

Memorandum

To: Distribution

From: Dave Holien, P.E. *DTH*
Consultant Design Engineer (acting)

Date: May 27, 2022

Subject: IM 90-8(195)450
Lockwood Interchange - Billings
UPN 9978000
Work Type 130 - Reconstruction – with added capacity

The Scope of Work Report for this project has been released on June 6, 2022. We request that those on the distribution review this report and submit your concurrence within two weeks of the above date.

Your comments and recommendations are also requested if you do not concur or concur subject to certain conditions. When all the personnel on the distribution list have concurred, we will submit this report to the Preconstruction Engineer for approval.

I recommend approval:

Approved _____ Date _____

Distribution:

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Scope of Work Report

Scope of Work

The proposed scope of work for the project is to reconstruct and reconfigure the Lockwood Interchange over I-90 to better accommodate traffic patterns and provide a more efficient interchange. The project also includes widening I-90 to provide three lanes in each direction between the Lockwood and Johnson Lane Interchanges. I-90 will remain two lanes in each direction under the Lockwood overpass; however, full reconstruction of the bridge over I-90 is proposed with the project to provide a longer service life for the structure and to accommodate for future interstate widening under the bridge. The project addresses future traffic patterns, ramp functionality, operational issues on I-90 and connecting routes, proposed interstate modifications, safety considerations and bridge reconstruction.

The project is split into two phases. The first phase of the project was an OT Phase which included work through the Alignment and Grade milestone (ACT 264 as shown in the current MDT Consultant Design Flowchart), including Activity 930 and 935, which is now complete. The first phase included a tiered approach including multiple interchange alternatives for improvements to Lockwood Interchange and two alternatives for widening of I-90. Ultimately, the alternative analysis determined a Diverging Diamond Interchange and widening I-90 to the inside as the preferred alternatives.

STPX 90-8(191)450 (OT Phase)
Lockwood Interchange - Billings
UPN 9588000

The second phase will be for the PE phase of the project.

IM 90-8(195)450 (PE Phase)
Lockwood Interchange - Billings
UPN 9978000

Purpose and Need

The purpose of this project is to address roadway deficiencies and improve traffic operations at the Lockwood Interchange as well as along I-90 between Lockwood Interchange and Johnson Lane Interchange. Improvements to I-90 west of this project is currently under construction as part of the I-90 Yellowstone R – Billings project, which ends on the west side of the Lockwood Interchange and includes interstate widening to provide three through lanes in each direction between the 27th Street and Lockwood Interchanges. The interchange directly east of the project, Johnson Lane, will be reconstructed as part of the Billings Bypass project. This project will connect the two adjacent projects while taking into consideration the operations and access at the Lockwood Interchange.

Context Specific Criteria and Scope Specific Considerations

In accordance with MDT's Baseline Criteria Practitioner's Guide published March 25, 2021, the following context-specific criteria are anticipated for the project:

Design Speed: The design speed will be 70 mph for Interstate I-90 in consideration of the functional classification, terrain, driver expectancy, and context of the facility. A design speed of 40 mph will be used for the majority of US-87, except where the DDI presents a change in driver expectancy and a geometric configuration consistent with 30 mph for urban conditions. The proposed design speeds are within the recommended design speeds per MDT's baseline guidance and therefore will not require a design exception.

Lane Width: Standard lane widths for both Interstate and Principal Arterials are 12-feet. The standard lane widths will be used, and 14-foot lane widths will be used within the DDI transition to allow for large vehicle tracking.

Ditches: The current baseline criteria for inslopes for an Urban Interstate is 6:1, while an uncurbed Urban principal arterial is 4:1. The standard inslopes will be used for the project and modified to 2:1 behind guardrail, as necessary. The standard ditch section also includes trapezoidal ditches with a 10-foot bottom, which will be used along I-90 and US-87 in full reconstruction sections. To generally reduce right-of-way acquisition and minimize utility impacts, 5-foot flat bottom ditches are proposed along Ramp B. A

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2-foot flat ditch is proposed along Ramp C and most of Ramp D. Behind guardrail, flat bottom ditch inslopes will be 2:1 with 2:1 backslopes.

Median Width: The current baseline criteria for median widths in urban conditions for both Interstate and Principal Arterials is 10-feet. The proposed median along I-90 varies from 50-feet to 26-feet, 50-feet where the project ties to existing median and 26-feet throughout the widening section including 10-foot inside shoulders and a 6-foot dimension for drainage and concrete median barrier.

Project Context Specific Criteria /Scope Specific Considerations				
Controlling Element	Existing Condition	Baseline Value	Proposed Criteria	Location
Design Speed	Posted 65 mph on I-90; Posted 45 mph on US-87	50-70 mph for Urban Interstate; 25-55 mph for Urban Principal Arterial	70 mph for I-90; 40 mph for US-87 except within the DDI crossover where 30 mph will be used	
Lane Width	12-feet	12-feet	12 to 14 feet	12-feet throughout project limits; 14-feet within DDI cross overs
Ditches	Varies	6:1 (10' trapezoidal bottom) for Urban Interstate; 4:1 for uncurbed Urban principal arterial	6:1 Urban Interstate and 4:1 Urban Principal Arterial (10' trapezoidal bottom); 5' flat bottom; 2' flat bottom	Standard ditches throughout project limits except 5' flat bottom along Ramp B and 2' flat bottom along Ramp C and D
Median Width	Varies	10-feet	50-feet for depressed median tie-in; 26-feet along I-90 widening sections; Varies along US-87 (minimum 4-feet)	

Public Summary

The proposed project evaluated alternatives to improve the access and operations at the Lockwood Interchange. The evaluation included proposed modifications along I-90 from Lockwood Interchange to Johnson Lane Interchange, interchange improvement options, safety considerations, bridge construction options, environmental issues, right-of-way impacts, and other factors necessary to determine a preferred improvement alternative. The preferred improvement alternative was determined to be a Diverging Diamond Interchange and widening I-90 to the inside median.

Project Location and Limits

The project is located along I-90 from the Lockwood Interchange to the Johnson Lane Interchange east of Billings in Yellowstone County. The project is located outside the city limit boundary of the City of Billings, is within the Billings Urban Boundary, and is approximately 1.5 miles from Downtown Billings. The project is within the Census-Designated Place for Lockwood, MT.

I-90 reconstruction will be from approximately RP 452.8 +/- to RP 455.0 +/-, which extends from just west of the Lockwood Interchange to the Johnson Lane Interchange. US-87 reconstruction limits extend just beyond the N Frontage Rd intersection to the north, with the southern limits extending to the Old Hardin

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Rd intersection at approximately RP 0.49 +/- . Reconstruction of N Frontage Rd will be from its intersection with US-87 at RP 0 to approximately RP 0.1 +/- . Coburn Road access improvements will likely require improvements for approximately 500 feet along Coburn Road. Coordination with Yellowstone County will be required to determine potential improvements to Rosebud Lane and Veva Street to provide access from Coburn Road to US-87.

I-90 is classified as an Urban Freeway (NHS – Interstate) and US-87 is classified as an Urban Principal Arterial.

The as-built project numbers are summarized in the table below.

Project ID	Location	Year Built	Description
I-IG 90-8(23) 447 Unit 2	27 th St to Lockwood	1966	Construction
I 90-8(70)388	Int Lockwood I-90 - Billings	1998	Bridge Rehab
IM 90-8(131)450	27 th St to Lockwood	2000	Overlay
IR90-8(102)455	Johnson Lane Interchange	1986	Construction
IR 90-8(118)453	Lockwood-Pinehill Interchange	1990	Construction

There are two adjacent projects that exist and are listed in the table below.

Project ID	From (RP)	To (RP)	Construction Year	Description
NCPD 56(55) UPN 4199007	455+/-	456+/-	2022	Billings Bypass (Johnson Lane)
NHPB 90-8(176)450 UPN 7972000	450.09	452.73	2021	I-90 Yellowstone R – Billings

The direction of this project is from west to east and stationing increases in the direction of the reference posts along I-90. The direction of US-87 will be from North to South.

I-90 EB	Signed Route	Department Route	Corridor Route	Reference Post + Offset	Accumulated Miles
Project begin	I-90 EB	I-90A	C000090A	452+0.731	450.570
Project end	I-90 EB	I-90A	C000090A	455+0.232	453.074
I-90 WB	Signed Route	Department Route	Corridor Route	Reference Post + Offset	Accumulated Miles
Project begin	I-90 WB	I-90D	C000090D	452+0.730	450.697
Project end	I-90 WB	I-90D	C000090D	455+0.226	453.194
Lockwood Interchange	Signed Route	Department Route	Corridor Route	Reference Post + Offset	Ramp Length
EB Off-Ramp	n/a	R090E452OFAA	C229126A	n/a	0.245
EB On-Ramp	n/a	R090E452ONAA	C229125A	n/a	0.321
WB Off-Ramp	n/a	R090W452OFAA	C229335A	n/a	0.238
WB On-Ramp	n/a	R090W452ONAA	C229334A	n/a	0.254
US 87 / Hardin Rd	Signed Route	Department Route	Corridor Route	Reference Post + Offset	Accumulated Miles
Project begin	Hardin Rd	U-1028A	C001028A	n/a	0.376
P00016000+00001 south end	Hardin Rd	U-1028A	C001028A	n/a	0.022
End Hardin Rd / Begin US 87	Hardin Rd	U-1028A	C001028A	n/a	0.000
End Hardin Rd / Begin US 87	US 87	N-16A	C000016A	0+0.000	0.000

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P00016000+00001 north end	US 87	N-16A	C000016A	0+0.036	0.036
Project end	US 87	N-16A	C000016A	0+0.308	0.308
North Frontage Rd	Signed Route	Department Route	Corridor Route	Reference Post + Offset	Accumulated Miles
Project begin	North Frontage Rd	X-56931A	C056931A	n/a	0.000
Project end	North Frontage Rd	X-56931A	C056931A	n/a	0.100
Coburn Rd	Signed Route	Department Route	Corridor Route	Reference Post + Offset	Accumulated Miles
Project begin	Coburn Rd	L-56-4808A	C248635A	n/a	0.000
Project end	Coburn Rd	L-56-4808A	C248635A	n/a	0.056

Physical Characteristics

The existing US-87 roadway is comprised of 2-12' travel lanes, 6' outside shoulders and 2' inside shoulders in each direction with a raised median. The raised median width varies from 2' to 16' and provides left turn access at major intersections. Old Hwy 87/Old Hardin Rd south of the interchange transitions from the US-87 existing roadway section to a single 12' lane with 6' shoulders in each direction. US-87 will be reconstructed to accommodate the new interchange configuration and will carry three through lanes north of N Frontage Rd. The remaining segments of US-87 will include two 12' travel lanes in each direction with 6' outside shoulders and variable width raised median. Left and right turn lanes will be provided where applicable.

The existing I-90 mainline consists of 2-12' travel lanes, 10' outside shoulders and 4' inside shoulders in each direction for a total pavement width of 38' in each direction. The existing interchange ramps consist of single 14' travel lanes, 6' outside shoulders and 4' inside shoulders for a total pavement width of 24'. The existing median width varies within the project limits with an average width of 40'. A third 12' auxiliary lane will be added between the Lockwood and Johnson Lane Interchanges in each direction of I-90. Ramp improvements will be necessary to accommodate the auxiliary lanes and interchange configuration.

The general terrain of the area is level and is within the Billings Urban Boundary.

The existing bridge data is given below:

<u>RP 450.52 (Int Lockwood I-90 - Billings)</u>	
Bridge Inventory Number	P00016000+00001
Year Built	1966
Year Reconstructed	1998
Length	275.9'
Deck Width (out-to-out)	82.1'
Bridge Rail Type	SBR T7
Superstructure Type	PS concrete girders
Sufficiency Rating	95.0
Deck Rating	6
Structure Status	Not Deficient

The proposed structure will be 87'-2" (out to out) deck width with a recommended girder type of steel.

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Traffic Data

Traffic counts were completed for the two interchange intersections and the Frontage Rd/US-87 intersection. A growth rate was established as part of the preliminary traffic report in Activity 112. The construction year has not yet been determined but is assumed to be 2024.

MDT Traffic Data Collection and Analysis Section provided the following traffic data:

I-90 RP 450.0 to RP 455.3

2019 AADT	28,570 – Present
2024 AADT	32,960 – Letting Year
2044 AADT	58,380 – Design Year
DHV	6070
T	13.8%
ESAL	1675
AGR	2.9%

US-87 RP 0.0 to RP 1.0

2019 AADT	23,690 – Present
2024 AADT	24,900 – Letting Year
2044 AADT	30,380 – Design Year
DHV	3190
T	6.7%
ESAL	353
AGR	1.0%

Old US-87 RP 0.0 to RP 0.510

2019 AADT	8,520 – Present
2024 AADT	8,960 – Letting Year
2044 AADT	10,930 – Design Year
DHV	1230
T	0.9%
ESAL	47
AGR	1.0%

Coburn Rd RP 0.0 to RP 4.954

2019 AADT	800 – Present
2024 AADT	840 – Letting Year
2044 AADT	1,020 – Design Year
DHV	120
AGR	1.0%

Crash Analysis

A safety analysis was completed on a portion of I-90 (including interchange ramps) from approximate reference posts 452.4 to 455.9 and a portion of US-87 from approximate reference post 0.0 to 0.5, a portion of Old Hardin Road from approximate reference post 0.0 to 0.6, and the North Frontage Road from approximate reference post 0.0 to 2.5 for the 5-year period January 1, 2013 through December 31, 2017.

The crash data shows the following information:

- 129 crashes along I-90 (including interchange ramps) between RP 452.4 and 455.9
- 108 crashes along US-87 between RP 0.0 and 0.5
- 44 crashes along Old Hardin Road between RP 0.0 and 0.6
- 21 crashes along North Frontage Road between RP 0.0 and 2.5

HDR performed a safety assessment of the Lockwood Interchange during the Tier 2 analysis for the Diverging Diamond Interchange. The DDI configuration utilized the FHWA CMF Clearinghouse to identify four CMFs for converting a diamond interchange to a DDI. All four CMFs are for crashes of all severities

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and are shown below. The average of the four CMFs equals 0.63, which estimates reducing crashes 37% when compared to the existing interchange.

CMF ID	CMF Value	Context
8258	0.67	Suburban
9104	0.592	Urban
9107	0.625	Urban
10135	0.633	Not specified

The crashes reported were documented as the following types of crashes:

- 81 Fixed object
- 2 Head on,
- 1 Jackknife
- 3 Left-turn, opposite direction
- 4 Left-turn, same direction
- 1 Lost control
- 3 Not fixed object or debris
- 4 Other
- 5 Rear to front
- 2 Rear to rear
- 2 Rear to side
- 118 Rear-end
- 46 Right angle
- 13 Roll over
- 4 Sideswipe, opposite direction
- 31 Sideswipe, same direction
- 19 Wild animal

The data provided extends beyond the project limits and includes Johnson Lane, interchange ramps extending east from Johnson Lane.

MDT Safety Management summary identified no HSIP funded projects. The project summary identified six crash clusters along I-90:

- In 2016, the section from RP 450.236-450.836 was identified as a crash cluster. No feasible countermeasures were identified to address any observed crash trends within this section of roadway.
- In 2016, the section from RP 451.735-452.650 was identified as a crash cluster. No feasible countermeasures were identified to address any observed crash trends within this section of roadway.
- In 2018, the section from RP 451.835-452.450 was identified as a crash cluster. No feasible countermeasures were identified to address any observed crash trends within this section of roadway.
- In 2013/2014, the section from RP 449.990-450.481 was identified as a crash cluster. No feasible countermeasures were identified to address any observed crash trends within this section of roadway.
- In 2013/2014, the section from RP 452.800-453.293 was identified as a crash cluster. No feasible countermeasures were identified to address any observed crash trends within this section of roadway.
- In 2012/2013, the section from RP 452.800-453.293 was identified as a crash cluster. No feasible countermeasures were identified to address any observed crash trends within this section of roadway.

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Major Design Features

- a. **Design Speed.** The design speed for I-90 mainline is 70 mph. The posted speed limits are 65 mph for all vehicles. Formal design speeds were not assigned but the ramp geometric features are designed for speeds between 35 and 60 mph. The speed limit along US-87 is 45 mph within the project limits. The design speed for US-87 is 40 mph following MDT geometric design standards for Urban Principal Arterials. However, a more appropriate design speed of 30 mph will be used for the DDI geometrics.
- b. **Horizontal Alignment.** The existing I-90 alignments meet current geometric standards, and no horizontal adjustments are proposed for most of the project. There are 4 existing horizontal curves along I-90 mainline within the project limits that will be maintained, with 5,730', 5,800', 5,800' and 11,459' radii respectively.

The US-87 alignment was revised to accommodate the proposed interchange configuration; however, it still generally follows the existing alignment. US-87 has 2 horizontal curves within the current project limits. The first is a 750' radii and the second is a 930' radii. For the proposed interchange, there will be separate northbound and southbound alignments controlling the DDI cross overs. The minimum radius for the DDI cross over is 289' which meets the urban geometric standards for 30 mph.

- c. **Vertical Alignment.** Independent vertical profiles were set for both the EB and WB I-90 roadways to control the surface drainage of the median and match the existing normal crown cross slope. In general, the profile of I-90 will match existing. However, existing superelevations on I-90 within the project limits do not meet current design standards and need to be increased by 1% cross slope. Locations with revisions to superelevation will include pavement pulverization and a revised profile to provide appropriate elevations for the concrete barrier rail in the median.

The vertical alignment of US87 will be flattened across the bridge, which raises the profile over I-90 providing proper vertical clearance and improves safety of the roadway, especially during inclement weather. On either side of the interchange, the vertical alignment of US-87 generally matches the existing roadway profile. The profile includes two crest curves and three sag curves.

The maximum gradient on the project is 3.0% on I-90, 3.4% on US-87 and 4.7% on N Frontage Rd. The minimum gradient on the project is 0.2% on I-90.

- d. **Typical Sections.** The proposed typical section for I-90 is comprised of 3-12' travel lanes, 10' outside shoulders, and 10' (min) inside shoulders between the Lockwood and Johnson Lane Interchanges. The finished top width for I-90 in the 3-lane section is 56' in each direction.

The proposed typical section for Ramp A, Ramp B and Ramp D generally consists of a single 15' travel lane, with 6' outside shoulders, and 4' inside shoulders. The proposed typical section for Ramp C generally consists of 2-12' travel lanes, 6' outside shoulders, and 4' inside shoulders. The proposed ramp typical sections transition widths as lane configuration changes are required for the proposed interchange intersections. The proposed finished top width for Ramp A varies from 25 feet to 46 feet. Ramp B proposed finished top width is 25 feet. Ramp C proposed finished top width varies from 34 feet to 46 feet. Ramp D proposed finished top width varies from 27 feet to 37 feet.

US-87 will be reconstructed to accommodate the new interchange configuration and will carry three through lanes north of N Frontage Rd. The remaining segments of US-87 will include two 12' travel lanes in each direction with 6' outside shoulders and variable width raised median. Left and right turn lanes will be provided where applicable. The finished top width for US-87 varies from 92 feet near N. Frontage Rd., as wide as 112 feet within the DDI, and 36 feet at the end to tie to existing PTW. Transition of the three lanes north of N Frontage Rd. to existing two lanes need to be coordinated during the PE Phase.

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- e. **Surfacing.** For the reconstruction portions of I-90, 0.6' of PMS over 0.9' of crushed aggregate course over 2' of special borrow is proposed. Where pavement preservation is appropriate, a 0.25' mill/fill is proposed.

Where US-87 will be reconstructed with PCCP, 0.65' of PCCP over 0.5' of crushed aggregate course over 2' of special borrow is proposed. The finished surface width from the beginning of US-87 to the Frontage intersection is 92 feet. Where US-87 will be reconstructed with PMS, 0.4' of PMS over 0.8' of crushed aggregate course, over 2' of special borrow is proposed.

Ramps A and B will be 0.4' PMS over 0.75' crushed aggregate course over 2' special borrow. Ramps C and D will be 0.4' PMS over 0.9' crushed aggregate course over 2' special borrow.

- f. **Grading.** Most of the project is in a fill condition with a cut section located just west of the Lockwood Interchange. Proposed side slopes meet current geometric design standard recommendations. Most of the grading along I-90 will be in the median where a 2' special borrow is recommended underneath the widening for the additional lane in each direction. The superelevation will be corrected for the existing horizontal curves to meet current design standards, requiring some additional grading work. Most of the grading for US-87 will be removal of existing roadway, curb and gutter and small amounts of sidewalk. The profile of US-87 will be revised to accommodate vertical clearance for the bridge and additional safety with the north side of the bridge being raised while the south end lowers slightly. The new ramp configurations and connections will require grading to accommodate the new interchange geometrics. The overall project will be an excess excavation job with no balance points.
- g. **Slope Design.** Existing guardrail will be replaced to meet MASH guardrail requirements and the existing guardrail widening will be evaluated and revised as appropriate to meet current design standards. The DDI will provide a larger footprint than the current interchange configuration and may result in retaining walls and/or guardrail with steep slopes behind guardrail. Proposed slopes will be designed in conjunction with the geotechnical recommendations for the native soils. Guardrail widening will be proposed where possible.
- h. **Geotechnical.** The geotechnical approach to this project will be similar to the I-90 Yellowstone R – Billings project, with the intent of utilizing as much of the existing pavement as possible along I-90 through mill/overlay and pavement pulverization. It is recommended to sub-excavate the existing clay soils and place a 2' special borrow in its place within the median widening construction. The new bridge will likely be constructed with drilled shafts or steel piles. There is a potential need for retaining walls along Ramp A and Ramp C depending on private property impacts.
- i. **Hydraulics.** Existing drainage patterns within the project limits generally flow toward the Yellowstone River. The project is located within the City of Billings Urbanized Area and is subject to local MS4 requirements which require stormwater water quality and quantity mitigation. The interchange modifications will include curb and gutter and a larger impervious area along US-87. This will require the addition of a new storm drain system and detention, retention, and/or infiltration facilities to provide required stormwater water quality and quantity mitigation. Bridge deck drainage will be evaluated and a bridge deck drainage system incorporated if needed to meet allowable spread requirements.

The addition of an auxiliary lane in both directions of I-90 between the Lockwood and Johnson Lane interchanges will increase the stormwater runoff compared to the existing conditions and storm drain inlet structures with outfalls to the roadway ditch will be necessary along the median. Draining the I-90 median along the concrete barrier rail will require careful attention to vertical profiles and cross slopes along the I-90 eastbound and westbound roadways. Detention, retention, and/or infiltration facilities will be incorporated adjacent to the roadway to provide required stormwater quality and quantity mitigation.

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Two major drainage crossings with FEMA regulatory floodplains with delineated floodways are located within the project limits. Both crossings are proposed to be protected in place and will not be impacted by the project. One major irrigation crossing exists within the project limits, crossing I-90 within the Lockwood Interchange and underneath Ramp C. Special care will be given to minimize impacts to this irrigation crossing.

New commercial development has occurred adjacent to the project and additional future development is proposed. Said development will impact stormwater runoff drainage patterns and will include additional buried utilities (e.g., water, sanitary sewer, and stormwater) that will need to be considered for the proposed stormwater drainage system design.

- j. **Permanent Erosion and Sediment Control (PESC) Features.** Disturbed areas will be replanted with native grasses. Permanent erosion control measures may be required to accommodate bridge drainage. Embankment protectors will be considered for steep embankments near the interchange.
- k. **Bridges.** The interchange improvements will require reconstruction of the existing Lockwood Interchange structure. Horizontal and vertical curvature will remain off the bridge to allow for a normal crown cross slope of 2% across the bridge. Appropriate vertical clearance will be provided to accommodate future overlays of I-90 as well as a potential widening of I-90 to three lanes in each direction under the bridge. The grade across the bridge will be flattened from the existing grade of nearly 4% to approximately 2% to improve the safety of the interchange, especially during inclement weather. The proposed out-to-out bridge width is 87'-2".
- l. **Safety Enhancements.** The existing diamond interchange will be replaced with a Diverging Diamond Interchange to improve overall safety and functionality of the interchange. The eastbound off-ramp will be realigned to reduce the skew of the intersection with US-87 to allow for WB-67 to safely maneuver the turn. The bridge over I-90 will be set to a grade of approximately 2% improving its existing 4% slope to allow for better sight distance and aid in slow moving traffic during inclement weather. Pedestrians will be directed to a concrete barrier protected median along the bridge, separated from traffic. The full access at Coburn Road will be converted to $\frac{3}{4}$ access to improve the overall safety by reducing conflict points.
- m. **Context Sensitive Design.** Coordination with Yellowstone County and stakeholders along Coburn Road and Rosebud Lane will be necessary to revise the Coburn Road access from full access to $\frac{3}{4}$ access.
- n. **Traffic.** The existing diamond interchange will be replaced with a Diverging Diamond Interchange, requiring modifications to the existing ramps and US-87 connections to tie into the new interchange configuration. New signing will be necessary to guide traffic through the revised interchange. The proposed interchange will include new signals at the ramp intersections. A dedicated left turn lane from N Frontage Rd onto US-87 will be added as well as lengthening the right turn lane from N Frontage Rd onto US-87. Coburn Rd will be converted to a $\frac{3}{4}$ access from its original full access operation, requiring improvements downstream of Coburn Rd to accommodate the NB left movements.

The project includes lighting at the interchange to meet current design standard with LED luminaires. Cantilever or overhead sign structures for ITS/VMS will be considered with the project.

- o. **Miscellaneous Features.** Existing guardrail, concrete barrier and end treatments will be evaluated and upgraded with this project. Existing and new traffic control devices will be replaced to meet current design standards, as applicable. Cable rail is located along the I-90 median between the Lockwood and Johnson Lane interchanges. Widening of I-90 towards the median will require the cable rail to be replaced with concrete median barrier. Cable rail will be replaced on the east end of the project when the auxiliary lane is dropped and the

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project transitions to match the existing median near the Johnson Lane Interchange. Fencing within the project limits will be replaced following right-of-way boundaries. For raised medians within the new interchange, sloped median curb will be considered to better accommodate snowplows.

- p. **Pedestrian/Bicycle/ADA.** Existing pedestrian facilities, in the form of concrete sidewalks, exist along the east side of US-87, north of the project limits, continuing up to and terminating at the N. Frontage Road intersection. The project proposes to include new pedestrian facilities including a 10-ft wide multi-use path beginning at the N. Frontage Rd. intersection along US-87, crossing to the center median within the interchange across the bridge, then crossing to the west side of US-87 south of the bridge. The multi-use path will terminate at the Coburn Rd. intersection. A proposed five foot wide sidewalk will continue along the west side of US-87 and terminate at the US-87/Old Hardin Rd. intersection. No bike lanes exist, and no bike lanes are proposed.

Design Exceptions and Baseline Variances

No design exceptions or baseline variances are identified at this time.

Right-of-Way

The existing right-of-way on either side of I-90 varies from 110' to 330' from existing centerline, with access control fencing varying from 100' to 300' from existing centerline. Generally, the existing R/W on either side of mainline is 140' from existing centerline. Existing R/W along the interchange ramps is variable.

The existing right-of-way for US-87 is generally 90' left and 100' right from the existing centerline.

Widening to the inside along I-90 will not require right-of-way acquisition along I-90. Interchange modifications for the diverging diamond interchange on US-87 will require right-of-way, particularly along the ramps, near the intersections with US-87. Improvements along US-87 will require additional right-of-way to accommodate the additional third northbound lane north of I-90. Retaining walls could reduce the amount of right-of-way along the ramps and will be reviewed as part of the design phase of the project. The total approximate right-of-way acquisition is 2.0 acres. Proposed right-of-way will be refined as design progresses.

It is anticipated that the project will not require a modification (addition or reduction) to the current federal aid agreement for RW.

Access Control

Interstate I-90 is a full access controlled facility. No changes to the existing access control for the interstate are included with this project. Minor modifications to the access control fence at the Lockwood Interchange may be required. Access control along US-87 south of I-90 will be modified with the addition of a raised median, and $\frac{3}{4}$ access at the Coburn Rd. intersection.

Utilities/Railroads

With the Exxon refinery located on the north side of the interstate between the Lockwood Interchange and the Johnson Lane Interchange, there are buried pipelines within the project limits. Numerous overhead and underground telephone, fiber optic, power, and natural gas lines exist within the project limits. A Phase I SUE survey was performed to locate both overhead and underground utilities. As the design phases are further developed, a Phase II SUE will be necessary to obtain depths and other additional information of existing utilities. There is no railroad involvement anticipated with this project.

It is anticipated that the project will not require a modification (addition or reduction) to the current federal aid agreement for IC.

Maintenance Items

Consideration of emergency services median turnarounds on I-90 will be included with this project. Consideration for maintenance, or agreements for maintenance of pedestrian/bicycle/ADA facilities will be determined as design progresses.

Scope of Work Report

Environmental Considerations

Preliminary environmental documentation has been completed during the OT phase that includes the following activities: 111, 177, 178, 181, 182, and 185. A summary of environmental determinations and concerns is provided by the following bullets.

- A cultural resources survey and report have been completed wherein one site, an historic residence at 1305 US Highway 87 East (Site 24YL2232), has been recommended as eligible for the National Register of Historic Places. SHPO concurred with the eligibility recommendation for Site 24YL2232 on February 3, 2020. Site 24YL2232 is located outside of existing right-of-way and beyond the potential area of highway improvements and no impact to this site is anticipated.
- The proposed project is not anticipated to impact any public park, recreation lands, or wildlife and waterfowl refuges protected under Section 4(f). Because there are no Section 6(f) properties within the project limits, the project as currently proposed would not result in the permanent conversion of any LWCF properties.
- The Preliminary Biological Assessment identified that the proposed project would have no effect on any federally listed threatened or endangered species and preparation of a final Biological Assessment is not necessary.
- A single wetland measuring 0.24-acre was delineated within the project area located between the eastbound off-ramp and interstate at the Johnson Lane interchange. Modifications to the Johnson Lane interchange are planned with an adjacent project and no wetland impacts would occur as a result of this project.
- The project was evaluated for potential wildlife accommodation needs. The Biological Resource Report (BRR) concluded that, based on the evaluation in the BRR and the limited scope of work, no wildlife accommodations are recommended for consideration with this project. Preparation of a WARM is not necessary.
- A noise analysis has been completed that identified impacted receptors throughout the project corridor. The draft report did not include noise abatement evaluation. During final design, the noise analysis will be updated as necessary and noise wall configurations and other potential abatement methods will be evaluated.
- The Lockwood Solvent Ground Water Plume NPL Site is located east of the Yellowstone River bridges on the north side of the interstate and the solvent plume is within existing MDT R/W. Depths of contaminated groundwater are documented by several nearby monitoring wells and past investigative work. Additional evaluation will be necessary moving forward to determine if project implementation would encounter known contamination.
 - Potential impacts to the Lockwood irrigation ditches are not anticipated to trigger the requirement for a Clean Water Act Section 404 permit. The Lower Lift Ditch has been determined by the U.S. Army Corps of Engineers (USACE) to be non-jurisdictional per the Approved Jurisdictional Determination (AJD) on May 11, 2021. An AJD has not been determined for the Upper Lift Ditch. Should the project require modification to the Upper Lift Ditch at the Coburn Road/Rosebud Lane intersection, additional coordination with the USACE will be necessary to determine if a Section 404 permit is necessary.
 - The proposed project is located within the Billings Urbanized Area and is subject to MS4 requirements. A LID Practice Analysis Form will be included.
- A Categorical Exclusion appears to be the appropriate level of environmental document and significant impacts are not anticipated.
- Environmental special provisions, if necessary, would be developed at a later phase in project development.

Energy Savings/Eco-Friendly Considerations

LED lighting will be included for the proposed interchange. Lighting along I-90 will not be included with this project. Lighting will be designed to meet current design standards and lighting requirements.

Experimental Features and Proprietary Products

No experimental features are planned for this project. The use of Proprietary Products is not anticipated for this project.

Work Zone Safety and Mobility

Scope of Work Report

At this time, Level 1 construction zone impacts are anticipated for this project as defined in the Work Zone Safety and Mobility (WZSM) guidance. The plans package will include a Transportation Management Plan (TMP) consisting mainly of a Traffic Control Plan (TCP). A limited Transportation Operations (TO) component and a Public Information (PI) component to address interchange ramp closures and wide load detours will also be included in the plan package. These issues are discussed in more detail under the Traffic Control and Public Involvement sections.

Other Projects

The following list of adjacent MDT projects are currently in development and may impact this project.

- I-90 Yellowstone R – Billings
- Billings Bypass (Johnson Lane Interchange)
- 1st Ave/Exposition Drive Intersection
- 1st Ave N – Billings
- Airport Rd/Main St intersection improvements

The following non-MDT projects and developments will be considered for this project.

- One Big Sky District (Chamber of Commerce development district)
- Metra Event Traffic
- Lockwood High School
- Camping World at the end of the Cul-de-sac on Rosebud Lane, west of Coburn Road
- Strip Mall Development in the Southeast quadrant of the Lockwood Interchange
- Town Pump Renovations (storm/sewer)

The Billings Long Range Transportation Plan Update (2018) includes the following recommended projects:

- I-90 from Lockwood Intch to Johnson Lane Intch - Add a third travel lane to I-90
- Lockwood Road & N Frontage Road - Reconfiguration of existing intersection
- Lockwood Interchange - Construct additional EB and WB mainline lanes under and through the Lockwood Interchange and improve pedestrian facilities

Traffic Control

Traffic and access will be maintained throughout the project during construction. Work on I-90 and overpass structure may require median crossovers, lane closures, and closing EB or WB roadway to traffic. Lane shifting and reductions during construction will likely be required on US-87 and the on and off ramps for interchange improvements. Innovative traffic control and construction sequencing techniques will be considered to reduce the total duration of lane reductions to maintain safety and mobility throughout the project corridor.

Project specific detailed traffic control plans will be developed to identify the construction phasing methods assumed for the project.

A Transportation Management Plan (TMP) consisting of a Traffic Control Plan (TCP), a limited Transportation Operations (TO) component and a Public Information (PI) component is appropriate for this project.

Wide loads will be detoured where practicable, or if necessary, a plan to stage and pilot wide loads through the project construction site at specific times will be developed.

Certain work requiring ramp closures, or other lane closures will be considered for off-peak hours, or during nighttime work. Advanced signage will be utilized to inform the traveling public of the construction activities and potential delays.

Intelligent Transportation Systems (ITS) Features

ITS will be considered with the project, including cantilever/overhead variable message boards to identify road closures, event traffic or other related items.

Scope of Work Report

Public Involvement

The project Level of Impact (LOI) has been determined to be Substantial and level of public involvement C, as defined by MDT's Public Involvement Plan.

A public meeting was held March 25th, 2021. Two virtual public meetings were held on the same day. Additional public meetings are anticipated during the PE Phase of the project.

A neighborhood meeting for the Coburn Rd/Rosebud Lane residents was held on February 24, 2022 to discuss possible options for traffic on Coburn Rd to access US-87, as the intersection will be revised to prohibit a left-turn onto US-87

Stakeholder outreach will be necessary to identify pedestrian facilities and access requirements as well as coordination with Yellowstone County and residents to determine Coburn Road access improvement feasibility.

Coordination will be necessary for oversize and overweight vehicles to aid in the development of sequence of operations and the traffic control plan.

Construction Cost Estimate

The cost estimate at AGR was \$45,100,000 for Total CN+CE (TOTAL costs w/INF + IDC)

	Estimated cost	Inflation (INF) (from PPMS)	TOTAL costs w/INF + IDC (from PPMS)
IM, CN	\$31,800,000		\$ 42,000,000
TOTAL CN	\$31,800,000	\$6,400,000	\$ 42,000,000
CE (11.5%)	\$3,600,000	\$750,000	\$ 4,800,000
<i>Project TOTAL from all of the funding types above:</i>			
Project TOTAL CN+CE	\$35,400,000	\$7,200,000	\$ 46,800,000

The estimate above includes \$1,500,000 for traffic control, 20% allowance for contingency, and 9% for mobilization. The CE cost includes additional concerted PI effort during construction.

Note: Inflation is calculated in PPMS to the letting date. If there is no letting date, the project is assumed to be inside the current TCP and is given a maximum of 5 years until letting. IDC is calculated at 9.66% for FY 2022.

Preliminary Engineering

The percent OT expended is 85%. The OT end date is 12/31/2022. FHWA Auth Date 1/28/2022 was issued for Full Preliminary Engineering (PE). A review of the expended preliminary engineering and hours used compared to the anticipated amounts required for completing the project design indicates that a modification is needed for the PE Phase of the project.

- The project OT Phase has been completed and an amendment is required for the PE Phase.

Project and Risk Management

This will be a consultant designed project. The MDT consultant project engineer administering this project will be Mark Studt, P.E. of the Consultant Design Bureau. The consulting firm for this project will be HDR. The project manager for this project will be:

HDR Engineering, Inc.
Tim Erickson, PE
970 S 29th St W
Billings, MT 59102
406.651.6656
tim.erickson@hdrinc.com

Scope of Work Report

A risk analysis and project feasibility study report were completed (6/11/2021) during the OT Phase of the project.

This project is considered a Project of Division Interest (PoDI) by FHWA. Following MDT's risk management guidance, a project risk analysis was completed, and the project's level of risk is identified as medium. Based on identification as a medium risk project, the Risk Management Plan Worksheet (RMP) was completed for risky elements for the project.

The significant risks and active management strategies are identified below.

Scope of Work Report

Project Risk Documentation – High Risk Level Elements	
Potential Risk Element	Mitigation Strategy
Proposed Scope of Work: <ul style="list-style-type: none"> • New interchange • Capacity adding/major widening • Major reconstruction 	Provide a consistent design and construction sequence for the entire I-90 corridor from the 27th Street Interchange to the Johnson Lane Interchange, including DDI elements. This will aid in both material acquisition, construction expectation, and driver expectancy.
Project Location and Local Coordination: <ul style="list-style-type: none"> • Urban with extensive City and County Coordination • Controversial or complex City or County agreements needed, in particular for bike/ped facilities • TIP and local plan coordination anticipated 	The project team will mitigate risks associated with project location and local coordination by engaging with the public and stakeholders and local agencies early in the design process. A virtual public meeting was completed on March 25, 2021, a neighborhood meeting for the Coburn Rd/Rosebud Lane residents was held on February 24, 2022, and conversations have been ongoing with Yellowstone County officials. The TIP amendment for the PE phase has also been completed and discussed through the Billings Policy Coordinating Committee (PCC).
Funding Considerations: <ul style="list-style-type: none"> • STPS - Reconstruction 	The current preliminary project construction cost estimate is \$35,500,000, which includes \$14,000,000 for I90 improvements and \$24,500,000 for the interchange including the new bridge. At this time, it is assumed the funding will be identified and the project programmed by MDT to construct the entire scope of the project and the design should proceed to survey and right-of-way phases for the project including the new bridge for the interchange.
Work Zone Safety and Mobility: <ul style="list-style-type: none"> • Level 1 (Significant) • Complex sequencing • Significant traffic disruptions 	Create a limited Transportation Operation (TO) component and a Public Information (PI) component to address interchange ramp closures and wide load detours, as well as creating a detailed special provision for sequencing of operations and traffic control. Innovative traffic control and construction sequencing techniques will be considered to reduce the total duration of lane reductions to maintain safety and mobility throughout the project corridor. Wide loads will be detoured, and if necessary, a plan to stage and pilot wide loads through the project construction site at specific times will be developed. Certain work requiring ramp closures, or other lane closures will be considered for off-peak hours, or during nighttime work. The project team will coordinate with the adjoining projects to mitigate concerns rising from overlapping construction seasons.
Traffic Considerations: <ul style="list-style-type: none"> • New traffic signal installation • Overhead signs • Substantial intersection re-design, e.g. DDI 	Enhanced public outreach to educate drivers and pedestrians alike on how to navigate the new interchange as well as additional signing and appropriate striping and signal timing to help educate drivers of how the interchange modifications intuitively channelize traffic, and have an overall benefit for operations and safety.
Utilities Involvement: <ul style="list-style-type: none"> • Multiple utilities require coordination 	Refining the design to minimize utility impacts and required relocations to the extent practicable is recommended. In addition, coordination with utility stakeholders throughout the design phase is recommended to identify existing and future conflicts as well as provide advanced notification for future installations. Phase II SUE will also be performed for utilities identified as potentially impacted to aid in relocation options and/or design revisions to avoid the utility impact. To reduce the risk of undocumented utility impacts during construction, maintain an active log of the utilities located within the project limits and document whether they are impacted by the proposed improvements.

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EPS Project Manager: Mark Studt

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<p>Public Involvement:</p> <ul style="list-style-type: none">• Level C• Local agencies heavily involved• High profile project• Major coordination among numerous stakeholders required, in particular non-motorized special interest groups	<p>A public meeting was held March 25th, 2021 with two virtual public meetings conducted. A neighborhood meeting for the Coburn Rd/Rosebud Lane residents was also held on February 24, 2022. Consistent public involvement with the adjoining I90 Yellowstone R – Billings project and the Johnson Lane Interchange project will help keep the public informed and aid in identifying the proper needs for the corridor. Early engagement with local stakeholders and agencies will help identify cost-effective and practical solutions to finalize the project's scope of work and project limits. Intelligent Transportation Systems (ITS) will be considered with the project to include variable message boards to identify road closures and/or event traffic for both construction and permanent installation.</p>
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EPS Project Manager: Mark Studt

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Ready Date

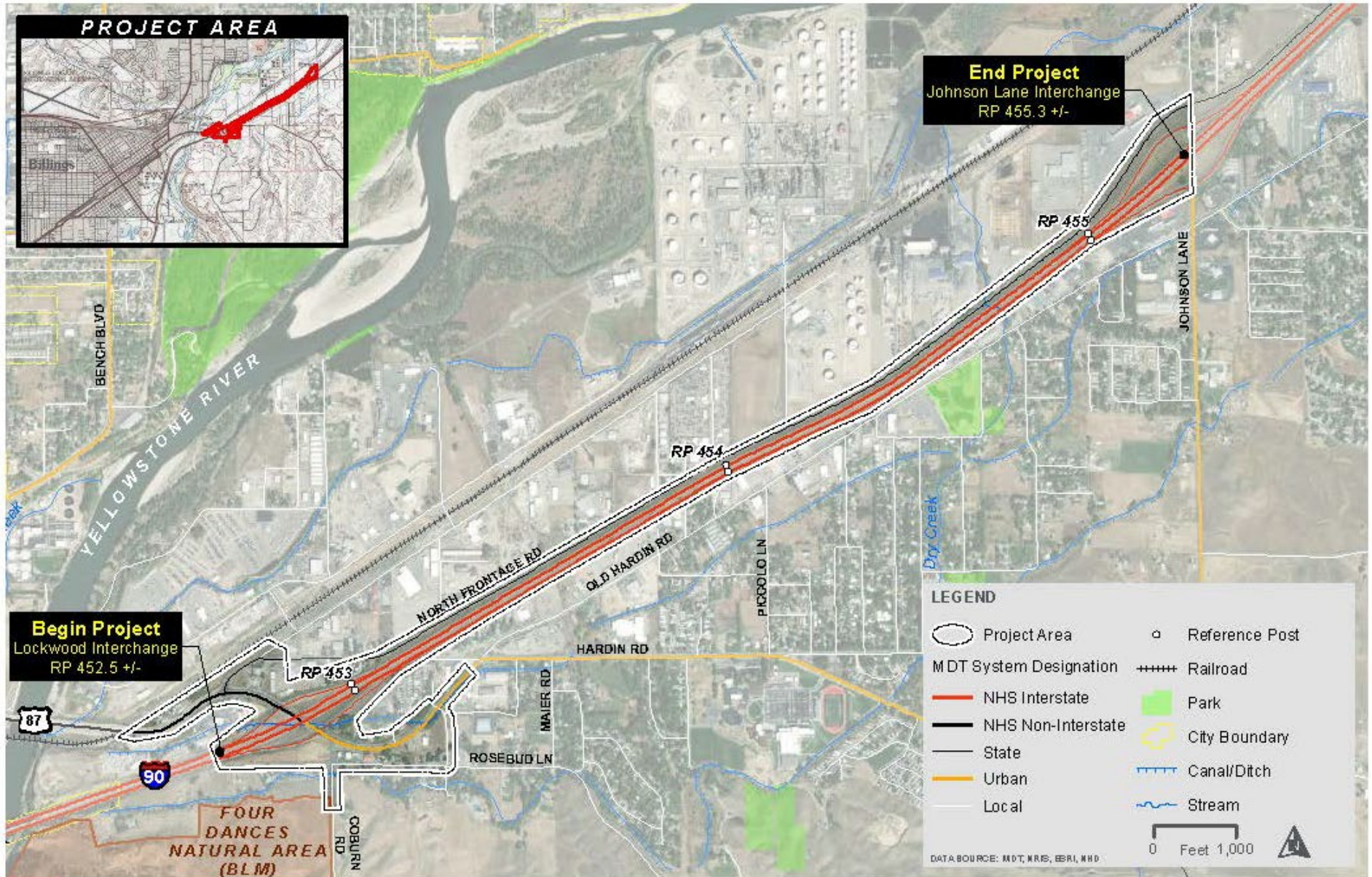
The target ready date for the project is tentative for Fall of 2024. A letting date has not been determined in the Tentative Construction Program at this time.

An EPS schedule will be established with the Phase 2 PE design. The current **PE End Date** is 1/31/2028. The current **OT End Date** is 12/31/2022.

Site Map

A project site map is attached.

Scope of Work Report



LOCKWOOD INTERCHANGE – BILLINGS
 STPX 90-8(191)450 | UPN 9588000
 PROJECT LOCATION MAP



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EPS Project Manager: Mark Studt

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CC:

Headquarters

Ryan Dahlke, Preconstruction Engineer	Steve Giard, Utilities Engineering Manager
Jacob Brotzler, Highways Design Engineer (acting)	Jonathan Ries, Lands Section Supervisor
Dave Hedstrom, Hydraulics Engineer	Bob Heiser, Acquisition Section Supervisor
Bill Weber, Supervisor, Photogrammetry & Survey	Jon Burnett, R/W Access Management Section Manager
Stanton Brelin, Traffic Operations Engineer	Jim Davies, Materials Bureau Chief
Tyrel Murfitt, Traffic Design Engineer	DJ Berg, Pavement Analysis Engineer
Patricia Burke, Safety Engineer	Miles Yerger, Surfacing Design Supervisor
Brett Harris, Engineering Cost Analyst	Scott Helm, Geotechnical Operations Manager
John Pirre, Engineering Information Services	Paul Johnson, Project Analysis Bureau
Megan Redmond, Communications Assistant	Jean Riley, Planner
Rebecca Ridenour, Research Section Supervisor	Tom Gocksch, ESB, Engineering Section Supervisor
Chad DeAustin, Experimental Project Manager	Erin Murphy, Fiscal Programming Section
Lisa Hurley, Fiscal Programming Section	Andy Cullison, Eng. Manager, Bridge Management System
David Phillips, Engineering Division	Jeremy Terry, Road Design Engineer (if involved)
Ed Cohlhepp, Engineering Division	Becky Duke, Traffic Data Collection Section Supervisor (WIM)
Andy White, Secondary Roads Engineer	Doug McBroom, Maintenance Division Operations Mgr (RWIS)
Sheila Ludlow, Bicycle/Pedestrian Coordinator (acting)	Matt Maze, ADA Coordinator
Joe Radonich, Remediation and Assessment	Bill Semmens, Environmental Resources Section Supervisor
Shane Pegram, Construction Bureau – VA Engineer	Jon Axline, Historian
Darin Reynolds, Engr. Const. Contracting Bureau Chief	Darcy Goodson, Reclamation Specialist
	Nathan Haddick, Bridge Design Engineer

Billings

Mike Taylor, Preconstruction Engineer	Tom Tilzey, Maintenance Chief (Billings)
Steven Helms, Materials Lab	Ron "Bud" Pederson, Maintenance Chief (Lewistown)
Michael Fabricius, Acting Right of Way Supervisor	Aaron Eschler, Right of Way Design Supervisor
Ted Thronson, Construction Engineer	TJ Ramaeker, Construction Ops Engineer
Jennifer Davis, Hydraulics Engineer	Tracy Stoner, Bridge Area Engineer
LeRoy Wosoba, Traffic Project Engineer	Dan Kluth, Geotechnical Manager
Susan Lenard, Biologist	Tommy Griffeth, Project Development Engineer
Kurtis Schnieber, Billings District Projects Engineer	Kevin Adkins, District MCS Captain
Andrew Harmon, District Utility Agent	Greg Zeihen, Surfacing Design
Steve Rogne, Signing Designer Supervisor	Christopher Trautmann, Constructability Reviewer
Kyle Osborne, Registered Land Surveyor	Jacob Brotzler, Road Design Area Engineer
Zach Kirkemo, District Traffic Engineer	Kyle Shuck, District Road Design Supervisor