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Memo

To:	Garry Southard and Tom Randall		
From:	Elliott B. Dick and Tim Casey	Project:	Paramount Electrum
cc:	Cynthia Parnow		
Date:	April 24, 2009	Job No:	84743

Re: Paramount Project: Drilling Operation Noise Assessment

INTRODUCTION

This noise assessment provides quantification of the expected increase in noise due to the implementation of the Paramount Exploration Drilling Project (Project) at the Paramount Project Area (PA) by Cougar Gold LLC (Cougar Gold). HDR Engineering, Inc. (HDR) performed a noise analysis in support of the proposed Project. Project-related noise was evaluated using the Cadna-A model. Modeling results were combined with monitoring data, and compared to assess the increase in noise due to the Project.

PROJECT LOCATION AND DESCRIPTION

The Project will investigate the subsurface geology and mineralogy in the PA. The PA is nine miles east of the town of Bridgeport, California, in the Bodie Wilderness Study Area (WSA). Access into the Project Area follows the Aurora Canyon County Road and then the Paramount Mine Road. The proposed exploration drilling will be performed via core drilling. Core drilling will consist of two coring rigs operating simultaneously 24 hours for approximately 45 days. The 11 core holes at 8 locations would be drilled within existing open vehicle ways.

In terms of land use, the surrounding wilderness is the only potential noise receptor. The nearest land use in other categories is towards the town of Bridgeport over 6 miles to the west. There are no occupied land uses in or near the PA. Other nearby lands which are similarly classified as wilderness or parks are Toiyabe National Forest in California: about 3 miles to the north and into Nevada 3 miles to the northeast, and Bodie State Park: at least 4 miles to the south by southeast.

Existing noise levels

Noise propagation in outdoor environments is significantly affected by terrain, including topography, the material of the ground surface, vegetation, and manmade structures. The terrain in and around the PA can be described as very mountainous. The terrain was muddy with frequent boulders and the occasional rocky outcropping. Where the ground had dried, it was hard and granular. There were also a few snowdrifts at the time of the noise monitoring. The vegetation was mainly low and sparse, with occasional loose clumps of aspen trees. Ground vegetation usually provides moderate ground absorption. However this sparse landscape reveals

bare, hard ground, which will hinder overall ground absorption. The vegetation is not tall or dense enough to provide obstruction-screening for sound sources, but the mountainous landscape will provide shielding from one side to another of a peak or ridge.

The existing acoustic environment was dominated by natural sounds including wind, occasional birdsong, and the sound of flowing water (when in close proximity). Additional sounds included very distant jet noise and two Jeeps on nearby Gieger Grade, an unpaved single-lane road (also identified on some maps as Bodie Masonic Road).

Noise monitoring was performed to evaluate the existing noise environment on two locations within the Project Area for a continuous 24-hour period from 3:00 pm May 29, 2008, to 3:00 pm May 30, 2008. Appendix B includes a figure which depicts the project area and noise monitoring locations. These sites were selected to represent the anticipated range of noises in the environment. Human activity was expected to most affect the existing noise level, specifically vehicular traffic, spare as it is.

The first monitoring location was located far from Gieger Grade, at a lower elevation, and was shielded from the road by a rise in land. The site is well-shielded from potential human activity, and is near a small stream and a thin clump of short aspen. There was also birdsong observed when the instrumentation was picked-up at 3:00 PM on May 30. This site represents an area where there is less likelihood of human activity than monitoring location number 2. GPS coordinates of the first monitor site are N 38° 16.613' and E 119° 04.093'. Table 1 summarizes the noise monitoring data measured at location 1.

The second noise monitoring location represents an area with the greatest likelihood of noise from human activity within a reasonable distance from the Project Area. The site is fairly close to Gieger Grade and near the project boundary. GPS coordinates of the second monitor site are N 38° 16.023' and E 119° 04.448'. Table 1 also summarizes the noise monitoring data measured at location 2. Additional information concerning existing noise levels can be found in Appendix A.

Table 1. 24-hour Summary of Existing Noise Levels

Monitoring Location	Average Sound Level, dBA		Statistical Centile Sound Level, dBA		
	Average Equivalent (L_{eq})	Day Night Average (L_{dn})	10% Exceedence (L_{10})	Median (L_{50})	90% Exceedence (L_{90})
Location 1	**34**	**39**	**35**	**29**	**27**
Location 2	**34**	**36**	**36**	**22**	**20**

Monitoring data, summarized in Table 1, indicates that the Project Area is a very quiet soundscape. Explanations of the noise metrics are in Appendix A. Noise levels were between 36 dBA and 20dBA (fast-average sound pressure level) at least 80% of the time at both noise monitoring locations (these two bounds represent the highest L10 and the lowest L90).

Comparing existing noise levels measured at the two locations, 24-hour average equivalent noise levels are comparable at each site, however the median sound level (L_{50}) was higher at Location 1. The sound level at the second location varied more than at the first location (note the range between the L_{10} and L_{90}). This suggests a more constant sound at Location 1 than at Location 2. This is most likely due to the stream near Location 1 providing a relatively constant sound of flowing water. Temperature changes and melting snow varied the flow volume, which consequently varied the sound level somewhat. At Location 1 the difference between the average equivalent sound level (L_{eq}) and the day-night average sound level (L_{dn}) is 5 dBA, which is mathematically consistent with relatively constant sound levels.

The wider range of noise levels at location 2 could be due to passing vehicular traffic, but it is unlikely that there would be enough traffic on this road to be solely responsible for the variation, and this cannot be confirmed. Whatever events caused the greater range of sounds, it is likely that the events occurred mainly during the daytime. The L_{dn} is only 2 dBA higher than the L_{eq}, which suggests lower nighttime sound levels, or events that occurred less frequently in the nighttime.

The second measurement was often measuring the lowest measurable sound level (noise floor) of the instrumentation, rather than the noise level of the environment. Therefore the actual noise level of the environment during this measurement may be lower than the measured level. The first location measurements were not often at the instrumentation noise floor, but they were near enough where it may have influenced the result. The noise floor theoretically cannot elevate the result by more than 3 dB, unless the noise floor of the instrumentation is higher than the actual sound level. The measured noise levels for both locations can be considered an estimate of the upper limit during the monitoring period, and more precisely at location one, it can be considered less than 3 dB above the actual environmental levels.

METHODOLOGY

Typically, noise assessment protocols are based on the applicable noise limits or assessment guidelines, which often exist in local ordinances, state or federal regulations, statutes, and/or guidelines from agencies having jurisdiction over aspects of a proposed project. The *Bureau of Land Management* (BLM) defers to "…applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation plans".[1] Other federal, state, and local noise regulation cannot be practically applied to the Project. A more basic approach is required to provide guidance.

The *Environmental Protection Agency* (EPA) *Office of Noise Abatement and Control* (ONAC) was closed in 1981, in favor of state and local enforcement, though the Noise Control Act of 1972 was not repealed. Long before it closed, the EPA ONAC researched suitable noise level criteria. This research is used as the basis for much of the nation's noise regulation today, at all levels of government. The criterion for outdoor activity interference and annoyance is $L_{dn} \leq 55$, "…where people spend widely varying amounts of time, and other places in which quiet is a

[1] Federal Land Policy and Management Act of 1976, as amended

basis for use."[2] Based on the precedent of this research being applied almost universally, the noise model methodology for the Project is based on the day-night level (L_{dn}) metric.

Noise Model

Project-related noise levels are predicted with Cadna-A, an acoustical analysis software package designed for evaluating environmental noise from stationary and mobile sources. Cadna-A is a three-dimensional noise model based on ISO 9613, "Attenuation of Sound during Propagation Outdoors," adopted by the International Standards Organization (ISO) in 1996. This standard provides a widely accepted engineering method for the calculation of outdoor environmental noise levels from sources of known sound emission. Features of the model for the Project-related noise are:

- A Digital Terrain Model to include relative elevations and shielding effects of ridges and peaks.
- Drilling equipment and generators.
- Vehicle traffic to and from drill sites for shift changes and other personnel, to deliver supplies, and service the drills.

Table 2 shows the noise emissions levels used in the Cadna-A model to assess Project related noise.

Table 2. Summary of Noise Source Reference Levels

Noise Source	Level	Metric	Reference Source
Drilling operation	112 dBA	Sound power level	Derived from noise surveys by maker of similar equipment [3,4,5]
Truck[6]	74 dBA	Sound pressure level at 50 feet	Report FHWA-PD-96-08[7]

The Cadna models were built to evaluate noise based on two scenarios, 24-hour and 12-hour work cycles. Drilling sites were modeled as point sources in Cadna. Vehicular traffic was

[2] The U.S. Environmental Protection Agency Office of Noise Abatement and Control. Information On Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. March 1974. pp. 3.

[3] "CS-4000 Unit #726 Full Noise Survey". 29 March 2000. US Borax Mine Site, Boron, California.

[4] "CS-1000 Unit #6580 Full Noise Survey". 22 April 1997. Morenci Mine Site, Morenci, Arizona.

[5] "CS-4000 Unit #5990 Full Noise Survey". 21 April 1997. Morenci Mine Site, Morenci, Arizona.

[6] The assumed weight of water trucks, pickups and vans are between ¾ ton and 3 tons, medium size truck by FHWA-PD-96-08 classification.

[7] "Development of National Reference Energy Mean Emission Levels for the FHWA Traffic Noise Model (FHWA TNM), Version 1.0". FHWA-PD-96-008 DOT-VNTSC-FHWA-96-2. November 1995.

modeled in Cadna as a line source. The height of the truck noise emission point was assumed at 2 meters. For purposes of the noise analysis, vehicle traffic is divided into three road segments:

- Segment 1: from Bridgeport to Paramount Mine Rd. via Aurora Canyon Rd. and Geiger Grade
- Segment 2: from Geiger Grade to "upper" drill pad via Paramount Mine Rd.
- Segment 3: from Paramount Mine Rd. to "lower" drill pad via Geiger Grade and 4WD track

Truck speed was assumed at 20 mph (32 km/h) on road segment 1, and 10 mph (16 km/h) on road segments 2 and 3. Expected average traffic volumes on each road segment were provided by the client and are presented in Table 3.

Table 3. Project-Related Vehicular Traffic

Vehicles	Details	GVWR	Expected Average Round Trips Per Day		
			Segment 1	Segment 2	Segment 3
3500 gallon water truck	Peterbilt 330 Tank Truck	34700	2	0	0
Crew van	Ford E-350, 15-passenger	9500	2	2	2
Service truck (fuel, parts)	Ford F-450	14500	1	2*	2*
Secondary water trucks	Ford F-450	14500	2	8*	9*
Geologist trucks	Ford F-250	9600	4	2	2
Project coordinator	Ford F-250	9600	2	2	2

* This traffic occurs during both daytime hours and nighttime hours;
All other traffic is limited to daytime hours (07:00 to 22:00)

For noise analysis daytime hours are from 07:00 to 22:00, as defined by the L_{dn} metric. Based on this definition, all traffic to and from Bridgeport, and all shift changes and associated road traffic will occur during daytime hours. The only road traffic which will occur during nighttime hours are the secondary water trucks and the service trucks, operating on road segments 2 and 3. This traffic was divided between daytime hours and nighttime hours (rounded to whole round trips).

For the 12-hour scenario, all traffic identified in Table 3 is reduced to half the round trips shown. For both the 24-hour and the 12-hour scenarios, the round trips were used to calculate the average hourly vehicle pass-by events over the 15 daytime hours and the 9 nighttime hours. Table 4 shows the results of the vehicle passby event calculation.

Table 4. Expected Average Traffic Vehicle Events

Road Segment	Hourly Average Vehicle Pass by Events per Hour			
	24 hour Scenario		12 hour Scenario	
	Daytime	Nighttime	Daytime	Nighttime
Segment 1	1.733	0.000	0.933	0.000
Segment 2	1.600	0.889	1.067	0.000
Segment 3	1.733	0.889	1.067	0.000

RESULTS

Results of the 24-hour scenario indicate the following concerning daily average Project related noise levels:

- There will be constant noise from the drilling operation, day and night. The highest daily noise level from this activity is predicted to be approximately 44 dBA L_{dn} at Gieger Grade, approximately 2,500 feet from the nearest drill site.
- Transportation noise from the project area during daytime hours resulting from vehicular traffic during shift changes, supply truck trips, water truck trips, and moving drill locations to another site will increase the noise level during some daytime hours. Model results indicate that noise levels could reach 52 dBA at Gieger Grade during daytime hours.
- There will be limited transportation noise around the project area during nighttime hours for water truck and service truck trips. These activities increase the noise level during some nighttime hours Analysis results indicate that noise levels could reach 42dBA at Gieger Grade during nighttime hours.
- Analysis results indicate that total project related noise levels, including project related traffic and drilling operations, levels could reach 54 dBA, on an L_{dn} basis, at Gieger Grade.
- The terrain around the project area allows the best sound propagation to the south-by-southeast (the terrain blocks sound from traveling in other direction). This is reflected in the levels at the north and the south project area boundaries, shown in Figure 2 in Appendix B (the boundary to the east is further from noise sources, resulting in a lower noise level; and vehicle noise crosses the boundary to the west resulting in a higher noise level).
- Project related noise is predicted to be less than 55 dBA, on an L_{dn} basis, at 258 meters [846 feet] from any drill site.

- Noise from trucks traveling from Bridgeport to the project area is anticipated to occur via Aurora Canyon Rd. The L_{dn} at a distance of 175 feet from the road is predicted to be 38 dBA, sometimes less. The road traffic volume is less than expected recreational traffic.

Analysis results of the 12-hour scenario indicate the following concerning daily average Project related noise levels:

- There will be constant noise from the drilling operation. This noise is very limited and analysis results indicate it will reach approximately 38 dBA, on an L_{dn} basis, at Gieger Grade, approximately 2,500 feet from the nearest drill site.
- Transportation noise from the project area will be limited to daytime hours for shift changes, supply truck trips, water truck trips, and moving drill locations to another site. These activities increase the noise level during the daytime hours.
- There are no project-related activities during nighttime hours and consequently no project-related noise during nighttime hours.
- Analysis results indicate that total project related noise levels, including project related traffic and drilling operations, could reach 54 dBA L_{dn} at Gieger Grade.
- The terrain around the project area allows the best sound propagation to the south-by-southeast (the terrain blocks sound from traveling in other direction). This is reflected in the levels at the north and the south project area boundaries, shown in Figure 3 in Appendix B (the boundary to the east is further from noise sources, resulting in a lower noise level; and vehicle noise crosses the boundary to the west resulting in a higher noise level).
- Project related noise is predicted to be less than 55 dBA, on an L_{dn} basis, at 96 meters [315 feet] from any drill site.
- Noise from trucks traveling from Bridgeport to the project area is anticipated to occur via Aurora Canyon Rd. The L_{dn} at a distance of 175 feet from the road is predicted to be 32 dBA, sometimes less. The road traffic volume is less than expected recreational traffic.

APPENDIX A

Environmental Noise at Monitoring Location #1.

Hourly Interval Start Time	Equivalent Average Level	Highest/Lowest Measured Level		Statistical Ln Level Exceeded n% of Interval Time		
(PDT)	Leq (dBA)	Lmax (dBA)	Lmin (dBA)	L10 (dBA)	L50 (dBA)	L90 (dBA)
3:00 PM	36	66	26	38	30	28
4:00 PM	34	72	26	35	29	28
5:00 PM	40	65	27	39	30	28
6:00 PM	32	51	27	30	28	27
7:00 PM	38	59	26	41	29	27
8:00 PM	34	58	27	33	29	28
9:00 PM	32	50	28	32	30	29
10:00 PM	31	46	28	32	30	28
11:00 PM	33	51	28	35	30	29
12:00 AM	30	46	28	31	30	29
1:00 AM	30	33	27	31	30	28
2:00 AM	30	40	27	31	30	28
3:00 AM	29	36	28	30	29	28
4:00 AM	33	50	28	35	31	29
5:00 AM	34	52	28	37	32	29
6:00 AM	33	51	26	35	30	28
7:00 AM	34	70	26	37	29	27
8:00 AM	34	54	25	37	28	27
9:00 AM	32	53	24	34	28	26
10:00 AM	29	53	24	31	28	26
11:00 AM	37	63	24	36	29	26
12:00 PM	34	55	24	35	28	26
1:00 PM	33	55	23	36	29	25
2:00 PM	34	58	23	35	27	25
24-hour	34	72	23	35	29	27
L_d	35					
L_n	32					
L_{dn}	39					

Environmental Noise at Monitoring Location #2.

Hourly Interval Start Time	Equivalent Average Level	Highest/Lowest Measured Level		Statistical L_n Level Exceeded n% of Interval Time		
(PDT)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)
3:00 PM	35	66	20	38	27	21
4:00 PM	28	45	19	32	22	19
5:00 PM	38	64	20	37	24	20
6:00 PM	30	50	19	28	21	19
7:00 PM	37	60	19	40	23	20
8:00 PM	29	55	19	28	21	19
9:00 PM	28	53	19	26	20	19
10:00 PM	25	43	19	26	20	19
11:00 PM	31	55	19	34	21	19
12:00 AM	24	47	19	22	20	19
1:00 AM	20	24	19	20	20	19
2:00 AM	22	41	19	21	20	19
3:00 AM	20	31	19	20	20	19
4:00 AM	23	41	19	23	20	19
5:00 AM	27	54	19	27	22	20
6:00 AM	31	54	19	32	23	20
7:00 AM	36	71	20	36	26	21
8:00 AM	35	53	20	39	31	23
9:00 AM	35	53	20	38	31	23
10:00 AM	35	55	20	38	31	24
11:00 AM	40	64	20	43	34	25
12:00 PM	37	58	20	40	30	22
1:00 PM	39	58	20	42	33	23
2:00 PM	35	56	20	38	27	21
24-hour	34	71	19	36	22	20
L_d	36					
L_n	27					
L_{dn}	36					

An explanation of noise metrics and measurement results follows:

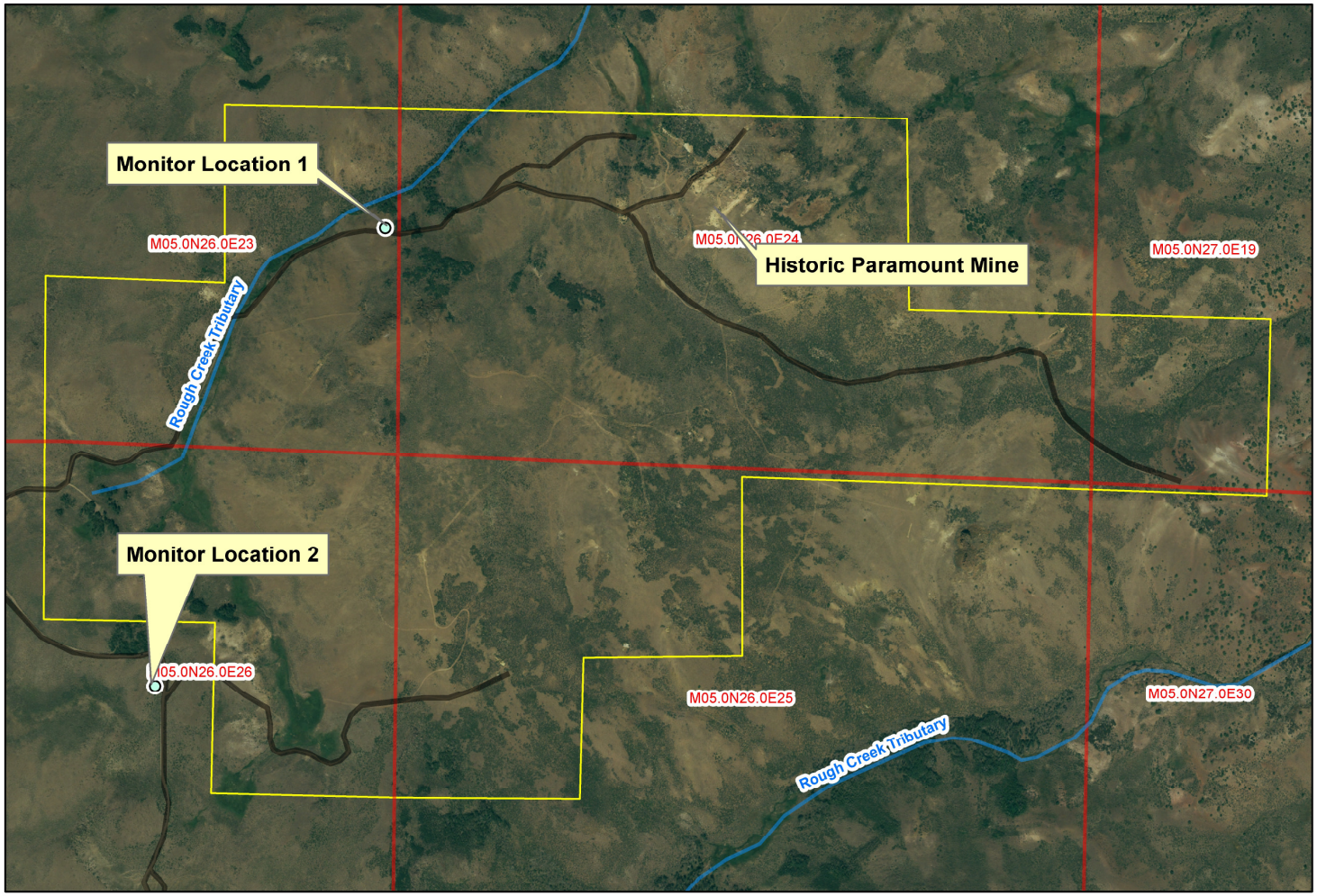
- **L_{eq}** – The average energy-equivalent sound level in A-weighted decibels (dBA) over a measurement interval. In any measurement interval, the instantaneous sound pressure level can vary. This is a level average, obtained by averaging the sound pressure. It is often considered the equivalent level, if the level were constant over the measurement interval.
- **L_d** – The average equivalent sound level in A-weighted decibels (dBA) during daytime hours (the 15 hours between 7:00 AM and 10:00 PM).
- **L_n** – The average equivalent sound level in A-weighted decibels (dBA) during nighttime hours (the 9 hours between 10:00 PM and 7:00 AM).
- **L_{dn}** – The average equivalent day-night sound level in A-weighted decibels (dBA) where nighttime hours (10:00 pm to 7:00 am) receive an additional 10 decibels. This is intended to represent a heightened sensitivity to noise disturbance during sleep. Other texts sometimes use the abbreviation 'DNL'.
- **L_{max}** – The highest fast-averaged sound level occurring within a measurement interval in A-weighted decibels (dBA).
- **L_{min}** – The lowest fast-averaged sound level occurring within a measurement interval in A-weighted decibels (dBA).
- **L_{10}, L_{50},** and **L_{90}** – Statistical noise descriptors that represent the fast-averaged sound level exceeded during the stated percent of a measurement interval in A-weighted decibels (dBA). The L_{50} is the sound level exceeded 50% of the time (the median sound level during the measurement interval). The L_{10} is the level exceeded 10% of the time during the interval, and is often higher where intermittent sounds occur during the measurement interval. The L_{90} is the level exceeded 90% of the time during the interval, and is near the background noise level.

The L_{max}, L_{min}, L_{10}, L_{50} and L_{90} metrics were measured with the standardized fast exponential time averaging characteristic and A-weighting characteristic. The average equivalent sound levels were measured with the standardized A-weighting characteristic. The A-weighting scale approximates the frequency-dependent sensitivity of the human hearing, and is the preferred weighting for environmental noise metrics.

The measurements also captured the sound of the field crew and observers (walking, clothes rustling, and opening/closing of equipment cases) during the first hour of monitoring and during the 7:00 AM hour for instrumentation checks. The instrumentation check noise would most likely have an effect on the L_{max} metric. Since the checks were brief, they may have increased the L_{eq} and statistical metrics only slightly during the measurement hour.

APPENDIX B

Figure 1 – Noise Monitoring Locations



HDR

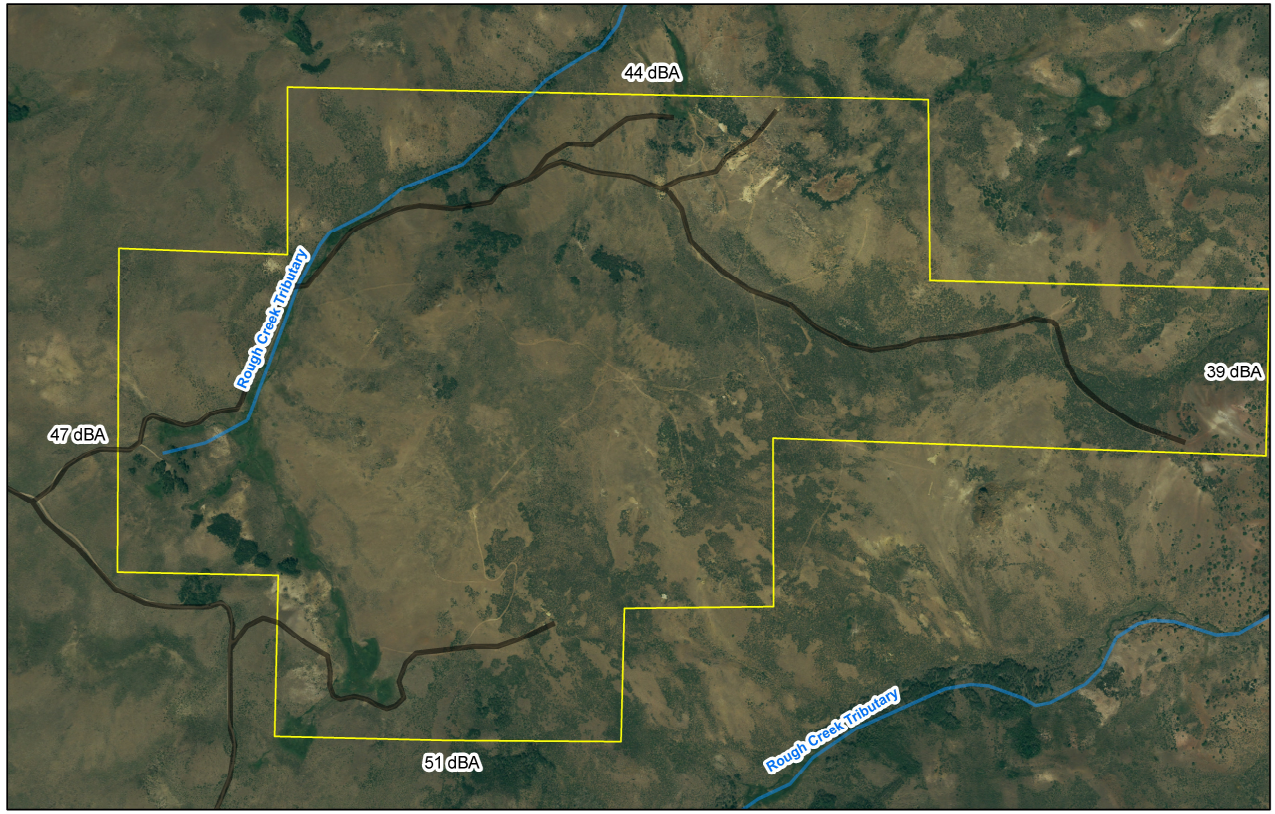
N

0 500 1,000 Feet

Paramount Mine
Noise Monitoring Locations

Legend
- Noise Monitoring Locations
- Study Area
- Roads
- Streams
- Public Land Survey

Figure 2 – 24-hour Work Cycle
Project Related Day-Night Sound Level



HDR

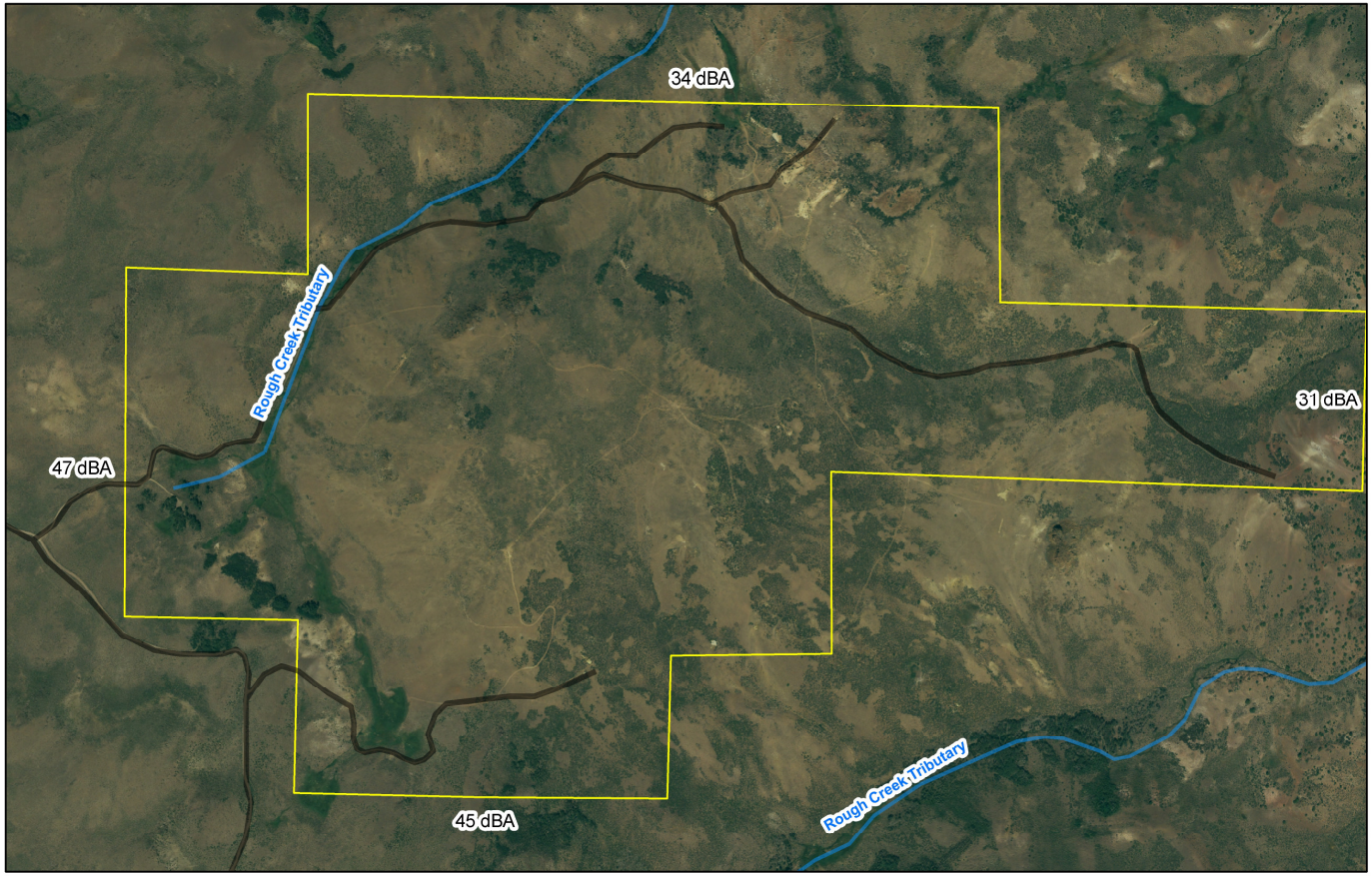
N

0 495 990 Feet

Paramount Mine
24-hour Work Cycle
Project Related Day-Night Sound Level
Ldn (dBA)

Legend
Study Area
Roads
Streams

Figure 3 – 12-hour Work Cycle
Project Related Day-Night Sound Level



HDR

N

0 490 980 Feet

Paramount Mine
12-hour Work Cycle
Project Related Day-Night Sound Level
Ldn (dBA)

Legend
Study Area
Roads
Streams