DEPARTMENT OF TRANSPORTATION

District 3
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August 5, 2020

Wendall Meyer
FHWA Division Administrator
380 Jackson Street
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St. Paul, Minnesota 55101-4802
Subject: SP 8680-173 Design Modification

Dear Mr. Meyer:

SP 8680-173 is under contract and is in the final design stages for the 15-mile segment of I-94 between Monticello and Clearwater. The Environmental Assessment (EA) for this project was approved and signed by MnDOT on January 9, 2019 and by FHWA on January 10, 2019. MnDOT's Negative Declaration of Impacts / Finding of Fact and Conclusion was issued April 12, 2019. The FHWA's Finding of No Significant Impact (FONSI) was issued May 8, 2019.

This memorandum documents a Proposed Alternative (design revisions since the Preferred Alternative in the EA) which improves the primary and secondary needs of the project. It is being submitted for your review and approval as it relates to two Alternative Technical Concept (ATC 2 and ATC 3) proposed by the contractor and conditionally approved by MnDOT on April 16, 2019 and April 26, 2019, respectively, during the design-build process.

BACKGROUND

The approved EA includes the I-94 corridor from TH 24 in Clearwater to CSAH 37 in Albertville. The EA divided this 24.2-mile corridor into four segments: Segment 1 was from Clearwater to Hasty, Segment 2 was from Hasty to Monticello, Segment 3 was from Monticello to CSAH 18 and Segment 4 was from CSAH 18 to CSAH 37 in Albertville. While the EA documented the entire corridor, this reevaluation only applies to the project currently under construction on segments 1 and 2 (Clearwater to Monticello).

Originally SP 8680-173 (I-94 Clearwater to Monticello) was programmed for a design-bid-build letting in January 2020. SP 8680-173 was accelerated and converted to a design-build project to coincide with construction of SP 2780-97 (I-94 Maple Grove to Rogers) and SP 8680-172 (I-94 St. Michael to Albertville). All three projects would be constructed in the 2019-2021 timeframe. This construction schedule avoids highway construction projects and traffic disruptions on other major routes in the northwest metro area scheduled for 2022 and beyond. Consolidating the three I-94 project schedules also allowed MnDOT to implement a corridor wide intelligent work-zone and coordinated communications plan.

APPROVED EA - PURPOSE AND NEED STATEMENT

Purpose

The purpose of this project is to provide a long-term solution for highway users by improving pavement conditions and freight movement, while enhancing traffic mobility on I-94 between Clearwater and Albertville.

Need

MnDOT has identified a number of factors justifying the need for the I-94 Albertville to Clearwater Project. The needs have been categorized by primary, secondary, and additional considerations. *Note, Needs are described in further detail within the approved EA/EAW.*

Primary needs include the primary transportation problems of the project corridor. The primary needs that have been examined include:

- Improve pavement condition
- Maintain freight mobility

Secondary needs are other transportation problems that may be able to be addressed at the same time as primary needs. The secondary needs that have been examined include:

- Address geometric deficiencies that restrict traffic flow
- Repair or replace degraded stormwater infrastructure

Additional considerations are elements that are not central to the purpose and need of the project but are important criteria for evaluating build alternatives, including:

- Environmental considerations such as wetland impacts and right-of-way acquisition

APPROVED EA AND FONSI PREFERRED ALTERNATIVE

The approved EA and FONSI document the following improvements for Segments 1 and 2 of the Preferred Alternative:

Segment 1

Segment 1 from Clearwater to Hasty was designed to add a third travel lane in each direction by adding pavement width to the outside shoulders. The rural median is maintained for drainage and snow storage, and high-tension cable barrier was included as a median safety barrier. Due to current project budget constraints, construction on this segment would include a bituminous overlay. In the future, Segment 1 would be programmed for an unbonded concrete overlay (UBOL).

Segment 2

Segment 2 from Hasty to Monticello was designed as a full reconstruction project with the addition of a third travel lane in each direction. The planned project widened the roadway towards the center median and included a center concrete median barrier and wide shoulders between the eastbound and westbound travel lanes.

During the procurement process, MnDOT elected to use the ATC process set forth in Instruction to Proposers to allow innovation and flexibility, and ultimately obtain the best value for the public. The submittal of – and approval of – the ATC 's is in support of MnDOT's desire for a long-term solution for I-94.

On April 4, 2019, the contractor submitted ATC 2 which requested deviations from the RFP for Segment 2. ATC 2 proposed the use of a combination of UBOL and reconstruction (rather than reconstruction alone) where prudent considering constructability, roadway geometry, and drainage requirements. This was approved with conditions regarding specific design requirements for the UBOL (e.g. concrete thickness).

On April 8, 2019, the contractor submitted ATC 3 which requested deviations from the RFP for Segment 2. ATC 3 proposed roadway widening to the outside instead of towards the center median, eliminating the center concrete median barrier and urban stormwater drainage system. This was conditionally approved with an understanding of risk that additional wetland impacts may occur.

EVALUATION OF THE PROPOSED ALTERNATIVE

The following sections provide an evaluation of the Proposed Alternative compared to the Preferred Alternative when evaluated against the project's Purpose and Need statement. Sections from the EA include:

- 4.2.3. Alternatives Summary
- 4.3.2. Recommended Alternative

Section 4.2.3 Alternatives Summary

The approved EA document Section 4.2.3 includes *Table 6: Alternatives Evaluation* which presents a comparison of build alternatives considered including those rejected (A, B, C, E1, and E2) and the Preferred Alternative (D). Table 6 has been modified within this memorandum (Page 10) to reflect only the comparison of the Preferred Alternative to the Proposed Alternative. Evaluation criteria in the rows of Table 6 remains the same as in the approved EA.

Preferred Alternative

The Preferred Alternative would provide a bituminous overlay (UBOL to be programmed in the future) of I-94 with widening to the outside between Clearwater and Hasty (Segment 1) and a full reconstruction of I-94 between Hasty and Monticello (Segment 2) as an urban section with a concrete median barrier. The overlay and reconstruction would address the primary need of the project which is improving poor pavement condition. In both segments, an additional 12-foot travel lane would be added in each travel direction. The proposed typical section (Attachment 2) includes three 12-foot travel lanes, a 10-foot inside shoulder, and a 10-foot paved outside shoulder in each direction. The addition of a third travel lane would allow the corridor to maintain two travel lanes in each direction during construction in order to maintain traffic flow for freight and commuter traffic.

The Preferred Alternative proposed a continuous concrete median barrier for the length of Segment 2. Barrier would be placed 10 feet outside the nearest travel lane in either direction, as required per design standards. The rigid concrete barrier is necessary as no deflection into the opposing roadway can be permitted in the narrow median configuration.

The Preferred Alternative addresses a secondary need of the project by repairing or replacing degraded stormwater infrastructure. In Segment 1 the existing vegetated median ditch would be maintained, and drainage functions would remain largely unchanged. Culverts and aprons found to be degraded or not operating as intended would be modified or improved to restore functionality. In Segment 2, a continuous concrete median barrier would be constructed to separate the two travel directions. New storm sewer would replace the stormwater drainage function of the existing vegetated median ditch in Segment 2. A total of seven stormwater management areas would also be constructed.

The Preferred Alternative would have a total of 2.19 acres of permanent impacts to wetlands and wet ditches. This alternative would acquire 2.77 acres of right-of-way as permanent easement for two stormwater ponds.

Proposed Alternative

The Proposed Alternative would incorporate two methods of roadway construction to improve the primary and secondary needs of this project and achieve MnDOT's desire for a long-term solution for I-94. Throughout Segments 1 and 2, bituminous overlay, UBOL and concrete pavement reconstruction would be used to improve the poor pavement condition. The application of bituminous overlay, UBOL and reconstruction is exhibited in Attachment 1. The proposed typical section (Attachment 2) includes three 12-foot travel lanes, a 10-foot paved inside shoulder, and a 10-foot paved outside shoulder in each direction. The Proposed Alternative offers a median width of 60-66 feet with the majority of Segment 2 proposed as 66 feet. HTCB is proposed in the median a minimum of four feet from the paved shoulder edge and a minimum of eight feet from the median ditch bottom.

Drainage functions would remain largely unchanged in both Segments 1 and 2. In Segment 1, between Clearwater and Hasty, median ditch depths and widths will be maximized to the extent possible. In Segment 2, between Hasty and Monticello, the existing vegetated median ditch would be improved to have a minimum depth of 4-feet and a minimum bottom width of 8-feet to store and convey stormwater. Specific improvements per segment are detailed below.

The Proposed Alternative would provide a bituminous overlay and widening of I-94 in Segment 1, the same as the Preferred Alternative. Refer to Attachment 1 for an illustration of where a bituminous overlay would be used. A short section of reconstruction would be required in Segment 1 to transition the median width from Segment 2. A short reconstruction section would also be required under the Grover Avenue Bridge to maintain vertical clearance.

In Segment 2, the Proposed Alternative would incorporate both reconstruction and UBOL, providing new concrete pavement. An UBOL would be used for most of I-94 eastbound, except under overpasses where reconstruction would be completed to maintain the required vertical clearance. The eastbound roadway would remain on the existing alignment but would be widened to the outside shoulder to accommodate the third travel lane.

The majority of I-94 westbound would be reconstructed. The westbound roadway would be shifted outward by 6 feet in areas of reconstruction accommodating a wider and deeper median ditch. This would also accommodate the third travel lane. UBOL would occur in areas of I-94 westbound where moisture susceptible soils have been identified to maintain the structure of the existing roadbed. This area is primarily west of the Enfield Rest Area. Refer to Attachment 1 for an illustration of where reconstruction and UBOL would be used.

The Proposed Alternative would have a total of 3.133 acres of permanent impacts to wetlands and wet ditches. This alternative would also acquire 2.77 acres of right-of-way as permanent easement for two stormwater ponds.

4.3.2 Recommended Alternative

The Proposed Alternative offers a typical section that also meets the primary and secondary needs of the project. The advantages include the following:

Primary Needs Evaluation

The *primary needs* for the proposed project are to maintain two lanes of travel in each direction during construction and address poor pavement conditions. Based on the current and projected traffic levels on I-94 and the lack of feasible diversion routes, two travel lanes in each direction on I-94 need to be maintained between Hasty and Monticello in order to maintain functional traffic operations.

Maintaining freight mobility. With both alternatives, construction staging operations would allow two lanes of travel to remain open in both directions during construction, equally satisfying a primary need for the project. Going beyond this primary need, the Proposed Alternative provides a safety benefit to long term operation by retaining a rural median, providing a greater minimum lateral offset to a barrier and creating more separation from live traffic for emergency stopping in the median. During emergency use, rural median shoulders are less restricted, allowing stopped motorists greater separation from live traffic.

Improve pavement condition. Pavement conditions along segments of I-94 are deteriorating and the pavement is reaching the end of its service life. For the I-94 project corridor to remain in operation as a viable route for passenger and freight mobility, as well as meet driver expectations as a safe and reliable interstate route, the pavement conditions need to be addressed.

Both the Preferred Alternative and Proposed Alternative address deteriorating pavement conditions. In Segment 1, both alternatives use a pavement overlay to address deteriorating pavement. In Segment 2, the Preferred Alternative provides a complete reconstruction, replacing deteriorating pavement while the Proposed Alternative would incorporate both reconstruction and UBOL as a preferred approach rather than reconstruction only. The UBOL pavement improves the existing pavement condition, meeting a *Primary Need* for this project. It also provides a longer service life than reconstruction, which meets the project's *Purpose* to "provide a long-term solution for highway users".

MnDOT Pavement Management's Highway Performance Management Applications (HPMA) is a decision and analysis tool for use by MnDOT district staff in regard to how to preserve or replace pavement on various roadway projects. MnDOT's statewide performance measures for pavements are based on the Ride Quality Index (RQI), which uses a zero to five rating scale with five being the highest or best to measure the smoothness of driving on a road. Most new construction projects have an initial RQI above 4.0 and pavements are normally designed for a terminal value of 2.5.

MnDOT conducted a *Service Life and Reliability Analysis* (Available from MnDOT Office of Materials & Road Research) of various pavement types to predict the future RQI of activities the HPMA calls construction or rehabilitation. Based on this analysis, the following conclusions were drawn about the relative performance of new construction of doweled concrete pavement (CD Construction) vs. UBOLs.

1) The Weibull Analysis, or measure of a product's expected life span, predicted the life of CD Construction from new to an RQI of 2.5 to be 22 years. The Weibull Analysis predicted life of an UBOL is 35 years from new construction to reach an RQI of 2.5. The dataset for this type of concrete pavement

construction is significantly larger than for CD Construction, meaning the modeling used for the predicted life is also more reliable.

2) MnDOT has a limited dataset for CD Construction since 1999. This speaks to the performance of UBOL and supports that in general, when the alignment of a roadway does not change, and there are not lanes added, MnDOT has constructed unbonded concrete overlays rather than reconstructing the roadways. This is also associated with the lower cost of an UBOL vs. reconstruction.
3) MnDOT performs a Life Cycle Cost Analysis (LCCA) of pavement design alternatives for major projects. Based upon the number of UBOL vs. CD Construction, it appears that the LCCA comparison would indicate that the UBOL alternative is preferred for the Proposed Alternative, based strictly on LCCA alone. This can be assumed because the LCCA analysis utilizes a fixed set of pavement rehabilitation options that are the same for a CD reconstruction and for an UBOL.

The practical application of the *Service Life and Reliability Analysis* is within MnDOT's Pavement Design Manual (PDM), or the state's standards and guidelines for pavement design, pavement-type selection, and documentation available to the contractor. The PDM further provides that I-94 would be a good candidate for an UBOL because the existing pavement has stable support conditions or will require only localized repairs and the roadway has room to permit a significant rise in road profile. The PDM also states that the use of UBOL, with the Proposed Alternative, "provides significantly streamlined construction as compared to reconstruction". For these reasons, the use of UBOL and reconstruction with the Proposed Alternative better satisfies a primary need to *Improve pavement condition* on this project than reconstruction only as documented by the Preferred Alternative.

In addition to providing an improved service life, the UBOL pavement improvement inherently uses fewer natural resources. The improvement does not require removal of the existing roadbed and uses less aggregate in construction of the new roadway. This eliminates the associated trucking of materials which impacts area roadways and reduces use of materials from nearby pits or quarries.

Secondary Needs Evaluation

The *secondary needs* for the proposed project are to address geometric deficiencies that restrict traffic flow and repair or replace degraded stormwater infrastructure.

Address geometric deficiencies. The existing four-foot inside paved shoulders along the corridor do not meet the interstate design standard width of 10-foot paved inside shoulder for six-lane freeways. The narrow, paved shoulders present potential safety conflicts for stopped or emergency vehicles, as well as impacts to mobility that need to be addressed.

The MnDOT Roadway Design Manual (RDM) provides standards and criteria for highway design based on critical, or controlling criteria, and general design elements. The controlling design elements are derived from FHWA's current Federal Aid Policy Guide (See Reference Appendix #3) and AASHTO's current *A Policy on Geometric Design of Highways and Streets,* otherwise known as the "Green Book" (See Reference Appendix #4), adopted by FHWA as the design standard for the National Highway System and are of primary importance to geometric design. FHWA's controlling criteria are identified as those that have substantial importance to the operation and safety performance of highways such that compliance with these criteria is essential in design decision making.

The Proposed Alternative and Preferred Alternative are identical when comparing certain design criteria, namely: lane width, shoulder width, vertical clearance, maximum grade, and design speed. They are similar when comparing stopping sight distance, curve radius and superelevation as these are based on design speed.

The primary difference between the two alternatives is with design elements in the median. The Proposed Alternative utilizes a vegetated median ditch and high-tension cable barrier (HTCB). The Preferred Alternative

utilizes a concrete median barrier along with the additional third travel lane (widening) in the existing median. HTCB provides a number of advantages including the following.

- According to MnDOT Technical Memorandum No. 15-08-TS-04 (See Reference Appendix #5), HTCB offers key advantages over other systems, including concrete barrier, where adequate deflection space is available, such as on this project. According to the memorandum, "A primary advantage of HTCB is that it can be placed on slopes as steep as 1:4, meaning it can be placed further down an inslope, farther away from the traveling public, allowing errant vehicles more room to regain control and avoid impact. Another prime advantage of HTCB is that, upon impact, it exerts less G-force on the occupants of the errant vehicle than semi-rigid and rigid barriers, typically lessening injury potential." (MnDOT Technical Memorandum No. 15-08-TS-4. See Reference Appendix #5) Whereas a concrete median barrier is placed closer to the travel lanes and does not give errant vehicles as much room to regain control outside the travel lanes and avoid an impact with the concrete median barrier.
- "Cable median barriers can reduce fatal crashes by 95 percent. There is no other safety device available that virtually guarantees consistent success in saving lives every year on the interstate system." (*Lessening crash severity and saving lives.* Cable Median Barriers. MnDOT. - See Reference Appendix #6)
- "HTCB is one of the most versatile and forgiving barriers built. It is designed so that when struck, the posts break and the cables flex to absorb the vehicles kinetic energy and redirect the vehicle along the barrier. With more traditional rigid systems, such as plate beam guardrail, there is a greater likelihood that the vehicle would be redirected back to the shoulder or lanes of traffic. Each barrier system has its application. Rigid barriers are very effective at preventing vehicles from leaving the road and hitting fixed objects, going over steep embankments, or crossing into nearby traffic when there is no space to provide a wide median to separate the traffic." (*Cable barrier in the news.* Cable Median Barriers. MnDOT. See Reference Appendix #7)
- According to the *National Cooperative Highway Research Program (NCHRP), Report 794, Median Cross Section Design for Rural Divided Highways* (See Reference Appendix #8), HTCB, referred to within the report as "flexible median barriers", are "generally more cost-effective than rigid barriers and generally should be preferred where the median is wide enough to accommodate the deflection that occurs when a vehicle strikes a flexible or semi-rigid barrier." (6.3 Median Barriers. Page 105. NCHRP. See Reference Appendix #8)
- During maintenance or repair, median barriers may have varying levels of effectiveness. For instance, HTCB are not effective when entirely down, such as after a severe strike. Because barrier installations include multiple anchorages, loss of barrier effectiveness can be reduced and not all strikes result in total loss of barrier performance. During maintenance or repair, both HTCB and concrete median barriers may retain some effectiveness, albeit degraded.
- Based on the contractor's low bid and MnDOT's research on HTCB, the Proposed Alternative is a better use of MnDOT funds because the present value cost of HTCB material, installation, and maintenance over the HTCB service life (20 years) is calculated at $1,989,242.24. This is 60% less than the $5,000,000.00 cost of concrete median barrier material and installation alone, in present dollars. Further, in 20 years, the future replacement cost in 2040 dollars of HTCB would be estimated at $4,358,674.82, which is still less than the cost of concrete median barrier materials and installation today. See Life Cycle Cost Analysis Calculations. (*Cost.* Cable Median Barriers. MnDOT. See Reference Appendix #9).

Both alternatives comply with the RDM and FHWA's controlling criteria and satisfy the secondary need for the project to address geometric deficiencies. However, the Proposed Alternative provides the potential for additional safety benefits due to the maintaining the existing rural median in Segment 2 as compared to the Preferred Alternative where a concrete median barrier is proposed.

- According to MnDOT's RDM, Section 4-5.01, the desirable median width on rural freeways is 66 feet. The Proposed Alternative provides a median width of 60-66 feet with the majority being 66 feet. This width complies with MnDOT's design guidance promoting the safe separation of opposing traffic streams. A median of this width provides for the required clear zone. HTCB would be provided as a further measure of safety against the potentially hazardous cross median crashes. The greater median width assumes there are no obstructions in the clear zone for one roadway (when HTCB is adjacent to opposite roadway). The Preferred Alternative places concrete median barrier in the clear zone of both directions of I-94. (4-5.01 Width. Page 18 of 50. MnDOT RDM. See Reference Appendix #10)
- The Proposed Alternative provides a safety benefit to long term operation by retaining a rural median, providing a greater minimum lateral offset to a barrier and creating more separation from live traffic for emergency stopping in the median. During emergency use, rural median shoulders are less restricted, allowing stopped motorists greater separation from live traffic. Much like the principle of clear zone, providing the physical separation from an obstruction provides an improved travel safety benefit.
- The Proposed Alternative improves winter snow removal maintenance. The median ditch accommodates winter plowing operations by providing a larger area for snow storage. The median ditch also aids in plowing operations where snow is less likely to be plowed onto an adjacent travel lane. (Strategic Highway Research Council (SHRP). SHRP-H-381. Page 306. See Reference Appendix #11)
- The Proposed Alternative provides improves winter travel safety. The open median ditch greatly reduces the potential of snow drifting near a median barrier. The rural median prevents reduced sight distance on curves, provides space for plowed snow to accumulate, and allows the equilibrium snow slope to tail out below the shoulder, providing clear-zone requirements. Concrete barrier may cause vision impairment with blowing snow and formation of drifts on the traveled way. (SHRP-H-381. Page 306-307, 344. See Reference Appendix #12)
- The Proposed Alternative provides improved access to emergency and enforcement services. The median provides 60-66 feet between opposing travel lanes. Emergency and enforcement vehicles can take refuge in the rural median when accessing the opposing travel lanes. Rural median crossovers do not require crash attenuation that barrier medians require to shield barrier ends at crossovers. (Section 10-7.05.02. MnDOT RDM. See Reference Appendix #13)

Repair or replace degraded stormwater infrastructure. Culverts along the project corridor were assessed by the MnDOT District Hydraulics Unit and it was determined some culverts and associated aprons were either degraded or not functioning as intended. Degraded or dysfunctional drainage can result in overflows, flooding or excessive water on the roadway which, in turn, can cause vehicles to hydroplane or drivers to suddenly decelerate as they approach the water, creating a hazardous condition for themselves and other motorists sharing the roadway.

The Proposed Alternative repairs or replaces degraded culverts and aprons along the project, meeting this secondary need for the project. However, the Proposed Alternative also provides the benefit of improving stormwater drainage. A median ditch in Segment 2 would be less prone to flooding than a storm sewer system as the median ditch has a much larger cross-sectional area and capacity to convey stormwater and provide

storage during high-intensity storm events. There is also no risk of grated inlets that may become clogged with ice or debris due to their small openings. The median ditch does not restrict stormwater drainage.

The Preferred Alternative allows the median shoulder to be covered with stormwater runoff during the 10-year storm design frequency according to MnDOT Technical Memorandum No. 16-05-B-02 (Table 1. See Reference Appendix #14). This memorandum also defines that during the 50-year storm, storm water is allowed to spread three feet into a travel lane in sag curves. MnDOT's Drainage Manual section 4.2.3 (See Reference Appendix #15) stipulates that freeboard in roadside channels be a minimum of one foot, leaving the median shoulder accessible during the 10-year design storm for the Proposed Alternative. Additionally, flood damage potential during the 100-year storm is evaluated for roadside ditches, including analysis or impacts to level of service of the roadway. (MnDOT Engineering Services Division Technical Memorandum No. 16-05-B-02. See Reference Appendix #16. Sections 4-5.0 through 4-5.02.04 RDM. See Reference Appendix #17)

The Proposed Alternative also provides the benefit of improved stormwater treatment. The vegetated median ditch would act as a dry swale to reduce the runoff volume from lower intensity storms, reduce pollutants, and reduce peak runoff rates. The median ditch has a larger capacity than urban median and slows the rate of runoff reaching stormwater basins. (Overview for Dry Swale (grass swale). Minnesota Stormwater Manual. See Reference Appendix #18)

Table 6 Revised provides a summary comparison of the Preferred Alternative and the Proposed Alternative.

Table 6 Revised

Evaluation Criteria	Segment 1	Segment 2	Segment 2
	Preferred Alternative and Proposed Alternative	Preferred Alternative	Proposed Alternative
Temporary right-of-way impacts (acres)[1]	0	0	0
Wetland impact (acres)	0.15**	2.04*	2.98*,[4]
Median barrier type	Cable	Concrete	Cable
Requires lane closure for maintenance and repair	No	No	No
Crossovers required?	Yes	No	Yes
Pavement Longevity[2]	Low	High	High
Minimum usable inside shoulder width (ft)	11.5	10	11.5
Minimum lateral offset to barrier (ft)	14/46	10	14/52
Lane closure likely due to incidents/ breakdowns in median?	No	Yes	No
Drainage Implications[3]	Replace and Extend Culverts	New Median Storm Sewer System; Maintain Outside Ditches	Replace and Extend Culverts

* Includes wetlands and wet ditches

** Per the EA, the Preferred Alternative would result in "less than 0.5 acres" of wetland impacts. The contractor investigated this further and determined that the actual wetland impact amount in Segment 1 would be 0.150 acres with the Preferred Alternative design which is the same as the Proposed Alternative design for Segment 1. No wet ditch impacts occur in Segment 1.

[1] All build alternatives involve 2.77 acres of right-of-way acquisition as permanent easement for two stormwater ponds.

[2] Low pavement longevity is the result of pavement on a bituminous overlay life cycle, high pavement longevity indicates a boosted initial pavement life from a new pavement construction.

[3] All build alternatives assume stormwater pond construction in same locations.

[4] 2.755 acres wet ditch, 0.228 acres of wetland

Additional considerations evaluation

This section of the memorandum includes the information provided on the standard state EAW form which was revised based on the Proposed Alternative. These sections include the following:

- 5.7. Cover Types
- 5.11.2.2. Stormwater
- 5.11.2.4. Surface Waters
- 5.13.3. Related to Rare Species
- 5.17 Noise

Section 5.7 Cover Types

The table below is *Table 9: Cover Types* from section 5.7 of the approved EA. The Proposed Alternative column was added as a comparison to the Preferred Alternative. This table reflects the additional considerations, or environmental factors that may be impacted by a proposed alternative. While this table reflects that more impacts to these environmental resources occur with the Proposed Alternative than the Preferred Alternative, they are tertiary to the primary and secondary needs of the project. Differences in the impacts is described in more detail in the sections below.

Table 9 Revised

Cover Type	Before (acres)	Preferred Alternative - After (acres)	Proposed Alternative - After (acres)
Wetlands	4.58	4.36	4.20
Wet Ditches	4.56	3.45	1.79
Deep Water/Tributaries	0.71	0.71	0.71
Wooded/Forest	1.50	0.00	0.00
Brush/Grassland	0.00	0.00	0.00
Cropland	0.00	0.00	0.00
Lawn/Landscaping	414.34	362.50	362.12
Impervious Surface	169.99	219.18	220.93
Stormwater Pond	0.00	5.49	5.94
Total	595.69	595.69	595.69

Section 5.11.2.2 Stormwater

There is no increase in impervious surface area associated with Segment 1 as the travel lanes and shoulder widths are identical between the Preferred Alternative and the Proposed Alternative.

In Segment 2, the Proposed Alternative increases the impervious surface area by 1.75 acres (76,230 sf). The Preferred Alternative and Proposed Alternative have identical travel lanes and shoulder widths in Segment 2. The increase in impervious surface is generated due to the combined difference in aggregate shoulder and concrete barrier surface area. Regarding the roadside areas, the Preferred Alternative has 5 feet of transverse distance in the typical section that is impervious accounting for two 1.5-foot outside aggregate shoulders and a

single 2-foot concrete median barrier. The Proposed Alternative has 6 feet of transverse distance in the typical section that is impervious accounting for four 1.5-foot aggregate shoulders.

Segment 1 remains unchanged from the Preferred Alternative.

In Segment 2, the Preferred Alternative requires the installation of a new median storm sewer system and re-grading the existing outside ditches to current design standards. The Proposed Alternative eliminates the storm sewer system and conveys stormwater in a vegetated median ditch. The vegetated median ditch would drain to the outside ditches via culverts under each roadway. The existing culverts in Segment 2 would be lined, extended or replaced. Additional culverts may be required to adequately drain the median; however, the overall drainage patterns would not change substantially. The roadside ditches would be regraded and shifted outward to accommodate the wider median and additional lanes, maintaining existing drainage patterns to the extent practicable.

The median vegetated ditch in the Proposed Alternative provides a stormwater treatment benefit by increasing the time drainage takes to reach downstream basins and discharges. The vegetated ditches also provide a benefit of increased total suspended solids removal in comparison with the Preferred Alternative storm sewer system. (Overview for Dry Swale (grass swale). Minnesota Stormwater Manual. See Reference Appendix #18. Calculating credits for dry swale (grass swale). Minnesota Stormwater Manual. See Reference Appendix #19.

Due to the extent of disturbance and amount of impervious surface increase, a National Pollutant Discharge Elimination Permit (NPDES) would be required for the project. The project proposes seven stormwater management areas that would be designed to meet NPDES permit criteria. Several of these areas are planned as infiltration practices, with at least three having pretreatment cells.

The NPDES Construction Stormwater Permit requires one inch of runoff from the new impervious surface be retained on-site through infiltration or other volume reduction methods.

There should be no increase in discharge rates off MnDOT right-of-way onto off-site properties without approval from project area cities. Therefore, there is a need to include stormwater management features with the project. The location of stormwater management features is determined by many factors such as: space limitations (i.e., available right-of-way), drainage patterns and boundaries, grades, discharge points, and environmental constraints.

Stormwater drainage would ultimately be conveyed to the same stormwater basin locations identified in the Preferred Alternative. The stormwater basins would be expanded to accommodate the increase in impervious area. See Table 9 for data regarding the increase in impervious area and stormwater basin size.

Section 5.11.2.4 Surface Waters

Wetlands

Over 50 acres of aquatic resources were identified within the existing I-94 right-of-way from TH 24 to the western city limits of Albertville. Based on construction limits and the wetland boundaries identified for the project, 3.133 acres of permanent wetland impact (wetlands and wet ditches) and 0.028 acres (1,228 square feet) of temporary wetland impact are anticipated. In addition, 365 linear feet (3,361 square feet) of permanent tributary impact and 1,096 linear feet (12,040 square feet) of temporary tributary impact are anticipated. The temporary impacts are due to culvert replacements and surcharge fills which would be restored to preconstruction elevations within 90 days of original disturbance. All permanent impacts included fill from roadway reconstruction or grading resulting from drainage improvements (i.e. culvert reconstruction). Of the permanent wetland impact total, 2.755 acres of impact are to wetlands confined to roadside ditches (referred to as "wet ditches"), 0.250 acres of which are within the median area of I-94. Permanent aquatic resource impact totals are listed in Table 1. Permanent impacts by plant community are included in Table 2.

Impacts to aquatic resources are regulated by the Minnesota Wetland Conservation Act (WCA) and by the USACE under Section 404 of the Clean Water Act (CWA); permits are required for wetland impacts from both agencies. It is anticipated that wetlands would be replaced at a 2:1 ratio within Bank Service Area 7 (BSA 7). Wet ditches typically would not require mitigation provided that the ditch is replaced and there is no loss of function. The project would maintain ditches along the outside of the proposed toe of slope. Specific credit purchase amounts would be determined through coordination with the USACE and the MnDOT Office of Environmental Stewardship. A Wetland 2-Part Finding Assessment is included as an attachment to this memorandum, which outlines the alternatives evaluation for wetland avoidance and minimization.

Table 1: Aquatic Resource Impacts by Type and Anticipated Mitigation Requirements

Aquatic Resource Type	Permanent Impact (acres)	Anticipated Compensatory Mitigation Requirements
Wetland	0.378	Minimum 2:1 replacement
Wet Ditch - Median	0.250	Assumed none
Wet Ditch - Outside	2.505	1:1 replacement on site
Tributary	0.077	Assumed none
Total	**3.210**	-

Table 2: Wetland Impacts by Community Type (excludes Wet Ditches and Tributaries)

Wetland Type Classification (Circular 39)	Wetland Type Classification (Eggers and Reed)	Anticipated Wetland Impacts (acres)
Type 1	Seasonally Flooded Basin	0.000
Type 2	Fresh (Wet) Meadow	0.052
Type 3	Shallow Marsh	0.321
Type 6	Shrub Swamp	0.005
	Total	**0.378**

Other surface waters

The project is avoiding permanent impacts to DNR Public Waters. Approximately 570 linear feet (5,697 square feet) of temporary impacts would take place at Silver Creek (Tributary 10), a Public Watercourse. An MPARS permit would be obtained for these impacts.

Section 5.13.3 under Rare Species

Tree removal within the existing right-of-way for the Proposed Alternative would be identical to that intended with the Preferred Alternative. The Preferred Alternative involved tree removal of approximately 2 acres within the existing right-of-way. Tree removal is also planned to occur within the proposed stormwater basin areas. Tree removal for the stormwater basins was not addressed in the Preferred Alternative but is required for all alternatives.

There is no change in tree removal with the Proposed Alternative as removal is driven by temporary widening for maintenance of traffic rather than the final roadway location.

Section 5.17 Noise

The following summarizes the findings in the I-94 Corridor Traffic Noise Analysis Report (Noise Report), which is included in Appendix 5.

Noise Re-Evaluation

A Traffic Noise Analysis was completed for this corridor by Kimley-Horn in January 2019 (2019 Report). The limits analyzed for the 2019 Report were from TH 24 to the western city limit of Albertville, an overall project length of 21.8 miles. It included the cities of Albertville, Clearwater, Monticello, and Otsego. The 2019 Report included noise measurements at seven sites along the Clearwater to Albertville project corridor for noise model validation.

The design-build contract associated with this project includes corridor limits from TH 24 in Clearwater to East of Wright County Road 39 in Monticello. This noise analysis focuses on an approximate 10-mile sub-section of this corridor from West of CSAH 8 in Hasty to East of Wright County Road 39 in Monticello.

In 2020, the Hasty to Monticello portion of the project corridor was re-evaluated. The Existing and No Build models, noise readings and model validation, NSAs, and receptors from the 2019 Report were carried over to this re-evaluation. The Proposed Alternative is the Build Alternative. Due to the differing project limits between the two noise evaluations, NSAs and receptors outside the Hasty to Monticello project corridor were removed from evaluation and discussion. Additionally, 30 newly identified receptors were added throughout the study corridor due to both new construction and wider study limits resulting from the design realignment.

Construction Noise

The construction activities associated with implementation of the proposed project will result in temporarily increased noise levels relative to existing conditions. These impacts will primarily be associated with construction equipment and pile driving.

Table 3 shows peak noise levels monitored at 50 feet from various types of construction equipment. This equipment is primarily associated with site grading/site preparation, which is generally the roadway construction phase associated with the greatest noise levels.

Table 3: Typical Construction Equipment Noise Levels at 50 Feet[1]

Equipment Type	Manufacturers Sampled	Total Number of Models in Sample	Peak Noise Level (dBA)	Equipment Type
Backhoes	5	6	74-92	83
Front Loaders	5	30	75-96	85
Dozers	8	41	65-95	85
Graders	3	15	72-92	84
Scrapers	2	27	76-98	87
Pile Drivers	N/A	N/A	95-105	101

Elevated noise levels are, to a degree, unavoidable for this type of project. MnDOT will require that construction equipment be properly muffled and in proper working order. While MnDOT and its contractor(s) are exempt from local noise ordinances, it is the practice to require contractor(s) to comply with applicable local noise restrictions and ordinances to the extent that is reasonable. Advanced notice will be provided to affected communities of any planned abnormally loud construction activities. It is anticipated that night construction may be required to expedite construction, minimize traffic impacts, and improve safety. However, construction will be limited to daytime hours as much as possible.

Any associated high-impact equipment noise, such as pile driving, pavement sawing, or jack hammering, will be unavoidable with construction of the proposed project. Pile driving noise is typically associated with bridge construction and not expected to be necessary for this project. High-impact noise construction activities will be limited in duration to the greatest extent possible. The use of pile drives, jack hammers, and pavement sawing equipment will be prohibited during nighttime hours.

Traffic Noise Analysis

The project includes the addition of through traffic lanes. As such, this project is considered a Federal Type I project requiring a traffic noise analysis.[2] The following is a summary of the revised *I-94 Corridor Traffic Noise Analysis Report (Noise Report).* Summary tables and maps showing receptor locations are included in the Noise Report in Appendix 5. This Noise Report includes background information on noise, information regarding

[1] Environmental Protection Agency (EPA) and FHWA.

[2] Federal Highway Administration, 23 CFR 772.5 and Type I Projects; more information available at https://www.fhwa.dot.gov/Environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/polguide02.cfm

Federal traffic noise regulations and MPCA state noise standards, a discussion of the traffic noise analysis methodology, documentation of the potential traffic noise impacts associated with the proposed project, and an evaluation of noise abatement measures.

Federal Requirements

The FHWA's traffic noise regulation is located in 23 Code of Federal Regulations (CFR) Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise). 23 CFR 772 requires the identification of highway traffic noise impacts and the evaluation of noise abatement measures, along with other considerations, in conjunction with the planning and design of a Federal-aid highway project (i.e., projects funded or approved through the FHWA).

Under Federal rules, traffic noise impacts are determined based on land use activities and predicted loudest hourly L_{eq} noise levels under future conditions.[3] For example, for residential land uses (Activity Category B), the Federal Noise Abatement Criterion (NAC) is 67 dBA (L_{eq}). The term receptor is used to refer to land uses that receive traffic noise. Receptor locations where modeled traffic noise levels are "approaching" or exceeding the NAC must be evaluated for noise abatement feasibility and reasonableness. In Minnesota, "approaching" is defined as 1 dBA or less below the Federal NAC. A noise impact is also defined when traffic receivers are projected to experience a "substantial increase" in the future traffic noise levels over the existing modeled noise levels. A "substantial increase" is defined as an increase of 5 dBA or greater from existing to future conditions.

State Requirements

The Minnesota state noise standards are located in Minnesota Rules Chapter 7030. The MPCA is the state agency responsible for enforcing state noise rules. In 2016, the Commissioners of the MPCA and MnDOT agreed that the traffic noise regulations and mitigation requirements from the FHWA are sufficient to determine reasonable mitigation measures for highway noise. By this agreement, existing and newly constructed segments of highway projects under MnDOT's jurisdiction are statutorily exempt from Minnesota State Noise Standard (MN Rule 7030) if the project applies the FHWA traffic noise requirements. As a result, any required noise analysis will follow FHWA criteria and regulations only, as has been completed for this project. This project is not required to address Minnesota Rule 7030.

Methodology

In the 2019 Report, field measurements of existing noise levels were measured at seven locations along the Clearwater to Albertville I-94 corridor. The seven locations were originally identified because they are representative of the surrounding area and the typical cross section for that section of highway. Within the 2019 Report, noise levels from the field measurements were within 3 dBA (L_{eq}) of modeled noise levels, validating the model. The seven locations from the 2019 Report were utilized in re-evaluating the noise model; however, only two of the seven locations were located along the Hasty to Monticello segment of the I-94 corridor. The model

[3] Measured traffic noise levels are characterized as a function of time. The equivalent steady-state sound level which in a stated period contains the same acoustic energy as the time-varying sound level during the same period, with $L_{eq}(h)$ being the hourly value of L_{eq}. In effect, it is analogous to the "average" sound level over a given period.

from the 2019 Report was used and no additional field measurements or validations were conducted for purposes of this analysis.

Traffic noise modeling was completed using the FHWA approved Traffic Noise Model 2.5 (TNM 2.5). Traffic noise levels were modeled for existing conditions (2017), the future (2040) No Build Alternative, and the future (2040) Build Alternative. The 4:00 P.M to 5:00 PM period of a typical Friday afternoon was identified as the loudest hour for the entirety of the 2019 Report study section, Clearwater to Albertville.[4] Traffic noise levels were modeled at 190 receptor locations representing residential, commercial, recreational, and industrial land uses along the Hasty to Monticello I-94 project corridor. Additional details regarding the noise modeling methodology are described in the Noise Report in Appendix 5.

Findings

Detailed analysis for each modeled receptor location can be found in the Noise Report in Appendix 5. The analysis result for the Hasty to Monticello segment of the I-94 noise analysis are summarized below.

- The existing L_{eq} noise levels at modeled receptors varied between 51.4 dBA and 74.8 dBA, approaching, or exceeding Federal noise abatement criteria at 69 receptors. This range is the same for the equivalent receptors from the 2019 Report.
- Future 2040 No Build L_{eq} noise levels were predicted to range between 52.3 dBA and 75.6 dBA, approaching or exceeding Federal noise abatement criteria at 74 receptors. This range is the same for the equivalent receptors from the 2019 Report.
- Future 2040 Build L_{eq} noise levels were predicted to range between 52.7 dBA and 76.5 dBA, approaching or exceeding Federal noise abatement criteria at 96 receptors. This compares to the equivalent receptors in the 2019 Report varying between 52.6 and 74.9 dBA.

The analysis shows that under future No Build Alternative conditions, traffic noise levels are projected to increase by 0.6 dBA to 1.0 dBA (L_{eq}) compared to existing conditions for most modeled receptors. This compares to the equivalent receptors in the 2019 Report varying between 0.7 dBA to 1.0 dBA (L_{eq}). Modeled traffic noise levels under the future Build Alternative are projected to vary by -0.4 dBA to 3.7 dBA (L_{eq}) compared to existing conditions. This compares to the equivalent receptors in the 2019 Report varying between -2.4 dBA to 2.7 dBA (L_{eq}).

In 2040, the No Build Alternative would result in noise levels approaching or exceeding Federal noise abatement criteria at 74 receptors. With the Proposed Alternative, noise levels would approach or exceed Federal noise abatement criteria at 96 receptors. In each scenario receptors are scattered along the project corridor.

Potential Noise Abatement

Noise abatement measures (i.e., noise walls) were evaluated along the I-94 project corridor at receptor locations where modeled noise levels were projected to approach or exceed Federal NAC, or result in an increase by 5 dBA or greater from existing to future built conditions.

[4] "Typical" Friday afternoon represents a non-holiday weekend.

The noise wall analysis was completed for 51 potential wall variations along the corridor. Of the 51 wall options analyzed, one wall with two alignment variations, met the feasibility and reasonableness criteria and is proposed as part of the project. A summary description of the proposed noise wall is provided below.

Two versions of Wall S1 representing different alignments were analyzed. Wall S1-KH is the alignment reflected in the 2019 Report and Wall S1-MH is a potential new and revised alignment.

- Wall S1-KH: Wall S1 would be located on the northern side of I-94, between West River Street and Monticello Country Club. The wall is proposed with a height of 20 feet and a length of 4,050 feet. There would be a total of 92 benefited receptors, and the preliminary cost per benefited receptor is $31,389.
- Wall S1-MH: Wall S1-MH is located at the same position as Wall S1-KH and has the same specifications. There would be a total of 93 benefited receptors, and the preliminary cost per benefited receptor is $31,051.

MINIMIZATION AND MITIGATION STRATEGIES

Not all impacts to the social, economic, or environmental resources surrounding the corridor are avoidable. Therefore, the following minimization and mitigation techniques are anticipated to be used with the Proposed Alternative. These strategies provide added benefit to the overall project, supporting the Proposed Alternative as a better solution addressing the project's purpose and need that the Preferred Alternative.

Minimization

Wetland Impacts. It was not feasible for the design of the Proposed Alternative to completely avoid all wetland impacts resulting from the proposed improvements. Wetland impacts that are considered unavoidable have been minimized to the extent practicable without compromising design, contributing to the safe, reliable, and efficient use of I-94. To minimize wetland impacts with the Proposed Alternative, the following minimization measures are proposed:

- 10 feet wide paved inside and outside shoulders (10.5 is standard).
- 1:4 reduced inslopes (1:6 is standard).
- 1:3 inslopes protected by guardrail at:
    - Wetland #2
    - Wetland #30
    - Wetland #32
- Profile adjustments at:
    - Wetland #2
    - Wetland #6
    - Wetland #9
- Roadway realignment minimizing wetland impacts at:
    - Wetland #9
    - Wetland #32
- Stormwater treatment areas have been designed to use existing stormwater best management practice (BMP) locations and avoid wetland impacts where possible. In total, 13 drainage areas between Clearwater and Monticello were evaluated for stormwater management. Areas were eliminated due to drainage limitations (i.e. not located in suitable location to receive stormwater runoff), insufficient right -of-way availability, or the presence of wetlands. Seven areas have been identified that met most or all of the siting criteria. In order to limit wetland impacts, two of these areas have been located in areas proposed for right-of-way acquisition.
- One of the remaining management areas is located in proximity to a Wetlands #1, 1A and 2. Design efforts were made to avoid these impacts but, due to the current level of data available at this stage of design, the size of this pond could not be modified to avoid wetland while maintaining BMP functions. The size and orientation of the pond has been reduced to the extent possible. The location of the pond has been situated to avoid larger wetland impacts near Fish Creek.

A Wetland 2-Part Finding Assessment, included in Attachment 4, outlines the alternatives evaluation from the approved EA/EAW document for wetland avoidance and minimization.

Mitigation

Wetland Impacts. The contractor investigated potential on-site wetland mitigation opportunities during the design build process. As required by the NEPA process and the Clean Water Act Section 404(b)(1) Guidelines (40 CFR 230), to offset potential wetland and stream impacts, the contractor must first investigate the potential of providing on-site wetland mitigation.

After investigation and discussion with MnDOT, it was determined documenting and managing the proper installation, monitoring, and creation of 8-12 separate wetland locations as on-site wetland mitigation was not feasible. The preferred method of wetland replacement is to use established, federally and state approved wetland bank credits. An application for wetland permits has therefore been prepared and will be coordinated with the appropriate agencies with wetland jurisdiction, as it was for the Preferred Alternative. Efforts will be made to replace wetland losses within the bank service area of the wetland impact. The specific wetland compensation (bank credits) to be used will be determined through consultation with the US Army Corps of Engineers (USACE) and the MnDOT Office of Environmental Stewardship (OES) as the project proceeds.

For the USACE, ditches with wetland bottoms may be replaced at a different ratio, dependent on the following items:

- If a ditch bottom wetland is filled but a new ditch created (the ditch is shifted) no mitigation is typically required.
- If a ditch bottom wetland is filled but no new ditch is created mitigation may be required at a 1:1 ratio.

The minimum amount of wetland mitigation anticipated to be required is estimated at 0.378 acres at a 2:1 ratio or 0.756 acres. The project area is located in Bank Service Area 7.

Traffic Noise. It was determined that the Proposed Alternative warranted a re-evaluation of anticipated traffic noise impacts along Segment 2 due to the addition of travel lanes to the outside of the existing roadway, rather than the inside of the existing roadway with the Preferred Alternative.

Upon completion of the noise barrier analysis for the project, it was determined that only Wall S1 met the feasible or reasonable criteria based on MnDOT Noise Requirements, and that the project was compliant with 23 CFR 773. However, most of the noise sensitive receptors saw a small increase, generally between 1 to 2 dBA, in the Build model noise when compared to the levels in the 2019 Report. With that in mind, MnDOT noted that the contractor had not met Section 4.4.3.8 of Book 2 of the design/build contract, which states that the D/B contractor must "make certain that the final noise analysis predicts daytime noise dB levels at each receptor at or below the levels predicted in Exhibit 4-B unless approved by MnDOT."

To address this, the contractor worked closely with MnDOT to identify additional noise mitigation and determined the best approach would be the use of earthen berms. Berms were considered at all noise sensitive areas (NSAs) where noise barriers were previously analyzed and where construction of a berm was possible within the existing I-94 right-of-way. These berms are of varying height and length depending on the number of noise sensitive receptors in each NSA. While not all impacted receptors can be benefited with the addition of grass berms, an overall benefit is expected.

A berm analysis was completed for 11 potential berm variations along the corridor. Of the 11 berm options analyzed, eight provide additional noise benefit to applicable receivers and are proposed as part of the project. In select areas where the preferred berm height for mitigation did not achieve engineering feasibility, wood

plank fencing on top of berms is proposed similar to MnDOT Standard Plan 5-297.661. A summary description of the proposed berms is provided below. A summary description of the proposed berms is provided below. See Noise Report, Appendix F for location details.

- Berm D: Berm D is located along the south side of I-94 adjacent to Locke Lake. The berm is divided into four separate sections, one on the west side of the lake, and three on the east side of the lake, and has a net-length of approximately 3,000 feet and a peak height of 6.5 feet. One area of the berm to the west of Locke Lake includes an approximately 150-foot long, 10.5-foot wood plank fence on top of the berm. The berm sections and fencing provide a reduction in L_{eq} traffic noise level of 0.3 to 5.7 dBA.

- Berm E: Berm E is located on the south side of I-94 adjacent to 127th Street NE and is approximately 1,400 feet long. An approximately 1,400-foot long, 4.5-foot peak height berm provides a reduction in L_{eq} traffic noise levels of 0.0 to 4.2 dBA.

- Berm F: Berm F is located on the south side of I-94 adjacent to Dalton Avenue NE and is approximately 2,150 feet long, with a peak berm height of 4.6 feet. Three select areas (approximately 100 to 200-foot sections) on the berm includes wood plank fencing that is 4 feet high. The berm and fencing provide a reduction in L_{eq} traffic noise level of 1.1 to 4.7 dBA.

- Berm R: Berm R is located on the north side of I-94 adjacent to Elm Street and is approximately 575 feet long. An approximately 575-foot long, 2.8-foot peak height berm provides a reduction in L_{eq} traffic noise levels of 1.1 to 1.6 dBA.

- Berm S2: Berm S2 is located on the north side of I-94 between CSAH 39 and the Monticello Country Club and is approximately 2,520 feet long. An approximately 2,520-foot long, 3.0-foot peak height berm provides a reduction in L_{eq} traffic noise levels of 0.0 to 2.0 dBA. Portions of the berm are not able to be designed to provide benefit due to site limitations; however, benefit is provided at key areas along the berm's length.

- Berm S3: Berm S3 is located on the north side of I-94 between West River Street and the Monticello City Softball Fields and is approximately 1,100 feet long. An approximately 1,100-foot long, 2.8-foot peak height berm provides a reduction in L_{eq} traffic noise levels of 0.1 to 2.8 dBA.

- Berm T: Berm T is located on the north side of I-94, east of Meridian Avenue and is approximately 2,600 feet long. An approximately 2,600-foot long, 4.5-foot peak height berm provides a reduction in L_{eq} traffic noise levels of 0.3 to 3.0 dBA.

- Berm U: Berm U is located on the north side of I-94 adjacent to Clementa Avenue NW and is approximately 1,430 feet long. An approximately 1,430-foot long, 4.5-foot peak height berm provides a reduction in L_{eq} traffic noise levels of 1.6 to 5.0 dBA.

CONCLUSION

Fulfillment of purpose and need for the project

This memorandum documents the Proposed Alternative which meets the primary and secondary Needs of the project. The Proposed Alternative satisfies the project Purpose and Need in the following way:

- It provides a long-term improvement to the poor pavement condition with new concrete pavement as both an UBOL and reconstruction.
- It maintains system operations both during construction and long-term by adding travel lanes for additional traffic capacity.
- It rectifies geometric deficiencies by widening shoulders and increasing the median width to 60-66 feet with most of median being 66 feet.
- It improves and enhances stormwater infrastructure.
- It is a better use of MnDOT funds as the cost of HTCB material and installation is less than concrete median barrier.

None of the changes noted in this reevaluation memorandum are believed to be substantial or cause the existing NEPA approval (approved EA and FONSI) to be invalidated. As noted in this document, wetland impacts for the Proposed Alternative are approximately 0.159 acres greater than the Preferred Alternative and in the Replacement Plan Permit Application (MVP-2018-03454-BGO) but the project remains within the USACE Regional General Permit 2017-02361 Transportation Category 2: Modification – Linear Transportation. Less than one acre of waters of the U.S. will be permanently impacted and temporary impacts to waters of the U.S. will be rectified in less than 90 days.

Wetland impacts for the Proposed Alternative are approximately 0.159 acres greater than the Preferred Alternative. Wetland impacts for the Proposed Alternative were vetted through detailed design effort and compared against the Preferred Alternative preliminary level of design detail when the EA/EAW was approved (January 10, 2019) and original permit application was submitted (January 24, 2019 with Revision March 10, 2019). Although it would incur more wetland impacts, the Proposed Alternative results in a lesser overall environmental impact.

As stated above, the Proposed Alternative provides a long-term improvement to the poor pavement condition with new concrete pavement as both an UBOL and reconstruction. In addition to providing an improved service life, the UBOL pavement improvement inherently uses fewer natural resources. The improvement does not require removal of the existing roadbed and uses less aggregate in construction of the new roadway. This eliminates the associated trucking of materials which impacts area roadways and reduces use of materials from nearby pits or quarries.

For these reasons, the use of UBOL and reconstruction with the Proposed Alternative better satisfies a Primary Need to Improve pavement condition on this project than reconstruction only, as proposed by the Preferred Alternative.

Further, the Proposed Alternative and Preferred Alternative repair or replace degraded culverts and aprons along the project, meeting this Secondary Need for the project. However, the Proposed Alternative also provides the benefit of improving stormwater drainage. The Proposed Alternative retains a rural median width of 60-66 feet with the majority of Segment 2 being 66 feet, or the desirable width on rural freeways per MnDOT's design guidance (MnDOT Roadway Design Manual, Section 4-5.01). The wider, rural median design:

- increases capacity to convey stormwater over a storm sewer system in the Preferred Alternative and provides storage during high-intensity storm events while at the same time slowing the rate of runoff reaching stormwater basins by increasing the median width to 60-66 feet (with most being 66 feet).
- uses the median as a dry swale to reduce the runoff volume from lower intensity storms, reduce pollutants, and reduce peak runoff rates.

To utilize UBOL on the project and provide an equal or better pavement design life than reconstruction alone, widening to the outside is necessary where existing infrastructure capable of accommodating UBOL exists. Similarly, maximizing stormwater benefits and meeting desirable design criteria for a rural median width means widening to the outside is necessary. Inherent in this is an increase in a wetland impacts as they are primarily located in the ditches outside the existing I-94 travel lanes. This is reflected in approval of ATC 3, Condition 4 which states, "The Contractor assumes any risks associated with this modified ditch concept including amended permits and further mitigation or costs associated with additional wetland impacts".

The advantages of the Proposed Alternative improve upon the Preferred Alternative when addressing the project's Primary and Secondary Needs. Considering this as well as economic, environmental, and other pertinent factors in accordance with Executive Order 11990, the Proposed Alternative is submitted for construction.

LIFE CYCLE COST ANALYSIS CALCULATIONS

(See Reference Appendix #20)

High Tension Cable Barrier (HTCB)

Present Value (PV) cost where

PV cost = Present value of the project cost for a specific segment

PV cost = (Initial construction cost) + (Annual maintenance cost) x PV Conversion factor

Initial construction cost = $125,000/mile - $150,000/mile (worst case $150,000/mile assumed)

Annual maintenance cost (statewide) = $3,600/mile (whenever possible, repair costs are recovered through insurance agencies of responsible parties damaging HTCB) (*Cost.* Cable Median Barriers. MnDOT. See Reference Appendix #9)

*PV cost = (L * -$150,000) + (L *-$3,600) * (P/A,i,y)*

L = Segment 2 length (10 miles)

(P/A,i,y) = Conversion factor for a series of uniform annual amounts to present value

i = Minimum attractive rate of return or discount rate (4%)

y = Year in the service life of the countermeasure (**20 years**) (**assume no salvage value after 20 years**)

And: $(P/A,i,y) = \frac{(1.0+i)^{(y)} - 1}{i * (1.0+i)^{(y)}} = 13.59$

*PV cost = (10 * -$150,000) + (10 * -$3,600) * (13.59) =* ***-$1,989,242.24***

*In 20 years, the future replacement cost in 2040 dollars estimated at PV cost * (1+0.04)^20 = $4,358,674.82 ($2040). However, the Present Value cost of the future replacement (2040) would be similar to the planned initial construction cost. The present value to install (2020) and replace (2040) the barrier would be approximately $4M.*

Concrete Median Barrier (Permanent)

Initial construction cost = $500,000/mile

Annual maintenance cost – assume no cost, replace sections if damaged by large vehicles/trucks

*PV cost = (L * -$500,000) + (L *-$0) * (P/A,i,y)*

*PV cost = (10 * -$500,000) + (0) =* ***-$5,000,000.00***

If concrete median barrier is assumed to have a lifespan of 40 years, HTCB can be installed and replaced for an equivalent life span comparison and a lower life cycle cost.

REFERENCE APPENDIX

1. *Chapter 9: Construction and Rehabilitation Alternatives.* Pages 10 and 16. MnDOT Pavement Design Manual http://www.dot.state.mn.us/materials/pvmtdesign/docs/manual/MnDOT_PaveDesign_Chapter9.pdf.
2. MnDOT Roadway Design Manual. https://roaddesign.dot.state.mn.us/
3. *Federal-Aid Policy Guide*. Federal Highway Administration https://www.fhwa.dot.gov/legsregs/directives/fapg/23intro.htm
4. *A Policy on Geometric Design of Highways and Streets*. AASHTO. Hardcopy. Available from: https://www.fhwa.dot.gov/programadmin/standards.cfm
5. *Introduction.* Technical Memorandum No. 15-08-TS-4. Available from http://www.dot.state.mn.us/design/roadsidesafety/links.html
6. *Lessening crash severity and saving lives.* Cable Median Barriers. Minnesota Department of Transportation. https://www.dot.state.mn.us/trafficeng/reports/cmbarrier.html.
7. *Cable barrier in the news.* Cable Median Barriers. Minnesota Department of Transportation. https://www.dot.state.mn.us/trafficeng/reports/cmbarrier.html.
8. *6.3 Median Barriers*. Report 794. Page 105. *Median Cross Section Design for Rural Divided Highways.* National Cooperative Highway Research Program.
9. *Cost.* Cable Median Barriers. Minnesota Department of Transportation. (https://www.dot.state.mn.us/trafficeng/reports/cmbarrier.html).
10. *4-5.01 Width*. Page 18 of 50. MnDOT Road Design Manual. Chapter 4 Cross Sections. https://roaddesign.dot.state.mn.us/
11. *SHRP-H-381.* Page 306. Design Guidelines for the Control or Blowing and Drifting Snow. Strategic Highway Research Council. February 1994. https://onlinepubs.trb.org/onlinepubs/shrp/SHRP-H-381.pdf
12. *SHRP-H-381.* Page 306-307, 344. Design Guidelines for the Control of Blowing and Drifting Snow. Strategic Highway Research Council. February 1994. https://onlinepubs.trb.org/onlinepubs/shrp/SHRP-H-381.pdf
13. *10-7.05.02. Project Considerations for Median Barriers.* Page 32 of 41. MnDOT Road Design Manual. Chapter 10 Traffic Control Devices and Traffic Barriers. https://roaddesign.dot.state.mn.us/
14. *Table 1.* Page 2. MnDOT Technical Memorandum No. 16-05-B-02. https://www.dot.state.mn.us/bridge/pdf/hydraulics/drainagemanual/tm1605b02-1758979-v2.pdf
15. *4.2.3 Roadside Channels.* Page 4 of 32. MnDOT Drainage Manual. https://www.dot.state.mn.us/bridge/pdf/hydraulics/drainagemanual/chapter%204.pdf
16. *MnDOT Engineering Services Division Technical Memorandum No. 16-05-B-02* https://www.dot.state.mn.us/bridge/pdf/hydraulics/drainagemanual/tm1605b02-1758979-v2.pdf
17. *4-5.0 through 4-5.02.04.* MnDOT Road Design Manual. Chapter 4 Cross Sections. https://roaddesign.dot.state.mn.us/
18. *Overview for Dry Swale (grass swale).* Minnesota Stormwater Manual https://stormwater.pca.state.mn.us/index.php?title=Overview_for_dry_swale_(grass_swale))
19. *Calculating credits for dry swale (grass swale).* Minnesota Stormwater Manual. https://stormwater.pca.state.mn.us/index.php?title=Calculating_credits_for_dry_swale_(grass_swale)).
20. *5.3 Estimated Costs. Pages 17-18.* Louisiana Department of Transportation and Development, Cable Median Barrier Systemic Review (May 2015). http://surveygizmoresponseuploads.s3.amazonaws.com/fileuploads/64484/3221238/21-391e942076f3c051d60a46828547fa8a_Cable_Barrier_Final_Draft_V6.pdf

ATTACHMENTS

The following attachments are included and have been updated to reflect the Proposed Alternative.

1. **Proposed Alternative UBOL / Reconstruction Exhibit**
2. **Proposed Alternative Typical Section**
3. **Proposed Wetland Impact Exhibit**
4. **Wetland 2-Part Finding**
5. **Traffic Noise Analysis Report**