Iron County Road Commission
2022 Transportation
Asset Management Plan

A plan describing the Iron County Road Commission's transportation assets and conditions

Prepared by:
Douglas C. Tomasoski
Superintendent/Manager/Engineer
800 West Franklin St
Iron River, MI 49935

CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

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 Iron County Road Commission's (ICRC) 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 plan, build, and maintain roads, bridges, and support assets in an efficient and effective manner. This asset management plan is intended to report on how ICRC is meeting its obligations to maintain the public assets for which it is responsible.

This plan identifies ICRC's assets and condition and how ICRC maintains and plans to improve the overall condition of those assets. An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of ICRC's obligations towards meeting these requirements. However, this plan and its supporting documents are intended to be much more than a fulfillment of required reporting. This asset management plan helps to demonstrate ICRC's responsible use of public funds by providing elected and appointed officials as well as the general public with the inventory and condition information of ICRC's assets, and it gives taxpayers the information they need to make informed decisions about investing in ICRC's essential transportation infrastructure.

INTRODUCTION

Asset management is defined by Public Act 325 of 2018 as "an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals". In other words, asset management is a process that uses data to manage and track assets, like roads and bridges, in a cost-effective manner using a combination of engineering and business principles. This process is endorsed by leaders in municipal planning and transportation infrastructure, including the Michigan Municipal League, County Road Association of Michigan, the Michigan Department of Transportation (MDOT), and the Federal Highway Administration (FHWA). The ICRC 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 and bridge network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial challenges of managing transportation infrastructure with a limited budget.

The Iron County Road Commission (ICRC) 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. ICRC is responsible for maintaining and operating over 269.87 Primary miles of roads, 363.08 Local miles of roads, 21 bridge structures, and approximately over 1000 culverts.

This 2022 plan identifies ICRC's transportation assets and their condition as well as the strategy that ICRC uses to maintain and upgrade particular assets given ICRC's condition goals, priorities of network's road users, and resources. An updated plan is to be released approximately every three years both to comply with Public Act 325 and to reflect changes in road conditions, finances, and priorities.

Questions regarding the use or content of this plan should be directed to Douglas C. Tomasoski or Brad Toivonen at 800 West Franklin St, Iron River, MI 49935 or at (906)-265-6686.

1. PAVEMENT ASSETS

ICRC is responsible for 629.87 miles of public roads. An inventory of these miles divides them into different network classes based on road purpose/use and funding priorities as identified at the state level: county primary road network, which is prioritized for state-level funding, and county local road network.

Inventory of Assets

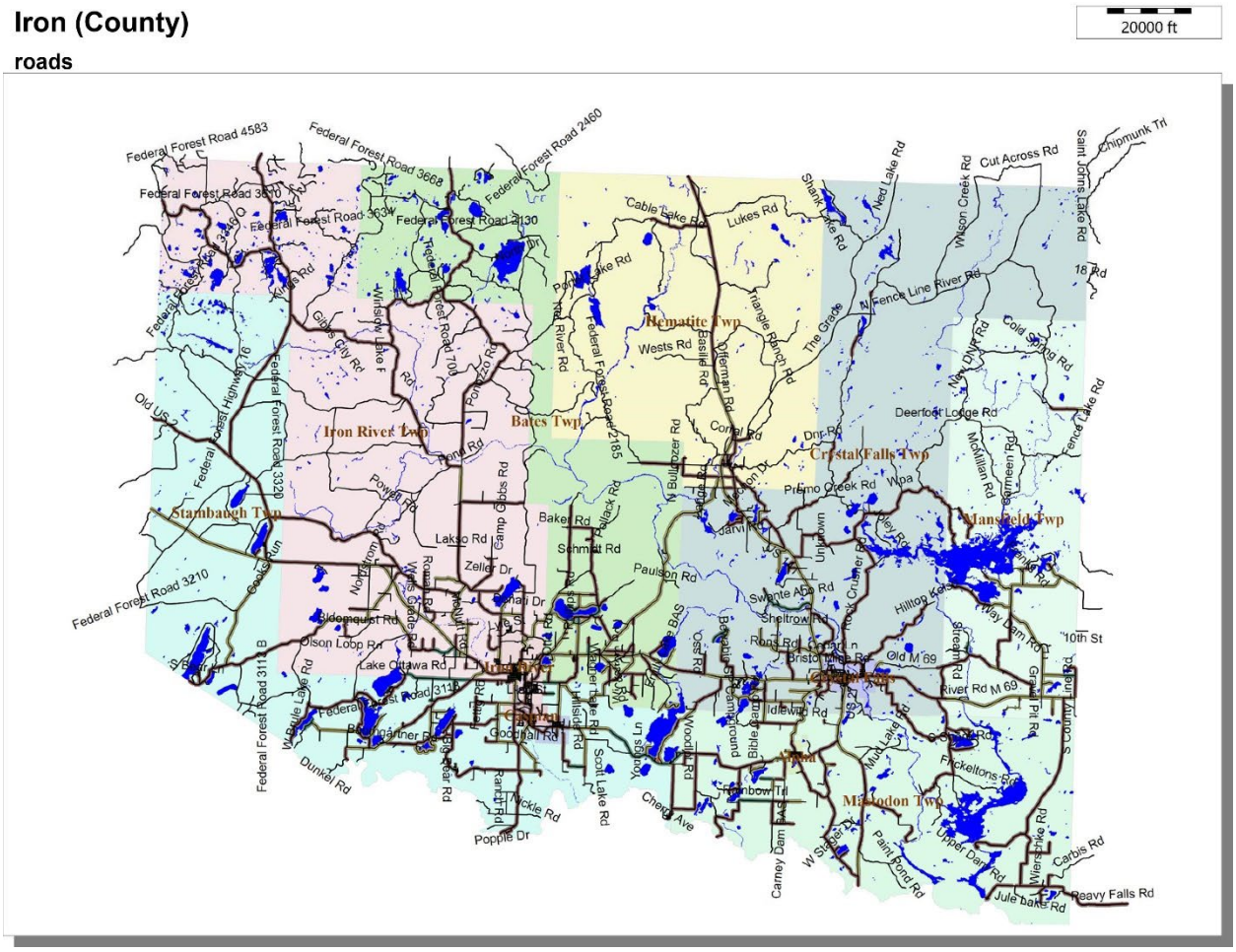


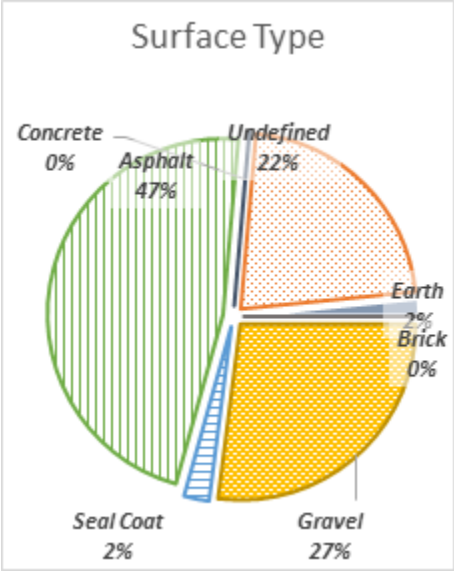
Figure 1: Map showing location or roads managed by ICRC and the current condition for paved roads in green for good (PASER 10, 9, 8), yellow for fair (PASER 7, 6, 5), and red for poor (PASER 4, 3, 2, 1).

Of ICRC's 632.95 miles of road, 269.87 miles are classified county primary road as Federal Aid eligible and 363.08 miles are classified as county local road (Figure 1 identifies these paved roads in green, yellow, and red with the colors being determined based on the road segment's condition). The ICRC does not have any roads part of the National Highway System (NHS); the NHS is subject to special rules and regulations and has its own performance metrics dictated by the FHWA. In addition, ICRC has 89 miles of county primary unpaved roads and approximately 232 miles of county local unpaved or undefined

roads. More detail about these road assets can be found in ICRC's Roadsoft database or by contacting ICRC.

Types

ICRC has multiple types of pavements in its jurisdiction, as shown below. ..Figure 2 shows a breakdown of these pavement types for all of ICRC's road assets.



..Figure 2: Pavement type by percentage maintained by ICRC. Undefined pavements have not been inventoried in ICRC's asset management system to date, but will be included as data becomes available.

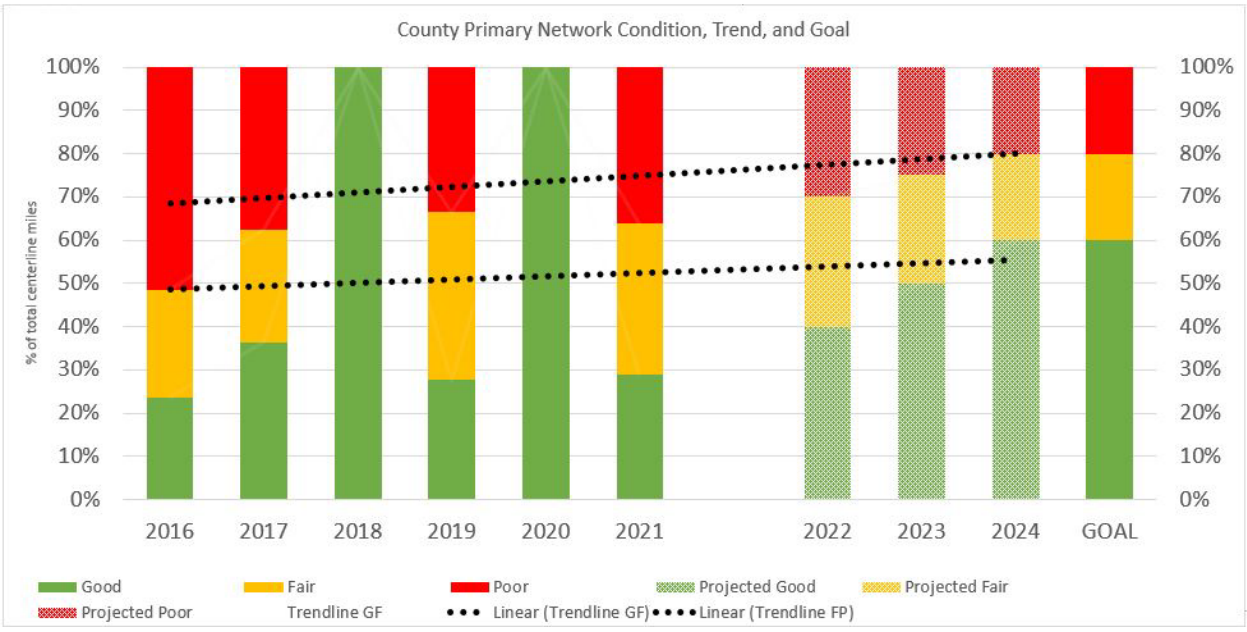
Condition, Goals, and Trend

Paved Roads

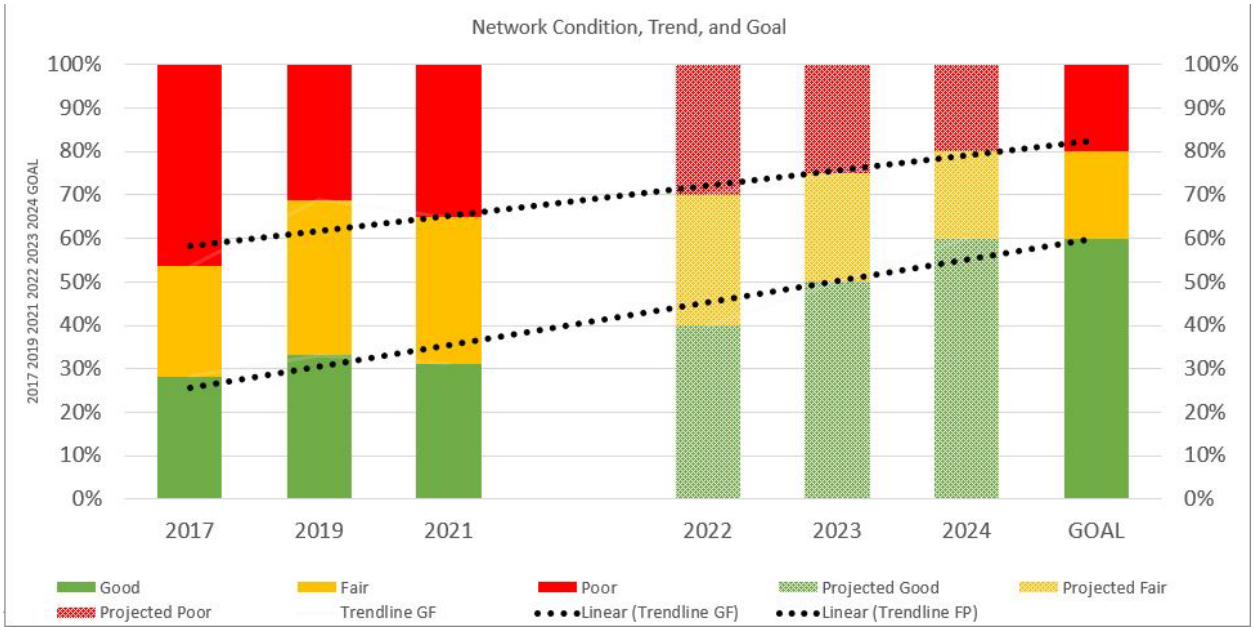
Paved roads in Michigan are rated using the Pavement Surface Evaluation and Rating (PASER) system, which is a 1 to 10 scale with 10 being a newly constructed surface and 1 being a completely failed surface. PASER scores are grouped into TAMC definition categories of good (8-10), fair (5-7), and poor (1-4) categories. ICRC collects PASER data every two years on 100 percent of those portions of its primary road network that are eligible for federal funding. To date, the ICRC does not have the staff to collect PASER data on the road networks that are not eligible for federal funding.

Currently, the county primary network has 30% of its roads in good condition, 38% in fair condition, and 32% in poor condition, and the county local network is not PASER rated but data has been imported for

every newly paved road since 2000. (..Figure 3 and ..Figure 4). ICRC's long-range goal for the primary road network is to have 60% of roads in good condition, 20% in fair condition, and 20% in poor condition, and for the local road network is to have 65% of roads in good condition, 25% in fair condition, and 10% in poor condition, ..Figure 3 and ..Figure 4 illustrate the historical and current condition (solid bars) of ICRC's primary and local networks, respectively; they also illustrate the projected trend (shaded bars), the overall trend in condition (trendlines), and ICRC's goal (final solid bar). ICRC does not PASER rate the local network but has been importing newly paved roads into the collectable data, which explain the high amount of good roads.



..Figure 3: Primary network condition, goals, and trend



..Figure 4: Local network condition, goals, and trend

Unpaved Roads

Unpaved roads rated with the Inventory-based Rating System™ receive an IBR number ranging from 1 to 10, with a 9 or 10 (less than one year old) having good surface width, good or fair drainage, and good structural adequacy and a 1 having poor surface width, poor drainage, and poor structural adequacy. IBR numbers can be grouped in a similar fashion as the TAMC definitions into good (8-10), fair (5-7), and poor (1-4) categories.

ICRC has approximately 312 miles of unpaved roads on its total system, which makes up 50% of the total network. Figure 5 shows the breakdown and percentages of road per township.

Unpaved Roads per Township and Type

Township	Undefined	Earth	Gravel	Totals	Percentage
Bates Twp	20.957	0	27.848	48.805	**16%**
Crystal Falls Twp	40.368	1.785	30.147	72.3	**23%**
Hematite Twp	12.371	0	8.804	21.175	**7%**
Iron River Twp	24.455	2.65	52.227	79.332	**25%**
Mansfield Twp	0	3.507	10.065	13.572	**4%**
Mastodon Twp	13.887	1.526	24.494	39.907	**13%**
Stambaugh Twp	24.619	0.183	12.96	37.762	**12%**
TOTALS	136.657	9.651	166.545	312.853	
Percentage	**44%**	**3%**	**53%**		

Unpaved Primary Roads by Township and Type

Description	Undefined	Earth	Gravel	Total	Percentage
Bates Twp	0	0	9.183	9.183	**10%**
Crystal Falls Twp	0	1.543	14.775	16.318	**10%**
Hematite Twp	0	0	0.515	0.515	**18%**
Iron River Twp	0	2.65	39.804	42.454	**1%**
Mansfield Twp	0	2.004	1.956	3.96	**46%**
Mastodon Twp	1.037	0.916	11.543	13.496	**4%**
Stambaugh Twp	0	0	7.263	7.263	**14%**
Totals	1.037	7.113	85.039	93.189	
Percentage	**1%**	**8%**	**91%**		

Unpaved Local Roads by Township and Type

Description	Undefined	Earth	Gravel	Total	Percentage
Bates Twp	20.957	0	18.665	39.622	**18%**
Crystal Falls Twp	40.368	0.242	15.372	55.982	**25%**
Hematite Twp	12.371	0	8.289	20.66	**9%**
Iron River Twp	24.455	0	12.423	36.878	**17%**
Mansfield Twp	0	1.503	8.109	9.612	**4%**
Mastodon Twp	12.85	0.61	12.951	26.411	**12%**
Stambaugh Twp	24.619	0.183	5.697	30.499	**14%**
Total	135.62	2.538	81.506	219.66	
Percentage	**62%**	**1%**	**37%**		

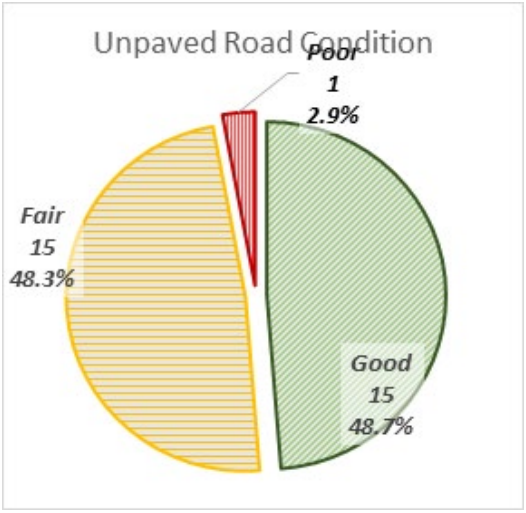


Figure 5: ICRC only uses the IBR System on Federal Aid eligible upaved roads at this time.

Modelled Trends, Gap Analysis, and Planned Projects

Table 1: Modelled Trends, Gap Analysis, and Planned Projects

Network 1 County Primary Road Network

Treatment	Average Yearly Miles of Treatment	Years of Life	Trigger-Reset	Planned Projects/Paved Condition Forecast		Additional Work Necessary to Overcome Deficit	
				Average Yearly Miles of Treatment	Trigger-Reset	Average Yearly Miles of Treatment	Trigger-Reset
Crackseal	20	1	7-7	30	7-7	30	7-7
Chipseal	20	5	5, 6-8	30	5, 6-8	15	5, 6-8
Overlay	1	10	3, 4-9	1	3, 4-9	8	3, 4-9
Reconstruct	2	20	1, 2, 3-10	2	1, 2, 3-10	5	1, 2, 3-10

Network 2 County Local Road Network

Treatment	Average Yearly Miles of Treatment	Years of Life	Trigger-Reset	Planned Projects/Paved Condition Forecast		Additional Work Necessary to Overcome Deficit	
				Average Yearly Miles of Treatment	Trigger-Reset	Average Yearly Miles of Treatment	Trigger-Reset
Crackseal	22	1	7-7	22	7-7	25	7-7
Chipseal	2	5	5, 6-8	2	5, 6-8	10	5, 6-8
Overlay	0	10	3, 4-9	1	3, 4-9	2	3, 4-9
Crush & Shape	5	18	1, 2, 3-10	5	1, 2, 3-10	10	1, 2, 3-10

Modelled Trends & Gap Analysis

The Roadsoft network analysis of the ICRC's planned projects for the count primary and county local networks from the ICRC's currently available budget does not allowed the IRCR to reach its pavement condition goals given the projects planned for the next three years.

Results from the Roadsoft for the county primary and county local network condition models indicate that the necessary additional work needed to meet the agency condition goal would cost and additional $5,000,000 per year.

Planned Projects

ICRC has projects planned for the next three years.

2023

- Co Rd 424 (Tree Line Dr to Blue Lk Rd)
  Total cost of these projects is approximately $600,000

2024

- Co Rd 424 (Blue Lk Hill to Blue Lk Pit)
- Baumgartner Rd (Eden to Snipe Lk)
- Brule Mt Rd (Snipe Lake to Ski Brule Village)
- Hagerman Lk Rd (Ottawa Lk Rd to Storti)
  Total cost of these projects is approximately $1.6 million

2025

- Co Rd 424 (Blue Lk Pit to Rysberg Hill)
- Hagerman Lk Rd (Storti to East Brule Lk Rd)
  Total cost of these projects is approximately $960,000

The total cost of the projects is approximately $3,160,000.

2. BRIDGE ASSETS

ICRC is responsible for 21 bridges that provide safe service to road users across the agency network. ICRC seeks to implement a cost-effective program of preventive maintenance to maximize the useful service life and safety of the local bridges under its jurisdiction.

Inventory of Assets

Bridges

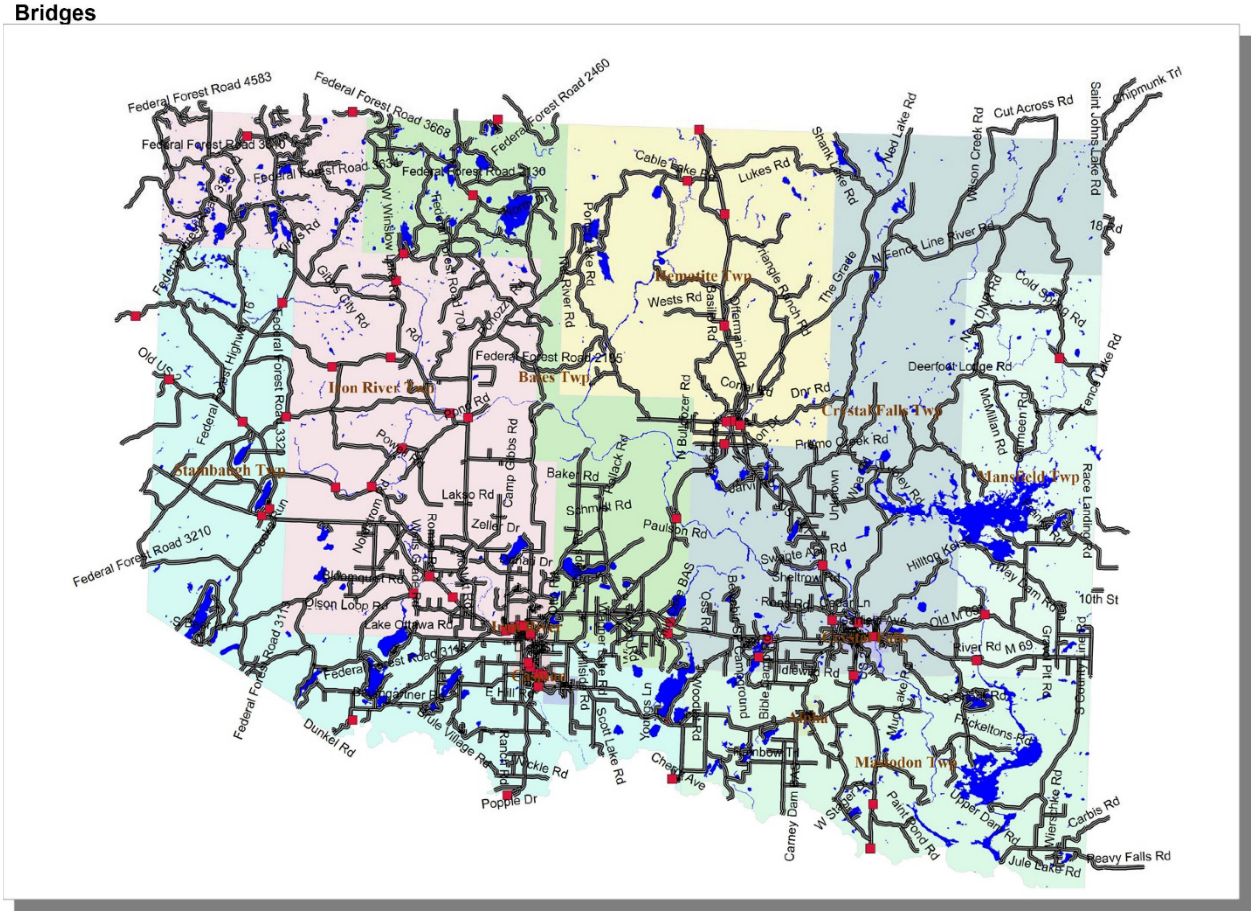


Figure 5: Map illustrating locations of ICRCs bridge assets

ICRC has 21 total bridges in its road and bridge network; these bridges connect various points of the road network, as illustrated in Figure 5. These bridge structures can be summarized by type, size, and condition, which are detailed in Table 2. More information about each of these structures can be found in ICRC's MiBRIDGE database or by contacting ICRC.

Table 2: Bridge Assets by Type: Inventory, Size, and Condition								
	Total Number of Bridges	Total Deck Area (sq ft)	Condition: Structurally Deficient, Posted, Closed			[2020] Condition		
Bridge Type			Struct. Defic	Posted	Closed	Poor	Fair	Good
Concrete	5	6,573	2 2602 sft	5	0	2	3	0
Steel	5	11,308	3 4829 sft	4	0	3	2	0
Pre-stressed Concrete	11	21,366	2 3796 sft	0	0	2	5	4
Total SD/Posted/Closed			**7 11,227 sft**	**9**	**0**			
Total	**21**	**39,247**				**7**	**10**	**4**
Percentage (%)			**33% 29% (sft)**	**43%**	**0%**	**33%**	**48%**	**19%**

Condition, Goals, and Trend

Bridges in Michigan are given a good, fair, or poor rating based on the National Bridge Inspection Standards (NBIS) rating scale, which was created by the Federal Highway Administration to evaluate a bridge's deficiencies and to ensure the safety of road users. The current condition of ICRC's bridge network based on the NBIS is 19 % structures rated good, 48 % structures rated fair, and 33 % structures rated poor.

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. ICRC has seven 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. ICRC has zero structures that are closed.

The goal of the program is the preservation and safety of ICRC's bridge network.

Programmed/Funded Projects, Gap Analysis, and Planned Projects

ICRC received an average of approximaterly $7,700,000 in total funding for the years 2019-2021 allocated to its complete transportation network which includes roads, bridges, culverts, signs and support infrastructure and equipment. The ICRC plans to spend about $50,000 per year during the life of this asset management plan on preventive and scheduled maintenance of bridges. The ICRC plans to replace 1 bridge (the Idlewild bridge) at an estimated cost of about $5,000,000. By performing the aforementioned preventive maintenance and replacement of bridge structures, ICRC may meet its overall bridge network condition goals.

3. CULVERT ASSETS

ICRC exercises awareness of its culvert assets. The ICRC monitors the known culverts for any deterioration and replaces culverts when conditions warrant.

Inventory of Assets

At present, ICRC tracks inventory data of its culvert assets as culverts get replaced. ICRC has inventoried over 1000 culverts since 2000. Since the ICRC has not inventoried all know culverts, they are unaware of all culvert locations and condition system wide at this time.

Enter any content that you want to repeat, including other content controls. You can also insert this control around table rows in order to repeat parts of a table.

Goals

The goal of ICRC's asset management program is the preservation of its culvert network. ICRC is responsible for preserving the known inventoried culverts as well as any un-inventoried culverts that underlie its entire road network.

Planned Projects

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

4. SIGNAL ASSETS

The ICRC does not own or have any traffic signal assets on its road network.

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, ICRC will overview its general expenditures and financial resources currently devoted to transportation infrastructure maintenance. This financial information is not intended to be a full financial disclosure or a formal report. Full details of ICRC's financial status can be found 800 West Franklin St, Iron River, MI 49935 or www.ironcountyroads.com.

Anticipated Revenues & Expenses

ICRC receives funding from the following sources:

- **State funds** – ICRC'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. Allocations 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. ICRC also receives revenue from the Michigan Department of Transportation to maintain (e.g. plow, patch, mow) the state trunklines within its 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 ICRC by allowing an economy of scale that enables us to provide better service at a lower cost for ICRC's roads while allowing the same for the State of Michigan. Examples of state grants also include local bridge grants, economic development funds, and metro funds.
- **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. Examples of federal funds include Surface Transportation Program (STP) funds, C and D funds, bridge funds, MDOT payments to private contractors, and negotiated contracts.
- **Local government entities or private developer contributions to construction projects 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 also include funding from a special assessment district levied by another governmental unit. Examples of contributions from local units include city, village, and township contributions to the county; special assessments; county appropriations; bond and note proceeds; contributions from counties to cities and villages; city general fund transfers; city municipal street funds; capital improvement funds; and tax millages (see below).

- **Local tax millages** – 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. ICRC has a 1/2-MILL local tax millage that generates funds that are used for equipment, roads, materials, etc. Also, some townships have a township road millage that they use on roads within their respective township.
- **Interest** – Interest from invested funds.
- **Permit fees** – Generally, permit fees cover the cost of a permit application review.
- **Other** – Other revenues can be gained through salvage sales, property rentals, land and building sales, sundry refunds, equipment disposition or installation, private sources, and financing.
- **Charges for services** – Funds from partner agencies who contract with ICRC to construct or maintain its roads, or roads under joint or neighboring jurisdictions, including state trunkline maintenance and non-maintenance services and preservation.

ICRC 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."[1]
- **Preservation and Structural Improvement Funds** – Preservation and structural improvements are "activities undertaken to preserve the integrity of the existing roadway system."[2] Preservation includes items such as a reconstruction of an existing road or bridge or adding structure to an existing road.
- **Routine and Preventive Maintenance Funds** – Routine maintenance activities are "actions performed on a regular or controllable basis or in response to uncontrollable events upon a highway, road, street, or bridge".[3] Preventive maintenance activities are "planned strategies 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".[4]
- **Winter Maintenance Funds** – Expenditures for snow and ice control.

[1] Public Act 51 of 1951, 247.660c Definitions
[2] Public Act 51 of 1951, 247.660c Definitions
[3] Public Act 51 of 1951, 247.660c Definitions
[4] Public Act 51 of 1951, 247.660c Definitions

- **Trunkline Maintenance Funds** – Expenditures spent under «agencyshort»'s maintenance agreement with MDOT for maintenance it performs 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.
- **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.

The Table (below) details the revenues and expenditures for ICRC.

Table 3 : Annual Fiscal-Year Revenues & Expenditures per Fiscal Year- 4 Year Average

REVENUES			EXPENDITURES		
Item	**Estimated $**	**Percent of Total**	**Item**	**Estimated $**	**Percent of Total**
State funds	4,200,000	58.3	Construction & capacity improvement (CCI)	0	0
Federal funds	442,000	6.1	Preservation & structural improvement (PSI)	1,860,000	21.2
Contributions for local units	741,000	10.3	Routine maintenance	2,970,000	33.8
Interest, rents, and other	459,000	6.4	Winter maintenance	1,560,000	17.8
Charges for services	1,360,000	18.9	Trunkline maintenance	1,530,000	17.4
			Administrative	403,000	4.6
			Other	454,000	5.2
TOTAL	7,202,000	100	TOTAL	8,777,000	100

Verify the information in this table. You can find your agency's information in the TAMC dashboard at https://www.mcgi.state.mi.us/mitrp/tamcDashboards.

6. RISK OF FAILURE ANALYSIS

Transportation infrastructure is designed to be resilient. The system of interconnecting roads and bridges maintained by ICRC 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. Key transportation links include:

- **Geographic divides:** Areas where a geographic feature (river, lake, hilly terrain, or limited access road) limits crossing points of the feature; bridge failures, in particular, can create loss of access to entire regions of the state
- **Emergency alternate routes for high-volume roads and bridges:** Roads and bridges that are routinely used as alternate routes for high-volume assets are included in an emergency response plan
- **Limited access areas:** Roads and bridges that serve remote or limited access areas that result in long detours if closed
- **Main access to key commercial districts:** Areas with a large concentration of businesses or where large-size business will be significantly impacted if a road is unavailable
- Our road and bridge network includes the following, but not limited, to critical assets:

- **ROADS**
    - Co Rd 424
    - Co Rd 643 (Bates -Amasa Rd)
    - Warner Mine Rd
    - Toleen Spur
    - Camp 5 Rd
    - Airport Rd
    - Mitchell Spur Rd
    - Gibbs City Rd
    - Ponozzo Rd
    - Osterlund Rd
    - Gibbs West Rd
    - Co Rd 436
    - Forest Highway 16
- **BRIDGES**
    - Co Rd 643 / Paint River Bridge
    - Ponozzo Rd / Paint River Bridge
    - Basswood Rd / Cooks Run River Bridge
    - Forest Highway 16 / S. Br of the Paint River Bridge
    - Chicagon Mine Rd / Chicagon Creek Bridge
    - Forest Highway 16 / Cooks Run Bridge
    - Winslow Lk Rd / Winlsow Creek Bridge
    - Winslow Lk Rd / North Branch of Paint River Bridge
    - Idlewild Rd / Fortune Creek Bridge

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. ICRC communicates with both public and private infrastructure owners to coordinate work in the following ways:

- The ICRC attends yearly task force meeting and urges Township officials to attend also.
- Discuss potential projects during monthly board meetings.
- Request a list of projects from Township officials.

EXAMPLE COORDINATED PLANNING TEXT

ICRC coordinates with Township agencies that maintain drinking water in addition to transportation assets. ICRC reviews Permits to work within the Righ-of-way with attached plans that are reveiewed and approved or disapproved.

ICRC does not own any sub surface infrastructure and coordination with local townships for waterline/sewerline upgrades or projects is frequently stressed.

EXAMPLE SUMMIT TEXT

ICRC stresses frequently, that sub surface infrastructure owners (township waterlines – sewerlines) to inform the ICRC of upcoming improvements/projects.

8. PROOF OF ACCEPTANCE

PUBLIC ACT 325

CERTIFICATION OF TRANSPORTATION ASSET MANAGEMENT PLAN

Certification Year: 2022

Local Road-owning Agency Name: Iron County Road Commission

Beginning October 2022 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	Ron Frailing	Printed Name Michelle Johnson	
Title Chairman	Date May 9, 2023	Title Financial Manager	Date 5-9-23

Due every three years based on agency submission schedule

Submittal Date: May 9, 2023

See attached council meeting minutes and/or resolution.

REGULAR MEETING

The regular meeting of the Board of County Road Commissioners of Iron County was held on Tuesday, May 9, 2023, at 8:30 a.m. in the Road Commission office at 800 W. Franklin Street, Iron River, Michigan.

Chairman Frailing led the Pledge of Allegiance and opened the meeting.

Present for the roll call were Chairman Ron Frailing, Vice-Chairman Dan Germic, Commissioners Ernie Schmidt, Chuck Battan, and Jim Cihak. Also present were Superintendent/Manager Douglas C. Tomasoski P.E., Interim Supr./ Mngr. Brad Toivonen, Finance Director Michelle Johnson, HR-PR Administrator Patti Leonoff, Const. Forman Kevin Schiavo, Interim Foreman Robert Johnson, Interim Foreman Dylon LaMay, Iron County Commissioner Ean Bruette, and Attorney Mark Tousignant.

ADDITIONS TO THE AGENDA

Accepted the agenda in a motion from Commissioner Schmidt, supported by Cihak.
Ayes: All
Nays: None
Motion carried.

MINUTES TO BE APPROVED

The following minutes were presented: Audit of April 11, 2023
A motion by Commissioner Germic, supported by Schmidt to accept the audit minutes.
Ayes: All
Nays: None
Motion carried.

The following minutes were presented: Regular of April 11, 2023
The motion by Commissioner Battan, supported by Cihak to accept the regular minutes.
Ayes: All
Nays: None
Motion carried.

DISBURSEMENTS TO BE APPROVED

The disbursements to be approved included:

a. Payrolls of:	$ 187,321.64
b. Prepaid Claims of:	96,358.95
c. Accounts Payables of:	163,621.68
Total:	$ 447,302.27

It was motioned by Schmidt, supported by Germic to approve the Audit Committee Report dated April 31, 2023, covering the above disbursements.

Roll call vote: Ayes- Cihak, Battan, Schmidt, Germic, Frailing
Nays: None
Motion carried.

SUPERINTENDENT'S REPORT

Interim Supr. Toivonen then reviewed his report:

Timber Sales- Oss: Cutting at the Oss Pit Expansion is complete, and wood is in the process of being hauled.

We have received the first check from Van Oss.

Fuel Tank Update- Fuel prices from the most recent delivery were provided. Trimedia- A Pollution Incident Prevention Plan for the Amasa and Oss salt sheds were added to the plan at $2,250 each to be State compliant. SPCC and PIPP plans are nearly complete.

Primary Roads-CR424 PH5 has a preconstruction meeting scheduled for May 11th with an anticipated start date of just after Memorial Day. CR424 Overlay is tentatively anticipated to be completed before Memorial Day. Waiting to hear back from Payne & Dolan to coordinate scheduling for the Osterlund Rd Overlay. Baumgartner Rd PH4-waiting to hear back from MDOT regarding questions that came up about the monument box. Phase 5 was also discussed.
An email received from W. Hagerman Lake Rd. resident Jon Wierda and the response sent from Superintendent Tomasoski, explaining the federal aid and State-D project schedule for 2025 and 2026 for Hagerman Lake Road was presented and discussed.

Local Roads-2023 Projects are finalized. A verbal confirm was received for Andreski Plat. Long lake Rd. is tentatively scheduled for before Memorial Day. A new product called Geogrid is going to be used in this year's projects to add strength.

Equipment- Proof of Loss for truck 291 insurance claim from the March accident will be submitted today. Finance Director Michelle Johnson discussed equipment damage and submission of insurance for labor and repairs; expecting 100% reimbursement.

Radio-Brief discussion about the quotes obtained from Motorola repairs: purchase and leasing options of radios. Interim Supr. Toivonen would like to budget next year for the purchase of four radios for each garage.

Employment- We have five summer new hires for each garage. Doug Bonno started on May 1 and two of the college kids started yesterday. Interviews for the HEOP position are set for May 16th, and the job posting for the mechanic position closed on May 8th.
Dylon LaMay has been filling in for Scott Weslin.
Kevin has been organizing flood repairs, assessing damage, and doing site visits with EGLE.

Bridges- Great Lakes Council Meeting update on statewide bridge funding: In 2023, 388 applications for a total of 470 million dollars were received statewide; of that, 53 applications totaling 45 million dollars were submitted for the U.P. Approx. 83 million was allocated for bridge funding in 2023.

General- COVID-19: The Public Health Emergency for COIVD-19 is expected to expire at the end of the day on May 11, 2023. It is still recommended to follow CDC guidelines.
Great Lakes Council Mtg./CRA update- discussed concerns with possible regulatory changes regarding mineral well brine and the State taking over gravel/aggregate sources.

Seasonal Weight Restrictions are still on.

There are still several roads closed due to flood damage. Interim Supr. Toivonen updated the Board on the status of the FEMA cost estimates as submitted for funding consideration, completed/pending repairs, and emergency funding qualifications. Local roads are eligible for FEMA funding, with an 18.5 million minimum threshold. Iron RC has consolidated with several other counties to exceed the minimum eligibility requirement. Primary roads are eligible for funding through the FHWA, with a 750,000 minimum threshold, which as of now we are estimated to meet.

Discussion was held about chloride vs. emulsion for dust control. Fahrner has a new, but expensive product, using recycled roof shingles mixed 1:1 with gravel.

Fiber Optics/Permitting: The new infrastructure bill for high-speed internet- utility companies are submitting extremely large permits that are vague and incomplete, as well as issues with permits not being followed. Iron RC received the first one, with over 100 pages, that was reviewed and will be sent back for revisions, clarifications, and resubmission. Toivonen is working with Gogebic for consistency in permitting, inspections

and penalties for non-compliance to try and avoid the problems occurring in other Counties down state.

Commissioner Schmidt also passed on a thank you from former Mastodon Twp. Supervisor Frank Siewiorek as he has resigned from the Township.

DELEGATIONS

Iron County Board: Commissioner Bruette will be bringing the gravel/aggregate sourcing issues to the County Board in the event that a resolution request is made in the future. Additionally, Commissioner Schmidt asked him to investigate the potential of the Road Commission being able to obtain some of the marijuana funding Iron County receives in future years as the County roads go right to the shops where the marijuana taxes are coming from.

COMMITTEE REPORTS

c) Township Liaisons-Commissioner Germic attended the Mansfield Twp. meeting a few weeks ago. He was able to answer questions regarding Doug's retirement and Brad's appointment as his replacement.
e) Safety- Chairman Frailing reported that the CPR and wound training held last week was excellent and informative.
g) Parks and Recreation-Commissioner Germic-there was not a meeting- next one is next week.
h) Personnel Committee-Commissioner Schmidt reiterated that there are interviews scheduled next week.

PUBLIC COMMENT

None.

OLD BUSINESS

None.

NEW BUSINESS

IDLEWILD RD-FORTUNE CREEK BRIDGE DESIGN ENGINEERING PROPOSAL

Design engineering proposals from UP Engineering, GEI Consultants and Coleman Engineering were received and presented for the Idlewild Rd. Bridge.
Interim Supr. Toivonen recommended UP Engineering as the low bidder.

A motion was made by Commissioner Schmidt, supported by Battan, to award the design engineering bid to UP Engineering for the total cost of $56,150.
Roll call vote: Ayes: Cihak, Germic, Battan, Schmidt, Frailing
Nays: None
Motion carried.

PROTECTING MI PENSION GRANT PROGRAM RESOLUTION

The resolution was read by Chairman Frailing and is included below:

PROTECTING MICHIGAN PENSION GRANT PROGRAM RESOLUTION

WHEREAS, the BOARD OF COUNTY ROAD COMMISSIONERS OF THE COUNTY OF IRON, STATE OF MICHIGAN recognizes the requirements of Public Act 202 of 2017;

WHEREAS, the BOARD OF COUNTY ROAD COMMISSIONERS OF THE COUNTY OF IRON, STATE OF MICHIGAN is committed to protecting the security of retirement benefits for its retirees and current employees;

WHEREAS, the BOARD OF COUNTY ROAD COMMISSIONERS OF THE COUNTY OF IRON, STATE OF MICHIGAN wishes to apply for the Protecting Michigan Pension Grant Program and authorize Michelle Johnson, Finance Director as the Chief Administrator role of the grant, described hereunder,

NOW, THEREFORE, BE IT RESOLVED, that the BOARD OF COUNTY ROAD COMMISSIONERS OF THE COUNTY OF IRON, STATE OF MICHIGAN approves the submission of the Protecting Michigan Pension Grant Application and has assigned Michelle Johnson, Finance Director, as the Chief Administrator role on behalf of the Iron County Road Commission, and who shall responsible for filing the claim for the grant payment as well as entering, updating, and submitting compliance reports for said program.

On a roll call vote: -
Ayes: Germic, Cihak, Schmidt, Battan, Frailing
Nays:

MDOT ENGINEERING REIMBURSEMENT

Commissioner Schmidt approved the recommendation to apply for the Engineering Reimbursement from MDOT. Support was by Battan.

Roll call vote: Ayes: Germic, Battan, Cihak, Schmidt, Frailing
Nays: None
Motion carried.

GRAVEL CRUSHING BIDS-AMASA PIT

Gravel crushing bids from Bacco Construction, Payne & Dolan, Iron City Enterprises and Northern Crushing & Screening were received and presented, with Interim Supr. Toivonen recommending Iron City Enterprises as the low bidder.

A motion was made by Commissioner Cihak, supported by Schmidt, to award the gravel crushing bid to Iron City Enterprises in the amount of $60,750.

Roll call vote: Ayes: Battan, Schmidt, Cihak, Germic, Frailing
Nays: None
Motion carried.

ASSET MANAGEMENT PLAN CERTFICATION

A motion was made by Commissioner Battan, supported by Germic, to certify the 2022 Transportation Asset Management Plan.

Roll call vote: Ayes: Schmidt, Battan, Germic, Cihak, Frailing
Nays: None
Motion carried.

UPDATE ON INVESTMENTS

Finance Director Johnson provided an update on the interest received in April from both the six-month and one- year CD's with Multibank Securities. Additionally, the six-month CD matured on April 19th and the $250,000 was rolled into a new 9-month CD at 4.8% interest.

TERRA LANGHAM FROM MERS WILL BE PRESENT AT THE JUNE 13TH MEETING.

COMMISSIONERS COMMENTS

None.

At 9:45 a.m. with no further business to come before the Board, it was motioned by Schmidt supported by Battan to adjourn.

Ron Frailing, Chairman

Michelle Johnson, Clerk

A. PAVEMENT ASSET MANAGEMENT PLAN

An attached pavement asset management plan follows.

Iron County Road Commission
2022 Pavement
Asset Management Plan

A plan describing the Iron County Road Commission's roadway assets and conditions

Prepared by:
Douglas C. Tomasoski
Superintendent/Manager/Engineer
800 West Franklin St
Iron River, MI 49935

CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

EXECUTIVE SUMMARY

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

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

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

ICRC owns and/or manages 632.95 centerline roads. This road network can be divided into the county primary network, the county local network, the unpaved road network, and the National Highway System (NHS) network based on the different factors these roads have that influence asset management decisions. A summary of ICRC historical and current network conditions, projected trends, and goals for county primary network and county local network can be seen in the two figures, below:

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). ICRC 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 Iron County Road Commission (ICRC) 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. ICRC is responsible for maintaining and operating over 622.842 centerline of roads.

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

Questions regarding the use or content of this plan should be directed to Doug Tomasoski at 800 West Franklin St, Iron River, MI 49935 or at (906)-265-6686/doug@ironcountyroads.com or Interim/Superintendent/Manager Brad Toivonen at same address above and email brad@ironcountyroads.com. Key terms used in this plan are defined in ICRC's comprehensive transportation asset management plan (also known as the "compliance plan") used for compliance with PA 325 or 2018.

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

Pavement Primer

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

The decision to pave with a particular material as well as the decision to leave a road unpaved allows road-owning agencies to tailor a road to a particular purpose, environment, and budget. Thus, selecting a pavement type or leaving a road unpaved depends upon purpose, 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 has been sealed with a thin asphalt binder coating that has stone chips spread on top (not to be confused with a chip seal treatment over HMA pavement). This type of a pavement relies on the gravel layer to provide structure to support traffic, and the asphalt binder coating and stone chips shed water and eliminate the need for maintenance grading. Nonetheless, sealcoat pavement does require additional maintenance steps that asphalt and gravel do not require 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, and/or 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. ICRC uses pavement condition age, and experience 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

ICRC is committed to monitoring the condition of its road network and using pavement condition data to drive cost-effective decision-making and preservation of valuable road assets. ICRC uses the Pavement Surface Evaluation and Rating (PASER) system to assess its Federal Aide eligible paved roads with the intent to collect ratings on all paved roads in the next two years. 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 ICRC 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. Figure 1 illustrates two road examples in this category. CPM can be cost effective for maintaining the road's "fair" condition or even raising it to "good" condition before the structural integrity of the pavement has been severely impacted. CPM treatments can be 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 percent every two years on all federal-aid-eligible roads in Michigan. The TAMC dictates and funds the required training and the format for this collection, and it shares the data regionally and statewide. In addition, ICRC is in the process of collecting PASER data on its non-federal-aid-eligible network.

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 ICRC also uses the IBR System™ for rating its unpaved roads. Information about the IBR System™ can be found at http://ctt.mtu.edu/inventory-based-rating-system.

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

The IBR System™ gathers reliable condition assessment data for unpaved 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 ICRC—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 20 years and costs $350,000 per lane mile. The following descriptions outline the main reconstruction treatments used by ICRC.

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

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 10- 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 $50,000 per mile.

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 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 ICRC.

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

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

An HMA overlay is a layer of new asphalt (liquid asphalt and stones) placed on an existing pavement (Figure 4). Depending on the overlay thickness, this treatment can add significant structural strength. This treatment also creates a new wearing surface for traffic and seals the pavement from water, debris, and sunlight damage. An HMA overlay lasts approximately five to ten years and costs $80,000 to $120,000 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 to $20,000 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 pavement's 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 20 years and cost $200,00 to $250,000 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 ICRC.

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

Crack Seal

Water that infiltrates the pavement surface softens the pavement structure and allows traffic loads to cause more damage to the pavement than in normal dry conditions. Crack sealing helps prevent water infiltration by sealing cracks in the pavement with asphalt sealant (Figure 5). ICRC seals 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 ICRC looks 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 $5,000 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$20,000 to $25,000 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. ICRC has one local road and one primary road with a slurry seal trial basis on them.

Maintenance Grading (for Unpaved Roads)

Maintenance grading involves regrading an unpaved road to remove isolated potholes, wash boarding, 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 once per year, by several Townships within the county and each application costs $700 to $1,000 per mile. ICRC does limited dust control on primary roads which have been recently scarified.

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).

Maintenance

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

1. PAVEMENT ASSETS

Building a mile of new road can cost over $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, USFS, 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 ICRC is responsible for a total of 632.95 centerline miles of public roads.

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 ICRC as either county primary or county local roads. State statute prioritizes expenditures on the county primary road network.

Of the 632.95 centerline miles of public roads owned and/or managed by ICRC, approximately 60% of all County Primary roads are classified as federal aid eligible, which allows them to receive federal funding for their maintenance and construction. There are no County Local roads considered federal aid eligible, which means state and local funds must be used to manage these roads.

Figure 7 illustrates the percentage of roads owned by ICRC that are classified as county primary and county local roads. ..Figure 8 illustrates this breakdown of these road networks by township boundary within ICRC's jurisdiction.

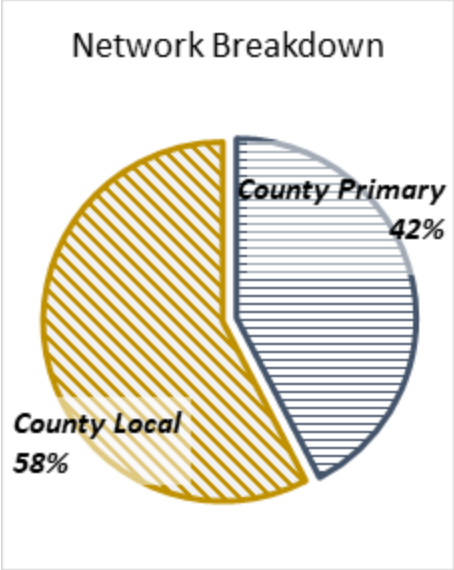
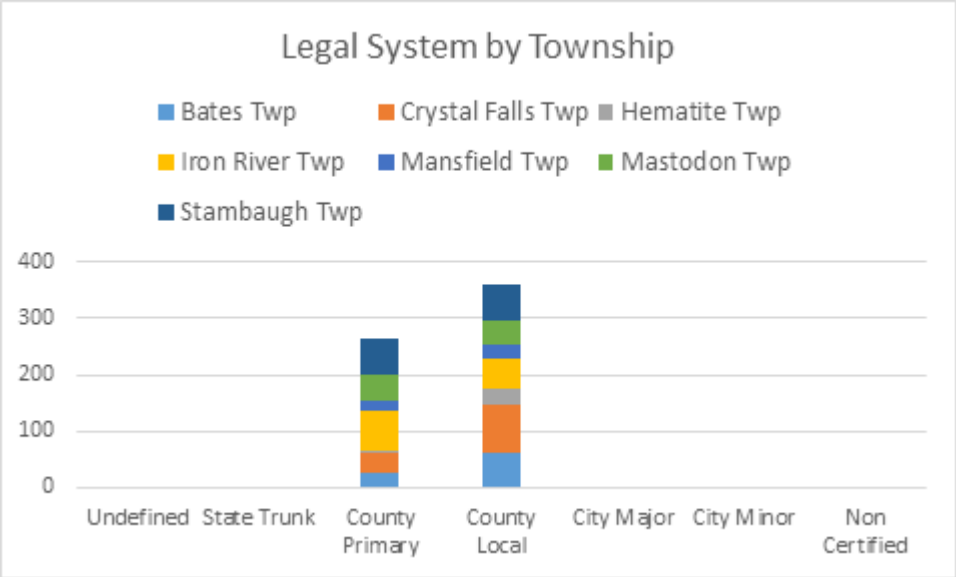


Figure 7: Percentage of county primary and county local roads for ICRC.



..Figure 8: county primary and county local roads by township for ICRC's jurisdiction.

ICRC does not have any roads that are part of the National Highway System (NHS). These are roads that are critical to the nation's economy, defense, and mobility. The NHS is subject to special rules and regulations and has its own performance metrics dictated by the FHWA. Most NHS roads in Michigan are managed by MDOT. ICRC also owns and manages 178.006 miles of unpaved roads.

Types

ICRC has multiple types of pavements in its jurisdiction, including: asphalt, sealcoat, and undefined; it also has unpaved roads (i.e., gravel and/or earth). 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 9 illustrates the percentage of various pavement types that ICRC has in its network. Figure 10 shows the pavement type by Township boundary for ICRC's jurisdiction.

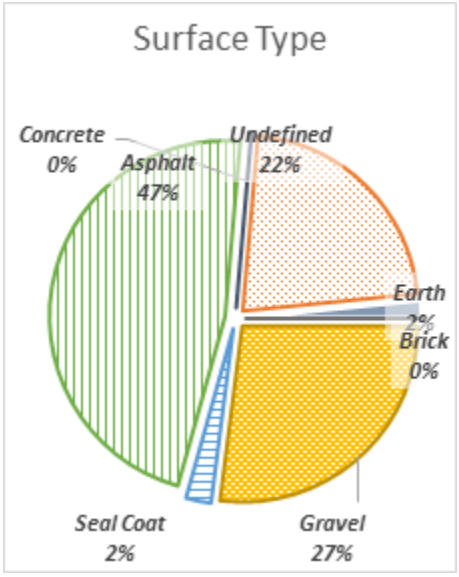


Figure 9: Pavement type by percentage maintained by ICRC Undefined pavements have not been inventoried in ICRC's asset management system to date but will be included as data becomes available.

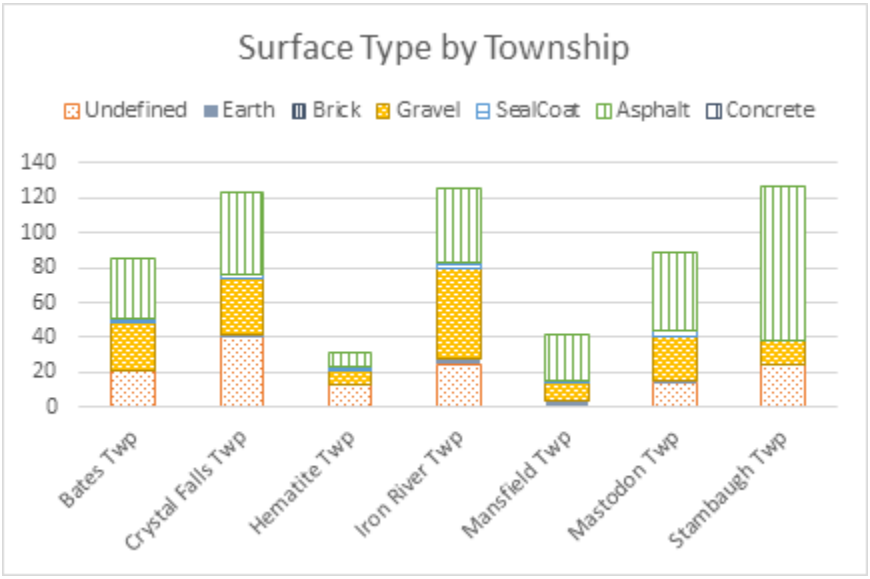


Figure 10: Pavement type by township within ICRC's jurisdiction. Undefined pavements have not been inventoried in ICRC's asset management system to date but will be included as data becomes available.

Locations

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

Condition

The road characteristic that road users most readily notice is pavement condition. Pavement condition is a major factor in determining the most cost-effective treatment—that is, routine maintenance, capital preventive maintenance, or structural improvement—for a given section of pavement. ICRC uses pavement condition, experience, and age to anticipate when a specific section of pavement will be a potential candidate for preventive maintenance. Pavement condition data enables ICRC 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

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

ICRC collects 100 percent of its PASER data every two years on all federal-aid-eligible roads in Michigan. At this time, ICRC does not collect PASER ratings on its paved non-federal-aid-eligible network using its own staff and resources.

ICRC's 2021 paved county primary road network has 30 percent of roads in the TAMC good condition category, 38 percent in fair, and 32 percent in poor (Figure 11A).

The paved county local road network is again not PASER rated but data has been imported for every newly paved road since 2000. These roads have never been rated since paving but the ICRC is making plans to have these rated in the next two years.

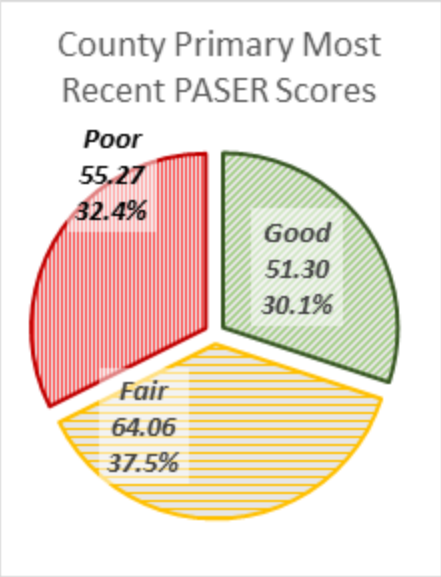


Figure 11: (A) Left: ICRC paved county primary road network conditions by percentage of good, fair, or poor.

In comparison, the statewide paved county primary road network has 60 percent of roads in the TAMC good condition category, 20 percent in fair, and 20 percent in poor (Figure 12A). Comparing Figure 11A and Figure 12A shows that ICRC's paved county primary road network shows similarly-classified roads, in nearly the same condition as in the rest of the state. Other road condition graphs can be viewed on the TAMC pavement condition dashboard at: http://www.mcgi.state.mi.us/mitrp/Data/PaserDashboard.aspx.

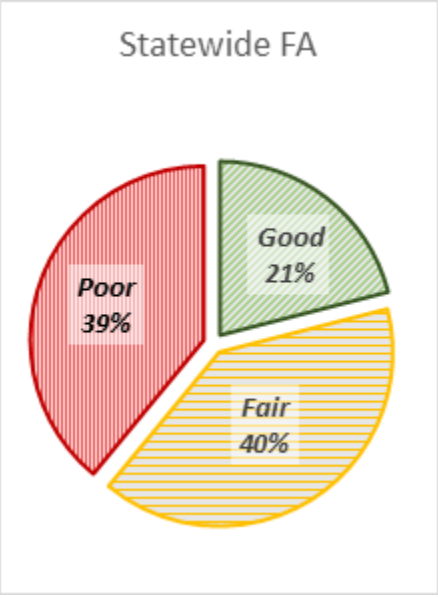


Figure 12 (A) Left: Statewide paved county primary road network conditions by percentage of good, fair, or poor.

ICRC's local road network has 2 of the 7 townships that have a dedicated road millage. These townships with road millages typically spend those dollars on the local road network within their township.

Figure 13 shows the number of miles for ICRC's roads with PASER scores expressed in TAMC definition categories for the paved county primary road network. ICRC 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.

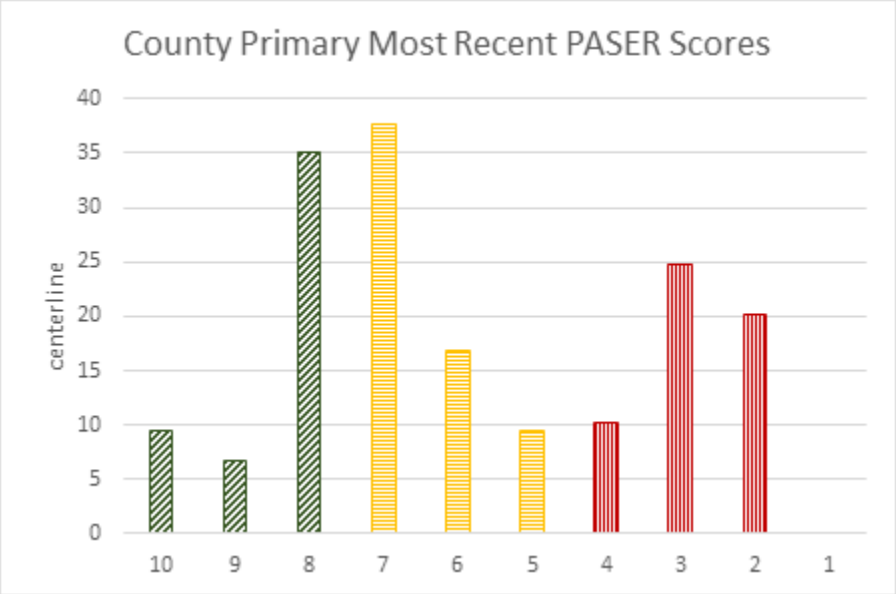


Figure 13: ICRC paved county primary road network conditions. Bar graph colors correspond to good/fair/poor TAMC designations. Only newly paved roads have been entered and the local system since 2000 and has not been PASER rated since.

Figure 15 illustrates ICRC's entire paved road network divided by township into the TAMC good/fair/poor designations.

Figure 16 provides a map illustrating the geographic location of paved roads and their respective PASER condition. An online version of the most recent PASER data is located at https://www.mcgi.state.mi.us/tamcMap/.

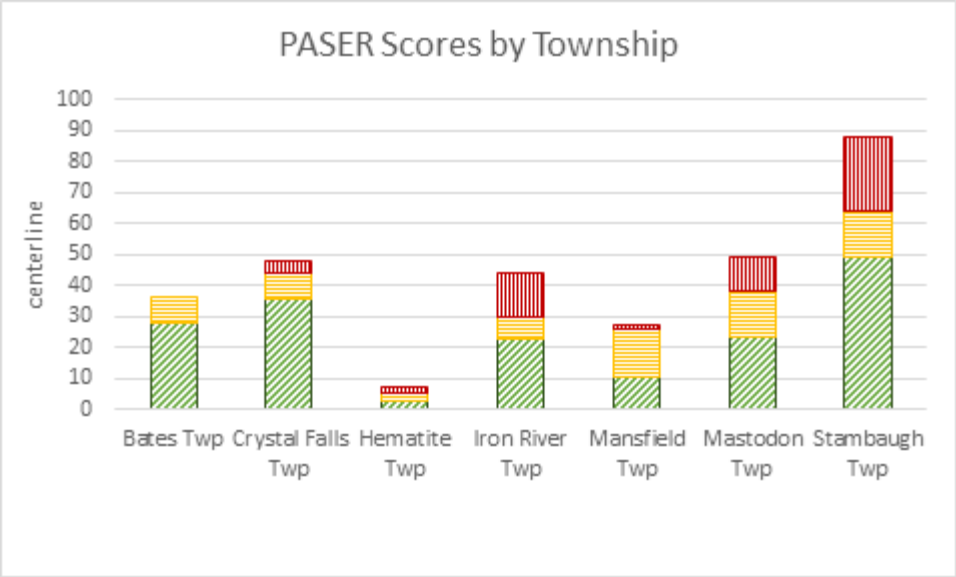


Figure 15: Number of miles of paved road in each township divided in categories of good (PASER 10, 9, 8), fair (PASER 7, 6, 5), and poor (PASER 4, 3, 2, 1). Only newly paved roads have been entered and the local system since 2000 and has not been PASER rated since.

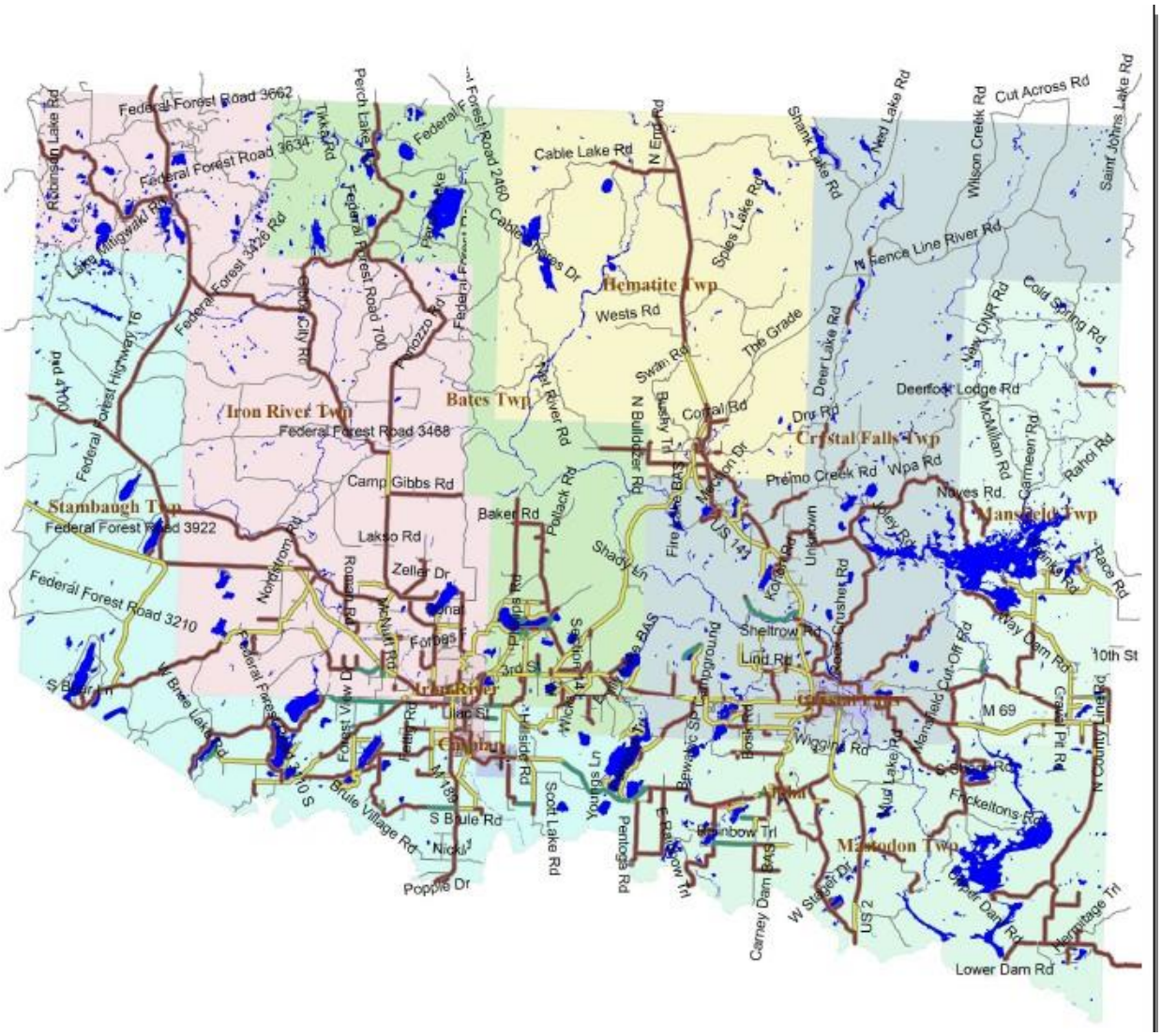


Figure 16: Map of the current paved road condition in good (PASER 10, 9, 8) shown in green, fair (PASER 7, 6, 5) shown in yellow, and poor (PASER 4, 3, 2, 1) shown in brown. Only Roads owned by ICRC are shown.

Historically, the overall quality of ICRC's paved county primary roads have been staying the same, and decreasing, as can be observed in Figure 17.

Comparing ICRC's paved county primary road condition trends illustrated in Figure 17 with overall statewide condition trends for similarly classified roads, which are illustrated in Figure 18, shows a different trend locally as in the rest of the state.

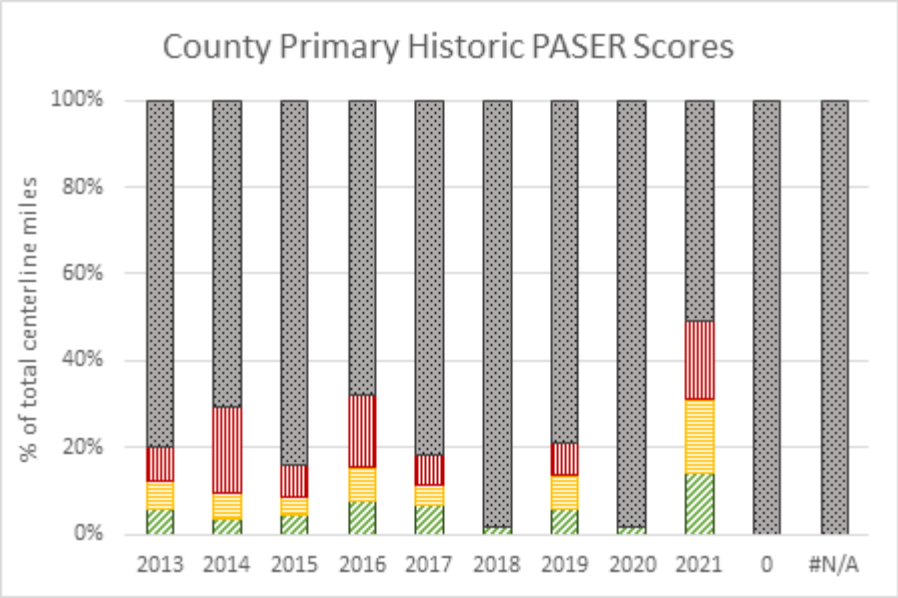


Figure 17: Historical ICRC paved county primary road network condition trend

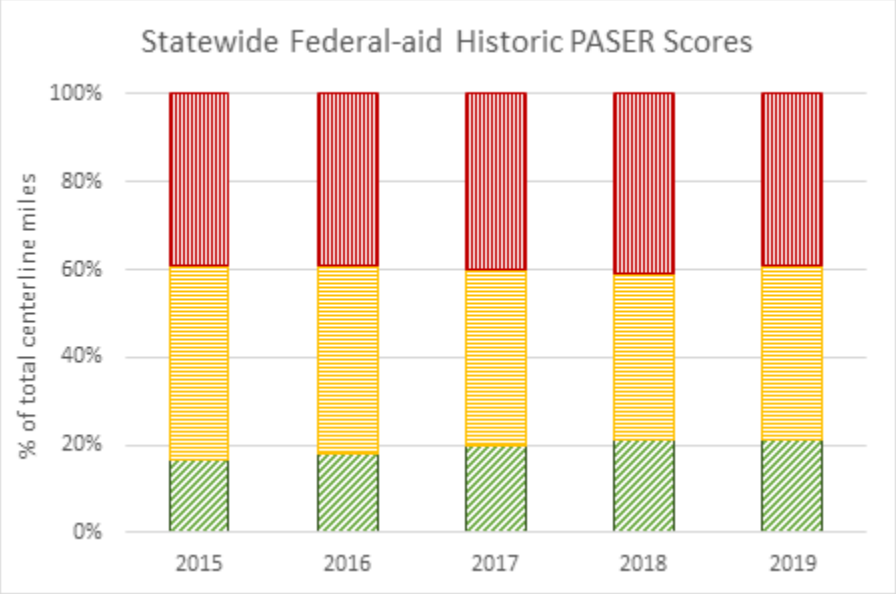


Figure 18: Historical statewide county primary road network condition trend

Historically, the overall quality of ICRC's paved county local roads have been decreasing as than the paved county primary road network because they lack a source of state and federal funding and therefore must be supported locally. Figure 19 does not clearly portray the condition of the paved county local road network because we do not currently rate all the county local system.

Comparing ICRC's paved county local road condition trends illustrated in Figure 19 with overall statewide condition trends for all paved county local roads illustrated in Figure 20 indicates a different

trend locally as in the rest of the state. Figure 19 shows the year-to-year variation in the paved county local 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. This trend is a direct result of our townships funding local paved road improvements within their township.

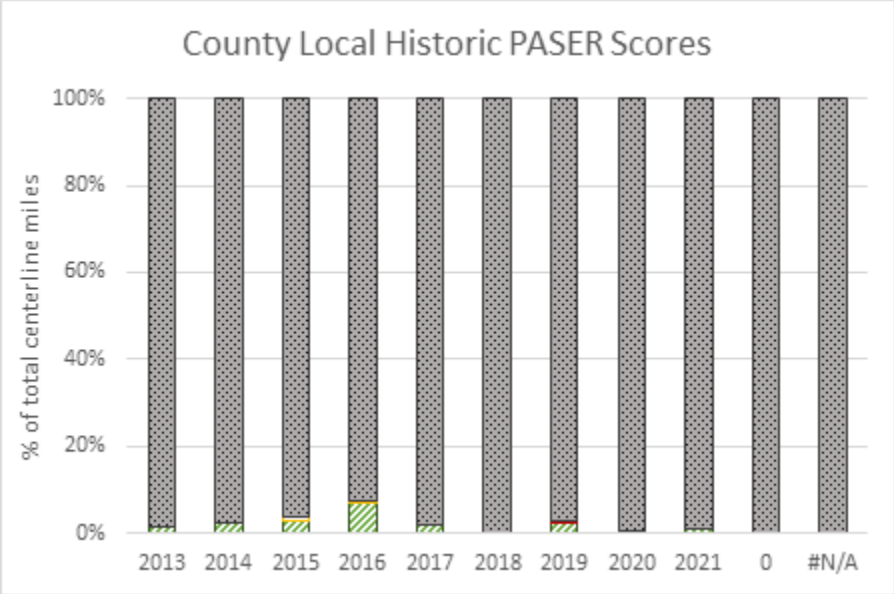


Figure 19: Historical ICRC paved county local road network condition trend

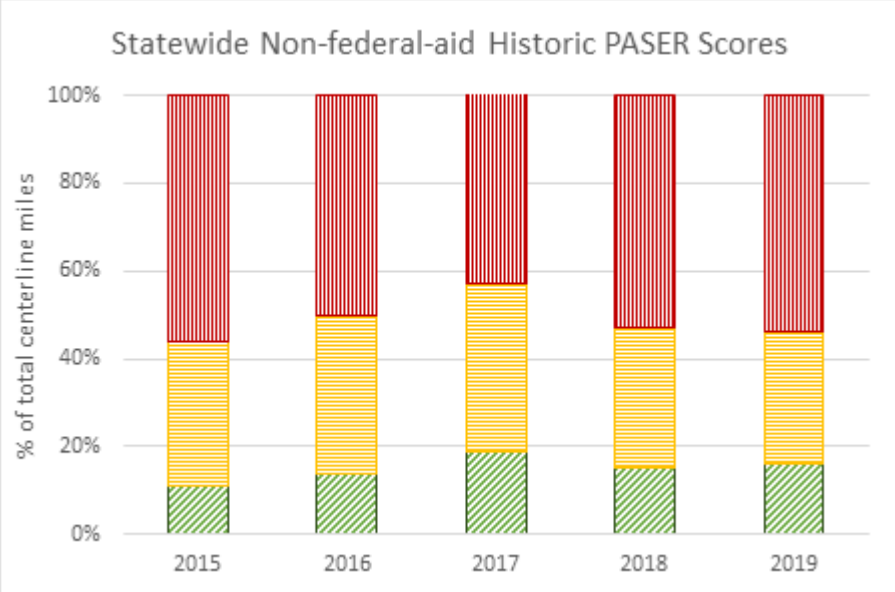


Figure 20: Historical statewide paved county local road network condition trend

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 ICRC uses the IBR System™ for rating its unpaved roads. More information regarding the IBR System™ can be found in Introduction's Pavement Primer.

ICRC only uses the IBR System on Federal Aid eligible unpaved roads at this time.

Figure 21 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 22 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.

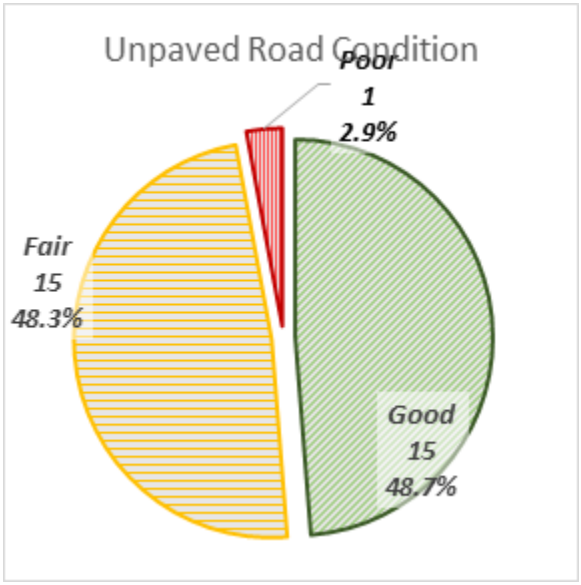


Figure 21: ICRC's unpaved road network condition by percentage of roads with IBR numbers of 10, 9, and 8; roads with IBR numbers of 7, 6, and 5; and IBR numbers of 4, 3, 2, and 1. Note that figures are distorted due to the limited amount of data collected at this time.

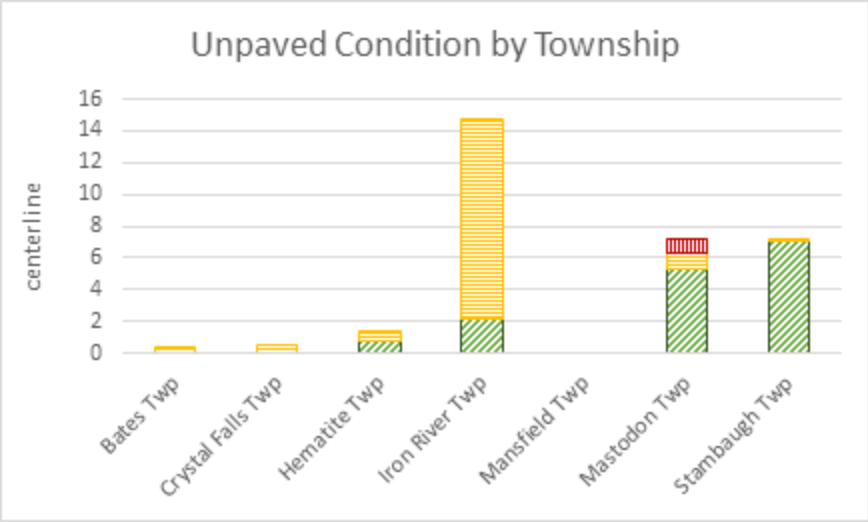


Figure 22: Number of miles of unpaved road in each township divided in categories of roads with IBR numbers of 10, 9, and 8; IBR numbers of 7, 6, and 5; and IBR numbers of 4, 3, 2, and 1. Note that figures are distorted due to the limited amount of data collected at this time.

ICRC's condition of our unpaved road network is generally improving. When the road commission and/or townships place a new aggregate surface on existing gravel roads, a product called Dense Aggregate 23A is commonly used. Also, tree clearing, and drainage improvements are done to prolong the new gravel surface life. Dense Aggregate 23A is generally 100% crushed aggregate and when compacted it can create a an almost impervious layer. This in turn reduces the amount of maintenance needed on those roads.

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. ICRC is not able to control any of these factors fully due to seasonal weather changes, traffic pattern changes, and its limited budget. In spite of the uncontrollable variables, it is still important to set realistic network condition goals that efficiently use budget resources to build and maintain roads meeting taxpayer expectations. An assessment of the progress toward these goals is provided in the *1. Pavement Assets*: *Gap Analysis* section of this plan.

Goals for Paved County Local Roads

The overall goal for ICRC's paved county local road network is to maintain or improve road conditions network-wide at 2021 levels.

ICRC's network-level pavement condition strategy for paved county local roads is:

1. Prevent its good and fair (PASER 10 - 5) paved county local roads from becoming poor (PASER 4 - 1).
2. Even though our paved county local roads are in fair condition the goal will be to keep them the same, and we realize our roads in the poor category to increase.

Goals for Unpaved Roads

The overall goal for ICRC's unpaved road network is to maintain or improve road conditions network-wide at 2021 levels. The baseline condition for this goal is illustrated in Figure 25.

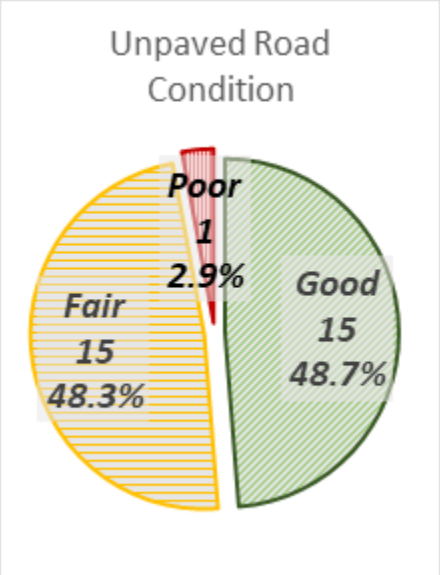


Figure 25: ICRC's 2021 unpaved road network condition by percentage of good/fair/poor

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, 49 % percent of ICRC's year-round unpaved roads have good or fair structural adequacy and 49% percent 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 pass ability and

safety but do not have a goal associated with them. Note that figures are distorted due to the limited amount of data collected at this time.

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

ICRC uses many types of repair treatments for its 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 ICRC's financial resources can be found in the *5. Financial Resources* section.

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

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

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

Roadsoft Pavement Condition Forecast to Forecast Future Trends

ICRC 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 26.

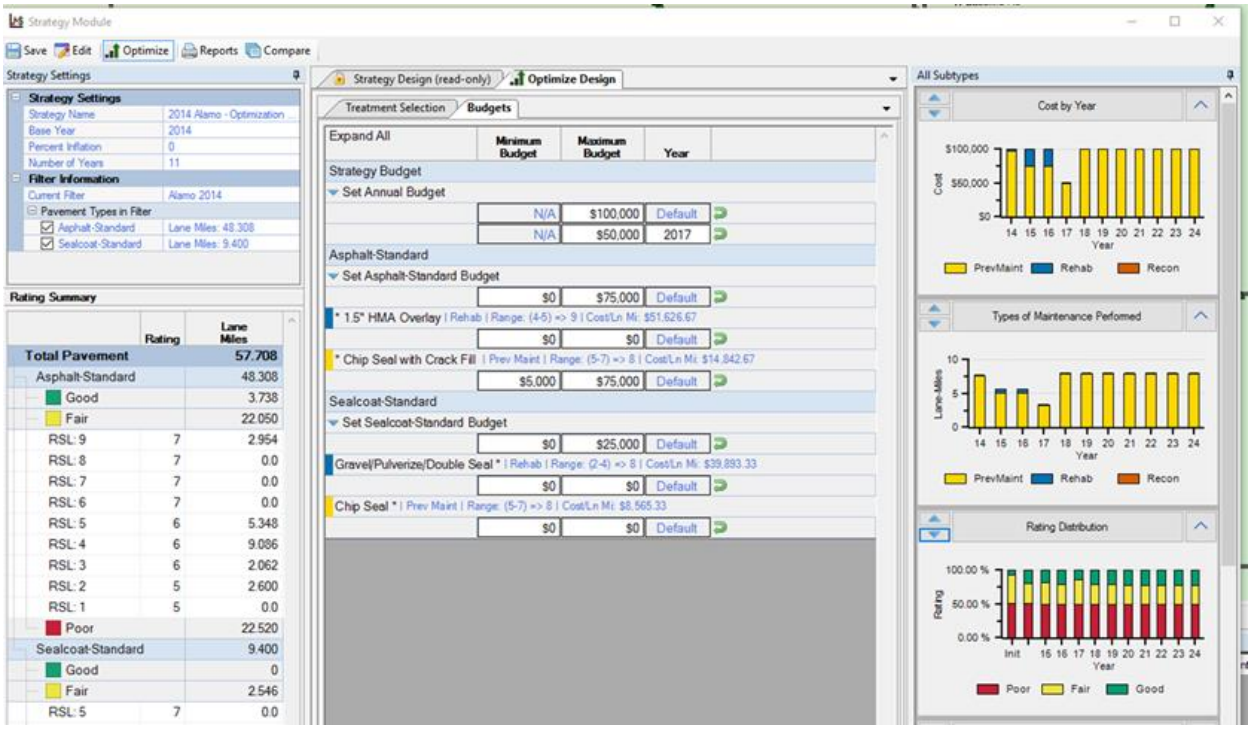


Figure 26: Pavement condition forecast model in the software program Roadsoft.

Paved County Primary Roads

Table 2 illustrates the network-level model inputs for Roadsoft on the paved county primary 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 on average over a 3-year period. See Appendix A of this plan for details on planned projects. Full model inputs and outputs are included in Appendix D.

Table 2: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for ICRC's Road Assets—Modelled Trends: Roadsoft Annual Work Program for the Paved County Primary Road Network Forecast

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger-Reset
Crack Seal	20	1	7–7
Chip Seal	20	5	5, 6-8
Overlay	1	10	3, 4-9
Reconstruct	2	20	1, 2, 3-10

The Roadsoft network analysis of ICRC's planned projects form its currently available budget does not allow ICRC to reach its pavement condition goals given the projects planned for the next three years.

Paved County Local Road

A screenshot of Roadsoft's pavement condition model and the associated output is shown in Figure 27.

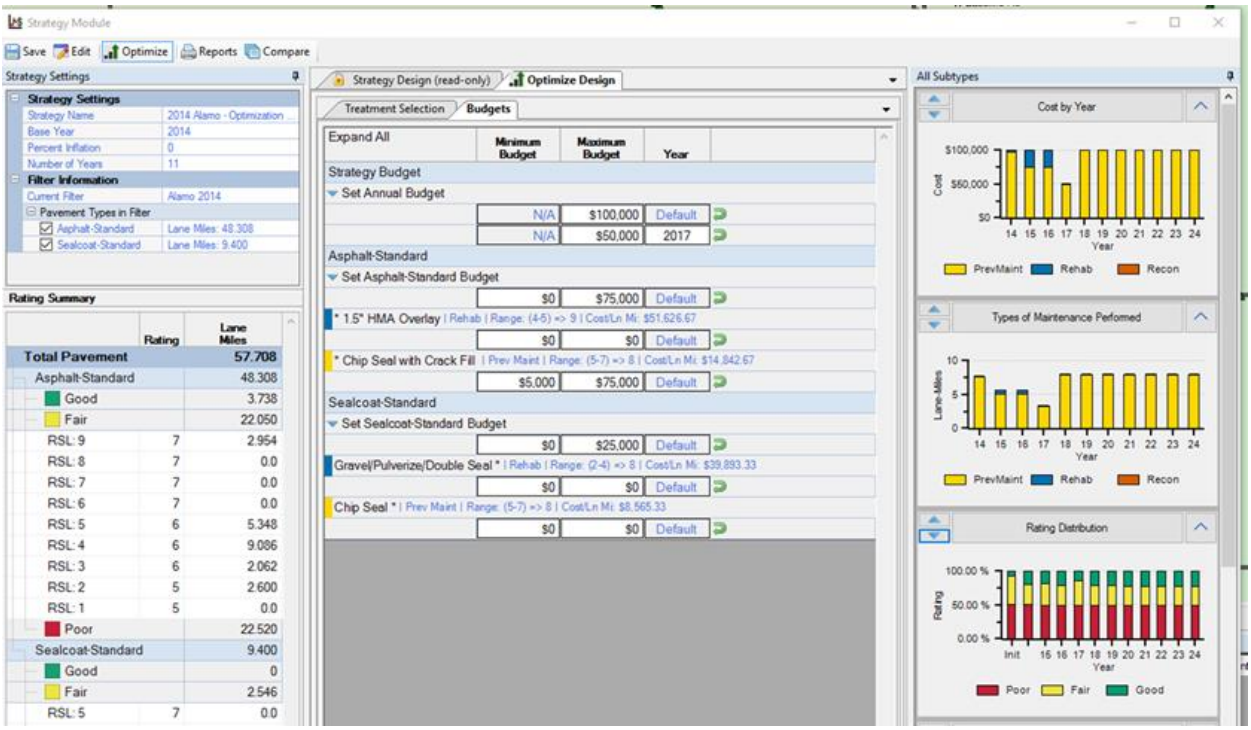


Figure 27: Pavement condition forecast model in the software program Roadsoft.

Table 3 illustrates the network-level model inputs for Roadsoft on the paved county local road network. Other pavement types in this network were neglected due to their small numbers relative to HMA pavements. The treatments outlined in Table 3 are the average treatment volume of planned projects scheduled to be completed in a 3-year period. Details on planned projects are included in Appendix A, and full model inputs and outputs are included in Appendix A

Table 3: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for ICRC's Road Assets—Modelled Trends: Roadsoft Annual Work Program for the Paved County Local Road Network Forecast

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger-Reset
Crack Seal	22	1	7–7
Chip Seal	2	5	5, 6-8
Overlay	0	10	3, 4-9
Reconstruct	5	18	1, 2, 3-10

The Roadsoft network analysis of ICRC's planned projects form its currently available budget does not allow ICRC to reach its pavement condition goals given the projects planned for the next three years.

Planned Projects

ICRC 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 county primary 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 ICRC to alter initial plans. Project planning information is used to predict the future condition of the road networks that ICRC 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 2023 - 2025, ICRC plans to do the following projects:

Paved County Primary Projects

2023

- Co Rd 424 (Tree Line Dr to Blue Lk Rd)
  Total cost of these projects is approximately $600,000

2024

- Co Rd 424 (Blue Lk Hill to Blue Lk Pit)
- Baumgartner Rd (Eden to Snipe Lk)
- Brule Mt Rd (Snipe Lake to Ski Brule Village)
- Hagerman Lk Rd (Ottawa Lk Rd to Storti)
  Total cost of these projects is approximately $1.6 million

2025

- Co Rd 424 (Blue Lk Pit to Rysberg Hill)
- Hagerman Lk Rd (Storti to East Brule Lk Rd)
  Total cost of these projects is approximately $960,000

Paved County Local Projects

ICRC is currently not planning any construction and maintenance projects on the paved county local road network. This is not to say that projects will not be forthcoming, but since local road projects are funded by our various township, planning for these projects is predominantly done at the township level.

Unpaved Road Projects

ICRC has recently stockpiled 23A Aggregate to place maintenance gravel on approximately 10 miles of unpaved roadway.

Gap Analysis

The current funding levels that ICRC receives are not sufficient to meet the goals for the paved county primary road network, the paved county local 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, ICRC 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 county primary road network, the paved county local road network, and the unpaved road network:

Roadsoft Pavement Condition Forecast for the Paved County Primary and County Local Network

ICRC used Roadsoft to forecast the necessary additional construction and maintenance work for meeting agency goals on the paved county primary and county local road networks. Tables 4 and Table 5 illustrate the network-level model inputs used for this simulation.

Table 4: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for ICRC's Road Assets—Pavement Condition Forecast and Gap Analysis: Roadsoft Annual Work Program for Paved County Primary Road Network

Pavement Condition Forecast			
Treatment Name	**Annual Miles of Treatment**	**Years of Life**	**Trigger-Reset**
Crack Seal	30	1	7–7
Chip Seal	30	5	5, 6-8
Overlay	1	10	3, 4-9
Crush & Shape	2	20	1, 2, 3-10
[Treatment 5]			
[Treatment 6]			
[Treatment 7]			
[Treatment 8]			
Additional Work Necessary to Overcome Deficit			
Treatment	**Annual Miles of Treatment**	**Years of Life**	**Trigger-Reset**
Crack Seal	30	1	7–7
Chip Seal	15	5	5, 6-8
Overlay	8	10	3, 4-9
Crush & Shape	5	20	1, 2, 3-10
[Treatment 5]			
[Treatment 6]			
[Treatment 7]			
[Treatment 8]			

Table 5: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for ICRC's Road Assets—Pavement Condition Forecast and Gap Analysis: Roadsoft Annual Work Program for Paved County Local Road Network

Pavement Condition Forecast

Treatment	Annual Miles of Treatment	Years of Life	Trigger-Reset
Crack Seal	22	1	7–7
Chip Seal	2	5	5, 6-8
Overlay	1	10	3, 4-9
Crush & Shape	5	20	1, 2, 3-10
[Treatment 5]			
[Treatment 6]			
[Treatment 7]			
[Treatment 8]			

Additional Work Necessary to Overcome Deficit

Treatment	Annual Miles of Treatment	Years of Life	Trigger-Reset
Crack Seal	25	1	7–7
Chip Seal	10	5	5, 6-8
Overlay	2	10	3, 4-9
Reconstruct	10	20	1, 2, 3-10
[Treatment 5]			
[Treatment 6]			
[Treatment 7]			
[Treatment 8]			

Results indicate that the necessary additional work needed to meet the agency's condition goal would cost an additional $5 million per year.

2. FINANCIAL RESOURCES

Public entities must balance the quality and extent of services they can provide with the tax resources provided by citizens and businesses, all while maximizing how efficiently funds are used. ICRC will overview its general expenditures and financial resources currently devoted to pavement maintenance and construction. This financial information is not intended to be a full financial disclosure or a formal report. Michigan agencies are required to submit an Act 51 Report to the Michigan Department of Transportation each year; this is a full financial report that outlines revenues and expenditures. This report can be obtained upon request-at the road commission office located at 800 West Franklin St, Iron River, MI, 49935 or website www.ironcountyroads.com

County Primary Network

ICRC has historically spent $1,000,000 annually on pavement-related projects. Over the next three years, ICRC plans to spend $1,000,000 on county primary-network projects consisting of, but not limited to, reconstruction, overlay, culvert replacement, and preventive maintenance. Spending on projects depends on revenue from Michigan Transportation Fund (MTF), township contributions, and federal/state programs.

County Local Network

ICRC has historically spent $100,000 annually on pavement-related projects. Over the next three years, ICRC plans to spend $300,000 on county local-network projects consisting of, but not limited to, reconstruction, overlay, culvert replacement, and preventive maintenance. Spending on projects depends on revenue from Michigan Transportation Fund (MTF), township contributions, and federal/state programs.

3. RISK OF FAILURE ANALYSIS

Transportation infrastructure is designed to be resilient. The system of interconnecting roads and bridges maintained by ICRC 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. Key transportation links in ICRC's Road network include 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.

Any critical failure on our Primary System would severely impact the motoring public by significantly increasing the commute time, as viable detour routes are limited.

4. COORDINATION WITH OTHER ENTITIES

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

COORDINATED PLANNING

ICRC maintains only transportation assets. ICRC follows an asset management process for all of its assets by coordinating the upgrade, maintenance, and operation of all major assets.

ICRC 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 if funding is available.
- 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 work toward all under pavement assets to be upgraded in the same project regardless of ownership.
- Goal to encourage 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.

An attempt is made to coordinate with infrastructure owners.

ICRC has regular contact with various infrastructure owners. Infrastructure owners are encouraged to communicate 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.

- The ICRC attends yearly task force meeting and urges Township officials to attend also.

- Discuss potential projects during monthly board meetings.

- Request a list of projects from Township officials.

-ICRC does not own any sub surface infrastructure and coordination with local townships for waterline/sewerline upgrades or projects is frequently stressed.

APPENDIX A: 2023 - 2025 PAVED COUNTY PRIMARY ROAD PLANNED PROJECTS

2023

- Co Rd 424 (Tree Line Dr to Blue Lk Rd)
  Total cost of these projects is approximately $600,000

2024

- Co Rd 424 (Blue Lk Hill to Blue Lk Pit)
- Baumgartner Rd (Eden to Snipe Lk)
- Brule Mt Rd (Snipe Lake to Ski Brule Village)
- Hagerman Lk Rd (Ottawa Lk Rd to Storti)
  Total cost of these projects is approximately $1.6 million

2025

- Co Rd 424 (Blue Lk Pit to Rysberg Hill)
- Hagerman Lk Rd (Storti to East Brule Lk Rd)
  Total cost of these projects is approximately $960,000

APPENDIX B: 2023 - 2025 PAVED COUNTY LOCAL ROAD PLANNED PROJECTS

The Iron County Road Commission requests annually to have a 3-year plan for local roads from each township since local road construction projects are 100% funded by the individual townships.

APPENDIX C: 2023 - 2025 UNPAVED ROAD PLANNED PROJECTS

Iron County Road Commission currently has stockpiled aggregate to place on approximately 10 miles of unpaved roadway.

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.

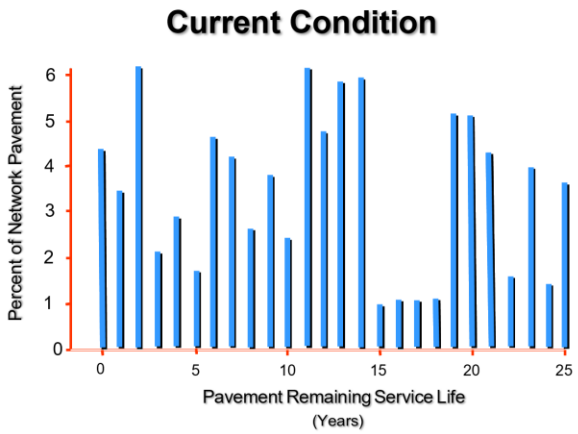


Figure 1 – Current Condition

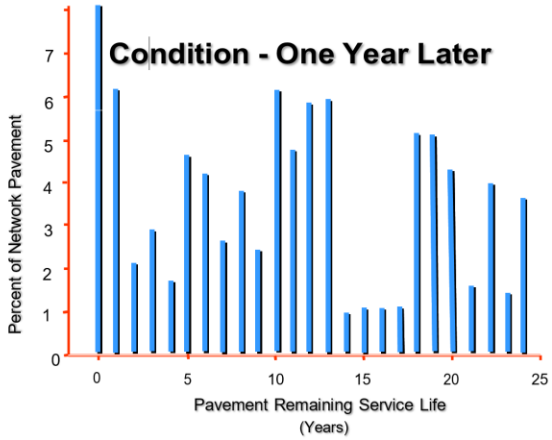


Figure 2 – Condition 1-Year Later

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: MEETING MINUTES VERIFYING PLAN ACCEPTANCE BY GOVERNING BODY

B. BRIDGE ASSET MANAGEMENT PLAN

An attached bridge asset management plan follows.

Iron County Road Commissionm
2022 Bridge
Asset Management Plan

A plan describing the Iron County Road Commission’s transportation assets and conditions

Prepared by:
Douglas C. Tomasoski, P.E.
Superintendent/Manager/Engineer
800 W. Franklin Street
Iron River, MI 49935

CONTENTS

SUMMARY OF FIGURES

SUMMARY OF TABLES

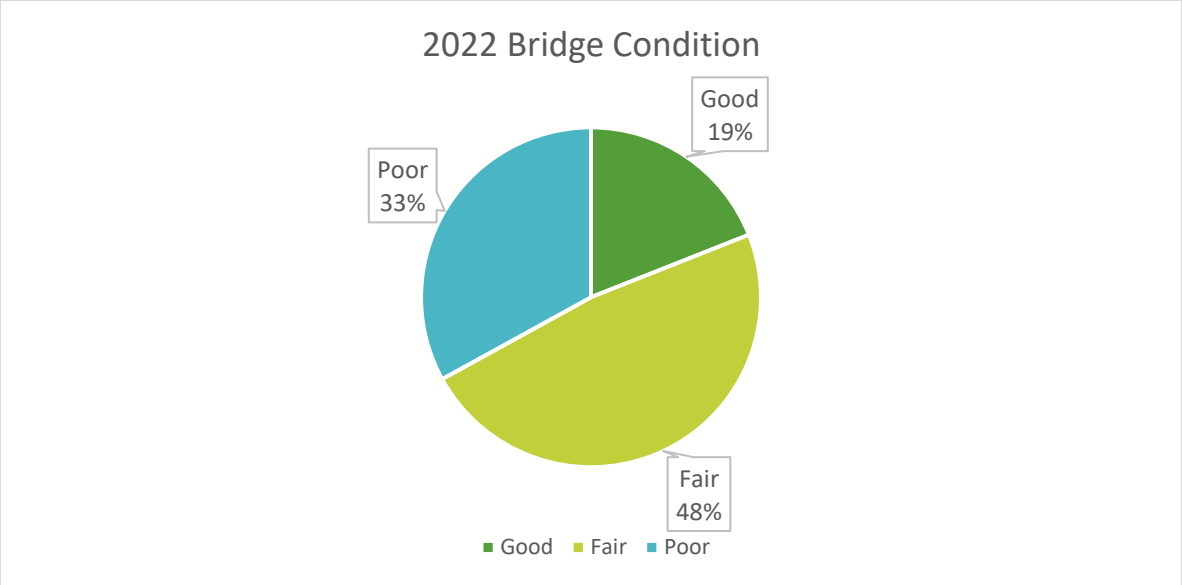
EXECUTIVE SUMMARY

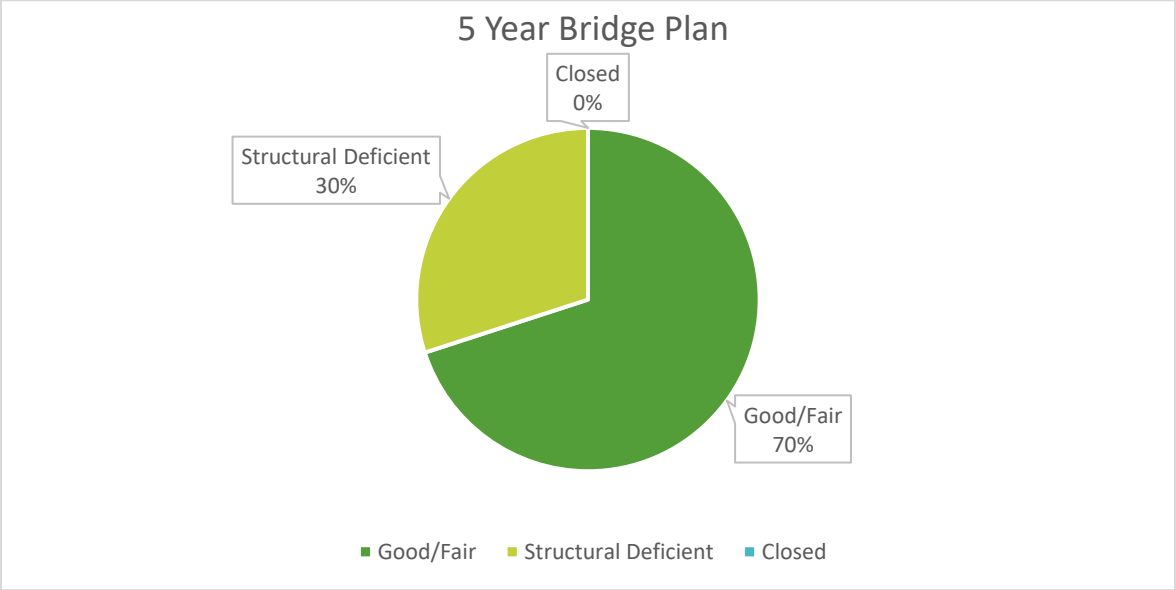
As conduits for commerce and connections to vital services, bridges are among the most important assets in any community along with other assets like roads, culverts, traffic signs, traffic signals, and utilities that support and affect the road network. The Iron County Road Commission's (ICRC) bridges, other road-related assets, and support systems are 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 bridges, their importance to society, and the investment made by taxpayers all place a high level of responsibility on local agencies to plan, build, and maintain the road and bridge network in an efficient and effective manner. This asset management plan is intended to report on how ICRC is meeting its obligations to maintain the bridges for which it is responsible.

This plan overviews ICRC's bridge assets and conditions and explains how ICRC works to maintain and improve the overall condition of those assets. These explanations can help answer:

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

The ICRC owns and/or manages 21 bridges. A summary of its historical and current bridge asset conditions, projected trends, and goals can be seen in the Figure, below.





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

INTRODUCTION

Asset management is defined by Public Act 325 of 2018 as "an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals". 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). The Iron County Road Commission (ICRC) 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 bridges in ICRC's road network. Asset management also provides for transparent decision-making, which allows the public to understand the technical and financial challenges of managing infrastructure with a limited budget.

The Iron County Road Commission (ICRC) has adopted an "asset management" process for its 21 bridges to help overcome the challenges presented by limited funds, staffing, and other resources while meeting stringent safety standards and bridge users' expectations.

This 2022 plan outlines how ICRC determines its strategy to maintain and upgrade bridge conditions given agency goals, priorities of users, and resources provided. An updated plan is to be released approximately every five (5) years to reflect changes in bridge conditions, finances, and priorities.

Questions regarding the use or content of this plan should be directed to Douglas C. Tomasoski, P.E., Superintendent/Manager/Engineer, at 800 W. Franllin Street, Iron River, Michigan, 49935, or Brad Toivonen Interim/Superintendent/Manager at same contact information.

Key terms used in this plan are defined in ICRC's comprehensive transportation asset management plan (also known as the "compliance plan") used for compliance with PA 325 or 2018.

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

Bridge Primer

Bridge Types

Bridges are structures that span 20 feet or more. These bridges can extend across one or multiple spans.

If culverts are placed side by side to form a span of 20 feet or more (for example, three 6-foot culverts with one-foot between each culvert), then this culvert system would be defined as a bridge. (Note: The Compliance Plan Appendix C contains a primer on culverts not defined as bridges.)

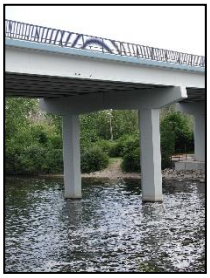


Figure 1: Girder bridge

Bridge types are classified based on two features: design and material.

The most common bridge design is the **girder system** (Figure 1). With this design, the bridge deck transfers vehicle loads to girders (or beams) that, in turn, transfer the load to the piers or abutments (see Figure 6).

A similar design that lacks girders (or beams) is a **slab bridge** (Figure 2 and see Figure 6). A slab bridge transfers the vehicle load directly to the abutments and, if necessary, piers.

Figure 2: Slab bridge

Truss bridges were once quite common and consisted of a support structure that is created when structural members are connected at joints to form interconnected triangles (Figure 4). Structural members may consist of steel tubes or angles connected at joints with gusset plates.

Another common bridge design in Michigan is the three-sided pre-cast box or arch bridge (Figure 4).

Michigan is also home to several unique bridge designs.

Figure 3: Truss bridge

Adding another layer of complexity to bridge typing is the primary construction materials used (Figure 5). Bridges are generally constructed from concrete, steel, pre-stressed concrete, or timber. Some historical bridges or bridge components in Michigan may be constructed from stone or masonry.

Figure 4: Three-sided box bridge

Figure 5: 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 (see Table for a summary of the 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 in the MDOT Bridge Field Services' *Bridge Safety Inspection NBI Rating Guidelines* (https://www.michigan.gov/documents/mdot/BIR_Ratings_Guide_Combined_2017-10-30_606610_7.pdf).

Table 1: Summary of the NBI Rating Scale

NBI Rating	General Condition
9-7	Like new/good
6-5	Fair
4-3	Poor/serious
2-0	Critical/failed

Bridge Treatments

Replacement

Replacement work is typically performed when a bridge is in poor condition (NBI rating of 4 or less) and will improve the bridge to good condition (NBI rating of 7 or more). The Local Bridge Program, a part of MDOT's Local Agency Program, defines bridge replacement as full replacement, which removes the entire bridge (superstructure, deck, and substructure) before re-building a bridge at the same location (Figure 6). The decision to perform a total replacement over rehabilitation (see below) should be made based on a life-cycle cost analysis. Generally, replacement is selected if rehabilitation costs more than two-thirds of the cost of replacement. Replacement is generally the most expensive of the treatment options.

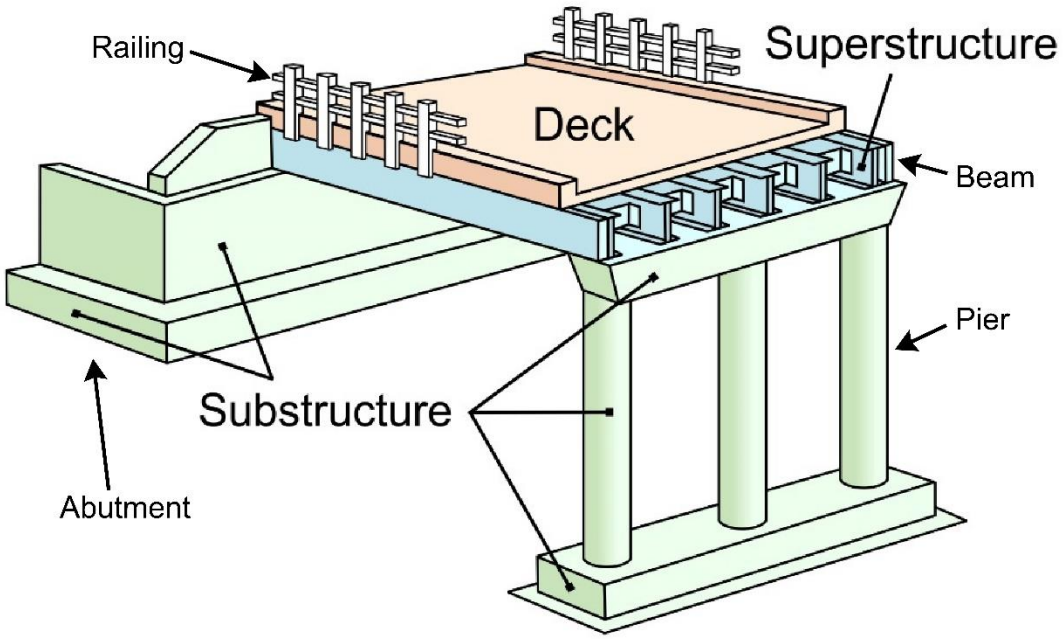


Figure 6: Diagram of basic elements of a bridge

Rehabilitation

Rehabilitation involves repairs that improve the existing condition and extend the service life of the structure and the riding surface. Most often, rehabilitation options are associated with bridges that have degraded beyond what can be fixed with preventive maintenance. Rehabilitation is typically performed on poor-rated elements (NBI rating of 4 or less) to improve them to fair or good condition (NBI rating of 5 or more). Rehabilitation can include superstructure replacement (removal and replacement of beams and deck) or deck replacement. While typically more expensive than general maintenance, rehabilitation treatments may be more cost-effective than replacing the entire structure.

- **Railing retrofit/replacement:** A railing retrofit or replacement either reinforces the existing railing or replaces it entirely (Figure 6). This rehabilitation is driven by a need for safety improvements on poor-rated railings or barriers (NBI rating less than 5).

- **Beam repair:** Beam repair corrects damage that has reduced beam strength (Figure 6). In the case of steel beams, it is performed 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, this is performed if there is 50 percent or more spalling (i.e., loss of material) at the ends of beams.

- **Substructure concrete patching and repair:** Patching and repairing the substructure is essential to keep a bridge in service. These rehabilitation efforts are performed when the abutments or piers are fair or poor (NBI rating of 5 or 4), or if spalling and delamination affect less than 30 percent of the bridge surface.

Preventive Maintenance

The Federal Highway Administration's (FHWA) *Bridge Preservation Guide* (2018) defines preventive maintenance as "a strategy of extending service life by applying cost-effective treatments to bridge elements…[that] retard future deterioration and avoid large expenses in bridge rehabilitation or replacements."

Preventive maintenance work is typically done on bridges rated fair (NBI rating of 5 or 6) in order to slow the rate of deterioration and keep them from falling into poor condition.

- **Concrete deck overlay:** A concrete deck overlay involves removing and replacing the driving surface. Typically, this is done when the deck surface is poor (NBI rating is less than 5) and the underneath portion of the deck is at least fair (NBI rating greater than 4). A shallow or deep concrete overlay may be performed depending on the condition of the bottom of the deck. The MDOT *Bridge Deck Preservation* matrices provide more detail on concrete deck overlays (see https://www.michigan.gov/mdot/0,4616,7-151-9625_24768_24773---,00.html).

- **Deck repairs:** Deck repairs include three common techniques: HMA overlay with or without waterproof membranes, concrete patching, deck sealing, crack sealing, and joint repair/replacement. An HMA overlay with an underlying waterproof membrane can be placed on bridge decks with a surface rating of fair or lower (NBI of 5 or less) and with deficiencies that cover between 15 and 30 percent of the deck surface and deck bottom. An HMA overlay without a waterproof membrane should be used on a bridge deck with a deck surface and deck bottom rating of serious condition or lower (NBI rating of 3 or less) and with deficiencies that cover greater than 30 percent of the deck surface and bottom; this is considered a temporary holdover to improve ride quality when a bridge deck is scheduled to undergo major rehabilitation within five years. All HMA overlays need to be accompanied by an updated load rating. Patching of the concrete on a bridge deck is done in response to an inspector's work recommendation or when the deck surface is in good, satisfactory, or fair condition (NBI rating of 7, 6, or 5) with minor delamination and spalling. To preserve a good bridge deck in good condition, a deck sealer can be used.

  Deck sealing should only be done when the bridge deck has a surface rating of fair or better (NBI of 5 or more). Concrete sealers should only be used when the top and bottom surfaces of the deck are free from major deficiencies, cracks, and spalling. An epoxy overlay may be used when between 2 and 5 percent of the deck surface has delamination's and spalls, but these deficiencies must be repaired prior to the overlay. An epoxy overlay may also be used to repair an existing epoxy overlay. Concrete crack sealing is an option to maintain concrete in otherwise good condition that has visible cracks with the potential of reaching the steel reinforcement. Crack sealing may be performed on concrete with a surface rating of good, satisfactory, or fair (NBIS rating of 7, 6, or 5) with minor surface spalling and delamination; it may also be performed in response to a work recommendation by an inspector who has determined that the frequency and size of the cracks require sealing.

- **Steel bearing repair/replacement:** Rather than sitting directly on the piers, a bridge superstructure is separated from the piers by bearings. Bearings allow for a certain degree of movement due to temperature changes or other forces. Repairing or replacing the bearings is considered preventive maintenance. Girders and a deck in at least fair condition (NBI of 5 or higher) and bearings in poor condition (NBI rating of 4 or less) 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 paint condition is in serious condition (NBI rating of 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 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 is fair or poor (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 based on a hydraulic analysis or to remove vegetation, debris, or sediment from the channel and banks (Figure 6).

- **Scour countermeasures:** An inspector's work recommendations or a hydraulic analysis may require scour countermeasures (see the *Risk Management* section of this plan for more information on scour). 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.

- **Approach 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 performed in response to an inspector's work recommendation, when the pavement surface is in poor condition (NBI rating of 4 or less), or when the bridge deck is replaced or rehabilitated (e.g., concrete overlay).

- **Guardrail repair/replacement:** A guardrail is a safety feature on many roads and bridges that prevents or minimizes the effects of lane departure incidents. 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.

Scheduled Maintenance

Scheduled maintenance activities are 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.

- **Drainage system cleanout/repair:** Keeping a bridge's drainage system clean and in good working order allows the bridge to shed water effectively. An inspector's work recommendation may indicate drainage system cleanout/repair. Signs that a drainage system needs cleaning or repair include clogs and broken, deteriorated, or damaged drainage elements.
- **Spot painting:** Spot painting is a form of partial bridge 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 is in fair or poor condition (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.
- **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.

1. BRIDGE ASSETS

ICRC seeks to implement an asset management program for its bridge structures. This program balances reconstruction, rehabilitation, preventive maintenance, scheduled maintenance, or new construction, with ICRC's bridge funding in order to maximize the useful service life and to ensure the safety of the ICRC's bridges.

Reality is, the ICRC has limited funds for improving the bridge network. Since preservation strategies like preventive maintenance are generally a more effective use of these funds than costly alternative management strategies like major rehabilitation or replacement, ICRC seeks to identify those bridges that will benefit from a planned maintenance program while addressing those bridges that pose usability and/or safety concerns.

The three-fold goal of ICRC's asset management program is the preservation and safety of its bridge network, increase of its bridge assets' useful service life by extending the time that bridges remain in good and fair condition, and reduction of future maintenance costs. To quantify this goal, ICRC specifically aims to have 70% or more of the agency's local bridges in fair to good condition and to have less than 30% classified as structurally deficient over this 5-year plan.

Thus, ICRC's asset management plan objectives are:

- To continue to track the current condition of the county's bridges
- To develop a "mix of fixes" that will:
    - Program scheduled maintenance actions to impede deterioration of bridges in good condition
    - Implement selective corrective repairs or rehabilitation for degraded bridge elements order to restore functionality
    - Identify and program those eligible bridges in need of replacement
- To identify available funding sources, such as:
    - Dedicated county resources
    - Obtaining funding through Michigan's Local Bridge Program
    - Opportunities to obtain other funding from outside sources
- To prioritize the programmed actions within available funding limitations
- To improve the condition of bridges currently rated poor (4 or lower) and/or preserve bridges currently rated fair (5 or higher) in their current condition in order to extend their useful service life.

Inventory

ICRC is responsible for 21 local bridges. Table 2 summarizes ICRC's bridge assets by type, sizes by bridge type, and condition by bridge type. Additional inventory data, condition ratings, and proposed preventive maintenance actions for each bridge are contained in Appendix 1. The bridge inventory data

was obtained from MDOT MiBRIDGE and other sources, and the 2022 condition data and maintenance actions are taken from the inspector's summary report (see Appendix 1).

Types

Of the ICRC's 21 structures for which it owns and is responsible to report, 5 are concrete structures that meet the definition of a bridge, 5 are steel bridges, and 11 are pre-stressed concrete bridges. The ICRC does not own any timber bridges.

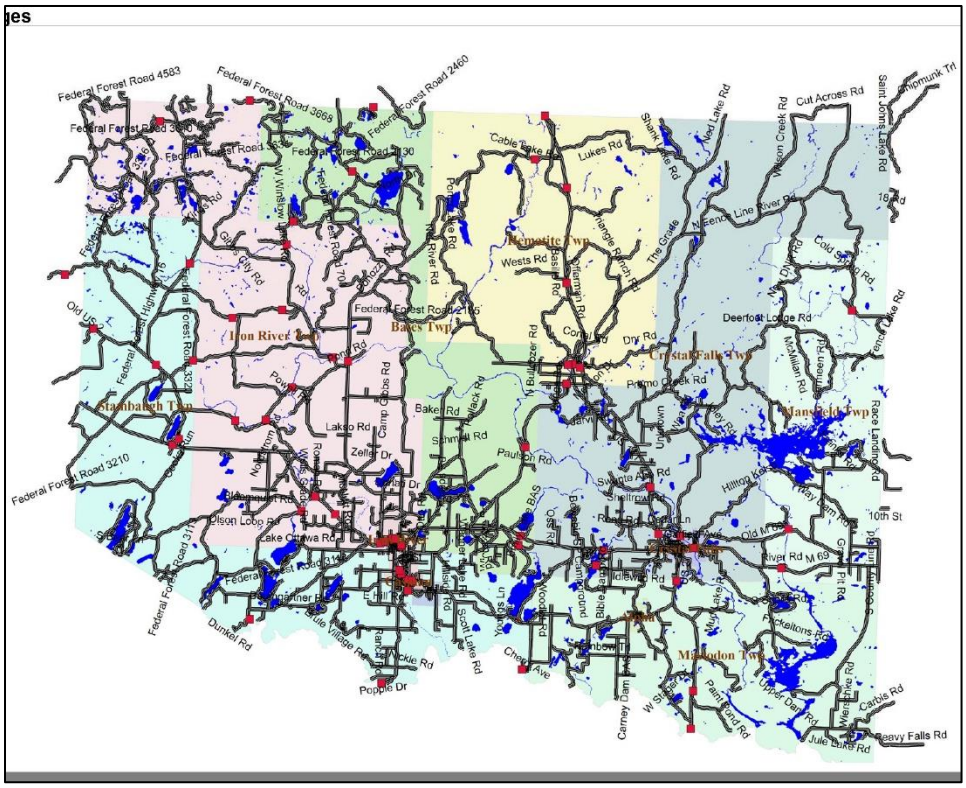


Figure 7: Map illustrating locations ICRC's of bridge assets

Locations and Sizes

Figure 7 illustrates the locations of bridge assets owned by the ICRC. Details about the locations and sizes of each individual asset can be found in ICRC's MiBRIDGE database. For more information, please refer to the agency contact listed in the *Introduction* of this bridge asset management plan.

Condition

ICRC evaluates its bridges according to the National Bridge Inspection Standards rating scale, with a rating of 9 to 7 being like new to good condition, a rating of 6 and 5 being fair condition, and a rating of 4

or lower being poor or serious/critical condition. The current condition of ICRC's bridge network is 4 (19%) are good, 10 (48%) are fair, and 7 (33%) are poor or lower.

Another layer of classification of ICRC's bridge inventory classifies 7 (33%) bridges as structurally deficient, 9 (43%) bridges as posted, and 0 (0%) bridges as closed. Structurally deficient bridges are those with a deck, superstructure, substructure, and/or culvert rated as "poor" according to the NBI rating scale, with a load-carrying capacity significantly below design standards, or with a waterway that regularly overtops the bridge during floods. Posted bridges are those that have declined in condition to a point where a restriction is necessary for what would be considered a safe vehicular or traffic load passing over the bridge; designating a bridge as "posted" has no influence on its condition rating. Closed bridges are those that are closed to all traffic; closing a bridge is contingent upon its ability to carry a set minimum live load.

Table 2: Bridge Assets by Type: Inventory, Size, and Condition

Bridge Type	Total Number of Bridges	Total Deck Area (sq ft)	Condition: Structurally Deficient, Posted, Closed			[2020] Condition		
			Struct. Defic	Posted	Closed	Poor	Fair	Good
Concrete	5	6,573	2 2602 sft	5	0	2	3	0
Steel	5	11,308	3 4829 sft	4	0	3	2	0
Pre-stressed Concrete	11	21,366	2 3796 sft	0	0	2	5	4
Total SD/Posted/Closed			**7 11,227 sft**	**9**	**0**			
Total	**21**	**39,247**				**7**	**10**	**4**
Percentage (%)			**33% 29% (sft)**	**43%**	**0%**	**33%**	**48%**	**19%**

Statewide, MDOT's statistics for local agency bridges show that 14% are poor and 86% are good/fair, indicating that the ICRC has a greater percentage of poor bridges compared to the statewide average for local agencies. Correspondingly, ICRC has 67% of its bridges in fair/good condition versus the statewide average of 86% for local agency bridges. Statewide, 8% of local agency bridge deck area classifies as structurally deficient compared to 29% of ICRC's bridge deck area.

Goals

The goal of ICRC's asset management program is the preservation and safety of its bridge network; it also aims to extend the period of time that bridges remain in good and fair condition, thereby increasing their useful service life and reducing future maintenance costs.

Specifically, this goal translates into long-range goals of having 70% of its bridges rated fair/good and having less than 30% classified as structurally deficient within a 5-year time period.

Several metrics will be used to assess the effectiveness of this asset management program. ICRC will monitor and report the annual change in the number of its bridges rated fair/good (5 or higher) and the annual change in the number of its bridges classified as structurally deficient.

Based on past inspection records and condition ratings, ICRC will establish a baseline of past performance by determining the average period of time that a bridge remains in good or fair condition. The performance measure will be the increased average amount of time a bridge is in the good or fair condition status after implementation of the asset management strategy when compared to the baseline time before implementation.

Prioritization, Programmed/Funded Projects, and Planned Projects

Prioritization

ICRC's asset management program aims to address the structures of critical concern by targeting elements rated as being in poor condition, and to maintain and possibly improve the overall condition of the bridge network through a strategy such as the 'mix-of-fixes' strategy. Therefore, ICRC will prioritize bridges for projects by evaluating multiple factors such as the following: condition, load capacity, traffic volume/roadway classification, safety, length of detour/impact to major stakeholders and cost. There may be several components within each factor which may be used to arrive at a score. Each project under consideration will be scored, and its total score is then compared with other proposed project to establish a priority order.

ICRC annually reviews the current condition of each of its bridges using the NBIS inspection data contained in the *MDOT Bridge Safety Inspection Report* and the inspector's work recommendations contained in MDOT's *Bridge Inspection Report*. The inspection inventory and condition of ICRC's bridges are shown in Appendix 1. ICRC then determines management and preservation needs and corresponding actions for each bridge (Appendix 1) as well as inspection follow-up actions (Appendix 1). The management and preservation actions are selected in accordance with criteria contained in the *Summary of Preservation Criteria* table (below) and adapted to ICRC's specific bridge network.

Table 3: Summary of Preservation Criteria

Preservation Action	Bridge Selection Criteria	Expected Service Life
Replacement		
Total Replacement	• NBI rating of 3 or less [1] [2] • *OR* Cost of rehabilitation exceeds cost of replacement [1] • *OR* Bridge is scour critical with no counter-measures available [1]	70 years
Superstructure Replacement	• NBI rating of 4 or less for the superstructure [1] [2] • *OR* Cost of superstructure and deck rehabilitation exceeds cost of replacement [1]	40 years [1]
Deck Replacement Epoxy Coated Steel	• Use guidelines in MDOT's Bridge Deck Preservation Matrix [3] [4] • NBI rating of 4 or less for the deck surface and deck bottom [1] [2]	60+ years [3] [4]

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
Black Steel	• Deck bottom has more than 25% total area with deficiencies [1] • *OR* Replacement cost of deck is competitive with rehabilitation [1]	
Rehabilitation		
Substructure Replacement (Full or Partial)	• NBI rating of 4 or less for abutments, piers, or pier cap [1] [2] • Has open vertical cracks, signs of differential settlement, or active movement [1] • Pontis rating of 3 or 5 for more than 30 percent of the substructure [1] [5] • *OR* Bridge is scour critical with no counter-measures available	40 years [1*]
Steel Beam Repair	• More than 25% section loss in an area of the beam that affects load carrying capacity [1] • *OR* To correct impact damage that impairs beam strength [1]	40 years [1*]
Prestressed Concrete Beam Repair	• More than 5% spalling at ends of prestressed I-beams [1] • *OR* Impact damage that impairs beam strength or exposes prestressing strands [1]	40 years [1*]
Substructure Concrete Patching and Repair	• NBI rating of 5 or 4 for abutments or piers, and surface has less than 30% area spalled and delaminated [1] [2] • *OR* Pontis rating of 3 or 4 for the column or pile extension, pier wall, and/or abutment wall and surface has between 2% and 30% area with deficiencies [1] [5] • *OR* In response to inspector's work recommendation for substructure patching [1]	
Abutment Repair/Replacement	• NBI rating of 4 or less for the abutment [1] [2] • *OR* Has open vertical cracks, signs of differential settlement, or active movement	
Railing/Barrier Replacement	• NBI rating greater than 5 for the deck [1] [2] • NBI rating less than 5 for the railing with more than 30% total area having deficiencies [1] [2] • *OR* Pontis rating is 4 for railing [1] [5] • *OR* Safety improvement is needed [1]	
Culvert Repair/Replacement	• NBI rating of 4 or less for culvert or drainage outlet structure • *OR* Has open vertical cracks, signs of deformation, movement, or differential settlement	
Preventive Maintenance		
Shallow Concrete Deck Overlay	• NBI rating is 5 or less for deck surface, and deck surface has more than 15% area with deficiencies [1] [2] • NBI rating of 4 or 5 for deck bottom, and deck bottom has between 5% and 30% area with deficiencies [1] [2] • *OR* In response to inspector's work recommendation [1]	12 years
Deep Concrete Deck Overlay	• NBI rating of 5 or less for deck surface, and deck surface has more than 15% area with deficiencies [1] [2] • NBI deck bottom rating is 5 or 6, and deck bottom has less than 10% area with deficiencies [1] [2] • *OR* In response to inspector's work recommendation [1]	25 years
HMA Overlay with Waterproofing	• NBI rating of 5 or less for deck surface, and both deck surface and bottom have between 15% and 30% area with deficiencies [1] [2]	

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
Membrane	• *OR* Bridge is in poor condition and will be replaced in the near future and the most cost-effective fix is HMA overlay [1]	
HMA Overlay Cap without Membrane	• Note: All HMA caps should have membranes unless scheduled for replacement within five years. • NBI rating of 3 or less for deck surface and deck bottom, and deck surface and deck bottom have more than 30% area with deficiencies. Temporary holdover to improve ride quality for a bridge in the five-year plan for rehab/replacement. [1] [2]	3 years
Concrete Deck Patching	• NBI rating of 5, 6, or 7 for deck surface, and deck surface has between 2% and 5% area with delamination and spalling [1] [2] • *OR* In response to inspector's work recommendation [1]	5 years
Steel Bearing Repair/Replacement	• NBI rating of 5 or more for superstructure and deck, and NBI rating 4 or less for bearing [2]	
Deck Joint Replacement	• Always include when doing deep or shallow concrete overlays [1] • NBI rating of 4 or less for joints [1] [2] • *OR* Joint leaking heavily [1] • *OR* In response to inspector's work recommendation for replacement [1]	
Pin and Hanger Replacement	• NBI rating of 4 or less for superstructure for pins and hangers [1] [2] • Pontis rating of 1, 2, or 3 for a frozen or deformed pin and hanger [1] [5] • *OR* Presence of excessive section loss, severe pack rust, or out-of-plane distortion [1]	15 years
Zone Repainting	• NBI rating of 5 or 4 for paint condition, and paint has 3% to 15% total area failing [1] [2] • *OR* During routine maintenance on beam ends or pins and hangers [1] • *OR* less than 15% of existing paint area has failed and remainder of paint system is in good or fair condition [1]	10 years
Complete Repainting	• NBI rating of 3 or less for paint condition [1] [2] • *OR* Painted steel beams that have greater than 15% of the existing paint area failing [1]	
Partial Repainting	• See Zone or Spot Painting	
Channel Improvements	• Removal of vegetation, debris, or sediment from channel and banks to improve channel flow • *OR* in response to inspector's work recommendation	
Scour Countermeasures	• Pontis scour rating of 2 or 3 and is not scheduled for replacement [1] [5] • OR NBI comments in abutment and pier ratings indicate presence of scour holes [1] [2]	
Approach Repaving	• Approach pavement relief joints should be included in all projects that contain a significant amount of concrete roadway (in excess of 1000' adjacent to the structure). The purpose is to alleviate the effects of pavement growth that may cause distress to the structure. Signs of pavement growth include: ○ Abutment spalling under bearings [1]	

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
	○ Beam end contact [1] ○ Closed expansion joints and/or pin and hangers [1] ○ Damaged railing and deck fascia at joints [1] ○ Cracking in deck at reference line (45 degree angle) [1]	
Guard Rail Repair/Replacement	• Guard rail missing or damaged [2*] • *OR* Safety improvement is needed [2*]	
Scheduled Maintenance		
Superstructure Washing	• When salt contaminated dirt and debris collected on superstructure is causing corrosion or deterioration by trapping moisture [1] • *OR* Expansion or construction joints are to be replaced and the steel is not to be repainted [1] • *OR* Prior to a detailed replacement [1] • *OR* In response to inspector's work recommendation [1]	2 years
Drainage System Clean-Out/Repair	• When drainage system is clogged with debris [1] • *OR* Drainage elements are broken, deteriorated, or damaged [1] • *OR* NBI rating comments for drainage system indicate need for cleaning or repair [1] [2]	2 years
Spot Repainting	• For zinc-based paint systems only. Do not spot paint with lead-based paints. • Less than 5% of paint area has failed in isolated areas [1] • *OR* In response to inspector's work recommendation [1]	5 years
Slope Paving Repair	• NBI rating is 5 or less for slope protection [1] [2] • *OR* Slope is degraded or sloughed • *OR* Slope paving has significant areas of distress, failure, or has settled [1]	
Riprap Installation	• To protect surface when erosion threatens the stability of side slopes of channel banks	
Vegetation Control	• When vegetation traps moisture on structural elements [1] • *OR* Vegetation is growing from joints or cracks [1] • *OR* In response to inspector's work recommendation for brush cut [1]	1 year
Debris Removal	• When vegetation, debris, or sediment accumulates on the structure or in the channel • *OR* In response to inspectors work recommendation	1 year
Deck Joint Repair	• Do not repair compression joint seals, assembly joint seals, steel armor expansions joints, and block out expansion joints; these should always be replaced. [1] • NBI rating is 5 for joint [1] [2] • *OR* In response to inspector's work recommendation for repair [1]	
Concrete Sealing	• Top surface of pier or abutments are below deck joints and, when contaminated with salt, salt can collect on the surface [1] • *OR* Surface of the concrete has heavy salt exposure. Horizontal surfaces of substructure elements are directly below expansion joints [1]	
Concrete Crack Sealing	• Concrete is in good or fair condition, and cracks extend to the depth of the steel reinforcement [1] • *OR* NBI rating of 5, 6, or 7 for deck surface, and deck surface has	5 years

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
	between 2% and 5% area with deficiencies [1] [2] • *OR* Unsealed cracks exist that are narrow and/or less than 1/8" wide and spaced more than 8' apart [1] • *OR* In response to inspector's work recommendation [1]	
Minor Concrete Patching	• Repair minor delaminations and spalling that cover less than 30% of the concrete substructure [1] • *OR* NBI rating of 5 or 4 for abutments or piers, and comments indicate that their surface has less than 30% spalling or delamination [1] [2] • *OR* Pontis rating of 3 or 4 for the column or pile extension, pier wall and/or abutment wall, and surface has between 2% and 30% area with deficiencies [1] [5] • *OR* In response to inspector's work recommendation [1]	
HMA Surface Repair/Replacement	• HMA surface is in poor condition • *OR* In response to inspector's work recommendation	
Seal HMA Cracks/Joints	• HMA surface is in good or fair condition, and cracks extend to the surface of the underlying slab or sub course • *OR* In response to inspector's work recommendation	
Timber Repair	• NBI rating of 4 or less for substructure for timber members • *OR* To repair extensive rot, checking, or insect infestation	
Miscellaneous Repair	• Uncategorized repairs in response to inspector's work recommendation	

This table was produced by TransSystems and includes information from the following sources:

[1] MDOT, *Project Scoping Manual*, MDOT, 2019.

[2] MDOT, *MDOT NBI Rating Guidelines*, MDOT, 2017.

[3] MDOT, *Bridge Deck Preservation Matrix - Decks with Uncoated "Black" Rebar*, MDOT, 2017.

[4] MDOT, *Bridge Deck Preservation Matrix - Decks with Epoxy Coated Rebar*, 2017.

[5] MDOT, *Pontis Bridge Inspection Manual*, MDOT, 2009.

* From source with interpretation added.

In terms of management and preservation actions, ICRC’s asset management program uses a 'mix-of-fixes' strategy, that is made up of replacement, rehabilitation, preventive maintenance and/or scheduled maintenance.

Replacement involves substantial changes to the existing structure, such as bridge deck replacement, superstructure replacement, or complete structure replacement, and is intended to improve critical or closed bridges to a good condition rating.

Rehabilitation is undertaken to extend the service life of existing bridges. The work will restore deficient bridges to a condition of structural or functional adequacy and may include upgrading geometric features. Rehabilitation actions are intended to improve the poor or fair condition bridges to fair or good condition.

Preventive maintenance work will improve and extend the service life of fair bridges and will be performed with the understanding that future rehabilitation or replacement projects will contain appropriate safety and geometric enhancements. Preventive maintenance projects are directed at limited bridge elements that are rated in fair condition with the intent of improving these elements to a good rating. Most preventive maintenance projects will be one-time actions in response to a condition state need. Routine maintenance will be performed by the ICRC's in-house maintenance team and/or contracted out.

ICRC’s **scheduled maintenance** program is an integral part of the preservation plan and is intended to extend the service life of fair and good structures by preserving the bridges in their current condition for a longer period of time. Scheduled maintenance is proactive and not necessarily condition driven. In-house maintenance crews will perform much of this work.

Certain of the severely degraded and structurally deficient bridges require replacement or major rehabilitation. Several of the remaining bridges require one-time preventive maintenance actions to repair defects and restore the structure to a higher condition rating. Most bridges are included in a scheduled maintenance plan with appropriate maintenance actions programmed for groups of bridges of similar material and type, and possibly bundled by location.

The replacement, rehabilitation, and preventive maintenance projects may be eligible for funding under the local bridge program, and any requests for funding may be submitted with ICRC's annual applications.

To achieve its goals, a primary objective of ICRC's asset management program is improvement of bridges rated poor (4 or lower) to a rating of fair (5) or higher and/or preservation of bridges currently rated fair (5) or higher in their current condition within a five (5) year time period through management and/or preservation activities. The primary work activities that will be used to meet this improvement objective include a combination of reconstruction, replacement, rehabilitation, preventive maintenance, and scheduled maintenance. The work will be prioritized by considering each individual bridge's needs, its importance, the present costs of improvements, and the impact of deferral (i.e., cost increase due to increased degradation). Additionally, ICRC's asset management program will incorporate preservation of bridges currently rated fair (5) or higher in their current condition in order to extend their useful service life. The primary work activities used to meet this preservation objective include some combination of scheduled and preventive maintenance. A bridge-by-bridge preservation – or maintenance – plan is presented in the Appendix 1.

Programmed/Funded Projects

ICRC received an average of approximaterly $7,700,000 in total funding for the years 2019-2021 allocated to its complete trnasportation network which includes roads, bridges, culverts, signs and support infrastructure and equipment. The ICRC plans to spend about $50,000 per year during the life of this asset management plan on preventive and scheduled maintenance of bridges. The ICRC plans to replace 1 bridge (the Idlewild bridge) at an estimated cost of about $5,000,000. By performing the aforementioned preventive maintenance and replacement of bridge structures, ICRC may meet its overall bridge network condition goals.

ICRC computes the estimated cost of each typical management and/or preservation action using unit prices in the latest *Bridge Repair Cost Estimate* spreadsheet contained in MDOT's *Local Bridge Program Call for Projects*. The cost of items of varying complexity, such as maintenance of traffic, staged construction, scour countermeasures, and so forth, are estimated on a bridge-by-bridge basis. The cost estimates are to be reviewed and updated periodically when better information becomes available. A summary of the programmed/funded projects and investments, along with those projects that remain unfunded, can be found in Table 4, the Cost Projection table, below.

Table 4: Planned Projects and Gap Analysis

Strategy	2023	2024	2025	2026	2027	GAP
New						
None	$0	$0	$0	$0	$0	
Subtotal	$0	$0	$0	$0	$0	
Replacement						
4184					$648,000	
4186						$ 712,000
4192						$1,366,000
4194						$ 822,000
4198						$1,174,000
Subtotal	**$0**	**$0**	**$0**	**$0**	**$648,000**	**$4,074,000**
Rehabilitation						
4193						$ 275,000
Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$ 275,000**
Scheduled Maintenance						
4185		$ 8,000				
4188			$ 63,000			
4190	$ 1,000					
4191	$ 2,000					
4195		$ 8,000				
4196	$ 7,000					
4201						$ 70,000
4202				$ 69,000		$ 69,000
Subtotal	**$ 10,000**	**$ 14,000**	**$ 63,000**	**$ 69,000**	**$0**	**$ 139,000**
Preventive Maintenance						
4197	$ 7,000					
4203						$ 140,000
4206	$ 9,000					
Subtotal	**$ 16,000**	**$0**	**$0**	**$0**	**$0**	**$ 140,000**
Other						
4199		$ 12,000				
4200						$ 88,000
Subtotal	**$0**	**$ 12,000**	**$0**	**$0**	**$0**	**$ 88,000**
Annual Totals	**$ 26,000**	**$ 26,000**	**$ 63,000**	**$ 69,000**	**$648,000**	
						$4,716,000

Gap Analysis

When ICRC compares its funding and its programmed/funded projects with all of its prioritized projects as shown in Table 4, ICRC believes it should be able to achieve a majority of its asset management goals for the period of this plan. For projects that it is unable to complete, ICRC will continue to monitor those bridge assets and take any necessary steps within its budget to prevent or mitigate a condition decline or a need to post or close the structure.

2. FINANCIAL RESOURCES

Anticipated Revenues

ICRC plans to prepare and submit application(s) for an identified funding type for the purpose(s) of various primary work types for identified bridges. This funding would be intended for use in the identified years.

Anticipated Expenses

Scheduled maintenance activities and minor repairs that are not affiliated with any applications, grants, or other funded projects will be performed by the agency's in-house maintenance forces and funded through the agency's annual operating budget.

3. RISK MANAGEMENT

ICRC recognizes that the potential risks associated with bridges generally fall into several categories:

- Personal injury and property damage resulting from a bridge collapse or partial failure;
- Loss of access to a region or individual properties resulting from bridge closures, restricted load postings, or extended outages for rehabilitation and repair activities; and
- Delays, congestion, and inconvenience due to serviceability issues, such as poor quality riding surface, loose expansion joints, or missing expansion joints.

ICRC addresses these risks by implementing regular bridge inspections and a preservation strategy consisting of preventive maintenance.

ICRC administers the biennial inspection of its bridges in accordance with NBIS and MDOT requirements. The inspection reports document the condition of ICRC's bridges and evaluate them in order to identify new defects and monitor advancing deterioration. The summary inspection report in Appendix 1 identifies items needing follow-up, special inspection actions, and recommended bridge-by-bridge maintenance activities.

Bridges that are considered "scour critical" pose a risk to ICRC's road and bridge network. Scour is the depletion of sediment from around the foundation elements of a bridge commonly caused by fast-moving water. According to MDOT's *Michigan Structure Inventory and Appraisal Coding Guide*, a scour critical bridge is one that has unstable abutment(s) and/or pier(s) due to observed or potential (based on an evaluation study) scour. Bridges receiving a scour rating of 3 or less are considered scour critical.

ICRC has scour critical bridges, which are listed in Table 5.

Table 5: Scour Critical Bridges

Bridge Structure Number	Scour Critical Rating
4184	3
4186	3
4189	3
4190	3
4194	3
4196	3
4198	3
4199	3

ICRC has posted bridges that are critical to accessing entire areas or individual properties within its jurisdiction. These bridges are listed in Table 6. ICRC currently has not no bridges that are closed.

Table 6: Posted/Closed Bridges that are Critical Links

Bridge Structure Number	P/K	Comments
4184	15	
4186	20	
4189	15	
4190	15	
4191	42-61-69	
4194	40	
4197	12	
4198	42	
4199	15	

The preservation strategy identifies actions in the operations and maintenance plan that are preventive or are responsive to specific bridge conditions. The actions are prioritized to correct critical structural safety and traffic issues first, and then to address other needs based on the operational importance of each bridge and the long-term preservation of the network. The inspection results serve as a basis for modifying and updating the operations and maintenance plan annually.

Appendix 1: Iron County Road Commission 2020 Bridge Inspection Report Summary of Additional Inspection Recommendations

Structure No. 4184 Idlewild Road over Fortune Creek

Given the current overall rating of two (2), with the condition of the superstructure stringer (rating of 2), paint (2), section loss (0) and bearings (3), it was decided that this bridge should be inspected every twelve (12) months. It if is determined there is additional deterioration, it may be necessary to reduce the current load posting (15 tons).

Structure No. 4186 Basswood Road over Cooks Run River

Given the current overall rating of four (4), with the condition of the superstructure stringer (rating of 4), paint (2) and section loss (0), it was decided that this bridge should be inspected every twelve (12) months. It if is determined there is additional deterioration, it may be necessary to reduce the current load posting (20 tons).

Structure No. 4192 Forest Highway 16 (FH-16) over North Branch Paint River

Given the current overall rating of four (4), with the condition of the superstructure section loss (rating of 3) and substructure piers (rating of 4), it was decided that this bridge should be inspected every twelve (12) months. It if is determined there is additional deterioration, it may be necessary to enact appropriate load restrictions or perform temporary repairs.

Structure No. 4193 Forest Highway 16 (FH-16) over South Branch Paint River

Given the current overall rating of three (3), with the condition of the superstructure section loss (rating of 3) and substructure piers (rating of 3), it was decided that this bridge should be inspected every twelve (12) months. It if is determined there is additional deterioration, it may be necessary to enact appropriate load restrictions or perform temporary repairs.

Structure No. 4194 Ponozzo Road (FAS 927) over Paint River

Given the current overall rating of four (4), with the condition of the deck surface (rating of 3), other joints (4), railings (4) and deck (4), and superstructure section loss (rating of 2) and approach pavement (3) and shoulders/sidewalks (3), it was decided that this bridge should be inspected every twelve (12) months. It if is determined there is additional deterioration, it may be necessary to reduce the current load posting (40 tons).

Structure No. 4198 Old US 141 over Hemlock River

Given the current overall rating of two (2), with the condition of the deck other joints (rating of 4), deck bottom surface (4) and deck (4); and superstructure stringer (rating of 2) and section loss (3); and approach pavement (rating of 4), it was decided that this bridge should be inspected every twelve (12) months. It if is determined there is additional deterioration, it may be necessary to reduce the current load posting (42 tons).

Structure No. 4199 Chicagon Mine Road over Chicagon Creek

Perform under water inspection of the bridge substructure is listed as a high priority. This will be performed to evaluate the condition of the abutments and underside as the water level of Chicagon Creek has been consistently higher in recent years obstructing dray visual inspection. As a very low volume road serving no permanent structures, it will be contracted out soon.

Given the current overall rating of two (2), with the condition of the deck other joints (rating of 4), deck bottom surface (4) and deck (4); and superstructure stringer (rating of 2) and section loss (3); and approach pavement (rating of 4), it was decided that this bridge should be inspected every twelve (12) months. It if is determined there is additional deterioration, it may be necessary to reduce the current load posting (42 tons).

Appendix 2: Iron County Road Commission 2022 Bridge Inspection Report Executive Summary

General Recommendations

- The Iron County Road Commission's bridge network is generally in fair condition.
- The Idlewild Bridge is currently scheduled to be replaced in 2025. Consideration will be given to increasing the water clearance.
- Preventative/Scheduled Maintenance work is planned for 2023 (5 locations), 2024 (3 locations), 2025 (1 location) and 2026 (1 location) to help maintain the ratings in fair/good condition.
- Continue to perform the present inspection program in order to properly assess the condition of each bridge and its structural elements.

4184 Idlewild Road (FAS 303) over Fortune Creek

Constructed: 1921 **Reconstructed:** NA **General Condition:** Critical (2)

Description: Single span bridge constructed in 1921 with steel beams with concrete deck and rails. The bridge is 36.7 feet long by 19.4 feet in width spanning Fortune Creek with connects Second and Third Fortune Lakes. The road is a county primary road connecting the east and west sides of the Fortune Lake string of lakes

Recommendations: During the most recent inspection it was recommended as a high priority that the superstructure of the structure be replaced. The other high priority items concerning the load rating and advance warning signs have been addressed through recent maintenance along with straightening of the fixed object markers.

4185 Mansfield Cutoff Road over Michigamme River

Constructed: 2006 **Reconstructed:** NA **General Condition:** Fair (6)

Description: Single span bridge constructed in 2006 as a prestressed concrete with multiple box beam girders. The bridge is 106 feet long by 31.4 feet in width spanning Michigamme River just downstream form the Hemlock Dam. The road is a county primary road.

Recommendations: During the most recent inspection it was recommended as a high priority to clean out approach expansion joint and reseal the end of the deck joints along with cracksealing the deck surface. The other high priority item is to work with the local utility to relocate utility line that is laying loose under the bridge at the west abutment.

4186 Basswood Road (FAS153) over Cooks Run River

Constructed: 1922 **Reconstructed:** overlay in 2000 **General Condition:** Poor (4)

Description: Single span bridge constructed in 1922 with steel stringers and concrete deck and rails. The bridge is 37.7 feet long by 24 feet in width spanning Cooks Run. An overlay of the deck and short sections of each approach was completed in 2000. The road is a county primary road providing access to section of the Ottawa National Forest.

Recommendations: During the most recent inspection it was recommended as high priority to replace the bridge railing and add guardrail along with cleaning and painting girder ends and repair areas with any section loss. Also of high priority was to trim around the load posting signs, replace and add signage as needed and to realign fixed object markers – these items were completed under routine maintenance.

A low priority item is to begin planning for structure replacement in the future.

4187 Old US-2 (Tamarack Rd – FF 157) over Tamarack River

Constructed: 2008 **Reconstructed:** NA **General Condition:** Good (8)

Description: Single span bridge constructed in 2008 as a prestressed concrete with multiple box beam girders. The bridge is 76 feet long by 29 feet in width spanning the Tamarack River. The road is a county primary road providing access within the Ottawa National Forest and is a link with adjacent Gogebic County.

Recommendations: During the most recent inspection it was recommended the only recommendations were to continue with routine maintenance such as clearing soil/gravel from shoulders and deck and to continue to monitor minor cracks for possible crackfilling, and to clean and maintain expansion joints.

4188 County Road 657 (Gibbs West – FH 57) over South Branch Paint River

Constructed: 1987 **Reconstructed:** NA **General Condition:** Fair (5)

Description: Single span bridge constructed in 1987 as a prestressed concrete with multiple box beam girders. The bridge is 76.8 feet long by 31.2 feet in width spanning the South Branch of the Paint River. The road is a county primary road providing access within the Ottawa National Forest.

Recommendations: During the most recent inspection the only high priority recommendation was to clear any trees/vegetation from around the structure and the channel. Some if this has been completed. Medium priority items include repair/replacement of broken and missing guardrail blocks and to plan for the milling and paving of the approaches. One other medium priority item was to realign on object marker – which has been completed. Only low priority item is to plan for milling and repaving of the wearing surface.

4189 Winslow Lake Road (FR 146) over Winslow Creek

Constructed: 1954 **Reconstructed:** NA **General Condition:** Fair (6)

Description: Single span bridge constructed in 1954 as concrete with concrete slab. The bridge is 27.9 feet long by 22 feet in width spanning Winslow Creek. The road is a county primary road providing access within the Ottawa National Forest.

Recommendations: During the most recent inspection the only high priority recommendations were to update load rating signs (due to fading), add advance warning signage and to replace one missing fixed object marker. All this work was completed under routine maintenance.

4190 Winslow Lake Road (FR 146) over North Branch Paint River

Constructed: 1952 **Reconstructed:** NA **General Condition:** Fair (6)

Description: Single span bridge constructed in 1952 as concrete with concrete slab. The bridge is 49.9 feet long by 16.4 feet in width spanning North Branch of the Paint River. The road is a county primary road providing access within the Ottawa National Forest.

Recommendations: During the most recent inspection the only high priority recommendation was to replace drain extension on west side of bridge.

4191 Forest Highway 16 (FH16 - FAS 300) over Cooks Run River

Constructed: 1986 **Reconstructed:** NA **General Condition:** Fair (5)

Description: Single span bridge constructed in 1986 as concrete with concrete slab. The bridge is 57.7 feet long by 44 feet in width spanning the Cooks Run River. The road is a county primary road (minor arterial) providing a major north-south route within the Ottawa National Forest. It is a connector between US-2 and M-28. This route is a major route for transportation of logging products from within the Ottawa National Forest.

Recommendations: During the most recent inspection the only high priority recommendations were to add object markers, replace damaged wood blocks in one quadrant and to remove buildup of sand/soil/debris from deck to allow for more efficient drainage from the deck surface.

Low priority recommendation is to plan for the milling and repaving of the approaches and wearing surface.

4192 Forest Highway 16 (FH16 - FAS 300) over North Branch Paint River

Constructed: 1955 **Reconstructed:** NA **General Condition:** Poor (4)

Description: This three-span bridge constructed in 1955 with prestressed concrete with multiple box beam girders and concrete slab. The bridge is 59.7 feet long by 31.8 feet in width spanning the North Branch of the Paint River. The road is a county primary road (minor arterial) providing a major north-south route within the Ottawa National Forest. It is a connector between US-2 and M-28. This route is a major route for transportation of logging products from within the Ottawa National Forest.

Recommendations: During the most recent inspection two high priority recommendations were made: 1 – replace object markers in two quadrants - this work was completed; and 2 – provide protection to steel H-piles.

Two other recommendations are to plan for the milling and repaving of the approaches (medium priority) and wearing surface (low priority).

4193 Forest Highway 16 (FH16 - FAS 300) over South Branch Paint River

Constructed: 1955 **Reconstructed:** NA **General Condition:** Serious (3)

Description: This three-span bridge constructed in 1955 with prestressed concrete with multiple box beam girders and concrete slab. The bridge is 59.7 feet long by 31.8 feet in width spanning the South Branch of the Paint River. The road is a county primary road (minor arterial) providing a major north-south route within the Ottawa National Forest. It is a connector between US-2 and M-28. This route is a major route for transportation of logging products from within the Ottawa National Forest.

Recommendations: During the most recent inspection two high priority recommendations were made: 1 – replace/realign object markers in three quadrants and perform routine maintenance to guardrail fasteners; and 2 – provide protective coating to steel H-piles.

Two other recommendations (medium priority) are to plan for the milling and repaving of the approaches and wearing surface.

4194 Ponozzo Road (FAS 927) over Paint River

Constructed: 1962 **Reconstructed:** NA **General Condition:** Poor (4)

Description: This two-span bridge constructed in 1962 as a continuous steel with multiple stringers and concrete deck. The bridge is 124 feet long by 25.9 feet in width spanning the Paint River. The road is a county primary road providing a major north-south route within the Ottawa National Forest. It is a connector between US-2 and M-28. This route is a major route for transportation of logging products from within the Ottawa National Forest.

Recommendations: During the most recent inspection a number of high priority recommendations were made including deck replacement with paving of approaches. Also noted were removing debris from upstream nose of pier, controlling of vegetation along guardrail, repairing damaged rail sections, cleaning and painting diaphragms and girders. Also noted were to add advance warning signs for load posting, replace load rating signs and add/realign object markers – these have been done under routine maintenance.

4195 Ponozzo Road (FR 137 / FAS 927) over Kidney Creek

Constructed: 2003 **Reconstructed:** NA **General Condition:** Fair (5)

Description: Single span bridge constructed in 2003 as a prestressed concrete with multiple box beam girders. The bridge is 46 feet long by 28 feet in width spanning Kidney Creek. The road is a county primary road providing a major north-south route within the Ottawa National Forest. It is a connector between US-2 and M-28. This route is a major route for transportation of logging products from within the Ottawa National Forest.

Recommendations: During the most recent inspection the only recommendations were to grout PT ducts and add/realign object markers.

4196 County Road 643 (Bates-Amasa Rd) over Paint River

Constructed: 1959 **Reconstructed:** 2015 **General Condition:** Fair (5)

Description: This three-span bridge constructed in 1959 as a steel with multiple stringers and concrete deck. The bridge is 180 feet long by 29.7 feet in width spanning the Paint River. The deck was replaced along with painting of girders in 2015. The road is a county primary road providing a major north-south connection between US-2 and US-141. This route is a major route for transportation of logging products and route of workers from the Iron River area to the Connors Sports Flooring facility in Crystal Falls Township near Amasa.

Recommendations: The bridge is in fair condition. In order to keep it in this functioning condition and maintain its rating, the bridge only requires routine maintenance tasks such as cleaning and possibly resealing of joints.

4197 Pentoga Road over Brule River

Constructed: 1924 **Reconstructed:** 1988 **General Condition:** Fair (6)

Description: This steel truss – thru and pony bridge was constructed in 1924. The bridge is 64 feet long by 17.7 feet in width spanning the Brule River. The road is a county primary road providing access to Wisconsin. It is heavily used year-round for recreational purposes as access to trails in northeast Wisconsin – it acts as a snowmobile thru-route in the winter. This structure is jointly maintained along with Florence County, Wisconsin.

Recommendations: During the most recent inspection items notes were typical routine maintenance-type items such as milling hole in SW quad (Wisconsin side), vegetation control, and updating/coordinating load rating signage with that on the Wisconsin side of the structure. The signage items have been done under routine maintenance.

4198 Old US-141 over Hemlock River

Constructed: 1924 **Reconstructed:** NA **General Condition:** Critical (2)

Description: This concrete girder bridge was constructed in 1924. The bridge is 59.7 feet long by 24.6 feet in width spanning the Hemlock River. The road is a county primary road. It is located in the community of Amasa providing access to the town proper.

Recommendations: During the most recent inspection a number of high priority items were noted. Milling and paving of the wearing surface of the structure and both approaches was recommended. Also of high priority was the repair of damaged approach guardrail and posts in one quadrant and the placement of advance posting signs – both of these items were completed under routine maintenance.

One other recommendation (high priority) was to plan for the replacement of the structure.

4199 Chicagon Mine Road over Chicagon Creek

Constructed: 1900 **Reconstructed:** NA **General Condition:** Poor (4)

Description: This concrete bridge was constructed in 1900. The bridge is 27.9 feet long by 16.1 feet in width spanning Chicagon Creek. The road is a dead-end county local road.

Recommendations: Two high priority items were noted in the most recent inspection:
1 – Recommendation of an underwater inspection: This will be performed to evaluate the condition of the abutments and underside as the water level of Chicagon Creek has been consistently higher in recent years obstructing dry-land visual inspection. As a very low volume road serving no permanent structures, it will be contracted as funding allows.

2 – Signage: add/replace object markers, load posting signs, and advance load posting signs.

4200 Cable Lake Road over West Branch Net River

Constructed: 1994 **Reconstructed:** NA **General Condition:** Good (7)

Description: Single span bridge constructed in 1994 as a prestressed concrete with multiple box beam girders. The bridge is 79.7 feet long by 31 feet in width spanning West Branch of the Net River. The road is a dead-end county local road which provides access to major recreational property west of the W Branch of Net River, including acting as a eastern entrance to the Ottawa National Forest.

Recommendations: Two medium priority items were noted in the most recent inspection; they are milling and repaving of approaches and sealing the end of deck joints. The only high priority item was to add object markers. This was done under routine maintenance.

The bridge is in good condition. In order to keep it in this high functioning condition and maintain its good rating, the bridge only requires routine maintenance tasks.

4201 Townline Road over Hemlock River

Constructed: 1989 **Reconstructed:** NA **General Condition:** Fair (6)

Description: Single span bridge constructed in 1989 as a prestressed concrete with multiple box beam girders. The bridge is 44.9 feet long by 27.9 feet in width spanning Hemlock River.

Recommendations: The most recent inspection noted as a low priority for the milling and repaving of the approaches and a medium priority for the resealing of both end of deck joints. This will be looked at for possible future bundling with similar work on other structures. The only high priority item, addition of object markers, was completed under routine maintenance.

The bridge is in fair condition. In order to keep it in this functioning condition and maintain its fair rating, the bridge will continue to receive routine maintenance activities.

4202 Parks Farm Road over Hemlock River

Constructed: 1989 **Reconstructed:** NA **General Condition:** Good (7)

Description: Single span bridge constructed in 1989 as a prestressed concrete with multiple box beam girders. The bridge is 49.9 feet long by 27.9 feet in width spanning Hemlock River.

Recommendations: The most recent inspection noted as a medium priority for the milling and repaving of the approaches and a medium priority for the resealing of both end of deck joints. This will be looked at for possible future bundling with similar work on other structures. The only high priority items, addition of object markers and vegetation control, was completed under routine maintenance.

The bridge is in good condition. In order to keep it in this high functioning condition and maintain its good rating, the bridge will continue to receive routine maintenance activities such and crack sealing and vegetation control.

4203 Old Beechwood Road over South Brach Iron River

Constructed: 1991 **Reconstructed:** NA **General Condition:** Fair (6)

Description: Single span bridge constructed in 1991 as a prestressed concrete with multiple box beam girders. The bridge is 69.9 feet long by 27.9 feet in width spanning South Branch of the Iron River.

Recommendations: Milling and repaving of one approach (high priority) and of the wearing surface (medium priority) were noted in the most recent inspection report. These will be looked at for possible future bundling with similar work on other structures. Additional high priority items noted, addition of object markers, approach guardrail and block maintenance and beaver control, have been completed under routine maintenance.

The bridge is in fair condition. In order to keep it in this functioning condition and maintain its fair rating, the bridge will continue to receive routine maintenance tasks.

4206 Fence River Road over Fence River

Constructed: 1991 **Reconstructed:** NA **General Condition:** Fair (6)

Description: Single span bridge constructed in 1991 as a prestressed concrete with multiple box beam girders. The bridge is 69.9 feet long by 27.9 feet in width spanning South Branch of the Iron River. The road is a dead-end county local road which provides access to agricultural area west of the Fence River .

Recommendations: One high priority item noted was the cleaning and sealing of end of deck joint. Another high priority item, the addition of object markers, was completed under routine maintenance. Vegetation control and repair/replacement of guardrail spacers were listed as medium priority items. Milling and repaving of approaches was noted as a low priority. This will be looked at for possible future bundling with similar work on other structures.

The bridge is in fair condition. In order to keep it in this functioning condition and maintain its fair rating, the bridge will continue to receive routine maintenance tasks such as cleaning/sealing of joints and vegetation control.

C. CULVERT ASSET MANAGEMENT PLAN SUPPLEMENT

Culvert Primer

Culverts are structures that lie underneath roads, enabling water to flow from one side of the roadway to the other (Figure C-1 and Figure C-2). 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. 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.

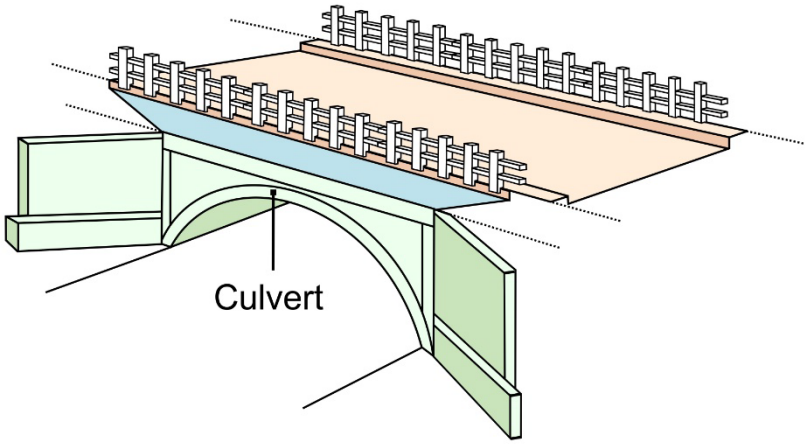


Figure C-1: Diagram of a culvert structure

Figure C-2: Examples of culverts. Culverts allow water to pass under the roadway (left), they are straight-line conduits with no intermediate 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 inventoried as part of the state-wide pilot project, the material type used for constructing culverts ranged from (in order of predominance) corrugated steel, concrete, plastic, aluminum, and masonry/tile, to timber materials. The shapes of the culverts were (in order of predominance) circular, pipe arch, arch, rectangular, horizontal ellipse, or box. 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 its 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. In 2018, Michigan local agencies participated in a culvert pilot data collection, gathering inventory and condition data; full detail on the condition assessment system used in the data collection can be found in Appendix G of the final 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 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.

D. TRAFFIC SIGNALS ASSET MANAGEMENT PLAN SUPPLEMENT

ICRC does not own any traffic signal assets.

E. GLOSSARY & ACRONYMS

Glossary

Alligator cracking: Cracking of the surface layer of an asphalt pavement that creates a pattern of interconnected cracks resembling alligator hide. This is often due to overloading a pavement, sub-base failure, or poor drainage.[5]

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".[6]

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 its jurisdiction systematically in order to ensure proper functioning and structural soundness.

Capital preventative maintenance: Also known as CPM, a planned set of cost-effective treatments to address of fair-rated infrastructure before the structural integrity of the system 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. Light capital preventive maintenance is a set of treatments designed to seal isolated areas of the pavement from water, such as crack and joint sealing, to protect and restore pavement surface from oxidation with limited surface thickness material, such as fog seal; generally, application of a light CPM treatment does not provide a corresponding increase in a segment's PASER score. Heavy capital preventive maintenance is a set of surface treatments designed to protect pavement from water intrusion or environmental weathering without adding significant structural strength, such as slurry seal, chip seal, or thin (less than 1.5-inch) overlays for bituminous surfaces or patching or partial-depth (less than 1/3 of pavement depth) repair for concrete surfaces.

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.

City major: A road classification, defined in Michigan Public Act 51, that encompasses the generally more important roads in a city or village. City major roads are designated by a municipality's governing body and are subject to approval by the State Transportation Commission. These roads do not include roads under the jurisdiction of a county road commission or trunkline highways.

City minor: A road classification, defined in Michigan Public Act 51, that encompasses the generally less important roads in a city or village. These roads include all city or village roads that are not city major road and do not include roads under the jurisdiction of a county road commission.

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

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 portland cement concrete. Concrete pavement 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*.

County local: A road classification, defined in Michigan Public Act 51, that encompasses the generally less important and low-traffic roads in a county. This includes all county roads that are not classified as county primary roads.

County primary: A road classification, defined in Michigan Public Act 51, that encompasses the generally more important and high-traffic roads in a county. County primary roads are designated by board members of the county road commissions and are subject to approval by the State Transportation Commission.

CPM: See *Capital preventive maintenance*.

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”.

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 allowing traffic to pass without being impeded; culverts span up to 20 feet.[7]

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.

[7] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual

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.[8]

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".[9] 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.

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.

Heavy capital preventive maintenance: See *Capital preventive maintenance*.

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

[8] Federal Highway Administration webpage https://www.fhwa.dot.gov/
[9] Inventory-based Rating System for Gravel Roads: Training Manual

compaction at high temperatures. 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.[10]

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.[11]

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.[12]

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.[13]

Investment Reporting Tool: Also known as IRT, a web-based system used to manage the process for submitting required items to the Michigan Transportation Asset Management Council. Required items include planned and completed maintenance and construction activity for roads and bridges and comprehensive asset management plans.

IRT: See *Investment Reporting Tool*.

Jurisdiction: Administrative power of an entity to make decisions for something. In Michigan, the three levels of jurisdiction classification for transportation assets are state highways, county roads, and city and village streets. State highways are under the jurisdiction of the Michigan Department of Transportation, county roads are under the jurisdiction of the road commission for the county in which the roads are located, and city and village streets are under the jurisdiction of the municipality in which the roads are located.

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.

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

[10] Inventory-based Rating System for Gravel Roads: Training Manual
[11] Inventory-based Rating System for Gravel Roads: Training Manual
[12] https://www.fhwa.dot.gov/interstate/faq.cfm#question3
[13] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual

Light capital preventive maintenance: See *Capital preventive maintenance*.

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.

MGF: See *Michigan Geographic Framework*.

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 Geographic Framework: Also known as MGF, this is the state of Michigan's official digital base map that contains location and road information necessary to conduct state business. The Michigan Department of Transportation uses the MGF to link transportation assets to a physical location.

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.[14]

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.[15]

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

[14] Inventory-based Rating System for Gravel Roads: Training Manual
[15] Inventory-based Rating System for Gravel Roads: Training Manual

council reports directly to the Michigan Infrastructure Council.[16] 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.

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.[17]

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 Functional Class: Also known as NFC, a federal grouping system for public roads that classifies roads according to the type of service that the road is intended to provide.

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.

NFC: See *National Functional Class*.

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

[16] Inventory-based Rating System for Gravel Roads: Training Manual
[17] https://www.fhwa.dot.gov/bridge/nbis/

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. 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.[18]

Pothole: A defect in a road that produces a localized depression.[19]

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 a state's legal vehicle loads.

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*.

[18] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual
[19] Inventory-based Rating System for Gravel Roads: Training Manual

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.[20]

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 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.[21]

Ruts/rutting: Deformation of a road that usually forms as a permanent depression concentrated under the wheel path parallel to the direction of travel.[22]

Scheduled maintenance: Low-cost, day-to-day activities applied to bridges on a scheduled basis that mitigates deterioration.[23]

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).[24]

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 by the TAMC definitions for condition.

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

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

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.

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.[25]

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.[26]

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.[27]

Washboarding: Ripples in the road surface that are perpendicular to the direction of travel.[28]

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 to address any deterioration of the car.

List of Acronyms

CPM: capital preventive maintenance

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

FHWA: Federal Highway Administration

HMA: hot-mix asphalt

I: trunkline abbreviation for routes on the Interstate system

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