Appendix D

Improvement Options Report

MISSOULA BRIDGES
PLANNING STUDY

IMPROVEMENT OPTIONS REPORT

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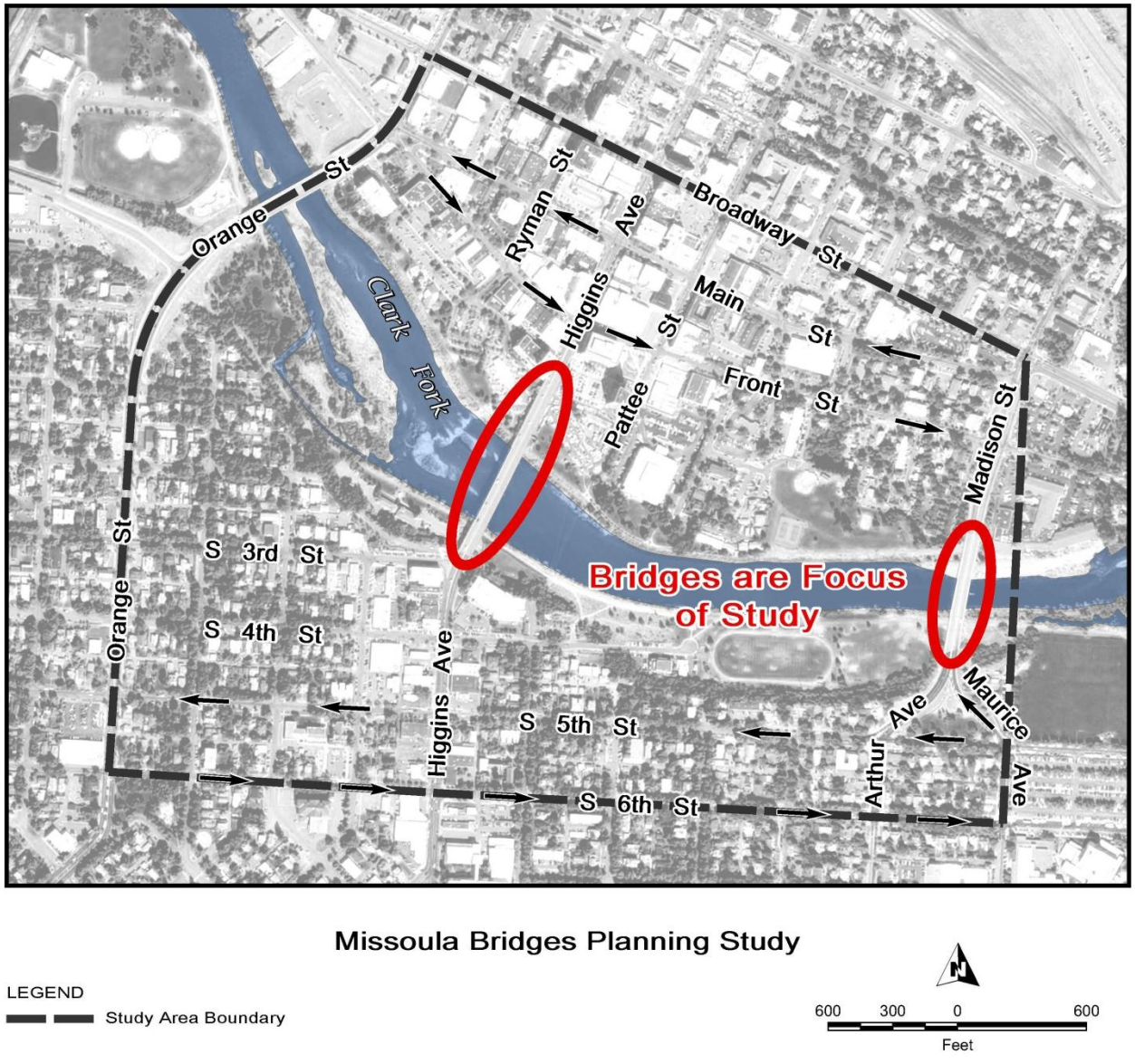
1.0 INTRODUCTION

This report presents improvement options for the Higgins Avenue Bridge and the Madison Street Bridge crossing the Clark Fork River in Missoula, MT. This report, along with the *Existing and Projected Conditions Report* and the *Environmental Scan*, are appendices to the planning study. Information presented in and pertaining to other appendices may not be repeated in this report. The planning study incorporates information from all appendices. Figure 1-1 illustrates the study area boundary. The transportation network within the broader study area is discussed only with respect to potential temporary impacts during construction of bridge improvement options, if forwarded from this planning study in potential future design and construction projects.

Figure 1-1 Study Area



2.0 Bridge 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 Montana Department of Transportation (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.

3.0 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.

3.1 Design Criteria

Title 23 USC 109 requires projects on the National Highway System (NHS) to comply with design standards approved by the Federal Highway Administration (FHWA). FHWA has adopted policies established by the American Association of State Highway and Transportation Officials (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 Public Rights-of-Way Accessibility Guidelines (PROWAG) in compliance with the Americans with Disabilities Act (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.

Within the study area, Higgins Avenue is classified as an urban minor arterial (non-NHS), and Madison Street is classified as an urban principal arterial (NHS). 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).

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 dedicated bicycle lane width of five feet.

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

The minimum width requirements noted above 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.

3.2 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:

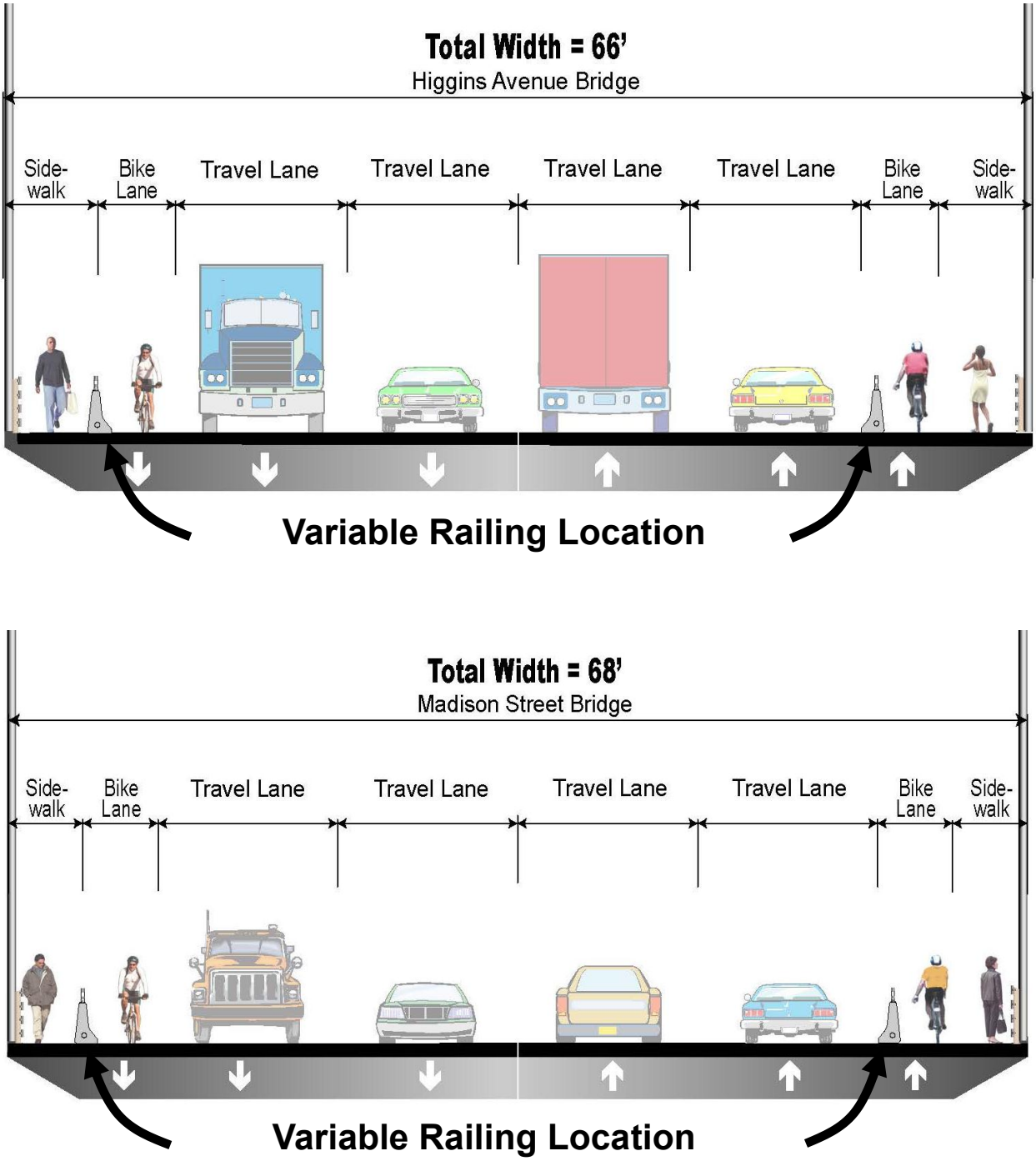
- concrete patching and crack sealing;
- replacement of bridge/pedestrian railings to meet current MDT design standards;
- spot painting of exposed steel members;
- repair or replacement of expansion and contraction joints;
- drainage improvements; and
- removal of center medians/lane restriping to widen 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 3-1 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 3-1 Minor or Major Rehabilitation



3.3 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;
    - 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 what reserve capacity (if any) would be available to support deck widening. 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 and is geometrically appropriate in form. 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 3-1 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.

3.4 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.

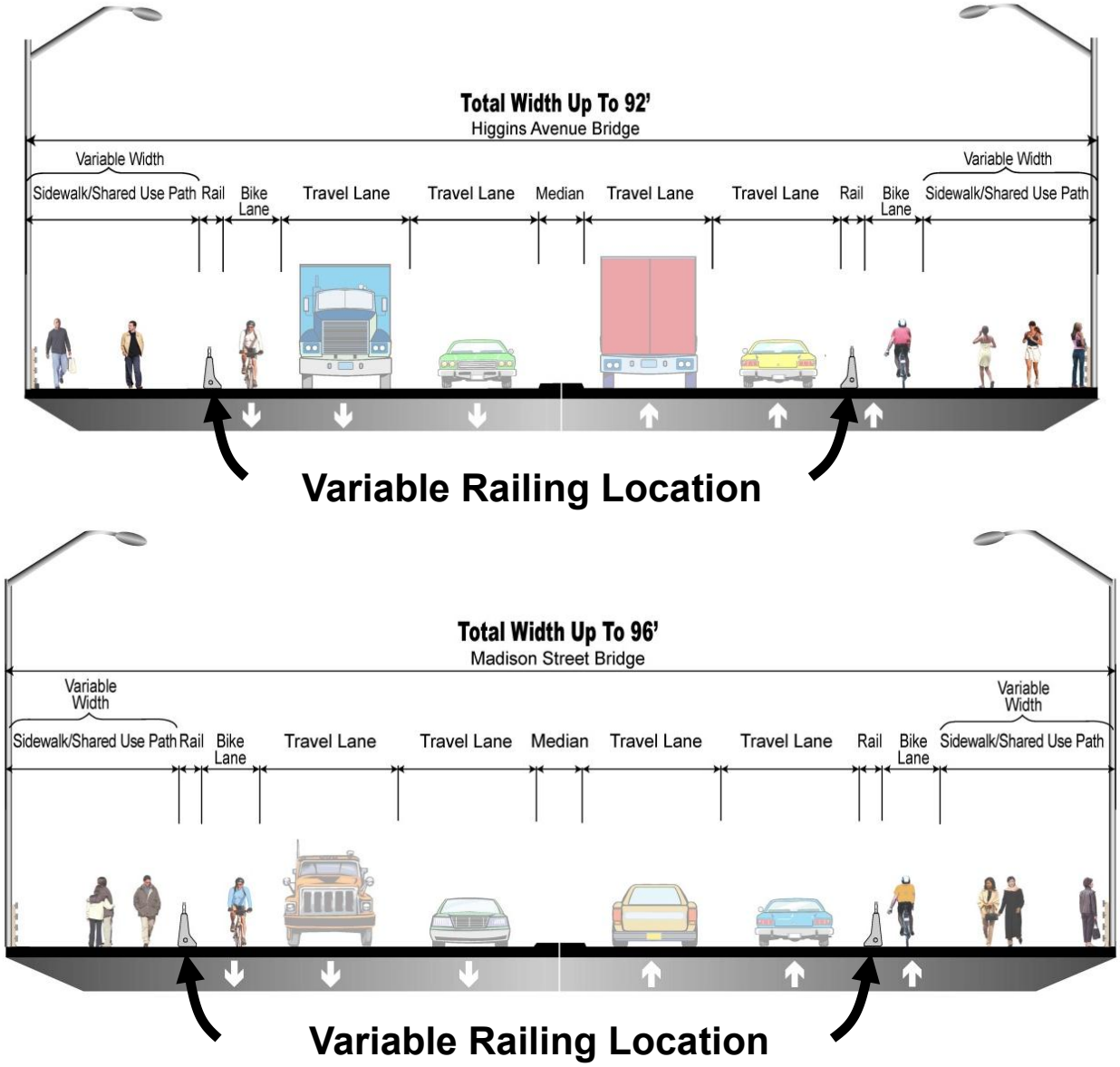
Non-motorized facilities could include dedicated bicycle lanes and sidewalks or shared use paths, which would meet or exceed current MDT design standards for width. A shared use path is intended for bi-directional use by pedestrians, bicyclists, and other non-motorized users, whereas sidewalks are intended 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 specific 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 at the time of a potential future design and construction project following this study.

Figure 3-2 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 3-2 Bridge Replacement (Four Lanes)



3.5 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.

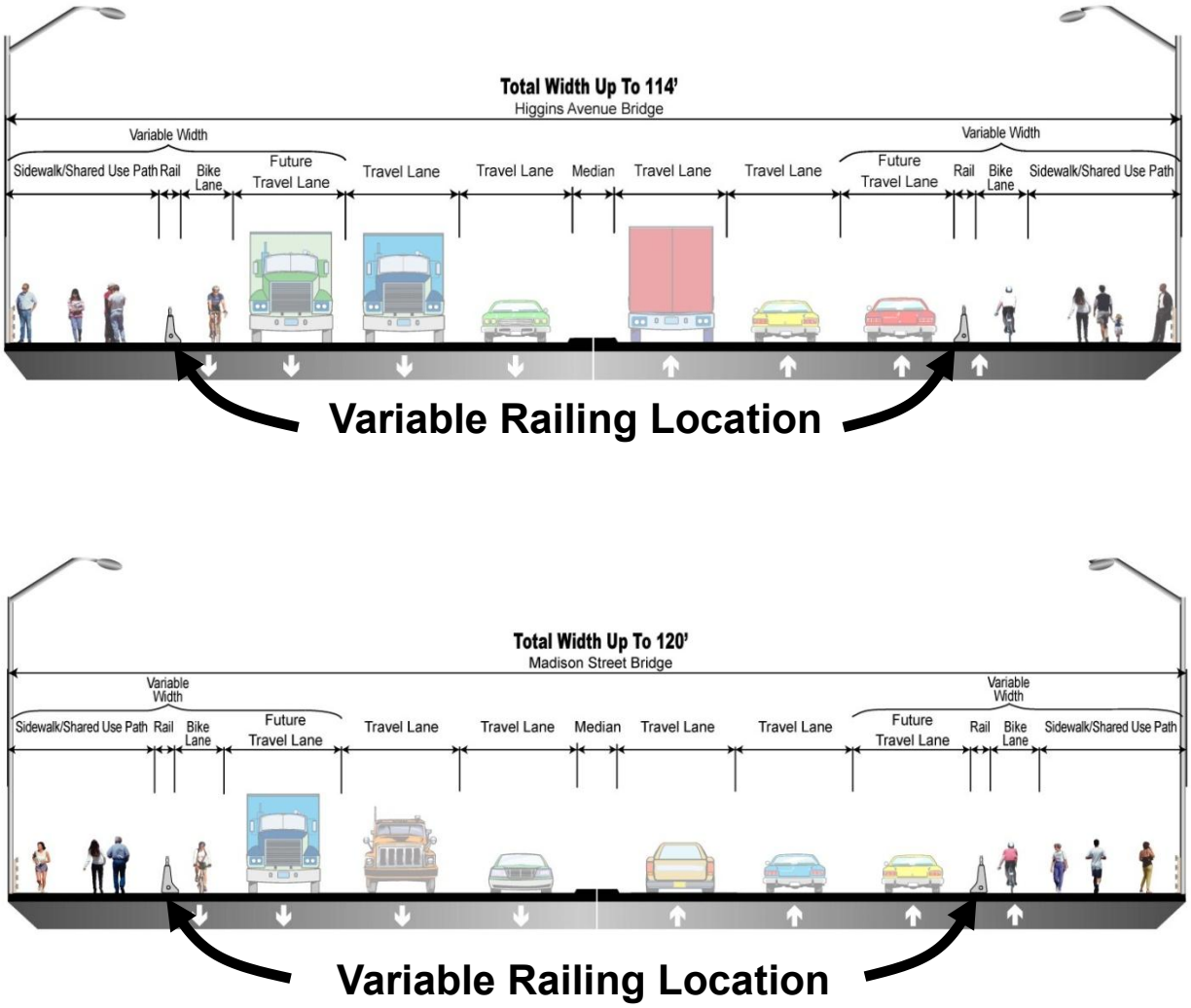
This option is intended to expand bridge capacity. Bridge capacity refers to the physical width allotted for vehicular travel lanes, bicycle lanes, and sidewalks. The *2012 Missoula Long Range Transportation Plan (LRTP)* documents growing vehicular demand on the Higgins Avenue Bridge and on the Madison Street Bridge throughout the 2040 planning horizon. Increased vehicular demand is associated with an increase in vehicular traffic volumes, which results in a decrease in operational conditions. 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 MDT *Traffic Engineering Manual* defines the minimum target for design of urban principal arterials (Madison Street Bridge) and urban minor arterials (Higgins Avenue Bridge) as LOS C. The 2012 *Missoula LRTP* identifies the Higgins Avenue Bridge segment as congested (LOS F) in 2040. The LRTP identifies the Madison Street Bridge segment as congesting (LOS D to E) in 2040. 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 at the time of a potential future design and construction project following this study.

Figure 3-3 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 3-3 Bridge Replacement (Six Lanes)



3.6 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. Needs and objectives for the *Missoula Bridges Planning Study* 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. Vehicular capacity refers to the physical widths provided for vehicular travel lanes. 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 throughout 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. 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 (or Do Nothing) 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 the National Environmental Policy Act (NEPA) as a baseline for comparison against the proposed action.

4.0 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.

4.1 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. Accordingly, viable options must provide a structurally-adequate bridge to continue serving the traveling public.

Table 4.1 describes screening outcomes for the structural adequacy criterion for the Higgins Avenue Bridge and Madison Street Bridge.

Table 4.1 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.	

4.2 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 throughout 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 4.2 describes outcomes for this screening criterion.

Table 4.2 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.	

4.3 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 University of Montana. 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 4.3 describes outcomes for this screening criterion.

Table 4.3 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	

4.4 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 4.4 describes outcomes for this screening criterion.

Table 4.4 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		

4.5 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. Current MDT design standards require a crashworthy bridge railing topped by a pedestrian/bicycle railing near the outside edge of a bridge or where used to separate pedestrians/bicyclists from vehicular traffic. Pedestrian railing can be installed at the edge of bridge decks if crashworthy barriers are located between pedestrian/bicycle facilities and the adjacent travel lane. This configuration is illustrated in the figures provided in Section 3 of this report. The *Montana Structures Manual* requires the combined height of crashworthy bridge railing and pedestrian/bicycle railing to 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. 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 4.5 describes outcomes for this screening criterion.

Table 4.5 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.	

4.6 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 the United States Army Corps of Engineers (USACE) prior to discharging dredged or fill material into Waters of the United States or adjacent wetlands. Under Section 404(b)(1) guidelines (40 CFR 230.10), USACE may only permit discharges into Waters of the United States that represent the least environmentally damaging practicable alternative (LEDPA), including actions which do not discharge fill material into Waters of the United States, 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 the United States Fish and Wildlife Service (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 the Montana Department of Natural Resources and Conservation (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 the Montana Department of Environmental Quality (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 National Historic Preservation Act. 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 State Historic Preservation Office (SHPO), the City of Missoula Historic Preservation Office, and City of Missoula Historic Preservation Commission.

- The study area is located within the Missoula Municipal Separate Storm Sewer System (MS4). 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 Caras Park, John Toole Park, the Missoula Irrigation Ditch, and possibly 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 4.6 describes outcomes for this screening criterion.

Table 4.6 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.	

4.7 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 incrementally 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.

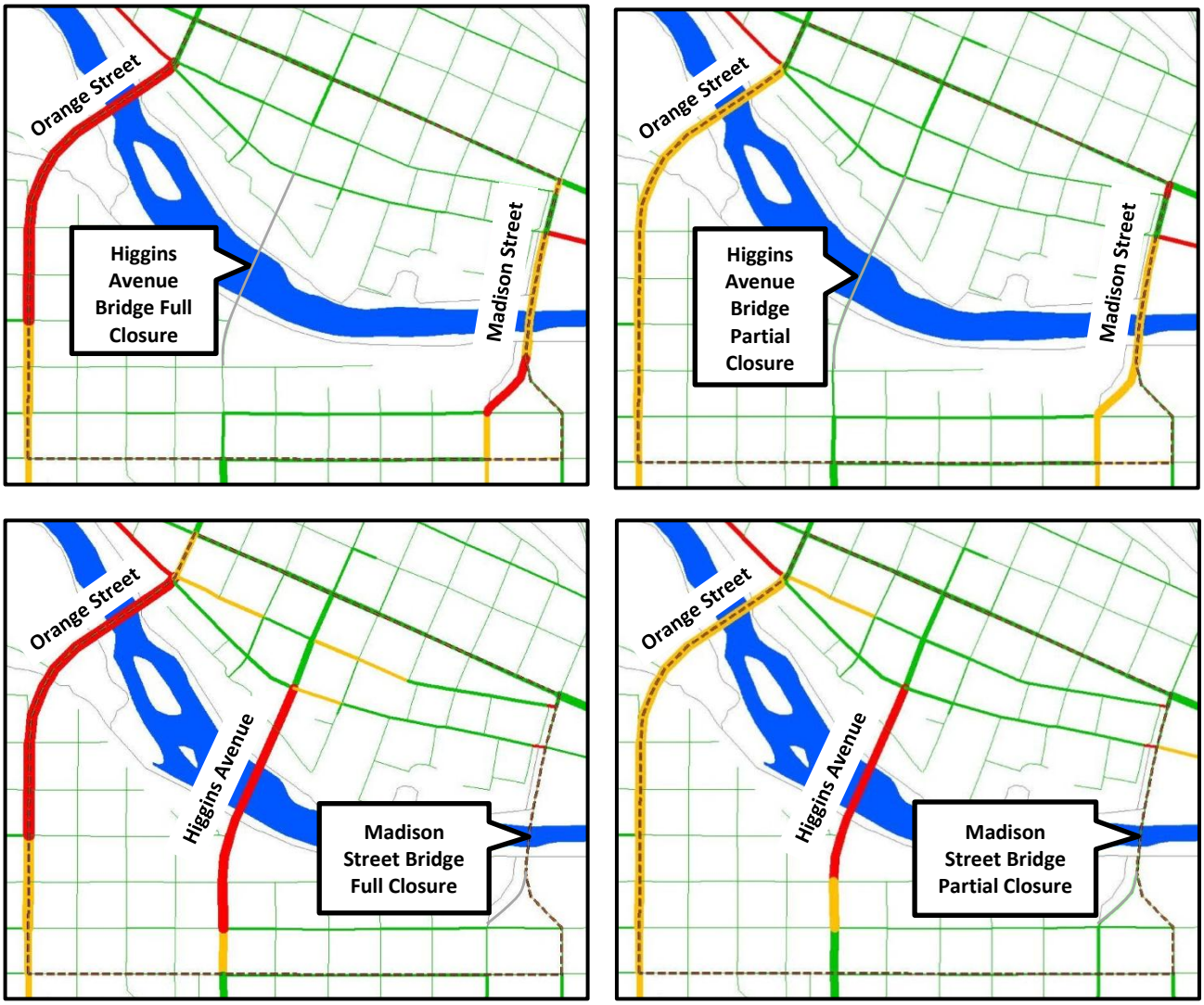
Figure 4-1 illustrates the peak hour segment level of service (LOS) for vehicles within the study area resulting from the four modeled closure scenarios. Operational conditions on transportation facilities are commonly assessed using the LOS concept based on vehicle delay and driver perception. LOS is measured on an A to F scale, with LOS A representing the best operating conditions and LOS F representing the worst conditions. 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 4-1 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 4.7 lists outcomes for this screening criterion.

Table 4.7 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		

4.8 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.

As part of the National Highway System (NHS), the Madison Street Bridge is subject to performance measures, still under development, in accordance with the Moving Ahead for Progress in the 21st Century Act (MAP-21). Table 4.8 describes outcomes for this screening criterion.

Table 4.8 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		

4.9 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 4.9 describes outcomes for this screening criterion.

Table 4.9 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.	

4.10 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 4.10 presents planning-level cost estimates for each option. Appendix 1 provides additional cost estimate tables. Estimated costs for improvement options include mobilization, contingencies, preliminary engineering, construction engineering, utilities, and indirect costs of construction. 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 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 (six-lane bridge) and any features outside the approximate footprint of the existing bridges (such as new ramp connections). Current right-of-way cost 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 estimate.

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 4.10, depending on the final scope of work (including amenities and other features).

Table 4.10 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.

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 4.11 describes outcomes for this screening criterion.

Table 4.11 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.	

4.11 Screening Summary

Table 4.12 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 ten 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 4.12 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.

5.0 Recommendations and Implementation Timeframes

This study recommends two improvement options for further consideration.

Option 2 (major rehabilitation) is recommended for implementation in the short term. A separate engineering study of both bridges will be needed to determine the feasibility of deck widening, and the specific scope of work that would be required. At the time of publication of this report, MDT is conducting a structural analysis to identify the load-bearing capacity of both bridges and determine the scope of work for a future rehabilitation project.

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 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 5.1 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 5.1 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

Appendix 1

Cost Estimate Tables

Option 1: Minor Rehabilitation

Item Description	Option 1 Higgins Avenue Bridge		Option 1 Madison Street Bridge	
	Low Estimate	High Estimate	Low Estimate	High Estimate
Bridge Length (FT)	975	975	560	560
Bridge Width (FT)	66	66	68	68
Bridge Area (SQFT)	64,350	64,350	38,080	38,080
Minor Rehabilitation Estimate (SQFT) [1]	$5.0	$15.0	$5.0	$15.0
Bridge Cost Estimate	**$322,000**	**$965,000**	**$190,000**	**$571,000**
Subtotal 1	$322,000	$965,000	$190,000	$571,000
Mobilization (18%)	$58,000	$174,000	$34,000	$103,000
Subtotal 2	$380,000	$1,139,000	$224,000	$674,000
Contingency (10%) [2]	$38,000	$113,900	$22,400	$67,400
Total Construction (CN)	$418,000	$1,253,000	$246,000	$741,000
Preliminary Engineering (PE) Costs (15% of CN)	$63,000	$188,000	$37,000	$111,000
Construction Engineering (CE) Costs (15% of CN)	$63,000	$188,000	$37,000	$111,000
IDC Costs (9.12%) [3]	$38,000	$114,000	$22,000	$68,000
TOTAL PLANNING-LEVEL COST ESTIMATE	**$582,000**	**$1,743,000**	**$342,000**	**$1,031,000**

[1] Unit cost identified in coordination with MDT Bridge Bureau.

[2] Contingency reflects unknown factors that may be encountered at the project stage.

[3] IDC percentage is subject to change.

Option 2: Major Rehabilitation

Item Description	Option 2 Higgins Avenue Bridge		Option 2 Madison Street Bridge	
	Low Estimate	High Estimate	Low Estimate	High Estimate
Bridge Length (FT)	975	975	560	560
Bridge Width (FT)	66	66	68	68
Bridge Area (SQFT)	64,350	64,350	38,080	38,080
Major Rehabilitation Estimate (SQFT) [1]	$30.0	$60.0	$30.0	$60.0
Bridge Cost Estimate	**$1,931,000**	**$3,861,000**	**$1,142,000**	**$2,285,000**
Utility Relocation	$100,000	$100,000	$70,000	$70,000
Subtotal 1	$2,031,000	$3,961,000	$1,212,000	$2,355,000
Mobilization (18%)	$366,000	$713,000	$218,000	$424,000
Subtotal 2	$2,397,000	$4,674,000	$1,430,000	$2,779,000
Contingency (20%) [2]	$479,400	$934,800	$286,000	$555,800
Total Construction (CN)	$2,876,000	$5,609,000	$1,716,000	$3,335,000
Preliminary Engineering (PE) Costs (15% of CN)	$431,000	$841,000	$257,000	$500,000
Construction Engineering (CE) Costs (15% of CN)	$431,000	$841,000	$257,000	$500,000
IDC Costs (9.12%) [3]	$262,000	$512,000	$156,000	$304,000
TOTAL PLANNING-LEVEL COST ESTIMATE	**$4,000,000**	**$7,803,000**	**$2,386,000**	**$4,639,000**

[1] Unit cost identified in coordination with MDT Bridge Bureau.

[2] Contingency reflects unknown factors that may be encountered at the project stage.

[3] IDC percentage is subject to change.

Option 3A: Bridge Replacment (Four Lanes)

Item Description	Option 3A Higgins Avenue Bridge		Option 3A Madison Street Bridge	
	Low Estimate	High Estimate	Low Estimate	High Estimate
Approach Span Length (FT)	527	527	170	170
Main Span Length (FT)	448	448	390	390
Bridge Width (FT)	74	92	78	96
Approach Span Estimate (SQFT) [1]	$100	$125	$100	$125
Main Span Estimate (SQFT) [1]	$150	$175	$150	$175
Bridge Cost Estimate	**$8,873,000**	**$13,273,000**	**$5,889,000**	**$8,592,000**
Utility Relocation	$100,000	$100,000	$70,000	$70,000
Remove Structure [2]	$525,000	$525,000	$525,000	$525,000
Pedestrian/Bicycle Underbridge [3]	NA	NA	$1,216,000	NA
Subtotal 1	$9,498,000	$13,898,000	$7,700,000	$9,187,000
Mobilization (18%)	$1,710,000	$2,502,000	$1,386,000	$1,654,000
Subtotal 2	$11,208,000	$16,400,000	$9,086,000	$10,841,000
Contingency (20%) [4]	$2,242,000	$3,280,000	$1,817,000	$2,168,000
Total Construction (CN)	$13,450,000	$19,680,000	$10,903,000	$13,009,000
Preliminary Engineering (PE) Costs (15% of CN)	$2,018,000	$2,952,000	$1,635,000	$1,951,000
Construction Engineering (CE) Costs (15% of CN)	$2,018,000	$2,952,000	$1,635,000	$1,951,000
IDC Costs (9.12%) [5]	$1,227,000	$1,795,000	$994,000	$1,186,000
TOTAL PLANNING-LEVEL COST ESTIMATE	**$18,713,000**	**$27,379,000**	**$15,167,000**	**$18,097,000**

[1] Unit cost identified in coordination with MDT Bridge Bureau.

[2] Based on removal cost of the Orange Street Bridge in Missoula (let in 2000) adjusted for inflation.

[3] Based on the existing Madison Street bicycle/pedestrian bridge (constructed in 2007), adjusted for inflation.

[4] Contingency reflects unknown factors that may be encountered at the project stage.

[5] IDC percentage is subject to change.

Option 3B: Bridge Replacment (Six Lanes)

Item Description	Option 3B Higgins Avenue Bridge		Option 3B Madison Street Bridge	
	Low Estimate	High Estimate	Low Estimate	High Estimate
Approach Span Length (FT)	527	527	170	170
Main Span Length (FT)	448	448	390	390
Bridge Width (FT)	96	114	102	120
Approach Span Estimate (SQFT) [1]	$100	$125	$100	$125
Main Span Estimate (SQFT) [1]	$150	$175	$150	$175
Bridge Cost Estimate	**$11,510,000**	**$16,447,000**	**$7,701,000**	**$10,740,000**
Utility Relocation	$100,000	$100,000	$70,000	$70,000
Remove Structure [2]	$525,000	$525,000	$525,000	$525,000
Pedestrian/Bicycle Underbridge [3]	NA	NA	$1,216,000	NA
Subtotal 1	$12,135,000	$17,072,000	$9,512,000	$11,335,000
Mobilization (18%)	$2,184,000	$3,073,000	$1,712,000	$2,040,000
Subtotal 2	$14,319,000	$20,145,000	$11,224,000	$13,375,000
Contingency (20%) [4]	$2,864,000	$4,029,000	$2,245,000	$2,675,000
Total Construction (CN)	$17,183,000	$24,174,000	$13,469,000	$16,050,000
Preliminary Engineering (PE) Costs (15% of CN)	$2,577,000	$3,626,000	$2,020,000	$2,408,000
Construction Engineering (CE) Costs (15% of CN)	$2,577,000	$3,626,000	$2,020,000	$2,408,000
IDC Costs (9.12%) [5]	$1,567,000	$2,205,000	$1,228,000	$1,464,000
TOTAL PLANNING-LEVEL COST ESTIMATE	**$23,904,000**	**$33,631,000**	**$18,737,000**	**$22,330,000**

[1] Unit cost identified in coordination with MDT Bridge Bureau.

[2] Based on removal cost of the Orange Street Bridge in Missoula (let in 2000), adjusted for inflation.

[3] Based on the existing Madison Street bicycle/pedestrian bridge (constructed in 2007), adjusted for inflation.

[4] Contingency reflects unknown factors that may be encountered at the project stage.

[5] IDC percentage is subject to change.