APPENDIX J-1: Noise Assessment Report

Big Sky Acoustics, LLC
P.O. Box 27 • Helena, Montana 59624
Tel: (406) 457-0407 • Fax: (406) 442-1296
www.bigskyacoustics.com

July 7, 2017

Mr. Bob Jacko
Tintina Resources, Inc.
PO Box 431
White Sulphur Springs, MT 59645

Re: Black Butte Copper Project
REVISED Noise Assessment
BSA Project #15134

Dear Bob:

Big Sky Acoustics, LLC (BSA) has revised the Noise Assessment for the Black Butte Copper Project near White Sulphur Springs, Montana to address DEQ's comments and included updated information. This report documents the existing ambient noise levels and the predicted noise levels for the Construction and Operation Phases. This document is intended for use as Appendix J of the Tintina Mine Operating Permit.

If you have any questions concerning this report, please do not hesitate to call me at (406) 457-0407 or email me at sean@bigskyacoustics.com.

Sincerely,

Sean Connolly
BIG SKY ACOUSTICS, LLC

cc: Allan Kirk / Geomin Resources

BLACK BUTTE COPPER PROJECT
REVISED NOISE ASSESSMENT

Prepared for:
Tintina Resources, Inc.
PO Box 431
White Sulphur Springs, MT 59645

Completed by:

Big Sky Acoustics, LLC

April 20, 2017

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1.0 INTRODUCTION

Big Sky Acoustics, LLC (BSA) completed a Noise Assessment for the Black Butte Copper Project near White Sulphur Springs, Montana. This report documents the existing ambient noise levels and the predicted noise levels for Construction and Operation Phases. A layout of the Project area and facilities is shown on **Figure 1** (attached) and the four noise assessment locations, including nearby residences. These are the same four locations that BSA used to measure the baseline ambient noise levels in 2013.

The Project will generally consist of two phases. The Construction Phase will include building the mill, portal pad and tailings facilities, and is estimated to last two to three years. The Operation Phase will include underground mining, and processing of ore at the mill with an outdoor crusher on the portal pad. Ore will be hauled off-site using haul trucks.

2.0 NOISE TERMINOLOGY

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Perception of noise is affected by intensity, frequency, pitch and duration.

The primary noise effect on humans is annoyance. Indirect effects may include speech interference, stress reactions, sleep interference, lower morale, efficiency reduction, and fatigue (Harris 1998). Response to noise on wildlife is a function of many variables, including characteristics and duration of the noise; habitat, season, previous noise exposure, etc. Different species have different levels of noise tolerance, habituation, and displacement.

Noise levels are quantified using units of decibels (dB). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies. The "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz [Hz]). Decibels are logarithmic values, and therefore, the combined noise level of two 50 dBA noise sources is 53 dBA, not 100 dBA. Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography blocks the line of sight between the source and receptor.

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, L_{eq}, during a certain time period. The L_{eq} metric is useful because it uses a single number, similar to an average, to describe the constantly fluctuating instantaneous noise levels at a receptor location during a period of time, and accounts for all of the noises and quiet periods that occur during that time period. The L_{max} metric denotes the maximum instantaneous sound level recorded during a measurement period.

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. The 90th percentile-exceeded noise level, L_{90}, is a metric that indicates the single noise level that is exceeded during 90 percent of a measurement period although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level is typically considered the ambient noise level, and is often near the low end of the instantaneous noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as bird chirps, dog barks, car horns, a single blast, etc. If a continuous noise is audible at a measurement location, such as an industrial fan or engine, typically it is that noise that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period.

The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} can be determined using 24 consecutive one–hour L_{eq} noise levels, or estimated using measured L_{eq} noise levels during shorter time periods. The L_{dn} includes a 10 decibel penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m., to account for people's higher sensitivity to noise at night when the background noise level is typically low.

C-weighting, or C-weighted decibels (dBC), gives equal emphasis to sounds of most frequencies. This dBC scale is generally used to describe low frequency noise, such as the "rumble" of large fans and the "boom" of blasting. Because A-weighting underestimates the human annoyance caused by these types of low frequency sounds, C-weighting is used to assess disturbance due to low frequency sounds. Large amplitude impulsive sounds, such as blasting, are commonly defined using the unweighted instantaneous peak noise level, L_{pk}, and reported as L_{pk} dBC.

3.0 NOISE GUIDELINES

As a result of the Noise Control Act of 1972, the U.S. Environmental Protection Agency (EPA) developed acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. The EPA identified outdoor L_{dn} noise levels less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA 1978). Although the EPA guideline is not an enforceable regulation, it is a commonly accepted target noise level for environmental noise studies.

A review of existing federal, state and county noise regulations, ordinances and guidelines was conducted and used to establish significance criteria for assessing compliance at identified noise-sensitive receptors (e.g., residences). **Table 3-1** lists the applicable Project noise guidelines.

TABLE 3-1
Project Noise Regulations and Guidelines

Regulatory Authority[1]	Regulations and Guidelines	Statute/Regulation
Environmental Protection Agency	Outdoor day-night average noise level (L_{dn}) less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use.	Noise Control Act of 1972, 42 U.S.C. §4901 et seq.
State of Montana	Every motor vehicle shall at all times be equipped with a muffler in good working order and in constant operation to prevent excessive or unusual noise. A person may not operate a motor vehicle with an exhaust system that emits a noise in excess of 95 dB, as measured by the Society of Automotive Engineers' standard j1169 (May 1998).	Montana Code Annotated § 61-9-403, § 61-9-435
Montana Department of Environmental Quality (DEQ)	Airblast must be controlled so that it does not exceed the values specified below at any dwelling, or public, commercial, community or institutional building, unless the structure is owned by the operator and is not leased to any other person. 0.1 Hz or lower - flat response = 134 L_{pk} 2 Hz or lower - flat response = 133 L_{pk} 6 Hz or lower - flat response = 129 L_{pk} C-weighted, slow response = 105 L_{pk} dBC	Administrative Rules of Montana (ARM) 17.24.624, 17.24.159
Montana Department of Transportation (MDT)	Traffic noise impacts occur if predicted one-hour L_{eq}(h) traffic noise levels are 66 dBA or greater at a residential property during the peak traffic hour, or if the projected traffic noise levels exceed the existing peak hour L_{eq}(h) by 13 dBA or more.	MDT Traffic Noise Analysis and Abatement Policy
Meagher County	Protect hearing of all workers whose noise exposures equal or exceed an action level of 85 decibels (dB) for an 8-hour day.	Meagher County Employee Safety Manual

Source: DEQ 2004, EPA 1978, MDT 2011, Meagher County 2014, Montana Code Annotated 2014

The Federal Transit Administration (FTA) has developed guidelines for assessing short (1-hour) and long-term (8-hour) construction activities. Assessment of construction noise includes evaluating the existing ambient noise environment, the absolute noise levels due to construction activities, the duration of construction, and the noise-sensitivity of the adjacent land use. **Table 3-2** summarizes the FTA construction noise guidelines at adjacent land uses. If these guidelines are exceeded, adverse community reaction may result.

TABLE 3-2
FTA Construction Noise Guidelines

Adjacent Land Use	Daytime L_{eq}	Nighttime L_{eq}
Short Duration Noise Guidelines (1 hour)		
Residential	90 dBA	80 dBA
Commercial	100 dBA	100 dBA
Industrial	100 dBA	100 dBA
Moderate Duration Noise Guidelines (8 hours)		
Residential	80 dBA	70 dBA
Commercial	85 dBA	85 dBA
Industrial	90 dBA	90 dBA

Source: FTA 2006

In addition to the absolute limits, changes in noise levels are used to determine audibility and gauge community response. Comparing the L_{eq} noise levels of a noise source to L_{90} (ambient) noise levels at a listener location helps approximate whether a noise source will be audible, and how significantly the ambient environment will change due to a new noise source. A comparison is summarized in **Table 3-3**.

TABLE 3-3
Audibility Guidelines

Condition	Description	Expected Community Reaction
$L_{eq} \leq L_{90}$	Rarely heard	Minimal
$L_{90} < L_{eq} \leq L_{90} + 10$	Sometimes audible	Moderate
$L_{eq} > L_{90} + 10$	Clearly audible	High

Source: Menge 2005 and Cavanaugh 2002.

4.0 EXISTING NOISE ENVIRONMENT

On September 10 and 11, 2013, BSA completed baseline noise level measurements for the Project. The ambient daytime and nighttime noise level measurements were completed at four locations indicated on **Figure 1**, and were intended to document the existing ambient noise levels, prior to mining operations. A 24-hour noise level measurement was completed at Location 1. A 1-hour "daytime" (7 a.m. to 7 p.m.) noise level measurement and a 15-minute "nighttime" (7 p.m. to 7 a.m.) noise level measurement were completed at Locations 2 through 4.

Noise level measurements were conducted by BSA in general accordance with the American National Standards Institute (ANSI) S12.18-1994, *Procedures for Outdoor Measurement of Sound Pressure Level* (ANSI 1994). BSA conducted the noise level measurements using Larson Davis Model 831 and CEL 593 Type I Sound Level Meters with preamplifiers, and 0.5-inch diameter microphone. The meters were calibrated prior to and after each measurement period using a CEL Instruments Model 284/2 Acoustical Calibrator. The sound level meters were set to "fast" response. Windscreens were used over the microphones, and the microphones were approximately 5 feet above the ground surface at each measurement location.

Weather data during the noise level measurements were recorded at Tintina Resource's onsite Core Shed weather station and are included in **Attachment A**. The atmospheric conditions were favorable for noise level measurements (i.e., low wind speeds, minimal precipitation, etc.).

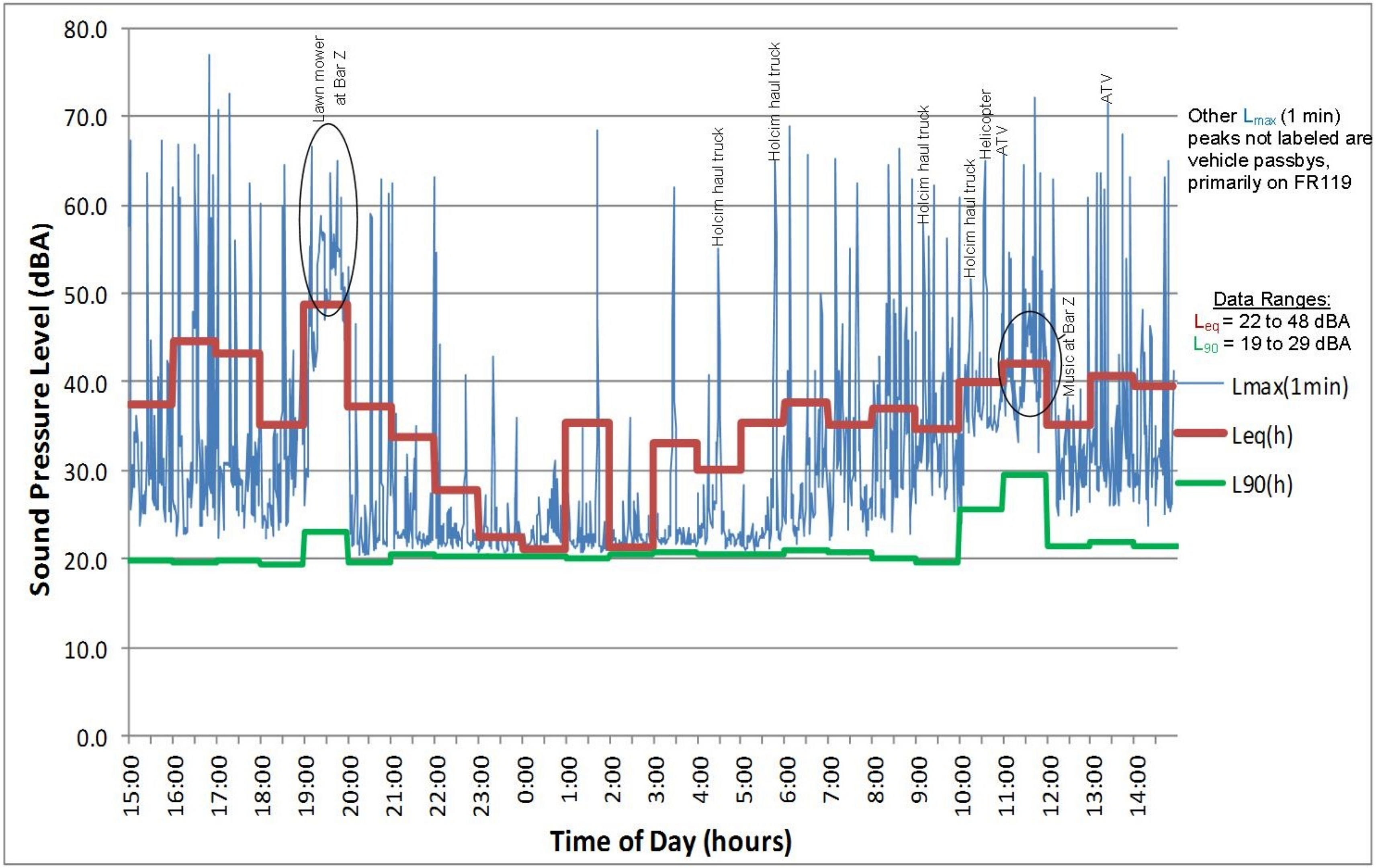
4.1 Location 1 – Bar Z Ranch

The 24-hour measurement Location 1 is approximately 0.5 miles north of the Portal on the Bar Z Ranch property, northwest of the intersection of Forest Road 119 (FR119) (a.k.a. Sheep Creek Road) and the Holcim Haul Road (a.k.a. Butte Creek Road) (**Figure 1**), as shown in the following picture.

Measurement Location 1 – Looking northwest at Bar Z Ranch lodge/residence**.**

The long-term noise level measurement at Location 1 was completed from 1500 hours on Tuesday, September 10th to 1500 hours on Wednesday, September 11th, to document the ambient noise level conditions at the lodge/residence. Vehicles on FR119 passed by Location 1 during the measurement period, including Holcim mine haul trucks, passenger cars, trucks, trailers and ATVs. The noise levels were measured in 1-minute and 1-hour increments during the measurement period, and the sound level meter recorded audio clips during high noise events. In general, the dominant L_{max} noise sources included vehicles and haul trucks passing by on FR119 and overhead aircraft. The results of the ambient noise level measurements at Location 1 are summarized in **Graph 3-1**. The L_{eq} ranged from 22 to 48 dBA and L_{90} ranged from 19 to 29 dBA, which are typical noise levels for sparsely-populated rural areas (Harris 1998). The average measured L_{eq} and L_{90} frequency spectrum for each measurement period is shown on **Attachment A, Figure 2.** Based on the measured hourly L_{eq} data, Location 1 is approximately L_{dn} 42 dBA.

GRAPH 4-1
Location 1 Ambient Noise Levels
September 10 – 11, 2013



4.2 Location 2 – Castle Mountain Ranch/U.S. 89

Measurement Location 2 is approximately 2 miles east of the site, on the west side of the U.S. 89 90-degree curve (that turns east) and north of the intersection with FR119 (**Figure 1**), adjacent to the Castle Mountain Ranch property, as shown in the following picture.

Measurement Location 2 – Looking east at U.S.89 and Castle Mountain Ranch property.

The results of the ambient noise level measurements at Location 2 are summarized in **Table 4-2,** and the measured L_{eq} and L_{90} frequency spectrum for each measurement period is shown on **Attachment A, Figure 3.** In general, the dominant noise source was traffic on U.S. 89. The measured L_{eq} and L_{90} noise levels are typical for traffic noise in rural areas (Harris 1998). Based on the measured L_{eq} data, Location 2 is approximately L_{dn} 48 dBA.

TABLE 4-2
Ambient Noise Levels at Location 2
Castle Mountain Ranch/U.S. 89

Date	Time (hours)	L_{eq} (dBA)	L_{90} (dBA)	Notes
9/11/13	Daytime 0954 – 1054	44	24	Dominant noise sources included vehicles on U.S. 89 and an overhead helicopter. Other noise sources included birds, cows, insects, water in creek, commercial aircraft in distance and haul trucks on FR119 turning south on U.S. 89.
9/10/13	Nighttime 2217 – 2232	41	26	Dominant noise sources were cars passing by on U.S. 89. Other noise sources included flowing water in creek and breeze in trees (faint).

4.3 Location 3 – Butte Creek Road Gate

Measurement Location 3 is approximately 2 miles west of the Portal and 2.4 miles southwest of the FR119/Butte Creek Road intersection at the road gate (**Figure 1**), as shown in the following picture. The location was selected to represent Butte Creek Road residences located beyond the gate.

Measurement Location 3 – Looking west at the locked gate on Butte Creek Road.

The results of the ambient noise level measurements at Location 3 are summarized in **Table 4-3,** and the average measured L_{eq} and L_{90} frequency spectrum for each measurement period is shown on **Attachment A, Figure 4**. In general, the daytime the dominant noise source was traffic, including Holcim mine haul trucks, on Butte Creek Road. The measured L_{eq} and L_{90} noise levels are typical for sparsely-populated rural areas (Harris 1998). Based on the measured L_{eq} data, Location 3 is approximately L_{dn} 33 dBA.

Measurement Location 3 – Looking south at a Holcim mine haul truck on Butte Creek Road.

TABLE 4-3
Ambient Noise Levels at Location 3
Butte Creek Road Gate

Date	Time (hours)	L_{eq} (dBA)	L_{90} (dBA)	Notes
9/11/13	Daytime 0822 – 0923	33	22	Dominant noise sources included a haul truck, a pickup truck and ATV's on Butte Creek Road. Other noise sources included birds, cows, faint breeze though grass and a propeller plane in distance.
9/10/13	Nighttime 2244 – 2310	24	21	Noise sources included breeze through grass and insects (faint).

4.4 Location 4 – Lodge at Sheep Creek

Measurement Location 4 is approximately 0.6 miles northeast of the Portal and 0.5 miles east of the FR119/Butte Creek Road intersection (**Figure 1**), and south of the Lodge at Sheep Creek. During the measurements, the lodge was being constructed on the north side of Strawberry Butte, as shown in the following picture.

Measurement Location 4 – Looking south at the lodge being constructed on Strawberry Butte.

The results of the ambient noise level measurements at Location 4 are summarized in **Table 4-4,** and the average measured L_{eq} and L_{90} frequency spectrum for each measurement period is shown on **Attachment A, Figure 5**. In general, the daytime the dominant noise sources were construction activities. The measured L_{eq} and L_{90} noise levels are typical for sparsely-populated rural areas (Harris 1998). Based on the measured L_{eq} data, Location 4 is approximately L_{dn} 31 dBA.

TABLE 4-4
Measured Ambient Noise Levels at Location 4
Lodge at Sheep Creek

Date	Time (hours)	L_{eq} (dBA)	L_{90} (dBA)	Notes
9/11/13	Daytime 0705 – 0804	28	23	Dominant noise sources included construction vehicles and hammering. Other noise sources included vehicles on FR119 and U.S.89, cows, water in Sheep Creek, and a commercial plane in distance.
9/10/13	Nighttime 2328 – 2343	24	22	Sheep Creek water flowing below (barely audible).

5.0 NOISE LEVEL PREDICTIONS

BSA predicted the Construction and Operation Phase noise levels using the Cadna-A Version 4.5 noise prediction software from DataKustik. Cadna-A uses algorithms from the International Organization for Standardization (ISO) Standard 9613-2, *Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation* (ISO 1996). This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers. Aerial photograph and topographic data was input into the model.

Calculations per ISO 9613-2 conservatively assume that atmospheric conditions are favorable for noise propagation, but atmospheric conditions can vary dramatically at large distances between a noise source and a receptor. Therefore, the estimated noise levels presented in this report should be assumed to be average noise levels, and temporary significant positive and negative deviations from the averages can occur (Harris 1998). Favorable atmospheric conditions for noise propagation mean that a light wind is blowing from a source to a receiver and a well-developed temperature inversion is in place.

The assumptions used for the noise predictions are summarized in **Table 5-1**. The noise predictions are based on the conservative assumption that all equipment and operations listed for a given phase will be operating simultaneously.

TABLE 5-1
Summary of Assumptions Used for Noise Study

Phase	Assumptions
Construction	• Two pieces of diesel-powered earth-moving equipment operating at the Cemented Tailings Facility (CTF) for 20 hours per day. • Two pieces of diesel-powered earth-moving equipment operating at the Process Water Pond (PWP) for 20 hours per day. • Two pieces of diesel-powered earth-moving equipment operating at the portal pad for 20 hours per day. • Two pieces of diesel-powered earth-moving equipment operating at the mill pad for 20 hours per day. • Crusher and screen plant operating with two pieces diesel-powered earth-moving equipment at the Temporary Construction Stockpile for 20 hours per day. • Haul or water trucks moving material from the portal pad area to the CTF or PWP. 80 round trips per day for 20 hours per day at 25 mph. • Air compressor and diesel generators operating 24 hours per day.
Operation	• Indoor mill operates 24 hours per day. • Outdoor crusher at west end of portal pad operates 20 hours per day. • Underground haul truck bringing material from portal to crusher. 82 round trips per day for 24 hours per day at 15 mph. • Front-end loader operating at crusher 20 hours per day. • Vent raises with ventilation fan at bottom of two 120 foot long, 7-foot diameter shafts. Fan is attenuated to meet 85 dBA at 3 feet.
Blasting	• Charge is 632 pounds of explosive per delay. • Construction surface and decline blasting within 500 feet of surface. • Operation underground decline and orebody blasting.

5.1 Construction Phase

Table 5-2 summarizes the predicted Construction Phase noise levels and a determination of the audibility of the Project noise at the four measurement locations shown on **Figure 1**. **Figure 2 (attached)** indicates the predicted L_{dn} noise level contours for the Construction Phase. As shown on the figure, the topography in the area affects how noise travels in the vicinity of the mine site. The predicted construction noise L_{dn} levels are less than the EPA guideline L_{dn} 55 dBA at each location.

As shown in **Table 5-2**, the audibility of construction noise is predicted to be L_{eq} 28 to 38 dBA at the noise measurement locations, which are typically considered "faint" noise levels due to the low ambient L_{90} noise levels in the area. The predicted construction L_{eq} 28 to 38 dBA noise levels are much lower than the L_{eq} 70 dBA FTA residential nighttime construction noise guidelines (**Table 3-2**). However, due to the low ambient L_{90} noise levels, the construction noise is predicted to be clearly audible at Location 1 (Bar Z Ranch), and occasionally audible at Location 2 (Butte Creek Road gate), Location 3 (Butte Creek Road Gate) and Location 4 (Lodge at Sheep Creek) (**Table 3-3**) (**Figure 2**).

TABLE 5-2
Summary of Predicted Construction Noise Levels (dBA)

Noise Measurement Location	L_{dn} Noise Level		Audibility			
	Calculated Baseline Noise Level (L_{dn})	Predicted Construction Noise Level (L_{dn})	Average Measured Baseline Noise Level (L_{90})	Predicted Construction Noise Level (L_{eq})	Difference ($L_{eq} – L_{90}$)	Perception of Construction Noise at Locations
1	42	41	24	38	+14	Clearly audible
2	48	32	25	30	+5	Occasionally audible
3	33	33	21	29	+8	Occasionally audible
4	31	31	22	28	+6	Occasionally audible

5.2 Operation Phase

Table 5-3 summarizes the predicted Operation Phase noise levels and a determination of the audibility of the Project noise at the four measurement locations shown on **Figure 1**. **Figure 3 (attached)** indicates the predicted L_{dn} noise level contours for the Operation Phase. As shown on the figure, the topography in the area affects how noise travels in the vicinity of the mine site. Please note the operation noise levels are primarily due to the outdoor crusher, which is the loudest noise source as identified in **Table 5-1**. The predicted operation noise L_{dn} levels are less than the EPA guideline L_{dn} 55 dBA at each location.

As shown on **Table 5-2**, the audibility of the Operation Phase noise is predicted to be L_{eq} 27 to 35 dBA, at the noise measurement locations, which are typically considered "faint" noise levels. However, the mine operation noise will be clearly to occasionally audible at the four measurement locations, due to the low ambient L_{90} noise levels in the area (**Figure 3**).

TABLE 5-3
Summary of Predicted Operation Noise Levels (dBA)

Noise Measurement Location	L_{dn} Noise Level		Audibility			
	Calculated Baseline Noise Level (L_{dn})	Predicted Operation Noise Level (L_{dn})	Average Measured Baseline Noise Level (L_{90})	Predicted Operation Noise Level (L_{eq})	Difference ($L_{eq} – L_{90}$)	Perception of Operation Noise at Locations
1	42	40	24	35	+11	Clearly audible
2	48	34	25	30	+5	Occasionally audible
3	33	36	21	31	+10	Clearly audible
4	31	32	22	27	+5	Occasionally audible

5.3 Back-Up Alarms

Federal regulations indicate that backup alarms shall be audible above the surrounding background noise level near the equipment, but does not specify a particular noise level (MSHA 2011). Because of their intermittent, high-pitched, impulsive sound, back-up alarms can cause high levels of annoyance and numerous complaints, even at noise levels equal to or less than the ambient noise levels at a listener location. However, back-up alarm noise has little influence on the L_{eq} or L_{dn} values.

Manufacturer-published back-up alarm sound levels vary between maximum noise levels of 90 and 110 dBA at 4 feet away, depending on the volume setting, model, working environment, etc. Back-up alarm noise levels will vary widely in the area around the Project site as mobile equipment move around, and may be clearly audible at times yet inaudible at others. To reduce the possibility of annoyance due to back-up alarms, traditional "beep-beep-beep" alarms on all mobile equipment should be replaced with manually adjustable, self-adjusting, or broadband sound alarms.

5.4 Blasting

Table 5-4 summarizes the predicted noise levels at the noise level measurement locations shown on **Figure 1** when the Construction Phase blasting occurs at or near the surface. Blasting will be audible for several miles around the Project site. As the Project progresses underground during the Operation Phase, blasting noise will decrease. The blast noise is predicted to be less than the Montana Department of Environmental Quality 105 L_{pk} dBC threshold at each location (**Table 3-1**).

TABLE 5-4
Predicted Noise Levels for Blasting At or Near the Surface

Noise Measurement Location	Predicted Blast Noise Level (L_{pk} dBC)
1	87
2	87
3	75
4	85

5.5 Traffic Noise

Project-related traffic will travel along US 89 and FR 119 to and from the site (**Figure 1**). BSA estimated traffic for both the Construction and Operation Phases of the Project. Speed limits are 70 mph for cars and 65 mph for trucks on US 89, and 35 mph on FR 119.

Traffic noise is evaluated using one-hour equivalent noise levels, L_{eq}(h) (MDT 2011), and therefore, road traffic noise is evaluated separately from the L_{dn}. Traffic noise levels were predicted using the Federal Highway Administration's (FHWA) Traffic Noise Model (TNM), Version 2.5.

During the Construction Phase, approximately six trucks per day will be used to transport material, supplies and water to/from the site, and approximately 45 employee vehicles per day are expected to travel roundtrip (Tintina 2015). From US 89, Construction Phase traffic will travel on FR 119, Butte Creek Road, and the construction access road located on the west side of the site (**Figure 1**). To estimate a volume of traffic during one hour, BSA conservatively assumed all 45 employee vehicles would travel the roads in the same hour near a shift change, but the truck volume would be distributed throughout an 8-hour shift, resulting in approximately 1 truck per hour.

During the Operation Phase, approximately 27 trucks (i.e., delivery, fuel and haul trucks) and 73 employee vehicles per day are predicted to travel roundtrip (Tintina 2015). From US 89, Operation Phase traffic will travel on FR119 to the operation access road located east of the site (**Figure 1**). Again, BSA assumed all 73 employee vehicles would travel the road in the same 1-hour period, and the trucks were distributed throughout an 8-hour shift, which results in approximately 4 trucks per hour.

The predicted traffic noise levels at noise level measurement at Locations 1, 3 and 4 near the mine site (**Figure 1**) are shown in **Table 5-5**. The traffic noise levels shown in the table include the effect of the natural topography in the area. Since Location 2 is adjacent to US 89, it was evaluated separately (**Table 5-6**). As shown, the predicted traffic noise levels with the addition of the mine-related traffic do not exceed MDT's L_{eq}(h) 66 dBA criterion, and do not exceed MDT's +13 dBA significant increase criterion at the receptors (**Table 3-2**).

TABLE 5-5
Traffic Noise Levels Near Mine Site

Noise Measurement Location	Measured Daytime L_{eq} (Section 4.0) (dBA)	Construction Phase		Operation Phase	
		Predicted L_{eq}(h) (dBA)	Difference vs. Measured L_{eq}	Predicted L_{eq}(h) (dBA)	Difference vs. Measured L_{eq}
1	38[1]	39	+1	22	-16
3	33	4	-29	7	-26
4	28	25	-3	26	-2

Note: [1]Represents the average measured daytime L_{eq}(h) obtained during the 24-hour measurement (**Section 4.1**).

The estimated traffic noise levels at various distances from US 89 are shown in **Table 5-6**. The predicted traffic noise levels shown assume a direct line of sight exists between the road and a listener. Where the line of sight between the road and a listener is blocked by terrain, the traffic noise levels will be less than those shown in **Table 5-6.**

Traffic data for US 89 were obtained from MDT (MDT 2014). The MDT traffic data is provided in terms of average annual daily traffic (AADT). Based on data for MDT Count Site 30-2-1, located at the 90-degree curve in US 89 east of the Project (**Figure 1**), the AADT in the year 2014 was 390, which includes 43 commercial (heavy) trucks. Since TNM bases its calculations on traffic volumes during a 1-hour period, BSA assumed that the 1-hour traffic volume was approximately 10% of the AADT.

As shown, the traffic noise levels due to the addition of mine-related traffic to the US 89 traffic volume is not predicted to exceed MDT's L_{eq}(h) 66 dBA criterion, and do not exceed MDT's +13 dBA significant increase criterion (**Table 3-2**).

TABLE 5-6
Predicted US 89 Traffic Noise Levels

Distance from Centerline of Road	Existing US 89 Traffic Noise Level L_{eq}(h) (dBA)	Construction Phase		Operation Phase	
		Existing US 89 + Construction Traffic Noise Level L_{eq}(h) (dBA)	Difference vs. Existing US 89 Traffic Noise	Existing US 89 + Operation Traffic Noise Level L_{eq}(h) (dBA)	Difference vs. Existing US 89 Traffic Noise
100 ft	56	59	+3	61	+5
200 ft	49	52	+3	54	+5
300 ft	45	47	+2	49	+4
400 ft	41	44	+3	45	+4
500 ft	39	41	+2	43	+4
750 ft (Location 2 Residence)	34	37	+3	38	+4
1,000 ft	32	34	+2	36	+4
5,000 ft	22	25	+3	26	+4
10,000 ft	18	21	+3	22	+4

6.0 NOISE MITIGATION MEASURES

Reasonable noise mitigation measures could be implemented to reduce the project noise levels at nearby residences due to the Construction and Operation Phase operations. Noise control measures will also reduce the noise exposure of workers in the vicinity of the equipment. Although noise mitigation measures could provide a clearly noticeable reduction in noise, the construction and operation noise sources will still be audible at nearby residences (**Tables 5-2 and 5-3**), even if noise mitigation measures are implemented.

The construction and operation noise could be reduced by implementing the following noise mitigation measures in order to minimize human annoyance and disruption of wildlife.

- On all diesel-powered construction equipment, replace standard back-up alarms with approved broadband alarms that limit the alarm noise to 5 to 10 dBA above the background noise. Broadband alarms replace the traditional "beep-beep-beep" alarms with a "shhh-shhh-shhh."

- Install high-grade mufflers on all diesel-powered equipment.

- Reduce the noise of the underground haulage trucks by enclosing the engine.

- Restrict the surface and outdoor construction and operation activities to daytime hours (7:00 am to 7:00pm).

- Combine noisy operations to occur for short durations during the same time periods. Turn idling equipment off.

7.0 CONCLUSION

BSA completed a Noise Assessment of the Black Butte Copper Project. The results are presented in **Section 5.0**. The Construction and Operation Phase noise levels are not predicted to exceed the EPA L_{dn} 55 dBA guideline at the noise measurement locations (**Sections 5.1 and 5.2**). Construction and operation noise levels are predicted to be "faint" but audible at the measurement locations due to the low ambient noise levels in the area (**Sections 5.1 and 5.2**). Back-up alarms are discussed in **Section 5.3**. Blasting noise is not predicted to exceed the Montana DEQ threshold (**Section 5.4**). Project-related traffic noise is not predicted to exceed MDT's L_{eq}(h) 66 dBA criterion, or significantly exceed the existing traffic noise levels (**Section 5.5**). To reduce the Construction and operation noise of the mine sources and proposed mill equipment in the surrounding residential areas, several noise mitigation measures should be considered (**Section 6.0**).

8.0 REFERENCES

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9.0 STANDARD OF CARE

To complete this report, BSA has endeavored to perform its services consistent with the professional skill and care ordinarily provided by acoustical consultants practicing in similar markets and under similar project conditions. BSA is fully experienced and properly qualified to perform acoustical consulting services. However, acoustical consulting services as offered and engaged in by BSA does not include "engineering" or "practice of engineering" or the "practice or offer to practice engineering" as these phrases are defined under Montana law.

BSA makes no warranty, either expressed or implied, as to the professional services it has rendered to complete this report. For the completion of this report, BSA has used data provided by Geomin Resources, Inc. and Tintina Resources, Inc. in performing its services and is entitled to rely upon the accuracy and completeness thereof. Therefore, if the information and assumptions used to create this report change, then the noise analysis and the recommended noise control measures may need to be reevaluated.

FIGURES

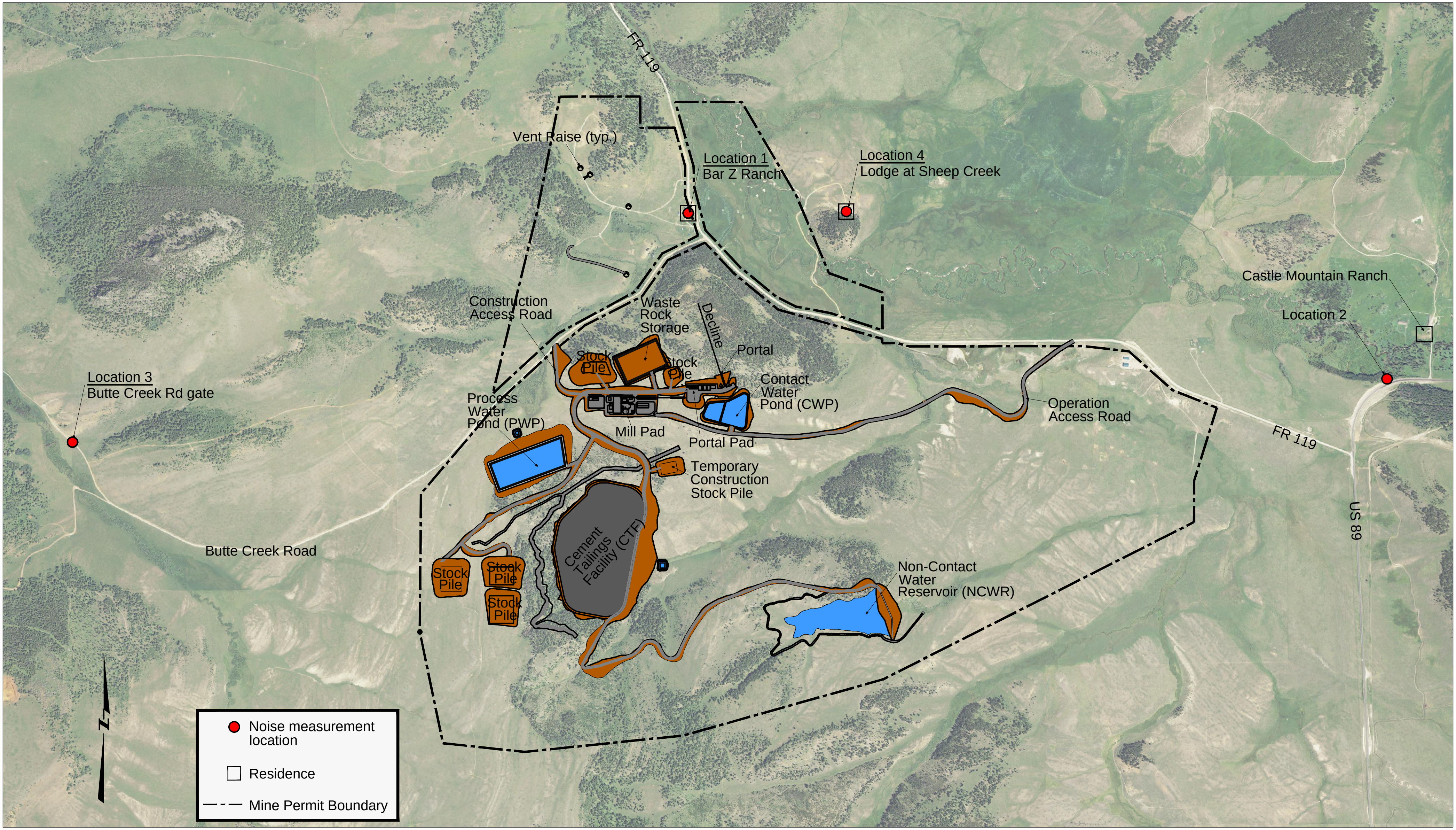

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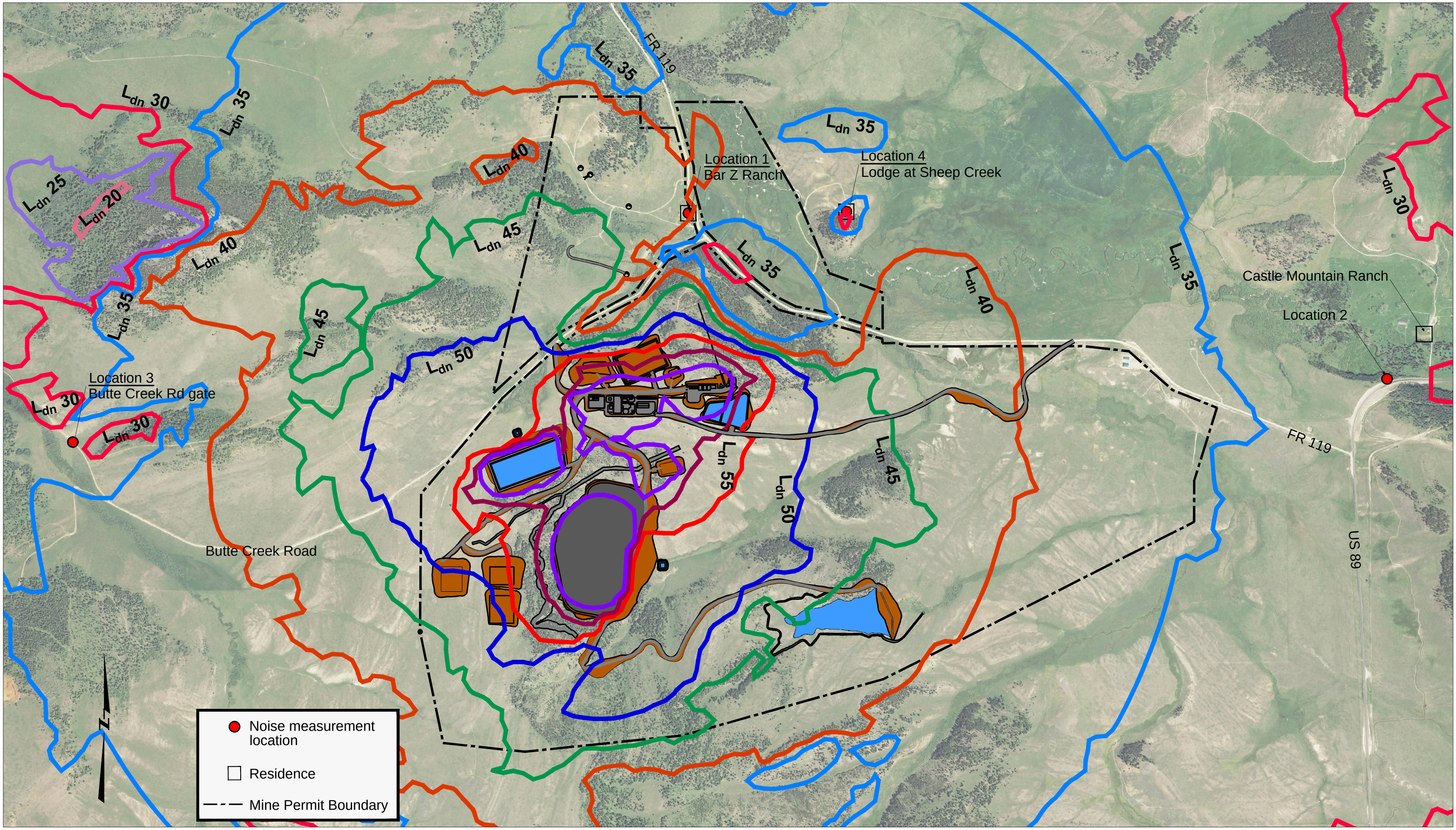
FIGURE 1

Project Facilities and Noise Measurement Locations

Black Butte Copper Project

Scale: 1 mm = 250 m (8.5"x11")



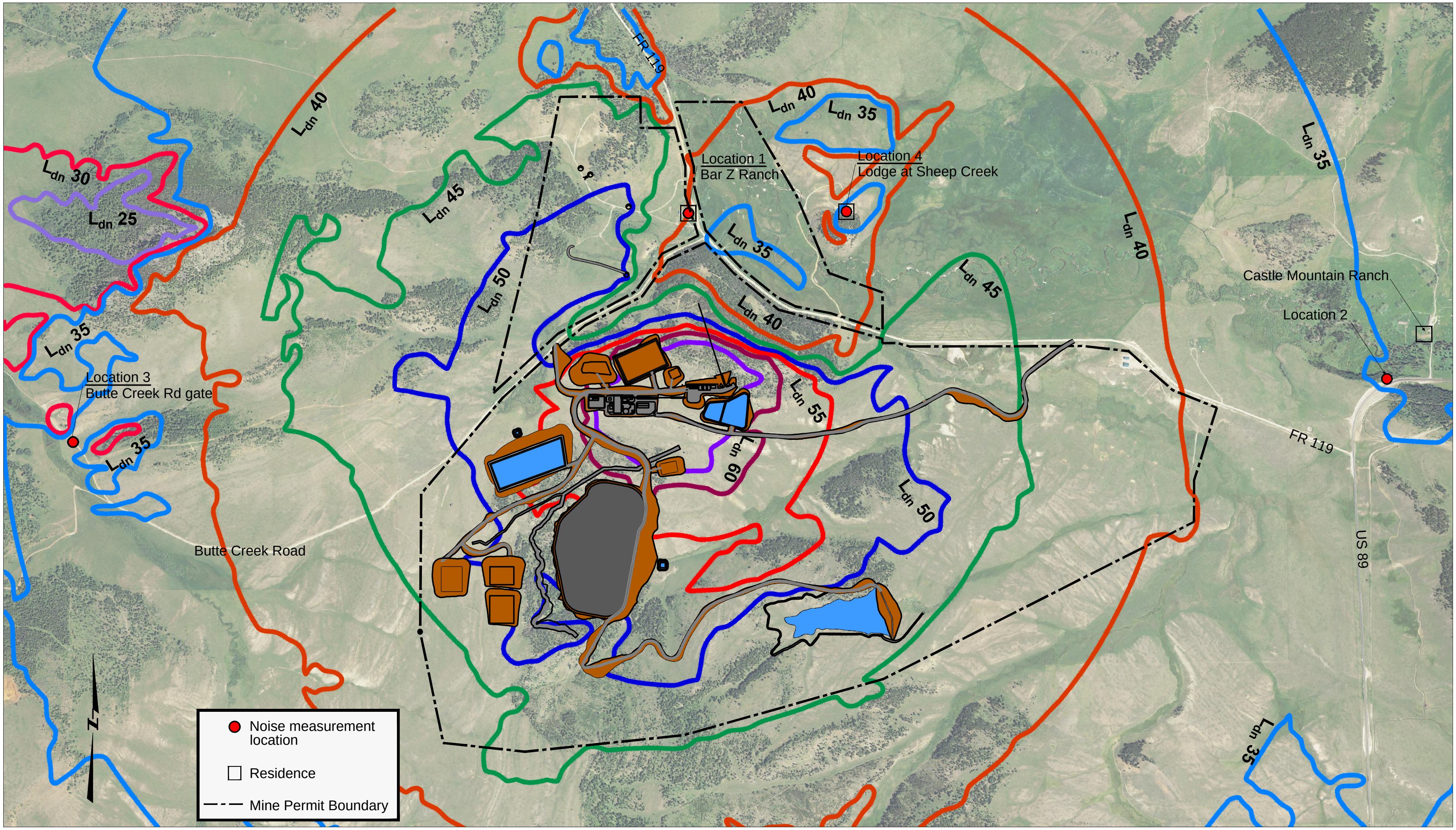
Big Sky Acoustics, LLC

FIGURE 2

Noise Contours (dBA): Construction Phase

Black Butte Copper Project

Scale: 1 mm = 250 m (8.5"x11")



Big Sky Acoustics, LLC

FIGURE 3

Noise Contours (dBA): Operation Phase

Black Butte Copper Project

Scale: 1 mm = 250 m (8.5"x11")

ATTACHMENT A

Weather Data and Measurement Results

METEOROLOGICAL DATA FOR TINTINA MONITORING SITE

DATE	HOUR ENDING	WIND SPEED 10 METERS (m/s)	WIND DIRECTION 10 METERS (deg)	WIND DIRECTION STD DEV 10 METERS (deg)	TEMPERATURE 9 METERS (deg C)	TEMPERATURE 2 METERS (deg C)	DELTA TEMP 9 METER - 2 METER (deg C)	SOLAR RADIATION 3 METERS (watts/m^2)	BAR PRESSURE 2 METERS (inches)	RELATIVE HUMIDITY 2 METERS (%)	PRECIPITATION (inches)
9/10/2013	1:00:00 AM	1.7	107	22	4.9	4.0	0.90	0	24.56	78.8	No data
9/10/2013	2:00:00 AM	1.2	82	41	4.2	3.3	0.87	0	24.56	79.2	No data
9/10/2013	3:00:00 AM	1.5	64	29	4.1	3.1	1.08	0	24.56	79.4	No data
9/10/2013	4:00:00 AM	1.4	66	40	4.2	3.3	0.90	0	24.56	79.0	No data
9/10/2013	5:00:00 AM	1.4	101	31	3.4	2.1	1.32	0	24.56	79.3	No data
9/10/2013	6:00:00 AM	1.2	102	59	2.5	1.2	1.25	1	24.57	79.5	No data
9/10/2013	7:00:00 AM	0.5	42	59	2.6	1.6	1.03	71	24.58	79.3	No data
9/10/2013	8:00:00 AM	1.5	137	19	5.2	5.2	0.00	244	24.60	75.7	No data
9/10/2013	9:00:00 AM	0.9	207	68	10.4	10.6	-0.18	412	24.60	60.7	No data
9/10/2013	10:00:00 AM	0.8	8	65	15.1	15.5	-0.45	563	24.60	45.6	No data
9/10/2013	11:00:00 AM	2.1	258	68	17.4	17.9	-0.52	688	24.59	36.6	No data
9/10/2013	12:00:00 PM	3.4	278	31	18.4	19.2	-0.81	758	24.59	30.0	No data
9/10/2013	1:00:00 PM	3.0	283	43	19.0	19.8	-0.83	776	24.59	28.5	No data
9/10/2013	2:00:00 PM	2.3	276	51	19.9	20.6	-0.72	740	24.58	26.5	No data
9/10/2013	3:00:00 PM	2.1	258	54	20.6	21.2	-0.63	647	24.57	25.7	No data
9/10/2013	4:00:00 PM	1.8	299	56	21.2	21.7	-0.55	518	24.56	23.4	No data
9/10/2013	5:00:00 PM	1.6	272	37	21.5	21.9	-0.34	353	24.55	23.7	No data
9/10/2013	6:00:00 PM	1.9	250	16	21.5	21.6	-0.09	178	24.56	25.6	No data
9/10/2013	7:00:00 PM	2.3	314	74	18.0	17.2	0.79	26	24.57	40.1	No data
9/10/2013	8:00:00 PM	3.1	59	29	14.2	13.7	0.46	0	24.59	51.3	No data
9/10/2013	9:00:00 PM	1.8	16	31	12.9	11.6	1.35	0	24.61	58.8	No data
9/10/2013	10:00:00 PM	2.0	52	42	11.2	10.5	0.76	0	24.62	62.5	No data
9/10/2013	11:00:00 PM	1.7	11	33	10.0	8.8	1.17	0	24.63	68.1	No data
9/11/2013	12:00:00 AM	2.0	55	26	9.5	8.6	0.89	0	24.64	67.4	No data
9/11/2013	1:00:00 AM	1.4	23	36	8.4	7.3	1.03	0	24.65	70.3	No data
9/11/2013	2:00:00 AM	1.9	61	31	7.9	6.7	1.16	0	24.65	70.5	No data
9/11/2013	3:00:00 AM	1.4	42	69	6.5	5.1	1.31	0	24.66	74.6	No data
9/11/2013	4:00:00 AM	1.1	83	68	5.3	4.2	1.08	0	24.67	75.7	No data
9/11/2013	5:00:00 AM	1.0	71	48	4.5	3.3	1.19	0	24.67	76.8	No data
9/11/2013	6:00:00 AM	1.0	38	49	4.5	3.3	1.21	1	24.68	77.5	No data
9/11/2013	7:00:00 AM	1.0	49	40	4.1	3.0	1.11	69	24.70	75.5	No data
9/11/2013	8:00:00 AM	0.5	332	96	5.8	6.1	-0.23	235	24.72	65.5	No data
9/11/2013	9:00:00 AM	0.8	324	61	11.5	11.9	-0.40	405	24.72	53.6	No data
9/11/2013	10:00:00 AM	1.1	287	49	17.5	17.9	-0.41	558	24.72	34.8	No data
9/11/2013	11:00:00 AM	2.2	312	72	19.6	20.3	-0.64	680	24.72	30.2	No data
9/11/2013	12:00:00 PM	3.2	127	37	21.0	21.6	-0.57	768	24.71	28.4	No data
9/11/2013	1:00:00 PM	3.6	102	25	21.6	22.2	-0.62	779	24.71	27.2	No data
9/11/2013	2:00:00 PM	3.4	120	33	22.0	22.6	-0.65	750	24.71	26.5	No data
9/11/2013	3:00:00 PM	3.2	97	36	22.1	22.5	-0.43	549	24.71	26.5	No data
9/11/2013	4:00:00 PM	3.7	99	24	22.2	22.7	-0.43	503	24.71	26.9	No data
9/11/2013	5:00:00 PM	4.8	100	15	21.8	22.1	-0.28	346	24.71	26.6	No data
9/11/2013	6:00:00 PM	4.6	81	14	20.8	20.9	-0.11	172	24.71	30.4	No data
9/11/2013	7:00:00 PM	4.3	81	9	18.4	18.2	0.20	22	24.72	37.9	No data
9/11/2013	8:00:00 PM	4.4	78	8	15.8	15.5	0.38	0	24.73	46.0	No data
9/11/2013	9:00:00 PM	4.1	84	10	15.4	14.9	0.50	0	24.74	47.7	No data
9/11/2013	10:00:00 PM	4.0	82	7	14.8	13.1	1.76	0	24.74	52.5	No data
9/11/2013	11:00:00 PM	4.1	82	4	14.6	11.7	2.85	0	24.75	55.3	No data
9/12/2013	12:00:00 AM	2.3	111	37	12.8	11.0	1.74	0	24.75	57.7	No data