Crawford County Road Commission
2022 Bridge
Asset Management Plan

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

Prepared by:
OHM Advisors
Amanda Porath, PE
Amanda.Porath@ohm-advisors.com

OHM Advancing Communities

CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

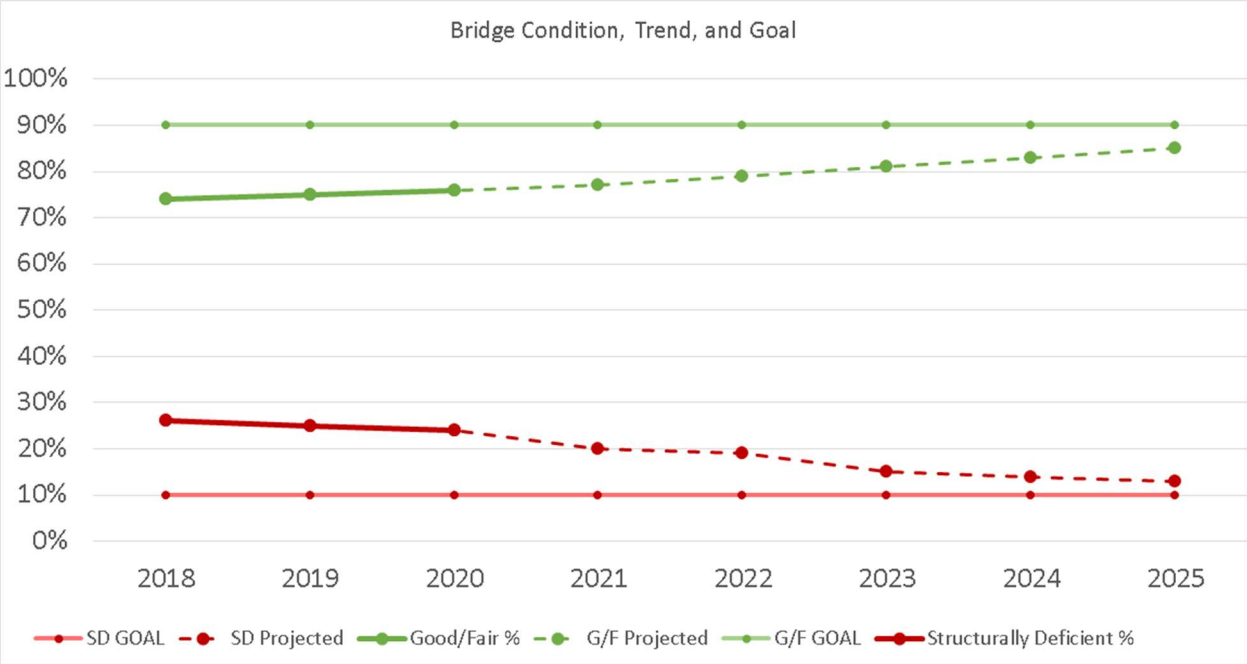
EXECUTIVE SUMMARY

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 Crawford County Road Commission's (CCRC) 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 CCRC is meeting its obligations to maintain the bridges for which it is responsible.

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

- What kinds of bridge assets CCRC has in its jurisdiction and the different options for maintaining these assets.
- What tools and processes CCRC uses to track and manage bridge assets and funds.
- What condition CCRC'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 CCRC's bridge assets' normal life cycle.
- What condition CCRC 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 CCRC's bridge assets.

CCRC 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 CCRC's obligations towards meeting these requirements. This asset management plan also helps demonstrate CCRC's responsible use of public funds by providing elected and appointed officials as well as the general public with inventory and condition information of CCRC'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". 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 Crawford County Road Commission 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 Crawford County Road Commission's Road network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial challenges of managing infrastructure with a limited budget.

The Crawford County Road Commission (CCRC) has adopted an "asset management" business process to overcome the challenges presented by having limited financial, staffing, and other resources while needing to meet safety standards and bridge users' expectations. CCRC is responsible for maintaining and operating 21 bridges.

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

Questions regarding the use or content of this plan should be directed to Donald Babcock at 500 Huron Street, Grayling Michigan 49738or at 989-348-2281. A copy of this plan can be accessed on our website at www.crawford-crc.com.

Key terms used in this plan are defined in CCRC'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).

Figure 2: Slab bridge

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.

Truss bridges were once quite common and consist 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.

Figure 3: Truss bridge

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.

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.

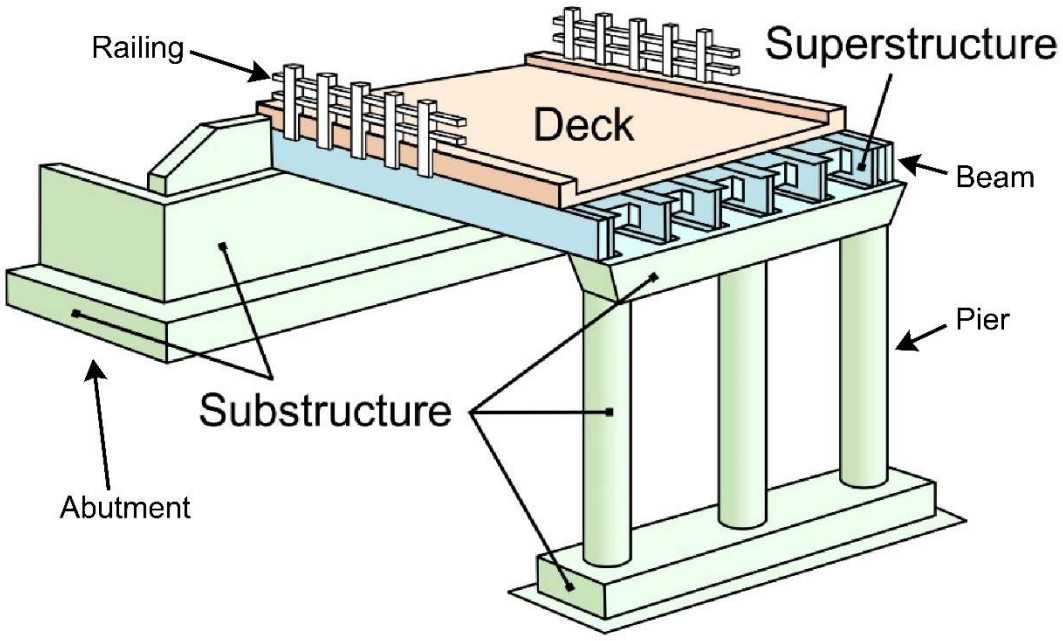


Figure 6: Diagram of basic elements of a bridge

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 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 delaminations 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

CCRC seeks to implement an asset management program for its bridge structures. This program balances the decision to perform reconstruction, rehabilitation, preventive maintenance, scheduled maintenance, or new construction, with CCRC's bridge funding in order to maximize the useful service life and to ensure the safety of the local bridges under its jurisdiction. In other words, CCRC's bridge asset management program aims to preserve and/or improve the condition of its local bridge network within the means of its financial resources.

Nonetheless, CCRC recognizes that limited funds are available 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, CCRC 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 CCRC's asset management program is the preservation and safety of its bridge network, increase of its bridge assets' useful service life by extending of the time that bridges remain in good and fair condition, and reduction of future maintenance costs. To quantify this goal, CCRC specifically aims to have to have 90% or more of the agency's local bridges in fair to good condition and to have less than 10% classify as structurally deficient over its three-year plan.

Thus, CCRC's asset management plan objectives are:

- To establish 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
    - County funding through Michigan's Local Bridge Program
    - Opportunities to obtain other funding
- To prioritize the programmed actions within available funding limitations
- To improve the condition of bridges currently rated poor (4 or lower).

Inventory

CCRC is responsible for 21 local bridges. Table 2 summarizes CCRC'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 the tables in Appendixes 3, 4, and 5. The bridge inventory data was obtained from MDOT MiBRIDGE and other sources, and the 2020 condition data and maintenance actions are taken from the inspector's summary report (see Appendix 2).

Types

Of the CCRC's 21 structures, 3 are steel bridges, 8 are pre-stressed concrete bridges, and 10 are timber bridges.

Locations and Sizes

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

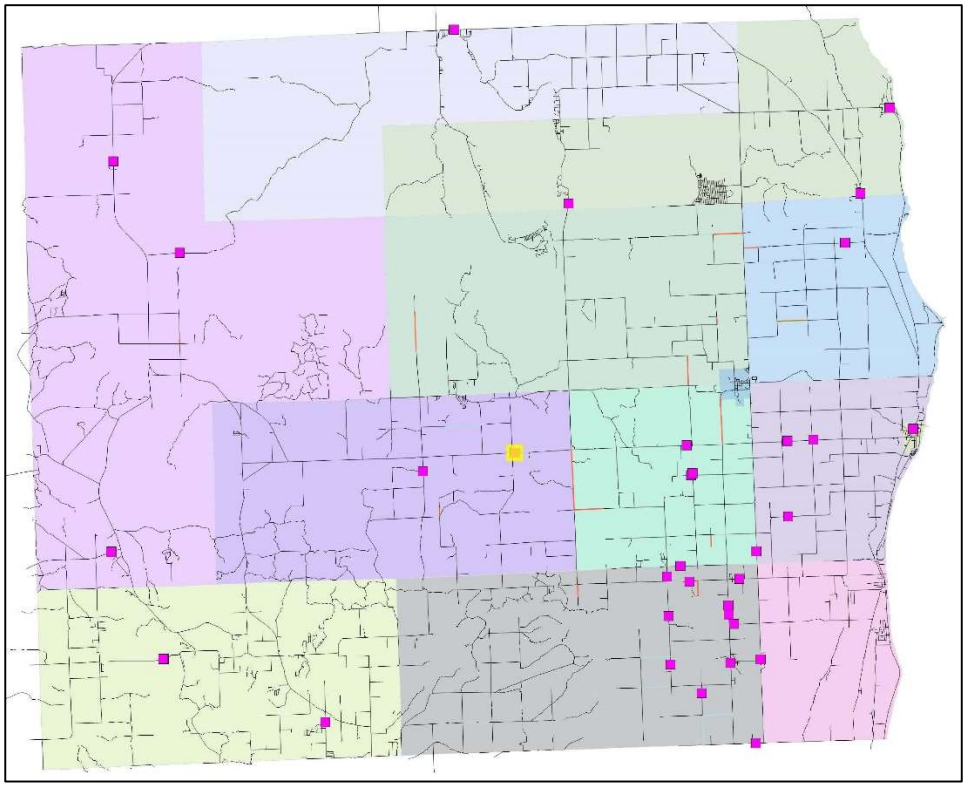


Figure 7: Map illustrating locations CCRC's of bridge assets

Condition

CCRC 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 CCRC's bridge network is 6 (29%) are good, 10 (48%) are fair, and 5 (24%) are poor or lower.

Another layer of classification of CCRC's bridge inventory classifies 5 (24%) bridges as structurally deficient, 3 (14%) bridges as posted, and 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
Prestressed concrete – Box beam/girders—multiple	8	18,673	3	1	0	3	4	1
Steel – Multistringer	3	4,368	1	2	0	1	2	0
Timber – Orthotopic	1	816	0	0	0	0	1	0
Timber – Slab	9	11,168	1	0	0	1	3	5
Total SD/Posted/Closed			**5**	**3**	**0**			
Total	**21**	**35,025**				**5**	**10**	**6**
Percentage (%)			**24%**	**14%**	**0**	**24%**	**48%**	**29%**

Statewide, MDOT's statistics for local agency bridges show that 11% are poor and 89% are good/fair, indicating that the CCRC has a greater percentage of poor bridges compared to the statewide average for local agencies. Correspondingly, CCRC has 77% of its bridges in fair/good condition versus the statewide average of 89% for local agency bridges. Statewide, 8% of local agency bridge deck area classifies as structurally deficient compared to 24% of CCRC's bridge deck area.

Goals

The goal of CCRC'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 90% of its bridges rated fair/good and having less than 10% classify as structurally deficient within 10 years. These goals are juxtaposed with the historic and current condition and the projected trend in Figure on page VI.

Several metrics will be used to assess the effectiveness of this asset management program. CCRC 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.

Prioritization, Programmed/Funded Projects, and Planned Projects

Prioritization

CCRC's asset management program aims to address the structures of critical concern by targeting elements rated as being in poor condition and to improve and maintain the overall condition of the bridge network to good or fair condition through a "mix of fixes" strategy. Therefore, CCRC prioritizes bridges for projects by evaluating five factors and weighting them as follows: condition –40%, load capacity –30%, traffic –10%, safety –15%, and detour –5%. There are several components within each factor that are used to arrive at its score. Each project under consideration is scored, and its total score is then compared with other proposed project to establish a priority order.

CCRC 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 data are consolidated in spreadsheet format for CCRC's bridges in Appendix 3. CCRC then determines management and preservation needs and corresponding actions for each bridge (Appendix 4) As well as inspection follow-up actions (Appendix 5). The management and preservation actions are selected in accordance with criteria contained in the *Summary of Preservation Criteria* table (below) and adapted to CCRC'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
Rehabilitation		
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 Black 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] • Deck bottom has more than 25% total area with deficiencies [1] • *OR* Replacement cost of deck is competitive with rehabilitation [1]	60+ years [3] [4]

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
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 Membrane	• 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] • *OR* Bridge is in poor condition and will be replaced in the near future and the most cost-effective fix is HMA overlay [1]	

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
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]
	  ○ Beam end contact [1]
	  ○ Closed expansion joints and/or pin and hangers [1]	

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
	○ 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 between 2% and 5% area with deficiencies [1] [2]	5 years

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
	• *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, CCRC's asset management program uses a "mix of fixes" strategy that is made up of replacement, rehabilitation, preventive maintenance, and 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 preventive work will be performed by the agency's in-house maintenance crews while larger, more complex work will be contracted.

CCRC'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, bundled by location.

The replacement, rehabilitation, and preventive maintenance projects are generally eligible for funding under the local bridge program, and any requests for funding will be submitted with Crawford County Road Commission's annual applications.

To achieve its goals, a primary objective of CCRC's asset management program is improvement of two bridges rated poor (4 or lower) to a rating of fair (5) or higher within a three-year time period through management and/or preservation activities. The primary work activities that will be used to meet this improvement objective include replacement and rehabilitation.The work has been 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, CCRC's asset management program incorporates 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 preventive maintenance and scheduled maintenance. A bridge-by-bridge preservation—or maintenance—plan is presented in the Appendix 4.

Programmed/Funded Projects

CCRC received $200,000 in total funding per year for the years 2023-2025. To achieve its goals, CCRC plans to spend $100,000 per year on preventive maintenance of bridges. CCRC plans to replace 1 bridge at a cost of $1,600,000 . By performing the aforementioned preventive maintenance and replacement of bridge structures, CCRC may or may not meet its overall bridge network condition goals.

CCRC 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 computed on a bridge-by-bridge basis. The cost estimates are

reviewed and updated annually. A summary of the programmed/funded projects and investments can be found in Table 4, the Cost Projection table, below.

Planned Projects

CCRC identifies additional priority projects that remain unfunded. These are identified according to high, medium, and low priority in Table 4.

Table 4: Cost Projection Table

Strategy	2023	2024	2025	2026	2027
Replacement					
2064	$1,726,000				
Rehabilitation					
2066	$442,000				
2073			$212,000		
2065			$330,000		
2062			$923,000		
2067			$1,109,000		
Subtotal	$2,168,000	$0	$2,574,000	$0	$0

2. FINANCIAL RESOURCES

Anticipated Revenues

CCRC has programmed project and/or has been granted and MDOT local-aid funding, a county appropriation of monies for bridge preservation, and federal funding. This funding is for the purpose(s) of and other, for the following bridge(s): 2064, and 2066. This funding is intended for use in 2023.

CCRC applied for MDOT local-aid funding, a county appropriation of monies for bridge preservation, and federal funding. This funding was requested in the application year 2022, for the following bridge(s): 2062, 2065, 2067, and 2073. This funding is intended for use in the year 2025.

Any projects submitted to the local aid program that are not selected for funding will be added to the agency's program.

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

CCRC 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.

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

CCRC administers the biennial inspection of its bridges in accordance with NBIS and MDOT requirements. The inspection reports document the condition of CCRC's bridges and evaluates 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 CCRC'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. CCRC has scour critical bridges, which are listed in Table 5.

Table 5: Bridges that are Considered Scour Critical : None

CCRC has posted bridges that are critical to accessing entire areas or individual properties within its jurisdiction. These bridges are listed in Table 6.

Table 6: Posted or Close Bridges that are Critical Links

Posted/Closed Bridges that are Critical Links		
Bridge Structure Number	**P/K**	**Comments**
2062	P	
2067	P	
2069	P	

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

CCRC 2020 Bridge Inspection Report Summary of Additional Inspection Recommendations

2061 North Down River Road over North Branch Au Sable River: Review existing drawings to verify that cracks in concrete piles are only in pile protection/covering material.

Appendix 2

CCRC 2020 Bridge Inspection Report Executive Summary

2060 North Down River Road over East Branch Au Sable River

Constructed: 2016 **Reconstructed:** N/A **General Condition:** Good

Description: 5 Prestressed Concrete Box Bm/Gird - Multiple.

Recommendations: Seal HMA-to-concrete joint at both approaches. Clean sand and pine needles from shoulders and approach drains. Remove sand from west approach expansion joint. Remove sand from sidewalk

2061 North Down River Road] over North Branch Au Sable River

Constructed: 1964 **Reconstructed:** N/A **General Condition:** Fair

Description: 5 Prestressed Concrete/05 Box Bm/Gird - Multiple.

Recommendations: Review original drawings to verify that cracks visible in concrete piles are only in pile protection/covering material. Seal cracks. Replace section of damaged railing beam element at NE approach. Realign displaced posts at NE approach. Replace broken spacer blocks at SW approach. Replace bent/broken posts at SW approach. Realign displaced posts at SW approach. Seal cracks and patch delaminations. Plug conduit holes through sheet pile at NE and NW quadrants to prevent loss of fill.

2062 North Down River Road over Big Creek

Constructed: 1948 **Reconstructed:** N/A **General Condition:** Poor

Description: 3 Steel / 02 Multi Str Non-Comp.

Recommendations: Consider adding riprap at both ends and full length of west abutment. Seal cracks. Remove trees and brush at all quadrants. Fill erosion hole behind guardrail at NE quadrant reference line. Replace terminal end of approach railing at SW and NE quadrants. Inject cracks at railing anchorage to concrete end blocks. Repair bridge railing system along with brush blocks and deck repairs noted below. Seal cracks. Consider cleaning and painting bridge. Remove hook from reinforcing flange plate at north fascia and grind weld smooth. Replace brush blocks. Repair deck fascia.

2063 County Road 612 over Manistee River

Constructed: 1920 **Reconstructed:** 1960 **General Condition:** Fair

Description: 5 Prestressed Concrete / 05 Box Bm/Gird - Multiple.

Recommendations: Seal cracks and replace HMA when bridge deck wearing surface is replaced. Consider adding riprap at west abutment and NE, NW, and SW wingwalls. Consider adding dike in channel to redirect flow of water through bridge opening. Replace wearing surface and membrane.

2064 County Road 612 over Au Sable River

Constructed: 1930 **Reconstructed:** 1965 **General Condition:** Serious

Description: 5 Prestressed Concrete / 05 Box Bm/Gird - Multiple.

Recommendations: Consider supplementing existing corroded sheet pile with riprap slope protection. Seal cracks at both reference lines and along centerline at both approaches. Cut brush at all quadrants. Replace expansion bolts at posts near midspan of north and south fascia box beams where existing expansion bolts have caused spalling. Seal cracks along edge angle at both fascia, along center line and within both lanes. Repair existing box beams to slow the rate of deterioration. Mortar P/T pockets in fascia box beams. Adjust NW approach railing terminal ending so that beam guardrail is inside of end device.

2065 County Road 612 over North Branch Au Sable River

Constructed:1961 **Reconstructed:** N/A **General Condition:** Poor

Description: 5 Prestressed Concrete / 05 Box Bm/Gird - Multiple.

Recommendations: Seal cracks and fill holes. Cut brush/trees all quadrants. Replace missing rail post at SE quadrant approach. Seal cracks in bridge surface. Mortar P/T pockets in fascia box beams.

2066 County Road 612 over Big Creek

Constructed: 1993 **Reconstructed:** N/A **General Condition:** Fair

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Consider adding gravel or HMA at sides of existing HMA approach wedges. Regrade approach shoulders to slope away from road. Cut tress at all quadrants. Remover tree from stream upstream from bridge. Seal cracks. Replace shims and tighten nuts on spreader beam bolts.

2067 Stephan Bridge Road over Au Sable River

Constructed: 1900 **Reconstructed:** 1960 **General Condition:** Fair

Description: 3 Steel / 02 Multi Str Non-Comp.

Recommendations: Replace HMA approaches. Remove downed tree at SW quadrant. Repair erosion in approach slopes. Grade shoulders to drain away from road. Replace HMA wearing surface and membrane.

2068 Chase Bridge Road over South Branch Au Sable River

Constructed: 1968 **Reconstructed:** N/A **General Condition:** Fair

Description: 5 Prestressed Concrete / 05 Box Bm/Gird - Multiple.

Recommendations: Remove tree in channel at NW quadrant. Replace guardrail and posts on bridge and approaches. Patch two spalls in west box beam.

2069 Wakeley Bridge Road over Au Sable River

Constructed: 1975 **Reconstructed:** N/A **General Condition:** Critical

Description: 5 Prestressed Concrete / 05 Box Bm/Gird - Multiple.

Recommendations: Suggest partial lane closure in SB lane until collapsing box beam patches and top flange of box beam are repaired or until bridge id replaced. Replace bridge. Move north load limit sign at bridge closer to bridge structure per MUTCD (within 50’ of north abutment).

2070 McMasters Bridge Road over Au Sable River

Constructed: 1990 **Reconstructed:** N/A **General Condition:** Fair

Description: 5 Prestressed Concrete / 05 Box Bm/Gird - Multiple.

Recommendations: Seal cracks in HMA approaches. Remove brush at all quadrants. Consider adding riprap at both abutments and all wingwalls. Fill erosion at NE and SE quadrant approaches. Replace missing nuts and washers at approach railings and tighten nuts at loose spacer blacks. Replace missing nut and washer at NW quadrant terminal ending cable and tighten terminal cables at approach railings in all quadrants. Seal cracks in HMA wearing surface. Clean and patch spalls and delaminations on west fascia beam with exposed strands. Remove obstructions to outlets of two drainage culverts at NE and NW quadrants.

2071 Lewiston Grade Road over East Branch Au Sable River

Constructed: 1960 **Reconstructed:** 2000 **General Condition:** Good

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Replace missing riprap. Consider adding paving wedge at both approaches. Add spacer block and bolts at NE and SW quadrants where missing. Sweep/shovel sand from deck and clean scuppers. Clean or replace advance warning load limit sign at Vista Drive.

2072 Pollack Bridge Road over Au Sable River

Constructed: 1987 **Reconstructed:** N/A **General Condition:** Fair

Description: 3 Steel / 72 Multi Str Timber Deck.

Recommendations: Consider adding fabric and riprap at base of both abutments and all wingwalls. Cut brush at NW, SW, and SE quadrants. Fill erosion hole at NE quadrant guardrail post. Consider cleaning and painting steel stringers and bearing plates. Sweep/shovel sand from bridge deck and clean scuppers.

2073 Batterson Road over Au Sable River

Constructed: 1979 **Reconstructed:** N/A **General Condition:** Good

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Replace pavement. Cut brush all quadrants. Add post at NE quadrant approach railing. Add bolt at SE quadrant railing transition. Add spacer at NE quadrant approach railing. Replace wearing surface and membrane, Replace missing but and washer on west spreader beam. Clean sand from scuppers.

2074 May Lake Road over Au Sable River

Constructed: 1995 **Reconstructed:** N/A **General Condition:** Good

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Repair riprap slopes at both abutments. Consider redoing approach wedges, especially SE quadrant. Seal cracks. Cut brush all quadrants. Repair erosion at SE quadrant. Seal cracks.

2075 Hulbert Road over Au Sable River

Constructed: 1993 **Reconstructed:** N/A **General Condition:** Fair

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Repair geotextile and riprap slopes along both abutments. Replace HMA approach paving. Grade shoulders to slope away from roadway. Cut brush at NE and SW quadrants. Trim tree branches at west end of approach guardrail at load limit sign. Remove sand blacking top end of spillways at NW and SW quadrants. Repair end of approach guardrail NE quadrant, Replace HMA wearing surface and membrane. Tighten nut on spreader beam. Move load limit signs to within 50' of each reference line per MUTCD

2076 Cameron Bridge Road over Manistee River

Constructed: 1993 **Reconstructed:** N/A **General Condition:** Fair

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Seal cracks. Consider adding wedges at both approaches, Cut brush at NW and SW quadrants. Replace cracked spacer blocks. Repair/Replace joint at center pier. Seal cracks. Clean sand off of bridge deck and clean sand out of scuppers.

2077 Wilcox Bridge Road over East Branch Au Sable River

Constructed: 2002 **Reconstructed:** N/A **General Condition:** Good

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Remove dam below bridge and repair riprap scour protection. Repair broken underdrain outlet ending at SE quadrant and add rodent screen at all quadrants.

2078 Steckert Bridge Road over South Branch Au Sable River

Constructed: 1979 **Reconstructed:** N/A **General Condition:** Fair

Description: 7 Wood or Timber / 01 Slab.

Recommendations: Relocate large broken concrete "riprap" pieces at SE quadrant to allow better water flow. Seal cracks in HMA Surface. Add bolt at NW quadrant approach railing transition to bridge railing. Seal cracks in HMA wearing surface. Add washers and tighten spreader beam nuts. Clean sand from scuppers.

12747 Ole Dam Road over Au Sable River

Constructed: 1977 **Reconstructed:** N/A **General Condition:** Fair

Description: 7 Wood or Timber / 08 Orthotropic.

Recommendations: Seal cracks in HMA approach at south reference line. Replace rail posts and blocks on bridge and approaches. Seal cracks in HMA wearing surface. Repair deck laminations at both fascia. Clean sand and leaves from deck and scuppers. Verify if new HMA was applied over old wearing surface or if old wearing surface was milled off. Perform new load rating if old HMA surface wasn't removed.

13742 West Karen Lake Road over East Branch Au Sable River

Constructed: 2016 **Reconstructed:** N/A **General Condition:** Good

Description: 7 Wood or Timber / 71 Slab-Timber Comp.

Recommendations: Replace post at NE quadrant terminal ending. Seal Cracks

Appendix 3

Inventory Data														Inspection Findings													Appraisal				
Bridge Type	Structure Number	Bridge ID	Facility Carried	Features Intersected	Primary or Secondary Route	Structure Type Main Span (Item 43A - Material)	Structure Type Main Span (Item 43B)	Number of Main Span (Item 45)	Total Str Length (Item 49)	Year Built (Item 27)	Year Reconstr (Item 106)	ADT	Year of ADT	Inspection Date	Operational Status (Item 41)	Deck Rating (Item 58)	Deck Bottom Rating (Item XX)	SuperStr Rating (Item 59)	Substr Rating (Item 60)	Channel Rating (Item 61)	Culvert Rating (Item 62)	Surface Rating (Item 58A)	Paint Rtg	Exp Joint Rating (Item XX)	Other Joints	Structure Evaluation	Structurally Deficient	Sufficiency Rating	Section Loss	Scour Critical (Item 113)
Prestressed concrete – Box beam/girders—multiple	**2060**	20200005000B010	N DOWN RIVER RD	E BR AU SABLE RIVER	Primary	5	5	1	80	2016		5067	2015	10/28/2020	A	8	N	9	9	8	N	8	N	7	7	G		97.6	3	8
Prestressed concrete – Box beam/girders—multiole	**2061**	20200006000B010	N DOWN RIVER RD	N BR AU SABLE RIVER	Primary	5	5	1	49.9	1964		287	1985	10/14/2020	A	7	N	7	5	7	N	5	N	N	N	F		83.8	N	8
Steel – Multistringer	**2062**	20200006000B020	N DOWN RIVER RD	BIG CREEK	Primary	3	2	1	49.9	1948		261	2010	9/22/2021	P	7	7	4	5	7	N	5	3	N	N	P	Struct Def	37.8	N	8
Prestressed concrete – Box beam/girders—multiole	**2063**	20200007000B010	COUNTY RD 612	MANISTEE RIVER	Primary	5	5	1	62	1920	1960	250	1985	11/4/2020	A	7	N	7	5	7	N	5	N	N	N	F		80.9	N	5
Prestressed concrete – Box beam/girders—multiple	**2064**	20200007000B020	COUNTY RD 612	AU SABLE RIVER	Primary	5	5	1	41	1930	1965	533	1985	9/22/2021	A	3	N	3	5	7	N	5	N	N	N	P	Struct Def	43.1	N	8
Prestressed concrete – Box beam/girders—multiple	**2065**	20200007000B030	COUNTY RD 612	N BR AU SABLE RIVER	Primary	5	5	1	45.9	1961		409	1985	9/22/2021	A	6	N	6	4	7	N	6	N	N	N	P	Struct Def	58.7	N	8
Timber – Slab	**2066**	20200007000B040	COUNTY RD 612	BIG CREEK	Primary	7	1	1	31.8	1993		700	2014	9/22/2021	A	5	5	4	6	8	N	3	N	N	N	P	Struct Def	70.9	N	8
Steel – Multistringer	**2067**	20200016000B010	STEPHAN BRIDGE RD	AU SABLE RIVER	Primary	3	2	1	61	1900	1960	560	2013	10/15/2020	P	7	7	5	6	8	N	4	4	N	N	F		57.9	N	8
Prestressed concrete – Box beam/girders—multiple	**2068**	20200017000B010	CHASE BRIDGE RD	S BR AU SABLE RIVER	Primary	5	5	1	61	1968		286	1985	10/28/2020	A	7	N	6	7	8	N	9	N	N	N	F		93.7	N	5
Prestressed concrete – Box beam/girders—multiple	**2069**	20200018000B010	WAKELEY BRIDGE RD	AU SABLE RIVER	Primary	5	5	3	110.9	1975		420	2013	9/22/2021	P	2	N	2	5	7	N	4	N	3	N	P	Struct Def	28.8	1	5
Prestressed concrete – Box beam/girders—multiple	**2070**	20200022000B010	MCMASTERS BRIDGERD	AU SABLE RIVER	Primary	5	5	1	91.9	1990		199	1990	10/15/2020	A	6	N	5	7	7	N	5	N	N	N	F		88.7	N	8
Timber – Slab	**2071**	20301H000990B010	LEWISTON GRADE RD	E BRANCH AU SABLE RIVER	Secondary	7	1	1	22	1960	2000	15	1999	10/15/2020	A	8	8	8	8	8	N	6	N	N	N	G		86.3	N	5
Steel – Multistringer	**2072**	20302A000038010	POLLAK BRIDGE ROAD	AU SABLE	Secondary	3	2	1	31.8	1987		50	1987	10/28/2020	A	6	6	5	7	8	N	6	2	N	N	F		75.4	N	5
Timber – Slab	**2073**	20302A000128010	BATTERSON ROAD	AU SABLE RIVER	Secondary	7	1	2	44	1979		120	1981	11/4/2020	A	7	7	7	7	8	N	4	N	N	N	G		100	N	5
Timber – Slab	**2074**	20302B000018010	MAY LAKE ROAD	AU SABLE RIVER	Secondary	7	1	1	34.8	1995		200	1995	11/4/2020	A	8	8	8	8	8	N	6	N	N	N	G		100	N	5
Timber – Slab	**2075**	20302B000028010	HULBERT ROAD	AU SABLE RIVER	Secondary	7	1	1	25.9	1993		150	1992	11/4/2020	A	6	6	6	7	7	N	4	N	N	N	F		100	N	5
Timber – Slab	**2076**	20302B000038010	CAMERON BRIDGE RD	MANISTEE RIVER	Secondary	7	1	2	87.9	1993		200	1992	11/4/2020	A	7	7	6	6	8	N	7	N	3	N	F		99.9	N	5
Timber – Slab	**2077**	20303D000118010	WILCOX BRIDGE RD	EAST BRANCH OF AU SABLE	Secondary	7	1	1	29	2002		250	2000	10/28/2020	A	8	8	8	8	7	N	6	N	N	N	G		99.9	N	5
Timber – Slab	**2078**	20306A000128010	STECKERT BRIDGE RD	SOUTH BRANCH AU SABLE	Secondary	7	1	3	55.8	1979		150	1981	10/28/2020	A	7	7	7	6	7	N	5	N	N	N	F		98.9	N	8
Timber – Orthotooic	**12747**	20303A000108010	OLE DAM ROAD	AUSABLE RIVER	Secondary	7	8	1	25.9	1977		100	1997	10/28/2020	A	7	7	7	6	7	N	7	N	N	N	F		99	N	5
Timber – Slab	**13742**	20303D000158010	W KAREN LAKE RD	E BR AUSABLE RIVER	Secondary	7	1	1	32	2016		50	2013	10/15/2020	A	9	9	9	9	7	N	6	N	N	N	G		98	N	5

Appendix 4

APPENDIX X-2

Inventory Data										Replacement			Rehabilitation								Proposed Preventive Maintenance								Proposed Scheduled Maintenance												
Bridge Type	Structure Number	Bridge ID	Facility Carried	Features Intersected	Structure Type Main Span (Item 43A - Material)	Structure Type Main Span (Item 43B)	Number of Main Spans (Item 45)	Total Str Length (Item 49)	Total Str Width (Item 52)	Total Str (sq ft)	Total	Super-structure	Deck	Sub-structure	Deep Overlay	Shallow Overlay	HMA Overlay w/ Membrane	HMA Cap	Replace/Retrofit Railing	Steel Beam Repairs	P/S Conc Beam Repairs	Repair/Replace Culvert	Repair/Replace Retaining Wall	Geometric Upgrades	Patch Substruct Concrete	Repair/Replace Deck	Repair/Replace Steel Bearings	Complete Painting	Zone Painting	Epoxy Overlays	HMA Cap w/o Membrane	Concrete Deck Patching	Channel Improvements	Scour Counter Measures	Superstruc Washing	Concrete Surface Washing	Vegetation Control	Debris Removal	Clean Drainage System	Spot Painting	Repair/Replace HMA Surface	Seal HMA Cracks/Joints	Seal Concrete Cracks/Joints	Minor Concrete Patching	Timber Repairs	Repair/Replace Guardrails	Repave Approaches	Repair Slopes	Install Riprap
Prestressed concrete – Box beam/girders—multiple	**2040**	2010005050090010	N DOWN RIVER RD	E BR AU SABLE RIVER	S	S	1	80	61.9	4952																																
Prestressed concrete – Box beam/girders—multiple	**2041**	2010005060090010	N DOWN RIVER RD	N BR AU SABLE RIVER	S	S	1	69.9	60.5	5122																																
Steel – Multistringer	**2042**	2010005060090020	N DOWN RIVER RD	BIG CREEK	3	2	1	49.9	31.2	1557		x																														
Prestressed concrete – Box beam/girders—multiple	**2043**	2010007070090010	COUNTY RD 612	MANISTEE RIVER	S	S	1	62	26.9	1668			x																		x												
Prestressed concrete – Box beam/girders—multiple	**2044**	2010007070090020	COUNTY RD 612	AU SABLE RIVER	S	S	1	61	30.2	1238	x																																
Prestressed concrete – Box beam/girders—multiple	**2045**	2010007070090060	COUNTY RD 612	N BR AU SABLE RIVER	S	S	1	45.9	26.9	1235			x																														
Timber – Stick	**2046**	2010009070090060	COUNTY RD 612	BIG CREEK	T	S	1	31.8	28.9	951		x																																
Steel – Multistringer	**2047**	2010016030090010	STEPHAN BRIDGE RD	AU SABLE RIVER	3	2	1	61	29.5	1850																																
Prestressed concrete – Box beam/girders—multiple	**2048**	2010001750090020	CHASE BRIDGE RD	S BR AU SABLE RIVER	S	S	1	61	30.2	1842																																
Prestressed concrete – Box beam/girders—multiple	**2049**	2010001850090010	WINSLEY BRIDGE RD	AU SABLE RIVER	S	S	3	110.9	30.2	3349																																
Prestressed concrete – Box beam/girders—multiple	**2070**	2010002150090020	MCMASTERS BRIDGERD	AU SABLE RIVER	S	S	1	91.9	31.2	2867																																
Timber – Stick	**2071**	2010104000990010	LEWISTON GRADE RD	E BRANCH AU SABLE RIVER	T	1	1	22	25.7	345																																x
Steel – Multistringer	**2072**	2010104200020010	POLLAK BRIDGE ROAD	AU SABLE	3	2	1	31.8	31.8	1011																		x														x
Timber – Stick	**2073**	2010104300120010	BATTERSON ROAD	AU SABLE RIVER	T	1	2	44	32.2	1417																		x														
Timber – Stick	**2074**	2010108000030020	MAY LAKE ROAD	AU SABLE RIVER	T	1	1	34.8	31.8	1107																																
Timber – Stick	**2075**	2010109000020020	HULBERT ROAD	AU SABLE RIVER	T	1	1	25.9	31.8	824																																
Timber – Stick	**2076**	2010108000030010	CAMERON BRIDGE RD	MANISTEE RIVER	T	1	2	87.9	31.8	2795																		x														
Timber – Stick	**2077**	2010010000118010	WILCOX BRIDGE RD	EAST BRANCH OF AU SABLE	T	1	1	28	32.1	931																																
Timber – Stick	**2078**	2010104200120010	STECKERT BRIDGE RD	SOUTH BRANCH AU SABLE	T	1	3	34.8	31.8	1774																		x														
Timber – Orthotropic	**12787**	2010104200100010	OLD DAM ROAD	AUSABLE RIVER	T	B	1	25.9	31.5	816																		x														
Timber – Stick	**12782**	2010103000130010	W KAREN LAKE RD	E BR AUSABLE RIVER	T	1	1	32	32	1024			x																													

Appendix 5

APPENDIX A-3

Inventory Data											Inspection Items							
Bridge Type	**Structure Number**	**Bridge ID**	**Facility Carried**	**Features Intersected**	**Structure Type Main Span (Item 43A - Material)**	**Structure Type Main Span (Item 43B)**	**Number of Main Span (Item 45)**	**Total Str Length (Item 49)**	**Total Str Width (Item 52)**	**Total Str (sq ft)**	**Initial Inspection**	**In Depth Steel Inspection**	**Pin and Hanger Inspection**	**Diving Inspection**	**Provide Monitoring**	**Review Scour Criticality**	**Load Rating**	**Update SIA**
Prestressed concrete – Box beam/girders—multiple	**2060**	20200005000B010	N DOWN RIVER RD	E BR AU SABLE RIVER	5	5	1	80	61.9	4952	x							
Prestressed concrete – Box beam/girders—multiple	**2061**	20200006000B010	N DOWN RIVER RD	N BR AU SABLE RIVER	5	5	1	49.9	30.5	1522	x							
Steel – Multistringer	**2062**	20200006000B020	N DOWN RIVER RD	BIG CREEK	3	2	1	49.9	31.2	1557	x							
Prestressed concrete – Box beam/girders—multiple	**2063**	20200007000B010	COUNTY RD 612	MANISTEE RIVER	5	5	1	62	26.9	1668	x							
Prestressed concrete – Box beam/girders—multiple	**2064**	20200007000B020	COUNTY RD 612	AU SABLE RIVER	5	5	1	41	30.2	1238	x							
Prestressed concrete – Box beam/girders—multiple	**2065**	20200007000B030	COUNTY RD 612	N BR AU SABLE RIVER	5	5	1	45.9	26.9	1235	x							
Timber – Slab	**2066**	20200007000B040	COUNTY RD 612	BIG CREEK	7	1	1	31.8	29.9	951	x							
Steel – Multistringer	**2067**	20200016000B010	STEPHAN BRIDGE RD	AU SABLE RIVER	3	2	1	61	29.5	1800	x							
Prestressed concrete – Box beam/girders—multiple	**2068**	20200017000B010	CHASE BRIDGE RD	S BR AU SABLE RIVER	5	5	1	61	30.2	1842	x							
Prestressed concrete – Box beam/girders—multiple	**2069**	20200018000B010	WAKELEY BRIDGE RD	AU SABLE RIVER	5	5	3	110.9	30.2	3349	x							
Prestressed concrete – Box beam/girders—multiple	**2070**	20200022000B010	MCMASTERS BRIDGERD	AU SABLE RIVER	5	5	1	91.9	31.2	2867	x							
Timber – Slab	**2071**	20301H00099B010	LEWISTON GRADE RD	E BRANCH AU SABLE RIVER	7	1	1	22	15.7	345	x							
Steel – Multistringer	**2072**	20302A00003B010	POLLAK BRIDGE ROAD	AU SABLE	3	2	1	31.8	31.8	1011	x							
Timber – Slab	**2073**	20302A00012B010	BATTERSON ROAD	AU SABLE RIVER	7	1	2	44	32.2	1417	x							
Timber – Slab	**2074**	20302B00001B010	MAY LAKE ROAD	AU SABLE RIVER	7	1	1	34.8	31.8	1107	x							
Timber – Slab	**2075**	20302B00002B010	HULBERT ROAD	AU SABLE RIVER	7	1	1	25.9	31.8	824	x							
Timber – Slab	**2076**	20302B00003B010	CAMERON BRIDGE RD	MANISTEE RIVER	7	1	2	87.9	31.8	2795	x							
Timber – Slab	**2077**	20303D00011B010	WILCOX BRIDGE RD	EAST BRANCH OF AU SABLE	7	1	1	29	32.1	931	x							
Timber – Slab	**2078**	20306A00012B010	STECKERT BRIDGE RD	SOUTH BRANCH AU SABLE	7	1	3	55.8	31.8	1774	x							
Timber – Orthotopic	**12747**	20303A00010B010	OLE DAM ROAD	AUSABLE RIVER	7	8	1	25.9	31.5	816	x							
Timber – Slab	**13742**	20303D00015B010	W KAREN LAKE RD	E BR AUSABLE RIVER	7	1	1	32	32	1024	x							