FREEFIELD LTD.
Ottawa, Ontario

ACOUSTIC ASSESSMENT FOR THE PROPOSED STORYLAND PIT TOWNSHIP OF HORTON, COUNTY OF RENFREW, ONTARIO

PEO License No. 90532110

Prepared for

R. W. Tomlinson Limited

Prepared by

Freefield Ltd.

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ACOUSTIC ASSESSMENT FOR THE PROPOSED STORYLAND PIT TOWNSHIP OF HORTON, COUNTY OF RENFREW, ONTARIO

Executive Summary

R. W. Tomlinson Limited, Tomlinson, is applying to the Ministry of Northern Development, Mines, Natural Resources and Forestry, MNDMNRF, for a Class "A" License, below water extraction, under the Aggregate Resources Act, ARA, for the proposed Storyland Pit to be located at Part of Lot 20, Concession 6, Geographic Township of Horton, Township of Horton, County of Renfrew, Ontario, as shown in Figures 1 and 2.

The MNDMNRF license application requires the submission of an Acoustic Assessment Report of the proposed operation. Freefield Ltd. has been retained by Tomlinson to complete this Acoustic Assessment.

The acoustic assessment has been carried out according to the applicable MECP Noise Assessment Guidelines, including NPC-300, published August 2013.

The assessment considers the impacts on nearby noise sensitive lands, including existing residences and land zoned for potential noise sensitive use, of noise generated by all on-site equipment operations, including extraction by loaders, excavators or a dredge, aggregate processing by a wash plant, loading and stockpiling operations by loaders or excavators and on-site truck movements used for delivery and shipping of product.

Noise impacts have been predicted and compared to the MECP sound level limits as set out in NPC-300. Where applicable, noise mitigation measures such as barriers and limits to operations have been designed to ensure all operations comply with the applicable sound level limits.

Assessment methodology is provided in Section 1. A detailed description of the facility and its operations is provided in Section 2. Noise sources associated with operations at the pit are summarized in Section 3. Noise sensitive receptors are described in Section 1 and Section 4, with Section 5, 6 and 7 detailing applicable assessment criteria, an assessment of noise impacts and recommended mitigation measures.

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ACOUSTIC ASSESSMENT FOR THE PROPOSED STORYLAND PIT TOWNSHIP OF HORTON, COUNTY OF RENFREW, ONTARIO

1.0 Introduction

R. W. Tomlinson Limited, Tomlinson, is applying to the Ministry of Northern Development, Mines, Natural Resources and Forestry, MNDMNRF, for a Class "A" License, below water extraction, under the Aggregate Resources Act, ARA, for the proposed Storyland Pit to be located at Part of Lot 20, Concession 6, Geographic Township of Horton, Township of Horton, County of Renfrew, Ontario, as shown in Figures 1 and 2.

This report describes an assessment, carried out by Freefield Ltd., of the potential impact of noise from operations at the proposed pit on nearby noise sensitive receptors in accordance with MECP guidelines for stationary noise sources. [1, 2]

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[2]. Noise from the facility is assessed according to MECP Documents: NPC-300, *Stationary and Transportation Sources – Approval and Planning*, August 2013.[1] This report follows the recommended format contained in, *Sample Application Package, Basic Comprehensive Certificate of Approval (Air and Noise)*, July 2009.[3]

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 vacant land zoned for potential noise sensitive use.

- Determination of the MECP sound level limits[1] 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 equipment at other aggregate operations in Ontario by Freefield Ltd.

- Based on the strengths of the individual noise sources, noise levels due to pit operations are predicted at nearby noise sensitive receptors using a prediction procedure[3] which is favoured by the MECP. The MECP methodology requires that compliance be assessed under predictable "worst case" conditions for normal operations.

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

Note that this assessment considers all significant noise sources in operation on the site. The pit is not a significant source of vibration therefore an assessment of vibration impacts is not required.

Surrounding Lands, Acoustic Environment and Noise Sensitive Receptors

The proposed Storyland Pit is located in a predominantly rural, agricultural and mineral extraction area, on the south side of Storyland Road, approximately 1.7 km east of the intersection with the Trans-Canada Highway 17, in the Geographic Township of Horton, Township of Horton, County of Renfrew, Ontario.

The site consists of a mix of cleared agricultural and wooded land. The site is relatively flat with minor changes in elevation ranging from approximately 168 mASL to 165 mASL.

The lands surrounding the pit consist of relatively flat topography generally sloping down in a north easterly direction to the Ottawa River.

Note that directions in this report are referenced to site north as shown in Figure 1.

The legal description of the land occupied by the proposed pit is as follows:

Part of Lot 20, Concession 6,
Geographic Township of Horton,
Township of Horton,
County of Renfrew,
Ontario

A location plan showing the site with respect to the surrounding area is provided in Figure 1. A site layout plan, showing the sites detailed arrangement and elevation contours, is provided in Figure 2. A land use zoning map is provided in Appendix 1.

The proposed pit is located on land zoned Extractive Industrial Reserve (EMR), Rural (RU) and Environmental Protection (EP), as shown on the Zoning Map, Appendix 1.

To the north of the site the land is zoned Extractive Industrial (EM) with small pockets of land zoned Rural (RU). An existing licensed pit, ARA License # 17733, lies immediately north of the site on land zoned EM with a number of existing residences, on land zoned RU, fronting Storyland

Road and Chapeski Lane. The closest existing residences in this direction have been selected as noise sensitive receptors in the following assessment.

To the east of the site the land is Rural (RU). A number of existing residences and a vacant lot zoned for potential noise sensitive use on land zoned RU lie in this direction fronting Ruttan Road. The closest existing and potential future residences in this direction have been selected as noise sensitive receptors in the following assessment.

To the south of the site the land is zoned Extractive Industrial Reserve (EMR) and Rural (RU). A number of existing residences exist in this direction fronting Eady Road, Ruttan Road and Jim Barr Road. The closest existing residences in this direction have been selected as noise sensitive receptors in the following assessment.

To the west of the site the land is Rural (RU). A number of existing residences lie in this direction fronting Eady Road. The closest existing residences in this direction have been selected as noise sensitive receptors in the following assessment.

Where receptors have been located on vacant land zoned for potential noise sensitive use i.e. a possible future residence located on land zoned Rural, the location selected for assessment is consistent with the existing pattern of development in the area.

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

Table 1 lists the noise sensitive receptors selected for analysis.

2.0 Facility Description

The proposed Storyland Pit will have an annual tonnage limit of 1,000,000 tonnes.

Raw material (sand and aggregate) will be primarily extracted by loader or excavator and taken by truck to stockpiles located in the central processing area near the wash plant. Sand is then fed into the feed bins by loader, where it is transported by conveyor to a dry screen. Oversized material is diverted to a rotary (cone) or a VSI crushing unit. After crushing material is fed back into the dry screen for further processing. Material that passes through the dry screen is transferred to a wet screen before being delivered to a classifier that separates the material by size (larger, heavier material falls to the bottom, and smaller, lighter material continues to flow into a separate area). Sand then passes through the screws which dewater the material. Material is stockpiled using conveyors and stackers. A loader then loads the stockpiled aggregates onto trucks that are used to deliver the product off-site.

Extraction below water will be carried out by an excavator with a large boom or dragline or a cutter suction dredge.

Additional material may be brought on site as needed, stored and processed, before being shipped off site.

Extraction of Storyland Pit will take in five phases, as shown in Figure 2, with up to two lifts in each phase, corresponding to above water extraction and below water extraction.

Phase 1 consists of extraction of above water material in the south-central portion of the site with the cut proceeding in a north, east and westerly direction to establish the central processing area and location of the wash plant near the approximate center of the site. The base of phase 1 will slope down in an easterly direction from an approximate elevation of 165.5 mASL at the north, west and central portion to approximately 164.5 mASL at the eastern limit of Phase 1.

Phase 2 will continue the above water extraction from the current lift face of Phase 1 and proceed in an easterly direction to the setback limits. The base will be sloped from an approximate elevation of 164.5 mASL at the western limit of Phase 2, abutting Phase 1, to an elevation ranging from approximately 161.5 mASL to 162.5 mASL at the site's eastern setback. Below water extraction may occur concurrently in Phase 2 following the above water extraction.

Phase 3 will continue the above water extraction from the current lift face of Phase 2 and proceed in a north and easterly direction to the extraction limits of the site. The lift floor will be sloped with approximate elevations ranging from 165.5 mASL at the western limit to 162.5 mASL at the eastern limit of Phase 3. Below water extraction will continue concurrently to the extraction limits of Phase 2.

Phase 4 will continue the above water extraction from the current lift face of Phase 1 and proceed in a westerly direction to the extraction limits of the site. The lift floor will be sloped from an approximate elevation of 165.5 mASL at the eastern limit of Phase 4 abutting Phase 1 to an

elevation of approximately 166.5 mASL at the site's western setback. Below water extraction may occur concurrently to the extraction limits of Phase 2 or Phase 3.

Phase 5 will continue the above water extraction from the current lift face of Phase 1 and 4 and proceed in a north and westerly direction to the extraction limits of the site. The lift floor will be sloped from an approximate elevation of 165.5 mASL at the eastern limit of Phase 5 to an approximate elevation of 166.5 mASL at the western limit. Below water extraction will continue to the extraction limits of Phase 4 and Phase 5 with the wash plant relocated to Phase 5 as extraction progresses.

Equipment will generally be located on the floor of the pit.

Access to the site is from the new site entrance off Storyland Road, as shown in Figure 2.

The following equipment will be operated on-site and is included in this assessment as significant sources of noise:

- One wash plant and associated diesel generator,
- Up to three loaders and excavators with buckets and or a dragline,
- One cutter suction dredge,
- Haulage Trucks,
- Portable equipment for site preparation and rehabilitation, including excavators, hydraulic shovels, dozers and scrapers.

A description of each operation follows:

Wash Plant

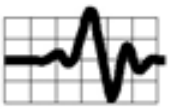
A wash plant is used to process extracted material and separate it into various grades of aggregate. The major components of the plant include a hopper (feed bin), dry screen deck, a rotary (cone) crushing unit or a VSI crushing unit, a wet screen deck, a classifier, one single and one double screw material washers and conveyors and stackers. Typically, associated operations include loaders used to supply raw material to the plant and to load trucks from stockpiles for delivery off-site. A diesel generator or hydro will be used to provide power to the plant. The wash plant may operate on a 24-hour basis.

Loaders and Excavators

Typically, loaders and excavators are required on-site for the following:

- Extracting raw material from the extraction face,
- Loading extracted material onto trucks for delivery to the wash plant,
- Delivery of material from the extraction face to the wash plant,
- Loading aggregate from stockpiles into the hoppers to feed the wash plant,
- Loading processed aggregate on to trucks for shipping off-site,
- Generally pushing around rock and aggregate to maintain the site in a safe state,
- Removing overburden and site preparation,

Loading and excavating activities may take place on a twenty-four-hour basis (24 hour).



Cutter Suction Dredge

A cutter suction dredge may be used during certain periods for extraction below water. This equipment consists of a rotating cutter head, for breaking up hard soils. The sand and aggregate is sucked up by dredge pumps and deposited via pipelines to the shore deposit area prior to it being fed into the wash plant for processing. Cutter suction dredge operations take place only during the daytime hours (07:00 – 19:00).

Aggregate Trucks

Aggregate trucks are used for delivery of material from the extraction face to the wash plant. It is assumed up to 5 loads per hour will be delivered from the extraction face to the wash plant during periods of maximum capacity during the daytime period. During the evening and nighttime period, during periods of reduced demand, it is assumed up to 3 loads per hour will be delivered from the extraction face to the wash plant. The aggregate trucks travel relatively slowly, typically 20 kph or less. The use of jake brakes (compression assisted brakes) is forbidden on site. Aggregate trucks delivering material from the extraction face to the wash plant may operate on a 24-hour basis.

Highway Trucks

To ship aggregate off-site, highway trucks enter via the site entry off Storyland Road, travel to stockpiles located in the central processing plant near the wash plant, are loaded by loader, and then leave the site. It is assumed up to 10 trucks per hour will enter the site and 10 trucks per hour will exit the site during periods of maximum capacity during the daytime period. During the evening and nighttime period, during periods of reduced demand, it is assumed a maximum of 5 trucks per enter the site and 5 trucks per hour exit the site. The highway trucks travel relatively slowly, typically 20 kph or less. Highway trucks may operate on a 24-hour basis.

Hours of Operation

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

- One wash plant and associated diesel generator,
- Up to three loaders or excavators,
- One cutter suction dredge,
- On-site truck movements, to deliver material to the central processing plant and haul the product off-site.

Evening and Nighttime Operations (19:00 – 07:00) – During the evening and nighttime period the following significant noise sources may be in operation:

- One wash plant and associated diesel generator,
- Up to two loaders or excavators,
- On-site truck movements, to haul the product off-site.

3.0 Noise Source Summary

The following noise sources have been used to model noise generated by operations at the Storyland 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.

- One wash and an associated loader (Source: Wash_Plant);
- One diesel generator with exhaust muffler (Source: Generator_Exhaust);
- Up to two additional loaders or excavators in operation at the extraction face (Source: Excavators)
- Aggregate trucks used for delivery of raw material to stockpiles (Source: IHR_Aggregate);
- Highway trucks used for delivery and shipping of product (Source: IHR_Shipping);

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

Noise from the wash plant has been modelled as a single point source located at the centre of the screener, 7.8 m above grade. The sound power for the wash plant includes noise from one loader which was in operation during the measurements. The wash plant was processing aggregate at the time of noise measurements.

The generator used to provide power to the plant will be located inside an enclosure (trailer). Noise from the generator has been modelled as a single point source, 4 m above grade, corresponding to the typical height of the generator exhaust located on the roof of the trailer.

Noise from loaders or excavators operating at the extraction face have been modelled as area sources in the following assessment. In all scenarios the sound power for the excavators has been used for the purpose of assessing compliance, as this sound power is slightly higher than the sound power for the loaders, as shown in Table 2, hence, represents worst case operating conditions.

Noise from the haul routes is estimated using the moving point source method and modelled as a continuous line source. Two internal haul route operations have been assessed. One haul route representing trucks delivering raw aggregate from the extraction face to the wash plant, and one haul route representing trucks used for delivery and shipping of product off site.

Refer Figure 3, 5, 7, 9 and 11 for location of sources for worst case scenarios analysed.

4.0 Point of Reception Summary

A total of twenty-two nearby noise sensitive receptors have been selected for detailed noise evaluation. These existing and potential future residences 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 twenty-two points of reception selected for analysis, POR 1 to POR 22, 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 noise sensitive receptor for which worst case sound levels have been calculated.

> POW – Plane of window (POW) 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.
>
> OPR – Outdoor Point of Reception, an area on the property of the residence. For large properties, the OPR point of reception can be up to 30 m from the dwelling at a height of 1.5 m above ground.

Where receptors have been located on vacant land zoned for potential noise sensitive use i.e. a possible future residence located on land zoned rural, the locations selected for assessment are consistent with the existing pattern of development in the area.

5.0 Assessment Criteria, Performance Limits

Sound level limits, as specified in the MECP guideline NPC-300 [1], 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.'

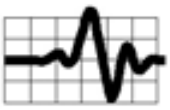
Due to the relatively low levels of road traffic along Storyland Road, Ruttan Road, Jim Barr Road and Eady Road, and the dominant rural character of the area, the area in which all receptors are located is classified as Class 3 Area.

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 Table 4, or the background sound level for that 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. A background noise assessment was not carried out, hence, the levels given in the Tables 3 and 4 are taken as the sound level limits at all points of reception for the purpose of this assessment according to their location in a Class 3 Area.

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 Impact Assessment

Noise levels have been predicted at the noise sensitive receptors using "predictable worst case" assumptions under normal operations and using ISO 9613-2 sound propagation methodology[4] as implemented in the sound prediction software Cadna-A, Version 2022. 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 estimation method includes the following:

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

In order to consider cases of worst noise impacts, five operational scenarios have been modeled. In general, the worst impacts are those which occur when all equipment is operating concurrently.

The following five worst case scenarios are presented in this report and form the basis for the recommended mitigation measures and assessment of compliance to MECP criteria:

Scenario 1: *Worst Case, All equipment in operation in Phase 1 (Day, Evening and Night) – Figure 3, 4.1 and 4.2.*

Scenario 2: *Worst Case, Wash plant in operation in Phase 1 with extraction occurring in Phase 2 (Day, Evening and Night) – Figure 5, 6.1 and 6.2.*

Scenario 3: *Worst Case, Wash plant in operation in Phase 1 with extraction occurring in Phase 2 and Phase 3 (Day, Evening and Night) – Figure 7, 8.1 and 8.2.*

Scenario 4: *Worst Case, Wash plant in operation in Phase 1 with extraction occurring in Phase 3 and Phase 4 (Day, Evening and Night) – Figure 9, 10.1 and 10.2.*

Scenario 5: *Worst Case, Wash plant in operation in Phase 5 with extraction occurring in Phase 1, Phase 4 and Phase 5 (Day, Evening and Night) – Figure 11, 12.1 and 12.2.*

In Table 6.1 to Table 6.5, estimated noise levels at the nearest receptors for the worst-case scenarios, during daytime and evening and nighttime periods of operation, are compared with the applicable sound level limits. More detailed estimates are contained in Appendix 2, Tables A2.7.01 to A2.7.10.

It can be seen that, with the recommended mitigation measures, the sound level limits are met at all noise sensitive points of reception, POR 1 to POR 22, for worst case operating conditions during

the proposed daytime 7 am to 7 pm (07:00 to 19:00), evening 7 pm to 11 pm (19:00 to 23:00), and nighttime, 11 pm to 7 am (23:00 – 07:00) period of operation.

Details of acoustic modeling are provided in Appendix 2. Figures 4.1, 4.2, 6.1, 6.2, 8.1, 8.2, 10.1, 10.2, 12.1 and 12.2 show predicted noise contours for each mode of operation analyzed.

Statement of Compliance

It is concluded that, with the recommended mitigation measures detailed in section 7.0, noise impacts from operations at the Storyland Pit will be in compliance with MECP Environmental Noise Guidelines1 for the proposed daytime 7 am to 7 pm (07:00 to 19:00), evening 7 pm to 11 pm (19:00 to 23:00), and nighttime, 11 pm to 7 am (23:00 – 07:00) period of operation.

7.0 Mitigation Measures (Site Plan Recommendations)

Noise mitigation measures for the Storyland Pit operations are detailed below. It is recommended that these measures be included on the official ARA Site Plan for the Pit.

The predicted noise impacts in Tables A2.7.01 to A2.7.10 are based on the implementation of the following mitigation measures:

7.1 Noise Barriers and Berms:

7.1.1 Noise barriers and berms are to be provided as per Table 7 and Figure 13, 14 and 15.
7.1.2 Noise barriers shielding receptors on vacant lots zoned for potential noise sensitive use are only required following development of a noise sensitive use.
7.1.3 Noise shielding portable equipment may be progressively established to shield line of site from equipment operation to the identified receptors.
7.1.4 Noise barriers and berms are to be solid, having no gaps, and are to have a surface density of no less than 20 kg/m2. Examples of suitable barriers or berms are as follow:
- 7.1.4.1 Lift face or existing terrain;
- 7.1.4.2 Earth, gravel or aggregate berms or stockpiles;
- 7.1.4.3 Concrete or brick walls;
- 7.1.4.4 Commercial noise barriers;
- 7.1.4.5 Shipping containers or buildings,

7.2 Wash Plant

7.2.1 The operation of the wash plant and associated diesel generator may take place on a twenty-four-hour basis (24-hour) and shall comply with the following:
- 7.2.1.1 The wash plant is to be located on the pit floor at a maximum elevation of 165.5 mASL in locations shown in Figure 2.
- 7.2.1.2 Noise barriers are to be provided as per Table 7 and Figure 14 and 15.
- 7.2.1.3 The maximum outdoor sound power of the generator, if used to provide power to the wash plant, must not exceed the levels given in Table 2. To achieve these ratings the generator will likely need to be fitted with an exhaust silencer that meets the minimum insertion loss requirements listed in Table 8. The silencer is to be located inside the enclosures or as close as possible to the location where the exhaust exits the enclosures with the duct material between the silencer and the generator constructed of 16-gauge weather resistant metal. The silencers shall have a high transmission loss casing.
- 7.2.1.4 Item 7.2.1.3 above does not apply if hydro is used to provide power to the plant

7.3 Loaders and Excavators

7.3.1 The operation of the loaders may take place) may take place on a twenty-four-hour basis (24-hour) and shall comply with the following:
- 7.3.1.1 <u>During the daytime period (07:00 to 19:00):</u> A maximum of three loaders or excavators may be in operation concurrently with a maximum of two loaders or excavators in operation at the extraction face.

7.3.1.2 During the evening and nighttime period (19:00 to 07:00): A maximum of two loaders or excavators may be in operation concurrently with a maximum of one loader or excavator in operation at the extraction face.

7.4 Trucks

7.4.1 The loading and shipping of product using highway trucks may take place on a twenty-four-hour basis (24-hour) and shall comply with the following:

7.4.1.1 When operating on-site, highway trucks shall not exceed 20 km/h and shall not use compression braking (Jake Brakes).

7.5 Portable construction equipment

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

7.6 New Process

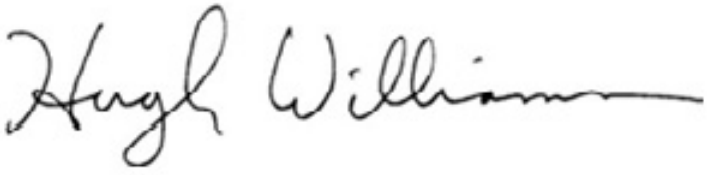
7.6.1 If a new process is introduced to the site, then this process shall be assessed by a qualified acoustical consultant prior to commissioning. Noise mitigation measures shall be reviewed, and altered, if necessary, to ensure that MECP sound level limits are met at all points of reception.

8.0 Conclusions

An acoustic assessment of operations at the proposed Storyland Pit has been conducted according to MECP noise assessment procedures[1, 2]. Operations include extraction by loaders, excavators or dredge, aggregate processing by a wash plant, loading and stockpiling operations by loaders or excavators and on-site truck movements used for delivery and shipping of product.

It has been found that noise levels from the operations at nearby receptors are in compliance with MECP sound level limits as set out in publication NPC-300[1], provided that the noise mitigation measures described in Section 7.0 of this report are followed.

Michael Wells, B. Architecture (Hons), B.Sc. Arch. Registered Architect of NSW, ARN: 8111
Member, Canadian Acoustical Association, Member, Australian Acoustical Society, Associate Member, INCE-USA



Hugh Williamson, Ph.D., P.Eng.
Member, Canadian Acoustical Association

References

1. Ministry of Environment, Conservation and Parks Publication NPC-300, *Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning*, August 2013, adopted by the MECP on 22 October 2013.

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

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

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

TABLES

Table 1: Point of Reception Summary Table

Point of Reception	Location*
POR 1	Residence 18 Ruttan Road (1 storey)
POR 2	Residence 26 Ruttan Road (1 storey)
POR 3	Residence 38 Ruttan Road (1 storey)
POR 4	Residence 58 Ruttan Road (1 storey)
POR 5	Vacant Lot (Currently used for pasture and storage) via Ruttan Road (2 storey)
POR 6	Residence 124 Ruttan Road (2 storey)
POR 7	Residence 375 Jim Barr Road (1 storey)
POR 8	Residence 2296 Eady Road (2 storey)
POR 9	Residence 2304 Eady Road (1 storey)
POR 10	Residence 2326 Eady Road (1 storey)
POR 11	Residence 2338 Eady Road (1 storey)
POR 12	Residence 2333 Eady Road (1 storey)
POR 13	Residence 2425 Eady Road (1 storey)
POR 14	Residence 2431 Eady Road (1.5 storey)
POR 15	Residence 2441 Eady Road (1 storey)
POR 16	Residence 2451 Eady Road (1.5 storey)

Point of Reception	Location*
POR 17	Residence 2459 Eady Road (1 storey)
POR 18	Residence 377 Storyland Road (2 storey)
POR 19	Residence 2036 Chapeski Lane (1 storey)
POR 20	Residence 498 Storyland Road (1 storey)
POR 21	Residence 554 Storyland Road (1 storey)
POR 22	Residence 549 Storyland Road (1 storey)

* For assessment purposes, points of reception, (POR), have been taken as upper floor windows (2 m above grade for single storey and 4.5 m above grade to represent two storey residences) and Outdoor Point of Receptions (30 m from Residence, 1.5 m above grade) in acoustic calculations. POR's located on vacant land have been assessed at 2 stories in height.

Table 2: Noise Source Summary Table

Name	Source ID	Sound Power (dBA)	Source Location Ht. above ground (m)*	Sound Character-istics	Noise Control Measures
Wash Plant (includes noise from one loader in operation at the plant)	Wash_Plant	109.5	7.8	Steady, non-tonal, non-directional	As noted in section 7.0
Generator	Generator	108.1**	4	Steady, non-tonal, directional	As noted in section 7.0
Cutter Suction Dredge	Dredge	110.8	2.5	Steady, moving, non-tonal, non-directional	As noted in section 7.0
Loaders (Cat 982M or similar)	Loader	103.0	2.5	Steady, moving non-tonal, non-directional	As noted in section 7.0
Excavators (CAT345DLME or similar)	Excavator	103.2	2.5	Steady, moving non-tonal, non-directional	As noted in section 7.0
Aggregate Trucks (Delivery of raw material to the wash plant)	IHR_Aggregate (Aggregate_Truck_Passby)	103.3	2.5	Steady, moving non-tonal, non-directional	As noted in section 7.0
Highway Trucks (Shipping)	IHR_Shipping (HWYTruck_Slow58)	110.1	2.5	Steady, moving non-tonal, non-directional	As noted in section 7.0

*Height measured from finished grade at location of equipment operation.
**Includes attenuation provided by the recommended silencer.

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 for the Daytime Period (07:00 – 19:00)

Receptor & Point of Reception POW = Plane of Widow OPR = Outdoor Point of Reception	Sound Level Limit 1-hour LAEQ dBA (Daytime Period, 07:00 – 19:00)	Sound Level Limit 1-hour LAEQ dBA (Evening Period, 19:00 – 23:00)	Sound Level Limit 1-hour LAEQ dBA (Nightime Period, 23:00 – 07:00)
POR_1_POW	45	40	40
POR_1_OPR	45	40	-
POR_2_POW	45	40	40
POR_2_OPR	45	40	-
POR_3_POW	45	40	40
POR_3_OPR	45	40	-
POR_4_POW	45	40	40
POR_4_OPR	45	40	-
POR_5_POW	45	40	40
POR_5_OPR	45	40	-
POR_6_POW	45	40	40
POR_6_OPR	45	40	-
POR_7_POW	45	40	40
POR_7_OPR	45	40	-
POR_8_POW	45	40	40
POR_8_OPR	45	40	-
POR_9_POW	45	40	40
POR_9_OPR	45	40	-
POR_10_POW	45	40	40
POR_10_OPR	45	40	-
POR_11_POW	45	40	40
POR_11_OPR	45	40	-
POR_12_POW	45	40	40
POR_12_OPR	45	40	-
POR_13_POW	45	40	40
POR_13_OPR	45	40	-
POR_14_POW	45	40	40
POR_14_OPR	45	40	-
POR_15_POW	45	40	40
POR_15_OPR	45	40	-

Receptor & Point of Reception POW = Plane of Widow OPR = Outdoor Point of Reception	Sound Level Limit 1-hour LAEQ dBA (Daytime Period, 07:00 – 19:00)	Sound Level Limit 1-hour LAEQ dBA (Evening Period, 19:00 – 23:00)	Sound Level Limit 1-hour LAEQ dBA (Nightime Period, 23:00 – 07:00)
POR_16_POW	45	40	40
POR_16_OPR	45	40	-
POR_17_POW	45	40	40
POR_17_OPR	45	40	-
POR_18_POW	45	40	40
POR_18_OPR	45	40	-
POR_19_POW	45	40	40
POR_19_OPR	45	40	-
POR_20_POW	45	40	40
POR_20_OPR	45	40	-
POR_21_POW	45	40	40
POR_21_OPR	45	40	-
POR_22_POW	45	40	40
POR_22_OPR	45	40	-

Table 6.1: Acoustic Assessment Summary Table, Scenario 1: Worst Case, Daytime Period (07:00 - 19:00) and Evening and Nighttime Period (19:00 - 07:00) of Operation

Point of Reception ID	POR Description	Location	Estimated Sound Level at POR Daytime Period (Worst Case) (dBA)	Performance Limit Daytime Period (dBA)	Estimated Sound Level at POR Evening and Nighttime Period (Worst Case) (dBA)	Performance Limit Evening and Nighttime Period (dBA)	Compliance with Performance Limit (Yes/No)	Verified by an acoustic Audit (Yes / No)
POR 1	Residence	POW	36.4	45	34.6	40	Yes	No
		OPR	36.1	45	34.4	40	Yes	No
POR 2	Residence	POW	36.2	45	34.4	40	Yes	No
		OPR	35.9	45	34.2	40	Yes	No
POR 3	Residence	POW	34.7	45	32.8	40	Yes	No
		OPR	35.5	45	33.7	40	Yes	No
POR 4	Residence	POW	28.6	45	26.2	40	Yes	No
		OPR	28.6	45	26.1	40	Yes	No
POR 5	Vacant Lot	POW	32.7	45	30.3	40	Yes	No
		OPR	31.4	45	28.9	40	Yes	No
POR 6	Residence	POW	35.2	45	32.9	40	Yes	No
		OPR	34.4	45	31.9	40	Yes	No
POR 7	Residence	POW	29.1	45	27.9	40	Yes	No
		OPR	26.7	45	25.5	40	Yes	No
POR 8	Residence	POW	38.5	45	37.3	40	Yes	No
		OPR	35.4	45	34.6	40	Yes	No
POR 9	Residence	POW	37.4	45	36.3	40	Yes	No
		OPR	33.8	45	32.8	40	Yes	No
POR 10	Residence	POW	35.5	45	34.0	40	Yes	No
		OPR	34.5	45	33.2	40	Yes	No
POR 11	Residence	POW	34.9	45	33.8	40	Yes	No
		OPR	31.5	45	29.8	40	Yes	No
POR 12	Residence	POW	37.5	45	36.2	40	Yes	No
		OPR	34.9	45	33.2	40	Yes	No
POR 13	Residence	POW	38.8	45	37.8	40	Yes	No
		OPR	38.7	45	37.6	40	Yes	No
POR 14	Residence	POW	38.6	45	37.4	40	Yes	No
		OPR	38.0	45	36.7	40	Yes	No
POR 15	Residence	POW	37.3	45	35.9	40	Yes	No
		OPR	37.2	45	35.8	40	Yes	No
POR 16	Residence	POW	38.1	45	36.4	40	Yes	No
		OPR	37.4	45	35.8	40	Yes	No
POR 17	Residence	POW	37.6	45	35.8	40	Yes	No

		OPR	37.4	45	35.7	40	Yes	No
POR 18	Residence	POW	40.3	45	38.7	40	Yes	No
		OPR	39.5	45	38.1	40	Yes	No
POR 19	Residence	POW	37.7	45	36.3	40	Yes	No
		OPR	33.9	45	32.1	40	Yes	No
POR 20	Residence	POW	41.2	45	38.5	40	Yes	No
		OPR	40.6	45	37.8	40	Yes	No
POR 21	Residence	POW	41.7	45	39.4	40	Yes	No
		OPR	42.0	45	39.7	40	Yes	No
POR 22	Residence	POW	40.4	45	37.9	40	Yes	No
		OPR	40.4	45	38.0	40	Yes	No

Notes:

1. Performance limits are based on 1-hour equivalent sound levels, Leq.
2. Refer to Tables A2.7.01 to A2.7.10 in Appendix 2 for more detailed sound level estimates by source.

Table 6.2: Acoustic Assessment Summary Table, Scenario 2: Worst Case, Daytime Period (07:00 - 19:00) and Evening and Nighttime Period (19:00 - 07:00) of Operation

Point of Reception ID	POR Description	Location	Estimated Sound Level at POR Daytime Period (Worst Case) (dBA)	Performance Limit Daytime Period (dBA)	Estimated Sound Level at POR Evening and Nighttime Period (Worst Case) (dBA)	Performance Limit Evening and Nighttime Period (dBA)	Compliance with Performance Limit (Yes/No)	Verified by an acoustic Audit (Yes / No)
POR 1	Residence	POW	43.4	45	37.0	40	Yes	No
		OPR	43.1	45	36.9	40	Yes	No
POR 2	Residence	POW	43.2	45	36.0	40	Yes	No
		OPR	43.2	45	36.8	40	Yes	No
POR 3	Residence	POW	43.4	45	37.5	40	Yes	No
		OPR	44.3	45	38.6	40	Yes	No
POR 4	Residence	POW	37.1	45	31.4	40	Yes	No
		OPR	37.0	45	31.5	40	Yes	No
POR 5	Vacant Lot	POW	41.8	45	34.9	40	Yes	No
		OPR	39.7	45	33.7	40	Yes	No
POR 6	Residence	POW	44.1	45	36.9	40	Yes	No
		OPR	41.4	45	35.7	40	Yes	No
POR 7	Residence	POW	30.8	45	28.4	40	Yes	No
		OPR	28.5	45	25.9	40	Yes	No
POR 8	Residence	POW	39.4	45	37.2	40	Yes	No
		OPR	36.3	45	34.4	40	Yes	No
POR 9	Residence	POW	38.0	45	35.8	40	Yes	No
		OPR	35.5	45	32.6	40	Yes	No
POR 10	Residence	POW	36.8	45	33.5	40	Yes	No
		OPR	35.7	45	32.7	40	Yes	No
POR 11	Residence	POW	36.5	45	34.1	40	Yes	No
		OPR	34.4	45	28.9	40	Yes	No
POR 12	Residence	POW	38.0	45	35.5	40	Yes	No
		OPR	35.9	45	31.9	40	Yes	No
POR 13	Residence	POW	39.2	45	37.5	40	Yes	No
		OPR	39.0	45	37.1	40	Yes	No
POR 14	Residence	POW	39.1	45	37.0	40	Yes	No
		OPR	38.3	45	36.2	40	Yes	No
POR 15	Residence	POW	37.7	45	35.3	40	Yes	No
		OPR	37.6	45	35.2	40	Yes	No
POR 16	Residence	POW	38.5	45	35.9	40	Yes	No
		OPR	37.8	45	35.4	40	Yes	No
POR 17	Residence	POW	38.0	45	35.4	40	Yes	No

		OPR	37.8	45	35.3	40	Yes	No
POR 18	Residence	POW	41.0	45	38.3	40	Yes	No
		OPR	39.7	45	37.7	40	Yes	No
POR 19	Residence	POW	38.3	45	36.2	40	Yes	No
		OPR	35.0	45	32.2	40	Yes	No
POR 20	Residence	POW	42.1	45	38.8	40	Yes	No
		OPR	41.1	45	37.9	40	Yes	No
POR 21	Residence	POW	44.4	45	39.4	40	Yes	No
		OPR	44.6	45	39.5	40	Yes	No
POR 22	Residence	POW	42.4	45	37.4	40	Yes	No
		OPR	42.4	45	37.4	40	Yes	No

Notes:

1. Performance limits are based on 1-hour equivalent sound levels, Leq.
2. Refer to Tables A2.7.01 to A2.7.10 in Appendix 2 for more detailed sound level estimates by source.

Table 6.3: Acoustic Assessment Summary Table, Scenario 3: Worst Case, Daytime Period (07:00 - 19:00) and Evening and Nighttime Period (19:00 - 07:00) of Operation

Point of Reception ID	POR Description	Location	Estimated Sound Level at POR Daytime Period (Worst Case) (dBA)	Performance Limit Daytime Period (dBA)	Estimated Sound Level at POR Evening and Nighttime Period (Worst Case) (dBA)	Performance Limit Evening and Nighttime Period (dBA)	Compliance with Performance Limit (Yes/No)	Verified by an acoustic Audit (Yes / No)
POR 1	Residence	POW	44.1	45	39.7	40	Yes	No
		OPR	44.3	45	39.9	40	Yes	No
POR 2	Residence	POW	43.2	45	38.8	40	Yes	No
		OPR	43.8	45	39.1	40	Yes	No
POR 3	Residence	POW	43.0	45	38.1	40	Yes	No
		OPR	43.8	45	38.9	40	Yes	No
POR 4	Residence	POW	36.0	45	28.3	40	Yes	No
		OPR	35.7	45	28.4	40	Yes	No
POR 5	Vacant Lot	POW	41.2	45	34.3	40	Yes	No
		OPR	38.7	45	31.6	40	Yes	No
POR 6	Residence	POW	43.4	45	36.5	40	Yes	No
		OPR	40.9	45	34.3	40	Yes	No
POR 7	Residence	POW	31.9	45	28.1	40	Yes	No
		OPR	29.2	45	25.9	40	Yes	No
POR 8	Residence	POW	39.1	45	37.0	40	Yes	No
		OPR	36.5	45	34.3	40	Yes	No
POR 9	Residence	POW	37.9	45	35.8	40	Yes	No
		OPR	35.5	45	32.4	40	Yes	No
POR 10	Residence	POW	36.2	45	33.1	40	Yes	No
		OPR	35.4	45	32.6	40	Yes	No
POR 11	Residence	POW	36.5	45	33.9	40	Yes	No
		OPR	33.7	45	28.2	40	Yes	No
POR 12	Residence	POW	37.8	45	35.5	40	Yes	No
		OPR	35.5	45	31.8	40	Yes	No
POR 13	Residence	POW	39.0	45	37.4	40	Yes	No
		OPR	38.9	45	37.1	40	Yes	No
POR 14	Residence	POW	39.0	45	36.9	40	Yes	No
		OPR	38.2	45	36.2	40	Yes	No
POR 15	Residence	POW	37.7	45	35.3	40	Yes	No
		OPR	37.4	45	35.2	40	Yes	No
POR 16	Residence	POW	38.9	45	35.9	40	Yes	No
		OPR	37.8	45	35.4	40	Yes	No
POR 17	Residence	POW	38.3	45	35.4	40	Yes	No

		OPR	37.8	45	35.3	40	Yes	No
POR 18	Residence	POW	40.7	45	38.2	40	Yes	No
		OPR	39.7	45	37.7	40	Yes	No
POR 19	Residence	POW	38.6	45	36.3	40	Yes	No
		OPR	35.7	45	32.7	40	Yes	No
POR 20	Residence	POW	43.8	45	39.6	40	Yes	No
		OPR	42.5	45	38.4	40	Yes	No
POR 21	Residence	POW	43.9	45	39.1	40	Yes	No
		OPR	42.2	45	37.7	40	Yes	No
POR 22	Residence	POW	43.4	45	38.9	40	Yes	No
		OPR	43.0	45	38.1	40	Yes	No

Notes:

1. Performance limits are based on 1-hour equivalent sound levels, Leq.
2. Refer to Tables A2.7.01 to A2.7.10 in Appendix 2 for more detailed sound level estimates by source.

Table 6.4: Acoustic Assessment Summary Table, Scenario 4: Worst Case, Daytime Period (07:00 - 19:00) and Evening and Nighttime Period (19:00 - 07:00) of Operation

Point of Reception ID	POR Description	Location	Estimated Sound Level at POR Daytime Period (Worst Case) (dBA)	Performance Limit Daytime Period (dBA)	Estimated Sound Level at POR Evening and Nighttime Period (Worst Case) (dBA)	Performance Limit Evening and Nighttime Period (dBA)	Compliance with Performance Limit (Yes/No)	Verified by an acoustic Audit (Yes / No)
POR 1	Residence	POW	44.3	45	34.1	40	Yes	No
		OPR	44.1	45	32.3	40	Yes	No
POR 2	Residence	POW	43.6	45	34.2	40	Yes	No
		OPR	43.8	45	33.7	40	Yes	No
POR 3	Residence	POW	42.8	45	32.5	40	Yes	No
		OPR	43.2	45	31.5	40	Yes	No
POR 4	Residence	POW	33.4	45	25.4	40	Yes	No
		OPR	33.0	45	24.8	40	Yes	No
POR 5	Vacant Lot	POW	40.2	45	32.8	40	Yes	No
		OPR	37.1	45	29.2	40	Yes	No
POR 6	Residence	POW	41.4	45	34.9	40	Yes	No
		OPR	39.3	45	31.4	40	Yes	No
POR 7	Residence	POW	32.0	45	27.5	40	Yes	No
		OPR	29.5	45	25.2	40	Yes	No
POR 8	Residence	POW	42.1	45	39.2	40	Yes	No
		OPR	40.4	45	37.9	40	Yes	No
POR 9	Residence	POW	41.2	45	38.7	40	Yes	No
		OPR	40.3	45	37.4	40	Yes	No
POR 10	Residence	POW	41.8	45	38.6	40	Yes	No
		OPR	41.5	45	38.5	40	Yes	No
POR 11	Residence	POW	42.4	45	39.7	40	Yes	No
		OPR	40.8	45	37.6	40	Yes	No
POR 12	Residence	POW	42.4	45	39.6	40	Yes	No
		OPR	41.8	45	38.8	40	Yes	No
POR 13	Residence	POW	42.3	45	39.4	40	Yes	No
		OPR	41.9	45	39.2	40	Yes	No
POR 14	Residence	POW	42.5	45	39.9	40	Yes	No
		OPR	41.7	45	39.2	40	Yes	No
POR 15	Residence	POW	41.1	45	38.5	40	Yes	No
		OPR	40.8	45	38.3	40	Yes	No
POR 16	Residence	POW	40.8	45	37.9	40	Yes	No
		OPR	40.1	45	37.5	40	Yes	No
POR 17	Residence	POW	39.8	45	37.0	40	Yes	No

		OPR	39.6	45	36.9	40	Yes	No
POR 18	Residence	POW	41.6	45	39.1	40	Yes	No
		OPR	41.0	45	38.8	40	Yes	No
POR 19	Residence	POW	39.3	45	36.3	40	Yes	No
		OPR	36.6	45	32.4	40	Yes	No
POR 20	Residence	POW	44.9	45	39.4	40	Yes	No
		OPR	43.8	45	38.2	40	Yes	No
POR 21	Residence	POW	44.9	45	36.4	40	Yes	No
		OPR	44.1	45	33.9	40	Yes	No
POR 22	Residence	POW	44.0	45	37.1	40	Yes	No
		OPR	43.6	45	35.9	40	Yes	No

Notes:

1. Performance limits are based on 1-hour equivalent sound levels, Leq.
2. Refer to Tables A2.7.01 to A2.7.10 in Appendix 2 for more detailed sound level estimates by source.

Table 6.5: Acoustic Assessment Summary Table, Scenario 5: Worst Case, Daytime Period (07:00 - 19:00) and Evening and Nighttime Period (19:00 - 07:00) of Operation

Point of Reception ID	POR Description	Location	Estimated Sound Level at POR Daytime Period (Worst Case) (dBA)	Performance Limit Daytime Period (dBA)	Estimated Sound Level at POR Evening and Nighttime Period (Worst Case) (dBA)	Performance Limit Evening and Nighttime Period (dBA)	Compliance with Performance Limit (Yes/No)	Verified by an acoustic Audit (Yes / No)
POR 1	Residence	POW	36.5	45	32.3	40	Yes	No
		OPR	35.8	45	30.5	40	Yes	No
POR 2	Residence	POW	36.3	45	32.0	40	Yes	No
		OPR	36.2	45	31.9	40	Yes	No
POR 3	Residence	POW	34.7	45	30.5	40	Yes	No
		OPR	35.2	45	29.6	40	Yes	No
POR 4	Residence	POW	30.6	45	23.4	40	Yes	No
		OPR	29.9	45	22.4	40	Yes	No
POR 5	Vacant Lot	POW	36.5	45	32.4	40	Yes	No
		OPR	35.5	45	31.8	40	Yes	No
POR 6	Residence	POW	37.3	45	33.0	40	Yes	No
		OPR	36.2	45	32.5	40	Yes	No
POR 7	Residence	POW	30.0	45	26.0	40	Yes	No
		OPR	28.0	45	24.0	40	Yes	No
POR 8	Residence	POW	41.7	45	36.2	40	Yes	No
		OPR	39.9	45	35.2	40	Yes	No
POR 9	Residence	POW	40.3	45	35.2	40	Yes	No
		OPR	40.2	45	34.7	40	Yes	No
POR 10	Residence	POW	41.2	45	34.7	40	Yes	No
		OPR	41.0	45	33.9	40	Yes	No
POR 11	Residence	POW	41.2	45	32.4	40	Yes	No
		OPR	38.8	45	27.7	40	Yes	No
POR 12	Residence	POW	41.2	45	34.2	40	Yes	No
		OPR	40.2	45	32.4	40	Yes	No
POR 13	Residence	POW	43.2	45	38.9	40	Yes	No
		OPR	42.5	45	37.1	40	Yes	No
POR 14	Residence	POW	43.4	45	39.3	40	Yes	No
		OPR	42.9	45	38.9	40	Yes	No
POR 15	Residence	POW	42.5	45	38.7	40	Yes	No
		OPR	42.6	45	38.8	40	Yes	No
POR 16	Residence	POW	42.8	45	39.1	40	Yes	No
		OPR	42.3	45	38.8	40	Yes	No
POR 17	Residence	POW	42.0	45	38.6	40	Yes	No

		OPR	42.1	45	38.7	40	Yes	No
POR 18	Residence	POW	43.9	45	40.0	40	Yes	No
		OPR	42.2	45	38.0	40	Yes	No
POR 19	Residence	POW	40.3	45	38.6	40	Yes	No
		OPR	39.7	45	38.3	40	Yes	No
POR 20	Residence	POW	43.6	45	39.0	40	Yes	No
		OPR	42.6	45	38.4	40	Yes	No
POR 21	Residence	POW	39.8	45	33.4	40	Yes	No
		OPR	38.8	45	31.9	40	Yes	No
POR 22	Residence	POW	41.5	45	38.0	40	Yes	No
		OPR	41.3	45	37.8	40	Yes	No

Notes:

1. Performance limits are based on 1-hour equivalent sound levels, Leq.
2. Refer to Tables A2.7.01 to A2.7.10 in Appendix 2 for more detailed sound level estimates by source.

Table 7: Recommended Noise Barriers

Barrier	Minimum Height (m)	Minimum Length (m)	Maximum Distance from Source (m)	Location	Required to shield Line of Sight from Identified Source ID	Required to shield Line of Sight to Identified Receptor/s	Description*
Barrier_1	6	195.5	Not applicable	Northern boundary setback, east of site entry, in location shown on Figure 13	IHR_Shipping (Extraction Equipment)	POR 20	New barrier (site berm): Required prior to commencement of operations in Phase 1 and Phase 2.
Barrier_2	6	560	Not applicable	Northern boundary setback in location shown on Figure 13	Extraction Equipment	POR 21 POR 22	New barrier (site berm): Required prior to commencement of extraction operations in Phase 3.
Barrier_3	4	280	Not applicable	Eastern boundary setback in location shown on Figure 13	Extraction Equipment	POR 1 POR 2 POR 3 POR 4	New barrier (site berm): Required prior to commencement of extraction operations in Phase 3.
Barrier_4	7	265	Not applicable	Western and southern boundary setback in location shown on Figure 13	Extraction Equipment	POR 10 POR 11 POR 12	New barrier (site berm): Required prior to commencement of extraction operations west of Line AA in Phase 4.
Barrier_5 (Extension)	6	210 (325)	Not applicable	Western boundary setback in location shown on Figure 13	Extraction Equipment	POR 13 POR 14 POR 15 POT 16 POR 17	New barrier (site berm): Required prior to commencement of extraction operations west of Line AA in Phase 4. (Barrier 5 is to be extended in length to shield line of sight (LOS) from extraction equipment to POR 13 to POR 17 when operating in Phase 5).

Barrier	Minimum Height (m)	Minimum Length (m)	Maximum Distance from Source (m)	Location	Required to shield Line of Sight from Identified Source ID	Required to shield Line of Sight to Identified Receptor/s	Description*
Barrier_6	6	155	Not applicable	Northern boundary setback in location shown on Figure 13	Extraction Equipment	POR 18	New barrier (site berm): Required prior to commencement of extraction operations in Phase 5.
Barrier_WP1 (Phase 1-4)	12 (9)	70.5	30	Local barrier at wash plant in Phase 1	Wash Plant	POR 1 POR 2 POR 3 POR 4 POR 6 POR 20 POR 21	New barrier (stockpile): Required when operating the wash plant in Phase 1. (Barrier WP1 may be reduced to 9 m in height following establishment of Barrier 3 shielding POR 21).
Barrier_WP2 (Phase 1-4)	8	20	30	Local barrier at wash plant in Phase 1	Wash Plant	POR 8 POR 9 POR 10 POR 11 POR 12	New barrier (stockpile): Required when operating the wash plant in Phase 1.
Barrier_WP3 (Phase 1-4)	8	16	30	Local barrier at wash plant in Phase 1	Wash Plant	POR 13 POR 14 POR 15 POT 16 POR 17 POR 18	New barrier (stockpile): Required when operating the wash plant in Phase 1.
Barrier_WP4 (Phase 5)	8	25	30	Local barrier at wash plant in Phase 5	Wash Plant	POR 20	New barrier (stockpile): Required when operating the wash plant in Phase 5.
Barrier_WP5 (Phase 5)	8	25	30	Local barrier at wash plant in Phase 5	Wash Plant	POR 8 POR 9 POR 10 POR 11 POR 12	New barrier (stockpile): Required when operating the wash plant in Phase 5.

Barrier	Minimum Height (m)	Minimum Length (m)	Maximum Distance from Source (m)	Location	Required to shield Line of Sight from Identified Source ID	Required to shield Line of Sight to Identified Receptor/s	Description*
Barrier_WP6 (Phase 5)	11	35	30	Local barrier at wash plant in Phase 5	Wash Plant	POR 13 POR 14 POR 15 POT 16 POR 17 POR 18	New barrier (stockpile): Required when operating the wash plant in Phase 5.

*Barriers (site berms) shielding extraction equipment may be progressively established to shield line of sight (LOS) from location of equipment operation to the identified receptors.

Table 8: Minimum Insertion Loss for Generator Exhaust Silencer

Name	Octave Band Centre Frequency, Hz Minimum Dynamic Insertion Loss (dB)								Rw
	63	125	250	500	1000	2000	4000	8000	
Silencer to be installed at the generator exhaust[2] (Source: Generator)	10	30	38	30	25	20	20	20	24

Notes:

1. Octave Band Centre Frequency, Hz, with minimum dynamic insertion loss in dB or dBA units re 10-12 Watts. Alternative levels at each frequency band permissible providing the overall insertion loss meets the overall insertion loss (Rw) as noted above and is not tonal in character.
2. Insertion loss based on Silex Silencer Model JB 6. Refer manufacturers data Appendix 3.

FIGURES

Figure 12.2: Prediction Results, Scenario 5: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

Figure 13: Detailed Site Plan showing Recommended Noise Barriers

Figure 14: Detailed Plan at Wash Plant in Phase 1 showing Recommended Noise Barriers

Figure 15: Detailed Plan at Wash Plant in Phase 5 showing Recommended Noise Barriers

Figure 1: Scaled Area Location Plan showing Receptor Locations

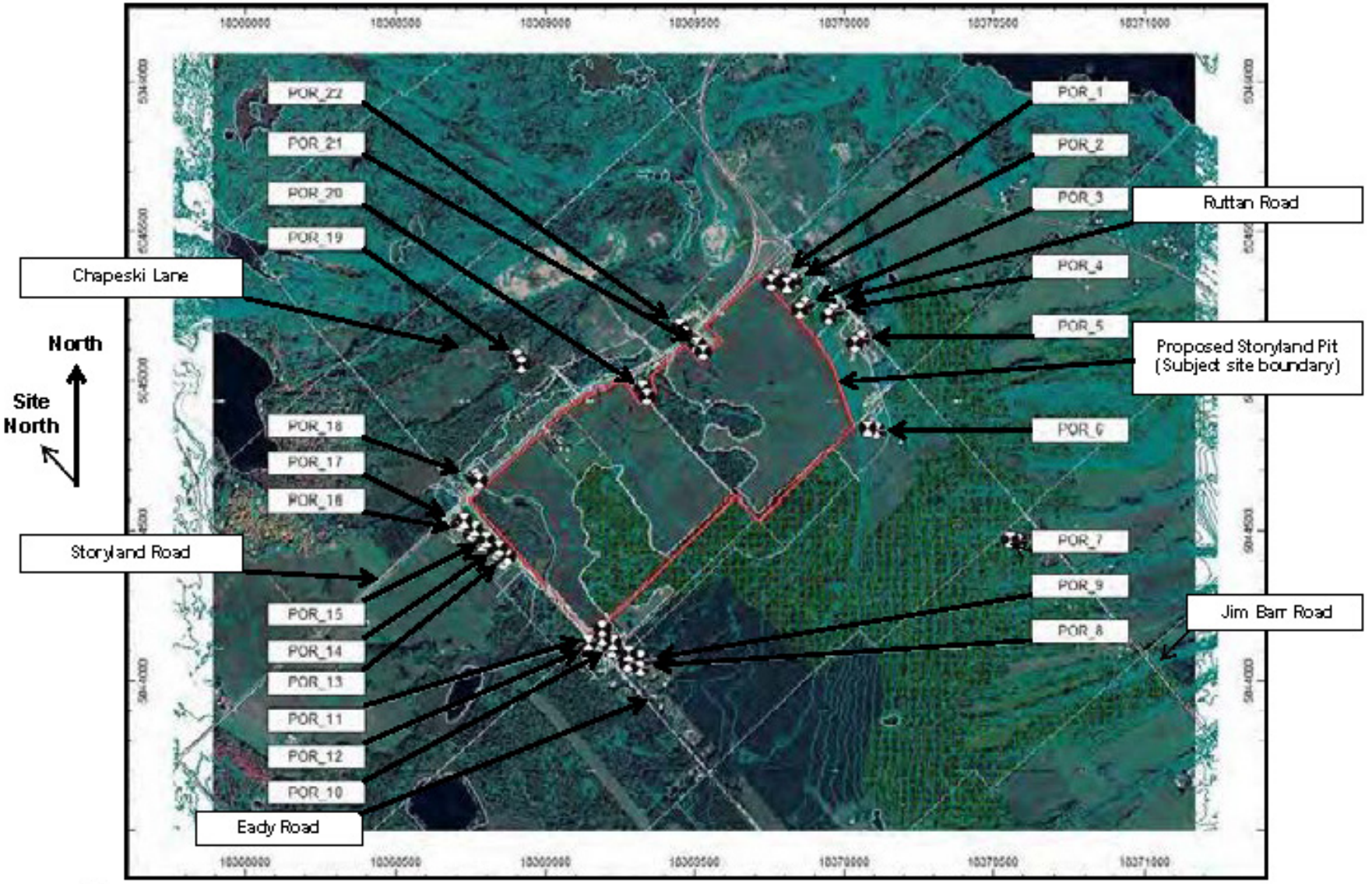


Figure 2: **Detail Site Layout & Surface Elevation Contours** (elevation contours for surrounding area based on LIO, Provincial Digital Elevation Model, shown at 1-meter intervals)

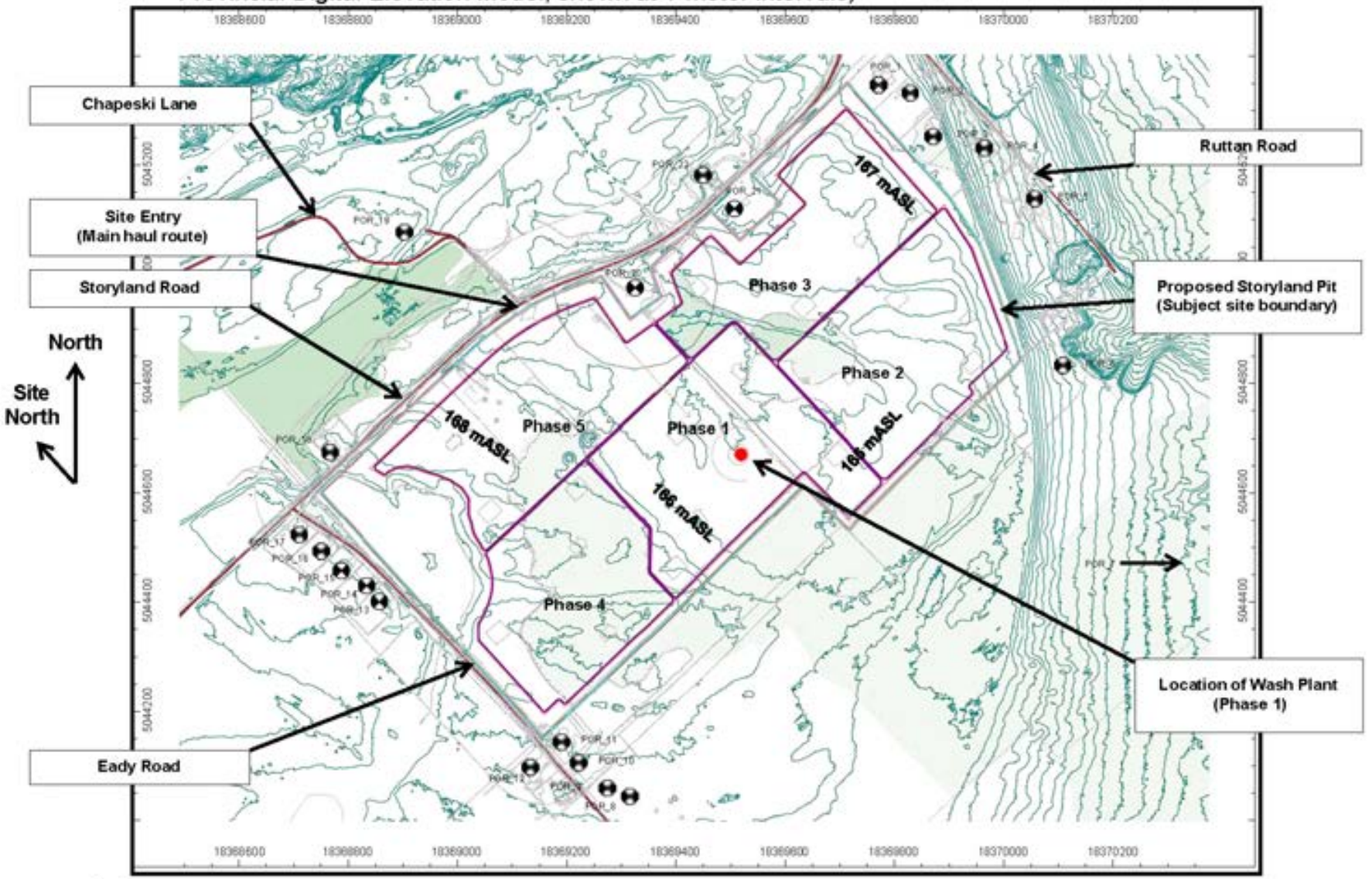


Figure 3: Scenario 1: Worst Case, All equipment in operation in Phase 1 (Day, Evening and Night)

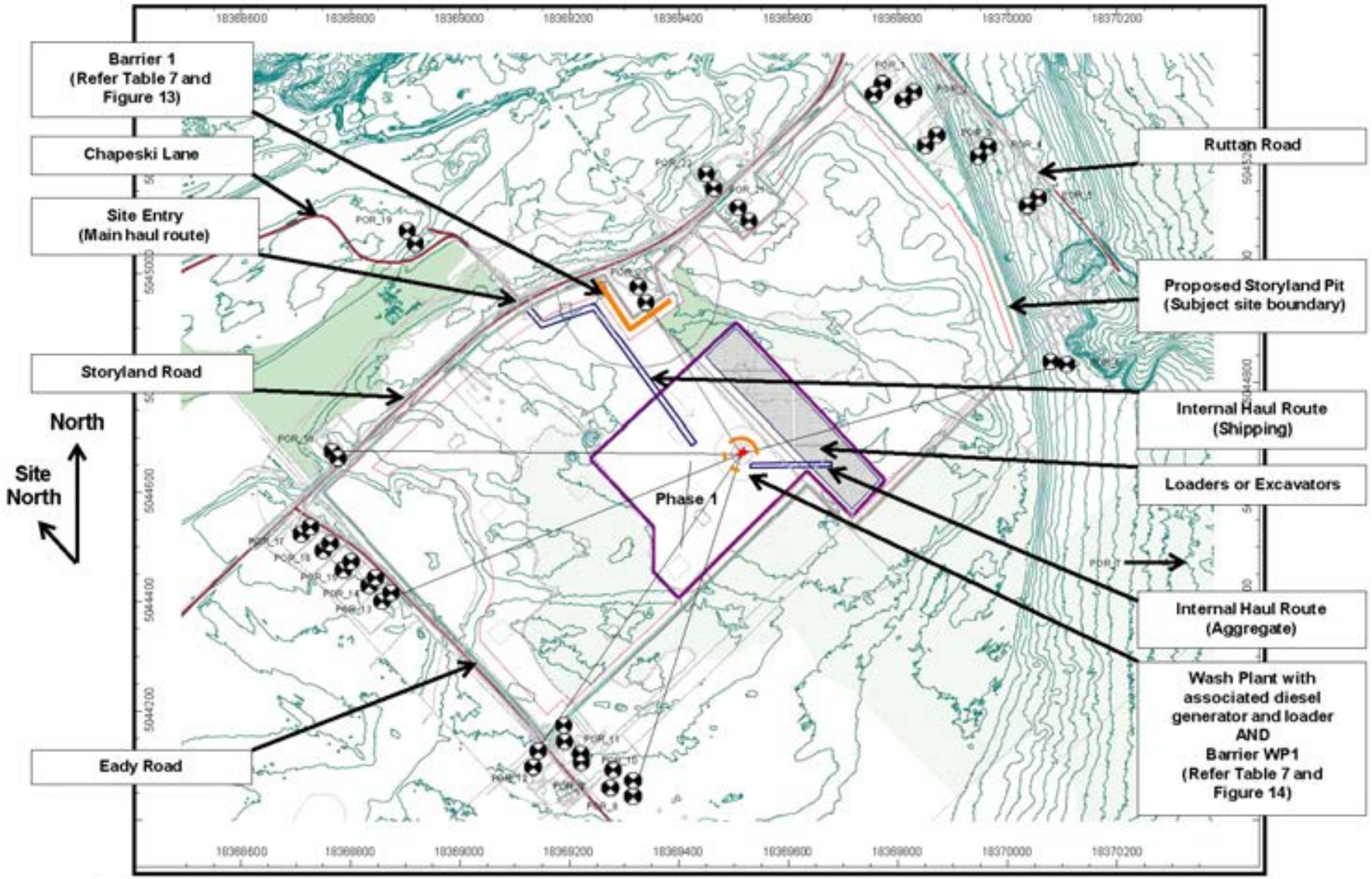


Figure 4.1: Prediction Results, Scenario 1: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

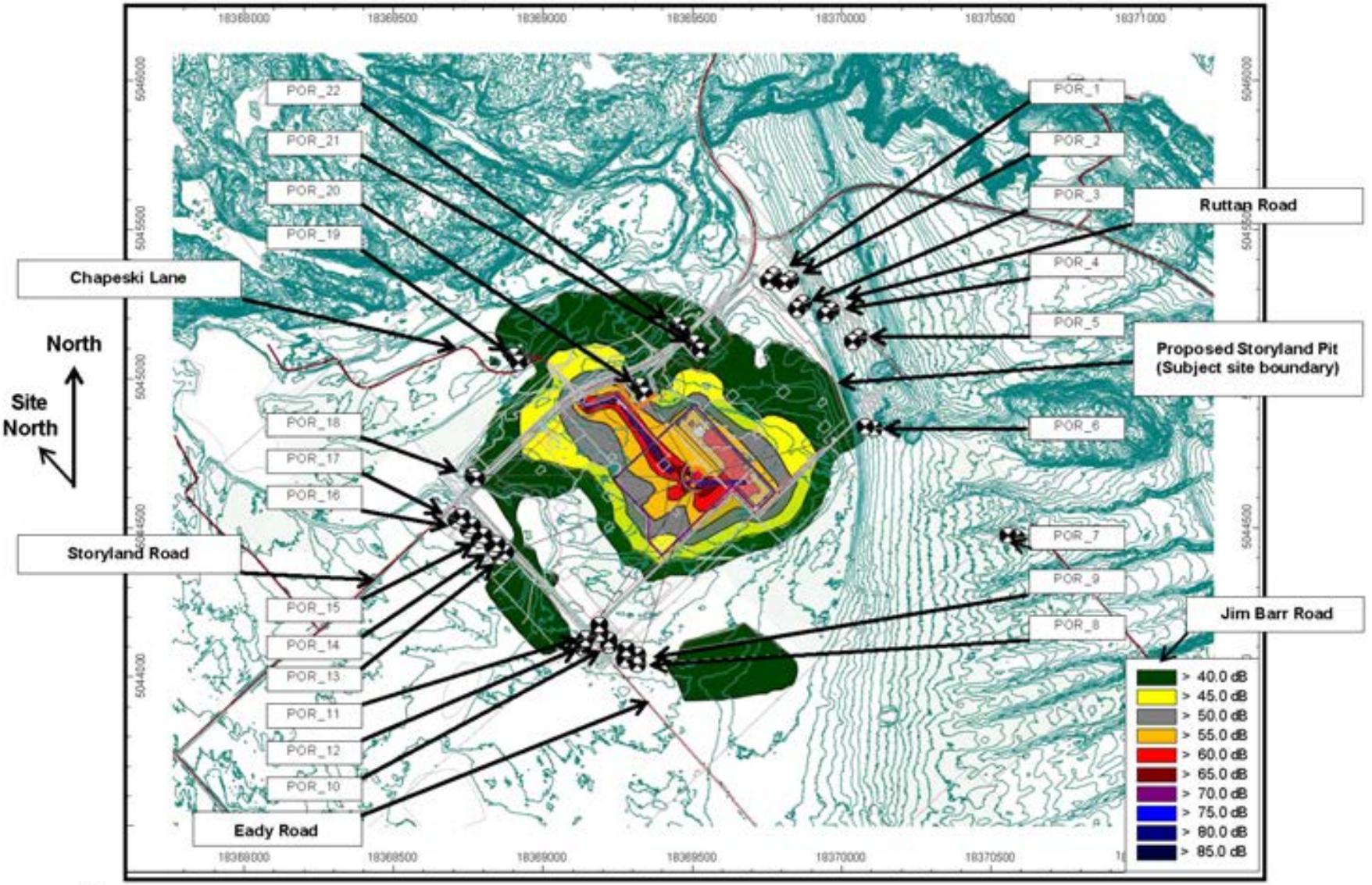


Figure 4.2: Prediction Results, Scenario 1: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

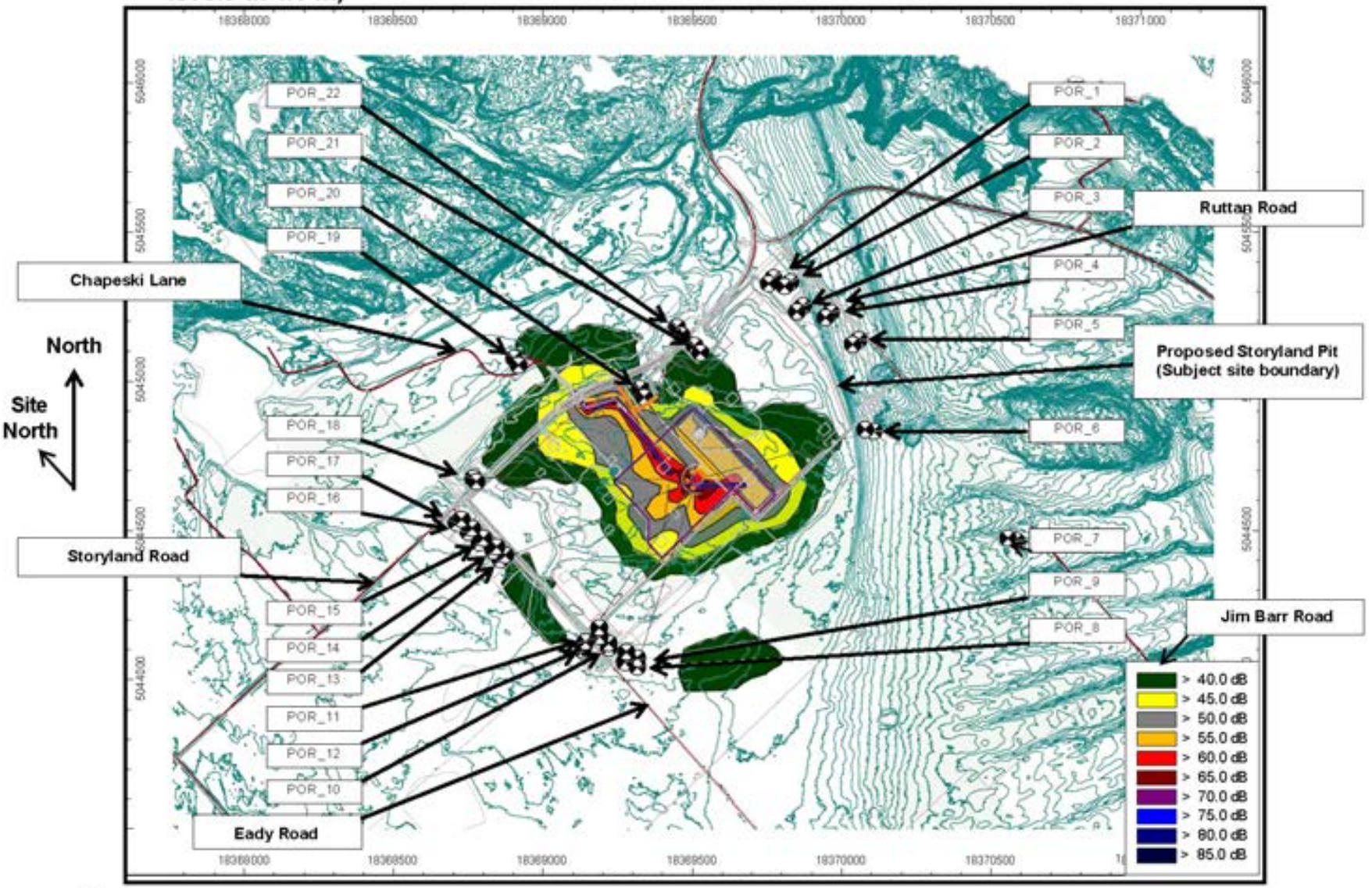


Figure 5: Scenario 2: Worst Case, Wash plant in operation in Phase 1 with extraction occurring in Phase 2 (Day, Evening and Night)

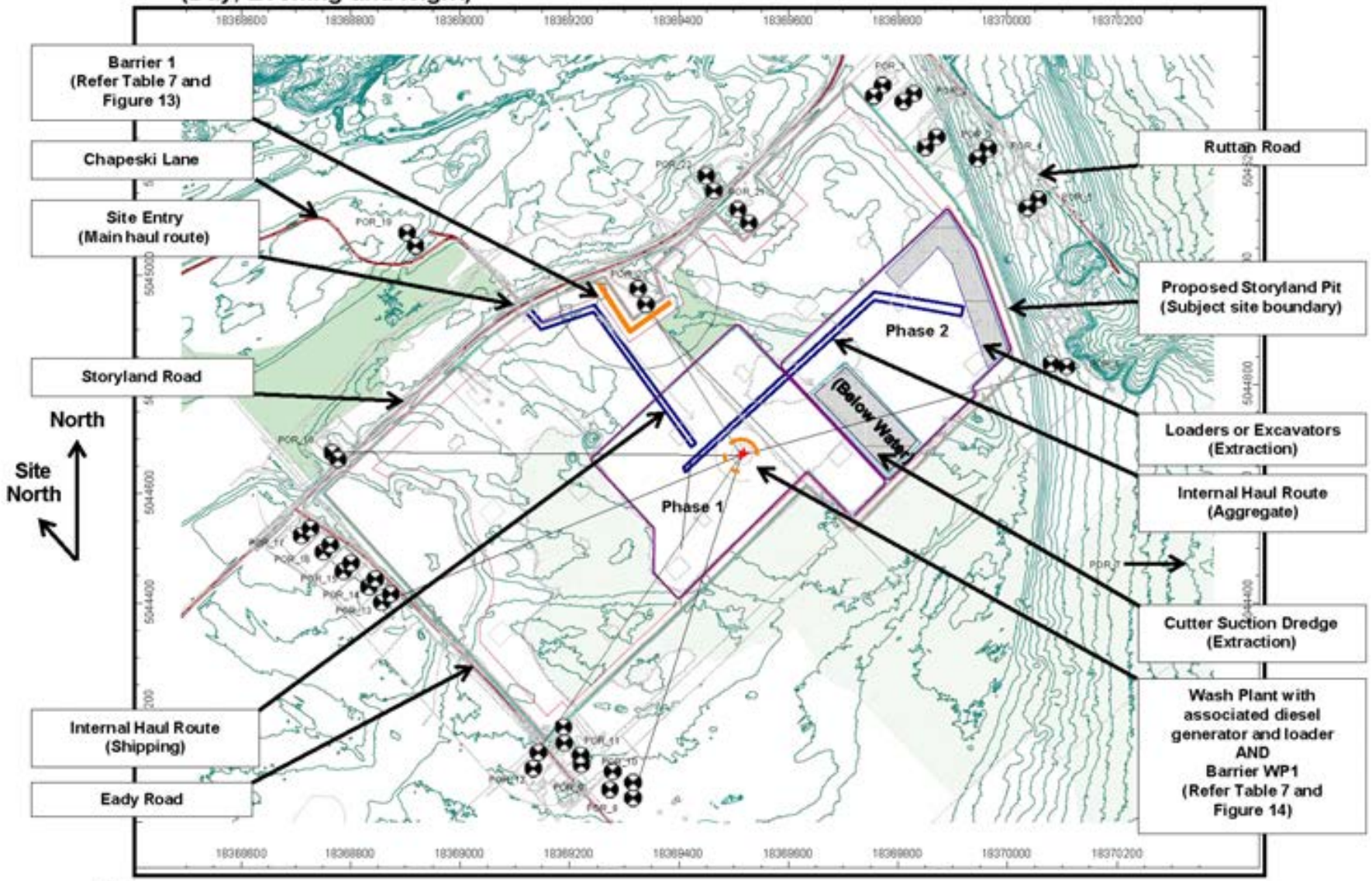


Figure 6.1: Prediction Results, Scenario 2: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

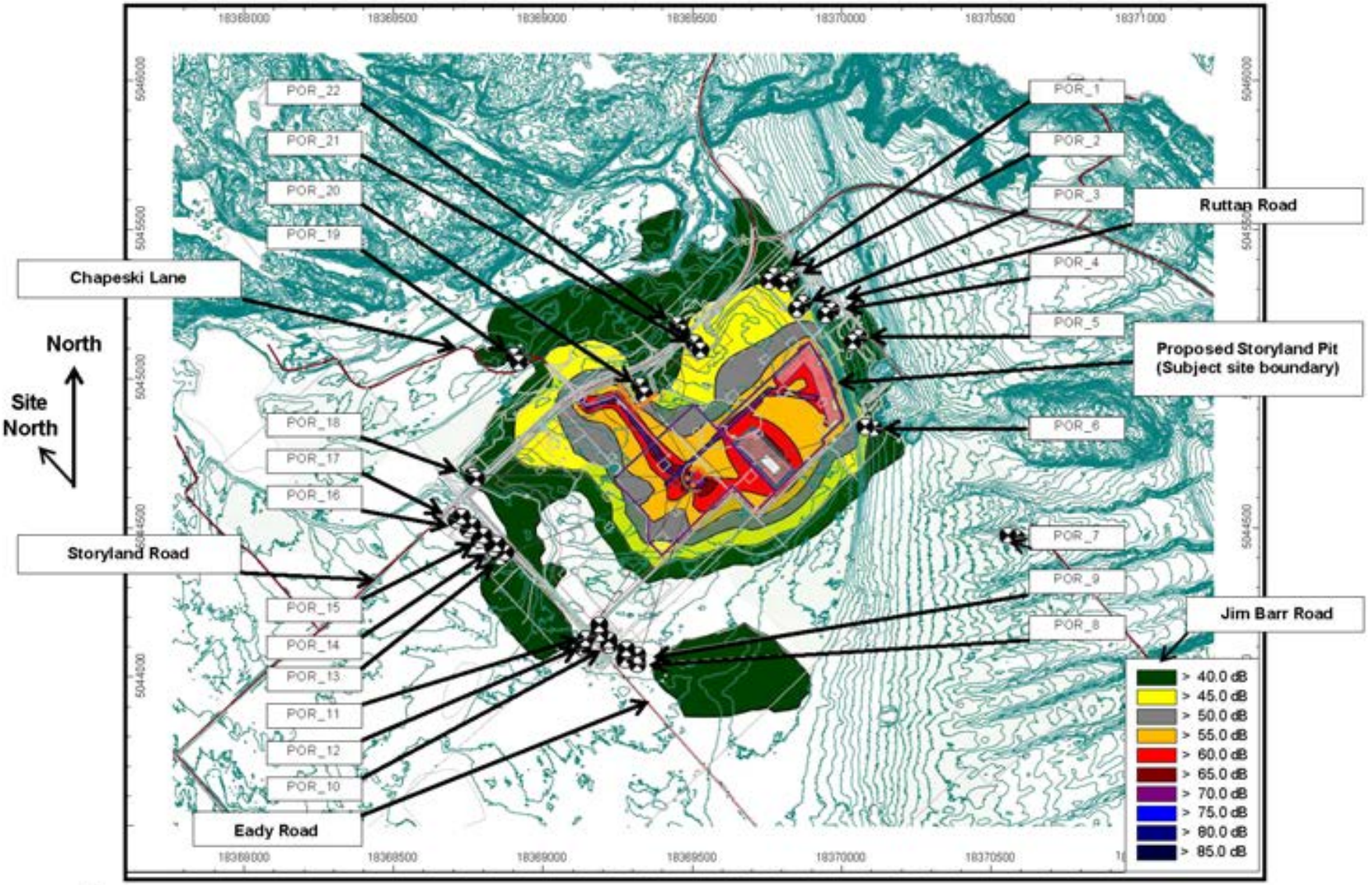


Figure 6.2: Prediction Results, Scenario 2: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

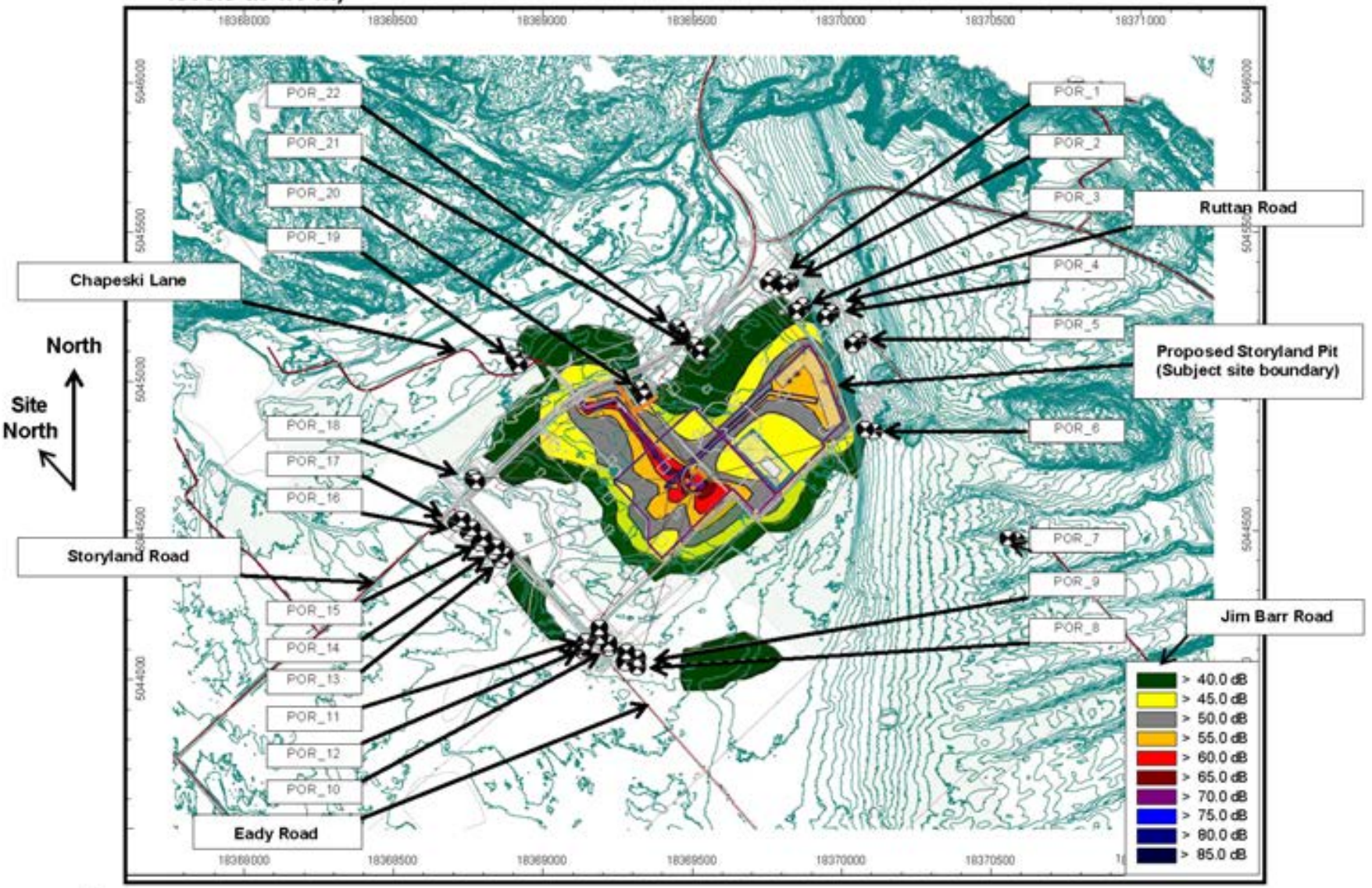


Figure 7: Scenario 3: Worst Case, Wash plant in operation in Phase 1 with extraction occurring in Phase 2 and Phase 3 (Day, Evening and Night)

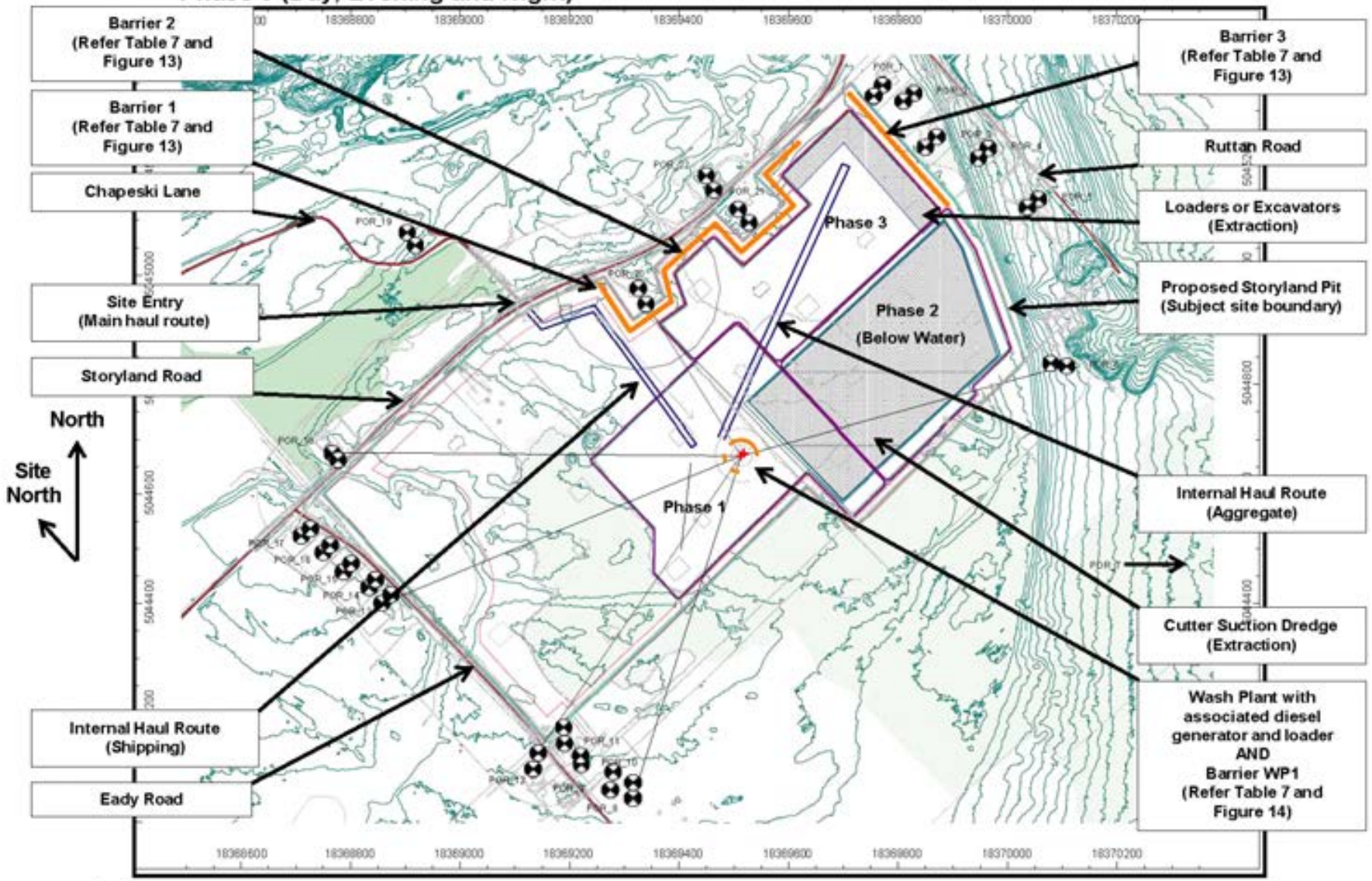


Figure 8.1: Prediction Results, Scenario 3: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

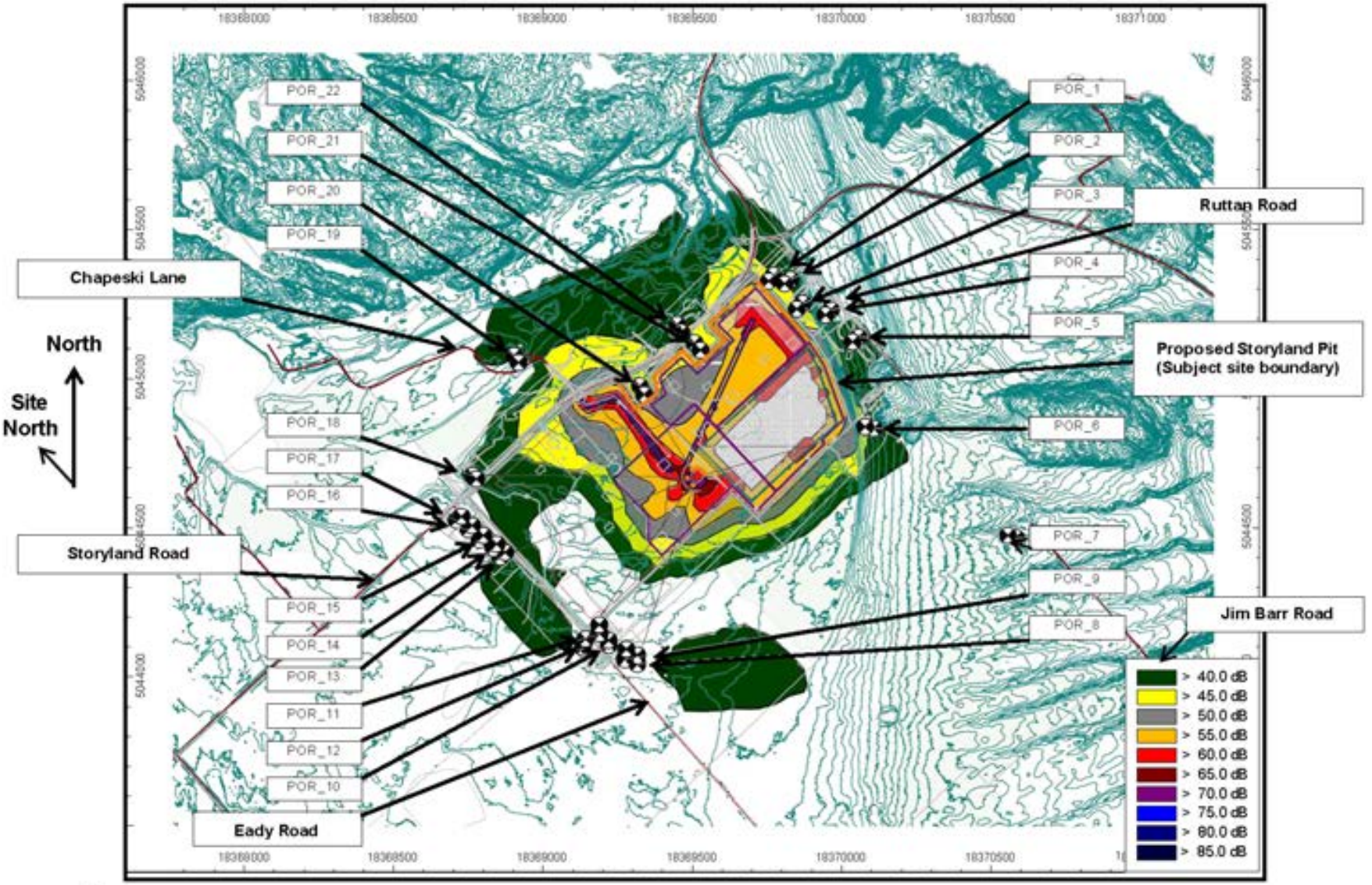


Figure 8.2: Prediction Results, Scenario 3: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

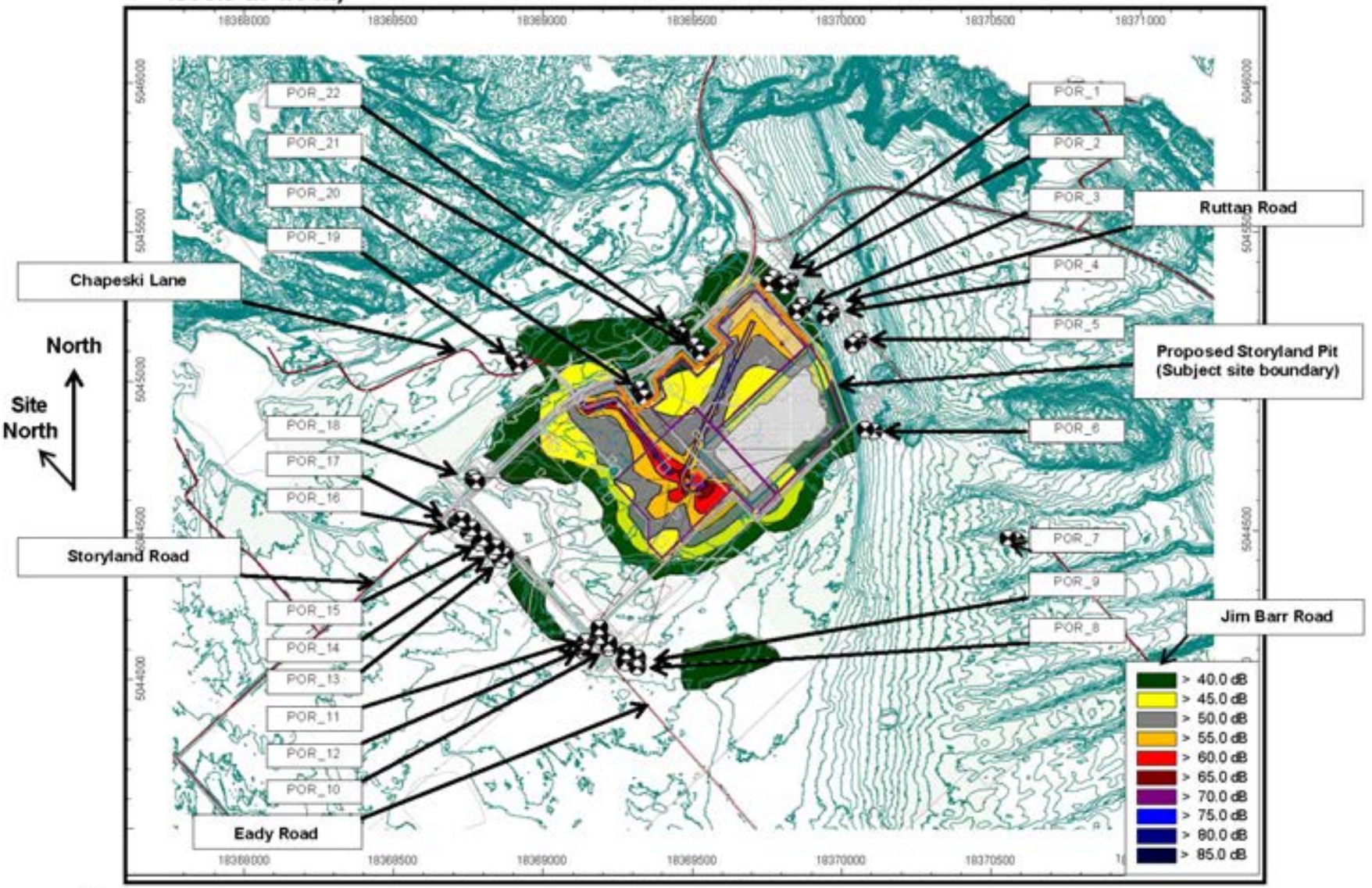


Figure 9: Scenario 4: Worst Case, Wash plant in operation in Phase 1 with extraction occurring in Phase 3 and Phase 4 (Day, Evening and Night)

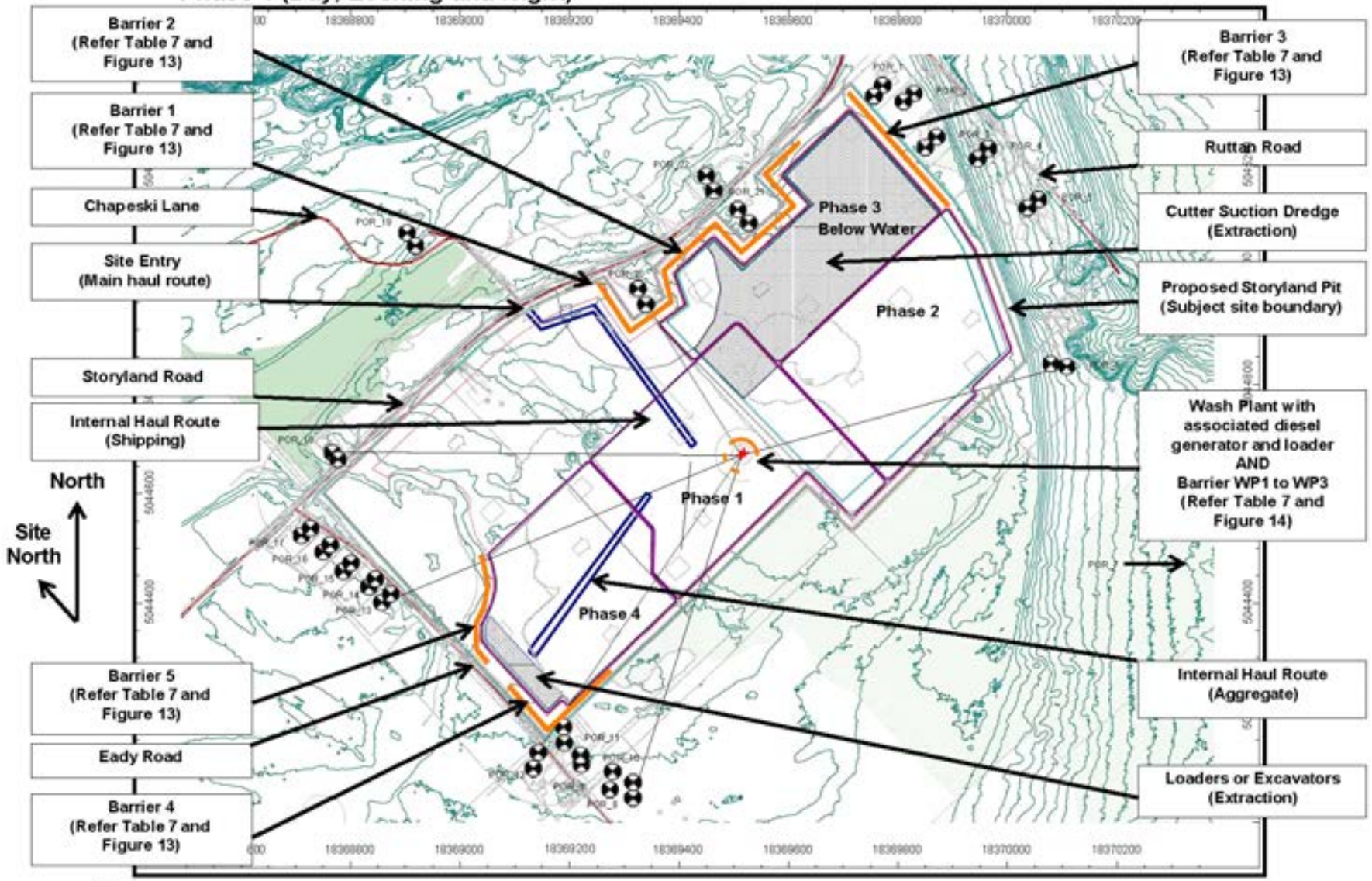


Figure 10.1: Prediction Results, Scenario 4: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

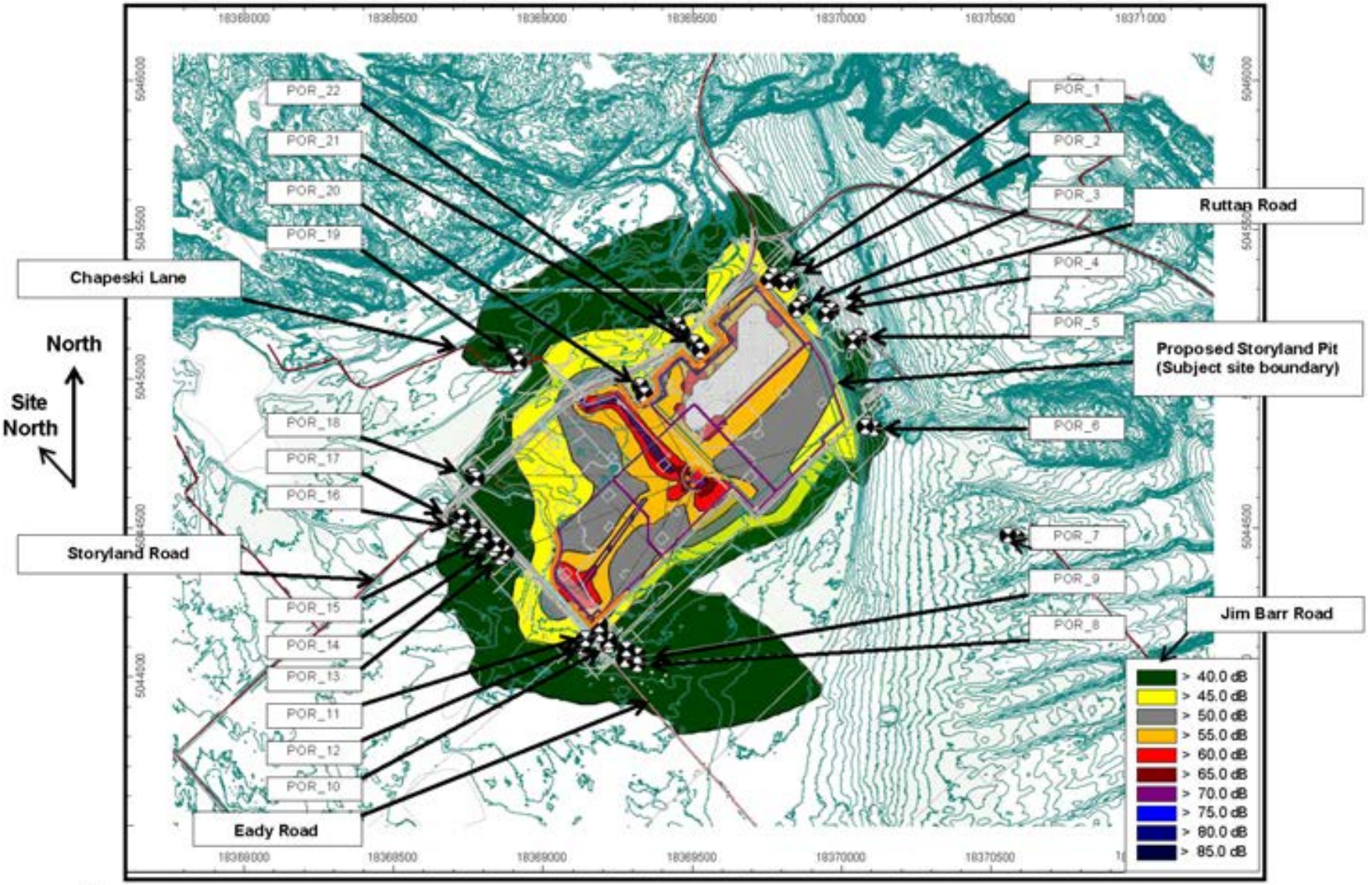


Figure 10.2: Prediction Results, Scenario 4: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

Figure 11: Scenario 5: Worst Case, Wash plant in operation in Phase 5 with extraction occurring in Phase 4 and Phase 5 (Day, Evening and Night)

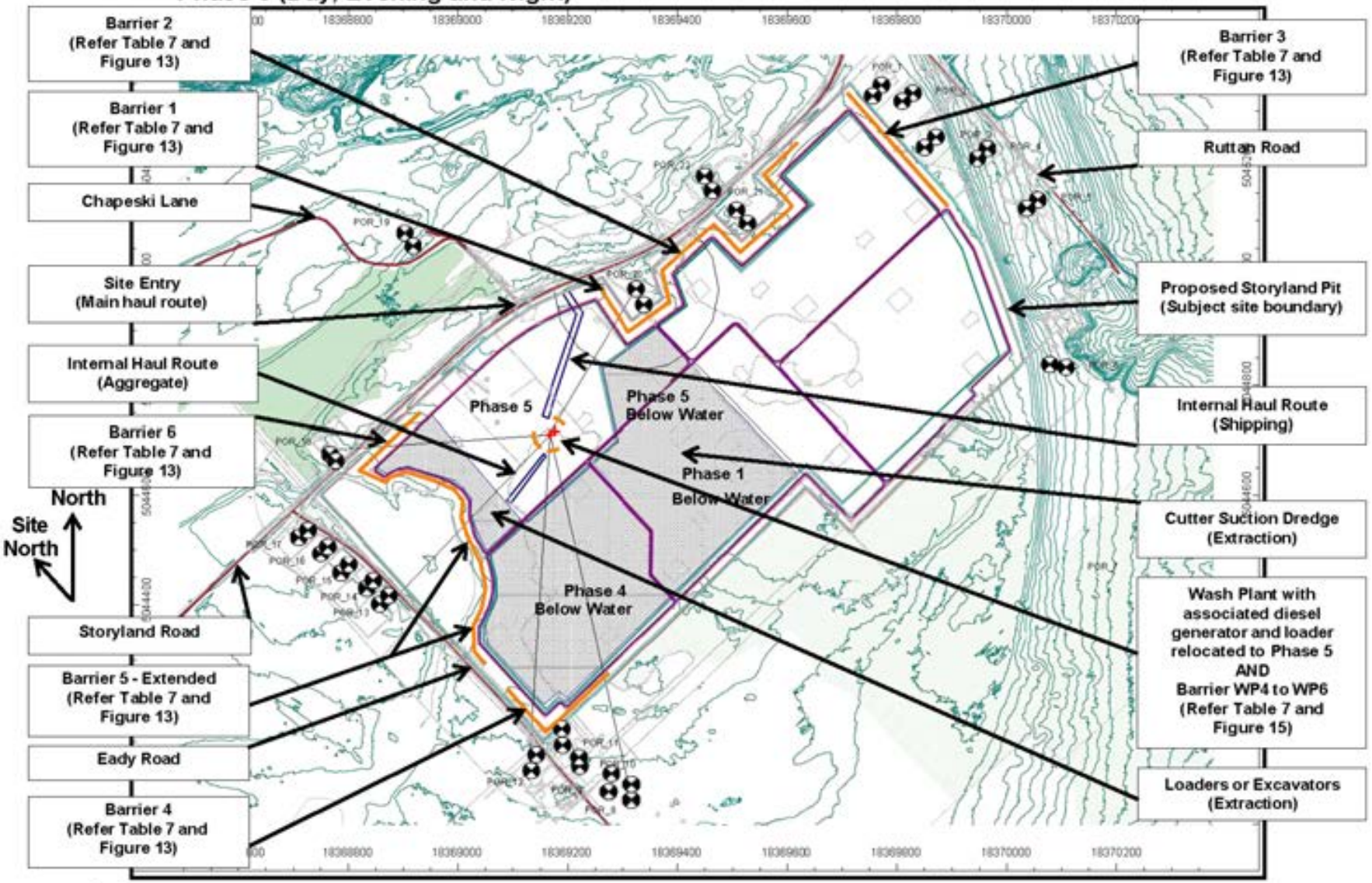


Figure 12.1: Prediction Results, Scenario 5: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

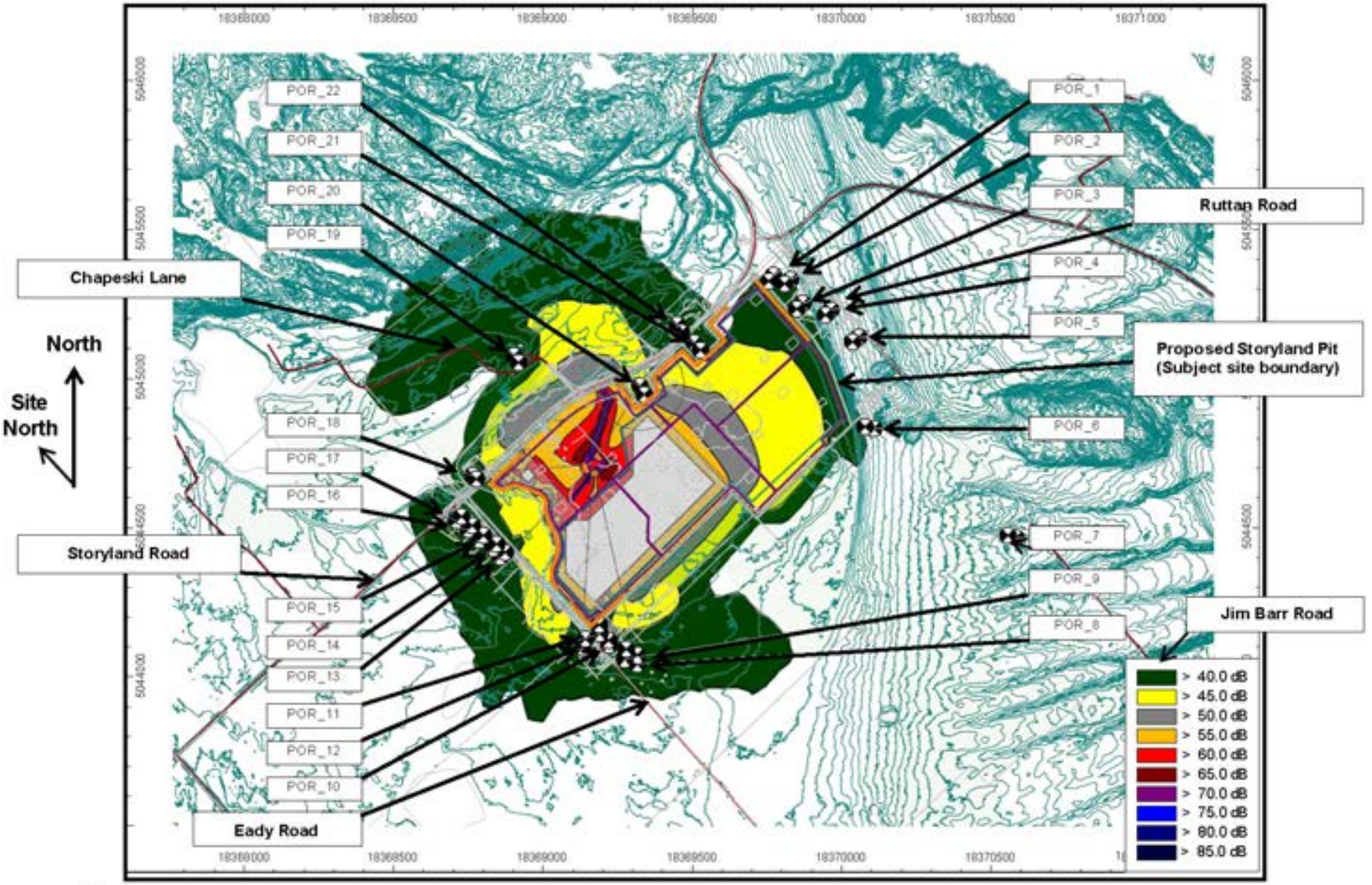


Figure 12.2: Prediction Results, Scenario 5: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

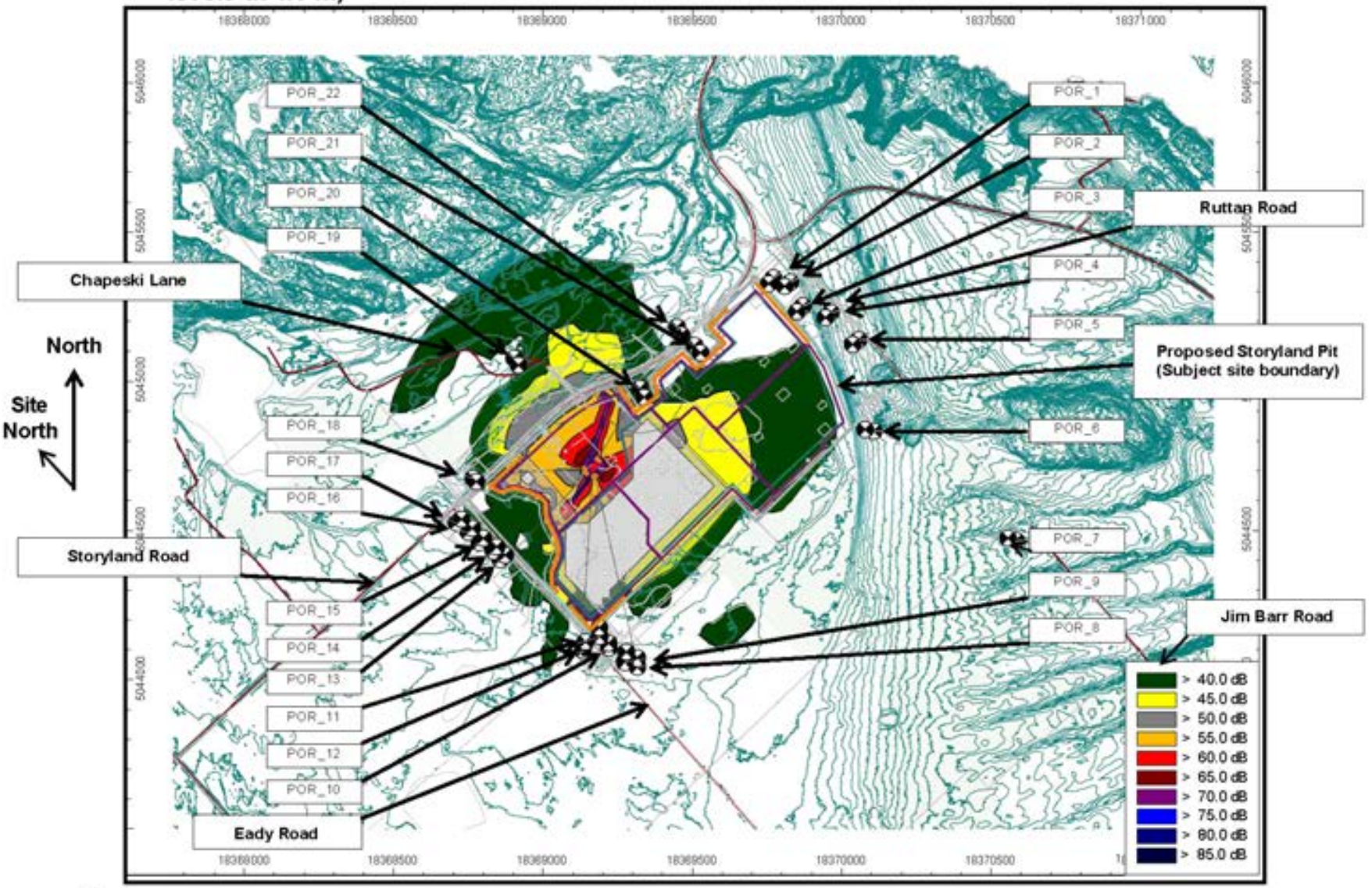


Figure 13: Detailed Plan showing Recommended Site Berms

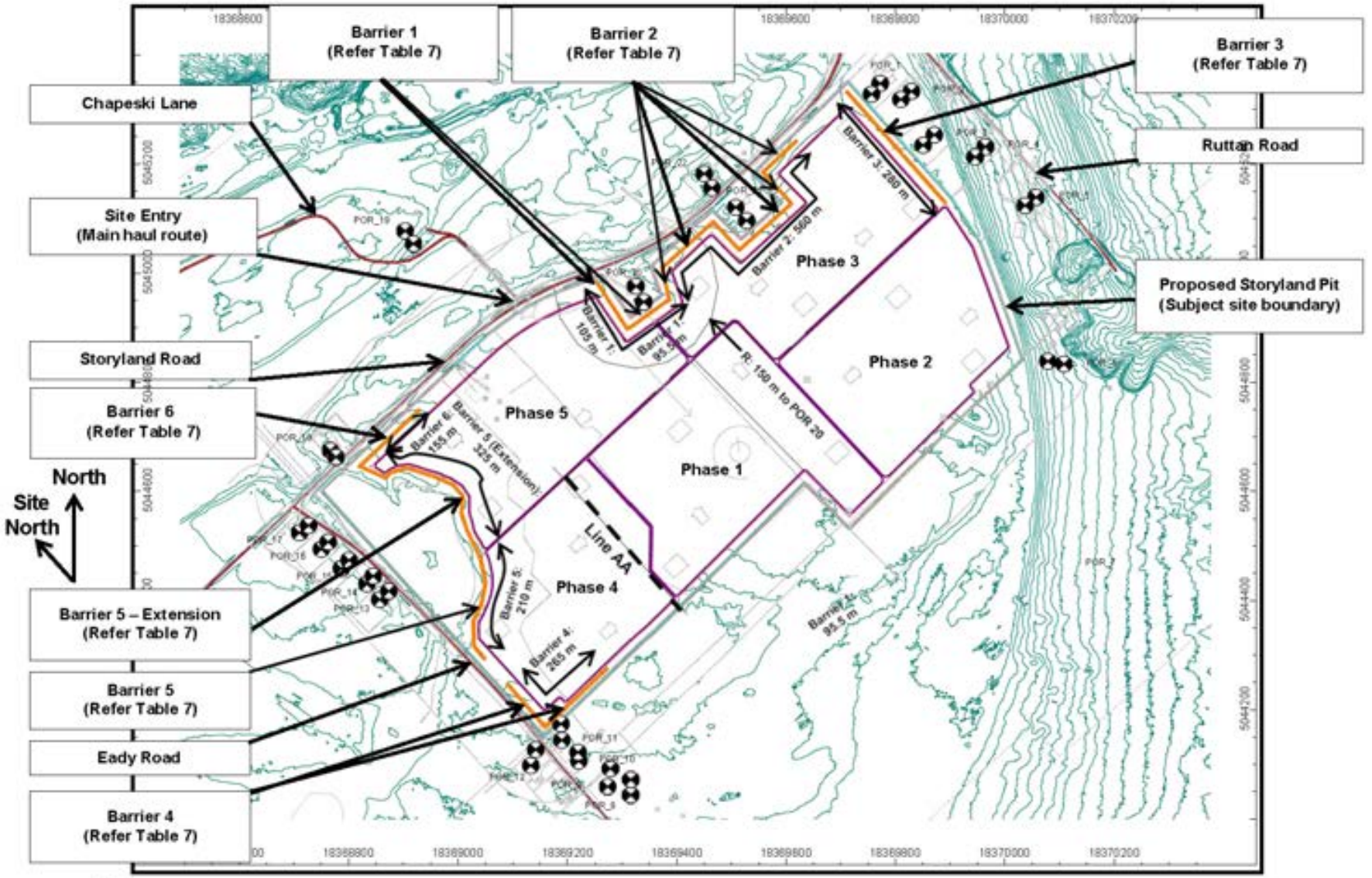


Figure 14: Detailed Plan at Wash Plant in Phase 1 showing Recommended Noise Barriers (Stockpiles)

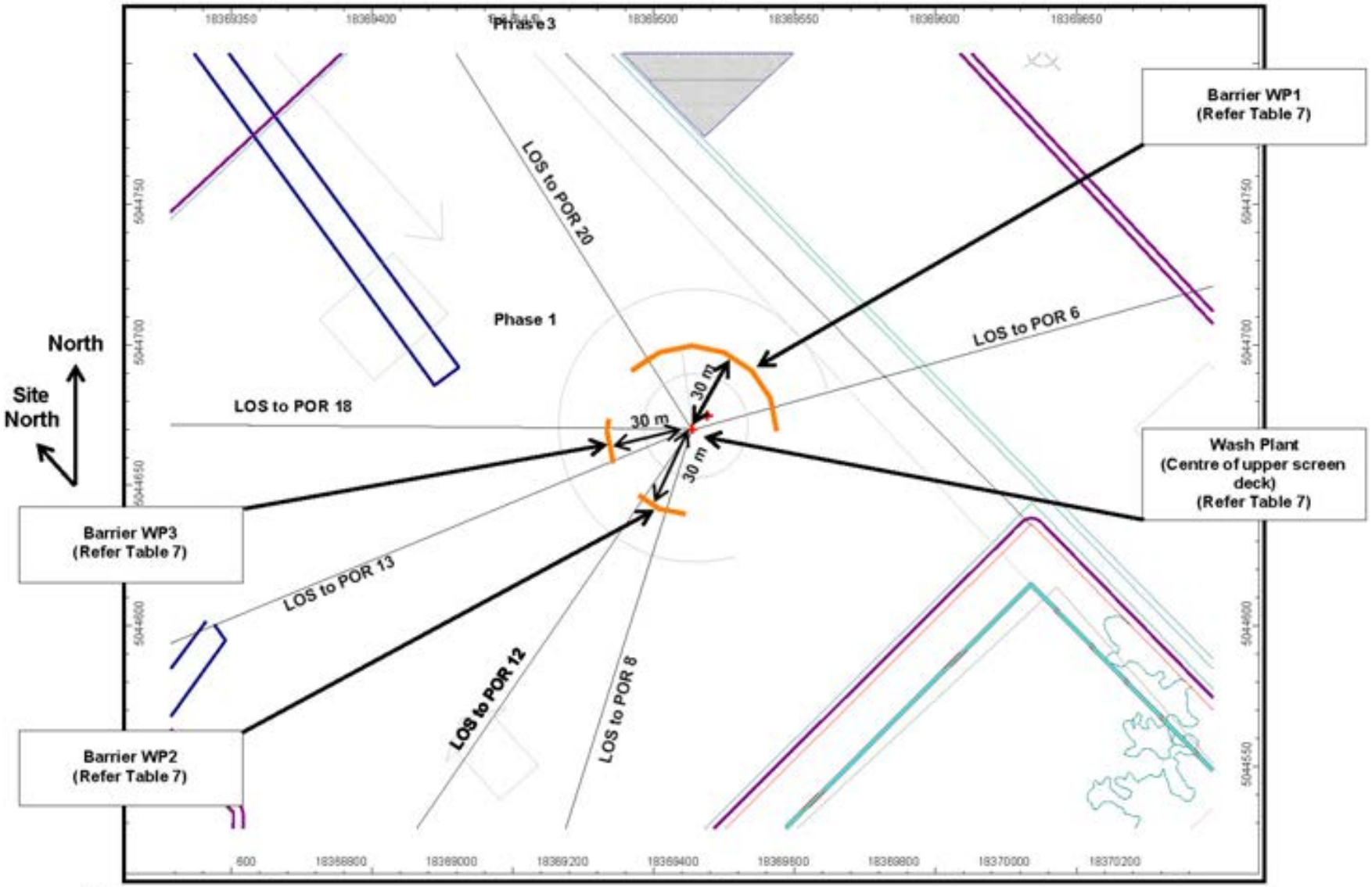
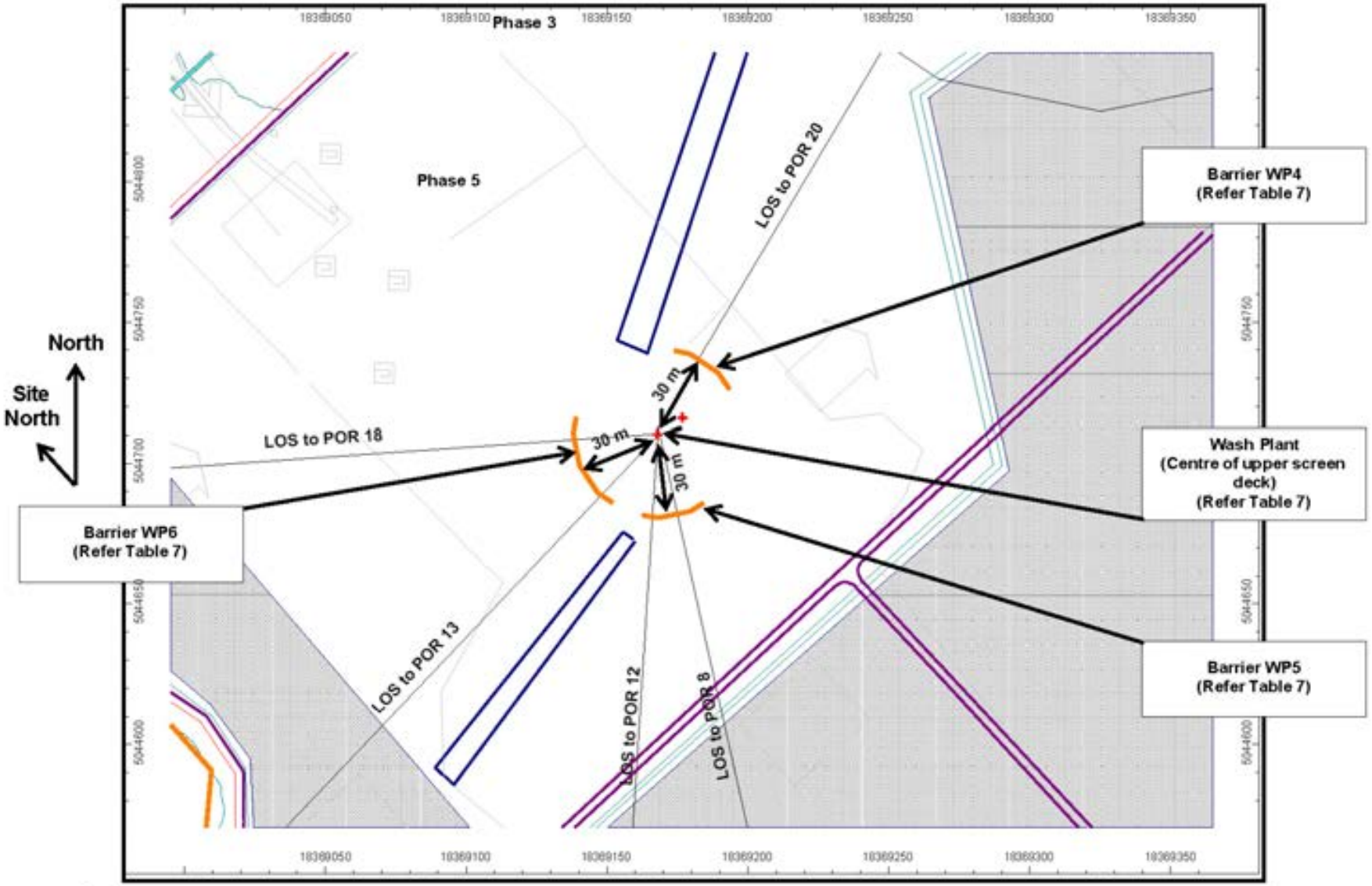


Figure 15: Detailed Plan at Wash Plant in Phase 5 showing Recommended Noise Barriers (Stockpiles)



Appendix 1

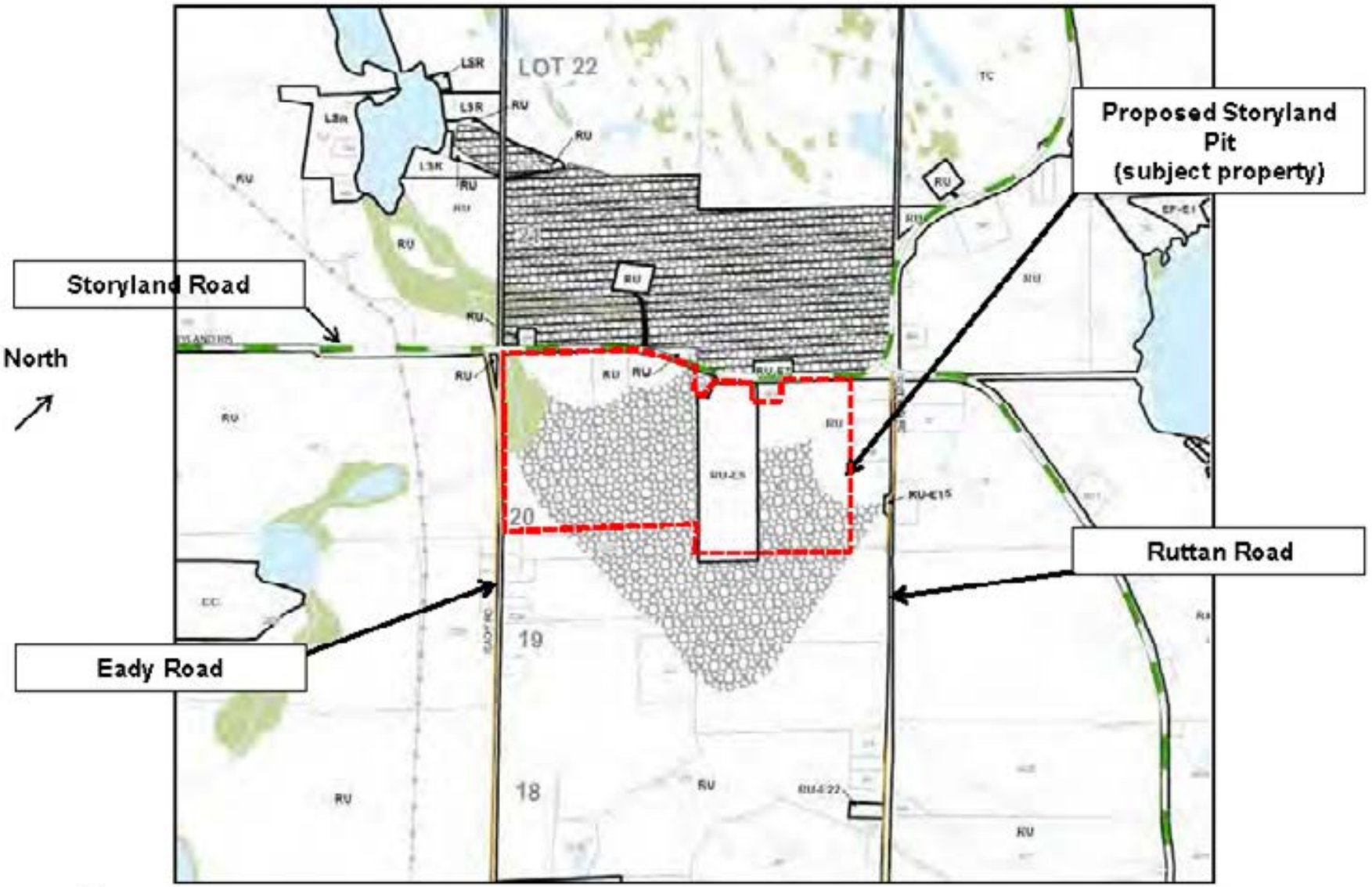
Zoning Plan and Land Use Designations

Contents:

- **Zoning Map: Township of Horton Zoning By-Law 2010-14 Schedule 'A' (Source: Township of Horton)**

Legend:

Zoning Map: **Township of Horton Zoning By-Law 2010-14 Schedule 'A' (Source: Township of Horton)**



Appendix 2

Acoustic Modelling Details

Modeling Notes:

1. Acoustic model developed uses Cadna-A software, Version 2022.
2. Sound propagation is modeled according to ISO 9613-2: 1996(E)[4].
3. The whole of the extraction area is modelled with an absorption coefficient of 0.5 representative of exposed earth. The surrounding area is modeled with an absorption coefficient of 1.0 indicative of a Class 3 Area.
4. MECP favoured conservative modelling assumptions are used, that is, 'no subtraction of negative ground attenuation' and 'no negative path differences'.

Contents:

Table A2.1 Point of Reception Location Table

ID	Height	Coordinates		
		X	Y	Z
	(m)	(m)	(m)	(m)
POR_1_POW	2.0	18369771.6	5045346.7	172.0
POR_1_OPR	1.5	18369756.1	5045327.1	171.2
POR_2_POW	2.0	18369829.1	5045332.5	172.0
POR_2_OPR	1.5	18369809.5	5045317.8	171.3
POR_3_POW	2.0	18369870.7	5045252.5	172.0
POR_3_OPR	1.5	18369850.3	5045233.6	170.5
POR_4_POW	2.0	18369964.4	5045231.0	164.0
POR_4_OPR	1.5	18369946.2	5045213.2	164.2
POR_5_POW	4.5	18370057.2	5045138.4	162.5
POR_5_OPR	1.5	18370036.8	5045123.1	160.3
POR_6_POW	4.5	18370108.0	5044832.6	165.2
POR_6_OPR	1.5	18370078.6	5044837.8	164.1
POR_7_POW	2.0	18370583.3	5044465.5	150.0
POR_7_OPR	1.5	18370556.5	5044473.4	149.5
POR_8_POW	4.5	18369316.2	5044043.5	170.5
POR_8_OPR	1.5	18369316.4	5044071.7	167.5
POR_9_POW	2.0	18369274.5	5044058.5	168.0
POR_9_OPR	1.5	18369279.3	5044091.4	167.5
POR_10_POW	2.0	18369221.8	5044105.2	168.7
POR_10_OPR	1.5	18369220.4	5044121.0	168.5
POR_11_POW	2.0	18369190.8	5044143.2	169.0
POR_11_OPR	1.5	18369189.1	5044173.1	168.5
POR_12_POW	2.0	18369133.9	5044096.8	168.9
POR_12_OPR	1.5	18369143.0	5044125.8	168.5
POR_13_POW	2.0	18368857.7	5044401.1	170.0
POR_13_OPR	1.5	18368874.3	5044416.5	168.8
POR_14_POW	3.0	18368834.1	5044429.5	170.8
POR_14_OPR	1.5	18368845.7	5044443.9	168.5
POR_15_POW	2.0	18368787.3	5044457.7	170.0
POR_15_OPR	1.5	18368801.3	5044473.2	169.5
POR_16_POW	3.0	18368750.7	5044493.2	172.0
POR_16_OPR	1.5	18368763.4	5044506.5	170.1
POR_17_POW	2.0	18368710.8	5044523.5	171.0
POR_17_OPR	1.5	18368727.5	5044536.6	170.4
POR_18_POW	4.5	18368766.9	5044674.5	172.5
POR_18_OPR	1.5	18368777.3	5044662.8	169.5
POR_19_POW	2.0	18368903.4	5045076.8	169.0
POR_19_OPR	1.5	18368918.9	5045053.4	166.5

ID	Height	Coordinates		
		X	Y	Z
	(m)	(m)	(m)	(m)
POR_20_POW	2.0	18369325.4	5044975.2	168.3
POR_20_OPR	1.5	18369339.4	5044946.3	168.0
POR_21_POW	2.0	18369507.4	5045119.8	168.0
POR_21_OPR	1.5	18369527.4	5045095.5	167.5
POR_22_POW	2.0	18369449.7	5045181.3	168.0
POR_22_OPR	1.5	18369463.9	5045155.1	167.5

Table A2.2 Point Sources

ID	Result. PWL			Lw / Li	Noise Source Library File	Attenuation	Operating Time			Direct.	Height
	Day	Evening	Night	Type	Value		Day	Evening	Night		
	(dBA)	(dBA)	(dBA)				(min/hr)	(min/hr)	(min/hr)		(m)
Wash_Plant_S1-4	109.5	109.5	109.5	Lw	Washplant		60.0	60.0	60.0	(none)	7.8
Generator_S1-4	108.1	108.1	108.1	Lw	Genset_Exhaust	Silex_Silencer_Model_JB_6	60.0	60.0	60.0	(none)	4.0
Wash_Plant_S5	109.5	109.5	109.5	Lw	Washplant		60.0	60.0	60.0	(none)	7.8
Generator_S5	108.1	108.1	108.1	Lw	Genset_Exhaust	Silex_Silencer_Model_JB_6	60.0	60.0	60.0	(none)	4.0

Table A2.3 Line Sources

ID	Result. PWL			Lw / Li	Noise Source Library File	Direct.	Moving Pt. Src			
	Day	Evening	Night	Type	Value		Number/hr			Speed
	(dBA)	(dBA)	(dBA)				Day	Evening	Night	(km/h)
IHR_Shipping_S1-4	106.7	103.7	103.7	PWL-Pt	HWYTruck_Slow58	(none)	10.0	5.0	5.0	20.0
IHR_Shipping_S5	104.1	101.1	101.1	PWL-Pt	HWYTruck_Slow58	(none)	10.0	5.0	5.0	20.0
IHR_Aggregate_S1	92.2	90.0	90.0	PWL-Pt	Aggregate_Truck_Passby	(none)	5.0	3.0	3.0	20.0
IHR_Aggregate_S2	98.4	96.2	96.2	PWL-Pt	Aggregate_Truck_Passby	(none)	5.0	3.0	3.0	20.0
IHR_Aggregate_S3	97.8	95.5	95.5	PWL-Pt	Aggregate_Truck_Passby	(none)	5.0	3.0	3.0	20.0
IHR_Aggregate_S4	96.0	93.8	93.8	PWL-Pt	Aggregate_Truck_Passby	(none)	5.0	3.0	3.0	20.0
IHR_Aggregate_S5	90.9	88.7	88.7	PWL-Pt	Aggregate_Truck_Passby	(none)	5.0	3.0	3.0	20.0

Table A2.4 Area Sources

ID	Result. PWL			Lw / Li	Noise Source Library File	Direct.	Moving Pt. Src		
	Day	Evening	Night	Type	Value		Number/hr		
	(dBA)	(dBA)	(dBA)				Day	Evening	Night
Excavators_S1	106.2	103.2	103.2	PWL-Pt	Excavator_CAT345DL	(none)	2.0	1.0	1.0
Excavators_S2	106.2	103.2	103.2	PWL-Pt	Excavator_CAT345DL	(none)	2.0	1.0	1.0
Excavators_S3	106.2	103.2	103.2	PWL-Pt	Excavator_CAT345DL	(none)	2.0	1.0	1.0
Excavators_S4	106.2	103.2	103.2	PWL-Pt	Excavator_CAT345DL	(none)	2.0	1.0	1.0
Excavators_S5	106.2	103.2	103.2	PWL-Pt	Excavator_CAT345DL	(none)	2.0	1.0	1.0
Dredge_S2	110.8	10.8	10.8	PWL-Pt	Dredge	(none)	1.0	0.0	0.0
Dredge_S3	110.8	10.8	10.8	PWL-Pt	Dredge	(none)	1.0	0.0	0.0
Dredge_S4	110.8	10.8	10.8	PWL-Pt	Dredge	(none)	1.0	0.0	0.0
Dredge_S5	110.8	10.8	10.8	PWL-Pt	Dredge	(none)	1.0	0.0	0.0

Table A2.5 Noise Barriers

ID	Height Above Grade (m)	Length
Barrier_1_S1-5	6.0	195.3
Barrier_2_S3-5	6.0	552.8
Barrier_3_S3-5	4.0	276.7
Barrier_4_S4-5	7.0	264.6
Barrier_5_S4	6.0	210
Barrier_5_Extended _S5	6.0	532.6
Barrier_6_S5	6.0	532.6
Barrier_WP1_S1-2	12.0	70.5
Barrier_WP1_S3-4 (Reduced in height)	9.0	70.5
Barrier_WP2_S1-4	8.0	18
Barrier_WP3_S1-4	8.0	15.9
Barrier_WP4_S5	8.0	24.9
Barrier_WP5_S5	8.0	23.1
Barrier_WP6_S5	11.0	35.3

Table A2.6 Noise Source Library

ID	Type	Spectra (dB)											Source
		31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Washplant	Lw	109.8	96.6	104.1	102.6	105.2	104.8	103.1	99.8	92.8	109.5	113.8	Albion_Pit_30/4/18 at 2.2m and 11/4/19 at L1-L5
Genset_Exhaust	Lw	64.9	97.4	112.5	120.2	121.8	122.9	124.9	121.1	109.3	129.3	129.6	Manufacturers Data - Cummin Model 600DQPAA
Dredge	Lw	116.6	109.0	111.2	110.4	106.7	107.0	102.9	94.4	85.7	110.8	119.5	Meas. Howe-Ross Pit 20-05-13 83dBA at 9.7m
Loader	Lw	107.3	109.5	107.1	101.8	99.4	97.6	95.9	90.1	82.9	103.0	113.6	Meas. Howe-Ross Pit 20-05-13 72dBA at 14m
Excavator_CAT345DL	Lw	100.0	110.2	109.0	100.8	98.5	98.0	95.2	92.6	87.7	103.2	113.5	Meas. OTR 23rd August 2017 at 13.0m
Aggregate_Truck_Passby	Lw	104.5	103.9	104.1	102.1	99.5	99.5	94.5	91.2	79.6	103.3	110.7	Meas. Howe-Ross Pit 20-05-13 73.7dBA at 12m
HWYTruck_Slow58	Lw	115.9	112.7	110.2	101.6	101.4	105.0	104.2	97.6	103.5	110.1	119.0	Brockville McDowell Study, 2003

Table A2.7 Noise Measurement Data

ID	Type	Spectra (dB)											Source
		31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Meas_Washplant	Li	92.2	79.0	86.5	85.0	87.6	87.2	85.5	82.2	75.2	91.9	96.2	Albion_Pit_30/4/18 at 2.2m and 11/4/19 at L1-L5
Meas_Dredge	Li	89.2	81.6	83.8	83.0	79.3	79.6	75.5	67.0	58.3	83.4	92.1	Meas. Howe-Ross Pit 20-05-13 83dBA at 9.7m
Meas_Loader	Li	76.3	78.5	76.1	70.8	68.4	66.6	64.9	59.1	51.9	72.0	82.6	Meas. Howe-Ross Pit 20-05-13 72dBA at 14m
Meas_Excavator_CAT345DL	Li	69.6	79.8	78.6	70.4	68.1	67.6	64.8	62.2	57.3	72.8	83.1	Meas. OTR 23rd August 2017 at 13.0m
Meas_Aggregate_Truck_Passby	Li	74.9	74.3	74.5	72.5	69.9	69.9	64.9	61.6	50.0	73.7	81.1	Meas. Howe-Ross Pit 20-05-13 73.7dBA at 12m
Meas_HWYTruck_Slow58	Li	67.5	64.3	61.8	53.2	53.0	56.6	55.8	49.2	55.1	61.7	70.6	adj. 90m source Brockville McDowell Study, 2003

Table A2.8.1 Point of Reception Impacts by Source for Scenario 1* - Day

	Daytime Period (07:00 to 19:00)					
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S1	Excavators_S1	Total
	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	31.2	17.2	29.6	20.3	32.9	36.4
POR_1	31.2	17.3	29.4	19	32.5	36.1
POR_2	31.1	16.9	29.2	20.4	32.7	36.2
POR_2	31.1	17	29	19.4	32.3	35.9
POR_3	29.4	14.8	26.8	18.7	31.7	34.7
POR_3	30.6	16.7	27.4	18.2	32.4	35.5
POR_4	19.5	5.2	22.6	12.8	26.4	28.6
POR_4	19.3	5.6	22	11.8	26.6	28.6
POR_5	24.4	11.2	26.6	17.9	30.2	32.7
POR_5	22.4	6.9	23.9	17.2	29.6	31.4
POR_6	26.9	14.9	27.6	20.3	33.3	35.2
POR_6	24.9	14.8	26.9	18.7	32.6	34.4
POR_7	26.2	4.6	20.2	10.2	24.4	29.1
POR_7	23.8	1.5	17.9	7.6	22.1	26.7
POR_8	34.4	29.6	32.4	17.4	32.3	38.5
POR_8	33.3	21.7	26.4	9.8	28.7	35.4
POR_9	34.2	26.4	31.3	14.2	30.4	37.4
POR_9	31.1	22	27	7.3	26.6	33.8
POR_10	30.9	23.7	30.1	13.8	30.3	35.5
POR_10	31	19.3	28	10	29.2	34.5
POR_11	32.3	18	26.4	16.8	29.3	34.9
POR_11	26.5	15.9	23.5	16.4	28.3	31.5
POR_12	33.7	26.3	30.7	20.6	31.9	37.5
POR_12	29.8	20	28.4	20.2	30.9	34.9
POR_13	35.7	29	30.7	19.5	32.4	38.8
POR_13	35.1	28.8	32.3	18.9	32	38.7
POR_14	34.9	28.3	31.4	19.9	32.9	38.6
POR_14	33.9	28.1	32.2	18.6	31.8	38.0
POR_15	32.5	27.4	31.7	18.6	31.8	37.3
POR_15	32.5	27.5	31.6	17.9	31.3	37.2
POR_16	32.3	27.2	34	18.7	32.1	38.1
POR_16	32	27.1	33.2	17.3	31	37.4
POR_17	31.6	26.6	33.9	17.4	31.1	37.6
POR_17	31.6	26.8	33.8	16.8	30.6	37.4
POR_18	33	33.1	36.5	19.9	33	40.3
POR_18	32.5	33	35.6	18.4	31.6	39.5
POR_19	33.9	21.8	33.6	14.9	30	37.7
POR_19	28.5	18.5	31.4	7.3	24.5	33.9
POR_20	28.7	17.6	40.2	15.6	33.1	41.2
POR_20	27.1	19.3	39.8	13	31.2	40.6
POR_21	34.2	22	35.2	21.3	39.3	41.7
POR_21	34.2	22.2	35.1	20.3	39.9	42.0
POR_22	31.2	18.4	35.6	22.1	37.6	40.4
POR_22	31.6	19.1	35.2	21.6	37.8	40.4

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.2 Point of Reception Impacts by Source for Scenario 1* - Night

	Evening and Nighttime Period (19:00 to 07:00)					
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S1	Excavators_S1	Total
	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	31.2	17.2	26.6	18.1	29.9	34.6
POR_1	31.2	17.3	26.4	16.7	29.5	34.4
POR_2	31.1	16.9	26.2	18.1	29.7	34.4
POR_2	31.1	17	26	17.2	29.3	34.2
POR_3	29.4	14.8	23.8	16.5	28.7	32.8
POR_3	30.6	16.7	24.4	16	29.4	33.7
POR_4	19.5	5.2	19.6	10.6	23.4	26.2
POR_4	19.3	5.6	19	9.6	23.6	26.1
POR_5	24.4	11.2	23.6	15.7	27.2	30.3
POR_5	22.4	6.9	20.9	15	26.5	28.9
POR_6	26.9	14.9	24.6	18.1	30.3	32.9
POR_6	24.9	14.8	23.9	16.5	29.6	31.9
POR_7	26.2	4.6	17.2	8	21.4	27.9
POR_7	23.8	1.5	14.9	5.4	19.1	25.5
POR_8	34.4	29.6	29.4	15.2	29.3	37.3
POR_8	33.3	21.7	23.4	7.6	25.7	34.6
POR_9	34.2	26.4	28.3	12	27.4	36.3
POR_9	31.1	22	24	5.1	23.5	32.8
POR_10	30.9	23.7	27.1	11.5	27.3	34.0
POR_10	31	19.3	25	7.8	26.2	33.2
POR_11	32.3	18	23.4	14.6	26.3	33.8
POR_11	26.5	15.9	20.5	14.1	25.3	29.8
POR_12	33.7	26.3	27.7	18.4	28.9	36.2
POR_12	29.8	20	25.4	18	27.9	33.2
POR_13	35.7	29	27.7	17.3	29.4	37.8
POR_13	35.1	28.8	29.3	16.7	29	37.6
POR_14	34.9	28.3	28.4	17.7	29.9	37.4
POR_14	33.9	28.1	29.2	16.3	28.8	36.7
POR_15	32.5	27.4	28.6	16.3	28.8	35.9
POR_15	32.5	27.5	28.6	15.7	28.3	35.8
POR_16	32.3	27.2	31	16.5	29.1	36.4
POR_16	32	27.1	30.2	15.1	28	35.8
POR_17	31.6	26.6	30.9	15.2	28.1	35.8
POR_17	31.6	26.8	30.8	14.6	27.6	35.7
POR_18	33	33.1	33.5	17.7	30	38.7
POR_18	32.5	33	32.6	16.2	28.6	38.1
POR_19	33.9	21.8	30.6	12.7	27	36.3
POR_19	28.5	18.5	28.4	5.1	21.5	32.1
POR_20	28.7	17.6	37.1	13.4	30.1	38.5
POR_20	27.1	19.3	36.7	10.7	28.2	37.8
POR_21	34.2	22	32.2	19.1	36.2	39.4
POR_21	34.2	22.2	32	18.1	36.9	39.7
POR_22	31.2	18.4	32.6	19.9	34.6	37.9
POR_22	31.6	19.1	32.1	19.4	34.8	38.0

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.3 Point of Reception Impacts by Source for Scenario 2* - Day

	Daytime Period (07:00 to 19:00)						
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S2	Excavators_S2	Dredge_S2	Total
	dBA	dBA	dBA	dBA	dBA		dBA
POR_1	31.4	17.3	29.5	29.5	37.1	41.3	43.4
POR_1	31.4	17.4	29.3	28.4	37.3	40.9	43.1
POR_2	31.3	17.1	29.1	29.8	35.1	41.6	43.2
POR_2	31.2	17.2	28.9	29.4	37	41.1	43.2
POR_3	29.7	15.2	26.7	30.2	38.9	40.7	43.4
POR_3	30.9	17	27.2	31.2	39.9	41.5	44.3
POR_4	19.9	6.9	22.6	22.6	33.3	33.9	37.1
POR_4	19.7	8.2	22	21.8	33.6	33.7	37.0
POR_5	25.3	12	26.9	27.7	36.3	39.7	41.8
POR_5	22.8	11.9	24	25.1	35.5	37	39.7
POR_6	27.5	15.6	28.2	29.1	38.4	42.2	44.1
POR_6	25.3	15.4	27.5	26.2	37.5	38.4	41.4
POR_7	26.2	4.5	20.4	17.1	25.6	24.1	30.8
POR_7	23.7	1.4	17.9	14.1	23.4	22.4	28.5
POR_8	34.4	29.5	32.4	25.2	30.3	32.7	39.4
POR_8	33.3	21.5	26.3	19.7	25.6	30.3	36.3
POR_9	34.2	25.3	31.2	19.4	25.6	31.9	38.0
POR_9	30.7	21.8	26.9	19	25.6	31.2	35.5
POR_10	30.6	23.5	30.1	21.1	27.2	32.5	36.8
POR_10	31	19.2	27.9	19.1	25.5	31.3	35.7
POR_11	32.6	17.9	26.3	21.6	28.8	30.8	36.5
POR_11	25.9	15.8	23.5	17.7	25.9	32.1	34.4
POR_12	33.7	25.9	30.7	20.4	25.2	33	38.0
POR_12	29.6	19.4	28.3	17.9	25.2	32.7	35.9
POR_13	35.7	29	30.7	24.6	27.6	32.4	39.2
POR_13	35.1	28.9	32.3	23	24.9	32.3	39.0
POR_14	34.9	28.3	31.4	25.2	28.2	32.8	39.1
POR_14	33.9	28.1	32.2	20.8	24.7	32.1	38.3
POR_15	32.5	27.4	31.6	23.8	25.9	31.8	37.7
POR_15	32.5	27.5	31.6	22.8	25.6	31.6	37.6
POR_16	32.3	27.2	33.9	24.4	27.6	32.1	38.5
POR_16	32	27.1	33.2	22.2	25.3	31.3	37.8
POR_17	31.6	26.7	33.9	22.3	26.1	31.1	38.0
POR_17	31.6	26.8	33.8	21.8	25	31	37.8
POR_18	33	33.1	36.5	25	27.2	35.2	41.0
POR_18	32.5	33	35.6	22.5	24.6	31.8	39.7
POR_19	33.9	21.7	33.6	21.2	27.7	30.7	38.3
POR_19	28.5	18.6	31.4	15.5	24.7	28.3	35.0
POR_20	29	17.6	40.1	27.8	33.8	33.7	42.1
POR_20	27.2	19.3	39.7	23.6	31.4	31.6	41.1
POR_21	34.5	22.1	35.2	33.5	37.4	41.4	44.4
POR_21	34.5	22.4	35	33.8	37.6	41.7	44.6
POR_22	31.5	18.6	35.5	31.2	34.5	39.2	42.4
POR_22	31.9	19.3	35.1	31.2	34.8	39	42.4

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.4 Point of Reception Impacts by Source for Scenario 2* - Night

	Evening and Nighttime Period (19:00 to 07:00)					
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S2	Excavators_S2	Total
	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	31.4	17.3	26.5	27.3	34.1	37.0
POR_1	31.4	17.4	26.3	26.1	34.3	36.9
POR_2	31.3	17.1	26.1	27.5	32.1	36.0
POR_2	31.2	17.2	25.9	27.1	34	36.8
POR_3	29.7	15.2	23.7	27.9	35.9	37.5
POR_3	30.9	17	24.2	29	36.8	38.6
POR_4	19.9	6.9	19.6	20.4	30.3	31.4
POR_4	19.7	8.2	19	19.6	30.5	31.5
POR_5	25.3	12	23.9	25.5	33.3	34.9
POR_5	22.8	11.9	21	22.8	32.5	33.7
POR_6	27.5	15.6	25.2	26.9	35.4	36.9
POR_6	25.3	15.4	24.5	24	34.5	35.7
POR_7	26.2	4.5	17.4	14.9	22.5	28.4
POR_7	23.7	1.4	14.9	11.9	20.4	25.9
POR_8	34.4	29.5	29.4	23	27.3	37.2
POR_8	33.3	21.5	23.3	17.5	22.6	34.4
POR_9	34.2	25.3	28.2	17.2	22.6	35.8
POR_9	30.7	21.8	23.9	16.8	22.6	32.6
POR_10	30.6	23.5	27	18.9	24.2	33.5
POR_10	31	19.2	24.9	16.9	22.5	32.7
POR_11	32.6	17.9	23.3	19.4	25.8	34.1
POR_11	25.9	15.8	20.5	15.4	22.9	28.9
POR_12	33.7	25.9	27.7	18.2	22.1	35.5
POR_12	29.6	19.4	25.3	15.7	22.1	31.9
POR_13	35.7	29	27.7	22.4	24.6	37.5
POR_13	35.1	28.9	29.3	20.8	21.8	37.1
POR_14	34.9	28.3	28.4	23	25.2	37.0
POR_14	33.9	28.1	29.2	18.6	21.7	36.2
POR_15	32.5	27.4	28.6	21.6	22.9	35.3
POR_15	32.5	27.5	28.6	20.6	22.6	35.2
POR_16	32.3	27.2	30.9	22.2	24.6	35.9
POR_16	32	27.1	30.2	19.9	22.3	35.4
POR_17	31.6	26.7	30.9	20	23.1	35.4
POR_17	31.6	26.8	30.8	19.5	22	35.3
POR_18	33	33.1	33.5	22.8	24.2	38.3
POR_18	32.5	33	32.6	20.3	21.6	37.7
POR_19	33.9	21.7	30.6	19	24.7	36.2
POR_19	28.5	18.6	28.4	13.2	21.7	32.2
POR_20	29	17.6	37.1	25.6	30.8	38.8
POR_20	27.2	19.3	36.7	21.4	28.4	37.9
POR_21	34.5	22.1	32.2	31.3	34.4	39.4
POR_21	34.5	22.4	32	31.6	34.6	39.5
POR_22	31.5	18.6	32.5	28.9	31.5	37.4
POR_22	31.9	19.3	32.1	29	31.8	37.4

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.5 Point of Reception Impacts by Source for Scenario 3* - Day

	Daytime Period (07:00 to 19:00)						
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S3	Excavators_S3	Dredge_S3	Total
	dBA	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	33	15.1	28.4	29.8	41.1	39.7	44.1
POR_1	30.6	14.5	28.1	29.4	41.9	39.6	44.3
POR_2	33.1	15.3	28.3	29.1	39.7	39.1	43.2
POR_2	32.6	15	28.2	29.2	40.4	39.8	43.8
POR_3	31.4	13.1	26.8	28.1	39.5	39.2	43.0
POR_3	29.6	14.1	27.5	28.4	40.8	39.8	43.8
POR_4	22.2	8.7	21.9	19.2	28.8	34.5	36.0
POR_4	21.5	9.3	20.8	18.3	29.5	33.9	35.7
POR_5	31.2	15.3	27.3	25.9	32.1	39.6	41.2
POR_5	26.5	14.1	25.7	22.9	31.3	37	38.7
POR_6	33.4	17.8	28.3	26.2	35.1	41.8	43.4
POR_6	28.9	17	27.5	24.4	34.5	38.9	40.9
POR_7	26.2	9.7	20.5	16.4	24.5	28.4	31.9
POR_7	23.7	6.4	18.1	13.4	23	25	29.2
POR_8	34.4	29.5	32.4	22.4	28.5	32.9	39.1
POR_8	33.3	21.5	26.3	19.2	24.7	31.5	36.5
POR_9	34.2	25	31.2	19.6	24.7	32	37.9
POR_9	30.6	21.8	26.9	18.3	24.7	31.4	35.5
POR_10	30.5	23.5	30	19	25	31.5	36.2
POR_10	31	19.2	27.8	19.2	24.8	30.7	35.4
POR_11	32.6	17.9	26.2	22.6	27	31.7	36.5
POR_11	25.8	15.8	23.5	14.6	23.5	31.7	33.7
POR_12	33.7	25.8	30.7	22.8	24.5	32.1	37.8
POR_12	29.6	19.2	28.3	17.5	24.4	31.8	35.5
POR_13	35.7	29	30.7	23.8	27.2	31.8	39.0
POR_13	35.1	28.9	32.3	22.5	24.7	31.7	38.9
POR_14	34.9	28.3	31.4	24.5	27.8	32.9	39.0
POR_14	33.9	28.1	32.2	19.7	24.6	31.5	38.2
POR_15	32.5	27.4	31.6	23.3	26.8	31.3	37.7
POR_15	32.5	27.5	31.6	21.8	24.4	31.1	37.4
POR_16	32.3	27.2	33.8	23.7	27.2	33.5	38.9
POR_16	32	27.1	33.2	22.3	26.1	30.8	37.8
POR_17	31.6	26.7	33.9	22.4	26.1	32.5	38.3
POR_17	31.6	26.8	33.8	21.8	25.7	30.5	37.8
POR_18	33	33.1	36.5	24.3	26.3	33.9	40.7
POR_18	32.5	33	35.6	21	25.2	31.3	39.7
POR_19	33.9	23.4	33.6	22.5	28.1	31.6	38.6
POR_19	28.5	19.2	31.4	19.4	28	29.4	35.7
POR_20	34.1	22.1	40	29.2	32.6	39.4	43.8
POR_20	29.9	20.9	39.7	27.6	32.2	37.2	42.5
POR_21	33.9	19.9	34.5	31.1	38.4	40.4	43.9
POR_21	30.4	19.1	32.4	30.4	38	38	42.2
POR_22	34.1	19.1	36.4	29.6	36.9	39.5	43.4
POR_22	31.6	18.7	35.9	29.4	37	39.4	43.0

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.6 Point of Reception Impacts by Source for Scenario 3* - Night

	Evening and Nighttime Period (19:00 to 07:00)					
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S3	Excavators_S3	Total
	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	33	15.1	25.4	27.5	38.1	39.6
POR_1	30.6	14.5	25.1	27.2	38.9	39.8
POR_2	33.1	15.3	25.3	26.9	36.7	38.7
POR_2	32.6	15	25.2	27	37.4	39.0
POR_3	31.4	13.1	23.8	25.9	36.5	38.0
POR_3	29.6	14.1	24.5	26.1	37.8	38.7
POR_4	22.2	8.7	18.9	16.9	25.8	28.2
POR_4	21.5	9.3	17.8	16.1	26.5	28.2
POR_5	31.2	15.3	24.3	23.7	29.1	34.1
POR_5	26.5	14.1	22.7	20.6	28.3	31.5
POR_6	33.4	17.8	25.3	24	32.1	36.5
POR_6	28.9	17	24.5	22.2	31.5	34.2
POR_7	26.2	9.7	17.5	14.2	21.4	28.1
POR_7	23.7	6.4	15.1	11.2	20	25.9
POR_8	34.4	29.5	29.4	20.2	25.5	37.0
POR_8	33.3	21.5	23.3	17	21.7	34.3
POR_9	34.2	25	28.2	17.4	21.7	35.8
POR_9	30.6	21.8	23.9	16	21.7	32.4
POR_10	30.5	23.5	27	16.8	22	33.1
POR_10	31	19.2	24.8	17	21.8	32.6
POR_11	32.6	17.9	23.2	20.4	24	33.9
POR_11	25.8	15.8	20.5	12.4	20.5	28.2
POR_12	33.7	25.8	27.6	20.6	21.4	35.5
POR_12	29.6	19.2	25.3	15.3	21.4	31.8
POR_13	35.7	29	27.7	21.6	24.2	37.4
POR_13	35.1	28.9	29.3	20.2	21.7	37.1
POR_14	34.9	28.3	28.4	22.3	24.8	36.9
POR_14	33.9	28.1	29.1	17.5	21.6	36.2
POR_15	32.5	27.4	28.6	21.1	23.8	35.2
POR_15	32.5	27.5	28.6	19.6	21.4	35.2
POR_16	32.3	27.2	30.8	21.5	24.2	35.9
POR_16	32	27.1	30.2	20.1	23.1	35.3
POR_17	31.6	26.7	30.9	20.2	23.1	35.4
POR_17	31.6	26.8	30.8	19.6	22.7	35.3
POR_18	33	33.1	33.5	22.1	23.2	38.2
POR_18	32.5	33	32.6	18.8	22.1	37.7
POR_19	33.9	23.4	30.6	20.3	25.1	36.3
POR_19	28.5	19.2	28.4	17.2	25	32.7
POR_20	34.1	22.1	37	27	29.5	39.6
POR_20	29.9	20.9	36.7	25.4	29.2	38.4
POR_21	33.9	19.9	31.5	28.9	35.4	39.1
POR_21	30.4	19.1	29.4	28.2	35	37.6
POR_22	34.1	19.1	33.4	27.3	33.9	38.9
POR_22	31.6	18.7	32.8	27.2	34	38.1

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.7 Point of Reception Impacts by Source for Scenario 4* - Day

	Daytime Period (07:00 to 19:00)						
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S4	Excavators_S4	Dredge_S4	Total
	dBA	dBA	dBA	dBA	dBA		dBA
POR_1	33	15.1	28.4	17	24.9	43.8	44.3
POR_1	30.7	14.5	28.1	16.9	24.8	43.7	44.1
POR_2	33.1	15.3	28.3	16.7	24.7	43	43.6
POR_2	32.6	15	28.2	16.6	24.6	43.2	43.8
POR_3	31.5	13.1	26.9	15.1	23.4	42.3	42.8
POR_3	29.7	14.1	27.5	16.2	24.3	42.8	43.2
POR_4	22.4	8.8	22	13.2	21.6	32.2	33.4
POR_4	21.6	9.4	20.9	12.8	21.6	31.9	33.0
POR_5	31.4	15.4	27.3	17.2	25.3	39.1	40.2
POR_5	26.7	14.2	25.8	14.9	24.4	35.9	37.1
POR_6	33.8	18	28.3	18.5	26.3	40.1	41.4
POR_6	29.2	17.1	27.6	17.7	25.6	38.2	39.3
POR_7	26.3	10.1	20.5	11.9	21.3	29.4	32.0
POR_7	23.8	6.8	18.1	10.1	19.8	26.7	29.5
POR_8	34.4	29.4	32.7	27.8	38.3	35.1	42.1
POR_8	34.3	21.4	26.5	26.9	37.6	31.5	40.4
POR_9	34.2	26.5	31.2	27.8	38.2	31.6	41.2
POR_9	31.3	21.7	27.3	27.8	38.3	31.2	40.3
POR_10	31.2	23.5	30.2	27.8	39.8	33.8	41.8
POR_10	31.1	24.6	29.6	27.5	39.7	31.9	41.5
POR_11	34.1	22.2	29.5	27.5	40.6	32.5	42.4
POR_11	28.9	18.9	25.8	24	39.6	31.3	40.8
POR_12	32.8	20.5	28.7	27.1	41.1	31.4	42.4
POR_12	29.5	18.6	28	25.7	40.8	31.1	41.8
POR_13	33.6	22	34.6	27.4	39.6	32.8	42.3
POR_13	33.5	21.3	34.9	27.5	39.1	31.7	41.9
POR_14	35.4	28.5	35	27.7	38.8	33.4	42.5
POR_14	34.3	28.2	34.7	27.3	38	31.6	41.7
POR_15	33.4	27.5	34.4	26.7	37.2	32.5	41.1
POR_15	33.2	27.5	34.3	26.7	36.9	31.3	40.8
POR_16	32.6	27.2	34.5	26.8	36.3	33.2	40.8
POR_16	32.2	27.1	34.1	26.1	35.8	31	40.1
POR_17	31.7	26.6	33.9	25.7	35	32.1	39.8
POR_17	31.7	26.7	33.8	25.5	34.9	30.8	39.6
POR_18	33	33.1	36.7	27.8	34.3	33.8	41.6
POR_18	33.1	33	36	26.6	34	32	41.0
POR_19	33.9	23.5	33.6	18.8	28.6	34.3	39.3
POR_19	28.5	19.3	31.9	17.1	23.9	32.8	36.6
POR_20	34.1	21.9	40.2	24	30.7	42	44.9
POR_20	29.9	20.7	39.8	22	30.3	40.9	43.8
POR_21	33.9	19.8	34.6	21.1	28.2	43.9	44.9
POR_21	30.4	19.1	32.5	20.8	28.1	43.4	44.1
POR_22	34.1	18.9	36.5	20.3	27.5	42.4	44.0
POR_22	31.7	18.6	36	20.3	27.5	42.3	43.6

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.8 Point of Reception Impacts by Source for Scenario 4* - Night

	Evening and Nighttime Period (19:00 to 07:00)					
ID	Wash_Plant_S1-4	Generator_S1-4	IHR_Shipping_S1-4	IHR_Aggregate_S4	Excavators_S4	Total
	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	33	15.1	25.4	14.7	21.9	34.1
POR_1	30.7	14.5	25.1	14.7	21.8	32.3
POR_2	33.1	15.3	25.3	14.5	21.7	34.2
POR_2	32.6	15	25.2	14.4	21.6	33.7
POR_3	31.5	13.1	23.8	12.9	20.4	32.5
POR_3	29.7	14.1	24.5	14	21.3	31.5
POR_4	22.4	8.8	19	10.9	18.6	25.4
POR_4	21.6	9.4	17.9	10.6	18.6	24.8
POR_5	31.4	15.4	24.3	14.9	22.3	32.8
POR_5	26.7	14.2	22.7	12.7	21.4	29.2
POR_6	33.8	18	25.3	16.3	23.3	34.9
POR_6	29.2	17.1	24.6	15.5	22.6	31.4
POR_7	26.3	10.1	17.5	9.7	18.3	27.5
POR_7	23.8	6.8	15.1	7.9	16.8	25.2
POR_8	34.4	29.4	29.7	25.5	35.3	39.2
POR_8	34.3	21.4	23.5	24.6	34.6	37.9
POR_9	34.2	26.5	28.2	25.6	35.2	38.7
POR_9	31.3	21.7	24.3	25.6	35.3	37.4
POR_10	31.2	23.5	27.2	25.6	36.8	38.6
POR_10	31.1	24.6	26.6	25.2	36.7	38.5
POR_11	34.1	22.2	26.5	25.2	37.6	39.7
POR_11	28.9	18.9	22.8	21.8	36.6	37.6
POR_12	32.8	20.5	25.7	24.9	38.1	39.6
POR_12	29.5	18.6	25	23.4	37.8	38.8
POR_13	33.6	22	31.6	25.2	36.6	39.4
POR_13	33.5	21.3	31.9	25.2	36	39.2
POR_14	35.4	28.5	32	25.4	35.8	39.9
POR_14	34.3	28.2	31.7	25	35	39.2
POR_15	33.4	27.5	31.4	24.5	34.2	38.5
POR_15	33.2	27.5	31.3	24.5	33.9	38.3
POR_16	32.6	27.2	31.5	24.6	33.3	37.9
POR_16	32.2	27.1	31.1	23.9	32.8	37.5
POR_17	31.7	26.6	30.9	23.5	32	37.0
POR_17	31.7	26.7	30.8	23.3	31.9	36.9
POR_18	33	33.1	33.7	25.6	31.3	39.1
POR_18	33.1	33	33	24.3	31	38.8
POR_19	33.9	23.5	30.6	16.6	25.6	36.3
POR_19	28.5	19.3	28.9	14.9	20.9	32.4
POR_20	34.1	21.9	37.2	21.8	27.7	39.4
POR_20	29.9	20.7	36.8	19.8	27.3	38.2
POR_21	33.9	19.8	31.5	18.9	25.2	36.4
POR_21	30.4	19.1	29.5	18.6	25	33.9
POR_22	34.1	18.9	33.5	18.1	24.5	37.1
POR_22	31.7	18.6	33	18	24.5	35.9

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.9 Point of Reception Impacts by Source for Scenario 5* - Day

	Daytime Period (07:00 to 19:00)						
ID	Wash_Plant_S5	Generator_S5	IHR_Shipping_S5	IHR_Aggregate_S5	Excavators_S5	Dredge_S5	Total
	dBA	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	31.1	13.8	25.2	9.2	26.4	33.8	36.5
POR_1	29	12.8	23.4	7.8	26.1	33.7	35.8
POR_2	30.8	14	25.2	9.8	26.1	33.6	36.3
POR_2	30.6	13.5	24.6	9.2	26	33.5	36.2
POR_3	29.2	11.8	23.2	9.3	24.9	32.1	34.7
POR_3	27.8	12	23.1	10.1	25.8	33.2	35.2
POR_4	19.8	6.2	18.2	7.5	22.1	29.1	30.6
POR_4	18.5	6.2	17.2	6.9	21.5	28.4	29.9
POR_5	30.5	25.2	23.2	11.9	25.4	34	36.5
POR_5	29.8	25.1	22	10.9	24.3	32.6	35.5
POR_6	30.9	25.8	24.3	12.8	26.3	34.8	37.3
POR_6	30.4	25.8	23.7	12.1	25.1	33.3	36.2
POR_7	23.8	17.1	18.3	6	21.3	27	30.0
POR_7	22	14.7	15.6	4.2	19.4	25	28.0
POR_8	34.4	23.4	29.4	17.9	31.8	39.7	41.7
POR_8	33.3	25.3	24.9	17.5	31.4	37.4	39.9
POR_9	33.5	20.6	25.3	17.9	31.7	38.1	40.3
POR_9	32.7	20.2	25.2	18.1	31.9	38.2	40.2
POR_10	32.4	20.1	25.4	18.9	32.5	39.7	41.2
POR_10	31.2	19.5	25.3	18.7	32.3	39.5	41.0
POR_11	28.6	18.5	25.2	18.3	31.6	40.3	41.2
POR_11	22.8	15	20.6	13.5	27.6	38.2	38.8
POR_12	31.3	19.4	24.9	18.9	33.1	39.7	41.2
POR_12	27.9	17.8	23.8	18.2	32.6	38.8	40.2
POR_13	36	26.2	30.1	22.7	37.3	39.8	43.2
POR_13	31.9	20.5	30.3	22.8	37.5	39.6	42.5
POR_14	36.3	26.4	30.6	23.1	37.8	40	43.4
POR_14	35.8	26.2	30.5	22.6	37.4	39.1	42.9
POR_15	35.7	25.9	30.2	22	37.3	38.6	42.5
POR_15	35.7	26	30.4	22.1	37.5	38.4	42.6
POR_16	35.9	26.1	30.3	21.8	38	38.5	42.8
POR_16	35.5	25.9	30.2	21.5	37.7	37.8	42.3
POR_17	35.4	25.6	29.9	20.8	37.6	37.3	42.0
POR_17	35.4	25.6	30	20.9	37.9	37.1	42.1
POR_18	32.7	21.1	34.5	23.4	41.1	38.4	43.9
POR_18	30.2	20	33	20.8	39.2	37	42.2
POR_19	35.9	31.9	33.1	17.2	32.1	32.1	40.3
POR_19	35.7	32.5	30.4	17	31.9	30.4	39.7
POR_20	36.2	24.4	36.6	14.9	33.7	40.6	43.6
POR_20	35.5	24.5	36.1	14.7	33.3	39.1	42.6
POR_21	30.7	18.1	29.9	13.5	29.3	38.1	39.8
POR_21	29.4	17.7	25.6	10.8	29.3	37.3	38.8
POR_22	36.1	21.3	34.2	15.4	32.2	37.6	41.5
POR_22	36.1	21.3	33.8	15.5	31	37.4	41.3

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8.10 Point of Reception Impacts by Source for Scenario 5* - Night

	Evening and Nighttime Period (19:00 to 07:00)					
ID	Wash_Plant_S5	Generator_S5	IHR_Shipping_S5	IHR_Aggregate_S5	Excavators_S5	Total
	dBA	dBA	dBA	dBA	dBA	dBA
POR_1	31.1	13.8	22.2	7	23.4	32.3
POR_1	29	12.8	20.4	5.6	23.1	30.5
POR_2	30.8	14	22.2	7.6	23.1	32.0
POR_2	30.6	13.5	21.6	7	23	31.9
POR_3	29.2	11.8	20.2	7.1	21.9	30.5
POR_3	27.8	12	20.1	7.9	22.7	29.6
POR_4	19.8	6.2	15.1	5.2	19.1	23.4
POR_4	18.5	6.2	14.2	4.7	18.5	22.4
POR_5	30.5	25.2	20.2	9.7	22.4	32.4
POR_5	29.8	25.1	19	8.7	21.3	31.8
POR_6	30.9	25.8	21.3	10.6	23.2	33.0
POR_6	30.4	25.8	20.6	9.8	22.1	32.5
POR_7	23.8	17.1	15.3	3.8	18.2	26.0
POR_7	22	14.7	12.6	1.9	16.4	24.0
POR_8	34.4	23.4	26.4	15.7	28.8	36.2
POR_8	33.3	25.3	21.9	15.3	28.4	35.2
POR_9	33.5	20.6	22.2	15.6	28.7	35.2
POR_9	32.7	20.2	22.1	15.9	28.8	34.7
POR_10	32.4	20.1	22.4	16.7	29.5	34.7
POR_10	31.2	19.5	22.2	16.5	29.3	33.9
POR_11	26.6	18.5	22.2	16.1	28.6	32.4
POR_11	22.8	15	17.6	11.3	24.6	27.7
POR_12	31.3	19.4	21.9	16.7	30.1	34.2
POR_12	27.9	17.8	20.7	16	29.6	32.4
POR_13	36	26.2	27.1	20.5	34.3	38.9
POR_13	31.9	20.5	27.3	20.6	34.5	37.1
POR_14	36.3	26.4	27.6	20.9	34.8	39.3
POR_14	35.8	26.2	27.5	20.4	34.4	38.9
POR_15	35.7	25.9	27.2	19.7	34.3	38.7
POR_15	35.7	26	27.4	19.9	34.5	38.8
POR_16	35.9	26.1	27.3	19.6	35	39.1
POR_16	35.5	25.9	27.2	19.3	34.7	38.8
POR_17	35.4	25.6	26.9	18.6	34.6	38.6
POR_17	35.4	25.6	27	18.7	34.9	38.7
POR_18	32.7	21.1	31.5	21.2	38.1	40.0
POR_18	30.2	20	30	18.6	36.2	38.0
POR_19	35.9	31.9	30.1	15	29.1	38.6
POR_19	35.7	32.5	27.4	14.8	28.9	38.3
POR_20	36.2	24.4	33.6	12.7	30.7	39.0
POR_20	35.5	24.5	33.1	12.5	30.3	38.4
POR_21	30.7	18.1	26.9	11.3	26.3	33.4
POR_21	29.4	17.7	22.5	8.6	26.3	31.9
POR_22	36.1	21.3	31.2	13.2	29.1	38.0
POR_22	36.1	21.3	30.8	13.3	28	37.8

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8 Distance Source to Point of Reception

ID	Coordinates		Wash_Plant_S1-4	Generator_S1-4	Wash_Plant_S5	Generator_S5
	X (m)		18369513.65	18369519.12	18369167.94	18369176.72
		Y (m)	5044669.86	5044674.76	5044710.19	5044715.84
POR_1_POW	18369771.62	5045346.74	724	718	877	867
POR_1_OPR	18369756.07	5045327.14	701	694	852	842
POR_2_POW	18369829.11	5045332.51	734	727	908	898
POR_2_OPR	18369809.48	5045317.77	712	706	884	873
POR_3_POW	18369870.71	5045252.47	683	676	888	877
POR_3_OPR	18369850.34	5045233.55	657	650	860	850
POR_4_POW	18369964.43	5045230.98	720	713	952	941
POR_4_OPR	18369946.17	5045213.23	694	687	927	916
POR_5_POW	18370057.16	5045138.38	718	710	987	977
POR_5_OPR	18370036.83	5045123.13	692	685	962	952
POR_6_POW	18370107.95	5044832.64	616	610	948	939
POR_6_OPR	18370078.64	5044837.8	589	583	920	910
POR_7_POW	18370583.27	5044465.47	1089	1085	1436	1429
POR_7_OPR	18370556.54	5044473.38	1061	1057	1409	1401
POR_8_POW	18369316.23	5044043.49	657	663	683	687
POR_8_OPR	18369316.35	5044071.66	630	636	656	659
POR_9_POW	18369274.47	5044058.5	656	663	660	665
POR_9_OPR	18369279.29	5044091.41	624	631	629	633
POR_10_POW	18369221.79	5044105.18	636	643	607	612
POR_10_OPR	18369220.42	5044121.04	622	629	591	596
POR_11_POW	18369190.84	5044143.18	618	625	567	573
POR_11_OPR	18369189.09	5044173.12	593	600	537	543
POR_12_POW	18369133.92	5044096.75	687	695	614	621
POR_12_OPR	18369142.96	5044125.82	658	665	585	591
POR_13_POW	18368857.68	5044401.11	709	716	438	448
POR_13_OPR	18368874.27	5044416.5	688	695	415	426
POR_14_POW	18368834.07	5044429.49	721	728	436	447
POR_14_OPR	18368845.69	5044443.94	705	712	418	428
POR_15_POW	18368787.27	5044457.66	757	763	457	467
POR_15_OPR	18368801.33	5044473.19	739	746	437	447
POR_16_POW	18368750.66	5044493.19	783	790	470	481
POR_16_OPR	18368763.42	5044506.53	768	774	453	463
POR_17_POW	18368710.8	5044523.52	816	822	494	504
POR_17_OPR	18368727.48	5044536.62	797	804	473	484
POR_18_POW	18368766.85	5044674.49	747	752	403	412
POR_18_OPR	18368777.25	5044662.75	736	742	394	403
POR_19_POW	18368903.43	5045076.8	733	735	452	453
POR_19_OPR	18368918.93	5045053.4	708	710	424	425
POR_20_POW	18369325.38	5044975.18	359	357	308	299
POR_20_OPR	18369339.4	5044946.29	327	326	292	282
POR_21_POW	18369507.43	5045119.79	450	445	532	522
POR_21_OPR	18369527.38	5045095.5	426	421	527	517
POR_22_POW	18369449.72	5045181.27	515	511	549	540
POR_22_OPR	18369463.94	5045155.06	488	483	534	525

Table A2.9 Sample Calculations – Scenario 1

Receiver
Name: POR_1
ID: POR_1_POW
X: 18369771.62 m
Y: 5045346.74 m
Z: 172.00 m

Point Source, ISO 9613, Name: "Wash_Plant", ID: "Wash_Plant_S1-4"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	Wa	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
108	18369513.65	5044669.86	173.30	0	D	32	70.4	0.0	0.0	0.0	0.0	68.2	0.0	-4.8	0.0	0.0	4.2	0.0	0.0	2.7
108	18369513.65	5044669.86	173.30	0	D	63	70.4	0.0	0.0	0.0	0.0	68.2	0.1	-4.8	0.0	0.0	4.6	0.0	0.0	2.3
108	18369513.65	5044669.86	173.30	0	D	125	88.0	0.0	0.0	0.0	0.0	68.2	0.3	4.2	0.0	0.0	0.7	0.0	0.0	14.5
108	18369513.65	5044669.86	173.30	0	D	250	94.0	0.0	0.0	0.0	0.0	68.2	0.8	5.4	0.0	0.0	0.0	0.0	0.0	19.6
108	18369513.65	5044669.86	173.30	0	D	500	102.0	0.0	0.0	0.0	0.0	68.2	1.4	1.6	0.0	0.0	4.1	0.0	0.0	26.6
108	18369513.65	5044669.86	173.30	0	D	1000	104.8	0.0	0.0	0.0	0.0	68.2	2.6	-0.4	0.0	0.0	6.6	0.0	0.0	27.8
108	18369513.65	5044669.86	173.30	0	D	2000	104.3	0.0	0.0	0.0	0.0	68.2	7.0	-0.6	0.0	0.0	8.0	0.0	0.0	21.7
108	18369513.65	5044669.86	173.30	0	D	4000	100.8	0.0	0.0	0.0	0.0	68.2	23.7	-0.6	0.0	0.0	9.8	0.0	0.0	-0.4
108	18369513.65	5044669.86	173.30	0	D	8000	91.7	0.0	0.0	0.0	0.0	68.2	84.7	-0.6	0.0	0.0	12.1	0.0	0.0	-72.7
108	18369513.65	5044669.86	173.30	0	N	32	70.4	0.0	0.0	0.0	0.0	68.2	0.0	-4.8	0.0	0.0	4.2	0.0	0.0	2.7
108	18369513.65	5044669.86	173.30	0	N	63	70.4	0.0	0.0	0.0	0.0	68.2	0.1	-4.8	0.0	0.0	4.6	0.0	0.0	2.3
108	18369513.65	5044669.86	173.30	0	N	125	88.0	0.0	0.0	0.0	0.0	68.2	0.3	4.2	0.0	0.0	0.7	0.0	0.0	14.5
108	18369513.65	5044669.86	173.30	0	N	250	94.0	0.0	0.0	0.0	0.0	68.2	0.8	5.4	0.0	0.0	0.0	0.0	0.0	19.6
108	18369513.65	5044669.86	173.30	0	N	500	102.0	0.0	0.0	0.0	0.0	68.2	1.4	1.6	0.0	0.0	4.1	0.0	0.0	26.6
108	18369513.65	5044669.86	173.30	0	N	1000	104.8	0.0	0.0	0.0	0.0	68.2	2.6	-0.4	0.0	0.0	6.6	0.0	0.0	27.8
108	18369513.65	5044669.86	173.30	0	N	2000	104.3	0.0	0.0	0.0	0.0	68.2	7.0	-0.6	0.0	0.0	8.0	0.0	0.0	21.7
108	18369513.65	5044669.86	173.30	0	N	4000	100.8	0.0	0.0	0.0	0.0	68.2	23.7	-0.6	0.0	0.0	9.8	0.0	0.0	-0.4
108	18369513.65	5044669.86	173.30	0	N	8000	91.7	0.0	0.0	0.0	0.0	68.2	84.7	-0.6	0.0	0.0	12.1	0.0	0.0	-72.7
108	18369513.65	5044669.86	173.30	0	E	32	70.4	0.0	0.0	0.0	0.0	68.2	0.0	-4.8	0.0	0.0	4.2	0.0	0.0	2.7
108	18369513.65	5044669.86	173.30	0	E	63	70.4	0.0	0.0	0.0	0.0	68.2	0.1	-4.8	0.0	0.0	4.6	0.0	0.0	2.3
108	18369513.65	5044669.86	173.30	0	E	125	88.0	0.0	0.0	0.0	0.0	68.2	0.3	4.2	0.0	0.0	0.7	0.0	0.0	14.5
108	18369513.65	5044669.86	173.30	0	E	250	94.0	0.0	0.0	0.0	0.0	68.2	0.8	5.4	0.0	0.0	0.0	0.0	0.0	19.6
108	18369513.65	5044669.86	173.30	0	E	500	102.0	0.0	0.0	0.0	0.0	68.2	1.4	1.6	0.0	0.0	4.1	0.0	0.0	26.6
108	18369513.65	5044669.86	173.30	0	E	1000	104.8	0.0	0.0	0.0	0.0	68.2	2.6	-0.4	0.0	0.0	6.6	0.0	0.0	27.8
108	18369513.65	5044669.86	173.30	0	E	2000	104.3	0.0	0.0	0.0	0.0	68.2	7.0	-0.6	0.0	0.0	8.0	0.0	0.0	21.7
108	18369513.65	5044669.86	173.30	0	E	4000	100.8	0.0	0.0	0.0	0.0	68.2	23.7	-0.6	0.0	0.0	9.8	0.0	0.0	-0.4
108	18369513.65	5044669.86	173.30	0	E	8000	91.7	0.0	0.0	0.0	0.0	68.2	84.7	-0.6	0.0	0.0	12.1	0.0	0.0	-72.7

Point Source, ISO 9613, Name: "Generator", ID: "Generator_S1-4"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	Wa	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
112	18369519.12	5044674.76	169.50	0	D	32	25.5	0.0	0.0	0.0	0.0	68.1	0.0	-5.2	0.0	0.0	5.3	0.0	0.0	-42.7
112	18369519.12	5044674.76	169.50	0	D	63	61.2	0.0	0.0	0.0	0.0	68.1	0.1	-5.2	0.0	0.0	6.4	0.0	0.0	-8.2
112	18369519.12	5044674.76	169.50	0	D	125	66.4	0.0	0.0	0.0	0.0	68.1	0.3	5.0	0.0	0.0	3.1	0.0	0.0	-10.1
112	18369519.12	5044674.76	169.50	0	D	250	73.6	0.0	0.0	0.0	0.0	68.1	0.7	6.2	0.0	0.0	3.9	0.0	0.0	-5.3
112	18369519.12	5044674.76	169.50	0	D	500	88.6	0.0	0.0	0.0	0.0	68.1	1.4	1.4	0.0	0.0	10.9	0.0	0.0	6.8
112	18369519.12	5044674.76	169.50	0	D	1000	97.9	0.0	0.0	0.0	0.0	68.1	2.6	-0.7	0.0	0.0	14.8	0.0	0.0	13.0
112	18369519.12	5044674.76	169.50	0	D	2000	106.1	0.0	0.0	0.0	0.0	68.1	6.9	-0.9	0.0	0.0	17.7	0.0	0.0	14.2
112	18369519.12	5044674.76	169.50	0	D	4000	102.1	0.0	0.0	0.0	0.0	68.1	23.5	-0.9	0.0	0.0	19.8	0.0	0.0	-8.5
112	18369519.12	5044674.76	169.50	0	D	8000	88.2	0.0	0.0	0.0	0.0	68.1	83.9	-0.9	0.0	0.0	19.9	0.0	0.0	-82.9
112	18369519.12	5044674.76	169.50	0	N	32	25.5	0.0	0.0	0.0	0.0	68.1	0.0	-5.2	0.0	0.0	5.3	0.0	0.0	-42.7
112	18369519.12	5044674.76	169.50	0	N	63	61.2	0.0	0.0	0.0	0.0	68.1	0.1	-5.2	0.0	0.0	6.4	0.0	0.0	-8.2
112	18369519.12	5044674.76	169.50	0	N	125	66.4	0.0	0.0	0.0	0.0	68.1	0.3	5.0	0.0	0.0	3.1	0.0	0.0	-10.1
112	18369519.12	5044674.76	169.50	0	N	250	73.6	0.0	0.0	0.0	0.0	68.1	0.7	6.2	0.0	0.0	3.9	0.0	0.0	-5.3
112	18369519.12	5044674.76	169.50	0	N	500	88.6	0.0	0.0	0.0	0.0	68.1	1.4	1.4	0.0	0.0	10.9	0.0	0.0	6.8
112	18369519.12	5044674.76	169.50	0	N	1000	97.9	0.0	0.0	0.0	0.0	68.1	2.6	-0.7	0.0	0.0	14.8	0.0	0.0	13.0
112	18369519.12	5044674.76	169.50	0	N	2000	106.1	0.0	0.0	0.0	0.0	68.1	6.9	-0.9	0.0	0.0	17.7	0.0	0.0	14.2
112	18369519.12	5044674.76	169.50	0	N	4000	102.1	0.0	0.0	0.0	0.0	68.1	23.5	-0.9	0.0	0.0	19.8	0.0	0.0	-8.5
112	18369519.12	5044674.76	169.50	0	N	8000	88.2	0.0	0.0	0.0	0.0	68.1	83.9	-0.9	0.0	0.0	19.9	0.0	0.0	-82.9
112	18369519.12	5044674.76	169.50	0	E	32	25.5	0.0	0.0	0.0	0.0	68.1	0.0	-5.2	0.0	0.0	5.3	0.0	0.0	-42.7
112	18369519.12	5044674.76	169.50	0	E	63	61.2	0.0	0.0	0.0	0.0	68.1	0.1	-5.2	0.0	0.0	6.4	0.0	0.0	-8.2
112	18369519.12	5044674.76	169.50	0	E	125	66.4	0.0	0.0	0.0	0.0	68.1	0.3	5.0	0.0	0.0	3.1	0.0	0.0	-10.1
112	18369519.12	5044674.76	169.50	0	E	250	73.6	0.0	0.0	0.0	0.0	68.1	0.7	6.2	0.0	0.0	3.9	0.0	0.0	-5.3
112	18369519.12	5044674.76	169.50	0	E	500	88.6	0.0	0.0	0.0	0.0	68.1	1.4	1.4	0.0	0.0	10.9	0.0	0.0	6.8
112	18369519.12	5044674.76	169.50	0	E	1000	97.9	0.0	0.0	0.0	0.0	68.1	2.6	-0.7	0.0	0.0	14.8	0.0	0.0	13.0
112	18369519.12	5044674.76	169.50	0	E	2000	106.1	0.0	0.0	0.0	0.0	68.1	6.9	-0.9	0.0	0.0	17.7	0.0	0.0	14.2

Appendix 3

Manufacturers Data

Contents:

- Manufacturers Data for Silex Silencer Model JB 6.

Manufacturers Data for Silex Silencer Model JB 6

www.silex.com

JB

CRITICAL CYLINDRICAL SILENCERS

25 to 32 dBA Noise Reduction

SILENCER SELECTION

For immediate assistance to select the appropriate silencer that best suits your application's acoustical and backpressure requirements contact Silex Innovations. Or, use our exclusive silencer sizing and selection program, found at www.silex.com.

PERFORMANCE & MATERIALS

The critical grade series are reactive silencers with good acoustical performance. All of the silencers are manufactured from light to heavy gauge steel and finished with high temperature black paint. A drain is included as a standard component on the silencer.

DIMENSIONS

Model	ØA in (mm)	ØB in (mm)	C in (mm)	D in (mm)	F** in (mm)	G in (mm)	H in (mm)	Wgt lb (kg)
JB-1.5	1.5	9(229)	24(610)	30(762)	4(102)	7.5(191)	27(686)	22(10)
JB-2	2	9(229)	24(610)	30(762)	4.5(114)	7.5(191)	27(686)	24(11)
JB-2.5	2.5	10(254)	26(711)	34(864)	5(127)	8(203)	31(787)	34(15)
JB-3	3	12(305)	30(813)	38(965)	5.5(140)	9(229)	35(889)	44(20)
JB-3.5	3.5	14(356)	36(914)	42(1067)	6(152)	10(254)	39(991)	63(29)
JB-4	4	14(356)	48(1016)	48(1219)	6.5(165)	11(279)	45(1143)	77(35)
JB-5	5	16(406)	48(1345)	53(1448)	7(178)	12(305)	53(1346)	107(49)
JB-6	6	18(457)	53(1397)	60(1600)	8(203)	13(330)	59(1499)	130(61)
JB-8	8	20(508)	66(1676)	76(1880)	9.5(241)	15(381)	70(1778)	208(94)
JB-10	10	26(660)	81(2057)	89(2261)	11.5(292)	19(432)	85(2159)	330(150)
JB-12	12	30(762)	96(2388)	102(2591)	13(330)	19(483)	98(2489)	505(229)
JB-14	14	34(914)	99(2515)	109(2769)	15.5(394)	20(508)	104(2642)	642(291)
JB-16	16	40(1016)	108(2749)	118(3023)	16.5(419)	20(508)	114(2896)	871(395)
JB-18	18	45(1143)	117(2972)	127(3226)	18(457)	23.5(597)	123(3099)	1167(529)
JB-20	20	50(1270)	127(3226)	137(3480)	20.5(521)	26(762)	132(3353)	1449(657)
JB-22	22	54(1372)	139(3531)	149(3785)	22.5(572)	28(813)	144(3658)	1772(804)
JB-24	24	60(1524)	150(3861)	167(4115)	24(610)	30(889)	157(3988)	2186(1007)
JB-26	26	64(1626)	173(4394)	180(4648)	25.5(648)	32(940)	178(4521)	2634(1195)
JB-28	28	68(1727)	190(4826)	200(5080)	26.5(673)	34(991)	190(4928)	3078(1487)
JB-30	30	70(1829)	204(5232)	214(5486)	28(711)	41(1041)	211(5359)	3777(1713)

** For F dimension other than that specified, please contact Silex Innovations.

OPTIONS

- Aluminized steel, 304L or 316L stainless steel
- Dual inlet or custom inlet / outlet configurations
- Thermal insulation blankets to suit all configurations
- Mounting brackets, gussets and lifting lugs

Corporate Headquarters
1602 Williams Drive
Georgetown, KY 40324
Tel: 502-570-1600

Silex INNOVATIONS

silex.com

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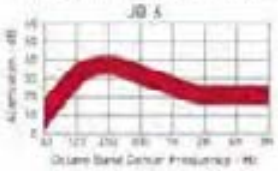
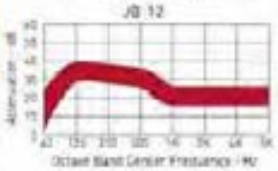
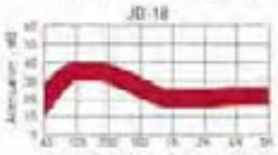
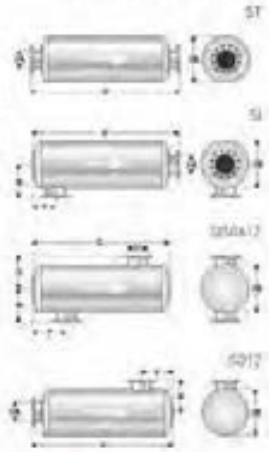
TYPICAL ATTENUATION CURVE







TYPICAL ORIENTATIONS



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

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, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group, R. W. Tomlinson Limited, Geo. Tackaberry Construction, Miller Paving, City of Ottawa.

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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

Member, Australian Acoustical Society

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.