# New Seward Highway: O'Malley Road to Dimond Boulevard Noise Analysis

Project No. FRAF-CA-MGS-NH-0A3-1(27)/52503

Prepared for

Alaska Department of Transportation and Public Facilities

August 2015

CH2MHILL®
949 E 36th Ave
Anchorage, AK 99508

# Contents

## Tables



## Figures

# Acronyms and Abbreviations

| | |
|---|---|
| °F | degrees Fahrenheit |
| μPa | micropascal |
| DOT&PF | Alaska Department of Transportation and Public Facilities |
| ANSI | American National Standards Institute |
| CFR | *Code of Federal Regulations* |
| dB | decibel |
| dBA | A-weighted decibel |
| DD | doubled distance |
| FHWA | Federal Highway Administration |
| Hz | hertz |
| kHz | kilohertz |
| $L_{dn}$ | day-night noise level |
| $L_{eq}$ | equivalent steady-state noise level, which in a stated period of time would contain the same acoustical energy as the time-varying noise level during the same period |
| $L_{eq}(h)$ | energy-average of the A-weighted noise levels occurring during a 1-hour period |
| NAC | noise abatement criteria (or criterion) |
| noise sensitive area | represents exterior ground locations where quiet is a substantial value |
| Receptor | point in the model representative of several noise sensitive locations |
| TNM | Traffic Noise Model |

# Executive Summary

This report describes the methods and findings for a noise analysis conducted for the New Seward Highway, O'Malley Road to Dimond Boulevard, environmental reevaluation. The O'Malley Road to Dimond Boulevard project is one phase of a larger project that extends from 36th Avenue to Rabbit Creek. As part of the reevaluation and also due to recent policy updates to both the FHWA and DOT&PF noise regulations, a new noise analysis is being prepared to reassess noise related impacts. The purpose of this analysis is to evaluate existing and projected future traffic noise levels at noise sensitive locations along the project corridor, ascertain the need for traffic noise abatement, and determine the feasibility and reasonableness of constructing noise barriers, if necessary. This analysis evaluates the potential for impacts and mitigation consistent with the current Alaska Department of Transportation and Public Facilities' (DOT&PF) Noise Policy (April 2011) (included as Appendix G for reference).

The DOT&PF proposes to improve the New Seward Highway, from Dimond Boulevard to O'Malley Road, in Anchorage, Alaska. This project provides improved access to the New Seward Highway between Dimond Boulevard and O'Malley Road. The project completes the crossing of the New Seward Highway at 92nd Avenue, currently Abbot to the west and Academy Drive to the east, with a roundabout east and west of the intersection. Additionally, this intersection will provide on and off ramps between 92nd Avenue and New Seward Highway. New Seward Highway will be widened in the northbound and southbound directions, and a southbound frontage, Homer Drive, west of New Seward Highway will be added to increase capacity.

Traffic noise levels were measured at five representative locations within the project area. Two measurements were taken at each location, in accordance with the DOT&PF's Noise Policy (Appendix G). Vehicle counts and classifications were performed at each of these sites to be used in validating the Federal Highway Administration Traffic Noise Model Version 2.5 (TNM).

This traffic noise analysis conforms to the current Federal Highway Administration and DOT&PF traffic noise analysis guidelines and requirements.

A total of 86 representative receptors, each representative of several noise sensitive locations, were included in the noise model to evaluate existing year (2015) and future year (2035) no build and build scenarios. As a result of this traffic noise analysis, the following conclusions are presented:

- The results of the noise analysis indicate that worst-case hour traffic noise levels at exterior activity areas under the Existing condition ranges from 58 to 72 A-weighted decibel (dBA).
- The results of the noise analysis indicate that worst-case hour traffic noise levels at exterior activity areas under the No Build condition ranges from 60 to 75 dBA.
- The results of the noise analysis indicate that worst-case hour traffic noise levels at exterior activity areas under the Build condition would range from 60 to 75 dBA. The calculated noise levels show that future increases above existing noise levels would be up to 6 dBA under the Build condition, below the DOT&PF substantial increase threshold of 15 dBA.

Table ES-1 presents a summary of the predicted impacts for each of the three scenarios analyzed.

TABLE ES-1
**Summary of Existing and Predicted Noise Impacts for Noise Sensitive Locations**

| Activity Category | Existing Impacts | No-Build Alternative Impacts | Project Build Alternative Impacts |
|---|---|---|---|
| B, C | 176 | 251 | 248 |

Mitigation options were analyzed and three barrier complexes were recommended based on satisfying the feasibility and reasonableness criteria. All three of the noise barrier complexes evaluated were considered both feasible and reasonable. As a result, all three barrier complexes are likely to be recommended. Table ES-2 presents a summary of the recommended barrier complexes.

TABLE ES-2
**Summary of Noise Mitigation: Barrier Descriptions**

| Barrier | Height (feet) | Length (feet) | Noise Reduction Potential (dBA) | Benefited Receptors | Construction Cost | Cost Per Benefited Receptor | Likely to be Implemented |
|---|---|---|---|---|---|---|---|
| 1 (R1-R11) | 10-14 | 1,619 | 5-8 | 36 | $640,860 | $17,801 | Yes |
| 2 (R12-R58) | 14 | 5,278 | 5-12 | 105 | $2,216,730 | $21,111 | Yes |
| 3 (R59-R86) | 10-18 | 4,442 | 5-12 | 68 | $1,576,590 | $23,185 | Yes |

Source: CH2M HILL

A unit cost of $30 per square foot was used to calculate barrier cost consistent with other studies in the corridor.

SECTION 1

# Introduction

## 1.1 Project Background and Purpose

The Alaska Department of Transportation and Public Facilities (DOT&PF) and the Federal Highway Administration (FHWA) are proposing improvements along New Seward Highway from O'Malley Road to Dimond Boulevard. The O'Malley Road to Dimond Boulevard project is one phase of a larger project that extends from 36th Avenue to Rabbit Creek. An Environmental Assessment and associated noise analysis was prepared for the larger 36th Avenue to Rabbit Creek project in 2006. Construction of the first phase, from Dowling Road to Tudor Road, was completed in 2013. Currently, the DOT&PF is preparing a NEPA reevaluation to evaluate additional design improvements for the project. Specifically, roundabouts have been incorporated into the interchange at 92nd Avenue to better facilitate traffic flow. As part of the reevaluation and also due to recent policy updates to both the FHWA and DOT&PF noise regulations, a new noise analysis is being prepared to reassess noise related impacts. Figure 1 is a vicinity map showing the project location and a 500-foot buffer. The proposed roadway improvements begin at O'Malley Road and include both widening and realigning the roadway. The proposed action would provide additional capacity and connectivity, as well as enhance safety. The purposes of the New Seward Highway, O'Malley Road to Dimond Boulevard, project are as follows:

- Accommodate 2035 travel demand
- Improve traffic circulation by linking east-west road segments of 92nd Avenue (currently Abbot Road and Academy Drive) that are currently separated by the New Seward Highway corridor
- Improve transportation safety by bringing New Seward Highway up to current roadway design standards and reducing congestion

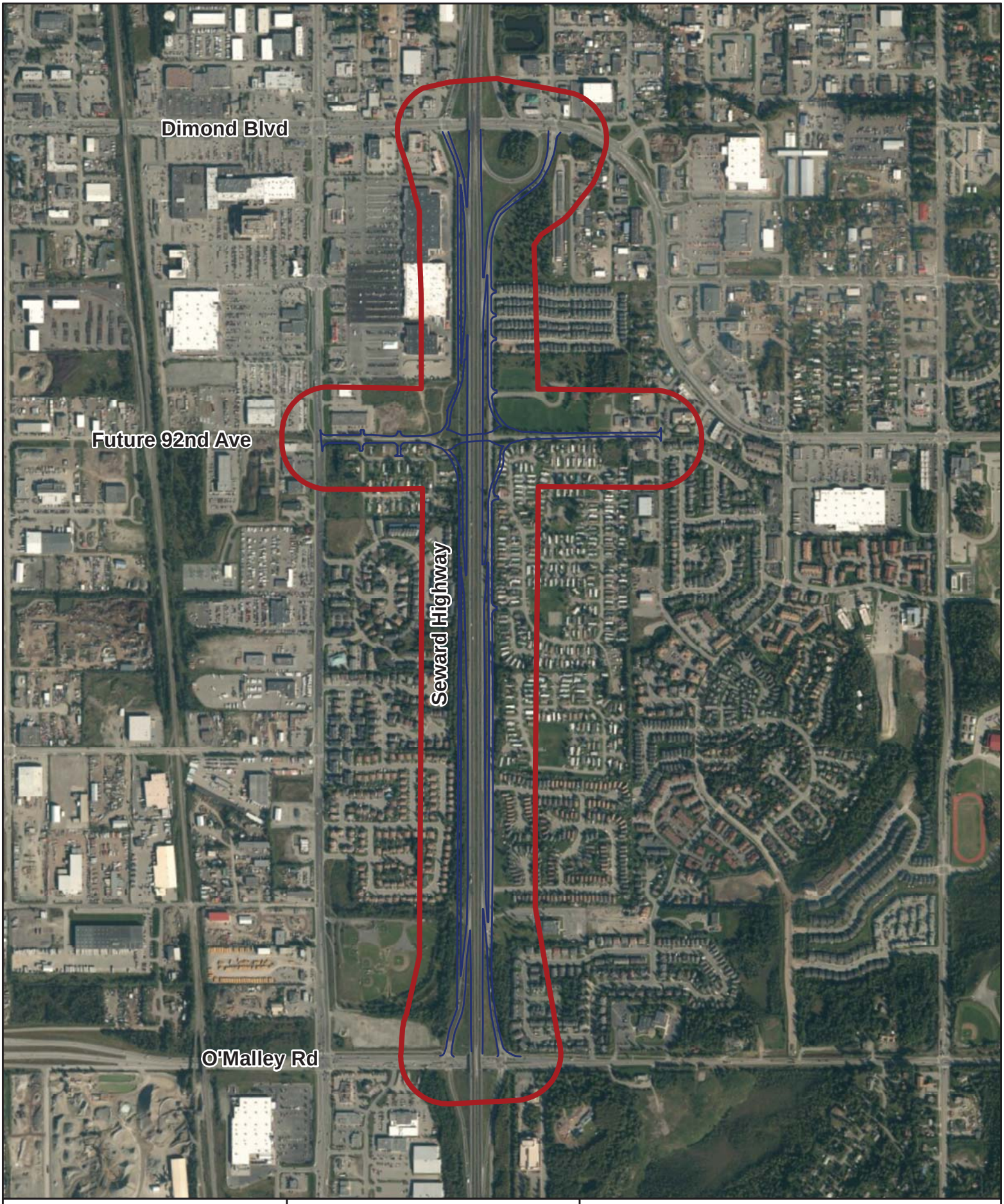
The New Seward Highway is the primary north-south traffic carrier for the Anchorage Bowl. The freeway is centrally located and provides important transportation functions for Southcentral Alaska residents, commercial goods movement, and visitors. The existing highway corridor is a four-lane, controlled-access facility from O'Malley Road to Dimond Boulevard.

During the morning commute period, traffic volume increases and travel speed reduces as travelers make their way to midtown and downtown Anchorage employment centers. During evening peak hours, the traffic exiting at ramps often backs up onto the freeway, creating potentially unsafe conditions. Additionally, the absence of a western frontage road and an east-west connection across the corridor increases out-of-direction travel and does not provide a safe pedestrian crossing opportunity. The *Anchorage 2035 Metropolitan Transportation Plan* (Municipality of Anchorage, DOT&PF, and Anchorage Metropolitan Area Transportation Solutions, 2012) indicates substantial population growth and economic development in the region served by the New Seward Highway corridor and study area, conditions expected to exacerbate the existing congestion problem.

The build alternative incorporates widening the highway from four to six lanes, adding a southbound Homer Drive, adding a grade separated interchange at 92nd Avenue, and improving 92nd Avenue between Old Seward Highway and Vanguard Drive. The improvements for 92nd Avenue intersection include a full-diamond interchange with on and off ramps from the frontage road and New Seward Highway to the newly connected 92nd Avenue.

## 1.2 Study Purpose

Since this project includes adding through-lanes and introducing a new interchange at 92nd Avenue, it is considered a Type 1 project as defined by the DOT&PF and FHWA noise policies, and therefore requires a traffic noise analysis. The purpose of this analysis is to assess current and future peak-hour traffic noise exposure at noise-sensitive locations along New Seward Highway from O'Malley Road to Dimond Boulevard, evaluate noise abatement measures for areas where applicable noise abatement criteria (NAC) are exceeded, and recommend noise abatement measures where such measures are deemed to be feasible and reasonable in accordance with DOT&PF Noise Policy (Appendix G). As discussed previously, a similar noise analysis was conducted in 2006 for the portion of New Seward Highway between Rabbit Creek and 36th Avenue, and included the O'Malley Road to Dimond Boulevard section. Section 6 provides additional discussion of the 2006 noise analysis compared to the current effort.




Project Limits
Study Area

N

0 1,000 2,000
Feet

**Figure 1 - Project Location**
Noise Analysis - New Seward Highway:
O'Malley Road to Dimond Boulevard

SECTION 2

# Fundamentals of Traffic Noise

In this report, all sound levels reported are in A-weighted decibels (dBA). A-weighted decibels are measured with a sound-level meter having the metering characteristics and a frequency weighting specified in the American National Standards Institute (ANSI) Specification for Sound Level Meters, ANSI S 1.4–1983. The A-weighting de-emphasizes lower frequency sounds below 1,000 hertz (Hz) (1 kilohertz [kHz]) and higher frequency sounds above 4 kHz. It emphasizes sounds between 1 kHz and 4 kHz. A-weighting is the most generally used measure for traffic and environmental noise throughout the world. Most community noise standards utilize A-weighting because it provides a high degree of correlation with human annoyance and health effects. Table 1 shows the relative A-weighted sound levels or noise levels of common sounds measured in the environment and in industry.

The actual impact of noise is not a function of loudness alone. The time of day during which noise occurs and the duration of the noise are also important. In addition, most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors have been used. The noise descriptor used for this study is $L_{eq}$, the equivalent steady-state noise level, which in a stated period of time would contain the same acoustical energy as the time-varying noise level during the same period. The $L_{eq}(h)$ is the energy-average of the A-weighted noise levels occurring during a 1-hour period, in decibels (a 1-hour $L_{eq}$).

From the source to the noise sensitive area, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise attenuates with distance depends on the following important factors:

- Geometric spreading from point and line sources
- Ground absorption
- Atmospheric effects and refraction
- Shielding by natural and manmade features, noise barriers, diffraction, and reflection

TABLE 1
**Common Environmental Noise Levels**

| Noise Source at a Given Distance | A-Weighted Noise level (decibels) | Subjective Impression |
|---|---|---|
| Military jet takeoff with after-burner (50 feet) | 140 | |
| Civil defense siren (100 feet) | 130 | |
| Jet takeoff (200 feet) | 120 | Threshold of pain |
| Loud rock music | 110 | |
| Pile driver (50 feet) | 100 | Very loud |
| Diesel truck (150 feet) | 90 | |
| Garbage disposal (3 feet) | 80 | |
| Vacuum cleaner (10 feet) | 70 | Moderately loud |
| Normal conversation (3 feet) | 60 | |
| Light traffic (100 feet); rainfall | 50 | |
| Bird calls (distant) | 40 | Quiet |
| Soft whisper (5 feet); rustling leaves | 30 | |

TABLE 1
**Common Environmental Noise Levels**

| Noise Source at a Given Distance | A-Weighted Noise level (decibels) | Subjective Impression |
|---|---|---|
| Library | 20 | |
| Normal breathing | 10 | |
| | 0-1 | Threshold of hearing |

Source; Center for Hearing and Communication. *Common Environmental Noise Levels Fact Sheet.* 2013.

Highway traffic noise is not a single, stationary point source of sound. The movement of multiple vehicles in close succession to each other makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval. Generally, noise levels from a highway decrease at rates of 3 dBA to 4.5 dBA for each doubling of distance from the highway, depending on the type of terrain between the highway and noise sensitive locations.

Research by the California Department of Transportation and others has shown that atmospheric condition can have a profound effect on noise levels within 200 feet of a highway. Wind has shown to be 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 humidity and turbulence, also have significant effects.

Changes in traffic noise levels are generally perceived as follows:

- 3–dBA change is barely perceptible.
- 5–dBA change is readily perceptible.
- 10–dBA change is perceived as a doubling or halving of noise.

SECTION 3

# FHWA and DOT&PF Criteria for Noise Abatement

This traffic noise analysis conforms to current FHWA and DOT&PF traffic noise analysis guidelines and requirements. All receptors with outdoor use considered for this analysis are classified as Category B and C. The measurement locations in this study consisted of exterior areas of frequent human use, including front or back yards at residences, a park and the outdoor areas of several churches.

TABLE 2
**DOT&PF Noise Abatement Criteria by Land Use Activity Category**

| Activity Category | Leq (decibels) | Description |
|---|---|---|
| A | 57 (Exterior) | Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. |
| B | 67 (Exterior) | Residential (single and multi-family units) |
| C | 67 (Exterior) | 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. |
| D | 52 (Interior) | Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios. |
| E | 72 (Exterior) | Hotels, motels, offices, restaurants, bars, and other developed lands, properties, or activities not included in A–D or F. Includes undeveloped land permitted for these activities. |
| 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. |

Source: DOT&PF. Alaska Environmental Procedures Manual Noise Policy. April 2011. (Appendix G)

The DOT&PF determines a noise impact to occur when predicted future traffic noise levels approach or exceed the established FHWA NAC listed in Table 2. The DOT&PF defines approach as within 1 dBA of the FHWA NAC (66 dBA for Activity Category B and C or 71 dBA for Category E). In addition to the criterion sound levels described above, FHWA and DOT&PF consider a traffic noise impact to occur if predicted sound levels substantially exceed the Existing noise levels. While FHWA guidance does not specifically define what constitutes a substantial increase, FHWA provides state highway agencies the flexibility in establishing their own definition of what constitutes a *substantial* increase. The DOT&PF considers predicted traffic noise level of at least 15 dBA over existing noise levels a *substantial* increase in noise levels for new highway projects.

SECTION 4

# Methodology

Traffic noise levels were evaluated using the FHWA Traffic Noise Model version 2.5 (TNM 2.5) computer program. TNM 2.5 is the latest analytical method developed for highway traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (two axles), heavy trucks (three or more axles), buses, and motorcycles with consideration given to vehicle volume, speed, roadway configuration, distance to the noise sensitive area, terrain features, and the acoustical characteristics of the site. TNM 2.5 was developed to predict hourly energy equivalent levels (Leq) for free-flowing and interrupted-flow traffic conditions, and is generally considered to be accurate within ±3 decibels.

The model enables the user to account for the effects of different pavement types, graded roadways, terrain variations, and attenuation over/through rows of buildings and dense vegetation. The model uses traffic noise emission curves to accurately calculate noise levels generated by highway traffic. Noise levels are determined under worst case traffic noise conditions. Primary consideration is given to exterior areas where frequent human use occurs. Unless otherwise stated, all sound levels reported are Leq, A-weighted, and measured in terms of decibels (dBA).

Modeling locations or sites are generally classified as either a Hard or Soft site as described below:

- **Hard sites**–Sites with a reflective surface between the source and the noise sensitive area, such as parking lots or smooth bodies of water. No excess ground attenuation is assumed for these sites, and the changes in noise levels with distance (drop-off rate) are primarily the result of geometric spreading of the line source at a rate of r 3 dBA/Doubling of distance (3 dBA/DD).
- **Soft sites**–Sites with an absorptive ground surface, such as soft dirt, grass, or scattered brush and trees. An excess ground attenuation value of 1.5 dBA/DD is normally assumed. When added to the geometric spreading, this value results in an overall drop-off rate of 4.5 dBA/DD for a line source.

The currently approved FHWA TNM 2.5 model does not offer analysis capabilities for the effects of other factors, such as wind and atmospheric inversions. Therefore, a no-wind condition is assumed for this noise analysis. The model was validated by comparing noise measurements made in the project area when winds were relatively calm, under 10 mph, with noise levels estimated by the model. Wind speeds must not exceed 12 mph during measurements.

Peak hour traffic data for Existing (2015), No Build (2035), and Build (2035) scenarios were obtained from CH2M HILL. Traffic volume data utilized for the analysis was based on a synthesis of data from various sources and is contained in Appendix D. Existing and Full-Build traffic volumes were developed from traffic data and reports prepared as a part of the following studies:

- New Seward Highway: Rabbit Creek Road to 36th Avenue - Transportation Report (CH2M HILL, 2003)
- New Seward Highway: Dimond Boulevard to Dowling Road - Traffic Analysis Report (CH2M HILL, 2013)
- New Seward Highway: 92nd Avenue Phase 1 - Draft Traffic Analysis Report (HDL/Kinney Engineering, 2011)
- Academy Drive/Vanguard Traffic Circulation Improvements - Traffic Analysis Report (CRW/Kittelson, 2012)
- No-Build traffic volumes were based on the New Seward Highway: Rabbit Creek Road to 36th Avenue - Transportation Report (CH2M HILL, 2003).

SECTION 5

# Existing Conditions

## 5.1 Setting

Vehicular traffic on New Seward Highway is the dominant source of environmental noise at noise-sensitive locations in the study area. Throughout most of the project corridor, traffic on frontage roads and other local roadways is an insignificant contributor to overall noise exposure.

## 5.2 Existing Land Use

Field investigation revealed in general that land uses in the project corridor were consistent with the applicable zoning designations. The majority of the land use adjacent to the project corridor is both single and multifamily residential, with limited commercial and office locations. A park is located west of New Seward Highway just north of O'Malley Road, and several churches are located east of New Seward Highway.

## 5.3 Noise Measurement Procedures

Noise level measurements and concurrent traffic counts were conducted at the exterior areas of representative locations along the project area at locations M01- M05 on March 24, 2015. The noise monitoring locations were selected based on a review of plans and a site inspection to determine the noise sensitive locations in the project area.

Measurement equipment consisted of a Bruel and Kjaer 2236 sound level meter. The equipment complies with the requirements of the American National Standards Institute and the International Electrotechnical Commission for precision sound level measurement instrumentation. Weather conditions during the March 24, 2015 measurements consisted of mostly clear skies and winds five to ten miles per hour (mph) from the north/northwest, with temperatures approximately 68ºF. A three inch windscreen was used to shield the microphone. Traffic noise was the dominant noise source. Two fifteen minute measurements were taken at each monitoring location.

## 5.4 Model and Validation Process

The purpose of the noise measurements was to validate the accuracy of the most current version of the FHWA TNM software, (2.5). The project area was closely inspected to gather input data that would allow accurate modeling of the roadway and receptor locations.

The location of the measurement sites, existing roadway geometry, vehicle counts, and estimated speeds obtained during the noise measurement periods were input into the noise model. Table 3 compares noise levels obtained during the noise measurements with the levels predicted by the noise model. The agreement between the noise levels measured in the field and noise levels calculated by the noise model serves to validate the model, as represented in the "Difference" column in Table 3. A positive difference indicates that noise levels measured in the field are lower than those predicted by the noise model. A negative difference shows that measured noise levels are greater than predicted noise levels. The DOT&PF's Noise Policy (Appendix G) identifies a 3 dBA difference as acceptable between measured and predicted noise levels.

As required by the DOT&PF Noise Policy, two measurements were taken at all five monitoring locations, with 10 total measurements labeled 1a, 1b, 2a, 2b, etc. Both measurements at each location were used in the validation, with the exception of M1. At M1, the noise meter was paused for a short time, due to someone walking by the meter on the trail and talking, interfering with the noise measurement. Since the

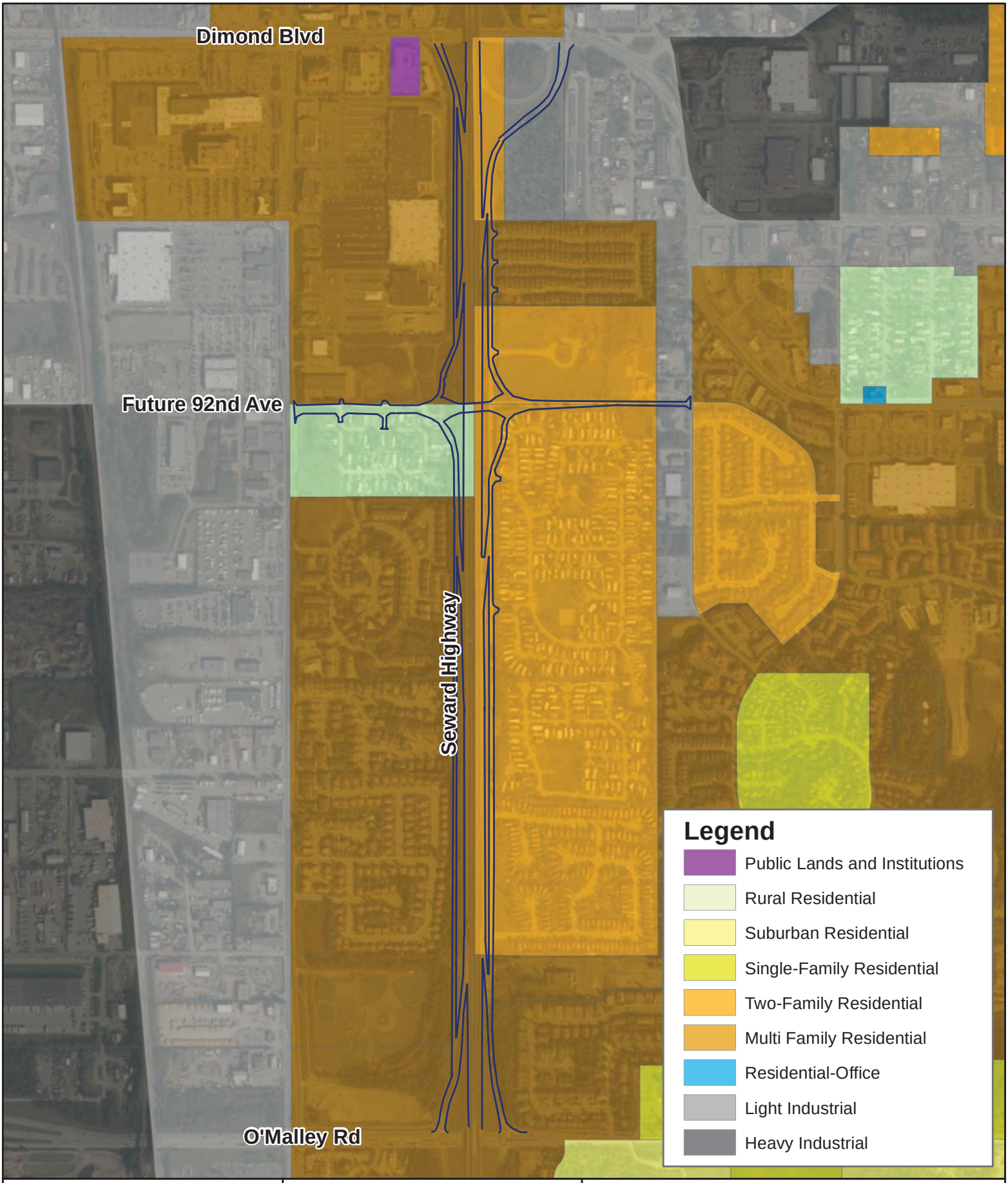
measurements are required to be continuous, this measurement was discarded and M1b was used to validate the model.

As shown in Table 3 and required by the DOT&PF Noise Policy (Appendix G), all monitoring locations are within 3 dBA of the measured results. Such differences show agreement between measured and predicted noise levels, and indicates that the TNM 2.5 may be used to accurately calculate noise exposure in the corridor.

TABLE 3
**Summary of Measured Traffic Noise Levels**

| Monitoring Location | Activity Category | | Distance from Roadway | Location Description | Measured Leq (dBA) | Predicted Leq (dBA) | Difference (dBA) |
|---|---|---|---|---|---|---|---|
| M1a | Residential | B | 160 ft from SB Seward Hwy | Long St and Abbott Road | 66.1 | 64.2 | 1.9 |
| M1b | Residential | B | 160 ft from SB Seward Hwy | Long St and Abbott Road | 66.1 | 64.0 | 2.1 |
| M2a | Institutional / Church | C | 160 ft from NB Seward Hwy | 10431 Brayton Drive | 68.7 | 65.9 | 2.8 |
| M2b | Institutional / Church | C | 160 ft from NB Seward Hwy | 10431 Brayton Drive | 68.9 | 66.4 | 2.5 |
| M3a | Residential | B | 135 ft from NB Seward Hwy | 10105 Salix Circle | 72.9 | 70.2 | 2.7 |
| M3b | Residential | B | 135 ft from NB Seward Hwy | 10105 Salix Circle | 72.5 | 70.6 | 1.9 |
| M4a | Residential | B | 125 ft from NB Seward Hwy | 62 Cornella Circle | 68.5 | 70.4 | -1.6 |
| M4b | Residential | B | 125 ft from NB Seward Hwy | 62 Cornella Circle | 68.8 | 70.4 | -1.9 |
| M5a | Residential | B | 110 ft from NB Seward Hwy | 1470 Moss Creek Avenue | 74.1 | 71.2 | 2.9 |
| M5b | Residential | B | 110 ft from NB Seward Hwy | 1470 Moss Creek Avenue | 73.7 | 71.7 | 2 |

$L_{eq}$: Equivalent average noise level for the measurement period
$L_{min}$: Minimum noise level for the measurement period
$L_{max}$: Maximum noise level during the measurement period



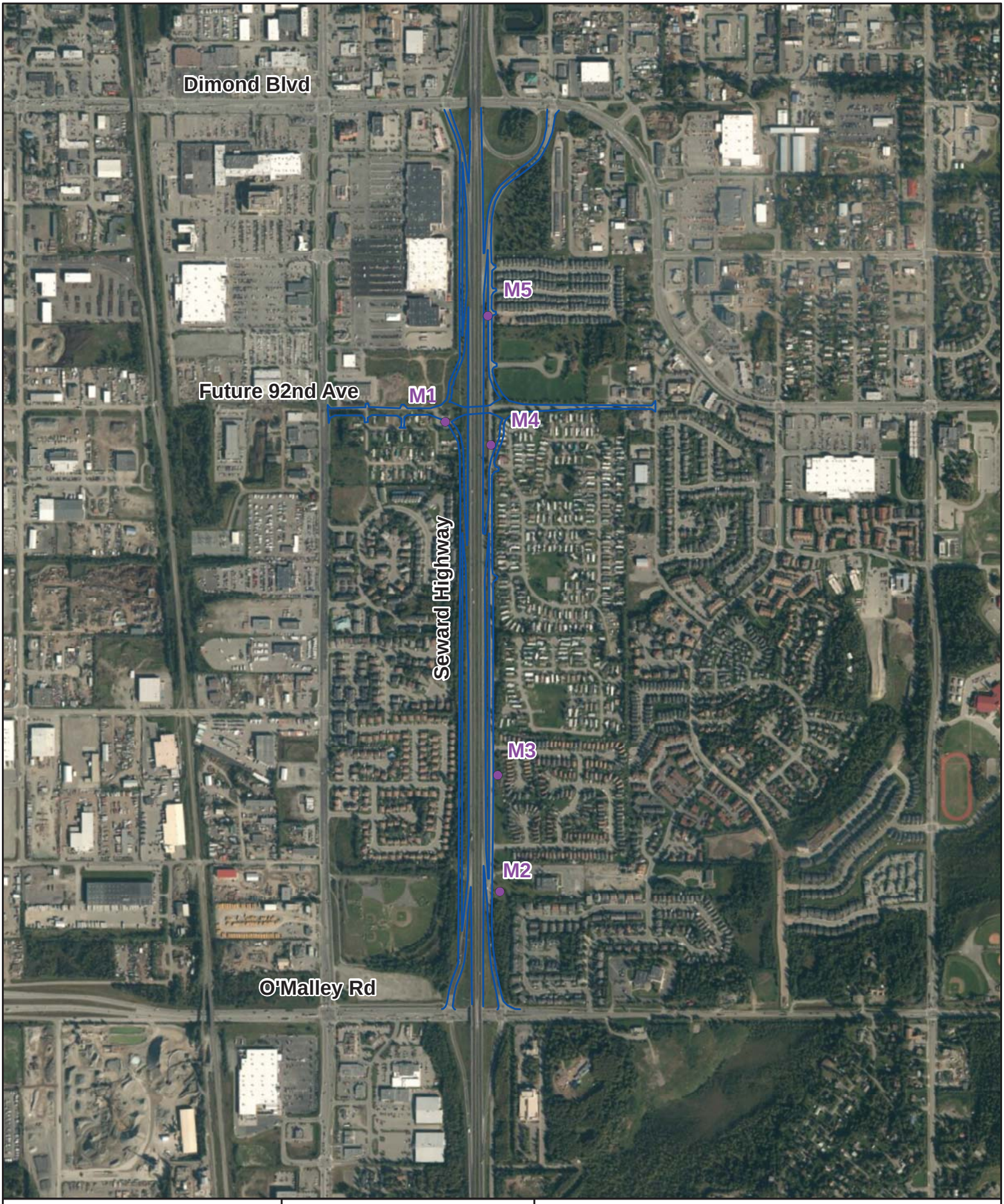

Project Limits

N

0 1,000 2,000
Feet

**Figure 2 - Zoning**

Noise Analysis - New Seward Highway:
O'Malley Road to Dimond Boulevard




Project Limits

Measurement Locations

N

0 1,000 2,000

Feet

**Figure 3 - Measurement Locations**

Noise Analysis - Seward Highway:
Dimond Blvd to O'Malley Rd

SECTION 6

# Traffic Noise Results

A model of noise-sensitive locations (such as single-family and multifamily residences, schools, parks, and churches) adjacent to the project corridor was conducted using TNM 2.5 to assess existing and future worst case hour traffic noise levels. Receptors were located in areas representative of frequent outdoor human use. Each modeled receptor is representative of several noise sensitive locations of common use.

## 6.1 Existing (2015) Noise Levels

The results of the noise analysis indicate that worst case hour traffic noise levels at exterior activity areas under the Existing condition ranges from 58 to 72 dBA. Noise levels at 38 modeled receptors, representing 176 noise sensitive locations, were predicted to exceed the NAC under the Existing condition. Each modeled receptor is representative of several noise sensitive locations of common use. Noise level results are included in Appendix C.

## 6.2 No Build (2035) Noise Levels

The results of the noise analysis indicate that worst case hour traffic noise levels at exterior activity areas under the No Build condition ranges from 60 to 75 dBA, as shown in Appendix C, representing a slight increase above Existing levels of up to 5 dBA. Noise levels at modeled 51 receptors, representing 251 noise sensitive locations, were predicted to exceed the NAC under the No Build condition.

As can be expected, noise levels under the No Build were higher and resulted in more impacted receptors than the Existing condition due to the increase in traffic volumes between 2015 and 2035.

## 6.3 Build (2035) Noise Levels

The results of the noise analysis indicate that worst case hour traffic noise levels at exterior activity areas under the Build condition would range from 60 to 75 dBA, with increases above existing levels of up to 6 dBA, as shown in Appendix C. Such increases are below the substantial increase criterion of 15 dB established by the DOT&PF. 51 modeled receptors, representing 248 noise sensitive locations, would meet or exceed the NAC. In general, noise levels would increase consistently throughout the corridor based on regional growth in traffic volumes.

Compared to the No Build condition, Build levels would decrease slightly near 92nd Avenue on both sides of New Seward Highway due to the grade separation.

Potential noise impacts associated with the proposed project include permanent impacts resulting from additional lanes, vehicular traffic traveling closer to noise sensitive locations, changes in the physical characteristics of the roadway, adding the new intersection at 92nd Avenue, and temporary impacts related to roadway construction activities. The results indicate that the project build alternative increases noise levels compared to the no-build alternative in areas where project improvements such as road widening, the new intersection at 92nd Ave, and the new frontage road west of the New Seward Highway would move traffic closer to the noise sensitive locations.

Table 4 below provides a summary of the impacted noise sensitive locations for the Existing, No Build, and Build scenarios.

TABLE 4
**Summary of Existing and Predicted Noise Impacts for Noise Sensitive Locations**

| Activity Category | Existing Impacts | No-Build Alternative Impacts | Project Build Alternative Impacts |
|---|---|---|---|
| B, C | 176 | 251 | 248 |

For the most part, noise levels are generally consistent with the levels predicted in the 2006 analysis. Specifically, the 2006 noise analysis predicted future build noise level increases above existing levels of up to 6 dBA, with levels approaching and exceeding the NAC and thereby requiring an evaluation of noise abatement consistent with the current analysis. It should be noted however that updated traffic volumes and design years have resulted in some changes to noise levels, and new development east of New Seward Highway between Dimond Boulevard and 92nd Avenue has allowed for more precise receptor placement in the model. In addition, the TNM has been updated to version 2.5 which also resulted in slight variances in predicted noise levels between the 2006 study and this noise analysis.


Dimond to O'Malley Design

Impacted Receptors

Non Impacted Receptors

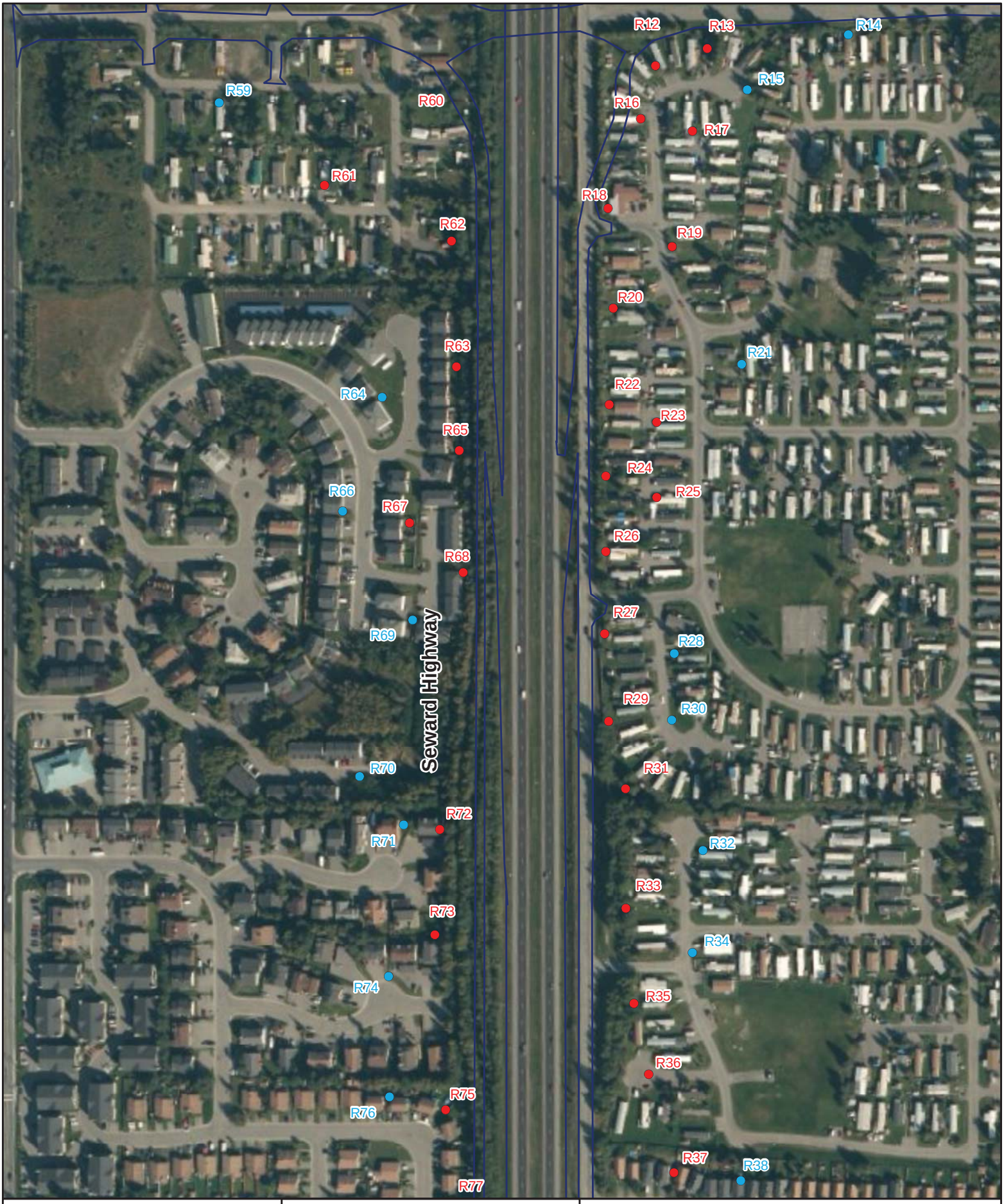
N

0 250 500 1,000

Feet

**Figure 4 - Receptor Locations North**

Noise Analysis - Seward Highway: O'Malley Road to Dimond Boulevard




Dimond to O'Malley Design

Impacted Receptors

Non Impacted Receptors

N

0 250 500 1,000

Feet

**Figure 5 - Receptor Locations Mid**

Noise Analysis - New Seward Highway: O'Malley Road to Dimond Boulevard


Dimond to O'Malley Design

Impacted Receptors

Non Impacted Receptors

N

0 250 500 1,000

Feet

**Figure 6 - Receptor Locations South**

Noise Analysis - New Seward Highway: O'Malley Road to Dimond Boulevard

SECTION 7

# Mitigation

## 7.1 Alaska Noise Abatement Guidelines

Noise abatement measures will be considered only when the existing or predicted future traffic noise levels approach or exceed the FHWA Noise Abatement Criteria (NAC) or when the predicted future traffic noise levels of the build alternative results in a substantial increase over the existing traffic noise levels. According to DOT&PF's Noise Policy (Appendix G), for a barrier to be implemented, it must be considered to be both feasible and reasonable, meeting the minimum criteria described below.

Feasibility is based on a minimum required noise level reduction and engineering considerations. The noise barrier must provide a minimum noise reduction of 5 dBA for at least 50 percent of front row dwelling units, and the barrier must not create a safety hazard to the driving public, protected receptors or maintenance workers. If abatement is not considered feasible, it will not be evaluated for reasonableness. The reasonableness criteria are based on the noise reduction design goal, the cost effectiveness of the barrier, and the viewpoints of the benefited receptors. The following criteria must be met for noise mitigation to be considered reasonable:

- The abatement measure must cost no more than $36,700 per benefited receptor (2015 costs adjusted for inflation, Appendix F), a benefited receptor being a location that achieves a minimum noise reduction of 5 dBA of greater. Appendix F includes the adjusted inflation calculations.
- The noise abatement must also achieve a noise reduction design goal of 7 dBA for at least 50 percent of front row of the noise sensitive locations to be considered reasonable.
- The preferences of the benefited property owners and residents must be taken into account in determining whether noise abatement measures are desired at a particular location.
- At least 60 percent of property owners and households must indicate a preference for the noise mitigation measure.

## 7.2 Traffic Noise Abatement Strategies

Noise abatement strategies should be considered at noise sensitive locations that approach (66 dBA for Category B and C) or exceed the NAC level, or result in a substantial increase (15 dB) over existing noise levels.

The following FHWA approved noise abatement may also be considered, where appropriate:

- Constructing noise barriers or earthen berms
- Traffic management measures (e.g., traffic control devices, time-use restrictions, prohibition of certain vehicle types, or modified speed limits).
- Change of roadway's vertical or horizontal alignment
- Acquisition of property for buffer zones
- Acoustic insulation of Activity Category D structures

Of these measures, the noise barrier option is usually the most practical, reasonable, and effective choice. Two common noise barrier options to control exposure from traffic noise impacts are vertical noise barriers and earthen berms. Vertical noise barriers are preferred since earthen berms may require substantial right-of-way acquisition.

To be effective, the noise barriers should be constructed of massive materials, such as masonry or concrete block, and should be continuous without gaps or openings that could result in flanking paths and reduce barrier performance. Other barrier materials may be acceptable but have to be approved by a qualified acoustical consultant.

It should be noted that noise barriers can have their own negative impacts. Barriers may interfere with the passage of air, interrupt scenic views, or create objectionable shadows. They could also create maintenance access problems, make it difficult to maintain landscaping, create drainage problems, or provide pockets for wind-borne trash and garbage to accumulate.

## 7.3 Barrier Analysis

Throughout the corridor, all the first row receptors exceed the applicable noise criteria, therefore, noise abatement was evaluated for the project. The non-impacted receptors, depicted in Figure 7, do not approach or exceed the applicable NAC and are therefore not eligible for mitigation. Noise abatement was evaluated for three barrier complexes that each protect multiple residential developments within the project area. The DOT&PF Noise Policy (Appendix G) states that "*the two required criteria to consider when evaluating the* incorporation *of noise abatement measures into a specific project are FEASIBILITY and REASONABLENESS."*

The analysis determined that all three of the barrier complexes would meet the established feasible and reasonableness criteria.

Although the three barrier complexes would extend through the majority of the project area, several areas were not included in the barrier analysis as these areas were either not impacted as discussed previously or were not considered a noise sensitive land use. Specifically, the area west of New Seward Highway between 92nd Avenue and Dimond Boulevard was not considered for noise abatement as development in this area is primarily commercial/industrial and did not contain noise sensitive land uses such as outdoor areas of frequent human use. Conversely, although the baseball diamonds west of New Seward Highway and the church to the east are both considered noise sensitive land uses, they are set far enough back from the mainline to not be impacted by noise based on noise levels predicted in the TNM.

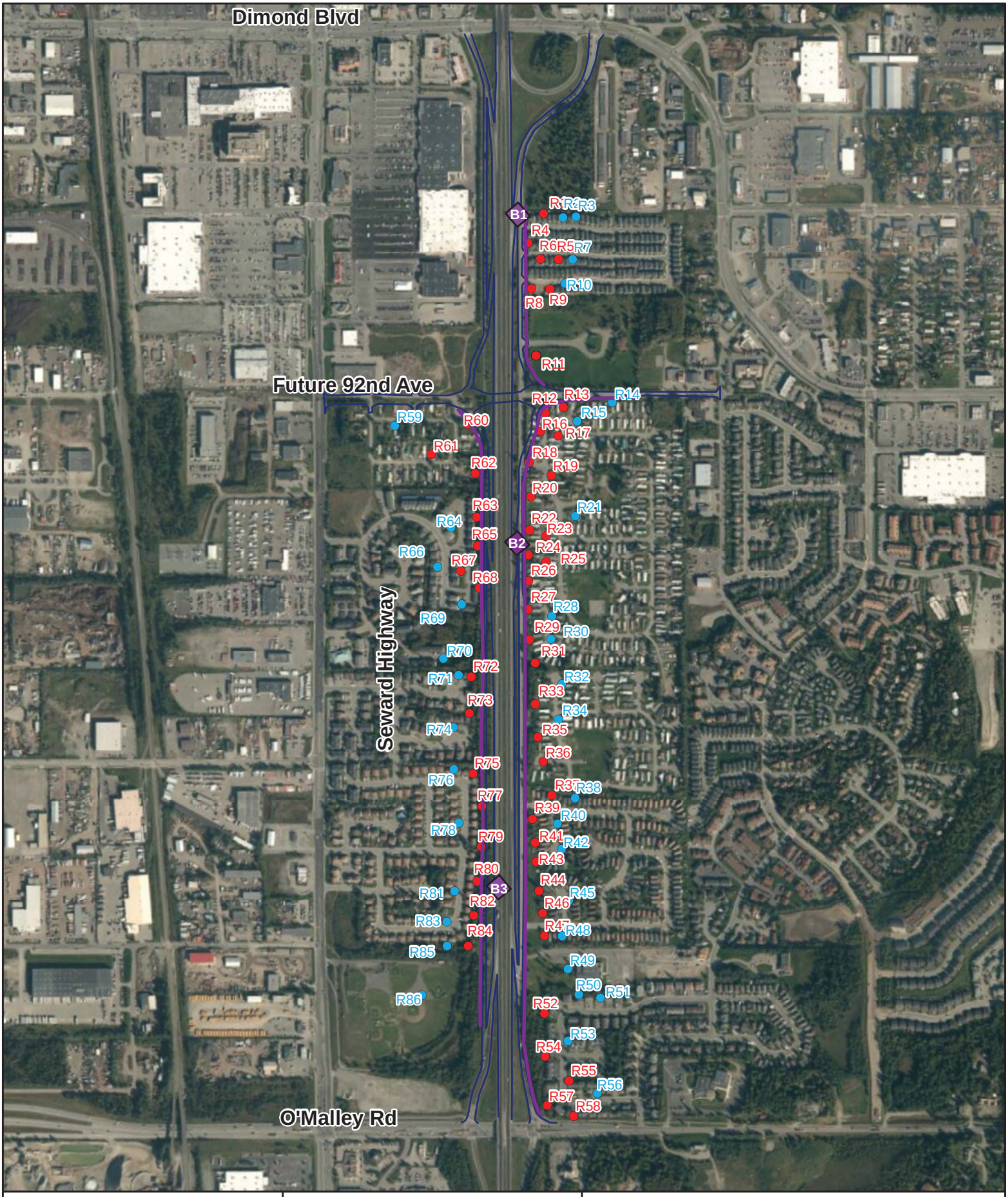
Table 5 summarizes the analysis of each barrier complex with a detailed discussion following the table.

TABLE 5
**Summary of Noise Mitigation: Barrier Descriptions**

| Barrier | Height (feet) | Length (feet) | Noise Reduction Potential (dBA) | Benefited Receptors | Construction Cost | Cost Per Benefited Receptor | Likely to be Implemented |
|---|---|---|---|---|---|---|---|
| 1 (R1-R11) | 10-14 | 1,619 | 5-8 | 36 | $640,860 | $17,801 | Yes |
| 2 (R12-R58) | 14 | 5,278 | 5-12 | 105 | $2,216,730 | $21,111 | Yes |
| 3 (R59-R86) | 10-18 | 4,442 | 5-12 | 68 | $1,576,590 | $23,185 | Yes |

Source: CH2M HILL

A unit cost of $30 per square foot was used to calculate barrier cost consistent with other studies in the corridor.




Project Limits
Impacted Receptors
Non Impacted Receptors
Barrier

N

0 1,000 2,000
Feet

**Figure 7 - Barrier Locations**

Noise Analysis - Seward Highway:
O'Malley Rd to Dimond Boulevard

**Barrier 1: East of New Seward Highway between 92 Avenue and Dimond Boulevard (R1-R11)**

A 1,619-linear-foot barrier complex was evaluated along the eastern side of New Seward Highway between 92nd Avenue and Dimond Boulevard along the right-of-way. Land use adjacent to this wall includes a mix of residences to the north and athletic fields to the south. Per the DOT&PF noise policy, equivalent number of residential units was 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. Although breaks were included in the TNM and would also be included in the barrier design to accommodate existing driveway access and likely reduced the performance of the barrier somewhat, the barrier complex was determined to still satisfy the DOT&PF feasibility and reasonableness criteria. Heights between 10 to 14 feet would be required to satisfy the 5-dBA feasibility and 7-dBA reasonableness design goals. Specifically, all 12 of the front row receptors (6 residences and 6 residential equivalents) would achieve a 5 dBA reduction, and four front row receptors would achieve a 7 dBA reduction. The total cost to construct the barrier complex would be $640,860, or $17,801 per benefited receptor, which is within the allowable cost criterion for reasonableness of $36,700. Therefore, a barrier is reasonable at this location.

**Barrier 2: East of New Seward Highway between 92nd Avenue and O'Malley Road (R12-R56)**

A 5,278-linear-foot barrier complex was evaluated along the eastern side of New Seward Highway between 92nd Avenue and O'Malley Road along the right-of-way. Although breaks were included in the TNM and would also be included in the barrier design to accommodate existing driveway access and likely reduced the performance of the barrier somewhat, the barrier complex was determined to still satisfy the DOT&PF feasibility and reasonableness criteria. A height of 14 feet would be required to satisfy the 5-dBA feasibility and 7-dBA reasonableness design goals. Specifically, all 102 of the front row receptors would achieve a 5 dBA reduction, and 57 front row receptors would achieve a 7 dBA reduction. The total cost to construct the barrier complex would be $2,216,730, or $21,111 per benefited receptor, which is within the allowable cost criterion for reasonableness of $36,700. Therefore, a barrier is reasonable at this location.

**Barrier 3: West of New Seward Highway between 92nd Avenue and O'Malley Road (R57-R86)**

A 4,442-linear-foot barrier complex was evaluated along the western side of New Seward Highway between 92nd Avenue and O'Malley Road along the right-of-way. Heights between 10 and 18 feet would be required to satisfy the 5-dBA feasibility and 7-dBA reasonableness design goals. Specifically, 69 of the 70 front row receptors would achieve a 5 dBA reduction, and 56 of the front row receptors would achieve a 7 dBA reduction. The total cost to construct the barrier complex would be $1,576,590 or $23,185 per benefited receptor, which is within the allowable cost criterion for reasonableness of $36,700. Therefore, a barrier is reasonable at this location.

SECTION 8

# Statement of Likelihood

As a result of the feasibility and reasonableness analysis conducted as a part of the environmental document, the DOT&PF proposes to incorporate all three of the noise barrier complexes discussed above into the proposed 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 the reevaluation of the approved NEPA document and the solicitation of additional public comment.

SECTION 9

# 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, distances to the 66 dBA and 71 dBA noise contours were determined. 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. A single area of land remains undeveloped along the New Seward Highway and is located southeast of the Dimond Boulevard Interchange. See Figure 8.

At a distance of approximately 275 feet from the center of the northbound travel lanes in this location, noise levels would be 66 dBA. The 71 dBA threshold would not extend beyond the proposed ROW line.


Dimond to O'Malley Design

Undeveloped Land

66 dBA Contour Line

N

0 380 760

Feet

**Figure 8 - Undeveloped Land Contour Map**

Noise Analysis - New Seward Highway: O'Malley Road to Dimond Boulevard

SECTION 10

# Construction Noise

During construction, noise from construction activities would add to the noise environment in the noise project area. Typical construction equipment includes backhoes, compressors, excavators, and other heavy equipment. The *Roadway Construction Noise Model (RCNM) User's Guide* (U.S. Department of Transportation, 2006) indicates that the loudest equipment generally emits noise in the range of 80 to 90 dBA at a distance of 50 feet.

Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours, although some work may be done at night. Mitigation of potential highway construction noise impacts shall incorporate low-cost, easy to implement measures into project plans and specifications, including equipment muffler requirements and limiting construction activities to daytime hours at specific locations. Should work occur at night, a noise permit may be required from the local municipality. This permit would likely include conditions that specify advanced notice to adjacent property owners of nighttime operations and special conditions and restrictions on specific activities.

SECTION 11

# Conclusions

As a result of the traffic noise analysis, the following conclusions are presented:

- The results of the noise analysis indicate that worst case hour traffic noise levels at exterior activity areas under the three scenarios analyzed:
  - The Existing condition ranges from 58 to 72 dBA
  - The No Build condition ranges from 60 to 75 dBA
  - The Build condition would range from 60 to 75 dBA, with future increases above existing noise levels of up to 6 dBA, below the DOT&PF substantial increase threshold of 15 dBA.
- Three barrier complexes were evaluated. All three of the noise barrier complexes evaluated were considered both feasible and reasonable. As a result, all three barrier complexes are likely to be recommended.

The recommendations provided are based on preliminary design information and current state and federal laws and policies. These recommendations would be reevaluated during the design of each construction phase of the proposed project.

SECTION 12

# References


Alaska Department of Transportation and Public Facilities (DOT&PF). 2011. *Noise Policy*.

CH2M HILL. 2003a. *New Seward Highway: Rabbit Creek Road to 36th Avenue - Transportation Report*.

CH2M HILL, 2003b. *No-Build traffic volumes were based on the New Seward Highway: Rabbit Creek Road to 36th Avenue - Transportation Report.*

CH2M HILL. 2004. *New Seward Highway Rabbit Creek to 36th Avenue Preliminary Engineering Report*. September.

CH2M HILL. 2006. *New Seward Highway Rabbit Creek Road to 36th Avenue Environmental Assessment*.

CH2M HILL. 2011. *92nd Avenue Draft Traffic Analysis Report*.

CH2M HILL. 2013. *New Seward Highway: Dimond Boulevard to Dowling Road - Traffic Analysis Report*.

CRW/Kittelson. 2012. *Academy Drive/Vanguard Traffic Circulation Improvements - Traffic Analysis Report*.

Federal Highway Administration (FHWA). 2004. *Traffic Noise Model (TNM)*. Version 2.5. April.

Federal Highway Administration (FHWA). 2006. *Roadway Construction Noise Manual.* Version 1.1

Federal Highway Administration (FHWA). 2011. *Highway Traffic Noise: Analysis and Abatement Guidance.* Report No. FHWA-HEP-10-025. Washington D.C. December.

Federal Highway Administration (FHWA). 2011. Title 23 Code of Federal Regulations (CFR) Part 772 *Procedures for Abatement of Highway Traffic Noise and Construction Noise*.

HDL/Kinney Engineering. 2011. *New Seward Highway: 92nd Avenue Phase 1 - Draft Traffic Analysis Report*.

Municipality of Anchorage, Alaska Department of Transportation and Public Facilities, and Anchorage Metropolitan Area Transportation Solutions. 2005. *Anchorage Bowl 2025 Long-Range Transportation Plan*. December.

U.S. Department of Transportation. 2006. *Roadway Construction Noise Model (RCNM) User's Guide.* Final Report. FHWA-HEP-05-054, DOT-VNTSC-FHWA-05-01. January. http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf

# Appendix A
# Acoustical Terminology

APPENDIX A

# Acoustical Terminology

**Ambient Noise (Level)** - All-encompassing noise (level) at a given place and time, usually a composite of sounds from all sources near and far, including any specific source(s) of interest.

**A-Weighted Sound Level [abbreviated dBA or dB(A)]** - Frequency weighted Sound Pressure Level approximating the frequency response of the human ear. It is defined as the sound level, in decibels, measured with a sound level meter having the metering characteristics and a frequency weighting specified in the American National Standards Institute Specification for Sound Level Meters, ANSI S 1.4 - 1983. The A-weighting de-emphasizes lower frequency sounds below 1000 Hz (1kHz) and higher frequency sounds above 4 kHz. It emphasizes sounds between 1kHz and 4 kHz. A-weighting is the most generally used measure for traffic and environmental noise throughout the world.

**Decibel (abbreviated dB)** - A decibel is one-tenth of a Bel. It is a measure on a logarithmic scale which indicates the squared ratio of sound pressure to a reference sound pressure (unit for *sound pressure level*) or the ratio of sound power to a reference sound power (unit for *sound power level*).

**Day-Night Noise Level ($L_{dn}$)** - A noise level that takes into account all the A-weighted noise energy from a source during 24 hours and weights the nighttime (10 p.m. to 7 a.m.) noise by adding 10 dBA during that period.

**Existing Noise Levels** - The noise, resulting from the natural and mechanical sources and human activity, considered usually present in a particular area.

**$L_{eq}$** - The equivalent steady state sound level which in a stated period would contain the same acoustical energy as the time-varying sound level during the same period.

**$L_{max}$** - The highest sound pressure level in a specific period.

**$L_n$ (where n = 1-99; for example, $L_{10}$, $L_{50}$)** - The sound pressure level exceeded n percent of a specific period. $L_{10}$ is the level exceeded 10 percent of the time; $L_{50}$ is the level exceeded 50 percent of the time.

# Appendix B
# Field Data Sheets

## Measurement Site Coordinates

| Measurement | Location | Latitude | Longitude | NAC |
|---|---|---|---|---|
| M1a | Long St and Abbott Road | 61.137544 | -149.857533 | B |
| M1b | Long St and Abbott Road | 61.137544 | -149.857533 | B |
| M2a | 10431 Brayton Drive | 61.126370 | -149.855312 | C |
| M2b | 10431 Brayton Drive | 61.126370 | -149.855312 | C |
| M3a | 10105 Salix Circle | 61.129221 | -149.855497 | B |
| M3b | 10105 Salix Circle | 61.129221 | -149.855497 | B |
| M4a | 62 Cornella Circle | 61.137038 | -149.855532 | B |
| M4b | 62 Cornella Circle | 61.137038 | -149.855532 | B |
| M5a | 1470 Moss Creek Avenue | 61.140110 | -149.855606 | B |
| M5b | 1470 Moss Creek Avenue | 61.140110 | -149.855606 | B |

## Modeled Noise Sensitive Area Coordinates

| Receiver | Location | Latitude | Longitude | NAC Category |
|---|---|---|---|---|
| R1 | 1485 N Heather Meadows Loop | 61.141063 | -149.8548 | B |
| R2 | 1495 N Heather Meadows Loop | 61.141072 | -149.854 | B |
| R3 | 1516 N Heather Meadows Loop | 61.141085 | -149.8535 | B |
| R4 | 1470 Moss Creek Ave | 61.140541 | -149.8554 | B |
| R5 | 1519 Moss Creek Ave | 61.140326 | -149.8542 | B |
| R6 | 1482 Moss Creek Ave | 61.140208 | -149.8549 | B |
| R7 | 1520 Moss Creek Ave | 61.140211 | -149.8541 | B |
| R8 | 1810 S Heather Meadows Loop | 61.139816 | -149.8555 | B |
| R9 | 1801 S Heather Meadows Loop | 61.139816 | -149.8546 | B |
| R10 | 1790 S Heather Meadows Loop | 61.139776 | -149.8539 | B |
| R11 | Undeveloped Land | 61.138604 | 149.85309 | C |
| R12 | 59 Cornella Cir | 61.137313 | -149.8548 | B |
| R13 | 58 Cornella Cir | 61.137345 | -149.854 | B |
| R14 | 57 Cornella Cir | 61.136806 | -149.854 | B |
| R15 | 56 Cornella Cir | 61.137067 | -149.8534 | B |
| R16 | 64 Cornella Cir | 61.136778 | -149.8554 | B |
| R17 | 66 Cornella Cir | 61.136499 | -149.8547 | B |
| R18 | 67 Cornella Cir | 61.136258 | -149.8554 | B |
| R19 | 69 Cornella Cir | 61.135999 | -149.8545 | B |
| R20 | 71 Helgelien Loop | 61.135563 | -149.8553 | B |

| Receiver | Location | Latitude | Longitude | NAC Category |
|---|---|---|---|---|
| R21 | 31 Helgelien Loop | 61.135219 | -149.8535 | B |
| R22 | 256 Helgelien Loop | 61.134934 | -149.8554 | B |
| R23 | 258 Helgelien Loop | 61.134804 | -149.8547 | B |
| R24 | 260 Helgelien Loop | 61.134425 | -149.8554 | B |
| R25 | 262 Helgelien Loop | 61.134302 | -149.8547 | B |
| R26 | 264 Helgelien Loop | 61.133935 | -149.8554 | B |
| R27 | Gross Cir | 61.133371 | -149.8554 | B |
| R28 | Gross Cir | 61.133229 | -149.8545 | B |
| R29 | Gross Cir | 61.132773 | -149.8554 | B |
| R30 | Gross Cir | 61.132763 | -149.8545 | B |
| R31 | Gross Cir | 61.132299 | -149.8551 | B |
| R32 | 409 Donna Dr | 61.131894 | -149.8541 | B |
| R33 | Stacy Cir and Donna Dr | 61.131499 | -149.8551 | B |
| R34 | 453 Donna Dr | 61.131186 | -149.8542 | B |
| R35 | 406 Donna Dr | 61.130855 | -149.855 | B |
| R36 | Jody Cir and Donna Dr | 61.130377 | -149.8549 | B |
| R37 | 1434 Cedrus Ct | 61.129761 | -149.8553 | B |
| R38 | 1492 Cedrus Ct | 61.129724 | -149.8545 | B |
| R39 | 10105 Salix Cir | 61.129245 | -149.8553 | B |
| R40 | 10107 Salix Cir | 61.129147 | -149.8542 | B |
| R41 | 10127 Salix Cir | 61.128776 | -149.8551 | B |
| R42 | 10130 Salix Cir | 61.128687 | -149.854 | B |
| R43 | 10133 Salix Cir | 61.128392 | -149.8551 | B |
| R44 | 10300 Thuja Cir | 61.127845 | -149.855 | B |
| R45 | 10320 Thuja Cir | 61.127644 | -149.8538 | B |
| R46 | 10334 Thuja Cir | 61.127398 | -149.8549 | B |
| R47 | 1535 Thuja Ave | 61.126961 | -149.8548 | B |
| R48 | 1553 Thuja Ave | 61.12697 | -149.854 | B |
| R49 | 10431 Brayton Dr | 61.13 | -149.85 | C |
| R50 | 1678 Elcadore Dr | 61.125749 | -149.8534 | B |
| R51 | 1732 Elcadore Dr | 61.125728 | -149.8525 | B |
| R52 | 1654 Elcadore Dr | 61.125417 | -149.8547 | B |
| R53 | 1625 Elcadore Dr | 61.124892 | -149.8538 | B |
| R54 | 1620 Elcadore Dr | 61.124591 | -149.8548 | B |
| R55 | 1615 Elcadore Dr | 61.12411 | -149.8538 | B |

| Receiver | Location | Latitude | Longitude | NAC Category |
|---|---|---|---|---|
| R56 | 1609 Elcadore Dr | 61.123878 | -149.8526 | B |
| R57 | 1610 Elcadore Dr | 61.123621 | -149.8546 | B |
| R58 | 1608 Elcadore Dr | 61.123422 | -149.8536 | B |
| R59 | 1212 Abbott Rd | 61.1374 | -149.86 | B |
| R60 | 9210 Long St | 61.137025 | -149.8575 | B |
| R61 | 9301 Long St | 61.136542 | -149.8586 | B |
| R62 | 9306 Long St | 61.136035 | -149.8576 | B |
| R63 | 9426 Alissa Cir | 61.135176 | -149.8575 | B |
| R64 | 9446 Alissa Cir | 61.134962 | -149.8586 | B |
| R65 | 9466 Alissa Cir | 61.134624 | -149.8575 | B |
| R66 | 9411 Morning Side Loop | 61.134203 | -149.8591 | B |
| R67 | 9410 Hilcrest Park Ct | 61.134137 | -149.8582 | B |
| R68 | 1314 Hillcrest Park Ct | 61.133782 | -149.8574 | B |
| R69 | 1302 Hillcrest Park Ct | 61.133386 | -149.8581 | B |
| R70 | End of Morningside Loop cul de sac | 61.132417 | -149.8589 | B |
| R71 | 1278 Surrey Cir | 61.132055 | -149.8584 | B |
| R72 | 1285 Surrey Cir | 61.132058 | -149.8577 | B |
| R73 | 1297 Surrey Cir | 61.131311 | -149.8579 | B |
| R74 | 1261 Balfour Dr | 61.131017 | -149.8586 | B |
| R75 | 10041 Thimble Berry Dr | 61.130134 | -149.8577 | B |
| R76 | 10051 Thimble Berry Dr | 61.13019 | -149.8585 | B |
| R77 | 10061 Thimble Berry Dr | 61.129507 | -149.8574 | B |
| R78 | 10113 Thimble Berry Dr | 61.129152 | -149.8583 | B |
| R79 | 10131 Thimble Berry Dr | 61.128718 | -149.8574 | B |
| R80 | 10204 Thimble Berry Dr | 61.128021 | -149.8576 | B |
| R81 | 10214 Thimble Berry Dr | 61.127823 | -149.8585 | B |
| R82 | 10236 Thimble Berry Dr | 61.127358 | -149.8577 | B |
| R83 | 10287 Thimble Berry Dr | 61.127206 | -149.8587 | B |
| R84 | 10302 Thimble Berry Dr | 61.126764 | -149.8579 | B |
| R85 | 10308 Thimble Berry Dr | 61.126735 | -149.8588 | B |
| R86 | 10333 Thimble Berry Dr | 61.125691 | -149.8588 | C |

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No. 429410 | |
| Site ID: M1 | | Measurement No 1 | |
| Conducted by: Rachel + David | | Date 3/24/15 | |
| Start Time: 9:30 | Stop Time 9:15 | $L_{eq}$ Range 40 120 | |
| Length of Measurement 15 min | | Microphone Height 4' | |

Street Address Open field north of 9202 Long St (lat/lon: 61.137544/-149.857533)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model | B+K 2236 | B+K 4188 | B+K 4231 | B+K 4189 |
| Serial No | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: 2.7

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| < 5 mph North | 25° | | NA |

*Noticeable Events*

| Source | dBA | Source | dBA |
|---|---|---|---|
| w/o Traffic: ~57 dBA | | | |
| w/ large truck: ~76.5 dBA | | | |

*Optional*

| | | | |
|---|---|---|---|
| $L_{eq}$ at 5 minutes 66.0 dBA | | L dBA | |
| $L_{eq}$ at 10 minutes 66.0 dBA | | L 68.5 dBA | |
| $L_{eq}$ at 15 minutes 66.1 dBA | | L 65.0 dBA | |
| $L_{eq}$ at 30 minutes dBA | | L 61.0 dBA | |

Max: 76.7
Min: 57.1

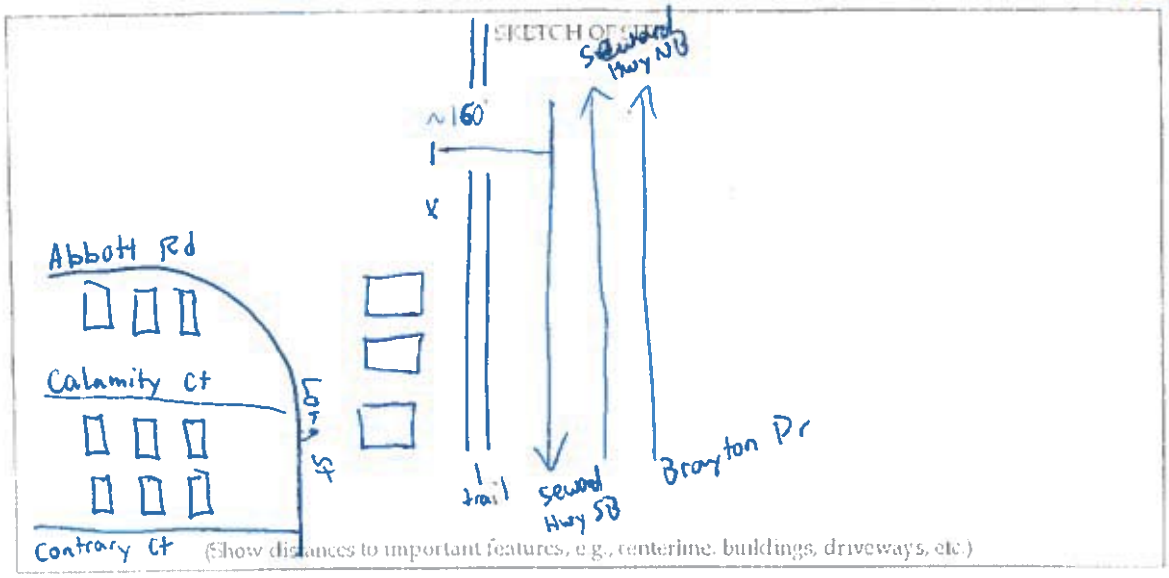
Overall $L_{eq}$ 66.1

*Traffic (Optional)*

| | Roadway Seward NB | | | Roadway Seward SB | | | Roadway | |
|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | Hr. Equiv. |
| Autos | 166 | = | 664 | 155 | = | 620 | = | |
| Medium Trucks | 10 | = | 40 | 13 | = | 52 | = | |
| Heavy Trucks | 15 | = | 60 | 6 | = | 24 | = | |
| Speed | 65mph | | | 65mph | | | | |

Noise Sources Other than Traffic Noise: Birds

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: Road ~ 10' higher than monitor




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

*Supplementary Information*

Comments: Paused meter when someone walked by meter on soft surface - open field

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name | Seward Highway | Project No. | 429410 |
| Site ID | M1 | Measurement No. | 2 |
| Conducted by | Rachel + David | Date | 3/24/15 |
| Start Time 9:45 | Stop Time 10:00 | $L_{eq}$ Range | 40-120 |
| Length of Measurement | 15 min | Microphone Height | 4' |

Street Address Open field North of 9202 Long St (lat/lon: 61.137544/-149.857533

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model | B+k 2236 | B+k 4188 | B+k 4213 | B+k 4180 |
| Serial No. | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: 2.7

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| < 5 mph North | 25° | | N/A |

*Noticeable Events*

| Source | dBA | Source | dBA |
|---|---|---|---|
| | | | |

*Optional*

| | | | |
|---|---|---|---|
| $L_{eq}$ at 5 minutes | 66.1 dBA | L | dBA |
| $L_{eq}$ at 10 minutes | 66.2 dBA | $L_{10}$ | 69.0 dBA |
| $L_{eq}$ at 15 minutes | 66.1 dBA | L | 65.0 dBA |
| $L_{eq}$ at 20 minutes | dBA | $L_{90}$ | 60.0 dBA |

Max: 74.7
Min: 54.8

Overall L: 66.1

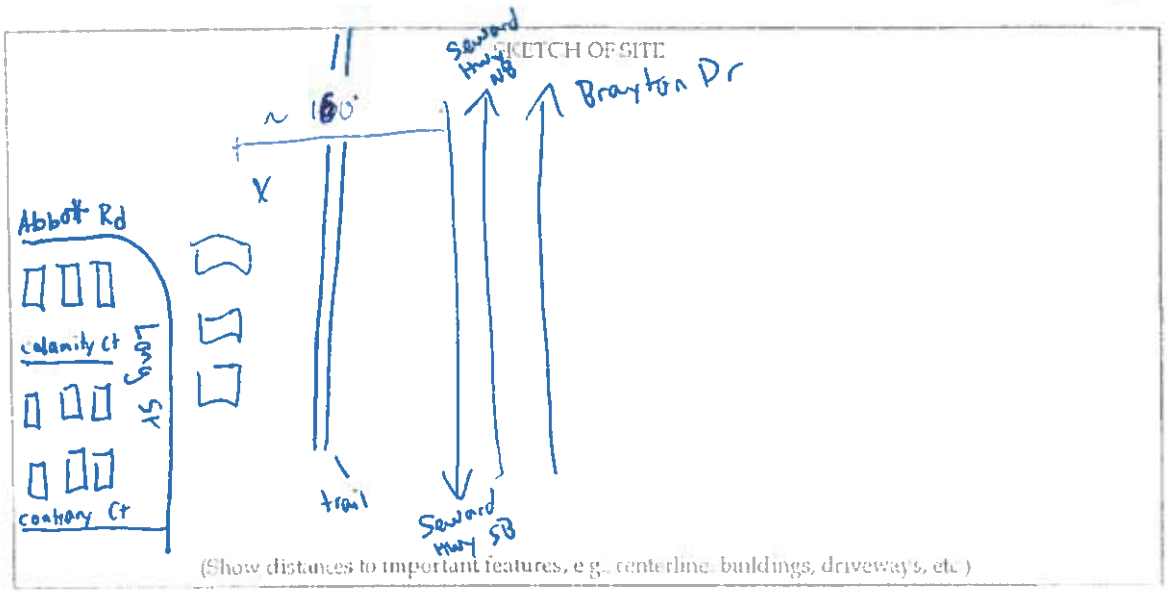
*Traffic (Optional)*

| | Roadway Seward NB | | Roadway Seward SB | | Roadway | |
|---|---|---|---|---|---|---|
| | Counted | Hr. Equiv. | Counted | Hr. Equiv. | Counted | Hr. Equiv. |
| Autos | 165 | = 660 | 150 | = 600 | | = |
| Medium Trucks | 10 | = 40 | 12 | = 48 | | = |
| Heavy Trucks | 12 | = 48 | 6 | = 24 | | = |
| Speed | 65 mph | | 65 mph | | | |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: Road ~ 10' higher than monitor

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

*Supplementary Information*

Comments: meter on soft surface open field

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M2 | | Measurement No.: 1 | |
| Conducted by: Rachel + David | | Date: 3/24/15 | |
| Start Time: 10:15 | Stop Time: 10:30 | $L_{eq}$ Range: 40-120 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 10431 Brayton Dr. (lat/lon: 61.126370/-149.855312)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4168 |
| Serial No.: | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: 2.7

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| <5 mph North | 25° | | N/A |

### Noticeable Events

| Source | dBA | Source | dBA |
|---|---|---|---|
| W/O traffic: ~58.0 dBA<br>W/ loud truck passing: ~79 | | | |

### Optional

| | | | |
|---|---|---|---|
| $L_{eq}$ at 5 minutes: 68.6 | dBA | $L_1$: | dBA |
| $L_{eq}$ at 10 minutes: 68.5 | dBA | $L_{10}$: 71.0 | dBA |
| $L_{eq}$ at 15 minutes: 68.7 | dBA | $L_{50}$: 68.0 | dBA |
| $L_{eq}$ at 20 minutes: | dBA | $L_{90}$: 63.5 | dBA |

Max: 79.2
Min: 57.0

Overall $L_{eq}$: 68.7

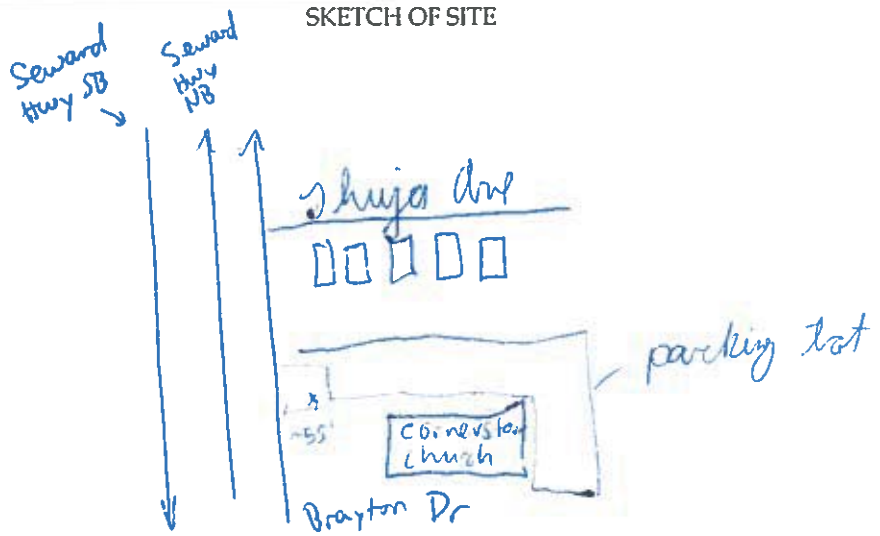
## *Traffic (Optional)*

| | Roadway: Seward NB | | | Roadway: Seward SB | | | Roadway: Seward NB on ramp | | | Brayton |
|---|---|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | |
| Autos | 54 | = | 216 | 69 | = | 276 | 83 | = | 332 | 22 = 88 |
| Medium Trucks | 2 | = | 8 | 11 | = | 44 | 1 | = | 4 | 3 = 12 |
| Heavy Trucks | 1 | = | 4 | 4 | = | 16 | 1 | = | 4 | 3 = 12 |
| Speed | 65 mph | | | 65 mph | | | 45 mph | | | 45 mph |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: ~ equal with road

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:
Meter on soft surface (grass in front of church), near entrance to Church

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M2 | | Measurement No.: 2 | |
| Conducted by: Rachel + David | | Date: 3/24/15 | |
| Start Time: 10:30 | Stop Time: 10.45 | $L_{eq}$ Range: 40-120 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 10431 Brayton Dr (lat/lon: 61.126370/-149.855312)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4180 |
| Serial No.: | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: _____

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| <5mph North | 25° | | NA |

### *Noticeable Events*

| Source | dBA | Source | dBA |
|---|---|---|---|
| | | | |

### *Optional*

| | |
|---|---|
| $L_{eq}$ at 5 minutes: 68.7 dBA | $L_1$: dBA |
| $L_{eq}$ at 10 minutes: 68.7 dBA | $L_{10}$: 71.5 dBA |
| $L_{eq}$ at 15 minutes: 68.9 dBA | $L_{50}$: 67.5 dBA |
| $L_{eq}$ at 20 minutes: dBA | $L_{90}$: 62.0 dBA |

Max. 81.6
Min 54.8

Overall $L_{eq}$: 68.0

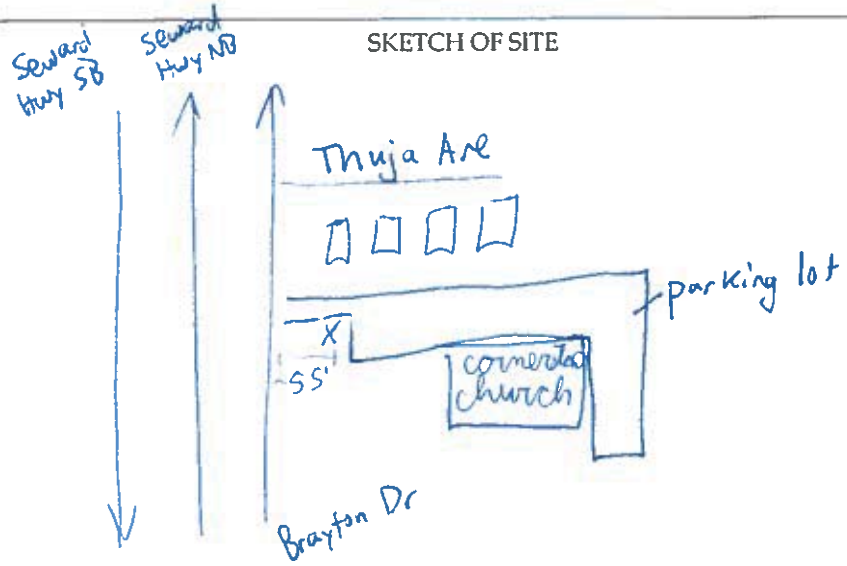
## *Traffic (Optional)*

| | Roadway: Seward NB | | | Roadway: Seward SB | | | Roadway: Seward on Ramp | | | Brayton |
|---|---|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | |
| Autos | 57 | = | 228 | 70 | = | 280 | 85 | = | 340 | 25 100 |
| Medium Trucks | 3 | = | 12 | 11 | = | 44 | 2 | = | 8 | 3 12 |
| Heavy Trucks | 2 | = | 8 | 5 | = | 20 | 1 | = | 4 | 3 12 |
| Speed | 65 mph | | | 65 mph | | | 45 mph | | | 45 mph |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: _____

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:

Meter on soft surface (grass in front of church) near entrance to church

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M3 | | Measurement No.: 1 | |
| Conducted by: Rachel + David | | Date: 3/24 | |
| Start Time: 10:45 | Stop Time: 11:00 | $L_{eq}$ Range: 40-120 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 10105 Salix Cir (lat/lon: 61.129221/-149.855497)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4188 |
| Serial No.: | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: _____

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| < 5 mph NNW | 30° | | N/A |

### Noticeable Events

| Source | dBA | Source | dBA |
|---|---|---|---|
| W/O traffic : ~ 64.5 dBA | | | |
| W/ loud truck passing : ~ 75 dBA | | | |

### Optional

| | |
|---|---|
| $L_{eq}$ at 5 minutes: 72.9 dBA | $L_1$: dBA |
| $L_{eq}$ at 10 minutes: 72.9 dBA | $L_{10}$: 75.5 dBA |
| $L_{eq}$ at 15 minutes: 72.9 dBA | $L_{50}$: 71.5 dBA |
| $L_{eq}$ at 20 minutes: dBA | $L_{90}$: 67.0 dBA |

Max. 83.8
Min: 58.0

Overall $L_{eq}$: 72.9

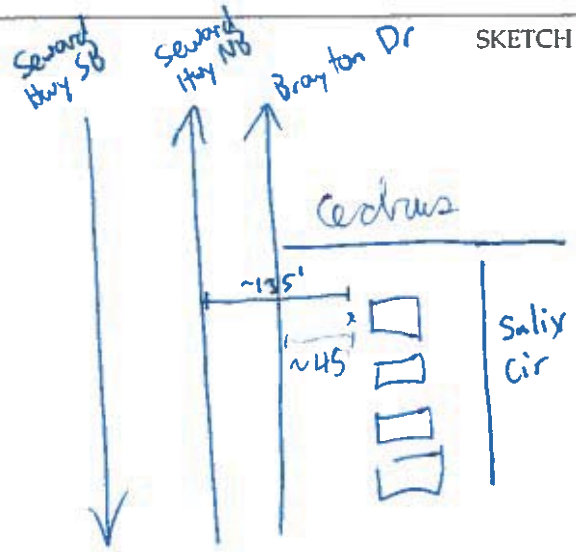
## *Traffic (Optional)*

| | Roadway: Seward NB | | Roadway: Seward SB | | Roadway: Brayton | |
|---|---|---|---|---|---|---|
| | Counted | Hr. Equiv. | Counted | Hr. Equiv. | Counted | Hr. Equiv. |
| Autos | 227 | = 908 | 225 | = 900 | 39 | = 156 |
| Medium Trucks | 8 | = 32 | 7 | = 28 | 4 | = 16 |
| Heavy Trucks | 13 | = 52 | 8 | = 32 | 2 | = 8 |
| Speed | 65 mph | | 65 mph | | 45 mph | |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: Road & Monitor ~equal

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:

car horn honked
airplane overhead
Meter on soft surface (grass between houses and Brayton)

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M3 | | Measurement No.: 2 | |
| Conducted by: Rachel + David | | Date: 3/24/15 | |
| Start Time: 11:00 | Stop Time: 11:15 | $L_{eq}$ Range: 40-20 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 10105 Salix Cir (lat/lon: 61.129221/-149.855497)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4188 |
| Serial No.: | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: _____

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| <5 mph NNW | 30° | | NA |

### *Noticeable Events*

| Source | dBA | Source | dBA |
|---|---|---|---|
| | | | |

### *Optional*

| | |
|---|---|
| $L_{eq}$ at 5 minutes: 71.7 dBA | $L_1$: dBA |
| $L_{eq}$ at 10 minutes: 72.3 dBA | $L_{10}$: 74.5 dBA |
| $L_{eq}$ at 15 minutes: 72.5 dBA | $L_{50}$: 71.0 dBA |
| $L_{eq}$ at 20 minutes: dBA | $L_{90}$: 66.0 dBA |

Max. 81.8
min: 58.3

Overall $L_{eq}$: 72.5

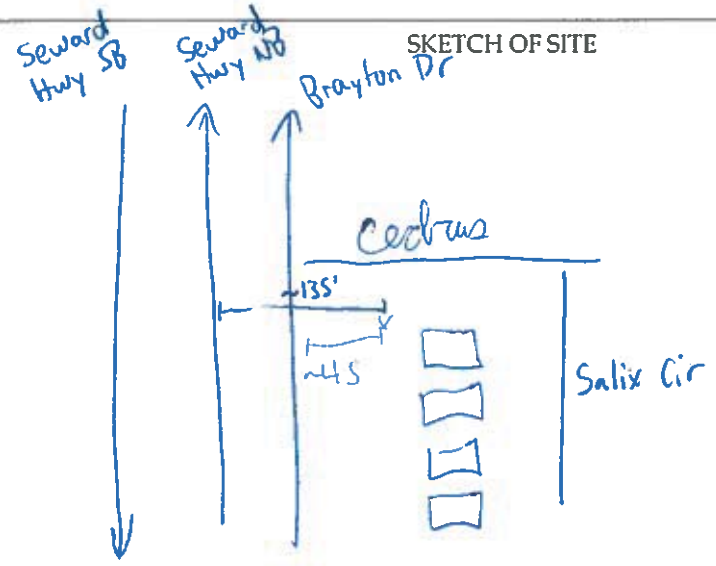
## *Traffic (Optional)*

| | Roadway: Seward NB | | | Roadway: Seward SB | | | Roadway: Brayton | | |
|---|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. |
| Autos | 224 | = | 896 | 223 | = | 892 | 35 | = | 140 |
| Medium Trucks | 7 | = | 28 | 6 | = | 24 | 1 | = | 4 |
| Heavy Trucks | 12 | = | 48 | 6 | = | 24 | 1 | = | 4 |
| Speed | 65 mph | | | 65 mph | | | 45 mph | | |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: _____

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:
Meter on soft surface (grass between houses and Brayton)

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M4 | | Measurement No.: 1 | |
| Conducted by: Rachel + David | | Date: 3/24/15 | |
| Start Time: 11:30 | Stop Time: 11:45 | $L_{eq}$ Range: 40-120 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 64 Cornella Cir (lat/lon: 61.137038 / -149.855532)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4188 |
| Serial No.: | ~~B~~ 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: _____

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| <5mph NNW | 35° | | N/A |

### Noticeable Events

| Source | dBA | Source | dBA |
|---|---|---|---|
| | | | |

### Optional

| | |
|---|---|
| $L_{eq}$ at 5 minutes: 68.6 dBA | $L_1$: dBA |
| $L_{eq}$ at 10 minutes: 68.8 dBA | $L_{10}$: 71.5 dBA |
| $L_{eq}$ at 15 minutes: 68.5 dBA | $L_{50}$: 65.0 dBA |
| $L_{eq}$ at 20 minutes: dBA | $L_{90}$: 62.0 dBA |

Min 59.4
Max 83.5

Overall $L_{eq}$: 68.5

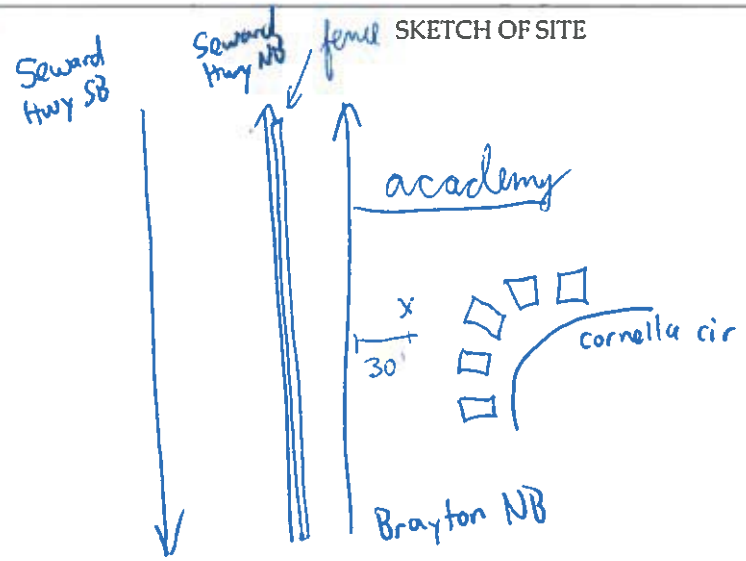
## *Traffic (Optional)*

| | Roadway: Seward NB | | | Roadway: Seward SB | | | Roadway: Brayton | | |
|---|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. |
| Autos | 203 | = | 812 | 260 | = | 1040 | 48 | = | 192 |
| Medium Trucks | 6 | = | 24 | 5 | = | 20 | 4 | = | 16 |
| Heavy Trucks | 5 | = | 20 | 8 | = | 32 | 0 | = | 0 |
| Speed | 65 mph | | | 65 mph | | | 45 mph | | |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: _____

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:

wood fence between measurement location + Seward Highway.
Determined this was only an aesthetic fence
Meter on soft surface (grass between houses and Brayton)

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M4 | | Measurement No.: 2 | |
| Conducted by: Rachel + David | | Date: 3/24/15 | |
| Start Time: 11:45 | Stop Time: 12:00 | $L_{eq}$ Range: 40-120 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 64 Cornella Cir (lat/lon: 61.137038/-149.855532)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4188 |
| Serial No.: | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: _____

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| <5 mph NNW | | | |

## Noticeable Events

| Source | dBA | Source | dBA |
|---|---|---|---|
| | | | |

## Optional

| | |
|---|---|
| $L_{eq}$ at 5 minutes: 68.8 dBA | $L_1$: dBA |
| $L_{eq}$ at 10 minutes: 68.8 dBA | $L_{10}$: 70.0 dBA |
| $L_{eq}$ at 15 minutes: 68.8 dBA | $L_{50}$: 64.0 dBA |
| $L_{eq}$ at 20 minutes: dBA | $L_{90}$: 61.0 dBA |

Min. 56.7
Max. 86.1

Overall $L_{eq}$: 68.8

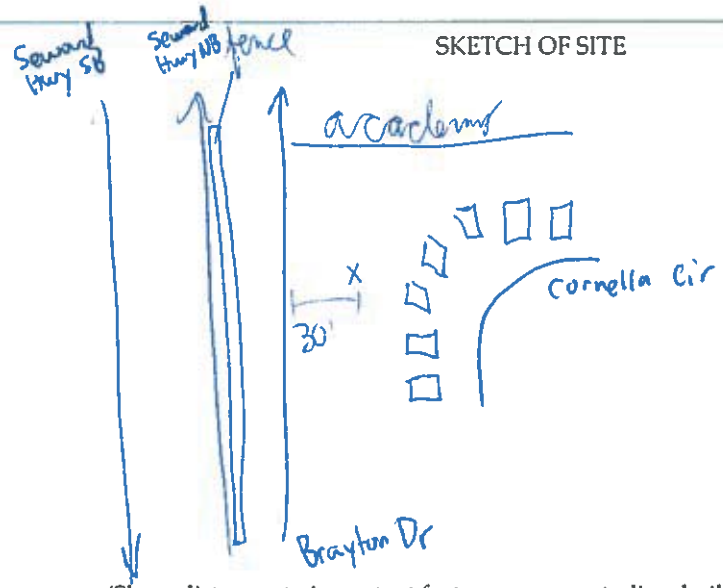
## *Traffic (Optional)*

| | Roadway: Seward NB | | | Roadway: Seward SB | | | Roadway: Brayton | | |
|---|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. |
| Autos | 200 | = | 800 | 199 | = | 1020 | 46 | = | 184 |
| Medium Trucks | 7 | = | 28 | 7 | = | 28 | 5 | = | 20 |
| Heavy Trucks | 5 | = | 20 | 6 | = | 24 | 0 | = | 0 |
| Speed | 65 mph | | | 65 mph | | | 45 mph | | |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: about the same level

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:

Meter on soft surface (grass between houses and Brayton)

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M5 | | Measurement No.: 1 | |
| Conducted by: Rachel + David | | Date: 3/24/15 | |
| Start Time: 12:00 | Stop Time: 12:15 | $L_{eq}$ Range: 40-120 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 1470 Moss Creek Ave (lat/lon: 61.140110 / -149.856606)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4188 |
| Serial No.: | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: _____

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| <5 mph North | 35° | | NA |

### *Noticeable Events*

| Source | dBA | Source | dBA |
|---|---|---|---|
| | | | |

### *Optional*

| | |
|---|---|
| $L_{eq}$ at 5 minutes: 74.0 dBA | $L_1$: dBA |
| $L_{eq}$ at 10 minutes: 74.2 dBA | $L_{10}$: 77.0 dBA |
| $L_{eq}$ at 15 minutes: 74.1 dBA | $L_{50}$: 72.5 dBA |
| $L_{eq}$ at 20 minutes: dBA | $L_{90}$: 68.0 dBA |

Min. 61.4
Max. 83.4

Overall $L_{eq}$: 74.1

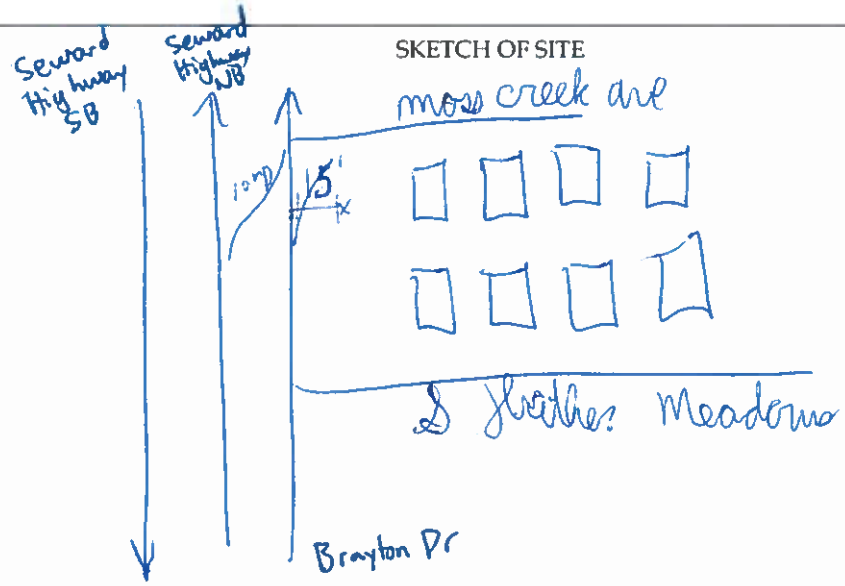
## *Traffic (Optional)*

| | Roadway: Seward SB | | | Roadway: Seward NB | | | Roadway: Brayton | | |
|---|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. |
| Autos | 240 | = | 960 | 255 | = | 1020 | 39 | = | 156 |
| Medium Trucks | 11 | = | 44 | 10 | = | 40 | 0 | = | 0 |
| Heavy Trucks | 3 | = | 12 | 2 | = | 8 | 0 | = | 0 |
| Speed | 65 mph | | | 65 mph | | | 45 mph | | |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: ~ equal heights

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:
Meter on soft surface (grass between houses and Brayton)

CH2MHILL

# Noise Measurement Record

| | | | |
|---|---|---|---|
| Project Name: Seward Highway | | Project No.: 429410 | |
| Site ID: M5 | | Measurement No.: 2 | |
| Conducted by: Rachel + David | | Date: 3/24/15 | |
| Start Time: 12:15 | Stop Time: 12:30 | $L_{eq}$ Range: 40-120 | |
| Length of Measurement: 15 | | Microphone Height: 4' | |

Street Address: 1470 Moss Creek Ave (lat/lon: 61.140110 / -149.855606)

| | Sound Level Meter | Microphone | Calibrator | Pistonphone |
|---|---|---|---|---|
| Model: | B+K 2236 | B+K 4188 | B+K 4213 | B+K 4188 |
| Serial No.: | 2015142 | 2120733 | 2010154 | 2120733 |

Calibration Check: _____

| Winds | Temperature | Humidity | Precipitation |
|---|---|---|---|
| <5 mph North | 35° | | N/A |

### *Noticeable Events*

| Source | dBA | Source | dBA |
|---|---|---|---|
| | | | |

### *Optional*

| | |
|---|---|
| $L_{eq}$ at 5 minutes: 73.6 dBA | $L_1$: dBA |
| $L_{eq}$ at 10 minutes: 73.6 dBA | $L_{10}$: 76.5 dBA |
| $L_{eq}$ at 15 minutes: 73.7 dBA | $L_{50}$: 72.5 dBA |
| $L_{eq}$ at 20 minutes: dBA | $L_{90}$: 67.0 dBA |

Min: 59.9
Max: 86.0

Overall $L_{eq}$: 73.7

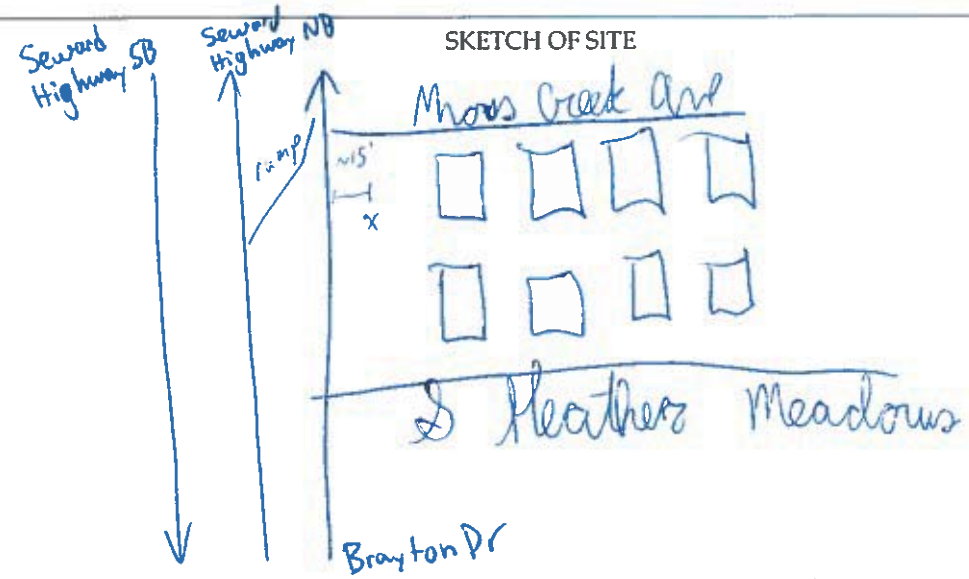
## *Traffic (Optional)*

| | Roadway: Seward SB | | | Roadway: Seward NB | | | Roadway: Brayton | | |
|---|---|---|---|---|---|---|---|---|---|
| | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. | Counted | | Hr. Equiv. |
| Autos | 245 | = | 980 | 257 | = | 1028 | 40 | = | 160 |
| Medium Trucks | 12 | = | 48 | 12 | = | 48 | 1 | = | 4 |
| Heavy Trucks | 5 | = | 20 | 3 | = | 12 | 1 | = | 4 |
| Speed | 65 mph | | | 65 mph | | | 45 mph | | |

Noise Sources Other than Traffic Noise: _____

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: ~ equal heights

SKETCH OF SITE




(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

## *Supplementary Information*

Comments:
Meter on soft surface (grass between houses and Brayton).

M1

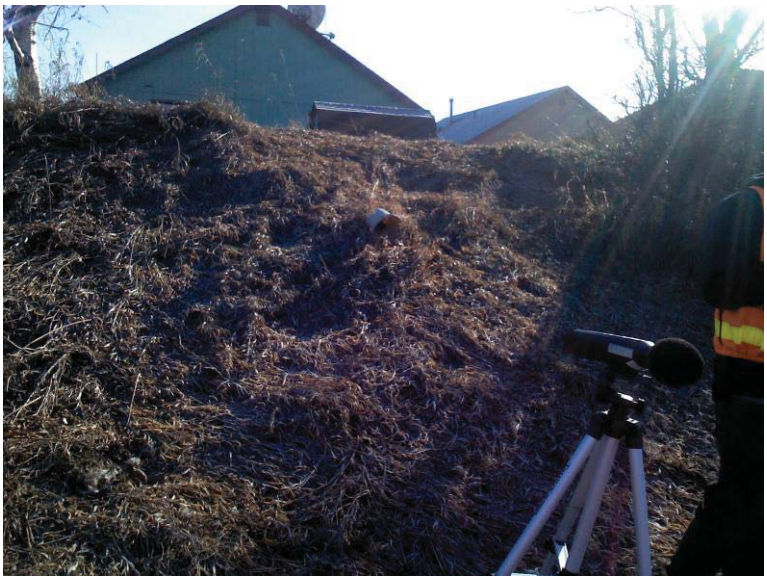
M1

M1

M2

M2

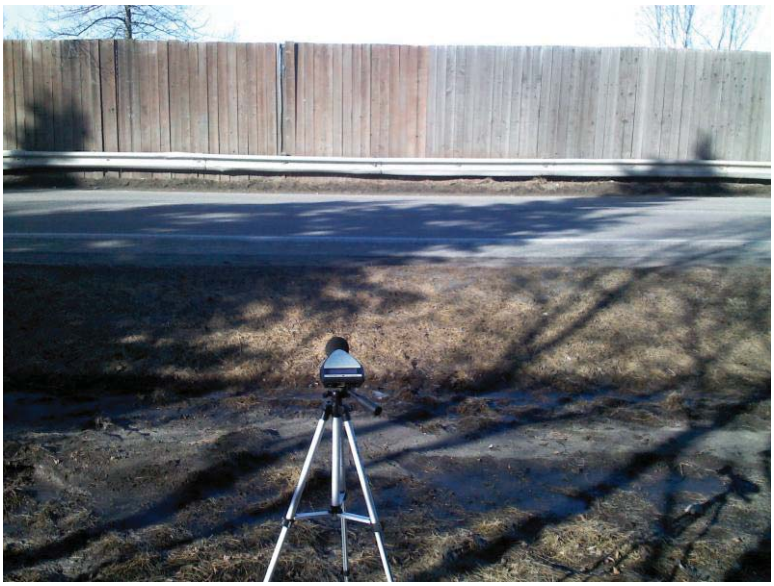
M3



M3

M3

M4



M4

M4


M5

M5

M5

# Appendix C
# Noise Level Results

| Representative Receptor | Land Use | Equivalent Residential Units | NAC Approach | Existing | No Build | Build | Build Increase Above Existing Levels | Build Impact |
|---|---|---|---|---|---|---|---|---|
| R1 | Residential | 9 | 66 | 68 | 70 | 69 | 1 | Y |
| R2 | Residential | 6 | 66 | 64 | 66 | 64 | 0 | |
| R3 | Residential | 6 | 66 | 62 | 63 | 63 | 1 | |
| R4 | Residential | 4 | 66 | 72 | 74 | 73 | 1 | Y |
| R5 | Residential | 6 | 66 | 65 | 66 | 66 | 1 | Y |
| R6 | Residential | 9 | 66 | 69 | 70 | 70 | 1 | Y |
| R7 | Residential | 6 | 66 | 63 | 64 | 64 | 1 | |
| R8 | Residential | 2 | 66 | 72 | 74 | 73 | 1 | Y |
| R9 | Residential | 4 | 66 | 67 | 68 | 68 | 1 | Y |
| R10 | Residential | 6 | 66 | 63 | 65 | 65 | 2 | |
| R11 | Church | 8 | 66 | 58 | 60 | 60 | 2 | |
| R12 | Residential | 5 | 66 | 67 | 70 | 71 | 4 | Y |
| R13 | Residential | 4 | 66 | 62 | 66 | 68 | 6 | Y |
| R14 | Residential | 6 | 66 | 58 | 63 | 64 | 6 | |
| R15 | Residential | 5 | 66 | 60 | 62 | 64 | 4 | |
| R16 | Residential | 3 | 66 | 69 | 72 | 71 | 2 | Y |
| R17 | Residential | 5 | 66 | 62 | 65 | 66 | 4 | Y |
| R18 | Residential | 3 | 66 | 72 | 75 | 72 | 0 | Y |
| R19 | Residential | 6 | 66 | 65 | 68 | 68 | 3 | Y |
| R20 | Residential | 3 | 66 | 71 | 74 | 72 | 1 | Y |
| R21 | Residential | 7 | 66 | 60 | 63 | 64 | 4 | |
| R22 | Residential | 4 | 66 | 71 | 74 | 74 | 3 | Y |
| R23 | Residential | 7 | 66 | 65 | 68 | 70 | 5 | Y |
| R24 | Residential | 3 | 66 | 71 | 74 | 74 | 3 | Y |
| R25 | Residential | 7 | 66 | 62 | 65 | 66 | 4 | Y |
| R26 | Residential | 3 | 66 | 70 | 73 | 74 | 4 | Y |
| R27 | Residential | 2 | 66 | 68 | 71 | 72 | 4 | Y |
| R28 | Residential | 4 | 66 | 62 | 64 | 65 | 3 | |
| R29 | Residential | 4 | 66 | 67 | 69 | 69 | 2 | Y |
| R30 | Residential | 3 | 66 | 61 | 64 | 65 | 4 | |
| R31 | Residential | 3 | 66 | 65 | 68 | 68 | 3 | Y |
| R32 | Residential | 3 | 66 | 59 | 62 | 62 | 3 | |
| R33 | Residential | 6 | 66 | 66 | 68 | 68 | 2 | Y |
| R34 | Residential | 5 | 66 | 60 | 62 | 63 | 3 | |
| R35 | Residential | 5 | 66 | 65 | 68 | 68 | 3 | Y |
| R36 | Residential | 5 | 66 | 65 | 67 | 67 | 2 | Y |
| R37 | Residential | 3 | 66 | 65 | 68 | 68 | 3 | Y |
| R38 | Residential | 3 | 66 | 60 | 63 | 63 | 3 | |
| R39 | Residential | 4 | 66 | 70 | 73 | 73 | 3 | Y |
| R40 | Residential | 4 | 66 | 62 | 65 | 65 | 3 | |
| R41 | Residential | 4 | 66 | 69 | 72 | 72 | 3 | Y |
| R42 | Residential | 7 | 66 | 62 | 64 | 64 | 2 | |
| R43 | Residential | 4 | 66 | 69 | 72 | 72 | 3 | Y |
| R44 | Residential | 4 | 66 | 69 | 72 | 72 | 3 | Y |
| R45 | Residential | 7 | 66 | 61 | 64 | 64 | 3 | |
| R46 | Residential | 4 | 66 | 68 | 71 | 70 | 2 | Y |
| R47 | Residential | 2 | 66 | 67 | 69 | 69 | 2 | Y |
| R48 | Residential | 4 | 66 | 63 | 65 | 65 | 2 | |
| R49 | Church | 3 | 66 | 63 | 65 | 65 | 2 | |
| R50 | Multifamily | 6 | 66 | 62 | 63 | 63 | 1 | |
| R51 | Multifamily | 4 | 66 | 58 | 60 | 60 | 2 | |
| R52 | Multifamily | 6 | 66 | 68 | 69 | 69 | 1 | Y |
| R53 | Multifamily | 6 | 66 | 63 | 64 | 65 | 2 | |
| R54 | Multifamily | 4 | 66 | 66 | 68 | 68 | 2 | Y |
| R55 | Multifamily | 4 | 66 | 63 | 64 | 66 | 3 | Y |

| Representative Receptor | Land Use | Equivalent Residential Units | NAC Approach | Existing | No Build | Build | Build Increase Above Existing Levels | Build Impact |
|---|---|---|---|---|---|---|---|---|
| R56 | Multifamily | 2 | 66 | 61 | 62 | 64 | 3 | |
| R57 | Multifamily | 6 | 66 | 67 | 68 | 69 | 2 | Y |
| R58 | Multifamily | 4 | 66 | 67 | 67 | 69 | 2 | Y |
| R59 | Residential | 5 | 66 | 59 | 63 | 65 | 6 | |
| R60 | Residential | 1 | 66 | 67 | 69 | 69 | 2 | Y |
| R61 | Residential | 9 | 66 | 62 | 64 | 66 | 4 | Y |
| R62 | Residential | 1 | 66 | 66 | 68 | 68 | 2 | Y |
| R63 | Multifamily | 8 | 66 | 68 | 70 | 70 | 2 | Y |
| R64 | Multifamily | 4 | 66 | 62 | 64 | 64 | 2 | |
| R65 | Multifamily | 8 | 66 | 71 | 73 | 73 | 2 | Y |
| R66 | Multifamily | 8 | 66 | 61 | 63 | 62 | 1 | |
| R67 | Multifamily | 8 | 66 | 65 | 67 | 67 | 2 | Y |
| R68 | Multifamily | 6 | 66 | 72 | 74 | 74 | 2 | Y |
| R69 | Multifamily | 4 | 66 | 64 | 67 | 64 | 0 | |
| R70 | Multifamily | 2 | 66 | 61 | 64 | 62 | 1 | |
| R71 | Multifamily | 8 | 66 | 64 | 66 | 64 | 0 | |
| R72 | Multifamily | 2 | 66 | 69 | 72 | 68 | -1 | Y |
| R73 | Multifamily | 6 | 66 | 68 | 70 | 67 | -1 | Y |
| R74 | Multifamily | 4 | 66 | 62 | 65 | 63 | 1 | |
| R75 | Multifamily | 6 | 66 | 69 | 71 | 68 | -1 | Y |
| R76 | Multifamily | 12 | 66 | 62 | 65 | 63 | 1 | |
| R77 | Multifamily | 8 | 66 | 72 | 74 | 75 | 3 | Y |
| R78 | Multifamily | 10 | 66 | 63 | 66 | 64 | 1 | |
| R79 | Multifamily | 8 | 66 | 72 | 74 | 74 | 2 | Y |
| R80 | Multifamily | 6 | 66 | 68 | 70 | 71 | 3 | Y |
| R81 | Multifamily | 6 | 66 | 63 | 64 | 63 | 0 | |
| R82 | Multifamily | 6 | 66 | 70 | 71 | 72 | 2 | Y |
| R83 | Multifamily | 4 | 66 | 62 | 63 | 62 | 0 | |
| R84 | Multifamily | 4 | 66 | 67 | 68 | 69 | 2 | Y |
| R85 | Multifamily | 4 | 66 | 63 | 64 | 64 | 1 | |
| R86 | Park | 21 | 66 | 62 | 62 | 63 | 1 | |

# Appendix D
# Traffic Data Summary

APPENDIX D

**Traffic Data Summary**

| Road | Direction | Location | PM Peak Hour | Autos | Medium | Heavy |
|---|---|---|---|---|---|---|
| Brayton | NB | North of 92nd | 566 | 526 | 25 | 14 |
| Brayton | NB | South of 92nd | 580 | 539 | 26 | 15 |
| Homer | SB | North of 92nd | 260 | 242 | 12 | 7 |
| Homer | SB | South of 92nd | 70 | 65 | 3 | 2 |
| Mainline | NB | Btwn ramps and Dimond | 2500 | 2325 | 113 | 63 |
| Mainline | NB | North of 92nd | 2930 | 2725 | 132 | 73 |
| Mainline | NB | South of 92nd | 2930 | 2725 | 132 | 73 |
| Mainline | NB | Btwn Ramps and O'Malley | 1570 | 1460 | 71 | 39 |
| Mainline | SB | btwn ramps and Dimond | 3590 | 3339 | 162 | 90 |
| Mainline | SB | North of 92nd | 4050 | 3767 | 182 | 101 |
| Mainline | SB | Between Ramps and 92 | 3154 | 2933 | 142 | 79 |
| Mainline | SB | South of 92nd | 3154 | 2933 | 142 | 79 |
| Mainline | SB | Btwn ramps and O'Malley | 2348 | 2184 | 106 | 59 |
| Mainline Off Ramp Dimond | NB | | 550 | 512 | 25 | 14 |
| Mainline and Brayton Off Ramp Dimond | NB | | 1030 | 958 | 46 | |
| Mainline On Ramp Dimond | NB | | 1050 | 977 | 47 | 26 |
| Mainline Off Ramp 92 | NB | | 309 | 287 | 14 | 8 |
| Mainline and Brayton Off Ramp 92 | NB | | 706 | 657 | 32 | 18 |
| Mainline On Ramp Dimond | SB | | 696 | 647 | 31 | 17 |
| Mainline and Homer On Ramp Diamond | SB | | 1160 | 1079 | 52 | 29 |
| Mainline Off Ramp 92 | SB | | 900 | 837 | 41 | 23 |
| Mainline and Homer Off Ramp 92 | SB | | 1222 | 1136 | 55 | 31 |
| Mainline On Ramp 92 | SB | | 143 | 133 | 6 | 4 |
| Mainline and Homer On Ramp 92 | SB | | 220 | 205 | 10 | 6 |
| Mainline Off Ramp O'Malley | SB | | 650 | 605 | 29 | 16 |
| Mainline and Homer Off Ramp O'Malley | SB | | 720 | 670 | 32 | 18 |
| Mainline On Ramp O'Malley | NB | | 1230 | 1144 | 55 | 31 |
| Mainline and Brayton On Ramp O'Malley | NB | | 1810 | 1683 | 81 | 45 |

APPENDIX D

**Traffic Data Summary**

| Road | Direction | Location | PM Peak Hour | Autos | Medium | Heavy |
|---|---|---|---|---|---|---|
| Dimond | EB | East of Mainline | 2223 | 2067 | 100 | 56 |
| Dimond | WB | East of Mainline | 1890 | 1758 | 85 | 47 |
| Dimond | EB | West of Mainline | 2304 | 2143 | 104 | 58 |
| Dimond | WB | West of Mainline | 1886 | 1754 | 85 | 47 |
| 92nd | EB | East of Mainline | 431 | 401 | 19 | 11 |
| 92nd | WB | East of Mainline | 527 | 490 | 24 | 13 |
| 92nd | EB | West of Mainline | 1194 | 1110 | 54 | 30 |
| 92nd | WB | West of Mainline | 1195 | 1111 | 54 | 30 |
| O'Malley | EB | East of Mainline | 1370 | 1274 | 62 | 34 |
| O'Malley | WB | East of Mainline | 900 | 837 | 41 | 23 |
| O'Malley | EB | West of Mainline | 2610 | 2427 | 117 | 65 |
| O'Malley | WB | West of Mainline | 1626 | 1512 | 73 | 41 |

# Appendix E
# Noise Abatement Checklists

APPENDIX C

# Feasibility and Reasonableness Worksheet Example
# HIGHWAY TRAFFIC NOISE ABATEMENT FOR PROJECT:

*Receiver ID No.(s):* R1- R11

*Location/Description:* Barrier 1

*Activity Category type:* B

*Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy):* 67

*Existing Noise Level (Leq):* 62-72

*Future Build Noise Level (Leq):* 64-73

*Future No-Build Noise Level:* 63-74

*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? Y

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? Y

***DOT&PF Mandatory Factors (State funded only)***

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

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

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

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

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

than the future No-Build noise levels?

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

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

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

What is the basis for this recommendation?

_____ _____

Regional Environmental Manager Date

_____ _____

DOT&PF Project Manager Date

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

_____ _____

Preconstruction Engineer [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 C

# Feasibility and Reasonableness Worksheet Example
# HIGHWAY TRAFFIC NOISE ABATEMENT FOR PROJECT:

*Receiver ID No.(s):* R12 - R58

*Location/Description:* Barrier 2

*Activity Category type:* B

*Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy):* 67

*Existing Noise Level (Leq):* 58-72

*Future Build Noise Level (Leq):* 60-74

*Future No-Build Noise Level:* 60-75

*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? Y

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? Y

***DOT&PF Mandatory Factors (State funded only)***

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

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

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

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

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

than the future No-Build noise levels?

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

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

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

What is the basis for this recommendation?

_____ _____

Regional Environmental Manager Date

_____ _____

DOT&PF Project Manager Date

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

_____ _____

Preconstruction Engineer [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 C

# Feasibility and Reasonableness Worksheet Example
# HIGHWAY TRAFFIC NOISE ABATEMENT FOR PROJECT:

*Receiver ID No.(s):* R59 - R86

*Location/Description:* Barrier 3

*Activity Category type:* B, C

*Noise Abatement Criteria for this Activity Category(Leq) (Table 1 DOT&PF Noise Policy):* 67

*Existing Noise Level (Leq):* 59-72

*Future Build Noise Level (Leq):* 62-75

*Future No-Build Noise Level:* 62-74

***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? Y

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? Y

***DOT&PF Mandatory Factors (State funded only)***

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

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

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

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

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

than the future No-Build noise levels?

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

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

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

What is the basis for this recommendation?

_____ _____

Regional Environmental Manager Date

_____ _____

DOT&PF Project Manager Date

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

_____ _____

Preconstruction Engineer [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 F
# Adjusted Inflation Calculation

The DOT&PF Noise Policy states the cost per benefitted receptor must be adjusted for inflation. Per DOT&PF, the Gross Domestic Product: Implicit Price Deflator was used as an index to compute inflation for 2015. The DOT&PF Alaska Highway Safety Improvement Program Handbook uses this index to perform inflation computations to determine the allowable cost per benefitted receptor as part of the reasonableness criteria. The calculations yielded a cost per benefitted receptor of $36,700, using this index. The calculations are included below.

| | | | | | | |
|---|---|---|---|---|---|---|
| Release: | Gross Domestic Product | | | | | |
| Seasonal Adjustment: | Seasonally Adjusted | | | | | |
| Frequency: | Quarterly | | | | | |
| Units: | Index 2009=100 | | | | | |
| Date Range: | 1947-01-01 to 2015-01-01 | | | | | |
| Last Updated: | 2015-04-29 8:11 AM CDT | | | | | |
| Notes: | BEA Account Code: A191RD3 | | | | | |
| | | | | | | |
| | The number of decimal places reported varies over time. A Guide to the | | | | | |
| | National Income and Product Accounts of the United States (NIPA) - | | | | | |
| | (http://www.bea.gov/national/pdf/nipaguid.pdf) | | | | | |
| | | | | | | |
| DATE | VALUE | | | | | |
| 2015-01-01 | 108.618 | | | | | |

Calculations:

2006 Value: 94.812

108.618/94.812=1.146

1.146*32,000=$36,672

Rounded to $36,700

# Appendix G
# 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
PHONE: (907) 465-6958
FAX: (907) 465-2460

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)

## 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: (l) 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 $90^{th}$ 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 time[1], 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 State[2]. 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 noise[3]. 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 ± 3dBA 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 factors[4] 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 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

sensitive[5] ) 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 $32,000[6] 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) benefited by the noise abatement measure in any subdivision and/or given development, and dividing that number into the total cost of the noise abatement measure. A benefited receptor is defined as the recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dBA. Each unit in a multi-family building will be counted as a separate receptor. Cost per 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 measure[7]. 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.

## SUPERCEDENCE

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]

| Activity Category | Activity Leq(h) | Criteria[9] L10 | Evaluation Location | Description of Activity Category |
|---|---|---|---|---|
| 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 benefited receptors in the development built before highway construction?

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

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

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

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

than the future No-Build noise levels?

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

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

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

What is the basis for this recommendation?

_____ _____

Regional Environmental Manager Date

_____ _____

DOT&PF Project Manager Date

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

_____ _____

Preconstruction Engineer [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