

SRF No. 0034686

TECHNICAL MEMORANDUM

TO: Peter Wasko, Mn/DOT
Jay Waldschmidt, Wis/DOT

CC: Todd Clarkowski, Mn/DOT
Alana Getty, Mn/DOT
Terry Pederson, Wis/DOT

FROM: Brett Danner, Environmental Planner

DATE: August 31, 2005

SUBJECT: ST. CROIX RIVER CROSSING PROJECT
2005 SUPPLEMENTAL FINAL ENVIRONMENTAL IMPACT STATEMENT (SFEIS)
PREFERRED ALTERNATIVE TRAFFIC NOISE MITIGATION ANALYSIS

INTRODUCTION

The purpose of this memorandum is to document traffic noise mitigation studies for the Preferred Alternative of St. Croix River Crossing Supplemental Final Environmental Impact Statement (SFEIS). The noise mitigation study documented in this memo uses the same noise modeling and preliminary roadway design information used in the Supplemental Draft Environmental Impact Statement (SDEIS) noise studies, with the exception of the Preferred Alternative TH 36 design in Minnesota. Refer to Section 8.2 of the SDEIS for a discussion of the noise analysis completed for the SDEIS No-Build Alternative and Build Alternatives.

BACKGROUND

Project Description

A SDEIS was completed for the proposed project and released to the public in August 2004. The SDEIS included an analysis of traffic noise impacts from a No-Build Alternative and four Build Alternatives. A preferred alternative (Alternative B-1_a) was identified in November 2004.

The St. Croix River Crossing Preferred Alternative includes reconstruction of Trunk Highway (TH) 36 in Minnesota, a new river crossing, and new State Trunk Highway (STH) 64 construction in Wisconsin. The total length of this construction/reconstruction is approximately 6.0 miles and includes:

- approximately 1.8 miles of approach roadway (TH 36) in Minnesota;
- 4,950-foot bridge between Minnesota and Wisconsin (2,840-foot bridge crossing over the St. Croix River); and
- approximately 3.3 miles of approach roadway (STH 64) in Wisconsin.

In Minnesota, TH 36, the TH 36 frontage roads, and cross streets (Oakgreen/Greeley and Osgood) will be reconstructed from east of Washington/Norell to Osgood Avenue. The intersections of TH 36 and local streets will remain as at-grade intersections. Frontage roads at Oakgreen/Greeley will be pulled back away from TH 36; frontage roads at Osgood will remain in place. East of Osgood Avenue, TH 36 will be reconstructed and a new TH 36/95 diamond interchange will be constructed along with corresponding improvements to TH 95.

The new bridge is located approximately 7,550 feet south of the Lift Bridge along the Minnesota shoreline and approximately 6,450 feet south of the Lift Bridge along the Wisconsin shoreline. The extradosed bridge type design was identified for the Preferred Alternative bridge. Under the Preferred Alternative, the Lift Bridge will be converted to a pedestrian/bicycle facility.

In Wisconsin, a new STH 64 roadway using a freeway design will be constructed from the new bridge to 150th Street, and includes construction of a new diamond interchange with relocated CTH E and a new STH 35 roadway between the interchange and existing STH 35.

Minnesota TH 36 (TH 5 to Osgood Avenue)

Since the SDEIS, the Preferred Alternative design has been revised to include the at-grade intersection design for TH 36 between TH 5 and Osgood Avenue that was approved as part of the 1995 Final EIS Preferred Alternative. Because traffic noise was not evaluated with this design as part of the SDEIS, existing (2002) noise levels, year 2030 No-Build noise levels, and year 2030 Preferred Alternative noise levels were analyzed for this segment of TH 36 and documented in the memorandum *St. Croix River Crossing Project 2005 Supplemental Final Environmental Impact Statement (SFEIS) Traffic Noise Analysis – Preferred Alternative*, June 21, 2005. The information in this technical memorandum is summarized in Section 8.2 of the SFEIS. Relevant noise mitigation material from the Preferred Alternative TH 36 traffic noise memorandum has been incorporated into this memorandum where appropriate.

Noise Analysis

The noise analysis completed for the SDEIS included predictions of noise levels along each alternative in the project area. The noise analysis used federal and state criteria to identify noise impacts. The Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC – see

Table 1) to initiate noise mitigation strategies for roadway design in residential areas is 70 dBA (L₁₀) and 67 dBA (Leq). Locations where noise levels are “approaching” or exceeding the criteria threshold must be evaluated for noise abatement feasibility. In Minnesota, 69 dBA (L₁₀) is considered approaching the criterion; in Wisconsin, 66 dBA (Leq) is considered approaching the criterion. See below for a discussion of Minnesota state noise regulation and Wisconsin policy.

**TABLE 1
 FEDERAL NOISE ABATEMENT CRITERIA**

FHWA Noise Abatement Criteria			
Category	L₁₀ dBA	Leq dBA	Land Use
A	60	57	Special areas requiring serenity
B	70	67	Residential and recreational areas
C	75	72	Commercial and industrial areas
D	N/A	N/A	Undeveloped areas
E	55*	52	Residential, hospitals, libraries, etc.

* Applies to interior noise levels. All other land uses are exterior levels.

Noise impacts are also defined where a “substantial increase” in the future noise levels over the existing noise levels occurs. The term “substantial increase” is defined on a state level. Minnesota Department of Transportation (Mn/DOT) considers an increase of 5 dBA or greater a substantial noise level increase; Wisconsin Department of Transportation (Wis/DOT) considers a 15 dBA or greater increase substantial.

State Regulation – Minnesota

Minnesota state noise standards have been established for daytime and nighttime periods and are listed in Table 2. Minnesota Statute 116.07, Subd. 2a. states that, Minnesota Statute 116.07 exempts from noise standards all city, township and county roads. Roads with full access control and roads within Minneapolis and St. Paul are not exempt. Within the Minnesota portion of the project study area, state standards apply to TH 36 and TH 95. Minnesota state noise standards are shown in Table 2.

Mn/DOT’s noise mitigation policy includes a cost-effectiveness analysis to determine whether a noise barrier is reasonable. This policy states that the cost-effectiveness of the barrier shall not exceed \$3,250/dBA/residence. A receptor’s inclusion in the cost-effectiveness calculation is contingent on the receptor receiving a minimum 5 dBA reduction due to the construction of the barrier. Mitigation is studied not only in areas where the federal abatement criteria are exceeded but also in areas where state daytime and nighttime noise standards are exceeded.

**TABLE 2
 MINNESOTA NOISE LEVEL STANDARDS**

Classification	Land Use	Daytime Noise Level (dBA)	Nighttime Noise Level (dBA)
Noise Area Classification 1	Residential	L ₁₀ = 65 L ₅₀ = 60	L ₁₀ = 55 L ₅₀ = 50
Noise Area Classification 2	Commercial	L ₁₀ = 70 L ₅₀ = 65	L ₁₀ = 70 L ₅₀ = 65
Noise Area Classification 3	Industrial	L ₁₀ = 80 L ₅₀ = 75	L ₁₀ = 80 L ₅₀ = 75

State Policy – Wisconsin

The criteria for siting noise barriers are set forth in Wisconsin Administrative Code Chapter Trans 405 (Trans 405). Wisconsin noise level criteria for consideration of noise barriers are shown in Table 3. Trans 405 defines a noise impact as a predicted noise level for 20 years after construction that approaches or exceeds the Wisconsin NAC decibel level [67 dBA] for Leq noise levels at residential land uses. The noise level criterion for commercial and industrial land uses is 72 dBA for Leq noise levels. Wis/DOT has determined “approach” to be defined as 1 dBA less than the NAC, or 66 dBA (Leq) for residential land uses and 71 dBA (Leq) for commercial and industrial land uses. A noise impact is also defined by Trans 405 as a projected increase of 15 dBA from pre-construction noise levels within 20 years after construction of the proposed project.

**TABLE 3
 WISCONSIN NOISE LEVEL CRITERIA FOR CONSIDERING BARRIERS**

Land Use Category	Leq (dBA)	Description of Land Use Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	N/A	Undeveloped lands.
E	52 (interior ⁽¹⁾)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

⁽¹⁾ Use of interior noise levels is limited to situations where exterior noise levels are not applicable.
 Source: Wisconsin Administrative Code – Chapter Trans 405.

When traffic noise impacts occur, measures to reduce or eliminate impacts should be considered by the project sponsor where such impacts are determined to be "reasonable and feasible". Trans 405 mandates that construction of noise barriers must reduce noise levels by at least 8 dBA at a cost of \$30,000 per dwelling unit or less to be considered reasonable.

NOISE MITIGATION ANALYSIS

23 CFR 772.13(c) identifies noise abatement measures that are considered when a noise impact is identified with a proposed project. One such noise abatement measure identified in 23 CFR 772.13(c) is the construction of noise barriers. The following sections describe the evaluation of noise barriers in Minnesota and Wisconsin for the St. Croix River Crossing Project.

Projected noise levels for the build condition (both with and without noise mitigation) were calculated using the Stamina 2.0 noise prediction model developed by the FHWA. Minnesota portions of the project area were modeled using a Minnesota Department of Transportation modified version of Stamina (MINNOISE). The noise model uses traffic volumes, vehicle type mix, vehicle speed, receptor locations, roadway alignments and noise wall heights and alignments to calculate noise levels. Where appropriate, existing and/or proposed landforms and retaining walls were included in the modeling. Section 8.2.2.1 of the SDEIS describes in greater detail the noise modeling methodology.

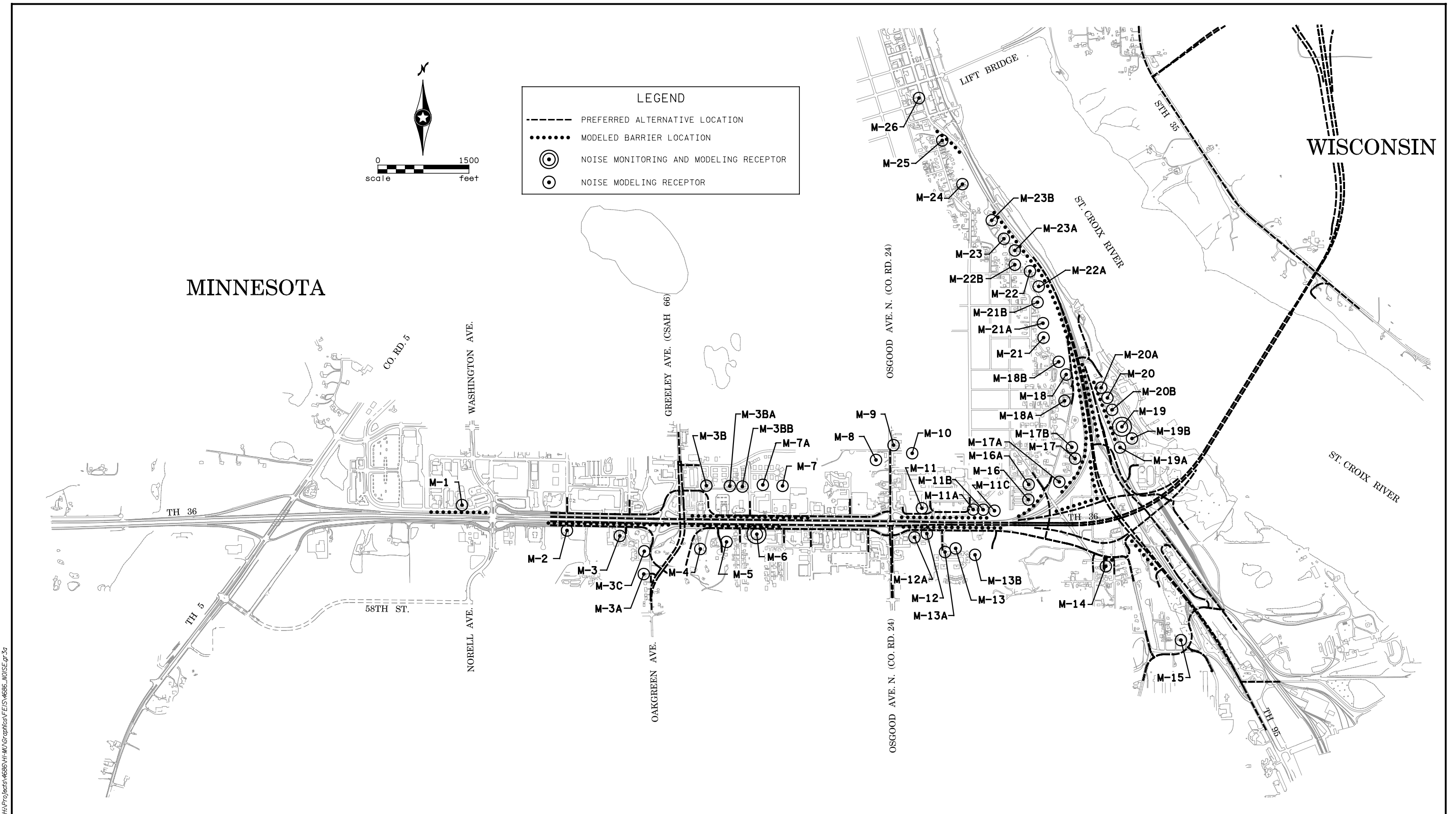
Noise barriers were coded into the noise models at locations where noise impacts (i.e., above state standards; approaching or exceeding noise abatement criteria; "substantial" increase in future noise levels over existing levels¹) were identified in the SDEIS. Additional modeled receptors were added at locations where noise impacts were identified for cost effectiveness calculations where appropriate. Noise barriers were coded at three different heights above ground level: 10 feet, 15 feet, and 20 feet.

Results and Discussion

Minnesota

Noise mitigation was studied at locations in Minnesota where future noise levels would exceed either the federal mitigation criteria or state standards. The more restrictive state standards, particularly the nighttime standard, would be exceeded throughout the entire project area, therefore noise mitigation was analyzed at all areas where residences are adjacent to proposed reconstruction areas. Figure 1 illustrates the location of noise modeling receptors and modeled noise barriers.

¹ Mn/DOT considers an increase of 5 dBA or greater a substantial increase; Wis/DOT considers a 15 dBA or greater increase substantial.



Noise Barrier Locations - Preferred Alternative Minnesota

St. Croix River Crossing Project

Figure 1

*Traffic Noise Mitigation Analysis
2005 Supplemental Final Environmental Impact Statement*

Cost effectiveness was calculated for each of the modeled wall heights based on predicted noise level reductions, number of affected residences and estimated cost of noise wall construction, based on \$15 per square foot of noise wall. Following Mn/DOT policy guidance, only those receptors receiving a minimum 5 dBA reduction were included in cost effectiveness calculations.

Cost effectiveness calculations and results estimating the cost per dBA reduction per affected residence are presented in the noise wall cost effectiveness worksheets in the Appendix. Table 4 shows the results of the noise mitigation analysis for daytime peak conditions in Minnesota. Nighttime noise levels are not shown in Table 4; nighttime noise levels are 1 to 2 dBA lower than the daytime levels. The modeled walls are as effective (within 0 to 1 dBA) for nighttime noise as for daytime noise.

North of TH 35, west of Washington Avenue (Receptor M-1)

This area includes commercial receptors along the north side of TH 36 between TH 5 and Washington Avenue. Receptor M-1 is a hotel, which is classified under area classification 1 (state L_{10} daytime standard of 65 dBA) and federal noise abatement criteria category B (L_{10} standard of 70 dBA). Another hotel is located to the west of this receptor, and commercial property is located to the east of this receptor.

An 883-foot noise barrier was modeled south of the hotel between the north frontage road and TH 36. This wall provided up to a 5 dBA noise reduction. The cost effectiveness figure (calculated for a 20 foot barrier) yields a cost effectiveness of \$26,490 per decibel per residence. This cost is well above the maximum \$3,250 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

South of TH 36, west of Oakgreen Avenue (Receptor M-2)

This area includes one residence located just south of TH 36 between Norell Avenue and Oakgreen Avenue. Commercial land uses are located to the east and west of the residence. Future noise levels at this residence exceeded state noise standards, but not federal noise abatement criteria.

An 864-foot noise barrier was modeled north of the residence between the south frontage road and TH 36. This wall provided up to a 4 dBA noise reduction. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

South of TH 36, west of Oakgreen Avenue (Receptor M-3, M-3A; M-3C)

This area includes several townhome units located just south of TH 36 and the south frontage road, west of Oakgreen Avenue (Receptor M-3). Commercial buildings are located to both the east and west of the townhomes. This area also includes newly-constructed townhomes located south of TH 36 west of the south frontage road/Oakgreen Avenue intersection (Receptor M-3C). Single family residences with driveway access to Oakgreen Avenue are located south of the south frontage road/Oakgreen Avenue intersection. Future noise levels at this location exceeded state noise standards, but not federal noise abatement criteria.

**TABLE 4
 MINNESOTA NOISE MITIGATION ANALYSIS RESULTS: DAYTIME**

Receptor	Build 2030 - No Wall	Build 2030 - 10' Wall		Build 2030 - 15' Wall		Build 2030 - 20' Wall	
	L ₁₀	L ₁₀	Difference	L ₁₀	Difference	L ₁₀	Difference
North of TH 36, west of Washington							
M-1	71	67	-4	67	-4	66	-5
South of TH 36, west of Oakgreen Avenue							
M-2	71	69	-2	67	-4	67	-4
M-3	67	65	-2	63	-4	63	-4
M-3A*	64	64	0	63	-1	63	-1
M-3C	69	68	-1	67	-2	67	-2
North of TH 36; east of Greeley Street							
M-3B*	64	63	-1	63	-1	63	-1
M-3Ba*	61	60	-1	59	-2	58	-3
M-3Bb*	60	59	-1	58	-2	56	-4
South of TH 36; east of Oakgreen Avenue							
M-4*	65	64	-1	63	-2	63	-2
M-5*	65	63	-2	62	-3	60	-5
M-6	69	68	-1	66	-3	65	-4
North of TH 36, between Greeley Street and Osgood Avenue							
M-7*	60	59	-1	58	-2	57	-3
M-7A*	60	59	-1	58	-2	56	-4
North of TH 36, east of Osgood							
M-11	68	62	-6	60	-8	60	-8
M-11A	70	67	-3	65	-5	63	-7
M-11B	69	67	-2	64	-5	61	-8
M-11C	69	66	-3	64	-5	62	-7
South of TH 36, east of Osgood							
M-12	70	67	-3	66	-4	65	-5
M-12A	72	69	-3	68	-4	67	-5
M-13*	64	61	-3	61	-3	60	-4
M-13A*	64	61	-3	60	-4	59	-5
M-13B*	63	61	-2	61	-2	61	-2
South of the TH 36/TH 95 Interchange – <i>between driveways along Beach Rd.</i>							
M-14	66	65	-1	64	-2	64	-2
South of the TH 36/TH 95 Interchange – <i>along TH 95</i>							
M-14	66	66	0	66	0	66	0
Northwest of the TH 36/95 Interchange							
M-16	63	60	-3	59	-4	58	-5
M-16A	62	60	-2	59	-3	59	-3

Bold numbers are above state noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

TABLE 4 – continued
MINNESOTA NOISE MITIGATION ANALYSIS RESULTS: DAYTIME

Receptor	Build 2030 - No Wall	Build 2030 - 10' Wall		Build 2030 - 15' Wall		Build 2030 - 20' Wall	
	L ₁₀	L ₁₀	Difference	L ₁₀	Difference	L ₁₀	Difference
North of the Interchange west of TH 95 – along north side of existing TH 36 alignment							
M-17*	61	61	0	59	-2	57	-4
M-17A*	61	61	0	60	-1	59	-2
M-17B*	61	61	0	60	-1	60	-1
M-18*	62	62	0	62	0	61	-1
M-18A*	60	60	0	60	0	59	-1
M-18B*	61	61	0	61	0	61	0
North of the Interchange west of TH 95 – along proposed interchange							
M-17*	61	60	-1	59	-2	58	-3
M-17A*	61	60	-1	60	-1	60	-1
M-17B*	61	60	-1	60	-1	59	-2
M-18*	62	62	0	62	0	61	-1
M-18A*	60	60	0	60	0	59	-1
M-18B*	61	61	0	61	0	61	0
East of TH 95 at the Sunnyside complex – along railroad embankment near Sunnyside							
M-19*	61	61	0	60	-1	60	-1
M-19A*	61	61	0	61	0	61	0
M-19B*	62	62	0	62	0	61	-1
M-20*	61	60	-1	59	-2	59	-2
M-20A*	61	60	-1	60	-1	60	-1
M-20B*	61	60	-1	59	-2	59	-2
East of TH 95 at the Sunnyside complex – along trail adjacent to TH 95							
M-19*	61	61	0	60	-1	60	-1
M-19A*	61	61	0	61	0	61	0
M-19B*	62	61	-1	61	-1	61	-1
M-20*	61	59	-2	59	-2	59	-2
M-20A*	61	60	-1	60	-1	60	-1
M-20B*	61	59	-2	59	-2	59	-2
West of TH 95 at northern project limits							
M-21*	56	56	0	56	0	56	0
M-21A*	55	55	0	55	0	55	0
M-21B*	54	54	0	54	0	54	0
M-22*	58	58	0	58	0	57	-1
M-22A*	58	58	0	58	0	57	-1
M-22B*	53	53	0	53	0	53	0
M-23*	62	62	0	61	-1	60	-2
M-23A*	61	61	0	61	0	60	-1
M-23B*	60	60	0	60	0	60	0
West of TH 95 near downtown Stillwater							
M-25*	61	61	0	61	0	61	0

Bold numbers are above state noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

A 1,326-foot noise barrier was modeled between the south frontage road and TH 36 west of Oakgreen Avenue. This noise barrier would also be located in front of the commercial properties adjacent to the residential receptors. This wall provided up to a 4 dBA noise reduction. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

North of TH 36, east of Greeley Street (Receptor M-3B, M-3Ba, M-3Bb)

This area includes a twin home development located north of TH 36 along Shelton Drive and west of Tuenge Drive. Commercial property (e.g., restaurant, florist) is located along the north frontage road between the residences and TH 36. Future noise levels at these residential receptors exceed state nighttime noise standards, but not state daytime standards or federal noise abatement criteria.

A 1,034 foot long noise barrier was modeled between the north frontage road and TH 36 east of Greeley Street. This noise barrier would be located in front of the commercial properties along the north frontage road. This wall provided up to a 4 dBA noise reduction for the residential receptors. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

South of TH 36, east of Oakgreen Avenue (Receptors M-4, M-5)

This area includes six existing residences south of TH 36, east of the Oakgreen Avenue/south frontage road intersection. Commercial properties are located near these residences along the south frontage road. Future noise levels at the residences exceed state nighttime noise standards, but did not exceed state daytime noise standards or federal noise abatement criteria.

An 890 foot long noise barrier was modeled between the north frontage road and TH 36 east of Oakgreen Avenue. This wall provided up to a 5 dBA noise reduction for the residential receptors. The cost effectiveness figure (calculated for a 20 foot barrier) yields a cost effectiveness of \$13,350 per decibel per residence. This cost is above the maximum \$3,250 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

South of TH 36, east of Oakgreen Avenue (Receptor M-6)

This area includes one residence south of TH 36, east of Oakgreen Avenue. Commercial properties are located both east and west of this receptor along the south frontage road. Future noise levels at this residence exceed state daytime noise standards and are approaching federal noise abatement criteria.

A 724 foot long noise barrier was modeled between the north frontage road and TH 36 east of Oakgreen Avenue. This noise barrier would be located in front of the commercial properties adjacent to the residence. This wall provided up to a 4 dBA noise reduction for the residential receptors. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

North of TH 36, between Greeley Street and Osgood Avenue (Receptor M-7, M-7a)

This area includes a twin home development located north of TH 36 along Shelton Drive and east of Tuenge Drive. Commercial properties (e.g., auto mall, restaurant, realty office) are located along the north frontage road between the residences and TH 36. Future noise levels at these residential receptors exceed state nighttime noise standards, but not state daytime standards or federal noise abatement criteria.

An 870 foot long noise barrier was modeled between the north frontage road and TH 36 west of Osgood Avenue. This noise barrier would be located in front of the commercial properties along the north frontage road. This wall provided up to a 4 dBA noise reduction for the residential receptors in the twin home development. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

North of TH 36 at Osgood Avenue/62nd Street Intersection (Receptors M-8, M-9, M-10)

This area includes two existing apartment complexes (Receptors M-8 and M-9), and a church (Receptor M-10) along Osgood Avenue (CSAH 24) at 62nd Street. Future noise levels at Receptor M-9 exceed state daytime noise standards; future noise levels at the other two receptors are below state daytime noise standards.

The dominant source of noise for these receptors is Osgood Avenue (CSAH 24). Because county, township, and city roads without access control outside of the cities of Minneapolis and St. Paul are exempt from state noise standards (Minnesota Statutes Section 116.07 Subd. 2a), noise mitigation was not considered for this location.

North of TH 36, east of Osgood Avenue (Receptor M-11)

This area includes an apartment complex located just north of TH 36 between Osgood Avenue and the Washington County Government Center. Commercial property is located to the west of the apartment complex at the Osgood Avenue/TH 36 intersection. Future noise levels at this apartment complex exceed state daytime noise standards but do not exceed federal noise abatement criteria.

A 968 foot long noise barrier was modeled east of Osgood Avenue between the apartments and TH 36. This wall provided up to an 8 dBA noise reduction. The cost effectiveness figure (calculated for a 20 foot barrier) yields a cost effectiveness of \$12,100 per decibel per residence. This cost is above the maximum \$3,250 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

North of TH 36, east of Osgood Avenue (Receptors M-11A, M-11B, M-11C)

This area includes three existing residences located just north of TH 36. Future noise levels at these residences exceed state noise standards and are approaching federal noise abatement criteria.

A 669 foot long noise barrier was modeled between the residences and TH 36 providing up to 8 decibels of noise reduction. The cost effectiveness figure (calculated for a 20 foot barrier) yields a cost effectiveness of \$9,123 per decibel per residence. This cost is above the maximum \$3,250 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

South of TH 36, east of Osgood Avenue (Receptors M-12, M-12A, M-13, M-13A and M-13B)

This area consists of an apartment complex and townhome development just south of TH 36 and east of Osgood Avenue. Future noise levels at these receptors would exceed both federal noise abatement criteria and state noise standards.

A 600 foot long noise barrier was modeled between the residences (M-12, M-12A) and TH 36 providing up to 5 decibels of noise reduction. The cost effectiveness figure (calculated for a 20 foot barrier) yields a cost effectiveness of \$9,000 per decibel per residence. This cost is above the maximum \$3,250 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

A 425 foot long barrier was modeled between the residences (M-13, M-13A, M-13B) and TH 36 providing up to 5 decibels of noise reduction. The cost effectiveness figure (calculated for a 20 foot barrier) yields a cost effectiveness of \$4,250 per decibel per residence. This cost is above the maximum \$3,250 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

The noise barrier modeled for Receptors M-13, M-13A, and M-13B is adjacent to a commercial site, the Log Cabin Restaurant (Club Tara). This is a historically-significant site that has been identified as eligible for listing on the National Register of Historic Places (NRHP) under Criterion A, as illustrative of the significant historical pattern of auto tourism that flourished during the 1920s and 1930s. The modeled barrier was located to the west of the Log Cabin Restaurant (i.e., not directly between the Log Cabin Restaurant and TH 36; see Figure 1).

South of the TH 36/TH 95 Interchange (Receptors M-14, and M-15)

The area surrounding the proposed TH36/95 interchange is largely vacant. The nearest receptors to the north (Receptor M-17) and to the south (Receptor M-14) were used to evaluate the effect of the proposed project on noise levels.

Two possible configurations of noise barriers were studied near receptor M-14: one adjacent to Beach Road placed between the driveways, and one along TH 95. The highest noise reduction possible from these noise barriers is 2 decibels. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

Northwest of the Interchange (Receptors M-16 and M-16A)

Northwest of TH 36, the project would re-align TH 36 away from receptors. A noise mitigation barrier was analyzed to protect six residences located north of the westbound on-ramp at Beach Road. While the barrier provides as much as 5 decibels of noise reduction, its cost is \$22,688 per decibel per residence, well above the maximum \$3,250 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

North of the Interchange west of TH 95 (Receptors M-17, M-17A, M-17B, M-18, M18A and M-18B)

North of proposed interchange, the project would re-align TH36 away from existing receptors on top of the river bluff. Two possible noise barrier configurations were studied in this area: along the north side of the existing TH 36 alignment, and along the proposed interchange alignment (south and east of the proposed pond). The studied barriers would only provide a maximum of 4 decibels of noise reduction. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

East of TH 95 at the Sunnyside complex (Receptors M-19, M-19A, M-19B, M-20, M-20A and M-20B)

Near the Sunnyside complex, the project generally re-aligns TH 95 away from the complex. Two possible noise barrier configurations were studied in this area: along the trail directly east of TH 95, and along the existing railroad embankment. The studied barriers would only provide a maximum of 2 decibels of noise reduction because the receptors are 350 to 600 feet away from the roadway. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

West of TH 95 at the northern project limits (Receptors M-21, M-21A, M-21B, M-22, M-22A, M-22B, M-23, M-23A, and M-23B)

Project construction in this area is confined to existing right of way and consists of rebuilding TH 95 on its current alignment. A noise barrier was analyzed along the west side of TH 95 to protect residences on top of the bluff. The studied barriers would only provide a maximum of 2 decibels of noise reduction. This noise decrease does not meet the minimum 5 decibel decrease required by Mn/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

West of TH 95 near downtown Stillwater (Receptors M-24, M-25, and M-26)

Receptor M-24 is a residential receptor located on top of the Minnesota bluff overlooking the St. Croix River and the northern limits of the Stillwater Municipal Barge Facility property. Modeled daytime and nighttime future noise levels for Receptor M-24 were below the state and federal threshold for consideration of noise barriers. Therefore, noise mitigation was not considered at this location.

Receptor M-25 is also a residential receptor located on top of the Minnesota bluff overlooking the St. Croix River and the southern limits of downtown Stillwater. Modeled future nighttime noise levels at Receptor M-25 were 59 dBA (L₁₀) and 52 dBA (L₅₀), above state nighttime noise standards. A 641-foot barrier was analyzed along the west side of TH 95 to protect residences along the bluff. The studied barrier would not provide any decibel reduction. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

Receptor M-26 is a commercial receptor located on Main Street between Nelson and Chestnut Streets in downtown Stillwater. Modeled noise levels at this receptor under the Preferred Alternative were below the state noise standards (70 dBA (L₁₀) and 65 dBA (L₅₀)) and federal noise abatement criteria for commercial and industrial receptors (75 dBA; see Table 1). Therefore, noise mitigation was not considered at this location.

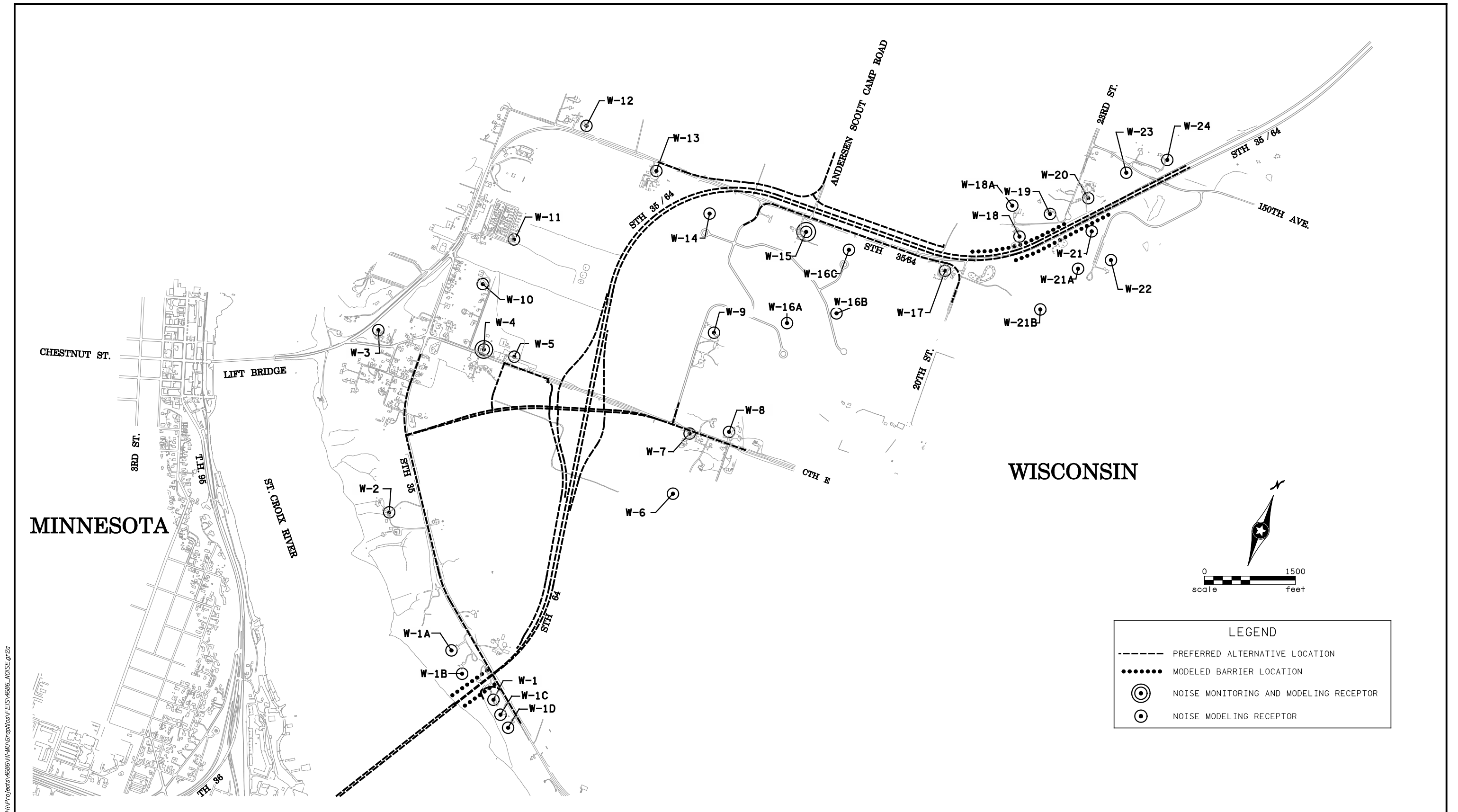
Wisconsin

Noise mitigation was studied at locations where future noise impacts are anticipated using Wisconsin noise mitigation criteria. Figure 2 illustrates the location of noise modeling receptors and modeled wall locations. Following Wis/DOT policy, only those lower-level, front-facing impacted receptors receiving a minimum 8 dBA reduction were included in cost effectiveness calculations. Cost effectiveness calculations and results estimating the cost per affected residence are presented on the noise wall cost effectiveness worksheets in the Appendix. Wisconsin noise impact criteria are met at receptors W-1, W-18 and W-21. Table 5 shows the results of the noise mitigation analysis in Wisconsin.

**TABLE 5
 WISCONSIN NOISE ANALYSIS RESULTS: DAYTIME**

Receptor	Build 2030 - No Wall	Build 2030 - 10' Wall		Build 2030 - 15' Wall		Build 2030 - 20' Wall	
	Leq	Leq	Difference	Leq	Difference	Leq	Difference
Northwest of the bridge at the bluff							
W-1B ⁽¹⁾	65	64	-1	64	-1	64	-1
Southeast of the bridge at the bluff							
W-1	66	65	-1	64	-2	64	-2
North of STH 35/64 near the eastern project terminus							
W-18	67	59	-8	57	-10	56	-11
South of STH 35/64 near the eastern project terminus							
W-21	66	62	-4	59	-7	57	-9

⁽¹⁾ There is a substantial noise increase (>15 dBA) at this receptor from existing conditions to future Build conditions.



Noise Receptor Locations - Wisconsin Preferred Alternative
 St. Croix River Crossing Project

Figure 2

Traffic Noise Mitigation Analysis
2005 Supplemental Final Environmental Impact Statement

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Discussion

Near the bridge at the Wisconsin bluff (Receptors W-1 and W-1B)

The Preferred Alternative river crossing utilizes an existing ravine in the Wisconsin bluff. Several residences are located both northwest and southeast of the Preferred Alternative along the Wisconsin bluff. Noise barriers were modeled on top of the embankment northwest and southeast of the proposed alignment as it cuts through the bluff where noise impacts were identified. Because the roadway is already much lower than these two receptors, the barrier would only provide a maximum of 2 decibels of noise reduction. This noise decrease does not meet the minimum 8 decibel decrease required by Wis/DOT for a barrier to be considered effective. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

Receptor W-18 – north of STH 64 at eastern end of project

A noise barrier was modeled at three residences located north of STH 35/64, near the eastern project terminus. While the most cost-effective barrier (10 feet high) provides 8 decibels of noise reduction to W-18, its cost is \$271,800 per residence, well above the maximum \$30,000 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

Receptor W-21 – south of STH 64 at eastern end of project

A noise barrier was modeled at the residence located south of STH 35/64, near the eastern project terminus. While the most cost-effective barrier (20 feet high) provides 9 decibels of noise reduction for this residence, its cost is \$705,600 per residence, well above the maximum \$30,000 threshold. Therefore, noise mitigation is not considered reasonable at this location and would not be constructed.

EVALUATION OF OTHER NOISE ABATEMENT MEASURES

In addition to the construction of noise barriers, 23 CFR 772.13(c) identifies other noise abatement measures that are to be considered when a noise impact is identified with a proposed project. Abatement measures listed in 23 CFR 772.13(c) include: traffic management devices (e.g., traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive land use designations); alteration of horizontal or vertical alignments; construction of noise barriers (including landscaping); acquisition of property to serve as a buffer to preempt development which would be adversely impacted by traffic noise; and noise insulation of public use or nonprofit institutional structures. Due to the nature of the project area, it was determined that the abatement measures listed in 23 CFR 772.13(c) would not be reasonable or feasible for this project. Additional discussion of these noise abatement measures is provided below.

- Traffic Management Measures. This would include a partial or total ban on trucks, time-use restrictions for certain vehicle types, and reduced speed limits. Although these measures

would reduce traffic noise levels somewhat, to limit the vehicle types, time of use, and speeds on the new TH 36 and STH 64 roadways would not be consistent with the function of TH 36 as a medium priority interregional corridor (IRC) and STH 64 as a Multilane Connector. Therefore, traffic management measures are not considered reasonable or feasible.

- Horizontal and Vertical Alignment. The Preferred Alternative was identified because it best meets the project transportation purpose and need while balancing the environmental, economic, social, and historic resource concerns within the project area. The alignment of the Preferred Alternative is restricted to its current location because of constraints caused by developed areas, surrounding topography, natural resources (e.g., St. Croix River; wetlands), and connections to existing roadways. Further substantial shifts in the Preferred Alternative alignment to reduce noise at residential receptors adjacent to the Preferred Alternative are not feasible because of other resulting impacts, including: residential and commercial relocations, severance of farm parcels, additional acquisition of farm land, or increased noise at other residential receptors.

TH 36 (TH 5 to Osgood Avenue) will be reconstructed largely at existing roadway grades. Alternatives for the long-term design of TH 36 through Oak Park Heights and Stillwater may be evaluated through future studies. Any future changes to TH 36 (e.g., vertical alignment) will be evaluated through a separate environmental documentation process.

- Landscaping/Natural Noise Screening. The use of vegetation as a noise screen can be effective only if at least 75 to 100 feet of dense, evergreen vegetation (evergreen vegetation maintains its foliage year around) is provided between the source and receptor. There is not enough right of way between the roadway and existing receptors in Minnesota and Wisconsin where future noise impacts are anticipated to provide an adequate vegetative noise screen. Therefore, vegetation as a noise mitigation measure is not a reasonable and feasible alternative.
- Acquisition of Property. Because most of the project corridor in Minnesota is already developed, right of way and community impacts do not make this a reasonable and feasible option. While the project corridor is less developed in Wisconsin, acquisition of property beyond the proposed right of way would result in greater and costly impacts including relocation of adjacent residences and additional farmland acquisition.

FUTURE LAND USE PLANNING

Minnesota

Most of the project corridor is already developed in Minnesota. The proposed project will take up all the available open space for the TH 36/95 interchange and stormwater ponds, and no land will be available for redevelopment in lower Oak Park Heights following construction of the project. It should be noted that Xcel Energy is considering development of their fly ash landfill (referred to as the A.S. King Ash Disposal Facility, or the “Moelter site”) as a park for Oak Park Heights. The Moelter Site is bound by TH 36 to the north, Beach Road and the Beach Road overpass to the east, and Valley View Park to the south. The proposed south frontage road extension between Osgood Avenue and Stagecoach Trail will form the northern boundary of this site following construction of the project. There is no other developable land on the Minnesota portion of the project, therefore future land use planning is not applicable.

Wisconsin

Large areas of land in the Wisconsin portion of the project area are currently undeveloped and are in agricultural use. Exclusive land use designation (e.g., agricultural; open space; commercial/industrial) by local officials immediately adjacent to the Preferred Alternative corridor would be an option in these areas to limit traffic noise exposure to any future residential development.

Traffic noise levels were studied adjacent to the project corridor at 50, 100, 200, 400, and 800 feet intervals from the proposed STH 64 roadway at a segment between existing STH 35 and the proposed STH 35/64/CTH E interchange. Traffic noise was modeled for the peak daytime hour.

Results show that for the Preferred Alternative alignment, Wisconsin noise impact criteria will be approached or exceeded (66 dBA or greater (Leq), see Table 3) within 200 feet of the roadway centerline (i.e., centerline of the eastbound or westbound STH 64 travel lanes). These results show that in order to avoid approaching the noise standards, residential areas should be placed at a minimum of 200 feet from the roadway centerline, if no mitigation such as berms or barriers is incorporated into the development. Noise barriers or berms, as well as commercial buildings directly adjoining the roadway, would block some traffic noise and result in levels meeting state standards at areas closer to the roadway.

Concurrent with the SFEIS process, local officials in Wisconsin will be contacted and provided with this information in order to help them plan compatible land uses within the project area.

CONCLUSIONS

Because the year 2030 Preferred Alternative noise levels are predicted to exceed State noise impact criteria at several locations along the project corridor, an analysis of noise abatement measures was completed. Cost-effectiveness of noise barriers was calculated; none of the modeled noise barriers were found to be cost-effective where a future noise impact was identified for Alternative B-1_a (Preferred Alternative) in the SDEIS. Therefore, no noise mitigation (i.e., noise barriers) is proposed with the project. Other noise abatement measures identified in 23 CFR 772.13(c) were addressed and also found to be not reasonable and feasible. Information will be provided to local officials in the Wisconsin portion of the project for future land use planning. A Noise Reasonableness and Exemption Request will be prepared for the project and submitted by Mn/DOT to the Minnesota Pollution Control Agency following publication of the SFEIS and Record of Decision (ROD).

APPENDIX

NOISE WALL COST EFFECTIVENESS TABLES

**ST. CROIX RIVER CROSSING PROJECT
MINNESOTA NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 10 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 (no wall)	Pref. Alt. year 2030 (10 ft wall)	Reduction (in dBA) with 10 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$15/sq ft	Cost/dBA/residence
North of TH 36, west of Washington								
M-1	71	67	4	2	0	883	\$132,450	NA
South of TH 36, west of Oakgreen Avenue								
M-2	71	69	2	1	0	864	\$129,600	NA
South of TH 36, west of Oakgreen Avenue								
M-3	67	65	2	8	0	1,326	\$198,900	NA
M-3A*	64	64	0	1	0			
M-3C	69	68	1	8	0			
North of TH 36; east of Greeley Street								
M-3B*	64	63	1	4	0	1,034	\$155,100	NA
M-3Ba*	61	60	1	4	0			
M-3Bb*	60	59	1	2	0			
South of TH 36; east of Oakgreen Avenue								
M-4*	65	64	1	2	0	890	\$133,500	NA
M-5*	65	63	2	4	0			
South of TH 36; east of Oakgreen Avenue								
M-6	69	68	1	1	0	724	\$108,600	NA
North of TH 36, between Greeley Street and Osgood Avenue								
M-7*	60	59	1	4	0	870	\$130,500	NA
M-7A*	60	59	1	4	0			
North of TH 36, east of Osgood								
M-11	68	62	6	2	2	968	\$145,200	\$12,100
North of TH 36, east of Osgood								
M-11A	70	67	3	1	0	669	\$100,350	NA
M-11B	69	67	2	1	0			
M-11C	69	66	3	1	0			
South of TH 36, east of Osgood								
M-12	70	67	3	2	0	600	\$90,000	NA
M-12A	72	69	3	2	0			
South of TH 36, east of Osgood Avenue								
M-13*	64	61	3	4	0	425	\$63,750	NA
M-13A*	64	61	3	6	0			
M-13B*	63	61	2	4	0			
South of the TH 36/TH 95 Interchange – between driveways along Beach Road								
M-14	66	65	-1	1	0	88	\$13,200	NA
South of the TH 36/TH 95 Interchange – along TH 95								
M-14	66	66	0	1	0	638	\$95,700	NA
Northwest of the TH 36/95 Interchange								
M-16	63	60	-3	2	0	756	\$113,400	NA
M-16A	62	60	-2	4	0			

Bold numbers are above state daytime noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

**ST. CROIX RIVER CROSSING PROJECT
MINNESOTA NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 10 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 (no wall)	Pref. Alt. year 2030 (10 ft wall)	Reduction (in dBA) with 10 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$15/sq ft	Cost/dBA/residence
North of the Interchange west of TH 95 – along north side of existing TH 36 alignment								
M-17*	61	61	0	3	0	2,386	\$357,900	NA
M-17A*	61	61	0	2	0			
M-17B*	61	61	0	3	0			
M-18*	62	62	0	2	0			
M-18A*	60	60	0	3	0			
M-18B*	61	61	0	2	0			
North of the Interchange west of TH 95 – along proposed interchange								
M-17*	61	60	-1	3	0	3,086	\$462,900	NA
M-17A*	61	60	-1	2	0			
M-17B*	61	60	-1	3	0			
M-18*	62	62	0	2	0			
M-18A*	60	60	0	3	0			
M-18B*	61	61	0	2	0			
East of TH 95 at the Sunnyside complex – along railroad embankment near Sunnyside								
M-19*	61	61	0	2	0	1,556	\$233,400	NA
M-19A*	61	61	0	5	0			
M-19B*	62	62	0	5	0			
M-20*	61	60	-1	5	0			
M-20A*	61	60	-1	4	0			
M-20B*	61	60	-1	2	0			
East of TH 95 at the Sunnyside complex – along trail adjacent to TH 95								
M-19*	61	61	0	2	0	1,310	\$196,500	NA
M-19A*	61	61	0	5	0			
M-19B*	62	61	-1	5	0			
M-20*	61	59	-2	5	0			
M-20A*	61	60	-1	4	0			
M-20B*	61	59	-2	2	0			
West of TH 95 at the northern project limits								
M-21	56	56	0	3	0	2,900	\$435,000	NA
M-21A	55	55	0	2	0			
M-21B	54	54	0	3	0			
M-22*	58	58	0	2	0			
M-22A*	58	58	0	3	0			
M-22B*	53	53	0	3	0			
M-23*	62	62	0	3	0			
M-23A*	61	61	0	3	0			
M-23B*	60	60	0	3	0			
West of TH 95 near downtown Stillwater								
M-25*	61	61	0	4	0	641	\$96,150	NA

Bold numbers are above state daytime noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

**ST. CROIX RIVER CROSSING PROJECT
MINNESOTA NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 15 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 (no wall)	Pref. Alt. year 2030 (10 ft wall)	Reduction (in dBA) with 10 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$15/sq ft	Cost/dBA/residence
North of TH 36, west of Washington								
M-1	71	67	4	2	0	883	\$198,675	NA
South of TH 36, west of Oakgreen Avenue								
M-2	71	67	4	1	0	864	\$194,400	NA
South of TH 36, west of Oakgreen Avenue								
M-3	67	63	4	8	0	1,326	\$298,350	NA
M-3A*	64	63	1	1	0			
M-3C	69	67	2	8	0			
North of TH 36; east of Greeley Street								
M-3B*	64	63	1	4	0	1,034	\$232,650	NA
M-3Ba*	61	59	2	4	0			
M-3Bb*	60	58	2	2	0			
South of TH 36; east of Oakgreen Avenue								
M-4*	65	63	2	2	0	890	\$200,250	NA
M-5*	65	62	3	4	0			
South of TH 36; east of Oakgreen Avenue								
M-6	69	66	3	1	0	724	\$162,900	NA
North of TH 36, between Greeley Street and Osgood Avenue								
M-7*	60	58	2	4	0	870	\$195,750	NA
M-7A*	60	58	2	4	0			
North of TH 36, east of Osgood								
M-11	68	60	8	2	2	968	\$217,800	\$13,612
North of TH 36, east of Osgood								
M-11A	70	65	5	1	1	669	\$150,525	\$10,350
M-11B	69	64	5	1	1			
M-11C	69	64	5	1	1			
South of TH 36, east of Osgood								
M-12	70	68	2	2	0	600	\$135,000	NA
M-12A	72	68	4	2	0			
South of TH 36, east of Osgood Avenue								
M-13*	64	61	3	4	0	425	\$95,625	NA
M-13A*	64	60	4	6	0			
M-13B*	63	61	2	4	0			
South of the TH 36/TH 95 Interchange – between driveways along Beach Road								
M-14	66	64	2	1	0	88	\$19,800	NA
South of the TH 36/TH 95 Interchange – along TH 95								
M-14	66	66	0	1	0	638	\$143,550	NA
Northwest of the TH 36/95 Interchange								
M-16	63	59	-4	2	0	756	\$170,100	NA
M-16A	62	59	-3	4	0			

Bold numbers are above state daytime noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

**ST. CROIX RIVER CROSSING PROJECT
MINNESOTA NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 15 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 (no wall)	Pref. Alt. year 2030 (15 ft wall)	Reduction (in dBA) with 15 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$15/sq ft	Cost/dBA/residence
North of the Interchange west of TH 95 – along north side of existing TH 36 alignment								
M-17*	61	59	-2	3	0	2,386	\$536,850	NA
M-17A*	61	60	-1	2	0			
M-17B*	61	60	-1	3	0			
M-18*	62	62	0	2	0			
M-18A*	60	60	0	3	0			
M-18B*	61	61	0	2	0			
North of the Interchange west of TH 95 – along proposed interchange								
M-17*	61	59	-2	3	0	3,086	\$694,350	NA
M-17A*	61	60	-1	2	0			
M-17B*	61	60	-1	3	0			
M-18*	62	62	0	2	0			
M-18A*	60	60	0	3	0			
M-18B*	61	61	0	2	0			
East of TH 95 at the Sunnyside complex – along railroad embankment near Sunnyside								
M-19*	61	60	-1	2	0	1,556	\$350,100	NA
M-19A*	61	61	0	5	0			
M-19B*	62	62	0	5	0			
M-20*	61	59	-2	5	0			
M-20A*	61	60	-1	4	0			
M-20B*	61	59	-2	2	0			
East of TH 95 at the Sunnyside complex – along trail adjacent to TH 95								
M-19*	61	60	-1	2	0	1,310	\$294,750	NA
M-19A*	61	61	0	5	0			
M-19B*	62	61	-1	5	0			
M-20*	61	59	-2	5	0			
M-20A*	61	60	-1	4	0			
M-20B*	61	59	-2	2	0			
West of TH 95 at the northern project limits								
M-21	56	56	0	3	0	2,900	\$652,500	NA
M-21A	55	55	0	2	0			
M-21B	54	54	0	3	0			
M-22*	58	58	0	2	0			
M-22A*	58	58	0	3	0			
M-22B*	53	53	0	3	0			
M-23*	62	61	-1	3	0			
M-23A*	61	61	0	3	0			
M-23B*	60	60	0	3	0			
West of TH 95 near downtown Stillwater								
M-25*	61	61	0	4	4	641	\$144,225	NA

Bold numbers are above state daytime noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

**ST. CROIX RIVER CROSSING PROJECT
MINNESOTA NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 20 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 L10 (no wall)	Pref. Alt. year 2030 L10 (20 ft wall)	Reduction (in dBA) with 20 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$15/sq ft	Cost/dBA/residence
North of TH 36, west of Washington								
M-1	71	66	5	2	2	883	\$264,900	\$26,490
South of TH 36, west of Oakgreen Avenue								
M-2	71	67	4	1	0	864	\$259,200	NA
South of TH 36, west of Oakgreen Avenue								
M-3	67	63	4	8	0	1,326	\$397,800	NA
M-3A*	64	63	1	1	0			
M-3C	69	67	2	8	0			
North of TH 36; east of Greeley Street								
M-3B*	64	63	1	4	0	1,034	\$310,200	NA
M-3Ba*	61	58	3	4	0			
M-3Bb*	60	56	4	2	0			
South of TH 36; east of Oakgreen Avenue								
M-4*	65	63	2	2	0	890	\$267,000	\$13,350
M-5*	65	60	5	4	4			
South of TH 36; east of Oakgreen Avenue								
M-6	69	65	4	1	0	724	\$217,200	NA
North of TH 36, between Greeley Street and Osgood Avenue								
M-7*	60	57	3	4	0	870	\$261,000	NA
M-7a*	60	56	4	4	0			
North of TH 36, east of Osgood								
M-11	68	60	8	2	2	968	\$290,400	\$12,100
North of TH 36, east of Osgood								
M-11a	70	63	7	1	1	669	\$200,700	\$9,123
M-11b	69	61	8	1	1			
M-11c	69	62	7	1	1			
South of TH 36, east of Osgood								
M-12	70	65	5	2	2	600	\$180,000	\$9,000
M-12a	72	67	5	2	2			
South of TH 36, east of Osgood Avenue								
M-13*	64	60	4	4	0	425	\$127,500	\$4,250
M-13a*	64	59	5	6	6			
M-13b*	63	61	4	4	0			
South of the TH 36/TH 95 Interchange – between driveways along Beach Road								
M-14	66	64	2	1	0	88	\$26,400	NA
South of the TH 36/TH 95 Interchange – along TH 95								
M-14	66	66	0	1	0	638	\$191,400	NA
Northwest of the TH 36/95 Interchange								
M-16	63	58	5	2	2	756	\$226,800	\$22,680
M-16A	62	59	3	4	0			

Bold numbers are above state noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

**ST. CROIX RIVER CROSSING PROJECT
MINNESOTA NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 20 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 L10 (no wall)	Pref. Alt. year 2030 L10 (10 ft wall)	Reduction (in dBA) with 10 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$15/sq ft	Cost/dBA/residence
North of the Interchange west of TH 95 – along north side of existing TH 36 alignment								
M-17*	61	57	-4	3	0	2,386	\$715,800	NA
M-17A*	61	59	-2	2	0			
M-17B*	61	60	-1	3	0			
M-18*	62	61	-1	2	0			
M-18A*	60	59	-1	3	0			
M-18B*	61	61	0	2	0			
North of the Interchange west of TH 95 – along proposed interchange								
M-17*	61	58	-3	3	0	3,086	\$925,800	NA
M-17A*	61	60	-1	2	0			
M-17B*	61	59	-2	3	0			
M-18*	62	61	-1	2	0			
M-18A*	60	59	-1	3	0			
M-18B*	61	61	0	2	0			
East of TH 95 at the Sunnyside complex – along railroad embankment near Sunnyside								
M-19*	61	60	-1	2	0	1,556	\$466,800	NA
M-19A*	61	61	0	5	0			
M-19B*	62	61	-1	5	0			
M-20*	61	59	-2	5	0			
M-20A*	61	60	-1	4	0			
M-20B*	61	59	-2	2	0			
East of TH 95 at the Sunnyside complex – along trail adjacent to TH 95								
M-19*	61	60	-1	2	0	1,310	\$393,000	NA
M-19A*	61	61	0	5	0			
M-19B*	62	61	-1	5	0			
M-20*	61	59	-2	5	0			
M-20A*	61	60	-1	4	0			
M-20B*	61	59	-2	2	0			
West of TH 95 at the northern project limits								
M-21	56	56	0	3	0	2,900	\$870,000	NA
M-21A	55	55	0	2	0			
M-21B	54	54	0	3	0			
M-22*	58	57	-1	2	0			
M-22A*	58	57	-1	3	0			
M-22B*	53	53	0	3	0			
M-23*	62	60	-2	3	0			
M-23A*	61	60	-1	3	0			
M-23B*	60	60	0	3	0			
West of TH 95 near downtown Stillwater								
M-25*	61	61	0	4	0	641	\$192,300	NA

Bold numbers are above state daytime noise standards.

* While these receptors do not exceed state daytime noise standards, the nighttime L₁₀ noise levels for these receptors exceed the state L₁₀ nighttime noise standard of 55 dBA.

**ST. CROIX RIVER CROSSING PROJECT
WISCONSIN NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 10 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 Leq (no wall)	Pref. Alt. year 2030 Leq (10 ft wall)	Reduction (in dBA) with 10 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$18/sq ft	Cost/residence
Northwest of the Preferred Alternative bridge at the bluff								
W-1B ⁽¹⁾	65	64	-1	1	0	745	\$134,100	NA
Southeast of the Preferred Alternative bridge at the bluff								
W-1	66	65	-1	1	0	670	\$120,600	NA
North of STH 35/64 near the eastern project terminus								
W-18	67	59	-8	1	1	1,510	\$271,800	\$271,800
South of STH 35/64 near the eastern project terminus								
W-21	66	62	-4	1	0	1,960	\$352,800	NA

⁽¹⁾ There is a substantial noise increase (>15 dBA) at this receptor from existing conditions to future Build conditions.

**ST. CROIX RIVER CROSSING PROJECT
WISCONSIN NOISE BARRIERS
COST EFFECTIVENESS RESULTS – 15 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 Leq (no wall)	Pref. Alt. year 2030 Leq (15 ft wall)	Reduction (in dBA) with 15 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$18/sq ft	Cost/residence
Northwest of the Preferred Alternative bridge at the bluff								
W-1B ⁽¹⁾	65	64	-1	1	0	745	\$201,150	NA
Southeast of the Preferred Alternative bridge at the bluff								
W-1	66	64	-2	1	0	670	\$180,900	NA
North of STH 35/64 near the eastern project terminus								
W-18	67	57	-10	1	1	1,510	\$407,700	\$407,700
South of STH 35/64 near the eastern project terminus								
W-21	66	59	-7	1	0	1,960	\$529,200	NA

⁽¹⁾ There is a substantial noise increase (>15 dBA) at this receptor from existing conditions to future Build conditions.

**ST. CROIX RIVER CROSSING PROJECT
 WISCONSIN NOISE BARRIERS
 COST EFFECTIVENESS RESULTS – 20 FOOT BARRIER**

Receptors	Pref. Alt. year 2030 Leq (no wall)	Pref. Alt. year 2030 Leq (20 ft wall)	Reduction (in dBA) with 20 ft noise wall	Number of residences	Number of affected residences	Length of wall (feet)	Total cost of wall \$18/sq ft	Cost/residence
Northwest of the Preferred Alternative bridge at the bluff								
W-1B ⁽¹⁾	65	64	-1	1	0	745	\$268,200	NA
Southeast of the Preferred Alternative bridge at the bluff								
W-1	66	64	-2	1	0	670	\$241,200	NA
North of STH 35/64 near the eastern project terminus								
W-18	67	56	-11	1	1	1,510	\$543,600	\$543,600
South of STH 35/64 near the eastern project terminus								
W-21	66	57	-9	1	1	1,960	\$705,600	\$705,600

⁽¹⁾ There is a substantial noise increase (>15 dBA) at this receptor from existing conditions to future Build conditions.