



Traffic Noise Analysis Report

Sterling Safety Corridor Improvements MP 82.5 to 94

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The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by DOT&PF pursuant to 23 U.S.C. 327 and a Memorandum of Understanding (MOU) dated November 3, 2017 and executed by FHWA and DOT&PF.

Contents

1	Summary	1
2	Project Introduction and Background	2
3	Purpose of Study	2
4	Methods.....	3
	4.1 Understanding Noise.....	3
	4.2 Regulatory Overview	4
	4.3 Model.....	5
	4.4 Model Validation Process.....	6
5	Description of Land Use Categories along the Corridor	7
6	Results.....	8
	6.1 Existing Conditions.....	8
	6.2 No-build Alternative	8
	6.3 Build Alternative	8
7	Identification of Noise Impacts	14
8	Noise Abatement Analysis Considerations	14
9	Abatement Analysis and Recommendations	16
	9.1 Receptors 9, 17, 50, 52, 57, 67, 74, 75, 76, 91, and 109.....	16
	9.2 Receptors 80, 81, and 81b.....	17
	9.3 Receptor 88.....	17
10	Statement of Likelihood.....	17
11	Construction Noise	18
12	Conclusion.....	19
	12.1 Information for Local Officials.....	19
13	References	20

Tables

Table 4-1. Logarithmic Nature of Sound	3
Table 4-2. FHWA Noise Abatement Criteria.....	5
Table 4-3. Measured Noise Levels in the Project Study Area (Leq-dBA).....	7
Table 6-1. Predicted Peak Hour Noise Levels for the Existing, No-build, and Build Alternatives	9
Table 11-1. Typical Construction Noise Levels.....	18
Table 12-1. Predicted Distances to Activity Category B, C, and E Noise Impact Thresholds	20

Appendices

Appendix A. DOT&PF *Noise Policy*

Appendix B. Traffic Data (TNM files are available electronically from DOT&PF)

Appendix C. Figures

Appendix D. Equipment Calibration Sheets

Appendix E. Field Data Sheets and Photos

Appendix F. Feasibility and Reasonableness Worksheets

Acronyms

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted decibel
DHV	Design Hour Volume
DOT&PF	Alaska Department of Transportation and Public Facilities
FHWA	Federal Highway Administration
Leq _h	hourly equivalent noise level
Lmax	maximum sound level during a single noise event
NAC	Noise Abatement Criteria
MP	Milepost
NHCCI	National Highway Construction Cost Index
SLM	sound level meter
TNM	Traffic Noise Model

Key Terminology

Term	Definition
A-weighted decibels (dBA)	Decibels with a frequency weighting applied to the sound energy in specific frequency bands to better represent the sensitivity of human hearing, and which is commonly used in environmental acoustical analyses.
Dwelling units	Individual properties, such as a single family residence or an apartment. Also referred to as receivers.
$L_{eq(h)}$	The average hourly noise level. It is defined as the equivalent steady-state sound level that, in a stated period of time, contains the same acoustic energy as the time-varying sound level during the same period.
Receivers	Individual residential units, such as a single family residence or an apartment. One or more individual receivers adjacent to the project may be represented in the noise model by a model receptor.
Receptor	A discrete point in space that is used in the noise model as a noise prediction site, and which may represent one or more receivers.

1 Summary

The Alaska Department of Transportation and Public Facilities (DOT&PF), in cooperation with the Federal Highway Administration (FHWA), proposes to improve the safety, capacity, and mobility of an 11.5-mile segment of the Sterling Highway between Sterling and Soldotna, from Sterling Highway Mileposts (MP) 82.5 to 94. The proposed project would widen the highway from two to four lanes, construct separated bike/pedestrian facilities, implement access management techniques, add turn lanes and frontage roads, realign intersections, and include other associated road construction activities. The Sterling Safety Corridor Improvements MP 82.5 to 94 Project (project) is located within the Kenai Peninsula Borough in Southcentral Alaska.

As part of the environmental documentation, a traffic noise analysis of the proposed project was conducted. The analysis included traffic noise monitoring and modeling. The FHWA Traffic Noise Model (TNM), Version 2.5, was used to evaluate traffic noise levels for the existing year and the 2050 build and no-build alternatives. Traffic noise analysis and impacts were evaluated in accordance with the 2011 DOT&PF *Noise Policy*.

Traffic noise under the existing conditions is primarily a result of traffic flows on the Sterling Highway, with secondary traffic noise associated with the local roadway network. The Sterling Highway is the only road connection between western Kenai Peninsula communities and the remaining Alaska road system. It carries commercial, recreation, and tourism traffic, in addition to being the main residential road that connects the communities of Sterling and Soldotna. It is often used by other residents of Southcentral Alaska, including residents from Anchorage, Seward, Kenai, Homer, and other Kenai Peninsula communities. The Sterling Highway provides access between the Sterling and Anchorage areas and beyond, and because of this, it has relatively steady traffic flow year-round and during the summer season in particular.

Existing traffic noise levels range from 50 to 67 A-weighted decibels (dBA) hourly equivalent noise level ($L_{eq(h)}$).

Traffic noise levels at area receptors under the 2050 no-build alternative were modeled in TNM and predicted to range from 51 to 68 dBA $L_{eq(h)}$. Traffic noise is predicted to increase by approximately 1 dBA due to projected increased vehicular traffic on area roadways.

Traffic noise under the 2050 build alternative was also modeled using TNM and is predicted to range from 50 to 68 dBA $L_{eq(h)}$. Relative to existing conditions, project build alternative traffic noise levels are predicted to increase up to 8 dBA. Increases in traffic noise would result from increased traffic volumes and reduced setback distance to the future roadway, since the build alternative would widen and realign the existing roadway in many areas. Conversely, decreases in sound levels up to 5 dBA are predicted to occur at receptors where the roadway alignment would be further away in the future build alternative conditions.

Fifteen receptors, representing seventeen dwelling units (receivers), would experience an impact in the 2050 design year under the build alternative. Noise barriers were evaluated for their ability to abate noise levels at these receivers. DOT&PF considers two

required criteria (feasibility and reasonableness) when evaluating the incorporation of noise abatement measures such as noise barriers. This traffic noise analysis found a substantial reduction (e.g., 5 dBA or greater) could be achieved at three impacted receptors; however, in order to achieve this reduction, the barrier would not meet cost effectiveness criterion. At all other impacted receptors, the line of sight from a given receptor to the Sterling Highway cannot be blocked due to access requirements, such as driveways. As a result, 5 dBA reductions cannot be achieved for these receptors and barriers are not feasible. Because noise barriers cannot feasibly or reasonably reduce noise levels at impacted receptors, their inclusion in the project is not recommended.

2 Project Introduction and Background

The DOT&PF recognizes the need to improve safety and mobility for the portion of the Sterling Highway between Sterling and Soldotna, on the Kenai Peninsula, due to increased traffic from growth in the community, recreation, and tourism. In this highway segment, MP 82.5 to 94, the Sterling Highway is a two-lane highway that has been the focus of several improvement projects over the past few decades. It was designated as a traffic safety corridor (fourth identified in the State) in 2009, which demonstrates the serious need for improvements. This section of the highway has no passing lanes, limited passing opportunities, and no slow-vehicle turnouts. As local communities and through traffic have grown, so have congestion and safety concerns. The road has a high rate of fatal and major injury crashes, is over capacity, and does not function efficiently during commute hours and summer peak traffic times.

DOT&PF, in cooperation with the FHWA, proposes to improve the safety, capacity, and mobility of this 11.5-mile-long segment of the Sterling Highway by widening it from two to four lanes. The proposed project also includes separated bike/pedestrian facilities, access management techniques, turn lanes, frontage roads, intersection realignments, and other associated road construction activities.

3 Purpose of Study

A traffic noise analysis was performed to identify existing and predicted future traffic noise levels associated with the project, determine if impacts occur, and evaluate abatement measures for feasibility and reasonableness where impacts occur. The proposed build alternative adds two additional travel lanes, one in each direction, and a center left-turn lane in some locations. The increased width of the highway reduces the separation distance between highway traffic noise and noise-sensitive receptors (typically representing outdoor areas of frequent human use), and could result in increased traffic noise levels. These characteristics classify the project as a Type 1 project, per 23 Code of Federal Regulations (CFR) 772.5, which requires a traffic noise analysis.

4 Methods

4.1 Understanding Noise

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, work, speech, or recreation. Vehicle noise is a combination of the noise produced by the engine, exhaust, and tires. Noise levels from highway traffic are affected by three factors: (1) traffic volume, (2) traffic speed, and (3) the number of trucks in the flow of traffic. Generally, traffic noise increases commensurate with these three factors. For example, the sound from one heavy truck is roughly equivalent to the sound of more than 20 automobiles.

Noise is measured in decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies of sound are given more or less “weight.” The A-weighted scale, denoted as dBA, corresponds to the sensitivity range for human hearing. (Note: acoustic terminology has been defined and included at the beginning of this report).

This analysis used the hourly equivalent noise level ($L_{eq(h)}$) to analyze traffic noise levels and identify noise impacts. The $L_{eq(h)}$ is defined as the equivalent steady-state sound level that, in a stated period of time, contains the same acoustic energy as the time-varying sound level during that same period.

Ambient noise level changes of 3 dBA are considered to be at the threshold of perceptible change for most adults with normal hearing, as shown in Table 4-1.

Table 4-1. Logarithmic Nature of Sound

Change in $L_{eq(h)}$ Sound Level	Perceived Loudness in the Natural Environment
+/- 3 dBA	Barely perceptible change
+/- 5 dBA	Readily perceptible change
+/- 10 dBA	Considered twice or half as loud

A few general relationships are helpful in understanding how sound is generated and how it travels. From a source (such as vehicles on a road) to a receptor (such as a residence), noise levels decrease with distance from the noise source. The manner in which noise decreases with distance depends on the following important factors:

- *Geometric spreading from point sources and line sources.* The $L_{eq(h)}$ from a line source, such as vehicle traffic on a road, will decrease by approximately 3 dBA each time you double the distance between the source (road) and the receptor (noise-sensitive land use). For example, if vehicles produce a sound level of 60 dBA at a distance of 100 feet from the road, the sound level will decrease to 57 dBA at 200 feet from the road and 54 dBA at 400 feet from the road.
- *Ground absorption.* Hard surfaces such as pavement tend to reflect noise, whereas soft surfaces such as vegetation tend to break up and reduce noise.

- *Atmospheric effects and refraction.* Atmospheric conditions can affect how well noise travels near highways. Wind is the single most important meteorological factor within approximately 500 feet, and vertical air temperature gradients are more important over longer distances. Other factors such as air temperature, humidity, and turbulence can also have significant effects.
- *Shielding by natural and manmade features, and noise barriers.* Noise levels can also decrease due to shielding from topographic features (such as hills) or structures (such as buildings) between the noise source and the receptor.

4.2 Regulatory Overview

The DOT&PF *Noise Policy* (Appendix A) states that potential noise impacts must be evaluated for all Type I federal aid and state-funded highway construction, as defined by 23 CFR 772.5. Type I projects are those projects that involve constructing new highways, reconstructing existing highways by significantly changing either the horizontal or vertical alignment or increasing the number of through travel lanes. This project qualifies as a Type 1 project because of the additional travel lanes.

FHWA assigns different types of land uses to different activity categories based on the type of activities occurring in each respective land use (e.g., residences, schools, churches, commercial land, and undeveloped land). Noise abatement criteria (NAC) are assigned to each activity category. These NAC represent the maximum traffic noise levels that allow uninterrupted use within each activity category. Table 4-2 lists the seven land use activity categories and the NAC associated with each.

Traffic noise impacts occur when traffic noise levels approach or exceed the FHWA NAC for specific land use types, or when the predicted traffic noise levels substantially exceed the existing noise levels. The DOT&PF is responsible for implementing the FHWA regulations in Alaska, identifying the approach criteria, defining “substantial increase,” and considering localized noise abatement.

The DOT&PF defines “approach” as noise levels within 1 dBA of FHWA NAC. The DOT&PF defines “substantial increase” as 15 dBA above existing levels. Noise levels resulting from design hour traffic volumes (DHV) on the highway (which typically equate to the 30th highest hourly traffic volume of the year) are compared to the NAC to assess compliance and/or the need for mitigation. If an adverse noise impact is predicted, FHWA regulations and DOT&PF policy require that noise abatement measures be considered.

Table 4-2. FHWA Noise Abatement Criteria

Activity Category	Activity Criteria $L_{eq(h)}$ ^a	Evaluation Location	Land Use Activity Description
A	57 dBA	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where preserving those qualities is essential if the area is to continue to serve its intended purpose.
B ^b	67 dBA	Exterior	Residential.
C ^b	67 dBA	Exterior	Active sports 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 dBA	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 ^b	72 dBA	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.

^a The $L_{eq(h)}$ activity criteria values are for impact determination only and are not design standards for noise abatement measures.

^b Includes undeveloped lands permitted for this activity category.

4.3 Model

Traffic noise levels were predicted using FHWA’s TNM (Version 2.5). TNM computes highway traffic noise at nearby receptors and aids in the design of mitigation measures, if needed. Inputs to the model include three-dimensional descriptions of road alignments; vehicle volumes in defined vehicle classes (e.g., cars, medium trucks, heavy trucks, buses, and motorcycles); vehicle speeds; traffic control devices; and data on the characteristics and locations of specific ground types, topographical features, and other features likely to influence the propagation of vehicle noise between the roadway and receptor. Traffic data inputs are outlined in Appendix B, and TNM input/output files are available electronically from the DOT&PF by request.

Noise levels were predicted at receptors representing exterior areas of frequent human use. Highway traffic noise levels were modeled at 151 receptors (noise prediction sites), representing 166 residences (Category B land use); one church, one school, one campground, one recreational area, one senior center, and one golf course (Category C land uses); one medical center (Category D land use); and three commercial properties

(Category E land use). Some receptors represent more than one noise sensitive location, such as groupings of homes that are at a similar distance from the Sterling Highway and share the same acoustic environment. The location of modeled noise receptors are shown in the figures contained in Appendix C.

The traffic data (e.g., DHVs and vehicle classification percentages [cars, trucks, etc.]) used as inputs to the TNM were provided by DOT&PF. Appendix B includes a summary of the traffic data inputs to the TNM.

Modeled noise levels for all analysis conditions were compared with the applicable NAC to determine project noise impacts.

4.4 Model Validation Process

Ambient noise levels were measured at 10 locations in the project study area on September 7, 2016, using a Larson Davis LxT sound level meter (SLM). The SLM was field calibrated using a Larson Davis CAL200 acoustic calibrator. All equipment used for the sound survey was calibrated within the previous year in a laboratory. Calibration certificates for the equipment used in this study are provided in Appendix D.

Ambient noise measurement sites were selected to capture a representative sample of properties near the project. Measurements were completed at representative outdoor areas of frequent human use. Site photos and data sheets are provided in Appendix E, and the locations are shown on the figures in Appendix C.

Noise levels were measured in 15-minute intervals, 5 feet above ground level. At each of the locations, per DOT&PF *Noise Policy* requirements, two separate 15-minute measurements were conducted using American National Standards Institute (ANSI) Type 1 (Precision) SLMs, and observations of traffic volumes on adjacent roadways were collected. Meteorological conditions during the field survey were dry, with an average temperature of 52 degrees Fahrenheit and wind speeds of less than 5 miles per hour.

The model is considered adequate to represent the existing acoustic environment and can be used to predict traffic noise levels at project area sensitive receptors, if the difference between measured and modeled sound levels is within +/- 3 dBA. As shown in Table 4-3, the measured and modeled sound levels are within +/- 3 dBA.

Table 4-3. Measured Noise Levels in the Project Study Area (L_{eq}-dBA)

Measurement Site	Site Description	Activity Category	Category NAC (dBA)	Measurement Duration (min)	Measured L _{eq(h)} Noise Level (dBA) ^a	Model L _{eq(h)} Noise Level (dBA)	Difference
M-1	Business	E	72	15	59.2	58.7	-0.5
M-2	Residence	B	67	15	58.1	58.0	0.1
M-3	Residence	B	67	15	56.1	57.4	1.3
M-4	Residence	B	67	15	55.3	57.0	1.7
M-5	Residence	B	67	15	63.3	60.9	-2.4
M-6	Residence	B	67	15	55.3	57.0	1.7
M-7	Business	E	72	15	56.9	57.4	1.3
M-8	Residence	B	67	15	59.5	56.5	-3.0
M-9	Church	C	67	15	59.0	59.2	0.2
M-10	School	C	67	15	58.0	58.3	-0.3

^a The DOT&PF *Noise Policy* requires that two measurements be conducted and that at least one measurement is validated with the model. Validation is typically demonstrated using the first measurement, and the second measurement is not evaluated unless agreement within +/-3 dBA is not possible. The two measurements are not averaged. For this analysis, model validation was demonstrated using the first measurement at each site for this project.

5 Description of Land Use Categories along the Corridor

A review of existing land use was conducted concurrently with the traffic noise measurement effort to identify those land uses that are sensitive to traffic noise. The project area is characterized by a mix of residential (Land Use Category B); places of worship, a campground/RV park, a recreational site (the Scout Lake State Recreation Site), a school (the Sterling Elementary School), and a golf course (Land Use Category C); a medical center (Land Use Category D); commercial and retail properties (Land Use Category E); a weigh station (Land Use Category F); and undeveloped lands (Land Use Category G).

There are a number of gift shop/tourist-related businesses along the highway in the project area but many of these do not appear to have exterior areas where frequent human use occurs.

Most institutional land uses were modeled at their outdoor use areas as Category C land uses. One medical center with no outdoor use areas was modeled to predict interior noise as a Category D land use. No Category A land uses were identified in the project area.

6 Results

The following sections present the results of the noise analysis for the existing conditions, future no-build alternative and future build alternative. The project area was modeled using 151 noise receptors. Traffic noise impacts were evaluated using the NAC. Receptor locations are provided in Appendix C. Table 6-1 provides the sound levels at each receptor point for the existing conditions and for the 2050 no-build and build alternatives.

6.1 Existing Conditions

Under the existing conditions, traffic noise ranges from 50 to 67 dBA $L_{eq(h)}$. Three receptors (R-53, R-81, and R-81b) are predicted to have exceedances of the NAC under the existing conditions, representing four residential receivers receiving 66 to 67 dBA $L_{eq(h)}$.

6.2 No-build Alternative

Under the 2050 no-build alternative, traffic noise would increase relative to the existing condition due to increased traffic volumes on area roadways. No-build traffic noise levels in the project area would range from 51 to 68 dBA $L_{eq(h)}$. No-build noise levels are predicted to increase up to 1 dBA over the existing conditions. Five receptors (R-53, R-67, R-76, R-81, and R-81b) representing six individual residential receivers are predicted to approach or exceed the NAC under the no-build alternative.

6.3 Build Alternative

Under the 2050 build alternative, traffic noise would increase relative to the existing condition due to increased traffic volumes and because the Sterling Highway would be widened, thus reducing the setback distance of some receptors from the highway. Traffic noise levels under the build alternative would range from 50 to 68 dBA $L_{eq(h)}$. Noise levels under the build alternative are predicted to change from a decrease of 5 dBA to an increase up to 8 dBA when compared to existing conditions. Noise levels at seventeen residential receivers are predicted to approach or exceed the NAC under the build alternative. Refer to Section 7, 8, and 9 for additional information on impacted receivers and abatement measures.

Compared to the no-build alternative, traffic noise levels would range from a decrease of 5 dBA to an increase of 7 dBA. In some areas, traffic noise levels would increase due to reduced setback distance of some receptors from the highway. In other areas, traffic noise levels would decrease due to the future roadway being located further from the existing Sterling Highway alignment.

Table 6-1. Predicted Peak Hour Noise Levels for the Existing, No-build, and Build Alternatives

Receptor	Land Use (Activity Category)	Number of Receivers Represented by Receptor	NAC (dBA)	Existing $L_{eq(h)}$ Noise Levels (dBA)	2050 No-build $L_{eq(h)}$ Noise Levels (dBA)	2050 Build $L_{eq(h)}$ Noise Levels (dBA)	Noise Impact
R-1	Residential (B)	3	66	55	56	59	No
R-2	Residential (B)	3	66	54	55	57	No
R-3	Residential (B)	1	66	60	61	58	No
R-4	Residential (B)	1	66	62	63	61	No
R-5	Residential (B)	1	66	58	59	58	No
R-6	Residential (B)	1	66	54	55	58	No
R-7	Residential (B)	1	66	58	59	60	No
R-8	Residential (B)	1	66	52	53	53	No
R-9	Residential (B)	1	66	64	65	67	Yes
R-10	Residential (B)	1	66	61	62	65	No
R-11	Residential (B)	3	66	64	65	65	No
R-12	Residential (B)	1	66	58	59	62	No
R-13	Residential (B)	1	66	53	54	55	No
R-14	Residential (B)	1	66	53	54	56	No
R-15	Residential (B)	1	66	55	56	58	No
R-16	Residential (B)	1	66	55	56	58	No
R-17	Residential (B)	1	66	64	65	66	Yes
R-18	Church of Christ Soldotna (C)	1	66	59	60	62	No
R-19	Residential (B)	1	66	62	63	65	No
R-20	Residential (B)	1	66	54	55	56	No
R-21	Residential (B)	1	66	54	55	56	No
R-22	Residential (B)	2	66	54	55	56	No
R-23	Residential (B)	2	66	54	55	55	No
R-24	Residential (B)	1	66	54	54	56	No
R-25	Residential (B)	1	66	54	54	56	No
R-26	Residential (B)	1	66	51	52	53	No
R-27	Residential (B)	1	66	53	54	56	No

Receptor	Land Use (Activity Category)	Number of Receivers Represented by Receptor	NAC (dBA)	Existing $L_{eq(h)}$ Noise Levels (dBA)	2050 No-build $L_{eq(h)}$ Noise Levels (dBA)	2050 Build $L_{eq(h)}$ Noise Levels (dBA)	Noise Impact
R-28	Residential (B)	1	66	59	60	62	No
R-29	Commercial (E) (property includes several tourist-related activities, including gold panning, carving, and a drive-through espresso stand)	1	71	65	66	67	No
R-30	Residential (B)	1	66	60	61	63	No
R-31	Residential (B)	1	66	59	60	63	No
R-32	Residential (B)	1	66	54	55	57	No
R-33	Residential (B)	1	66	54	54	56	No
R-34	Residential (B)	1	66	61	62	61	No
R-35	Residential (B)	2	66	50	51	50	No
R-36	Residential (B)	1	66	50	51	50	No
R-37	Residential (B)	1	66	55	56	59	No
R-38	Residential (B)	1	66	59	60	61	No
R-39	Residential (B)	1	66	59	60	59	No
R-40	Residential (B)	1	66	55	56	61	No
R-41	Residential (B)	1	66	60	61	59	No
R-42	Residential (B)	4	66	59	59	58	No
R-43	Residential (B)	4	66	63	64	62	No
R-44	Residential (B)	1	66	59	60	56	No
R-45	Residential (B)	3	66	57	57	55	No
R-46	Residential (B)	1	66	57	57	54	No
R-47	Residential (B)	1	66	55	56	61	No
R-48	Residential (B)	1	66	53	54	60	No
R-49	Residential (B)	1	66	58	59	65	No
R-50	Residential (B)	2	66	59	60	66	Yes
R-51	Residential (B)	1	66	57	58	63	No
R-52	Residential (B)	1	66	60	61	68	Yes

Receptor	Land Use (Activity Category)	Number of Receivers Represented by Receptor	NAC (dBA)	Existing $L_{eq(h)}$ Noise Levels (dBA)	2050 No-build $L_{eq(h)}$ Noise Levels (dBA)	2050 Build $L_{eq(h)}$ Noise Levels (dBA)	Noise Impact
R-53	Residential (B)	1	66	67	68	65	No
R-54	Residential (B)	1	66	56	57	59	No
R-55	Residential (B)	1	66	54	54	59	No
R-56	Residential (B)	1	66	61	62	65	No
R-57	Residential (B)	1	66	64	65	66	Yes
R-58	Residential (B)	1	66	62	62	65	No
R-59	Residential (B)	1	66	55	56	59	No
R-60	Residential (B)	1	66	63	63	65	No
R-61	Residential (B)	1	66	60	61	64	No
R-62	Residential (B)	1	66	53	54	57	No
R-63	Residential (B)	1	66	52	53	55	No
R-64	Residential (B)	1	66	64	64	65	No
R-65	Residential (B)	1	66	62	63	64	No
R-66	Residential (B)	1	66	55	55	57	No
R-67	Residential (B)	1	66	65	66	66	Yes
R-68	Residential (B)	1	66	57	57	57	No
R-69	Residential (B)	1	66	56	57	55	No
R-70	Residential (B)	2	66	52	53	53	No
R-71	Residential (B)	1	66	54	55	53	No
R-72	Residential (B)	1	66	53	54	57	No
R-73	Residential (B)	1	66	58	59	62	No
R-74	Residential (B)	1	66	64	65	66	Yes
R-75	Residential (B)	1	66	63	64	66	Yes
R-76	Residential (B)	1	66	65	66	67	Yes
R-77	Residential (B)	1	66	62	63	63	No
R-78	Residential (B)	1	66	52	53	53	No
R-79	Residential (B)	1	66	54	55	55	No
R-80	Residential (B)	1	66	64	65	66	Yes

Receptor	Land Use (Activity Category)	Number of Receivers Represented by Receptor	NAC (dBA)	Existing $L_{eq(h)}$ Noise Levels (dBA)	2050 No-build $L_{eq(h)}$ Noise Levels (dBA)	2050 Build $L_{eq(h)}$ Noise Levels (dBA)	Noise Impact
R-81	Residential (B)	1	66	66	67	67	Yes
R-81b	Residential (B)	2	66	66	67	67	Yes
R-82	Residential (B)	1	66	55	55	57	No
R-83	Residential (B)	2	66	56	57	54	No
R-84	Residential (B)	1	66	53	53	50	No
R-85	Residential (B)	1	66	58	58	53	No
R-86	Residential (B)	1	66	54	55	59	No
R-87	Residential (B)	1	66	56	57	62	No
R-88	Residential (B)	1	66	59	60	66	Yes
R-89	Residential (B)	1	66	59	60	64	No
R-90	Residential (B)	1	66	53	54	57	No
R-91	Residential (B)	1	66	61	62	66	Yes
R-92	Residential (B)	1	66	59	60	65	No
R-93	Residential (B)	2	66	52	53	57	No
R-94	Residential (B)	2	66	54	55	59	No
R-95	Residential (B)	1	66	55	55	59	No
R-96	Residential (B)	1	66	54	55	58	No
R-97	Residential (B)	1	66	56	57	61	No
R-98	Residential (B)	1	66	53	54	54	No
R-99	Residential (B)	1	66	56	57	57	No
R-100	Residential (B)	1	66	58	59	62	No
R-101	Residential (B)	1	66	54	54	58	No
R-102	Residential (B)	1	66	53	54	55	No
R-103	Residential (B)	1	66	62	63	63	No
R-104	Residential (B)	2	66	52	53	53	No
R-105	Residential (B)	2	66	55	56	58	No
R-106	Residential (B)	1	66	55	56	58	No
R-107	Scout Lake State Recreation Site (C)	1	66	51	52	55	No

Receptor	Land Use (Activity Category)	Number of Receivers Represented by Receptor	NAC (dBA)	Existing $L_{eq(h)}$ Noise Levels (dBA)	2050 No-build $L_{eq(h)}$ Noise Levels (dBA)	2050 Build $L_{eq(h)}$ Noise Levels (dBA)	Noise Impact
R-108	Residential (B)	1	66	59	60	62	No
R-109	Residential (B)	1	66	64	65	66	Yes
R-110	Residential (B)	1	66	57	58	60	No
R-111	Residential (B)	1	66	64	65	65	No
R-112	Residential (B)	1	66	63	64	64	No
R-113	Residential (B)	1	66	60	61	64	No
R-114	Residential (B)	1	66	58	58	60	No
R-115	Residential (B)	1	66	58	59	61	No
R-116	Residential (B)	1	66	56	57	59	No
R-117	Residential (B)	1	66	56	57	57	No
R-118	Residential (B)	1	66	61	62	63	No
R-119	Residential (B)	1	66	56	57	59	No
R-120	Campground (C)	1	66	62	63	64	No
R-121	Residential (B)	1	66	55	56	59	No
R-122	Residential (B)	1	66	64	65	65	No
R-123	Residential (B)	1	66	61	62	62	No
R-124	Residential (B)	1	66	56	57	57	No
R-125	Residential (B)	1	66	59	59	61	No
R-126	Residential (B)	1	66	57	57	59	No
R-127	Residential (B)	1	66	54	55	55	No
R-128	Sterling Elementary School (C)	1	66	52	53	56	No
R-129	Residential (B)	1	66	54	55	56	No
R-130	Residential (B)	1	66	54	55	55	No
R-131	Residential (B)	1	66	55	56	55	No
R-132	Residential (B)	1	66	55	56	55	No
R-133	Residential (B)	1	66	54	55	56	No
R-134	Residential (B)	1	66	54	55	57	No
R-135	Residential (B)	1	66	52	53	55	No

Receptor	Land Use (Activity Category)	Number of Receivers Represented by Receptor	NAC (dBA)	Existing $L_{eq(h)}$ Noise Levels (dBA)	2050 No-build $L_{eq(h)}$ Noise Levels (dBA)	2050 Build $L_{eq(h)}$ Noise Levels (dBA)	Noise Impact
R-136	Residential (B)	1	66	52	53	54	No
R-137	Residential (B)	1	66	59	60	62	No
R-138	Residential (B)	1	66	54	54	55	No
R-139	Residential (B)	1	66	59	60	60	No
R-140	Residential (B)	1	66	57	58	58	No
R-141	Residential (B)	1	66	60	61	60	No
R-142	Residential (B)	1	66	59	59	59	No
R-143	Residential (B)	1	66	58	59	59	No
R-144	Residential (B)	1	66	55	56	56	No
R-145	Residential (B)	1	66	63	64	64	No
R-146	Birch Ridge Golf Course (C)	1	66	61	62	63	No
R-147	Commercial (ice cream parlor) (E)	1	71	62	62	65	No
R-148	Senior Center (C)	1	66	63	64	65	No
R-149	Medical Center (D) ¹	1	51	44	44	44	No
R-150	Acapulco Restaurant (E)	1	71	61	61	65	No

¹ Interior noise levels were conservatively calculated assuming a light frame construction and single glazed windows yielding a 20 dBA reduction from modeled outdoor levels (FHWA, 2011).

7 Identification of Noise Impacts

Seventeen dwelling units at fifteen receptors (R-9, R-17, R-50, R-52, R-57, R-67, R-74, R-75, R-76, R-80, R-81, R-81b, R-88, R-91, and R-109) are predicted to be impacted by traffic noise from the project under 2050 traffic conditions for the build alternative.

8 Noise Abatement Analysis Considerations

For Type I projects, noise abatement measures are considered and evaluated for **feasibility** and **reasonableness**, where predicted traffic noise levels approach or exceed the NAC, or when the predicted traffic noise levels substantially exceed the existing

noise levels. In abating traffic noise impacts, the DOT&PF gives primary consideration to exterior areas of frequent human use. The DOT&PF Feasibility and Reasonableness worksheets prepared for this analysis are included in Appendix F.

Acoustic feasibility criteria deal primarily with physics and engineering considerations (i.e., can a substantial noise reduction be achieved, given the conditions of a specific location; is the ability to achieve noise reduction limited by factors such as topography, access requirements for driveways or ramps, the presence of cross streets, or other noise sources in the area). In addition, the DOT&PF provides the following two feasibility considerations:

1. Noise abatement measures are not feasible if a minimum reduction of 5 dBA or more cannot be achieved for at least 50 percent of the front row dwelling units.
2. Noise abatement measures are not feasible if they create a safety hazard to the driving public, protected receptors, or maintenance personnel.

Reasonableness is a more subjective criterion than feasibility. It implies that common sense and good judgment were applied in arriving at a decision for abatement.

Reasonableness is based on a number of factors, not just one criterion. FHWA noise regulations define three mandatory reasonableness factors that must be evaluated for a noise abatement measure to be considered reasonable.

1. Cost effectiveness

The DOT&PF policy states that the noise abatement measure cost be no more than \$32,000 per benefited receiver, based upon the design engineer's estimate. This allowable cost was escalated per the 2011 DOT&PF *Noise Policy* using the FHWA *National Highway Construction Cost Index (NHCCI) 2.0* to \$38,349 for the purposes of assessing reasonableness. A benefited receiver is defined as the recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dBA.

2. Viewpoints of the property owners and residents that benefit from noise abatement measures

The policy requires that viewpoints of the property owners and residents who benefit from noise abatement measures be considered. To determine the desires 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. At least 60 percent of households and property owners surveyed must want the noise abatement measure to be deemed "reasonable".

3. Noise reduction design goal

The DOT&PF noise reduction design goal is a minimum of 7 dBA. Fifty percent or more of the benefitted receivers in the first row of structures must achieve this design goal for the noise abatement to be considered reasonable.

The DOT&PF considers these three mandatory reasonable factors to determine reasonableness. Noise abatement in the form of noise barriers was considered for the impacted receptors under the build alternative.

9 Abatement Analysis and Recommendations

Noise abatement to reduce highway vehicle noise can take a number of physical or operational forms. The most common and often most cost-effective approach to mitigating highway noise is the construction of traditional noise walls or barriers. Other methods of reducing highway noise include roadway alignment changes, truck restrictions, speed restrictions, and the acquisition of real property to create a buffer between a highway and the nearest noise sensitive land uses.

Realigning the Sterling Highway to increase the setback between existing land uses and the highway would involve considerable expense, and it is very unlikely to be able to meet the reasonableness criteria per benefited receiver due to the relatively low development density in the project area. Similarly, the cost of acquiring real property and displacing existing residents and businesses would be very unlikely to be able to meet the reasonableness criteria per benefited receiver allowable by the DOT&PF *Noise Policy*.

In addition, restrictions on the ability of trucks to use the Sterling Highway, as well as overall speed restrictions, would be counter to the primary function of this important freight and transportation route in this part of Alaska.

Therefore, noise barriers were evaluated at all impacted receptors for the purposes of mitigating predicted noise impacts.

9.1 Receptors 9, 17, 50, 52, 57, 67, 74, 75, 76, 91, and 109

For a noise barrier to be effective, it must be of sufficient length and height to block the line of sight from the receptor to the roadway. A 5 dBA reduction in traffic noise is possible only when the line of sight to a roadway, in this case the Sterling Highway, from an impacted receptor is blocked. In cases where it is not possible to block the line of sight between the highway and the receptor, either because of differences in elevation due to topography or gaps need to be left in the wall to allow access to properties, noise reductions (e.g. a 5 dBA reduction to be considered “benefitted” by the wall per the DOT&PF *Noise Policy*) typically cannot be attained. In addition, obtaining the design goal of 7 dBA reduction at one first-row receiver cannot be obtained when there is direct line of sight between a receptor and the highway.

In addition, where isolated impacts occur (i.e., single impacts that are not clustered with other adjacent impacts), noise barrier length parallel to the highway typically needs to be at least four times the perpendicular distance of the receptor to the highway in order to produce the level of noise reduction required to begin to show a benefit per the DOT&PF *Noise Policy*. In cases where there is only one impact to mitigate, wall costs quickly exceed the allowable cost per residence of \$38,349, making the wall unreasonable.

Noise mitigation was considered at Receptors 9, 17, 50, 52, 57, 67, 74, 75, 76, 91, and 109. Uncontrolled access directly onto the Sterling Highway in front of or adjacent to the properties means that noise mitigation could not break the line of sight from the highway for Receptors 17, 50, 52, 57, 74, 75, 91, and 109. At Receptors 9, 67, and 76 the length of wall that would be required (at least four times the distance of the receptor to the

highway) would not meet the cost reasonableness criterion for single, impacted properties. Therefore, noise mitigation is not recommended for these receptors.

9.2 Receptors 80, 81, and 81b

A wall was evaluated at Receptors 80, 81, and 81b using TNM due to the potential to block the line of sight between the highway and the receivers. Noise levels at one adjacent, second-row receiver (represented by Receptor 79) were also assessed to determine whether additional receivers could benefit from a noise wall and therefore be included in the reasonableness calculation, per DOT&PF policy. The analysis concluded that R-79 would not be benefited by the wall and was therefore not counted in the reasonableness conclusions presented below.

The results of the TNM analysis indicated that a 720-foot-long, 10-foot-high barrier between the receivers and the roadway would result in a 5 dBA or more reduction at all four front row, impacted receivers; therefore, a noise barrier would be feasible.

In addition, more than fifty percent of the benefitted receivers in the first row of structures would be able to achieve the 7-dBA design goal with the wall.

Assuming a barrier cost of \$60 per square foot, the wall would cost \$432,000 to construct, or \$108,000 per benefitted receiver, of which there are four. This cost exceeds the reasonable amount established by DOT&PF; therefore, it is not reasonable. As a result, noise mitigation is not recommended for these receptors.

9.3 Receptor 88

A 651-foot-long, 10 to 16-foot-high wall was evaluated at Receptor 88 using TNM due to the potential to block the line of sight between the highway and the residence. Noise levels at adjacent non-impacted receivers (Receptors 86, 87, 89 and 90) with the wall were also assessed to determine whether additional receivers could benefit and allow a wall to meet DOT&PF criteria to reduce noise levels at Receptor 88. The results of the TNM analysis indicated that 50 percent or more of the front row receivers, including R-89 which is not predicted to be impacted, would achieve a 5-dBA reduction from a noise barrier; therefore, a noise barrier would be feasible.

However, in order to achieve the 7-dBA design goal, the height of the noise barrier would need to range from 10 to 16 feet high, resulting in a square footage of 9,868. Assuming a barrier cost of \$60 per square foot, the wall would cost \$592,080, or \$296,040 per benefitted receiver, of which there are two. This cost exceeds the reasonable amount established by DOT&PF; therefore, it is not reasonable. As a result, noise mitigation is not recommended for these receptors.

10 Statement of Likelihood

As a result of the feasibility and reasonableness analysis conducted as a part of the environmental document, the DOT&PF does not propose to incorporate noise abatement measures into the project. These noise abatement recommendations are preliminary and based upon the feasibility and reasonableness analysis completed at the time of 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 reevaluation of the approved National Environmental Policy Act document and the solicitation of additional public comment.

11 Construction Noise

The DOT&PF *Noise Policy* requires that construction noise be evaluated for Type 1 Federal and State Projects, such as this one. Specifically, it is DOT&PF policy to:

- Identify land uses or activities that may be affected by noise from construction of the project.
- Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community.
- Incorporate the needed abatement measures in the plans and specifications.

Construction noise sensitive land uses are the same as those identified in the noise analysis discussed above. Adjacent land uses and activities will experience increased sound levels during construction of the proposed project. Noise levels for these activities can be expected to range from approximately 70 to 100 dBA maximum sound level during a single noise event (L_{max}) at sites 50 feet from the equipment activities (see Table 11-1).

Table 11-1. Typical Construction Noise Levels

Types of Activity	Types of Equipment	Range of Noise Levels at 50 feet (dBA L_{max})
Materials Handling	Concrete mixers	75-87
	Concrete pumps	81-83
	Cranes (movable)	76-87
	Cranes (derrick)	86-88
Stationary Equipment	Pumps	69-71
	Generators	71-82
	Compressors	74-87
Impact Equipment	Pile driver ^a	95-101
	Pneumatic wrenches	83-88
	Rock drills	81-98
Land Clearing	Bulldozer	77-96
	Dump truck	82-94
Grading	Scraper	80-93
	Bulldozer	77-96
Paving	Paver	86-88

Types of Activity	Types of Equipment	Range of Noise Levels at 50 feet (dBA L _{max})
	Dump truck	82-94

Source: U.S. Environmental Protection Agency 1971, unless otherwise noted.

^a FHWA Roadway Construction Noise Model User's Guide, 2006.

No one receptor is expected to be exposed to long-duration construction noise; therefore, extended disruption of normal activities is not anticipated. As a result, project-specific construction noise abatement measures are not anticipated to be needed. Construction noise would occur from the project, but would be limited to daytime hours to the extent practicable and would last up to three years. Construction noise would be controlled by keeping construction equipment in good working order with functional mufflers. Additionally, when possible, construction equipment would be staged as far away from noise-sensitive receivers as is practical.

12 Conclusion

The project would result in some operational traffic noise and temporary construction noise. Under the build alternative, traffic noise is predicted to approach or exceed the NAC at 15 receptors, representing 17 individual receivers. No substantial noise increase impacts are predicted as a result of the project. Noise abatement in the form of noise barriers was evaluated for feasibility and reasonableness at the impacted receivers, but they did not meet the established criteria. Therefore, noise abatement is not recommended for this project.

12.1 Information for Local Officials

The DOT&PF *Noise Policy* also requires the distance to NAC limits for all exterior land use categories be calculated for undeveloped lands (Activity Category G) near the project. The distance to traffic noise thresholds from the build alternative centerline were calculated conservatively, assuming the roadway is a straight line and that there are no topographical effects to traffic noise propagation. Table 12-1 presents the distances to the DOT&PF NAC approach thresholds.

It should be noted that the distances of noise impact contours for different land uses are guidelines only. More detailed noise analysis should be performed for specific future proposed developments.

Table 12-1. Predicted Distances to Activity Category B, C, and E Noise Impact Thresholds

Sterling Highway Segment	Distance to Activity Category B and C NAC (feet)*	Distance to Activity Category E NAC (feet)*
Sterling Weigh Station to Swanson River Road	109	47
Swanson River Road to West Scout Lake Road	140	60
West Scout Lake Road to Robinson Loop Road	140	60
Robinson Loop Road to Forest Lane	147	63
Forest Lane to Boundary Street	172	67
Boundary Street to Devin Drive	219	89

* Activity Category B and C NAC is 66 dBA, and Activity Category E NAC is 71 dBA.

13 References

- DOT&PF (Alaska Department of Transportation and Public Facilities). 2011. *Alaska Environmental Procedures Manual – Noise Policy*. April 2011.
- U.S. Environmental Protection Agency. 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. NTID300.1.
- FHWA (Federal Highway Administration). 2006. *Roadway Construction Noise Model User’s Guide*. FHWA-HEP-05-054. January 2006.
- . 2010. 23 CFR 772. Procedures for Abatement of Highway Traffic Noise and Construction Noise. *Federal Register* Volume 75, No. 133. July 13, 2010.
- . 2011. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*. Office of Environment and Planning. December 2011.

Appendix A. DOT&PF *Noise Policy*

Alaska Department of Transportation & Public Facilities
Alaska Environmental Procedures Manual

Noise Policy

April 2011



STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES
STATEWIDE DESIGN & ENGINEERING SERVICES DIVISION

SEAN PARNELL, GOVERNOR

3132 CHANNEL DRIVE
P.O. Box 112500
JUNEAU, ALASKA 99811-2500
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April 14, 2011

Mr. David Miller
Division Administrator
Federal Highway Administration
Alaska Division
709 West 9th Street, Rm 851
P.O. Box 21648
Juneau, AK 99802

Reference: DOT&PF Noise Policy

Dear Mr. Miller:

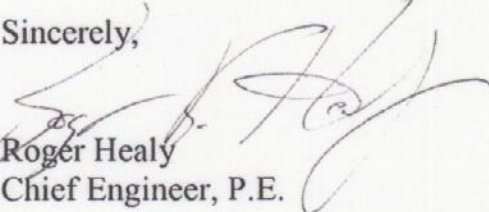
The Alaska Department of Transportation and Public Facilities (ADOT&PF) hereby submits a copy of the DOT&PF Noise Policy dated April 2001 for review and approval by the Federal Highway Administration Alaska Division. We would like to thank your staff and Mark Ferroni of your Washington D.C. office for your review and comments on previous drafts. These comments have been incorporated into this version of the document. This policy is in response to changes in 23 CFR 772. It is our intent that this noise policy will go into effect upon your approval of this policy.

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

Approved: _____


(David Miller, Division Administrator, FHWA Alaska Division)

Sincerely,


Roger Healy
Chief Engineer, P.E.

Enclosure: DOT&PF Noise Policy (April 2011)

"Providing for the safe movement of people and goods and the delivery of state services."

INTRODUCTION

This document contains the Alaska Department of Transportation and Public Facilities (DOT&PF) noise policy on highway traffic noise and construction noise. This policy describes DOT&PF's implementation of the requirements of the Federal Highway Administration (FHWA) Noise Standard at 23 Code of Federal Regulations (CFR) Part 772 (see Appendix A). This policy also addresses how traffic noise is considered on state funded projects. It applies to both design-build and design-bid-build projects. DOT&PF developed this policy and submitted it to FHWA for their review and concurrence.

Noise is defined as unwanted sound. Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit which expresses the ratio of the sound pressure level being measured to a standard reference level. Sound is composed of various frequencies, but the human ear does not respond to all frequencies. Frequencies to which the human ear does not respond must be filtered out when measuring highway noise levels. Since noise is measured on a logarithmic scale, an increase 10 dB in the sound pressure level will be perceived by an observer to be a doubling of the sound whereas a decrease in 10 dB will be perceived as a halving of the sound. For example, a sound at 70 dB will be perceived as twice as loud as a sound at 60 dB.

The level of highway traffic noise depends on three things: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of the traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater numbers of trucks. Vehicle noise is a combination of the noises produced by the engine, exhaust, and tires. The loudness of traffic noise can also be increased by defective mufflers or other faulty equipment on vehicles. Any condition (such as a steep incline) that causes heavy laboring of motor vehicle engines will also increase traffic noise levels. In addition, there are other more complicated factors that affect the loudness of traffic noise. For example, as a person moves away from a highway, traffic noise levels are reduced by distance, terrain, vegetation, and natural and manmade obstacles. While traffic noise is not usually a problem for people who live more than about 450 feet (150 meters) from heavily traveled freeways or more than about 90-180 feet (30 to 60 meters) from lightly traveled roads) there may be incidences (ex. quiet settings, rural areas, etc.) where people can detect highway noise over greater distances.

During the rapid expansion of the Interstate Highway System and other roadways in the 20th century, communities began to recognize that highway traffic noise and construction noise had become 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 policy 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.

In addition to defining traffic noise impacts, the FHWA Noise Standard requires that noise abatement measures be considered when traffic noise impacts are identified for Type I federal projects, as defined in 23 CFR 772.5. For a more detailed definition of a Type I project see the definitions section of this policy. Noise abatement measures that are 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. The DOT&PF has accepted the federal definition of a Type I project for all state-funded projects as well.

Federal regulations also include standards for Type II federal projects. A Type II federal project is defined as 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 state highway agency must develop and implement a Type II program in accordance with 23 CFR 772.7(e). Type II programs are entirely voluntary. The DOT&PF has elected not to participate in a Type II program to retrofit existing state highways with noise abatement.

Type III federal projects are those that neither meet the definitions of Type I or Type II and for which a noise analysis is not required and no consideration of noise abatement is warranted. The DOT&PF has accepted the federal definition of a Type III projects for all state-funded projects as well.

PURPOSE

This policy describes the DOT&PF program to implement 23 CFR 772. 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 the design and construction of state-funded projects.

NOISE STANDARDS

This policy outlines the DOT&PF program to implement the FHWA Noise Standards found in 23 CFR 772. It also describes how the DOT&PF addresses traffic noise on state-funded projects. These standards include traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials.

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 project follows slightly different procedures (discussed the section of this policy entitled *State-Funded Projects*).

DEFINITIONS

The federal noise regulations definitions are located at 23 CFR 772.5. These regulations are located in Appendix A.

Benefited Receptor. The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dBA

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, and cross-roads.

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.

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. It should be for the existing year of analysis.

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.

First Row Receivers: Closest residences or business impacted by noise from the highway facility.

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 receptors and benefited receptors.

Noise Barrier: A physical obstruction 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 dBA 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 of the DOT&PF is 7dBA.

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.

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 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, DOT&PF considers an increase in noise levels of 15 dBA in the design year over the existing noise level to be a substantial noise increase.

Traffic Noise Impacts: Design year build condition noise levels that approach or exceed the NAC listed in Table 1 in 23 CFR 772 for the future build condition; or design year build condition noise levels that create a substantial noise increase over existing noise levels. The DOT&PF defines “approach” as 1 dBA below the FHWA noise abatement criteria and a “substantial” noise increase as a 15 dBA 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 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: 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). The DOT&PF has elected not to participate in the voluntary Type II program at this time¹, so the retrofitting of noise barriers on existing roads is not currently done.

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 or consideration of noise Abatement.

APPLICABILITY

This DOT&PF policy applies to all Type I federal highway projects in the State of Alaska, that is, any projects that receive federal-aid funds or are otherwise subject to FHWA approval. They include federal projects that are administered by Local Public Agencies (LPAs) as well as DOT&PF.

This policy also applies to all Type I state-funded projects, and all Type I projects proposed by Toll Road Authorities in the State of Alaska. Presently, the Knik Arm Crossing Toll Authority (KABATA) is the only such authority in the State². This policy applies to state-funded design-build and design-bid-build projects. This policy does not apply to Type III state-funded maintenance and operations activities and projects. In general, the same methods are followed in the identification of noise impacts for state-funded projects as with federal-aid projects. For state-funded projects, results of noise analyses will be documented in the State Projects Environmental Checklist. If noise abatement is determined to be feasible and reasonable, the Regional Environmental Manager will make a noise abatement recommendation to the Preconstruction Engineer. The Preconstruction Engineer will decide whether the recommended abatement measure will be constructed on state-funded projects. Abatement will be provided only if it meets the feasibility and reasonableness criteria of this policy and the state-funded appropriation can accommodate this expenditure.

The requirements of this policy apply uniformly and consistently to all Type I federal projects, Type I state-funded projects, and Type I Toll Authority projects within the State of Alaska.

DOT&PF has elected not to participate in the voluntary Type II noise program. Consequently, the retrofitting of existing roads with noise abatement is not done by the Department, unless there is a special appropriation by the State Legislature for such abatement and the Department is designated the responsible agency for the project. In those cases, the noise abatement measures being proposed must meet the feasibility

¹ The Knik Arm Crossing Toll Authority (KABATA) has developed a PA that indicates that if Noise Abatement Criteria are exceeded then there will be noise barriers retrofitted to the project.

² Projects that come out of KABATA are state-funded, they follow the noise abatement procedures for State-funded projects, whereas if they are federally funded, they follow the procedures for federal projects.

and reasonableness criteria of this policy. Any disputes with this provision of the policy and state lawmakers should be resolved by the DOT&PF Commissioner.

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.

If there are any questions about whether a project is subject to this policy or the FHWA Noise Standard, contact the Regional Environmental Manager. Disagreements on these determinations should be directed to the Statewide Environmental Manager. Due to the long lead time necessary to complete a traffic noise study, the need for a noise study should be determined early in project scoping.

TRAFFIC NOISE PREDICTION

The most recent version of the FHWA Traffic Noise Model (TNM), or other model found acceptable to FHWA, pursuant to 23 CFR 772.9, will be utilized for all noise predictions. The use of TNM Look-up Tables or any other model unacceptable to FHWA is prohibited. Existing noise levels and future design year noise levels must be predicted for all reasonable build alternatives carried forward in the National Environmental Policy Act (NEPA) document. The future design year noise levels for the No-Build alternative must also be predicted to satisfy documentation requirements of NEPA.

The average pavement type must be used for all noise predictions unless the DOT&PF obtains FHWA approval to use a different pavement type.

The use of noise contour lines can only be used for project alternative screening or for land use planning purposes. Noise contour lines cannot be used for determining traffic noise impacts. DOT&PF will use FHWA's Traffic Noise Model most recently available version to develop noise contours. The predictions will be for worst case hour noise conditions. Generally, worst case hour are traffic levels at Level of Service (LOS) C or D, rather than heavy traffic volumes. In heavily congested urban areas, the peak traffic period (often LOS E or F) may not represent the worst noise conditions. For example, speeds may be low and heavy truck volumes may drop as truckers try to avoid severe congestion. Seasonal traffic variations should also be considered when determining the worse case hour noise condition. The Project Manager should consult with appropriate traffic and planning staff and review the annual traffic report in order to determine the appropriate volumes and speeds to use in the analysis. This input and any assumptions must be documented in the noise analyses report. DOT&PF will use a design hourly volume (DHV) that correlate with Level C or D rather than peak hour traffic. This will require coordination with Planning and Traffic to collect this information.

The input parameters for the TNM noise predictions should be documented in the noise analysis report. Input parameters should be approved by the DOT&PF Environmental Impact Analyst prior to modeling. All prediction results will be rounded off to the closest whole number (i.e., 67.5 dBA will be rounded up to 68 dBA, 67.4 dBA will be rounded down to 67dBA).

ANALYSIS OF TRAFFIC NOISE IMPACTS AND NOISE MEASUREMENTS

It is the DOT&PF Policy to utilize TNM noise predictions to model existing and future worst case noise levels. Actual measurements of existing noise levels are only utilized to validate TNM or other models acceptable to FHWA.

Noise Measurements

All noise measurements will be taken with an ANSI Type 1 or 2 integrating sound level meter and will be A-weighted.

For proposed highways on new alignments where no highway currently exists, noise measurements will be taken at representative receptor locations along the proposed route in order to determine the existing noise level.

In general, noise measurements will be taken during either the morning or evening peak traffic periods; or if LOS E or F exist, DOT&PF will use the traffic levels at Level of Service (LOS) C or other time period to replicate the model. Noise measurements may be taken outside the peak traffic periods for the sole intent of validating the TNM or other model acceptable to FHWA. Noise measurements will follow FHWA procedures for measuring traffic noise³. The locations, date, time, weather (sky cover, approximate temperature, wind speed and direction, precipitation and snow cover), a description of ground cover (hard or soft site), and traffic conditions (number of vehicles, percentage medium and heavy trucks, motorcycles) will be recorded on each measurement data sheet. Average traffic speeds can be estimated or measured and should also be noted on the data sheet. A map depicting the measurement site relative to the road and adjacent buildings must be provided (use actual measurements or locations using GPS, estimated locations are not acceptable). Sufficient information should be provided to allow re-creation of the measurements if necessary.

Two fifteen minute measurements will be taken at each receptor. Any noise sources other than highway sources should be noted on the dated sheet.

Model Validation

³ FHWA Final Report – *Measurement of Highway – Related Noise*, 1996 [FHWA-PD-96-046DOT-VNTSC-FHWA-96-5]

Noise measurements will be taken at representative locations throughout the proposed project corridor. Locations of the measurements must be approved by the DOT&PF Environmental Impact Analyst prior to being taken. Traffic counts will be taken simultaneously with noise measurements. The actual traffic counts, vehicle types, and speeds (estimated or measured) collected during the measurements will be utilized as input to TNM for the purpose of validation. Noise prediction results will be compared with actual measured results. Differences between the actual and predicted noise measurements within $\pm 3\text{dBA}$ will be considered acceptable. If the difference is greater than 3dBA , DOT&PF will coordinate with FHWA for direction. Either the model input will be reevaluated at those locations to ensure an accurate representation of site geometry and input, the noise measurements will be retaken, or shielding factors⁴ might be input into TNM to offset these differences. Once the model is determined to be valid the existing, Design Year Build (for all reasonable alternatives) and No-Build Noise Levels can be predicted.

Noise Predictions and Impact Assessment

DOT&PF gives primary consideration to exterior areas of frequent human use. Noise levels should typically be measured and/or predicted at exterior areas that receive frequent human use at the first row of structures (i.e., residences and/or businesses). These include patios or balconies of residential receivers. If access cannot be obtained to take measurements on private property, then a location close to the highway right of way line should be utilized. Measurements should not occur any closer than 10 feet from a building or fence, because the object can reflect noise. The location of receptors for noise predictions should be located at areas that receive frequent human use rather than at the right of way line. Preferably, the receptor locations will be at locations that will remain after construction of the proposed facility. Typically, a receptor location should not be selected if the location will not exist after construction of the proposed project because the basis for comparison would be lost. However, there may be some receptors that are relocated with one Build Alternative and remain with another, so it is not always possible to select receptor location that will exist after the construction of the preferred alternative.

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 within the categorical exclusion documentation, environmental assessment or environmental impact statement and 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

⁴ Shielding factors are to be used only as an absolute last attempt option. In just about every case reviewing the location to ensure accuracy will either correct the differences. If not, then shielding factor is used as an adjustment factor that is applied to the single receiver to bring it into the 3 dB(A) range.

discussed with FHWA and other participating agencies early in the project planning process.

For state-funded Type I projects a similar method of analysis will be followed. The preferred alternative carried forward in the State Environmental Checklist will be evaluated for noise impacts.

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.

For Type I projects, the noise study area will be consistent with project limits, beginning of the project to the end of the project based on logical termini for that specific project (Beginning of Project to End of Project). The noise analysis must include analysis for each Activity Category present in the study area.

LAND USE CATEGORIES

Federal land use activity categories are defined by 23 CFR 772. DOT&PF has accepted the FHWA definition of these activity categories.

Activity Category A: Lands on which serenity and quiet are of extraordinary significance and serve an important public need. DOT&PF must submit justifications to FHWA on a case-by-case basis to designate any lands as Category A. Proposals and justifications for designating land as Activity Category A will be submitted from the Regional Environmental Manager through the state's FHWA Division Office and FHWA Headquarters.

Activity Category B: Residential - exterior areas of single-family and multi-family homes. Noise receptors should be located in areas that receive frequent human use (i.e., patios, balconies, playgrounds, gardens, etc.).

Activity Category C: Non-residential exterior areas of lands such as active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings, etc. Receptors should be located in areas that represent the area that receives the most frequent human use. Noise measurements and predictions will be taken at an outdoor location that is representative of the typical use for this area that receives the most frequent use. For structures, noise measurements and predictions will be taken at a location that is representative of the exterior area that receives the

most frequent use. Since the impact determinations are based on each area of frequent human use, then the number of areas impacted would be calculated and an equivalent number of residential units would be calculated to assess the feasibility and reasonableness of any abatement measures. Equivalent number of residential units will be calculated by determining the average residential lot size for the vicinity and then dividing this into the non-residential area for a total amount 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 then we would use 8 equivalent residential units to assess the feasibility and reasonableness of a proposed abatement measure.

Activity Category D: Includes interiors of auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios. The impact determination will be based on the area of frequent human use; therefore the number of those areas that are impacted would be carried over to feasibility and reasonableness. For example: If a daycare center has 15 various areas of frequent human use (building and open space), but only 10 are impacted then 10 equivalent residential units would be used for the feasibility and reasonableness determination. An indoor analysis shall only be done after exhausting all reasonable outdoor analysis options. If there are no exterior areas that receive frequent human use then representative interior measurements may be appropriate if determined by DOT&PF. Permission will be obtained from property owner to take interior noise measurements at a designated receptor. Measurements will be taken with windows closed and open if possible. Traffic counts will be taken concurrent with the measurements.

Activity Category E: Exteriors of Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F or other developed lands that are less sensitive to highway noise. Noise measurements and predictions will be taken at a location that is representative of the exterior area that receives the most frequent use. The impact determination would be based on the total number of units within the complex, and/or the capacity limit of the facility. For example: If a hotel has 45 units and two meeting areas with a total capacity of 100 people each, then the number of receptors used for feasibility and reasonableness would be 200+ the 45 units.

Activity Category F: Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship-yards, utilities (water resources, water treatment, electrical), warehousing, and other land uses that are not sensitive to highway traffic noise. No highway noise analysis is required under 23 CFR 772 at Activity Category F land uses. For example, no noise analysis is required at locations that typically generate excessive levels of noise themselves or where the activities taking place on them are not considered noise

sensitive⁵) Proposals for designation of properties as Category F Activity Categories must be approved by the Environmental Impact Analyst assigned to the project.

Activity Category G: (Undeveloped lands that are not permitted) Land permitted for development (that is, a building permit has been issued on or before the date of public knowledge), that land shall be analyzed under the Activity Category for that type of development.

For land not permitted for development by the date of public knowledge (approval date of NEPA document or State Environmental Checklist), DOT&PF shall determine future noise levels pursuant to 23 CFR 772.17(a). The results shall be documented in the project environmental documentation and in the noise analysis report. The analysis should report the distance - measured from the proposed edge of the traveled way - to the Noise Abatement Criteria (NAC) for all exterior land use categories. Any noise abatement for such lands shall not be eligible for federal-aid participation.

DOT&PF DEFINITION OF “APPROACH THE NAC”

The DOT&PF defines “approach the NAC” as 1 dBA less than the NAC for Activity Categories A-E in Table 1 that is located in Appendix B of this policy.

A traffic noise impact may occur even if the future noise level is lower than the existing noise level. If the future noise level is 1 dBA less than or higher than the NAC for the activity category, then a noise impact exists.

DOT&PF DEFINITION OF “SUBSTANTIAL INCREASE OVER EXISTING NOISE LEVEL”

DOT&PF defines a “substantial increase over existing noise level” as 15 dBA over existing noise levels. A substantial increase is independent of the absolute noise level. A substantial increase over existing noise level is a noise impact, even if the future noise level does not approach or exceed the NAC.

The traffic noise analysis will identify all measurement sites with the predecessor capital letter M (i.e., M-1, M-2, M-3, etc.). All receptor sites where existing and future noise levels are being predicted and where noise measurements were not taken will be identified with the predecessor capital letter R (i.e., R-1, R-2, R-3, etc.). Receptors where noise impacts are predicted to exist will be identified by receptor identification number in the analyses report. Locations of the receptors will be identified on a map or

⁵ FAA does require noise analyses for certain types of airport projects, but this policy only applies to Highway Projects.

figure of appropriate scale and described in the text (physical location, address, GPS coordinates, etc.).

The following information will be identified in the noise analysis for each receptor:

- Receptor identification number
- Activity Category designation
- Specific noise abatement criteria for the receptor's activity category as modified by DOT&PF approach definition (i.e., For Activity Category B, the modified NAC would be 66dBA. For Activity Category E, it would be 71 dBA).
- Predicted existing noise level. It should be for the existing year of the analysis.
- Predicted future Design Year No-Build Noise Level
- Predicted future Design Year Build Noise Level for all reasonable alternatives
- Identification of whether a noise impact exists or will exist at this receptor in the future with and without the project.

ANALYSIS OF NOISE ABATEMENT MEASURES

A decision on whether to provide or not to provide a noise abatement measure must not be arbitrary or capricious. The basis for the decision must be documented and supportable, particularly if the decision is not to provide abatement and the affected residents want an abatement measure to be constructed. The decision must be based upon consistent and uniform application of this policy.

Noise abatement measures will be considered only when the existing or predicted future traffic noise levels approach or exceed the FHWA Noise Abatement Criteria (Table 1), or when the predicted future traffic noise levels (Design Year) of a build alternative results in a substantial increase over the existing traffic noise levels. DOT&PF considers a predicted noise level of 1 dBA below the FHWA Noise Abatement Criteria as the condition of "approach".

When traffic noise impacts are identified, then noise abatement shall be considered and evaluated for acoustic feasibility and reasonableness. On a federal Type I project, then the DOT&PF will construct it as a part of the project. For state Type I projects, if noise abatement is considered feasible and reasonable, then the Regional Environmental Manager will make a noise abatement recommendation to the Preconstruction Engineer. The Preconstruction Engineer will decide whether the recommended abatement measure will be constructed. Abatement will be provided on state funded projects only if the Preconstruction Engineer determines that the state funded appropriation can accommodate an expenditure on a noise abatement measure.

DOT&PF policy is that abatement for Activity Category A, B, C, D or E needs to be feasible and reasonable on their own merits. DOT&PF does not provide noise abatement measures for Activity Category F or G land uses unless it is necessary to

protect adjacent sensitive land uses (for example if there is an Activity Category F or G land use that is wedged into the project area that includes sensitive land uses, then by default it will be evaluated for abatement). Land uses not sensitive to highway traffic noise, and undeveloped lands will not be provided noise abatement.

Undeveloped land that is permitted for development (that is, a building permit has been issued on or before the date of public knowledge) will be analyzed under the Activity Category it has been permitted for. For example, if the undeveloped land is permitted to be developed for residential land use (Activity Category B), then it will be considered residential property in the analysis.

The following design principles from the *“Guide on Evaluation and Abatement of Traffic Noise, American Association of State Highway and Transportation Officials, 1993 and “FHWA Highway Noise Barrier Design Handbook”, Federal Highway Administration, December 2000* will be considered when determining whether to provide noise abatement at impacted receptors.

Noise barriers will be designed such that they do not pose a hazard to birds or other wildlife (i.e., clear panel barriers such as glass or plexiglass should not be used unless there is some means incorporated into the panel to prevent bird collisions).

FEASIBILITY AND REASONABLENESS ANALYSIS

The two required criteria to consider when evaluating the incorporation of noise abatement measures into a specific project are acoustic feasibility and reasonableness. A noise abatement measure will be determined acoustically feasible and reasonable as discussed below.

Acoustic Feasibility Criteria

Acoustic feasibility deals primarily with physics and engineering considerations (i.e., can a substantial noise reduction be achieved given the conditions of a specific location; is the ability to achieve noise reduction limited by factors such as topography, access requirements for driveways or ramps, the presence of cross streets, or other noise sources in the area).

1. Noise abatement measures are not feasible if a minimum of 5 dBA or more reduction cannot be achieved for at least 50 percent of the front row dwelling units. Noise abatement measures which do not achieve at least a 5 dBA reduction are not prudent expenditures of public funds as any less of a reduction is not easily detected by most people.

2. Noise abatement measures are not feasible if they create a safety hazard to the driving public, protected receptors or maintenance personnel. The Regional Environmental Manager will consult with the Design and Maintenance & Operations Sections when making this decision. The abatement measure 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 is within 30 feet of the traveled way, a traffic barrier may be warranted.
- Noise abatement measures should not block the recommended site 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 in the “*Guide on Evaluation and Abatement of Traffic Noise*”, AASHTO, 1993.

- a) Maintenance factors relating to replacement of materials damaged by impact, cleaning the noise barrier, and maintenance associated with adjoining landscape should be considered when determining feasibility.
- b) Barrier access points for emergencies or water sources needed during emergencies should be considered.
- c) Minimum setback distances and placement of noise abatement measures located at on/off-ramps and intersections should be based upon stopping sight distances, which depend on driver reaction time and deceleration rate.
- d) Placement of noise abatement measures should be a sufficient distance from the travel way to assure adequate space for storage of plowed snow and to assure that the abatement measure can withstand the additional loads that may result from blown snow being both thrown and piled up against the noise abatement measure.
- e) Noise abatement measure design should minimize shading highways in critical areas so that sunlight can melt ice or snow on the shoulders and travel lanes.

Reasonableness Criteria

Reasonableness is a more subjective criterion than feasibility. It implies that common sense and good judgment were applied in arriving at a decision. Reasonableness should be based on a number of factors, not just one criterion. FHWA noise regulations define three mandatory reasonableness factors that must be evaluated for a noise abatement measure to be considered reasonable. They are:

- A. Viewpoints of the property owners and residents of the benefitted receptors
- B. Cost Effectiveness
- C. Noise Reduction Design Goal

The DOT&PF considers these three mandatory reasonableness factors to determine reasonableness. The following optional reasonableness factors can only be used to increase the cost allowed only on state-funded projects:

- A. Date of development
- B. Length of time receivers have been exposed to highway traffic noise impacts
- C. Exposure to higher absolute traffic noise Levels
- D. Changes between existing and future build conditions
- E. Percentage of mixed zone development
- F. Use of noise compatible planning concepts by the local government

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

1. Cost Effectiveness (federal mandatory criterion). The noise abatement measure cost is no more than \$32,000⁶ per receptor, based upon the design engineer's estimate. This is determined by counting all receptors (including owner-occupied, rental units, mobile homes, and businesses) benefitted 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 benefitted 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 benefitted 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, drainage modification, foundations, retaining walls and right-of-way. Include a cost item

⁶ This figure was updated during DOT&PF 2009 development of a noise guideline to reflect inflation numbers of previous policies as well as updated with more current information that was provided by region offices.

only if it is directly related to the construction of the noise abatement measure⁷. If a necessary a 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.

The cost per benefited receptor must be adjusted for inflation. Use the most recent annual composite price index available from the FHWA Office of Program Administration www.fhwa.dot.gov/programadmin/pricetrends.cfm. The latest price index that FHWA developed is from 2006. This will be used until FHWA provides more current index. In the event that FHWA does not provide a more current index, DOT&PF will use the 2006 index and adjust it for inflation as necessary. This will be accomplished by determining the ratio between the 2006 annual composite index (221.3) and the most recent annual composite index available at the time of the completion of the Noise Abatement Recommendation Worksheet and adjust the \$32,000 cost accordingly. DOT&PF will also take into consideration the actual costs associated with project costs completed within the time since 2006 in determining a more accurate cost per benefited receptor.

2. Views of the property owners and residents (federal mandatory criterion) that benefit from noise abatement measures. To determine the desires 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 could 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. At least 60 percent of households and property owners surveyed must want the noise abatement measure. The term "household" is used instead of residents because a single dwelling unit could have more or less inhabitants than another. The idea is not to give a dwelling unit with multiple inhabitants more consideration than one with fewer inhabitants. Also, property owners are also included as the dwelling units might be rentals. The property owner should have a say in whether noise abatement is provided to their property.

3. Noise reduction design goal (federal mandatory criterion). The DOT&PF noise reduction design goal is 7dBA. 50 percent or more of the benefitted receptors in the first row of structures must achieve this design goal for the noise abatement

⁷ 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

to be considered reasonable. The DOT&PF goal is to provide more than the minimum 7 dBA reduction to a majority of the benefitted receptors in the first row of structures. This design goal is not extended to benefitted receptors beyond the first row of structures, as the further one gets from the noise barrier the more difficult it is to obtain a 7 dBA reduction.

The following criteria only apply to those state funded projects:

1. Development vs. Highway Timing (State funded only criterion). 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 (State funded only criterion). 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 (State funded only criterion). 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 (State funded only criterion). 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 (State funded only criterion). 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 (State funded only criterion). 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.

Noise Abatement Recommendation Worksheet

A noise abatement recommendation worksheet (Appendix B) will be filled out for each noise receptor in the noise study. The Regional Environmental Manager will approve and sign the worksheets. If an abatement measure is determined not feasible, then the reasonableness analysis section of the Worksheet does not need to be completed. Likewise, if it determined that the abatement measure is not reasonable, the feasibility portion of the checklist will not have to be filled out. DOT&PF will only implement a noise abatement measure if it has been determined both feasible and reasonable. The Regional Environmental Manager 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 quiet pavements are recommended as abatement on State-funded projects. The Regional Environmental Manager will ensure that the recommendation is included in the project's environmental document.

NOISE ANALYSIS REPORT

The results of the noise analysis will be presented in noise analysis report. The report will discuss the purpose of the study, the methods utilized, the results of the study, any proposed mitigation recommendations and a statement of likelihood. The noise analysis will be appended to the environmental document. The following general format will be followed for noise analysis reports.

Cover Page

Table of Contents

Summary

Project Background

Purpose of Study

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

Model- run inputs/outputs (optional)

During the detailed design of the proposed project, the 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 reevaluated or supplemented as appropriate.

NOISE ABATEMENT MEASURE REPORTING PER 23 CFR772.13(f)

DOT&PF will maintain an inventory of all constructed noise abatement measures and report to FHWA per the requirements of 23 CFR 772.13(f). The inventory shall include the following parameters:

- 1) Type of abatement and cost (overall cost, unit cost per/sq. ft.);
- 2) Average height;
- 3) Length;
- 4) Area;
- 5) Location (state, city, route);
- 6) Year of construction;
- 7) Average insertion loss/noise reduction as reported by the model in the noise analysis; NAC category(s) protected;
- 8) Material(s) used (precast concrete, berm, lock, 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, other federal funding, state funding, local funding).

INFORMATION REQUIRED FOR NEPA DECISION

Prior to CE approval or issuance of a FONSI or ROD for a Type I project, the DOT&PF must identify,

- The noise abatement measures that are feasible and reasonable, and are likely to be incorporated into the project; Noise impacts for which no abatement appears to be feasible and reasonable; and
- The NEPA documentation shall identify the locations where noise impacts will occur, where noise abatement is feasible and reasonable, and the locations that have no feasible and reasonable abatement.

Statement of likelihood The statement of likelihood should identify the preliminary locations of feasible and reasonable abatement and a statement that the final noise abatement recommendation will be made after the final design and public involvement processes are complete. This statement of likelihood will be included in all NEPA documentation and noise analyses reports:

“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”.

THIRD PARTY FUNDING OF NOISE ABATEMENT

For federal projects, third party funding CANNOT be used to make up the difference in cost between the reasonable cost allowance and the actual cost. Third party funding can only be used to pay for additional features such as landscaping, aesthetic treatments, etc. for noise barriers that meet cost-effectiveness criteria.

FEDERAL PARTICIPATION FOR TYPE I FEDERAL PROJECTS

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

- (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.

Quieter pavement is currently not listed in federal regulations (23 CFR 772) as a noise abatement measure for which federal funding may be used. Consequently, quiet pavements cannot be used as noise abatement on federal-aid projects.

DOT&PF may consider quieter pavement to reduce traffic noise on a state-funded project. However, the decision to provide such a measure will be decided by the Preconstruction Engineer as described elsewhere in this policy.

INFORMATION FOR LOCAL OFFICIALS

In an effort to prevent future traffic noise impacts on currently undeveloped lands and to maintain compatibility between highways and future development, DOT&PF will inform local officials whose jurisdiction is within the highway project of the best estimation of future noise levels for both developed and undeveloped properties in the immediate vicinity of the project. In addition, information on federal-aid, non-eligibility of noise abatement for lands permitted for development after the date of public knowledge will also be provided to local officials. This usually will be accomplished by providing a copy of either the project's noise analysis or the approved environmental document to the local government. This information may also be provided through the plat review process.

CONSTRUCTION NOISE

For all Type I Federal and State Projects, it is the policy of DOT&PF 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 Regional Environmental Manager will work with the Design Engineering Manager to reduce construction noise by requiring the contract specifications include the statement that all construction equipment be properly maintained and have mufflers in acceptable working condition. In the event that construction noise complaints occur during the

course of construction activities, measures will be taken by the Construction Project Engineer 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, the Department will make every effort to notify the public prior to conducting these activities. The public involvement in these cases should occur during design and throughout the construction duration. In some communities, local ordinances may restrict noise generating activities. Where this is the case, the Department and its contractor will comply with local noise ordinances and acquire any necessary noise permits for these activities prior to their initiation.

STATE-FUNDED PROJECTS

In general, the same methods are followed in the identification of noise impacts for state-funded projects and federal-aid projects. Results of noise analyses will be documented in the State Projects Environmental Checklist. If noise abatement is determined to be feasible and reasonable, then the Regional Environmental Manager 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 state funded appropriation can accommodate this expenditure.

SUPERCEDEENCE

This policy is effective upon signature and replaces the Department's March 1996 Noise Policy and the April 2009 Traffic Noise Abatement Guidance. This policy is applicable to any project that does not have an approved NEPA document prior to its implementation.

WEBLINKS as of November 2010.

<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,

APPENDIX B

NOISE ABATEMENT CRITERIA TABLE

FHWA NOISE ABATEMENT CRITERIA from 23 CFR 772 Table 1

Hourly A – Weighted Sound levels decibels (dBA)⁸

<u>Activity Category</u>	<u>Activity Leq(h)</u>	<u>Criteria⁹ L10</u>	<u>Evaluation Location</u>	<u>Description of Activity Category</u>
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 ¹⁰	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	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A–D or F.
F	None	None	None	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	None	None	None	Undeveloped lands that are not permitted.

⁸ Either Leq(h) or L10(h) (but not both) may be used on a project

⁹ The Leq(h) or L10(h) Activity Criteria

¹⁰ Includes undeveloped lands permitted for this activity category.

APPENDIX C

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 benefitted receptors in the development built before highway construction?
- 5 **Development Existence.** Have at least 50 percent of benefitted 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 ¹¹

Date

¹¹ 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. Traffic Data (TNM files are available electronically from DOT&PF)

Vehicle Classification Data

Class	Description	AK DOT&PF Count Data		TNM % Classifications		
		WB	EB	Description	WB	EB
1	Motorcycles	0.58%	0.65%	Motorcycles	0.58%	0.65%
2	Passenger Cars	51.50%	52.54%	Autos	91.12%	91.58%
3	Other Two-Axle, Four-Tire Single Unit Vehicles	39.62%	39.04%			
4	Buses	0.23%	0.21%	Buses	0.23%	0.21%
5	Two-Axle, Six tire, Single-Unit Trucks	5.67%	5.55%	Medium Trucks	5.67%	5.55%
6	Three-Axle Single-Unit Trucks	0.52%	0.60%			
7	Four or More Axle Single-Unit Trucks	0.00%	0.00%	Heavy Trucks	2.39%	2.34%
8	Four or Fewer Axle Single-Trailer Trucks	0.36%	0.39%			
9	Five-Axle Single-Trailer Trucks	0.83%	0.70%			
10	Six or More Axle Single-Trailer Trucks	0.34%	0.35%			
11	Five or fewer Axle Multi-Trailer Trucks	0.00%	0.00%			
12	Six-Axle Multi-Trailer Trucks	0.00%	0.00%			
13	Seven or More Axle Multi-Trailer Trucks	0.34%	0.30%			
% Lane split		49.81%	50.19%			

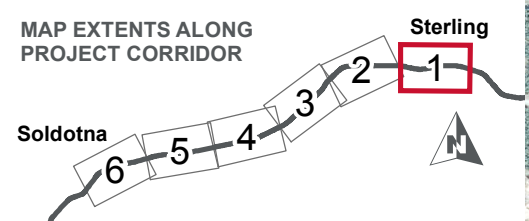
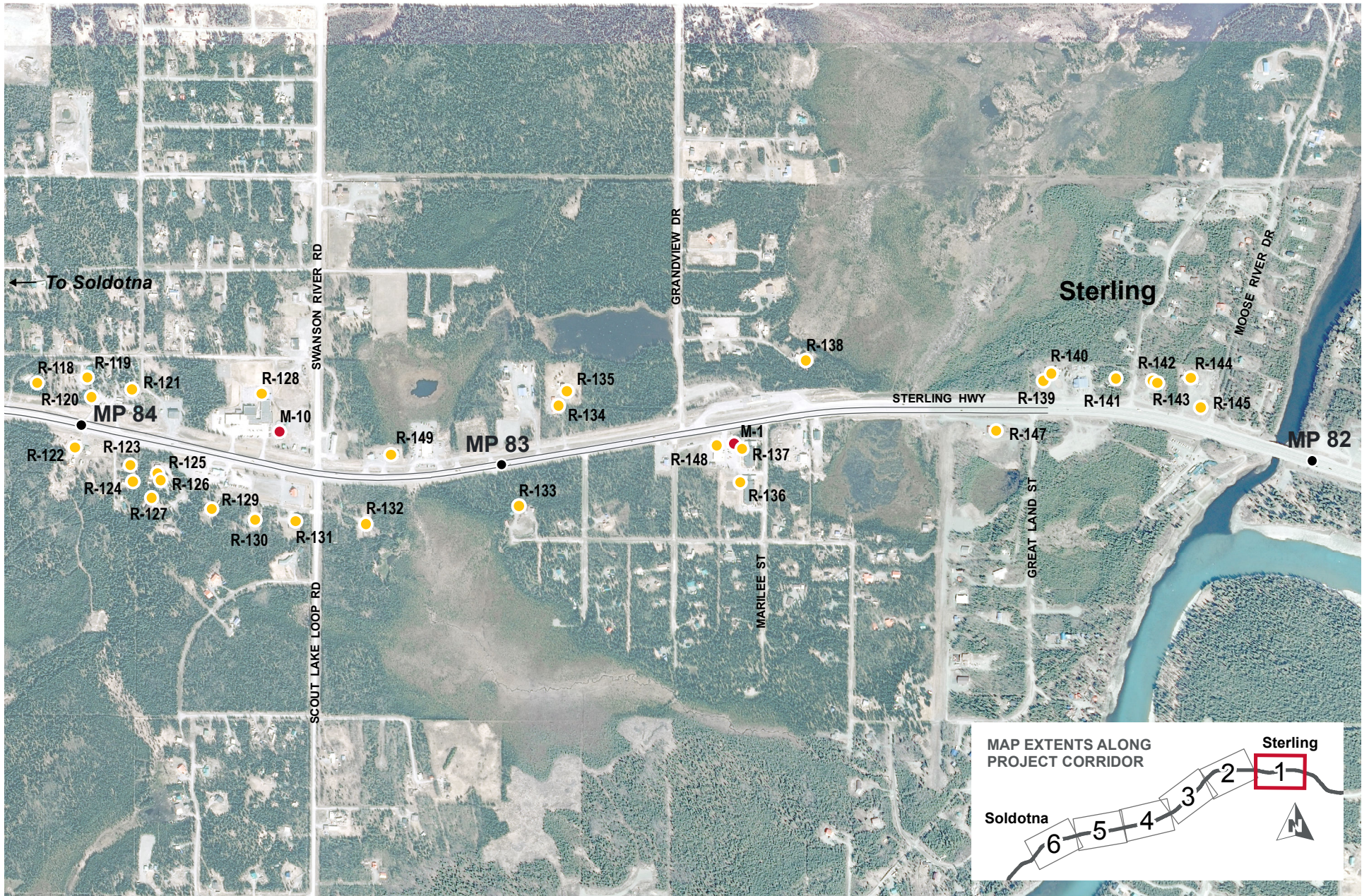
Design Hour Volume Calculations

Highway Segment	AADT			AADT to DHV Conversion %	DHV		
	Existing (2015)	No Build (2050)	Build (2050)		Existing (2015)	No Build (2050)	Build (2050)
Sterling Weigh Station to Swanson River Road	5,931.00	7,200.00	7,200.00	11.9	706	857	857
Swanson River Road to West Scout Lake Road	8,349.00	10,100.00	10,100.00	11.9	994	1202	1202
West Scout Lake Road to Robinson Loop Road	8,349.00	10,100.00	10,100.00	11.9	994	1202	1202
Robinson Loop Road to Forest Lane	8,577.00	10,400.00	10,400.00	11.9	1021	1238	1238
Forest Lane to Boundary Street	10,046.00	12,200.00	12,200.00	11.9	1195	1452	1452
Boundary Street to Devin Drive	14,646.00	17,700.00	17,700.00	11.9	1743	2106	2106

TNM Roadway Volume Inputs

Highway Segment	Existing (2015)				No Build (2050)				Build (2050)			
	Vehicle Class	Vehicle Volume (WB)	Vehicle Volume (EB)	Posted Speed (mph)	Vehicle Class	Vehicle Volume (WB)	Vehicle Volume (EB)	Posted Speed (mph)	Vehicle Class	Vehicle Volume (WB)	Vehicle Volume (EB)	Posted Speed (mph)
Sterling Weigh Station to Swanson River Road	Autos	320	324	55	Autos	389	394	55	Autos	389	394	55
	Medium Trucks	20	20	55	Medium Trucks	24	24	55	Medium Trucks	24	24	55
	Heavy Trucks	8	8	55	Heavy Trucks	10	10	55	Heavy Trucks	10	10	55
	Buses	1	1	55	Buses	1	1	55	Buses	1	1	55
	Motorcycles	2	2	55	Motorcycles	2	3	55	Motorcycles	2	3	55
Swanson River Road to West Scout Lake Road	Autos	451	457	55	Autos	546	552	55	Autos	546	552	55
	Medium Trucks	28	28	55	Medium Trucks	34	33	55	Medium Trucks	34	33	55
	Heavy Trucks	12	12	55	Heavy Trucks	14	14	55	Heavy Trucks	14	14	55
	Buses	1	1	55	Buses	1	1	55	Buses	1	1	55
	Motorcycles	3	3	55	Motorcycles	3	4	55	Motorcycles	3	4	55
West Scout Lake Road to Robinson Loop Road	Autos	451	457	55	Autos	546	552	55	Autos	546	552	55
	Medium Trucks	28	28	55	Medium Trucks	34	33	55	Medium Trucks	34	33	55
	Heavy Trucks	12	12	55	Heavy Trucks	14	14	55	Heavy Trucks	14	14	55
	Buses	1	1	55	Buses	1	1	55	Buses	1	1	55
	Motorcycles	3	3	55	Motorcycles	3	4	55	Motorcycles	3	4	55
Robinson Loop Road to Forest Lane	Autos	463	469	55	Autos	562	569	55	Autos	562	569	55
	Medium Trucks	29	28	55	Medium Trucks	35	34	55	Medium Trucks	35	34	55
	Heavy Trucks	12	12	55	Heavy Trucks	15	14	55	Heavy Trucks	15	15	55
	Buses	1	1	55	Buses	1	1	55	Buses	1	1	55
	Motorcycles	3	3	55	Motorcycles	4	4	55	Motorcycles	4	4	55
Forest Lane to Boundary Street	Autos	543	549	55	Autos	659	667	55	Autos	659	667	55
	Medium Trucks	34	33	55	Medium Trucks	41	40	55	Medium Trucks	41	40	55
	Heavy Trucks	14	14	55	Heavy Trucks	17	17	55	Heavy Trucks	17	17	55
	Buses	1	1	55	Buses	2	2	55	Buses	2	2	55
	Motorcycles	3	4	55	Motorcycles	4	5	55	Motorcycles	4	5	55
Boundary Street to Devin Drive	Autos	791	801	55/45	Autos	956	968	55/45	Autos	956	968	55/45
	Medium Trucks	49	49	55/45	Medium Trucks	59	59	55/45	Medium Trucks	59	59	55/45
	Heavy Trucks	21	20	55/45	Heavy Trucks	25	25	55/45	Heavy Trucks	25	25	55/45
	Buses	2	2	55/45	Buses	2	2	55/45	Buses	2	2	55/45
	Motorcycles	5	6	55/45	Motorcycles	6	7	55/45	Motorcycles	6	7	55/45

Appendix C. Figures

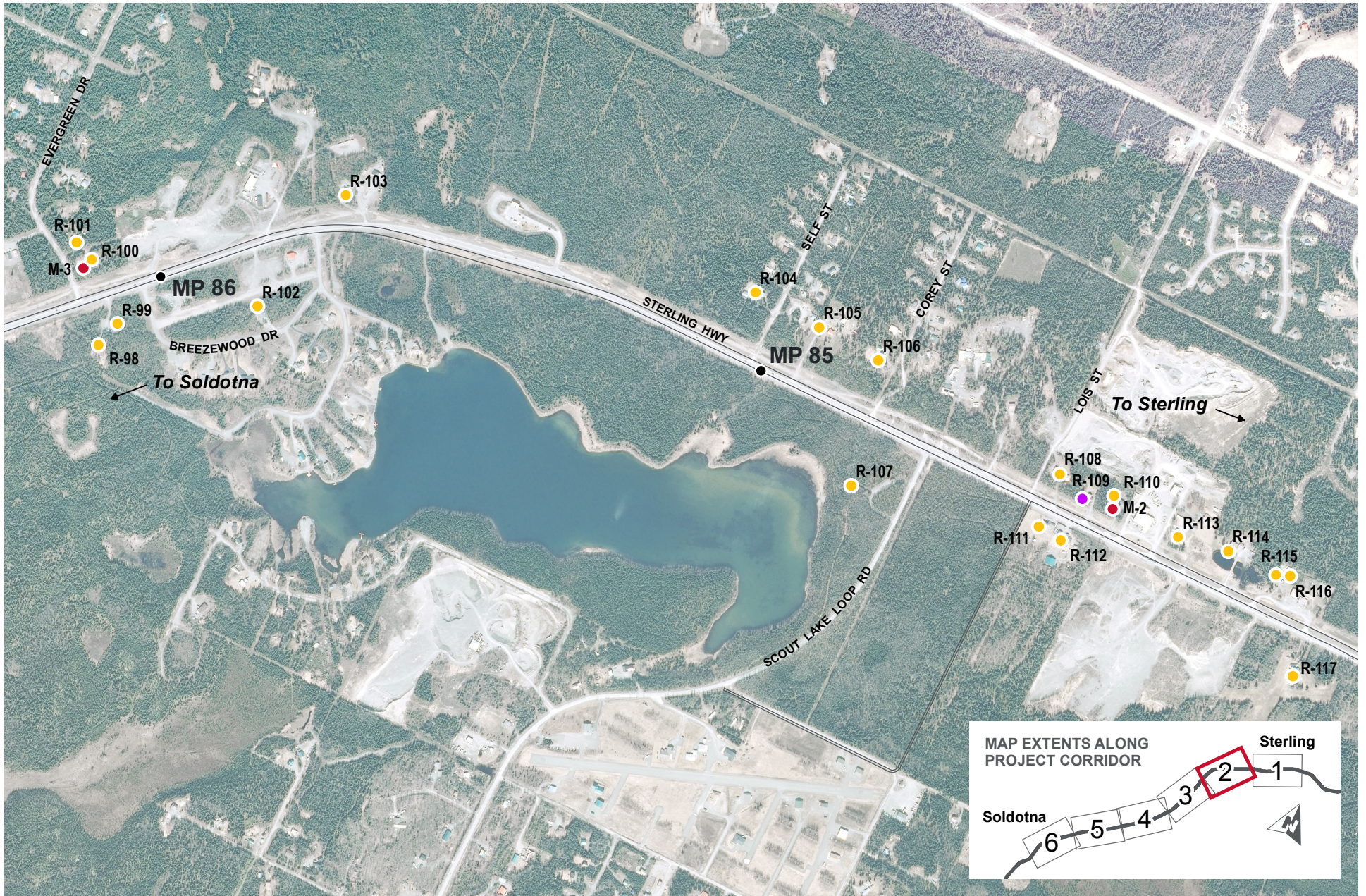


STERLING SAFETY CORRIDOR
IMPROVEMENTS MP 82.5 TO 94
PROJECT NO. CFHWY00130/0A33026

- Noise Receptors
 - Impacted
 - Not impacted
- Monitoring locations
- Proposed alternative

1 inch = 1,000 feet
0 Feet 1,000

PROPOSED ACTION
NOISE IMPACTS
FIGURE 1

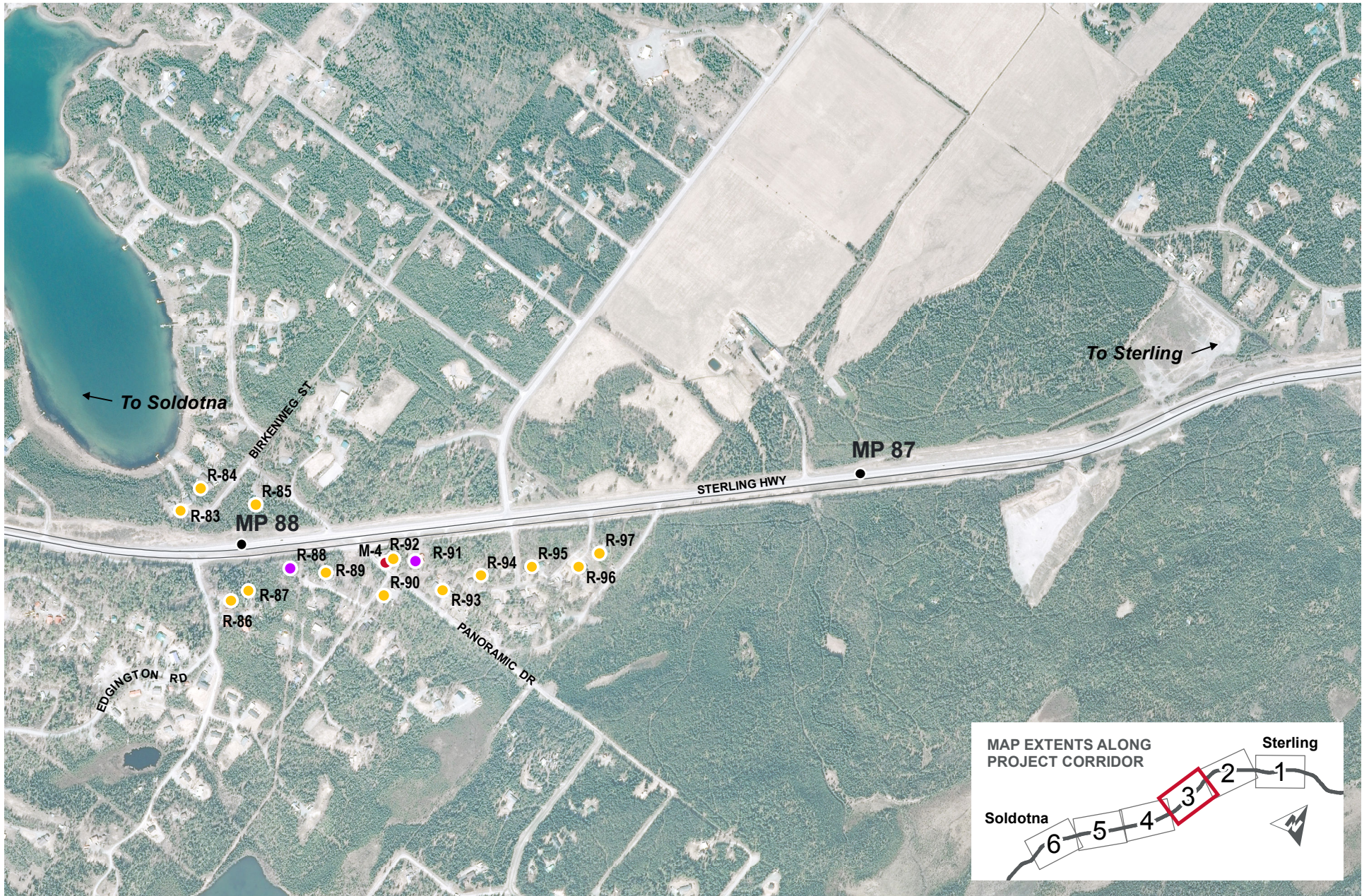


STERLING SAFETY CORRIDOR
IMPROVEMENTS MP 82.5 TO 94
PROJECT NO. CFHWY00130/0A33026

Noise Receptors
 ● Impacted
 ● Not impacted
 ● Monitoring locations
 — Proposed alternative

1 inch = 1,000 feet
 0 Feet 1,000

PROPOSED ACTION
NOISE IMPACTS
FIGURE 2



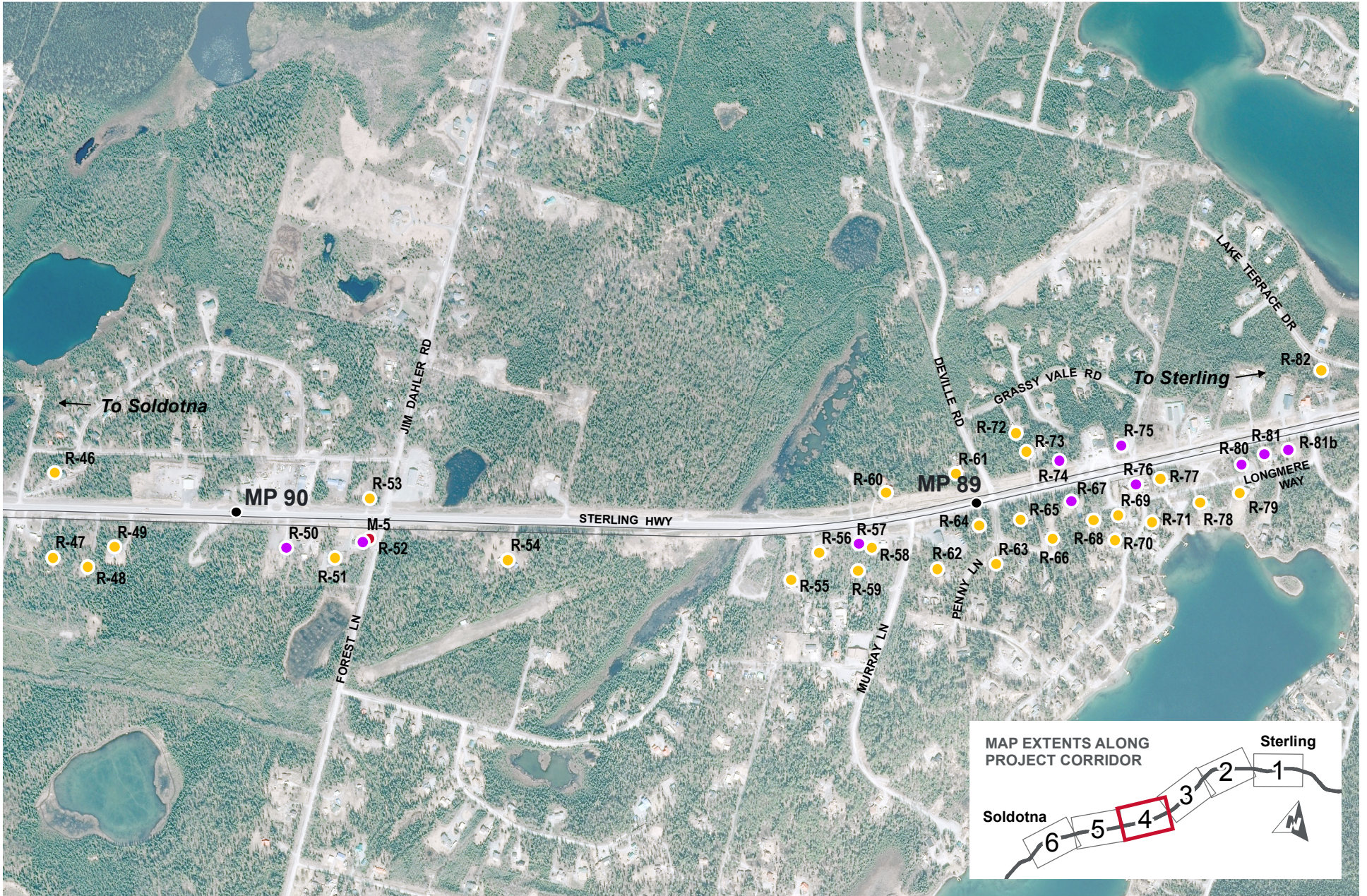
STERLING SAFETY CORRIDOR
IMPROVEMENTS MP 82.5 TO 94
PROJECT NO. CFHWY00130/0A33026

Noise Receptors
 ● Impacted
 ● Not impacted

● Monitoring locations
 — Proposed alternative

1 inch = 1,000 feet
 0 Feet 1,000

PROPOSED ACTION
NOISE IMPACTS
FIGURE 3



STERLING SAFETY CORRIDOR
IMPROVEMENTS MP 82.5 TO 94
PROJECT NO. CFHWY00130/0A33026

Noise Receptors
● Impacted
● Not impacted

Monitoring locations
● Proposed alternative

1 inch = 1,000 feet
 0 Feet 1,000

PROPOSED ACTION
NOISE IMPACTS
FIGURE 4

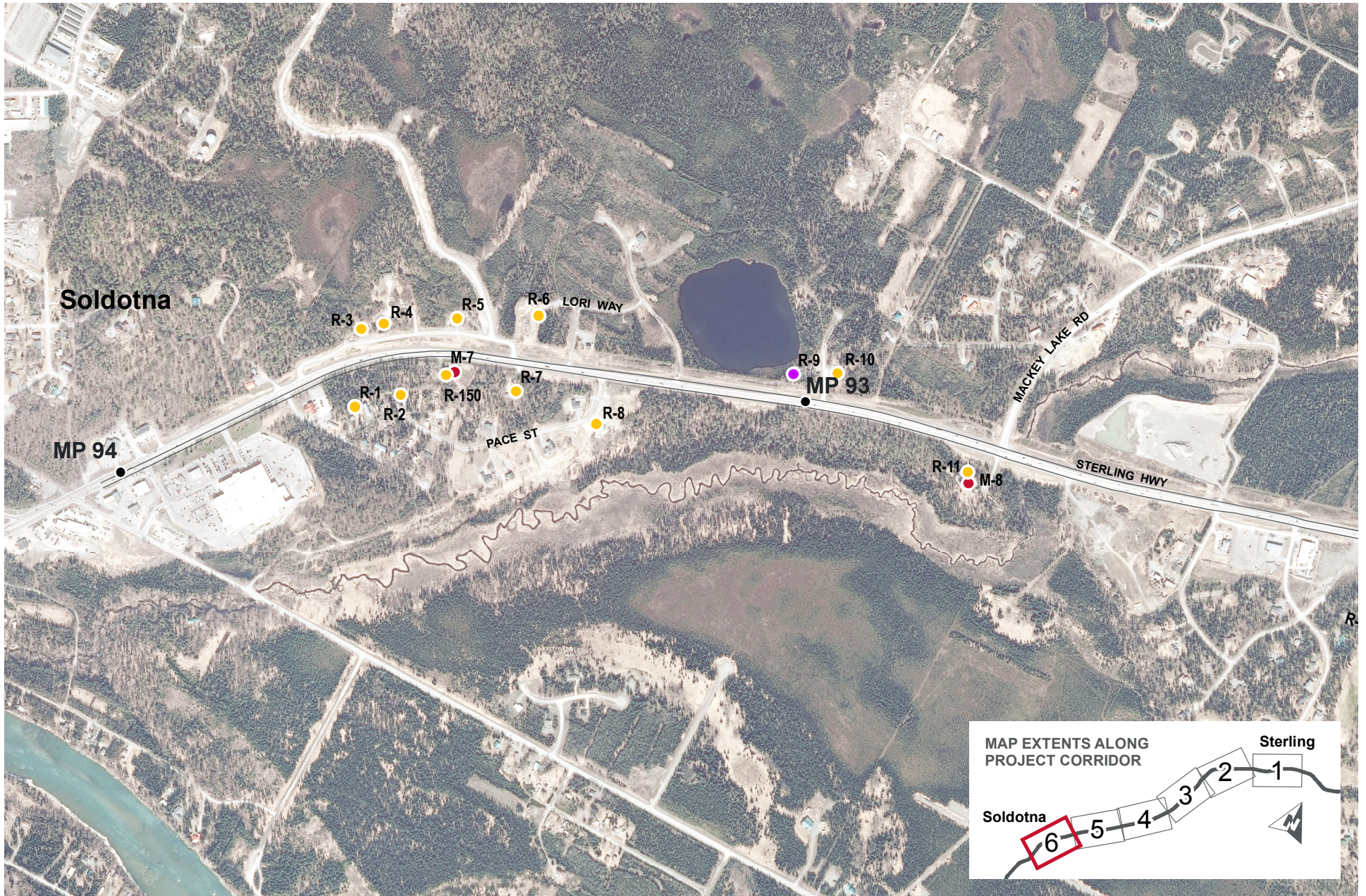


STERLING SAFETY CORRIDOR
IMPROVEMENTS MP 82.5 TO 94
PROJECT NO. CFHWY00130/0A33026

Noise Receptors
 ● Impacted
 ● Not impacted
 ● Monitoring locations
 — Proposed alternative

1 inch = 1,000 feet
 0 Feet 1,000

PROPOSED ACTION
NOISE IMPACTS
FIGURE 5



STERLING SAFETY CORRIDOR
IMPROVEMENTS MP 82.5 TO 94
PROJECT NO. CFHWY00130/0A33026

Noise Receptors
 ● Impacted
 ● Not impacted
 ● Monitoring locations
 — Proposed alternative

1 inch = 1,000 feet
 0 Feet 1,000

PROPOSED ACTION
NOISE IMPACTS
FIGURE 6

Appendix D. Equipment Calibration Sheets

Calibration Certificate

Certificate Number 2016006473

Customer:

HDR Engineering Inc
Suites 1800 & 1900
1001 Southwest 5th Avenue
Portland, OR 97204, United States

Model Number LxT SE
Serial Number 0004202
Test Results Pass
Initial Condition AS RECEIVED same as shipped
Description Sound Expert LxT

Procedure Number D0001.8384
Technician Ron Harris
Calibration Date 18 Jul 2016
Calibration Due 18 Jul 2017
Temperature 23.29 °C ± 0.01 °C
Humidity 49.4 %RH ± 0.5 %RH
Static Pressure 86.52 kPa ± 0.03 kPa

Evaluation Method **Tested with:** **Data reported in dB re 20 µPa.**

PRMLxT1L. S/N 029354
377B20. S/N 150268

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.

Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	06/21/2016	06/21/2017	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	06/17/2016	06/17/2017	006946
Larson Davis CAL200 Acoustic Calibrator	08/12/2015	08/12/2016	007027
Larson Davis Model 831	03/01/2016	03/01/2017	007182
1/2 inch Microphone - P - 0V	03/07/2016	03/07/2017	007185
Larson Davis CAL291 Residual Intensity Calibrator	09/24/2015	09/24/2016	007287

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001



Calibration Certificate

Certificate Number 2016006367

Customer:

HDR Engineering Inc
Suites 1800 & 1900
1001 Southwest 5th Avenue
Portland, OR 97204, United States

Model Number CAL200
Serial Number 7160
Test Results Pass
Initial Condition AS RECEIVED same as shipped
Description Larson Davis CAL200 Acoustic Calibrator

Procedure Number D0001.8386
Technician Scott Montgomery
Calibration Date 13 Jul 2016
Calibration Due 13 Jul 2017
Temperature 24 °C ± 0.3 °C
Humidity 33 %RH ± 3 %RH
Static Pressure 101.4 kPa ± 1 kPa

Evaluation Method The data is acquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.

Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used			
Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/04/2015	09/04/2016	001021
Sound Level Meter / Real Time Analyzer	04/07/2016	04/07/2017	001051
Microphone Calibration System	08/20/2015	08/20/2016	005446
1/2" Preamplifier	10/09/2015	10/09/2016	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/20/2015	08/20/2016	006507
1/2 inch Microphone - RI - 200V	08/17/2015	08/17/2016	006511
Pressure Transducer	10/12/2015	10/12/2016	007204

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001



Calibration Certificate

Certificate Number 2016006454

Customer:

HDR Engineering Inc
Suites 1800 & 1900
1001 Southwest 5th Avenue
Portland, OR 97204, United States

Model Number	LxT SE	Procedure Number	D0001.8378
Serial Number	0004202	Technician	Ron Harris
Test Results	Pass	Calibration Date	18 Jul 2016
Initial Condition	AS RECEIVED same as shipped	Calibration Due	18 Jul 2017
Description	Sound Expert LxT	Temperature	23.13 °C ± 0.01 °C
		Humidity	49.6 %RH ± 0.5 %RH
		Static Pressure	86.54 kPa ± 0.03 kPa

Evaluation Method Tested electrically using PRMLxT1L S/N 029354 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 23.6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-S Humidity/Temperature Sensor	06/17/2016	06/17/2017	006946
SRS DS360 Ultra Low Distortion Generator	07/06/2016	07/06/2017	007118



Calibration Certificate

Certificate Number 2016006453

Customer:

HDR Engineering Inc
Suites 1800 & 1900
1001 Southwest 5th Avenue
Portland, OR 97204, United States

Model Number PRMLxT1L

Serial Number 029354

Test Results Pass

Initial Condition AS RECEIVED same as shipped

Description Larson Davis 1/2" Preamplifier for LxT Class 1
-1 dB

Procedure Number D0001.8383

Technician Bryce Whiteley

Calibration Date 18 Jul 2016

Calibration Due 18 Jul 2017

Temperature 23.33 °C ± 0.01 °C

Humidity 49.8 %RH ± 0.5 %RH

Static Pressure 86.5 kPa ± 0.03 kPa

Evaluation Method Tested electrically using a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Description	Standards Used		
	Cal Date	Cal Due	Cal Standard
Sound Level Meter / Real Time Analyzer	11/05/2015	11/05/2016	001150
Hart Scientific 2626-S Humidity/Temperature Sensor	06/17/2016	06/17/2017	006946
Agilent 34401A DMM	06/07/2016	06/07/2017	007165
SRS DS360 Ultra Low Distortion Generator	11/10/2015	11/10/2016	007167

Appendix E. Field Data Sheets and Photos

M-1 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 8:06 AM
Monitoring Period: AM
Location: Soldotna, Alaska

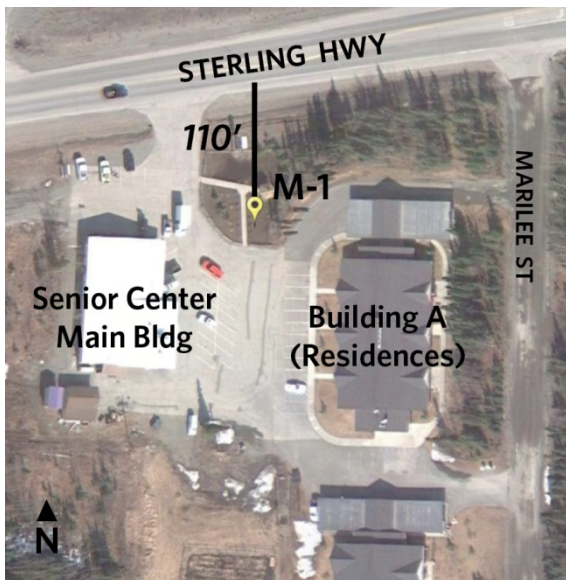
Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Partly Cloudy	42	3	91

Data and Results		
Measurement #	1	2
Leq	59.2	60.1
Lmin	44.7	45.3
Lmax	75.5	72.9
Start Time	8:06	8:24
Duration	15 min.	15 min.
File No.	AKDOT.001	AKDOT.002

TNM Vehicle Class Counts: Sterling Hwy				
	Count #1		Count #2	
	WB	EB	WB	EB
Cars	31	32	29	44
Medium Trucks	-	-	-	4
Heavy Trucks	1	2	-	3
Buses	1	-	3	-
Motorcycles	-	-	-	-

Monitoring Location Sketch:



Photos:



Notes :

- Low hum of HVAC from building adjacent
- Truck idling 200ft + away, pulled out at 8:08 – 8:09 AM
- Car pulled out of driveway at 8:12 AM
- Periodic squirrels
- Baby crying at 8:18 AM
- Cars pulling out at 8:21 AM and 8:32 AM

M-2 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 8:54 AM
Monitoring Period: AM
Location: Soldotna, Alaska

Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Cloudy	42	3	91

Data and Results		
Measurement #	1	2
Leq	58.1	55.4
Lmin	39.8	37.9
Lmax	81.1	76.7
Start Time	8:54	9:10
Duration	15 min.	15 min.
File No.	AKDOT.003	AKDOT.004

TNM Vehicle Class Counts: Sterling Hwy				
	Count #1		Count #2	
	WB	EB	WB	EB
Cars	42	31	33	28
Medium Trucks	-	2	1	3
Heavy Trucks	3	1	-	1
Buses	-	-	-	-
Motorcycles	1	-	-	-

Monitoring Location Sketch:



Photos:



Notes :

- Dog barking at technicians at beginning of measurement

M-3 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 9:40 AM
Monitoring Period: AM
Location: Soldotna, Alaska

Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
95% cloud cover	50	3	85

Data and Results		
Measurement #	1	2
Leq	56.1	52.7
Lmin	42.2	40.9
Lmax	83.1	63.8
Start Time	9:40	9:58
Duration	15 min.	15 min.
File No.	AKDOT.005	AKDOT.006

TNM Vehicle Class Counts: Sterling Hwy				
	Count #1		Count #2	
	WB	EB	WB	EB
Cars	37	40	42	40
Medium Trucks	1	6	1	3
Heavy Trucks	1	6	1	1
Buses	-	-	-	-
Motorcycles	-	1	-	-

Monitoring Location Sketch:



Photos:



Notes :

- Grader passed 9:54 – 9:55 AM
- Aircraft overhead 10:05 AM

M-4 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 10:26 AM
Monitoring Period: AM
Location: Soldotna, Alaska

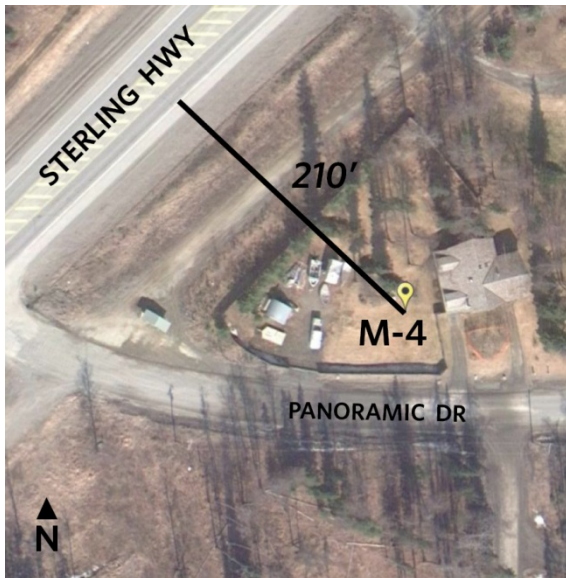
Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
40% cloud cover; partly sunny	53	3	8

Data and Results		
Measurement #	1	2
Leq	55.3	55.7
Lmin	44.5	40.8
Lmax	64.0	64.2
Start Time	10:26	10:52
Duration	15 min.	15 min.
File No.	AKDOT.007	AKDOT.009

TNM Vehicle Class Counts								
	Count #1				Count #2			
	Highway		Local		Highway		Local	
	WB	EB	NB	SB	WB	EB	NB	SB
Cars	54	43	3	2	42	64	4	7
Medium Trucks	3	1	-	-	1	1	-	-
Heavy Trucks	-	4	-	-	3	3	-	1
Buses	-	-	-	-	-	-	-	-
Motorcycles	-	-	-	-	-	-	-	-

Monitoring Location Sketch:



Photos:



Notes :

- Aircraft at 10:31 AM (distant), local road 15 mph
- Paused meter while grader on local road drove by leveling potholes (initially file no. AKDOT.008); re-set meter (file no. AKDOT.009) for 15-minutes for measurement without grader
- Aircraft at 11:04 AM

M-5 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 11:28 AM
Monitoring Period: AM
Location: Soldotna, Alaska

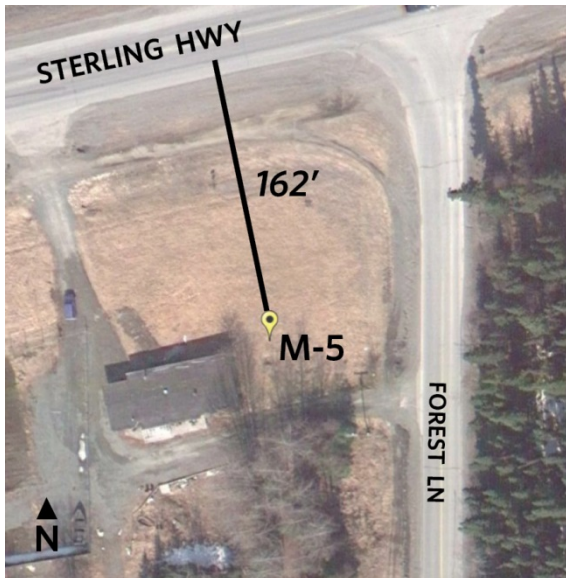
Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
Cloudy	54	3	85

Data and Results		
Measurement #	1	2
Leq	63.3	63.0
Lmin	44.7	42.8
Lmax	75.9	74.4
Start Time	11:28	11:44
Duration	15 min.	15 min.
File No.	AKDOT.010	AKDOT.011

TNM Vehicle Class Counts								
	Count #1				Count #2			
	Highway		Local		Highway		Across Hwy	
	WB	EB	NB	SB	WB	EB	NB	SB
Cars	95	72	6	2	65	71	1	-
Medium Trucks	3	3	-	-	-	3	-	-
Heavy Trucks	1	3	-	-	2	3	-	-
Buses	1	1	-	-	-	-	-	-
Motorcycles	-	2	-	-	1	-	-	-

Monitoring Location Sketch:



Photos:



Notes :

- 11:50 AM home owner left in car
- Aircraft overhead at 11:51 AM (ML-5)

M-6 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 12:22 PM
Monitoring Period: PM
Location: Soldotna, Alaska

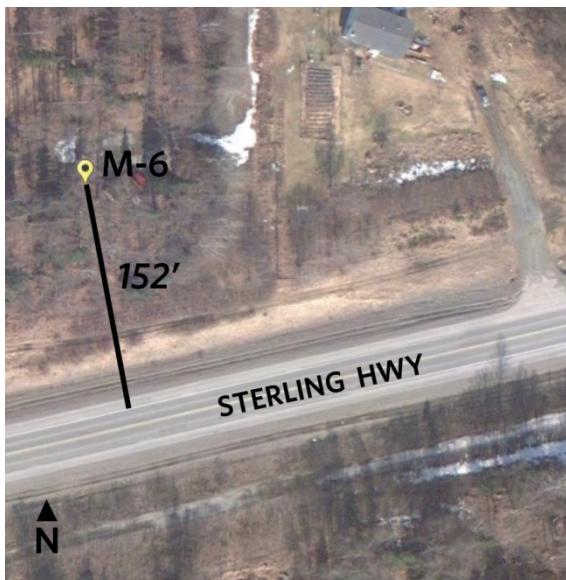
Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
80% cloud cover	54	3	85

Data and Results		
Measurement #	1	2
Leq	55.3	56.6
Lmin	38.8	41.8
Lmax	63.6	66.3
Start Time	12:22	12:40
Duration	15 min.	15 min.
File No.	AKDOT.012	AKDOT.013

TNM Vehicle Class Counts				
	Count #1		Count #2	
	WB	EB	WB	EB
Cars	83	73	90	95
Medium Trucks	1	1	2	5
Heavy Trucks	3	1	2	8
Buses	-	-	-	-
Motorcycles	-	1	1	-

Monitoring Location Sketch:



Photos:



Notes :

- 12:41 PM Aircraft in distance (ML-4)
- Solid Rock Bible camp location

M-7 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 1:50 PM
Monitoring Period: PM
Location: Soldotna, Alaska

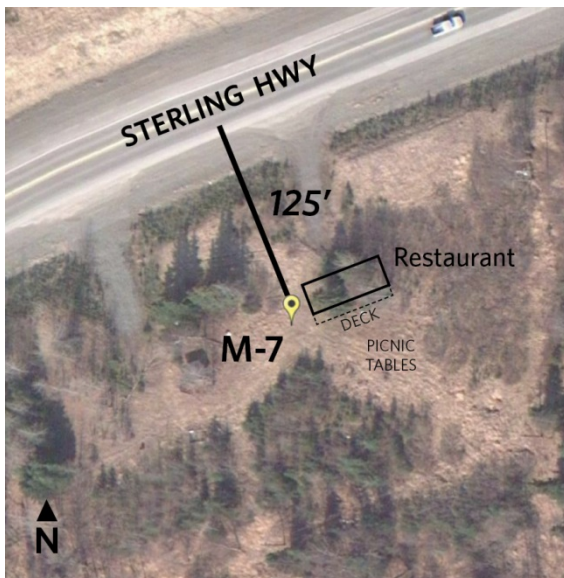
Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
85% cloud cover	55	2	80

Data and Results		
Measurement #	1	2
Leq	56.9	56.7
Lmin	46.2	49.3
Lmax	73.8	65.1
Start Time	1:48	2:07
Duration	15 min.	15 min.
File No.	AKDOT.014	AKDOT.015

TNM Vehicle Class Counts				
	Count #1		Count #2	
	WB	EB	WB	EB
Cars	106	109	94	139
Medium Trucks	3	7	5	5
Heavy Trucks	1	6	4	3
Buses	-	-	-	1
Motorcycles	-	-	-	-

Monitoring Location Sketch:



Photos:



Notes :

M-8 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 2:30 PM
Monitoring Period: PM
Location: Soldotna, Alaska

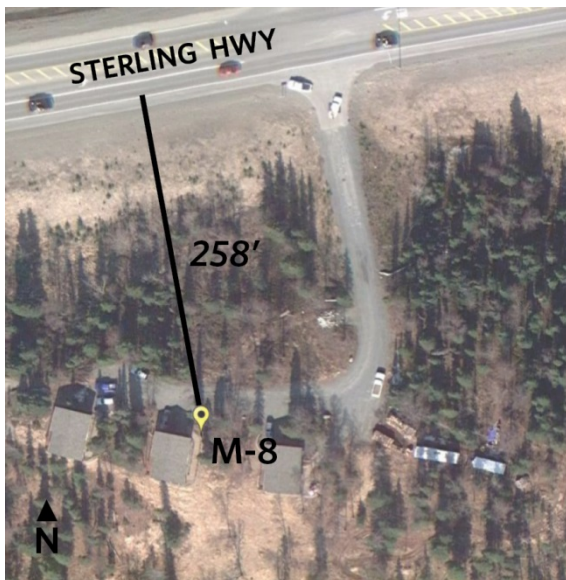
Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
75% cloud cover	57	4	73

Data and Results		
Measurement #	1	2
Leq	59.5	59.8
Lmin	45.2	42.1
Lmax	69.4	69.5
Start Time	2:32	2:50
Duration	15 min.	15 min.
File No.	AKDOT.016	AKDOT.017

TNM Vehicle Class Counts								
	Count #1				Count #2			
	Highway		Cross St (Mackey Lake Rd)		Highway		Cross St (Mackey Lake Rd)	
	WB	EB	NB	SB	WB	EB	NB	SB
Cars	95	113	22	19	82	130	25	10
Medium Trucks	2	3	-	1	1	4	-	-
Heavy Trucks	4	1	1	-	3	1	-	-
Buses	-	1	-	1	-	5	-	-
Motorcycles	-	1	-	-	1	-	2	-

Monitoring Location Sketch:



Photos:



Notes :

- 2:46 PM small aircraft overhead
- Mackey Lake Road on the other side of the highway to the north

M-9 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16
Time: 3:15 PM
Monitoring Period: PM
Location: Soldotna, Alaska

Client: Alaska DOT&PF
Project No.: 54830
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
75% cloud cover	57	4	73

Data and Results		
Measurement #	1	2
Leq	59.0	59.2
Lmin	46.6	42.4
Lmax	71.6	69.4
Start Time	3:15	3:32
Duration	15 min.	15 min.
File No.	AKDOT.018	AKDOT.019

TNM Vehicle Class Counts: Sterling Hwy				
	Count #1		Count #2	
	WB	EB	WB	EB
Cars	107	121	107	118
Medium Trucks	2	3	2	1
Heavy Trucks	3	1	4	3
Buses	1	1	1	1
Motorcycles	0	0	-	-

Monitoring Location Sketch:



Photos:



Notes :

- 3:20 PM ATV went by

M-10 Ambient Noise Monitoring Data Sheet

Date: Wed. 9/7/16

Time: 4:14 PM

Monitoring Period: PM

Location: Soldotna, Alaska

Client: Alaska DOT&PF

Project No.: 54830

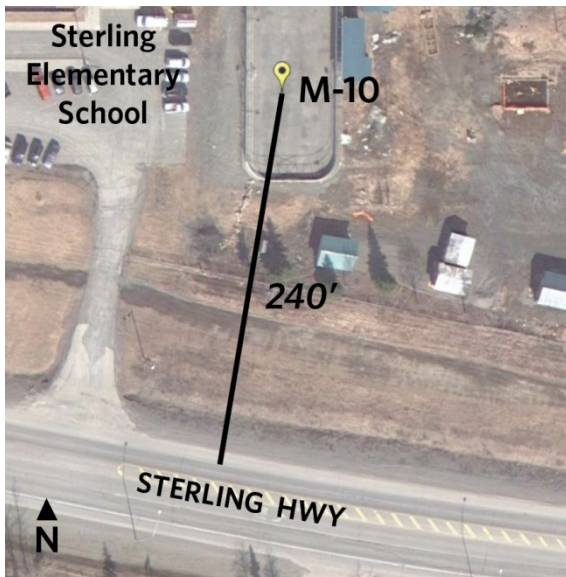
Project Title: Sterling Hwy MP 82.5-94

Weather Description	Temp (°F)	Wind (mph)	RH (%)
90% cloud cover	57	3	70

Data and Results		
Measurement #	1	2
Leq	58.0	57.6
Lmin	47.0	45.2
Lmax	67.4	67.2
Start Time	4:14	4:32
Duration	15 min.	15 min.
File No.	AKDOT.020	AKDOT.021

TNM Vehicle Class Counts: Sterling Hwy				
	Count #1		Count #2	
	WB	EB	WB	EB
Cars	57	63	40	74
Medium Trucks	5	3	1	-
Heavy Trucks	4	3	1	2
Buses	-	-	1	1
Motorcycles	-	-	-	1

Monitoring Location Sketch:



Photos:



Notes :

- 4:26 PM small aircraft overhead
- (measurement 1) 3 cars in parking lot

Appendix F. Feasibility and Reasonableness Worksheets

Feasibility and Reasonableness Worksheet

HIGHWAY TRAFFIC NOISE ABATEMENT:

Receiver ID No.(s): R-17, R-50, R-52, R-57, R-74, R-75, R-91, and R-109

Locations/Descriptions: Residential

Activity Category type: NAC B

Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy): 66 dBA Leq

Existing Noise Level (Leq): 59-64 dBA

Future Build Noise Level (Leq):66-68 dBA

Future No-Build Noise Level: 60-65 dBA

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: Not feasible

Feasibility

Is the proposed noise abatement measure acoustically feasible?	Yes	<input type="checkbox"/> No
Is the proposed noise abatement measure engineering feasible	Yes	<input type="checkbox"/> No

Reasonableness

Is the proposed noise abatement measure considered reasonable?	Yes	No	Note that the reasonableness criteria was not evaluated because the mitigation was not judged to be acoustically feasible.
--	-----	----	--

Federal Mandatory Factors

- 1 **Cost Effectiveness.** Is the abatement measure cost effective? N/A
- 2 **Views of Benefited Residents and Property Owners.** Do at least 60 percent of the impacted residents and property owners surveyed desire noise abatement? N/A
- 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? N/A

DOT&PF Mandatory Factors (State funded only)

- 4 **Development vs. Highway Timing.** Were at least 50 percent of benefitted receptors in the development built before highway construction?
- 5 **Development Existence.** Have at least 50 percent of benefitted 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? No

Is Noise Abatement recommended for this impacted receptor(s)? No

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? The wall is not considered acoustically feasible.

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 ¹¹

Date

¹¹ 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

Feasibility and Reasonableness Worksheet

HIGHWAY TRAFFIC NOISE ABATEMENT:

Receiver ID No.(s): R-9, R-67, R-76

Locations/Descriptions: Residential

Activity Category type: NAC B

Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy): 66
dBA Leq

Existing Noise Level (Leq): 64-65 dBA

Future Build Noise Level (Leq):66-67 dBA

Future No-Build Noise Level: 65-66 dBA

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: Not acoustically feasible

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

DOT&PF Mandatory Factors (State funded only)

- 4 **Development vs. Highway Timing.** Were at least 50 percent of benefitted receptors in the development built before highway construction?
- 5 **Development Existence.** Have at least 50 percent of benefitted 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? No.

Is Noise Abatement recommended for this impacted receptor(s)? No

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? The wall is not considered acoustically feasible.

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 ¹¹

Date

¹¹ 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

Feasibility and Reasonableness Worksheet

HIGHWAY TRAFFIC NOISE ABATEMENT:

Receiver ID No.(s): R- 80, 81 and 81b

Location/Description: Residential

Activity Category type: NAC B

Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy): 66 dBA Leq

Existing Noise Level (Leq): 64-66 dBA

Future Build Noise Level (Leq):66-67 dBA

Future No-Build Noise Level: 65-67 dBA

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: Feasible not Reasonable

Feasibility

Is the proposed noise abatement measure acoustically feasible?

No

Is the proposed noise abatement measure engineering feasible

No

Reasonableness

Is the proposed noise abatement measure considered reasonable?

Yes

No

Federal Mandatory Factors

- 1 **Cost Effectiveness.** Is the abatement measure cost effective? No
- 2 **Views of Benefited Residents and Property Owners.** Do at least 60 percent of the impacted residents and property owners surveyed desire noise abatement? N/A
- 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?
Yes

DOT&PF Mandatory Factors (State funded only)

- 4 **Development vs. Highway Timing.** Were at least 50 percent of benefitted receptors in the development built before highway construction?
- 5 **Development Existence.** Have at least 50 percent of benefitted 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? No.

Is Noise Abatement recommended for this impacted receptor(s)? No.

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) N/A

What is the basis for this recommendation? The wall is not considered reasonable due to cost.

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 ¹¹

Date

¹¹ 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

Feasibility and Reasonableness Worksheet

HIGHWAY TRAFFIC NOISE ABATEMENT:

Receiver ID No.(s): R-88

Location/Description: Residential

Activity Category type: NAC B

Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy): 66 dBA Leq

Existing Noise Level (Leq): 59 dBA

Future Build Noise Level (Leq):66 dBA

Future No-Build Noise Level: 60 dBA

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: Feasible not Reasonable

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? No
- 2 **Views of Benefited Residents and Property Owners.** Do at least 60 percent of the impacted residents and property owners surveyed desire noise abatement? N/A
- 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?
Yes

DOT&PF Mandatory Factors (State funded only)

- 4 **Development vs. Highway Timing.** Were at least 50 percent of benefitted receptors in the development built before highway construction?
- 5 **Development Existence.** Have at least 50 percent of benefitted 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? No

Is Noise Abatement recommended for this impacted receptor(s)? No

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) N/A

What is the basis for this recommendation? The wall is not considered reasonable due to cost.

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 ¹¹

Date

¹¹ 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

Feasibility and Reasonableness Worksheet

HIGHWAY TRAFFIC NOISE ABATEMENT:

Receiver ID No.(s): R-1 through (thru) R-8; R-10 thru R-16; R-18; R-19 thru R-49; R-51; R-53 thru R-56; R-58 thru R-66; R-68 thru R-73; R-77 thru R-79; R-82 thru R-87; R-89 and R-90; R-92 thru R-108; R-110 thru R-150.

Locations/Descriptions: Residential: R-1 thru R-8, R-10 thru R-16, R-19 thru R-28, R-30 thru R-49, R-51, R-53 thru R-56, R-58 thru R-66, R-68 thru R-73, R-77 thru R-79, R-82 thru R-87, R-89 and R-90, R-92 thru R-106, R-108, R-110 thru R-119, R-121 thru R-127, R-129 thru R-145. Church: R-18. Commercial: R-29, R-147, R-150. Recreation site: R-107. Campground: R-120. School: R-128. Golf course: R-146. Senior center: R-148. Medical center (interior): R-149.

Activity Category type: Residential: B. Church, school, campground, recreation site, golf course, senior center: C. Interior medical center: D. Commercial: E.

*Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy):
B and C: 66 dBA. D: 51 dBA. E: 71 dBA.*

Existing Noise Level (Leq): B: 52-62 dBA; C: 51-63; D: 44-62; E: 61-65

Future Build Noise Level (Leq): B: 55-64 dBA; C: 55-65; D: 44-65; E: 65-67

Future No-Build Noise Level: B: 52-63 dBA; C: 52-64; D: 44-62; E: 61-66

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: Not applicable

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
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Federal Mandatory Factors

- 1 **Cost Effectiveness.** Is the abatement measure cost effective? N/A
- 2 **Views of Benefited Residents and Property Owners.** Do at least 60 percent of the impacted residents and property owners surveyed desire noise abatement? N/A
- 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? N/A

DOT&PF Mandatory Factors (State funded only)

- 4 **Development vs. Highway Timing.** Were at least 50 percent of benefitted receptors in the development built before highway construction?
- 5 **Development Existence.** Have at least 50 percent of benefitted 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? No.

Is Noise Abatement recommended for this impacted receptor(s)? No

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? There are no impacts at these receivers.

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 ¹¹

Date

¹¹ 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