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# GRIP ROAD MINE NOISE AND VIBRATION STUDY



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## 1. INTRODUCTION

Miles Sand & Gravel Company (Miles) is proposing to mine gravel from a 68 acre parcel located in unincorporated Skagit County near Sedro Woolley, Washington. The mine would be situated in the middle of 726 acres of contiguously owned property. The site is forested, and most of the existing buffers would remain intact. All of the material from the mine would be sold as pit run or transported to other facilities for processing.

The following report reviews noise terminology, regulatory criteria applicable to the project, and the methods and findings of the analysis.

## 2. TERMINOLOGY AND BACKGROUND

### 2.1 Noise Level Terminology and Human Hearing

The human ear responds to a very wide range of sound intensities. The decibel scale (dB) used to describe sound is a logarithmic rating system which accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dB. Therefore, a 70-dB sound level will sound about twice as loud as a 60-dB sound level. People generally cannot detect differences of 1 dB; in ideal laboratory situations, differences of 2 or 3 dB can be detected by people, but such a change probably would not be detectable in an average outdoor environment. A 5-dB change would probably be perceived under normal listening conditions.

When addressing the effects of noise on people, it is useful to consider the frequency response of the human ear. Sound-measuring instruments are therefore often programmed to weight measured sounds based on the way people hear. The frequency-weighting most often used is A-weighting because it approximates the frequency response of human hearing and is highly correlated to the effects of noise on people. Measurements from instruments using this system are reported in "A-weighted decibels" or dBA. All sound levels in this evaluation are reported in A-weighted decibels.

Distance from the source, the frequency of the sound, the absorbency of the intervening ground, obstructions, and duration of the noise-producing event all affect the transmission and perception of noise. The degree of this effect also depends on who is listening and on existing sound levels.

### 2.2 Vibration Terminology

Vibration is an oscillatory motion that can be measured and characterized by the frequency and amplitude of waves of motion. Because it takes time for the human body to perceive and respond to vibration signals, vibration amplitude (i.e., the size of the wave of motion) is usually characterized using a "smoothed" amplitude based on the root mean square (rms).

Some methodologies used for assessing potential impacts from vibration consider vibration amplitude reported as rms velocity, converted to vibration decibel levels or VdB. The typical background level in residential areas is about 50 VdB, and most people generally cannot detect levels below about 65 VdB, and generally do not consider levels below 70 VdB to be of significance. However, the duration of a vibration event has an effect on human response. Generally, as the duration of a vibration event increases, the potential for adverse human response increases. Additionally, the rate of recurrence of events can also affect human response.

### 3. AFFECTED ENVIRONMENT

#### 3.1 Skagit County Noise Regulations

The project site and surrounding properties are located in unincorporated Skagit County. Chapter 9.50 of the Skagit County Code (SCC 9.50) adopts regulations established in Chapter 173-60 of the Washington Administrative Code (WAC).

Chapter 173-60 of the WAC limits the levels and durations of noise crossing property boundaries ([Table 1](#)). Allowable "maximum permissible" sound levels depend on the Environmental Designation of Noise Abatement (EDNA) of the source of the noise and the EDNA of the receiving property. WAC 173-60-030 stipulates that EDNA land classification shall conform to land uses unless a local jurisdiction has adopted a program in which EDNA classifications are based on zoning. Generally, lands of residential use are considered Class A EDNAs, commercial properties are considered Class B EDNAs, and industrial areas are considered Class C EDNAs.

**Table 1. WAC Maximum Permissible Sound Levels (dBA)**

EDNA of Sound Source	EDNA of Receiving Property		
	Class A Day / Night	EDNA B	EDNA C
EDNA A	55 / 45	57	60
EDNA B	57 / 47	60	65
EDNA C	60 / 50	65	70

The limitations for noise received in a Class A EDNA are reduced by 10 dBA during nighttime hours, defined as between 10 PM and 7 AM.  
Source: WAC 173-60-040

The "maximum permissible" environmental noise levels in [Table 1](#) may be exceeded for short periods as defined in WAC 173-60-040. The allowed short-term increases are as follows: 5 dBA for no more than 15 minutes in any hour, or 10 dBA for no more than 5

minutes of any hour, or 15 dBA for no more than 1.5 minutes of any hour. These allowed short-term increases can be described in terms of noise "metrics" that represent the percentage of time certain levels are exceeded. For example, the hourly L25 metric represents the sound level that is exceeded 25 percent of the time, or 15 minutes in an hour. Similarly, the L8.3 and L2.5 are the sound levels exceeded 5 and 1.5 minutes in an hour, respectively. The maximum permissible levels are not to be exceeded by more than 15 dBA at any time, and this limit is represented by the Lmax noise metric.

The Washington Administrative Code (173-60-050) identifies a number of noise sources or activities that are exempt from the maximum permissible sound levels. The following sources are among those exempt:

- Sounds created by motor vehicles on public roads when individual vehicles are subject to performance standards regulated by WAC 173-62 (motor vehicle fleet performance standards)
- Sounds caused by motor vehicles, licensed or unlicensed, when operated off public highways, except when such sounds are received in Class A EDNAs; and
- Sounds created by warning devices not operating continuously for more than five minutes (such as back-up alarms on vehicles).

### **3.2 FTA Vibration Impact Criteria**

There are currently no applicable vibration limits or regulations established by Skagit County. Therefore, we are applying Federal Transit Administration (FTA) vibration impact criteria in this assessment to gauge the potential for vibration impacts from the proposed mining and material transport activities.

FTA vibration impact criteria vary depending on the type of receiver and the frequency of occurrence of vibration events. FTA categorizes receiving properties as Category 1 (e.g., most sensitive, such as research facilities with vibration sensitive equipment), Category 2 (e.g., residences), and Category 3 (e.g., institutional uses such as schools, churches, etc.). For this project, groundborne vibration would have the potential to primarily affect residences (Category 2 receiving properties), and these types of properties are the focus of this assessment. The FTA vibration impact criteria for Category 2 receivers are shown in [Table 2](#).

**Table 2. FTA Vibration Impact Criteria**

<b>Land Use Category</b>	<b>Frequent Events</b>	<b>Occasional Events</b>	<b>Infrequent Events</b>
Category 2 - Residential	72 VdB	75 VdB	80 VdB
<p>"Frequent Events" is defined as more than 70 vibration events of the same source per day.                      "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.                      "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.</p>			

**3.3 Land Uses and Zoning**

The proposed mining area and surrounding properties are zoned RRv and RRc-NRL (Rural Reserve and Rural Resource, respectively). Skagit County does not specifically assign an EDNA based on zoning designations, so the EDNA classification of the site and surrounding properties are based on the uses of the properties. Mining uses are typically classified as Class C EDNA noise sources and residential uses are classified as Class A EDNAs.

The applicable noise limits for a Class C EDNA noise source affecting a Class A receiver are 60 dBA during daytime hours (7 AM to 10 PM) and 50 dBA during nighttime hours (10 PM to 7 AM). Allowable short-term increases to the above levels are as described previously. Operation of the mine is generally expected to occur between 7 AM and 5 PM, Monday through Friday, but the mine could potentially operate during weekends or at night, on occasion. The applicable noise limits at the nearby receivers from mining activities would be 60 dBA during standard daytime operation and 50 dBA during potential nighttime operation.

**3.4 Existing Sound Levels**

In January 2018, Ramboll measured day-long sound levels at three locations representative of residences nearest the proposed mining area and access drive. The measurements were taken using Larson Davis Class 1 sound level meters (Model LxT). The meters had been factory certified within the previous 12 months and were field calibrated immediately prior to the measurements. The microphones of the meters were fitted with wind screens and set approximately 5 feet above the ground (at a typical listening height).

The sound level measurements were taken at the following locations:

- **SLM1** –onsite near northern property boundary
- **SLM2** –approximately 0.3 miles northwest of the site along Wildlife Acres Lane
- **SLM3** – near the southern property boundary at the entrance of the mine site, approximately 50 feet from Grip Road



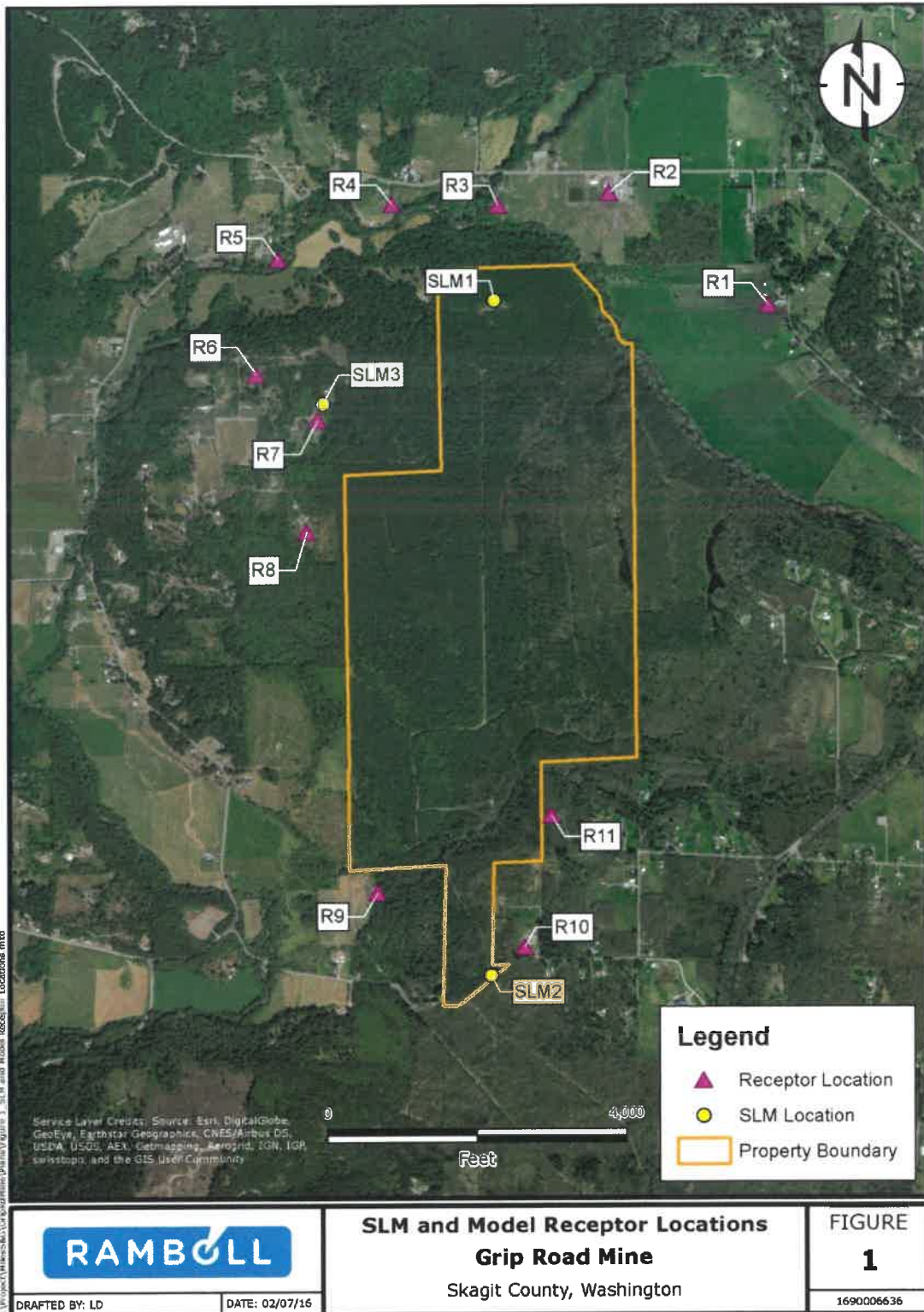
The measured sound levels are summarized in [Table 3](#), and the sound level measurement locations are depicted in [Figure 1](#). Details of hourly sound level measurements can be found in Appendix A.

**Table 3. Measured Existing Sound Levels (dBA)**

Location	Time of Day <sup>(a)</sup>	Range of Hourly Sound Levels (dBA) <sup>(b)</sup>				
		Leq	L25	L8.3	L2.5	Lmax
SLM1	Day	32-46	32-47	33-50	33-55	40-73
	Night	33-41	32-41	35-44	37-47	47-63
	7 AM - 5 PM	32-46	32-47	33-50	33-55	40-73
SLM2	Day	46-56	32-52	37-61	52-66	71-79
	Night	43-55	31-49	33-58	41-65	70-78
	7 AM - 5 PM	52-56	36-52	52-59	59-66	72-79
SLM3	Day	32-55	32-55	34-59	37-61	45-86
	Night	31-47	31-40	33-44	35-52	42-77
	7 AM - 5 PM	32-55	32-55	34-59	37-61	49-86

(a) "Day" refers to the hours between 7 AM and 10 PM and "Night" to the hours between 10 PM and 7 AM. 7 AM to 5 PM is the standard hours of operation.

(b) The Leq is the "energy-averaged" sound level. The Lmax is the-highest measured sound level. The L2.5, L8.3, and L25 levels are defined previously in this report in the discussion of the regulatory noise limits.



**Figure 1. Sound Level Measurement and Model Receptor Locations**

## 4. OPERATIONAL NOISE IMPACT

### 4.1 Noise Sources

The primary noise sources introduced by the proposal would be a front-end loader excavating material from the floor of the pit in the expansion area and trucks used to export the pit run. No crushing or processing is proposed on the site. Trucks would travel on an on-site road south to Grip Road to exit the site.

### 4.2 Noise Model Used

Noise modeling of on-site sources was completed using the CadnaA noise model. CadnaA is a computer tool that calculates sound levels after considering the noise reductions or enhancements caused by distance, topography, varying ground surfaces, atmospheric absorption, and meteorological conditions. For the loader and truck in the mine, the model uses algorithms that comply with the international standards in ISO-9613-2:1996.

The modeling process includes the following steps: (1) characterizing the noise sources, (2) creating 3-dimensional maps of the site and vicinity to enable the model to evaluate effects of distance and topography on noise attenuation, and (3) assigning equipment and activity sound levels to appropriate locations on the site. CadnaA then constructs topographic cross sections to calculate sound levels in the vicinity of a project site.

### 4.3 Modeling Assumptions

The following assumptions were used in our assessment:

- When excavating the southern half of the site, the front-end loader was assumed to be excavating at existing elevation. This is likely to occur only at the beginning of mining, after which the loader would be expected to be working at a lower excavation, with the slopes of the mine acting somewhat as a noise barrier. Therefore, this is a conservative assumption.
- When excavating the northern half of the site, the front-end loader was assumed to be excavating on the mining slope.
- In any location, the loader was assumed to work continuously in the same general area for a one-hour period. Two loader locations were considered in the southern half of the site and two in the northern half of the site to identify the loader location with the maximum noise potential for each receptor.
- A truck would arrive in proximity to the loader and wait to be loaded. A waiting truck was assumed to be present continuously over the hour.
- The sound level of the loader was assumed to be 75 dBA at a distance of 100 feet. The sound level of the waiting truck was assumed to be 60 dBA at 100 feet.
- In addition to the waiting trucks, we considered noise from 12 trucks per hour traveling on the on-site access road to and from the mine. This estimated number of hourly trucks was based on the estimated average number of 8 trucks, with an

additional 50% increase to ensure a conservative noise estimate. Trucks traveling on the onsite road were modeled using the TNM module of CadnaA.<sup>1</sup>

- The model-calculated sound levels represent hourly Leqs. For most mining operations, the Leqs are very similar to the L25s. Therefore, the modeled hourly Leqs are used to assess compliance with the State’s L25 noise limit.

#### 4.4 Compliance Assessment Results

As part of the noise assessment, Ramboll first considered the potential for onsite noise to comply with the applicable WAC noise limits. For this assessment, Ramboll considered the potential sound levels from two working scenarios; 1) a loader excavating at existing grade in the southern half of the site, and 2) a loader operating on the mine slope in the northern half of the site. The resulting model-calculated sound levels for each scenario were compared to the applicable noise limits to assess potential compliance with the WAC noise limits.

The resulting model-calculated sound levels are displayed in [Table 4](#). As can be seen by the values in [Table 4](#), sound levels from the Grip Road Mine are expected to easily comply with the State’s daytime noise limit during excavation. In addition, if mining activities were to occur at night, they would be expected to easily comply with the stricter nighttime limit.

**Table 4. Model-Calculated Sound Levels (Leq/L25, dBA)**

Model Receptor	Southern Scenario	Northern Scenario	Daytime/Nighttime Noise Limit <sup>a</sup>
R1	37	36	60/50
R2	39	38	60/50
R3	43	36	60/50
R4	42	35	60/50
R5	36	37	60/50
R6	39	38	60/50
R7	37	37	60/50
R8	34	36	60/50
R9	36	36	60/50
R10	40	36	60/50
R11	41	41	60/50

<sup>a</sup> Daytime refers to the hours between 7 AM and 10 PM. Nighttime refers to the hours between 10 PM and 7 AM.  
Source: Ramboll

<sup>1</sup> The CadnaA noise model includes a module that applies the FHWA’s Traffic Noise Model (TNM) traffic noise emission levels and noise attenuation algorithms.

**4.4.1 Increases Over Existing Noise Levels From Project Sources**

In addition to evaluating the potential compliance of onsite sources, Ramboll considered potential noise impacts caused by project-related increases over existing background sound levels. For the existing background sound level, we used the period Leq (energy-average sound level) between 7 AM and 5 PM to represent the existing baseline sound levels.

**Table 5. Calculated Increases over Existing Levels (Leq, dBA)**

Receptor	Existing <sup>(a)</sup>	Southern Scenario			Northern Scenario		
		Project	Cumulative <sup>(b)</sup>	Increase	Project	Cumulative <sup>(b)</sup>	Increase
R1	43	37	44	1	36	44	1
R2	43	39	45	1	38	44	1
R3	43	43	46	3	36	44	1
R4	43	42	46	2	35	44	1
R5	43	36	44	1	37	44	1
R6	49	39	49	0	38	49	0
R7	49	37	49	0	37	49	0
R8	49	34	49	0	36	49	0
R9	54	36	54	0	36	54	0
R10	54	40	54	0	39	54	0
R11	54	41	54	0	41	54	0

Notes:

(a) The existing sound level shown is the period Leq between 7 AM and 5 PM. When identifying existing sound levels, the sound levels measured at SLM1 were assumed to represent receptors R1-R5, the levels at SLM3 represent R6-R8, and the levels at SLM2 represent R9-R11.

(b) Cumulative levels represent the existing measured sound levels + the modeled project-related sound levels.

Source: Ramboll

As can be seen in [Table 5](#), the sound levels when the loader is assumed to be working at the existing grade in the southern half of the mine site increase by 0 to 3 dBA at the nearest residential receivers to the site. Increases of 0-2 dBA would be generally be not perceptible or barely perceptible. Increases of 3 dBA may be somewhat perceptible but would not be characterized as a substantial increase. It should be noted that these levels are modeled using a conservative assumption that the loaders are operating at the existing grade. Soon after mining begins, the loaders would be working below the existing grade in a pit, and the walls of the pit would begin to act as a noise barrier to residences north of the site. Further reducing potential increases over existing sound levels. When mining in the northern half of

the site, the estimated increases over existing levels are 0 to 1 dBA, which would not generally be perceptible. No impacts are expected due to increases over existing levels.

## **5. OPERATIONAL VIBRATION IMPACT**

Although most gravel mining operations do not typically result in perceptible vibrations at offsite locations (unless blasting is required), vibration was mentioned as a source of concern by residents in the project vicinity. Therefore, Ramboll evaluated the potential for vibration impacts from the project. The proposed onsite mining operations and haul road would be located more than 500 feet (and generally much farther) from the nearest residential structures, and there is no potential for impacts from groundborne vibration due to these onsite activities. Therefore, this assessment focused on the potential for vibration impacts from trucks traveling between the site and Old Highway 99 via Grip Road and Prairie Road. For this assessment, we used FTA vibration assessment methods in conjunction with the FTA vibration impact criteria identified earlier in this report.

### **1.1 FTA Vibration Screening Procedure**

FTA guidance (2006) includes a screening procedure to identify locations where there is little possibility of vibration impacts related to facility operations. Based on specific screening distances for various types of sources, the screening review applies the principle that if no sensitive receivers are identified within the screening distance, no vibration impacts would be expected, and no further assessment is necessary. Ramboll employed this screening procedure as the first step in the review of ground-borne vibration related to the Project. As per FTA guidance, the screening distance for rubber-tired vehicles affecting residences is 50 feet. Therefore, any residential structures farther than 50 feet from Grip Road or Prairie Road are not expected to be affected by vibration from trucks traveling to and from the site.

Ramboll identified all residential structures located within 50 feet of the nearest and farthest lanes of Grip Road and Prairie Road, west of the mine entrance. The following two residences were identified for additional consideration:

- A residential property to the west of the mine entrance along Grip Road, approximately 48 feet from the westbound lanes of the road
- A residential property along Prairie Road, approximately 41 feet from the westbound lanes of the road

## 1.2 FTA General Vibration Assessment

Based on the findings of the FTA vibration impact screening procedure it was necessary to conduct a more detailed "general vibration assessment" for the two residential properties identified. Ramboll conducted a general vibration assessment as described below.

The FTA guidance manual includes a chart used to estimate potential vibration levels (VdB) based on a reference travel speed, a general transit vehicle type (e.g., rubber-tired vehicles), and distance from the lane of travel. Using these reference vibration levels, adjustments can be made to account for variations in speed. Using this method, Ramboll estimated the future vibration levels at each of the two locations, as detailed below.

**Residential Property Along Grip Road** – There is a single residential structure that is approximately 48 feet from the westbound travel lane of Grip Road. The eastbound lane is more than 50 feet from the residence and is beyond the screening distance. The reference vibration level for a rubber-tired vehicle traveling 30 mph at a distance of 48 feet is 64 VdB. The posted speed limit on this section of Grip Road is 40 mph, and the reference vibration level is adjusted by +2.5 VdB to account for the higher travel speed. With this adjustment, the estimated vibration level at the residential structure along Grip Road is approximately 67 VdB. There would be approximately 23 trucks per day traveling in the westbound lane, and the calculated vibration level of 67 VdB is well below the 80-VdB FTA impact criterion for infrequent events (i.e., fewer than 30 per day), and no vibration impacts are anticipated.

**Residential Property Along Prairie Road** – There is a single residential structure that is approximately 41 feet from the westbound travel lane of Prairie Road. The eastbound lane is more than 50 feet from the residence and is beyond the screening distance. The reference vibration level for a rubber-tired vehicle traveling 30 mph at a distance of 41 feet is 65 VdB. The posted speed limit on this section of Prairie Road is 50 mph, and the reference vibration level is adjusted by +4.4 VdB to account for the higher travel speed. With this adjustment, the estimated vibration level at the residential structure along Grip Road is approximately 69 VdB. With approximately 23 trucks per day traveling in the westbound lane, the calculated vibration level of 69 VdB is well below the 80-VdB FTA impact criterion for infrequent events (i.e., fewer than 30 per day), and no vibration impacts are anticipated.

## 6. CONCLUSION

Model-calculated sound levels from onsite mining equipment and haul trucks are well below both the daytime noise limit of 60 dBA (applicable between 7 AM and 10 PM) and the nighttime limit of 50 dBA (applicable between 10 PM and 7 AM). Therefore, the mine is expected to easily comply with the applicable noise limits. Furthermore, estimated increases over existing levels range from 0 to 3 dBA, and would be less than 3 dBA during the vast

majority of mining activities. Therefore, no impacts are expected from onsite mining operations.

In addition to noise impacts, the potential for vibration impacts from haul trucks traveling along Grip Road and Prairie Road were considered. Using FTA vibration impact methods and criteria, we found that there would be no impacts to residences from trucks traveling to and from the site on these roads.



## **APPENDIX A: SOUND LEVEL MEASUREMENT DATA**

**Table A- 1. Measured Sound Levels at SLM1 (dBA)**

Date	Time	Leq	Lmax	L2.5	L8.3	L25	L90
22/01/2018	13:00:00	32.9	48.6	37.0	34.3	32.7	31.4
22/01/2018	14:00:00	31.8	40.1	33.0	32.5	32.0	31.3
22/01/2018	15:00:00	32.6	52.9	34.3	33.4	32.6	31.4
22/01/2018	16:00:00	42.2	71.4	48.7	38.8	34.5	32.0
22/01/2018	17:00:00	35.6	45.3	39.0	37.8	36.3	33.2
22/01/2018	18:00:00	36.3	47.7	40.8	39.1	36.9	33.2
22/01/2018	19:00:00	35.5	49.2	41.4	38.4	35.6	32.0
22/01/2018	20:00:00	34.6	47.5	40.3	37.3	34.7	31.7
22/01/2018	21:00:00	33.8	50.2	38.5	36.0	33.8	31.6
22/01/2018	22:00:00	33.2	46.8	37.3	34.8	33.3	31.4
22/01/2018	23:00:00	33.0	48.4	37.2	34.7	32.9	31.4
23/01/2018	00:00:00	33.4	51.1	38.7	35.5	33.1	31.2
23/01/2018	01:00:00	34.1	51.0	41.0	36.0	32.4	31.2
23/01/2018	02:00:00	34.5	48.1	40.2	37.3	34.3	31.6
23/01/2018	03:00:00	37.0	55.8	44.0	42.3	35.7	31.7
23/01/2018	04:00:00	35.0	50.4	39.8	37.7	35.5	32.4
23/01/2018	05:00:00	37.5	58.0	43.4	40.2	36.9	33.2
23/01/2018	06:00:00	41.2	63.3	47.1	43.6	40.9	36.6
23/01/2018	07:00:00	46.2	67.9	54.5	50.3	44.6	36.7
23/01/2018	08:00:00	45.8	63.7	51.4	49.2	46.5	38.9
23/01/2018	09:00:00	45.8	64.6	52.2	48.6	45.4	40.7
23/01/2018	10:00:00	44.9	69.9	52.3	47.5	43.1	37.8
23/01/2018	11:00:00	43.0	72.9	48.0	45.0	42.9	38.4
23/01/2018	12:00:00	42.4	64.4	48.0	44.8	42.0	37.4

**Table A- 2. Measured Sound Levels at SLM2 (dBA)**

Date	Time	Leq	Lmax	L2.5	L8.3	L25	L90
22/01/2018	13:00:00	52.8	72.5	63.6	54.6	39.5	30.6
22/01/2018	14:00:00	51.8	74.4	62.1	52.3	35.7	30.7
22/01/2018	15:00:00	53.0	71.5	64.0	56.2	40.8	30.5
22/01/2018	16:00:00	55.5	73.7	66.2	59.3	46.8	31.2
22/01/2018	17:00:00	55.9	74.2	66.4	60.8	47.9	31.0
22/01/2018	18:00:00	54.2	77.1	64.7	56.8	39.6	30.2
22/01/2018	19:00:00	51.5	73.4	61.7	51.0	33.0	29.9
22/01/2018	20:00:00	51.2	74.0	60.5	47.1	33.2	30.1
22/01/2018	21:00:00	45.9	71.0	52.0	37.3	32.0	29.8
22/01/2018	22:00:00	45.8	70.4	52.5	37.3	32.2	29.8
22/01/2018	23:00:00	45.3	73.8	46.5	34.7	31.4	29.7
23/01/2018	00:00:00	44.7	72.0	45.6	34.4	31.1	29.4
23/01/2018	01:00:00	46.9	76.8	40.6	32.6	32.0	29.9
23/01/2018	02:00:00	43.5	70.3	41.3	34.8	32.5	30.3
23/01/2018	03:00:00	43.1	71.5	46.7	44.1	38.0	32.2
23/01/2018	04:00:00	47.4	71.9	54.1	43.2	39.9	34.5
23/01/2018	05:00:00	53.7	78.1	62.8	53.9	45.7	37.8
23/01/2018	06:00:00	55.0	74.4	65.2	58.3	49.4	40.8
23/01/2018	07:00:00	54.4	76.7	64.6	57.0	49.0	39.9
23/01/2018	08:00:00	56.0	79.2	65.4	58.6	52.0	43.1
23/01/2018	09:00:00	54.7	74.4	63.4	56.9	51.6	44.3
23/01/2018	10:00:00	51.9	72.5	59.4	53.8	50.0	42.1
23/01/2018	11:00:00	52.1	72.0	60.7	53.2	48.8	41.5
23/01/2018	12:00:00	53.1	74.9	62.4	54.0	46.7	41.0

**Table A- 3. Measured Sound Levels at SLM3 (dBA)**

Date	Time	Leq	Lmax	L2.5	L8.3	L25	L90
22/01/2018	13:00:00	34.3	55.0	40.5	37.3	33.8	30.2
22/01/2018	14:00:00	32.5	48.8	37.0	33.8	32.3	30.3
22/01/2018	15:00:00	38.3	52.7	47.2	43.9	34.6	30.5
22/01/2018	16:00:00	43.6	69.9	49.7	46.8	42.6	31.2
22/01/2018	17:00:00	33.6	47.9	37.5	35.1	33.6	31.7
22/01/2018	18:00:00	33.1	46.6	36.8	34.6	33.2	31.3
22/01/2018	19:00:00	33.4	44.5	36.8	35.2	33.8	31.5
22/01/2018	20:00:00	33.6	49.9	38.0	35.9	33.9	31.4
22/01/2018	21:00:00	33.3	48.6	37.9	35.0	33.3	31.1
22/01/2018	22:00:00	32.4	46.7	36.4	34.3	32.4	30.5
22/01/2018	23:00:00	32.3	46.9	36.9	33.9	32.3	30.3
23/01/2018	00:00:00	32.3	46.5	36.4	34.7	32.7	30.0
23/01/2018	01:00:00	31.0	42.1	34.8	32.7	30.8	29.8
23/01/2018	02:00:00	31.8	47.1	35.3	33.4	31.8	29.9
23/01/2018	03:00:00	36.4	63.8	43.1	40.5	32.7	30.3
23/01/2018	04:00:00	35.0	66.7	38.5	35.6	33.7	31.3
23/01/2018	05:00:00	36.5	63.0	40.8	38.0	36.1	32.2
23/01/2018	06:00:00	47.4	77.4	51.9	44.0	40.4	35.9
23/01/2018	07:00:00	48.4	77.9	51.5	47.2	43.4	36.5
23/01/2018	08:00:00	54.5	83.1	61.4	58.6	54.6	42.6
23/01/2018	09:00:00	48.7	76.2	54.3	49.8	46.0	40.3
23/01/2018	10:00:00	46.4	72.7	52.1	47.2	42.9	38.0
23/01/2018	11:00:00	52.7	86.2	53.9	50.5	47.1	38.8
23/01/2018	12:00:00	46.6	65.4	54.2	51.5	46.9	37.5