MICHIGAN DEPARTMENT of TRANSPORTATION

Noise Abatement Analysis

US-127 Auxiliary Lanes

University Region

CS 33172, JN 110926

Ingham County

September 2012

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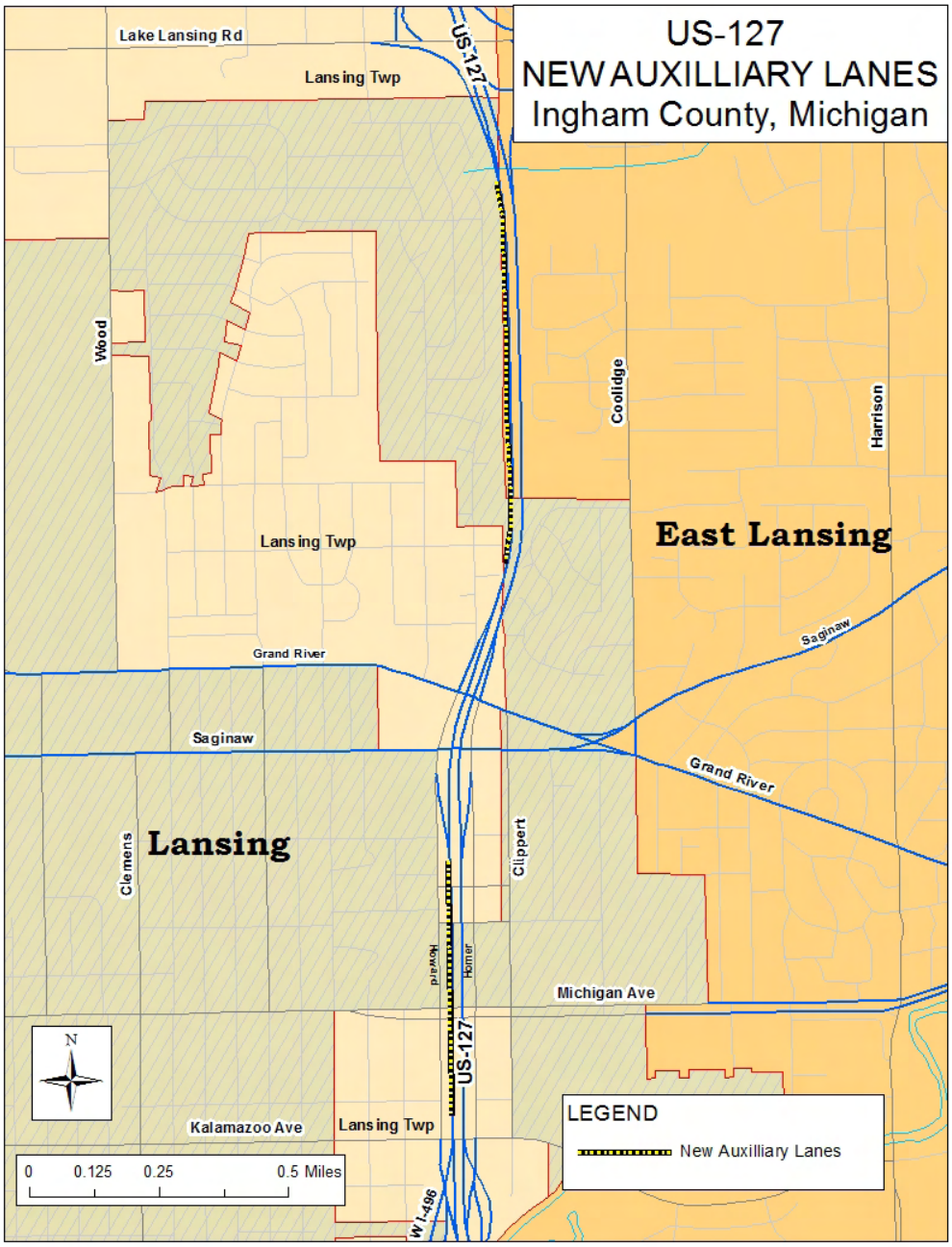
1. Executive Summary

This report evaluated the potential noise impacts and abatement of the proposed improvements along the US-127 corridor between Lake Lansing Road and I-496 in Ingham County in conformance with corresponding Federal regulations and guidance and the National Environmental Policy Act (NEPA). The goal of the project is to add auxiliary weave lanes along the southbound mainline US-127 connecting the entrance and exit ramps between Lake Lansing and Grand River Roads, and between Saginaw Road and I-496. The locations of these projects are depicted in Figure S-1.

FIGURE S-1 – Project Area



The project is being studied as a Type I project because it includes the addition of a new auxiliary lane, which triggers the requirement for a noise analysis.

The noise analysis presents the existing and future acoustical environment at various receptors located along the US-127 corridor. The determination of noise abatement measures and locations is in compliance with the Federal Highways 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, July 2011*. The MDOT *Highway Noise Analysis and Abatement Handbook* is in compliance with the MDOT's *State Transportation Commission Policy 10136 Noise Abatement,* dated July 31, 2003.

Field measurements with concurrent traffic counts were taken to compare with modeled noise levels to validate the TNM for use on the specific project to predict existing and design year noise levels. Existing noise level measurements were conducted on May 3 and June 26, 2012 at five representative sites in the project vicinity. A minimum 15 minute measurement was taken at each site during off-peak traffic time periods. Traffic counts were taken at each site, concurrent with the noise measurements.

The traffic noise prediction program, TNM®2.5, was used to model existing, and 2033 Build traffic noise levels within the study area. The table in Appendix B lists the modeled receptors and highlights the receptors along the project corridor that are impacted, that is, they approach or exceed the FHWA Noise Abatement Criteria (NAC). 521 units were modeled and 76 are impacted. The future traffic noise levels, within the overall project area, would increase by a maximum 0.8 dB(A) Leq over the existing conditions.

Two (2) noise barriers have been evaluated for this noise study. See Tables S-1and S-2, and Figure S-2. The barriers meet preliminary feasibility and reasonableness criteria. Barrier BCD along northbound US-127 would provide mitigation for 54 residential units and 108 residential units in 22 apartment buildings. The height of Barrier BCD would average 18 feet, have an approximate length of 4715 feet, and provide 0 to 15 dB(A) of insertion loss. The estimated cost of this barrier is $3,811,194.00 with a cost that would equal $23,525.89 per benefitted residence. Barrier A along southbound US-127 would provide mitigation for 17 residential units in 6 apartment buildings. The height of Barrier A would average 23 feet, have an approximate length of 707 feet, and provide 0 to 17 dB(A) of insertion loss. The estimated cost of this barrier is $731,326.00 with a cost that would equal $43,019.18 per benefitted residence.

TABLE S-1 - Evaluated Noise Barriers

Barrier ID	Figure #	Locations	Existing Noise Levels	Range of Future Noise Levels		Noise Reduction	Barrier Characteristics	
				w/o Barrier	With Barrier		Length (ft)	Height (ft)
A		SB US-127 Madison Apartment Complex	46.6dB(A)-76.3dB(A)	46.7dB(A)-76.7dB(A)	45.8dB(A)-60.7dB(A)	0.9dB(A)-16.0dB(A)	707	23
BCD		NB US-127 between Grand River Ave. and Lake Lansing Road	33.9dB(A)-76.0dB(A)	33.9dB(A)-76.2dB(A)	33.9dB(A)-65.1dB(A)	0.0dB(A)-11.1dB(A)	4715	18

TABLE S-2 - Noise Barrier Feasibility and Reasonableness

Barrier ID	Number of Attenuated Locations					Cost	Cost/Benefit	Feasible	Reasonable
	≥ 10 dB(A)	≥ 7 dB(A)		≥ 5 dB(A)					
		#	% of Benefited	#	% of Impacted			(Y/N)	(Y/N)
A	12	14	82	17	100	$731,326	$43,019	Y	Y
BCD	51	104	64	162	100	$3,811,194	$23,526	Y	Y

FIGURE S-2 – Proposed Noise Barriers

MDOT's noise policy states that all noise abatement measure 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 north section of the proposed US-127 project meet the MDOT feasibility and reasonableness factors for the residential units.

2. Purpose of this Report

This report evaluates the potential noise impacts of the proposed improvements along US-127 between Lake Lansing Road and I-496 in Ingham County in conformance with corresponding Federal regulations, guidance and the National Environmental Policy Act (NEPA). The project includes the construction of two auxiliary weave lanes along the southbound mainline of US-127. The addition of auxiliary lanes fits under the definition of a Type I project under 23 CFR 772.5 and such projects are required to undergo a noise analysis.

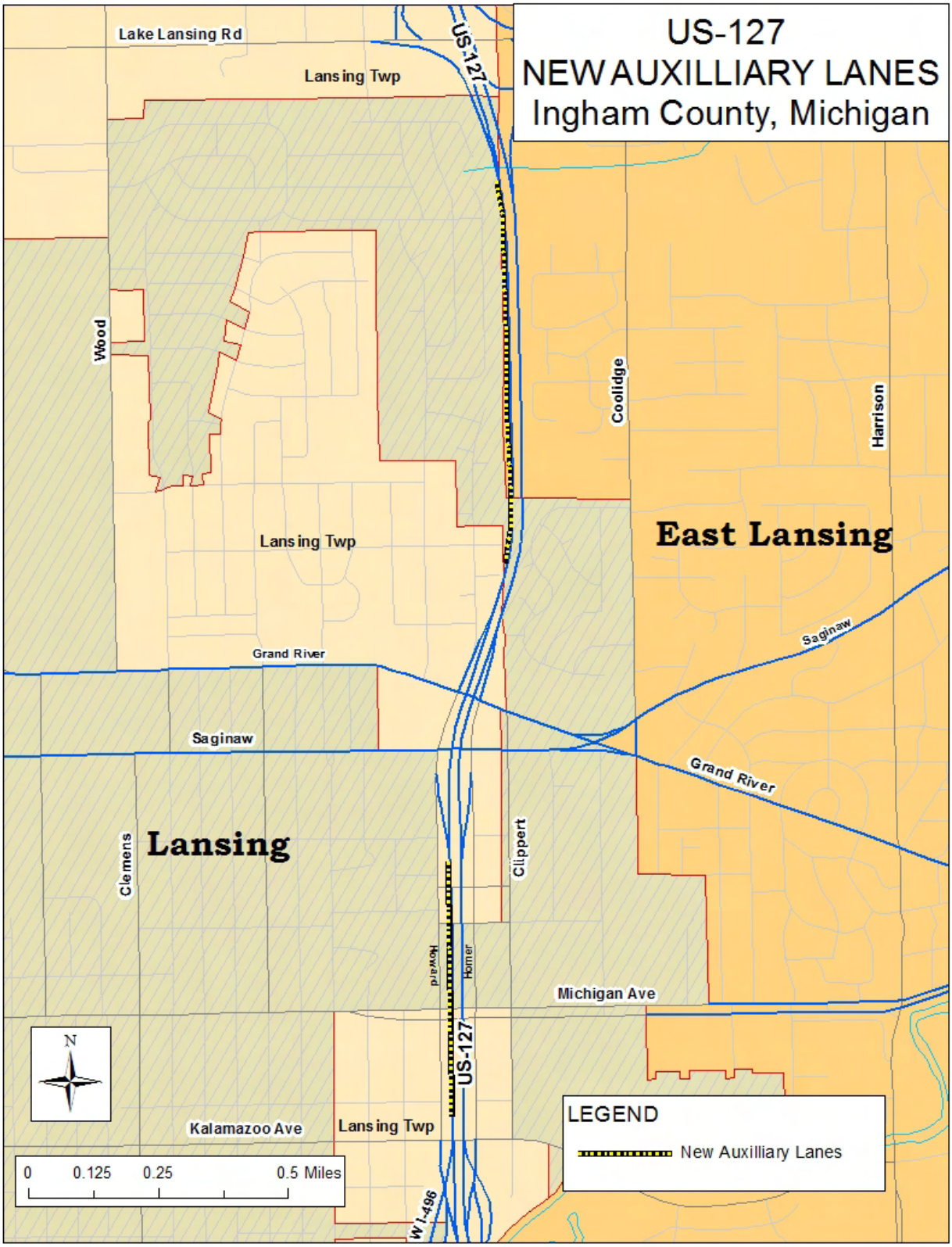
The noise analysis presents the existing and future acoustical environment at various receptors located along the project locations in the US-127 corridor. The determination of noise abatement measures and locations is in compliance with the Federal Highways Administration's (FHWA's) *Procedures for 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, July 2011*. The MDOT: *Highway Noise Analysis and Abatement Handbook* is in compliance with the *State Transportation Commission Policy 10136 Noise Abatement*, dated July 31, 2003.

2.1 Project Description

US-127 is a north-south route, and within Michigan the northern terminus connects with I-75 at Exit 249 six miles south of Grayling and the southern terminus is at the Ohio state line ten miles south of Hudson. US-127 continues south of Michigan and terminates near Chattanooga, Tennessee. US-127 serves as a major route that connects the south central portion of the Lower Peninsula (i.e. Lansing and Jackson) to the rural vacation areas in the northern parts of Michigan.

The project is located in Ingham County. The limits of this project are bound between Lake Lansing Road on the north and the westbound I-496 exit ramp on the south as shown in Figure 1. Throughout this segment, US-127 is presently a four-lane facility with a two auxiliary lanes along the northbound side with one connecting the entrance ramp from eastbound I-496 and exit ramp to E. Saginaw Street and the other connecting the entrance ramp from Grand River Avenue and exit ramp to Lake Lansing Road . The new auxiliary lanes are along the southbound side and will connect the entrance and exit ramps between Lake Lansing and Grand River Roads, and between E. Saginaw Street and westbound I-496. The intent of this project is to improve the weave activity and reduce traffic conflicts between the ramps and the mainline.

FIGURE 1 – Project Area



3. Traffic Noise Concepts, Policy and Guidelines

3.1 Basic Acoustic Concepts

Noise can be described as unwanted sound that may interfere with communication, or may disturb the community. Three characteristics of noise have been identified as being important to analyzing the subjective community response to noise: intensity, frequency, and the time-varying characteristics of the noise.

Intensity is a measure of the magnitude or energy of the sound, and is directly related to pressure level. The human ear is capable of sensing a wide range of pressure levels. Pressure levels are expressed in terms of a logarithmic scale with units called decibels (dB). As the intensity of a noise increases, it is judged to be more annoying.

The decibel scale is a logarithmic representation of the actual sound pressure variations. The manner in which the logarithmic nature of sound is perceived as loudness, and the accompanying change in traffic volumes is depicted in Table 1.

TABLE 1- Logarithmic Nature of Sound

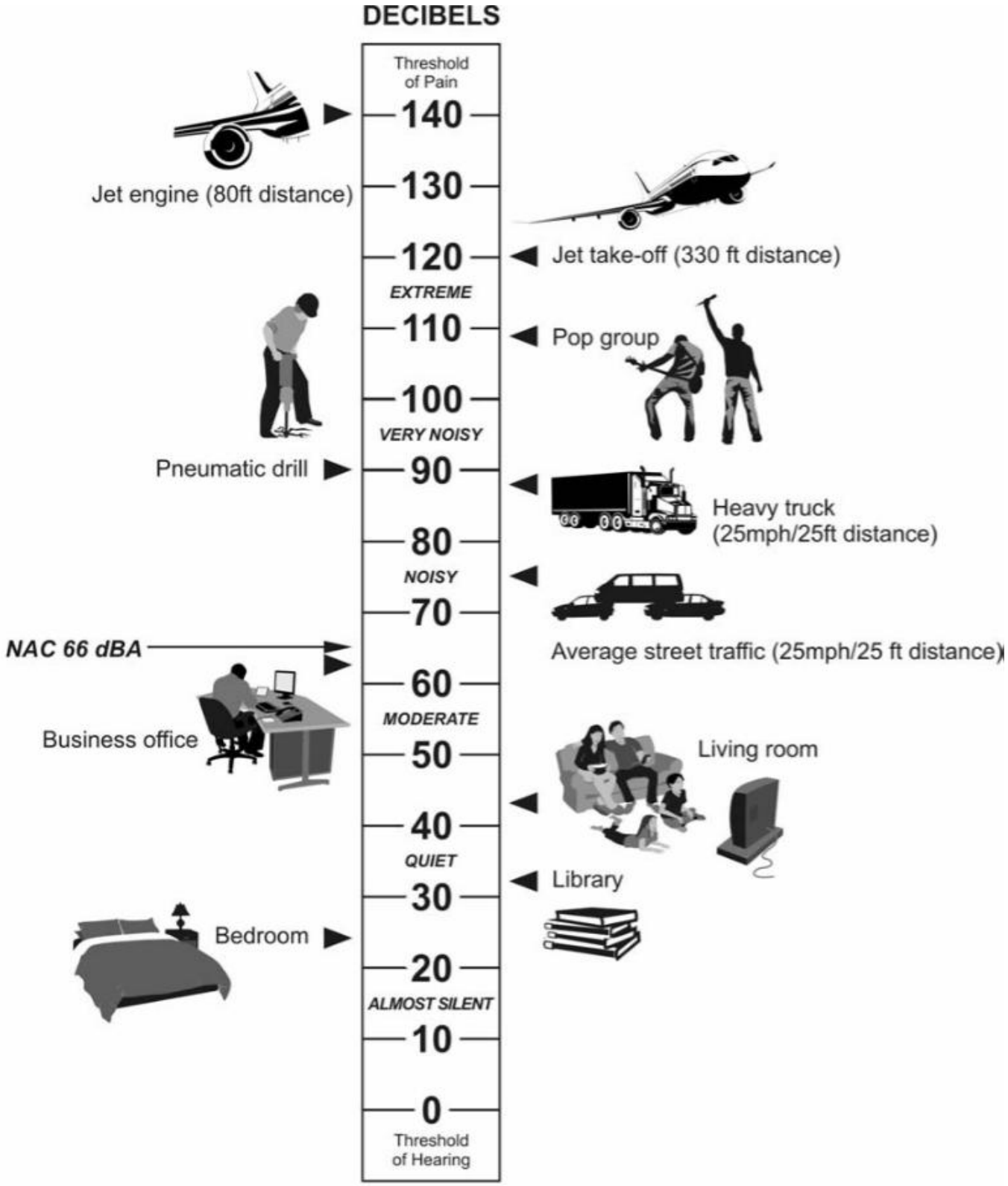
Change in Leq (1h) Sound Level	Relative Loudness in the Natural Environment
+/- 3 dB(A)	Barely Perceptible Change
+/- 5 dB(A)	Readily Perceptible Change
+/- 10 dB(A)	Considered Twice or Half as Loud

Frequency is a measure of the tonal qualities of sound. The spectrum of frequencies provides the identity of a sound. People are most sensitive to sounds in the middle to high frequencies; therefore, higher frequencies tend to cause more annoyance. This sensitivity led to the use of the A-weighted sound level, which provides a single number measure that weighs different frequencies of the frequency spectrum in a manner similar to the sensitivity of the human ear. Thus, the A-weighted sound level in decibels (dB(A)) provides a simple measure of intensity and frequency that correlates well with the human response to environmental noise.

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 (Leq) 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 (Leq in dB(A)) that helps to evaluate human response to noise, and has been chosen for use in this study. The time period used to determine noise levels is typically one hour and uses the descriptor Leq(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, however, average tire and pavement conditions are assumed in the noise prediction model. At lower speeds, especially in trucks and buses, the dominant noise source is the engine and exhaust.

FIGURE 2 - Sound Levels of Typical Noise Sources



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

3.2 Federal Regulations and Guidance

FHWA's *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, 23 CFR 772, requires the following during the planning and design of a highway project.

1) Identification of highway traffic noise impacts;
2) Examination of potential abatement measures;
3) Gather public input approval for reasonable and feasible abatement measures;
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 when they are considered permitted developments.

After the existing and proposed land uses are established, the existing noise levels are determined based on a noise model validation process that compares modeled noise levels to actual measured noise levels. The existing noise environment is determined by gathering noise measurements and concurrent site and traffic information. The FHWA mandates the use of the most recent version of the Traffic Noise Model® (TNM) software be used to construct these models. The noise model must predict noise levels that are within 3 dB(A) of the actual levels in order to be considered valid. Future design year traffic is applied to a model that has been validated for the existing condition to estimate future 2033 noise levels.

The FHWA Noise Abatement Criteria (NAC), which is presented in 23 CFR 772, establishes the noise abatement criteria for various land uses, and is presented in Table 2. 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 E. The FHWA allows states to define a substantial noise increase as an increase of anywhere between 5 and 15 dB(A).

TABLE 2 - FHWA Noise Abatement Criteria (NAC)[1]

Hourly A-Weighted Sound Level in Decibels (dB(A))

Activity Category	Activity Criteria[2]		Evaluation Locator	Activity Description
	Leq(h)[3]	L10(h)[4]		
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[5]	67	70	Exterior	Residential
C[5]	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools , television studios, trails, and trail crossings
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E[5]	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	----	----	----	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	----	----	----	Undeveloped lands that are not permitted

[1] MDOT identifies a significant noise impact as a 10 dBA increase between the existing and predicted design year sound levels, or a measured or modeled noise level 1 dBA less than the NAC standard

[2] Either Leq(h) or L10(h) (but not both) may be used on a project. MDOT uses Leq(h). The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[3] Leq 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 Leq(h) being the hourly value of Leq.

[4] L10 is the sound level that is exceeded 10 percent of the time (90th percentile) for the period under consideration, with L10 being the hourly value of L10.

[5] Includes undeveloped lands permitted for this activity category

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;
5) Noise insulation of Activity Category D land use facilities listed in Table 2.

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 23 CFR 772.13 (d)(1)(i). MDOT's feasibility criteria are provided in Section 2.3.

The FHWA lists three required reasonableness factors when considering noise barriers: cost effectiveness; viewpoints of benefitting receptors; and achievement of noise reduction design goals. For reasonableness, 23 CFR 772.13 (d)(2)(iii) requires state DOTs 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. MDOT's reasonableness criteria are provided in Section 2.3.

3.3 State Rules and Procedures

MDOT's Highway Noise Analysis and Abatement Handbook is the State's tool for implementing 23 CFR 772, which was discussed in Section 4.2. The Highway Noise Analysis and Abatement Handbook expands on 23 CFR 772 by refining definitions and establishing mile stones within the design phase for the completion of noise impact analysis and mitigation development.

The Highway Noise Analysis and Abatement Handbook includes the following definitions:

Noise Impact: A substantial noise increase or a predicted design year noise level that is 1 dB(A) less, equal to, or greater than the NAC level.

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% of the impacted receptors.

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

Cost Effective Noise Barrier: A noise barrier analyzed for environmental clearance with a preliminary construction cost that is not more than 3 % above the allowable cost per benefited receptor unit (CPBU) of $45,509 (year 2012), assuming a $45.00 per square foot noise barrier construction cost.

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

Attenuation Requirement: Reduce design year traffic noise by 10 dB(A) for at least one benefited receptor and provide at least a 7 dB(A) reduction for 50% 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.

4. Noise Analysis

4.1. FHWA Traffic Noise Model (TNM)

TNM is FHWA's computer program for highway traffic noise prediction and analysis. The use of the most recent TNM software, or any other model determined by the FHWA to be consistent with the methodology of the FHWA TNM is a mandatory requirement for all traffic noise related projects, under 23 CFR 772.9. The following parameters are used in this model to calculate an hourly Leq at a specific receiver location:

- Distance between roadway and receiver;
- Relative elevations of roadway and receiver;
- Hourly traffic volumes by classification;
- Vehicle speeds;
- Ground absorption;
- Weather conditions; and
- Topographic features, including retaining walls and berms.

Hourly traffic volumes have been divided into five vehicle classifications: automobiles (A); medium trucks (MT); heavy trucks (HT); Buses (B); and Motorcycles (M). Each vehicle class is defined by the *FHWA Traffic Noise Model, User's Guide, (February 1998); TNM v2.5 Update Sheet, Technical Manual: Part 1* as follows:

- Automobiles – all vehicles with two axles and four tires, includes passenger vehicles and light trucks, less than 9,900 pounds.
- Medium trucks – all vehicles having two axles and six tires, vehicle weight between 9,900 and 26,400 pounds.
- Heavy trucks – all vehicles having three or more axles, vehicle weight greater than 26,400 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.

4.2 Analysis

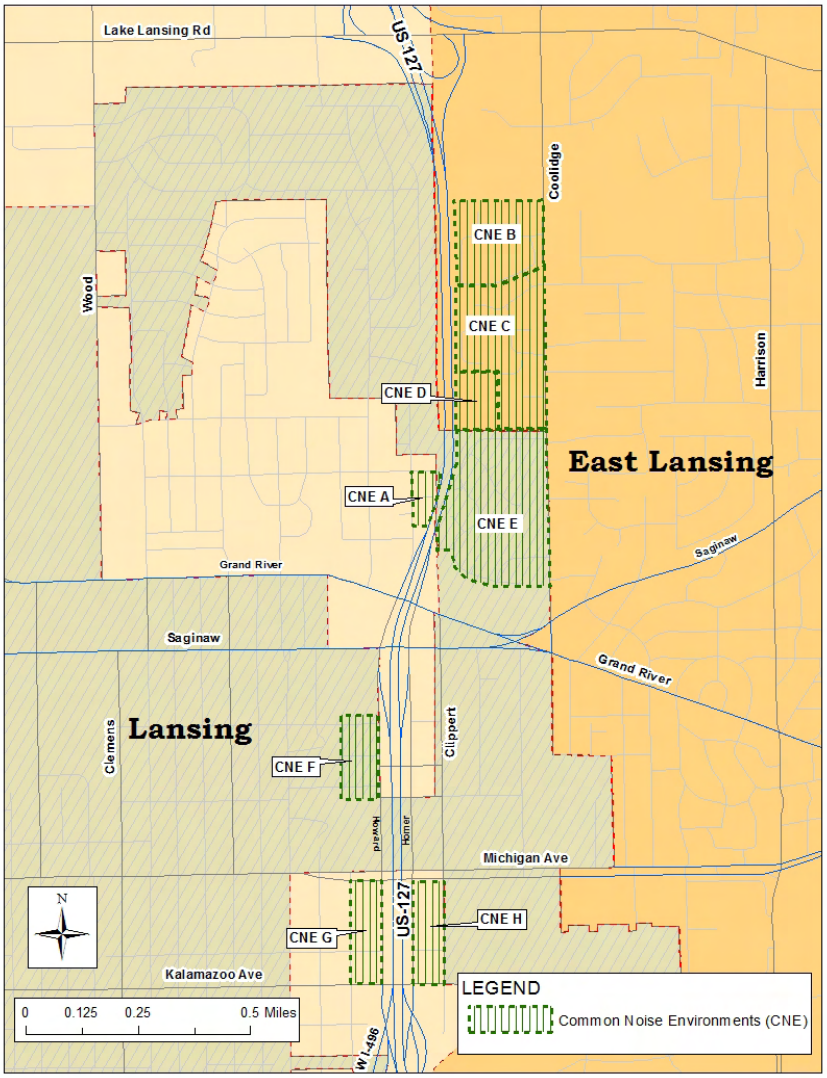
4.2.1 Land Use and Field Measurement Levels

The project corridor was divided into common noise environments (CNE) to facilitate the analysis of highway noise of areas of like land uses. The CNE are listed boundaries are identified in Table 3 and illustrated in Figure 2.

TABLE 3 - Project Area Common Noise Environment

CNE	Site Description
A	Madison Apartments bounded by Woodruff Ave., N. Homer St. and Covington Court
B	Timber Lake Apartments (with balconies)
C	Pebble Creek Apartments
D	Outdoor activity areas within Pebble Creek Apartments
E	Residential area bounded by Stonewood and Holiday Drives, Fairway Lane and Coolidge Road
F	Residential area bounded by Fernwood, N. Howard, Midvale Avenues and La Salle Gardens
G	Residential/Commercial area bounded by Michigan and S. Howard Avenues, and E. Kalamazoo and Detroit Streets
H	Residential/Commercial area bounded by Michigan Avenue and S. Homer and E. Kalamazoo and S. Clippert Streets

FIGURE 2 – Common Noise Environments (CNE)



Field measurements with concurrent traffic counts are taken to compare with modeled noise levels to validate the TNM for use on the specific project to predict existing and design year noise levels. Figure 3 shows the locations of the field measurement sites.

A minimum fifteen minute measurement was taken at each site, during off-peak traffic time periods. The measurements were made in accordance with FHWA and MDOT guidelines using an integrating sound level analyzer. Traffic counts were taken at each site, concurrent with the noise measurements. The data collected at the 5 sites are presented in Table 4.

TABLE 4 - Measured Existing Noise Levels

Field Site ID	Traffic Counts					Measured Noise Level dB(A) Leq(1h)
	Autos	Medium Trucks	Heavy Trucks	Busses	Motorcycles	
FM1	3932	132	204	0	0	71.5
FM2	4684	116	172	0	0	76.4
FM3	2644	136	161	0	0	69.8
FM4	2936	124	156	0	0	62.9
FM5	3020	104	176	0	0	66.5

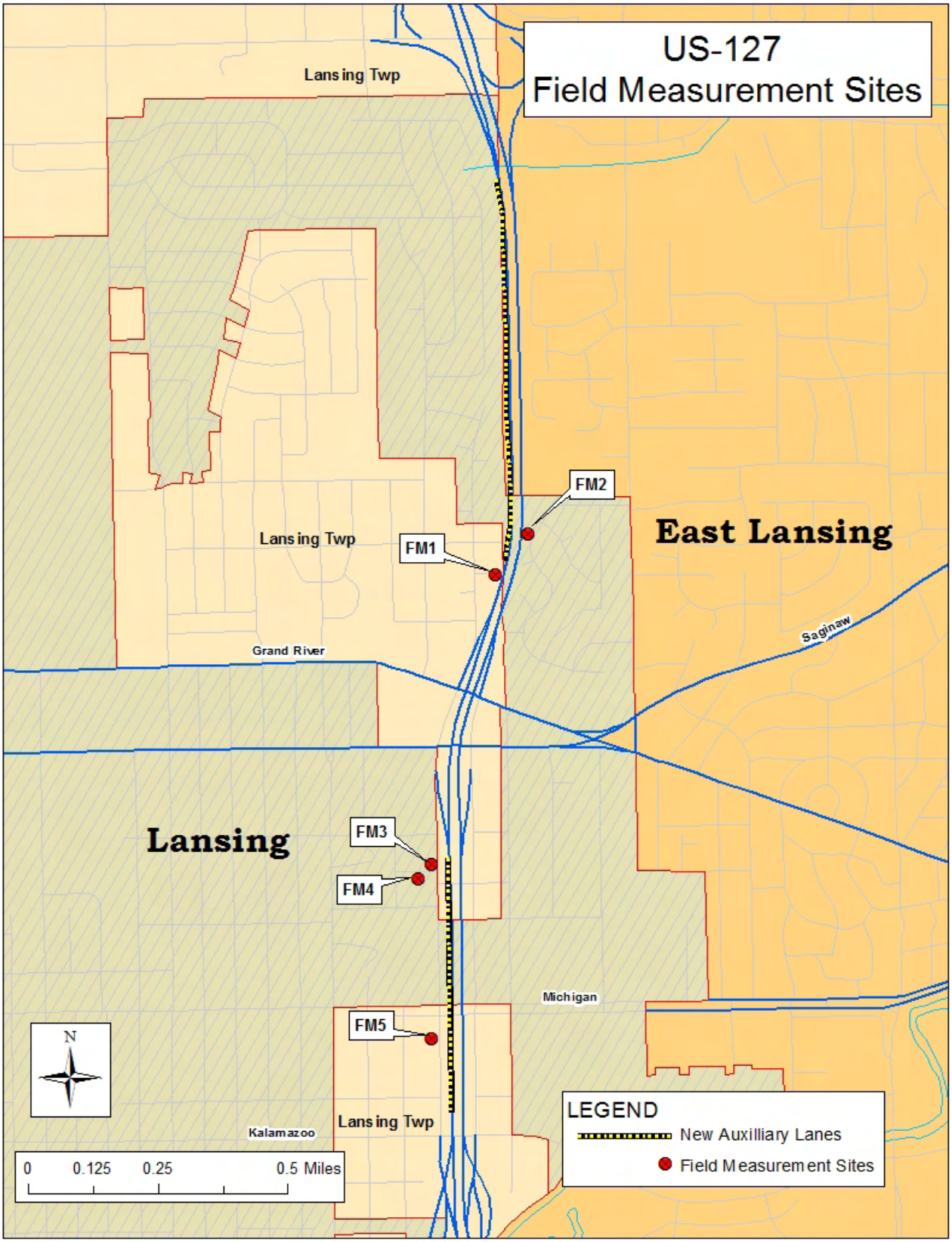
4.2.2 Fields Measurements vs. Modeled Noise Levels

TNM was used to compare the field measurements to the model using the traffic count information. Comparing the modeled noise levels to the measured noise levels validates the TNM model for use on the specific project. Traffic counts were taken concurrently with the noise measurements at all of the sites and used in the model. All 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 5.

TABLE 5 - Comparison of Measured and Modeled Noise Levels

Field Site ID	Noise Level dB(A) Leq(1h)		Difference in Noise Level dB(A) Leq(1h)
	Measured	Modeled	
FM1	71.5	72.2	+0.7
FM2	76.4	77.9	+1.5
FM3	69.8	67.1	-2.7
FM4	62.9	61.4	-1.5
FM5	66.5	64.4	-2.1

FIGURE 3 – Field Measurement Sites



4.2.3 Predicted Traffic Noise Levels and Noise Impact Analysis

The traffic noise prediction program, TNM, was used to model existing and design year traffic noise levels within the project area. The traffic volumes were provided by MDOT's Traffic Analysis and Systems Units.

TABLE 6 - 2012 Existing AM Peak Hour Traffic Volumes

Roadway Segment	Total Traffic Volume	Volume by Vehicle Type		
		Autos	Medium Trucks	Heavy Trucks
NB US-127 north of Grand River Ave	2475	2291	18	166
SB US-127 north of Grand River Ave	3575	3309	26	240
NB US-127 south of Saginaw Street	2475	2291	18	166
SB US-127 south of Saginaw Street	3575	3309	26	240

TABLE 7 - 2033 Design Year AM Peak Hour Traffic Volumes

Roadway Segment	Total Traffic Volume	Volume by Vehicle Type		
		Autos	Medium Trucks	Heavy Trucks
NB US-127 north of Grand River Ave	2749	2544	20	185
SB US-127 north of Grand River Ave	3969	3674	29	266
NB US-127 south of Saginaw Street	2749	2544	20	185
SB US-127 south of Saginaw Street	3969	3674	29	266

Modeled receptors are 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 as the back yard area within 35 feet from the back of a residence. 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. Second floor balconies are included in noise impact and abatement analyses. Balconies on floors higher than the second floor may be included depending on their relationship to the level of the roadway.

A traffic noise impact is defined as a future noise level that approaches or exceeds the FHWA Noise Abatement Criteria (NAC); or a future noise level that creates a substantial noise increase over existing noise levels. MDOT identifies a significant noise impact as a 10 dB(A) increase between the existing and predicted design year sound levels, or a measured or modeled noise level 1 dB(A) less than the NAC standard. There are 522 modeled sites for both sections of the project. The existing and design year noise levels table of modeled sites can be viewed in Appendix B.

5. Abatement Measures

5.1. Federal and State Abatement Guidance

MDOT's Highway Noise Analysis and Abatement Handbook has established the criteria for determining where noise abatement must be provided. The Internet address to access the Handbook can be found in the reference section of this report.
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 the clearance of the Categorical Exclusion will be the date of public knowledge. 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 commercial and industrial sites prefer that there be no interference with the view to their establishments. Therefore, when commercial and residential sites expected to convert to a commercial or industrial land use (e.g., some of the residential units have converted to commercial/industrial, or the area has been rezoned commercial) are found to be reasonable and feasible, they will be asked if they want noise abatement. If they do not want it, it will not be provided.
- 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% of impacted receivers 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% above allowable per benefitting unit level ($42,509 in 2012 dollars);
    - 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 benefitted unit and at least a 7 dB(A) for 50% or more of the benefitted units.

Highway traffic noise abatement alternatives, which are listed in 23 CFR 772.15(c) include:

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 use 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 for any reason; and the construction of noise berms is neither feasible nor reasonable because of the amount of space that would be required. Therefore, the construction of noise barriers within the existing Right-of-Way was the only mitigation measure that received in-depth evaluation.

5.2 Barrier Analysis

Abatement analysis was done for 2 noise barriers. As a minimum, the MDOT *Highway Noise Analysis and Abatement Handbook* requires that noise barriers be analyzed as a noise abatement measure. To satisfy this requirement, a noise barrier has been evaluated for each of the CNE areas with impacted noise receptors as a part of this noise study. The results of each evaluated barrier, including barrier location, future Leq(1h) noise levels without and with a barrier, barrier length and height, and the noise reduction provided by the barrier are presented in Table 8. The number of substantial noise reduction locations, the number of locations with more than 7 dB(A) attenuation, total estimated cost (based on $45.00 per square foot), the number of benefited receivers (i.e. residential, commercial, or equivalent), the cost per benefited receiver, feasibility determination, and reasonableness determination for each of the barriers is presented in Table 9. The evaluated noise barriers are presented in Figure 4.

TABLE 8 - Evaluated Noise Barriers

Barrier ID	Figure #	Locations	Existing Noise Levels	Range of Future Noise Levels		Noise Reduction	Barrier Characteristics	
				w/o Barrier	With Barrier		Length (ft)	Height (ft)
A		SB US-127 Madison Apartment Complex	46.6dB(A)-76.3dB(A)	46.7dB(A)-76.7dB(A)	45.8dB(A)-60.7dB(A)	0.9dB(A)-16.0dB(A)	707	23
BCD		NB US-127 between Grand River Ave. and Lake Lansing Road	33.9dB(A)-76.0dB(A)	33.9dB(A)-76.2dB(A)	33.9dB(A)-65.1dB(A)	0.0dB(A)-11.1dB(A)	4715	18

FIGURE 4 – Proposed Noise Barriers

TABLE 9 - Noise Barrier Feasibility and Reasonableness

Barrier ID	Number of Attenuated Locations					Cost	Cost/Benefit	Feasible	Reasonable
	≥ 10 dB(A)	≥ 7 dB(A)		≥ 5 dB(A)					
		#	% of Benefited	#	% of Impacted			(Y/N)	(Y/N)
A	12	14	82	17	100	$731,326	$43,019	Y	Y
BCD	51	104	64	162	100	$3,811,194	$23,526	Y	Y

MDOT's allowable upper cost criteria limit is $42,509 (2012), plus 3% ($43,784), per benefited receptor. Appendix C includes the table showing the results of the abatement analysis and highlights the benefitting receptors. The barriers are located across multiple jurisdictions with Barrier A approximately being 50% within each of the City of Lansing and Lansing Township. Barrier BCD is divided approximately as 68% within the City of East Lansing, 25% within the City of Lansing, and 7% within Lansing Township.

6. Conclusions and Recommendations

Barriers A and BCD both meet MDOT's preliminary feasible and reasonableness criteria. The CNE "F" (see Figure A-6 in Appendix A) has one dwelling unit which is predicted to receive a future noise impact of 66 dB(A). This dwelling unit is located along the Howard Street service road at the corner of Fernwood Street. An effective noise reducing barrier could not be located along Howard Street due to a gap in the barrier which would be created by maintaining access to Fernwood Street. A barrier located along the shoulder of southbound US-127 could potentially provide only minimal noise reduction to the impacted dwelling unit and at an estimated construction cost of $200,000-$400,000. These projected costs far exceed MDOT's allowable cost per benefitting dwelling unit criteria for environmental clearance of $43,784. Furthermore, this barrier would have to be designed with extraordinary large dimensions in order to meet MDOT's noise reduction feasibility criteria.

6.1 Statement of Likelihood

Based on the studies thus far accomplished, the Michigan Department of Transportation intends to install highway traffic noise abatement in the form of the barriers presented in Table 9 in this document. The preliminary indications of likely abatement measures are based on preliminary design for barrier cost(s) and noise abatement as illustrated in Table 9 in this document. If it subsequently develops during final design that these conditions have substantially changed, the

abatement measures might not be provided. A final decision of the installation and aesthetics of the abatement measures(s) will be made upon completion of the project's final design and the Context Sensitive Design process which include public invovlement.

6.2 Construction Noise

The noise produced on highway construction sites originates from a variety of sources, which can be described by identifying those phases of construction applicable to the recommended project. Specifically, each phase of construction has its own scope, objective, mix of equipment, and therefore, its own noise characteristics. For most projects these phases will overlap due to time constraints and interdependency of activities.

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.

7. References

"Commission Policy", (Guidance Document 10136), Michigan Transportation Commission, Michigan Department of Transportation, July 31, 2003.

Lau, Michael C., Cynthia S. Y. Lee, Gregg G. Judith L. Rochat, Eric R. Boeker, and Gregg C. Fleming. FHWA Traffic Noise Model® Users Guide (Version 2.5 Addendum). Federal Highway Administration, April 2004.

"Highway Noise Analysis and Abatement Handbook" Michigan Department of Transportation, July 13, 2011.
http://michigan.gov/documents/mdot/MDOT_HighwayNoiseAnalysis_and_AbatementHandbook_358156_7.pdf

"Highway Traffic Noise: Analysis and Abatement Guidance", Federal Highway Administration, January 2011.
http://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/revguidance.pdf

Title 23 CFR Part 772, "Procedure for abatement of Highway Traffic Noise and Construction Noise", Code of Federal Regulations
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;sid=1253e5cedf4b79ecfc5150fe9d7d00e7;rgn=div5;view=text;node=23%3A1.0.1.8.44;idno=23;cc=ecfr

APPENDIX A

Highway Noise Modeled Receptor Locations

The single receptor site symbols with multiple identification numbers in Figures A-2 and A-3 are different dwelling units within a single apartment building. The symbol represents the rating of one or more of the dwelling units in the building.

Appendix A pages are divided into 2 separate web pages due to their files sizes.

Appendix A links:

Appendix A-1

Appendix A-2

Appendix B
Highway Noise Impact Analysis Table

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Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
A1	Residential	B	67	78.8	79.2	0.4	Y
A2	Residential	B	67	78.6	79.0	0.4	Y
A3	Residential	B	67	46.7	46.8	0.1	N
A4	Residential	B	67	54.0	54.1	0.1	N
A5	Residential	B	67	68.6	69.2	0.6	Y
A6	Residential	B	67	68.9	69.7	0.8	Y
A7	Residential	B	67	57.6	58.2	0.6	N
A8	Residential	B	67	58.8	59.3	0.5	N
A9	Residential	B	67	76.5	76.9	0.4	Y
A10	Residential	B	67	76.3	76.7	0.4	Y
Picnic Table	Outdoor Use	C	67	78.1	78.6	0.5	Y
A11	Residential	B	67	46.6	46.7	0.1	N
A12	Residential	B	67	49.0	49.3	0.3	N
A13	Residential	B	67	65.9	66.0	0.1	Y
A14	Residential	B	67	63.1	63.4	0.3	N
A15	Residential	B	67	54.6	55.4	0.8	N
A16	Residential	B	67	54.9	55.6	0.7	N
A17	Residential	B	67	75.0	75.5	0.5	Y
A18	Residential	B	67	74.2	74.6	0.4	Y
A19	Residential	B	67	68.2	68.5	0.3	Y
A20	Residential	B	67	67.0	67.4	0.4	Y
A21	Residential	B	67	73.1	73.6	0.5	Y
A22	Residential	B	67	72.0	72.5	0.5	Y
A23	Residential	B	67	67.7	68.1	0.4	Y
A24	Residential	B	67	67.1	67.6	0.5	Y
B1	Residential	B	67	74.5	74.4	-0.1	Y
B2	Residential	B	67	67.4	67.6	0.2	Y
B3	Residential	B	67	76.0	75.9	-0.1	Y
B4	Residential	B	67	65.9	66.2	0.3	Y
B5	Residential	B	67	63.0	63.2	0.2	N
B6	Residential	B	67	62.1	62.4	0.3	N
B7	Residential	B	67	61.6	61.9	0.3	N
B8	Residential	B	67	62.6	63.0	0.4	N
B9	Residential	B	67	64.9	65.3	0.4	N
B10	Residential	B	67	66.5	66.9	0.4	Y
B11	Residential	B	67	68.9	69.4	0.5	Y
B12	Residential	B	67	60.2	60.4	0.2	N
B13	Residential	B	67	61.2	61.4	0.2	N
B14	Residential	B	67	61.2	61.4	0.2	N
B15	Residential	B	67	60.0	60.1	0.1	N
B16	Residential	B	67	58.7	58.8	0.1	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
B17	Residential	B	67	58.2	58.3	0.1	N
B18	Residential	B	67	56.2	56.3	0.1	N
B19	Residential	B	67	55.7	55.9	0.2	N
B20	Residential	B	67	56.5	56.7	0.2	N
B21	Residential	B	67	57.5	57.9	0.4	N
B22	Residential	B	67	59.0	59.3	0.3	N
B23	Residential	B	67	61.4	61.8	0.4	N
B24	Residential	B	67	62.2	62.6	0.4	N
B25	Residential	B	67	62.7	63.0	0.3	N
B26	Residential	B	67	63.4	63.9	0.5	N
B27	Residential	B	67	64.2	64.7	0.5	N
B28	Residential	B	67	65.5	66.0	0.5	Y
B29	Residential	B	67	62.1	62.4	0.3	N
B30	Residential	B	67	59.9	60.1	0.2	N
B31	Residential	B	67	59.4	59.6	0.2	N
B32	Residential	B	67	59.3	59.6	0.3	N
B33	Residential	B	67	58.2	58.4	0.2	N
B34	Residential	B	67	57.4	57.7	0.3	N
B35	Residential	B	67	57.1	57.4	0.3	N
B36	Residential	B	67	56.7	57.0	0.3	N
B37	Residential	B	67	50.9	51.1	0.2	N
B38	Residential	B	67	55.3	55.6	0.3	N
B39	Residential	B	67	52.1	52.4	0.3	N
B40	Residential	B	67	56.0	56.4	0.4	N
B41	Residential	B	67	57.5	57.8	0.3	N
B42	Residential	B	67	59.3	59.7	0.4	N
B43	Residential	B	67	60.3	60.7	0.4	N
B44	Residential	B	67	63.1	63.5	0.4	N
B45	Residential	B	67	64.5	65.0	0.5	N
B46	Residential	B	67	66.5	67.0	0.5	Y
B47	Residential	B	67	67.2	67.6	0.4	Y
B48	Residential	B	67	52.9	53.1	0.2	N
B49	Residential	B	67	51.1	51.3	0.2	N
B50	Residential	B	67	50.3	50.4	0.1	N
B51	Residential	B	67	49.6	49.8	0.2	N
B52	Residential	B	67	49.6	49.8	0.2	N
B53	Residential	B	67	49.7	49.9	0.2	N
B54	Residential	B	67	49.7	49.9	0.2	N
B55	Residential	B	67	49.8	50.0	0.2	N
B56	Residential	B	67	49.3	49.5	0.2	N
B57	Residential	B	67	48.1	48.4	0.3	N
B58	Residential	B	67	48.6	48.9	0.3	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
B59	Residential	B	67	48.9	49.1	0.2	N
B60	Residential	B	67	48.9	49.1	0.2	N
B61	Residential	B	67	48.7	49.0	0.3	N
B62	Residential	B	67	48.7	48.9	0.2	N
B63	Residential	B	67	48.9	49.2	0.3	N
B64	Residential	B	67	49.1	49.4	0.3	N
B65	Residential	B	67	49.8	50.2	0.4	N
B66	Residential	B	67	49.6	50.0	0.4	N
B67	Residential	B	67	50.1	50.5	0.4	N
B68	Residential	B	67	50.9	51.3	0.4	N
B69	Residential	B	67	52.0	52.4	0.4	N
B70	Residential	B	67	52.9	53.1	0.2	N
B71	Residential	B	67	53.2	53.6	0.4	N
B72	Residential	B	67	52.7	52.9	0.2	N
B73	Residential	B	67	51.3	51.4	0.1	N
B74	Residential	B	67	50.3	50.5	0.2	N
B75	Residential	B	67	51.7	51.9	0.2	N
B76	Residential	B	67	50.7	50.9	0.2	N
B77	Residential	B	67	50.4	50.6	0.2	N
B78	Residential	B	67	49.9	50.2	0.3	N
B79	Residential	B	67	51.6	51.9	0.3	N
B80	Residential	B	67	51.4	51.6	0.2	N
B81	Residential	B	67	52.0	52.2	0.2	N
B82	Residential	B	67	51.7	51.9	0.2	N
B83	Residential	B	67	51.1	51.4	0.3	N
B84	Residential	B	67	50.0	50.3	0.3	N
B85	Residential	B	67	49.7	49.9	0.2	N
B86	Residential	B	67	49.5	49.7	0.2	N
B87	Residential	B	67	49.0	49.4	0.4	N
B88	Residential	B	67	48.7	49.0	0.3	N
B89	Residential	B	67	48.7	49.0	0.3	N
B90	Residential	B	67	47.8	48.0	0.2	N
B91	Residential	B	67	52.0	52.2	0.2	N
B92	Residential	B	67	52.9	53.1	0.2	N
B93	Residential	B	67	55.0	55.3	0.3	N
B94	Residential	B	67	56.1	56.4	0.3	N
B95	Residential	B	67	52.1	52.5	0.4	N
B96	Residential	B	67	51.4	51.8	0.4	N
B97	Residential	B	67	54.2	54.5	0.3	N
B98	Residential	B	67	57.2	57.7	0.5	N
B99	Residential	B	67	58.5	58.9	0.4	N
B100	Residential	B	67	60.5	60.9	0.4	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
B101	Residential	B	67	63.0	63.4	0.4	N
B102	Residential	B	67	54.0	54.3	0.3	N
B103	Residential	B	67	54.1	54.5	0.4	N
B104	Residential	B	67	55.1	55.5	0.4	N
B105	Residential	B	67	56.3	56.7	0.4	N
B106	Residential	B	67	56.8	57.2	0.4	N
B107	Residential	B	67	57.1	57.5	0.4	N
B108	Residential	B	67	57.4	57.8	0.4	N
B109	Residential	B	67	57.6	58.0	0.4	N
B110	Residential	B	67	59.5	60.0	0.5	N
B111	Residential	B	67	60.8	61.2	0.4	N
B112	Residential	B	67	62.3	62.7	0.4	N
B113	Residential	B	67	63.9	64.4	0.5	N
B114	Residential	B	67	65.7	66.2	0.5	Y
B115	Residential	B	67	54.5	54.9	0.4	N
B116	Residential	B	67	55.3	55.7	0.4	N
B117	Residential	B	67	56.4	56.8	0.4	N
B118	Residential	B	67	57.1	57.5	0.4	N
B119	Residential	B	67	57.8	58.2	0.4	N
B120	Residential	B	67	59.1	59.5	0.4	N
B121	Residential	B	67	60.7	61.1	0.4	N
B122	Residential	B	67	62.5	62.9	0.4	N
B123	Residential	B	67	64.4	64.9	0.5	N
B124	Residential	B	67	68.1	68.5	0.4	Y
B125	Residential	B	67	71.8	72.3	0.5	Y
B126	Residential	B	67	49.7	50.0	0.3	N
B127	Residential	B	67	50.0	50.3	0.3	N
B128	Residential	B	67	49.8	50.1	0.3	N
B129	Residential	B	67	49.0	49.3	0.3	N
B130	Residential	B	67	49.8	50.1	0.3	N
B131	Residential	B	67	49.9	50.2	0.3	N
B132	Residential	B	67	50.0	50.3	0.3	N
B133	Residential	B	67	50.3	50.7	0.4	N
B134	Residential	B	67	50.6	51.0	0.4	N
B135	Residential	B	67	50.9	51.3	0.4	N
B136	Residential	B	67	51.0	51.4	0.4	N
B137	Residential	B	67	51.8	52.2	0.4	N
B138	Residential	B	67	52.6	53.0	0.4	N
B139	Residential	B	67	53.1	53.6	0.5	N
B140	Residential	B	67	53.6	54.0	0.4	N
B141	Residential	B	67	53.2	53.6	0.4	N
C1	Residential	B	67	59.5	60.0	0.5	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
C2	Residential	B	67	63.1	63.5	0.4	N
C3	Residential	B	67	64.3	64.8	0.5	N
C4	Residential	B	67	66.0	66.4	0.4	Y
C5	Residential	B	67	68.0	68.4	0.4	Y
C6	Residential	B	67	71.2	71.7	0.5	Y
Basketball court	Outdoor Use	C	67	66.3	66.7	0.4	Y
Ball field	Outdoor Use	C	67	62.0	62.4	0.4	N
Non-profit garden	Outdoor Use	C	67	59.6	60.1	0.5	N
C7	Residential	B	67	60.2	60.7	0.5	N
C8	Residential	B	67	58.5	58.9	0.4	N
C9	Residential	B	67	53.8	54.2	0.4	N
C10	Residential	B	67	52.0	52.4	0.4	N
C11	Residential	B	67	55.7	56.1	0.4	N
C12	Residential	B	67	43.0	43.4	0.4	N
C13	Residential	B	67	44.1	44.5	0.4	N
C14	Residential	B	67	42.8	43.2	0.4	N
C15	Residential	B	67	42.8	43.2	0.4	N
C16	Residential	B	67	46.7	46.8	0.1	N
C17	Residential	B	67	58.9	59.3	0.4	N
C18	Residential	B	67	53.5	53.9	0.4	N
C19	Residential	B	67	52.8	53.3	0.5	N
C20	Residential	B	67	56.1	56.5	0.4	N
C21	Residential	B	67	57.9	58.4	0.5	N
C22	Residential	B	67	57.7	58.2	0.5	N
C23	Residential	B	67	54.8	55.2	0.4	N
C24	Residential	B	67	53.5	54.1	0.6	N
C25	Residential	B	67	57.3	57.7	0.4	N
C26	Residential	B	67	56.1	56.7	0.6	N
C27	Residential	B	67	56.2	56.6	0.4	N
C28	Residential	B	67	58.5	58.9	0.4	N
C29	Residential	B	67	57.7	58.1	0.4	N
Pool	Outdoor Use	C	67	52.2	52.6	0.4	N
Pool	Outdoor Use	C	67	51.5	52.0	0.5	N
Active garden	Outdoor Use	C	67	50.9	51.3	0.4	N
C30	Residential	B	67	71.9	72.3	0.4	Y
Playground	Outdoor	C	67	60.7	61.2	0.5	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
	Use						
C31	Residential	B	67	58.5	58.9	0.4	N
C32	Residential	B	67	58.0	58.5	0.5	N
C33	Residential	B	67	57.7	58.0	0.3	N
C34	Residential	B	67	57.9	58.3	0.4	N
C35	Residential	B	67	57.4	57.8	0.4	N
C36	Residential	B	67	56.8	57.2	0.4	N
C37	Residential	B	67	39.3	39.5	0.2	N
C38	Residential	B	67	38.5	38.9	0.4	N
C39	Residential	B	67	40.7	41.0	0.3	N
C40	Residential	B	67	40.9	41.1	0.2	N
C41	Residential	B	67	48.4	48.9	0.5	N
C42	Residential	B	67	50.4	50.8	0.4	N
C43	Residential	B	67	45.8	46.2	0.4	N
C44	Residential	B	67	46.4	46.9	0.5	N
C45	Residential	B	67	60.4	60.8	0.4	N
C46	Residential	B	67	59.9	60.3	0.4	N
C47	Residential	B	67	54.9	55.4	0.5	N
C48	Residential	B	67	49.9	50.3	0.4	N
C49	Residential	B	67	49.8	50.2	0.4	N
C50	Residential	B	67	53.5	53.8	0.3	N
C51	Residential	B	67	47.5	47.9	0.4	N
C52	Residential	B	67	52.8	53.2	0.4	N
C53	Residential	B	67	55.8	56.1	0.3	N
C54	Residential	B	67	55.4	55.8	0.4	N
C55	Residential	B	67	55.0	55.5	0.5	N
C56	Residential	B	67	55.5	56.1	0.6	N
C57	Residential	B	67	56.4	56.8	0.4	N
C58	Residential	B	67	54.2	54.7	0.5	N
C59	Residential	B	67	55.3	55.7	0.4	N
C60	Residential	B	67	54.3	54.7	0.4	N
C61	Residential	B	67	52.7	53.1	0.4	N
C62	Residential	B	67	52.0	52.4	0.4	N
C63	Residential	B	67	52.9	53.4	0.5	N
C64	Residential	B	67	51.1	51.5	0.4	N
C65	Residential	B	67	51.2	51.6	0.4	N
C66	Residential	B	67	51.3	51.6	0.3	N
C67	Residential	B	67	52.0	52.4	0.4	N
C68	Residential	B	67	51.8	52.1	0.3	N
C69	Residential	B	67	50.5	50.9	0.4	N
C70	Residential	B	67	49.9	50.3	0.4	N
C71	Residential	B	67	48.0	48.2	0.2	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
C72	Residential	B	67	47.8	48.0	0.2	N
C73	Residential	B	67	48.6	49.0	0.4	N
C74	Residential	B	67	48.0	48.3	0.3	N
C75	Residential	B	67	49.1	49.4	0.3	N
C76	Residential	B	67	51.5	51.9	0.4	N
D1	Residential	B	67	63.9	64.4	0.5	N
D2	Residential	B	67	68.4	68.9	0.5	Y
D3	Residential	B	67	70.9	71.4	0.5	Y
D4	Residential	B	67	74.0	74.5	0.5	Y
D5	Residential	B	67	70.3	70.7	0.4	Y
D6	Residential	B	67	72.3	72.8	0.5	Y
D7	Residential	B	67	59.5	60.0	0.5	N
D8	Residential	B	67	63.0	63.4	0.4	N
D9	Residential	B	67	59.1	59.6	0.5	N
D10	Residential	B	67	65.6	66.1	0.5	Y
D11	Residential	B	67	69.1	69.6	0.5	Y
D12	Residential	B	67	73.6	74.0	0.4	Y
D13	Residential	B	67	68.6	69.0	0.4	Y
D14	Residential	B	67	71.1	71.5	0.4	Y
D15	Residential	B	67	45.1	45.4	0.3	N
D16	Residential	B	67	48.1	48.4	0.3	N
D17	Residential	B	67	57.4	57.8	0.4	N
D18	Residential	B	67	64.4	64.8	0.4	N
D19	Residential	B	67	69.6	70.0	0.4	Y
D20	Residential	B	67	73.5	74.0	0.5	Y
D21	Residential	B	67	69.6	70.0	0.4	Y
D22	Residential	B	67	71.7	72.1	0.4	Y
D23	Residential	B	67	54.7	55.1	0.4	N
D24	Residential	B	67	57.3	57.7	0.4	N
D25	Residential	B	67	57.1	57.6	0.5	N
D26	Residential	B	67	63.6	64.1	0.5	N
D27	Residential	B	67	69.7	70.1	0.4	Y
D28	Residential	B	67	73.4	73.9	0.5	Y
D29	Residential	B	67	69.8	70.3	0.5	Y
D30	Residential	B	67	71.9	72.3	0.4	Y
D31	Residential	B	67	57.4	57.8	0.4	N
D32	Residential	B	67	60.5	60.9	0.4	N
D33	Residential	B	67	51.6	52.0	0.4	N
D34	Residential	B	67	59.5	59.9	0.4	N
D35	Residential	B	67	58.2	58.7	0.5	N
D36	Residential	B	67	63.2	63.7	0.5	N
D37	Residential	B	67	58.4	58.9	0.5	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
D38	Residential	B	67	63.7	64.1	0.4	N
D39	Residential	B	67	54.1	54.4	0.3	N
D40	Residential	B	67	58.9	59.3	0.4	N
D41	Residential	B	67	45.8	46.1	0.3	N
D42	Residential	B	67	55.4	55.7	0.3	N
D43	Residential	B	67	55.5	55.9	0.4	N
D44	Residential	B	67	61.7	62.2	0.5	N
D45	Residential	B	67	55.7	56.1	0.4	N
D46	Residential	B	67	61.5	62.0	0.5	N
D47	Residential	B	67	51.8	51.5	-0.3	N
D48	Residential	B	67	55.0	54.9	-0.1	N
D49	Residential	B	67	44.1	44.4	0.3	N
D50	Residential	B	67	46.9	47.2	0.3	N
D51	Residential	B	67	51.9	52.3	0.4	N
D52	Residential	B	67	57.0	57.4	0.4	N
D53	Residential	B	67	55.5	55.5	0.0	N
D54	Residential	B	67	60.2	60.5	0.3	N
D55	Residential	B	67	49.5	49.4	-0.1	N
D56	Residential	B	67	51.8	51.9	0.1	N
D57	Residential	B	67	43.7	44.0	0.3	N
D58	Residential	B	67	45.9	46.2	0.3	N
D59	Residential	B	67	49.9	50.4	0.5	N
D60	Residential	B	67	55.0	55.4	0.4	N
D61	Residential	B	67	51.7	51.9	0.2	N
D62	Residential	B	67	56.3	56.7	0.4	N
D63	Residential	B	67	45.2	45.0	-0.2	N
D64	Residential	B	67	47.4	47.2	-0.2	N
D65	Residential	B	67	43.7	43.9	0.2	N
D66	Residential	B	67	44.2	44.5	0.3	N
D67	Residential	B	67	47.9	48.3	0.4	N
D68	Residential	B	67	51.1	51.4	0.3	N
D69	Residential	B	67	48.5	48.8	0.3	N
D70	Residential	B	67	54.4	54.7	0.3	N
D71	Residential	B	67	45.2	44.8	-0.4	N
D72	Residential	B	67	48.0	47.7	-0.3	N
D73	Residential	B	67	42.6	42.7	0.1	N
D74	Residential	B	67	42.9	43.1	0.2	N
D75	Residential	B	67	48.1	48.5	0.4	N
D76	Residential	B	67	39.2	39.6	0.4	N
D77	Residential	B	67	46.2	46.3	0.1	N
D78	Residential	B	67	42.7	42.7	0.0	N
D79	Residential	B	67	45.1	45.1	0.0	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
D80	Residential	B	67	43.7	43.9	0.2	N
D81	Residential	B	67	42.6	42.8	0.2	N
D82	Residential	B	67	42.6	42.7	0.1	N
D83	Residential	B	67	44.7	44.9	0.2	N
D84	Residential	B	67	41.9	42.3	0.4	N
D85	Residential	B	67	46.9	46.9	0.0	N
D86	Residential	B	67	46.3	46.4	0.1	N
D87	Residential	B	67	48.2	48.2	0.0	N
D88	Residential	B	67	41.4	41.6	0.2	N
D89	Residential	B	67	42.6	42.7	0.1	N
D90	Residential	B	67	42.2	42.4	0.2	N
D91	Residential	B	67	47.9	47.7	-0.2	N
D92	Residential	B	67	46.2	46.6	0.4	N
D93	Residential	B	67	50.5	50.9	0.4	N
D94	Residential	B	67	47.3	47.7	0.4	N
D95	Residential	B	67	52.0	52.3	0.3	N
D96	Residential	B	67	41.2	41.4	0.2	N
D97	Residential	B	67	45.2	45.2	0.0	N
D98	Residential	B	67	46.1	46.4	0.3	N
D99	Residential	B	67	47.4	47.5	0.1	N
D100	Residential	B	67	44.7	45.0	0.3	N
D101	Residential	B	67	48.4	48.7	0.3	N
D102	Residential	B	67	46.8	47.1	0.3	N
D103	Residential	B	67	49.9	50.2	0.3	N
D104	Residential	B	67	43.7	43.9	0.2	N
D105	Residential	B	67	44.6	44.7	0.1	N
D106	Residential	B	67	45.1	45.4	0.3	N
D107	Residential	B	67	50.5	50.6	0.1	N
D108	Residential	B	67	47.7	48.2	0.5	N
D109	Residential	B	67	51.4	51.8	0.4	N
D110	Residential	B	67	48.1	48.5	0.4	N
D111	Residential	B	67	52.2	52.6	0.4	N
D112	Residential	B	67	42.7	42.8	0.1	N
D113	Residential	B	67	45.4	45.6	0.2	N
D114	Residential	B	67	45.5	45.8	0.3	N
D115	Residential	B	67	48.0	48.2	0.2	N
D116	Residential	B	67	52.5	53.0	0.5	N
D117	Residential	B	67	49.8	50.1	0.3	N
D118	Residential	B	67	48.5	48.7	0.2	N
D119	Residential	B	67	52.9	53.3	0.4	N
D120	Residential	B	67	43.2	43.4	0.2	N
D121	Residential	B	67	45.6	45.7	0.1	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
D122	Residential	B	67	45.6	45.9	0.3	N
D123	Residential	B	67	49.6	49.6	0.0	N
D124	Residential	B	67	56.6	57.0	0.4	N
D125	Residential	B	67	61.6	62.0	0.4	N
D126	Residential	B	67	56.2	56.6	0.4	N
D127	Residential	B	67	59.2	59.7	0.5	N
D128	Residential	B	67	44.0	43.7	-0.3	N
D129	Residential	B	67	46.6	46.8	0.2	N
D130	Residential	B	67	44.3	44.5	0.2	N
D131	Residential	B	67	47.3	47.6	0.3	N
D132	Residential	B	67	60.6	61.0	0.4	N
D133	Residential	B	67	66.7	67.2	0.5	Y
D134	Residential	B	67	59.1	59.5	0.4	N
D135	Residential	B	67	63.9	64.3	0.4	N
D136	Residential	B	67	44.7	44.4	-0.3	N
D137	Residential	B	67	46.8	47.0	0.2	N
D138	Residential	B	67	51.8	52.0	0.2	N
D139	Residential	B	67	54.2	54.6	0.4	N
D140	Residential	B	67	53.5	54.0	0.5	N
D141	Residential	B	67	61.0	61.4	0.4	N
D142	Residential	B	67	63.1	63.5	0.4	N
D143	Residential	B	67	68.6	69.0	0.4	Y
D144	Residential	B	67	62.0	62.4	0.4	N
D145	Residential	B	67	67.0	67.5	0.5	Y
D146	Residential	B	67	71.9	72.3	0.4	Y
D147	Residential	B	67	73.8	74.3	0.5	Y
D148	Residential	B	67	74.6	75.1	0.5	Y
D149	Residential	B	67	75.4	75.8	0.4	Y
D150	Residential	B	67	68.7	69.0	0.3	Y
D151	Residential	B	67	69.5	69.9	0.4	Y
D152	Residential	B	67	58.1	58.5	0.4	N
D153	Residential	B	67	63.5	64.0	0.5	N
D154	Residential	B	67	67.6	68.1	0.5	Y
D155	Residential	B	67	71.2	71.6	0.4	Y
D156	Residential	B	67	74.3	74.7	0.4	Y
D157	Residential	B	67	75.8	76.2	0.4	Y
D158	Residential	B	67	71.3	71.6	0.3	Y
D159	Residential	B	67	72.1	72.3	0.2	Y
D160	Residential	B	67	53.3	52.3	-1	N
D161	Residential	B	67	54.7	54.0	-0.7	N
D162	Residential	B	67	61.2	61.0	-0.2	N
D163	Residential	B	67	64.3	64.3	0	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
D164	Residential	B	67	43.5	44.4	0.9	N
D165	Residential	B	67	47.6	47.8	0.2	N
D166	Residential	B	67	67.2	67.6	0.4	Y
D167	Residential	B	67	71.8	72.2	0.4	Y
D168	Residential	B	67	66.3	66.7	0.4	Y
D169	Residential	B	67	69.2	69.5	0.3	Y
D170	Residential	B	67	57.1	57.5	0.4	N
D171	Residential	B	67	64.6	64.9	0.3	N
D172	Residential	B	67	59.7	59.7	0.0	N
D173	Residential	B	67	64.4	64.5	0.1	N
D174	Residential	B	67	55.9	55.5	-0.4	N
D175	Residential	B	67	59.3	59.0	-0.3	N
D176	Residential	B	67	51.8	52.0	0.2	N
D177	Residential	B	67	47.0	46.8	-0.2	N
D178	Residential	B	67	44.5	44.8	0.3	N
D179	Residential	B	67	52.9	53.2	0.3	N
D180	Residential	B	67	57.3	57.2	-0.1	N
D181	Residential	B	67	62.2	62.2	0.0	N
D182	Residential	B	67	56.4	56.2	-0.2	N
D183	Residential	B	67	60.1	60.0	-0.1	N
D184	Residential	B	67	39.3	39.6	0.3	N
D185	Residential	B	67	43.9	44.2	0.3	N
D186	Residential	B	67	54.2	53.9	-0.3	N
D187	Residential	B	67	59.4	59.3	-0.1	N
D188	Residential	B	67	52.0	51.5	-0.5	N
D189	Residential	B	67	54.8	54.2	-0.6	N
D190	Residential	B	67	40.5	40.8	0.3	N
D191	Residential	B	67	44.5	44.8	0.3	N
D192	Residential	B	67	49.4	49.8	0.4	N
D193	Residential	B	67	52.3	52.7	0.4	N
D194	Residential	B	67	52.0	52.0	0.0	N
D195	Residential	B	67	57.2	57.1	-0.1	N
D196	Residential	B	67	54.0	54.0	0.0	N
D197	Residential	B	67	57.2	57.2	0.0	N
D198	Residential	B	67	47.0	46.6	-0.4	N
D199	Residential	B	67	47.5	46.9	-0.6	N
D200	Residential	B	67	43.5	43.7	0.2	N
D201	Residential	B	67	46.4	46.5	0.1	N
D202	Residential	B	67	53.3	53.0	-0.3	N
D203	Residential	B	67	56.8	56.8	0.0	N
D204	Residential	B	67	51.6	51.4	-0.2	N
D205	Residential	B	67	55.1	54.9	-0.2	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
D206	Residential	B	67	33.9	33.9	0.0	N
D207	Residential	B	67	41.2	41.3	0.1	N
D208	Residential	B	67	43.8	44.1	0.3	N
D209	Residential	B	67	54.1	54.1	0.0	N
D210	Residential	B	67	44.5	44.4	-0.1	N
D211	Residential	B	67	48.3	48.5	0.2	N
D212	Residential	B	67	38.9	39.0	0.1	N
D213	Residential	B	67	39.8	40.1	0.3	N
D214	Residential	B	67	46.1	46.5	0.4	N
D215	Residential	B	67	49.8	50.2	0.4	N
D216	Residential	B	67	46.2	46.6	0.4	N
D217	Residential	B	67	48.6	48.5	-0.1	N
D218	Residential	B	67	49.8	49.7	-0.1	N
D219	Residential	B	67	53.2	53.0	-0.2	N
D220	Residential	B	67	51.2	51.0	-0.2	N
D221	Residential	B	67	55.1	54.9	-0.2	N
D222	Residential	B	67	46.8	46.5	-0.3	N
D223	Residential	B	67	46.1	45.5	-0.6	N
D224	Residential	B	67	42.7	43.0	0.3	N
D225	Residential	B	67	47.4	47.4	0.0	N
D226	Residential	B	67	43.9	44.2	0.3	N
D227	Residential	B	67	48.7	49.1	0.4	N
D228	Residential	B	67	47.4	47.6	0.2	N
D229	Residential	B	67	51.2	51.5	0.3	N
D230	Residential	B	67	48.2	48.2	0.0	N
D231	Residential	B	67	51.2	51.6	0.4	N
D232	Residential	B	67	42.8	42.5	-0.3	N
D233	Residential	B	67	41.6	41.6	0.0	N
D234	Residential	B	67	48.0	46.9	-1.1	N
D235	Residential	B	67	51.1	50.3	-0.8	N
D236	Residential	B	67	43.6	43.8	0.2	N
D237	Residential	B	67	51.5	51.9	0.4	N
D238	Residential	B	67	53.9	54.3	0.4	N
D239	Residential	B	67	59.8	60.3	0.5	N
D240	Residential	B	67	54.6	54.9	0.3	N
D241	Residential	B	67	59.1	59.5	0.4	N
D242	Residential	B	67	57.5	57.9	0.4	N
D243	Residential	B	67	63.9	64.4	0.5	N
D244	Residential	B	67	59.2	59.2	0.0	N
D245	Residential	B	67	63.9	64.0	0.1	N
D246	Residential	B	67	54.7	54.4	-0.3	N
D247	Residential	B	67	57.7	57.5	-0.2	N

Highway Noise Impact Analysis Table (Impacted receptors are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Existing	Future Year	Change	Impact (Y/N)
D248	Residential	B	67	50.4	50.8	0.4	N
D249	Residential	B	67	59.1	59.5	0.4	N
D250	Residential	B	67	57.4	57.8	0.4	N
D251	Residential	B	67	64.5	64.9	0.4	N
D252	Residential	B	67	64.5	65.0	0.5	N
D253	Residential	B	67	70.5	70.9	0.4	Y
D254	Residential	B	67	66.7	67.1	0.4	Y
D255	Residential	B	67	69.9	70.3	0.4	Y
Offices	Commercial	E	72	69.2	69.3	0.1	N
Offices 2	Commercial	E	72	61.4	61.1	-0.3	N
Offices 3	Commercial	E	72	65.2	65.0	-0.2	N
Offices 4	Commercial	E	72	65.5	65.5	0.0	N
Balcony 1	Commercial	E	72	65.7	65.9	0.2	N
Balcony 2	Commercial	E	72	63.1	63.2	0.1	N
Restaurant Ent.	Commercial	E	72	60.1	60.2	0.1	N
M1	Residential	B	67	65.9	66.8	0.9	Y
M2	Residential	B	67	62.6	63.4	0.8	N
M3	Residential	B	67	64.1	64.9	0.8	N
M4	Residential	B	67	63.3	64.1	0.8	N
M5	Residential	B	67	63.4	63.8	0.4	N
M6	Residential	B	67	63.0	63.6	0.6	N
M7	Residential	B	67	64.3	65.3	1.0	N
M8	Residential	B	67	63.0	64.0	1.0	N
M9	Residential	B	67	63.0	63.5	0.5	N
M10	Residential	B	67	61.6	62.1	0.5	N

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Appendix C
Highway Noise Abatement Analysis – Benefiting Units Table

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Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
A1	Residential	B	67	79.2	67.1	12.1	Y
A2	Residential	B	67	79.0	66.0	13.0	Y
A3	Residential	B	67	46.8	46.3	0.5	N
A4	Residential	B	67	54.1	47.8	6.3	Y
A5	Residential	B	67	69.2	56.2	13.0	Y
A6	Residential	B	67	69.7	56.0	13.7	Y
A7	Residential	B	67	58.2	58.2	0.0	N
A8	Residential	B	67	59.3	59.3	0.0	N
A9	Residential	B	67	76.9	60.9	16.0	Y
A10	Residential	B	67	76.7	60.7	16.0	Y
Picnic Table	Outdoor Use	C	67	78.6	61.6	17	Y
A11	Residential	B	67	46.7	45.8	0.9	N
A12	Residential	B	67	49.3	49.0	0.3	N
A13	Residential	B	67	66.0	58.7	7.3	Y
A14	Residential	B	67	63.4	58.9	4.5	N
A15	Residential	B	67	55.4	55.4	0.0	N
A16	Residential	B	67	55.6	55.6	0.0	N
A17	Residential	B	67	75.5	58.7	16.8	Y
A18	Residential	B	67	74.6	57.6	17.0	Y
A19	Residential	B	67	68.5	53.2	15.3	Y
A20	Residential	B	67	67.4	52.0	15.4	Y
A21	Residential	B	67	73.6	63.3	10.3	Y
A22	Residential	B	67	72.5	63.2	9.3	Y
A23	Residential	B	67	68.1	62.9	5.2	Y
A24	Residential	B	67	67.6	62.6	5.0	Y
B1	Residential	B	67	74.4	61.9	12.5	Y
B2	Residential	B	67	67.6	59.4	8.2	Y
B3	Residential	B	67	75.9	61.3	14.6	Y
B4	Residential	B	67	66.2	59.1	7.1	Y
B5	Residential	B	67	63.2	57.4	5.8	Y
B6	Residential	B	67	62.4	56.4	6.0	Y
B7	Residential	B	67	61.9	56.2	5.7	Y
B8	Residential	B	67	63.0	56.9	6.1	Y
B9	Residential	B	67	65.3	58.4	6.9	Y
B10	Residential	B	67	66.9	59.3	7.6	Y
B11	Residential	B	67	69.4	59.9	9.5	Y
B12	Residential	B	67	60.4	55.5	4.9	N
B13	Residential	B	67	61.4	57.8	3.6	N
B14	Residential	B	67	61.4	55.8	5.6	Y
B15	Residential	B	67	60.1	56.5	3.6	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
B16	Residential	B	67	58.8	55.0	3.8	N
B17	Residential	B	67	58.3	55.5	2.8	N
B18	Residential	B	67	56.3	51.6	4.7	N
B19	Residential	B	67	55.9	53.9	2.0	N
B20	Residential	B	67	56.7	55.3	1.4	N
B21	Residential	B	67	57.9	55.3	2.6	N
B22	Residential	B	67	59.3	54.2	5.1	Y
B23	Residential	B	67	61.8	55.3	6.5	Y
B24	Residential	B	67	62.6	56.3	6.3	Y
B25	Residential	B	67	63.0	56.2	6.8	Y
B26	Residential	B	67	63.9	56.9	7.0	Y
B27	Residential	B	67	64.7	57.0	7.7	Y
B28	Residential	B	67	66.0	57.7	8.3	Y
B29	Residential	B	67	62.4	55.8	6.6	Y
B30	Residential	B	67	60.1	55.1	5.0	Y
B31	Residential	B	67	59.6	54.2	5.4	Y
B32	Residential	B	67	59.6	53.9	5.7	Y
B33	Residential	B	67	58.4	52.6	5.8	Y
B34	Residential	B	67	57.7	52.6	5.1	Y
B35	Residential	B	67	57.4	52.8	4.6	N
B36	Residential	B	67	57.0	52.4	4.6	N
B37	Residential	B	67	51.1	46.8	4.3	N
B38	Residential	B	67	55.6	51.3	4.3	N
B39	Residential	B	67	52.4	48.7	3.7	N
B40	Residential	B	67	56.4	52.6	3.8	N
B41	Residential	B	67	57.8	53.3	4.5	N
B42	Residential	B	67	59.7	54.6	5.1	Y
B43	Residential	B	67	60.7	55.9	4.8	N
B44	Residential	B	67	63.5	56.6	6.9	Y
B45	Residential	B	67	65.0	57.5	7.5	Y
B46	Residential	B	67	67.0	58.5	8.5	Y
B47	Residential	B	67	67.6	59.2	8.4	Y
B48	Residential	B	67	53.1	54.5	-1.4	N
B49	Residential	B	67	51.3	46.9	4.4	N
B50	Residential	B	67	50.4	46.4	4.0	N
B51	Residential	B	67	49.8	46.2	3.6	N
B52	Residential	B	67	49.8	45.8	4.0	N
B53	Residential	B	67	49.9	45.5	4.4	N
B54	Residential	B	67	49.9	46.3	3.6	N
B55	Residential	B	67	50.0	46.6	3.4	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
B56	Residential	B	67	49.5	46.3	3.2	N
B57	Residential	B	67	48.4	47.1	1.3	N
B58	Residential	B	67	48.9	45.8	3.1	N
B59	Residential	B	67	49.1	46.2	2.9	N
B60	Residential	B	67	49.1	46.2	2.9	N
B61	Residential	B	67	49.0	46.1	2.9	N
B62	Residential	B	67	48.9	46.2	2.7	N
B63	Residential	B	67	49.2	46.7	2.5	N
B64	Residential	B	67	49.4	47.0	2.4	N
B65	Residential	B	67	50.2	47.3	2.9	N
B66	Residential	B	67	50.0	47.1	2.9	N
B67	Residential	B	67	50.5	47.7	2.8	N
B68	Residential	B	67	51.3	48.6	2.7	N
B69	Residential	B	67	52.4	52.2	0.2	N
B70	Residential	B	67	53.1	49.4	3.7	N
B71	Residential	B	67	53.6	49.3	4.3	N
B72	Residential	B	67	52.9	48.8	4.1	N
B73	Residential	B	67	51.4	47.9	3.5	N
B74	Residential	B	67	50.5	48.3	2.2	N
B75	Residential	B	67	51.9	48.4	3.5	N
B76	Residential	B	67	50.9	47.0	3.9	N
B77	Residential	B	67	50.6	46.9	3.7	N
B78	Residential	B	67	50.2	46.9	3.3	N
B79	Residential	B	67	51.9	48.5	3.4	N
B80	Residential	B	67	51.6	48.3	3.3	N
B81	Residential	B	67	52.2	48.3	3.9	N
B82	Residential	B	67	51.9	48.1	3.8	N
B83	Residential	B	67	51.4	47.8	3.6	N
B84	Residential	B	67	50.3	47.1	3.2	N
B85	Residential	B	67	49.9	46.6	3.3	N
B86	Residential	B	67	49.7	46.2	3.5	N
B87	Residential	B	67	49.4	46.0	3.4	N
B88	Residential	B	67	49.0	45.9	3.1	N
B89	Residential	B	67	49.0	45.7	3.3	N
B90	Residential	B	67	48.0	46.4	1.6	N
B91	Residential	B	67	52.2	47.6	4.6	N
B92	Residential	B	67	53.1	48.2	4.9	N
B93	Residential	B	67	55.3	50.0	5.3	Y
B94	Residential	B	67	56.4	51.1	5.3	Y
B95	Residential	B	67	52.5	50.8	1.7	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
B96	Residential	B	67	51.8	51.2	0.6	N
B97	Residential	B	67	54.5	52.2	2.3	N
B98	Residential	B	67	57.7	53.9	3.8	N
B99	Residential	B	67	58.9	55.4	3.5	N
B100	Residential	B	67	60.9	56.8	4.1	N
B101	Residential	B	67	63.4	58.2	5.2	Y
B102	Residential	B	67	54.3	51.0	3.3	N
B103	Residential	B	67	54.5	51.1	3.4	N
B104	Residential	B	67	55.5	52.1	3.4	N
B105	Residential	B	67	56.7	52.8	3.9	N
B106	Residential	B	67	57.2	53.5	3.7	N
B107	Residential	B	67	57.5	54.0	3.5	N
B108	Residential	B	67	57.8	54.3	3.5	N
B109	Residential	B	67	58.0	54.6	3.4	N
B110	Residential	B	67	60.0	55.5	4.5	N
B111	Residential	B	67	61.2	57.0	4.2	N
B112	Residential	B	67	62.7	58.2	4.5	N
B113	Residential	B	67	64.4	59.1	5.3	Y
B114	Residential	B	67	66.2	59.9	6.3	Y
B115	Residential	B	67	54.9	51.2	3.7	N
B116	Residential	B	67	55.7	51.9	3.8	N
B117	Residential	B	67	56.8	53.0	3.8	N
B118	Residential	B	67	57.5	54.1	3.4	N
B119	Residential	B	67	58.2	55.0	3.2	N
B120	Residential	B	67	59.5	56.2	3.3	N
B121	Residential	B	67	61.1	57.4	3.7	N
B122	Residential	B	67	62.9	58.6	4.3	N
B123	Residential	B	67	64.9	59.8	5.1	Y
B124	Residential	B	67	68.5	61.4	7.1	Y
B125	Residential	B	67	72.3	62.6	9.7	Y
B126	Residential	B	67	50.0	47.1	2.9	N
B127	Residential	B	67	50.3	47.8	2.5	N
B128	Residential	B	67	50.1	48.2	1.9	N
B129	Residential	B	67	49.3	48.0	1.3	N
B130	Residential	B	67	50.1	48.4	1.7	N
B131	Residential	B	67	50.2	48.5	1.7	N
B132	Residential	B	67	50.3	48.6	1.7	N
B133	Residential	B	67	50.7	48.9	1.8	N
B134	Residential	B	67	51.0	48.8	2.2	N
B135	Residential	B	67	51.3	49.0	2.3	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
B136	Residential	B	67	51.4	49.3	2.1	N
B137	Residential	B	67	52.2	48.1	4.1	N
B138	Residential	B	67	53.0	48.7	4.3	N
B139	Residential	B	67	53.6	49.6	4.0	N
B140	Residential	B	67	54.0	50.1	3.9	N
B141	Residential	B	67	53.6	50.5	3.1	N
C1	Residential	B	67	60.0	56.4	3.6	N
C2	Residential	B	67	63.5	57.0	6.5	Y
C3	Residential	B	67	64.8	57.9	6.9	Y
C4	Residential	B	67	66.4	58.8	7.6	Y
C5	Residential	B	67	68.4	59.4	9.0	Y
C6	Residential	B	67	71.7	59.7	12.0	Y
Basketball court	Outdoor Use	C	67	66.7	59.1	7.6	Y
Ball field	Outdoor Use	C	67	62.4	58.3	4.1	N
Non-profit garden	Outdoor Use	C	67	60.1	56.4	3.7	N
C7	Residential	B	67	60.7	56.4	4.3	N
C8	Residential	B	67	58.9	55.7	3.2	N
C9	Residential	B	67	54.2	51.9	2.3	N
C10	Residential	B	67	52.4	49.8	2.6	N
C11	Residential	B	67	56.1	50.5	5.6	Y
C12	Residential	B	67	43.4	43.7	-0.3	N
C13	Residential	B	67	44.5	44.7	-0.2	N
C14	Residential	B	67	43.2	43.6	-0.4	N
C15	Residential	B	67	43.2	43.5	-0.3	N
C16	Residential	B	67	46.8	45.0	1.8	N
C17	Residential	B	67	59.3	51.4	7.9	Y
C18	Residential	B	67	53.9	49.4	4.5	N
C19	Residential	B	67	53.3	49.8	3.5	N
C20	Residential	B	67	56.5	52.3	4.2	N
C21	Residential	B	67	58.4	53.1	5.3	Y
C22	Residential	B	67	58.2	53.2	5.0	Y
C23	Residential	B	67	55.2	51.1	4.1	N
C24	Residential	B	67	54.1	51.6	2.5	N
C25	Residential	B	67	57.7	53.4	4.3	N
C26	Residential	B	67	56.7	50.6	6.1	Y
C27	Residential	B	67	56.6	51.0	5.6	Y
C28	Residential	B	67	58.9	55.4	3.5	N
C29	Residential	B	67	58.1	55.7	2.4	N
Pool	Outdoor Use	C	67	52.6	50.4	2.2	N
Pool	Outdoor Use	C	67	52.0	49.5	2.5	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
Active garden	Outdoor Use	C	67	51.3	48.7	2.6	N
C30	Residential	B	67	72.3	61.9	10.4	Y
Playground	Outdoor Use	C	67	61.2	57.4	3.8	N
C31	Residential	B	67	58.9	55.6	3.3	N
C32	Residential	B	67	58.5	55.1	3.4	N
C33	Residential	B	67	58.0	54.6	3.4	N
C34	Residential	B	67	58.3	55.1	3.2	N
C35	Residential	B	67	57.8	54.5	3.3	N
C36	Residential	B	67	57.2	53.8	3.4	N
C37	Residential	B	67	39.5	39.9	-0.4	N
C38	Residential	B	67	38.9	39.3	-0.4	N
C39	Residential	B	67	41.0	41.9	-0.9	N
C40	Residential	B	67	41.1	41.9	-0.8	N
C41	Residential	B	67	48.9	47.5	1.4	N
C42	Residential	B	67	50.8	48.8	2.0	N
C43	Residential	B	67	46.2	46.7	-0.5	N
C44	Residential	B	67	46.9	46.8	0.1	N
C45	Residential	B	67	60.8	54.8	6.0	Y
C46	Residential	B	67	60.3	54.5	5.8	Y
C47	Residential	B	67	55.4	50.8	4.6	N
C48	Residential	B	67	50.3	48.7	1.6	N
C49	Residential	B	67	50.2	48.0	2.2	N
C50	Residential	B	67	53.8	50.6	3.2	N
C51	Residential	B	67	47.9	46.8	1.1	N
C52	Residential	B	67	53.2	50.5	2.7	N
C53	Residential	B	67	56.1	52.8	3.3	N
C54	Residential	B	67	55.8	52.3	3.5	N
C55	Residential	B	67	55.5	51.5	4.0	N
C56	Residential	B	67	56.1	52.0	4.1	N
C57	Residential	B	67	56.8	54.6	2.2	N
C58	Residential	B	67	54.7	51.1	3.6	N
C59	Residential	B	67	55.7	52.2	3.5	N
C60	Residential	B	67	54.7	51.3	3.4	N
C61	Residential	B	67	53.1	50.0	3.1	N
C62	Residential	B	67	52.4	49.5	2.9	N
C63	Residential	B	67	53.4	50.6	2.8	N
C64	Residential	B	67	51.5	49.4	2.1	N
C65	Residential	B	67	51.6	49.4	2.2	N
C66	Residential	B	67	51.6	49.5	2.1	N
C67	Residential	B	67	52.4	49.5	2.9	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
C68	Residential	B	67	52.1	49.5	2.6	N
C69	Residential	B	67	50.9	48.2	2.7	N
C70	Residential	B	67	50.3	48.1	2.2	N
C71	Residential	B	67	48.2	47.3	0.9	N
C72	Residential	B	67	48.0	47.0	1.0	N
C73	Residential	B	67	49.0	47.3	1.7	N
C74	Residential	B	67	48.3	47.4	0.9	N
C75	Residential	B	67	49.4	47.0	2.4	N
C76	Residential	B	67	51.9	49.0	2.9	N
D1	Residential	B	67	64.4	57.1	7.3	Y
D2	Residential	B	67	68.9	62.3	6.6	Y
D3	Residential	B	67	71.4	61.3	10.1	Y
D4	Residential	B	67	74.5	67.2	7.3	Y
D5	Residential	B	67	70.7	60.8	9.9	Y
D6	Residential	B	67	72.8	64.8	8.0	Y
D7	Residential	B	67	60.0	53.8	6.2	Y
D8	Residential	B	67	63.4	55.5	7.9	Y
D9	Residential	B	67	59.6	52.7	6.9	Y
D10	Residential	B	67	66.1	57.0	9.1	Y
D11	Residential	B	67	69.6	59.9	9.7	Y
D12	Residential	B	67	74.0	64.8	9.2	Y
D13	Residential	B	67	69.0	59.5	9.5	Y
D14	Residential	B	67	71.5	61.4	10.1	Y
D15	Residential	B	67	45.4	44.9	0.5	N
D16	Residential	B	67	48.4	48.7	-0.3	N
D17	Residential	B	67	57.8	53.8	4.0	N
D18	Residential	B	67	64.8	55.9	8.9	Y
D19	Residential	B	67	70.0	60.4	9.6	Y
D20	Residential	B	67	74.0	65.7	8.3	Y
D21	Residential	B	67	70.0	60.2	9.8	Y
D22	Residential	B	67	72.1	63.1	9.0	Y
D23	Residential	B	67	55.1	49.1	6.0	Y
D24	Residential	B	67	57.7	51.1	6.6	Y
D25	Residential	B	67	57.6	51.4	6.2	Y
D26	Residential	B	67	64.1	57.2	6.9	Y
D27	Residential	B	67	70.1	60.4	9.7	Y
D28	Residential	B	67	73.9	66.0	7.9	Y
D29	Residential	B	67	70.3	60.3	10.0	Y
D30	Residential	B	67	72.3	63.8	8.5	Y
D31	Residential	B	67	57.8	51.4	6.4	Y

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
D32	Residential	B	67	60.9	53.1	7.8	Y
D33	Residential	B	67	52.0	49.6	2.4	N
D34	Residential	B	67	59.9	52.5	7.4	Y
D35	Residential	B	67	58.7	52.4	6.3	Y
D36	Residential	B	67	63.7	54.1	9.6	Y
D37	Residential	B	67	58.9	52.1	6.8	Y
D38	Residential	B	67	64.1	55.1	9.0	Y
D39	Residential	B	67	54.4	50.2	4.2	N
D40	Residential	B	67	59.3	52.2	7.1	Y
D41	Residential	B	67	46.1	46.9	-0.8	N
D42	Residential	B	67	55.7	51.6	4.1	N
D43	Residential	B	67	55.9	51.7	4.2	N
D44	Residential	B	67	62.2	54.5	7.7	Y
D45	Residential	B	67	56.1	51.8	4.3	N
D46	Residential	B	67	62.0	54.1	7.9	Y
D47	Residential	B	67	51.5	49.6	1.9	N
D48	Residential	B	67	54.9	51.8	3.1	N
D49	Residential	B	67	44.4	45.4	-1.0	N
D50	Residential	B	67	47.2	47.8	-0.6	N
D51	Residential	B	67	52.3	49.2	3.1	N
D52	Residential	B	67	57.4	51.9	5.5	Y
D53	Residential	B	67	55.5	52.6	2.9	N
D54	Residential	B	67	60.5	55.3	5.2	Y
D55	Residential	B	67	49.4	47.9	1.5	N
D56	Residential	B	67	51.9	50.1	1.8	N
D57	Residential	B	67	44.0	44.9	-0.9	N
D58	Residential	B	67	46.2	46.5	-0.3	N
D59	Residential	B	67	50.4	47.9	2.5	N
D60	Residential	B	67	55.4	51.4	4.0	N
D61	Residential	B	67	51.9	49.0	2.9	N
D62	Residential	B	67	56.7	51.4	5.3	Y
D63	Residential	B	67	45.0	45.2	-0.2	N
D64	Residential	B	67	47.2	47.2	0.0	N
D65	Residential	B	67	43.9	45.4	-1.5	N
D66	Residential	B	67	44.5	44.8	-0.3	N
D67	Residential	B	67	48.3	46.5	1.8	N
D68	Residential	B	67	51.4	48.9	2.5	N
D69	Residential	B	67	48.8	46.8	2.0	N
D70	Residential	B	67	54.7	50.6	4.1	N
D71	Residential	B	67	44.8	44.9	-0.1	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
D72	Residential	B	67	47.7	48.0	-0.3	N
D73	Residential	B	67	42.7	43.6	-0.9	N
D74	Residential	B	67	43.1	42.2	0.9	N
D75	Residential	B	67	48.5	46.6	1.9	N
D76	Residential	B	67	39.6	40.7	-1.1	N
D77	Residential	B	67	46.3	46.8	-0.5	N
D78	Residential	B	67	42.7	43.1	-0.4	N
D79	Residential	B	67	45.1	45.7	-0.6	N
D80	Residential	B	67	43.9	44.7	-0.8	N
D81	Residential	B	67	42.8	43.3	-0.5	N
D82	Residential	B	67	42.7	43.8	-1.1	N
D83	Residential	B	67	44.9	45.5	-0.6	N
D84	Residential	B	67	42.3	43.4	-1.1	N
D85	Residential	B	67	46.9	47.1	-0.2	N
D86	Residential	B	67	46.4	46.6	-0.2	N
D87	Residential	B	67	48.2	48.5	-0.3	N
D88	Residential	B	67	41.6	42.2	-0.6	N
D89	Residential	B	67	42.7	43.8	-1.1	N
D90	Residential	B	67	42.4	43.9	-1.5	N
D91	Residential	B	67	47.7	49.1	-1.4	N
D92	Residential	B	67	46.6	46.0	0.6	N
D93	Residential	B	67	50.9	49.0	1.9	N
D94	Residential	B	67	47.7	46.1	1.6	N
D95	Residential	B	67	52.3	50.0	2.3	N
D96	Residential	B	67	41.4	42.2	-0.8	N
D97	Residential	B	67	45.2	46.0	-0.8	N
D98	Residential	B	67	46.4	46.6	-0.2	N
D99	Residential	B	67	47.5	47.6	-0.1	N
D100	Residential	B	67	45.0	45.4	-0.4	N
D101	Residential	B	67	48.7	47.4	1.3	N
D102	Residential	B	67	47.1	46.6	0.5	N
D103	Residential	B	67	50.2	48.8	1.4	N
D104	Residential	B	67	43.9	43.9	0.0	N
D105	Residential	B	67	44.7	45.3	-0.6	N
D106	Residential	B	67	45.4	46.2	-0.8	N
D107	Residential	B	67	50.6	51.4	-0.8	N
D108	Residential	B	67	48.2	47.3	0.9	N
D109	Residential	B	67	51.8	49.2	2.6	N
D110	Residential	B	67	48.5	47.1	1.4	N
D111	Residential	B	67	52.6	49.6	3.0	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
D112	Residential	B	67	42.8	43.4	-0.6	N
D113	Residential	B	67	45.6	45.6	0.0	N
D114	Residential	B	67	45.8	46.4	-0.6	N
D115	Residential	B	67	48.2	48.4	-0.2	N
D116	Residential	B	67	53.0	50.2	2.8	N
D117	Residential	B	67	50.1	49.9	0.2	N
D118	Residential	B	67	48.7	47.4	1.3	N
D119	Residential	B	67	53.3	49.9	3.4	N
D120	Residential	B	67	43.4	43.8	-0.4	N
D121	Residential	B	67	45.7	46.1	-0.4	N
D122	Residential	B	67	45.9	47.2	-1.3	N
D123	Residential	B	67	49.6	49.9	-0.3	N
D124	Residential	B	67	57.0	52.6	4.4	N
D125	Residential	B	67	62.0	54.1	7.9	Y
D126	Residential	B	67	56.6	51.3	5.3	Y
D127	Residential	B	67	59.7	51.3	8.4	Y
D128	Residential	B	67	43.7	44.2	-0.5	N
D129	Residential	B	67	46.8	47.1	-0.3	N
D130	Residential	B	67	44.5	44.8	-0.3	N
D131	Residential	B	67	47.6	47.9	-0.3	N
D132	Residential	B	67	61.0	54.9	6.1	Y
D133	Residential	B	67	67.2	57.8	9.4	Y
D134	Residential	B	67	59.5	53.2	6.3	Y
D135	Residential	B	67	64.3	55.0	9.3	Y
D136	Residential	B	67	44.4	45.4	-1.0	N
D137	Residential	B	67	47.0	47.8	-0.8	N
D138	Residential	B	67	52.0	48.1	3.9	N
D139	Residential	B	67	54.6	49.9	4.7	N
D140	Residential	B	67	54.0	50.1	3.9	N
D141	Residential	B	67	61.4	54.4	6.9	Y
D142	Residential	B	67	63.5	56.9	6.6	Y
D143	Residential	B	67	69.0	60.0	9.0	Y
D144	Residential	B	67	62.4	55.9	6.5	Y
D145	Residential	B	67	67.5	57.9	9.7	Y
D146	Residential	B	67	72.3	60.3	12.0	Y
D147	Residential	B	67	74.3	67.1	7.2	Y
D148	Residential	B	67	75.1	62.2	12.9	Y
D149	Residential	B	67	75.8	69.0	6.8	Y
D150	Residential	B	67	69.0	58.7	10.3	Y
D151	Residential	B	67	69.9	61.6	8.3	Y

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
D152	Residential	B	67	58.5	52.4	6.1	Y
D153	Residential	B	67	64.0	57.7	6.3	Y
D154	Residential	B	67	68.1	57.2	10.9	Y
D155	Residential	B	67	71.6	62.2	9.4	Y
D156	Residential	B	67	74.7	61.9	12.8	Y
D157	Residential	B	67	76.2	69.5	6.7	Y
D158	Residential	B	67	71.6	60.5	11.1	Y
D159	Residential	B	67	72.3	65.6	6.7	Y
D160	Residential	B	67	52.3	50.2	2.1	N
D161	Residential	B	67	54.0	54.1	-0.1	N
D162	Residential	B	67	61.0	56.6	4.4	N
D163	Residential	B	67	64.3	60.6	3.7	N
D164	Residential	B	67	44.4	44.9	-0.5	N
D165	Residential	B	67	47.8	47.8	0.0	N
D166	Residential	B	67	67.6	57.7	9.9	Y
D167	Residential	B	67	72.2	61.6	10.6	Y
D168	Residential	B	67	66.7	56.9	9.8	Y
D169	Residential	B	67	69.5	62.0	7.5	Y
D170	Residential	B	67	57.5	53.1	-0.6	N
D171	Residential	B	67	64.9	58.4	6.5	Y
D172	Residential	B	67	59.7	56.6	3.1	N
D173	Residential	B	67	64.5	60.2	4.3	N
D174	Residential	B	67	55.5	54.0	1.5	N
D175	Residential	B	67	59.0	57.6	1.4	N
D176	Residential	B	67	52.0	54.3	-2.3	N
D177	Residential	B	67	46.8	51.2	-4.4	N
D178	Residential	B	67	44.8	45.1	-0.3	N
D179	Residential	B	67	53.2	49.9	3.3	N
D180	Residential	B	67	57.2	55.2	2.0	N
D181	Residential	B	67	62.2	59.2	3.0	N
D182	Residential	B	67	56.2	54.5	1.7	N
D183	Residential	B	67	60.0	58.2	1.8	N
D184	Residential	B	67	39.6	41.6	-2.0	N
D185	Residential	B	67	44.2	44.7	-0.5	N
D186	Residential	B	67	53.9	52.7	1.2	N
D187	Residential	B	67	59.3	57.6	1.7	N
D188	Residential	B	67	51.5	51.0	0.5	N
D189	Residential	B	67	54.2	54.6	-0.4	N
D190	Residential	B	67	40.8	43.6	-2.8	N
D191	Residential	B	67	44.8	45.4	-0.6	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
D192	Residential	B	67	49.8	47.6	2.2	N
D193	Residential	B	67	52.7	49.1	3.6	N
D194	Residential	B	67	52.0	49.9	2.1	N
D195	Residential	B	67	57.1	55.6	1.5	N
D196	Residential	B	67	54.0	51.3	2.7	N
D197	Residential	B	67	57.2	55.6	1.6	N
D198	Residential	B	67	46.6	45.8	0.8	N
D199	Residential	B	67	46.9	47.8	-0.9	N
D200	Residential	B	67	43.7	45.7	-2.0	N
D201	Residential	B	67	46.5	49.9	-3.4	N
D202	Residential	B	67	53.0	50.7	2.3	N
D203	Residential	B	67	56.8	55.3	1.5	N
D204	Residential	B	67	51.4	49.9	1.5	N
D205	Residential	B	67	54.9	54.1	0.8	N
D206	Residential	B	67	33.9	37.1	-3.2	N
D207	Residential	B	67	41.3	41.6	-0.3	N
D208	Residential	B	67	44.1	43.0	1.1	N
D209	Residential	B	67	54.1	51.9	2.2	N
D210	Residential	B	67	44.4	44.7	-0.3	N
D211	Residential	B	67	48.5	47.6	0.9	N
D212	Residential	B	67	39.0	42.5	-3.5	N
D213	Residential	B	67	40.1	41.1	-1.0	N
D214	Residential	B	67	46.5	45.2	1.3	N
D215	Residential	B	67	50.2	47.2	3.0	N
D216	Residential	B	67	46.6	44.7	1.9	N
D217	Residential	B	67	48.5	48.5	0.0	N
D218	Residential	B	67	49.7	48.3	1.4	N
D219	Residential	B	67	53.0	52.6	0.4	N
D220	Residential	B	67	51.0	49.6	1.4	N
D221	Residential	B	67	54.9	54.0	0.9	N
D222	Residential	B	67	46.5	45.3	1.2	N
D223	Residential	B	67	45.5	46.3	-0.8	N
D224	Residential	B	67	43.0	45.1	-2.1	N
D225	Residential	B	67	47.4	52.0	-4.6	N
D226	Residential	B	67	44.2	45.1	-0.9	N
D227	Residential	B	67	49.1	47.3	1.8	N
D228	Residential	B	67	47.6	47.1	0.5	N
D229	Residential	B	67	51.5	50.3	1.2	N
D230	Residential	B	67	48.2	47.0	1.2	N
D231	Residential	B	67	51.6	47.9	3.7	N

Highway Noise Abatement Analysis – Benefiting Units Table
(Benefiting units are highlighted)

Receiver ID	Land Use	Activity Category	NAC Level	Noise Levels - dB(A) Leq(1h)			
				Future Year	Noise Level w/Barrier	Change with Barrier	Benefiting Unit (Y/N)
D232	Residential	B	67	42.5	42.6	-0.1	N
D233	Residential	B	67	41.6	42.8	-1.2	N
D234	Residential	B	67	46.9	46.8	0.1	N
D235	Residential	B	67	50.3	50.4	-0.1	N
D236	Residential	B	67	43.8	45.3	-1.5	N
D237	Residential	B	67	51.9	48.9	3.0	N
D238	Residential	B	67	54.3	50.3	4.0	N
D239	Residential	B	67	60.3	53.0	7.3	Y
D240	Residential	B	67	54.9	51.2	3.7	N
D241	Residential	B	67	59.5	53.2	6.3	Y
D242	Residential	B	67	57.9	53.0	4.9	N
D243	Residential	B	67	64.4	56.2	8.2	Y
D244	Residential	B	67	59.2	55.9	3.3	N
D245	Residential	B	67	64.0	59.4	4.6	N
D246	Residential	B	67	54.4	52.7	1.7	N
D247	Residential	B	67	57.5	55.1	2.4	N
D248	Residential	B	67	50.8	48.5	2.3	N
D249	Residential	B	67	59.5	51.4	8.1	Y
D250	Residential	B	67	57.8	52.4	5.4	Y
D251	Residential	B	67	64.9	56.1	8.8	Y
D252	Residential	B	67	65.0	56.5	8.5	Y
D253	Residential	B	67	70.9	61.1	9.8	Y
D254	Residential	B	67	67.1	57.7	9.4	Y
D255	Residential	B	67	70.3	60.0	10.3	Y
Offices 1	Commercial	E	72	69.3	62.6	6.7	Y
Offices 2	Commercial	E	72	61.1	59.1	2.0	N
Offices 3	Commercial	E	72	65.0	60.7	4.3	N
Offices 4	Commercial	E	72	65.5	61.4	4.1	N
Balcony 1	Commercial	E	72	65.9	61.7	4.2	N
Balcony 2	Commercial	E	72	63.2	60.1	3.1	N
Restaurant Ent.	Commercial	E	72	60.2	56.1	4.1	N