Draft Traffic Noise Analysis Report

Hwy 169 Redefine – Elk River
Hwy 101/10 to 197th Avenue

Report Version 3.0

Project Partners:
MnDOT District 3, Sherburne County & City of Elk River

Date: August 2020

State Project (SP) 7106-87

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Chapter 1 Introduction

The purpose of this noise analysis is to evaluate and document the effect of the proposed Trunk Highway (Hwy) 169 Project (SP 7106-87) (hereafter referred to as "Hwy 169 Redefine") on traffic generated noise levels. A combined Federal Environmental Assessment (EA)/State Environmental Assessment Worksheet (EAW) was previously approved for the project in September 2010. The Federal Highway Administration (FHWA) issued a Finding of No Significant Impact (FONSI) in January 2013, concluding the federal environmental review process. The Minnesota Department of Transportation (MnDOT) issued a Negative Declaration in January 2013, concluding the state environmental review process.

The proposed project was awarded Corridors of Commerce funding by the Minnesota State Legislature in 2018 and is being funded through state and local sources. The project does not include federal-aid funding. Under Minnesota Rules 4410.1000 Subp. 5 (Changes in Proposed Project, New EAW), the responsible governmental unit (RGU) is responsible for determining if substantial changes have been made in a project, and as a result, if a new EAW is required.

> *If, after a negative declaration has been issued but before the proposed project has received all approvals or been implemented, the RGU determines that a substantial change has been made in the proposed project or has occurred in the project's circumstances, which change may affect the potential for significant adverse environmental effects that were not addressed in the existing EAW, a new EAW is required.*

MnDOT, as RGU for the Hwy 169 Redefine Project, has determined that there has not been a substantial change in the proposed project or in the project's circumstances since the 2013 Negative Declaration decision, and that a new State EAW is not required.

A traffic noise analysis was included with the previous 2009 EA/EAW following the 1997 Minnesota Department of Transportation (MnDOT) Noise Policy for Type I Federal Aid Projects as per 23 CFR 772. Traffic noise levels were modeled at receptor locations along Hwy 169 for existing and future (year 2030) conditions. Since completion of the 2009 EA/EAW, there have been three updates to the MnDOT noise requirements: 2011, 2015, and 2017. This traffic noise analysis was completed as a stand-alone update for the Hwy 169 corridor following the

procedures and guidance described in the 2017 MnDOT Noise Requirements for Type I Federal-aid Projects as per 23 CFR 772 (effective July 10, 2017).[1]

1.1 General Project Description

The Hwy 169 Redefine Project is in the City of Elk River, Sherburne County, Minnesota between the Mississippi River and 197th Avenue, including the Hwy 10/101/169 system interchange. Figure 1.1 includes a state location map. Figure 1.2 includes a project area map. The total project length along Hwy 169 is approximately five miles.

The existing highway is a four-lane, rural section expressway with traffic signals at Main Street, School Street, 193rd Avenue, and 197th Avenue. The project includes reconstruction of Hwy 169 from the Hwy 10/101/169 system interchange and the Mississippi River to 197th Avenue as a four-lane freeway facility. Hwy 169 would be reconstructed with a concrete center median barrier and roadside ditches along the outside shoulders. The existing traffic signals would be removed, and grade-separated interchanges would be constructed at intersecting street locations. Proposed interchange locations and types are summarized below.

- Hwy 169 and Main Street would be constructed as a single-point urban interchange. Hwy 169 would go over Main Street.
- Hwy 169 and School Street would be constructed as a single-point urban interchange. School Street would go over Hwy 169. Auxiliary lanes would be constructed on Hwy 169 between the Main Street and School Street interchange ramps.
- Hwy 169 and 193rd Avenue would be constructed as a single-point urban interchange. Hwy 169 would go over 193rd Avenue. Auxiliary lanes would be constructed on Hwy 169 between the School Street and 193rd Avenue interchange ramps.
- Hwy 169 and 197th Avenue would be constructed as a partial-access interchange. 197th Avenue would go over Hwy 169. Interchange ramps would provide access to Hwy 169 to and from the north.

Elements of the Hwy 10/101/169 system interchange would be reconstructed with the project. The northbound Hwy 101 bridge over Hwy 10 would be replaced. The existing traffic signal at the Hwy 10/101/169 north intersection would be removed.

[1] The 2017 MnDOT noise requirements document is available online on the MnDOT Office of Environmental Stewardship webpage at http://www.dot.state.mn.us/environment/noise/pdf/2017-noise-requirements.pdf.

Figure 1.1 State Location Map

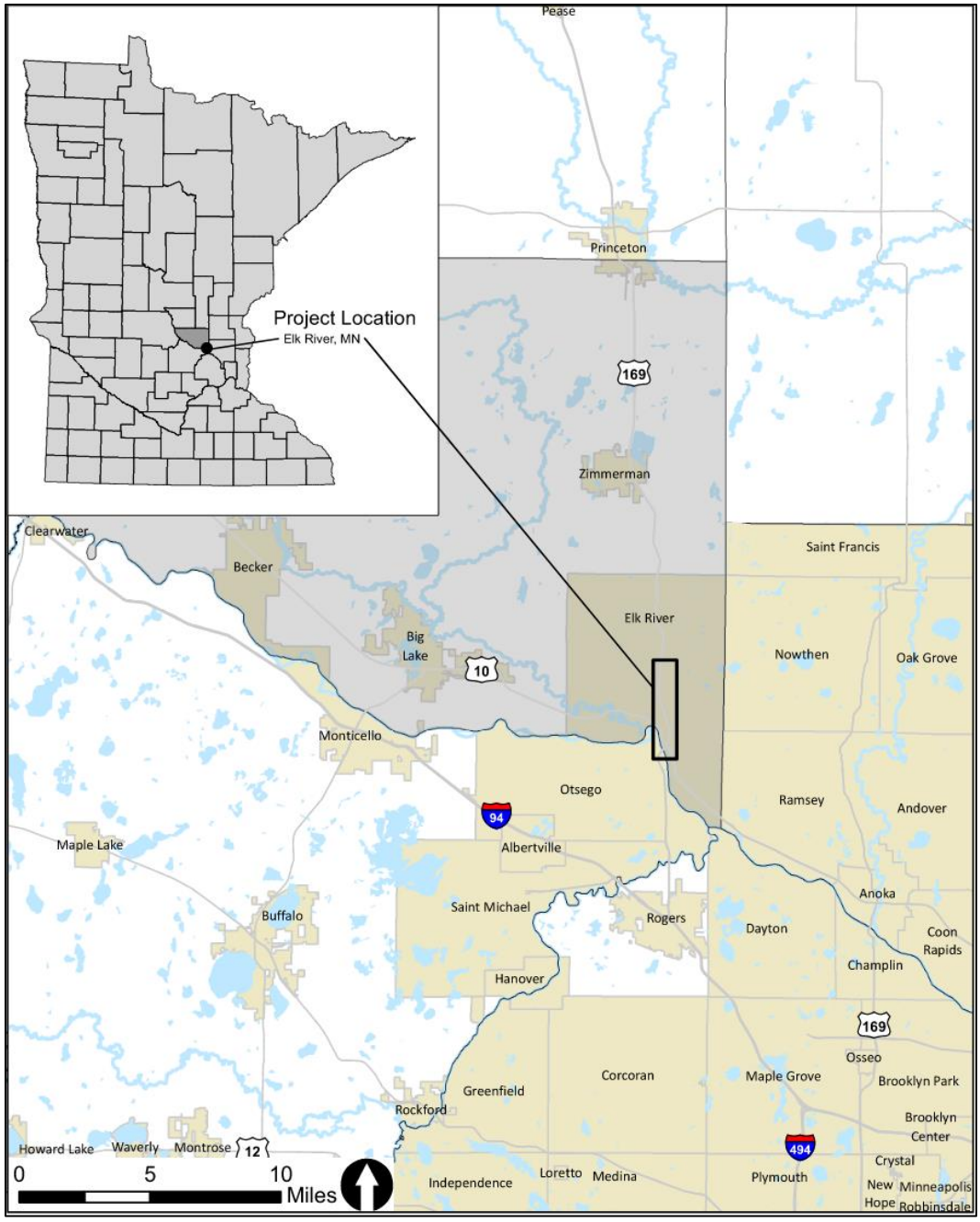
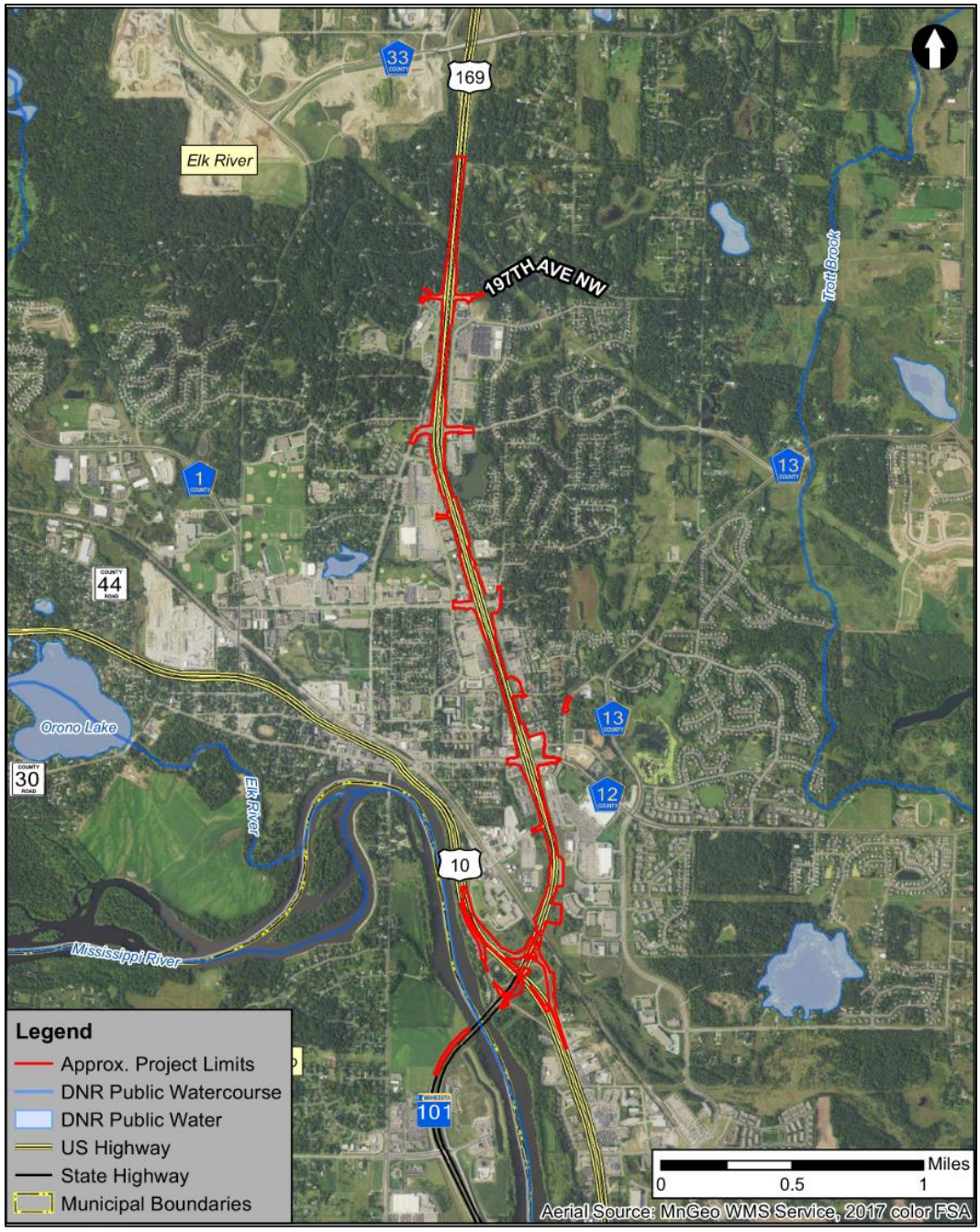


Figure 1.2 Project Location Map



The interchange ramps from westbound Hwy 10 to northbound Hwy 169, and southbound Hwy 169 to westbound Hwy 10 would be reconstructed. The existing access from eastbound Hwy 10 to northbound Hwy 169 would be removed and replaced with a left-turn lane on eastbound Hwy 10 to the exit ramp from westbound Hwy 10 to northbound Hwy 169. A traffic signal would be constructed on Hwy 10 west of the system interchange to accommodate the movement from westbound Hwy 10 to southbound Hwy 101.

The project also includes construction of an auxiliary lane on southbound Hwy 101 from the Hwy 101 bridge over the Mississippi River to the exit ramp to the County State Aid Highway (CSAH) 39 interchange in the City of Otsego, Wright County. Lands on the west side of Hwy 101 and south of the Mississippi River adjacent to the proposed auxiliary lane are undeveloped; therefore, this area was not included as part of this traffic noise analysis.

1.2 Background Information On Noise

Noise is defined as any unwanted sound. Sound travels in a wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels. Decibels (dB) represent the logarithm of the ratio of a sound energy relative to a reference sound energy. For highway traffic noise, an adjustment, or weighting, of the high- and low- pitched sound is made to approximate the way that an average person hears sound. The adjusted sound levels are stated in units of "A-weighted decibels" (dBA). A sound increase of 3 dBA is barely noticeable by the human ear, a 5 dBA increase is clearly noticeable, and a 10 dBA increase is heard as twice as loud. For example, if the sound energy is doubled (i.e., the amount of traffic doubles), there is a 3 dBA increase in noise, which is just barely noticeable to most people. On the other hand, if traffic increases by a factor of ten times, the resulting sound level will increase by about 10 dBA and be heard to be twice as loud.

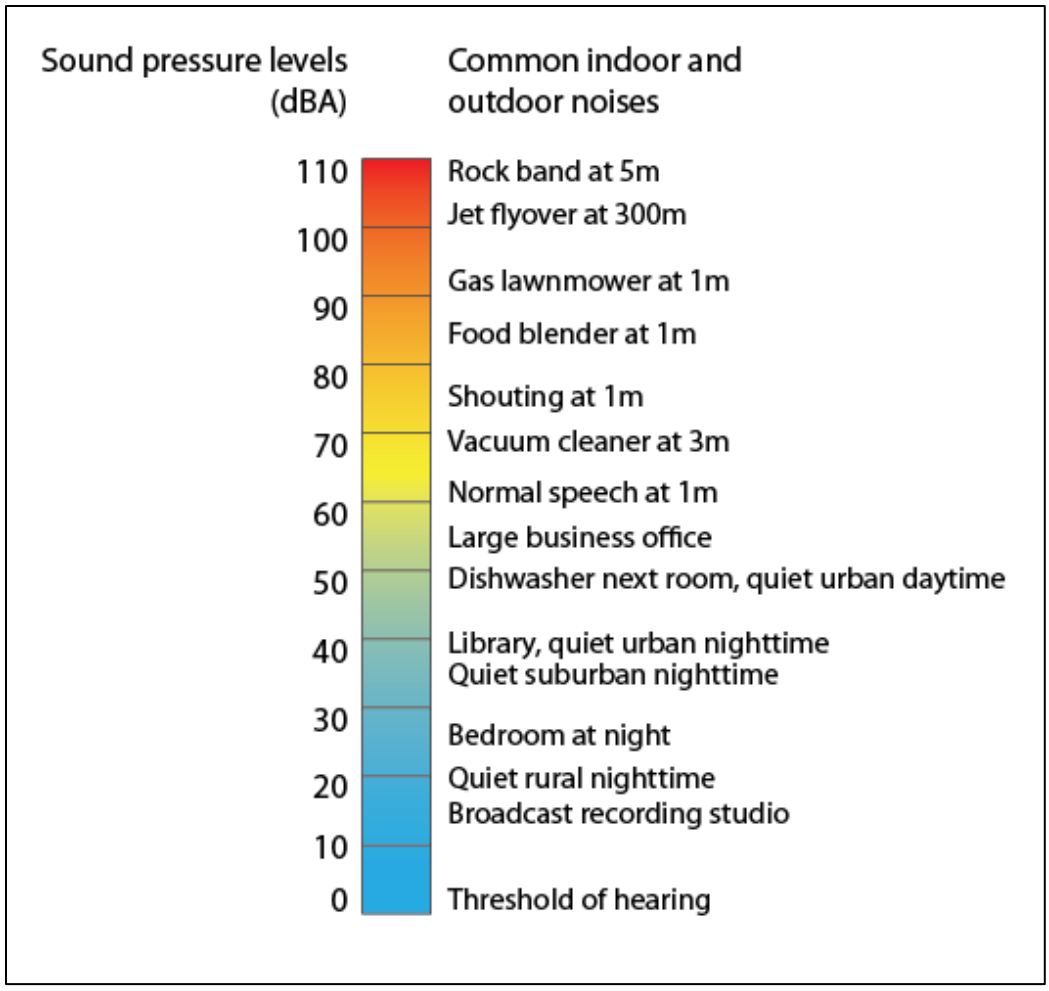
In Minnesota, traffic noise impacts are evaluated by measuring and/or modeling the equivalent steady-state sound level. The equivalent steady-state sound level contains the same acoustic energy as the time-varying sound level over a stated period of time. This number is referred to as the Leq level, with Leq(h) being the hourly value of Leq. The Leq is analogous to the "average" sound level over a given period of time.

Along with the volume of traffic and other factors (e.g., topography of the area and vehicle speed) that contribute to the loudness of traffic noise, the distance of a receptor from a sound's source is also a key factor. Sound level decreases as distance from a source increases. A general rule regarding sound level decrease due to increasing distance from a line source (roadway) that is commonly used is: beyond approximately 50 feet from the sound source, each doubling of distance from the line source over hard ground (such as pavement or water) will reduce the sound level

by 3 dBA, whereas each doubling of distance over soft ground (such as vegetated or grassy ground) results in a sound level decrease of 4.5 dBA.

Figure 1.3 provides a rough comparison of the noise levels of some common noise sources.

Figure 1.3 Decibel Level of Common Noise Sources



Source: Minnesota Pollution Control Agency. Noise Pollution accessed February 11, 2020 and available at https://www.pca.state.mn.us/air/noise-pollution.

1.3 Federal Traffic Noise Regulations

The FHWA's traffic noise regulation is described in 23 Code of Federal Regulations (CFR) Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise). 23 CFR 772 requires the identification of highway traffic noise impacts and the evaluation of potential noise abatement measures, along with other considerations, in conjunction with the planning and design of a Federal-aid highway project. The MnDOT requirements for implementation of the requirements of 23

CFR 772 is described in the *MnDOT Noise Requirements for Type I Federal-aid Projects* (effective July 10, 2017). The MnDOT noise requirements applies to all projects that receive Federal-aid funds or projects that are subject to FHWA approval.

A traffic noise impact analysis is required for all Type I Federal-aid projects. Type I projects are defined in 23 CFR 772.5. The Hwy 169 Redefine Project meets the definition of a Type I project. The project includes the addition of auxiliary lanes between Main Street and School Street, and between School Street and 193rd Avenue. Therefore, a traffic noise analysis is required for the project.

1.3.1 Traffic Noise Impact Criteria

Federal Noise Abatement Criteria

Under FHWA criteria and regulations, traffic noise impacts are determined in two ways. First, future build worst hour noise levels are compared to FHWA Noise Abatement Criteria (NAC). Table 1.1 lists the FHWA noise abatement criteria by land use activity category. If a future build worst hour noise level approaches or exceeds the NAC noise level, then an impact exists. A noise level approaches NAC when it is within 1 dBA of the NAC noise level. For example, 66 dBA (Leq) is defined as "approaching" the noise abatement criterion for residential land uses (Activity Category B). Second, future build worst hour noise levels are compared with the existing no-build noise levels. If the future level is greater than the existing level by 5 dBA or more (i.e., substantial increase), an impact exists.

Table 1.1 23 CFR 772: Federal Noise Abatement Criteria

Activity Category	Activity Criteria Leq(h) (1)	Evaluation Location	Activity Descriptions
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential, if the area is to continue to serve its intended purpose.
B	67	Exterior	Residential.
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds

(1) The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

(2) Includes undeveloped lands permitted for this activity category.

(3) Hotels and motels that function as apartment buildings are classified under Activity Category B.

Table 1.1 continued 23 CFR 772: Federal Noise Abatement Criteria

Activity Category	Activity Criteria Leq(h) (1)	Evaluation Location	Activity Descriptions
C	67	Exterior	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 (2) (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.

(1) The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

(2) Includes undeveloped lands permitted for this activity category.

(3) Hotels and motels that function as apartment buildings are classified under Activity Category B.

Minnesota State Noise Standards

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. Projects will no longer directly address Minnesota Rule 7030.

Chapter 2 Analysis Methodology

2.1 Affected Environment

The project is in the City of Elk River in Sherburne County, Minnesota. Existing land uses along the project segment of Hwy 169 include residential; retail and highway commercial; business office; and industrial uses. Baldwin Park is a City of Elk River-owned park on the east side of Hwy 169 between Main Street and School Street. There are no other parks, recreational land uses, trails, or places of worship in the project area.

2.2 Traffic Noise Monitoring

2.2.1 Noise Level Monitoring Results

Noise level monitoring is commonly performed during a noise study to document existing noise levels and to validate the noise model for the project (see discussion of "Field Measurements and Predicted Noise Levels" below). Existing noise levels were monitored at four representative locations in the project area along Hwy 169. Monitoring Site 1 (Site M1) is in Baldwin Park on the east side of Hwy 169 between Main Street and 5th Street Northwest. Monitoring Site 2 (Site M2) is a single-family residence on the east side of Hwy 169and south of 193rd Avenue (11508 190th Lane, Elk River). Monitoring Site 3 (Site M3) is a single-family residence on the west side of Hwy 169 and north of 193rd Avenue (19440 Holt Street, Elk River). Monitoring Site 4 (Site M4) is a single-family residence on the west side of Hwy 169 and north of 197th Avenue (19757 Irving Street, Elk River). Appendix B includes field measurement data sheets illustrating the field measurement locations.

Daytime noise levels were collected on October 9, 2019 at the four receptor locations described above. Noise levels were monitored at each location for 15 minutes. A trained noise monitoring technician was present at each session for the entire field measurement session to ensure correct operation of the sound level meter (SLM). Table 2.1 presents the field measurement results.

Table 2.1 Field Measurement Summary Results

Receptor ID	Location Description	Start Time	End Time	Measured Level, Leq, dBA
Site M1	East of Hwy 169 between Main Street and 5th Street NW (Baldwin Park)	12:10 p.m.	12:25 p.m.	65.8

Bold numbers approach or exceed the Federal noise abatement criterion (see Table 1.1).

Table 2.1 continued Field Measurement Summary Results

Receptor ID	Location Description	Start Time	End Time	Measured Level, Leq, dBA
Site M2	East of Hwy 169, south of 193rd Avenue (11508 190th Lane, Elk River)	12:45 p.m.	1:00 p.m.	**68.0**
Site M3	West of Hwy 169, north of 193rd Avenue (19440 Holt Street, Elk River)	1:20 p.m.	1:35 p.m.	63.2
Site M4	West of Hwy 169, north of 197th Avenue (19757 Irving Street, Elk River)	1:45 p.m.	2:00 p.m.	64.4

Bold numbers approach or exceed the Federal noise abatement criterion (see Table 1.1).

2.2.2 Field Measurements and Predicted Noise Levels

Table 2.2 lists the field measurement results and computer modeling results for existing traffic noise levels. Computer modeling results are based on classified traffic counts for Hwy 169 during the field measurement period (i.e., cars, medium trucks, heavy trucks). The speed used for Hwy 169 was the existing posted speed (i.e., 55 miles per hour [mph] south of 197th Avenue and 65 mph north of 197th Avenue).

Table 2.2 Field Measurements and Predicted Noise Levels

Receptor ID	Measured Level, Leq, dBA	Predicted Noise Level, Leq, dBA	Difference (Measured – Predicted) (Leq, dBA)	Difference ≤ 3.0 dBA, Leq
Site M1	65.8	64.5	1.3	Yes
Site M2	**68.0**	**67.0**	1.0	Yes
Site M3	63.2	65.5	-2.3	Yes
Site M4	64.4	61.6	2.8	Yes

Bold numbers approach or exceed the Federal noise abatement criterion (see Table 1.1).

A discrepancy equal to or less than 3.0 dBA between field measurements and predicted levels is considered acceptable for noise model validation. Field measurements at each of the four locations are within 3.0 dBA of predicted levels; therefore, no adjustments to the noise model input are necessary.

2.3 Worst Hourly Traffic Noise Analysis

In general, higher traffic volumes, vehicle speeds, and greater numbers of heavy trucks increase the loudness of highway traffic noise. The worst hourly traffic noise impact typically occurs when traffic is flowing more freely (e.g., level of service C conditions) and when heavy truck volumes are the greatest. For determining the worst-case traffic noise hour for the proposed project, traffic noise levels for three time periods were modeled at 30 representative receptor locations within the project area (morning, midday, afternoon). The worst hourly traffic noise analysis considered the appropriate classified traffic mix (cars, medium trucks, heavy trucks) and directional split (northbound Hwy 169 and southbound Hwy 169) in traffic during each analysis period. The speeds used for the model predictions were existing posted speeds for Hwy 169 (e.g., 55 mph from Hwy 10/101/169 interchange to 197th Avenue).

Table 2.3 summarizes the modeled Leq levels for each of the three time periods. Based on this analysis, it was determined that the 4:00 p.m. to 5:00 p.m. period represents the worst-case traffic noise hour. Modeled noise levels for representative receptor locations along Hwy 169 were the highest during the 4:00 p.m. to 5:00 p.m. period. The 4:00 p.m. to 5:00 p.m. hour represents a period of higher overall traffic volumes and higher heavy truck volumes at the start of the afternoon peak hour.

Table 2.3 Worst Hourly Traffic Noise Summary (Existing Modeled Noise Levels by Time Period)

Receptor ID	Activity Description	Federal Activity Category	7:00-8:00 a.m. dBA, Leq	12:00-1:00 p.m. dBA, Leq	4:00-5:00 p.m. dBA, Leq
A-9	Residential	B	62.4	59.3	63.4
B-8	Residential	B	49.9	46.8	50.7
B-17	Restaurant/Bar	E	66.6	62.5	65.5
C-6	Retail Facility	F	63.0	59.1	62.2
C-15	Retail Facility	F	54.6	51.0	54.8
C-24	Restaurant/Bar	E	55.6	51.6	55.1
C-33	Retail Facility	E	56.8	54.3	57.9
D-9	Offices	E	55.9	53.2	56.1
D-14	Residential	E	49.3	47.4	50.6
D-18	Medical Facility	C	58.6	59.6	60.9
E-7	Residential	B	54.1	51.5	54.8
E-16	Retail Facility	F	66.6	63.2	65.4
G-3	Retail Facility	F	59.0	55.9	59.9

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

Table 2.3 continued Worst Hourly Traffic Noise Summary (Existing Modeled Noise Levels by Time Period)

Receptor ID	Activity Description	Federal Activity Category	7:00-8:00 a.m. dBA, Leq	12:00-1:00 p.m. dBA, Leq	4:00-5:00 p.m. dBA, Leq
H-4	Retail Facility	F	61.0	58.2	62.7
H-13	Residential	B	**67.9**	65.7	**69.9**
H-29	Residential	B	52.4	49.3	53.7
H-35	Retail Facility	F	65.8	63.9	68.1
H-39	Residential	B	47.8	45.4	48.8
I-7	Residential	B	53.7	51.1	54.5
I-16	Residential	B	51.5	49.0	52.5
I-25	Residential	B	42.3	39.6	43.6
I-34	Retail Facility	F	62.1	60.2	63.9
I-43-1	Residential	B	54.6	52.4	56.2
I-52	Residential	B	43.4	40.9	44.8
I-61-1	Residential	B	65.0	63.5	**67.6**
I-70-1	Residential	B	52.8	51.3	56.1
I-79-1	Residential	B	48.0	45.7	49.8
J-2	Retail Facility	F	53.3	50.8	54.6
J-11	Business Office	E	61.0	58.2	62.0
J-17	Business Office	E	52.7	49.8	53.6

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

2.4 Traffic Noise Modeling

Noise modeling was done using the FHWA's noise prediction program Traffic Noise Model (TNM), version 2.5. This model uses traffic volumes, speed, class of vehicle (e.g., cars, medium trucks, heavy trucks, buses, and motorcycles), and the typical characteristics of the roadway being analyzed (e.g., roadway width, horizontal alignment, vertical profile, etc.) to predict traffic noise levels.

Traffic data for noise model input files included existing and future (year 2040) No Build Alternative and Build Alternative forecast traffic volumes for the project segment of Hwy 169. Year 2040 was identified as the future year for analysis because this is the horizon year for travel demand forecasts prepared for the project. The modeled speed for Hwy 169 under existing conditions was 55 mph because this is the existing posted speed. The modeled speed for Hwy 169 under the 2040 Build Alternative was 55 mph because this is the design speed for the project.

The hour of analysis was the 4:00 p.m. to 5:00 p.m. hour (see Worst Hourly Traffic Noise Analysis discussion above). The 4:00 p.m. to 5:00 p.m. hour was determined to represent approximately eight percent of the daily traffic volumes for the project segment of Hwy 169. Table 2.4 includes the directional split and traffic characteristics on northbound and southbound Hwy 169 during the worst noise hour for existing conditions and the future (year 2040) No Build and Build Alternatives.

Table 2.4 Hwy 169 Traffic Characteristics (Worst Traffic Noise Hour)

Roadway	Directional Split	Vehicle Mix (% Cars)	Vehicle Mix (% Medium Trucks)	Vehicle Mix (% Heavy Trucks)	Vehicle Mix (% Buses)	Vehicle Mix (% Motor cycles)
Northbound Hwy 169	70%	93%	2%	5%	0%	0%
Southbound Hwy 169	30%	93%	2%	5%	0%	0%

Chapter 3 Predicted Noise Levels and Noise Impacts

3.1 Noise Receptors

Traffic noise impacts were assessed by modeling noise levels at receptor sites likely to be affected by the proposed project. Traffic noise levels were modeled at 323 receptor locations along Hwy 169 project corridor between the Hwy 10/101/169 system interchange and north of 197th Avenue representing residences, restaurants/bars, business offices, retail commercial uses, industrial uses, parkland (Baldwin Park), and proposed trails along Main Street and 193rd Avenue. One receptor location was assigned for each 250 feet of proposed trail along Main Street and 193rd Avenue.[2]

The layout figures in Appendix A illustrate modeled receptor locations. Table 3.1 identifies the land use and the Federal noise abatement criterion (NAC) for each modeled receptor location.

3.2 Noise Model Results

Table 3.1 tabulates the results of the noise modeling analysis for existing conditions, the 2040 No Build Alternative, and the 2040 Build Alternative. The results of the traffic noise modeling analysis are summarized below.

3.2.1 Existing Conditions

Existing Leq noise levels at modeled receptor locations along Hwy 169 range from 44.0 dBA to 72.3 dBA. Modeled Leq noise levels approach or exceed the Federal noise abatement criterion for Activity Category B at 25 receptor locations and exceed the Federal noise abatement criterion for Activity Category C at two receptor locations representing Baldwin Park. Modeled Leq noise levels at all other receptor locations are below Federal noise abatement criteria.

[2] Minnesota Department of Transportation. July 10, 2017. *Noise Requirements for MnDOT and Other Type I Federal-aid Projects*. Appendix A, Guidance on Selection and Use of Noise Analysis Locations, Assigning Noise Receptors for Activity Category C.

Table 3.1 Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
A-1 (1)	Residential	B	63.4	64.2	0.8	63.1	-0.3
A-2 (1)	Residential	B	65.9	**66.8**	0.9	65.4	-0.5
A-3 (1)	Residential	B	64.6	65.4	0.8	63.9	-0.7
A-4 (1)	Residential	B	64.3	65.2	0.9	62.7	-1.6
A-5 (1)	Residential	B	63.0	63.8	0.8	60.9	-2.1
A-6 (1)	Residential	B	64.3	65.2	0.9	61.8	-2.5
A-7 (1)	Residential	B	**66.4**	**67.2**	0.8	63.4	-3.0
A-8 (1)	Residential	B	64.7	65.5	0.8	64.3	-0.4
A-9 (1)	Residential	B	64.4	65.3	0.9	62.2	-2.2
A-10 (1)	Residential	B	61.3	62.2	0.9	57.3	-4.0
B-1 (1)	Retail Facility	F	67.0	67.9	0.9	63.4	-3.6
B-2 (1)	Retail Facility	F	59.9	60.7	0.8	57.8	-2.1
B-3 (1)	Retail Facility	F	57.4	58.3	0.9	56.0	-1.4
B-4 (1)	Retail Facility	F	55.6	56.5	0.9	53.9	-1.7
B-5 (1)	Day Care	C	58.9	59.8	0.9	57.8	-1.1
B-6 (1)	Residential	B	52.3	53.2	0.9	50.7	-1.6
B-7 (1)	Residential	B	48.3	49.3	1.0	48.3	0.0
B-8 (1)	Residential	B	50.7	51.6	0.9	49.4	-1.3
B-9 (1)	Residential	B	50.5	51.4	0.9	49.2	-1.3

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
B-10 (1)	Residential	B	54.4	55.3	0.9	51.5	-2.9
B-11 (1)	Residential	B	52.2	53.2	1.0	51.1	-1.1
B-12 (1)	Residential	B	60.5	61.4	0.9	58.4	-2.1
B-13 (1)	Residential	B	58.8	59.6	0.8	55.7	-3.1
B-14 (1)	Residential	B	48.5	49.4	0.9	47.7	-0.8
B-15 (1)	Residential	B	44.0	44.9	0.9	43.1	-0.9
B-16 (1)	Residential	B	49.3	50.3	1.0	47.6	-1.7
B-17 (1)	Restaurant/Bar	E	65.5	66.4	0.9	61.5	-4.0
B-18 (2)	Business Office	E	65.5	66.4	0.9	61.5	-4.0
B-19 (2)	Restaurant/Bar	E	65.6	66.7	1.1	62.4	-3.2
B-20 (1)	Retail Facility	F	65.8	67.0	1.2	64.0	-1.8
B-21 (1)	Residential	B	55.7	56.5	0.8	53.0	-2.7
B-22 (1)	Residential	B	53.2	54.1	0.9	50.8	-2.4
C-1 (1)	Retail Facility	F	63.1	64.3	1.2	62.2	-0.9
C-2 (1)	Retail Facility	F	53.9	55.0	1.1	55.4	1.5
C-3 (1)	Restaurant/Bar	E	56.6	57.6	1.0	55.2	-1.4
C-4 (1)	Retail Facility	F	57.8	58.7	0.9	56.2	-1.6
C-5 (2)	Retail Facility	F	58.0	59.0	1.0	56.6	-1.4
C-6 (1)	Retail Facility	F	62.2	63.1	0.9	59.6	-2.6

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
C-7 (1)	Retail Facility	F	58.3	59.2	0.9	56.8	-1.5
C-8 (1)	Retail Facility	F	57.9	58.8	0.9	56.7	-1.2
C-9 (3)	Restaurant/Bar	E	66.3	67.2	0.9	64.1	-2.2
C-10 (1)	Restaurant/Bar	E	52.1	53.0	0.9	50.7	-1.4
C-11 (4)	Retail Facility	F	55.8	56.7	0.9	54.1	-1.7
C-12 (4)	Restaurant/Bar	E	55.2	56.1	0.9	53.6	-1.6
C-13 (1)	Retail Facility	F	55.0	55.9	0.9	53.3	-1.7
C-14 (1)	Retail Facility	F	59.0	59.8	0.8	56.5	-2.5
C-15 (1)	Retail Facility	F	54.8	55.7	0.9	53.0	-1.8
C-16 (1)	Retail Facility	F	54.7	55.7	1.0	52.9	-1.8
C-17 (1)	Restaurant/Bar	E	59.5	60.5	1.0	57.6	-1.9
C-18 (3)	Retail Facility	F	54.8	55.7	0.9	52.9	-1.9
C-19 (1)	Restaurant/Bar	E	65.3	66.3	1.0	63.6	-1.7
C-20 (6)	Retail Facility	F	53.9	54.9	1.0	52.5	-1.4
C-21 (1)	Restaurant/Bar	E	53.3	54.3	1.0	51.5	-1.8
C-22 (5)	Retail Facility	F	53.7	54.6	0.9	51.8	-1.9
C-23 (1)	Retail Facility	F	53.9	54.8	0.9	51.9	-2.0
C-24 (1)	Restaurant/Bar	E	55.2	56.1	0.9	52.7	-2.5

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
C-25 (1)	Sidewalk (2)	E	59.1	60.0	0.9	57.0	-2.1
C-26 (1)	Sidewalk (2)	E	69.2	70.1	0.9	67.2	-2.0
C-27 (3)	Retail Facility	F	52.5	53.8	1.3	51.6	-0.9
C-28 (4)	Retail Facility	F	54.5	55.6	1.1	52.6	-1.9
C-29 (1)	Business Office	E	52.2	53.4	1.2	51.0	-1.2
C-30 (1)	Business Office	E	61.4	62.4	1.0	58.6	-2.8
C-31 (1)	Restaurant/Bar	E	55.6	57.0	1.4	55.2	-0.4
C-32 (4)	Restaurant/Bar	E	60.3	61.6	1.3	59.0	-1.3
C-33 (1)	Retail Facility	F	57.9	62.0	4.1	61.0	3.1
D-1 (1)	Retail Facility	F	56.5	58.0	1.5	57.4	0.9
D-2 (1)	Restaurant/Bar	E	62.1	63.0	0.9	61.9	-0.2
D-3 (1)	Retail Facility	F	62.5	63.4	0.9	60.9	-1.6
D-4 (1)	Medical Facility	C	58.4	59.4	1.0	60.5	2.1
D-5 (1)	Restaurant/Bar	E	59.0	59.9	0.9	60.8	1.8
D-6 (1)	Retail Facility	F	53.4	54.3	0.9	54.3	0.9
D-7 (1)	Retail Facility	F	46.7	47.8	1.1	47.5	0.8
D-8 (2)	Retail Facility	F	52.7	53.6	0.9	51.9	-0.8

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

(2) The pedestrian bridge over Hwy 169 north of School Street and connecting facilities are identified as sidewalks in the City of Elk River Trail Master Plan (March 19, 2018) available at https://www.elkrivermn.gov/DocumentCenter/View/6660/2018-Elk-River-Trails-Master-Plan. There is no Federal noise abatement criterion for sidewalks.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
D-9 (3)	Business Office	E	56.1	56.9	0.8	55.1	-1.0
D-10 (1)	Residential	B	61.2	62.0	0.8	59.9	-1.3
D-11 (1)	Residential	B	55.2	56.0	0.8	54.2	-1.0
D-12 (1)	Retail Facility	F	69.5	70.3	0.8	68.2	-1.3
D-13 (1)	Retail Facility	F	67.4	68.2	0.8	66.6	-0.8
D-14 (1)	Residential	B	50.5	51.4	0.9	51.1	0.6
D-15 (1)	Residential	B	53.2	54.1	0.9	54.0	0.8
D-16 (2)	Retail Facility	E	60.6	61.5	0.9	61.2	0.6
D-17 (1)	Restaurant/Bar	E	58.2	59.0	0.8	58.5	0.3
D-18 (1)	Medical Facility	C	60.9	61.6	0.7	63.6	2.7
D-19 (1)	Restaurant/Bar	E	58.3	59.5	1.2	59.0	0.7
D-20 (1)	Retail Facility	F	63.2	64.6	1.4	63.1	-0.1
E-1 (2)	Business Office	E	58.8	59.4	0.6	61.7	2.9
E-2 (4)	Business Office	E	59.9	61.1	1.2	61.1	1.2
E-3 (1)	Retail Facility	E	68.5	69.7	1.2	66.7	-1.8
E-4 (2)	Residential	B	54.6	55.7	1.1	55.0	0.4
E-5 (2)	Residential	B	56.0	57.1	1.1	55.5	-0.5
E-6 (2)	Residential	B	57.5	58.6	1.1	56.7	-0.8
E-7 (2)	Residential	B	54.8	55.9	1.1	55.5	0.7

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
E-8 (2)	Residential	B	54.1	55.3	1.2	54.7	0.6
E-9 (2)	Residential	B	53.9	55.1	1.2	54.4	0.5
E-10 (2)	Residential	B	53.5	54.7	1.2	54.6	1.1
E-11 (2)	Residential	B	54.5	55.5	1.0	55.2	0.7
E-12 (2)	Residential	B	54.1	55.1	1.0	54.8	0.7
E-13 (2)	Residential	B	51.8	52.8	1.0	52.7	0.9
E-14 (1)	Retail Facility	F	66.7	67.7	1.0	64.2	-2.5
E-15 (1)	Retail Facility	F	65.1	66.1	1.0	63.0	-2.1
E-16 (3)	Business Office	E	65.4	66.4	1.0	63.3	-2.1
E-17 (1)	Restaurant/Bar	E	65.5	66.5	1.0	63.4	-2.1
E-18 (2)	Restaurant/Bar	E	65.2	66.2	1.0	63.3	-1.9
E-19 (4)	Retail Facility	F	65.3	66.2	0.9	63.3	-2.0
E-20 (2)	Restaurant/Bar	E	65.3	66.3	1.0	63.4	-1.9
E-21 (1)	Industrial	F	62.0	62.5	0.5	64.0	2.0
F-1 (1)	Residential	B	**69.5**	**70.3**	0.8	**68.6**	-0.9
F-2 (1)	Residential	B	60.6	61.4	0.8	59.1	-1.5
F-3 (1)	Residential	B	56.1	56.9	0.8	55.6	-0.5
F-4 (1)	Residential	B	52.6	53.4	0.8	52.6	0.0
F-5 (1)	Residential	B	56.9	57.7	0.8	53.7	-3.2

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

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Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
F-6 (1)	Residential	B	60.6	61.4	0.8	59.4	-1.2
F-7 (1)	Residential	B	63.2	64.0	0.8	61.9	-1.3
F-8 (1)	Residential	B	64.0	64.8	0.8	62.9	-1.1
F-9 (1)	Residential	B	59.4	60.2	0.8	58.3	-1.1
F-10 (1)	Residential	B	57.6	58.5	0.9	56.7	-0.9
F-11 (1)	Residential	B	**68.6**	**69.4**	0.8	**70.0**	1.4
F-12 (1)	Residential	B	56.5	57.3	0.8	56.6	0.1
F-13 (1)	Residential	B	65.5	**66.3**	0.8	65.2	-0.3
G-1 (1)	Retail Facility	F	60.3	61.2	0.9	58.4	-1.9
G-2 (1)	Retail Facility	F	61.0	61.8	0.8	60.2	-0.8
G-3 (1)	Retail Facility	F	59.9	60.8	0.9	59.1	-0.8
G-4 (1)	Restaurant/Bar	E	61.8	62.7	0.9	60.5	-1.3
G-5 (5)	Retail Facility	F	61.4	62.2	0.8	60.1	-1.3
G-6 (1)	Retail Facility	F	62.6	63.5	0.9	60.6	-2.0
G-7 (1)	Retail Facility	F	59.7	60.9	1.2	59.3	-0.4
G-8 (1)	Retail Facility	F	68.4	69.5	1.1	68.0	-0.4
H-1 (1)	Retail Facility	F	62.7	64.6	1.9	65.8	3.1
H-2 (1)	Business Office	E	53.1	54.3	1.2	55.5	2.4
H-3 (1)	Day Care	C	62.4	63.3	0.9	63.1	0.7

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

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Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

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Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
H-4 (2)	Retail Facility	F	62.7	63.6	0.9	62.9	0.2
H-5 (2)	Business Office	E	63.1	64.0	0.9	63.2	0.1
H-6 (2)	Restaurant/Bar	E	63.6	64.5	0.9	63.4	-0.2
H-7 (1)	Restaurant/Bar	E	64.5	65.4	0.9	63.7	-0.8
H-8 (1)	Business Office	E	61.6	62.5	0.9	61.0	-0.6
H-9 (1)	Residential	B	54.9	55.8	0.9	54.9	0.0
H-10 (1)	Residential	B	56.3	57.3	1.0	56.1	-0.2
H-11 (1)	Residential	B	58.8	59.7	0.9	58.1	-0.7
H-12 (1)	Residential	B	**69.3**	**70.2**	0.9	**67.2**	-2.1
H-13 (1)	Residential	B	**69.9**	**70.8**	0.9	**68.0**	-1.9
H-14 (1)	Residential	B	57.7	58.6	0.9	56.1	-1.6
H-15 (1)	Residential	B	53.4	54.3	0.9	52.9	-0.5
H-16 (1)	Residential	B	49.4	50.3	0.9	49.1	-0.3
H-17 (1)	Residential	B	**70.6**	**71.5**	0.9	**68.5**	-2.1
H-18 (1)	Residential	B	56.7	57.6	0.9	54.7	-2.0
H-19 (1)	Residential	B	**70.3**	**71.1**	0.8	**68.1**	-2.2
H-20 (1)	Residential	B	56.2	57.1	0.9	55.1	-1.1
H-21 (1)	Residential	B	**70.2**	**71.1**	0.9	**68.9**	-1.3
H-22 (1)	Residential	B	56.3	57.2	0.9	55.5	-0.8

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

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Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
H-23 (1)	Residential	B	**70.2**	**71.0**	0.8	**69.1**	-1.1
H-24 (1)	Residential	B	56.3	57.2	0.9	56.1	-0.2
H-25 (1)	Residential	B	51.4	52.3	0.9	51.0	-0.4
H-26 (1)	Residential	B	**67.2**	**68.1**	0.9	**67.2**	0.0
H-27 (1)	Residential	B	64.8	65.7	0.9	64.9	0.1
H-28 (1)	Residential	B	58.0	58.9	0.9	58.2	0.2
H-29 (1)	Residential	B	53.7	54.6	0.9	53.5	-0.2
H-30 (1)	Sidewalk (2)	E	69.5	70.4	0.9	68.9	-0.6
H-31 (1)	Sidewalk (2)	E	55.7	56.7	1.0	56.5	0.8
H-32 (1)	Sidewalk (2)	E	53.5	54.5	1.0	52.7	-0.8
H-33 (1)	Hotel	E	62.0	62.9	0.9	62.4	0.4
H-34 (3)	Restaurant/Bar	E	60.7	61.7	1.0	62.4	1.7
H-35 (1)	Restaurant/Bar	E	68.1	69.0	0.9	68.8	0.7
H-36 (1)	Residential	B	53.2	54.1	0.9	52.2	-1.0
H-37 (1)	Residential	B	54.9	55.9	1.0	54.2	-0.7
H-38 (1)	Residential	B	55.7	56.6	0.9	55.0	-0.7
H-39 (1)	Residential	B	57.5	58.4	0.9	56.9	-0.6

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(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

(2) The pedestrian bridge over Hwy 169 north of School Street and connecting facilities are identified as sidewalks in the City of Elk River Trail Master Plan (March 19, 2018) available at https://www.elkrivermn.gov/DocumentCenter/View/6660/2018-Elk-River-Trails-Master-Plan. There is no Federal noise abatement criterion for sidewalks.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
H-40 (1)	Residential	B	59.1	60.1	1.0	58.9	-0.2
H-41 (1)	Residential	B	59.4	60.4	1.0	60.1	0.7
H-42 (1)	Truck Station	F	52.2	53.1	0.9	50.6	-1.6
I-1 (1)	Residential	B	61.1	62.1	1.0	60.2	-0.9
I-2 (1)	Residential	B	56.5	57.5	1.0	58.0	1.5
I-3 (1)	Residential	B	53.5	54.3	0.8	56.3	2.8
I-4 (2)	Business Office	E	58.4	59.4	1.0	57.1	-1.3
I-5 (5)	Business Office	E	65.0	65.9	0.9	63.7	-1.3
I-6 (1)	Business Office	E	56.4	57.3	0.9	55.7	-0.7
I-7 (1)	Residential	B	54.5	55.4	0.9	56.9	2.4
I-8 (1)	Residential	B	52.9	53.8	0.9	54.6	1.7
I-9 (1)	Restaurant/Bar	E	61.9	62.7	0.8	61.5	-0.4
I-10 (4)	Residential	B	53.0	53.9	0.9	55.4	2.4
I-11 (1)	Residential	B	52.8	53.6	0.8	55.7	2.9
I-12 (1)	Residential	B	47.8	48.7	0.9	50.2	2.4
I-13 (1)	Retail Facility	F	54.8	55.6	0.8	54.8	0.0
I-14 (4)	Residential	B	52.3	53.1	0.8	52.9	0.6
I-15 (4)	Residential	B	52.7	53.5	0.8	54.3	1.6
I-16 (4)	Residential	B	52.5	53.4	0.9	53.2	0.7

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
I-17 (1)	Restaurant/Bar	E	65.0	65.8	0.8	65.1	0.1
I-18 (1)	Business Office	E	53.9	54.7	0.8	54.4	0.5
I-19 (4)	Residential	B	46.6	47.4	0.8	47.5	0.9
I-20 (9)	Business Office	E	65.7	66.5	0.8	65.8	0.1
I-21 (26)	Residential	B	45.2	46.1	0.9	46.4	1.2
I-22 (3)	Retail Facility	F	66.5	67.3	0.8	66.2	-0.3
I-23 (3)	Business Office	E	52.2	53.0	0.8	52.6	0.4
I-24 (1)	Residential	B	50.1	50.9	0.8	51.1	1.0
I-25 (1)	Residential	B	48.4	49.3	0.9	50.0	1.6
I-26 (1)	Residential	B	47.3	48.2	0.9	49.2	1.9
I-27 (1)	Residential	B	46.5	47.4	0.9	48.5	2.0
I-28 (1)	Residential	B	46.5	47.4	0.9	48.1	1.6
I-29 (1)	Residential	B	46.0	46.9	0.9	47.4	1.4
I-30 (1)	Residential	B	46.0	46.9	0.9	47.0	1.0
I-31 (1)	Residential	B	48.4	49.3	0.9	48.8	0.4
I-32 (3)	Business Office	E	63.3	64.1	0.8	63.0	-0.3
I-33 (1)	Restaurant/Bar	E	66.8	67.6	0.8	N/A	N/A
I-34 (1)	Retail Facility	F	63.9	64.7	0.8	63.4	-0.5
I-35 (7)	Business Office	E	56.1	56.9	0.8	56.0	-0.1

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
I-36-1 (1)	Residential	B	**72.0**	**72.8**	0.8	**71.1**	-0.9
I-36-2 (1)	Residential	B	**72.2**	**73.0**	0.8	**71.1**	-1.1
I-37-1 (1)	Residential	B	61.5	62.3	0.8	61.0	-0.5
I-37-2 (1)	Residential	B	62.2	63.0	0.8	61.0	-1.2
I-38-1 (1)	Residential	B	**72.0**	**72.8**	0.8	**71.1**	-0.9
I-38-2 (1)	Residential	B	**72.2**	**73.0**	0.8	**71.1**	-1.1
I-39-1 (1)	Residential	B	54.5	55.3	0.8	54.5	0.0
I-39-2 (1)	Residential	B	56.4	57.2	0.8	54.5	-1.9
I-40-1 (1)	Residential	B	**72.1**	**72.9**	0.8	**71.1**	-1.0
I-40-2 (1)	Residential	B	**72.3**	**73.1**	0.8	**71.1**	-1.2
I-41-1 (1)	Residential	B	54.4	55.2	0.8	54.5	0.1
I-41-2 (1)	Residential	B	56.2	57.1	0.9	54.5	-1.7
I-42-1 (1)	Residential	B	**72.0**	**72.8**	0.8	**71.1**	-0.9
I-42-2 (1)	Residential	B	**72.2**	**73.1**	0.9	**71.1**	-1.1
I-43-1 (1)	Residential	B	56.2	57.1	0.9	56.1	-0.1
I-43-2 (1)	Residential	B	58.3	59.2	0.9	56.0	-2.3
I-44-1 (1)	Residential	B	52.0	52.9	0.9	52.3	0.3
I-44-2 (1)	Residential	B	54.4	55.2	0.8	52.3	-2.1
I-45-1 (1)	Residential	B	50.3	51.2	0.9	50.9	0.6

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
I-45-2 (1)	Residential	B	52.5	53.4	0.9	50.8	-1.7
I-46-1 (1)	Residential	B	50.9	51.7	0.8	51.4	0.5
I-46-2 (1)	Residential	B	52.5	53.3	0.8	51.4	-1.1
I-47-1 (1)	Residential	B	47.4	48.4	1.0	48.0	0.6
I-47-2 (1)	Residential	B	49.6	50.5	0.9	47.9	-1.7
I-48-1 (1)	Residential	B	53.1	53.9	0.8	54.1	1.0
I-48-2 (1)	Residential	B	56.3	57.1	0.8	54.1	-2.2
I-49-1 (1)	Residential	B	47.4	48.3	0.9	47.7	0.3
I-49-2 (1)	Residential	B	49.4	50.3	0.9	47.7	-1.7
I-50-1 (1)	Residential	B	57.1	58.0	0.9	58.5	1.4
I-50-2 (1)	Residential	B	61.1	61.9	0.8	58.5	-2.6
I-51-1 (1)	Residential	B	47.1	48.1	1.0	48.0	0.9
I-51-2 (1)	Residential	B	49.2	50.1	0.9	48.0	-1.2
I-52 (1)	Residential	B	53.5	54.4	0.9	53.5	0.0
I-53 (1)	Residential	B	46.9	47.8	0.9	47.6	0.7
I-54 (1)	Residential	B	52.0	52.9	0.9	52.3	0.3
I-55 (1)	Residential	B	48.2	49.1	0.9	48.3	0.1
I-56 (1)	Residential	B	61.6	62.4	0.8	62.0	0.4
I-57 (1)	Residential	B	48.6	49.6	1.0	49.1	0.5

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
I-58 (1)	Residential	B	49.9	50.9	1.0	51.0	1.1
I-59 (1)	Residential	B	51.8	52.8	1.0	53.2	1.4
I-60 (1)	Residential	B	53.1	54.2	1.1	54.4	1.3
I-61-1 (1)	Residential	B	**67.6**	**68.4**	0.8	**67.2**	-0.4
I-61-2 (1)	Residential	B	**68.3**	**69.1**	0.8	**67.2**	-1.1
I-62-1 (1)	Residential	B	65.1	**66.0**	0.9	65.0	-0.1
I-62-2 (1)	Residential	B	**66.6**	**67.4**	0.8	65.0	-1.6
I-63-1 (1)	Residential	B	61.9	62.7	0.8	62.1	0.2
I-63-2 (1)	Residential	B	64.8	65.6	0.8	62.1	-2.7
I-64-1 (1)	Residential	B	61.1	61.9	0.8	61.3	0.2
I-64-2 (1)	Residential	B	64.3	65.2	0.9	61.3	-3.0
I-65-1 (1)	Residential	B	**70.5**	**71.3**	0.8	**70.0**	-0.5
I-65-2 (1)	Residential	B	**70.8**	**71.6**	0.8	**70.0**	-0.8
I-66-1 (1)	Residential	B	51.0	51.9	0.9	51.5	0.5
I-66-2 (1)	Residential	B	52.9	53.9	1.0	51.5	-1.4
I-67-1 (1)	Residential	B	**66.4**	**67.2**	0.8	**66.5**	0.1
I-67-2 (1)	Residential	B	**67.1**	**67.9**	0.8	**66.5**	-0.6
I-68-1 (1)	Residential	B	62.1	62.9	0.8	63.2	1.1
I-68-2 (1)	Residential	B	63.7	64.5	0.8	63.2	-0.5

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
I-69-1 (1)	Residential	B	58.3	59.1	0.8	59.6	1.3
I-69-2 (1)	Residential	B	60.8	61.6	0.8	59.6	-1.2
I-70-1 (1)	Residential	B	56.0	56.9	0.9	57.3	1.3
I-70-2 (1)	Residential	B	59.1	60.0	0.9	57.3	-1.8
I-71 (1)	Residential	B	53.3	54.5	1.2	54.4	1.1
I-72 (1)	Residential	B	52.4	53.6	1.2	53.9	1.5
I-73 (1)	Residential	B	57.9	59.1	1.2	57.1	-0.8
I-74 (1)	Retail Facility	F	63.2	64.3	1.1	N/A	N/A
I-75 (1)	Residential	B	58.0	59.2	1.2	57.7	-0.3
I-76 (1)	Residential	B	48.0	49.8	1.8	50.4	2.4
I-77-1 (1)	Residential	B	53.9	54.8	0.9	56.8	2.9
I-77-2 (1)	Residential	B	58.2	59.1	0.9	57.0	-1.2
I-78-1 (1)	Residential	B	51.6	52.5	0.9	53.8	2.2
I-78-2 (1)	Residential	B	55.5	56.4	0.9	53.6	-1.9
I-79-1 (1)	Residential	B	49.8	50.7	0.9	51.7	1.9
I-79-2 (1)	Residential	B	53.3	54.3	1.0	51.7	-1.6
I-80-1 (1)	Residential	B	48.5	49.4	0.9	50.6	2.1
I-80-2 (1)	Residential	B	52.5	53.4	0.9	50.6	-1.9
I-81-1 (1)	Residential	B	60.3	62.7	2.4	63.7	3.4

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
I-81-2 (1)	Residential	B	63.4	65.6	2.2	63.7	0.3
I-82-1 (1)	Residential	B	60.8	63.2	2.4	64.2	3.4
I-82-2 (1)	Residential	B	63.8	**66.0**	2.2	64.2	0.4
I-83-1 (1)	Residential	B	59.9	62.4	2.5	63.1	3.2
I-83-2 (1)	Residential	B	62.6	65.0	2.4	63.1	0.5
I-84-1 (1)	Residential	B	59.3	61.7	2.4	62.4	3.1
I-84-2 (1)	Residential	B	61.9	64.4	2.5	62.4	0.5
I-85-1 (1)	Residential	B	57.6	60.2	2.6	60.4	2.8
I-85-2 (1)	Residential	B	60.1	62.9	2.8	60.4	0.3
I-86-1 (1)	Residential	B	57.1	59.6	2.5	59.8	2.7
I-86-2 (1)	Residential	B	59.6	62.3	2.7	59.8	0.2
I-87 (1)	Park	C	**69.3**	**70.1**	0.8	**68.6**	-0.7
I-88 (1)	Park	C	**69.0**	**69.8**	0.8	**68.6**	-0.4
J-1 (1)	Retail Facility	F	64.5	68.1	3.6	67.4	2.9
J-2 (1)	Retail Facility	F	54.6	56.0	1.4	55.9	1.3
J-3 (1)	Retail Facility	F	51.5	52.8	1.3	53.9	2.4
J-4 (3)	Restaurant/Bar	E	52.8	53.8	1.0	54.5	1.7
J-5 (2)	Restaurant/Bar	E	52.5	53.5	1.0	53.3	0.8
J-6 (4)	Restaurant/Bar	E	54.5	55.4	0.9	54.5	0.0

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments re presented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
J-7(1)	Retail Facility	F	55.3	56.2	0.9	54.9	-0.4
J-8 (1)	Retail Facility	F	62.6	63.5	0.9	61.9	-0.7
J-9 (5)	Restaurant/Bar	E	60.3	61.2	0.9	59.8	-0.5
J-10 (1)	Retail Facility	F	57.0	58.0	1.0	56.6	-0.4
J-11 (1)	Business Office	E	62.0	62.9	0.9	61.7	-0.3
J-12 (1)	Retail Facility	F	57.5	58.4	0.9	56.9	-0.6
J-13 (1)	Retail Facility	F	54.4	55.3	0.9	54.4	0.0
J-14 (1)	School	C	54.8	55.7	0.9	55.0	0.2
J-15 (1)	School	C	56.8	57.6	0.8	57.1	0.3
J-16 (5)	Business Office	E	55.1	55.9	0.8	55.3	0.2
J-17 (1)	Business Office	E	53.6	54.4	0.8	53.8	0.2
J-18 (1)	Residential	B	63.9	64.4	0.5	63.6	-0.3
J-19 (1)	Retail Facility	F	66.0	66.6	0.6	65.6	-0.4
J-20 (1)	Retail Facility	F	68.3	68.8	0.5	68.5	0.2
TR1 (1)	Trail	C	--	--	--	**67.7**	--
TR2 (1)	Trail	C	--	--	--	**68.4**	--
TR3 (1)	Trail	C	--	--	--	**68.7**	--
TR4 (1)	Trail	C	--	--	--	**73.4**	--
TR5 (1)	Trail	C	--	--	--	**73.3**	--

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

Table 3.1 continued Hwy 169 Redefine Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
TR6 (1)	Trail	C	--	--	--	**66.9**	--
TR7 (1)	Trail	C	--	--	--	**70.6**	--
TR8 (1)	Trail	C	--	--	--	**71.6**	--
TR9 (1)	Trail	C	--	--	--	**71.7**	--
TR10 (1)	Trail	C	--	--	--	**71.1**	--
Federal Activity Category B	--	B	67	67	--	67	--
Federal Activity Category C	--	C	67	67	--	67	--
Federal Activity Category E	--	E	72	72	--	72	--
Federal Activity Category F	--	F	--	--	--	--	--

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774.15(f)(3).

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

3.2.2 2040 No Build Alternative

Future Leq noise levels under the 2040 No Build Alternative are projected to range from 44.9 dBA to 73.1 dBA. Modeled traffic noise levels are predicted to increase by 0.5 dBA to 4.1 dBA under the 2040 No Build Alternative compared to existing conditions. Modeled Leq noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category B at 29 receptor locations under the 2040 No Build Alternative. Modeled Leq noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C at two receptor locations representing Baldwin Park under the 2040 No Build Alternative. Modeled Leq noise levels at all other receptor locations are below Federal noise abatement criteria.

3.2.3 2040 Build Alternative

Future Leq noise levels under the 2040 Build Alternative are projected to range from 43.1 dBA to 73.4 dBA. Modeled Leq noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category B at 23 receptor locations under the 2040 Build Alternative. Modeled Leq noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C at two receptor locations representing Baldwin Park under the 2040 Build Alternative. Modeled Leq noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C at 10 receptor locations representing proposed trails along 193rd Avenue and Main Street. Modeled Leq noise levels at all other receptor locations are below Federal noise abatement criteria.

Modeled traffic noise levels are predicted to change by -4.0 dBA to 3.4 dBA under the 2040 Build Alternative compared to existing conditions. None of the modeled receptor locations are projected to experience a substantial increase in noise levels (i.e., increase of 5 dBA or greater from existing to 2040 Build Alternative conditions).

Decreases in traffic noise levels are projected at modeled receptor locations because of changes in the horizontal alignment and vertical profile of Hwy 169 under the Build Alternative. The northbound and southbound Hwy 169 travel lanes are shifted towards the middle of the corridor, removing the existing center median ditch and constructing a center median barrier. The Hwy 169 vertical profile is depressed below the existing ground elevation at School Street and 197th Avenue. Removing the existing traffic signals on Hwy 169 also reduces traffic noise levels associated with accelerating and decelerating vehicles.

Chapter 4 Consideration of Noise Abatement

MnDOT's noise requirements (July 10, 2017) describes noise abatement measures that are to be considered when a traffic noise impact has been identified with a highway improvement project (i.e., modeled traffic noise levels approach or exceed Federal noise abatement criteria, a 5 dBA or greater increase in noise levels from existing to future Build Alternative conditions). These noise abatement measures are described below.

- Construction of noise barriers (noise walls or earthen berms), including acquisition of property rights, either within or outside the highway right of way. Landscaping is not a viable noise abatement measure.
- 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, modified speed limits, and exclusive lane designations.
- Alteration of horizontal and vertical alignments.
- 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.

4.1 Noise Barrier Evaluation

The policies and procedures for evaluating noise barrier feasibility and reasonableness are set forth in Section 5.2 (Feasibility) and Section 5.3 (Reasonableness) of MnDOT's noise requirements (July 10, 2017). The factors for determining noise barrier feasibility and reasonableness as described in the MnDOT noise requirements document are summarized below.

4.1.1 Noise Barrier Feasibility

Noise barrier feasibility is determined based on a consideration of two factors: 1) acoustic feasibility and 2) engineering feasibility.

- **Acoustic feasibility:** For a noise barrier to be considered acoustically effective, it must achieve a noise reduction of at least 5 dBA at the impacted receptors for those receptors to be considered benefited by a noise barrier. Not every

impacted receptor must receive this minimum 5 dBA reduction; however, at least one impacted receptor must meet the minimum 5 dBA reduction for a noise barrier to achieve acoustic feasibility.

- **Engineering feasibility:** Engineering feasibility addresses whether it is possible to design and construct a proposed noise abatement measure. A sample of potential constructability considerations includes safety, topography, drainage, utilities, and maintenance considerations. Engineering considerations are also taken into consideration in 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. It was assumed that utilities in existing right of way could be relocated, existing and proposed drainage could be maintained, and no soil corrections would be necessary for the construction of noise walls. All modeled noise barriers were located within existing or proposed Hwy 169 right of way limits.

4.1.2 Noise Barrier Reasonableness

Noise barrier reasonableness decisions are based on a consideration of three reasonableness factors: 1) noise reduction design goal, 2) cost effectiveness, and 3) the 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) should be equal to, or less than $78,500. To assess cost effectiveness, at least one benefited receptor behind the noise barrier must meet the noise reduction design goal described above. The following formula is used to determine the cost-effectiveness of the barrier:

The cost-effectiveness index is equal to the cost of the noise barrier divided by the number of individual benefited receptors (i.e., residences, commercial entities, industrial entities) that are predicted to experience noise level reductions of 5 dBA or more. Only those receptors that experience a 5 dBA or greater decibel decrease are considered in this formula. The result is a cost per benefited receptor value (residence, commercial entity, or industrial entity represented by each modeled receptor).

The cost of a noise barrier is calculated 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.[3] To be considered cost-effective, the cost per individual benefited receptor must be equal to or less than $78,500 per receptor.

There are several steps to assessing the cost effectiveness of a noise barrier. First, the cost-effective noise barrier height is determined for each segment of the project area. If this noise barrier meets the reasonableness criteria and is feasible, it would be proposed for construction. Noise barrier heights up to MnDOT's maximum noise wall height of 20 feet are studied. Noise barrier cost effectiveness is studied up to the point where a modeled barrier does not meet the noise reduction design goal of a minimum 7 dBA reduction for at least one benefited receptor.

Viewpoint of Benefited Residents and Property Owners

The third criterion in determining noise barrier reasonableness is the viewpoint of benefited residents and property owners. A benefited property is defined as a receptor adjacent to a proposed noise abatement measure that receives a noise reduction equal to or greater than 5 dBA. 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 would 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 measures. 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 in a vote that is weighted as follows:

The owner of a benefited property immediately adjacent to the highway right of way for the proposed project (i.e., first-row properties) receives 4 points and the resident (owner or renter) receives 2 points. The owner/resident of a benefited property receives a total of 6 points.

The owner of a benefited property not immediately adjacent to the highway right of way for the proposed project (e.g., second-row properties, third-row properties) receives 2 points and the resident (owner or renter) receives 1 point. The owner/resident of a benefited property receives a total of 3 points.

When there is no outdoor area of frequent human use associated with a benefited property, the owner of the benefited property receives a total of 4 points if the property is located immediately adjacent to the highway right of way (i.e., first-row properties). If the property is not immediately adjacent to the

[3] The concrete post and concrete panel noise wall is MnDOT's standard noise wall design.

highway right of way (i.e., second-row properties, third-row properties), the owner of the benefited property receives a total of 2 points.

Only those benefited property owners and residents, including individual units of multi-family residential buildings that are benefited receptors, regardless of floor location (e.g., first floor, second floor, etc.), have a vote according to the point system described above. Non-benefiting receptors do not receive points. MnDOT's noise requirements allows for up to two solicitation periods to request votes and determine the outcome regarding proposed noise abatement measures.

- **Initial 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 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 Request**: If the combination of the first and second solicitation results in responses for at least 25 percent of all possible 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 noise barrier will be constructed.

4.1.3 Noise Barrier Analysis Results

Noise barriers (i.e., noise walls) were evaluated at modeled receptor locations adjacent to Hwy 169 where traffic noise levels are predicted to approach or exceed Federal noise abatement criteria under the 2040 Build Alternative, or where modeled receptor locations are projected to experience a substantial increase in noise levels from existing conditions to the 2040 Build Alternative. The layout figures in Appendix A illustrate the locations of modeled noise walls. Table C1 through Table C3 in Appendix C tabulate the modeled noise wall cost-effectiveness results.

Noise Wall 1, East Side of Hwy 169 Between Main Street and 5th Street Northeast (Receptor I-36-1 to Receptor I-88)

Residential land uses are on the east side of Hwy 169 between Main Street and 5th Street Northeast. Baldwin Park is also on the east side of Hwy 169, north of Main Street. Modeled traffic noise levels at residential receptor locations are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative. Modeled traffic noise levels at Baldwin Park are projected to exceed the Federal noise abatement criterion for Activity Category C;

therefore, a noise wall was evaluated on the east side of Hwy 169 between Main Street and 5th Street Northeast.

An approximately 1,075-foot long, 20-foot high noise wall was modeled along the east side of Hwy 169 in highway right of way between Main Street and 5th Street Northeast. The 20-foot high noise wall provides a reduction in traffic noise levels that varies from 0 dBA to 12.7 dBA (see Table C.1 in Appendix C). Noise Wall 1 achieved a 7 dBA reduction or greater at 31 receptors, and a 5 dBA reduction or greater at 33 receptors. The cost-effectiveness of the noise wall is $22,800 per benefited receptor. The approximately 1,075-foot long, 20-foot high noise wall is below MnDOT's cost effectiveness criterion of $78,500 per benefited receptor; therefore, Noise Wall 1 is proposed.

Noise Wall 2, East Side of Hwy 169 Between School Street and 193rd Avenue (Receptor H9 through Receptor H29)

Residential land uses are on the east side of Hwy 169 between School Street and 193rd Avenue, north of the MnDOT Truck Station. Modeled traffic noise levels at receptor locations closest to the Hwy 169 right of way limits are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the east side of Hwy 169 between School Street and 193rd Avenue.

An approximately 975-foot long, 20-foot high noise wall was modeled along the east side of Hwy 169 between School Street and 193rd Avenue. The modeled wall was in highway right of way and extends from the MnDOT Truck Station north of School Street to the pond south of 193rd Avenue. The 20-foot high noise wall provides a reduction in traffic noise levels that varies from 0.4 dBA to 12.6 dBA (see Table C.2 in Appendix C). Noise Wall 2 achieved a 7 dBA reduction or greater at eight receptors, and a 5 dBA reduction or greater at 11 receptors. The cost-effectiveness of the noise wall is $61,855 per benefited receptor. The approximately 975-foot long, 20-foot high noise wall is below MnDOT's cost effectiveness criterion of $78,500 per benefited receptor; therefore, Noise Wall 2 is proposed.

Noise Wall 3, East Side of Hwy 169, North of 197th Avenue (Receptor F1 through Receptor F3)

Residential land uses are on the east side of Hwy 169, north of 197th Avenue. Modeled traffic noise levels at Receptor F1 in the northeast quadrant of Hwy 169 and 197th Avenue are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the east side of Hwy 169, north of 197th Avenue.

An approximately 330-foot long, 20-foot high noise wall was modeled along the east side of Hwy 169, north of 197th Avenue. The modeled wall was in highway right of

way along the entrance ramp to northbound Hwy 169. The 20-foot high noise wall provides a 0.2 dBA to 8.2 dBA reduction in traffic noise levels (see Table C.3 in Appendix C). The approximately 330-foot long, 20-foot high noise wall achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at one receptor. The cost-effectiveness of the noise wall is $216,000 per benefited receptor. The approximately 330-foot long, 20-foot high noise wall exceeds MnDOT's cost effectiveness criterion of $78,500 per benefited receptor and is not proposed.

A 12-foot high noise wall was identified as the maximum noise wall height necessary to achieve the MnDOT noise reduction design goal of a 7 dBA reduction or greater at one receptor location behind Noise Wall 3. Therefore, a 12-foot high noise wall was evaluated.

An approximately 330-foot long, 12-foot high noise wall was modeled along the east side of Hwy 169, north of 197th Avenue. The 12-foot high noise wall provides a 0.2 dBA to 7.0 dBA reduction in traffic noise levels (see Table C.4 in Appendix C). The approximately 330-foot long, 12-foot high noise wall achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at one receptor. The cost-effectiveness of the noise wall is $142,560 per benefited receptor. The approximately 330-foot long, 12-foot high noise wall exceeds MnDOT's cost effectiveness criterion of $78,500 per benefited receptor and is not proposed.

An approximately 330-foot long, 10-foot high noise wall was modeled along the east side of Hwy 169, north of 197th Avenue. The 10-foot high noise wall provides a 0.2 dBA to 6.2 dBA reduction in traffic noise levels (see Table C.5 in Appendix C). The approximately 330-foot long, 10-foot high noise wall does not meet the MnDOT noise reduction design goal of 7 dBA for at least one benefited receptor to be considered reasonable; therefore, Noise Wall 3 is not proposed.

Noise Wall 4, East Side of Hwy 169, South of 201st Avenue (Receptor F11 through Receptor F13)

Residential land uses are on the east side of Hwy 169, south of 201st Avenue. Modeled traffic noise levels at Receptor F11 are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative. Modeled traffic noise levels at Receptor F12 are projected to approach the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the east side of Hwy 169, south of 201st Avenue.

An approximately 830-foot long, 20-foot high noise wall was modeled along the east side of Hwy 169, south of 201st Avenue. The modeled wall was in MnDOT right of way between the northbound Hwy 169 lanes and an overhead utility line along the right of way limits. The 20-foot high noise wall provides a 3.2 dBA to 11.0 dBA reduction in traffic noise levels (see Table C.6 in Appendix C). The approximately

830-foot long, 20-foot high noise wall achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at two receptors. The cost-effectiveness of the noise wall is $288,000 per benefited receptor. The approximately 830-foot long, 20-foot high noise wall exceeds MnDOT's cost effectiveness criterion of $78,500 per benefited receptor and is not proposed.

A 14-foot high noise wall was identified as the maximum noise wall height necessary to achieve a minimum reduction of at least 5 dBA reduction or greater at two receptor locations behind Noise Wall 4. Therefore, a 14-foot high noise wall was evaluated.

An approximately 830-foot long, 14-foot high noise wall was modeled along the east side of Hwy 169, south of 201st Avenue. The 14-foot high noise wall provides a 1.9 dBA to 9.2 dBA reduction in traffic noise levels (see Table C.7 in Appendix C). The approximately 830-foot long, 14-foot high noise wall achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at two receptors. The cost-effectiveness of the noise wall is $206,280 per benefited receptor. The approximately 830-foot long, 14-foot high noise wall exceeds MnDOT's cost effectiveness criterion of $78,500 per benefited receptor and is not proposed.

A 10-foot high noise wall was identified as the maximum noise wall height necessary to achieve the MnDOT noise reduction design goal of a 7 dBA reduction or greater at one receptor location behind Noise Wall 4. Therefore, a 10-foot high noise wall was evaluated.

An approximately 830-foot long, 10-foot high noise wall was modeled along the east side of Hwy 169, south of 201st Avenue. The 10-foot high noise wall provides a 1.2 dBA to 7.3 dBA reduction in traffic noise levels (see Table C.8 in Appendix C). The approximately 830-foot long, 10-foot high noise wall achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at one receptor. The cost-effectiveness of the noise wall is $298,800 per benefited receptor. The approximately 830-foot long, 10-foot high noise wall exceeds MnDOT's cost effectiveness criterion of $78,500 per benefited receptor and is not proposed.

An approximately 830-foot long, 8-foot high noise wall was modeled along the east side of Hwy 169, south of 201st Avenue. The 8-foot high noise wall provides a 0.9 dBA to 5.6 dBA reduction in traffic noise levels (see Table C.9 in Appendix C). The approximately 830-foot long, 10-foot high noise wall does not meet the MnDOT noise reduction design goal of 7 dBA for at least one benefited receptor to be considered reasonable; therefore, Noise Wall 4 is not proposed.

Noise Wall 5, South Side of Main Street at Hwy 169 (Receptor TR6 through Receptor TR10)

Modeled receptor locations on the south side of Main Street between Carson Avenue and Zane Street Northwest represent a proposed trail. Modeled traffic noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C under the 2040 Build Alternative; therefore, a noise wall was evaluated on the south side of Hwy 169 at Main Street.

Based on the MnDOT noise requirement guidance of no more than one receptor per 250 feet of trail, and with no other adjacent benefited receptors, the maximum possible noise wall height adjacent to a trail that can meet MnDOT's cost effectiveness criteria is an 8-foot high noise wall. There are no other impacted receptors on the south side of Main Street at Hwy 169. Therefore, an 8-foot high noise wall was evaluated.

An approximately 630-foot long, 8-foot high noise wall was modeled along the south side of Main Street from Carson Avenue to Zane Street Northwest. The modeled wall was in the boulevard area between the trail and Main Street. Gaps were included in the modeled wall to accommodate interchange ramps to southbound Hwy 169 and from northbound Hwy 169. The 8-foot high noise wall provides a 0.4 dBA to 6.9 dBA reduction in traffic noise levels (see Table C.10 in Appendix C). The approximately 630-foot long, 8-foot high noise wall does not meet the MnDOT noise reduction design goal of 7 dBA for at least one benefited receptor to be considered reasonable; therefore, Noise Wall 5 is not proposed.

Noise Wall 6, South side of 193rd Avenue at Hwy 169 (Receptor TR1 through TR5)

Modeled receptor locations on the south side of 193rd Avenue, from west of Holt Street Northwest to Evans Street Northwest, represent a proposed trail. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2040 Build Alternative; therefore, a noise wall was evaluated on the south side of 193rd Avenue at Hwy 169.

Based on the MnDOT noise requirement guidance of no more than one receptor per 250 feet of trail, and with no other adjacent benefited receptors, the maximum possible noise wall height adjacent to a trail that can meet MnDOT's cost effectiveness criteria is an 8-foot high noise wall. There are no other impacted receptors on the south side of 193rd Avenue at Hwy 169. Therefore, an 8-foot high noise wall was evaluated.

An approximately 620-foot long, 8-foot high noise wall was modeled along the south side of 193rd Avenue from west of Holt Street Northwest to Evans Street Northwest. The modeled wall was in the boulevard area between the trail and 193rd Avenue. Gaps were included in the modeled wall to accommodate interchange ramps to

southbound Hwy 169 and from northbound Hwy 169. The 8-foot high noise wall provides a 0 dBA to 7.9 dBA reduction in traffic noise levels (see Table C.11 in Appendix C). The approximately 620-foot long, 10-foot high noise wall achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at one receptor. The cost-effectiveness of the noise wall is $178,560 per benefited receptor. The approximately 620-foot long, 8-foot high noise wall exceeds MnDOT's cost effectiveness criterion of $78,500 per benefited receptor and is not proposed.

An approximately 620-foot long, 6-foot high noise wall was modeled along the south side of 193rd Avenue from west of Holt Street Northwest to Evans Street Northwest. The modeled wall was in the boulevard area between the trail and 193rd Avenue. Gaps were included in the modeled wall to accommodate interchange ramps to southbound Hwy 169 and from northbound Hwy 169. The 6-foot high noise wall provides a 0 dBA to 5.1 dBA reduction in traffic noise levels (see Table C.12 in Appendix C). The approximately 620-foot long, 6-foot high noise wall does not meet the MnDOT noise reduction design goal of 7 dBA for at least one benefited receptor to be considered reasonable; therefore, Noise Wall 6 is not proposed.

4.1.4 Other Noise Mitigation Techniques

Noise abatement measures other than noise walls were considered but determined not feasible and reasonable for the proposed project. These measures are summarized below.

Traffic Management Measures

Traffic management measures include such items as prohibition of certain vehicle types and time-use restrictions for certain vehicle types. These traffic management measures are not reasonable for the Hwy 169 corridor. These measures would be inconsistent with the function Hwy 169 as principal arterial roadways and as a major freight corridor connecting the Twin Cities to greater Minnesota and beyond. Hwy 169 is identified by MnDOT in the *Minnesota State Freight System and Investment Plan* (January 2018) as a critical rural freight corridor. Hwy 169 also is identified in the Metropolitan Council's *Regional Trunk Highway Corridor Study* as a tier 1 freight corridor.

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 Hwy 169 is 55 mph. The design speed for the project segment of Hwy 169 is 55 mph. Lowering the speed limit on Hwy 169 would be inconsistent with its function as a principal arterial roadway. In addition, motorists would likely not obey a substantially lower speed limit.

Vertical and Horizontal Alignment

The proposed Hwy 169 improvements following the existing highway corridor from the Hwy 101/10 interchange to 197th Avenue. The proposed northbound and southbound Hwy 169 alignments are within existing highway right of way. The existing highway is a divided, rural section highway with center median ditch. The proposed Hwy 169 freeway shifts the northbound and southbound lanes to the middle of the corridor, removing the center median ditch and constructing concrete median barrier. In general, the proposed freeway alignment follows the center of corridor. Shifting the freeway alignment to either the east or west sides of the corridor would reduce traffic noise levels on one side of the corridor at the expense of increasing traffic noise levels on the opposite of the corridor. Changes in the Hwy 169 corridor alignment also would increase right of way impacts for adjacent properties.

The proposed project includes changes in the Hwy 169 vertical profile compared existing conditions from Main Street to 197th Avenue. Changes in the Hwy 169 vertical profile are summarized below. The proposed vertical profile along Hwy 169 was identified based on groundwater elevations; to minimize right of way impacts to adjacent properties; and to maintain driveway access and local road connections along the east and west sides of Hwy 169.

- Hwy 169 would go over Main Street and 193rd Avenue. The proposed freeway elevation would be approximately 16 feet above the existing ground elevation at Main Street, and approximately 18 feet above the existing ground elevation at 193rd Avenue. Retaining walls would be constructed on east and west sides of Hwy 169. Main Street and 193rd Avenue would be depressed to provide the minimum vertical clearance between the roadway and bottom of the proposed Hwy 169 bridges.

- The vertical profile of Hwy 169 would be depressed below existing ground by approximately 12 feet at School Street. School Street would cross over Hwy 169. Retaining walls would be constructed along School Street and the entrance and exit ramps to Hwy 169.

- The vertical profile of Hwy 169 would be depressed below existing ground by approximately 15 feet at 197th Avenue. 197th Avenue would cross over Hwy 169.

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.

Exclusive Land Use Designations

Buffer zones are undeveloped, open spaces adjacent to a roadway corridor. Residential, retail facilities, business offices, restaurants/bars, and industrial land uses are located along Hwy 169 from the Hwy 101/10 interchange to north of 197th Avenue. Because the project is 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.

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 (Leq) (see Table 1.1).

There are day care centers, medical facilities, and schools within the project limits. New Horizon Academy (Receptor B-5) is on the west side of Hwy 169 north of 193rd Avenue. Dawn of Discovery Childcare Center (Receptor H-3) is on the east side of Hwy 169, south of 193rd Avenue. North Memorial Health Clinic (Receptor D-4) is on the west side of Hwy 169, south of School Street. Fairview Health Clinic (Receptor D-18) is on the west side of Hwy 169, north of Main Street. Spectrum Middle School (Receptor J-14) and Spectrum High School (Receptor J-15) are on the east side of Hwy 169 between the BNSF Railway and Main Street. There are no other schools, hospitals, or other land uses identified within Activity Category D in the project area.

New Horizon Academy

New Horizon Academy is a day care on the west side of Hwy 169 between 193rd Avenue and 197th Avenue and is represented by Receptor B-5 (see layout figures in Appendix A, Map 5). Receptor B-5 is at the building entrance on the north side of the building. Outdoor play areas are on the south side of the building. The modeled noise level at Receptor B-5 under the 2040 Build Alternative is 57.8 dBA (Leq).

The modeled noise level at Receptor B-5 is projected to be below the Federal noise abatement criterion of 67 dBA for Activity Category C. The New Horizon Academy property is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative; therefore, interior noise levels were not evaluated.

Dawn of Discovery Childcare Center

Dawn of Discovery Childcare Center is on the east side of Hwy 169, south of 193rd Avenue, and is represented by Receptor H-3 (see layout figures in Appendix A, Map 3). Receptor H-3 is at the building entrance on the west side of the building facing Hwy 169. Outdoor play areas are on the north and east sides of the building. The modeled noise level at Receptor H-3 under the 2040 Build Alternative is 63.1 dBA (Leq).

The modeled noise level at Receptor H-3 is projected to be below the Federal noise abatement criterion of 67 dBA for Activity Category C. Receptor H-3 is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative; therefore, interior noise levels were not evaluated.

North Memorial Health Clinic

North Memorial Health Clinic is on the west side of Hwy 169, south of School Street, and is represented by Receptor D-4 (see layout figures in Appendix A, Map 2). Receptor D-4 is at the building entrance on the east side of the building facing Hwy 169. The modeled noise level at Receptor D-4 under the 2040 Build Alternative is 60.5 dBA (Leq).

The modeled noise level at Receptor D-4 is projected to be below the Federal noise abatement criterion of 67 dBA for Activity Category C. Receptor D-4 is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative; therefore, interior noise levels were not evaluated.

Fairview Health Clinic

Fairview Health Clinic is on the west side of Hwy 169, north of Main Street, and is represented by Receptor D-18 (see layout figures in Appendix A, Map 2). Receptor D-18 is at the building entrance on the south side of the building facing Main Street. The modeled noise level at Receptor D-18 under the 2040 Build Alternative is 63.6 dBA (Leq).

The modeled noise level at Receptor D-18 is projected to be below the Federal noise abatement criterion of 67 dBA for Activity Category C. Receptor D-18 is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative; therefore, interior noise levels were not evaluated.

Spectrum Middle School

Spectrum Middle School is on the east side of Hwy 169 between the BNSF Railway and Main Street and is represented by Receptor J-14 (see layout figures in Appendix A, Map 1). Receptor J-14 is at the building entrance on the west side of the building

facing Hwy 169. The modeled noise level at Receptor J-14 under the 2040 Build Alternative is 55.0 dBA (Leq).

The modeled noise level at Receptor J-14 is projected to be below the Federal noise abatement criterion of 67 dBA for Activity Category C. Receptor J-14 is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative; therefore, interior noise levels were not evaluated.

Spectrum High School

Spectrum High School is on the east side of Hwy 169 between the BNSF Railway and Main Street and is represented by Receptor J-15 (see layout figures in Appendix A, Map 1). Receptor J-15 is at the building entrance on the east side of the building. The modeled noise level at Receptor J-15 under the 2040 Build Alternative is 57.1 dBA (Leq).

An athletic field is located on the south side of the Spectrum High School building. An additional modeling receptor was placed in the center of the athletic field to represent an outdoor area of frequent human use at the school. The modeled noise level at the athletic field under the 2040 Build Alternative is 58.7 dBA (Leq).

The modeled noise levels at Receptor J-15 and the athletic field are projected to be below the Federal noise abatement criterion of 67 dBA for Activity Category C. Receptor J-15 is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative; therefore, interior noise levels were not evaluated.

Chapter 5 Construction Noise

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

Table 5.1 shows peak noise levels monitored at 50 feet from various types of construction equipment. This equipment is primarily associated with site grading/site preparation, which is generally the roadway construction phase associated with the greatest noise levels.

Table 5.1 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: United States Environmental Protection Agency and Federal Highway Administration

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

Any associated high-impact equipment noise, such as pile driving, pavement sawing, or jack hammering, will be unavoidable with construction of the proposed project. Pile-driving noise is associated with any bridge construction and sheet piling necessary for retaining wall construction. While pile-driving equipment results in the highest peak noise level, as shown in Table 5.1 it is limited in duration to the

activities noted above (e.g., bridge construction, retaining wall construction). The use of pile drivers, jack hammers, and pavement sawing equipment will be prohibited during nighttime hours.

Chapter 6 Conclusions and Recommendations

6.1 Traffic Noise Analysis Results

Construction of the Hwy 169 Redefine Project is anticipated to increase modeled future traffic noise levels compared to existing conditions. Modeled Leq noise levels are predicted to range from 43.1 dBA to 73.4 dBA under the 2040 Build Alternative. Modeled Leq noise levels are projected to change by -4.0 dBA to 3.4 dBA under the 2040 Build Alternative compared to existing conditions. Modeled noise levels are predicted to approach or exceed Federal noise abatement criteria at 23 modeled receptor locations representing residential land uses, two receptors representing Baldwin Park, and 10 receptors representing proposed trails along 193rd Avenue and Main Street under the 2040 Build Alternative. None of the 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 2040 Build Alternative.

6.2 Consideration of Noise Abatement Measures

Noise walls were evaluated along Hwy 169 at modeled receptor locations that are projected to approach or exceed Federal noise abatement criteria under the 2040 Build Alternative, or experience a substantial increase from existing conditions to the 2040 Build Alternative. Six noise walls were modeled along the project corridor. Four modeled noise walls did not meet MnDOT's cost effectiveness criterion and noise reduction design goal of 7 dBA or greater.

Based upon the analysis completed following the guidelines and procedures identified in the 2017 MnDOT Noise Requirements, MnDOT intends to construct two noise walls with the Hwy 169 Redefine Project. The layout figures in Appendix A illustrate the location of the proposed noise walls. The following noise walls are being proposed as part of the project:

- Noise Wall 1 is on the east side of Hwy 169 between Main Street and 5th Street Northeast. Noise Wall 1 has a preliminary cost per benefited receptor of $22,800. Noise Wall 1 is 20 feet tall with a proposed length of approximately 1,075 feet. Thirty-three (33) benefited receptors are adjacent to Noise Wall 1.
- Noise Wall 2 is on the east side of Hwy 169 between School Street and 193rd Avenue. Noise Wall 2 has a preliminary cost per benefited receptor of $61,855. Noise Wall 2 is 20 feet tall with a proposed length of approximately 975 feet. Eleven (11) benefited receptors are adjacent to Noise Wall 2.

6.3 Statement of Likelihood

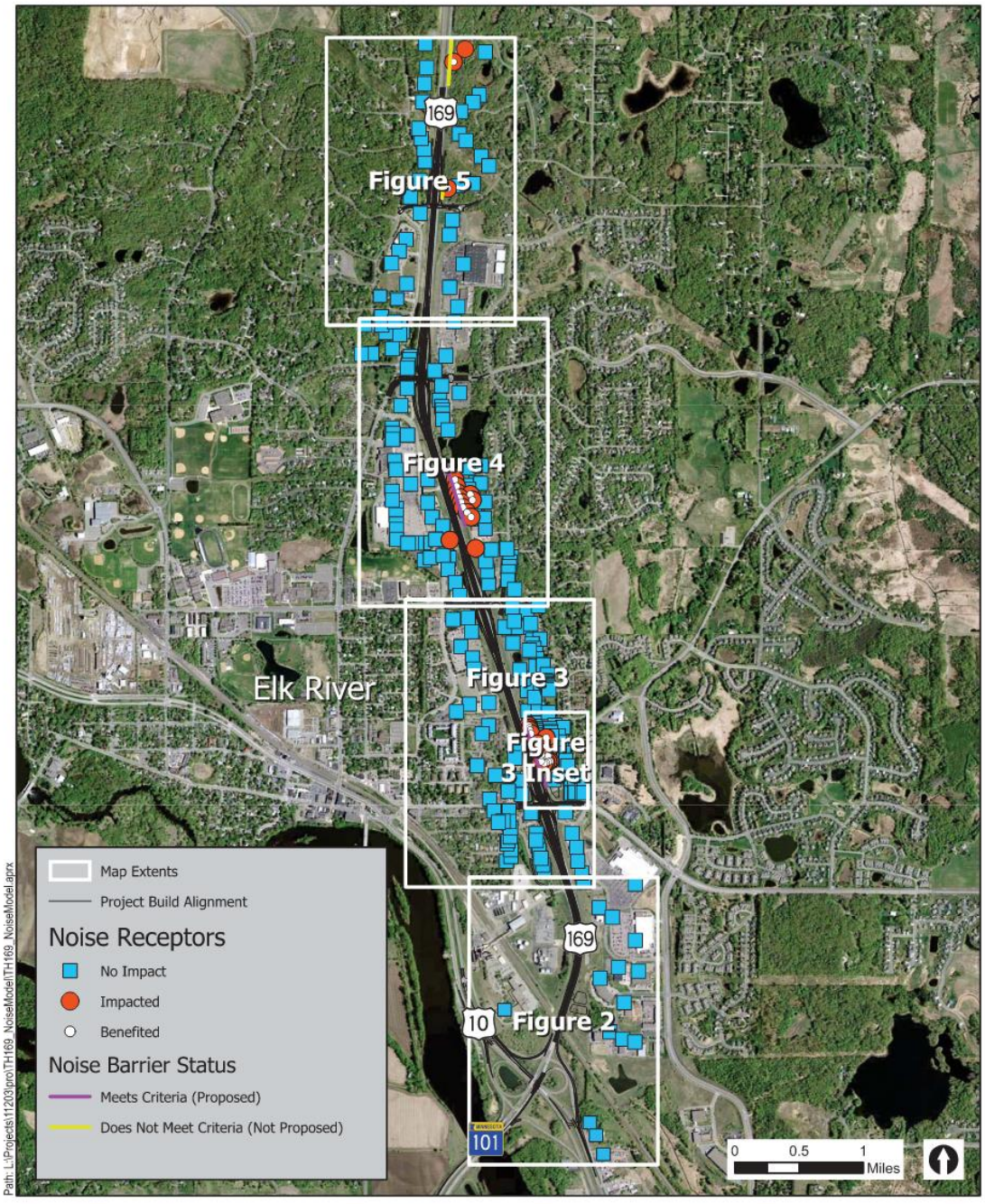
The traffic noise analysis for the proposed noise wall described above is based upon preliminary design studies completed to date. Final noise mitigation decisions will be subject to final design considerations and the viewpoint of benefited residents and property owners.

If conditions substantially change by the time the project reaches the final design stage, noise abatement measures may not be provided. If the final plan changes substantially, receptors that would have received benefits from noise walls, along with local officials, will be notified of plans to eliminate or substantially modify a noise abatement measure prior to the final design process. This notification will explain any changes in site conditions (if any), additional site information, any design changes implemented during the final design process, and explanation of noise wall feasibility and reasonableness. A final decision regarding installation of the proposed abatement measure will be made upon completion of the project's final design and the public involvement process.

Appendix A

Figures

Appendix A. Figure 1 Noise Model



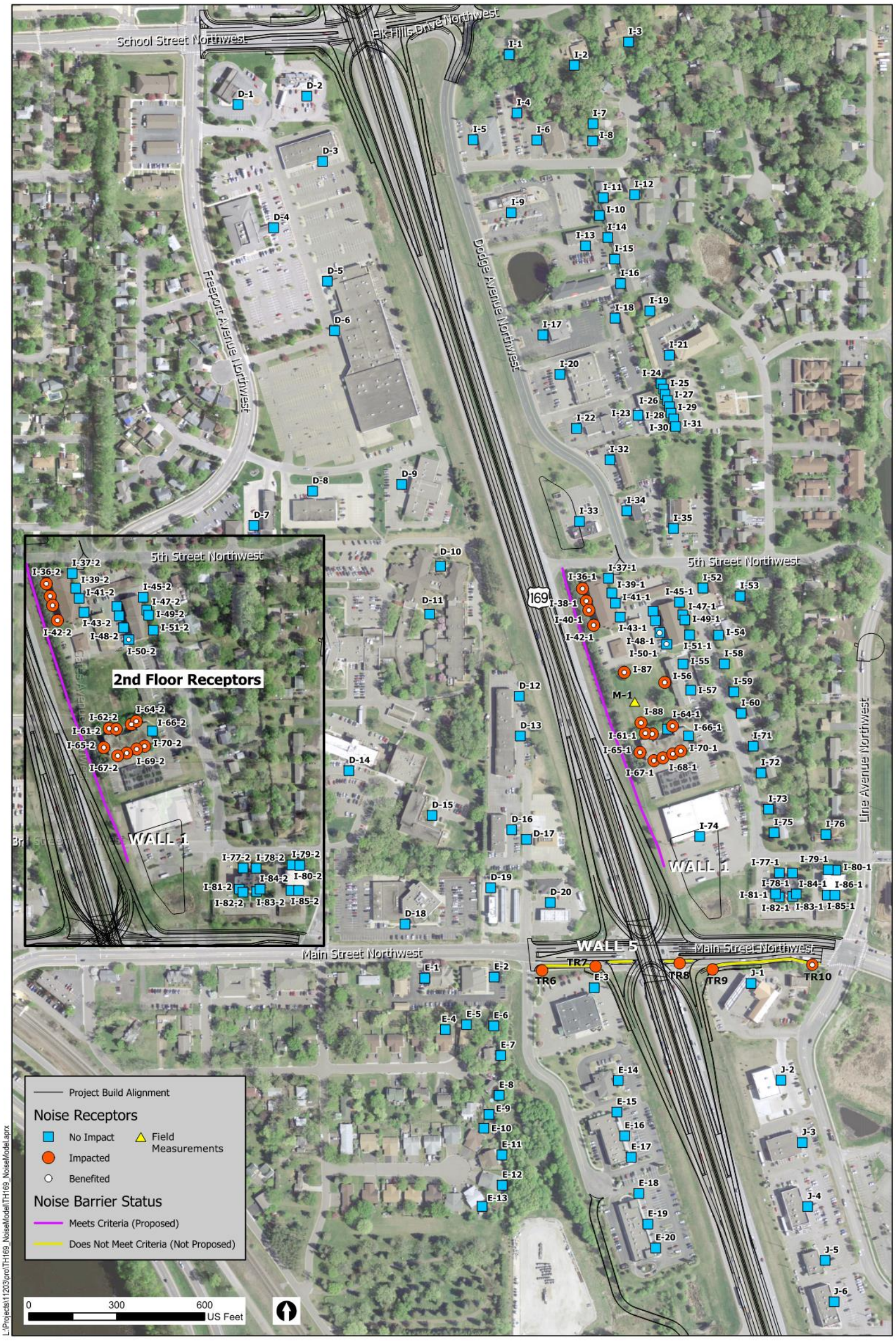
Noise Model
Hwy 169 Redefine – Elk River
MnDOT District 3, SP 7106-87

Figure 1

Noise Receptors - Map 1

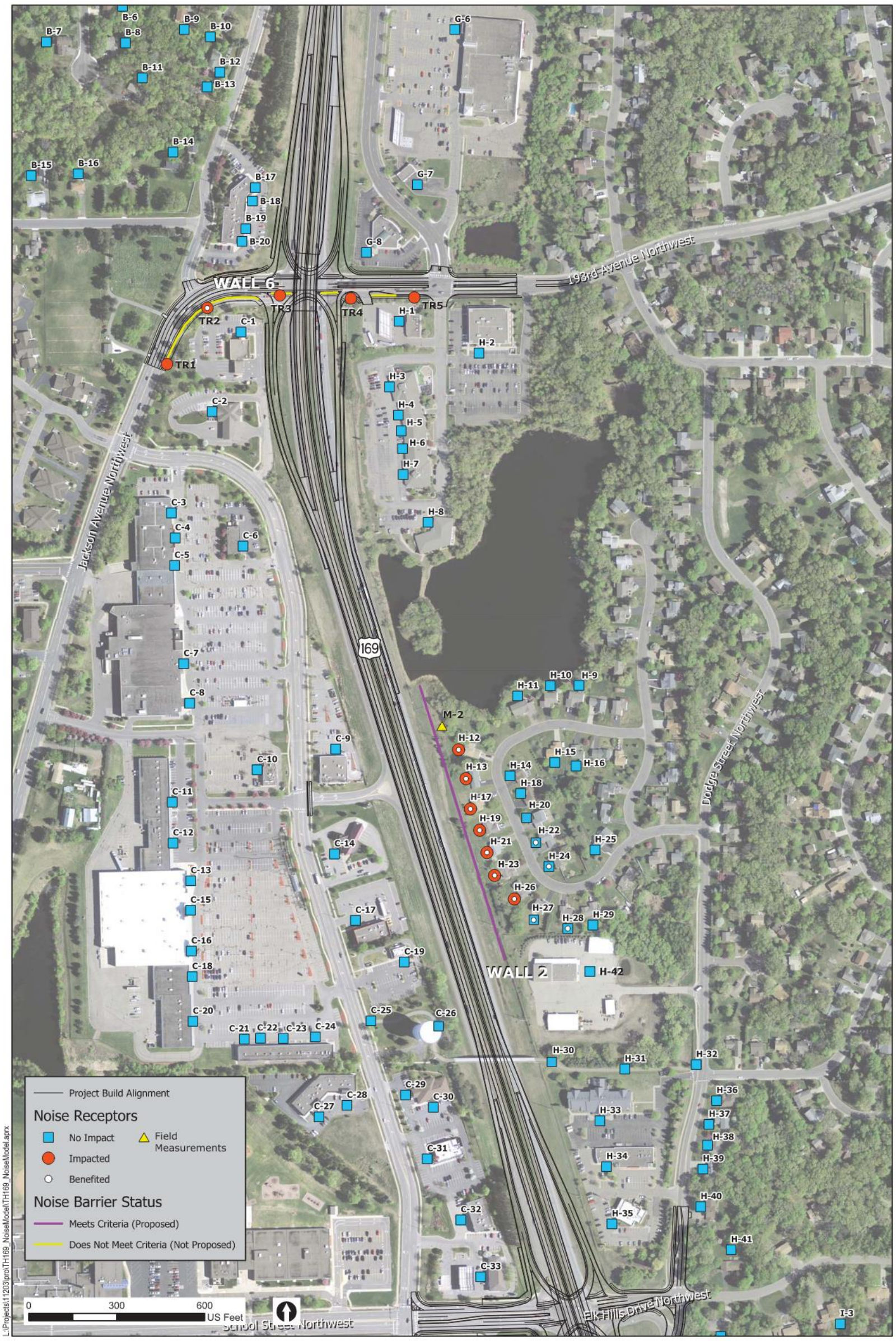
Hwy 169 Redefine – Elk River
MnDOT District 3, SP 7106-87

Figure 2



Noise Receptors - Map 2 — **Figure 3**

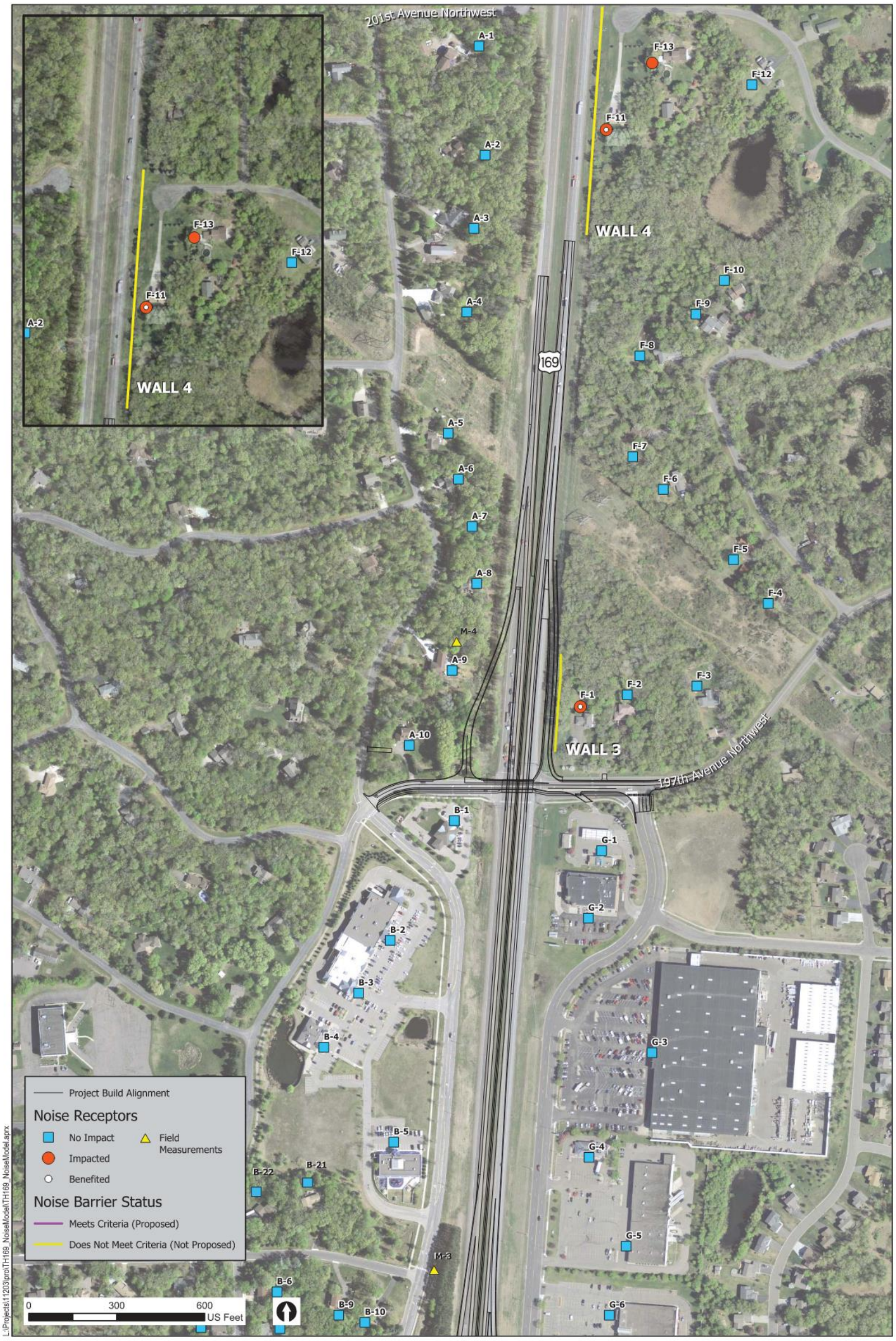
Hwy 169 Redefine – Elk River
MnDOT District 3, SP 7106-87



Noise Receptors - Map 3 — **Figure 4**

Hwy 169 Redefine – Elk River
MnDOT District 3, SP 7106-87

Appendix A. Figure 5 Noise Receptors – Map 4



Noise Receptors - Map 4

Hwy 169 Redefine – Elk River
MnDOT District 3, SP 7106-87

Figure 5

Appendix B

Field Measurement Data Sheets

Appendix B. Field Measurement Data Sheet, Site M1

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT, Sherburne Co., Elk River
Time:	**Fast**	Slow	Date:	October 9, 2019
Weighting:	Lin.	**A**	Project Name:	Hwy 169 Redefine
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 7106-87

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration

Initial Calibration	0.03	Time	12:05 PM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Monitor Location #1 (east side of TH 169, north of Main Street in Baldwin Park) (north of 337 Baldwin Avenue, Elk River), flat terrain along TH 169, highway depressed

Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 169

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/9/2019				
Start Time	12:10 PM				
End Time	12:25 PM				
Weather	Sunny				
Temp (° F)	70				
Rel. Humidity (%)	41				
Wind (mph)	16				
Wind direction	South				
Road conditions	Dry				

TRAFFIC					
Test Number	1 (NB TH 169)	2 (SB TH 169)	3	4	5
Autos	280	264			
Med Trucks	14	17			
Heavy Trucks	26	23			
Buses	--	--			
Motorcycles	--	--			
Total	320	304			
Speed Limit	55 mph	55 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	72.5				
L5	70.3				
L10	69.0				
L50	64.3				
L90	58.9				
L99	54.6				
Leq	65.8				
Lmax	78.9				
Lmin	52.8				

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

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Plan view and cross section images

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

GPS Coordinates: X: 45.305425 Y: -93.55447

Comments:

PLAN VIEW

CROSS SECTION

View from northbound Hwy 169 looking east towards monitor location #1 in Baldwin Park

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Appendix B. Field Measurement Data Sheet, Site M2

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT, Sherburne Co., Elk River
Time:	**Fast**	Slow	Date:	October 9, 2019
Weighting:	Lin.	**A**	Project Name:	Hwy 169 Redefine
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 7106-87

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration

Initial Calibration	--	Time	--
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Monitor Location #2 (east side of TH 169, south of 193rd Avenue) (single-family residence at 11508 190th Lane, Elk River) flat terrain along TH 169, highway depressed

Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 169

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/9/2019				
Start Time	12:45 PM				
End Time	1:00 PM				
Weather	Sunny				
Temp (° F)	70				
Rel. Humidity (%)	41				
Wind (mph)	16				
Wind direction	South				
Road conditions	Dry				

TRAFFIC					
Test Number	1 (NB TH 169)	2 (SB TH 169)	3	4	5
Autos	220	207			
Med Trucks	9	13			
Heavy Trucks	26	24			
Buses	--	--			
Motorcycles	--	--			
Total	255	244			
Speed Limit	55 mph	55 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	75.2				
L5	72.7				
L10	71.5				
L50	66.8				
L90	58.7				
L99	54.5				
Leq	68.0				
Lmax	79.0				
Lmin	53.0				

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

Page 1 of 2

Plan view and cross section images

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

GPS Coordinates: X: 45.317358 Y: -93.558962

Comments:

PLAN VIEW

CROSS SECTION

View from northbound Hwy 169 looking east towards monitor location #2

Appendix B. Field Measurement Data Sheet, Site M3

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT, Sherburne Co., Elk River
Time:	**Fast**	Slow	Date:	October 9, 2019
Weighting:	Lin.	**A**	Project Name:	Hwy 169 Redefine
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 7106-87

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration

Initial Calibration	--	Time	--
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Monitor Location #3 (west side of TH 169, between 193rd and 197th Avenue) (single family residence at 19440 Holt St, Elk River) flat terrrain along TH 169, highway at-grade with location

Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 169

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/9/2019				
Start Time	1:20 PM				
End Time	1:35 PM				
Weather	Sunny				
Temp (^{o} F)	70				
Rel. Humidity (%)	41				
Wind (mph)	16				
Wind direction	South				
Road conditions	Dry				

TRAFFIC					
Test Number	1 (NB TH 169)	2 (SB TH 169)	3	4	5
Autos	240	206			
Med Trucks	8	13			
Heavy Trucks	28	25			
Buses	--	--			
Motorcycles	--	--			
Total	276	244			
Speed Limit	55 mph	55 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	71.5				
L5	68.1				
L10	66.5				
L50	61.0				
L90	54.8				
L99	51.4				
Leq	63.2				
Lmax	76.0				
Lmin	50.2				

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

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Plan view and cross section images

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

GPS Coordinates: X: 45.324277 Y: -93.562223

Comments:

PLAN VIEW

CROSS SECTION

View from Holt Street at monitor location #3 looking east towards Hwy 169

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Appendix B. Field Measurement Data Sheet, Site M4

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT, Sherburne Co., Elk River
Time:	**Fast**	Slow	Date:	October 9, 2019
Weighting:	Lin.	**A**	Project Name:	Hwy 169 Redefine
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 7106-87

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration

Initial Calibration	--	Time	--
Final Calibration	0.01	Time	2:05 PM

Monitor Location and Terrain Conditions: Monitor Location #4 (west side of TH 169, north of 197th Avenue) (single-family residence at 19757 Irving Street, Elk River) flat terrain along TH 169, highway depressed

Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 169

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/9/2019				
Start Time	1:45 PM				
End Time	2:00 PM				
Weather	Sunny				
Temp (° F)	70				
Rel. Humidity (%)	41				
Wind (mph)	16				
Wind direction	South				
Road conditions	Dry				

TRAFFIC					
Test Number	1 (NB TH 169)	2 (SB TH 169)	3	4	5
Autos	--	--			
Med Trucks	--	--			
Heavy Trucks	--	--			
Buses	--	--			
Motorcycles	--	--			
Total	--	--			
Speed Limit	65 mph	65 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	70.7				
L5	68.2				
L10	67.2				
L50	63.5				
L90	58.4				
L99	55.8				
Leq	64.4				
Lmax	73.6				
Lmin	53.9				

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

Page 1 of 2

Plan view and cross section images

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

GPS Coordinates: X: 45.329882 Y: -93.561843

Comments: No traffic counts during field measurement. Highway not visible from receiver location.

PLAN VIEW

CROSS SECTION

View from southbound Hwy 169 looking west towards monitor location #4
(Line of sight between measurement location and hwy blocked by vegetation)

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Appendix C

Noise Wall Cost Effectiveness Results

Table C.1 Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: East Side of Hwy 169 Between Main Street and 5th Street Northeast) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
I-36-1	**71.1**	63.5	7.6	1	1	1	1,075	20,900	$752,400	$22,800
I-36-2	**71.1**	63.5	7.6	1	1	1				
I-37-1	61.0	60.7	0.3	1	0	0				
I-37-2	61.0	60.7	0.3	1	0	0				
I-38-1	**71.1**	61.9	9.2	1	1	1				
I-38-2	**71.1**	61.9	9.2	1	1	1				
I-38-2	63.2	50.5	12.7	1	1	1				
I-39-1	54.5	52.8	1.7	1	0	0				
I-39-2	54.5	52.8	1.7	1	0	0				
I-40-1	**71.1**	61.1	10.0	1	1	1				
I-40-2	**71.1**	61.1	10.0	1	1	1				
I-41-1	54.5	52.7	1.8	1	0	0				
I-41-2	54.5	52.7	1.8	1	0	0				
I-42-1	**71.1**	60.2	10.9	1	1	1				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.1 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: East Side of Hwy 169 Between Main Street and 5th Street Northeast) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
I-42-2	**71.1**	60.2	10.9	1	1	1	1,075	20,900	$752,400	$22,800
I-43-1	56.1	52.2	3.9	1	0	0				
I-43-2	56.0	52.2	3.8	1	0	0				
I-44-1	52.3	48.9	3.4	1	0	0				
I-44-2	52.3	48.9	3.4	1	0	0				
I-45-1	50.9	50.5	0.4	1	0	0				
I-45-2	50.8	50.5	0.3	1	0	0				
I-46-1	51.4	48.8	2.6	1	0	0				
I-46-2	51.4	48.8	2.6	1	0	0				
I-47-1	48.0	47.0	1.0	1	0	0				
I-47-2	47.9	46.9	1.0	1	0	0				
I-48-1	54.1	48.8	5.3	1	1	0				
I-48-2	54.1	48.8	5.3	1	1	0				
I-49-1	47.7	46.6	1.1	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.1 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: East Side of Hwy 169 Between Main Street and 5th Street Northeast) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
I-49-2	47.7	46.6	1.1	1	0	0	1,075	20,900	$752,400	$22,800
I-50-1	58.5	50.3	8.2	1	1	1				
I-50-2	58.5	50.3	8.2	1	1	1				
I-51-1	48.0	46.7	1.3	1	0	0				
I-51-2	48.0	46.7	1.3	1	0	0				
I-52	53.5	53.2	0.3	1	0	0				
I-53	47.6	45.8	1.8	1	0	0				
I-54	52.3	50.3	2.0	1	0	0				
I-55	48.3	45.3	3.0	1	0	0				
I-56	62.0	53.0	9.0	1	1	1				
I-57	49.1	46.7	2.4	1	0	0				
I-58	51.0	49.7	1.3	1	0	0				
I-59	53.2	50.0	3.2	1	0	0				
I-60	54.4	50.9	3.5	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.1 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: East Side of Hwy 169 Between Main Street and 5th Street Northeast) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
I-61-1	**67.2**	56.5	10.7	1	1	1	1,075	20,900	$752,400	$22,800
I-61-2	**67.2**	56.5	10.7	1	1	1				
I-62-1	65.0	54.9	10.1	1	1	1				
I-62-2	65.0	54.8	10.2	1	1	1				
I-63-1	62.1	53.2	8.9	1	1	1				
I-63-2	62.1	53.2	8.9	1	1	1				
I-64-1	61.3	52.7	8.6	1	1	1				
I-64-2	61.3	52.7	8.6	1	1	1				
I-65-1	**70.0**	58.3	11.7	1	1	1				
I-65-2	**70.0**	58.3	11.7	1	1	1				
I-66-1	51.5	48.9	2.6	1	0	0				
I-66-2	51.5	48.9	2.6	1	0	0				
I-67-1	**66.5**	54.0	12.5	1	1	1				
I-67-2	**66.5**	54.0	12.5	1	1	1				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.1 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: East Side of Hwy 169 Between Main Street and 5th Street Northeast) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
I-68-1	63.2	50.5	12.7	1	1	1	1,075	20,900	$752,400	$22,800
I-69-1	59.6	48.2	11.4	1	1	1				
I-69-2	59.6	48.2	11.4	1	1	1				
I-70-1	57.3	47.3	10.0	1	1	1				
I-70-2	57.3	47.3	10.0	1	1	1				
I-71	54.4	52.8	1.6	1	0	0				
I-72	53.9	52.9	1.0	1	0	0				
I-73	57.1	56.7	0.4	1	0	0				
I-74	N/A	N/A	N/A	N/A	N/A	N/A				
I-75	57.7	57.1	0.6	1	0	0				
I-76	50.4	49.9	0.5	1	0	0				
I-77-1	56.8	56.2	0.6	1	0	0				
I-77-2	57.0	56.7	0.3	1	0	0				
I-78-1	53.8	52.8	1.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.1 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: East Side of Hwy 169 Between Main Street and 5th Street Northeast) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
I-78-2	53.6	52.7	0.9	1	0	0	1,075	20,900	$752,400	$22,800
I-79-1	51.7	50.8	0.9	1	0	0				
I-79-2	51.7	51.2	0.5	1	0	0				
I-80-1	50.6	49.8	0.8	1	0	0				
I-80-2	50.6	49.8	0.8	1	0	0				
I-81-1	63.7	63.7	0.0	1	0	0				
I-81-2	63.7	63.7	0.0	1	0	0				
I-82-1	64.2	64.1	0.1	1	0	0				
I-82-2	64.2	64.1	0.1	1	0	0				
I-83-1	63.1	63.1	0.0	1	0	0				
I-83-2	63.1	63.1	0.0	1	0	0				
I-84-1	62.4	62.4	0.0	1	0	0				
I-84-2	62.4	62.4	0.0	1	0	0				
I-85-1	60.4	60.4	0.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.1 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: East Side of Hwy 169 Between Main Street and 5th Street Northeast) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
I-85-2	60.4	60.4	0.0	1	0	0	1,075	20,900	$752,400	$22,800
I-86-1	59.8	59.8	0.0	1	0	0				
I-86-2	59.8	59.8	0.0	1	0	0				
I-87	**68.6**	57.4	11.2	1	1	1				
I-88	**68.6**	57.7	10.9	1	1	1				
Total number of benefited residences, commercial, or industrial establishments for Modeled Wall 1					33	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.2 Noise Mitigation Cost Effectiveness Results (Modeled Wall 2: East Side of Hwy 169 Between School Street and 193rd Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
H-9	54.9	54.5	0.4	1	0	0	975	18,900	$680,400	$61.855
H-10	56.1	55.5	0.6	1	0	0				
H-11	58.1	56.8	1.3	1	0	0				
H-12	**67.2**	55.4	11.8	1	1	1				
H-13	**68.0**	55.8	12.2	1	1	1				
H-14	56.1	52.4	3.7	1	0	0				
H-15	52.9	49.5	3.4	1	0	0				
H-16	49.1	46.1	3.0	1	0	0				
H-17	**68.5**	55.9	12.6	1	1	1				
H-18	54.7	51.2	3.5	1	0	0				
H-19	**68.1**	56.0	12.1	1	1	1				
H-20	55.1	50.4	4.7	1	0	0				
H-21	**68.9**	56.5	12.4	1	1	0				
H-22	55.5	50.2	5.3	1	1	0				
H-23	**69.1**	57.2	11.9	1	1	1				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.2 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 2: East Side of Hwy 169 Between School Street and 193rd Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
H-24	56.1	50.8	5.3	1	1	0	975	18,900	$680,400	$42,525
H-25	51.0	49.1	1.9	1	0	0				
H-26	**67.2**	56.7	10.5	1	1	1				
H-27	64.9	57.7	7.2	1	1	1				
H-28	58.2	52.7	5.5	1	1	0				
H-29	53.5	49.4	4.1	1	0	0				
Total number of benefited residences, commercial, industrial establishments for Modeled Wall 2					**11**	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.3 Noise Mitigation Cost Effectiveness Results (Modeled Wall 3: East Side of Hwy 169, North of 197th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
F1	**68.2**	60.0	8.2	1	1	1	330	6,000	$216,000	$216,000
F2	58.1	56.8	1.3	1	0	0				
F3	55.1	54.9	0.2	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.4 Noise Mitigation Cost Effectiveness Results (Modeled Wall 3: East Side of Hwy 169, North of 197th Avenue) (12-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
F1	**68.2**	61.2	7.0	1	1	1	330	3,960	$142,560	$142,560
F2	58.1	56.9	1.2	1	0	0				
F3	55.1	54.9	0.2	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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 C.5 Noise Mitigation Cost Effectiveness Results (Modeled Wall 3: East Side of Hwy 169, North of 197th Avenue) (10-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
F1	**68.2**	62.0	6.2	1	1	0	330	3,300	$118,800	N/A
F2	58.1	57.0	1.1	1	0	0				
F3	55.1	54.9	0.2	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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 no ise barrier.

Table C.6 Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: East Side of Hwy 169, South of 201st Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
F11	**69.9**	58.9	11.0	1	1	1	830	16,000	$576,000	$288,000
F12	56.7	53.5	3.2	1	0	0				
F13	**66.1**	59.5	6.6	1	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.7 Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: East Side of Hwy 169, South of 201st Avenue) (14-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
F11	**69.9**	60.7	9.2	1	1	1	830	11,460	$412,560	$206,280
F12	56.7	54.8	1.9	1	0	0				
F13	**66.1**	61.1	5.0	1	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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) Area of the barrier includes tapers on both ends.

Table C.8 Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: East Side of Hwy 169, South of 201st Avenue) (10-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
F11	**69.9**	62.6	7.3	1	1	1	830	8,300	$298,800	$298,800
F12	56.7	55.5	1.2	1	0	0				
F13	**66.1**	62.8	3.3	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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 C.9 Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: East Side of Hwy 169, South of 201st Avenue) (8-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
F11	**69.9**	64.3	5.6	1	1	0	830	6,640	$239,040	N/A
F12	56.7	55.8	0.9	1	0	0				
F13	**66.1**	63.9	2.2	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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 C.10 Noise Mitigation Cost Effectiveness Results (Modeled Wall 5: South Side of Main Street at Hwy 169) (8-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
TR6	**66.9**	65.3	1.6	1	0	0	630	5,040	$181,440	N/A
TR7	**70.6**	**70.2**	0.4	1	0	0				
TR8	**71.6**	**68.1**	3.5	1	0	0				
TR9	**71.7**	**68.3**	3.4	1	0	0				
TR10	**71.1**	64.2	6.9	1	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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 C.11 Noise Mitigation Cost Effectiveness Results (Modeled Wall 6: South Side of 193rd Avenue at Hwy 169) (8-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
TR1	**67.7**	63.9	3.8	1	0	0	620	4,960	$178,560	$178,560
TR2	**68.4**	60.5	7.9	1	1	1				
TR3	**68.7**	64.8	3.9	1	0	0				
TR4	**73.4**	**73.3**	0.1	1	0	0				
TR5	**73.3**	**73.3**	0.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA or greater 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 C.12 Noise Mitigation Cost Effectiveness Results (Modeled Wall 6: South Side of 193rd Avenue at Hwy 169) (6-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, 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
TR1	**67.7**	65.0	2.7	1	0	0	620	3,720	$133,920	N/A
TR2	**68.4**	63.3	5.1	1	1	0				
TR3	**68.7**	**66.0**	2.7	1	0	0				
TR4	**73.4**	**73.3**	0.1	1	0	0				
TR5	**73.3**	**73.3**	0.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15(f)(2) or 23 CFR 774(f)(3).

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

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