Manh Choh Mine Project

Noise Technical Report

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KINROSS

Manh Choh

A JV with Contango ORE

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Acronyms

ADOT&PF	Alaska Department of Transportation and Public Facilities
AK2	Elliott Highway
AK4	Richardson Highway
AK6	Steese Highway
ANSI	American National Standards Institute
ATV	All-Terrain Vehicle
CAD	Computer-Aided Drafting
dB	Decibels
dBA	A-weighted decibels
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HT	Heavy Trucks: Tractor trailers and other large multi-axel vehicle
HWY	Highway
L90	Statistical noise descriptor for 90th percentile
Leq	Equivalent sound level
Lmax	Maximum sound level
Lmin	Minimum sound level
MT	Medium Trucks: Delivery trucks, large travel trailers, some trucks
NAC	Noise Abatement Criteria
NOAA	National Oceanic and Atmospheric Administration
PPV	Peak Particle Velocity
RMS	Root Mean Square
TCC	Tanana Chiefs Conference
TNM	FHWA Traffic Noise Model

1 SUMMARY

The purpose of this technical report is to provide the results of a noise analysis for the construction and operation of the Manh Choh Project, a proposed open pit mining operation located on Native Village of Tetlin (Tetlin) land in Alaska. This report provides a worst-case analysis of noise from the operations of the proposed Manh Choh Mine. In addition to noise, mine related vibration was also reviewed for potential impacts. The proposed mine is accessible from the Alaska Highway via an existing exploration road. The deposit is well defined, and highway ore transport trucks will be used to transport the material from the proposed Manh Choh Mine to the Fort Knox Mine for processing.

There are four main components to the noise analysis; general noise from mining operations, highway ore transport trucks travelling to and from Fort Knox, blasting noise, and occasional noise from helicopters used for exploration and surveys. Projections of noise levels were performed using existing noise models, including the Federal Highway Administration Traffic Noise Model and reference construction noise levels, also from the Federal Highway Administration. To aid in understanding of this information a detailed summary of acoustics is included in the body of the report.

Prior to performing the noise study, a review of the project area land use along with measurements and calculations of existing noise levels throughout the haul route and near the proposed mine was performed. Land uses in the study area includes residential, parklands, industrial, and undeveloped. In addition, noise monitoring and traffic counts were performed at 19 locations along the haul route with 17 locations monitored twice. The data was used to validate the noise models and establish the existing noise environment.

The most notable noise source from mine operations at nearby noise sensitive land uses in the corridor, which includes residences, hotels, churches, schools, and parks, is material haulage from the proposed mine to Fort Knox via the Alaska Highway from Tok to Fairbanks, the Steese Expressway to the intersection of the Steese and Elliott Highways, and the final leg along the Steese Highway to Fort Knox.

Material haulage, along with blasting, employee's transportation, and mine related operations could increase noise levels by 10 to 19 dB at five cabins located along Tetlin Access Road during late night hours. During daytime hours, these same five cabins are predicted to have increases of 10 to 11 dB, with 12 to 17 dB increases during late evening and early morning hours. Even with the increases, hourly noise levels at the cabins are not predicted to exceed 43 dBA Leq, which is similar to the existing noise in many small communities and villages in the area, including Tok and Dot Lake.

For other areas along the haul route, north of the Tetlin Access Road, noise levels are predicted to increase by up to 7 to 8 decibels (dB) during the late night hours around 2:00 am for most rural areas, including Tok, Dot Lake, some parts of Delta Junction, Birch Lake, Salcha, and some residences near the access road to Fort Knox. Even with the increases, typical hour equivalent sound pressure level (Leq) noise levels during the quietest overnight hours are not predicted to exceed 50 dBA at any location that did not already have noise levels approaching or exceeding 50 dBA, with some locations remaining below 40 dBA.

Noise level increases during daytime hours are substantially lower than those predicted for overnight hours. The worst-case traffic noise level increases during daytime hours ranged from only 1 to 2 dB (modeled for 2:00 pm). Finally, an additional analysis of evening and morning hours was also performed using traffic data from 10:00 pm (typically also similar to 5:00am volumes). During this period, increases

of 1 to 6 dB can be expected, with the highest noise level increases occurring in less populated areas such as Tok, Dot Lake, and some locations near Fort Knox along Ridge Run and Fish Creek Road.

Noise related to mining operations and blasting may be audible at some receivers within 10 miles (Tok, Tetlin Village, Tok River Recreation Area, and Butch Kuth Avenue) when atmospheric conditions (wind, temperature, and pressure) are favorable for noise transmission. Atmospheric conditions that could result in increased noise transmission could include wind blowing toward a noise sensitive area, colder temperatures, temperature inversions and high humidity. During other periods, most locations would not be able to discern any noise from the proposed mine.

The proposed mine would help to mitigate noise by using late model and well maintained highway ore transport trucks for the trips to and from Fort Knox and by training drivers to operate the truck in an efficient manner that also reduces noise levels, such as restricting the use of engine compression breaks (i.e., Jake breaks) to emergency situations. No additional noise mitigation has been identified at this time.

Vibration from the operation of the proposed mine, including blasting, will not affect any nearby properties. As shown in the noise analysis, all receivers (residences, schools, and other noise sensitive uses) are over 3,000 feet from the proposed mine. At those distances, mine related vibration would not be noticeable.

Vibration from the highway ore transport trucks along the Alaska Highway and Steese Highway could be noticeable at locations within 100 feet of the travel lanes on rough roadways. The magnitude of the vibration would be similar to vibration levels from heavy trucks already in use along the corridor. In most cases, haul truck related vibration would not be noticeable at distances greater than 50 to 100 feet from the travel lanes.

1.1 Conclusion

Overall, noise from actual mining operations is simply too far from most noise sensitive land uses, including residential areas, hotel/motels, schools, and churches, to cause a notable increase in the overall noise levels. However, due to being located away from the Alaska Highway, and thereby having lower background noise levels, when the noise levels at the five cabins along Tetlin Access Road are predicted to have nighttime increase of 10 to 19 dB over the background ambient the hourly noise levels remain below 43 dBA Leq.

At all other areas evaluated, noise levels from the proposed mine are predicted to remain below 28 dBA Lmax at all nearby noise sensitive properties. Noise from blasting, which typically will not occur more than once per day, is not predicted to exceed 31.5 dBA at any noise sensitive properties near the proposed mine.

Noise from the haul trucks along the highway haul routes could increase noise levels by up to 7 to 8 dB over existing conditions during late night hours. However, even with the increase noise levels at sensitive properties during the same time are all predicted to remain below 58 dBA, which is 8 dB below the FHWA and ADOT&PF traffic noise criteria. Finally, a cumulative analysis of all mine related noise sources predicted worst case cumulative noise levels increases of 7 dB at the Tok River Recreational Site and along the Alaska Highway in Tok. North of Tok the cumulative noise level is the noise level from the haul trucks, with increase of 7 to 8 dB.

2 INTRODUCTION

The purpose of this technical report is to provide the results of a noise analysis for the construction and operation of the Manh Choh Project. Included as part of this report are general information on the project, an introduction to acoustics, information on the existing conditions, such as land use and noise levels, and an analysis of project related noise levels during the operation of the proposed mine.

3 STUDY REQUIREMENTS

This report is intended to meet all requirements, guidelines, regulations, and standards of the US Environmental Protection Agency (EPA), US Bureau of Mines, US Office of Surface Mining Reclamation and Enforcement, and the National Research Council for the preparation of an environmental noise analysis of a mining project.

4 PROJECT DESCRIPTION

The Manh Choh Gold deposit is located on top of a group of low hills in the northern part of the Tetlin Lease. The name 'Manh Choh' ("mon-CHO") was chosen by the Village of Tetlin Chief, Michael Sam, and the tribal Council and can be translated from the Upper Tanana Athabascan language to 'Big Lake,' referring to the nearby Tetlin Lake, a site of high cultural significance in the community.

Figure 3-1 provides a general overview of the area and identifies the relative locations of the proposed Manh Choh mine, Fort Knox Mine, and select communities and landmarks for reference. More detailed maps are provided in the analysis section. The entire area is included due to the use of highway ore transport trucks to move material from the proposed Manh Choh Mine to the Fort Knox Mine for final processing. This will require highway ore transport trucks traveling from the proposed Manh Choh Mine to Fort Knox via the Alaska Hwy and Steese Hwy to deliver materials, and then returning to the proposed Manh Choh Mine to repeat the process on a frequent basis. Therefore, it is not only mine operations that were evaluated, but also the noise from the highway ore transport trucks traveling back and forth between the two mines.

Figure 3-1. Overview of Study Area and Proposed Manh Choh Mine Location

5 INTRODUCTION TO NOISE AND VIBRATION

To aid in the understanding of noise and vibration, the following sections describing noise and vibration measurements and levels are included with this analysis.

5.1 NOISE INTRODUCTION

Noise is generally defined as unwanted sound. Human response to noise is subjective and can vary greatly from person to person. Factors that can influence individual response to noise include the loudness, frequency, amount of background noise present before an intruding noise, and the nature of the work or activity (e.g., sleeping) that the noise affects.

The unit used to measure the loudness of noise is the decibel (dB). To better approximate the sensitivity of the human ear to sounds of different frequencies, the A-weighted decibel scale was developed. Because the human ear is less sensitive to higher and lower frequencies, the A-weighted scale reduces the sound level contributions of these frequencies. When the A-weighted scale is used, the decibel levels are denoted as dBA. The A-scale is used in most ordinances and standards that regulate noise levels.

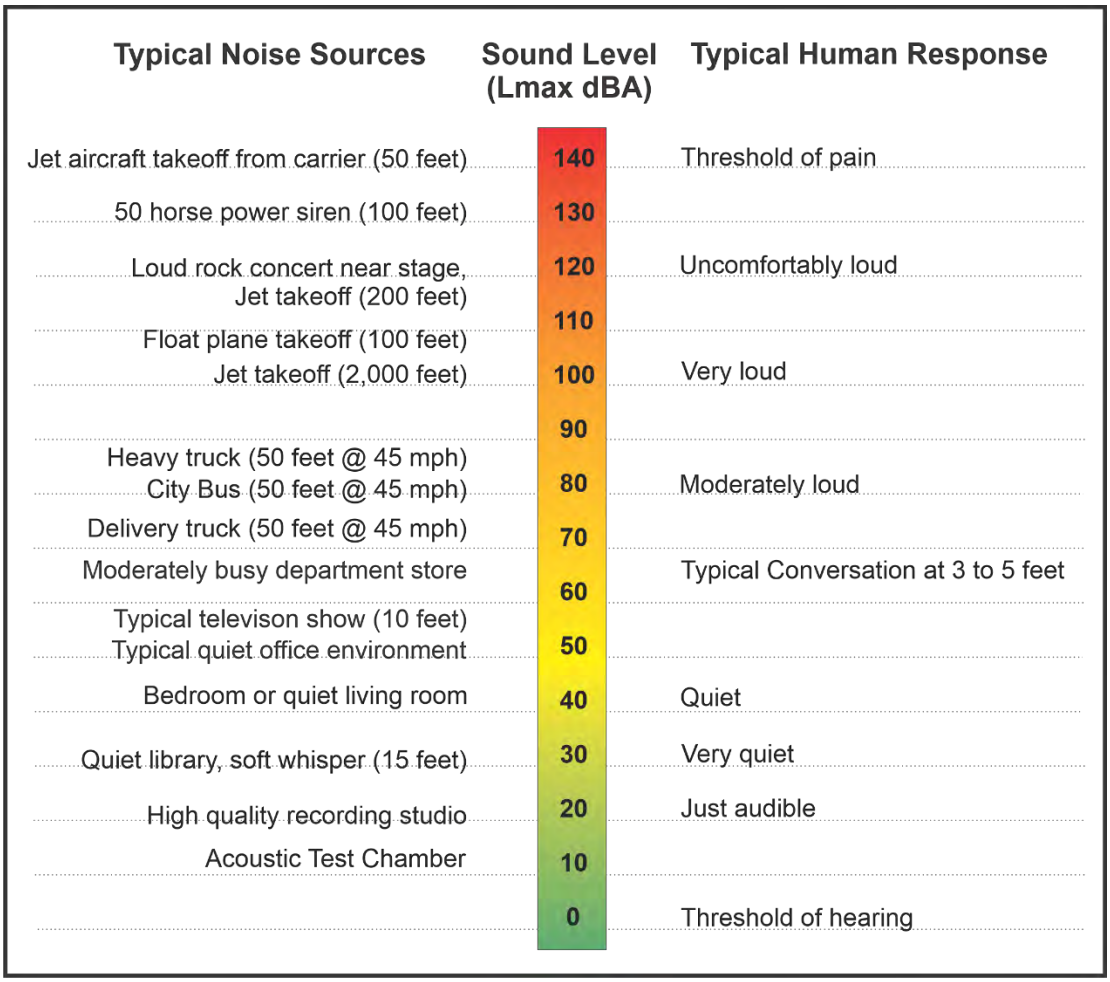
The following are “rules of thumb” that are handy in understanding changes in noise levels and how humans perceive such changes.

- The smallest broad band (e.g., traffic noise) noise-level change that can be detected by the human ear is approximately 3 dB;
- A 5 dB change in noise levels are typically noticeable to most people; and
- An increase of 10 dB is roughly equivalent to a doubling in the perceived sound level.

Normal conversation ranges between 44 and 65 dBA when speakers are 3 to 6 feet apart. Noise levels in a very quiet rural area at night are typically between 30 and 35 dBA, while noise levels in some of the quietest parts of Alaska can range from 20 to 30 dBA. Quiet urban nighttime noise levels range from 40 to 50 dBA. Noise levels during the day in a noisy urban area, like Fairbanks Alaska, are frequently as high as 70 to 80 dBA. Noise levels above 110 dBA become intolerable and then painful, while levels higher than 80 dBA over continuous periods can result in hearing loss. Figure 5-1 provides the different sound levels for some familiar common noise sources and compares their relative loudness to that of an 80 dBA source such as a garbage disposal or food blender.

The information in Figure 5-1 may be useful when reviewing the data provided later in this analysis. Information to be presented includes measured noise levels along the potential haul route and in communities near the proposed mine.

Figure 5-1. Sound Levels and Relative Loudness of Typical Noise Sources



5.1.1 Sound Propagation Characteristics

There are several factors which determine how sound levels reduce over distance. Under ideal conditions, a point noise source in free space will attenuate at a rate of 6 dB per doubling of distance (using the inverse square law). An ideal line source (such as constant flowing traffic on a busy highway) reduces at a rate of approximately 3 dB per doubling of distance. Under normal conditions however, noise sources are usually some combination of the two examples resulting in sound attenuation which lies somewhere between the two ideal reduction factors.

Other factors that affect the attenuation of sound with distance include existing structures, topography, foliage, ground cover, and atmospheric conditions such as wind, temperature, and relative humidity. The following sections provide some general information on the potential effects of each of the factors on sound attenuation.

- **Existing Structures:** Existing structures can have a substantial effect on noise levels in any given area. Structures can reduce noise by physically blocking the sound transmission, and in some circumstances, can cause an increase in noise levels if the sound is reflected off the structure

and transmitted to a nearby receiver location. Measurements have shown that a single story house has the potential, through shielding, to reduce noise levels by as much a 10 dB or greater. The actual noise reduction will depend greatly on the geometry of the noise source, receiver, and location of the structure. Increases in reflected noise are normally kept to 3 dB or less.

- **Topography:** Topography includes existing hills, berms, and other surface features between the noise source and receiver location. As with structures, topography has the potential to reduce or increase sound depending on the geometry of the area. Hills and berms when placed between the noise source and receiver can have a significant effect on noise levels. In many situations, berms are used as noise mitigation by physically blocking the noise source from the receiver location. In some locations, however, the topography can result in an overall increase in sound levels by either reflecting or channeling the noise towards a sensitive receiver location.
- **Foliage:** Foliage, if dense, can provide slight reductions in noise levels in the near distance, with greater effects if the foliage is dense and thick. The Federal Highway Administration (FHWA) provides for up to a 3 dBA reduction in traffic noise for locations with at least 100 feet of dense foliage that contains leaves year around.
- **Ground Cover:** The ground cover between the receiver and the noise source can have a significant effect on noise transmission. For example, sound will travel very well across reflective surfaces such as water and pavement but can be attenuated when the ground cover is field grass, lawns, loose soil, or snow. Appropriate ground coverage was used in the analysis, including powder snow, granular snow, and field grass.
- **Atmospheric Conditions:** Atmospheric conditions that can have an effect on the transmission of noise include wind, temperature, humidity, and precipitation. Wind can increase sound levels if it is blowing from the noise source to the receiver, and conversely, can reduce noise levels if blowing in the opposite direction. Temperature, by itself, normally would have a small effect on noise levels; however, project area temperatures can vary from below -40 to over 70 degrees Fahrenheit. In addition, atmospheric conditions have the most noticeable effect on receivers located over 250 feet from the noise source, which is the case along much of the proposed Manh Choh mine haul route to Fort Knox. Temperature variations of this magnitude, when grouped with humidity and pressure, can have a noticeable impact on noise levels as measured at distant receiver locations. Historical atmospheric conditions used in the analysis were obtained from the Fairbanks National Weather Service.

5.1.2 Analysis Noise Level Descriptors

Noise levels used in this analysis are stated as sound pressure levels in terms of decibels on the A-scale (dBA). The A-scale is used in most ordinances and standards including the applicable standards for this project. To account for the time-varying nature of noise several noise metrics are useful. The equivalent sound pressure level (Leq) is defined as the average noise level, on an energy basis, for a stated time period (for example, hourly).

A second version of the Leq is the Ldn. The Ldn provides a single number that represents the acoustical energy received over a 24-hour period. To account for the increased sensitivity of people during nighttime hours, noise levels between the hours of 10:00 pm and 7:00 am include a 10 dB penalty. This penalty essentially weights the Ldn toward the nighttime levels. The Ldn is a good measure of livability of an area and is used by the Federal Aviation Administration (FAA) and the Federal Transit Administration (FTA), along with several local noise regulations.

Other commonly used noise descriptors include the Ln, Lmax, and Lmin. The Lmax and Lmin are the greatest and smallest RMS (root mean square) sound levels, in dBA, measured during a specified measurement period. The sound level descriptor Ln is defined as the sound level exceeded "n" percent of the time. For example, the L25 is the sound level exceeded 25 percent of the time; therefore, during a one hour period, a 60 dBA L25 indicates that the sound levels were equal to, or greater then, 60 dBA for 15 minutes during that one hour period. The L10, which is a measure of the loudest 6 minutes of an hour can be used to determine the louder noise levels over a measurement period, while the L25 is typically slightly greater than the Leq described above. The L90, or the noise level exceeded for 54 minutes during the hour, is a measure of the lowest noise levels during the measurement (quietest 6 minutes of a one hour measurement).

The five main descriptors used for this study include the following:

- Leq: Acoustical energy over a measurement period – most widely used noise descriptor
- Lmax: Maximum noise level during a measurement period – identifies the loudest noise sources
- L10: loudest 10% of a measurement period – typical louder noise sources in an area
- L90: quietest 10% of a measurement period – a measure of the background or ambient noise level

5.1.2.1 Traffic Noise

Noise sources associated with transportation projects can divided into three general categories: passenger vehicles and light trucks, medium box trucks, and heavy trucks and buses. Each of these vehicles produces noise; however, the source and magnitude of the noise can vary greatly depending on vehicle type. For example, while the noise from passenger vehicles occurs mainly from the tire-roadway interface and is therefore located at ground level, noise from heavy trucks is produced by a combination of noise from tires, engine, and exhaust, resulting in a noise source that is approximately eight feet above the ground. The following list provides information on the types of transportation noise sources that will be part of a roadway project and describes the type of noise each produces.

- **Passenger Vehicles (cars and light trucks):** Noise emitted from 0 to 2 feet above roadway, primarily from tire-roadway interface. This category includes normal passenger vehicles, small and regular pickup trucks, small to mid-size sport utility vehicles, mini- and full-size passenger vans. Typical noise levels for passenger vehicles are 72 to 74 dBA at 55 mph at a distance of 50 feet.
- **Medium Trucks (MT):** Noise emitted from 2 to 5 feet above roadway, combined noise from tire-roadway interface and engine exhaust noise. This category includes delivery vans, such as UPS and Federal Express trucks, large sport utility vehicles with knobby tires, large diesel engine trucks, some tow-trucks, city transit and school buses with under vehicle exhaust, moving vans (U-Haul-type trucks), small to medium recreational motor homes and other larger trucks with the exhaust located under the vehicle. Typical noise levels for medium trucks are 78 to 82 dBA at 55 mph at 50 feet.
- **Heavy Trucks (HT):** Noise emitted from 6 to 8 feet above the roadway surface, combined noise sources include tire-roadway interface, engine noise, and exhaust stack noise. This category includes all long-haul tractor-trailers (semi-trucks), large tow trucks, dump trucks, cement mixers, large transit buses, motor homes with exhaust located at top of vehicle, and other vehicles with the exhaust located above the vehicle (typical exhaust height of 12 to 15 feet). Typical noise levels for heavy trucks are 82 to 86 dBA at 55 mph at 50 feet.

Other main factors where traffic noise is concerned is the speed of the vehicles, and the total volume of traffic. Speed is important because for each 10 mph speed increase, a corresponding increase in the noise levels of approximately 3 dB can be expected. Conversely, a reduction of speed by 10 mph would also reduce the noise levels by approximately 3 dB. Traffic volumes also obey a 3 dB rule, for example, keeping the speeds and vehicle mixture the same (cars, medium and heavy trucks), it takes a doubling of the traffic volume to increase noise by 3 dB, and if volumes are cut in half, noise would be reduced by 3 dB. For example, an urban area with 2000 vehicles per hour at 35 mph would have similar noise levels as a more rural area with 500 vehicles traveling at 55 mph.

5.1.2.2 Decibel Math

An important factor to recognize is that noise is measured on a decibel scale and combining two noises is not achieved by simple addition. For example, combining two 60 dB noises does not give 120 dB (which is near the pain threshold), but yields 63 dB which is lower than the volume at which most people listen to their TVs. For reference, if two noise sources are 10 dB apart, for example 50 dB and 60 dB, the sum of the two noise levels will simply be the louder of the two, in this case 60 dB. This is to say that for similar noise sources that are 10 dB apart in magnitude, a person would only be able to hear the louder of the two sources.

Examples of simplified decibel addition, based on the difference between the two levels, are provided below for reference, as they will aid in the understanding of the project noise impact analysis.

Difference between the two noise sources	Amount added to the higher of the two noise levels
0 to 1 dB	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0 dB

Finally, when refereeing to a noise level in decibels, a descriptor like those described above (Leq, Lmax and L90) is used and followed by dBA (decibels with A-Weighting). However, when discussing the change in noise levels, it is simple the change in decibels (e.g., dB, not dBA). For example, the measured noise level was 55 dBA Leq, and the heavy trucks were 10 dB louder than a typical passenger car.

5.2 VIBRATION PRIMER

Vibration consists of oscillatory waves that propagate from the source through the ground to adjacent buildings. Vibration from construction projects is caused by general equipment operations, and is usually highest during pile driving, soil compacting, jackhammering and construction related demolition activities. Although the vibration is sometimes noticeable outdoors, it is almost exclusively an indoor problem. Although it is conceivable for ground-borne vibration from construction projects to cause building damage, the vibration from mining and construction activities is almost never of sufficient amplitude to cause even minor cosmetic damage to buildings unless they are somewhat close (100 to 200 feet) from the vibration producing activity. The primary concern is that the vibration can be intrusive and annoying to building occupants.

6 LAWS AND REGULATIONS FOR NOISE AND VIBRATION

The following sections contain information on the noise regulations and ordinances from federal and state sources along with recommended vibration limits from federal agencies. These regulations, ordinances and recommendations were used to develop a criteria for the evaluation of potential impacts associated with the proposed Manh Choh Mine. Included are regulations from the Federal Highway Administration (FHWA) for traffic noise, and the EPA guidelines for community noise and noise related to blasting.

Several local noise control ordinances were also evaluated for use in this analysis. Most cities or boroughs near the proposed mine and along the haul route do not have a noise control ordinance applicable to this project. Therefore, the City of Anchorage noise control ordinance was also included and reviewed. A summary of the noise regulations and ordinances considered are provided in the following sections.

6.1 Federal Highway Administration Regulations

The FHWA traffic noise abatement criteria (NAC), are provided in Title 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. The criterion applicable for residences, churches, schools, recreational uses, and similar areas is an exterior hourly equivalent sound level (Leq) that approaches or exceeds 67 dBA. The criterion applicable for other developed lands, such as commercial and industrial uses, is an exterior Leq that approaches or exceeds 72 dBA. There are no criteria for undeveloped lands or construction noise. The criteria are provided in Table 6-1.

The Alaska Department of Transportation & Public Facilities (DOT&PF) Noise Policy, (Alaska Environmental Procedures Manual, September 2018), considers a traffic noise impact to occur when predicted project traffic noise levels approach, within one dBA, the NAC for a given land use category, or substantially exceed existing levels. Therefore, residential impacts (Category B property) occur at 66 dBA. For ease of reading, the term NAC will be used to reference the DOT&PF noise abatement criteria. In addition, DOT&PF considers a 15 dB increase over the existing noise levels a substantial increase, and therefore an impact.

Table 6-1. Roadway Noise Abatement Criteria by Land Use Category				
Activity Category	**Activity Criteria in hourly Leq (dBA)**		**Evaluation Location**	**Activity Description**
	FHWA NAC	**DOT&PF NAC**		
A	57	56	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67	66	Exterior	Residential (single- and multi-family units)
C	67	66	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72	71	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	--	Undeveloped lands that are not permitted
Undeveloped lands permitted for activity category B, C or E are evaluated as existing				

6.2 Environmental Protection Agency Noise Control

The U.S. Environmental Protection Agency (EPA) is in charge of the Noise Control Act of 1972, which established a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. The Noise Control Act also set out limits for noise emissions from new and in-use vehicles. However, in 1981 the Administration concluded that noise issues were best managed at the State and local level. As a result, the primary responsibility of addressing noise issues was transferred to State and local governments. Even with this change the EPA still has information that can be used to assist in developing a criteria for areas where none exist. For example, Table 6-2 contains the EPA standards that can be used as a guideline for expected community reaction to a noise increase above existing ambient levels

Table 6-2. EPA Guidelines for Expected Noise Impact

Increase in Noise over Existing Level	Expected Community Reaction
0 - 5 dBA	Few complaints if gradual increase
5 - 10 dBA	More complaints, especially if conflicts with sleeping hours
Over 10 dBA	Substantial number of complaints

6.3 State and Local Regulations

Regulations and ordinances from the State of Alaska along with the cities of Fairbanks, Delta Junction, and the North Pole were reviewed and summarized in the following sections. Due to the limited noise control ordinances and lack of defined criteria in most areas, the city of Anchorage noise control ordinance is also included. This ordinance was included as it provides a definitive and measurable criteria for heavy trucks, like the ones that would be used on the proposed Project.

6.3.1 Alaska State Noise Control

Many states have noise control for new and in use vehicles that are operated on public roadways. Some also regulate noise from personal use vehicles, including snow machines, watercraft and motorcycles and all-terrain vehicles (ATV's). However, the State of Alaska has no formal vehicle noise regulations and allows local jurisdictions to regulate noise. The state does require that all vehicles are equipped with a muffler. In the Alaska State Administrative Code, Chapter 13, Section AAC 04.215, the code states:

> *A motor vehicle must be equipped, maintained, and operated so as to prevent excessive or unusual noise and the escape of fumes into the vehicle. A motor vehicle must be equipped with a muffler or other effective noise-suppressing system in good working order and in constant operation. No person may use a muffler cutout, bypass, or similar device, or modify the exhaust system of a motor vehicle in a manner which amplifies or increases the noise emitted by the engine of the vehicle above that emitted by the muffler originally installed on the vehicle for use on the highway or a vehicular way or area. A person may not alter an exhaust particle emission system built into a motor vehicle to decrease its effectiveness.*

The above code requires all vehicles, including the haul trucks proposed for the Manh Choh Project, to be equipped with mufflers or other noise-suppressing system in good working order. Several other

airport related noise codes were identified, but none were applicable to this project. No other noise specific regulatory requirement was identified under the Alaska State Administrative Code.

6.3.2 Delta Junction

A review of the Delta Junction Code of Ordinances was performed. The two sections reviewed in detail include Title III, Public Health and Safety and Title IV, Land Use. Neither of these has any noise specific regulations that would be applicable to the Manh Choh Mine Project.

6.3.3 Fairbanks

The City of Fairbanks Administrative Code was also examined for noise specific regulations that would be applicable to the Manh Choh Project. Although the Fairbanks Code has several noise related subjects, including Airport Noise Sensitive Area Standards and military noise standards, there were no noise regulations or ordinances applicable to the Manh Choh Project.

6.3.4 North Pole

The City of North Pole was reviewed, and a noise specific ordinance was identified in Chapter 8, Section 04, Nuisances. This code is specific to nuisance related noise, such as loud music, and other disturbances. The code has no specific decibel limits on noise and is not applicable to the Manh Choh Project.

6.3.5 Anchorage

The Anchorage noise control ordinance is not applicable to the Manh Choh Project as the project and haul routes are not anywhere near Anchorage. However, because none of the above cities or boroughs have specific noise regulations or ordinances, the Anchorage code is presented to use as a baseline for the project noise criteria. The noise code is found under Title 15, Environmental Protection, Chapter 15.70, Noise Control. A second vehicle specific section is provided under Title 9, Vehicles and Traffic, Chapter 9.44.330, Mufflers and Exhaust Systems. A summary of relevant parts of the code that were used in developing the project criteria follows.

6.3.5.1 Anchorage Community Noise Criteria

Title 15, Chapter 70.080 of the Anchorage noise code sets property line noise limits that are based on the land use types. The code is applicable to most residential, commercial, and industrial land uses. The limits are provided in Table 6-3. These criteria have several exemptions, including construction noise between the hours of 6:00 am to 10:00 pm, aircraft, watercraft, firearms, blasting and other explosives, emergency services and licensed vehicles operating on public roadways. Therefore, it would not be applicable to noise from haul trucks when traveling on public highways, like the haul route from Tok to Fort Knox.

Table 6-3. Anchorage Noise Pollution Control Ordinance			
Land Use of Receiving Property	**Maximum Allowable Daytime Sound Level in dBA at Receiving Property Line Limits (Nighttime 10:00 pm to 7:00 am)**		
	Residential	**Commercial**	**Industrial**
Residential	60 (Night 50)	65 (Night 55)	70 (Night 65)
Commercial	70 (Night 60)	70 (Night 60)	75 (Night 70)
Industrial	80 (Night 80)	80 (Night 80)	80 (Night 80)
Source: Anchorage Administrative Code			

6.3.5.2 Anchorage Vehicle Noise Emission Standards

The City of Anchorage also sets limits on the noise emissions from motor vehicles. These limits are set by vehicle type and operational conditions. In addition, the standards restrict the use of any motor vehicle or motorcycle without proper muffler or other sound dissipative device. Table 6-4 list the noise standards by vehicle type and operational conditions.

Table 6-4. Anchorage Motor Vehicle Noise Emissions Standards			
Vehicle Class	**Speed Zones 35 mph or less**	**Speed Zones over 35 mph**	**Stationary Run-up**
Motor vehicle of GVWR or GCWR of 10,000 pounds or more engaged in interstate commerce	86	90	88
All other motor vehicles of GVWR or GCWR of 10,000 pounds or more	86	90	--
motorcycle	76	80	--
Any other motor vehicle and any combination of vehicles towed by such motor vehicle	76	80	--
Source: Anchorage Administrative Code			

6.4 Project Noise Criteria

Based on a review of the available regulations, a combination of ADOT & PF, EPA and Anchorage criteria were used to evaluate noise from operations of the proposed Manh Choh Mine Project.

For mine related noise, excluding blasting, the most stringent maximum noise level of 60 dBA daytime and 50 dBA nighttime was used for impacts. Traffic on public would be reviewed based on the FHWA and Alaska DOT&PF criteria of 66 dBA Leq, or a 15 dB increase in noise levels at residential receivers. Finally, an additional analysis of the increase in total cumulative noise following the EPA guidelines, applied as follows:

- Increase of 0 to 3 dB is typically not noticeable and considered no adverse effect
- Increases of 4 dB to 9 dB may be notable and will be discussed based on land use and time of day the levels meet the 4 to 9 dB increase thresholds
- Increase of 10 to 14 dB are likely to be noticeable and will be discussed based on land use and time of day
- Increases above 15 dB will be considered for reasonable and feasible noise mitigation

6.5 Project Vibration Criteria

There are no local, state, or federal regulations governing vibration. Vibration will be produced by several different types of construction equipment throughout the project area. Table 6-5 summarizes the levels of vibration and the usual effect on people and buildings. While there are no vibration-specific regulations that are applicable to construction of the project, the U.S. Department of Transportation (U.S. DOT) has guidelines for vibration levels from construction related to their activities, and the U.S. DOT recommends that the maximum peak-particle-velocity (PPV) levels remain below 0.5 inches per second at the nearest vibration sensitive structures. Vibration levels above 0.5 inches per second PPV have the potential to cause minor architectural damage to sensitive dwellings. Most modern buildings can sustain vibration levels up to one inch per second without any notable damage. The U.S. DOT also states that the level at which vibration becomes annoying to people inside a building is approximately 0.64 inches per second.

Table 6-5. Effects of Construction Vibration

Peak Particle Velocity (in/sec)	Effects on Humans	Effects on Buildings
<0.005	Imperceptible	No effect on buildings
0.005 to 0.015	Barely perceptible	No effect on buildings
0.02 to 0.05	Level at which continuous vibrations begin to annoy in buildings	No effect on buildings
0.1 to 0.5	Vibrations considered unacceptable for people exposed to continuous or long-term vibration	Minimal potential for damage to weak or sensitive structures
0.5 to 1.0	Vibrations considered bothersome by most people, however tolerable if short term in length	Threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. Some risk to ancient monuments and ruins.
1.0 to 2.0	Vibrations considered unpleasant by most people	U.S. Bureau of Mines data indicates that blasting vibration in this range will not harm most buildings. Most construction vibration limits are in this range.
>3.0	Vibration is unpleasant	Potential for architectural damage and possible minor structural damage

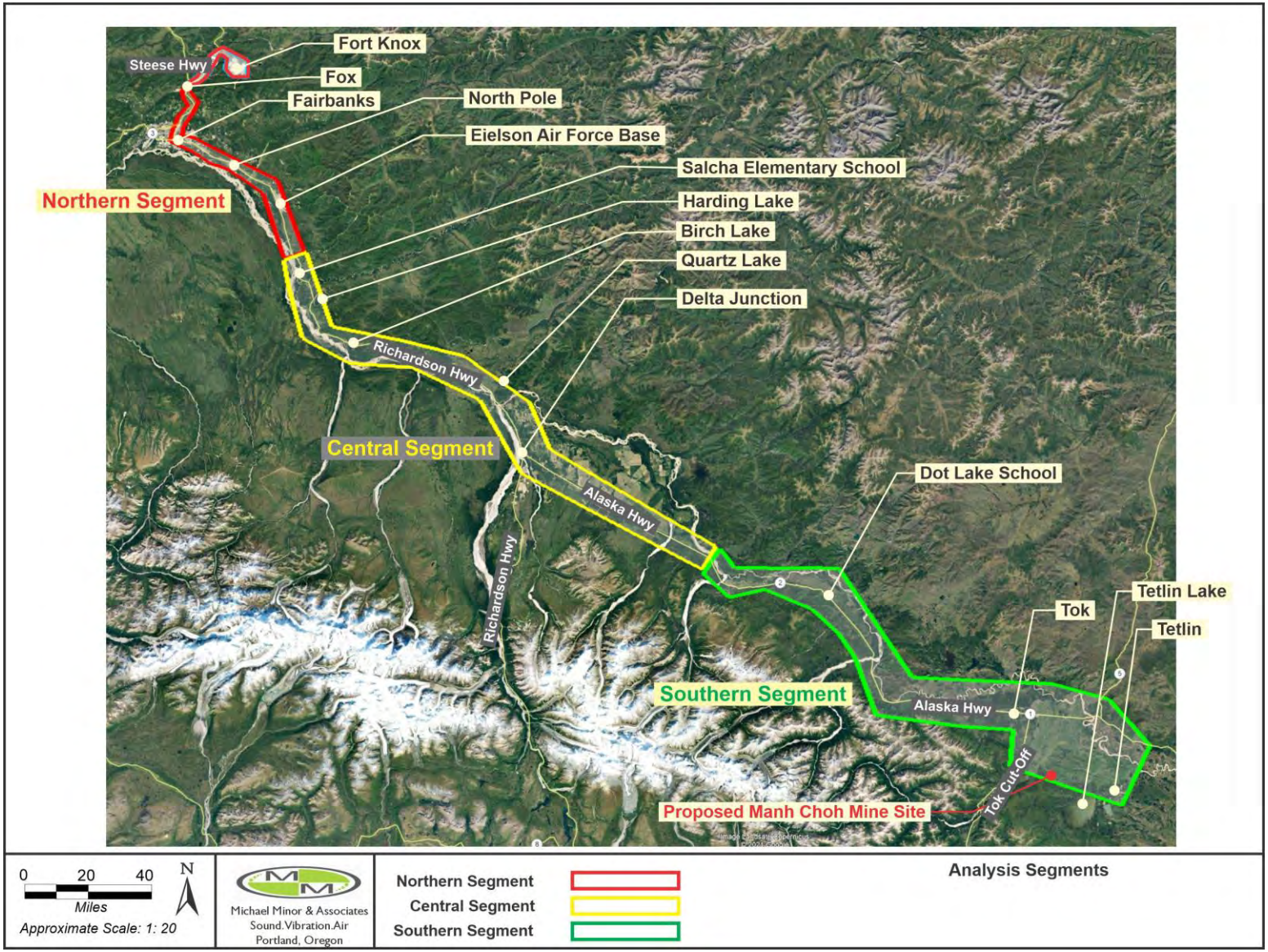
7 LAND USE AND BACKGROUND NOISE LEVELS

Land use in the study area includes residential, hotels, churches, schools, parklands, commercial, industrial, and undeveloped. Land uses considered sensitive under FHWA, and the ADOT&PF are defined in Table 6-1 under activity categories B, C, D and E. There were no Category A land uses identified in the corridor. Activity categories F and G have no criteria and are not considered noise sensitive under FHWA and most other state and local regulations. Also, most offices, restaurants and bars are not considered noise sensitive or considered for noise mitigation. Exceptions could include a restaurant with exclusive exterior seating in a quiet area, or a commercial use that depends on low noise levels, such as an audiology laboratory.

Due to the length of the haul route, the project study areas were divided into three more manageable segments. The segments were developed with consideration for the level of existing traffic, noise sources and population density. Figure 7-1 shows the overall corridor and identifies the four segments, and the list below provides a brief description for each segment.

1. **Southern Segment:** Tetlin Village – Tok area to north of Dot Lake
2. **Central Segment:** North of Dot Lake to Salcha (Delta Junction, Big Delta, Birch Lake)
3. **Northern Segment:** Stringer Road and Eielson Air Force Base, North Pole, and Fairbanks to Fox intersection, continuing from the Fox intersection to Fort Knox along the Steese Highway.

Figure 7-1 Noise Analysis Segments



7.1 LAND USE

The entire corridor is approximately 250 miles from the proposed Manh Choh Mine to the Fort Knox Mine. A review of land use along the haul route corridor was performed during the on-site noise monitoring and traffic counts, with additional information from on-line maps and data. Noise sensitive land use within the corridor include residences, schools, churches, and parklands. Land use descriptions for each of the three segments are provided in the following sections.

7.1.1 Southern Segment Land Use

The southern section has four main communities, Tetlin Village, Tok, Tanacross, and the Dot Lake community and School. Information on much of this area was obtained from the Tanana Chiefs Conference (TCC), an Alaska Native non-profit corporation assisting the needs of Tribal members and beneficiaries throughout this region.

Tetlin Village is a small community located along the Tetlin River, near Tetlin Lake and approximately 20 miles southeast of Tok and west of the Tetlin National Wildlife Refuge. The village is connected by a gravel road to Alaska Highway. The community incudes a church and school along with several single family residences. The town is separated by the Tetlin River, with a bridge connecting the two sides of the town.

There are few major noise sources in the Tetlin Village community. Main noise sources in the community include infrequent local area traffic, school activities, snow machines in the winter and ATVs in the summer. Occasional aircraft overflights from small, fixed wing aircraft and helicopters also occur. The village is supplied with power, and the only generators would be backup generators used in the event of a power outage.

Between Tetlin Village and the Alaska Highway, along the Tetlin Village Road, five cabins were identified. Four of the five are located between 1,000 and 2,000 feet from the Alaska Highway, with the fifth approximately 3,900 feet from the Alaska Highway. The Tok River State Recreation Site is located just west of the Tetlin Village Road, and east of Tok, along the Tok River. East of the Tetlin Village Road, where the Alaska Highway crosses the Tanana River, there is a boat launch and a historical marker.

The town of Tok is located at the connection of the Alaska Highway and the Glenn Highway (Tok cut-off). Tok has a population of approximately 1,400 and is the trade center for the nearby Athabascan Native villages. This is the largest town in the area, has a school, an airport and several commercial and industrial businesses, hotels/motels, bed and breakfasts, and cabins. It is frequently used as a base for hunting and other sporting activities. The Moon Lake State Recreation Site is located west of Tok along with the Mukluk Land Theme Park. South of Tok, along the Tok Cut-Off Highway is the Butch Kuth Avenue area with approximately 17 to 20 residential structures.

Tanacross is located on the Tanana River approximately 12 miles northwest from the center of Tok. Tanacross has a small airport and it located about 1-mile from the Alaska Highway. Like Tetlin Village, Tanacross is a very small community with only local residential noise sources, like local traffic, school activities, snow machines in the winter and ATVs in the summer and occasional aircraft overflights from small, fixed wing aircraft and helicopters also occur. Tanacross is over 4500 feet from the haul route and therefore would not be expected to have any increase from the haul tuck operations.

The Dot Lake community and school area are located approximately 50 miles northwest of Tok and 155 miles southeast of Fairbanks. This community lies south of the Tanana River and includes Dot School and Dot Village. Dot Village would have similar noise sources as described for Tetlin Village and Tanacross, with increased noise due to the closer proximity to the Alaska Highway.

In addition to the communities described above, there are also several residential land uses along both sides of the Alaska Highway between Tok and Dot Lake. Some notable residential land uses include the Cathedral Creeks Bed & breakfast, a group of residences on Pringle Road and Backburn Street and also along Fireweed Drive.

Overall, the main source of noise for most of these areas is traffic on the Alaska Highway and connector roadways. In Tok, noise from the Glenn Highway (Tok cut-off) and local commercial and industrial activities also contribute to the existing conditions. Results of the noise monitoring for the southern segment is provided under Noise Monitoring in Section 7.2.3.

7.1.2 Central Segment Land Use

Major populated cities and boroughs in the Central Segment include Delta Junction, Fort Greely, and Big Delta. There are also several recreational areas, churches and schools and smaller communities, including the Salcha community and residential areas near Harding and Birch Lakes. The Alaska Highway connects to the Richardson Highway AK 4 in Delta Junction, providing access to the south and on to Valdez or Anchorage and increasing traffic volumes in the Delta Junction area.

Starting in the southern end, north of Dot Lake School, land use is primarily farmlands and forests. There are several single family residences located along the Alaska Highway, with density increasing closer to Delta Junction. In addition to the increase in residences, there is also an increase in commercial and industrial land uses to the south of Delta Junction, including rock quarries and other sites with haul trucks and other industrial uses. Most residences along this part of the haul route are 150 to 200 feet or more from the Alaska Highway.

At the south of Delta Junction there are several commercial uses, the Snowed Inn RV, Campers & Tents (Formerly Bergstad's RV & Trailer Court), The Diamond Willow Inn, the House of Prayer Church, and several residential uses, most are set back from the Alaska Highway by 50 to 100 feet. At the intersection of the Alaska Highway and the Richardson Highway, land use is mainly commercial, and includes a visitor center, Pioneer Park, restaurants, automotive service centers, and, farther south along State Highway 4, Fort Greely. Fort Greely is sufficiently far from the Alaska Highway that noise from traffic on the Alaska Highway would not be noticeable on the base.

The main area of Delta Junction, between the Alaska Highway – Richardson Highway intersection and the Delta State Recreation site, land use is mainly commercial and light industrial. There is also a hotel and three churches located near the Alaska Highway. The Delta Junction Library, Community Center and the Delta Junction City Hall are all located off Deborah Street. At the north end of Delta Junction, near Rapid Street, there are several single and at least one multi-family residence along Rapids Street.

At the northern end of Delta Junction is Delta Junction Airport and the Delta State Recreation Site, a 23 acre site with 25 campsites. Farther north is the Alaska Recreational Ranch Recreational Vehicle Park and the Green Acres Recreational Vehicle Park. Several other single family residences were identified on

the westside of the Alaska Highway, while the westside of the highway is a large quarry operation along the banks of the Tanana River.

Farther north, between Jack Warner Road and Big Delta, there are single family residences intermixed with hotels/motels/cabins, commercial and industrial uses along both sides of the Alaska Highway. There is a clear cut area of 50 to 75 feet along both sides of the Alaska Highway, and all residences are located outside this area, with some residences located over 100 feet or more from the highway. Toward the southern end of Big Delta, there is a residential area along Spengler Road. North of Riak's Road is the Big Delta State Historic Park, the Tanana River Public Boat Launch, and a viewing area for the Alaska Pipeline.

North of Big Delta to Birch Lake, land use is very rural, with most lands under Department of Natural Resource control, with some infrequent residences and commercial uses. At Birch Lake there is a recreational area and several residences located along the lake front. There are also more residences west of the Alaska Highway near Chisholm Lake, with most of the residences over 1000 feet from the highway.

From Birch Lake to Harding Lake the highway has the same clear cut area of 50 to 75 feet along both sides, and there are very few residences. There are at least two active quarries or mines located in this area. Several residences were also identified west of the highway along Old Valdez Trail (Old Richardson Highway) with several more residences located along the shore of Harding Lake.

North of Harding Lake there are several single family residences along both sides of the Alaska Highway, and the Salcha River State Recreation Site is located east of the highway, and on the south side of the Salcha River. North of the Salcha river are several single family residences on both sides of the highway, with the Salcha Elementary School located on the east side of the highway, two miles north of the Salcha River Bridge.

Between the Salcha Elementary School and the Northern Segment, land use includes single family residences mainly on the west side of the highway with some residences and the Salcha Store on the east side. Much of the land east of the highway is restricted from development due to Eielson Airforce Base runways

7.1.3 Northern Segment

The Northern Segment includes the more densely populated area from, and including, just south of the Eielson Air force Base north along the Alaska Highway to Fairbanks, connecting to the Steese Highway to Fox Alaska and the intersection of the Steese Highway and the Elliot Highway, continuing along the Steese Highway to Fort Knox. Notable cities, towns, communities, and facilities in this segment include Eielson Air Force Base, Moose Creek, North Pole, Fort Wainwright, Fairbanks, Farmers Loop, Goldstream, and Fox. Land use includes residential, commercial, and industrial with some churches, schools and a cemetery also located near the corridor.

North of the Salcha River, and west of Eielson Air Force Base facility, land use includes single family residential uses along the west side of the highway. As the highway travels along the base, it is parallel to the airport runway and no noise sensitive properties were identified. Just south of the main entrance to Eielson Air Force Base, the highway is divided in to a full separated four lane highway heading north toward Fairbanks. North of the base, in Moose Creek, there are residences, three churches and

commercial and industrial uses along the highway. The Moose Creek Bluff, a historical landmark, is just north of Moose Creek.

The four lane highway crosses over the Chena Flood Control Project area, into North Pole, where there are churches, residences, and commercial and industrial uses on both sides of the Richardson Highway. Between North Pole and Fort Wainwright, land use is a mixture of commercial and industrial uses with some residential uses. At the eastern part of Fort Wainwright land use includes motor pools and shooting ranges, however in the west end of Fort Wainwright, the highway is within 600 feet of base residential barracks.

As the haul route transitions to the east side of Fairbanks, via the Steese Highway, land use is mainly commercial and industrial to Airport Way (Gaffney Road to Fort Wainwright). Exceptions include barracks on the eastside of the highway and a residential area in Fairbanks north of 16th Avenue. The barracks are over 500 feet from the highway, however, the residential areas north of 16th Avenue are as close as 100 feet from the highway.

North of Airport Way and south of College Road, land use to the east of the highway is primarily residential with single family residence located along the Chena River, which is between the highway and residences on Bentley Island. The west side of the highway includes a residential area, the Clay Street Cemetery, and a transition to commercial uses north of the Chena River bridge.

Between College Road and Johansen Expressway, land use to the west of the highway is entirely commercial and industrial with some hotels and motels and one church (Kingdom Hall of Jehovah's Witnesses). East of the highway, land use is primarily single family residential, with two churches near Lazelle Road/City Lights Boulevard. From the Johansen Expressway north to Chena Hot Springs Road, land use to the east of the highway is mainly residential wit most homes set back from the highway. Other uses east of the highway include the Birch Hill Cemetery and two churches. West of the highway, from the Johansen Expressway north to Chena Hot Springs Road, land use is primarily commercial and industrial.

From Chena Hot Springs Road to Tera Road (Winch Road), land use consists of generally of single family residences on large lots, with the exception of the Rainbow Valley Mobile Home Park. North of Tera Road to the Fox, most land uses are undeveloped or commercial and industrial. The Alaska Pipeline Viewing area is located in this part of this segment, 2.6 miles south from the Elliott Highway (AK 2) and the Steese Highway (AK 6) interchange.

The remaining nine miles covers the last part of the haul route from the Fox to Fort Knox. Near the Steese Highway - the Elliot Highway intersection, land use is mainly commercial and light industrial with the Northern Moosed Recreational Vehicle Park and Campground located just north of the intersection, on the Elliot Highway.

Land use along the Steese Highway consists of a mixture of single family residences, mixed uses properties, commercial uses, and industrial uses, including mining. The National Oceanic and Atmospheric Administration (NOAA) Fairbanks Command and Data Acquisition Station is located along the Steese Highway on Eiesle Road. Because all sensitive buildings at this facility are over 3000 feet from the highway, traffic noise would not be notable at any sensitive building. North of the NOAA facility is the Felix Pedro Monument.

North of the monument to the Fort Knox Entrance, land use is mainly undeveloped with the exception of two quarries or mines. Just north of the Fort Knox entrance is a small residential area that includes the Aurora Borealis Lodge and Cleary Summit Cabins along Pedro Dome Road and Ridge Run Road. The Ski Land Ski Resort is located northeast of the Fort Knox entrance, and there are also a few residences located along Fish Creek Road.

7.2 Noise Monitoring

Noise monitoring and traffic counts were performed at 19 locations along the haul route with 17 locations monitored twice. Traffic counts and photos were taken at each site, except at Moosehead Road, 1/2 mile west of the Tok Cut-off, where photos were not taken by mistake. The traffic counts were divided by vehicle types, including passenger vehicles and light trucks, medium trucks, and heavy trucks. Figures 7-2 through 7-4 show the monitoring locations for each segment with more detailed information and photos provided in each of the segment descriptions below.

Figure 7-2. Noise Monitoring Locations in Southern Segment

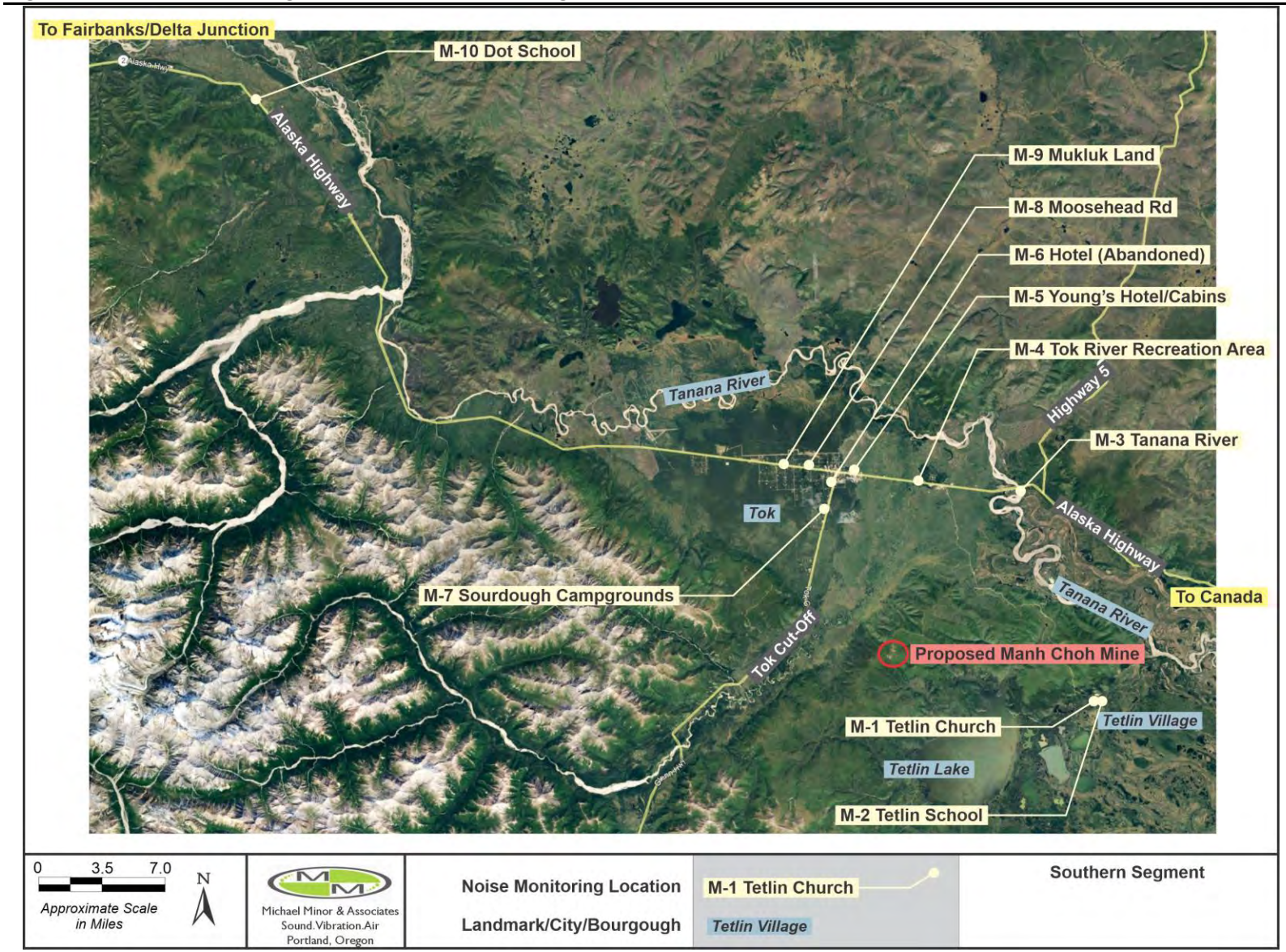


Figure 7-3. Noise Monitoring Locations Central Segment

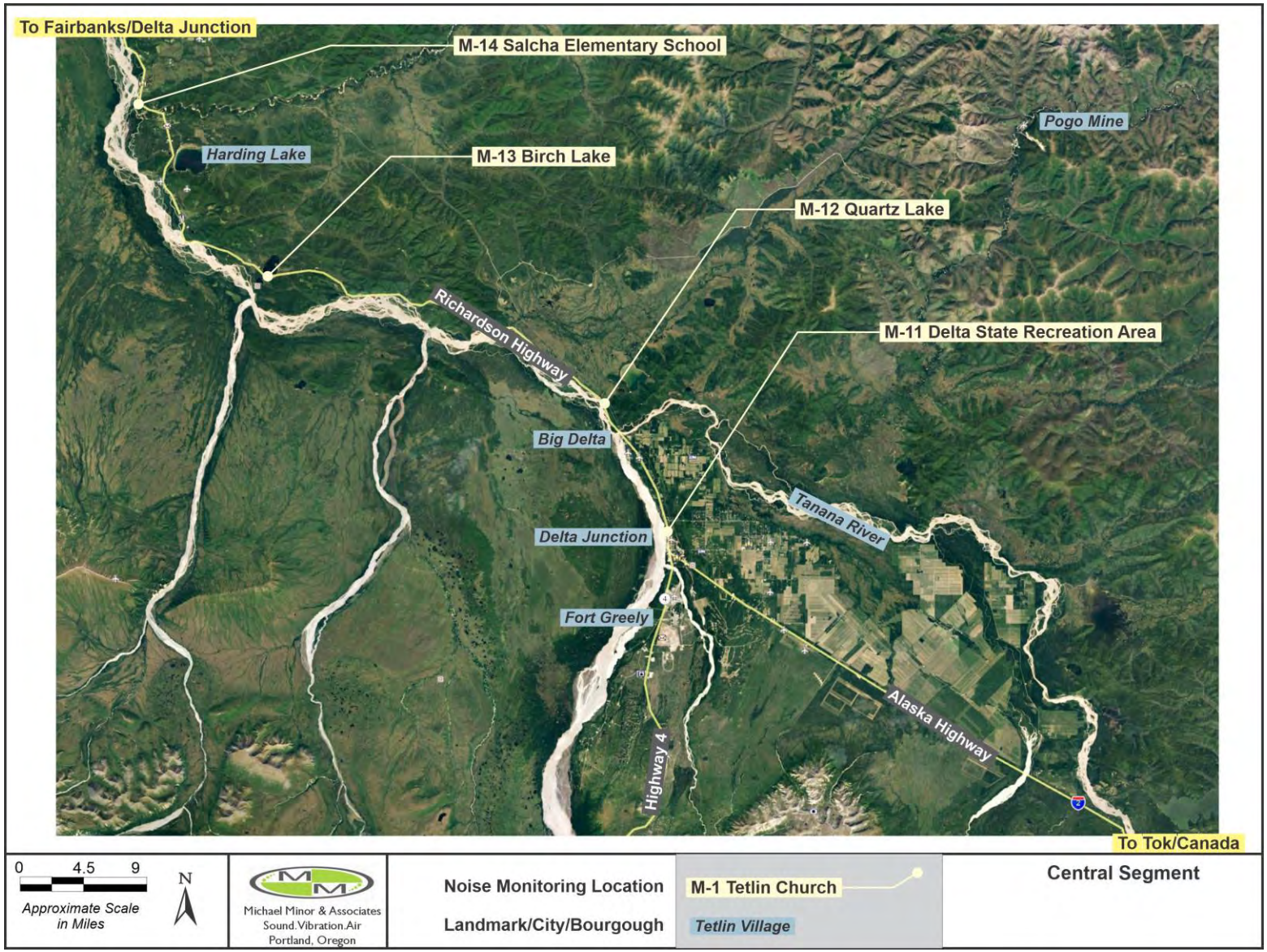
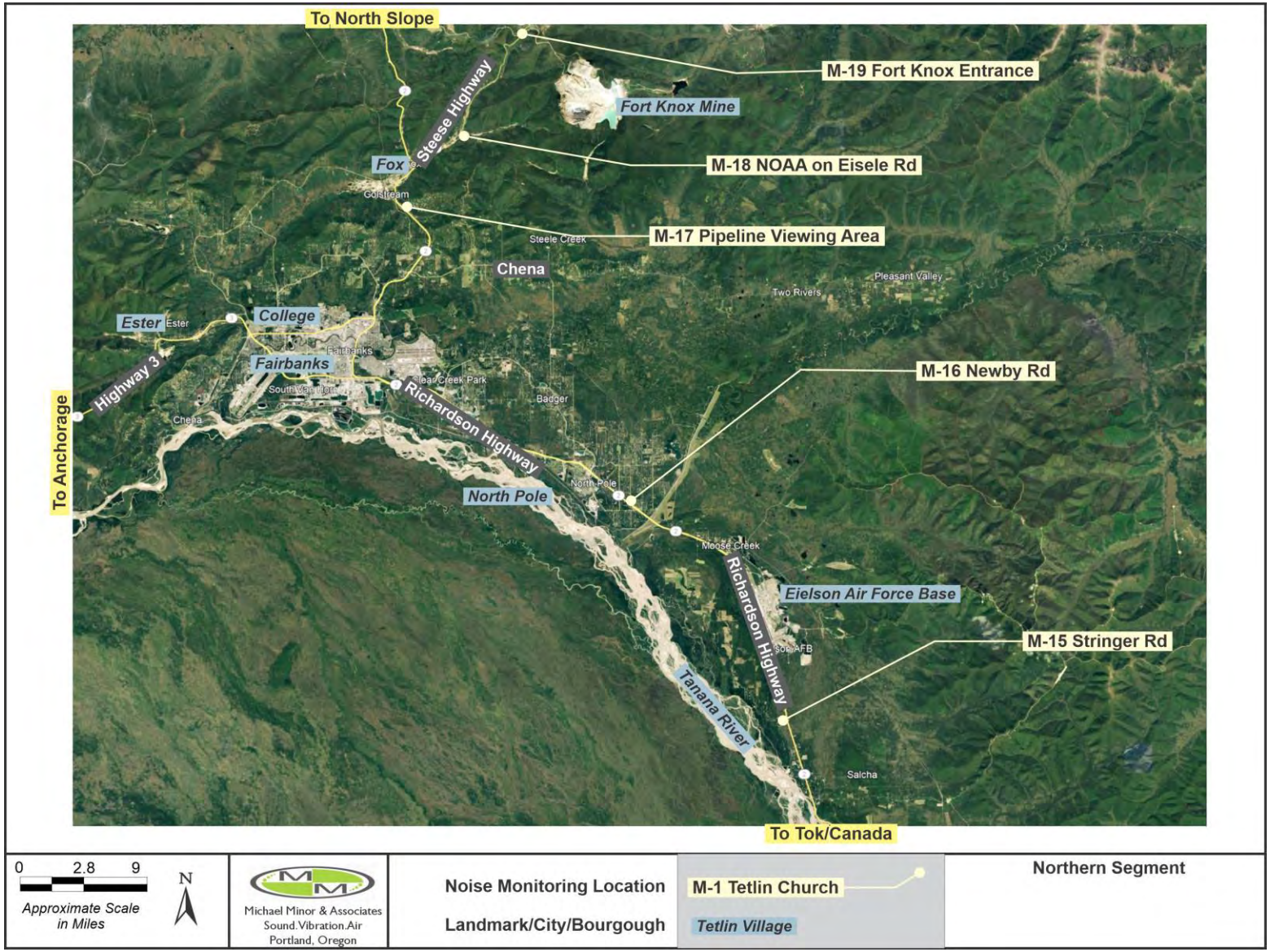


Figure 7-4. Noise Monitoring Locations Fairbanks Segment and Northern Segment



7.2.1 Noise Measurement Methods and Equipment

All noise measurements were taken in accordance with the Alaska DOT&PF and the American National Standards Institute (ANSI) procedures for community noise measurements. The measurement locations were at least five feet from any solid structure to prevent acoustical reflections and at a height of five feet of the ground as required by the Alaska DOT&PF and the ANSI procedures. The equipment used for noise monitoring was a Bruel & Kjaer Type 2250 Sound Level Analyzer equipped with detailed statistical analysis, third octave bandwidth frequency data and audio recording as needed. The meter was calibrated prior to, and after the measurements using a Larson Davis Sound Level Calibrator. Complete system calibration is performed on an annual basis by an accredited acoustical laboratory traceable to the National Institute of Standards and Testing (NIST). The system meets or exceeds the requirements for an ANSI Type 1 noise measurement system.

7.2.2 Traffic Data Sources and On-Site Traffic Counts

Traffic counts were taken with all noise measurements and are used to validate the noise models used in this analysis. The volumes used for the impact analysis are weekly averages taken from the ADOT&PF traffic counts provided in Attachment A available on the website at:

https://alaskatrafficdata.drakewell.com/publicmultinodemap.asp *(Link verified 10/18/2021)*

The level and detail of traffic data from this website varies with location. For some locations, typically in areas with higher total volumes, the data set contains historic data for several years. Other sites, typically in more rural areas, will have less detailed information. Some sites included detailed percentages by vehicle type, including full percentages for all types of vehicles. For sites without complete data, the traffic counts and data from nearby areas are used to supplement the data from the Alaska DOT&PF.

After a review of the volumes, the data for the year 2018 was used to avoid reduced volumes during the COVID-19 restrictions. Finally, the traffic data was divided into different hourly segments, where possible, to include peak hour(s) and typical daytime, evening and early morning hours and overnight hours, when traffic volumes are lowest. The divisions were based primarily on the volumes and changes in volumes as much as time to provide comparisons based on the volumes and time of day. The traffic volume outputs are provided in Attachment B.

7.2.3 Southern Segment Noise Measurements and Traffic Data

The southern segment had ten measurement sites, with eight of the sites measured twice. The two sites measured once are the two locations in Tetlin Village. This segment has the most measurement sites because of the low and varying population density, and low overall traffic volumes. Figure 7-2 shows the entire southern segment, and the noise monitoring sites. Table 7-1 has the noise measurements and traffic counts for this segment. A discussion of the noise measurement and traffic counts follows the table.

Table 7-1. Noise Monitoring Results Southern Segment (Tetlin Village and Tok)

Rec#	Location	Date Time	Leq	Lmin	L90	L50	L10	Lmax	Cars	MT	HT
M-1	Tetlin Church	8/31/2021 10:17	48.8	18.3	21.4	29.8	48.9	73.6	2	0	0
M-2	Tetlin School	8/31/2021 10:48	39.9	23.3	26.3	29.3	40.7	67.4	2	2	2
M-3	Tanana River Viewpoint	8/31/2021 12:05	44.8	34.8	37.6	40.6	46.3	74.1	4	8	0
		8/31/2021 19:07	37.9	25.7	28.4	30.9	41.3	53.5	20	12	0
M-4	Tok River Recreation	8/31/2021 12:57	52.3	26.4	29.1	35.2	52.1	74	36	16	4
		8/31/2021 19:49	55.5	23.2	24.8	36.8	57.5	75.7	40	0	12
M-5	Youngs Motel	8/31/2021 21:34	39	24.9	29	33.3	43.3	53.7	24	4	0
		9/1/2021 6:43	46.1	28.3	34.4	38.8	49.5	61.3	28	8	4
M-6	Old Hotel	8/31/2021 13:26	53.3	35.2	38.3	45.5	57.8	69.4	52	4	0
		8/31/2021 19:58	56	35.6	38.9	48.2	58.5	76.4	4	12	8
M-7	Sourdough Campground	8/31/2021 13:48	55.2	19.4	22.4	38.1	55.6	73.4	40	8	0
		8/31/2021 20:17	57.7	21.5	23.6	32.4	56.8	79.3	8	12	0
M-8	Moosehead Road	8/31/2021 14:13	55.5	37	39.5	46.8	58.5	74	116	12	4
		9/1/2021 7:46	57.7	44	47.6	53.9	61.2	73.4	88	24	0
M-9	Mukluk Land Entrance	8/31/2021 18:32	55	22.5	35.7	45.7	59.5	70.5	68	4	0
		9/1/2021 8:07	59.3	27.7	34.3	44.4	63.3	76.6	64	16	4
M-10	Dot Lake School	8/30/2021 11:25	52.8	23.9	26.8	31.8	46.7	76.9	16	0	4
		8/31/2021 17:38	56.2	22.5	29.9	46	57.9	74.1	24	12	4

Notes:

1. Receivers shown in Figures 7-2 and 7-5 through 7-14
2. Description of monitoring site
3. Date and start time for the measurement
4. Measured noise level based on descriptor
5. Number of vehicles passing the monitoring site normalized to one hour

Sites M-1 and M-2 were both in Tetlin Village, one near the Tetlin Church and one near the Tetlin School. The area is very quiet with background noise levels based on the L90 ranging from 21 to 26 dBA. Noise sources include passing vehicles, birds, water flowing in the Tetlin River, and residential and community activities. Because the village is not along or near any major highway, there is no background traffic noise that is typical for other locations in this study that are along the project haul route. Because of the low background noise levels, distant aircraft flights and helicopters are sometimes audible from the distance. Maximum levels were from local vehicles, passing near the meter, at 67 to 74 dBA, with an L50 level of 30 dBA. The locations are shown on Figures 7-5 and 7-6. Average daily traffic volumes between 2017 and 2018 ranged from 69 to 71 vehicles per day.

Figure 7-5. Monitoring Site M-1: Tetlin Church

Figure 7-6. Monitoring Site M-2: Tetlin School

Site M-3 is to the east of the haul route along Alaska Highway toward Canada. The measurement was taken at the historic Tanana River Viewpoint. Site M-4, also along Alaska Highway but just west of the connection of the proposed haul road from the proposed mine and Tetlin Village, was at the Tok River Recreation Area, just east of Tok. The measurement was at campsite 26 facing toward Alaska Highway. The sites are shown in Figures 7-7 and 7-8.

Noise sources at the M-3 included primarily water noise, traffic noise, wind, and birds. The Leq ranged from 38 to 45, with L90 noise levels of 26 to 25 dBA. Maximum levels, caused by loud trucks on the highway, ranged from 54 to 74 dBA, with minimum levels of 28 to 35 dBA. At site M-4, which is notably closer to the highway, the Leq ranged from 52 to 56 dBA Leq, with an L90 ranging from 25 to 29 dBA,

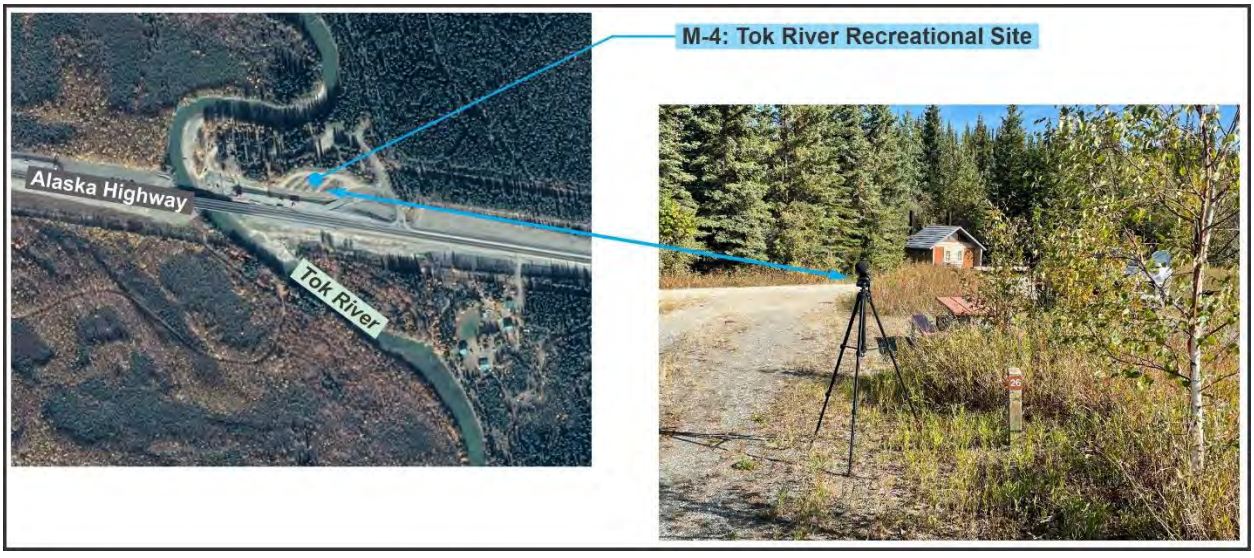
maximum levels of 74 to 76 dBA and minimum levels of 23 to 26 dBA. The loudest levels were from heavy trucks and medium trucks with louder exhausts.

The daily counts across the Tanana Bridge range from around 57 to 77 vehicles per hour during the peak hours of 9:00 am and 11:00 am. Typical daytime hours have total volumes of 40 to 60 vehicles per hour while nighttime and early morning volumes range from 0 to 20 vehicles per hour.

Traffic volumes at the Tok River Recreational Area range from 50 to 62 during daytime hours of 10:00 am to 6:00 pm, with evening and morning volumes of 21 to 13 vehicles. Overnight volumes range from 4 to 13 vehicles per hour.

Figure 7-7. Monitoring Site M-3: Tanana River Historic Site

Figure 7-8. Measurement Sites M-4: Tok River Recreational Site



Measurement sites M-5 through M-9 are all located in or near Tok. Site M-5 was at the Youngs Motel, site M-6 was at the old abandoned Westmark Hotel complex and site M-7 was at the Sourdough Campgrounds, just south of Tok along Highway 1. Site M-8 was on Alaska Highway at Moosehead Road and site M-9 is at the Mukluk Land amusement park, along the highway, west of Tok. The sites are shown in Figures 7-9 through 7-13.

Figure 7-9. Measurement Site M-5: Young's Motel

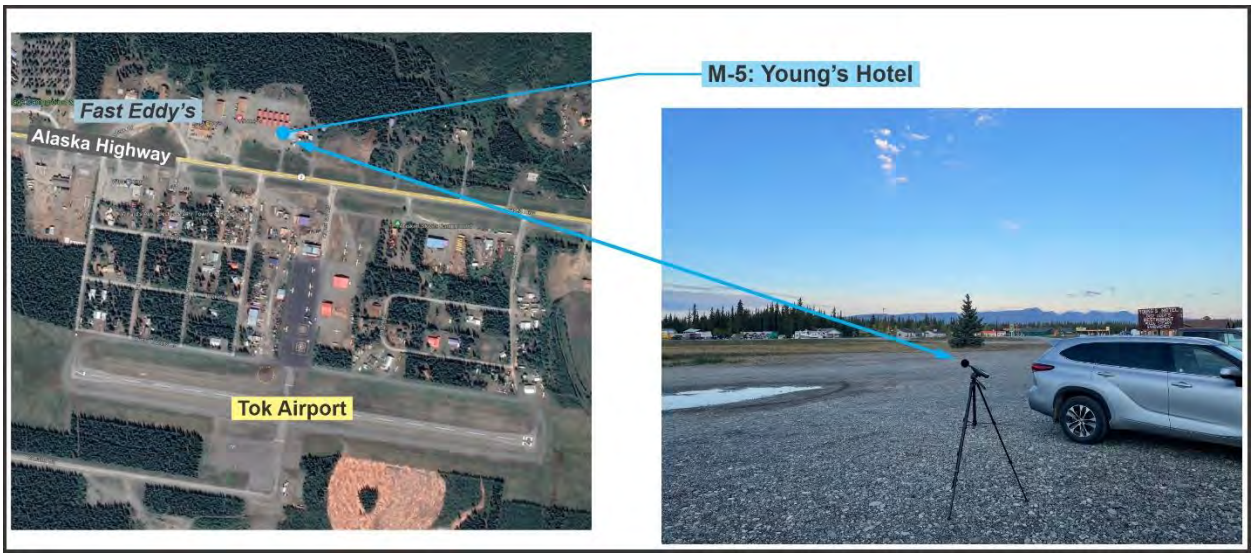


Figure 7-10. Measurement Site M-6: Westmark Hotel

Figure 7-11. Measurement Site M-7: Sourdough Campgrounds

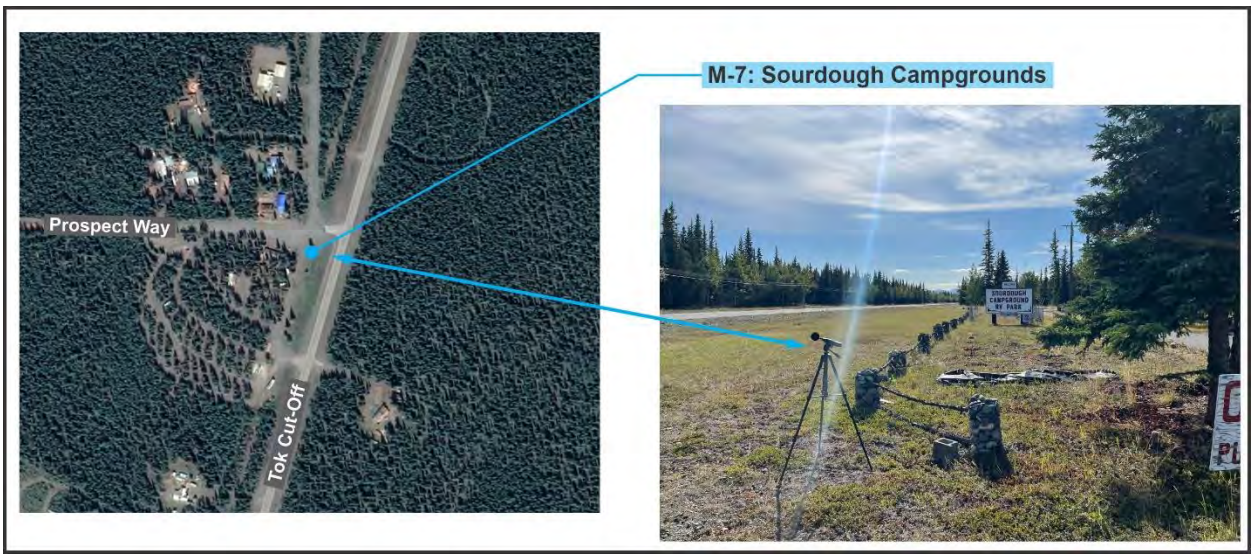


Figure 7-12. Measurement Site M-8: Moosehead Road

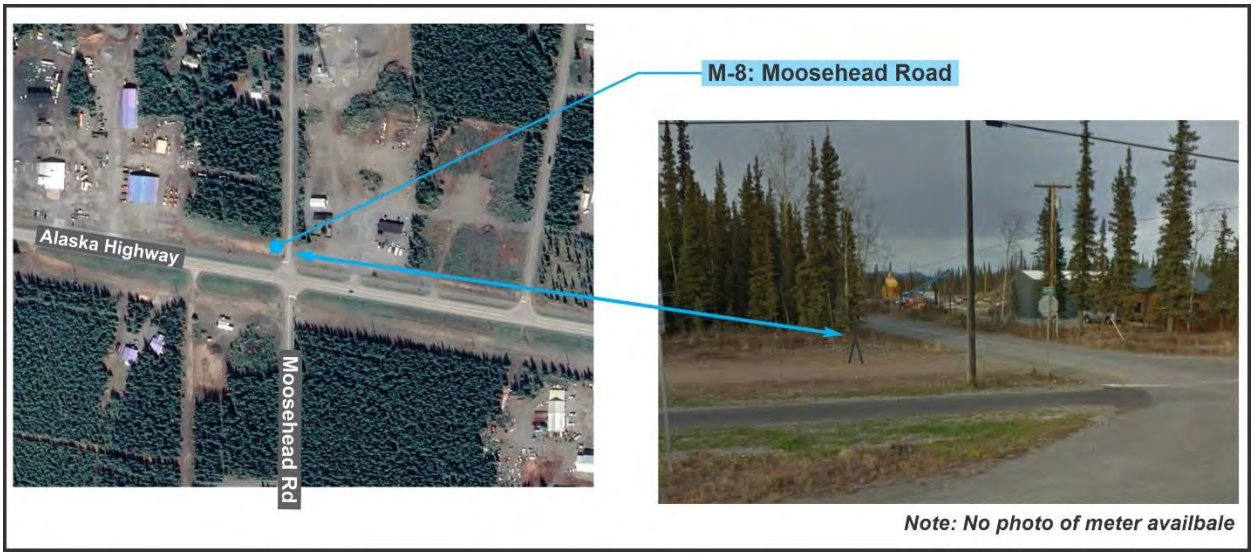
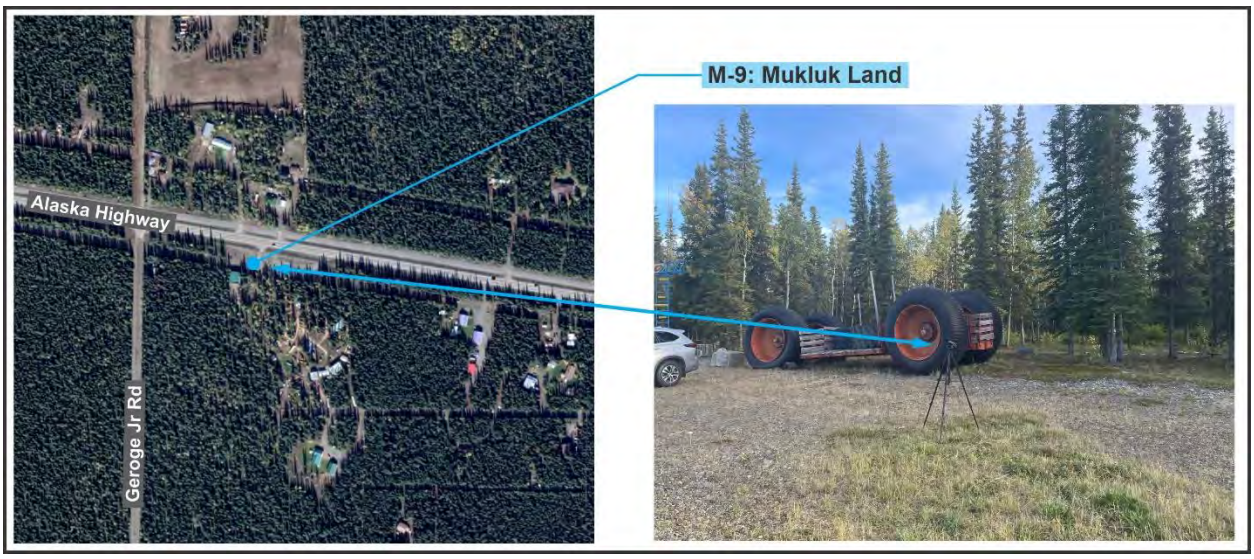


Figure 7-13. Measurement Site M-9: Mukluk Land



Overall, the hourly Leq at these five measurement sites ranged from 39 to 59 dBA Leq. The lowest noise levels were early in the morning or in the late evening (see M-5) where levels ranged from 39 to 46 dBA Leq with L90 levels (also at M-5) that ranged from 25 to 29 dBA. Measurements at the other site, taken between 7:46 am and 8:17 pm, ranged from 53 to 59 dBA, with L90 ranging from 22 to 48 dBA, both are typical noise levels for a small rural town. It is important to note that in Tok other noise sources include commercial and industrial activities, aircraft overflights, residential activities and local ATVs in the summer and snow machines in the winter.

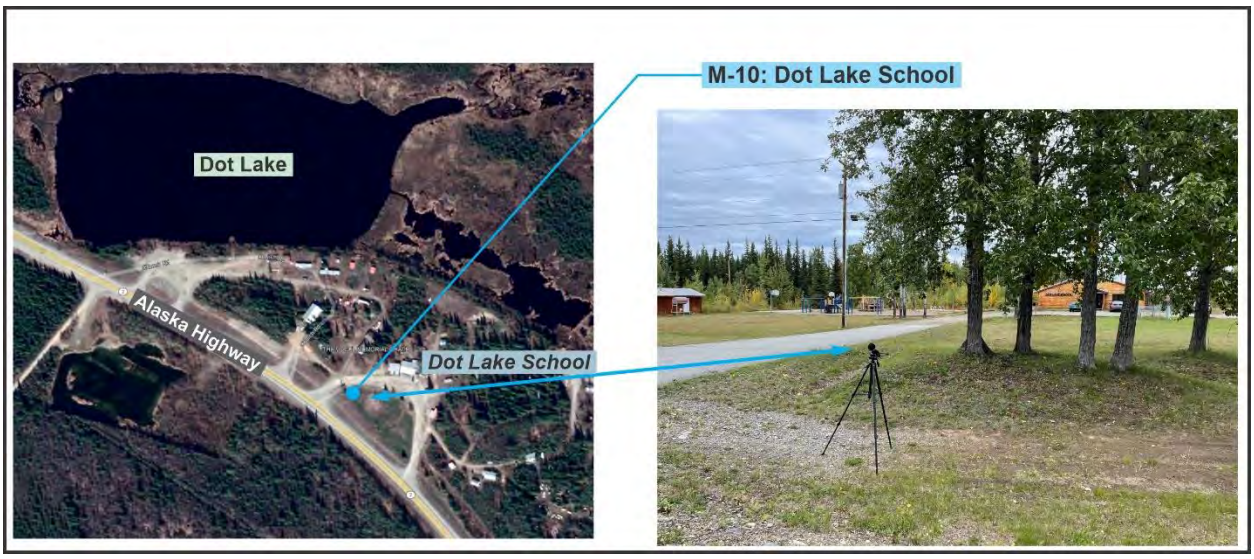
The highest traffic volumes to the east of the Tok Cut-off intersection were around 11:00 am to 5:00 pm where volumes ranged from 100 to 190 vehicles per hour, with evening and morning volumes ranging from approximately 19 to nearly 100 vehicles per hour (5:00 to 7:00 am and 8:00 pm to midnight). Late night volumes range from 2 to 25 vehicles per hour (midnight to 5:00 am).

Traffic along the Tok Cut-Off is lower than along the Alaska Highway, with peak levels of 65 to 100 vehicles per hour and minimum daytime volumes of approximately 20 vehicles per hour. Evening and early morning hours have volumes ranging from 7 to 20 vehicles per hour with nighttime levels of 1 to 5 vehicles per hour.

West of the Tok Cut-Off, near the Tundra RV Park and Bar, average daytime traffic volumes range from 60 to 120, with the highest volumes occurring between 1:00 pm and 5:00 pm. Evening and morning volumes are in the 20 to 50 vehicle per hour range, with nighttime volumes from one to approximately 20 vehicles per hour.

The final measurement site in this segment, M-10, was at the Dot Lake School. West of Tanacross traffic volumes remain fairly constant until just south of Delta Junction, where there is an increase. Because traffic is the main noise source in this part of the Southern Segment, measurements at the school are used to define noise levels throughout this part of the haul route. The measurement site is shown in Figure 7-14.

Figure 7-14. Measurement Site M-10: Dot Lake School



The hourly Leq at Dot Lake School ranged from 53 to 56 dBA, with L90 levels of 27 to 30 dBA. Some aircraft was notable at a distance, but still contributed to the ambient noise in the area. Maximum levels of 74 to 77 dBA were due to trucks passing by, and the minimum levels ranged from 23 to 27 dBA.

Traffic volumes in this segment are low, with peak hours volumes of 30 vehicles and typical daytime volumes of only 5 to 15 vehicles per hour. Evening, early morning and overnight volumes range from 0 to 5 vehicles per hour. The Alaska DOT&PF traffic data also provided vehicle percentages for this highway segment, with 76% passenger vehicle and light trucks, 15% medium trucks and 9% heavy trucks.

7.2.4 Central Segment Noise Measurements and Traffic Data

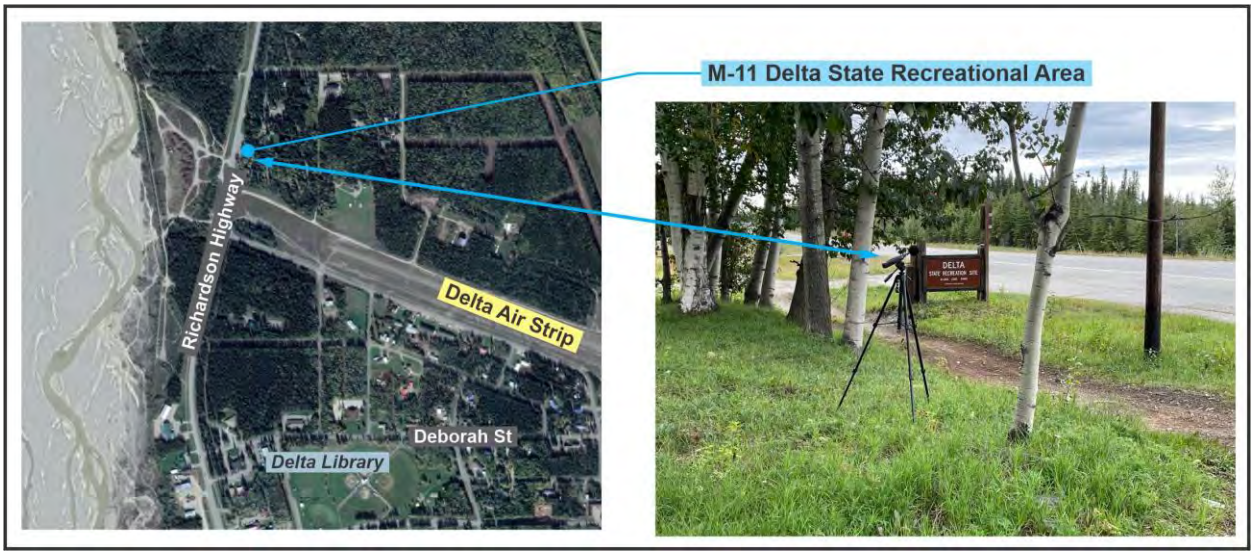
The Central Segment, from northwest of Dot Lake to the Salcha Elementary School had four measurement sites, all measured twice. Site M-11 is just north of the Delta Junction intersection with Highway 4, at the Delta State Recreation Area. Site M-12 was at the entrance to the Quartz Lake State Recreation Area, and site M-13 was along the shore of Birch Lake at the rest stop, with a clear view of many residences located on the lake. Finally, site M-14 is at the Salcha School. The sites were all shown in Figure 7-3, with noise measurements and traffic data provided in Table 7-2 and a discussion of the measurements and traffic volumes following the table. Figures 7-15 to 7-19 are more detailed graphics with photos of the meter.

Table 7-2. Noise Monitoring Results Central Segment (Delta Junction to Salcha)											
Rec#	**Location**	**Date Time**	**Leq**	**Lmin**	**L90**	**L50**	**L10**	**Lmax**	**Cars**	**MT**	**HT**
M-11	Delta State Recreation	8/30/2021 10:05	67.9	29.6	42.3	52.4	71.3	89.9	124	20	4
		8/31/2021 15:59	68.9	28.9	40.7	58.2	73.7	85.5	240	56	8
M-12	Quartz Lake Road	8/30/2021 9:28	60	28.5	32.8	43.4	63.6	78	104	20	4
		9/1/2021 10:14	60.3	36.1	40.8	49.9	64.1	78.5	84	28	4
M-13	Birch Lake Stop	8/30/2021 8:44	58.2	25.7	35.3	47.1	63.4	70.6	68	12	4
		9/1/2021 10:58	58	28.8	32.9	40.8	63.5	72.8	60	24	0
M-14	Salcha School	8/30/2021 8:05	56.7	29.2	31.4	43.7	60.2	76.8	64	12	8
		9/1/2021 11:32	59.8	29.4	33.2	49.7	64.5	76.2	140	40	4

Notes:

1. Receivers shown in Figure 7-3 and 7-15 through 7-19
2. Description of monitoring site
3. Date and start time for the measurement
4. Measured noise level based on descriptor
5. Number of vehicles passing the monitoring site normalized to one hour

Figure 7-15. Monitoring Site M-11



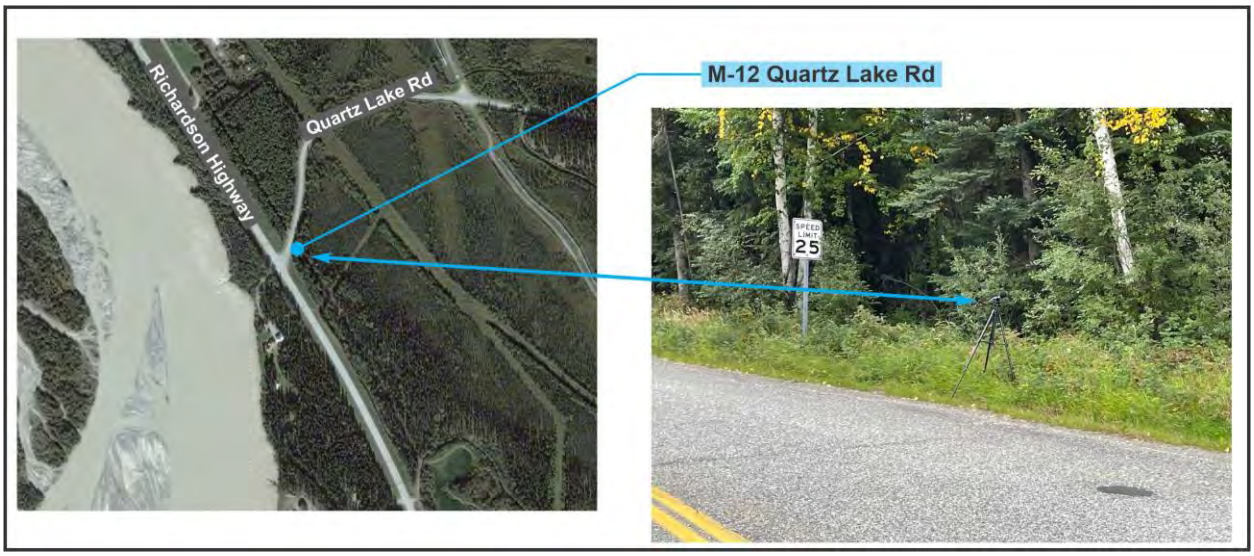
Noise levels are highest near the City of Delta Junction (M-11) where traffic volumes are higher due to the local retail, commercial and industrial land uses and the connection to the Richardson Highway. The measured daytime Leq at the recreation area (M-11) was 68 to 69 dBA, and the L90 was 41 to 42 dBA. Maximum noise levels ranged from 86 to 90 dBA with minimums at 29 to 30 dBA.

Traffic data and counts in this area show that volumes on the Alaska highway north of the Alaska Highway – Richardson Highway intersection, are the highest in the area. A review of three sets of data, one on each of the three highway legs, lists volumes of approaching 400 vehicles per hour to the north

of the intersection, with volumes of 341 on the Richardson Highway, south of the intersection and 215 vehicles per hour to the southeast along the Richardson Highway. Evening and early morning volumes range from approximately 40 to 100 vehicles per hour with late night volumes of only 10 to 50 vehicles per hour.

Two of the three sites also provided vehicle type percentages, with additional truck percentages obtained from a traffic count site farther north along the Alaska Highway. Based on the data, passenger vehicles and light trucks make up approximately 80%, medium trucks 15% and heavy trucks 5%.

Figure 7-16. Monitoring Site M-12



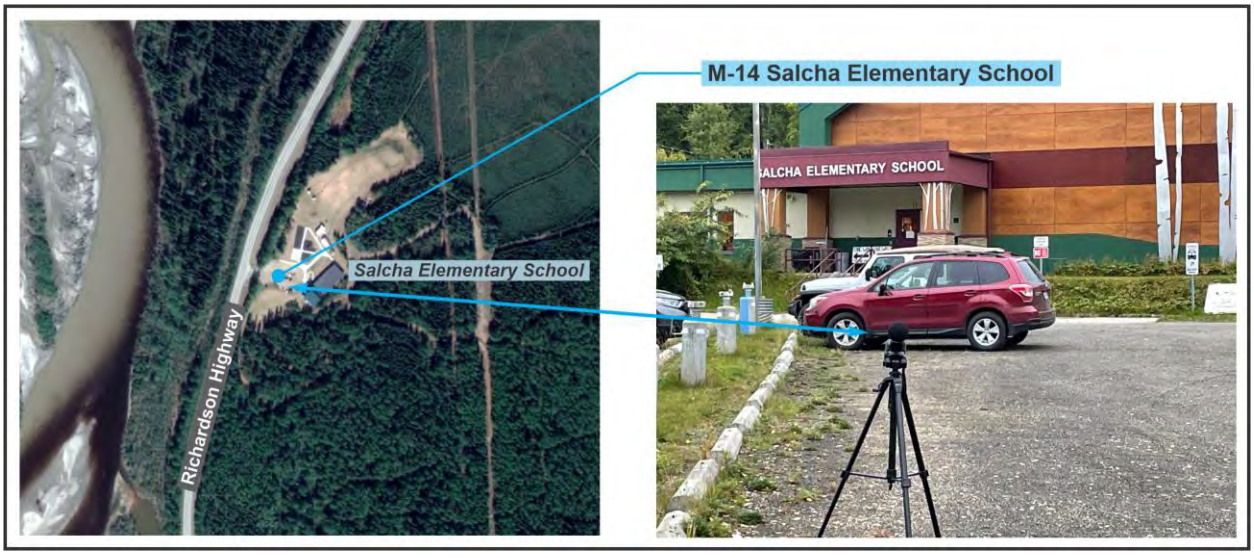
Farther to the northwest, at the entrance to Quartz Lake, the hourly Leq was 60 dBA and the L90 was 33 to 41 dBA. The lower noise levels are due to the lower traffic volumes; however, occasional aircraft was audible during both measurements. The minimum level was 29 to 36 dBA and the maximum levels ranged from 78 to 79 dBA.

Traffic volumes near the Quartz Lake Road are fairly steady during daytime hours, typically ranging from 100 to 140 vehicles per hour from 8:00 am to 6:00 pm. Evening and early morning volumes range from 10 to 55 vehicles per hour, with late night volumes of 2 to 24 vehicles per hour. Vehicle classifications from nearby counts are 81% passenger and light trucks, 11% medium trucks, and 8% heavy trucks.

Figure 7-17. Monitoring Site M-13

Measurements at Birch Lake had identical hourly Leq for both measurements, at 58 dBA Leq. This is due to the similar traffic volumes during both measurements. The L90 ranged from 33 to 35 dBA, the maximum level was 73 dBA, and the minimum level was 26 dBA. Daytime vehicle volumes and the counts agreed, ranging from 50 to 86 vehicles per hour. Evening and morning volumes range from 3 to 25 vehicles per hour, with nighttime volumes of 1 to 16 vehicles per hour.

Figure 7-18. Monitoring Site M-14: Salcha Elementary School



Noise levels at the Salcha Elementary School ranged from 58 to 60 dBA Leq, with L90 noise levels of 31 to 33 dBA. Minimum noise levels during both sessions were 29 dBA and maximum levels were 76 to 77 dBA. Daytime vehicle volumes range from 90 to over 200 vehicles per hour. Evening and morning volumes range from 23 to 60 vehicles per hour, with nighttime volumes of 6 to 37 vehicles per hour.

Vehicle classifications from nearby sites were 75% passenger and light trucks, 20% medium trucks, and 5% heavy trucks.

7.2.5 Northern Segment Noise Measurements and Traffic Data

The Northern Segment had five measurement sites, two sites south of Fairbanks (M-15 and M-16), one just north of Fairbanks (M-17), one near the entrance to NOAA (M-18) and one near the entrance to Fort Knox (M-19). This segment of the haul route has increased population density and corresponding higher traffic volumes throughout the day, evening, and nighttime hours. The higher the existing traffic volumes, the less overall affect the additional highway ore transport trucks will have on the existing noise environment.

Site M-15 is just off Highway 2 south of the Eielson Air Force Base at Springer Road. Site M-16 is farther north in North Pole and Site M-17 is at the Pipeline Viewing area just north of Fairbanks. The NOAA site (M-18) is fairly close to the intersection of Highway 2 and Highway 6 and would be representative of most residences east of the highway intersection. The second site, near the Fort Knox Access Road intersection with Steese Highway (M-19) was selected due to the close proximity to the residences along Pedro Dome Road and Ridge Run Road.

Noise levels at the three sites south of Fairbanks were similar, with Leq noise levels that only ranged from 63 to 67 dBA Leq. North of Fairbanks, closer to Fort Knox, noise levels remain in the upper 60 dB range during daytime hours, with lower levels when traffic volumes reduce during evening and nighttime hours. The L90 levels were lower at Stringer Road, as expected, due to less traffic flow south of the air force base. There was also a period at M-17 when virtually all traffic was absent for a brief period, resulting in the lower L90 for one of the measurement sessions. Overall, the L90 levels ranged from 34 to 54 dBA, with minimums ranging from 31 to 45 dBA. The maximum noise levels ranged from 76 to 89 dBA. The full data set is provided in Table 7-3, and the site are shown in Figure 7-4 and with more detail in Figures 7-19 through 7-23.

Table 7-3. Noise Monitoring Results North Pole Fairbanks Segment

Rec#	Location	Date Time	Leq	Lmin	L90	L50	L10	Lmax	Cars	MT	HT
M-15	Stringer Road	8/30/2021 7:35	65.4	34.4	41.6	58.5	68.9	86.5	124	40	8
		9/1/2021 12:19	62.6	30.7	42.9	54.4	66.8	82.3	168	16	4
M-16	Newby Road	8/30/2021 14:02	67	44.4	53.8	63.5	71	85	632	52	40
		9/1/2021 12:51	64.6	45.3	52.5	60.9	68.4	80.6	520	52	24
M-17	Pipeline Viewing Area	8/29/2021 18:06	62.6	32	36.2	45.3	65.3	81.7	240	80	12
		9/1/2021 14:28	62.7	42.9	51.6	58.7	66.6	76.3	216	24	12
M-18	NOAA	8/29/2021 18:02	65.2	44.8	49.0	58.0	67.0	88.7	96	48	0
		8/30/2021 6:34	67.1	41.7	45.3	58.4	71.8	81.6	264	35	6
M-19	Fort Knox	8/29/2021 17:35	64.4	34.3	39.8	56.4	69.5	78.8	48	16	0
		9/1/2021 13:56	59.1	31.2	33.7	37.3	52.6	83.5	72	0	0

Notes:

1. Receivers shown in Figures 7-4 and 7-19 through 7-21
2. Description of monitoring site
3. Date and start time for the measurement
4. Measured noise level based on descriptor
5. Number of vehicles passing the monitoring site normalized to one hour

Figure 7-19. Monitoring Site M-15: Stringer Road

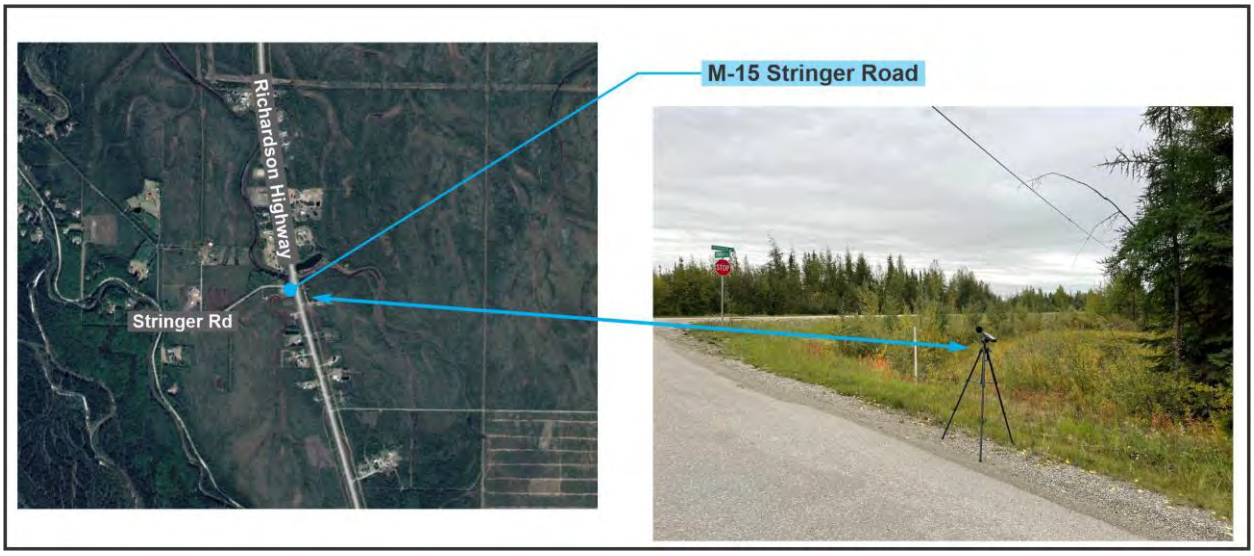


Figure 7-20. Monitoring Site M-16: Newby Road North Pole

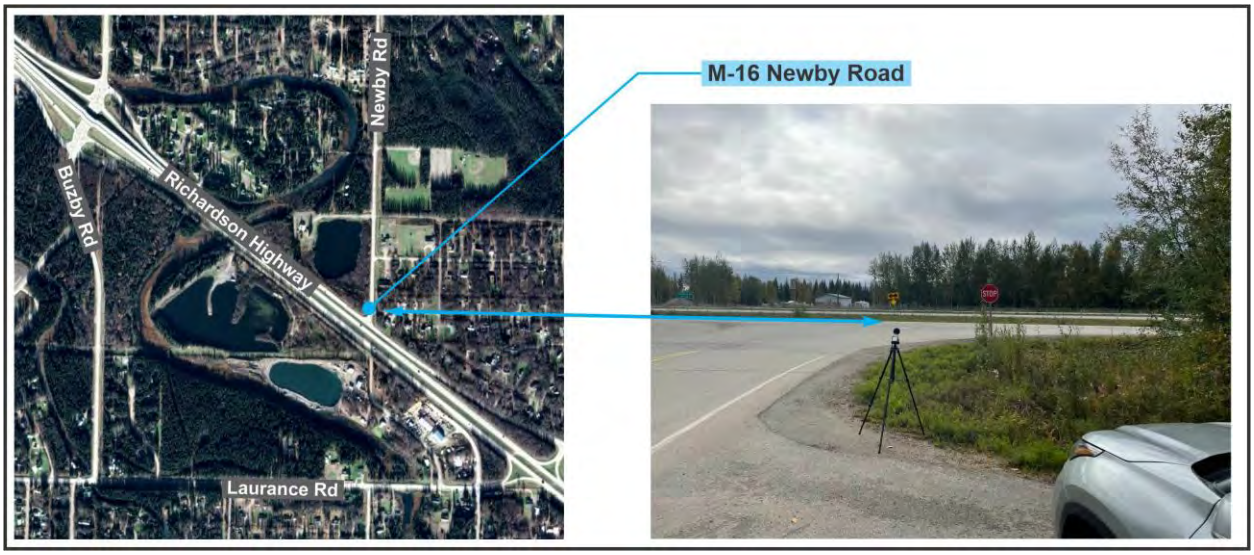
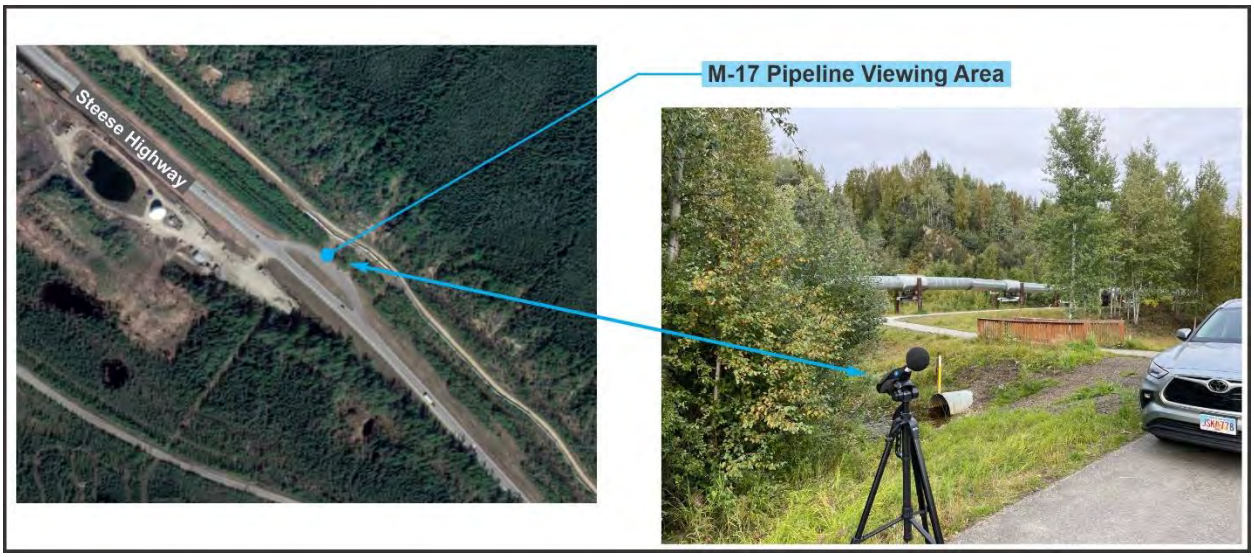


Figure 7-21. Monitoring Site M-17: Pipeline Viewing Area, North of Fairbanks



There is no Alaska DOT&PF traffic data between the M-14 data (Salcha School) and the Eielson Air Force Base, however they are likely similar, but with higher volumes at Stringer Road based on the traffic counts. Farther north, in North Pole, traffic volumes are notable higher than any of the previous volumes for roadways south of this site. Typical peal hour volumes range from 882 to 1189 vehicles per hour, with average daytime volumes of 499 to over 800 vehicles per hour. Early morning and evening volumes range from 150 to 400 vehicles per hour and late night volumes range from 30 to over 300 vehicles per hour. At the pipeline viewing area, peak hours volumes range from 250 vehicles per hour during am peak (7:00 am) to 400 vehicles per hour during pm peak (5:00 pm). Typical daytime volumes

range from 100 to 250 vehicles per hour, early morning and evening range from 41 to 127 vehicles per hour, with late night volumes of 19 to 180 vehicles per hour.

Vehicle percentages for Highway 2 in the North Pole area are 87% passenger vehicles and light trucks, 8% medium trucks and 5% heavy trucks. Volumes of passenger vehicles increases notably through the core of Fairbanks, with 90% passenger vehicles and light trucks, 5% medium trucks and 5% heavy trucks. North of Fairbanks, near the pipeline viewing aera, truck percentages are higher again, with trucks accounting for up to 16% of the total traffic volumes. The vehicle breakdown near site M-17 was 83% passenger vehicles, 8% medium trucks, and 9% heavy trucks.

Figure 7-22. Monitoring Site M-18: NOAA

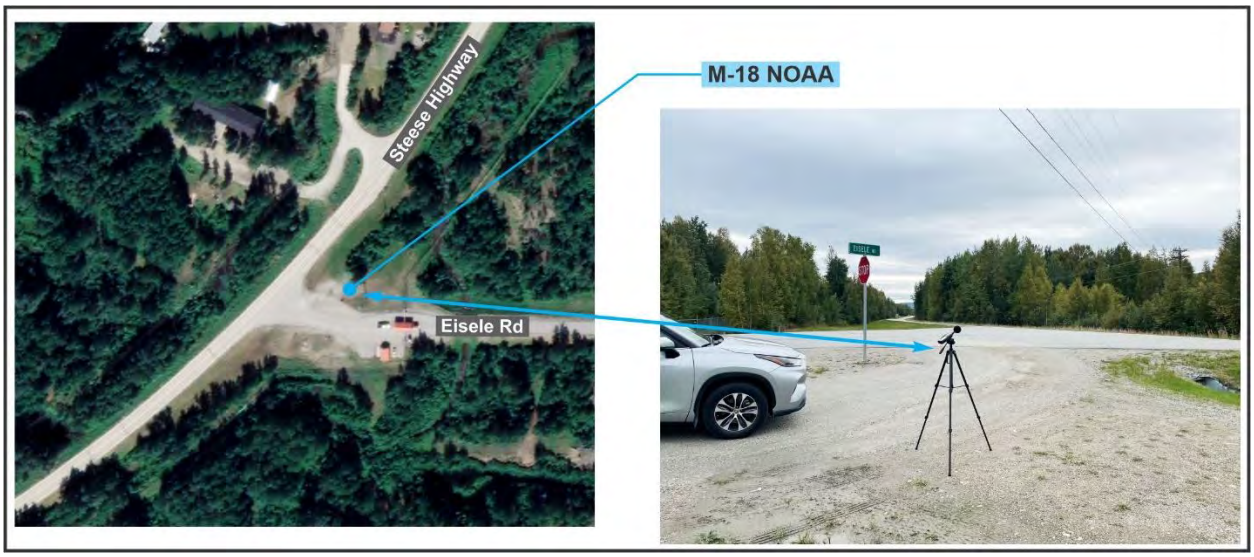
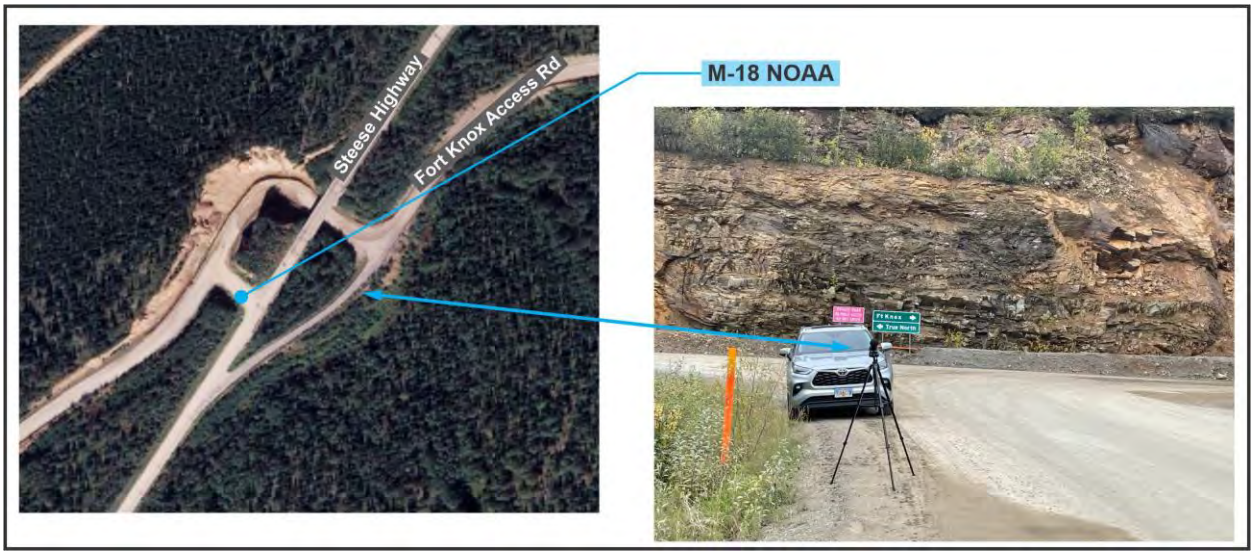


Figure 7-23. Monitoring Site M-19: Fort Knox

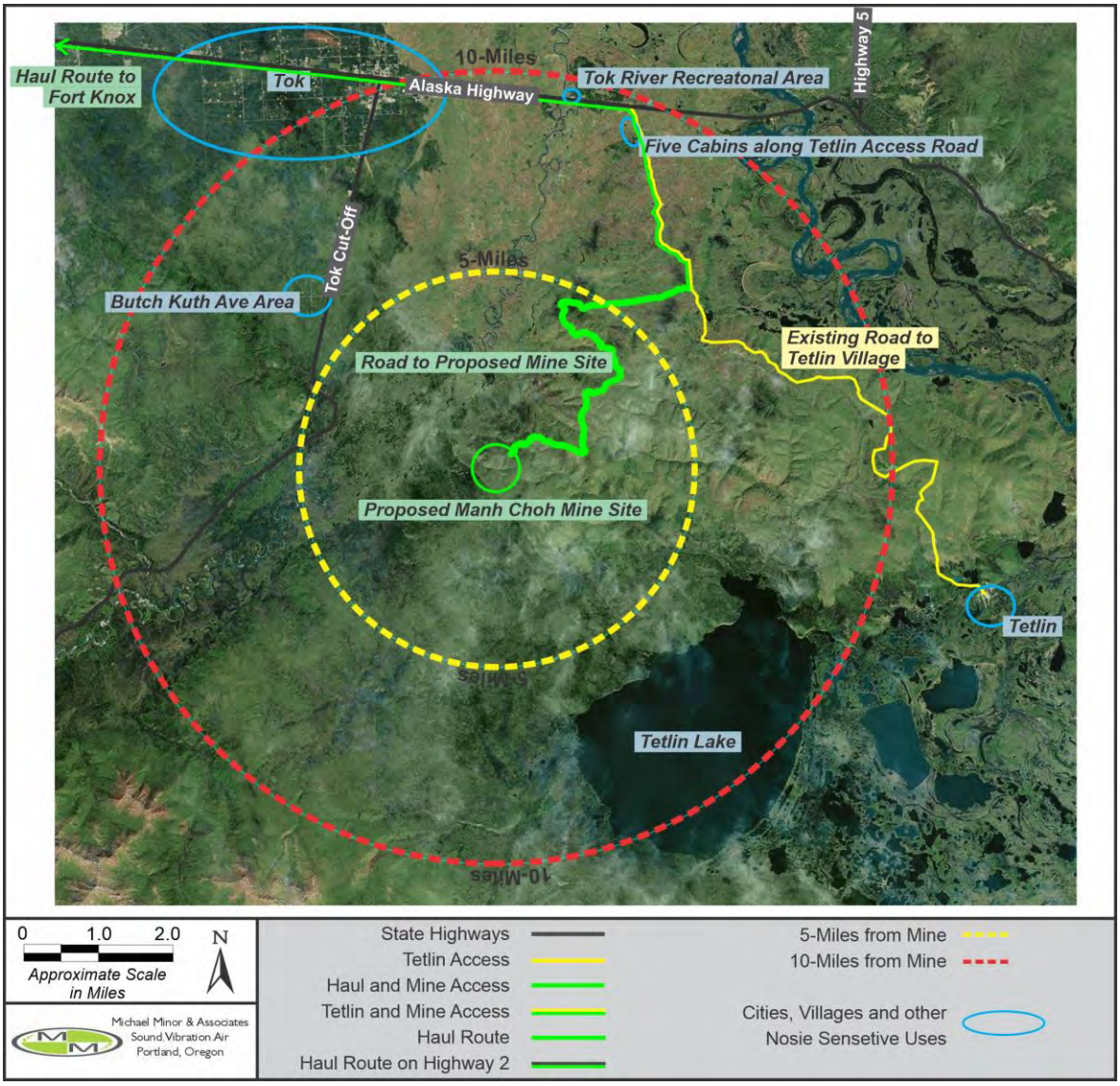


The traffic counts provided in Table 7-3 also shows that the volumes of traffic were much higher at NOAA then at Fort Knox. These traffic counts also agree with the ADOT&PF traffic counts provided in the dashboard output for Highway 6, provided in Attachment B. The daily counts range from around 240 to 275 vehicles per hour during the two peak hours of 6:00 am and 5:00 pm. Typical daytime hours have volumes of 80 to 110 vehicles per hours. Nighttime hours, between 10:00 pm and 5:00 am range from approximately 10 to 15 vehicles per hour at the minimum to 40 to 50 vehicles per hour by 4:00 am, increasing to over 130 by 5:00 am. North of Fox, on the Steese Highway volumes are 80% to 85% passenger vehicles and light trucks, 10% to 15% medium trucks and 5% heavy trucks. Actual percentage depends on proximity to the intersection at Fox.

8 NOISE ANALYSIS METHODS AND ASSUMPTIONS

There are four main components to the noise analysis; general noise from mining operations, highway ore transport trucks travelling to and from Fort Knox, blasting noise, and occasional noise from helicopters used for exploration and surveys. Assumptions for each is provided in the following sections. Figure 8-1 provides a map of the project site, including 5- and 10-mile buffers from the proposed mine, and identifies access roads, nearby towns, villages, and other noise sensitive land uses.

Figure 8-1. Proposed Mine Site and Area Overview



8.1 General Mining Operations

General mining operations, which includes general mining equipment (loaders and other equipment outlined below), employees traveling to and from work (including buses to take general mine workers to

and from Tok), deliveries, and any other mining related work, except blasting and highway ore transport trucks to Fort Knox, are discussed separately.

In order to accurately predict noise levels from production mining, noise modeling was performed using reference noise levels for the proposed mining equipment and information from the proposed Manh Choh Mine. Input to the model used for this analysis included topographical information and computer-aided drafting (CAD) information along with local area surveys. Additional information and assumptions on the proposed mine operations, including highway haul truck frequency and truck types, described below, were also used as input to the modeling effort.

8.1.1 Proposed Mine Site Equipment and Reference Noise Levels

Equipment used for mining operations are similar to those used for large scale buildings, highways, or other major infrastructure projects. One primary difference is mining operations frequently use larger capacity equipment that can transfer larger quantities of material. Table 8-1 provides a listing of the equipment used at the proposed mine site, typical usage factors, and the reference noise levels used in the predictions.

Table 8-1. Equipment Listing, Usage and Sound Levels			
Equipment Name (Representative Model)[1]	**Peak Number[2]**	**Usage Factor[3]**	**Sound Level Leq and (Lmax) dBA (at 50 feet)[4]**
100 ton Haul Trucks (CAT 777G)	15-16	68%	82 – 84 (88)
6.0-7.0 m3 Excavators (CAT 6015-B)	2	68%	80 – 82 (85)
16.0 m3 Face Shovel (CAT 6030FS)	1	68%	82 – 84 (86)
Front-end Loader (CAT 992)	1	68%	80 – 84 (86)
Front-end Loader (CAT 966)	1	68%	77 – 84 (85)
Production Drills (Epiroc DM45)	3	50%	82 – 84 (90)
Pre-split Drill (Epiroc D65)	1	50%	82 – 84 (90)
Primary Dozers (CAT D9)	4	68%	85 – 90 (94)
Support Dozers (CAT D6)	2	50%	81 – 85 (86)
Graders (CAT 16M)	2	68%	86 (91)
Support Graders (CAT12M)	2	50%	72 – 88 (92)
Support / Construction Excavator (CAT 320)	1	50%	80 – 82 (85)
Fuel + Lube Truck (CAT 740 custom box)	1	50%	68 – 76 (78)
Water Truck (CAT 740 custom box)	1	50%	68 – 80 (82)
Custom Box Light Vehicles	4	50%	68 – 76 (78)
F350 Light Vehicles	12	50%	65 – 70 (75)

Notes:

1. Equipment types and typical make and models
2. Number of units at the proposed mine
3. Percentage of time the equipment is typically in use while the proposed mine is open
4. Noise levels, Typical worst-case 15-minute Leq and maximum noise levels (Lmax) from FHWA, FTA and measurements at 50 feet

8.1.2 Proposed Mine Access

There are several different groups of vehicles accessing the proposed mine, including general access for workers, deliveries, and haul trucks making round trips to Fort Knox. The following section outline assumptions used for the traffic noise modeling.

8.1.2.1 Proposed Mine Access, Personnel and Work Force, and Deliveries

Access to the proposed mine will be along a new, and upgraded, roadway from the Alaska Highway with a direct connection to the mine. This same roadway will be used by highway ore transport trucks, workers, and any deliveries to the mine site.

This analysis assumes the mine would operate 24 hours a day, seven day per week. Most workers, approximately 180 total, or 90 per shift, would work 12-hour shifts, with shift changes at 6:00 am and 6:00 pm. The shift change would also require a 45 minute period to transfer workers between the

proposed mine site and Tok. Some shift changes will be staggered to allow for bus transfers and staggered eating times in the kitchen. Blasting could occur during the shift changes.

There is also a potential for a worker's barracks located south of Tok, or potentially somewhere in Tok. Most workers would likely be transferred to and from the mine using 2 to 3 school buses, reducing the overall traffic along the roadway to and from the proposed mine. However, there is an estimated 15 to 20 support and technical staff would also work at the proposed mine who may use private vehicles and carpooling for access. These support and technical staff would most likely work at the mine during normal daytime hours.

Summary for proposed Manh Choh Mine related traffic:

- Three school type buses round trips twice daily during shift changes
- Ten passenger vehicles and/or light trucks round trip twice daily during normal daytime hours
- Five round trip commercial delivery vehicles daily

8.1.2.2 **Haul Trucks**

All highway ore transport trucks will be public roadway legal vehicles and be required to meet all manufacture requirements from the EPA. The tractor units will be similar to a Kenworth T-880, with 500 to 600 horsepower engines. The haul systems (tractor and trailers) will look similar to the haul trucks currently in use at the Red Chris Mine and the Silver Tip Mine, located in northern British Columbia, Canada just south of the Yukon border. A typical haul system is shown in the photo to the right.

Typical Haul Trucks for Transporting Material to Fort Knox

Current production assumptions include an average of 4,000 ton per day. Each truck can haul 45 ton per trip for an estimated 90 round trips per day. This totals to 180 one-way trips per day. Over a 24 hour period, 180 one-way trips is the equivalent of a truck passing in each direction every 8 minutes.

These trucks produce similar noise levels as other heavy trucks currently operating along the entire haul route. At 50 to 55 mph, the trucks produce approximately 84 to 86 dBA Lmax during a pass-by. This noise level is consistent with the limits provide in Table 6-4, *Anchorage Motor Vehicle Noise Emissions Standards.*

Summary Highway Haul Truck

- Current Plan: Four highway ore transport trucks departing the mine per hour, for a total of eight highway haul truck round trips per hour. Operations continue for 24 hours per day, seven day per week.

8.1.3 **Blasting**

Noise levels for the surface blasting are taken from U.S. Bureau of Mines Offices of Mining Reclamation and Enforcement (Rosenthal, 1987), measured data from similar blasts, and information on the blasting to be performed at the proposed Manh Choh Mine. Current estimate of blasting during peak mining

would likely occur once per day with approximately 15 tons of explosive. Alternative blast schedules could include the use of up to 30 tons of explosive every other day, or up to 40 tons of explosive every third day. Since the loudness is directly proportional to the mass of explosives, the higher the tonnage the louder the noise level. However, the actual difference in decibels between a 15 ton and 40 ton explosion would be approximately 4 to 5 dB. To aid in understanding blast noise levels in the closest communities, projections were performed for the worst-case scenario.

8.1.4 Helicopters

Helicopters are used infrequently between Anchorage, where the helicopters are based, and the proposed mine location. These flights would occur during daylight hours and would be used to transport equipment and personnel to the mine. During the initial mining phase, flights could occur up to twice per month, however that is expected to be reduced to approximately eight flights yearly, or two flights every three months. The helicopters will be Airbus Type H125 or other similar standard light utility helicopters. Given the low number of flights, helicopter operations are not expected to be a notable source of community noise.

9 NOISE IMPACT ANALYSIS

Each of the notable sources described above, mine access, mine operations, blasting, and truck haul to Fort Knox, were reviewed for potential noise impacts. A cumulative analysis is provided at the end of this section.

9.1 MINE OPERATIONS

The proposed Manh Choh mine is located over six miles from any noise sensitive properties, with significant topographical conditions and dense forest providing additional noise reduction. Therefore, much of the noise from the proposed mine will not normally be audible in the communities of Tok, Tetlin Village, or other noise sensitive land uses. The nearest residences identified are located in the Butch Kuth Avenue area, south of Tok, along the Tok Cut-Off Highway. Several residences were identified in this area, with the closest at 35,071 feet (6.6 miles) from the proposed mine.

Assuming that ten of the 100 ton mine haul trucks, along with all of the other equipment in Table 7-1, are in continuous operation producing the Lmax level, the total noise levels at 50 feet would be 102.8 dBA. The assumption of 10 of the 100 ton mine trucks operations simultaneously is based on 68% of the 15 to 16 trucks that could be in used during peak mining. Also, by assuming all other equipment is also in operation and using the Lmax, or the loudest one-second typically produced by each piece of equipment, this is a worst-case prediction of noise levels.

Noise levels at any distance from the mine can be predicted using standard acoustical formulas for sound propagation with a correction factor for ground cover attenuation:

$$Sound\ Level\ at\ Distance\ D = Reference\ Level\ in\ dBA - 20 * Log_{10}\left(\frac{D}{D_o}\right) - G * 10 * Log_{10}\left(\frac{D}{D_o}\right)$$

Where:

- *Reference Level = 102.8 dBA*
- *D = distance to the receiver in question*
- *D_0 = reference distance of 50 feet*
- *G = ground cover, 1 = soft field grass with dense foliage, .66 = soft grass or light snow, 0 = pavement or water*

The first part of the equation; "$-20 * Log_{10}\left(\frac{D}{D_o}\right)$" is the standard formula for the atmospheric noise reduction, and second part; "$-G * 10 * Log_{10}\left(\frac{D}{D_o}\right)$" is the standard formula for ground cover attenuation.

Using these formulas, and the reference noise level above, operational noise levels from the mine were predicted using two different levels of ground shielding factors, one to represent periods of dense foliage during spring and summer months (G = 1), and a second, with a lower ground cover factor, to represent the periods of temperature inversions and snow cover (G = 0.66). Note that in many cases snow can dampen noise and act more like a like a semi-soft ground cover than a hard ground cover, like pavement or water.

This analysis did not account for the noise reducing effects of topographical conditions between the mine site and the noise sensitive receivers. However, because the topographical conditions between the mine and the nearby areas vary from site to site, the level of noise reduction would also be expected to vary. For example, the community of Tetlin Village appears to have the most shielding from mine related noise due to the continuous rolling hillsides between the mine and the community. For the communities of Tok and residences in the Butch Kuth Avenue area, less overall reduction would be expected as these

two locations are downhill in a valley from the proposed mine and may have at least a partial line of site toward the proposed mine.

The analysis was performed for the nearest residential area (Butch Kuth Avenue), Tetlin Village, Tok High School, the Tok River Recreational Area, and a group of cabins, approximately 1/2 to 3/4 of a mile from the Alaska Highway, along the Tetlin Village Road, (denoted Mine Receiver R-1 through R-5). For the cabins (R-5) the nearest cabin to the mine was used for all five residences, although at these distances, all cabins would be expected to have approximately the same noise level. The locations of the modeling sites are shown in Figure 9-1. Tables 9-1 and 9-2 provide the results of the analysis.

Figure 9-1. Analysis Sites for Mine Operational Noise Projections

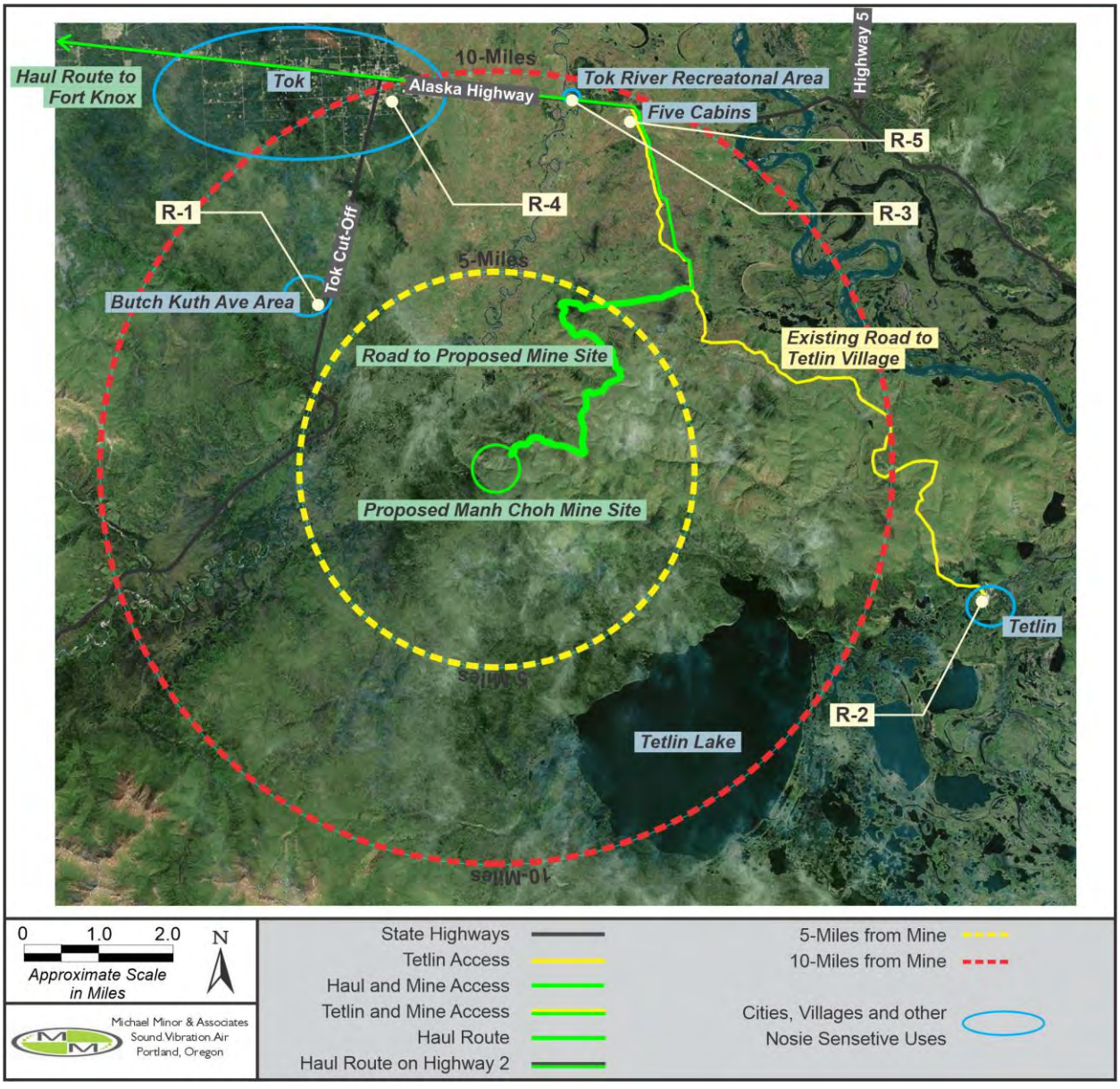


Table 9-1. Mine Noise Levels Soft Site with Dense Foliage

ID#[1]	Description[2]	Dist.[3]	Background Level (L90 dBA)[4]	Operational Noise (Lmax dBA)[5]	Total Noise[6]	Change in Decibels[7]
R-1	Butch Kuth Ave Area	35,071	23.0	17.4	24.1	+1.1
R-2	Tetlin Village	66,172	22.0	9.1	22.2	+0.2
R-3	Tok River Recreation Area	54,935	26.9	11.6	27.0	+0.1
R-4	Tok High School	55,737	35.6	11.4	35.6	+0.0
R-5	Cabins: Tetlin Village Rd	52,172	24.0	12.2	24.3	+0.3

Notes:

1. See Figure 9-1 for location of receivers
2. General description of the area used for the analysis
3. Distance from mine site to the area in the analysis
4. Background levels are the average measured L90 at the location closest to, or best representing, the analysis site
5. Operational noise level from the mine with standard acoustical absorption and additional attenuation from foliage and trees
6. Total noise, existing noise level plus noise from the mine operations
7. Increase in noise from the mine operations

Table 9-2. Mine Noise Levels Soft Site

ID#[1]	Description[2]	Dist.[3]	Background Level (L90)[4]	Operational Noise[5]	Total Noise[6]	Change in Decibels[7]
R-1	Butch Kuth Ave Area	35,071	23.0	27.1	28.5	+5.5
R-2	Tetlin Village	66,172	22.0	19.8	24.0	+2.0
R-3	Tok River Recreation Area	54,935	26.9	21.9	28.1	+1.2
R-4	Tok High School	55,737	35.6	21.7	35.8	+0.2
R-5	Cabins: Tetlin Village Rd	52,172	24.0	22.5	26.3	+2.3

Notes:

1. See Figure 9-1 for location of receivers
2. General description of the area used for the analysis
3. Distance in feet from mine site to the area in the analysis
4. Background levels are the average measured L90 at the location closest to, or best representing, the analysis site
5. Operational noise level from the mine with standard acoustical absorption and additional attenuation from foliage and trees
6. Total noise, existing noise level plus noise from the mine operations
7. Increase in noise from the mine operations

The predicted noise levels show that, with the exception of the Butch Kuth Avenue area, all noise level increases would be approximately 2 dB or less, an amount that this not typically noticeable to an average person. In addition, the predictions are conservative, assume maximum noise from all equipment operating simultaneously (which is not likely to ever happen), assumes a direct line-of-sight placement, and did not account for any topographical shielding. Therefore, it is unlikely that noise from the operation of the mine itself will be noticeable in most residential and noise sensitive areas surrounding the proposed mine. During periods of low pressure and/or inversions, with wind assistance, it may be possible to notice noise from the mine, but only likely in the absence of other noise sources.

9.2 Traffic Noise

Access to the proposed mine along the new access roadway south of the Alaska Highway is not near any noise sensitive properties. However, for the Fort Knox round-trip highway ore transport trucks, workers, and deliveries, primary access would be along the Alaska Highway from Tok to the proposed mine access road. To provide an understanding of the change in noise levels along the haul routes from mine related vehicles, traffic noise modeling using the FHWA Traffic Noise Model (TNM) was performed.

Noise emission levels used in the model were nationwide averages for automobiles (including light trucks at times), medium trucks, and heavy trucks provided by the FHWA and built into the TNM. Due to the length of the corridor, 18 individual areas were selected for noise modeling. The locations were selected based on the changing traffic volumes, which are highest near and in Fairbanks, to the lowest near more rural areas like Dot Lake School and the Tok River recreation area. Model traffic input includes traffic volumes, vehicle types, and speed information for the existing conditions obtained from the ADOT&PF as previously described. Each of the model areas were evaluated for noise-reducing effects of topography and dense foliage. Actual roadway widths and average pavement type were used for all highway travel.

The 18 traffic noise modeling areas for truck traffic include (from south to north):

1. Tetlin Village Road and Tok River Recreation Area
2. Tok
3. Dot Lake School and area
4. South of Delta Junction
5. Delta Junction
6. Quartz Lake Area
7. Birch Lake Area
8. Salcha School and Harding Lake Area
9. Stringer Road and areas south of the Eielson Airforce Base
10. North of Eielson Airforce Base
11. North Pole
12. Fort Wainwright
13. 15th Avenue Fairbanks and Fort Wainwright
14. Bentley Island and Clay Cemetery
15. North Fairbanks Joyce Road Area
16. Chena Hot Springs Road
17. NOAA area
18. Fort Knox Access, Pedro Dome Road and Ridge Run Road area

For each of the 18 sites, three modeling periods were selected:

- 2:00 am: This is, on average, the hour with the lowest traffic volumes throughout the haul route from the proposed Manh Choh Mine to Fort Knox.
- 2:00 pm: This is a typical daytime hour, not usually the peak traffic hour, but also not one of the lowest ones.
- 10:00 pm: The 10:00 pm was selected to represent the late evening hours when most people are beginning to retire for the evening. This period also has notable lower volumes of traffic then daytime hours and is also representative of the early morning hours of 5:00 am to 6:00 am.

For each of the 18 models, all three of the above traffic scenarios was used as input to TNM. All models used posted speed limits and included tree zones in those areas where dense forest is dominate. The modeling effort did not include structural shielding that would occur in most cities, towns, and boroughs. In these areas, the first rows of homes and/or business that are located between a second row receiver and the highway can reduce the noise at that second row receiver by 3 to 7 dB or more.

Finally, the modeling effort only includes noise from traffic on the haul routes. The Tok Cut-Off was included in the models for the Tok areas, and the Richardson Highway (AK 4) was included in the Delta Junction area modeling. The modeling for the Fort Knox area included the Fort Knox access road along with the access road to Cleary Summit. All other modeling only included the Alaska Highway or the Steese Highway. Also, because the models only include traffic, noise from other non-traffic related noise sources would further lower the increases in total noise from the project. For example, noise from commercial and industrial activities along with aircraft, snow machines, ATVs, construction, and other noise sources are not reflected in these comparisons. Signalized intersections were included where applicable to model for acceleration noise.

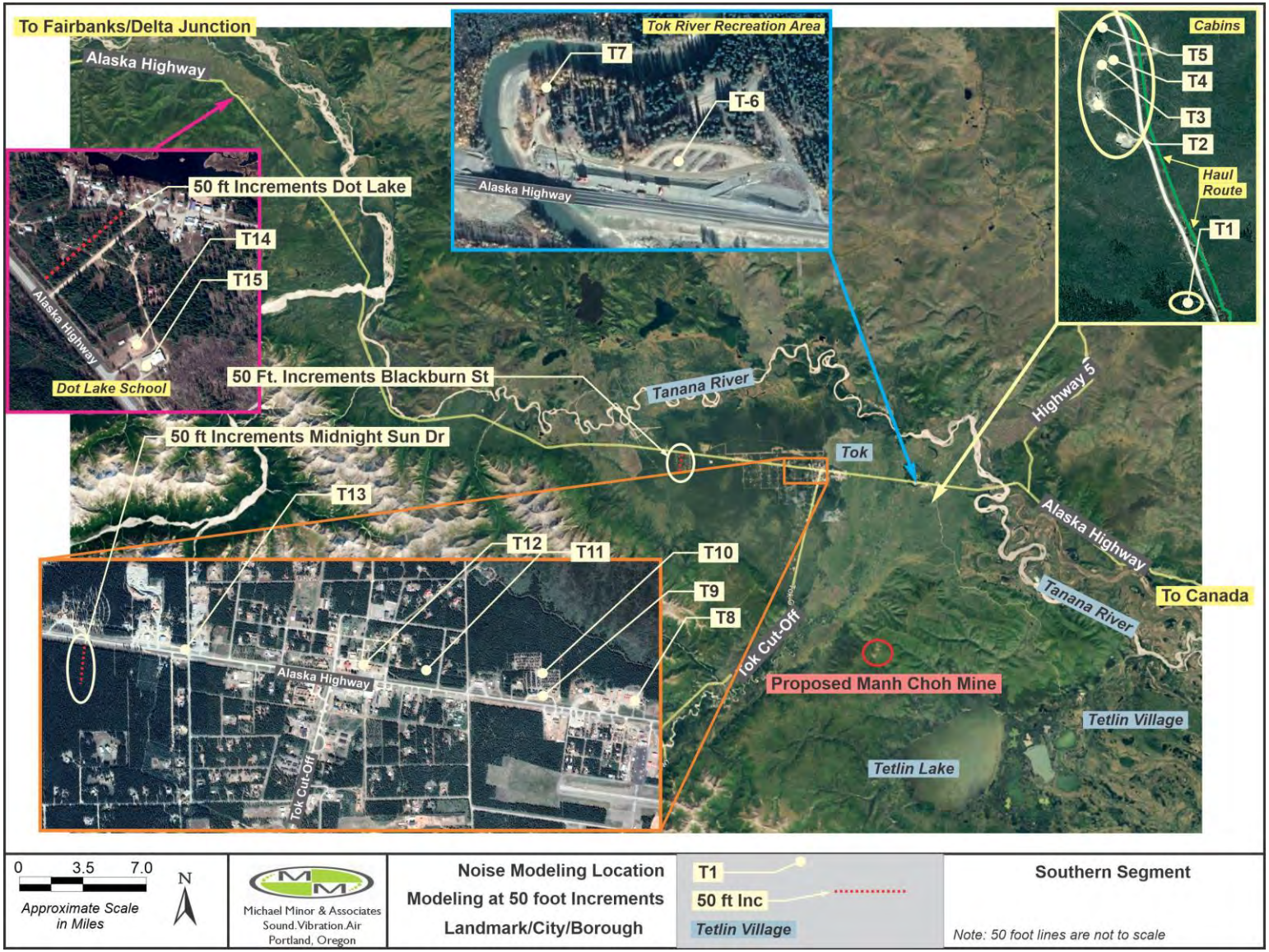
To determine the effect of the haul route, all 18 modes were updated with an extra eight heavy highway ore transport trucks per hour (four in each direction). For noise modeling sites located between Tok and the Tetlin Access Road, the analysis also assumed an extra three school buses (modeled as medium trucks) and 20 passenger vehicles in addition to the highway ore transport trucks. The modeling was performed for specific locations and also used to derive sound level versus distance from the highway, allowing predictions along the entire corridor. This latter is performed by locating receivers in 50 foot increments from the shoulder of the highway to 750 feet, a distance where traffic noise becomes negligible. By comparing the traffic noise levels without the proposed mine to the traffic noise levels with the mine, the change in noise levels can be calculated. The change in noise level was used to determine the effect of the highway ore transport trucks for most communities along the haul routes because the overall traffic noise levels, even with the haul trucks, are well below the FHWA and ADOT& PF regulations.

9.2.1 Southern Segment Traffic Noise

To provide and aid in the understanding of the potential noise increases related to the highway ore transport trucks, individual receivers were located at the five cabins located along Tetlin Road, between 1000 and 3900 feet from the Alaska Highway. Additional receivers were also placed at the Tok River Recreation Area, with several additional representative receiver sites in Tok and two locations at the Dot Lake School.

In addition to the selected representative receivers, propagation receivers from 50 to 750 feet from the haul route (on the Alaska Highway) were included near the west end of Tok between West C Street and Midnight Sun Drive, and outside of Tok between Backburn Street and Pineridge Road. Propagation receivers were also located in the Dot Lake Community. Receivers used in the modeling for this segment are provided in Figure 9-2.

Figure 9-2 Southern Segment Noise Modeling Locations



Unlike all other receivers along the haul routes, which are adjacent to a state highway, the five cabins are along Tetlin Road, and are all over 1000 feet from the Alaska Highway. Therefore, the main noise source would be vehicles using the Tetlin Road. Each of the cabins was modeled separately (T1 through T5) and are shown on the inset in Figure 9-2. Existing noise levels for the 2:00 am period was taken from measured noise levels in Tetlin, with corrections for those cabins closest to the Alaska Highway, ranging from 24 dBA Leq to 28 dBA Leq. Operation of the highway ore transport trucks are predicted to increase the hourly Leq by 10 to 19 dBA at the five cabins, with the highest increase at receiver T1. Nighttime noise levels of 35 to 43 dBA Leq can be expected at the cabins.

Daytime noise levels for 2:00 pm, which also included the three school buses and added passenger vehicle traffic, could increase noise levels by 10 to 11 dB, with peak daytime noise levels ranging from 35 to 44 dBA Leq. Noise levels in the evening hours with the highway ore transport trucks are predicted to increase by 10 to 17 dBA, again the highest increase was at receiver T1, farthest from the Alaska Highway. Traffic noise levels during evening hours would range from 35 to 43 dBA Leq at the cabins. Table 9-3 provides the modeling results for the three periods at each of the five cabins and Figure 9-2 shows the locations of the cabins.

Table 9-3. Tetlin Road Traffic Noise Levels: Without/With Highway Ore Transport Trucks

		2:00 am Noise Levels[3]			2:00 pm Noise Levels[4]			10:00 pm Noise Levels[5]		
Site[1]	**Description[2]**	**Exist**	**W/Trk**	**Chg**	**Exist**	**W/Trk**	**Chg**	**Exist**	**W/Trk**	**Chg**
T1	Cabin (3900 ft)	24	43	19	32	43	11	26	43	17
T2	Cabin (1900 ft)	25	35	10	25	35	10	25	35	10
T3	Cabin (1500 ft)	26	38	12	27	38	11	26	38	12
T4	Cabin (1500 ft)	26	42	16	32	43	11	26	43	17
T5	Cabin (1000 ft)	28	43	15	34	44	10	28	43	15
Minimum		24	35	10	25	35	10	25	35	10
Maximum		28	43	19	34	44	11	28	43	17

Notes:

1. See Figure 9-2 for location of receivers; T-1 through T-5 also include approximate distance in feet to the Alaska Highway for reference
2. General description of the modeling area
3. Noise levels at 2:00 am based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
4. Noise levels at 2:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
5. Noise levels at 10:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic

As for the other receivers in this analysis, the highest increase in noise also occurred during the 2:00 am period, where worst case increases of 7 to 8 dB could occur. The existing modeled traffic noise level could increase from 31 to 46 dBA Leq to 38 to 53 dBA Leq for receivers along the Alaska Highway. These noise levels are still relatively quiet noise levels and for most receivers, located more than 100 feet from the Alaska Highway, noise levels associated with the highway ore transport trucks will be below 48 dBA Leq.

During daytime hours, the change in noise levels would be far less notable, ranging from 0 to 2 dB. During daytime hours where traffic volumes are higher, ranging from 44 to 57 dBA Leq, the addition of the highway ore transport trucks only increases the noise levels to 45 to 58 dBA Leq. Finally, during the evening hours, after 10:00 pm, the increase in noise is predicted to range from 3 to 6 dB. Slightly higher evening traffic volumes produce an hourly Leq of 37 to 48 dBA, which could increase to 40 to 53 dBA with the highway ore transport trucks.

Table 9-4 provides a list of the specific locations and the modeling results for the three periods and Figure 9-2 showed the locations. Attachment C provides tables with modeled noise levels in 50 foot increments, from 50 feet to 750 feet, at the west end of Tok between West C Street and Midnight Sun Drive, outside of Tok, between Backburn Street and Pineridge Road, and in the Dot Lake Community. The data at all three sites is consistent with the information discussed above. In general, maximum increases of up to 8 dB can be expected west of Tok and in the Dot Lake Community during overnight hours. This will reduce to 3 to 6 dB during morning and evening hours. During daytime hours, noise levels are not predicted to increase by more than 1 to 2 dB.

Table 9-4. Southern Segment Traffic Noise Levels: Without/With Highway Ore Transport Trucks

		2:00 am Noise Levels[3]			2:00 pm Noise Levels[4]			10:00 pm Noise Levels[5]		
Site[1]	Description[2]	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
T6	Tok River Site 26	46	53	7	57	58	1	48	53	5
T7	Tok River Near River	40	47	7	50	52	2	41	47	6
T8	Youngs Motel	36	43	7	50	51	1	42	45	3
T9	Tok RV Village Office	41	48	7	55	55	0	47	50	3
T10	Tok RV Village RV	34	41	7	47	48	1	40	43	3
T11	E Slana Ave; E 3rd St.	31	38	7	44	45	1	37	40	3
T12	E Slana Ave; W 2nd St.	34	42	8	44	46	2	38	43	5
T13	Moosehead 80 ft. to Rd	44	52	8	54	56	2	48	53	5
T14	Dot Lake Playground	38	46	8	47	49	2	41	47	6
T15	Dot Lake School	41	49	8	50	52	2	44	50	6
Minimum		**31**	**38**	**7**	**44**	**45**	**0**	**37**	**40**	**3**
Maximum		**46**	**53**	**8**	**57**	**58**	**2**	**48**	**53**	**6**

Notes:

1. See Figure 9-2 for location of receivers
2. General description of the modeling area
3. Noise levels at 2:00 am based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
4. Noise levels at 2:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
5. Noise levels at 10:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic

Noise levels at the five cabins will see the highest increase in overall noise levels with operation of the highway ore transport trucks. Due to the lack of any notable existing noise source, increases of up to 19 dB over the background nighttime noise levels could be expected at T1. However, the overall noise levels of 35 dBA Leq to 43 dBA Leq (increasing to 44 dBA Leq during peak daytime hours) are typically considered acceptable for a rural residential area. For comparison, the existing nighttime noise levels in Tok ranged from 31 dBA Leq to 46 dBA Leq.

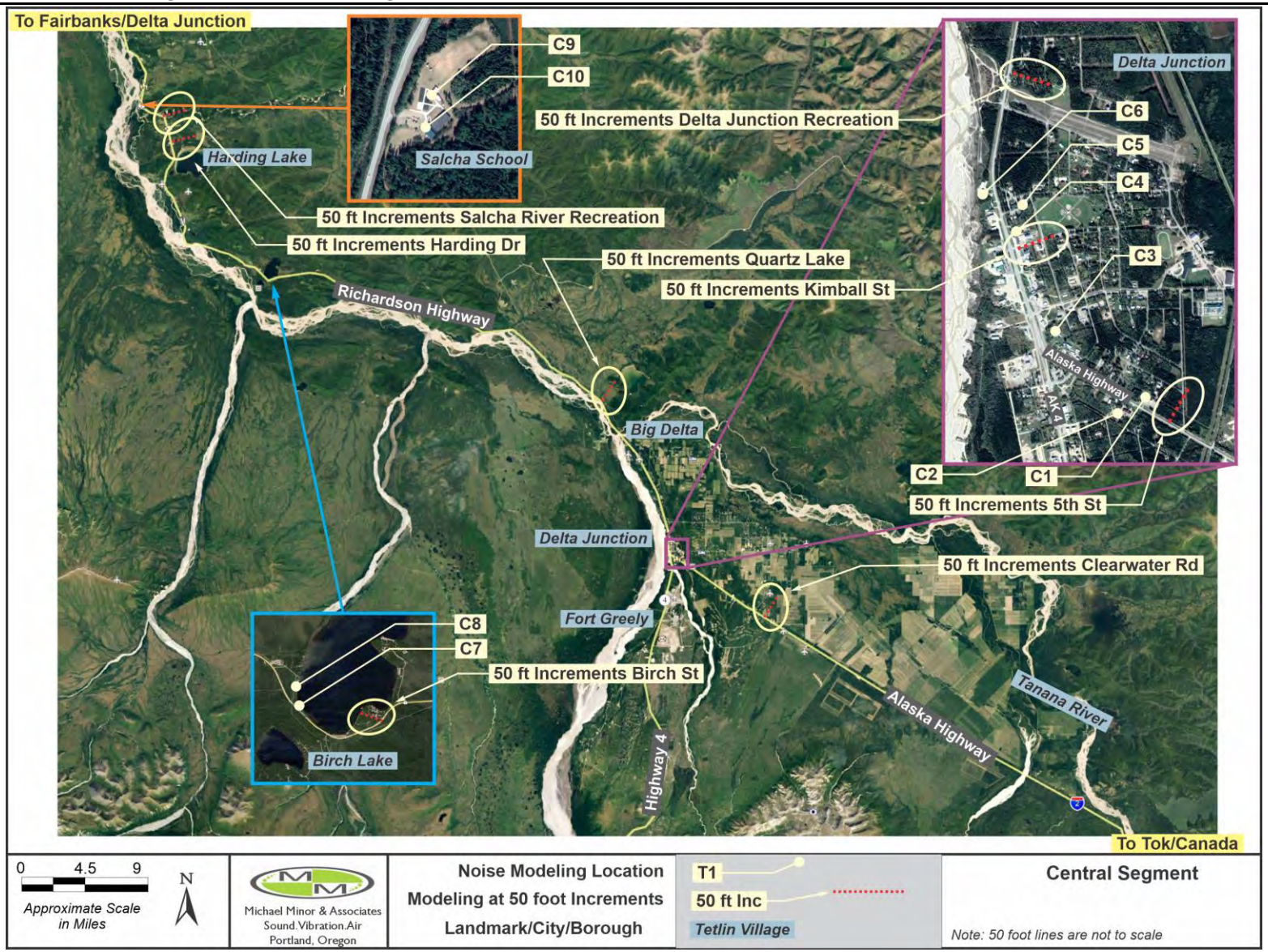
For receivers along the Alaska Highway, although there are noise level increases of up to 8 dB, the overall noise levels at all modeling sites in Table 9-4 are predicted to remain below 48 dBA during overnight and evening hours, well below the FHWA criteria for noise sensitive properties (66 dBA Leq). Also, at schools, churches, and other land uses with daytime sensitivity to noise, noise levels are not predicted to increase by more the 6 dB and will typically remain below 3 dB to 6 dB for most daytime hours.

9.2.2 Central Segment Traffic Noise

The Central Segment includes the area south of Delta Junction to just south of Salcha. For this segment there are ten individual locations modeled as representative receivers and eight locations where receivers were placed from 50 to 750 feet from the Richardson Highway to provide traffic noise propagation information. As previously stated, as existing traffic volumes increase, the contribution of the highway ore transport trucks is diminished. In this segment, increases were highest in areas with lower traffic, including those areas south or north of Delta Junction, and the lowest in the downtown Delta Junction area (north of the Highway 4 intersection and south of Deborah Street).

Figure 9-3 provides an aerial view of the Central Segment noise modeling locations.

Figure 9-3. Central Segment Noise Modeling Locations



South of Delta Junction during the overnight hours, noise levels are predicted to increase by 7 to 9 dB, with daytime increase of 1 to 3 dB and early morning and late evening increases of up to 4 to 8 dB. In the central downtown area of Delta Junction, early morning noise levels are predicted to increase by 5 to 7 dB with daytime increases of only 1 dB. Early morning and evening levels are predicted to increase by 2 to 4 dB. Noise levels at specific locations, like the Hours of Prayer Church, are expected to have increases of only 1 to 3 dB during morning to evening hours when the church is typically in use. At the Diamond Willow Inn, worst-case overnight levels could increase by up to 7 dB overnight, with traffic levels increasing from 45 dBA Leq to 52 dBA Leq, still well below the FHWA and ADOT&PF criteria.

Other daytime noise sensitive sites near the haul route, including two other churches and the Delta Junction Library, are predicted to have daytime levels of 42 to 56 dBA Leq, increases of 1 to 3 dB over the existing levels. Noise levels at the Delta Junction Recreational Area were evaluated using receivers 50 to 750 feet from the haul route. The data, provided in Attachment C, shows increases of 6 to 7 dB at 2:00 am, a 1 dB increase during daytime hours, and a 2 to 3 dB increase at 10:00 pm (representing evening and morning hours).

Based on propagation receivers, farther north, at Quartz Lake, the modeling predicts an increase of 6 to 7 dB during nighttime hours, and 2 to 3 dB during late evening and early morning hours. Daytime hours are only predicted to have an increase of approximately 1 dB over existing conditions. Similar noise levels were predicted for those sensitive receivers near the Birch Lake and surrounding area. Near Harding Lake, the increase in traffic noise levels with the project are slightly lower then at Quartz Lake due to a slight increase in the overall existing traffic volumes as the route moves farther north.

Noise levels at the Salcha School and Playgrounds have predicted increases of only 1 dB during the daytime hours and 3 to 4 dB for early morning and late evening hours. Overnight increase could reach 7 dB; however, schools are typically not in use during these overnight hours. The maximum daytime traffic levels at the Salcha School of 47 to 51 dBA Leq are well within the FHWA and ADOT&PF regulations.

Overall, the change in noise levels in this segment range from a high of approximately 7 dB, occurring south of Delta Junction at 2:00 am, to a low of approximately 1 to 3 dB during the daytime throughout the corridor. As previously discussed, a change of 3 dB is typically not noticeable to an average person. Although there will be increases in the overall noise, the final noise levels are sufficiently low, rarely exceeding 55 to 60 dBA Leq during daytime hours at noise sensitive properties, except for receivers within 50 feet of the highway. Overall, traffic noise impacts of the highway haul truck operation are predicted to be minimal in this segment. Table 9-5 summarizes the traffic noise modeling results for this segment. Complete data sets for all modeling locations are provided in Attachment C.

Table 9-5. Central Area Traffic Noise Levels: Without/With Highway Ore Transport Trucks

		2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Site	**Description**	**Exist**	**W/Trk**	**Chg**	**Exist**	**W/Trk**	**Chg**	**Exist**	**W/Trk**	**Chg**
C1	House of Prayer Church	38	45	7	50	51	1	44	47	3
C2	Diamond Willow Inn	45	52	7	57	58	1	50	54	4
C3	Pioneer Park	36	42	6	48	49	1	42	45	3
C4	Delta Presbyterian	42	47	5	55	56	1	49	51	2
C5	Delta Library	32	39	7	46	47	1	39	42	3
C6	First Baptist Church	41	47	6	54	55	1	48	50	2
C7	Birch Lake North	51	58	7	63	64	1	57	60	3
C8	Birch Lake South	46	53	7	58	59	1	52	55	3
C9	Salcha Playground	39	46	7	51	52	1	45	48	3
C10	Salcha School	36	43	7	47	48	1	41	45	4
Minimum		32	39	5	46	47	1	39	42	2
Maximum		51	58	7	63	64	1	57	60	4

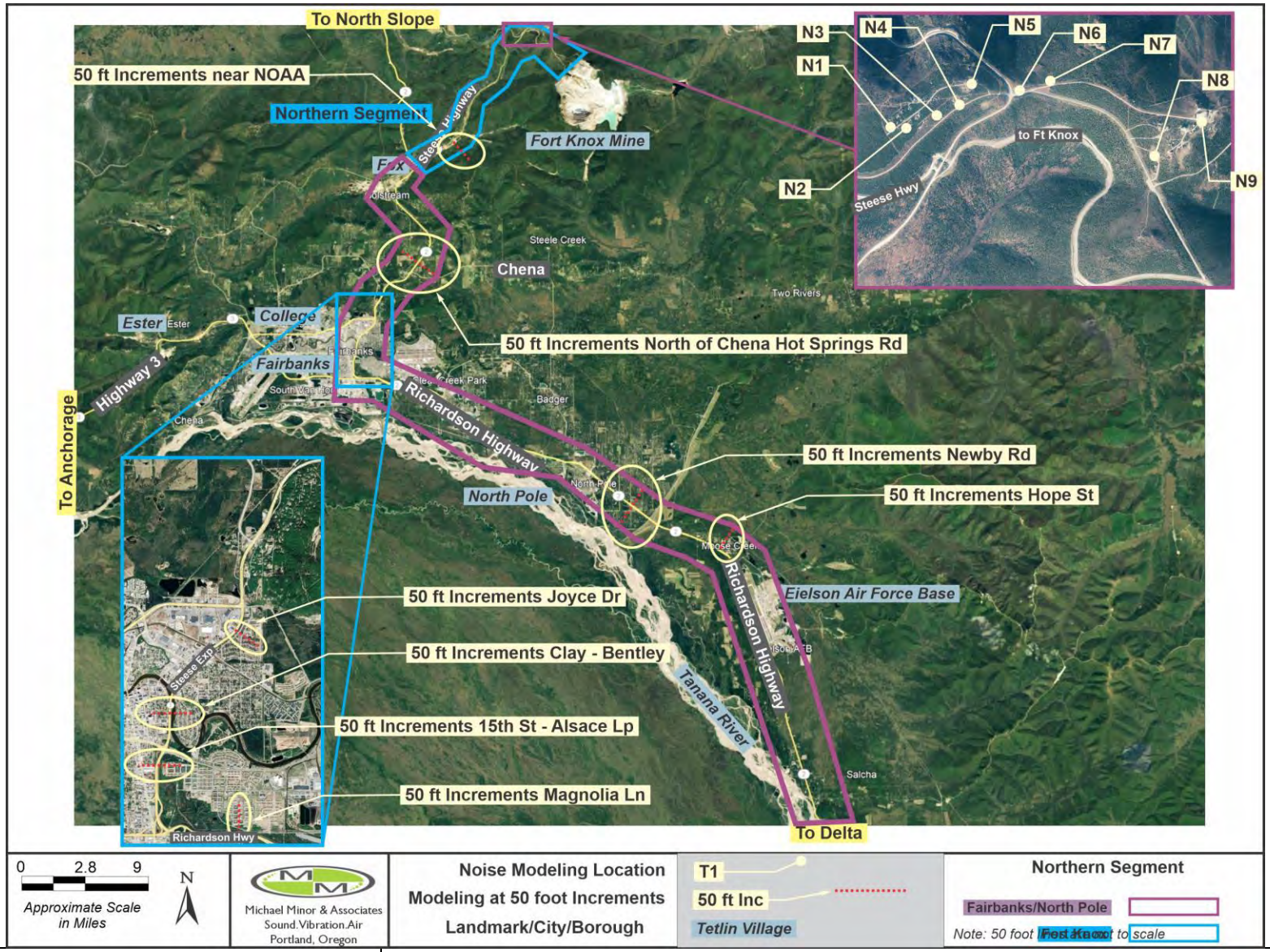
Notes:

1. See Figure 9-3 for location of receivers
2. General description of the modeling area
3. Noise levels at 2:00 am based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
4. Noise levels at 2:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
5. Noise levels at 10:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic

9.2.3 Northern Segment

The northern segment of the study area was evaluated primarily with receivers at 50 foot increments, along one or both sides of the highway, depending on land use. Analysis locations include the east side of the Richardson Highway, just north of Eisele Airforce Base (near Hope Street), both sides of the Richardson Highway in North Pole (Newby Road), and at a set of barracks on Fort Wainwright, just before the haul route transitions to the Steese Highway. Figure 9-4 shows the modeling sites for the northern segment.

Figure 9-4. North Segment Noise Modeling Locations



In Fairbanks, there were five analysis locations, two to the west of the Steese Highway and three on the east side. Detailed modeling with receivers at 50 foot increments were also performed along Joyce Drive near Jeanne Drive, just north of Chena Hot Springs Road and along the Steese Highway at Eisele Road. Finally, due to steep topographical conditions, a more detailed model was also developed for residences near the Cleary Summit, at the connection to Fort Knox Road from the Steese Highway which includes topography.

The change in noise levels with the highway ore transport trucks is becoming less negligible as traffic volumes increase in the more populated areas. Just north of Eielson Airforce Base, at Hope Street and again near Newby Street in North Pole, the increase in noise levels with the highway ore transport trucks is reduced to 2 to 3 dB during the 2:00 am hour, with evening increases limited to 2 to 4 dB. The highway ore transport trucks contribution to the daytime noise level is less than 0.5 dB. At Fort Wainwright, just prior to the transition to the Steese Highway, the increase at 2:00 am is predicted at 1.0 to 1.4 dB, with no measurable increase in daytime or evening hours.

Highway ore transport trucks along the Steese Highway, from the Richardson Highway to Chena Hot Springs Road are also similar to those discussed above. Modeled noise levels south and north of Airport Way, representing residences at Fort Wainwright, Eielson Steet at 15th Avenue, Bentley Island, the Clay Street Cemetery and nearby residences and the single family residences along Joyce Drive just north of College Road, all have similar increases in noise levels. Late night increases in traffic noise of 2 to 3 dB, evening increases of 1 to 2 dB, and no measurable change in daytime traffic noise levels. The data is provided in Attachment B.

North of Chena Hot Springs Road there is a notable drop in traffic volumes, and a corresponding increase in the effect of the highway ore transport trucks. Increases of 4 to 6 dBA can be expected at 2:00 am; however, the noise levels at the nearest house would be in the range of 46 to 49 dBA Leq, well below the FHWA and ADOT&PF criteria. Evening and early morning levels increase by 1 to 2 dB with daytime levels increasing by up to 1 dB.

Along the final stretch of the Steese Highway, near the NOAA facility on Eisele Road, lower existing traffic volumes result in increases during late night hours (2:00 am) of 7 to 9 dB over the existing conditions. Evening levels are predicted to increase by 4 to 6 dB, with daytime increases of only 2 to 3 dB.

The residences to the north of the Steese Highway, along Ridge Run Road, Pedro Dome Road are predicted to have increases of 2 to 6 dB, with the highest increases in the eastern part of the hillside at 2:00 am. Noise levels at residences along Fish Creek Road could see increases of 7 to 8 dB; however, the final noise level (with highway ore transport trucks) of only 34 to 44 dBA Leq at residences in this area is considered very quiet and suitable for this type of rural area. Daytime and evening increases range from 0 to 3 dB for daytime hours and 0 to 5 dB for evening hours. Locations with little to no change in future noise levels are shielded from the haul route by topographical conditions that were included in this model.

Complete data sets for all modeling locations are provided in Attachment C. Table 9-5 provides the modeling results for residences near Cleary Summit.

Table 9-5. Northern Area Traffic Noise Levels: Without/With Highway Ore Transport Trucks

		2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Site	**Description**	**Exist**	**W/Trk**	**Chg**	**Exist**	**W/Trk**	**Chg**	**Exist**	**W/Trk**	**Chg**
N1	Ridge Run (West)	31	37	6	37	39	2	32	37	5
N2	Pedro Dome (West)	36	42	6	42	44	2	38	42	4
N3	Pedro Dome (Center)	28	34	6	34	36	2	30	34	4
N4	Pedro Dome (East)	32	36	4	36	38	2	33	36	3
N5	Ridge Run (East)	35	37	2	38	39	1	35	37	2
N6	Cleary Summit View	45	45	0	52	52	0	47	48	1
N7	Ski Land Rd (West)	26	28	2	35	36	1	29	30	1
N8	Fish Creek Rd Resident	28	36	8	40	41	1	31	36	5
N9	Ski Land Resort	24	31	7	32	34	2	26	31	5
Minimum		24	28	0	32	34	0	26	30	1
Maximum		45	45	8	52	52	2	47	48	5

Notes:

1. See Figure 9-4 for location of receivers
2. General description of the modeling area
3. Noise levels at 2:00 am based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
4. Noise levels at 2:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic
5. Noise levels at 10:00 pm based on average traffic volumes from ADOT&PF, without and with mine related traffic
    a. Exist = Existing; W/Trk = Existing with mine traffic; Chg = increase from mine related traffic

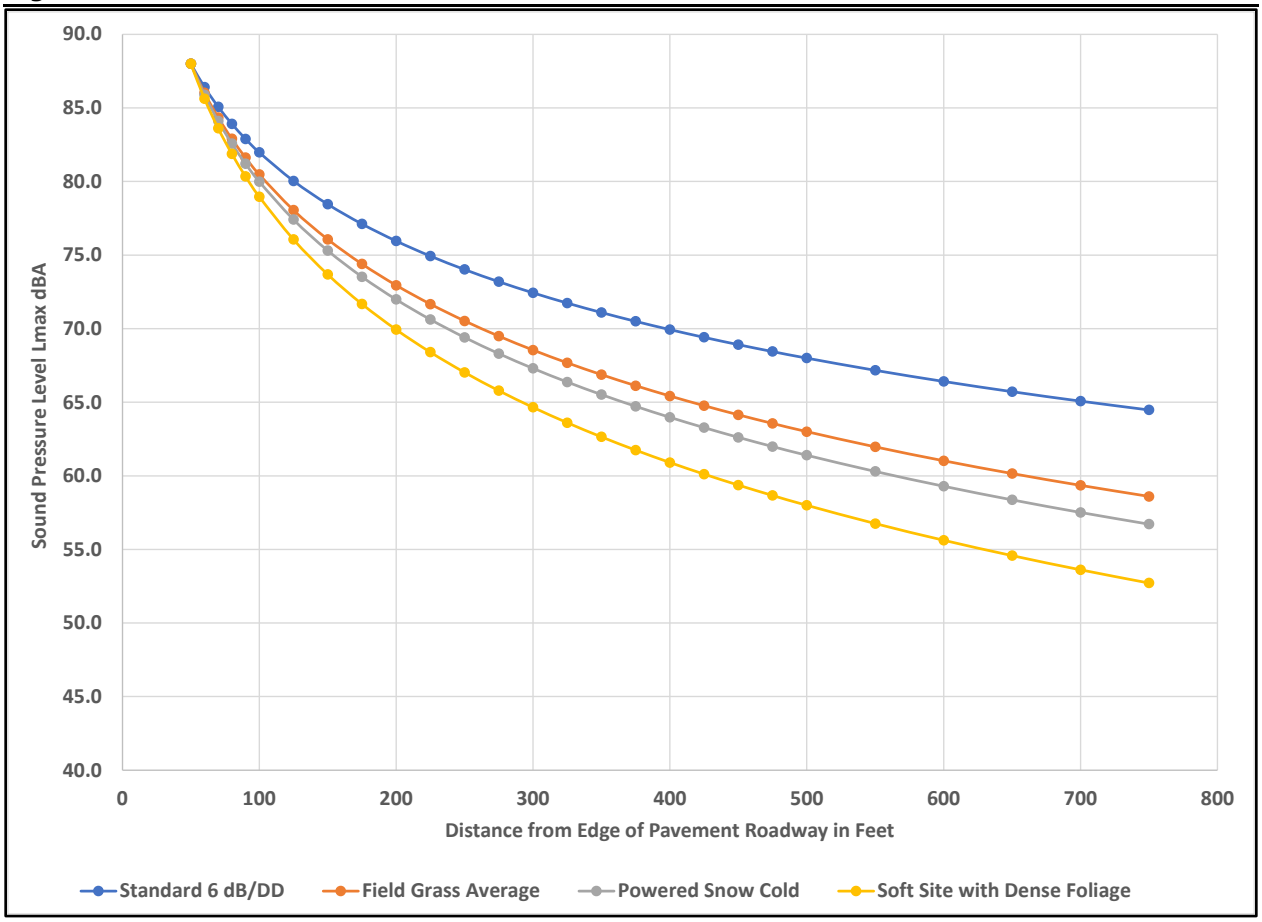
9.3 Maximum Pass-By Noise Levels for Heavy Trucks

Maximum pass-by noise levels for the highway ore transport trucks are the same as most large haul trucks currently in use along the haul routes. As with any vehicle, the noise level is directly related to the speed of the vehicle for speeds above 25 to 30 MPH. The noise level can also be increased if the trucks are pulling up a hill and reduced if coasting down a hill. At low speeds, below 25 MPH, the engine noise is often the dominate noise from trucks as they increase speed from a stop or turn.

Pavement condition can also affect the noise from the trucks. Rough pavement will produce a higher tire-pavement noise then a recently paved, smooth asphalt roadway. Tire-pavement noise can also be reduced if the roadway is packed with snow; however, the use of tire chains may off-set some of the benefit from snowpack at reducing noise.

In general, at speeds of 50 to 60 MPH, maximum noise levels of 88 dBA at 50 feet are typical, and at 35 MPH that level is reduced to 80 to 82 dBA at 50 feet. Finally, at 25 to 35 MPH noise levels vary more with operational conditions and could range from 76 to 82 dBA at 50 feet. Figure 9-5 is a graph with noise reduction versus distance for a reference level of 88 dBA Lmax at 50 feet under difference atmospheric and ground cover conditions.

Figure 9-5. Illustration of Noise Reduction versus Distance for 88 dBA Lmax at 50 Feet



9.4 BLASTING NOISE

Blasting would occur twice daily, with up to 40 tons per blast. As described above, noise levels from most sources can be projected at a distance using the formulas above (see Section 8.1.1). However, for noise from blasting, which has significant low frequency energy, ground affects, like trees and rolling hills, have much less overall noise effect then they would have for broadband noise sources, like vehicle traffic. Therefore, blasting noise levels were predicted using octave band noise levels to account for the increased level of atmospheric absorption at higher frequencies, with notably less absorption at the lower frequencies. The octave noise band levels are based on a sound pressure level of 135 dB at 50 feet.

The predictions were performed for the five locations closest to the mine: the Butch Kuth Avenue area, the closest of the five cabins, Tetlin Village, Tok River Recreation Area, and the Tok High School (see Figure 9-1). The results of the modeling are provided in Table 9-6.

Table 9-6. Blast Noise Levels

ID#[1]	Description[2]	Dist.[3]	Background Level (L90 dBA)[4]	Blast Noise Level (Lmax dBA)[5]	Total Noise[6]	Short-Term Change in Decibels[7]
R-1	Butch Kuth Ave Area	35,071	23.0	31.5	32.1	+9.1
R-2	Tetlin Village	66,172	22.0	15.8	22.9	+0.9
R-3	Tok River Recreation Area	54,935	26.9	20.8	27.9	+1.0
R-4	Tok High School	55,737	35.6	20.5	35.7	+0.1
R-5	Cabins: Tetlin Village Rd	52,172	24.0	22.2	26.2	+2.2

Notes:

1. See Figure 9-1 for location of receivers
2. General description of the area used for the analysis
3. Distance in feet from mine site to the area in the analysis
4. Background levels are the average measured L90 at the location closest to, or best representing, the analysis site
5. Operational noise level from the mine with standard acoustical absorption and additional attenuation from foliage and trees
6. Total noise, existing noise level plus noise from the mine operations
7. Increase in noise from the mine operations

Blast noise levels, while noticeable at some locations, will last only for a few seconds, and only occur twice daily. The low noise levels should mostly be negligible due to the large distances between the proposed mine and sensitive receivers in Tok and Tetlin Village. In the Butch Kuth Avenue area, where blasting may be more notable, the audibility of a blast varies with different meteorologic conditions, such as wind direction and speed and low pressure and temperature inversions. Even though the predicted noise level of 32 dBA is considered very quiet, in some cases the low frequency energy of the blast may be noticeable, and some people may actually feel the blast energy more than actually hearing the blast. However, the low level of 32 dBA is not likely to be disturbing to most people inside a structure, like a residence. Also, given the distance between the proposed mine and all of the nearby residential and sensitive areas, the overpressure normally associated with blasting, which rattles windows and produces vibration, should not occur at any of the sites due to atmospheric spreading of the blast energy.

10 CUMULATIVE NOISE IMPACTS

Cumulative noise levels from the proposed mine are only applicable in those areas nearest the mine, where noise from mine operations could be combined with noise from traffic. For residences in the Butch Kuth Avenue Area, Tok High School, and Tetlin Village, where highway haul truck noise would not contribute to the existing ambient noise levels, the cumulative levels would be the same as presented in Tables 9-1, and 9-2. Also, because blasting would typically occur between shifts, only minimal equipment would be in operation, and blasting would be the dominate noise source, resulting in the same noise levels as presented in Table 9-6.

To evaluate the cumulative noise levels along the Alaska Highway haul route, an analysis at several representative locations along the Alaska Highway haul route between Tetlin Road and the Tok Cut-Off was performed. Locations selected include the Tok River Recreation Area (T1 and T2), Younge Motel

(T3), the Tok Recreational Village (T4 and T5), and East Slana Avenue between East 3rd and East 4th Streets (T6). The results of the analysis are provided in Table 9-7.

Table 9-7. Worst Case (2:00 am) Cumulative Noise Levels along Haul Route

ID#[1]	Description[2]	Background Traffic Level (Leq dBA)[3]	Traffic Level with Haul Route (Leq dBA)[4]	Mine Noise Level[5]	Total Noise[7]	Short-Term Change in Decibels[8]
T1	Cabin (3900 ft)	24.0	43.0	22.5	43.0	+19.0
T2	Cabin (1900 ft)	25.0	35.0	22.5	35.2	+10.2
T3	Cabin (1500 ft)	26.0	38.0	22.5	38.1	+12.1
T4	Cabin (1500 ft)	26.0	42.0	22.5	42.0	+16.0
T5	Cabin (1000 ft)	28.0	43.0	22.5	43.0	+15.0
T6	Tok River Site 26	46.0	53.0	21.9	53.0	+7.0
T7	Tok River Near River	40.0	47.0	21.8	47.0	+7.0
T8	Youngs Motel	36.0	43.0	21.4	43.0	+7.0
T9	Tok RV Village Office	41.0	48.0	21.3	48.0	+7.0
T10	Tok RV Village RV	34.0	41.0	21.3	41.0	+7.0
T11	E Slana Ave; E 3rd St.	31.0	38.0	21.3	38.1	+7.1

Notes:

1. See Figure 9-1 for location of receivers
2. General description of the area used for the analysis
3. Background traffic noise levels at 2:00 am calculated using FHWA TNM and traffic data from the ADOT&PF, see Table 8.3.
4. Traffic noise levels at 2:00 am with haul truck traffic, see Table 9-3
5. Worst case mine noise levels calculated as previously described see also Table 9-2.
6. Worst case blast noise levels, see Table 9-6
7. Total noise, existing noise level plus noise from the mine operations
8. Worst case increases in noise from the mine operations with all equipment, blasting and haul trucks.

As is illustrated in the table, the noise from the mine will have little to no overall effect on the noise levels along the haul route. As described under Section 5.1, when adding two noise sources, if one is 10 dB higher than the other, it dominates and there is no measurable increase in the overall noise level. Noise from the highway ore transport trucks is the dominant source and the increases are most noticeable at the five cabins along Tetlin Road due to low existing noise levels. The cabins could see increases of 10 to 19 dB over the existing noise environment. Other areas can expect a worst case increase of 7 dB.

11 VIBRATION IMPACT ANALYSIS

Vibration from the operation of the proposed mine, including blasting, will not affect any nearby properties. As shown in the noise analysis, all residential, hotels, churches, schools, parklands, and other noise sensitive uses, which are also typically sensitive to vibration, are over six miles from the proposed mine. At those distances, mine related vibration would not be noticeable as the vibration, even from blasting, would be absorbed by the strata between the proposed mine and any of the nearby properties.

Vibration from the highway ore transport trucks along the Alaska Highway and Steese Highway could be noticeable at location within 100 feet of the travel lanes. The magnitude of the vibration would be similar to vibration levels from heavy trucks already in use along the corridor. In most cases, highway haul truck related vibration would not be noticeable at distances greater than 50 to 100 feet from the travel lanes. Increased vibration from truck traffic can occur along rough or unpaved roadways, and at potholes, bridge abutments and rail crossings, or other discontinuities on the roadway surface.

Because much of the vibration from rubber tired vehicles is absorbed by the tires, and homes and sensitive building are set back 80 to 100 feet or more, vibration levels along the corridor would not be predicted to meet or exceed 0.015 inches per second, peak particle velocity. Given that vibration levels this low are considered barely perceptible, no vibration impacts are predicted.

12 NOISE MITIGATION

Because there are no exceedances of any federal, state, or local noise control ordinance or regulations, no additional formal noise mitigation is proposed. However, the Manh Choh Project has committed to the following operational methods that will limit the increase in noise levels in Tetlin Village, Tok, the Butch Kuth Avenue Area, and the Tok River Recreational area, in addition to all other receivers along the haul routes to Fort Knox:

- Using late model and well maintained highway ore transport trucks equipped with noise suppression systems
- Driver training for all highway haul truck personnel to maintain speeds at or below the speed limits
- Avoid the use of engine compression breaks (i.e., Jake breaks), except in emergencies
- Use a slow to moderate acceleration from stops and signalized intersections
- Limit the use of personal vehicles to access the proposed mine through the use of buses to transport the majority of workers to and from the mine

13 REFERENCES

Alaska Department of Transportation & Public Facilities. *Noise Policy, Alaska Environmental Procedures Manual*, April 2018.

Federal Highway Administration (FHWA). *Roadway Construction Noise Model*, U.S. Department of Transportation, August 2006.

Federal Highway Administration (FHWA). *Highway Traffic Noise Prediction Model*, U.S. Department of Transportation, Report No. FHWA-FD-77-108, December 1978.

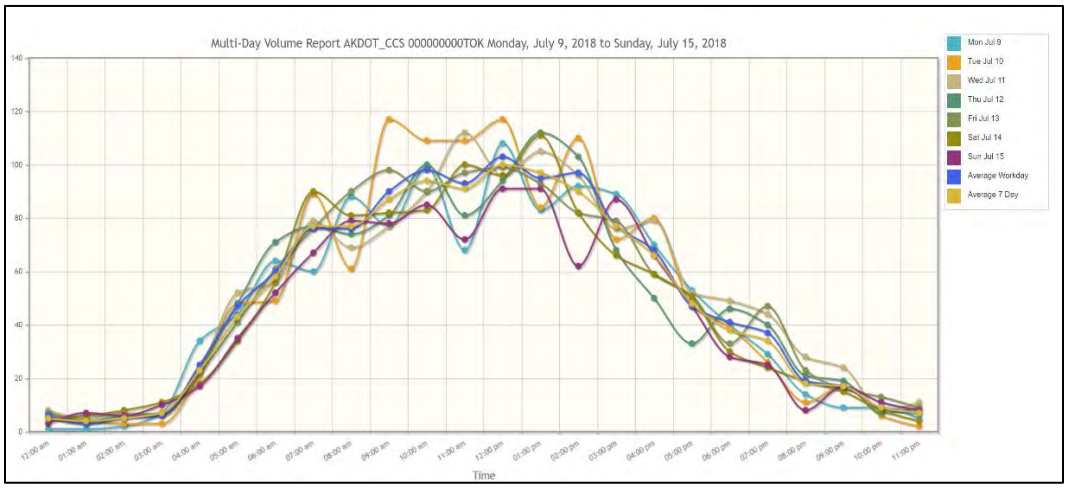
Federal Highway Administration (FHWA). *Highway Traffic Noise Model User's Guide*, U.S. Department of Transportation, Report No. FHWA-PD-96-009, January 1998.

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

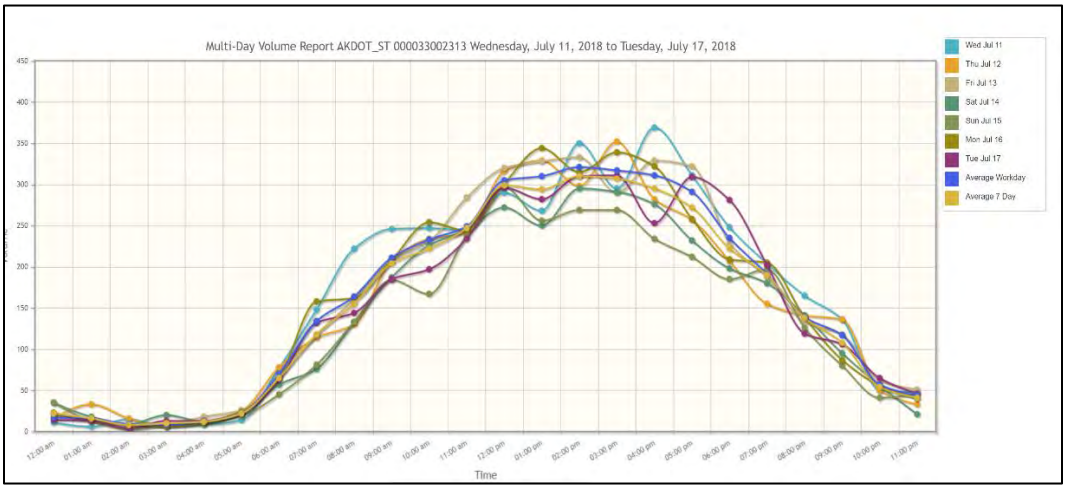
Federal Transit Administration (FTA). *Transit Noise and Vibration Impact Assessment Manual*, U.S. Department of Transportation, September 2018.

ATTACHMENT A: TRAFFIC DATA

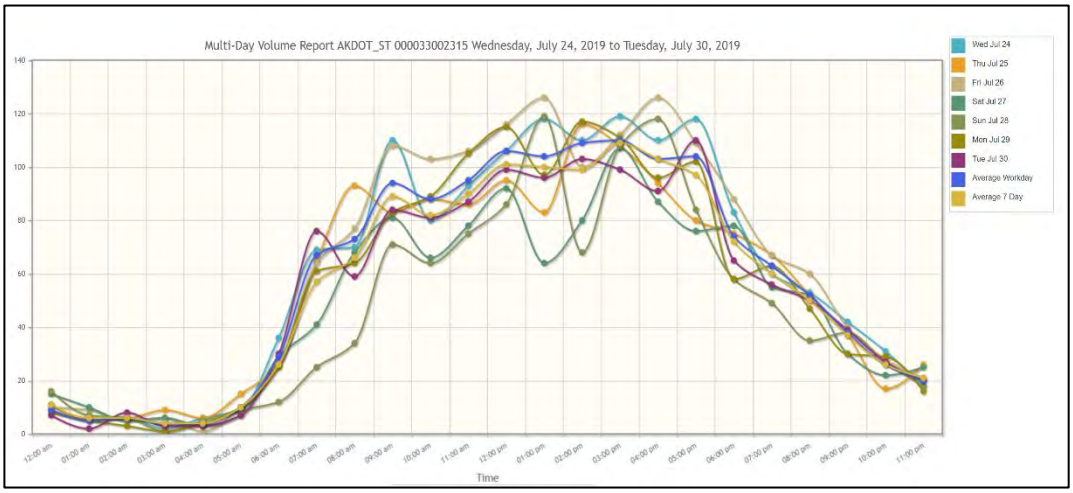
Tok River Recreation Area on Alaska Highway MP 1310



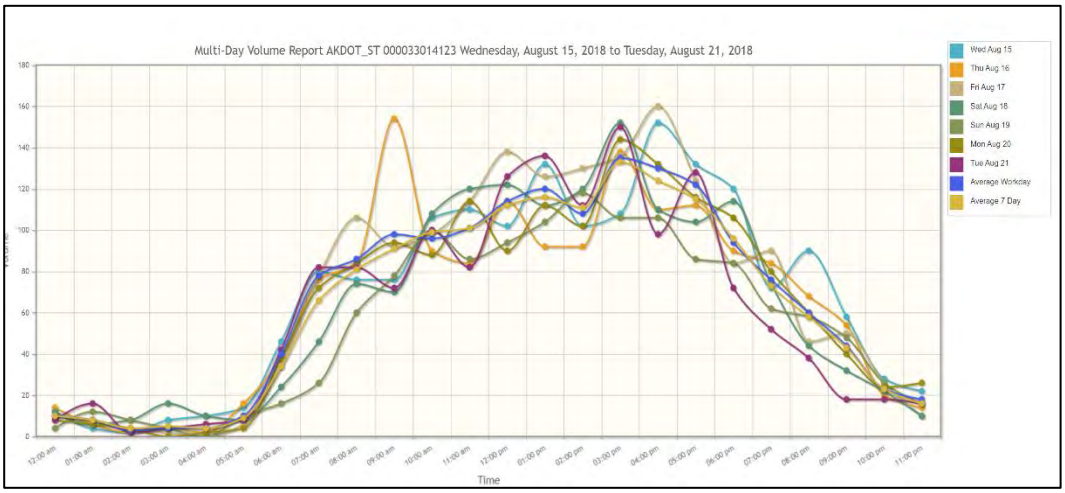
East of Tok on Alaska Highway MP 1313



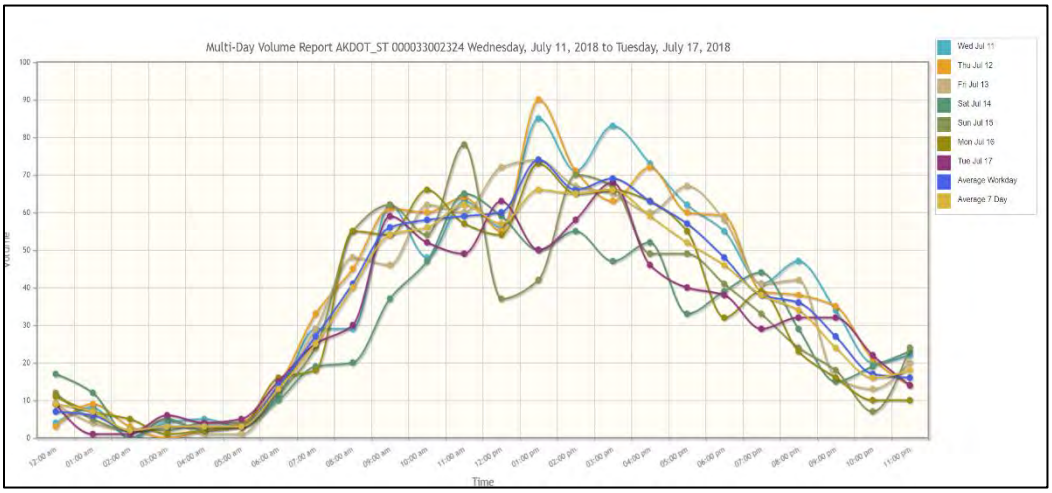
West end of Tok Central on Alaska Highway MP 1315



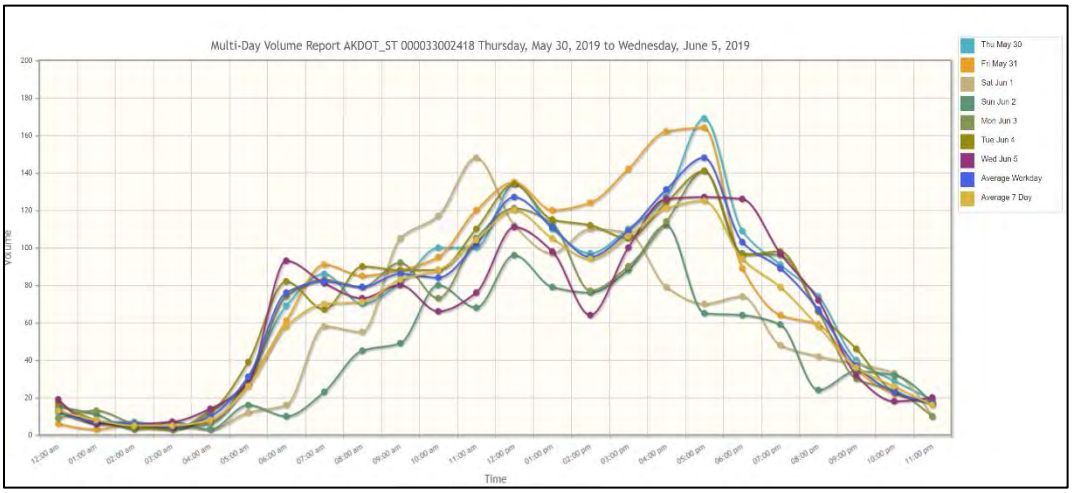
Tok Cut-Off South of West Willow Avenue MP 124.0



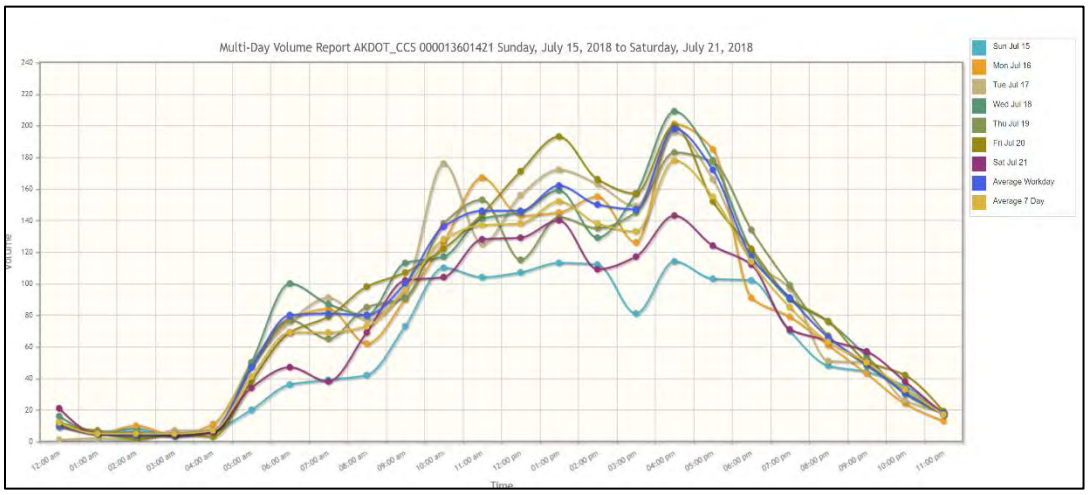
West of Tok on Alaska Highway MP 1324



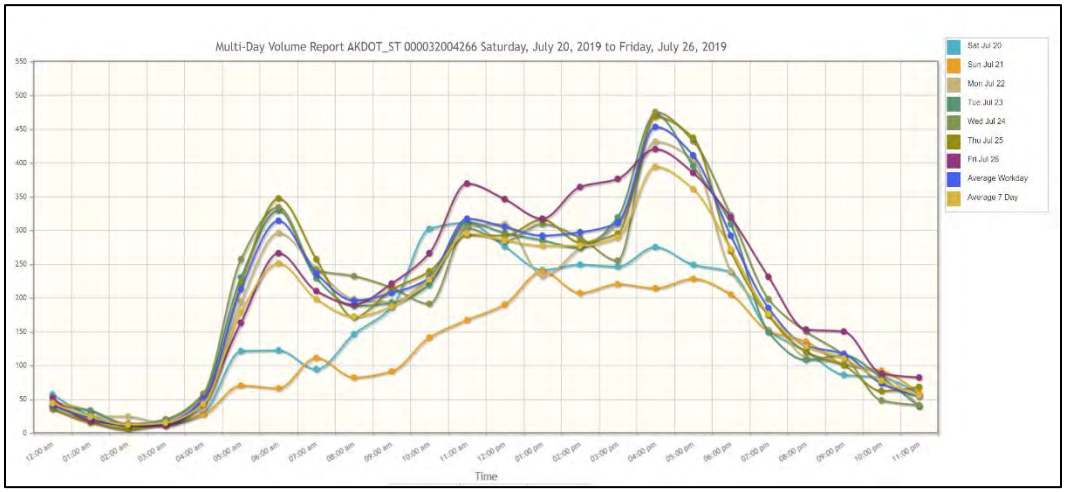
Southeast of Delta Junction on Alaska Highway MP 1418



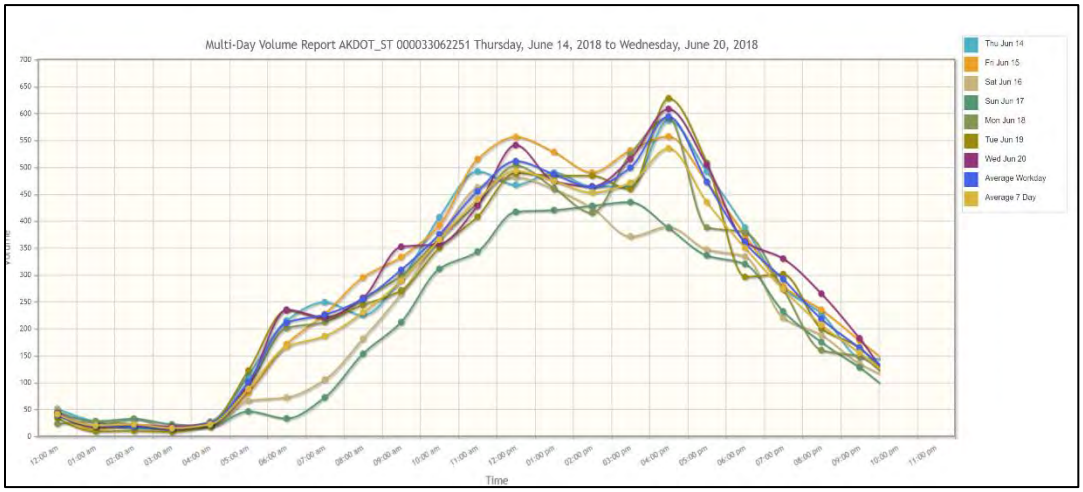
Southeast of Delta Junction on Alaska Highway MP 1421



South of Delta Junction on Richardson Highway MP 265.5

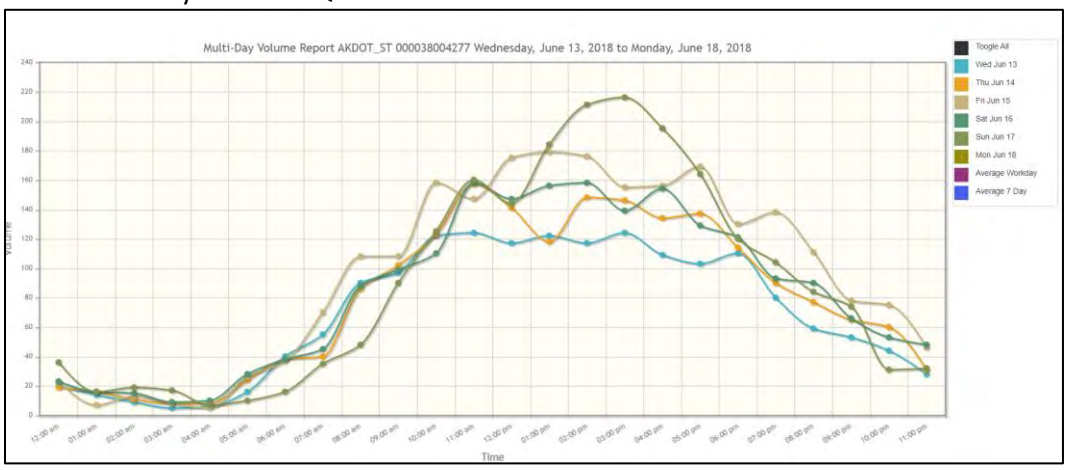


Central Delta Junction North of Nistler Road on Richardson Highway MP 266.5

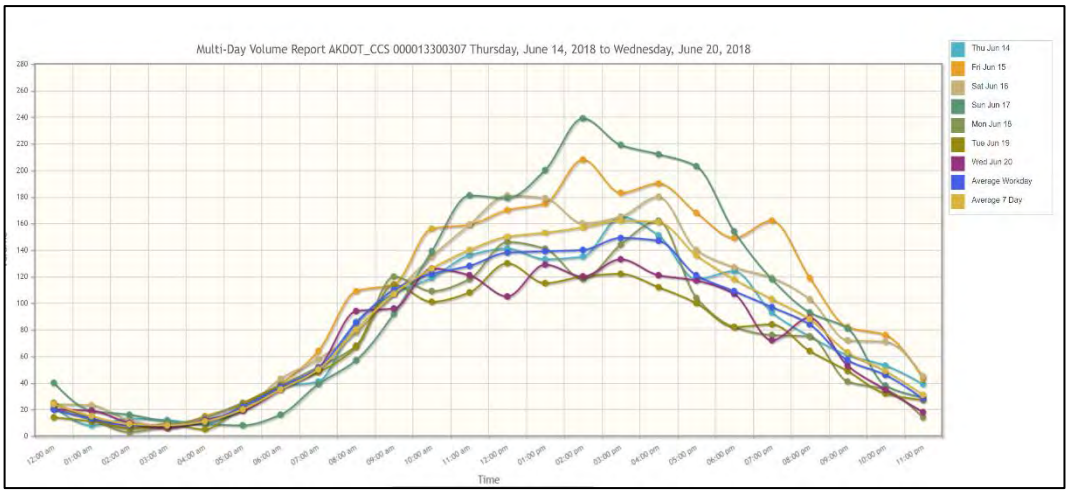


Manh Choh Project	
Technical Noise Study	

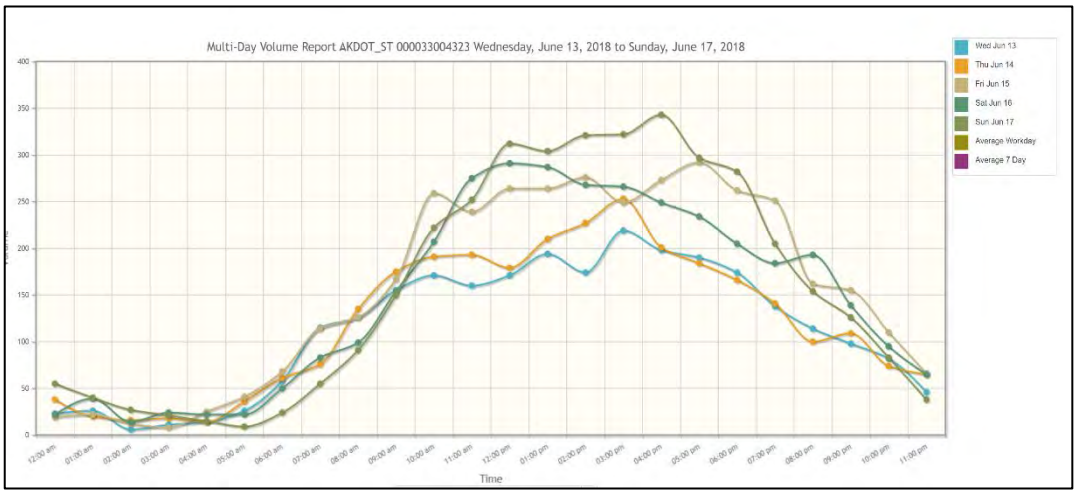
Richardson Hwy North Of Quartz Lake Rd MP 277



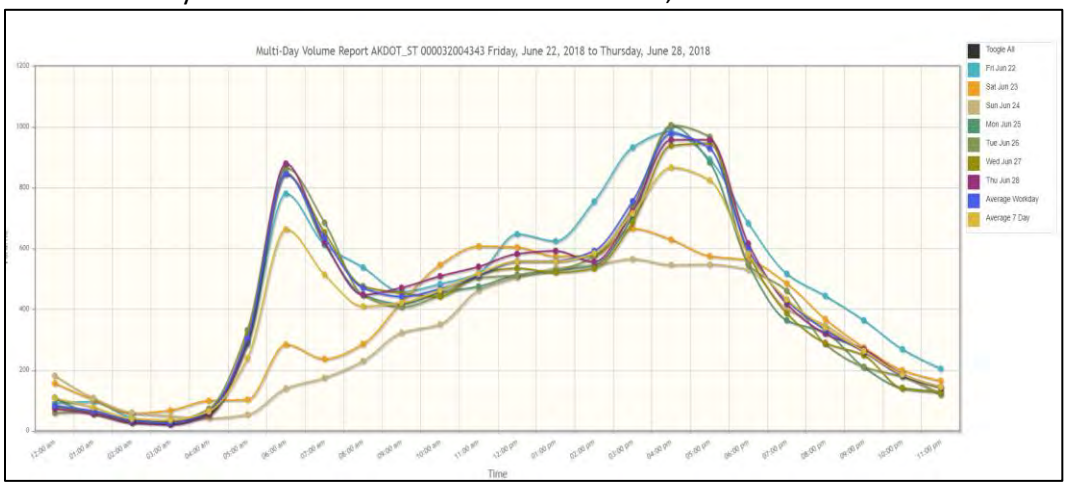
Richardson Highway at Birch Lake Maintenance Camp MP 307



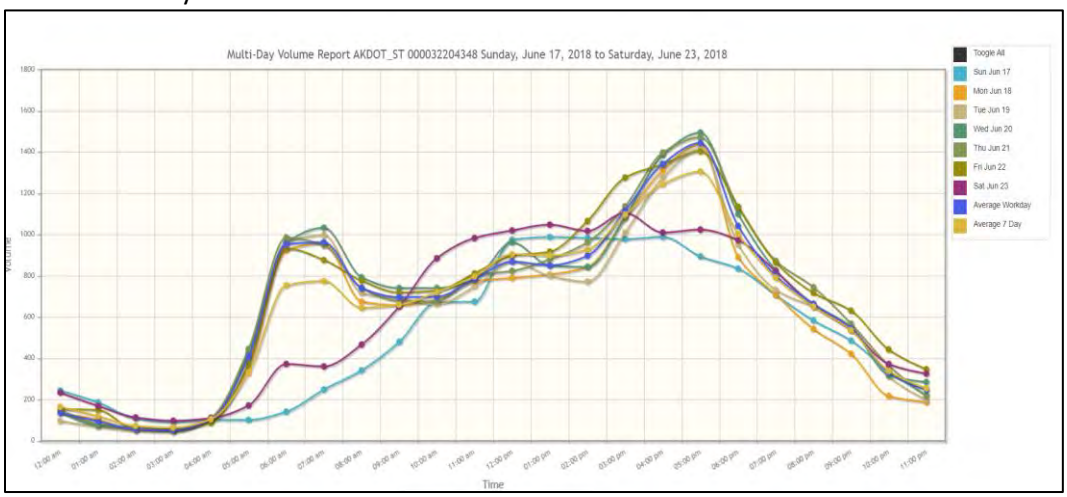
Richardson Hwy at the Salcha River Bridge MP 324



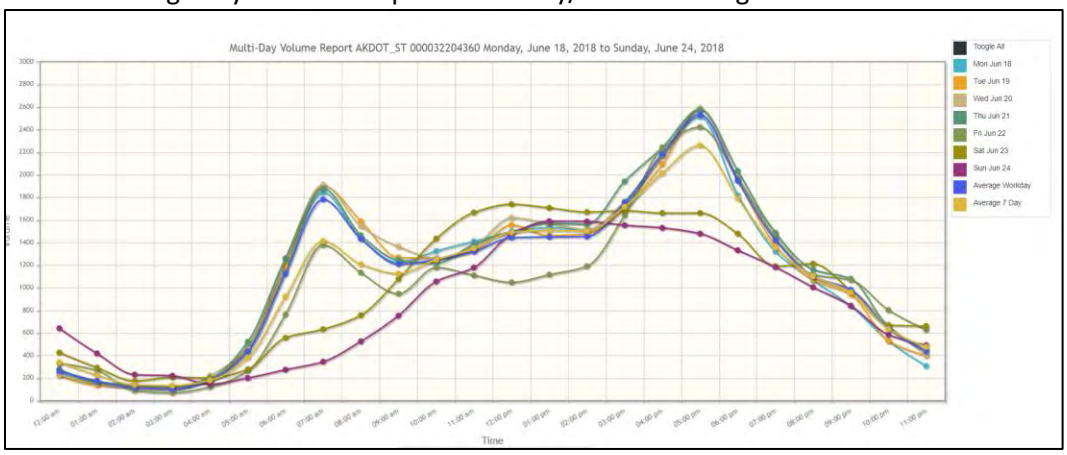
Richardson Hwy South of Old Richardson Eielson Access, North of Eielson AFB MP 343



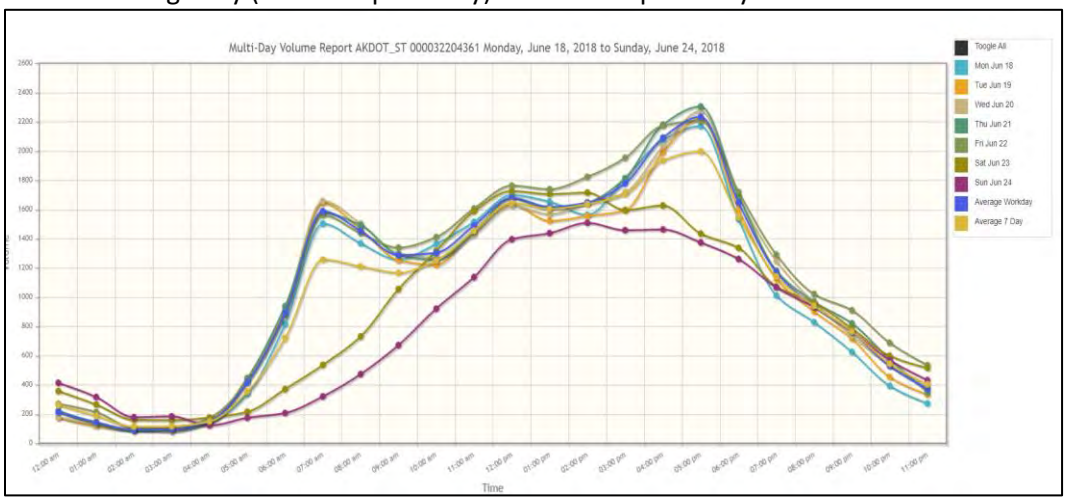
Richardson Hwy East Of 5th Ave North Pole MP 348



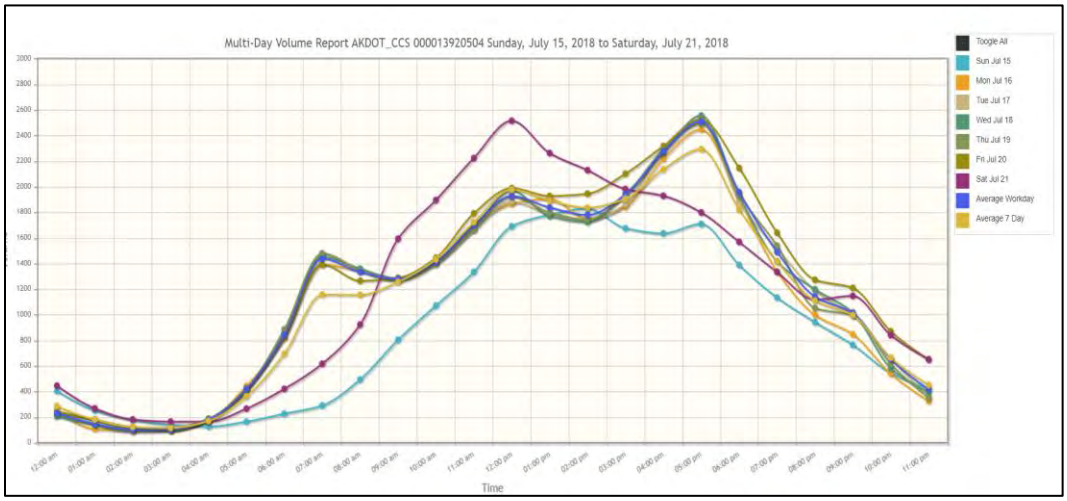
Richardson Highway East of Ramp to Parks Hwy/Fort Wainwright MP 360



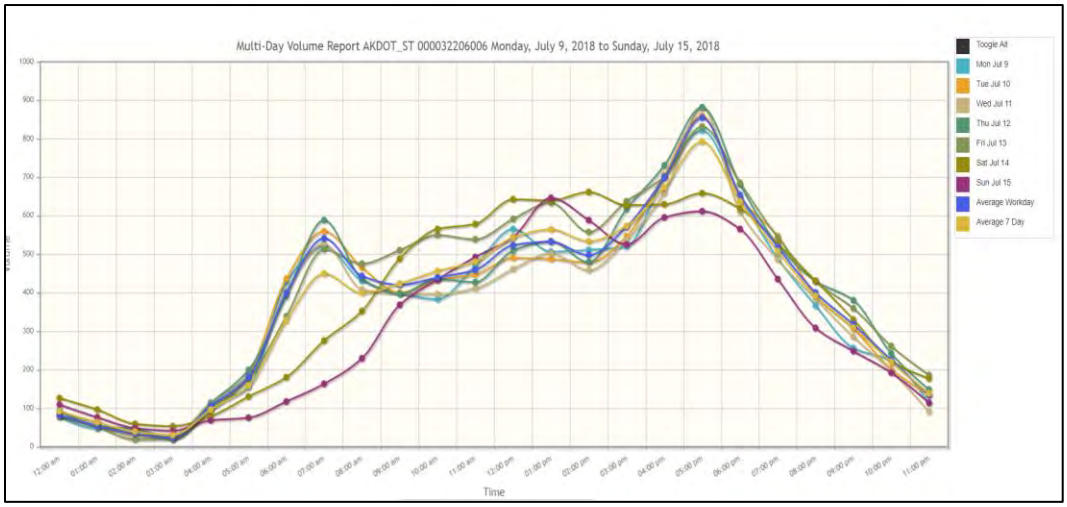
Richardson Highway (Steese Expressway) South of Airport Way MP 361



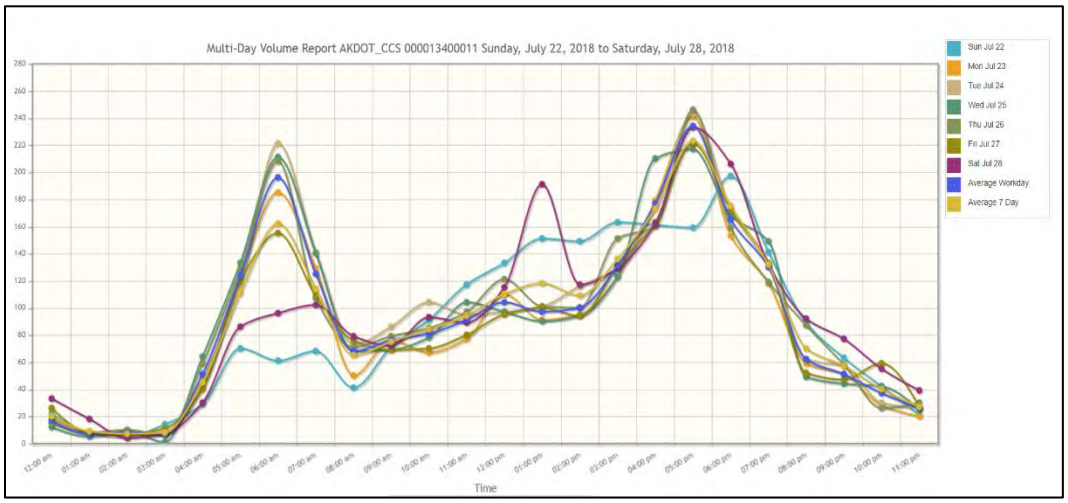
Steese Expressway at the Chena River Bridge MP 0.471



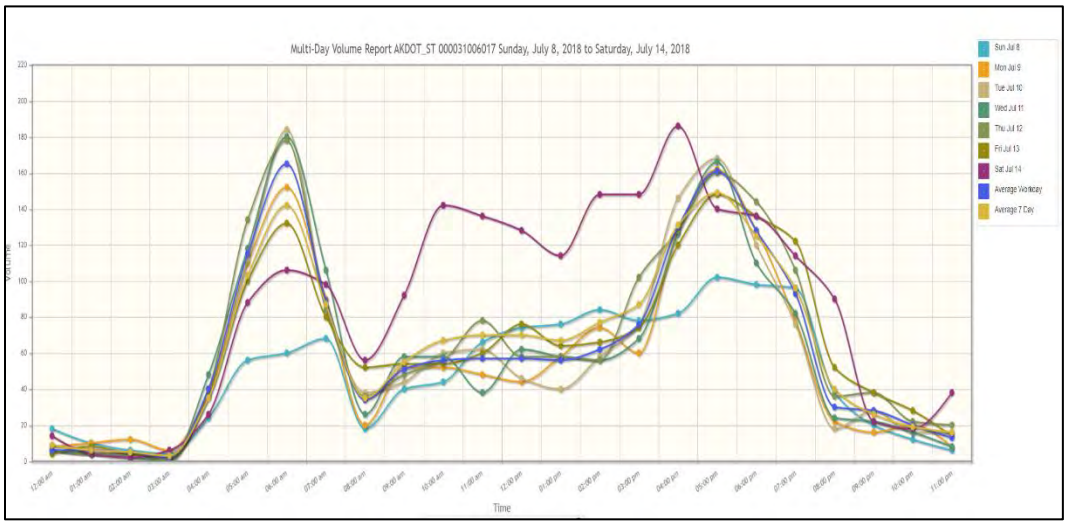
Steese Expressway North of Chena Hot Springs Road MP 06



Steese Highway Southwest of NOAA MP 11



Steese Highway at Ft Knox MP 17



ATTACHMENT B: MODELED NOISE LEVELS TABLES

West end of Tok, between West C Street and Midnight Sun Drive: See Inset Figure 9-2									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	47.5	55	7.5	57.8	59.3	1.5	51.6	56	4.4
100 ft	44	51.5	7.5	54.2	55.8	1.6	48.1	52.5	4.4
150 ft	42.1	49.6	7.5	52.2	53.8	1.6	46	50.6	4.6
200 ft	39.2	47	7.8	49.2	51	1.8	43	47.9	4.9
250 ft	37	44.9	7.9	46.8	48.7	1.9	40.5	45.7	5.2
300 ft	35.5	43.6	8.1	45.1	47.1	2	38.9	44.3	5.4
350 ft	34	42.2	8.2	43.5	45.6	2.1	37.2	42.8	5.6
400 ft	33	41.2	8.2	42.4	44.6	2.2	36.1	41.8	5.7
450 ft	32	40.3	8.3	41.4	43.6	2.2	35	40.9	5.9
500 ft	31.1	39.4	8.3	40.4	42.6	2.2	34	40	6
550 ft	30.3	38.6	8.3	39.6	41.9	2.3	33.2	39.2	6
600 ft	29.5	37.8	8.3	38.9	41.1	2.2	32.5	38.4	5.9
650 ft	28.9	37.2	8.3	38.2	40.4	2.2	31.8	37.7	5.9
700 ft	28.2	36.5	8.3	37.6	39.8	2.2	31.2	37.1	5.9
750 ft	27.6	35.9	8.3	37	39.2	2.2	30.6	36.5	5.9
Minimum	**27.6**	**35.9**	**7.5**	**37**	**39.2**	**1.5**	**30.6**	**36.5**	**4.4**
Maximum	**47.5**	**55**	**8.3**	**57.8**	**59.3**	**2.3**	**51.6**	**56**	**6**

Pringle Road and Backburn Street: See Figure 9-2									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	50.8	58.3	7.5	60.2	62.1	1.9	54.3	59.2	4.9
100 ft	47.3	54.8	7.5	56.7	58.6	1.9	50.8	55.7	4.9
150 ft	43.6	51.1	7.5	52.9	54.8	1.9	47	52	5
200 ft	39.5	47.3	7.8	48.6	50.7	2.1	42.8	48	5.2
250 ft	36.1	44	7.9	44.9	47.2	2.3	39.1	44.6	5.5
300 ft	33.3	41.4	8.1	42	44.4	2.4	36.2	42	5.8
350 ft	30.8	38.9	8.1	39.3	41.8	2.5	33.5	39.4	5.9
400 ft	28.6	36.8	8.2	37.1	39.6	2.5	31.3	37.3	6
450 ft	26.7	34.8	8.1	35.1	37.6	2.5	29.3	35.4	6.1
500 ft	24.8	33	8.2	33.3	35.8	2.5	27.5	33.6	6.1
550 ft	23.4	31.6	8.2	31.8	34.4	2.6	26.1	32.1	6
600 ft	22	30.2	8.2	30.4	33	2.6	24.7	30.7	6
650 ft	20.8	28.9	8.1	29.3	31.8	2.5	23.5	29.5	6
700 ft	19.8	28	8.2	28.3	30.8	2.5	22.5	28.5	6
750 ft	19.2	27.3	8.1	27.7	30.1	2.4	21.9	27.8	5.9
Minimum	**19.2**	**27.3**	**7.5**	**27.7**	**30.1**	**1.9**	**21.9**	**27.8**	**4.9**
Maximum	**50.8**	**58.3**	**8.2**	**60.2**	**62.1**	**2.6**	**54.3**	**59.2**	**6.1**

Dot Lake: See Figure 9-2									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	51.3	59	7.7	61.2	63	1.8	55.3	60	4.7
100 ft	48.3	56.1	7.8	58.2	60	1.8	52.3	57	4.7
150 ft	43.8	51.7	7.9	53.4	55.3	1.9	47.5	52.5	5
200 ft	39.9	48	8.1	49.2	51.4	2.2	43.4	48.8	5.4
250 ft	36.7	44.9	8.2	45.8	48.1	2.3	40	45.6	5.6
300 ft	33.9	42.2	8.3	42.7	45.2	2.5	37	42.8	5.8
350 ft	31.5	39.8	8.3	40.2	42.7	2.5	34.5	40.4	5.9
400 ft	29.4	37.7	8.3	38.1	40.6	2.5	32.3	38.3	6
450 ft	27.5	35.8	8.3	36.2	38.7	2.5	30.4	36.4	6
500 ft	25.7	34	8.3	34.4	36.9	2.5	28.6	34.6	6
550 ft	24.2	32.5	8.3	33	35.4	2.4	27.2	33.1	5.9
600 ft	22.8	31.1	8.3	31.6	34	2.4	25.8	31.7	5.9
650 ft	21.6	29.8	8.2	30.4	32.8	2.4	24.6	30.4	5.8
700 ft	20.5	28.8	8.3	29.4	31.8	2.4	23.6	29.4	5.8
750 ft	19.9	28.1	8.2	28.7	31.1	2.4	22.9	28.7	5.8
Minimum	**19.9**	**28.1**	**7.7**	**28.7**	**31.1**	**1.8**	**22.9**	**28.7**	**4.7**
Maximum	**51.3**	**59**	**8.3**	**61.2**	**63**	**2.5**	**55.3**	**60**	**6**

Southeast of Delta Junction on Alaska Highway at Clearwater Rd: See Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	53.2	60.3	7.1	63.8	65.2	1.4	57.9	61.7	3.8
100 ft	48.7	55.7	7	59.3	60.6	1.3	53.4	57.2	3.8
150 ft	45.6	52.6	7	56.2	57.5	1.3	50.3	54	3.7
200 ft	42.3	49.6	7.3	52.8	54.2	1.4	46.8	50.9	4.1
250 ft	38.8	46.4	7.6	49	50.7	1.7	43.1	47.5	4.4
300 ft	36.2	44.1	7.9	46	47.9	1.9	39.9	45	5.1
350 ft	33.8	42	8.2	43.4	45.5	2.1	37.3	42.7	5.4
400 ft	31.8	40.2	8.4	41.2	43.4	2.2	35	40.8	5.8
450 ft	30.8	39.5	8.7	39.7	42.3	2.6	33.4	39.9	6.5
500 ft	29.4	38.2	8.8	38.1	40.9	2.8	31.8	38.6	6.8
550 ft	28.3	37.2	8.9	36.9	39.7	2.8	30.5	37.5	7
600 ft	27.3	36.3	9	35.7	38.7	3	29.3	36.6	7.3
650 ft	26.5	35.5	9	34.7	37.8	3.1	28.3	35.7	7.4
700 ft	25.9	34.9	9	34.2	37.2	3	27.7	35.2	7.5
750 ft	25.3	34.3	9	33.5	36.6	3.1	27	34.6	7.6
Minimum	**25.3**	**34.3**	**7**	**33.5**	**36.6**	**1.3**	**27**	**34.6**	**3.7**
Maximum	**53.2**	**60.3**	**9**	**63.8**	**65.2**	**3.1**	**57.9**	**61.7**	**7.6**

Southeast End of Delta Junction @ 5th St: See Inset Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	51.3	58.2	6.9	63.4	64.3	0.9	57.3	60.2	2.9
100 ft	46	52.9	6.9	58.1	59	0.9	52	54.9	2.9
150 ft	42.6	49.6	7	54.6	55.6	1	48.6	51.6	3
200 ft	38.7	45.9	7.2	50.5	51.6	1.1	44.5	47.7	3.2
250 ft	35.5	42.8	7.3	47.1	48.3	1.2	41.1	44.6	3.5
300 ft	32.6	40.1	7.5	44.1	45.3	1.2	38.1	41.7	3.6
350 ft	30.1	37.7	7.6	41.5	42.8	1.3	35.5	39.3	3.8
400 ft	28.1	35.7	7.6	39.5	40.8	1.3	33.5	37.3	3.8
450 ft	26.4	34	7.6	37.7	39	1.3	31.7	35.5	3.8
500 ft	24.7	32.3	7.6	36	37.3	1.3	30.1	33.8	3.7
550 ft	23.2	30.8	7.6	34.6	35.9	1.3	28.7	32.4	3.7
600 ft	22.1	29.6	7.5	33.5	34.8	1.3	27.6	31.2	3.6
650 ft	21.1	28.5	7.4	32.6	33.8	1.2	26.6	30.2	3.6
700 ft	20.4	27.7	7.3	31.9	33.1	1.2	26	29.4	3.4
750 ft	19.9	27.3	7.4	31.5	32.7	1.2	25.5	29	3.5
Minimum	**19.9**	**27.3**	**6.9**	**31.5**	**32.7**	**0.9**	**25.5**	**29**	**2.9**
Maximum	**51.3**	**58.2**	**7.6**	**63.4**	**64.3**	**1.3**	**57.3**	**60.2**	**3.8**

Central Delta Junction @ Kimball St: See Inset Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	49.5	54.7	5.2	62.9	63.4	0.5	56.4	58.1	1.7
100 ft	46.6	51.8	5.2	60	60.4	0.4	53.4	55.2	1.8
150 ft	44.3	49.6	5.3	57.7	58.1	0.4	51.1	52.9	1.8
200 ft	41.4	47.1	5.7	54.8	55.3	0.5	48.3	50.2	1.9
250 ft	39.2	45.2	6	52.7	53.2	0.5	46.1	48.2	2.1
300 ft	37.5	43.7	6.2	50.9	51.5	0.6	44.4	46.6	2.2
350 ft	36.1	42.5	6.4	49.5	50.2	0.7	43	45.3	2.3
400 ft	34.9	41.4	6.5	48.3	49	0.7	41.8	44.1	2.3
450 ft	34	40.6	6.6	47.4	48.1	0.7	40.9	43.2	2.3
500 ft	33.1	39.7	6.6	46.5	47.2	0.7	40	42.4	2.4
550 ft	32.2	38.9	6.7	45.6	46.3	0.7	39.1	41.5	2.4
600 ft	31.5	38.2	6.7	44.9	45.6	0.7	38.4	40.8	2.4
650 ft	30.9	37.5	6.6	44.3	44.9	0.6	37.7	40.1	2.4
700 ft	30.3	36.9	6.6	43.6	44.3	0.7	37.1	39.5	2.4
750 ft	29.7	36.3	6.6	43.1	43.8	0.7	36.6	39	2.4
Minimum	**29.7**	**36.3**	**5.2**	**43.1**	**43.8**	**0.4**	**36.6**	**39**	**1.7**
Maximum	**49.5**	**54.7**	**6.7**	**62.9**	**63.4**	**0.7**	**56.4**	**58.1**	**2.4**

Delta Junction State Recreation Area: See Inset Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	50.7	55.8	5.1	64.1	64.5	0.4	57.6	59.2	1.6
100 ft	46.1	51.2	5.1	59.4	59.9	0.5	52.9	54.5	1.6
150 ft	43.7	48.7	5	57.1	57.5	0.4	50.6	52.2	1.6
200 ft	41.8	46.7	4.9	55.1	55.5	0.4	48.6	50.2	1.6
250 ft	39.2	44.3	5.1	52.6	53	0.4	46	47.7	1.7
300 ft	36.9	42.2	5.3	50.3	50.7	0.4	43.7	45.5	1.8
350 ft	34.3	39.8	5.5	47.7	48.2	0.5	41.2	43	1.8
400 ft	32.4	38	5.6	45.8	46.3	0.5	39.2	41.1	1.9
450 ft	30.5	36.3	5.8	43.9	44.4	0.5	37.3	39.3	2
500 ft	29.2	35	5.8	42.6	43.1	0.5	36.1	38.1	2
550 ft	27.8	33.6	5.8	41.2	41.7	0.5	34.6	36.6	2
600 ft	26.6	32.5	5.9	40	40.5	0.5	33.4	35.4	2
650 ft	25.7	31.6	5.9	39.1	39.6	0.5	32.6	34.6	2
700 ft	24.8	30.7	5.9	38.2	38.8	0.6	31.7	33.7	2
750 ft	24.1	29.9	5.8	37.5	38	0.5	30.9	32.9	2
Minimum	**24.1**	**29.9**	**4.9**	**37.5**	**38**	**0.4**	**30.9**	**32.9**	**1.6**
Maximum	**50.7**	**55.8**	**5.9**	**64.1**	**64.5**	**0.6**	**57.6**	**59.2**	**2**

Quartz Lake: See Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	54.6	60.3	5.7	65.9	66.7	0.8	60.7	62.9	2.2
100 ft	49.9	55.5	5.6	61.1	61.9	0.8	56	58.2	2.2
150 ft	46.6	52.4	5.8	57.9	58.7	0.8	52.7	55	2.3
200 ft	43.5	49.4	5.9	54.7	55.5	0.8	49.5	51.9	2.4
250 ft	39.8	46	6.2	50.9	51.9	1	45.7	48.3	2.6
300 ft	36.6	43.1	6.5	47.7	48.7	1	42.4	45.2	2.8
350 ft	33.8	40.4	6.6	44.8	45.9	1.1	39.5	42.5	3
400 ft	31.4	38.1	6.7	42.3	43.4	1.1	37	40.1	3.1
450 ft	29.3	36.1	6.8	40.2	41.4	1.2	35	38	3
500 ft	27.5	34.3	6.8	38.4	39.5	1.1	33.1	36.2	3.1
550 ft	25.9	32.7	6.8	36.8	37.9	1.1	31.5	34.6	3.1
600 ft	24.3	31.1	6.8	35.2	36.4	1.2	29.9	33	3.1
650 ft	23.1	29.9	6.8	34	35.1	1.1	28.7	31.8	3.1
700 ft	22.2	29	6.8	33.1	34.2	1.1	27.8	30.9	3.1
750 ft	21.5	28.3	6.8	32.4	33.6	1.2	27.1	30.2	3.1
Minimum	**21.5**	**28.3**	**5.6**	**32.4**	**33.6**	**0.8**	**27.1**	**30.2**	**2.2**
Maximum	**54.6**	**60.3**	**6.8**	**65.9**	**66.7**	**1.2**	**60.7**	**62.9**	**3.1**

Birch Lake: See Inset Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	54.2	59.7	5.5	65.5	66.3	0.8	60.4	62.5	2.1
100 ft	50.7	56.3	5.6	62	62.8	0.8	56.9	59	2.1
150 ft	47	52.7	5.7	58.2	59	0.8	53.1	55.3	2.2
200 ft	43	49.1	6.1	54.1	55.1	1	48.9	51.5	2.6
250 ft	39.5	46.2	6.7	50.5	51.6	1.1	45.2	48.2	3
300 ft	37.8	44.6	6.8	48.7	49.8	1.1	43.4	46.5	3.1
350 ft	35.9	42.8	6.9	46.7	47.9	1.2	41.4	44.7	3.3
400 ft	35.7	42.5	6.8	46.6	47.8	1.2	41.3	44.4	3.1
450 ft	34.8	41.7	6.9	45.7	46.9	1.2	40.4	43.6	3.2
500 ft	34.4	41.2	6.8	45.3	46.4	1.1	40	43.1	3.1
550 ft	33	39.8	6.8	43.9	45	1.1	38.6	41.7	3.1
600 ft	31.8	38.5	6.7	42.7	43.8	1.1	37.4	40.5	3.1
650 ft	30.7	37.5	6.8	41.6	42.8	1.2	36.4	39.4	3
700 ft	31.5	38.1	6.6	42.4	43.5	1.1	37.2	40.1	2.9
750 ft	31.4	38	6.6	42.3	43.4	1.1	37.1	40	2.9
Minimum	**30.7**	**37.5**	**5.5**	**41.6**	**42.8**	**0.8**	**36.4**	**39.4**	**2.1**
Maximum	**54.2**	**59.7**	**6.9**	**65.5**	**66.3**	**1.2**	**60.4**	**62.5**	**3.3**

Salcha River Recreation Area: See Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	49.2	54.5	5.3	61.2	61.8	0.6	56.6	58.1	1.5
100 ft	46.4	52	5.6	58.4	59	0.6	53.7	55.4	1.7
150 ft	44.3	50.3	6	56.2	56.9	0.7	51.5	53.4	1.9
200 ft	42.2	48.5	6.3	54.1	54.9	0.8	49.4	51.5	2.1
250 ft	40.4	46.6	6.2	52.3	53.1	0.8	47.5	49.6	2.1
300 ft	40.2	46.2	6	52.1	52.9	0.8	47.4	49.3	1.9
350 ft	39.9	45.8	5.9	51.8	52.6	0.8	47.1	49	1.9
400 ft	39.4	45.3	5.9	51.4	52.1	0.7	46.7	48.5	1.8
450 ft	38.8	44.7	5.9	50.8	51.5	0.7	46.1	47.9	1.8
500 ft	38	43.9	5.9	49.9	50.7	0.8	45.2	47.1	1.9
550 ft	37.3	43.2	5.9	49.2	49.9	0.7	44.5	46.4	1.9
600 ft	36.6	42.7	6.1	48.5	49.3	0.8	43.8	45.8	2
650 ft	35.8	42.1	6.3	47.7	48.5	0.8	42.9	45.1	2.2
700 ft	35	41.5	6.5	46.9	47.8	0.9	42.2	44.4	2.2
750 ft	34.3	40.8	6.5	46.2	47	0.8	41.4	43.7	2.3
Minimum	**34.3**	**40.8**	**5.3**	**46.2**	**47**	**0.6**	**41.4**	**43.7**	**1.5**
Maximum	**49.2**	**54.5**	**6.5**	**61.2**	**61.8**	**0.9**	**56.6**	**58.1**	**2.3**

Harding Lake: See Figure 9-3									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	55.4	60	4.6	67.4	67.9	0.5	62.8	64.1	1.3
100 ft	52.3	57.1	4.8	64.4	64.9	0.5	59.8	61.1	1.3
150 ft	50.2	54.9	4.7	62.2	62.7	0.5	57.6	58.9	1.3
200 ft	48.4	53.1	4.7	60.4	60.9	0.5	55.8	57.1	1.3
250 ft	45.4	50.3	4.9	57.4	58	0.6	52.8	54.2	1.4
300 ft	42.1	47.3	5.2	54.2	54.8	0.6	49.5	51	1.5
350 ft	39.3	44.6	5.3	51.3	51.9	0.6	46.6	48.2	1.6
400 ft	36.7	42.3	5.6	48.7	49.3	0.6	44	45.7	1.7
450 ft	34.3	40.1	5.8	46.3	47	0.7	41.6	43.4	1.8
500 ft	32.1	38.1	6	44.1	44.8	0.7	39.4	41.3	1.9
550 ft	30.3	36.3	6	42.2	43	0.8	37.5	39.5	2
600 ft	28.6	34.8	6.2	40.5	41.3	0.8	35.8	37.8	2
650 ft	27.1	33.3	6.2	39	39.8	0.8	34.2	36.3	2.1
700 ft	25.8	32.1	6.3	37.6	38.5	0.9	32.9	35.1	2.2
750 ft	24.6	31	6.4	36.5	37.3	0.8	31.7	33.9	2.2
Minimum	**24.6**	**31**	**4.6**	**36.5**	**37.3**	**0.5**	**31.7**	**33.9**	**1.3**
Maximum	**55.4**	**60**	**6.4**	**67.4**	**67.9**	**0.9**	**62.8**	**64.1**	**2.2**

Stringer Road: See Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	56	60.9	4.9	68.1	68.6	0.5	63.5	64.8	1.3
100 ft	52.8	57.7	4.9	64.9	65.4	0.5	60.2	61.6	1.4
150 ft	50.7	55.7	5	62.8	63.3	0.5	58.2	59.6	1.4
200 ft	48.2	53.3	5.1	60.3	60.8	0.5	55.6	57.1	1.5
250 ft	45.5	50.9	5.4	57.5	58.1	0.6	52.8	54.4	1.6
300 ft	44	49.4	5.4	56	56.6	0.6	51.3	53	1.7
350 ft	40.7	46.3	5.6	52.6	53.3	0.7	48	49.7	1.7
400 ft	38	43.7	5.7	49.9	50.6	0.7	45.3	47.1	1.8
450 ft	35.6	41.5	5.9	47.6	48.3	0.7	42.9	44.7	1.8
500 ft	33.6	39.5	5.9	45.5	46.3	0.8	40.8	42.7	1.9
550 ft	31.7	37.7	6	43.7	44.4	0.7	39	40.9	1.9
600 ft	30.1	36	5.9	42	42.8	0.8	37.3	39.2	1.9
650 ft	28.5	34.4	5.9	40.5	41.2	0.7	35.8	37.7	1.9
700 ft	27	32.9	5.9	39	39.7	0.7	34.3	36.2	1.9
750 ft	25.8	31.6	5.8	37.7	38.4	0.7	33	34.9	1.9
Minimum	**25.8**	**31.6**	**4.9**	**37.7**	**38.4**	**0.5**	**33**	**34.9**	**1.3**
Maximum	**56**	**60.9**	**6**	**68.1**	**68.6**	**0.8**	**63.5**	**64.8**	**1.9**

North of Eielson Air Force Base @ Hope St: See Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	58.2	60.1	1.9	69.5	69.7	0.2	64.9	67	2.1
100 ft	55.4	57.4	2	66.7	66.9	0.2	62.1	64.3	2.2
150 ft	51.9	54	2.1	63.3	63.5	0.2	58.7	60.7	2
200 ft	48	50.2	2.2	59.3	59.5	0.2	54.8	56.9	2.1
250 ft	44.7	47	2.3	56	56.2	0.2	51.4	53.7	2.3
300 ft	42.1	44.5	2.4	53.3	53.5	0.2	48.8	51.2	2.4
350 ft	39.7	42.1	2.4	50.9	51.1	0.2	46.4	48.9	2.5
400 ft	37.5	40	2.5	48.7	49	0.3	44.2	46.8	2.6
450 ft	35.8	38.3	2.5	47	47.2	0.2	42.5	45.3	2.8
500 ft	34.4	36.7	2.3	45.4	45.7	0.3	41	44	3
550 ft	33.2	35.5	2.3	44.2	44.5	0.3	39.9	43	3.1
600 ft	32	34.3	2.3	43	43.3	0.3	38.7	41.9	3.2
650 ft	30.9	33.2	2.3	41.9	42.1	0.2	37.6	40.8	3.2
700 ft	30.1	32.3	2.2	41.1	41.3	0.2	36.8	40	3.2
750 ft	29.5	31.7	2.2	40.4	40.7	0.3	36.2	39.5	3.3
Minimum	**29.5**	**31.7**	**1.9**	**40.4**	**40.7**	**0.2**	**36.2**	**39.5**	**2**
Maximum	**58.2**	**60.1**	**2.5**	**69.5**	**69.7**	**0.3**	**64.9**	**67**	**3.3**

North Pole @ Newby Rd: See Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft - East Side	59.1	61.1	2	70.5	70.6	0.1	65.9	67.9	2
100 ft - East Side	56.6	58.6	2	68	68.1	0.1	63.4	65.6	2.2
150 ft - East Side	54.5	56.6	2.1	65.9	66.1	0.2	61.3	63.4	2.1
200 ft - East Side	52.2	54.4	2.2	63.6	63.8	0.2	59	61.1	2.1
250 ft - East Side	50	52.3	2.3	61.3	61.5	0.2	56.7	59	2.3
300 ft - East Side	48.1	50.6	2.5	59.4	59.6	0.2	54.8	57.3	2.5
350 ft - East Side	46.5	49.1	2.6	57.7	58	0.3	53.2	55.8	2.6
400 ft - East Side	45.3	47.9	2.6	56.4	56.7	0.3	51.9	54.6	2.7
450 ft - East Side	44.4	47	2.6	55.5	55.7	0.2	51.1	54	2.9
500 ft - East Side	43.8	46.4	2.6	54.9	55.1	0.2	50.5	53.5	3
550 ft - East Side	43.2	45.7	2.5	54.2	54.4	0.2	49.9	53.1	3.2
600 ft - East Side	42.7	45.2	2.5	53.7	53.9	0.2	49.4	52.7	3.3
650 ft - East Side	42.3	44.6	2.3	53.1	53.4	0.3	48.9	52.3	3.4
700 ft - East Side	41.9	44.2	2.3	52.7	53	0.3	48.5	52	3.5
750 ft - East Side	41.4	43.7	2.3	52.2	52.5	0.3	48.1	51.6	3.5
50 ft - West Side	59.7	61.5	1.8	70.6	70.7	0.1	66.4	69.8	3.4
100 ft - West Side	56.7	58.6	1.9	67.6	67.7	0.1	63.4	67	3.6
150 ft - West Side	54.6	56.5	1.9	65.4	65.6	0.2	61.2	64.9	3.7
200 ft - West Side	52.4	54.4	2	63.2	63.4	0.2	59.1	62.7	3.6
250 ft - West Side	50.1	52.3	2.2	61	61.2	0.2	56.8	60.3	3.5
300 ft - West Side	48.2	50.5	2.3	59.1	59.3	0.2	54.9	58.3	3.4
350 ft - West Side	46.7	49.1	2.4	57.6	57.9	0.3	53.3	56.7	3.4
400 ft - West Side	45.5	48	2.5	56.5	56.8	0.3	52.2	55.4	3.2
450 ft - West Side	46.1	48.3	2.2	57.4	57.6	0.2	52.8	55.2	2.4
500 ft - West Side	45	47.3	2.3	56.3	56.5	0.2	51.8	54.2	2.4
550 ft - West Side	44.3	46.5	2.2	55.6	55.8	0.2	51	53.3	2.3
600 ft - West Side	43.8	46.1	2.3	55.2	55.4	0.2	50.6	52.7	2.1
650 ft - West Side	43.4	45.6	2.2	54.8	55	0.2	50.1	52.1	2
700 ft - West Side	42.8	45	2.2	54.2	54.4	0.2	49.6	51.5	1.9
750 ft - West Side	42.4	44.5	2.1	53.8	54	0.2	49.2	51	1.8
Minimum	**41.4**	**43.7**	**1.8**	**52.2**	**52.5**	**0.1**	**48.1**	**51**	**1.8**
Maximum	**59.7**	**61.5**	**2.6**	**70.6**	**70.7**	**0.3**	**66.4**	**69.8**	**3.7**

Fort Wainwright on Richardson Highway @ Magnolia Ln: See Inset Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft North	59.7	60.9	1.2	70.4	70.5	0.1	66.1	66.4	0.3
100 Ft North	55.9	57	1.1	66.4	66.5	0.1	62.3	62.6	0.3
150 ft North	52.5	53.7	1.2	63.1	63.2	0.1	58.9	59.2	0.3
200 ft North	49.2	50.5	1.3	59.8	59.9	0.1	55.6	56	0.4
250 ft North	46	47.3	1.3	56.5	56.6	0.1	52.4	52.7	0.3
300 ft North	45.4	46.8	1.4	56	56.1	0.1	51.8	52.2	0.4
350 ft North	45	46.3	1.3	55.4	55.5	0.1	51.4	51.8	0.4
400 ft North	44.5	45.8	1.3	54.8	54.9	0.1	51	51.3	0.3
450 ft North	44.1	45.3	1.2	54.2	54.3	0.1	50.5	50.8	0.3
500 ft North	43.5	44.7	1.2	53.6	53.7	0.1	50	50.3	0.3
550 ft North	42.9	44.1	1.2	52.9	53	0.1	49.4	49.7	0.3
600 ft North (Nearest Barracks)	42.5	43.7	1.2	52.4	52.5	0.1	49	49.3	0.3
650 ft North	42	43.1	1.1	51.8	51.9	0.1	48.5	48.8	0.3
700 ft North	41.2	42.4	1.2	51.1	51.2	0.1	47.8	48.1	0.3
750 ft North	40.5	41.7	1.2	50.3	50.5	0.2	47	47.3	0.3
Minimum	**40.5**	**41.7**	**1.1**	**50.3**	**50.5**	**0.1**	**47**	**47.3**	**0.3**
Maximum	**59.7**	**60.9**	**1.4**	**70.4**	**70.5**	**0.2**	**66.1**	**66.4**	**0.4**

Fort Wainwright and 15th Street on Steese Highway: See Inset Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft east	56.6	58.2	1.6	68	68.1	0.1	62.8	63.2	0.4
100 ft east	52.4	54.3	1.9	63.8	63.9	0.1	58.8	59.3	0.5
150 ft east	49.6	51.7	2.1	61	61.2	0.2	56.1	56.7	0.6
200 ft east	47.2	49.5	2.3	58.6	58.8	0.2	53.8	54.4	0.6
250 ft east	45.7	48.1	2.4	57	57.3	0.3	52.3	52.9	0.6
300 ft east	44.3	46.8	2.5	55.6	55.9	0.3	50.9	51.6	0.7
350 ft east	43	45.5	2.5	54.3	54.6	0.3	49.6	50.3	0.7
400 ft east	41.6	44.2	2.6	53	53.2	0.2	48.3	49	0.7
450 ft east	40.7	43.3	2.6	52.1	52.3	0.2	47.4	48.1	0.7
500 ft east	39.8	42.4	2.6	51.2	51.4	0.2	46.5	47.2	0.7
550 ft east	39	41.6	2.6	50.4	50.7	0.3	45.8	46.5	0.7
600 ft east	38.4	41	2.6	49.8	50.1	0.3	45.2	45.9	0.7
650 ft east	37.8	40.3	2.5	49.2	49.5	0.3	44.6	45.3	0.7
700 ft east	37.3	39.8	2.5	48.7	48.9	0.2	44.1	44.8	0.7
750 ft east	36.8	39.2	2.4	48.2	48.4	0.2	43.6	44.3	0.7
50 ft west	57.1	58.6	1.5	68.7	68.8	0.1	64.4	64.7	0.3
100 ft west	52.2	54	1.8	63.7	63.9	0.2	59.3	59.7	0.4
150 ft west	49.5	51.6	2.1	61	61.2	0.2	56.6	57.1	0.5
200 ft west	47.4	49.7	2.3	58.9	59.1	0.2	54.4	55	0.6
250 ft west	45.8	48.2	2.4	57.3	57.5	0.2	52.8	53.4	0.6
300 ft west	44.4	46.8	2.4	55.9	56.1	0.2	51.4	52	0.6
350 ft west	43.2	45.7	2.5	54.7	54.9	0.2	50.1	50.8	0.7
400 ft west	42.2	44.7	2.5	53.6	53.9	0.3	49.1	49.7	0.6
450 ft west	41.2	43.8	2.6	52.7	52.9	0.2	48.2	48.8	0.6
500 ft west	40.4	42.9	2.5	51.9	52.1	0.2	47.3	48	0.7
550 ft west	39.8	42.3	2.5	51.3	51.5	0.2	46.7	47.4	0.7
600 ft west	39.2	41.6	2.4	50.6	50.9	0.3	46	46.7	0.7
650 ft west	38.4	40.9	2.5	49.9	50.1	0.2	45.3	45.9	0.6
700 ft west	37.8	40.2	2.4	49.2	49.5	0.3	44.6	45.3	0.7
750 ft west	37.2	39.6	2.4	48.6	48.8	0.2	44	44.6	0.6
Minimum	**36.8**	**39.2**	**1.5**	**48.2**	**48.4**	**0.1**	**43.6**	**44.3**	**0.3**
Maximum	**57.1**	**58.6**	**2.6**	**68.7**	**68.8**	**0.3**	**64.4**	**64.7**	**0.7**

Bentley Island and Clay Cemetery on Steese Highway: See Inset Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft east	54.8	56.8	2	66.5	66.7	0.2	62.5	62.9	0.4
100 ft east	50.8	53.1	2.3	62.5	62.7	0.2	58.5	59	0.5
150 ft east (water)	48.5	50.9	2.4	60.2	60.4	0.2	56.1	56.7	0.6
200 ft east (water)	46.8	49.3	2.5	58.5	58.7	0.2	54.4	55	0.6
250 ft east (water)	45.6	48.1	2.5	57.3	57.5	0.2	53.2	53.8	0.6
300 ft east (water)	44.6	47.1	2.5	56.3	56.5	0.2	52.2	52.7	0.5
350 ft east	44.4	46.8	2.4	56.1	56.3	0.2	51.9	52.4	0.5
400 ft east	42.5	45.2	2.7	54.2	54.5	0.3	50.1	50.7	0.6
450 ft east	41.6	44.2	2.6	53.3	53.5	0.2	49.2	49.8	0.6
500 ft east	40.8	43.5	2.7	52.5	52.8	0.3	48.4	49	0.6
550 ft east	40.1	42.7	2.6	51.8	52	0.2	47.7	48.3	0.6
600 ft east	39.4	42	2.6	51.1	51.3	0.2	47	47.5	0.5
650 ft east	38.7	41.3	2.6	50.4	50.7	0.3	46.3	46.9	0.6
700 ft east	38.1	40.7	2.6	49.8	50	0.2	45.7	46.2	0.5
750 ft east	37.5	40.1	2.6	49.2	49.4	0.2	45.1	45.7	0.6
50 ft west	54.2	56.3	2.1	65.9	66	0.1	61.7	62.1	0.4
100 ft west	50.7	53	2.3	62.4	62.6	0.2	58.2	58.7	0.5
150 ft west	48.3	50.8	2.5	60	60.2	0.2	55.9	56.4	0.5
200 ft west	46.7	49.2	2.5	58.4	58.6	0.2	54.2	54.8	0.6
250 ft west	45.2	47.8	2.6	56.9	57.2	0.3	52.8	53.4	0.6
300 ft west	44.3	46.9	2.6	56	56.2	0.2	51.9	52.5	0.6
350 ft west	43.4	46	2.6	55.1	55.3	0.2	51	51.6	0.6
400 ft west	42.4	45	2.6	54.1	54.4	0.3	50	50.6	0.6
450 ft west	41.5	44.2	2.7	53.2	53.5	0.3	49.1	49.7	0.6
500 ft west	40.7	43.3	2.6	52.4	52.6	0.2	48.3	48.8	0.5
550 ft west	39.9	42.6	2.7	51.6	51.9	0.3	47.5	48.1	0.6
600 ft west	39.3	41.9	2.6	51	51.2	0.2	46.8	47.4	0.6
650 ft west	38.5	41.1	2.6	50.2	50.4	0.2	46	46.6	0.6
700 ft west	37.8	40.4	2.6	49.5	49.8	0.3	45.4	46	0.6
750 ft west	37.3	39.8	2.5	48.9	49.2	0.3	44.8	45.4	0.6
Minimum	**37.3**	**39.8**	**2**	**48.9**	**49.2**	**0.1**	**44.8**	**45.4**	**0.4**
Maximum	**54.8**	**56.8**	**2.7**	**66.5**	**66.7**	**0.3**	**62.5**	**62.9**	**0.6**

North Fairbanks (Joyce Dr) on Steese Highway: See Inset Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft east	55.7	57.7	2	66.5	66.7	0.2	62.1	62.6	0.5
100 ft east	53.3	55.3	2	64	64.2	0.2	59.6	60.1	0.5
150 ft east	51.1	53.2	2.1	61.8	62	0.2	57.4	58	0.6
200 ft east	48.8	51	2.2	59.4	59.7	0.3	55	55.7	0.7
250 ft east	46.7	49	2.3	57.4	57.6	0.2	53	53.6	0.6
300 ft east	45.2	47.6	2.4	55.9	56.2	0.3	51.5	52.2	0.7
350 ft east	44.1	46.6	2.5	54.8	55.1	0.3	50.4	51.1	0.7
400 ft east	43.2	45.6	2.4	53.8	54.1	0.3	49.5	50.2	0.7
450 ft east	42.4	44.8	2.4	53.1	53.3	0.2	48.7	49.4	0.7
500 ft east	41.6	44	2.4	52.2	52.5	0.3	47.9	48.6	0.7
550 ft east	40.9	43.3	2.4	51.5	51.8	0.3	47.2	47.9	0.7
600 ft east	40.2	42.6	2.4	50.9	51.1	0.2	46.6	47.2	0.6
650 ft east	39.8	42.1	2.3	50.5	50.8	0.3	46.2	46.9	0.7
700 ft east	39.3	41.6	2.3	50	50.2	0.2	45.7	46.3	0.6
750 ft east	38.9	41.1	2.2	49.6	49.8	0.2	45.3	45.9	0.6
Minimum	**38.9**	**41.1**	**2**	**49.6**	**49.8**	**0.2**	**45.3**	**45.9**	**0.5**
Maximum	**55.7**	**57.7**	**2.5**	**66.5**	**66.7**	**0.3**	**62.1**	**62.6**	**0.7**

North Chena Hot Spring Road on Steese Highway: See Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft east	41.2	45.6	4.4	52.7	53.2	0.5	49	50.1	1.1
100 ft east	43.3	48.8	5.5	54.8	55.5	0.7	51.1	52.6	1.5
150 ft east	42.4	47.6	5.2	53.9	54.6	0.7	50.2	51.6	1.4
200 ft east	41.5	46.5	5	53	53.6	0.6	49.2	50.6	1.4
250 ft east	40.7	45.8	5.1	52.1	52.8	0.7	48.4	49.8	1.4
300 ft east	40.2	45.4	5.2	51.6	52.3	0.7	47.8	49.3	1.5
350 ft east	39.5	44.6	5.1	50.9	51.5	0.6	47.1	48.5	1.4
400 ft east	38.7	43.8	5.1	50.1	50.8	0.7	46.3	47.8	1.5
450 ft east	38.1	43.1	5	49.5	50.1	0.6	45.7	47.1	1.4
500 ft east	37.5	42.4	4.9	48.9	49.5	0.6	45.1	46.4	1.3
550 ft east	37	41.8	4.8	48.4	48.9	0.5	44.6	45.9	1.3
600 ft east	36.3	41.1	4.8	47.7	48.3	0.6	43.9	45.2	1.3
650 ft east	35.7	40.4	4.7	47.1	47.7	0.6	43.3	44.6	1.3
700 ft east	35.2	39.9	4.7	46.6	47.2	0.6	42.8	44.1	1.3
750 ft east	34.8	39.4	4.6	46.2	46.7	0.5	42.4	43.6	1.2
50 ft west	48.6	53	4.4	59.8	60.3	0.5	55.7	57	1.3
100 ft west	46.4	51.1	4.7	57.6	58.2	0.6	53.5	54.9	1.4
150 ft west	44.7	49.5	4.8	56	56.6	0.6	51.9	53.4	1.5
200 ft west	43.1	48	4.9	54.3	55	0.7	50.3	51.8	1.5
250 ft west	41.7	46.7	5	52.9	53.6	0.7	48.9	50.4	1.5
300 ft west	40.7	45.7	5	51.9	52.6	0.7	47.9	49.4	1.5
350 ft west	39.5	44.6	5.1	50.7	51.4	0.7	46.8	48.3	1.5
400 ft west	38.5	43.6	5.1	49.8	50.5	0.7	45.8	47.3	1.5
450 ft west	37.5	42.6	5.1	48.8	49.4	0.6	44.8	46.3	1.5
500 ft west	36.6	41.7	5.1	47.9	48.5	0.6	43.9	45.4	1.5
550 ft west	35.8	40.9	5.1	47.1	47.7	0.6	43.1	44.6	1.5
600 ft west	35.2	40.2	5	46.4	47.1	0.7	42.4	43.9	1.5
650 ft west	34.5	39.5	5	45.7	46.4	0.7	41.7	43.2	1.5
700 ft west	34	38.9	4.9	45.3	45.9	0.6	41.3	42.7	1.4
750 ft west	33.6	38.4	4.8	44.8	45.4	0.6	40.8	42.2	1.4
Minimum	**33.6**	**38.4**	**4.4**	**44.8**	**45.4**	**0.5**	**40.8**	**42.2**	**1.1**
Maximum	**48.6**	**53**	**5.5**	**59.8**	**60.3**	**0.7**	**55.7**	**57**	**1.5**

NOAA Facilities on Steese Highway: See Figure 9-4									
	2:00 am Noise Levels			2:00 pm Noise Levels			10:00 pm Noise Levels		
Dist.	Exist	W/Trk	Chg	Exist	W/Trk	Chg	Exist	W/Trk	Chg
50 ft	52.7	59.7	7	62.4	64.2	1.8	58.1	61.6	3.5
100 ft	46.3	53.8	7.5	55.6	57.7	2.1	51.4	55.4	4
150 ft	43.2	51.1	7.9	52.1	54.5	2.4	47.9	52.5	4.6
200 ft	41	49.2	8.2	49.7	52.3	2.6	45.5	50.4	4.9
250 ft	39.2	47.6	8.4	47.8	50.6	2.8	43.6	48.7	5.1
300 ft	37.7	46.2	8.5	46.2	49	2.8	42	47.3	5.3
350 ft	36.5	45.1	8.6	44.9	47.8	2.9	40.7	46.1	5.4
400 ft	35.5	44.1	8.6	43.8	46.8	3	39.7	45.1	5.4
450 ft	34.6	43.2	8.6	42.8	45.9	3.1	38.7	44.2	5.5
500 ft	33.7	42.4	8.7	41.9	45	3.1	37.8	43.3	5.5
550 ft	32.9	41.6	8.7	41.1	44.2	3.1	37	42.5	5.5
600 ft	32.1	40.8	8.7	40.4	43.4	3	36.3	41.7	5.4
650 ft	31.4	40.1	8.7	39.6	42.7	3.1	35.5	41	5.5
700 ft	30.7	39.3	8.6	38.9	42	3.1	34.8	40.3	5.5
750 ft	30	38.7	8.7	38.3	41.3	3	34.2	39.6	5.4
Minimum	**30**	**38.7**	**7**	**38.3**	**41.3**	**1.8**	**34.2**	**39.6**	**3.5**
Maximum	**52.7**	**59.7**	**8.7**	**62.4**	**64.2**	**3.1**	**58.1**	**61.6**	**5.5**