

MEETING AGENDA
January 21, 2025

Tom Baker Meeting Room

**City/County Building,
Bismarck**

1:30 PM

The City of Bismarck and Policy Board members are encouraging citizens to provide their comments for public hearing items on the Bismarck-Mandan MPO Policy Board agenda via email to mpo@bismarcknd.gov. Please include which item number your comment references. It will be sent to the members, as well as placed with the minutes. To ensure your comments are received prior to the meeting, please submit them by 5:00 pm 1 business day prior to the meeting. If you would like to participate via video or audio link for a 3-5 minute comment on a regular agenda public hearing item, please provide your name, agenda item and e-mail address to the above e-mail at least 3 days before the meeting.

Any of the 5 (five) Policy Board members can attend this meeting remotely. **Policy Board members and those presenting at the meeting will receive ZOOM invites approximately 1 business day prior to the meeting. Individuals wishing to participate via ZOOM should email contact information to mpo@bismarcknd.gov at least 3 days in advance of the meeting to receive a meeting invite tailored uniquely to them.**

As always, live meeting coverage is available on Government Access Channels 2 & 602HD or streaming live and archived online at [FreeTv.org](https://www.free-tv.org). Agenda items can be found online at [MPO Policy Board](#).

AGENDA

1. PLEDGE OF ALLEGIANCE
2. CALL TO ORDER
3. MINUTES
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Kim Riepl, MPO
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Expressway Bridge Chip Seal Project Amendment (Exhibit C) 13
ACTION ITEM: 2025-2028 TIP Amendments
5. 2024 PAVEMENT CONDITIONS COLLECTION & ANALYSIS – Kim Riepl, MPO
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ACTION ITEM: Pavement Conditions Collection Final Report Adoption
6. 2025 ITS RA UPDATE, ATAC MASTER AGREEMENT ADDENDUM – Kim Riepl, MPO
ITS RA Update Scope of Work (Exhibit E) 57
ATAC Master Agreement Addendum (Exhibit F) 61
ACTION ITEM: SFY26 5339 & 5310 Grant Applications
7. 2025 SAFETY POLICY STUDY – Kim Riepl, MPO & Scott Harmstead, SRF
8. GOVERNMENT PARTNERS PROGRAM– Kim Riepl, MPO
9. BICYCLE FRIENDLY COMMUNITY – Kim Riepl, MPO
10. OTHER BUSINESS

11. ADJOURNMENT

The next scheduled Policy Board meeting is on 2/18/2025. Please call 701-355-1844 with questions. Any individual requiring special accommodations to allow access or participation at the meeting is asked to notify ADA Coordinator, Bismarck-Mandan MPO, PO Box 5503, Bismarck, ND 58506 or complete and submit the Request for Reasonable Accommodations form at <https://www.bismarcknd.gov/DocumentCenter/View/44505/Request-for-Reasonable-Accommodations-or-LEP-Language-Assistance-Form--Instructions> at least five (5) days prior to the meeting.

PROJECTS UPDATE

<u>Project</u>	<u>% Complete</u>	<u>Contracted Completion Date</u>
Arrive 2050 Forecast/Arrive 2050 MTP (MPO-wide)	100	03/31/2025
Safe Routes to Services Study (Bis/Man)	100	12/31/2024
Pavement Conditions Collection & Analysis (Bis/Man)	100	12/31/2024
Safety Policy Study (MPO-wide)	0	12/31/2025

Common MPO Acronyms

ATAC: Advanced Traffic Analysis Center	NDDOT: North Dakota Department of Transportation
CPG: Consolidated Planning Grant	TAZ: Traffic Analysis Zone
FHWA: Federal Highway Administration	TDMSE: Travel Demand Model & Socioeconomic Data
FTA: Federal Transit Administration	TIP: Transportation Improvement Plan
MTP: Metropolitan Transportation Plan	UPWP: Unified Planning Work Program

A full list of common MPO acronyms may be accessed online
<https://www.bismarcknd.gov/DocumentCenter/View/37890/MPO-acronyms>

**BISMARCK-MANDAN METROPOLITAN PLANNING ORGANIZATION
POLICY BOARD MEETING
DECEMBER 17, 2024**

The Bismarck-Mandan Metropolitan Planning Organization (MPO) Policy Board met December 17, 2024, at 1:30 p.m. in the Ed “Bosh” Froehlich Meeting Room, City Hall, 205 2nd Ave NW, Mandan, ND. Mike Schmitz presided.

Members present or participating via Zoom were Mike Schmitz, James Froelich, Keli Berglund, and Steve Schwab. Member absent was Andy Zachmeier.

Others present or attending via Zoom were Kim Riepl, Paulette Jacobsen, and Stephen Larson of the Bismarck-Mandan MPO; Deidre Hughes, Bis-Man Transit; Mike Bittner, Bolton & Menk; Will Hutchings, NDDOT; Kurt Keifer, QES; and Jason Carbee, HDR.

PLEDGE OF ALLEGIANCE AND CALL TO ORDER

Chair Schmitz called the December 17, 2024 meeting of the Bismarck-Mandan Metropolitan Planning Organization Policy Board to order.

MINUTES

Chair Schmitz called for a motion to approve the minutes of the November 19, 2024 Meeting.

MOTION: Mr. Froelich made a motion to approve the November minutes. Ms. Berglund seconded the motion and with James Froelich, Steve Schwab, Keli Berglund, and Chair Schmitz voting in favor, the motion was approved.

**2025-2028 TRANSPORTATION IMPROVEMENT PROGRAM (TIP)
AMENDMENT**

Mr. Larson presented. This month, the MPO processed an amendment to the 2024-2027 and the 2025-2028 TIP. The amendment was advertised for the required 15-day public comment period, and a public hearing was held at yesterday’s TAC meeting. No public comments were received. The amendment increases the cost estimates (as noted in Exhibit A) for a project in the TIP for RRFB installation at four school related locations in Mandan. TAC recommended approval of the amendment as presented.

Mr. Schwab asked what HEU refers to regarding this project. Mr. Larson stated it refers to the funding source. HEU indicates it is an urban safety project on a non-national highway system.

MOTION: Mr. Schwab made a motion to approve the 2025-2028 TIP Amendment as presented. Mr. Froelich seconded the motion and with James Froelich, Steve Schwab, Keli Berglund, and Chair Schmitz voting in favor, the motion was approved.

SAFE ROUTES TO SERVICES/COMPLETE STREETS STUDY

Mr. Bittner presented an overview of the final report for the Safe Routes to Services/Complete Streets Study. The study was to aid in developing a comprehensive, integrated multi-modal transportation network to allow for safe travel within Bismarck and Mandan for all users, including populations of a traditionally vulnerable, underserved, or disabled status. They investigated issues, identified alternatives, and in the final phase, created implementation strategies. Mr. Bittner shared some demographic information on poverty, minorities, and disabilities in the Bismarck-Mandan area, and statistics on the vulnerability of bicyclists and pedestrians on the roadways. He noted these statistics have the greatest impact on low-income and Native American populations. The engagement of stakeholders and public engagement for this study was significant. A lot of the transportation blind spots in the community need to be identified through conversations with users of the network. A big part of this effort was the use of Community Advisory Groups. The consultant paid four local nonprofits to participate in the study and help connect the study with the individuals they serve in the community.

Bolton & Menk conducted a technical barriers assessment, looking at activity, amenities, and barriers throughout the transportation network. Taking all the information they received through the Steering Committee, public engagement, and technical analysis, they were able to identify priority infrastructure hotspots in both Mandan and Bismarck, evaluating the existing concerns in those areas and providing potential options for improvements. Mr. Bittner showed examples of this on the Airport Road Corridor in Bismarck, and in the Shady Acres region in Mandan. The study focuses on low cost, high impact solutions, while also providing potential long-term improvements.

The study also identified priority strategies for the community. A Transit Circulator Route is a proposed strategy for Bismarck, and Microtransit for Mandan. Another strategy proposed is Mobility Hubs, and potential locations for these were examined as part of the study. Finally, Complete Streets Policies, with a focus on Four Seasons Complete Streets, were proposed.

Mr. Schmitz asked if the Transit Circulator Route is an additional route Bis-Man Transit would be adding and populating with two vehicles per hour. Mr. Bittner confirmed this would be an additional route, or possibly a modification to an existing route. The study recognizes this would be something money would need to be set aside for, and community discussion and support would be needed.

Mr. Schwab asked how equity fits into the discussion about Microtransit. Mr. Bittner explained Microtransit can provide improved transportation connections and accessibility. Microtransit is often technology-based but is still more in-tune with the needs of populations who do not have access to other forms of transportation.

Mr. Schmitz noted the Bismarck City Commission will want details about the transit route recommendations. There is a group he is part of that will be studying transit within the City of Bismarck, and possibly more broadly.

Mr. Froelich asked about the 242 bicycle/pedestrian crashes that took place from 2018-2022. He asked where these numbers are taken from, and Mr. Bittner confirmed from Bismarck and Mandan combined. Mr. Froelich asked if this study took a deep dive into these numbers and the causes of each incident. Mr. Bittner explained the incident locations and causes vary widely. Mr. Froelich said the crash number may be a little misleading, and Ms. Berglund mentioned it is taken from a four-year period and only

goes up to 2022. Mr. Froelich said he would want to take a deeper dive into the causes of these safety incidents before recommending policies or spending money based on the data. He certainly wants to prevent crashes but wants to know more details.

Ms. Riepl said the safety numbers are raw data collected to inform the consultant about potential hotspots in the Bismarck-Mandan area. It was beyond the scope of this study to take a deep dive into causation. She would recommend taking a deeper dive into the numbers if a jurisdiction looks at pursuing a policy change based on this study. Mr. Bittner added that they used the data to identify specific areas of concern, and in those areas they did take a deeper dive into the data and it helped educate some of the solutions they proposed. Mr. Froelich thanked Mr. Bittner for this clarification.

Ms. Riepl said TAC recommended approval of the study as presented, contingent on approval by the Bismarck City Commission this evening. The Mandan City Commission approved the plan on December 3.

MOTION: Mr. Froelich made a motion to approve the Safe Routes to Services Study, as presented, contingent on Bismarck City Commission approval. Ms. Berglund seconded the motion and with James Froelich, Keli Berglund, and Chair Schmitz voting in favor, and Steve Schwab voting against, the motion was approved.

ARRIVE 2050 METROPOLITAN TRANSPORTATION PLAN (MTP)

Mr. Carbee went through some slides providing a high-level overview of the MTP. He noted the document has been approved by all ten relevant jurisdictional boards. There was some good discussion at these approvals. There are eleven chapters in the MTP. The MTP is one of the MPO's core, federally required products. Updates are required every five years. It should align with Federal Metropolitan Transportation requirements and NDDOT's Long-Range Planning. It also seeks to set performance measures and targets for transportation in the MPO area (the Arrive 2050 sets eight goals), and to provide project lists that align with the regional vision. HDR conducted extensive public engagement (in-person and online) for the study and worked extensively with jurisdictional staff. The MTP provides demographics and existing conditions for Bismarck-Mandan, and looks at transportation safety, trends, and congestion (HDR is projecting between 30% and 40% growth in population and households through 2050). The Forecast portion of the MTP projected future growth for the region. The MTP provides a strategies toolbox and a range of potential projects for the network. HDR assessed available transportation funding. It is currently assumed that inflation will outmatch growth in revenues. The MTP includes a Fiscally Constrained Plan, which provides short-term, mid-term, and long-term transportation projects for the MPO area. Finally, the MTP includes a chapter demonstrating compliance with Federal regulations.

Ms. Berglund noted Lincoln is not usually highlighted in these kinds of presentations. They are a small but growing community, and she would appreciate in the future that they be highlighted more in these kinds of projects. Mr. Froelich agreed with this. He also asked if Mr. Carbee has any recommendations for handling the gap between assumed growth in transportation revenues and project cost inflation. Mr. Carbee said their projections are conservative. He mentioned opportunities for discretionary grants. The MTP is required to have a Fiscally Constrained Plan, which cannot cite funding

sources that are unreliable, but there are additional funding opportunities available and the MTP does include projects that could be eligible for these funds. Having potential projects in the MTP better positions the community to pursue them in the future.

MOTION: Mr. Froelich made a motion to approve the Arrive 2050 MTP as presented. Mr. Schmitz seconded the motion and with James Froelich, Keli Berglund, and Chair Schmitz voting in favor, and Steve Schwab voting against, the motion was approved.

2024 PAVEMENT CONDITIONS COLLECTION & ANALYSIS

Mr. Keifer presented the final report for QES. He noted there are still a few roadways being investigated, so this report will be updated based on this effort. In the meantime, he shared a presentation about the report. The project surveyed the pavement conditions on approximately 225 centerline miles of collectors and arterials in the MPO area, collecting both Pavement Condition Index (PCI) values and International Roughness Index (IRI) values. As part of the project QES updated the pavement management system (PAVER) for the MPO and linked the data in this system to GIS.

As part of the project, QES updated the inventory of the MPO area's functionally classified roadways. They performed the collection with a roadway data collection system (through Roadway Asset Services), and coordinated a media event with the MPO in October so local media could film the collection vehicle. The vehicle can collect 3-D pavement imagery to help evaluate roadway conditions. This is a significant advance in technology. QES looked at PCI scores for each of the MPO's jurisdictions. 0-55 indicates unsatisfactory pavement, 56-70 indicates degraded pavement, and above 70 indicates adequate pavement. He noted that all the MPO's jurisdictions have an overall PCI score of 70 or above, which is good. It is cheaper over the long-term to maintain a roadway in good condition. QES generated a PCI map based on their data collection. There are some roadways in unsatisfactory condition, but some of these are being evaluated based on feedback received from the City of Bismarck.

As part of the analysis for this project, they evaluated maintenance activities for the region and projected potential conditions and costs for maintaining the various roadways over the next seven years. Overall, the MPO area received an average PCI score of 72.5, indicating that the MPO functionally classified pavements are in an overall adequate condition. QES recommends continuing to implement pavement preservation treatments, using Structural Testing to determine the root causes of pavement deterioration (when looking at major rehabilitation or design projects), and continuing to pursue routine pavement condition monitoring and updates to the PAVER database.

Ms. Berglund said the City of Lincoln is looking to use Mastic to do some rehab on inner-city streets. She asked if Mr. Keifer would advise them to also do some Structural Testing. Mr. Keifer said he would recommend additional testing to determine if the application of Mastic on the roadway would have the desired positive effect. He indicated he would pursue additional conversations with Ms. Berglund on this off-line.

Ms. Riepl said Mr. Keifer was unfortunately not able to get online for TAC yesterday. There were some questions from the City of Bismarck on some of the analysis, and so TAC recommended tabling this item until January to allow these questions to be resolved before final approval.

MOTION: Ms. Berglund made a motion to continue this item until January. Mr. Froelich seconded the motion and with James Froelich, Steve Schwab, Keli Berglund, and Chair Schmitz voting in favor, the motion was approved.

SFY2026 BIS-MAN TRANSIT 5339 & 5310 GRANT APPLICATIONS

Ms. Jacobsen presented. North Dakota Department of Transportation (NDDOT) has solicited for its SFY 2026 Section 5339 and Section 5310 Grant Programs. Section 5339 is a Bus and Bus Facilities Grant Program, while Section 5310 is the Enhanced Mobility of Seniors and Individuals with Disabilities Program. Bis-Man Transit is requesting approval to submit grant applications for both programs.

Transit's 5339 application is for one fixed-route bus, and extra funds needed to complete the purchase of an additional fixed-route bus partially funded by an existing grant. They are also seeking funding for a power floor scrubber and eight fat-tire bike racks. If awarded, the federal share would be \$755,050, while Transit would provide a local share of \$135,950.

Transit's 5310 application would cover costs for Transit's After-hours service, Sunday service, Holiday service, Early-morning service, and salary for their existing mobility manager position. The application also includes requests to purchase four new cutaway buses to replace existing paratransit vehicles that have exceeded their Federal Transit Administration (FTA) defined useful life. The total federal share provided, if NDDOT approves all projects in the application, would be \$860,504, and Transit would provide a local share of \$333,236. TAC recommended approval of these applications, and MPO staff is requesting approval of both applications, contingent on Bismarck City Commission approval at their December 17 meeting.

MOTION: Mr. Froelich made a motion to approve the SFY26 5339 & 5310 Applications as presented, contingent on Bismarck City Commission approval. Ms. Berglund seconded the motion and with James Froelich, Steve Schwab, Keli Berglund, and Chair Schmitz voting in favor, the motion was approved.

FY 2029 URBAN REGIONAL PROJECTS

Ms. Riepl presented. Five applications were submitted to the MPO for this solicitation, all by the City of Bismarck. On December 3, the Urban Regional Prioritization Committee (consisting of Dean Schloss, District NDDOT, Gabe Schell, City of Bismarck, Jarek Wigness, City of Mandan, and Ms. Riepl) met to discuss and prioritize the projects. Engineer Schell provided his priorities to the committee, based on his expertise and perception of needs, and the Prioritization Committee voted to accept his recommendations. This prioritization is shown in Exhibit K. The Exhibit K project summary also shows the scores MPO staff gave each project based on the goals and objectives of the MTP. The scores were provided for discussion but did not impact the prioritization. NDDOT did not express concerns about the Prioritization Committee's recommended prioritization, and TAC recommended support. MPO staff also supports the committee's recommendation.

MOTION: Ms. Berglund made a motion to approve the FY 2029 Urban Regional Projects, prioritized as presented. Mr. Froelich seconded the motion and with

James Froelich, Steve Schwab, Keli Berglund, and Chair Schmitz voting in favor, the motion was approved.

FY 2029 URBAN ROADS PROJECT

Ms. Riepl presented. The MPO received one application for the Urban Roads Program this year from the City of Mandan for the reconstruction of 8th Avenue NW (from 24th Street to 27th Street) and 27th Street NW (from 8th Avenue NW to Highway 1806). The MPO and its jurisdictions met with NDDOT representatives to discuss the Urban Roads Program and the available funding for FY 2029. Increased traffic volumes and the new Mandan High School have made the 8th Avenue project a priority for the City of Mandan. They are proposing to swap this project for an Old Red Trail Urban Roads project already programmed under FY 2027. The Old Red Trail reconstruction project would then be moved into FY 2029. Based on discussion with NDDOT and the consensus reached among the MPO's jurisdictions, MPO staff recommends approval of Mandan's request to move the 8th Avenue project into FY 2027 and remove the Old Red Trail project to be considered for funding in FY 2029. The 8th Avenue project would still receive the \$4 million in federal funding scheduled for FY 2027, requiring Mandan to provide slightly more in local share. Mandan previously pursued the 8th Avenue project for FY 2028 but there was not enough funding available in this fiscal year. TAC recommended approval of Mandan's requested application and project swap.

MOTION: Mr. Froelich made a motion to approve the FY 2029 Urban Roads Project as presented. Ms. Berglund seconded the motion and with James Froelich, Steve Schwab, Keli Berglund, and Chair Schmitz voting in favor, the motion was approved.

Note: Ms. Berglund departed the meeting after this item.

FY 2025 URBAN RAIL/HIGHWAY CROSSING SAFETY PROGRAM PROJECTS

Mr. Larson presented. Exhibit S contains a summary of the 2025 Urban Rail/Highway Crossing Safety projects. The MPO received two projects from the City of Bismarck. MPO staff determined these projects are consistent with the MTP but does not have a list of MTP objectives for scoring Urban Rail projects. NDDOT's solicitation for Urban Rail is less formal than most of their other grant programs and does not require an application form. MPO staff has not historically recommended prioritizing Urban Rail projects when forwarding to NDDOT. Urban Rail projects awarded funding through FY 2026 will be funded 100% federally.

The first project is on the 26th Street Railroad Crossing between Main and Bowen Avenues. The project would involve the installation of additional panels on the west side of the railroad crossing to function as a sidewalk for pedestrians and complete the recent pedestrian improvements made in the project area. The second project is at the 24th Street Railroad Crossing between Main Avenue and Front Avenue, for the replacement or removal of the southern two railroad crossings. Any crossing not in use will be removed, and any crossing still being used will be replaced. TAC recommended approval of both applications to forward to NDDOT, unprioritized.

MOTION: Mr. Froelich made a motion to approve the FY 2025 Urban Rail Projects as presented, unprioritized. Mr. Schwab seconded the motion and with James Froelich, Steve Schwab, and Chair Schmitz voting in favor, the motion was approved.

2025 UNIFIED PLANNING WORK PROGRAM (UPWP) CONTRACT

Ms. Riepl presented. Exhibit V shows the standard annual contract (with no one-time changes) between NDDOT and the MPO. It is connected to the MPO's 2025 UPWP and to the MPO's share of the 2025 Consolidated Planning Grant (CPG). The contracting parties are now listed as NDDOT and the City of Bismarck, on behalf of the MPO. This change was made because the MPO's funding is first provided by the City of Bismarck and is then reimbursed back to the City by NDDOT using CPG funds. The 2025 UPWP Contract runs from January 1 through December 31 of 2025, and the contracted amount is for a maximum of \$684,174 in CPG funding to fund the federal share of MPO's 2025 UPWP. The contract has been reviewed by the City of Bismarck and will be brought to the Bismarck City Commission on December 17. TAC recommended approval of the contract as presented.

MOTION: Mr. Froelich made a motion to approve the 2025 UPWP Contract as presented, contingent on Bismarck City Commission approval. Mr. Schmitz seconded the motion and with James Froelich, Steve Schwab, and Chair Schmitz voting in favor, the motion was approved.

2025 MONITORING REPORT UPDATE

Mr. Larson presented. The MPO solicited six consultants for its 2025 Monitoring Report Update and received two proposals. MPO staff scored these proposals and has selected HDR to perform the update. Mr. Larson is in the process of contract negotiations, and will start the project early next year, pending the finalization of the UPWP contract.

2025 MEETING CALENDAR

Mr. Larson presented on Exhibit W, the 2025 calendar of TAC and Policy Board meetings. TAC and Policy Board will be moving to the Tom Baker Room in Bismarck January through June and will return to Mandan next July.

ADJOURNMENT

There being no further business, Chair Schmitz adjourned at 2:50 p.m. The next scheduled meeting will take place January 21, 2025, at 1:30 p.m. in the Tom Baker Meeting Room the City/County Building, 221 N 5th St, Bismarck.

Respectfully submitted,

APPROVED:

Stephen Larson
Recording Secretary

MPO Policy Board Chair

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Bismarck-Mandan MPO

TIP 2025-28 Amendment

Project Year(s) 2025

Entity	Project	Federal	State	Local	Total	Federal Funding Source
NDDOT	25.6.23	\$2,790,000	\$310,000	\$0	\$3,100,000	IM

Project Description:

This amendment adds a new project for a chip seal coat on I-94 from the ND 25 junction to 3 miles east of the US 83 junction. The PCN is 24541.

Consistency with the
Bismarck-Mandan MPO
Metropolitan
Transportation Plan:

This project is consistent with the Arrive 2045 MTP, specifically with goal 2A.

Amendment Approved on _____ by the Bismarck-Mandan MPO Policy Board

Bismarck-Mandan MPO Policy Board Chair

Bismarck-Mandan MPO

TIP 2025-28 Amendment

Project Year(s) 2025

Entity	Project	Federal	State	Local	Total	Federal Funding Source
NDDOT	25.6.24	\$180,000	\$20,000	\$0	\$200,000	IM

Project Description:

This amendment adds a new project for a chip seal coat on I-194 from the I-94 junction to Bismarck Expressway. The PCN is 24542.

Consistency with the
Bismarck-Mandan MPO
Metropolitan
Transportation Plan:

This project is consistent with the Arrive 2045 MTP, specifically with goal 2A.

Amendment Approved on _____ by the Bismarck-Mandan MPO Policy Board

Bismarck-Mandan MPO Policy Board Chair

Bismarck-Mandan MPO

TIP 2025-28 Amendment

Project Year(s) 2025

Entity	Project	Federal	State	Local	Total	Federal Funding Source
NDDOT	25.6.25	\$161,860	\$18,140	\$20,000 (Bismarck/Mandan)	\$200,000	NHU

Project Description:

This amendment adds a new project for a chip seal coat on the Memorial Highway/Expressway Bridge. The PCN is 24543.

Consistency with the
Bismarck-Mandan MPO
Metropolitan
Transportation Plan:

This project is consistent with the Arrive 2045 MTP, specifically with goal 2A.

Amendment Approved on _____ by the Bismarck-Mandan MPO Policy Board

Bismarck-Mandan MPO Policy Board Chair

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2024 Pavement Conditions and Analysis Report

Final Report

Prepared for:
Bismarck-Mandan Metropolitan Planning Organization

Prepared by:
Quality Engineering Solutions, Inc.
180 N. Franklin Street, Suite G
PO Box 891
Cochran, PA 16314

January 10, 2025



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Bismarck-Mandan MPO

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1 EXECUTIVE SUMMARY

1.1 Pavement Data Collection

In August of 2024, the Bismarck-Mandan Metropolitan Planning Organization (MPO) retained the services of Quality Engineering Solutions, Inc. (QES) to perform a pavement condition assessment of the functionally classified roadways within the MPO's jurisdiction. This project includes the Cities of Bismarck, Mandan, Lincoln and the Counties of Burleigh and Morton. The results of the pavement condition assessment will assist the MPO's five (5) member jurisdictions in planning future pavement maintenance and rehabilitation (M&R) projects. To achieve this goal, QES assessed the condition of approximately 243.4 centerline miles of functionally classified roadways, entered the collected condition data into a Pavement Management System (PMS), and evaluated the pavement maintenance and repair (M&R) needs for the jurisdictions.

For this project, QES collaborated with Roadway Asset Services, LLC (RAS) to conduct the pavement data collection. In the fall of 2024, RAS utilized their cutting-edge 3D Pavement Condition Survey Systems, known as Roadway Asset Collection (RAC) vehicles (shown in Figure 1), to automatically collect pavement condition data. These advanced RAC vehicles captured continuous, high-resolution data on pavement cracking, rutting, and roughness across the roadways. The collected data was subsequently processed and entered into the PAVER Pavement Management System (PAVER), where baseline pavement condition scores were calculated for each roadway. The pavement condition scores were then used to develop network-level M&R recommendations for the jurisdictions' consideration.



Figure 1. RAS Pavement Conditions Data Collection Systems

1.2 The PAVER Pavement Management System

PAVER uses Pavement Condition Index (PCI) scores to determine the most cost-effective maintenance and rehabilitation (M&R) strategies. It prioritizes preventive measures such as crack sealing, slurry sealing, and localized patching over expensive options like resurfacing or reconstruction. The system also maintains detailed records of pavement inventory, historical M&R activities, and unit cost data. This extensive dataset allows PAVER to forecast future pavement conditions, analyze network-wide deterioration trends, and define long-term M&R needs. Additionally, it enables jurisdictions to evaluate whether their current M&R practices are delivering the desired performance outcomes.

1.3 Project Scope

Bismarck-Mandan MPO

This project involved a network-level pavement condition survey for the functionally classified roadways within the MPO's five member jurisdictions. The collected data was integrated into the PAVER, specifically developed for the roadways covered by the project. Using the pavement condition data and PAVER's inventory, network-level M&R needs were identified and prioritized to support jurisdictions' strategic decision-making.

1.4 Results

Pavement Condition Index (PCI) values were determined for each roadway. These values provide an indication of both the structural integrity and surface operational condition of a pavement. PCI values range from 0 (a failed pavement) to 100 (a pavement in excellent condition). Table 1 shows the MPO's pavement condition categories, which are based on ranges of PCI values. For each category, typical pavement distresses and M&R recommendations are provided.

Table 1. MPO's pavement condition categories.

Category	Typical Distresses and Typical Level of M&R Needed	PCI Range
Adequate	More extensive longitudinal and transverse cracking and weathering of surface Preventive maintenance: <i>Crack sealing and surface treatments</i>	71-100
Degraded	Extensive longitudinal and transverse cracking, early-stage alligator (fatigue) cracking, early-stage rutting, and weathering of surface Global preventive maintenance and localized repairs: <i>Localized surface and/or full-depth patching, surface treatments, and thin overlays</i>	56-70
Unsatisfactory	More extensive and more severe longitudinal and transverse cracking, alligator (fatigue) cracking, rutting, weathering of surface, potholes Major rehabilitation: <i>Full-depth patching, mill and overlays, traditional overlays, and reconstruction</i>	0-55

At the time of inspection, the functionally classified pavements were found to have an average PCI of 84, indicating that the roadways are in overall "adequate" condition.

IRI values measure the roughness of a roadway:

- IRI values less than 200 inches/mile indicate "smooth" pavement.
- IRI values between 200 and 400 inches/mile indicate a "marginally rough" pavement.
- IRI values greater than 400 inches/mile indicate "rough" pavement.

The roadways were found to have an average IRI value of 181 inches/mile, which indicates overall "smooth" pavement.

Table 2 shows average PCI and IRI values for each jurisdiction. Pavement condition maps are also presented in Appendix A.

Table 2. Pavement conditions by jurisdiction.

Jurisdiction	Centerline Miles	PCI	PCI Category	IRI	IRI Category
City of Bismarck	137	86	Adequate	187	Smooth
City of Lincoln	1.4	90	Adequate	128	Smooth
City of Mandan	45.9	76	Adequate	237	Marginally Rough
Burleigh County	43.4	83	Adequate	123	Smooth
Morton County	15.7	84	Adequate	101	Smooth
Total	243.4	84	Adequate	181	Smooth

Bismarck-Mandan MPO

Pavement deterioration, reflected in PCI values, generally falls into three categories: vehicle load-related, climate or durability-related, and issues stemming from construction defects or material problems. The inspection revealed that the observed deterioration resulted from a combination of vehicle load and climate-related factors. Vehicle load-related distresses, such as alligator cracking and rutting, were prominent across many roadways and had the greatest impact on lowering PCI scores. Climate-related issues, including block cracking and weathering, were also evident and contributed significantly to the overall pavement condition.

1.5 Recommendations

To maximize the return on investment from this project, it is recommended that jurisdictions fully implement the PAVER system if they have not already done so. This will enable them to better identify roadways that would benefit from pavement preservation techniques, track pavement performance and M&R expenditures, and assess the effectiveness of maintenance activities to determine when resurfacing is no longer cost-effective and reconstruction is necessary. Additionally, the system will facilitate forecasting M&R needs and understanding the impact of funding levels on pavement conditions. With proper use, PAVER will become a reliable repository of accurate, up-to-date data and the primary tool for more proactive and cost-efficient M&R planning.

2 INTRODUCTION

This section of the report builds upon the Executive Summary by offering a detailed overview of the project's goals and objectives. It includes a conceptual introduction to pavement management and outlines the benefits and costs associated with conducting pavement condition surveys and implementing a PMS. Detailed discussions on the pavement condition survey and the implementation of the PAVER are presented in Sections 4, 5, and 6.

2.1 Background, Scope, and Objectives

In August 2024, the Bismarck-Mandan Metropolitan Planning Organization (MPO) retained the services of QES to conduct pavement management analyses on functionally classified roadways within its jurisdiction. The project's primary goals are to perform a network-level pavement condition survey, implement or update the PAVER, and evaluate network-level pavement M&R needs. This project aims to provide the MPO and its member jurisdictions with a comprehensive understanding of current roadway conditions, along with strategic recommendations for future M&R activities. Looking ahead, the PAVER system—if fully implemented by the jurisdictions—could function as a centralized repository for pavement condition data, historical M&R records, and insights into pavement condition trends over time.

2.2 Project Tasks

To achieve the objectives of this project, QES undertook several key tasks, which are detailed in Sections 4, 5, and 6 of this report. First, QES implemented/updated the PAVER of the participating jurisdictions. QES developed the PAVER inventory database and worked with the jurisdictions to update the PAVER database with the recent M&R projects and unit costs. This step established the foundational database for the analysis. Next, QES subcontracted RAS to conduct a network-level pavement condition survey by using the Laser Crack Measurements System (LCMS-2), which is the most advanced pavement imaging and profiling technology used across the United States. This survey was completed in the fall of 2024, and the collected data were then analyzed using a hybrid methodology that incorporates both automated crack detection and classification along with manual quality control providing comprehensive data on the condition of the roadway network. Finally, QES analyzed the collected pavement condition data using PAVER to determine the network-level M&R funding needs for the jurisdictions' functionally classified roadways. These analyses form the basis for informed decision-making on future maintenance and repair investments.

2.3 Conceptual Overview of Pavement Management

A PMS provides municipal agencies with a structured approach to efficiently manage their pavement networks, including roads, parking lots, and alleys. Defined by the American Public Works Association, it involves systematically collecting, storing, and analyzing data to maximize the utility of limited maintenance and construction budgets.

Central to this system is the Pavement Condition Index (PCI), an industry-standard method outlined in ASTM D6433. PCI uses field observations and measurements to assign a numerical value (0–100) to a pavement's condition, with 0 indicating failure and 100 representing excellent condition. PCI values guide M&R decisions, helping to prioritize improvements and optimize resource allocation.

Maintaining pavements above a "Critical PCI" is key to cost-effective management. Preventive maintenance can extend pavement life when conditions are good, but once a pavement deteriorates below its Critical PCI, preventive measures become less viable, and more expensive rehabilitation or reconstruction is often required. As shown in Figure 2, pavement management aims to keep pavements in good condition, minimizing costs and the need for extensive repairs.

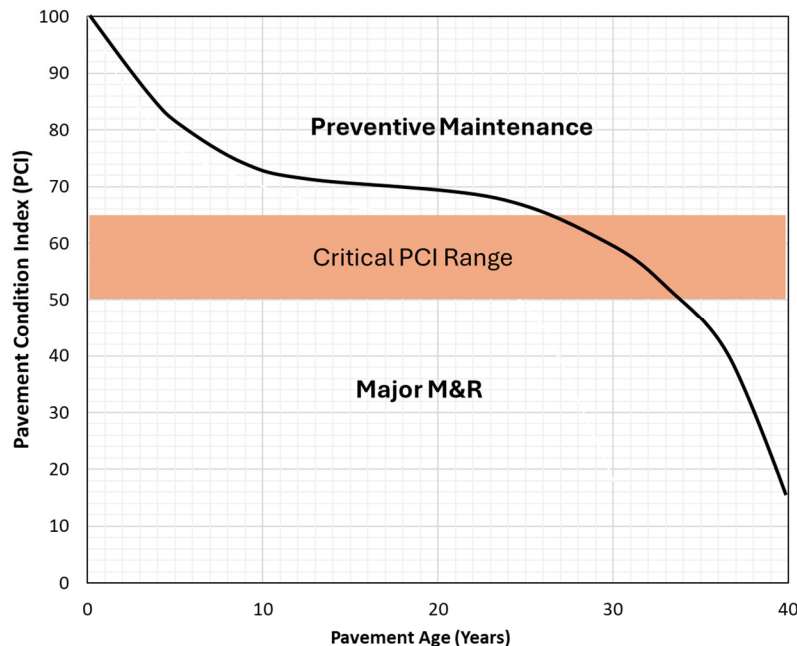


Figure 2. Example of the correct timing of preventive and major M&R relative to the Critical PCI.

Critical PCI value is established based on ongoing pavement condition measurements and the specific M&R policies of an agency. Typically ranging between 50 and 65, the Critical PCI marks the point at which pavement deterioration accelerates, necessitating more costly M&R. Agencies may adjust Critical PCI values depending on their priorities; for example, arterial roadways, which experience heavier traffic and higher speeds, often have higher Critical PCI values than local roads to ensure they are maintained to a higher standard. For the jurisdictions in this project, a Critical PCI value of 65 was applied to asphalt roadways and 75 to concrete roadways.

2.4 Benefits and Costs of Implementing a PMS

A PMS offers centralized storage for pavement condition and inventory data, including construction, maintenance, and rehabilitation records. They provide decision-making tools to evaluate M&R alternatives, assess the impact of different funding levels on pavement conditions, and improve scheduling and coordination of M&R and infrastructure projects. These systems also include analysis tools to assess the effectiveness of past rehabilitation methods and reporting tools to simplify complex data for justifying funding needs to decision-makers.

The benefits of such systems increase over time as more data is collected, but there are ongoing costs associated with maintaining them. These costs include data collection and routine updates to the pavement inventory, regular pavement condition surveys (typically every two to three years, depending on the roadway type), annual evaluations of pavement performance, software acquisition and maintenance, and staff training.

Implementing a PMS provides the additional advantage of helping agencies identify pavements suitable for preventive maintenance. Applying preventive maintenance early in a pavement's life, before significant deterioration occurs, has proven to be a highly cost-effective strategy for extending its service life.

The following preventive maintenance treatments have proven effective when applied at the appropriate time during a pavement's service life: crack sealing, crack filling, and joint sealing for both flexible and rigid pavements; patching and edge repairs; surface treatments such as chip seals, fog seals, and slurry seals;

micro-surfacing; and thin overlays designed for functional or maintenance purposes.

Preventive maintenance strategies should be applied to pavements that are in relatively good condition, and the activities should be planned and applied systematically following either the resurfacing or reconstruction of a pavement. The following FHWA website provides additional information for pavement preservation: <https://www.fhwa.dot.gov/pavement/preservation/>.

2.5 Summary

This section offered an overview of the creation and implementation of the PAVER for the functionally classified roadways within the participating jurisdictions. It provided a conceptual introduction to pavement management, highlighting the benefits of implementing such a system, the anticipated costs of maintaining it, and its additional functionality in helping jurisdictions objectively optimize the allocation of M&R funding. Detailed discussions of the PAVER system's implementation are presented in Sections 3, 4, 5 and 6.

3 PAVEMENT MANAGEMENT SYSTEM IMPLEMENTATION

3.1 Introduction

This section provides an overview of PAVER, a brief description of the modules available to the jurisdictions in PAVER, and insight into the PAVER database development.

3.2 Objective

The objective of this task was to update the PAVER for the jurisdictions' functionally classified roadway pavements. PAVER was initially implemented for MPO's functionally classified roads in 2020 by another consultant. QES completed the PMS update by collecting current pavement condition data, importing the data into PAVER, customizing and running the analysis.

3.3 PAVER Overview

The PAVER offers agencies a robust framework for managing their pavement networks by determining the timing, location, and appropriate level of M&R, as well as estimating associated costs. It provides a range of specialized tools, known as "modules," that support jurisdictions in key activities. These include organizing pavement inventory, assessing current conditions, predicting future conditions, analyzing past and projected performance, creating funding- or condition-based M&R scenarios, and planning and prioritizing projects.

The system's modules are specifically designed to address different aspects of pavement management and include:

Inventory: Organizing and maintaining pavement data.

M&R History: Recording past maintenance and repair activities.

Inspection: Documenting current pavement conditions.

Prediction Modeling: Estimating future pavement performance.

Condition Analysis: Evaluating the state of pavements.

M&R Planning: Developing cost-effective maintenance strategies.

Project Planning: Prioritizing and scheduling M&R projects.

Reporting: Presenting data insights into informed decision-making.

By integrating these tools, PAVER equips jurisdictions with a data-driven approach to optimize pavement management and resource allocation.

A brief description of these modules is presented in the following sub-sections.

3.3.1 Inventory and M&R History Modules

The PAVER Inventory and M&R History modules are based on a hierarchical structure composed of networks (groups of roadways managed with one source of funding), branches (specific roadways), and sections. Sections are the smallest area for which conditions are reported and M&R activities recommended. Sections typically conform to existing GIS segmentation and are commonly defined from intersection to intersection by default. Figure 3 shows an example of roadway ranks stored in the PAVER Inventory module.

One network is defined for each jurisdiction and each roadway is a branch. Pavement sections are defined within each branch following the jurisdictions' existing GIS segmentation in the MPO's geodatabase. This structure allows the jurisdictions to easily organize their inventory and historical M&R data and provides a simple and efficient way for rolling-up data to higher levels of the pavement hierarchy.

3.3.2 Inspection Module

PAVER uses the PCI as the primary measure of pavement condition. The Inspection module enables agencies to store raw pavement condition survey data and then calculate PCI values.

3.3.3 Family Modeling Module

The Family Modeling module in PAVER allows users to categorize pavements with similar construction characteristics and exposure to comparable traffic, weather, and other performance-influencing factors into "families." It utilizes historical pavement condition data to create models that forecast future pavement performance. This interactive module requires jurisdictions to update prediction models after each condition survey. If historical pavement data is unavailable, PAVER offers default pavement prediction curves and supports the creation of customized prediction models for specific sites, as shown in Figure 4.

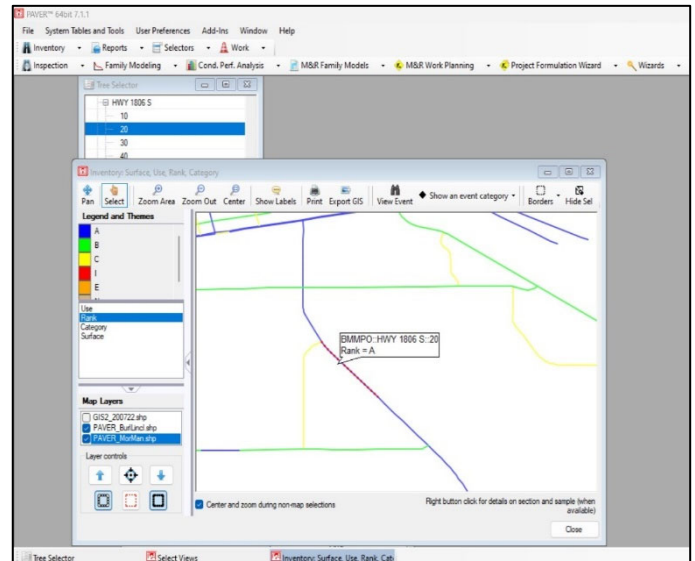


Figure 3. Example roadway ranks stored in inventory module.

3.3.4 Condition Performance Analysis Module

The Condition Performance Analysis module allows jurisdictions to predict the condition of their entire pavement network or any selected portions over time. It reports past conditions by interpolating historical condition data and projects future conditions by applying prediction models developed using the Prediction Modeling module.

3.3.5 M&R work planning module

The M&R Work Planning module evaluates the impact of a specified funding level on pavement conditions and estimates the resulting backlog of major M&R work. This helps jurisdictions identify the funding needed to achieve their specific pavement condition goals. These features enable the development of more efficient M&R programs based on available resources and provide a basis for justifying M&R requirements.

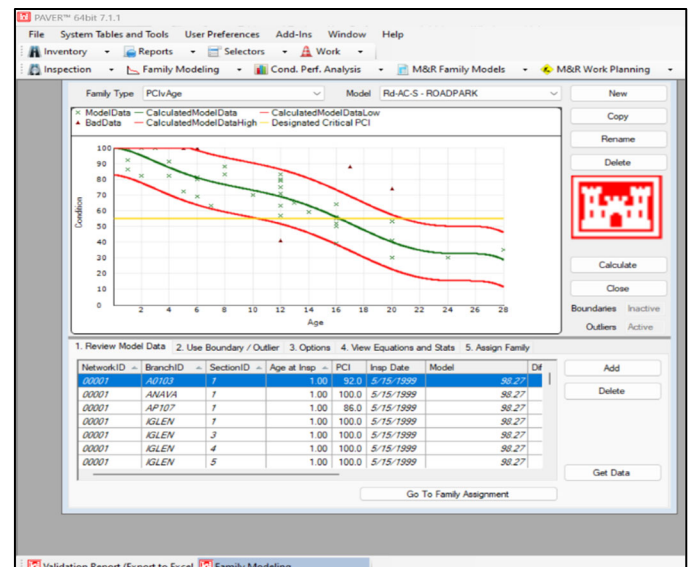


Figure 4. Example of a deterioration curve developed using the family modeling module

3.3.6 Reporting module

Each module of PAVER can produce a variety of reports to support jurisdictions in analyzing, interpreting, and presenting pavement data. In addition to reports specific to each module, PAVER includes several pre-configured "canned" reports, such as:

GIS Reports: Internal and external reporting of inventory and condition data.

Summary Charts: Basic graphs and tables summarizing inventory and inspection data.

Inspection Reports: Overviews of collected pavement condition data.

Work History: Summaries of past maintenance, repair, and rehabilitation activities.

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Branch Listing: Summaries of overall pavement inventory data.

Branch Condition: Summaries of overall pavement condition data.

Section Condition: Summaries of condition data for individual sections.

PAVER also supports on-the-fly “user-defined” reports, allowing users to customize reports to meet specific needs. This feature enables the extraction of any data stored in the system for export to GIS shapefiles, spreadsheets, or text files.

3.3.7 Summary

This section covered the initial task of the project: implementing a pavement management system. It provided an overview of the non-proprietary PAVER, a summary of the modules available for use by jurisdictions, and an explanation of the development of the PAVER database. The databases have been customized to include specific and relevant data for the functionally classified roadway networks within the jurisdictions. When fully implemented, PAVER’s comprehensive analysis and planning tools will empower jurisdictions to manage their roadway pavement networks more efficiently.

4 PAVEMENT INVENTORY

4.1 Introduction

This section provides an overview of the jurisdictions' roadway pavement inventory as recorded in the PAVER. It outlines the data sources utilized to develop the inventory and presents a summary of the collected data.

4.2 Objective

The objective of this task was to update an inventory of the jurisdictions' functionally classified roadway pavements for inclusion in PAVER. The roadway pavement inventory provides the underlying data on which analysis and reporting is performed with PAVER. In addition, the inventory provides the framework in which all routinely collected pavement condition data and historical work data are stored.

4.3 PAVER Inventory Update

The jurisdictions' PAVER inventories were updated using GIS data provided by the MPO. Additional pavement information from aerial imagery and field observations was incorporated into the PAVER database, including details such as pavement surface type and the approximate length and width of each roadway section.

A shapefile generated from the GIS was linked to the PAVER database, allowing jurisdictions to easily navigate roadway data within PAVER and produce various map-based inventory and condition reports.

4.4 Inventory summary

The functionally classified roadway network consists of approximately 243.4 centerline miles of predominantly asphalt-surfaced roadways. Table 3 shows the distribution of the jurisdictions' roadway network in mileage and by pavement surface type.

Table 3. Roadway summary data by jurisdiction and pavement surface type.

Jurisdiction	Centerline Mileage			
	Asphalt	Concrete	Gravel	Total
City of Bismarck	101	36	-	137
City of Lincoln	1.4	-	-	1.4
City of Mandan	34.8	11.1	-	45.9
Burleigh County	42.4	-	1.0	43.4
Morton County	14.7	1.0	-	15.7
Total	194.3	48.6	1.0	243.4

5 PAVEMENT CONDITION INSPECTION

5.1 Introduction

This section covers the second task of the project which is conducting a detailed pavement condition survey of the jurisdictions' functionally classified roadways. The survey involved collecting high-resolution pavement imagery and profile measurements using advanced pavement condition survey equipment. For this purpose, RAS utilized their RAC vehicles equipped with LCMS-2 systems, capable of capturing continuous, detailed 20-foot linear samples with crack measurements at a resolution of 1 millimeter per pixel. Right-of-way images were also captured using a 360-degree high-definition camera system. The high-resolution, geospatially referenced imagery collected by the RAC vehicles met and exceeded the technical requirements for the project. The collected data were analyzed to calculate PCI and IRI values for the surveyed roadways. This section details the pavement condition survey system, the data collection process, the analysis of the collected data, and field observations.

5.2 Objective

The purpose of the pavement condition survey is to evaluate the current structural integrity and surface operational state of the jurisdictions' roadways, offering a detailed snapshot of pavement conditions at the time of data collection.

To maintain and improve roadway performance, jurisdictions are encouraged to conduct pavement condition surveys regularly. Routine surveys can help objectively monitor pavement performance, identify immediate maintenance and repair (M&R) needs, assess the effectiveness of past M&R activities, track pavement deterioration trends, and forecast both short- and long-term M&R requirements.

5.3 Pavement Condition Data Acquisition

RAS deployed a state-of-the-art RAC pavement data collection system to capture high-resolution pavement imagery and surface data necessary to assess the roadway condition. The RAC system is shown in Figure 5.



Figure 5. RAC pavement condition data collection system.

Bismarck-Mandan MPO

The RAC system was deployed to survey all roadways included in the project scope, collecting data on the outermost lanes in both directions. During the survey, the RAC system continuously gathered the following data for each roadway:

- High-resolution 2D and 3D pavement images for identifying pavement distresses and calculating Pavement Condition Index (PCI) values.
- Transverse profiles for measuring rutting.
- Longitudinal profiles for determining International Roughness Index (IRI) values.
- High-resolution forward-facing right-of-way images for manual data review.

The collected data were processed using automated tools, with results verified through manual review to ensure accuracy. The final pavement condition assessments were then entered into the PAVER databases.

5.4 Pavement Condition Index (PCI) method

The pavement condition survey was conducted using the Pavement Condition Index (PCI) method, a standardized approach for evaluating pavement health. The PCI method involves identifying and quantifying pavement distress types, severities, and extents during a detailed field inspection. This data is then analyzed to calculate a PCI value, as shown in Figure 6. The PCI value serves as a reliable indicator of the structural integrity and surface operational performance of a pavement section. The PCI method is widely adopted as the best practice for assessing pavement conditions and supporting data-driven maintenance and repair decisions.

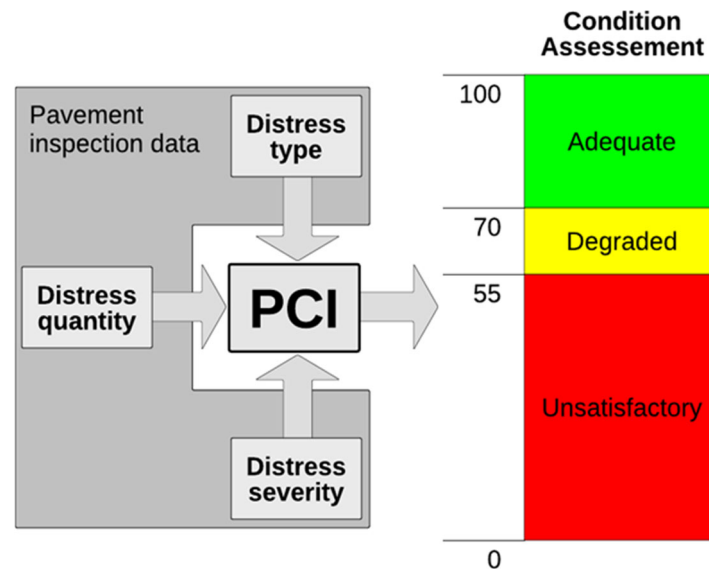


Figure 6. PCI inputs and the MPO's assessment scale

A newly constructed pavement has a PCI of 100. Over time, the pavement deteriorates due to factors such as vehicle loads, environmental conditions, and aging. Common distress types identified and assessed for asphalt and concrete pavements are summarized in Table 4. During inspections, points are deducted from the initial PCI of 100 for each observed distress based on its type, severity, and extent. When multiple types of distress are present, the deduct values are adjusted to avoid disproportionately compounding their impact, ensuring an accurate PCI calculation. For each roadway of jurisdictions, the severity and extent of observed distresses are carefully documented. These recorded data are then processed using the PCI calculation algorithm in PAVER, resulting in a PCI value that quantifies the pavement's condition.

Table 4. Asphalt and concrete pavement distress types.

Asphalt Pavement Distress	Cause	Concrete Pavement Distress	Cause
Block Cracking	Climate/Durability	Blowup/Buckling	Climate/Durability
Joint Reflection Cracking	Climate/Durability	Durability ("D") Cracking	Climate/Durability
Longitudinal and Transverse Cracking	Climate/Durability	Joint Seal Damage	Climate/Durability
Raveling	Climate/Durability	Shrinkage Cracks	Climate/Durability
Weathering	Climate/Durability	Spalling, Corner	Climate/Durability
Alligator Cracking	Load	Spalling, Joint	Climate/Durability
Edge Cracking	Load	Corner Break	Load
Pothole	Load	Divided Slab	Load
Rutting	Load	Linear Cracking	Load
Bleeding	Other	Punchout	Load
Bumps and Sags	Other	Faulting	Other
Corrugation	Other	Lane/Shoulder Drop-Off	Other
Depression	Other	Patching, Large and Utility Cuts	Other
Lane/Shoulder Drop-Off	Other	Patching, Small	Other
Patching and Utility Cut Patching	Other	Polished Aggregate	Other
Polished Aggregate	Other	Popouts	Other
Railroad Crossing	Other	Pumping	Other
Shoving	Other	Railroad Crossing	Other
Slippage Cracking	Other	Scaling, Map Cracking, and Crazeing	Other
Swell	Other		

5.5 Pavement Condition Index (PCI) data interpretation and evaluation

The RAC system captured 2D and 3D images of the roadway surface from which pavement surface distresses are evaluated. The collected images and data are imported into the RAS Artificial Intelligence (AI) enhanced pavement rating tool RoadTRIP™ (Technical Rating Intelligence Program), as shown in Figure 7. The import process creates mappings to the data so that users do not need to keep track of where the data is stored on central data server. At this stage, major data processing tasks also occur, such as generation of right-of-way and pavement image streams, calculation of profile roughness, rutting, detection of cracks and other distresses.

The automated crack analysis in RoadTRIPTM detects cracks that are overlaid on the pavement images and offset to assist with the verification of the detected cracks. During reporting, the distress cracks are defined by road zone and accumulated according to the units defined in the client specification. The severity levels are identified based upon the defined limits (ASTM D6433) and verified for resolution through visual quality control checks of image files. Where density metrics are required, these are determined using the length of the interval being reported and the width of road zones included.

The RoadTRIPTM application was designed around the ASTM D6433 data collection protocols and even contains a PCI calculator that uses distress deduct curves and Q-correction. This PCI is used for Quality Assurance before importing detailed extent/severity distress data into PAVER software.

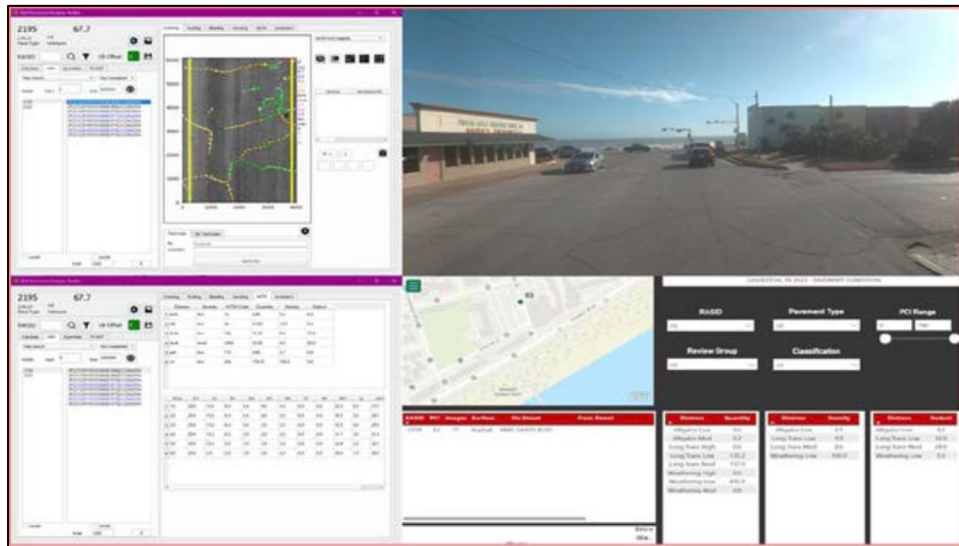


Figure 7. RAS RoadTRIP™ Pavement Evaluation Environment

The QC and QA ratings are the most important steps in the project. RAS uses RoadTRIPTM software for evaluating distresses using both automated algorithms and manual supplemental ratings. All QC/QA are performed by highly trained and experienced engineers in accordance with the principles of the ASTM D6433 standard, using the LCMS pavement images gathered during collection with the distresses superimposed and color-coded (Figure 8). Each detailed 20-foot LCMS sample is geocoded for real world distress location identification. In addition, the 20-foot level distress data is processed at the 2,500 sq.ft. sample size per ASTM D6433 protocols. This results in a localized failure heatmap deliverable of all samples with distress densities that are geotagged and available in the mapping interface.

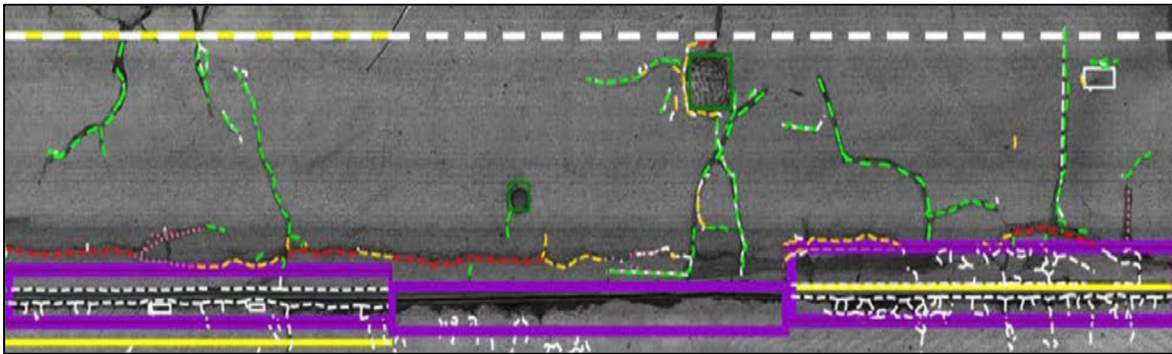


Figure 8. Automated and manual rating for QC/QA of pavements using RoadTRIP™

In addition to capturing 2D and 3D imagery from which pavement surface distresses are evaluated, the RAS system also captures high-resolution longitudinal and transverse profiles of the roadway surface. The longitudinal profile data are analyzed to determine the IRI values, and the transverse profiles are used to measure rutting.

5.6 Existing pavement conditions and field observations

The collected pavement survey data were used to calculate PCI value for each pavement section. Table 5 shows the pavement condition assessment criteria used to analyze the pavement network.

Table 5. City's pavement condition categories.

Category	Typical Distresses and Typical Level of M&R Needed	PCI Range
Adequate	More extensive longitudinal and transverse cracking and weathering of surface Preventive maintenance: <i>Crack sealing and surface treatments</i>	71-100
Degraded	Extensive longitudinal and transverse cracking, early-stage alligator (fatigue) cracking, early-stage rutting, and weathering of surface Global preventive maintenance and localized repairs: <i>Localized surface and/or full-depth patching, surface treatments, and thin overlays</i>	56-70
Unsatisfactory	More extensive and more severe longitudinal and transverse cracking, alligator (fatigue) cracking, rutting, weathering of surface, potholes Major rehabilitation: <i>Full-depth patching, mill and overlays, traditional overlays, and reconstruction</i>	0-55

At the time of inspection, the functionally classified pavements were found to have an average PCI of 84, indicating that the roadways are in overall “adequate” condition. Pavement condition data summarized by jurisdiction is presented in Table 6. Overall average PCI values for each jurisdiction at the time of inspection are shown in Figure 9. The condition distribution of each jurisdictions’ pavements at the time of inspection is shown in Figure 10, and a detailed condition map can be found in Appendix A.

Table 6. Roadway summary condition data by jurisdiction.

Jurisdiction	Centerline Miles	PCI	PCI Category	IRI	IRI Category
City of Bismarck	137	84	Adequate	187	Smooth
City of Lincoln	1.4	90	Adequate	128	Smooth
City of Mandan	45.9	80	Adequate	237	Marginally Rough
Burleigh County	43.4	86	Adequate	123	Smooth
Morton County	15.7	85	Adequate	101	Smooth
Total	243.4	84	Adequate	181	Smooth

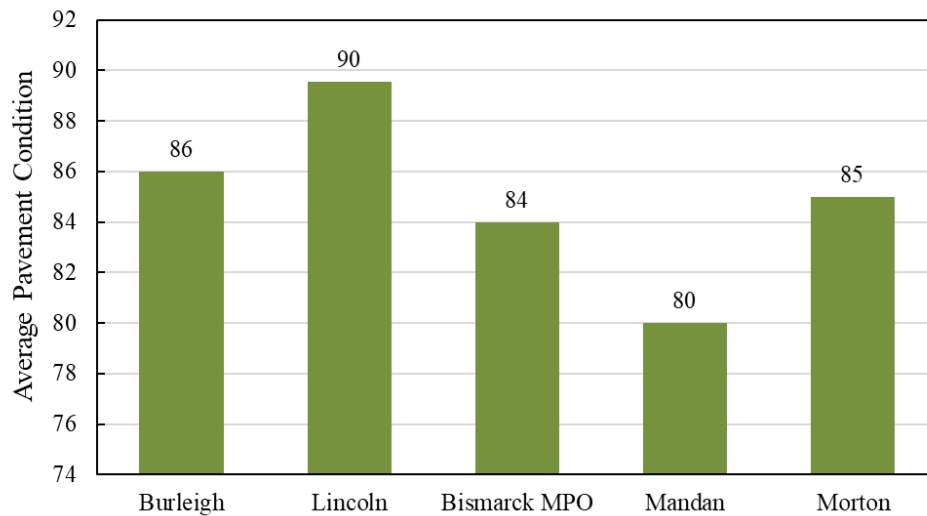


Figure 9. Overall pavement conditions by jurisdiction.

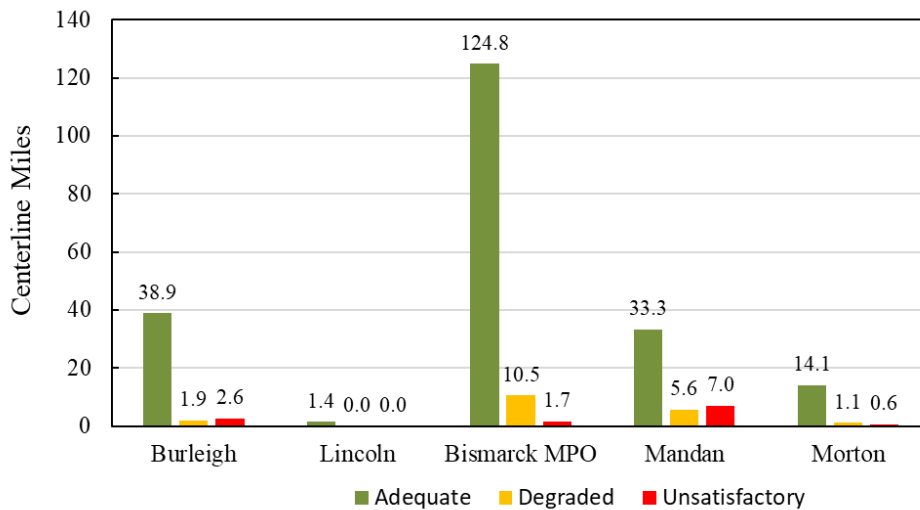


Figure 10. Pavement condition category distributions by jurisdiction.

The causes of pavement deterioration, as quantified by the Pavement Condition Index (PCI), can be broadly categorized into three main areas: vehicle load-related, climate and durability-related, and other factors such as construction defects or material issues. Pavement deterioration and eventual failure is a complex process often driven by the interaction of multiple mechanisms. Across the observed jurisdictions, the primary contributors to pavement deterioration were a combination of load- and climate-related distresses. Vehicle load-related issues, such as alligator cracking and rutting, were particularly prevalent and significantly impacted roadway conditions. Additionally, climate-related distresses, including longitudinal and transverse cracking, were widespread throughout the pavement inventory.

In practice, visually observed pavement distresses collected during network-level condition surveys are used to infer the likely mechanisms contributing to roadway deterioration. However, before developing M&R strategies, it is essential to identify the root causes of deterioration. This can be achieved through a combination of techniques, including traffic load analysis, drainage assessments, structural testing, coring,

and material testing.

For instance, vehicle load-related issues like alligator cracking can be analyzed through load studies and material evaluations. These issues may stem from sustained exposure to loads exceeding the roadway's design capacity or from the pavement simply reaching the end of its design life. On the other hand, climate- or durability-related distresses, such as transverse cracking, often result from freeze-thaw cycles and oxidation or embrittlement of asphalt layers. Distresses attributed to "other" causes, such as construction or material defects, are best diagnosed through coring, boring, and detailed material testing. Understanding these underlying mechanisms is critical for developing targeted and effective repair strategies.

In addition to PCI values, IRI values were determined for each of the roadways. IRI values, reported in inches per mile, describe the amount of roughness in both wheel paths over a given length of pavement. The IRI is a standard measure of roughness used worldwide. The IRI assessment scale is shown in Table 7.

Table 7. IRI assessment criteria

Category	IRI Value
Smooth	0-200
Marginal	201-400
Rough	>401

At the time of inspection, the pavement sections were found to be in overall “smooth” condition, with an average IRI of 181 inches/mile. Detailed condition maps can be found in Appendix A.

5.7 Summary

This section provided an overview of the methodology employed for the 2024 pavement condition survey and summarized its findings. A cutting-edge RAC pavement condition survey system was utilized to capture detailed pavement imagery and profile data across the jurisdictions’ roadways. The collected data were systematically analyzed to calculate PCI and IRI values for each road surveyed. The results indicated that the roadways were generally in "adequate" condition, with an average PCI score of 84. Also, the roadways were found to be in overall “smooth” condition with an average IRI of 181 inches/mile.

6 MAINTENANCE AND REHABILITATION FUNDING ANALYSES

6.1 Introduction

This section focuses on the third task of the project: the analysis of maintenance and rehabilitation (M&R) needs. It presents the results of the analyses conducted for the jurisdictions, outlines the assumptions that informed the analyses, and details the findings. Recommendations based on these analyses are included in this section, with additional details provided in Appendix B.

6.2 Objective

The M&R Planning module in PAVER offers preliminary recommendations regarding the timing, location, and estimated costs of pavement maintenance and rehabilitation (M&R) activities. These recommendations serve as a foundation for jurisdictions to develop comprehensive, programmatic M&R plans. Such plans can be tailored to align with anticipated annual funding levels or to achieve and maintain a desired pavement condition standard.

A seven-year analysis was conducted for the functionally classified roadways within each jurisdiction to

Bismarck-Mandan MPO

estimate the funding levels required to address the major maintenance and rehabilitation (M&R) backlog. The primary objective of this analysis was to identify the roadways that should be prioritized over the next seven years to bring functionally classified roadways to an adequate condition. Additional analyses can also be undertaken to evaluate the effects of anticipated funding levels or to determine the funding required to achieve a desired network-wide average pavement condition.

6.3 Assumptions

The M&R analyses were based on the results of the fall 2024 PCI survey and the pavement inventory. The following assumptions were made in the analysis.

- Critical PCI values (the PCI value below which a pavement is considered a candidate for major M&R) of 65 and 75 were assumed for all asphalt and concrete roadways, respectively. Pavements at or below the Critical PCI during the analysis period triggered major M&R recommendations.
- The M&R unit costs used in these analyses were obtained from the information provided by the City of Bismarck.
- A pavement deterioration rate of approximately 2 points per year was applied to asphalt roadways, corresponding to an estimated pavement life of around 17.5 years between major rehabilitations. For concrete roadways, a deterioration rate of about 1 point per year was used, resulting in an estimated pavement life of roughly 25 years between major rehabilitations. These rates are regularly refined as additional historical work records are incorporated into PAVER and as more PCI inspection data becomes available over time.
- The starting date for the analysis was set as January 1, 2025, with an assumed annual inflation rate of 3% applied over the seven-year period from 2025 to 2031.

Results

The results of the PAVER M&R analysis are summarized in Table 8, which illustrates the estimated seven-year pavement M&R costs required to eliminate major M&R backlog. Additionally, it highlights the projected change in PCI resulting from the total estimated funding by 2031.

Appendix B provides a detailed list of all roadways recommended for major M&R over the next seven years to address each jurisdiction's rehabilitation backlog. The table specifies the roadways identified by PAVER for rehabilitation each year. These recommendations are solely based on the results of the image-based pavement condition survey conducted for this project and do not account for factors such as pavement structural characteristics (e.g., subgrade or base stiffness), specific traffic loadings, drainage issues, or geographic proximity. Therefore, these recommendations should be subject to project-level engineering evaluations before being incorporated into programming.

Table 8. Estimated Seven-Year Pavement M&R Costs to Eliminate Major M&R Backlog

Jurisdiction	1 st Year Funding	Est. Annual Funding for 2 nd to 7 th Year	Est. Total Funding (2025-2031)	2025 PCI	2031 PCI
City of Bismarck	\$8.9M	\$2.1M	\$21.7M	84	82
City of Lincoln	-	-	-	90	78
City of Mandan	9.1M	\$645K	\$13M	80	84
Burleigh County	2.9M	\$541K	\$6.2M	86	80
Morton County	\$762K	\$105K	\$1.4M	85	78

It should be noted that due to the relatively high PCI value recorded in 2025 for most of the jurisdictions, the funding level required to eliminate the backlog results in an overall lower forecasted average PCI value in 2031. Preventive maintenance activities are required to increase the average PCI value. Also, the PCI values for the City of Lincoln network are greater than the critical PCI from 2025 to 2031, so there is no major M&R backlog for the City of Lincoln.

7 SUMMARY AND RECOMMENDATIONS

7.1 Summary

In August 2024, the Bismarck-Mandan MPO engaged QES to conduct a pavement condition assessment for the functionally classified roadways within its jurisdiction and to project network-level maintenance and rehabilitation (M&R) needs for the participating jurisdictions. QES collaborated with RAS for pavement data collection, utilizing RAS's advanced 3D Pavement Condition Survey Systems, known as Roadway Asset Collection (RAC) vehicles, to automatically gather data in the fall of 2024. The collected pavement condition data was analyzed using PAVER, which facilitated network-level evaluations and predictions for future pavement M&R requirements. These analyses specifically estimated the funding required by each jurisdiction to address its backlog of major M&R over a seven-year planning period.

To maximize the return on investment from this project, it is recommended that jurisdictions fully implement PAVER if they have not already done so. This implementation will allow jurisdictions to:

1. Effectively identify roadways that would benefit most from pavement preservation techniques.
2. Monitor pavement performance and track M&R expenditures.
3. Evaluate the effectiveness of M&R activities, such as determining when resurfacing is no longer cost-effective, and reconstruction is necessary.
4. Simplify the forecasting of M&R needs and assess how funding levels affect pavement conditions

QES presents the following broad recommendations based on the initial analysis and PCI data collection for the roadways:

7.2 Recommendations

7.2.1 Implementing Pavement Preservation Treatments

pavement preservation activities like crack sealing, localized patching, and chip sealing offer a cost-effective approach to extending pavement lifespan. Jurisdictions are encouraged to continue integrating these strategies into their M&R plans. Additionally, they should prioritize routine preventive maintenance for roadways that have been recently resurfaced or reconstructed.

7.2.2 Use of Structural Testing to Determine the Root Causes of Pavement Deterioration

As pavements age and undergo multiple resurfacing cycles, the effectiveness of subsequent resurfacing projects diminishes due to ongoing deterioration of the underlying pavement structure, often caused by moisture infiltration, freeze-thaw cycles, and vehicular loading. To address these challenges, jurisdictions should integrate structural testing methods such as Falling Weight Deflectometer (FWD) testing and coring, along with material testing and traffic load analyses, to identify the root causes of pavement deterioration before developing a specific M&R strategy.

While visually observed pavement distresses collected during network-level condition surveys can indicate likely mechanisms of deterioration, a more in-depth investigation is essential. Determining the root cause may involve a combination of traffic load analyses, drainage investigations, structural testing, coring, and material testing.

By leveraging these techniques alongside M&R history and performance tracking of resurfaced roadways, jurisdictions can pinpoint when reconstruction is more appropriate than resurfacing. This data-driven approach ensures the selection of the most cost-effective and durable M&R strategies, extending the service life of pavement networks while optimizing resource allocation.

7.2.3 Conduct Routine Pavement Condition Monitoring

To enhance pavement management and maximize the benefits of the current condition survey, jurisdictions should implement a regular cycle for PCI surveys. Consistent inspections will allow for improved tracking of pavement deterioration, identification of trends to better predict future conditions, and more strategic application of M&R funding. These inspections will also support the assessment and monitoring of the effectiveness of preservation and major rehabilitation activities.

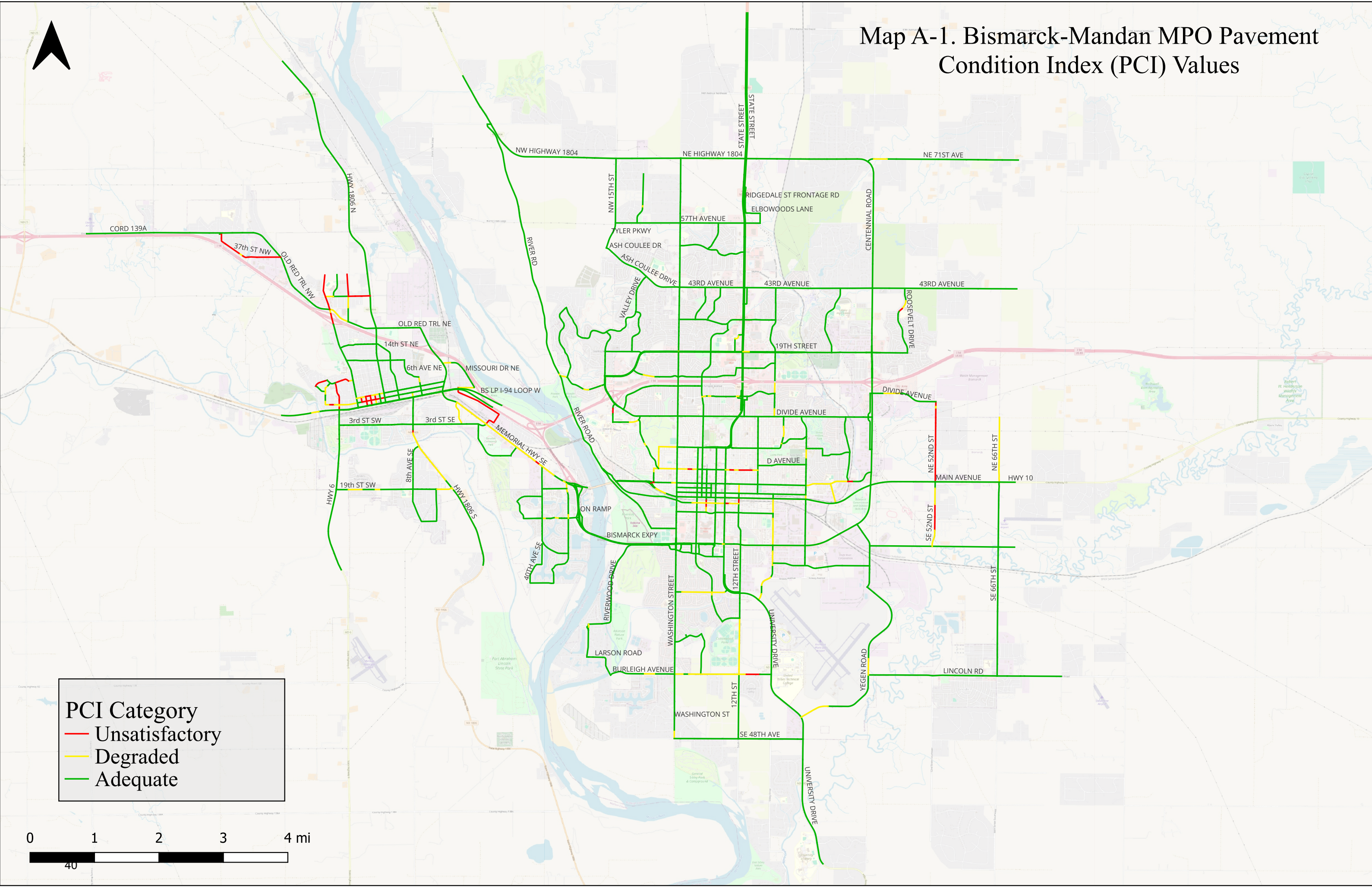
7.2.4 Routine Update of the PAVER Database

To optimize pavement management, it is recommended that jurisdictions routinely update the PAVER with current data. The City of Bismarck's decade of successful PAVER use demonstrates its value in generating meaningful recommendations for maintenance and rehabilitation (M&R) strategies. To fully leverage PAVER, other jurisdictions should consider its implementation and commit to annual updates following the paving season. These updates should capture major M&R activities, routine maintenance efforts, and any changes to the pavement inventory, such as the addition of new roadways, jurisdictional changes, or realignments.

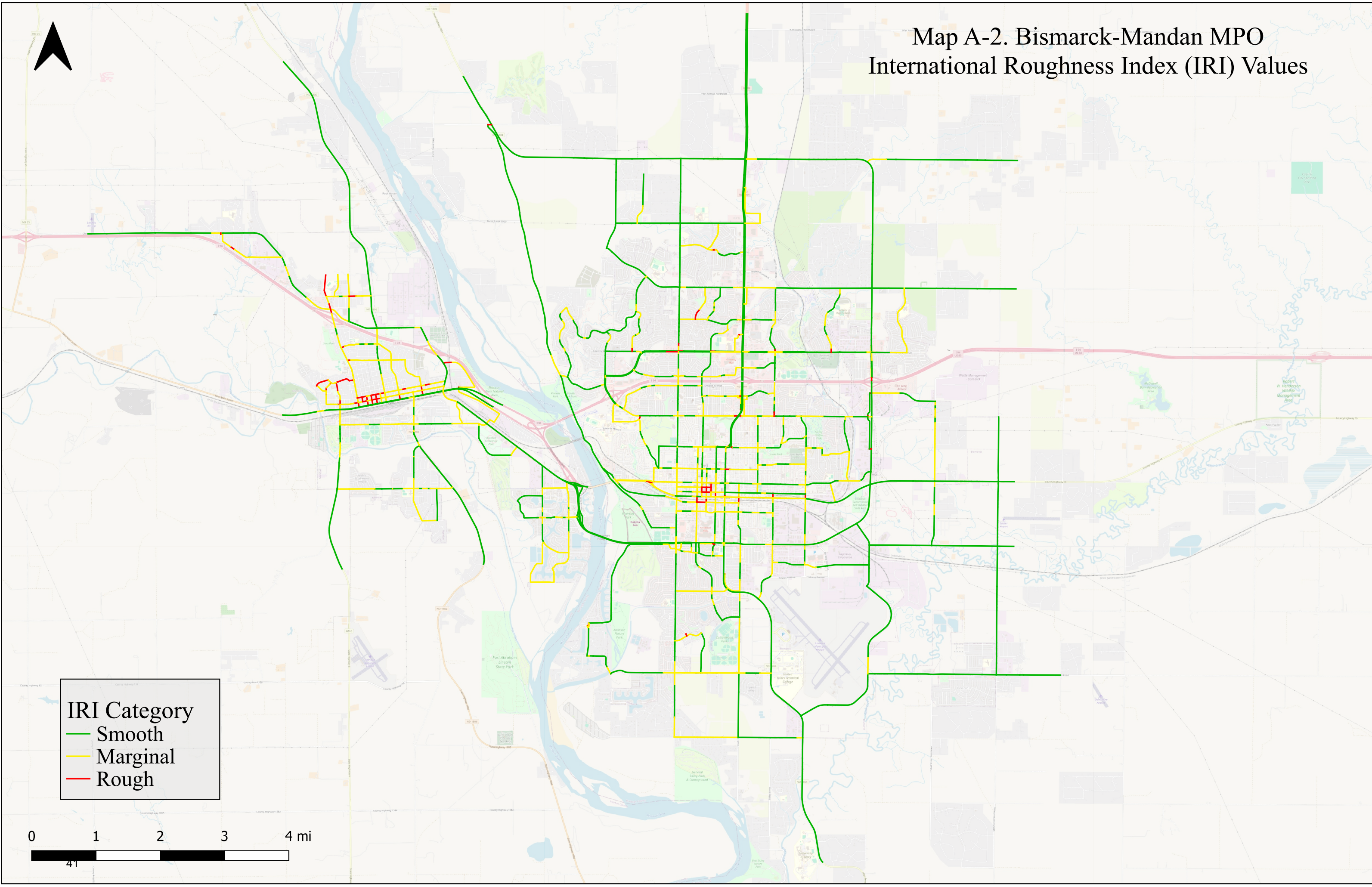
Routine updates ensure that PAVER provides accurate and actionable insights, improving the ability to track pavement deterioration, predict future conditions, and strategically allocate resources for preservation and rehabilitation. This approach supports proactive pavement management, reduces the need for costly emergency repairs, and extends the service life of roadways. With consistent updates, PAVER can become a reliable tool for optimizing pavement performance, prioritizing maintenance needs, and ensuring efficient use of available resources across all jurisdictions.

Appendix A – Pavement Condition Map

Map A-1. Bismarck-Mandan MPO Pavement Condition Index (PCI) Values

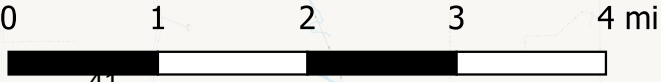


Map A-2. Bismarck-Mandan MPO
International Roughness Index (IRI) Values



IRI Category

- Smooth
- Marginal
- Rough



Appendix B – Network Level Maintenance and Rehabilitation Recommendations

Jurisdiction: City of Bismarck

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
05TH_ST	15	AC	372	51	2025	Rehabilitation	\$101,713
05TH_ST	20	AC	228	56	2025	Rehabilitation	\$57,395
09TH_ST	35	PCC	107	73	2025	Rehabilitation	\$11,277
12TH_ST	100	AC	380	61	2025	Rehabilitation	\$28,861
12TH_ST	4	AC	418	63	2025	Rehabilitation	\$27,145
12TH_ST	85	AC	462	51	2025	Rehabilitation	\$90,346
12TH_ST	95	AC	381	61	2025	Rehabilitation	\$29,265
17TH_ST	25	AC	378	64	2025	Rehabilitation	\$80,319
19TH_ST	135	PCC	379	72	2025	Rehabilitation	\$41,566
43RD_AV	10	AC	955	54	2025	Rehabilitation	\$170,387
43RD_AV	100	AC	1,827	26	2025	Rehabilitation	\$319,213
43RD_AV	105	AC	1,882	26	2025	Rehabilitation	\$328,823
43RD_AV	15	AC	1,790	61	2025	Rehabilitation	\$234,178
43RD_AV	20	AC	1,103	55	2025	Rehabilitation	\$188,349
43RD_AV	25	AC	874	53	2025	Rehabilitation	\$162,431
43RD_AV	5	AC	600	64	2025	Rehabilitation	\$73,942
43RD_AV	50	AC	1,018	51	2025	Rehabilitation	\$175,380
43RD_AV	70	AC	1,387	26	2025	Rehabilitation	\$242,337
43RD_AV	75	AC	1,278	26	2025	Rehabilitation	\$223,292
43RD_AV	80	AC	2,648	26	2025	Rehabilitation	\$462,658
43RD_AV	85	AC	507	26	2025	Rehabilitation	\$88,583
43RD_AV	90	AC	471	26	2025	Rehabilitation	\$82,293
43RD_AV	95	AC	533	26	2025	Rehabilitation	\$93,126
52ND_ST	55	AC	1,577	61	2025	Rehabilitation	\$104,068
52ND_ST	65	AC	5,275	64	2025	Rehabilitation	\$307,160
52ND_ST	70	AC	667	60	2025	Rehabilitation	\$45,638
AIRPO_RD	30	AC	472	63	2025	Rehabilitation	\$96,035
AIRPO_RD	45	AC	481	64	2025	Rehabilitation	\$93,933
AIRPO_RD	75	AC	473	60	2025	Rehabilitation	\$104,216
AIRPO_RD	80	AC	477	59	2025	Rehabilitation	\$108,173
ASH_C_DR	75	AC	2,395	51	2025	Rehabilitation	\$429,615
BELL_ST	15	AC	567	55	2025	Rehabilitation	\$85,169
BISMA_EX	60	PCC	118	64	2025	Rehabilitation	\$27,933
BOULE_AV	105	PCC	366	74	2025	Rehabilitation	\$30,974
BOULE_AV	115	PCC	308	68	2025	Rehabilitation	\$11,595
BOULE_AV	120	PCC	338	72	2025	Rehabilitation	\$10,187
BURLE_AV	65	AC	1,120	65	2025	Rehabilitation	\$81,989
BURLE_AV	70	AC	605	63	2025	Rehabilitation	\$46,201
C_AV	100	AC	380	62	2025	Rehabilitation	\$28,229
C_AV	105	AC	380	52	2025	Rehabilitation	\$51,091
C_AV	110	AC	380	60	2025	Rehabilitation	\$40,348
C_AV	115	AC	369	51	2025	Rehabilitation	\$54,534
C_AV	120	AC	381	36	2025	Rehabilitation	\$123,033

Jurisdiction: City of Bismarck

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
C_AV	125	AC	381	52	2025	Rehabilitation	\$69,815
C_AV	130	AC	380	60	2025	Rehabilitation	\$42,370
C_AV	25	AC	379	64	2025	Rehabilitation	\$36,873
C_AV	30	AC	381	63	2025	Rehabilitation	\$38,430
C_AV	40	AC	380	63	2025	Rehabilitation	\$38,247
C_AV	55	APC	380	62	2025	Rehabilitation	\$31,558
CAPIT_AV	90	AC	208	61	2025	Rehabilitation	\$26,437
CENTU_AV	175	PCC	489	64	2025	Rehabilitation	\$44,083
CENTU_AV	190	PCC	1,101	75	2025	Rehabilitation	\$62,165
CENTU_AV	215	PCC	682	65	2025	Rehabilitation	\$57,693
DIVID_AV	100	AC	343	50	2025	Rehabilitation	\$96,420
DIVID_AV	110	AC	319	53	2025	Rehabilitation	\$78,163
DIVID_AV	115	AC	329	47	2025	Rehabilitation	\$132,623
DIVID_AV	125	AC	865	56	2025	Rehabilitation	\$180,200
DIVID_AV	15	AC	347	51	2025	Rehabilitation	\$93,384
DIVID_AV	20	AC	1,265	48	2025	Rehabilitation	\$456,025
DIVID_AV	25	AC	254	61	2025	Rehabilitation	\$40,063
DIVID_AV	90	AC	166	59	2025	Rehabilitation	\$28,575
DIVID_AV	95	AC	333	52	2025	Rehabilitation	\$85,609
EASTD_DR	10	AC	380	58	2025	Rehabilitation	\$59,049
FRONT_AV	25	AC	761	62	2025	Rehabilitation	\$96,532
FRONT_AV	30	AC	367	65	2025	Rehabilitation	\$48,462
FRONT_AV	40	AC	379	61	2025	Rehabilitation	\$48,985
FRONT_AV	45	AC	384	57	2025	Rehabilitation	\$60,955
FRONT_AV	50	AC	382	58	2025	Rehabilitation	\$56,944
FRONT_AV	60	AC	384	64	2025	Rehabilitation	\$46,416
GRIFF_ST	40	AC	431	64	2025	Rehabilitation	\$42,232
INTER_AV	20	AC	981	62	2025	Rehabilitation	\$122,515
MAIN_AV	35	PCC	933	71	2025	Rehabilitation	\$49,377
MAIN_AV	45	PCC	858	63	2025	Rehabilitation	\$191,026
MAIN_AV	46	PCC	881	69	2025	Rehabilitation	\$118,377
MAIN_AV	95	PCC	385	72	2025	Rehabilitation	\$54,319
MEMOR_HY	10	AC	502	63	2025	Rehabilitation	\$28,568
ROOSE_DR	45	AC	361	58	2025	Rehabilitation	\$47,605
ROOSE_DR	50	AC	395	63	2025	Rehabilitation	\$43,419
ROSSE_AV	11	AC	180	36	2025	Rehabilitation	\$93,016
ROSSE_AV	15	AC	234	46	2025	Rehabilitation	\$44,348
ROSSE_AV	210	AC	380	63	2025	Rehabilitation	\$56,832
ROSSE_AV	220	AC	349	51	2025	Rehabilitation	\$95,803
ROSSE_AV	5	AC	352	59	2025	Rehabilitation	\$14,098
SCHAF_ST	20	AC	446	50	2025	Rehabilitation	\$115,266
WACHT_AV	40	AC	935	64	2025	Rehabilitation	\$112,666
WASHI_ST	310	PCC	50	64	2025	Rehabilitation	\$11,356

Jurisdiction: City of Bismarck

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
WEISS_AV	10	AAC	410	61	2025	Rehabilitation	\$52,657
YEGEN_RD	15	AC	1445	59	2025	Rehabilitation	\$138,593
YEGEN_RD	5	AC	2431	58	2025	Rehabilitation	\$237,949
06TH_ST	20	AC	382	64	2026	Rehabilitation	\$42,767
12TH_ST	5	AC	4178	65	2026	Rehabilitation	\$270,437
26TH_ST	105	AC	871	65	2026	Rehabilitation	\$129,781
52ND_ST	75	AC	620	63	2026	Rehabilitation	\$38,821
AIRPO_RD	50	AC	559	63	2026	Rehabilitation	\$115,973
AIRPO_RD	60	AC	589	64	2026	Rehabilitation	\$118,318
AIRPO_RD	70	AC	274	63	2026	Rehabilitation	\$56,330
BELL_ST	30	AC	380	64	2026	Rehabilitation	\$37,868
BOULE_AV	80	PCC	387	75	2026	Rehabilitation	\$32,373
BURLE_AV	75	AC	1577	65	2026	Rehabilitation	\$119,346
C_AV	45	APC	379	63	2026	Rehabilitation	\$31,666
C_AV	60	APC	381	64	2026	Rehabilitation	\$31,584
CENTU_AV	205	PCC	677	74	2026	Rehabilitation	\$39,369
EASTD_DR	15	AC	538	63	2026	Rehabilitation	\$67,340
EASTD_DR	5	AC	712	63	2026	Rehabilitation	\$89,491
GRIFF_ST	35	AC	1353	64	2026	Rehabilitation	\$138,088
ROOSE_DR	55	AC	327	64	2026	Rehabilitation	\$36,204
ROSSE_AV	195	AC	328	64	2026	Rehabilitation	\$50,451
ROSSE_AV	215	AC	423	64	2026	Rehabilitation	\$63,794
WACHT_AV	35	AC	890	63	2026	Rehabilitation	\$111,123
19TH_ST	130	PCC	504	75	2027	Rehabilitation	\$51,755
19TH_ST	80	AC	298	64	2027	Rehabilitation	\$37,678
22ND_ST	60	AC	941	64	2027	Rehabilitation	\$118,535
26TH_ST	55	AC	373	65	2027	Rehabilitation	\$62,644
AIRPO_RD	15	AC	1140	64	2027	Rehabilitation	\$239,524
AIRPO_RD	40	AC	315	63	2027	Rehabilitation	\$67,332
AIRPO_RD	55	AC	255	64	2027	Rehabilitation	\$52,764
BOULE_AV	10	AC	381	63	2027	Rehabilitation	\$40,648
BOULE_AV	195	AC	122	64	2027	Rehabilitation	\$15,464
BOULE_AV	5	AC	371	64	2027	Rehabilitation	\$38,999
BURLE_AV	55	AC	794	65	2027	Rehabilitation	\$62,133
BURLE_AV	85	AC	1744	64	2027	Rehabilitation	\$138,702
C_AV	50	APC	544	64	2027	Rehabilitation	\$46,095
C_AV	75	AAC	380	64	2027	Rehabilitation	\$47,269
CAPIT_AV	95	AC	210	64	2027	Rehabilitation	\$26,707
CENTU_AV	180	PCC	371	75	2027	Rehabilitation	\$22,219
DIVID_AV	285	AC	1364	63	2027	Rehabilitation	\$238,093
FRONT_AV	55	AC	374	64	2027	Rehabilitation	\$47,788
ROSSE_AV	200	AC	342	65	2027	Rehabilitation	\$52,745
ROSSE_AV	205	AC	322	63	2027	Rehabilitation	\$51,415

Jurisdiction: City of Bismarck

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
WACHT AV	45	AC	627	64	2027	Rehabilitation	\$80,160
WACHT AV	50	AC	1035	65	2027	Rehabilitation	\$129,935
WASHI ST	145	PCC	162	75	2027	Rehabilitation	\$24,276
WASHI ST	150	PCC	133	75	2027	Rehabilitation	\$19,892
WASHI ST	155	PCC	366	75	2027	Rehabilitation	\$54,732
05TH ST	10	AC	387	63	2028	Rehabilitation	\$69,419
09TH ST	30	PCC	463	75	2028	Rehabilitation	\$44,043
19TH ST	110	AC	846	64	2028	Rehabilitation	\$110,669
19TH ST	75	AC	330	64	2028	Rehabilitation	\$43,537
AIRPO RD	25	AC	790	65	2028	Rehabilitation	\$166,604
AIRPO RD	5	AC	550	64	2028	Rehabilitation	\$117,922
AIRPO RD	65	AC	405	65	2028	Rehabilitation	\$86,032
BOULE AV	140	PCC	214	74	2028	Rehabilitation	\$7,052
BOULE AV	15	AC	753	63	2028	Rehabilitation	\$82,003
BOULE AV	70	PCC	372	75	2028	Rehabilitation	\$20,996
BURLE AV	40	AC	1043	63	2028	Rehabilitation	\$79,782
BURNT DR	5	AC	579	64	2028	Rehabilitation	\$40,470
C AV	35	AC	379	63	2028	Rehabilitation	\$41,318
C AV	65	APC	380	64	2028	Rehabilitation	\$32,973
CALGA AV	65	AC	418	64	2028	Rehabilitation	\$57,977
CAPIT AV	70	AC	325	64	2028	Rehabilitation	\$35,156
CAPIT AV	80	AC	110	65	2028	Rehabilitation	\$11,657
CENTU AV	200	PCC	677	75	2028	Rehabilitation	\$41,784
CENTU AV	210	PCC	682	75	2028	Rehabilitation	\$42,059
COLLE DR	15	AC	904	64	2028	Rehabilitation	\$118,050
FRONT AV	20	AC	382	63	2028	Rehabilitation	\$62,658
FRONT AV	35	AC	393	65	2028	Rehabilitation	\$51,295
GALLE PL	5	PCC	313	75	2028	Rehabilitation	\$27,225
LASAL DR	100	AC	84	64	2028	Rehabilitation	\$10,148
ROSSE AV	185	AC	1394	64	2028	Rehabilitation	\$225,700
ROSSE AV	190	AC	322	63	2028	Rehabilitation	\$52,761
ROSSE AV	225	AC	664	64	2028	Rehabilitation	\$106,247
ROSSE AV	45	AC	398	64	2028	Rehabilitation	\$64,764
WACHT AV	30	AC	527	64	2028	Rehabilitation	\$69,220
WHISP DR	30	AC	203	65	2028	Rehabilitation	\$9,342
03RD ST	125	AAC	381	64	2029	Rehabilitation	\$63,439
03RD ST	30	AC	320	64	2029	Rehabilitation	\$43,036
19TH ST	125	PCC	413	75	2029	Rehabilitation	\$44,944
43RD AV	45	AC	1631	64	2029	Rehabilitation	\$191,767
52ND ST	50	AC	2157	63	2029	Rehabilitation	\$255,047
BOULE AV	85	PCC	302	75	2029	Rehabilitation	\$28,786
BURLE AV	80	AC	792	63	2029	Rehabilitation	\$134,875
BURNT DR	15	AC	367	64	2029	Rehabilitation	\$49,486
CALGA AV	15	AAC	300	64	2029	Rehabilitation	\$40,504
CAPIT AV	50	AC	264	65	2029	Rehabilitation	\$28,790

Jurisdiction: City of Bismarck

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
CAPIT_AV	60	AC	291	64	2029	Rehabilitation	\$32,271
CAPIT_AV	75	AC	327	64	2029	Rehabilitation	\$36,270
COLEM_ST	20	AC	156	64	2029	Rehabilitation	\$17,074
CROCU_AV	15	AC	367	63	2029	Rehabilitation	\$41,360
D_AV	95	AC	381	64	2029	Rehabilitation	\$42,590
DIVID_AV	130	AC	277	63	2029	Rehabilitation	\$59,462
LASAL_DR	75	AC	816	65	2029	Rehabilitation	\$99,155
MAIN_AV	25	PCC	1114	75	2029	Rehabilitation	\$61,947
NORMA_ST	5	AC	817	64	2029	Rehabilitation	\$89,235
RIVER_RD	25	AC	168	64	2029	Rehabilitation	\$11,516
ROSSE_AV	230	AC	1237	65	2029	Rehabilitation	\$214,778
ROSSE_AV	35	AC	363	65	2029	Rehabilitation	\$59,168
WARD_RD	15	AC	289	63	2029	Rehabilitation	\$32,547
03RD_ST	35	AC	333	65	2030	Rehabilitation	\$45,652
04TH_ST	30	AAC	381	65	2030	Rehabilitation	\$47,723
19TH_ST	105	AC	356	64	2030	Rehabilitation	\$49,249
19TH_ST	95	AC	130	64	2030	Rehabilitation	\$18,157
22ND_ST	55	AC	486	65	2030	Rehabilitation	\$66,433
26TH_ST	65	AC	379	63	2030	Rehabilitation	\$72,150
AIRPO_RD	10	AC	597	63	2030	Rehabilitation	\$138,402
AIRPO_RD	20	AC	912	64	2030	Rehabilitation	\$209,742
AIRPO_RD	35	AC	487	64	2030	Rehabilitation	\$110,082
ARBOR_AV	15	AC	389	64	2030	Rehabilitation	\$44,713
BOULE_AV	190	AC	937	64	2030	Rehabilitation	\$128,933
BOULE_AV	45	AC	187	64	2030	Rehabilitation	\$34,973
BURLE_AV	50	AC	909	65	2030	Rehabilitation	\$77,034
BURNT_DR	10	AC	1748	63	2030	Rehabilitation	\$131,971
C_AV	70	AAC	382	64	2030	Rehabilitation	\$51,458
CAPIT_AV	110	AC	262	65	2030	Rehabilitation	\$35,929
CAPIT_AV	130	AC	507	64	2030	Rehabilitation	\$70,009
CENTE_RD	15	PCC	773	75	2030	Rehabilitation	\$50,616
CENTE_RD	5	PCC	222	74	2030	Rehabilitation	\$46,590
CENTU_AV	50	PCC	274	75	2030	Rehabilitation	\$17,907
CROCU_AV	5	AC	458	64	2030	Rehabilitation	\$52,817
D_AV	100	AC	379	63	2030	Rehabilitation	\$43,825
DAYTO_DR	5	AAC	204	64	2030	Rehabilitation	\$25,725
DENVE_AV	20	AC	307	64	2030	Rehabilitation	\$34,770
DENVE_AV	25	AC	311	63	2030	Rehabilitation	\$36,225
INTER_AV	40	AC	564	64	2030	Rehabilitation	\$78,011
LASAL_DR	105	AC	273	65	2030	Rehabilitation	\$34,139
MORRI_AV	17	PCC	979	75	2030	Rehabilitation	\$120,133
NEBRA_DR	22	AC	263	65	2030	Rehabilitation	\$32,635
NEBRA_DR	25	AC	643	64	2030	Rehabilitation	\$81,102
NORMA_ST	10	AC	870	64	2030	Rehabilitation	\$96,520
RIVERS_RD	20	AC	634	64	2030	Rehabilitation	\$72,870
ROOSE_DR	10	AC	515	64	2030	Rehabilitation	\$63,335

Jurisdiction: City of Bismarck

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
ROOSE_DR	5	AC	284	64	2030	Rehabilitation	\$35,291
TURNP_AV	10	AC	1930	65	2030	Rehabilitation	\$264,537
TURNP_AV	45	AC	322	65	2030	Rehabilitation	\$40,144
WACHT_AV	55	AC	289	64	2030	Rehabilitation	\$39,940
WASHI_ST	90	AC	488	64	2030	Rehabilitation	\$92,241
WASHI_ST	95	AC	489	65	2030	Rehabilitation	\$100,185
03RD_ST	130	APC	381	65	2031	Rehabilitation	\$66,191
03RD_ST	135	APC	380	64	2031	Rehabilitation	\$60,372
03RD_ST	45	AC	870	63	2031	Rehabilitation	\$126,854
04TH_ST	40	AAC	472	64	2031	Rehabilitation	\$61,949
10TH_ST	75	AC	536	63	2031	Rehabilitation	\$55,492
19TH_ST	120	PCC	993	75	2031	Rehabilitation	\$114,785
19TH_ST	85	AC	295	63	2031	Rehabilitation	\$43,060
19TH_ST	90	AC	169	65	2031	Rehabilitation	\$23,770
35TH_ST	25	AC	1146	64	2031	Rehabilitation	\$134,857
ARBOR_AV	20	AC	469	63	2031	Rehabilitation	\$71,235
BISMA_EX	65	PCC	170	75	2031	Rehabilitation	\$28,643
BOULE_AV	200	AC	247	65	2031	Rehabilitation	\$28,586
BOULE_AV	75	PCC	457	75	2031	Rehabilitation	\$28,163
BOULE_AV	95	PCC	328	75	2031	Rehabilitation	\$33,208
BURLE_AV	45	AC	623	64	2031	Rehabilitation	\$51,281
BURLE_AV	60	AC	371	64	2031	Rehabilitation	\$33,242
BURLE_AV	90	AC	917	63	2031	Rehabilitation	\$82,495
CALGA_AV	70	AC	1290	64	2031	Rehabilitation	\$183,468
CAPIT_AV	120	AC	202	64	2031	Rehabilitation	\$28,916
CENTU_AV	160	PCC	606	75	2031	Rehabilitation	\$40,837
COLLE_DR	10	AC	750	64	2031	Rehabilitation	\$116,188
CROCU_AV	10	AC	702	63	2031	Rehabilitation	\$83,737
CROCU_AV	20	AC	739	64	2031	Rehabilitation	\$86,306
D_AV	90	AC	380	65	2031	Rehabilitation	\$44,044
FRAIN_RD	35	AC	62	63	2031	Rehabilitation	\$5,423
INTER_AV	60	AC	328	64	2031	Rehabilitation	\$46,991
INTER_AV	70	AC	333	65	2031	Rehabilitation	\$47,019
INTER_AV	80	AC	268	63	2031	Rehabilitation	\$51,986
LASAL_DR	80	AC	507	64	2031	Rehabilitation	\$66,120
NEBRA_DR	20	AC	241	65	2031	Rehabilitation	\$31,049
RIVER_DR	65	AAC	589	65	2031	Rehabilitation	\$75,270
RIVERS_RD	5	AC	1201	63	2031	Rehabilitation	\$143,349
ROOSE_DR	15	AC	133	63	2031	Rehabilitation	\$17,091
ROOSE_DR	25	AC	827	64	2031	Rehabilitation	\$105,737
VALLE_AV	10	AC	260	65	2031	Rehabilitation	\$30,045
VALLE_DR	70	AC	229	64	2031	Rehabilitation	\$38,609
WARD_RD	20	AC	310	64	2031	Rehabilitation	\$36,088
WASHI_ST	25	AC	1070	64	2031	Rehabilitation	\$83,214
WASHI_ST	305	AC	250	65	2031	Rehabilitation	\$73,571
WASHI_ST	50	AAC	801	64	2031	Rehabilitation	\$99,903

Jurisdiction: City of Bismarck

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
YEGEN_RD	10	AC	5041	64	2031	Rehabilitation	\$478,734

Jurisdiction: Burleigh County

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
NE 52ND ST	10	AC	3,046	53	2025	Rehabilitation	\$617,934
NE 52ND ST	20	AC	1,773	39	2025	Rehabilitation	\$893,622
NE 52ND ST	30	AC	456	34	2025	Rehabilitation	\$230,071
NE 52ND ST	40	AC	667	43	2025	Rehabilitation	\$274,657
NE 52ND ST	50	AC	225	62	2025	Rehabilitation	\$30,786
NE 52ND ST	60	AC	533	49	2025	Rehabilitation	\$132,171
NE 71S AVE	120	AC	1,086	64	2025	Rehabilitation	\$141,924
SE 52ND ST	10	AC	1,334	65	2025	Rehabilitation	\$172,981
SE 52ND ST	20	AC	1,117	52	2025	Rehabilitation	\$237,494
SE 52ND ST	30	AC	1,028	54	2025	Rehabilitation	\$199,399
SE 52ND ST	40	AC	253	55	2025	Rehabilitation	\$46,768
CENTE RD	130	AC	3,375	65	2028	Rehabilitation	\$474,515
WASHI ST	5	AC	699	63	2028	Rehabilitation	\$101,573
12TH ST	2	AC	1,561	65	2029	Rehabilitation	\$227,100
SE 48T AVE	20	AC	1,129	63	2029	Rehabilitation	\$169,403
SE 48T AVE	30	AC	2,290	64	2029	Rehabilitation	\$337,176
CENTE RD	100	AC	872	64	2030	Rehabilitation	\$132,505
NE 71S AVE	60	AC	1,456	64	2030	Rehabilitation	\$220,115
CENTE RD	110	AC	727	64	2031	Rehabilitation	\$114,827
CENTE RD	120	AC	1,715	64	2031	Rehabilitation	\$270,938
CENTE RD	90	AC	1,989	65	2031	Rehabilitation	\$306,721
NE 71S AVE	10	AC	924	64	2031	Rehabilitation	\$143,117
NE 71S AVE	50	AC	1,231	64	2031	Rehabilitation	\$194,484
SE 48T AVE	50	AC	2,651	65	2031	Rehabilitation	\$405,817
WASHI ST	10	AC	941	64	2031	Rehabilitation	\$148,352

Jurisdiction: City of Mandan

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
10th E NW	10	AC	69	59	2025	Rehabilitation	\$10,319
10th E NW	20	AC	142	45	2025	Rehabilitation	\$49,956
10th E NW	30	AC	212	64	2025	Rehabilitation	\$27,501
10th E NW	40	AC	387	47	2025	Rehabilitation	\$115,078
10th E NW	50	AC	408	41	2025	Rehabilitation	\$199,737
10th E NW	60	AC	422	35	2025	Rehabilitation	\$212,437
10th E NW	70	AC	639	43	2025	Rehabilitation	\$271,746
13th E NW	50	AC	290	62	2025	Rehabilitation	\$39,722
19th ST SE	10	AC	898	64	2025	Rehabilitation	\$117,446
1st ST NW	10	AC	380	63	2025	Rehabilitation	\$50,629
1st ST NW	110	AC	378	52	2025	Rehabilitation	\$77,667
1st ST NW	120	AC	381	55	2025	Rehabilitation	\$69,851
1st ST NW	130	AC	381	38	2025	Rehabilitation	\$192,040
1st ST NW	140	AC	380	25	2025	Rehabilitation	\$191,274
1st ST NW	150	AC	382	42	2025	Rehabilitation	\$168,099
1st ST NW	20	AC	189	56	2025	Rehabilitation	\$33,663
1st ST NW	30	AC	191	54	2025	Rehabilitation	\$37,111
1st ST NW	50	AC	193	65	2025	Rehabilitation	\$24,943
1st ST NW	60	AC	379	62	2025	Rehabilitation	\$52,034
1st ST NW	70	AC	380	61	2025	Rehabilitation	\$52,915
1st ST NW	80	AC	364	59	2025	Rehabilitation	\$54,635
1st ST NW	90	AC	383	59	2025	Rehabilitation	\$59,772
27th ST N	10	AC	571	30	2025	Rehabilitation	\$287,692
27th ST N	20	AC	480	21	2025	Rehabilitation	\$242,000
27th ST N	30	AC	73	18	2025	Rehabilitation	\$36,654
27th ST N	40	AC	663	30	2025	Rehabilitation	\$334,343
2nd AVE NW	10	AC	408	64	2025	Rehabilitation	\$53,714
2nd AVE NW	20	AC	382	49	2025	Rehabilitation	\$92,154
2nd ST NE	20	PCC	383	29	2025	Rehabilitation	\$205,760
2nd ST NE	30	PCC	379	46	2025	Rehabilitation	\$97,432
2nd ST NW	10	AC	384	59	2025	Rehabilitation	\$57,940
2nd ST NW	20	AC	383	59	2025	Rehabilitation	\$58,089
2nd ST NW	30	AC	380	43	2025	Rehabilitation	\$155,523
2nd ST NW	40	AC	381	57	2025	Rehabilitation	\$64,021
2nd ST NW	50	AC	382	60	2025	Rehabilitation	\$54,426
2nd ST NW	60	AC	384	57	2025	Rehabilitation	\$65,413
37th ST NW	10	AC	387	44	2025	Rehabilitation	\$156,048
37th ST NW	20	AC	364	44	2025	Rehabilitation	\$141,707
37th ST NW	30	AC	339	41	2025	Rehabilitation	\$165,253
37th ST NW	40	AC	339	35	2025	Rehabilitation	\$170,736
37th ST NW	50	AC	323	35	2025	Rehabilitation	\$162,567
37th ST NW	60	AC	379	57	2025	Rehabilitation	\$63,732
37th ST NW	70	AC	280	55	2025	Rehabilitation	\$52,477

Jurisdiction: City of Mandan

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
37th ST NW	80	AC	913	30	2025	Rehabilitation	\$459,979
37th ST NW	90	AC	1,941	53	2025	Rehabilitation	\$384,324
3rd AVE NW	10	AC	407	43	2025	Rehabilitation	\$168,613
3rd AVE NW	20	AC	382	29	2025	Rehabilitation	\$192,600
40th E NW	20	AC	346	49	2025	Rehabilitation	\$89,180
40th E NW	30	AC	233	37	2025	Rehabilitation	\$117,552
43rd ST NW	10	AC	156	40	2025	Rehabilitation	\$78,727
46th E SE	80	AC	395	62	2025	Rehabilitation	\$54,872
4th AVE NW	10	AC	404	36	2025	Rehabilitation	\$203,743
4th AVE NW	20	AC	385	42	2025	Rehabilitation	\$167,939
5th AVE NW	10	AC	382	33	2025	Rehabilitation	\$192,486
6th AVE SE	100	AC	732	59	2025	Rehabilitation	\$111,064
6th AVE SE	80	AC	201	54	2025	Rehabilitation	\$39,377
6th ST NW	10	AC	276	62	2025	Rehabilitation	\$37,660
6th ST NW	50	AC	261	48	2025	Rehabilitation	\$73,930
6th ST NW	60	AC	334	43	2025	Rehabilitation	\$137,342
6th ST NW	70	AC	599	54	2025	Rehabilitation	\$117,166
6th ST NW	80	AC	374	64	2025	Rehabilitation	\$49,050
E MAI ST E	10	AC	61	48	2025	Rehabilitation	\$17,096
E MAI ST E	20	AC	433	65	2025	Rehabilitation	\$56,123
MEMOR Y SE	100	AC	175	60	2025	Rehabilitation	\$24,932
MEMOR Y SE	120	AC	303	64	2025	Rehabilitation	\$40,114
MEMOR Y SE	140	AC	399	64	2025	Rehabilitation	\$51,974
MEMOR Y SE	40	AC	1,969	62	2025	Rehabilitation	\$273,823
MEMOR Y SE	50	AC	1,173	64	2025	Rehabilitation	\$153,235
MEMOR Y SE	70	AC	1,173	57	2025	Rehabilitation	\$197,986
MEMOR Y SE	80	AC	361	58	2025	Rehabilitation	\$56,506
OLD R L NW	20	AC	1,868	64	2025	Rehabilitation	\$246,977
RIVER E SE	10	AC	1,908	64	2025	Rehabilitation	\$251,008
SUNSE R NW	100	AC	675	48	2025	Rehabilitation	\$185,346
SUNSE R NW	90	AC	441	53	2025	Rehabilitation	\$87,736
1st ST NW	40	AC	186	63	2026	Rehabilitation	\$25,436
27th ST NW	10	AC	654	63	2026	Rehabilitation	\$89,621
46th E SE	10	AC	466	64	2026	Rehabilitation	\$63,172
MEMOR Y SE	10	AC	1,588	63	2026	Rehabilitation	\$218,927
13th E NW	10	AC	381	65	2027	Rehabilitation	\$52,005
19th ST SE	20	AC	1,116	64	2027	Rehabilitation	\$154,756
6th AVE SE	90	AC	155	64	2027	Rehabilitation	\$21,646
8th AVE NW	10	AC	925	64	2027	Rehabilitation	\$128,496
DIVIS T NE	10	AC	625	64	2027	Rehabilitation	\$86,793
MAIN ST E	10	AC	811	63	2027	Rehabilitation	\$115,178
MCKEN R SE	50	AC	362	64	2027	Rehabilitation	\$50,682
MEMOR Y SE	110	AC	937	63	2027	Rehabilitation	\$132,949

Jurisdiction: City of Mandan

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
MEMOR Y SE	20	AC	2,195	63	2027	Rehabilitation	\$309,782
MEMOR Y SE	30	AC	782	64	2027	Rehabilitation	\$109,812
MEMOR Y SE	60	AC	709	64	2027	Rehabilitation	\$99,446
MEMOR Y SE	90	AC	150	64	2027	Rehabilitation	\$21,109
13th E NW	30	AC	130	64	2028	Rehabilitation	\$18,835
13th E NW	40	AC	192	64	2028	Rehabilitation	\$27,794
19th ST SW	20	AC	1,218	64	2028	Rehabilitation	\$174,494
19th ST SW	30	AC	875	65	2028	Rehabilitation	\$122,774
19th ST SW	40	AC	576	64	2028	Rehabilitation	\$82,593
40th E SE	60	AC	185	64	2028	Rehabilitation	\$26,514
46th E SE	20	AC	263	64	2028	Rehabilitation	\$38,071
46th E SE	60	AC	161	65	2028	Rehabilitation	\$22,630
9th AVE NE	40	AC	382	63	2028	Rehabilitation	\$56,102
DIVIS T NW	10	AC	180	64	2028	Rehabilitation	\$25,544
MCKEN R SE	40	AC	122	65	2028	Rehabilitation	\$17,131
MCKEN R SE	90	AC	426	64	2028	Rehabilitation	\$60,538
MISSO R NE	30	AC	294	64	2028	Rehabilitation	\$41,959
SUNSE R NW	80	AC	355	64	2028	Rehabilitation	\$50,653
24th E SE	10	AC	239	64	2029	Rehabilitation	\$35,142
46th E SE	30	AC	571	65	2029	Rehabilitation	\$82,815
MCKEN R SE	110	AC	48	63	2029	Rehabilitation	\$7,196
MCKEN R SE	130	AC	318	65	2029	Rehabilitation	\$46,136
13th E NW	20	AC	383	64	2030	Rehabilitation	\$58,317
2nd ST NE	90	AC	381	65	2030	Rehabilitation	\$57,256
46th E SE	140	AC	478	65	2030	Rehabilitation	\$71,296
46th E SE	70	AC	223	64	2030	Rehabilitation	\$33,580
MEMOR Y SE	130	AC	819	64	2030	Rehabilitation	\$124,120
MEMOR Y SE	160	AC	379	65	2030	Rehabilitation	\$56,835
SUNSE R NW	60	AC	372	65	2030	Rehabilitation	\$55,820
19th ST SE	30	AC	667	63	2031	Rehabilitation	\$106,358
2nd ST NE	130	AC	380	65	2031	Rehabilitation	\$58,174
2nd ST NE	80	AC	376	63	2031	Rehabilitation	\$60,051
32nd E SE	10	AC	851	65	2031	Rehabilitation	\$130,274
3rd ST SE	130	AC	424	64	2031	Rehabilitation	\$66,776
3rd ST SE	60	AC	874	64	2031	Rehabilitation	\$136,105
46th E SE	40	AC	582	65	2031	Rehabilitation	\$89,751
9th AVE NE	20	AC	378	64	2031	Rehabilitation	\$59,033
MEMOR HWY	10	AC	595	64	2031	Rehabilitation	\$93,122

Jurisdiction: Morton County

Branch ID	Section ID	Surface	Section Length (ft)	PCI Before	Year	M&R Level	Cost
19th ST SE	110	AC	332	64	2025	Rehabilitation	\$43,737
BS LP LOOP	30	AC	289	63	2025	Rehabilitation	\$38,716
HWY 1806 S	20	AC	2,304	64	2025	Rehabilitation	\$303,239
HWY 1806 S	30	AC	296	65	2025	Rehabilitation	\$38,124
HWY 1806 S	40	AC	916	60	2025	Rehabilitation	\$135,294
HWY 1806 S	60	AC	261	64	2025	Rehabilitation	\$34,392
SUNSE R NW	70	AC	915	55	2025	Rehabilitation	\$169,230
HWY 1806 S	10	AC	275	65	2026	Rehabilitation	\$36,577
BS LP LOOP	20	AC	402	64	2029	Rehabilitation	\$60,037
19th ST SE	120	AC	892	64	2030	Rehabilitation	\$135,838
HWY 1806 S	50	AC	838	65	2030	Rehabilitation	\$125,562
MANDA PY W	10	AC	788	64	2030	Rehabilitation	\$118,855
OFF RAMP	20	AC	1,064	65	2030	Rehabilitation	\$158,194

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Bismarck-Mandan Regional ITS Architecture Update

Scope of Work

Version 5.0
December 31, 2024

Prepared for:

**Bismarck-Mandan Metropolitan Planning
Organization**

Principal Investigator:

MD Sharijad Hasan, PhD

Advanced Traffic Analysis Center
Upper Great Plains Transportation Institute
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INTRODUCTION

This proposal outlines the scope of work required to complete an update for the Bismarck-Mandan Regional ITS Architecture (Bis-Man RA) in accordance with FHWA requirements. The RA provides a comprehensive framework that can be used to plan future ITS, define system requirements, coordinate agency roles, and integrate functions across jurisdictional lines. The original Bis-Man RA was completed in 2005 by the Advanced Traffic Analysis Center (ATAC) under the sponsorship of the Bismarck-Mandan Metropolitan Planning Organization (Bis-Man MPO) and has been updated periodically since.

REGIONAL ARCHITECTURE

The Regional Architecture (RA) provides a framework for integrating ITS in a region to ensure desired functions are performed while maximizing regional benefits, which are higher than agency- or jurisdiction-specific systems working independently. The RA is functionally oriented and not technology specific, which allows it to remain valid over time as technology may change.

The RA typically has the following main components:

1. A description of the region
2. Identification of participating agencies and other stakeholders
3. An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture
4. Any agreements (existing or new) required for operations, including, at a minimum, those affecting ITS project interoperability, utilization of ITS-related standards, and the operation of the projects identified in the regional ITS architecture
5. System functional requirements
6. Interface requirements and information exchanges with planned and existing systems and subsystems
7. Identification of ITS standards supporting regional and national interoperability
8. The sequence of project implementation

REGIONAL ARCHITECTURE UPDATE

Similar to other transportation plans, the RA must be updated to reflect relevant transportation changes in the region. Further, the update is mandated by the FHWA under the ITS Architecture Conformity Rule. The update addresses changes in regional needs, changes in stakeholders, changes in the scope of services considered, deployment of ITS projects in the region, and changes in the national ITS architecture.

UPDATE PLAN

The success of updating the RA depends on the effective participation of key transportation stakeholders. Although a wide range of stakeholders will be involved in the RA, their involvement varies depending on the degree to which they own/operate/use transportation system components. This section describes the various parties involved in the project and their respective roles.

PROJECT MANAGEMENT

The Bis-Man MPO oversees all activities undertaken by ATAC for this project in accordance with the approved contract. ATAC will coordinate project activities with the MPO, especially stakeholder meetings and any public input required to complete the update.

TECHNICAL STAKEHOLDERS

The technical stakeholders provide ATAC with technical information on existing and planned systems and provide input on the architecture update. The stakeholder group will consist of agencies that own, operate, or maintain existing systems or planned systems and can potentially include:

1. Bis-Man MPO
2. Bismarck and Mandan
 - a. Engineering
 - b. Planning
 - c. Public works
 - d. IT
 - e. Transit
 - f. Emergency management
3. Burleigh and Morton County
 - a. Engineering
 - b. Public works
 - c. Emergency management
4. NDDOT Bismarck District

TASKS

It is anticipated that the majority of all meetings will be held virtually. ATAC has video conferencing capabilities via Microsoft Teams and Zoom, the appropriate meeting platform will be chosen in consultation with the MPO.

1. Hold project kickoff meeting (by 3/2025)
 - a. Present RA update process
 - b. Identify key regional contacts
 - c. Finalize ITS stakeholders
2. Hold stakeholder small group meetings (by 5/2025)
 - a. Outline steps for RA update
 - b. Identify roles and responsibilities
 - c. Explain the data collection process
 - i. Inventory
 - ii. Planned systems/activities
 - d. Meet each stakeholder small group individually to gather updated data
3. Update system inventory (by 8/2025)
 - a. Identify changes to systems deployed since the previous RA update
 - b. Identify systems planned for deployment
 - c. Identify projects associated with the architecture since the last update.
4. Review service packages and functional requirements (by 10/2025)
 - a. Update ITS service packages

- b. Incorporate appropriate service packages from the National ITS Reference Architecture (ARC-IT 9.3)
 - c. Identify potential new elements in the RA
 - d. Map service packages to MPO planning goals and objectives
- 5. Implement RA updates (by 11/2025)
 - a. Enter all pertinent information into Regional Architecture Development for Intelligent Transportation (RAD-IT) software
 - b. Create RAD-IT website
 - c. Create RA update report
- 6. Prepare RA update document (12/2025)
 - a. Submit draft document for review
 - b. Finalize document

DELIVERABLES

- 1. Updated RAD-IT database
- 2. RA update report
- 3. RAD-IT website

North Dakota MPO Planning Support Program Master Agreement

Bismarck Mandan MPO Addendum to the Master Agreement

Upon execution by the parties below, this Addendum and any attachments shall become attached to and incorporated into the 'North Dakota MPO Planning Support Program Master Agreement' between 'Bismarck Mandan MPO' and North Dakota State University.

1. *Project Title:* **Bismarck-Mandan Regional ITS Architecture Update**
2. *Effective Dates:* **February 1, 2025 through December 31, 2025**
3. *Statement of Work:* ATAC will update the existing Intelligent Transportation Systems Regional Architecture for the Bismarck Mandan MPO following national ITS architecture guidelines.
4. *Principal Investigator:* MD Sharijad Hasan
5. *Desired Deliverables:*
 1. Hold project kickoff meeting (by 3/2025)
Present RA update process, identify key regional contacts, and finalize ITS stakeholders.
 2. Hold stakeholder small group meetings (by 5/2025)
Outline steps for RA update, identify stakeholders' roles and responsibilities, and explain the data collection process for ITS inventory and activities. The PI will meet each stakeholder individually in a small group to collect this information.
 3. Update system inventory (by 8/2025)
Identify changes to systems and added projects deployed since the previous RA update
 4. Review service packages and functional requirements (by 10/2025)
Update ITS service packages and incorporate potential service packages from the National ITS Reference Architecture (ARC-IT 9.3) to align them with MPO planning goals and objectives. Potential new elements in the RA will also be identified.
 5. Implement RA updates (by 11/2025)
Input all relevant data into the Regional Architecture Development for Intelligent Transportation (RAD-IT) software, create RAD-IT website and RA update report.
 6. Prepare RA update document (12/2025)
Submit the draft document for review to finalize the document
6. *Contract Amount (ESTIMATE):* \$ 34,998

SOURCE(S) of FUNDING

- Federal Source: \$

/	/	
CFDA #	Federal Award Date	Federal Award Identification Number
• Federal Source: \$		
/	/	
CFDA #	Federal Award Date	Federal Award Identification Number
• State: \$		
• Other: \$		

AUTHORIZATION:
Bismarck Mandan MPO

North Dakota State University

Authorized Signature

Name and Title Date

Authorized Signature

Name and Title Date

BUDGET:

Project Title: Bismarck-Mandan Regional ITS Architecture Update

Cost Item	Amount
Staff Salaries	\$ 17,270
Benefits	\$ 7,081
Grad Student Salaries	\$ -
Undergrad Student Salaries	\$ -
Benefits	\$ -
Operating	\$ 90
Total direct costs	\$ 24,440
NDSU overhead (43.2%)	\$ 10,558
Total project cost	\$ 34,998