HUGH WILLIAMSON ASSOCIATES INC.
Ottawa, Ontario, Canada

ACOUSTIC ASSESSMENT REPORT

FREYMOND QUARRY

TOWNSHIP OF FARADAY
HASTINGS COUNTY

Prepared for

Freymond Lumber Ltd.

Prepared by

Hugh Williamson Associates Inc.

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Postal Address: PO Box 74056, RPO Beechwood, Ottawa, Ontario, K1M 2H9, Canada
Phone/Fax: (613) 747 0983, Email: hugh@hwacoustics.ca, http://www.hwacoustics.ca

ACOUSTIC ASSESSMENT OF THE PROPOSED FREYMOND QUARRY TOWNSHIP OF FARADAY HASTINGS COUNTY

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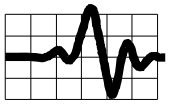
Resumes, Dr. Hugh Williamson, Michael Wells



ACOUSTIC ASSESSMENT OF THE FREYMOND QUARRY TOWNSHIP OF FARADAY

1.0 Introduction

Freymond Lumber Ltd. are in the process of applying to the Ministry of Natural Resources for a License under the Aggregate Resources Act for the proposed Freymond Quarry, located in the Township of Faraday, see Figures A1.1 and A1.2, Appendix 1.

This report describes an assessment, carried out by Hugh Williamson Associates, of the potential impact of noise from operations at the Freymond Quarry on nearby receptors in accordance with Ontario Ministry of Environment (MoE) guidelines for stationary noise sources.

This report has been prepared in accordance with the MoE Document NPC-233, *Information to be Submitted for Approval of Stationary Sources of Sound*, October 1995[1]. Noise from the facility is to be assessed according to MoE Documents: NPC-205, *Sound Level Limits for Stationary Sources in Class 1 & 2 (Urban) Areas*, October 1995[2] and NPC-232, *Sound Level Limits for Stationary Sources in Class 3 (Rural) Areas*, October 1995[3]. The report follows the recommended format contained in, *Sample Application Package, Basic Comprehensive Certificate of Approval (Air and Noise)*, July 2009[4].

The noise assessment methodology is summarised below.

- Identification of noise sensitive receptors in the vicinity of the quarry. Potential noise sensitive receptors include residences, motels, places of worship, schools and hospitals.

- Determination of the MoE sound level limits[2, 3] which will apply at each of the noise sensitive receptors.

- Identification of the sources of noise that will arise from quarry operations. In the current study, the strengths of the various noise sources were obtained from noise measurements of similar operations at other aggregate operations in Ontario.

- Based on the strengths of the individual noise sources, noise levels due to quarry operations are predicted at nearby noise sensitive receptors using a prediction procedure[5] which is favoured by the MoE. The MoE methodology requires that compliance be assessed under predictable "worst case" conditions for normal operations.

- Assessment of compliance of the noise due to quarry operations with MoE sound level limits. Where appropriate, mitigation measures are recommended such that compliance with MoE sound level limits is achieved at all receptors.

Note that this assessment considers all noise sources on the site except for the noise and vibrations caused by blasting. The impacts of blasting at the Freymond Quarry will be assessed by others.

Surrounding Lands, Acoustic Environment and Critical Receptors

The Freymond Quarry is located in a heavily wooded and hilly area on the west side of Bay Lake Road, Part of Lots 51 and 52, Concession W.H.R. in the Township of Faraday, Hastings County. The site is at the intersection of Bay Lake Road and Highway 62 as shown in Figure A1.1. Highway 62 carries significant traffic on a 24-hour basis.

Note that directions in this report are referenced to Site North as shown in Figure A1.1.

The legal description of the land occupied by the Freymond Quarry is as follows:

Part of Lots 51 and 52, Concession W.H.R.
Township of Faraday
Hastings County

The land surrounding the proposed Freymond Quarry is a mixture of Marginal Agriculture, Rural Industrial, Environmental Protection, Rural Residential, Limited Service Residential and Recreational / Resort Commercial land uses, as shown on the Zoning Map (refer Appendix 2). The site is zoned Marginal Agriculture.

Highway 62 is located approximately 175 m to the east of the eastern boundary of the proposed quarry and has a significant effect on the background noise levels in the vicinity.

Immediately north of the quarry the land is predominantly natural vegetation and forest. Further north runs Jeffrey Lake Road. A number of residences exist in this direction fronting Jeffrey Lake Road. The closest residences in this direction have been selected as critical receptors.

To the east of the quarry the land is zoned Marginal Agriculture, zoned MA, with pockets of Rural Industrial to the northeast, zoned RI, and, Environmental Protection to the southeast zoned EP. Bay Lake Road lies to the east of the site and intersects with Highway 62 at approximately 175 m east of the site's northeast corner. A number of residences fronting Bay Lake Road and Highway 62 lie in this direction. The closest residences in this direction have been selected as critical receptors.

South of the proposed quarry the land is predominantly natural vegetation and forest, zoned Marginal Agriculture, Environmental Protection and Rural Residential, with existing residences fronting Bay Lake Road in this direction. The closest residences in this direction have been selected as critical receptors.

To the west of the proposed Freymond Quarry the land is predominantly natural vegetation and forest zoned Marginal Agriculture with a small area of land zoned Limited Service Residential to the northwest. A number of residences fronting Gaebel Road lie in this direction. The closest residences in this direction have been selected as critical receptors.

The quarry site and surroundings lie on undulating land with moderate changes in elevation.

The surrounding land is relatively hilly sloping down to the north and south of the site which lies on an undulating ridge running east west across the site.

The quarry site itself consists of an undulating ridge running east west across the site. The ridge rises in the mid portion of the site to an elevation of approximately 385 m and towards the site's western boundary to an elevation of 390 m. A saddle runs between the two rises, dropping to an elevation of approximately 375 m in the mid-west region of the site. The land slopes down to the north and south of this ridge, to an elevation of approximately 360 m to 340 m at the site's northern boundary and to an elevation of approximately 370 m to 365 m at the site's southern boundary. The ridge slopes down to the east to an elevation of approximately 330 m at the site's eastern boundary. See Figure A1.2.

The noise sensitive receptors, which have been selected for detailed analysis, are shown in Figure A1.1. These were selected as being the receptors most likely impacted by noise from the Freymond Quarry. Other noise sensitive receptors are at greater distances and will be less affected by noise from the quarry. Table 1 lists the noise sensitive receptors selected for analysis.

Table 1: Points of Reception

Point of Reception	Description
POR 1	Residence (closest to the northeast) 2344 Bay Lake Road
POR 2	Residence (closest to the east) 27915 Highway 62
POR 3	Residence (closest to the east) 2258 Bay Lake Road
POR 4	Residence (closest to the southeast) A-B 2204 Bay Lake Road
POR 5	Residence (closest to the south) 2001 Bay Lake Road
POR 6	Residence (closest to the west) 431 Gaebel Road
POR 7	Residence (closest to the northwest) 342 Gaebel Road
POR 8	Residence (to the north) 169 Jeffrey Lake Road

For assessment purposes, points of reception, (POR), have been taken as upper floor windows (4.5 m above grade) and Outdoor Living Areas (30 m from Residence, 1.5 m above grade) in acoustic calculations.

2.0 Detailed Facility Description

The stone at the Freymond Quarry is extracted through drilling and blasting. Blasting produces large pieces of rock which are then crushed and screened into aggregate products of various grades before being shipped off site.

The operations plan calls for all crushing and screening to be done with a portable plant located near the pile of blasted rock. After blasting, a loader will be used to feed rock into the portable crushing and screening plant. The aggregates produced will then be placed in stockpiles, using conveyors. A loader will then load the stockpiled aggregates onto highway trucks which are used to haul the product off-site.

Excavation of the Freymond Quarry will take place in a number of lifts of varying height. For the purposes of assessing worst-case noise impacts for the extraction operation, equipment is assumed to be located on the surface and/or one or more lifts down.

The entry to the Quarry, as shown in Figure A1.2, is onto Bay Lake Road which connects through to Highway 62.

Hours of Operation

Daytime Operations (07:00 – 19:00) - During the Daytime period, all significant noise sources are assumed to be in operation, and include the following:

- One Standard Hydraulic Rock Drill or One Low Noise Hydraulic Rock Drill;
- One Portable Crushing Plant, may consist of primary, secondary and tertiary crushing and screening units (up to three total) and an associated diesel generator;
- Up to Two Loaders;
- On-Site Truck movements, to haul the product off-site;

Night Operations (19:00 – 07:00) – Loading and Hauling operations only may take place at night. Noise sources assumed to be in operation at night include the following:

- One Loader;
- On-Site Truck movements, to haul the product off-site;

It is understood that under normal circumstances, there are no plans to operate the quarry at night. Night operations have been modeled to access the impacts of loading and hauling which may occur under exceptional circumstances.

3.0 Noise Source Summary

The following noise sources have been used to model noise generated by operations at the Freymond Quarry. In brackets are the shortened names of the noise sources as used in the acoustic model. The characteristics of these sources, as used in acoustic modelling, are summarized in Table 2.

- Rock Drill (source Rockdrill_TH_72);
- Low Noise Rock Drill (source Rockdrill_SmartRIG);
- Portable Crushing Plant (source Crusher_CR) – Includes primary, secondary and tertiary crushing and screening units and an associated diesel generator;
- Loaders (source Loader);
- On-site Truck Movements (sources HWYTruck_Slow58).

The strengths of the noise sources, i.e. the sound powers shown in Table 2 and used in this analysis, are taken from a database of noise measurements made by Hugh Williamson Associates of similar operations at other aggregate operations in Ontario. Conveyors used to transfer crushed stone to stockpiles are considered as insignificant noise sources.

Noise from the loading operations is estimated using the area source method. It is assumed that a maximum of two (2) loaders will operate concurrently during the daytime period (07:00 to 19:00) and a maximum of one (1) loader will operate during periods of maximum capacity during the nighttime period (19:00 to 07:00).

Noise from the haul routes is estimated using the moving point source method. It is assumed that a maximum of 8 loads per hour will be shipped during periods of maximum capacity during the daytime period (07:00 to 19:00) and a maximum of 4 loads per hour will be shipped during periods of maximum capacity during the nighttime period (19:00 to 07:00).

Portable equipment for site preparations and rehabilitation

Portable construction equipment will be used occasionally for site preparation (e.g. land clearing and construction of berms) and rehabilitation. This equipment would typically include excavators, hydraulic shovels, dozers and scrapers. To minimize the impact of noise during site preparation and rehabilitation, the construction equipment used, excavators, bulldozers, etc., will comply with MoE Publication NPC-115[5], *Construction Equipment*, August 1978. This publication gives noise standards to be met by construction equipment in Ontario.

Site preparation and rehabilitation activities will take place only during daytime hours (07:00 – 19:00).

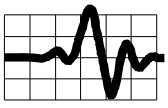


Table 2: Noise Source Summary Table

Source ID	Source Description	Sound Power (dBA)	Source Ht. above ground (m)	Sound Characteristics	Noise Control Measures
Standard Hydraulic Rock Drill (Rockdrill_TH_72)	Portable hydraulic rock drill	120.8	2	Steady, non-tonal, non-directional noise source	As per Section 5.0*
Low Noise Hydraulic Rock Drill (Rockdrill_SmartRIG)	Portable hydraulic Low Noise rock drill with sound power (Lw) less than or equal to 108.3 dBA	108.3	2	Steady, non-tonal, non-directional noise source	As per Section 5.0*
Portable Crushing Plant (Crusher_CR)	Crushing and screening units powered by a generator	120.5	3	Steady, non-tonal, non-directional noise source	As per Section 5.0*
Loader (Loader)	Wheeled loader CAT or similar	107.5	3	Steady, moving, non-tonal, non-directional noise source	As per Section 5.0*
Truck Movements (HWYTruck_Slow58)	Slow moving highway truck, no Jake brakes, maximum speed 20 kph	110.1	3	Steady, moving, non-tonal, non-directional noise source	As per Section 5.0*

* Location and shielding restrictions apply in some situations as set out in Section 5.0; Refer to Section 5.0 for recommended Noise Mitigation Measures.

4.0 Point of Reception Summary

Noise levels have been predicted at the critical receptors using "worst case" assumptions under normal operations and using the ISO sound propagation methodology[5], as implemented in the sound prediction software Cadna-A, version 4.2.141. The ISO methodology, which is favored by the MoE, provides a conservative (i.e. high) estimate of the noise level at each receptor taking into account adverse wind and meteorological conditions.

The estimation method includes the following:

- Distance attenuation is based on spherical spreading.
- Atmospheric attenuation.
- Ground attenuations, as appropriate.
- Barrier attenuation, as appropriate.

In order to consider cases of worst noise impacts, a number of operational scenarios have been modeled. In general, the worst impacts are those which occur when the equipment is operating on the original surface, i.e. at grade, with the impact becoming less as the equipment is located on lower lifts, i.e. below grade. The following three worst cases scenarios are presented in this report and are the basis of the mitigation recommendations specified in Section 5.0.

Scenario 1: Worst case, All equipment in operation on surface, Low Noise Rock Drill unshielded located minimum 350 m from POR 7, Existing terrain shielding POR 4 and POR 8 from Portable Crushing Plant - Day only;
Figures A1.3 & A1.4

Scenario 2: Worst case, All equipment in operation, Low Noise Rock Drill with 4 m high barrier located less than 350 m from POR 7, 5.2 m high barrier or berm shielding POR 4 and POR 8 from Crushing Plant - Day only;
Figures A1.5 & A1.6

Scenario 3: Worst Case, Loading and Hauling only – Day or Night operation;
Figures A1.7 & A1.8

Detailed prediction results are contained in Appendix 3, with Tables A3.7.1 to 3.6.3 giving a summary of predicted noise impacts at each point of reception (POR) for the individual sources.

5.0 Recommended Noise Mitigation Measures

Noise mitigation measures for quarry operations are detailed below. It is recommended that these measures be reflected in the Site Plan for the Quarry.

The predicted noise impacts in Tables A3.7.1, A3.7.2, and, A3.7.3 are based on the implementation of the following mitigation measures.

1. The operation of a Standard Hydraulic Rock Drill, can take place only during the daytime period (07:00 – 19:00), and, shall comply with the following:

    a. The operation of a Standard Hydraulic Rock Drill is not to operate concurrently with other equipment.

    b. Noise barriers are to be provided such that points of reception (POR) are shielded from noise from the Standard Hydraulic Rock Drill as specified in Table 3.

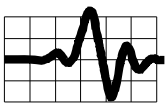
Table 3: Standard Hydraulic Rock Drill Shielding Specification Table

Shielding	Distance to point of reception (m) 50 dBA limit (applies to POR 1, 2, 3, 4)	Distance to point of reception (m) 45 dBA limit (applies to POR 5, 6, 7, 8)
No barrier	> 585 m	> 850 m
4 m high barrier at maximum 10 m from source	585 m to 255 m	850 m to 450 m
4 m high barrier at maximum 5 m from source	255 m to 190 m	450 m to 315 m
6 m high barrier at maximum 5 m from source	190 m to 140 m	315 m to 215 m
6 m high barrier at maximum 10 m from source; operating 30 minutes per hour maximum	140 m to 100 m	215 m to 160 m
Not to operate	< 100 m	< 160 m

2. The operation of a Low Noise Hydraulic Rock Drill, can take place concurrently with other operations anywhere in the extraction area, above or below grade, and, shall comply with the following:

    a. The Low Noise Rock Drill may operate only during the daytime period (07:00 – 19:00).

    b. When operating the Low Noise Rock Drill on the surface less than 350 m from POR 7, a 4 m high barrier located at a maximum of 5 m from source is to be provided shielding line of site (LOS) to POR 7.



3. The operation of the Portable Crushing and Screening Plant, can take place only during the daytime period (07:00 – 19:00) and shall comply with the following:

    a. The Portable Crushing and Screening Plant is to be located at an elevation of plus or minus 338 m (or lower) in location shown in Figure A1.3.

    b. A noise barrier is to be provided, shielding line of sight (LOS) to POR 1, POR 2, and, POR 3, as shown in Figure A1.3 and Figure A1.5. The barrier is to comply with one of the following options:

        i. Minimum 5.2 m high located at a maximum of 5 m from plant, OR,

        ii. Minimum 6 m high located at a maximum of 10 m from plant, OR,

        iii. Minimum 8 m high located at a maximum of 20 m from plant.

    c. A 5.2 m high barrier is to be provided shielding line of sight (LOS) to POR 4, as shown in Figure A1.5. The existing terrain to the south of the plant may be utilized to provide shielding in this direction providing the terrain is a minimum of 5.2 m high and shields line of sight (LOS) to POR 4, as shown in Figure A1.3.

    d. A 5.2 m high barrier, located at a maximum of 60 m from plant, is to be provided shielding line of sight (LOS) to POR 8, as shown in Figure A1.5. The existing terrain to the north of the plant may be utilized to provide shielding in this direction providing the terrain is a minimum of 5.2 m high and shields line of sight (LOS) to POR 8, as shown in Figure A1.3.

4. The operation of Loaders may take anywhere in the extraction area, above or below grade and comply with the following:

    a. The operation of a maximum of two Loaders can take place during the daytime period (07:00 – 19:00).

    b. The operation of a maximum of one (1) Loader can take place during the nighttime period (19:00 – 07:00).

    c. A 6 m high barrier is to be provided shielding POR 1 and POR 2 as shown in Figure A1.3.

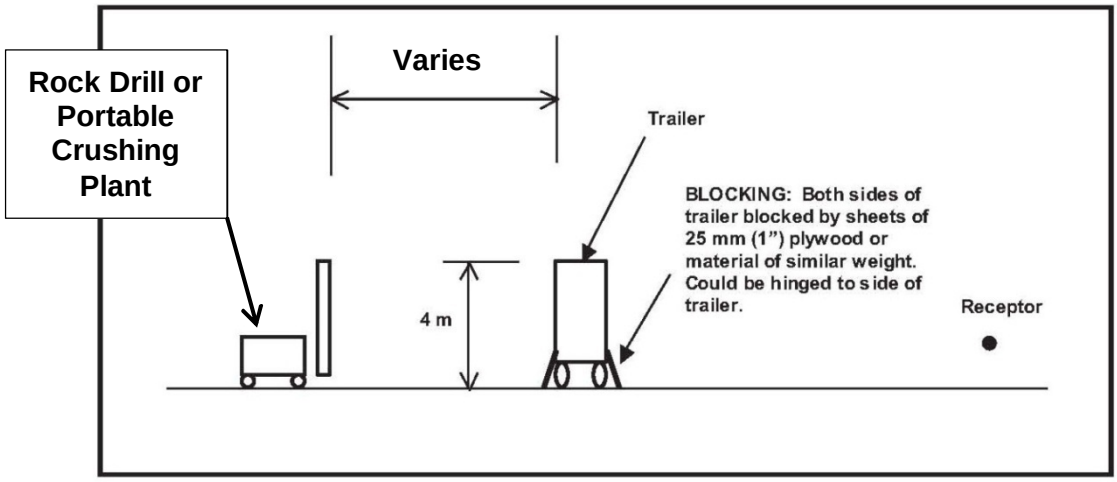
5. The loading and shipping of aggregate product from stockpiles using Highway Trucks may take place on a 24-hour basis.

6. When operating on-site, Highway Trucks shall not exceed 20 kph and shall not use compression braking (Jake Brakes).

7. Noise barriers or berms are to be solid, having no gaps, and are to have a surface density of no less than 20 kg/m^2. Examples of suitable barriers or berms are as follows:

    a. Earth, gravel or aggregate berms;
    b. Lift Face or existing terrain;
    c. Concrete or brick walls;
    d. Commercial noise barriers;
    e. A shipping container;
    f. A portable barrier such as a truck trailer equipped with movable flaps to block the space between the ground and the bottom of the trailer. (Refer to Diagram 1).

Diagram 1: Example of Portable Noise Barrier (not to scale)



8. Portable construction equipment used for site preparation (e.g. land clearing and construction of berms) and rehabilitation shall comply with MoE Publication NPC-115[5], *Construction Equipment*, August 1978. (This publication gives noise standards to be met by construction equipment in Ontario.) Site preparation and rehabilitation activities shall take place only during daytime hours (07:00 – 19:00).

9. If a new process is introduced to the site, then this process shall be assessed by a qualified acoustical consultant as soon as possible after commissioning. Noise mitigation measures shall be reviewed, and altered if necessary, to ensure that MoE sound level limits are met at all points of reception.

6.0 Assessment Criteria, Performance Limits

Sound level limits in the MoE guidelines[2,3] depend on the acoustical classification of the area as Class 1, 2 or 3.

> **Class 1 Area (Urban)** 'an area with an acoustical environment typical of a major urban area, where the background noise is dominated by urban hum (primarily road traffic noise)'
>
> **Class 2 Area (Urban)** 'an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 Areas, and in which a low ambient sound level, normally occurring between 23:00 and 07:00 hours in Class 1 areas, will typically be realised as early as 19:00 hours.
>
> **Class 3 Area (Rural)** 'acoustical environment that is dominated by natural sounds having little or no road traffic ….'

Due to the high levels of road traffic along Highway 62, the area in which POR 1, POR 2, POR 3, POR 4 are located is subject to road traffic noise, particularly during the period from 07:00 to 23:00 hours. Hence these receptors are classified as Class 2 Area (Urban). Receptors POR 5, POR 6, POR 7 and POR 8 are somewhat further from Highway 62, located on Bay Lake Rd, Jeffrey Lake Rd and Gaebel Rd, in a rural area, with occasional daytime traffic but dominated by natural sounds for the majority of the time. As such receptors POR 5, POR 6, POR 7 and POR 8 can be classified as Class 3 Area (Rural).

For a Class 2 Area (Urban) and a Class 3 Area (Rural), the applicable outdoor sound limits at noise sensitive receptors, based on 1-hour equivalent sound levels, $L_{EQ,}$ are either the exclusion noise limits given in Table 4, or higher limits if established by an assessment of background noise.

A background noise assessment was carried out at the points of reception in close proximity to Highway 62. While this assessment indicated elevated sound levels at a number of receptors, the worst case points of reception lie in locations shielded from highway noise. As such the levels given in the Table 4 are taken as the sound level limits at all points of reception for the purpose of this assessment.

Appendix 4 contains an analysis of background traffic noise at points of reception based on road traffic data obtained from the Ontario Ministry of Transportation for Highway 62.

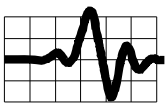


Table 4: Exclusion Sound Level Limits by Time of Day for a Class 2 Area (Urban)[2] and a Class 3 Area (Rural)[3]

Time of Day	Class 2 Area (Urban) L_{EQ} (dBA)	Class 3 Area (Rural) L_{EQ} (dBA)
Day 07:00 – 19:00	50	45
Night 19:00 – 07:00	45	40

Notes: Sound level limits are based on 1-hour equivalent sound levels.
Bldg. Points of Reception are at the residential buildings, height 2 – 4.5 m,
OLA = Outdoor Living Area, up to 30 m from the residence, height 1.5 m
** Daytime Limit is 50 dBA at POR 2 where location shielded from highway noise.

7.0 Impact Assessment

Noise impacts of the Freymond Quarry at nearby receptors have been completed for the day and night operations. The analyzed operations are for worst case conditions and locations of equipment, and include the recommended mitigation measures set out in Section 5.0.

In Table 5, estimated noise levels at the nearest receptors for the worst cases among all scenarios are compared with the applicable sound level limits. More detailed estimates, for all sources and scenarios are contained in Appendix 3, Tables A3.7.1 to A3.7.3. Note that these worst cases will occur for only brief periods during the many year life of the quarry.

Statement of Compliance

With the recommended mitigation measures, the noise impacts of operations at the Freymond Quarry are predicted to meet the applicable MoE guideline limits[2, 3] for both day and night operations.

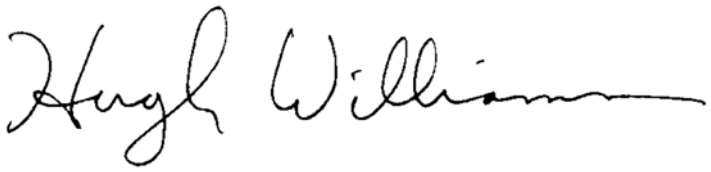
Table 5: Acoustic Assessment Summary Table, Worst Cases

Point of Reception ID	Day 07:00 to 19:00			Night 19:00 to 07:00		
	Estimated Sound Level at POR (worst case)	Sound Level Limit 07:00-19:00	Compliance With Performance Limit	Estimated Sound Level at POR (worst case)	Sound Level Limit 19:00-07:00	Compliance With Performance Limit
POR 1	50 dBA	50 dBA	Yes	42 dBA	45 dBA	Yes
POR 2	50 dBA	50 dBA	Yes	40 dBA	45 dBA	Yes
POR 3	49 dBA	50 dBA	Yes	35 dBA	45 dBA	Yes
POR 4	50 dBA	50 dBA	Yes	36 dBA	45 dBA	Yes
POR 5	31 dBA	45 dBA	Yes	18 dBA	40 dBA	Yes
POR 6	45 dBA	45 dBA	Yes	25 dBA	40 dBA	Yes
POR 7	44 dBA	45 dBA	Yes	29 dBA	40 dBA	Yes
POR 8	44 dBA	45 dBA	Yes	31 dBA	40 dBA	Yes

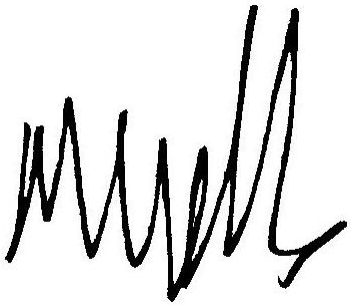
* The highest predicted sound level at window or outdoor living area are given above as these where the most critical at each point of reception. Refer to Tables A3.7.1, A3.7.2 and A3.7.3 in Appendix 3 for more detailed sound level estimates by source.

8.0 Conclusions

An acoustic assessment of operations at the proposed Freymond Quarry has been conducted according to MoE noise assessment procedures. Operations include Rock Drilling, Crushing and Screening, Loading of Highway Trucks and Shipping off-site. It has been found that noise levels from the operations at nearby receptors are in compliance with MoE sound level limits as set out in publications NPC-205[2] and NPC-232[3], provided that the mitigation measures described in Section 5.0 are followed.



Hugh Williamson, Ph.D., P.Eng.
Member, Canadian Acoustical Society
Member, American Society of Heating, Ventilating, Air-conditioning Engineers, ASHRAE



Michael Wells, B.Arch. (Hons) B.Sc. (Arch)
Registered Architect of NSW, ARN: 8111
Member, Canadian Acoustical Society

References

1. Ministry of Environment Publication NPC-233, *Information to be Submitted for Approval of Stationary Sources of Sound*, October 1995.

2. Ministry of Environment Publication NPC-205, *Sound Level Limits for Stationary Sources in Class 1 & 2 (Urban) Areas*, October 1995.

3. Ministry of Environment Publication NPC-232, *Sound Level Limits for Stationary Sources in Class 3 (Rural) Areas*, October 1995.

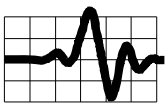
4. Ministry of Environment, *Sample Application Package, Basic Comprehensive Certificate of Approval (Air and Noise)*, July 2009.

5. Ministry of Environment Publication NPC-115, *Construction Equipment*, August 1978.

6. International Standards Organization, *Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation*, ISO 9613-2: 1996(E).

7. City of Ottawa, *City of Ottawa Environmental Noise Control Guidelines*, May 2006.

8. Ministry of Environment Publication NPC-104, *Sound Level Adjustments*



Appendix 1

Figures

Contents:

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Figure A1.2: Site Details & Surface Elevation Contours

Figure A1.3: Scenario 1: Worst case, All equipment in operation on surface, Low Noise Rock Drill unshielded located minimum 350 m from POR 7, Existing terrain shielding POR 4 and POR 8 from Crushing Plant (Day only)

Figure A1.4: Scenario 1: Noise Contours, Day: (Noise levels at 4.5 m)

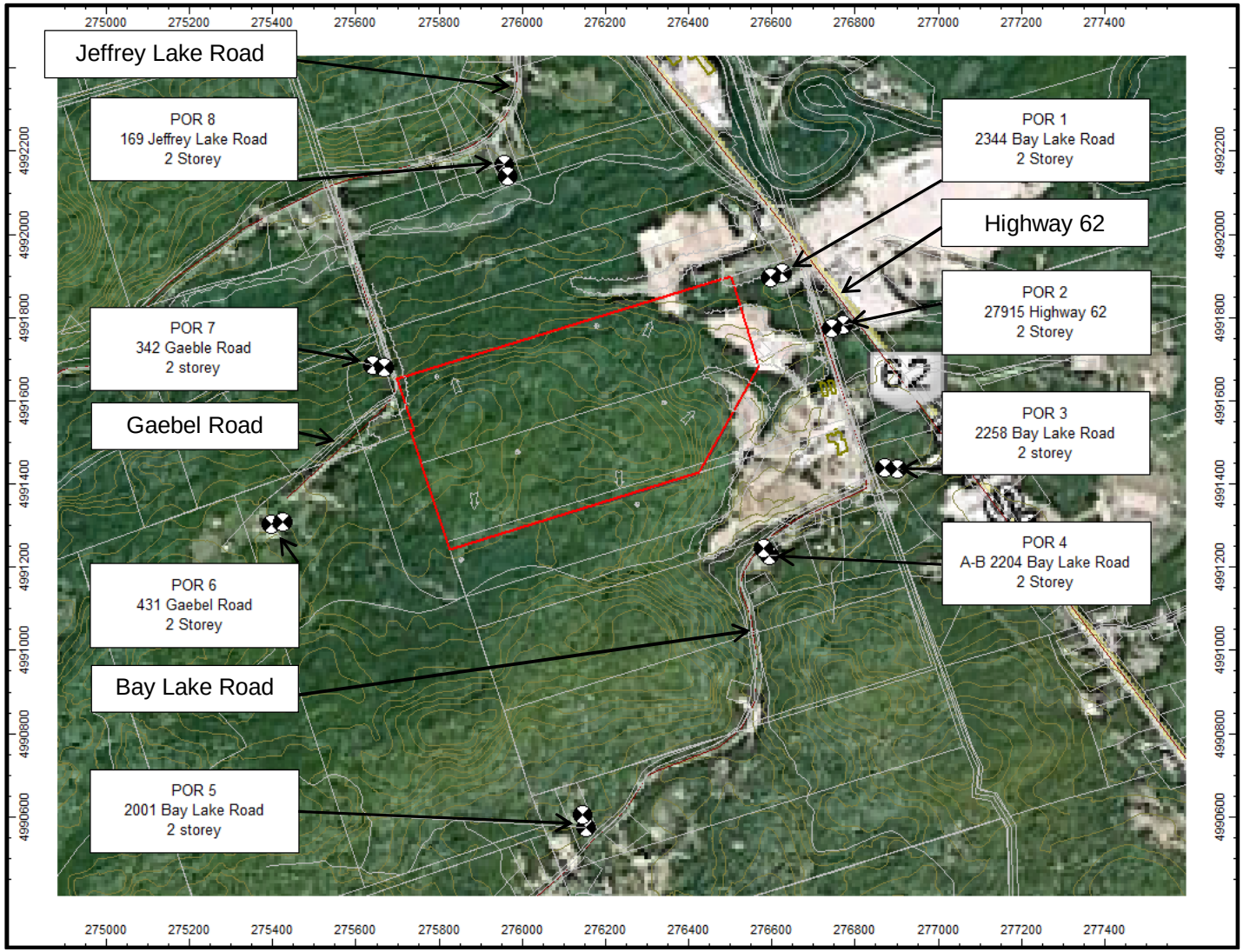
Figure A1.5: Scenario 2: Worst case, All equipment in operation, Low Noise Rock Drill with 4 m high barrier located less than 350 m from POR 7, 5.2 m high barrier or berm shielding POR 4 and POR 8 from Crushing Plant (Day only)

Figure A1.6: Scenario 2: Noise Contours, Day: Worst case (Noise levels at 4.5 m)

Figure A1.7: Scenario 3: Worst case, Loading and hauling only (Day or Night)

Figure A1.8: Scenario 3: Noise Contours, Night: Worst case (Noise levels at 4.5 m)

Figure A1.1: Area Plan Showing Receptor Locations



Site North

Figure A1.2: **Site Detail & Surface Elevation Contours** (elevation contours at 5 meter intervals)

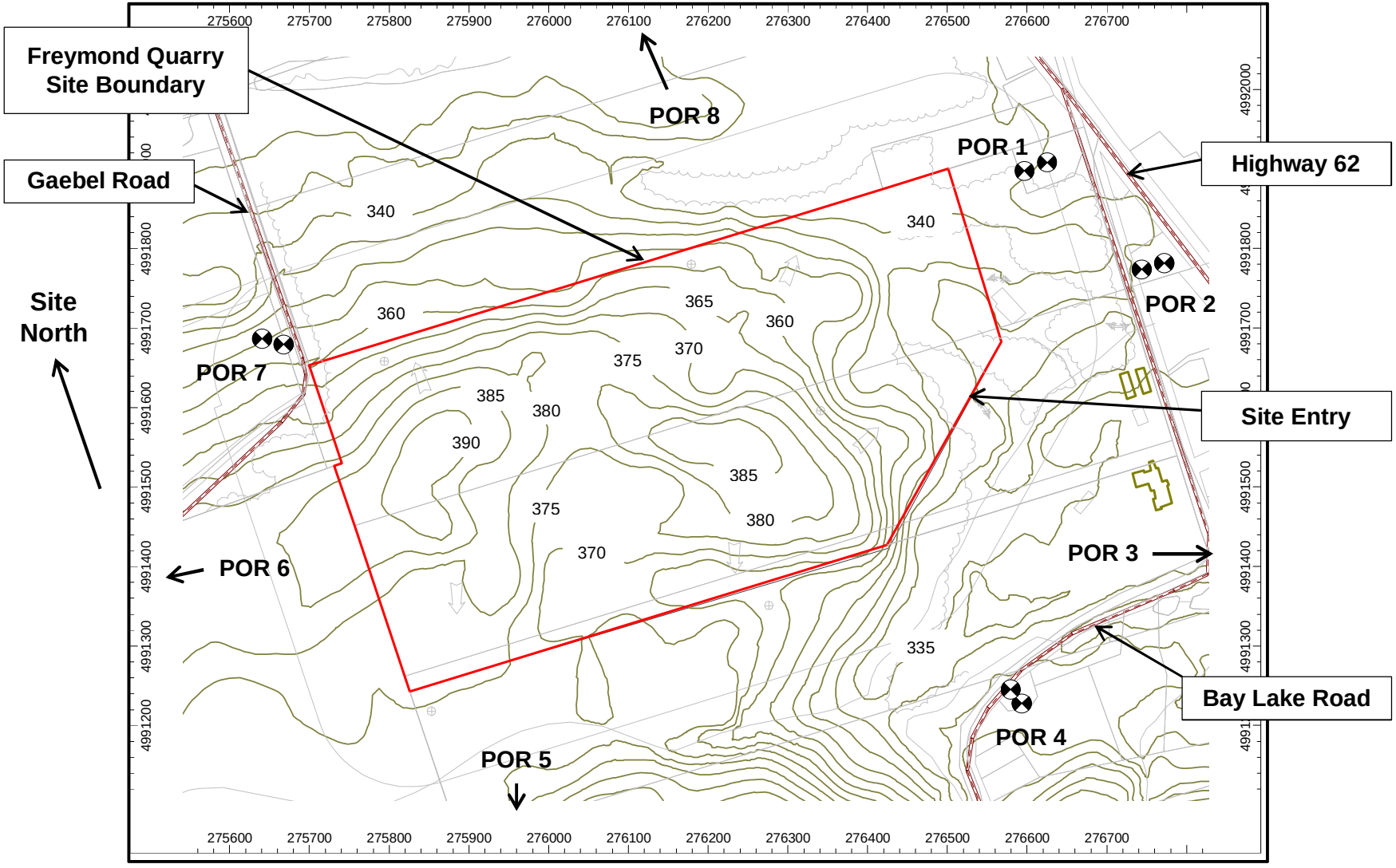


Figure A1.3: Scenario 1: Worst case, All equipment in operation on surface, Low Noise Rock Drill unshielded located minimum 350 m from POR 7 (Day only)

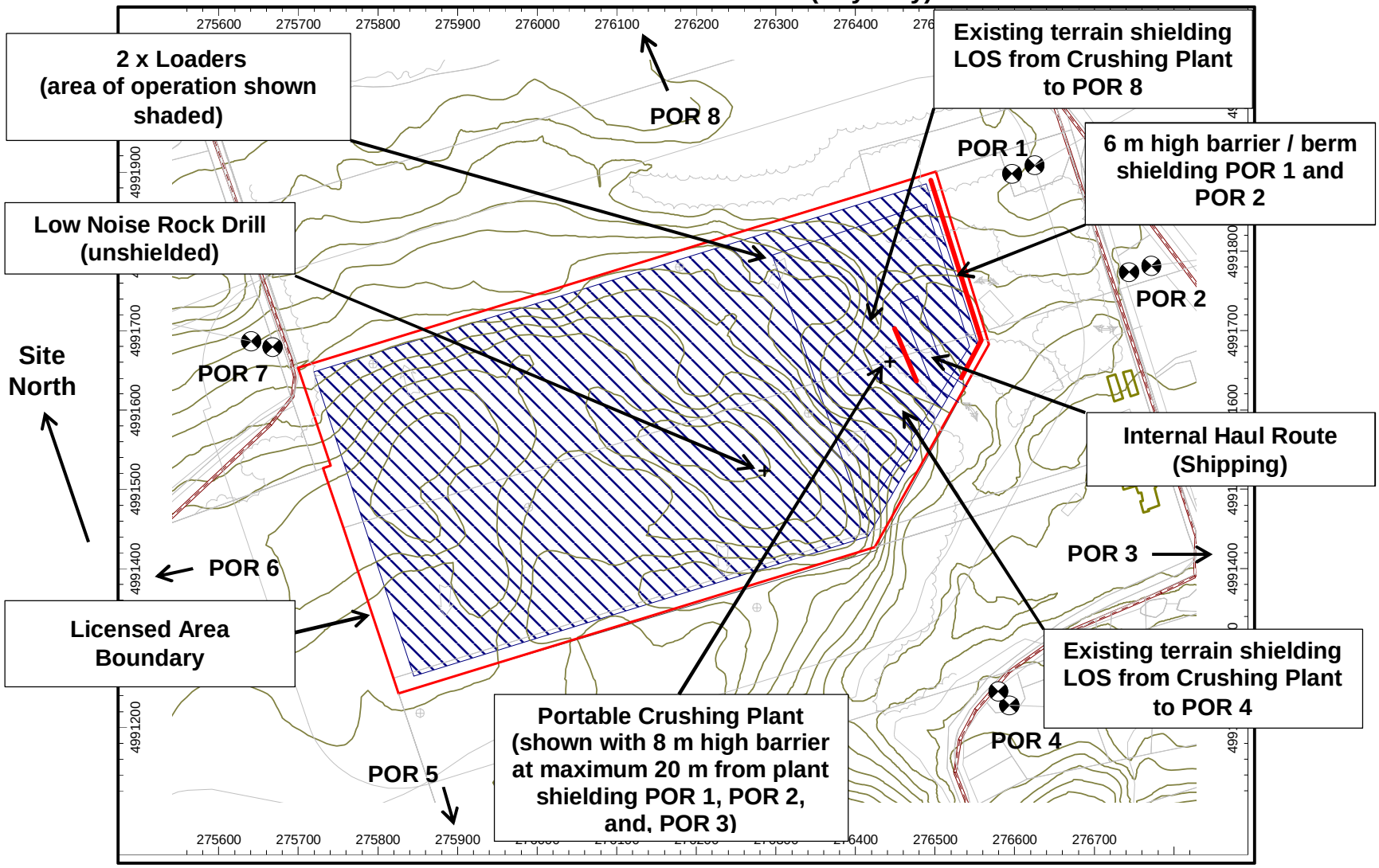
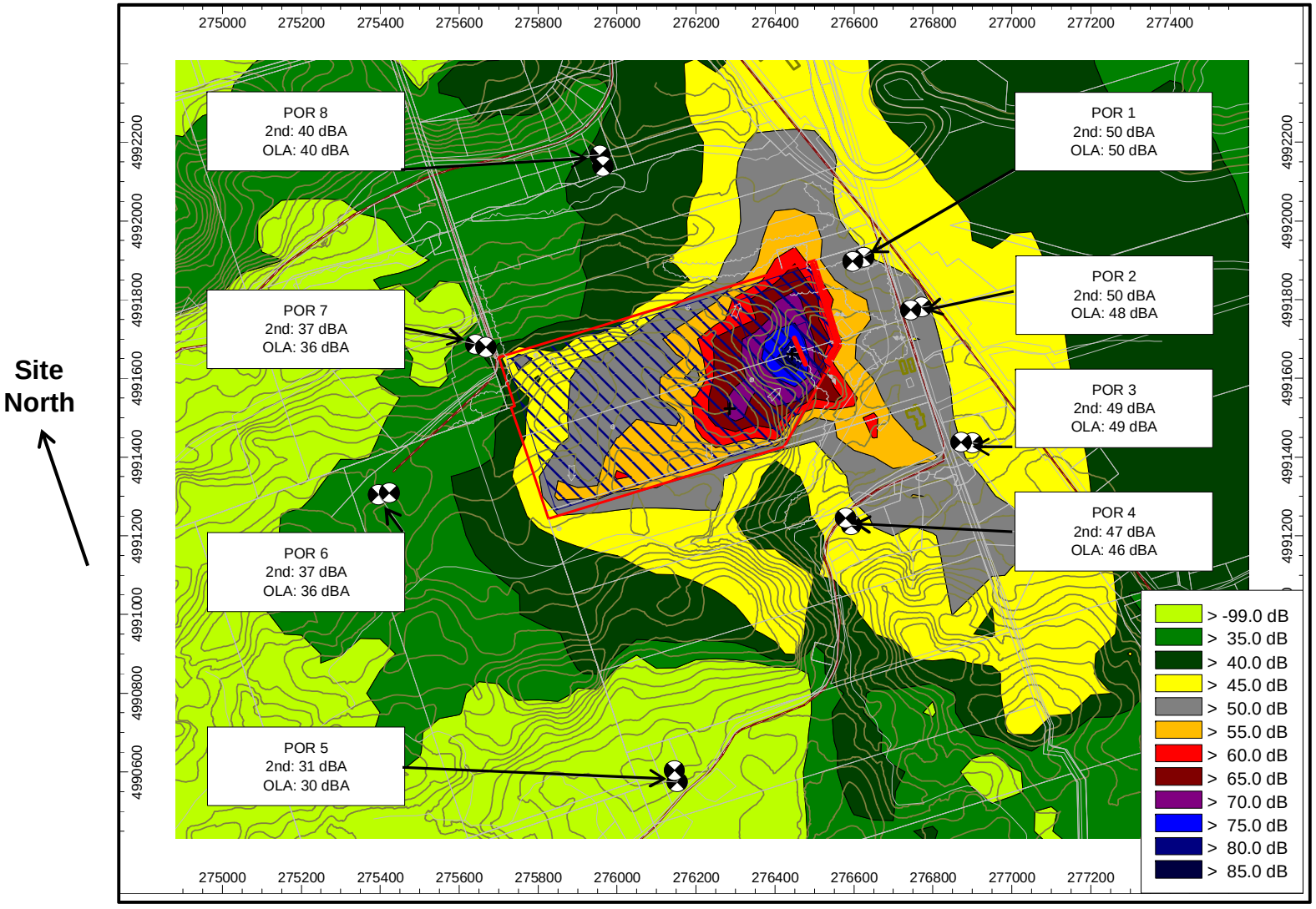


Figure A1.4: Scenario 1: Noise Contours, Day: (Noise levels at 4.5 m)



Site North

Figure A1.5: Scenario 2: Worst case, All equipment in operation, Low Noise Rock Drill with 4 m high barrier located less than 350 m from POR 7 (Day only)

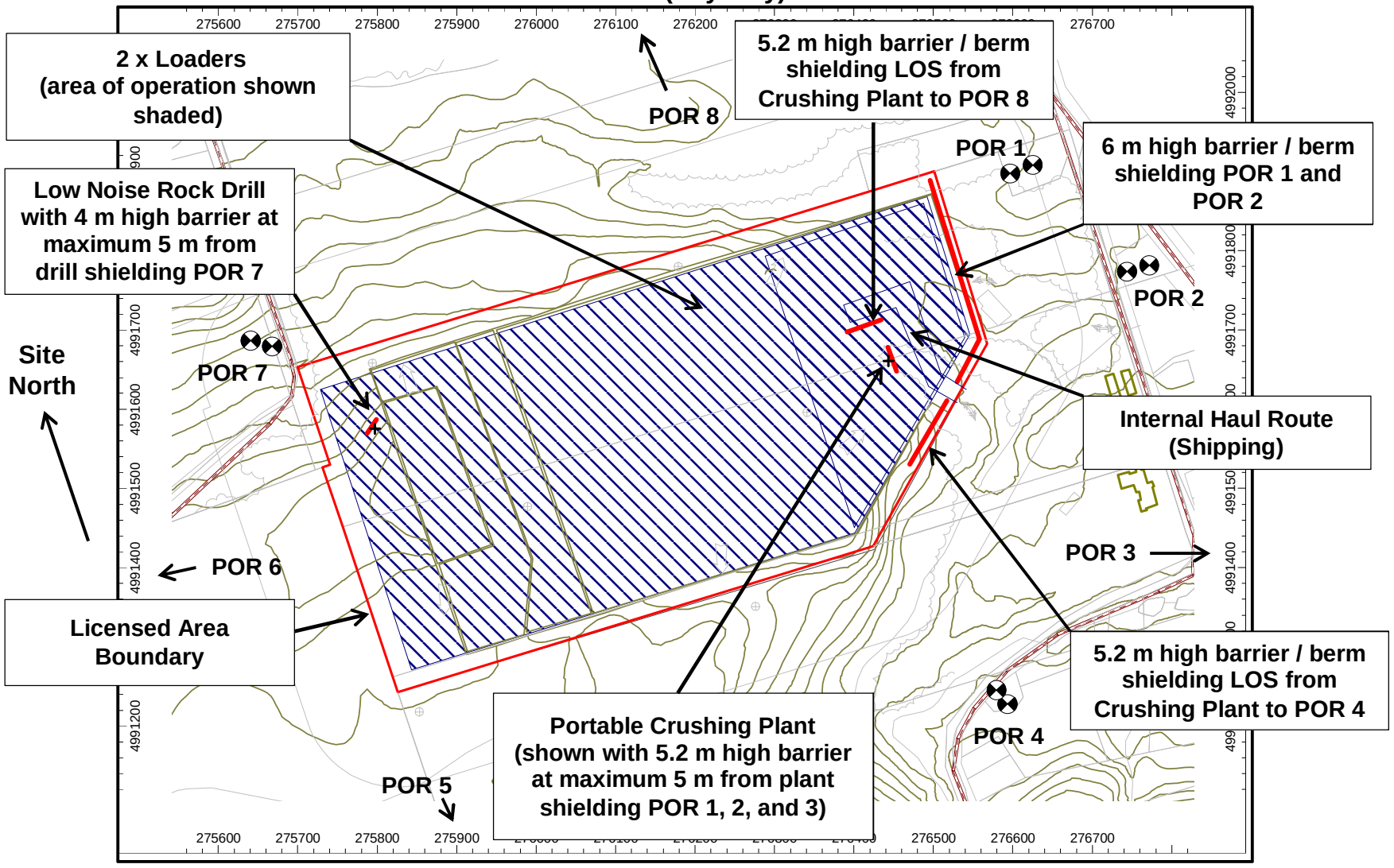
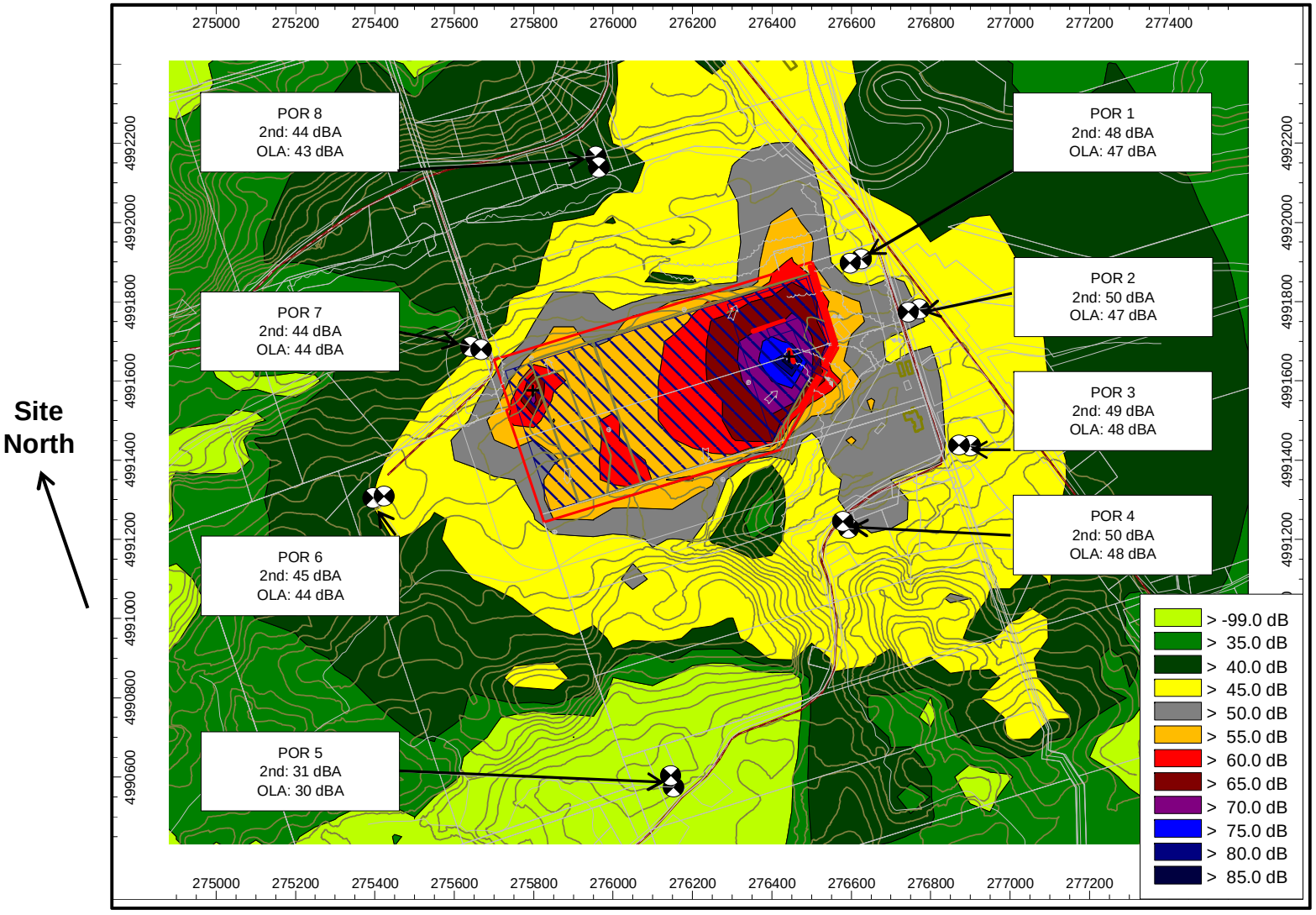


Figure A1.6: Scenario 2: Noise Contours, Day: Worst case (Noise levels at 4.5 m)



Site North

Figure A1.7: Scenario 3: Worst case, Loading and Hauling only (Night)

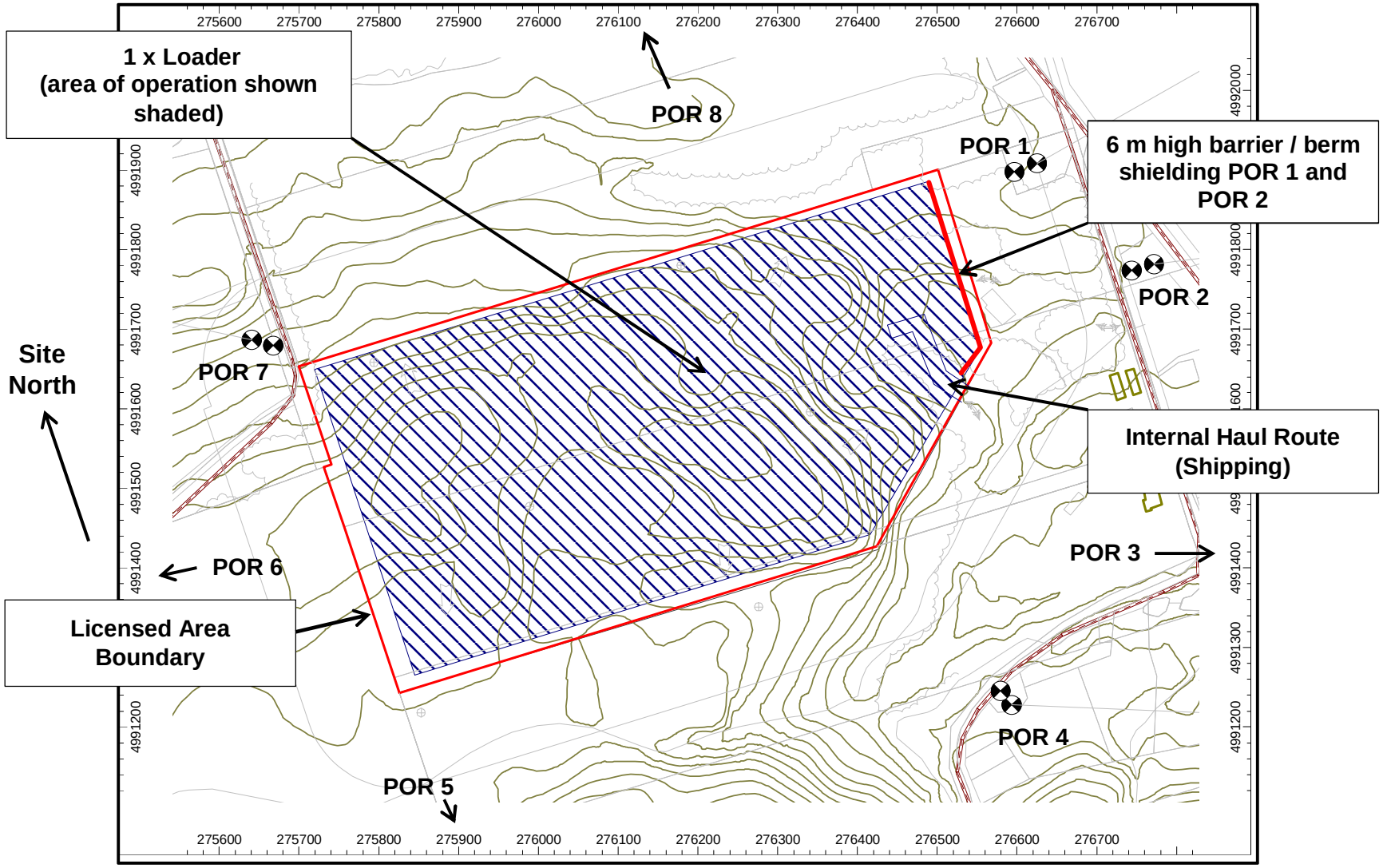
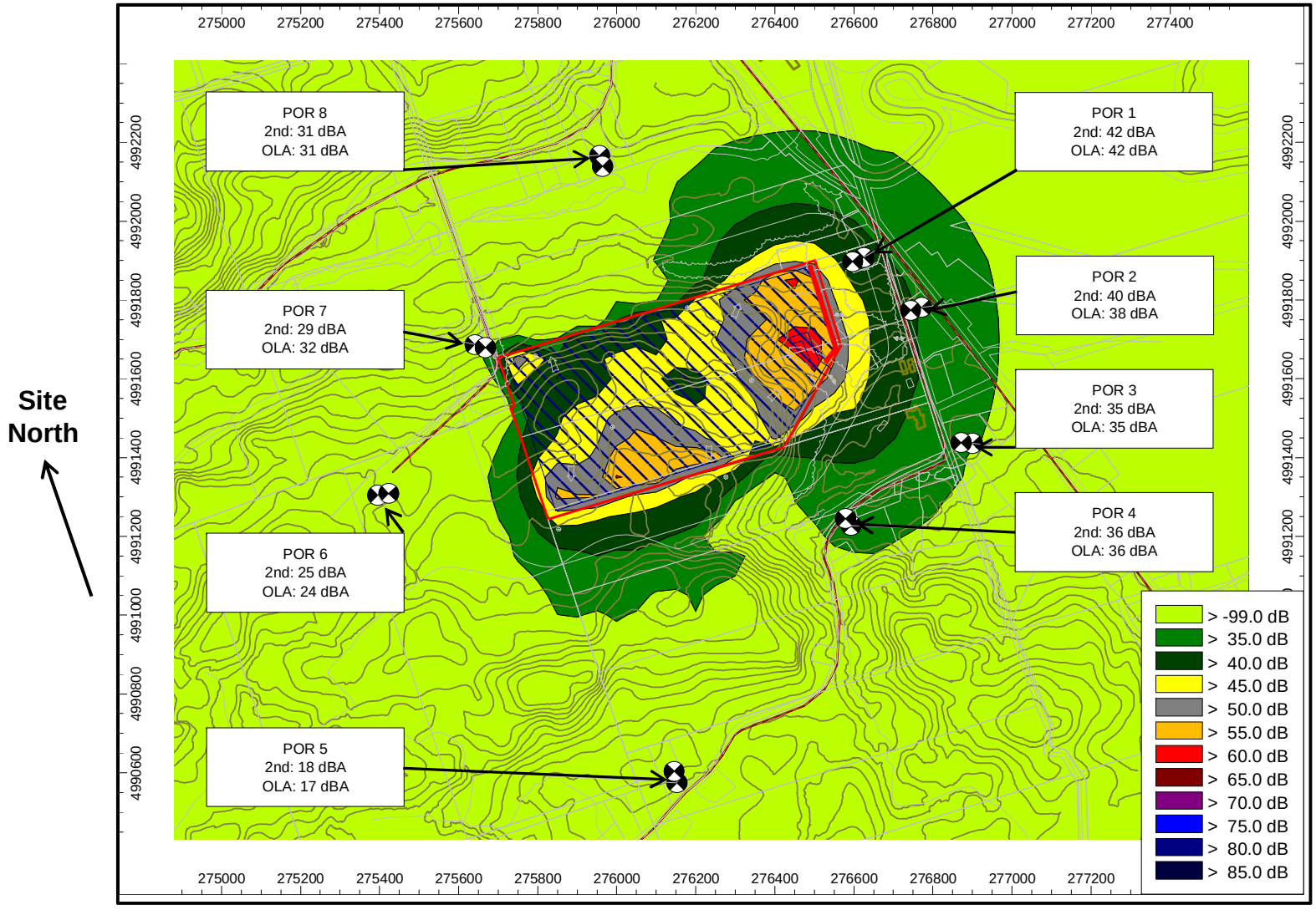


Figure A1.8: Scenario 3: Noise Contours, Night: Worst case (Noise levels at 4.5 m)



Site North

Appendix 2

Zoning Plan and Land Use Designations

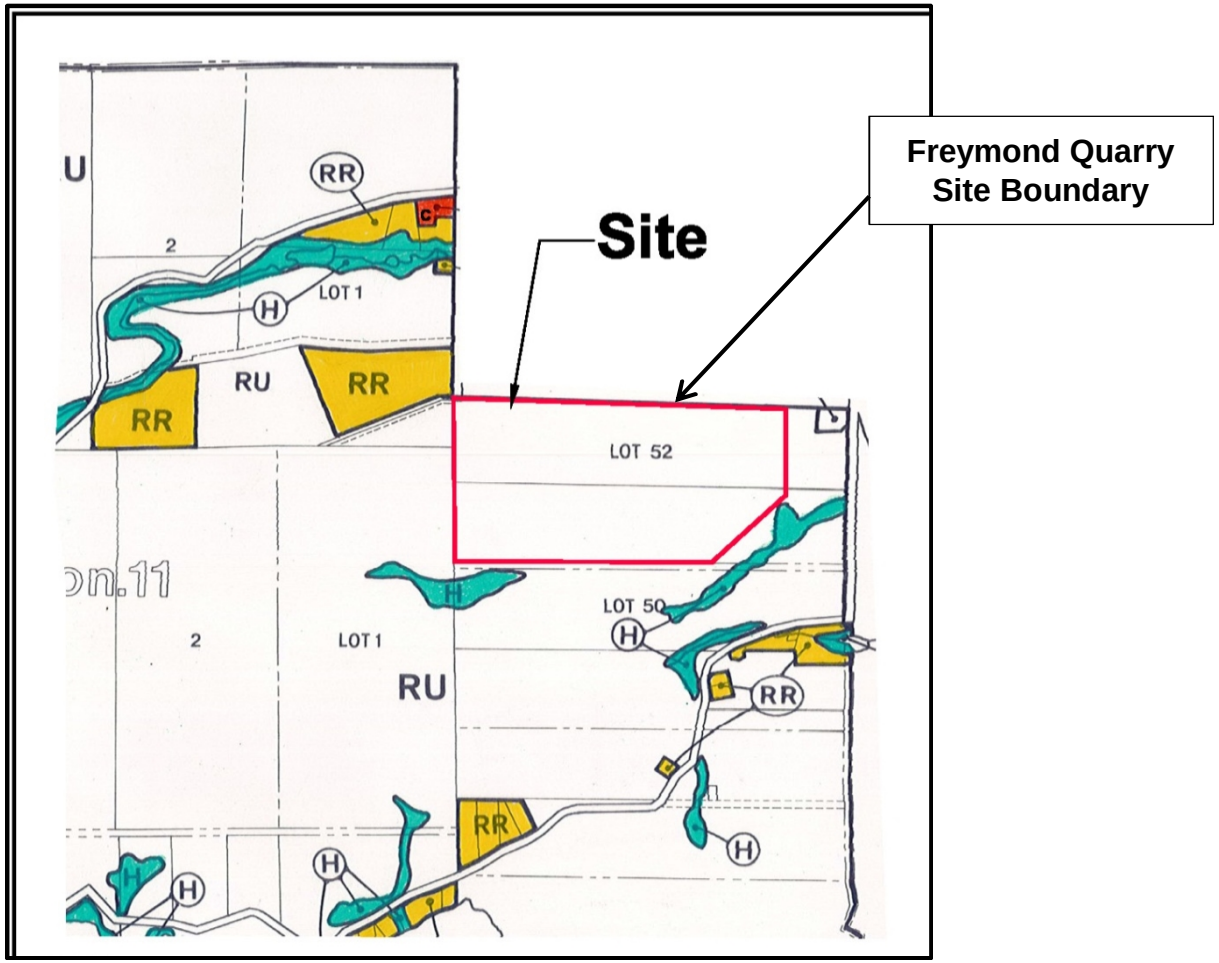
Contents:

- **Detailed Zoning Plan - Township of Faraday**
- **Official Plan Schedule A5-1 - Township of Faraday**
- **Official Plan Schedule A6-1 - Township of Bancroft**

Legend for Land Use Designations for Detailed Zoning Plan:

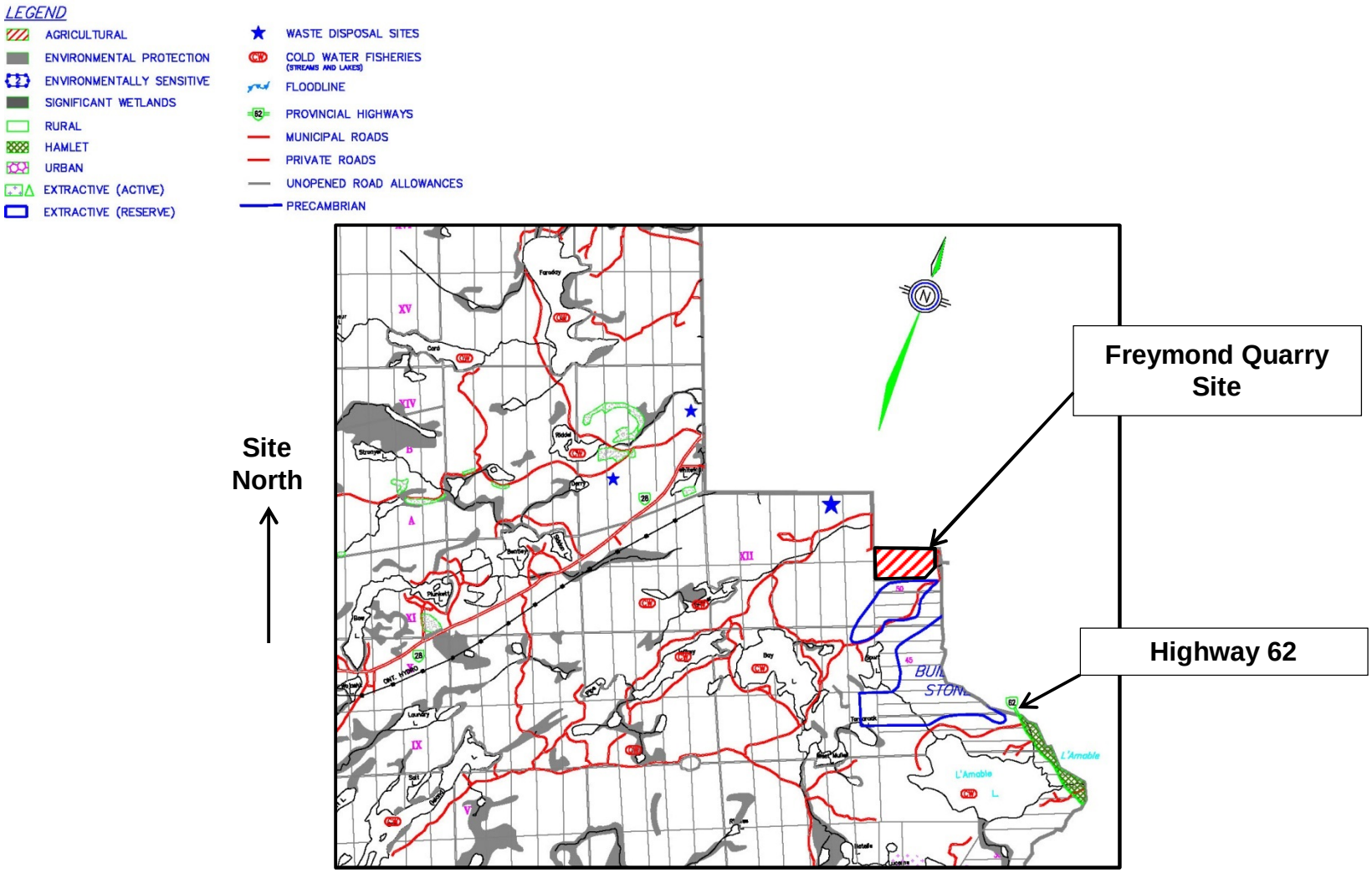
RU - Rural
H - Hazard
RR - Rural Residential
C - Commercial

Detailed Zoning Plan, source: EcoVue Consulting Services Inc. – Township of Faraday Zoning By-law

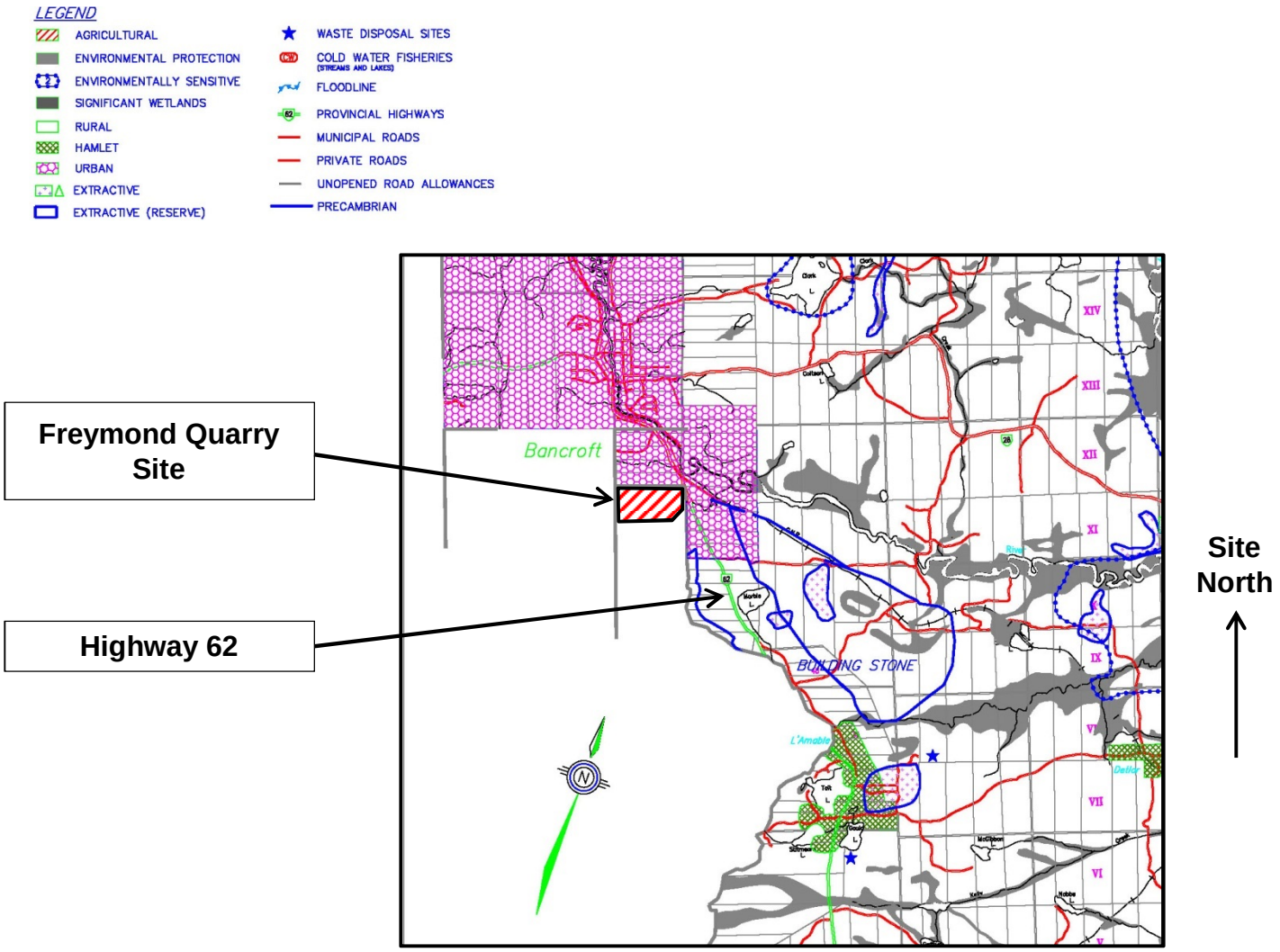


Site North

Official Plan Schedule A5-1 - Township of Faraday, source: Official Plan of the County of Hastings



Official Plan Schedule A6-1 - Township of Bancroft, source: Official Plan of the County of Hastings



Appendix 3

Acoustic Modelling Details

Modeling Notes:

1. Acoustic model developed using Cadna-A software, Version 4.2.141.
2. Sound propagation is modeled according to ISO 9613-2: 1996(E).
3. The whole of the extraction area is modeled as reflective, a conservative assumption.
4. MoE favoured conservative modelling assumptions are used, that is, 'no subtraction of negative ground attenuation' and 'no negative path differences'.

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Table A3.2 Point of Reception Location Table
Table A3.3 Point Sources
Table A3.4 Line Sources
Table A3.5 Area Sources
Table A3.6 Noise Source Library
Table A3.7.1 Point of Reception Impacts by Source for Scenario 1
Table A3.7.2 Point of Reception Impacts by Source for Scenario 2
Table A3.7.3 Point of Reception Impacts by Source for Scenario 3

Table A3.1 Calculation Configuration

Configuration	
Parameter	Value
General	
Country	Germany (TA Lärm)
Max. Error (dB)	0.00
Max. Search Radius (m)	2000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (m)	1000.00
Min. Length of Section (m)	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	60.00
Reference Time Night (min)	60.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	0
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rvcr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (°C)	10
rel. Humidity (%)	70
Ground Absorption G	1.00
Wind Speed for Dir. (m/s)	3.0
Roads (RLS-90)	
Strictly acc. to RLS-90	
Railways (Schall 03)	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Table A3.2 Point of Reception Location Table

Name	ID	Height	Coordinates, ground		
		Above Ground	X	Y	Z
		(m)	(m)	(m)	(m)
POR 1 W	POR_1_W	4.5	276625.1	4991908.3	339.5
POR 1 OLA	POR_1_OLA	1.5	276596.6	4991897.6	336.5
POR 2 W	POR_2_W	4.5	276771.8	4991781.6	339.5
POR 2 OLA	POR_2_OLA	1.5	276743.7	4991773.6	336.5
POR 3 W	POR_3_W	4.5	276900.4	4991436.3	336.5
POR 3 OLA	POR_3_OLA	1.5	276871.7	4991437.8	335.4
POR 4 W	POR_4_W	4.5	276593.2	4991227.7	342.1
POR 4 OLA	POR_4_OLA	1.5	276579.4	4991245.5	337.8
POR 5 W	POR_5_W	4.5	276152.0	4990574.8	366.6
POR 5 OLA	POR_5_OLA	1.5	276145.2	4990603.6	366.5
POR 6 W	POR_6_W	4.5	275395.2	4991304.1	394.5
POR 6 OLA	POR_6_OLA	1.5	275423.0	4991309.2	389.7
POR 7 W	POR_7_W	4.5	275640.7	4991686.5	358.8
POR 7 OLA	POR_7_OLA	1.5	275667.7	4991679.3	358.5
POR 8 W	POR_8_W	4.5	275956.5	4992167.2	334.5
POR 8 OLA	POR_8_OLA	1.5	275963.7	4992139.6	331.5

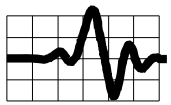

Table A3.3 Point Sources

Name	Result. PWL			Lw / Li	Noise Source	Operating Time			Direct.	Source
	Day	Evening	Night	Type	Library File	Day	Evening	Night		Height
	(dBA)	(dBA)	(dBA)			(min/Hr)	(min/Hr)	(min/Hr)		(m)
Rock Drill - Smart Rig	108.3	108.3	108.3	Lw	Rockdrill_SmartRIG				(none)	2
Crusher	120.5	120.5	120.5	Lw	Crusher_CR				(none)	3
Rock Drill - Standard	120.8	120.8	120.8	Lw	Rockdrill_TH_72				(none)	2

Table A3.4 Line Sources

Name	Point Source PWL			Numbers of vehicles per hour			Modelling Type/ Noise Source Lib. File	Speed	Source
	Day	Evening	Night	Day	Evening	Night			Height
	(dBA)	(dBA)	(dBA)					(km/h)	(m)
Internal Haul Route (IHR)	102.9	102.9	98.2	8	4	4	Moving Point Source/ HWYTruck_Slow58	20	4

Table A3.5 Area Sources

Name	Result. PWL			Number of Moving Pt. Sources			Modelling Type/ Noise Source Lib. File	Lw / Li	Source
	Day	Evening	Night	Day	Evening	Night			Height
	(dBA)	(dBA)	(dBA)					Type	(m)
Loader	107.5	107.5	107.5	2	1	1	Moving Point Source/ Loader	PWL-Pt	3

Table A3.6 Noise Source Library

ID	Type	Spectra (dB)											Source*
		31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Rockdrill_TH_72	Lw	113.4	112.8	114.6	111.1	110.9	111.5	115.8	114.4	112.1	120.8	122.8	Measured 2007
Rockdrill_SmartRIG	Lw	103.4	109.4	112.6	106.8	102.2	101.7	102.5	98.6	91.3	108.3	116	Measured Aug 2011
Crusher_CR	Lw	121.7	124.5	125.1	116.2	116.2	115.7	114.1	107.5	95.3	120.5	129.6	Williamsberg Meas.
Loader	Lw	113.9	117.4	103.5	93.9	92.6	106.6	97.2	85.8	76.1	107.5	119.4	Measured April 2012
HWYTruck_Slow58	Lw	115.9	112.7	110.2	101.6	101.4	105	104.2	97.6	103.5	110.1	119	Brockville McDowell

* Measured by Hugh Williamson Associates at a similar facility or in similar circumstances in Ontario.

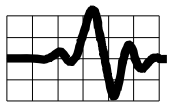

Table A3.7.1 Point of Reception Impacts by Source for Scenario 1, day only

	Day (07:00 to 19:00)															
	POR 1		POR 2		POR 3		POR 4		POR 5		POR 6		POR 7		POR 8	
	dBA		dBA		dBA		dBA		dBA		dBA		dBA		dBA	
Sources	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA
Rock_Drill_S1	43	42	42	41	40	39	39	39	28	27	36	35	33	30	34	33
Crusher_S1	46	45	48	43	48	47	45	43	26	25	30	29	33	31	35	34
IHR_S1	35	32	34	33	31	31	34	33	9	8	12	10	12	11	23	21
Loader_S1	40	39	38	37	34	34	35	35	17	17	25	24	30	32	31	31
Loader_S1	46	45	44	44	41	41	42	40	19	18	23	22	25	24	36	36
Total	**50**	**50**	**50**	**48**	**49**	**49**	**48**	**46**	**31**	**30**	**38**	**36**	**37**	**36**	**40**	**40**

Table A3.7.2 Point of Reception Impacts by Source for Scenario 2, day only

	Day (07:00 to 19:00)															
	POR 1		POR 2		POR 3		POR 4		POR 5		POR 6		POR 7		POR 8	
	dBA		dBA		dBA		dBA		dBA		dBA		dBA		dBA	
Sources	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA
Rock_Drill_S2	33	30	31	30	29	28	26	24	20	19	42	41	43	43	39	38
Crusher_S2	46	45	49	45	48	48	49	48	30	29	42	41	39	37	42	40
IHR_S2	37	35	38	35	34	34	32	32	11	11	22	22	21	19	25	24
Loader_S2	41	39	41	39	37	37	36	35	17	14	23	21	24	23	30	30
Loader_S2	37	35	38	36	32	32	31	30	20	19	28	27	29	30	30	29
Total	**48**	**47**	**50**	**47**	**49**	**48**	**50**	**48**	**31**	**30**	**45**	**44**	**44**	**44**	**44**	**43**

Table A3.7.3 Point of Reception Impacts by Source for Scenario 3, day or night

	Night (19:00 to 07:00)															
	POR 1		POR 2		POR 3		POR 4		POR 5		POR 6		POR 7		POR 8	
	dBA		dBA		dBA		dBA		dBA		dBA		dBA		dBA	
Sources	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA	4.5 m	OLA
IHR_S3	32	28	32	31	29	29	31	29	5	5	9	7	10	8	17	15
Loader_S3	41	42	39	37	34	34	35	35	18	17	25	24	29	32	31	31
Total	**42**	**42**	**40**	**38**	**35**	**35**	**37**	**36**	**18**	**17**	**26**	**24**	**29**	**32**	**31**	**31**

Appendix 4

Background Traffic Noise Analysis

This Appendix presents the results of an analysis of background noise from road traffic on Highway 62, south of Bancroft, approx. 8.6 km north of the intersection with Hastings Road, in the vicinity of the Freymond Quarry, conducted in October 2010.

The 24-hour period occurring on Wednesday the 6th of October 2010 was selected on the basis that this period of time represented the lowest traffic volumes occurring during a period of time that the Freymond Quarry is proposed to be in operation. This results in the calculation of the minimum background noise from Highway 62 at the selected points of reception.

The minimum background noise level is determined for one time period.

Day: 07:00 to 19:00 – daytime operational period for the Freymond Quarry

Contents:

Table A4.1 Traffic Volumes and Background Noise Estimates

Traffic data from the MTO Northeastern Region Traffic Section

Sample outputs from STAMSON

Table A4.1: Traffic Volumes and Background Noise Estimates for Highway 62 near Proposed Freymond Quarry

Project: Proposed Freymond Quarry
Traffic count from MTO - Kingston
Count from Highway 62, south of Bancroft, Approx. 8.6 km north of Hastings Road intersection Highway 62.
Posted Speed Limit: 60 km/h
Traffic Count Date: Wednesday 6th October, 2010

		Estimated split**			Noise Predictions in dBA, STAMSON		
Hour Beginning	Total Vehicles Count no.	Cars no.	Medium Trucks no.	Heavy Trucks no.	POR 2 2nd Storey d = 30 m h = 1.5 m	POR 2 OLA d = 30 m h = 4.5 m	***
0:00	6						
1:00	2						
2:00	I						
3:00	3						
4:00	19						
5:00	28						
6:00	79						
7:00	118						
8:00	152						
9:00	161						
10:00	140						
11:00	159						
12:00	148						
13:00	150						
14:00	163						
15:00	156						
16:00	181						
17:00	152						
18:00	**90**	**79.2 (79)**	**6.3 (6)**	**4.5 (5)**	**54.38**	**53.95**	*
19:00	75						
20:00	49						
21:00	41						
22:00	20						
23:00	10						
Total	2103						

* Minimum background sound level for Day, 18:00 to 19:00 inclusive
** Estimated Split based on City of Ottawa Environmental Noise Control Guidelines as no suitable data available. Split used for Medium Trucks to Heavy Trucks is 7% and 5% respectively.
*** Receptors effected by Highway 62 Background Noise.

Data from the MTO Kingston, hourly traffic counts - Hwy 62 South of Bancroft

Traffic Engineering Software

Weekly Volume Summary

Thu, Nov 18, 2010

Location: Hwy 62 - 8.6 km North of Hastings Rd 620
LHRS/Offset: 33780 / 0.0 **Region:** Eastern
Pattern Type: Low Tourist **PCS#:** 49 **Hwy. TVIS#:** 62125
Count Direction: NB/SB **Report Dates:** Sep 30, 2010 **to** Oct 6, 2010

Hour Interval	Thu 10/09/30	Fri 1	Sat 2	Sun 3	Mon 4	Tue 5	Wed 6	Thu 7
0:00- 1:00		12	10	22	2	5	6	2
1:00- 2:00		8	15	6	10	8	2	3
2:00- 3:00		6	9	4	2	4	1	5
3:00- 4:00		2	5	5	4	3	3	7
4:00- 5:00		13	7	3	15	10	19	14
5:00- 6:00		21	12	10	35	33	28	21
6:00- 7:00		58	19	18	78	65	79	71
7:00- 8:00		117	77	30	132	113	118	117
8:00- 9:00		138	119	47	176	159	152	175
9:00-10:00		169	183	96	160	139	161	161
10:00-11:00		161	199	172	157	129	140	174
11:00-12:00		193	205	182	154	136	159	158
AM Total	0	898	860	595	925	804	868	908
12:00-13:00	151	206	231	216	170	151	148	
13:00-14:00	151	166	232	217	166	152	150	
14:00-15:00	161	205	203	233	153	179	163	
15:00-16:00	189	229	223	213	166	169	156	
16:00-17:00	162	234	182	194	188	152	181	
17:00-18:00	180	219	169	157	172	154	152	
18:00-19:00	110	151	109	105	95	98	90	
19:00-20:00	83	111	88	111	69	76	75	
20:00-21:00	65	64	71	57	42	36	49	
21:00-22:00	60	67	56	44	25	32	41	
22:00-23:00	23	50	50	18	24	26	20	
23:00-24:00	19	23	26	6	6	6	10	
PM Total	1,354	1,725	1,640	1,571	1,276	1,231	1,235	0
24 Hr. Total	1,354	2,623	2,500	2,166	2,201	2,035	2,103	908
Noon - Noon	2,252	2,585	2,235	2,496	2,080	2,099	2,143	

ADT	AWD	AADT	AAWD	SADT	SAWDT	WADT	DHV
2,270	2,144	2,154	2,081	2,950	2,767	1,594	274

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Samples of Traffic Noise Predictions using STAMSON

```
STAMSON 5.0        SUMMARY REPORT        Date: 08-09-2012 17:17:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por2_w.te            Time Period: 1 hours
```

Description: POR 2 2nd Storey

```
Road data, segment # 1:
------------------------
Car traffic volume  :    79 veh/TimePeriod
Medium truck volume :     6 veh/TimePeriod
Heavy truck volume  :     5 veh/TimePeriod
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1:
----------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.00 m
Receiver height           :   4.50 m
Topography                :      1       (Flat/gentle slope; no
barrier)
Reference angle           :   0.00

Result summary
--------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+---------+---------+---------
 1.                 !     1.54 !    54.38 !    54.38
--------------------+---------+---------+---------
                      Total                  54.38 dBA


TOTAL Leq FROM ALL SOURCES:       54.38
```

```
STAMSON 5.0         SUMMARY REPORT        Date: 08-09-2012 17:18:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: por2_OLA.te          Time Period: 1 hours
```

Description: POR 2 OLA

```
Road data, segment # 1:
-----------------------
Car traffic volume  :    79 veh/TimePeriod
Medium truck volume :     6 veh/TimePeriod
Heavy truck volume  :     5 veh/TimePeriod
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1:
----------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no
barrier)
Reference angle           :   0.00

Result summary
--------------

                    !  source  !   Road   !  Total
                    !  height  !   Leq    !   Leq
                    !   (m)    !  (dBA)   !  (dBA)
--------------------+---------+---------+---------
 1.                 !     1.54 !    53.95 !    53.95
--------------------+---------+---------+---------
                      Total                 53.95 dBA
```

TOTAL Leq FROM ALL SOURCES: 53.95

HUGH WILLIAMSON ASSOCIATES INC.
Ottawa, Ontario, Canada

RESUMÉ: Dr. HUGH WILLIAMSON, P.Eng.

QUALIFICATIONS:

Ph.D. Mechanical Engineering, University of New South Wales, 1972

B.Sc. Mechanical Engineering, (with Distinction), University of Alberta, 1967

Member, Professional Engineers, Ontario

Member, Canadian Acoustical Association

Member, American Society of Heating, Refrigeration and Air-conditioning Engineers

KEY COMPETENCIES:

- Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning
- Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services.
- Industrial noise and vibration assessment and control.
- Transportation noise and vibration.

PROFESSIONAL EXPERIENCE:

Hugh Williamson is a professional engineer with many years of experience in the measurement, analysis and control of noise and vibration. Hugh Williamson Associates was incorporated in 1997 and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to establishing Hugh Williamson Associates, his career included extensive periods in industry as well as university level research and teaching. He is a former Director of the Acoustics and Vibration Unit at the Australian Defence Force Academy. He has published over 50 engineering and scientific papers and has been an invited speaker on noise and vibration at national and international conferences. He has more than 20 years of experience as a consultant.

CLIENT LIST:

Hugh Williamson Associates provides consulting services to large and small clients including: National Research Council, National Capital Commission, J. L. Richards & Associates, Barry Padolsky Associates, HOK Urbana Architects, Genivar, Nasittuq Corporation, PWGSC, R. W. Tomlinson, Geo. Tackaberry Construction and Miller Paving.

Postal Address: PO Box 74056, RPO Beechwood, Ottawa, Ontario, K1M 2H9, Canada
Phone/Fax: (613) 747 0983, Email: hugh@hwacoustics.ca, http://www.hwacoustics.ca

RESUMÉ: MICHAEL WELLS

QUALIFICATIONS:

Registered Architect of NSW, Registration Number: 8111

B. Architecture (Hons), University of Sydney, 2002

B.Sc. Architecture, University of Sydney, 1999

Member, Canadian Acoustical Association

KEY COMPETENCIES:

- Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning.
- Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services.
- Industrial noise and vibration assessment and control.
- Transportation noise and vibration.
- Design services including sketch design, design development (development / permit applications), contract documents, tendering and contract administration.

PROFESSIONAL EXPERIENCE:

Michael Wells is a professional Architect registered in NSW with many years of experience in the Architectural and Construction industries. With key competencies in measurement, analysis and control of noise and vibration, Michael Wells joined Hugh Williamson Associates in 2012 and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to joining Hugh Williamson Associates, his career includes the founding of Michael Wells Architect in Sydney Australia which specialized in the design of institutional, commercial and residential projects. He is a Director of Architectural Workshops Australia and Vision Blue Pty Ltd. He has more than 10 years of experience as a consultant.

CLIENT LIST:

Hugh Williamson Associates provides consulting services to large and small clients including: National Research Council, National Capital Commission, J. L. Richards & Associates, Barry Padolsky Associates, HOK Urbana Architects, Genivar, Nasittuq Corporation, PWGSC, R. W. Tomlinson, Geo. Tackaberry Construction and Miller Paving.

Postal Address: PO Box 74056, RPO Beechwood, Ottawa, Ontario, K1M 2H9, Canada
Phone/Fax: (613) 747 0983, Email: michael@hwacoustics.ca, http://www.hwacoustics.ca