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Acoustics
Noise
Vibration

Noise Impact Study
project number: 11007

Hidden Quarry

Rockwood Ontario

Prepared for:

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1 Introduction

Aercoustics Engineering Limited has been retained by James Dick Construction Limited to carry out an environmental noise impact study for the subject quarry in the Township of Guelph-Eramosa, Ontario.

The purpose of this study is to assess the noise impact of the proposed quarry on the neighbouring residences. It has been prepared in accordance with the Aggregate Resources Act requirement for noise assessment. An area location map is given in Figure 1 which illustrates the designated calculation locations for processing noise (i.e. R1 through R19). An operational plan is shown in Figure 2A and 2B which identifies the extraction boundaries, phasing, equipment locations, and proposed direction of extraction.

2 Background Information

The background information used in evaluating the noise impact of this quarry is taken from the Aercoustics Engineering Limited database which comprises information obtained from acoustic performance measurement surveys conducted for numerous processing plants, pits, and quarries throughout Ontario. The proposed equipment type and operation is similar to a number of other sites. In order to assess the noise and vibration impact of the proposed quarry, it was necessary to conduct site and terrain specific noise modelling of work patterns, phasing and proposed equipment operation. Operation of peak period activity under both start-up conditions and operation at the extraction limits were modelled at the designated calculation locations identified in this study.

Site-specific information pertaining to this proposed quarry is as follows:

1. The proposed hours of full operation are normally:
    - 0600-1800 hours for shipping
    - 0700-1900 for drilling, processing, and extraction
2. The quarry extraction stages will be phased as shown in Figure 2A and 2B, with sand and gravel extraction occurring during Stage 1, and dolomite extraction occurring in Stage 2.
3. The operation will entail the use of the following equipment:
    - processing plant, crusher, screens, wash plant (700,000 tonnes per year)
    - delivery trucks
    - 1 extraction front end loader
    - 1 sales/shipping loader
    - 1 dragline (8 yard)

- 1 hydraulic drill
- Bulldozer/backhoe/scraper for site preparation and construction
- 3 rock trucks.

4. There are no fish spawning beds in the vicinity of the quarry.

3 Criteria and Guidelines

The noise impact methodology used in this study is based on sound and vibration impact guidelines stipulated by MOE in publications NPC-205/232/233, and the Aggregate Resources Act. MOE publication NPC-115 has also been referenced accordingly in order to address construction noise due to site preparation activities such as berm construction.

In addition, ISO standard 9613-2 on sound propagation outdoors has been used to further substantiate the environmental noise assessment presented in this study.

3.1 Ambient Noise Assessment

The existing noise environment comprises mostly natural sounds, as well as road traffic noise on Highway 7, 6th Line and 5th Line. The sound level criteria at points of reception are set by the guidelines in MOE publications NPC-205/232. According to these publications, the applicable sound level limit is the greater of the lowest 1-hour Leq measured at the critical receptor or the MOE defined limit for that class designation.

Nineteen sensitive points of reception have been identified surrounding the proposed Quarry. The locations and assigned ID#s for each receptor are labelled in the Figure 1 Area Location Map.

Receptors R1, R2, R10, and R12 to R16 are exposed to elevated levels of traffic noise from Highway 7. These receptors are considered to exist in a Class 2 area, as defined by the MOE, while all others are considered to exist in a Class 3 area. Receptor classes are summarized in the following table:

Table 1: Summary of Receptor Classes

Receptor ID		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19
MOE Acoustical Class	2	•	•								•		•	•	•	•	•			
	3			•	•	•	•	•	•	•		•						•	•	•

Daytime performance limits have been established for some of these receptors based on STAMSON prediction calculations, using Ministry of Transportation (MTO) annual average daily traffic (AADT) volume data from 2007. The predicted daytime background noise level due to Highway 7 traffic at these receptors is given in Table 2. Sample calculations are provided in Appendix C.

Table 2: Daytime Performance Limit Summary for Class 2 Receptors

Receptor ID	Daytime (07:00-19:00) Performance Limit (dBA)
R2	51
R10	53
R14	53
R16	57

The applicable sound level performance limit for each receptor is summarized in Table 3:

Table 3: Summary of Sound Level Performance Limits for All Receptors

Receptor ID	Daytime (07:00-19:00) dBA	Evening (19:00-23:00) dBA	Night time (19:00-07:00) dBA
R1	50	45	45
R2	51	45	45
R3	45	40	40
R4	45	40	40
R5	45	40	40
R6	45	40	40
R7	45	40	40
R8	45	40	40
R9	45	40	40
R10	53	45	45
R11	45	40	45
R12	50	45	45
R13	50	45	45
R14	53	45	45
R15	50	45	45
R16	57	45	45
R17	45	40	40
R18	45	40	40
R19	45	40	40

The receptor height used for calculation purposes is 1.5m above the receptor area grade for daytime points of reception, and for night-time points of reception on dwellings with only one storey. A 4.5m receptor height was used in the assessment for night-time quarry operations at two-storey dwellings.

3.2 Construction and Site Preparation/Rehabilitation Noise

Construction and site preparation/rehabilitation activities will be occurring during various stages of quarrying and will include activities such as site clearing and berm construction. These activities will occur as preparation for the various stages of the operation.

These activities are considered to be exempt from satisfying the MOE stationary noise source guidelines (i.e., 'non-stationary' noise source); namely publication NPC-205/232. All construction

equipment must meet the sound emission standards defined in MOE publication NPC-115 and Guelph/Eramosa Bylaw 5001/05. The relevant background information on non-stationary noise sources as well as publication NPC-115 is given in MOE Model Municipal Noise Control Bylaw, 1978 as well as the sound source exclusions defined in MOE publications NPC 205/232, 1995

4 Recommendations

The following recommendations are provided in order to meet the applicable criteria:

- 12m and 10m high stockpiles should be maintained in certain locations around the processing plant for each phase and stage. The stockpile peaks should be located no further than 30m from the processing plant, and should be located such that, in plan, they block line-of-sight between processing plant equipment and sensitive receptors, as described in the table below:

Table 4: Recommended Stockpile Height and Position

Stockpiles Positioned to Shield Receptor IDs	Minimum Stockpile Height (m)
R1, R15, R16, R17, R18	10
R3, R4, R5, R11, R19	12

This configuration is illustrated on Figure 3.

- A quiet drill with a maximum sound power rating of 112dBA should be used. This corresponds to a maximum sound pressure level rating of 75dBA at 30 meters.

- Earth berms should be constructed to the elevations shown and located as shown on Figure 3.

- The recommended direction of extraction is indicated on Figure 3.

- The permanent processing plant area should be established at an elevation of 349m, and a haul route trench connecting the processing plant area to the Stage 1 Phase 1 extraction area should be excavated to the same 349m elevation.

- All construction equipment used in site preparation/construction must meet the sound emission standards defined in MOE publication NPC-115 and Guelph/Eramosa Bylaw 5001/05. The relevant background information on non-stationary noise sources as well as publication NPC-115 is given in MOE Model Municipal Noise Control Bylaw, 1978 as well as the sound source exclusions defined in MOE publications NPC 205/232, 1995, included in the attached.

5 Noise Level Predictions

The general operation of the proposed quarry is discussed in Section 2.0. Equipment sound power levels and source heights are listed in Table 5 and are based on information in the Aercoustics Engineering Limited pits and quarries noise emission database.

Table 5: Summary of Stationary Source Sound Power Levels

Source ID	Source Description	Sound Power Level (dBA)	Effective Source Height (m)
S1	Processing Plant	123	3
S2	Shipping Loader	107	2.5
S3	Drill	112	1.5
S4	Shipping Truck	103	1.5
S5	Extraction Loader	107	2.5
S6	Quarry Truck	112	2.5

From this information, the source to receptor geometry can be established in order to facilitate noise level calculations and design any mitigation measures such as shielding berms and stockpiles.

The noise impact prediction calculations were performed using the DataKustik CadnaA environmental noise prediction software. The calculations are based on established prediction methods; ISO 9613-2: A Standard for Outdoor Noise Propagation standard. The noise impact predictions assumed downwind propagation conditions as defined by the standard.

Table 6 shows a summary of impacts that are predicted to occur with the implementation of recommendations given in Section 4 of this report.

Table 6: Summary of Predicted Impacts

		Worst Case Impact From Source							
Receptor ID	Time Period	Processing Plant (dBA)	Shipping Loader (dBA)	Shipping Truck (dBA)	Extraction Loader (dBA)	Rock Trucks (dBA)	Drill (dBA)	Overall (dBA)	Limit (dBA)
R1	Day	43	33	25	34	33	34	45	50
	Night	N/A	34	26	N/A	N/A	N/A	34	45
R2	Day	46	31	22	32	31	32	47	51
	Night	N/A	31	22	N/A	N/A	N/A	31	45
R3	Day	36	20	26	39	39	40	43	45
	Night	N/A	20	26	N/A	N/A	N/A	27	40
R4	Day	35	19	22	35	35	36	40	45
	Night	N/A	19	22	N/A	N/A	N/A	24	40
R5	Day	34	17	20	36	36	35	40	45
	Night	N/A	17	20	N/A	N/A	N/A	22	40
R6	Day	39	15	13	28	30	30	40	45
	Night	N/A	15	13	N/A	N/A	N/A	16	40
R7	Day	39	24	14	29	30	30	40	45
	Night	N/A	24	16	N/A	N/A	N/A	24	40
R8	Day	39	24	15	30	30	31	41	45

		Worst Case Impact From Source							
Receptor ID	Time Period	Processing Plant (dBA)	Shipping Loader (dBA)	Shipping Truck (dBA)	Extraction Loader (dBA)	Rock Trucks (dBA)	Drill (dBA)	Overall (dBA)	Limit (dBA)
	Night	N/A	24	16	N/A	N/A	N/A	25	40
R9	Day	40	25	16	31	31	32	41	45
	Night	N/A	25	16	N/A	N/A	N/A	25	40
R10	Day	46	31	20	36	36	38	48	53
	Night	N/A	31	20	N/A	N/A	N/A	31	45
R11	Day	35	19	23	37	37	37	41	45
	Night	N/A	19	23	N/A	N/A	N/A	24	40
R12	Day	46	31	22	36	37	41	48	50
	Night	N/A	31	22	N/A	N/A	N/A	32	45
R13	Day	43	29	18	37	40	45	48	50
	Night	N/A	29	18	N/A	N/A	N/A	30	45
R14	Day	47	31	19	35	36	37	48	53
	Night	N/A	31	19	N/A	N/A	N/A	31	45
R15	Day	42	29	24	37	35	37	44	50
	Night	N/A	29	24	N/A	N/A	N/A	30	45
R16	Day	46	38	25	38	34	38	48	57
	Night	N/A	38	25	N/A	N/A	N/A	38	45
R17	Day	37	25	19	31	31	32	40	45
	Night	N/A	25	20	N/A	N/A	N/A	27	40
R18	Day	41	29	25	34	33	34	43	45
	Night	N/A	29	26	N/A	N/A	N/A	31	40
R19	Day	35	19	23	39	39	39	43	45
	Night	N/A	19	23	N/A	N/A	N/A	24	40

Note: The listed noise levels represent the maximum predicted impact for each individual source, and the overall. It should be noted that the overall may not equal the sum of the source maximums, as each maximum may not occur concurrently (i.e during different stages or phases).

Sample calculations and sound level contours are given in Appendix C.

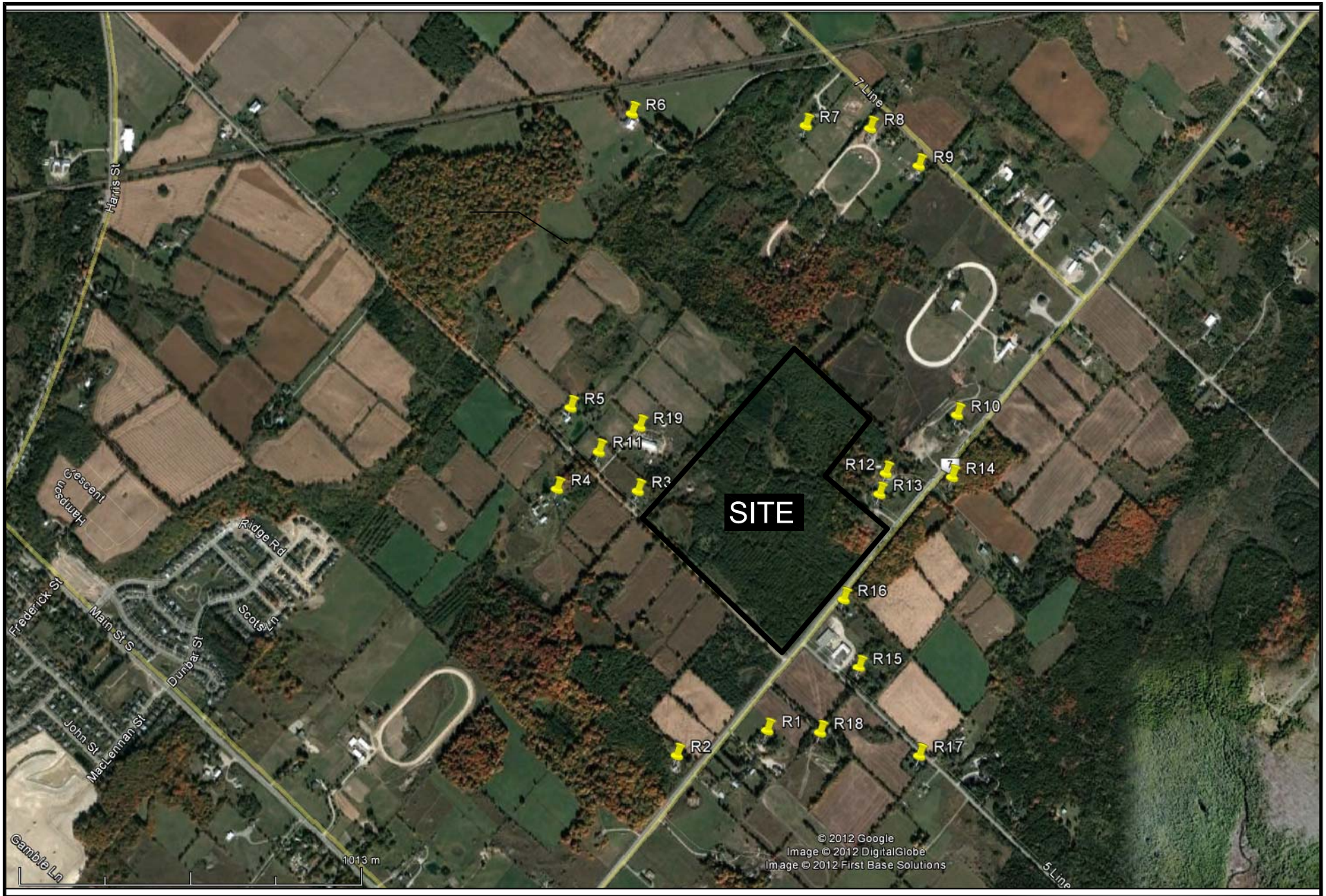
With the mitigation recommended the impacts at each sensitive point of reception are predicted to satisfy the applicable MOE limits.

6 Conclusions

Aercoustics Engineering Limited has been retained by James Dick Construction Limited to carry out an environmental noise impact study for the subject quarry in the Township of Guelph-Eramosa, Ontario.

Receptor locations have been identified, and criteria have been established for each. Recommendations have been provided which include the implementation and enforcement of stockpile, earth berm, and direction of extraction requirements, pneumatic drill sound level limitations, and processing plant positioning requirements.

With the implementation of these recommendations, it has been demonstrated that the applicable criteria are satisfied.



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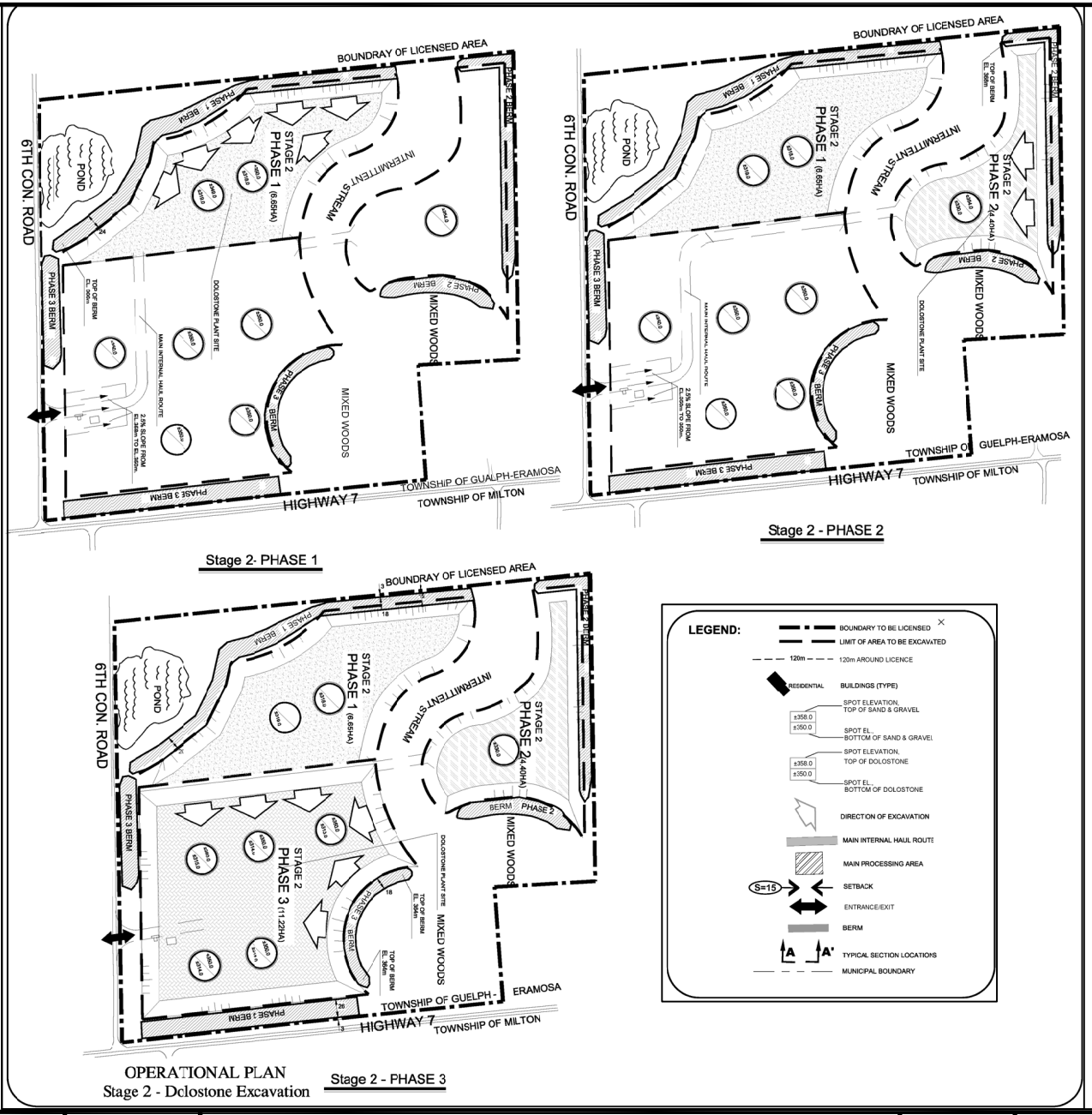
Eramosa Quarry
Figure 1: Area Location Map

Drawn	Eng.	Drawing
DG	VG	Area Location Map

The scope of the work outlined in this document is limited to the acoustic noise & vibration control aspects of the design. Contractor to verify all dimensions.

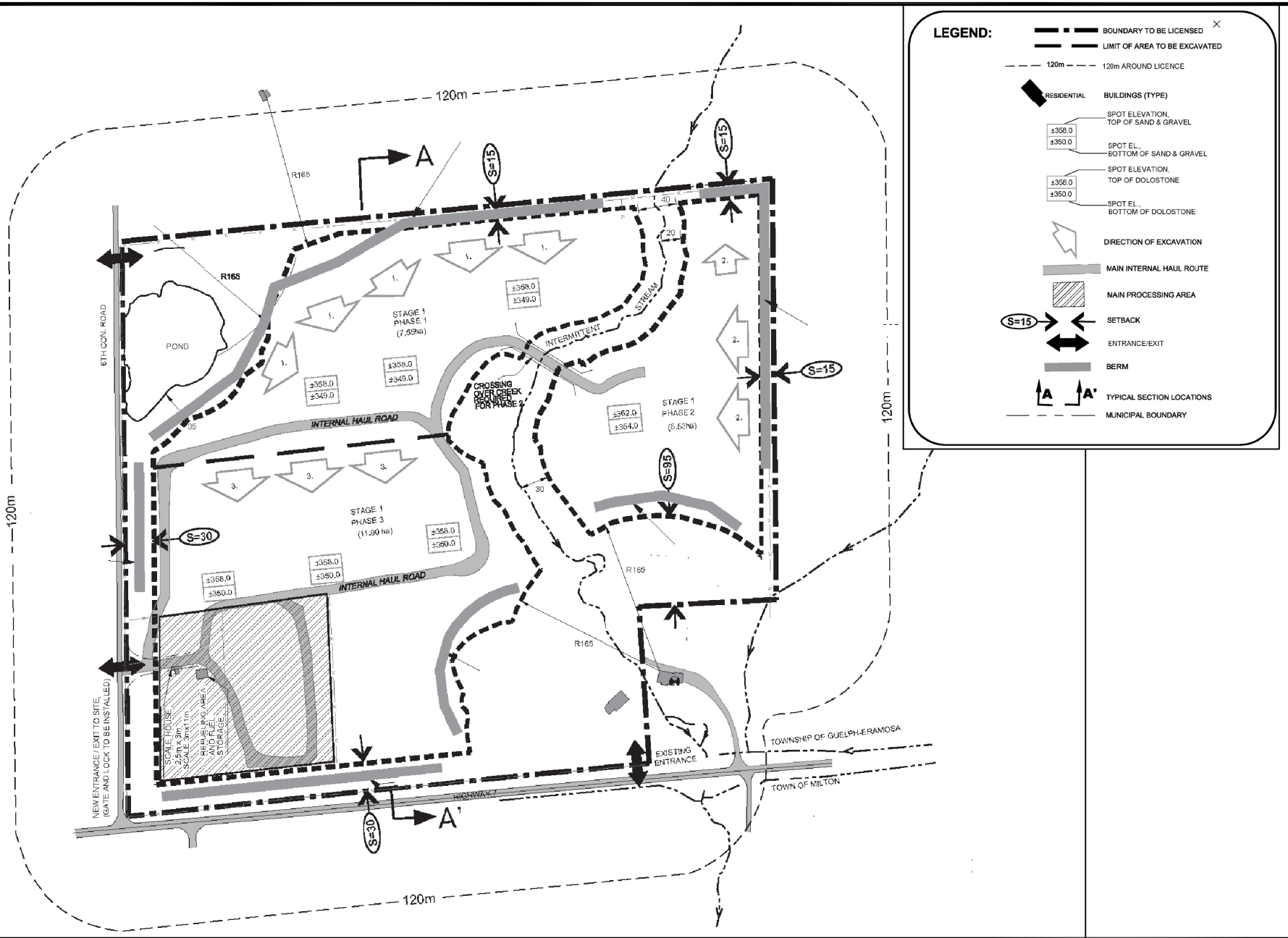
Scale	Figure
AS SHOWN	1



OPERATIONAL PLAN
Stage 2 - Dolostone Excavation

Stage 2 - PHASE 3

AERCOUSTICS ENGINEERING LIMITED	50 Ronson Drive Suite 165 Toronto Canada M9W 1B3 (416)249-3361	Eramosa Quarry Figure 2B: Stage 2 Site Plan	Drawn: DG; Eng.: VG; Drawing: S2 Site Plan The scope of the work outlined in this document is limited to the acoustic noise & vibration control aspects of the design. Contractor to verify all dimensions. Scale: AS SHOWN; Figure: 2B



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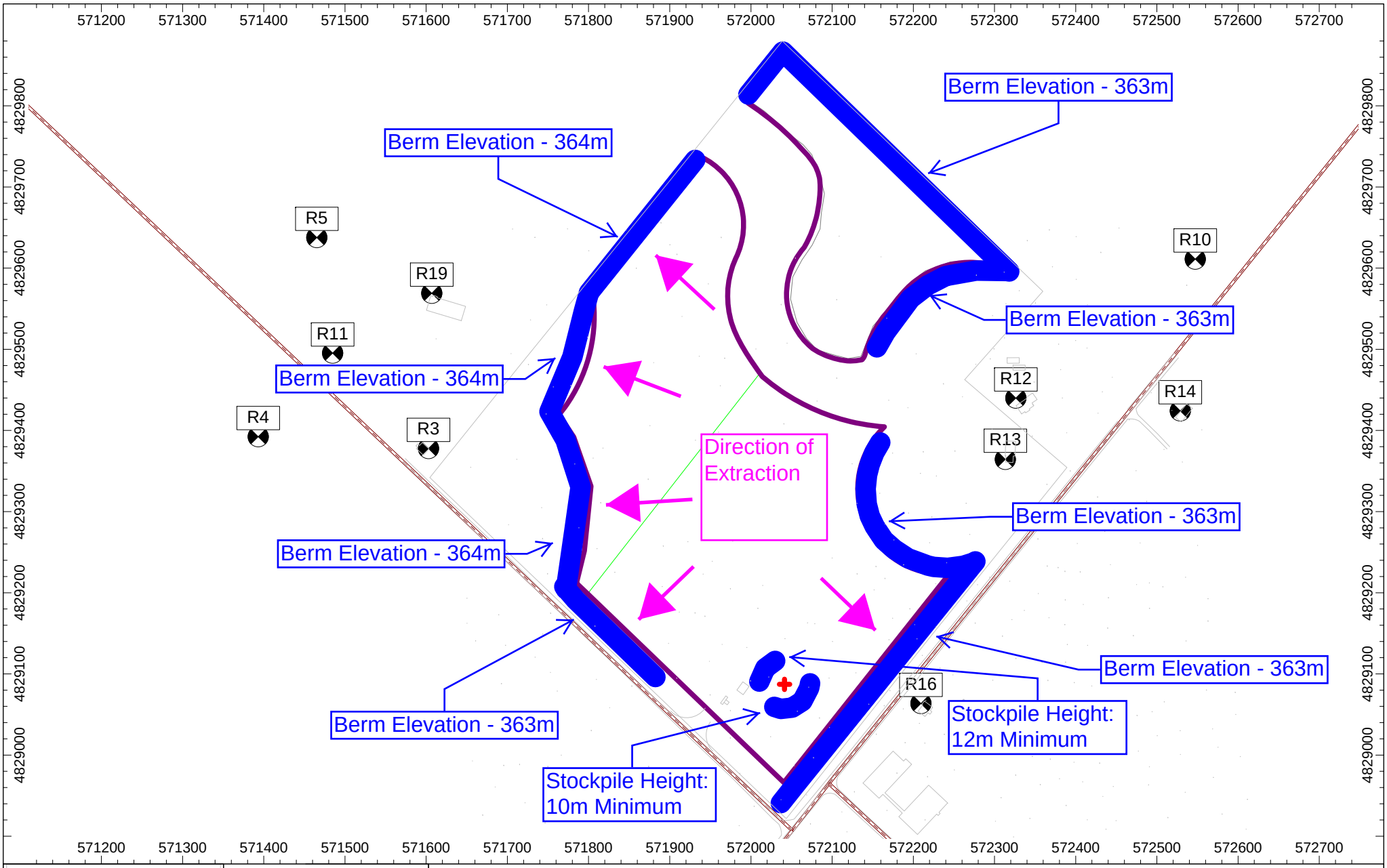
Eramosa Quarry
Figure 2A: Stage 1 Site Plan

Drawn	Eng.	Drawing
DG	VG	S1 Site Plan

The scope of the work outlined in this document is limited to the acoustic noise & vibration control aspects of the design. Contractor to verify all dimensions.

Scale	Figure
AS SHOWN	2A



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Scale: NTS
Drawn: DG
Eng: VG
Date: Jul 13, 2012

The scope of the work outlined in this document is limited to the acoustic, noise, and/or vibration control aspects of the design. Contractors to verify all dimensions

Project:
Eramosa Quarry

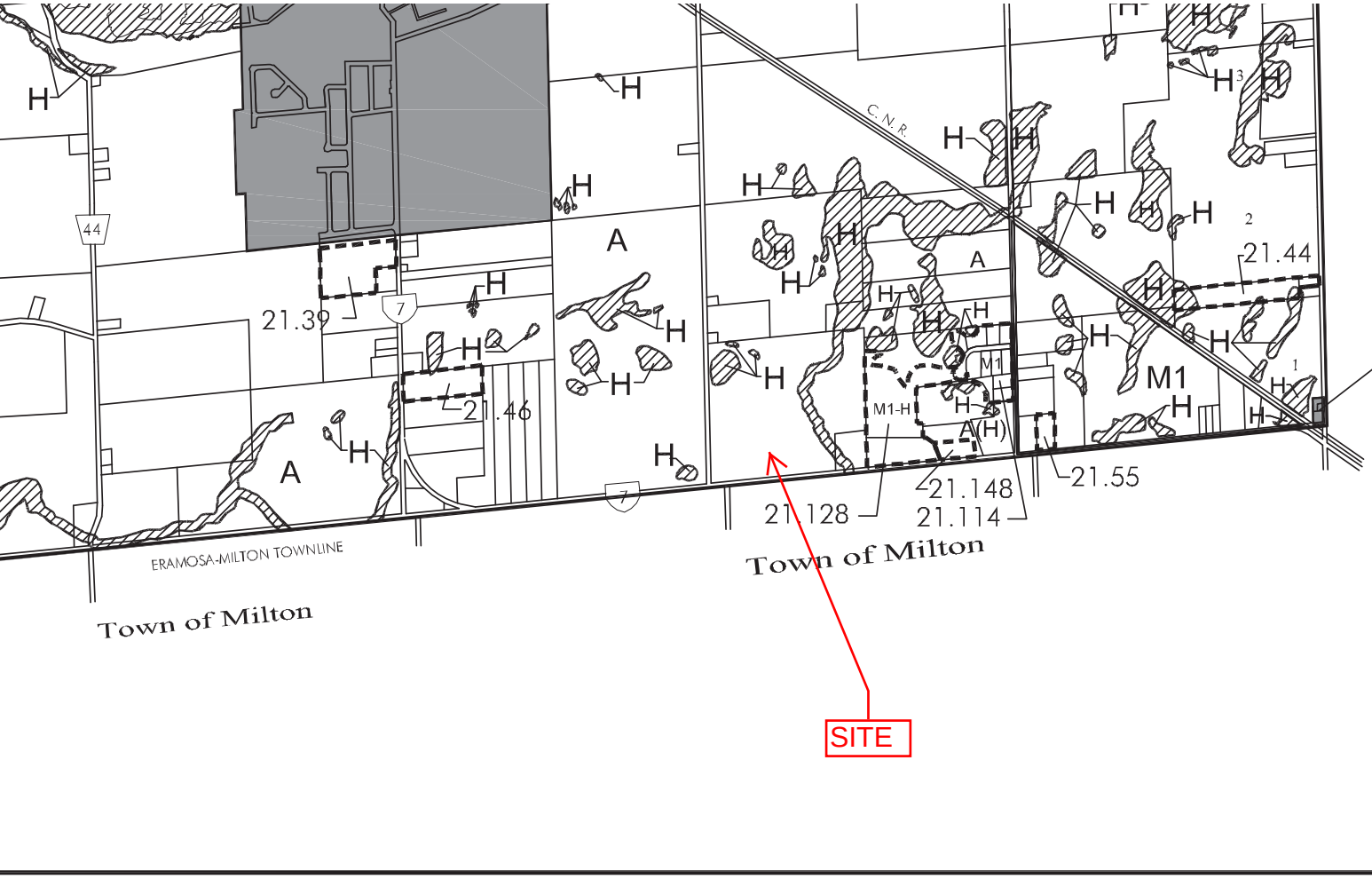
Project Number: 11107

Drawing Title:
Recommended Noise Controls

Figure: 3

Appendix A

Zoning Map



LEGEND

A	Agricultural
R1	Village Residential Low Density
R2	Village Residential Medium Density
RR	Rural Residential
C1	Village Commercial
C2	Village Service Commercial
C3	Hamlet Mixed Use
C4	Highway Commercial
I	Institutional
M1	Rural Industrial
M2	Agricultural Business
M3	Extractive Industrial
M4	Disposal Industrial
OS	Open Space
	Hazard
	Special Provisions

NOTE: THIS SCHEDULE TO BE READ IN CONJUNCTION WITH APPLICABLE SECTIONS OF THE BY-LAW.

CONSOLIDATED TO DECEMBER 31,2009

Appendix B

Sound Power Data

Name	63	125	250	500	1000	2000	4000	8000	A	lin
Processing Plant	114	117	121	119	119	116	110	100	123	126
Cat 980H	118	113	106	102	101	100	91	93	107	120
Drill	122	114	107	104	105	106	103	98	112	124
Rock Truck passby at 30km/hr	108	109	110	109	108	106	101	97	112	117
Highway Truck (25 kph)	106	100	98	100	100	96	88	78	103	111

Appendix C

Sample Calculations

Highway	Location Description - From	Location Description - To	Dist. (km)	AADT
6	MANITOULIN/SUDBURY DIST BDY	FOSTER DR-ESPANOLA S LTS-START OF NA ESPANOLA-HWY TRANSFER	20.6	3,450
6	FOSTER DR-ESPANOLA S LTS-START OF NA ESPANOLA-HWY TRANSFER	TUDHOPE ST-ESPANOLA-END OF NA	3.9	
6	TUDHOPE ST-ESPANOLA-END OF NA	HWY 17 -HWY END END OF HWY 6	2.7	8,450
7	HWY S 417&17 IC	HAZELDEAN RD -RMOC RD 36 (S)	2.5	14,700
7	HAZELDEAN RD -RMOC RD 36 (S)	DWYER HILL RD(N)-DWYER HILL RD(S)	7.6	16,600
7	DWYER HILL RD(N)-DWYER HILL RD(S)	ASHTON STATION RD(N)-ASHTON STATION RD(S)	3.8	14,700
7	ASHTON STATION RD(N)-ASHTON STATION RD(S)	MCNEELYAVE (N)	7.0	14,700
7	MCNEELYAVE (N)	HWY 15(N)-FRANKTOWN ROAD(S)	0.6	14,700
7	HWY 15(N)-FRANKTOWN ROAD(S)	MISSISSIPPI RD(S)LANARK RD 29-TOWNLINE RD (N)	3.8	6,950
7	MISSISSIPPI RD(S)LANARK RD 29-TOWNLINE RD (N)	LANARK RD 15 -FERGUSON FALLS RD(N)	9.0	8,400
7	LANARK RD 15 -FERGUSON FALLS RD(N)	A POINT 2.6 KM W OF LANARK RD 15	2.6	6,850
7	A POINT 2.6 KM W OF LANARK RD 15	LANARK RD 43/WILSON ST(S)-CANADIAN TIRE ENT(N	18.2	9,100
7	LANARK RD 43/WILSON ST(S)-CANADIAN TIRE ENT(N	LANARK RD 511(N)	0.7	18,100
7	LANARK RD 511(N)	ANGLICAN CHURCH RD EAST(N)	10.5	4,650
7	ANGLICAN CHURCH RD EAST(N)	LANARK RD 36 -BOLINGBROOKE RD(S)-ELPHIN RD(N)	12.2	4,650
7	LANARK RD 36 -BOLINGBROOKE RD(S)-ELPHIN RD(N)	LANARK/FRONTENAC CTYBDY	4.9	4,300
7	LANARK/FRONTENAC CTYBDY	ROAD 38(S)	7.7	4,300
7	ROAD 38(S)	ROAD 509 (N)	1.3	4,900
7	ROAD 509 (N)	A POINT 11.7 KM W OF MOUNTAIN GROVE R	26.4	3,650
7	A POINT 11.7 KM W OF MOUNTAIN GROVE R	FRONTENAC/LENNOX/ADDINGTON BDY	8.3	3,650
7	FRONTENAC/LENNOX/ADDINGTON BDY	HWY 41(N)-HASTINGS RD 41(S)	5.4	3,650
7	HWY 41(N)-HASTINGS RD 41(S)	LENNOX-ADDINGTON/HASTINGS BDY	12.0	4,850
7	LENNOX-ADDINGTON/HASTINGS BDY	HWY 37-ACTINOLITE	10.0	4,850
7	HWY 37-ACTINOLITE	PIGDEN RD (N)-ST LAWRENCE STREET E (S)	10.7	3,300
7	PIGDEN RD (N)-ST LAWRENCE STREET E (S)	HWY 62	2.8	2,950
7	HWY 62	MARMORA E LTS-MALONEYST-START OF NA MARMORA	16.3	3,500
7	MARMORA E LTS-MALONEYST-START OF NA MARMORA	CROWE RIVER BR (N)-DIST BDY-END OF NA	1.3	
7	CROWE RIVER BR (N)-DIST BDY-END OF NA	MARMORA W LTS -CROWE LAKE RD	0.5	4,750
7	MARMORA W LTS -CROWE LAKE RD	FIRST RD (S)-TERRACE RD (N)	4.5	4,750
7	FIRST RD (S)-TERRACE RD (N)	HAVELOCK E LT C8-9-MARYST-START OF NA HAVELOCK	11.3	4,750
7	HAVELOCK E LT C8-9-MARYST-START OF NA HAVELOCK	RAILWAYCROSSING -END OF NA	1.8	
7	RAILWAYCROSSING -END OF NA	NORWOOD E LTS	7.7	7,600
7	NORWOOD E LTS	PETERBOROUGH RD 45	1.4	7,600
7	PETERBOROUGH RD 45	NORWOOD W LTS	0.8	7,600
7	NORWOOD W LTS	PETERBOROUGH RD 38-WESTWOOD SDRD	9.0	8,050
7	PETERBOROUGH RD 38-WESTWOOD SDRD	OTONABEE TWP RD C 3-4	5.5	9,950
7	OTONABEE TWP RD C 3-4	HWY 28(N)CTYRD 34-HERITAGE LINE(S)	4.3	11,100
7	HWY 28(N)CTYRD 34-HERITAGE LINE(S)	DRUMMOND LINE	4.3	15,000
7	DRUMMOND LINE	OTONABEE TWP RD C10-11-BURNHAM LINE	1.2	15,000
7	OTONABEE TWP RD C10-11-BURNHAM LINE	PETERBOROUGH RD 30-TELEVISION RD(N)	1.8	21,200
7	PETERBOROUGH RD 30-TELEVISION RD(N)	ASHBURNHAM DR IC	1.4	15,000
7	ASHBURNHAM DR IC	BENSFORT RD IC	1.6	15,000
7	BENSFORT RD IC	HWY 7/115 -PARKWAY	3.3	26,000

Highway	Location Description - From	Location Description - To	Dist. (km)	AADT
7	HWY 7/115 -PARKWAY	CITYRD 11-AIRPORT RD	2.4	22,900
7	CITYRD 11-AIRPORT RD	HWY 7 &S JCT HWY 115 IC	4.0	22,900
7	HWY 7 &S JCT HWY 115 IC	STEWART LINE(W)P'BORO RD 15-N MONAGHAN PWY(E)	3.6	10,100
7	STEWART LINE(W)P'BORO RD 15-N MONAGHAN PWY(E)	PETERBORO RD 5-MAPLEGROVE RD	1.4	10,100
7	PETERBORO RD 5-MAPLEGROVE RD	P'BORO RD-1 LINDSEYRD(E)KAWARTHA LAKES RD26(	7.4	11,500
7	P'BORO RD-1 LINDSEYRD(E)KAWARTHA LAKES RD26(	OMEMEE E LTS L8-9 -START OF NA OMEMEE	8.7	9,750
7	OMEMEE E LTS L8-9 -START OF NA OMEMEE	OMEMEE W LTS C/L L4 -END OF NA	2.7	
7	OMEMEE W LTS C/L L4 -END OF NA	REABORO-PEACE AVE L 10-11	6.2	7,000
7	REABORO-PEACE AVE L 10-11	HWY 36	7.0	6,850
7	HWY 36	HWY 35 E JCT(S)KAWARTHA LAKES RD 15(N)	1.5	12,400
7	HWY 35 E JCT(S)KAWARTHA LAKES RD 15(N)	KAWARTHA LK RD4-LIT BRITIAN (S)ANGELINE ST(N	1.4	12,300
7	KAWARTHA LK RD4-LIT BRITIAN (S)ANGELINE ST(N	W JCT HWY 35	4.1	6,800
7	W JCT HWY 35	ELGIN ST(N)	8.7	8,950
7	ELGIN ST(N)	FINGERBOARD RD(S)KAWARTHA LK RD 46(N)	6.2	6,900
7	FINGERBOARD RD(S)KAWARTHA LK RD 46(N)	DUR RD2-SIMC ST(S)-KAWARTHA LK RD2-SIMC ST(N)	3.1	4,200
7	DUR RD2-SIMC ST(S)-KAWARTHA LK RD2-SIMC ST(N)	N JCT HWY 12	7.0	4,200
7	N JCT HWY 12	DURHAM RD 10-BROCK TWP RD C6 (E)	2.8	8,450
7	DURHAM RD 10-BROCK TWP RD C6 (E)	ALBERT ST (W)	1.2	5,900
7	ALBERT ST (W)	DURHAM RD 6-SAINTFIELD	8.0	6,400
7	DURHAM RD 6-SAINTFIELD	HWY 47	5.8	7,800
7	HWY 47	DURHAM RD 8-PORT PERRYRD	4.2	6,300
7	DURHAM RD 8-PORT PERRYRD	HWY 7A -MANCHESTER	2.9	7,700
7	HWY 7A -MANCHESTER	DURHAM RD 26-THICKSON RD	10.1	11,700
7	DURHAM RD 26-THICKSON RD	S JCT HWY 12-BROOKLIN-WHITBY	4.1	9,900
7	S JCT HWY 12-BROOKLIN-WHITBY	DURHAM RD 1-BROCK RD-PICKERING	12.6	16,000
7	DURHAM RD 1-BROCK RD-PICKERING	DURHAM/YORK REG BDY-NORTH JCT	6.9	10,200
7	DURHAM/YORK REG BDY-NORTH JCT	A PT 7.9 KM W OF DURHAM RD 1-BROCK RD-PICKERING	1.0	10,200
7	A PT 7.9 KM W OF DURHAM RD 1-BROCK RD-PICKERING	MARKHAM-HWY 48-MAIN ST -START OF NA MARKHAM-HWY TRANSFER	1.9	11,000
7	MARKHAM-HWY 48-MAIN ST -START OF NA MARKHAM-HWY TRANSFER	S JCT HWY 410-HEART LK RD-END OF NA OVERLAP HWY 410	48.4	
7	S JCT HWY 410-HEART LK RD-END OF NA OVERLAP HWY 410	N JCT HWY 410-CTYRD 10-BOVAIRD DR	3.1	
7	N JCT HWY 410-CTYRD 10-BOVAIRD DR	AT RAMP -START OF NA	0.4	58,800
7	AT RAMP -START OF NA	PEEL/HALTON BDY-HALTON HILLS LTS-END OF NA	10.7	
7	PEEL/HALTON BDY-HALTON HILLS LTS-END OF NA	HAL RD 19-WINSTON CHURCHILL BVD	0.5	14,200
7	HAL RD 19-WINSTON CHURCHILL BVD	HALL RD-START OF NA FORMER GEORGETOWN	1.6	17,500
7	HALL RD-START OF NA FORMER GEORGETOWN	HALTON RD 32-HALTON HILLS-END OF NA	5.0	
7	HALTON RD 32-HALTON HILLS-END OF NA	S JCT HALTON RD 3-TRAFALGAR RD	1.4	12,900
7	S JCT HALTON RD 3-TRAFALGAR RD	N JCT HALTON RD 3	3.5	18,500
7	N JCT HALTON RD 3	CHURCHILL RD-HALTON HILLS-START OF NA HALTON HILLS-ACTON	5.7	10,300
7	CHURCHILL RD-HALTON HILLS-START OF NA HALTON HILLS-ACTON	N JCT HWY 25-HALTON HILLS-END OF NA	2.0	
7	N JCT HWY 25-HALTON HILLS-END OF NA	HALTON HILL-MILTON TOWNLINE RD	3.1	7,750
7	HALTON HILL-MILTON TOWNLINE RD	A POINT 2.6 KM W OF 6TH LINE-MILTON	3.9	7,750
7	A POINT 2.6 KM W OF 6TH LINE-MILTON	WELLINGTON RD 50	2.2	7,750
7	WELLINGTON RD 50	WELLINGTON RD 27-GOWAN RD	1.1	7,750
7	WELLINGTON RD 27-GOWAN RD	WELLINGTON RD 29-ERAMOSA RD	4.1	9,000

Highway	Location Description - From	Location Description - To	Dist. (km)	AADT
7	WELLINGTON RD 29-ERAMOSA RD	GUELPH E LTS-START OF NA GUELPH	3.2	9,000
7	GUELPH E LTS-START OF NA GUELPH	W JCT HWY 24 & S JCT HWY 6-END OF NA OVERLAPS HWY 6	7.2	
7	W JCT HWY 24 & S JCT HWY 6-END OF NA OVERLAPS HWY 6	N JCT HWY 6-WOODLAWN RD-START OF NA GUELPH	3.7	
7	N JCT HWY 6-WOODLAWN RD-START OF NA GUELPH	IMPERIAL RD -GUELPH W LTS -END OF NA	2.9	
7	IMPERIAL RD -GUELPH W LTS -END OF NA	WELLINGTON/WATERLOO BDY	3.2	19,500
7	WELLINGTON/WATERLOO BDY	WOOLWICH ST E JCT -START OF NA KITCHENER/WATERLOO	5.8	21,300
7	WOOLWICH ST E JCT -START OF NA KITCHENER/WATERLOO	HWY 86 OP-CONESTOGA PKWY-END OF NA	5.7	
7	HWY 86 OP-CONESTOGA PKWY-END OF NA	OTTAWA ST IC-KITCHENER	1.9	103,800
7	OTTAWA ST IC-KITCHENER	E JCT HWY 8 OP IC-KING ST	1.3	90,600
7	E JCT HWY 8 OP IC-KING ST	COURTLAND AV IC OP	1.4	82,700
7	COURTLAND AV IC OP	HOMER WATSON BV-WATERLOO RD 28	1.3	79,000
7	HOMER WATSON BV-WATERLOO RD 28	FISCHER-HALLMAN RD -WATERLOO RD 58	2.4	51,300
7	FISCHER-HALLMAN RD -WATERLOO RD 58	A POINT 1.4 KM W OF WATERLOO RD 58	1.4	30,000
7	A POINT 1.4 KM W OF WATERLOO RD 58	TRUSSLER RD-WATERLOO RD 70	1.7	30,000
7	TRUSSLER RD-WATERLOO RD 70	WATERLOO RD 12 -PETERSBURG	3.8	23,300
7	WATERLOO RD 12 -PETERSBURG	WATERLOO RD 51 -NEW HAMBURG ROAD	5.1	21,500
7	WATERLOO RD 51 -NEW HAMBURG ROAD	WATERLOO RD 5	2.2	21,900
7	WATERLOO RD 5	E JCT WATERLOO RD 4	1.4	21,000
7	E JCT WATERLOO RD 4	W JCT WATERLOO RD 4-HAYSVILLE RD	0.9	22,500
7	W JCT WATERLOO RD 4-HAYSVILLE RD	WATERLOO RD 1-WAT/PERTH BDY	3.3	15,600
7	WATERLOO RD 1-WAT/PERTH BDY	PERTH ROAD 107-SHAKESPEARE	8.2	11,100
7	PERTH ROAD 107-SHAKESPEARE	A POINT 5.8 KM W OF PERTH ROAD 107	5.8	10,100
7	A POINT 5.8 KM W OF PERTH ROAD 107	STRATFORD E LTS L41-42-START OF NA STRATFORD	2.9	10,100
7	STRATFORD E LTS L41-42-START OF NA STRATFORD	PERTH LINE 29 -END OF NA	7.3	
7	PERTH LINE 29 -END OF NA	PERTH SOUTH LINE 20 (S)	4.2	9,200
7	PERTH SOUTH LINE 20 (S)	PERTH SOUTH LINE 9 (S)	4.8	9,200
7	PERTH SOUTH LINE 9 (S)	PERTH RD 118/OXFORD RD 119	3.0	6,500
7	PERTH RD 118/OXFORD RD 119	PERTH RD 123 (N)	6.4	5,800
7	PERTH RD 123 (N)	PERTH SOUTH LINE 2 (N)	6.0	5,350
7	PERTH SOUTH LINE 2 (N)	MIDDLESEX RD 50 (N)-PROSPECT HILL RD(N &S)	1.5	5,350
7	MIDDLESEX RD 50 (N)-PROSPECT HILL RD(N &S)	HWY 23	8.8	5,900
7	HWY 23	0.1 KM W OF HWY 4-END OF HWY END OF HWY 7	1.3	6,650
7A	W JCT HWY 115 IC	PETERBOROUGH/VICTORIA BDY	9.0	4,400
7A	PETERBOROUGH/VICTORIA BDY	S JCT HWY 35-COMMUTER PKG N	8.9	4,400
7A	S JCT HWY 35-COMMUTER PKG N	N JCT HWY 35	1.5	9,950
7A	N JCT HWY 35	BANCROFT -TORONTO MTO DIST BDY	6.4	4,950
7A	BANCROFT -TORONTO MTO DIST BDY	N JCT DURHAM RD 57 -CAESAREA RD	7.7	5,300
7A	N JCT DURHAM RD 57 -CAESAREA RD	CARTWRIGHT-SCUGOG TWP BDY	6.6	12,300
7A	CARTWRIGHT-SCUGOG TWP BDY	ISLAND RD	1.9	10,900
7A	ISLAND RD	PORT PERRYE LTS -WATER ST	1.9	18,100
7A	PORT PERRYE LTS -WATER ST	DURHAM RD 2-PORT PERRY-OSHAWA RD	0.5	19,600
7A	DURHAM RD 2-PORT PERRY-OSHAWA RD	QUEEN ST (E);BREWERS RETAILS (N)	1.2	12,500
7A	QUEEN ST (E);BREWERS RETAILS (N)	HWY S 7 &12-MANCHESTER -HWY END END OF HWY 7A	2.7	12,200

Hourly Road Noise Predictions based on ITE Traffic Distribution

Type of Traffic Distribution: Residential Area

Roadway:	**Highway 7**		Receptor:	**R16**	
AADT:	7750		Rh:	1.5	m
MT%	3.5%		Distance:	40	m
HT%	3.5%		Angle 1:	-90	degrees
Posted Speed Limit:	80	km/hr	Angle 2:	90	degrees
Grade:	0%				

Hour Ending	% of AADT	Total	Cars	MT	HT	Hourly L_{eq} (dBA)
0:00	3.0%	233	216	8	8	57
1:00	2.4%	186	173	7	7	56
2:00	0.8%	62	58	2	2	51
3:00	0.3%	23	22	1	1	47
4:00	0.2%	16	14	1	1	45
5:00	0.2%	16	14	1	1	45
6:00	0.6%	47	43	2	2	50
7:00	2.7%	209	195	7	7	57
8:00	5.7%	442	411	15	15	60
9:00	6.9%	535	497	19	19	61
10:00	4.2%	326	303	11	11	58
11:00	4.1%	318	296	11	11	58
12:00	4.6%	357	332	12	12	59
13:00	5.3%	411	382	14	14	59
14:00	5.5%	426	396	15	15	60
15:00	5.2%	403	375	14	14	59
16:00	6.3%	488	454	17	17	60
17:00	8.5%	659	613	23	23	61
18:00	8.2%	636	591	22	22	61
19:00	6.8%	527	490	18	18	61
20:00	6.2%	481	447	17	17	60
21:00	4.7%	364	339	13	13	59
22:00	4.1%	318	296	11	11	58
23:00	3.5%	271	252	9	9	58

ISO 9613-2 Sample Calculation

Receiver: R3

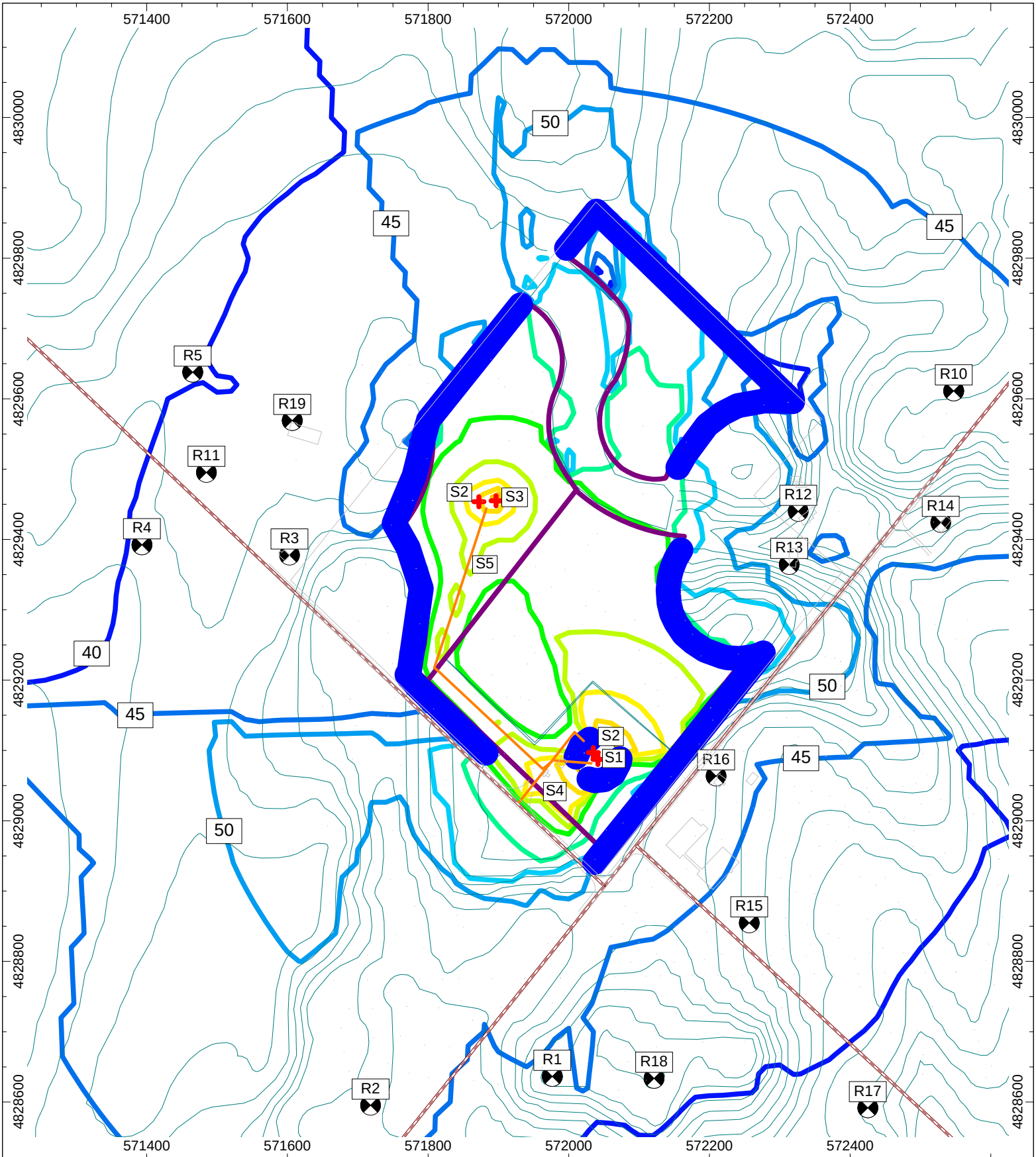
Project: Hidden Quarry

Project Number: 11007

Time Period	Total (dBA)
Day	43

Receiver Name	Receiver ID	X	Y	Z	Ground
R3	R3	571603	4829378	360.8	359.3

Source Name	Source ID	X	Y	Z	Ground	ReflOrd	LxT	LxN	L/A	Dist.	hm	Freq	Adiv	KOb	Agr	Abar	z	Aatm	Afol	Ahous	Cmet	CmetN	Dc	RL	LtotT	LtotN
Processing Plant	A01_S1	572041	4829087	352.0	349	0	123	-1	1.0	526	9.4	0	65.4	0	2.1	16.9	1.3	2.5	0.0	0.0	0.0	0.0	0.0	0.0	36	-88
Shipping Loader	A01_S2	572035	4829097	351.5	349	0	107	107	1.0	515	9.4	0	65.2	0	1.0	18.0	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	20	20
Drill	D09_S3	571897	4829455	351.5	350	0	112	-11	1.0	304	5.4	0	60.7	0	0.7	8.1	0.4	2.5	0.0	0.0	0.0	0.0	0.0	0.0	40	-82
Extraction Loader	D09_S2	571872	4829454	352.5	350	0	107	-1	1.0	280	5.3	0	59.9	0	1.9	6.6	0.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	37	-70
Shipping Truck	A01_S4	571986	4829098	350.5	349	0	94	94	71.8	475	6.6	0	64.5	0	0.3	5.0	0.3	2.1	0.0	0.0	0.0	0.0	0.0	0.0	22	22
Rock Trucks	D09_S5	571815	4829237	352.5	350	0	97	-16	40.4	255	5.8	0	59.1	0	5.6	10.3	1.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	20	-93
Rock Trucks	D09_S5	571837	4829303	352.5	350	0	101	-13	99.0	246	5.8	0	58.8	0	4.9	10.1	1.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	25	-88
Rock Trucks	D09_S5	571868	4829397	352.5	350	0	101	-13	99.0	265	5.7	0	59.5	0	2.5	8.5	0.6	1.6	0.0	0.0	0.0	0.0	0.0	0.0	28	-85
Rock Trucks	D09_S5	571926	4829108	351.5	349	0	101	-12	101.4	421	6.9	0	63.5	0	1.4	4.7	0.3	2.3	0.0	0.0	0.0	0.0	0.0	0.0	29	-84
Rock Trucks	D09_S5	571852	4829178	351.5	349	0	101	-12	101.4	320	6.3	0	61.1	0	2.7	8.3	0.7	1.9	0.0	0.0	0.0	0.0	0.0	0.0	27	-86
Shipping Truck	A01_S4	571944	4829045	361.5	360	0	88	88	16.2	477	4.8	0	64.6	0	3.8	1.8	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	15	15
Shipping Truck	A01_S4	571938	4829037	361.5	360	0	82	82	4.1	478	4.8	0	64.6	0	3.2	1.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	11	11
Shipping Truck	A01_S4	571933	4829031	361.5	360	0	86	86	11.7	479	3.4	0	64.6	0	2.5	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	17	17
Shipping Truck	A01_S4	571957	4829061	356.0	354.5	0	90	90	25.7	475	8.0	0	64.5	0	0.4	4.3	0.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0	18	18
Shipping Truck	A01_S4	572015	4829120	350.5	349	0	88	88	18.0	486	6.5	0	64.7	0	0.2	5.0	0.3	2.2	0.0	0.0	0.0	0.0	0.0	0.0	16	16
Rock Trucks	D09_S5	572012	4829094	351.5	349	0	97	-16	47.0	498	9.6	0	65.0	0	0.7	23.3	9.3	2.6	0.0	0.0	0.0	0.0	0.0	0.0	6	-107
Rock Trucks	D09_S5	571978	4829090	351.5	349	0	97	-16	44.1	473	7.1	0	64.5	0	1.0	4.2	0.2	2.5	0.0	0.0	0.0	0.0	0.0	0.0	25	-88
Rock Trucks	D09_S5	571812	4829215	352.0	349.5	0	90	-23	8.1	265	5.8	0	59.5	0	5.6	10.4	1.5	1.6	0.0	0.0	0.0	0.0	0.0	0.0	13	-100



aercoustics engineering limited

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Scale: NTS
Drawn: DG
Eng: VG
Date: Apr 26, 2013

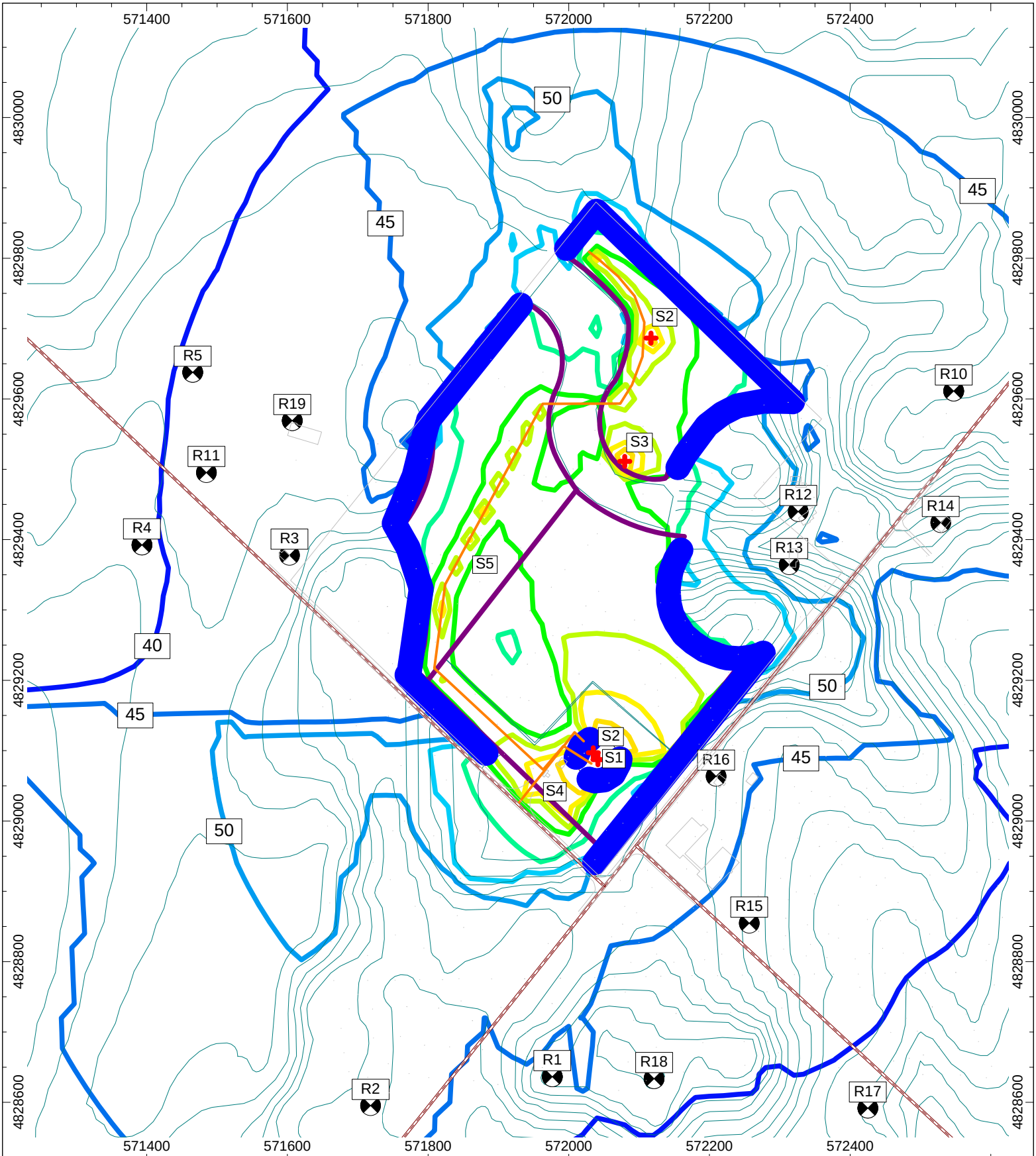
The scope of the work outlined in this document is limited to the acoustic, noise, and/or vibration control aspects of the design. Contractors to verify all dimensions

Project:
Hidden Quarry

Project Number: 11007

Drawing Title:
Sound Level Contours @ 1.5m Height
Phase 1, Stage 2

Figure: 1



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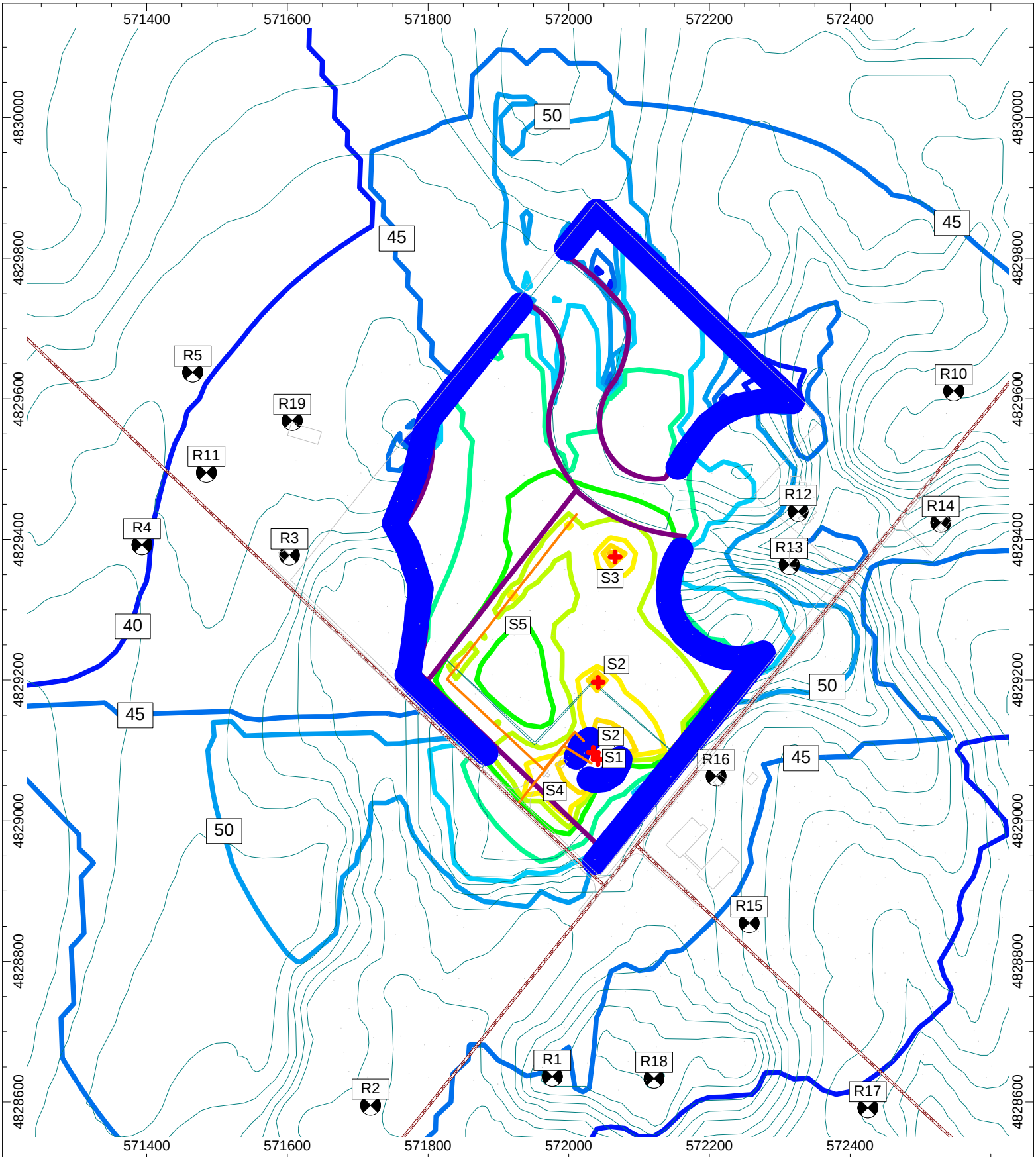
Project:
Hidden Quarry

Project Number: 11007

Drawing Title:
Sound Level Contours @ 1.5m Height
Phase 2, Stage 2

Figure: 2



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Project:
Hidden Quarry

Project Number: 11007

Drawing Title:
Sound Level Contours @ 1.5m Height
Phase 3, Stage 2

Figure: 3

Appendix D

CVs

aercoustics
engineering limited

Acoustics
Noise
Vibration

david grant
B.A.Sc.

credentials + experience

- performed work to support noise impact feasibility studies for several major **Mattamy Homes** housing developments while working at an acoustical consulting firm.
- joined Aercoustics in April 2008 as a noise and vibration consultant.
- involved in environmental compliance projects for several pits and quarries, including **Devon Pit, Hendrik's Quarry, and Flamboro Dufferin Aggregate Quarry.**
- responsible for several environmental compliance projects for a range of industrial/commercial facilities including **Décor Precast**, **IBM Canada**, **HP Canada**, **Royal Bank of Canada**, **Canadian Tire**, and **Bell Canada.**
- performed field sound transmission class (FSTC) testing for the **Waterloo Police** as part of a study to determine architectural noise control solutions that address speech-privacy concerns relating to inmate interrogation.
- involved in architectural noise control for a call center at an **HP Canada** datacenter facility.
- involved in several studies to document and provide recommendations for rail vibration measurements for the **Toronto Transit Commission**, as well as measuring and considering subway vibration and streetcar noise.
- performed supporting noise and vibration prediction modeling for several **Toronto Transit Commission** Environmental Assessments.
- jazz pianist, recording studio operator, and avid volleyball player.
- B.A.Sc., Electrical Engineering, Queen's University, 2006

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Acoustics
Noise
Vibration

vince gambino
B.A.Sc., P.Eng.

credentials + experience

- first worked for Pratt & Whitney, testing and analyzing gas turbine engine components and aircraft structures for noise and vibration control.
- as a consulting engineer expanded expertise to environmental noise and vibration assessment, noise control design, finite element analysis, structural vibration and machinery dynamics.
- became one of four principals of Aercoustics Engineering Limited in 1992.
- notable projects include one of the world's first outdoor Active Noise Cancellation systems for the **TransAlta** cogeneration facility near the Ottawa Health Sciences Centre – landed an **Award of Excellence** from the Association of Consulting Engineers of Canada; noise assessment and noise control review for the Millbank ABB GT11N Combustion Turbine Generating Station for **New Brunswick Power**; noise assessment for conversion of the Rolls Royce RB211 gas turbine to the WR21 marine power plant for **Westinghouse**; sound measurement program for the Rolls Royce RB211 on behalf of **Cooper-Rolls Royce** for **TransCanada PipeLines**; specialized loudspeaker transducers for Nortel Networks – in media applications, they created the aural impression of a full soundstage for listeners; acoustics and noise control for Toronto's **Filmport Studio** complex; and a field study of wind machine noise in the Niagara wine region.
- has appeared as an **expert witness** on numerous occasions before the Ontario Energy Board (OEB) and Ontario Municipal Board (OMB) and various Environmental Assessment Review Panels, and court cases.
- designs and manufactures loudspeaker systems for **specialized acoustic applications** ranging from active noise cancellation to sound reinforcement systems – has made extensive use of the National Research Council of Canada's computerized anechoic room facilities to optimize enclosure and filter designs.
- member of the **Canadian Acoustical Association, American Society of Mechanical Engineers, Acoustical Society of America and Audio Engineering Society**.
- B.A.Sc. (Mechanical Engineering), University of Toronto, 1984.

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