# APPENDIX G

## Noise Analysis

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## Summary of Changes in Project Scope

The Seward Highway Milepost (MP) 99 to MP 105: Bird to Indian project was originally evaluated as an Environmental Assessment (EA) with 3 design alternatives: (1) No-Action Alternative; (2) resurfacing, restoration, and rehabilitation (3R) with Passing Lanes Alternative; and (3) Passing Lanes and Frontage Road Alternative. During the early planning process, rerouting the road into Turnagain Arm was discussed, but was ruled out due to cost and environmental concerns. The attached technical report may discuss multiple alternatives. However, the Categorical Exclusion (CE) document only relates to Alternative 2, 3R with Passing Lanes, which is the proposed design that is being carried forward. It is anticipated that there has been no change in the built and natural environment since the attached study was completed.

# HIGHWAY TRAFFIC NOISE ANALYSIS

## SEWARD HIGHWAY - BIRD TO INDIAN - MILEPOSTS 99 TO 105

## Federal/DOT&PF Project No. STP-F-021-2(15)/53577

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### LIST OF ACRONYMS

CFR ..... Code of Federal Regulations
dBA ..... decibels
DOT&PF ..... State of Alaska Department of Transportation and Public Facilities
DOWL HKM ..... previously doing business as DOWL Engineers
EA ..... Environmental Assessment
FHWA ..... Federal Highway Administration
NAC ..... noise abatement criteria
SLC ..... sound level calibrator
SLM ..... sound level meter
TNM ..... Traffic Noise Model

# 1.0 INTRODUCTION

## 1.1 Background

The State of Alaska Department of Transportation and Public Facilities (DOT&PF) in cooperation with the Federal Highway Administration (FHWA) is initiating a project to evaluate proposed improvements to the Seward Highway along Turnagain Arm in the Municipality of Anchorage (Figure 1-1). The purpose of this project is to upgrade the highway to enhance the safety for motorized and non-motorized users. The project is being administered by DOT&PF and is funded by the FHWA.

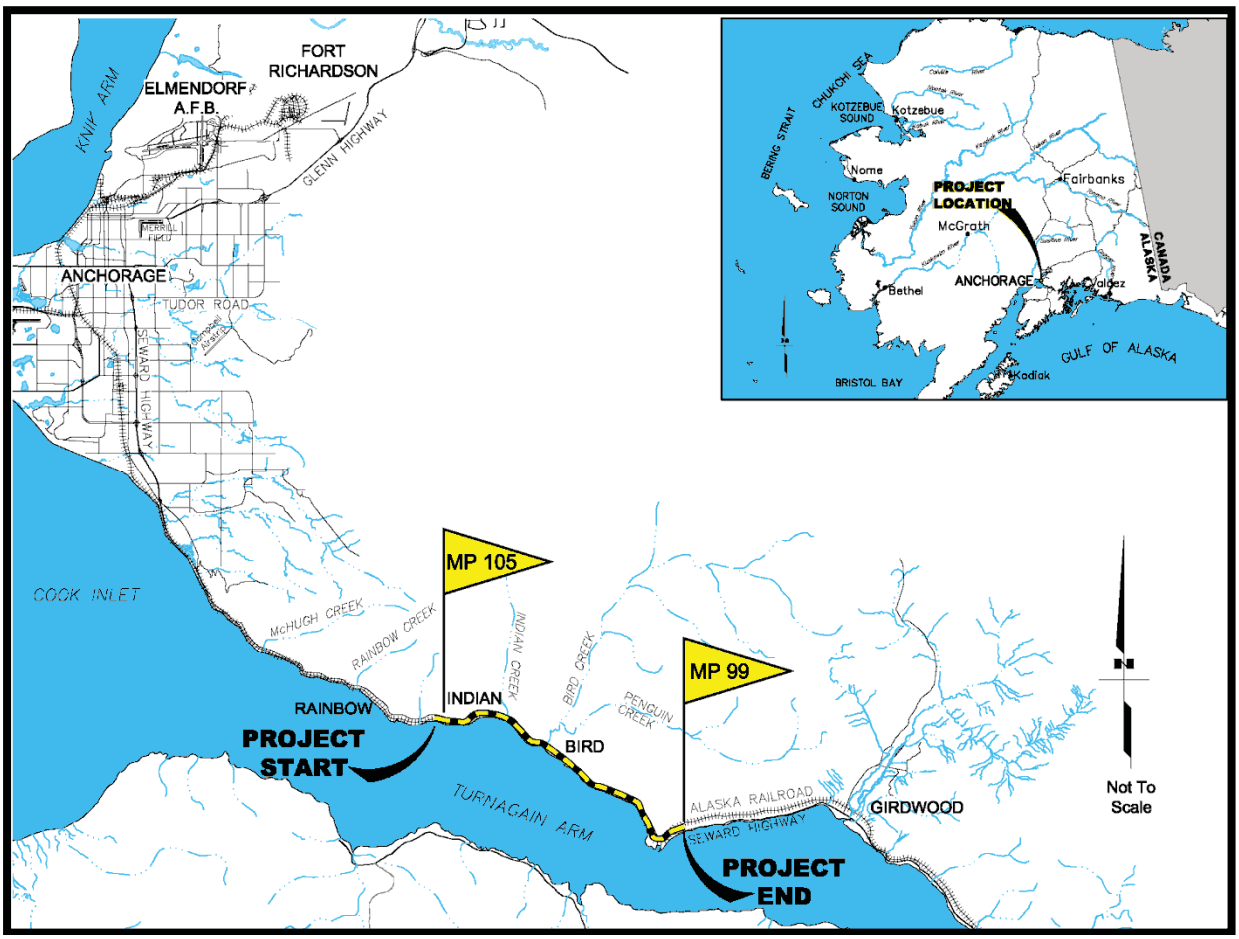



**Figure 1-1: Vicinity Map**

## 1.2 Objectives

The objective of this noise analysis is to evaluate potential traffic noise impacts of the proposed Seward Highway project in support of the project Environmental Assessment (EA).

This highway traffic noise analysis considers existing noise levels, future no-build noise levels (design year 2020), and future build noise levels (design year 2020).

## 2.0 PROJECT DESCRIPTION

### 2.1 Project Improvements

Two design alternatives are being considered for this project. Alternative 2 proposes to resurface the existing highway without changing the typical section or the horizontal and vertical alignments. It will include the addition of a four-lane section south of Bird to allow for northbound and southbound passing. However, the area proposed for the passing lanes is not adjacent to any sensitive receivers. Alternative 3 proposes to shift the highway centerline north in Indian and south in Bird to provide for new frontage roads. The frontage roads will minimize the number of driveways coming onto the highway by becoming the only access point to local drives. Turn lanes and acceleration lanes will be provided at the frontage road access points to separate turning and accelerating traffic from thru traffic. The project's total length is six miles.

### 2.2 Scenarios Evaluated

The traffic noise scenarios evaluated in this analysis include the following:

- Existing p.m. peak hour noise levels (2007),
- Design year (2020) no-build p.m. peak hour noise levels, and
- Design year (2020) build p.m. peak hour noise levels.

Due to the lack of geometric changes adjacent to sensitive receivers in Alternative 2, it is represented by the 2020 no-build scenario. Alternative 3 is represented by the 2020 build scenario. Refer to the *Draft Environmental Assessment* (DOWL HKM, June 2009) for further discussion of the project alternatives.

## 3.0 ACOUSTIC METHODOLOGY

### 3.1 Noise Definitions

Noise is defined in the Merriam-Webster's Dictionary as:

(a) sound ; especially one that lacks agreeable musical quality or is noticeably unpleasant;

(b) any sound that is undesired or interferes with one's hearing of something.

Therefore, noise is sound, and often, unwanted sound. Unwanted is a subjective term. Most commonly, unwanted sound is that which causes annoyance, interference with sleep or activities, and stress.

There are several characteristics that help us to better describe sound:

- Magnitude (subjectively, loudness)
- Frequency (subjectively, pitch)
- Time (duration and variation)

For example, how does the sound of an idling engine differ from the sound of car horn? The idling engine is lower in magnitude, lower in pitch, and typically longer in duration than a car horn.

The human ear detects the magnitude of sound by feeling the pressure of the sound wave. The ear can detect sound pressures ranging from 0.00002 pascals to the threshold of pain at 100 pascals. That's a range of 5 million pascals. For this reason, noise levels are measured with a logarithmic scale using decibels. Table 1 lists average noise levels compared to relatable sounds.

**Table 1: Examples of Standard Noise Levels**

| | Decibels (dB) | Representative Noise |
|---|---|---|
| Faint | 30 | whisper, quiet library |
| | 40 | quiet room |
| Moderate | 50 | moderate rainfall |
| | 60 | conversation, dishwasher |
| Very Loud | 70 | busy traffic, vacuum cleaner |
| | 80 | alarm clock |
| Extremely Loud | 90 | lawnmower, shop tools, truck traffic, subway |
| | 100 | snowmobile, chain saw, pneumatic drill |
| | 110 | rock music, model airplane |
| Painful | 120 | jet plane take-off, amplified rock music at 4-6 feet, car stereo, band practice |
| | 130 | jackhammer |
| | 140 | firearms, air raid siren, jet engine |
| | 150 | rock music peak |

### 3.2 Acoustic Weighting

In accordance with DOT&PF policy, all noise levels reported in this analysis are given in A-weighted decibels (dBA). A-weighting places the greatest emphasis on the human ear's audible spectrum, particularly the range that most humans commonly hear (1,000 to 6,000 Hz). The human ear's detectable threshold between two sound pressure levels is approximately 3 dBA. A-weighting is the most accepted scale for measuring highway traffic noise because it closely simulates the human ear's hearing response and correlates well with perceived auditory nuisance patterns.

### 3.3 Noise Level Reporting

In this noise analysis, existing and future noise levels are reported in terms of $L_{eq}$ (i.e., the A-weighted equivalent noise level during a fixed period of time). $L_{eq\,(h)}$ represents the acoustical

energy average of noise levels measured over a one hour period (typically the peak hour of traffic). It provides a single, convenient value that contains the same acoustical energy over that period as the acoustical energy generated by the variable readings over the same period. This method of noise level reporting is the industry standard and is prescribed by FHWA and DOT&PF policy.

### 3.4 Noise Modeling Software

FHWA's Traffic Noise Model Version 2.5 (TNM 2.5) traffic noise prediction and analysis software is capable of accurately predicting highway traffic noise. Released in April 2004, TNM 2.5 supersedes Version 2.1 and is the latest version currently available. FHWA specifies TNM 2.5 as the required noise analysis software on all Federal-aid highway projects starting on or after October 14, 2004.

TNM predicts noise levels at user-defined receivers based on vehicle volume, speed, fleet mix, distance to receiver, and area terrain. TNM also serves as a noise barrier design tool by determining the most effective location and height of highway noise barriers along their length.

### 3.5 Calibration Procedures

The sound level meter (SLM) used in this analysis is a Rion NL-22 Type-II Sound Level Meter equipped with microphone UC-52, preamplifier NH-21, and windscreen WS-10. Type-II SLMs meet FHWA and DOT&PF accuracy criteria for traffic noise analyses.

The SLM was calibrated at the beginning of each measurement cycle using Rion Sound Level Calibrator (SLC) NC-73, factory calibrated on June 22, 2004. The SLC emits a constant tone of 94 dBA at 1,000 Hz. The SLM read to within 0.1 dBA in all calibration checks.

TNM's output of modeled noise levels in this analysis (existing, design year no-build, and design year build) was validated through field noise measurements of existing noise levels and traffic volumes. Area terrain and roadway geometry were verified in the model and adjusted to coincide with preliminary design plans.

### 3.6 Software Limitations

Highway traffic noise measurements can be influenced by noise sources other than those originating from the subject roadway. For example, community background noise (animal noise, sports/recreational noise, children playing, loud music, lawn and yard equipment, etc.), wind noise, aircraft noise, railroad noise, and noise from surrounding roadways are not modeled by TNM and generally cannot be addressed by the installation of noise barriers along the subject roadway.

In addition, TNM cannot model the following traffic-related noises: studded tire noise, roadside rumble strips, and engine exhaust "Jake" brakes frequently used by heavy trucks.

## 4.0 NOISE REGULATIONS

### 4.1 Noise Impacts

Title 23 of the Code of Federal Regulations, Part 722 (23 CFR 772), *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, contains FHWA's criteria for evaluating noise impacts. Table 2 contains the FHWA noise abatement criteria (NAC). Refer to Appendix A for additional information on the federal criteria.

**Table 2: Federal Highway Administration Noise Abatement Criteria**

| Activity Category | $L_{eq}$ | Description of Activity Category |
|---|---|---|
| A | 57 (Exterior) | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. |
| B | 67 (Exterior) | Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals. |
| C | 72 (Exterior) | Developed lands, properties, or activities not included in Categories A or B above. |
| D | n/a | Undeveloped lands. |
| E | 52 (Interior) | Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums. |

The NAC typically apply to locations of exterior human activity and at ground level. Sensitive receivers are positioned in outdoor areas at the nearest point of human activity to the study roadway.

NAC threshold values vary according to land use activity category, with Activity Category A being the most sensitive and Activity Category C being the least sensitive. Activity Category A (NAC threshold $L_{eq(h)}$ approaches or exceeds 57 dBA) is defined as "lands on which serenity and quiet are of extraordinary significance and serve as an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose." Examples of Category A land use included outdoor amphitheaters and monasteries. The project area contains no adjacent Activity Category A noise receivers.

Activity Category B (NAC threshold $L_{eq(h)}$ approaches or exceeds 67 dBA) is defined as "picnic areas, recreational areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals." The majority of modeled receivers in the project are Activity Category B noise receivers.

Activity Category C (NAC threshold $L_{eq\ (h)}$ approaches or exceeds 72 dBA) includes commercial and industrial land uses. The Indian Valley Mine (R1), Indian Valley Restaurant (R6), Turnagain House Restaurant (R7), and Bird Ridge Café (R18) were considered Activity Category C for this analysis. Category D includes undeveloped lands. Due to the existing recreational trail uses in the area, some of the vacant lands along the project were assumed to be Activity Category B rather than Activity Category D. Activity Category E includes interior noise levels in residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

23 CFR 772.11 states that,

> *"In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit. In those situations where there are no exterior activities to be affected by the traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, the interior criterion shall be used as the basis of determining noise impacts."*

The amount of noise transmission loss through exterior building walls typically determines whether or not an interior noise impact occurs.

23 CFR 772.5 gives a two-part definition of a traffic noise impact,

> *"Impacts which occur when the predicted traffic noise levels approach or exceed the noise abatement criteria, or when the predicted traffic noise levels substantially exceed the existing noise levels."*

DOT&PF's *Traffic Noise Abatement Guidance* defines "approach" as being 1 dBA and "substantially exceed" as 15 dBA. Therefore, according to DOT&PF's policy a noise impact to a land use Activity Category B receiver, for example, occurs when: (1) the predicted peak hour Leq in the design year is equal to or greater than 66 dBA, or (2) the predicted peak hour Leq in the design year is greater than or equal to 15 dBA above the existing peak hour Leq at the receiver. Appendix B contains DOT&PF's *Traffic Noise Abatement Guidance*.

## 4.2 Noise Mitigation Alternatives

In accordance with 23 CFR 772.11(c), when noise impacts are identified, the following abatement measures must be considered: (1) traffic management measures [e.g., 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], (2) alteration of horizontal and vertical alignments, (3) acquisition of property rights for construction of noise barriers, (4) construction of noise barriers, (5) acquisition of real property or interests therein [predominantly unimproved property] to serve as a buffer zone to preempt development that would be adversely impacted by traffic noise, and (6) noise insulation of public use or non-profit institutional structures. In the urban environment where available right-of-way is limited, construction of noise barriers is typically the noise abatement measure of choice, but not necessarily the most practical or cost effective to implement.

Equal-height earth berms mitigate traffic noise comparably to noise barriers. However, when right-of-way is a design constraint, earth berms are not recommended because they have a relatively large footprint.

# 5.0 MODEL PREPARATION

## 5.1 Land Use

Property throughout the corridor is a mix of residential, commercial, and public uses such as parks, trails, fishing areas, and campgrounds.

## 5.2 Model Input

Existing information was input into TNM for the purpose of modeling existing and future no-build noise levels. Existing information includes 2006 traffic volumes, traffic mix, posted speed (55 miles per hour on the Seward Highway), existing roadway profile elevations, surrounding topography, existing structures, and existing ground zones (grass, vegetation, water bodies, etc.).

Design year build information was input into the validated model in order to predict future build noise levels. Design information includes projected traffic volumes, projected traffic mix, proposed posted speeds (35 miles per hour for the frontage roads), proposed roadway profile elevations, and proposed topography within the project slope limits. The sections of the roadway to be constructed on bridge structure were input. Proposed roadway geometric data was taken from the conceptual design plan (*Preliminary Engineering Report*). Remaining information (surrounding topography and ground zones) was assumed to be the same as existing conditions.

## 5.3 Traffic Volume Data

Existing traffic volumes were obtained from the *2005 DOT&PF Annual Traffic Report* and supplemented by manual turning movement counts performed in the corridor by DOWL HKM in July and August 2006. Design year build traffic volumes were calculated using a linear trend line from a graph generated from DOT&PF historical traffic data. Note that heavy truck traffic is a significant contributor to overall noise levels. The project is assumed to have approximately 12.0 percent heavy truck traffic. Refer to Table 3 for the existing and projected future traffic volumes used in the validated model.

**Table 3: P.M. Peak Hour Traffic Volume Data**

| Roadway Segment | Existing 2007 | No-Build (Alternative 2) 2020 | Build (Alternative 3) 2020 |
|---|---|---|---|
| **Seward Highway, MP 99 to 105** | | | |
| Northbound | 581 | 774 | 774 |
| Southbound | 710 | 947 | 947 |
| **Indian Frontage Road** | | | |
| Northbound | n/a | n/a | 51 |
| Southbound | n/a | n/a | 36 |
| **Bird Frontage Road** | | | |
| Northbound | n/a | n/a | 47 |
| Southbound | n/a | n/a | 70 |

## 5.4 Noise Model Validation

Noise level measurements were taken at seven locations, chosen through consultation with DOT&PF, throughout the project corridor (Figures 2-1 through 2-4). Refer to Table 4 for a description of each monitoring site.

Noise measurements were taken on Monday, September 11, and Tuesday, September 12, 2006.

Readings were taken at 10-second intervals for a 20-minute duration and stored on memory card for subsequent upload and $L_{eq\ (h)}$ computations. Manual vehicle volume counts were taken concurrently and classified by vehicle type.

Field-verified elevation differences between the roadway, intervening terrain, and receivers were input. The validation procedure resulted in acceptable correlation (less than 3 dBA difference) between measured and modeled noise levels, as shown in Table 4. The successful validation of measured noise levels in TNM signifies that TNM can be used to accurately model existing and future noise levels (no-build and build scenarios).

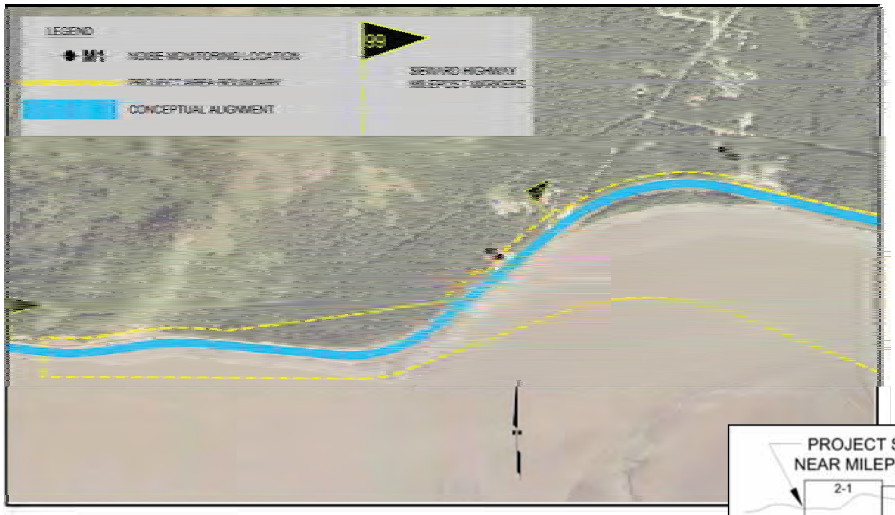



Figure 2-1

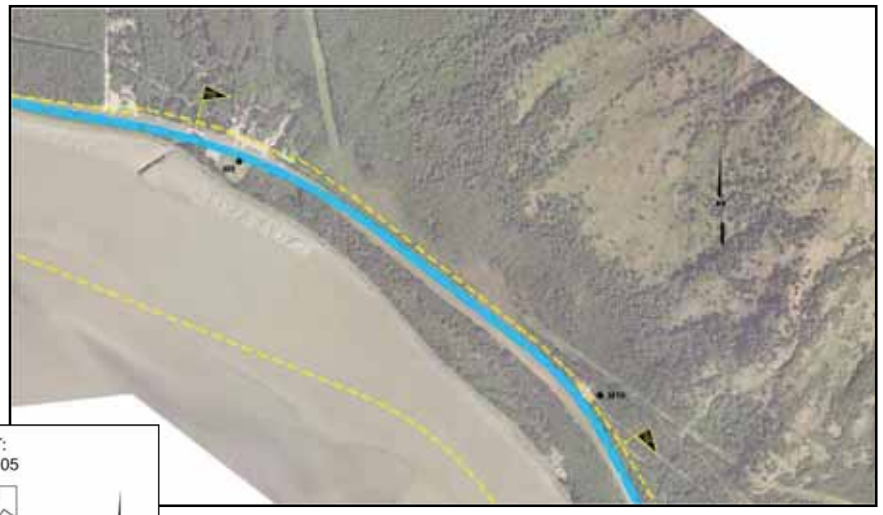


Figure 2-2

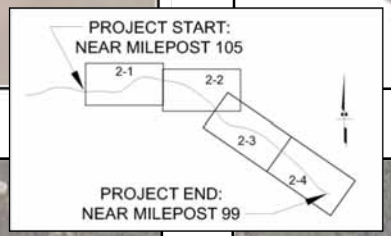



Figure 2-3

Figure 2-4

**Figures 2-1 through 2-4: Field Noise Monitoring Locations**

**Table 4: Validation of Measured Versus Modeled 2006 Traffic Noise Levels**

| Location ID | Description | Monitoring Location (distance from road) | Monitoring Date and Time | Measured $L_{eq}$ (dBA) | Modeled $L_{eq}$ (dBA) | Difference (dBA) |
|---|---|---|---|---|---|---|
| M1 | Indian Valley Mine | 130' | 9/11/06 9:47 a.m. | 61.9 | 60.4 | -1.5 |
| M5 | Single-family residence--yard | 330' | 9/11/06 10:32 a.m. | 56.8 | 54.8 | -2.0 |
| M8 | Indian Creek recreation area and sports field | 120' | 9/11/06 11:18 a.m. | 56.3 | 58.9 | 2.6 |
| M10 | Bird Ridge trailhead | 210' | 9/11/06 12:00 p.m. | 52.3 | 54.9 | 2.6 |
| M11 | Bird Creek fishing and recreation area | 110' | 9/11/06 12:48 p.m. | 53.0 | 55.7 | 2.7 |
| M15 | Single-family residence--yard | 180' | 9/11/06 2:19 p.m. | 55.3 | 55.1 | -0.2 |
| M21 | Whispering Bird Studio and single-family residence--yard | 260' | 9/12/06 9:08 a.m. | 57.1 | 55.2 | -1.9 |

## 6.0 TRAFFIC NOISE MODELING RESULTS

### 6.1 Traffic Noise Impacts

Twenty-one modeled receiver locations were selected throughout the corridor for traffic noise predictions. For complete receiver descriptions, see Appendix C. Locations are identified as R1-R21 and are represented on Figures 3-1 through 3-4. Receiver locations coincide with their corresponding monitoring locations, where applicable.

Ultimately, the magnitude of the predicted noise levels and their increase over existing levels determines if a noise impact occurs (Section 4.1). Table 5 lists the modeled receivers and their TNM-predicted p.m. peak hour noise levels in the 2007, 2020 no-build (Alternative 2), and 2020 build (Alternative 3) scenarios. The table indicates that receiver/scenario combinations TNM predicts will experience a traffic noise impact. Refer to Appendix D for TNM output files.

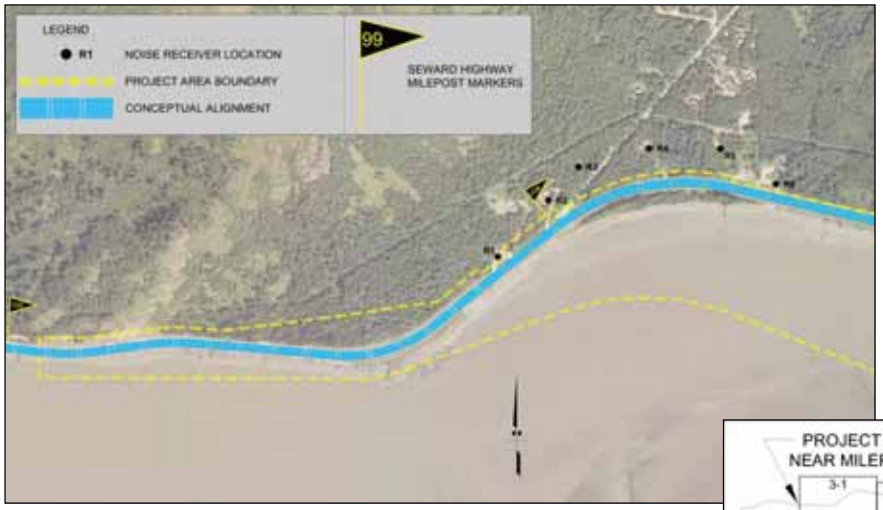



Figure 3-1

Figure 3-2

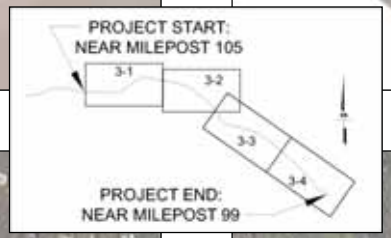



Figure 3-3

Figure 3-4

**Figures 3-1 through 3-4: Predicted Noise Receiver Locations**

**Table 5: Modeled Noise Levels (dBA)**

| | | Existing 2007 p.m. Peak Hour | No-Build (Alternative 2) 2020 p.m. Peak Hour | | | Build (Alternative 3) 2020 p.m. Peak Hour | | |
|---|---|---|---|---|---|---|---|---|
| **Receiver No.** | **Noise Abatement Criteria** | **$L_{eq}$** | **$L_{eq}$** | **Increase Over Existing** | **Noise Impact ?** | **$L_{eq}$** | **Increase Over Existing** | **Noise Impact ?** |
| R1 | 71 | 67 | 68 | 1 | NO | 69 | 2 | NO |
| R2 | 66 | 60 | 62 | 2 | NO | 63 | 3 | NO |
| R3 | 66 | 56 | 57 | 1 | NO | 61 | 5 | NO |
| R4 | 66 | 58 | 59 | 1 | NO | 60 | 2 | NO |
| R5 | 66 | 60 | 62 | 2 | NO | 61 | 1 | NO |
| R6 | 71 | 68 | 69 | 1 | NO | 68 | 0 | NO |
| R7 | 71 | 67 | 68 | 1 | NO | 69 | 2 | NO |
| R8 | 66 | 66 | 67 | 1 | **YES*** | 67 | 1 | **YES*** |
| R9 | 66 | 68 | 69 | 1 | **YES*** | 70 | 2 | **YES*** |
| R10 | 66 | 63 | 64 | 1 | NO | 65 | 2 | NO |
| R11 | 66 | 63 | 65 | 2 | NO | 66 | 3 | **YES** |
| R12 | 66 | 63 | 64 | 1 | NO | 64 | 1 | NO |
| R13 | 66 | 59 | 60 | 1 | NO | 62 | 3 | NO |
| R14 | 66 | 59 | 60 | 1 | NO | 61 | 2 | NO |
| R15 | 66 | 61 | 63 | 2 | NO | 63 | 2 | NO |
| R16 | 66 | 54 | 55 | 1 | NO | 60 | 6 | NO |
| R17 | 66 | 58 | 59 | 1 | NO | 65 | 7 | NO |
| R18 | 71 | 64 | 65 | 1 | NO | 64 | 0 | NO |
| R19 | 66 | 59 | 61 | 2 | NO | 62 | 3 | NO |
| R20 | 66 | 62 | 63 | 1 | NO | 58 | -4 | NO |
| R21 | 66 | 62 | 64 | 2 | NO | 61 | -1 | NO |

**YES** = $L_{eq\,(h)}$ greater than or equal to 66 dBA.

* Per FHWA Guidelines; even though the existing noise level is above the NAC, it is considered an impact if the noise level remains above the NAC in the future conditions.

The following conclusions can be drawn from Table 5:

- Existing traffic noise levels (2007) are below the NAC at all receivers except at receivers R8 and R9.
- 2020 traffic noise levels increase in the build and no-build scenarios at all receivers.
- 2020 traffic noise levels in the no-build (Alternative 2) scenario are below the NAC at all receivers except for those already impacted in 2007.
- 2020 traffic noise levels in the build (Alternative 3) scenario result in a noise impact at receivers R8, R9, and R11.

### 6.2 Construction Noise Impacts

With the exception of aircraft and rail operations in the vicinity of a highway, road construction noise tends to overshadow highway traffic noise. Road construction machinery generates approximately 85 dBA at a distance of 100 feet. All receivers in the area will be subject to construction noise impacts. Construction noise will likely be a secondary noise source to the existing traffic noise from surrounding arterials and should be limited to normal daytime work hours. Increased truck traffic from earthmoving activities will add to the noise character in the corridor throughout construction. These earthmoving activities, when occurring in the vicinity of residential areas, should also be limited to daytime hours.

Nighttime construction may be allowed in undeveloped areas on the Seward Highway provided a noise permit from the Municipality of Anchorage can be obtained. A noise permit obtained in accordance with the Municipality of Anchorage Noise Control Ordinance (AO No. 78-48 and Anchorage Municipal Code Chapter 15.70) would be required for activities that cause a noise disturbance at a sensitive receiver between the hours of 10 p.m. and 7 a.m. during winter months, 10 p.m. and 6 a.m. during summer months, and anytime on Sundays, and for activities that exceed a 1-hour $L_{eq}$ of 80 dBA between the hours of 7 a.m. and 10 p.m.

The contractor must comply with local noise control ordinances. To mitigate construction noise, the contractor may be required to do things like maintain factory-equivalent mufflers on construction equipment, limit excessive idling of machinery, and locate construction staging areas as far from residential areas as practical.

## 7.0 FEASIBILITY AND REASONABLENESS

### 7.1 Definitions

According to DOT&PF's *Traffic Noise Abatement Guidance*, noise abatement must meet feasibility and reasonableness criteria in order to be recommended for implementation. Abatement measures that fail to demonstrate feasibility criteria are not evaluated for reasonableness.

The policy states,

> *"Feasibility deals primarily with 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?) A proposed noise abatement measure that will not attenuate a minimum of a 5-dBA reduction under good conditions is not feasible."*

Safety and maintenance considerations also factor into the feasibility analysis. Examples of safety hazards include noise barriers that block corner sight distance at intersecting roadways and driveways or are located in the clear zone. Barriers located in the clear zone may meet guardrail warrants. Noise abatement measures that create safety hazards or complicate maintenance operations are not considered feasible.

The policy further states,

> *"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 criteria."*

Factors include:

- Whether traffic noise levels at all modeled receivers increase in all scenarios,
- The amount of noise reduction provided,
- The number of residences that would benefit from a noise barrier,
- The cost of abatement. In accordance with DOT&PF criteria, cost should be equal to or less than $32,000 (in 2006 dollars) per benefited residence. Benefited residences include all residences that realize a noise benefit (at least 5 dBA reduction) due to the barrier, regardless of whether or not they were found to be impacted (including residences not immediately adjacent to the corridor),

- The opinions and desires of impacted residents. Most residents wanting a barrier will factor into the reasonableness evaluation. DOT&PF defines "most" as at least 60 percent,
- The future absolute traffic noise levels,
- The difference between the future traffic noise levels and the existing noise levels,
- The difference between future traffic noise levels for the build and the no-build alternatives,
- The amount of development that occurred before and after the initial construction of the highway,
- The extent to which zoning or land use is changing, and
- The effectiveness of land use controls implemented by local officials to prevent incompatible development.

Reasonableness evaluation begins with a barrier cost analysis. Excessive-cost barriers are considered to be unreasonable unless the receiver experiences a "severe noise impact". A severe noise impact occurs when the predicted design year build noise level is 75 dBA or higher, or there is an increase of 30 dBA or more over existing noise levels. Barriers below the cost per benefited residence threshold and excessive-cost barriers that are associated with a severe noise impact are evaluated against the remaining reasonableness criteria described above.

Refer to Appendix E for the completed DOT&PF feasibility and reasonableness checklists.

### 7.2 Feasibility Evaluation

Noise abatement (such as a noise barrier) would not be feasible at location R8 (recreation and sports field) due to the driveway required for access, which necessitates a break in the noise barrier and precludes any noise reduction benefit. In addition, a noise barrier would limit the visibility of pedestrians using the existing multi-use trail that runs adjacent to the sports field.

Installing a noise barrier for the house, church, and retailer represented by R9 would not be feasible because the multiple properties require direct vehicular access to the Indian frontage

road and therefore would require breaks in the noise barrier. A noise barrier would also result in limited sight distance along the Indian frontage road corridor.

Noise abatement would not be feasible at location R11 (Bird Creek fishing area) due to the Bird Creek bridge.

### 7.3 Reasonableness Evaluation

Reasonableness criteria were not evaluated herein because noise abatement was not found to be feasible in Section 7.2.

## 8.0 CONCLUSION

Predicted noise levels in the project are generated predominately by the high-speed, high-volume through lanes of traffic on the Seward Highway. The lower-volume, lower-speed frontage roads proposed as part of the build (Alternative 3) scenario will have a negligible effect on future noise levels even though they are closer to the receivers.

This noise analysis concludes that although a noise impact is predicted for receivers R8 and R9 in the 2020 no-build (Alternative 2) scenario and for receivers R8, R9, and R11 in the 2020 build (Alternative 3) scenario, noise abatement is not feasible due to existing driveways, pedestrian facilities, and bridges. Consequently, noise abatement is not recommended for this project.

# APPENDIX A

## Code of Federal Regulations 23 CFR 772

(vii) Proximity impacts will be mitigated to a condition equivalent to, or better than, that which would occur under a no-build scenario;

(viii) Change in accessibility will not substantially diminish the utilization of the section 4(f) resource; or

(ix) Vibration levels from project construction activities are mitigated, through advance planning and monitoring of the activities, to levels that do not cause a substantial impairment of the section 4(f) resource.

(6) When a constructive use determination is made, it will be based, to the extent it reasonably can, upon the following:

(i) Identification of the current activities, features, or attributes of a resource qualified for protection under section 4(f) and which may be sensitive to proximity impacts;

(ii) An analysis of the proximity impacts of the proposed project on the section 4(f) resource. If any of the proximity impacts will be mitigated, only the net impact need be considered in this analysis. The analysis should also describe and consider the impacts which could reasonably be expected if the proposed project were not implemented, since such impacts should not be attributed to the proposed project;

(iii) Consultation, on the above identification and analysis, with the Federal, State, or local officials having jurisdiction over the park, recreation area, refuge, or historic site.

(7) A temporary occupancy of land is so minimal that it does not constitute a use within the meaning of section 4(f) when the following conditions are satisfied:

(i) Duration must be temporary, i.e., less than the time needed for construction of the project, and there should be no change in ownership of the land;

(ii) Scope of the work must be minor, i.e., both the nature and the magnitude of the changes to the section 4(f) resource are minimal;

(iii) There are no anticipated permanent adverse physical impacts, nor will there be interference with the activities or purposes of the resource, on either a temporary or permanent basis;

(iv) The land being used must be fully restored, i.e., the resource must be returned to a condition which is at least as good as that which existed prior to the project; and

(v) There must be documented agreement of the appropriate Federal, State, or local officials having jurisdiction over the resource regarding the above conditions.

[52 FR 32660, Aug. 28, 1987; 53 FR 11066, Apr. 5, 1988, as amended at 56 FR 13279, Apr. 1, 1991; 57 FR 12411, Apr. 10, 1992]

### § 771.137 International actions.

(a) The requirements of this part apply to:

(1) Administration actions significantly affecting the environment of a foreign nation not participating in the action or not otherwise involved in the action.

(2) Administration actions outside the U.S., its territories, and possessions which significantly affect natural resources of global importance designated for protection by the President or by international agreement.

(b) If communication with a foreign government concerning environmental studies or documentation is anticipated, the Administration shall coordinate such communication with the Department of State through the Office of the Secretary of Transportation.

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

Sec.



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

SOURCE: 47 FR 29654, July 8, 1982; 47 FR 33956, Aug. 5, 1982, unless otherwise noted.

### § 772.1 Purpose.

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

### § 772.3 Noise standards.

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

### § 772.5 Definitions.

(a) *Design year.* The future year used to estimate the probable traffic volume for which a highway is designed. A time, 10 to 20 years, from the start of construction is usually used.

(b) *Existing noise levels.* The noise, resulting from the natural and mechanical sources and human activity, considered to be usually present in a particular area.

(c) $L_{10}$. The sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration.

(d) $L_{10}$(h). The hourly value of $L_{10}$.

(e) *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.

(f) *Leq*(h). The hourly value of Leq.

(g) *Traffic noise impacts.* Impacts which occur when the predicted traffic noise levels approach or exceed the noise abatement criteria (Table 1), or when the predicted traffic noise levels substantially exceed the existing noise levels.

(h) *Type I projects.* A proposed Federal or Federal-aid highway project for the construction of a highway on new location or the physical alteration of an existing highway which significantly changes either the horizonal or vertical alignment or increases the number of through-traffic lanes.

(i) *Type II projects.* A proposed Federal or Federal-aid highway project for noise abatement on an existing highway.

### § 772.7 Applicability.

(a) *Type I projects.* This regulation applies to all Type I projects unless it is specifically indicated that a section applies only to Type II projects.

(b) *Type II projects.* The development and implementation of Type II projects are not mandatory requirements of 23 U.S.C. 109(i) and are, therefore, not required by this regulation. When Type II projects are proposed for Federal-aid highway participation at the option of the highway agency, the provisions of §§ 772.9(c), 772.13, and 772.19 of this regulation shall apply.

### § 772.9 Analysis of traffic noise impacts and abatement measures.

(a) The highway agency shall determine and analyze expected traffic noise impacts and alternative noise abatement measures to mitigate these impacts, giving weight to the benefits and cost of abatement, and to the overall social, economic and environmental effects.

(b) The traffic noise analysis shall include the following for each alternative under detailed study:

(1) Identification of existing activities, developed lands, and undeveloped lands for which development is planned, designed and programmed, which may be affected by noise from the highway;

(2) Prediction of traffic noise levels;

(3) Determination of existing noise levels;

(4) Determination of traffic noise impacts; and

(5) Examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts.

(c) Highway agencies proposing to use Federal-aid highway funds for Type II projects shall perform a noise analysis of sufficient scope to provide information needed to make the determination required by § 772.13(a) of this chapter.

**§ 772.11 Noise abatement.**

(a) In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit.

(b) In those situations where there are no exterior activities to be affected by the traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, the interior criterion shall be used as the basis of determining noise impacts.

(c) If a noise impact is identified, the abatement measures listed in § 772.13(c) of this chapter must be considered.

(d) When noise abatement measures are being considered, every reasonable effort shall be made to obtain substantial noise reductions.

(e) Before adoption of a final environmental impact statement or finding of no significant impact, the highway agency shall identify:

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

(2) Noise impacts for which no apparent solution is available.

(f) The views of the impacted residents will be a major consideration in reaching a decision on the reasonableness of abatement measures to be provided.

(g) The plans and specifications will not be approved by FHWA unless those noise abatement measures which are reasonable and feasible are incorporated into the plans and specifications to reduce or eliminate the noise impact on existing activities, developed lands, or undeveloped lands for which development is planned, designed, and programmed.

**§ 772.13 Federal participation.**

(a) Federal funds may be used for noise abatement measures where:

(1) A traffic noise impact has been identified,

(2) The noise abatement measures will reduce the traffic noise impact, and

(3) The overall noise abatement benefits are determined to outweigh the overall adverse social, economic, and environmental effects and the costs of the noise abatement measures.

(b) For Type II projects, noise abatement measures will only be approved for projects that were approved before November 28, 1995, or are proposed along lands where land development or substantial construction predated the existence of any highway. The granting of a building permit, filing of a plat plan, or a similar action must have occurred prior to right-of-way acquisition or construction approval for the original highway. Noise abatement measures will not be approved at locations where such measures were previously determined not to be reasonable and feasible for a Type I project.

(c) The noise abatement measures listed below may be incorporated in Type I and Type II projects to reduce traffic noise impacts. The costs of such measures may be included in Federal-aid participating project costs with the Federal share being the same as that for the system on which the project is located, except that Interstate construction funds may only participate in Type I projects.

(1) Traffic management measures (e.g., traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive land designations).

(2) Alteration of horizontal and vertical alignments.

(3) Acquisition of property rights (either in fee or lesser interest) for construction of noise barriers.

(4) Construction of noise barriers (including landscaping for esthetic purposes) whether within or outside the highway right-of-way. Interstate construction funds may not participate in landscaping.

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

(6) Noise insulation of public use or nonprofit institutional structures.

(d) There may be situations where (1) severe traffic noise impacts exist or are

expected, and (2) the abatement measures listed above are physically infeasible or economically unreasonable. In these instances, noise abatement measures other than those listed in §772.13(c) of this chapter may be proposed for Types I and II projects by the highway agency and approved by the Regional Federal Highway Administrator on a case-by-case basis when the conditions of §772.13(a) of this chapter have been met.

[47 FR 29654, July 8, 1982; 47 FR 33956, Aug. 5, 1982, as amended at 61 FR 45321, Aug. 29, 1996]

### §772.15 Information for local officials.

In an effort to prevent future traffic noise impacts on currently undeveloped lands, highway agencies shall inform local officials within whose jurisdiction the highway project is located of the following:

(a) The best estimation of future noise levels (for various distances from the highway improvement) for both developed and undeveloped lands or properties in the immediate vicinity of the project,

(b) Information that may be useful to local communities to protect future land development from becoming incompatible with anticipated highway noise levels, and

(c) Eligibility for Federal-aid participation for Type II projects as described in §772.13(b) of this chapter.

### §772.17 Traffic noise prediction.

(a) Any traffic noise prediction method is approved for use in any noise analysis required by this regulation if it generally meets the following two conditions:

(1) The methodology is consistent with the methodology in the FHWA Highway Traffic Noise Prediction Model (Report No. FHWA–RD–77–108).*

(2) The prediction method uses noise emission levels obtained from one of the following:

(i) National Reference Energy Mean Emission Levels as a Function of Speed (appendix A).

(ii) Determination of reference energy mean emission levels in Sound Procedures for Measuring Highway Noise: Final Report, DP–45–1R.*

(b) In predicting noise levels and assessing noise impacts, traffic characteristics which will yield the worst hourly traffic noise impact on a regular basis for the design year shall be used.

### §772.19 Construction noise.

The following general steps are to be performed for all Types I and II projects:

(a) Identify land uses or activities which 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 which 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 the costs of the abatement measures.

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

TABLE 1 TO PART 772—NOISE ABATEMENT CRITERIA

[Hourly A-Weighted Sound Level—decibels (dBA)[1]]

| Activity Category | Leq(h) | $L_{10}$(h) | Description of activity category |
|---|---|---|---|
| A | 57 (Exterior) | 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 | 67 (Exterior) | 70 (Exterior) | Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals. |

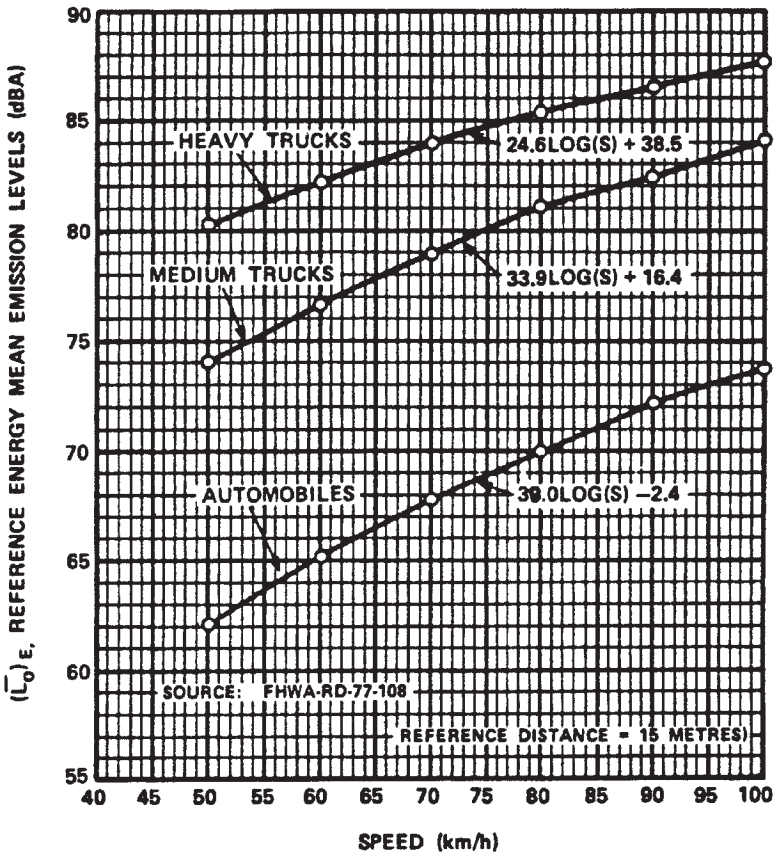
*These documents are available for inspection and copying as prescribed in 49 CFR part 7, appendix D.

[Hourly A-Weighted Sound Level—decibels (dBA)[1]]

| Activity Category | Leq(h) | $L_{10}$(h) | Description of activity category |
|---|---|---|---|
| C | 72 (Exterior) | 75 (Exterior) | Developed lands, properties, or activities not included in Categories A or B above. |
| D | | | Undeveloped lands. |
| E | 52 (Interior) | 55 (Interior) | Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums. |

[1] Either $L_{10}$(h) or Leq(h) (but not both) may be used on a project.

APPENDIX A TO PART 772—NATIONAL REFERENCE ENERGY MEAN EMISSION LEVELS AS A FUNCTION OF SPEED




LEGEND:

1. AUTOMOBILES: ALL VEHICLES WITH TWO AXLES AND FOUR WHEELS.
2. MEDIUM TRUCKS: ALL VEHICLES WITH TWO AXLES AND SIX WHEELS.
3. HEAVY TRUCKS: ALL VEHICLES WITH THREE OR MORE AXLES.

**National Reference Energy Mean Emission Levels as a Function of Speed**