US-23 FLEX ROUTE PHASE 2 PROJECT
TRAFFIC NOISE TECHNICAL REPORT

May 2022

FlexRoute23

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1 Executive Summary

This report evaluates the potential noise impacts of the proposed completion of the US-23 Flex Route Phase 2 project located in Livingston County, Michigan in conformance with corresponding Federal regulations and guidance, and the National Environmental Policy Act (NEPA). The determination of noise abatement measures and locations complies with the Federal Highway Administration's (FHWA's) *Procedures for Abatement of Highway Traffic Noise and Construction Noise* as presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 722), and the Michigan Department of Transportation (MDOT): *Highway Noise Analysis and Abatement Handbook*, dated July 2011 (Handbook). The Handbook complies with *the State Transportation Commission Policy 10136 Noise Abatement*, dated October 17, 2019.

US-23 Flex Route Phase 1 is a 9-mile, part-time shoulder-use lane between M-14 and M-36 (9 Mile Road) in Washtenaw and Livingston Counties. Open to traffic in 2017, the Flex Route is operational during peak periods and incidents and has reduced peak hour travel times and primary and secondary crashes. To further improve the US-23 corridor, MDOT plans to extend the Flex Route through the M-36 (9 Mile Road) interchange to I-96 in fiscal year 2023.

MDOT has begun to study Phase 2 of the project to extend the Flex Route to the I-96/US-23 interchange (the Build alternative). The project will perform traffic analysis, roadway and bridge scoping, conduct environmental surveys and prepare National Environmental Policy Act (NEPA) documentation. The project limits are along US-23 from south of M-36 (9 Mile Road) to one mile north of Spencer Road, which is north of I-96. Note that the noise analysis for the study area south of M-36 (9 Mile Road) was added to this report later than the rest of the study area because at the commencement of this noise study, active construction was taking place on the existing noise barrier in CNE R (constructed with the Phase 1 noise analysis) that would have made measurements and modeling inaccurate in this area until work on the noise barrier was complete.

Highway improvement projects categorized as Type I according to 23 CFR 772.5 are required to undergo a noise abatement analysis. The project is being studied as a Type I project because of the addition of flex lanes, along with interchange reconfigurations at M-36 (9 Mile Road) and Silver Lake Road.

Existing noise level measurements were conducted on August 20th, August 21st, and September 23rd, 2020. Existing noise level measurements were also conducted on December 20, 2021 south of M-36 (9 Mile Road). In total, existing noise level measurements were gathered at 13 representative sites in the project corridor. The existing noise measurements were conducted in order to validate use of the FHWA's Traffic Noise Model Version 2.5 (TNM) to predict future noise levels. Fifteen-minute measurements were taken at each site. Measurement locations are shown as "field sites" on the figures in Appendix A. Traffic was counted concurrently during each noise measurement and classified by vehicle type: cars, medium trucks (two axles), heavy trucks (three or more axles), buses and motorcycles. To validate TNM, the measured noise levels were compared to the modeled noise levels using the same traffic volumes,

speeds, and vehicle types that were present during each field measurement. The modeled noise levels at the 13 sites compared within 3 dB(A) of the measured levels, which satisfies the MDOT requirement for validating TNM.

TNM was used to model existing (2020) and future design year (2045) Build worst-case traffic noise levels within the noise study area. The analysis modeled 524 noise receivers representing 529 receptors (or units). The analysis provides existing and future noise levels, as well as identifies receptors that are impacted, that is, they approach or exceed the FHWA Noise Abatement Criteria (NAC). The analysis results indicate 192 receivers representing 193 receptor units, including 188 residential units (NAC B), four (4) outdoor recreational receptors (NAC C), and one (1) hotel outdoor courtyard (NAC E), are impacted by the Build alternative. No future noise levels would substantially exceed existing noise levels.

Noise abatement was analyzed for impacted receptors per MDOT policy. Eighteen (18) noise barriers have been evaluated for this noise study. Seventeen (17) barriers meet preliminary feasibility criteria, but do not meet reasonableness criteria as the estimated cost of these barriers per benefited receptor would exceed 3 percent above the allowable cost per benefited receptor unit (CPBU) of $48,425 in 2020 dollars (3 percent above results in a not to exceed cost of $49,878).[1] The noise barrier evaluated in CNE L was found to meet MDOT's preliminary feasibility and reasonableness criteria.

In addition to the 18 noise barriers evaluated, the existing noise barrier in CNE R was also evaluated and found to meet MDOT's feasibility and reasonableness criteria as built; therefore, no further modification for this barrier is required as part of this project. The noise barriers are summarized in Table 1 and shown on the figures in Appendix A.

There are scattered residential (NAC B) impacts throughout the corridor that are isolated and were not feasible or reasonable to include with the noise abatement analyzed. Because these impacts are isolated or located too far from denser areas of noise-sensitive use, noise barriers would not be an effective abatement strategy for these impacted locations. There is an impacted hotel courtyard (NAC E) that was not analyzed for noise abatement because it is isolated from other impacted areas, and the property has advertisement signs that are visible from the highway. It is generally known that NAC E sites prefer that there be no interference with the view to their establishments.

MDOT's noise policy states that all noise abatement measures determined to be feasible and reasonable shall be incorporated into the transportation improvement project. Based on the study completed, preliminary abatement of noise impacts for the project meets the MDOT feasibility and reasonableness factors at one (1) location for impacted receptors in CNE L.

[1] Thomas Hanf, MDOT Air Quality & Noise Abatement, email regarding "2020 CPBU", November 9, 2020.

Table 1. Noise Barrier Designs Analyzed

Barrier ID	Number of Attenuated Locations					Cost	Cost/Benefit	Feasible[a]	Reasonable[b]
	≥ 10 dB(A)	≥ 7 dB(A)		≥ 5 dB(A) (Benefited Receivers)					
		#	% of Benefited	#	% of Impacted			(Y/N)	(Y/N)
Barrier A	1	7	88%	8	100%	$3,663,675	$457,959	Y	N
Barrier B1	2	6	55%	11	91%	$2,123,865	$193,079	Y	N
Barrier B2	2	3	60%	5	83%	$2,310,255	$462,051	Y	N
Barrier C1	0	2	67%	3	100%	$1,741,185	$580,395	Y	N
Barrier C2	1	4	67%	6	100%	$1,439,865	$239,978	Y	N
Barrier C3	1	9	82%	11	100%	$1,628,910	$148,083	Y	N
Barrier E1	0	1	33%	3	100%	$1,619,595	$539,865	Y	N
Barrier E2	1	11	65%	17	100%	$1,475,910	$86,818	Y	N
Barrier EF	1	23	53%	43	93%	$3,527,775	$82,041	Y	N
Barrier F	1	3	75%	4	100%	$1,170,000	$292,500	Y	N
Barrier G	0	0	0%	29	86%	$2,017,935	$69,584	Y	N
Barrier K	6	14	52%	27[c]	100%	$1,664,820	$61,660	Y	N
Barrier L	3	8	53%	15	100%	$734,535	$48,969	Y	Y
Barrier M	1	2	67%	3	100%	$528,120	$176,040	Y	N
Barrier N1	2	15	71%	21	100%	$1,251,855	$59,612	Y	N
Barrier N2	2	7	50%	14	100%	$1,629,090	$116,364	Y	N
Barrier O	1	11	58%	19	100%	$2,025,090	$106,584	Y	N
Barrier R[d]	19	41	60%	68	90%	$1,656,045	$24,354	Y	Y
Barrier S	1	6	50%	12	100%	$1,585,008[e]	$132,084	Y	N

[a]) MDOT requires that noise barriers achieve a 5 dB(A) reduction at 75 percent of the impacted receptors. If a barrier cannot achieve this, abatement is considered to not be acoustically feasible. Noise barrier abatement also might not be feasible due to constructability or safety constraints.

[b]) The design year attenuation requirement for Michigan is to provide a noise reduction of 10 dB(A) for at least one benefited receptor and at least a 7 dB(A) reduction for 50 percent or more of the benefited receptor sites.

[c]) K-48 behind this barrier represents two dwelling units.

[d]) The noise barrier analysis for this existing noise barrier reflects design year noise level reductions without the barrier in place in order to show the feasibility and reasonableness of the existing barrier. Note the figures in Appendix A show impacts with the barrier in place, and barrier analysis results by receiver, including benefits behind the existing barrier based on design year noise levels with and without the barrier in place, are given in Table D-18 in Appendix D.

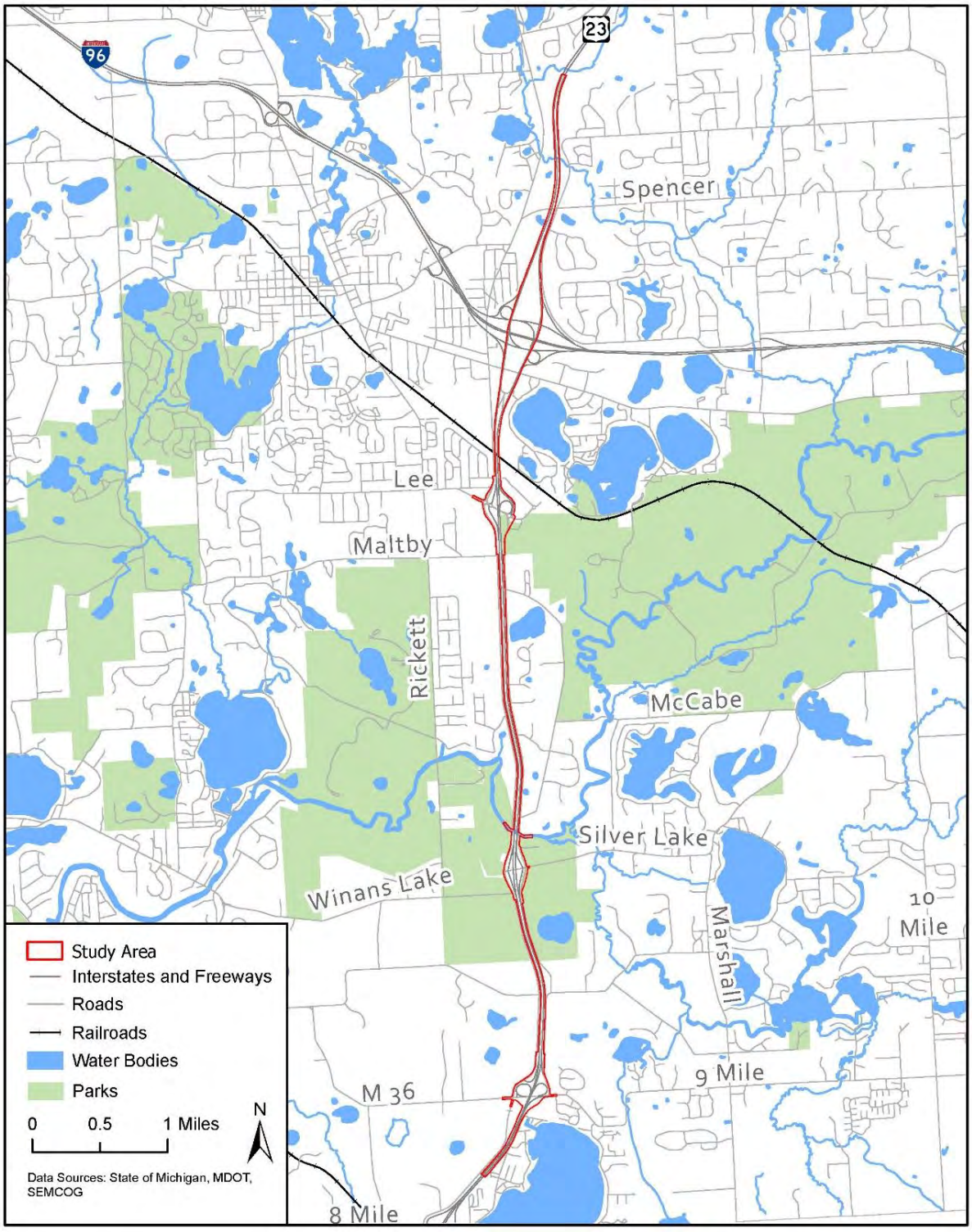
[e]) Cost includes an additional $9/sqft above the $45/sqft planning cost for additional moment slab concrete to balance the noise wall load on proposed retaining wall.

2 Purpose of this Report

This technical report evaluates the potential noise impacts and analyzes potential abatement for the proposed completion of the US-23 Flex Route Phase 2 project based on existing and proposed traffic data and engineering designs for the project. The project proposes to improve traffic operations and safety by extending the Flex Route on US-23 through the M-36 (9 Mile Road) interchange to the I-96/US-23 interchange (the Build alternative) in Livingston County, MI. Figure 1 shows the project location; the study area shown represents the limits of environmental analysis for the project.

One alternative is being evaluated for the project. The noise study area for the project is shown on the figures in Appendix A and includes a 500-foot boundary around the limits of environmental analysis.

Figure 1. Project Location



2.1 Project Description

US-23 Flex Route Phase 1 is a 9-mile, part-time shoulder-use lane between M-14 and M-36 (9 Mile Road) in Washtenaw and Livingston Counties. Open to traffic in 2017, the Flex Route is operational during peak periods and incidents and has reduced peak hour travel times and primary and secondary crashes. To further improve the US-23 corridor, the Michigan Department of Transportation (MDOT) plans to extend the Flex Route through the M-36 (9 Mile Road) interchange to I-96 in fiscal year 2023.

MDOT has begun to study Phase 2 of the project to extend the Flex Route to the I-96/US-23 interchange (the Build alternative). The project will perform traffic analysis, roadway and bridge scoping, conduct environmental surveys and prepare National Environmental Policy Act (NEPA) documentation. The project limits are along US-23 from south of M-36 (9 Mile Road) to one mile north of Spencer Road, which is north of I-96.

3 Traffic Noise Concepts, Policy and Guidelines

3.1 Basic Noise Information

Noise is defined as unwanted sound. Sound is what we hear when there are variations in air pressure. The ear is sensitive to this pressure variation and perceives it as sound. The intensity of these pressure variations causes the ear to discern different levels of loudness. These pressure differences are most commonly measured in decibels.

The decibel (dB) is the unit of measurement for sound. The decibel scale audible to humans spans approximately 140 dB. A level of zero decibels corresponds to the lower limit of audibility, while 140 dB produces a sensation more akin to pain than sound. The decibel scale is a logarithmic representation of the actual sound pressure variations. Therefore, a 26 percent change in the energy level only changes the sound level 1-dB. The human ear would not detect this change except in an acoustical laboratory. A doubling of the energy level would result in a 3-dB increase, which would be barely perceptible in the natural environment. A tripling in energy sound level would result in a clearly noticeable change of 5-dB in the sound level. A change of ten (10) times the energy level would result in a 10-dB change in the sound level. This would be perceived as a doubling (or halving) of the apparent loudness. Table 2 provides a comparison of sound level changes with relative loudness.

The human ear has a non-linear sensitivity to noise. To account for this in noise measurements, electronic weighting scales are used to define the relative loudness of different frequencies. The "A" weighting scale is widely used in environmental work because it closely resembles the non-linearity of human hearing. Therefore, the unit of measurement for an A-weighted noise level is dB(A).

Table 2. Logarithmic Nature of Sound

Change in $L_{eq(1h)}$ Sound Level	Relative Loudness in the Natural Environment
+/- 3 dB(A)	Barely Perceptible Change
+/- 5 dB(A)	Readily Perceptible Change
+/- 10 dB(A)	Considered Twice or Half as Loud

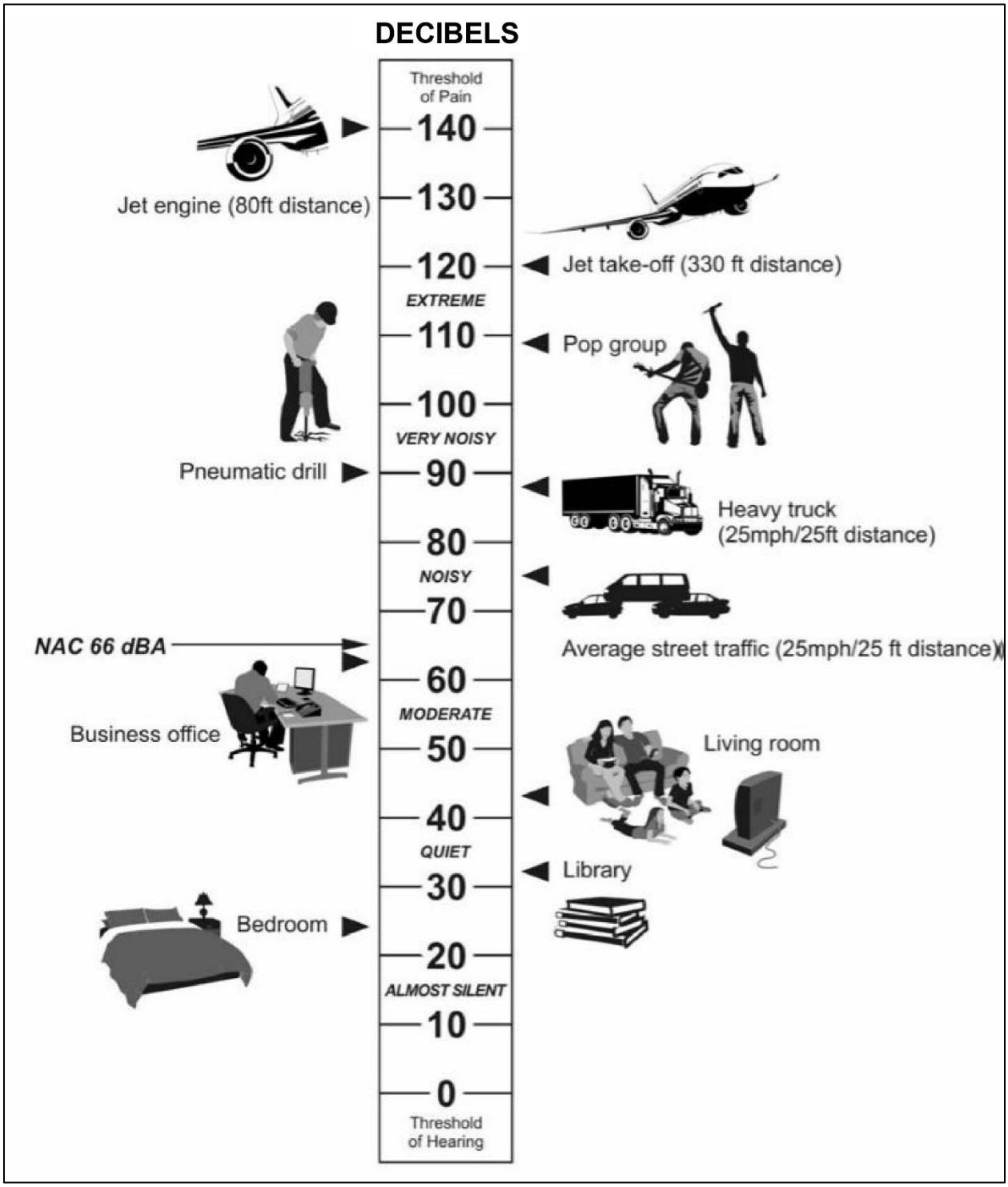
Traffic noise is not constant. It varies as each vehicle passes through a certain location. The time-varying characteristics of environmental noise are analyzed statistically to determine the duration and intensity of noise exposure. In an urban environment, noise is made up of two distinct components. One is ambient or background noise. Wind noise and distant traffic noise make up the ambient acoustical environment surrounding the project. These sounds are not readily recognized but combine to produce a non-irritating ambient sound level. This background sound level varies throughout the day, being lowest at night and highest during the day. The other component of urban noise is intermittent and louder than the background noise. Transportation noise and local

industrial noise are examples of this type of noise. It is for these reasons that environmental noise is analyzed statistically.

It is necessary to use a method of measure that will account for the time-varying nature of sound when studying environmental noise. The equivalent sound pressure level (L_{eq}) is defined as the continuous steady sound level that would have the same total A-weighted sound energy as the real fluctuating sound measured over a given period of time. As a result, the three characteristics of noise combine to form a single descriptor (L_{eq} in dB(A)) that is used to evaluate human response to noise and has been chosen for use in this study. The time-period used to determine traffic noise levels is one hour and uses the descriptor $L_{eq(1h)}$.

Traffic noise at a receiver is influenced by the following major factors: distance from the traffic to the receiver, volume of traffic, speed of traffic, vehicle mix, and acoustical shielding. Tire sound levels increase with vehicle speed but also depend upon road surface, vehicle weight, tread design and wear. Change in any of these can vary noise levels. At lower speeds, especially in trucks and buses, the dominant noise source is the engine and related accessories. Figure 2 provides sound levels of typical noise sources.

Figure 2. Sound Levels of Typical Noise Sources



Source: Adopted from "Environmental Criteria for Road Traffic Noise", Environmental Protection Authority, South Sydney, NSW, May 1999, Page 38.

3.2 Federal Regulations and Guidance

The Federal Highway Administration (FHWA) *Procedures for Abatement of Highway Traffic Noise and Construction Noise* are presented in the Code of Federal Regulations, Title 23 Part 772 (23 CFR 772), July 2010. This regulation, plus other guidance documents written to explain the regulation, sets forth the process for performing a traffic noise analysis. The process includes the following:

1. Identification of highway traffic noise impacts;
2. Examination of potential abatement measures;
3. Gathering of public input approval for reasonable and feasible abatement measure;
4. Incorporation of reasonable and feasible highway traffic noise abatement measures into the highway project;
5. Coordination with local officials to provide helpful information on compatible land use planning and control; and
6. Identification and incorporation of necessary measures to abate construction noise.

The highway traffic noise impact identification process involves a review of the existing land use activity categories that parallel the highway corridor and determining existing and future noise levels within those areas. Existing land use of developed lands is identified by inspecting aerial photography and performing site reconnaissance. Highway traffic noise analyses are also performed for undeveloped lands that have received a building permit.

After the existing and proposed land uses are established, ambient noise levels are measured along the corridor with simultaneous traffic counts. The measured noise levels are then compared to modeled noise levels based on the traffic counts. The model is validated if measured highway traffic noise levels and predicted highway traffic noise levels for the existing conditions are within +/- 3 dB(A).[2] This modeling, as required by the FHWA, is performed with Traffic Noise Model Version 2.5 (TNM). Once the model is validated, TNM is used to model the existing and the future build loudest hour for traffic noise analysis.

The FHWA Noise Abatement Criteria (NAC), which are presented in 23 CFR 772, establish the NAC for various land uses, and are presented in Table 3. A traffic noise impact is defined as a future noise level that approaches or exceeds the NAC, or a future noise level that creates a substantial noise increase over existing noise levels. An approaching noise level is defined as being at least 1 dB(A) less than the noise level value listed in the NAC for Activity Category A through G. For Activity Category C/D land uses, NAC C is applied if an exterior use is present, and NAC D is applied if there is no exterior use or if abatement (e.g., a noise barrier) for NAC C is not feasible and reasonable. The FHWA allows states to define a substantial noise increase as an increase of anywhere between 5 and 15 dB(A).

[2] Highway Noise Analysis and Abatement Handbook, Michigan Department of Transportation, 2011, page 16.

After traffic noise impacts are identified, potential abatement alternatives are examined. The following abatement alternatives, which are listed in 23 CFR 772.15(c) are permitted and can be evaluated where applicable:

1. Construction of noise barriers including acquisition of property rights, either within or outside the highway right-of-way;
2. Traffic management measures;
3. Alteration of horizontal and vertical alignments;
4. Acquisition of real property or interests therein to serve as a buffer zone to preempt development; and
5. Noise insulation of Activity Category D land use activities listed in Table 3.

At a minimum, state highway agencies are required to consider noise abatement in the form of noise barriers.

FHWA defines feasible highway traffic noise abatement as objective engineering considerations (e.g., can a barrier be built given the topography of the location; can a substantial noise reduction be achieved given certain access, drainage, safety, or maintenance requirements; are other noise sources present in the area, etc.). An abatement measure must achieve a noise reduction of at least 5 dB(A) to be considered feasible, according to 23 CFR 772.13 (d)(1)(i). MDOT's feasibility criteria are provided in Section 5.1 of this document.

The FHWA lists three required reasonableness factors when considering noise barriers: cost effectiveness, viewpoints of benefiting receptors, and achievement of noise reduction design goals. For reasonableness, 23 CFR 772.13 (d)(2)(iii) requires state Departments of Transportation to define design year reduction goals somewhere between 7 and 10 dB(A). FHWA lists optional reasonableness factors that can be added to but not overrule the required reasonableness factors.

Table 3. Noise Abatement Criteria (NAC)

Activity Category	Activity Criteria[a,b] $L_{eq(h)}$[c]	Activity Criteria[a,b] $L_{10(h)}$[d]	Evaluation Location	Activity Description
A	57	60	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[e]	67	70	Exterior	Residential
C[e]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	55	Interior	Auditoriums, daycare 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[e]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	N/A	N/A	N/A	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	N/A	N/A	N/A	Undeveloped lands that are not permitted.

Source: Highway Noise Analysis and Abatement Handbook, Michigan Department of Transportation, 2011.

[a]) MDOT defines a noise impact as a 10 dB(A) increase between the existing noise level to the design year predicted noise level, OR a predicted design year noise level that is 1 dB(A) less than the levels Table 3 shows.

[b]) Either $L_{eq(h)}$ or $L_{10(h)}$ (but not both) may be used on a project. MDOT uses $L_{eq(h)}$. The $L_{eq(h)}$ and $L_{10(h)}$ Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

[c]) L_{eq} is the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq(h)}$ being the hourly value of L_{eq}.

[d]) L_{10} is the sound level that is exceeded 10 percent of the time (90th percentile) for the period under consideration, with L_{10} being the hourly value of L_{10}.

[e]) Includes undeveloped lands permitted for this activity category.

3.3 State Rules and Procedures

The MDOT *Highway Noise Analysis and Abatement Handbook*, dated July 2011 (Handbook) is the State's tool for implementing 23 CFR 772. The Handbook expands on 23 CFR 772 by refining definitions and establishing milestones within the design phase for the completion of noise impact analysis and mitigation development.

The Handbook includes the following definitions:

Noise Impact: A substantial noise increase or a predicted design year noise level that is one dB(A) less, equal to, or greater than the NAC level.

Common Noise Environment (CNE): A group of receptors within the same Activity Category that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections, and cross-roads.

Substantial Noise Increase: A 10 dB(A) or greater increase between the existing noise level and the design year predicted noise level.

Feasible Noise Barrier: A barrier that has no construction impediments, meets safety requirements for the traveling public, and provides at least 5 dB(A) noise reduction at 75 percent of the impacted receptors.

Reasonable Noise Barrier: A barrier that is cost effective, favorable to the majority of benefited receptors, and achieves noise reduction design goals by meeting or exceeding the reasonableness factors.

Cost Effective Noise Barrier: A noise barrier analyzed for environmental clearance with a preliminary construction cost that is not more than 3 percent above the allowable cost per benefited receptor unit (CPBU) of $48,425 in 2020 dollars (3 percent above results in a not to exceed cost of $49,878), assuming a $45.00 per square foot noise barrier construction cost.

Benefited Receptor: A receptor that receives a 5 dB(A) or greater traffic noise reduction as a result of a proposed noise barrier.

Design Year Attenuation Requirement: Design year traffic noise reduction goal of 10 dB(A) for at least one benefited receptor and provide at least a 7 dB(A) reduction for 50 percent or more of the benefited receptor sites.

Permitted Development: Any presently undeveloped lands that have received a building permit from the local township or city.

Dwelling Unit Equivalent (DUE): The receptor count for public use areas such as parks, schools, libraries, and churches.

3.4 Highway Traffic Induced Vibration

Automobiles, trucks and buses do not typically generate enough vibration to be a concern, except under specific situations, such as pavement irregularities adjacent to sensitive locations. Studies to assess the impact of operational traffic induced vibrations have shown that both measured and predicted vibration levels are less than any known criteria for structural damage to buildings. Normal living activities (e.g., closing doors, walking across floors, operating appliances) within a building have been shown to create greater levels of vibration than highway traffic. There are no Federal requirements directed specifically to highway traffic induced vibration.

4 Noise Analysis

4.1 FHWA Traffic Noise Model (TNM)

TNM Version 2.5 is FHWA's computer model for highway traffic noise prediction and analysis. The following parameters are used in this model to calculate an hourly $L_{eq(1h)}$ at a specific receiver location:

- Distance between roadway and receiver
- Relative elevations of roadway and receiver
- Hourly traffic volume in light-duty (two axles, four tires), medium-duty (two axles, six tires), and heavy-duty (three or more axles) vehicles
- Vehicle speed
- Ground absorption
- Topographic features, including retaining walls and berms

Highway noise sources have been divided into five types of vehicles; automobiles, medium trucks, heavy trucks, buses and motorcycles. Each vehicle type is defined as follows[3]:

- Automobiles – all vehicles with two axles and four tires, includes passenger vehicles and light trucks, less than 10,000 pounds
- Medium trucks – all vehicles having two axles and six tires, vehicle weight between 10,000 and 26,000 pounds
- Heavy trucks – all vehicles having three or more axles, vehicle weight greater than 26,000 pounds
- Buses – all vehicles designed to carry more than nine passengers
- Motorcycles – all vehicles with two or three tires and an open-air driver/passenger compartment

Noise levels produced by highway vehicles can be attributed to three major categories:

- Running gear and accessories (tires, drive train, fan and other auxiliary equipment)
- Engine (intake and exhaust noise, radiation from engine casing)
- Aerodynamic and body noise

[3] G.S. Anderson, C.S.Y. Lee, G.G. Fleming and C. Menge, "FHWA Traffic Noise Model®, Version 1.0 User's Guide", Federal Highway Administration, January 1998, p.60.

4.2 Analysis

4.2.1 Land Use and Field Measurement Levels

The US-23 Flex Route Phase 2 noise analysis study area includes residential single-family properties, duplexes at the Scenic Pointe development, a private school, Little Friends of Whitmore Lake daycare, Oak Valley Driving Range, Green Oak Free Methodist Church, Brighton Assembly of God, Teddy Bear's Playhouse daycare, Brighton Christian Church, Holiday Inn Express & Suites Brighton and other commercial and restaurant properties with areas of outdoor use. The criteria stated in Table 3 helps to determine if the proposed project will produce noise levels that approach or exceed the NAC throughout the corridor.

The project corridor was divided into 19 common noise environments (CNEs) to facilitate the analysis of highway noise in areas of like land uses. The CNE boundaries are illustrated in Figure 3 and identified in Table 4.

Figure 3. Study Area Common Noise Environments (CNE)

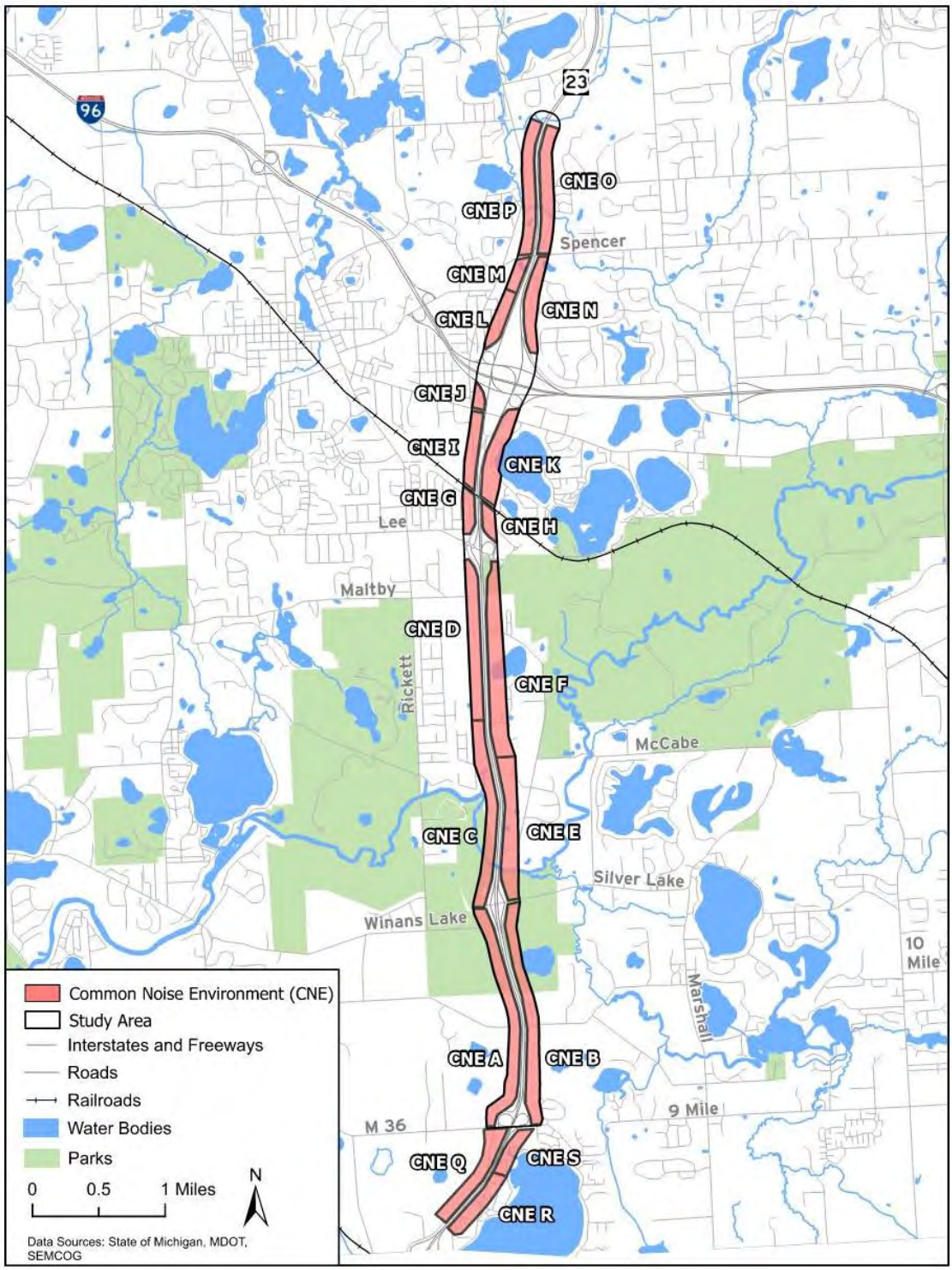


Table 4. Study Area Common Noise Environments (CNE)

CNE	Site Description
A	*Oak Valley Driving Range and single-family residential properties* located west of US-23 between M-36 (9 Mile Road) and Silver Lake Road.
B	*Little Friends of Whitmore Lake daycare, Green Oak Free Methodist Church and single-family residential properties* located east of US-23 between M-36 (9 Mile Road) and Silver Lake Road.
C	*Single-family residential properties and commercial outdoor use* located west of US-23 between Silver Lake Road and Carmel Court.
D	*Brighton Assembly of God Church and Holiday Inn Express and Suites outdoor seating area* located west of US-23 between Carmel Court and Lee Road.
E	*Green Oak Charter Township and single-family residential properties* located east of US-23 between Silver Lake Road and Baytes Drive.
F	*Single-family residential properties* located east of US-23 between Baytes Drive and Lee Road.
G	*Single-family residential properties* located west of US-23 between Lee Road and the railroad.
H	*Restaurant outdoor seating areas* located east of US-23 between Lee Road and the CSX Railroad.
I	*Commercial outdoor use* west of US-23 between the CSX Railroad and Grand River Avenue.
J	*Single-family residential property* west of US-23 between Grand River Avenue and the I-96 interchange.
K	*Single-family and duplex residential properties and restaurant outdoor seating* located east of US-23 between the railroad and the I-96 interchange. The duplexes are part of the Scenic Pointe development that is permitted in this CNE.
L	*Single-family residential properties* west of US-23 from the I-96 interchange to 1,500 feet south of Spencer Road.
M	*Teddy Bear's Playhouse playgrounds and an office building with outdoor use* west of US-23 from 1,500 feet south of Spencer Road to Spencer Road.
N	*Single-family residential properties* east of US-23 from the I-96 interchange to Spencer Road.
O	*Single-family residential properties and Brighton Christian Church* located east of US-23 between Spencer Road and the project limit one mile north of Spencer Road.
P	*Commercial and industrial land use* west of US-23 between Spencer Road and the project limit one mile north of Spencer Road. There is no noise-sensitive outdoor use present.

CNE	Site Description
Q	*Commercial and industrial land use* west of US-23 south of M-36 to the project limit at approximately Heidelberg Road. There is no noise-sensitive outdoor use present.
R	*Single-family residential properties and a private school* east of US-23 from DNR Park Road to the project limit at approximately Heidelberg Road.
S	*Single-family residential properties* east of US-23 south of M-36 to DNR Park Road.

Existing noise level measurements were conducted on August 20th, August 21st, and September 23rd, 2020. Existing noise level measurements were also conducted on December 20, 2021 south of M-36 (9 Mile Road). In total, existing noise level measurements were gathered at 13 representative sites in the project corridor. The existing noise measurements were conducted in order to validate use of FHWA's TNM to predict future noise levels. Fifteen-minute measurements were taken at each site. Traffic classification counts were taken concurrently with the noise measurements. Vehicle speeds were determined from field observation. The measurements were made in accordance with MDOT guidelines using an integrating sound level analyzer meeting American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC) Type 1 specifications. The locations of the field measurement sites are presented in Appendix A. Sound level analyzer calibration certification documentation and field data sheets are provided in Appendix B. The data collected at the 13 sites are presented in Table 5.

Table 5. Measured Existing Noise Levels

Field Site #	Site Description	Date	Start Time	Traffic Count Duration[a]	Traffic							Noise Level, dB(A) $L_{eq(1h)}$
					Direction	Auto	Med. Truck	Heavy Truck	Buses	MC	Speed, mph	
FS-1	East of US-23 and north of M-36 (9 Mile Road) near single-family homes	08/20/20	10:18am	15-minute	US-23 NB	383	5	62	0	0	75	74
					US-23 SB	391	6	37	2	0	75	
					Fieldcrest Drive	8	1	2	0	0	40	
FS-2	West of US-23 and south of Spicer Road near single-family homes	09/23/2020	11:33am	15-minute	US-23 NB	401	26	48	0	0	75	71
					US-23 SB	354	22	66	0	1	75	
					Whitmore Lake Road	42	0	1	0	1	45	
FS-3	East of US-23 at Green Oak Free Methodist Church	08/20/20	10:42am	15-minute	US-23 NB	483	3	58	1	0	75	79
					US-23 SB	379	3	42	1	0	75	
FS-4	East of US-23 and north of Bishop Road at single-family home	08/20/20	11:17am	15-minute	US-23 NB	536	6	79	1	4	75	79
					US-23 SB	351	2	53	2	0	75	
					Fieldcrest Drive	35	1	0	0	0	45	
FS-5	West of US-23 and south of Baytes Drive near single-family homes	08/20/20	11:47am	15-minute	US-23 NB	542	6	64	1	2	75	76
					US-23 SB	398	3	52	1	0	75	
					Whitmore Lake Road	82	1	5	0	0	45	

Field Site #	Site Description	Date	Start Time	Traffic Count Duration[a]	Traffic							Noise Level, dB(A) $L_{eq(1h)}$
					Direction	Auto	Med. Truck	Heavy Truck	Buses	MC	Speed, mph	
FS-6	East of US-23 and north of Carmel Court near single-family homes	08/21/20	1:32pm	15-minute	US-23 NB	658	5	38	1	2	35	74
					US-23 SB	548	3	41	2	1	70	
					Fieldcrest Drive	48	0	0	0	1	50	
FS-7	West of US-23 and south of Leo Drive at single-family home	08/21/20	1:06pm	15-minute	US-23 NB	708	9	41	3	8	30	72
					US-23 SB	647	4	42	2	1	70	
					Whitmore Lake Road	97	0	2	0	1	40	
FS-8	East of US-23 and south of Crowe Avenue at single-family home	08/21/20	12:30pm	15-minute	US-23 NB	737	2	39	0	2	70	70
					US-23 SB	550	7	50	0	5	70	
FS-9	West of US-23 and south of Old Lane Drive near single-family home	08/21/20	11:38am	13-minute	I-96 EB Ramp to US-23 SB	236	1	15	0	0	45	61
					I-96 EB Collector-Distributor Road	96	3	2	0	0	55	
				10-minute	US-23 SB	248	2	16	0	0	70	

Field Site #	Site Description	Date	Start Time	Traffic Count Duration[a]	Traffic							Noise Level, dB(A) $L_{eq(1h)}$
					Direction	Auto	Med. Truck	Heavy Truck	Buses	MC	Speed, mph	
FS-10	West of US-23 and north of I-96 at single-family home	09/23/2020	1:50pm	5-minute	US-23 SB Ramp to I-96 WB	17	0	0	0	0	40	73
				15-minute	Stuhrberg Drive	1	0	0	0	0	15	
				10-minute	US-23 SB	229	8	27	0	0	75	
FS-11	East of US-23 and south of Canyon Oaks Drive at single-family home	09/23/2020	2:05pm	10-minute	US-23 NB	318	6	22	1	0	75	75
					US-23 SB	261	18	33	0	1	75	
				15-minute	Culver Drive	41	0	0	0	0	40	
FS-12	East of US-23 at Buno Road near single-family homes	09/23/2020	2:39pm	10-minute	US-23 NB	401	9	26	1	1	75	66
					US-23 SB	272	15	25	1	1	75	
				15-minute	Buno Road	16	0	0	0	0	25	
FS-13	Main Street at North Shore Drive	12/20/2021	4:15pm	10-minute	US-23 NB	560	22	39	1	0	75	70
					US-23 SB	155	10	37	0	0	75	
					Main Street	1	0	0	0	0	25	

[a]) All noise measurements were conducted for a duration of 15 minutes.

4.2.2 Field Measurements versus Modeled Noise Levels

Comparing the modeled noise levels to the measured noise levels validates TNM for use on the specific project. Traffic counts were taken concurrently with the noise measurements at the sites and classified by vehicle type: cars, medium trucks (two axles), heavy trucks (three or more axles), buses and motorcycles. The traffic counts taken during each measurement were used in the model. The modeled data compared within 3 dB(A) of the measured levels, which satisfies the MDOT requirement for validating noise measurements. The site-by-site comparison is presented in Table 6.

Table 6. Comparison of Measured and Modeled Noise Levels

Field Site	Appendix A Map Page #	Noise Level, dB(A) $L_{eq(1h)}$		Difference in Noise Level, dB(A) $L_{eq(1h)}$ (Modeled Minus Measured)[a]
		Measured	Modeled	
FS-1	Page 3	74	75	+2
FS-2	Page 3	71	74	+3
FS-3	Page 3	79	79	0
FS-4	Page 4	79	80	+1
FS-5	Page 5	76	75	-1
FS-6	Page 5	74	73	0
FS-7	Page 7	72	74	+2
FS-8	Page 7	70	72	+2
FS-9	Page 7	61	59	-2
FS-10	Page 8	73	75	+2
FS-11	Page 8	75	74	-1
FS-12	Page 9	66	68	+3
FS-13	Page 2	70	73	+3

[a]) Difference may appear incorrect due to rounding

4.2.3 Traffic Noise Levels and Noise Impact Analysis

FHWA's TNM Version 2.5 was used to model existing (2020) and future design year (2045) Build worst-case traffic noise levels within the US-23 Flex Route Phase 2 noise analysis study area.

Modeled receptors were placed in accordance with FHWA requirements in areas with evidence of frequent human use. This area is typically located between the highway and any structure, such as a residence. MDOT considers this area within 35 feet from the back of a residence as the backyard area. Balconies in apartment buildings are included when the balcony faces the highway and there are no ground-level areas of frequent human use between the highway and the building.

FHWA's *Recommended Best Practices for the Use of the FHWA Traffic Noise Model (TNM)* states, "The loudest hour of the day is dependent upon traffic conditions – vehicle volume, operating speed, and number of trucks – that combine to produce the highest hourly noise levels adjacent to the highway corridor. According to FHWA guidance, the 'worst hourly traffic noise impact' usually occurs at a time when truck volumes and vehicle speeds are the greatest, typically when traffic is free flowing and at or near LOS C conditions. Based on this guidance, the use of traffic data that are based on LOS was the preferred approach."

Traffic engineers determined that the AM and PM peak traffic hours were not consistently at LOS C or better conditions for the entire study area. The PM shoulder peak hour from 3:45 p.m. to 4:45 p.m. was determined to be at LOS C or better for the existing (2020) and future design (2045) years. The design year volumes were developed and traffic conditions were analyzed using VISSIM, a traffic microsimulation model. The posted speed limits were used on US-23 and adjacent roadways in the noise model for both the existing and future conditions. The flex lane was modeled with operations northbound in the PM shoulder peak hour with 33 to 40 percent of the northbound automobiles in the flex lane depending on section of the roadway. No trucks were modeled in the flex lane.

Within the 19 identified CNEs, a total 524 noise receivers were modeled; these noise receivers represented 529 receptors. Each receiver represents a single point in the noise model and is representative of the noise receptors being analyzed. One receiver can represent multiple receptors in the noise analysis, such as H-1, K-42, K-43, K48, and K-50 in this study. These receivers were selected to model noise impacts as shown in Appendix A.

The existing and design year noise levels at the modeled receivers are presented in Appendix C, along with a land use description, the FHWA NAC, and the number of receptors represented by each receiver.

4.3 Impact Assessment

A traffic noise impact is defined as a future noise level that approaches[4] or exceeds the NAC; or a future noise level that creates a substantial noise increase over existing noise levels.[5] MDOT identifies a noise impact as a 10 dB(A) increase between the existing noise level to the design year predicted traffic noise level, or a design year build condition noise level that approaches (equal to 1 dB(A) less than the NAC) or exceeds the NAC level for the future build condition.

Three (3) noise receivers were modeled as NAC D (interior) land use because no observable exterior area of frequent human use was identified, including Brighton Assembly of God (D-1), Green Oak Charter Township (E-2), and Brighton Christian

[4] A noise level 'approaches' when the noise level is one dB(A) less than the NAC standard.

[5] Substantial Noise Increase: A 10 dB(A) or greater increase between the existing noise level and the design year predicted noise level.

Church (O-4). Table 6[6] in FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* provides values to help estimate interior noise levels. A building noise reduction factor of 25 dB was used for the NAC D receivers as they are all masonry buildings with at least single glazed windows. The building noise reduction factor was applied to modeled exterior noise levels to determine interior noise levels at NAC D receivers. No impacts are predicted at NAC D receivers based on the estimated interior noise levels.

Per guidance in Appendix D of the Handbook, the typical residential lot size adjacent to impacted NAC C and E receivers was used to determine the Dwelling Unit Equivalents (DUE). The total impacted area of each impacted receiver (B-26, Green Oak Free Methodist Church playground; D-2, Holiday Inn Express & Suites Brighton courtyard; M-3 and M-4, 2 playground areas at Teddy Bear's Playhouse; R-76, a private school) was identified and divided by the typical residential lot size in the project area. Based on parcel data, a conservatively small average lot size of 150 feet by 75 feet (11,250 square feet) was used for most of the study area. A more conservative residential lot size of 100 feet by 100 feet (10,000 square feet) was used for the study area south of M-36 (9 Mile Road) where mobile homes are also present. The following calculations were made for each receiver:

- B-26: 15'x15' playground area / 11,250 sq ft = 225 / 11,250 = 0.02 DUE (rounds up to 1 DUE)
- D-2: 60'x20' courtyard / 11,250 sq ft = 1200 / 11,250 = 0.11 DUE (rounds up to 1 DUE)
- M-3 and M-4: 140'x100' playground area / 11,250 sq ft = 14,000 / 11,250 = 1.24 DUE (rounds up to 2, resulting in 1 DUE for each modeled receiver)
- R-76: 100'x100' area of the outdoor use spaces / 10,000 sq ft = 10,000 / 10,000 = 1 DUE

Note that other NAC C, D and E receivers that were not impacted were generally assigned 1 unit (or DUE) per property or outdoor space being represented (see Table C-1 in Appendix C). In a few instances, NAC C, D and E receivers were included in barrier analyses when not impacted (C-3, commercial outdoor space; M-1, office building outdoor seating; R-56 through R-60, R-62, R-64 and R-65, R-68, and R-72, private school). In the instance of the private school in CNE R, an approximate 100' grid of 11 receivers was placed in the outdoor use areas, resulting in a 110,000 square foot area. Dividing by the conservative lot size of 10,000 square feet south of M-36 (9 Mile Road) results in 1 DUE for each modeled receiver for the private school outdoor areas.

Predicted existing year (2020) exterior traffic noise levels for modeled receivers range from 52 to 77 dB(A) $L_{eq(1h)}$.

[6] FHWA Noise Analysis and Abatement Guidelines, https://www.fhwa.dot.gov/Environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/polguide02.cfm

4.3.1 Future Build

Predicted future design year (2045) noise levels adjacent to the proposed Build alternative would approach or exceed the NAC at 192 receiver locations representing 193 receptor units, including 188 residential receptors, four (4) recreational receptors (Green Oak Free Methodist Church playground, two (2) playground areas at Teddy Bear's Playhouse, and one (1) receiver at a private school outdoor area), and one (1) commercial outdoor use (Holiday Inn Express & Suites Brighton courtyard). The noise levels at these 193 impacted receptor units would range from 66 to 78 dB(A) $L_{eq(1h)}$ in the future design year. K-48 is the only impacted receiver representing two (2) dwelling units for a duplex in the Scenic Pointe development. The noise levels already approach or exceed the NAC in the existing year (2020) at 160 of the residential receptors, the four (4) recreational receptors and the one (1) commercial receptor.

One recreational receiver (B-1) is impacted in the existing year (2020) but not in the future design year (2045) due to the reconfiguration of the M-36 (9 Mile Road) interchange moving US-23 northbound on-ramp traffic farther from this receiver. Noise level decreases are also predicted from the existing year (2020) to the future design year (2045) in the area of the US-23 northbound off-ramp to M-36 (9 Mile Road) due to the addition of a 3.5-foot crash barrier wall along the proposed ramp. The proposed standard safety barrier wall is required to protect vehicles from a vertical drop-off along the ramp; however, it also provides some shielding of the line of sight to the US-23 mainline and off-ramp traffic noise for neighboring residents.

Changes in $L_{eq(1h)}$ noise levels under the future Build alternative will range from -5 to 2 dB(A) compared to existing conditions. Therefore, none of the predicted future noise levels would substantially exceed existing noise levels.

5 Noise Abatement Measures

5.1 Federal and State Abatement Guidance

The Handbook has established the criteria for determining where noise abatement must be provided.[7]

The policy is summarized as follows:

- Where adverse noise impacts are expected to occur, noise abatement will be considered and will be implemented if found feasible and reasonable for existing developments and future developments that were approved before the date of public knowledge of the project. Approved means that a building permit has been received. After the date of public knowledge, MDOT is not responsible for providing noise abatement for new developments. The date of public knowledge is the date on which the project's environmental documentation (e.g., the date of the ROD for an EIS) is approved. The provision of noise abatement for new developments becomes the responsibility of local governments and private developers.
- All sites will be considered; however, it is generally known that NAC E sites prefer that there be no interference with the view to their establishments. Only residential land use that is converted or zoned commercial before the Date of Public Knowledge will be given the option on abatement.
- Feasible – This refers to engineering considerations such as: constructability of a noise barrier on the existing topography; achievement of substantial noise reductions; the presence of other noise sources in the area; and the ability to maintain access, drainage, safety, utilities in the area. While every reasonable effort should be made to obtain a substantial noise reduction, a noise abatement measure is not feasible if it cannot achieve at least a 5 dB(A) noise reduction for 75 percent of impacted receptors during design year traffic noise.
- Reasonable – Noise mitigation will be considered reasonable if:
    - During the environmental clearance phase, the preliminary cost per benefiting unit is less than 3 percent above the allowable cost per benefited receptor unit (CPBU) of $48,425 in 2020 dollars (3 percent above results in a not to exceed cost of $49,878);
    - The public viewpoint reasonableness factor for the environmental clearance phase receives generally positive comments from the benefiting units; and
    - The noise barrier provides a design year traffic noise reduction of 10 dB(A) for at least one benefited unit and at least a 7 dB(A) for 50 percent or more of the benefited units.

[7] The Handbook and other MDOT resources can be found at https://www.michigan.gov/mdot/0,4616,7-151-9621_11041_25846---,00.html.

23 CFR 772.15(c) lists abatement alternatives. The following list summarizes abatement alternatives examined for this project:

1. Construction of noise barriers including acquisition of property rights, either within or outside the highway right-of-way;
2. Traffic management measures;
3. Alteration of horizontal and vertical alignments;
4. Acquisition of real property or interests therein to serve as a buffer zone to preempt development;
5. Noise insulation of Activity Category D land use facilities listed in Table 3.

Upon review of the listed abatement alternatives, it has been determined that:

- Reductions of speed limits, although acoustically beneficial, are seldom practical unless the design speed of the proposed roadway is also reduced;
- Restriction or prohibition of trucks is extremely undesirable;
- Design criteria, project limits, and the existing alignment and land uses preclude substantial horizontal and vertical alignment shifts that could potentially produce noticeable changes in the projected acoustical environment;
- Cost restrictions typically prohibit the acquisition of property;
- The construction of noise berms is neither feasible nor reasonable because of the amount of space that would be required; and
- Noise impact is not predicted at Activity Category D land uses.

Therefore, the construction of noise barriers within the existing right-of-way was the only mitigation measure that received in-depth evaluation.

5.2 Abatement Analysis

At a minimum, the Handbook requires that noise barriers be analyzed as a noise abatement measure. Nineteen (19) CNEs were identified within the project limits. CNEs P and Q do not contain noise-sensitive land use, and CNEs H and I have no impacted receptors with the future design year (2045) Build alternative and do not require abatement analysis. There are scattered residential (NAC B) impacts throughout the corridor that are isolated and were not feasible or reasonable to include with the noise abatement analyzed, including one residential impact in CNE J (J-1). Because these impacts are isolated or located too far from denser areas of noise-sensitive use, noise barriers would not be an effective abatement strategy for these impacted locations. There is an impacted hotel courtyard in CNE D (D-2, Holiday Inn Express & Suites Brighton) that was not analyzed for noise abatement because it is isolated from other impacted areas, and the property has advertisement signs that are visible from the highway.

Abatement analysis was completed for 18 noise barriers in the remaining 13 CNE areas where impacted noise receptors were identified. Noise barrier locations are shown in Appendix A.

Of the 18 noise barriers evaluated, 17 barriers meet preliminary feasibility criteria but do not meet reasonableness criteria, as the estimated cost of these barriers per benefited receptor would exceed 3 percent above the allowable CPBU of $48,425 in 2020 dollars (3 percent above results in a not to exceed cost of $49,878).[8] The noise barrier evaluated in CNE L was found to meet MDOT's preliminary feasibility and reasonableness criteria.

In each CNE, shorter length noise barriers were also evaluated for areas where receptors are denser; however, none of the noise barriers were found to meet MDOT's feasibility and reasonableness criteria or come near to 3 percent above the allowable CPBU of $48,425 in 2020 dollars (results in $49,878).

In addition to the 18 noise barriers evaluated, an existing noise barrier in CNE R was also evaluated. Per FHWA guidance, if noise impact is identified behind an existing noise barrier, an analysis should be completed to determine if the barrier is still feasible and reasonable.[9] The design year noise levels are determined with and without the existing noise barrier for this analysis. If the existing noise barrier is feasible and reasonable as built, no further analysis is required. Note that the figures in Appendix A show the existing noise barrier (Barrier R) and reflect the impacted receptors with the existing barrier in place.

To summarize the noise barriers analyzed:

- Barrier A is located on the west side of US-23 from approximately 1,750 feet south of Spicer Road to 2,000 feet north of Spicer Road. Barrier A is shown on Pages 3 and 4 of the figures in Appendix A. Barrier A is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 88 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($457,959) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier B1 is located on the east side of US-23 from approximately M-36 (9 Mile Road) to approximately 2,300 feet north of M-36 (9 Mile Road). Barrier B1 is shown on Page 3 of the figures in Appendix A. Barrier B1 is acoustically feasible, as 91 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 55 percent of benefited receptors achieving 7 dB(A) noise reduction and 2 benefited receptors achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($193,079) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

[8] Thomas Hanf, MDOT Air Quality & Noise Abatement, email regarding "2020 CPBU", November 9, 2020.

[9] FHWA, Consideration of Existing Noise Barrier in a Type I Noise Analysis, https://www.fhwa.dot.gov/environment/noise/noise_barriers/abatement/existing.cfm

- Barrier B2 is located on the east side of US-23 from approximately 400 feet south of Fairlane Drive to 2,000 feet north of Fairlane Drive. Barrier B2 is shown on Pages 3 and 4 of the figures in Appendix A. Barrier B2 is acoustically feasible, as 83 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 60 percent of benefited receptors achieving 7 dB(A) noise reduction and 2 benefited receptors achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($462,051) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier C1 is located on the west side of US-23 from approximately the Huron River to 1,900 feet north of the Huron River. Barrier C1 is shown on Pages 4 and 5 of the figures in Appendix A. Barrier C1 is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirement of 7 dB(A) for 50 percent or more of the benefited receptors is being met with 67 percent of benefited receptors achieving 7 dB(A) noise reduction; however, no benefited receptors are achieving 10 dB(A) noise reduction. The estimated cost per benefited receptor ($580,395) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier C2 is located on the west side of US-23 from approximately 2,200 feet north of the Huron River to 700 feet south of Baytes Drive. Barrier C2 is shown on Page 5 of the figures in Appendix A. Barrier C2 is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 67 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($239,978) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier C3 is located on the west side of US-23 from approximately 600 feet south of Baytes Drive to 1,500 feet north of Baytes Drive. Barrier C3 is shown on Page 5 of the figures in Appendix A. Barrier C3 is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 82 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($148,083) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier E1 is located on the east side of US-23 from approximately 300 feet south of Fernbrook Drive to Bishop Road. Barrier E1 is shown on Page 4 of the figures in Appendix A. Barrier E1 is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. However, the attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or

more of the benefited receptors are not met, with only 33 percent of benefited receptors achieving 7 dB(A) noise reduction. The estimated cost per benefited receptor ($539,865) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier E2 is located on the east side of US-23 from approximately the Huron River to approximately 2,000 feet north of Bishop Road. Barrier E2 is shown on Pages 4 and 5 of the figures in Appendix A. Barrier E2 is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 65 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($86,818) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier EF is located on the east side of US-23 from approximately 2,300 feet north of Bishop Road to approximately 1,950 feet north of Carmel Court. Barrier EF is shown on Pages 5 and 6 of the figures in Appendix A. Barrier EF is acoustically feasible, as 93 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 53 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($82,041) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars)

- Barrier F is located on the east side of US-23 from approximately 1,500 feet south of Bishop Road to Bishop Road. Barrier F is shown on Page 6 of the figures in Appendix A. Barrier F is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 75 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($292,500) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier G is located on the west side of US-23 from Lee Road to the CSX Railroad. Barrier G is shown on Pages 6 and 7 of the figures in Appendix A. Barrier G is acoustically feasible, as 86 percent of the impacted receptors achieve a 5 dB(A) reduction. However, the attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are not met, with 0 percent of benefited receptors achieving 7 dB(A) noise reduction. The estimated cost per benefited receptor ($69,584) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier K is located on the east side of US-23 from approximately 800 feet north of the CSX Railroad to Scenic Bluff Drive. Barrier K is shown on Page 7 of the figures in Appendix A. Receivers K-42, K-43, K-48 and K-50 represent two (2) dwelling units each for duplexes in the Scenic Pointe development. Barrier K is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 52 percent of benefited receptors achieving 7 dB(A) noise reduction and 6 benefited receptors achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($61,660) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier L is located in the northwest quadrant of the I-96/US-23 interchange from Walsh Drive to approximately 550 feet north of Stuhrberg Drive. Barrier L is shown on Page 8 of the figures in Appendix A. Barrier L is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 53 percent of benefited receptors achieving 7 dB(A) noise reduction and 3 benefited receptors achieving 10 dB(A) noise reduction. The estimated cost per benefited receptor ($48,969) is less than 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars). Therefore, Barrier L meets MDOT's preliminary feasibility and reasonableness criteria.

- Barrier M is located on the west side of US-23 from approximately 800 feet south of Spencer Road to Spencer Road. Barrier M is shown on Page 8 of the figures in Appendix A. Barrier M is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 67 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($176,040) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier N1 is located northeast quadrant of the I-96/US-23 interchange from approximately Farmbrook Drive to approximately 300 feet north of Overhill Drive. Barrier N1 is shown on Page 8 of the figures in Appendix A. Barrier N1 is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 71 percent of benefited receptors achieving 7 dB(A) noise reduction and 2 benefited receptors achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($59,612) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier N2 is located on the east side of US-23 from approximately 700 feet north of Overhill Drive to 800 feet north of Canyon Oaks Drive. Barrier N2 is shown on

Page 8 of the figures in Appendix A. Barrier N2 is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 50 percent of benefited receptors achieving 7 dB(A) noise reduction and 2 benefited receptors achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($116,364) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier O is located on the east side of US-23 from approximately 1,200 feet north of Spencer Road to 700 feet north of Buno Road. Barrier O is shown on Page 9 of the figures in Appendix A. Barrier O is acoustically feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 58 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($106,584) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars).

- Barrier R was evaluated under the *US-23 Improvements from M-14/US-23 West Interchange to Silver Lake Road Noise Analysis Report* (Flex Route Phase 1 noise analysis) and constructed under that project after being found feasible and reasonable.[10] As such, the barrier was evaluated as an existing noise barrier per FHWA guidance. Barrier R ranges in height from 12 feet to 16 feet. The barrier is located on the east side of US-23 from approximately 1,400 feet north of 8 Mile Road to DNR Park Road. Barrier R is shown on Page 2 of the figures in Appendix A. Following the guidance outlined in FHWA-HEP-12-051, *Consideration of Existing Noise Barrier in a Type I Noise Analysis*, Barrier R was re-analyzed at its existing height compared to a "no barrier" scenario to determine if the barrier achieves the MDOT feasibility and reasonableness requirements. At its existing height, Barrier R is acoustically feasible, as 90 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 60 percent of benefited receptors achieving 7 dB(A) noise reduction and 19 benefited receptors achieving 10 dB(A) noise reduction. The estimated cost per benefited receptor ($24,354) is less than the allowable cost per benefited receptor ($48,425 in 2020 dollars). Therefore, Barrier R is both feasible and reasonable, and no further modification for this barrier is required as part of this project.

- Barrier S is located on the east side of US-23 from approximately 150 feet north of DNR Park Road to approximately 650 feet south of M-36 (9 Mile Road). Barrier S is shown on Page 2 of the figures in Appendix A. Barrier S is acoustically

[10] MDOT, US-23 Improvements from M-14/US-23 West Interchange to Silver Lake Road Noise Analysis Report, February 2015.

feasible, as 100 percent of the impacted receptors achieve a 5 dB(A) reduction. The attenuation requirements of 10 dB(A) for at least one benefited receptor and 7 dB(A) for 50 percent or more of the benefited receptors are also met with 50 percent of benefited receptors achieving 7 dB(A) noise reduction and 1 benefited receptor achieving 10 dB(A) noise reduction. However, the estimated cost per benefited receptor ($132,084) would exceed 3 percent above the allowable cost per benefited receptor ($48,425 in 2020 dollars). Note that the cost of Barrier S includes an additional $9.00 per square foot above the $45.00 per square foot planning cost for additional moment slab concrete to balance the noise wall load on proposed retaining wall.

The results of the evaluated noise barriers, including future $L_{eq(1h)}$ noise levels without and with the barrier, barrier length and height, and the noise reduction provided by the barrier, are presented in Table 7. Whether the barrier meets the design goal, total estimated cost (based on $45.00 per square foot), the number of benefited receptors (i.e., residential, commercial, or equivalent), the cost per benefited receptor, feasibility determination, and reasonableness determination for the barrier is presented in Table 8. The design year noise levels with and without the incorporation of a noise barrier for the modeled sites are presented in Appendix D.

Table 7. Evaluated Noise Barriers

Noise Barrier ID	Receiver IDs	Existing Noise Levels dB(A)	Future Noise Levels dB(A)		Noise Reduction dB(A)	Barrier Length (ft)	Barrier Height (ft)
			W/O Barrier	W/ Barrier			
Barrier A	A-2 – A-9	63 – 74	63 – 74	56 - 68	6 - 10	3,951	8 - 24
Barrier B1	B-1 – B-23	59 – 73	59 – 74	57 - 64	1 – 10	2,300	8 – 22
Barrier B2	B-25 – B-30	67 - 77	68 - 78	62 - 64	4 – 16	2,464	8 – 24
Barrier C1	C-1 – C-3	67 - 71	68 – 72	62 – 64	6 – 8	1,612	24
Barrier C2	C-4 – C-9	63 - 73	64 - 74	57 – 65	5 - 10	1,700	10 - 22
Barrier C3	C-11 – C-25	62 - 72	63 – 73	62 – 66	1 - 10	2,000	12 - 20
Barrier E1	E-1 – E-7	41 - 72	42 - 73	41 - 64	1 – 8	1,500	24
Barrier E2	E-8 – E-32	60 - 75	61 – 76	58 – 70	2 – 10	2,400	8 – 20
Barrier EF	E-33 – E-51, F-1 – F-30	57 - 75	58 - 76	54 - 71	2 - 10	4,900	10 - 22
Barrier F	F-31 – F-34	68 - 74	69 – 75	60 – 68	6 – 10	1,400	14 – 20
Barrier G	G-1 – G-48	58 - 73	59 - 74	55 - 71	3 - 6	1,870	24
Barrier K	K-1 – K-52	52 – 74	53 – 74	51 – 67	1– 15	1,900	8 - 24
Barrier L	L-1 – L-37	54 – 71	55 – 71	54 - 64	0 – 11	1,402	8 - 14
Barrier M	M-1 – M-4	56 – 74	57 – 75	57 – 65	0 – 10	799	8 - 18
Barrier N1	N-1 – N-23	53 – 69	53 - 70	51 – 62	2 – 10	1,795	12 - 18
Barrier N2	N-24 – N-46	57 – 72	57 – 73	52 – 62	2 – 11	2,100	14 – 22
Barrier O	O-5 – O-25	57 – 68	57 – 69	51 – 59	3 – 10	2,100	18 - 24
Barrier R[a]	R-1 – R-130	54 - 66	58 - 78	55 - 67	0 - 15	2,704	12 - 16
Barrier S	S-1 – S-20	62 - 71	61 - 70	57 - 61	3 - 10	1,182	12 - 30

[a]) Future noise levels and noise reductions reported for the existing noise barrier reflect design year noise levels with and without the barrier in place in order to show the feasibility and reasonableness of the existing barrier. Note the figures in Appendix A show impacts based on future noise levels with the barrier in place, and barrier analysis results by receiver, including benefits behind the existing barrier based on design year noise levels with and without the barrier in place, are given in Table D-18 in Appendix D.

Table 8. Noise Barrier Designs Analyzed

Barrier ID	Number of Attenuated Locations					Cost	Cost/Benefit	Feasible[a]	Reasonable[b]
	≥ 10 dB(A)	≥ 7 dB(A)		≥ 5 dB(A) (Benefited Receivers)					
		#	% of Benefited	#	% of Impacted			(Y/N)	(Y/N)
Barrier A	1	7	88%	8	100%	$3,663,675	$457,959	Y	N
Barrier B1	2	6	55%	11	91%	$2,123,865	$193,079	Y	N
Barrier B2	2	3	60%	5	83%	$2,310,255	$462,051	Y	N
Barrier C1	0	2	67%	3	100%	$1,741,185	$580,395	Y	N
Barrier C2	1	4	67%	6	100%	$1,439,865	$239,978	Y	N
Barrier C3	1	9	82%	11	100%	$1,628,910	$148,083	Y	N
Barrier E1	0	1	33%	3	100%	$1,619,595	$539,865	Y	N
Barrier E2	1	11	65%	17	100%	$1,475,910	$86,818	Y	N
Barrier EF	1	23	53%	43	93%	$3,527,775	$82,041	Y	N
Barrier F	1	3	75%	4	100%	$1,170,000	$292,500	Y	N
Barrier G	0	0	0%	29	86%	$2,017,935	$69,584	Y	N
Barrier K	6	14	52%	27[c]	100%	$1,664,820	$61,660	Y	N
Barrier L	3	8	53%	15	100%	$734,535	$48,969	Y	Y
Barrier M	1	2	67%	3	100%	$528,120	$176,040	Y	N
Barrier N1	2	15	71%	21	100%	$1,251,855	$59,612	Y	N
Barrier N2	2	7	50%	14	100%	$1,629,090	$116,364	Y	N
Barrier O	1	11	58%	19	100%	$2,025,090	$106,584	Y	N
Barrier R[d]	19	41	60%	68	90%	$1,656,045	$24,354	Y	Y
Barrier S	1	6	50%	12	100%	$1,585,008[e]	$132,084	Y	N

[a]) MDOT requires that noise barriers achieve a 5 dB(A) reduction at 75 percent of the impacted receptors. If a barrier cannot achieve this, abatement is considered to not be acoustically feasible. Noise barrier abatement also might not be feasible due to constructability or safety constraints.

[b]) The design year attenuation requirement for Michigan is to provide a noise reduction of 10 dB(A) for at least one benefited receptor and at least a 7 dB(A) reduction for 50 percent or more of the benefited receptor sites.

[c]) K-48 behind this barrier represents two dwelling units.

[d]) The noise barrier analysis for this existing noise barrier reflects design year noise level reductions without the barrier in place in order to show the feasibility and reasonableness of the existing barrier. Note the figures in Appendix A show impacts with the barrier in place, and barrier analysis results by receiver, including benefits behind the existing barrier based on design year noise levels with and without the barrier in place, are given in Table D-18 in Appendix D.

[e]) Cost includes an additional $9/sqft above the $45/sqft planning cost for additional moment slab concrete to balance the noise wall load on proposed retaining wall.

6 Undeveloped Lands

The distances to 66 dB(A) and 71 dB(A) $L_{eq(1h)}$, which vary along the project corridor due to changing traffic volumes and topography, were developed to assist local planning authorities in developing land use control over the remaining undeveloped lands along the project to prevent further development of incompatible land uses. There are scattered undeveloped areas throughout the project corridor in CNEs A, B, C, D, F, L, M, O, P, and Q.

Appendix A provides setback distances for 66 dB(A) and 71 dB(A) in undeveloped areas where receptors sites are not modeled. It is recommended that any future development proposed in the project area be modeled with accurate survey data to avoid creating incompatible land uses adjacent to the project.

7 Conclusions and Recommendations

Eighteen (18) noise barriers have been evaluated for this noise study. Seventeen (17) barriers meet preliminary feasibility criteria, but do not meet reasonableness criteria as the estimated cost of these barriers per benefited receptor would exceed 3 percent above the allowable CPBU of $48,425 in 2020 dollars (3 percent above results in a not to exceed cost of $49,878).[11] The noise barrier evaluated in CNE L (Barrier L) was found to meet MDOT's preliminary feasibility and reasonableness criteria. The existing noise barrier in CNE R (Barrier R) was also evaluated and found to meet MDOT's feasibility and reasonableness criteria as built; therefore, no further modification for this barrier is required as part of this project.

7.1 Statement of Likelihood

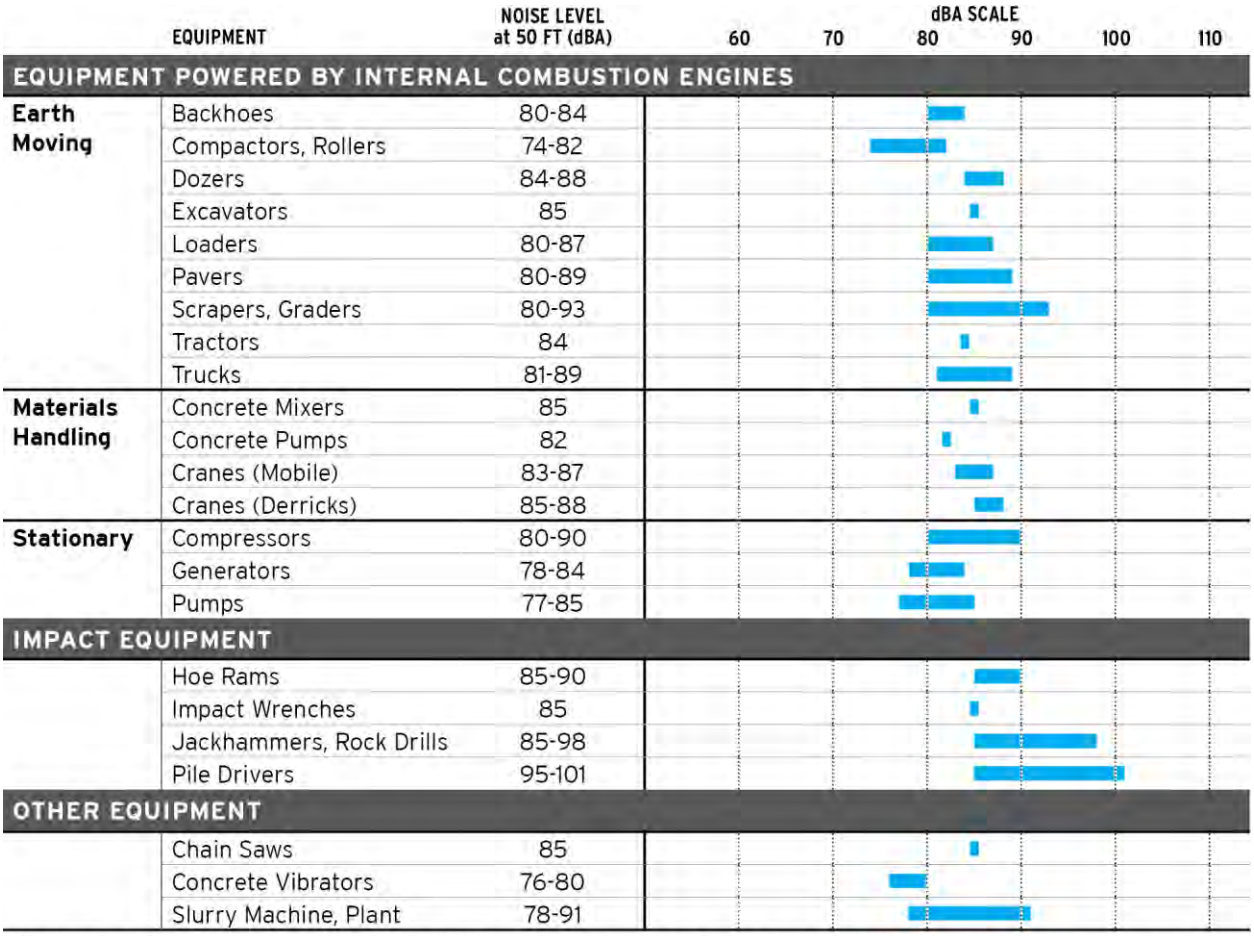
Based on the studies thus far accomplished, MDOT intends to install highway traffic noise abatement in the form of a barrier presented in Table 8 in this document. The preliminary indications of likely abatement measures are based on preliminary design for barrier cost(s) and noise reduction as illustrated in Table 8. If it subsequently develops during final design that these conditions have substantially changed, the abatement measures might not be provided. A final decision on the installation of the abatement measure(s) will be made upon completion of the project's final design and the Context Sensitive Solutions process.

7.2 Construction Noise

In addition to noise from traffic, construction activities themselves can produce increased noise of a temporary nature. The major construction elements of this project are expected to be demolition, hauling, grading, paving, and bridge construction. Construction of the proposed improvements will result in a temporary increase in the ambient noise level along US-23. General construction noise impacts for passerby and those individuals living or working near the project can be expected particularly from demolition, earth moving, pile driving, and paving operations. Equipment associated with construction generally includes backhoes, graders, pavers, concrete trucks, compressors, and other miscellaneous heavy equipment. Figure 4 illustrates typical peak operating noise levels at 50 feet, grouping construction equipment according to mobility and operating characteristics. Considering the relatively short-term nature of construction noise, impacts are not expected to be substantial. The transmission loss characteristics of nearby structures are believed to be sufficient to moderate the effects of intrusive construction noise.

[11] Thomas Hanf, MDOT Air Quality & Noise Abatement, email regarding "2020 CPBU", November 9, 2020.

Figure 4. Construction Noise Sound Levels



SOURCE: FHWA, Effective Noise Control During Nighttime Construction, *https://ops.fhwa.dot.gov/wz/workshops/accessible/schexnayder_paper.htm*

7.3 Construction Vibration

Temporary vibration impacts could occur in residential areas and at other vibration-sensitive land uses from activities associated with construction of the project, such as excavation, demolition, and vibratory compaction, as well as pile-driving at bridges, noise walls, and retaining walls. The potential for vibration impact would be greatest at locations near pile-driving for bridges and other structures, pavement breaking, and at locations close to vibratory compactor operations.

The equipment with the highest vibration level for roadway construction is the vibratory roller, and the highest potential vibration level for pile driving is with the impact pile driver. For buildings near pile driving activities, short-term construction vibration impact can extend to approximately 100 feet from the construction site. For buildings near roadway construction activities, short-term construction vibration impact can extend to approximately 30 feet from the construction site.

Human annoyance from pile driving could extend to approximately 400 feet from the construction site while roadway construction annoyance could extend to approximately 100 feet from the construction site.

The primary means of mitigating short-term vibration impacts resulting from construction activities is to require the contractors to prepare a vibration control plan. Key elements of a plan include:

- Identify vibration sensitive buildings;
- Conduct a pre-construction of inspection of residences, historical and other vibration sensitive structures in the project corridor;
- Prohibit certain activities that create higher vibration levels during nighttime hours;
- Implement vibration control measures where appropriate; and
- Develop a method for responding to community complaints.

8 References

Anderson, G. S., C.S.Y. Lee, G.G. Fleming and C. Menge, "FHWA Traffic Noise Model®, Version 1.0 User's Guide", Federal Highway Administration, January 1998, p. 60.

FHWA, *Consideration of Existing Noise Barrier in a Type I Noise Analysis*, FHWA-HEP-12-051, https://www.fhwa.dot.gov/environment/noise/noise_barriers/abatement/existing.cfm.

FHWA, Noise Policy FAQs – Frequently Asked Questions, https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/faq_nois.cfm#D4e.

FHWA, *Procedures for Abatement of Highway Traffic Noise and Construction Noise,* Code of Federal Regulations, Title 23 Part 772 (23 CFR 722), July 13, 2010.

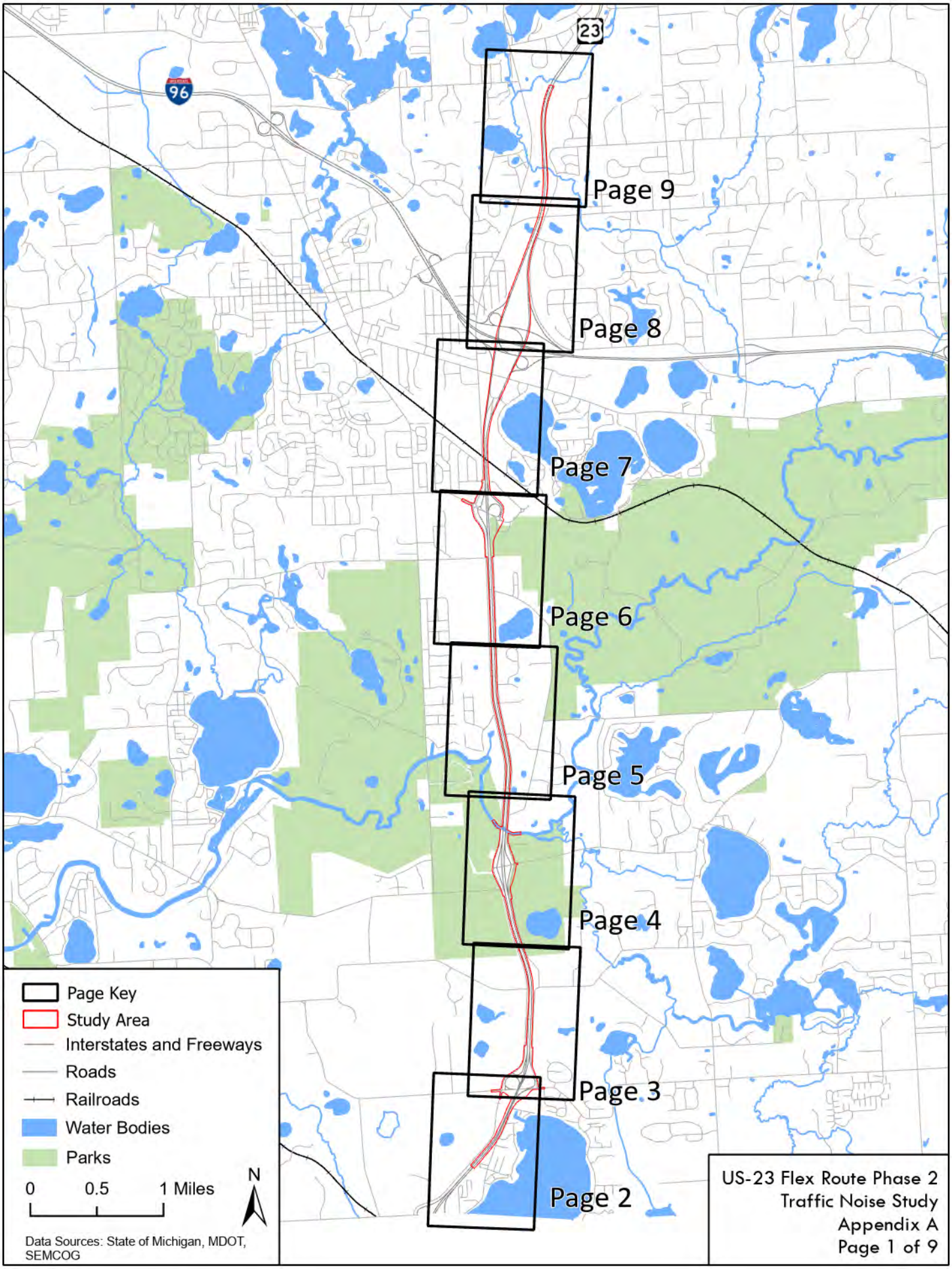
FHWA, *Recommended Best Practices for the Use of the FHWA Traffic Noise Model (TNM), TNM Object Input, Noise Barrier Optimization, and Quality Assurance, Final Report*, December 8, 2015.

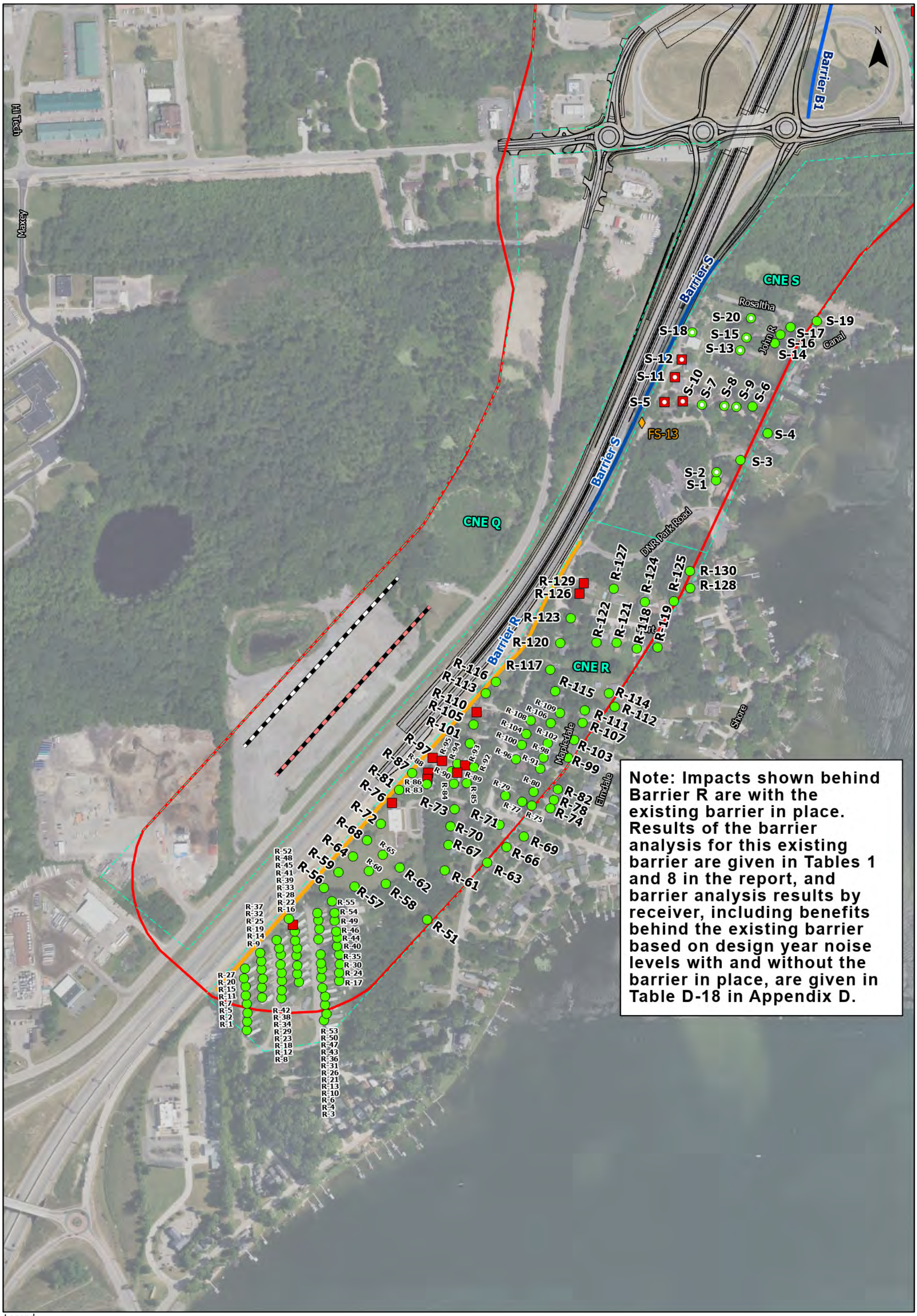
Hanf, Thomas, Email regarding "2020 CPBU", MDOT Air Quality & Noise Abatement, November 9, 2020.

Michigan Department of Transportation, Highway Noise Analysis and Abatement Handbook, July 2011.

Michigan Department of Transportation, US-23 Improvements from M-14/US-23 West Interchange to Silver Lake Road Noise Analysis Report, February 2015.

APPENDIX A: Traffic Noise Study Exhibits


23
96
Page 9
Page 8
Page 7
Page 6
Page 5
Page 4
Page 3
Page 2
Page Key
Study Area
Interstates and Freeways
Roads
Railroads
Water Bodies
Parks
0
0.5
1 Miles
N
Data Sources: State of Michigan, MDOT, SEMCOG
US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A
Page 1 of 9



Note: Impacts shown behind Barrier R are with the existing barrier in place. Results of the barrier analysis for this existing barrier are given in Tables 1 and 8 in the report, and barrier analysis results by receiver, including benefits behind the existing barrier based on design year noise levels with and without the barrier in place, are given in Table D-18 in Appendix D.

Legend

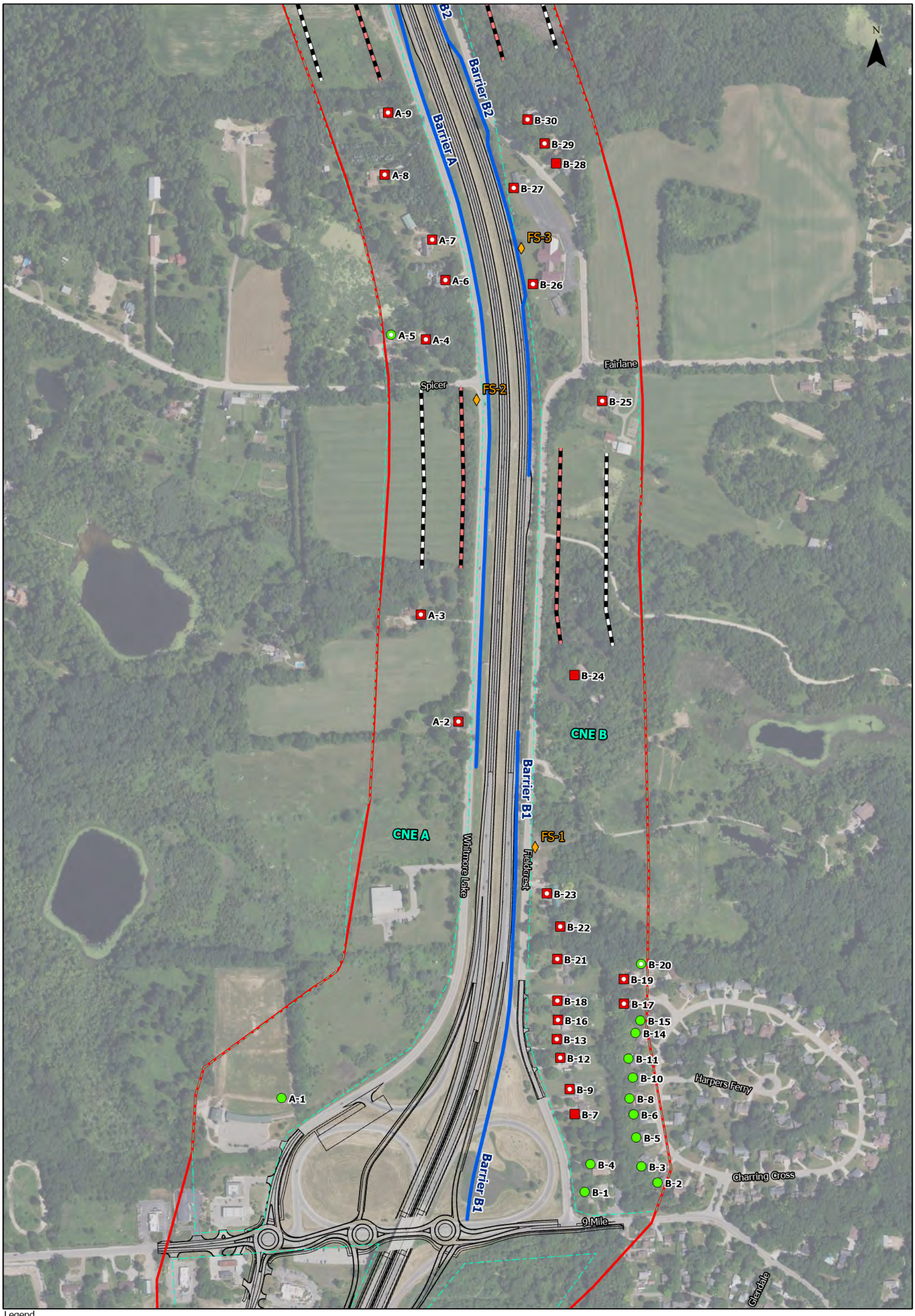
- Field Sites
- Receiver Not Impacted, Not Benefited
- Receiver Not Impacted, Benefited
- Receiver Impacted, Not Benefited
- Receiver Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet



Legend

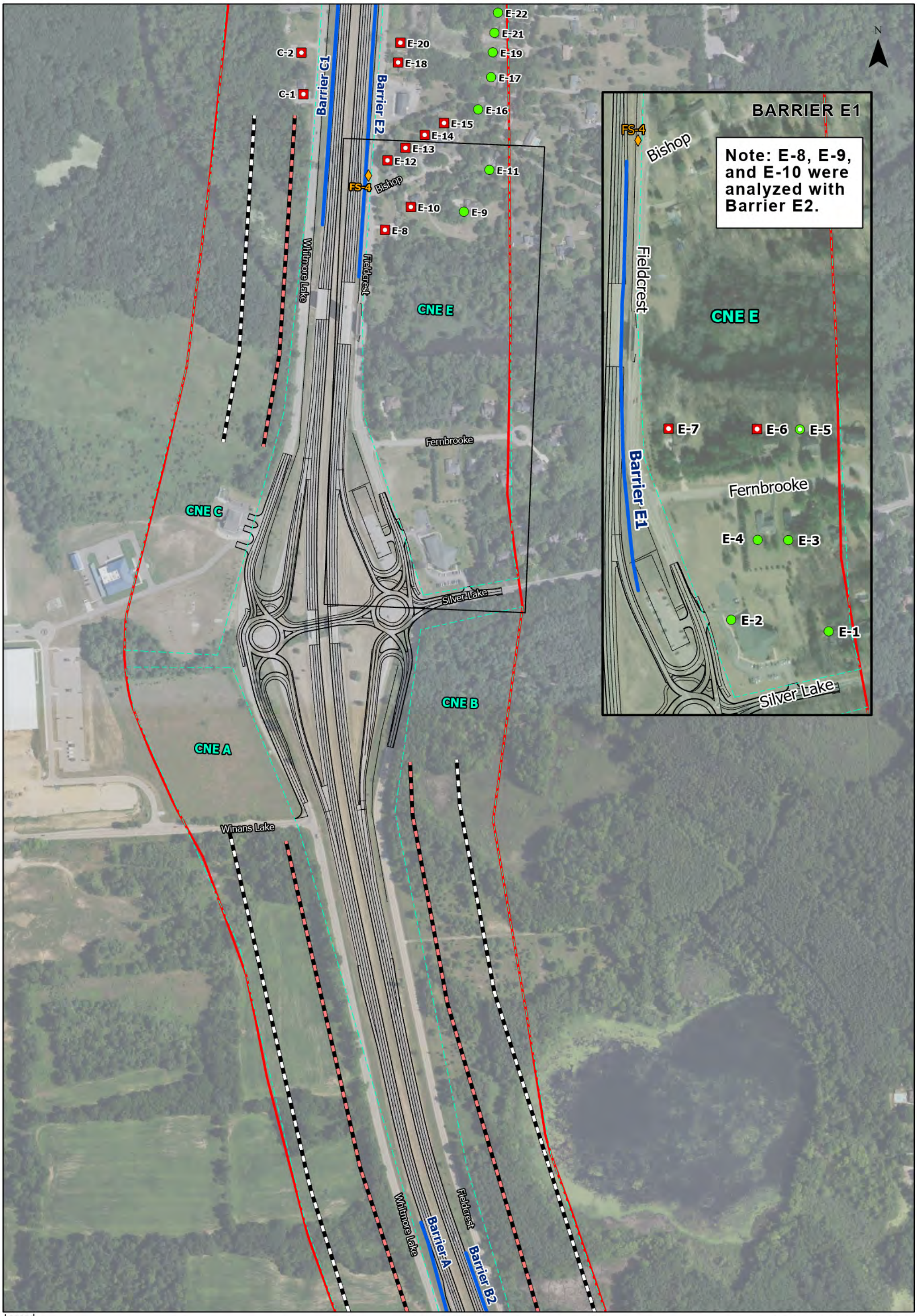
- Field Sites
- Not Impacted, Not Benefited
- Not Impacted, Benefited
- Impacted, Not Benefited
- Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet



Legend

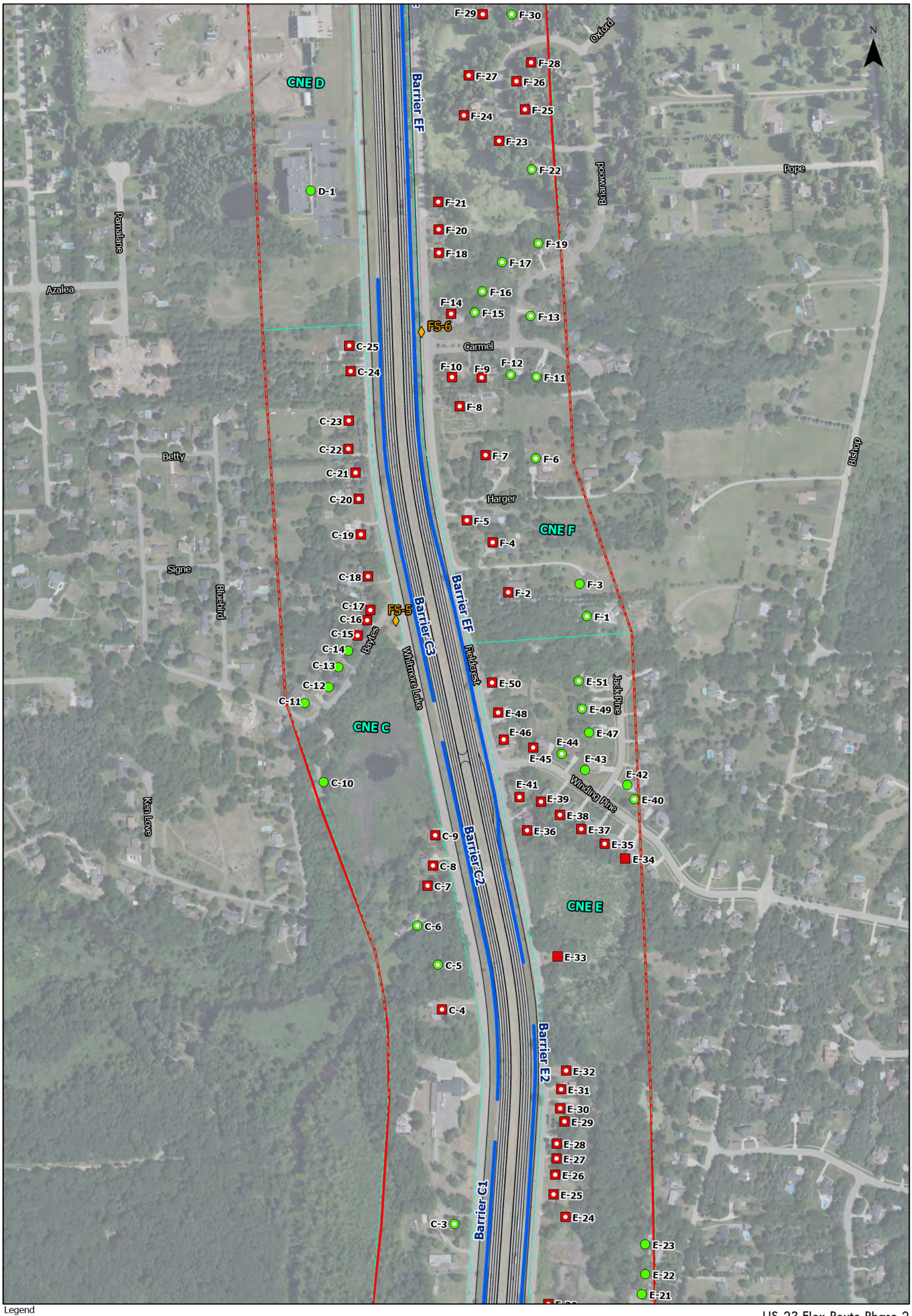
- Field Sites
- Not Impacted, Not Benefited
- Not Impacted, Benefited
- Impacted, Not Benefited
- Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet



Legend

- Field Sites
- Not Impacted, Not Benefited
- Not Impacted, Benefited
- Impacted, Not Benefited
- Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet

Legend

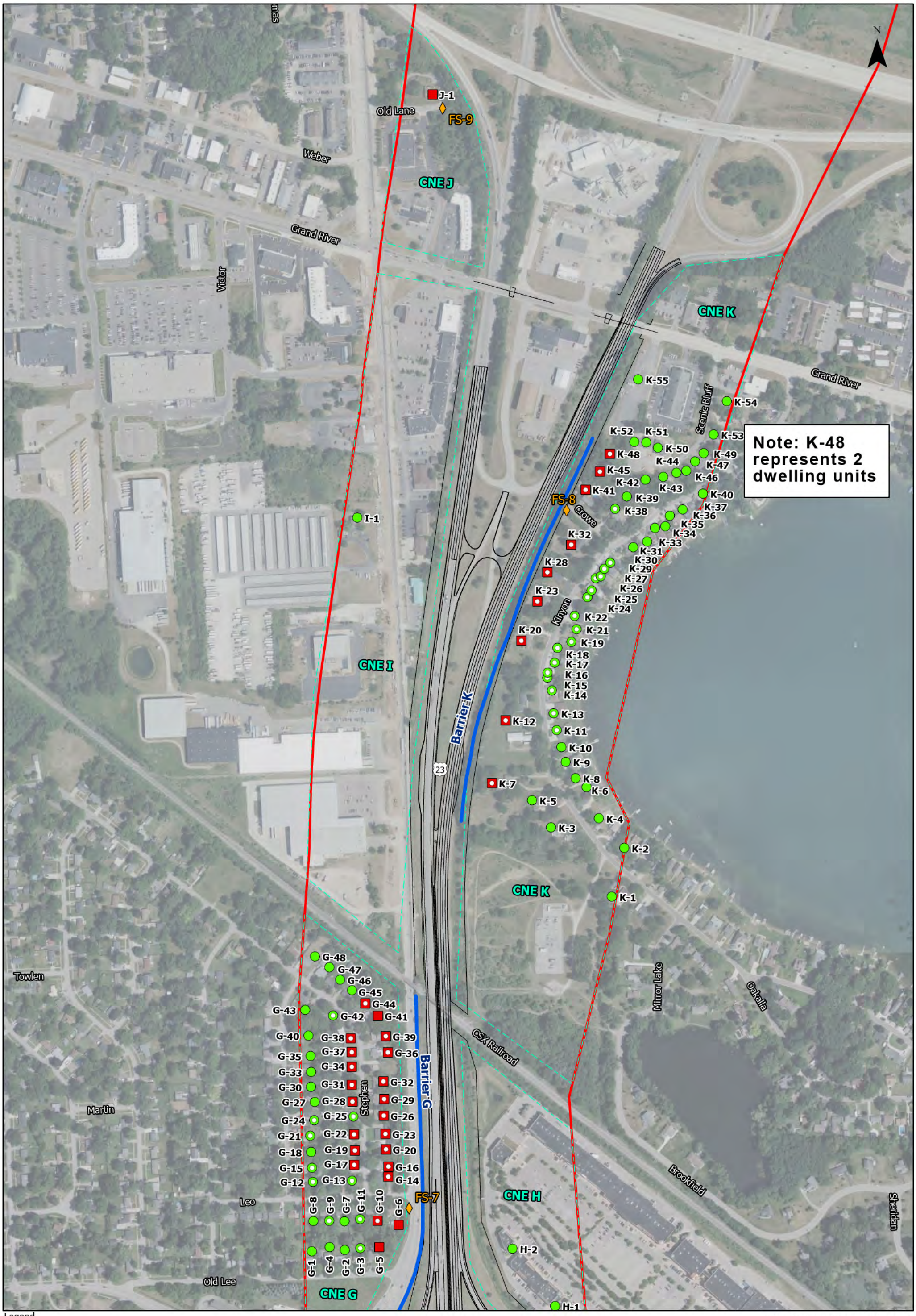
- Field Sites
- Not Impacted, Not Benefited
- Not Impacted, Benefited
- Impacted, Not Benefited
- Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet



Legend

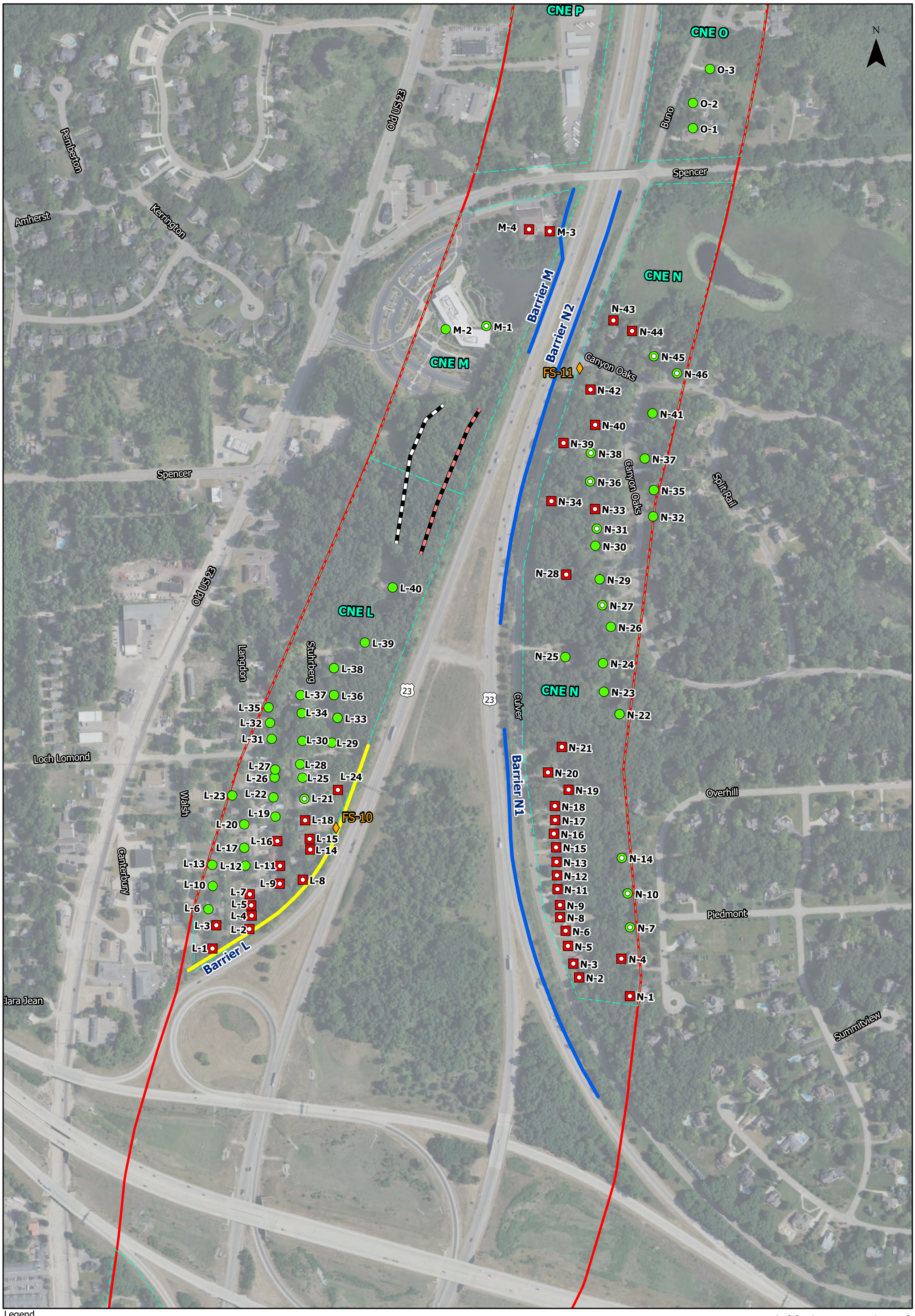
- Field Sites
- Not Impacted, Not Benefited
- Not Impacted, Benefited
- Impacted, Not Benefited
- Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet



Legend

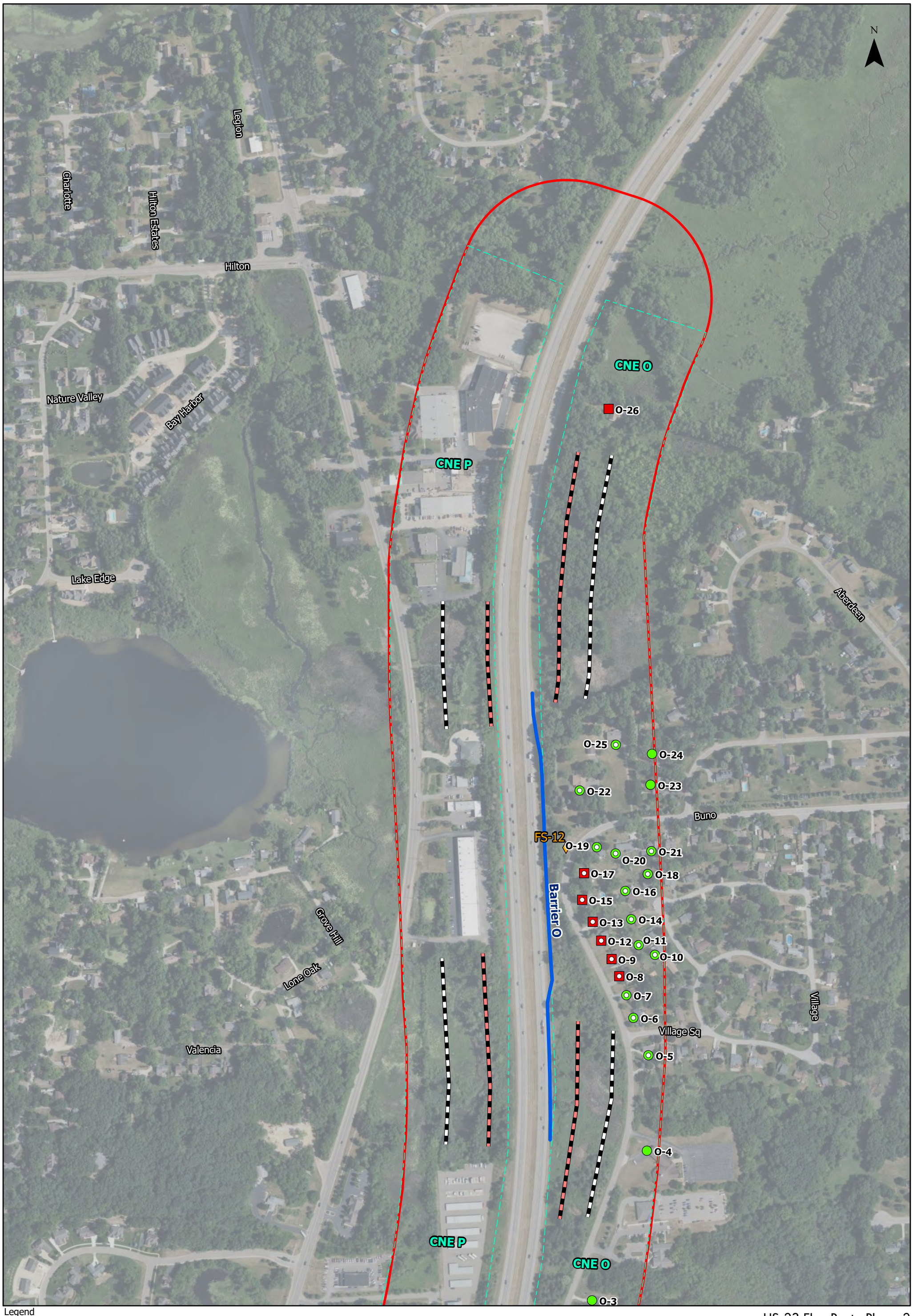
- Field Sites
- Not Impacted, Not Benefited
- Not Impacted, Benefited
- Impacted, Not Benefited
- Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet



Legend

- Field Sites
- Not Impacted, Not Benefited
- Not Impacted, Benefited
- Impacted, Not Benefited
- Impacted, Benefited
- 66 dB(A) Setback
- 71 dB(A) Setback
- Proposed Alignment
- Common Noise Environment (CNE)
- Traffic Noise Study Area

Noise Barriers Analyzed

- Feasible, Not Reasonable
- Feasible and Reasonable
- Existing

US-23 Flex Route Phase 2
Traffic Noise Study
Appendix A

0 100 200 400 Feet

APPENDIX B: Calibration Certificates and Data Sheets

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.44618

Instrument: **Sound Level Meter**
Model: **118**
Manufacturer: **Norsonic**
Serial number: **31483**
Tested with: **Microphone 1225 s/n 52318**
Preamplifier 1206 s/n 30522
Type (class): **1**
Customer: **HNTB Corporation**
Tel/Fax: **763-852-2166 / 414-359-2314**

Date Calibrated: **3/26/2020** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No
Calibration service: __ Basic _X_ Standard
Address: **5500 Wayzata Blvd Suite 450, Minneapolis, MN 55416**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2019	Scantek, Inc./ NVLAP	Oct 31, 2020
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 22, 2019	ACR Env. / A2LA	Oct 22, 2020
HM30-Thommen	Meteo Station	1040170/39633	Oct 24, 2019	ACR Env./ A2LA	Oct 24, 2020
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 23, 2019	Scantek, Inc./ NVLAP	Oct 23, 2020

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.9	99.79	40.7

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	3/26/2020	Date	3/27/2020

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - IEC61672-3 ED.2 CLAUSE 10	Passed	0.15
SELF-GENERATED NOISE - IEC 61672-3 ED.2 CLAUSE 11	Passed	0.3
FREQUENCY WEIGHTINGS: A NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.2
FREQUENCY WEIGHTINGS: C NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.2
FREQUENCY WEIGHTINGS: Z NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	0.2
FREQUENCY AND TIME WEIGHTINGS AT 1 KHZ IEC 61672-3 ED.2.0 CLAUSE 14	Passed	0.2
LEVEL LINEARITY ON THE REFERENCE LEVEL RANGE - IEC 61672-3 ED.2 CLAUSE 16	Passed	0.25
TONEBURST RESPONSE - IEC 61672-3 ED.2.0 CLAUSE 18	Passed	0.3
PEAK C SOUND LEVEL - IEC 61672-3 ED.2.0 CLAUSE 19	Passed	0.35
OVERLOAD INDICATION - IEC 61672-3 ED.2.0 CLAUSE 20	Passed	0.25
HIGH LEVEL STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 21	Passed	0.1
LONG TERM STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 15	Passed	0.1
FILTER TEST 1/1OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3	Passed	0.25
COMBINED ELECTRICAL AND ACOUSTICAL TEST - IEC 61672-3 ED.2.0 CLAUSE 13	Passed	See test report

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 Parameters are certified at actual environmental conditions.

3 The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2, to demonstrate that the model of sound level meter fully conforms to the requirements in the IEC 61672-2, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: Norsonic 1225 s/n 52318 for acoustical test
Preamplifier: Norsonic 1206 s/n 30522 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: Norsonic 1251 s/n 30825
Windscreen: Norsonic Nor1451 (ø 60mm)

Measured Data: in Test Report # 44618 of 9 +1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.44619

Instrument: **Microphone**
Model: **1225**
Manufacturer: **Norsonic**
Serial number: **52318**
Composed of:

Date Calibrated: **3/26/2020** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **HNTB Corporation**
Tel/Fax: **763-852-2166/414-359-2314**
Address: **5500 Wayzata Blvd Suite 450, Minneapolis, MN 55416**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2019	Scantek, Inc./ NVLAP	Oct 31, 2020
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 22, 2019	ACR Env. / A2LA	Oct 22, 2020
HM30-Thommen	Meteo Station	1040170/39633	Oct 24, 2019	ACR Env./ A2LA	Oct 24, 2020
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Oct 23, 2019	Scantek, Inc./ NVLAP	Oct 23, 2020
1203-Norsonic	Preamplifier	14059	March 3, 2020	Scantek, Inc./ NVLAP	March 3, 2021
4180-Brüel&Kjær	Microphone	2246115	Oct 1, 2019	DPLA / DANAK	Oct 1, 2021

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E. Marshall
Date	3/26/2020	Date	3/27/2020

Document stored as: Y:\Calibration Lab\Mic 2020\NOR1225_52318_M1.doc

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Results are normalized to the reference conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.8 ± 1.0	99.89 ± 0.020	40.9 ± 2.0

Main measured parameters:

Tone frequency (Hz)	Measured[4]/Nominal Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-25.92 ± 0.61/ -26.0	50.56

[4] The reported expanded uncertainty is calculated with a coverage factor k=3.31

Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 44619 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.44620

Instrument:	**Acoustical Calibrator**
Model:	**1251**
Manufacturer:	**Norsonic**
Serial number:	**30825**
Class (IEC 60942):	**1**
Barometer type:	
Barometer s/n:	
Customer:	**HNTB Corporation**
Tel/Fax:	**763-852-2166 / 414-359-2314**

Date Calibrated: **3/26/2020** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Address: **5500 Wayzata Blvd Suite 450, Minneapolis, MN 55416**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2019	Scantek, Inc./ NVLAP	Oct 31, 2020
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 22, 2019	ACR Env. / A2LA	Oct 22, 2020
HM30-Thommen	Meteo Station	1040170/39633	Oct 24, 2019	ACR Env./ A2LA	Oct 24, 2020
140-Norsonic	Real Time Analyzer	1406423	Oct 31, 2019	Scantek / NVLAP	Oct 31, 2020
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	173368	Oct 23, 2019	Scantek, Inc. / NVLAP	Oct 23, 2020
1203-Norsonic	Preamplifier	14059	March 3, 2020	Scantek, Inc./ NVLAP	March 3, 2021

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	3/26/2020	Date	3/27/2020

Document stored as: Y:\Calibration Lab\Cal 2020\NOR1251_30825_M1.doc

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES[1] FROM STANDARDS REFERENCED IN PROCEDURES:	MET[2]	NOT MET	COMMENTS
Manufacturer specifications			
Manufacturer specifications: Sound pressure level	X		
Manufacturer specifications: Frequency	X		
Manufacturer specifications: Total harmonic distortion	X		
Current standards			
ANSI S1.40:2006 B.3 / IEC 60942: 2003 B.2 - Preliminary inspection	X		
ANSI S1.40:2006 B.4.4 / IEC 60942: 2003 B.3.4 - Sound pressure level	X		
ANSI S1.40:2006 A.5.4 / IEC 60942: 2003 A.4.4 - Sound pressure level stability	-	-	
ANSI S1.40:2006 B.4.5 / IEC 60942: 2003 B.3.5 - Frequency	X		
ANSI S1.40:2006 B.4.6 / IEC 60942: 2003 B.3.6 - Total harmonic distortion	X		

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 The tests marked with (*) are not covered by the current NVLAP accreditation.

Main measured parameters [3]:

Measured[4]/Acceptable[5] Tone frequency (Hz):	Measured[4]/Acceptable[5] Total Harmonic Distortion (%):	Measured [4]/Acceptable Level[5] (dB):
1000.01 ± 1.0/1000.0 ± 10.0	0.23 ± 0.10/ < 3	114.14 ± 0.12/114.0 ± 0.4

3 The stated level is valid at reference conditions.

4 The above expanded uncertainties for frequency and distortion are calculated with a coverage factor k=2; for level k=2.00

5 Acceptable parameters values are from the current standards

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.0 ± 1.0	99.92 ± 0.000	41.0 ± 2.0

Tests made with following attachments to instrument:

Calibrator ½" Adaptor Type: 1443
Other:

Adjustments: Unit was not adjusted.
Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Measured Data: in Acoustical Calibrator Test Report # 44620 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan U.

SITE: FS-1 DATE: 8-20-20 TIME: Start 10:18AM

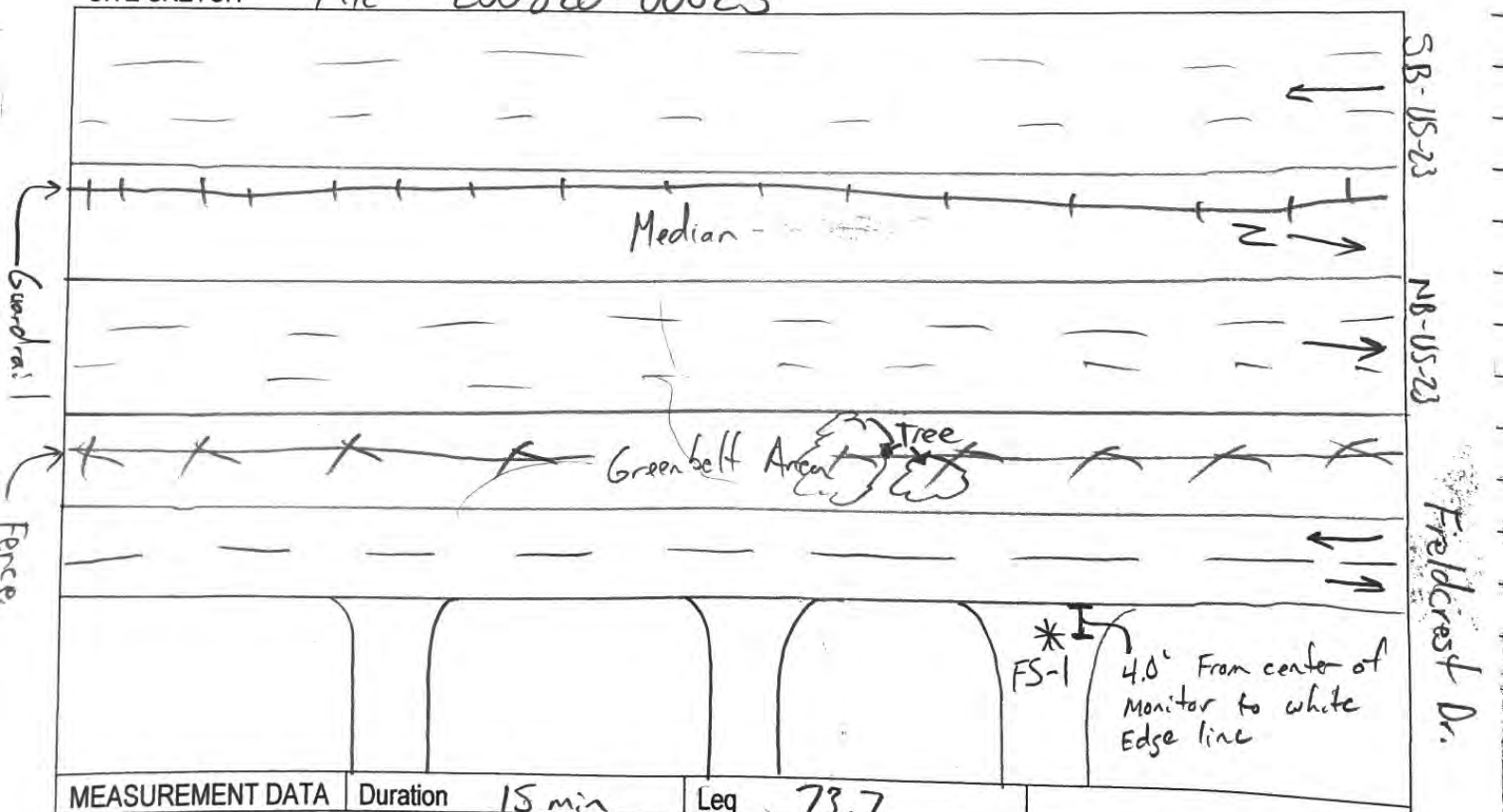
CALIBRATION: 113.8 at 1k Hz dB. ✓ JB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA				
ROAD (Name/Dir)	NB/23	NB Field crest	SB23	SB Field crest
AUTOS	383	6	391	2
MED TRKS	5	0	6	1
HVY TRKS	62	1	37	1
BUS	0	0	2	0
MOTORCYCLE	0	0	0	0
SPEED	75	40	75	40

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200820-0002S



MEASUREMENT DATA	Duration 15 min	Leq 73.7	

WEATHER DATA WIND SPEED (MPH) 3.1 Max DIR. W to E TEMP. 82.1 HUMIDITY N/A CLOUD COVER Clear

BACKGROUND NOISE None

MAJOR SOURCES None General traffic flow

UNUSUAL EVENTS

OTHER NOTES Avg speeds on US-23 70 to 75 mph
surface Rd. Fieldcrest 40 mph

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Ryan S

SITE: FS-2 Rev DATE: 9/23/20 TIME: 11:33 am

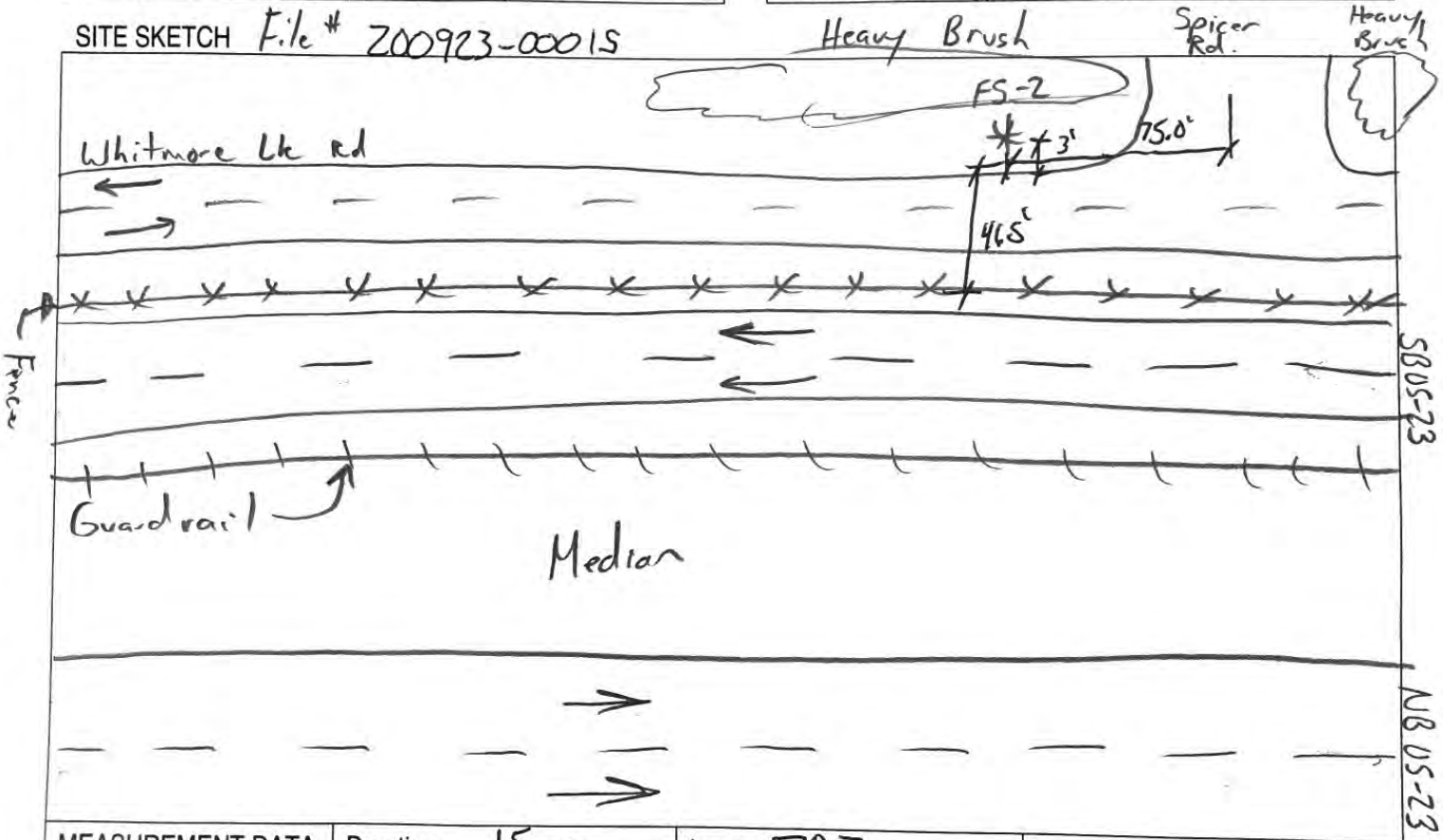
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA				
ROAD (Name/Dir)	NB 23	NB Whitmore Lk	SB 23	SB Whitmore Lk
AUTOS	401	21	354	21
MED TRKS	26	0	22	0
HVY TRKS	48	1	66	0
BUS	0	0	0	0
MOTORCYCLE	0	1	~~0~~ 1	0
SPEED	75	45	75	45

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200923-0001S



MEASUREMENT DATA	Duration	15 min	Leq	70.7	

WEATHER DATA WIND SPEED (MPH) 2.4 DIR. S to N TEMP. 82.5 HUMIDITY ~~52%~~ 52% CLOUD COVER clear

BACKGROUND NOISE None

MAJOR SOURCES General traffic on service rd + US-23

UNUSUAL EVENTS None

OTHER NOTES None

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan V

SITE: FS-3 DATE: 8/20/20 TIME: 10:42 Am

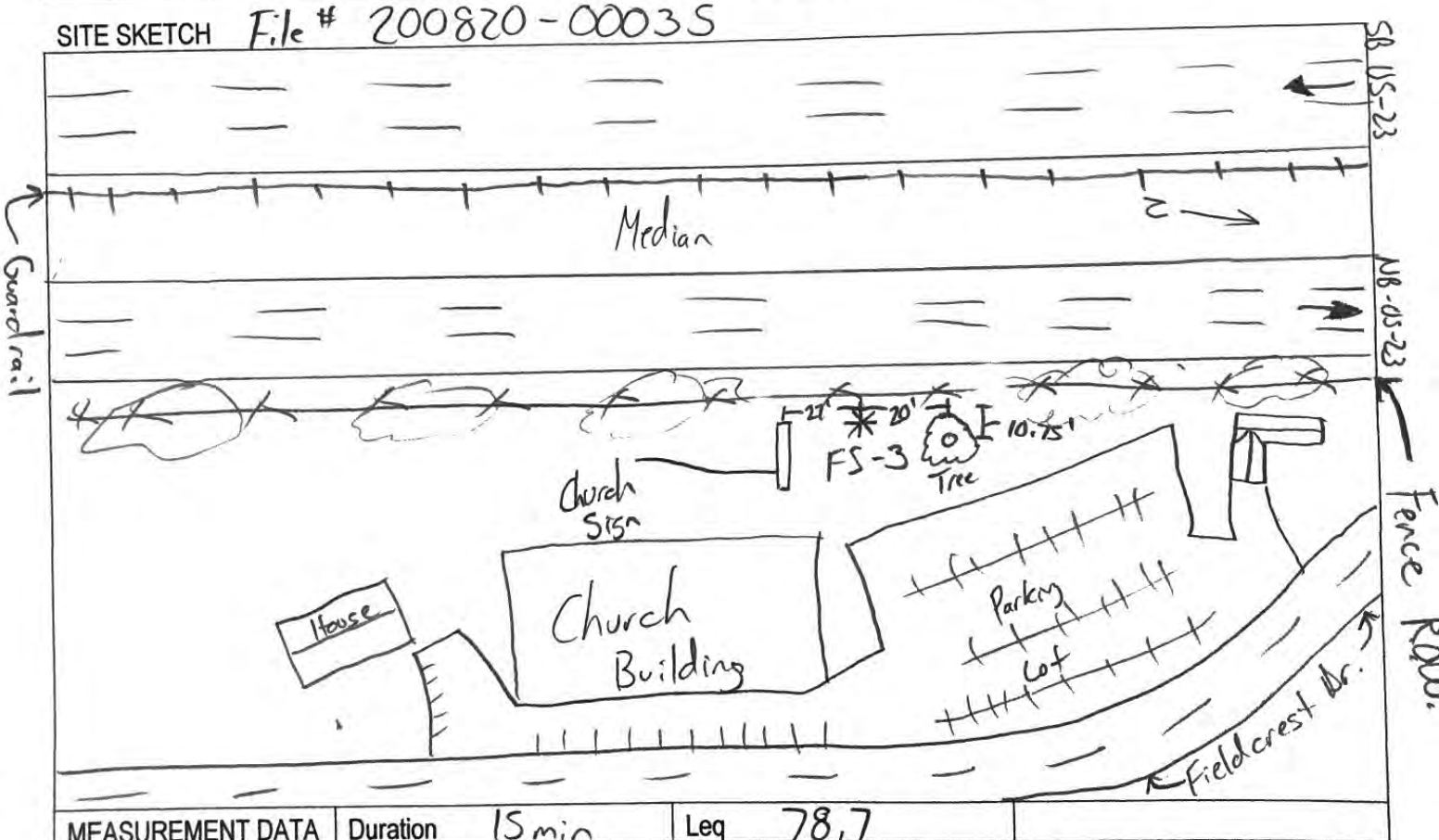
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA		
ROAD (Name/Dir)	NB-US-23	SB US-23
AUTOS	483	379
MED TRKS	3	3
HVY TRKS	58	42
BUS	1	1
MOTORCYCLE	0	0
SPEED	75	75

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200820-0003S



MEASUREMENT DATA	Duration	15 min	Leq	78.7	

WEATHER DATA WIND SPEED (MPH) 3.8 DIR. W to E TEMP. 80.4 HUMIDITY N/A CLOUD COVER clear

BACKGROUND NOISE None

MAJOR SOURCES Traffic Flow

UNUSUAL EVENTS None

OTHER NOTES Distance From ROW Fence to Monitor 5.5' do East
Distance From Church Sign 27' do North
Distance From Tree 20' south + 10.75' West

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan V

SITE: FS-4 DATE: 8/20/20 TIME: 11:17 Am

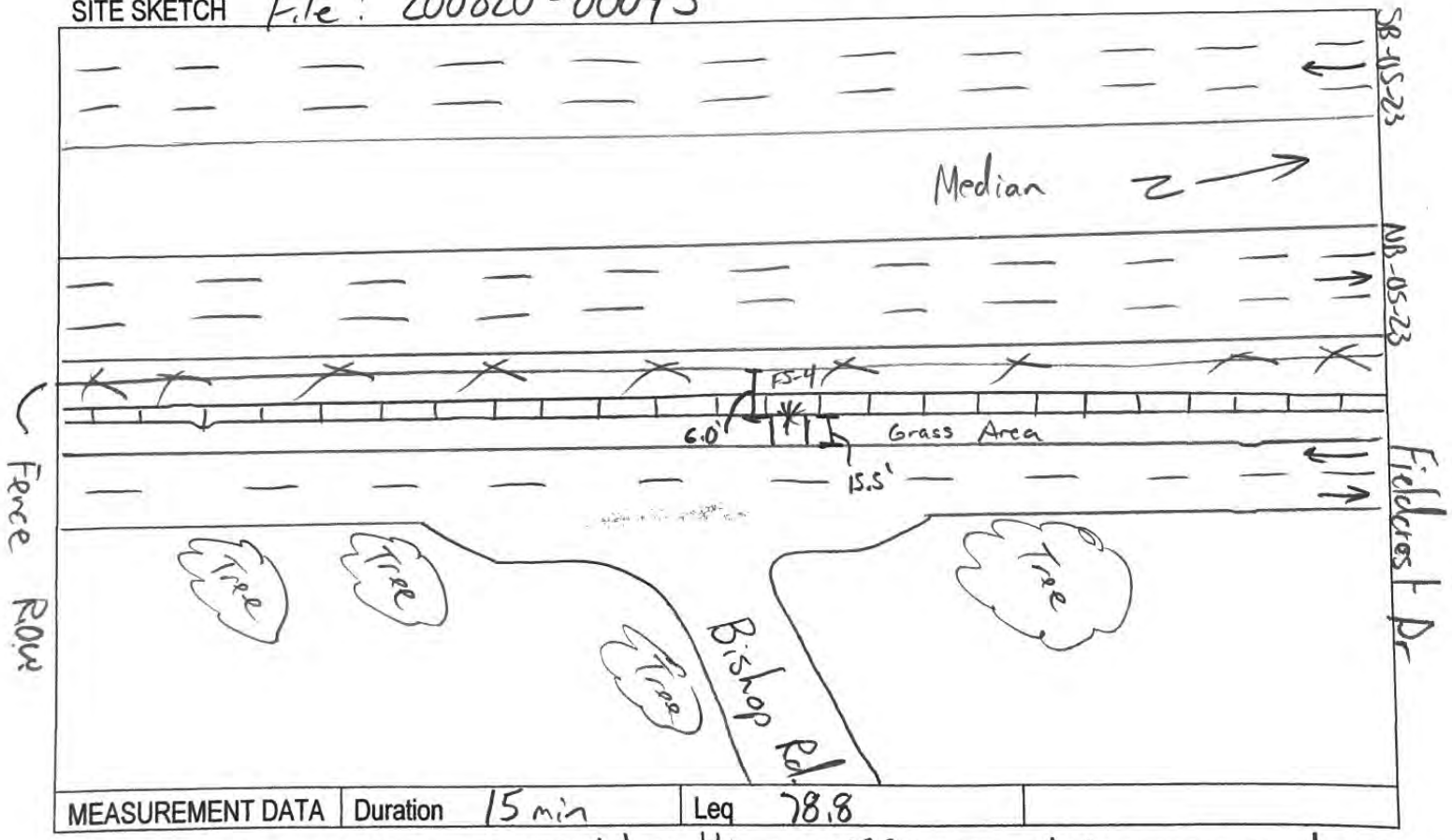
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA				
ROAD (Name/Dir)	NB23	NB Fieldcrest	SB US-23	SB Fieldcrest
AUTOS	536	20	351	15
MED TRKS	6	1	2	0
HVY TRKS	79	0	53	0
BUS	1	0	2	0
MOTORCYCLE	4	0	0	0
SPEED	75	45	75	45

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File: 200820-0004S



MEASUREMENT DATA	Duration 15 min	Leq 78.8	

WEATHER DATA WIND SPEED (MPH) 4.1 DIR. W to E TEMP. 82.3 HUMIDITY N/A CLOUD COVER clear

BACKGROUND NOISE None

MAJOR SOURCES Normal traffic flow

UNUSUAL EVENTS 2 people walked by the monitor @ 11:26 am

OTHER NOTES Monitor is located 6.0' East of the ROW Fence

Monitor is located 15.5' West of the SB Fieldcrest Edge line

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan V

SITE: FS-5 DATE: 8/20/20 TIME: 11:47 AM

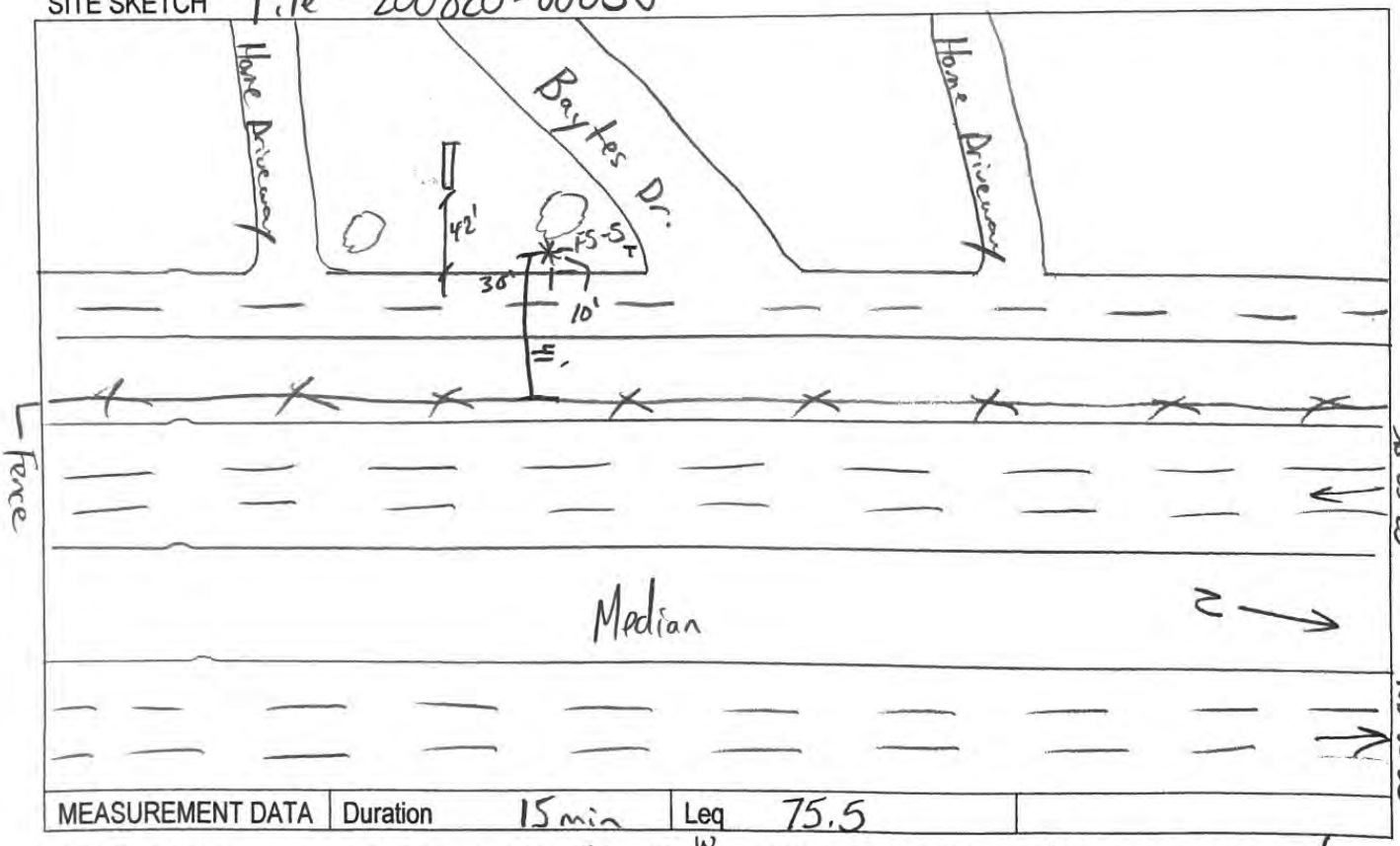
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA				
ROAD (Name/Dir)	NB-23	NB Whitmore Lk	SB 23	NB Whitmore Lk.
AUTOS	542	52	398	30
MED TRKS	6	0	3	1
HVY TRKS	64	2	52	3
BUS	1	0	1	0
MOTORCYCLE	2	0	0	0
SPEED	75	45	75	45

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200820-00055



MEASUREMENT DATA	Duration	15 min	Leq	75.5	

WEATHER DATA WIND SPEED (MPH) 3.1 DIR. W to E TEMP. 81.2 HUMIDITY N/A CLOUD COVER clear

BACKGROUND NOISE None

MAJOR SOURCES Traffic Flow

UNUSUAL EVENTS None

OTHER NOTES Monitor is 10' west of SB Whitmore Lk Rd White edge line
Monitor is 30' North and 42' East of Subdivision sign
Monitor is 41' west of ROW Fence

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan V

SITE: FS-6 DATE: 8-21-20 TIME: 1:32 pm

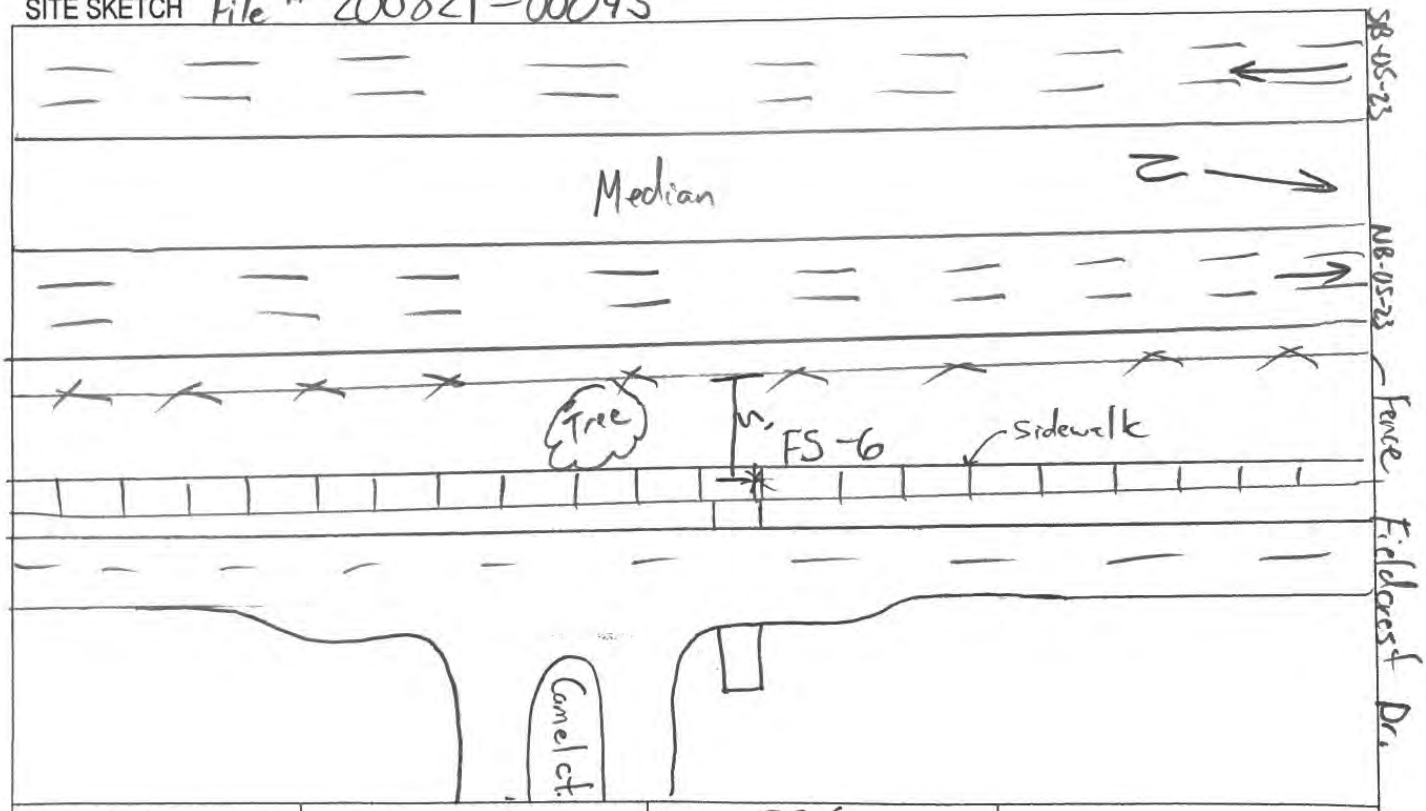
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA				
ROAD (Name/Dir)	NB US 23	NB Fieldcrest	SB US-23	SB Fieldcrest
AUTOS	658	27	548	21
MED TRKS	5	0	3	0
HVY TRKS	38	0	41	0
BUS	1	0	2	0
MOTORCYCLE	2	1	1	0
SPEED	35	50	70	50

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200821-0004S



MEASUREMENT DATA	Duration 15 min	Leq 73.8	

WEATHER DATA WIND SPEED (MPH) 1.8 DIR. W TEMP. 85 HUMIDITY N/A CLOUD COVER clear

BACKGROUND NOISE None

MAJOR SOURCES Traffic sounds

UNUSUAL EVENTS NB Traffic was heavy so vehicles were traveling @ 30 to 35 mph

OTHER NOTES Monitor is located 5' East off ROW Fence

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan V

SITE: FS-7 DATE: 8-21-20 TIME: 1:06 pm

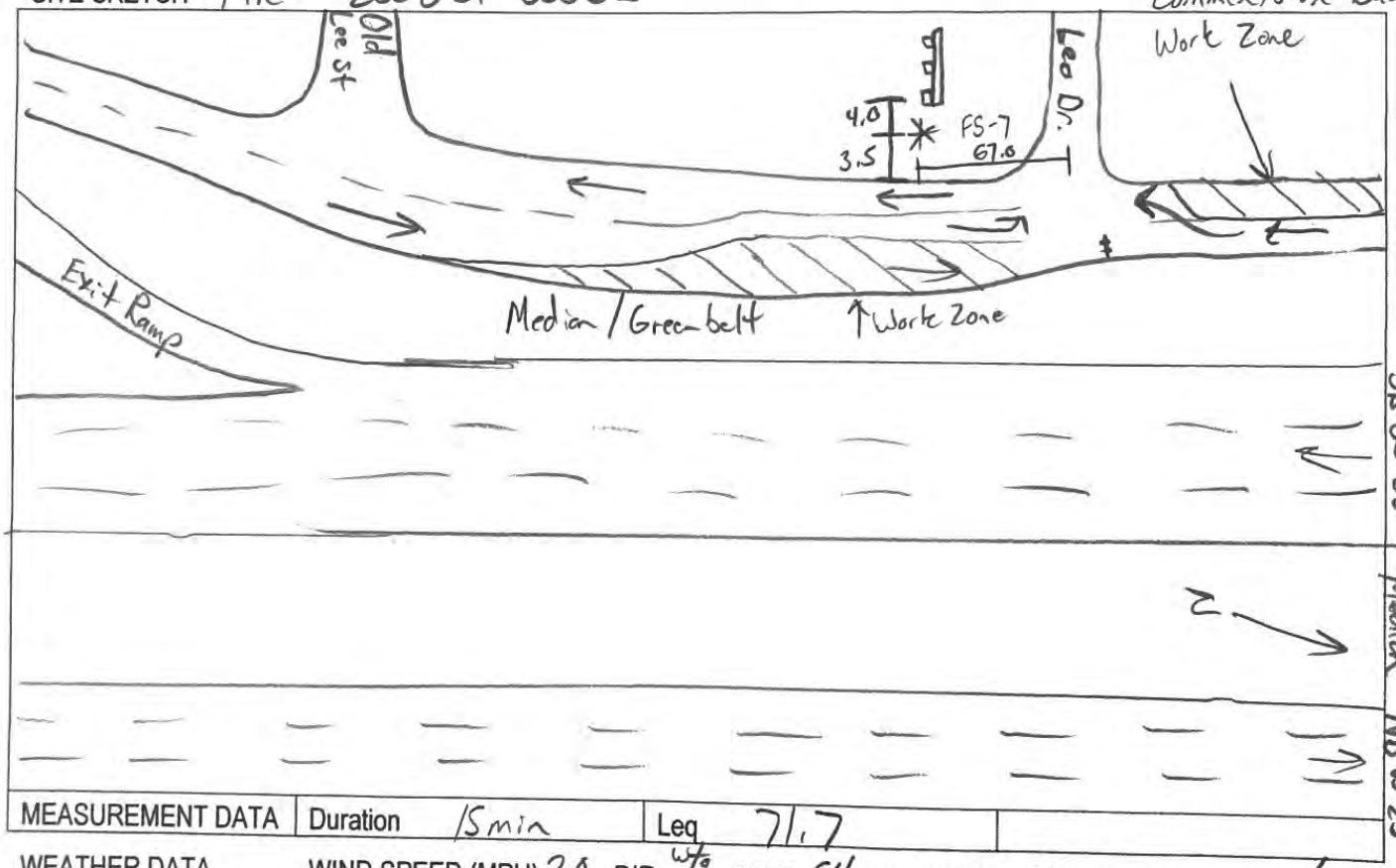
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA			
ROAD (Name/Dir)	NB US-23	NB Whitmore	SB US-23
AUTOS	708	97	647
MED TRKS	9	0	4
HVY TRKS	41	2	42
BUS	3	0	2
MOTORCYCLE	8	1	1
SPEED	30	40	70

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200821-0003S *Comments on Back*



MEASUREMENT DATA	Duration 15min	Leq 71.7	

WEATHER DATA WIND SPEED (MPH) 2.0 DIR. W to E TEMP. 84 HUMIDITY N/A CLOUD COVER clear

BACKGROUND NOISE None

MAJOR SOURCES Vehicle traffic

UNUSUAL EVENTS SB Whitmore Lk Rd closed due to construction

OTHER NOTES Monitor is 3.5' West of Back of Curb
Monitor is 4.0' East of the East Sign post
Monitor is 67.0' South of the ℄ of Leo Dr.

* Note: NB traffic was backed up and traveling around 30 mph just do to heavy traffic

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan U

SITE: FS-8 DATE: 8-21-20 TIME: 12:30 pm

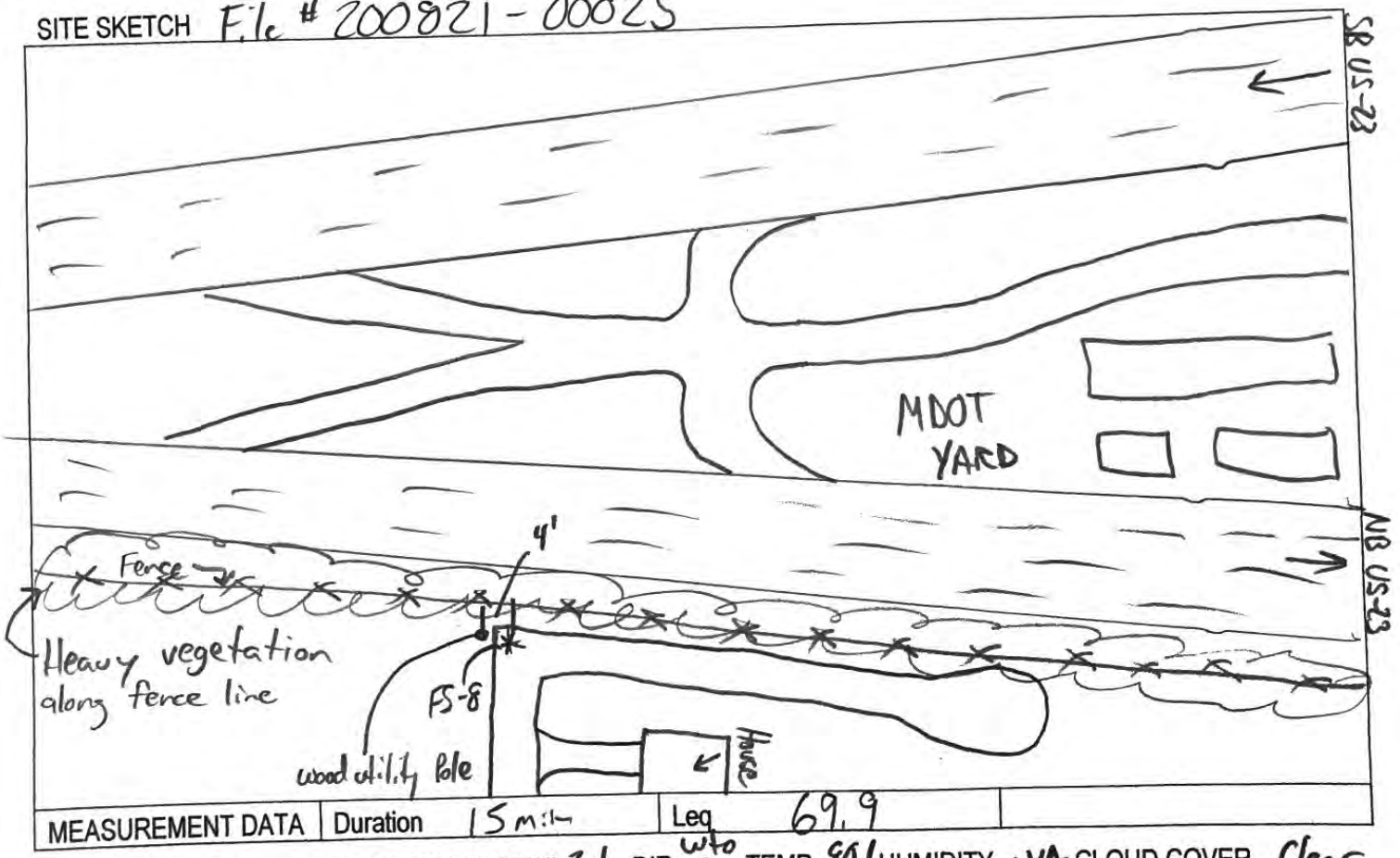
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA		
ROAD (Name/Dir)	NB US-23	SB US-23
AUTOS	737	550
MED TRKS	2	7
HVY TRKS	39	50
BUS	0	0
MOTORCYCLE	2	5
SPEED	70	70

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200821-0002S



MEASUREMENT DATA	Duration	15 min	Leq	69.9	

WEATHER DATA WIND SPEED (MPH) 2.1 DIR. W to E TEMP. 80.1 HUMIDITY N/A CLOUD COVER Clear

BACKGROUND NOISE None

MAJOR SOURCES General vehicle traffic sounds

UNUSUAL EVENTS None

OTHER NOTES Monitor 4' North of Wood Utility Pole

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Alan V

SITE: FS-9 DATE: 8-21-20 TIME: 11:38 AM

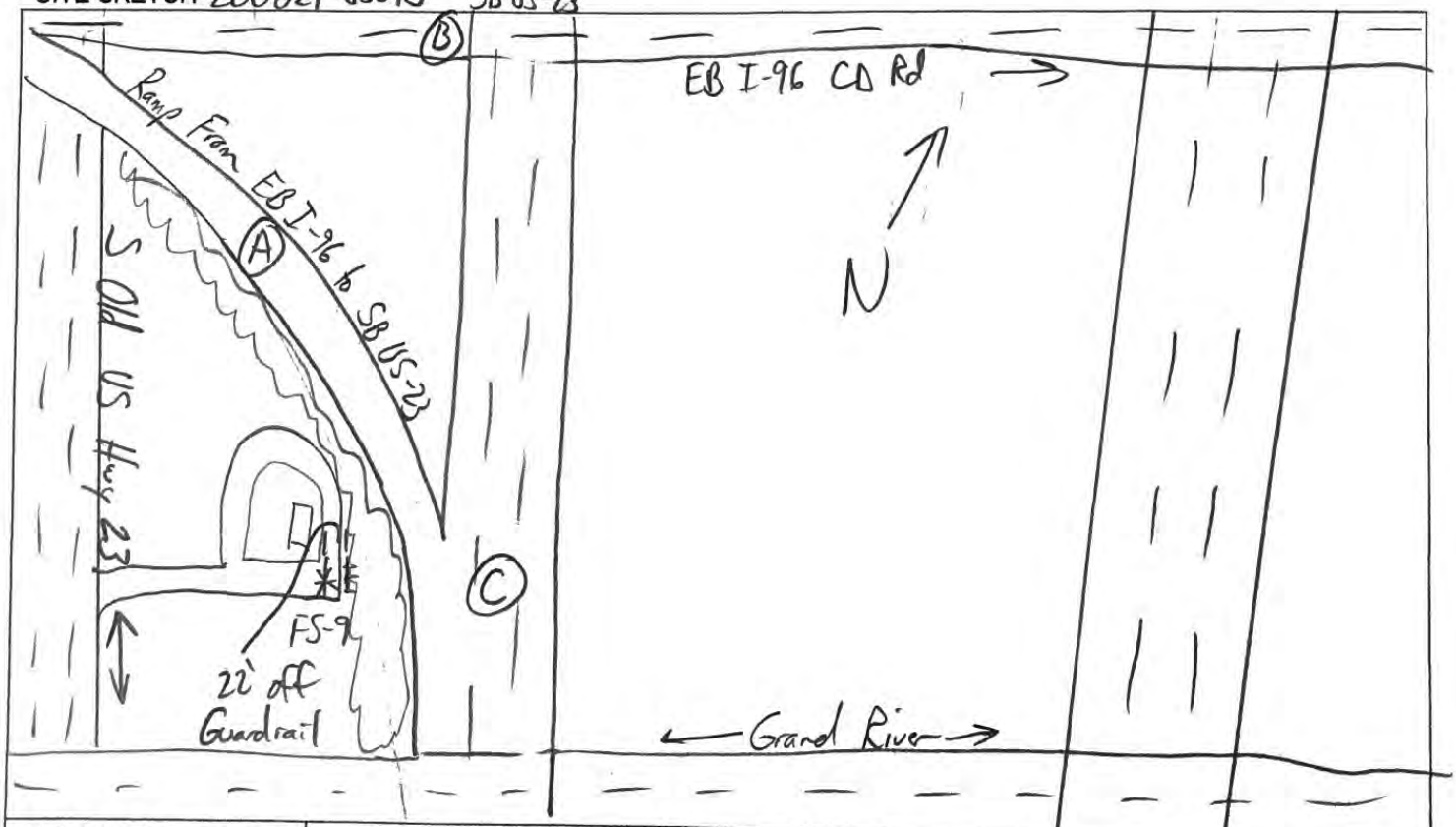
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

TRAFFIC DATA	(A)	(B)	(C)
ROAD (Name/Dir)	EB I-96 Ramp to SB US-23	SB US-23	EB I-96 CD Rd
AUTOS	236	248	96
MED TRKS	1	2	3
HVY TRKS	15	16	2
BUS	0	0	0
MOTORCYCLE	0	0	0
SPEED	45	70	55

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File 200821-0001S SB US-23



MEASUREMENT DATA	Duration 15	Leq 61.0	

WEATHER DATA WIND SPEED (MPH) 1.8 DIR. W to E TEMP. 80 HUMIDITY N/A CLOUD COVER Clear

BACKGROUND NOISE None

MAJOR SOURCES Vehicle traffic

UNUSUAL EVENTS None

OTHER NOTES EB I-96 Ramp to SB US-23 & EB I-96 CD Rd traffic counts are for 13 mins

SB US-23 traffic counts are for 10 min

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Ryan S

SITE: FS-10 DATE: 9/23/20 TIME: 1:50 pm

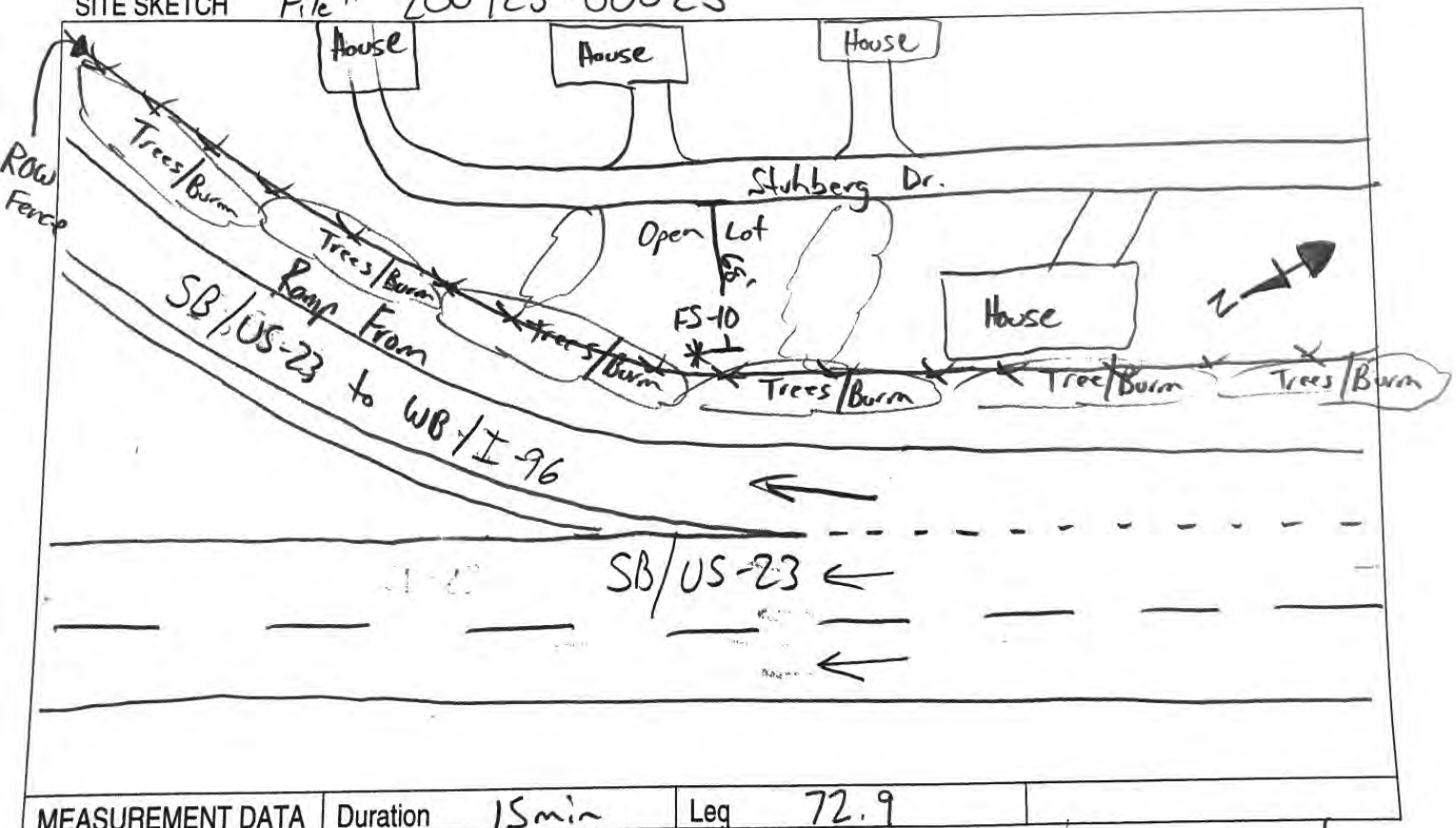
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW 15min 5mins 10min WEIGHTING: A / C / LIN.

TRAFFIC DATA			
ROAD (Name/Dir)	Stuhberg Dr	SB-23 to WB 96	SB / US-23
AUTOS	1	17	229
MED TRKS	0	0	8
HVY TRKS	0	0	27
BUS	0	0	0
MOTORCYCLE	0	0	0
SPEED	15	40	75

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200923-00025



MEASUREMENT DATA	Duration 15min	Leq 72.9	

WEATHER DATA WIND SPEED (MPH) 2.1 DIR. S/N TEMP. 84.7 HUMIDITY 52% CLOUD COVER Clear

BACKGROUND NOISE None

MAJOR SOURCES Freeway traffic

UNUSUAL EVENTS None

OTHER NOTES SB/US-23 10mins
SB/US-23 to WB I-96 5mins
Stuhberg Dr. 15mins
The monitor was 68' East of Stuhberg Dr East E/M

HNTB NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Ryan S

SITE: FS-11 DATE: 9/23/20 TIME: 2:05

CALIBRATION: 113.8 at 1k Hz dB.

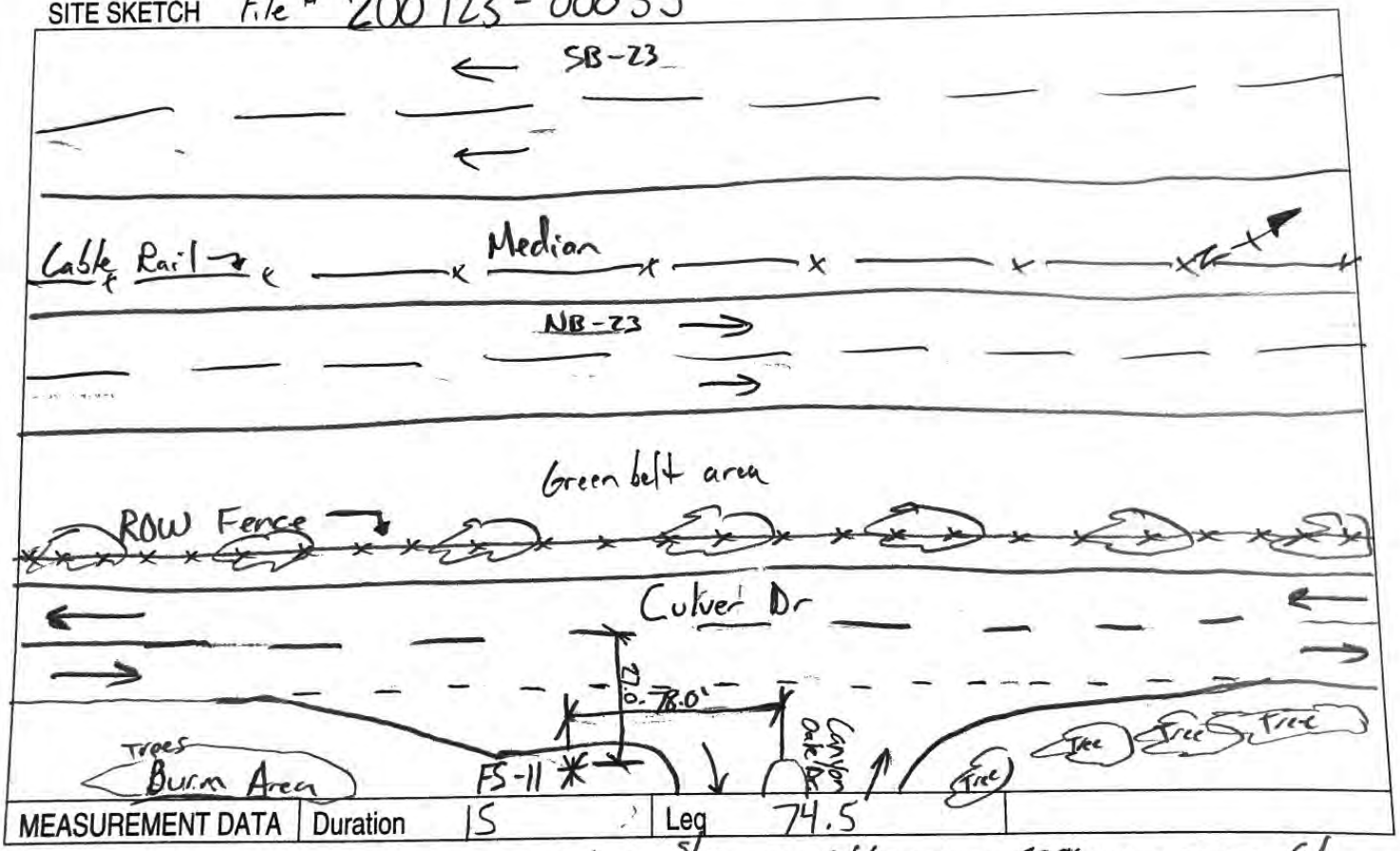
RESPONSE: FAST / SLOW

WEIGHTING: A / C / LIN.

TRAFFIC DATA	SB US-23 (10 min)	NB US-23 (10 min)	Culver Dr NB (15 mins)	Culver Dr SB (15 mins)
ROAD (Name/Dir)	SB US-23	NB US-23	NB	SB
AUTOS	261	318	21	20
MED TRKS	18	6	0	0
HVY TRKS	33	22	0	0
BUS	0	1	0	0
MOTORCYCLE	1	0	0	0
SPEED	75	75	40	40

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200923-0003S



MEASUREMENT DATA	Duration	15	Leg	74.5	

WEATHER DATA WIND SPEED (MPH) 2.1 DIR. S/N TEMP. 84.6 HUMIDITY 52% CLOUD COVER Clear

BACKGROUND NOISE None

MAJOR SOURCES Freeway traffic

UNUSUAL EVENTS None

OTHER NOTES

① SB-US-23	10 mins	Meter was 27' East of the ℄ of Culv
② NB-US-23	10 mins	Meter was 78' South of the ℄ of Canyo
③ Culver Dr	15 mins	

HNTB NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: Jonathan B / Ryan S

SITE: FS-12 DATE: 9/23/20 TIME: 2:39 pm

CALIBRATION: 113.8 at 1k Hz dB.

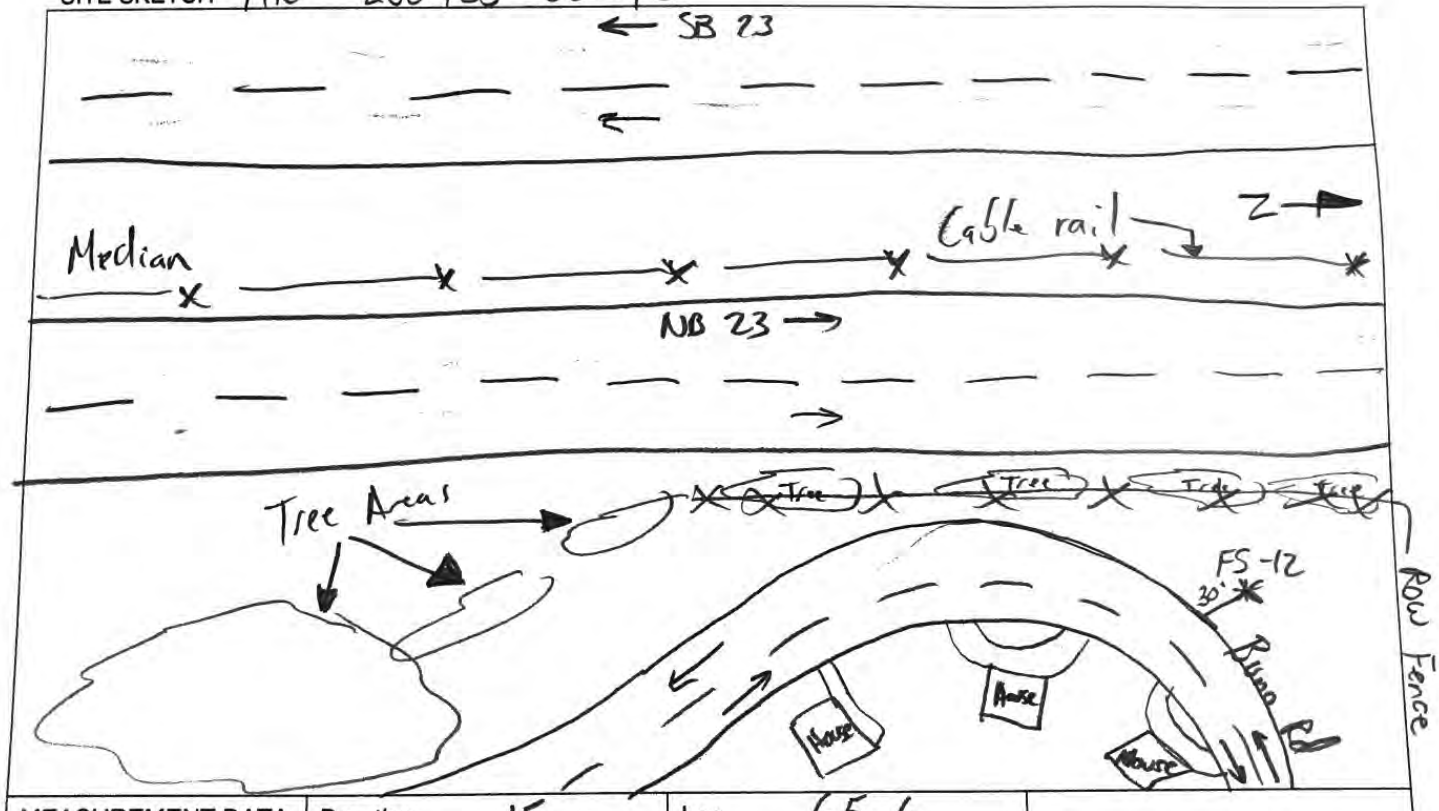
RESPONSE: FAST / SLOW

WEIGHTING: A / C / LIN.

	TRAFFIC DATA (10 mins)		Buno Rd (15 min)	
ROAD (Name/Dir)	NB-23	SB 23	NB	SB
AUTOS	401	272	5	11
MED TRKS	9	15	0	0
HVY TRKS	26	25	0	0
BUS	1	1	0	0
MOTORCYCLE	1	1	0	0
SPEED	75	75	25	25

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH File # 200923-0004S



MEASUREMENT DATA	Duration	15 min	Leq	65.6	

WEATHER DATA WIND SPEED (MPH) 1.2 DIR. S/N TEMP. 84.5 HUMIDITY 52% CLOUD COVER Clear

BACKGROUND NOISE None

MAJOR SOURCES Freeway traffic

UNUSUAL EVENTS None

OTHER NOTES

SB - US-23	10 mins	The Monitor was 30' NW of the
NB - US-23	10 mins	west E/M of Buno Rd
Buno Rd.	15 mins	

HNTB

NOISE MEASUREMENT DATA SHEET

PROJECT: US-23 Flex Route JOB #: 72206 BY: JAR

SITE: FS-13 DATE: 12/20/2021 TIME: 4:15 PM

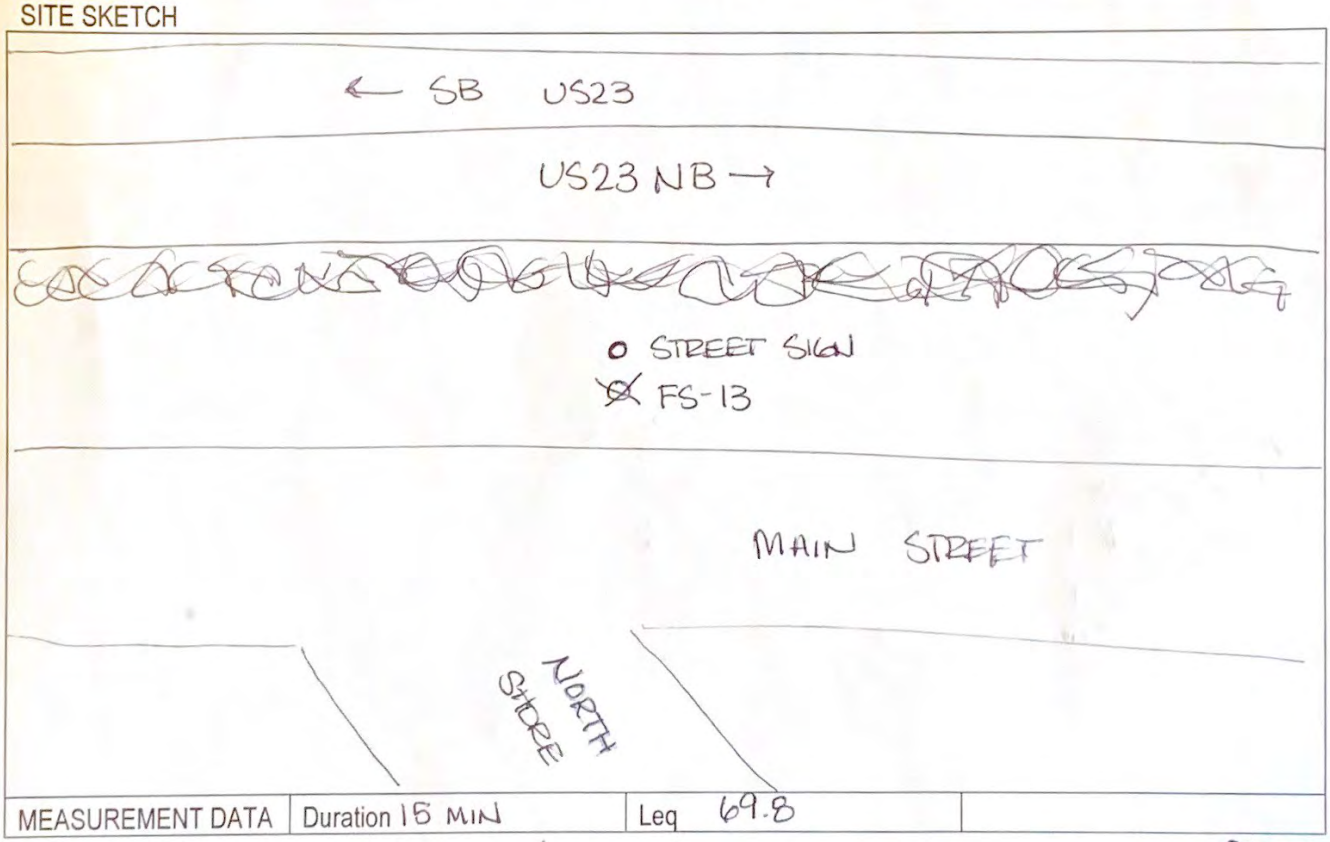
CALIBRATION: 113.8 at 1k Hz dB.

RESPONSE: FAST / SLOW WEIGHTING: A / C / LIN.

10 MIN COUNTS TRAFFIC DATA			
ROAD (Name/Dir)	US23 NB	US23 SB	LOCAL
AUTOS	560	155	1
MED TRKS	22	10	0
HVY TRKS	39	37	0
BUS	1	0	0
MOTORCYCLE	0	0	0
SPEED	70-75	70-75	25

EQUIPMENT	
INSTRUMENT	
SLM MANUFACTURER	Norsonic
SLM MODEL	Type 118
SLM	S / N 31483
PREAMPLIFIER – Type 1206	S / N 30522
MICROPHONE – Type 1225	S / N 52318
CALIBRATOR – Type 1251	S / N 30825

SITE SKETCH



MEASUREMENT DATA	Duration 15 MIN	Leq 69.8	

WEATHER DATA WIND SPEED (MPH) 4-1 DIR. N TEMP. HUMIDITY CLOUD COVER PARTIAL CLOUD

BACKGROUND NOISE

MAJOR SOURCES ROAD

UNUSUAL EVENTS

OTHER NOTES

APPENDIX C: Impact Analysis Results, dB(A) $L_{eq(1h)}$

Table C-1. Predicted Noise Levels by Receiver, dBA $L_{eq(1h)}$

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
CNE A								
A-1	Driving Range - Recreational	C	66	1	61	61	0	N
A-2	**Residential**	**B**	**66**	**1**	**74**	**74**	**1**	**Y**
A-3	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
A-4	**Residential**	**B**	**66**	**1**	**69**	**69**	**1**	**Y**
A-5	Residential	B	66	1	63	63	1	N
A-6	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
A-7	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
A-8	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
A-9	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
CNE B								
B-1	Daycare Playground	C	66	1	66	64	-2	N
B-2	Residential	B	66	1	59	59	1	N
B-3	Residential	B	66	1	59	60	1	N
B-4	Residential	B	66	1	64	63	-1	N
B-5	Residential	B	66	1	60	61	1	N
B-6	Residential	B	66	1	60	61	1	N
B-7	**Residential**	**B**	**66**	**1**	**67**	**66**	**0**	**Y**
B-8	Residential	B	66	1	61	61	1	N
B-9	**Residential**	**B**	**66**	**1**	**67**	**67**	**0**	**Y**
B-10	Residential	B	66	1	61	61	1	N
B-11	Residential	B	66	1	61	61	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
B-12	**Residential**	**B**	**66**	**1**	**67**	**67**	**0**	**Y**
B-13	**Residential**	**B**	**66**	**1**	**67**	**67**	**0**	**Y**
B-14	Residential	B	66	1	62	62	1	N
B-15	Residential	B	66	1	62	63	1	N
B-16	**Residential**	**B**	**66**	**1**	**68**	**68**	**0**	**Y**
B-17	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
B-18	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
B-19	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
B-20	Residential	B	66	1	65	65	1	N
B-21	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
B-22	**Residential**	**B**	**66**	**1**	**70**	**71**	**0**	**Y**
B-23	**Residential**	**B**	**66**	**1**	**73**	**74**	**0**	**Y**
B-24	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
B-25	**Residential**	**B**	**66**	**1**	**67**	**69**	**1**	**Y**
B-26	**Church Playground**	**C**	**66**	**1**	**77**	**78**	**1**	**Y**
B-27	**Residential**	**B**	**66**	**1**	**76**	**77**	**1**	**Y**
B-28	**Residential**	**B**	**66**	**1**	**67**	**68**	**0**	**Y**
B-29	**Residential**	**B**	**66**	**1**	**67**	**68**	**0**	**Y**
B-30	**Residential**	**B**	**66**	**1**	**69**	**69**	**1**	**Y**
CNE C								
C-1	**Residential**	**B**	**66**	**1**	**71**	**72**	**1**	**Y**
C-2	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
C-3	Commercial Outdoor Use	E	71	1	67	68	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
C-4	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
C-5	Residential	B	66	1	64	65	1	N
C-6	Residential	B	66	1	63	64	1	N
C-7	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
C-8	**Residential**	**B**	**66**	**1**	**73**	**73**	**1**	**Y**
C-9	**Residential**	**B**	**66**	**1**	**73**	**74**	**1**	**Y**
C-10	Residential	B	66	1	60	61	1	N
C-11	Residential	B	66	1	62	63	1	N
C-12	Residential	B	66	1	64	65	1	N
C-13	Residential	B	66	1	64	65	1	N
C-14	Residential	B	66	1	64	65	1	N
C-15	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
C-16	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
C-17	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
C-18	**Residential**	**B**	**66**	**1**	**68**	**68**	**0**	**Y**
C-19	**Residential**	**B**	**66**	**1**	**71**	**72**	**1**	**Y**
C-20	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
C-21	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
C-22	**Residential**	**B**	**66**	**1**	**72**	**72**	**1**	**Y**
C-23	**Residential**	**B**	**66**	**1**	**72**	**72**	**1**	**Y**
C-24	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
C-25	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
CNE D								
D-1(M)	Church	D	51	1	42	43	1	N
D-2	**Hotel Courtyard**	**E**	**71**	**1**	**72**	**73**	**1**	**Y**
CNE E								
E-1	Residential	B	66	1	57	57	1	N
E-2(M)	Public	D	51	1	41	42	1	N
E-3	Residential	B	66	1	59	60	1	N
E-4	Residential	B	66	1	62	63	1	N
E-5	Residential	B	66	1	62	63	1	N
E-6	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
E-7	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
E-8	**Residential**	**B**	**66**	**1**	**74**	**76**	**1**	**Y**
E-9	Residential	B	66	1	64	65	1	N
E-10	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
E-11	Residential	B	66	1	61	62	1	N
E-12	**Residential**	**B**	**66**	**1**	**75**	**76**	**1**	**Y**
E-13	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
E-14	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
E-15	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
E-16	Residential	B	66	1	61	62	1	N
E-17	Residential	B	66	1	60	61	1	N
E-18	**Residential**	**B**	**66**	**1**	**75**	**75**	**1**	**Y**
E-19	Residential	B	66	1	60	61	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
E-20	**Residential**	**B**	**66**	**1**	**74**	**74**	**0**	**Y**
E-21	Residential	B	66	1	62	63	1	N
E-22	Residential	B	66	1	61	62	1	N
E-23	Residential	B	66	1	61	62	1	N
E-24	**Residential**	**B**	**66**	**1**	**71**	**71**	**0**	**Y**
E-25	**Residential**	**B**	**66**	**1**	**75**	**76**	**1**	**Y**
E-26	**Residential**	**B**	**66**	**1**	**74**	**75**	**1**	**Y**
E-27	**Residential**	**B**	**66**	**1**	**74**	**75**	**1**	**Y**
E-28	**Residential**	**B**	**66**	**1**	**74**	**74**	**0**	**Y**
E-29	**Residential**	**B**	**66**	**1**	**73**	**74**	**1**	**Y**
E-30	**Residential**	**B**	**66**	**1**	**74**	**74**	**0**	**Y**
E-31	**Residential**	**B**	**66**	**1**	**75**	**75**	**0**	**Y**
E-32	**Residential**	**B**	**66**	**1**	**74**	**74**	**1**	**Y**
E-33	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
E-34	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
E-35	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
E-36	**Residential**	**B**	**66**	**1**	**74**	**74**	**1**	**Y**
E-37	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
E-38	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
E-39	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
E-40	Residential	B	66	1	60	61	1	N
E-41	**Residential**	**B**	**66**	**1**	**75**	**76**	**1**	**Y**
E-42	Residential	B	66	1	60	61	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
E-43	Residential	B	66	1	60	60	1	N
E-44	Residential	B	66	1	62	63	1	N
E-45	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
E-46	**Residential**	**B**	**66**	**1**	**74**	**74**	**1**	**Y**
E-47	Residential	B	66	1	58	59	1	N
E-48	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
E-49	Residential	B	66	1	58	59	1	N
E-50	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
E-51	Residential	B	66	1	57	58	1	N
CNE F								
F-1	Residential	B	66	1	61	61	1	N
F-2	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
F-3	Residential	B	66	1	60	61	1	N
F-4	**Residential**	**B**	**66**	**1**	**67**	**67**	**1**	**Y**
F-5	**Residential**	**B**	**66**	**1**	**72**	**73**	**0**	**Y**
F-6	Residential	B	66	1	61	62	1	N
F-7	**Residential**	**B**	**66**	**1**	**69**	**69**	**1**	**Y**
F-8	**Residential**	**B**	**66**	**1**	**71**	**72**	**0**	**Y**
F-9	**Residential**	**B**	**66**	**1**	**66**	**66**	**1**	**Y**
F-10	**Residential**	**B**	**66**	**1**	**73**	**73**	**0**	**Y**
F-11	Residential	B	66	1	61	61	1	N
F-12	Residential	B	66	1	61	62	1	N
F-13	Residential	B	66	1	59	60	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
F-14	**Residential**	**B**	**66**	**1**	**73**	**73**	**0**	**Y**
F-15	Residential	B	66	1	65	65	1	N
F-16	Residential	B	66	1	62	63	1	N
F-17	Residential	B	66	1	62	63	1	N
F-18	**Residential**	**B**	**66**	**1**	**75**	**76**	**1**	**Y**
F-19	Residential	B	66	1	63	63	1	N
F-20	**Residential**	**B**	**66**	**1**	**75**	**76**	**1**	**Y**
F-21	**Residential**	**B**	**66**	**1**	**75**	**76**	**1**	**Y**
F-22	Residential	B	66	1	62	63	1	N
F-23	**Residential**	**B**	**66**	**1**	**67**	**67**	**1**	**Y**
F-24	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
F-25	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
F-26	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
F-27	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
F-28	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
F-29	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
F-30	Residential	B	66	1	64	65	1	N
F-31	**Residential**	**B**	**66**	**1**	**74**	**75**	**1**	**Y**
F-32	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
F-33	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
F-34	**Residential**	**B**	**66**	**1**	**70**	**70**	**0**	**Y**
CNE G								
G-1	Residential	B	66	1	59	60	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
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(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
G-2	Residential	B	66	1	62	63	1	N
G-3	Residential	B	66	1	64	65	1	N
G-4	Residential	B	66	1	60	61	1	N
G-5	**Residential**	**B**	**66**	**1**	**68**	**70**	**1**	**Y**
G-6	**Residential**	**B**	**66**	**1**	**73**	**74**	**1**	**Y**
G-7	Residential	B	66	1	62	63	1	N
G-8	Residential	B	66	1	59	59	1	N
G-9	Residential	B	66	1	60	61	1	N
G-10	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
G-11	Residential	B	66	1	64	65	1	N
G-12	Residential	B	66	1	60	61	1	N
G-13	Residential	B	66	1	64	65	1	N
G-14	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
G-15	Residential	B	66	1	60	61	1	N
G-16	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
G-17	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
G-18	Residential	B	66	1	60	60	1	N
G-19	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
G-20	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
G-21	Residential	B	66	1	60	61	1	N
G-22	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
G-23	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
G-24	Residential	B	66	1	60	61	1	N

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
G-25	Residential	B	66	1	65	65	1	N
G-26	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
G-27	Residential	B	66	1	60	61	1	N
G-28	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
G-29	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
G-30	Residential	B	66	1	59	60	1	N
G-31	**Residential**	**B**	**66**	**1**	**65**	**66**	**2**	**Y**
G-32	**Residential**	**B**	**66**	**1**	**70**	**71**	**1**	**Y**
G-33	Residential	B	66	1	59	60	1	N
G-34	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
G-35	Residential	B	66	1	59	60	1	N
G-36	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
G-37	**Residential**	**B**	**66**	**1**	**64**	**66**	**1**	**Y**
G-38	**Residential**	**B**	**66**	**1**	**64**	**66**	**1**	**Y**
G-39	**Residential**	**B**	**66**	**1**	**72**	**72**	**1**	**Y**
G-40	Residential	B	66	1	58	59	1	N
G-41	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
G-42	Residential	B	66	1	62	63	1	N
G-43	Residential	B	66	1	58	59	1	N
G-44	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
G-45	Residential	B	66	1	63	64	1	N
G-46	Residential	B	66	1	61	62	1	N
G-47	Residential	B	66	1	59	61	1	N

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(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
G-48	Residential	B	66	1	58	60	2	N
CNE H								
H-1	Restaurant Outdoor Seating	E	71	2	63	64	1	N
H-2	Restaurant Outdoor Seating	E	71	1	65	66	1	N
CNE I								
I-1	Commercial Outdoor Use	E	71	1	65	66	1	N
CNE J								
J-1	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
CNE K								
K-1	Residential	B	66	1	60	61	1	N
K-2	Residential	B	66	1	58	59	1	N
K-3	Residential	B	66	1	62	63	1	N
K-4	Residential	B	66	1	59	59	1	N
K-5	Residential	B	66	1	64	65	1	N
K-6	Residential	B	66	1	59	60	1	N
K-7	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
K-8	Residential	B	66	1	60	61	1	N
K-9	Residential	B	66	1	61	62	1	N
K-10	Residential	B	66	1	61	62	1	N
K-11	Residential	B	66	1	62	63	1	N
K-12	**Residential**	**B**	**66**	**1**	**71**	**72**	**1**	**Y**
K-13	Residential	B	66	1	62	63	1	N
K-14	Residential	B	66	1	62	62	1	N

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
K-15	Residential	B	66	1	63	64	1	N
K-16	Residential	B	66	1	63	64	1	N
K-17	Residential	B	66	1	62	63	1	N
K-18	Residential	B	66	1	62	63	1	N
K-19	Residential	B	66	1	60	61	1	N
K-20	**Residential**	**B**	**66**	**1**	**73**	**73**	**0**	**Y**
K-21	Residential	B	66	1	60	61	1	N
K-22	Residential	B	66	1	61	61	1	N
K-23	**Residential**	**B**	**66**	**1**	**73**	**74**	**1**	**Y**
K-24	Residential	B	66	1	61	62	1	N
K-25	Residential	B	66	1	61	62	1	N
K-26	Residential	B	66	1	62	64	1	N
K-27	Residential	B	66	1	60	61	1	N
K-28	**Residential**	**B**	**66**	**1**	**74**	**74**	**1**	**Y**
K-29	Residential	B	66	1	60	61	1	N
K-30	Residential	B	66	1	59	60	1	N
K-31	Residential	B	66	1	57	57	1	N
K-32	**Residential**	**B**	**66**	**1**	**69**	**71**	**1**	**Y**
K-33	Residential	B	66	1	54	55	1	N
K-34	Residential	B	66	1	53	54	1	N
K-35	Residential	B	66	1	52	53	1	N
K-36	Residential	B	66	1	53	53	1	N
K-37	Residential	B	66	1	52	53	1	N

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
K-38	Residential	B	66	1	63	65	1	N
K-39	Residential	B	66	1	61	62	1	N
K-40	Residential	B	66	1	53	54	1	N
K-41	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
K-42	Residential	B	66	2	60	62	1	N
K-43	Residential	B	66	2	60	61	1	N
K-44	Residential	B	66	1	59	60	1	N
K-45	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
K-46	Residential	B	66	1	59	59	1	N
K-47	Residential	B	66	1	58	59	1	N
K-48	**Residential**	**B**	**66**	**2**	**66**	**67**	**1**	**Y**
K-49	Residential	B	66	1	58	59	1	N
K-50	Residential	B	66	2	61	61	1	N
K-51	Residential	B	66	1	62	63	1	N
K-52	Residential	B	66	1	63	64	1	N
K-53	Residential	B	66	1	57	58	1	N
K-54	Residential	B	66	1	59	60	1	N
K-55	Restaurant Outdoor Seating	E	71	1	59	60	1	N
CNE L								
L-1	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
L-2	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
L-3	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
L-4	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
L-5	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
L-6	Residential	B	66	1	65	65	1	N
L-7	**Residential**	**B**	**66**	**1**	**66**	**66**	**1**	**Y**
L-8	**Residential**	**B**	**66**	**1**	**71**	**71**	**1**	**Y**
L-9	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
L-10	Residential	B	66	1	64	64	1	N
L-11	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
L-12	Residential	B	66	1	63	64	1	N
L-13	Residential	B	66	1	63	63	1	N
L-14	**Residential**	**B**	**66**	**1**	**70**	**70**	**1**	**Y**
L-15	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
L-16	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
L-17	Residential	B	66	1	63	63	1	N
L-18	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
L-19	Residential	B	66	1	64	65	1	N
L-20	Residential	B	66	1	62	63	1	N
L-21	Residential	B	66	1	64	64	1	N
L-22	Residential	B	66	1	63	64	1	N
L-23	Residential	B	66	1	61	62	1	N
L-24	**Residential**	**B**	**66**	**1**	**69**	**69**	**1**	**Y**
L-25	Residential	B	66	1	62	63	1	N
L-26	Residential	B	66	1	62	63	1	N
L-27	Residential	B	66	1	62	63	1	N

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
L-28	Residential	B	66	1	61	62	1	N
L-29	Residential	B	66	1	62	62	1	N
L-30	Residential	B	66	1	61	61	1	N
L-31	Residential	B	66	1	61	61	1	N
L-32	Residential	B	66	1	60	61	1	N
L-33	Residential	B	66	1	58	59	1	N
L-34	Residential	B	66	1	57	57	1	N
L-35	Residential	B	66	1	59	59	1	N
L-36	Residential	B	66	1	58	58	1	N
L-37	Residential	B	66	1	54	55	1	N
L-38	Residential	B	66	1	59	60	1	N
L-39	Residential	B	66	1	62	63	1	N
L-40	Residential	B	66	1	62	62	1	N
CNE M								
M-1	Office Outdoor Seating	E	71	1	64	65	1	N
M-2	Office Outdoor Seating	E	71	1	56	57	1	N
M-3	**Daycare Playground**	**C**	**66**	**1**	**74**	**75**	**1**	**Y**
M-4	**Daycare Playground**	**C**	**66**	**1**	**69**	**70**	**1**	**Y**
CNE N								
N-1	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
N-2	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
N-3	**Residential**	**B**	**66**	**1**	**69**	**69**	**1**	**Y**
N-4	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
N-5	**Residential**	**B**	**66**	**1**	**67**	**68**	**1**	**Y**
N-6	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
N-7	Residential	B	66	1	62	63	1	N
N-8	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
N-9	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
N-10	Residential	B	66	1	60	61	1	N
N-11	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
N-12	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
N-13	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
N-14	Residential	B	66	1	61	62	1	N
N-15	**Residential**	**B**	**66**	**1**	**69**	**69**	**1**	**Y**
N-16	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
N-17	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
N-18	**Residential**	**B**	**66**	**1**	**69**	**70**	**1**	**Y**
N-19	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
N-20	**Residential**	**B**	**66**	**1**	**68**	**68**	**1**	**Y**
N-21	**Residential**	**B**	**66**	**1**	**66**	**66**	**1**	**Y**
N-22	Residential	B	66	1	53	53	1	N
N-23	Residential	B	66	1	54	54	1	N
N-24	Residential	B	66	1	57	57	1	N
N-25	Residential	B	66	1	61	61	1	N
N-26	Residential	B	66	1	59	60	1	N
N-27	Residential	B	66	1	61	61	1	N

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
N-28	**Residential**	**B**	**66**	**1**	**68**	**68**	**1**	**Y**
N-29	Residential	B	66	1	58	58	1	N
N-30	Residential	B	66	1	59	60	1	N
N-31	Residential	B	66	1	63	64	1	N
N-32	Residential	B	66	1	57	58	1	N
N-33	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
N-34	**Residential**	**B**	**66**	**1**	**72**	**73**	**1**	**Y**
N-35	Residential	B	66	1	59	60	1	N
N-36	Residential	B	66	1	61	62	1	N
N-37	Residential	B	66	1	58	58	1	N
N-38	Residential	B	66	1	64	64	1	N
N-39	**Residential**	**B**	**66**	**1**	**72**	**72**	**1**	**Y**
N-40	**Residential**	**B**	**66**	**1**	**66**	**66**	**1**	**Y**
N-41	Residential	B	66	1	60	61	0	N
N-42	**Residential**	**B**	**66**	**1**	**67**	**67**	**1**	**Y**
N-43	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
N-44	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
N-45	Residential	B	66	1	58	58	0	N
N-46	Residential	B	66	1	61	61	1	N
CNE O								
O-1	Residential	B	66	1	59	59	1	N
O-2	Residential	B	66	1	65	65	1	N
O-3	Residential	B	66	1	64	65	1	N

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Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
0-4(M)	Church	D	51	1	38	38	1	N
0-5	Residential	B	66	1	60	60	1	N
0-6	Residential	B	66	1	64	65	1	N
0-7	Residential	B	66	1	65	65	1	N
0-8	**Residential**	**B**	**66**	**1**	**66**	**66**	**1**	**Y**
0-9	**Residential**	**B**	**66**	**1**	**66**	**67**	**1**	**Y**
0-10	Residential	B	66	1	61	62	1	N
0-11	Residential	B	66	1	63	63	1	N
0-12	**Residential**	**B**	**66**	**1**	**67**	**67**	**1**	**Y**
0-13	**Residential**	**B**	**66**	**1**	**68**	**68**	**0**	**Y**
0-14	Residential	B	66	1	62	63	1	N
0-15	**Residential**	**B**	**66**	**1**	**68**	**69**	**1**	**Y**
0-16	Residential	B	66	1	62	63	1	N
0-17	**Residential**	**B**	**66**	**1**	**67**	**67**	**0**	**Y**
0-18	Residential	B	66	1	57	58	1	N
0-19	Residential	B	66	1	64	64	0	N
0-20	Residential	B	66	1	62	63	1	N
0-21	Residential	B	66	1	57	57	1	N
0-22	Residential	B	66	1	64	65	1	N
0-23	Residential	B	66	1	58	59	1	N
0-24	Residential	B	66	1	57	58	1	N
0-25	Residential	B	66	1	61	62	1	N
0-26	**Residential**	**B**	**66**	**1**	**68**	**68**	**1**	**Y**

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
CNE R								
R-1	Residential	B	66	1	59	59	0	N
R-2	Residential	B	66	1	59	60	1	N
R-3	Residential	B	66	1	55	56	1	N
R-4	Residential	B	66	1	56	56	1	N
R-5	Residential	B	66	1	59	60	1	N
R-6	Residential	B	66	1	57	57	1	N
R-7	Residential	B	66	1	60	61	1	N
R-8	Residential	B	66	1	59	59	1	N
R-9	Residential	B	66	1	60	60	1	N
R-10	Residential	B	66	1	57	58	1	N
R-11	Residential	B	66	1	61	61	1	N
R-12	Residential	B	66	1	59	59	1	N
R-13	Residential	B	66	1	57	58	1	N
R-14	Residential	B	66	1	61	61	1	N
R-15	Residential	B	66	1	62	63	1	N
R-16	Residential	B	66	1	58	59	1	N
R-17	Residential	B	66	1	57	58	1	N
R-18	Residential	B	66	1	61	61	1	N
R-19	Residential	B	66	1	61	62	1	N
R-20	Residential	B	66	1	63	63	1	N
R-21	Residential	B	66	1	58	58	1	N
R-22	Residential	B	66	1	60	61	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
R-23	Residential	B	66	1	61	62	1	N
R-24	Residential	B	66	1	58	59	1	N
R-25	Residential	B	66	1	62	63	1	N
R-26	Residential	B	66	1	57	58	1	N
R-27	Residential	B	66	1	64	65	1	N
R-28	Residential	B	66	1	60	61	1	N
R-29	Residential	B	66	1	61	62	1	N
R-30	Residential	B	66	1	60	60	1	N
R-31	Residential	B	66	1	58	59	1	N
R-32	Residential	B	66	1	63	64	1	N
R-33	Residential	B	66	1	60	61	1	N
R-34	Residential	B	66	1	62	63	1	N
R-35	Residential	B	66	1	59	59	0	N
R-36	Residential	B	66	1	59	60	1	N
R-37	Residential	B	66	1	64	65	1	N
R-38	Residential	B	66	1	63	63	1	N
R-39	Residential	B	66	1	62	63	1	N
R-40	Residential	B	66	1	60	61	1	N
R-41	Residential	B	66	1	63	64	1	N
R-42	Residential	B	66	1	63	64	1	N
R-43	Residential	B	66	1	60	61	1	N
R-44	Residential	B	66	1	61	62	1	N
R-45	Residential	B	66	1	62	63	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
R-46	Residential	B	66	1	60	61	1	N
R-47	Residential	B	66	1	62	62	1	N
R-48	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-49	Residential	B	66	1	61	62	1	N
R-50	Residential	B	66	1	62	63	1	N
R-51	Residential	B	66	1	54	55	1	N
R-52	Residential	B	66	1	64	65	1	N
R-53	Residential	B	66	1	62	63	1	N
R-54	Residential	B	66	1	62	63	1	N
R-55	Residential	B	66	1	62	63	1	N
R-56	School Outdoor Spaces	C	66	1	64	65	1	N
R-57	School Outdoor Spaces	C	66	1	61	62	1	N
R-58	School Outdoor Spaces	C	66	1	59	60	1	N
R-59	School Outdoor Spaces	C	66	1	64	65	1	N
R-60	School Outdoor Spaces	C	66	1	61	62	1	N
R-61	Residential	B	66	1	58	59	1	N
R-62	School Outdoor Spaces	C	66	1	58	58	1	N
R-63	Residential	B	66	1	56	57	1	N
R-64	School Outdoor Spaces	C	66	1	63	64	1	N
R-65	School Outdoor Spaces	C	66	1	60	61	1	N
R-66	Residential	B	66	1	56	57	1	N
R-67	Residential	B	66	1	60	61	1	N
R-68	School Outdoor Spaces	C	66	1	63	64	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
R-69	Residential	B	66	1	55	56	1	N
R-70	Residential	B	66	1	61	62	1	N
R-71	Residential	B	66	1	58	59	1	N
R-72	School Outdoor Spaces	C	66	1	63	64	1	N
R-73	Residential	B	66	1	62	63	1	N
R-74	Residential	B	66	1	57	58	1	N
R-75	Residential	B	66	1	57	58	1	N
R-76	**School Outdoor Spaces**	**C**	**66**	**1**	**66**	**67**	**1**	**Y**
R-77	Residential	B	66	1	58	59	1	N
R-78	Residential	B	66	1	57	58	1	N
R-79	Residential	B	66	1	60	61	1	N
R-80	Residential	B	66	1	58	59	1	N
R-81	Residential	B	66	1	63	64	1	N
R-82	Residential	B	66	1	58	59	1	N
R-83	Residential	B	66	1	64	65	1	N
R-84	Residential	B	66	1	63	65	2	N
R-85	Residential	B	66	1	60	61	1	N
R-86	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-87	Residential	B	66	1	64	63	-1	N
R-88	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-89	**Residential**	**B**	**66**	**1**	**64**	**66**	**2**	**Y**
R-90	Residential	B	66	1	64	65	1	N
R-91	Residential	B	66	1	58	59	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
R-92	Residential	B	66	1	64	65	1	N
R-93	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-94	Residential	B	66	1	64	65	1	N
R-95	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-96	Residential	B	66	1	61	62	1	N
R-97	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-98	Residential	B	66	1	59	60	1	N
R-99	Residential	B	66	1	58	59	1	N
R-100	Residential	B	66	1	61	62	1	N
R-101	Residential	B	66	1	64	65	1	N
R-102	Residential	B	66	1	59	60	1	N
R-103	Residential	B	66	1	59	60	1	N
R-104	Residential	B	66	1	61	63	1	N
R-105	Residential	B	66	1	64	65	1	N
R-106	Residential	B	66	1	60	61	1	N
R-107	Residential	B	66	1	59	61	1	N
R-108	Residential	B	66	1	62	63	1	N
R-109	Residential	B	66	1	60	61	1	N
R-110	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-111	Residential	B	66	1	60	61	1	N
R-112	Residential	B	66	1	59	59	1	N
R-113	Residential	B	66	1	64	64	1	N
R-114	Residential	B	66	1	61	62	1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
R-115	Residential	B	66	1	61	62	1	N
R-116	Residential	B	66	1	64	64	1	N
R-117	Residential	B	66	1	63	64	1	N
R-118	Residential	B	66	1	60	60	0	N
R-119	Residential	B	66	1	57	58	1	N
R-120	Residential	B	66	1	64	65	1	N
R-121	Residential	B	66	1	60	61	1	N
R-122	Residential	B	66	1	62	63	1	N
R-123	Residential	B	66	1	64	65	1	N
R-124	Residential	B	66	1	62	62	0	N
R-125	Residential	B	66	1	63	62	0	N
R-126	**Residential**	**B**	**66**	**1**	**65**	**66**	**1**	**Y**
R-127	Residential	B	66	1	64	64	0	N
R-128	Residential	B	66	1	63	62	0	N
R-129	**Residential**	**B**	**66**	**1**	**65**	**66**	**0**	**Y**
R-130	Residential	B	66	1	63	63	-1	N
CNE S								
S-1	Residential	B	66	1	63	62	-1	N
S-2	Residential	B	66	1	63	62	-1	N
S-3	Residential	B	66	1	62	61	-1	N
S-4	Residential	B	66	1	64	64	0	N
S-5	**Residential**	**B**	**66**	**1**	**71**	**70**	**-1**	**Y**
S-6	Residential	B	66	1	64	64	0	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

Receiver ID	Noise Abatement Criteria			Receptors	Noise Level dB(A) $L_{eq(1h)}$			
	Description	Category	Criteria $L_{eq(1h)}$		Existing	Future Build Alternative		
						NL	Change from Existing*	Impact (Y/N)
S-7	Residential	B	66	1	66	65	-1	N
S-8	Residential	B	66	1	66	65	-1	N
S-9	Residential	B	66	1	65	65	0	N
S-10	**Residential**	**B**	**66**	**1**	**68**	**67**	**-2**	**Y**
S-11	**Residential**	**B**	**66**	**1**	**70**	**67**	**-3**	**Y**
S-12	**Residential**	**B**	**66**	**1**	**70**	**66**	**-4**	**Y**
S-13	Residential	B	66	1	65	63	-2	N
S-14	Residential	B	66	1	64	63	-1	N
S-15	Residential	B	66	1	65	63	-2	N
S-16	Residential	B	66	1	64	63	-1	N
S-17	Residential	B	66	1	63	63	0	N
S-18	Residential	B	66	1	70	65	-5	N
S-19	Residential	B	66	1	62	62	0	N
S-20	Residential	B	66	1	65	64	-1	N

Boldface indicates noise levels that approach, equal or exceed the NAC and create an impact with the future Build alternative.
*Change in noise level may appear incorrect due to rounding.
(M) represents masonry buildings where Activity Category D noise reduction factor of 25 dBA has been applied to exterior noise levels.

APPENDIX D: Abatement Analysis Results per Receiver, dB(A) $L_{eq(1h)}$

Table D-1. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier A											
A-2	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**1**	**68**	**7**	**Yes**
A-3	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**60**	**6**	**Yes**
A-4	**Residential**	**B**	**66**	**1**	**69**	**69**	**Yes**	**1**	**60**	**10**	**Yes**
A-5	**Residential**	**B**	**66**	**1**	**63**	**63**	**No**	**1**	**56**	**7**	**Yes**
A-6	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**61**	**8**	**Yes**
A-7	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**61**	**7**	**Yes**
A-8	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**59**	**7**	**Yes**
A-9	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**61**	**7**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-2. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier B1											
B-1	Daycare Playground	C	66	1	66	64	No	-2	63	1	No
B-2	Residential	B	66	1	59	59	No	1	58	1	No
B-3	Residential	B	66	1	59	60	No	1	57	2	No
B-4	Residential	B	66	1	64	63	No	-1	61	2	No
B-5	Residential	B	66	1	60	61	No	1	58	2	No
B-6	Residential	B	66	1	60	61	No	1	59	2	No
B-7	Residential	B	66	1	67	66	Yes	0	63	3	No
B-8	Residential	B	66	1	61	61	No	1	58	3	No
B-9	**Residential**	**B**	**66**	**1**	**67**	**67**	**Yes**	**0**	**62**	**5**	**Yes**
B-10	Residential	B	66	1	61	61	No	1	58	3	No
B-11	Residential	B	66	1	61	61	No	1	57	4	No
B-12	**Residential**	**B**	**66**	**1**	**67**	**67**	**Yes**	**0**	**61**	**6**	**Yes**
B-13	**Residential**	**B**	**66**	**1**	**67**	**67**	**Yes**	**0**	**60**	**7**	**Yes**
B-14	Residential	B	66	1	62	62	No	1	58	4	No
B-15	Residential	B	66	1	62	63	No	1	60	4	No
B-16	**Residential**	**B**	**66**	**1**	**68**	**68**	**Yes**	**0**	**60**	**8**	**Yes**
B-17	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**61**	**5**	**Yes**
B-18	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**60**	**9**	**Yes**
B-19	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**62**	**5**	**Yes**
B-20	**Residential**	**B**	**66**	**1**	**65**	**65**	**No**	**1**	**60**	**5**	**Yes**
B-21	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**60**	**10**	**Yes**
B-22	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**0**	**60**	**10**	**Yes**
B-23	**Residential**	**B**	**66**	**1**	**73**	**74**	**Yes**	**0**	**64**	**9**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-3. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier B2											
B-25	**Residential**	**B**	**66**	**1**	**67**	**69**	**Yes**	**1**	**64**	**5**	**Yes**
B-26	**Church Playground**	**C**	**66**	**1**	**77**	**78**	**Yes**	**1**	**62**	**16**	**Yes**
B-27	**Residential**	**B**	**66**	**1**	**76**	**77**	**Yes**	**1**	**63**	**14**	**Yes**
B-28	Residential	B	66	1	67	68	Yes	0	64	4	No
B-29	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**0**	**63**	**5**	**Yes**
B-30	**Residential**	**B**	**66**	**1**	**69**	**69**	**Yes**	**1**	**63**	**7**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-4. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier C1											
C-1	**Residential**	**B**	**66**	**1**	**71**	**72**	**Yes**	**1**	**64**	**8**	**Yes**
C-2	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**63**	**7**	**Yes**
C-3	**Commercial Outdoor Use**	**E**	**71**	**1**	**67**	**68**	**No**	**1**	**62**	**6**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-5. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier C2											
C-4	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**63**	**5**	**Yes**
C-5	**Residential**	**B**	**66**	**1**	**64**	**65**	**No**	**1**	**60**	**5**	**Yes**
C-6	**Residential**	**B**	**66**	**1**	**63**	**64**	**No**	**1**	**57**	**7**	**Yes**
C-7	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**60**	**10**	**Yes**
C-8	**Residential**	**B**	**66**	**1**	**73**	**73**	**Yes**	**1**	**65**	**9**	**Yes**
C-9	**Residential**	**B**	**66**	**1**	**73**	**74**	**Yes**	**1**	**65**	**9**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-6. Abatement Analysis Results per Receiver, dB(A) $L_{eq\,(1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier C3											
C-11	Residential	B	66	1	62	63	No	1	62	1	No
C-12	Residential	B	66	1	64	65	No	1	63	2	No
C-13	Residential	B	66	1	64	65	No	1	63	2	No
C-14	Residential	B	66	1	64	65	No	1	62	3	No
C-15	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**62**	**5**	**Yes**
C-16	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**64**	**7**	**Yes**
C-17	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**63**	**7**	**Yes**
C-18	**Residential**	**B**	**66**	**1**	**68**	**68**	**Yes**	**0**	**62**	**6**	**Yes**
C-19	**Residential**	**B**	**66**	**1**	**71**	**72**	**Yes**	**1**	**64**	**8**	**Yes**
C-20	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**64**	**9**	**Yes**
C-21	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**64**	**9**	**Yes**
C-22	**Residential**	**B**	**66**	**1**	**72**	**72**	**Yes**	**1**	**63**	**10**	**Yes**
C-23	**Residential**	**B**	**66**	**1**	**72**	**72**	**Yes**	**1**	**63**	**9**	**Yes**
C-24	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**65**	**8**	**Yes**
C-25	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**66**	**7**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-7. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier E1											
E-1	Residential	B	66	1	57	57	No	1	56	1	No
E-2	Public	D	51	1	41	42	No	1	41	1	No
E-3	Residential	B	66	1	59	60	No	1	58	2	No
E-4	Residential	B	66	1	62	63	No	1	60	3	No
E-5	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**57**	**6**	**Yes**
E-6	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**61**	**6**	**Yes**
E-7	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**64**	**8**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-8. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier E2											
E-8	**Residential**	**B**	**66**	**1**	**74**	**76**	**Yes**	**1**	**69**	**6**	**Yes**
E-9	Residential	B	66	1	64	65	No	1	63	2	No
E-10	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**64**	**7**	**Yes**
E-11	Residential	B	66	1	61	62	No	1	59	3	No
E-12	**Residential**	**B**	**66**	**1**	**75**	**76**	**Yes**	**1**	**67**	**9**	**Yes**
E-13	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**63**	**10**	**Yes**
E-14	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**62**	**8**	**Yes**
E-15	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**61**	**6**	**Yes**
E-16	Residential	B	66	1	61	62	No	1	58	3	No
E-17	Residential	B	66	1	60	61	No	1	58	3	No
E-18	**Residential**	**B**	**66**	**1**	**75**	**75**	**Yes**	**1**	**67**	**8**	**Yes**
E-19	Residential	B	66	1	60	61	No	1	58	3	No
E-20	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**0**	**67**	**8**	**Yes**
E-21	Residential	B	66	1	62	63	No	1	60	3	No
E-22	Residential	B	66	1	61	62	No	1	59	3	No
E-23	Residential	B	66	1	61	62	No	1	59	3	No
E-24	**Residential**	**B**	**66**	**1**	**71**	**71**	**Yes**	**0**	**66**	**5**	**Yes**
E-25	**Residential**	**B**	**66**	**1**	**75**	**76**	**Yes**	**1**	**69**	**6**	**Yes**
E-26	**Residential**	**B**	**66**	**1**	**74**	**75**	**Yes**	**1**	**68**	**7**	**Yes**
E-27	**Residential**	**B**	**66**	**1**	**74**	**75**	**Yes**	**1**	**68**	**7**	**Yes**
E-28	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**0**	**67**	**7**	**Yes**
E-29	**Residential**	**B**	**66**	**1**	**73**	**74**	**Yes**	**1**	**67**	**7**	**Yes**
E-30	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**0**	**67**	**7**	**Yes**
E-31	**Residential**	**B**	**66**	**1**	**75**	**75**	**Yes**	**0**	**69**	**6**	**Yes**
E-32	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**1**	**70**	**5**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-9. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier EF											
E-33	Residential	B	66	1	72	73	Yes	1	71	2	No
E-34	Residential	B	66	1	65	66	Yes	1	61	4	No
E-35	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**62**	**5**	**Yes**
E-36	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**1**	**65**	**9**	**Yes**
E-37	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**63**	**6**	**Yes**
E-38	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**63**	**6**	**Yes**
E-39	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**63**	**7**	**Yes**
E-40	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**56**	**5**	**Yes**
E-41	**Residential**	**B**	**66**	**1**	**75**	**76**	**Yes**	**1**	**67**	**9**	**Yes**
E-42	Residential	B	66	1	60	61	No	1	58	4	No
E-43	Residential	B	66	1	60	60	No	1	57	4	No
E-44	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**57**	**6**	**Yes**
E-45	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**60**	**8**	**Yes**
E-46	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**1**	**66**	**8**	**Yes**
E-47	Residential	B	66	1	58	59	No	1	55	4	No
E-48	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**66**	**7**	**Yes**
E-49	**Residential**	**B**	**66**	**1**	**58**	**59**	**No**	**1**	**54**	**5**	**Yes**
E-50	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**66**	**6**	**Yes**
E-51	**Residential**	**B**	**66**	**1**	**57**	**58**	**No**	**1**	**54**	**5**	**Yes**
F-1	**Residential**	**B**	**66**	**1**	**61**	**61**	**No**	**1**	**56**	**5**	**Yes**
F-2	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**62**	**6**	**Yes**
F-3	Residential	B	66	1	60	61	No	1	57	4	No
F-4	**Residential**	**B**	**66**	**1**	**67**	**67**	**Yes**	**1**	**62**	**5**	**Yes**
F-5	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**0**	**66**	**7**	**Yes**
F-6	**Residential**	**B**	**66**	**1**	**61**	**62**	**No**	**1**	**57**	**5**	**Yes**
F-7	**Residential**	**B**	**66**	**1**	**69**	**69**	**Yes**	**1**	**62**	**8**	**Yes**
F-8	**Residential**	**B**	**66**	**1**	**71**	**72**	**Yes**	**0**	**62**	**9**	**Yes**
F-9	**Residential**	**B**	**66**	**1**	**66**	**66**	**Yes**	**1**	**59**	**7**	**Yes**
F-10	**Residential**	**B**	**66**	**1**	**73**	**73**	**Yes**	**0**	**64**	**9**	**Yes**
F-11	**Residential**	**B**	**66**	**1**	**61**	**61**	**No**	**1**	**56**	**5**	**Yes**
F-12	**Residential**	**B**	**66**	**1**	**61**	**62**	**No**	**1**	**57**	**5**	**Yes**
F-13	**Residential**	**B**	**66**	**1**	**59**	**60**	**No**	**1**	**54**	**6**	**Yes**
F-14	**Residential**	**B**	**66**	**1**	**73**	**73**	**Yes**	**0**	**64**	**10**	**Yes**
F-15	**Residential**	**B**	**66**	**1**	**65**	**65**	**No**	**1**	**59**	**6**	**Yes**
F-16	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**57**	**6**	**Yes**
F-17	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**57**	**6**	**Yes**

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
F-18	Residential	B	66	1	75	76	Yes	1	67	9	Yes
F-19	Residential	B	66	1	63	63	No	1	56	8	Yes
F-20	Residential	B	66	1	75	76	Yes	1	67	9	Yes
F-21	Residential	B	66	1	75	76	Yes	1	67	9	Yes
F-22	Residential	B	66	1	62	63	No	1	56	7	Yes
F-23	Residential	B	66	1	67	67	Yes	1	59	9	Yes
F-24	Residential	B	66	1	69	70	Yes	1	63	7	Yes
F-25	Residential	B	66	1	67	68	Yes	1	61	7	Yes
F-26	Residential	B	66	1	67	68	Yes	1	61	7	Yes
F-27	Residential	B	66	1	68	69	Yes	1	62	7	Yes
F-28	Residential	B	66	1	65	66	Yes	1	59	7	Yes
F-29	Residential	B	66	1	69	70	Yes	1	64	6	Yes
F-30	Residential	B	66	1	64	65	No	1	61	5	Yes

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-10. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier F											
F-31	**Residential**	**B**	**66**	**1**	**74**	**75**	**Yes**	**1**	**68**	**7**	**Yes**
F-32	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**62**	**9**	**Yes**
F-33	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**60**	**10**	**Yes**
F-34	**Residential**	**B**	**66**	**1**	**70**	**70**	**Yes**	**0**	**64**	**6**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-11. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier G											
G-1	Residential	B	66	1	59	60	No	1	56	3	No
G-2	Residential	B	66	1	62	63	No	1	58	4	No
G-3	**Residential**	**B**	**66**	**1**	**64**	**65**	**No**	**1**	**60**	**5**	**Yes**
G-4	Residential	B	66	1	60	61	No	1	57	4	No
G-5	Residential	B	66	1	68	70	Yes	1	65	4	No
G-6	Residential	B	66	1	73	74	Yes	1	71	3	No
G-7	Residential	B	66	1	62	63	No	1	59	4	No
G-8	Residential	B	66	1	59	59	No	1	55	4	No
G-9	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**57**	**5**	**Yes**
G-10	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**62**	**5**	**Yes**
G-11	**Residential**	**B**	**66**	**1**	**64**	**65**	**No**	**1**	**60**	**5**	**Yes**
G-12	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**56**	**5**	**Yes**
G-13	**Residential**	**B**	**66**	**1**	**64**	**65**	**No**	**1**	**60**	**5**	**Yes**
G-14	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**66**	**5**	**Yes**
G-15	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**56**	**5**	**Yes**
G-16	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**66**	**5**	**Yes**
G-17	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**60**	**5**	**Yes**
G-18	Residential	B	66	1	60	60	No	1	56	4	No
G-19	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**61**	**6**	**Yes**
G-20	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**65**	**5**	**Yes**
G-21	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**56**	**5**	**Yes**
G-22	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**61**	**5**	**Yes**
G-23	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**65**	**5**	**Yes**
G-24	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**56**	**5**	**Yes**
G-25	**Residential**	**B**	**66**	**1**	**65**	**65**	**No**	**1**	**60**	**5**	**Yes**
G-26	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**65**	**5**	**Yes**
G-27	Residential	B	66	1	60	61	No	1	56	4	No
G-28	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**61**	**5**	**Yes**
G-29	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**66**	**5**	**Yes**
G-30	Residential	B	66	1	59	60	No	1	56	4	No
G-31	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**2**	**61**	**5**	**Yes**
G-32	**Residential**	**B**	**66**	**1**	**70**	**71**	**Yes**	**1**	**67**	**5**	**Yes**
G-33	Residential	B	66	1	59	60	No	1	56	4	No
G-34	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**61**	**5**	**Yes**
G-35	Residential	B	66	1	59	60	No	1	56	4	No
G-36	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**68**	**5**	**Yes**
G-37	**Residential**	**B**	**66**	**1**	**64**	**66**	**Yes**	**1**	**61**	**5**	**Yes**

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
G-38	**Residential**	**B**	**66**	**1**	**64**	**66**	**Yes**	**1**	**61**	**5**	**Yes**
G-39	**Residential**	**B**	**66**	**1**	**72**	**72**	**Yes**	**1**	**67**	**5**	**Yes**
G-40	Residential	B	66	1	58	59	No	1	56	3	No
G-41	Residential	B	66	1	69	70	Yes	1	66	4	No
G-42	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**58**	**5**	**Yes**
G-43	Residential	B	66	1	58	59	No	1	55	4	No
G-44	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**63**	**5**	**Yes**
G-45	Residential	B	66	1	63	64	No	1	60	4	No
G-46	Residential	B	66	1	61	62	No	1	59	3	No
G-47	Residential	B	66	1	59	61	No	1	58	3	No
G-48	Residential	B	66	1	58	60	No	2	57	3	No

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-12. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier K											
K-1	Residential	B	66	1	60	61	No	1	60	1	No
K-2	Residential	B	66	1	58	59	No	1	58	1	No
K-3	Residential	B	66	1	62	63	No	1	62	1	No
K-4	Residential	B	66	1	59	59	No	1	58	2	No
K-5	Residential	B	66	1	64	65	No	1	63	2	No
K-6	Residential	B	66	1	59	60	No	1	58	2	No
K-7	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**67**	**7**	**Yes**
K-8	Residential	B	66	1	60	61	No	1	58	3	No
K-9	Residential	B	66	1	61	62	No	1	59	3	No
K-10	Residential	B	66	1	61	62	No	1	58	4	No
K-11	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**58**	**5**	**Yes**
K-12	**Residential**	**B**	**66**	**1**	**71**	**72**	**Yes**	**1**	**62**	**10**	**Yes**
K-13	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**57**	**5**	**Yes**
K-14	**Residential**	**B**	**66**	**1**	**62**	**62**	**No**	**1**	**56**	**7**	**Yes**
K-15	**Residential**	**B**	**66**	**1**	**63**	**64**	**No**	**1**	**56**	**8**	**Yes**
K-16	**Residential**	**B**	**66**	**1**	**63**	**64**	**No**	**1**	**56**	**8**	**Yes**
K-17	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**56**	**7**	**Yes**
K-18	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**56**	**7**	**Yes**
K-19	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**55**	**6**	**Yes**
K-20	**Residential**	**B**	**66**	**1**	**73**	**73**	**Yes**	**0**	**60**	**13**	**Yes**
K-21	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**54**	**6**	**Yes**
K-22	**Residential**	**B**	**66**	**1**	**61**	**61**	**No**	**1**	**55**	**6**	**Yes**
K-23	**Residential**	**B**	**66**	**1**	**73**	**74**	**Yes**	**1**	**59**	**14**	**Yes**
K-24	**Residential**	**B**	**66**	**1**	**61**	**62**	**No**	**1**	**55**	**6**	**Yes**
K-25	**Residential**	**B**	**66**	**1**	**61**	**62**	**No**	**1**	**55**	**7**	**Yes**
K-26	**Residential**	**B**	**66**	**1**	**62**	**64**	**No**	**1**	**58**	**6**	**Yes**
K-27	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**56**	**5**	**Yes**
K-28	**Residential**	**B**	**66**	**1**	**74**	**74**	**Yes**	**1**	**60**	**15**	**Yes**
K-29	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**55**	**6**	**Yes**
K-30	**Residential**	**B**	**66**	**1**	**59**	**60**	**No**	**1**	**54**	**6**	**Yes**
K-31	Residential	B	66	1	57	57	No	1	53	4	No
K-32	**Residential**	**B**	**66**	**1**	**69**	**71**	**Yes**	**1**	**58**	**13**	**Yes**
K-33	Residential	B	66	1	54	55	No	1	52	3	No
K-34	Residential	B	66	1	53	54	No	1	51	2	No
K-35	Residential	B	66	1	52	53	No	1	51	2	No
K-36	Residential	B	66	1	53	53	No	1	51	2	No
K-37	Residential	B	66	1	52	53	No	1	51	2	No

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
K-38	**Residential**	**B**	**66**	**1**	**63**	**65**	**No**	**1**	**58**	**6**	**Yes**
K-39	Residential	B	66	1	61	62	No	1	58	4	No
K-40	Residential	B	66	1	53	54	No	1	52	2	No
K-41	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**60**	**10**	**Yes**
K-42	Residential	B	66	2	60	62	No	1	60	2	No
K-43	Residential	B	66	2	60	61	No	1	59	2	No
K-44	Residential	B	66	1	59	60	No	1	58	2	No
K-45	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**60**	**7**	**Yes**
K-46	Residential	B	66	1	59	59	No	1	58	1	No
K-47	Residential	B	66	1	58	59	No	1	58	1	No
K-48	**Residential**	**B**	**66**	**2**	**66**	**67**	**Yes**	**1**	**62**	**5**	**Yes**
K-49	Residential	B	66	1	58	59	No	1	58	1	No
K-50	Residential	B	66	2	61	61	No	1	60	2	No
K-51	Residential	B	66	1	62	63	No	1	61	2	No
K-52	Residential	B	66	1	63	64	No	1	62	2	No

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-13. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier L											
L-1	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**60**	**7**	**Yes**
L-2	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**58**	**10**	**Yes**
L-3	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**62**	**5**	**Yes**
L-4	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**63**	**5**	**Yes**
L-5	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**62**	**5**	**Yes**
L-6	Residential	B	66	1	65	65	No	1	64	2	No
L-7	**Residential**	**B**	**66**	**1**	**66**	**66**	**Yes**	**1**	**61**	**5**	**Yes**
L-8	**Residential**	**B**	**66**	**1**	**71**	**71**	**Yes**	**1**	**60**	**11**	**Yes**
L-9	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**61**	**8**	**Yes**
L-10	Residential	B	66	1	64	64	No	1	63	1	No
L-11	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**62**	**6**	**Yes**
L-12	Residential	B	66	1	63	64	No	1	62	2	No
L-13	Residential	B	66	1	63	63	No	1	62	1	No
L-14	**Residential**	**B**	**66**	**1**	**70**	**70**	**Yes**	**1**	**61**	**10**	**Yes**
L-15	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**60**	**9**	**Yes**
L-16	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**61**	**5**	**Yes**
L-17	Residential	B	66	1	63	63	No	1	62	2	No
L-18	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**60**	**7**	**Yes**
L-19	Residential	B	66	1	64	65	No	1	62	3	No
L-20	Residential	B	66	1	62	63	No	1	61	2	No
L-21	**Residential**	**B**	**66**	**1**	**64**	**64**	**No**	**1**	**60**	**5**	**Yes**
L-22	Residential	B	66	1	63	64	No	1	62	2	No
L-23	Residential	B	66	1	61	62	No	1	61	1	No
L-24	**Residential**	**B**	**66**	**1**	**69**	**69**	**Yes**	**1**	**63**	**7**	**Yes**
L-25	Residential	B	66	1	62	63	No	1	60	3	No
L-26	Residential	B	66	1	62	63	No	1	61	2	No
L-27	Residential	B	66	1	62	63	No	1	61	2	No
L-28	Residential	B	66	1	61	62	No	1	60	3	No
L-29	Residential	B	66	1	62	62	No	1	60	2	No
L-30	Residential	B	66	1	61	61	No	1	60	2	No
L-31	Residential	B	66	1	61	61	No	1	61	1	No
L-32	Residential	B	66	1	60	61	No	1	60	1	No
L-33	Residential	B	66	1	58	59	No	1	58	1	No
L-34	Residential	B	66	1	57	57	No	1	56	2	No
L-35	Residential	B	66	1	59	59	No	1	59	1	No
L-36	Residential	B	66	1	58	58	No	1	58	0	No
L-37	Residential	B	66	1	54	55	No	1	54	1	No

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-14. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier M											
M-1	**Office Outdoor Seating**	**E**	**71**	**1**	**64**	**65**	**No**	**1**	**60**	**5**	**Yes**
M-2	Office Outdoor Seating	E	71	1	56	57	No	1	57	0	No
M-3	**Daycare Playground**	**C**	**66**	**1**	**74**	**75**	**Yes**	**1**	**65**	**10**	**Yes**
M-4	**Daycare Playground**	**C**	**66**	**1**	**69**	**70**	**Yes**	**1**	**62**	**7**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-15. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier N1											
N-1	**Residential**	**B**	**66**	**1**	**66**	**67**	**Yes**	**1**	**62**	**5**	**Yes**
N-2	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**62**	**7**	**Yes**
N-3	**Residential**	**B**	**66**	**1**	**69**	**69**	**Yes**	**1**	**62**	**7**	**Yes**
N-4	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**60**	**6**	**Yes**
N-5	**Residential**	**B**	**66**	**1**	**67**	**68**	**Yes**	**1**	**61**	**7**	**Yes**
N-6	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**61**	**7**	**Yes**
N-7	**Residential**	**B**	**66**	**1**	**62**	**63**	**No**	**1**	**56**	**6**	**Yes**
N-8	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**61**	**8**	**Yes**
N-9	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**61**	**9**	**Yes**
N-10	**Residential**	**B**	**66**	**1**	**60**	**61**	**No**	**1**	**55**	**6**	**Yes**
N-11	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**61**	**9**	**Yes**
N-12	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**61**	**9**	**Yes**
N-13	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**60**	**10**	**Yes**
N-14	**Residential**	**B**	**66**	**1**	**61**	**62**	**No**	**1**	**56**	**6**	**Yes**
N-15	**Residential**	**B**	**66**	**1**	**69**	**69**	**Yes**	**1**	**60**	**9**	**Yes**
N-16	**Residential**	**B**	**66**	**1**	**68**	**69**	**Yes**	**1**	**60**	**9**	**Yes**
N-17	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**60**	**10**	**Yes**
N-18	**Residential**	**B**	**66**	**1**	**69**	**70**	**Yes**	**1**	**61**	**9**	**Yes**
N-19	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**58**	**8**	**Yes**
N-20	**Residential**	**B**	**66**	**1**	**68**	**68**	**Yes**	**1**	**60**	**8**	**Yes**
N-21	**Residential**	**B**	**66**	**1**	**66**	**66**	**Yes**	**1**	**62**	**5**	**Yes**
N-22	Residential	B	66	1	53	53	No	1	51	2	No
N-23	Residential	B	66	1	54	54	No	1	52	2	No

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-16. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier N2											
N-24	Residential	B	66	1	57	57	No	1	56	2	No
N-25	Residential	B	66	1	61	61	No	1	60	2	No
N-26	Residential	B	66	1	59	60	No	1	57	3	No
N-27	**Residential**	**B**	**66**	**1**	**61**	**61**	**No**	**1**	**57**	**5**	**Yes**
N-28	**Residential**	**B**	**66**	**1**	**68**	**68**	**Yes**	**1**	**62**	**6**	**Yes**
N-29	Residential	B	66	1	58	58	No	1	55	4	No
N-30	Residential	B	66	1	59	60	No	1	57	3	No
N-31	**Residential**	**B**	**66**	**1**	**63**	**64**	**No**	**1**	**59**	**5**	**Yes**
N-32	Residential	B	66	1	57	58	No	1	55	3	No
N-33	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**60**	**6**	**Yes**
N-34	**Residential**	**B**	**66**	**1**	**72**	**73**	**Yes**	**1**	**62**	**11**	**Yes**
N-35	Residential	B	66	1	59	60	No	1	56	4	No
N-36	**Residential**	**B**	**66**	**1**	**61**	**62**	**No**	**1**	**55**	**7**	**Yes**
N-37	Residential	B	66	1	58	58	No	1	55	4	No
N-38	**Residential**	**B**	**66**	**1**	**64**	**64**	**No**	**1**	**56**	**9**	**Yes**
N-39	**Residential**	**B**	**66**	**1**	**72**	**72**	**Yes**	**1**	**61**	**11**	**Yes**
N-40	**Residential**	**B**	**66**	**1**	**66**	**66**	**Yes**	**1**	**57**	**9**	**Yes**
N-41	Residential	B	66	1	60	61	No	0	57	4	No
N-42	**Residential**	**B**	**66**	**1**	**67**	**67**	**Yes**	**1**	**62**	**6**	**Yes**
N-43	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**59**	**7**	**Yes**
N-44	**Residential**	**B**	**66**	**1**	**65**	**66**	**Yes**	**1**	**57**	**8**	**Yes**
N-45	**Residential**	**B**	**66**	**1**	**58**	**58**	**No**	**0**	**52**	**6**	**Yes**
N-46	**Residential**	**B**	**66**	**1**	**61**	**61**	**No**	**1**	**56**	**5**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-17. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier O											
O-5	**Residential**	**B**	**67**	**1**	**60**	**60**	**No**	**1**	**56**	**5**	**Yes**
O-6	**Residential**	**B**	**67**	**1**	**64**	**65**	**No**	**1**	**58**	**7**	**Yes**
O-7	**Residential**	**B**	**67**	**1**	**65**	**65**	**No**	**1**	**58**	**7**	**Yes**
O-8	**Residential**	**B**	**67**	**1**	**66**	**66**	**Yes**	**1**	**59**	**7**	**Yes**
O-9	**Residential**	**B**	**67**	**1**	**66**	**67**	**Yes**	**1**	**59**	**7**	**Yes**
O-10	**Residential**	**B**	**67**	**1**	**61**	**62**	**No**	**1**	**56**	**6**	**Yes**
O-11	**Residential**	**B**	**67**	**1**	**63**	**63**	**No**	**1**	**57**	**6**	**Yes**
O-12	**Residential**	**B**	**67**	**1**	**67**	**67**	**Yes**	**1**	**59**	**8**	**Yes**
O-13	**Residential**	**B**	**67**	**1**	**68**	**68**	**Yes**	**0**	**59**	**9**	**Yes**
O-14	**Residential**	**B**	**67**	**1**	**62**	**63**	**No**	**1**	**58**	**6**	**Yes**
O-15	**Residential**	**B**	**67**	**1**	**68**	**69**	**Yes**	**1**	**59**	**10**	**Yes**
O-16	**Residential**	**B**	**67**	**1**	**62**	**63**	**No**	**1**	**57**	**5**	**Yes**
O-17	**Residential**	**B**	**67**	**1**	**67**	**67**	**Yes**	**0**	**58**	**9**	**Yes**
O-18	**Residential**	**B**	**67**	**1**	**57**	**58**	**No**	**1**	**51**	**6**	**Yes**
O-19	**Residential**	**B**	**67**	**1**	**64**	**64**	**No**	**0**	**57**	**8**	**Yes**
O-20	**Residential**	**B**	**67**	**1**	**62**	**63**	**No**	**1**	**57**	**6**	**Yes**
O-21	**Residential**	**B**	**67**	**1**	**57**	**57**	**No**	**1**	**51**	**7**	**Yes**
O-22	**Residential**	**B**	**67**	**1**	**64**	**65**	**No**	**1**	**57**	**8**	**Yes**
O-23	Residential	B	67	1	58	59	No	1	55	3	No
O-24	Residential	B	67	1	57	58	No	1	55	3	No
O-25	**Residential**	**B**	**67**	**1**	**61**	**62**	**No**	**1**	**56**	**6**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.

Table D-18. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier R											
R-1	Residential	B	67	1	59	62	No	3	59	3	No
R-2	Residential	B	67	1	59	63	No	4	60	3	No
R-3	Residential	B	67	1	55	60	No	5	56	4	No
R-4	Residential	B	67	1	56	60	No	5	56	4	No
R-5	Residential	B	67	1	59	64	No	5	60	4	No
R-6	Residential	B	67	1	57	61	No	5	57	4	No
R-7	**Residential**	**B**	**67**	**1**	**60**	**66**	**Yes**	**6**	**61**	**5**	**Yes**
R-8	**Residential**	**B**	**67**	**1**	**59**	**64**	**No**	**5**	**59**	**5**	**Yes**
R-9	**Residential**	**B**	**67**	**1**	**60**	**66**	**Yes**	**6**	**60**	**5**	**Yes**
R-10	Residential	B	67	1	57	62	No	4	58	4	No
R-11	**Residential**	**B**	**67**	**1**	**61**	**68**	**Yes**	**7**	**61**	**6**	**Yes**
R-12	**Residential**	**B**	**67**	**1**	**59**	**65**	**No**	**6**	**59**	**6**	**Yes**
R-13	Residential	B	67	1	57	62	No	5	58	4	No
R-14	**Residential**	**B**	**67**	**1**	**61**	**68**	**Yes**	**7**	**61**	**6**	**Yes**
R-15	**Residential**	**B**	**67**	**1**	**62**	**71**	**Yes**	**9**	**63**	**8**	**Yes**
R-16	**Residential**	**B**	**67**	**1**	**58**	**64**	**No**	**6**	**59**	**5**	**Yes**
R-17	Residential	B	67	1	57	61	No	4	58	4	No
R-18	**Residential**	**B**	**67**	**1**	**61**	**66**	**Yes**	**6**	**61**	**5**	**Yes**
R-19	**Residential**	**B**	**67**	**1**	**61**	**69**	**Yes**	**8**	**62**	**7**	**Yes**
R-20	**Residential**	**B**	**67**	**1**	**63**	**75**	**Yes**	**12**	**63**	**12**	**Yes**
R-21	Residential	B	67	1	58	63	No	5	58	4	No
R-22	Residential	B	67	1	60	65	No	5	61	4	No
R-23	**Residential**	**B**	**67**	**1**	**61**	**68**	**Yes**	**7**	**62**	**6**	**Yes**
R-24	Residential	B	67	1	58	62	No	4	59	3	No
R-25	**Residential**	**B**	**67**	**1**	**62**	**72**	**Yes**	**10**	**63**	**9**	**Yes**
R-26	**Residential**	**B**	**67**	**1**	**57**	**63**	**No**	**6**	**58**	**5**	**Yes**
R-27	**Residential**	**B**	**67**	**1**	**64**	**77**	**Yes**	**14**	**65**	**13**	**Yes**
R-28	**Residential**	**B**	**67**	**1**	**60**	**66**	**Yes**	**6**	**61**	**5**	**Yes**
R-29	**Residential**	**B**	**67**	**1**	**61**	**69**	**Yes**	**8**	**62**	**7**	**Yes**
R-30	Residential	B	67	1	60	62	No	3	60	2	No
R-31	**Residential**	**B**	**67**	**1**	**58**	**64**	**No**	**6**	**59**	**5**	**Yes**
R-32	**Residential**	**B**	**67**	**1**	**63**	**75**	**Yes**	**12**	**64**	**11**	**Yes**
R-33	**Residential**	**B**	**67**	**1**	**60**	**68**	**Yes**	**7**	**61**	**6**	**Yes**
R-34	**Residential**	**B**	**67**	**1**	**62**	**71**	**Yes**	**8**	**63**	**8**	**Yes**
R-35	Residential	B	67	1	59	63	No	5	59	4	No
R-36	**Residential**	**B**	**67**	**1**	**59**	**65**	**No**	**6**	**60**	**5**	**Yes**
R-37	**Residential**	**B**	**67**	**1**	**64**	**77**	**Yes**	**14**	**65**	**13**	**Yes**

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
R-38	**Residential**	**B**	**67**	**1**	**63**	**73**	**Yes**	**10**	**63**	**9**	**Yes**
R-39	**Residential**	**B**	**67**	**1**	**62**	**69**	**Yes**	**7**	**63**	**6**	**Yes**
R-40	Residential	B	67	1	60	64	No	4	61	4	No
R-41	**Residential**	**B**	**67**	**1**	**63**	**70**	**Yes**	**7**	**64**	**7**	**Yes**
R-42	**Residential**	**B**	**67**	**1**	**63**	**75**	**Yes**	**12**	**64**	**11**	**Yes**
R-43	**Residential**	**B**	**67**	**1**	**60**	**67**	**Yes**	**7**	**61**	**6**	**Yes**
R-44	Residential	B	67	1	61	65	No	4	62	3	No
R-45	**Residential**	**B**	**67**	**1**	**62**	**73**	**Yes**	**10**	**63**	**9**	**Yes**
R-46	**Residential**	**B**	**67**	**1**	**60**	**66**	**Yes**	**6**	**61**	**5**	**Yes**
R-47	**Residential**	**B**	**67**	**1**	**62**	**69**	**Yes**	**7**	**62**	**6**	**Yes**
R-48	**Residential**	**B**	**67**	**1**	**65**	**74**	**Yes**	**10**	**66**	**9**	**Yes**
R-49	**Residential**	**B**	**67**	**1**	**61**	**67**	**Yes**	**6**	**62**	**5**	**Yes**
R-50	**Residential**	**B**	**67**	**1**	**62**	**70**	**Yes**	**8**	**63**	**7**	**Yes**
R-51	Residential	B	67	1	54	59	No	5	55	4	No
R-52	**Residential**	**B**	**67**	**1**	**64**	**78**	**Yes**	**13**	**65**	**13**	**Yes**
R-53	**Residential**	**B**	**67**	**1**	**62**	**71**	**Yes**	**9**	**63**	**8**	**Yes**
R-54	**Residential**	**B**	**67**	**1**	**62**	**68**	**Yes**	**6**	**63**	**5**	**Yes**
R-55	**Residential**	**B**	**67**	**1**	**62**	**70**	**Yes**	**9**	**63**	**8**	**Yes**
R-56	**School Outdoor Spaces**	**C**	**67**	**1**	**64**	**75**	**Yes**	**11**	**65**	**11**	**Yes**
R-57	**School Outdoor Spaces**	**C**	**67**	**1**	**61**	**69**	**Yes**	**8**	**62**	**7**	**Yes**
R-58	**School Outdoor Spaces**	**C**	**67**	**1**	**59**	**66**	**Yes**	**6**	**60**	**6**	**Yes**
R-59	**School Outdoor Spaces**	**C**	**67**	**1**	**64**	**76**	**Yes**	**12**	**65**	**11**	**Yes**
R-60	**School Outdoor Spaces**	**C**	**67**	**1**	**61**	**70**	**Yes**	**9**	**62**	**8**	**Yes**
R-61	Residential	B	67	1	58	61	No	4	59	3	No
R-62	**School Outdoor Spaces**	**C**	**67**	**1**	**58**	**63**	**No**	**6**	**58**	**5**	**Yes**
R-63	Residential	B	67	1	56	59	No	3	57	2	No
R-64	**School Outdoor Spaces**	**C**	**67**	**1**	**63**	**75**	**Yes**	**12**	**64**	**11**	**Yes**
R-65	**School Outdoor Spaces**	**C**	**67**	**1**	**60**	**68**	**Yes**	**8**	**61**	**7**	**Yes**
R-66	Residential	B	67	1	56	59	No	3	57	2	No
R-67	Residential	B	67	1	60	63	No	4	61	3	No
R-68	**School Outdoor Spaces**	**C**	**67**	**1**	**63**	**76**	**Yes**	**12**	**64**	**12**	**Yes**
R-69	Residential	B	67	1	55	58	No	2	56	1	No
R-70	Residential	B	67	1	61	65	No	4	62	3	No
R-71	Residential	B	67	1	58	60	No	3	59	2	No
R-72	**School Outdoor Spaces**	**C**	**67**	**1**	**63**	**76**	**Yes**	**13**	**64**	**12**	**Yes**
R-73	Residential	B	67	1	62	66	Yes	4	63	3	No
R-74	Residential	B	67	1	57	58	No	1	58	0	No
R-75	Residential	B	67	1	57	60	No	2	58	1	No
R-76	**School Outdoor Spaces**	**C**	**67**	**1**	**66**	**78**	**Yes**	**12**	**67**	**11**	**Yes**
R-77	Residential	B	67	1	58	60	No	2	59	1	No
R-78	Residential	B	67	1	57	59	No	1	58	1	No

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
R-79	Residential	B	67	1	60	63	No	3	61	2	No
R-80	Residential	B	67	1	58	61	No	2	59	1	No
R-81	**Residential**	**B**	**67**	**1**	**63**	**78**	**Yes**	**15**	**64**	**14**	**Yes**
R-82	Residential	B	67	1	58	59	No	1	59	1	No
R-83	**Residential**	**B**	**67**	**1**	**64**	**74**	**Yes**	**10**	**65**	**9**	**Yes**
R-84	**Residential**	**B**	**67**	**1**	**63**	**70**	**Yes**	**6**	**65**	**5**	**Yes**
R-85	Residential	B	67	1	60	64	No	4	61	3	No
R-86	**Residential**	**B**	**67**	**1**	**65**	**75**	**Yes**	**10**	**66**	**9**	**Yes**
R-87	**Residential**	**B**	**67**	**1**	**64**	**78**	**Yes**	**15**	**63**	**15**	**Yes**
R-88	**Residential**	**B**	**67**	**1**	**65**	**76**	**Yes**	**11**	**66**	**10**	**Yes**
R-89	**Residential**	**B**	**67**	**1**	**64**	**71**	**Yes**	**7**	**66**	**5**	**Yes**
R-90	**Residential**	**B**	**67**	**1**	**64**	**72**	**Yes**	**8**	**65**	**7**	**Yes**
R-91	Residential	B	67	1	58	60	No	2	59	1	No
R-92	Residential	B	67	1	64	69	Yes	5	65	4	No
R-93	**Residential**	**B**	**67**	**1**	**65**	**71**	**Yes**	**6**	**66**	**5**	**Yes**
R-94	**Residential**	**B**	**67**	**1**	**64**	**72**	**Yes**	**8**	**65**	**7**	**Yes**
R-95	**Residential**	**B**	**67**	**1**	**65**	**75**	**Yes**	**10**	**66**	**9**	**Yes**
R-96	Residential	B	67	1	61	64	No	3	62	2	No
R-97	**Residential**	**B**	**67**	**1**	**65**	**77**	**Yes**	**12**	**66**	**11**	**Yes**
R-98	Residential	B	67	1	59	60	No	2	60	1	No
R-99	Residential	B	67	1	58	60	No	2	59	1	No
R-100	Residential	B	67	1	61	65	No	4	62	3	No
R-101	**Residential**	**B**	**67**	**1**	**64**	**72**	**Yes**	**8**	**65**	**8**	**Yes**
R-102	Residential	B	67	1	59	60	No	1	60	0	No
R-103	Residential	B	67	1	59	61	No	2	60	1	No
R-104	Residential	B	67	1	61	65	No	4	63	3	No
R-105	**Residential**	**B**	**67**	**1**	**64**	**74**	**Yes**	**10**	**65**	**9**	**Yes**
R-106	Residential	B	67	1	60	62	No	2	61	1	No
R-107	Residential	B	67	1	59	61	No	2	61	0	No
R-108	Residential	B	67	1	62	66	Yes	4	63	3	No
R-109	Residential	B	67	1	60	63	No	3	61	2	No
R-110	**Residential**	**B**	**67**	**1**	**65**	**76**	**Yes**	**11**	**66**	**11**	**Yes**
R-111	Residential	B	67	1	60	62	No	2	61	1	No
R-112	Residential	B	67	1	59	60	No	1	59	1	No
R-113	**Residential**	**B**	**67**	**1**	**64**	**77**	**Yes**	**14**	**64**	**13**	**Yes**
R-114	Residential	B	67	1	61	62	No	2	62	1	No
R-115	Residential	B	67	1	61	65	No	4	62	3	No
R-116	**Residential**	**B**	**67**	**1**	**64**	**76**	**Yes**	**12**	**64**	**12**	**Yes**
R-117	Residential	B	67	1	63	67	Yes	5	64	4	No
R-118	Residential	B	67	1	60	61	No	1	60	1	No
R-119	Residential	B	67	1	57	59	No	1	58	1	No

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
R-120	Residential	B	67	1	64	68	Yes	5	65	4	No
R-121	Residential	B	67	1	60	62	No	2	61	1	No
R-122	Residential	B	67	1	62	65	No	2	63	2	No
R-123	Residential	B	67	1	64	69	Yes	5	65	4	No
R-124	Residential	B	67	1	62	63	No	1	62	1	No
R-125	Residential	B	67	1	63	63	No	0	62	0	No
R-126	**Residential**	**B**	**67**	**1**	**65**	**71**	**Yes**	**6**	**66**	**5**	**Yes**
R-127	Residential	B	67	1	64	66	Yes	2	64	2	No
R-128	Residential	B	67	1	63	63	No	0	62	0	No
R-129	**Residential**	**B**	**67**	**1**	**65**	**71**	**Yes**	**6**	**66**	**5**	**Yes**
R-130	Residential	B	67	1	63	63	No	0	63	1	No

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

Future noise levels and noise reductions reported for this existing noise barrier reflect design year noise levels with and without the barrier in place in order to show the feasibility and reasonableness of the existing barrier. Note the figures in Appendix A show impacts based on future noise levels with the barrier in place.

Table D-19. Abatement Analysis Results per Receiver, dB(A) $L_{eq\ (1h)}$

Receiver ID	Description	Category	Criteria	Dwelling Units/Receptors	Existing	Future w/o Barrier	Approach or Exceed NAC (Impacted)	Increase (Future w/o Barrier - Existing)*	Future w/ Barrier	Noise Barrier Reduction*	Benefited Receptor
Barrier S											
S-1	Residential	B	67	1	63	62	No	-1	58	4	No
S-2	**Residential**	**B**	**67**	**1**	**63**	**62**	**No**	**-1**	**57**	**5**	**Yes**
S-3	Residential	B	67	1	62	61	No	-1	57	4	No
S-4	Residential	B	67	1	64	64	No	0	60	3	No
S-5	**Residential**	**B**	**67**	**1**	**71**	**70**	**Yes**	**-1**	**60**	**10**	**Yes**
S-6	Residential	B	67	1	64	64	No	0	60	4	No
S-7	**Residential**	**B**	**67**	**1**	**66**	**65**	**No**	**-1**	**59**	**7**	**Yes**
S-8	**Residential**	**B**	**67**	**1**	**66**	**65**	**No**	**-1**	**60**	**5**	**Yes**
S-9	**Residential**	**B**	**67**	**1**	**65**	**65**	**No**	**0**	**61**	**5**	**Yes**
S-10	**Residential**	**B**	**67**	**1**	**68**	**67**	**Yes**	**-2**	**58**	**8**	**Yes**
S-11	**Residential**	**B**	**67**	**1**	**70**	**67**	**Yes**	**-3**	**59**	**8**	**Yes**
S-12	**Residential**	**B**	**67**	**1**	**70**	**66**	**Yes**	**-4**	**58**	**7**	**Yes**
S-13	**Residential**	**B**	**67**	**1**	**65**	**63**	**No**	**-2**	**58**	**6**	**Yes**
S-14	Residential	B	67	1	64	63	No	-1	60	3	No
S-15	**Residential**	**B**	**67**	**1**	**65**	**63**	**No**	**-2**	**59**	**5**	**Yes**
S-16	Residential	B	67	1	64	63	No	-1	60	3	No
S-17	Residential	B	67	1	63	63	No	0	60	3	No
S-18	**Residential**	**B**	**67**	**1**	**70**	**65**	**No**	**-5**	**58**	**7**	**Yes**
S-19	Residential	B	67	1	62	62	No	0	60	3	No
S-20	**Residential**	**B**	**67**	**1**	**65**	**64**	**No**	**-1**	**59**	**5**	**Yes**

Boldface indicates the receptor is benefited with 5 dB(A) or more noise reduction.

* Change in noise level may appear incorrect due to rounding.

See Appendix C for receivers not listed that are not directly behind or benefited by the barrier.