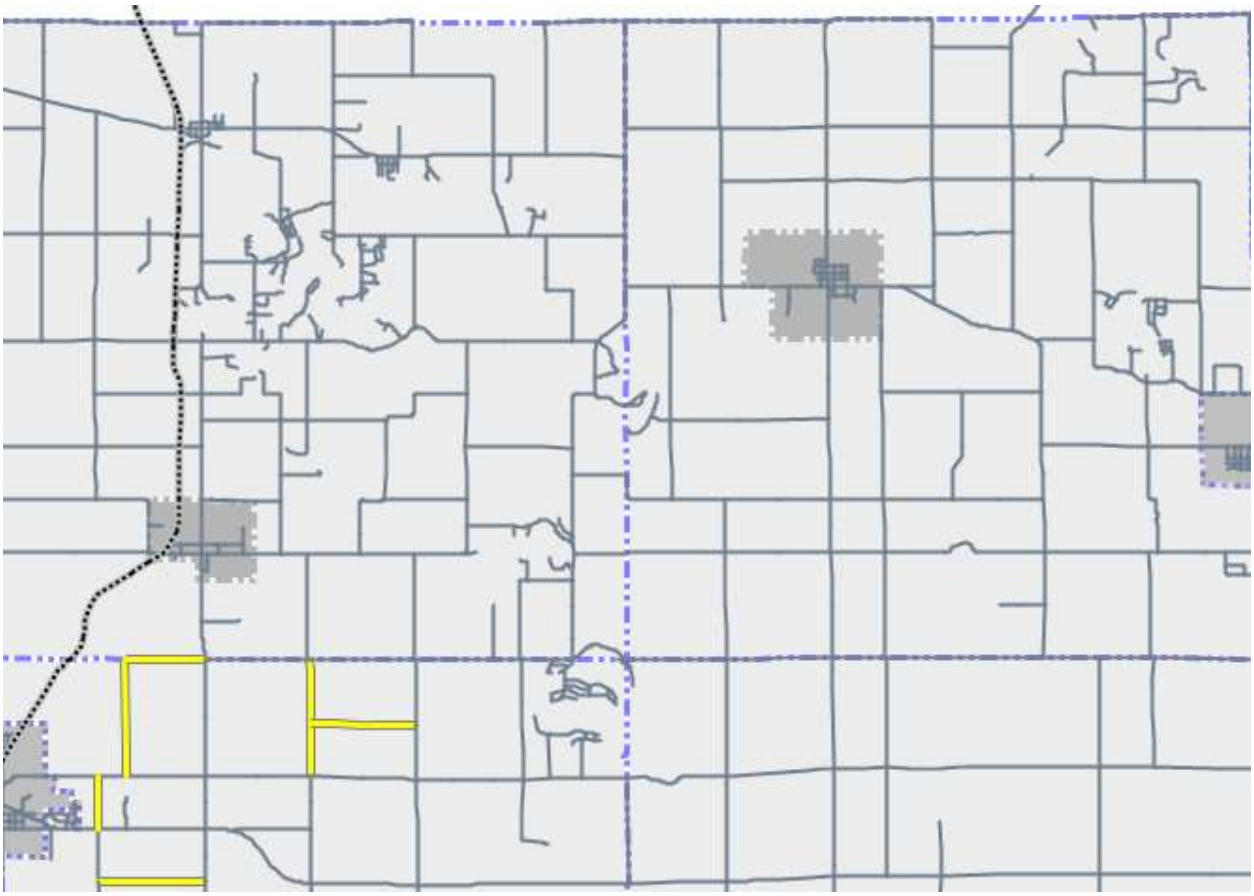


Figure 36: Map of the current IBR structural adequacy good (greater than 7”) shown in green, fair (4” to 7”) shown in orange, and poor (less than 4”) shown in red. Only unpaved roads owned by <#AGENCYSHORT> are shown.

<#YOUR CONTENT HERE: Explain the state of gravel roads in your network with respect to widening work, drainage work, and re-gravelling that may be apparent from the above data.>

Goals

Goals help set expectations to how pavement conditions will change in the future. Pavement condition changes are influenced by water infiltration, soil conditions, sunlight exposure, traffic loading, and repair work performed. <#AGENCYSHORT> is not able to control any of these factors fully due to seasonal weather changes, traffic pattern changes, and our 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 *Future Pavement Condition Trend* and *Alternate Strategy* sections of this plan.

Goals for Paved <#NETWORK1> Roads

<#YOUR CONTENT HERE: Discuss condition goals for your first network type with one of the optional guides. Use/modify content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

The overall goal for <#AGENCYSHORT>'s paved <#NETWORK1> road network is to maintain or improve road conditions network-wide at <#YEAR> levels. The baseline condition for this goal is illustrated in Figure 37.

Figure 37: <#AGENCYSHORT>'s <#YEAR> <#NETWORK1> road network condition by percentage of good/fair/poor

<#AGENCYSHORT>'s network-level pavement condition strategy for paved <#NETWORK1> roads is:

1. Prevent our good and fair (PASER 10 - 5) paved <#NETWORK1> from becoming poor (PASER 4 - 1).
2. Move <#YOUR CONTENT HERE: Insert percent in ## format> percent of paved <#NETWORK1> roads out of the poor category.

Goals for Paved <#NETWORK2> Roads

<#YOUR CONTENT HERE: Discuss condition goals for your second network type with one of the optional guides. Use/modify content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

The overall goal for <#AGENCYSHORT>'s paved <#NETWORK2> road network is to maintain or improve road conditions network-wide at <#YEAR> levels. The baseline condition for this goal is illustrated in Figure 38.

Figure 38: <#AGENCYSHORT> <#YEAR> paved <#NETWORK2> road network condition by percentage of good/fair/poor

<#AGENCYSHORT>'s network-level pavement condition strategy for paved <#NETWORK2> roads is:

1. Prevent our good and fair (PASER 10 - 5) paved <#NETWORK2> roads from becoming poor (PASER 4 - 1).
2. Move <#YOUR CONTENT HERE: Insert percent in ## format> percent of paved <#NETWORK2> roads out of the poor category.

Goals for Unpaved Roads

<#YOUR CONTENT HERE: Discuss condition goals for your unpaved road network with one of the optional guides. Use/modify content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

The overall goal for <#AGENCYSHORT>'s unpaved road network is to maintain or improve road conditions network-wide at <#YEAR> levels. The baseline condition for this goal is illustrated in Figure 39.

Figure 39: <#AGENCYSHORT>'s <#YEAR> unpaved road network condition by percentage of good/fair/poor

Our year-round unpaved roads will be maintained at their current structural adequacy assessments and current drainage adequacy assessments for roads where these two IBR elements are assessed as good or fair. Currently, <#YOUR CONTENT HERE: Insert percent in ## format> of our year-round unpaved roads have good or fair structural adequacy and <#YOUR CONTENT HERE: Insert percent in ## format> have good or fair drainage adequacy. Year-round unpaved roads that have either or both of these two categories assessed as poor will be strategically upgraded as funding is available to address, first, drainage issues and, then, structural issues. Surface widths will be addressed on an as-needed basis to provide service or to address safety issues. Seasonal roads will be addressed to provide passability and safety but do not have a goal associated with them.

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, <#AGENCYSHORT> must complete treatment projects that either protect and/or add life to our pavements. The year-end condition of the whole network depends upon changes or preservation of individual road section condition that preservation treatments have affected.

<#AGENCYSHORT> uses many types of repair treatments for our roads, each selected to balance costs, benefits, and road life expectancy. When agency trends are modelled, 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 <#AGENCYSHORT>'s financial resources can be found in the *5. Financial Resources* section.

Treatments and strategies that counter pavement-damaging forces include:

> **Structural improvement** is required for roads exhibiting alligator cracking and rutting and rated poor in the TAMC scale. Road rutting is evidence that the underlying structure is beginning to fail and it must be either rehabilitated with a structural treatment such as a crush and shape or totally reconstructed using the following types of structural treatments. Structural improvement

tools include hot-mix asphalt (HMA) overlay with/without overlay, crush and shape, and reconstruction. Those tools specific to treating concrete pavements include full-depth repair. Structural improvement tools for unpaved roads include ditching and gravel overlay.

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. CPM tools for paved roads include crack seal, fog seal, chip seal, slurry seal/microsurface, and partial-depth concrete repair or concrete spall repair. CPM tools for unpaved roads include maintenance grading and dust control.

Innovative treatments…<#YOUR CONTENT HERE: Detail the innovative treatments that your agency is employing. For example, this content may read like this: Our agency strives to be innovative with our pavement treatments by looking for ways to prevent pavement damage and save taxpayer dollars. One such innovation is undersealing, which was performed on a test section on Main Street in 2016. This treatment consists of chip seal that then has an HMA overlay applied. This treatment has been shown by the Minnesota Department of Transportation to delay old pavement cracks from reflecting up into new HMA overlays. We hope to gain favorable results from this trial on our roads and use this treatment as another one of our pavement preservation best practices.>

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.

For a more complete discussion on the pavement treatment tools, refer to the 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 <#YOUR CONTENT HERE: Explain the other factors that the agency may use for selection of projects><#YOUR CONTENT HERE: Explain the other factors that the agency may use for selection of projects>

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

Fix Type	Life Extension (in years)*			PASER
	Flexible	Composite	Rigid	
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

<#YOUR CONTENT HERE: If you are using the NCPP method and NOT Roadsoft—Use/modify applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

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 100 mile-years.

Paved <#NETWORK1> Roads

Table 2 illustrates the calculations for the NCPP Quick Check method of <#AGENCYSHORT>'s paved <#NETWORK1> road network. The treatments outlined in **Error! Reference source not found.** are the average treatment volume of planned projects scheduled to be completed in <#YOUR CONTENT HERE: Insert the range in years appropriate to your agency's circumstance. An example is: 2018-2020>. The *Planned Projects* section of this plan provides further detail. Results from the NCPP Quick Check for the paved <#NETWORK1> roads indicate the average volume of work that <#AGENCYSHORT> has been able to afford over the last five years, <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **is**, **is not**> keeping up with the natural deterioration of the road network due to age and use. Continuing the current treatment volume on this network will result in an ongoing <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **deficit**, **surplus**)> of <#YOUR CONTENT HERE: Insert the number of miles here, e.g. 100> mile-years of project benefit to stabilize this trend and maintain current conditions.

Table 2: NCPP Quick Check Method for Paved <#NETWORK1> Road Network – <#YOUR CONTENT HERE: Insert the number of miles in the network, e.g. 100> miles

Treatment Name	Average Yearly Miles of Treatment	Years of Life	Mile - Years
Crack Seal	50	1	50
Chip Seal	30	5	150
Overlay	10	10	100
Reconstruction	5	20	100
Total			**400**
(Deficit)/Surplus			**(100)**

The NCPP analysis of our planned projects from our currently-available budget <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **does**, **does not**> allows <#AGENCYSHORT> to reach its pavement condition goal given the projects planned for the next three years. <#YOUR CONTENT HERE: Explain why you can or cannot meet your goals. What can be done to help reach your goals if you have not been able to reach them thus far?>

Paved <#NETWORK2> Road

Table 3 illustrates the calculations for the NCPP Quick Check method of <#AGENCYSHORT>'s paved <#NETWORK2> road network. The treatments outlined in Table 3 are the average treatment volume of planned projects scheduled to be completed in <#YOUR CONTENT HERE: Insert the range in years appropriate to your agency's circumstance. An example is: 2018-2020>. The *Planned Projects* section of this plan provides further detail. Results from the NCPP Quick Check for the paved <#NETWORK2> roads indicate the average volume of work that <#AGENCYSHORT> has been able to afford over the last five years <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **is**, **is not**> keeping up with the natural deterioration of the road network due to age and use. Continuing the current treatment volume on this network will result in an ongoing <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **deficit**, **surplus**> of <#YOUR CONTENT HERE: Insert the number of miles here, e.g. 100> mile-years of project benefit to stabilize this trend and maintain current conditions.

Table 3: NCPP Quick Check Method for Paved <#NETWORK2> Road Network – <#YOUR CONTENT HERE: Insert the number of miles in the network, e.g. 100> miles

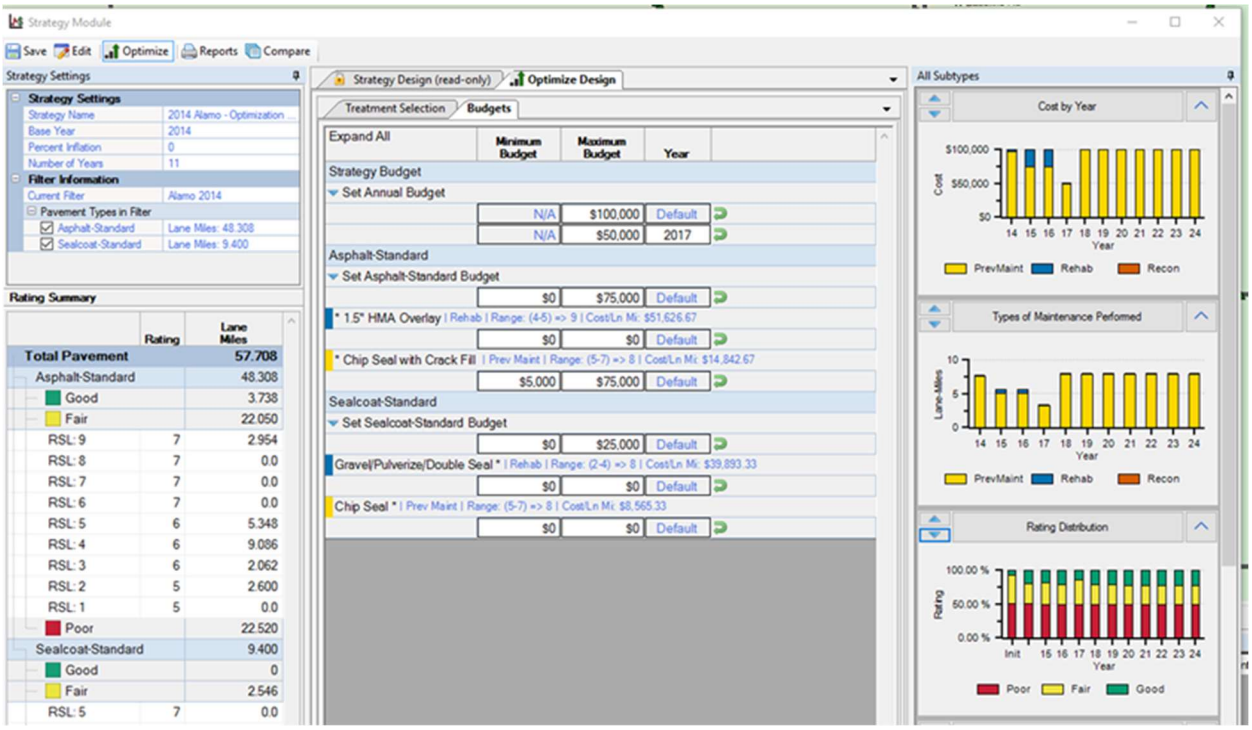
Treatment Name	Average Yearly Miles of Treatment	Years of Life	Mile - Years
Crack Seal	50	1	50
Chip Seal	60	5	300
Overlay	0	10	0
Reconstruction	1	20	20
Total			**370**
(Deficit)/Surplus			**(430)**

The NCPP analysis of our planned projects from our currently available budget <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: does, does not> allow <#AGENCY> to reach its pavement condition goals given the projects planned for the next three years.

<#YOUR CONTENT HERE: If you are using Roadsoft and NOT the the NCPP method—Use/modify applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

Roadsoft Pavement Condition Forecast to Forecast Future Trends

The <#AGENCYSHORT> uses Roadsoft, an asset management software suite, to manage road- and bridge-related infrastructure. Roadsoft is developed by Michigan Technological University and is available for Michigan local agencies at no cost to them. Roadsoft uses pavement condition data to drive



network-level deterioration models that forecast future road conditions based on planned construction and maintenance work. A screenshot of Roadsoft's pavement condition model and the associated output is shown in Figure 40.

Figure 40: Pavement condition forecast model in the software program Roadsoft.

Paved <#NETWORK1> Roads

Table 4 illustrates the network-level model inputs for Roadsoft on the HMA-paved <#NETWORK1> road network. Other pavement types in this network were neglected due to their small numbers relative to HMA pavements. The treatments outlined in Table 4 are the average treatment volume of planned

projects scheduled to be completed by <#YOUR CONTENT HERE: Insert the range in years appropriate to your agency's circumstance. An example is: 2018-2020>. See Appendix A of this plan for details on planned projects. Full model inputs and outputs are included in Appendix D.

Table 4: Roadsoft Annual Work Program for HMA Paved <#NETWORK1> Road Network Forecast

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger - Reset
Crack Seal	50	1	7-7
Chip Seal	60	5	5,6-8
Overlay	0	10	3,4-9
Reconstruction	1	18	1,2,3-10

Results from the Roadsoft network condition model for the <#NETWORK1> roads are shown in Figure 41. The Roadsoft network analysis of our planned projects from our currently-available budget <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **does, does not**> allow <#AGENCYSHORT> to reach its pavement condition goals given the projects planned for the next three years.

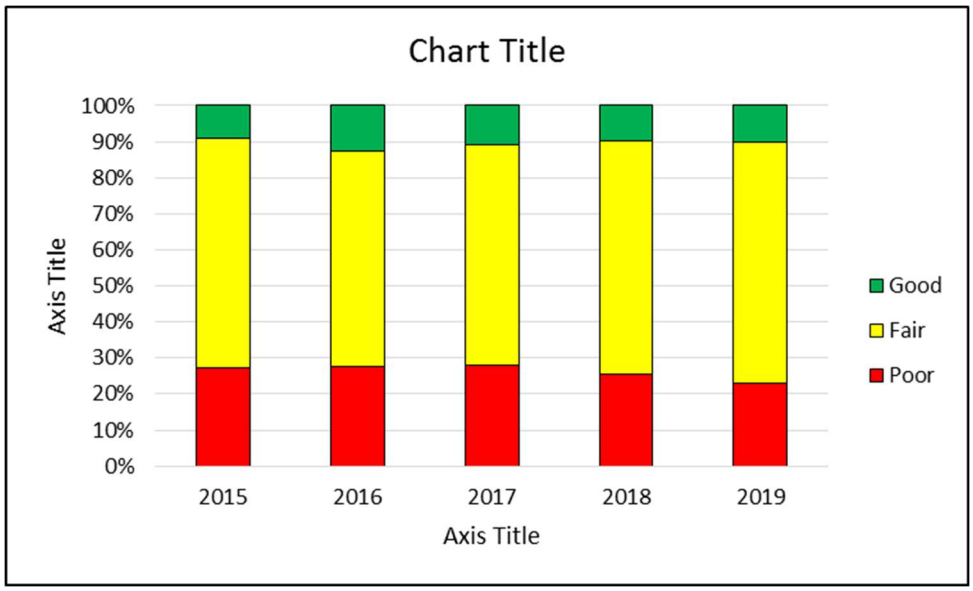


Figure 41: Forecast good/fair/poor Changes to <#AGENCYSHORT> Network Condition from planned projects on the <#NETWORK1> road network.

<#YOUR CONTENT HERE: Explain the condition trends shown in previous sections are related to the results of the Roadsoft model. Relate decreases or increase in overall condition of the network over the same period of time. Describe why there is an increase or decrease in condition.>

Paved <#NETWORK2> Road

A screenshot of Roadsoft's pavement condition model and the associated output is shown in Figure 42.

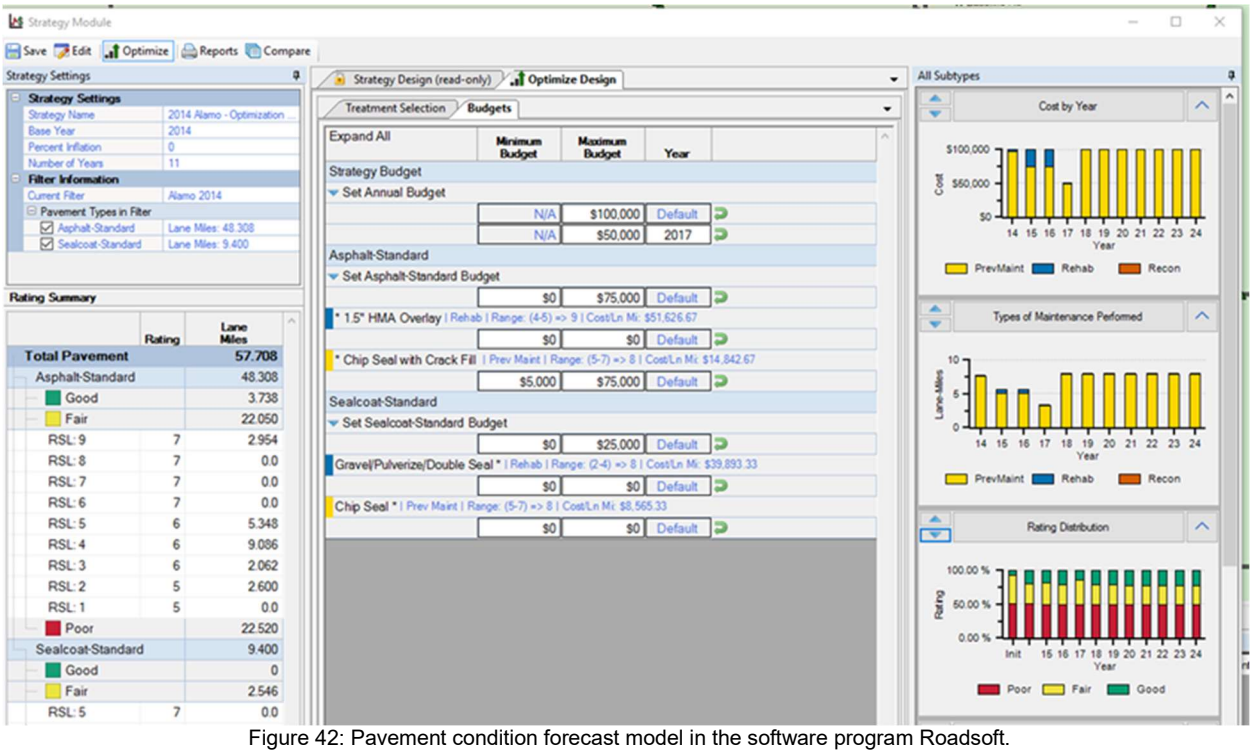


Figure 42: Pavement condition forecast model in the software program Roadsoft.

Table 5 illustrates the network-level model inputs for Roadsoft on the HMA-paved <#NETWORK2> road network. Other pavement types in this network were neglected due to their small numbers relative to HMA pavements. The treatments outlined in Table 5 are the average treatment volume of planned projects scheduled to be completed by <#YOUR CONTENT HERE: Insert the range in years appropriate to your agency's circumstance. An example is: 2018-2020>. Details on planned projects are included in Appendix A, and full model inputs and outputs are included in Appendix D.

Table 5: Roadsoft Annual Work Program for HMA-paved <#NETWORK2> Road Network Forecast

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger - Reset
Crack Seal	50	1	7-7
Chip Seal	60	5	5,6-8
Overlay	0	10	3,4-9
Reconstruction	1	18	1,2,3-10

Results from the Roadsoft network condition model for the paved <#NETWORK2> roads are shown in Figure 43. The Roadsoft network analysis of our planned projects from our currently available budget <#YOUR CONTENT HERE: Select from the following the word/phrase that best fits your agency's circumstance: **does**, **does not**> allow <#AGENCYSHORT> to reach its pavement condition goal given the projects planned for the next three years.

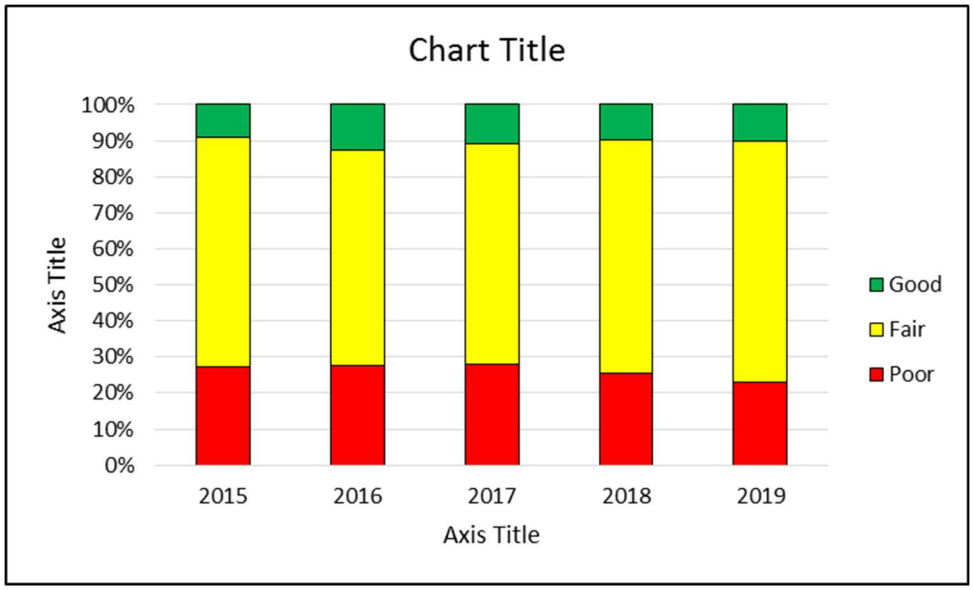


Figure 43: Forecast good/fair/poor Changes to <#AGENCYSHORT> Network Condition from planned projects on the paved <#NETWORK2> road network.

<#YOUR CONTENT HERE: Explain the condition trends shown in previous sections and how they are related to the results of the Roadsoft model. Relate decreases or increase in overall condition of the network over the same period of time. Describe why there is an increase or decrease in condition.>

<#YOUR CONTENT HERE: If you are using neither Roadsoft nor the NCPP method but another method—Create applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

Title - Heading 4

Body

<#YOUR CONTENT HERE: If unpaved roads condition trends are applicable for your agency's plan—Use and/or modify content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

Unpaved Road Condition Trends

<#YOUR CONTENT HERE: Since only a limited unpaved road condition history is likely, explain the expected condition trends on the unpaved road network. Explain the strategy for maintaining gravel roads and the general quantity of work involved.>

Planned Projects

The <#AGENCYSHORT> plans construction and maintenance projects several 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 <#NETWORK1> 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 storm water discharges, and other regulatory and administrative requirements.

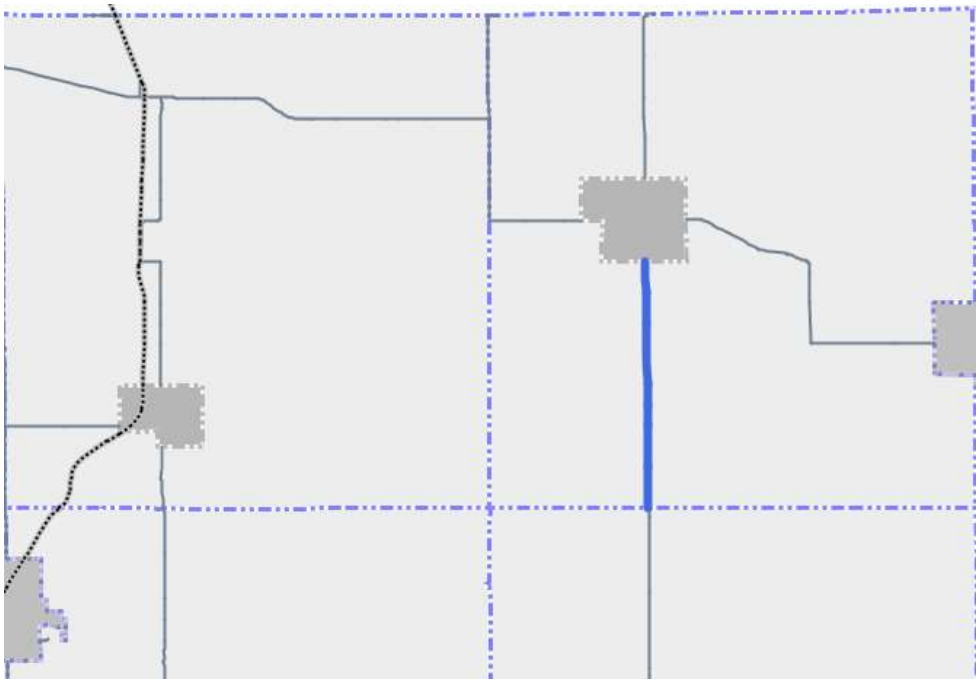
Per PA 499 of 2002 (later amended by PA 199 of 2007), road projects for the upcoming three years are required to be reported annually to the TAMC. Planned projects represent the best estimate of future activity; however, changes in design, funding, and permitting may require the <#AGENCYSHORT> to alter initial plans. Project planning information is used to predict the future condition of the road networks that the <#AGENCYSHORT> maintains. 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 <#YOUR CONTENT HERE: Insert Year Span>, <#AGENCYSHORT> plans to do the following projects:

Paved <#NETWORK1> Projects

The <#AGENCYSHORT> is currently planning the construction and maintenance projects listed in Appendix A for the paved <#NETWORK1> road network. The locations of these projects are shown in Figure 44, Figure 45, and Figure 46. The total cost of these projects is approximately <#YOUR CONTENT HERE: Insert your cost in $ XXX,XXX format>.

Figure 44: Map showing paved <#NETWORK1> road projects planned for 2018
Figure 45: Map showing paved <#NETWORK1> road projects planned for 2019.



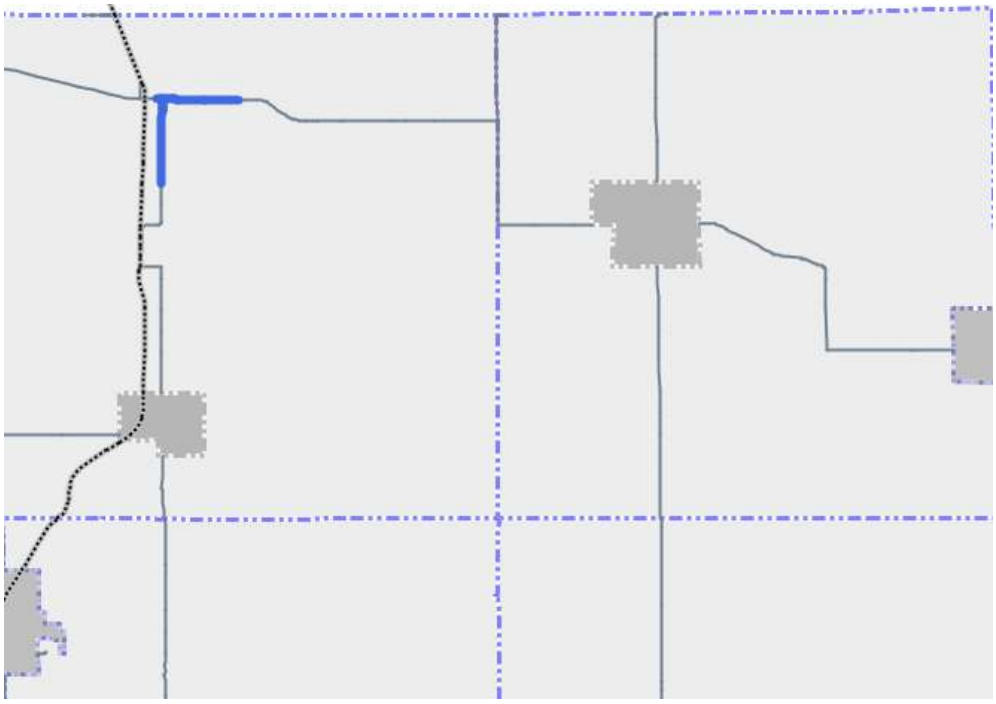


Figure 46: Map showing paved <#NETWORK1> road projects planned for 2020.

Paved <#NETWORK2> Projects

The <#AGENCYSHORT> is currently planning the construction and maintenance projects listed in Appendix B for the paved <#NETWORK2> road network. The locations of these projects are shown in Figure 47, Figure 48, and Figure 49. The total cost of these projects is approximately <#YOUR CONTENT HERE: Insert your cost in $ XXX,XXX format.>.

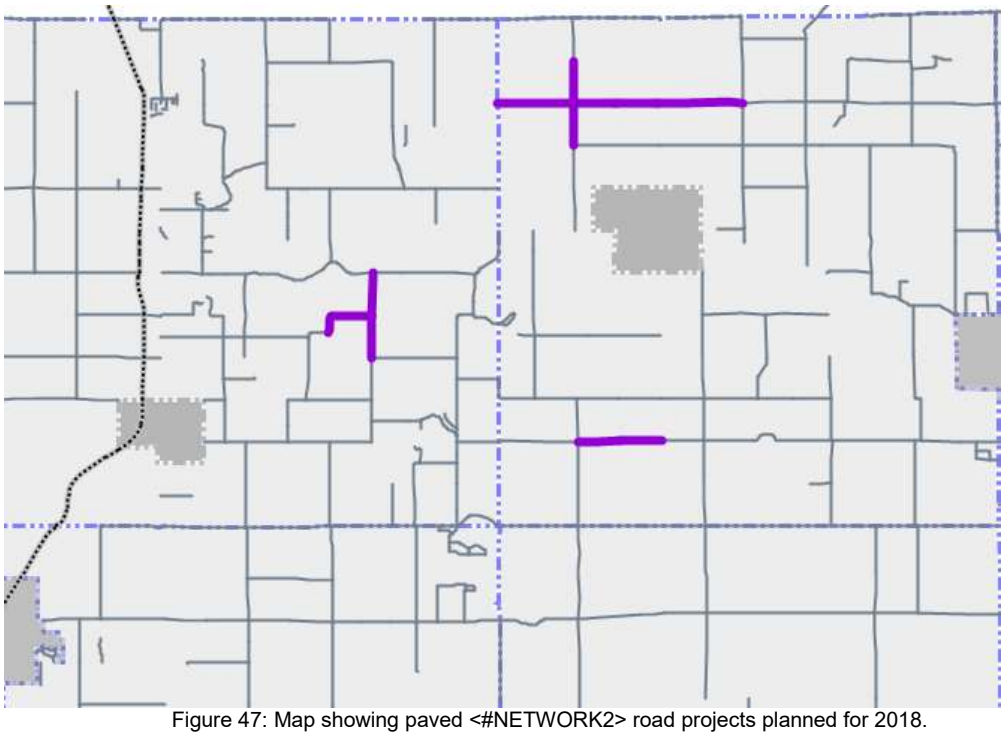


Figure 47: Map showing paved <#NETWORK2> road projects planned for 2018.

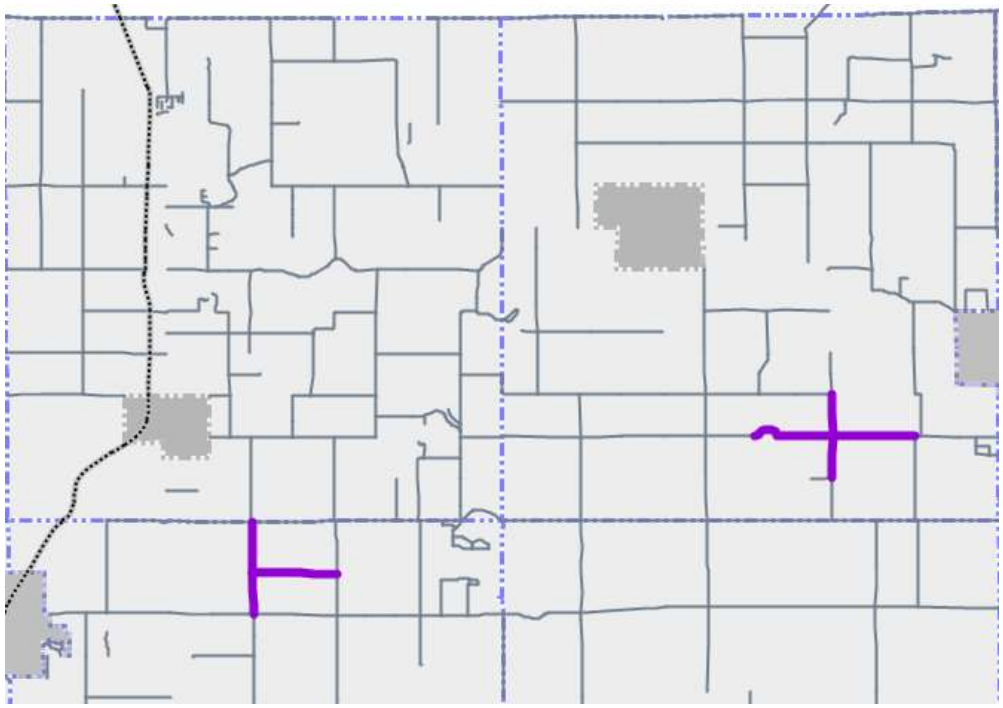


Figure 48: Map showing paved <#NETWORK2> road projects planned for 2019.

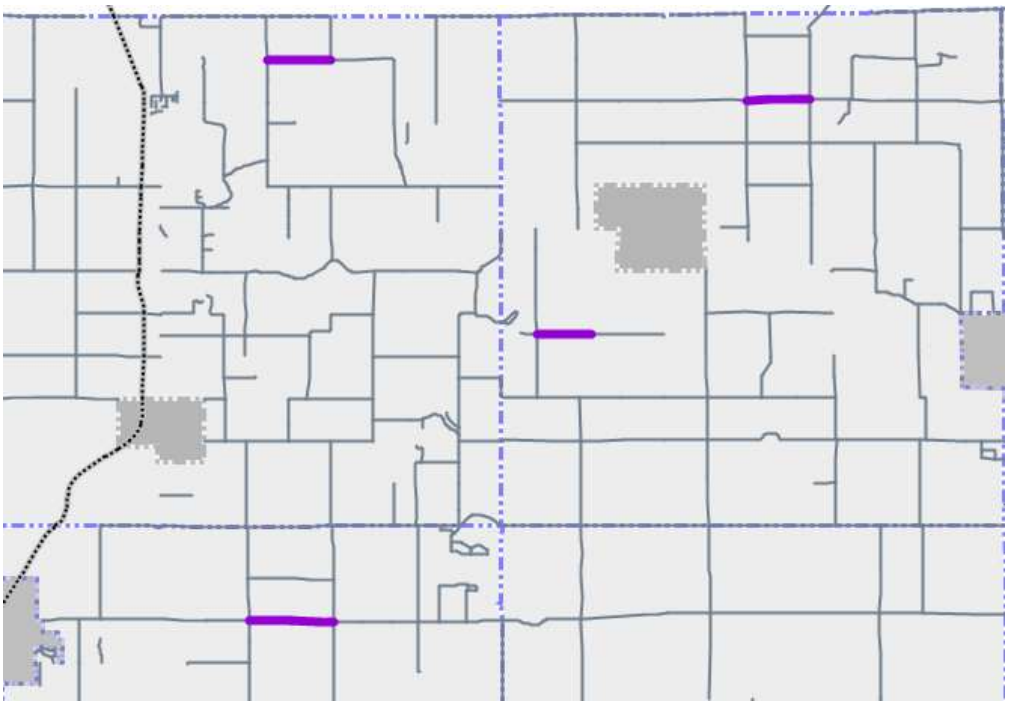


Figure 49: Map showing paved <#NETWORK2> road projects planned for 2020.

Unpaved Road Projects

The <#AGENCYSHORT> is currently planning the construction and maintenance projects listed in Appendix C for the unpaved road network. The location of these projects are shown in Figure 50. The total cost of these projects is approximately <#YOUR CONTENT HERE: Insert your cost in $ XXX,XXX format>.

<#YOUR CONTENT HERE: Detail the significant projects your agency plans to complete, address differences in project volume between your Federal-aid paved, non-Federal-aid paved, and/or unpaved road networks.>

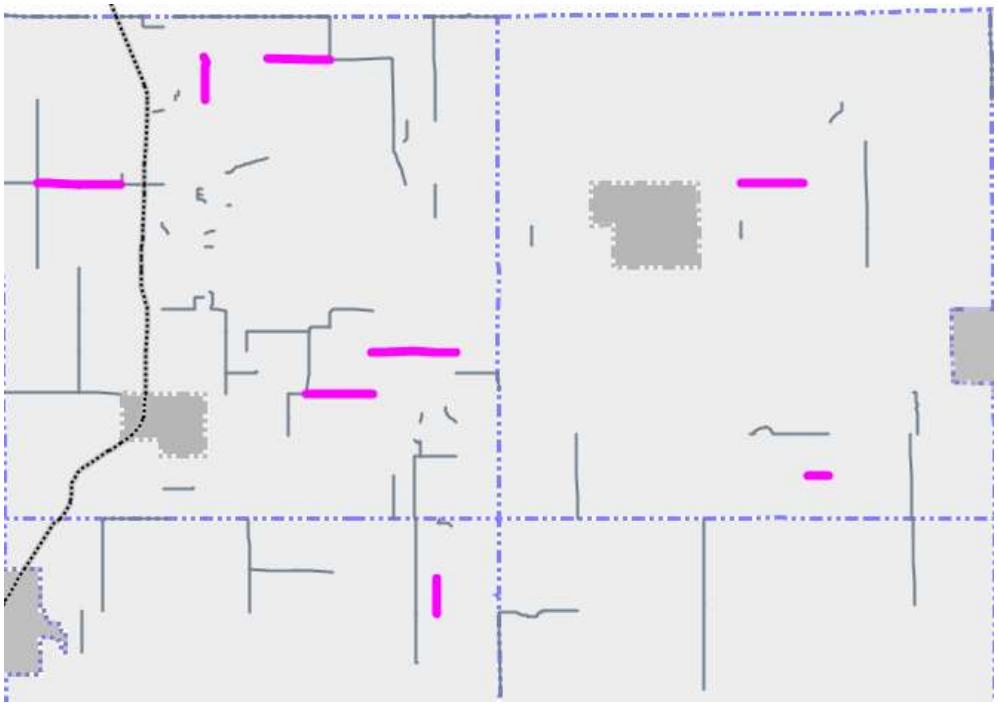


Figure 50: Map showing unpaved road projects planned for 2018-2020.

More detailed information on these projects can be found in Appendix ##.

Gap Analysis

The current funding levels that <#AGENCYSHORT> receives are not sufficient to meet the goals for the paved <#NETWORK1> road network, the paved <#NETWORK2> road network, and the unpaved road network. The *1. Pavement Assets: Goals* section of this plan provides further detail about the goals and the *1. Pavement Assets: Modelled Trends* section provides further detail on the shortfall given the current budget. However, <#AGENCYSHORT> believes that the overall condition of this network can be maintained or improved with additional funding for construction and maintenance. An alternate strategy may be used to overcome the current shortfall and meet the goals on the paved <#NETWORK1> road network, the paved <#NETWORK2> road network, and the unpaved road network:

<#YOUR CONTENT HERE: If you are using the NCPP method and NOT Roadsoft—Use/modify applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

NCPP Network Quick Check to Meet Goals on the Paved <#NETWORK2> Network

The NCPP Quick Check can be used as an indicator of potential change in future pavement conditions based on the planned maintenance and construction work and the network size. This method is described in the *1. Pavement Assets: Modelled Trends* section of this plan and further detailed in Appendix D.

Table 6 in the *1. Pavement Assets: Modelled Trends* section of this plan illustrates the results of the NCPP Quick Check method. It shows that there will be a deficit of <#YOUR CONTENT HERE: Insert the number of deficit mile years appropriate to your agency's circumstance (e.g., 430)> mile-years of improvement on the paved <#NETWORK2> road network. To maintain current road conditions, this deficit must be overcome with a combination of maintenance and construction work.

Table 6: NCPP Quick Check Method for Paved <#NETWORK2> Road Network – <#YOUR CONTENT HERE: Insert the number of miles in the network, e.g. 100> miles—Future Annual Planned Work & Additional Work Needed to Overcome Deficit

Additional Annual Work Necessary To Overcome Deficit			
Treatment Name	**Average Yearly Miles of Treatment**	**Years of Life**	**Mile - Years**
Crack Seal	50	1	50
Chip Seal	60	5	300
Overlay	0	10	0
Reconstruction	1	20	20
Total			**370**
(Deficit)/Surplus			**(430)**
Additional Annual Work Necessary To Overcome Deficit			
Chip Seal	40	5	200
Overlay	13	10	130
Reconstruction	5	20	100
Total			**430**
(Deficit)/Surplus			**0**

Table 6 outlines the additional project work that would be required for the paved <#NETWORK2> road network to meet its goal of maintaining <#YOUR CONTENT HERE: Insert the year appropriate to your agency's circumstance> road conditions. This additional work is anticipated to cost approximately <#YOUR CONTENT HERE: Insert the cost appropriate to your agency's circumstance in $XXXXXX format> per year.

<#YOUR CONTENT HERE: If you are using Roadsoft and not the NCPP method—Use/modify applicable content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

Roadsoft Pavement Condition Forecast for the Paved <#NETWORK2> Network

The <#AGENCYSHORT> used Roadsoft to forecast the necessary additional construction and maintenance work for meeting agency goals on the paved <#NETWORK2> road network. Table 7 illustrates the network-level model inputs used for this simulation (Table 9). Full model inputs and outputs are included in Appendix D.

Table 7: Roadsoft Annual Work Program for HMA Paved <#NETWORK2> Road Network Forecast

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger - Reset
Crack Seal	50	1	7-7
Chip Seal	100	5	5,6-8
Overlay	13	10	3,4-9
Reconstruction	6	18	1,2,3-10

Results from the Roadsoft network condition model given the inputs in Table 7 are shown in Figure 51 below. Results indicate that the necessary additional work needed to meet the agency condition goal would cost and additional <#YOUR CONTENT HERE: Insert the cost appropriate to your agency's circumstance in $XXX,XXX format> per year.

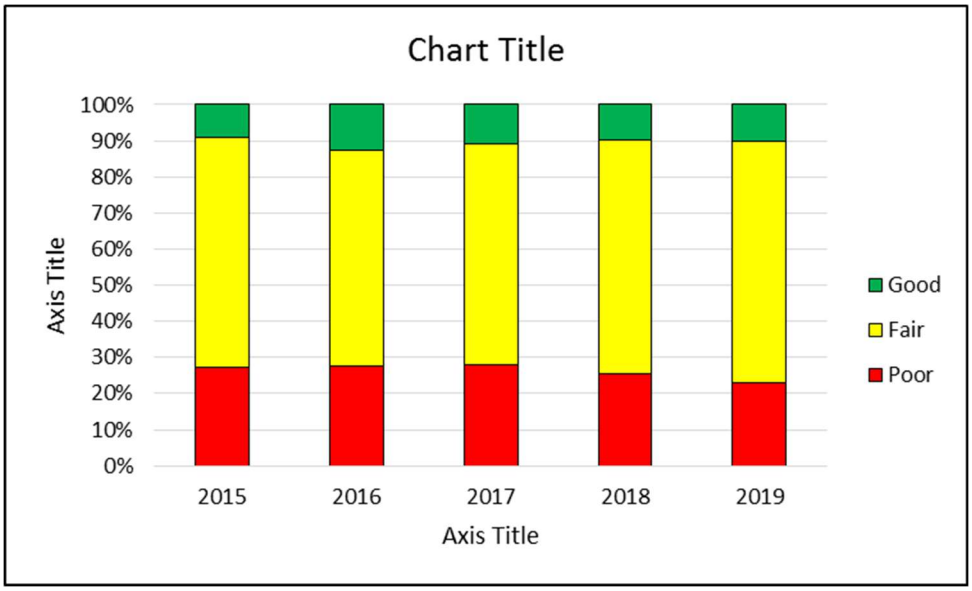


Figure 51: Forecast good/fair/poor Changes to <#AGENCYSHORT> Network Condition from planned projects on the <#NETWORK2> paved road network.

<#YOUR CONTENT HERE: Explain the condition trends shown in previous sections and how they relate to the results of the Roadsoft model. Relate decreases or increase in overall condition of the network over the same period of time. Describe why there is an increase or decrease in condition.>

2. BRIDGE ASSETS

<#AGENCYSHORT> seeks to implement a cost-effective program of preventive maintenance to maximize the useful service life of the local bridges under its jurisdiction. A comprehensive asset management plan for <#AGENCYSHORT>'s bridge network is available <#YOUR CONTENT HERE: in Appendix ##/on our website or by request from our agency's office>.

Inventory of Assets

Locations and sizes of each asset can be found in <#AGENCYSHORT>'s MiBRIDGE database. For more detail, please contact:

Insert contact info

The current condition of <#AGENCYSHORT>'s bridge network is <##ofGOOD> structures rated good, <##ofFAIR> structures rated fair, and <##ofPOOR> structures rated poor according to the National Bridge Inspection Standards rating scale.

Bridges are designed to carry legal loads in terms of vehicles and traffic. Due to a decline in condition, a bridge may be "posted" with a restriction for what would be considered safe loads passing over the bridge. On occasion, posting a bridge may also restrict other load-capacity-related elements like speed and number of vehicles on the bridge, but this type of posting designates the bridge differently. <#AGENCYSHORT> has <##ofPOSTED> structures that are posted for load restriction. Designating a bridge as "posted" has no influence on its condition rating. A "closed" bridge is one that is closed to all traffic. Closing a bridge is contingent upon its ability to carry a set minimum live load.

Goals

The goal of the program is the preservation of our bridge network. <#AGENCYSHORT> is responsible for <##ofStructures> structures.

Modelled Trends and Planned Projects

<#AGENCYSHORT> received <##TOTALBRIDGEFUNDING> in total funding. Preventive maintenance is a more effective use of these funds that the costly alternative of major rehabilitation or replacement. Since <#AGENCYSHORT> recognizes that limited funds are available for improving the bridge network, we seek to identify those bridges that will benefit from a planned maintenance program and we plan to spend <##DOLLARSALLOTTED> per year for the next three years on preventive maintenance of bridges. <#AGENCYSHORT> plans to replace <##REPLACEBRIDGE> bridges within the next three years at a cost of <##COSTTOREPLACE> dollars. By performing the aforementioned preventive maintenance and replacement of bridge structures, <#AGENCYSHORT> should achieve its goal of keeping its overall bridge network at the same condition.

3. CULVERT ASSETS

<#YOUR CONTENT HERE: Include a short description of the state of assets in your agency here. Note that the TAMC currently does not require a formal management plan of culvert assets. Per their September 12, 2018 letter from TAMC Chair Joanna Johnson, local agencies are only required to include a short description of the state of these assets. The TAMC estimates there are approximately 1.81 culverts per centerline mile for counties, and 0.95 culverts per centerline mile for cities. For more details on these estimates see the 2018 Michigan Local Agency Culvert Inventory Pilot Evaluation Report on the TAMC's website.>

<#AGENCYSHORT> exercises awareness of its culvert assets.

Inventory of Assets

Locations, types, and sizes of each asset can be found in <#AGENCYSHORT>'s <#CHOOSE: Roadsoft database/asset tracking spreadsheet/ledgers>. For more detail, please contact:

Insert contact info

At present, <#AGENCYSHORT> tracks inventory data of their culvert assets only.

At present, <#AGENCYSHORT> tracks inventory and condition data of their culvert assets. Of our tracked and rated culverts, <#AGENCYSHORT> has <##ofGOODC> culverts considered good, <##ofFAIRC> culverts considered fair, <##ofPOORC> culverts considered poor, and <##ofFAILEDC> culverts considered failed based on the culvert rating system we use (see the Introduction's Culvert Primer).

Goals

The goal of the <#AGENCYSHORT>'s asset management program is the preservation of our culvert network. <#AGENCYSHORT> is responsible for preserving <##ofCULVERTS> inventoried culverts as well as any uninventoried culverts that underlie our entire road network.

Planned Projects

<#AGENCYSHORT>'s policy is to replace or repair culvert assets concurrent with projects affecting road segments carried by the particular culverts. <#AGENCYSHORT> also includes culvert assets in scheduled maintenance projects affecting road segments carried by the particular culverts.

4. TRAFFIC SIGNAL ASSETS

<#YOUR CONTENT HERE: Include a short description of the state of your traffic signal assets here. Note that the TAMC currently does not require a formal management plan of traffic signal assets. Per their September 12, 2018 letter from TAMC Chair Joanna Johnson, local agencies are only required to include a short description of the state of these assets. If known, list the approximate number of signals in the agency.>

<#AGENCYSHORT> exercises awareness of its traffic sign and signal assets.

Inventory of Assets

Locations and element data of each asset can be found in <#AGENCYSHORT>'s <#CHOOSE: Roadsoft database/asset tracking spreadsheet/ledgers>. For more detail, please contact:

Insert contact info

At present, <#AGENCYSHORT> tracks only inventory data for traffic signals.

At present, <#AGENCYSHORT> tracks inventory and condition data for traffic signals. Of our <##ofSIGNALS> tracked and rated traffic signals, <#AGENCYSHORT> has <##ofSIGNALSpass> signals in passing condition and <##ofSIGNALSfail> signals with one or multiple elements in failing condition.

Goals

The goal of the <#AGENCYSHORT>'s asset management program is the preservation of our traffic signals. <#AGENCYSHORT> is responsible for preserving <##ofTOTALSIGNALS> inventoried traffic signals as well as any uninventoried traffic signals along our entire road network.

Planned Projects

<#AGENCYSHORT>'s policy is to evaluate traffic signal assets based on condition assessment for replacement or repair during any reconstruction, rehabilitation, preventive maintenance, of schedule maintenance activities on the roadway affected by the particular signal. We also conduct replacements or repairs for those traffic signal assets reported as non-functional or as performing with reduced function. <#AGENCYSHORT> adheres to regular maintenance and servicing policies outlined in the Michigan Manual of Uniform Traffic Control Devices.

5. 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. Therefore, the <#AGENCYSHORT> will overview its general expenditures and financial resources currently devoted to pavement maintenance. This financial information is not intended to be a full financial disclosure or a formal report. Full details of <#AGENCYSHORT>'s financial status can be found at: <#YOUR CONTENT HERE: Insert a web link for your agency's full financial report>.

Anticipated Revenues

The <#AGENCYSHORT>'s principal source of transportation funding is received from the Michigan Transportation Fund (MTF). This fund is supported by vehicle registration fees and the state's per-gallon gas tax. Allocation from the MTF are distributed to state and local governmental units based on a legislated formula, which includes factors such as population, miles of certified roads, and vehicle registration fees for vehicles registered in the agency's jurisdiction.

<#YOUR CONTENT HERE: If you are an agency contracting with MDOT, use and modify this content by right-clicking the content control and then "Remove Control". Otherwise, select the control handle and use your Delete key; if desired, write alternate text.>

The <#AGENCYSHORT> receives revenue from the Michigan Department of Transportation to maintain (e.g. plow, patch, mow) the state trunklines within our jurisdictional boundary. Revenue from these maintenance contracts are received on a time and materials basis as resources are expended to maintain the State's roads. While these contracts do not allow for capital gain (profit) and only bring in revenue to cover the cost of the work, they do provide a benefit to <#AGENCYSHORT> by allowing an economy of

scale that enables us to provide better service at a lower cost for <#AGENCYSHORT>'s roads while allowing the same for the State of Michigan.

Many local agencies in Michigan use local tax millages to supplement their road-funding budget. These taxes can provide for additional construction and maintenance for new or existing roads that are also funded using MTF or MDOT funds. <#AGENCYSHORT> <#YOUR CONTENT HERE: Select one of the following words/phrases that reflects whether your agency has a local tax millage: **has**, **does not have**> local tax millages in their road-funding budget. <#YOUR CONTENT HERE: Write an explanation of the millage(s) in your agency's jurisdiction and the intended use of the funds.>

Other sources of transportation funds that <#AGENCYSHORT> receives are:

- Federal and state grants for individual projects. These are typically competitive funding applications that are targeted at a specific project type to accomplish a specific purpose. These may include safety enhancement projects, economic development projects, or other targeted funding.
- Construction project funding from private developers or governmental entities for specific improvements. This category includes funding received to mitigate the impact of commercial developments as a condition of construction of a specific development project, and can include funds from a special assessment district levied by another governmental unit.
- Permit fees, which generally cover the cost of a permit application review.
- Interest from invested funds.
- Funds from partner agencies who contract with our agency to construct or maintain their roads, or roads under joint or neighboring jurisdictions.

Table 8 lists the anticipated revenues for the <#FISCALYR> fiscal year.

Table 8: Anticipated Revenues for <#FISCALYR> Fiscal Year			
Revenue Source	**Estimated ($)**	**County**	**Cities and Villages**
State Funds		MFT funds (engineering, snow removal urban road and allocation) Local bridge Economic Development Funds • Target industries (A) • Urban congestion (C) • Rural primary (D) • Forest road (E) • Urban area (F) Other	State Grants (MFT allocation, winter maintenance, local bridges, economic development, and metro funds)
Federal Funds		Surface Transportation Program (STP) C Funds D Funds Bridge High Priority Other	MDOT payments to private contractors Negotiated contracts
Contributions from Local Units		City and village contributions Township contributions Other contributions County-wide millage taxes Other taxes Special assessments County appropriations Bond proceeds Note proceeds	Tax levies Special assessments Contributions from counties Contributions from adjacent Governmental units City general fund transfers City municipal street funds Capital improvement funds Bond proceeds
Interest, Rents and Other		Licenses and permits Salvage sales Interest earned Property rentals Land and building sales Sundry refunds Gain or loss on equipment Disposition Contributions from private sources Installment purchases and leases Other financing	Interest Equipment installment Purchase proceeds Miscellaneous Other
Charges for Services		Trunkline maintenance Trunkline non-maintenance	State trunkline preservation
Total			

Anticipated Expenses

<#AGENCYSHORT> is required to report transportation fund expenditures to the State of Michigan using a prescribed format with predefined expenditure categories. The definitions of these categories according to Public Act 51 of 1951 may differ from common pavement management nomenclature and practice. For the purposes of reporting under PA 51, the expenditure categories are:

Construction/Capacity Improvement Funds– According to PA 51 of 1951, this financial classification of projects includes, "new construction of highways, roads, streets, or bridges, a project that increases the capacity of a highway facility to accommodate that part of traffic having neither an origin nor destination within the local area, widening of a lane width or more, or adding turn lanes of more than 1/2 mile in length."[27]

Preservation and Structural Improvement Funds – Preservation and structural improvements are "activit[ies] undertaken to preserve the integrity of the existing roadway system."[28] Preservation includes items such as a reconstruction of an existing road or adding structure to an existing road. Pavement treatments that may fall into this classification include crush and shape or HMA overlay projects. Descriptions of these types of projects can be found in the Introduction's *Pavement Primer*.

Routine and Preventive Maintenance Funds – Routine maintenance are "actions performed on a regular or controllable basis or in response to uncontrollable events upon a highway, road, street, or bridge".[29] Routine maintenance may include items such as mowing, pothole patching and grading. Preventive maintenance activities are "planned strategy[ies] of cost-effective treatments to an existing roadway system and its appurtenances that preserve assets by retarding deterioration and maintaining functional condition without significantly increasing structural capacity".[30] Pavement treatments that may fall into this classification include chip sealing, crack sealing and concrete patching. Descriptions of these types of projects can be found in the Introduction's *Pavement Primer*.

Winter Maintenance Funds– Expenditures for snow and ice control.

Trunkline Maintenance Funds – Expenditures spent under our maintenance agreement with MDOT for maintenance we perform on MDOT trunkline routes.

Administrative Funds – There are specific items that can and cannot be included in administrative expenditures as specified in PA 51 of 1951. The law also states that the amount of MTF revenues that are spent on administrative expenditures is limited to 10 percent of the annual MTF funds that are received.

[27] Public Act 51 of 1951, 247.660c Definitions
[28] Public Act 51 of 1951, 247.660c Definitions
[29] Public Act 51 of 1951, 247.660c Definitions
[30] Public Act 51 of 1951, 247.660c Definitions

Other Funds– Expenditures for equipment, capital outlay, debt principal payment, interest expense, contributions to adjacent governmental units, principal, interest and bank fees, and miscellaneous for cities and villages.

Expenditures are broken down below for <#FISCALYR> in Table 9. Figure 52 and Figure 53 illustrate historical expenditures and historical funding sources respectively for the past three years.

Table 9: Expenditures by Fiscal Year

Expenditure Item	<#FISCALYR> Cost	Percent of Total
CCI – Construction & Capacity Improvement	<#exCCI>	<#exCCIP>
PSI – Preservation & Structural Improvement	<#exPSI>	<#exPSIP>
Routine – Routine Maintenance	<#exRM>	<#exRMP>
Winter – Winter Maintenance	<#exW>	<#exWP>
Trunkline – Trunkline Maintenance	<#exTL>	<#exTLP>
Admin – Administrative	<#exADM>	<#exADMP>
Other	<#exO>	<#exOP>

Figure 52: Historical expenditure categories

Figure 53: Historical revenue sources

<#YOUR CONTENT HERE: It is highly recommended that you include a discussion of your financial trends. Use/modify content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

Historical Trends

<#YOUR CONTENT HERE: Explain the historical trends. How have funding levels changed in the past five years? How have the costs of maintaining their roads changed in the past five years? Detail your agency's historical equipment costs, snow removal costs, construction costs, and others?>

MTF Funding Trends

<#YOUR CONTENT HERE: Explain the MTF trends in your agency's budget. Is the historical trend of the MTF going up or down? For information on the MTF, visit http://www.michigan.gov/mdot/0,4616,7-151-9620_67094---,00.html and select "New Revenue Package". How is the MTF divided out between MDOT, counties, and cities?>

Local Agency Funds

<#YOUR CONTENT HERE: Explain local agency funding that impacts your budget. Have there been any specific millage approvals or proposals that may change the financial outlook? Are there any private development projects or partnering projects that will add significantly to the overall network condition?>

6. RISK OF FAILURE ANALYSIS

Transportation infrastructure is designed to be resilient. The system of interconnecting roads and bridges maintained by <#AGENCYSHORT> provides road users with multiple alternate options in the event of an unplanned disruption of one part of the system. There are, however, key links in the transportation system that may cause significant inconvenience to users if they are unexpectedly closed to traffic. Figure 54 illustrates the key transportation links in <#AGENCYSHORT>'s road network, including those that meet the following types of situations:

- **Geographic divides:** 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:** Roads which are routinely used as alternate routes for high volume roads or roads that are included in an emergency response plan
- **Limited access areas:** Roads that serve remote or limited access areas that result in long detours if closed
- **Main access to key commercial districts:** Areas where large number or large size business will be significantly impacted if a road is unavailable.

Our road network includes the following critical assets: <#YOUR CONTENT HERE: Explain the condition of these links and any mitigating factors or plans that could be used to lessen the impact of a failure> (see Figure 54).

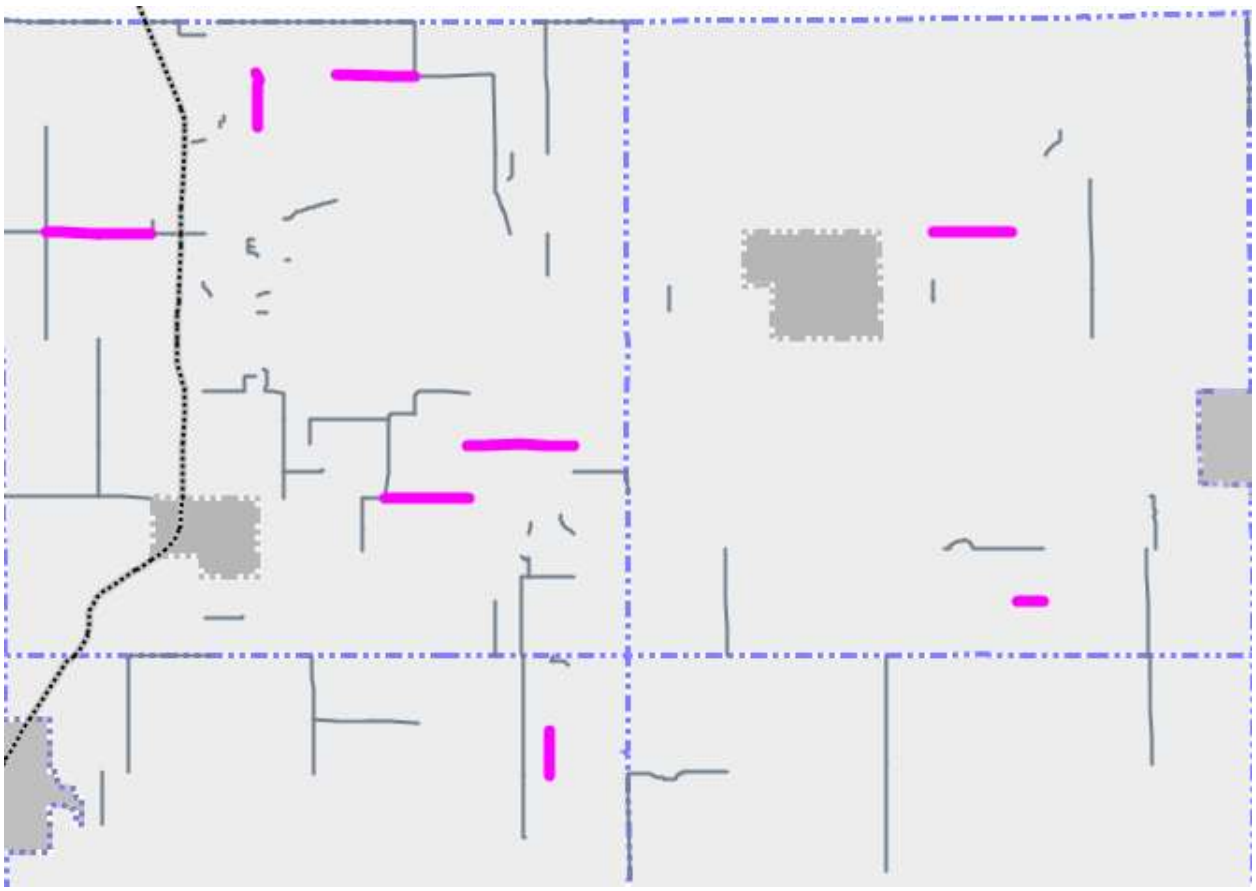


Figure 54: Key transportation links in <#AGENCYSHORT>’s road network

7. 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. <#AGENCYSHORT> communicates with both public and private infrastructure owners to coordinate work in the following ways:

<#YOUR CONTENT HERE: Use/modify the sample content by right-clicking the content control and then "Remove Control"; otherwise, select the control handle and use your Delete key.>

<#YOUR CONTENT HERE: Explain on how the agency coordinates with other asset owners. This can be internal to the agency, such as including a short description of an integrated asset management processes for municipalities illustrating how water and sewer assets the municipality are considered when determining pavement projects, with a link to the agency's water and sewer asset management plan. This could also include holding an annual infrastructure summit that includes invitations to all public and private utility owners where future planned projects are presented to other infrastructure owners in an attempt to coordinate. This section is intended to show tax payers the thought and planning that goes into coordination of infrastructure projects.>

EXAMPLE COORDINATED PLANNING TEXT

<#AGENCYSHORT> maintains drinking water, sanitary and storm sewer assets in addition to transportation assets. <#AGENCYSHORT> follows an asset management process for all of its assets by coordinating the upgrade, maintenance, and operation of all major assets.

Planned projects for subsurface infrastructure that <#AGENCYSHORT> owns are listed in the following asset management plans: drinking water distribution system asset management plan, wastewater collection system asset management plan, storm sewer system asset management plan. These three sub-

surface utility plans are coordinated with the transportation infrastructure plans to maximize value and minimize service disruptions and cost to the public.

<#AGENCYSHORT> takes advantage of coordinated infrastructure work to reduce cost and maximize value using the following policies:

- Roads which are in poor condition that have a subsurface infrastructure project planned which will destroy more than half the lane with will be rehabilitated or reconstructed full width using transportation funds to repair the balance of the road width.
- Subsurface infrastructure projects which will cause damage to pavements in good condition will be delayed as long as possible, or will consider methods that do not require pavement cuts.
- Subsurface utility projects will be coordinated to allow all under pavement assets to be upgraded in the same project regardless of ownership.
- Road reconstruction projects will not be completed until agency owned sub surface utilities are upgraded to have at least a 40 years of remaining service life.

EXAMPLE SUMMIT TEXT

Annually <#AGENCYSHORT> convenes an infrastructure planning summit in the first quarter of the year. Representatives from all of the major public and private infrastructure owners that have assets in the road right of way are provided notice for the meeting and are invited to attend. An attempt is made to coordinate the schedule of the event to allow the majority of infrastructure owners to attend.

<#AGENCYSHORT> provides all attendees of the infrastructure planning summit with a list of all planned road projects for the next three years that include new pavement structure. Infrastructure owners are encouraged to discuss planned projects that would disrupt transportation services or cause damage to pavements. Projects which may cause damage to pavements in good or fair condition are discussed and mitigation measures are proposed to minimize the impact to pavements. Mitigation measures could include rescheduling and coordinating projects to maximize value and minimize disruptions and cost to the public.

8. PROOF OF ACCEPTANCE

PUBLIC ACT 325

CERTIFICATION OF TRANSPORTATION ASSET MANAGEMENT PLAN

Certification Year: _____

Local Road-owning Agency Name: _____

Beginning October 2019 and on a three-year cycle thereafter, certification must be made for compliance to Public Act 325. A local road-owning agency with 100 certified miles or more must certify that it has developed an asset management plan for the road, bridge, culvert, and traffic signal assets. Signing this form certifies that the hitherto referred agency meets with minimum requirements as outlined by Public Act 325 and agency-defined goals and objectives.

This form must be signed by the chairperson of the local road-owning agency or the county executive and chief financial officer of the local road-owning agency.

Signature		Signature	
Printed Name		Printed Name	
Title	Date	Title	Date

Due every three years based on agency submission schedule

Submittal Date: _____

See attached council meeting minutes and/or resolution.

APPENDIX A: <#YOUR CONTENT HERE: INSERT THE RANGE IN YEARS APPROPRIATE TO YOUR AGENCY'S CIRCUMSTANCE. AN EXAMPLE IS: 2018-2020> PAVED <#NETWORK1> ROAD PLANNED PROJECTS

APPENDIX B: <#YOUR CONTENT HERE: INSERT THE RANGE IN YEARS APPROPRIATE TO YOUR AGENCY'S CIRCUMSTANCE. AN EXAMPLE IS: 2018-2020> PAVED <#NETWORK2> ROAD PLANNED PROJECTS

APPENDIX C: <#YOUR CONTENT HERE: INSERT THE RANGE IN YEARS APPROPRIATE TO YOUR AGENCY'S CIRCUMSTANCE. AN EXAMPLE IS: 2018-2020> UNPAVED ROAD PLANNED PROJECTS

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.

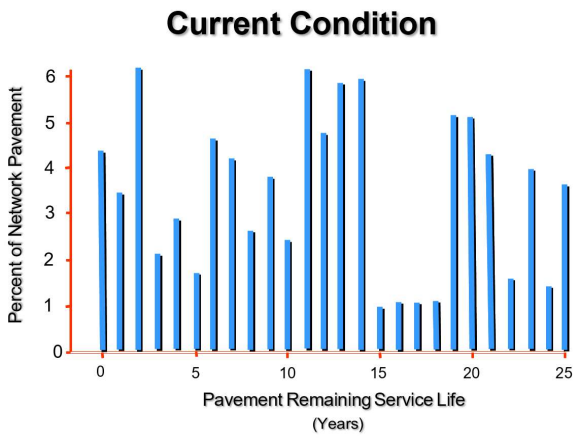


Figure 1 – Current Condition

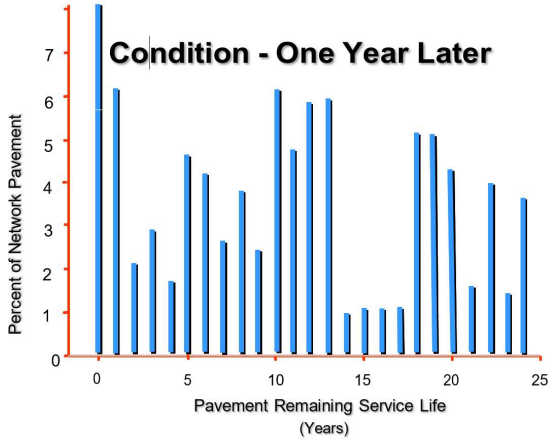


Figure 2 – Condition 1-Year Later

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*** ~~(1,090)~~	**$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: ROADSOFT NETWORK-LEVEL MODEL INPUTS AND OUTPUTS

APPENDIX F: MEETING MINUTES VERIFYING PLAN ACCEPTANCE BY GOVERNING BODY

Attachment 3

2020
2021
2022

Michigan Transportation Asset Management Council

DRAFT 2

Strategic Work Program

Michigan Transportation Asset Management Council

Chair: Joanna Johnson, CRA: Vice-Chair: Bill McEntee, CRA: Gary Mekjian, MML: Bob Slattery, MML: Jon Start, MTPA: Todd White, MDOT: Brad Wieferich, MDOT: Christopher Bolt, MAC: Derek Bradshaw, MAR: Jennifer Tubbs, MTA: Rob Surber, MCSS

Michigan Transportation Asset Management Council
2020 – 2022 Strategic Work Program

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TAMC Overview

The Transportation Asset Management Council (TAMC) is expanding the practice of asset management statewide to enhance the productivity of investing in Michigan's roads and bridges through coordination and collaboration among state and local transportation agencies. The Council's activities include surveying and reporting the condition of roads, bridges, and surface transportation system by functional classification categories and assessing completed and planned investments in roads and bridges. TAMC also supports the development of appropriate asset management methodologies and provides education and training on the benefits of developing road improvement programs using asset management principles and procedures. A key component for the TAMC is providing value to transportation agencies fortraining, education, reporting and analysis.

TAMC is comprised of professionals from county road agencies, cities, township officials, regional and metropolitan planning organizations, and state transportation department personnel. The Council reports directly to the Michigan Infrastructure Council and is a resource for the State Transportation Commission and the Michigan Legislature. Council members are appointed to 3-year terms. The Center for Shared Solutions (CSS) is the central data storage agency of the Council and serves as a non-voting member. The activities of the Council are supported by the TAMC Coordinator and Michigan Department of Transportation (MDOT).

Vision: A national leader, promoting asset management principles and practices, to guide investment decisions among Michigan's Transportation Agencies

Mission: To develop and support excellence in managing Michigan's Transportation assets by:

1. Advising the Legislature, the State Transportation Commission (STC), the Michigan Infrastructure Council (MIC), Transportation Committees, and others
2. Promoting Asset Management Principles
3. Providing tools and practices for road agencies
4. Collaborate and coordinate with Water Asset Management Council (WAMC) and other asset owners

Purpose

The purpose of this work program is to provide guidance on the strategies, financial and tactical tasks associated with carrying out the TAMC program as required under Michigan law. The work program also provides tactical objectives directing the various committees, contractors, support staff and program partners for the timeframe of –2020-2022.

TAMC Legislation and Public Act 51

TAMC was formed under Public Act (PA) 499 of 2002 followed by several amendments, including PA 338 of 2006, PA 199 of 2007, PA 257 of 2010, PA 298 of 2012, PA 506 of 2012, PA 323 and PA 325 of 2018. PA 499 of 2002 established TAMC as an organization with membership and staffing within MDOT and created the responsibility to prepare an annual report detailing its activities during the previous year and plans for upcoming years. Initially, under PA 499 TAMC was accountable to the State Transportation Commission; in 2018 this changed under PA 323, where the Michigan Infrastructure Council would have oversight responsibility of TAMC as well as the Water Asset Management Council (WAMC).

The TAMC's current list of statutory responsibilities includes:

- Advising the State Transportation Commission (STC) on a statewide asset management strategy (MCL 247.659a(2));
- Advising the STC on the processes and necessary tools needed to implement asset management strategies on a statewide basis, beginning with the federal-aid eligible highway system and, once completed, continuing with the county road and municipal systems, in a cost-effective, efficient manner (MCL 247.659a(2));
- Developing such procedures and requirements as are necessary for the administration of the asset management process, including (MCL 247.659a(5));
    - Data collection
    - Data storage and accessibility
    - Training
    - Reporting
    - Development of a multi-year program,
    - TAMC budgeting and annual funding requests
    - Addressing other issues related to asset management that may arise from time to time.
- Adopting quality control standards and protocols consistent with any existing federal requirements and regulations and existing government accounting standards;
- Setting requirements for asset management plans prepared by counties, cities, and villages (MCL247.663(13)(6));
- Working with the Michigan Department of Transportation (MDOT) and all other road agencies in the state to develop and implement a pavement management system for all federal-aid eligible roads in Michigan (MCL 247.651g);
- Allowing road agencies in the state to link to the TAMC dashboards to improve government transparency as it relates to transportation infrastructure (P.A. 257);
- TAMC is also permitted, under the act, to appoint technical advisory panels, made up of representatives from the transportation construction associations and related transportation road interests (MCL 247.659a(6));
- TAMC is permitted to direct the technical advisory panel to research issues, or it can assign projects to the panel that would assist in the development of statewide

policies. The technical advisory panel's recommendations are considered advisory only and not binding on TAMC (MCL 247.659a).

- TAMC is required to provide an annual report no later than May 2 of every year describing the current state of Michigan's roads and bridges and describing the activities of TAMC during the previous year. At a minimum, the annual report is to be delivered to the STC, the Senate Majority Leader, the Speaker of the House, and the Chairs of the House and Senate Transportation Committees (MCL 247.659a(9)).

TAMC also plays a variety of roles that support and promote the asset management process. These roles include:

- Communication conduits to and from the constituent organizations, ensuring that the needs and concerns of the various stakeholder organizations are aired during TAMC deliberations, and that TAMC decisions and policies are then shared with, and when necessary, discussed with those same organizations.
- Ensuring that certain activities prescribed in the authorizing legislation are completed in accordance with that legislation (MCL 247.659a).
- Ensuring that any additional activities undertaken by the TAMC are completed within the timeframe and budget established by the TAMC, and accordance with the overall intent of the authorizing legislation.

Appendix B contains Public Act 51 legislation as amended into Michigan Codified Law.

Appropriation & Budget

Once established in Michigan Compiled Law in 2002, TAMC was provided an appropriation of $1,626,400 from the Michigan Transportation Fund (MTF). This amount remained consistent until 2017 when TAMC made a request for an additional $250,000. The State of Michigan fiscal year budget of 2018 provided $1,876,400 to TAMC. At this time, it is anticipated that the FY2020 TAMC budget will be based upon $1,876,400 for revenues.

In January of 2018, a second appropriation of $2,000,000 was provided to TAMC out of the State of Michigan's Infrastructure Fund. Under House Bill 4320 (S-3), a supplemental appropriation was given to TAMC for the purpose creating a pilot project for the collection of data and the evaluation of culverts owned by local transportation agencies within Michigan. This appropriation will not be continued in FY2020, however funds still remain from this initial allocation.

Appendix C contains the TAMC financial and budget report. This report also includes the expenditures and fund balance from the 2018 supplemental appropriation for the culvert pilot project.

TAMC Organizational Structure

The TAMC was created to promote asset management principles and the asset management process, and the legislation designates that TAMC members are appointed by various public stakeholder organizations within the transportation community. This requires a series of well-orchestrated and coordinated efforts, carried out by a multitude of actors and organizations in both a formal and informal manner. What follows is a high-level description of the formal entities that have roles and responsibilities for administration of the TAMC, the TAMC Work Program, the various technical and contractual assistance provision and ongoing operational support staff required to perform TAMC's statutory reporting and various defined and undefined roles.

Note: These descriptions are intended to be summaries and are not an exhaustive reporting of all aspects of TAMC coordination.

TAMC - Council

From the formal legislation that created TAMC and responsibilities it charged TAMC with completing, it can be inferred that TAMC members are expected to attend and participate in meetings of the organization, to chair and/or serve on at least one committee and/or subcommittees of the organization, and such other responsibilities as are assigned and necessary for the organization to achieve its goals (by-laws). TAMC and committee chairs are expected to work with the TAMC support staff to prepare agendas for their meetings and to arrange for speakers, exhibits, and/or presentations on topics of interest to the committee or TAMC.

Michigan Compiled Law defines the council representation and partner organizational membership. Currently, TAMC shall consist of 10 voting members approved by the MIC. The council shall include 2 members from the county road association of Michigan, 2 members from the Michigan municipal league, 2 members from the state planning and development regions, 1 member from the Michigan townships association, 1 member from the Michigan association of counties, and 2 members from MDOT. Nonvoting members shall include 1 person from the Central Data Storage Agency (CDSA) or office selected as the location for central data storage.

It is the responsibility of each member organization to seek out qualified individuals for nomination to the TAMC. Once the nomination is received, it must be acted upon by the MIC. The position of the CDSA shall be nonvoting and shall be for as long as the agency continues to serve as the data storage repository. All terms for TAMC members shall be for 3 years, except for the MDOT and central data storage agency representatives.

The chairperson shall be selected from among the voting members of the council. All voting members of the TAMC are eligible to be Chairperson or Vice- chairperson of the TAMC. The Chairperson and Vice-chairperson's Terms of Office shall be three years. Officers may be reelected to additional terms by the TAMC. Terms may be consecutive. Elections for

Chairperson and Vice-chairperson of the TAMC shall be held during the September TAMC meeting in the last year of the 3-year term or as needed to fill a vacant officer position. Election shall be by a majority vote of the attending voting TAMC members during a regular TAMC meeting where a quorum is present. It is the responsibility of the Chairperson to chair monthly meetings, publicly represent the TAMC and speak on its behalf. It is the responsibility of the Vice-chairperson to perform these duties in the absence of the Chairperson. If the Chairperson or Vice-chairperson fails to meet this responsibility, the voting membership of TAMC may dismiss the Chairperson or Vice-chairperson by majority vote.

TAMC- Committees

At a minimum, each voting member shall serve on one TAMC Committee. The TAMC Chairperson shall select TAMC members for each committee. Member assignments may be reviewed and changed by the TAMC Chairperson as necessary during the Chairperson's term of office. Each committee of the TAMC shall have a Chairperson and a Vice-chairperson selected by majority vote of the voting membership of each Committee. Each committee Chairperson and Vice-chairperson shall serve a 3-year term. In the absence of the committee Chairperson, the committee Vice-chairperson shall manage the committee meetings. Any committee may include for support, technical, or other reasons; non-TAMC members as non-voting advisory participants in the committees.

The TAMC has three permanent committees as follows:

1. Administrative, Communications and Education (ACE Committee): Committee comprised of 3 to 5 TAMC members that advises the TAMC on matters pertaining to training, communications, education and budget.
2. Data Committee: Committee comprised of 3 to 5 TAMC members that advises the TAMC on matters pertaining to data collection, quality, and analysis.
3. Bridge Committee: Committee comprised of 3 to 5 TAMC members that advises the TAMC on matters pertaining to application of asset management principles to bridges and the creation of guidance materials and training program.

The TAMC or the TAMC Chairperson may establish other 'ad hoc' committees as necessary for the operation of the TAMC. Such committees shall operate until the TAMC or TAMC Chairperson disbands them.

Appendix D includes the TAMC member roster, representative organizations, terms of service and committee assignments.

Support Staff

In addition to having two seats on TAMC, MDOT is also directed to provide qualified administrative staff to support the TAMC's functioning. There are a multitude of tasks that are included in the coordination of the TAMC program. At a high level, this includes managing the TAMC work program, providing TAMC with regular updates on progress of the program and

assisting in the periodic creation of new work programs and ensuring that TAMC is fulfilling statutory obligations as defined in legislation and compiled law.

Operationally, support also includes preparations with TAMC Chairperson and Committee Chairpersons for preparations for meeting agendas, scheduling, ensuring compliance with the Open Meetings Act, budgetary, contracting and accounting functions and coordinating TAMC communications with partner agencies, contracting entities as well as the general public. TAMC support staff also coordinate and manage the logistics and facility contracts for conferences, meetings and various other ad-hoc and routine activities. Support staff also ensure adherence to State of Michigan requirements and regulations pertaining to lodging, meals and travel reimbursements for TAMC members, partner organizations and local agency participants.

MDOT also participates in the annual Federal-Aid data collection effort by providing trained staff members for the rating teams. This effort also includes provision of vehicles and coordination with the respective Regional Planning Agency and Metropolitan Planning Organization (RPA/MPO) and local agencies to schedule and collect data.

Lastly, TAMC policy, MDOT contractual guidelines and Act 51 regulation establishes a series of compliance requirements that TAMC contractors and local agencies are subject to follow. Support staff at MDOT have the responsibility to ensure compliance with these Act 51 requirements. This includes reporting of the status of compliance for reporting requirements on an ongoing basis as well as act Program Manager with oversight of technical assistance, training and work program contracts with the CDSA, RPA/MPO contracts and the contracts for training, technical assistance and TAMC-sponsored conferences, meetings and workshops.

Central Data Storage Agency

In addition to having one non-voting seat on TAMC, the CDSA is also responsible for providing a secure data storage facility, ensuring that the data is accessible to the TAMC, the 617 transportation agencies in the state, the 14 regional planning agencies, metropolitan planning organizations and to the greater public. The CDSA is also responsible for the coordination of any activities contracted for with TAMC such as the development, operation and maintenance of TAMC's Investment Reporting Tool (IRT), TAMC's interactive performance dashboards, interactive maps and website. Currently, the CDSA designation for TAMC is the Michigan Department of Technology, Management and Budget's (DTMB) Center for Shared Solutions (CSS).

Appendix E contains the Work Program for CSS.

Technical Assistance – Regional and Metropolitan Planning (RPA/MPO)

In addition to MDOT support staff, the TAMC annually contracts with Michigan's Regional Planning Agencies and Metropolitan Planning Organizations (RPA/MPO) to provide technical assistance related to the promotion of asset management principles, PASER data collection and

other activities within each regional boundary. The TAMC Budget contains annual allocations to the RPA/MPO, and MDOT support staff coordinates and administers the Unified Work Program for asset management. At a high level, RPA/MPO allocations provide funding for training, equipment and data collection expenses incurred by planning staff as well as local agencies that participate in TAMC program activities. RPA/MPO work programs also include provision of technical support to local agencies for asset management plan development, data sharing and assistance with compliance with TAMC and Public Act 51 reporting requirements.

Appendix H contains the Unified Work Program for RPA/MPO; appendix C is the TAMC Budget which includes allocations to each of the RPA/MPO contracts involved with TAMC's program.

Technical Assistance – Michigan Technological University (MTU) Center for Technology & Training (CTT)

As part of its function to provide staff support for TAMC, MDOT has contracted with Michigan Technological University's Center for Technology and Training (CTT) to develop and administer a training program that has the principle components to meet the needs of TAMC's audience as well as prepare participants and certify their competence to perform annual data collection activities. Due to its expertise in managing registrations for the variety of training programs hosted by CTT, MTU also has the roles of registering participants in the TAMC spring and fall conferences, managing the audio/visual tech for the conferences, and collecting and analyzing the feedback from conference participants.

MTU is the creator of the Roadsoft software that was selected by TAMC as the preferred data collection tool for PASER ratings. As the owner of the software, MTU is also responsible for training in the use of Roadsoft, tech support for any issues associated with Roadsoft, coordinating with CSS for the efficient and accurate collection and transfer of TAMC data from Roadsoft to CSS's database, developing new tools that speed and simplify the collection of TAMC data or other data of use by transportation agencies, as well as perform annual updates of the Roadsoft software.

CTT also functions as a technical advisor to TAMC providing insights into current research practices in the field of asset management, and providing explorative, applied research activities to meet the needs of TAMC programs. This includes providing technical briefings, pilot studies or professional opinion when requested.

Appendix F contains the MTU CTT Training contract; appendix G contains the MTU CTT Activities contract.

TAMC Goals & Objectives 2020-2022

Strategic Sessions

On June 6, 2018 TAMC held a Strategic Planning Session to guide TAMC's future work programs and provide direction to the various partner and contractual entities that assist TAMC in the deployment of asset management. After a thorough review of pending legislation, TAMC members revised the Mission Statement and Vision Statement (as found on page 2) as well as debated the potential impacts of the legislation on partner agencies and TAMC. TAMC also reviewed elements identified from both the Regional Asset Management Pilots project and the 21st Century Infrastructure Council Report. Lastly, TAMC also discussed assignments of action items to various TAMC Committees and partners. Outcomes of the June 6, 2018 Strategic Session included a commitment to maintain the program tenants that have been deployed over the last decade.

On June 5, 2019 TAMC held another Strategic Planning Session to review TAMC's goals and priorities in light of recent amendments to Public Act 51, including PA 323, PA 324 and PA 325 of 2018. Again, outcomes of the June 5, 2019 Strategic Session included a commitment to maintain the foundation of the program as well as pursuit of tasks that align TAMC's program with legislative requirements.

TAMC is committed to reviewing priorities, relevant changes in legislation and changes in the transportation landscape. To this end, TAMC will review and update the Work Program on an annual basis. TAMC has targeted the month of June as an appropriate timeframe to hold strategy meetings to ensure budgetary and contractual considerations are met.

TAMC Priorities

PA 499 of 2002 created TAMC and established the structure and organizational membership. Additional legislation thereafter increased reporting requirements for local agencies as well as TAMC. TAMC has monitored these changes and has responded with Work Program updates and priorities to continue progress of the statewide asset management strategy, incorporating updates in technology, industry standards, and changes in public policy and demands for service. The following goals and objectives are the result of TAMC's engagement in these areas during 2018 and 2019.

TAMC Council

Goal 1: Promote the principles of asset management statewide to enhance the productivity of investment in Michigan's roads and bridges through coordination and collaboration among state and local transportation agencies; TAMC will promote and communicate

this statewide strategy with the legislature, MIC, STC and other transportation committees.

Objectives

1. Surveying and reporting the condition of roads and bridges by functional classification and legal system ownership categories.
2. Analyzing completed and planned investments in roads and bridges.
3. Supporting the development of appropriate asset management methodologies.
4. Providing education and training on the benefits of asset management principles and procedures.
5. Additional forecasting to create a statewide strategy built on the basis of a mix of fixes.
6. Coordinate/education and communication activities with the MIC/WAMC.
7. Share information around the world on asset management practices.

Goal 2: Provide fiscal and budgetary accountability for TAMC's budget appropriation as well as all other supplemental appropriations, funding grants and financial resources.

Objectives

1. Develop an annual budget categorized by work program activity, regional allocations for technical assistance and data collection, CDSA operations, contractual funding for technical assistance and activity support as well as TAMC-specific activities.
2. Include TAMC budget as part of annual reporting to MIC, STC and legislature.
3. Report financial status of contracts and TAMC budget status on a monthly basis.
4. Create a consistent timeline for TAMC budget submissions and needs to the MDOT.
5. Create a draft three-year budget plan to match the work program goals.
6. Review and define allocation to our regional partners across the State.

Goal 3: Coordination of asset management with MIC, WAMC and other partner organizations such as MDOT, County Road Association (CRA), Michigan Municipal League (MML), Michigan Association of Regions (MAR), Michigan Transportation Planning Association (MTPA), Michigan Association of Counties (MAC) and the Michigan Township Association (MTA).

Objectives

1. Develop coordinated approach to condition assessment and other areas when applicable.
2. Communicate with MIC/WAMC on transparency and what needs to be coordinated.
3. Attend and monitor MIC meetings.

4. Attend and monitor WAMC meetings.
5. Participate on MIC/WAMC/TAMC X-Council (cross council).
6. Support TAMC partner agencies at various trainings, conferences and workshops.
7. Define the process to seek procurement of TAMC assistance from outside vendors or consultants for coordinated activities.

Goal 4: Evaluate asset management plan submissions and make recommendations regarding compliance.

Objectives

1. Update TAMC asset management plan template accounting for all required elements per PA 325.
2. Provide training and workshops for use of the asset management plan template.
3. Establish TAMC policy for the submittal and review of asset management plans for PA 325 requirements as well as PA 338 of 2006.
4. Report monthly on the number and compliance status of local agency submittal of asset management plans.
5. Identify technology that may expedite data collection for PA 325 requirements, including the IRT.

TAMC Committee Priorities

The following goals and objectives are the result of TAMC's engagement of current and ongoing activities at the committee level during 2018 and 2019. Many of these objectives have been directed to the appropriate committee by TAMC.

ACE Committee

Goal 1: Evaluate asset management plan submissions and make recommendations regarding compliance for agencies with a minimum of 100 certified miles.

Objectives

1. Recommend TAMC asset management plan template accounting for all required elements per PA 325 and make assessible to public.
2. Provide training and workshops for use of the asset management plan template.
3. Recommend TAMC policy for the submittal and review of asset management plans for PA 325 requirements as well as PA 338 of 2006.
5. Review monthly on the number and compliance status of local agency submittal of asset management plans.
6. Recommend technology that may expedite data collection for PA 325 requirements, including the IRT.

7. Discuss how other infrastructure assets will be considered for future data collection and asset management plan inclusion.

Goal 2: Increase awareness and improve familiarity with TAMC annual report.

Objectives

1. Coordinate press releases and report cover letters in well-orchestrated manner to ensure maximum exposure and accessibility of TAMC members and support staff.
2. Provide summary reports of Michigan road and bridge conditions by legislative district with distribution of annual report; each legislator receives both conditions for local district as well as statewide summaries found in report.

Goal 3: Raise awareness of asset management principles; promote outstanding agency performance in the area of asset management.

Objectives

1. Establish an annual schedule and develop 4 articles each year for the Local Technical Assistance Program's *The Bridge* Newsletter.
2. Seek nominations and highlight best practices of organizations and individuals through the TAMC Awards program; develop scoring matrices evaluate and update selection process of award recipients.
3. Coordinate 2 educational conferences per year; incorporate "best practice case-studies" into educational sessions for high-performing agencies to advocate their learning and methods; provide formal presentation of TAMC Award recipients at conferences and in conference materials.
4. Distribute press releases outlining TAMC Awards program recipients.
5. Explore social media platforms.
6. Pilot two 90-second videos.

Goal 4: Ensure TAMC's training programs and policies are appropriate and optimized for ongoing support of TAMC's data collection and reporting requirements; ensure these programs and policies are well-communicated among partnering agencies and participants.

Objectives

1. Continue review and update of TAMC Policy for the Collection of Roadway Surface Condition Data to accommodate technological updates, appropriateness of training certification for qualifying participants and in response to changing or challenging trends in technology or industry needs.

2. Provide monthly Regional Coordinator conference calls from April through December each year for communicating TAMC policies, announcements, training opportunities and provide forum for participants to raise issues and respond to inquiries.
3. Update and maintain TAMC website, TAMC brochure and TAMC training resources as appropriate to incorporate changes in legislation, reporting requirements, TAMC policy and procedures as well as technological advancements.
4. Create a decision-tree/policy which can be utilized to determine when a request for work from CSS/MTU can be approved at the committee level.
5. Create a training program for culverts and traffic signals, and/or other infrastructure assets.

Bridge Committee

Goal 1: Ensure TAMC's training programs and policies are appropriate and optimized for ongoing support of TAMC's bridge data collection and reporting requirements; ensure these programs and policies are well-communicated among partnering agencies and participants.

Objectives

1. Continue review and update of TAMC Policy for the Collection of Bridge Condition Data to accommodate technological updates and in response to changing trends in technology or changes in Federal/State industry reporting standards.
2. Work with TAMC to ensure TAMC Dashboards and Interactive Map applications are compatible with data structure and reporting standards of the Michigan Bridge Inventory.
3. Compare and analyze bridge condition data and TAMC IRT data for planned bridge project data; incorporate IRT data into Bridge Forecasting Tool.
4. Review potential for bridge cost information to be included in the ADARS reporting.

Goal 2: Continue progress of roadway culvert asset management integration building upon lessons learned from 2018 TAMC Local Agency Culvert Inventory Pilot project as well as culvert data collection efforts performed by MDOT, other transportation agencies and other stakeholder organizations including WAMC, Michigan Department of Environment, Great Lakes and Energy (EGLE) and Michigan Department of Natural Resources (DNR).

Objectives

1. Develop data governance and standards for roadway culverts.

2. Develop culvert performance metrics for local agency reporting and integration into asset management plans and TAMC technological reporting.
3. Establish TAMC Policy for the Collection of Culvert Condition Data to provide guidance and directives for ongoing culvert inventory updates, condition assessment, and data integration procedures.
4. Provide tools and training for the ongoing collection of roadway culvert inventory and condition assessment.
5. Incorporate culvert inventory and condition data into TAMC Dashboards and Interactive Map applications.
6. Review other agencies for culvert information which can be incorporated into inventory for reduction in duplication of effort, i.e. EGLE, DNR, Drain Commissioners, etc.

Data Committee

Goal 1: Ensure TAMC's training programs, policies and technological applications are appropriate, current with most recent data and optimized for continuation of TAMC's Federal Aid, Non-Federal Aid and Inventory-based Rating System data collection efforts; TAMC will continue collecting no less than ½ of Federal Aid system annually.

Objectives

1. Continue review and update of TAMC Policy for the Collection of Roadway Surface Condition Data to accommodate technological updates.
2. Ensure Framework Base Map, Roadsoft and TAMC Investment Reporting Tool (IRT) applications are compatible and up-to-date to accept pavement condition data.
3. Report on Road Data Collection progress on a monthly basis during the collection season.
4. Annually perform quality control assessment of pavement condition data collected by rating teams.
5. Develop data for costs-per-mile of data collection.
6. Ensure TAMC's Dashboards, Interactive Map, and IRT applications are updated routinely with latest available data sets.

Goal 2: Ensure TAMC's training programs and IRT applications are appropriate and optimized for continuation of the annual investment reporting requirements as part of Act 51.

Objectives

1. Ensure Roadsoft, MDOT's Act 51 Distribution and Reporting System (ADARS) and TAMC IRT applications are compatible and up-to-date.
2. Monitor IRT compliance and report compliance status on a monthly basis.

3. Perform quality checks on IRT data and report on quality of information.
4. Update Average Project Cost data by improvement category on an annual basis.
5. Compare pavement condition data and IRT planned road project data.
6. Develop an understanding of roadway asset deterioration.
7. Develop means to upload 3-year capital project data into the IRT from electronic State Transportation Improvement Program (STIP) and RPA/MPO Transportation Improvement Programs (TIP).
8. Develop condition forecasting tool that uses IRT planned project data.
9. Incorporate pavement warranty data fields into IRT for ongoing reporting and compliance.

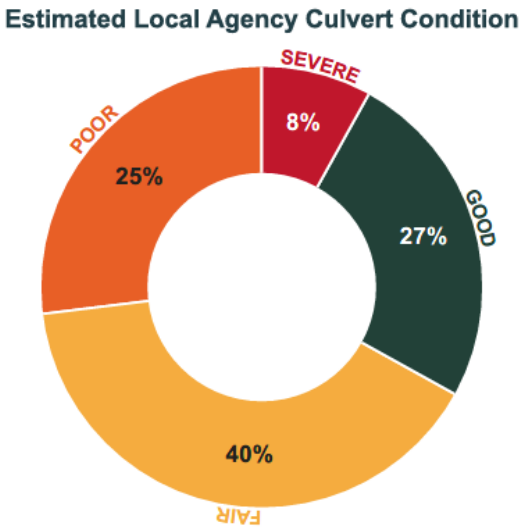
Goal 3: Develop traffic signal asset management integration building upon guidance from traffic signal subject matter experts at MDOT and other local transportation agencies.

Objectives

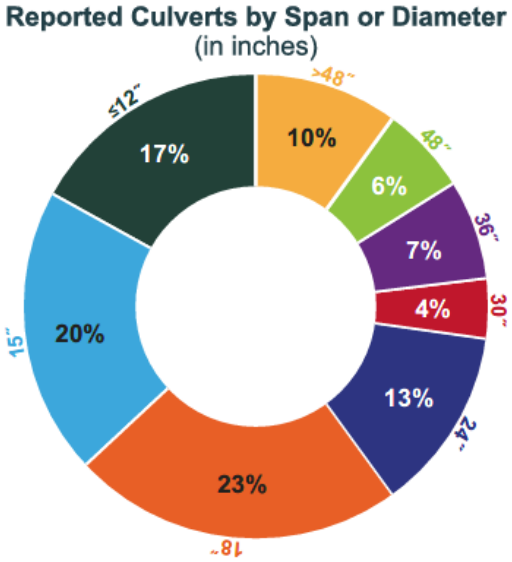
1. Develop data governance and standards for traffic signals.
2. Develop traffic signal performance metrics for local agency reporting and integration into asset management plans and TAMC technological reporting.
3. Establish TAMC Policy for the Collection of Traffic Signal Data to provide guidance and directives for ongoing inventory updates and data integration procedures.
4. Provide tools and training for the ongoing collection of traffic signal inventories and condition assessments.
5. Incorporate traffic signal inventory data into TAMC Dashboards and Interactive Map applications.

APPENDICES

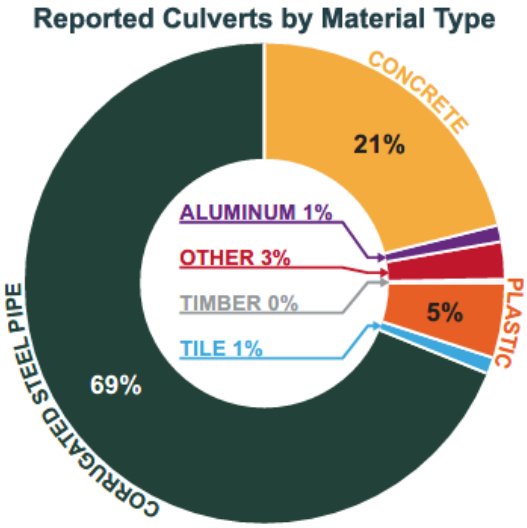
TAMC Culvert Pilot – Data Fields/Elements for TAMC Dashboards & Interactive Maps (DRAFT)



- Agency Name
- Agency Type (County/City/Village)
- Culvert ID
- Location
- Condition Rating (10 Scale Rating)
- Summary of Rating
  - Good
  - Fair
  - Poor
  - Severe



- Agency Name
- Agency Type (County/City/Village)
- Culvert ID
- Location
- Summary of Size Categories:
  - 24” or less
  - > 24”- 48”
  - > 48”- 10’
  - > 10’- < 20’



- Agency Name
- Agency Type (County/City/Village)
- Culvert ID
- Location
- Culvert Material Type
  - Corrugated Steel
  - Concrete
  - Plastic
  - Other