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ACOUSTIC ASSESSMENT REPORT FOR THE CAVANAGH OTTAWA AIRORT PIT

CITY OF OTTAWA

Prepared for

Thomas Cavanagh Construction Limited

Prepared by

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ACOUSTIC ASSESSMENT REPORT FOR THE CAVANAGH OTTAWA AIRORT PIT

Executive Summary

The Ottawa International Airport Authority (OIAA) owns land to the south of the Ottawa International Airport, and, intends to develop various parcels of this land for aggregate extraction. It is proposed that Thomas Cavanagh Construction Limited (Cavanagh) conduct pit operations on the OIAA site shown in Figure 1, with the site to be known as the Cavanagh Ottawa Airport Pit (Pit). In other studies of OIAA land, this site is identified as Parcel C.

Freefield Ltd. has been engaged by Cavanagh to prepare this acoustic assessment report for the proposed operations on the Cavanagh Ottawa Airport Pit. The acoustic assessment report is to be submitted to the OIAA and the City of Ottawa as part of the approval process for the Pit.

This report describes an assessment of the potential impact of noise from operations at as the Cavanagh Ottawa Airport Pit in accordance with City of Ottawa Environmental Noise Control Guidelines[1] (ENCG) and the Ontario Ministry of Environment, Conservation and Parks, MECP, guidelines for noise assessment, NPC-300[2] and NPC-233[3].

Noise impacts have been predicted and compared to the City of Ottawa and MECP sound level limits. Section 7.0 of this report sets out noise mitigation measures such as berms and limits to operations which are designed to ensure all operations are in compliance with the applicable sound level limits.

ACOUSTIC ASSESSMENT REPORT FOR THE CAVANAGH OTTAWA AIRORT PIT

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Resumes, Dr. Hugh Williamson, Michael Wells

ACOUSTIC ASSESSMENT REPORT FOR THE CAVANAGH OTTAWA AIRORT PIT

1.0 Introduction

The Ottawa International Airport Authority (OIAA) owns land to the south of the Ottawa International Airport, and, intends to develop various parcels of this land for aggregate extraction. It is proposed that Thomas Cavanagh Construction Limited (Cavanagh) conduct pit operations on the OIAA site shown in Figure 1, with the site to be known as the Cavanagh Ottawa Airport Pit (Pit). In other studies of OIAA land, this site is identified as Parcel C.

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This report has been prepared in accordance with the MECP Document NPC-233, *Information to be Submitted for Approval of Stationary Sources of Sound*, October 1995[3]. Noise from the facility is assessed according to MECP Document: NPC-300, *Stationary and Transportation Sources – Approval and Planning*, August 2013[2].

The noise assessment methodology is summarised below.

- Identification of noise sensitive receptors in the vicinity of the Pit. Potential noise sensitive receptors include residences, motels, places of worship, schools, hospitals and land zoned for a potential noise sensitive use.

- Determination of the sound level limits[1,2] which apply at each of the noise sensitive receptors.

- Identification of the sources of noise that will arise from Pit operations. In the current study, the strengths of the various noise sources were obtained from noise measurements of similar Cavanagh operations, and, from noise measurements by Freefield Ltd. of similar aggregate operations in Ontario.

- Based on the strengths of the individual noise sources, noise levels due to Pit operations are predicted at nearby noise sensitive receptors using an ISO prediction procedure[4] which is strongly favoured by the MECP. Compliance is assessed under predictable "worst case" conditions for normal operations.

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

Surrounding Lands, Acoustic Environment and Critical Receptors

Directions in this report refer to site north as shown in Figure 1.

The proposed Cavanagh Ottawa Airport Pit is located on the west side of Albion Road, approximately 400 m north of the intersection of Albion Road and Rideau Road, see Figure 1. The Rideau Carleton Raceway and Slots is located on the east side of Albion Road, approximately opposite to the proposed Pit.

The legal description of the land occupied by the proposed Cavanagh Ottawa Airport Pit is as follows:

Part of Lots 23 and 24, Concession 3
Rideau River Geographic Township of Gloucester
City of Ottawa, Ontario.

A zoning plan for the area is provided in Figure 2.

The topography of the site and surrounding land is relatively flat with minor changes in elevation.

The land surrounding the proposed Pit is zoned for a mixture of uses including mineral extraction and reserve, zones ME and MR, commercial and industrial, zones RC and RG, parks and open space, zone OA1, and, rural and rural residential, zones RU and RR. The proposed pit and surrounding land are within land designated as Ottawa Airport Operating Influence Zone (AOIZ) or Airport Vicinity Development Zone (AVDZ).

The general area is on the southern fringe of the urbanized area of Ottawa and hence is a relatively busy area. The nearby roads, Albion Road, Rideau Road and Bowesville Road carry significant amounts of road traffic, including passenger, commuter, commercial and industrial vehicles. There are a number of active nearby pits and quarries which generate significant amounts of heavy vehicle traffic. Hence significant road traffic noise is generated in the area, especially during the day. The area also experiences significant aircraft noise from the nearby Ottawa International Airport. Hence the acoustic environment of the area is considered to be urban, see further discussion in Section 5.0.

Points of Reception

This noise study considers the impacts at noise sensitive points of reception potentially including residences, motels, places of worship, schools, hospitals and land zoned for a potential noise sensitive use. Sixteen of the closest points of reception (POR's) to the Pit have been selected for analysis, these being shown in Figure 1 and listed in Table 1. Note that in some cases the selected points of reception are representative of a group of nearby residences. Noise sensitive points of reception which are further from the proposed Pit than those selected for analysis will receive lesser levels of noise and impact from Pit operations.

It is normally required to consider the potential noise impacts on vacant lots which in the future may be developed for noise sensitive uses. In this case, all of the land surrounding the Pit is within land designated as Ottawa Airport Operating Influence Zone (AOIZ) or Airport Vicinity Development Zone (AVDZ). The City of Ottawa does not generally allow any new noise sensitive developments in the AOIZ or the AVDZ, hence no additional points of reception have been considered.

2.0 Detailed Facility Description

The primary product of the proposed Cavanagh Ottawa Airport Pit will be sand. Excavation will be accomplished with loaders and excavators within the limit of extraction of the site, see Figure 3. There will be no rock drilling or blasting.

Material excavated from the Pit will be transported to a screening plant which will separate any larger stones and rocks from the sand. The sand will be stockpiled, then shipped from the site using highway trucks.

The larger stones and rocks which are separated by the screening plant will be moved to a crushing area for later crushing into aggregate. It is anticipated that crushing will occur only occasionally using a portable crushing plant which is brought to site when needed. The aggregate produced will also be loaded onto highway trucks and shipped from the site.

The floor of the Pit is proposed to be approximately 110.7 masl, resulting in excavation depths up to approximately 6 m. Excavation will take place in one lift.

The hours of operation of the Pit will be within daytime hours, 7 a.m. to 7 p.m.

Site preparation and rehabilitation activities will take place only during daytime hours, 7 a.m. to 7 p.m.

Significant noise generating equipment to be used in pit operations will consist of the following.

- One screening plant, with associated conveyors and stackers.
- One portable crushing plant, brought to site occasionally, when required.
- Up to 3 loaders, typically 2 associated with the screening operation and 1 associated with the crushing operation.
- Up to 3 excavators, typically 2 associated with the screening operation and 1 associated with the crushing operation.
- Highway trucks used to ship the product off site.

Under maximum production conditions it is assumed that up to 14 truckloads per hour will be shipped from the site, nominally10 truck loads per hour of sand and 4 truck loads per hour of crushed aggregate.

3.0 Noise Source Summary

The following noise sources and data have been used to model noise generated by operations at the proposed Cavanagh Ottawa Airport Pit. 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.

- Screening Plant (source name in model: Screener)
- Loaders (source name in model: Loader_Ship)
- Excavator (source name in model: Excavator)
- Mobile crushing plant (source name in model: Mobile_Crush)
- Highway Truck Movements (source name in model: Truck_Ship)

The noise modelling considers various scenarios relating to different areas of operation as described in Section 6.0. For each scenario, the locations of the noise sources are selected for worst case noise impacts.

The strengths of the noise sources, i.e. the sound powers shown in Table 2 and, are derived from a database of noise measurements by Freefield Ltd. of similar operations made at other aggregate operations in Ontario.

Sound measurements for the assessment of noise sources have been made by Freefield using Bruel and Kjaer sound level meters, Types 2250 and 2270. These meters are field calibrated using a Bruel and Kjaer Type 4231 Field Calibrator before and after each series of measurements. The field calibration did not vary by more than 0.1 dB over the period of the measurements. In addition, the meters and field calibrators are laboratory calibrated on an annual basis. Copies of the relevant calibration certificates are available on request.

Noise measurement periods have been restricted to times when the meteorological conditions are well suited to noise measurements. In particular, measurements are not taken during rain or when wind speeds exceed 20 km/hour. All measurements were made with microphones mounted on tripods, 1.5 m above the ground and at least 3 m away from any major obstacles.

Noise from the highway trucks, and associated on-site haul routes, are estimated using the moving point source method and modelled as a loop indicating the worst-case on-site truck movements. When operating on-site, highway trucks shall not exceed 30 kph and shall not use compression braking (Jake Brakes).

Insignificant noise sources:

Conveyors, stackers and noise from employee or service vehicles have been assessed as insignificant noise sources in this analysis.

4.0 Point of Reception Summary

A total of sixteen nearby noise sensitive receptors have been selected for detailed noise evaluation, as shown in Figure 1. These residences, including one church, are those closest to the Pit in all directions and represent the worst case noise impacts in comparison to other nearby or more distant noise sensitive receptors.

The sixteen receptors selected for analysis, POR 1 to POR 16, are shown in Figure 1 and listed in Table 1.

As per MECP Guideline NPC-300, two points of reception (POR) have been selected at each receptor for which worst case sound levels have been calculated.

> W – Plane of Window points of reception are located on the dwelling or noise sensitive building, typically 2 m above ground for single storey dwellings and 4.5 m above ground for two storey dwellings.
>
> O – Outdoor points of reception, represent an outdoor amenity area on the property of the residence. For large properties, the outdoor point of reception can be up to 30 m from the dwelling at a height of 1.5 m above ground.

Noise prediction results are summarized in Tables 6 by point of reception for each of the 5 operational scenarios described in Section 6.0. Figures 7, 9, 11, 13 and 15 show predicted noise impacts as noise contours for Scenario 1 through 5.

Point of reception noise impacts by noise source are contained in Appendix 1, Table A1.6.1 to A1.6.5.

Because POR 5 is located very close to, and at the intersection of, Albion and Rideau Roads, the daytime background noise due to road traffic as calculated in Appendix 2 is very high, 65.5 dBA, more than 15 dBA above the MECP exclusion limit of 50 dBA. If noise from the Pit were to approach this limit of 65.5 dBA, then there would be potential for complaints about noise. However, POR 5 is more than 300 m from the Pit and calculated levels of noise from the Pit at POR 5 are of the order of 46 to 51 dBA, see Table 6. Hence, noise from the Pit at POR 5 not only meets the MECP criteria but is also not likely to result in noise complaints.

5.0 Assessment Criteria, Sound Level Limits & Acoustic Environment

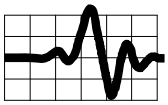
Sound level limits, as specified in the City of Ottawa ENCG[1] guidelines and MECP guideline NPC-300[2], depend on the acoustical classification of the area as Class 1, 2, 3 or 4.

> **Class 1 area** 'an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as urban hum.'
>
> **Class 2 area** 'an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas: sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours); and, low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours).'
>
> **Class 3 area** 'a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as: a small community; agricultural area; a rural resort area such as a cottage or resort area; or, a wilderness area. '
>
> **Class 4 area** 'an area or specific site that would otherwise be defined as Class 1 or 2 and which: is an area intended for development with new noise sensitive land use(s) that are not yet built; is in proximity to existing, lawfully established stationary source(s); and, has formal confirmation from the land use planning authority with the Class 4 area classification which is determined during the land use planning process. Additionally, areas with existing noise sensitive land use(s) cannot be classified as Class 4 areas.'

Due to the high levels of road traffic on Albion Road and Rideau Road, the areas near these roads are subject to significant road traffic noise, particularly during the daytime hours. Hence all receptors located adjacent to either Albion or Rideau Roads are classified as being in a Class 2 Area, i.e. POR 1 to POR 10, and, POR 16.

Traffic levels are much lighter on Bowesville Road and High Road. Also, Fico Crescent carries only local traffic. Although it could be argued that the whole area surrounding the proposed Pit is Class 2, the conservative assumption was made that the receptors on Bowesville Road, Fico Crescent and High Road are classified as being in a Class 3 Area, i.e. POR 11 to POR 15.

For a Class 2 and Class 3 Areas the applicable outdoor sound level limit at a point of reception is the higher of the applicable exclusion limit value, given in Tables 3 and 4, or, the background sound level due to road traffic for each point of reception. Background sound level means the sound level that is present in the environment, produced by noise sources other than the source under assessment. Road traffic noise is the most common source of background sound.



A background noise assessment from road traffic was carried using the MECP methodology[4,5,6] at points of reception in close proximity to the Albion Road and Rideau Road, i.e. POR 1 to POR 9. Appendix 2 contains the details of the analysis of background road traffic noise at points of reception based on the most recently available traffic count data from the City of Ottawa for Albion and Rideau Roads.

The background road traffic assessment indicated elevated sound levels, above the Class 2 area exclusion limits, for POR 1 to POR 9 during the daytime period. For the remainder of the points of reception, POR 10 to POR16, the MECP exclusion limits shown in Tables 3 and 4 are assumed to apply.

POR 16 is subject to significant traffic noise from Albion Road; however, the west side of the residence is shielded from noise from Albion Road and yet still exposed to noise from the proposed Pit. Hence, Class 2 exclusion limits are applied at POR 16.

The applicable sound level limits for each point of reception are set out in Table 5.

Sound levels are assessed in terms of the 1-hour equivalent sound level, L_{eq}, effectively the average sound level over each hour. All sound levels are A-weighted, A-weighting being a frequency weighting with represents sensitivity of human hearing to sounds of differing frequencies.

6.0 Noise Impact Assessment

Noise levels have been calculated at the selected points of reception for "predictable worst case" operations in the Pit using the ISO sound propagation methodology[7] as implemented in the sound prediction software Cadna-A, Version 2020. The "predictable worst case" is interpreted as meaning the greatest noise impact anticipated under normal operating conditions. The ISO methodology provides a conservative (i.e. high) estimate of the noise level at a receptor taking into account adverse wind and meteorological conditions.

The calculation method includes the following factors:

- 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 concurrent operations occur.

The following five worst case scenarios are presented in this report and form the basis for the assessment of compliance. The five Scenarios correspond to extraction taking place in five separate areas of the Pit as shown in Figure 4.

Scenario 1: Excavation in Area A. See Figures 6A, 6B and 6C

Scenario 2: Excavation in Area B1S. See Figures 8A and 8B

Scenario 3: Excavation in Area B1N. See Figures 10A and 10B.

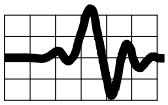
Scenario 4: Excavation in Area B2S. See Figures 12A and 12B.

Scenario 5: Excavation in Area B1S. See Figures 14A and 14B.

Note that Figure 6C shows the detailed configuration of the crushing operation which applies to all scenarios.

It was found that some restrictions in the location of screening and crushing plants were needed in order to achieve compliance with the sound level limits. Also, some barriers/berms were also required to achieve compliance. These restrictions and berms are described in Section 7.0 and illustrated in Figure 5.

The height of the working face varies across the pit from virtually zero to 6 m. Surface elevations in the extraction area range from 111 to 117 masl, and, the floor of the Pit has been modelled conservatively as 111 msal. The proposed floor of the Pit is slightly lower, approximately 110.7 masl. For large areas of the pit, the working face will be less than 3 m. The heights of the



noise sources for the pit equipment are 3 to 5 m above grade, hence for most of the Pit, the working face will not provide any significant shielding for the points of reception. In all the above worst case scenarios, the screening and crushing plants are located such that there will be no significant screening from the working faces for any points of reception. This provides a conservative, worst case, condition for each of the scenarios.

For most of the areas surrounding the Pit, the ground is assumed to be acoustically absorptive, G = 1.0 in the model. Within the excavated area of the Pit, more reflective ground has been assumed, G = 0.3 in the model. Paved road surfaces and parking lots are generally quite reflective, and these have been assumed to be perfectly reflective in the model, G = 0.0. These assumptions concerning ground reflectivity are considered to be conservative and reasonable.

Table 6 contains calculated noise levels at the nearest receptors for the worst case for each scenario are compared with the applicable sound level limits. More detailed estimates, for all sources and scenarios are contained in Appendix 1, Tables A1.6.1 to A1.6.5.

Statement of Compliance

It is concluded that, with the recommended mitigation measures, noise impacts from operations at the proposed Cavanagh Ottawa Airport Pit will be in compliance with City of Ottawa and MECP Environmental Noise Guidelines[1,2] for the proposed daytime period of operation 7 am to 7 pm.

7.0 Noise Mitigation Measures

Noise mitigation measures for proposed Cavanagh Ottawa Airport Pit are detailed below.

The predicted noise impacts in Table 6 are based on the implementation of the following mitigation measures:

7.1 Operations at the Pit shall take place only during the daytime period, 7 a.m. to 7 p.m.

7.2 The operation of the screening plant shall comply with the following:

a. The screening plant shall be located on the floor of the Pit.
b. When operating in Area A, there are no restrictions on the location of the screening plant.
c. When operating in Area B, the screening plant shall be at least 150 m west of the eastern site boundary and at least 115 m south of the northern site boundary, see Figure 5.

7.3 The operation of the crushing plant shall comply with the following:

a. The crushing plant shall be located on the floor of the Pit.
b. The crushing plant shall be located within the area indicated in Figure 5.
c. The crushing plant shall be shielded by Berms 4 and 5 as described in Table 7 and below.

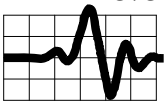
7.4 Noise barriers or berms are to be provided as follows:

a. Noise barriers or berm are to be provided as per Table 7. Note that Berms 1, 2 and 3 are only required when excavation is taking place in Area B.

b. A noise barrier may be substituted for a berm, and vice versa, provided that the minimum height, minimum extent and location requirements are satisfied.

c. 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.
   i. Lift face or existing terrain.
   ii. Earth, gravel or aggregate berms or stockpiles.
   iii. Concrete or brick walls.
   iv. Commercial noise barriers.
   v. Shipping containers.

7.5 If a new process is introduced to the site, then this process shall be assessed by a qualified acoustical consultant prior to commissioning. Noise mitigation measures shall be reviewed, and altered if necessary, to ensure that City of Ottawa and MECP sound level limits are met at all points of reception.

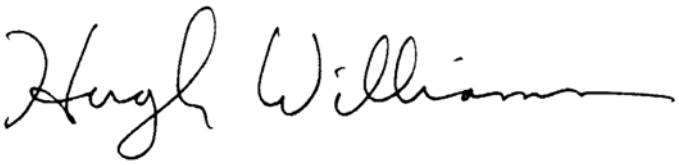


8.0 Conclusions

An acoustic assessment of operations at the proposed Cavanagh Ottawa Airport Pit has been conducted according to the City of Ottawa and MECP noise assessment procedures.

Proposed operations at the Pit include extraction with loaders and excavators, screening, crushing and the loading of product onto highway trucks for shipping off site.

It has been found that noise levels from operations, at nearby receptors, will be in compliance with City of Ottawa and MECP sound level limits provided that the noise mitigation measures described in Section 7.0 are followed.



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1. City of Ottawa, *Environmental Noise Control Guidelines*, January 2016. (ENCG)

2. Ministry of Environment, Conservation and Parks, Publication NPC-300, *Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning*, August 2013.

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

4. Ministry of Environment, Conservation and Parks Publication NPC-206, *Sound Levels due to Road Traffic,* October 1995.

5. Ministry of Environment, Conservation and Parks, Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), 1989.

6. Ministry of Environment, Conservation and Parks, STAMSON Software, Version 5.03, 1996. (Software implementation of reference 4).

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

8. RWDI AIR Inc. Publication, *"Typical Hourly Traffic Distribution for Noise Modelling"*, Vol. 36 No. 3 (2008).

Tables

Contents:

Table 1: Point of Reception Summary Table

Point of Receptor Symbol	Location (See Figures 1)
POR_1	4897 Albion Road, 2-storey residence
POR_2	4953 Albion Road, 2-storey residence
POR_3	4959 Albion Road, 1-storey residence
POR_4	2594 Rideau Road, 2-storey residence
POR_5	2536 Rudeau Road, Church
POR_6	2530 Rideau Road, 2-storey residence
POR_7*	2422 Rideau Road, 1-storey residence
POR_8*	2414 Rideau Road, 2-storey residence
POR_9*	2380 Rideau Road, 1-storey residence
POR_10	2050 Rideau Road, 2-storey residence, also cottages
POR_11**	5595 Fico Crescent, 2-storey residence
POR _12	4839 Bowesvill Road, 2-storey residence
POR _13	4739 Bowesvill Road, 2-storey residence
POR_14	4600 High Road, 2-storey residence
POR_15	4801 High Road, 2-storey residence
POR_16	4788 Albion Road, 2-storey residence

Notes:

- At each noise sensitive building, two points of reception are considered:
  - Plane of Window (W) points of reception are taken to be at 2 m above ground for 1-storey and 4.5 m above ground for 2-storey residences. E.g. POR_1_W
  - Outdoor (O) points of reception are taken at 1.5 m above ground level. E.g. POR_1_O

- * Representing several residences on this section of Rideau Road

- ** The most affected residence on Fico Crescent. Other residences in Fico Crescent will be less affected.

Table 2: Noise Source Summary Table

Source ID	Source Description	Sound Power (dBA)	Source Location Ht. above ground (m)	Sound Character-istics	Noise Control Measures
Screener	Screening Plant	111.0	3.0	Steady, moving, no significant tonality, non-directional	Refer Section 7.0
Loader_Ship	Loader used for loading trucks or feeding the screener or crusher	107.9	3	Steady, moving, no significant tonality, non-directional	Refer Section 7.0
Excavator	Excavator for extraction or loading the screener or crusher	103.4	3.0 (when excavating) 5.0 (when feeding plant)	Steady, moving, no significant tonality, non-directional	Refer Section 7.0
Mobile_Crush	Mobile Crushing Plant	120.0	3.0	Steady, moving, no significant tonality, non-directional	Refer Section 7.0
Truck_Ship	On-site truck movements for shipping	107.8	3.0	Steady, moving, no significant tonality, non-directional	Refer Section 7.0

Table 3: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Outdoor Points of Reception

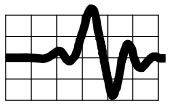
Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	55
19:00 – 23:00	50	45	40	55

Table 4: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Plane of Window of Noise Sensitive Spaces

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	60
19:00 – 23:00	50	50	40	60
23:00 – 07:00	45	45	40	55

Table 5: Applicable One Hour Sound Level Limits at Points of Reception

Receptor & Point of Reception _W = Plane of Widow _O = Outdoor	Sound Level Limit 1-hour L_{AEQ} dBA (Daytime Period, 07:00 – 19:00)	Sound Level Limit 1-hour L_{AEQ} dBA (Evening Period, 19:00 – 23:00)	Sound Level Limit 1-hour L_{AEQ} dBA (Nighttime Period, 23:00 – 07:00)
POR_1_W**	55.0	50.0	45.0
POR_1_O**	55.0	45.0	*
POR_2_W**	55.0	50.0	45.0
POR_2_O**	55.0	45.0	*
POR_3_W**	55.0	50.0	45.0
POR_3_O**	55.0	45.0	*
POR_4_W**	57.5	50.0	45.0
POR_4_O**	57.5	45.0	*
POR_5_W**	65.5	50.0	45.0
POR_5_O**	65.5	45.0	*
POR_6_W**	57.5	50.0	45.0
POR_6_O**	57.5	45.0	*
POR_7_W**	58.5	50.0	45.0
POR_7_O**	58.5	45.0	*
POR_8_W**	58.5	50.0	45.0
POR_8_O**	58.5	45.0	*
POR_9_W**	58.5	50.0	45.0
POR_9_O**	58.5	45.0	*
POR_10_W	50.0	50.0	45.0
POR_10_O	50.0	45.0	*
POR_11_W***	45.0	40.0	40.0
POR_11_O***	45.0	40.0	*
POR_12_W***	45.0	40.0	40.0
POR_12_O***	45.0	40.0	*
POR_13_W***	45.0	40.0	40.0



Receptor & Point of Reception _W = Plane of Widow _O = Outdoor	Sound Level Limit 1-hour L_{AEQ} dBA (Daytime Period, 07:00 – 19:00)	Sound Level Limit 1-hour L_{AEQ} dBA (Evening Period, 19:00 – 23:00)	Sound Level Limit 1-hour L_{AEQ} dBA (Nighttime Period, 23:00 – 07:00)
POR_13_O***	45.0	40.0	*
POR_14_W***	45.0	40.0	40.0
POR_14_O***	45.0	40.0	*
POR_15_W***	45.0	40.0	40.0
POR_15_O***	45.0	40.0	*
POR_16_W	50.0	50.0	45.0
POR_16_O	50.0	45.0	*

*Nighttime sound level limit not applicable at Outdoor Point of Reception as per NPC-300.

**For POR's 1 to 9, the applicable daytime sound level limits are based on assessment of background noise from road traffic on Albion and Rideau Roads, refer Appendix 2.

*** POR's 11 to 15 are assumed to be in a Class 3 Area. All other POR's are assumed to be in a Class 2 Area.

Table 6: Acoustic Assessment Summary Table, Worst Case, Daytime Period of Operation, 7 am to 7 pm

Point of Reception ID	POR Description	Location	Scenario 1 Area A Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 2 Area B1 S Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 3 Area B1 N Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 4 Area B2 S Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 5 Area B2 N Estimated Sound Level Daytime Period (Worst Case) (dBA)	Performance Limit* Daytime Period (dBA)	Compliance with Performance Limit (Yes/No)	Verified by Acoustic Audit (Yes/No)
POR 1	Residence	POW	52.0	51.0	51.7	52.8	53.9	55.0	Yes	No
		OPR	51.4	50.0	50.9	51.4	52.8	55.0	Yes	No
POR 2	Residence	POW	50.2	52.6	50.9	54.4	52.0	55.0	Yes	No
		OPR	49.3	51.3	50.8	52.6	52.7	55.0	Yes	No
POR 3	Residence	POW	49.0	51.5	50.2	52.7	50.9	55.0	Yes	No
		OPR	48.9	51.1	49.9	52.3	50.8	55.0	Yes	No
POR 4	Residence	POW	42.8	45.4	44.2	45.9	44.5	57.5	Yes	No
		OPR	41.5	42.6	42.4	43.8	43.1	57.5	Yes	No
POR 5	Place of Worship	POW	46.9	50.1	48.2	50.3	48.5	65.5	Yes	No
		OPR	46.6	49.8	47.8	50.0	48.0	65.5	Yes	No
POR 6	Residence	POW	50.7	52.2	51.2	52.2	51.3	57.5	Yes	No
		OPR	49.7	51.2	50.2	51.3	50.3	57.5	Yes	No
POR 7	Residence	POW	51.2	51.5	51.2	51.5	51.2	58.5	Yes	No
		OPR	50.9	51.2	50.9	51.2	50.9	58.5	Yes	No
POR 8	Residence	POW	52.0	52.3	52.0	52.2	52.0	58.5	Yes	No
		OPR	51.0	51.3	51.0	51.3	51.0	58.5	Yes	No
POR 9	Residence	POW	51.6	51.7	51.6	51.7	51.6	58.5	Yes	No
		OPR	51.1	51.2	51.0	51.2	51.0	58.5	Yes	No
POR 10	Residence	POW	42.2	42.4	42.2	42.4	42.2	50.0	Yes	No
		OPR	37.3	37.6	37.2	37.6	37.2	50.0	Yes	No

Point of Reception ID	POR Description	Location	Scenario 1 Area A Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 2 Area B1 S Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 3 Area B1 N Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 4 Area B2 S Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 5 Area B2 N Estimated Sound Level Daytime Period (Worst Case) (dBA)	Performance Limit* Daytime Period (dBA)	Compliance with Performance Limit (Yes/No)	Verified by Acoustic Audit (Yes/No)
POR 11	Residence	POW	42.1	41.8	41.8	41.8	41.8	45.0	Yes	No
		OPR	41.2	40.8	40.8	40.8	40.9	45.0	Yes	No
POR 12	Residence	POW	39.9	38.9	39.4	38.7	39.5	45.0	Yes	No
		OPR	39.0	38.2	38.6	38.0	38.5	45.0	Yes	No
POR 13	Residence	POW	42.5	42.5	42.2	42.4	42.2	45.0	Yes	No
		OPR	40.9	40.5	40.5	40.5	40.5	45.0	Yes	No
POR 14	Residence	POW	41.6	40.9	41.5	40.9	41.4	45.0	Yes	No
		OPR	40.0	39.3	39.8	39.3	39.9	45.0	Yes	No
POR 15	Residence	POW	43.9	42.3	43.0	42.4	43.2	45.0	Yes	No
		OPR	42.4	41.6	42.3	41.6	42.4	45.0	Yes	No
POR 16	Residence	POW	49.4	48.5	49.2	48.8	49.4	50.0	Yes	No
		OPR	49.0	46.6	48.7	46.7	49.0	50.0	Yes	No

* Performance limits are based on 1-hour equivalent sound levels, Leq.

For POR's 1 to 9, the applicable daytime sound level limits are based on assessment of background noise from road traffic on Albion and Rideau Roads, refer Appendix 2.

Table 7: Recommended Noise Barriers/Berms

Barrier	Source Name	Minimum Height (m)	Minimum Length (m)	Maximum Distance from Source (m)	Location	Receptors	Description
Berm 1	Extraction, processing and shipping operations	5.0	140	-	As per: Figure 5	POR 2, POR 3	Berm or barrier located in the setback
Berm 2	Extraction, processing and shipping operations	5.0	130	-	As per: Figure 5	POR 1	Berm or barrier located in the setback
Berm 3	Extraction, processing and shipping operations	4.0	200	-	As per: Figure 5	POR 16	Berm or barrier located in the setback
Berm 4	Crushing plant	5.0	40	15 m from crushing plant	As per: Figure 5, Northeast of Crushing Plant	POR 16	Berm or Barrier oriented to shield POR 16
Berm 5	Crushing plant	5.0	30	30 m from crushing plant	As per: Figure 5, West of Crushing Plant	POR 11	Berm or Barrier oriented to shield POR 11

Figures

Contents:

Figure 1: Scaled Area Location Plan - Showing Receptor Locations (Source: GeoOttawa)

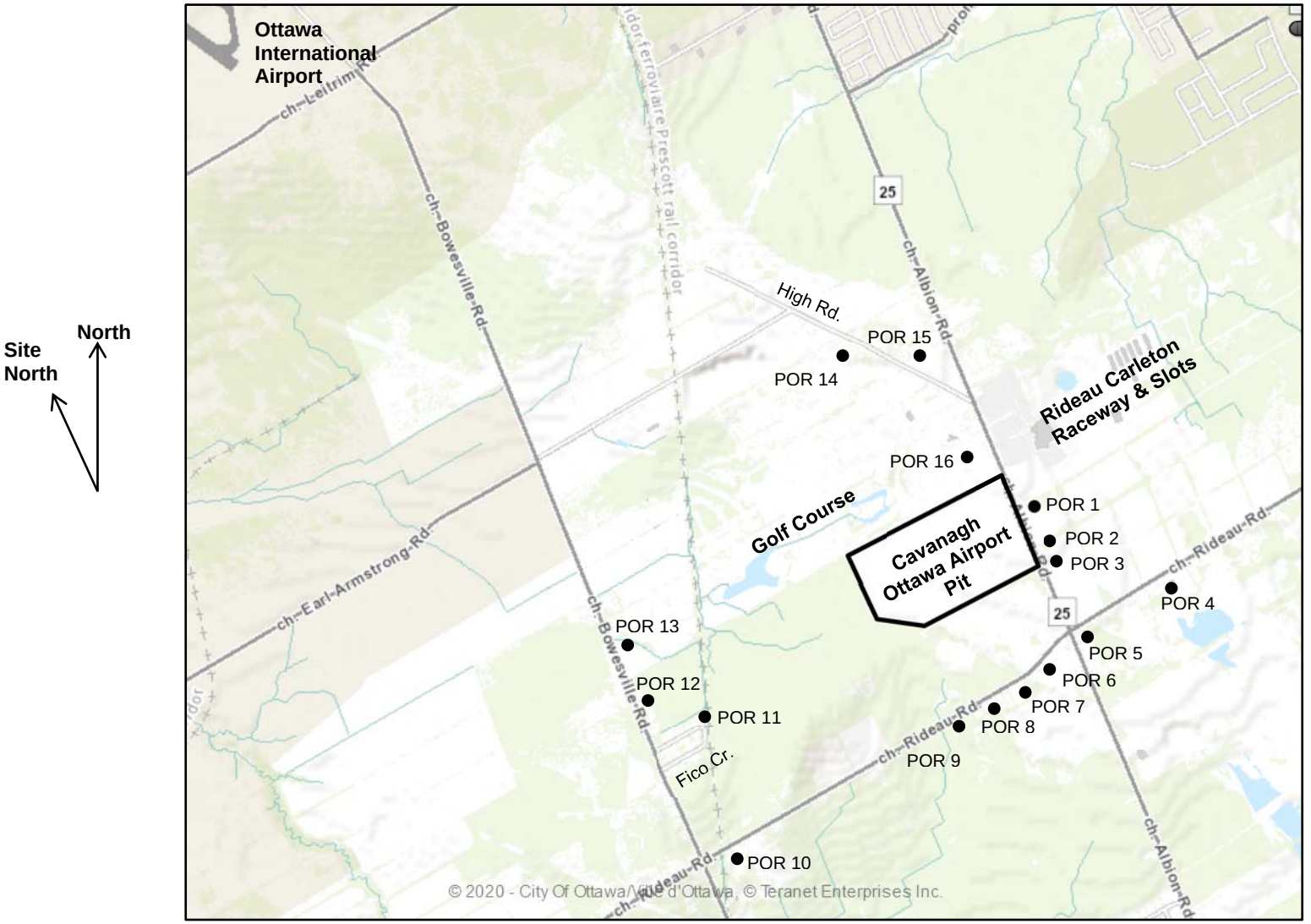
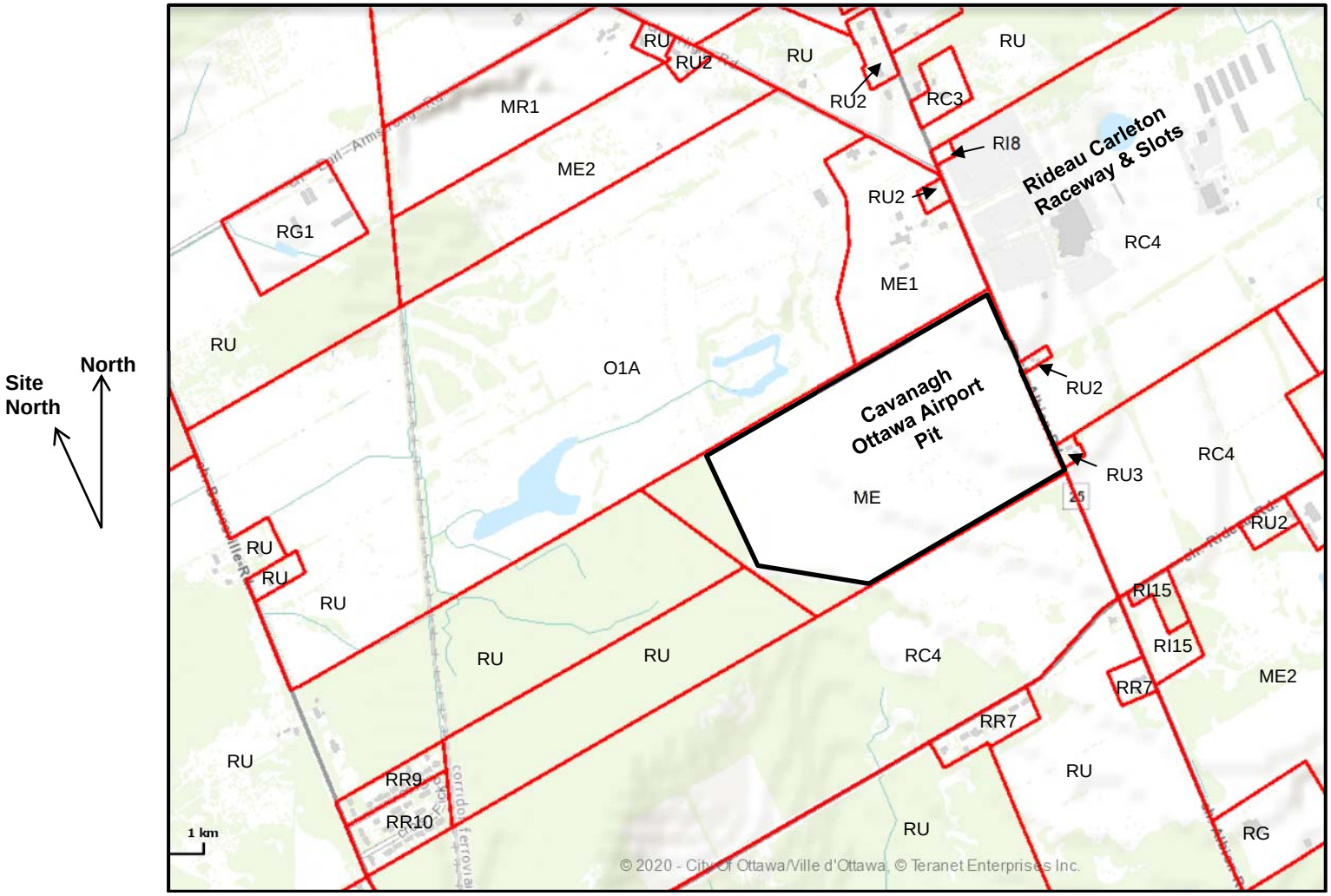


Figure 2: Zoning Plan (Source: GeoOttawa, City of Ottawa)



Legend next page

Figure 2: Zoning Plan – Legend

ME, ME1, ME2	Mineral Extraction Zones
MR1	Mineral Aggregate Reserve Zone
O1A	Parks and Open Space Zone
RC3, RC4	Rural Commercial Zones
RG, RG1	Rural General Industrial Zones
RI8, RI15	Rural Institutional Zone
RR9, RR19	Rural Residential Zones
RU, RU2	Rural Countryside Zones

Figure 3: Site Plan, Proposed Cavanagh Ottawa Airport Pit

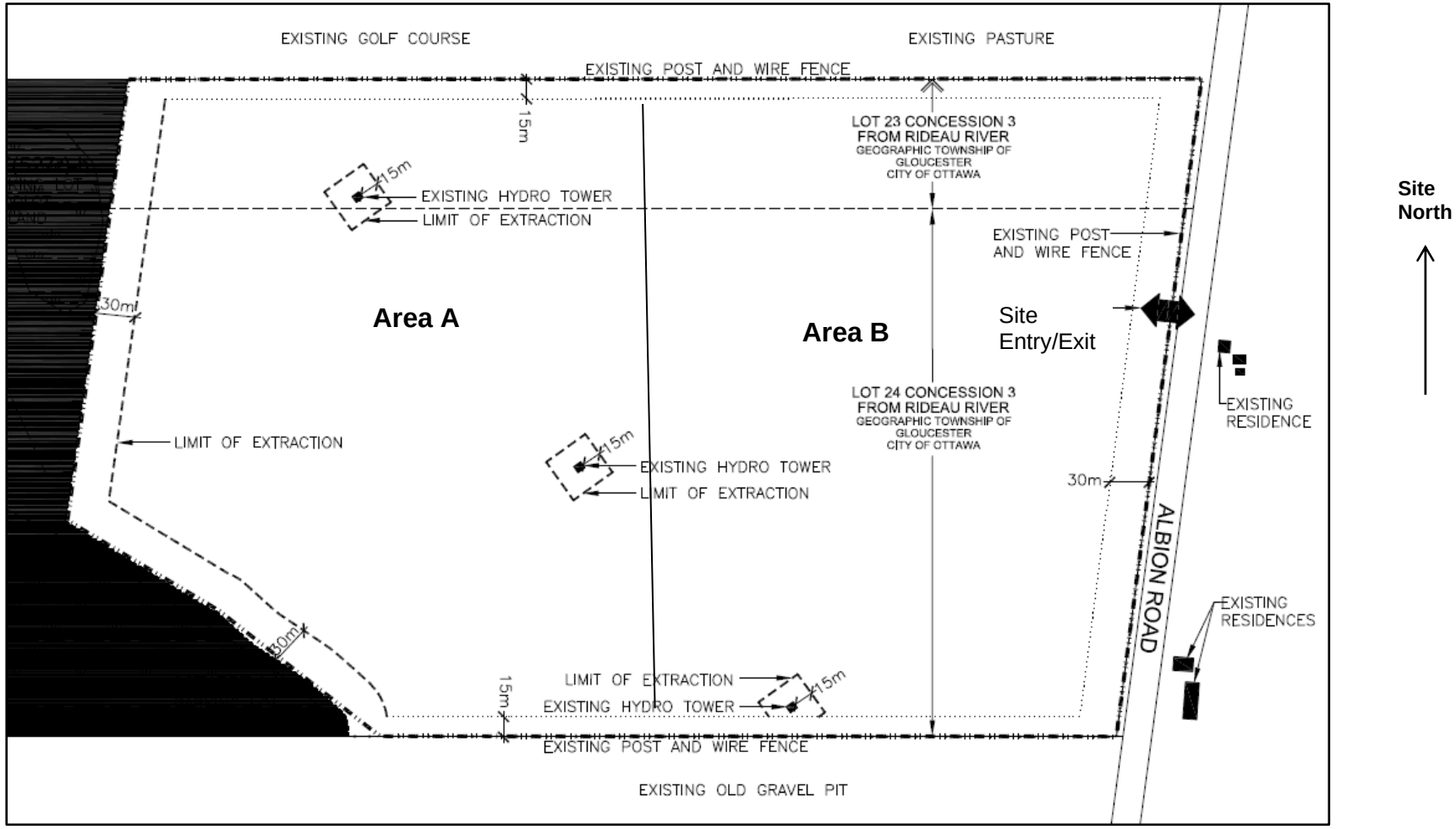


Figure 4: Site Plan Showing Extraction Areas for Noise Analysis (analysis scenarios)

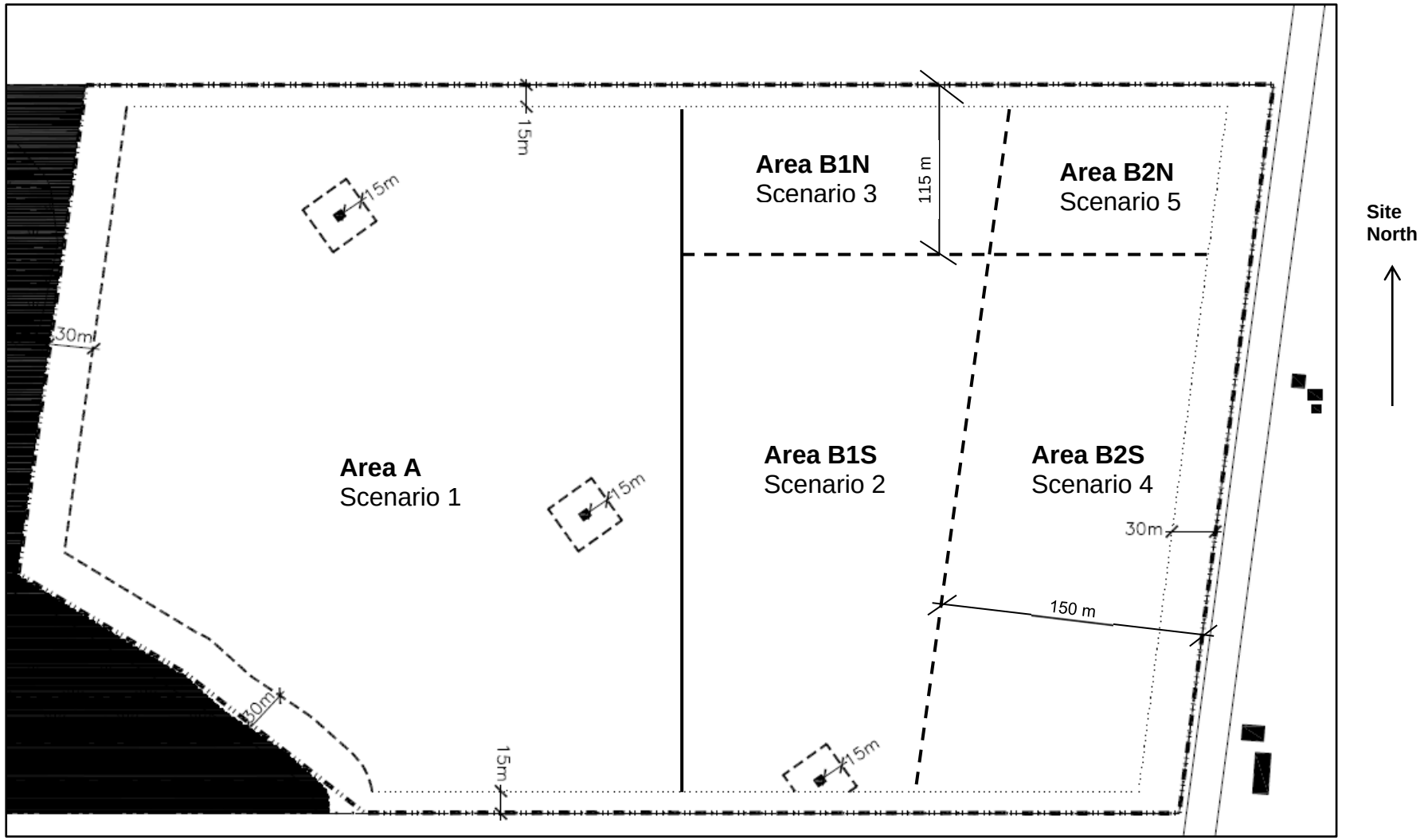


Figure 5: Mitigation Measures: Operational Restrictions and Berms

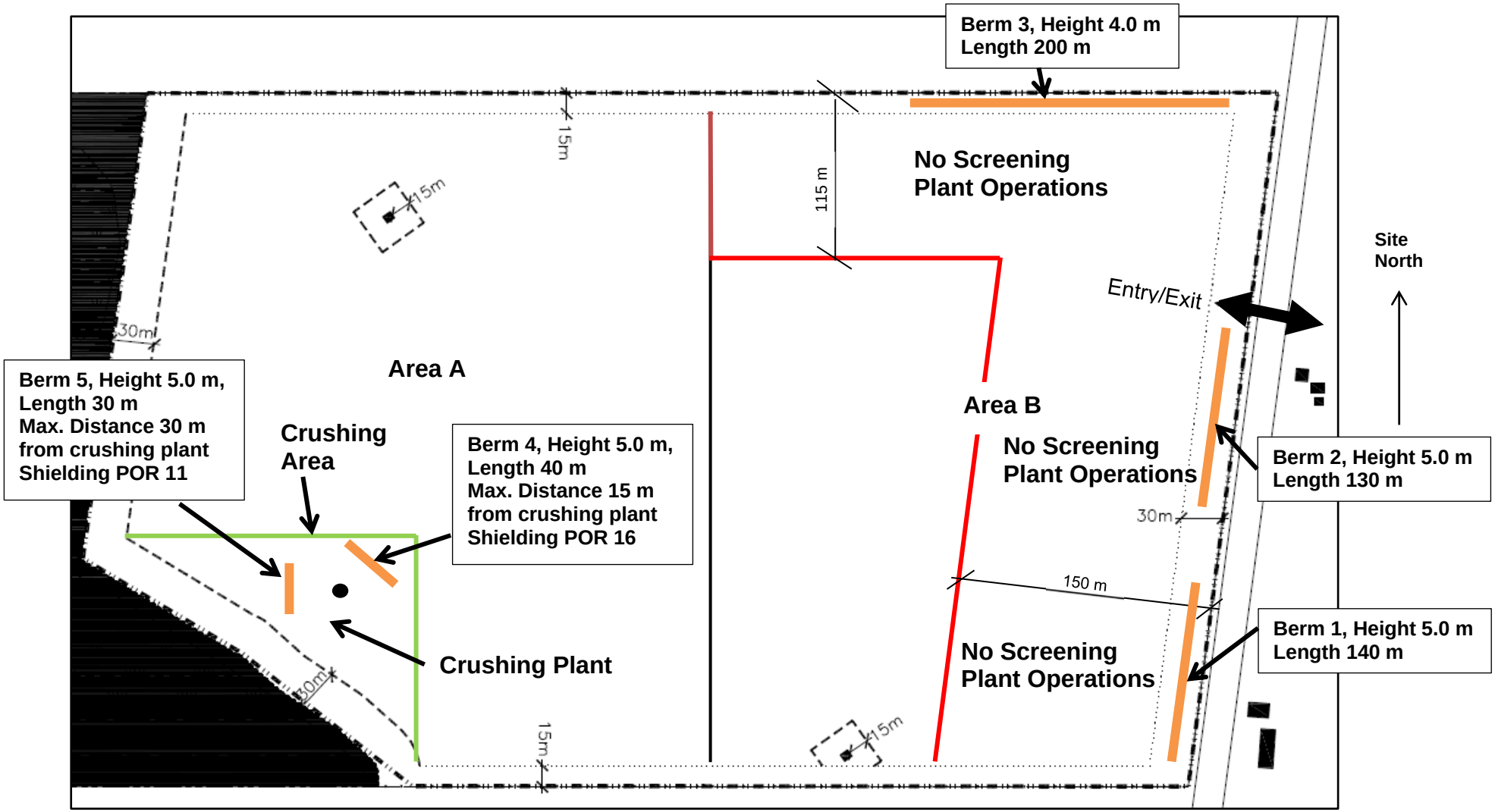


Figure 6A: Scenario 1: Excavation of Area A, Worst Case Operations, Daytime – Overall View

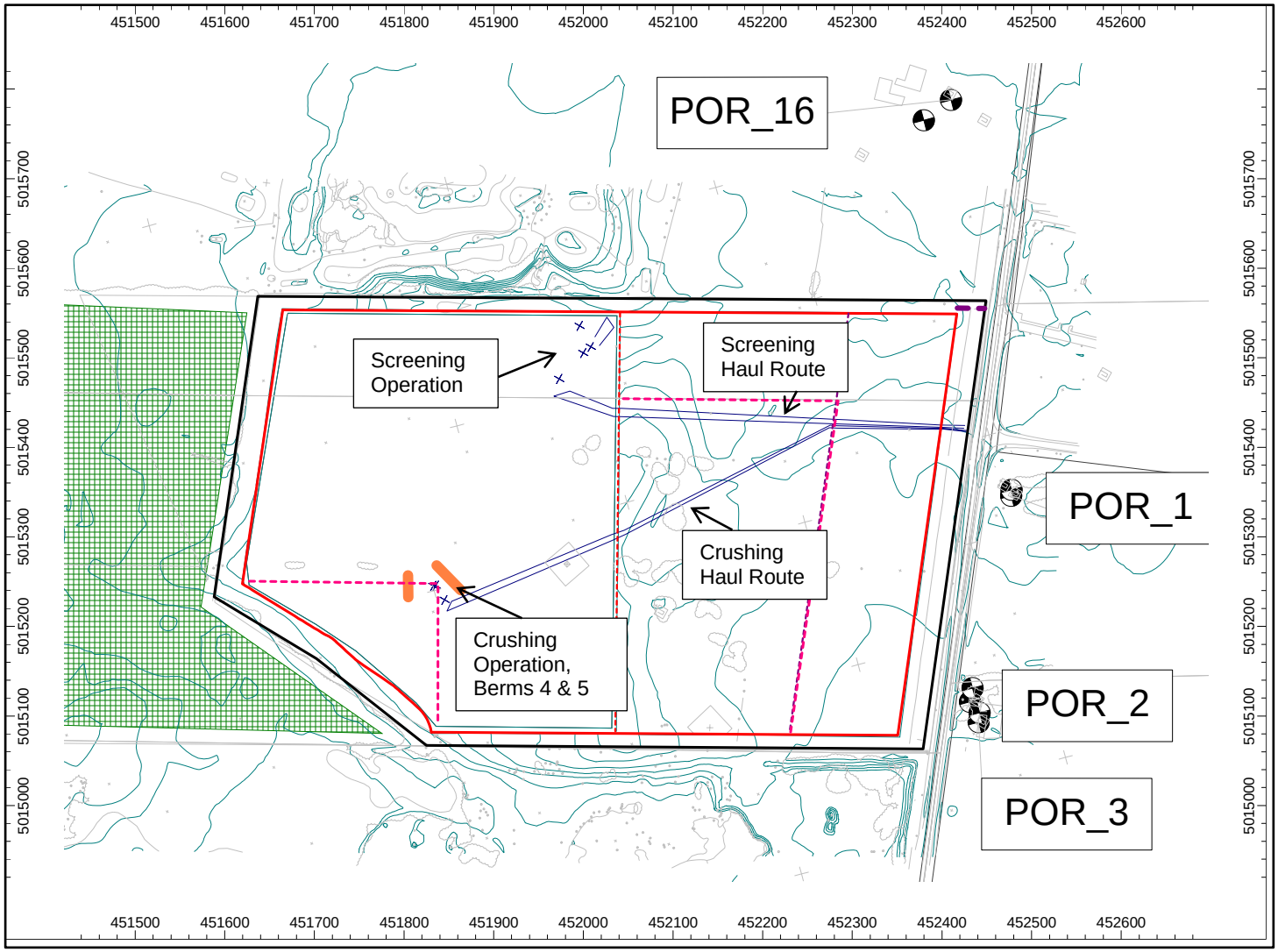


Figure 6B: Scenario 1: Excavation of Area A, Worst Case Operations, Daytime – Detail View of Screening

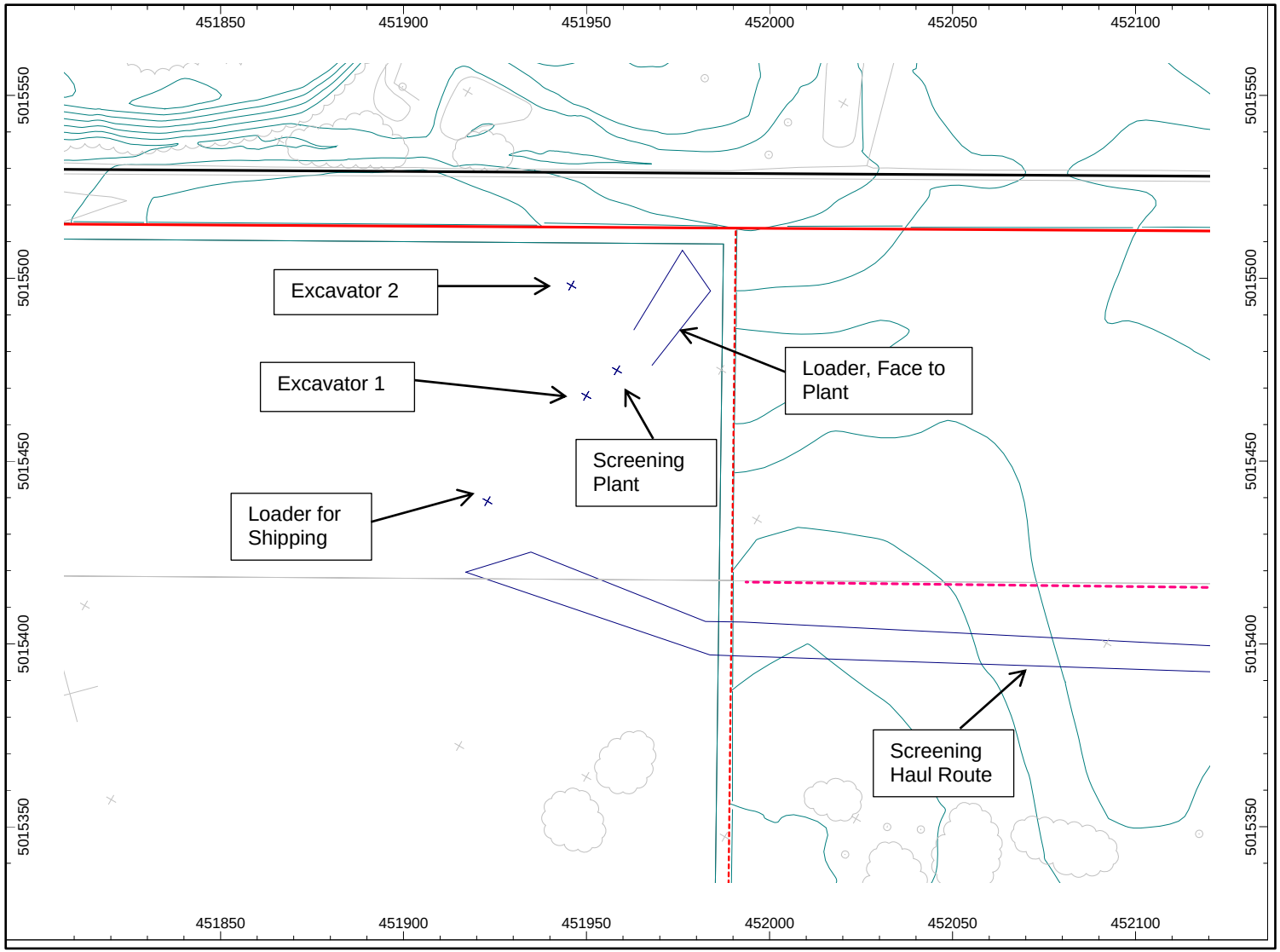


Figure 6C: Scenario 1: Excavation of Area A, Worst Case Operations, Daytime – Detail View of Crushing Applies to Crushing operations in all Scenarios.

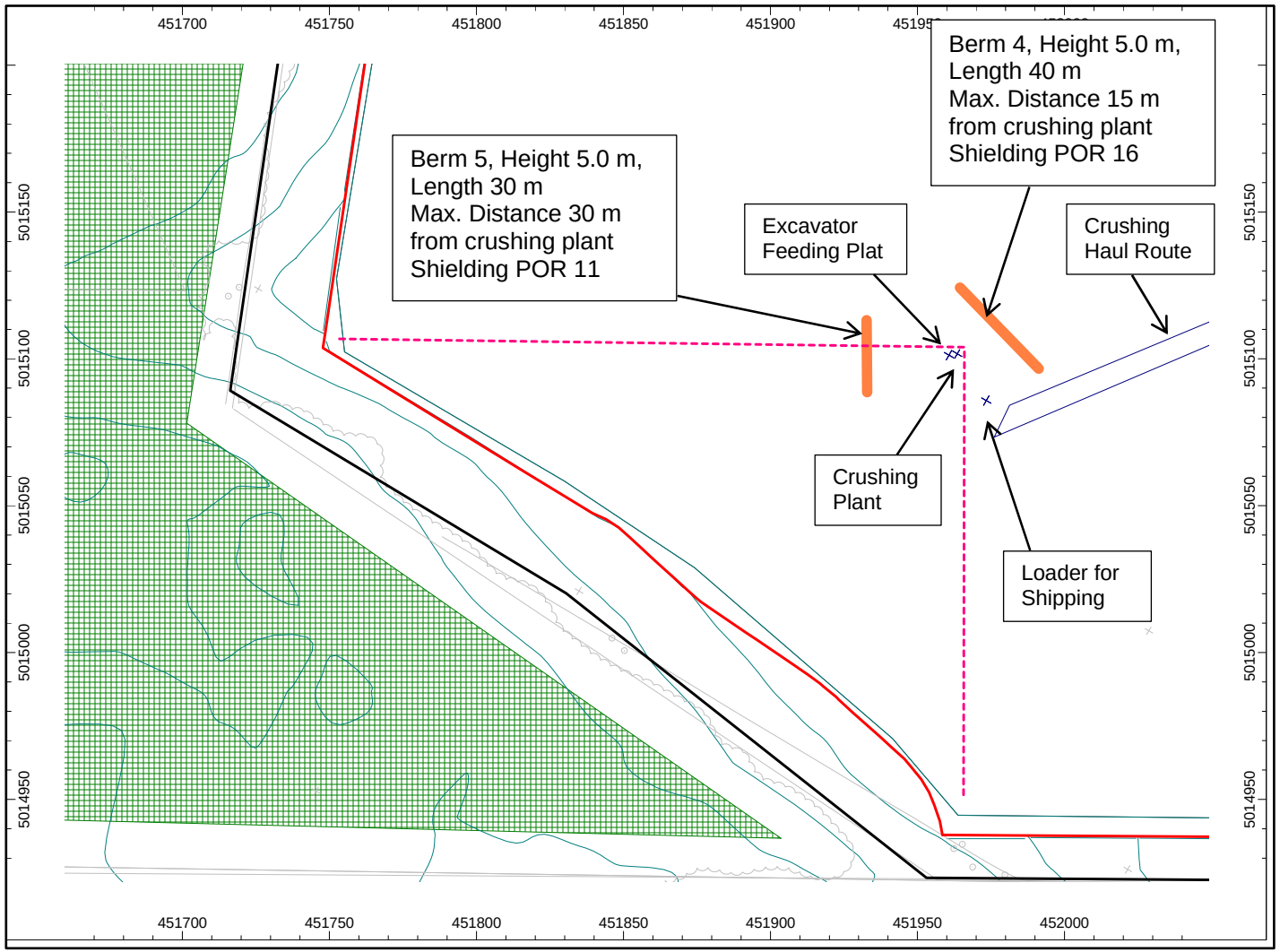


Figure 7: Scenario 1 Noise Contours: Excavation of Area A, Worst Case Operations, Daytime Sound Levels 4.5 m above grade, dBA

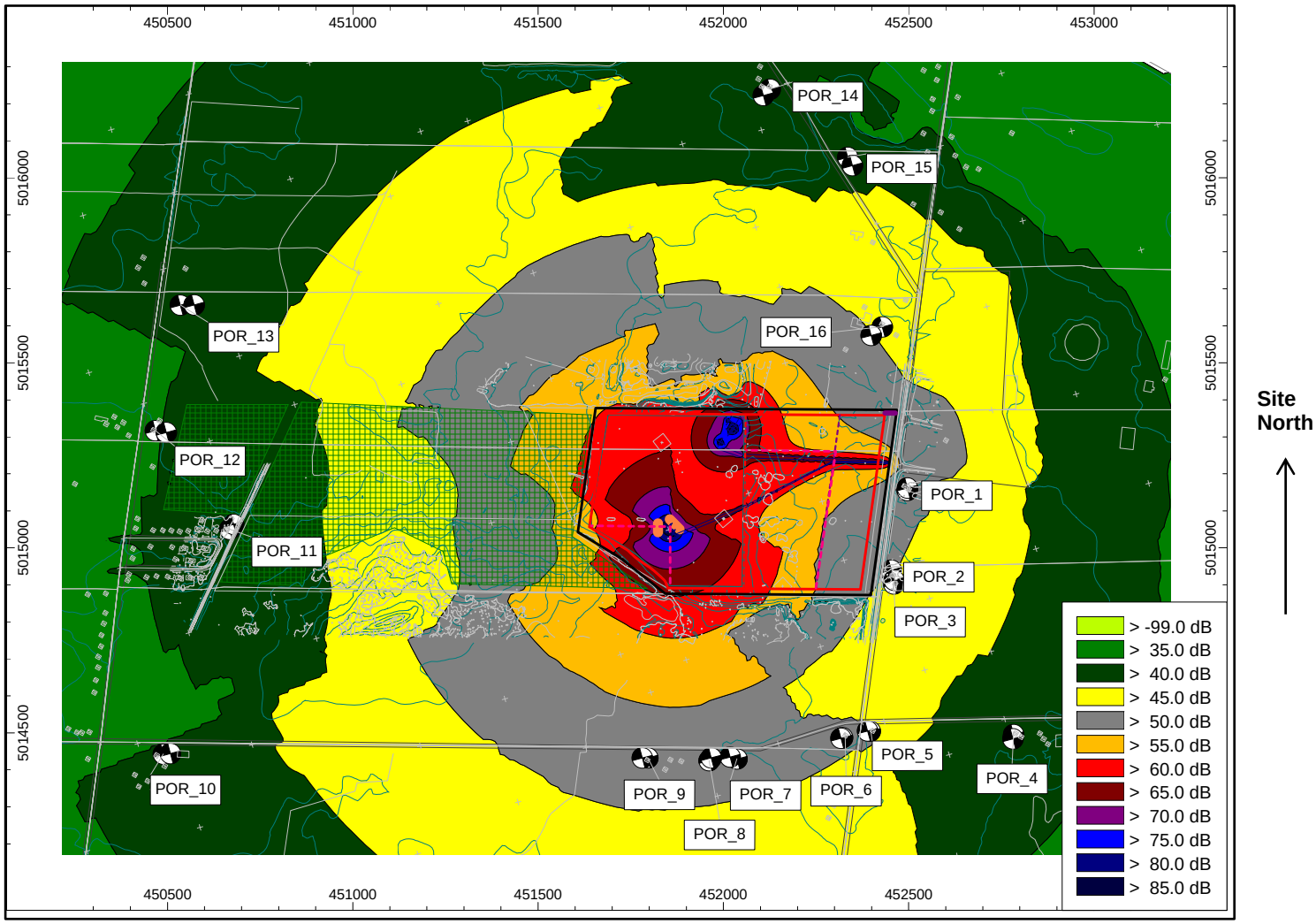


Figure 8A: Scenario 2: Excavation of Area B1S, Worst Case Operations, Daytime – Overall View

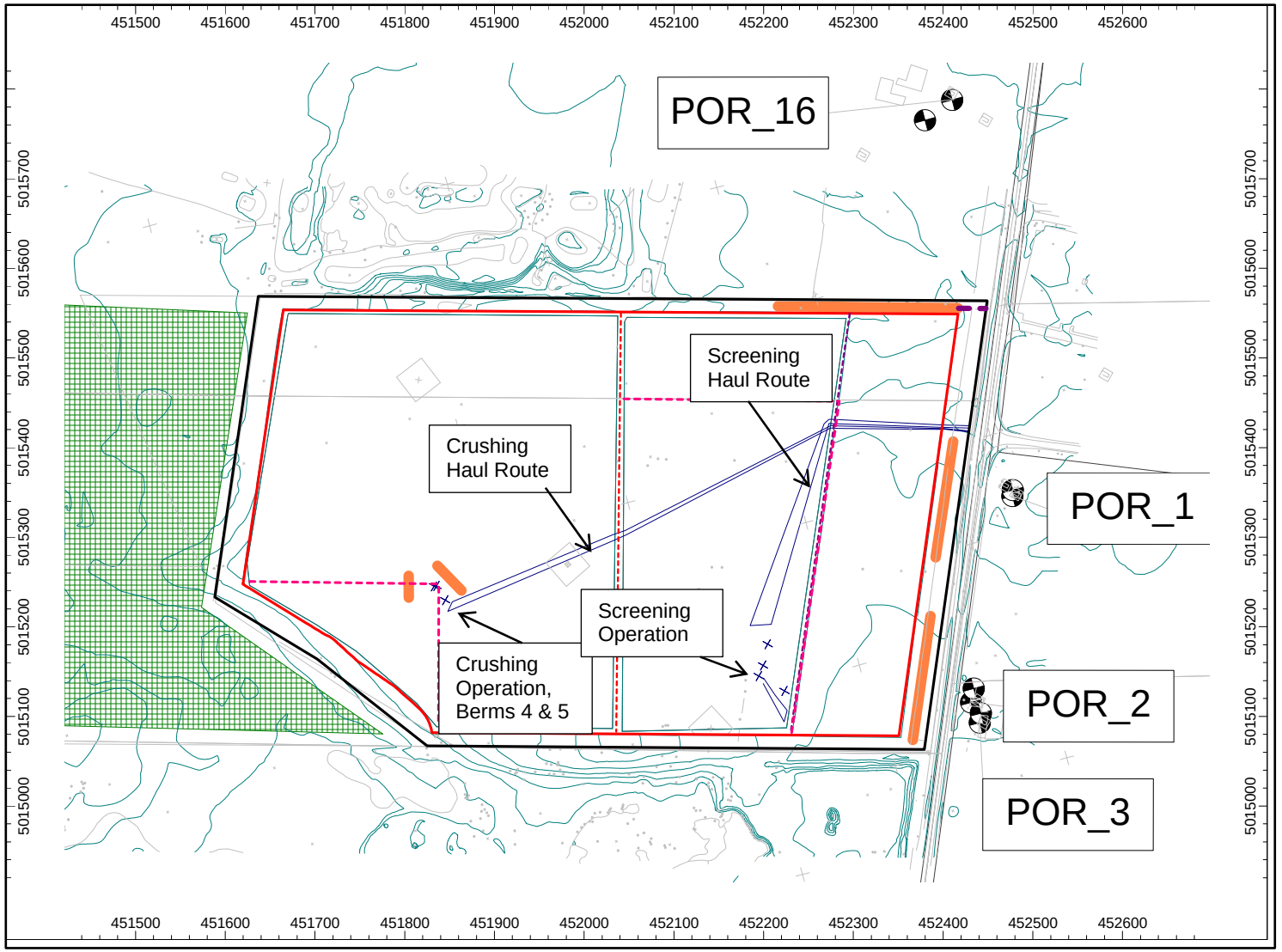


Figure 8B: Scenario 2: Excavation of Area B1S, Worst Case Operations, Daytime – Detail View of Screening

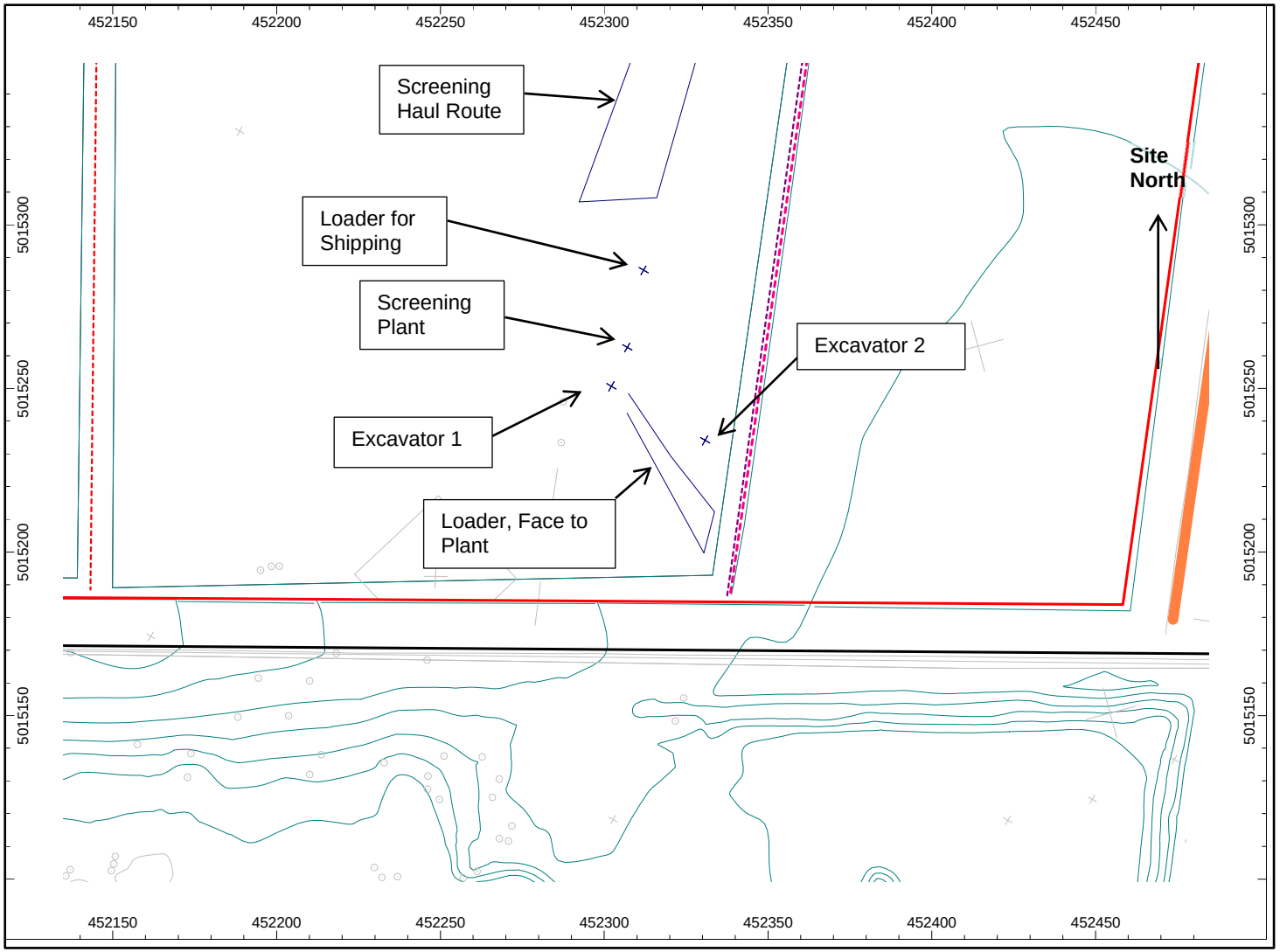


Figure 9: Scenario 2 Noise Contours: Excavation of Area B1S, Worst Case Operations, Daytime Sound Levels 4.5 m above grade, dBA

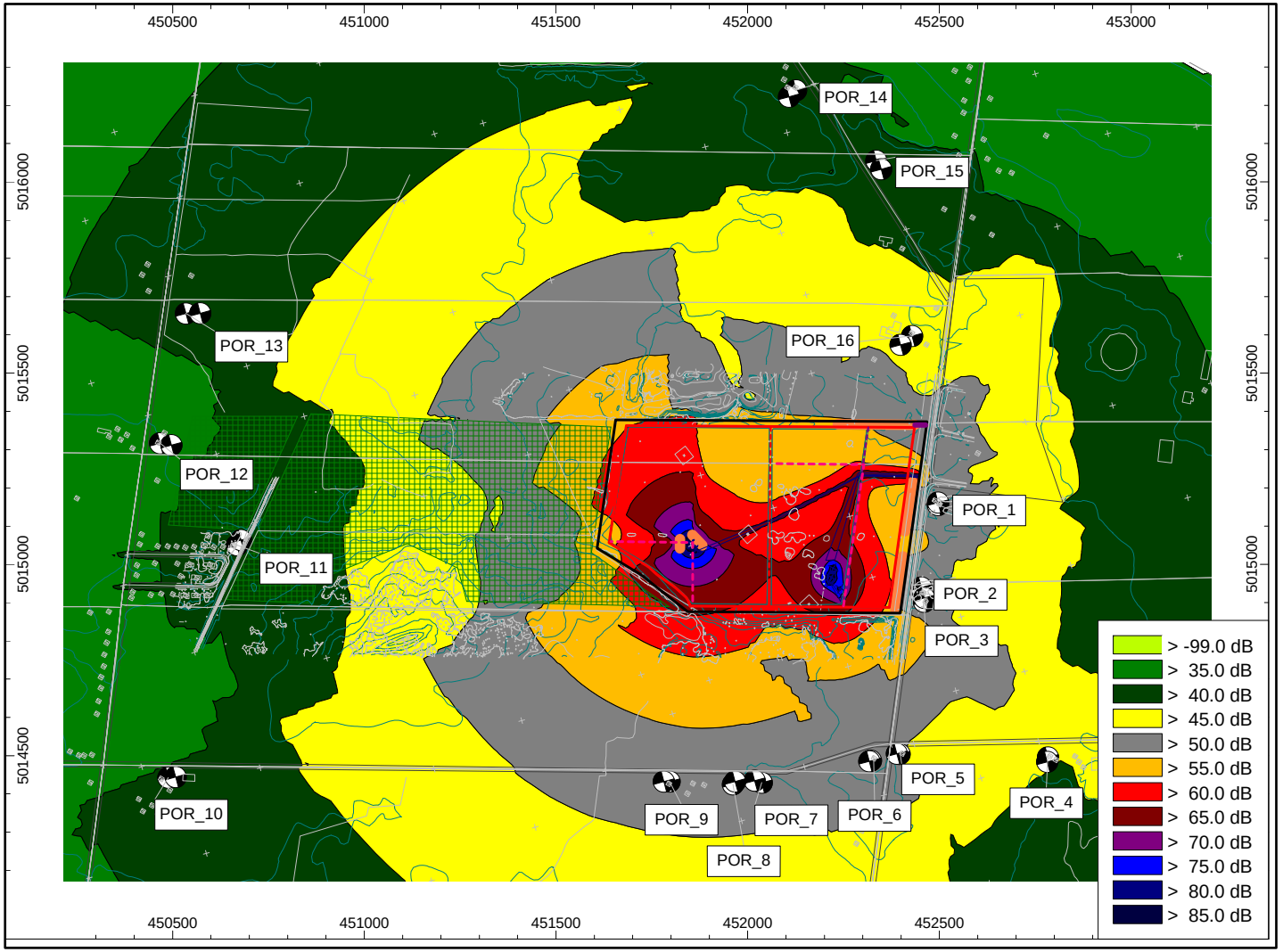


Figure 10A: Scenario 3: Excavation of Area B1N, Worst Case Operations, Daytime – Overall View

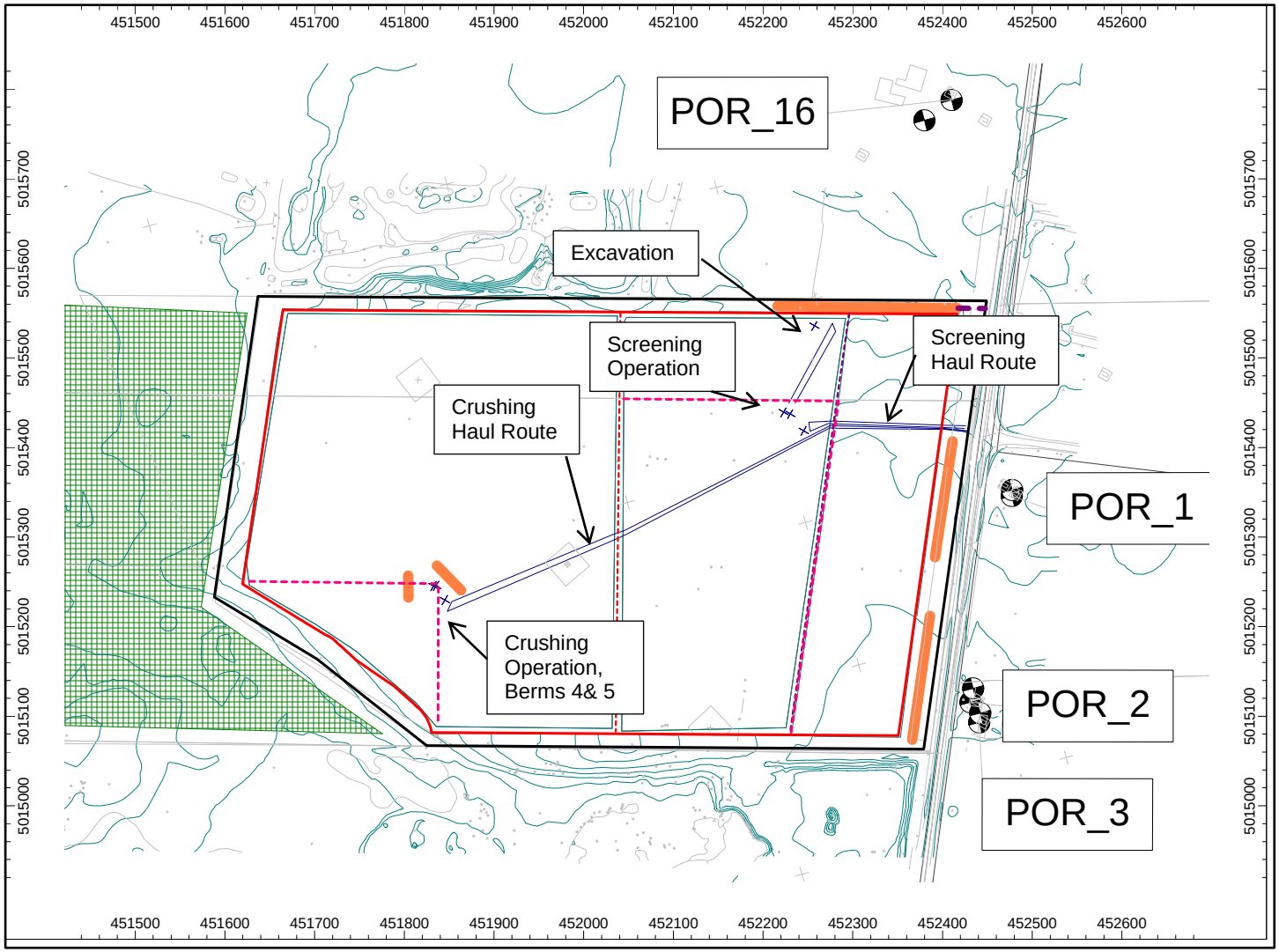


Figure 10B: Scenario 3: Excavation of Area B1N, Worst Case Operations, Daytime – Detail View of Screening

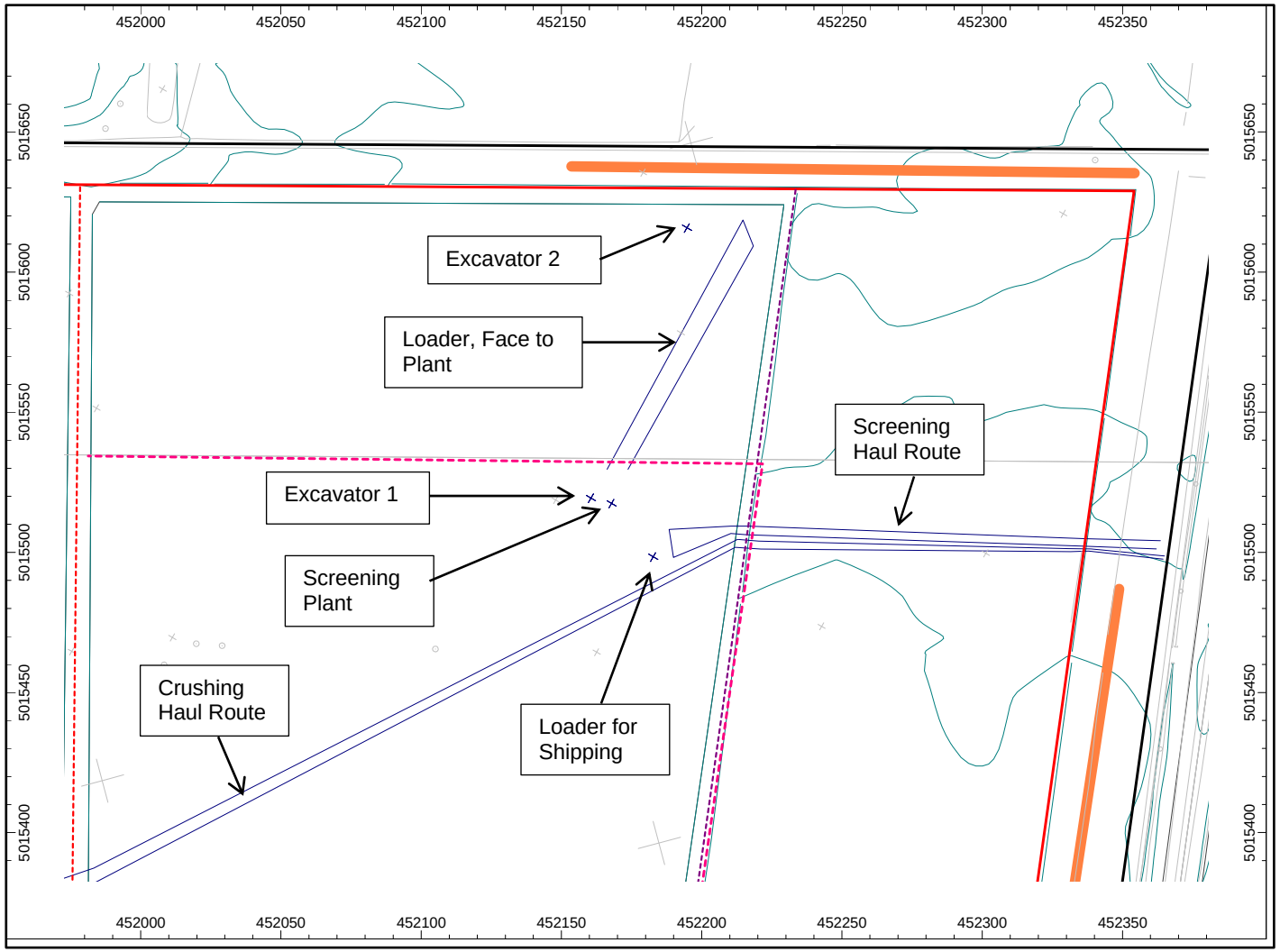


Figure 11: Scenario 3 Noise Contours: Excavation of Area B1N, Worst Case Operations, Daytime Sound Levels 4.5 m above grade, dBA

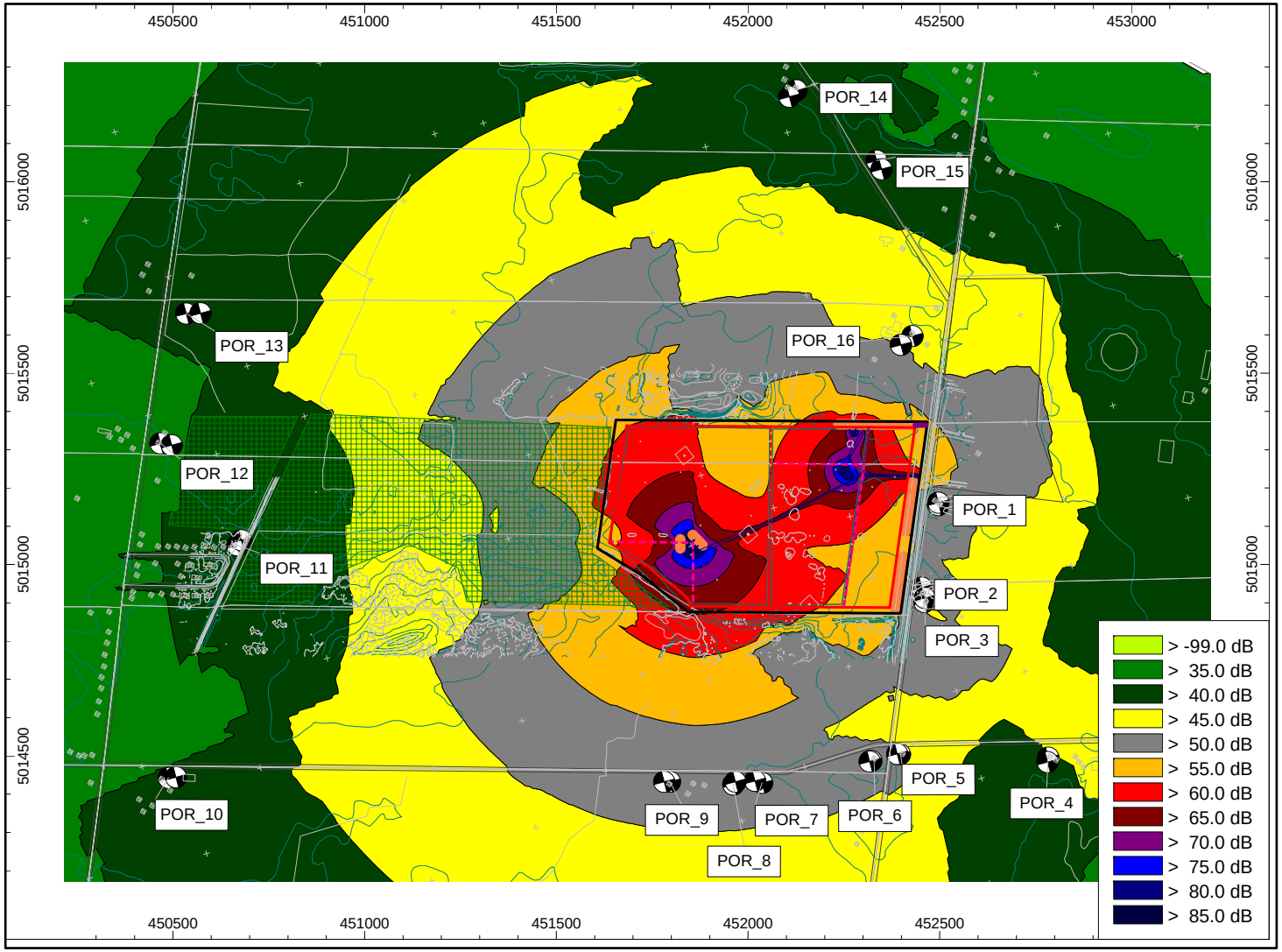


Figure 12A: Scenario 4: Excavation of Area B2S, Worst Case Operations, Daytime – Overall View

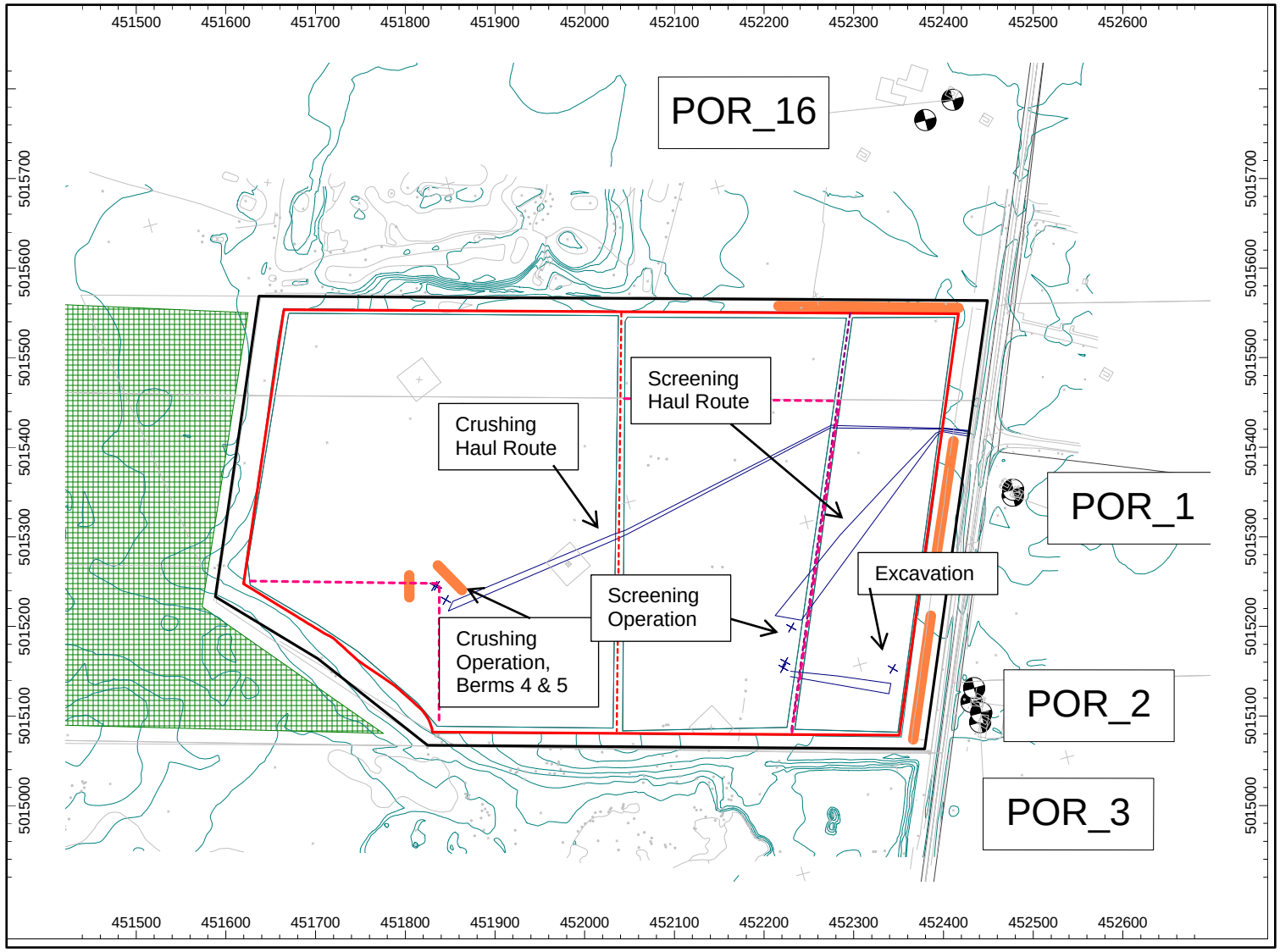


Figure 12B: Scenario 4: Excavation of Area B2S, Worst Case Operations, Daytime – Detail View of Screening

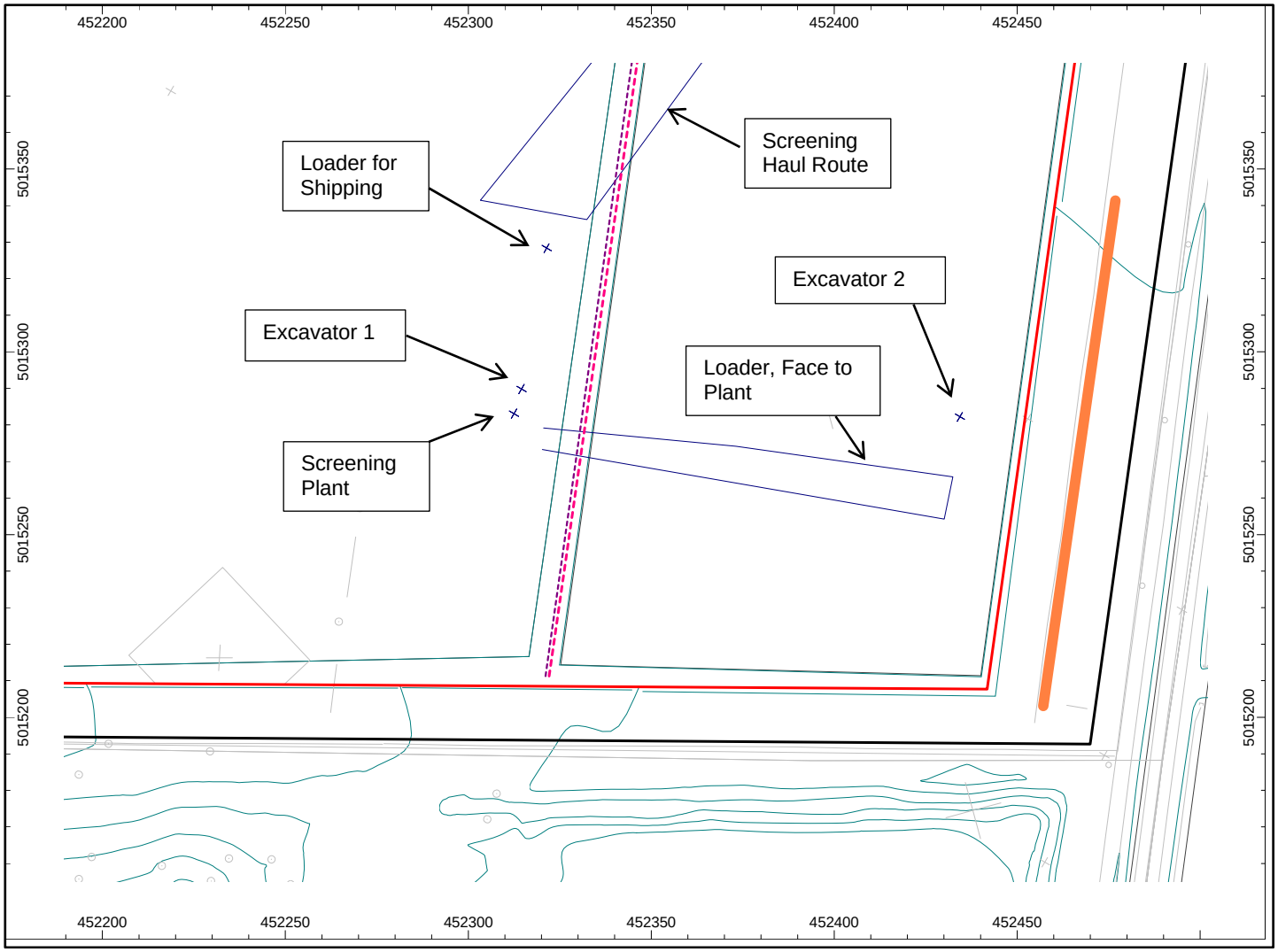


Figure 13: Scenario 4 Noise Contours: Excavation of Area B2S, Worst Case Operations, Daytime Sound Levels 4.5 m above grade, dBA

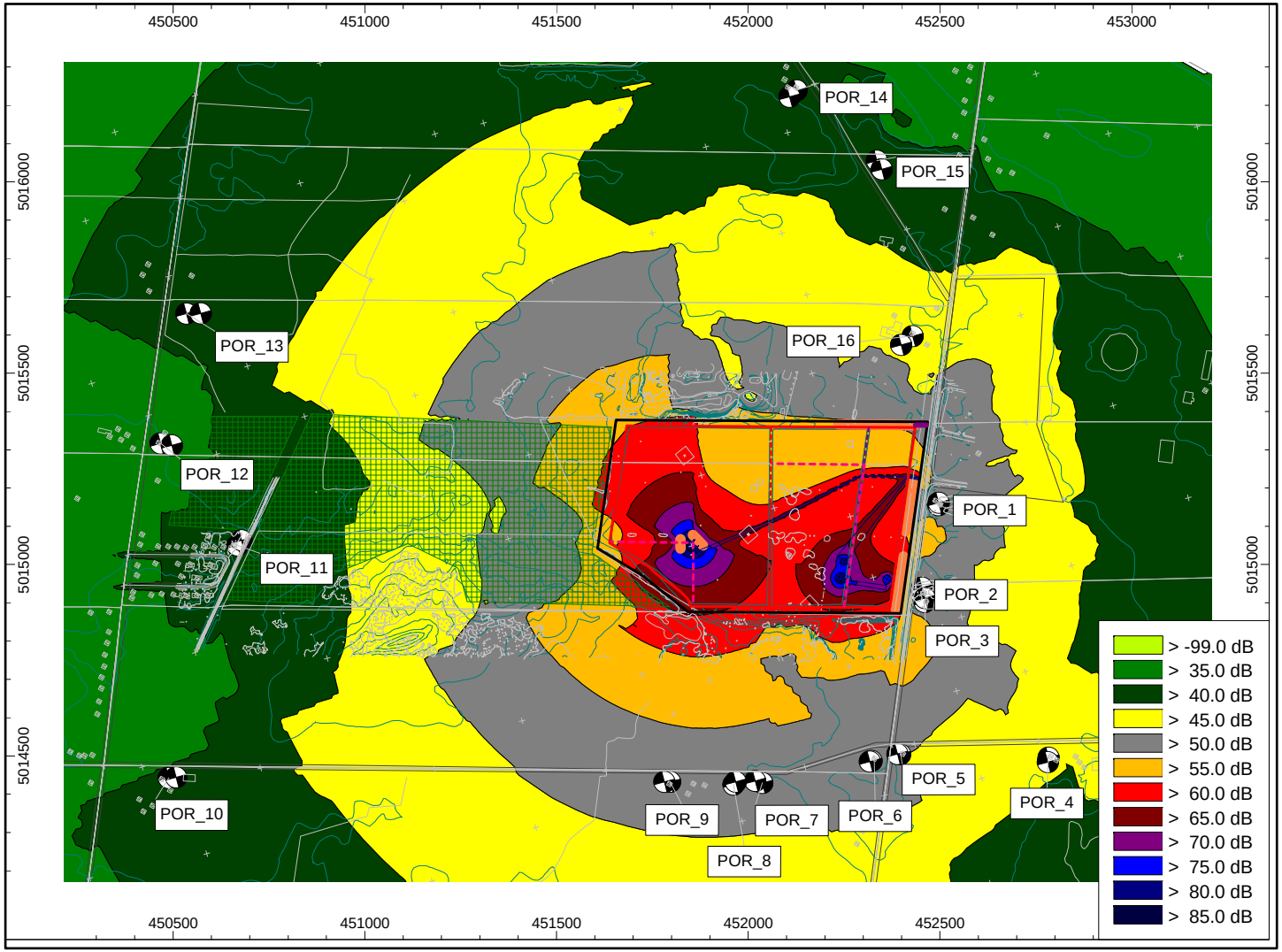


Figure 14A: Scenario 5: Excavation of Area B2N, Worst Case Operations, Daytime – Overall View

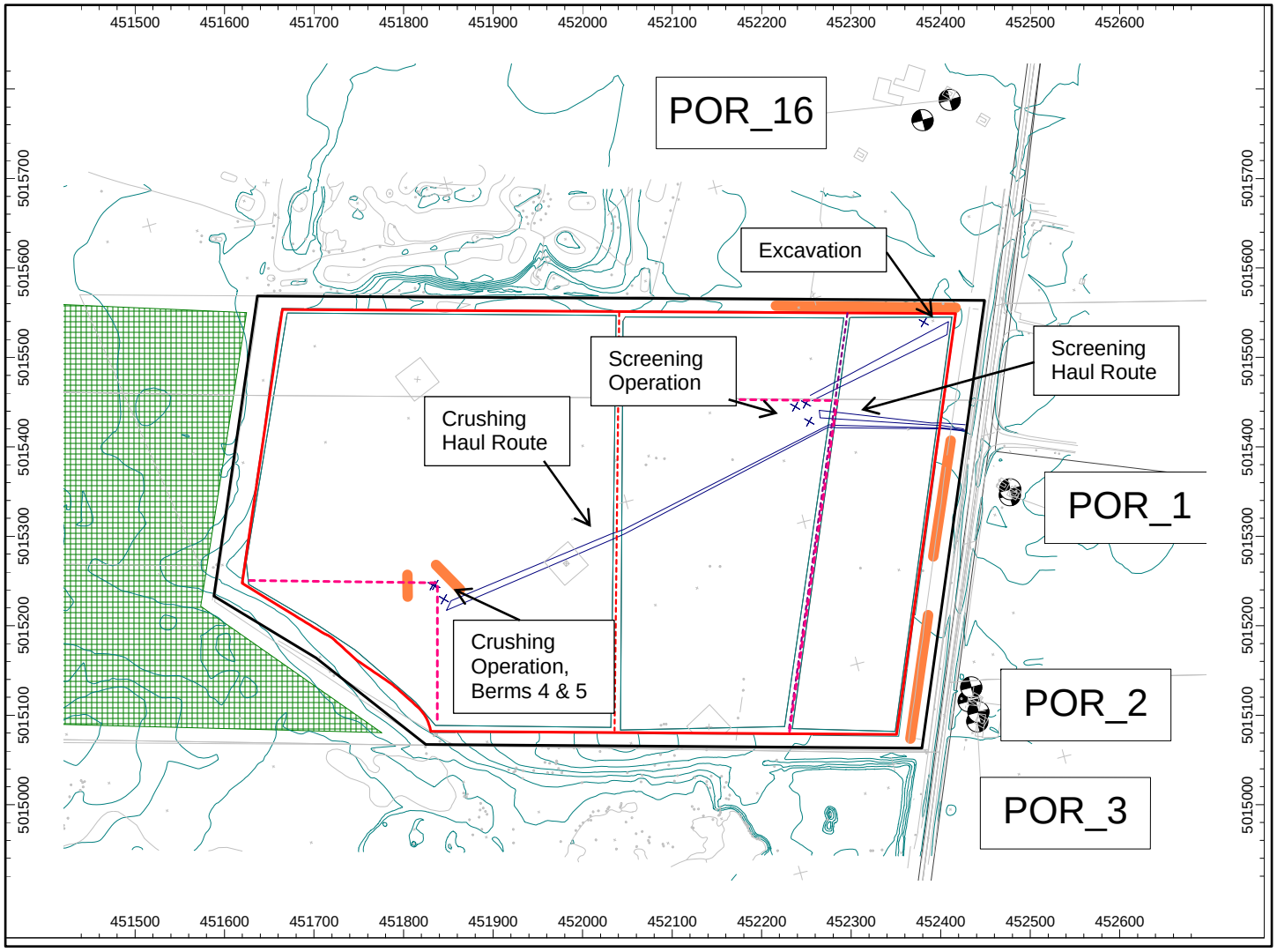


Figure 14B: Scenario 5: Excavation of Area B2N, Worst Case Operations, Daytime – Detail View of Screening

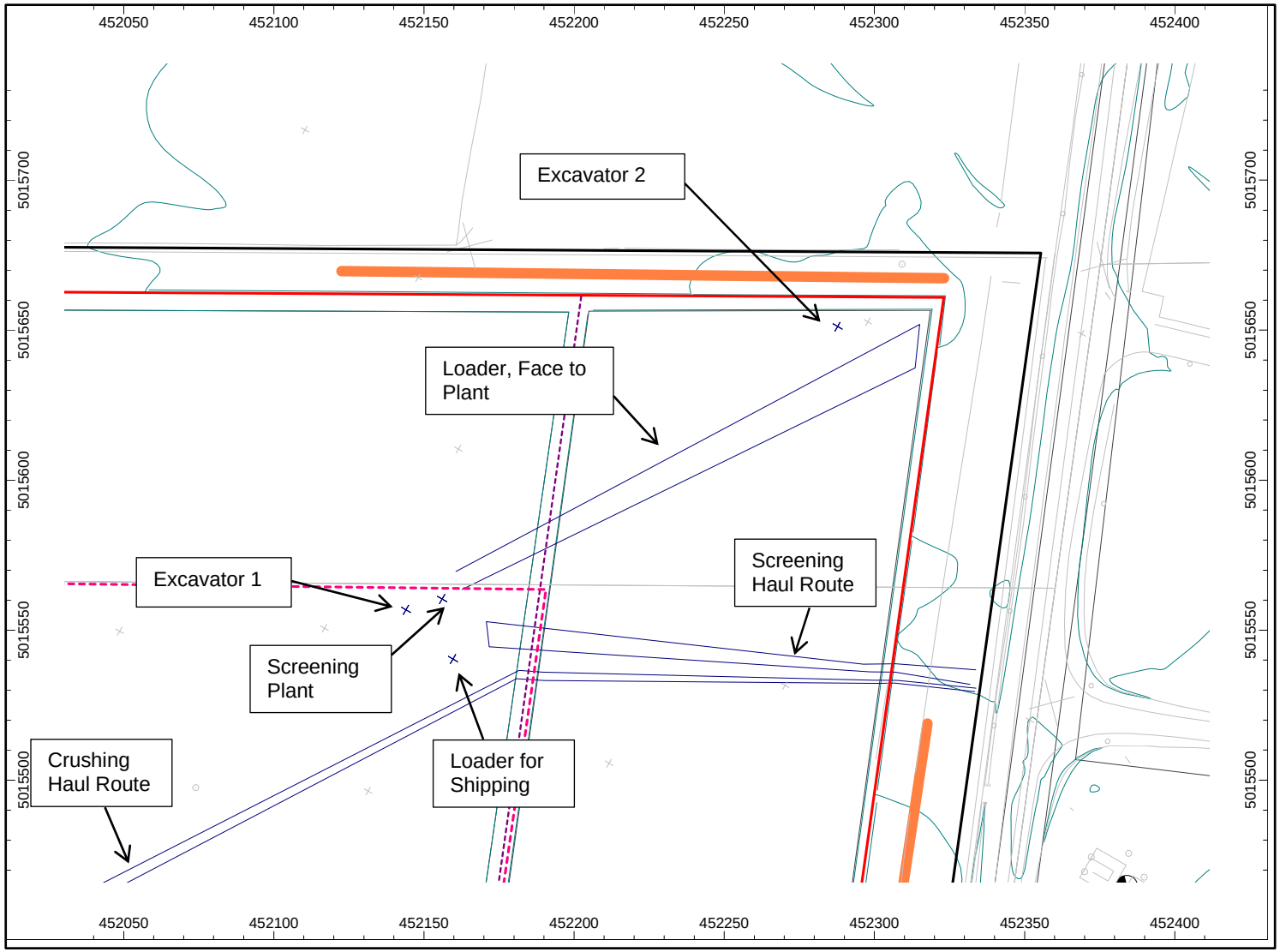
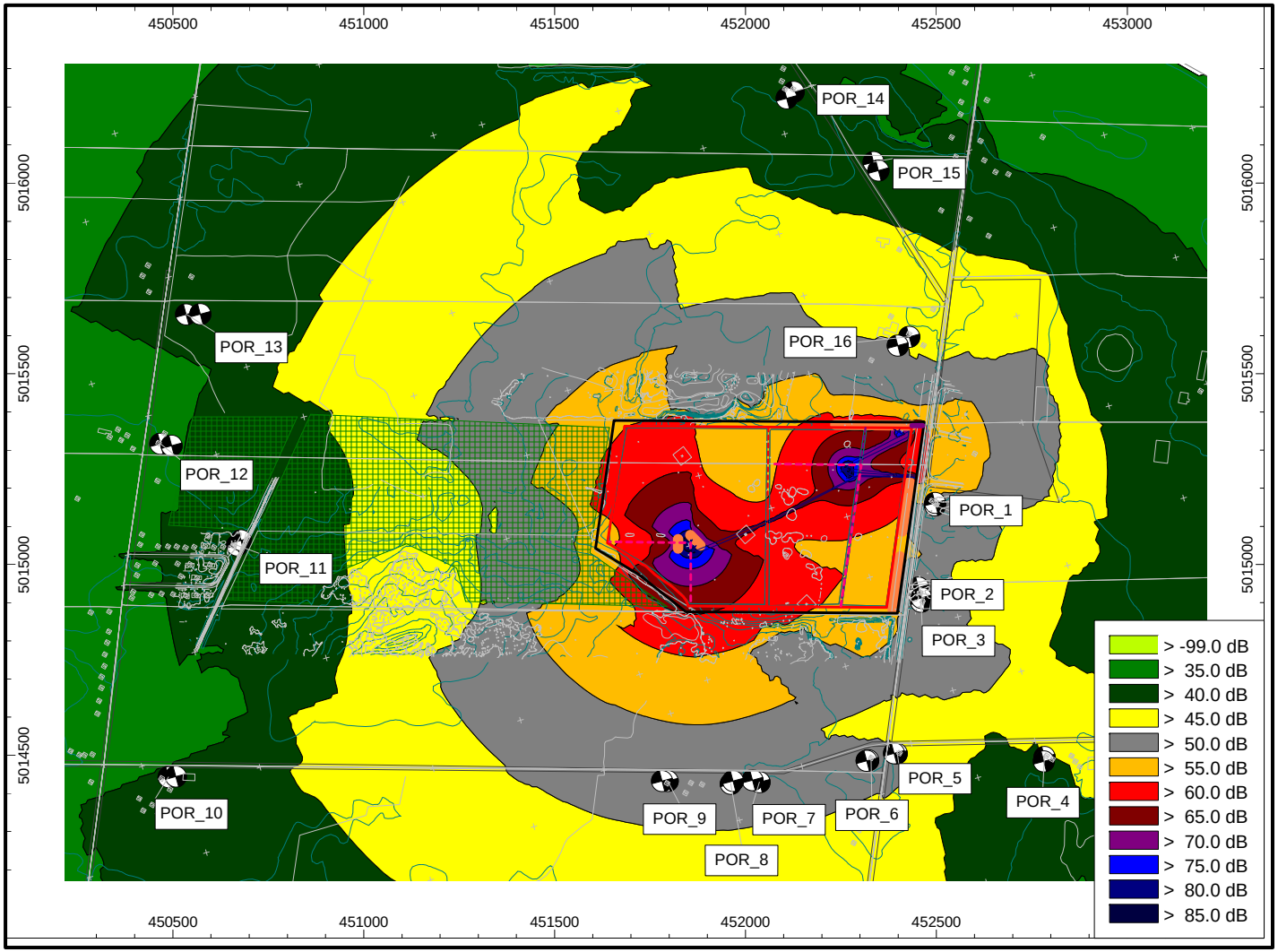


Figure 15: Scenario 5 Noise Contours: Excavation of Area B2N, Worst Case Operations, Daytime Sound Levels 4.5 m above grade, dBA



Appendix 1

Acoustic Modelling Details

Modeling Notes:

1. Acoustic model developed uses Cadna-A software, Version 2020.
2. Sound propagation is modeled according to ISO 9613-2: 1996(E).
3. The whole of the excavated area is modeled as relatively reflective with an absorption coefficient of 0.30, a conservative assumption.
4. MECP favoured conservative modelling assumptions are used, that is, 'no subtraction of negative ground attenuation' and 'no negative path differences'.

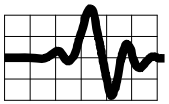
Contents:

Table A1.1 Calculation Configuration

Configuration	
General	
Max. Error (dB)	0.0
Max Search Radius (m)	3000.0
Min. Dist Src to Rcvr	0.0
Partition	
Raster Factor	0.50
Max. Length of Section (m)	1000.0
Min. Length of Section (m)	1.0
Min. Length of Section (%)	0.0
Proj. Line Sources	on
Proj. Area Sources	on
Ref. Time	
Reference Time Day (min)	720
Reference Time Evening (min)	240
Reference Time Night (min)	480
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Ground Absorption Default	1.00
Reflection	
Max. Order of Reflection	3
Search Radius Source (m)	100.0
Search Radius Receiver (m)	100.0
Max. Distance Source-Rcvr (m)	1000.00, 1000.00
Min. Distance Rcvr-Reflector (m)	1.00, 1.00
Min. Distance Source-Reflector (m)	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)
No sub. Of negative Ground Att.	On
No Neg. path difference	On
Barrier Coefficients, C1,2,3	3.0, 20.0, 0.0
Temperature (°C)	10
Rel. Humidity (%)	70
Ground Attenuation G (default)	1.00

Table A1.2 Point of Reception Location Table

Name	Height	Coordinates		
		X	Y	Z
	(m)	(m)	(m)	(m)
POR_1_W	4.5	452434.1	5015558.8	119.0
POR_1_O	1.5	452431.0	5015564.7	116.1
POR_2_W	4.5	452509.5	5015336.4	117.5
POR_2_O	1.5	452504.3	5015351.3	114.5
POR_3_W	2.0	452529.0	5015321.7	115.0
POR_3_O	1.5	452524.9	5015331.3	114.5
POR_4_W	4.5	453012.2	5015131.3	116.3
POR_4_O	1.5	453016.3	5015120.1	113.0
POR_5_W	4.5	452672.8	5014945.2	119.3
POR_5_O	1.5	452666.2	5014942.6	116.4
POR_6_W	4.5	452616.6	5014892.9	119.4
POR_6_O	1.5	452614.2	5014889.8	116.4
POR_7_W	2.0	452398.7	5014700.9	112.0
POR_7_O	1.5	452380.4	5014696.3	111.5
POR_8_W	4.5	452336.2	5014659.5	114.1
POR_8_O	1.5	452336.9	5014668.7	111.2
POR_9_W	2.0	452189.0	5014583.4	110.1
POR_9_O	1.5	452176.5	5014575.3	109.4
POR_10_W	4.5	451051.6	5013938.1	113.6
POR_10_O	1.5	451067.7	5013949.1	110.6
POR_11_W	4.5	450903.0	5014554.0	111.0
POR_11_O	1.5	450905.6	5014571.1	107.6
POR_12_W	4.5	450596.4	5014684.8	109.5
POR_12_O	1.5	450624.3	5014694.9	106.4



Name	Height	Coordinates		
		X	Y	Z
	(m)	(m)	(m)	(m)
POR_13_W	4.5	450484.7	5015011.7	106.5
POR_13_O	1.5	450517.0	5015031.2	103.5
POR_14_W	4.5	451571.6	5016312.6	109.5
POR_14_O	1.5	451564.1	5016288.8	106.5
POR_15_W	4.5	451844.6	5016258.0	114.5
POR_15_O	1.5	451867.1	5016245.5	112.1
POR_16_W	4.5	452154.9	5015908.0	119.2
POR_16_O	1.5	452140.0	5015873.2	116.1

Table A1.3 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)	(min)	(min)		(m)
Screening Plant	111.0	111.0	111.0	Lw	Powerscreen_Chieftion_1700_Lw	720	0	0	(none)	3.0
Loader for shipping, screening	107.9	107.9	107.9	Lw	SA1_LOADER_1	720	0	0	(none)	3.0
Excavator 1, screening	103.4	103.4	103.4	Lw	Excavator_CAT30D_LAeq	720	0	0	(none)	5.0
Excavator 2, screening	103.4	103.4	103.4	Lw	Excavator_CAT30D_LAeq	720	0	0	(none)	3.0
Mobile Crusher	120.0	120.0	120.0	Lw	Crusher_KPI_JCI	720	0	0	(none)	3.0
Excavator for Crusher	103.4	103.4	103.4	Lw	Excavator_CAT30D_LAeq	720	0	0	(none)	5.0
Loader for shipping. Crushing	107.9	107.9	107.9	Lw	SA1_LOADER_1	720	0	0	(none)	3.0

Table A1.4 Line Sources

Name	Point Source PWL			Numbers of vehicles per hour			Lw / Li	Modelling Type/ Noise Source Lib. File	Speed
	Day	Evening	Night	Day	Evening	Night			
	(dBA)	(dBA)	(dBA)						(km/h)
Trucks, shipping, screener	103.9	-	-	10	0	0	PWL-Pt	ConTruck_Slow_Lw	20
Loader feed to Screener	100.0	-	-	30	0	0	PWL-Pt	SA1_LOADER_1	20
Truck_Ship_Crush	101.8	-	-	4	0	0	PWL-Pt	ConTruck_Slow_Lw	20

Table A1.5 Noise Source Library & Noise Measurement Data

ID	Type	Spectra (dB)											Notes
		31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Powerscreen_Chiefton_1700	Li	66.2	70.0	72.2	69.9	64.1	64.5	64.2	60.3	51.3	70.3	77.0	Measured 21 Oct 2019, Cavanagh Pine Grove Pit
Powerscreen_Chiefton_1700_Lw	Lw	106.9	110.7	112.9	110.6	104.8	105.2	104.9	101.0	92.0	111.0	117.7	Measured 21 Oct 2019, Cavanagh Pine Grove Pit
Meas_SA1_LOADER_1	Li	90.7	96.6	86.7	74.9	75.5	81.5	74.2	66.4	58.4	83.5	98.1	Albion_Pit_30 April 2018 at 6.5m
SA1_LOADER_1	Lw	115.1	121.0	111.1	99.3	99.9	105.9	98.6	90.8	82.8	107.9	122.5	Albion_Pit_30 April 2018 at 6.5m
Meas_Excavator_CAT30D	Li	64.8	78.3	74.5	67.9	68.6	63.0	58.3	55.2	47.1	69.3	80.6	Measured 2nd April 2012 HW @ 20m, Van Dyke Q
Excavator_CAT30D_LAeq	Lw	98.9	112.4	108.6	102.0	102.7	97.1	92.4	89.3	81.2	103.4	114.7	Measured 2nd April 2012 HW @ 20m, Van Dyke Q
Crusher_KPI_JCI_Meas	Li	67.3	77.0	71.3	72.5	65.4	70.0	65.1	57.7	48.1	77.7	85.5	Measured 18 March 2019, KNL Construction Site,50m
Crusher_KPI_JCI	Lw	115.5	123.3	122.3	118.8	114.9	116.5	111.7	105.9	96.4	120.0	127.7	Measured 18 March 2019, KNL Construction Site
ConTruck_Slow_Li	Li	72.9	71.2	71.9	70.3	66.3	76.0	70.3	56.9	55.6	77.7	80.6	McNamee Measurements, 4 March 2016
ConTruck_Slow_Lw	Lw	103.4	102.2	99.8	97.6	94.3	105.7	101.8	86.1	86.1	107.8	110.4	McNamee Measurements, 4 March 2016

* Measured by Freefield Ltd. on Cavanagh site or at a similar aggregate facility in Ontario.

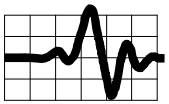


Table A1.6.1 Point of Reception Impacts by Source for Scenario 1

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	43.0	42.3	41.4	37.3	36.7	36.5	29.9	28.4	32.9	32.9	33.0	32.6	33.2	33.1	33.4	33.1
Loader for shipping	41.7	37.1	36.1	36.2	35.8	35.7	29.2	28.7	32.1	32.2	32.1	32.0	32.6	32.4	32.6	32.4
Excavator 1	36.9	35.4	35.5	34.3	34.4	33.5	28.8	25.8	31.6	31.0	31.6	29.7	27.1	27.1	32.5	27.0
Excavator 2	36.7	35.3	35.3	30.8	30.4	30.3	24.5	23.4	27.2	26.7	27.2	26.6	26.9	26.8	27.6	26.7
Mobile Crusher	46.7	46.2	47.4	47.1	47.0	46.9	41.0	40.0	44.9	45.1	49.9	48.9	50.5	50.2	51.3	50.3
Excavator for Crusher	35.3	33.7	36.0	30.7	30.5	30.5	30.1	24.5	33.7	33.5	34.0	32.2	34.1	33.3	35.3	33.5
Loader for shipping. Crushing	35.5	35.3	36.2	36.1	36.0	35.9	30.0	29.4	38.5	34.2	38.9	38.6	40.0	39.9	40.3	40.0
Trucks, shipping, sand	46.1	46.2	39.7	39.9	38.9	38.7	29.3	28.4	32.0	32.0	31.5	31.2	28.2	27.9	27.9	26.5
Loader feed to Screener	31.7	31.6	30.0	25.7	26.6	25.1	18.4	17.9	21.1	21.3	21.1	20.9	21.9	21.7	21.9	21.7
Truck_Ship_Crush	42.7	42.7	36.9	37.1	36.2	36.1	26.6	25.7	29.7	29.7	29.4	29.0	28.6	26.7	28.4	26.0
Total	52.0	51.4	50.2	49.3	49.0	48.9	42.8	41.5	46.9	46.6	50.7	49.7	51.2	50.9	52.0	51.0

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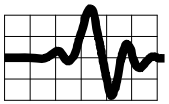

Table A1.6.1 Point of Reception Impacts by Source for Scenario 1

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	32.9	32.7	25.1	24.0	32.3	30.1	30.7	28.5	26.5	25.8	31.9	31.0	37.8	33.3	43.1	42.7
Loader for shipping	32.4	32.1	24.5	24.1	31.8	31.2	30.3	29.8	30.4	30.0	30.6	30.4	32.2	32.2	41.4	41.5
Excavator 1	31.1	30.2	20.3	19.3	27.3	24.5	25.9	23.2	25.9	23.3	30.4	25.8	32.2	30.4	36.8	35.2
Excavator 2	26.7	26.4	20.2	19.2	27.3	24.6	25.9	23.3	21.2	20.6	26.2	25.8	27.9	27.7	36.8	35.4
Mobile Crusher	50.9	50.4	41.6	36.0	39.7	38.9	37.6	36.9	41.6	39.9	39.4	37.5	40.7	40.0	44.3	44.0
Excavator for Crusher	34.4	33.5	21.8	23.3	24.3	23.6	22.4	21.8	26.5	24.0	24.2	23.5	25.3	24.7	33.3	31.1
Loader for shipping. Crushing	40.4	40.0	30.6	25.5	33.0	32.4	26.5	26.3	26.1	26.0	28.3	27.4	29.5	29.3	33.9	33.3
Trucks, shipping, sand	25.6	25.3	19.6	15.2	22.8	22.2	21.6	20.7	21.1	20.7	27.0	23.9	30.7	26.6	38.7	39.0
Loader feed to Screener	21.5	21.3	13.9	13.5	21.2	20.6	19.8	19.3	15.2	15.1	20.6	20.6	22.4	22.5	29.9	30.4
Truck_Ship_Crush	25.4	25.1	18.9	15.6	20.4	19.8	19.0	18.1	18.9	18.3	23.0	20.3	26.6	22.8	34.2	34.4
Total	51.6	51.1	42.2	37.3	42.1	41.2	39.9	39.0	42.5	40.9	41.6	40.0	43.9	42.4	49.4	49.0

Table A1.6.2 Point of Reception Impacts by Source for Scenario 2

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	43.2	42.5	46.6	44.2	44.7	44.3	38.9	33.5	44.1	43.9	43.8	42.8	37.6	37.4	37.3	37.1
Loader for shipping	41.7	41.5	44.4	42.6	43.0	42.6	37.8	32.6	42.2	42.4	42.2	41.8	36.0	35.8	35.5	35.5
Excavator 1	36.3	36.0	39.7	38.5	38.7	38.4	33.3	30.4	37.7	37.0	37.5	35.7	35.0	34.1	35.5	33.8
Excavator 2	40.5	38.2	40.6	38.6	38.9	38.6	33.2	28.3	37.8	37.2	37.6	36.0	31.5	31.3	35.5	30.9
Mobile Crusher	44.2	41.7	48.1	47.5	47.6	47.3	41.1	40.1	44.9	45.1	49.9	48.9	50.5	50.2	51.3	50.3
Excavator for Crusher	31.4	30.3	32.0	30.9	31.0	30.7	30.2	27.1	33.7	33.5	34.0	32.2	34.1	33.3	35.3	33.5
Loader for shipping. Crushing	36.1	35.8	36.8	36.5	36.6	36.4	30.1	29.4	38.5	34.2	38.9	38.6	40.0	39.9	40.3	40.0
Trucks, shipping, sand	44.3	43.9	39.0	38.4	37.8	37.6	27.4	26.4	34.3	34.3	33.9	33.6	29.3	29.0	28.9	27.6
Loader feed to Screener	36.8	35.5	36.9	34.8	35.5	34.9	27.2	25.3	35.1	32.2	34.9	31.6	28.6	28.4	27.9	28.0
Truck_Ship_Crush	40.3	39.9	34.9	34.9	34.1	33.9	26.0	23.4	30.7	30.8	30.5	30.1	27.4	27.2	27.3	26.5
Total	51.0	50.0	52.6	51.3	51.5	51.1	45.4	42.6	50.1	49.8	52.2	51.2	51.5	51.2	52.3	51.3

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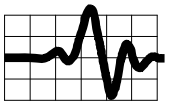

Table A1.6.2 Point of Reception Impacts by Source for Scenario 2

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	35.9	35.6	24.8	23.6	30.9	28.6	24.9	24.1	29.0	23.9	29.0	28.2	31.0	30.3	40.9	36.3
Loader for shipping	34.3	34.0	28.5	27.6	30.2	29.5	24.0	23.8	28.4	23.7	28.1	27.8	30.1	29.8	40.0	35.5
Excavator 1	33.3	32.4	24.6	21.3	26.0	23.2	24.5	21.8	24.3	21.6	28.1	22.8	25.5	24.6	34.8	29.9
Excavator 2	29.5	29.3	19.8	18.7	25.8	20.5	24.2	21.6	24.0	18.8	23.5	22.7	25.5	24.4	33.9	29.6
Mobile Crusher	50.9	50.4	41.6	36.0	39.7	38.9	37.6	36.9	41.6	39.9	39.4	37.5	40.7	40.0	44.7	44.3
Excavator for Crusher	34.4	33.5	21.8	23.3	24.3	23.6	22.4	21.8	26.5	24.0	24.2	23.5	25.3	24.7	33.7	31.5
Loader for shipping. Crushing	40.4	40.0	30.6	25.5	33.0	32.4	26.5	26.3	26.1	26.0	28.3	27.4	29.5	29.3	34.2	34.2
Trucks, shipping, sand	26.5	26.2	20.3	16.6	22.9	22.1	20.9	20.3	20.0	15.9	23.1	22.8	25.9	25.6	36.5	34.2
Loader feed to Screener	26.6	26.3	15.8	15.4	22.1	17.2	20.5	19.9	20.2	15.5	19.6	19.3	21.6	21.2	30.9	26.4
Truck_Ship_Crush	26.0	25.7	19.6	14.9	21.6	20.9	19.7	19.2	19.6	17.3	21.0	20.7	26.5	23.3	33.8	32.3
Total	51.7	51.2	42.4	37.6	41.8	40.8	38.9	38.2	42.5	40.5	40.9	39.3	42.3	41.6	48.5	46.6

Table A1.6.3 Point of Reception Impacts by Source for Scenario 3

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	45.6	44.5	42.2	43.3	41.7	41.2	36.6	31.2	40.0	39.5	39.5	38.3	33.8	33.6	33.7	33.4
Loader for shipping	44.1	43.1	40.7	42.4	40.6	40.5	35.8	34.9	38.8	38.8	38.4	38.0	32.9	32.7	32.6	32.4
Excavator 1	38.6	38.1	35.4	36.4	34.8	34.8	31.0	27.0	34.1	33.3	33.6	31.7	27.5	27.5	32.6	27.3
Excavator 2	39.7	40.8	38.4	37.3	36.7	35.6	26.5	24.9	33.0	31.4	32.4	30.5	26.5	26.4	27.1	26.2
Mobile Crusher	44.2	41.7	48.1	47.5	47.6	47.3	41.1	40.1	44.9	45.1	49.9	48.9	50.5	50.2	51.3	50.3
Excavator for Crusher	31.4	30.3	32.0	30.9	31.0	30.7	30.2	27.1	33.7	33.5	34.0	32.2	34.1	33.3	35.3	33.5
Loader for shipping. Crushing	36.1	35.8	36.8	36.5	36.6	36.4	30.1	29.4	38.5	34.2	38.9	38.6	40.0	39.9	40.3	40.0
Trucks, shipping, sand	43.2	42.9	36.0	36.1	34.8	34.8	23.9	23.3	28.9	28.1	28.3	28.0	25.9	25.6	25.6	22.4
Loader feed to Screener	38.8	39.1	37.4	34.5	33.6	33.4	25.5	24.8	32.7	30.7	32.2	31.7	26.8	26.6	26.6	26.4
Truck_Ship_Crush	40.3	39.9	34.9	34.9	34.1	33.9	26.0	23.4	30.7	30.8	30.5	30.1	27.4	27.2	27.3	26.5
Total	51.7	50.9	50.9	50.8	50.2	49.9	44.2	42.4	48.2	47.8	51.2	50.2	51.2	50.9	52.0	51.0

Continued

Table A1.6.3 Point of Reception Impacts by Source for Scenario 3

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	32.6	32.4	24.1	23.0	30.8	28.4	29.2	26.9	25.0	24.2	31.6	30.8	34.1	33.4	41.9	42.2
Loader for shipping	31.8	31.5	23.2	22.7	29.9	29.3	28.5	28.0	24.0	23.9	30.2	29.9	32.6	32.3	39.8	40.3
Excavator 1	26.6	26.4	19.4	18.3	25.9	23.1	24.5	21.8	24.6	19.4	30.2	25.2	28.2	27.6	39.7	35.4
Excavator 2	25.7	25.4	18.9	17.8	25.5	22.8	24.3	21.6	19.3	18.6	25.7	22.6	28.1	24.8	35.9	36.0
Mobile Crusher	50.9	50.4	41.6	36.0	39.7	38.9	37.6	36.9	41.6	39.9	39.4	37.5	40.7	40.0	44.7	44.3
Excavator for Crusher	34.4	33.5	21.8	23.3	24.3	23.6	22.4	21.8	26.5	24.0	24.2	23.5	25.3	24.7	33.7	31.5
Loader for shipping. Crushing	40.4	40.0	30.6	25.5	33.0	32.4	26.5	26.3	26.1	26.0	28.3	27.4	29.5	29.3	34.2	34.2
Trucks, shipping, sand	21.0	20.7	14.7	13.7	18.2	17.5	16.5	15.9	11.9	11.5	19.6	19.5	22.7	22.6	35.4	32.0
Loader feed to Screener	25.8	25.6	19.7	17.3	24.6	24.0	23.2	22.7	18.7	18.5	25.4	24.7	28.0	27.0	36.1	36.5
Truck_Ship_Crush	26.0	25.7	19.6	14.9	21.6	20.9	19.7	19.2	19.6	17.3	21.0	20.7	26.5	23.3	33.8	32.3
Total	51.6	51.0	42.2	37.2	41.8	40.8	39.4	38.6	42.2	40.5	41.5	39.8	43.0	42.3	49.2	48.7

Table A1.6.4 Point of Reception Impacts by Source for Scenario 4

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	46.1	44.2	48.4	45.7	46.2	45.7	39.9	34.5	44.0	43.8	43.5	42.6	37.5	37.3	37.2	36.9
Loader for shipping	43.6	43.1	46.0	43.9	44.3	43.9	38.5	37.6	42.1	42.3	41.6	41.3	35.6	35.4	35.1	35.1
Excavator 1	37.9	37.5	41.7	39.6	39.7	39.4	33.9	31.0	37.7	37.0	37.2	35.4	34.7	33.8	35.2	33.4
Excavator 2	44.3	42.0	44.8	42.7	41.8	41.7	30.1	29.2	39.0	37.2	37.9	36.2	30.5	30.3	34.7	29.8
Mobile Crusher	44.8	41.9	48.8	47.8	47.9	47.6	41.1	40.1	44.9	45.1	49.9	48.9	50.5	50.2	51.3	50.3
Excavator for Crusher	31.9	30.4	32.7	31.1	31.3	30.9	30.2	27.1	33.7	33.5	34.0	32.2	34.1	33.3	35.3	33.5
Loader for shipping. Crushing	36.6	36.1	37.4	36.9	36.9	36.7	30.1	29.4	38.5	34.2	38.9	38.6	40.0	39.9	40.3	40.0
Trucks, shipping, sand	43.9	43.3	40.8	40.3	39.2	38.9	28.0	26.5	34.5	34.2	33.9	33.6	27.6	27.3	27.2	26.9
Loader feed to Screener	43.6	42.7	43.7	40.8	40.8	40.5	33.8	30.5	39.1	39.2	38.4	38.1	31.4	31.2	30.7	30.7
Truck_Ship_Crush	40.3	39.9	36.0	35.9	35.0	34.8	26.3	23.4	31.2	31.2	30.9	30.4	26.9	26.7	26.8	26.6
Total	52.8	51.4	54.4	52.6	52.7	52.3	45.9	43.8	50.3	50.0	52.2	51.3	51.5	51.2	52.2	51.3

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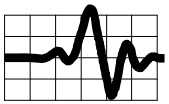

Table A1.6.4 Point of Reception Impacts by Source for Scenario 4

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	35.7	35.4	24.6	23.5	30.8	28.4	24.7	24.0	28.9	23.8	28.9	28.2	31.0	30.2	41.5	36.6
Loader for shipping	33.9	33.6	28.3	27.4	30.0	29.4	23.9	23.7	28.3	23.5	28.2	27.9	30.3	30.0	40.6	36.1
Excavator 1	33.0	32.1	24.4	21.1	25.9	23.1	19.9	19.1	24.1	21.5	28.2	22.9	25.7	24.8	35.3	30.3
Excavator 2	28.3	28.1	19.1	18.0	25.1	19.7	19.2	18.3	23.4	18.2	23.6	22.7	25.7	24.7	36.1	30.7
Mobile Crusher	50.9	50.4	41.6	36.0	39.7	38.9	37.6	36.9	41.6	39.9	39.4	37.5	40.7	40.0	44.7	44.3
Excavator for Crusher	34.4	33.5	21.8	23.3	24.3	23.6	22.4	21.8	26.5	24.0	24.2	23.5	25.3	24.7	33.7	31.5
Loader for shipping. Crushing	40.4	40.0	30.6	25.5	33.0	32.4	26.5	26.3	26.1	26.0	28.3	27.4	29.5	29.3	34.2	34.2
Trucks, shipping, sand	25.6	25.3	19.3	15.7	21.0	18.2	19.8	16.8	16.8	14.6	21.9	21.4	24.8	24.3	33.6	32.9
Loader feed to Screener	29.3	29.0	18.8	18.3	25.0	20.1	21.6	18.7	20.2	18.5	23.1	22.8	25.3	24.9	35.8	31.1
Truck_Ship_Crush	26.1	25.8	19.7	14.4	21.8	21.1	19.9	18.9	19.5	17.3	21.3	20.8	26.6	23.5	32.7	32.5
Total	51.7	51.2	42.4	37.6	41.8	40.8	38.7	38.0	42.4	40.5	40.9	39.3	42.4	41.6	48.8	46.7

Table A1.6.5 Point of Reception Impacts by Source for Scenario 5

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	47.0	45.7	43.9	47.7	42.7	42.8	37.2	35.0	40.6	39.8	39.7	38.5	33.6	33.4	33.5	33.2
Loader for shipping	45.2	44.0	42.4	44.8	41.6	41.7	36.4	35.4	39.1	39.0	38.6	38.3	32.7	32.5	32.4	32.3
Excavator 1	39.8	38.7	36.4	38.2	35.7	35.6	31.7	28.7	34.5	33.4	33.9	31.9	27.4	27.4	32.5	27.2
Excavator 2	45.4	43.6	36.0	34.9	34.4	34.3	26.6	25.5	30.9	29.6	33.0	31.0	26.0	25.9	26.5	25.6
Mobile Crusher	44.8	41.9	48.8	47.8	47.9	47.6	41.1	40.1	44.9	45.1	49.9	48.9	50.5	50.2	51.3	50.3
Excavator for Crusher	31.9	30.4	32.7	31.1	31.3	30.9	30.2	27.1	33.7	33.5	34.0	32.2	34.1	33.3	35.3	33.5
Loader for shipping. Crushing	36.6	36.1	37.4	36.9	36.9	36.7	30.1	29.4	38.5	34.2	38.9	38.6	40.0	39.9	40.3	40.0
Trucks, shipping, sand	43.2	42.8	37.2	37.3	35.9	35.9	24.8	22.8	30.1	29.6	29.3	29.0	23.6	23.3	23.6	23.1
Loader feed to Screener	46.9	46.7	42.0	40.7	39.4	39.5	28.8	28.2	35.9	35.3	35.2	34.8	28.9	28.8	28.7	28.5
Truck_Ship_Crush	40.3	39.9	36.0	35.9	35.0	34.8	26.3	23.4	31.2	31.2	30.9	30.4	26.9	26.7	26.8	26.6
Total	53.9	52.8	52.0	52.7	50.9	50.8	44.5	43.1	48.5	48.0	51.3	50.3	51.2	50.9	52.0	51.0

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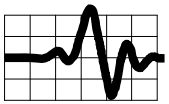

Table A1.6.5 Point of Reception Impacts by Source for Scenario 5

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	32.5	32.2	23.9	22.8	30.6	28.2	29.1	26.8	24.8	24.1	31.6	30.9	34.3	33.6	42.3	42.7
Loader for shipping	31.6	31.3	23.1	22.7	29.9	29.2	28.4	27.9	24.0	23.8	30.2	30.0	32.7	32.4	40.0	40.5
Excavator 1	26.5	26.3	19.3	18.2	25.8	23.0	24.4	21.7	24.5	19.4	27.1	25.2	28.2	27.6	39.9	35.7
Excavator 2	25.0	24.7	22.9	17.2	24.7	22.0	23.5	20.8	18.3	17.7	25.1	22.0	27.6	23.9	35.8	35.9
Mobile Crusher	50.9	50.4	41.6	36.0	39.7	38.9	37.6	36.9	41.6	39.9	39.4	37.5	40.7	40.0	44.7	44.3
Excavator for Crusher	34.4	33.5	21.8	23.3	24.3	23.6	22.4	21.8	26.5	24.0	24.2	23.5	25.3	24.7	33.7	31.5
Loader for shipping. Crushing	40.4	40.0	30.6	25.5	33.0	32.4	26.5	26.3	26.1	26.0	28.3	27.4	29.5	29.3	34.2	34.2
Trucks, shipping, sand	21.5	21.1	15.9	11.3	18.5	17.8	16.8	13.1	12.1	11.7	20.2	19.7	23.3	22.8	33.1	32.5
Loader feed to Screener	27.9	27.6	19.8	19.3	26.4	25.7	25.1	20.4	20.6	20.4	27.7	27.1	30.6	29.5	39.0	39.2
Truck_Ship_Crush	26.1	25.8	19.7	14.4	21.8	21.1	19.9	18.9	19.5	17.3	21.3	20.8	26.6	23.5	32.7	32.5
Total	51.6	51.0	42.2	37.2	41.8	40.9	39.5	38.5	42.2	40.5	41.4	39.9	43.2	42.4	49.4	49.0

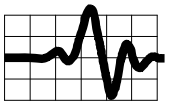

Table A1.7.1 Distances, Source to Point of Reception (m) – Scenario 1

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	497	495	580	571	602	596	1119	1126	896	892	884	884	891	886	898	891
Loader for shipping	521	519	583	576	605	599	1118	1125	879	875	864	863	857	851	861	853
Excavator 1	503	501	581	573	603	597	1120	1127	893	890	881	881	885	879	891	883
Excavator 2	517	515	605	596	627	621	1145	1152	922	919	910	910	915	909	921	913
Mobile Crusher	650	651	610	610	624	623	1084	1088	772	766	735	734	651	641	638	632
Excavator for Crusher	652	654	612	612	627	626	1086	1090	774	768	736	735	651	641	638	632
Loader for shipping. Crushing	643	644	597	597	611	610	1067	1071	754	748	716	715	633	623	621	614
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Continued

Table A1.7.1 Distances, Source to Point of Reception (m) – Scenario 1

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	918	923	1772	1754	1386	1373	1560	1531	1530	1494	923	905	796	781	487	449
Loader for shipping	875	879	1723	1706	1345	1332	1525	1495	1504	1468	963	944	843	828	537	499
Excavator 1	909	914	1761	1744	1377	1364	1551	1522	1523	1487	931	912	806	791	498	460
Excavator 2	937	942	1773	1755	1379	1365	1548	1518	1513	1476	902	883	780	765	485	447
Mobile Crusher	624	627	1497	1478	1187	1176	1411	1382	1451	1417	1215	1195	1110	1096	790	753
Excavator for Crusher	624	626	1494	1476	1184	1173	1409	1379	1448	1414	1217	1196	1112	1098	793	755
Loader for shipping. Crushing	609	612	1499	1481	1196	1186	1424	1394	1466	1432	1229	1208	1121	1106	794	757
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Table A1.7.2 Distances, Source to Point of Reception (m) – Scenario 2

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	336	340	235	236	249	248	735	741	494	491	490	490	566	567	599	589
Loader for shipping	319	323	236	235	252	250	746	752	515	512	512	512	590	591	622	613
Excavator 1	347	351	238	240	251	251	731	737	485	482	479	480	553	554	586	577
Excavator 2	334	339	208	211	220	220	698	704	460	456	457	458	548	550	584	575
Mobile Crusher	650	651	610	610	624	623	1084	1088	772	766	735	734	651	641	638	632
Excavator for Crusher	652	654	612	612	627	626	1086	1090	774	768	736	735	651	641	638	632
Loader for shipping. Crushing	643	644	597	597	611	610	1067	1071	754	748	716	715	633	623	621	614
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Continued

Table A1.7.2 Distances, Source to Point of Reception (m) – Scenario 2

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	680	690	1807	1788	1553	1543	1786	1756	1820	1786	1277	1261	1096	1075	665	635
Loader for shipping	702	711	1819	1800	1557	1547	1786	1757	1816	1781	1254	1238	1072	1051	641	611
Excavator 1	668	678	1799	1780	1549	1539	1783	1754	1820	1786	1288	1273	1108	1088	678	647
Excavator 2	673	684	1822	1803	1579	1569	1815	1785	1853	1819	1307	1292	1122	1101	686	656
Mobile Crusher	624	627	1497	1478	1187	1176	1411	1382	1451	1417	1215	1195	1110	1096	790	753
Excavator for Crusher	624	626	1494	1476	1184	1173	1409	1379	1448	1414	1217	1196	1112	1098	793	755
Loader for shipping. Crushing	609	612	1499	1481	1196	1186	1424	1394	1466	1432	1229	1208	1121	1106	794	757
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Table A1.7.3 Distances, Source to Point of Reception (m) – Scenario 3

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	263	261	379	368	403	395	921	929	756	754	763	764	844	844	870	861
Loader for shipping	243	241	355	344	379	371	897	905	735	733	742	744	829	830	857	848
Excavator 1	271	269	385	374	409	401	927	935	760	757	765	766	844	843	870	861
Excavator 2	291	286	455	442	479	470	989	998	849	847	859	860	946	946	972	963
Mobile Crusher	650	651	610	610	624	623	1084	1088	772	766	735	734	651	641	638	632
Excavator for Crusher	652	654	612	612	627	626	1086	1090	774	768	736	735	651	641	638	632
Loader for shipping. Crushing	643	644	597	597	611	610	1067	1071	754	748	716	715	633	623	621	614
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Continued

Table A1.7.3 Distances, Source to Point of Reception (m) – Scenario 3

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	931	939	1935	1917	1594	1581	1783	1754	1763	1727	1000	986	814	793	394	360
Loader for shipping	922	930	1941	1923	1606	1594	1799	1769	1782	1746	1021	1007	831	810	405	372
Excavator 1	929	937	1930	1911	1587	1574	1776	1746	1755	1719	998	983	812	792	396	362
Excavator 2	1030	1038	2002	1984	1635	1622	1809	1780	1769	1732	907	893	713	692	295	260
Mobile Crusher	624	627	1497	1478	1187	1176	1411	1382	1451	1417	1215	1195	1110	1096	790	753
Excavator for Crusher	624	626	1494	1476	1184	1173	1409	1379	1448	1414	1217	1196	1112	1098	793	755
Loader for shipping. Crushing	609	612	1499	1481	1196	1186	1424	1394	1466	1432	1229	1208	1121	1106	794	757
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Table A1.7.4 Distances, Source to Point of Reception (m) – Scenario 4

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	320	324	213	214	227	226	716	722	484	481	482	483	571	572	605	596
Loader for shipping	287	291	217	215	235	232	740	746	524	522	526	527	616	618	650	641
Excavator 1	314	319	212	213	227	226	719	725	490	487	489	489	578	579	612	603
Excavator 2	235	241	95	93	114	110	628	635	459	457	476	478	624	629	670	660
Mobile Crusher	650	651	610	610	624	623	1084	1088	772	766	735	734	651	641	638	632
Excavator for Crusher	652	654	612	612	627	626	1086	1090	774	768	736	735	651	641	638	632
Loader for shipping. Crushing	643	644	597	597	611	610	1067	1071	754	748	716	715	633	623	621	614
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Continued

Table A1.7.4 Distances, Source to Point of Reception (m) – Scenario 4

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	691	702	1827	1808	1575	1565	1808	1778	1842	1807	1282	1267	1097	1076	662	632
Loader for shipping	732	742	1849	1830	1582	1572	1808	1779	1833	1798	1237	1223	1051	1030	616	586
Excavator 1	698	708	1831	1812	1577	1567	1809	1779	1841	1806	1275	1260	1090	1069	655	625
Excavator 2	775	786	1944	1925	1697	1687	1928	1898	1955	1920	1299	1286	1094	1072	639	614
Mobile Crusher	624	627	1497	1478	1187	1176	1411	1382	1451	1417	1215	1195	1110	1096	790	753
Excavator for Crusher	624	626	1494	1476	1184	1173	1409	1379	1448	1414	1217	1196	1112	1098	793	755
Loader for shipping. Crushing	609	612	1499	1481	1196	1186	1424	1394	1466	1432	1229	1208	1121	1106	794	757
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Table A1.7.5 Distances, Source to Point of Reception (m) – Scenario 5

POR	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	250	247	379	367	403	395	919	928	764	762	772	773	859	860	887	878
Loader for shipping	239	237	360	348	384	376	901	909	743	741	752	753	841	842	869	861
Excavator 1	259	257	382	370	406	398	923	931	762	760	769	771	853	853	879	871
Excavator 2	216	210	426	411	450	440	934	944	844	843	865	867	988	990	1022	1013
Mobile Crusher	650	651	610	610	624	623	1084	1088	772	766	735	734	651	641	638	632
Excavator for Crusher	652	654	612	612	627	626	1086	1090	774	768	736	735	651	641	638	632
Loader for shipping. Crushing	643	644	597	597	611	610	1067	1071	754	748	716	715	633	623	621	614
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Continued

Table A1.7.5 Distances, Source to Point of Reception (m) – Scenario 5

POR	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
Window/Outdoor	W	O	W	O	W	O	W	O	W	O	W	O	W	O	W	O
Source																
Screening Plant	950	958	1957	1939	1614	1602	1802	1772	1779	1743	992	978	801	780	376	343
Loader for shipping	935	943	1953	1934	1615	1603	1806	1777	1787	1751	1012	999	820	800	392	360
Excavator 1	941	949	1945	1927	1602	1589	1790	1761	1768	1732	994	980	805	785	384	351
Excavator 2	1097	1106	2115	2097	1758	1745	1933	1904	1891	1854	932	922	710	687	250	226
Mobile Crusher	624	627	1497	1478	1187	1176	1411	1382	1451	1417	1215	1195	1110	1096	790	753
Excavator for Crusher	624	626	1494	1476	1184	1173	1409	1379	1448	1414	1217	1196	1112	1098	793	755
Loader for shipping. Crushing	609	612	1499	1481	1196	1186	1424	1394	1466	1432	1229	1208	1121	1106	794	757
Trucks, shipping, sand	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Loader feed to Screener	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Truck_Ship_Crush	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

Appendix 2

Background Traffic Noise Analysis

This appendix presents the results of an analysis of background noise from road traffic on Albion Road and Rideau Road at receptors in the vicinity of the proposed Cavanagh Ottawa Airport Pit.

Noise generated by road traffic is calculated from traffic data using STAMSON[5,6], a traffic noise model developed by the MECP. STAMSON takes into account such factors as traffic speed, distance from the road, height, nature of the intervening buildings and terrain, ground absorption, and noise barriers, if present.

The results of the background noise level calculations are presented in Tables A2.1 at the relevant points of reception. Samples of the outputs of the STAMSON software are also provided.

Noise calculations are based on the most recently available traffic data for Albion and Rideau Roads provided by the City of Ottawa, attached. Data provided by the City are recent intersection turning movement traffic surveys for the following intersections.

> Albion Road at the entry to the Rideau Carleton Raceway and Slots, Tuesday 1 September 2015
>
> Albion Road and Rideau Road, Thursday 4 May 2017

The City data provides peak hour counts, a breakdown of heavy vehicle counts, and an estimate of 24-hour counts (AADT).

In order to consider the lowest background noise occurring during the daytime hours (07:00 to 19:00), hourly traffic volumes were calculated from AADT based on the methodology contained RWDI AIR Inc. Publication, "Typical Hourly Traffic Distribution for Noise Modelling", Vol. 36 No. 3 (2008)[8]. The calculated noise at each point of reception for the hour with the least traffic volume is taken to be the sound level limit for the whole daytime period. Where there are adjacent houses, the lowest sound level limit is assumed to apply to all the adjacent houses.

Contents:

Sample outputs from STAMSON

Traffic Data from the City of Ottawa, extracts

- Albion Rd. @ 210 m South of High Rd., Tuesday 1 September 2015
- Albion Rd. at Rideau Rd., Thursday 4 May 2017

Table A2.1: Background Sound Level at Receptors Impacted by Noise from Road Traffic on Albion Road and Rideau Road

Point of Reception **(applied both to plane of window and outdoor points of reception)**	**Sound Level Limit 1-hour L_{AEQ} dBA (Daytime Period, 07:00 – 19:00)**
POR 1, POR 2 & POR 3 (on Albion Rd. north of Rideau Rd.)	55.0 (see Table A2.4)
POR 4 (on Rideau Road, east of Albion Road)	57.5 (see Table A2.5)
POR 5 (at the intersection of Albion and Rideau, most affected by traffic on Albion Rd. south of Rideau Rd.)	65.5 (see Table A2.6)
POR 6 (on Rideau Road, west of Albion Road)	57.5 (see Table A2.7.1)
POR 7, POR 8 & POR 9 (on Rideau Road, west of Albion Road)	58.5 (see Table A2.7.2)

Table A2.2 Calculation of Road Volumes, Albion @ Rideau Carleton Raceway
Source Data: City of Ottawa, Albion Rd. @ 210 m South of High Rd., Tuesday 1 September 2015
Note: This is a T-intersection
Count Hours: 7 - 10 am, 11:30 am - 1:30 pm, 3 - 6 pm, 8 hours total

Turning Movement Counts	Albion Northbound			Albion Southbound			RCR Eastbound			RCR Westbound		
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT
8 hr totals, all vehicles	0	2418	139	663	2247	0	0	0	0	107	0	350
8 hr Total, Heavy vehicles	0	133	8	12	147	0	0	0	0	4	0	11
% Heavy Vehicles												
24 hr estimates, all vehicles	0	4403	253	1207	4092	0	0	0	0	195	0	637

Road Volumes	Albion, North of RCR Entrance			Albion, South of RCR Entrance			RCR Entrance, East of Albion			no road		
	N bound	S bound	2-way Tot	N bound	S bound	2-way Tot	E Bound	W Bound	2-way Tot	E Bound	W Bound	2-way Tot
8 hr totals, all vehicles	2768	2910	5678	2557	2354	4911	802	457	1259	0	0	0
8 hr Total, Heavy vehicles	144	159	303	141	151	292	20	15	35	0	0	0
% Heavy Vehicles	5.20	5.46	5.34	5.51	6.41	5.95	2.49	3.28	2.78	#DIV/0!	#DIV/0!	#DIV/0!
24 hr estimates, all vehicles	5040	5299	10339	4656	4287	8943	1460	832	2292	0	0	0

Table A2.3 Calculation of Road Volumes, Albion @ Rideau
Source Data: City of Ottawa, Albion Rd. @ Rideau Rd., Thursday 4 May 2017
Count Hours: 7 - 10 am, 11:30 am - 1:30 pm, 3 - 6 pm, 8 hours total

Turning Movement Counts	Albion Northbound			Albion Southbound			Rideau Eastbound			Rideau Westbound		
	LT	ST	RT	LT	ST	RT	LT	ST	RT	LT	ST	RT
8 hr totals, all vehicles	170	2431	679	337	1935	198	172	801	226	828	1154	380
8 hr Total, Heavy vehicles	19	73	177	15	87	7	5	112	35	174	84	31
% Heavy Vehicles												
24 hr estimates, all vehicles	279	3984	1113	552	3171	324	282	1313	370	1357	1891	623

Road Volumes	Albion, North of Rideau			Albion, South of Rideau			Rideau, East of Albion			Rideau, West of Albion		
	N bound	S bound	2-way Tot	N bound	S bound	2-way Tot	E Bound	W Bound	2-way Tot	E Bound	W Bound	2-way Tot
8 hr totals, all vehicles	2983	2470	5453	3280	2989	6269	1817	2362	4179	1199	1522	2721
8 hr Total, Heavy vehicles	109	109	218	269	296	565	304	289	593	152	110	262
% Heavy Vehicles	3.65	4.41	4.00	8.20	9.90	9.01	16.73	12.24	14.19	12.68	7.23	9.63
24 hr estimates, all vehicles	4889	4047	8936	5376	4898	10274	2978	3871	6849	1965	2494	4459

Table A2.4: Traffic Volumes and Calculated Noise, Albion north of Rideau

Albion Road, immediately north of Rideau Road
Posted Speed Limit: 60 km/h Vehicle Classification based on count data and City Guideline[1]

Hour	Typical Distribution	Estimated Total Vehicles	Estimated volumes by Vehicle Classification			Estimated Noise Levels by STAMSON					
			Cars	Medium Trucks	Heavy Trucks	POR_1_W d = 39 m 0 to 90 deg	POR_1_O d = 39 m 0 to 90 deg	POR_2_W d = 25 m 0 to 90 deg	POR_2_O d = 25 m 0 to 90 deg	POR_3_W d = 36 m 0 to 90 deg	POR_3_O d = 36 m 0 to 90 deg
Beginning	See Ref. 8 %		89%	7%	4%	h = 4.5 m	h = 1.5 m	h = 4.5 m	h = 1.5 m	h = 4.5 m	h = 1.5 m
Midnight	0.87	76.3	67.9	5.3	3.1						
1:00	0.49	43.0	38.2	3.0	1.7						
2:00	0.36	31.6	28.1	2.2	1.3						
3:00	0.30	26.3	23.4	1.8	1.1						
4:00	0.36	31.6	28.1	2.2	1.3						
5:00	0.95	83.3	74.2	5.8	3.3						
6:00	2.75	241.2	214.7	16.9	9.6						
7:00	5.05	442.9	394.2	31.0	17.7	55.78	**55.27**	58.82	58.47	56.32	55.84
8:00	6.55	574.5	511.3	40.2	23.0						
9:00	5.62	492.9	438.7	34.5	19.7	58.79	58.46	61.83	61.48	59.34	60.66
10:00	5.50	482.4	429.3	33.8	19.3						
11:00	6.04	529.8	471.5	37.1	21.2						
12:00	6.48	568.3	505.8	39.8	22.7						
13:00	6.26	549.0	488.7	38.4	22.0						
14:00	6.60	578.9	515.2	40.5	23.2						
15:00	7.41	649.9	578.4	45.5	26.0						
16:00	7.82	685.9	610.4	48.0	27.4						
17:00	7.65	671.0	597.2	47.0	26.8						
18:00	6.27	549.9	489.4	38.5	22.0						
19:00	5.12	449.1	399.7	31.4	18.0						
20:00	4.99	437.7	389.5	30.6	17.5						
21:00	3.41	299.1	266.2	20.9	12.0						
22:00	3.41	299.1	266.2	20.9	12.0						
23:00	1.67	146.5	130.4	10.3	5.9						
Total		**8940**									

Table A2.5: Traffic Volumes and Calculated Noise, Rideau East of Albion

Rideau Road, immediately east of Albion Road, Posted Speed Limit: 80 km/h, Vehicle Classification based on count data and City Guideline[1]

Hour	Typical Distribution*	Estimated Total Vehicles	Estimated volumes by Vehicle Classification			Estimated Noise Levels by STAMSON			
			Cars	Medium Trucks	Heavy Trucks	POR_4_W d = 41 m 0 to 90 deg	POR_4_O d = 52 m 0 to 90 deg	POR_5_W d = 22 m 0 to 90 deg	POR_5_O d = 22 m 0 to 90 deg
			79%	7%	14%				
Beginning	%					h = 4.5 m	h = 1.5 m	h = 4.5 m	h = 1.5 m
Midnight	0.87	58.5	46.2	4.1	8.2				
1:00	0.49	32.9	26.0	2.3	4.6				
2:00	0.36	24.2	19.1	1.7	3.4				
3:00	0.30	20.2	15.9	1.4	2.8				
4:00	0.36	24.2	19.1	1.7	3.4				
5:00	0.95	63.8	50.4	4.5	8.9				
6:00	2.75	184.8	146.0	12.9	25.9				
7:00	5.05	339.3	268.1	23.8	47.5	60.00	**57.75**	64.21	63.91
8:00	6.55	440.1	347.7	30.8	61.6				
9:00	5.62	377.6	298.3	26.4	52.9				
10:00	5.50	369.6	292.0	25.9	51.7				
11:00	6.04	405.8	320.6	28.4	56.8				
12:00	6.48	435.4	344.0	30.5	61.0				
13:00	6.26	420.6	332.3	29.4	58.9				
14:00	6.60	443.5	350.3	31.0	62.1				
15:00	7.41	497.9	393.3	34.9	69.7				
16:00	7.82	525.5	415.1	36.8	73.6				
17:00	7.65	514.0	406.1	36.0	72.0				
18:00	6.27	421.3	332.8	29.5	59.0				
19:00	5.12	344.0	271.8	24.1	48.2				
20:00	4.99	335.3	264.9	23.5	46.9				
21:00	3.41	229.1	181.0	16.0	32.1				
22:00	3.41	229.1	181.0	16.0	32.1				
23:00	1.67	112.2	88.6	7.9	15.7				
Total	101.93	**6849**							

Table A2.6: Traffic Volumes and Calculated Noise, Albion South of Rideau

Albion Road, immediately south of Rideau Road, Posted Speed Limit: 80 km/hr, Vehicle Classification based on count data and City Guideline[1]

Hour	Typical Distribution*	Estimated Total Vehicles	Estimated volumes by Vehicle Classification			Estimated Noise Levels by STAMSON	
			Cars	Medium Trucks	Heavy Trucks	POR_5_W d = 30 m -90,+90 deg	POR_5_O d = 22 m -90,+90 deg
			84%	7%	9%		
Beginning	%					h = 4.5 m	h = 1.5 m
Midnight	0.87	87.7	73.7	6.1	7.9		
1:00	0.49	49.4	41.5	3.5	4.4		
2:00	0.36	36.3	30.5	2.5	3.3		
3:00	0.30	30.2	25.4	2.1	2.7		
4:00	0.36	36.3	30.5	2.5	3.3		
5:00	0.95	95.8	80.4	6.7	8.6		
6:00	2.75	277.2	232.8	19.4	24.9		
7:00	5.05	509.0	427.6	35.6	45.8	**65.54**	67.34
8:00	6.55	660.2	554.6	46.2	59.4		
9:00	5.62	566.5	475.8	39.7	51.0		
10:00	5.50	554.4	465.7	38.8	49.9		
11:00	6.04	608.8	511.4	42.6	54.8		
12:00	6.48	653.1	548.6	45.7	58.8		
13:00	6.26	631.0	530.0	44.2	56.8		
14:00	6.60	665.2	558.8	46.6	59.9		
15:00	7.41	746.9	627.4	52.3	67.2		
16:00	7.82	788.2	662.1	55.2	70.9		
17:00	7.65	771.1	647.7	54.0	69.4		
18:00	6.27	632.0	530.9	44.2	56.9		
19:00	5.12	516.1	433.5	36.1	46.4		
20:00	4.99	503.0	422.5	35.2	45.3		
21:00	3.41	343.7	288.7	24.1	30.9		
22:00	3.41	343.7	288.7	24.1	30.9		
23:00	1.67	168.3	141.4	11.8	15.1		
Total	101.93	**10274**					

Table A2.7.1: Traffic Volumes and Calculated Noise, Rideau West of Albion (Part 1)

Rideau Road, immediately west of Albion Road, Posted Speed Limit: 80 km/hr, Vehicle Classification based on count data and City Guideline[1]

Hour	Typical Distribution*	Estimated Total Vehicles	Estimated volumes by Vehicle Classification			Estimated Noise Levels by STAMSON	
			Cars	Medium Trucks	Heavy Trucks	POR_6_W d = 33 m 0 to 90 deg	POR_6_O d = 33 m 0 to 90 deg
Beginning	%		84%	7%	9%	h = 4.5 m	h = 1.5 m
Midnight	0.87	38.1	32.0	2.7	3.4		
1:00	0.49	21.4	18.0	1.5	1.9		
2:00	0.36	15.7	13.2	1.1	1.4		
3:00	0.30	13.1	11.0	0.9	1.2		
4:00	0.36	15.7	13.2	1.1	1.4		
5:00	0.95	41.6	34.9	2.9	3.7		
6:00	2.75	120.3	101.1	8.4	10.8		
7:00	5.05	220.9	185.6	15.5	19.9	58.31	**57.85**
8:00	6.55	286.5	240.7	20.1	25.8		
9:00	5.62	245.9	206.5	17.2	22.1		
10:00	5.50	240.6	202.1	16.8	21.7	64.07	63.14
11:00	6.04	264.2	221.9	18.5	23.8		
12:00	6.48	283.5	238.1	19.8	25.5		
13:00	6.26	273.8	230.0	19.2	24.6		
14:00	6.60	288.7	242.5	20.2	26.0		
15:00	7.41	324.2	272.3	22.7	29.2		
16:00	7.82	342.1	287.4	23.9	30.8		
17:00	7.65	334.7	281.1	23.4	30.1		
18:00	6.27	274.3	230.4	19.2	24.7		
19:00	5.12	224.0	188.1	15.7	20.2		
20:00	4.99	218.3	183.4	15.3	19.6		
21:00	3.41	149.2	125.3	10.4	13.4		
22:00	3.41	149.2	125.3	10.4	13.4		
23:00	1.67	73.1	61.4	5.1	6.6		
Total	101.93	**4459**					

Table A2.7.2: Traffic Volumes and Calculated Noise, Rideau West of Albion (Part 2)

Rideau Road, immediately west of Albion Road, Posted Speed Limit: 80 km/hr, Vehicle Classification based on count data and City Guideline[1]

Hour	Typical Distribution*	Estimated Total Vehicles	Estimated volumes by Vehicle Classification			POR_7_W d = 24 m 0 to 90 deg	POR_7_O d = 21 m 0 to 90 deg	POR_8_W d = 31 m 0 to 90 deg	POR_8_O d = 23 m 0 to 90 deg	POR_9_W d = 24 m 0 to 90 deg	POR_9_O d = 24 m 0 to 90 deg
			Cars	Medium Trucks	Heavy Trucks						
			84%	7%	9%						
Beginning	%					h = 4.5 m	h = 1.5 m	h = 4.5 m	h = 1.5 m	h = 4.5 m	h = 1.5 m
Midnight	0.87	38.1	32.0	2.7	3.4						
1:00	0.49	21.4	18.0	1.5	1.9						
2:00	0.36	15.7	13.2	1.1	1.4						
3:00	0.30	13.1	11.0	0.9	1.2						
4:00	0.36	15.7	13.2	1.1	1.4						
5:00	0.95	41.6	34.9	2.9	3.7						
6:00	2.75	120.3	101.1	8.4	10.8						
7:00	5.05	220.9	185.6	15.5	19.9	60.47	61.09	**58.73**	60.44	60.47	60.13
8:00	6.55	286.5	240.7	20.1	25.8						
9:00	5.62	245.9	206.5	17.2	22.1						
10:00	5.50	240.6	202.1	16.8	21.7	63.48	64.10	61.75	63.45	63.48	63.14
11:00	6.04	264.2	221.9	18.5	23.8						
12:00	6.48	283.5	238.1	19.8	25.5						
13:00	6.26	273.8	230.0	19.2	24.6						
14:00	6.60	288.7	242.5	20.2	26.0						
15:00	7.41	324.2	272.3	22.7	29.2						
16:00	7.82	342.1	287.4	23.9	30.8						
17:00	7.65	334.7	281.1	23.4	30.1						
18:00	6.27	274.3	230.4	19.2	24.7						
19:00	5.12	224.0	188.1	15.7	20.2						
20:00	4.99	218.3	183.4	15.3	19.6						
21:00	3.41	149.2	125.3	10.4	13.4						
22:00	3.41	149.2	125.3	10.4	13.4						
23:00	1.67	73.1	61.4	5.1	6.6						
Total	101.93	**4459**									

Samples of Traffic Noise Predictions using STAMSON

STAMSON 5.0 NORMAL REPORT Date: 20-01-2020 12:58:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1_o.te Time Period: 1 hours
Description: POR 1 Outdoor, 7 - 8 AM, Background Traffic

Road data, segment # 1: Albion Road

Car traffic volume : 394 veh/TimePeriod
Medium truck volume : 31 veh/TimePeriod
Heavy truck volume : 18 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Albion Road

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 39.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Albion Road

Source height = 1.42 m

ROAD (0.00 + 55.27 + 0.00) = 55.27 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
0 90 0.66 66.62 0.00 -6.89 -4.47 0.00 0.00 0.00 55.27

Segment Leq : 55.27 dBA

Total Leq All Segments: 55.27 dBA

TOTAL Leq FROM ALL SOURCES: 55.27

STAMSON 5.0 COMPREHENSIVE REPORT Date: 20-01-2020 10:35:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R4_O.te Time Period: 1 hours
Description: POR 4 Outdoor, 7 - 8 am, Rideau Rd, BG Traffic

Road data, segment # 1: Rideau East

Car traffic volume : 268 veh/TimePeriod
Medium truck volume : 24 veh/TimePeriod
Heavy truck volume : 47 veh/TimePeriod
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Rideau East

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 52.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: Rideau East

Source height = 1.93 m

ROAD (0.00 + 57.75 + 0.00) = 57.75 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
0 90 0.65 71.09 0.00 -8.89 -4.45 0.00 0.00 0.00 57.75

Segment Leq : 57.75 dBA

Total Leq All Segments: 57.75 dBA

TOTAL Leq FROM ALL SOURCES: 57.75

STAMSON 5.0 NORMAL REPORT Date: 20-01-2020 11:02:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R5_W.te Time Period: 1 hours
Description: POR 5 Window, 7 - 8 AM, Albion Rd. BG Traffic

Road data, segment # 1: Albion S

Car traffic volume : 427 veh/TimePeriod
Medium truck volume : 35 veh/TimePeriod
Heavy truck volume : 45 veh/TimePeriod
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Albion S

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

Results segment # 1: Albion S

Source height = 1.73 m

ROAD (0.00 + 65.54 + 0.00) = 65.54 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 71.53 0.00 -4.71 -1.29 0.00 0.00 0.00 65.54

Segment Leq : 65.54 dBA

Total Leq All Segments: 65.54 dBA

STAMSON 5.0 NORMAL REPORT Date: 20-01-2020 12:26:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6_o.te Time Period: 1 hours
Description: POR 6 Outdoor, 7 - 8 AM, Background Traffic

Road data, segment # 1: Rideau West

Car traffic volume : 185 veh/TimePeriod
Medium truck volume : 15 veh/TimePeriod
Heavy truck volume : 20 veh/TimePeriod
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Rideau West

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 33.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Rideau West

Source height = 1.74 m

ROAD (0.00 + 57.85 + 0.00) = 57.85 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
0 90 0.65 67.96 0.00 -5.66 -4.46 0.00 0.00 0.00 57.85

Segment Leq : 57.85 dBA

Total Leq All Segments: 57.85 dBA

TOTAL Leq FROM ALL SOURCES: 57.85

STAMSON 5.0 NORMAL REPORT Date: 20-01-2020 12:37:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8_w.te Time Period: 1 hours
Description: POR 8 Window, 7 - 8 AM, Background Traffic

Road data, segment # 1: Rideau West

Car traffic volume : 185 veh/TimePeriod
Medium truck volume : 15 veh/TimePeriod
Heavy truck volume : 20 veh/TimePeriod
Posted speed limit : 80 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Rideau West

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 31.00 m
Receiver height : 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Rideau West

Source height = 1.74 m

ROAD (0.00 + 58.73 + 0.00) = 58.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.56	67.96	0.00	-4.93	-4.30	0.00	0.00	0.00	58.73

Segment Leq : 58.73 dBA

Total Leq All Segments: 58.73 dBA

TOTAL Leq FROM ALL SOURCES: 58.73

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. Freefield Ltd. was incorporated in 2017 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 Freefield Ltd. Hugh Williamson founded and directed Hugh Williamson Associates Inc. which specialized in consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. 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 25 years of experience as a consultant.

CLIENT LIST:

Hugh Williamson has provided consulting services to large and small clients including: National Research Council, R. W. Tomlinson, G. Tackaberry & Sons Construction, Miller Paving, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group and Industry Canada.

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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 Associate Member, INCE-USA
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, Australia, with many years of experience in the measurement, analysis and control of noise and vibration. Michael Wells is a founding Director of Freefield Ltd. which was incorporated in 2017, 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 Freefield Ltd., his career included working for Hugh Williamson Associates Inc. specializing in acoustics, noise and vibration consulting services, and, the founding of Michael Wells Architect in Sydney, Australia, specializing in the design of institutional, commercial and residential projects. He is the former Director of Architectural Workshops Australia and Vision Blue Pty Ltd. He has more than 15 years of experience as a consultant.

CLIENT LIST:

Michael Wells has provided consulting services to large and small clients including: National Research Council, R. W. Tomlinson, G. Tackaberry & Sons Construction, Miller Paving, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group and Industry Canada.

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