Sound and Vibration Analysis Report

Resolution Copper Mine Project
Pinal County, Arizona

April 2017

Prepared for:

Resolution Copper Mining
102 Magma Heights
Superior, AZ 85173

Prepared by:

Tetra Tech, Inc.
160 Federal Street
Boston, MA 02110

TETRA TECH

EXECUTIVE SUMMARY

Resolution Copper Mine is proposing the construction and operation of an underground mine, ore processing operation, and associated facilities and infrastructure. The Project will incorporate various noise sources including stationary mechanical equipment, conveyors, mobile equipment, a railway, and vehicular traffic operating on public and site access roadways. Facilities and infrastructure components are located in north-central Pinal County.

This assessment provides background information on concepts related to environmental sound including: descriptions of the noise and vibration metrics used throughout the report; applicable noise standards and regulations; the results of the ambient sound and vibration measurement program; predicted noise levels from the operations of Project equipment; and an assessment of the potential noise impacts from development and operation of the proposed Project.

Noise levels resulting from operation of the Project were evaluated with respect to noise guidelines and policies as established by the Pinal County. Pinal County's Municipal Ordinance established a noise threshold limit of 60 dBA L_{eq} for the daytime period and 55 dBA L_{eq} for the nighttime period for residential land uses. Construction noise related to the project was not evaluated at the time of this study. However, a construction management plan will be developed prior to the start of construction and will address construction noise impacts and will also included noise mitigation measures.

Tetra Tech conducted ambient sound and vibration measurements from June 7 through July 5, 2016. Although Pinal County noise standards are based on specific property boundary decibel levels, existing ambient levels are provided for context and characterization of the setting. Measurements included continuous long-term measurements that collected near the East Plant Site (EPS), West Plant Site (WPS), Tailings Storage Facility (TSF), and Filter Plant and Loadout Facility. Results of the ambient sound survey indicate that sound levels surrounding the proposed Project are relatively low levels. As expected, measurement locations closer to existing Resolution Mine related noise sources (EPS and WPS) generally experienced louder ambient noise levels associated with these existing operations. Periodic public and Resolution Mine related vehicle traffic, particularly during the daytime period, was also a significant contributor. Ambient sound levels did exhibit typical diurnal patterns. Daytime L_{eq} sound levels at the measurement locations ranged from a low of 43 dBA in proximity to the Tailings Facility to a high of 50 dBA adjacent to the EPS. Nighttime L_{eq} sound levels ranged from a low of 34 dBA near the existing Filter Plant to 49 dBA at the EPS. The vibration levels at the measurement locations are relatively low and are at or below the threshold of human perception. At times there were levels that could be perceived by humans, but were not found to be of a level that would even approach thresholds used to describe the potential for damage to existing structures. The measured average PPV ranged from 0.0031 inch/sec at EPS monitoring location to 0.0077 inch/sec. The measured maximum PPV ranged from a low of 0.013 inch/sec at EPS and 0.0723 inch/sec at WPS. No strange or unusual vibrations were identified over the course on the vibration monitoring program.

The noise model was used to calculate sound pressure levels from the operation of the Project equipment in the vicinity of the Project Site. The noise model incorporated input data for the EPS, WPS, TSF, Magma Arizona Railroad Company (MARRCO) corridor, and the Filter Plant. Broadband (dBA) sound pressure levels were calculated for expected Project operations at all facilities assuming that all components identified are operating concurrently based on the applied utilization factor using representative sound source levels. The sound energy was then summed to determine the equivalent continuous A-weighted downwind sound pressure level at a point of reception. During normal Project operations, noise levels from the Project will range from 21 to 55 dBA L_{eq}. The Project will fully comply with the Pinal County noise standards. The ambient nighttime noise levels range from 34 to 54 dBA L_{eq}, the predicted sound level increases range from 8 dBA to 16 dBA. While audible, the resulting sound levels will not be construed as a noise nuisance per the county noise standards.

Reasonable efforts will be made to minimize the impact of noise resulting from Project activities at proximate noise sensitive areas, which will be the priority. Compliance with MSHA standards will be achieved through equipment mitigation practices, use of personal protective equipment such as hearing protection devices, and limitations on exposure.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ANSI	American National Standards Institute
^{o}F	degrees Fahrenheit
µPa	microPascal
dB	decibel
dBA	A-weighted decibel
dBL	linear decibel
EIS	Environmental Impact Statement
EPS	East Plant Site
FTA	Federal Transit Authority
Hz	Hertz
ISO	International Organization for Standardization
kHz	kilohertz
L_{eq}	equivalent sound level
L_{W}	sound power level
L_{P}	sound pressure level
m	meters
MARRCO	Magma Arizona Railroad Company
mi	miles
ML	monitoring location
mph	Miles per hour
PPV	Peak-Particle-Velocity
pW	picowatt
OSHA	Occupational Safety and Health Administration
OSMRE	Office of Surface Mining Reclamation and Enforcement
rms	root mean square
TSF	Tailings Storage Facility
USEPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
USBM	U.S. Bureau of Mines
WPS	West Plant Site

1.0 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) has prepared this noise impact assessment for the proposed Resolution Copper Project (the Project) to support an environmental impact statement (EIS). The Project consists of an underground mine, ore processing operation, and associated facilities and infrastructure. The Project will incorporate various noise sources including stationary mechanical equipment located both inside and outside of buildings, conveyors, mobile equipment, a 7 mile section of railway, and vehicular traffic operating on public and site access roadways (see Figure 1).

This report provides background information on concepts related to environmental sound including: descriptions of the noise and vibration metrics used throughout the report; applicable noise standards and regulations; the results of the ambient sound and vibration measurement program; predicted noise levels from the operations of Project equipment; and an assessment of the potential noise impacts from development and operation of the proposed Project.

The objectives of this report are to:

- Identify noise-sensitive area(s) that may be affected by the Project;
- Describe the regulations and guidelines to which the Project is held;
- Document existing ambient noise and vibration levels in the area;
- Identify the principal noise source levels associated with the Project;
- Assess the potential impact of the Project on noise levels through the use of a predictive acoustic modeling for operation analysis; and
- Propose practicable measures to minimize noise impacts associated with operation of the Project. These mitigation measures are presented to show the proposed Project is capable of meeting the specific noise requirements; however, final design may incorporate different mitigation measures in order to achieve the same objective as demonstrated in this assessment.

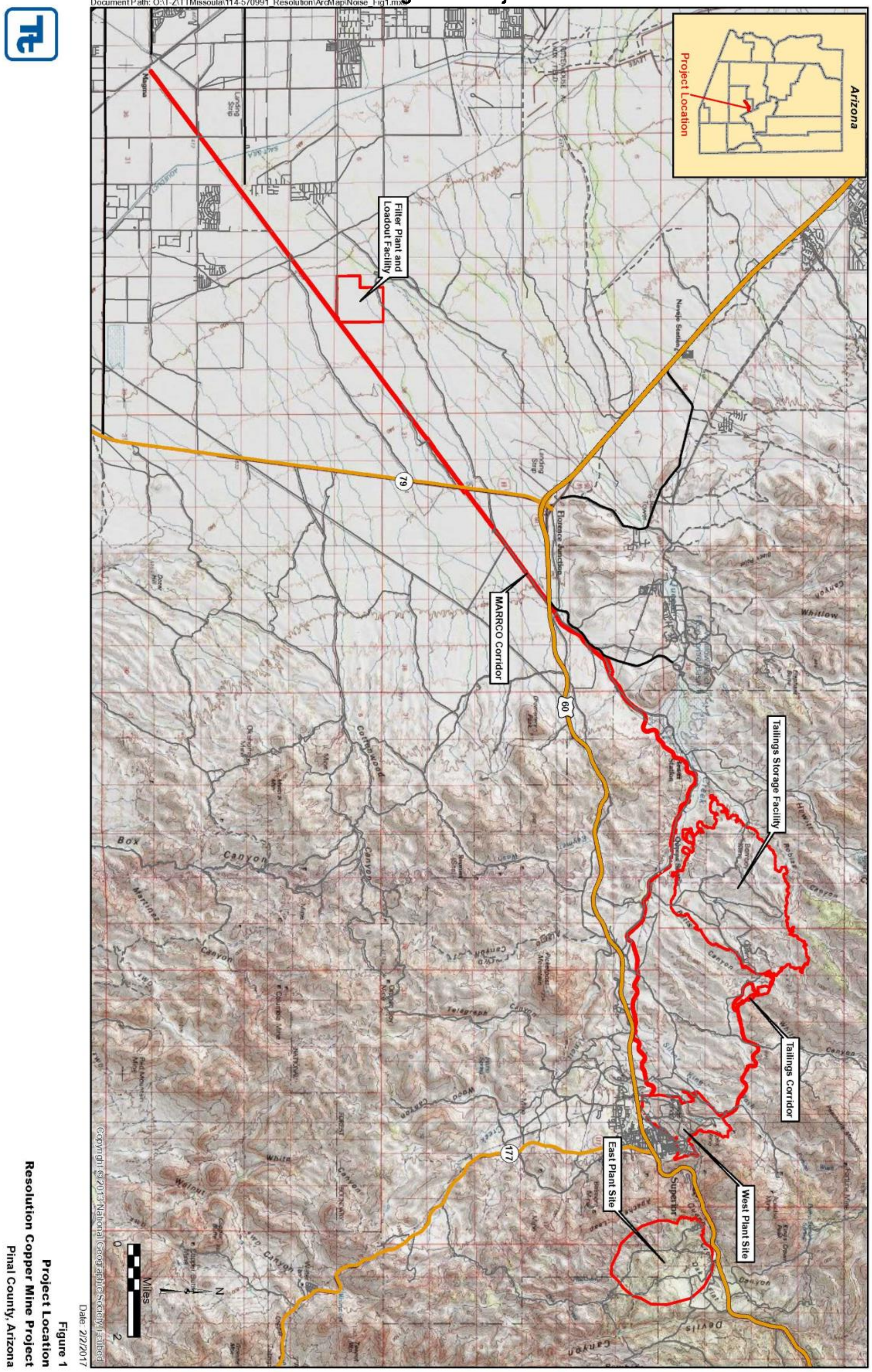
Resolution Copper's administrative headquarters are currently located on private land near Superior, Pinal County, Arizona, specifically at Resolution Copper's West Plant Site (WPS). These administrative offices are located immediately north of Superior at 102 Magma Heights, Superior, Arizona. The proposed ore processing facilities (the Concentrator) will be located at the WPS in the area of the historic Magma Copper Mine.

Facilities and infrastructure components are located in north-central Pinal County (see Figure 1). The East Plant Site (EPS) encompasses the proposed underground mine, associated shafts, and surface support facilities. The EPS is located approximately 6 road miles east of the WPS and is accessed from US 60 by turning south on the Magma Mine Road. The existing mine site and related surface support facilities are currently located on private lands, and during production will largely expand on private lands.

The copper concentrate filtration plant and concentrate loadout facility (the Filter Plant and Loadout Facility) will be constructed on already disturbed private lands near Magma Junction, adjacent to the existing Magma Arizona Railroad Company (MARRCO) right-of-way. The MARRCO Corridor will be the site of connecting infrastructure, such as water supply pipelines, dewatering pipelines, concentrate pipelines, and power lines, and the existing rail line.

A Tailings Storage Facility (TSF) will be situated west of the WPS and within the Tonto National Forest. Tailings will arrive at the TSF from the WPS via a pipeline that traverses the intervening area (along with other infrastructure) along the Tailings Corridor. The linear infrastructure elements are primarily located within the Tailings Corridor, within the MARRCO Corridor on private land alongside existing disturbed land, or alternatively located underground, and include ore conveyors, roads, power lines, copper concentrate pipelines, tailings pipelines, railroad, and water supply pipelines.

Figure 1: Project Location



1.1 ACOUSTIC METRICS AND TERMINOLOGY

All sounds originate at a source, whether it is a human voice, motor vehicles on a roadway, or a combustion turbine. Energy is required to produce sound and this sound energy is transmitted through the air in the form of sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear. A sound source is defined by a sound power level (abbreviated "L_W"), which is independent of any external factors. By definition, sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts.

A source sound power level cannot be measured directly. It is calculated from measurements of sound intensity or sound pressure at a given distance from the source outside the acoustic and geometric near-field. A sound pressure level (abbreviated "L_P") is a measure of the sound wave fluctuation at a given receiver location, and can be obtained through the use of a microphone or calculated from information about the source sound power level and the surrounding environment. The sound pressure level in decibels (dB) is the logarithm of the ratio of the sound pressure of the source to the reference sound pressure of 20 microPascals (μPa), multiplied by 20[1]. The range of sound pressures that can be detected by a person with normal hearing is very wide, ranging from about 20 μPa for very faint sounds at the threshold of hearing, to nearly 10 million μPa for extremely loud sounds such as a jet during take-off at a distance of 300 feet.

Broadband sound includes sound energy summed across the entire audible frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum can be completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), measuring the cycles per second of the sound pressure waves. Typically the frequency analysis examines 11 octave bands ranging from 16 Hz (low) to 16,000 Hz (high). Since the human ear does not perceive every frequency with equal loudness, spectrally-varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system, and is represented in dBA.

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (L_{eq}). The equivalent sound level has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 1. Table 2 presents additional reference information on terminology used in the report.

Table 1. Sound Pressure Levels (L_P) and Relative Loudness of Typical Noise Sources and Acoustic Environments

Noise Source or Activity	Sound Level (dBA)	Subjective Impression
Vacuum cleaner (10 feet)	70	Moderate
Passenger car at 65 miles per hour (25 feet)	65	
Large store air-conditioning unit (20 feet)	60	
Light auto traffic (100 feet)	50	Quiet
Quiet rural residential area with no activity	45	
Bedroom or quiet living room; Bird calls	40	Faint
Typical wilderness area	35	
Quiet library, soft whisper (15 feet)	30	Very quiet

[1] The sound pressure level (L_p) in decibels (dB) corresponding to a sound pressure (p) is given by the following equation:

$$Lp = 20 \log10 (p / pref);$$

Where:

p = the sound pressure in μPa; and

pref = the reference sound pressure of 20 μPa.

Noise Source or Activity	Sound Level (dBA)	Subjective Impression
Wilderness with no wind or animal activity	25	Extremely quiet
High-quality recording studio	20	
Acoustic test chamber	10	Just audible
	0	Threshold of hearing

Adapted from: Kurze and Beranek (1988) and United States Environmental Protection Agency (1971)

Table 2. Acoustic Terms and Definitions

Term	Definition
Noise	Typically defined as unwanted sound. This word adds the subjective response of humans to the physical phenomenon of sound. It is commonly used when negative effects on people are known to occur.
Sound Pressure Level (L_P)	Pressure fluctuations in a medium. Sound pressure is measured in dB referenced to 20 microPascals, the approximate threshold of human perception to sound at 1,000 Hz.
Sound Power Level (L_W)	The total acoustic power of a noise source measured in dB referenced to picowatts (one trillionth of a watt). Noise specifications are provided by equipment manufacturers as sound power as it is independent of the environment in which it is located. A sound level meter does not directly measure sound power.
Equivalent Sound Level (L_{eq})	The L_{eq} is the continuous equivalent sound level, defined as the single sound pressure level that, if constant over the stated measurement period, would contain the same sound energy as the actual monitored sound that is fluctuating in level over the measurement period.
A-Weighted Decibel (dBA)	Environmental sound is typically composed of acoustic energy across all frequencies. To compensate for the auditory frequency response of the human ear, an A-weighting filter is commonly used for describing environmental sound levels. Sound levels that are A-weighted are presented as dBA in this report.
Unweighted Decibels (dBL)	Unweighted sound levels are referred to as linear. Linear decibels are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear are presented as dBL in this report.
Propagation and Attenuation	Propagation is the decrease in amplitude of an acoustic signal due to geometric spreading losses with increased distance from the source. Additional sound attenuation factors include air absorption, terrain effects, sound interaction with the ground, diffraction of sound around objects and topographical features, foliage, and meteorological conditions including wind velocity, temperature, humidity, and atmospheric conditions.
Octave Bands	The audible range of humans spans from 20 to 20,000 Hz and is typically divided into center frequencies ranging from 31 to 8,000 Hz.
Broadband Noise	Noise which covers a wide range of frequencies within the audible spectrum, i.e., 200 to 2,000 Hz.
Frequency (Hz)	The rate of oscillation of a sound, measured in units of Hz or kilohertz (kHz). One hundred Hz is a rate of one hundred times (or cycles) per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate. For comparative purposes, the lowest note on a full range piano is approximately 32 Hz and middle C is 261 Hz.

1.2 VIBRATION METRICS AND TERMINOLOGY

Vibration is an oscillatory motion that is described in terms of the displacement, velocity, or acceleration. Velocity is the most common descriptor used when evaluating human perception or structural damage. Velocity represents the instantaneous speed of movement and more accurately describes the response of humans, buildings, and equipment to vibrations.

Peak-Particle-Velocity (PPV) and root mean square (rms) velocity are typical metrics used to describe vibration levels in units of inches per second in the USA and meters per second in the rest of the world. PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is commonly used in evaluating the potential of building damage and is used to measuring blasting events.

However, to evaluate and describe vibration levels from transit operations, the vibration decibel (VdB) notation is commonly used. The decibel notation acts to compress the range of numbers required to describe vibration. In the USA, the accepted velocity reference for converting to decibels is 1×10^{-6} inches per second.

In contrast to airborne noise, ground-borne vibration is not an everyday occurrence for humans. The background vibration velocity levels within residential areas are usually 0.0013 PPV in/sec (50 VdB) or lower, which is well below the human perception threshold of approximately 0.007 PPV in/sec (65 VdB). However, human response to vibration is not usually significant unless the vibration exceeds 0.013 PPV in/sec (70 VdB). Outdoor sources that generate perceptible ground-borne vibrations are typically construction equipment, steel-wheeled trains, and traffic on uneven roadways. Table 3 provides common vibration sources as well as human and structural response to ground borne vibrations.

Table 3. Typical Levels of Ground-Borne Vibration

Human/Structural Response	PPV (In/sec)	Velocity Level (VdB)*	Typical sources 50 feet from source)
Threshold, Minor Cosmetic Damage, Fragile Buildings	0.4	100	Blasting from Construction Projects
	0.15-0.2	92-94	Heavy Tracked Construction Equipment
Difficulty with Tasks Such as Reading a VDT Screen	0.13	90	
	0.07	85	Commuter Rail, Upper Range
Residential Annoyance, Infrequent Events	0.04	80	Rapid Transit, Upper Range
	0.022	75	Commuter Rail, Typical
Residential Annoyance, Frequent Events	0.016	72	Bus or Truck Bump Over
	0.013	70	Rapid Transit, Typical
Approximate Threshold of Human Perception	0.007	65	
	0.005	62	Bus or Truck, Typical
	0.0013	50	Typical Background Vibration Levels

*RMS Vibration Velocity in VdB reference to 10^{-6} inches/second

Source: FTA Transit Noise and Vibration Impact Assessment Manual, 2006

Vibration from construction and traffic do not typically result in damage to buildings, with the occasional exception of blasting and pile-driving during construction operations. The U.S. Bureau of Mines (USBM) and Office of Surface Mining Reclamation and Enforcement (OSMRE) have developed a blast vibration criteria for the protection of buildings with various structure types and conditions.

The degree of annoyance cannot always be explained by the magnitude of the vibrations alone. Ground-borne noise, rattling, visual effects such as movement of hanging objects and time of day all influence the response of individuals. The American National Standards Institute (ANSI) and the International Organization for

Standardization (ISO) have developed criteria for evaluation of human exposure to vibrations. The recommendations of these standards and other studies evaluating human response to vibrations have been incorporated into the Federal Transit Authority's (FTA) published "Transit Noise and Vibration Impact Assessment Manual", May 2006. The Criteria within this manual is used to assess noise and vibration impacts from transit operations.

2.0 NOISE LEVEL REQUIREMENTS AND GUIDELINES

Noise levels resulting from operation of the Project were evaluated with respect to noise guidelines and policies as established by the Pinal County. Pinal County Municipal Ordinance, Section 050306-ENO, provides noise threshold limits for excessive noise levels at specific identified land use areas. The Pinal County noise regulations are further discussed below.

2.1 PINAL COUNTY EXESSIVE NOISE ORDINANCE

The Pinal County Excessive Noise Ordinance (Section 050306-ENO) prescribes noise limits along property boundaries according to the land use category as shown in Table 4.

Table 4. Limiting Sound Levels for Land Use Districts

Zoning District Classifications	L_{eq} Limits, dBA
(Residential) CR-1A, CR-1, CR-2, CR-3, CR-4, CR-5, OS, MH, RV, MHP, PM/RVP, TR	60dBA{7am-8pm} 55dBA {8pm-7am}
(Commercial or Business) CB-1, CB-2	65dBA{7am-10pm} 60dBA{10pm-7am}
(Industrial) CI-B, CI-1, CI-2	70dBA{7am-10pm} 65dBA{10pm-7am}
(Rural) CAR, SR, SR-1, SH, GR, GR-5, GR-10	65dBA{7am-9pm} 60dBA{9pm-7am}

Source: Pinal County 2011.

(a) The Leq limits specified in Table 4 are Leq for a two minute time interval. Partial Leq levels may be obtained as necessary to assure an accurate indication of the representative sound environment for the site.

(b) Sound projected from property within one zoning district into property within another zoning district of a lesser sound level limit shall not exceed such lesser sound level limit.

3.0 EXISTING ENVIRONMENT

Tetra Tech conducted ambient sound and vibration level measurements to characterize the existing acoustic environment in the vicinity of the Project. This section summarizes the methodologies used by Tetra Tech to conduct the sound and vibration survey, describes the measurement locations, and presents the results of the ambient measurements. Although Pinal County noise standards are based on specific property boundary decibel levels, existing ambient levels are provided for context and characterization of the setting.

3.1 FIELD METHODOLOGY

Ambient sound and vibration measurements were performed from June 7 through July 5, 2016. Measurements included continuous long-term measurements that collected sound and vibration data in five minute intervals.

All of the noise measurements were collected using four Larson Davis Model 831 precision integrating sound-level meters that meet the ANSI Standards for Type 1 precision instrumentation. This model has an operating range of 5 to 140 dB, and an overall frequency range of 8 to 20,000 Hz. During the measurement program, microphones were fitted with windscreens, and set upon a tripod approximately 8 feet above ground, and located out of the influence of any vertical reflecting surfaces. The sound analyzer was calibrated at the beginning and end of the measurement period and during data downloads using a Larson Davis Model CAL200 acoustic calibrator according to procedures from the National Institute of Standards and Technology. The sound level meters were programmed to sample and store A-weighted (dBA) and octave band-specific sound level data, including L_{eq} sound levels.

All of the vibration measurements were conducted using the Instantel Micromate seismographs using a tri-axial geophone sensor. The geophone sensor has a frequency range of 0.025 to 800 Hz and is considered appropriate for ground vibration monitoring. Each of the geophone sensors measured PPV on three mutually perpendicular axes (Vx, Vy, Vz) corresponding to a radial, transverse, and vertical directions. The geophone was deployed using spikes pressed into the ground and was buried at a depth of six inches. Table 5 lists the measurement equipment employed during the survey. The equipment calibration certificates are provided in Appendix A.

Table 5. Measurement Equipment

Description	Manufacturer	Type	Serial Number
Signal Analyzer	Larson Davis	831	3847
Signal Analyzer	Larson Davis	831	1350
Signal Analyzer	Larson Davis	831	4001
Preamplifier	Larson Davis	PRM831	036754
Preamplifier	Larson Davis	PRM831	010875
Preamplifier	Larson Davis	PRM831	036849
Microphone	PCB	377B02	150728
Microphone	PCB	377B02	109271
Microphone	PCB	377B02	156091
Windscreen	ACO Pacific	7-inch	NA
Calibrator	Larson Davis	CAL200	9540

Description	Manufacturer	Type	Serial Number
Vibration Monitor System[1]	Instantel	Micromate System	UM10191
Vibration Monitor System[1]	Instantel	Micromate System	UM10400
Vibration Monitor System[1]	Instantel	Micromate System	UM10397
Vibration Monitor System[1]	Instantel	Micromate System	UM10398

[1]The vibration monitor system included a geophone, cables, a rugged lockable weather proof enclosure, and powered by a solar panel.

There was no substantial precipitation during the survey. Temperatures ranged from 94 to 111 degrees Fahrenheit (°F) during the daytime, and 70 to 90°F during the nighttime. Wind speeds were variable, averaging from 1 to 2 miles per hour (mph) during the daytime, and 2 to 6 mph during the nighttime. Atmospheric conditions during the survey period were acceptable for the collection of accurate sound measurements.

3.2 MONITORING LOCATIONS

Four sound and vibration monitors were deployed on the Resolution Mine property and at the closest noise-sensitive receptors. Monitors were located at the EPS in the direction of the Oak Flat Campground, at the WPS near the Town of Superior's residential property lines, at a residence near the Tailings Facility, and at the Filter Plant in the direction of the residences located southwest.

The monitoring locations are described in Table 6 and mapped on Figure 1. Additional descriptions of the monitoring locations and field observations are provided in the following sections.

Table 6. Sound Level Monitoring Locations

Monitoring Location	Coordinates (Universal Transverse Mercator Zone 12S)	
	Easting (m)	Northing (m)
EPS	493849	3685065
WPS	490775	3684460
TSF	480458	3684456
Filter Plant and Loadout Facility	460654	3672647

3.2.1 EPS Monitoring Location

The EPS monitor was located at the edge of the EPS facility approximately 646 feet from the existing shaft 10. The nearest receptor is the Oak Flat Campground located approximately 0.8 miles to the east of EPS. This location was selected to document the noise and vibration levels from the existing EPS operations and the vehicle traffic from Highway 60. Sound level measurements at this location were collected from June 7 through June 20,

2016. Noise level data was not collected after June 20, 2016 due to extreme temperatures affecting the equipment. The vibration data was collected from June 7 through July 5, 2016.

3.2.2 WPS Monitoring Location

The WPS monitor was located at the Hydro House of the existing WPS facility. The nearest residential property line is located approximately 260 feet south of the WPS monitor location. This location was selected to document the noise and vibration levels from the existing WPS operations and community sources from the nearby Town of Superior. The existing noise and vibration sources include the WPS operations and vehicle traffic from local roadways. Sound level measurements at this location were collected from June 7 through 10, 2016 and from June 22 through July 5, 2016. Noise level data for this location was not collected from June 11, 2016 through June 21, 2016 due to temporary equipment failure related to the extreme temperatures. The vibration data was collected from June 7 through July 5, 2016.

3.2.3 TSF Monitoring Location

The Tailings Facility monitor was located on residential property located at 32898 Hewitt Station Road in Superior within the Tonto National Forest. The monitors were located at the back part of the residential property approximately 1,000 feet from the edge of the proposed TSF. This location was selected to document the ambient noise and vibration levels at the residences nearest the TSF. The existing noise and vibration sources include operations from ranchers and vehicle traffic on local roadways. Sound level measurements at this location were collected from June 7 through June 16, 2016 and from June 20 through July 5, 2016. Noise level data for this location was not collected from June 17 through 19, 2016 due to temporary equipment failure related to the extreme temperatures. The vibration data was collected from June 7 through July 5, 2016.

3.2.4 Filter Plant and Loadout Facility Monitoring Locations

The Filter Plant and Loadout Facility monitor was positioned on southwestern potion of the property, an area that is proposed for siting of the Filter Plant and Loadout Facility. The nearest receptor is located along Skyline Drive approximately 1.6 miles in City of San Tan Valley. This location was selected to document the baseline noise and vibration levels for comparison to modeled values.   This location is isolated from any significant noise and vibration sources, however Highway 79 is approximately 4.3 miles east and local residential roads are approximately 1.6 miles southeast. The MARRCO is directly south of the proposed Filter Plant and Loadout Facility location. Aircraft overflights were observed during equipment deployment and readily identifiable in the dataset. Sound level measurements were collected from June 7 through 16, 2016 and from June 20 through July 5, 2016. Noise level data for this location was not collected from June 17through 19, 2016 due to temporary equipment failure that was once again weather related. The vibration data was collected from June 7 through July 5, 2016.

3.3 MEASUREMENT RESULTS

Table 7 provides a summary of the measured ambient sound levels at each of the monitoring locations. For each monitoring location, Table 7 provides the daytime and nighttime L_{eq}.

Table 7. Sound Measurements Results Summary

Monitoring Location	Time Period	L_{eq} (dBA)
EPS	Day	50
	Night	49
WPS	Day	53
	Night	43
TSF	Day	43
	Night	36
Filter Plant and Loadout Facility	Day	45
	Night	34

Results of the ambient sound survey indicate that sound levels surrounding the proposed Project are relatively low levels. As expected, measurement locations closer to the existing Resolution Copper facilities related noise sources (EPS and WPS) generally experienced louder ambient noise levels associated with these existing operations. Periodic public and Resolution Copper related vehicle traffic, particularly during the daytime period, was also a significant contributor. Ambient sound levels did exhibit typical diurnal patterns. Daytime L_{eq} sound levels at the measurement locations ranged from a low of 43 dBA in proximity to the TSF to a high of 50 dBA adjacent to the EPS. Nighttime sound levels ranged from a low of 34 dBA near the existing Filter Plant and Loadout Facility to 49 dBA at the EPS. The noise levels at EPS did not vary much from day to night due to the existing operations and near continuous vehicle traffic occurring on Highway 60. Appendix B provides the full noise measurement dataset.

Table 8 provides a summary of the measured ambient vibration levels at each of the monitoring locations. For each monitoring location, Table 8 provides the average PPV and the maximum PPV.

Table 8. Vibration Measurement Results Summary

Measurement Locations	Average PPV (inch/sec)	Maximum PPV (inch/sec)
EPS	0.0031	0.013
WPS	0.0034	0.0723
TSF	0.0035	0.0164
Filter Plant and Loadout Facility	0.0077	0.0186

The vibration levels at the measurement locations are relatively low and are at or below the threshold of human perception. At times there were levels that could be perceived by humans, but were not found to be of a level that would even approach thresholds used to describe the potential for damage to existing structures. The measured average PPV ranged from 0.0031 inch/sec at EPS monitoring location to 0.0077 inch/sec. The measured maximum PPV ranged from a low of 0.013 inch/sec at EPS and 0.0723 inch/sec at WPS. No strange or unusual vibrations were identified over the course on the vibration monitoring program. Appendix C provides the full vibration measurement dataset.

Figure 2a: Sound and Vibration Level Monitoring Locations – West Plant Site and East Plant Site

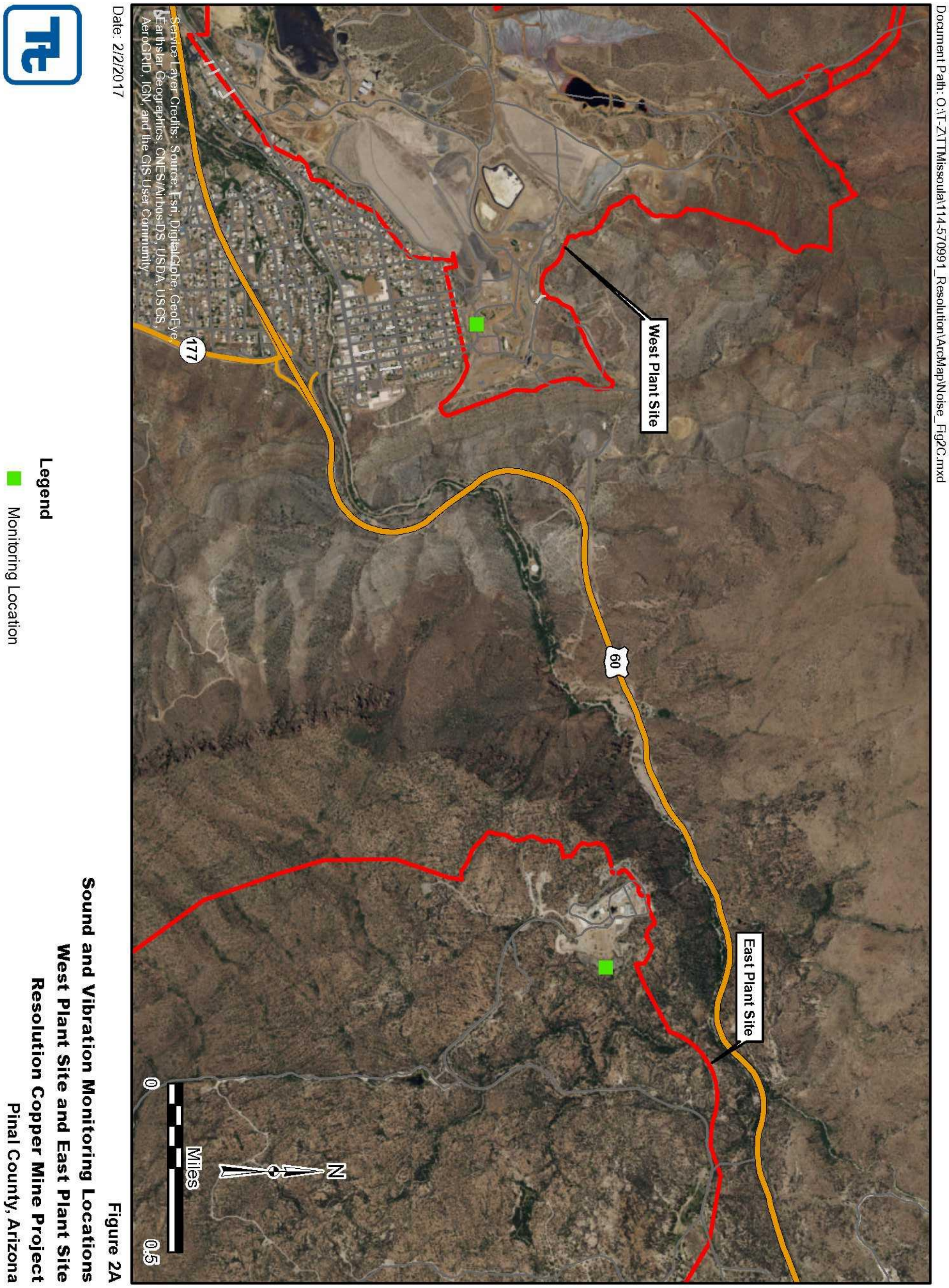


Figure 2b: Sound and Vibration Level Monitoring Locations – Tailings Storage Facility

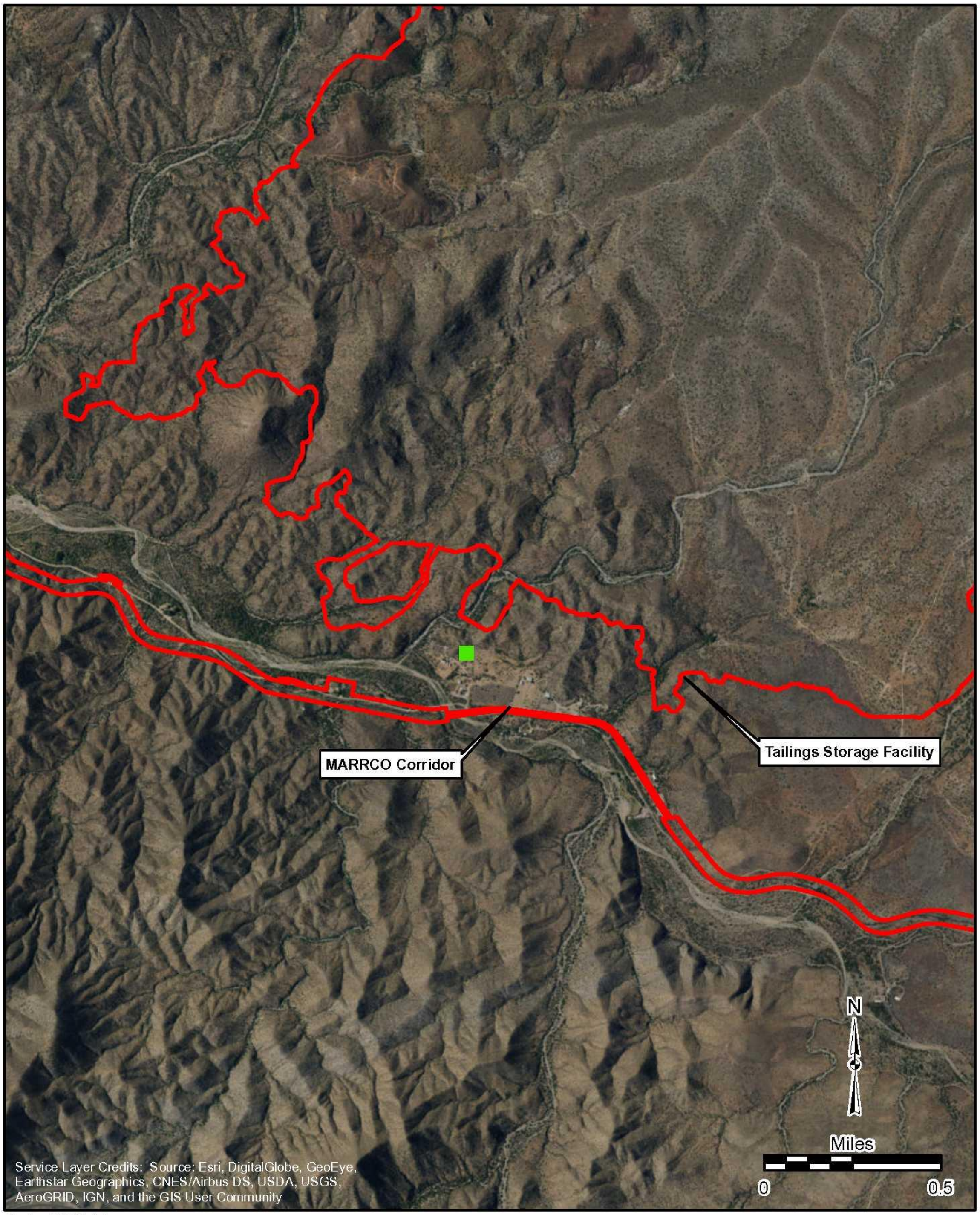
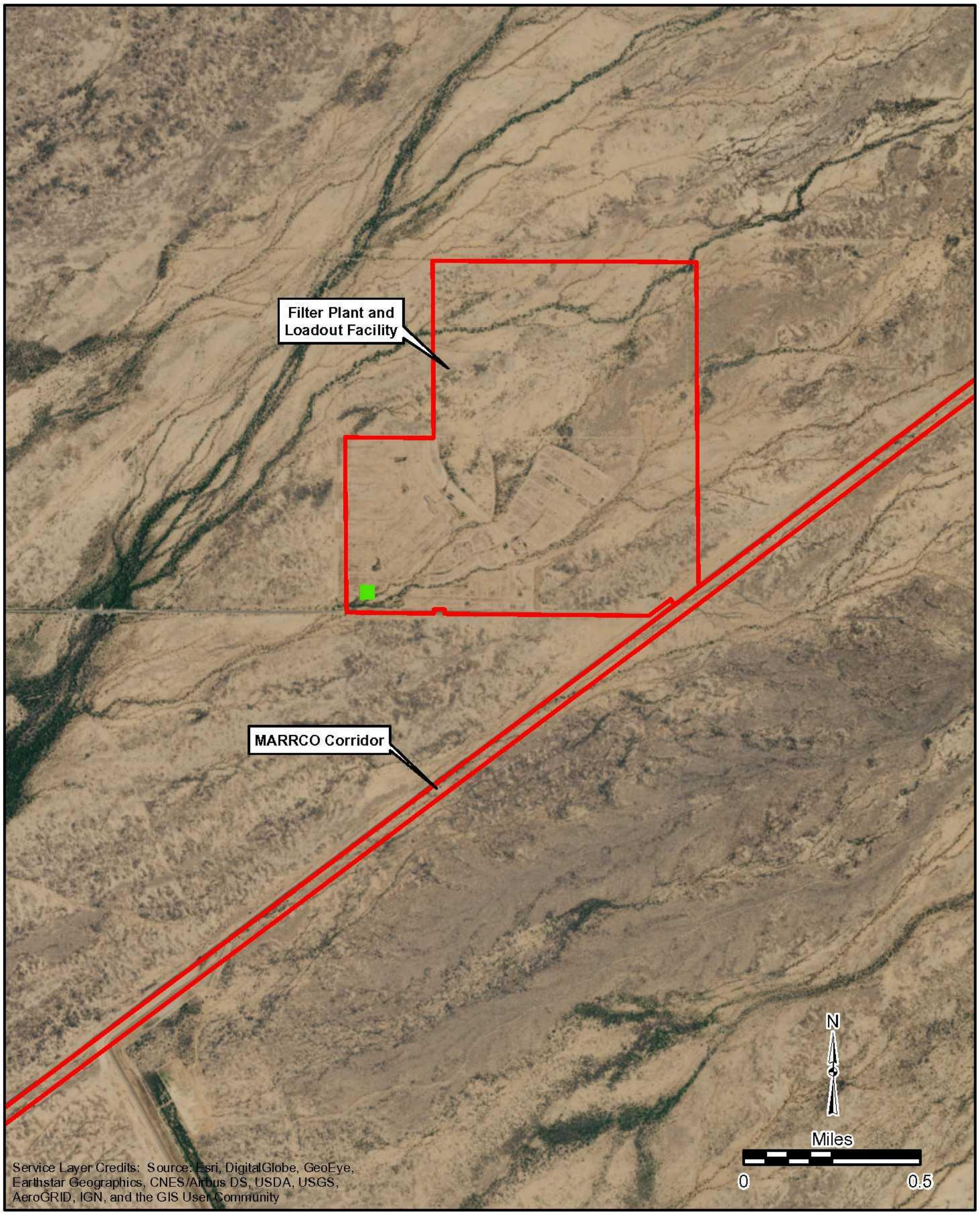


Figure 2c: Sound and Vibration Level Monitoring Locations – Filter Plant and Loadout Facility



Date: 2/2/2017

Figure 2C

Sound and Vibration Monitoring Locations
Filter Plant and Loadout Facility
Resolution Copper Mine Project
Pinal County, Arizona

Legend

Monitoring Location

4.0 OPERATIONAL NOISE

This section describes the methods and input assumptions used to calculate noise levels due to the Project's normal operation, a conceptual noise mitigation strategy, and the results of the noise impact analysis.

4.1 NOISE PREDICTION MODEL

The Cadna-A® computer noise model was used to calculate sound pressure levels from the operation of the Project equipment in the vicinity of the Project Site. An industry standard, Cadna-A® was developed by DataKustik GmbH to provide an estimate of sound levels at distances from sources of known emission. It is used by acousticians and acoustic engineers due to the capability to accurately describe noise emission and propagation from complex facilities consisting of various equipment types like the Project and in most cases yields conservative results of operational noise levels in the surrounding community.

The current International Organization for Standardization (ISO) standard for outdoor sound propagation, ISO 9613 Part 2 – "Attenuation of Sound during Propagation Outdoors," was used within Cadna-A® (ISO 1996). The method described in this standard calculates sound attenuation under weather conditions that are favorable for sound propagation, such as for downwind propagation or atmospheric inversion, conditions which are typically considered worst-case. The calculation of sound propagation from source to receiver locations consists of full octave band sound frequency algorithms, which incorporate the following physical effects:

- Geometric spreading wave divergence;
- Reflection from surfaces;
- Atmospheric absorption at 10 º Celsius and 70 percent relative humidity;
- Screening by topography and obstacles;
- The effects of terrain features including relative elevations of noise sources;
- Sound power levels from stationary and mobile sources;
- The locations of noise-sensitive land use types;
- Intervening objects including buildings and barrier walls;
- Ground effects due to areas of pavement and unpaved ground;
- Sound power at multiple frequencies;
- Source directivity factors;
- Multiple noise sources and source type (point, area, and/or line); and
- Averaging predicted sound levels over a given time period.

Cadna-A® allows for three basic types of sound sources to be introduced into the model: point, line, and area sources. Each noise-radiating element was modeled based on its noise emission pattern. Point sources were programmed for mobile sources such as dozers and graders. Larger dimensional sources such as the grinding building and conveyor belts were modeled as area sources. Noise walls, equipment enclosures, stationary equipment were modeled as solid structures as diffracted paths around and over structures tend to reduce computed noise levels. The interaction between sound sources and structures was taken into account with reflection loss. The reflective characteristic of the structure is quantified by its reflection loss, which is typically defined as a smooth façade from which the reflected sound energy is 2 dB less than the incident sound energy. Transformer fire walls and sound barriers were modeled as reflective or absorptive barriers.

Topographical information was imported into the acoustic model to accurately represent terrain in three dimensions. Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 Standard accounts for ground absorption rates by assigning a numerical coefficient of G=0 for acoustically hard, reflective surfaces and G=1 for absorptive surfaces and soft ground. If the ground is hard-packed dirt, typically found in industrial complexes, pavement, bare rock or for sound traveling over water, the absorption coefficient is defined as G=0 to account for reduced sound attenuation and higher reflectivity. In contrast, ground covered in vegetation, including suburban lawns, livestock and agricultural fields (both fallow with bare soil and planted with crops), will be acoustically absorptive and aid in sound attenuation (i.e., G=1.0). For the Project acoustic modeling analysis, a reflective ground factor (G=0) was used for paved areas and a mixed (semi-reflective) ground factor of G=0.5 was used throughout the rest of the Project study area, which is a standardize modeling technique. In addition to geometrical divergence, attenuation factors include topographical features, terrain coverage, and/or other natural or anthropogenic obstacles that can affect sound attenuation and result in acoustical screening. To be conservative, sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings was not included in the model.

Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, the temperature of 10º Celsius (50º Fahrenheit) and 70 percent relative humidity parameters were selected as reasonably representative of conditions favorable to sound propagation. Atmospheric absorption depends on temperature and humidity and is most important at higher frequencies. Over short distances, the effects of atmospheric absorption are minimal. The ISO 9613-2 Standard calculates attenuation for meteorological conditions favorable to propagation, i.e., downwind sound propagation or what might occur typically during a moderate atmospheric ground level inversion. In addition, the acoustic modeling algorithms essentially assume laminar atmospheric conditions, in which neighboring layers of air do not mix. This conservative assumption does not take into consideration turbulent eddies and micrometeorological inhomogeneities that may form when winds change speed or direction, which can interfere with the sound wave propagation path and increase attenuation effects.

The output from Cadna-A® includes tabular sound level results at selected receiver locations and color coded noise contour maps (isopleths) that show areas of equal and similar noise levels.

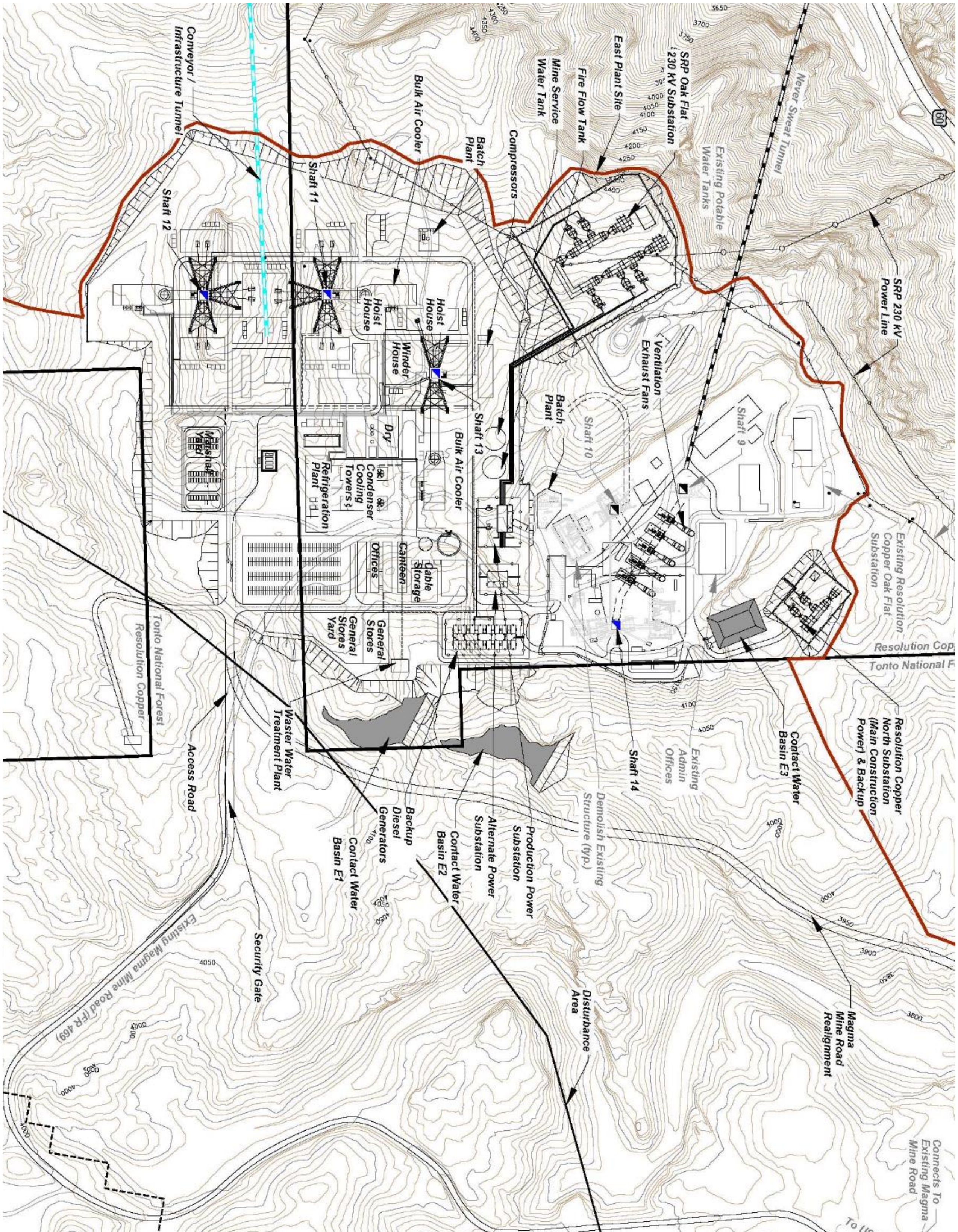
4.2 INPUT TO THE NOISE PREDICTION MODEL

The noise model incorporated input data for the EPS, WPS, TSF, MARRCO corridor, and the Filter Plant and Loadout Facility. The inputs and noise sources for each of the project elements are further described below. Reference sound power levels input to Cadna-A® were provided by equipment manufacturers, based on information contained in reference documents, or developed using empirical methods. The reference sound power levels used within this analysis are provided in Tables 9 through 13 below. The source levels used in the predictive modeling are based on estimated sound power levels that are generally deemed to be conservative. The sound power level (abbreviated "L_W") is defined as ten times the logarithm (to the base 10) of the ratio of a given sound power to the reference sound power of 1 picowatt. Sound power is defined as the rate per unit time at which sound energy is radiated from a source and is expressed in terms of watts.

4.2.1 EPS Noise Model Input

The EPS general arrangement and equipment list were reviewed and directly imported into the acoustic model so that on-site equipment could be easily identified; buildings and structures could be added; and sound emission data could be assigned to sources as appropriate. Figure 3 shows the EPS equipment layout based on Figure 3.2-2 of the General Plan of Operations dated January 12, 2016.

Figure 3: EPS Project Equipment Layout



The primary noise sources for the EPS include ventilation exhaust fans, transformers, condenser cooling towers, refrigeration plant, bulk air cooler, hoist houses, and batch plants. The EPS was modeled assuming all shafts are in operation. Table 9 summarizes the equipment sound power level data, equipment quantity, and utilization factors used as inputs to the modeling analysis.

Table 9. Sound Power Level (L_P) for EPS Major Pieces of Project Equipment

Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
Ventilation Exhaust Fans	6	100	107
Hoist Houses	10	100	101
Compressor House	2	100	91
Transformers	11	100	91
Substations	2	100	91
Chillers	2	100	101
Batch Plants	2	100	101
Bulk Air Cooler	3	100	106
Condenser Cooling Tower	2	100	85
Refrigeration Plant	1	100	101

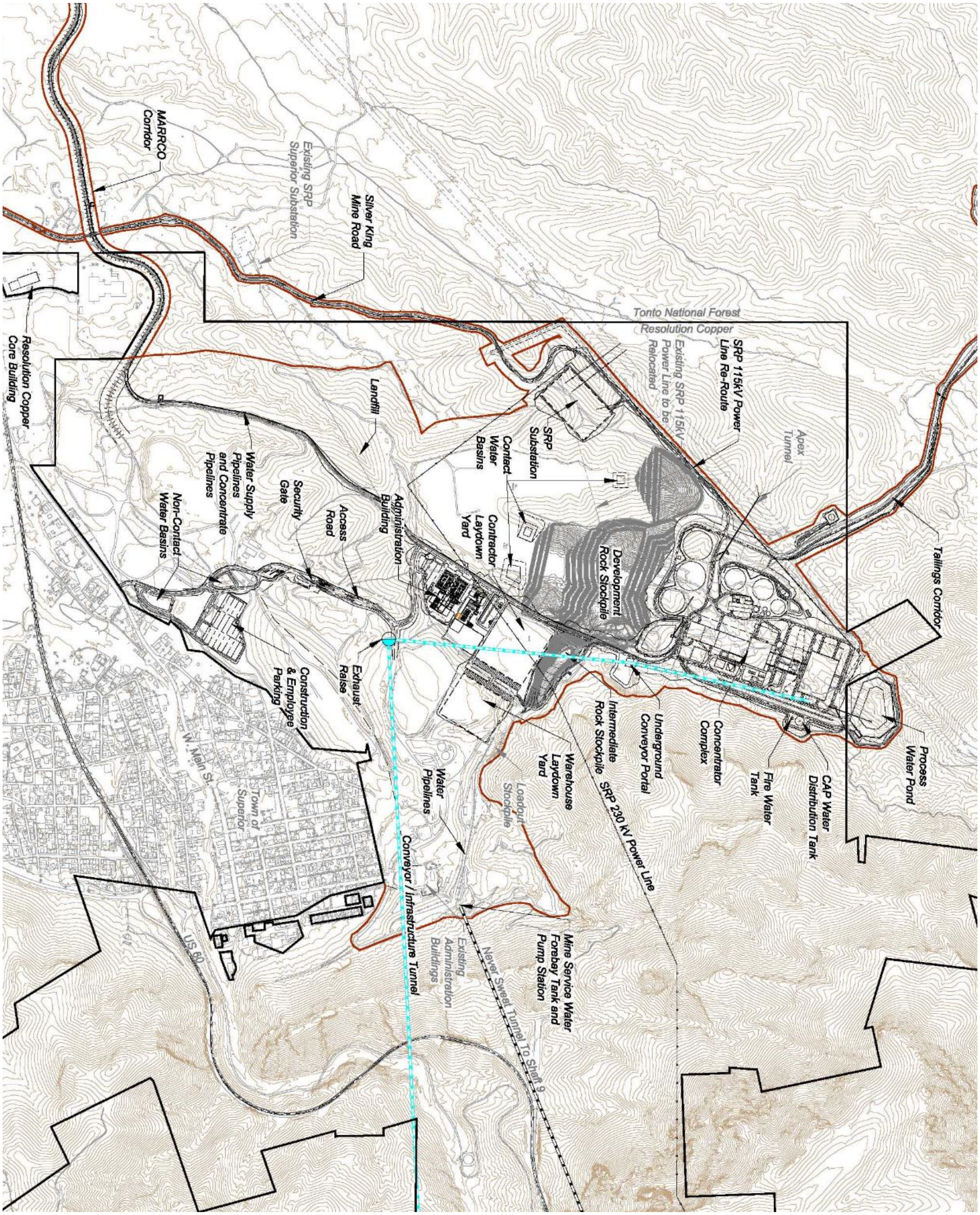
The EPS incorporates an entrance road that is estimated to have an average of 436 personnel trips per day and a maximum of 25 truck shipments per day. The entrance road was inputted as a roadway linear sound source in the Cadna-A® model.

The existing vehicles per day is 17,255 along US 60 in the vicinity of the EPS. With the addition of the EPS traffic discussed above the overall noise increase to the existing environment along US 60 in the vicinity of EPS is expected to be less than 1 dB.

4.2.2 WPS Noise Model Input

The WPS general arrangement and equipment list was reviewed and sound emission data assigned based on manufacturers technical specifications and representative data from engineering technical guidelines. Figure 4 shows the EPS equipment layout based on Figure 3.3-1a of the General Plan of Operations, dated January 12, 2016.

Figure 4: WPS Project Equipment Layout



The primary noise sources associated with the WPS include conveyors, waste water treatment plant, SAG Chillers, Grinding Building, flotation areas, compressor buildings, pebble crusher, molybdenum (Moly) plant and mobile equipment. The WPS was modeled with all expected equipment operating based the assigned utilization factor. Table 10 summarizes the WPS equipment sound power level data, equipment quantity, and utilization factor used as inputs to the modeling analysis.

Table 10. Sound Power Level (L_P) for WPS Major Pieces of Project Equipment

Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
SAG Mill Chiller	8	100	101
Grinding Building	1	100	108
Rougher Flotation Area	1	100	91
Cleaner Flotation Area	1	100	91
Compressor Building	1	100	111
Waste Water Plant	1	100	104
Conveyors	9	100	93
Pebble Crusher	1	100	116
Moly Plant	1	100	96
Thickeners	8	100	91
Regrinding Mill	8	100	103
Regrinding Cyclone	2	100	116
Dozer	1	60	120
Boom Truck	1	60	119
Wheel Loader	2	60	115
Fork Lifts	4	60	115
Bobcats	2	60	115
Flatbed Truck	3	90	119
Storm Water Pump	3	90	115
Grader	1	60	120

Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
Backhoe	1	60	115
Water Truck	2	60	119
Fuel Lube Truck	1	90	119
Cranes	2	50	120
Air Compressors	2	90	115
Lights	2	90	117
Fusion Machine	1	90	117
Maintenance Vehicle	1	80	115
Bucket Truck	1	90	119
Vacuum Truck	1	90	119
Boom Lift	2	50	119
Loader	1	60	115
Ventilation Exhaust Fans	1	100	107

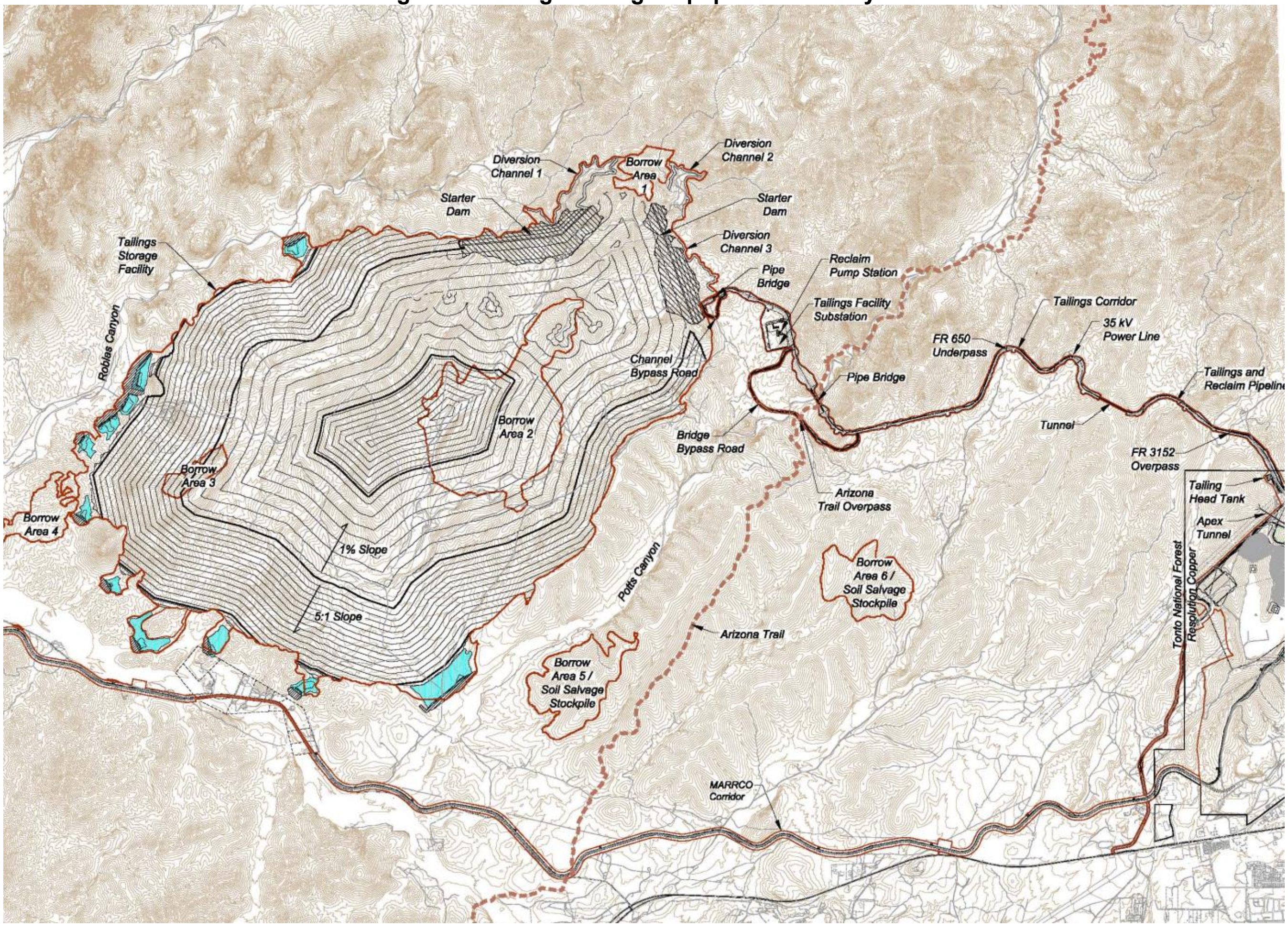
The WPS incorporates an entrance road that is estimated to have an average of 1,098 personnel trips per day and a maximum of 72 truck shipments per day. The entrance road to the facility was entered as a linear roadway noise source in the Cadna-A® model.

The existing vehicles per day is 10,740 along US 60 in the vicinity of the WPS. With the addition of the WPS traffic discussed above the overall noise increase to the existing environment along US 60 in the vicinity of WPS is expected to be less than 1 dB.

4.2.3 TSF Noise Model Input

The TSF general arrangement is shown in Figure 5, with the equipment layout based on Figure 3.3-3a of the General Plan of Operations, dated January 12, 2016.

Figure 5: Tailings Storage Equipment Site Layout



The primary noise sources for the TSF include pumps and mobile equipment. The TSF was modeled using the maximum expected equipment operations. Table 11 summarizes the TSF equipment sound power level data, equipment quantity, and utilization factors used as inputs to the modeling analysis.

Table 11. Sound Power Level (LP) for TSF Major Pieces of Project Equipment

Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
Pump Station	1	100	95
Substation	1	100	91
Flat Bed Truck	1	90	119
Boom Truck	1	60	119
Excavators	7	60	120

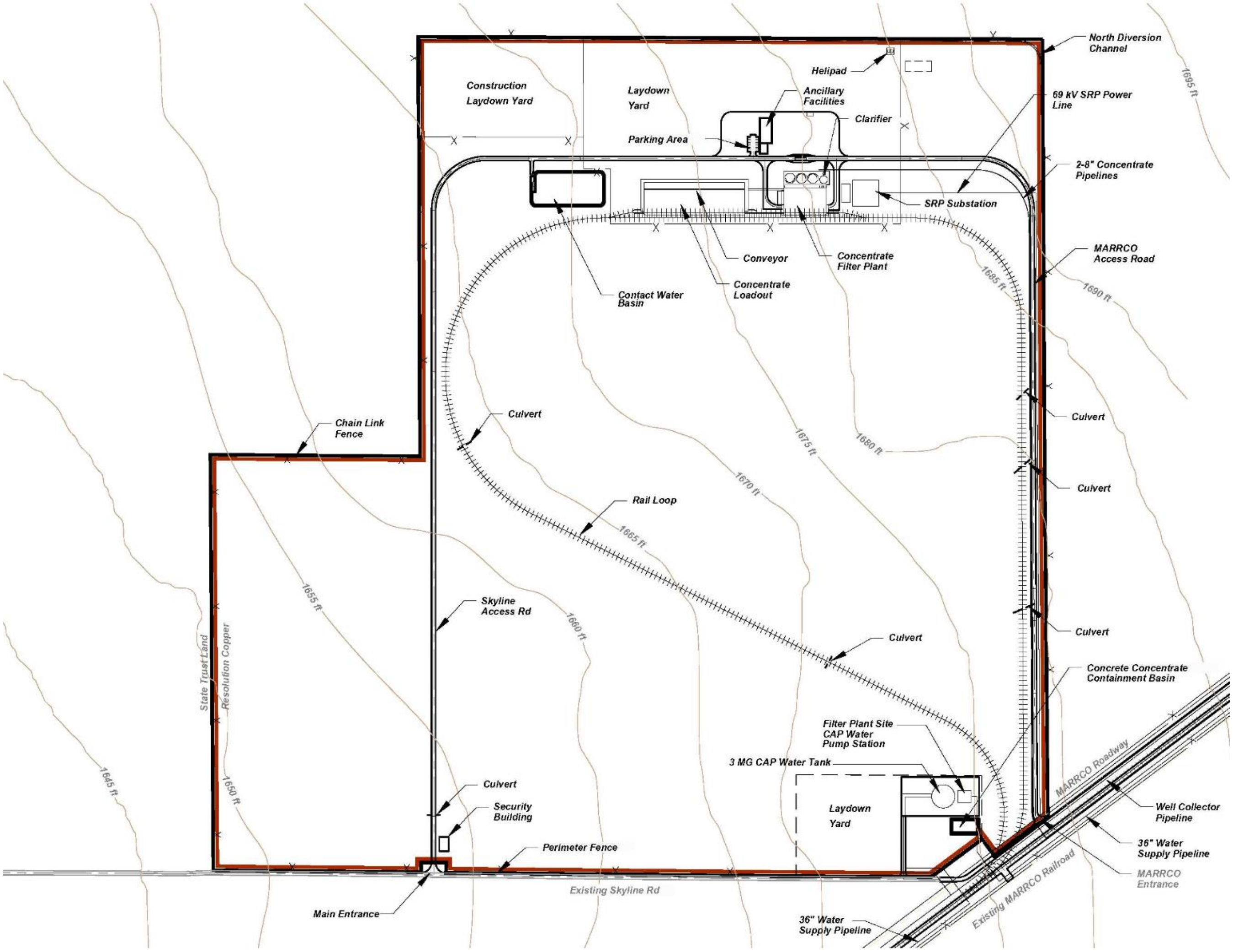
Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
Bulldozers	15	60	120
Loaders	8	60	115
Graders	2	60	120
Water Truck	1	60	119
Compactors	15	60	115
Skid Steer	2	60	117
Pipe Fusion	1	90	115
Haul Truck	21	60	119

The TSF incorporates a roadway that connects WPS to the TSF. This roadway that is estimated to have a maximum of 21 truck shipments per day. The entrance road was entered as a roadway source in the Cadna-A® noise model.

4.2.4 Filter Plant and Loadout Facility Noise Model Input

The Filter Plant and Loadout Facility general arrangement and equipment list was reviewed and directly imported into the acoustic model. Sound emission levels were assigned based on manufacturer specification and engineering technical guidelines. Figure 6 shows the Filter Plant and Loadout Facility equipment layout based on Figure 3.3-11 of the General Plan of Operations, dated January 12, 2016.

Figure 6: Filter Plant and Loadout Facility Equipment Site Layout



The primary noise sources for the Filter Plant and Loadout Facility include conveyors, concentrator filter plant, substation and mobile equipment. Table 12 summarizes the Filter Plant and Loadout Facility equipment sound power level data, equipment quantity, and utilization factors used as inputs to the modeling analysis.

Table 12. Sound Power Level (L_P) for Filter Plant and Loadout Facility Major Pieces of Project Equipment

Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
Conveyors	2	100	93
Substation	1	100	91
Concentrate Filter Plant	1	100	110
Thickeners	3	100	91

Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
Compressors	6	100	115
Switch Engine	1	80	120
Wheel Loader	1	60	115
Track Mobile	1	60	120
Sweeper	1	60	119
Loader	3	60	115
Filter Plant Pump Station	1	100	105

The Filter Plant and Loadout Facility incorporates an entrance road that is estimated to have 60 average personnel trips per day and a maximum of 16 truck shipments per day. The entrance road was entered as a roadway source in the Cadna-A® noise model.

The Filter Plant and Loadout Facility also incorporates a railway system that will tie into the existing railway located along the MARRCO corridor. The facility will be able load a maximum of two trains per day with100 cars. This railway was entered as a railway source in the noise model and was evaluated from the Filter Plant to Magma Junction.

4.2.5 MARRCO Corridor Noise Model Input

Figure 7 shows the MARRCO Corridor location based on Figure 3.4-1 of the General Plan of Operations, dated January 12, 2016. The linear infrastructure elements of the Project are primarily located within the MARRCO Corridor. These elements include power lines, copper concentrate pipelines, tailings pipelines, and water supply pipelines. A proposed Clean Valley Booster pump station is the only significant noise source to be located in the MARRCO Corridor, with the exception of the railway operations associated with the Filter Plant and Loadout Facility.

Figure 7: MARRCO Corridor Site Layout

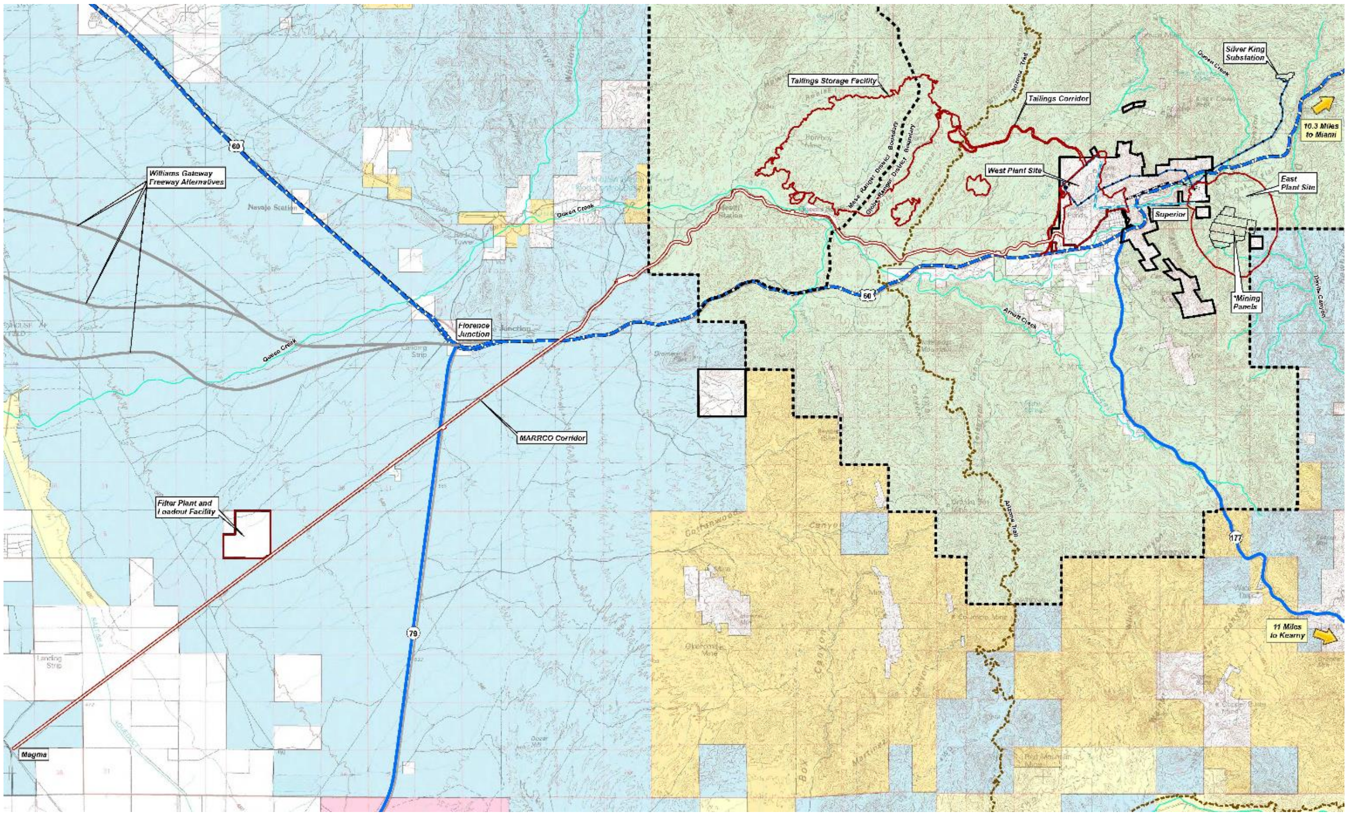


Table 13 summarizes the MARRCO Corridor equipment sound power level data, quantity, utilization factors used as inputs to the modeling analysis.

Table 13. Sound Power Level (L_P) for MARRCO Corridor Major Pieces of Project Equipment

Sound Source	Quantity	Utilization Factor	Broadband Level
		%	dBA
Clean Valley Booster Pump Station	1	100	105

4.3 NOISE PREDICTION MODEL RESULTS

Broadband (dBA) sound pressure levels were calculated for expected Project operations at all facilities assuming that all components identified previously are operating concurrently based on the applied utilization factor using representative sound source levels. The sound energy was then summed to determine the equivalent continuous A-weighted downwind sound pressure level at a point of reception. Sound contour plots displaying broadband (dBA) sound levels presented as color-coded isopleths are provided in Figures 8a and 8b. The noise contours are graphical representations of the cumulative noise associated with full operation of the equipment and show how operational noise would be distributed over the surrounding area of the Project Site. The contour lines shown are analogous to elevation contours on a topographic map, i.e., the noise contours are continuous lines of equal noise level around some source, or sources, of noise. Figure 8 also shows the monitoring locations and identified sensitive receptor locations, representative of proximate noise sensitive areas, which were used to assess potential noise impacts on a cumulative basis.

Table 14 shows the projected exterior sound levels resulting from full, normal operation of the Project at the identified measurement and noise sensitive receptor locations. The noise levels in Table 14 show that the Project operations will comply with the Pinal County noise threshold limits.

Table 14. Acoustic Modeling Results Summary

Location	Pinal County Nighttime Noise Threshold Limit (dBA)	Project Sound Level, dBA
EPS	65	62
WPS	55	50
TSF	55	48
Filter Plant and Loadout Facility	55	50
Oak Flat Campground	55	46
West Plant Property Line	55	53
Tailings Receptor	55	48
Queen Valley	55	<10
Westernstar Road Resident	55	<10
Lind Road Residents	55	32
Felix Road Resident	55	26
Attaway Road Resident	55	21

Table 15 shows the total predicted net increase in sound energy at each of the measurement locations. The predicted sound level increases range from 8 dBA at the WPS to 16 dBA at the Filter Plant and Loadout Facility. The measurement for the EPS, WPS, and Filter Plant are located at the facility sites where the noise levels at the nearest sensitive receptors are more distant, which as shown in the noise contour isopleths presented in Figure 8, the projected noise impacts are lower. Therefore, net increases in environmental sound levels are also expected to be lower at these noise sensitive locations.

Table 15. Project Related Predicted Sound Level Increase

Monitoring Location	Nighttime Ambient L_{eq}, dBA	Project Sound Level, dBA	Total Sound Level (Ambient + Project), dBA	Net Increase in Sound Level, dBA
EPS	49	62	62	13
WPS	43	50	51	8
TSF	36	48	48	12
Filter Plant and Loadout Facility	34	50	50	16

Figure 8a: Received Sound Levels: Normal Operation

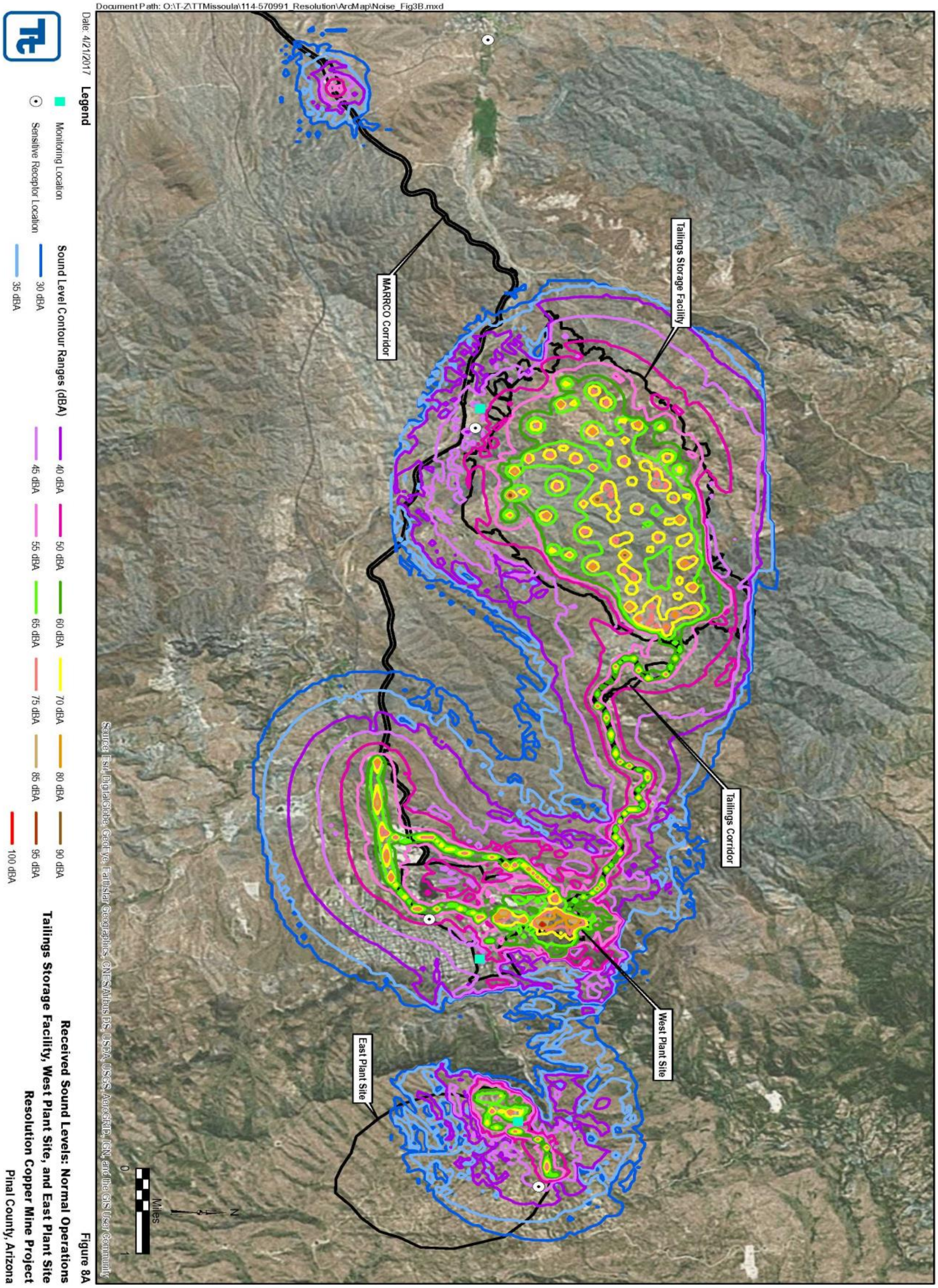
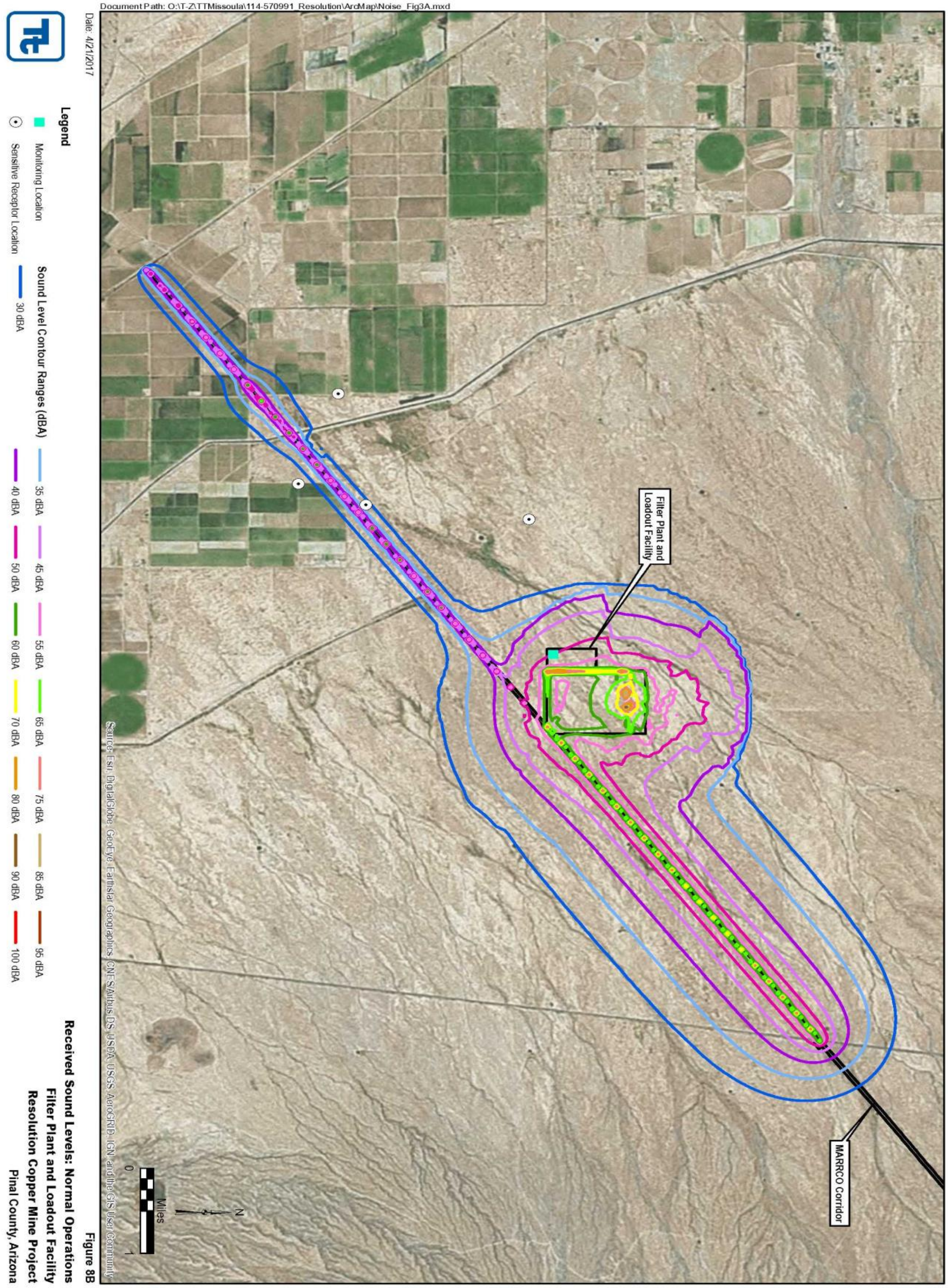


Figure 8b: Received Sound Levels: Normal Operation – Filter Plant and Loadout Facility



5.0 CONCLUSIONS

During normal Project operations, noise levels from the Project will range from 21 to 55 dBA L_{eq}. The Project will fully comply with the Pinal County noise standards. The ambient nighttime noise levels range from 34 to 54 dBA L_{eq}, the predicted sound level increases range from 8 dBA to 16 dBA. While audible, the resulting sound levels will not be construed as a noise nuisance per the county noise standards. The measurement for the EPS, WPS, and Filter Plant and Loadout Facility are located at the facility sites where the noise levels at the nearest sensitive receptors are lower and would result in a lesser increase in sound levels.

Reasonable efforts will be made to minimize the impact of noise resulting from Project activities at proximate noise sensitive areas, which will be the priority. Compliance with MSHA/OSHA standards will be achieved through equipment mitigation practices, use of personal protective equipment such as hearing protection devices, and limitations on exposure.

6.0 REFERENCES

ANSI S1.4-1983 American National Standard Specification for Sound Level Meters, (R 2006), 1819 L Street, N.W., Sixth Floor, Washington, D.C. 20036

Barron, R. 2003. Industrial Noise Control and Acoustics. Marcel Dekker Inc., New York.

Bies D. and Hansen C. 2003. “Engineering Noise Control: Theory and Practice”, Published by Taylor & Francis, 2003.

FTA. 2006. *Transit Noise and Vibration Impact Assessment Manual.* Chapter 12: Noise and Vibration during Construction. FTA-VA-90-1003-06. May.

Harris, Cyril M. 1998. *Handbook of Acoustical Measurements and Noise Control*, 3rd Edition. Acoustical Society of America

ISO. 1996. Acoustics – Attenuation of Sound during Propagation Outdoors. Part 2: General Method of Calculation. ISO Standard 9613-2. Geneva, Switzerland.

Kurze, U. and L. Beranek. 1988. Noise and Vibration Control. Institute of Noise Control Engineering, Washington, DC.

McConnell, Kenneth G. and Varoto, Paulo S. 2008. Vibration Testing: Theory and Practice, Second Edition.

Pinal County. 2011. Municipal Ordinance No. 050306-ENO: Regulation of Excessive Noises.

Resolution Copper Mining, LLC. 2016. General Plan of Operations.

USEPA (U.S. Environmental Protection Agency). 1971. Noise from Construction Equipment and Operations, US Building Equipment, and Home Appliances. Prepared by Bolt Beranek and Newman for USEPA Office of Noise Abatement and Control, Washington, DC.

APPENDIX A: CALIBRATION CERTIFICATION DOCUMENTATION

Calibration Certificate

Part Number: 721A2501
Description: Micromate ISEE Base Unit

Serial Number: UM10191
Calibration Date: MAY 0 6 2016
Calibration Equipment: 714J7403

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: [signature]
Xiaoming Yang

Instantel

71408901 Rev 01

 71405201 Rev 10

Calibration Certificate

Part Number:	721A2501
Description:	Micromate ISEE Base Unit
Serial Number:	UM10397
Calibration Date:	MAY 06 2016
Calibration Equipment:	714J7403

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By:

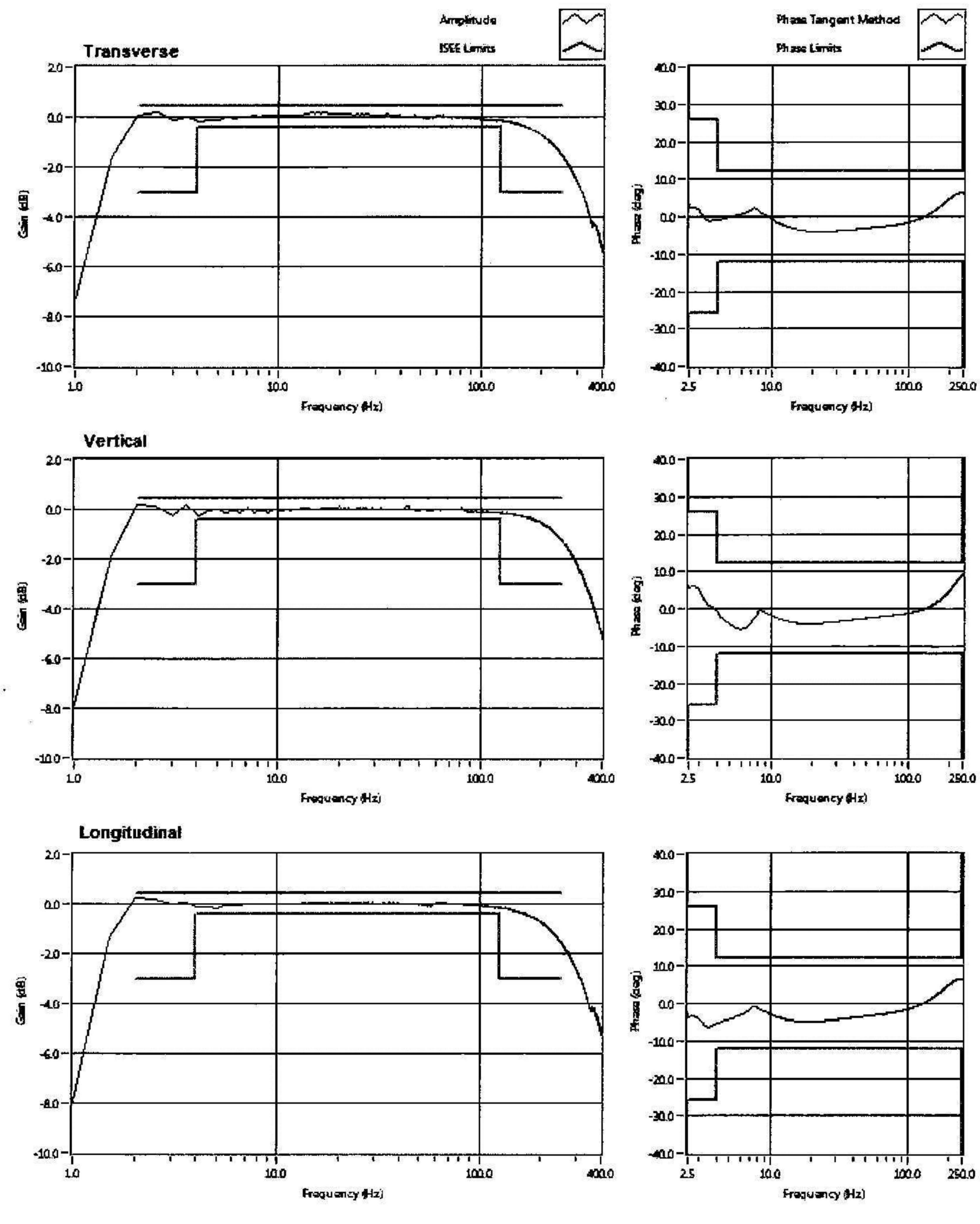
Xiaoming Yang

Instantel®

71408901 Rev 01

 71405201 Rev 10

Frequency Response of UM10397



Calibration Certificate

Part Number:	721A2501
Description:	Micromate ISEE Base Unit
Serial Number:	UM10398
Calibration Date:	MAY 0 6 2016
Calibration Equipment:	714J7403

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

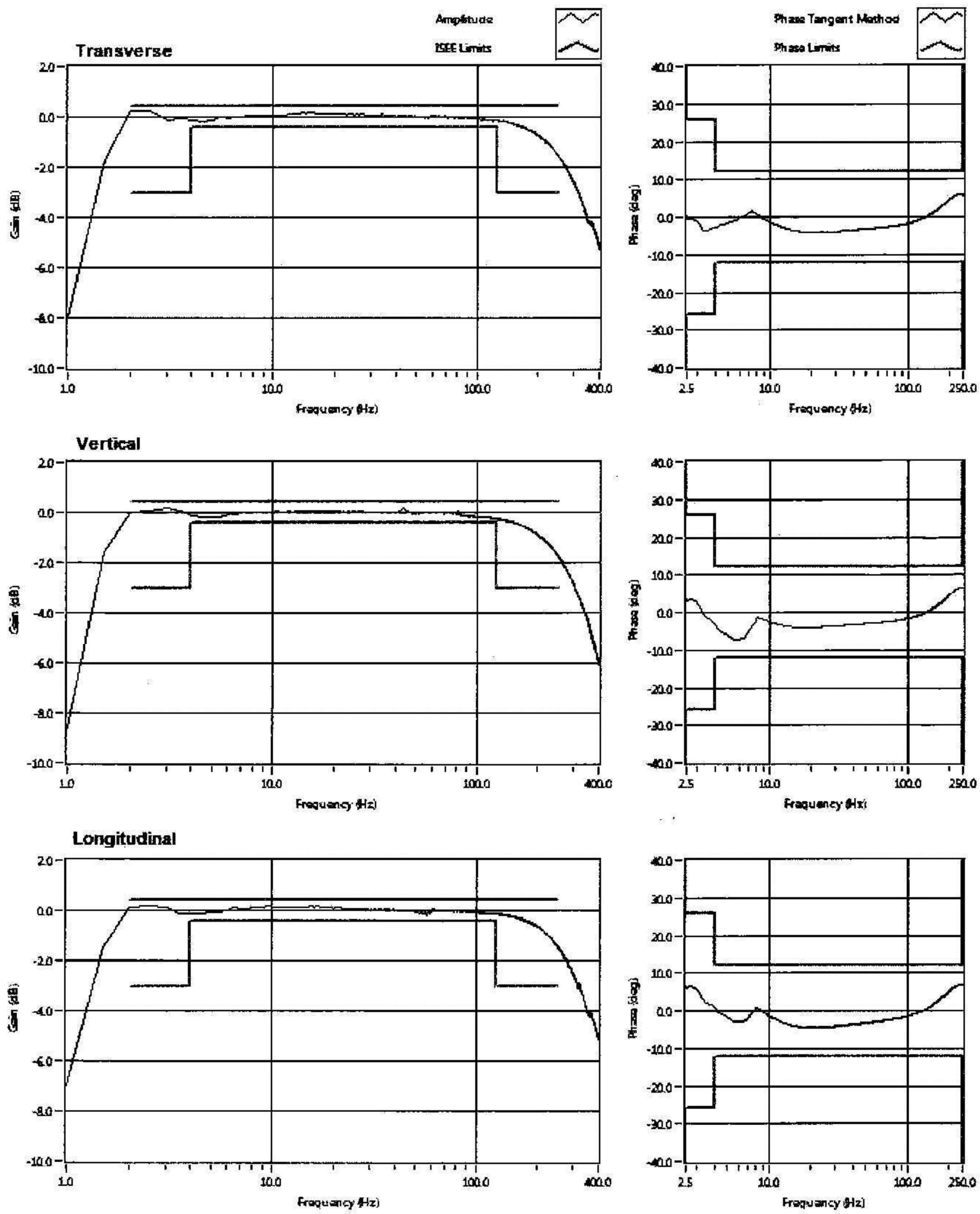
Calibrated By: ______________
Xiaoming Yang

Instantel

 71405201 Rev 10

71408901 Rev 01

Frequency Response of UM10398



Calibration Certificate

Part Number:	721A2501
Description:	Micromate ISEE Base Unit
Serial Number:	UM10400
Calibration Date:	MAY 06 2016
Calibration Equipment:	714J7403

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

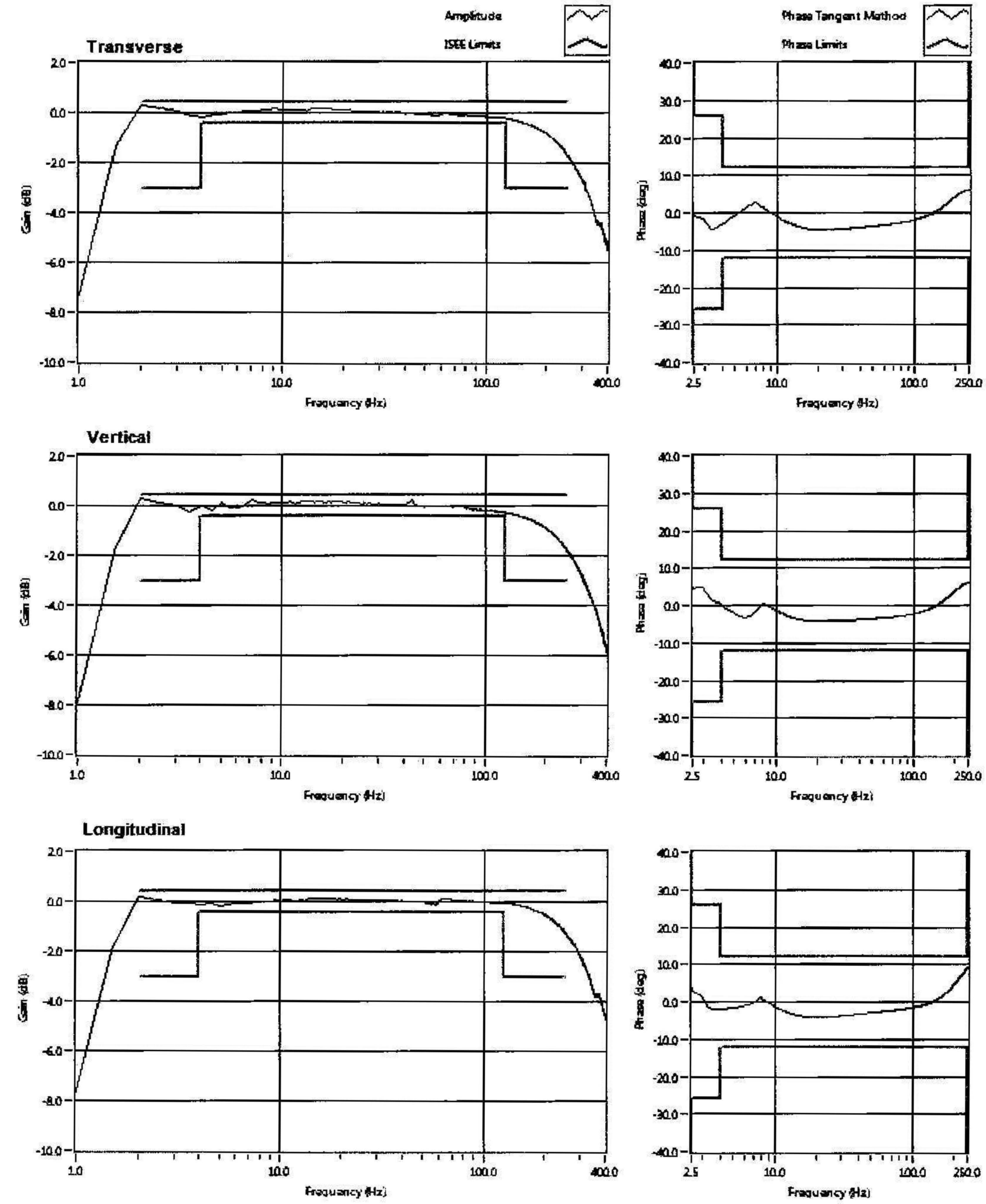
Calibrated By: Xiaoming Yang

Instantel

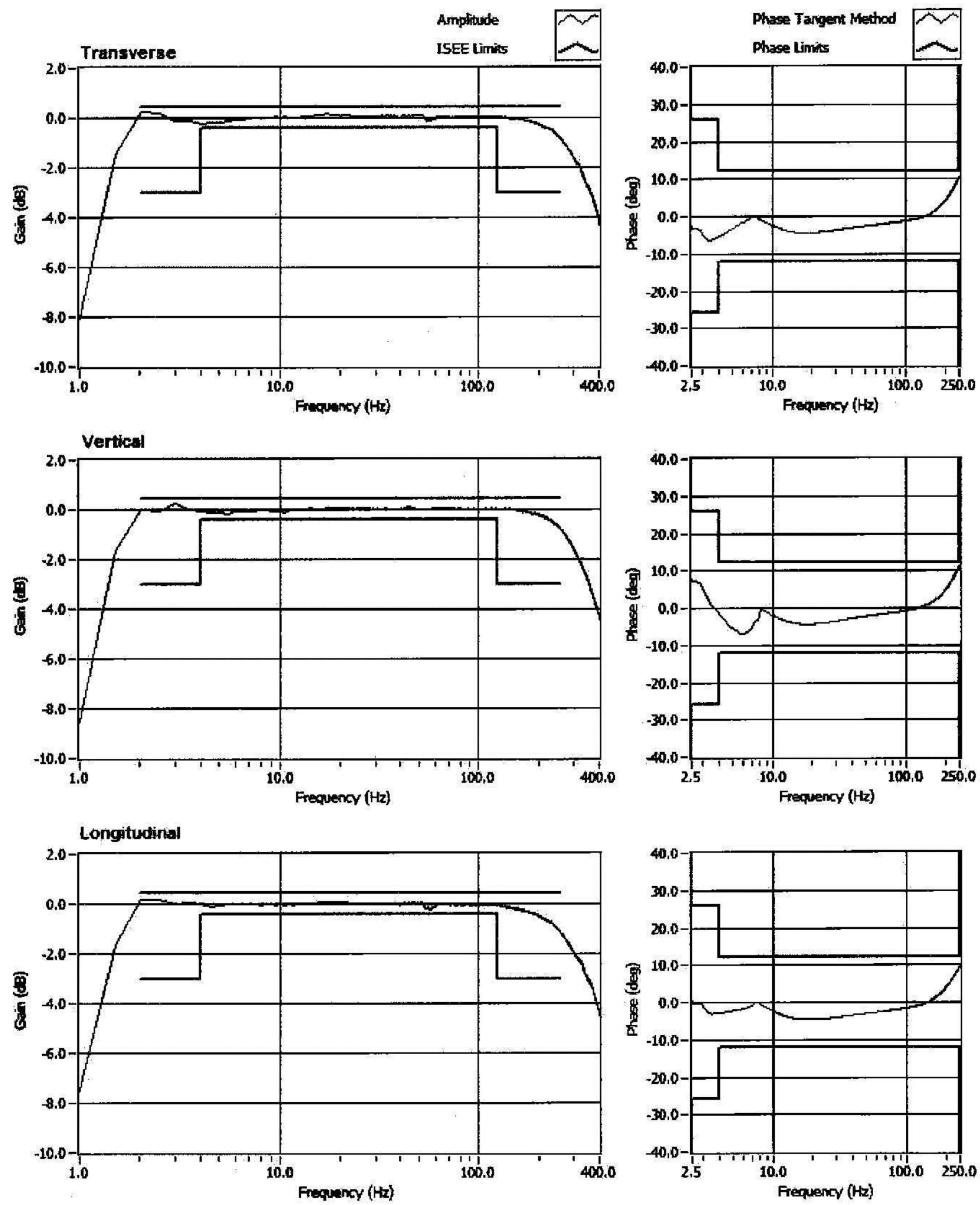
71405201 Rev 10

71408901 Rev 01

Frequency Response of UM10400



Frequency Response of UM10191



PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180376

Instrument Model MPR001, Serial Number B5397, was calibrated on 03OCT2013. The instrument meets factory specifications per Procedure D0001.8159.

Instrument found to be in calibration as received: YES
Date Calibrated: 03OCT2013
Calibration due: 03OCT2014

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0612 / 0102	12 Months	07JAN2014	2013-168437
PCB	377A13	134649	12 Months	13FEB2014	2013-169955
PCB	426B03	1603	12 Months	16APR2014	2013-172781

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade Relative Humidity: 31 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As Received" data is the same as shipped data.

Signed: Nick Rasmussen
Technician: Nick Rasmussen

Page 1 of 1

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Larson Davis Microphone and Preamp Data
Model: MPR001 Serial Number: B5397

Sensitivity @ 1 KHz: 3.36 mV/Pa

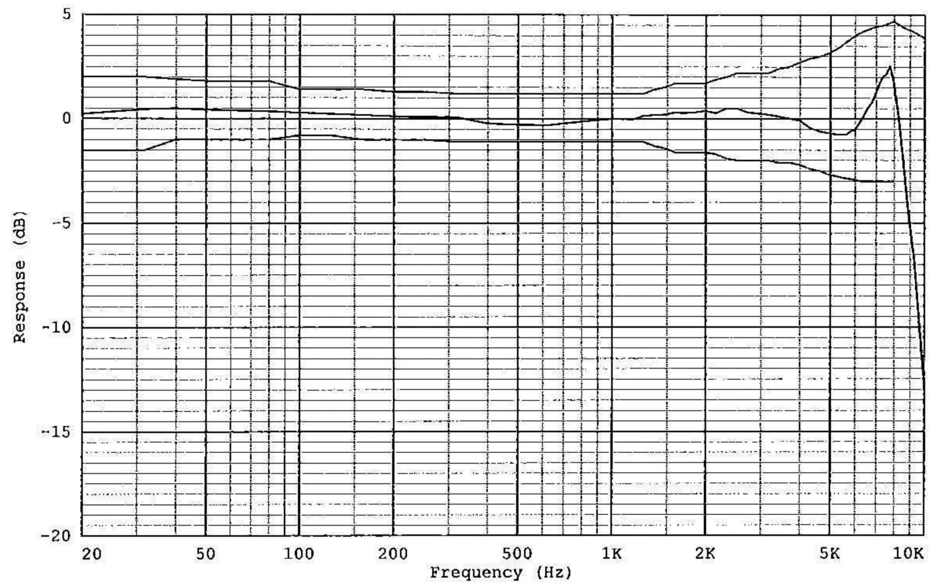
Test Conditions:

Powered by LD Spark 706RC. Compared to PCB 377A13 microphone in Larson Davis CAL291. Corrected to 0° free field response.

Data taken with LD 2900.

2900 Serial Number: 0612 CAL291 Serial Number: 0128

377A13 Serial Number: 134649 Spark 706RC Serial Number: 17000



Frequency Response with reference at 1 KHz

Frequency	Response	Limits
19.95	0.23	-1.50/2.00
25.12	0.34	-1.50/2.00
31.62	0.45	-1.50/2.00
39.81	0.49	-1.00/1.90
50.12	0.43	-1.00/1.80
63.10	0.39	-1.00/1.80
79.43	0.35	-1.00/1.80
100.00	0.29	-0.80/1.40
125.89	0.22	-0.80/1.40
158.49	0.18	-1.00/1.40
199.53	0.11	-1.00/1.30
251.19	0.07	-1.00/1.30
316.23	0.08	-1.10/1.20
398.11	-0.23	-1.10/1.20
501.19	-0.28	-1.10/1.20
630.96	-0.30	-1.10/1.20
794.33	-0.14	-1.10/1.20
1000.00	0.00	-1.10/1.20
1079.78	-0.01	-1.10/1.20
1165.91	-0.03	-1.10/1.20

Frequency	Response	Limits
1258.93	0.14	-1.10/1.20
1359.36	0.18	-1.30/1.40
1467.80	0.20	-1.40/1.50
1584.89	0.30	-1.60/1.70
1711.33	0.29	-1.60/1.70
1847.85	0.31	-1.60/1.70
1995.26	0.37	-1.60/1.70
2154.43	0.28	-1.70/1.90
2326.31	0.51	-1.90/2.00
2511.89	0.51	-2.00/2.20
2712.27	0.32	-2.00/2.20
2928.64	0.25	-2.00/2.20
3162.28	0.20	-2.00/2.20
3414.55	0.11	-2.10/2.40
3686.95	0.01	-2.10/2.50
3981.07	-0.07	-2.20/2.70
4298.66	-0.43	-2.40/2.90
4641.59	-0.61	-2.50/3.00
5011.87	-0.70	-2.70/3.20
5207.95	-0.74	-2.75/3.35

Frequency	Response	Limits
5411.70	-0.75	-2.80/3.50
5623.41	-0.75	-2.85/3.70
5843.41	-0.56	-2.90/3.90
5994.84	-0.53	-2.93/4.00
6150.20	-0.24	-2.97/4.10
6309.57	-0.01	-3.00/4.20
6473.08	0.35	-3.00/4.26
6640.83	0.61	-3.00/4.33
6812.92	0.84	-3.00/4.40
6989.47	1.24	-3.00/4.43
7170.60	1.70	-3.00/4.47
7356.42	2.06	-3.00/4.50
7547.06	2.16	-3.00/4.56
7742.64	2.54	-3.00/4.63
7943.28	1.90	-3.00/4.70
8254.04	0.06	-∞ /4.55
8576.96	-2.26	-∞ /4.40
8912.51	-4.66	-∞ /4.30
9261.19	-6.64	-∞ /4.20
10000.00	-12.92	-∞ /3.90

Tested by Nick Rasmussen on 3OCT2013

Calibration Certificate

Certificate Number 2016004484

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	CAL150
Serial Number	3555
Test Results	**Pass**
Initial Condition	Adjusted
Description	Larson Davis CAL150 Calibrator

Procedure Number	D0001.8386		
Technician	Scott Montgomery		
Calibration Date	23 May 2016		
Calibration Due	23 May 2017		
Temperature	23	°C	± 0.3 °C
Humidity	28	%RH	± 3 %RH
Static Pressure	101.3	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 μPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/04/2015	09/04/2016	001021
Sound Level Meter / Real Time Analyzer	04/07/2016	04/07/2017	001051
Microphone Calibration System	08/20/2015	08/20/2016	005446
1/2" Preamplifier	10/09/2015	10/09/2016	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/20/2015	08/20/2016	006507
1/2 inch Microphone - RI - 200V	08/17/2015	08/17/2016	006511
Pressure Transducer	10/12/2015	10/12/2016	007204

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/23/2016 2:03:23PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004613

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	706RC
Serial Number	17540
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	Spark Model 706RC Dosimeter

Procedure Number	D0001.8380		
Technician	Nicholas Rasmussen		
Calibration Date	25 May 2016		
Calibration Due	25 May 2017		
Temperature	22.53	°C	± 0.01 °C
Humidity	29.1	%RH	± 0.5 %RH
Static Pressure	86.09	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 µPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	01/25/2016	01/25/2017	006239
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:30:32PM

Page 1 of 7

Calibration Certificate

Certificate Number 2016004623

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	**Procedure Number**	D0001.8390		
Serial Number	B5379	**Technician**	Nicholas Rasmussen		
Test Results	**Pass**	**Calibration Date**	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	**Calibration Due**	25 May 2017		
		Temperature	21.40	°C	± 0.01 °C
Description	3/8 inch Microphone - RI - 0V	**Humidity**	30.20	%RH	± 0.5 %RH
		Static Pressure	101.34	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:31:54PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004614

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+	***Procedure Number***	D0001.8380		
Serial Number	41093	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	Spark Model 705+ Dosimeter	***Temperature***	22.54	°C	± 0.01 °C
		Humidity	29.1	%RH	± 0.5 %RH
		Static Pressure	86.09	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 μPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	**Cal Date**	**Cal Due**	**Cal Standard**
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
SRS DS360 Ultra Low Distortion Generator	03/17/2016	03/17/2017	007174

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:30:41PM

Page 1 of 7

Calibration Certificate

Certificate Number 2016004624

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	***Procedure Number***	D0001.8390		
Serial Number	B5382	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
		Temperature	21.29	°C	± 0.01 °C
Description	3/8 inch Microphone - RI - 0V	***Humidity***	29.40	%RH	± 0.5 %RH
		Static Pressure	101.37	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:31:58PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004615

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+	***Procedure Number***	D0001.8380		
Serial Number	41094	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	Spark Model 705+ Dosimeter	***Temperature***	22.54	°C	± 0.01 °C
		Humidity	29.1	%RH	± 0.5 %RH
		Static Pressure	86.09	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 μPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
SRS DS360 Ultra Low Distortion Generator	06/18/2015	06/18/2016	007117

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:30:49PM

Page 1 of 7

Calibration Certificate

Certificate Number 2016004625

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	***Procedure Number***	D0001.8390		
Serial Number	B5385	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	3/8 inch Microphone - RI - 0V	***Temperature***	21.29	°C	± 0.01 °C
		Humidity	29.90	%RH	± 0.5 %RH
		Static Pressure	101.58	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:02PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004616

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+
Serial Number	41095
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	Spark Model 705+ Dosimeter

Procedure Number	D0001.8380		
Technician	Nicholas Rasmussen		
Calibration Date	25 May 2016		
Calibration Due	25 May 2017		
Temperature	22.56	°C	± 0.01 °C
Humidity	29	%RH	± 0.5 %RH
Static Pressure	86.09	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 μPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
SRS DS360 Ultra Low Distortion Generator	07/07/2015	07/07/2016	007118

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:30:57PM

Page 1 of 7

Calibration Certificate

Certificate Number 2016004626

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	***Procedure Number***	D0001.8390		
Serial Number	B5397	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	3/8 inch Microphone - RI - 0V	***Temperature***	21.27	°C	± 0.01 °C
		Humidity	29.60	%RH	± 0.5 %RH
		Static Pressure	101.41	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:05PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004617

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+	***Procedure Number***	D0001.8380
Serial Number	41096	***Technician***	Nicholas Rasmussen
Test Results	**Pass**	***Calibration Date***	25 May 2016
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017
Description	Spark Model 705+ Dosimeter	***Temperature***	22.59 °C ± 0.01 °C
		Humidity	28.7 %RH ± 0.5 %RH
		Static Pressure	86.08 kPa ± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 μPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	06/24/2015	06/24/2016	006311
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2016004627

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	***Procedure Number***	D0001.8390		
Serial Number	B5417	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
		Temperature	20.84	°C	± 0.01 °C
Description	3/8 inch Microphone - RI - 0V	***Humidity***	28.10	%RH	± 0.5 %RH
		Static Pressure	101.50	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:09PM

Calibration Certificate

Certificate Number 2016004618

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+
Serial Number	41097
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	Spark Model 705+ Dosimeter

Procedure Number	D0001.8380		
Technician	Nicholas Rasmussen		
Calibration Date	25 May 2016		
Calibration Due	25 May 2017		
Temperature	22.83	°C	± 0.01 °C
Humidity	28.9	%RH	± 0.5 %RH
Static Pressure	86.06	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 μPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	01/25/2016	01/25/2017	006239
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:31:14PM

Page 1 of 7

Calibration Certificate

Certificate Number 2016004628

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	***Procedure Number***	D0001.8390
Serial Number	B5437	***Technician***	Nicholas Rasmussen
Test Results	**Pass**	***Calibration Date***	25 May 2016
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017
Description	3/8 inch Microphone - RI - 0V	***Temperature***	20.92 °C ± 0.01 °C
		Humidity	29.00 %RH ± 0.5 %RH
		Static Pressure	101.34 kPa ± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA A2LA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:12PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004619

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+
Serial Number	44420
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	Spark Model 705+ Dosimeter

Procedure Number	D0001.8380		
Technician	Nicholas Rasmussen		
Calibration Date	25 May 2016		
Calibration Due	25 May 2017		
Temperature	22.83	°C	± 0.01 °C
Humidity	28.9	%RH	± 0.5 %RH
Static Pressure	86.06	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 μPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
SRS DS360 Ultra Low Distortion Generator	03/17/2016	03/17/2017	007174

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA A2LA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:31:22PM

Calibration Certificate

Certificate Number 2016004629

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001
Serial Number	B10125
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	3/8 inch Microphone - RI - 0V

Procedure Number	D0001.8390		
Technician	Nicholas Rasmussen		
Calibration Date	25 May 2016		
Calibration Due	25 May 2017		
Temperature	21.14	°C	± 0.01 °C
Humidity	29.50	%RH	± 0.5 %RH
Static Pressure	101.72	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:16PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004620

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+	***Procedure Number***	D0001.8380		
Serial Number	44421	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	Spark Model 705+ Dosimeter	***Temperature***	22.83	°C	± 0.01 °C
		Humidity	28.9	%RH	± 0.5 %RH
		Static Pressure	86.06	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 μPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	**Cal Date**	**Cal Due**	**Cal Standard**
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
SRS DS360 Ultra Low Distortion Generator	06/18/2015	06/18/2016	007117

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:31:30PM

Calibration Certificate

Certificate Number 2016004630

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	***Procedure Number***	D0001.8390		
Serial Number	B10123	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	3/8 inch Microphone - RI - 0V	***Temperature***	21.26	°C	± 0.01 °C
		Humidity	29.80	%RH	± 0.5 %RH
		Static Pressure	101.40	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA A2LA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:20PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004621

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+	***Procedure Number***	D0001.8380		
Serial Number	44422	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	Spark Model 705+ Dosimeter	***Temperature***	22.88	°C	± 0.01 °C
		Humidity	28.8	%RH	± 0.5 %RH
		Static Pressure	86.06	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 µPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
SRS DS360 Ultra Low Distortion Generator	07/07/2015	07/07/2016	007118

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:31:39PM

Page 1 of 7

Calibration Certificate

Certificate Number 2016004631

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001	***Procedure Number***	D0001.8390		
Serial Number	B10124	***Technician***	Nicholas Rasmussen		
Test Results	**Pass**	***Calibration Date***	25 May 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 May 2017		
Description	3/8 inch Microphone - RI - 0V	***Temperature***	21.21	°C	± 0.01 °C
		Humidity	29.90	%RH	± 0.5 %RH
		Static Pressure	101.56	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:23PM

Page 1 of 3

Calibration Certificate

Certificate Number 2016004622

Customer:

Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	705+
Serial Number	44423
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	Spark Model 705+ Dosimeter

Procedure Number	D0001.8380		
Technician	Nicholas Rasmussen		
Calibration Date	25 May 2016		
Calibration Due	25 May 2017		
Temperature	22.89	°C	± 0.01 °C
Humidity	28.7	%RH	± 0.5 %RH
Static Pressure	86.06	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an adaptor substituted for the microphone and gain set at 0 dB unless noted. Data reported in dB re 20 µPa assuming a microphone sensitivity of 6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards:

IEC 60651:1979 Type 2	ANSI S1.4:1983 (R2006) Type 2
IEC 60804:1985 Type 2	ANSI S1.43:1997 (R2007) Type 2
IEC 61252:2000	ANSI S1.25:1991 (R2007)

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	06/24/2015	06/24/2016	006311
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:31:48PM

Page 1 of 7

Calibration Certificate

Certificate Number 2016004632

Customer:
Resolution Copper Mining
102 Magma Heights
Superior, AZ 85273, United States

Model Number	MPR001
Serial Number	B10122
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	3/8 inch Microphone - RI - 0V

Procedure Number	D0001.8390		
Technician	Nicholas Rasmussen		
Calibration Date	25 May 2016		
Calibration Due	25 May 2017		
Temperature	21.02	°C	± 0.01 °C
Humidity	31.00	%RH	± 0.5 %RH
Static Pressure	101.48	kPa	± 0.03 kPa

Evaluation Method Tested acoustically using a comparison coupler.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	08/27/2015	08/27/2016	005376
Sound Level Meter / Real Time Analyzer	06/10/2015	06/10/2016	006508
LD 2209 External Attenuator	06/10/2015	06/10/2016	006509
NI USB-4431 signal acquisition module	03/25/2016	03/25/2017	006903
Hart Scientific 2626-S Humidity/Temperature Sensor	06/08/2015	06/08/2016	006946
1/2 inch Microphone - P - 0V	02/01/2016	02/01/2017	007101
Pressure Transducer	06/17/2015	06/17/2016	007203
PCB 1/4" ICP® Preamplifier	04/14/2016	04/14/2017	007286

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

5/25/2016 6:32:27PM

Page 1 of 3

APPENDIX B:NOISE MONITORING DATA

Location **East Plant**
Serial# ***2227***

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
6/7/2016	Daytime	46.3	52.1	43.9	73.2	67.9	62.0	58.0	49.9	45.2	44.8	41.4	36.0	27.9	15.7	32.0
	Nighttime	45.8	50.2	44.1	51.5	54.3	56.9	56.0	46.8	43.4	43.5	41.5	35.9	28.2	13.0	41.8
6/8/2016	Daytime	52.9	68.1	45.3	74.1	68.5	64.3	64.4	54.8	54.2	51.5	47.5	41.9	35.5	26.4	28.1
	Nighttime	47.7	57.9	45.7	69.7	64.1	63.8	59.8	50.2	45.1	44.9	43.2	38.3	32.8	22.2	37.8
6/9/2016	Daytime	50.3	63.7	45.7	80.4	75.4	69.5	64.4	55.7	49.6	47.1	44.8	41.4	36.5	28.4	22.5
	Nighttime	47.8	58.4	44.9	74.5	69.2	64.3	58.4	51.3	45.6	45.2	42.9	38.9	34.1	21.5	38.4
6/10/2016	Daytime	52.5	68.1	47.1	80.8	75.9	70.4	65.9	57.7	52.1	49.0	45.9	43.1	39.6	38.2	34.5
	Nighttime	47.3	59.7	45.0	68.9	63.6	63.4	58.2	50.0	44.4	44.1	42.5	38.9	34.9	26.0	40.0
6/11/2016	Daytime	46.7	57.3	43.6	69.1	63.7	60.9	59.5	51.9	43.8	43.4	40.9	38.3	37.0	23.5	28.1
	Nighttime	45.8	52.9	43.4	62.6	58.3	56.9	55.3	48.6	43.3	42.9	40.7	37.0	33.8	20.5	40.1
6/12/2016	Daytime	46.9	56.2	43.1	76.2	71.0	64.7	58.5	52.7	46.5	44.6	41.5	37.0	30.2	21.4	27.0
	Nighttime	47.0	55.7	44.8	62.6	58.0	57.2	56.1	48.1	43.3	43.9	42.2	38.8	34.3	20.9	41.2
6/13/2016	Daytime	51.7	65.8	44.2	76.4	71.2	66.0	62.9	54.8	48.6	46.5	44.9	44.1	44.7	27.3	30.7
	Nighttime	51.8	68.9	46.8	53.6	55.0	63.1	59.2	49.4	44.7	46.3	44.7	45.5	44.5	29.0	41.6
6/14/2016	Daytime	51.0	65.4	46.3	71.7	66.5	65.0	63.6	55.2	50.2	48.0	46.2	41.8	36.0	27.0	30.9
	Nighttime	47.6	55.4	45.4	51.2	54.6	62.5	58.0	49.3	44.6	45.2	43.2	37.9	30.2	19.2	41.6
6/15/2016	Daytime	48.1	63.1	42.8	74.7	69.2	63.9	63.4	53.1	45.4	45.0	42.6	38.4	37.2	24.0	22.6
	Nighttime	47.8	56.1	46.0	57.4	56.0	63.8	59.9	50.1	45.0	45.5	43.5	37.6	31.7	23.0	37.6
6/16/2016	Daytime	53.3	66.0	43.9	73.7	68.5	65.0	64.6	52.8	45.7	45.0	49.3	48.2	32.7	24.1	17.7
	Nighttime	47.9	55.1	46.2	52.5	54.7	63.0	58.6	49.0	44.8	45.5	43.7	38.6	31.1	20.8	36.4
6/17/2016	Daytime	47.4	62.1	43.2	69.8	64.1	59.9	62.3	51.0	44.9	44.6	43.0	38.1	31.4	23.4	18.4
	Nighttime	48.3	56.4	45.7	51.3	54.5	63.0	58.8	49.4	44.4	45.9	44.1	39.7	30.8	19.4	28.5
6/18/2016	Daytime	45.2	53.4	41.9	78.8	73.3	66.1	58.6	53.0	45.0	43.4	39.5	32.7	24.4	15.8	15.1
	Nighttime	45.5	49.9	43.6	67.4	61.9	57.7	55.8	48.1	43.3	44.2	41.2	34.8	26.9	19.1	26.0
6/19/2016	Daytime	46.8	55.9	42.1	82.2	77.4	70.6	62.2	55.7	47.0	44.1	40.2	34.2	27.2	21.7	17.0
	Nighttime	45.3	51.2	42.9	77.5	71.7	64.2	57.8	51.5	43.5	43.2	40.1	34.3	31.2	16.4	21.8

Location East Plant
Serial# 2227

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
6/20/2016	Daytime	50.2	65.0	44.3	80.3	75.3	69.7	65.0	55.5	47.9	48.0	44.9	39.8	34.9	27.5	19.0
	Nighttime	57.6	76.6	42.3	77.4	73.2	68.6	63.4	57.6	50.7	45.6	43.1	37.1	35.1	29.3	26.6
6/21/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/22/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/23/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/24/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/25/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/26/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/27/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/28/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/29/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/30/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/1/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/2/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/3/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Location East Plant
Serial# 2227

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
7/4/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/5/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Location West Plant
Serial # 2667

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8	160
6/7/2016	Daytime	41.6	58.1	32.3	68.1	61.8	54.7	51.4	47.9	39.3	39.1	34.7	33.6	31.4	26.8	17.2
	Nighttime	33.1	39.9	29.7	42.8	41.3	40.0	46.6	36.4	31.7	32.1	28.8	20.4	12.7	7.3	8.2
6/8/2016	Daytime	44.6	58.3	38.4	69.3	63.3	56.6	53.9	52.0	44.5	42.4	38.3	34.2	33.9	26.2	18.0
	Nighttime	40.5	48.2	36.8	51.4	48.9	47.1	51.1	44.0	39.0	38.5	35.2	29.0	30.7	24.9	20.7
6/9/2016	Daytime	44.3	55.3	36.7	73.7	67.3	60.2	56.8	54.8	45.5	40.8	35.8	32.1	31.9	24.9	18.0
	Nighttime	39.8	47.3	36.6	47.0	48.7	50.3	51.0	43.8	38.3	38.1	34.6	27.9	29.8	19.4	21.3
6/10/2016	Daytime	48.3	64.9	37.7	74.7	69.3	62.3	58.3	56.9	49.6	43.5	38.0	34.9	33.4	28.8	22.5
	Nighttime	39.0	47.5	34.9	48.4	46.7	44.4	47.7	42.1	36.8	36.8	33.7	28.1	29.8	23.9	22.4
6/11/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/12/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/13/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/14/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/15/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Location **West Plant**
Serial # **2667**

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8	160
6/16/2016	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/17/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/18/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/19/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/20/2016	Daytime	44.8	58.9	34.9	72.9	67.6	61.2	55.6	53.4	47.1	41.8	34.6	34.7	32.6	25.5	19.8
	Nighttime	57.4	74.5	25.9	70.7	67.7	63.4	57.6	54.3	53.3	49.4	41.3	38.0	34.0	31.2	31.1
6/21/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/22/2016	Daytime	43.2	53.6	35.1	72.6	66.4	58.6	51.9	52.7	43.1	39.5	33.2	58.6	32.0	24.8	17.4
	Nighttime	33.7	39.8	31.2	41.7	41.3	39.7	41.0	38.4	31.8	31.0	27.4	31.2	27.9	18.4	8.2
6/23/2016	Daytime	48.0	62.3	38.6	68.3	62.2	56.1	53.4	55.5	50.4	45.4	38.0	54.6	34.8	41.8	30.7
	Nighttime	40.9	48.3	37.7	46.9	47.7	46.1	47.8	44.0	38.3	37.6	34.7	37.5	35.2	25.1	18.6
6/24/2016	Daytime	42.9	52.2	36.5	70.1	63.8	56.2	51.0	51.2	40.5	38.9	33.8	56.3	32.6	35.4	23.1
	Nighttime	41.4	46.6	38.4	49.8	47.2	44.1	47.5	42.9	37.3	36.4	32.9	38.3	38.2	30.2	18.8
6/25/2016	Daytime	43.6	54.4	36.6	66.6	60.1	52.8	49.2	49.5	41.1	38.4	35.3	52.8	33.2	38.9	26.3
	Nighttime	39.9	45.0	37.2	49.8	47.9	44.2	44.0	42.2	35.7	36.4	32.6	38.1	35.4	26.8	16.3
6/26/2016	Daytime	42.4	52.7	37.0	61.7	55.7	48.8	46.3	45.5	36.9	35.7	31.9	48.2	32.7	39.9	26.4
	Nighttime	40.3	48.2	37.2	59.1	53.1	47.0	44.4	43.2	35.6	35.0	31.7	45.7	36.3	29.8	21.5
6/27/2016	Daytime	52.1	72.1	39.8	71.1	66.0	60.6	56.4	55.8	51.2	49.0	46.4	57.2	38.5	38.4	31.8
	Nighttime	45.7	65.3	38.1	72.7	67.1	60.0	52.3	50.0	40.6	38.5	33.1	58.6	42.8	30.8	21.1
6/28/2016	Daytime	46.0	59.0	38.2	70.2	64.4	57.7	52.7	51.2	44.9	40.4	36.7	56.4	36.4	40.9	28.3
	Nighttime	46.3	58.1	39.7	75.3	70.0	63.8	56.5	53.9	45.3	41.7	36.7	61.3	39.7	32.8	21.8
6/29/2016	Daytime	65.0	87.8	49.7	78.0	73.8	68.2	63.2	62.8	60.9	56.5	53.6	64.4	50.8	47.5	43.1
	Nighttime	50.8	62.6	40.7	80.2	75.4	68.9	61.4	57.8	50.6	47.3	44.0	66.0	40.0	36.8	30.1
6/30/2016	Daytime	39.4	50.6	34.3	56.6	51.6	52.0	51.7	48.1	42.6	36.9	31.7	43.6	25.3	24.7	16.4
	Nighttime	40.8	51.9	34.5	63.5	58.9	52.3	48.4	46.5	42.1	37.9	33.7	49.4	29.6	23.9	20.3

Location West Plant
Serial # 2667

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8	160
7/1/2016	Daytime	48.0	67.2	39.9	70.0	64.2	56.9	51.1	50.2	42.5	41.4	42.8	40.9	37.0	32.4	29.3
	Nighttime	39.9	47.7	36.3	65.2	58.8	51.2	48.6	46.3	39.8	36.8	31.6	36.4	33.7	26.5	23.2
7/2/2016	Daytime	43.7	54.1	37.5	71.7	66.5	59.6	51.6	49.3	39.4	38.3	34.3	35.0	36.5	37.7	24.1
	Nighttime	45.1	57.4	39.4	75.1	69.5	62.6	54.0	53.4	43.8	40.6	36.4	34.7	37.7	33.5	27.2
7/3/2016	Daytime	42.6	53.1	37.5	66.5	59.7	51.5	47.8	47.1	36.6	37.3	31.9	31.7	36.8	37.7	25.8
	Nighttime	42.4	53.3	39.9	47.9	46.0	43.2	43.6	42.7	37.9	38.0	33.0	28.6	38.6	32.4	18.3
7/4/2016	Daytime	48.2	64.1	36.3	68.8	62.3	54.7	53.8	55.4	49.7	46.6	40.7	36.1	33.9	37.6	27.4
	Nighttime	43.5	63.3	38.7	52.1	47.9	45.2	45.5	45.1	44.0	40.1	35.7	31.0	37.2	31.0	19.5
7/5/2016	Daytime	39.3	52.3	32.5	42.6	42.2	42.2	43.3	40.8	36.9	33.6	33.4	30.7	31.5	28.7	17.3
	Nighttime	43.9	62.6	38.8	50.1	47.1	44.7	46.7	43.6	38.1	38.4	36.1	31.8	39.3	35.6	24.9

Location Tailings Facility
Serial# 3555

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
6/7/2016	Daytime	45.2	59.0	33.3	70.4	64.6	57.3	50.0	46.2	40.5	40.4	37.7	39.0	37.7	32.6	22.4
	Nighttime	25.8	31.2	22.6	36.6	32.6	31.1	31.1	29.0	21.3	19.8	23.1	14.4	16.7	7.5	7.7
6/8/2016	Daytime	38.5	50.7	27.8	67.6	60.8	51.6	44.4	42.7	38.7	34.8	28.8	28.8	32.4	21.8	14.3
	Nighttime	35.9	48.4	27.9	44.2	42.1	38.9	39.8	35.4	33.4	28.8	27.3	29.6	30.1	20.7	13.9
6/9/2016	Daytime	41.2	52.2	30.7	71.8	65.3	56.4	47.3	43.2	39.7	37.8	31.1	29.9	36.5	25.8	16.9
	Nighttime	36.8	48.0	28.5	61.3	53.9	45.1	41.3	37.1	32.5	26.9	25.4	29.4	33.0	21.7	15.3
6/10/2016	Daytime	43.6	52.9	35.3	75.2	69.3	61.7	52.3	46.8	42.0	40.3	34.8	33.7	37.9	27.5	18.7
	Nighttime	37.8	48.0	31.7	63.3	56.7	49.2	44.1	40.0	34.8	30.1	27.4	30.6	33.4	22.2	19.8
6/11/2016	Daytime	40.4	51.4	34.2	67.5	60.9	52.3	45.7	45.1	39.1	34.9	30.7	31.1	35.6	25.4	16.0
	Nighttime	39.8	49.0	34.2	55.5	49.6	45.8	47.3	41.6	38.2	33.9	30.7	31.1	34.9	24.7	18.5
6/12/2016	Daytime	41.1	51.3	31.8	73.6	67.4	59.4	49.6	45.6	40.3	38.8	32.1	30.2	34.5	24.4	15.2
	Nighttime	37.4	49.7	32.2	46.6	40.8	38.5	37.1	33.0	29.9	25.0	27.2	31.5	32.9	25.0	19.0

Location	Tailings Facility															
Serial#	3555															
Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
6/13/2016	Daytime	41.5	51.9	30.2	74.0	68.0	59.9	50.4	47.6	42.4	39.8	33.0	30.2	32.8	21.4	15.1
	Nighttime	35.7	48.9	28.6	43.4	40.2	45.3	43.5	36.3	31.4	27.4	25.6	29.3	30.7	20.0	22.6
6/14/2016	Daytime	39.8	50.8	29.2	70.7	64.4	55.9	48.6	46.4	41.2	37.2	29.0	26.9	33.2	22.8	17.6
	Nighttime	35.6	46.7	27.4	39.0	42.8	39.4	39.8	36.2	32.8	30.0	25.5	28.7	30.3	18.4	14.8
6/15/2016	Daytime	40.9	52.3	30.2	74.6	68.6	60.6	51.1	46.5	40.7	39.3	32.6	29.9	32.1	21.2	16.8
	Nighttime	35.0	48.9	27.3	40.4	37.4	39.2	40.6	34.1	31.8	26.9	24.2	29.8	29.3	19.0	14.7
6/16/2016	Daytime	37.2	47.8	24.4	59.5	52.4	47.3	40.8	38.7	35.0	34.3	31.0	28.1	29.5	19.7	10.8
	Nighttime	35.3	47.0	27.1	38.5	40.7	38.9	40.2	36.9	32.4	27.7	24.5	29.2	30.2	18.1	19.0
6/17/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/18/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/19/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/20/2016	Daytime	41.6	53.1	28.6	71.6	66.3	59.0	50.4	47.3	54.8	41.3	47.3	57.9	27.0	15.2	11.6
	Nighttime	26.1	34.6	22.5	55.1	48.2	39.6	37.6	33.6	39.0	22.1	31.8	41.7	18.4	9.4	7.8
6/21/2016	Daytime	40.3	52.3	29.7	69.9	63.8	55.3	48.5	46.9	53.5	38.4	46.0	56.3	30.5	19.6	14.3
	Nighttime	36.5	51.2	29.0	41.6	39.4	39.1	42.4	38.2	33.2	28.5	28.9	33.3	31.8	21.1	18.0
6/22/2016	Daytime	44.8	55.0	40.3	72.2	66.3	58.3	50.9	47.4	55.4	41.3	48.4	58.5	34.8	25.6	16.1
	Nighttime	48.6	68.8	27.5	45.4	46.1	44.1	40.7	36.7	35.0	29.1	34.5	43.2	45.3	30.0	18.6
6/23/2016	Daytime	44.9	58.5	30.1	69.5	63.3	55.0	49.7	51.1	54.0	43.8	45.9	55.9	32.8	23.1	14.6
	Nighttime	38.7	59.9	27.3	41.4	40.1	38.8	40.2	36.3	32.8	26.4	26.4	35.5	34.1	20.4	17.2
6/24/2016	Daytime	37.9	48.4	28.7	69.1	62.8	54.1	46.3	42.5	52.4	34.6	45.0	55.5	32.7	21.2	14.1
	Nighttime	33.7	45.4	26.8	37.7	41.1	39.1	38.7	35.1	31.0	25.0	23.8	30.5	29.7	17.4	15.9
6/25/2016	Daytime	39.1	51.4	30.6	69.5	63.3	54.8	47.3	44.4	52.9	34.7	45.6	56.0	34.0	22.2	16.5
	Nighttime	35.5	47.3	28.5	48.3	41.4	39.8	41.3	37.8	35.5	26.4	28.4	36.8	30.2	19.0	14.9
6/26/2016	Daytime	38.6	50.0	30.5	61.5	54.5	45.6	42.4	41.8	45.9	29.6	38.4	48.3	35.3	22.5	14.2

Location **Tailings Facility**
Serial# **3555**

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
	Nighttime	35.8	45.6	29.7	48.0	42.9	39.7	40.1	37.3	36.3	28.2	29.1	36.4	31.4	20.3	15.7
6/27/2016	Daytime	47.6	61.3	39.5	73.7	69.3	63.6	57.4	53.9	57.2	43.3	49.5	60.2	37.4	35.7	34.1
	Nighttime	35.2	46.6	29.9	50.7	45.0	41.6	41.7	36.4	37.0	25.1	30.4	38.7	30.8	21.1	14.5
6/28/2016	Daytime	39.7	52.3	29.7	69.7	63.8	55.7	49.0	47.8	53.2	35.7	45.6	56.1	32.5	22.4	18.6
	Nighttime	38.6	49.5	32.0	69.0	62.9	54.6	45.0	40.8	52.0	36.4	44.7	55.2	31.1	22.3	15.6
6/29/2016	Daytime	52.0	71.2	38.8	68.5	63.8	59.5	58.8	58.9	56.5	47.6	46.8	55.7	35.2	29.2	26.4
	Nighttime	42.0	52.7	33.6	74.3	68.9	61.8	53.5	47.9	57.0	39.4	49.7	60.5	30.3	23.6	17.4
6/30/2016	Daytime	37.6	50.0	30.3	45.5	41.0	43.5	45.3	45.0	38.2	31.2	29.8	36.5	29.9	20.2	16.7
	Nighttime	38.4	54.7	32.8	40.9	40.6	38.4	41.7	39.9	34.5	30.0	31.1	36.0	25.9	23.2	20.0
7/1/2016	Daytime	41.7	51.2	35.3	52.0	45.9	44.3	45.8	45.4	41.6	35.3	35.8	41.2	34.3	29.0	26.9
	Nighttime	35.3	44.8	30.9	49.5	44.9	42.6	44.3	41.7	37.7	29.3	30.8	38.4	24.4	17.7	17.2
7/2/2016	Daytime	39.4	49.9	32.1	60.8	53.5	46.7	47.4	46.2	46.5	33.6	39.0	48.1	31.9	19.2	14.9
	Nighttime	38.2	50.8	33.4	55.3	49.2	47.7	50.9	46.3	42.8	32.1	34.9	43.6	25.4	18.1	15.4
7/3/2016	Daytime	38.0	49.8	31.1	57.3	50.2	45.5	45.0	43.2	43.7	33.4	36.3	44.8	31.0	17.9	14.7
	Nighttime	36.6	48.1	31.5	33.4	43.1	42.8	47.4	42.9	34.2	29.5	27.7	35.0	26.5	17.0	15.2
7/4/2016	Daytime	36.8	49.1	29.3	58.6	51.9	45.0	43.5	42.4	44.1	32.7	36.8	45.8	28.4	16.8	14.2
	Nighttime	35.7	47.0	29.6	34.1	44.2	43.6	43.6	41.1	36.6	31.1	28.7	32.7	25.4	16.9	14.4
7/5/2016	Daytime	33.0	45.5	23.6	48.1	41.1	40.3	40.1	39.5	37.3	30.5	28.4	36.1	22.3	10.1	8.1
	Nighttime	34.1	47.4	29.4	34.4	37.1	36.3	40.6	38.1	33.0	27.9	27.2	30.8	25.8	16.2	13.3

Location **Filter Plant**
Serial # **3140**

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
6/7/2016	Daytime	41.7	55.3	32.2	72.0	65.9	58.7	52.7	52.1	43.3	38.1	31.9	30.9	29.0	24.3	16.3
	Nighttime	23.5	35.1	13.6	44.0	37.8	31.2	34.7	34.6	23.7	17.0	9.6	4.1	17.2	13.6	7.1

Location	Filter Plant														
Serial #	3140														
Date	Time	dB(A)			dB										
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
6/8/2016	Daytime	42.1	54.7	24.7	69.9	63.7	56.3	49.8	50.6	44.0	39.5	35.4	30.9	26.2	19.5	15.9
	Nighttime	39.0	56.4	27.1	56.0	48.7	42.5	42.7	48.3	41.9	37.9	27.5	21.5	28.6	14.5	12.9
6/9/2016	Daytime	43.8	59.2	27.1	73.3	67.1	60.1	52.1	51.3	45.8	42.3	36.6	32.0	29.2	20.7	13.8
	Nighttime	41.4	56.3	26.2	57.9	51.5	44.0	43.3	47.2	40.5	32.8	27.9	37.4	32.6	18.2	17.4
6/10/2016	Daytime	45.1	56.7	31.8	79.4	73.5	67.2	58.2	55.3	47.7	43.8	34.1	29.4	27.3	17.8	15.1
	Nighttime	40.2	52.8	26.9	62.3	56.8	49.0	45.3	50.9	43.7	37.0	29.7	24.7	27.9	17.6	13.4
6/11/2016	Daytime	44.9	61.8	25.3	70.1	63.8	55.8	49.8	52.0	47.0	43.3	37.8	33.6	30.2	26.1	17.5
	Nighttime	32.8	41.4	24.1	52.5	46.0	41.4	41.5	43.2	36.2	28.2	17.4	16.1	25.7	17.4	14.2
6/12/2016	Daytime	42.0	53.9	26.4	75.9	70.1	63.3	55.0	52.5	44.6	40.0	31.4	25.3	23.7	15.5	13.9
	Nighttime	31.6	44.6	21.1	51.4	44.3	39.6	39.8	38.0	31.6	25.2	27.0	19.8	23.2	15.2	18.9
6/13/2016	Daytime	42.0	55.1	26.3	76.4	70.9	64.2	55.5	52.9	45.0	39.6	30.3	24.5	23.1	17.5	14.0
	Nighttime	36.7	50.0	19.4	49.7	47.2	43.2	44.5	41.2	39.0	35.4	30.3	22.8	21.8	12.6	15.8
6/14/2016	Daytime	40.6	56.0	22.6	73.2	67.3	59.7	51.9	51.0	44.5	37.8	25.6	17.9	19.7	14.7	15.9
	Nighttime	28.1	41.2	20.5	54.8	48.6	41.5	41.9	36.1	30.2	24.5	16.4	12.7	20.4	12.7	12.8
6/15/2016	Daytime	51.1	69.7	25.9	77.8	72.4	65.5	56.8	55.5	50.2	50.4	43.9	39.9	37.9	34.8	28.0
	Nighttime	30.3	40.6	21.0	54.1	46.8	41.0	40.8	41.6	33.9	26.2	14.0	12.3	20.7	13.2	14.9
6/16/2016	Daytime	39.7	52.4	22.3	68.1	61.8	53.8	50.8	51.4	42.8	37.5	28.8	21.3	20.6	15.1	14.3
	Nighttime	35.0	48.6	21.1	53.9	46.9	41.0	41.8	43.5	36.0	31.1	30.6	21.6	20.6	12.2	12.8
6/17/2016	Daytime	39.6	52.5	22.9	67.9	61.6	53.7	48.5	49.9	43.3	38.1	28.3	20.3	17.0	13.5	13.2
	Nighttime	36.6	50.8	21.3	52.7	46.6	40.9	41.2	44.4	41.5	35.1	25.9	19.0	21.3	12.8	15.4
6/18/2016	Daytime	42.0	54.0	24.7	75.6	69.6	63.2	54.3	52.3	45.3	40.7	30.5	23.5	19.5	15.5	14.2
	Nighttime	29.9	40.9	19.8	52.3	45.4	39.9	40.4	38.4	33.3	27.0	18.4	11.7	21.1	12.3	13.0
6/19/2016	Daytime	39.1	49.6	25.2	75.1	69.2	62.6	53.2	49.8	40.1	38.2	27.3	23.7	19.3	14.1	14.8
	Nighttime	28.5	40.2	18.1	49.4	42.9	38.2	41.8	35.9	31.5	25.2	17.2	15.8	18.3	12.4	12.8
6/20/2016	Daytime	42.5	55.6	25.6	78.5	73.3	66.5	57.9	52.9	44.6	39.6	31.3	27.7	24.7	19.1	16.6
	Nighttime	33.4	43.4	23.2	68.6	62.8	55.1	46.4	45.3	36.1	30.2	19.4	14.6	17.9	12.9	15.4
6/21/2016	Daytime	40.6	53.3	24.3	71.8	65.7	58.0	50.8	51.2	43.5	38.3	31.1	26.2	21.8	18.1	17.1
	Nighttime	39.2	55.5	20.3	60.9	54.0	46.0	44.8	43.5	41.0	37.9	33.3	26.1	18.5	14.8	17.2

Location **Filter Plant**
Serial # **3140**

Date	Time	dB(A)			dB											
		Leq	Lmax	Lmin	8	16.0	31.5	63.0	125	250	500	1000	2000	4000	8000	16000
6/22/2016	Daytime	44.0	57.0	27.6	73.7	67.6	61.2	55.1	55.5	46.4	41.3	32.1	26.5	21.5	22.4	20.3
	Nighttime	38.9	56.7	23.5	52.5	47.1	43.1	44.6	49.2	41.9	37.7	30.1	21.6	17.6	13.0	12.8
6/23/2016	Daytime	43.7	55.5	28.5	77.8	72.1	65.1	57.3	56.3	45.7	39.7	29.5	25.0	20.8	20.6	18.7
	Nighttime	34.9	44.6	23.8	53.0	47.4	42.2	43.3	45.1	38.8	32.4	23.5	15.9	23.6	13.7	14.5
6/24/2016	Daytime	51.1	64.4	27.2	69.8	65.5	59.1	56.8	56.8	52.2	50.1	45.2	39.7	30.8	25.8	22.8
	Nighttime	39.9	57.5	23.2	51.8	45.4	41.3	43.2	50.2	43.8	38.3	29.3	23.0	20.2	15.5	15.1
6/25/2016	Daytime	39.2	51.1	22.5	69.1	62.7	55.6	50.5	51.2	42.0	35.8	27.2	22.4	18.7	17.4	14.1
	Nighttime	32.9	44.6	20.5	53.9	46.7	41.0	42.0	43.2	37.0	29.7	19.9	19.9	18.8	14.3	12.9
6/26/2016	Daytime	37.9	50.2	21.3	66.0	59.4	51.7	48.6	48.9	40.4	33.6	27.1	27.0	22.0	17.6	13.2
	Nighttime	32.2	44.6	19.8	61.8	54.5	46.5	42.7	39.7	34.0	31.2	24.2	14.4	17.8	16.4	21.4
6/27/2016	Daytime	49.4	61.7	35.4	76.0	71.9	66.4	60.2	57.1	48.2	45.2	38.8	34.1	31.7	28.3	22.4
	Nighttime	29.5	41.3	18.1	51.1	45.4	40.3	41.4	39.8	32.9	25.9	17.7	16.1	18.0	13.9	12.4
6/28/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/29/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6/30/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/1/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/2/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/3/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/4/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7/5/2016	Daytime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nighttime	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX C:VIBRATION MONITORING DATA

Location East Plant
Serial #UM10398

	Average			Max			Min		
Date	Iran (in/s)	Vert (in/s)	Long (in/s)	Iran (in/s)	Vert (in/s)	Long (in/s)	Iran (in/s)	Vert (in/s)	Long (in/s)
6/7/2016	0.002593	0.002631	0.003824	0.003413	0.003103	0.004655	0.001862	0.002172	0.003103
6/8/2016	0.002541	0.002667	0.003662	0.004655	0.004965	0.007447	0.001862	0.002172	0.002482
6/9/2016	0.002527	0.002637	0.003709	0.004655	0.004034	0.007447	0.001862	0.002482	0.002482
6/10/2016	0.002492	0.002691	0.003563	0.004344	0.004965	0.005896	0.001862	0.002172	0.002482
6/11/2016	0.002742	0.002656	0.003393	0.006827	0.003724	0.006827	0.001862	0.002172	0.002482
6/12/2016	0.002526	0.002646	0.003564	0.003724	0.003103	0.004655	0.001862	0.002172	0.002482
6/13/2016	0.002628	0.002964	0.003790	0.003724	0.003724	0.005896	0.001862	0.002482	0.002793
6/14/2016	0.002641	0.003026	0.003652	0.004034	0.003724	0.005896	0.001862	0.002482	0.002482
6/15/2016	0.002671	0.003090	0.003650	0.003724	0.004034	0.005586	0.001862	0.002482	0.002482
6/16/2016	0.002717	0.002813	0.003448	0.004344	0.004344	0.005275	0.001862	0.002172	0.002172
6/17/2016	0.002700	0.002742	0.003499	0.007137	0.004965	0.008378	0.001862	0.002482	0.002172
6/18/2016	0.002883	0.002714	0.003611	0.004344	0.003103	0.004965	0.001862	0.002172	0.002482
6/19/2016	0.003121	0.002717	0.003943	0.004655	0.003413	0.004965	0.001862	0.002172	0.002793
6/20/2016	0.002965	0.002794	0.004084	0.007758	0.011792	0.007137	0.001862	0.002172	0.003103
6/21/2016	0.002742	0.002838	0.004107	0.004655	0.004344	0.005586	0.001862	0.002482	0.003103
6/22/2016	0.002788	0.003015	0.004167	0.004655	0.003724	0.005275	0.001862	0.002482	0.003103
6/23/2016	0.002754	0.003106	0.004049	0.004655	0.003724	0.005275	0.001862	0.002482	0.003103
6/24/2016	0.002800	0.003233	0.004167	0.004344	0.004034	0.005586	0.001862	0.002793	0.003413
6/25/2016	0.002800	0.003093	0.003914	0.004344	0.003724	0.004965	0.001862	0.002482	0.003103
6/26/2016	0.002533	0.002891	0.003608	0.004034	0.003413	0.004344	0.001862	0.002482	0.003103
6/27/2016	0.003048	0.002951	0.003904	0.004965	0.004344	0.005275	0.001862	0.002482	0.002793
6/28/2016	0.002922	0.002808	0.003970	0.004344	0.003413	0.005275	0.001862	0.002482	0.002793
6/29/2016	0.002715	0.003026	0.003883	0.004344	0.013033	0.007447	0.001862	0.002482	0.003103
6/30/2016	0.002250	0.002992	0.003424	0.003103	0.003413	0.004034	0.001862	0.002482	0.002793
7/1/2016	0.002390	0.003046	0.003404	0.003103	0.005275	0.004965	0.001862	0.002793	0.002793
7/2/2016	0.002570	0.003058	0.003811	0.003413	0.005275	0.004965	0.001862	0.002482	0.002793
7/3/2016	0.002654	0.002997	0.004042	0.003724	0.003724	0.004965	0.001862	0.002482	0.003103
7/4/2016	0.002742	0.002994	0.004289	0.004965	0.003724	0.005586	0.001862	0.002482	0.003103
7/5/2016	0.002172	0.003139	0.003650	0.003413	0.004965	0.004965	0.001862	0.002793	0.003103

Location West Plant
Serial # UM10397

	Average			Max			Min		
Date	Iran	Vert	Long	Iran	Vert	Long	Iran	Vert	Long
6/7/2016	0.00332	0.002644	0.005008	0.007447	0.014584	0.011171	0.002793	0.001552	0.002172
6/8/2016	0.00327	0.002608	0.004215	0.025135	0.041581	0.031651	0.002482	0.001862	0.001552
6/9/2016	0.00321	0.002517	0.004173	0.004965	0.004344	0.007447	0.002482	0.001862	0.001862
6/10/2016	0.00321	0.002513	0.003753	0.006516	0.010550	0.007137	0.002482	0.001862	0.001862
6/11/2016	0.00321	0.002557	0.003854	0.007137	0.003724	0.009620	0.002482	0.001862	0.001862
6/12/2016	0.00326	0.002593	0.004098	0.005586	0.004344	0.011481	0.002482	0.001862	0.001862
6/13/2016	0.00324	0.002569	0.003942	0.004965	0.003724	0.006516	0.002482	0.001862	0.001862
6/14/2016	0.00322	0.002610	0.004157	0.007137	0.005586	0.010240	0.002482	0.001862	0.001862
6/15/2016	0.00325	0.002596	0.004171	0.004344	0.003413	0.007137	0.002482	0.001862	0.001862
6/16/2016	0.00352	0.002655	0.004147	0.015515	0.008378	0.009930	0.002482	0.001862	0.001552
6/17/2016	0.00356	0.002666	0.004281	0.004344	0.003413	0.008068	0.002793	0.001862	0.001862
6/18/2016	0.00362	0.002680	0.004512	0.004655	0.003413	0.007758	0.002793	0.001862	0.001862
6/19/2016	0.00381	0.002694	0.004720	0.004655	0.003724	0.008378	0.002793	0.001862	0.001552
6/20/2016	0.00427	0.002888	0.004987	0.066406	0.072302	0.067027	0.003413	0.001862	0.002172
6/21/2016	0.00399	0.002505	0.004196	0.004965	0.003413	0.007758	0.003103	0.001862	0.001862
6/22/2016	0.00402	0.002572	0.004126	0.005586	0.003413	0.008378	0.003103	0.001862	0.001552
6/23/2016	0.00397	0.002443	0.003567	0.004655	0.003103	0.006516	0.003413	0.001862	0.001862
6/24/2016	0.00403	0.002517	0.004062	0.004965	0.003413	0.008378	0.003413	0.001862	0.001862
6/25/2016	0.00388	0.002488	0.003694	0.005275	0.003413	0.007137	0.003103	0.001862	0.001862
6/26/2016	0.00381	0.002263	0.003247	0.006827	0.003724	0.006516	0.003103	0.001862	0.001862
6/27/2016	0.00402	0.002522	0.004127	0.005275	0.003413	0.007758	0.003413	0.001862	0.001862
6/28/2016	0.00417	0.002467	0.003981	0.007137	0.005586	0.007758	0.003413	0.001862	0.001552
6/29/2016	0.00430	0.002694	0.003934	0.045615	0.025135	0.052442	0.003413	0.001862	0.001552
6/30/2016	0.00370	0.002234	0.002425	0.008689	0.004965	0.005586	0.003103	0.001862	0.001862
7/1/2016	0.00371	0.002473	0.003105	0.010861	0.015826	0.020170	0.003103	0.001862	0.001862
7/2/2016	0.00390	0.002495	0.003692	0.008378	0.004655	0.009620	0.003103	0.001862	0.001862
7/3/2016	0.00384	0.002505	0.003894	0.005275	0.003413	0.006827	0.003103	0.001862	0.001862
7/4/2016	0.00389	0.002619	0.004081	0.007758	0.007758	0.007137	0.003103	0.001862	0.001862
7/5/2016	0.00362	0.002264	0.002533	0.016136	0.011481	0.022652	0.003103	0.001862	0.001862

Location	Tailings Facility								
Serial #	UM10191								
	Average			Max			Min		
Date	Tran (in/s)	Vert (in/s)	Long (in/s)	Tran (in/s)	Vert (in/s)	Long (in/s)	Tran (in/s)	Vert (in/s)	Long (in/s)
6/7/2016	0.002740	0.003093	0.006640	0.003413	0.004344	0.008999	0.001862	0.002172	0.003103
6/8/2016	0.002796	0.002668	0.005199	0.009620	0.006206	0.013343	0.001862	0.001862	0.002172
6/9/2016	0.002751	0.002689	0.005292	0.003724	0.003724	0.008068	0.001862	0.001862	0.002482
6/10/2016	0.002674	0.002579	0.005011	0.003724	0.003724	0.008068	0.001862	0.001862	0.002793
6/11/2016	0.002808	0.002496	0.004956	0.004034	0.003413	0.008068	0.001862	0.001862	0.002172
6/12/2016	0.002902	0.002524	0.004990	0.004034	0.004034	0.008068	0.001862	0.001862	0.002172
6/13/2016	0.002982	0.002447	0.004636	0.004344	0.003413	0.007758	0.001862	0.001862	0.002172
6/14/2016	0.003085	0.002495	0.004825	0.004655	0.003724	0.008068	0.001862	0.001862	0.002172
6/15/2016	0.003015	0.002454	0.004847	0.004655	0.003413	0.007758	0.001862	0.001862	0.002172
6/16/2016	0.003077	0.002460	0.004810	0.010861	0.005896	0.008068	0.001862	0.001862	0.002172
6/17/2016	0.003098	0.002545	0.005026	0.004344	0.003724	0.008689	0.001862	0.001862	0.002172
6/18/2016	0.003195	0.002618	0.005423	0.004655	0.003724	0.008999	0.001862	0.001862	0.002172
6/19/2016	0.003130	0.002732	0.005745	0.004344	0.004034	0.009930	0.001862	0.001862	0.002482
6/20/2016	0.002838	0.002686	0.005647	0.014895	0.012723	0.011481	0.001862	0.001862	0.002482
6/21/2016	0.002690	0.002547	0.005833	0.003413	0.003724	0.008999	0.001862	0.001862	0.002793
6/22/2016	0.002838	0.002604	0.005893	0.016446	0.014584	0.010550	0.001862	0.001862	0.003103
6/23/2016	0.002707	0.002323	0.005161	0.004034	0.003103	0.007758	0.001862	0.001862	0.002793
6/24/2016	0.002768	0.002428	0.005454	0.003724	0.003724	0.008999	0.001862	0.001862	0.003103
6/25/2016	0.002890	0.002431	0.005391	0.006206	0.003413	0.008999	0.001862	0.001862	0.002172
6/26/2016	0.002840	0.002247	0.004863	0.003724	0.002793	0.007137	0.001862	0.001862	0.003103
6/27/2016	0.002852	0.002595	0.005547	0.005275	0.003724	0.008999	0.001862	0.001862	0.002793
6/28/2016	0.002820	0.002564	0.005326	0.004655	0.003724	0.008999	0.001862	0.001862	0.002172
6/29/2016	0.002960	0.002490	0.005262	0.013654	0.015826	0.015826	0.002172	0.001862	0.002793
6/30/2016	0.003045	0.002132	0.003493	0.004034	0.003103	0.005275	0.002172	0.001862	0.002172
7/1/2016	0.003032	0.002271	0.003657	0.003724	0.003413	0.006827	0.001862	0.001862	0.002172
7/2/2016	0.002908	0.002601	0.004860	0.004344	0.004034	0.008689	0.001862	0.001862	0.002482
7/3/2016	0.002836	0.002741	0.005253	0.004965	0.003724	0.008378	0.001862	0.001862	0.002172
7/4/2016	0.002835	0.003050	0.005646	0.004655	0.004344	0.008999	0.001862	0.001862	0.002172
7/5/2016	0.002903	0.002911	0.004311	0.007447	0.006206	0.011171	0.001862	0.002482	0.003103

Location Filter Plant
Serial # UM10400

	Average			Max			Min		
Date	Iran (in/s)	Vert (in/s)	Long (in/s)	Iran (in/s)	Vert (in/s)	Long (in/s)	Iran (in/s)	Vert (in/s)	Long (in/s)
6/7/2016	0.009253	0.007792	0.011286	0.012412	0.01086	0.015205	0.002482	0.002172	0.003413
6/8/2016	0.007372	0.005593	0.008466	0.015205	0.01272	0.018618	0.001862	0.001552	0.002172
6/9/2016	0.007715	0.005806	0.008751	0.013033	0.00993	0.014584	0.002172	0.001552	0.002172
6/10/2016	0.006783	0.004776	0.007634	0.011792	0.00868	0.012723	0.003103	0.001552	0.003103
6/11/2016	0.007252	0.005720	0.008399	0.012102	0.00993	0.014584	0.001862	0.001862	0.001862
6/12/2016	0.007525	0.005866	0.008639	0.012412	0.00993	0.015515	0.001862	0.001862	0.001862
6/13/2016	0.007050	0.005686	0.007958	0.012102	0.00993	0.013654	0.001552	0.001862	0.001862
6/14/2016	0.006927	0.005854	0.007979	0.011792	0.00993	0.013964	0.001862	0.001862	0.001862
6/15/2016	0.007160	0.005992	0.008274	0.012102	0.01024	0.014274	0.001862	0.001862	0.001862
6/16/2016	0.007445	0.006171	0.008567	0.012723	0.01055	0.015205	0.001862	0.001552	0.001552
6/17/2016	0.007648	0.006319	0.008817	0.013033	0.01086	0.015515	0.001862	0.001862	0.001862
6/18/2016	0.008100	0.006581	0.009307	0.013654	0.01148	0.016136	0.001862	0.001862	0.001862
6/19/2016	0.009079	0.007174	0.010443	0.014584	0.01241	0.017688	0.002172	0.001862	0.001862
6/20/2016	0.009583	0.007633	0.011218	0.014584	0.01241	0.017377	0.004034	0.002793	0.004655
6/21/2016	0.009791	0.007730	0.011430	0.014584	0.01210	0.017688	0.004655	0.003413	0.005275
6/22/2016	0.009530	0.007525	0.011195	0.015826	0.01427	0.017067	0.004034	0.002482	0.004344
6/23/2016	0.008402	0.006521	0.009874	0.014274	0.01148	0.016446	0.004344	0.002793	0.004965
6/24/2016	0.009206	0.007241	0.010804	0.013964	0.01179	0.016757	0.004655	0.003413	0.005586
6/25/2016	0.009006	0.006913	0.010640	0.013654	0.01148	0.016446	0.003103	0.001862	0.003724
6/26/2016	0.007578	0.005537	0.008858	0.012102	0.00868	0.013654	0.004965	0.003103	0.005586
6/27/2016	0.008998	0.006897	0.010653	0.013964	0.01117	0.016446	0.003413	0.002482	0.004344
6/28/2016	0.009196	0.007057	0.010882	0.014274	0.01179	0.017067	0.003413	0.002172	0.003724
6/29/2016	0.008918	0.006727	0.010377	0.013654	0.01365	0.016136	0.003413	0.001862	0.003724
6/30/2016	0.004418	0.003122	0.004803	0.007447	0.00465	0.008068	0.002172	0.001862	0.002482
7/1/2016	0.004880	0.003092	0.005359	0.009309	0.00651	0.010861	0.002482	0.001552	0.002793
7/2/2016	0.007362	0.005382	0.008483	0.012412	0.00993	0.014584	0.002793	0.001862	0.003103
7/3/2016	0.008293	0.006339	0.009639	0.013033	0.01086	0.016136	0.002793	0.001862	0.003103
7/4/2016	0.008805	0.006691	0.010419	0.016136	0.01427	0.017377	0.003103	0.001862	0.003413
7/5/2016	0.006388	0.004206	0.007257	0.013343	0.00962	0.015205	0.002793	0.001862	0.003413