APPENDIX E

Noise Discipline Report

Seldon Road Extension, Phase II Project - CFHWY00562

Noise Discipline Report

October 2022

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EXECUTIVE SUMMARY

This Noise Discipline Report for the Seldon Road Extension, Phase II Project was prepared for the State of Alaska Department of Transportation and Public Facilities. This project would extend Seldon Road with a 2.25-mile two-lane arterial roadway. The purpose of this report is to provide a traffic noise impact and abatement analysis meeting the requirements of the Federal Highway Administration (FHWA) and the Alaska Department of Transportation and Public Facilities (DOT&PF) and in accordance with DOT&PF *2018 Noise Policy* (2018 DOT&PF Policy).

As part of this study, on-site inspection and noise monitoring was performed, with measured noise levels ranging from 44.9 to 58.6 dBA Leq. These measured noise levels, and traffic counts taken at the time of the measurements, were used to validate the *Traffic Noise Model* (TNM) from the FHWA. Using traffic volumes from project traffic engineers, and TNM, noise levels were modeled at 65 independent locations to determine the potential overall noise effects of the project and identify project impacts. Modeled noise levels for the existing conditions ranged from 36 to 56 dBA Leq during the PM peak hour. Under the No-Build conditions, noise levels ranged from 38 to 57 dBA, with variations of 0 to +2 dB when compared to the existing conditions.

Modeled noise levels under the Build alternative range from 45 to 60 dBA Leq, with variations of 0 to +13 dB over the existing noise levels. No sensitive uses are predicted to meet the DOT&PF NAC criteria of 66 dBA or more, nor the substantial increase of +15 dB, therefore no noise abatement was considered.

Information for local governments and agencies to aid in future development is provided in Section 11. In general, residential development within 68 feet on the northside and 78 feet on the southside of the proposed Seldon Road extension would likely have noise levels above the DOT&PF criteria of 66 dBA Leq during peak traffic noise hour. Per DOT&PF policy, sites were also modeled for 64 dBA Leq at 94 feet on the northside and 101 feet on the southside, and 60 dBA Leq at 174 feet on the northside and 188 feet on the southside. Since the northside of the roadway (westbound traffic) has slightly higher traffic volumes, the distance to the 66 dB criteria is slightly higher to the north of Seldon Road than it is on the southside.

Noise from construction would be similar to other highway construction projects. Maximum noise levels to reach 86 dBA during periods of heavy construction at sites within 100 feet from construction activities. Typical DOT&PF construction noise mitigation measures are included in the construction noise analysis section.

Supporting material, including noise monitoring details and traffic counts, are provided in the appendices.

1. INTRODUCTION

This Noise Discipline Report for the Seldon Road Extension, Phase II Project was prepared for the State of Alaska Department of Transportation and Public Facilities. The purpose of this report is to provide a traffic noise impact and abatement analysis meeting the requirements of the Federal Highway Administration (FHWA) and the Alaska Department of Transportation and Public Facilities (DOT&PF). This noise analysis was performed in accordance with the policy and procedures given in the current DOT&PF *2018 Noise Policy* (2018 DOT&PF Policy). See Appendix A for the full 2018 DOT&PF Policy. If traffic noise impacts are identified, abatement that is found to meet DOT&PF criteria will be reviewed by DOT&PF, Matanuska-Susitna Borough, and affected residents, and could be recommended for inclusion in the project.

2. GENERAL PROJECT DESCRIPTION

The purpose of the proposed project is to continue the roadway connection between Church Road and Pittman Road, the next link in the east-west corridor running from Palmer to Houston. The project will provide an alternate route to the Parks Highway, improve overall traffic circulation in the area, and provide better facilities for pedestrians.

The proposed work includes an extension of Seldon Road with a 2.25-mile two-lane arterial roadway, constructing frontage roads to tie into the existing road network, reconstructing portions of adjacent roads to meet current standards and create new intersections, a new 10-foot-wide separated pedestrian pathway on the south side of the new roadway, and a new trailhead parking area at the new Pittman Road intersection.

Figure 1 provides a general vicinity map of the project corridor. Detailed maps are provided in Figures 2 and 3 and identify the proposed improvements. See Appendix B for more information about the project design.

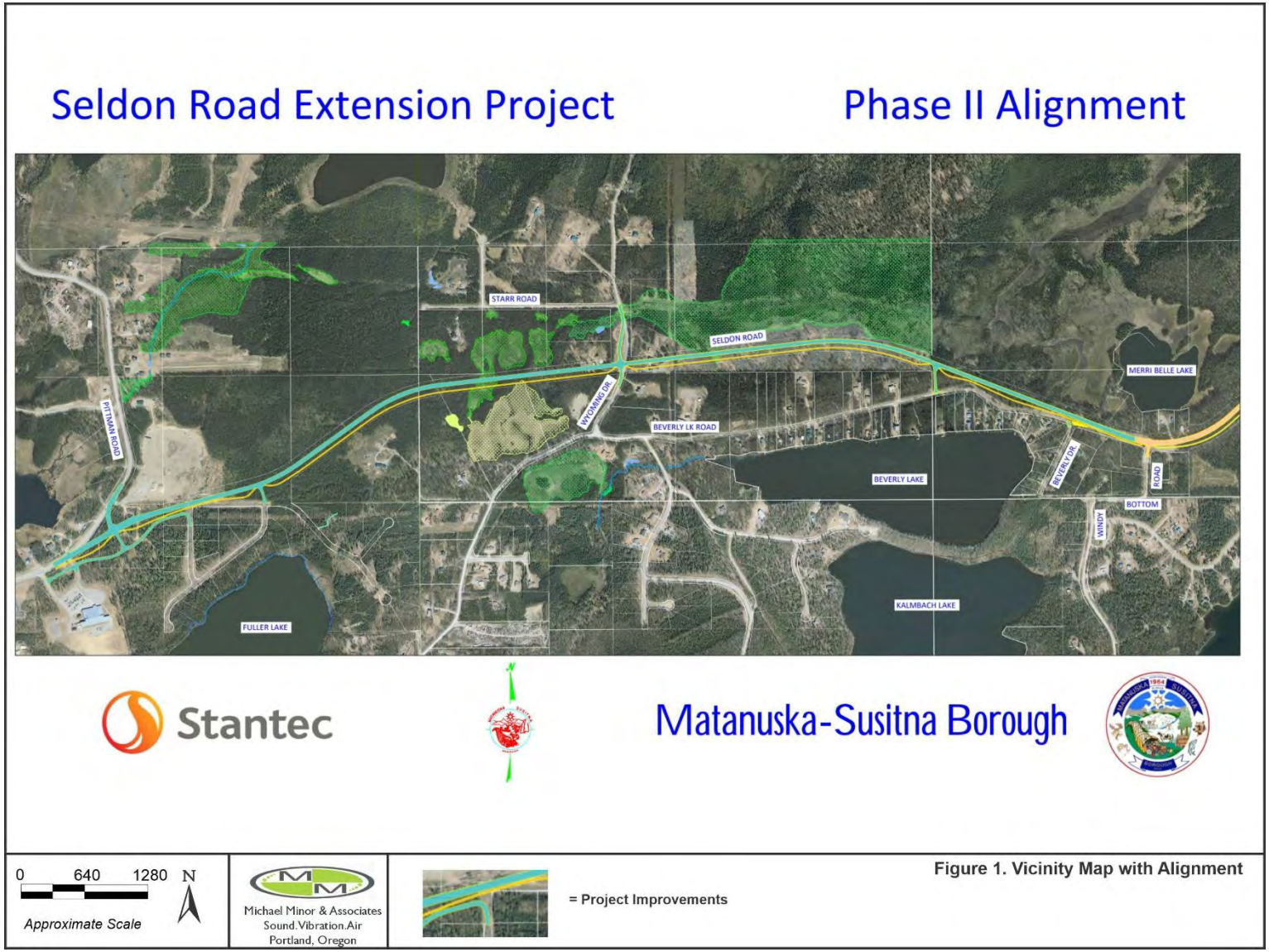


Figure 1. Vicinity Map with Alignment

3. ANALYSIS REQUIREMENT

A Traffic Noise Analysis is required whenever a Type I project is federally funded or requires FHWA approval. A Type I project is a project that includes construction of a new highway or roadway, an increase in the number of traffic lanes, a substantial realignment (horizontal or vertical) of an existing highway, or significant changes to the existing topography around roadways. The proposed project would include a new roadway in a new location, and, therefore, meets the requirements for a detailed noise impact and abatement analysis.

4. METHODOLOGY

This section provides a summary of the methods used for the Traffic Noise Analysis. In general, the methods follow the DOT&PF policy and procedures for a traffic noise study as published in the 2018 DOT&PF Policy. Reference policies, manuals and guides used for this report are provided in Section 13.

4.1. Introduction to Acoustics

Noise is generally defined as unwanted sound. Noise is measured in terms of sound pressure level. It is expressed in decibels (dB), which are defined as 10 log P^2/P^2ref, where P is the root-mean-square (rms) sound pressure and P_{ref} is the reference rms sound pressure of 2 x 10^5 Newtons per square meter.

The number of fluctuation cycles or pressure waves per second of a particular sound is the frequency of the sound. The human ear is less sensitive to higher and lower frequencies than to mid-range frequencies. Therefore, sound level meters used to measure environmental noise generally incorporate a weighing system that filters out higher and lower frequencies in a manner similar to the human ear. This system produces noise measurements that approximate the normal human perception of noise. Measurements made with this weighing system are termed "A-weighted" and are specified as "dBA" readings.

Several noise descriptors are used that take into account the variability of noise over time. The minimum noise level during a measurement period is denoted Lmin. The maximum noise levels (denoted Lmax) that occur during an event, such as the passing of a heavy truck or the flyover of an airplane, can be useful indicators of interference with speech or sleep. The equivalent sound level (Leq) is the level of a constant sound for a specified period of time that has the same sound energy as an actual fluctuating noise over the same period of time. It is an energy average sound level and is the descriptor used for traffic noise studies.

In summary, the noise level descriptors are defined as follows:

Symbol	Description
Leq	The average noise level (energy basis)
Lmin	The minimum noise level
Lmax	The maximum noise level

Noise levels decrease with distance from a noise source. For each doubling of the distance from a point source (such as an engine), noise levels decrease by 6 dBA because of the geometric divergence of the sound waves. Excess noise reduction (attenuation) can be provided by vegetation, terrain, and atmospheric effects that block or absorb noise. The Leq noise level from a line source (such as a road) will decrease by 3 dBA for each doubling of distance (3 dB / DD) because of geometric divergence alone. However, the Lmax from individual vehicles on the road will decrease by 6 dBA / DD. Therefore, the maximum noise levels (Lmax) decrease more rapidly with distance from the road than do the average noise levels (Leq).

It is important to understand how humans perceive noise and changes in noise levels. Subjectively, a 10-dBA change in traffic noise levels is judged by most people to be approximately a twofold change in loudness (e.g., an increase from 50 dBA to 60 dBA causes the loudness to double). A 3-dBA increase in traffic noise is a barely perceptible increase. Therefore, if traffic noise levels increase by 1 to 2 dB, the majority of people may not even notice the change in noise levels.

It is also important to understand the compatibility with land use based on area noise levels. For example, noise levels at night in a quiet rural area are typically between 32 and 35 dBA. Quiet urban nighttime noise levels range from 40 to 50 dBA. Daytime noise levels in a noisy urban area are frequently as high as 70 to 80 dBA.

In summary, areas with PM peak hour traffic noise levels below 50 dBA Leq are typically found in quiet bedroom communities (rural and suburban) that are far from interstate or state highways, major arterial roadways, and urban areas. PM peak hour traffic noise levels from 50 dBA to 60 dBA Leq are typically found in quiet bedroom communities with arterial roadways nearby and primarily passenger traffic accessing the area (little or no truck traffic). Communities with traffic noise levels of 60 dBA to 67 dBA Leq are typically closer to urban areas and / or major arterial roadways, where some truck traffic is present, or near airports.

A more detailed section about acoustics is provided in Appendix C.

4.2. Regulatory Setting and Impact Criteria

The FHWA traffic noise impact criteria, against which the project traffic noise levels are evaluated, are taken from Title 23 of the Code of Federal Regulations (CFR) Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. The FHWA criterion applicable for residences is an exterior hourly equivalent sound level (Leq) that

approaches or exceeds 67 dBA. The exterior criterion for places of worship, schools, recreational uses, and similar areas is also 67 dBA Leq. The criterion applicable for hotels, motels, offices, restaurants / bars, and other developed lands is an exterior Leq that approaches or exceeds 72 dBA. There are no FHWA traffic noise impact criteria for retail facilities, industrial, warehousing, undeveloped lands that are not permitted for development, or construction noise. No traffic noise analysis is required for those uses for which no criteria exist.

DOT&PF considers a predicted sound level of 1 dBA below the NAC as sufficient to satisfy the condition of "approach," or approaching the NAC, required by FHWA for all land use categories. For example, where the NAC is 67 dBA for outdoor use at a residence, a noise level of 66 dBA is considered an impact under DOT&PF policy. Receivers are also considered impacted when the peak hour traffic noise level is predicted to increase 15 dBA ("substantial increase") or more between the Existing and Build conditions. Impacts at places of worship, schools, and recreational areas (Category C properties) also occur at 66 dBA or higher in Alaska. Hotel / motel, office building, and restaurant / bar impacts (Category E properties) occur at 71 dBA or higher. Table 1 summarizes the FHWA and the DOT&PF traffic noise abatement criteria.

Table 1. Noise Abatement Criteria (NAC) by Land Use Category				
Activity Category	Activity Criteria in hourly Leq (dBA)		Evaluation Location	Activity Description
	FHWA NAC	DOT&PF NAC		
A	57	56	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[1]	67	66	Exterior	Residential (single and multi-family units)
C[1]	67	66	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	51	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[1]	72	71	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
Notes: 1. Includes undeveloped lands permitted for this activity category				

The primary FHWA categories applicable to this analysis are Category B and Category C, which includes exterior noise levels at residential land uses, including West Lakes Fire Station, and Meadow Lakes Elementary School. Under FHWA policy, the noise impact criteria are applicable to frequently used exterior areas at residences, for example, a backyard deck or patio.

4.3. Analysis and Modeling Procedures

The methodology used for a Type I traffic noise analysis is defined in the 2018 DOT&PF Policy. A summary of the policy follows.

Projected traffic noise level conditions were calculated using the FHWA Traffic Noise Model (TNM). Noise emission levels used in the model were nationwide averages for automobiles, medium trucks, and heavy trucks provided by the FHWA and built into TNM. Model input included traffic volumes, and vehicle type and speed information. The area was evaluated for noise-reducing effects of first row[1] residences, existing outbuildings, roadway depressions, and topography. Actual roadway width and average pavement type were used for existing and future conditions. The effects of controlled intersections (stop signs) were also included where appropriate. A multi-use path proposed along the south side of the Seldon Road Extension was also included in the model to aid in setting topographic conditions.

Traffic volumes and vehicle class percentages used for the modeled roadways were provided by Stantec traffic engineers. The vehicle class percentages include a breakdown of passenger vehicles and light trucks, medium trucks, and heavy trucks. The traffic data used for the analysis is provided in Appendix E. Vehicle speeds used are the current or proposed posted speeds. The PM peak traffic hour on weekdays has the highest total traffic volumes and, therefore, was used throughout the analysis to ensure the worst-case noise levels were predicted.

Finally, it is important to remember that TNM is just that, a traffic noise model. Therefore, the noise levels predicted by TNM is only for traffic on nearby roadways. If there are no nearby roadways, TNM can predict lower than normal noise levels. Under this condition, the measured noise levels in that area are commonly used to supplement the predicted noise levels from TNM. This is frequently the case when construction of a new roadway is in an area where no existing roadways currently exists. In some areas of Phase II of the Seldon Road Extension, the measured noise levels, discussed later in this report, are used to establish an existing background minimum noise level.

1 For the purpose of this report, "first row" refers to noise sensitive receivers located directly adjacent to the Project roadway.

5. AFFECTED ENVIRONMENT

This section provides a summary of the land use in the project area, including planned and permitted developments and project related structure removal.

5.1. Land Use

Land use in the project area includes single-family dwelling units, commercial uses, West Lakes Fire Station 71, Meadow Lakes Elementary School, and undeveloped lands. The highest concentration of single-family residential land uses are south of Zehnder Road just east of Pittman Road and south of Beverly Lake Road. Land uses in the study area are shown on Figure 2 and Figure 3.

5.2. Planned and Permitted Projects

There are currently no planned or permitted projects that would affect this noise study

5.3. Displacements Due to Project Construction

There are no planned displacements as part of this project that would affect the transmission of noise.

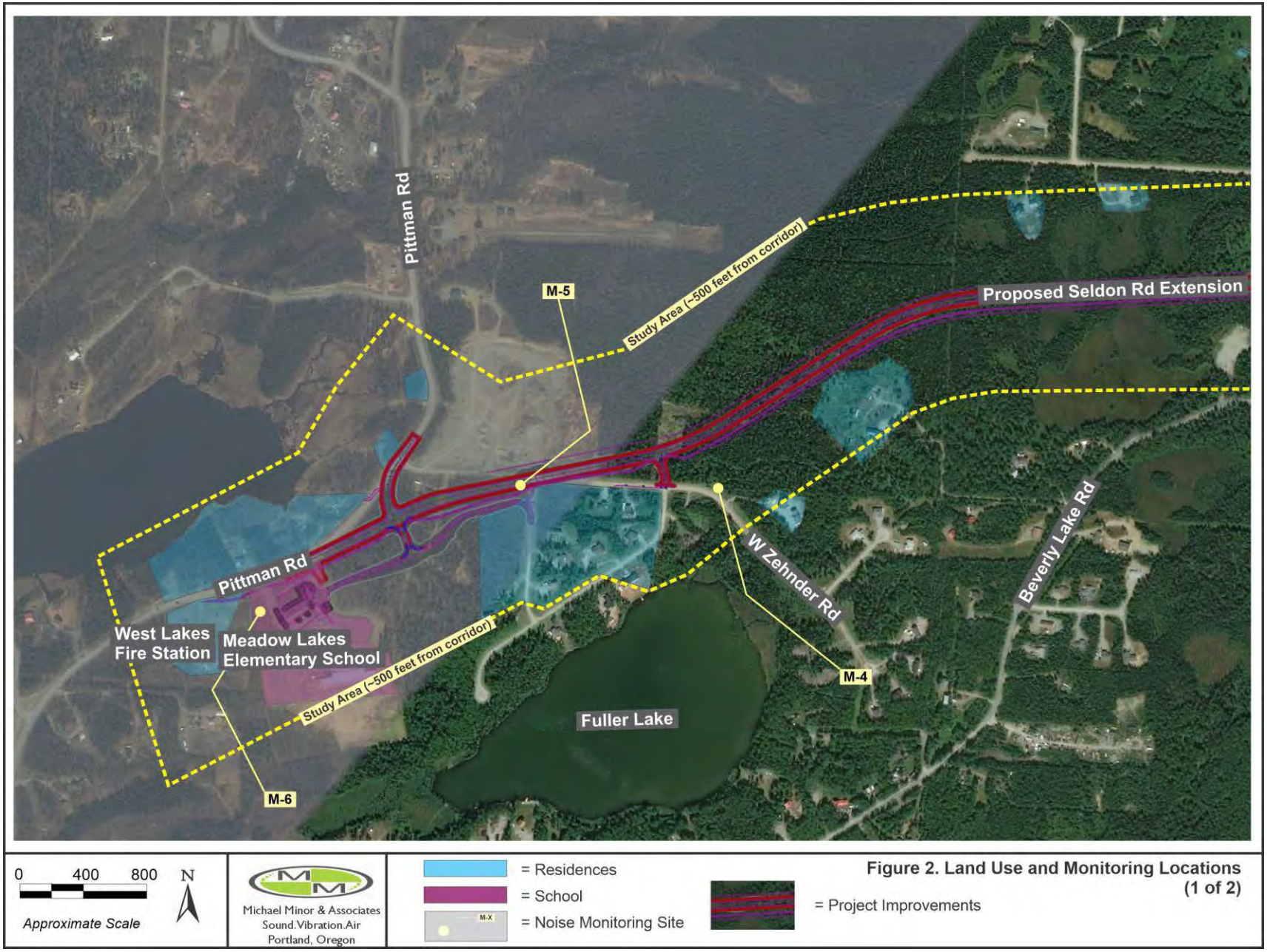


Figure 2. Land Use and Monitoring Locations (1 of 2)

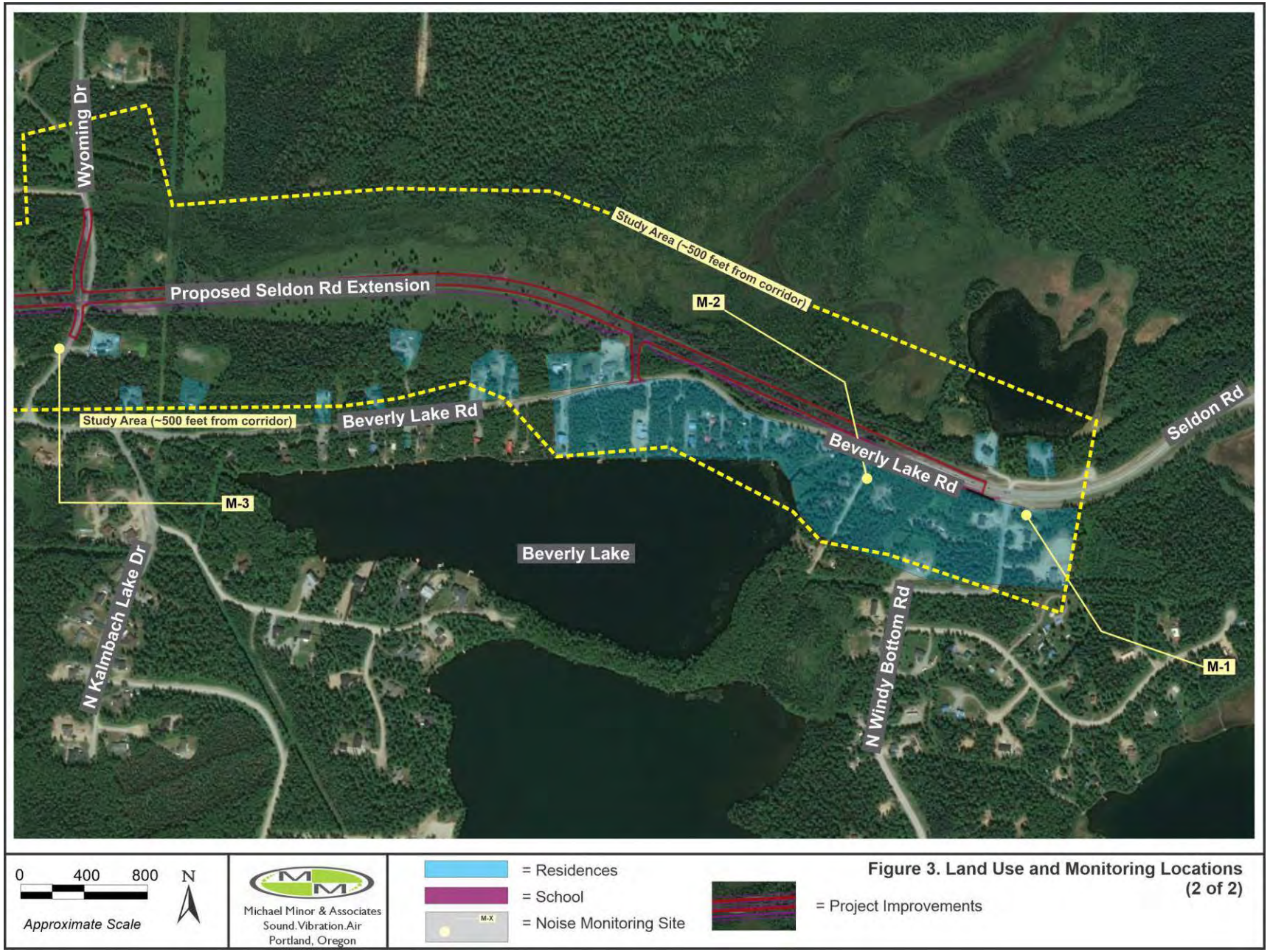


Figure 3. Land Use and Monitoring Locations (2 of 2)

5.4. Noise Monitoring

On-site noise monitoring and traffic counts were performed at six locations and used to verify the noise model as well as provide ambient noise measurements. Figure 2 and Figure 3 provided an overview of the monitoring locations, denoted M-1 through M-6, within the project area. Figures for each noise monitoring sites are included in Appendix D and provide detailed information on each monitoring site, including aerial views, photos showing the exact location of the monitoring site, and traffic counts.

The monitoring for M-1 through M-6 was performed on June 7 and June 8, 2022. Each monitoring site was measured for 30 minutes at approximately the same time each day. Due to the rural area and low traffic volumes the 30-minute measurements were taken instead of the recommended 15-minute measurements by DOT&PF. Noise measurements were taken in accordance with methods provided in the 2018 DOT&PF Policy and in accordance with the American National Standards Institute (ANSI) procedures for community noise measurements (ANSI/ANA S12.9-2013/Part1). The equipment used for noise monitoring were Bruel & Kjaer Type 2238 Sound Level Meters. All meters were calibrated prior to and after the measurement period using a Bruel & Kjaer Type 4231 Sound Level Calibrator. Calibration varied by less than 0.1 dB during the measurement period. Complete system calibration is performed on an annual basis by an accredited instrument calibration laboratory. System calibration is traceable to the National Institute of Standards and Testing (NIST). The system meets or exceeds the requirements for an ANSI Type 1 noise measurement system.

All measurements taken included one-second Leq, Lmax and Lmin. Bruel & Kjaer Type 7820 Evaluation Software was used for data post-processing and calculations of the hour Leq noise levels presented in this report. All data transfer and analysis was performed using a computer interface, preventing any data editing or corruption.

5.5. Measurement Results

The noise monitoring sites were located within the public right-of-way. The measured noise levels on June 7, 2022, ranged from 47.6 to 58.6 dBA Leq and on June 8, 2022, ranged from 44.9 to 57.0 dBA Leq. Traffic on local roads was the primary noise source at most of the monitoring locations.

Table 2 and Table 3 provide summaries of the measured noise levels. A discussion of the measurements for specific areas follows the table.

Table 2. Noise Monitoring Results – June 7, 2022			
Site	**Time**	**Location Description**	**Noise Level[1]**
M-1	8:53-9:23 a.m.	N Windy Bottom Road at Seldon Road	58.6
M-2	9:42-10:12 a.m.	N Beverly Drive at Beverly Lake Road	52.6
M-3	10:26-10:56 a.m.	Wyoming Drive at Beverly Lake Road	57.5
M-4	11:31-12:01 p.m.	W Zehnder Road east of N Monroe Circle	51.9
M-5	12:08-12:38 p.m.	W Zehnder Road at N Fullers Place	57.2
M-6	1:30-1:33 p.m.	Meadow Lakes Elementary School	47.6
Notes: All data is presented as an hourly Leq in short-term measurement of 30 minutes.			

Table 3. Noise Monitoring Results – June 8, 2022			
Site	**Time**	**Location Description**	**Noise Level[1]**
M-1	9:07-9:37 a.m.	N Windy Bottom Road at Seldon Road	57.0
M-2	9:50-10:20 a.m.	N Beverly Drive at Beverly Lake Road	50.0
M-3	10:32-11:02 a.m.	Wyoming Drive at Beverly Lake Road	54.4
M-4	11:18-11:48 a.m.	W Zehnder Road east of N Monroe Circle	46.6
M-5	11:56-12:26 p.m.	W Zehnder Road at N Fullers Place	49.0
M-6	12:37-1:07 p.m.	Meadow Lakes Elementary School	44.9
Notes: 1. All data is presented as an hourly Leq in short-term measurement of 30 minutes.			

As required by ADOT&PF, if measurements at any one site differ by more than 3-dB, justification must be provided. This occurred at sites M-3, M-4 and M-5. The differences are as follows:

- At site M-3 the levels are 3.1 dB higher on June 7 when compared to June 8: Reason for the higher reading on June 7 is due to 5 medium trucks on June 7 and none on June 8.

- At site M-4 the levels are 5.3 dB higher on June 7 when compared to June 8: Reason for the higher levels on June 7 is due to this area being a dirt road with very low traffic, and on June 7 there were 5 vehicles and only two on June 8.

- At site M-5 the levels are 8.2 dB higher on June 7 when compared to June 8: Reason for the higher levels on June 7 is due to this area being a dirt road with very low traffic, and on June 7 there were 5 vehicles and only 2 on June 8 in addition to two plane overflights on June 7 and none on June 8.

6. NOISE MODEL VALIDATION AND RECEIVERS

As previously described, the noise levels used for describing the existing and future conditions are taken from the FHWA TNM. This section describes the noise model validation results and selection of receivers used for modeling noise levels related to the Seldon Road Extension, Phase II Project.

6.1. Noise Model Validation

Traffic noise levels were modeled to assess the agreement of calculated and measured noise levels. For model verification, the actual traffic counts and speeds as observed during the noise monitoring were used as inputs to the model. The noise model was used to predict the traffic noise levels of each of the modeling sites. A comparison of the monitoring locations is provided in Table 4 and Table 5.

Table 4. Measured vs. Modeled Noise Levels, June 7, 2022

Receiver	Measured (dBA)	Modeled (dBA)	Difference (dBA)
M-1	58.6	56.9	-1.7
M-2	52.6	50.4	-2.2
M-3	57.5	58.5	1.0
M-4	51.9	---[1]	---[1]
M-5	57.2	---[1]	---[1]
M-6	47.6	48.5	.09

Notes:

1. Data at M-4 and M-5 is used to determine ambient noise levels where there is little to no traffic. See section 6.2 for a detailed explanation.

Table 5. Measured vs. Modeled Noise Levels, June 8, 2022

Receiver	Measured (dBA)	Modeled (dBA)	Difference (dBA)
M-1	57.0	56.8	-0.2
M-2	50.0	52.9	2.9
M-3	54.4	52.5	-1.9
M-4	46.6	---[1]	---[1]
M-5	49.0	---[1]	---[1]
M-6	44.9	44.7	-0.2

Notes:

1. Data at M-4 and M-5 is used to determine ambient noise levels where there is little to no traffic. See section 6.2 for a detailed explanation.

The modeled and measured noise results at M-1, M-2, M-3, and M-6 agree within +/- 3 dBA. Because a 3 dBA change in noise levels is barely perceptible to a person with average

hearing, the agreement of +/- 3 dBA or less is considered an acceptable deviation for modeled and measured noise levels.

6.2. Ambient Measurements at Sites M-4 and M-5

As previously discussed, TNM only predicts noise from traffic, and in some areas, the traffic volumes are so low, other noise sources, including residential activity, snow machines and all-terrain vehicles, aircraft over-flights, wind, and birds are responsible for the background noise levels. Therefore, the measurements taken at sites M-4 and M-5 are used to establish background noise levels at the residential areas along W Zehnder Road, Beverly Lake Road, and other areas far from roadways in the western part of the project area. In these areas, there is nothing except the very limited local traffic, and therefore, to establish the background noise levels at these residences, measurements were taken on W Zehnder Road near N Monroe Circle and N Fullers Place.

The sound level meter picks up all noise sources in the area and can be a more accurate measurement of the existing background noise level than that produced by the TNM model, which would only include traffic noise on North Pitman Road. M-4 is over 800 feet from North Pitman Road, and M-5 is over 1800 feet from North Pitman Road, both with notable topographical shielding of traffic noise from North Pitman Road. Therefore, the main purpose for the measurements at M-4 and M-5 was to establish a baseline for the existing noise levels to be used if the modeled noise levels were lower than the measured levels. Therefore, the measured noise was used in the existing, future no-build, and future build models when modeled noise levels in the area were less than 47 dBA Leq, the lowest overall measured noise level near residences near W Zehnder Road.

6.3. Selection of Receivers

Noise modeling sites were selected to represent noise-sensitive areas located within the project corridor where traffic noise impacts are most likely to occur. More specifically, the receiver locations were located in areas of frequent outdoor human use such as a front or back yard. Figure 4 through Figure 7 provide aerial views of all project noise modeling locations and project elements. Although some receivers appear to point to an area with no visible structure, there are homes at each of the locations, however, they are too new to show up on the available aerial mapping.

Traffic noise modeling was performed using the FHWA TNM. Existing and future traffic noise levels were predicted throughout the project corridor at 65 locations representing single-family residences, West Lakes Fire Station, and Meadow Lakes Elementary School. In many instances, one receiver location is used to represent a group of two or more neighboring residences expected to experience similar sound levels for both existing and future conditions and have comparable noise reductions if a noise barrier was constructed. Receiver locations are denoted R-1 through R-65.

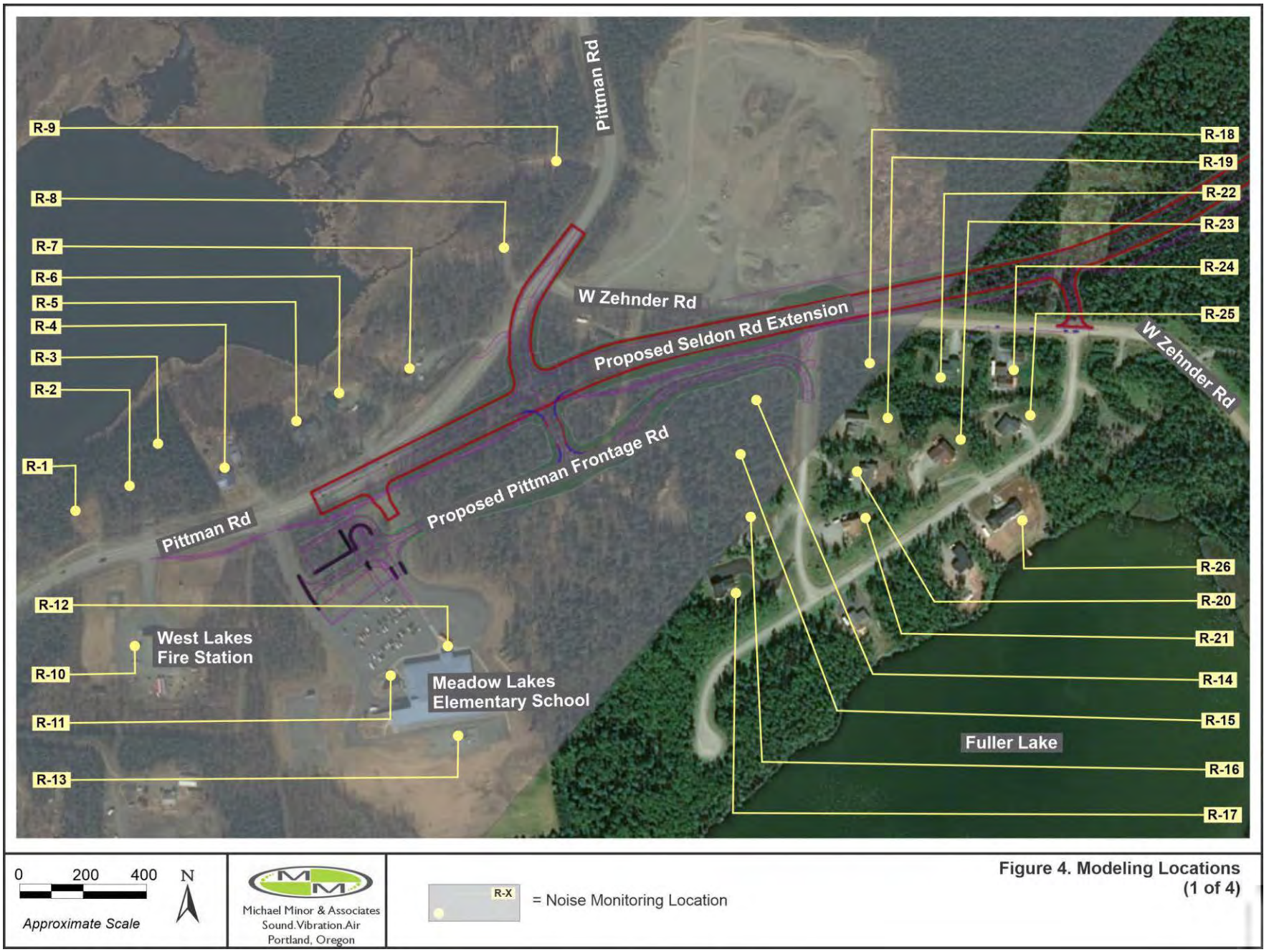


Figure 4. Modeling Locations (1 of 4)

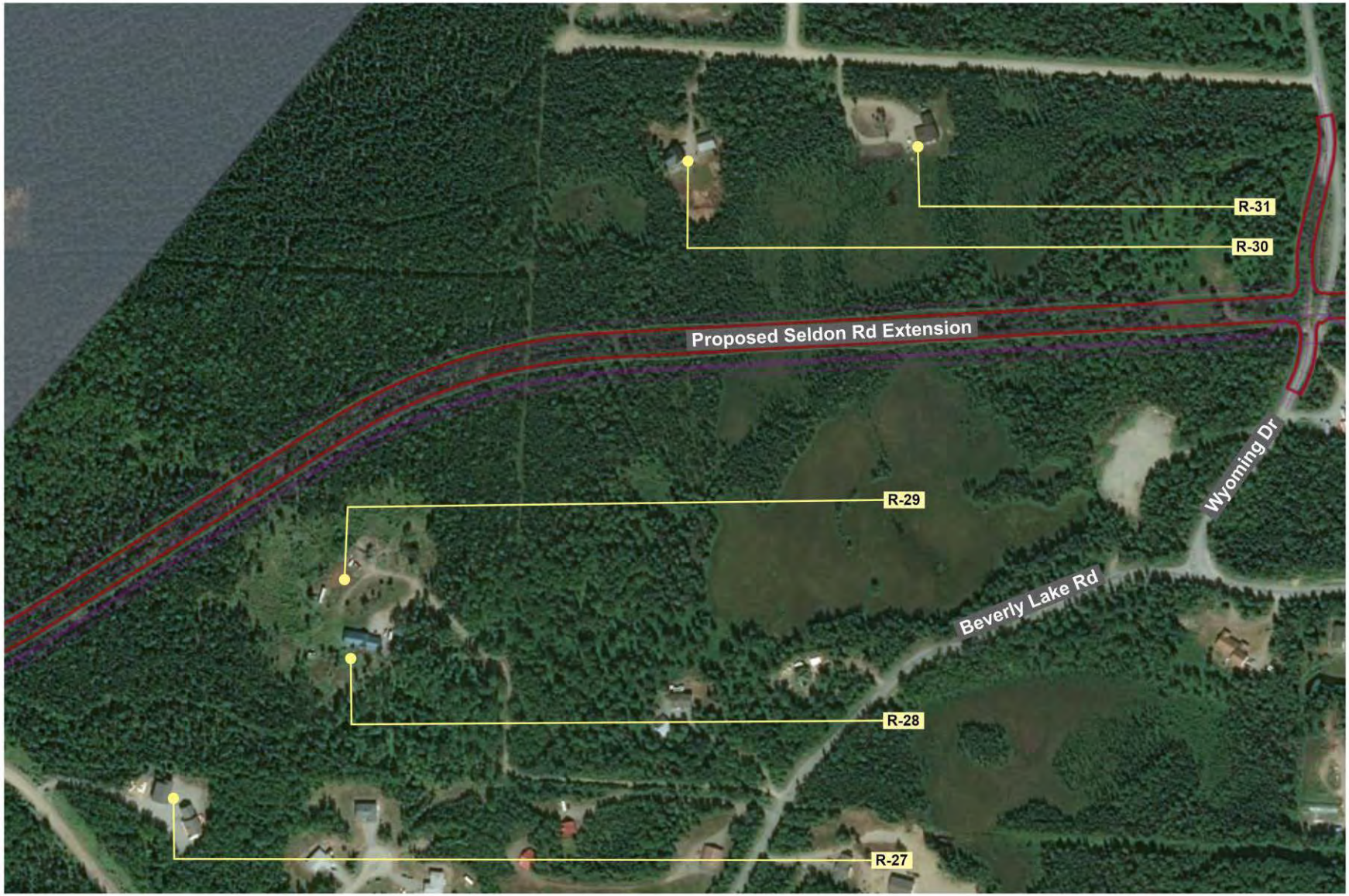


Figure 5. Modeling Locations (2 of 4)

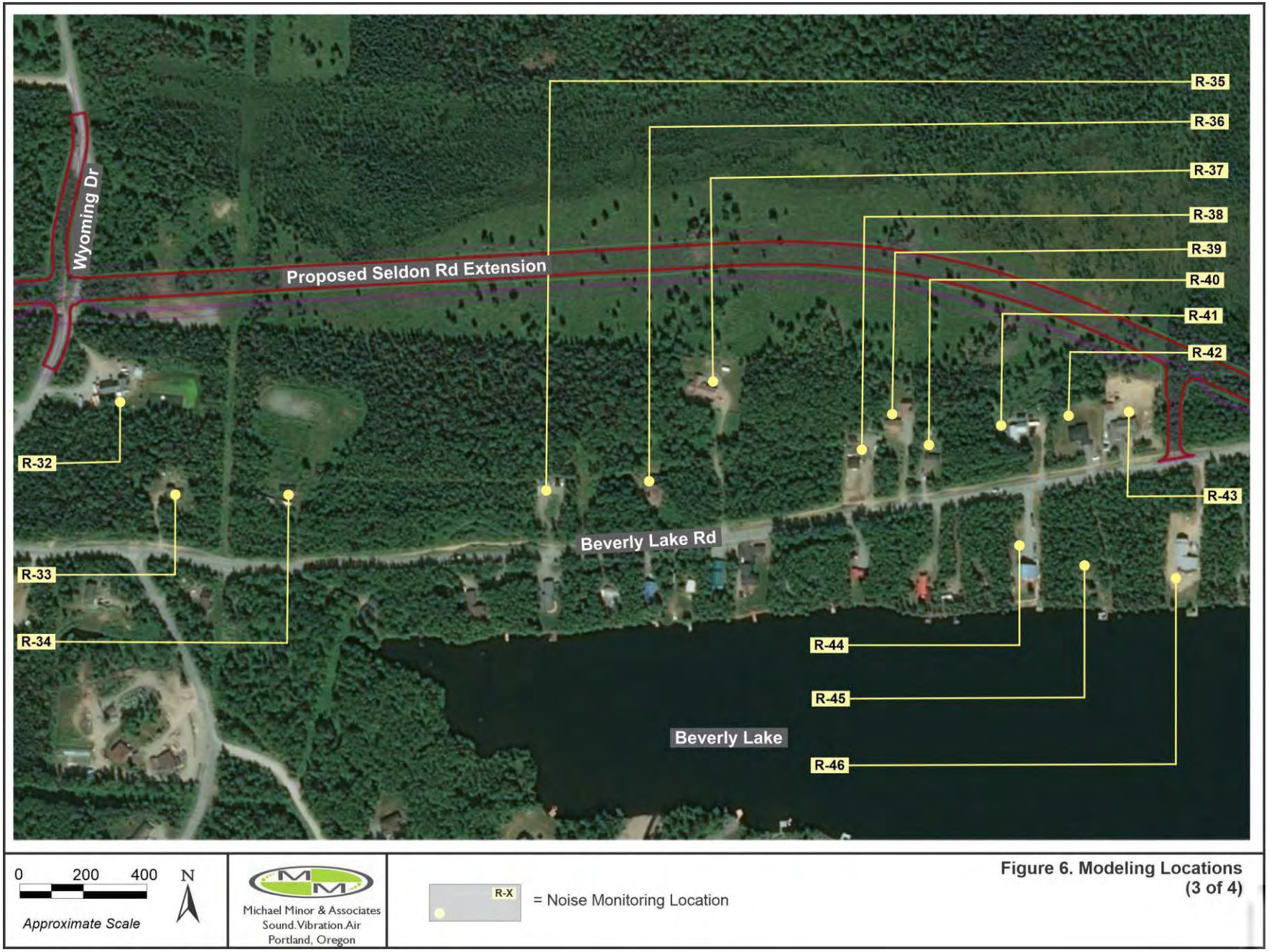


Figure 6. Modeling Locations (3 of 4)

Figure 7. Modeling Locations (4 of 4)

7. EXISTING ENVIRONMENT

Modeling was performed for 65 representative receiver locations shown on Figures 4 through 7 for the existing conditions (year 2022) PM peak traffic hour. Overall, noise levels ranged from 36 to 56 dBA Leq, and no sensitive uses meet the DOT&PF NAC. The lowest noise levels were at the Meadow Lakes Elementary school, modeled at 36-40 dBA Leq. Note that in those locations in the most rural, western part of the corridor, far from any TNM roadways, the minimum measured noise level of 47 dBA Leq was used if levels were below 47 dBA (based on M-4 minimum measured Leq). Table 6 provides a summary of the existing modeled traffic noise levels.

8. FUTURE CONDITIONS

The following two sections provide the modeling results of the year 2040 with (Build) and without (No-Build) the project.

8.1. Future Build Alternative

The same noise modeling locations used to model the existing conditions were modeled for the Build Alternative with year 2048 PM peak hour traffic conditions. The TNM inputs include the proposed Seldon Road Extension, proposed Pittman Frontage Road, proposed Beverly Lake Road and W Zehnder Road connectors from the proposed Seldon Road extension, modifications to W Zehnder Road, the new intersection of Wyoming Drive and Seldon Road, the proposed multi-use path parking lot at the Meadow Lakes Elementary School, the proposed multi-use path south of the proposed Seldon Road extension, and year 2048 traffic volumes and speeds prepared for this project. The traffic noise levels for the Build Alternative are the worst-case noise levels for the year 2048.

Future Build alternative traffic noise levels are predicted to range from 45 to 60 dBA Leq during the PM peak hour. Noise levels in the project area change by 0 to +13 dB over the existing conditions. No sensitive uses are predicted to meet the DOT&PF NAC. The areas with the highest noise increases are typically at the east and west ends of the project corridor where residences are in higher concentrations and closest to the proposed Seldon Road extension. The western rural area was set to a minimum of 47 dBA Leq based on M-4, although under the Build conditions, there are only two sites with TNM predicted levels below 47 dBA, R-26 and R-27. Table 6 provides a summary of the future build traffic noise levels for R-1 through R-65.

8.2. Future No-Build Conditions

Noise modeling was also performed for the No-Build conditions using traffic volumes projected for the year 2048 with no changes to any of the roadways in the project corridor. The same 65 noise modeling locations used to model the existing conditions were modeled

for the No-Build conditions PM peak hour traffic conditions. The TNM inputs include year 2048 traffic data.

Based on the future projected traffic data for the year 2048 without the proposed project, increased traffic volumes along Pittman Road and Beverly Lake Road produced slightly higher noise levels. Overall, noise levels ranged from 38 to 57 dBA Leq. Changes in noise levels range 0 to +2 dB over the existing conditions, and no sensitive uses meet the DOT&PF NAC. The western rural area was set to a minimum of 47 dBA Leq based on M-4. Table 6 provides a summary of the no-build modeled traffic noise levels.

Table 6. Traffic Noise Level Summary										
Receiver[1]	Land Use[2]	Units[3]	Criteria (dBA Leq)[4]	Existing Conditions (2022)	Build Alternative (2048)				No-Build Alternative (2048)	
				Level (Leq dBA)[5]	Level (Leq dBA)[5]	Vs. Exist (in dB)[6]	No. of Impacts[7]	Vs. No-Build (in dB)[8]	Level (Leq dBA)[5]	Vs. Exist (in dB)[9]
R-1	B	1	66	52	59	7	0	5	54	2
R-2	B	1	66	48	55	7	0	5	50	2
R-3	B	1	66	45	52	7	0	5	47	2
R-4	B	1	66	49	55	6	0	5	50	1
R-5	B	1	66	48	54	6	0	4	50	2
R-6	B	1	66	48	54	6	0	5	49	1
R-7	B	1	66	49	54	5	0	3	51	2
R-8	B	1	66	52	54	2	0	1	53	1
R-9	B	1	66	56	58	2	0	1	57	1
R-10	B	1	66	47	52	5	0	4	48	1
R-11	C	1	66	40	48	8	0	6	42	2
R-12	C	1	66	40	48	8	0	6	42	2
R-13	C	1	66	36	45	9	0	7	38	2
R-14[10]	B	1	66	47 (42)	58	11	0	11	47 (44)	0
R-15[10]	B	1	66	47 (41)	54	7	0	7	47 (42)	0
R-16[10]	B	1	66	47 (40)	50	3	0	3	47 (41)	0
R-17[10]	B	1	66	47 (37)	47	0	0	0	47 (38)	0
R-18[10]	B	1	66	47 (38)	60	13	0	13	47 (40)	0
R-19[10]	B	1	66	47 (39)	56	9	0	9	47 (41)	0
R-20[10]	B	1	66	47 (39)	52	5	0	5	47 (40)	0
R-21[10]	B	1	66	47 (36)	49	2	0	2	47 (37)	0
R-22[10]	B	1	66	47 (36)	57	10	0	10	47 (38)	0

Table 6. Traffic Noise Level Summary										
Receiver[1]	Land Use[2]	Units[3]	Criteria (dBA Leq)[4]	Existing Conditions (2022)	Build Alternative (2048)				No-Build Alternative (2048)	
				Level (Leq dBA)[5]	Level (Leq dBA)[5]	Vs. Exist (in dB)[6]	No. of Impacts[7]	Vs. No-Build (in dB)[8]	Level (Leq dBA)[5]	Vs. Exist (in dB)[9]
R-23[10]	B	1	66	47 (35)	53	6	0	6	47 (37)	0
R-24[10]	B	1	66	47 (34)	54	7	0	7	47 (35)	0
R-25[10]	B	1	66	47 (32)	51	4	0	4	47 (33)	0
R-26[10]	B	1	66	47 (32)	47	0	0	0	47 (33)	0
R-27[10]	B	1	66	47 (29)	47	0	0	0	47 (31)	0
R-28[10]	B	1	66	47 (29)	50	3	0	3	47 (31)	0
R-29[10]	B	1	66	47 (29)	53	6	0	6	47(31)	0
R-30[10]	B	1	66	47 (30)	51	4	0	4	47 (31)	0
R-31[10]	B	1	66	47 (31)	50	3	0	3	47 (33)	0
R-32[10]	B	1	66	47 (40)	55	8	0	8	47 (42)	0
R-33	B	1	66	49	50	1	0	-1	51	2
R-34	B	1	66	47	49	2	0	0	49	2
R-35	B	1	66	48	50	2	0	0	50	2
R-36	B	1	66	47	50	3	0	1	49	2
R-37[10]	B	1	66	47 (40)	53	6	0	6	47 (41)	0
R-38	B	1	66	48	51	3	0	1	50	2
R-39[10]	B	1	66	47 (44)	53	6	0	6	47 (45)	0
R-40	B	1	66	50	52	2	0	1	51	1
R-41	B	1	66	48	53	5	0	3	50	2
R-42	B	1	66	50	55	5	0	4	51	1
R-43	B	1	66	50	58	8	0	7	51	1
R-44	B	1	66	47	49	2	0	0	49	2

Table 6. Traffic Noise Level Summary										
Receiver[1]	Land Use[2]	Units[3]	Criteria (dBA Leq)[4]	Existing Conditions (2022)	Build Alternative (2048)				No-Build Alternative (2048)	
				Level (Leq dBA)[5]	Level (Leq dBA)[5]	Vs. Exist (in dB)[6]	No. of Impacts[7]	Vs. No-Build (in dB)[8]	Level (Leq dBA)[5]	Vs. Exist (in dB)[9]
R-45[10]	B	1	66	47 (44)	48	1	0	1	47 (45)	0
R-46[10]	B	1	66	47 (43)	48	1	0	1	47 (45)	0
R-47	B	1	66	45	52	7	0	5	47	2
R-48	B	1	66	48	53	5	0	3	50	2
R-49	B	1	66	50	54	4	0	3	51	1
R-50	B	1	66	49	52	3	0	1	51	2
R-51	B	1	66	51	54	3	0	1	53	2
R-52	B	1	66	53	57	4	0	2	55	2
R-53	B	1	66	55	59	4	0	2	57	2
R-54	B	1	66	46	54	8	0	6	48	2
R-55	B	1	66	42	52	10	0	8	44	2
R-56	B	1	66	45	56	11	0	9	47	2
R-57	B	1	66	45	52	7	0	6	46	1
R-58	B	1	66	49	57	8	0	6	51	2
R-59	B	1	66	50	56	6	0	4	52	2
R-60	B	1	66	49	55	6	0	5	50	1
R-61	B	1	66	39	48	9	0	7	41	2
R-62	B	1	66	44	52	8	0	6	46	2
R-63	B	1	66	44	51	7	0	5	46	2
R-64	B	1	66	47	56	9	0	7	49	2
R-65	B	1	66	50	56	6	0	4	52	2
Summary		**Minimum**		36	45	0	0	-1	38	0

Table 6. Traffic Noise Level Summary

Receiver[1]	Land Use[2]	Units[3]	Criteria (dBA Leq)[4]	Existing Conditions (2022)	Build Alternative (2048)				No-Build Alternative (2048)	
				Level (Leq dBA)[5]	Level (Leq dBA)[5]	Vs. Exist (in dB)[6]	No. of Impacts[7]	Vs. No-Build (in dB)[8]	Level (Leq dBA)[5]	Vs. Exist (in dB)[9]
		Maximum		56	60	13	0	13	57	2
		Total Meeting NAC					**0**			
Substantial increase noise impacts with future noise levels 15 dB or more above existing =							**0**			

Notes:

1. All receivers are shown in Figures 4 through 7.
2. FHWA land use: See Table 1.
3. Number of uses or dwellings represented by each receiver.
4. DOT&PF traffic noise abatement criteria by land use type.
5. Predicted peak hour noise levels in dBA Leq for condition stated, taken from TNM version 2.5 with bold red typeface used to indicate noise levels that are equal to or greater than the NAC of 66 dBA Leq for Category B and C uses.
6. Change in noise: Build compared to existing conditions.
7. Number of uses predicted to meet or exceed the DOT&PF NAC, either the level criteria or substantial increase criteria.
8. Change in noise: Build compared to No-Build for reference only.
9. Change in noise: No-Build compared to existing conditions.
10. The measured noise levels from M-4 were used when the modeled levels were below 47 dB – modeled noise levels are provided in parentheses, e.g., 47 (40).

The summary shows that one receiver, R-33, will have reduced noise levels under the Build Alternative. R-33 has a lower noise level under the Build Alternative because it is located along Beverly Lake Road, which has lower traffic volumes because most traffic is diverted to the new Seldon Road extension. Furthermore, the reason that R-33 has a lower noise level when R-34 has no change, is because R-33 is slightly closer to Beverly Lake Road.

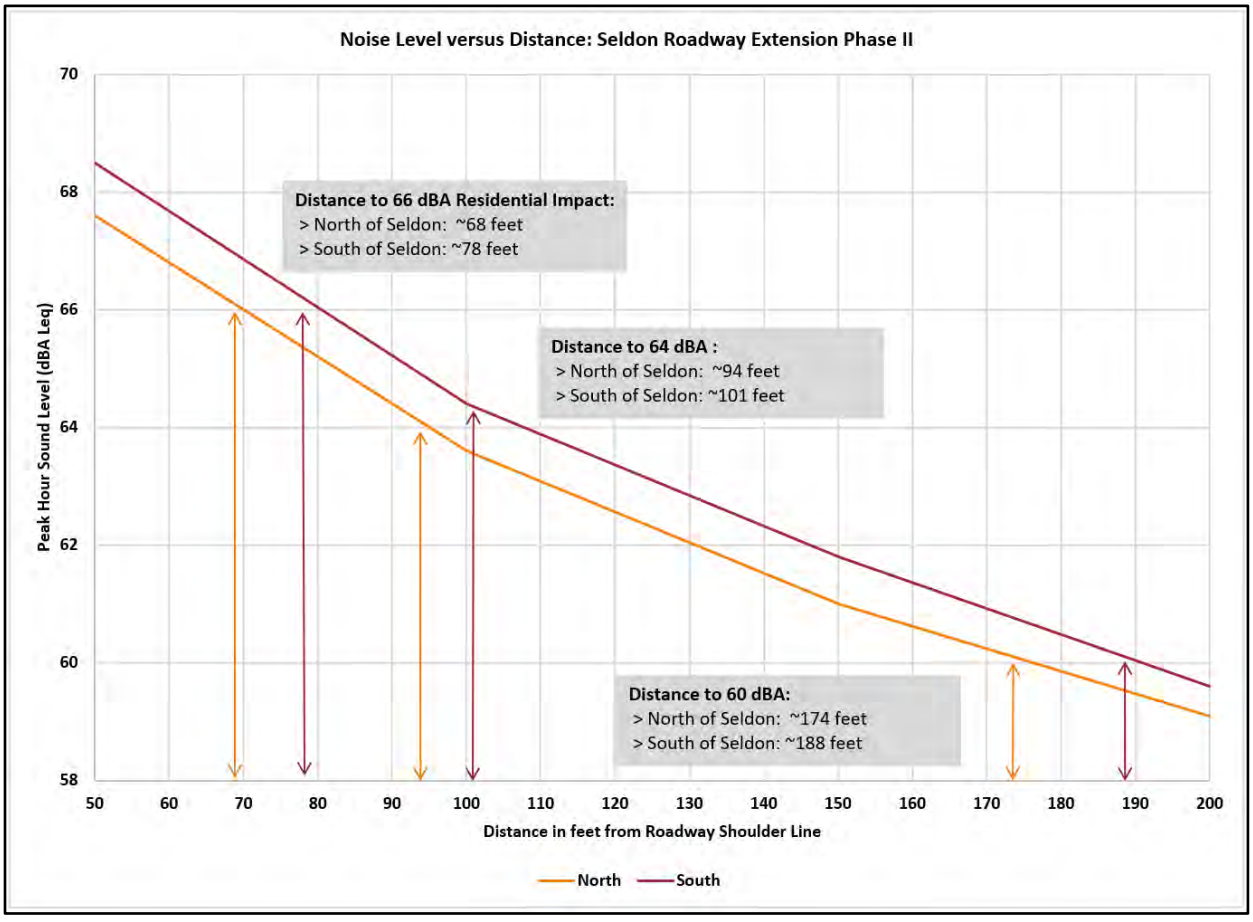
9. NOISE ABATEMENT MEASURES

No noise abatement measures were considered since there are no receivers that meet the impact NAC of 66 dB nor any substantial increases of +15 dB.

10. FUTURE NOISE LEVELS ON UNDELVEOPED LANDS

To aid in future developments along and near the corridor, the distance to the 66 dBA Leq residential impact criteria on each side of the Seldon Road Extension was predicted using future (2045) traffic volumes. Based on the noise modeling, any new developments along the northside of the proposed Seldon Road corridor would need to be at least 68 feet from the shoulder of the roadway. On the southside of Seldon, that distance is increased to 78 feet. 64 dBA Leq would occur at 94 feet along the northside and 101 feet on the southside. 60 dBA Leq would occur at 174 feet on the northside and 188 feet on the southside. Since the northside of the roadway has slightly higher traffic volumes the distance to the 66 dB criteria is slightly lower than it is on the southside of the roadway. Figure 8 is a graph of noise levels versus distance along the north and southsides of Seldon Road during peak hour.

Figure 8. Distance to Residential Impact Criteria



11.CONSTRUCTION NOISE ANALYSIS

Construction noise would result from normal construction activities. Noise levels for these activities can be expected to reach 86 dBA during periods of heavy construction at sites within 100 feet from construction activities. Typical peak noise levels that can be expected at approximately 100 feet from different construction activities are listed in Table 7.

Table 7. Estimated Peak Hour Construction Noise Levels

Construction Phase	Loudest Equipment	Noise Level (dBA Lmax)[a]
Clearing and grubbing	Bulldozer, backhoe	83
Earthwork	Scraper, bulldozer	85
Foundation	Backhoe, loader	82
Base preparation	Trucks, bulldozer, compactor	85
Paving	Paver, trucks	86

a. Estimated maximum noise levels for typical activities measured at 100 feet from the source

11.1. Construction Noise Mitigation Measures

The following construction noise abatement measures could be included in the project specifications.

- No construction shall be performed within 1,000 feet of an occupied dwelling unit on Sundays, legal holidays, or between the hours of 10 p.m. and 7 a.m. on other days, without the approval of the DOT&PF construction project manager.
- All equipment used shall have sound-control devices no less effective than those provided on the original equipment. No equipment shall have unmuffled exhaust.
- All equipment shall comply with pertinent equipment noise standards of the U.S. Environmental Protection Agency.

If a specific noise impact complaint is received during construction of the project, the contractor may be required to implement one or more of the following noise mitigation measures at the contractor's expense, as directed by the project manager:

- Locate stationary construction equipment as far from nearby noise-sensitive properties as feasible.
- Shut off idling equipment.
- Reschedule construction operations to avoid periods of noise annoyance identified in the complaint.
- Notify nearby residents whenever extremely noisy work will be occurring.
- Install temporary or portable acoustic barriers around stationary construction noise sources.

- Operate electrically powered equipment using line voltage power or solar power.

12. CONCLUSION

Traffic noise modeling was performed for 65 receiver locations representing several residential uses and Meadow Lakes Elementary School. Inputs to the model included peak-traffic volume and speed provided by Stantec and existing, future No-Build, and future Build Alternative roadways and traffic controls. The existing (2022) modeled noise levels range 36 to 56 dBA Leq.

Under the 2048 Future Build alternative, noise levels throughout the modeled areas range from 45 to 60 dBA Leq, with noise level changes of 0 to +13 dBA when compared to existing conditions. Noise levels for the future No-Build (2048) conditions range from 38 to 57 dB. Although the project will result in changes to noise levels throughout the area, there are no noise sensitive uses that meet or exceed the NAC under the Build Alternative and therefore, no traffic noise mitigation was evaluated.

13. REFERENCES

Alaska Department of Transportation and Public Facilities. 2018 Noise Policy. DOT & PF November 2018.

American National Standards Institute. Quantities and Procedures for Description and Measurement of Environmental Sound - Part 1: Basic Quantities and Definitions. Ansi/ASA S12.9-2013/Part1. February 27, 2013.

U.S. Department of Transportation. FHWA Highway Traffic Noise Model User's Guide, Report No. FHWA-PD-96-009. Federal Highway Administration, Washington, D.C. January 1998.

U.S. Department of Transportation. FHWA Highway Traffic Noise Model User's Guide (Version 2.5 Addendum) Final Report. Federal Highway Administration, Washington, D.C. April 2004.

Appendix A: DOT&PF Noise Policy

THE STATE
of ALASKA
GOVERNOR BILL WALKER

Department of Transportation and Public Facilities

Statewide Design & Engineering Services
Environmental Section

3132 Channel Drive
Juneau, Alaska 99811-2500
Main: 907-465-2975
Toll free: 800-467-6955
Fax: 907-465-3124

November 1, 2018

Sandra Garcia-Aline
P.O. Box 21648
Juneau, AK 99802-1648

Reference: DOT&PF Noise Policy

Dear Mrs. Garcia-Aline,

The Alaska Department of Transportation and Public Facilities (DOT&PF) hereby submits a copy of the DOT&PF Noise Policy dated October 2018 for review and approval by the Federal Highway Administration Alaska Division. We would like to thank your staff and Aileen Varela-Margolles of your Washington D.C. office for your review and comments on previous drafts. This policy is an update of DOT&PFs April 2011 policy and in response to changes in 23CFR 772. It is our intent that this Noise Policy will go into effect upon your approval.

Your approval of the attached noise policy is hereby requested. If you have any questions or wish to discuss further do not hesitate to contact Douglas Kolwaite of my office.

Approved: _____

(Sandra Garcia-Aline, Division Administrator, FHWA Alaska Division)

Sincerely,

Kenneth J. Fisher, P.E.
Chief Engineer

Enclosure: DOT&PF Noise Policy (October 2018)

Alaska Department of Transportation & Public Facilities

Noise Policy

November 2018

ACRONYMS USED IN THIS DOCUMENT

ADT: Average Daily Traffic

ANSI: American National Standards Institute

BR: Benefitted Receptor

CE: Categorical Exclusion (as defined in 23 CFR Part 771)

CEI: Cost Effectiveness Index

CFR: Code of Federal Regulations

CPI: Consumer Price Index

dB: Decibel

dBA: Decibel when referring to an A-weighted sound level

DHV: Design Hourly Volume (for traffic)

DOT&PF: Alaska Department of Transportation and Public Facilities

EA: Environmental Assessment (as defined in 23 CFR 771)

EIS: Environmental Impact Statement (as defined in 23 CFR 771)

FHWA: Federal Highway Administration

FHWA TNM: Federal Highway Administration Traffic Noise Model

FONSI: Finding of No Significant Impact (as defined in 23 CFR 771)

LOS: Level of Service

L_{eq}: Equivalent sound level in dBA

$L_{eq}(h)$: One-hour equivalent sound level in dBA

NAC: Noise Abatement Criterion

NEPA: National Environmental Policy Act

NSA: Noise Study Areas

RCNM: Road Construction Noise Model

REM: Regional Environmental Manager

ROD: Record of Decision (as defined in 23 CFR 771)

TABLE OF CONTENTS

1.0 INTRODUCTION

This document contains the Alaska Department of Transportation and Public Facilities (DOT&PF) policy on highway traffic noise and construction noise as it affects the human environment. The policy describes DOT&PF's implementation of the requirements of the Federal Highway Administration (FHWA) Noise Standard at Title 23 Code of Federal Regulations (CFR) Part 772 (see Appendix A.) The policy also addresses how traffic noise is considered on state funded projects. DOT&PF developed this policy which was then, reviewed and approved by FHWA, and is considered effective as of the date on the title page. This policy replaces DOT&PF's Noise Policy dated April 2011.

During the rapid expansion of the Interstate Highway System and other roadways in the 20th century, communities began to recognize highway traffic noise and construction noise as important environmental impacts. In the 1972 Federal-aid Highway Act, Congress required FHWA to develop a noise standard for new Federal-aid highway projects. While providing national criteria and requirements for all highway agencies, the FHWA Noise Standard gives highway agencies flexibility that reflects state-specific attitudes and objectives in approaching the problem of highway traffic and construction noise. This document contains DOT&PF's policy on how highway traffic and construction noise impacts are defined, how noise abatement is evaluated, and how noise abatement decisions are made.

The FHWA Noise Standard requires noise abatement measures be considered when traffic noise impacts are identified for Type I federal projects, as defined in 23 CFR 772.5. Noise abatement measures found to be feasible and reasonable must be constructed for Type I federal projects. Feasible and reasonable noise abatement measures are eligible for federal-aid participation at the same ratio or percentage as other eligible project costs. As part of NEPA's requirement to consider the environmental effects of federally funded projects, the impact determinations and abatement considerations will be used to support development of the NEPA document.

2.0 PURPOSE

This policy outlines the DOT&PF program to implement the FHWA Noise Standards found in 23 CFR 772. These standards include traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials. Where FHWA has given DOT&PF flexibility in implementing the standard, this policy describes the DOT&PF approach to implementation. This policy also defines how the DOT&PF addresses traffic noise in State-funded projects.

The State of Alaska does not have any traffic noise regulations. It is the DOT&PF policy to follow the federal standards for traffic noise prediction requirements, and noise analyses. Federal noise abatement criteria are followed to determine whether noise

impacts exist and if abatement is feasible and reasonable, however, the decision to provide noise abatement on State-funded projects follows slightly different procedures (see Section 9.0 of this policy, *State-Funded Projects.*)

3.0 DEFINITIONS

A-Weighted Sound Level: The sound level in decibels measured with a frequency weighting network corresponding to the A-scale on a standard Type 1 or 2 sound level meter as specified by ANSI S1.4-1983 (R2006)/ANSI S1.4a-1985 (R2006,) American National Standard Specification for Sound Level meters (or latest version.) This is the most widely used weighting system for assessing transportation-related noise because it best approximates sound as heard by the normal human ear.

Acoustically Representative: A receptor location that represents the same land use category and magnitude of noise as another location. Proper acoustical representation includes nearly the same roadway geometry, topography, traffic flow, and distance from source to receptor.

Benefited Receptor: A receptor that receives at least a 5dBA noise reduction from an abatement measure.

Common Noise Environment: A group of receptors within the same Activity Category in 23 CFR 772, Table 1 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.

Date of Development: The date at which land is permitted for development.

Date of Public Knowledge: The date of approval of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), the Record of Decision (ROD), or in the case of a state-funded project, approval of the State Environmental Checklist.

Decibel (dB): A unit of sound pressure level which denotes the ratio between two sound pressures; the number of decibels is 10 times the base 10 logarithm of this ratio.

Design Hourly Volume (DHV): The 30^{th} highest hourly volume of the future year traffic assigned for the design, expressed in vehicles per hour.

Design Year: The future year used to estimate the probable traffic volume for which a highway is designed. This is determined by adding the project's design life to the anticipated date of construction completion.

Existing Noise Levels: The representative worst noise hour level resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

Feasibility: The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

Federal-aid Project: Any project utilizing federal funds for one or more phases (*i.e.*, Environmental, Design, Right of Way, or Construction) or that is otherwise subject to federal approval.

Field Measurement Point: Physical noise measurement site within the noise study boundary used to validate TNM and document existing noise levels. A field noise measurement point may also serve as a receiver in the TNM.

First Row Receptors: Closest residences or businesses impacted by noise from the highway facility.

Impacted Receptor: A noise-sensitive location for which a traffic noise impact has been calculated.

L_{eq}: 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 L_{eq} for one hour.

Multifamily Dwelling: A residential structure containing more than one residence. Each residence with a private exterior space in a multifamily dwelling shall be counted as one receptor when determining impacted receptors and benefited receptors and determining barrier reasonableness.

Noise Analysis Boundary: Limits of analysis for the proposed project(s). Boundaries typically extend 500 feet on either side of a proposed projects improvements; however, some geometric conditions and traffic volumes/mixes may cause noise impacts beyond 500 feet. The boundaries must encompass all potential noise impacts.

Noise Barrier: A physical obstruction constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level by reducing the transmission of sound, including stand-alone noise walls, noise berms (earth or other material), and combination berm/wall systems.

Noise Contour: A line on a map representing points of equal sound level (similar to ground elevation contour lines on a topographic map.)

Noise Reduction Design Goal: The minimum desired sound level reduction, determined by calculating the difference between future build noise levels with and without abatement. The DOT&PF noise reduction design goal is 7 dBA.

Permitted: A definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit.

Property Owner: An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

Reasonableness: The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

Receiver: A modeling point in the FHWA Traffic Noise Model (TNM) at which sound levels are predicted. An individual receiver may represent multiple receptors.

Receptor: A discrete or representative location (such as a residence or an activity area on a parcel of land) being studied for noise impacts.

Residence: A dwelling unit, such as a single family home or each dwelling unit in a multifamily dwelling.

Resident: Someone who resides at a dwelling unit. May not necessarily be the owner of the dwelling unit.

State-funded Project: A project that is solely funded by state monies appropriated by the Alaska State Legislature and requires no federal approvals for implementation.

Statement of Likelihood: A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

Substantial Noise Increase: One of two types of highway traffic noise impacts. For a Type I project, DOT&PF defines it as an increase in design year noise levels of 15 or more dBA over the existing noise level.

Traffic Noise Impacts: Design year build condition noise levels that create a substantial noise increase (defined above) over existing noise levels or design year build condition noise levels that approach or exceed the Noise Abatement Criteria (NAC) listed in Table 1 in 23 CFR 772 for the future build condition. The DOT&PF defines "approach" as one dBA below the NAC.

Type I Project: As defined in 23 CFR 772:
(1) The construction of a highway on new location; or,
(2) The physical alteration of an existing highway where there is either:
    (i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
    (ii) Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,

(3) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
(4) The addition of an auxiliary lane, except when the auxiliary lane is a turn lane; or,
(5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
(6) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,
(7) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.
(8) If a project is determined to be a Type I project under this definition, the entire project area as defined in the environmental document is a Type I project.

Type II Project: A Federal or Federal aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e). DOT&PF does not have a Type II program.

Type III Project: A Federal or Federal aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Worst Noise Hour: A period of 60 minutes within a 24-hour day that reflects the noisiest hour resulting from the maximum amount of traffic traveling at the greatest speed. The worst noise hour may be when the vehicle mix is dominated by truck traffic rather than a high volume of automobile traffic.

4.0 APPLICABILITY

This Noise Policy applies to all Federal or Federal Aid Highway Projects authorized under Title 23, United States Code; therefore, this Noise Policy applies to any highway or multimodal project that:

1. Requires FHWA approval regardless of funding sources, or

2. Is funded with Federal Aid highway funds. This includes Federal or Federal-aid projects that are administered by Local Public Agencies as well as Alaska DOT&PF.

All projects without an approved noise report before the 2018 Noise Policy update adoption date shall use the 2018 Noise Policy update. Projects that have an approved noise report under the 2011 Noise Policy may continue to use the existing noise report or prepare a new noise report using the 2018 Noise Policy update. Projects that have an approved noise report under the 2011 Noise Policy have three years from the adoption date of the 2018 Noise Policy update to obtain an Authority to Proceed with Construction; otherwise, the noise report shall be updated to conform to the 2018 Noise Policy update.

4.1 Type I Projects

The requirements of this policy apply uniformly and consistently to all Type I federal projects, Type I State-funded projects (see Section 9.0 of this policy), and Type I Toll Authority projects within the State of Alaska. If a project is determined to be a Type I project under the definition outlined in 23 CFR 772.5, then the entire project area as defined in the environmental document is a Type I project.

4.2 Type II Projects

DOT&PF has elected not to participate in the voluntary Type II noise program; therefore, no noise analyses will be completed for Type II projects. Type II projects are not discussed further in this policy.

4.3 Type III Projects

Type III projects are those projects that neither meet the definition of a Type I or Type II project nor require a noise analysis or consideration of noise abatement. However, it may be necessary to consider conducting a construction noise analyses in certain circumstances (*e.g.*, pile driving near residences.) Construction noise is discussed in Section 8.0 of this policy.

5.0 ANALYSIS OF TRAFFIC NOISE IMPACTS

It is important to determine early on in project scoping if a noise analysis is necessary, in order to accurately plan a project timeline.

5.1 Minimum Qualifications for Noise Analysts

DOT&PF highway traffic noise analyses must be performed by qualified personnel who have successfully completed training in the area of highway noise analysis and are proficient in the use of the latest version of the FHWA-approved traffic noise modeling software. These personnel must have experience conducting noise analysis studies for highway transportation projects and have a working knowledge of this policy and the regulations outlined in 23 CFR 772.

5.2 General Requirements for All Type I Projects

All Type I projects require a noise analysis; however, projects may not require the same level of analysis. This policy describes three levels of analyses:

- Narrative Analysis – a non-quantitative analysis of noise impacts where noise impacts are not anticipated.
- Screening Analysis – a streamlined quantitative analysis where noise impacts are unlikely or abatement actions are clearly not feasible and/or reasonable.

- Detailed Analysis – a comprehensive quantitative analysis where noise impacts are possible and noise abatement may be feasible and reasonable.

Coordination with the Statewide Environmental Office (SEO) is required before a narrative or screening analysis is conducted. Failure to coordinate with the SEO may result in a need to reanalyze the project using a detailed analysis. There are limitations to the narrative and screening procedures, and they are not applicable to all projects. The appropriate level of noise analysis will depend on the presence of noise sensitive land uses (existing or permitted), probable occurrence of highway traffic noise impacts, the potential for noise abatement measures, and/or noise-related public controversy. The levels of analysis are described in detail in Sections 5.4 through 5.6 of this policy.

For Type I projects, a traffic noise analysis is required for all build alternatives under detailed study in the NEPA process. All reasonable alternatives that have been carried forward for detailed analysis and were not rejected as unreasonable during the alternatives screening process will be analyzed for noise impacts. For Environmental Impact Statements or other studies that will examine broad corridors, the appropriate scope and methodology of the noise analysis should be discussed with participating agencies early in the project planning process.

A Type I traffic noise analysis generally consists of the following steps, which are described in more detail in subsequent sections of this policy:

1. Identify noise analysis boundaries and receptors by land use Activity Category (Section 5.3) and distance to the edge of the closest travel lane of the proposed project;
2. Determine existing noise levels at a representative subset of receptors;
3. Predict future "build" noise levels at a larger representative subset of receptors. Predict future "no-build" noise levels for the proposed project;
4. Determine traffic noise impacts;
5. Evaluate abatement feasibility and reasonableness if there are traffic noise impacts;
6. Address coordination with local officials;
7. Address construction noise; and
8. Prepare the noise analysis report (Section 6.7.)

Noise impact modeling and abatement evaluation/design for DOT&PF projects require use of the latest approved version of the FHWA Traffic Noise Model (FHWA TNM) or another model determined by FHWA to be consistent with the methodology of the FHWA TNM, pursuant to 23 CFR 772.9(a.)

If any segment or component of an alternative meets the definition of a Type I project, then the entire alternative is considered to be Type I and is subject to these noise analysis requirements. The noise analysis boundaries will be consistent with project limits, from the beginning of the project to the end of the project based on logical termini for that specific project (BOP to EOP).

5.3 Land Use Activity Categories

Federal land use activity categories are defined in 23 CFR 772. DOT&PF has accepted the FHWA definition of these activity categories (Appendix B, Table 1.) Noise analyses must address each activity category present within the noise analysis boundaries. If undeveloped land has been permitted for development (*i.e.*, a building permit has been issued on or before the date of public knowledge,) that land should be assigned to the appropriate activity category and analyzed in the same manner as developed lands in that category.

Activity Category A: Lands on which serenity and quiet are of extraordinary significance and serve an important public need 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.

Activity Category B: Residential (single-family and multi-family homes.) Noise receivers should be located in exterior areas that receive frequent human use (*i.e.*, patios, balconies, playgrounds, gardens, etc.) When an area of frequent use cannot be determined, an area mid-way between the residence and the right-of-way line should be chosen. For residences and structures that face the highway, choose an area of frequent use in the front, such as a front door landing. For apartment buildings, second-floor or higher balconies should be used in addition to ground floor units. For any shared-use exterior areas, the number of residential equivalents will be equal to the total number of dwelling units in multi-family building(s).

Activity Category C: Exterior areas of non-residential lands such as schools, parks, cemeteries, etc., as listed in Appendix B. Receivers should be located in areas that receive the most frequent human use and represent the typical use of the area. Since impact determinations are based on each area of frequent human use, the number of areas impacted should be calculated and an equivalent number of residential units should then be calculated to assess the feasibility and reasonableness of abatement measures. The equivalent number of residential units is calculated by determining the average residential lot size for the vicinity and dividing it into the non-residential area, for a total number of residential units. For example: if a park has an area of 87,120 square feet, and the average residential lot size is 60 feet by 200 feet, or 12,000 square feet, use 8 equivalent residential units to assess the feasibility and reasonableness of a proposed abatement measure. Receiver placement for non-residential use sites is similar to that of the residential analysis. Receivers should be placed at the closest location to the highway right of way (ROW) line where outdoor activity normally occurs to determine if the NAC is exceeded. In addition, receivers should be placed at locations away from the ROW line to determine the extent of impact and to consider sensitive receptors if the NAC are exceeded at the ROW line.

Activity Category D: Interiors of certain Category C facilities, such as those listed in Appendix B. Interior receptor locations should only be used if there are no reasonable

exterior (Category C) receptor options. Only consider the interior levels at these land uses after fully completing an analysis of any outdoor activity areas or determining that exterior abatement measures are not feasible or reasonable. The 52 dB(A) criteria for the category only apply to the interior areas of this category.

An interior analysis will only be performed after exhaustion all exterior options.

This will involve:

1,) identify the expected noise reduction due to the composition of the building envelope: Table 6.1 found in the FHWA publication HEP-18-065, Noise Measurement Handbook Final Report (2018)

www.fhwa.dot.gov/environment/noise/measurement/handbook.cfm#toc492990722

2.) Determine if interior noise levels should assume an open-window or closed window conditions; Open window should be assumed unless there is reliable information that the windows are in fact kept closed almost all of the time while the facility is in use.

3.) If the expected reductions cannot be determined as identified in #1 or #2, physical measurements of the amount of noise reduction provided by the building envelop will be conducted consistent with methodology found in the FHWA publication HEP-18-065, Noise Measurement Handbook Final Report (2018)

www.fhwa.dot.gov/environment/noise/measurement/handbook.cfm#toc492990722

Activity Category E: Exteriors of developed lands that are less sensitive to highway noise that are not included in Categories A-D of F. Noise measurements will be taken and predictions will be made at locations that receive the most frequent use. Category E are specifically excluded from Category D and no interior noise analysis is required. The FHWA research publication A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations shall be used to assess whether noise abatement is feasible and/or reasonable.

www.fhwa.dot.gov/environMent/noise/noise_barriers/abatement/reasonableness_2009/met02.cfm

Activity Category F: Land uses that are not sensitive to highway noise (examples listed in Appendix B.) No highway noise analysis is required under 23 CFR 772 for Activity Category F land uses. The noise analysis report should identify any Category F land uses by name, location, and type of land use.

Activity Category G: Undeveloped lands that are not permitted. Land permitted for development (*i.e.,* a building permit has been issued on or before the date of public knowledge) shall be analyzed under the Activity Category for that type of development. When possible, use the filed plat to choose receptor locations representing the exterior

areas of frequent human use. For residential plats, determine if each lot represents a single-family or multifamily dwelling. Choose representative receptor locations for second row residences as well (these receptors may be grouped two or three at a time.)

For lands not permitted for development by the date of public knowledge, DOT&PF shall determine future noise levels pursuant to 23 CFR 772.17(a). For detailed noise analyses, this analysis should report (at a minimum) the distances from the proposed edge of the near travel lane out to where worst hour $L_{eq}(h)$ levels of 60 and 64 dBA are modeled to occur. The results shall be documented in the project environmental documentation and in the noise analysis report, when applicable. Federal participation in noise abatement measures will not be considered for Category G lands unless another future Type I project is planned adjacent to such lands.

5.4 Narrative Analysis for Type I Projects

A narrative analysis is a qualitative analysis that may be completed for Type I projects where noise-related impacts are not anticipated. If there are no receptors that could potentially be exposed to traffic noise impacts, a narrative analysis is appropriate, and no further analysis is required. If there are receptors that could potentially be exposed to traffic noise impacts, and the project has the potential to adversely affect the acoustic environment based on an evaluation of the following factors, a quantitative analysis (i.e., screening or detailed analysis) is required and a narrative analysis is not applicable.

- The identification of any existing activities, developed lands, and undeveloped lands for which development is permitted which may be affected by noise from the proposed project;
- Change of traffic volume (greater than 10%);
- Change of traffic composition (increased truck volumes);
- Change of traffic speed (greater than 10 miles per hour);
- Change of geometric relationships (either horizontal or vertical) between the roadway facility and receptors;
- Projects on new location;
- Change in distribution of traffic patterns; and/or;
- Public controversy based on noise-related issues or perceptions.

It is impossible to identify and account for every special consideration that may arise on a specific highway project and address it in the corresponding noise analysis. Therefore, the list above is to be used as a guide and not considered inclusive.

A narrative analysis will consist of a discussion of the proposed project, its relationship to receptors (if present) and why further analysis is not required. If no receptors are present, a brief statement should be included that summarizes the fact that there are no noise-sensitive land uses within the noise analysis boundaries. Depending on the project circumstances, some analysis may be required to justify the results of the narrative analysis and to document the non-significance of the change in the acoustical

environment (*e.g.* noise measurements or using a simplified two-dimensional FHWA TNM run to assess the worst-case conditions.)

If local officials associated with undeveloped lands in the project area could benefit from information regarding future noise levels for planning purposes, then that information still needs to be provided even if a narrative analysis has been performed. This can be done using the simplified modeling procedure described in Section 5.5, below.

5.5 Screening Analysis for Type I Projects

For some Type I projects, a screening analysis may be appropriate. The screening analysis is a streamlined procedure in which simplified TNM modeling is used to predict traffic noise levels and make a conservative estimation of noise impacts. This procedure can be effective for reducing time and resources associated with a detailed analysis. If a project passes the screening analysis, additional noise analysis under 23 CFR 772 is normally not necessary. If a project is considered controversial, a detailed analysis (see "Detailed Analysis") is warranted regardless of whether the screening procedure indicates otherwise.

A screening analysis is generally appropriate for projects where the following conditions occur:

- No noise impacts are anticipated;
- Noise impacts are anticipated but potential noise abatement actions will clearly not be feasible and reasonable.

Typically, these will be rural highway projects with uncontrolled access, few receptors, and large distances between receptors.

For example, acoustical feasibility (Section 6.4.1) requires that at least three receptors be protected by a continuous proposed noise barrier that guarantees at least a 5 dBA reduction in noise. If there are less than three receptors in the area where noise abatement is being considered, then no further analysis of noise abatement is required.

Unless or until there are other FHWA-approved screening methods available, TNM modeling must still be performed. However, the models may be simpler than for a detailed analysis. There are several simplifying measures that can be used in screening TNM template models, including using flat ground elevation data with straight-line roads. Receptors will be offset perpendicularly from the center of the model roads at distances that represent the distances from project roads to the nearest noise-sensitive receptors, and/or spaced at 50-foot intervals out to 500 feet to identify distances to NAC approach levels. The model roads will extend a minimum of 1,500 feet past the model receptors at each end of the study area.

The following items must be considered when using a screening analysis:

- Model validation is not required, but the need for onsite noise measurements will be determined on a case by case basis;
- Non-traffic noise sources important to the analysis area must be taken into account;
- Existing conditions for the analysis area must be modeled to determine if future noise levels may increase by 15 dBA or more;
- All of the future alternatives under consideration for the project must be modeled;
- Future noise levels must be evaluated for noise impacts according to the criteria in Section 3;
- If design year noise levels are 64 dBA or less or if noise levels are not predicted to increase more than 10 dBA over existing, then the screening analysis is sufficient;
- Traffic noise abatement actions will not be modeled;
- Noise measurements may be needed to justify results of a screening analysis that has identified impacts and feasible abatement appears unlikely.

This procedure can be used for Type I projects void of sensitive receptors in order to satisfy the requirement of analyzing noise impacts for undeveloped lands for use in local noise compatible planning (see Sections 5.4. and 5.6.4 of this policy.)

The decision to use a screening analysis in place of a detailed analysis should be made carefully. If the screening procedure is passed and no need for a detailed analysis is indicated, the results of the screening procedure are documented in a Noise Analysis report. If impacts are noted and abatement is clearly NOT feasible (*e.g.* driveway access), the screening procedure should suffice and a detailed analysis is not needed. However, impacts and the rationale for determining that noise abatement would not be feasible and reasonable must be clearly documented in a Noise Analysis report. If a project does not pass the screening procedure or if warranted by other conditions (*e.g.* public controversy), a detailed noise impact analysis must be performed.

5.6 Detailed Analysis for Type I Projects

A detailed noise analysis is the level of analysis performed for DOT&PF Type I projects when a narrative or screening analysis has been determined to not be appropriate. DOT&PF's processes for determining which projects qualify for a narrative or screening level analysis are described in Sections 5.4 and 5.5, respectively.

5.6.1 Identification of Analysis Boundaries, Noise Study Areas, and Receptors

Noise analysis boundaries must encompass all potential impacts. Potential benefits and impacts outside of the project limits may also need to be considered (*e.g.*, changes in traffic volumes on other facilities due to the proposed project.) All land uses within the noise analysis boundaries are identified and assigned to the appropriate Activity Categories.

It is usually beneficial on large projects to group land uses together into smaller noise study areas for the purposes of noise modeling and abatement evaluation. A noise

study area (NSA) is generally not longer than a mile. Decision factors for dividing a project into NSAs include the extents of individual neighborhoods or residential subdivisions, major terrain features, location of large tracts of undeveloped lands, and boundaries defining major changes in land use. Individual receptor locations within the land uses are also chosen, as outlined above in Section 5.3, Land Use Activity Categories.

5.6.2 Determination of Existing Noise Levels and Model Validation

For projects on new alignments, determine the worst hour existing noise levels (including non-highway traffic noise sources) for developed land uses and activities by field noise measurements. For projects on existing alignments, existing noise levels can be determined by modeling, although field measurements are recommended.

5.6.2.1 Ambient Noise Level Measurements

Field measurements are conducted in accordance with procedures outlined in FHWA's *Measurement of Highway-Related Noise* report (FHWA Report Number FHWA-PD-96-046, 1996) or the most recent available protocols. Field measurement points are generally a subset of all identified receptors, and should be chosen to be acoustically representative of a grouping of similarly located receptors.

Noise measurements typically consist of a series of 15-minute measurements (minimum of two at roughly the same time of day.) If these measurements differ by more than 3 dBA, a third measurement is needed, unless the variation can be explained by specific noise events that occurred during the measurement period.

On rural or smaller widening road projects, there may be a small number of receptors, such that determination of existing noise levels along the entire project may not be necessary. One approach to this situation is to make a longer term measurement (including peak traffic periods and daytime off-peak periods) at one measurement location close to the existing road. The results can then be used to determine the worst noise hour. Short term measurements taken at other locations during this longer term measurement can be adjusted later to represent the worst hour based on data from the longer term measurement location. While ambient noise level measurements should be made during the worst noise hour, it may not always be practical to do so in rural areas of Alaska.

5.6.2.2 Model Validation

Model validation is done by comparing measured noise levels with modeled noise levels using the same traffic volumes, mix, and speeds tallied during field noise measurements. Noise measurements for model validation do not have to be during the worst noise hour, but should not be made during periods of slow-moving traffic congestion.

Validation measurement locations should be representative of first-row receptor locations and should not be blocked by buildings or terrain features. Two or three measurements of at least 15 minutes in length are made at each location. Directional

traffic classification counts and average travel speeds of the five FHWA TNM vehicle types are made during each measurement. Pavement type must be noted and used in FHWA TNM.

For a FHWA TNM run of an NSA to be considered valid, two of the three modeled levels at each validation location must be within +/-3 dBA of the corresponding measured levels. When a discrepancy is over 3 dBA, the model input data should be examined for errors and refinements made. If a measured/modeled difference remains over 3 dBA after revision of the model, the discrepancy (and potential explanation) is noted in the noise analysis report.

5.6.3 Prediction of Future Noise Levels

Future condition noise predictions are made for each alternative under consideration, including the no-build alternative, using the latest version of the FHWA TNM program. Design year traffic conditions representing the worst noise hour (generally, Level of Service (LOS) C or D,) are used. Highway traffic noise analysis should consider absolute noise levels as well as substantial increases in noise levels for abatement evaluations.

Where appropriate, take into account any seasonal variations in traffic. Use the guidance in Sections 5.3 and 5.4.1 of this policy when choosing receptors for modeling as receivers in FHWA TNM. Loss of shielding of the roadway due to topography, buildings, or vegetation that may be eliminated when the roadway is built should be taken into account.

5.6.4 Determination of Future Noise Levels on Undeveloped Lands

Design year noise levels based on design hourly volumes need to be predicted for Category G lands. This can be done using the simplified modeling procedure described in Section 5.5 of this policy. At a minimum, this analysis should report the distances from the proposed edge of the near travel lane out to where worst hour $L_{eq}(h)$ levels of 60 and 64 dBA are modeled to occur. These results are then provided to local public agencies to assist them in planning.

Creation of noise contours for undeveloped lands will be considered on an individual project basis. Noise contours may only be used for project alternative screening or for land use planning purposes. They may not be used for determining highway traffic noise impacts.

5.6.5 Determination of Traffic Noise Impacts

For Type I projects, noise impacts must be determined for all Activity Category A-E land uses in the analysis area. Impacts occur when a proposed project results in a substantial noise increase or when the predicted design year noise levels approach, meet, or exceed the NAC. As defined in Section 3.0, a "substantial noise increase" occurs when a design year noise level ($L_{eq}(h)$) is predicted to increase 15 or more dBA above the existing level and "approach" means a design year noise level is predicted to be one decibel below the NAC for Activity Categories A-E (Appendix B, Table 1.) When

one or both impact type(s) occur, noise abatement measures must be evaluated for Type I projects.

6.0 ANALYSIS OF NOISE ABATEMENT MEASURES

Depending upon the date of public knowledge of the project and the Activity Category of the receptors, traffic noise abatement measures are to be considered when traffic noise impacts have been identified through the noise analysis process, with the exceptions noted in Sections 5.4 and 5.5.

6.1 Date of Public Knowledge

The date of public knowledge of a proposed transportation project is used to determine whether noise abatement should be considered as part of the project. This date (as defined in 23 CFR 772) is the date that a NEPA decision document was approved for the project. DOT&PF will only consider abatement measures if the impacted receptor was developed or permitted for development before the date of public knowledge.

6.2 Abatement Considerations

Noise abatement measures must be found to be both feasible and reasonable in order to be included in a proposed project. A Noise Abatement Recommendation Worksheet (located in Appendix C) should be completed to assist in the decision-making process. Feasibility and reasonableness are each described in detail later in this section.

For Type I projects that have had a Detailed Noise Analysis conducted, DOT&PF will evaluate noise abatement when traffic noise impacts are predicted for land use Activity Categories A-E, with some exceptions as noted in Section 5.3. When an impact is identified, noise abatement measures will be evaluated after first considering whether project design changes (*e.g.*, altering the horizontal and/or vertical alignment) may reduce or eliminate the impact.

6.3 Possible Noise Abatement Measures

Federal funds may be used for the following noise abatement measures when traffic noise impacts have been identified and abatement measures have been determined to be feasible and reasonable, pursuant to 23 CFR 772.13(d). The costs of such measures may be included in Federal-aid participation project costs with the Federal share being the same as that for the system on which the project is located.

The following noise abatement measures may be considered for incorporation into a Type I project to reduce traffic noise impacts.

(1) Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way. Landscaping is not a viable noise abatement measure.

(2) Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
(3) Alteration of horizontal and vertical alignments.
(4) Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
(5) Noise insulation of Activity Category D land use facilities listed in Table 1. Post-installation maintenance and operational costs for noise insulation are not eligible for federal-aid funding.

Alternative (quieter) pavement is not a FHWA-approved noise abatement measure for Federal-aid projects and consequently cannot be used as noise abatement on Federal-aid projects. DOT&PF may consider using alternative pavements to reduce traffic noise on State-funded projects (see Section 9.0 of this policy.)

At this time, DOT&PF does not use absorptive treatments as a functional enhancement of noise barriers.

6.4 Feasibility

Determinations of noise abatement measure feasibility are made by considering whether a certain amount of noise reduction can be achieved by the measure and whether the measure is possible to design and construct.

6.4.1 Acoustical Feasibility

Acoustical feasibility refers to the minimum number of impacted receptors that must receive 5 dBA highway traffic noise reduction for a proposed abatement measure to be feasible. For DOT&PF projects, a 5 dBA or more reduction must be achieved for at least three impacted front row receptors in order for the abatement measure to be considered acoustically feasible.

If significant non-highway noise sources exist in the project area, such as rail lines or airports, noise barrier effectiveness may be compromised. These situations will be carefully evaluated to determine if a noise barrier for the highway noise sources is feasible.

6.4.2 Engineering Feasibility

Noise abatement measures are not feasible if they create a safety hazard to the driving public, protected receptors, or maintenance personnel. The project development team will consult with the appropriate DOT&PF functional groups when determining whether it is possible to design and construct a noise abatement measure. Noise abatement measures should be consistent with the following general design principles:

- Noise abatement measures should be located beyond the recovery zone of the traveled way; if a noise abatement measure must be located within the recovery zone, a traffic barrier may be warranted.

- Noise abatement measures may not block the recommended sight distance (Alaska Highway Preconstruction Manual, Chapter 11) between vehicles and intersecting roadways or on/off-ramps.
- Protrusions on noise abatement measures near a traffic lane should be avoided.
- Facings on noise abatement measures that can become dislodged, or barrier components that could shatter during an accident, or facings that create excessive glare should be avoided.
- Access should be provided to all sides of noise abatement measures to allow for maintenance activities to take place.

All noise abatement measures should consider the design principles outlined in the "*Guide on Evaluation and Abatement of Traffic Noise*", AASHTO, 1993 and the *"FHWA Highway Noise Barrier Design Handbook*", FHWA, 2000.

6.5 Reasonableness

The following three reasonableness factors must be evaluated in order for a noise abatement measure to be considered reasonable, pursuant to 23 CFR 772.13:

1) Viewpoints of the property owners and residents of the benefitted receptors.
2) Cost Effectiveness.
3) Noise Reduction Design Goal.

These three reasonableness factors must collectively be achieved in order for a noise abatement measure to be deemed reasonable. Refer to Section 9.0 for a list of additional optional reasonableness factors that may be used only on State-funded projects.

6.5.1 Viewpoints of the property owners and residents of the benefited receptors

Public involvement for noise abatement is required for all categories of environmental document. To determine the views of benefited households and property owners, DOT&PF will contact all benefited households and property owners to determine the level of interest for a noise abatement measure. This contact can be in the form of a mail out questionnaire, phone call survey, or door to door interviews - whichever is most practical and cost effective for the size of the proposed project.

Noise abatement will be carried forward if there is a 60% majority of viewpoints received in support of the barrier. If a property has multiple dwelling units, the owner(s) of the multi-unit dwelling will provide input for the property as a whole, not for each individual dwelling unit. A second outreach attempt will be made if the response rate is less than 40% of all possible respondents.

6.5.2 Cost Effectiveness

The noise abatement measure cost is no more than $38,000[1] per benefitted receptor, based upon the design engineer's estimate. This is determined by counting all receptors (including owner-occupied, rental units, mobile homes, and businesses) benefited by the noise abatement measure in any subdivision and/or given development, and dividing that number into the total cost of the noise abatement measure. A benefited receptor is defined as the recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dBA. Each unit in a multi-family building will be counted as a separate receptor. Cost per benefited receptor must be reanalyzed at a regular interval not to exceed 5 years.

When the design engineer determines abatement measure cost, the estimate will include all items necessary for the construction of the noise abatement measure. Examples of cost items that should be included are traffic control (related to the noise barrier), drainage modification, foundations, retaining walls and right-of-way. Include a cost item only if it is directly related to the construction of the noise abatement measure[2]. If a necessary project feature such as a retaining wall is included, then that cost will not be added into the noise abatement construction cost estimate. If the project incorporates visual mitigation such as the use of a transparent barrier with surface texture, the additional cost will not be included in the abatement construction cost estimate for the purpose of determining reasonableness. Aesthetic treatments, such as artwork, re-vegetation, landscaping, and barrier treatments will not be included in the abatement measure cost estimate for the purpose of determining reasonableness.

6.5.3 Noise Reduction Design Goal

The DOT&PF noise reduction design goal is 7 dBA. At least 50 percent of the benefited receptors in the first row of structures must achieve this design goal for the noise abatement to be considered reasonable. If this design goal is not attainable, then the noise abatement cannot be carried forward. Refer to Section 9.0 for a list of additional criteria that apply only to State-funded projects.

6.5.4 Noise Abatement Recommendation Worksheet

A noise abatement recommendation worksheet (Appendix C) will be filled out for each NSA in the noise analysis. The REM will approve and sign the worksheets. If an abatement measure is determined to not be feasible, then the reasonableness analysis section of the worksheet does not need to be completed. Likewise, if it is determined that the abatement measure is not reasonable, the feasibility portion of the worksheet does not have to be filled out.

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[1] DOT&PFs April 2011 cost per benefited receptor was adjusted for inflation (CPI September 2018) to $38,000 cost per benefited receptor.

[2] DOT&PF will need to provide proof to the FHWA Division Office that the cost of any of these are solely and directly related to the noise abatement measure

DOT&PF will only implement a noise abatement measure if it has been determined to be both feasible and reasonable. The REM will recommend or not recommend that a noise abatement measure be implemented. The recommendation worksheet will be submitted to the Project Manager (PM) who will sign the recommendation worksheet. If the PM does not approve the recommendation then the Preconstruction Engineer will resolve the dispute. The Preconstruction Engineer only needs to sign the noise abatement recommendation worksheet if alternative pavements are recommended as abatement on State-funded projects. The REM will ensure that the recommendation is included in the project's environmental document.

6.6 Third Party Funding

For Type I Federal-aid projects, third party funding cannot be used if the noise abatement would require the additional funding in order to be considered feasible and/or reasonable. Third party funding can be used to pay for additional features such as landscaping, aesthetic treatments, and functional enhancements for noise barriers that have already been determined to be feasible and reasonable.

6.7 Information Required for a NEPA Decision

It is important to maintain accurate and complete documentation of noise impact analyses and any decisions to provide noise abatement. The noise analysis reports for Type I projects are stand-alone documents. Information is taken from the noise analysis report to support the NEPA analysis and decision. The specific information required is outlined in 23 CFR 772.13.

Decisions to provide or not provide noise abatement must be well-explained and defensible. Prior to the NEPA decision, DOT&PF must identify and document:

1) Where noise impacts occur;
2) The prospective noise abatement measures that are feasible and reasonable, and are likely to be incorporated into the project; and
3) Noise impact locations for which no abatement appears to be feasible and reasonable.

For noise abatement measures that have been found to be feasible and reasonable, a statement of likelihood, similar to the following, should be included in the environmental document narrative in the interest of public disclosure:

"As a result of the feasibility and reasonableness analysis conducted as a part of the environmental document, the DOT&PF proposes to incorporate the following noise abatement measures (type, locations) into the proposed project. These noise abatement recommendations are preliminary and based upon the feasibility and reasonableness analysis completed at the time the environmental document. Final recommendations for noise abatement will be based upon the feasibility and reasonable analysis conducted during the detailed design of the project. Any changes in the final abatement

recommendations will result in the reevaluation of the approved NEPA document and the solicitation of additional public comment."

The noise analysis report should include a description of each abatement measure considered, a discussion of the anticipated costs, problems, and disadvantages associated with that abatement measure, and a discussion of the anticipated benefits. The noise analysis must be appended to the environmental document, and should be in the following general format:

Cover Page
Table of Contents
Summary
Project Background
Purpose of Analysis
Methods
    Model
    Validation Process
Description of Land Use Categories along the Corridor
Results
Identification of Noise Impacts
Noise Abatement Analysis
Abatement Recommendations
Statement of Likelihood
Construction Noise
Conclusion
Appendices
    DOT&PF NOISE POLICY
    TNM Model inputs/outputs and supporting CAD/design files

During the detailed design of the proposed project, recommendations for noise abatement made in the environmental document will be reevaluated to determine if they are still valid. If it is determined that any noise abatement measure recommendation is no longer valid, then the affected public will be notified and the environmental document will be reevaluated or supplemented as appropriate.

6.8 Design-Build Projects

For design-build projects, as with any DOT&PF project, DOT&PF is ultimately responsible for the NEPA decisions and as such, noise abatement measures must be considered, developed, and constructed in accordance with the provisions of 23 CFR 772, 23 CFR 636.109, and this policy.

6.9 Inventory and Reporting of Abatement Measures

DOT&PF will maintain an inventory of all constructed noise abatement measures and will on a periodic basis provide the Alaska Division of FHWA the parameters outlined in

23 CFR 772.13(f). DOT&PF will enter the data into a spreadsheet as abatement measures are implemented.

7.0 INFORMATION FOR LOCAL OFFICIALS

In an effort to reduce future traffic noise impacts on currently undeveloped lands and to maintain compatibility between highways and future development, DOT&PF will provide the results of Type I highway traffic noise analyses to local government officials. With regard to undeveloped lands that have not been permitted for development, the results will include at a minimum the distances from the proposed edge of the traveled way to where the design year $L_{eq}(h)$ of 60 and 64 dBA are predicted to occur.

8.0 CONSTRUCTION NOISE

Construction of a highway project may cause localized, short-duration noise impacts. Construction noise can adversely affect people living in the area. Analysis and mitigation of construction noise impacts will be addressed when noise and vibration issues arise during project development or if complaints are received by the public.

For all Type I Federal and State Projects, it is DOT&PF policy to:

(a) Identify land uses or activities that may be affected by noise from construction of the project. The identification is to be performed during the project development studies.
(b) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall include a weighing of the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.
(c) Incorporate the needed abatement measures in the plans and specifications.

The REM, environmental analyst and design engineering manager will coordinate to incorporate appropriate mitigation measures for construction noise as determined appropriate by DOT&PF. These may be incorporated into the plans and specifications and include: requirements for staging areas, time periods where no noise generating activities can occur, and public outreach requirements.

In the event that construction noise complaints occur during the course of construction activities, measures will be taken by the Construction Project Engineer, in consultation with the REM, to resolve the problem to the extent practical. Measures might include locating stationary construction equipment as far from nearby noise sensitive receivers as possible, shutting off idling equipment, rescheduling construction operations to avoid periods of noise annoyance, notifying nearby residents whenever extremely noisy operations will be occurring, and installing permanent or portable acoustic abatement measures around stationary construction noise sources.

In some cases there are no alternatives to conducting construction activities during the night, on weekends, or on holidays. When deemed necessary, DOT&PF will make every effort to notify the public prior to conducting these activities. Public involvement in these cases should occur during design and throughout the construction duration. In some communities, local ordinances may restrict noise generating activities. DOT&PF and its contractor(s) will comply with local noise ordinances and acquire any necessary noise permits for construction activities prior to their initiation.

While construction noise modeling is not regularly done for Type I noise studies, the FHWA Roadway Construction Noise Model (RCNM) may be used to predict noise levels from various types of equipment and construction activities. In some cases (*e.g.*, pile driving near residences,) construction noise modeling may be warranted for Type III projects as well.

9.0 STATE-FUNDED PROJECTS

In general, the same methods are followed in the identification of noise impacts for Type I State-funded projects as for Type I Federal-aid projects. Results of noise analyses will be documented in the State Project Environmental Checklist. If noise abatement is determined to be feasible and reasonable, then the REM will make a recommendation to the Preconstruction Engineer. The Preconstruction Engineer will decide whether the recommended abatement measure will be constructed. Abatement will be provided only if it meets the feasibility and reasonableness criteria of this policy and the Preconstruction Engineer determines that the state funded appropriation can accommodate the expenditure.

In addition to the reasonableness factors outlined for Federal-aid projects in Section 6.5, above, the following optional reasonableness factors may be used to increase the cost allowed on State-funded projects:

1) Date of development.
2) Length of time receivers have been exposed to highway traffic noise impacts.
3) Exposure to higher absolute traffic noise levels.
4) Changes between existing and future build conditions.
5) Percentage of mixed zone development.
6) Use of noise compatible planning concepts by the local government.

No single optional reasonableness factor shall be used to determine that a noise abatement measure is unreasonable.

In addition to the criteria outlined for Federal-aid projects in Section 6.5.3, above, the following noise reduction design goal criteria apply only to State-funded projects:

1) Development vs. Highway Timing. At least 50 percent of impacted receptors in the development (subdivision, apartment complex, etc.) were built before initial construction of the highway. The date of development is an important part of the determination of reasonableness. More consideration is given to developments that were built before the highway was built.
2) Development Existence. At least 50 percent of impacted receptors in the development have existed for at least 10 years. More consideration is given to residents who have experienced traffic noise impacts for long periods of time.
3) Absolute Predicted Build Noise Level. The predicted future build noise levels are at least 66 dBA. More consideration should be given to areas with higher absolute traffic noise levels. Absolute noise levels typically found along highways, 60-75 dBA, are deemed undesirable and cause complaints from adjacent residents. In general, the higher the absolute noise, the more complaints.
4) Relative Predicted Build Noise Level. The predicted future build noise levels are at least 10 dBA greater than the existing noise levels. More consideration is given to areas with larger increases over existing noise levels. This gives greater consideration to projects for highways on new location and major reconstruction than it does to projects of smaller magnitude. For most people, a 3 dBA increase is barely perceptible, a 5 dBA increase is readily perceptible, and a 10 dBA increase doubles the perceived loudness of the noise.
5) Build vs. No-Build Noise Levels. The future build noise levels are at least 5 dBA greater than the future no-build noise levels. More consideration should be given to areas where larger changes in traffic noise levels are expected to occur if the project is constructed than if it is not.
6) Land use. Land use is not changing rapidly and there are local ordinances or zoning in place to control the new development of noise sensitive land uses adjacent to transportation corridors.

DOT&PF may consider using alternative pavements to reduce traffic noise on State-funded projects. However, the decision to provide such a measure will be made by the Preconstruction Engineer.

10.0 UPDATES TO POLICY

This policy is effective upon signature and replaces the Alaska DOT&PF April 2011 Noise Policy. Changes to the policy will be made as needed, or every 5 years, per FHWA recommendation.

REFERENCES

"*Guide on Evaluation and Abatement of Traffic Noise*" (AASHTO, 1993)

"FHWA Highway Noise Barrier Design Handbook" (FHWA, 2000)

"Measurement of Highway-Related Noise" report (FHWA Report Number FHWA-PD-96-046, 1996)

http://www.fhwa.dot.gov/environment/noise/

FHWA *Highway Traffic Noise: Analysis and Abatement Guidance* June 2010 is available at the following website
http://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/guidancedoc.pdf

Noise Model Web site at the following URL http://www.fhwa.dot.gov/environment/noise/index.htm.

APPENDIX A - FHWA 23 CFR 772

Code of Federal Regulations
Current as of October 12, 2018
Title 23 → Chapter I → Subchapter H → Part 772

PART 772—PROCEDURES FOR ABATEMENT OF HIGHWAY TRAFFIC NOISE AND CONSTRUCTION NOISE

Contents

AUTHORITY: 23 U.S.C. 109(h) and (i); 42 U.S.C. 4331, 4332; sec. 339(b), Pub. L. 104-59, 109 Stat. 568, 605; 49 CFR 1.48(b).

SOURCE: 75 FR 39834, July 13, 2010, unless otherwise noted.

§772.1 Purpose.

To provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to title 23 U.S.C.

§772.3 Noise standards.

The highway traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials in this regulation constitute the noise standards mandated by 23 U.S.C. 109(1). All highway projects which are developed in conformance with this regulation shall be deemed to be in accordance with the FHWA noise standards.

§772.5 Definitions.

Benefited receptor. The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dB(A), but not to exceed the highway agency's reasonableness design goal.

Common Noise Environment. A group of receptors within the same Activity Category in Table 1 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, cross-roads.

Date of public knowledge. The date of approval of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), or the Record of Decision (ROD), as defined in 23 CFR part 771.

Design year. The future year used to estimate the probable traffic volume for which a highway is designed.

Existing noise levels. The worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

Feasibility. The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

Impacted Receptor. The recipient that has a traffic noise impact.

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

Leq. 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.

Multifamily dwelling. A residential structure containing more than one residence. Each residence in a multifamily dwelling shall be counted as one receptor when determining impacted and benefited receptors.

Noise barrier. A physical obstruction that is constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level, including stand alone noise walls, noise berms (earth or other material), and combination berm/wall systems.

Noise reduction design goal. The optimum desired dB(A) noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The noise reduction design goal shall be at least 7 dB(A), but not more than 10 dB(A).

Permitted. A definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit.

Property owner. An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

Reasonableness. The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

Receptor. A discrete or representative location of a noise sensitive area(s), for any of the land uses listed in Table 1.

Residence. A dwelling unit. Either a single family residence or each dwelling unit in a multifamily dwelling.

Statement of likelihood. A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

Substantial construction. The granting of a building permit, prior to right-of-way acquisition or construction approval for the highway.

Substantial noise increase. One of two types of highway traffic noise impacts. For a Type I project, an increase in noise levels of 5 to 15 dB(A) in the design year over the existing noise level.

Traffic noise impacts. Design year build condition noise levels that approach or exceed the NAC listed in Table 1 for the future build condition; or design year build condition noise levels that create a substantial noise increase over existing noise levels.

Type I project. (1) The construction of a highway on new location; or,

(2) The physical alteration of an existing highway where there is either:

(i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,

(ii) Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,

(3) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,

(4) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,

(5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,

(6) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,

(7) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

(8) If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I project.

Type II project. A Federal or Federal-aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e).

Type III project. A Federal or Federal-aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

§772.7 Applicability.

(a) This regulation applies to all Federal or Federal-aid Highway Projects authorized under title 23, United States Code. Therefore, this regulation applies to any highway project or multimodal project that:

(1) Requires FHWA approval regardless of funding sources, or

(2) Is funded with Federal-aid highway funds.

(b) In order to obtain FHWA approval, the highway agency shall develop noise policies in conformance with this regulation and shall apply these policies uniformly and consistently statewide.

(c) This regulation applies to all Type I projects unless the regulation specifically indicates that a section only applies to Type II or Type III projects.

(d) The development and implementation of Type II projects are not mandatory requirements of section 109(i) of title 23, United States Code.

(e) If a highway agency chooses to participate in a Type II program, the highway agency shall develop a priority system, based on a variety of factors, to rank the projects in the program. This priority system shall be submitted to and approved by FHWA before the highway agency is allowed to use Federal-aid funds for a project in the program. The highway agency shall re-analyze the priority system on a regular interval, not to exceed 5 years.

(f) For a Type III project, a highway agency is not required to complete a noise analysis or consider abatement measures.

§772.9 Traffic noise prediction.

(a) Any analysis required by this subpart must use the FHWA Traffic Noise Model (TNM), which is described in "FHWA Traffic Noise Model" Report No. FHWA-PD-96-010, including Revision No. 1, dated April 14, 2004, or any other model determined by the FHWA to be consistent with the methodology of the FHWA TNM. These publications are incorporated by reference in accordance with section 552(a) of title 5, U.S.C. and part 51 of title 1, CFR, and are on file at the National Archives and Record Administration (NARA). For information on the availability of this material at NARA, call (202) 741-6030 or go to *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* These documents are available for copying and inspection at the Federal Highway Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590, as provided in part 7 of title 49, CFR. These documents are also available on the FHWA's Traffic Noise Model Web site at the following URL: *http://www.fhwa.dot.gov/environment/noise/index.htm.*

(b) Average pavement type shall be used in the FHWA TNM for future noise level prediction unless a highway agency substantiates the use of a different pavement type for approval by the FHWA.

(c) Noise contour lines may be used for project alternative screening or for land use planning to comply with §772.17 of this part, but shall not be used for determining highway traffic noise impacts.

(d) In predicting noise levels and assessing noise impacts, traffic characteristics that would yield the worst traffic noise impact for the design year shall be used.

§772.11 Analysis of traffic noise impacts.

(a) The highway agency shall determine and analyze expected traffic noise impacts.

(1) For projects on new alignments, determine traffic noise impacts by field measurements.

(2) For projects on existing alignments, predict existing and design year traffic noise impacts.

(b) In determining traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs.

(c) A traffic noise analysis shall be completed for:

(1) Each alternative under detailed study;

(2) Each Activity Category of the NAC listed in Table 1 that is present in the study area;

(i) *Activity Category A.* This activity category includes the exterior impact criteria for 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 for the area to continue to serve its intended purpose. Highway agencies shall submit justifications to the FHWA on a case-by-case basis for approval of an Activity Category A designation.

(ii) *Activity Category B.* This activity category includes the exterior impact criteria for single-family and multifamily residences.

(iii) *Activity Category C.* This activity category includes the exterior impact criteria for a variety of land use facilities. Each highway agency shall adopt a standard practice for analyzing these land use facilities that is consistent and uniformly applied statewide.

(iv) *Activity Category D.* This activity category includes the interior impact criteria for certain land use facilities listed in Activity Category C that may have interior uses. A highway agency shall conduct an indoor analysis after a determination is made that exterior abatement measures will not be feasible and reasonable. An indoor analysis shall only be done after exhausting all outdoor analysis options. In situations where no exterior activities are to be affected by the traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, the highway agency shall use Activity Category D as the basis of determining noise impacts. Each highway agency shall adopt a standard practice for analyzing these land use facilities that is consistent and uniformly applied statewide.

(v) *Activity Category E.* This activity category includes the exterior impact criteria for developed lands that are less sensitive to highway noise. Each highway agency shall adopt a standard practice for analyzing these land use facilities that is consistent and uniformly applied statewide.

(vi) *Activity Category F.* This activity category includes developed lands that are not sensitive to highway traffic noise. There is no impact criteria for the land use facilities in this activity category and no analysis of noise impacts is required.

(vii) *Activity Category G.* This activity includes undeveloped lands.

(A) A highway agency shall determine if undeveloped land is permitted for development. The milestone and its associated date for acknowledging when undeveloped land is considered permitted shall be the date of issuance of a building permit by the local jurisdiction or by the appropriate governing entity.

(B) If undeveloped land is determined to be perrmitted, then the highway agency shall assign the land to the appropriate Activity Category and analyze it in the same manner as developed lands in that Activity Category.

(C) If undeveloped land is not permitted for development by the date of public knowledge, the highway agency shall determine noise levels in accordance with 772.17(a) and document the results in the project's environmental clearance documents and noise analysis documents. Federal participation in noise abatement measures will not be considered for lands that are not permitted by the date of public knowledge.

(d) The analysis of traffic noise impacts shall include:

(1) Identification of existing activities, developed lands, and undeveloped lands, which may be affected by noise from the highway;

(2) For projects on new or existing alignments, validate predicted noise level through comparison between measured and predicted levels;

(3) Measurement of noise levels. Use an ANSI Type I or Type II integrating sound level meter;

(4) Identification of project limits to determine all traffic noise impacts for the design year for the build alternative. For Type II projects, traffic noise impacts shall be determined from current year conditions;

(e) Highway agencies shall establish an approach level to be used when determining a traffic noise impact. The approach level shall be at least 1 dB(A) less than the Noise Abatement Criteria for Activity Categories A to E listed in Table 1 to part 772;

(f) Highway agencies shall define substantial noise increase between 5 dB(A) to 15 dB(A) over existing noise levels. The substantial noise increase criterion is independent of the absolute noise level.

(g) A highway agency proposing to use Federal-aid highway funds for a Type II project shall perform a noise analysis in accordance with §772.11 of this part in order to provide information needed to make the determination required by §772.13(a) of this part.

§772.13 Analysis of noise abatement.

(a) When traffic noise impacts are identified, noise abatement shall be considered and evaluated for feasibility and reasonableness. The highway agency shall determine and analyze alternative noise abatement measures to abate identified impacts by giving weight to the benefits and costs of abatement and the overall social, economic, and environmental effects by using feasible and reasonable noise abatement measures for decision-making.

(b) In abating traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs.

(c) If a noise impact is identified, a highway agency shall consider abatement measures. The abatement measures listed in §772.15(c) of this part are eligible for Federal funding.

(1) At a minimum, the highway agency shall consider noise abatement in the form of a noise barrier.

(2) If a highway agency chooses to use absorptive treatments as a functional enhancement, the highway agency shall adopt a standard practice for using absorptive treatment that is consistent and uniformly applied statewide.

(d) *Examination and evaluation of feasible and reasonable noise abatement measures for reducing the traffic noise impacts.* Each highway agency, with FHWA approval, shall develop feasibility and reasonableness factors.

(1) *Feasibility*: (i) Achievement of at least a 5 dB(A) highway traffic noise reduction at impacted receptors. The highway agency shall define, and receive FHWA approval for, the number of receptors that must achieve this reduction for the noise abatement measure to be acoustically feasible and explain the basis for this determination; and

(ii) Determination that it is possible to design and construct the noise abatement measure. Factors to consider are safety, barrier height, topography, drainage, utilities, and maintenance of the abatement measure, maintenance access to adjacent properties, and access to adjacent properties (*i.e.* arterial widening projects).

(2) *Reasonableness*:(i) *Consideration of the viewpoints of the property owners and residents of the benefited receptors.* The highway agency shall solicit the viewpoints of all of the benefited receptors and obtain enough responses to document a decision on either desiring or not desiring the noise abatement measure. The highway agency shall define, and receive FHWA approval for, the number of receptors that are needed to constitute a decision and explain the basis for this determination.

(ii) *Cost effectiveness of the highway traffic noise abatement measures.* Each highway agency shall determine, and receive FHWA approval for, the allowable cost of abatement by determining a baseline cost reasonableness value. This determination may include the actual construction cost of noise abatement, cost per square foot of abatement, the maximum square

footage of abatement/benefited receptor and either the cost/benefited receptor or cost/benefited receptor/dB(A) reduction. The highway agency shall re-analyze the allowable cost for abatement on a regular interval, not to exceed 5 years. A highway agency has the option of justifying, for FHWA approval, different cost allowances for a particular geographic area(s) within the State, however, the highway agancy must use the same cost reasonableness/construction cost ratio statewide.

(iii) *Noise reduction design goals for highway traffic noise abatement measures.* When noise abatement measure(s) are being considered, a highway agency shall achieve a noise reduction design goal. The highway agency shall define, and receive FHWA approval for, the design goal of at least 7 dB(A) but not more than 10 dB(A), and shall define the number of benefited receptors that must achieve this design goal and explain the basis for this determination.

(iv) The reasonableness factors listed in §772.13(d)(5)(i), (ii) and (iii), must collectively be achieved in order for a noise abatement measure to be deemed reasonable. Failure to achieve §772.13(d)(5)(i), (ii) or (iii), will result in the noise abatement measure being deemed not reasonable.

(v) In addition to the required reasonableness factors listed in §772.13(d)(5)(i), (ii), and (iii), a highway agency has the option to also include the following reasonableness factors: Date of development, length of time receivers have been exposed to highway traffic noise impacts, exposure to higher absolute highway traffic noise levels, changes between existing and future build conditions, percentage of mixed zoning development, and use of noise compatible planning concepts by the local government. No single optional reasonableness factor can be used to determine reasonableness.

(e) Assessment of Benefited Receptors. Each highway agency shall define the threshold for the noise reduction which determines a benefited receptor as at or above the 5 dB(A), but not to exceed the highway agency's reasonableness design goal.

(f) *Abatement measure reporting*: Each highway agency shall maintain an inventory of all constructed noise abatement measures. The inventory shall include the following parameters: type of abatement; cost (overall cost, unit cost per/sq. ft.); average height; length; area; location (State, county, city, route); year of construction; average insertion loss/noise reduction as reported by the model in the noise analysis; NAC category(s) protected; material(s) used (precast concrete, berm, block, cast in place concrete, brick, metal, wood, fiberglass, combination, plastic (transparent, opaque, other); features (absorptive, reflective, surface texture); foundation (ground mounted, on structure); project type (Type I, Type II, and optional project types such as State funded, county funded, tollway/turnpike funded, other, unknown). The FHWA will collect this information, in accordance with OMB's Information Collection requirements.

(g) Before adoption of a CE, FONSI, or ROD, the highway agency shall identify:

(1) Noise abatement measures which are feasible and reasonable, and which are likely to be incorporated in the project; and

(2) Noise impacts for which no noise abatement measures are feasible and reasonable.

(3) *Documentation of highway traffic noise abatement*: The environmental document shall identify locations where noise impacts are predicted to occur, where noise abatement is feasible and reasonable, and locations with impacts that have no feasible or reasonable noise abatement alternative. For environmental clearance, this analysis shall be completed to the extent that design information on the alterative(s) under study in the environmental document is available at the time the environmental clearance document is completed. A statement of likelihood shall be included in the environmental document since feasibility and reasonableness determinations may change due to changes in project design after approval of the environmental document. The statement of likelihood shall include the preliminary location and physical description of noise abatement measures determined feasible and reasonable in the preliminary analysis. The statement of likelihood shall also indicate that final recommendations on the construction of an abatement measure(s) is determined during the completion of the project's final design and the public involvement processes.

(h) The FHWA will not approve project plans and specifications unless feasible and reasonable noise abatement measures are incorporated into the plans and specifications to reduce the noise impact on existing activities, developed lands, or undeveloped lands for which development is permitted.

(i) For design-build projects, the preliminary technical noise study shall document all considered and proposed noise abatement measures for inclusion in the NEPA document. Final design of design-build noise abatement measures shall be based on the preliminary noise abatement design developed in the technical noise analysis. Noise abatement measures shall be considered, developed, and constructed in accordance with this standard and in conformance with the provisions of 40 CFR 1506.5(c) and 23 CFR 636.109.

(j) Third party funding is not allowed on a Federal or Federal-aid Type I or Type II project if the noise abatement measure would require the additional funding from the third party to be considered feasible and/or reasonable. Third party funding is acceptable on a Federal or Federal-aid highway Type I or Type II project to make functional enhancements, such as absorptive treatment and access doors or aesthetic enhancements, to a noise abatement measure already determined feasible and reasonable.

(k) On a Type I or Type II projects, a highway agency has the option to cost average noise abatement among benefited receptors within common noise environments if no single common noise environment exceeds two times the highway agency's cost reasonableness criteria and collectively all common noise environments being averaged do not exceed the highway agency's cost reasonableness criteria.

§772.15 Federal participation.

(a) *Type I and Type II projects.* Federal funds may be used for noise abatement measures when:

(1) Traffic noise impacts have been identified; and

(2) Abatement measures have been determined to be feasible and reasonable pursuant to §772.13(d) of this chapter.

(b) *For Type II projects.* (1) No funds made available out of the Highway Trust Fund may be used to construct Type II noise barriers, as defined by this regulation, if such noise barriers were not part of a project approved by the FHWA before the November 28, 1995.

(2) Federal funds are available for Type II noise barriers along lands that were developed or were under substantial construction before approval of the acquisition of the rights-of-ways for, or construction of, the existing highway.

(3) FHWA will not approve noise abatement measures for locations where such measures were previously determined not to be feasible and reasonable for a Type I project.

(c) *Noise abatement measures.* The following noise abatement measures may be considered for incorporation into a Type I or Type II project to reduce traffic noise impacts. The costs of such measures may be included in Federal-aid participating project costs with the Federal share being the same as that for the system on which the project is located.

(1) Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way. Landscaping is not a viable noise abatement measure.

(2) Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.

(3) Alteration of horizontal and vertical alignments.

(4) Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise. This measure may be included in Type I projects only.

(5) Noise insulation of Activity Category D land use facilities listed in Table 1. Post-installation maintenance and operational costs for noise insulation are not eligible for Federal-aid funding.

§772.17 Information for local officials.

(a) To minimize future traffic noise impacts on currently undeveloped lands of Type I projects, a highway agency shall inform local officials within whose jurisdiction the highway project is located of:

(1) Noise compatible planning concepts;

(2) The best estimation of the future design year noise levels at various distances from the edge of the nearest travel lane of the highway improvement where the future noise levels meet the highway agency's definition of "approach" for undeveloped lands or properties within the project limits. At a minimum, identify the distance to the exterior noise abatement criteria in Table 1;

(3) Non-eligibility for Federal-aid participation for a Type II project as described in §772.15(b).

(b) If a highway agency chooses to participate in a Type II noise program or to use the date of development as one of the factors in determining the reasonableness of a Type I noise abatement measure, the highway agency shall have a statewide outreach program to inform local officials and the public of the items in §772.17(a)(1) through (3).

§772.19 Construction noise.

For all Type I and II projects, a highway agency shall:

(a) Identify land uses or activities that may be affected by noise from construction of the project. The identification is to be performed during the project development studies.

(b) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall include a weighing of the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.

(c) Incorporate the needed abatement measures in the plans and specifications.

Table 1 to Part 772—Noise Abatement Criteria

[Hourly A-Weighted Sound Level_decibels (dB(A))[1]]

Activity category	Activity Leq(h)	Criteria[2] L10(h)	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[3]	67	70	Exterior	Residential.
C[3]	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[3]	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]Either Leq(h) or L10(h) (but not both) may be used on a project.

[2]The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[3]Includes undeveloped lands permitted for this activity category.

APPENDIX B - Land Use Activity Categories and Noise Abatement Criteria

Table 1. Land Use Activity Categories and Noise Abatement Criteria

Activity Category	Activity Criteria[1] $L_{eq}(h)$, dBA	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A–D or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

[1]Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2]Includes undeveloped lands permitted for this activity category.

APPENDIX C - Feasibility and Reasonableness Worksheet

Feasibility and Reasonableness Worksheet Example

HIGHWAY TRAFFIC NOISE ABATEMENT FOR PROJECT:

Receiver ID No.(s):

Location/Description:

Activity Category type:

Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy):

Existing Noise Level (Leq):

Future Build Noise Level (Leq):

Future No-Build Noise Level:

Has a noise impact been identified (If yes continue filling out worksheet. If no, no noise abatement is required. Sign worksheet and recommend no noise abatement)?: Yes No

Highway Traffic Noise Abatement Feasibility and Reasonableness Analysis:

Feasibility

Is the proposed noise abatement measure acoustically feasible?	Yes	No

Is the proposed noise abatement measure engineering feasible	Yes	No

Reasonableness

Is the proposed noise abatement measure considered reasonable?	Yes	No

Federal Mandatory Factors

1 **Cost Effectiveness.** Is the abatement measure cost effective?

2 **Views of Benefited Residents and Property Owners.** Do at least 60 percent of the impacted residents and property owners' surveyed desire noise abatement?

3 **Noise reduction design goal**? Does the noise abatement measure provide 7 dBA reduction to 50 percent or more of the benefitted receptors in the first row of structures?

DOT&PF Mandatory Factors (State funded only)

4. Development vs. Highway Timing. Were at least 50 percent of benefited receptors in the development built before highway construction?

5 **Development Existence.** Have at least 50 percent of benefited receptors in the development existed for at least 10 years?

6 **Absolute Predicted Build Noise Level**. Are the predicted future build noise levels at least 66dBA?

7 **Relative Predicted Build Noise Level**. Are the predicted future build noise levels at least 10 dBA greater than the existing noise levels?

8 **Build vs. No-Build Noise Levels**. Are the future build noise levels at least 5 dBA greater than the future No-Build noise levels?

9..**Land Use**. Is the land use changing rapidly and are there local ordinances or zoning in place to control the new development of noise sensitive land uses adjacent to transportation corridors?

Is Noise Abatement recommended for this impacted receptor(s)?

What type of noise abatement is recommended? (Note – The use of quiet pavements is not an approved noise abatement measure on Federal- Aid Projects. Quiet pavements can be utilized as an abatement measure on State-funded projects with the approval of the Regional Preconstruction Engineer)

What is the basis for this recommendation?

_____ _____

Regional Environmental Manager Date

_____ _____

DOT&PF Project Manager Date

I have determined that the use of quiet pavement to mitigate noise impacts on a state-funded project is within the cost constraints of the legislative appropriation for the proposed project.

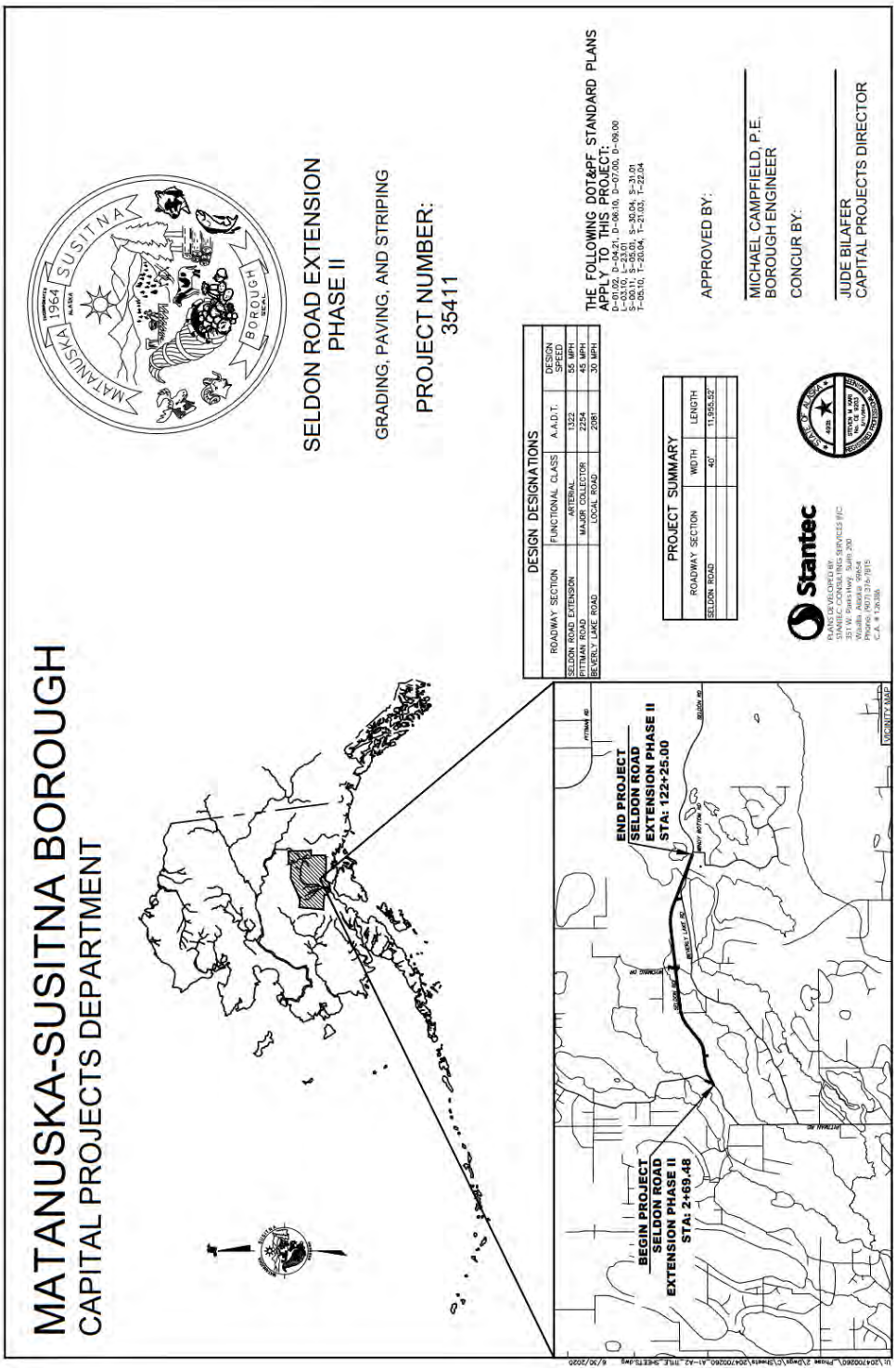
_____ _____

Preconstruction Engineer [3] Date

[3] The Preconstruction Engineer's signature is only required if quiet pavements are recommended on State-funded projects. The Preconstruction Engineer must determine whether the incorporation of quiet pavements into the State-funded project is within the cost constraints of the legislative appropriation

Appendix B: Project Design

The analysis is based on the following design files available from Stantec.



Appendix C: Introduction to Acoustics

Sound is defined as any pressure variation that the human ear can detect, from barely perceptible sounds to sound levels that can cause hearing damage. The magnitude of the variations of the air pressure from the static air pressure is a measure of the sound level. The number of cyclic pressure variations per second is the frequency of sound. When sounds are unpleasant, unwanted, or disturbingly loud, we tend to classify them as noise.

Compared with the static air pressure, the audible sound pressure variations range from the threshold of hearing, a very small 20 μPa (20 x 10^{-6} Pascal), to 100 Pa, a level so loud it is referred to as the threshold of pain. Because the ratio between these numbers is more than a million to one, using Pascal to describe sound levels can be awkward. The "dB" measurement is a logarithmic conversion of air pressure level variations from Pascal to a unit of measure with a more convenient numbering system. This conversion not only allows for a more convenient scale but is also a more accurate representation of how the human ear reacts to variations in air pressure. Measurements made using the decibel scale will be denoted dB.

The smallest noise level change that can be detected by the human ear is approximately 3 dB. A doubling in the static air pressure amounts to a change of 6 dB, and an increase of 10 dB is roughly equivalent to a doubling in the perceived sound level. Under free-field conditions, where there are no reflections or additional attenuation, sound is known to decrease at a rate of 6 dB for each doubling of distance. This is commonly known as the inverse square law. For example, a sound level of 70 dB at a distance of 100 feet would decrease to 64 dB at 200 feet, or 58 dB at 400 feet. The mathematical definition of sound pressure level in dB is listed below.

L_p (sound pressure level). The sound pressure in dB is 20 times the log of the ratio of the measured pressure, p, to the static pressure, p_o, where p_o is 20 μPa.

$$L_{pa} = 20Log_{10}\left(\frac{p}{p_o}\right)dB \quad (re\ 20\mu Pa)$$

In acoustic measurements where the primary concern is the effect on humans, the sound readings are sometimes compensated by an "A"-weighted filter. The A-weighted filter accounts for people's limited hearing response in the upper and lower frequency bands. Sound pressure level measurements made using the A-weighted filter are denoted dBA.

General Measurement Descriptors

- **Leq (equivalent continuous sound level).** The constant sound level in dBA that, lasting for a time "T," would have produced the same energy in the same time period "T" as an actual A-weighted noise event.

$$L_{eq} = 20Log_{10}\frac{1}{T}\int_{T}^{0}\left(\frac{p(t)}{p_o}\right)^2 dt$$

- **MaxPeak (maximum A-weighted sound level).** The greatest continuous sound level, in dBA, measured during the preset measurement period.
- **Lmax (maximum A-weighted RMS sound level).** The greatest RMS (root-mean square) sound level, in dBA, measured during the preset measurement period.
- **Lmin (minimum A-weighted RMS sound level).** The lowest RMS (root-mean square) sound level, in dBA, measured during the preset measurement period.

Statistical Noise Level Descriptors

Public response to sound depends greatly upon the range that the sound varies in a given environment. For example, people generally find a moderately high, constant sound level more tolerable than a quiet background level interrupted by high-level noise intrusions. In light of this subjective response, it is often useful to look at a statistical distribution of sound levels over a given time period. Such distributions identify the sound level exceeded and the percentage of time exceeded. Therefore, it allows for a more complete description of the range of sound levels during the given measurement period.

The sound level descriptor L_{xx} is defined as the sound level exceeded XX percent of the time. Some of the more common versions of this descriptor and their corresponding definitions are listed below:

- L01 The sound level is exceeded 1 percent of the time. This is a measure of the loudest sound levels during the measurement period. Example: During a 1-hour measurement, an L01 of 95 dBA means the sound level was at or above 95 dBA for 36 seconds.
- L50 The sound level is exceeded 50 percent of the time. This level corresponds to the median sound level. Example: During a 1-hour measurement, an L50 of 67 dBA means the sound level was at or above 67 dBA for 30 minutes.
- L90 The sound level is exceeded 90 percent of the time. This is a measure of the nominal background level. Example: During a 1-hour measurement, an L90 of 50 dBA means the sound level was at or above 50 dBA for 54 minutes.

Other commonly used LXX values include L2.5, L8.3, and L25. These correspond to the 5-, 10-, and 15-minute time levels for a 1-hour measurement period, respectively.

Typical Sound Levels

Table B-1 contains some common noise sources, their nominal maximum sound level in dBA, and the usual public response. The levels in this graph are comparable to the Lmax noise level descriptor. This graph would be useful when comparing the loudest noise produced with other familiar noise sources a person may have experienced.

Table B-1. Typical Maximum Sound Levels

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (human judgment of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-horsepower siren (100 feet)	130		32 times as loud
Loud rock concert near stage, Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal, food blender (2 feet), Pneumatic drill (50 feet)	80	Moderately loud	Reference loudness
Vacuum cleaner (10 feet), Passenger car at 65 mph (25 feet)	70		1/2 as loud
Large store air-conditioning unit (20 feet)	60		1/4 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Bedroom or quiet living room Bird calls	40		1/16 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	
High quality recording studio	20		
Acoustic Test Chamber	10	Just audible	
	0	Threshold of hearing	

Sources: Beranek (1988) and U.S. EPA (1971).

Appendix D: Noise Monitoring

Photo 1: Aerial View

Photo 2: Looking North

Photo 3: Looking Northeast

Photo 4: Looking Northwest

Monitoring Location M-1
Seldon Road east of N Windy Bottom Road

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Detailed Noise Monitoring Site Photos
Seldon Road Extension, Phase II Project

Photo 1: Aerial View

Photo 2: Looking North

Photo 3: Looking South

Photo 4: Looking East

Monitoring Location M-2
Northeast corner of N Beverly Drive
at Beverly Lake Road

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Detailed Noise Monitoring Site Photos
Seldon Road Extension, Phase II Project

Photo 1: Aerial View

Photo 2: Looking South

Photo 3: Looking North

Photo 4: Looking West

Monitoring Location M-3
Northwest on Wyoming Drive
at Beverly Lake Road

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Detailed Noise Monitoring Site Photos
Seldon Road Extension, Phase II Project

Photo 1: Aerial View

Photo 2: Looking East

Photo 3: Looking Southwest

Photo 4: Looking North

Monitoring Location M-4
W Zehnder Road east of N Monroe Circle

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Detailed Noise Monitoring Site Photos
Seldon Road Extension, Phase II Project

Photo 1: Aerial View

Photo 2: Looking West

Photo 3: Looking Southeast

Photo 4: Looking Northwest

Monitoring Location M-5
W Zehnder Road at N Fullers Place

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Detailed Noise Monitoring Site Photos
Seldon Road Extension, Phase II Project

Photo 1: Aerial View

Photo 2: Looking Southeast

Photo 3: Looking Northeast

Photo 4: Looking West

Monitoring Location M-1
Meadow Lakes Elementary School Entrance

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Detailed Noise Monitoring Site Photos
Seldon Road Extension, Phase II Project

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Traffic Noise Monitoring Information Sheet

Project Name: Seldon Rd Extension, Phase II **Date:** 10-7-2022 **Site Number:** M-1

Monitoring Location: Seldon Rd at Windy Bottom **Meter:** 2238 **Color:** Green **Rec #:** M-1

Start Time: 8:53 am **End Time:** 9:23 am **Last 1-Secnod Leq:** _____ **Overall Leq:** 58.6

Temp: 55 **Cloud Cover:** Cloudy **Wind:** Slight **Precipitation:** Ø

Traffic Counts:

Roadway Name: Seldon - Eastbound **Cars** 27 **MTrucks** 2 **HTrucks** 1 **Speeds:** 50

Roadway Name: Seldon - Westbound **Cars** 17 **MTrucks** 1 **HTrucks** Ø **Speeds:** 50

Roadway Name: Windy Bottom - Nbound **Cars** 6 **MTrucks** Ø **HTrucks** Ø **Speeds:** 30

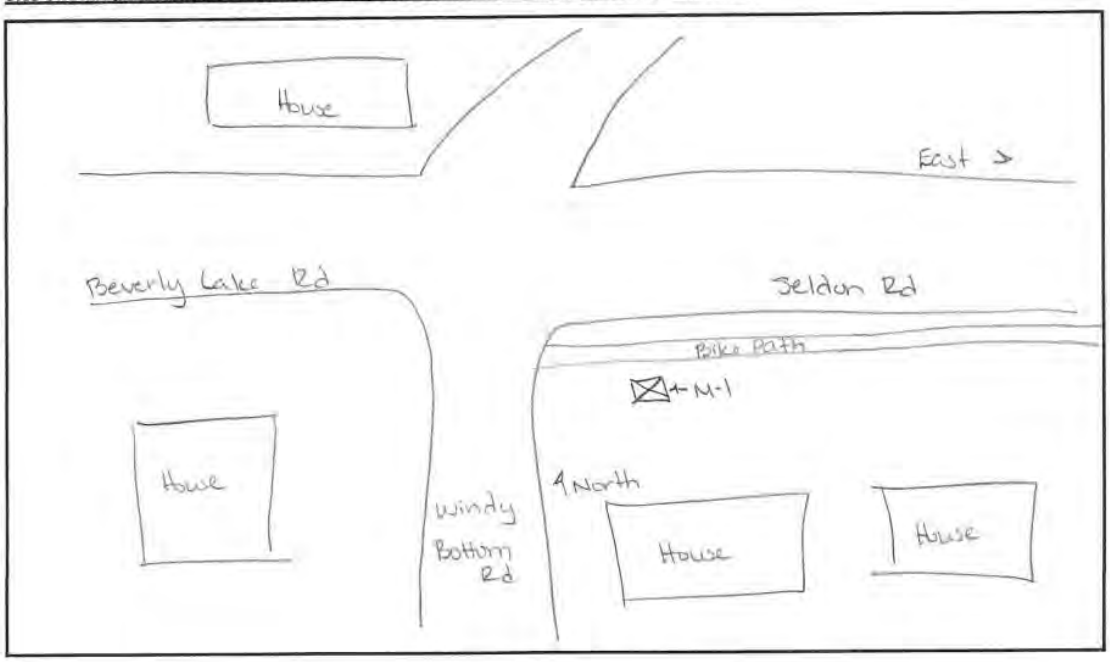
Roadway Name: Windy Bottom - Sbound **Cars** 3 **MTrucks** Ø **HTrucks** Ø **Speeds:** 30

Area Observations: _____

Non-Traffic Noise Sources: Jet - 8:54 ; Plane - 8:56 ; Plane - 9:01 ; Jet - 9:02 ; Jet - 9:10 ; Dog Barking

Topographical Information: _____

Site Sketch (*include direction arrow and approximate distance to roadway/curb*):



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Traffic Noise Monitoring Information Sheet

Supplemental Monitoring Sheet *(see site details on previous page)*

Project Name: Seldon Rd Extension, Phase II Date: 6.8.222 Site Number: M-1(2)

Monitoring Location: Windy Bottom Rd at Seldon Meter: 2239 Color: Green Rec #: M-1

Measurement Session 2

Start Time: 9:07 End Time: 9:37 Last 1-Secnod Leq: _____ Overall Leq: 57.0

Temp: 64° Cloud Cover: Clear Wind: Light Precipitation: Ø

Traffic Counts:

Roadway Name: Seldon EB	Cars 31	MTrucks Ø	HTrucks 1	Speeds: 50	
Roadway Name: Seldon WB	Cars 23	MTrucks Ø	HTrucks Ø	Speeds: 50	
Area Observations: Windy Bottom NB	7	Ø	Ø	30	
Windy Bottom SB	6	Ø	Ø	30	

Non-Traffic Noise Sources: Plane - 9:13 , Equipment Noise in Distance - 9:26

Topographical Information: _____

Measurement Session 3

Start Time: _____ End Time: _____ Last 1-Secnod Leq: _____ Overall Leq: _____

Temp: _____ Cloud Cover: _____ Wind: _____ Precipitation: _____

Traffic Counts:

Roadway Name: _____ Cars _____ MTrucks _____ HTrucks _____ Speeds: _____

Roadway Name: _____ Cars _____ MTrucks _____ HTrucks _____ Speeds: _____

Area Observations: _____

Non-Traffic Noise Sources: _____

Topographical Information: _____

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Traffic Noise Monitoring Information Sheet

Project Name: Seldon Rd Ext Phase II **Date:** 6-7-22 **Site Number:** M-2

Monitoring Location: Beverly Lake Rd at Bev. Dr **Meter:** 2238 **Color:** Green **Rec #:** M-2

Start Time: 9:42 **End Time:** 10:12 **Last 1-Secnod Leq:** _____ **Overall Leq:** 52.6

Temp: 55° **Cloud Cover:** Heavy **Wind:** Slight **Precipitation:** Ø

Traffic Counts:

Roadway Name: Bev. Lake - EB **Cars** 14 **MTrucks** 1 **HTrucks** Ø **Speeds:** 50

Roadway Name: Bev. Lake - WB **Cars** 9 **MTrucks** Ø **HTrucks** Ø **Speeds:** 50

Roadway Name: Bev. Dr - NB **Cars** Ø **MTrucks** Ø **HTrucks** Ø **Speeds:** —

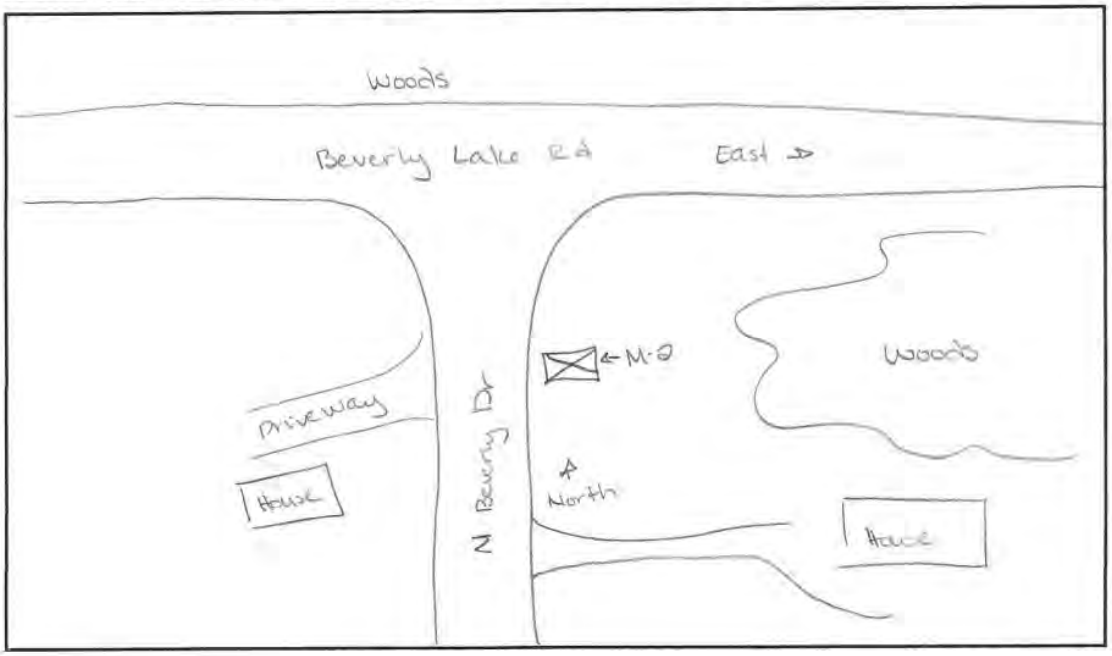
Roadway Name: Bev. Dr - SB **Cars** Ø **MTrucks** Ø **HTrucks** Ø **Speeds:** —

Area Observations: _____

Non-Traffic Noise Sources: Plane - 9:54 ; Plane - 10:00 ; Jet - 10:04 ; Dog Barking

Topographical Information: _____

Site Sketch (*include direction arrow and approximate distance to roadway/curb*):



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Traffic Noise Monitoring Information Sheet

Supplemental Monitoring Sheet *(see site details on previous page)*

Project Name: Seldon Rd Extension, Phase II **Date:** 6·8·2022 **Site Number:** M·2 (2)

Monitoring Location: Bev. Lake Rd at Bev. Dr. **Meter:** 2238 **Color:** Green **Rec #:** M·2

Measurement Session 2

Start Time: 9:50 **End Time:** 10:20 **Last 1-Secnod Leq:** _____ **Overall Leq:** 50.0

Temp: 64 **Cloud Cover:** Partial **Wind:** Slight **Precipitation:** Ø

Traffic Counts:

Roadway Name: Bev. Lake EB	**Cars** 25	**MTrucks** Ø	**HTrucks** Ø	**Speeds:** 50	
Roadway Name: Bev. Lake WB	**Cars** 14	**MTrucks** 2	**HTrucks** Ø	**Speeds:** 50	
Area Observations: Bev. Dr NB	Ø	Ø	Ø	Ø	
Bev. Dr SB	Ø	Ø	Ø	Ø	

Non-Traffic Noise Sources: Engine Drone : Chainsaw: 9:55 , 10:17 ; Plane - 10:18 ; Jet - 10:07, 10:12

Topographical Information: woodchopper in distance

Measurement Session 3

Start Time: _____ **End Time:** _____ **Last 1-Secnod Leq:** _____ **Overall Leq:** _____

Temp: _____ **Cloud Cover:** _____ **Wind:** _____ **Precipitation:** _____

Traffic Counts:

Roadway Name: _____	**Cars** _____	**MTrucks** _____	**HTrucks** _____	**Speeds:** _____
Roadway Name: _____	**Cars** _____	**MTrucks** _____	**HTrucks** _____	**Speeds:** _____

Area Observations: _____

Non-Traffic Noise Sources: _____

Topographical Information: _____

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Traffic Noise Monitoring Information Sheet

Project Name: Seldon Rd Ext. Phase II **Date:** 6.7.22 **Site Number:** M.3

Monitoring Location: Wyoming Dr at Bev. Lake Rd **Meter:** 2238 **Color:** Green

Start Time: 10:26 **End Time:** 10:56 **Last 1-Secnod Leq:** _____ **Overall Leq:** 57.5

Temp: 58 **Cloud Cover:** Heavy **Wind:** Slight **Precipitation:** Ø

Traffic Counts:

Roadway Name: Bev. Lake WB **Cars** 4 **MedTrucks** 1 **HvyTrucks** Ø **Speeds:** 45

Roadway Name: Bev. Lake EB **Cars** 11 **MedTrucks** 1 **HvyTrucks** Ø **Speeds:** 45

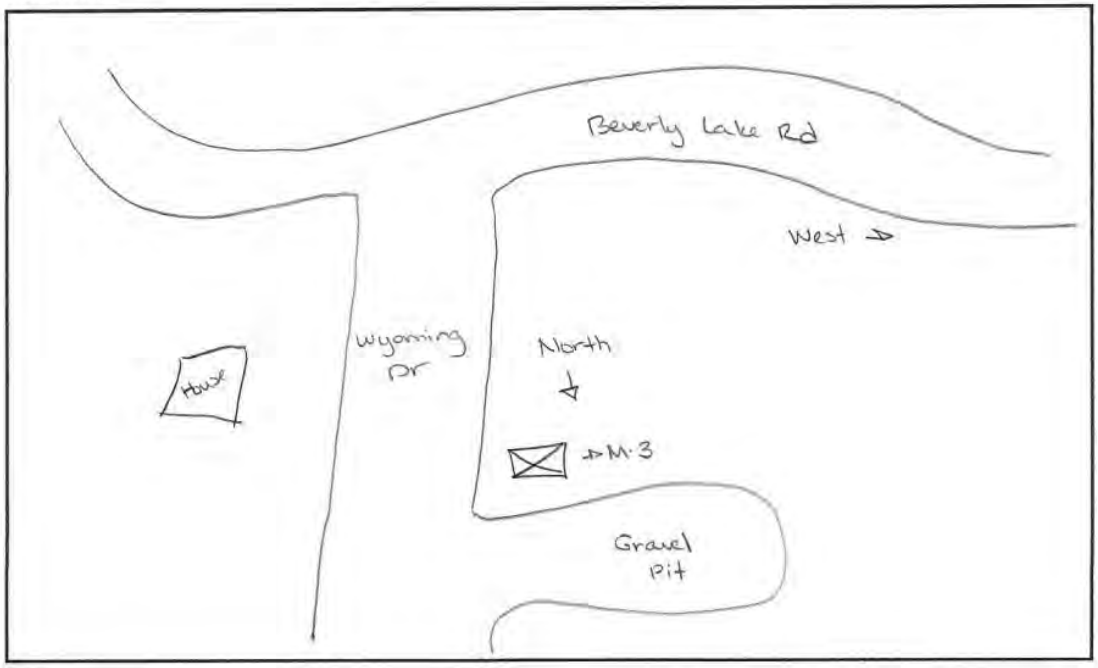
Roadway Name: Wyoming N **Cars** 7 **MedTrucks** Ø **HvyTrucks** Ø **Speeds:** 30

Roadway Name: Wyoming S **Cars** 1 **MedTrucks** 4 **HvyTrucks** Ø **Speeds:** 30

Area Observations: Jet - 10:26 ; Horn - 10:30 ; Dog - 10:36 ; Plane - 10:42, 10:45 ; Horn - 10:50

Sporadic Dog Barking

Site Sketch



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Traffic Noise Monitoring Information Sheet

Supplemental Monitoring Sheet *(see site details on previous page)*

Project Name: Seldon Rd Ext, Phase II **Date:** 6.8.22 **Site Number:** M.3(2)

Monitoring Location: Wyoming Dr at Bev. Lake Rd **Meter:** 2238 **Color:** Green **Rec #:** M.3

Measurement Session 2

Start Time: 10:32 **End Time:** 11:02 **Last 1-Secnod Leq:** _____ **Overall Leq:** 54.4

Temp: 66 **Cloud Cover:** Light **Wind:** Calm **Precipitation:** Ø

Traffic Counts:

Roadway Name: Bev. Lake WB **Cars** 8 **MTrucks** Ø **HTrucks** 0 **Speeds:** 30

Roadway Name: Bev. Lake EB **Cars** 10 **MTrucks** Ø **HTrucks** 1 **Speeds:** 30

Area Observations: Wyoming NB 1 Ø Ø 45
Wyoming SB 4 1 Ø 45

Non-Traffic Noise Sources: Dog Barking @ 10:33 ; Phone - 10:33, 10:38, 10:45, 10:47, 10:50

Topographical Information: _____

Measurement Session 3

Start Time: _____ **End Time:** _____ **Last 1-Secnod Leq:** _____ **Overall Leq:** _____

Temp: _____ **Cloud Cover:** _____ **Wind:** _____ **Precipitation:** _____

Traffic Counts:

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Area Observations: _____

Non-Traffic Noise Sources: _____

Topographical Information: _____

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Traffic Noise Monitoring Information Sheet

Project Name: Seldon Rd Ext, Phase II **Date:** 6-7-22 **Site Number:** M-4

Monitoring Location: W Zehnder Rd at Monroe Cr. **Meter:** 2238 **Color:** Green **Rec #:** M-4

Start Time: 11:31 **End Time:** 12:01 **Last 1-Secnod Leq:** _____ **Overall Leq:** 51.9

Temp: 58 **Cloud Cover:** Heavy **Wind:** Slight **Precipitation:** Ø

Traffic Counts:

Roadway Name: Zehnder Rd - EB **Cars** 4 **MTrucks** 9 **HTrucks** Ø **Speeds:** 20

Roadway Name: Zehnder Rd - WB **Cars** 1 **MTrucks** Ø **HTrucks** Ø **Speeds:** 20

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

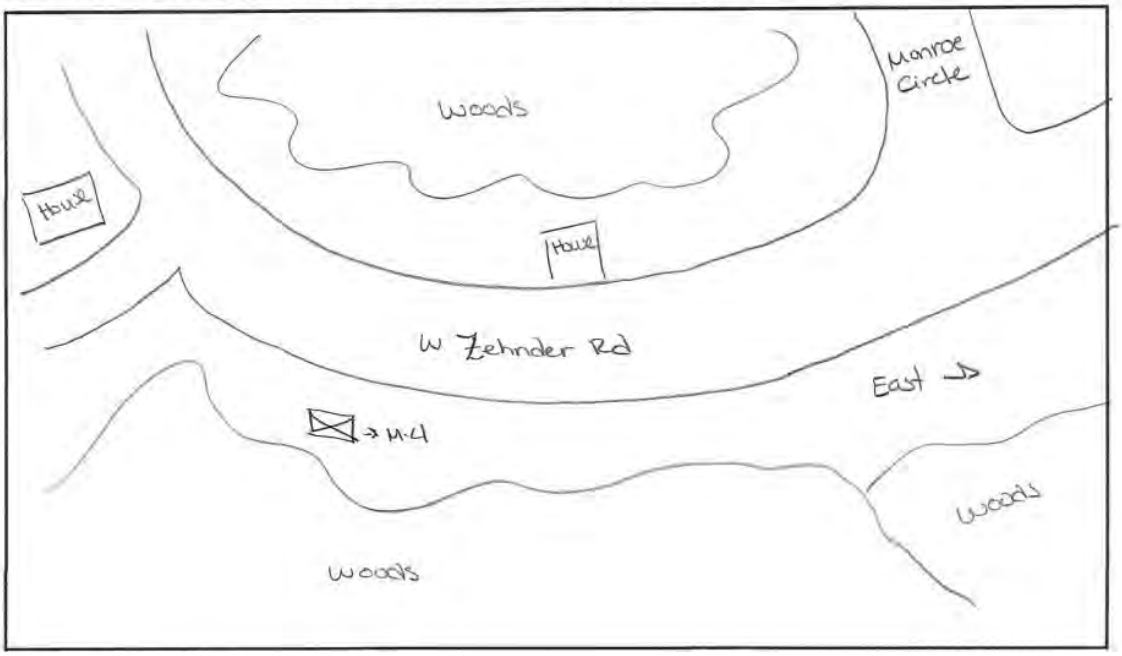
Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Area Observations: Gravel Road

Non-Traffic Noise Sources: Dog Barking - 12:01

Topographical Information: Zehnder & Monroe both gravel roads.

Site Sketch (*include direction arrow and approximate distance to roadway/curb*):



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Traffic Noise Monitoring Information Sheet

Supplemental Monitoring Sheet *(see site details on previous page)*

Project Name: Seldon Rd Ext, Phase II **Date:** 6.8.22 **Site Number:** M.4 (2)

Monitoring Location: Zehnder Rd at Monroe Circle **Meter:** 22397 **Color:** Green **Rec #:** M.4

Measurement Session 2

Start Time: 11:18 **End Time:** 11:48 **Last 1-Secnod Leq:** _____ **Overall Leq:** 46.6

Temp: 66° **Cloud Cover:** Light **Wind:** Calm **Precipitation:** Ø

Traffic Counts:

Roadway Name: Zehnder EB **Cars** Ø **MTrucks** Ø **HTrucks** Ø **Speeds:** 20

Roadway Name: Zehnder WB / Monroe Circle **Cars** 1 / 1 **MTrucks** Ø / Ø **HTrucks** Ø / Ø **Speeds:** 20

Area Observations: _____

Non-Traffic Noise Sources: Plane - 11:19 ; Dirtbike - 11:20 ; Plane - 11:29, 11:35, 11:36

Topographical Information: Zehnder ; Monroe both gravel roads

Measurement Session 3

Start Time: _____ **End Time:** _____ **Last 1-Secnod Leq:** _____ **Overall Leq:** _____

Temp: _____ **Cloud Cover:** _____ **Wind:** _____ **Precipitation:** _____

Traffic Counts:

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Area Observations: _____

Non-Traffic Noise Sources: _____

Topographical Information: _____

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Traffic Noise Monitoring Information Sheet

Project Name: Seldon Rd Ext, Phase II **Date:** 6.7.22 **Site Number:** M.5

Monitoring Location: Zehnder at Fullers PL **Meter:** 2238 **Color:** Green

Start Time: 12:08 **End Time:** 12:38 **Last 1-Secnod Leq:** _____ **Overall Leq:** 57.2

Temp: 55 **Cloud Cover:** Heavy **Wind:** Moderate **Precipitation:** Light Rain

Traffic Counts:

Roadway Name: Zehndr WB **Cars** 4 **MedTrucks** Ø **HvyTrucks** Ø **Speeds:** 30

Roadway Name: Zehndr EB **Cars** 1 **MedTrucks** Ø **HvyTrucks** Ø **Speeds:** 30

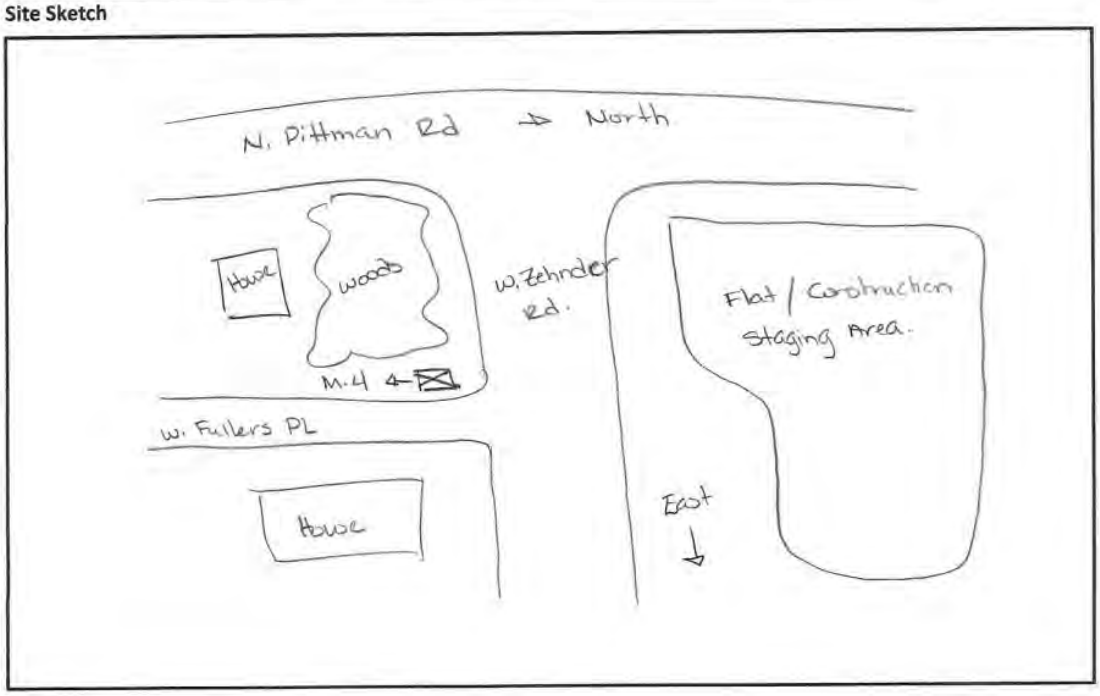
Roadway Name: Pitman NB **Cars** 9 **MedTrucks** Ø **HvyTrucks** 3 **Speeds:** 45

Roadway Name: Pittman SB **Cars** 5 **MedTrucks** Ø **HvyTrucks** 1 **Speeds:** 45

Area Observations: Plane: 12:09, 12:28

Zehndrer is a gravel Rd.

Site Sketch



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Traffic Noise Monitoring Information Sheet

Supplemental Monitoring Sheet *(see site details on previous page)*

Project Name: Seldon Rd Ext, Phase II **Date:** 6.8.22 **Site Number:** M-5(2)

Monitoring Location: Zehndor at Fullers Pl **Meter:** 2238 **Color:** Green **Rec #:** M-5

Measurement Session 2

Start Time: 11:56 **End Time:** 12:26 **Last 1-Secnod Leq:** _____ **Overall Leq:** 49

Temp: 48° **Cloud Cover:** Light **Wind:** Slightly **Precipitation:** Ø

Traffic Counts:

Roadway Name: Zehndr WB **Cars** 2 **MTrucks** Ø **HTrucks** Ø **Speeds:** 20

Roadway Name: Zehndr EB **Cars** Ø **MTrucks** Ø **HTrucks** Ø **Speeds:** 20

Area Observations: Pittman NB 14 1 2 45
Pittman SB 18 1 1 45

Non-Traffic Noise Sources: _____

Topographical Information: Meter at higher elevation than Pittman Rd
Zehndr is a gravel Rd

Measurement Session 3

Start Time: _____ **End Time:** _____ **Last 1-Secnod Leq:** _____ **Overall Leq:** _____

Temp: _____ **Cloud Cover:** _____ **Wind:** _____ **Precipitation:** _____

Traffic Counts:

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Area Observations: _____

Non-Traffic Noise Sources: _____

Topographical Information: _____

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Traffic Noise Monitoring Information Sheet

Project Name: Seldon Rd Ext, Phase II **Date:** 6-7-22 **Site Number:** M-6

Monitoring Location: Meadow Lakes Elementary at Pittman **Meter:** 2238 **Color:** Green **Rec #:** M-6

Start Time: 13:03 **End Time:** 15:33 **Last 1-Secnod Leq:** _____ **Overall Leq:** 47.6

Temp: 56° **Cloud Cover:** Heavy **Wind:** Slight **Precipitation:** Light

Traffic Counts:

Roadway Name: Pittman NB **Cars** 21 **MTrucks** 0 **HTrucks** 0 **Speeds:** 30

Roadway Name: Pittman SB **Cars** 25 **MTrucks** 5 **HTrucks** 4 **Speeds:** 30

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

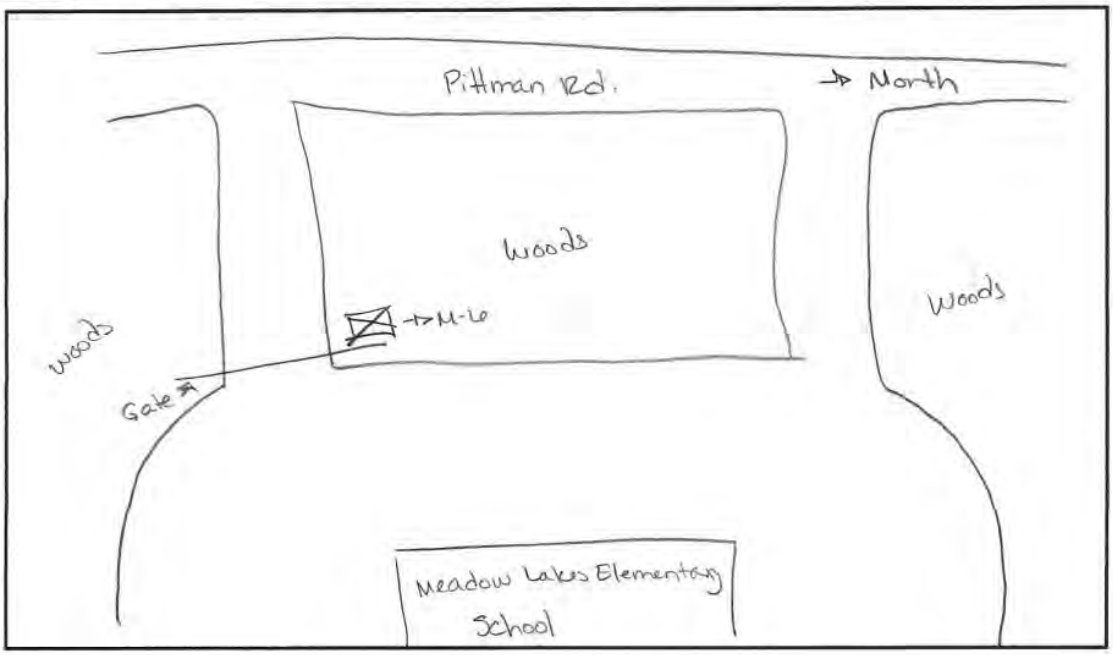
Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Area Observations: _____

Non-Traffic Noise Sources: _____

Topographical Information: _____

Site Sketch (*include direction arrow and approximate distance to roadway/curb*):



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Traffic Noise Monitoring Information Sheet

Supplemental Monitoring Sheet *(see site details on previous page)*

Project Name: Seldon Rd Ext, Phase II **Date:** 6.8.22 **Site Number:** M.L (2)

Monitoring Location: Meadow Lakes Elementary at Pittman Rd. **Meter:** 2238 **Color:** Green **Rec #:** M.L

Measurement Session 2

Start Time: 12:57 **End Time:** 13:07 **Last 1-Secnod Leq:** _____ **Overall Leq:** 44.9

Temp: 68° **Cloud Cover:** Sparse **Wind:** Calm **Precipitation:** Ø

Traffic Counts:

Roadway Name: Pittman NB **Cars** 19 **MTrucks** 1 **HTrucks** Ø **Speeds:** 50

Roadway Name: Pittman SB **Cars** 21 **MTrucks** Ø **HTrucks** 2 **Speeds:** 50

Area Observations: _____

Non-Traffic Noise Sources: Jet - 12:39 ; Plane - 12:46, 12:49, 13:03

Topographical Information: _____

Measurement Session 3

Start Time: _____ **End Time:** _____ **Last 1-Secnod Leq:** _____ **Overall Leq:** _____

Temp: _____ **Cloud Cover:** _____ **Wind:** _____ **Precipitation:** _____

Traffic Counts:

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Roadway Name: _____ **Cars** _____ **MTrucks** _____ **HTrucks** _____ **Speeds:** _____

Area Observations: _____

Non-Traffic Noise Sources: _____

Topographical Information: _____

CERTIFICATE OF CALIBRATION
27170-5
FOR BRÜEL & KJÆR
SOUND LEVEL METER

Model **2238** Serial No. **2301300**
ID No. **N/A**
With Microphone Model **4188** Serial No. **2288971**

Customer: **Michael Minor & Associates**
Portland, OR 97202 P.O. No. **Letter/M. Minor**

was tested and met factory specifications at the points tested and as outlined in ANSI S1.4-1983 Type 1; IEC 651-1979 Type 1; IEC-61672-3:2006 Class 1

on **02 JUN 2022** **BY HAROLD LYNCH**
Service Manager

As received and as left condition: Within Specification.
Re-calibration due on: **02 JUN 2023**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	1051	1777523	28 SEP 2021	28 SEP 2022
B&K	2636	1423390	03 JAN 2022	03 JAN 2023
B&K	4226	3274134	30 NOV 2021	30 NOV 2022
B&K	4231	1770857	09 SEP 2021	09 SEP 2022
HP	34401A	MY45023668	25 JAN 2022	25 JAN 2023
HP	3458A	2823A07179	21 AUG 2021	21 AUG 2022

Performed in Compliance with ANSI, NCSL Z-540-1, 1994
and ISO 17025, ISO 9001:2015 Certification NQA No. 11252
*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" condition.

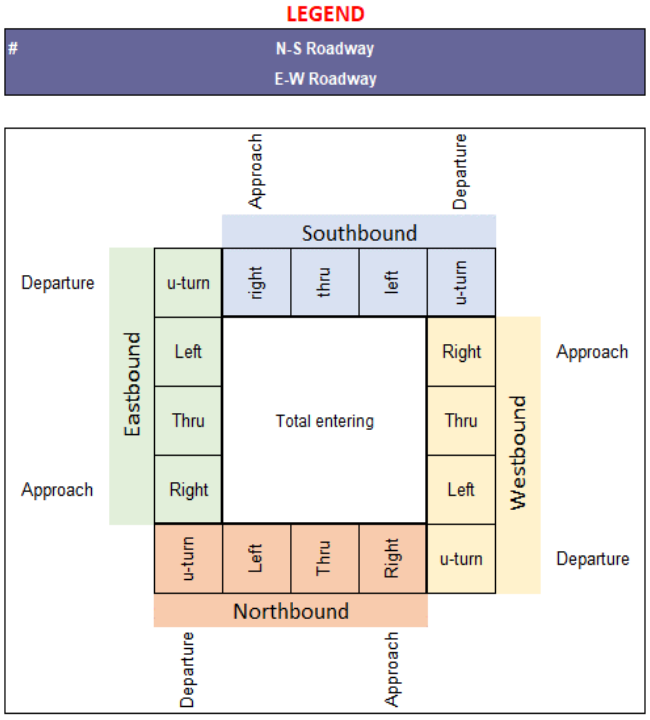
Reference Test Procedure: **ACCT Procedure 2238 Version 2.1.0.** (Rev. Aug 2013)
Brüel & Kjær Factory Service Instructions: **2238**

Temperature	Relative Humidity	Barometric Pressure
23°C	**36** %	**989.34** hPa

Signed: Harold Lynch

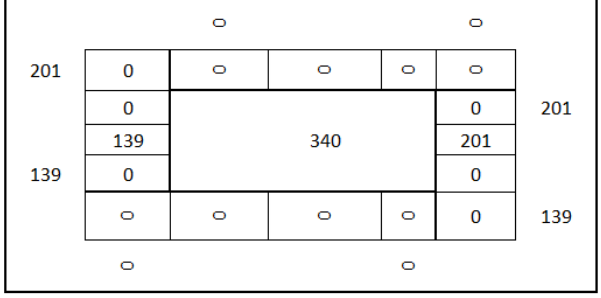
ODIN METROLOGY, INC.
CALIBRATION OF BRÜEL & KJÆR INSTRUMENTS
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

Appendix E: Traffic Volumes



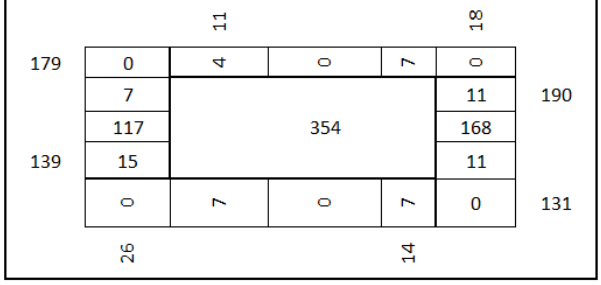
2022 Existing PM Peak Traffic Volumes

1	NB+SB	N Windy Bottom Rd
	EB+WB	Beverly Lake Rd/Seldon Rd



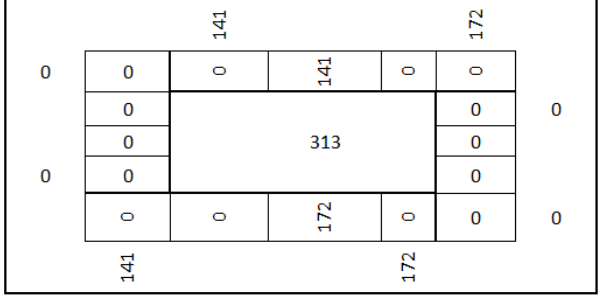
1	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	30
Westbound	95%	5%	0%	50
Northbound	95%	5%	0%	25
Southbound	95%	5%	0%	25

2	NB+SB	Wyoming Dr
	EB+WB	Beverly Lake Rd



2	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	30
Westbound	95%	5%	0%	30
Northbound	95%	5%	0%	30
Southbound	95%	5%	0%	30

3	NB+SB	Pittman Rd
	EB+WB	Meadow LakesElementary School

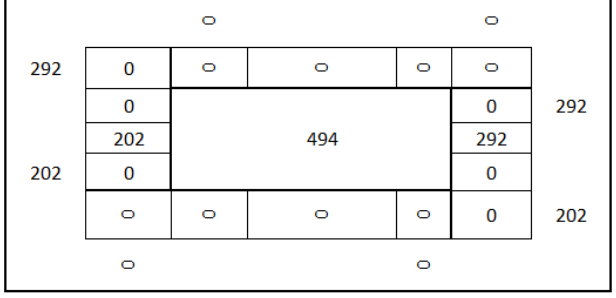


3	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	25
Westbound	95%	5%	0%	25
Northbound	95%	5%	0%	45
Southbound	95%	5%	0%	45

Traffic data provided by Stantec.

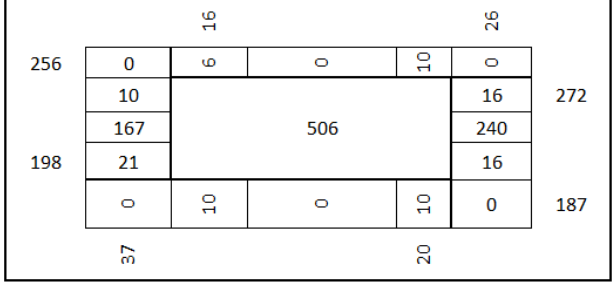
2048 Future No-Build PM Peak Traffic Volumes

1	NB+SB	N Windy Bottom Rd
	EB+WB	Beverly Lake Rd/Seldon Rd



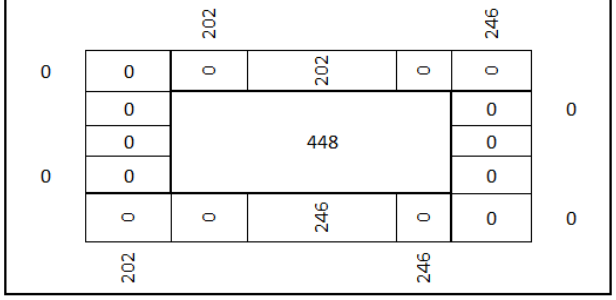
1	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	30
Westbound	95%	5%	0%	50
Northbound	95%	5%	0%	25
Southbound	95%	5%	0%	25

2	NB+SB	Wyoming Dr
	EB+WB	Beverly Lake Rd



2	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	30
Westbound	95%	5%	0%	30
Northbound	95%	5%	0%	30
Southbound	95%	5%	0%	30

3	NB+SB	Pittman Rd
	EB+WB	Meadow LakesElementary School



3	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	25
Westbound	95%	5%	0%	25
Northbound	95%	5%	0%	45
Southbound	95%	5%	0%	45

Traffic data provided by Stantec.

2048 Future Build PM Peak Traffic Volumes

1	NB+SB	N Windy Bottom Rd			
	EB+WB	Beverly Lake Rd/Seldon Rd			
		0			0
484	0	0	0	0	0
	0				0
	416		998		472
435	19				60
	0	12	0	19	0
	79			31	

1	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	55
Westbound	95%	5%	0%	50
Northbound	95%	5%	0%	25
Southbound	95%	5%	0%	25

2	NB+SB	Beverly Lake Rd Connection			
	EB+WB	Seldon Rd			
		0			0
455	0	0	0	0	0
	0				0
	408		928		452
413	5				32
	0	3	0	28	0
	37			31	

2	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	55
Westbound	95%	5%	0%	55
Northbound	95%	5%	0%	30
Southbound	95%	5%	0%	30

3	NB+SB	Wyoming Dr			
	EB+WB	Seldon Rd			
		78			89
375	0	14	0	64	0
	26				63
	308		924		346
362	28				32
	0	15	0	28	0
	60			43	

3	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	55
Westbound	95%	5%	0%	55
Northbound	95%	5%	0%	30
Southbound	95%	5%	0%	30

Traffic data provided by Stantec.

2048 Future Build PM Peak Traffic Volumes

4	NB+SB	Pittman Rd			
	EB+WB	Seldon Rd			
		254			288
426	0	165	1	88	0
	198				89
	248		1,064		260
447	1				8
	0	1	1	4	0
	10			6	

3	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	55
Westbound	95%	5%	0%	55
Northbound	95%	5%	0%	45
Southbound	95%	5%	0%	45

5	NB+SB	Frontage Rd Connection			
	EB+WB	Frontage Rd			
		10			5
1	0	0	0	10	0
	0				5
	0		16		1
0	0				0
	0	0	0	0	0
	0			0	

3	Vehicle Class Percentage Vehicle Speeds			
Movement Direction	Passenger Vehicles	Medium Trucks	Heavy Trucks	Speeds
Eastbound	95%	5%	0%	35
Westbound	95%	5%	0%	35
Northbound	95%	5%	0%	35
Southbound	95%	5%	0%	35

Traffic data provided by Stantec.