TH 61 Corridor Improvement Project

NOISE REPORT

SCENIC DRIVE TO PARK ROAD
TWO HARBORS, LAKE COUNTY

July 2025

SP 3804-62 | MNDOT DISTRICT 1

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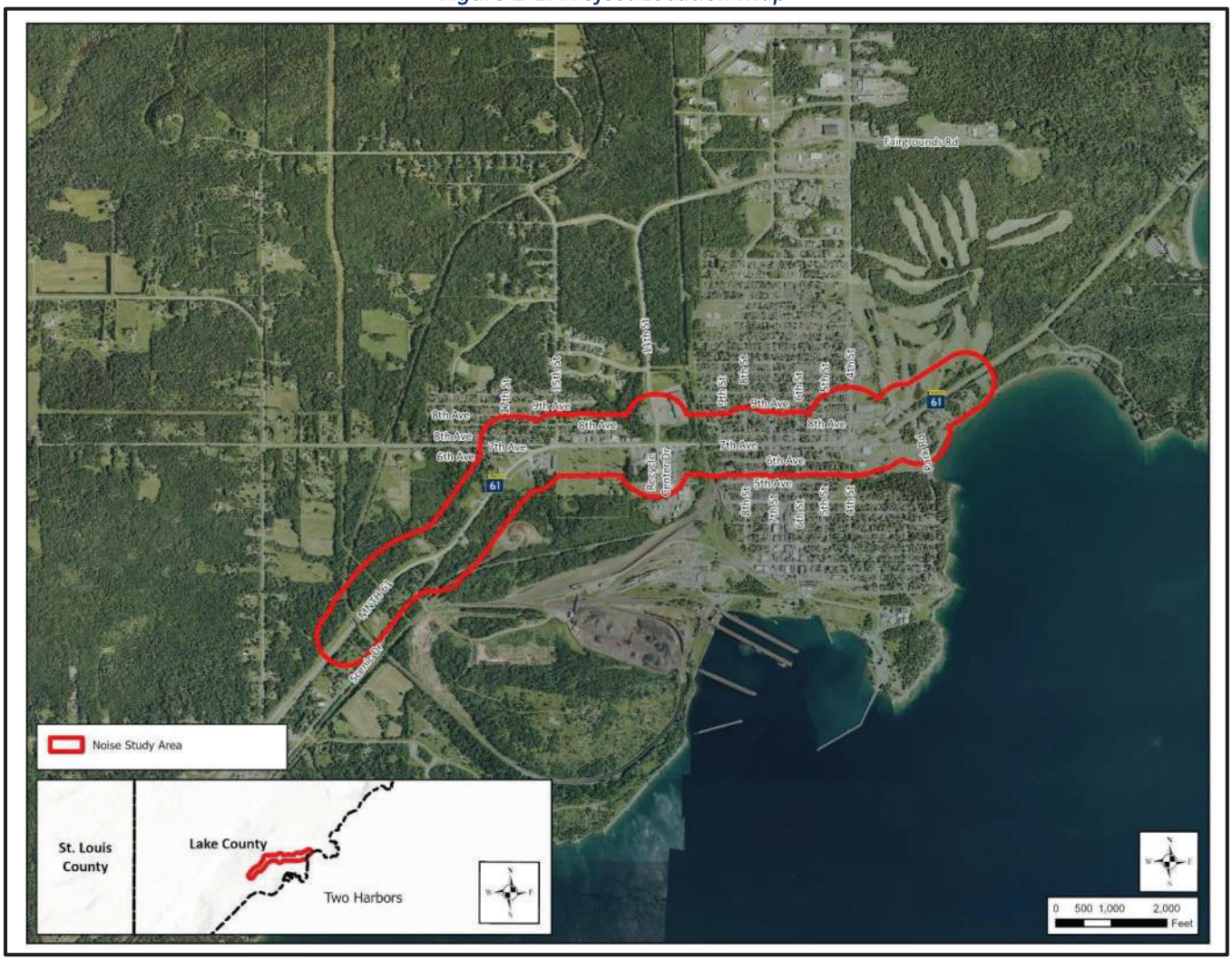
Glossary of Acronyms

CFR	Code of Federal Regulations
dB	Decibel
dBA	Decibel, A-Weighted
EQB	Environmental Quality Board
FHWA	Federal Highway Administration
L_{eq}	Equivalent steady-state sound level
$L_{eq}(h)$	Hourly equivalent steady-state sound level
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
mph	Miles per hour
NAC	Noise Abatement Criteria
SP	State Project
TH	Trunk Highway
TNM	Traffic Noise Model
TNM 2.5	FHWA Traffic Noise Model Version 2.5
USGS	United States Geological Survey

1. Introduction

A traffic noise analysis was conducted for the Minnesota Department of Transportation's (MnDOT) proposed Trunk Highway (TH) 61 corridor improvement project. The project (SP 3804-62) is located in Lake County within the city limits of Two Harbors, Minnesota. Depicted in **Figure 1-1**, the study limits span roughly 2.5 miles along TH 61, from approximately 2,050 feet west of Scenic Drive to 1,200 feet east of Park Road. The proposed work includes reconstruction of much of the TH 61 roadway through Two Harbors, the addition of a continuous left turn lane, replacement of two signalized intersections with roundabouts, new bicycle and pedestrian facilities, lighting, signs, and utilities. This corridor improvement project necessitates the analysis of both existing and future noise impacts, as well as possible methods of noise mitigation.

Figure 1-1: Project Location Map



1.1. Objective

The objective of this study is to:

- Evaluate existing and future traffic noise levels for No-Build and Build alternatives
- Determine whether any traffic noise impacts will occur as a result of the proposed corridor improvement project
- Evaluate whether it is feasible and reasonable to mitigate potential traffic noise impacts
- Propose appropriate noise mitigation measures to address potential traffic noise impacts
- Collect and present solicited opinions, in the form of votes on proposed traffic noise mitigation plans, of benefited owners and residents

This traffic noise analysis was completed following the procedures and guidance described in the Minnesota Department of Transportation (MnDOT) *Noise Requirements for MnDOT and other Type I Federal-aid Projects* (effective July 10, 2017) as per Title 23 Code of Federal Regulations (CFR) Part 772. MnDOT's noise requirements apply to all projects administered by MnDOT that exceed mandatory Environmental Quality Board (EQB) thresholds for highway projects and/or Federal Highway Administration (FHWA) 23 CFR 772 Noise Abatement Criteria (NAC).

2. Noise Fundamentals

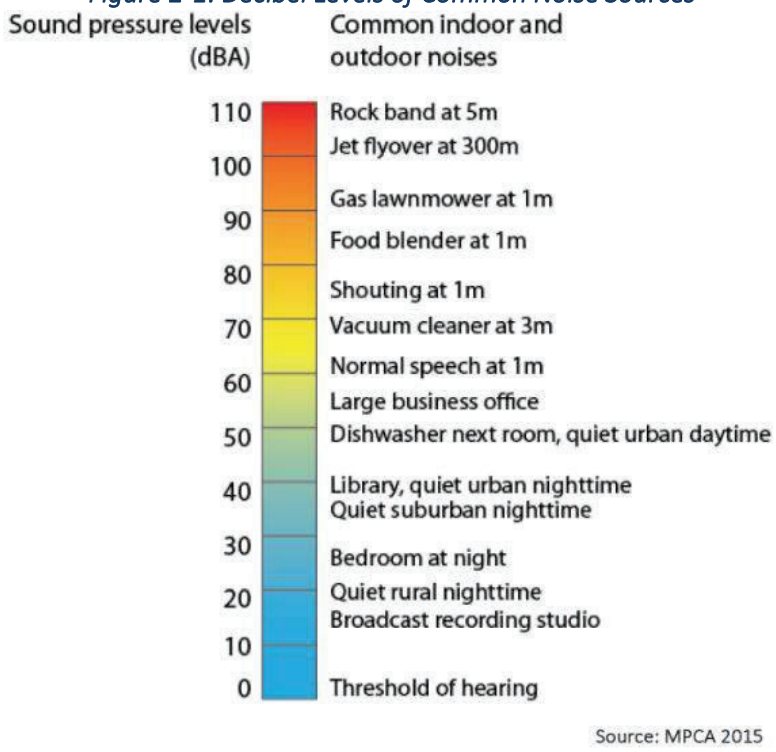
FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* provides information on fundamental concepts relevant to highway traffic noise analysis. Noise is defined by FHWA as unwanted sound. The intensity of sound is described in terms of decibels (dB). The decibel is a logarithmic unit expressing the ratio of a measured sound pressure level to a standard reference level. Sound is composed of a wide range of frequencies, but the human ear does not respond equally to all frequencies. Sound level meters are typically equipped with weighting circuits that filter out selected frequencies. A-weighted circuits approximate the frequency response of the human ear by filtering out frequencies to which the human ear does not respond. Sound pressure levels recorded this way are reported as dBA.

In Minnesota, traffic noise impacts are evaluated in terms of the equivalent steady-state sound level. Analogous to the "average" sound level, the equivalent steady-state sound level contains the same acoustic energy as the time-varying sound level over a stated period of time. This level is referred to as the L_{eq}, with $L_{eq}(h)$ representing the hourly value of L_{eq}. Modeled noise levels in this report are stated as hourly equivalent sound pressure levels, $L_{eq}(h)$, in terms of dBA.

There are many factors that contribute to the loudness of highway traffic noise, including the topography of the area, the number and speed of vehicles, and the types of vehicles (e.g., automobiles, trucks, and motorcycles). Generally, heavier traffic volumes, higher speeds, and greater numbers of trucks increase the loudness of highway traffic noise. Another important factor is the distance between the receptor and the source of the traffic noise. Sound intensity decreases in proportion with the square of the distance from the source. Doubling the distance from the line source (roadway) over hard ground (such as pavement or water) reduces the sound level by approximately 3 dBA. Doubling the distance over soft ground (such as vegetated or grassy ground) reduces the sound level by approximately 4.5 dBA.

Typically, a sound level increase of 3 dBA is barely noticeable to the average person, an increase of 5 dBA is clearly noticeable, and a 10 dBA increase is perceived as a doubling of loudness. Common indoor and outdoor noise levels are presented in Figure 2-1.

Figure 2-1: Decibel Levels of Common Noise Sources



2.1. Construction Noise

Construction activities cause increased noise levels relative to existing conditions due to pile driving and equipment operation for a variety of activities (e.g., grading, sawing, and paving). See Table 2-1 for a summary of construction noise associated with 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.

Elevated noise levels during roadway construction activities are, to a degree, unavoidable. This construction noise may affect adjacent land uses, including commercial, residential, and industrial areas. Advance notice of any planned abnormally loud construction activities will be provided to affected communities. It is anticipated that night construction may sometimes be required to minimize traffic impacts and to improve safety. However, construction will be limited to daytime hours as much as possible. The project is expected to be under construction for two years. If necessary, a detailed nighttime construction mitigation plan will be developed during the project final design stage.

Table 2-1: Typical Construction Equipment Noise Levels at 50 feet

Equipment Type	Manufacturers Sampled	Total Number of Models in Sample	Peak Noise Level (dBA) (Range)	Peak Noise Level (dBA) (Average)
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

Source: Adapted from *FHWA Construction Noise Handbook*

High-impact equipment noise, such as pile driving, pavement sawing, or jackhammering, will be unavoidable with construction of the proposed project. Pile-driving noise is associated with any bridge construction and sheet piling necessary for retaining wall construction. While pile-driving equipment results in the highest peak noise level, it is limited in duration to certain activities (e.g., bridge construction). The use of pile drivers, jack hammers, and pavement sawing equipment will be prohibited during nighttime hours.

2.2. Federal Traffic Noise Regulations

The Federal Aid Highway Act of 1970 required the FHWA to develop noise standards and abatement requirements for highway traffic noise. The associated traffic noise regulation is codified in Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772). These procedures require the identification of highway traffic noise impacts and evaluation of potential noise abatement measures, along with other considerations, in conjunction with the planning and design of a Federal-aid highway project.

Traffic noise analysis is applicable to three project types: Type I, Type II, and Type III, as defined in 23 CFR 772.5. A traffic noise impact analysis is required for all Type I and Type II projects that receive Federal-aid funding or otherwise require FHWA approval. The implementation of a Type II (retrofit) program is optional and are not considered for abatement in Minnesota. The proposed TH 61 corridor improvements project meets the definition of a Type I project due to changes to the roadway alignment. Therefore, a traffic noise analysis is required for the project.

FHWA regulations establish procedures and Noise Abatement Criteria (NAC) activity categories based on land use to assess potential traffic noise impacts as defined in 23 CFR 772. FHWA's NAC and descriptions of the land use categories are listed in Table 2-2. FHWA's NAC are used to identify locations where traffic noise impacts occur, with primary consideration given to exterior areas where frequent human use occurs. NAC are not used as goals for noise attenuation design criteria or design targets.

Under FHWA criteria and regulations, traffic noise impacts may occur under two conditions. First, traffic noise impacts occur when predicted design year worst hour noise levels under the build scenario approach, meet, or exceed the NAC. Second, traffic noise impacts can also occur if there are substantial increases (equivalent to 5 dBA or more) in traffic noise over existing conditions, independent of the NAC.

Table 2-2: FHWA Noise Abatement Criteria

Activity Category	Activity Criteria [1,2] $L_{eq}(h)$ dBA	Evaluation Location	Activity Description
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[3]	67	Exterior	Residential
C[3]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E[3]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	Undeveloped lands that are not permitted

Source: *FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise*

[1] $L_{eq}(h)$ shall be used for impact assessment

[2] $L_{eq}(h)$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement

[3] Includes undeveloped lands permitted for this activity category

2.3. Minnesota Traffic Noise Requirements

MnDOT's policy for implementation of the requirements of 23 CFR 772 is described in the MnDOT *Noise Requirements for MnDOT and other Type I Federal-aid Projects* (effective July 10, 2017). This policy describes the MnDOT process used in determining traffic noise impacts and abatement measures and the equitable and cost-effective expenditure of public funds for traffic noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, the policy describes MnDOT's approach to implementation.

MnDOT's *Noise Requirements for MnDOT and other Type I Federal-aid Projects* has adopted the NAC established by FHWA and defines traffic noise impacts as occurring if at least one of the following two conditions is met:

1. The predicted design year traffic noise levels under the build scenario approach, meet, or exceed the NAC, as shown in Table 2-2. MnDOT defines "approach" as being 1 dBA, or less, below the applicable Federal NAC. For example, for a Category B receptor, 66 dBA is approaching 67 dBA, and the receptor would be considered impacted.
2. The predicted design year traffic noise levels under the build scenario substantially exceed the respective existing scenario noise levels. MnDOT's *Noise Requirements for MnDOT and other Type I Federal-aid Projects* defines "Substantial Noise Increase" as an increase in noise levels of at least 5 dBA in the design year compared to the existing noise level.

In 2016, the Commissioners of the Minnesota Pollution Control Agency (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 (Minnesota 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. Highway projects will no longer directly address Minnesota Rule 7030.

3. Analysis Methodology

3.1. Affected Environment

The TH 61 corridor improvement project is located within the city of Two Harbors in Lake County, Minnesota. The noise study area was created by buffering the proposed roadway geometry by 500 feet. Due to the presence of a range of roadway functional classifications, including arterial, collector, and local systems, noise within the study area is primarily generated by vehicle traffic.

To assess the NAC assigned to study area noise sensitive receptors, an investigation of existing and future land use was conducted. The City of Two Harbors and Lake County maintain a series of planning documents and resources that pertain to the TH 61 study area, which include the *Two Harbors Zoning Code and Map* (2021), *Two Harbors Comprehensive Plan* (2015), and *Lake County Comprehensive Plan* (2017). A review of these documents, parcel data, and aerial imagery identified that the existing land use along the project corridor represents diverse activity within a developed urban context. The noise study limits encompass residential, commercial, institutional, recreational, and industrial land uses. A review of these planning documents and other available resources revealed no significant changes in future land use.

Per MnDOT policy, coordination with local governments is necessary to determine if there are any newly permitted land uses within the study area for inclusion in the noise analysis. Upon review of documents obtained, it was confirmed that no permitted or under-construction noise-sensitive developments were within the study area limits and therefore, no such developments were included within this noise analysis.

3.2. Traffic Noise Monitoring

The assessment of traffic noise impacts require the use of a predictive noise model to quantify noise levels for a variety of scenarios (Existing, 2048 No-Build, and 2048 Build Alternative). To use quantitative modeling to predict traffic noise levels, it must first be demonstrated that the use of approved noise prediction methods satisfactorily estimates the vehicle traffic noise levels. This validation process is accomplished by comparing field-measured values to predicted model noise values.

The current FHWA-approved model for prediction of traffic noise, Traffic Noise Model (TNM 2.5), was used for comparison to the field-measured data, and for all other modeling in the noise study. Modeled values must be within +/- 3.0 dBA of the field measurements for the noise model to be considered validated (FHWA, 2011). A favorable comparison indicates that the noise source at the time of measurement is predominantly highway traffic and that the model results represent valid predictions suitable for use in assessing traffic noise impacts.

FIELD NOISE MEASUREMENTS

Field noise measurements were planned and conducted in accordance with guidance provided in the FHWA *Noise Measurement Handbook* and FHWA *Noise Measurement Field Guide*. Six field measurement sites were selected for noise model validation that represent the various land uses within the project area. The layout figures in Appendix A and data sheets in Appendix B illustrate the field measurement locations.

Field noise measurements were recorded in 30-minute intervals per site during the morning and afternoon of June 26, 2024. During the field noise measurements, the noise meter was tripod-mounted, and the microphone was located approximately five feet above the ground surface. The meter was calibrated with the manufacturer-supplied standard noise calibrator before use and was also checked before each sound level measurement session. No adjustments to the calibration were required during any of the field noise monitoring. A foam windscreen (supplied by the manufacturer) was used during all field traffic noise measurements.

In addition to noise monitoring, traffic volume, vehicle composition, and vehicle speeds during the field monitoring period were recorded based on field observations. All weather parameters were within acceptable ranges for

conducting noise measurements. Table 3-1 summarizes the existing noise levels measured during field monitoring. The associated field reports can be found in Appendix B.

Table 3-1: Field-Measured Noise Levels

Monitoring Site ID	Location Description	Start Time	End Time	Measured Level, dBA, L_{eq}
1	West of town, west of TH 61	9:10 AM	9:40 AM	69.4
2	AmericInn	10:10 AM	10:40 AM	65.3
3	Abandoned MinitMart Car Wash	11:07 AM	11:37 AM	69.5
4	West of Living Waters Fellowship	11:53 AM	12:23 PM	68.0
5	R.J. Houle Visitor Information Center Parking Lot	12:40 PM	1:10 PM	64.7
6	Burlington Bay Campground RV Park	1:33 PM	2:03 PM	64.1

MODEL VALIDATION

Model validation is a critical step in the noise analysis process, ensuring the reliability of predicted traffic noise levels. To achieve this, the accuracy of model-predicted traffic noise levels is verified against the field-collected ambient traffic noise measurements taken at the same measurement site locations under identical traffic conditions. This comparison serves to refine and verify the noise model's accuracy for representing real-world conditions.

Measured and predicted noise levels for this project are presented in Table 3-2. The difference between the measured and predicted values fell within 3 dBA for all six validation locations. Based on this comparison, it was determined that the TNM 2.5 model developed for the TH 61 improvement project accurately predicts highway traffic noise within the study area.

Table 3-2: Noise Model Validation Summary

Monitoring Site ID	Measured Level, dBA, L_{eq}	Predicted Level, dBA, L_{eq}(h)	Difference (Predicted-Measured), dBA, L_{eq}	Difference ≤ 3 dBA, L_{eq}
1	69.4	68.6	-0.8	Yes
2	65.3	64.7	-0.6	Yes
3	69.5	66.9	-2.6	Yes
4	68.0	68.2	-0.2	Yes
5	64.7	64.7	0.0	Yes
6	64.1	64.9	0.8	Yes

3.3. Worst Hourly Traffic Noise Analysis

The principal traffic noise model inputs include existing and forecasted (2048) loudest hour traffic volumes, operating speeds, and vehicle classifications (automobile, medium truck, and heavy truck). In general, higher traffic volumes, vehicular speeds, and greater numbers of heavy trucks increase the loudness of roadway traffic noise.

The highest hourly traffic noise impact typically occurs when higher traffic volumes flow more freely and/or when heavy truck volumes are the greatest. Traffic volumes were collected from MnDOT's Automatic Traffic Recorder (ATR) station data from January to December 2023 to investigate peak hour conditions representative of the loudest hour. Station 213 was used and is located along TH 61 southwest of Two Harbors. Given the variation in seasonal traffic demand and weekly timeframes during which higher truck volumes, vehicle volumes, and congestion occur, a detailed investigation of four scenarios to determine the loudest hour was conducted:

1. Recreational Truck Peak: Highest volume of trucks (autumn Friday from 12:00 – 1:00 PM)

2. Recreational Morning Peak: Highest total volume of vehicles (autumn Thursday from 9:00 – 10:00 AM)
3. Recreational Total/Afternoon Peak: Highest total volume of vehicles (autumn Friday from 4:00 – 5:00 PM)
4. Recreational Midday Peak: Highest total volume of vehicles (autumn Saturday from 3:00 – 4:00 PM)

Table 3-3 summarizes the $L_{eq}(h)$ levels for each of the four scenarios across 20 various receptor locations that provided a geographically distributed sample of the study area. Based on this worst noise hour analysis, it was determined that the Truck Peak period from 12:00 to 1:00 PM represents the loudest traffic noise hour.

Table 3-3: Worst Hourly Traffic Noise Summary

Sound Level Metric	Truck Peak 12:00 – 1:00 PM dBA, $L_{eq}(h)$	AM (Thursday) Peak 9:00 – 10:00 AM dBA, $L_{eq}(h)$	PM (Friday) Peak 4:00 – 5:00 PM dBA, $L_{eq}(h)$	Saturday Peak 3:00 – 4:00 PM dBA, $L_{eq}(h)$	Field Measurement dBA, L_{eq}
Highest	67.8	66.1	67.4	**68.0**	69.5
Lowest	**59.0**	57.9	58.0	57.1	64.1
Mean	**64.4**	62.7	63.2	63.2	66.8

Bold numbers represent the highest modeled value for each respective sound level metric.

4. Predicted Noise Levels and Noise Impacts

4.1. Noise Receptors

Traffic noise impacts were assessed by modeling noise levels at receptor sites likely to be affected by the proposed project. Noise sensitive receptors are defined as discrete points at which the model calculates noise levels. These noise sensitive receptors were located based on a review of aerial photography, topographic mapping, and field reconnaissance. Within the TNM 2.5 noise model, positions of the noise sensitive receptors are defined by latitude and longitude, while the elevations at ground level were obtained from LiDAR data accessed through the U.S. Geological Survey (USGS) TNM Download Client. Noise sensitive receptors were modeled as five feet above ground. No noise sensitive receptors required height modifications to accommodate features such as multi-story units.

Traffic noise levels were modeled at a total of 453 noise sensitive receptor locations within the study area, representing primarily residences, trails, retail facilities, and office uses. The layout figure in Appendix A illustrates modeled receptor locations. The land use and federal noise abatement criterion (NAC) for each modeled receptor location are identified in Appendix C.

4.2. Noise Model Results

The following summarizes the results of the noise modeling analysis for existing conditions, 2048 No-Build Alternative, and 2048 Build Alternative. There are no noise barriers or other mitigation affecting the noise levels in the existing and future models. Full traffic noise model results are provided in Appendix C.

The existing and forecasted vehicle composition and traffic volumes were primarily sourced from the 2021 turning movement counts and analysis conducted by KLJ for the predecessor Two Harbors Corridor Study. The traffic forecast methodology incorporated both background growth rates and additional growth projected north of Two Harbors due to recreational traffic over the next 20 years. Vehicular speeds were modeled as the posted speed limit throughout the study corridor except for locations exhibiting deceleration, such as those associated with turning vehicles. Field observations during the ambient noise measurements and speed data sourced from Iteris ClearGuide also corroborate the use of posted speed limits for use in the models.

EXISTING CONDITIONS

The existing condition scenario established $L_{eq}(h)$ noise levels at modeled receptor locations in the project area ranging from 47.4 to dBA to 70.4 dBA. Modeled $L_{eq}(h)$ noise levels approach or exceed the Federal noise abatement criterion for Activity Category B at eight receptor locations (E10, M30, M31, M33, M34, N29, R2, and S2). Modeled

L_{eq}(h) noise levels approach or exceed the Federal noise abatement criterion for Activity Category C at five receptor locations (Y2, Y3, Y5, Y11 and Y12). Modeled L_{eq}(h) noise levels at all other receptor locations are below Federal noise abatement criteria.

2048 NO-BUILD ALTERNATIVE

Future L_{eq}(h) noise levels under the 2048 No-Build Alternative are projected to range from 47.8 dBA to 71.1 dBA. Modeled traffic noise levels are predicted to increase by 0.1 dBA to 1.0 dBA under the 2048 No-Build Alternative compared to existing conditions. Modeled L_{eq}(h) noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category B at 12 receptor locations (E10, M30, M31, M33, M34, N29, O28, O30, R2, S2, S3, and U1) under the 2048 No-Build Alternative. Modeled L_{eq}(h) noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C at 6 receptor locations (Y2, Y3, Y4, Y5, Y11, and Y12) under the 2048 No-Build Alternative. Modeled L_{eq}(h) noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category E at one receptor location (N23) under the 2048 No-Build Alternative. Modeled L_{eq}(h) noise levels at all other receptor locations are below Federal noise abatement criteria.

2048 BUILD ALTERNATIVE

Future traffic L_{eq}(h) noise levels under the 2048 Build Alternative are projected to range from 46.0 dBA to 71.9 dBA. Modeled traffic noise levels are predicted to increase by -3.2 dBA to 2.1 dBA under the 2048 Build Alternative compared to existing conditions. Modeled noise levels are predicted to decrease at several receptor locations due to proposed adjustments to the roadway alignment increasing the distance between these receptors and the traffic noise source. Modeled traffic L_{eq}(h) noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category B at 13 receptor locations (E10, L26, M30, M31, M33, M34, N26, N29, O28, O29, O30, R2, and S2) under the 2048 Build Alternative. Modeled L_{eq}(h) noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C at 29 receptor locations (all of them trail receptors except O32, a place of worship) under the 2048 Build Alternative. Modeled L_{eq}(h) noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category E at one receptor location (N23) under the 2048 Build Alternative. Modeled L_{eq}(h) noise levels at all other receptor locations are below Federal noise abatement criteria.

4.3. Noise Impact Assessment

As previously described, MnDOT's *Noise Requirements for MnDOT and other Type I Federal-aid Projects* defines an impacted receptor as one whose "design year build condition noise levels approach or exceed the FHWA NAC or create a substantial noise increase." Modeled traffic noise levels were analyzed to identify whether predicted noise levels associated with the Build scenario would result in impacted receptors.

A total of 41 noise sensitive receptors approach, meet, or exceed the NAC and are therefore considered impacted under the 2048 Build scenario. No noise sensitive receptors are projected to experience a substantial increase (5 dBA or more) in noise levels. A summary of impacted receptors is presented in **Table 4-1**, further detailed in **Appendix C**, and mapped in **Appendix A**.

Table 4-1: Traffic Noise Impact Summary

2048 Build Alternative Impacts	Number of Receptors Approaching or Exceeding Activity Criteria					Total
	A	B	C	D	E	
Based on NAC Criteria Only	0	13	29	0	1	43
Based on Substantial Increase Criteria Only	0	0	0	0	0	0
Based on Both Criteria	0	0	0	0	0	0
Total Impacts	0	13	29	0	1	43

SECTION 4(F) PROPERTIES

MnDOT's 2017 Noise Requirements include documentation titled *How 23 CFR 772 and 774 Work Together: Analyzing Noise Impacts for Receptors*, dated January 11, 2021. The documentation includes a state specific requirement to consider locations where Quiet is Important (QII), and is intended for certain uses of 4(f) properties. For this project, the locations that QII applies is 4(f) properties where sleeping area of a campground, which applies to the Burlington Bay Campground.

Receptors Y6, Y7, Y8, Y9, Y10, CG1, CG2, CG3, CG4, CG5, and CG 6 represent receptors for the City of Two Harbor's Burlington Bay Campground (See Appendix A for exhibits of the campground noise receptor locations).

Table 4-2 shows the noise levels associated with the campground receptors. None of these receptors approach or exceed their respective noise abatement criteria thresholds, and none of these receptors experience a 3-decibel or more noise increase from No Build to Build. As a result, the project does not induce a constructive use per 23 CFR 774.15, and no further investigation into 4(f) impacts are required.

Table 4-2: Section 4(f) Property Assessment

Section 4(f) receptor Noise Levels (Leq dBA)						
Receptor	**Existing**	**2048 No Build**	**2048 Build (without Mitigation)**	**2048 Build (With proposed mitigation)**	**Exceeds NAC?**	**Increase from No Build to Build >= 3 dBA?**
CG1	50.2	50.8	50.7	49.4	NO	NO
CG2	56.1	57.1	56.6	48.6	NO	NO
CG3	50.9	51.9	51.6	46.9	NO	NO
CG4	55.0	55.9	55.8	49.1	NO	NO
CG5	53.0	53.8	53.6	47.2	NO	NO
CG6	58.2	58.9	58.8	49.8	NO	NO
Y6	55.8	56.6	55.8	52.9	NO	NO
Y7	61.9	62.9	61.2	52.3	NO	NO
Y8	58.0	59.0	58.3	50.2	NO	NO
Y9	60.1	61.1	60.8	50.8	NO	NO
Y10	61.6	62.6	62.4	51.0	NO	NO

5. Consideration of Noise Abatement

Following the determination of traffic noise impacts, MnDOT's *Noise Requirements for MnDOT and other Type I Federal-aid Projects* and FHWA *Highway Traffic Noise: Analysis and Abatement Guidance* provide a systematic approach to identifying locations along the project corridor that require further evaluation. The application of the policy procedures aims to assess noise impacts and determine appropriate abatement measures, which include:

- Construction of noise barriers (noise walls or earthen berms), including acquisition of property rights, either within or outside the highway right of way.
- Traffic management measures, including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, exclusive lane designations, and modified speed limits.

- Alteration of horizontal and vertical alignment.
- Landscaping incorporating use of dense vegetation. This approach requires a significant area of land and is therefore not generally a feasible noise abatement measure for transportation agencies.
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
- Noise insulation of certain facilities, including auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.

5.1. Evaluation of Noise Abatement Measures

If traffic noise impacts are identified, an evaluation of noise abatement measures must be conducted. The most common form of abatement is the construction of noise barriers, although other forms of abatement are evaluated on a case-by-case basis, per 23 CFR 772.

Feasibility and reasonability are the key considerations when evaluating noise abatement measures. Summarized below, the MnDOT *Noise Requirements for MnDOT and Other Type I Federal-Aid Projects* establishes the policies and procedures for determining the Feasibility and Reasonableness of noise abatement measures.

FEASIBILITY

The feasibility of a noise abatement measure is determined based upon a consideration of acoustic feasibility and engineering feasibility.

Acoustic Feasibility

A noise abatement measure must achieve a noise reduction of at least 5 dBA at impacted receptors for those receptors to be considered benefited. While not every impacted receptor must receive this minimum 5 dBA reduction, at least one impacted receptor must meet the minimum 5 dBA reduction for a noise abatement measure to achieve acoustic feasibility.

Engineering Feasibility

Engineering feasibility addresses whether it is possible to design and construct a proposed noise abatement measure. Potential constructability considerations include safety, topography, drainage, utilities, and maintenance considerations. Engineering factors are also taken into consideration when determining noise barrier height. MnDOT has established a maximum noise barrier height of 20 feet above the finished ground line at the noise barrier.

The feasibility of noise barrier construction is sometimes dependent on design details that are not known until the final design phase of the project. For this traffic noise analysis, it was assumed that noise barriers were feasible with respect to engineering feasibility/constructability considerations. Gaps were included in the modeled noise barriers to accommodate driveway connections, sidewalks, and intersecting side streets. Special consideration was taken to account for sight distance along the corridor in the development of noise wall alignments. Required sight distances and sight triangles were evaluated using the *MnDOT Access Management Manual*. It was also assumed that utilities in existing right of way could be relocated, proposed drainage requirements could be met, and any necessary soil corrections could be achieved for the construction of noise walls.

REASONABLENESS

Determination of noise abatement measure reasonableness is based on a consideration of three factors: 1) noise reduction design goal, 2) cost effectiveness, and 3) viewpoint of benefited residents and property owners.

Noise Reduction Design Goal

A minimum 7 dBA reduction must be achieved for at least one benefited receptor behind the noise barrier to meet MnDOT's noise reduction design goal.

Cost Effectiveness

To be considered cost effective, the cost per individual benefited receptor (e.g., residence, commercial entity, industrial entity) must be equal to or less than $78,500. The following details the primary considerations used to determine the cost-effectiveness of the barrier:

- Benefited receptors: The number of individual benefited receptors (e.g., residences, commercial entities, industrial entities) is determined based on those predicted to experience a noise level reduction of 5 dBA or more.
- Noise barrier cost: The cost of a noise barrier is calculating using an estimated construction cost of $36 per square foot of barrier. This price is for an acoustically absorbent concrete post/concrete panel type barrier.
    - Additional costs are incorporated on a case-by-case basis.
- Cost per benefited receptor: The cost per benefited receptor is calculated by dividing the cost of the noise barrier by the number of individual benefited receptors.
- Cost-effectiveness threshold: To be considered cost effective, the cost per individual benefited receptor must be equal to or less than $78,500 per receptor.

For projects on the trunk highway system, the analysis shall maximize noise reduction for as many benefited receptors as possible while remaining within the 20-foot limit placed on barrier height and the $78,500 per benefited receptor limit placed on cost effectiveness.

If a noise abatement measure is determined to meet all feasibility and reasonableness criteria, it will be proposed.

Viewpoint of Benefited Residents and Property Owners

The third criterion in determining noise barrier reasonableness is the viewpoint of benefited residents and property owners. The solicitation of viewpoints from benefited receptors is only conducted for the preferred alternative when the noise abatement measure has been determined to be feasible, to meet noise design reduction goals, and to be cost effective. If benefited residents and property owners indicate that a proposed noise barrier is not desired, then the noise barrier is removed from further consideration and will not be constructed with the project.

There are two steps in determining the desires of the benefited property owners and residents regarding the construction of a proposed noise abatement measure. First, the viewpoint of benefited property owners and residents is solicited through a public involvement process (e.g., open house meeting, direct mailing of a solicitation form). Second, the input received from benefited property owners and residents through this public involvement process is expressed through votes that are weighted according to a range of factors, including but not limited to whether the property abuts the proposed highway right-of-way, whether there is an exterior area of frequent human use, and the habitation of the property with respect to owner, renter, and association. Only property owners and residents of benefited receptors are allowed to vote. Complete information on the weighting of benefited receptor votes is detailed in *Noise Requirements for MnDOT and Other Type I Federal-aid Projects*.

MnDOT's noise requirements allows for up to two solicitation periods to request votes and determine the outcome regarding proposed noise abatement measures.

- First Solicitation: If at least 50 percent of all possible voting points from eligible voters are received after the initial request for votes, a simple majority of voting points cast will determine whether the proposed noise barrier will be constructed. If less than 50 percent of the possible voting points for a barrier are

received after this initial request, then a second ballot will be distributed to the benefited property owners who did not respond to the first solicitation.

- Second Solicitation: If the combination of the first and second solicitation results in responses for at least 25 percent of all possible voting points for a barrier, a simple majority of voting points cast will determine whether the proposed noise barrier will be constructed. If fewer than 25 percent of total possible points for a noise barrier are received after the second request for votes, then the barrier will not be constructed. If there is a tie, where there are equal numbers of points for and against a noise barrier, then the noise barrier will be constructed.

6. Noise Barrier Analysis Results

Noise barriers (i.e., noise walls) were evaluated for locations adjacent to TH 61 at which traffic noise levels are predicted to approach, meet, or exceed the FHWA NAC under the 2048 Build Alternative.

The development of potential noise abatement alternatives included an examination of various alignments by the engineering design team. Fourteen (14) potential noise barrier locations were developed as abatement alternatives for the 43 impacted receptors. Details of the barrier analysis with respect to feasibility and reasonability criteria are presented in Table 6-9.

- Eight (8) noise barriers (Barriers 5 – 12 and 13b) were determined to be not reasonable as they failed to achieve the noise reduction design goal at the maximum barrier height of 20 feet. Consequently, no further analysis iterations with different wall heights were performed.
- Four (4) noise barriers (Barriers 1 ,2, 4, 13b) were determined to not be reasonable as they failed to achieve the allowable cost-effectiveness threshold of $78,500 per benefited receptor. Additional analysis iterations with different wall heights were conducted, but none were cost effective.
- Three (3) noise barriers (Barriers 3, 13a, 14) were determined to meet the noise reduction design goal and be cost effective at the maximum barrier height of 20 feet.

The layout figure in Appendix A illustrates the locations of modeled noise walls. Modeled noise wall cost-effectiveness results are tabulated in Appendix D.

6.1. Result Narratives

Modeled Noise Wall 1, South Side of TH 61, West of 7th Ave (Receptors B1 – B9)

Modeled receptor locations on the south side of TH 61 west of 7th Avenue represents trail use planned along the corridor. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2048 Build Alternative, therefore, a noise wall was evaluated on the south side of TH 61, west of 7th Avenue.

An approximately 2,150-foot long, 20-foot high noise wall was modeled along the south side of TH 61 west of 7th Avenue. As shown in Appendix D Table D-1, the 20-foot high noise wall achieved a 7 dBA reduction or greater at nine locations, and a 5 dBA reduction or greater at the same nine locations. Due to the need for ROW acquisition, crash-worthy noise barrier, and a major sign relocate, the cost effectiveness of the noise wall is $188,862 per benefited receptor. The cost breakdown for the modeled wall is shown below.

Table 6-1: Wall 1 at 20 ft Height Cost Breakdown

Element	Estimated Cost
Construction[1]	$1,492,704
Added Costs[2]	$207,053
Total	**$1,699,757**

[1]Based on $36/sqft

[2]Based on Historical Bid Prices. Details can be found in **Appendix D**.

As shown in **Appendix D** Table D-2, analysis of an 8-foot high noise wall also achieved a 7 dBA reduction or greater at nine locations, and a 5 dBA reduction or greater at the same nine locations. Due to the need for ROW acquisition, crash-worthy noise barrier, and a major sign relocate the cost effectiveness of the noise wall is $91,806 per benefited receptor. The cost breakdown for the modeled wall is shown below.

Table 6-2: Wall 1 at 8 ft Height Cost Breakdown

Element	Estimated Cost
Construction[1]	$619,200
Added Costs[2]	$207,053
Total	**$91,806**

[1]Based on $36/sqft

[2]Based on Historical Bid Prices. Details can be found in **Appendix D**.

No potentially cost-effective wall height was identified to meet MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor on the south side of TH 61 west of 7th Ave, therefore Noise Wall 1 is not proposed.

Modeled Noise Wall 2, South Side of TH 61, West of 11th St (Receptors H1 – H7)

Modeled receptor locations on the south side of TH 61 west of 11th Street represents trail use planned along the corridor. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2048 Build Alternative, therefore, a noise wall was evaluated on the south side of TH 61, west of 11th Street.

An approximately 280-foot long, 20-foot high noise wall was modeled along the south side of TH 61 west of 11th Street. In order to maintain adequate sight distances for the accesses found on the south side of TH 61, the modeled noise wall length was maximized with respect to the sight distance requirements to maximize the noise reductions for the effected receptors. As shown in **Appendix D** Table D-3, the 20-foot high noise wall achieved a 7 dBA reduction or greater at two locations, and a 5 dBA reduction or greater at the same two locations. Due to the need for reinterment relocates the cost effectiveness of the noise wall is $167,220 per benefited receptor. The cost breakdown for the modeled wall is shown below.

Table 6-3: Wall 2 at 20 ft Height Cost Breakdown

Element	Estimated Cost
Construction[1]	$109,440
Reinterment Relocates[2]	$225,000
Total	**$334,440**

[1]Based on $36/sqft

[2]Based on Engineering Judgement

As shown in **Appendix D** Table D-4, analysis of a 10-foot high noise wall achieved a 7 dBA reduction or greater at one location, and a 5 dBA reduction or greater at two locations. Due to the need for sidewalk removal and reinterment relocates the cost effectiveness of the noise wall is $160,020 per benefited receptor. The cost breakdown for the modeled wall is shown below.

Table 6-4: Wall 2 at 10 ft Height Cost Breakdown

Element	Estimated Cost
Construction[1]	$95,040
Reinterment Relocates[2]	$225,000
Total	$320,040

[1]Based on $36/sqft
[2]Based on Engineering Judgement

Sidewalk removal was included since the noise wall would require the proposed trail to shift south of the current alignment. No potentially cost effective wall height was identified to meet MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor on the south side of TH 61 west of 11th Street, therefore Noise Wall 2 is not proposed.

Modeled Noise Wall 3, North Side of TH 61, East of 15th Street (Receptors E9 – E11)

Modeled receptor locations on the north side of TH 61 east of 15th Street represent residential use. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2048 Build Alternative, therefore, a noise wall was evaluated on the north side of TH 61, east of 15th Street.

An approximately 88-foot long, 20-foot high noise wall was modeled along the north side of TH 61 east of 15th Street. As shown in **Appendix D** Table D-5, the 20-foot high noise wall achieved a 7 dBA reduction or greater at one location, and a 5 dBA reduction or greater at one location. Costs for the wall include the need for asphalt removal and ROW acquisition, and the resulting cost effectiveness of the noise wall is $70,431 per benefited receptor. The cost breakdown for the modeled wall is shown below.

Table 6-5: Wall 3 at 20 ft Height Cost Breakdown

Element	Estimated Cost
Construction[1]	$63,360
Added Costs[2]	$7,071
Total	$70,431

[1]Based on $36/sqft
[2]Based on Historical Bid Prices. Details can be found in **Appendix D**.

The 20-foot-high wall with tapers down to 10 feet meets MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor on the south side of TH 61 west of 11th Street, therefore Noise Wall 3 is proposed.

Modeled Noise Wall 4, South Side of TH 61, East of 11th St (Receptors J1, J5, Q1)

Modeled receptor locations on the south side of TH 61 east of 11th Street represents trail and residential uses. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C and B respectively under the 2048 Build Alternative, therefore, a noise wall was evaluated on the south side of TH 61, east of 11th Street.

An approximately 330-foot long, 20-foot high noise wall was modeled along the south side of TH 61 east of 11th Street. As shown in **Appendix D** Table D-6, the 20-foot high noise wall achieved a 7 dBA reduction or greater at two locations, and a 5 dBA reduction or greater at two locations. The cost effectiveness of the noise wall is $169,344 per benefited receptor which exceeds MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor and is not proposed.

Subsequent to the 20 foot wall analysis, additional iterations decreasing the wall height by one foot increments were modeled to identify if any wall heights achieved a reasonable cost effectiveness. However, although all receptors benefited at 20 feet remained benefited at all height iterations, none achieved cost effectiveness prior

to the design goal not being met. As shown in Appendix D Table D-7, the 10-foot high noise model achieved a 7dBA reduction or greater at two locations, and a 5 dBA reduction or greater at the same two locations. The cost effectiveness of the noise wall is $88,704 per benefited receptor which exceeds MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor. As shown in Appendix D Table D-8, the 8-foot high noise model provides a 6.2 dBA reduction in traffic noise levels which does not meet MnDOT's noise reduction goal therefore, Noise Wall 4 is not proposed.

Modeled Noise Wall 5, North Side of TH 61, East of 9th St (Receptor L26)

The modeled receptor location on the north side of TH 61 east of 9th Street represents residential use. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2048 Build Alternative, therefore, a noise wall was evaluated on the north side of TH 61, east of 9th Street.

An approximately 101-foot long, 20-foot high noise wall was modeled along the north side of TH 61 east of 9th Street. As shown in Appendix D Table D-9, the 20-foot high noise wall achieved a 4.4 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length required for driveway access. Therefore, Noise Wall 5 is not proposed.

Modeled Noise Wall 6, South Side of TH 61, East of 8th St (Receptor R2)

The modeled receptor location on the south side of TH 61 east of 8th Street represents residential use. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2048 Build Alternative, therefore, a noise wall was evaluated on the south side of TH 61, east of 8th Street.

An approximately 44-foot long, 20-foot high noise wall was modeled along the south side of TH 61 east of 8th Street. As shown in Appendix D Table D-10, the 20-foot high noise wall achieved a 2.7 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length of the wall, and the openings required for sidewalks and driveways. Therefore, Noise Wall 6 is not proposed.

Modeled Noise Wall 7, North Side of TH 61, East of 8th St (Receptors M30 – M34)

Modeled receptor locations on the north side of TH 61 east of 8th Street represents residential uses. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2048 Build Alternative, therefore, a noise wall was evaluated on the north side of TH 61, east of 8th Street.

An approximately 199-foot long, 20-foot high noise wall was modeled along the north side of TH 61 east of 8th Street. As shown in Appendix D Table D-11, the 20-foot high noise wall achieved a 6.4 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length of the wall, and the openings required for sidewalks. Therefore, Noise Wall 7 is not proposed.

Modeled Noise Wall 8, South Side of TH 61, East of 7th St (Receptors S1 – S3)

Modeled receptor locations on the south side of TH 61 east of 7th Street represents residential and retail uses. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B and E respectively under the 2048 Build Alternative, therefore, a noise wall was evaluated on the south side of TH 61, east of 7th Street.

An approximately 68-foot long, 20-foot high noise wall was modeled along the south side of TH 61 east of 7th Street. As shown in Appendix D Table D-12, the 20-foot high noise wall achieved a 3.0 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length of the wall, and the openings required for sidewalks and driveways. Therefore, Noise Wall 8 is not proposed.

Modeled Noise Wall 9, North Side of TH 61, East of 7th St (Receptors N26 – N27)

Modeled receptor locations on the north side of TH 61 east of 7th Street represents residential and retail uses. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B

and E respectively under the 2048 Build Alternative, therefore, a noise wall was evaluated on the north side of TH 61, east of 7th Street.

An approximately 57-foot long, 20-foot high noise wall was modeled along the north side of TH 61 east of 7th Street. As shown in Appendix D Table D-13, the 20-foot high noise wall achieved a 1.9 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length of the wall, and the openings required for sidewalks and driveways. Therefore, Noise Wall 9 is not proposed.

Modeled Noise Wall 10, North Side of TH 61, West of 6th St (Receptors N28 - N29)

Modeled receptor locations on the north side of TH 61 west of 6th Street represents residential and retail uses. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B and E respectively under the 2048 Build Alternative, therefore, a noise wall was evaluated on the north side of TH 61, west of 6th Street.

An approximately 90-foot long, 20-foot high noise wall was modeled along the north side of TH 61 west of 6th Street. As shown in Appendix D Table D-14, the 20-foot high noise wall achieved a 5.3 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length of the wall, the proximity of the receptor to the end of the wall, and the openings required for sidewalks. Therefore, Noise Wall 10 is not proposed.

Modeled Noise Wall 11, North Side of TH 61, East of 6th St (Receptors O28 – O30)

Modeled receptor locations on the north side of TH 61 east of 6th Street represents residential uses. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2048 Build Alternative, therefore, a noise wall was evaluated on the north side of TH 61, east of 6th Street.

An approximately 184-foot long, 20-foot high noise wall was modeled along the north side of TH 61 east of 6th Street. As shown in Appendix D Table D-15, the 20-foot high noise wall achieved a 6.3 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length of the wall, and the openings required for sidewalks. Therefore, Noise Wall 11 is not proposed.

Modeled Noise Wall 12, North Side of TH 61, West of 5th St (Receptor O32)

The modeled receptor location on the north side of TH 61 west of 5th Street represents a place of worship. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2048 Build Alternative, therefore, a noise wall was evaluated on the north side of TH 61, west of 5th Street.

An approximately 66-foot long, 20-foot high noise wall was modeled along the north side of TH 61 west of 5th Street. As shown in Appendix D Table D-16, the 20-foot high noise wall achieved a 3.7 dBA reduction which does not meet MnDOT's noise reduction goal due to the short length of the wall, and the openings required for sidewalks and driveways. Therefore, Noise Wall 12 is not proposed.

Receptor O32 was also considered for indoor noise criteria, and discussed further in section 7.6 of this document. The interior noise analysis also demonstrates that the interior noise level does not approach or exceed the Activity Category D criterion of 52 dBA (L_{eq}(h)). Therefore, no interior noise mitigation is proposed, and no further noise analysis is required.

Modeled Noise Wall 13, South Side of TH 61, East of 4th St (Receptors W1-W4)

Modeled receptor locations on the south side of TH 61 east of 4th Street represent trail use planned along the corridor. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2048 Build Alternative, therefore, noise walls were evaluated on the south side of TH 61, east of 4th Street.

Wall 13 was analyzed in subsections labeled as Wall 13a and 13b which can be seen in **Appendix A**. Wall 13a was modeled as an approximately 104-foot long, 20-foot high noise wall and Wall 13b was modeled as an approximately 168-foot long, 20-foot high noise wall along the south side of TH 61 east of 4th Street. As part of the planned improvements, side street alignments will vary from existing conditions to improve approach angles. In order to maintain adequate sight distances for the accesses and spacing near buildings found on the south side of TH 61, the modeled noise wall length was maximized with respect to the sight distance requirements to maximize the noise reductions for the effected receptors. As shown in **Appendix D** Table D-17 and Table D-18, Wall 13a and Wall 13b each achieved a 7 dBA reduction or greater at one location, and a 5 dBA reduction or greater at one location. With the inclusion of costs for some utility relocates the cost effectiveness of the noise wall is $71,700 per benefited receptor for Wall 13a and $127,908 for Wall 13b. The cost breakdowns for the modeled wall segments are shown below.

Table 6-6: Wall 13a and Wall 13b at 20 ft Height Cost Breakdown

Element	13a - Estimated Cost	13b – Estimated Cost
Construction[1]	$56,448	$102,528
Added Costs[2]	$15,252	$25,380
Total	**$71,700**	**$127,908**

[1]Based on $36/sqft

[2]Based on Historical Bid Prices. Details can be found in **Appendix D**.

Wall 13b was modeled at 10-feet high to determine if it could be cost effective. As shown in **Appendix D** Table D-19, analysis of a 10-foot high noise wall achieved a 7 dBA reduction or greater at one location, and a 5 dBA reduction or greater at one location. Due to the inclusion of some utility relocates the cost effectiveness of the noise wall is $84,708 per benefited receptor. The cost breakdown for the modeled wall is shown below.

Table 6-7: Wall 13b at 10 ft Height Cost Breakdown

Element	Estimated Cost
Construction[1]	$59,328
Added Costs[2]	$25,380
Total	**$84,708**

[1]Based on $36/sqft

[2]Based on Historical Bid Prices. Details can be found in **Appendix D**.

Wall 13b was modeled at 8-feet height to determine if it could be cost effective and maintain the noise reduction design goal. As shown in **Appendix D** Table D-20, analysis of an 8-foot high noise wall did not achieve a 7 dBA reduction or greater at any location which does not meet MnDOT's noise reduction design goal requirements.

The 20-foot-high Wall 13a meets MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor on the south side of TH 61 east of 4th Street, therefore Noise Wall 13a is proposed. No potentially cost-effective wall height was identified to meet MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor for Wall 13b on the south side of TH 61 east of 4th Street, therefore Noise Wall 13b is not proposed.

Modeled Noise Wall 14, South Side of TH 61, East of Park Rd (Receptors Y1-Y12, CG1 – CG6)

Modeled receptor locations on the south side of TH 61 east of Park Road represent trail and campground use along the corridor. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2048 Build Alternative, therefore, a noise wall was evaluated on the south side of TH 61, east of Park Road.

An approximately 1,640-foot long, 20-foot high noise wall was modeled along the south side of TH 61 east of Park Road. As shown in **Appendix D** Table D-21, the 20-foot high noise wall achieved a 7 dBA reduction or greater at 31

locations, and a 5 dBA reduction or greater at 47 locations. With the need for utility relocates and drainage structures the cost effectiveness of the noise wall is $25,262 per benefited receptor. The cost breakdown for the modeled wall is shown below.

Table 6-8: Wall 14 at 20 ft Height Cost Breakdown

Element	Estimated Cost
Construction[1]	$1,162,368
Added Costs[2]	$24,962
Total	**$1,187,330**

[1]Based on $36/sqft

[2]Based on Historical Bid Prices. Details can be found in **Appendix D**.

The 20-foot high wall was identified to meet MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor on the south side of TH 61 east of Park Road, therefore Noise Wall 14 is proposed.

6.2. Additional Costs

The analysis of barriers 1 – 3 and 13 – 14 included costs expanding upon the standard $36 per square foot due to the complexity of construction within the built urban environment. The additional costs reflect those incurred directly due to the construction of the noise barrier itself. Estimates were developed through historical bid prices for similar construction tasks as well as right-of-way cost estimates provided by MnDOT. Detailed cost estimates for each barrier can be found in Appendix D.

Table 6-9: Noise Barrier Analysis Summary

Barrier	Location			Noise Wall				Feasibility	Reasonableness			Determination
	Placement	Receptor(s)	Land Use(s)	Model Iteration[1]	Length (ft)	Height (ft)	Noise Reduction (dBA)	Acoustic[2]	Benefitted Receptors[3]	Noise Reduction Design Goal[4]	Cost per Benefited Receptor[6]	Noise Wall Analysis Results[5]
1	South side of TH 61, west of 7th Ave	B1 – B9	Trail	1	2,150	20	12.0 - 18.8	9	9	9	$188,862	Not Reasonably Cost Effective
				2	2,150	8	8.6 -10.1	9	9	9	$91,806	Not Reasonably Cost Effective
2	South side of TH 61, west of 11th St	H1 – H7	Trail	1	400	20	0 – 8.9	2	2	2	$167,220	Not Reasonably Cost Effective
				2	400	10	0 – 8.9	2	2	1	$160,020	Not Reasonably Cost Effective
3	North side of TH 61, east of 15th St	E9 – E11	Residential	1	150	20	1.2 – 11.1	1	1	1	**$70,431**	**Propose to Construct**
4	South side of TH 61, east of 11th St	J1, J5, Q1	Trail and residential	1	496	20	3.0 - 15.4	2	2	2	$169,344	Not Reasonably Cost Effective
				2	496	8	1.5 - 6.2	2	2	0	N/A	Does Not Meet Design Goal
5	North side of TH 61, east of 9th St	L26	Residential	1	101	20	4.4	0	0	0	N/A	Does Not Meet Design Goal
6	South side of TH 61, east of 8th St	R2	Residential	1	44	20	2.7	0	0	0	N/A	Does Not Meet Design Goal
7	North side of TH 61, east of 8th St	M30 – M34	Residential	1	199	20	4.0 - 6.4	2	2	0	N/A	Does Not Meet Design Goal
8	South side of TH 61, east of 7th St	S1 – S3	Residential and retail	1	68	20	1.2 – 3.0	0	0	0	N/A	Does Not Meet Design Goal
9	North side of TH 61, east of 7th St	N26 - N27	Residential and office	1	57	20	1.3 - 1.9	0	0	0	N/A	Does Not Meet Design Goal
10	North side of TH 61, west of 6th St	N28 - N29	Residential and office	1	90	20	0.5 - 5.3	1	1	0	N/A	Does Not Meet Design Goal
11	North side of TH 61, east of 6th St	O28 - O30	Residential	1	184	20	5.3 - 6.3	3	3	0	N/A	Does Not Meet Design Goal
12	North side of TH 61, west of 5th St	O32	Place of Worship	1	66	20	3.7	0	0	0	N/A	Does Not Meet Design Goal
13a	South side of TH 61, east of 4th St	W1 – W2	Trail	1	104	20	0 - 9.3	2	2	1	**$71,700**	**Propose to Construct**
13b		W3 – W4	Trail	1	168	20	0 – 9.6	1	1	1	$127,908	Not Reasonably Cost Effective
				2	168	10	0 – 8.1	1	1	1	$84,708	Not Reasonably Cost Effective
				3	168	8	0 = 5.0	1	1	0	N/A	Does Not Meet Design Goal
14	South side of TH 61, east of Park Rd	Y1 – Y12 CG1 – CG6	Trail and campground	1	1,640	20	1.0 – 17.4	5	33	23	**$25,262**	**Propose to Construct**

[1]Barriers for which the initial 20-foot wall height analysis resulted in a *Not Reasonably Cost Effective* determination were evaluated in a second analysis iteration reflecting the maximum potentially cost-effective noise wall height.
[2]Number of impacted receptors for which a noise reduction of 5 dBA or greater is achieved. A value of at least one indicates that the Acoustic Feasibility requirement has been satisfied.
[3]Number of receptors for which a noise reduction of 5 dBA or greater is achieved.
[4]Number of receptors for which a noise reduction of 7 dBA or greater is achieved. A value of at least one indicates the Noise Reduction Design Goal has been satisfied.
[5]**Bolded** content denotes noise wall analysis resulting in a Feasible and Reasonable determination. Viewpoints will be solicitated to determine the third Reasonableness criterion, Viewpoint of Benefited Residents and Owners.
[6]Detailed cost estimates can be found in **Appendix D**.

7. Other Noise Mitigation Techniques

Noise abatement measures other than noise walls were considered but determined not feasible and reasonable for the proposed project based on a combination of social, economic, and environmental factors. These measures are summarized below.

7.1. Traffic Management Measures

Traffic management measures include such items as prohibition of certain vehicle types and time-use restrictions for certain vehicle types. These measures would be inconsistent with the function of TH 61 as a principal arterial roadway and are therefore not reasonable for the TH 61 corridor.

7.2. Modified Speed Limits

In general, a decrease in speed of approximately 20 mph is necessary for a noticeable decrease in noise levels. The existing posted speed limit on the project segment of TH 61 ranges from 30 to 45 mph. The design speed for the project segment of TH 61 ranges from 35 to 60 mph, and the anticipated speed limit ranges from 30 to 55 mph. Lowering the speed limit on TH 61 would be inconsistent with its function as a principal arterial roadway. In addition, motorists would likely not obey a substantially lower speed limit.

7.3. Vertical and Horizontal Alignment

The proposed TH 61 improvements generally follow the existing roadway horizontal alignment and vertical profile. Revising the horizontal alignment or vertical profile as a means of noise mitigation would result in significant right of way impacts to adjacent properties.

7.4. Landscaping/Natural Noise Screening

Vegetation is only effective for reducing noise levels if it is at least 100 feet to 200 feet deep, a minimum of 15 feet above the line of sight, and dense enough that it cannot be seen through (e.g., evergreen vegetation that maintains its foliage year-round). It is not feasible to plant enough vegetation within existing and proposed right of way to achieve substantial noise level reductions. As such, vegetation is not a reasonable noise mitigation measure.

7.5. Exclusive Land Use Designations

Buffer zones are undeveloped, open spaces adjacent to a roadway corridor. Residential, commercial, and industrial uses are located along both sides of TH 61 from Scenic 61 to Park Road. The project is partially within a developed, urban area and, because of the large amount of land necessary to accommodate buffer zones, acquisition of land to create buffer zones is not feasible.

7.6. Noise Insulation of Non-Residential Building

Under MnDOT's noise requirements, only non-residential buildings such as schools, hospitals, and places of worship should be considered for acoustical insulation if there are no exterior areas of frequent human use associated with the property. These land uses fall under Federal Activity Category D. The Federal noise abatement criterion for interior locations under Activity Category D is 52 dBA (L_{eq}(h)) (see Table 2-2).

If there are impacts to exterior areas of frequent human uses at an Activity Category C receptor, and exterior noise abatement is not feasible or reasonable, then an interior noise analysis is completed if the receptor also falls under Activity Category D. Interior noise mitigation is proposed only if the modeled interior noise level exceeds the Activity Category D criterion of 52 dBA (L_{eq}(h)).

There are two places of worship and a school within the project limits. Of these, only receptor O32 (a place of worship) is expected to experience an impact under the noise abatement criterion for Activity Category C. A 20-foot-high noise wall (Barrier 12) was modelled in front of this receptor. This noise wall did not meet MnDOT's noise reduction design goal of 7 dBA and is therefore not proposed. Receptor O32 was subsequently evaluated for interior

noise under Activity Category D. Following guidance in the MnDOT *Interior Noise Analysis Flowchart for Category D Facilities* (2017), the MnDOT interior noise spreadsheet was used to estimate interior noise levels. It was assumed that the windows on the façade of the building facing TH 61 will not be open, and that the windows and wall on this façade are constructed of materials with the lowest available exterior wall noise ratings (EWNR). This yielded a composite EWNR of 24 and expected interior noise level of 42.3 dBA (L_{eq}(h)). This interior noise level does not approach or exceed the Activity Category D criterion of 52 dBA (L_{eq}(h)). Therefore, no interior noise mitigation is proposed, and no further noise analysis is required. The interior noise analysis is included in Appendix E.

8. Conclusion and Recommendations

8.1. Traffic Noise Analysis Results

Construction of the TH 61 corridor improvements project is anticipated to increase future traffic noise levels compared to existing conditions. Modeled L_{eq}(h) noise levels are predicted to range from 46.0 dBA to 71.9 dBA under the 2048 Build Alternative. In comparison to existing conditions, 2048 Build Alternative L_{eq}(h) noise levels are projected to change by -3.2 dBA to 2.1 dBA.

Modeled noise levels are predicted to approach, meet, or exceed FHWA NAC at 13 modeled receptor locations representing residential land uses (Activity Category B), 29 modeled receptor locations representing proposed trail uses and a place of worship (Activity Category C), and at one modeled receptor location representing restaurant/bar use (Activity Category E). No modeled receptor locations are predicted to experience a substantial increase in traffic noise levels (i.e., increase of 5 dBA or greater) from existing conditions to the 2048 Build Alternative.

CONSIDERATION OF NOISE ABATEMENT MEASURES

Fourteen (14) noise barriers representing locations where traffic noise levels are predicted to approach, meet, or exceed the FHWA NAC under the 2048 Build Alternative were evaluated adjacent to TH 61. 11 modeled noise walls failed to meet both MnDOT's noise reduction design goal and cost-effectiveness criteria and were therefore deemed unreasonable. These noise barriers did not meet both MnDOT's criteria of achieving a noise reduction design goal of at least 7 dBA at one benefited receptor behind each noise wall, or did not meet MnDOT's cost-effectiveness criteria of $78,500 per benefited receptor. Three of the modeled noise walls did meet the noise reduction design goal and cost-effectiveness criteria which include Wall 3, Wall 13a, and Wall 14. The proposed noise walls can be seen in Appendix A.

9. Statement of Likelihood

Based on the studies thus far accomplished, MnDOT intends to install highway traffic noise abatement measures in the form of a barrier at Wall 3, Wall 13a, and Wall 14. These preliminary indications of likely abatement measures are based upon preliminary design for a barrier cost as described below:

Wall 3:
Wall 3 is anticipated to cost approximately $70,431 and provides a noise reduction of approximately 11.5 dB(A) for one residence.

Wall 13a:
Wall 13a is anticipated to cost approximately $71,700 and provides a noise reduction of approximately 11.5 dB(A) for a portion of a trail.

Wall 14:
Wall 14 is anticipated to cost approximately $1,162,368 and provides a noise reduction ranging from approximately 1.0 dB(A) to 17.4 dB(A) for the campground, which includes 7 trail receptors and 40 camp sites and campground facilities that are benefitted by the proposed wall.

If it subsequently develops during final design that these conditions have substantially changed, the abatement measures might not be provided. A final decision regarding installation of the abatement measure(s) will be made upon completion of the project's final design and the public involvement processes.

The viewpoints of the impacted residents and property owners are a major consideration in determining the reasonableness of highway traffic noise abatement measures for proposed highway construction projects. These viewpoints will be determined and addressed during the environmental phase of project development.

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Appendix A -

Receptors and Modeled Noise Wall Locations

Figure A-1: Receptors and Modeled Noise Wall Locations

SP 3804-62
TH 61 Corridor Improvements
Two Harbors, MN

- Noise Study Area (500' Buffer)
- Does Not Meet Design Goal
- Not Reasonably Cost Effective
- Proposed
- Receptor Benefited (Assumes Minimum Wall Height Discussed in Noise Barrier Analysis Results)
- Receptor Not Impacted
- Receptor Impacted
- Field Site
- Design Geometry

0 125 250 500 US Feet

DEPARTMENT OF TRANSPORTATION

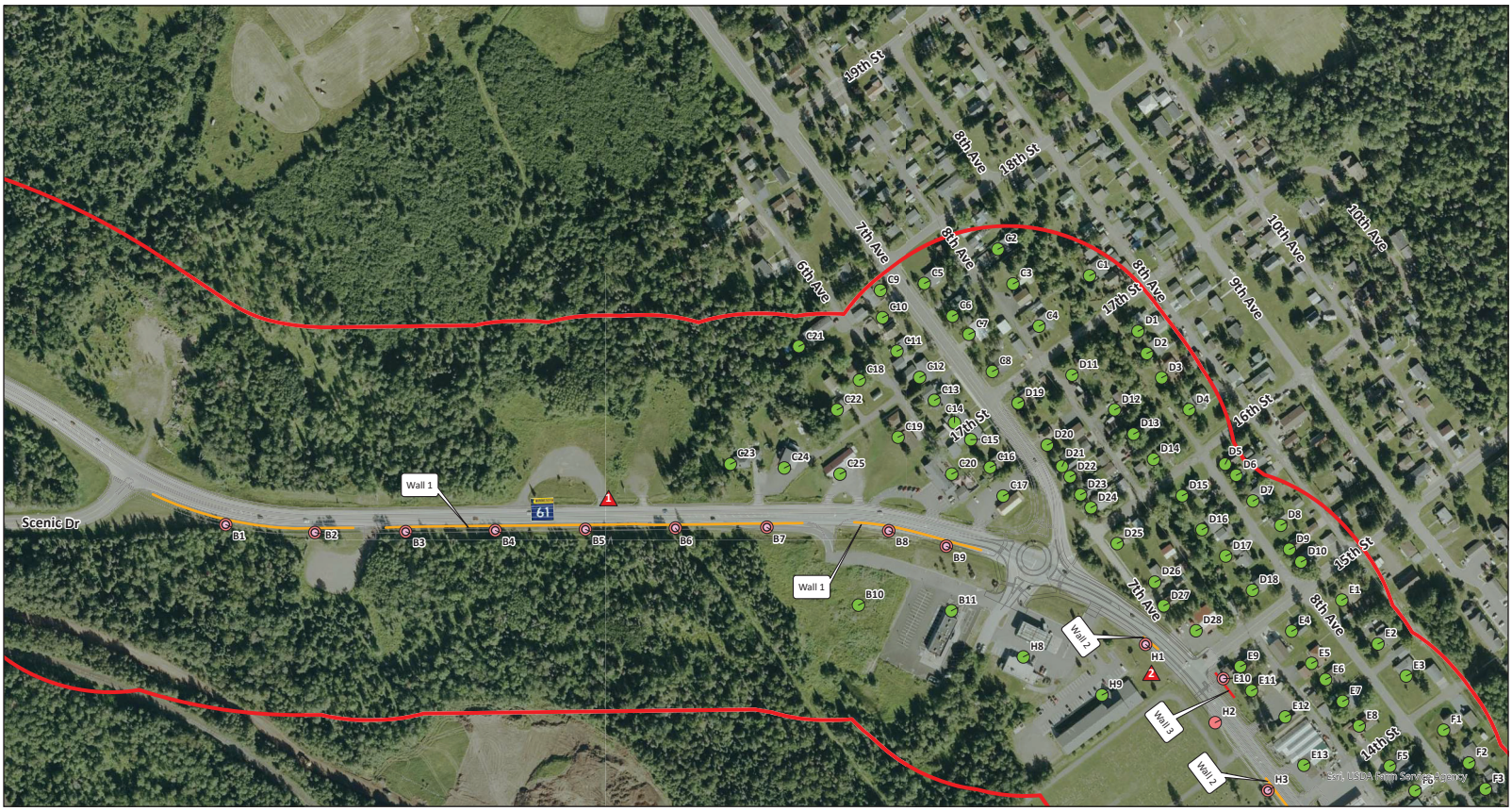


Figure A-1: Receptors and Modeled Noise Wall Locations

SP 3804-62
TH 61 Corridor Improvements
Two Harbors, MN

- Noise Study Area (500' Buffer)
- Does Not Meet Design Goal
- Not Reasonably Cost Effective
- Proposed
- Receptor Benefited (Assumes Minimum Wall Height Discussed in Noise Barrier Analysis Results)
- Receptor Not Impacted
- Receptor Impacted
- Field Site
- Design Geometry

0 125 250 500 US Feet

DEPARTMENT OF TRANSPORTATION

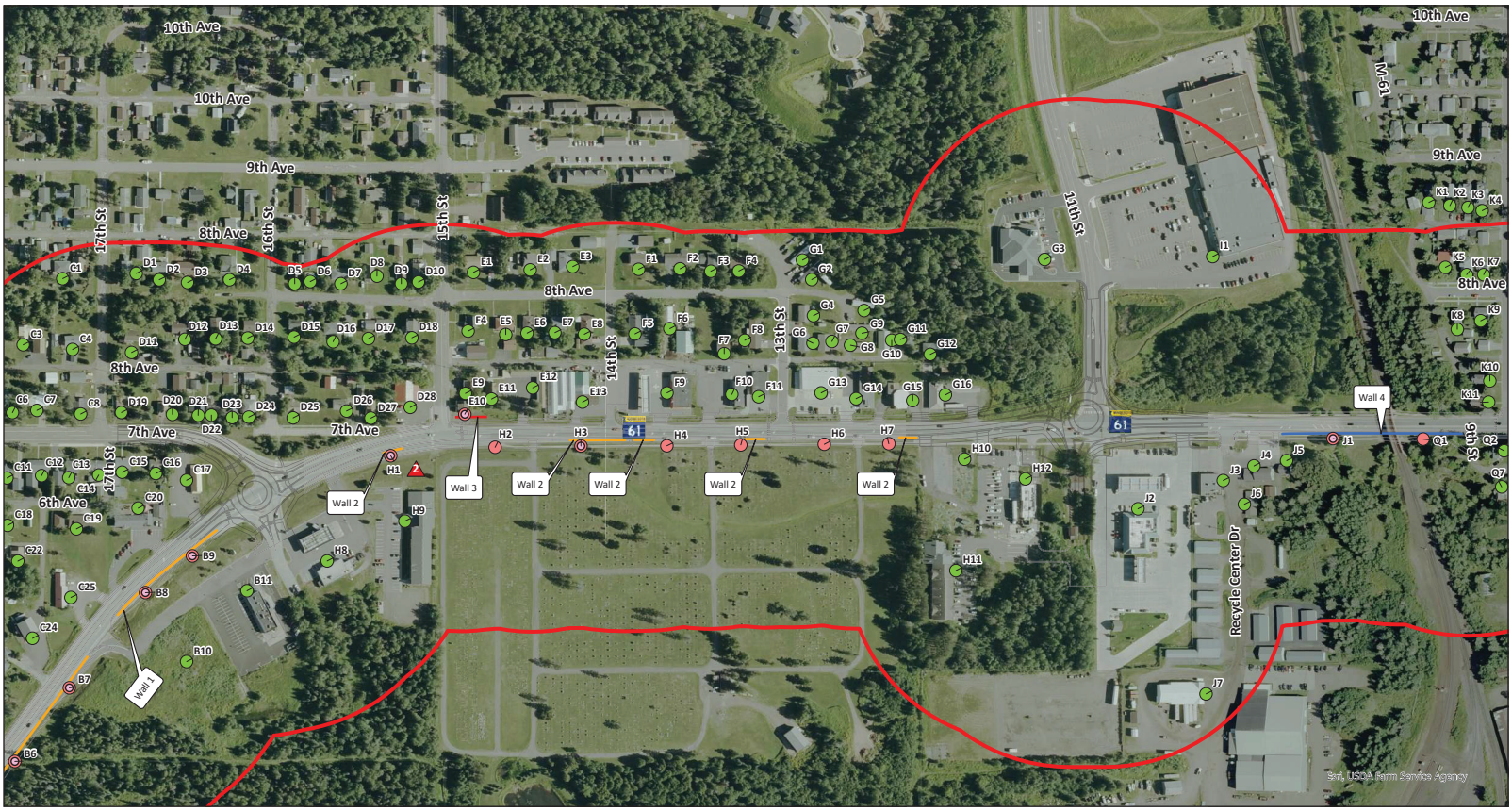


Figure A-1: Receptors and Modeled Noise Wall Locations

SP 3804-62
TH 61 Corridor Improvements
Two Harbors, MN

- Noise Study Area (500' Buffer)
- Does Not Meet Design Goal
- Not Reasonably Cost Effective
- Proposed
- Receptor Benefited (Assumes Minimum Wall Height Discussed in Noise Barrier Analysis Results)
- Receptor Not Impacted
- Receptor Impacted
- Field Site
- Design Geometry

DEPARTMENT OF TRANSPORTATION

0 125 250 500 US Feet

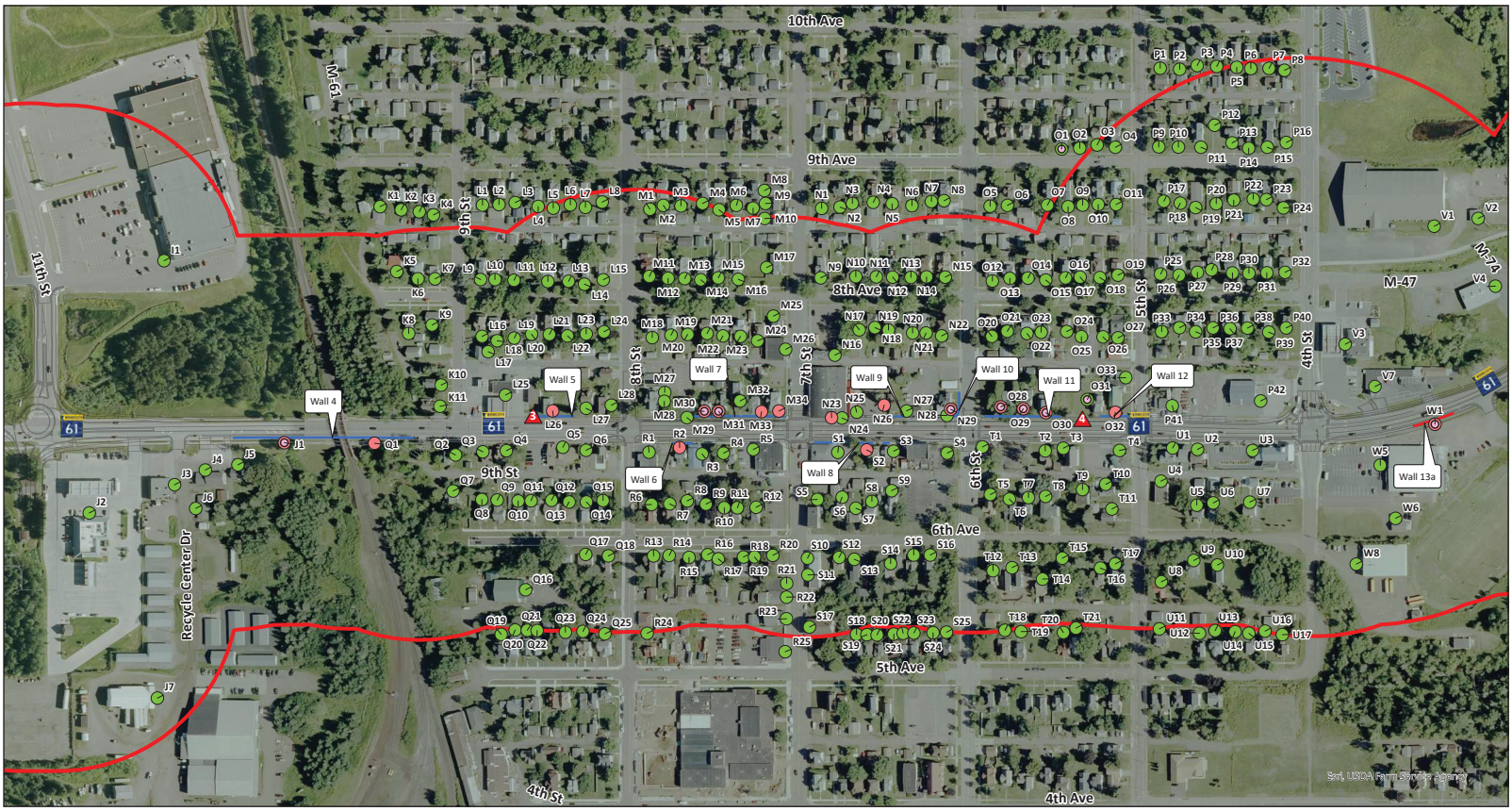


Figure A-1: Receptors and Modeled Noise Wall Locations

SP 3804-62
TH 61 Corridor Improvements
Two Harbors, MN

- Noise Study Area (500' Buffer)
- Does Not Meet Design Goal
- Not Reasonably Cost Effective
- Proposed
- Receptor Benefited (Assumes Minimum Wall Height Discussed in Noise Barrier Analysis Results)
- Receptor Not Impacted
- Receptor Impacted
- Field Site
- Design Geometry

DEPARTMENT OF TRANSPORTATION

0 125 250 500 US Feet

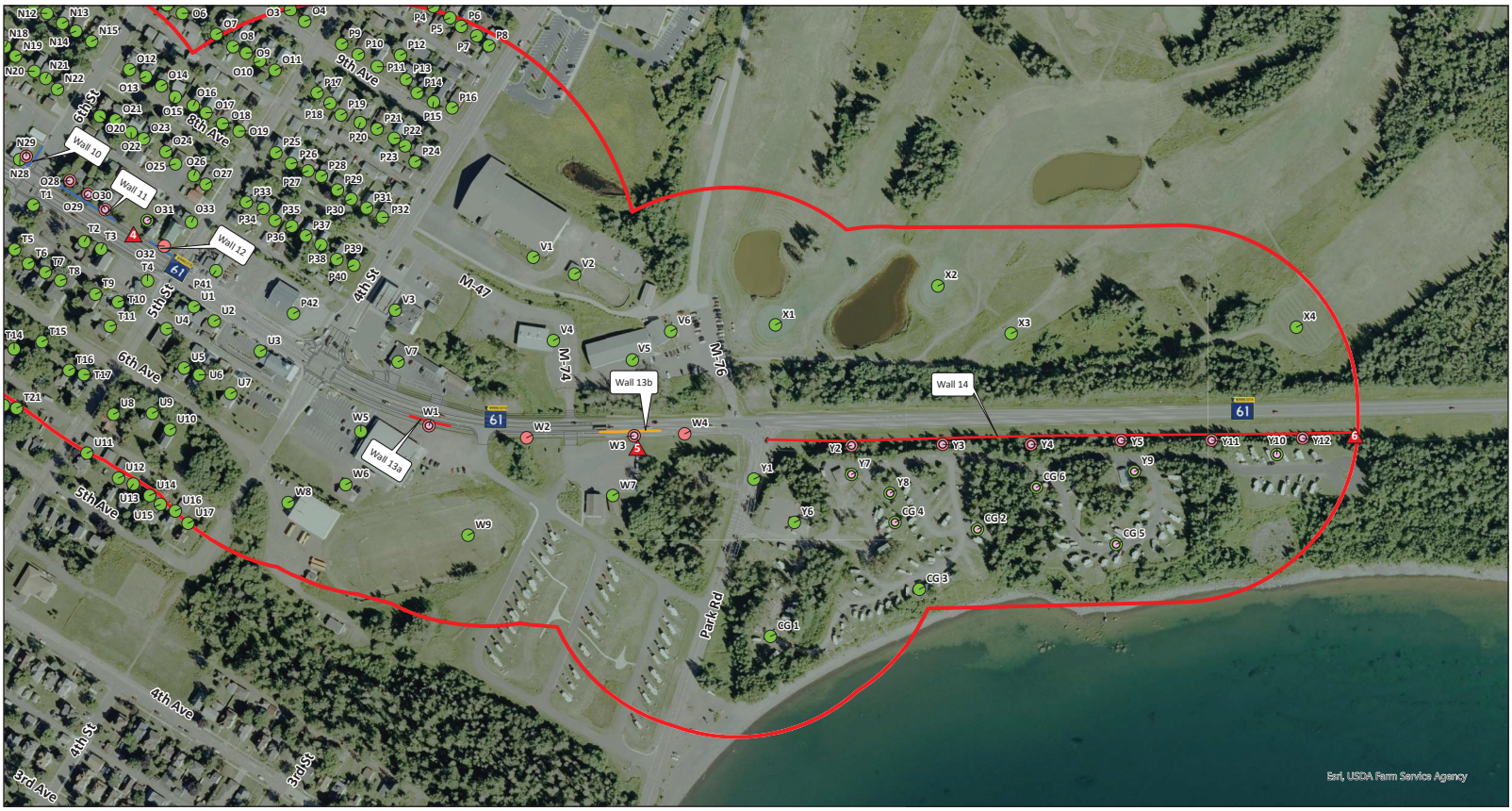


Figure A-1: Receptors and Modeled Noise Wall Locations

SP 3804-62
TH 61 Corridor Improvements
Two Harbors, MN

- Noise Study Area (500' Buffer)
- Does Not Meet Design Goal
- Not Reasonably Cost Effective
- Proposed
- Receptor Benefited (Assumes Minimum Wall Height Discussed in Noise Barrier Analysis Results)
- Receptor Not Impacted
- Receptor Impacted
- Field Site
- Design Geometry

0 125 250 500 US Feet

DEPARTMENT OF TRANSPORTATION

Appendix B -

Field Measurement Data Sheets

Field Measurement Data Sheet, Monitoring Site 1

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings

Time:	**Fast**	Slow
Weighting:	Lin.	**A**

Name:	KLJ Engineering
Date:	6/26/2024
Project Name:	TH 61 Corridor Improvements
Project Number:	SP 3804-62

Sound Level Meter (SLM)

Manufacturer	3M
Model	SoundPro DL
Serial No.	BKK080011
Microphone	B&K 4936 ½ In. Electret

Calibrator

Manufacturer	Quest
Model	QC-20 Calibrator
Serial No.	QOK09004

Calibration

Initial Calibration	114.0 dB	Time	8:51 AM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 1, West of town to the west of TH 61

Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 61

MONITOR RESULTS (dBA)		
Test Number	1	2
L10		
L50		
L90		
Leq	69.4	

TRAFFIC				
Direction	EB	WB	NB	SB
Autos	170	158		
Medium Trucks	9	9		
Heavy Trucks	7	17		
Buses	0	1		
Motorcycles	0	0		
Total	186	185		
Speed Limit	45 mph	45 mph		

MEASUREMENT INFORMATION		
Test Number	1	2
Date	6/26/2024	
Start Time	9:10 AM	
End Time	9:40 AM	
Weather	Cloudy	
Temp (°F)	55° F	
Rel. Humidity (%)		
Wind (mph)	9 mph	
Wind direction	NE	
Road conditions	Dry	

(See other page for plan view and cross section images)

Field Measurement Data Sheet, Monitoring Site 1 (continued)

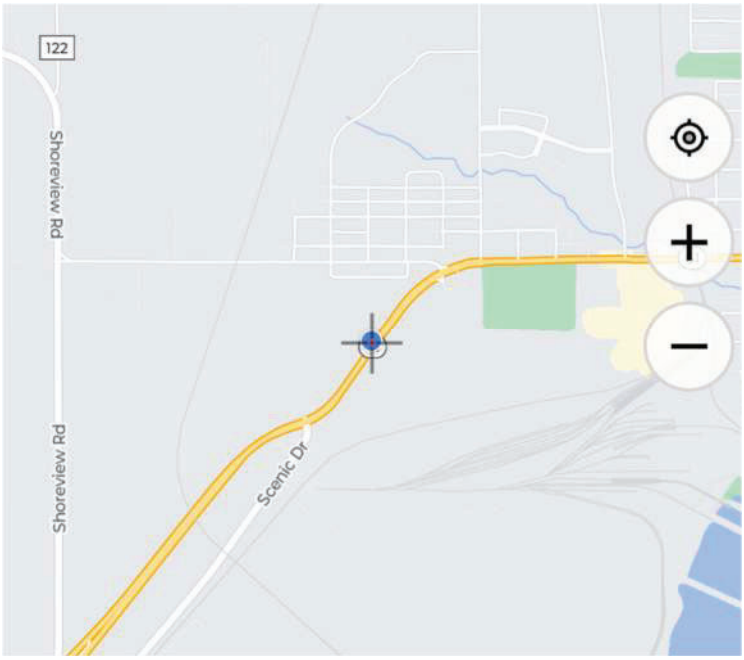
Plan view and cross section images

(include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks, and approximate distances)

GPS Coordinates: X: 47.022776 Y: -91.693948

Comments:

PLAN VIEW



CROSS SECTION

Field Measurement Data Sheet, Monitoring Site 2

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings

Time:	**Fast**	Slow
Weighting:	Lin.	**A**

Name:	KLJ Engineering
Date:	6/26/2024
Project Name:	TH 61 Corridor Improvements
Project Number:	SP 3804-62

Sound Level Meter (SLM)

Manufacturer	3M
Model	SoundPro DL
Serial No.	BKK080011
Microphone	B&K 4936 ½ In. Electret

Calibrator

Manufacturer	Quest
Model	QC-20 Calibrator
Serial No.	QOK09004

Calibration

Initial Calibration	114.0 dB	Time	8:51 AM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 2, AmericInn
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 61

MONITOR RESULTS (dBA)		
Test Number	1	2
L10		
L50		
L90		
Leq	65.3	

TRAFFIC				
Direction	EB	WB	NB	SB
Autos	185	248		
Medium Trucks	11	9		
Heavy Trucks	14	7		
Buses	1	3		
Motorcycles	2	2		
Total	213	269		
Speed Limit	35 mph	35 mph		

MEASUREMENT INFORMATION		
Test Number	1	2
Date	6/26/2024	
Start Time	10:10 AM	
End Time	10:40 AM	
Weather	Cloudy	
Temp (°F)	56° F	
Rel. Humidity (%)		
Wind (mph)	9 mph	
Wind direction	NE	
Road conditions	Dry	

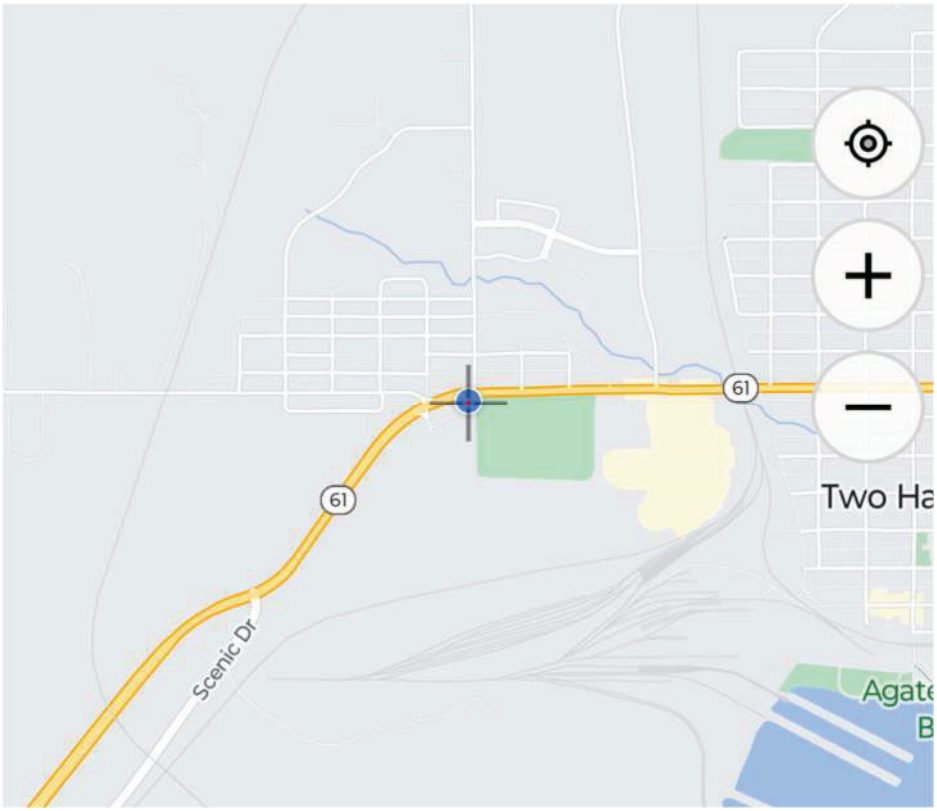
(See other page for plan view and cross section images)

Field Measurement Data Sheet, Monitoring Site 2 (continued)

Plan view and cross section images
(include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks, and approximate distances)

GPS Coordinates: X: 47.025283 Y: -91.688724
Comments:

PLAN VIEW



CROSS SECTION

Page 2 of 2

Field Measurement Data Sheet, Monitoring Site 3

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings

Time:	**Fast**	Slow
Weighting:	Lin.	**A**

Name:	KLJ Engineering
Date:	6/26/2024
Project Name:	TH 61 Corridor Improvements
Project Number:	SP 3804-62

Sound Level Meter (SLM)

Manufacturer	3M
Model	SoundPro DL
Serial No.	BKK080011
Microphone	B&K 4936 ½ In. Electret

Calibrator

Manufacturer	Quest
Model	QC-20 Calibrator
Serial No.	QOK09004

Calibration

Initial Calibration	114.0 dB	Time	8:51 AM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 3, Abandoned MinitMart Car Wash
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 61

MONITOR RESULTS (dBA)		
Test Number	1	2
L10		
L50		
L90		
Leq	69.5	

TRAFFIC				
Direction	EB	WB	NB	SB
Autos	270	283		
Medium Trucks	10	20		
Heavy Trucks	4	3		
Buses	1	1		
Motorcycles	3	3		
Total	288	310		
Speed Limit	30 mph	30 mph		

MEASUREMENT INFORMATION		
Test Number	1	2
Date	6/26/2024	
Start Time	11:07 AM	
End Time	11:37 AM	
Weather	Cloudy	
Temp (°F)	57° F	
Rel. Humidity (%)		
Wind (mph)	3 mph	
Wind direction	NE	
Road conditions	Dry	

(See other page for plan view and cross section images)

Field Measurement Data Sheet, Monitoring Site 3 (continued)

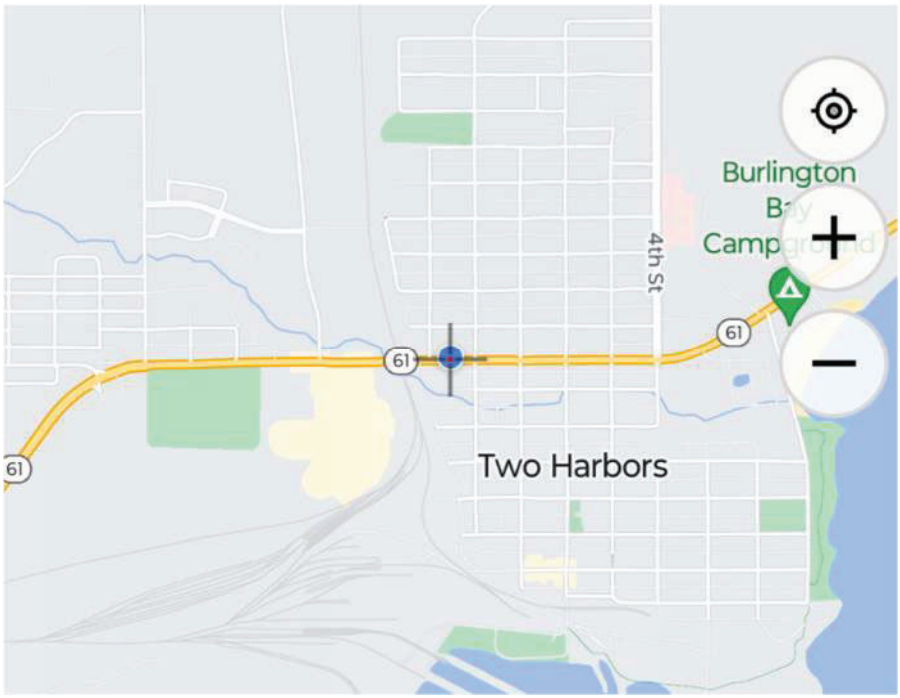
Plan view and cross section images

(include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks, and approximate distances)

GPS Coordinates: X: 47.025741 Y: -91.675830

Comments:

PLAN VIEW



CROSS SECTION

Page 2 of 2

Field Measurement Data Sheet, Monitoring Site 4

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings

Time:	**Fast**	Slow
Weighting:	Lin.	**A**

Name:	KLJ Engineering
Date:	6/26/2024
Project Name:	TH 61 Corridor Improvements
Project Number:	SP 3804-62

Sound Level Meter (SLM)

Manufacturer	3M
Model	SoundPro DL
Serial No.	BKK080011
Microphone	B&K 4936 ½ In. Electret

Calibrator

Manufacturer	Quest
Model	QC-20 Calibrator
Serial No.	QOK09004

Calibration

Initial Calibration	114.0 dB	Time	8:51 AM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 4, West of Living Waters Fellowship
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 61

MONITOR RESULTS (dBA)		
Test Number	1	2
L10		
L50		
L90		
Leq	68.0	

TRAFFIC				
Direction	EB	WB	NB	SB
Autos	223	229		
Medium Trucks	10	25		
Heavy Trucks	1	0		
Buses	1	3		
Motorcycles	4	3		
Total	239	260		
Speed Limit	30 mph	30 mph		

MEASUREMENT INFORMATION		
Test Number	1	2
Date	6/26/2024	
Start Time	11:53 AM	
End Time	12:23 PM	
Weather	Cloudy	
Temp (°F)	61° F	
Rel. Humidity (%)		
Wind (mph)	3 mph	
Wind direction	SE	
Road conditions	Dry	

(See other page for plan view and cross section images)

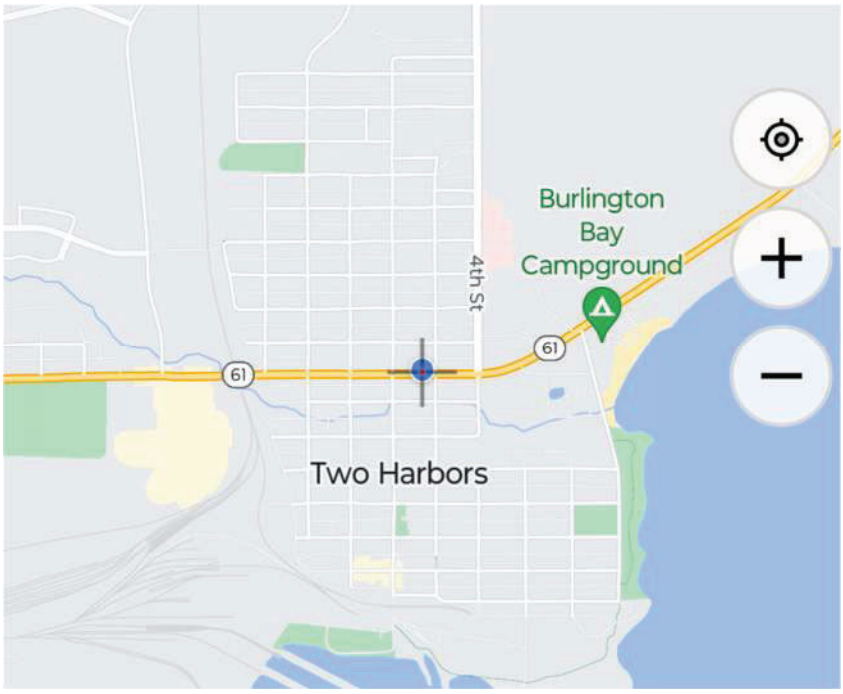
Field Measurement Data Sheet, Monitoring Site 4 (continued)

Plan view and cross section images

(include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks, and approximate distances)

GPS Coordinates: X: 47.025788 Y: -91.669721
Comments:

PLAN VIEW



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Page 2 of 2

Field Measurement Data Sheet, Monitoring Site 5

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings

Time:	**Fast**	Slow
Weighting:	Lin.	**A**

Name:	KLJ Engineering
Date:	6/26/2024
Project Name:	TH 61 Corridor Improvements
Project Number:	SP 3804-62

Sound Level Meter (SLM)

Manufacturer	3M
Model	SoundPro DL
Serial No.	BKK080011
Microphone	B&K 4936 ½ In. Electret

Calibrator

Manufacturer	Quest
Model	QC-20 Calibrator
Serial No.	QOK09004

Calibration

Initial Calibration	114.0 dB	Time	8:51 AM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 5, R.J. Houle Visitor Center Parking Lot
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 61

MONITOR RESULTS (dBA)		
Test Number	1	2
L10		
L50		
L90		
Leq	64.7	

TRAFFIC				
Direction	EB	WB	NB	SB
Autos	198	211		
Medium Trucks	5	10		
Heavy Trucks	1	5		
Buses	0	0		
Motorcycles	1	2		
Total	205	228		
Speed Limit	30 mph	30 mph		

MEASUREMENT INFORMATION		
Test Number	1	2
Date	6/26/2024	
Start Time	12:40 PM	
End Time	1:10 PM	
Weather	Cloudy	
Temp (°F)	61° F	
Rel. Humidity (%)		
Wind (mph)	3 mph	
Wind direction	E	
Road conditions	Dry	

(See other page for plan view and cross section images)

Field Measurement Data Sheet, Monitoring Site 5 (continued)

Plan view and cross section images
(include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks, and approximate distances)

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Comments:

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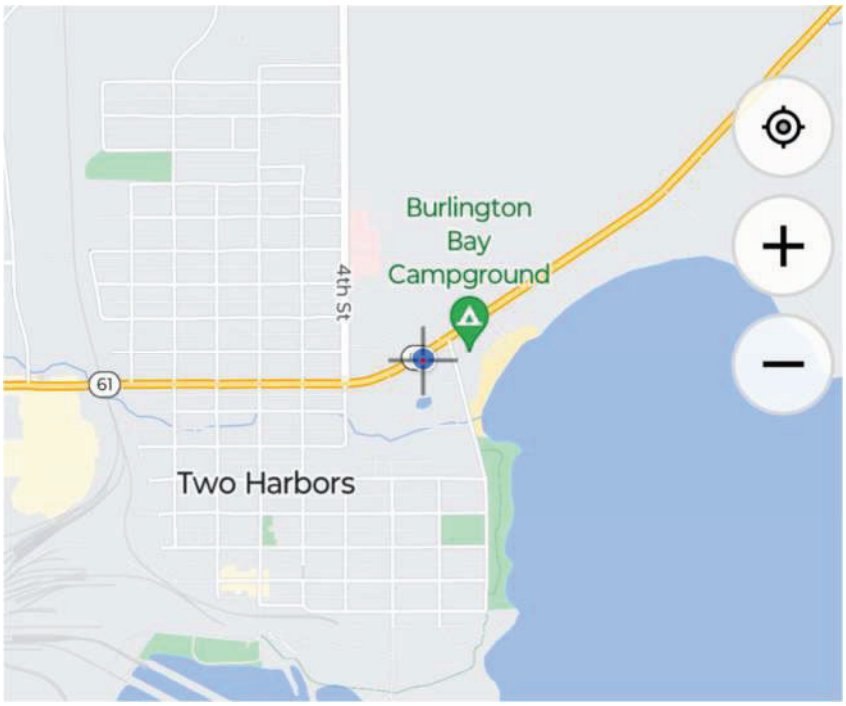


CROSS SECTION

Page 2 of 2

Field Measurement Data Sheet, Monitoring Site 6

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings

Time:	**Fast**	Slow
Weighting:	Lin.	**A**

Name:	KLJ Engineering
Date:	6/26/2024
Project Name:	TH 61 Corridor Improvements
Project Number:	SP 3804-62

Sound Level Meter (SLM)

Manufacturer	3M
Model	SoundPro DL
Serial No.	BKK080011
Microphone	B&K 4936 ½ In. Electret

Calibrator

Manufacturer	Quest
Model	QC-20 Calibrator
Serial No.	QOK09004

Calibration

Initial Calibration	114.0 dB	Time	8:51 AM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 5, Burlington Bay Campground RV Park
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 61

MONITOR RESULTS (dBA)		
Test Number	1	2
L10		
L50		
L90		
Leq	64.1	

TRAFFIC				
Direction	EB	WB	NB	SB
Autos	162	170		
Medium Trucks	6	7		
Heavy Trucks	3	2		
Buses	0	0		
Motorcycles	1	2		
Total	172	181		
Speed Limit	55 mph	55 mph		

MEASUREMENT INFORMATION		
Test Number	1	2
Date	6/26/2024	
Start Time	1:33 PM	
End Time	2:03 PM	
Weather	Partly Cloudy	
Temp (°F)	63° F	
Rel. Humidity (%)		
Wind (mph)	3 mph	
Wind direction	ESE	
Road conditions	Dry	

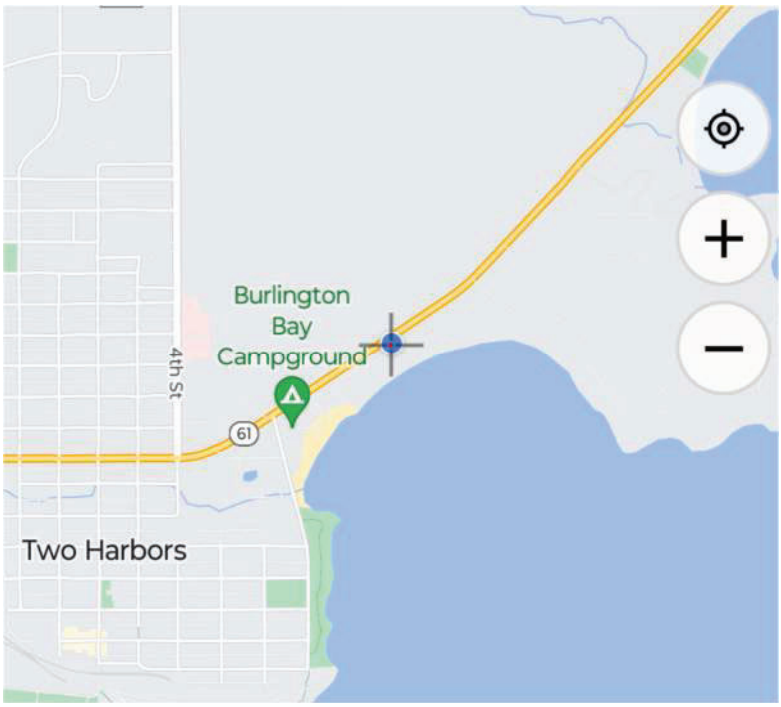
(See other page for plan view and cross section images)

Field Measurement Data Sheet, Monitoring Site 6 (continued)

Plan view and cross section images
(include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks, and approximate distances)

GPS Coordinates: X: 47.029425 Y: -91.657013
Comments:

PLAN VIEW



CROSS SECTION

Page 2 of 2

Appendix C -

Traffic Noise Model Results

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
A1	1	B	67.0	51.9	52.5	+0.6 dBA	50.6	-1.3 dBA
A2	1	C	67.0	55.8	56.5	+0.7 dBA	56.7	+0.9 dBA
A3	1	B	67.0	58.4	58.9	+0.5 dBA	58.9	+0.5 dBA
A4	1	B	67.0	57.8	58.3	+0.5 dBA	58.4	+0.6 dBA
A5	1	B	67.0	58.9	59.5	+0.6 dBA	58.9	--
B1	1	C	67.0	--	--	--	**69.5**	--
B2	1	C	67.0	--	--	--	**70.2**	--
B3	1	C	67.0	--	--	--	**70.0**	--
B4	1	C	67.0	--	--	--	**70.1**	--
B5	1	C	67.0	--	--	--	**69.7**	--
B6	1	C	67.0	--	--	--	**67.9**	--
B7	1	C	67.0	--	--	--	**67.5**	--
B8	1	C	67.0	--	--	--	**67.8**	--
B9	1	C	67.0	--	--	--	**67.3**	--
B10	1	G	--	56.0	56.4	+0.4 dBA	54.4	-1.6 dBA
B11	1	E	72.0	58.4	58.8	+0.4 dBA	55.8	-2.6 dBA
C1	1	B	67.0	48.3	48.6	+0.3 dBA	46.9	-1.4 dBA
C2	1	B	67.0	47.4	47.8	+0.4 dBA	46.0	-1.4 dBA
C3	1	B	67.0	48.4	48.8	+0.4 dBA	46.9	-1.5 dBA
C4	1	B	67.0	50.6	50.9	+0.3 dBA	49.4	-1.2 dBA
C5	1	B	67.0	55.3	55.6	+0.3 dBA	55.0	-0.3 dBA
C6	1	B	67.0	54.8	55.1	+0.3 dBA	54.4	-0.4 dBA
C7	1	B	67.0	54.6	54.9	+0.3 dBA	54.1	-0.5 dBA
C8	1	B	67.0	56.7	57.1	+0.4 dBA	56.2	-0.5 dBA
C9	1	B	67.0	54.0	54.4	+0.4 dBA	53.8	-0.2 dBA
C10	1	B	67.0	52.2	52.6	+0.4 dBA	51.7	-0.5 dBA
C11	1	B	67.0	52.8	53.1	+0.3 dBA	52.0	-0.8 dBA
C12	1	B	67.0	54.1	54.5	+0.4 dBA	53.2	-0.9 dBA
C13	1	B	67.0	54.5	54.9	+0.4 dBA	53.3	-1.2 dBA
C14	1	B	67.0	55.8	56.2	+0.4 dBA	54.4	-1.4 dBA
C15	1	B	67.0	56.8	57.2	+0.4 dBA	55.3	-1.5 dBA
C16	1	B	67.0	58.3	58.7	+0.4 dBA	56.8	-1.5 dBA
C17	1	F	--	60.6	61.0	+0.4 dBA	59.1	-1.5 dBA
C18	1	B	67.0	52.6	53.0	+0.4 dBA	51.7	-0.9 dBA
C19	1	B	67.0	56.1	56.5	+0.4 dBA	55.3	-0.8 dBA
C20	1	C	67.0	58.8	59.3	+0.5 dBA	57.7	-1.1 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020 Existing Condition	2045 No Build Conditions	Δ Existing, No Build	2045 Build Conditions	Δ Existing, Build
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
C21	1	B	67.0	50.9	51.3	+0.4 dBA	50.3	-0.6 dBA
C22	1	B	67.0	54.5	55.0	+0.5 dBA	54.0	-0.5 dBA
C23	1	B	67.0	58.6	59.0	+0.4 dBA	58.3	-0.3 dBA
C24	1	F	--	59.9	60.4	+0.5 dBA	59.9	--
C25	1	F	--	60.4	60.8	+0.4 dBA	60.4	--
CG1	4	C	67.0	50.2	50.8	+0.6 dBA	50.7	+0.5 dBA
CG2	4	C	67.0	56.1	57.1	+1.0 dBA	56.6	+0.5 dBA
CG3	6	C	67.0	50.9	51.9	+1.0 dBA	51.6	+0.7 dBA
CG4	4	C	67.0	55.0	55.9	+0.9 dBA	55.8	+0.8 dBA
CG5	12	C	67.0	53.0	53.8	+0.8 dBA	53.6	+0.6 dBA
CG6	8	C	67.0	58.2	58.9	+0.7 dBA	58.8	+0.6 dBA
D1	1	B	67.0	49.7	50.0	+0.3 dBA	48.1	-1.6 dBA
D2	1	B	67.0	49.9	50.3	+0.4 dBA	47.9	-2.0 dBA
D3	1	B	67.0	50.3	50.7	+0.4 dBA	48.4	-1.9 dBA
D4	1	B	67.0	51.0	51.4	+0.4 dBA	49.4	-1.6 dBA
D5	1	B	67.0	55.7	55.9	+0.2 dBA	55.0	-0.7 dBA
D6	1	B	67.0	55.0	55.2	+0.2 dBA	54.1	-0.9 dBA
D7	1	B	67.0	55.5	55.8	+0.3 dBA	54.8	-0.7 dBA
D8	1	B	67.0	54.2	54.6	+0.4 dBA	53.3	-0.9 dBA
D9	1	B	67.0	56.0	56.4	+0.4 dBA	55.5	-0.5 dBA
D10	1	B	67.0	56.4	57.1	+0.7 dBA	56.4	--
D11	1	B	67.0	52.2	52.5	+0.3 dBA	50.8	-1.4 dBA
D12	1	B	67.0	51.9	52.2	+0.3 dBA	49.9	-2.0 dBA
D13	1	B	67.0	52.3	52.6	+0.3 dBA	49.5	-2.8 dBA
D14	1	B	67.0	53.8	54.1	+0.3 dBA	51.9	-1.9 dBA
D15	1	B	67.0	55.2	55.6	+0.4 dBA	53.6	-1.6 dBA
D16	1	B	67.0	53.9	54.3	+0.4 dBA	52.1	-1.8 dBA
D17	1	B	67.0	55.0	55.5	+0.5 dBA	53.5	-1.5 dBA
D18	1	B	67.0	56.7	57.4	+0.7 dBA	55.8	-0.9 dBA
D19	1	B	67.0	57.2	57.5	+0.3 dBA	56.6	-0.6 dBA
D20	1	B	67.0	58.4	58.8	+0.4 dBA	56.5	-1.9 dBA
D21	1	B	67.0	58.8	59.2	+0.4 dBA	56.1	-2.7 dBA
D22	1	B	67.0	58.6	59.0	+0.4 dBA	55.6	-3.0 dBA
D23	1	B	67.0	59.0	59.4	+0.4 dBA	55.8	-3.2 dBA
D24	1	B	67.0	59.5	59.9	+0.4 dBA	56.6	-2.9 dBA
D25	1	B	67.0	60.3	60.7	+0.4 dBA	58.0	-2.3 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020 Existing Condition	2045 No Build Conditions	Δ Existing, No Build	2045 Build Conditions	Δ Existing, Build
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
D26	1	B	67.0	60.6	61.1	+0.5 dBA	60.1	-0.5 dBA
D27	1	B	67.0	63.0	63.5	+0.5 dBA	63.7	+0.7 dBA
D28	1	F	--	62.4	63.0	+0.6 dBA	62.7	+0.3 dBA
E1	1	B	67.0	54.4	55.1	+0.7 dBA	53.8	-0.6 dBA
E2	1	B	67.0	53.1	53.5	+0.4 dBA	51.9	-1.2 dBA
E3	1	B	67.0	52.6	53.0	+0.4 dBA	51.6	-1.0 dBA
E4	1	B	67.0	57.2	58.0	+0.8 dBA	56.6	-0.6 dBA
E5	1	B	67.0	56.8	57.3	+0.5 dBA	55.6	-1.2 dBA
E6	1	B	67.0	56.6	57.1	+0.5 dBA	55.3	-1.3 dBA
E7	1	B	67.0	56.4	56.9	+0.5 dBA	55.0	-1.4 dBA
E8	1	B	67.0	56.5	57.0	+0.5 dBA	55.3	-1.2 dBA
E9	1	B	67.0	62.1	62.8	+0.7 dBA	61.3	-0.8 dBA
E10	1	B	67.0	**67.8**	**68.4**	+0.6 dBA	**67.7**	-0.1 dBA
E11	1	B	67.0	63.3	63.8	+0.5 dBA	62.5	-0.8 dBA
E12	1	E	72.0	61.4	61.8	+0.4 dBA	60.5	-0.9 dBA
E13	1	F	--	64.1	64.6	+0.5 dBA	64.0	-0.1 dBA
F1	1	B	67.0	53.0	53.4	+0.4 dBA	52.0	-1.0 dBA
F2	1	B	67.0	53.1	53.5	+0.4 dBA	52.1	-1.0 dBA
F3	1	B	67.0	53.7	54.1	+0.4 dBA	52.7	-1.0 dBA
F4	1	B	67.0	53.9	54.3	+0.4 dBA	53.0	-0.9 dBA
F5	1	B	67.0	56.8	57.2	+0.4 dBA	55.9	-0.9 dBA
F6	1	B	67.0	56.0	56.5	+0.5 dBA	55.0	-1.0 dBA
F7	1	B	67.0	57.6	58.1	+0.5 dBA	57.1	-0.5 dBA
F8	1	B	67.0	56.8	57.3	+0.5 dBA	56.2	-0.6 dBA
F9	1	F	--	62.0	62.4	+0.4 dBA	61.8	-0.2 dBA
F10	1	E	72.0	62.3	62.7	+0.4 dBA	62.2	-0.1 dBA
F11	1	F	--	62.9	63.4	+0.5 dBA	62.9	--
G1	1	B	67.0	53.2	53.7	+0.5 dBA	52.3	-0.9 dBA
G2	1	B	67.0	53.8	54.3	+0.5 dBA	52.9	-0.9 dBA
G3	1	E	72.0	59.1	60.0	+0.9 dBA	59.2	+0.1 dBA
G4	1	B	67.0	55.7	56.2	+0.5 dBA	54.8	-0.9 dBA
G5	1	B	67.0	55.2	55.7	+0.5 dBA	54.4	-0.8 dBA
G6	1	B	67.0	57.2	57.7	+0.5 dBA	56.5	-0.7 dBA
G7	1	B	67.0	56.9	57.3	+0.4 dBA	56.4	-0.5 dBA
G8	1	B	67.0	57.2	57.6	+0.4 dBA	56.7	-0.5 dBA
G9	1	B	67.0	56.5	57.0	+0.5 dBA	55.8	-0.7 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
G10	1	B	67.0	57.1	57.6	+0.5 dBA	56.4	-0.7 dBA
G11	1	B	67.0	57.1	57.6	+0.5 dBA	56.5	-0.6 dBA
G12	1	B	67.0	58.5	59.0	+0.5 dBA	58.2	-0.3 dBA
G13	1	F	--	62.2	62.7	+0.5 dBA	62.1	-0.1 dBA
G14	1	E	72.0	63.8	64.3	+0.5 dBA	63.8	--
G15	1	F	--	64.9	65.4	+0.5 dBA	65.0	+0.1 dBA
G16	1	F	--	63.7	64.2	+0.5 dBA	64.2	+0.5 dBA
H1	1	C	67.0	--	--	--	**68.5**	--
H2	1	C	67.0	--	--	--	**68.7**	--
H3	1	C	67.0	--	--	--	**68.9**	--
H4	1	C	67.0	--	--	--	**68.7**	--
H5	1	C	67.0	--	--	--	**68.7**	--
H6	1	C	67.0	--	--	--	**68.5**	--
H7	1	C	67.0	--	--	--	**68.5**	--
H8	1	F	--	57.9	58.4	+0.5 dBA	54.8	-3.1 dBA
H9	1	E	72.0	58.1	58.5	+0.4 dBA	56.1	-2.0 dBA
H10	1	C	67.0	64.6	65.2	+0.6 dBA	63.0	-1.6 dBA
H11	1	E	72.0	54.2	54.7	+0.5 dBA	52.7	-1.5 dBA
H12	1	E	72.0	61.5	62.0	+0.5 dBA	58.6	-2.9 dBA
I1	1	F	--	54.5	55.2	+0.7 dBA	53.7	-0.8 dBA
J1	1	C	67.0	--	--	--	**67.2**	--
J2	1	F	--	58.9	59.4	+0.5 dBA	56.6	-2.3 dBA
J3	1	E	72.0	59.4	59.9	+0.5 dBA	57.9	-1.5 dBA
J4	1	F	--	60.9	61.4	+0.5 dBA	59.6	-1.3 dBA
J5	1	B	67.0	61.5	62.0	+0.5 dBA	60.3	-1.2 dBA
J6	1	F	--	56.9	57.4	+0.5 dBA	55.9	-1.0 dBA
J7	1	F	--	48.7	49.2	+0.5 dBA	48.0	-0.7 dBA
K1	1	B	67.0	49.2	49.7	+0.5 dBA	48.9	-0.3 dBA
K2	1	B	67.0	49.1	49.6	+0.5 dBA	49.0	-0.1 dBA
K3	1	B	67.0	49.9	50.4	+0.5 dBA	49.8	-0.1 dBA
K4	1	B	67.0	50.8	51.3	+0.5 dBA	50.9	+0.1 dBA
K5	1	B	67.0	52.2	52.6	+0.4 dBA	52.2	--
K6	1	B	67.0	54.3	54.6	+0.3 dBA	54.4	+0.1 dBA
K7	1	B	67.0	55.0	55.3	+0.3 dBA	55.1	+0.1 dBA
K8	1	B	67.0	54.0	54.4	+0.4 dBA	54.4	+0.4 dBA
K9	1	B	67.0	54.7	55.2	+0.5 dBA	55.1	+0.4 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
K10	1	B	67.0	59.8	60.4	+0.6 dBA	59.7	-0.1 dBA
K11	1	B	67.0	63.8	64.3	+0.5 dBA	65.3	+1.5 dBA
L1	1	B	67.0	50.2	50.7	+0.5 dBA	50.4	+0.2 dBA
L2	1	B	67.0	49.1	49.6	+0.5 dBA	49.2	+0.1 dBA
L3	1	B	67.0	48.6	49.1	+0.5 dBA	48.8	+0.2 dBA
L4	1	B	67.0	49.0	49.5	+0.5 dBA	49.2	+0.2 dBA
L5	1	B	67.0	49.2	49.7	+0.5 dBA	49.4	+0.2 dBA
L6	1	B	67.0	49.4	49.8	+0.4 dBA	49.6	+0.2 dBA
L7	1	B	67.0	49.8	50.2	+0.4 dBA	50.0	+0.2 dBA
L8	1	B	67.0	50.4	50.9	+0.5 dBA	50.7	+0.3 dBA
L9	1	B	67.0	55.4	55.7	+0.3 dBA	55.5	+0.1 dBA
L10	1	B	67.0	54.8	55.1	+0.3 dBA	55.0	+0.2 dBA
L11	1	B	67.0	54.9	55.2	+0.3 dBA	55.1	+0.2 dBA
L12	1	B	67.0	55.2	55.4	+0.2 dBA	55.3	+0.1 dBA
L13	1	B	67.0	55.4	55.6	+0.2 dBA	55.6	+0.2 dBA
L14	1	B	67.0	56.3	56.5	+0.2 dBA	56.5	+0.2 dBA
L15	1	B	67.0	56.1	56.3	+0.2 dBA	56.2	+0.1 dBA
L16	1	B	67.0	55.3	55.8	+0.5 dBA	55.8	+0.5 dBA
L17	1	B	67.0	55.7	56.3	+0.6 dBA	56.2	+0.5 dBA
L18	1	B	67.0	54.7	55.2	+0.5 dBA	55.2	+0.5 dBA
L19	1	B	67.0	54.5	55.1	+0.6 dBA	55.0	+0.5 dBA
L20	1	B	67.0	54.3	54.8	+0.5 dBA	54.8	+0.5 dBA
L21	1	B	67.0	54.4	54.9	+0.5 dBA	54.9	+0.5 dBA
L22	1	B	67.0	54.8	55.3	+0.5 dBA	55.3	+0.5 dBA
L23	1	B	67.0	55.2	55.6	+0.4 dBA	55.5	+0.3 dBA
L24	1	B	67.0	55.7	56.2	+0.5 dBA	56.2	+0.5 dBA
L25	1	F	--	60.6	61.3	+0.7 dBA	60.9	+0.3 dBA
L26	1	B	67.0	64.7	65.4	+0.7 dBA	**66.3**	+1.6 dBA
L27	1	B	67.0	64.1	64.7	+0.6 dBA	65.6	+1.5 dBA
L28	1	B	67.0	63.8	64.4	+0.6 dBA	65.0	+1.2 dBA
M1	1	B	67.0	52.1	52.5	+0.4 dBA	52.4	+0.3 dBA
M2	1	B	67.0	50.6	51.1	+0.5 dBA	50.9	+0.3 dBA
M3	1	B	67.0	49.9	50.5	+0.6 dBA	50.3	+0.4 dBA
M4	1	B	67.0	49.8	50.4	+0.6 dBA	50.2	+0.4 dBA
M5	1	B	67.0	50.0	50.5	+0.5 dBA	50.4	+0.4 dBA
M6	1	B	67.0	50.3	50.8	+0.5 dBA	50.7	+0.4 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
M7	1	B	67.0	51.0	51.5	+0.5 dBA	51.4	+0.4 dBA
M8	1	B	67.0	51.0	51.6	+0.6 dBA	51.5	+0.5 dBA
M9	1	B	67.0	51.5	52.1	+0.6 dBA	52.0	+0.5 dBA
M10	1	B	67.0	51.9	52.4	+0.5 dBA	52.4	+0.5 dBA
M11	1	B	67.0	55.6	55.9	+0.3 dBA	55.9	+0.3 dBA
M12	1	B	67.0	55.0	55.3	+0.3 dBA	55.3	+0.3 dBA
M13	1	B	67.0	54.8	55.1	+0.3 dBA	55.1	+0.3 dBA
M14	1	B	67.0	55.1	55.4	+0.3 dBA	55.4	+0.3 dBA
M15	1	B	67.0	54.8	55.1	+0.3 dBA	55.1	+0.3 dBA
M16	1	B	67.0	55.4	55.7	+0.3 dBA	55.7	+0.3 dBA
M17	1	B	67.0	54.6	55.0	+0.4 dBA	55.0	+0.4 dBA
M18	1	B	67.0	57.2	57.6	+0.4 dBA	57.5	+0.3 dBA
M19	1	B	67.0	55.8	56.4	+0.6 dBA	56.3	+0.5 dBA
M20	1	B	67.0	55.8	56.3	+0.5 dBA	56.3	+0.5 dBA
M21	1	B	67.0	55.7	56.3	+0.6 dBA	56.4	+0.7 dBA
M22	1	B	67.0	56.3	56.9	+0.6 dBA	56.9	+0.6 dBA
M23	1	B	67.0	56.7	57.2	+0.5 dBA	57.3	+0.6 dBA
M24	1	B	67.0	57.3	57.9	+0.6 dBA	57.9	+0.6 dBA
M25	1	B	67.0	56.5	56.9	+0.4 dBA	56.9	+0.4 dBA
M26	1	E	72.0	59.6	60.2	+0.6 dBA	60.3	+0.7 dBA
M27	1	B	67.0	59.5	60.1	+0.6 dBA	60.1	+0.6 dBA
M28	1	B	67.0	63.5	64.2	+0.7 dBA	64.8	+1.3 dBA
M29	1	F	--	69.3	69.9	+0.6 dBA	71.4	+2.1 dBA
M30	1	B	67.0	**67.1**	**67.8**	+0.7 dBA	**68.8**	+1.7 dBA
M31	1	B	67.0	**67.3**	**67.9**	+0.6 dBA	**68.9**	+1.6 dBA
M32	1	B	67.0	64.3	64.9	+0.6 dBA	65.6	+1.3 dBA
M33	1	B	67.0	**68.6**	**69.3**	+0.7 dBA	**70.0**	+1.4 dBA
M34	1	B	67.0	**69.1**	**69.7**	+0.6 dBA	**70.6**	+1.5 dBA
N1	1	B	67.0	53.2	53.8	+0.6 dBA	53.7	+0.5 dBA
N2	1	B	67.0	51.3	51.8	+0.5 dBA	51.8	+0.5 dBA
N3	1	B	67.0	50.7	51.2	+0.5 dBA	51.2	+0.5 dBA
N4	1	B	67.0	49.8	50.3	+0.5 dBA	50.4	+0.6 dBA
N5	1	B	67.0	49.8	50.3	+0.5 dBA	50.3	+0.5 dBA
N6	1	B	67.0	50.0	50.5	+0.5 dBA	50.6	+0.6 dBA
N7	1	B	67.0	50.5	51.0	+0.5 dBA	51.0	+0.5 dBA
N8	1	B	67.0	51.4	51.9	+0.5 dBA	51.9	+0.5 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
N9	1	B	67.0	57.0	57.4	+0.4 dBA	57.4	+0.4 dBA
N10	1	B	67.0	55.5	55.9	+0.4 dBA	55.9	+0.4 dBA
N11	1	B	67.0	55.3	55.7	+0.4 dBA	55.8	+0.5 dBA
N12	1	B	67.0	55.4	55.8	+0.4 dBA	55.9	+0.5 dBA
N13	1	B	67.0	55.5	55.9	+0.4 dBA	55.9	+0.4 dBA
N14	1	B	67.0	55.7	56.1	+0.4 dBA	56.1	+0.4 dBA
N15	1	B	67.0	56.4	56.8	+0.4 dBA	56.8	+0.4 dBA
N16	1	B	67.0	58.5	59.0	+0.5 dBA	59.2	+0.7 dBA
N17	1	B	67.0	56.2	56.8	+0.6 dBA	56.9	+0.7 dBA
N18	1	B	67.0	56.2	56.7	+0.5 dBA	56.8	+0.6 dBA
N19	1	B	67.0	56.5	57.0	+0.5 dBA	57.1	+0.6 dBA
N20	1	B	67.0	56.7	57.3	+0.6 dBA	57.3	+0.6 dBA
N21	1	B	67.0	56.6	57.2	+0.6 dBA	57.3	+0.7 dBA
N22	1	B	67.0	57.3	57.9	+0.6 dBA	58.0	+0.7 dBA
N23	1	E	72.0	70.4	**71.1**	+0.7 dBA	**71.6**	+1.2 dBA
N24	1	F	--	69.6	70.3	+0.7 dBA	71.3	+1.7 dBA
N25	1	E	72.0	67.1	67.8	+0.7 dBA	69.0	+1.9 dBA
N26	1	B	67.0	65.0	65.7	+0.7 dBA	**66.8**	+1.8 dBA
N27	1	E	72.0	67.0	67.7	+0.7 dBA	68.7	+1.7 dBA
N28	1	F	--	69.8	70.5	+0.7 dBA	71.9	+2.1 dBA
N29	1	B	67.0	**67.8**	**68.6**	+0.8 dBA	**69.5**	+1.7 dBA
O1	1	B	67.0	54.4	54.6	+0.2 dBA	54.6	+0.2 dBA
O2	1	B	67.0	54.3	54.5	+0.2 dBA	54.5	+0.2 dBA
O3	1	B	67.0	53.7	53.9	+0.2 dBA	53.9	+0.2 dBA
O4	1	B	67.0	55.1	55.2	+0.1 dBA	55.3	+0.2 dBA
O5	1	B	67.0	52.7	53.2	+0.5 dBA	53.2	+0.5 dBA
O6	1	B	67.0	51.1	51.5	+0.4 dBA	51.5	+0.4 dBA
O7	1	B	67.0	50.5	51.0	+0.5 dBA	51.0	+0.5 dBA
O8	1	B	67.0	50.6	51.0	+0.4 dBA	51.1	+0.5 dBA
O9	1	B	67.0	50.7	51.1	+0.4 dBA	51.2	+0.5 dBA
O10	1	B	67.0	50.9	51.4	+0.5 dBA	51.4	+0.5 dBA
O11	1	B	67.0	51.3	51.7	+0.4 dBA	52.0	+0.7 dBA
O12	1	B	67.0	56.8	57.1	+0.3 dBA	57.1	+0.3 dBA
O13	1	B	67.0	55.2	55.5	+0.3 dBA	55.6	+0.4 dBA
O14	1	B	67.0	54.8	55.1	+0.3 dBA	55.2	+0.4 dBA
O15	1	B	67.0	55.2	55.5	+0.3 dBA	55.5	+0.3 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
O16	1	B	67.0	54.8	55.1	+0.3 dBA	55.1	+0.3 dBA
O17	1	B	67.0	54.9	55.3	+0.4 dBA	55.3	+0.4 dBA
O18	1	B	67.0	55.2	55.6	+0.4 dBA	55.6	+0.4 dBA
O19	1	B	67.0	55.3	55.7	+0.4 dBA	55.8	+0.5 dBA
O20	1	B	67.0	57.5	58.1	+0.6 dBA	58.0	+0.5 dBA
O21	1	B	67.0	56.2	56.8	+0.6 dBA	56.7	+0.5 dBA
O22	1	B	67.0	55.9	56.5	+0.6 dBA	56.3	+0.4 dBA
O23	1	B	67.0	55.5	56.1	+0.6 dBA	55.9	+0.4 dBA
O24	1	B	67.0	55.2	55.8	+0.6 dBA	55.7	+0.5 dBA
O25	1	F	--	55.3	55.9	+0.6 dBA	55.7	+0.4 dBA
O26	1	B	67.0	55.7	56.3	+0.6 dBA	56.0	+0.3 dBA
O27	1	B	67.0	55.9	56.5	+0.6 dBA	56.3	+0.4 dBA
O28	1	B	67.0	65.9	**66.7**	+0.8 dBA	**67.2**	+1.3 dBA
O29	1	B	67.0	65.0	65.7	+0.7 dBA	**66.3**	+1.3 dBA
O30	1	B	67.0	65.5	**66.3**	+0.8 dBA	**67.1**	+1.6 dBA
O31	1	B	67.0	61.1	--	--	61.6	+0.5 dBA
O32	1	C	67.0	64.7	65.5	+0.8 dBA	**66.3**	+1.6 dBA
O33	1	B	67.0	58.5	59.2	+0.7 dBA	58.4	-0.1 dBA
P1	1	B	67.0	47.8	48.4	+0.6 dBA	48.4	+0.6 dBA
P2	1	B	67.0	47.4	48.0	+0.6 dBA	48.0	+0.6 dBA
P3	1	B	67.0	47.6	48.2	+0.6 dBA	48.2	+0.6 dBA
P4	1	B	67.0	48.4	48.9	+0.5 dBA	49.0	+0.6 dBA
P5	1	B	67.0	49.7	50.3	+0.6 dBA	50.3	+0.6 dBA
P6	1	B	67.0	51.3	51.9	+0.6 dBA	51.9	+0.6 dBA
P7	1	B	67.0	53.6	54.1	+0.5 dBA	54.2	+0.6 dBA
P8	1	B	67.0	56.6	57.1	+0.5 dBA	57.1	+0.5 dBA
P9	1	B	67.0	54.5	54.7	+0.2 dBA	54.8	+0.3 dBA
P10	1	B	67.0	54.3	54.4	+0.1 dBA	54.5	+0.2 dBA
P11	1	B	67.0	54.2	54.4	+0.2 dBA	54.4	+0.2 dBA
P12	1	B	67.0	50.7	51.1	+0.4 dBA	51.1	+0.4 dBA
P13	1	B	67.0	53.8	54.0	+0.2 dBA	54.1	+0.3 dBA
P14	1	B	67.0	55.6	55.9	+0.3 dBA	55.9	+0.3 dBA
P15	1	B	67.0	56.6	57.0	+0.4 dBA	57.0	+0.4 dBA
P16	1	B	67.0	58.7	59.1	+0.4 dBA	59.1	+0.4 dBA
P17	1	B	67.0	51.7	52.2	+0.5 dBA	52.5	+0.8 dBA
P18	1	B	67.0	51.6	52.0	+0.4 dBA	52.2	+0.6 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
P19	1	B	67.0	51.7	52.2	+0.5 dBA	52.3	+0.6 dBA
P20	1	B	67.0	51.9	52.4	+0.5 dBA	52.5	+0.6 dBA
P21	1	B	67.0	52.8	53.3	+0.5 dBA	53.4	+0.6 dBA
P22	1	B	67.0	54.2	54.7	+0.5 dBA	54.8	+0.6 dBA
P23	1	B	67.0	55.5	56.0	+0.5 dBA	56.1	+0.6 dBA
P24	1	B	67.0	57.8	58.4	+0.6 dBA	58.4	+0.6 dBA
P25	1	B	67.0	55.0	55.4	+0.4 dBA	55.7	+0.7 dBA
P26	1	B	67.0	55.0	55.4	+0.4 dBA	55.5	+0.5 dBA
P27	1	B	67.0	54.5	55.0	+0.5 dBA	55.1	+0.6 dBA
P28	1	B	67.0	54.1	54.6	+0.5 dBA	54.7	+0.6 dBA
P29	1	B	67.0	55.2	55.7	+0.5 dBA	55.8	+0.6 dBA
P30	1	B	67.0	55.6	56.1	+0.5 dBA	56.2	+0.6 dBA
P31	1	B	67.0	56.7	57.2	+0.5 dBA	57.3	+0.6 dBA
P32	1	B	67.0	59.1	59.6	+0.5 dBA	59.7	+0.6 dBA
P33	1	B	67.0	55.5	56.1	+0.6 dBA	56.2	+0.7 dBA
P34	1	B	67.0	55.4	56.1	+0.7 dBA	55.9	+0.5 dBA
P35	1	B	67.0	55.7	56.3	+0.6 dBA	56.2	+0.5 dBA
P36	1	B	67.0	55.7	56.3	+0.6 dBA	56.3	+0.6 dBA
P37	1	B	67.0	55.9	56.6	+0.7 dBA	56.7	+0.8 dBA
P38	1	B	67.0	56.6	57.2	+0.6 dBA	57.3	+0.7 dBA
P39	1	B	67.0	57.9	58.6	+0.7 dBA	58.7	+0.8 dBA
P40	1	B	67.0	60.0	60.6	+0.6 dBA	60.7	+0.7 dBA
P41	1	F	--	63.7	64.5	+0.8 dBA	64.5	+0.8 dBA
P42	1	F	--	63.8	64.5	+0.7 dBA	64.3	+0.5 dBA
Q1	1	C	67.0	--	--	--	**67.0**	--
Q2	1	B	67.0	62.9	63.5	+0.6 dBA	62.5	-0.4 dBA
Q3	1	B	67.0	63.7	64.3	+0.6 dBA	63.4	-0.3 dBA
Q4	1	E	72.0	64.0	64.7	+0.7 dBA	63.8	-0.2 dBA
Q5	1	E	72.0	65.3	66.0	+0.7 dBA	65.2	-0.1 dBA
Q6	1	E	72.0	64.5	65.2	+0.7 dBA	64.5	--
Q7	1	B	67.0	56.6	57.1	+0.5 dBA	56.3	-0.3 dBA
Q8	1	B	67.0	55.6	56.1	+0.5 dBA	55.6	--
Q9	1	B	67.0	55.6	56.1	+0.5 dBA	55.6	--
Q10	1	B	67.0	55.7	56.3	+0.6 dBA	55.7	--
Q11	1	B	67.0	55.8	56.3	+0.5 dBA	55.8	--
Q12	1	B	67.0	55.9	56.4	+0.5 dBA	55.9	--

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020 Existing Condition	2045 No Build Conditions	Δ Existing, No Build	2045 Build Conditions	Δ Existing, Build
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
Q13	1	B	67.0	56.0	56.6	+0.6 dBA	56.1	+0.1 dBA
Q14	1	B	67.0	56.5	57.0	+0.5 dBA	56.5	--
Q15	1	B	67.0	57.6	58.2	+0.6 dBA	57.6	--
Q16	1	F	--	48.8	49.2	+0.4 dBA	48.8	--
Q17	1	B	67.0	54.8	55.1	+0.3 dBA	55.0	+0.2 dBA
Q18	1	B	67.0	56.4	56.7	+0.3 dBA	56.6	+0.2 dBA
Q19	1	B	67.0	48.9	49.4	+0.5 dBA	49.0	+0.1 dBA
Q20	1	B	67.0	49.8	50.4	+0.6 dBA	49.9	+0.1 dBA
Q21	1	B	67.0	49.8	50.3	+0.5 dBA	50.0	+0.2 dBA
Q22	1	B	67.0	49.9	50.4	+0.5 dBA	50.0	+0.1 dBA
Q23	1	B	67.0	50.0	50.6	+0.6 dBA	50.3	+0.3 dBA
Q24	1	B	67.0	49.5	50.0	+0.5 dBA	49.7	+0.2 dBA
Q25	1	B	67.0	51.3	51.8	+0.5 dBA	51.7	+0.4 dBA
R1	1	F	--	65.4	66.0	+0.6 dBA	65.1	-0.3 dBA
R2	1	B	67.0	**66.7**	**67.4**	+0.7 dBA	**66.5**	-0.2 dBA
R3	1	E	72.0	64.8	65.5	+0.7 dBA	64.4	-0.4 dBA
R4	1	B	67.0	65.2	65.9	+0.7 dBA	64.8	-0.4 dBA
R5	1	F	--	67.4	68.1	+0.7 dBA	66.9	-0.5 dBA
R6	1	B	67.0	58.5	59.0	+0.5 dBA	58.5	--
R7	1	B	67.0	58.1	58.7	+0.6 dBA	57.9	-0.2 dBA
R8	1	B	67.0	58.5	59.1	+0.6 dBA	58.0	-0.5 dBA
R9	1	B	67.0	58.3	58.9	+0.6 dBA	58.1	-0.2 dBA
R10	1	B	67.0	58.1	58.7	+0.6 dBA	58.2	+0.1 dBA
R11	1	B	67.0	58.3	58.9	+0.6 dBA	58.5	+0.2 dBA
R12	1	B	67.0	59.1	59.6	+0.5 dBA	59.3	+0.2 dBA
R13	1	B	67.0	57.1	57.4	+0.3 dBA	57.3	+0.2 dBA
R14	1	B	67.0	56.8	57.2	+0.4 dBA	56.9	+0.1 dBA
R15	1	B	67.0	56.5	56.9	+0.4 dBA	56.5	--
R16	1	B	67.0	57.1	57.5	+0.4 dBA	57.1	--
R17	1	B	67.0	56.5	56.9	+0.4 dBA	56.6	+0.1 dBA
R18	1	B	67.0	57.4	57.8	+0.4 dBA	57.6	+0.2 dBA
R19	1	B	67.0	57.8	58.2	+0.4 dBA	58.0	+0.2 dBA
R20	1	B	67.0	59.6	59.9	+0.3 dBA	59.8	+0.2 dBA
R21	1	F	--	61.2	61.5	+0.3 dBA	61.5	+0.3 dBA
R22	1	F	--	60.9	61.2	+0.3 dBA	61.2	+0.3 dBA
R23	1	B	67.0	60.7	61.0	+0.3 dBA	61.0	+0.3 dBA

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Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
R24	1	B	67.0	52.6	53.1	+0.5 dBA	53.0	+0.4 dBA
R25	1	F	--	59.6	59.9	+0.3 dBA	59.9	+0.3 dBA
S1	1	F	--	66.3	66.9	+0.6 dBA	66.4	+0.1 dBA
S2	1	B	67.0	**66.1**	**66.8**	+0.7 dBA	**66.5**	+0.4 dBA
S3	1	B	67.0	65.8	**66.5**	+0.7 dBA	65.9	+0.1 dBA
S4	1	E	72.0	67.4	68.1	+0.7 dBA	67.5	+0.1 dBA
S5	1	B	67.0	61.9	62.3	+0.4 dBA	62.3	+0.4 dBA
S6	1	B	67.0	59.4	60.0	+0.6 dBA	59.7	+0.3 dBA
S7	1	B	67.0	58.0	58.5	+0.5 dBA	58.4	+0.4 dBA
S8	1	B	67.0	57.6	58.1	+0.5 dBA	58.0	+0.4 dBA
S9	1	B	67.0	59.1	59.7	+0.6 dBA	59.3	+0.2 dBA
S10	1	E	72.0	63.3	63.7	+0.4 dBA	63.6	+0.3 dBA
S11	1	E	72.0	62.9	63.2	+0.3 dBA	63.2	+0.3 dBA
S12	1	B	67.0	55.9	56.2	+0.3 dBA	56.1	+0.2 dBA
S13	1	B	67.0	54.9	55.3	+0.4 dBA	55.1	+0.2 dBA
S14	1	B	67.0	52.8	53.1	+0.3 dBA	53.1	+0.3 dBA
S15	1	B	67.0	54.3	54.6	+0.3 dBA	54.6	+0.3 dBA
S16	1	B	67.0	56.6	56.9	+0.3 dBA	56.9	+0.3 dBA
S17	1	B	67.0	61.7	62.0	+0.3 dBA	62.0	+0.3 dBA
S18	1	B	67.0	54.1	54.5	+0.4 dBA	54.5	+0.4 dBA
S19	1	B	67.0	53.9	54.4	+0.5 dBA	54.3	+0.4 dBA
S20	1	B	67.0	53.7	54.2	+0.5 dBA	54.1	+0.4 dBA
S21	1	B	67.0	53.9	54.4	+0.5 dBA	54.3	+0.4 dBA
S22	1	B	67.0	54.3	54.8	+0.5 dBA	54.7	+0.4 dBA
S23	1	B	67.0	54.8	55.3	+0.5 dBA	55.1	+0.3 dBA
S24	1	B	67.0	56.0	56.5	+0.5 dBA	56.4	+0.4 dBA
S25	1	B	67.0	58.1	58.5	+0.4 dBA	58.5	+0.4 dBA
T1	1	E	72.0	69.7	70.5	+0.8 dBA	69.7	--
T2	1	B	67.0	64.8	65.6	+0.8 dBA	65.1	+0.3 dBA
T3	1	B	67.0	65.1	65.8	+0.7 dBA	65.4	+0.3 dBA
T4	1	E	72.0	64.5	65.3	+0.8 dBA	64.5	--
T5	1	B	67.0	62.2	62.8	+0.6 dBA	62.2	--
T6	1	B	67.0	58.0	58.6	+0.6 dBA	58.6	+0.6 dBA
T7	1	B	67.0	56.7	57.3	+0.6 dBA	57.3	+0.6 dBA
T8	1	B	67.0	56.6	57.2	+0.6 dBA	57.2	+0.6 dBA
T9	1	B	67.0	58.5	59.2	+0.7 dBA	57.9	-0.6 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020	2045	Δ Existing, No Build	2045	Δ Existing, Build
				Existing Condition	No Build Conditions		Build Conditions	
ID	Dwelling Units	Activity Category	Activity Criteria $L_{eq}(h)$	L_{eq}	L_{eq}	L_{eq}	L_{eq}	L_{eq}
T10	1	B	67.0	59.0	59.7	+0.7 dBA	58.3	-0.7 dBA
T11	1	B	67.0	57.6	58.2	+0.6 dBA	57.5	-0.1 dBA
T12	1	B	67.0	58.8	59.2	+0.4 dBA	59.2	+0.4 dBA
T13	1	B	67.0	56.9	57.3	+0.4 dBA	57.2	+0.3 dBA
T14	1	B	67.0	55.2	55.8	+0.6 dBA	55.5	+0.3 dBA
T15	1	B	67.0	54.6	55.0	+0.4 dBA	54.9	+0.3 dBA
T16	1	B	67.0	53.7	54.2	+0.5 dBA	54.0	+0.3 dBA
T17	1	B	67.0	55.1	55.6	+0.5 dBA	55.4	+0.3 dBA
T18	1	B	67.0	56.4	56.9	+0.5 dBA	56.7	+0.3 dBA
T19	1	B	67.0	55.1	55.6	+0.5 dBA	55.3	+0.2 dBA
T20	1	B	67.0	53.6	54.2	+0.6 dBA	53.7	+0.1 dBA
T21	1	B	67.0	53.5	54.1	+0.6 dBA	53.6	+0.1 dBA
U1	1	B	67.0	65.5	**66.3**	+0.8 dBA	65.3	-0.2 dBA
U2	1	B	67.0	65.0	65.8	+0.8 dBA	65.3	+0.3 dBA
U3	1	E	72.0	65.3	66.1	+0.8 dBA	66.2	+0.9 dBA
U4	1	F	--	59.1	59.7	+0.6 dBA	58.7	-0.4 dBA
U5	1	B	67.0	53.5	54.1	+0.6 dBA	54.2	+0.7 dBA
U6	1	B	67.0	54.9	55.5	+0.6 dBA	55.3	+0.4 dBA
U7	1	B	67.0	55.9	56.5	+0.6 dBA	56.7	+0.8 dBA
U8	1	B	67.0	54.7	55.3	+0.6 dBA	55.1	+0.4 dBA
U9	1	B	67.0	54.2	54.6	+0.4 dBA	54.6	+0.4 dBA
U10	1	B	67.0	53.7	54.3	+0.6 dBA	54.2	+0.5 dBA
U11	1	B	67.0	54.1	54.7	+0.6 dBA	54.4	+0.3 dBA
U12	1	B	67.0	52.8	53.5	+0.7 dBA	53.1	+0.3 dBA
U13	1	B	67.0	52.7	53.4	+0.7 dBA	53.0	+0.3 dBA
U14	1	B	67.0	52.4	53.1	+0.7 dBA	52.9	+0.5 dBA
U15	1	B	67.0	52.4	53.1	+0.7 dBA	52.8	+0.4 dBA
U16	1	B	67.0	52.4	53.1	+0.7 dBA	52.8	+0.4 dBA
U17	1	B	67.0	52.3	53.0	+0.7 dBA	52.8	+0.5 dBA
V1	1	C	67.0	51.1	51.7	+0.6 dBA	52.2	+1.1 dBA
V2	1	C	67.0	50.9	51.6	+0.7 dBA	52.2	+1.3 dBA
V3	1	F	--	59.4	60.1	+0.7 dBA	60.1	+0.7 dBA
V4	1	E	72.0	54.3	55.1	+0.8 dBA	55.9	+1.6 dBA
V5	1	E	72.0	55.9	56.7	+0.8 dBA	57.0	+1.1 dBA
V6	1	C	67.0	53.8	54.6	+0.8 dBA	55.7	+1.9 dBA
V7	1	E	72.0	61.6	62.4	+0.8 dBA	61.9	+0.3 dBA

Appendix C

Noise Analysis Receptor Summary
Existing and Future Scenarios

Noise Level Comparison	
XX	Approaches or Exceeds Noise Abatement Criteria
XX	Substantial Increase (≥15 dBA Leq)

Receptor		FHWA Noise Abatement Criteria		2020 Existing Condition	2045 No Build Conditions	Δ Existing, No Build	2045 Build Conditions	Δ Existing, Build
ID	**Dwelling Units**	**Activity Category**	**Activity Criteria $L_{eq}(h)$**	**L_{eq}**	**L_{eq}**	**L_{eq}**	**L_{eq}**	**L_{eq}**
W1	1	C	67.0	--	--	--	**69.5**	--
W2	1	C	67.0	--	--	--	**68.1**	--
W3	1	C	67.0	--	--	--	**67.8**	--
W4	1	C	67.0	--	--	--	**68.4**	--
W5	1	F	--	60.8	61.6	+0.8 dBA	62.0	+1.2 dBA
W6	1	E	72.0	55.2	55.9	+0.7 dBA	56.1	+0.9 dBA
W7	1	F	--	55.8	56.6	+0.8 dBA	56.3	+0.5 dBA
W8	1	C	67.0	52.3	53.0	+0.7 dBA	53.4	+1.1 dBA
W9	1	E	72.0	52.1	52.8	+0.7 dBA	53.5	+1.4 dBA
X1	1	C	67.0	55.4	56.3	+0.9 dBA	57.3	+1.9 dBA
X2	1	C	67.0	53.3	54.2	+0.9 dBA	54.7	+1.4 dBA
X3	1	C	67.0	58.2	59.2	+1.0 dBA	59.7	+1.5 dBA
X4	1	C	67.0	57.6	58.6	+1.0 dBA	58.6	+1.0 dBA
Y1	1	C	67.0	--	--	--	64.1	--
Y2	1	C	67.0	**67.7**	**69.1**	+1.4 dBA	**67.4**	-0.3 dBA
Y3	1	C	67.0	**67.5**	**68.6**	+1.1 dBA	**67.2**	-0.3 dBA
Y4	1	C	67.0	65.4	**68.2**	+2.8 dBA	**66.3**	+0.9 dBA
Y5	1	C	67.0	**66.6**	**67.3**	+0.7 dBA	**67.2**	+0.6 dBA
Y6	1	C	67.0	55.8	56.6	+0.8 dBA	55.8	--
Y7	1	C	67.0	61.9	62.9	+1.0 dBA	61.2	-0.7 dBA
Y8	1	C	67.0	58.0	59.0	+1.0 dBA	58.3	+0.3 dBA
Y9	5	C	67.0	60.1	61.1	+1.0 dBA	60.8	+0.7 dBA
Y10	6	C	67.0	61.6	62.6	+1.0 dBA	62.4	+0.8 dBA
Y11	1	C	67.0	**66.9**	**67.8**	+0.9 dBA	**68.1**	+1.2 dBA
Y12	1	C	67.0	**66.8**	**67.8**	+1.0 dBA	**68.2**	+1.4 dBA

Appendix D -

Noise Wall Cost-effectiveness Results

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TABLE D-0A

S.P. 3804-62

NOISE WALL COST ESTIMATE (UPDATED APRIL 2025)

ITEM NO.	ITEM DESCRIPTION	UNITS	UNIT BID PRICE	NOISE WALL 1		NOISE WALL 3		NOISE WALL 13a		NOISE WALL 13b		NOISE WALL 14	
				ESTIMATED QUANTITY	ESTIMATED PRICE	ESTIMATED QUANTITY	ESTIMATED PRICE	SOURCE A: ESTIMATED QUANTITY	ESTIMATED PRICE	SOURCE A: ESTIMATED QUANTITY	ESTIMATED PRICE	SOURCE A: ESTIMATED QUANTITY	ESTIMATED PRICE
	SAWING BIT PAVEMENT (FULL DEPTH)	LIN FT	$2.65			100	$265.00						
	REMOVE BITUMINOUS PAVEMENT	SQ YD	$4.75			236	$1,121.00						
	EXCAVATION - COMMON	CU YD	$9.75	1900	$18,525.00	25	$243.75	200	$1,950.00	200	$1,950.00	750	$7,312.50
	COMMON EMBANKMENT (CV)	CU YD	$6.50	950	$6,175.00	25	$162.50	100	$650.00	100	$650.00	1100	$7,150.00
	AGGREGATE BASE (CV) CLASS 5	CU YD	$45.00					25	$1,125.00	25	$1,125.00		
	24" RC PIPE SEWER DES 3006 CL III	LIN FT	$115.00									8	$920.00
	RELOCATE PIPE APRON	EACH	$1,500.00									2	$3,000.00
	GLUE LAMINATED RUB RAIL	LIN FT	$35.00	2150	$75,250.00			177.5	$6,212.50	177.5	$6,212.50		
	RELOCATE SIGN STRUCTURE	EACH	$5,000.00	2	$10,000.00								
	RELOCATE TRAFFIC CAMERA	EACH	$5,000.00					1	$5,000.00				
	END TREATMENT-ENERGY ABSORBING TERMINAL	EACH	$5,000.00	4	$20,000.00								
	MOBILIZATION *	7%		1	$9,096.50	1	$1,500.00	1	$1,045.63	1	$695.63	1	$1,500.00
	TURF ESTABLISHMENT & EROSION CONTROL **	5%		1	$6,497.50	1	$500.00	1	$746.88	1	$496.88	1	$919.13
	EASEMENTS/ROW	LUMP SUM		1	$27,000.00	1	$2,100.00	1	$3,000.00	1	$3,000.00		
		SUBTOTALS		**$172,544.00**		**$5,892.25**		**$19,730.01**		**$14,130.01**		**$20,801.63**	
	NOTES: BID PRICES REFLECT YEAR 2026 ESTIMATED CONSTRUCTION COST	**CONTINGENCY *** 20%**		**$34,508.80**		**$1,178.45**		**$3,946.00**		**$2,826.00**		**$4,160.33**	
		TOTALS		**$207,052.80**		**$7,070.70**		**$23,676.01**		**$16,956.01**		**$24,961.96**	

NOTES

* $1500.00 minimum. Calculated from all other base construction costs except easements/ROW

** $500.00 minimum. Calculated from all other base construction costs except easements/ROW

*** Calculated based on subtotal for the wall costs.

Table D-0B: Detailed Noise Barrier Cost Estimate Summaries

Wall	Iteration	Height [ft]	Length [ft]	Construction Cost[1]	Misc Description	Misc Cost[2]	Total Cost	Cost Per Benefitted Receptor
W1	1	20	2150	$ 1,492,704.00	Excavation / Common Embankment / Rub Rail / Sign Relocates / End Treatments / Mobilization / Erosion Control	$ 207,053.00	$ 1,699,757.00	$ 188,861.89
W1	2	8	2150	$ 619,200.00	Excavation / Common Embankment / Rub Rail / Sign Relocates / End Treatments / Mobilization / Erosion Control	$ 207,053.00	**$ 826,253.00**	**$ 91,805.89**
W2	1	20	280	$ 109,440.00	Reinterment Relocates (Avg per L of Roadway, 0.16 per ft)	$ 225,000.00	$ 334,440.00	$ 167,220.00
W2	2	10	280	$ 95,040.00	Reinterment Relocates (Avg per L of Roadway, 0.16 per ft)	$ 225,000.00	**$ 320,040.00**	**$ 160,020.00**
W3	1	20	88	$ 63,360.00	Sawing Pavement / Remove Pavement / Excavation / Common Embankment / Mobilization / Erosion Control	$ 7,071.00	**$ 70,431.00**	**$ 70,431.00**
W13a	1	20	104	$ 56,448.00	Excavation / Common Embankment / Sewer / Relocate Pipe / Mobilization/ Erosion Control	$ 15,252.00	$ 71,700.00	$ 71,700.00
W13b	3	20	168	$ 102,528.00	Excavation / Common Embankment / Sewer / Relocate Pipe / Mobilization/ Erosion Control	$ 25,380.00	$ 127,908.00	$ 127,908.00
W13b	4	10	168	$ 59,328.00	Excavation / Common Embankment / Sewer / Relocate Pipe / Mobilization/ Erosion Control	$ 25,380.00	**$ 84,708.00**	**$ 84,708.00**
W14	1	20	1640	$ 1,162,368.00	Excavation / Common Embankment / Sewer / Relocate Pipe / Mobilization/ Erosion Control	$ 24,962.00	**$ 1,187,330.00**	**$ 25,262.34**

[1] Construction Cost: Based on noise wall construction cost of $36/ft^2.

[2] Misc Cost: Based on data found in MnDOT Historical Bid Prices. Reinterment relocates are based on $7,500 per relocate. See Table D-0A for detailed cost breakdown.

Table D-0C: Cost Units

Wall	Length [ft]	Construction Cost[1]	Misc Description	Misc Cost[2]
W1	2,150	ft^2 of Wall	Sign Relocate	2 Signs
W2	400	ft^2 of Wall	Reinterment Relocates (Avg per L of Roadway, 0.16 per ft)	30 Reinterments (187.5 ft)
W3	150	ft^2 of Wall	Utility Relocates / Erosion Control	Lump Sum
W13	330	ft^2 of Wall	Utility Relocates / Earthwork / Erosion Control	Lump Sum
W14	1,000	ft^2 of Wall	Utility Relocates / Drainage Structures / Earthwork	Lump Sum

Table D-1: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 1: South Side of TH 61, West of 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
B1	Trail	**69.5**	52.1	17.4	1	1	1	2,150	41,464	$207,053	$1,492,704	$188,862
B2	Trail	**70.2**	54.4	15.8	1	1	1					
B3	Trail	**70.0**	58.0	12.0	1	1	1					
B4	Trail	**70.1**	51.3	18.8	1	1	1					
B5	Trail	**69.7**	51.1	18.6	1	1	1					
B6	Trail	**67.9**	50.3	17.6	1	1	1					
B7	Trail	**67.5**	51.4	16.1	1	1	1					
B8	Trail	**67.8**	54.7	13.1	1	1	1					
B9	Trail	**67.3**	53.4	13.9	1	1	1					
					Totals	9	9					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-2: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 1: South Side of TH 61, West of 7th Avenue) (8-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
B1	Trail	**69.5**	59.4	10.1	1	1	1	2,150	17,200	$207,053	$619,200	$91,806
B2	Trail	**70.2**	60.3	9.9	1	1	1					
B3	Trail	**70.0**	61.4	8.6	1	1	1					
B4	Trail	**70.1**	60.0	10.1	1	1	1					
B5	Trail	**69.7**	59.6	10.1	1	1	1					
B6	Trail	**67.9**	57.9	10.0	1	1	1					
B7	Trail	**67.5**	57.9	9.6	1	1	1					
B8	Trail	**67.8**	58.6	9.2	1	1	1					
B9	Trail	**67.3**	58.3	9.0	1	1	1					
					Totals	9	9					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-3: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 2: South Side of TH 61, West of 11th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
H1	Trail	**68.5**	59.6	8.9	1	1	1	280	3,040	$225,000	$109,440	$167,220
H2	Trail	**68.7**	**68.7**	0	1	0	0					
H3	Trail	**68.9**	60.9	8.0	1	1	1					
H4	Trail	**68.7**	**68.3**	0.4	1	0	0					
H5	Trail	**68.7**	**67.5**	1.2	1	0	0					
H6	Trail	**68.5**	**68.5**	0	1	0	0					
H7	Trail	**68.5**	**67.9**	0.6	1	0	0					
					Totals	2	2					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-4: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 2: South Side of TH 61, West of 11th Street) (10-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
H1	Trail	**68.5**	59.6	8.9	1	1	1	280	2,640	$225,000	$95,040	$160,020
H2	Trail	**68.7**	**68.7**	0	1	0	0					
H3	Trail	**68.9**	63.8	5.1	1	1	0					
H4	Trail	**68.7**	**68.4**	0.3	1	0	0					
H5	Trail	**68.7**	**67.7**	1.0	1	0	0					
H6	Trail	**68.5**	**68.5**	0	1	0	0					
H7	Trail	**68.5**	**68.0**	0.5	1	0	0					
					Totals	2	1					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-5: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 3: North Side of TH 61, East of 15th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
E9	Residential	61.3	59.3	2.0	1	0	0	88	2,488	$7,071	$63,360	$70,431
E10	Residential	**67.7**	56.2	11.5	1	1	1					
E11	Residential	62.5	60.9	1.6	1	0	0					
					Totals	1	1					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-6: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 4: South Side of TH 61, East of 11th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
J1	Trail	**67.2**	51.8	15.4	1	1	1	496	9,408	$338,688	$169,344
J5	Residential	60.3	57.3	3.0	1	0	0				
Q1	Trail	**67.0**	53.0	14.0	1	1	1				
					Totals	2	2				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-7: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 4: South Side of TH 61, East of 11th Street) (10-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
J1	Trail	**67.2**	57.1	10.1	1	1	1	496	4,928	$177,408	$88,704
J5	Residential	60.3	58.7	1.6	1	0	0				
Q1	Trail	**67.0**	57.2	9.8	1	1	1				
					Totals	2	2				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-8: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 4: South Side of TH 61, East of 11th Street) (8-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
J1	Trail	**67.2**	61.0	6.2	1	1	0	496	3,968	$142,848	N/A
J5	Residential	60.3	58.8	1.5	1	0	0				
Q1	Trail	**67.0**	60.8	6.2	1	1	0				
					Totals	2	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

Table D-9: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 5: North Side of TH 61, East of 9th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
L26	Residential	**66.3**	61.9	4.4	1	0	0	101	1,620	$58,320	N/A
					Totals	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-10: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 6: South Side of TH 61, East of 8th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
R2	Residential	**66.5**	63.8	2.7	1	0	0	44	824	$29,655	N/A
					Totals	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-11: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 7: North Side of TH 61, East of 8th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
M30	Residential	**68.8**	62.4	6.4	1	1	0	199	3,380	$121,680	N/A
M31	Residential	**68.9**	62.7	6.2	1	1	0				
M32	Residential	65.6	61.2	4.4	1	0	0				
M33	Residential	**70.0**	65.2	4.8	1	0	0				
M34	Residential	**70.6**	**66.6**	4.0	1	0	0				
					Totals	2	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-12: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 8: South Side of TH 61, East of 7th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
S1	Retail	66.4	63.4	3.0	1	0	0	68	1,135	$40,860	N/A
S2	Residential	**66.5**	63.5	3.0	1	0	0				
S3	Residential	65.9	64.7	1.2	1	0	0				
					Totals	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-13: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 9: North Side of TH 61, East of 7th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
N26	Residential	**66.8**	64.9	1.9	1	0	0	57	1,040	$37,440	N/A
N27	Office	68.7	67.4	1.3	1	0	0				
					Totals	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-14: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 10: North Side of TH 61, West of 6th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
N28	Retail	71.9	71.4	0.5	1	0	0	90	1,400	$50,400	N/A
N29	Residential	**69.5**	64.2	5.3	1	1	0				
					Totals	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-15: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 11: North Side of TH 61, East of 6th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
O28	Residential	**67.2**	61.9	5.3	1	1	0	184	3,080	$110,880	N/A
O29	Residential	**66.3**	60.0	6.3	1	1	0				
O30	Residential	**67.1**	61.8	5.3	1	1	0				
					Totals	3	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-16: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 12: North Side of TH 61, West of 5th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (with Noise Wall)	Reduction (in dBA) with Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design Goal Reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
O32	Place of Worship	**66.3**	62.6	3.7	1	0	0	66	1,095	$39,420	N/A
					Totals	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table D-17: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 13a: South Side of TH 61, East of 4th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
W1	Trail	**68.9**	57.4	11.5	1	1	1	104	1,568	$15,252	$56,448	$71,700
W2	Trail	**68.1**	**68.1**	0	1	0	0					
					Totals	1	1					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-18: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 13b: South Side of TH 61, East of 4th Street) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
W3	Trail	**67.8**	58.2	9.6	1	1	1	168	2,848	$25,380	$102,528	$127,908
W4	Trail	**68.4**	**68.4**	0	1	0	0					
					Totals	1	1					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-19: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 13b: South Side of TH 61, East of 4th Street) (10-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
W3	Trail	**67.8**	59.9	7.9	1	1	1	168	1,648	$25,380	$59,328	$84,708
W4	Trail	**68.4**	**68.4**	0	1	0	0					
					Totals	1	1					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-20: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 13b: South Side of TH 61, East of 4th Street) (8-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
W3	Trail	**67.8**	62.9	4.9	1	1	0	168	1,344	$25,380	$48,384	N/A
W4	Trail	**68.4**	**68.4**	0	1	0	0					
					Totals	1	0					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Table D-21: Noise Mitigation Cost Effectiveness Results (Modeled Noise Wall 14: South Side of TH 61, East of Park Road) (20-foot Tall Noise Wall)

Receptor ID	Activity Description	Leq Noise Level, 2048 Build (No Noise Wall)	Leq Noise Level, 2048 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Trails, Commercial, or Industrial Establishments	Number of Benefited Residences, Trails, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Add'l Costs (4)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
Y1	Trail	64.1	63.1	1.0	1	0	0	1,640	32,288	$24,962	$1,162,368	$25,262
Y2	Trail	**67.4**	51.6	15.8	1	1	1					
Y3	Trail	**67.2**	51.5	15.7	1	1	1					
Y4	Trail	66.3	52.0	14.3	1	1	1					
Y5	Trail	**67.2**	51.5	15.7	1	1	1					
Y6	Campground	55.8	52.9	2.9	1	0	0					
Y7	Campground	61.2	52.3	8.9	1	1	1					
Y8	Campground	58.3	50.2	8.1	1	1	1					
Y9	Campground	60.8	50.8	10.0	5	5	5					
Y10	Campground	62.4	51.0	11.4	6	6	6					
Y11	Trail	**68.1**	51.6	16.5	1	1	1					
Y12	Trail	**68.2**	50.8	17.4	1	1	1					
CG1	Campground	50.7	49.4	1.3	4	0	0					
CG2	Campground	56.6	48.6	8.0	4	4	4					
CG3	Campground	51.6	46.9	4.7	6	0	0					
CG4	Campground	55.8	49.1	6.7	4	4	0					
CG5	Campground	53.6	47.2	6.4	12	12	0					
CG6	Campground	58.8	49.8	9.0	8	8	8					
					Totals	47	31					

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**).
N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.
(1) Number of benefited residences, trails, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.
(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.
(3) Noise wall area includes tapers at both ends of the noise wall.
(4) Details of additional costs are in Table D-0 and which include itemized costs including removals, right of way, wall protection, and other miscellaneous items.

Appendix E -

Interior Noise Analysis

Table E.1 - Exterior Wall Noise Ratings of Windows

Composite window value input

Enter EWNR of Windows.	24
Enter % of window that's open (EWNR=4)	0
Composite EWNR value for each window	24

Enter % of entire wall area per window	15
Enter # windows in the wall.	1

Composite EWNR of the wall with windows.	**Composite EWNR** 24

Single Glazed Window	EWNR
1/16", 1/8", 1/4" glass	24
5/16" glass	28
3/8" glass	30
2-ply glass .53" total	38
3-ply glass .82" total	41
Double Glazed Window	EWNR
3/32" glass, 4" airspace, 3/32" glass	30
1/8" glass, 2-1/4" airspace, 1/8" glass	32
1/8" glass, 2-1/4" airspace, 1/4" glass	36
1/4" glass, 2-1/4" airspace, 1/4" glass	38
3/16" glass, 2" airspace, 1/4" glass	39
1/4" glass, 2" airspace, 3/8" glass	40
3/16" glass, 2" airspace, 3/8" glass	41
3/16" glass, 4-3/4" airspace, 1/4" glass	44

Notes:

The addition of a storm window increases the windows EWNR by 5 dB

If window can fully open EWNR value is 4 dB. If window can't completely open (sliding or double hung) use 4 dB for open area and given value for closed area.

Table E.2 - Exterior Wall Noise Ratings of Wall Materials

Wall information

Enter EWNR Wall 1	Enter EWNR Wall 2
24	24
Enter % area Wall 1	% area Wall 2
of entire wall area	of entire wall area
including windows	including windows
50	50

Exteriors \ Interiors	1/2" to 5/8" Gypsumboard	1/8" to 1/2" Plaster on 3/8" Gypsum Lath	1/2" Soundboard on 3/8 to 1/2" Gypsumboard	1/2" to 7/8" Plaster	1/2" Plywood	1/4" Plywood Paneling	1/4" Hardboard Paneling	Exposed Solid Wall
Alum/Vinyl Siding on 1/2" wood	28	31	29	32	25	29	31	--
7/8" Stucco	36	34	37	30	33	37	38	--
7/8" Stucco on 1/2" Wood	37	36	37	32	34	38	39	--
Wood Siding	27	29	27	31	24	28	30	--
4-1/2" Brick Veneer	44	42	44	39	42	45	46	--
9" Brick	47	50	50	45	45	45	45	45
4" Concrete	46	47	47	41	40	40	40	40
6" Concrete	46	48	48	42	42	42	42	42
6" Concrete Block	38	40	40	34	33	33	33	33
8" Concrete Block	40	42	42	36	35	35	35	35
6" Block w/ 1/2" Stucco	39	41	41	35	34	34	34	34
8" Block w/ 1/2" Stucco	41	43	43	37	36	36	36	36

Table E.3 - Interior Noise Level Summary

Receptor ID	Activity Description	Federal Activity Category	Modeled 2048 Build Alternative Exterior Noise Level (dBA, Leq)	Exterior Wall Noise Rating (EWNR) (dBA, Leq)	Modeled 2048 Build Alternative Interior Noise Level (dBA, Leq)
O32	Place of Worship	D	**66.3**	24.0	42.3

Bold numbers approach or exceed Federal noise abatement criteria (see **Table 2-2**)