Missoula Bridges Planning Study

May 2014

Prepared For:

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Prepared By:

DOWL HKM

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Visit the study website at:

http://www.mdt.mt.gov/pubinvolve/missoulabridges/

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ABBREVIATIONS AND ACRONYMS

AADT ..... Annual Average Daily Traffic
AASHTO ..... American Association of State Highway and Transportation Officials
ADA ..... Americans with Disabilities Act
CBD ..... Central Business District
CO ..... Carbon Monoxide
DEQ ..... Montana Department of Environmental Quality
DNRC ..... Montana Department of Natural Resources and Conservation
FAQs ..... Frequently Asked Questions
FEMA ..... Federal Emergency Management Agency
FHWA ..... Federal Highway Administration
FWP ..... Montana Fish, Wildlife & Parks
HCM ..... Highway Capacity Manual
HSSR ..... Highway State Special Revenue
LEDPA ..... Least Environmentally Damaging Practicable Alternative
LID ..... Low Impact Development
LOS ..... Level of Service
LRTP ..... Long Range Transportation Plan
MAP-21 ..... Moving Ahead for Progress in the 21st Century Act
MATP ..... Missoula Active Transportation Plan
MBMG ..... Montana Bureau of Mines and Geology
MCA ..... Montana Code Annotated
MDT ..... Montana Department of Transportation
MEPA ..... Montana Environmental Policy Act
MNHP ..... Montana Natural Heritage Program
MPDES ..... Montana Pollutant Discharge Elimination System
mph ..... miles per hour
MPO ..... Metropolitan Planning Organization
MS4 ..... Missoula Municipal Separate Storm Sewer System
MUTD ..... Missoula Urban Transportation District
NBI ..... National Bridge Inventory
NEPA ..... National Environmental Policy Act
NHPA ..... National Historic Preservation Act
NHPP ..... National Highway Performance Program
NHS ..... National Highway System
NRHP ..... National Register of Historic Places
NRIS ..... Natural Resource Information System
NWI ..... National Wetland Inventory
PM_{10} ..... Particulate Matter
PROWAG ..... Public Rights-Of-Way Accessibility Guidelines
RP ..... Reference Post
Section 4(f) ..... Section 4(f) of the 1966 Department of Transportation Act
Section 6(f) ..... Section 6(f) of the National Land and Water Conservation Funds Act
SHPO ..... State Historic Preservation Office
SID ..... Special Improvement District
SPA ..... Montana Stream Protection Act

ABBREVIATIONS AND ACRONYMS

STIP ..... State Transportation Improvement Program
STP ..... Surface Transportation Program
STP - Bridge ..... Surface Transportation Program Bridge
STPP ..... Surface Transportation Program Primary
STPS ..... Surface Transportation Program Secondary
STPU ..... Surface Transportation Program Urban
SWMP ..... Storm Water Management Program
TA ..... Transportation Alternatives
TDP ..... Transit Development Plan
TIF ..... Tax Increment Financing
TIP ..... Transportation Improvement Program
TMDL ..... Total Maximum Daily Load
TPCC ..... Transportation Policy Coordinating Committee
UM ..... University of Montana
UPP ..... Urban Pavement Preservation
UPWP ..... Unified Planning Work Program
URD ..... Urban Renewal District
URSA ..... Urban Service Area
USACE ..... U.S. Army Corps of Engineers
USEPA ..... U.S. Environmental Protection Agency
USFWS ..... U.S. Fish and Wildlife Service
UST ..... Underground Storage Tank
VMT ..... Vehicle Miles Traveled

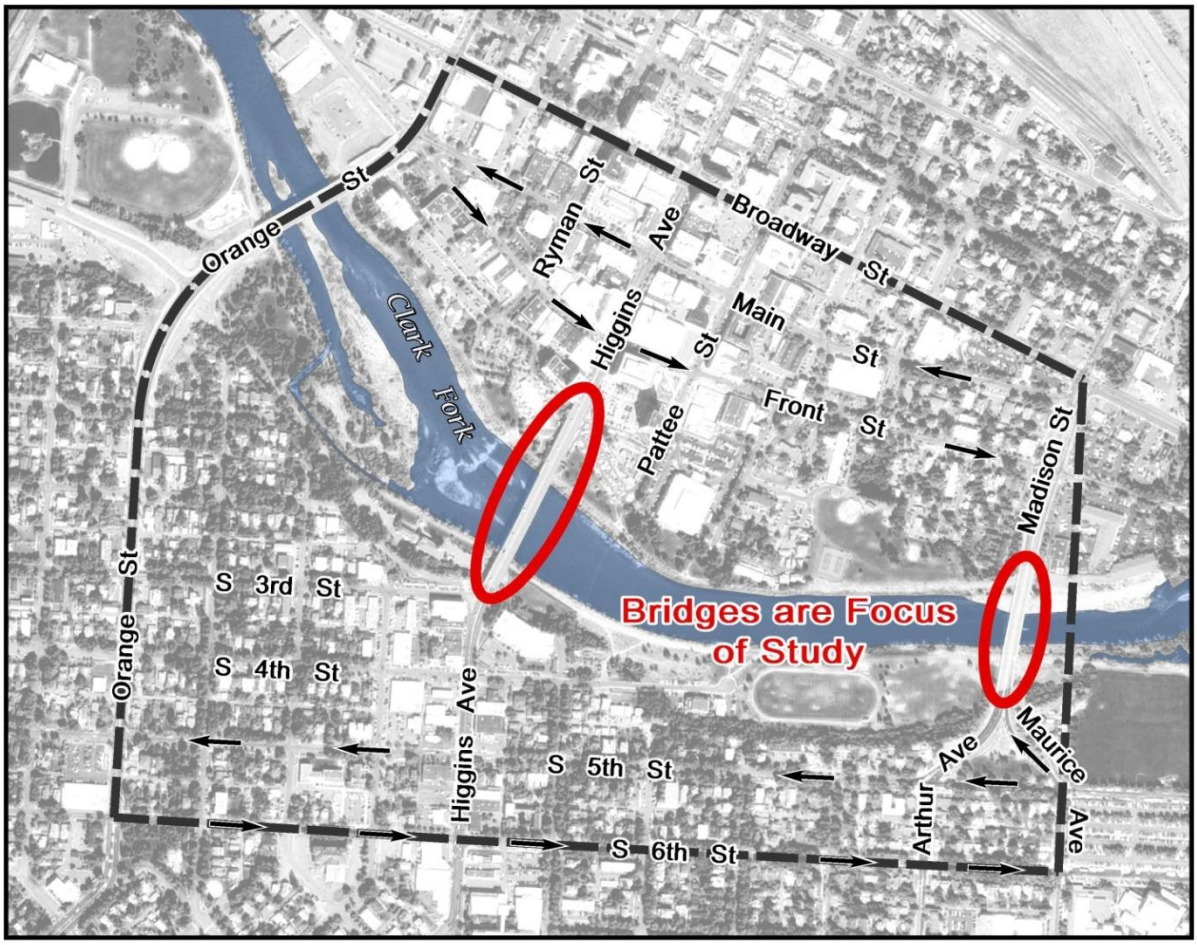
EXECUTIVE SUMMARY

The Montana Department of Transportation (MDT), in partnership with the Federal Highway Administration (FHWA) and the City of Missoula, initiated the *Missoula Bridges Planning Study* to identify potential bridge improvement options for the Higgins Avenue and Madison Street Bridges.

A planning study is a planning-level assessment of a study area occurring before project-level environmental compliance activities under the National and Montana Environmental Policy Acts (NEPA/MEPA). The planning study process is designed to determine what, if anything, can be done to improve bridge conditions and to facilitate a smooth and efficient transition from transportation planning to environmental review and potential project development. The process involves conducting a planning-level review of safety, operational, and environmental resources to identify needs and constraints. It also allows early coordination with members of the public, resource agencies, and other interested stakeholders. This process is separate from a project's NEPA/MEPA environmental compliance documentation, design, right-of-way acquisition, or construction. Depending on needs and funding availability, an improvement option may be forwarded from this planning-level study and developed into a project at a later date.

The study is focused on the Higgins Avenue and Madison Street Bridges. The transportation network within the broader study area is discussed only with respect to potential future impacts during construction of bridge improvement options, if forwarded. A detailed analysis of future traffic demand for the broader area has been evaluated and documented in the *2012 Missoula Long Range Transportation Plan (LRTP) Update*. Figure ES-1 illustrates the study area.

Figure ES-1 Study Area



ES.1 Existing and Projected Conditions

The Higgins Avenue and Madison Street Bridges are river crossings within Missoula, Montana. Issues and concerns identified through review of existing and projected conditions are listed below.

- Bridge Condition – The Higgins Avenue and Madison Street Bridges are structurally deficient and ranked poor for structure condition and deck condition.
- Seismic Hazard – The Higgins Avenue and Madison Street Bridges exhibit multiple seismic hazards.
- Bicycle and Pedestrian Elements – Higgins Avenue and Madison Street Bridge bicycle lanes, sidewalks, and railings do not meet current design standards.

- Operational Conditions – The *2012 Missoula LRTP* documents growing vehicular demand on the Higgins Avenue Bridge and the Madison Street Bridge through the 2040 planning horizon.
- Environmental Conditions – Physical, biological, social and cultural features within the study area may be affected by potential improvements to the Higgins Avenue and Madison Street Bridges.

ES.2 Needs and Objectives

Needs and objectives for the *Missoula Bridges Planning Study* are based on existing and projected conditions within the study area, comments from the public and resource agencies, and input from the study advisory committee. The following needs and objectives are intended to reflect MDT and community desires to maintain and ideally improve connectivity, safety, accessibility, and capacity where practicable given physical constraints and funding availability. Needs and objectives serve as the primary basis for identification of bridge improvement options. Needs, objectives, and other considerations are listed below.

Need 1: Maintain equivalent connectivity at the two river crossings.

Objectives

To the extent practicable:

1.a. Provide structurally-adequate bridges that will deliver long-term performance.
1.b. Preserve existing bridge capacity for all users, at a minimum.
1.c. Accommodate non-motorized connectivity.

Need 2: Improve bridge safety and accessibility.

Objectives

To the extent practicable:

2.a. Provide pedestrian and bicycle facilities that meet current MDT guidelines/standards, at a minimum.
2.b. Provide safety features consistent with current MDT design standards.

Other Considerations

The issues listed below were considered during the improvement option identification and screening process.

- Impacts to environmental, social, cultural/historic, scenic, and recreational resources and characteristics.
- Construction duration and temporary impacts to traffic operations.
- Structural limitations and remaining service life of existing bridges.
- Funding availability and cost.
- Future growth.
- Locally-adopted plans.

ES.3 Recommended Improvement Options

Recommended improvement options were identified in cooperation with the advisory committee to address the needs and objectives for this study. Local planning documents were considered during the identification of improvement options.

This study recommends two improvement options for further consideration.

Option 2 (major rehabilitation) is recommended for implementation in the short term. A structural analysis of both bridges will be needed to identify the load-bearing capacity of both bridges, the feasibility of deck widening, and the specific scope of work that would be required for a future rehabilitation project. Option 2 is recommended in the short term regardless of the findings of the structural analysis.

Option 3A (four-lane bridge replacement) is recommended as a long-term option if the existing bridge deck cannot be widened and Option 2 is unable to meet all needs and objectives. Although Option 3A is more costly, it would meet all needs and objectives identified in this study.

Implementation of recommended improvement options is dependent on funding availability and other system priorities statewide. Table ES.1 lists recommended improvements for further consideration and potential implementation timeframes.

Table ES.1 Recommended Options and Potential Implementation Timeframes

Potential Implementation Timeframe	Recommended Improvement Options		Cost	
			Higgins	Madison
Short Term (1 to 5 Years)	**2**	**Major Rehabilitation**	$4M to $8M	$2M to $5M
Long Term (Greater than 20 Years)	**3A**	**Bridge Replacement (Four Lanes)**	$18M to $28M	$15M to $18M

1.0 INTRODUCTION

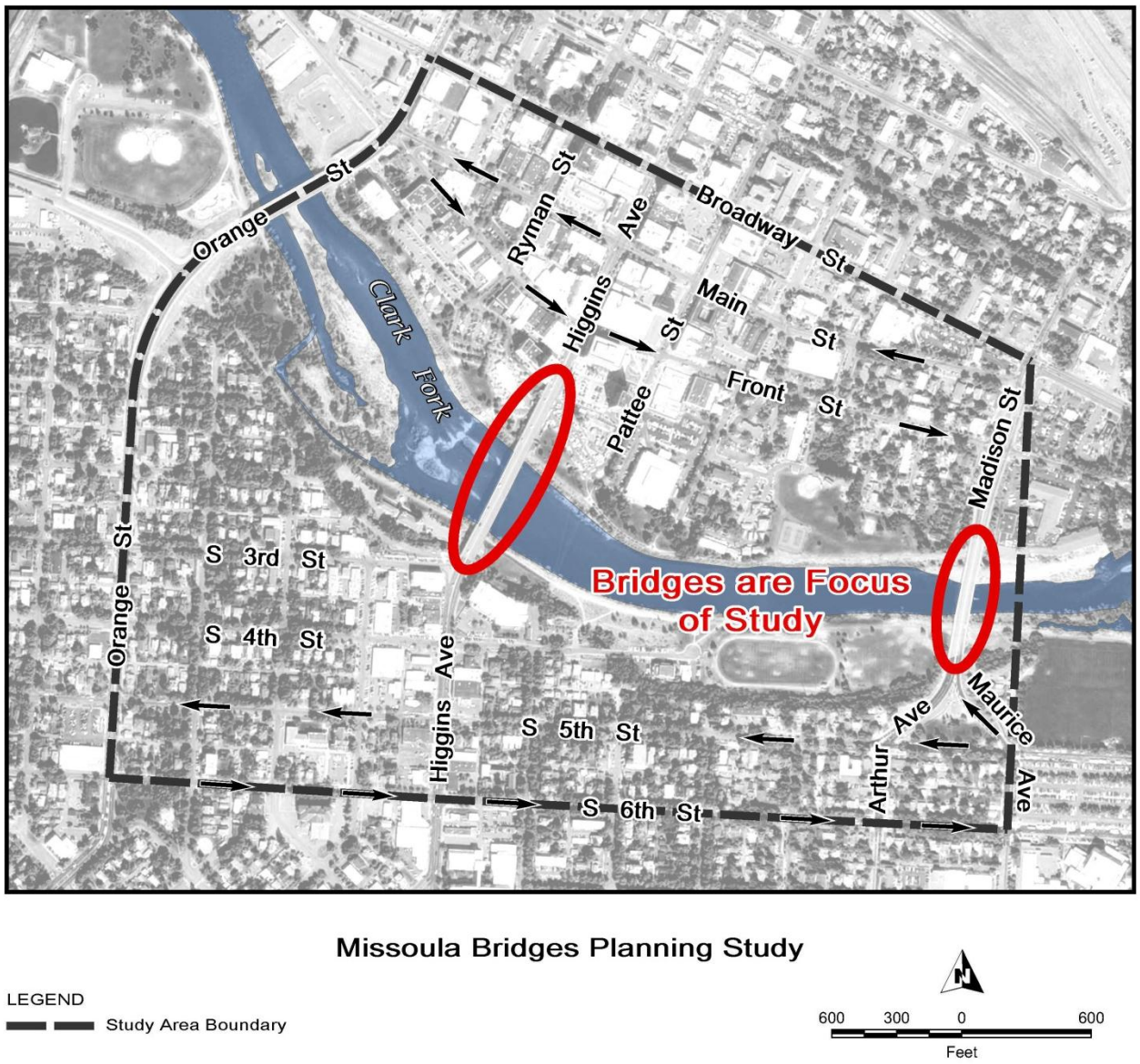
The Montana Department of Transportation (MDT), in partnership with the Federal Highway Administration (FHWA) and the City of Missoula, initiated the *Missoula Bridges Planning Study* to identify potential bridge improvement options for the Higgins Avenue and Madison Street Bridges. The transportation network within the broader study area is discussed only with respect to potential future impacts during construction of bridge improvement options, if forwarded. The study area is located within the City of Missoula in Missoula County. Figure 1-1 illustrates the study area.

1.1. Study Process

The study follows the 2009 *Montana Business Process to Link Planning and National and Montana Environmental Policy Act (NEPA/MEPA) Reviews*, MDT's guideline for conducting planning studies. This process facilitates a smooth and efficient transition from early transportation planning to project development and NEPA/MEPA environmental review. The planning process identifies needs and objectives; provides opportunities for early engagement with the public, stakeholders, and resource agencies; and identifies feasible improvement options.

Early planning efforts simplify and streamline subsequent project development by identifying and avoiding fatal flaws. A planning study can provide a basis for early screening, allowing exclusive focus on reasonable, feasible alternatives during the NEPA/MEPA process. The findings and recommendations provided in this report can be used to streamline a future NEPA/MEPA effort if MDT pursues bridge improvements.

Figure 1-1 Study Area



2.0 PUBLIC AND AGENCY PARTICIPATION

Public involvement and consultation with federal, state, and local agencies are key elements in linking planning studies and subsequent NEPA/MEPA reviews. MDT invited resource agencies, stakeholders, and members of the public to participate throughout the planning process to provide input on needs, issues, concerns, and recommended improvement options. Specific outreach measures are described in the following sections. Additional information is provided in the *Public and Agency Participation Plan* developed for this study (Appendix A).

2.1. Study Website

A website (http://www.mdt.mt.gov/pubinvolve/missoulabridges/) was developed to provide information about this study. Draft documents were posted for public review and comment during the planning process. Informational meeting announcements were posted to the website to encourage public involvement. Website links provided an opportunity for members of the public to post comments during the study process. A frequently asked questions (FAQs) page provided information about the planning process and public participation opportunities. Related links provided access to MDT's website homepage and a link to the *Montana Business Process to Link Planning Studies and NEPA/MEPA Reviews*.

2.2. Advisory Committee Meetings

A study advisory committee was established with representatives from MDT, FHWA, and the City of Missoula. The committee met regularly during the study period to discuss study progress, analysis methodologies and results, draft reports, and other issues and concerns. The committee served in an advisory role and reviewed study documentation before publication.

2.3. Public and Agency Involvement Activities

Informational Meetings

Two informational meetings and one public review period were conducted for the planning study. Meetings were advertised in the Missoula Independent newspaper. A press release was issued to radio stations, newspapers, and other local media outlets before each meeting. Newsletters were provided at the informational meetings, and included information on study progress, upcoming participation opportunities, and available study documentation. Newsletters were also distributed to the study mailing list before each meeting. Materials from the two informational meetings, including advertisements, press releases, sign-in sheets, agendas, newsletters, presentations, meeting minutes, and written comments, are included in Appendix A.

First Informational Meeting

Twenty-eight members of the public attended the first informational meeting held on June 12, 2013, at the Missoula Senior Center located at 705 South Higgins Avenue. The meeting began with an introduction of MDT representatives and local advisory committee members. The meeting continued with an overview of the MDT planning study process and key findings from the *Existing and Projected Conditions Report*, including transportation system conditions and environmental conditions. Following the presentation, attendees separated into small groups to discuss issues and concerns. The groups were moderated by advisory committee representatives who gathered public comments and later shared common themes with the full group of attendees. Comment topics are summarized in Table 2.1. Additional information is provided in Appendix A.

Table 2.1 Summary of Comments from Informational Meeting #1

Topic	Comments and Concerns
Bicycle/Pedestrian Facilities	○ Sidewalks on both sides of bridges are not wide enough to accommodate the passage of multiple wheelchairs or baby carriages. ○ Bicycle lanes are too narrow. ○ Pedestrian/bicycle safety and accessibility should be improved.
Lane Configuration	○ Worn striping makes it difficult to identify vehicular and bicycle lanes.
Bridge Deck	○ Pavement and expansion joints are in need of repair.
Environmental Concerns	○ Bridges do not have adequate drainage features.
Connectivity and Accessibility	○ Connections from the Higgins Avenue Bridge to Caras Park need improvement. ○ Connections from the Madison Street Bridge to the grade-separated bicycle/pedestrian bridge need improvement.
Amenities and Aesthetic Appeal	○ The existing bridges do not provide attractive lighting and railings. ○ The existing bridges do not provide adequate viewing/observation areas.
Railings	○ Railings do not meet current design standards.
Higgins Avenue Bridge Lane Configuration	○ The appropriate number of lanes on the Higgins Avenue Bridge should be considered (with comments ranging from two lanes to four lanes).

Second Informational Meeting

Twenty-six members of the public attended the second informational meeting held on October 8, 2013, at the Holiday Inn – Missoula Downtown located at 200 South Pattee Street. The informational meeting began with a presentation that provided an overview of the planning study process, existing conditions, planning study needs and objectives, improvement options, and screening criteria. The presentation concluded with an explanation of anticipated next steps following completion of the planning study. A discussion period was held following the presentation. Major themes include bicycle/pedestrian concerns, reducing vehicular capacity and accepting higher levels of congestion, maintaining vehicular capacity, consistency with the *Missoula Greater Downtown Master Plan*, and a new river crossing location in addition to the Higgins Avenue and Madison Street Bridges. Table 2.2 summarizes public comments. Additional information is provided in Appendix A.

Table 2.2 Summary of Comments from Informational Meeting #2

Topic	Comments and Concerns
Bicycle/Pedestrian Facilities	○ Sidewalks and bicycle lanes are not wide enough to accommodate users. ○ Perpetuation of the grade-separated bicycle/pedestrian bridge at Madison Street is important to the public.
Higgins Avenue Bridge Lane Configuration	○ The appropriate number of lanes on the Higgins Avenue Bridge should be considered (with comments ranging from two lanes to four lanes).
Traffic Operations	○ Vehicular operations should be balanced with bicycle/pedestrian needs. ○ Increasing traffic congestion is more acceptable than roadway widening. ○ New river crossings should be considered to accommodate growing vehicular demand.
Enhanced Connectivity and Accessibility	○ Connections from the Higgins Avenue Bridge to Caras Park need improvement. ○ Connections from the Madison Street Bridge to the grade-separated bicycle/pedestrian bridge need improvement.
Amenities and Aesthetic Appeal	○ The existing bridges do not provide attractive lighting and railings. ○ The existing bridges do not provide adequate viewing areas.
Consistency with Local Plans	○ Consistency with the *Missoula Greater Downtown Master Plan* recommendations is important to the public, including enhanced river connectivity, multimodal mobility, and a commitment to preserving the grade-separated pedestrian/bicycle bridge at Madison Street.

Resource Agency Meeting

Resource agencies were invited to a meeting on June 26, 2013, to discuss environmental resource issues and concerns within the study area. Representatives from MDT, U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), and the Montana Department of Natural Resources and Conservation (DNRC) attended the meeting. The meeting began with a presentation summarizing the planning study process and key findings from the *Existing and Projected Conditions Report* and the *Environmental Scan*. Following the presentation, agencies commented on osprey and yellow-billed cuckoo observations in the study vicinity, storm water drainage from the bridges, consultation with USFWS regarding bull trout, and the potential historic status of the Missoula Irrigation Ditch and the old Milwaukee Road. Meeting minutes are provided in Appendix A.

Public and Agency Review Period

The public and agency review period for the draft planning study extended from March 18, 2014, to April 18, 2014. Eight written comments were received during the review period. Table 2.3 provides a brief summary of comment topics. Written comments and MDT responses are presented in Appendix A.

Table 2.3 Summary of Review Period Comment Topics

#	Comment Date	First Name	Last Name	Agency	Comment Topic	Response
1	3/31/2014	Bonnie	Lovelace	Montana Department of Environmental Quality	Comment regarding: • permitting requirements.	Thank you for your comment. MDT will coordinate with regulatory agencies regarding permitting requirements for any future bridge projects.
2	4/7/2014	Mike	Haynes	City of Missoula Development Services	Concern regarding: • bridges that meet the needs and desires of the community.	Thank you for your comment. Option 2 (major rehabilitation) is recommended for implementation in the short term. It is expected to be the lowest-cost option that will address the structural condition of the bridges and provide an adequate service life extension. A major rehabilitation may not meet all the needs and objectives identified through this study. For this reason, Option 3A (four-lane bridge replacement) is recommended for consideration as a long-term option to meet all identified needs and objectives.

#	Comment Date	First Name	Last Name	Agency	Comment Topic	Response
3	4/8/2014	Robert	Wachtel	Missoula Bicycle & Pedestrian Advisory Board	Concern regarding: • roadway dimensions; • sidewalk and bicycle lane widths; • three/two-lane configuration on Higgins Avenue; and • timely bridge improvements. Support regarding: • further study of Option 2 (major rehabilitation).	Thank you for your comment. Current roadway striping may vary from dimensions indicated in bridge plans. The Missoula Bridges Planning Study is primarily focused on the total bridge deck width. MDT will consider specific dimensions for bridge elements (including vehicular travel lanes, sidewalks, bicycle lanes, and railings) following nomination of a future project. As indicated in Section 6.2, this study identifies a need to maintain connectivity equivalent to the two existing river crossings and to preserve existing bridge capacity. This need was primarily identified based on the *2012 Missoula LRTP*, which documents growing vehicular demand on the Higgins Avenue Bridge and Madison Street Bridge through the 2040 planning horizon. These demand projections indicate a need to preserve the existing number of travel lanes on each bridge. The study recognizes the Higgins Avenue and Madison Street Bridges are in need of repair/rehabilitation. Implementation timeframes for improvement options are dependent on funding availability. Thank you for comment. Option 2 (major rehabilitation) is recommended for implementation in the short term.

#	Comment Date	First Name	Last Name	Agency	Comment Topic	Response
4	4/14/2014	Linda	McCarthy	Missoula Downtown Association	Concern regarding: • consistency with the Missoula Greater Downtown Master Plan; • sidewalk and bicycle lane widths; • ramps from bridge deck to riverfront corridor; • grade-separated bicycle/pedestrian bridge at Madison Street; • Missoula's recently-implemented wayfinding system; and • viewing locations along the Higgins Avenue Bridge.	Thank you for your comment. The Missoula Bridges Planning Study considers recommendations outlined in local plans in the context of federal and state funding requirements, which require compliance with relevant design standards and guidelines, as discussed in Section 6.1. The study recognizes the need for improved bicycle and pedestrian facilities, as indicated in Section 5.0. The study recognizes the need to accommodate non-motorized connectivity, as indicated in Section 5.0. MDT is committed to maintaining a grade-separated bicycle/pedestrian bridge at Madison Street. MDT will consider specific bridge signage following nomination of a future project. The current bridge decks cannot accommodate viewing areas. Future engineering analysis is needed to determine if the existing bridge decks can be widened during a major rehabilitation project.

#	Comment Date	First Name	Last Name	Agency	Comment Topic	Response
5	4/17/2014	Kim	Latrielle	Missoula Area Chamber of Commerce	Support regarding: • current four-lane configuration on Higgins Avenue; • Option 2 (major rehabilitation); • structural analysis to determine potential for bridge deck widening; and • ADA access, connectivity to the riverfront corridor, and grade-separated bicycle/pedestrian bridge at Madison Street. Concern regarding: • timeliness of future bridge improvements.	Thank you for your comment. As indicated in Section 6.2, the study identifies a need to maintain connectivity equivalent to the two existing river crossings and to preserve existing bridge capacity. Thank you for comment. Option 2 (major rehabilitation) is recommended for implementation in the short term. Thank you for your comment. MDT will conduct a structural analysis to identify the load-bearing capacity of both bridges and determine the scope of work for a future rehabilitation project. Thank you for your comment. MDT recognizes the need to accommodate non-motorized connectivity, as indicated in Section 5.0. MDT is committed to maintaining a grade-separated bicycle/pedestrian bridge at Madison Street. MDT is committed to working cooperatively with the City of Missoula to improve the Higgins Avenue and Madison Street Bridges.
6	4/18/2014	Randy	Arnold	Montana Fish, Wildlife & Parks	Concern regarding: • recreational river access.	Thank you for your comment. The study now lists floating as one of the recreational opportunities on the Clark Fork River. As indicated in Section 6.3, MDT recognizes that temporary impacts to recreation may result due to limited river access during construction periods for any improvement option. MDT will coordinate with FWP regarding recreational considerations following nomination of a future project.

#	Comment Date	First Name	Last Name	Agency	Comment Topic	Response
7	4/18/2014	Bob	Giordano	Missoula Institute for Sustainable Transportation	Concern regarding: • roadway dimensions; • traffic volumes; • vehicular level of service (LOS); • bicycle lane widths; • bridge railings; • water, air, and soil quality; and • three/two-lane configuration on Higgins Avenue.	Thank you for your comment. Current roadway striping may vary from dimensions indicated in bridge plans. The Missoula Bridges Planning Study is primarily focused on the total bridge deck width. Traffic volumes are drawn from the *2012 Missoula LRTP,* and were produced by the Missoula TransCAD model, a travel demand forecasting software program. Volumes do not reflect actual count data. Based on information drawn from the *2012 Missoula LRTP*, the Higgins Avenue Bridge and the Madison Street Bridge are both expected to operate below MDT's design target of LOS B for urban principal and urban minor arterials. Reconsidering MDT's target LOS for urban arterials is outside the scope of this study. Minimum width specifications do not preclude MDT from considering wider facilities. As indicated in Section 4.1, bridge railings do not meet current design standards. Railings would be replaced as part of any future design project. MDT would minimize impacts to water, air, and soil quality, to the extent practicable, with any future design and construction project. As indicated in Section 6.2, this study identifies a need to maintain connectivity equivalent to the two existing river crossings and to preserve existing bridge capacity. This need was primarily identified based on the *2012 Missoula LRTP*, which documents growing vehicular demand on the Higgins Avenue Bridge and Madison Street Bridge through the 2040 planning horizon. These demand projections indicate a need to preserve the existing number of travel lanes on each bridge.

#	Comment Date	First Name	Last Name	Agency	Comment Topic	Response
8	4/18/2014	John	Wolverton	-	Concern regarding: • consistency with Missoula Greater Downtown Master Plan; • pedestrian facilities and future public involvement opportunities; • three/two-lane configuration on Higgins Avenue; • vehicular LOS; and • grade-separated bicycle/pedestrian bridge at Madison Street.	Thank you for your comment. The Missoula Bridges Planning Study considers recommendations outlined in local plans in the context of federal and state funding requirements, which require compliance with relevant design standards and guidelines, as discussed in Section 6.1. This study recommends short-term implementation (1 to 5 years) of Option 2 (major rehabilitation), which would include improvements to bicycle and pedestrian facilities. MDT would provide additional public involvement opportunities as part of any future design and construction project. As indicated in Section 6.2, this study identifies a need to maintain connectivity equivalent to the two existing river crossings and to preserve existing bridge capacity. This need was primarily identified based on the *2012 Missoula LRTP*, which documents growing vehicular demand on the Higgins Avenue Bridge and Madison Street Bridge through the 2040 planning horizon. These demand projections indicate a need to preserve the existing number of travel lanes on each bridge. While Option 3B (six-lane bridge) is anticipated to improve vehicular LOS compared to a four-lane bridge, the study recognizes this option would result in excessive impacts to downtown Missoula. MDT is committed to maintaining a grade-separated bicycle/pedestrian bridge at Madison Street

3.0 LOCAL PLANNING

The Missoula Office of Development Services is responsible for planning within the City of Missoula, including code compliance, development and building review, permits and inspections, zoning, non-motorized programming, and transportation planning.

3.1. Transportation Planning

A metropolitan planning organization (MPO) is a regional planning organization responsible for transportation planning and allocation of federal transportation funding. Urban areas with a population exceeding 50,000 are required to have an MPO. The Missoula Transportation Policy Coordinating Committee (TPCC) serves as the policy-making body for the MPO, and the Transportation Division of the Missoula Office of Development Services performs transportation planning functions for the MPO.

The MPO prepares a unified planning work program (UPWP) annually that identifies projects and funding for the upcoming program year. The UPWP is augmented with a five-year transportation improvement program (TIP) that identifies a priority list of projects and a financial plan demonstrating fiscal constraint. The TIP is the five-year incremental implementation of the *2012 Missoula Long Range Transportation Plan (LRTP)*, which establishes a long-term vision for transportation investments. Missoula updates its TIP annually. The draft 2013-2017 TIP does not include projects on or adjacent to the Higgins Avenue or Madison Street Bridges.

2012 Missoula Long Range Transportation Plan Update

The *2012 Missoula LRTP Update* is a revision of the 2008 LRTP. The 2012 LRTP analyzes existing and projected transportation conditions and identifies surface transportation projects and programs for all modes through 2040 to meet Missoula's transportation needs. The LRTP strives to link the city's vision for transportation, land use, and community development while remaining fiscally constrained by the amount of federal, state, and local funding anticipated to be available during the planning horizon.

The LRTP proposes studying the feasibility of different treatments on Higgins Avenue to improve access and safety for all modes, including converting the current four-lane roadway to a three-lane section with a single travel lane in each direction and a center two-way left-turn lane.

Missoula Urban Transportation District Urban Streetcar Study

The *Missoula Urban Transportation District (MUTD) Urban Streetcar Study* evaluates operational factors and potential alignments for streetcar routes. The plan discusses potential funding options to build and maintain an initial streetcar line, required conditions to foster long-term support, and potential effects on property development. The plan proposes to

construct a streetcar track along the Madison Street Bridge. Funding for implementation of a streetcar system has not been identified at this time.

Missoula Urban Transportation District Long Range Plan

The *MUTD Long Range Plan* is a 30-year plan designed to help meet Missoula's goals of providing safe and efficient transportation services. Specific goals identified in the plan include increasing the use of transit, improving transportation options, reducing single vehicle dependence, improving public health, creating incentives for reducing traffic congestion, and building partnerships to reduce vehicle miles traveled (VMT). The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

2011 Missoula Active Transportation Plan

The 2011 *Missoula Active Transportation Plan (MATP)* provides guidance for the development of active transportation facilities in Missoula. The MATP identifies policies, designs, and proposed projects based on the community's vision for bicycle and pedestrian components of the multi-modal transportation system, and presents recommendations for prioritizing federal aid transportation funding for bicycle and pedestrian infrastructure. The plan proposes protected bikeways, widened walkways, historic roadway lighting, and enhanced connections to Caras Park along the Higgins Avenue Bridge. The plan also proposes Riverfront Trail connections along the north side of the Clark Fork River at Madison Street, Higgins Avenue, and Orange Street.

Missoula Transit Development Plan

The *Missoula Transit Development Plan (TDP)* is prepared by the MUTD, which operates the Mountain Line bus system. The TDP describes existing transit facilities and identifies future transit needs over a five-year planning horizon with the MUTD. These projects are incorporated into the Missoula TIP when funding allows. The TDP aims to contribute to a safe, convenient, and accessible transportation system for the MUTD, which reduces VMT, carbon emissions, air pollution, and traffic congestion. The Missoula TDP does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

3.2. Land Use Planning

Missoula County Growth Policy (2005 Update)

The *Missoula County Growth Policy* is an official public document that provides a framework for local government land use development decisions in Missoula and Missoula County. The growth policy combines more than 30 years of land use planning to provide a framework for existing goals and policies, and establishes the legal and philosophical foundation upon which future plans and regulations will be based. The growth policy notes, "a primary objective of managing growth is to ensure the availability and affordability of infrastructure such as sewer, water, transportation, public safety, health and social services, public lands, parks and other

open spaces, cultural resources, and education. Adequate infrastructure is essential to a healthy, natural, economic, and social environment in Missoula County." The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Missoula Urban Comprehensive Plan (1998 Update)

The *Missoula Urban Comprehensive Plan* is a policy document outlining Missoula's growth trends in population, residential development, commercial development, industrial development, and economic activity. It provides a coordinated guide for managing long-term growth and development. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Missoula Greater Downtown Master Plan

The *Missoula Greater Downtown Master Plan* guides the growth of Missoula's downtown with regard to land use and circulation for all modes of transportation. The plan notes, "the *Missoula Greater Downtown Plan* is a comprehensive, balanced-center strategy for strengthening and expanding downtown Missoula's role as the economic and cultural heart of the community." The plan proposes to construct a streetcar track along the Madison Street Bridge. It also recommends consideration of three-lane and four-lane roadway configurations on Higgins Avenue, increased widths of sidewalks and dedicated bicycle lanes, and new bicycle/pedestrian connections to Caras Park.

The Missoula Urban Fringe Development Area Project

The *Missoula Urban Fringe Development Area Project* is a land use document providing regional context for residential growth on the edges of the City of Missoula. The goal of this project is to identify how an estimated 15,000 new residential units could be accommodated within the Missoula Urban Service Area (URSA), and develop implementation strategies for addressing growth in accordance with adopted policies. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

2012 Missoula County Parks and Trails Master Plan

The *2012 Missoula County Parks and Trails Master Plan* is a land use plan that guides the administration and management of parks and recreational lands to improve recreational opportunities in Missoula County. The plan strives to promote personal health, social well-being, and economic benefits to improve the quality of life in Missoula County. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Missoula Urban Area Open Space Plan (2006 Update)

The *Missoula Urban Area Open Space Plan* is a land use plan aiming to conserve and expand existing open spaces for recreational and ecological purposes. The plan envisions a trail system "to provide recreational opportunities and help further facilitate non-motorized transportation as a viable option for more people in and around the city." It prioritizes extension and

connectivity of existing trails. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

Master Parks and Recreation Plan for the Greater Missoula Area (2004)

The *Master Parks and Recreation Plan for the Greater Missoula Area* is a land use guide for parks, trails, open spaces, conservation lands, the urban forest, and recreational opportunities in the greater Missoula urban area. The plan establishes desired parkland acreage and standards for developed parks, and identifies goals, policies, and action items to increase the quantity and quality of parks. The plan does not identify any specific proposals for the Higgins Avenue or Madison Street Bridges.

4.0 EXISTING AND PROJECTED CONDITIONS

The *Existing and Projected Conditions Report* (Appendix B) and the *Environmental Scan* (Appendix C) provide a planning-level summary of transportation system features and physical, biological, social, and cultural characteristics to help the advisory committee identify issues, constraints, and opportunities within the study area. The following sections summarize key information from these reports.

4.1. Transportation System

Physical features and characteristics of the study area were identified through field observation and a review of published statistics, documentation, GIS data, and available drawings. A field review was conducted in March 2013 to identify opportunities and constraints within the study area.

Roadway System & Functional Classification

Functional classification characterizes public roads and highways in accordance with FHWA guidelines according to the type of service provided by the facility and the corresponding level of travel mobility and access to and from adjacent property.

Urban principal arterials serve the major activity centers of an urban area and consist mainly of the highest-traffic-volume corridors. Urban principal arterials place an emphasis on mobility, and access to abutting land may be limited. Urban principal arterials carry a high proportion of the total VMT within the urban area; most of these trips have an origin or destination within the urban area. These roads also serve trips bypassing the central business districts (CBD) of urbanized areas. Urban principal arterials include interstate facilities with fully-controlled access and other principal arterials with partial or no controlled access.

Roadways that interconnect with and augment urban principal arterials are classified as urban minor arterials. These roadways serve trips of moderate length and place more emphasis on property access than mobility. Minor arterials provide intra-community connections and may serve local bus routes.

Within the study area, Higgins Avenue has a posted speed limit of 25 miles per hour (mph) and is classified as an urban minor arterial on the urban system. Madison Street has a posted speed limit of 30 mph and is classified as an urban principal arterial on the primary system.

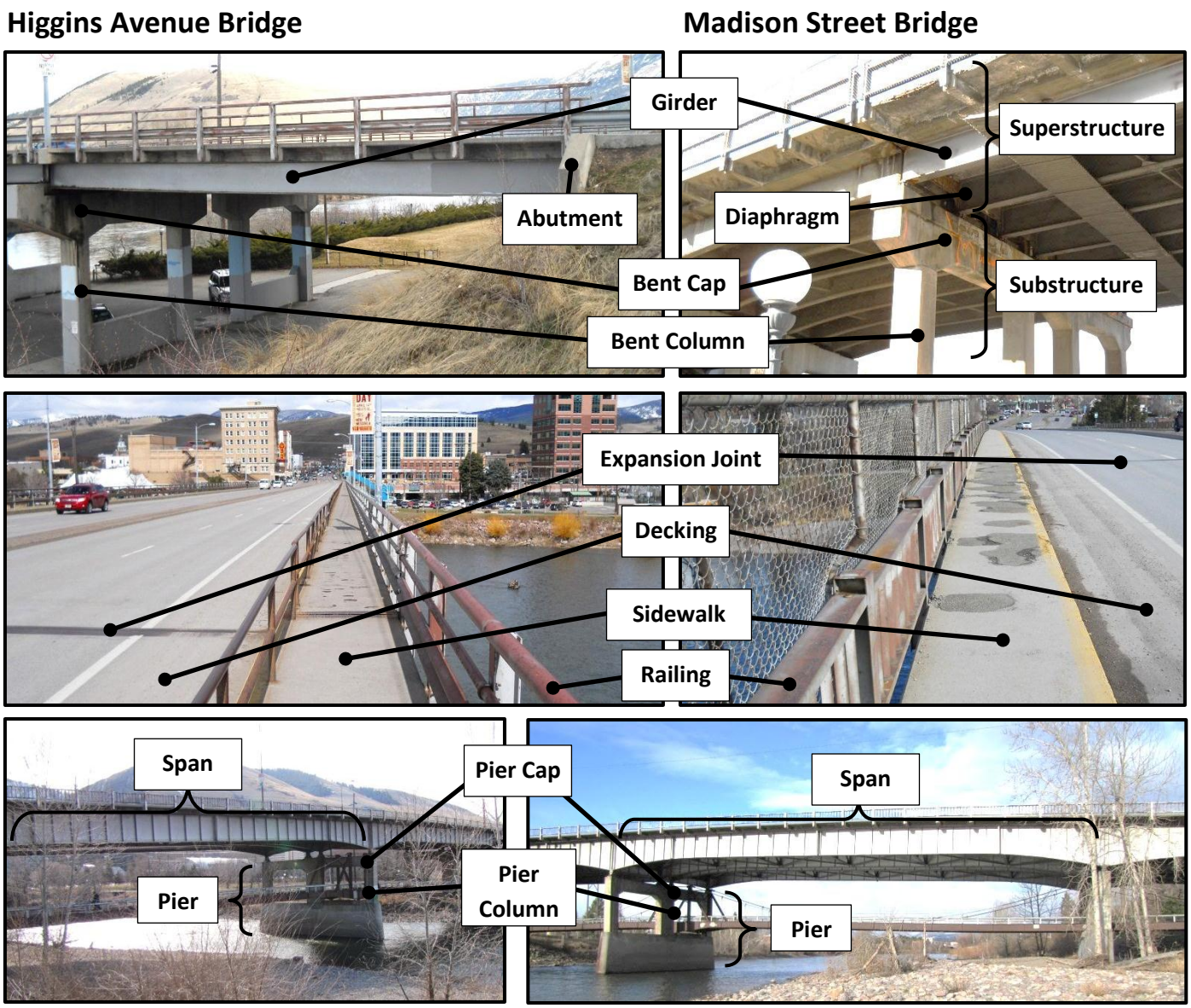
The Higgins Avenue Bridge connects the downtown Missoula CBD to commercial, recreational, and residential areas to the south, including the commercial development known as the "Hip Strip," parks and trails along the Clark Fork River, and multiple residential neighborhoods.

The Madison Street Bridge connects the downtown CBD to the University of Montana (UM) campus and surrounding residential areas. The grade-separated Madison Street pedestrian/bicycle bridge, located underneath the roadway bridge, connects riverfront trails on both sides of the Clark Fork River. The bridge provides convenient access to and from Interstate 90, and is heavily used during special events hosted by the UM campus.

Bridge Terminology

Figure 4-1 illustrates terms used to describe elements of the Higgins Avenue and Madison Street Bridges.

Figure 4-1 Terminology for Bridge Elements



Note: The term pier refers to substructure within the river. The term bent refers to substructure on dry land.

Bridge Type and Dimensions

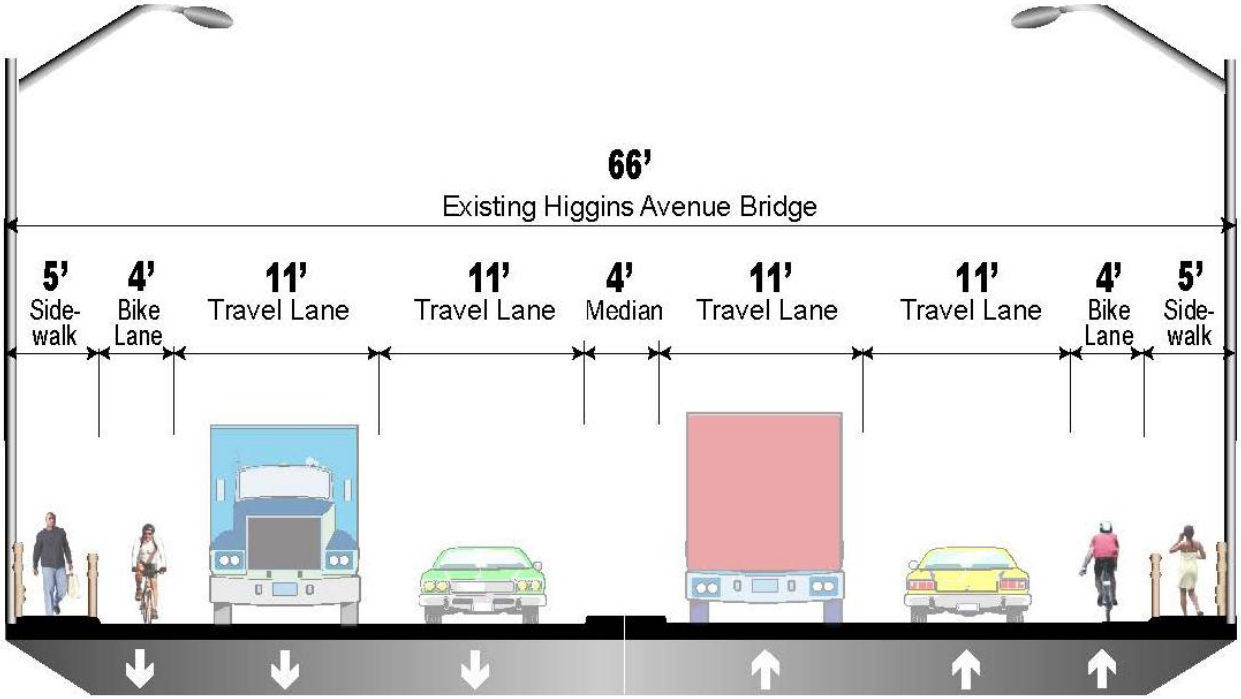
Higgins Avenue Bridge

The Higgins Avenue Bridge (Bridge ID U08113000+02381) is a four-lane structure located within the City of Missoula on MDT Route U-8113 at Reference Post (RP) 0.23. Originally constructed in 1962, the bridge has a total of thirteen spans, including two approach spans at each end, three main girder spans over the Clark Fork River, and eight intermediate spans. The bridge is

constructed with riveted plate girders, prestressed beams, and rolled steel beams. It is composed of two individual bridges separated by a one-inch expansion joint within the median.

Bridge plans indicate the total bridge width, including the center gap, is approximately 66 feet, which accommodates two five-foot sidewalks, two four-foot bicycle lanes, four 11-foot driving lanes, and a four-foot median. Railings are provided on the inner edge (back of curb) and outer edge of the sidewalks, reducing usable width of the sidewalk. The total bridge length is approximately 972 feet. Figure 4-2 illustrates the Higgins Avenue Bridge lane configuration.

Figure 4-2 Higgins Avenue Bridge Configuration



Note: Dimensions include striping and railing widths.

Madison Street Bridge

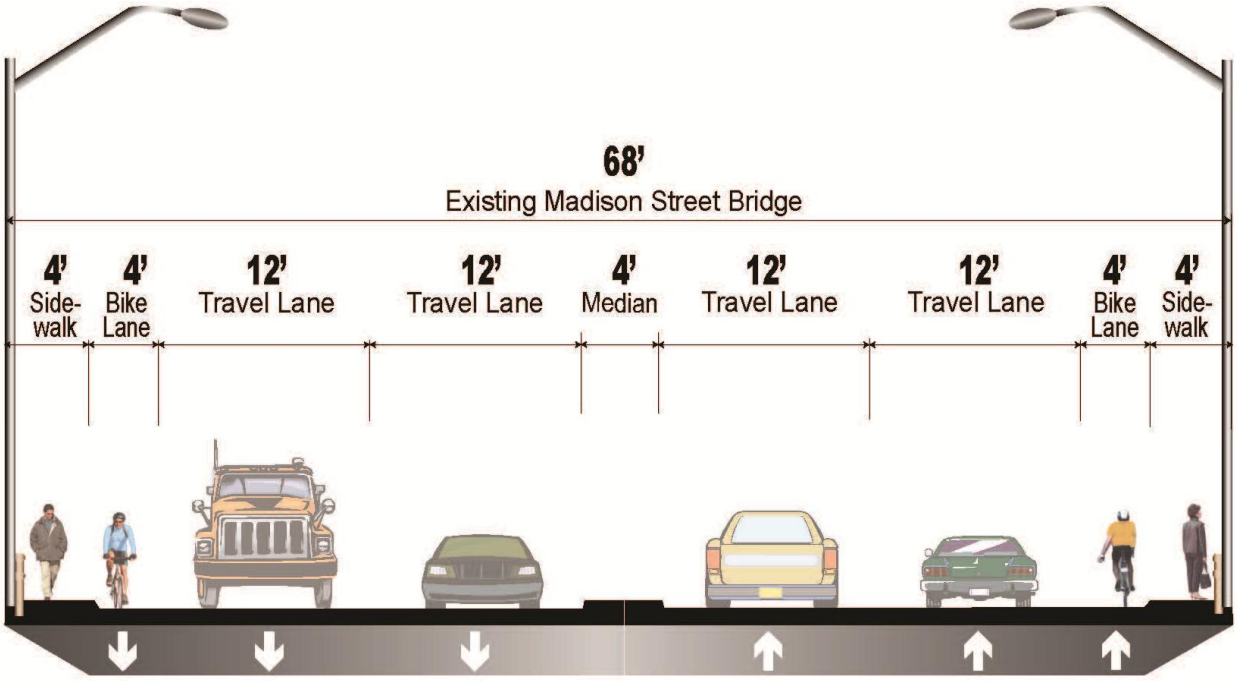
The Madison Street Bridge (Bridge ID P00007095+00581) is a four-lane structure located within the City of Missoula on MDT Route P-7 (US-12) at RP 95.05. Originally constructed in 1958, this bridge has a total of six spans, including an approach span on the south end of the bridge, two intermediate spans, and three main girder spans over the Clark Fork River. The bridge is constructed with riveted plate girders, prestressed beams, and rolled steel beams.

Similar to the Higgins Avenue Bridge, the bridge consists of two independent structures separated by a small expansion gap (approximately one inch), with the exception of piers 4, 5, and 6, which were constructed as single substructure elements.

Madison Street
Pedestrian/Bicycle Bridge

Bridge plans indicate the total deck width is approximately 68 feet, including two four-foot sidewalks, two four-foot bicycle lanes, four 12-foot driving lanes, and a four-foot-wide median. Railing is provided on the outer edge of the sidewalk. The northbound bridge is approximately 544 feet long, and the southbound bridge is approximately 559 feet long. A separate bridge (constructed in 2006) is supported on the walls of piers 4, 5, and 6 below the main bridge superstructure. This bridge provides a grade-separated crossing facility for pedestrians and cyclists. Figure 4-3 illustrates the Madison Street Bridge lane configuration.

Figure 4-3 Madison Street Bridge Configuration



Note: Dimensions include striping and railing widths.

Bridge Projects

Higgins Avenue Bridge

The Higgins Avenue Bridge received a high-density concrete overlay of the bridge deck in 1981. The project included removal and replacement of delaminated deck sections and repairs to the expansion joints and deck drains. A crack sealant treatment of the bridge deck was completed in the early 1990s.

Madison Street Bridge

The Madison Street Bridge received a high-density concrete overlay of the bridge deck in 1981. The project included removal and replacement of delaminated deck sections and repairs to the expansion joints and deck drains.

Bridge Condition and Bridge Program Performance Measures

MDT has developed bridge performance measures to assess bridge condition. The performance measures use National Bridge Inventory (NBI) ratings, including structurally-deficient status, to assess bridge condition.

Bridges are considered structurally deficient if load carrying elements have deteriorated enough to be in poor condition or the adequacy of the waterway opening provided by the bridge is insufficient, causing intolerable traffic interruptions. When a bridge is classified as structurally deficient, it does not mean that it is unsafe. A structurally-deficient bridge typically requires increased maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies.

The Higgins Avenue and Madison Street Bridges are structurally deficient and ranked poor for structure condition and deck condition. Both bridges are eligible for repair or replacement. Additional information on the condition of the bridges is summarized below.

Concrete spalling is a form of surface failure resulting in splintered concrete chips and fragments.

Higgins Avenue Bridge – Field Observations

A June 2012 MDT bridge inspection report noted several forms of deterioration, including concrete deck cracking and spalling, delamination of the riding surface and pedestrian sidewalks, exposed and corroded reinforcing bars, and corroded steel members. These conditions were confirmed during the March 2013 field review.

Concrete delamination is a form of surface failure resulting in separation of the surface layer.

Concrete diaphragms at bents 2 through 8 exhibit deterioration in the form of spalled concrete and corrosion of the reinforcing steel. This condition appears to be exacerbated by leaking joints in the bridge deck, which allow precipitation and de-icing chemicals to saturate the diaphragms and bents located below, furthering the deterioration process.

Madison Street Bridge – Field Observations

A June 2012 MDT bridge inspection report indicates the bridge exhibits deterioration including delaminated concrete decks and sidewalks, cracked and spalled concrete, corroded reinforcing steel, corroded structural steel, and pack rust at the steel girder bearings. These conditions were confirmed during the March 2013 field review.

Structure Loading

Bridges are rated according to the loads they may safely carry. Available documentation provided by MDT indicates the Higgins Avenue and Madison Street Bridges are currently able to safely carry legal loads.

Seismic Hazard

MDT identifies seismic ratings for bridges in Montana according to criteria outlined in the MDT *Bridge Design Standards*.

The seismic rating scale ranges from 7 to 100, with 7 indicating the least vulnerable bridge and 100 indicating the most vulnerable bridge. The average seismic rating of the 1,200 bridges rated in Montana is 24.4, with the most vulnerable bridge in Montana rated at 66.

The Higgins Avenue Bridge has a seismic rating of 45, and the Madison Street Bridge has a seismic rating of 46. While these ratings fall in the mid-range of the rating scale, they are more vulnerable than the statewide average rating.

MDT has identified multiple substructure and superstructure hazards that may affect the Higgins Avenue and Madison Street Bridges' ability to resist a seismic event. The existing bridges do not meet current MDT design requirements for seismicity.

Channel Adequacy and Scour

Assessment of channel adequacy considers the physical conditions associated with the flow of water through a bridge, such as stream stability and the condition of the channel, riprap, slope protection, or any stream control devices.

Scour is the erosion of streambed or bank material due to flowing water. This effect is often localized around bridge piers and abutments.

Higgins Avenue Bridge

Channel adequacy and scour vulnerability data provided in the 2012 MDT inspection report indicate the bridge deck and approaches have a slight chance of being overtopped during a flood and the bridge foundations are stable for the calculated potential scour conditions. MDT analysis indicates the Higgins Avenue Bridge footings are not vulnerable due to scour. No evidence of scour or undermining of the bridge piers was observed during the March 2013 field review.

Madison Street Bridge

The 2012 MDT inspection report indicates the channel is adequate and banks are protected or well vegetated. MDT considers the Madison Street Bridge to be a low risk for scour due to estimated scour depths within or above pier footings, and because abutment scour is mitigated by riprap and natural boulders along the riverbanks.

Railings and Ramps

Current MDT design standards require crashworthy bridge railing topped by a pedestrian/bicycle railing at the outside edge of a bridge or where used to separate pedestrians/bicyclists from vehicular traffic. The combined height of crashworthy bridge railing and pedestrian/bicycle railing must be a minimum of 43 inches above the walking surface. Pedestrian/bicycle railing used alone must also be a minimum of 43 inches in height.

Higgins Avenue Bridge

A steel handrail approximately 36 inches in height separates the inside edge of the pedestrian sidewalks from the main Higgins Avenue Bridge decking. The outer edge of each sidewalk is protected with bridge rail approximately 44 inches in height. The inner railing does not meet current MDT standards for crashworthy design or minimum height. The height of the outer railing complies with current MDT design standards for height, although the rails do not conform to the standard design for size and spacing.

Ramp transitions from the roadway sidewalks to the Higgins Avenue Bridge sidewalks are not compliant with the Americans with Disabilities Act (ADA) due to vertical surface discontinuities (i.e., trip hazards).

Madison Street Bridge

Railing on the outer edge of each sidewalk is approximately 32 inches in height. Portions of railing are augmented in height with chain link fencing for a total combined height of approximately six feet. There is no railing separating the inside edge of the pedestrian sidewalks from the adjacent roadway. The outer railing does not meet current MDT standards for crashworthy design. Portions of the railing do not meet current MDT design standards for minimum height for a combination rail.

Ramp transitions from the roadway sidewalks to the Madison Street Bridge sidewalks are not compliant with ADA requirements due to vertical surface discontinuities.

Vehicular Lanes

According to bridge plans, vehicular lanes on the Higgins Avenue Bridge are approximately 11 feet wide and travel lanes on the Madison Street Bridge are approximately 12 feet wide. MDT geometric design criteria listed in the *Road Design Manual* specify 11-foot minimum travel lanes for urban minor arterials (Higgins Avenue) and 12-foot minimum travel lanes for urban principal arterials (Madison Street).

Non-motorized Facilities

Dedicated four-foot bicycle lanes are located adjacent to the Higgins Avenue Bridge and Madison Street Bridge travel lanes within the street. Bicycle lanes are delineated by white lines

and bicycle symbols. In some instances the painted white lines and bicycle symbols have faded. Signing before the Higgins Avenue Bridge indicates bicycles are not allowed on sidewalks.

American Association of State Highway and Transportation Officials (AASHTO) guidelines note bicycle lane widths should be determined by context, including the speed, volume, and type of vehicles in adjacent lanes. For roadways where bicycle lanes are immediately adjacent to a curb, guardrail, or other vertical surface, AASHTO recommends a minimum bicycle lane width of five feet.

According to bridge plans, Higgins Avenue Bridge sidewalks are approximately five feet wide and Madison Street Bridge sidewalks are approximately four feet wide. Railings reduce usable sidewalk width on both bridges.

Public rights-of-way accessibility guidelines (PROWAG) Section R301.3.1 recommends a minimum continuous, unobstructed clear width of four feet for a pedestrian access route, exclusive of the width of the curb. PROWAG Section R301.3.2 also recommends provision of passing spaces five feet in width by five feet in length at intervals of 200 feet. AASHTO guidelines recommend sidewalk widths ranging from four to eight feet in residential and commercial areas, including bridge applications.

The Higgins Avenue and Madison Street Bridges are high-use corridors for bicyclists and pedestrians, providing connections between residential and commercial developments on the north and south sides of the Clark Fork River. Bicycle/pedestrian trails and the separate Madison Street bicycle/pedestrian bridge under the roadway bridge provide off-street bicycle/pedestrian access within the study area. The Ron MacDonald River Trail System parallels both banks of the Clark Fork River within the study area. The trail system is heavily used by joggers, pedestrians, bicyclists, and skateboarders. Outside the study area, the river trail system connects to the Kim Williams Trail (to the east) and the Milwaukee Trail and the Bitterroot Branch Trail (to the west) allowing users to move throughout the city with limited vehicular traffic contact.

Right-of-Way and Jurisdiction

The State of Montana owns the Higgins Avenue and Madison Street Bridges and has contracted with the City of Missoula to maintain the existing right-of-way on each end of both bridges. Right-of-way limits for each bridge are described below.

Higgins Avenue Bridge

Right-of-way drawings for the Higgins Avenue Bridge indicate the right-of-way width along the full length of the bridge is 100 feet.

Madison Street Bridge

Right-of-way drawings for the Madison Street Bridge illustrate variable right-of-way width along the length of the bridge. Right-of-way widths range from 100 feet to more than 200 feet.

Utilities

A communication line runs underneath the Higgins Avenue Bridge deck through a false ceiling. Security lights are attached beneath the Madison Street Bridge deck to illuminate the grade-separated bicycle/pedestrian bridge. Both the Higgins Avenue and the Madison Street Bridges are lighted for vehicular traffic. No other utilities are contained within the bridge structures.

Transit

Mountain Line is a public transit agency serving the Missoula area. Mountain Line operates 12 fixed routes within the Missoula area. Mountain Line also operates para-transit service, a senior van, and provides transportation for special events. Route 6 runs along the Higgins Avenue Bridge. Route 12, Route 1, and the UM Park and Ride Shuttle run along the Madison Street Bridge. Public transit service to and from downtown Missoula is generally available from 6:00 AM to 8:00 PM Monday through Friday and from 10:00 AM to 6:00 PM on Saturdays. No scheduled service is provided on Sundays.

Crash Analysis

MDT provided crash data for the Higgins Avenue and Madison Street Bridge segments for the five-year period from January 1, 2008, to December 31, 2012. Crash details are described below.

Higgins Avenue Bridge

A total of six crashes were reported on the Higgins Avenue Bridge during the five-year analysis period. One injury, no fatalities, and no vehicle crashes involving pedestrians/bicycles were reported. The single crash resulting in injury was identified as a collision with a bridge/pier/abutment, with alcohol and careless driving identified as contributing factors.

The majority of crashes on the Higgins Avenue Bridge (4 out of 6, or 66.7 percent) were classified as sideswipe collisions occurring between two vehicles. Contributing factors to sideswipe-type crashes included drugs, careless driving, and improper lane changing.

The majority of crashes, including the crash resulting in injury, occurred during clear, icy, and dark-lighted conditions.

Correctable crash trends were not identified based on the reported information.

Madison Street Bridge

A total of 12 crashes were reported on the Madison Street Bridge during the five-year analysis period. One injury, no fatalities, and no vehicle crashes involving pedestrians/bicycles were reported. The single crash resulting in injury was classified as a single vehicle crash, with failure to comply with a license restriction identified as a contributing factor.

The majority of crashes on the Madison Street Bridge (6 out of 12, or 50 percent) were classified as single vehicle collisions. Most of these crashes (5 out of 6, or 83.3 percent) involved collisions with roadside features, including traffic signs, guardrail, and curbs. One crash was attributed to debris in the road.

The majority of crashes (6 out of 12, or 50 percent) occurred during clear and dry conditions. Crashes were evenly split between daylight and dark-lighted conditions. The single crash resulting in injury occurred during clear, dry, and daylight conditions. Contributing factors for the 12 total crashes included speed, alcohol, careless driving, following too closely, inattentive driving, and not complying with a license restriction.

Correctable crash trends were not identified based on the reported information.

Volumes and Operation

Annual Average Daily Traffic Volumes

Annual average daily traffic (AADT) is the total of all motorized vehicles traveling in both directions on a roadway on an average day during a given year.

Table 4.1 presents base-year (2010) and projected (2040) traffic volumes on the Higgins Avenue and Madison Street Bridges reported in the *2012 Missoula LRTP*. 2010 volumes reflect existing transportation infrastructure. 2040 volumes incorporate committed and recommended transportation projects identified in the LRTP. The term "committed" refers to transportation projects with dedicated funding. The term "recommended" refers to transportation projects that may require further analysis before being committed to implementation. Volumes listed in Table 4.1 were produced by the Missoula TransCAD model, a travel demand forecasting software program. Volumes do not reflect actual count data.

Table 4.1 AADT Volumes – Higgins Avenue and Madison Street Bridges (2010 and 2040)

Year	Condition	Higgins Avenue Bridge AADT Volumes	Madison Street Bridge AADT Volumes
2010	**Existing**	18,148	12,665
2040	**Existing, Committed, and Recommended**	23,578	22,411

Source: Missoula LRTP Update, 2012.

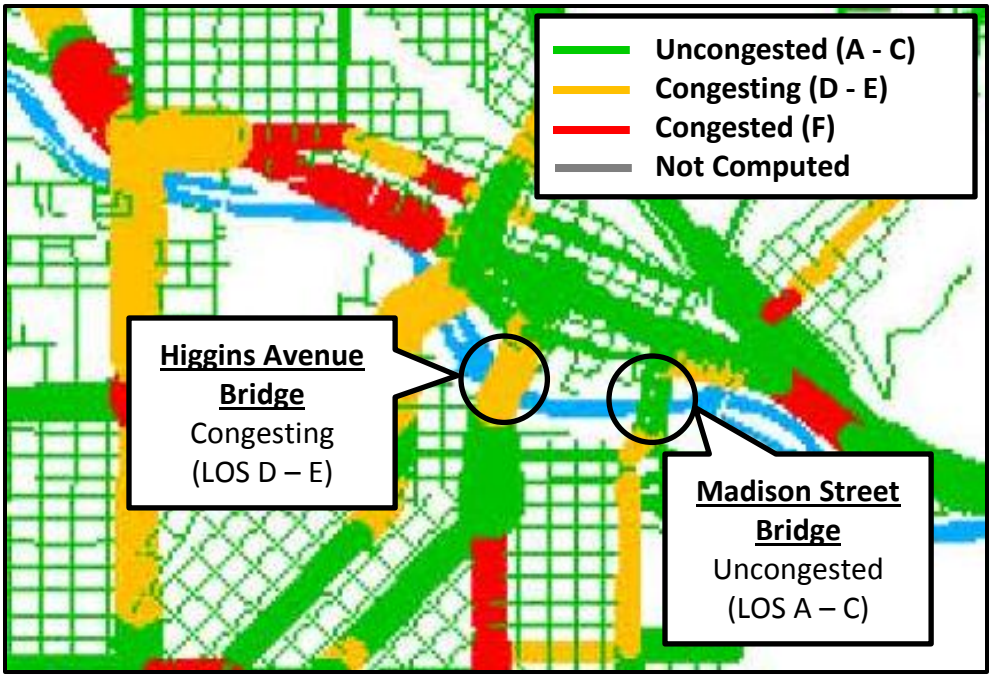
Vehicular Level of Service

Operational conditions on transportation facilities are commonly assessed using the level of service (LOS) concept. LOS is measured on an A to F scale, with LOS A representing the best operating conditions from the traveler's perspective and LOS F representing the worst.

The 2012 Missoula LRTP Update identifies the Higgins Avenue Bridge segment as congesting (LOS D to E) in 2010 and congested (LOS F) in 2040. The LRTP identifies the Madison Street Bridge segment as uncongested (LOS A to C) in 2010 and congesting (LOS D to E) in 2040. Figures 4-4 and 4-5 illustrate bridge segment LOS in 2010 and 2040.

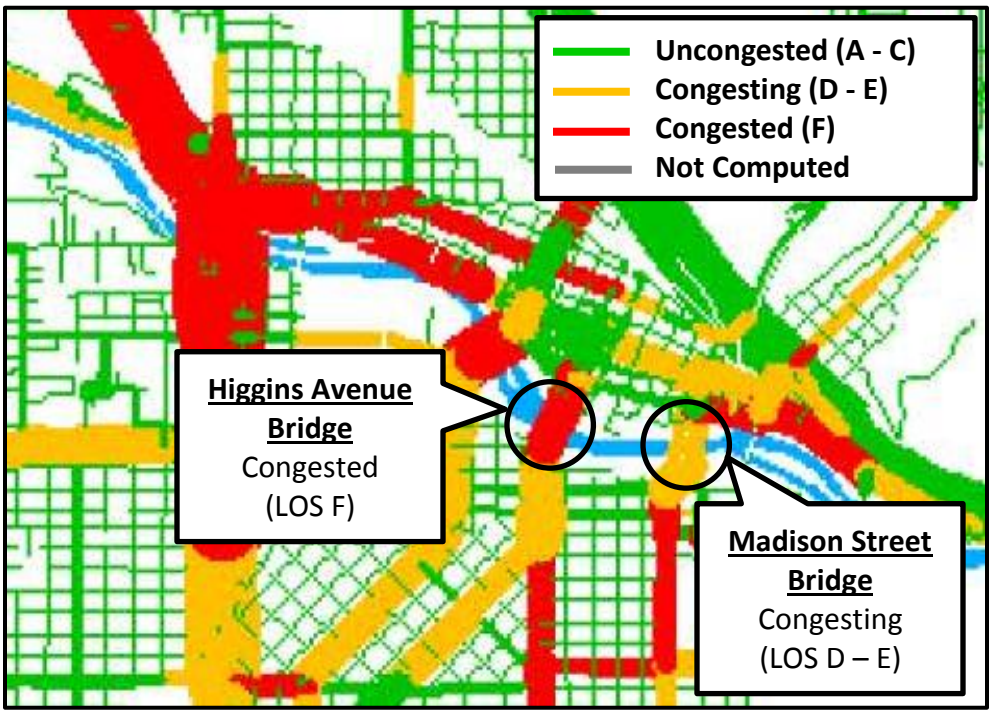
The MDT *Traffic Engineering Manual* defines the desirable target for design of urban principal and urban minor arterials as LOS B, and defines the minimum target for design as LOS C. The Higgins Avenue Bridge currently operates below LOS C, and vehicular operations on the bridge are forecasted to worsen by 2040. The Madison Street Bridge currently operates at LOS C or better, but is expected to fall below LOS C by 2040.

Figure 4-4 Bridge Segment LOS (2010 – Existing)



Source: Missoula LRTP, 2012.

Figure 4-5 Bridge Segment LOS (2040 – Existing, Committed, and Recommended)



Source: Missoula LRTP, 2012.

Bicycle Level of Service

The *Highway Capacity Manual (HCM) 2010* defines LOS for bicycles along roadway segments based on a score relating to bicyclists' comfort and perceived exposure to vehicular traffic. This score considers the following five variables, listed in descending order of importance:

- average effective width of the outside through lane,
- motorized vehicle volumes,
- motorized vehicle speeds,
- heavy vehicle (truck) volumes, and
- pavement condition.

Table 4.2 presents the results of the bicycle LOS analysis for existing (2013) conditions for an average day (Monday – Sunday) along the roadway deck of the Higgins Avenue and Madison Street Bridges.

Table 4.2 Existing Bicycle LOS (2013)

Segment	LOS	
	AM Peak Hour	PM Peak Hour
Higgins Avenue Bridge Northbound	B	B
Higgins Avenue Bridge Southbound	B	B
Madison Street Bridge Northbound	B	B
Madison Street Bridge Southbound	B	B

Source: DOWL HKM, 2013.

The Higgins Avenue and Madison Street Bridges are both rated LOS B for bicycle usage. LOS B corresponds to above-average bicyclist comfort.

4.2. Social and Environmental Conditions

Physical Environment

Soil Resources and Prime Farmland

The study area is within the city limits of Missoula in a primarily urban area. Natural Resources Conservation Service soil mapping indicates there is no prime or unique farmland or farmland of statewide or local importance within the study area.

Geologic Resources

Montana Bureau of Mines and Geology (MBMG) maps indicate the study area is primarily composed of alluvium (i.e., gravel, sand, and silt) of older and active stream channels and floodplains.

Surface Waters

The Higgins Avenue and Madison Street Bridges cross the Clark Fork River, the major water body within the study area. The Missoula Irrigation Ditch parallels the Clark Fork River to the south before veering southwest.

The Clark Fork River is an impaired water body under Section 303(d) of the Clean Water Act. Montana Department of Environmental Quality (DEQ) total maximum daily loads (TMDL) standards and potential impacts to water quality would need to be considered if improvement options are forwarded from this study.

The Clark Fork River is a Water of the U.S. and falls within the jurisdiction of USACE under Section 404 of the Clean Water Act. It is considered a navigable waterway by the State of Montana from Deer Lodge, Montana, to the Idaho state line. Jurisdiction of the irrigation ditch has not been determined. The study area is also located within the Missoula Municipal Separate Storm Sewer System (MS4).

Wetlands

National Wetland Inventory (NWI) mapping for the study area indicates freshwater forested/shrub wetlands may be present west of the Higgins Avenue Bridge. NWI maps are based on aerial and satellite imagery and have not been field verified. Future wetland delineations would be required if bridge improvements include work within the Clark Fork River or other Waters of the U.S. Unavoidable impacts to wetlands must be compensated through mitigation in accordance with the USACE regulatory requirements. Work within Waters of the U.S., including jurisdictional wetlands, would require a Clean Water Act 404 permit (USACE).

Floodplains

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Missoula (FEMA 2013) indicate a portion of the study area is within the 100-year floodplain of the Clark Fork River. The City of Missoula is currently in the process of adopting updated floodplain boundaries within the study area. The City of Missoula Floodplain Administrator is responsible for administering the floodplain management requirements in Missoula. If improvement options are forwarded from this study, impacts to floodplains would need to be identified and evaluated. Project development would require coordination with the City of Missoula to minimize floodplain impacts and obtain necessary floodplain permits.

Groundwater Resources

The Missoula Aquifer is a shallow, unconfined aquifer extending from the Clark Fork River at Hellgate Canyon to the Bitterroot River. The saturated portion of the aquifer averages eighty feet in thickness, and the depth below the surface to water (static water level) varies from 10 to 40 feet. According to the MBMG Groundwater Information Center, public water supply well depths within the study area range from 130 to 200 feet, with static water levels between 30 and 55 feet. The Missoula Aquifer is the sole or principal source of drinking water in the Missoula area and was designated as a Sole Source Aquifer by the U.S. Environmental Protection Agency (USEPA) in 1988. Any improvement options forwarded from this study must meet the provisions found in the 1994 Missoula Aquifer Protection Ordinance, and would be subject to USEPA review if federally funded.

Hazardous Materials

DEQ and Montana Natural Resources Information System (NRIS) records indicate 10 underground storage tanks (UST) in the study area. Of these, three have been reported as leaking, with petroleum releases occurring at three of the sites. The study area is also located within the Petty Creek and Woodman mining districts. If improvement options are forwarded from this study, further evaluation may be needed at specific sites to determine the potential for encountering contaminated soils or groundwater during construction. If contaminated soils or groundwater is encountered during construction, handling and disposing of the contaminated material would be conducted in accordance with applicable federal, state, and local laws and regulations.

Air Quality

The Missoula urban area was designated as non-attainment for particulate matter (PM_{10}) in 1991. The study area is located within the PM_{10} non-attainment area. Missoula was also designated as a non-attainment area for carbon monoxide (CO) in 1991. It was redesignated as a CO maintenance area in August 2007. Any improvement options forwarded from this study would need to demonstrate compliance with federal and state requirements.

Biological Resources

Biological Community

The study area is located within the intermountain grassland ecosystem at an elevation of 3,209 feet above mean sea level. The landscape within the study area has been largely altered, with the majority of native vegetation replaced with hard surfaces or urban landscaping. Native vegetation is primarily found along the Clark Fork River corridor.

The Montana Natural Heritage Program (MNHP) database indicates a number of mammals, birds, amphibians, and reptiles have been observed within the study area vicinity. Several bird species found in the area are protected under the Migratory Bird Treaty Act. Cliff swallow nests have been observed under the Madison Street Bridge. Cliff swallows may also nest under the Higgins Avenue Bridge. Osprey have been observed outside of the study area in the McCormick Park Ball Field just west of the Orange Street Bridge. Restrictions on construction activities potentially affecting occupied nests during the May 1st to August 15th breeding period would need to be considered if improvement options are forwarded from this study. This may include restrictions on vegetation removal and structure modification.

Aquatic Resources

Fifteen fish species are known to occur in the Clark Fork River within the study area. Occurrence of these species ranges from rare to abundant. Abundant and common species include largescale sucker, longnose sucker, longnose dace, mountain whitefish, and rainbow trout. Effects on aquatic resources would need to be considered if improvement options are forwarded from this study.

Threatened and Endangered Species

Seven threatened, proposed threatened, and candidate animal and plant species occur in Missoula County. Of these, bull trout is most likely to occur within the study area. The Clark Fork River is designated as critical habitat for bull trout. MNHP data shows recent observations of yellow-billed cuckoo outside of the study area on Beckwith Street, Myrtle Street, and Tower Street. The yellow-billed cuckoo may use cottonwood/willow habitat along the Clark Fork River within the study area as it migrates to more suitable breeding habitat; however, it is not likely to stay in the study area. Coordination with USFWS and an evaluation of potential impacts to all endangered, threatened, proposed, or candidate species would need to be completed during the project development process for any improvement options forwarded from this study.

Species of Concern

Seventeen state species of concern have been documented by the MNHP within the study area vicinity as of March 26, 2013 (not counting federally-listed species). An evaluation of potential impacts to all species of concern would need to be completed during the project development process if improvement options are forwarded from this study.

Noxious Weeds

Four noxious weeds are prevalent in the study area, including Dalmatian toadflax, leafy spurge, spotted knapweed, and sulfur cinquefoil. Any improvement options forwarded from this study would need to follow federal, state, and local noxious weed laws and regulations during construction. Coordination with the Missoula County Weed District would need to be conducted during project development to minimize noxious weed impacts.

Social Conditions and Cultural Resources

Population and Growth

According to the 2010 Census, Missoula County was the second most populous county in Montana with 109,299 residents. For the last half century, population growth in the county has continued to outpace both the nation and the state. High population growth in Missoula County is expected to continue, with a projected population above 140,000 by 2030 (Montana Department of Commerce, 2012).

All Census tracts within Missoula County increased in population from 1990 to 2000, with the exception of the Missoula City Center which decreased by 155 people (6.9 percent). Urban and rural populations continued to grow in most Census tracts from 2000 to 2012, although the rate of growth slowed from 1990-2000 levels. The combined urban Census tract population in Missoula increased 17.7 percent from 1990-2000, and 14.4 percent from 2000-2010.

Population Demographics

As of the 2010 Census, 93 percent of Missoula County identified as White, with American Indian and Alaska Native individuals comprising 2.6 percent of the population. A number of other races make up the remainder of the population.

The population in Missoula County is aging, consistent with national trends. A 2035 MDT population model projects a substantial increase in the proportion of the population over age 65, as compared to the proportion of the 2035 population under the age of 18.

Employment and Income

The UM dominates employment in the area. The public sector is a primary employer for the Missoula area, including a large number of jobs in the public school system, Missoula County, the U.S. Forest Service, and the City of Missoula. Large private employers include St. Patrick Hospital and Community Medical Center. In the coming decades, employment gains are

projected in office and health service occupations. Production occupations and farm, fishing, and forestry occupations are anticipated to stagnate or decrease by 2030.

Unemployment in Missoula County has closely tracked statewide conditions for the last 10 years, with unemployment numbers increasing from 2007 to 2010. Both Montana and Missoula County have fared relatively well in comparison to the nation as a whole, with unemployment rates (at approximately 7.0 percent) below the national average (at approximately 9.0 percent).

Environmental Justice

Potential impacts related to Title VI of the Civil Rights Act of 1964 and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, would need to be considered if improvements options are forwarded from this study.

Land Ownership and Land Use

Cadastral maps for Missoula show land within the study area is held in private ownership, or is owned by the City of Missoula or the UM.

The study area is within the Missoula city limits. According to NRIS, the study area is predominately urban with low- and high-density residential and commercial areas. Public open space and parks within the study area are primarily found along the Clark Fork River corridor.

Recreational Resources

The Clark Fork River and adjacent lands provide a variety of recreational opportunities within the study area. Recreational opportunities on the Clark Fork River include fishing, floating, and boating. Brennan's Wave, just west of the Higgins Avenue Bridge, is an engineered whitewater feature used by kayakers. Multiple public open spaces and parks are located along the river corridor. The Ron MacDonald River Trail System parallels both banks of the Clark Fork River within the study area. Outside the study area, the river trail system connects to the Kim Williams Trail (to the east) and the Milwaukee Trail and the Bitterroot Branch Trail (to the west).

Caras Park, the Clark Fork Natural Area, Bess Reed Park, Brennan's Wave, John Toole Park, Jeanette Rankin Park, Kiwanis Park, and the Ron MacDonald River Trail System (excluding portions funded with Community Transportation Enhancement Program [CTEP] funds), may be protected under Section 4(f) of the U.S. Department of Transportation Act of 1966. Caras Park and Kiwanis Park received funds from the National Land and Water Conservation Fund Act, known as Section 6(f). Potential effects on recreational use would need to be considered in accordance with Section 4(f) and Section 6(f) protections if improvement options are forwarded from this study.

Cultural Resources

The study area contains portions of three historic districts listed on the National Register of Historic Places (NRHP), including the Downtown Historic District, the Southside Historic District, and the University Area Historic District. Approximately 297 individual properties within the Downtown Historic District have been listed or are eligible for listing on the NRHP. A number of individual properties within and outside of the three districts have also been listed or are eligible for listing on the NRHP. Individually-listed properties near the Higgins Avenue Bridge include the Wilma Building and the Milwaukee Depot. In addition to protections granted under the National Historic Preservation Act (NHPA), these districts and properties are also protected under Section 4(f) of the Transportation Act due to their historic significance.

No records of archaeological sites were identified within the study area.

According to the Montana State Historic Preservation Office (SHPO) and MDT, neither the Higgins Avenue Bridge nor the Madison Street Bridge have been surveyed or recorded as historic properties. Both bridges, along with other potential properties in the study area (including the Missoula Irrigation Ditch and the old Milwaukee Road that parallel the south side of the Clark Fork River), would need to be surveyed and assessed for eligibility in accordance with Section 106 of the NHPA if bridge improvement options are forwarded from this study. Concurrence from the Montana SHPO on eligibility determinations would need to be requested. Indirect impacts (such as visual, noise, and access impacts) to eligible or listed properties would also need to be considered.

Noise

The study area is located within an urban environment. Sensitive receptors, such as residences, are located within the study area and several are within 1,000 feet of the Higgins Avenue and Madison Street Bridges. Any proposed bridge improvements forwarded from this study that include substantial vertical or horizontal alignment alterations or the addition of through-traffic lanes would need to evaluate potential noise effects consistent with FHWA requirements and MDT policy.

Visual Resources

The study area is characterized as urban, with low- and high-density residential areas, commercial areas, a transportation network of roadways and bridges, public open space, and parks. The Clark Fork River bisects the study area from east to west. A narrow riparian corridor of primarily cottonwood and willow extends on both sides of the Clark Fork River. Landscaped public city parks extend beyond the riparian corridor to the north and south, transitioning into the more developed historic downtown and south side commercial/residential districts. Mount Sentinel is visible to the southeast and Mount Jumbo visible to the northeast.

5.0 NEEDS AND OBJECTIVES

Needs and objectives for the *Missoula Bridges Planning Study* are based on existing and projected conditions within the study area, comments from members of the public and resource agencies, and input from the study advisory committee. The following needs and objectives are intended to reflect MDT and community desires to maintain and ideally improve connectivity, safety, accessibility, and capacity where practicable given physical constraints and funding availability. Needs and objectives serve as the primary basis for identification of bridge improvement options. Needs, objectives, and other considerations are listed below.

Need 1: Maintain equivalent connectivity at the two river crossings.

Objectives

To the extent practicable:

1.a. Provide structurally-adequate bridges that will deliver long-term performance.
1.b. Preserve existing bridge capacity for all users, at a minimum.
1.c. Accommodate non-motorized connectivity.

Need 2: Improve bridge safety and accessibility.

Objectives

To the extent practicable:

2.a. Provide pedestrian and bicycle facilities that meet current MDT guidelines/standards, at a minimum.
2.b. Provide safety features consistent with current MDT design standards.

Other Considerations

The items listed below were considered during the improvement option identification and screening process.

- Impacts to environmental, social, cultural/historic, scenic, and recreational resources and characteristics.
- Construction duration and temporary impacts to traffic operations.
- Structural limitations and remaining service life of existing bridges.
- Funding availability and cost.
- Future growth.
- Locally-adopted plans.

6.0 IMPROVEMENT OPTIONS

Improvement options were identified in cooperation with the advisory committee to address the needs and objectives for this study. Local planning documents were considered during the identification of improvement options. The following sections describe improvement options

for the Higgins Avenue Bridge and the Madison Street Bridge. Additional information is provided in the *Improvement Options Report* (Appendix D).

6.1 Design Criteria

Title 23 USC 109 requires projects on the National Highway System (NHS) to comply with design standards approved by FHWA. FHWA has adopted policies established by AASHTO for NHS facilities. All other MDT projects not on the NHS must be designed in accordance with state laws and standards. MDT has generally adopted AASHTO policies and PROWAG in compliance with the ADA. MDT design standards and guidelines consulted for this study include the *Montana Structures Manual, Road Design Manual, Traffic Engineering Manual*, and *Environmental Manual*, among others. Minimum width specifications do not preclude MDT from considering wider facilities. A design exception is required for facilities narrower than specified minimum widths. MDT considers applicable local standards and guidelines, but must adhere to state and federal requirements.

6.2 Description of Options

Option 1 - Minor Rehabilitation

A minor rehabilitation would extend the service life of the bridges by approximately five to 10 years by providing minor upgrades and repairing deteriorated and damaged elements. The ultimate life span of the bridges would be dependent on the continuing rate of deterioration, extent of repair work, and occurrence of damage from flooding and vehicular accidents. Minor rehabilitation may involve:

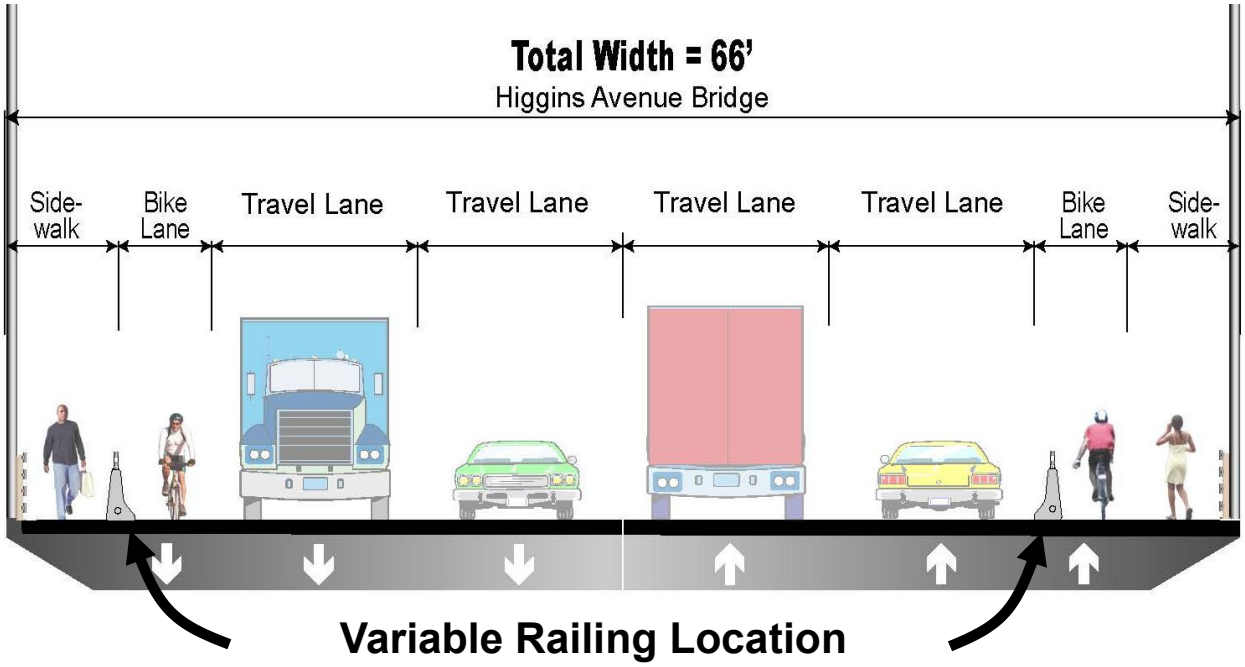
- concrete patching and crack sealing;
- replacement of bridge/pedestrian railings to meet current MDT design standards;
- spot painting of exposed steel members;
- repair or replacement of expansion and contraction joints;
- drainage improvements; and
- removal of center medians/lane restriping to widen bicycle and pedestrian facilities and provide railings.

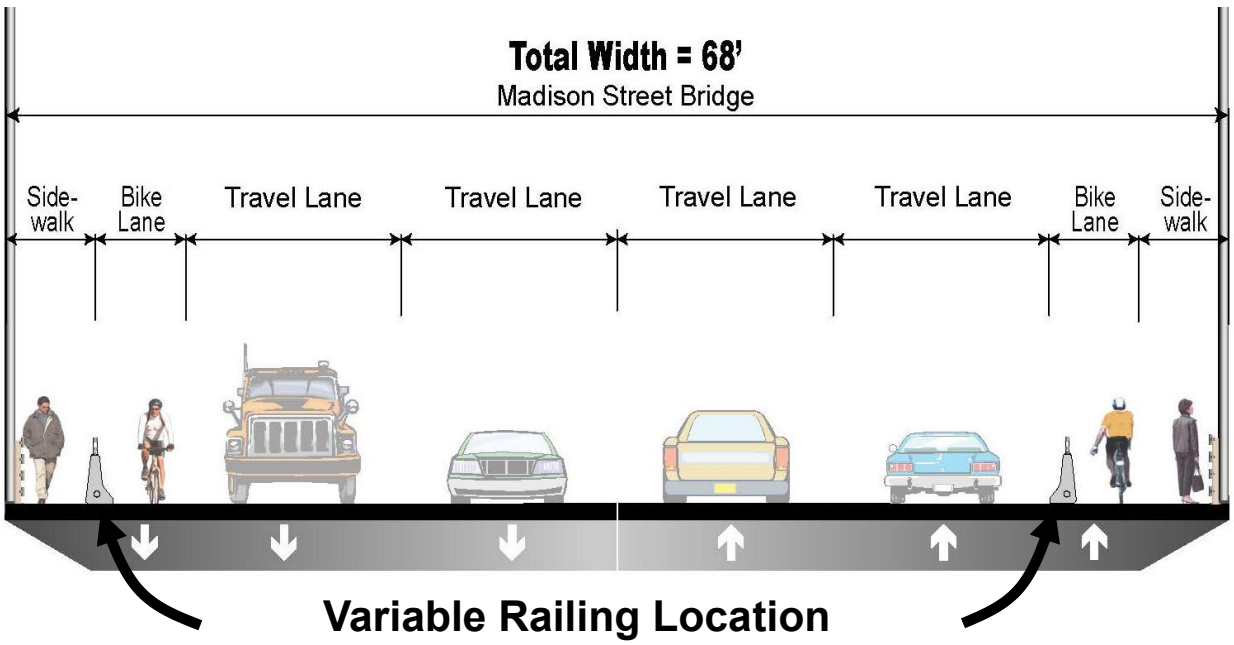
This option would not widen the total deck width for the bridges, which is limited to 66 feet for the Higgins Avenue Bridge and 68 feet for the Madison Street Bridge. Bridge deck width currently occupied by center medians could be redistributed to widen bicycle lanes and sidewalks and provide railings. Current MDT design standards require crashworthy bridge railing topped by pedestrian/bicycle railing at the outside edge of the bridge or where used to separate pedestrians/bicyclists from vehicular traffic.

Ongoing inspection, maintenance, and periodic minor rehabilitation activities would continue to be required.

Figure 6-1 illustrates conceptual cross sections of the existing Higgins Avenue Bridge and the Madison Street Bridge following a minor rehabilitation. Exact travel lane, bicycle lane, and sidewalk widths and the types and locations of railing and lighting features would be determined at the time of a potential future design and construction project following this study.

Figure 6-1 Minor or Major Rehabilitation





Option 2 - Major Rehabilitation (Four Lanes)

A major rehabilitation would extend the service life of the bridges by approximately 25 to 50 years by rehabilitating or replacing important structural elements. As noted for Option 1, the ultimate life span of the bridges would be dependent on the continuing rate of deterioration, extent of repair work, and occurrence of damage from flooding and vehicular accidents. A separate engineering feasibility study and structural analysis would be required to determine the exact scope of work and viability of a major rehabilitation. A major rehabilitation may involve:

- deck overlay or complete deck replacement;
- substructure repairs, including
    - concrete demolition/replacement and surface restoration,
    - sandblasting and painting of exposed steel members, and
    - replacement of bearing devices;
- replacement of bridge/pedestrian railings to meet current MDT design standards;
- repair or replacement of expansion and contraction joints;
- drainage improvements; and
- removal of center medians/lane restriping to widen bicycle lanes and sidewalks and provide railings.

Deck widening is desirable to provide additional width for sidewalks and bicycle lanes. A separate engineering feasibility and structural analysis would be needed to verify if the bridge deck can be widened. Both the Higgins Avenue Bridge and Madison Street Bridge consist of two steel plate girders in each direction of travel that are continuous over their intermediate supports. Widening a bridge of this type could overload the existing girders or limit future use or modification due to diminished capacity of the structural elements. Furthermore, the existing substructure of each bridge (including pier caps, piers, bents, and other foundation elements) have been sized to support the existing bridge decks. Widening the decks may prove undesirable if the additional loading demand exceeds the foundation capacity. Should foundation capacity be exceeded, the result would likely be a significant increase in the construction scope, which could ultimately approach the cost of a bridge replacement project. An engineering feasibility study and structural analysis is outside the scope of this planning study.

Figure 6-1 illustrates conceptual cross sections of the existing Higgins Avenue Bridge and the Madison Street Bridge following a major rehabilitation, while maintaining the existing deck width. Exact travel lane, bicycle lane, and sidewalk widths and the types and locations of railing and lighting features would be determined at the time of a potential future project following this study.

As with Option 1, ongoing inspection, maintenance, and periodic minor rehabilitation activities would continue to be required.

Option 3A – Bridge Replacement (Four Lanes)

Option 3A would replace the existing Higgins Avenue Bridge and Madison Street Bridge with new four-lane structures. A new bridge would provide an estimated service life of 75 to 100 years.

Each bridge could be constructed using methods and structure types commonly used throughout Montana. Substructures could consist of pile or drilled shaft foundations supporting cast-in-place concrete pile caps, pier walls, or hammerhead caps. Superstructures could range from steel plate girders to pre-stressed concrete girders supporting cast-in-place concrete deck slabs. A new bridge would include bridge/pedestrian/bicycle railings. These types of construction methods and structures were assumed for this study.

Design and construction of a new bridge would provide an opportunity for a wider bridge deck, ranging up to 92 feet for the Higgins Avenue Bridge and 96 feet for the Madison Street Bridge. Option 3A would continue to provide two opposing vehicular travel lanes in each direction and could be separated by a center median. Where width is available, a center median may be desirable to provide separation from opposing traffic to minimize head-on crashes, to aid emergency vehicle navigation by providing additional room to bypass vehicles in the travel lane, and to facilitate snow removal operations.

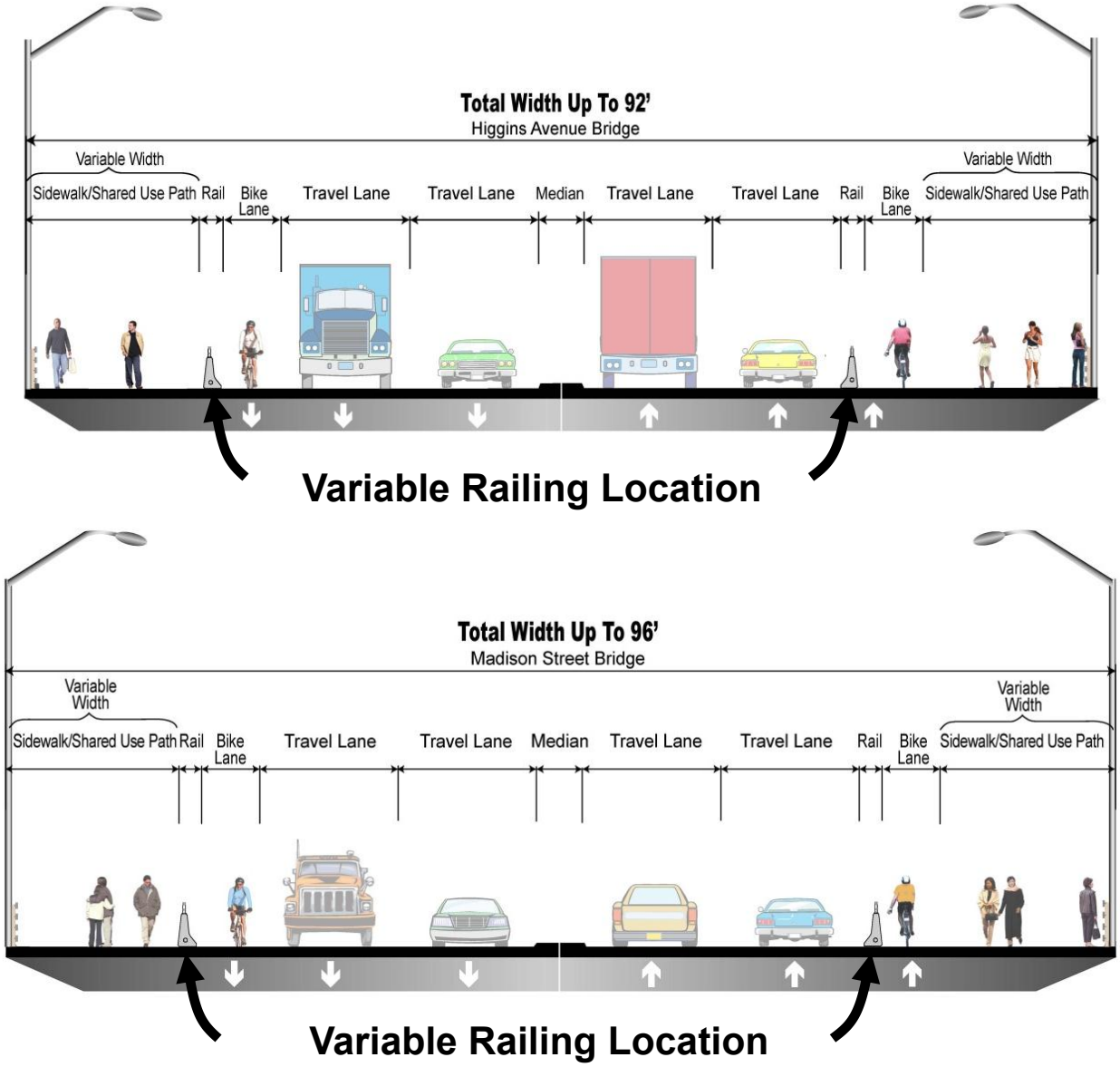
Non-motorized facilities could include dedicated bicycle lanes and sidewalks or shared use paths, which would meet or exceed current MDT design standards for width. A shared use path is intended for bi-directional use by pedestrians, bicyclists, and other non-motorized users, whereas sidewalks are intended exclusively for pedestrians. Sidewalk widths could range from a minimum of five feet up to eight feet, while shared use paths could range from 10 feet to 14 feet in width. The ultimate width of non-motorized facilities is dependent on context, volume, and mix of uses, and would be determined at the time of a potential future design and construction project following this study.

Option 3A would remove the grade-separated bicycle/pedestrian bridge at Madison Street during construction. The grade-separated bridge could be reconstructed or replaced with a new grade-separated bridge depending on design considerations such as grade and vertical clearance of the main bridge. MDT is committed to maintaining non-motorized function and connectivity at the Madison Street river crossing. A new Higgins Avenue Bridge could possibly be designed to accommodate a future grade-separated bicycle/pedestrian bridge similar to the facility provided at Madison Street. The general configuration for each structure would be determined at the time MDT nominates a future design and construction project.

Exact travel lane, bicycle lane, and sidewalk widths and the types and locations of amenities, railing, and lighting features would be determined during the design of a future construction project.

Figure 6-2 illustrates conceptual cross sections of the Higgins Avenue Bridge and Madison Street Bridge following a four-lane bridge replacement. These concepts illustrate the maximum width considered for Option 3A.

Figure 6-2 Bridge Replacement (Four Lanes)



Option 3B – Bridge Replacement (Six Lanes)

Option 3B would replace the existing Higgins Avenue Bridge and Madison Street Bridge with new structures capable of accommodating a total of six vehicular travel lanes (three opposing lanes in each direction). Under this option, the new bridge deck could range in width up to 114 feet for the Higgins Avenue Bridge and up to 120 feet for the Madison Street Bridge. Each new bridge structure would have an estimated design life of 75 to 100 years.

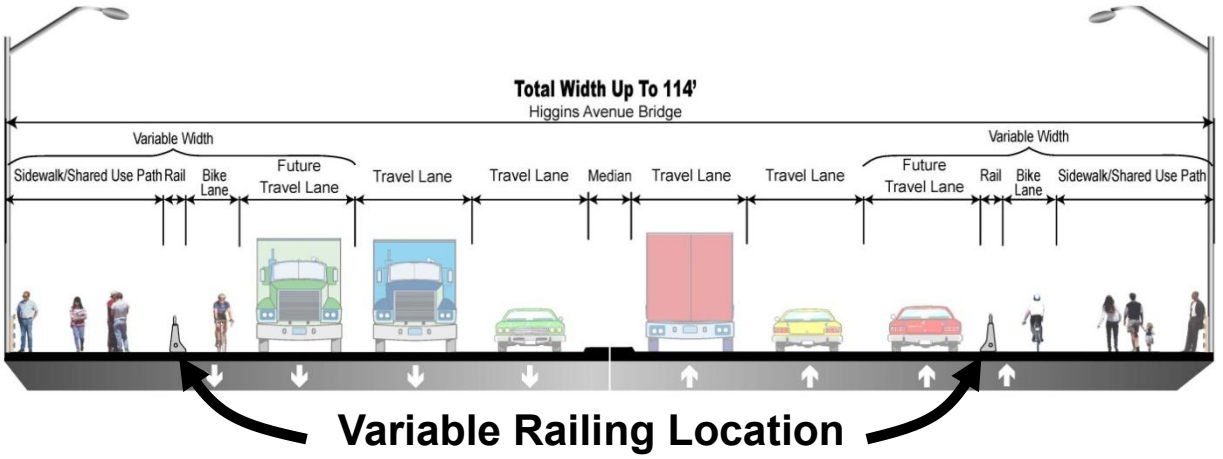
This option is intended to expand bridge capacity. Bridge capacity refers to the physical width allotted for vehicular travel lanes, bicycle lanes, and sidewalks. The *2012 Missoula LRTP* documents growing vehicular demand on the Higgins Avenue Bridge and on the Madison Street Bridge through the 2040 planning horizon. A bridge with six vehicular travel lanes is expected to improve vehicular operations compared to the current four-lane configuration.

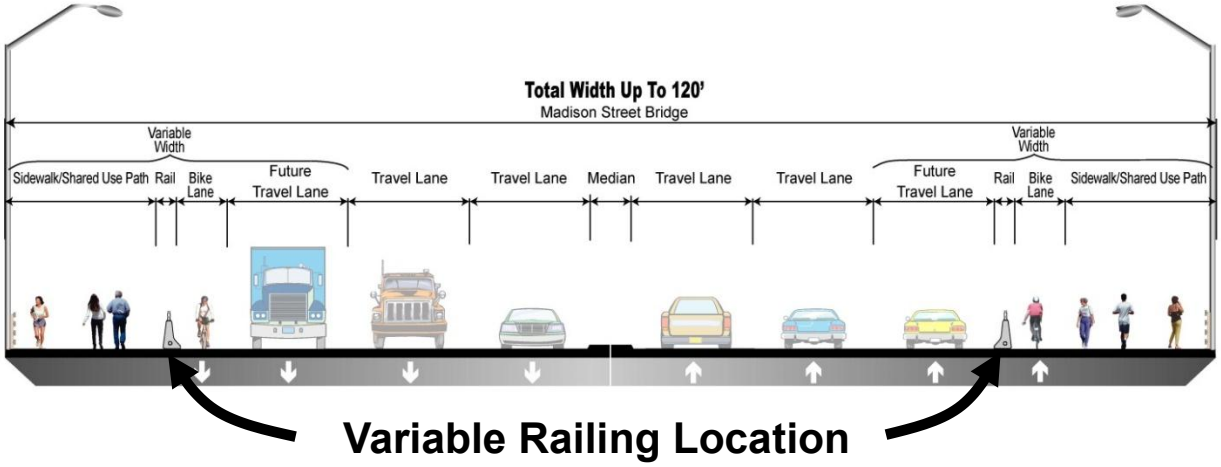
For this study, Option 3B exclusively addresses bridge replacement. It does not include widening Higgins Avenue or Madison Street to provide six travel lanes north and south of the bridges, or construction of transition sections to the existing four-lane roadways. Initially, a new bridge structure could be striped to provide two opposing vehicular travel lanes in each direction separated by a center median (four total vehicular lanes), with non-motorized facilities occupying the remainder of the bridge deck. Option 3B would preserve MDT's ability to expand bridge capacity as necessary to address future traffic demands, at which time a six-lane configuration could be implemented.

Exact travel lane, bicycle lane, and sidewalk widths and the types and locations of amenities, railing, and lighting features would be determined during the design of a future construction project.

Figure 6-3 illustrates a conceptual cross section of the Higgins Avenue Bridge and Madison Street Bridge following a six-lane bridge replacement. These concepts illustrate the maximum width considered for Option 3B.

Figure 6-3 Bridge Replacement (Six Lanes)





Options Not Considered

Major Rehabilitation (Two Lanes)

Members of the public expressed interest in a two-lane option for the Higgins Avenue Bridge. Improvement options were identified with the intent of addressing bridge needs and objectives, which are based on best available data, comments from members of the public and resource agencies, and input from the study advisory committee. This study identifies a need to maintain connectivity equivalent to the two existing river crossings and to preserve existing bridge capacity. This need was primarily identified based on the *2012 Missoula LRTP*, which documents growing vehicular demand on the Higgins Avenue Bridge and Madison Street Bridge through the 2040 planning horizon. These demand projections indicate a need to preserve the existing number of travel lanes on each bridge.

A two-lane configuration on Higgins Avenue could be assessed through a separate analysis initiated by the City of Missoula, in coordination with MDT and FHWA. Following the *Missoula Bridges Planning Study*, potential project nomination for the Higgins Avenue Bridge will likely take several years, allowing time for the City of Missoula to consider alternative lane configurations on Higgins Avenue and potential impacts to the roadway network. Options presented in this study would not preclude consideration of alternative lane configurations in the future. With any future project, MDT would maintain, at a minimum, the total existing bridge width.

No Build Option

A No Build Option was not considered for this study. For the reasons outlined in the *Existing and Projected Conditions Report*, MDT recognizes the Higgins Avenue Bridge and Madison Street Bridge are both in need of rehabilitation or replacement. A No Build Option would not address the bridge needs and objectives for all users, including pedestrians, bicyclists, and vehicles.

If MDT nominates a design and construction project in the future, a No Build Option would be considered during the environmental process in compliance with NEPA as a baseline for comparison against the proposed action.

6.3 Improvement Option Screening

Screening criteria are based on bridge needs, objectives, and other considerations identified through coordination with MDT, the study advisory committee, and members of the public. The following sections discuss screening criteria and outcomes.

Structural Adequacy

The *Existing and Projected Conditions Report* for this study notes the Higgins Avenue Bridge and the Madison Street Bridge both are ranked "poor" by MDT for structure condition and deck condition performance measures. The Higgins Avenue Bridge deck is rated four out of nine, indicating advanced deterioration. The Madison Street Bridge deck is rated three out of nine, indicating deterioration that has seriously affected primary structural components. Without improvements, the bridges will continue to deteriorate and may no longer be able to remain in service.

MDT is committed to maintaining equivalent connectivity at the existing Higgins Avenue and Madison Street river crossings. Viable options must provide a structurally-adequate bridge to continue serving the traveling public.

Table 6.1 describes screening outcomes for the structural adequacy criterion for the Higgins Avenue Bridge and Madison Street Bridge.

Table 6.1 Screening Results for Criterion 1

Option	Criterion 1: Structural Adequacy To the extent practicable, will the option provide a structurally-adequate bridge?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	No. A minor rehabilitation would not address existing structural deficiencies.	
2	Yes. A major rehabilitation is expected to address existing structural deficiencies by providing a deck overlay or replacement and repairing substructure elements.	
3A	Yes. A new four-lane bridge would be designed and constructed to meet current MDT design standards.	
3B	Yes. A new six-lane bridge would be designed and constructed to meet current MDT design standards.	

Bridge Capacity

Bridge capacity refers to the physical width allotted for vehicular travel lanes, bicycle lanes, and sidewalks. The *2012 Missoula LRTP* documents growing vehicular demand on the Higgins Avenue Bridge and on the Madison Street Bridge through the 2040 planning horizon. These demand projections indicate a need to preserve, at a minimum, the existing number of travel lanes for vehicles.

Public feedback and published planning documents (including the *Missoula Greater Downtown Master Plan*) indicate a local desire for non-motorized facilities to serve current and future pedestrian and bicyclist demand. Accordingly, options must preserve existing bridge capacity for all users, at a minimum.

Table 6.2 describes outcomes for this screening criterion.

Table 6.2 Screening Results for Criterion 2

Option	Criterion 2: Bridge Capacity To the extent practicable, will the option preserve existing bridge capacity for all users, at a minimum?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	Yes. A minor rehabilitation would preserve the total existing bridge deck width. This option would maintain four travel lanes (two in each direction). The existing center median would be removed to provide additional width for bicycle lanes, sidewalks, and railings.	
2	Yes. A major rehabilitation would preserve the total existing bridge deck width. This option would maintain four travel lanes (two in each direction). A separate engineering feasibility study and structural analysis would be needed to verify what reserve capacity (if any) would be available to support deck widening. The existing center median would be removed to provide additional width for bicycle lanes, sidewalks, and railings.	
3A	Yes. A new four-lane bridge would be designed and constructed to exceed the existing bridge deck width. This option would provide four travel lanes, center medians, bicycle lanes, and sidewalks/shared use paths that meet current MDT design standards, at a minimum.	
3B	Yes. A new six-lane bridge would be designed and constructed to exceed the existing bridge deck width. This option would provide six travel lanes, center medians, bicycle lanes, and sidewalks/shared use paths that meet current MDT design standards, at a minimum.	

Non-motorized Connectivity

The Higgins Avenue Bridge and Madison Street Bridge are high-use corridors for bicyclists and pedestrians, providing connections between the north and south sides of the Clark Fork River, including residential and commercial developments and the UM. Each bridge also provides connections with trail systems and public parks located along both banks of the river. MDT is committed to maintaining the function and connectivity of existing pedestrian and bicycle facilities on each of the bridges. Specific non-motorized connections between the bridges and riverfront trails will be considered at the time of a potential future design and construction project.

Table 6.3 describes outcomes for this screening criterion.

Table 6.3 Screening Results for Criterion 3

Option	Criterion 3: Non-motorized Connectivity To the extent practicable, will the option maintain non-motorized function/connectivity?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	Yes. A minor rehabilitation would maintain the function and connectivity of existing non-motorized facilities.	
2	Yes. A major rehabilitation would maintain the function and connectivity of existing non-motorized facilities.	
3A	Yes. A new four-lane bridge would maintain the function and connectivity of existing non-motorized facilities.	
3B	Yes. A new six-lane bridge would maintain the function and connectivity of existing non-motorized facilities	

Non-motorized Guidelines/Standards

According to existing bridge plans, bicycle lanes and/or sidewalks on the Higgins Avenue and Madison Street Bridges do not meet current MDT design guidelines and standards for five-foot minimum widths. Roadside curbs and railings further reduce the usable width of non-motorized facilities. MDT considers applicable local standards and guidelines for sidewalk and bicycle lane widths, but must adhere to state and federal requirements. Minimum width requirements do not preclude MDT from considering wider facilities.

Under Options 1 and 2, the existing Higgins Avenue Bridge and Madison Street Bridge decks do not provide sufficient width to meet minimum MDT guidelines/standards for sidewalks, bicycle lanes, railings, and vehicular travel lanes. Width currently occupied by center medians could be redistributed to widen bicycle lanes and sidewalks, although width for railings would also need to be accommodated. Additional design solutions should be explored if a project moves forward. For Option 2, a separate engineering feasibility study and structural analysis would be needed to verify any capacity that may be available to support deck widening.

Options 3A and 3B would provide non-motorized facilities that meet or exceed current MDT design standards.

Table 6.4 describes outcomes for this screening criterion.

Table 6.4 Screening Results for Criterion 4

Option	Criterion 4: Non-motorized Guidelines/Standards Will the option provide pedestrian/bicycle facilities that meet current MDT standards, at a minimum?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	No. The existing Higgins Avenue Bridge and Madison Street Bridge decks do not provide sufficient width to meet minimum MDT guidelines/standards for sidewalks, bicycle lanes, railings, and vehicular travel lanes, even with removal of center medians.	
2	Unknown. A separate engineering feasibility study and structural analysis would be needed to determine what reserve capacity (if any) would be available to support deck widening. In addition to removal of center medians, deck widening would be needed to meet minimum MDT guidelines/standards for sidewalks, bicycle lanes, railings, and vehicular travel lanes. The types and locations of pedestrian, bicycle, and railing features would be determined at the time of a potential future project following this study.	
3A	Yes. This option would provide usable widths for bicycle lanes and sidewalks/shared use paths that meet or exceed current MDT guidelines/standards.	
3B		

Safety Features

Bridge railings perform an important safety function by redirecting errant vehicles back into the travel way. They can also be used to separate vehicular traffic from pedestrians and/or bicyclists. Existing railings on the Higgins Avenue Bridge and on the Madison Street Bridge do not meet current MDT design standards for type and minimum height. MDT is committed to providing safety features consistent with current MDT design standards, where practicable.

Center medians are also considered a safety feature because they provide separation from opposing traffic. Because Options 1 and 2 are assumed to be limited to the existing bridge width, these options would remove the existing center medians in favor of widening bicycle lanes and sidewalks. Continuous center medians are not included along the entire length of Higgins Avenue or along Madison Street, and therefore their removal from the bridges is not likely to alter driver expectancy. For Options 1 and 2, it is not practicable to provide center medians in combination with providing additional width for bicycle lanes, sidewalks, and railings.

Table 6.5 describes outcomes for this screening criterion.

Table 6.5 Screening Results for Criterion 5

Option	Criterion 5: Safety Features To the extent practicable, will the option provide safety features consistent with current MDT design standards?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	Yes. A minor rehabilitation would provide railings that meet current MDT design standards. The option would remove the existing center median to provide additional width for bicycle lanes and sidewalks, which is not anticipated to alter driver expectancy.	
2	Yes. A major rehabilitation would provide railings that meet current MDT design standards. The option would remove the existing center median to provide additional width for bicycle lanes and sidewalks, which is not anticipated to alter driver expectancy.	
3A	Yes. A new four-lane bridge would provide railings and center medians that meet current MDT design standards.	
3B	Yes. A new six-lane bridge would provide railings and center medians that meet current MDT design standards.	

Potentially-impacted Resources

Protection of the human and natural environments is an important consideration at the pre-NEPA/MEPA planning level. All of the identified improvement options would result in some degree of impact on resources within the study area. The following resources may potentially be impacted by the identified improvement options.

- Surface water bodies, including the Clark Fork River and the Missoula Irrigation Ditch
- Wetland areas
- Floodplains
- Aquatic species
- Federally- and state-listed species and habitat, including critical habitat for bull trout
- Migratory birds
- Vegetation
- Recreational resources
- Cultural resources
- Potential Section 4(f) sites
- Noise levels
- Visual resources
- Community cohesion

Multiple regulatory agencies may have permitting jurisdiction or other involvement in the project development process for improvement options carried forward from this study. Potential regulatory agency jurisdiction/involvement is discussed below. Specific permitting, authorization, and consultation requirements would be identified after a future design and construction project is nominated.

- Section 404 of the Clean Water Act requires permitting through USACE prior to discharging dredged or fill material into Waters of the U.S. or adjacent wetlands. Under Section 404(b)(1) guidelines (40 CFR 230.10), USACE may only permit discharges into Waters of the U.S. that represent the least environmentally damaging practicable alternative (LEDPA), including actions which do not discharge fill material into Waters of the U.S., provided the alternative meets the project purpose and does not have other significant adverse environmental consequences. In this context, the term "practicable" includes consideration of cost, existing technology, and logistics in light of overall project purposes.
- Coordination with USFWS may be required during the project development phase due to possible impacts to federally-listed threatened and endangered species, and possible temporary and/or permanent impacts to the Clark Fork River.
- The Clark Fork River is considered a state navigable water. Any improvements below the low water mark of a navigable water require a Montana Land Use Easement from DNRC.
- The Montana Stream Protection Act (SPA) 124 requires authorization by Montana Fish, Wildlife & Parks (FWP) for any work on the bed or banks of any stream in the state.
- The Montana Floodplain and Floodway Management Act would require a Floodplain Development Permit from the City of Missoula Floodplain Administrator for any new development within the floodplain.
- Construction activities causing short-term or temporary violations of state surface water quality standards for turbidity must obtain 318 Authorization from DEQ. DEQ may review and issue, conditionally issue, deny, or waive water quality certification under Clean Water Act Section 401. DEQ requires coverage under the Montana Pollutant Discharge Elimination System (MPDES) General Permit for Storm Water Discharge Associated with Construction Activity if improvement options would involve one or more acres of ground disturbance.
- The Higgins Avenue Bridge, Madison Street Bridge, and other features within the study area (including the Missoula Irrigation Ditch and the old Milwaukee Road paralleling the south side of the Clark Fork River) would need to be recorded and assessed for eligibility in accordance with Section 106 of the NHPA. Both bridges will fall under the guidelines of the Historic Roads & Bridges Programmatic Agreement should mitigation be necessary. Impacts to historic buildings (such as the Wilma Theater) and historic districts would need to be identified and mitigated in coordination with the Montana SHPO, the City of Missoula Historic Preservation Office, and City of Missoula Historic Preservation Commission.

- Under the Small MS4 General Permit, Missoula is required to regulate the discharge of potential pollutants in storm water runoff within their storm sewer system and develop, implement, and enforce a Storm Water Management Program (SWMP). New development or redevelopment projects greater than or equal to one acre in size must implement, when practicable, low impact development (LID) practices that infiltrate, evapotranspire, or capture for reuse the runoff generated from the first half-inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation.

Option 1 would be the least impactful option. Minor rehabilitation activities may result in minor impacts to cliff swallows and other migratory birds that nest on or adjacent to the bridges during the breeding season.

Impacts under Option 2 would also be minimal. Major rehabilitation of the bridges may impact cliff swallows and other migratory birds. Minor, temporary impacts to the Clark Fork River may result from temporary access within the river to work on bridge substructures.

Options 3A and 3B would have a greater impact to migratory birds that nest in the area due to removal of the existing bridges and longer construction durations. Adjacent vegetation would be impacted. Potential expansion of bridge pier footprints may result in a minor permanent loss of Waters of the U.S. Replacing the bridges would necessitate longer construction durations within the Clark Fork River, potentially impacting bull trout and other aquatic species. Use of the Ron MacDonald Riverfront trail system within the construction areas would be temporarily impacted. Widened bridge structures may involve minor encroachment into potential Section 4(f) resources including but not limited to Caras Park, John Toole Park, and the Wilma Theater. Access across the Clark Fork River via the grade-separated bicycle/pedestrian bridge at Madison Street would also be impacted. Specific impacts would depend on the design of the bridges/transition sections and construction duration/phasing of a potential future project.

Option 3B may result in significant indirect impacts to adjacent resources. Construction of a six-lane bridge may lead to future roadway widening on Higgins Avenue and on Madison Street north and south of the bridges. This widening could impact adjacent historic districts and historic buildings, parks and trails, and residential and commercial developments.

All options would temporarily impact the movement of goods and services due to reduced access across the Clark Fork River. Temporary impacts to recreation may result due to limited river access during construction periods. Potential impacts to community cohesion may occur, such as disruptions to community events and downtown businesses.

Table 6.6 describes outcomes for this screening criterion.

Table 6.6 Screening Results for Criterion 6

Option	Criterion 6: Potentially-impacted Resources Will the option avoid or minimize significant permanent impacts to the natural and human environments?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	Yes. Minor impacts to migratory birds may occur.	
2		
3A	Yes. Minor impacts to migratory birds, Waters of the U.S., bull trout, Caras Park, the trail system, and the Wilma Theater may occur.	Yes. Minor impacts to migratory birds, Waters of the U.S., bull trout, John Toole Park, Missoula Irrigation Ditch, the trail system, and the grade-separated bicycle/pedestrian bridge may occur.
3B	No. Significant indirect impacts to historic buildings/districts, parks/trails, and commercial/residential developments may result from this option.	

Construction Duration and Temporary Impacts

Construction durations for the improvement options identified in this study would vary depending on the scope of work involved. Option 1 would likely require the shortest construction duration, with Options 2, 3A, and 3B requiring longer construction periods. Construction activities may continue year-round, or may be temporarily suspended during winter months. Estimated construction duration ranges for each option, based on standard construction methods, are listed below. Specific construction durations could range above or below these estimates, depending on the defined scope and construction phasing of potential future projects.

Option 1: 4 to 6 months
Option 2: 6 to 18 months
Option 3A: 18 to 24 months
Option 3B: 20 to 30 months

Construction activities on the Higgins Avenue Bridge and on the Madison Street Bridge would temporarily affect vehicular and non-motorized operations and connectivity. To better understand potential traffic impacts within the study area, the City of Missoula Development Services, Transportation Planning Division modeled four closure scenarios, including full and partial closure of the Higgins Avenue Bridge and the Madison Street Bridge. Full closure means the bridge would be removed from service during the defined construction period. A partial closure refers to closure of the existing northbound or southbound travel lanes, sidewalk, and bicycle lane during construction activities. Northbound and southbound vehicular travel would be reduced to one lane in either direction on the remaining open half of the bridge. Pedestrian and bicycle travel would be confined to the existing bicycle lane and sidewalk width on the open half of the bridge. Closure scenarios occurring simultaneously along both the Higgins

Avenue Bridge and the Madison Street Bridge were not modeled, due to anticipated unreasonable traffic impacts to the roadway network.

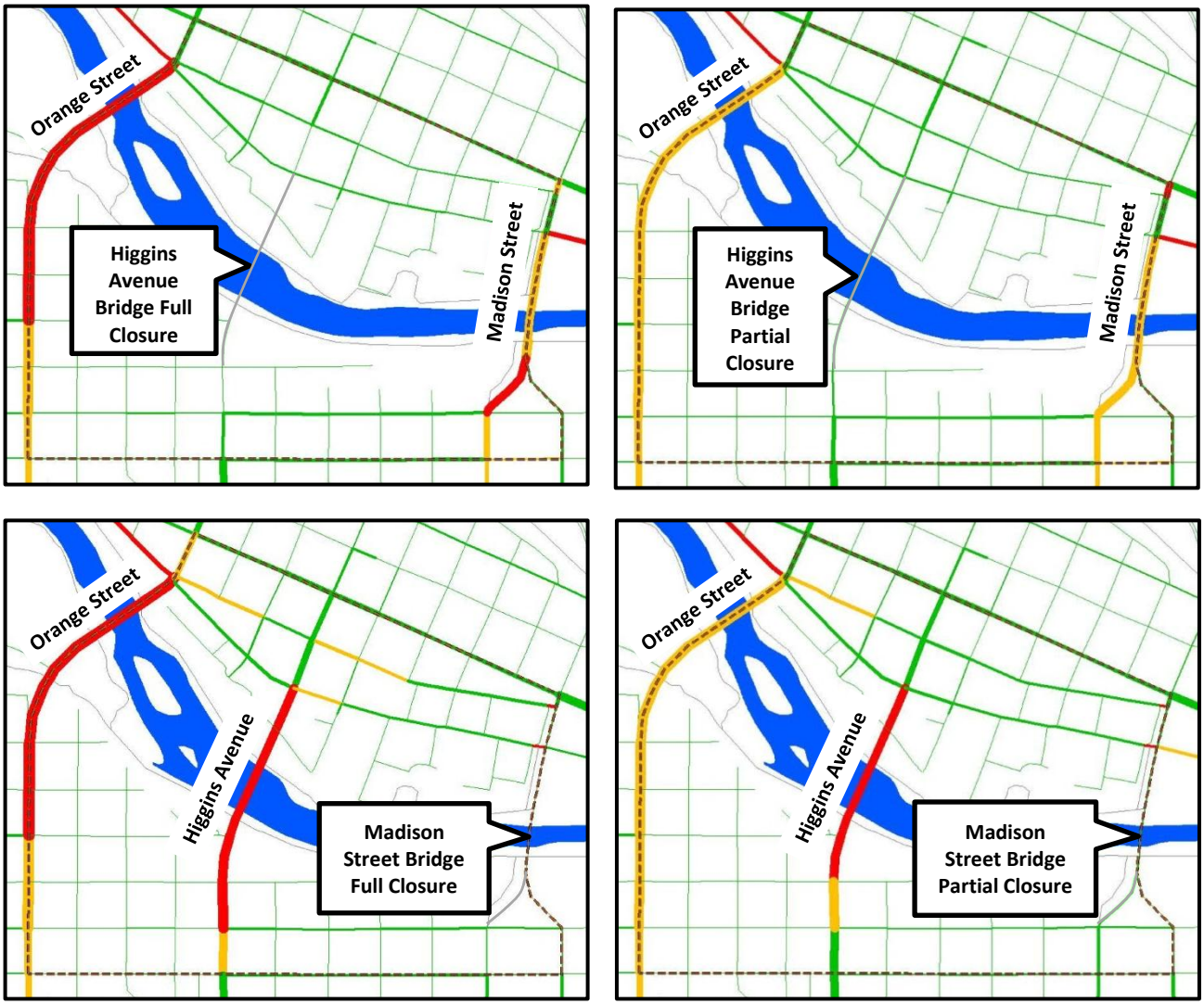
Figure 6-4 illustrates the peak hour segment LOS for vehicles within the study area resulting from the four modeled closure scenarios. LOS is illustrated by color.

- Green indicates an *uncongested* condition (LOS A to C).
- Yellow indicates a *congesting* condition (LOS D and E).
- Red indicates a *congested* condition (LOS F).
- Gray indicates LOS was not calculated for that segment.

During construction, vehicular traffic is expected to shift from fully/partially closed bridges to adjacent river crossings. Within the study area, traffic operations on the Orange Street, Higgins Avenue, and Madison Street river crossings would worsen if either the Higgins Avenue Bridge or the Madison Street Bridge was fully or partially closed for a period of time. Temporary degradation in traffic operations would likely manifest as increased congestion, resulting in more compact traffic flow and delays.

- The Higgins Avenue Bridge full closure scenario is predicted to result in a congested (LOS F) Orange Street Bridge and a congesting (LOS E and D) to congested (LOS F) Madison Street Bridge.
- The Higgins Avenue Bridge partial closure scenario is predicted to result in a congesting (LOS D and E) Orange Street Bridge and Madison Street Bridge.
- The Madison Street Bridge full closure scenario is predicted to result in a congested (LOS F) Orange Street Bridge and Higgins Avenue Bridge.
- The Madison Street Bridge partial closure scenario is predicted to result in a congesting (LOS D and E) Orange Street Bridge and congested (LOS F) Higgins Avenue Bridge.

Figure 6-4 Higgins Avenue and Madison Street Bridge Closure LOS Scenarios



Source: City of Missoula Development Services Transportation Planning, 2013.

Bicycle and pedestrian access would be impacted during construction activities. Temporary partial and full closure of the Higgins Avenue Bridge or the Madison Street Bridge, as well as anticipated temporary full closure of the grade-separated bicycle/pedestrian bridge at Madison Street, may prompt bicyclists and pedestrians to choose alternate routes. Community events at public parks located adjacent to the Higgins Avenue Bridge and Madison Street Bridge (such as the Missoula Farmers Market at Caras Park) may be temporarily disrupted or displaced during construction. Temporary impacts to recreation may also result due to limited river access during construction periods.

To limit the degree of disruption, construction activities could occur through partial closure phases undertaken during separate periods of time for the Higgins Avenue Bridge or the

Madison Street Bridge. While a partial closure may minimize traffic disruptions, it would likely lengthen the total construction duration compared to a full closure scenario. In some instances it may be necessary to close an entire bridge for a period of time while necessary construction activities occur. Construction managers could direct these activities to occur during off-peak time periods to the extent practicable. Construction acceleration options such as double shifts and seven-day work weeks could be considered to shorten construction duration and minimize temporary impacts.

If a design and construction project is nominated in the future, MDT, in coordination with FHWA and the City of Missoula, could develop a mitigation plan for vehicular traffic and non-motorized users during the construction period. This plan could include a variety of measures to attempt to minimize temporary construction impacts. Detours could be used to identify routes around a designated area of prohibited access. For example, traffic could be diverted to the Orange Street Bridge or the Madison Street Bridge during closure of the Higgins Avenue Bridge. A media campaign using radio, television, internet, and newspaper sources could be used to disseminate information on road closures, detours, and any critical updates for the traveling public. Traffic control strategies could include measures such as temporary signal re-timings to optimize traffic flow affected by temporary construction activities and additional traffic/road signs to provide information pertaining to roadway conditions. Specific accommodations and mitigation strategies could be identified to reduce temporary impacts to bicyclists and pedestrians. Measures such as advance warning/guidance signs and protective barriers providing a safe area away from construction activities and motorized vehicles could be used to limit the effects of temporary construction activities on bicyclists and pedestrians. Regardless of the measures implemented, temporary impacts cannot be avoided for any of the identified improvement options. Table 6.7 lists outcomes for this screening criterion.

Table 6.7 Screening Results for Criterion 7

Option	Criterion 7: Construction Duration and Temporary Impacts Will the option minimize construction duration and temporary impacts during construction?	
	Higgins Avenue Bridge	Madison Street Bridge
1	Yes. Measures to minimize construction duration and temporary impacts during construction could be implemented.	
2		
3A		
3B		

Service Life

The traveling public relies on the Higgins Avenue Bridge and the Madison Street Bridge to provide important connections across the Clark Fork River. MDT desires to maintain connectivity at the two river crossings by providing bridges that deliver long-term performance.

For this report, long-term performance is defined as a minimum 25-year service life extension for major rehabilitation and a 75-year service life for bridge replacement options.

Table 6.8 describes outcomes for this screening criterion.

Table 6.8 Screening Results for Criterion 8

Option	Criterion 8: Service Life Does the option deliver long-term performance?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	No. This option would only extend the service life of the bridges by approximately five to 10 years.	
2	Yes. This option is expected to extend the service life of the existing bridges by 25 to 50 years.	
3A	Yes. This option would provide new bridge structures with a service life of approximately 75 to 100 years.	
3B		

Consistency with Local Plans and Public Input

Although there is no local consensus on a preferred improvement option for the Higgins Avenue Bridge or the Madison Street Bridge, consistent themes from public feedback include a desire for wider sidewalks and bicycle lanes (particularly on the Higgins Avenue Bridge); perpetuation of non-motorized connections with the river, trail systems, and parks (particularly the grade-separated bicycle/pedestrian bridge at Madison Street); safe railings; and minimization of impacts to adjacent resources.

Many of these themes are echoed in local plans. The *Missoula 2011 Active Transportation Plan* and the *Missoula Greater Downtown Master Plan* propose increasing the widths of sidewalks and dedicated bicycle lanes and improvements for non-motorized connectivity.

Some members of the public expressed a desire for a reduced number of travel lanes on Higgins Avenue. Others stated a desire to maintain existing bridge capacity. This variance is reflected in local plans, with both four-lane and three- or two-lane Higgins Avenue Bridge configurations illustrated in the *Missoula Greater Downtown Master Plan*. As noted in Section 3.5, this study is based on the best available data from the *2012 Missoula LRTP* indicating a need to preserve existing bridge capacity. None of the options identified in this study would preclude consideration of an alternative lane configuration on Higgins Avenue or other local proposals in the future.

Table 6.9 describes outcomes for this screening criterion.

Table 6.9 Screening Results for Criterion 9

Option	Criterion 9: Consistency with Local Plans and Public Input Is the option consistent with local plans and public input?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	No. Minimal improvements to sidewalks/bicycle lanes/railings and short-term service life extension are not consistent with local plans or public input.	
2	Unknown. A separate engineering feasibility study and structural analysis is needed to determine what reserve capacity (if any) would be available to support deck widening. MDT would consider widening sidewalks/bicycle lanes beyond minimum standards if supported by future analysis. Option would not preclude consideration of alternative lane configurations in the future.	Unknown. A separate engineering feasibility study and structural analysis is needed to determine what reserve capacity (if any) would be available to support deck widening. Option would perpetuate the grade-separated bicycle/pedestrian bridge, consistent with public feedback and local plans.
3A	Yes. This option would provide four travel lanes, dedicated bicycle lanes, and sidewalks/shared-use paths ranging above minimum width standards. The new bridge could be designed to accommodate a future grade-separated bicycle/pedestrian bridge.	Yes. This option would provide four travel lanes, dedicated bicycle lanes, and sidewalks/shared-use paths ranging above minimum width standards. Connections to the river and trail system would be perpetuated.
3B	No. A six-lane facility is not consistent with local plans or public input.	

Cost Effectiveness

Cost is an important consideration at the pre-NEPA/MEPA planning level. An improvement option can be screened from further consideration if it would not be feasible due to excessive cost. An estimated cost may be deemed unreasonable if it is substantially greater than costs for other options that meet bridge needs, objectives, and other considerations. Costly projects are not practicable or feasible due to difficulties in securing funding.

Table 6.10 presents planning-level cost estimates for each option. Estimated costs for improvement options include mobilization, contingencies, preliminary engineering, construction engineering, utilities, and indirect costs of construction. The need for right-of-way acquisition is not anticipated for Options 1, 2, and 3A, and is not included in the estimates. Mobilization refers to costs incurred during the assembling and transportation of equipment, supplies, and personnel to the work site. Contingencies are included to account for unknown factors that may be encountered during design and construction phases. Preliminary engineering refers to work necessary to advance a potential project from the planning stage to

the design and construction phase. Construction engineering refers to implementation and management of the engineering design. The term indirect costs refers to costs not directly associated with the construction project, but incurred during the design and construction process.

The need for right-of-way acquisition is not anticipated for Option 1 (minor rehabilitation), Option 2 (major rehabilitation), or Option 3A (bridge replacement – four lanes). The purchase of additional right-of-way adjacent to the Higgins Avenue Bridge or the Madison Street Bridge may be required for Option 3B (bridge replacement – six lanes) and any features outside the approximate footprint of the existing bridges (such as new ramp connections). Current right-of-way costs range from $25 to $65 per square foot, and average $45 per square foot in the immediate vicinity of the bridges. Potential costs associated with utility relocation (including the communication line running underneath the Higgins Avenue Bridge and lighting on both bridges) would be relatively minor and are included in the cost estimates.

Cost ranges reflect an estimate of potential construction costs based on planning-level assumptions, and should not be considered an actual cost encompassing all scenarios and circumstances. Cost estimates are provided in 2013 dollars and are based on standard construction methods (as opposed to accelerated project delivery). Costs for inflation are not included due to unknown implementation timeframes. All dollar amounts are rounded for planning purposes. Cost estimate ranges for Options 1 and 2 assume only a small portion of the bridges would require rehabilitation, and do not include costs for deck widening. Future engineering analysis would be required to determine the specific scope of work for a potential future project. Actual costs for all options could range below or above the planning-level estimates listed in Table 6.10, depending on the final scope of work (including amenities and other features).

Table 6.10 Planning-level Cost Estimates

Improvement Option		Cost Estimate Ranges (2013)	
		Higgins Avenue Bridge	Madison Street Bridge
1	Minor Rehabilitation	$0.5M to $1.8M	$0.3M to $1.1M
2	Major Rehabilitation	$4M to $8M	$2M to $5M
3A	Bridge Replacement (Four Lanes)	$18M to $28M	$15M to $18M
3B	Bridge Replacement (Six Lanes)	$23M to $34M	$18M to $23M

Source: DOWL HKM, 2013. Estimates do not include costs associated with right-of-way acquisition. The need for right-of-way acquisition is not anticipated for Options 1, 2, and 3A.

There are no dedicated funding sources for improvements to the Higgins Avenue Bridge or the Madison Street Bridge. Generally, a more costly option will require a longer period to secure funding compared to a less costly option. Therefore, cost is an important factor in MDT investment decisions. For this report, cost effectiveness is measured based on the option's

ability to meet the needs, objectives, and other considerations discussed in this report at the lowest cost.

Table 6.11 describes outcomes for this screening criterion.

Table 6.11 Screening Results for Criterion 10

Option	Criterion 10: Cost Effectiveness Will the option minimize cost while meeting needs, objectives, and other considerations?	
	Higgins Avenue Bridge	**Madison Street Bridge**
1	No. Although Option 1 is the least costly, it does not meet bridge needs, objectives, and other considerations.	
2	Unknown. A separate engineering feasibility study and structural analysis is needed to determine the feasibility of deck widening. Option 2 is expected to be the least costly option that addresses most bridge needs, objectives, and other considerations.	
3A	Yes. This option would provide additional benefits at a higher cost compared to Option 2.	
3B	No. This option is unnecessarily costly when other criteria are also considered. Less-costly options address bridge needs, objectives, and other considerations.	

Screening Summary

Table 6.12 summarizes the improvement option screening.

Option 1 fails the screening process due to its inability to provide a structurally-adequate bridge, failure to meet current non-motorized guidelines/standards, limited service life extension, inconsistency with local plans and public input, and its poor cost effectiveness. Option 1 is eliminated from further consideration.

Option 2 passes seven of 10 screening criteria. Screening results for Criteria 4, 9, and 10 are unknown pending additional analysis to determine the feasibility of deck widening. A major rehabilitation is expected to be the lowest-cost option to address the structural condition and provide a long-term service life extension for the Higgins Avenue Bridge and the Madison Street Bridge. If future engineering analysis indicates widening is not feasible, creative design solutions would be needed to accommodate railings, pedestrian/bicycle facilities, and travel lanes within the available deck width.

Option 3A passes the screening process. A new four-lane bridge would provide an opportunity to widen the bridge deck to meet or exceed minimum MDT design standards and would provide a longer service life extension compared to Option 2.

Option 3B fails the screening process due to anticipated significant indirect impacts, inconsistency with local plans and public input, and high cost.

Table 6.12 Screening Summary

		Higgins Avenue				Madison Street			
	Screening Criteria	**1**	**2**	**3A**	**3B**	**1**	**2**	**3A**	**3B**
1	Structural Adequacy	✗	✓	✓	✓	✗	✓	✓	✓
2	Bridge Capacity	✓	✓	✓	✓	✓	✓	✓	✓
3	Non-motorized Connectivity	✓	✓	✓	✓	✓	✓	✓	✓
4	Non-motorized Guidelines/Standards	✗	?*	✓	✓	✗	?*	✓	✓
5	Safety Features	✓	✓	✓	✓	✓	✓	✓	✓
6	Resource Impacts	✓	✓	✓	✗	✓	✓	✓	✗
7	Construction Duration and Temporary Impacts	✓	✓	✓	✓	✓	✓	✓	✓
8	Service Life	✗	✓	✓	✓	✗	✓	✓	✓
9	Consistency with Local Plans and Public Input	✗	?*	✓	✗	✗	?*	✓	✗
10	Cost Effectiveness	✗	?*	✓	✗	✗	?*	✓	✗

✓ indicates option passes screen. ✗ indicates option fails screen.
* Screening result is unknown pending additional analysis.

7.0 POTENTIAL FUNDING SOURCES

MDT administers a number of programs funded from state and federal sources. Local funding sources may also be available to provide additional features or amenities associated with a bridge improvement option. Primary funding for minor/major rehabilitation or replacement of the Higgins Avenue and Madison Street Bridges would be provided through the MDT Bridge Program (formerly known as the Highway Bridge Replacement and Rehabilitation Program).

7.1. Federal and State Funding Programs

Each year, in accordance with Montana Code Annotated (MCA) § 60-2-127, the Montana Transportation Commission allocates a portion of available federal-aid highway funds for projects located on the various systems in the state. The following sections summarize major

federal transportation funding categories received by the state through Titles 23-49 of the U.S. Code, including state-developed implementation/sub-programs that may be potential sources for projects. To receive project funding under these programs, projects must be included in the State Transportation Improvement Program (STIP) and the MPO TIP, where relevant.

National Highway Performance Program

The National Highway Performance Program (NHPP) provides funding for the NHS, including the interstate system and NHS bridges. The purpose of the NHS is to provide an interconnected system of principal arterial routes which serve major population centers, international border crossings, intermodal transportation facilities and other major travel destinations; meet national defense requirements; and serve interstate and interregional travel. The NHS includes all interstate routes, a large percentage of urban and rural principal arterials, the defense strategic highway network, and strategic highway connectors.

Allocations and Matching Requirements

NHPP funds are federally apportioned to Montana and allocated by the Montana Transportation Commission to MDT Districts based on system performance. The federal share for non-Interstate NHS projects is 86.58 percent, and the state is responsible for the remaining 13.42 percent. The state share is funded through the Highway State Special Revenue Account.

Eligibility and Planning Considerations

Activities eligible for NHPP funding include construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of NHS roadways; construction, replacement, rehabilitation, preservation, and protection of NHS bridges; and projects or programs supporting national goals for improving infrastructure condition, safety, mobility, or freight movements on the NHS. Operational improvements as well as highway safety improvements are also eligible. Other miscellaneous activities that may qualify for NHS funding include bikeways and pedestrian walkways, environmental mitigation, restoration and pollution control, infrastructure-based intelligent transportation systems, traffic and traveler monitoring and control, and construction of intra- or inter-city bus terminals serving the NHS. The Montana Transportation Commission establishes priorities for the use of NHPP funds, and projects are let through a competitive bidding process. The Madison Street Bridge is on the NHS.

Federal and state funds under this program are used to finance bridge inspection, improvement, and replacement projects on interstate and non-interstate NHS routes. NHPP program funding is established at the discretion of the state. However, Title 23 U.S.C. establishes minimum standards for NHS bridge conditions. If more than 10 percent of the total deck area of NHS bridges in a state is on structurally-deficient bridges for three consecutive years, the state must direct NHPP funds equal to 50 percent of the state's FY 2009 Highway Bridge Program to improve bridges each year until the state's NHS bridge condition meets the minimum standard.

The Missoula District is anticipated to receive an average of approximately $28.5 million annually of NHPP funds during the next five years. Current Missoula District priorities already under development total an estimated construction cost of $241 million. Given the estimated range of planning-level costs, NHPP funding for improvements recommended in this study is highly unlikely over the short term, but may be available toward the end of the planning horizon depending on other NHS needs within the Missoula District.

Surface Transportation Program

The Surface Transportation Program (STP) is a funding category under MAP-21 that may be used to preserve or improve conditions and performance on any non-NHS federal-aid highway. STP funds are federally appropriated to Montana and allocated by the Montana Transportation Commission to various programs, including the Surface Transportation Program Primary (STPP), Surface Transportation Program Secondary (STPS), Surface Transportation Program Urban (STPU), Surface Transportation Program Bridge (STP-Bridge), and Urban Pavement Preservation (UPP) Program.

Allocations and Matching Requirements

State law guides the allocation of urban funds to projects on the Urban Highway System in Montana's urban areas (population of 5,000 or greater) through a statutory formula based on each area's population compared to the total population in all urban areas. The federal share for STP projects is 86.58 percent, and the state is responsible for the remaining 13.42 percent, which is typically funded through the Highway State Special Revenue (HSSR) account.

STP-Bridge Program[1] – Eligibility and Planning Considerations

Federal and state funds available under STP-Bridge are used to finance bridge projects for on-system and off-system routes in Montana. Title 23 U.S.C. requires a minimum amount (equal to 15 percent of Montana's 2009 federal Bridge Program funding apportionment) to be set aside for off-system bridge projects. The remainder of bridge program funding is established at the discretion of the state. Bridge Program funds are primarily used for bridge rehabilitation or reconstruction activities on primary, secondary, urban, or off-system routes. Projects are identified based on bridge condition and performance metrics.

The Montana Transportation Commission establishes priorities for the use of STP funds, and projects are let through a competitive bidding process. Once funding is allocated to the bridge program, funding is designated for specific projects based on identified bridge needs and statewide priorities. The Higgins Avenue Bridge is on an urban route, and is eligible for STP-Bridge funds.

[1] State funding program developed to distribute federal funding within Montana.

STPU Program[2] – Eligibility and Planning Considerations

The federal and state funds available under this program are used to finance transportation projects on Montana's urban highway system, per MCA § 60-3-211. STPU allocations are based on a per capita distribution and are recalculated each decade following the census. State law guides the allocation of STPU funds to projects on the urban highway system in Montana's urban areas (population of 5,000 or greater) through a statutory formula based on each area's population compared to the total population in all urban areas.

STPU funds are primarily used for resurfacing, rehabilitation, or reconstruction of existing facilities; operational improvements; bicycle facilities; pedestrian walkways; and carpool projects. Priorities for the use of urban funds are established at the local level through local planning processes, with final approval by the Transportation Commission. The Higgins Avenue Bridge is on an urban route, and is eligible for STPU funds.

Transportation Alternatives Program

The Transportation Alternatives (TA) program requires MDT to obligate 50 percent of the funds within the state based on population, using a competitive application process, while the remaining 50 percent may be obligated in any area of the state. The federal share for these projects is 86.58 percent, and the state is responsible for the remaining 13.42 percent, which is typically funded through the HSSR account. Funds may be obligated for projects submitted by:

- local governments;
- transit agencies;
- natural resource or public land agencies;
- school district, schools, or local education authority;
- tribal governments; or
- other local government entities with responsibility for recreational trails for eligible use of these funds.

Eligibility and Planning Considerations

Eligible categories include:

- on-road and off-road trail facilities for pedestrians and bicyclists, including ADA improvements;
- historic preservation and rehabilitation of transportation facilities;
- archeological activities relating to impacts for a transportation project;

[2] State funding program developed to distribute federal funding within Montana.

- any environmental mitigation activity, including prevention and abatement to address highway related stormwater runoff and to reduce vehicle/animal collisions including habitat connectivity;
- turnouts, overlooks, and viewing areas;
- conversion/use of abandoned railroad corridors for trails for non-motorized users;
- inventory, control, and removal of outdoor advertising;
- vegetation management in transportation right-of-way for safety, erosion control, and controlling invasive species;
- construction, maintenance and restoration of trails, development and rehabilitation of trailside and trailhead facilities;
- development and dissemination of publications and operation of trail safety and trail environmental protection programs;
- education funds for publications, monitoring and patrol programs and for trail-related training;
- planning, design, and construction of projects that will substantially improve the ability of students to walk and bicycle to school; and
- non-infrastructure-related activities to encourage walking and bicycling to school, including public awareness campaigns and outreach to press and community leaders, traffic education and enforcement in the vicinity of schools, student sessions on bicycle and pedestrian safety, health, and environment, and training.

Competitive Process

The state and any MPOs required to obligate TA funds must develop a competitive process to allow eligible applicants an opportunity to submit projects for funding. MDT's process emphasizes safety, ADA, relationships to state and community planning efforts, existing community facilities, and project readiness.

Congressionally-directed or Discretionary Funds

Congressionally-directed funds may be received through highway program authorization or annual appropriations processes. These funds are generally described as "demonstration" or "earmark" funds. Discretionary funds are typically awarded through a federal application process or Congressional direction. If a locally-sponsored project receives these types of funds, MDT will administer the funds in accordance with the Montana Transportation Commission Policy #5 – "*Policy resolution regarding Congressionally-directed funding: including Demonstration Projects, High Priority Projects, and Project Earmarks."*

State Fuel Tax

The State of Montana assesses a tax of $0.27 per gallon on gasoline and $.2775 on clear diesel fuel used for transportation purposes. According to state law, each incorporated city and town within the state receives an allocation of the total tax funds based upon:

1) the ratio of the population within each city and town to the total population in all cities and towns in the state, and
2) the ratio of the street mileage (exclusive of the federal-aid interstate and primary systems) within each city and town to the total street mileage in all incorporated cities and towns in the state.

State law also establishes that each county be allocated a percentage of the total tax funds based upon:

1) the ratio of the rural population of each county to the total rural population in the state, excluding the population of all incorporated cities or towns within the county and state;
2) the ratio of the rural road mileage in each county to the total rural road mileage in the state, less the certified mileage of all cities or towns within the county and state; and
3) the ratio of the land area in each county to the total land area of the state.

For state fiscal year 2014, the City of Missoula will receive $1,085,628.48 in state fuel tax funds. The amount varies annually.

All fuel tax funds allocated to city and county governments must be used for the construction, reconstruction, maintenance, and repair of rural roads or city streets and alleys. The funds may also be used for the share that the city or county might otherwise expend for proportionate matching of federal funds allocated for the construction of roads or streets that are part of the primary, secondary or urban system.

Priorities for the use of these funds are established by each recipient jurisdiction.

7.2. Local Funding Sources

Local governments generate revenue through a variety of funding mechanisms. Bridge amenities, such as decorative railing or lighting, may be eligible for funding through the following programs.

City of Missoula Special Improvement Districts

Special improvement districts (SIDs) provide funding for construction and maintenance of infrastructure, such as sewer lines, roads, and lighting. SIDs are created by action of the Missoula City Council. A resolution of intent is passed and advertised in the newspaper to notify people who will be affected by the SID. Citizens have the opportunity to protest and make public comments. If the protest hasn't been sufficient to cancel the project, a final resolution is passed.

SID costs are distributed across the properties benefiting from the new infrastructure or maintenance (i.e., the district). State law allows distribution on the basis of the area of each parcel in the district, the assessed value of each parcel, number of parcels, front footage of

each parcel bordering a street, or a combination of these methods.

The city sells bonds that are paid off over a period of up to 20 years to fund the costs of the improvements or maintenance efforts. The city in turn assesses the parcels in the district to generate the money needed to pay off the bonds. The interest rate charged by the city is the average interest rate payable on the outstanding bonds, plus up to one percent to cover administration costs.

City of Missoula Urban Renewal Districts

In accordance with MCA §§ 7-15-42 and 7-15-73, the City of Missoula may establish an urban renewal district (URD) to eliminate and prevent development or spread of blighted areas, to encourage needed urban rehabilitation, and provide opportunities for redevelopment. These efforts may include repair and rehabilitation of deteriorated or deteriorating structures.

URDs enable the city to use tax increment financing (TIF) and other strategies to finance revitalization activities to foster economic growth. TIF is a state-authorized, locally-driven funding mechanism that allows cities and counties to direct property tax dollars that accrue from new development, within a specifically-designated district, to community and economic development activities. A base year is established from which incremental increases in property values are measured. Resulting new property tax dollars can be directed to redevelopment and economic revitalization activities within the area in which they are generated. TIF does not increase taxes for property owners of existing development within the district. Rather, it only affects the way that taxes are distributed.

The Front Street URD is an existing district in downtown Missoula located east of Higgins Avenue and north of the Clark Fork River, and includes the northern portions of the Higgins Avenue and Madison Street Bridges. The city has also proposed a new East Broadway URD bounded by Madison Street on the west. The proposed East Broadway URD is contiguous with and to the east of the existing Front Street URD.

8.0 CONCLUSIONS AND NEXT STEPS

This study recommends two improvement options for further consideration.

Option 2 (major rehabilitation) is recommended for implementation in the short term. MDT will conduct a structural analysis of both bridges to identify the load-bearing capacity of both bridges, the feasibility of deck widening, and the scope of work for a future rehabilitation project. Option 2 is recommended in the short term regardless of the findings of the structural analysis.

Option 3A (four-lane bridge replacement) is recommended as a long-term option if the existing bridge decks cannot be widened and Option 2 is unable to meet all needs and objectives.

Although Option 3A is more costly, it would meet all needs and objectives identified in this study.

Implementation of improvement options is dependent on funding availability and other system priorities statewide. There are no dedicated funding sources for improvements to the Higgins Avenue Bridge or the Madison Street Bridge. Table 8.1 lists recommended improvements for further consideration and potential implementation timeframes. Potential implementation timeframes include preconstruction and construction durations. For example, nomination of a major rehabilitation project might be initiated in the next one to two years, depending on funding availability. The project development process could extend two to five years following funding identification and project nomination. Construction would likely occur toward the end of the potential implementation timeframe range.

Table 8.1 Recommended Options and Potential Implementation Timeframes

Potential Implementation Timeframe	Recommended Improvement Options		Cost	
			Higgins	Madison
Short Term (1 to 5 Years)	**2**	**Major Rehabilitation**	$4M to $8M	$2M to $5M
Long Term (Greater than 20 Years)	**3A**	**Bridge Replacement (Four Lanes)**	$18M to $28M	$15M to $18M

MDT anticipates nomination of major rehabilitation projects for the Higgins Avenue and Madison Street Bridges following completion of this study. Upon project nomination, MDT will conduct a structural analysis to determine if the bridge decks can be widened to meet the needs and objectives identified in this study. If the bridge decks cannot be widened, MDT will consider creative design solutions to best accommodate all modes of travel within the existing bridge deck widths. MDT will provide public and stakeholder involvement opportunities during the design and construction process for any future project.