APPENDIX 8-A

Noise Modeling Report

IDM MINING LTD.

RED MOUNTAIN UNDERGROUND GOLD PROJECT

APPENDIX 8-A NOISE MODELLING REPORT

WSP Project No.: 161-02631-00

APRIL 2017

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WSP Project No.: 161-02631-00
April 2017

Report

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1 GLOSSARY

Below is a glossary of noise measurement terminology for this study.

Acoustics

Decibel (dB)	The unit of sound level and noise exposure measurement.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dB(A)	Decibels A weighted.
Z Weighting	Z weighting is a flat frequency response between 10Hz and 20kHz.
dB(Z)	Decibels Z weighted.
L_d	Average noise level during the day (usually 7h to 19h).
$LA_{eq,t}$	Equivalent continuous sound pressure level. A measure of the average sound pressure level during a period of time, t, in dB with 'A' weighting.
L_{Peak}	The maximum value reached by the sound pressure at any instant during a measurement period (in dB usually with C frequency weighting).
Acoustic Calibrator	An instrument that provides a reference noise source that is used to calibrate and check the performance of a Sound Level Meter.
IEC 61672:2002	The International standard for Sound Level Meter and Integrating Averaging Sound Level Meters, has superseded both IEC 60651 and IEC 60804.

Vibration

Overpressure	Large air displacement produced by a rapid displacement of large masses of rock due to blasting activities.
Kg of explosive per delay	Amount of explosive material (in kg) allowed to react in a 8 millisecond period.
mm/s	Millimetres per second. Standard measuring units of vibratory impact for blasting operations.

2 INTRODUCTION

IDM Mining Ltd. (IDM, the Proponent) proposes to develop and operate the Red Mountain Underground Gold Project (the Project), an underground gold mine in the Bitter Creek Valley on a contiguous group of mineral tenures known collectively as the Red Mountain property, located near Stewart, in northwest British Columbia (Figure 2-1). The Project will extract high-grade gold and silver ore to be processed on-site.

The Project will be composed of two main areas with interconnecting access roads: the Mine Site with an underground mine and dual portal access at the upper elevations of Red Mountain; and Bromley Humps situated in the Bitter Creek valley, with a Process Plant and Tailings Management Facility (TMF). This environmental noise study supports the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application/EIS) to identify and assess potential environmental effects resulting from the Project.

The objective of this environmental noise study is to:

- Evaluate the noise effects of proposed Project components and activities, including: the Mine Site, Process Plant, and mobile and fixed mechanical equipment;
- Verify that the noise levels generated in the local study area (LSA) are within acceptable levels as established by applicable regulations; and
- Evaluate any vibration-related effects and suggest mitigation measures.

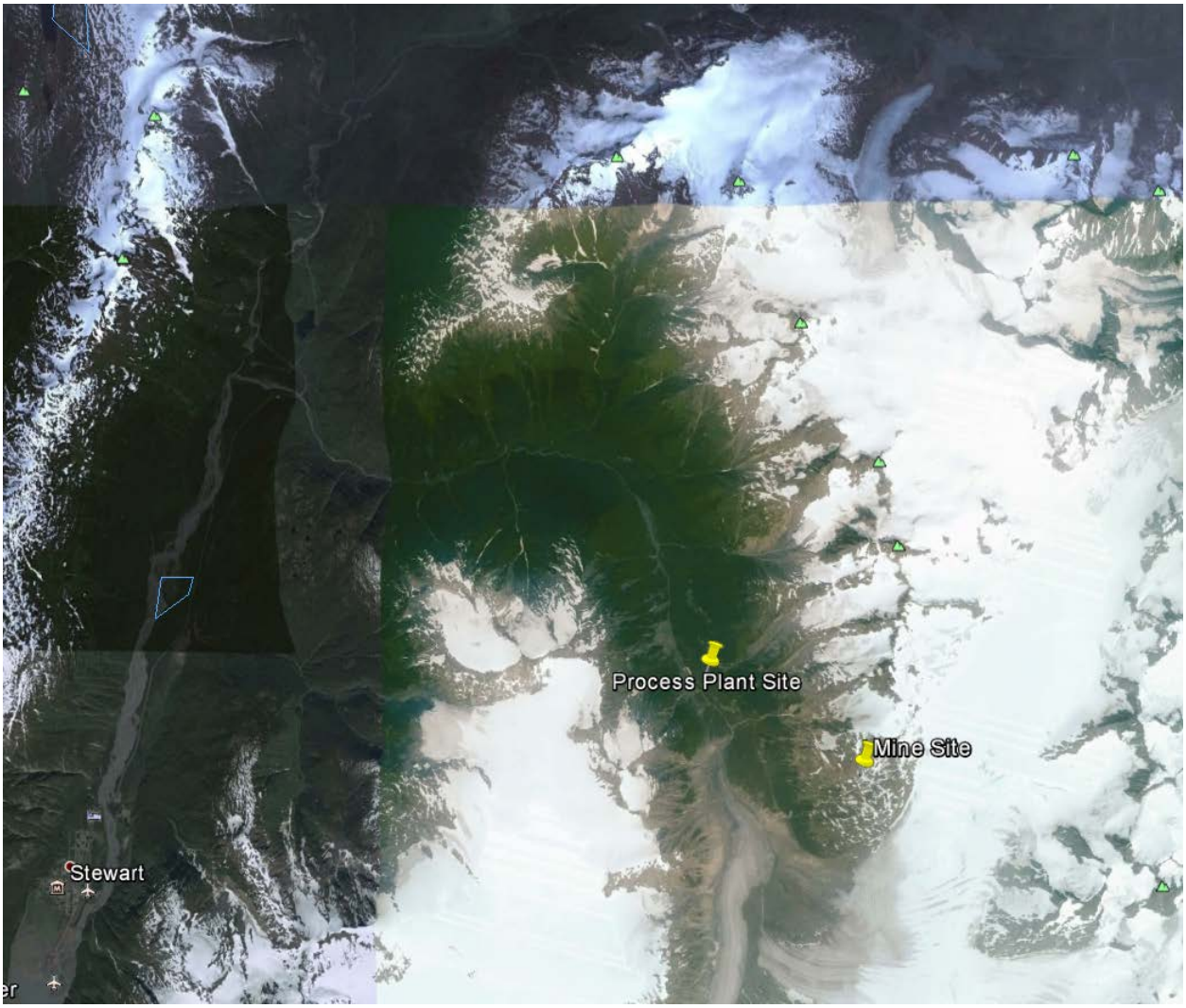

Figure 2-1 Local Study Area for the Project

3 METHODOLOGY

The methodology for estimating noise levels is as follows:

- Project-related technical information was provided by IDM, namely: topography, process description, equipment list, and location of main equipment;
- A noise model was prepared with SoundPLAN v7.4 software, using the ISO 9613-02: 1996 noise propagation standard, in order to assess the noise generated by the Project;
- Vibrations caused by operations were quantified based on standard propagation calculations (ISEE[1]) to ensure sensitive receptors are not significantly impacted by blasting operations;
- Two noise scenarios were modelled: Construction and Operation Phases;
- For the 4 sensitive receptor points, conformity to applicable regulations was assessed;
- If needed, mitigation measures were proposed that would be required in order to meet the noise criteria; and
- Findings of the noise study were summarized in a technical report.

[1] ISSE (2014),"Blasters' Handbook – 18th Edition", International Society of Explosive Engineers.

4 REGULATION

4.1 NOISE

4.1.1 MUNICIPAL REGULATION

The closest town to the Project is the District of Stewart, located approximately 15 km away, over a mountain range. District of Stewart by-law no. 669-1996[2] regulates the control of noises and sounds in the District of Stewart. However, since there are no quantitative criteria specified in the by-law, it was not considered in this study. The Project is also outside of the boundaries of the District of Stewart.

4.1.2 PROVINCIAL REGULATION

The only provincial noise regulation in British Columbia (BC) is provided by the *British Columbia Noise Control Best Practices Guideline*[3], published by BC Oil & Gas Commission. In section 1.3 (Scope Levels), it is specified that, "This guideline applies to oil and gas activities approved under the *Oil and Gas Commission Act*, the *Petroleum & Natural Gas Act*, and the *Pipeline Act*." Furthermore, in section 1.2.2: "This guideline refers to noise at the point of the receptor (dwelling), rather than at the property line". Finally, in section 2.1: "If dwelling exist within 1.5 km, the PSL (Permissible Sound Level) is determined as described below."

Considering the above statements, the remote location of the Project, and the fact that the nearest dwellings are approximately 15 km away in the District of Stewart, this regulation was not considered in this study.

4.1.3 FEDERAL REGULATION

In Canada, there is no federal legislation regarding noise levels generated by mining activities. However Environment Canada does provide a guideline noise criteria in its *Environmental Code of Practice for Metal Mines*[4], as follows:

> "In residential areas adjacent to mine sites, the equilibrium sound pressure level (L_{eq}) from mining activities should not exceed 55 dBA during the day and 45 dBA at night. Ambient noise can also affect wildlife, so sites in remote locations should also work to meet these objectives for off-site ambient noise levels."

There are no residential areas immediately adjacent to the Project. However, this guideline was used for the purposes of this study as excessive Project noise levels could affect wildlife.

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[2] District of Stewart (1996). "By-law No. 669-1996, Regulation and Control of Noises and Sound Bylaw". November 1996.
[3] BC Oil & Gas Commission (2009). "British Columbia Noise Control Best Practices Guideline". March 2009.
[4] Environment Canada (2009). "Environmental Code of Practice for Metal Mines". 2009.

4.2 BLASTING AND VIBRATION

In Canada, there is no federal legislation regarding noise and vibration levels generated by blasting activities at mines. However, the *Environmental Code of Practice for Metal Mines*[5] provides noise criteria related to blasting events from mining operations as follows:

> "Mines in areas where ground vibration and noise from blasting are not regulated should design their blasts so that the following criteria are not exceeded at or beyond the boundaries of the mine property:
>
> - Concussion noise of a maximum of 128 dB."

The assessment of potential intermittent blasting during the Construction Phase uses this limit (see Section 8). Further limits may be considered for the effects to Wildlife Habitat.

High vibration levels may also be generated by blasting events. Given the remote location of the Project and its distance from the closest human receptor, vibration levels from blasting are not anticipated to effect human receptors. However, the LSA includes the fish habitat and fish spawning ground along Bitter Creek. Canada's Department of Fisheries and Oceans in its *Guidelines for the Use of Explosives In or Near Canadian Fisheries Water*[6], provides criteria pertaining to vibration as listed below:

- No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swim bladder of a fish; and
- No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 $mm \bullet s^{-1}$ in a spawning bed during the period of egg incubation.

[5] Environment Canada (2009). "Environmental Code of Practice for Metal Mines". 2009.
[6] Wright, D.G., and Hopky, G.E. (1998). "Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters. Canadian Technical Report of Fisheries and Aquatic Sciences 2107." 1998.

5 RECEPTORS SUMMARY

5.1 GENERAL MINING ACTIVITIES

The Project attributable sound level is the sum of the individual source contributions at each point of reception (POR). PORs for an acoustic assessment are those locations where sound from the Project is received and assessed against applicable limits.

The objective of this assessment is to determine the predictable worst-case one hour equivalent sound level (L_{eq}, 1 hour dBA) at the worst-case POR. The worst-case POR is defined as the receptor with the greatest potential exposure to the noise sources due to proximity and direct line-of-sight.

Information provided by other environmental assessment disciplines identified the nearest human receptor as a location on a recreational hiking trail at the top of Ore Mountain. No permanent human receptors were identified, but as a measure of due diligence a receptor was placed at the District of Stewart, located 15 kilometers (km) away from the Project site. With an approximately 1,600 metre (m) in height mountain range located in between the Project and Stewart, noise was not anticipated at this nearest community. Two other PORs were considered for potential effects to Fish and Fish Habitat near the Project. Contoured noise model results were delivered for the assessment of noise effects on Wildlife Habitat.

The locations of the PORs are summarized in Table 5-1 below. All PORs were located 1.5 m above ground level.

Table 5-1 Location and Description of Receptors

RECEPTOR ID	DESCRIPTION	UTM X (m)	UTM Y (m)
H1	District of Stewart	438,365	6,200,072
H2	Top of Ore Mountain	456,755	6,207,069
F1	Bitter Creek Fish Spawning	442,787	6,210,845
F2	Bitter Creek Downstream of Tailings	452,213	6,204,487

Receptor F2 is also potentially affected by vibration caused by blasting operations in the Construction Phase.

6 NOISE SOURCE SUMMARY

This study focused on the sound emissions from the noise sources identified in the Project footprint with the potential to adversely effect potential receptors within the LSA. Receptors are mainly related to Wildlife Habitat, as there are no dwellings within 15 km radius. For the purposes of this assessment, all significant noise sources were assumed to be operating simultaneously, 24 hours in a day, as the representative worst-case scenario.

6.1 CONSTRUCTION PHASE

Table 6-1 summarizes all significant noise-generating construction equipment at the Project site and Table 6-2 summarizes the Sound Power Levels (PWL) of all the significant sources. The complete equipment noise spectra used is presented in Appendix 1. The Construction Phase was evaluated at two locations (Process Plant and mining site) separately, with the same equipment used at each location. Figure 6-1 and Figure 6-2 below show the ID and location of the noise generating sources. The sound power levels were obtained from WSP's acoustical database, which contains actual on-site measurements for identical or similar equipment during various projects.

Table 6-1 Significant Noise Sources (Construction Phase)

SOURCE ID	DESCRIPTION	SOURCE TYPE	NUMBER OF EQUIPMENT/HOUR
DOZ-1	CAT D6T Dozer	Area	1
DOZ-2	CAT D6T Dozer	Area	1
DRL-1	Top Percussion Drill – Sandvik DX800	Point	1
DRL-2	Top Percussion Drill – Sandvik DX800	Point	1
EXC-1	CAT 345D Excavator	Point	1
GEN-1	CAT XQ1000 Construction Power Plant	Point	1
LOD-1	CAT 966K Loader	Point	1
PAK-1	CAT CS56 Vibrating Packer	Area	1
TRK-1	CAT 740 Articulated Truck	Moving point	4
TRN-1	Transformer 138/25 kV	Point	1

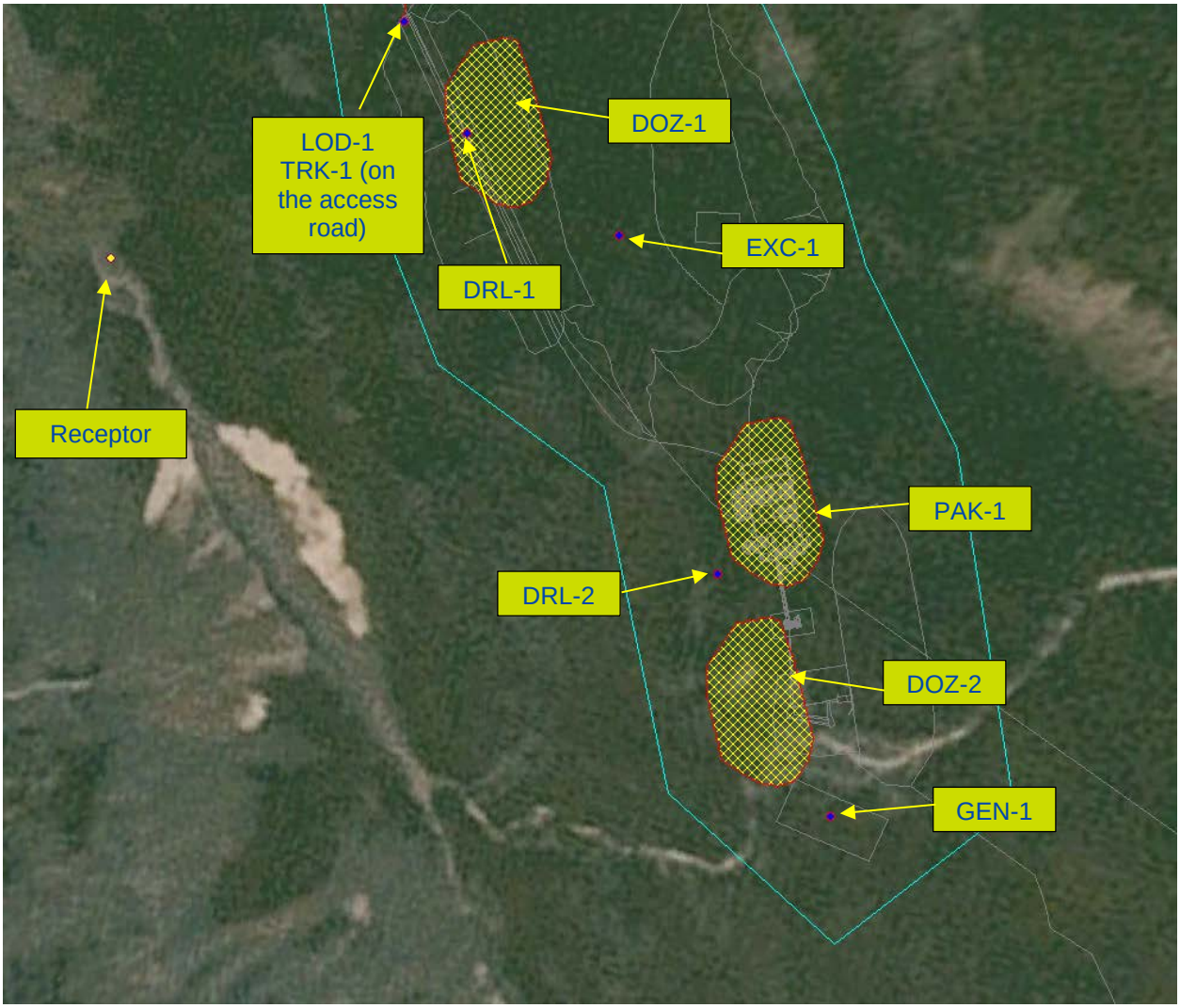

Figure 6-1 Noise Sources Location (Near Process Plant)

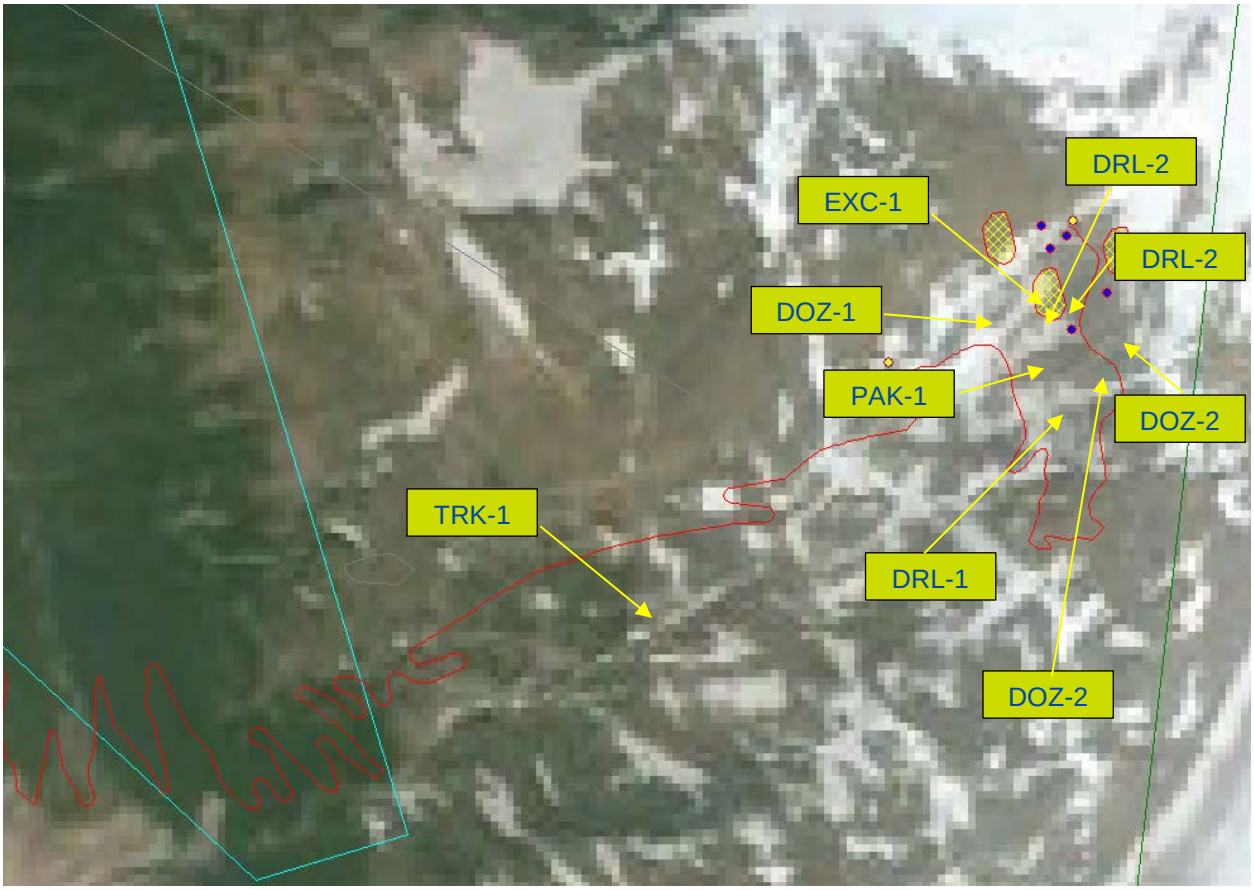

Figure 6-2 Noise Sources Location (Near Upper Portal)

Table 6-2 Equipment Sound Power Level (Construction Phase)

SOURCE ID	DESCRIPTION	SOURCE TYPE	NUMBER OF EQUIPMENT/HOUR
DOZ-1	CAT D6T Dozer	Area	1
DOZ-2	CAT D6T Dozer	Area	1
DRL-1	Top Percussion Drill – Sandvik DX800	Point	1
DRL-2	Top Percussion Drill – Sandvik DX800	Point	1
EXC-1	CAT 345D Excavator	Point	1
GEN-1	CAT XQ1000 Construction Power Plant	Point	1
LOD-1	CAT 966K Loader	Point	1
PAK-1	CAT CS56 Vibrating Packer	Area	1
TRK-1	CAT 740 Articulated Truck	Line	4
TRN-1	Transformer 138/25 kV	Point	1

6.2 OPERATION PHASE

Table 6-3 summarizes all significant noise generating equipment at the Project site, and Table 6-4 summarizes the PWL of all the significant sources. The complete equipment noise spectra are presented in Appendix 2. Figure 6-3 and Table 6-4 below shows the ID and location of the noise generating sources. The sound power levels were obtained from WSP's acoustical database, which includes actual on-site measurements for identical or similar equipment during various projects.

Table 6-3 Significant Noise Sources (Operation Phase)

SOURCE ID	DESCRIPTION	SOURCE TYPE	NUMBER OF EQUIPMENT/HOUR
CRS-1	Primary Crusher (Metso Norberg)	Point	1
CRS-2	Secondary Crusher (Cedarapids MPV380, cone)	Point	1
CRS-3	Tertiary Crusher (Cedarapids MPV380, cone)	Point	1
JCK-1	Primary Crusher Jackhammer	Point	1
LOD-1	CAT 966K Loader	Point	1
SCR-1	Screen (Cedarapids, 7x20, triple deck)	Point	1
STA-1	Smelting Furnace (Baghouse) Stack	Point	1
STA-2	Reagent-Fume Extraction Stack (7 at same location)	Point	7
STA-3	Assay Lab Stack	Point	1
STA-4	Stockpile and Reclaim Dust Collector Stack	Point	1
STA-5	Primary Crusher Dust Collector Stack	Point	1
TCK-1	Rougher Concentrate Thickener	Point	1
TNK1 to	Leach tank	Point	1
TRK-1	30T Haul Truck	Line	4
TRK-2	Sand/Plow Truck	Line	1
TRK-3	CAT 14M Grader	Line	1
TRK-4	Road Truck – 12 Wheels	Line	1
TRK-5	Water Truck	Line	1
TRN-1	Transformer 138/25 kV	Point	1
VEN-1	Upper Portal Mine Ventilator	Point	1
VEN-2	Lower Portal Mine Ventilator	Point	1

Note: Crusher models were not specified by IDM. Typical models have been used instead.

Figure 6-3 Noise Sources Location (Near Process Plant)

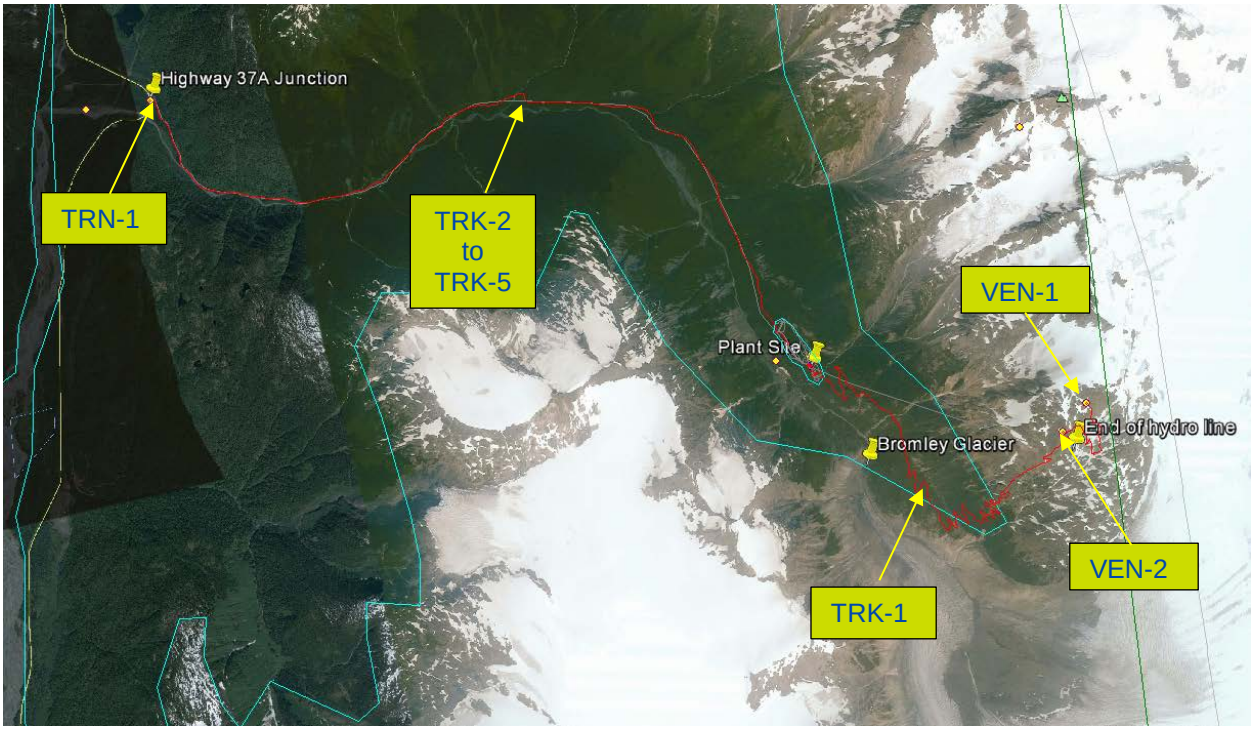

Figure 6-4 Noise Sources Location (Local Study Area)

Table 6-4 Equipment Sound Power Level (Operation Phase)

SOURCE ID	DESCRIPTION	SOUND POWER LEVEL (dBA)
CRS-1	Primary Crusher (Metso Norberg)	122
CRS-2	Secondary crusher (Cedarapids MPV380, cone)	116
CRS-3	Tertiary crusher (Cedarapids MPV380, cone)	116
JCK-1	Primary Crusher Jackhammer	126
LOD-1	CAT 966K Loader	107
SCR-1	Screen (Cedarapids, 7x20, triple deck)	116
STA-1	Smelting Furnace (Baghouse) Stack	76
STA-2	Reagent-Fume Extraction Stack (7)	82
STA-3	Assay Lab Stack	81
STA-4	Stockpile and Reclaim Dust Collector Stack	97
STA-5	Primary Crusher Dust Collector Stack	97
TCK-1	Rougher Concentrate Thickener	109
TNK1 to TNK6	Leach Tank	109

SOURCE ID	DESCRIPTION	SOUND POWER LEVEL (dBA)
TRK-1	30T Haul Truck	115
TRK-2	Sand/Plow Truck	105
TRK-3	CAT 14M Grader	118
TRK-4	Road Truck – 12 Wheels	106
TRK-5	Water Truck	103
TRN-1	Transformer 138/25 kV	66
VEN-1	Upper Portal Mine Ventilator	112
VEN-2	Lower Portal Mine Ventilator	112

6.3 INSIGNIFICANT SOURCES

There are a number of noise sources located internally within the enclosed Process Plant building that were identified as insignificant noise sources in the environment. These are:

- Ball mills;
- Vertical mill; and
- Grinding cyclones.

Underground equipment and stack exhausts with a flow of less than 1,000 CFM were not modelled. Utility vehicles (e.g., buses, pick-up trucks, etc.), the portable diesel light plants, and portable diesel heaters were also considered negligible.

7 EFFECT ASSESSMENT

The modelled sound level based on the noise sources PWL was assessed based on the worst case operating scenario, as described in Section 4. The Project sound levels were assessed against the applicable noise level guidelines. The noise levels at each receptor are below the applicable limits (both 55 dBA daytime and 45 dBA nighttime) when modelled.

7.1 NOISE MODELLING

SoundPLAN, version 7.4, was used to model the potential effect of the significant noise sources. SoundPLAN calculates sound level emissions based on the ISO 9613-2 standard “Acoustics – Attenuation of sound during propagation outdoors”. The SoundPLAN noise propagation modelled considered the following factors:

- Source PWL;
- Distance attenuation;
- Source-receptor geometry;
- Ground and air (atmospheric) attenuation; and
- Wind speed and direction.

7.2 MODELLING RESULTS

Noise contour maps are presented in Figure 7-1 and Figure 7-2. Noise levels predicted for the Construction and Operation Phases are presented in Table 7-1 and Table 7-2. Since all equipment is assumed to operate for 24 hours a day, the noise levels for day (0700 - 2300) and night (2300 - 0700) are identical.

Table 7-1 Noise Levels Predicted (Construction Phase)

RECEPTOR ID	DESCRIPTION	NOISE LEVEL PREDICTED ($LA_{eq,1h}$, dBA)	Meets Applied Noise Criteria
H1	District of Stewart	0	✓
H2	Top of Ore Mountain	13	✓
F1	Bitter Creek Fish Spawning	24	✓
F2	Bitter Creek Downstream of Tailings	44	✓

Table 7-2 Noise Levels Predicted (Operation Phase)

RECEPTOR ID	DESCRIPTION	NOISE LEVEL PREDICTED ($LA_{eq,1h}$, dBA)	Meets Applied Noise Criteria
H1	District of Stewart	0	✓
H2	Top of Ore Mountain	10	✓
F1	Bitter Creek Fish Spawning	21	✓
F2	Bitter Creek Downstream of Tailings	44	✓

An example of the modelling output file, detailing step-by-step calculations of noise effects of each of the sources for receptor F2, as well as a noise contribution list for each equipment and receptor point are attached in Appendix 3, for the operation phase.

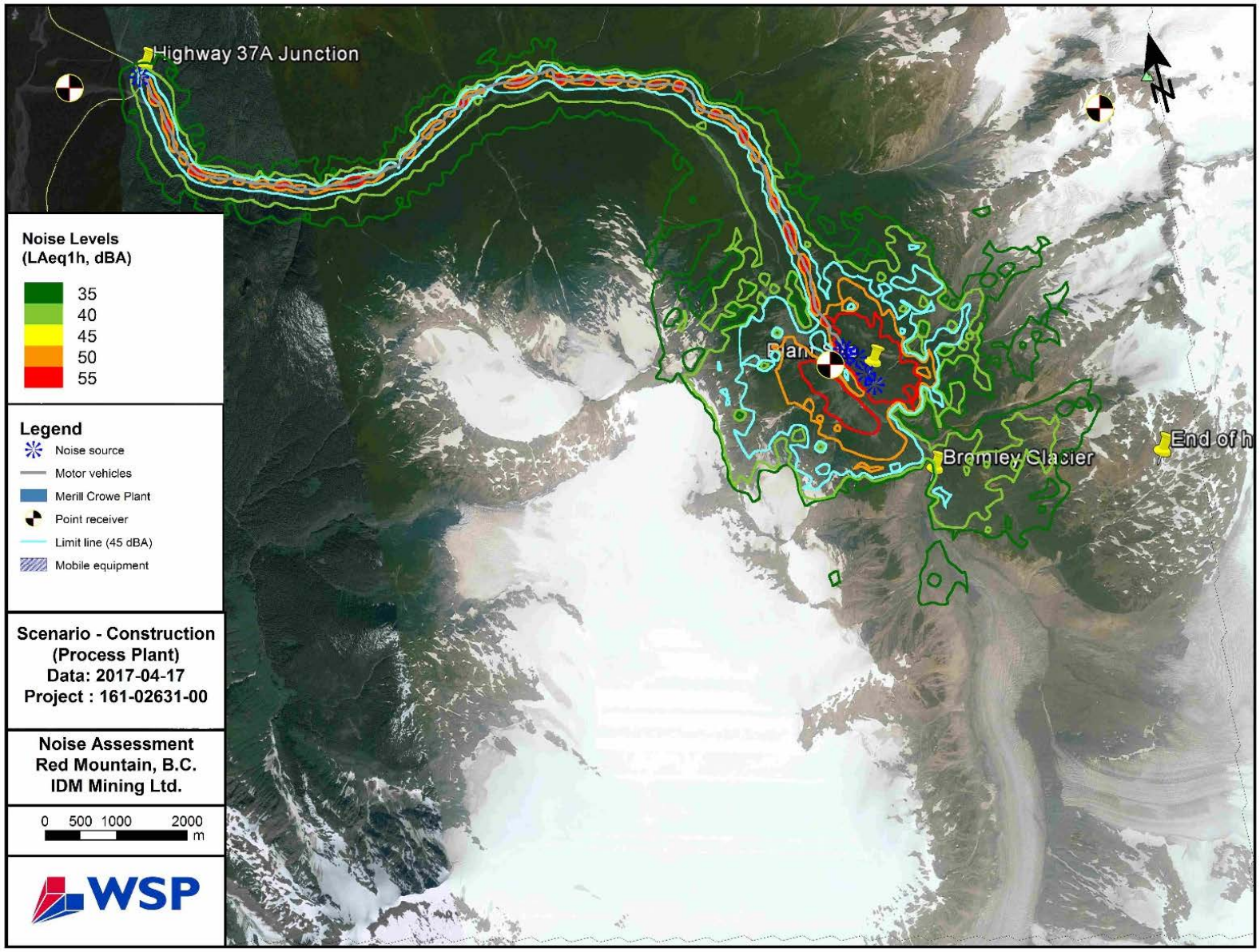

Figure 7-1 Noise Contour Map (Construction)

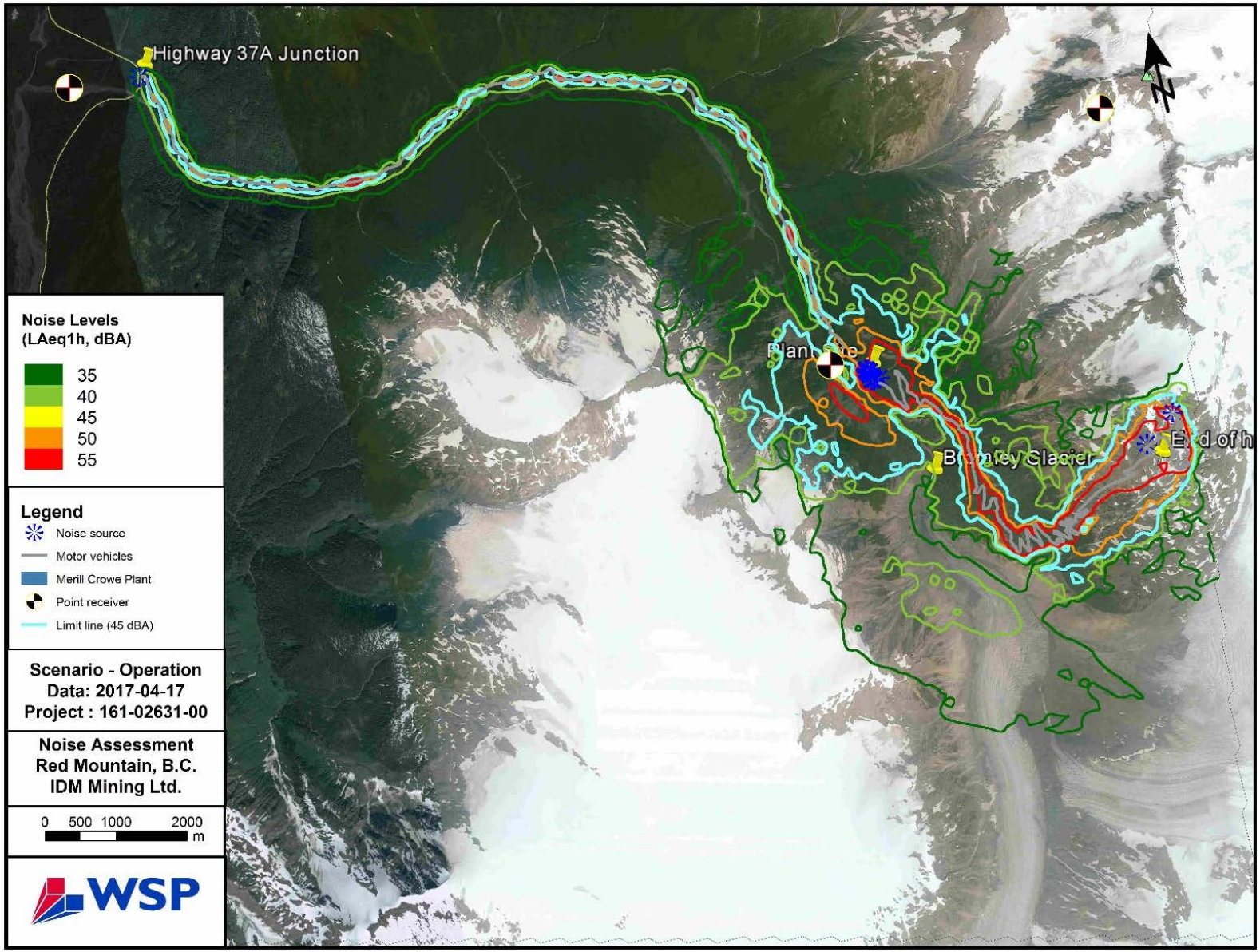

Figure 7-2 Noise Contour Map (Operation)

8 NOISE AND VIBRATION RELATED TO BLASTING

This section addresses the potential effects related to noise and vibration from blasting. In both cases, effects have been assessed for fish and human receptor protection as per the criteria in Section 4.2.

Blasting calculations have not considered any risk related to avalanches (airborne or ground borne transmitted vibration). This specific aspect and any risk related to avalanches should be analyzed by an expert related to such issues.

8.1.1 CONSTRUCTION PHASE

Calculations were completed following the same assumptions as those given for noise from other Project sources. Blasting patterns were configured to a maximum limit of 50 kg of explosives per delay. A number of blasting locations were selected along the Project footprint to represent possible blast locations. It should be noted, however, that the blasting scenario considers the predicted peak noise levels (L_{peak}) from multiple potential blast locations to provide a composite prediction of potential effects. The spatial extent of noise effects presented in Figure 8-1 is a presentation of the composite prediction from all blast locations. The effect from each individual blast or blasting location would be intermittent and restricted to only a small portion of the Construction Phase as each Project component was completed. Predicted levels above the noise threshold criteria for blasting of 128 dB (L_{peak}) is restricted to the area immediately around the blast location and therefore meets the requirement that this level is not exceeded at or beyond the boundaries of the property.

Vibrational effects were assessed the nearest fish habitat receptor location at Bitter Creek (F2). The shortest distance between the proposed location of the Process Plant and Bitter Creek is 475 m. At this distance, standard propagation calculation methods predict vibration levels close to 2 mm/s. Since the Department of Fisheries and Oceans sets a vibration limit of 13 mm/s near fish habitat, Construction activities are well below recommended limits. Vibration will be produced by other blasting activities during Construction (e.g., preparation of the main Haul Road between the Process Plant and the mine), but there are no sensitive receptors that were identified to be as close as the F2 receptor. Therefore, no significant effect is anticipated.

8.1.2 OPERATIONAL PHASE

Blasting operations related to ore fragmentation and extraction are assumed to be underground during the Operation Phase and are located away from sensitive receptors. Due to these mitigating factors and the results of the blasting assessment for Construction, effects from blasting are not anticipated during Operation.

Figure 8-1 Noise Contour Map (Blasting)

9 CONCLUSION

An assessment of the Project's attributable sound levels was completed by modelling the individual contributions of all significant noise sources as well as potential blasting locations. The noise and blasting effects from the Project sources were shown to meet the *Environmental Code of Practice for Metal Mines* sound level guidelines for daytime, nighttime, and blasting operations for both the Construction and Operation Phases.

Appendix 1

NOISE SPECTRA : CONSTRUCTION PHASE EQUIPMENT

Source ID	Description	Octave Band										
		31Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	16kHz	Global (dB)
CRS-1	Primary Crusher (Metso Norberg)	118,4	124,2	123,1	118,6	119,2	117,0	113,8	107,0	98,1	88,6	128,9
CRS-2	Secondary crusher (Cedarapids MPV380,	116,4	114,2	112,1	111,6	113,2	112,0	107,8	102,0	94,1	81,6	121,6
CRS-3	Tertiary crusher (Cedarapids MPV380, cone)	116,4	114,2	112,1	111,6	113,2	112,0	107,8	102,0	94,1	81,6	121,6
JCK-1	Primary Crusher Jackhammer	151,4	130,2	131,1	127,6	122,2	117,0	117,8	116,0	106,1		151,5
LOD-1	CAT 966K Loader	89,5	95,9	106,3	110,4	101,7	100,8	98,2	93,6	86,8	80,3	112,9
SCR-1	Screen (Cedarapids, 7x20, triple deck)	116,4	117,2	115,1	111,6	111,2	111,0	110,8	107,0	99,1	86,6	122,7
STA-1	Smelting Furnace (Baghouse) Stack		77,0	80,0	74,0	73,0	69,0	68,0	65,0	60,0		83,3
STA-2	Reagent-Fume Extraction Stack		79,0	84,0	80,0	81,0	77,0	71,0	69,0	63,0		88,0
STA-3	Assay Lab Stack		82,0	85,0	79,0	78,0	74,0	73,0	70,0	65,0		88,3
STA-4	Stockpile and Reclaim Dust Collector Stack	86,5	88,0	90,0	92,3	91,1	84,3	78,3	73,1	97,2	80,3	100,3
STA-5	Primary Crusher Dust Collector Stack	86,5	88,0	90,0	92,3	91,1	84,3	78,3	73,1	97,2	80,3	100,3
TCK-1	Rougher Concentrate Thickener	108,1	95,2	100,8	97,9	111,2	99,2	93,1	84,0	74,1	61,2	113,6
TNK1 to	Leach tank	108,1	95,2	100,8	97,9	111,2	99,2	93,1	84,0	74,1	61,2	113,6
TRK-1	30T Haul Truck	104,0	106,0	118,0	117,0	113,0	108,0	107,0	102,0	95,0	84,0	121,8
TRK-2	Sand/Plow Truck	102,9	103,9	103,9	96,9	99,9	102,9	95,9	89,9	79,9		105,0
TRK-3	CAT 14M Grader	107,4	110,4	116,4	117,4	116,4	112,4	108,4	104,4	96,4	84,4	122,7
TRK-4	Road Truck – 12 Wheels	103,8	106,0	111,1	110,2	100,2	99,5	96,3	91,9	82,0	71,8	115,1
TRK-5	Water Truck	96,0	117,0	111,0	102,0	101,0	95,0	94,0	91,0	88,0	83,0	118,2
TRN-1	Transformer 138/25 kV		42,4	64,4	68,7	67,0	56,9	50,9	38,2	28,9		72,0
VEN-1	Upper Portal Mine Ventilator		107,0	109,0	110,0	110,0	108,0	103,0	98,0	93,0		116,2
VEN-2	Lower Portal Mine Ventilator		107,0	109,0	110,0	110,0	108,0	103,0	98,0	93,0		116,2

Appendix 2

NOISE SPECTRA: OPERATION PHASE EQUIPMENT

Source ID	Description	Octave Band										Global (dB)
		31Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	16kHz	
DOZ-1	CAT D6T Dozer	106,0	109,3	113,8	109,8	110,3	111,3	108,8	106,7	96,7	87,6	119,2
DOZ-2	CAT D6T Dozer	106,0	109,3	113,8	109,8	110,3	111,3	108,8	106,7	96,7	87,6	119,2
DRL-1	Top Percussion Drill – Sandvik DX800	105,1	109,6	117,1	116,3	118,2	117,5	119,6	117,8	113,8	104,5	126,1
DRL-2	Top Percussion Drill – Sandvik DX800	105,1	109,6	117,1	116,3	118,2	117,5	119,6	117,8	113,8	104,5	126,1
EXC-1	CAT 345D Excavator	110,9	112,6	114,6	107,2	106,4	106,1	103,1	95,4	87,0	76,4	118,8
GEN-1	CAT XQ1000 Construction Power Plant	107,5	112,2	124,3	117,9	117,3	116,0	112,4	105,8	99,2	92,5	126,7
LOD-1	CAT 966K Loader	89,5	95,9	106,3	110,4	101,7	100,8	98,2	93,6	86,8	80,3	112,9
PAK-1	CAT CS56 Vibrating Packer	88,5	111,6	109,1	100,8	103,1	94,6	92,6	88,9	85,0		114,2
TRK-1	CAT 740 Articulated Truck	108,8	118,7	112,6	111,1	107,1	105,1	103,7	94,9	87,6	79,9	120,9
TRN-1	Transformer 138/25 kV		42,4	64,4	68,7	67,0	56,9	50,9	38,2	28,9		72,0

Appendix 3

NOISE CONTRIBUTION CALCULATION FOR RECEPTOR F2

Mean Propgation L_{eq}

Source	Source type	time slice	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB
Assay Lab Stack	Point	Ld			80,6	80,6		0	0	0
Assay Lab Stack	Point	Ln			80,6	80,6		0	0	0
Crusher Dust Collector Stack	Point	Ld			97,3	97,3		0	0	0
Crusher Dust Collector Stack	Point	Ln			97,3	97,3		0	0	0
Grader CAT 14M	Line	Ld			73,8	115,2	13865,8	0	0	0
Grader CAT 14M	Line	Ln			73,8	115,2	13865,8	0	0	0
Haul Truck 30T	Line	Ld			72,2	113,5	13455,1	0	0	0
Haul Truck 30T	Line	Ln			72,2	113,5	13455,1	0	0	0
Leach tank 1	Point	Ld			108,7	108,7		0	0	0
Leach tank 1	Point	Ln			108,7	108,7		0	0	0
Leach tank 2	Point	Ld			108,7	108,7		0	0	0
Leach tank 2	Point	Ln			108,7	108,7		0	0	0
Leach tank 3	Point	Ld			108,7	108,7		0	0	0
Leach tank 3	Point	Ln			108,7	108,7		0	0	0
Leach tank 4	Point	Ld			108,7	108,7		0	0	0
Leach tank 4	Point	Ln			108,7	108,7		0	0	0
Leach tank 5	Point	Ld			108,7	108,7		0	0	0
Leach tank 5	Point	Ln			108,7	108,7		0	0	0
Leach tank 6	Point	Ld			108,7	108,7		0	0	0
Leach tank 6	Point	Ln			108,7	108,7		0	0	0
Loader CAT 966K	Point	Ld			106,7	106,7		0	0	0
Loader CAT 966K	Point	Ln			106,7	106,7		0	0	0
Mine Ventilation - Stack 1 - 300000 CFM	Point	Ld			112,1	112,1		0	0	0
Mine Ventilation - Stack 1 - 300000 CFM	Point	Ln			112,1	112,1		0	0	0
Mine Ventilation - Stack 2 - 300000 CFM	Point	Ld			112,1	112,1		0	0	0
Mine Ventilation - Stack 2 - 300000 CFM	Point	Ln			112,1	112,1		0	0	0
Primary crasher - jackhammer	Point	Ld			125,9	125,9		0	0	0
Primary crasher - jackhammer	Point	Ln			125,9	125,9		0	0	0
Primary crusher - jaw	Point	Ld			121,6	121,6		0	0	0
Primary crusher - jaw	Point	Ln			121,6	121,6		0	0	0
Reagent-Fume Extraction	Point	Ld			82	82		0	0	0
Reagent-Fume Extraction	Point	Ln			82	82		0	0	0
Road Truck - 12 wheels	Line	Ld			62	103,4	13865,8	0	0	0
Road Truck - 12 wheels	Line	Ln			62	103,4	13865,8	0	0	0
Rougher concentrate thickener	Point	Ld			108,7	108,7		0	0	0
Rougher concentrate thickener	Point	Ln			108,7	108,7		0	0	0
Sand/plow truck	Line	Ld			61,1	102,5	13865,8	0	0	0
Sand/plow truck	Line	Ln			61,1	102,5	13865,8	0	0	0
Screen - triple deck	Point	Ld			116,5	116,5		0	0	0
Screen - triple deck	Point	Ln			116,5	116,5		0	0	0
Secondary crusher - cone	Point	Ld			115,8	115,8		0	0	0
Secondary crusher - cone	Point	Ln			115,8	115,8		0	0	0
Smelting Furnace - Bag House - Stack	Point	Ld			75,6	75,6		0	0	0
Smelting Furnace - Bag House - Stack	Point	Ln			75,6	75,6		0	0	0
Stockpile and Reclaim dust collector sta	Point	Ld			97,3	97,3		0	0	0
Stockpile and Reclaim dust collector sta	Point	Ln			97,3	97,3		0	0	0
Tertiary crusher - cone	Point	Ld			115,8	115,8		0	0	0
Tertiary crusher - cone	Point	Ln			115,8	115,8		0	0	0
Transformer 138/25 kV	Point	Ld			65,6	65,6		0	0	0
Transformer 138/25 kV	Point	Ln			65,6	65,6		0	0	0
Water truck	Line	Ld			59,2	100,7	13865,8	0	0	0
Water truck	Line	Ln			59,2	100,7	13865,8	0	0	0

Source	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
Assay Lab Stack	578,44	-66,2	2,2	-24,5	-2,8		0	0	-10,7	0	0	0	-10,7
Assay Lab Stack	578,44	-66,2	2,2	-24,5	-2,8		0	0	-10,7	0	0	0	-10,7
Crusher Dust Collector Stack	659,02	-67,4	2,6	-18,1	-2,7		0	0	11,8	0	0	0	11,8
Crusher Dust Collector Stack	659,02	-67,4	2,6	-18,1	-2,7		0	0	11,8	0	0	0	11,8
Grader CAT 14M	1138,1	-72,1	1,8	-16	-5,4		0	0	23,5	-13,8	0	0	5,7
Grader CAT 14M	1138,1	-72,1	1,8	-16	-5,4		0	0	23,5	-13,8	0	0	5,7
Haul Truck 30T	2177,8	-77,8	1,4	-6,1	-4,6		0	0	26,4	6	0	0	32,1
Haul Truck 30T	2177,8	-77,8	1,4	-6,1	-4,6		0	0	26,4	6	0	0	32,1
Leach tank 1	518,13	-65,3	0,8	-21,2	-1,1		0	2	24	0	0	0	24
Leach tank 1	518,13	-65,3	0,8	-21,2	-1,1		0	2	24	0	0	0	24
Leach tank 2	521,56	-65,3	0,7	-20,9	-1,1		0	2	24,1	0	0	0	24,1
Leach tank 2	521,56	-65,3	0,7	-20,9	-1,1		0	2	24,1	0	0	0	24,1
Leach tank 3	525,02	-65,4	0,7	-19,6	-1,1		0	1,9	25,3	0	0	0	25,3
Leach tank 3	525,02	-65,4	0,7	-19,6	-1,1		0	1,9	25,3	0	0	0	25,3
Leach tank 4	521,84	-65,3	0,7	-18,8	-1,1		0	1,3	25,5	0	0	0	25,5
Leach tank 4	521,84	-65,3	0,7	-18,8	-1,1		0	1,3	25,5	0	0	0	25,5
Leach tank 5	518,3	-65,3	0,7	-19,8	-1,1		0	1,4	24,7	0	0	0	24,7
Leach tank 5	518,3	-65,3	0,7	-19,8	-1,1		0	1,4	24,7	0	0	0	24,7
Leach tank 6	514,93	-65,2	0,7	-20,6	-1,1		0	1,6	24,1	0	0	0	24,1
Leach tank 6	514,93	-65,2	0,7	-20,6	-1,1		0	1,6	24,1	0	0	0	24,1
Loader CAT 966K	725,68	-68,2	2,7	-10	-1,9		0	0	29,2	0	0	0	29,2
Loader CAT 966K	725,68	-68,2	2,7	-10	-1,9		0	0	29,2	0	0	0	29,2
Mine Ventilation - Stack 1 - 300000 CFM	5077,13	-85,1	3,7	-24,9	-13		0	0	-7,3	0	0	0	-7,3
Mine Ventilation - Stack 1 - 300000 CFM	5077,13	-85,1	3,7	-24,9	-13		0	0	-7,3	0	0	0	-7,3
Mine Ventilation - Stack 2 - 300000 CFM	4769,93	-84,6	3,5	-25	-12,3		0	0	-6,3	0	0	0	-6,3
Mine Ventilation - Stack 2 - 300000 CFM	4769,93	-84,6	3,5	-25	-12,3		0	0	-6,3	0	0	0	-6,3
Primary crasher - jackhammer	648,88	-67,2	2,5	-12,2	-0,7		0	0	48,3	-20,8	0	0	27,5
Primary crasher - jackhammer	648,88	-67,2	2,5	-12,2	-0,7		0	0	48,3	-20,8	0	0	27,5
Primary crusher - jaw	652,34	-67,3	2,6	-14,9	-1,6		0	0	40,3	0	0	0	40,3
Primary crusher - jaw	652,34	-67,3	2,6	-14,9	-1,6		0	0	40,3	0	0	0	40,3
Reagent-Fume Extraction	546,79	-65,7	0,6	-7,6	-1,6		0	0	7,6	0	0	0	7,6
Reagent-Fume Extraction	546,79	-65,7	0,6	-7,6	-1,6		0	0	7,6	0	0	0	7,6
Road Truck - 12 wheels	1138,1	-72,1	1,4	-15,4	-3,9		0	0	13,4	6	0	0	15,5
Road Truck - 12 wheels	1138,1	-72,1	1,4	-15,4	-3,9		0	0	13,4	6	0	0	15,5
Rougher concentrate thickener	539,36	-65,6	1,6	-10	-1,2		0	2,1	35,6	0	0	0	35,6
Rougher concentrate thickener	539,36	-65,6	1,6	-10	-1,2		0	2,1	35,6	0	0	0	35,6
Sand/plow truck	1138,1	-72,1	2,6	-16,3	-6,5		0	0	10,2	0	0	0	6,2
Sand/plow truck	1138,1	-72,1	2,6	-16,3	-6,5		0	0	10,2	0	0	0	6,2
Screen - triple deck	624,21	-66,9	2,7	-14,8	-2,5		0	0	35,1	0	0	0	35,1
Screen - triple deck	624,21	-66,9	2,7	-14,8	-2,5		0	0	35,1	0	0	0	35,1
Secondary crusher - cone	651,44	-67,3	2,7	-15,5	-2		0	0	33,7	0	0	0	33,7
Secondary crusher - cone	651,44	-67,3	2,7	-15,5	-2		0	0	33,7	0	0	0	33,7
Smelting Furnace - Bag House - Stack	534,91	-65,6	0,9	-5,3	-2,5		0	0	3,1	0	0	0	3,1
Smelting Furnace - Bag House - Stack	534,91	-65,6	0,9	-5,3	-2,5		0	0	3,1	0	0	0	3,1
Stockpile and Reclaim dust collector sta	592,62	-66,4	2,4	-12,9	-3,8		0	0	16,5	0	0	0	16,5
Stockpile and Reclaim dust collector sta	592,62	-66,4	2,4	-12,9	-3,8		0	0	16,5	0	0	0	16,5
Tertiary crusher - cone	654,39	-67,3	2,7	-15,4	-2		0	0	33,8	0	0	0	33,8
Tertiary crusher - cone	654,39	-67,3	2,7	-15,4	-2		0	0	33,8	0	0	0	33,8
Transformer 138/25 kV										0		0	
Transformer 138/25 kV										0		0	
Water truck	1137,63	-72,1	2	-15,2	-2,5		0	0	12,8	0	0	0	8,9
Water truck	1137,63	-72,1	2	-15,2	-2,5		0	0	12,8	0	0	0	8,9

Source Contribution – Operation Scenario

	Source		LAeq (1h)				
			dB(A)				
	Receiver District of Stewart Fl GF LrD dB(A) LrN dB(A)						
	Assay Lab Stack						
	Crusher Dust Collector Stack						
	Grader CAT 14M						
	Haul Truck 30T						
	Leach tank 1						
	Leach tank 2						
	Leach tank 3						
	Leach tank 4						
	Leach tank 5						
	Leach tank 6						
	Loader CAT 966K						
	Mine Ventilation - Stack 1 - 300000						
	Mine Ventilation - Stack 2 - 300000						
	Primary crasher - jackhammer						
	Primary crusher - jaw						
	Reagent-Fume Extraction						
	Road Truck - 12 wheels						
	Rougher concentrate thickener						
	Sand/plow truck						
	Screen - triple deck						
	Secondary crusher - cone						
	Smelting Furnace - Bag House -						
	Stockpile and Reclaim dust						
	Tertiary crusher - cone						
	Transformer 138/25 kV						
	Water truck						

Receiver F1 - Bitter Creek Fish Spawning Fl GF LrD 20,8 dB(A) LrN 20,8 dB(A)							
	Road Truck - 12 wheels	18,9					
	Sand/plow truck	12,6					
	Water truck	10,9					
	Grader CAT 14M	10,9					
	Transformer 138/25 kV	-8,2					
	Assay Lab Stack						
	Crusher Dust Collector Stack						
	Haul Truck 30T						
	Leach tank 1						
	Leach tank 2						
	Leach tank 3						
	Leach tank 4						
	Leach tank 5						
	Leach tank 6						
	Loader CAT 966K						
	Mine Ventilation - Stack 1 - 300000						
	Mine Ventilation - Stack 2 - 300000						
	Primary crasher - jackhammer						
	Primary crusher - jaw						
	Reagent-Fume Extraction						
	Rougher concentrate thickener						
	Screen - triple deck						
	Secondary crusher - cone						
	Smelting Furnace - Bag House -						
	Stockpile and Reclaim dust						
	Tertiary crusher - cone						

Receiver F2 - Bitter Crk. Down Stream of Tailings Fl GF LrD 44,4 dB(A) LrN 44,4 dB(A)							
	Primary crusher - jaw	40,3					
	Rougher concentrate thicke	35,6					
	Screen - triple deck	35,1					
	Tertiary crusher - cone	33,8					
	Secondary crusher - cone	33,7					
	Haul Truck 30T	32,1					
	Loader CAT 966K	29,2					
	Primary crasher - jackhamr	27,5					
	Leach tank 4	25,5					
	Leach tank 3	25,3					
	Leach tank 5	24,7					
	Leach tank 2	24,1					
	Leach tank 6	24,1					
	Leach tank 1	24					
	Stockpile and Reclaim dust	16,5					
	Road Truck - 12 wheels	15,5					
	Crusher Dust Collector Sta	11,8					
	Water truck	8,9					
	Reagent-Fume Extraction	7,6					
	Sand/plow truck	6,2					
	Grader CAT 14M	5,7					
	Smelting Furnace - Bag Ho	3,1					
	Mine Ventilation - Stack 2 -	-6,3					
	Mine Ventilation - Stack 1 -	-7,3					
	Assay Lab Stack	-10,7					
	Transformer 138/25 kV						

	Receiver F3 - Top of Otter Mtn - Highest point Fl GF LrD 10,0 dB(A) LrN 10,0 dB(A)						
	Primary crusher - jaw	5,5					
	Haul Truck 30T	0,6					
	Mine Ventilation - Stack 1 -	-1,4					
	Screen - triple deck	-1,6					
	Secondary crusher - cone	-1,9					
	Tertiary crusher - cone	-1,9					
	Mine Ventilation - Stack 2 -	-2,8					
	Primary crasher - jackhamr	-5,4					
	Road Truck - 12 wheels	-6,5					
	Rougher concentrate thicke	-6,9					
	Leach tank 1	-7,1					
	Leach tank 6	-7,1					
	Leach tank 2	-7,2					
	Leach tank 5	-7,2					
	Leach tank 3	-7,2					
	Leach tank 4	-7,2					
	Loader CAT 966K	-8,4					
	Water truck	-11,6					
	Grader CAT 14M	-18,1					
	Sand/plow truck	-19,2					
	Stockpile and Reclaim dust	-23,6					
	Crusher Dust Collector Sta	-23,7					
	Assay Lab Stack	-32,1					
	Reagent-Fume Extraction	-33,7					
	Smelting Furnace - Bag Ho	-39,4					
	Transformer 138/25 kV						