

## **APPENDIX J: Baseline Noise Survey**

## MEMORANDUM

**DATE:** October 7, 2013

**TO:** Allan Kirk / Geomin Resources  
Bob Jacko / Tintina Resources

**FROM:** Sean Connolly

**RE:** **Black Butte Copper Project**  
**Baseline Noise Survey**  
**BSA Project #13124**

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### 1.0 INTRODUCTION

On September 10 and 11, 2013, Big Sky Acoustics, LLC (BSA) completed baseline noise level measurements for the Black Butte Copper 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 “background” noise levels, prior to mining operations. A 24-hour noise level measurement was completed at Location 1. One 1-hour “daytime” (7 a.m. to 7 p.m.) noise level measurement and one 15-minute “nighttime” (7 p.m. to 7 a.m.) noise level measurement were completed at Locations 2 through 4. This memo documents the results of the baseline noise level measurements.

### 2.0 NOISE TERMINOLOGY

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 ambient 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 90<sup>th</sup> percentile-exceeded noise level,  $L_{90}$ , is a metric that indicates the single noise level that is exceeded during 90% of a measurement period, although the actual instantaneous noise levels fluctuate continuously. The  $L_{90}$  noise level helps quantify the acoustical character of an environment, such as “rural area,” “urban area,” or “noisy neighborhood” because it represents the residual (i.e., ambient) noise between individual noise events, such as a vehicle pass-by or aircraft over flight.

The  $L_{90}$  noise level is often near the low end of the instantaneous noise levels during a measurement period. Brief, intermittent and loud sources, such as an aircraft flyover, car doors

closing, bird chirps, dog barks, car horns, vehicle pass-by, etc., will influence the  $L_{eq}$  of the measurement period but typically not the  $L_{90}$ , even though these other noise sources may be briefly audible and louder than the a noise source of interest during the same measurement period. If a person was only listening to one continuously operating noise source, such as a large fan, the  $L_{eq}$  and  $L_{90}$  noise levels at that location would be approximately equal.

$L_{min}$  is a metric that indicates the minimum instantaneous noise level recorded by the sound level meter during the measurement period. The  $L_{max}$  metric denotes the maximum instantaneous noise level recorded during the measurement period.

### **3.0 NOISE LEVEL MEASUREMENTS**

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 as **Attachment A**.

#### **Location 1 – Bar Z Ranch**

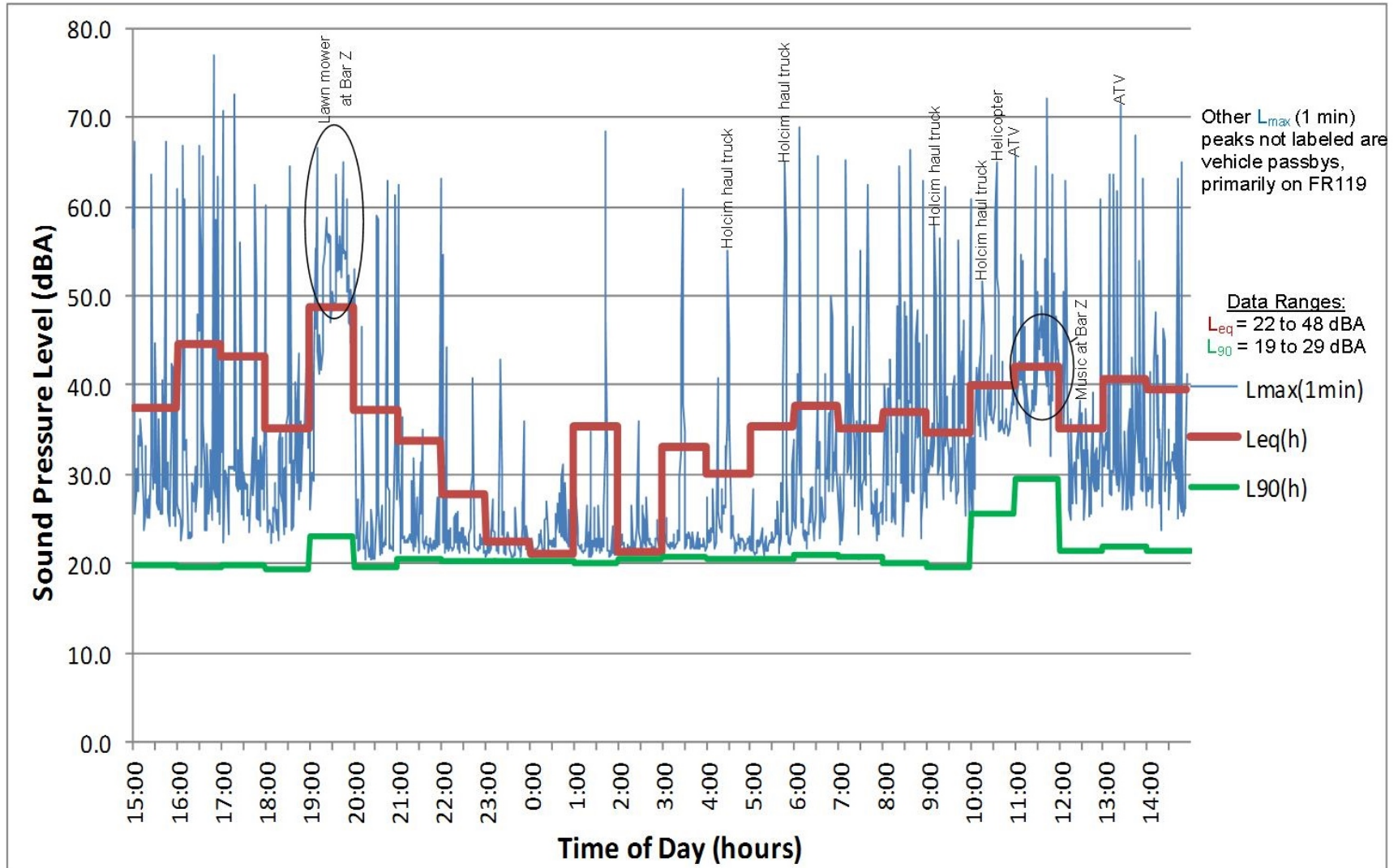
The 24-hour measurement Location 1 is approximately 0.5 miles north of the Portal on the Bar Z Ranch property, northwest of the intersection of Forest Road 119 (FR119) (a.k.a. Sheep Creek Road) and the Holcim Haul Road (a.k.a. Butte Creek Road) (**Figure 1**, attached), as shown in the following picture.



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 10<sup>th</sup> to 1500 hours on Wednesday, September 11<sup>th</sup>, to document the ambient noise level conditions at the lodge/residence. Vehicles on FR119 passed by Location 1 during the measurement period, including Holcim haul trucks, passenger cars, trucks and 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. BSA analyzed the audio files to relate vehicle noise source to a recorded noise level at the residence. 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 **Figure 2** (attached).

Graph 3-1: Location 1 Ambient Noise Levels  
September 10 – 11, 2013



**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 curve (that turns east) and north of the intersection with FR119 (**Figure 1**), as shown in the following picture.



Measurement Location 2 – Looking east at U.S.89

The results of the ambient noise level measurements at Location 2 are summarized in **Table 1**, and the measured  $L_{eq}$  and  $L_{90}$  frequency spectrum for each measurement period is shown on **Figure 3** (attached). 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).

**Table 1: Ambient Noise Levels (dBA) at Location 2  
Castle Mountain Ranch/U.S. 89**

Date	Time (hours)	$L_{eq}$	$L_{90}$	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).

### **Location 3 – Butte Creek Road Gate**

Measurement Location 3 is approximately 2 miles west of the Portal and 2.4 miles southwest of the site FR119/Butte Creek Road intersection at the road gate (**Figure 1**), as shown in the following picture.



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 2**, and the average measured  $L_{eq}$  and  $L_{90}$  frequency spectrum for each measurement period is shown on **Figure 4** (attached). In general, the daytime the dominant noise source was traffic, including haul trucks, on Butte Creek Road. The measured  $L_{eq}$  and  $L_{90}$  noise levels are typical for sparsely-populated rural areas (Harris 1998).



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

**Table 2: Average Ambient Noise Levels (dBA) at Location 3  
 Butte Creek Road Gate**

Date	Time (hours)	L <sub>eq</sub>	L <sub>90</sub>	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 through grass, and a propeller plane in distance.
9/10/13	Nighttime 2244 – 2310	24	21	Noise sources included breeze through grass and insects (faint).

**Location 4 – Strawberry Butte**

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



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

The results of the ambient noise level measurements at Location 4 are summarized in **Table 3**, and the average measured L<sub>eq</sub> and L<sub>90</sub> frequency spectrum for each measurement period is shown on **Figure 5** (attached). In general, the daytime the dominant noise sources were construction activities. The measured L<sub>eq</sub> and L<sub>90</sub> noise levels are typical for sparsely-populated rural areas (Harris 1998).



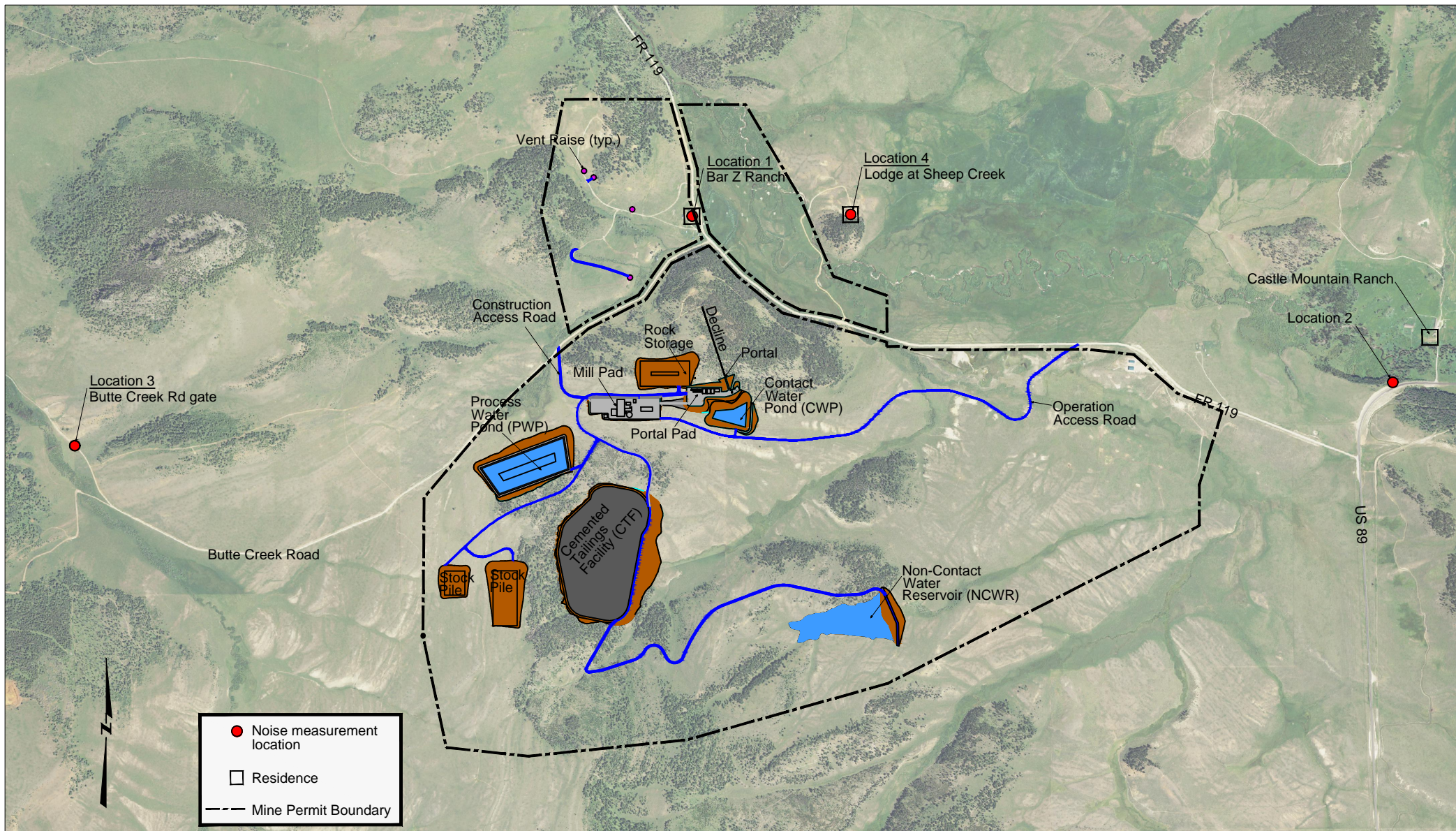
**Table 3: Average Ambient Noise Levels (dBA) at Location 4  
Strawberry Butte**

<b>Date</b>	<b>Time (hours)</b>	<b>L<sub>eq</sub></b>	<b>L<sub>90</sub></b>	<b>Notes</b>
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).

#### **4.0 REFERENCES**

American National Standards Institute (ANSI). 1994. S12.18-1994, *Procedures for Outdoor Measurement of Sound Pressure Level*.

Harris, C., ed. 1998. *Handbook of Acoustical Measurements and Noise Control*, 3<sup>rd</sup> edition. Acoustical Society of America, Woodbury, New York.

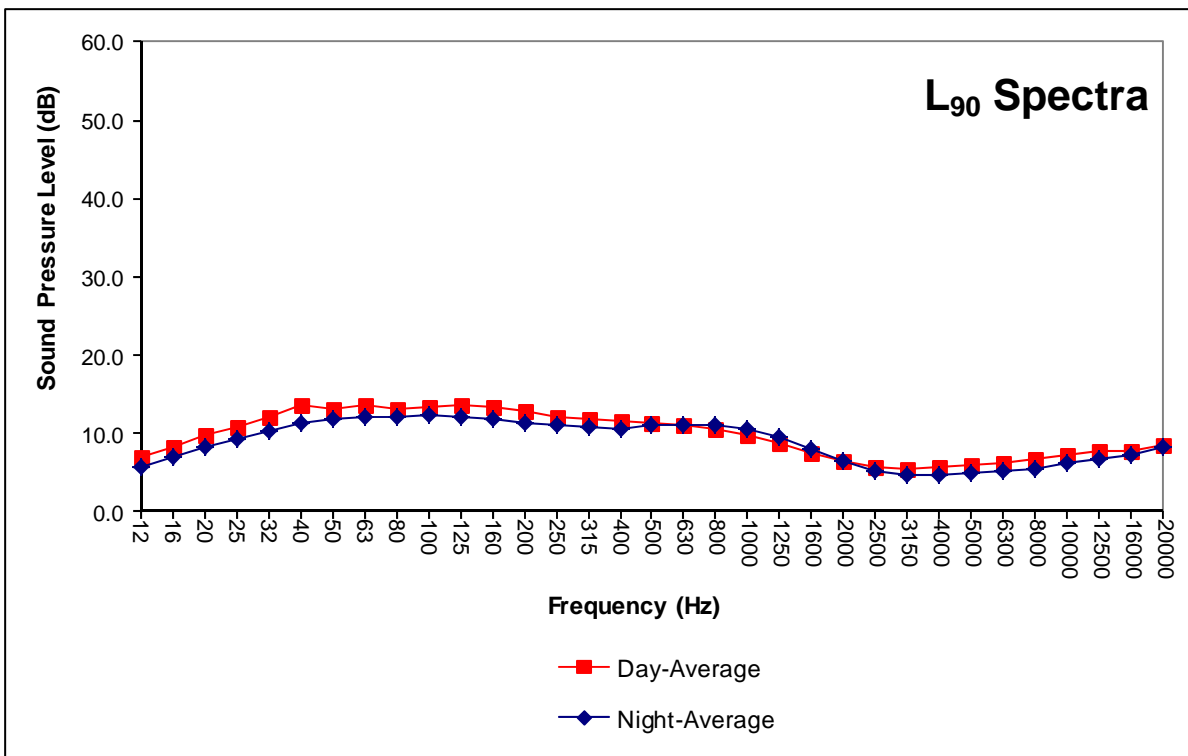
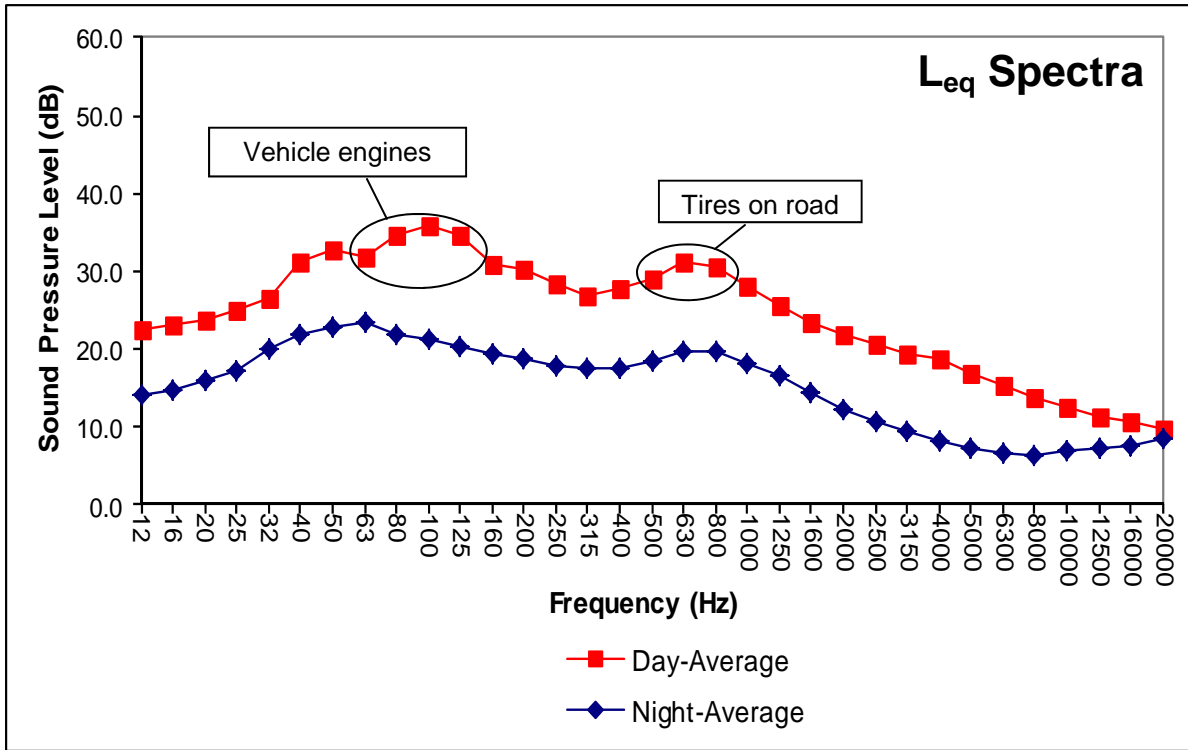


**FIGURE 1**

Project Facilities and Noise Measurement Locations

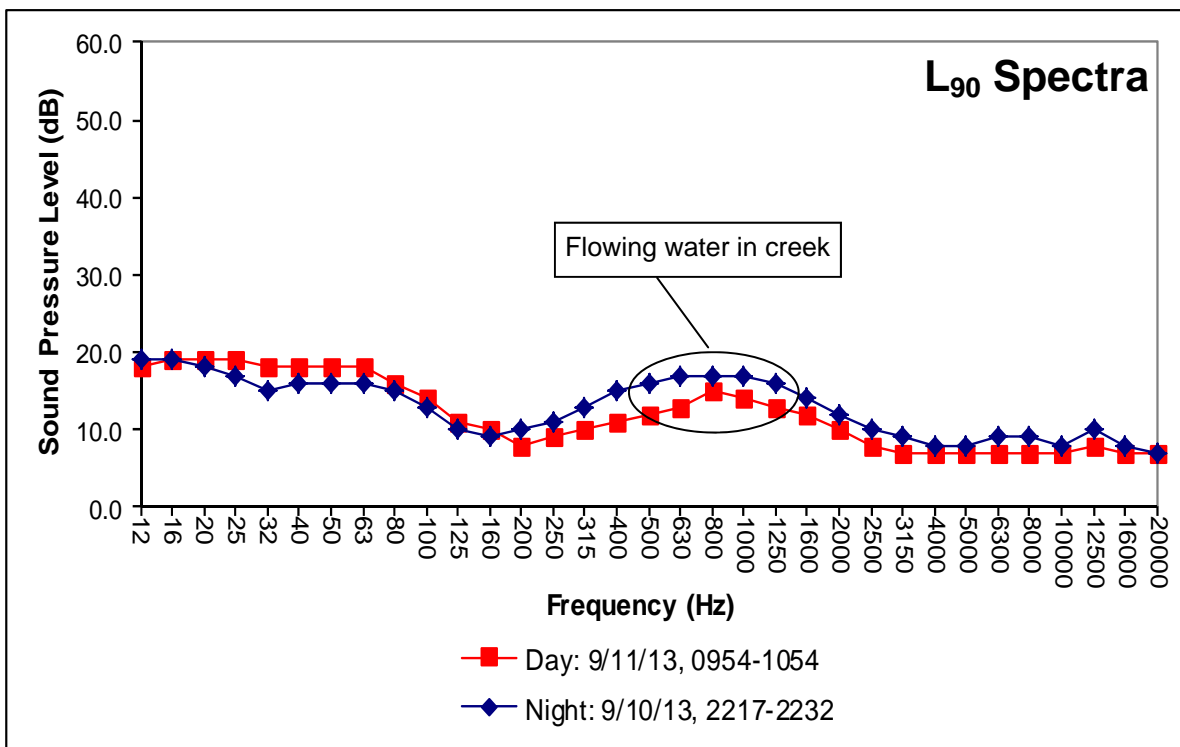
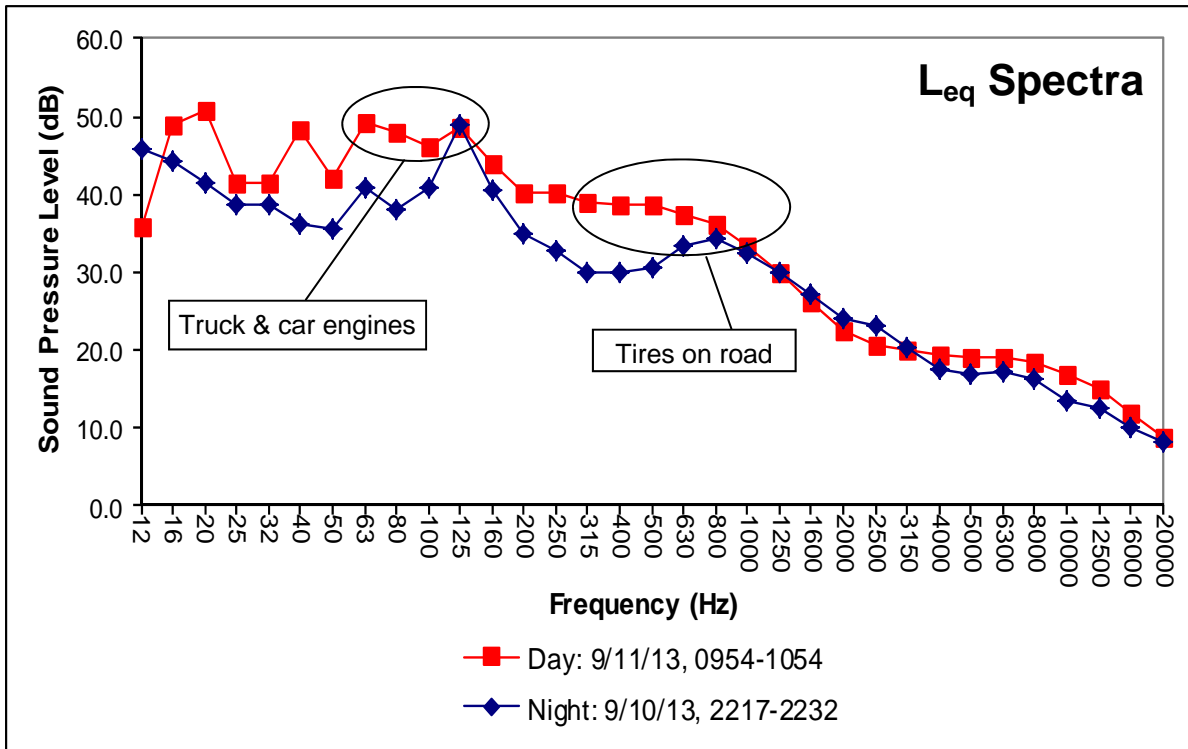
Black Butte Copper Project

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



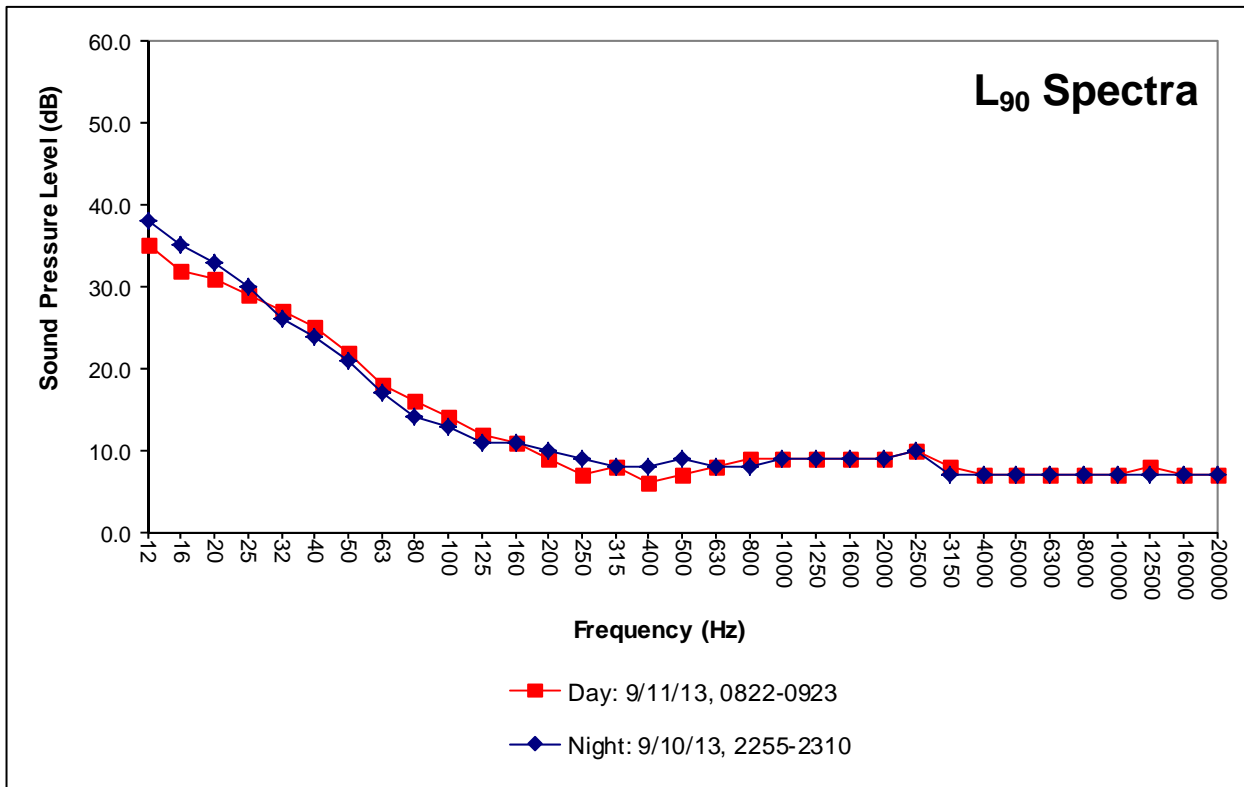
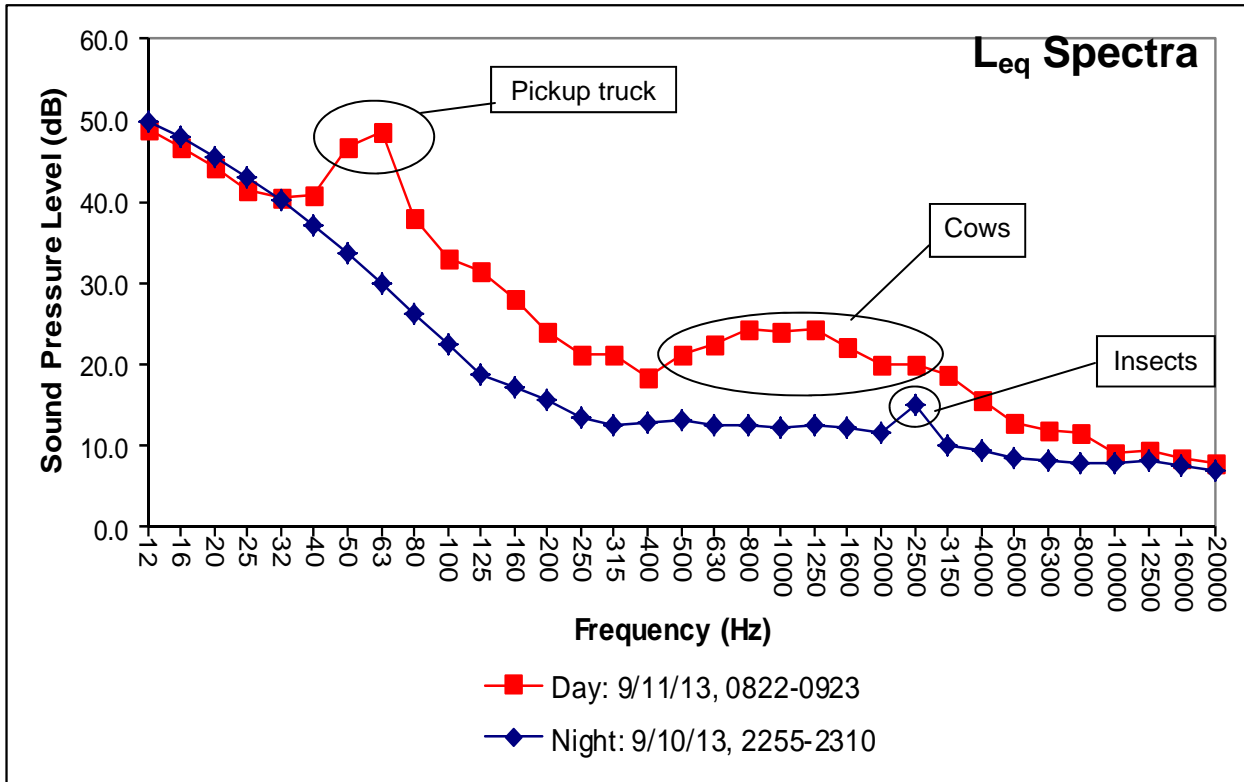
**FIGURE 2**

Baseline Ambient Noise Measurements:  
 Location 1 Frequency Spectra  
 Bar Z Ranch



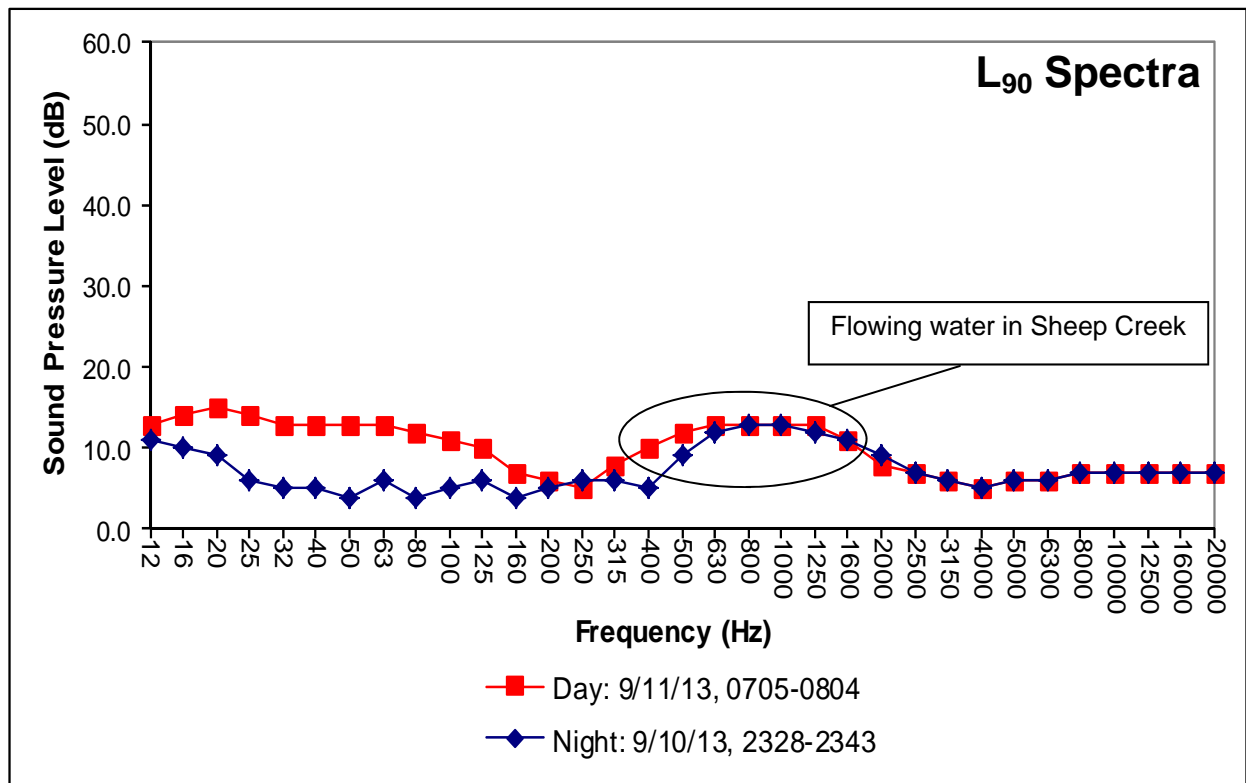
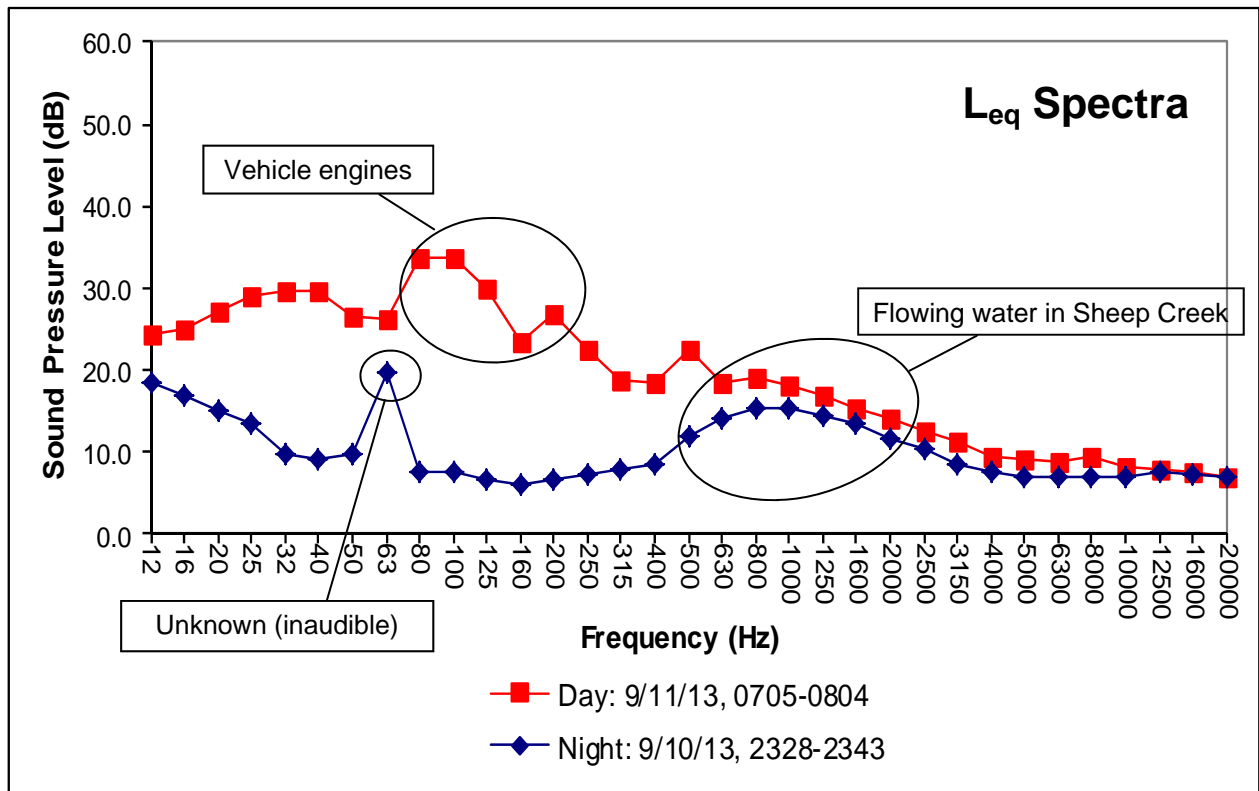
**FIGURE 3**

Baseline Ambient Noise Measurements:  
 Location 2 Frequency Spectra  
 Castle Mountain Ranch/U.S. 89



**FIGURE 4**

Baseline Ambient Noise Measurements:  
 Location 3 Frequency Spectra  
 Butte Creek Road Gate



**FIGURE 5**

Baseline Ambient Noise Measurements:  
 Location 4 Frequency Spectra  
 Strawberry Butte