D2 NOISE UPDATED EFFECTS ASSESSMENT REPORT

Marathon Palladium Project Environmental Impact Statement Addendum
Appendix D2: Noise Updated Effects Assessment Report

FINAL

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Abbreviations

A- Weighting	Weighting characteristic that approximates the relative sensitivity of human hearing to different frequencies (pitch) of sound
AIR	Additional Information Request
CEA Act	Canadian Environmental Assessment Act
CEA Agency	Canadian Environmental Assessment Agency
CIAR	Canadian Impact Assessment Registry
dB	Decibel, dimensionless unit of measure for sound pressure level
dBA	A-weighted decibel(s): the sound pressure level modified by application of A-weighting
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EIS	Environmental Impact Statement
GenPGM	Generation PGM Inc.
IR	Information Request
ISO	International Standards Organization
L	Sound pressure level
LD	Daytime noise level
LDN	Day-Night noise level
LN	Nighttime noise level
Leq	Equivalent continuous A-weighted sound pressure level
$L_{eq(1)}$	One-hour Leq
$L_{eq(16)}$	Sixteen-hour Leq
$L_{eq(8)}$	Eight-hour Leq
LSA	Local Study Area
MECP	Ontario Ministry of the Environment, Conservation and Parks
MOE	Ontario Ministry of the Environment (former name for MECP)
MRSA	Mine Rock Storage Area
MTO	Ontario Ministry of Transportation

NPC	Noise Pollution Control Document
NSR	Noise-sensitive receptor(s)
POR	Point of Reception
PSMF	Process Solids Management Facility
RSA	Regional Study Area
SIR	Supplemental Information Request
SSA	Site Study Area
TNM	Traffic Noise Model

1.0 INTRODUCTION

Generation PGM Inc. (GenPGM) proposes to develop the Marathon Palladium Project (the "Project"), which is a platinum group metals (PGM), copper (Cu) and possibly iron (Fe) open pit mine and processing operations near the Town of Marathon, Ontario. The Project is being assessed in accordance with the *Canadian Environmental Assessment Act* (CEA Act, 2012) and Ontario's *Environmental Assessment Act* (EA Act) through a Joint Review Panel (the Panel) pursuant to the *Canada-Ontario Agreement on Environmental Assessment Cooperation* (2004).

The Project is located approximately 10 km north of the Town of Marathon, Ontario (Figure 1, Appendix A). Marathon is a community of approximately 3,300 people (Statistics Canada, 2017) located adjacent to the Trans-Canada Highway (Highway 17) on the northeast shore of Lake Superior approximately 300 km east of Thunder Bay and 400 km northwest of Sault Ste. Marie. The centre of the Project footprint sits at approximately 48° 47' N latitude, 86° 19' W longitude (UTM NAD83 N16 Easting 550197 and Northing 5403595). The footprint of the proposed mine location is roughly bounded by Highway 17 and the Marathon Airport to the south, the Pic River and Camp 19 Road to the east, Hare Lake to the west, and Bamoos Lake to the north. Access is currently gained through Camp 19 Road. For a more detailed description of the Project refer to Chapter 1 of the Environmental Impact Statement (EIS) Addendum (Volume 1) (CIAR #727). Stantec Consulting Ltd. (Stantec) has been retained by GenPGM to conduct an updated assessment of potential noise effects as a result of the Project. This report provides an update to the noise effects assessment desribed in the information currently on the record, including:

- Supporting Information Document #17 (SID#17): Impact Assessment Technical Report – Noise - Marathon PGM – Cu Project prepared by True Grit Consulting Ltd. (July 5, 2012) (CIAR #233)
- Supporting Information Document #13 (SID#13): Baseline Technical Report – Noise - Marathon PGM – Cu Project prepared by True Grit Consulting Ltd. (July 5, 2012) (CIAR #233)
- Response to IR11.1 through 11.11 (CIAR #435, 463, 395, 374, 444, 395)
- Response to SIR2 Measuring Baseline Levels (CIAR #577)
- Response to AIR15 Baseline Noise Level (CIAR #664)

This updated noise effects assessment has been completed to inform the Addendum to the Marathon PGM-Cu Environmental Impact Statement (EIS Addendum) as input to the Joint Review Panel process. It has been prepared pursuant to CEA Act, 2012 and in consideration of the *Guidelines for the Preparation of an Environmental Impact Statement – Marathon Platinum Group Metals and Copper Mine Project* (EIS Guidelines) (Canadian Environmental Assessment Agency (CEA Agency) and Ontario Ministry of the Environment (MOE, now the Ontario Ministry of the Environment, Conservation, and Parks (MECP)), 2011).

1.1 ASSESSMENT PURPOSE AND OBJECTIVES

The purpose of this updated effects assessment is to address 'changes' that may have occurred since the original assessment, including:

1) Changes to the characterization of existing baseline conditions since previous baseline studies, as documented in the Noise Updated Baseline Report (CIAR #722)

2) Changes to applicable criteria, standards, and/or thresholds for determining the significance of potential residual environmental effects

3) Changes to the Project, including refinements to project components and activities implemented by GenPGM

The information presented in this report is intended to identify changes from the original assessment and provide an updated effects assessment for noise and vibration at key receptors in order to determine potential and residual cumulative changes with the Project. The impact assessment includes the following sections:

- Project overview and purpose of this assessment, as well as the identification of spatial and temporal Project boundaries and noise-sensitive receptors (NSRs) (Section 1.0)
- Summary of previous impact assessment findings (Section 2.0)
- Identification of regulatory framework used for the assessment (Section 3.0)
- Review of existing conditions specific to the relevant effects being assessed (Section 4.0)
- Explains the methodology and approach used to conduct the impact assessment (Section 5.0)
- Presents the results and mitigation measures to be implemented (Section 6.0)
- Updated summary of potential predicted residual and cumulative effects (Section 7.0)

1.2 ASSESSMENT BOUNDARIES

For the purpose of this assessment, the spatial boundaries considered include the direct and indirect effects related to site preparation, construction/commissioning, operation, and decommissioning/post-closure of the Project. These areas are generally consistent with the spatial boundaries used in the original EIS (2012) and associated supporting information documents, with appropriate revisions / refinements and rationale provided below. The Site Study Area (SSA), Local Study Area (LSA) and Regional Study Area (RSA) are shown on Figure 1 (Appendix A).
Furthermore, Figure 1 (Appendix A) shows the limits of surface mining rights controlled through surface leases registered to GenPGM which are referred to as the modelling boundary for the purpose of this

assessment. It was assumed that noise-sensitive developments would not be constructed within this area during the life of the Project.

1.2.1 Site Study Area (SSA)

The Site Study Area (SSA) is the direct footprint of the Project (Figure 1, Appendix A). Based on refinements to the Project footprint, and in recognition of project components originally located outside of the SSA, a revised SSA has been developed that encompasses the immediate area in which Project activities and components may occur and, as such, represents the area within which direct physical disturbance may occur as a result of the Project, whether temporary or permanent.

1.2.2 Local Study Area (LSA)

The Local Study Area (LSA) is the maximum area within which environmental effects from Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence (Figure 1, Appendix A).

Although the LSA was described in Sections 2.4 and 6.2 of the original EIS (2012), it was not highlighted again in the Impact Assessment Technical Report SID #17 (CIAR #233). Therefore, for the purpose of this updated report, an LSA is included that encompasses the SSA and includes NSRs within a 1 km setback from the SSA.

1.2.3 Regional Study Area (RSA)

The Regional Study Area (RSA) is the area within which residual environmental effects from Project activities and components may interact cumulatively with the residual environmental effects of other past, present and future (i.e., certain or reasonably foreseeable) physical activities. The RSA is based on the potential for interactions between the Project and other existing or future potential projects (Figure 1, Appendix A).

Although the RSA was described in Sections 2.4 and 6.2 of the original EIS Report (2012), it was not highlighted again in the Impact Assessment Technical Report SID #17 (CIAR #233). Therefore, for the purpose of this updated report, an RSA is included that encompasses the SSA and includes NSRs within a 5 km setback from the SSA, as well as the Town of Marathon.

1.3 TEMPORAL BOUNDARIES PHASES

The temporal boundaries for the Project are defined by the duration and timing of the individual Project phase (Phase I – Site Preparation, Construction and Commissioning, Phase II – Operations, Phase III – Decommissioning and Post Closure). Through refinements to the Project, the timing and duration of these phases has been revised as follows:

- **Phase I Site Preparation and Construction**: This phase consists of pre-operation activities to prepare the site for excavation activities, which includes site preparation and construction activities to be completed concurrently over a period of 18-24 months (previously 18 months)
    - **Phase 1A Site Preparation:** This phase consists of site clearing, grading and excavation to permit the subsequent construction
    - **Phase 1B Construction:** This phase consists of the building of the physical infrastructure and structures necessary to bring the Project into production
- **Phase II – Operations**: This phase consists of the extraction and processing of selected minerals and will last for approximately 12.7 years (previously 11.5 years)
- **Phase III – Decommissioning and Post Closure**: While the site will be reclaimed on an on-going basis to the extent practical during all previous phases, this phase consists of the relatively intense period of reclamation and decommissioning upon cessation of mine operations and the duration of time required for the mine site to be stabilized following implementation of the closure plan.
    - **Phase IIIA – Decommissioning/Closure:** This phase will occur throughout the life of the project but the most intensive part (i.e., decommissioning activities), which will occur post-operation, will last for approximately 2 years (no change, previously 2 years)
    - **Phase IIIB – Post-Closure:** This phase will occur following substantial completion of all on-site decommissioning activities and will consist primarily of follow-up and monitoring programs and the subsequent stabilization of existing environmental conditions specific to each VEC (i.e., regeneration of vegetative cover, stabilization of water levels in the pits). For the purposes of the effects assessment, this phase is anticipated to last for up to approximately 45 years (to be confirmed based on the results of the effects assessment) (no change, previously 45 years)

A review of the Impact Assessment Technical Report SID #17 (CIAR #233) identifies the following temporal phases originally considered for the Project:

- Phase 1 (Site Preparation) and Phase 2 (Construction and Commissioning) were assessed concurrently for construction noise and vibration impacts.
- Phase 3 (Operations) was assessed for operational noise and vibration impacts.
- Phase 4 (Decommissioning and Post Closure) was not assessed, as these activities are of reduced or no impact for noise and vibration compared to Phase 3.

2.0 PREVIOUS ASSESSMENT OF POTENTIAL EFFECTS

The Impact Assessment Technical Report SID #17 (CIAR #233) and supporting IRs include the previous assessment of potential noise and vibration effects for the Project. These are summarized below in Table 2.1.

Table 2.1: Previous Assessments

Phase	Reference	Overview of Impact
Site Preparation	SID#17	The highest predicted hourly sound levels from site preparation at the Project site ranged from 23.6 dBA to 39.0 dBA which were below the NPC-300 criteria at the closest representative NSRs.
Construction and Commissioning	SID#17	The range of highest predicted hourly sound levels from construction at the Project site ranged from 26.0 dBA to 41.6 dBA which were below the NPC-300 criteria at the closest representative NSRs. For construction traffic noise impacts, sound level increases of 0.1 to 0.2 dB were reported for most NSRs. One NSR (Hare Lake Cottage) showed a sound level increase of 3.8 dB, which is below the 5 dB threshold identified by the Ontario Ministry of Transportation (MTO) to address mitigation. The reported sound level of 12.3 dBA was also well below the NPC-300 criteria of 55 dBA for traffic noise impact mitigation.
Operations – Project Site	SID#17	The range of highest predicted hourly sound levels from operations at the Project Site were below the NPC-300 criteria at the closest representative NSRs as shown below. • 33.2 dBA to 43.1 dBA in Year 3 • 32.7 dBA to 43.1 dBA in Year 6 • 32.6 dBA to 43.1 dBA in Year 11 We note that a Year 0 (start of operations) scenario was not included in the previous assessment. We consider that the Year 2 operating scenario is applicable to the worst-case noise impacts based on the current Project operating assumptions provided by GenPGM. Other operating years do not require assessment.
Operations - Operations Traffic, Highway 17	SID#17	For operations traffic noise impacts, sound level increases of 0.0 to 0.4 dB were reported for the NSRs which were below the 5 dB threshold identified by MTO to address mitigation.
Operations – Rail Loadout Route for Option 1	SID#17	For rail loadout (Option 1) traffic noise impacts, sound level increases of less than 1.5 dB were reported for most NSRs. One NSR (Kingdom Hall Church) showed a sound level increase of 1.9 dB, which was below the 5 dB threshold identified by MTO to address mitigation.

Table 2.1: Previous Assessments

Phase	Reference	Overview of Impact
Operations – Rail Loadout Route for Option 2	SID#17	For rail loadout (Option 2) traffic noise impacts, sound level increases of less than 4.5 dB were reported for most NSRs which were below the 5 dB threshold identified by MTO to address mitigation. One NSR (Seniors' Centre) showed a sound level increase of 5.3 dB. Although this was above the 5 dB threshold for MTO to trigger a review for mitigation, the absolute traffic sound level was 51.8 dB which was below the NPC-300 criterion of 55 dBA for traffic noise impact mitigation. Therefore, mitigation was not investigated at this location, although the increase was noted to be a perceptible increase in traffic noise by the residents of the Senior's Centre.
Operations – Rail Loadout Facility for Option 1	SID#17	For rail loadout (Option 1) facility noise impacts, the highest predicted hourly sound level at the nearest NSR was 44.0 dBA, which was below the NPC-300 criteria.
Operations – Rail Loadout Facility for Option 2	SID#17	For rail loadout (Option 2) facility noise impacts, the highest predicted hourly sound level at the nearest NSRs was 43.1 dBA which was below the NPC-300 criteria.
Decommissioning and Post Closure	SID#17	Decommissioning and post-closure impact phases were not identified in the previous assessment. It was assumed that the noise impacts during this phase are less than those during operations. Therefore, decommissioning and post-closure do not need to be assessed.

Blasting noise and vibration impacts were also assessed (SID #17[CIAR #233], IR 11.2, 11.6 [CIAR #489]).

Human health effects were qualitatively assessed using the MECP exclusionary criteria. The MECP criteria is based on perceptibility and annoyance (IR 11.4 [CIAR #489]).

Wildlife effects were qualitatively assessed (IR 11.1 [CIAR #489]).

The following noise and vibration assessments have been identified for this update but were not included in the previous assessment: human health effects with respect to updated Health Canada Guidelines; and blasting impacts on fish habitat. The assessment for each of these has been included in Chapter 6 of the EIS Addendum (Volume 2) under their respective section.

3.0 REGULATORY BACKGROUND AND ASSESSMENT CRITERIA

The Noise Impact Assessment Technical Report SID #17 (CIAR #233) was completed in accordance with several reference publications (Table 3.1). Some of these references have since been considered obsolete and replaced with newer guidance documents.

The provincial assessment methodology and criteria was developed by the MECP to identify an adverse effect on NSRs; where an adverse effect may include a health effect and/or loss of enjoyment of normal property use. The federal assessment methodology and criteria was specifically developed by Health Canada to identify an adverse effect on human health (See Section 6.2.10 [Human Health] of the EIS Addendum [Vol 2]). The provincial and federal methodologies/criteria are independent of one another but are both used by each respective agency to identify adverse effects.

Table 3.1: Reference Publications

Effects Assessment	Current Reference Document	Obsolete or Replaced Reference Document
Stationary Noise Impact – Operations and Construction	• MECP publication NPC-300; Stationary and Transportation Source – Approval and Planning (NPC-300) • MECP publication NPC-104: Adjustments for Intermittency and Tonality (NPC-104). • MECP publication NPC-233: Information to be Submitted for Approval of Stationary Sources of Sound (NPC-233).	• MECP publication LU-131: Noise Assessment Criteria in Land Use Planning (LU-131). • MECP publication NPC-205: Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (NPC-205). • MECP publication NPC-232: Sound Level Limits for Stationary Sources in Class 3 Areas (NPC-232).
Traffic Noise Impact	• MECP publication NPC-300; Stationary and Transportation Source – Approval and Planning (NPC-300) • MECP publication: Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT). • Ministry of Transportation (MTO), Environmental Guide for Noise (MTO Guide), dated October 2006.	• MECP publication NPC-206: Sound Level due to Road Traffic (NPC-206).
Blasting, General	• MECP publication NPC-119: Blasting (NPC-119).	• Not Applicable
Human Health Effects	• Health Canada Guidance for Evaluating Human Health Impacts in Environmental Assessment: NOISE, 2017 (HC NOISE)	• Not Applicable
Wildlife	• Government of Canada, Guidelines to reduce risk to migratory birds (https://www.canada.ca/en/environment-climate-	• Not Applicable

Table 3.1: Reference Publications

Effects Assessment	Current Reference Document	Obsolete or Replaced Reference Document
	change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html#toc5)	
Blasting Effects, Fish	• D.G. Wright G.E Hopky. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters, (DFO BLASTING)	• Not Applicable

4.0 EXISTING CONDITIONS

Noise baseline data was collected between 2009 and 2013 through a combination of field measurement and traffic noise modelling for the Project. These results were presented in the Baseline Technical Report SID #13 (CIAR #233), Marathon Palladium Project Environmental Noise Updated Baseline Report (Stantec 2020) (CIAR #722), and through supplemental work prepared through the IR process to address MECP comments (CIAR #732). The original noise baseline was reviewed and noted that no significant revisions were required to the original work presented. During the review it was noted that newer baseline traffic data from the MTO was available for Highway 17. Since the impact traffic model was being updated to address 'changes' that may have occurred since the original assessment, the baseline traffic modelling was also updated to include the newer MTO traffic data.

A summary of the baseline noise assessment is provided here for reference. Further details on this noise baseline can be found in the reports noted above.

4.1 NOISE-SENSITIVE RECEPTORS

Figure 2 (Appendix A) shows the locations of the NSRs identified for the Project. This list includes representative receptors (typically the closest to the Project activities) identified as Points of Reception (PORs) adjacent to the SSA and within the Town of Marathon. The rest of the NSRs in the LSA and RSA are expected to experience lower sound levels due to increased setback distances and screening provided by intervening structures. A list of the representative NSR used in the assessment is provided in Table 4.1.

Table 4.1: Noise-Sensitive Receptors

NSR Description	Location	Number of Storeys
Project Site		
North Hare Lake Cottage (PS_1)	Hare Lake	1
South Hare Lake Cottage (PS_2)	Hare Lake	1
May's Gifts (PS_3)	Highway 17	1
Wayfare Inn (PS_4)	Highway 17	2
Peninsula Inn (PS_5)	Highway 17	2
Travelodge Hotel (PS_6)	Highway 17	2
Laughing Moose Restaurant and Residence (PS_7)	Highway 17	1
Residence (PS_8)	Highway 17	2

Table 4.1: Noise-Sensitive Receptors

NSR Description	Location	Number of Storeys
Rail Loadout Transportation Routes		
Anglican Church (PW_5)	Steven's Avenue	1
Bayview Apartments (R_8)	Steven's Avenue	3
Senior's Centre (RH_2)	Steven's Avenue	2
Catholic Church (PW_4)	Steven's Avenue	1
Condominium (R_5)	North corner of Peninsula Road and Hemlo Drive	3
Harbour Inn (O_2)	Peninsula Road	1
Hospital (H_1)	Peninsula Road	2
Library (O_5)	Peninsula Road	2
Pic Motel (O_1)	Peninsula Road	1
Kingdom Hall Church (PW_1)	Peninsula Road	1
Zero-100 Motor Inn (O_3)	Peninsula Road	1
Residence (R_1)	North corner of Peninsula Road and Industrial Park Road	1
Residence (R_14)	North corner of Peninsula Road and Ontario Street (Across from Hospital)	1
Residence (R_13)	South corner of Peninsula Road and Ontario Street (Across from Hospital)	1
Residence (R_15)	Northeast corner of Ontario Street and Alberta Street	1
Residence (R_12)	North End of Steedman Drive	1
Residence (R_11)	Southwest corner of Sund Crescent and Peninsula Road	1
Residence (R_23)	East corner of Stevens Avenue and Drake Street	2
Residence (R_9)	West side of Whitman Court	2
OPP Station (O_4)	101 Peninsula Road	1
I Sew Studio and Residence (R_7)	3 Woodsen Street	1
Bergagnini Apartment Rental (R_3)	85 Peninsula Road	2
Residence (R_24)	18 Manitoba Street	2
Residence (R_25)	102 McKenzie Street	1

The Town of Marathon zoning map (Figure 2, Appendix A) was reviewed to identify if there were vacant lots in the vicinity of the Project that could be developed into a sensitive land use. The vacant area in the SSA is zoned rural and surrounding vacant areas are zoned rural and heavy industrial. Residential is a permitted use in a rural zone; however, access to most of the rurally-zoned lands is restricted by mining surface rights retained by GenPGM. See Figure 2 (Appendix A) for the mining surface rights boundary and the noise modelling boundary. Access to rurally-zoned lands outside of the modelling boundary is

limited to Highway 17 and the Hare Lake access road. There are two NSRs on existing Hare Lake cottages and multiple NSRs on the north side of Highway 17 that were included in the assessment.

Multiple NSRs assessed in the Town of Marathon were closer than any sensitive vacant lots to the rail loadout route/facility.

The NSR assessment areas that were selected for the Project are representative of worst-case Project impacts since they are closer to the Project than accessible sensitive vacant lots. Therefore, the representative NSRs selected for assessment adequately cover potential vacant lot receptors for the Project.

4.2 FIELD SURVEYS AND MODELLING

Baseline noise measurements were completed in August 2009 as part of the original Baseline Acoustical Technical Report (SID #13) (CIAR #233). Further to review and comment by the MECP, updated baseline noise measurements were completed in September 2013. The measurement procedures and locations were approved by the MECP in a pre-test plan. GenPGM has not updated the baseline measurements since 2013 and considers them representative of the current (2021) condition as there have been no significant changes within the LSA or RSA that would change the ambient noise in the area.

Baseline noise modelling was completed in the Baseline Technical Report (SID #13) (CIAR #233) to produce noise grid maps describing baseline traffic noise conditions at the Project site, along Highway 17 and within the Town of Marathon. Two noise models were prepared to provide the following: 1) baseline traffic noise at the nearest NSR (May's Gifts), and 2) baseline traffic noise along Highway 17 and within the Town of Marathon.

4.3 UPDATES TO BASELINE CONDITIONS

The following updates to baseline noise conditions were reviewed and incorporated as appropriate.

- Updated 2016 MTO traffic data on Highway 17 was available. GenPGM updated the baseline modelling to include this updated traffic data.
- Stantec has confirmed with GenPGM that there are no changes to the original receptors since the Baseline Technical Report (SID #13) (CIAR #233) was completed, and that the original receptors do not need to be updated.
- Stantec confirmed with GenPGM that there are new receptors since the Baseline Technical Report (SID #13) (CIAR #233) was completed. Although the original receptors were still considered representative of characterizing project impacts, the new receptors were assessed when the baseline traffic data was remodelled using the updated MTO traffic data.

5.0 EFFECTS ASSESSMENT METHODOLOGY

The updated noise effects assessment methodology applied to assess noise and vibration for the construction and operations of the Project are defined as follows: construction noise impact, operations noise impact, traffic noise impact and blasting noise impact. Additionally, an assessment for human health criteria and wildlife are also provided.

5.1 UPDATES TO IMPACT CONDITIONS

The following updates to impact noise conditions were reviewed and incorporated as appropriate.

- The Process Solids Management Facility (PSMF) construction activities increased and were also considered during operational phases and mitigated by to account for increasing the berm heights.
- The open pit configuration changed from mining six pits to three pits (North, Central and South).
- The location of the Project infrastructure (road, building and process equipment) was rearranged.
- Traffic volumes of concentrate to the rail loadout were modelled assuming 30 trucks per day. This includes a minimum of 10 concentrate trucks (which will be used to transfer PGM-copper concentrate to the rail loadout per day), plus an additional 20 loads of copper and iron-nickel concentrates per day if market conditions are favourable. While the number of additional trucks may vary (i.e., 0 to 30) based on market conditions, 20 additional trucks per day was considered most likely.
- The rail loadout building configuration and most loadout noise sources were moved inside the building.
- The blasting detonation charge increased.

5.2 NOISE MODELLING

The Impact Assessment Technical Report SID #17 (CIAR #233) completed predictive noise modelling for site preparation, construction, and operations (years three, six and eleven). For the updated noise effects assessment, predictive noise modelling was completed to determine future Project noise emissions for two Project phases: Construction (Year –1) and Operations (Year 2). Based on the Project operating assumptions and results presented in SID #17 (CIAR #233), we consider that the construction scenario in Year –1 will be the worst-case pre-operations year with respect to noise. We consider that the operations scenario Year 2 will be applicable to the worst-case operating year with respect to noise based on the following:

- The open pit extraction volumes are at or near maximum capacity.
- The south open pit (closest to nearest receptors) extraction is near surface.

- The PSMF construction/earthwork location is closest to the NSR.

The updated noise effects assessment also assesses noise impacts from the rail loadout traffic and facility. Sound levels from both facility option 1 and 2 showed compliance with applicable MECP criteria in SID #17 (CIAR #233). The facility noise impacts from both options at the NSR were similar in magnitude (~1 dB difference); however, the rail loadout option 2 travel route was longer and interacts with more NSRs in the Town of Marathon. Therefore, option 2 was the worst-case rail loadout facility location assessed with respect to noise.

SID #17 (CIAR #233) used the SoundPLAN software to complete both construction and operational noise modelling. For the updated noise effects assessment, the CADNA/A software was used. Both software programs adopted the ISO 9613-2 outdoor sound propagation standard and are considered comparable. CADNA/A was used to update the noise prediction modelling for compatibility with Stantec technical resources, and in recognition of MECP familiarity with the software.

The version 2.5 traffic noise model (TNM) component developed by the US Federal Highway Administration (FHWA), as incorporated into the CADNA/A software, was used to predict traffic noise from the Project access road (Camp 19 Road), along Highway 17 and within the Town of Marathon. SoundPLAN also utilizes the TNM 2.5 traffic noise model, as used in SID #13 (CIAR #233) and SID #17 (CIAR #233). Comparison between both software programs show similar predictive results.

We also understand that the MECP accepts TNM 3.0 as a valid traffic noise model. However, since the CADNA/A software does not yet incorporate the TNM 3.0 model, the TNM 2.5 model has been used to predict traffic noise level. TNM 2.5 has been a North American industry standard prediction model for traffic noise, and is generally accepted for the purpose of noise prediction and assessment. However, to assess whether variances exist between the TNM 2.5 and TNM 3.0 versions, a prediction comparison of TNM 2.5 and 3.0 results was also completed.

Stationary sources emitting sound into the environment were modelled conservatively as concentrated point sources. Dozers, excavators and compactors were assumed to be stationary sources and grouped in areas closest to the NSR. Since this equipment is mobile during operation, the distance from the equipment to the NSR will vary and sound levels will decrease as equipment moves away from the NSR. Furthermore, the equipment was assumed to be operating at maximum capacity for the full hour which may be conservative since the equipment may idle or be working at a reduced capacity based on the task.

Automobiles and mining trucks were modelled as line sources, while emissions through building openings as well as activities occurring over larger areas were modelled as vertical area sources.

Representative site terrain data was used for this assessment. A ground absorption factor of 0.7 was used to represent the combination of vegetation, forested areas, waterbodies and compacted ground at the Project site. A ground absorption of 0.3 was used to represent the compacted and reflective ground in

the Town of Marathon. Two orders of reflection were considered in the assessment. No foliage was considered in the model for forested areas, conservatively.

Commonly accepted meteorological values for Ontario were used to initialize several parameters in the model. These included a temperature of 10 degrees Celsius and a relative humidity of 70%.

5.3 FACILITY CONSTRUCTION AND OPERATIONS

ISO 9613-2 standard for outdoor sound propagation algorithm in CADNA/A was used to predict stationary/mobile noise impacts at the Project site within the modelling boundary during construction and operations. The US FHWA TNM 2.5 incorporated into CADNA/A was used to predict traffic noise from the Project access road within the modelling boundary. Noise impacts were assessed by comparing the predicted hourly continuous sound levels to the relevant MECP criteria.

Noise source summary tables for the construction phase and operations phase are provided in Appendix C and list the noise sources and assumptions used in the assessment. The sound power levels for the noise sources were taken from the equipment manufacturers' datasheets (where available), Stantec's database, and/or estimated based on the equipment capacity when not available. Sound power levels from Stantec's database are based on site measurements from similar projects that were taken in accordance with applicable MECP guidelines. Outdoor source sound power levels less than 100 dBA and indoor sources enclosed within buildings (with no significant openings) were considered insignificant and not included in the updated modelling. It was assumed that the Project equipment within the SSA would operate 24 hours per day and seven days per week. The conceptual design contemplates Project equipment operating during the day/evening was also assumed to be operating during the night, at permitting, limitations around the following activities will need to be confirmed at the PSMF during both the construction and operation phases:

- The compactors do not operate between the hours of 11:00 pm and 7:00 am for both construction and operations phases.
- During operations, the bulldozer working on the southern portion of PSMF berm does not operate between the hours of 11:00 pm and 7:00 am
- In the southern portion of the PSMF, if heavy equipment activities are focused in one general area and equipment is congregating during operations, equipment may be required to idle while trucks are dumping and/or truck traffic would be reduced to an average of 4 haul trucks per hour from 11:00 pm to 7:00 am

Noise source location plans for the construction phase are provided as Figure 3 to Figure 5, Appendix A.

- Figure 3: Construction Source Location Plan - Overview
- Figure 4: Construction Source Location Plan - Primary Crusher Building

- Figure 5: Construction Source Location Plan - Processing Area

Noise source location plans for the operations phase are provided as Figure 7 to Figure 9**,** Appendix A.

- Figure 7: Operations Source Location Plan – Overview
- Figure 8: Operations Source Location Plan - Primary Crusher Building
- Figure 9: Operations Source Location Plan - Processing Area

A separate assessment was completed to assess the cumulative noise impact of the existing Marathon Waste Disposal Site (MWDS) and the Marathon Waste Transfer Site (MWTS) operations at the receptors when combined with the Project operational noise.

The MWDS is located on Camp 19 Road and is approximately 1,200 m away from the closest receptors along Highway 17 (Travelodge and Residence) and approximately 2,600 m away from May's Gifts. The MWDS only operates during the daytime. Based on information provided by the Town of Marathon, there is a loader, excavator and compactor that operate at the site with a maximum of 13 heavy vehicles travelling to the site per day (the landfill is not open to the public).

The MWTS is located on Penn Lake Road in the Town of Marathon and is approximately 450 m away from the closest receptor (Harbour Inn). This POR had the highest Project-related impact as a result of the proposed rail loadout facility, and was selected for the evaluation of cumulative impact resulting from the MWTS. The MWTS only operates during the daytime. Based on information provided by the Town of Marathon, there is a loader, three hydraulic storage bins, and a compaction trailer that operate at the site. A maximum of 40 passenger vehicles and 1 heavy vehicle travel to the site per day (the waste transfer site is open to the public).

5.3.1 Criteria – Steady-State Noise

The Project site southern modelling boundary area along Highway 17 contains an acoustic environment dominated by road traffic from Highway 17. In accordance with NPC-300, the Highway 17 corridor was conservatively identified as a Class 2 area.

The Project site western modelling boundary near Hare Lake contains an acoustic environment dominated by natural sounds with little to no road traffic. In accordance with NPC-300, the Hare Lake area is identified as a Class 3 area.

For the noise impact assessment of stationary steady-state noise during operations, the NPC-300 exclusionary noise limits were applied for the Project (Table 5.1).

Table 5.1: Facility Steady-State Noise Sound Limits

Time of Day	Exclusionary Limit ($L_{eq(1)}$ dBA)	
	Class 2 Area for Receptors along Highway 17	Class 3 Area for Receptors at Hare Lake
07:00 – 19:00	50	45
19:00 – 23:00	50	40
23:00 – 07:00	45	40

5.4 TRAFFIC

The US FHWA TNM 2.5 incorporated into CADNA/A was used to predict traffic noise outside of the modelling boundary from Highway 17 and within the Town of Marathon. Baseline noise at NSRs along Highway 17 and the proposed Town of Marathon transportation corridor is dominated by roadway traffic noise. It is expected that the Project may result in increased traffic volumes, which may result in an associated noise impact. Noise impacts were assessed by comparing the predicted 16-hour continuous sound levels to the relevant provincial criteria.

Project-related traffic utilizing the Highway 17 and Town of Marathon transportation corridors is limited to the hours of 7:00 am to 11:00 pm. According to the Project description, the mine site shift changes will occur at 7:00 am and 7:00 pm. Concentrate hauling to the proposed rail loadout facility will occur between the hours of 7:00 am and 11:00 pm. Criteria relevant during this period are summarized below.

The original noise baseline traffic modelling was reviewed and it was noted that no significant revisions were required to the original work presented. During the review, it was noted that newer baseline traffic data from the MTO was available for Highway 17. Since the impact traffic model was being updated to address ‘changes’ that may have occurred since the original assessment, the baseline traffic modelling was also updated to include the newer MTO traffic data.

Baseline and Project traffic data for both construction and operational phases are provided in Appendix D**.** A noise source location plan for the construction traffic is provided as Figure 6 (Appendix A). A noise source location plan for the operations traffic is provided as Figure 10 (Appendix A)**.**

5.4.1 Criteria

MECP publication NPC-300, which includes land use planning, contains a road traffic daytime criterion for 16-hour equivalent continuous sound level ($L_{eq(16)}$) for sensitive outdoor living environments (Table 5.2). This has been adopted as the base noise level limit for combined baseline traffic and Project traffic noise at the NSR.

Table 5.2: Road Traffic Daytime Outdoor Sound Limits

Time Period	Road Traffic Noise Limit Leq 16hr dBA
16-hour, 07:00 – 23:00	55

Highway 17 is also a provincial highway and Peninsula Road (Town of Marathon Access) is a former provincial Highway (formerly Highway 626). The MTO Guide identifies that mitigation (noise barriers) is necessary to reduce the impact of traffic noise when the predicted $L_{eq(16)}$ is greater than 65 dBA and the increase is at least 5 dB greater than the baseline $L_{eq(16)}$. The MTO Guide states that noise mitigation is not required when the predicted $L_{eq(16)}$ is less than 65 dBA and the increase in traffic noise is less than 5 dB.

Since the MTO Guide is used to assess highway traffic noise, the 65 dBA exclusionary noise limit may be excessive for the entire travel route in the Town of Marathon; instead, the 55 dBA criterion has been adopted. But consideration to implement mitigation based on a 5 dB increase in road traffic noise, as this represents a perceptible increase in loudness, is an appropriate consideration for this noise impact assessment.

5.5 RAIL LOAD OUT

ISO 9613-2 standard for outdoor sound propagation algorithm in CADNA/A was used to predict stationary and mobile noise impacts at rail loadout facility location 2.

Each of the two proposed rail loadout facilities is located in an acoustic environment dominated by road traffic with an evening background sound level infrequent of human activity. The MECP publication NPC-300 noise guideline for stationary noise is applicable to the rail loadout facility.

A noise source summary table for the rail load out facility in the operations phase is provided in Appendix C which lists the noise sources and assumptions used in the assessment. It was assumed that the rail loadout facility would operate between the hours of 7:00 am and 11:00 pm. Also, it was assumed that an average of three rail car couples would occur in a given hour.

A noise source location plan is provided as Figure 10, Appendix A.

5.5.1 Criteria – Steady State Noise

In accordance with NPC-300, these proposed rail loadout locations are identified as Class 2 areas. NPC-300 states that no restrictions apply to any stationary source resulting in an $L_{eq(1)}$ at a Class 2 sensitive POR lower than the following daytime and nighttime exclusionary limits (Table 5.3).

Table 5.3: Rail Loadout Steady-State Noise Sound Limits

Time of Day	Exclusionary Limit ($L_{eq(1)}$ dBA)	
	Outdoor Point of Reception	Plane of Window of Noise Sensitive Spaces
07:00 – 19:00	50	50
19:00 – 23:00	45	50
23:00 – 07:00	-	45

5.5.2 Criteria – Impulse Noise

For the noise impact assessment of impulsive noise for operations (e.g. coupling at rail loadout), the NPC-300 exclusionary noise limits for impulsive noise were applied for the Project (Table 5.4).

Table 5.4: Rail Loadout Impulsive Noise Sound Limits

Time of Day	Actual Number of Impulses in Period of One-Hour	Class 2 Exclusionary Limit (LLM, dBAI)
07:00 – 23:00	9 or more	50
	7 to 8	55
	5 to 6	60
	4	65
	3	70
	2	75
	1	80

5.6 BLASTING

Blasting during Project development is impulsive and provides a low frequency air blast and ground vibration at large distances. Air blast is low frequency sound generated by energy waves transferred through the air. Vibration is energy waves transferred through the ground and characterized by particle velocity.

Blasting is assessed based on potential structural damage to buildings. The type of geology and the blast configuration influence how the energy of the blast is released into the atmosphere. During a blast, the majority of the energy is consumed in fragmenting the desired portion of rock with the remaining energy released as undesirable by-products including airblast and ground vibration.

Blasting was analyzed separately from the regular continuous operations at the Project site, according to the requirements of NPC-119.

5.6.1 Criteria

MECP publication NPC-119, USBM 8485 and USBM 8507 were assessed to determine regulatory blasting criteria for the Project site. NPC-119 provides Ontario regulatory criteria intended to reduce annoyance and structural damage to neighbouring buildings, while USBM 8485 and 8507 are US regulatory documents based on physical studies related only to the effect blasting has on structures.

MECP publication NPC-119 restricts the peak air blast level at a structure to 120 dB as a cautionary limit. If the blasting operation carries out routine monitoring (air blast and vibration), the peak air blast level at a structure is restricted to 128 dB. NPC-119 also restricts the peak ground vibration at a structure to 10.0 mm/s as a cautionary limit and, if blasts are routinely monitored, the ground vibration at a structure is restricted to 12.5 mm/s.

USBM 8485 recommends that, at frequency of 2 Hz, an air blast of 133 dB or less at a structure results in minimal to no damage. USBM 8507 recommends that, at frequencies below 40 Hz (predominant blast frequencies), a ground vibration results in minimal to no structural damage at 12.7 mm/s or less.

Table 5.5: Blasting Noise and Vibration Limits

Regulatory Criterion	Recommended Air Blast Limit (dB)	Recommended Ground Vibration Limit (mm/s)
NPC-119	120 (no monitoring), 128 (monitoring)	10.0 (no monitoring), 12.5 (monitoring)
USBM 8485	133	-
USBM 8507	-	12.7

As the NPC-119 criteria are the most stringent for both air blast and ground vibration, these are adopted for the blasting assessment.

5.6.2 Blasting Inputs

As the Project has been updated to include a North, Central and South Pit, the blasting design for these has also been revised. Updated blasting information has been provided (Table 5.6).

Table 5.6: Updated Blasting Information

Blasting Input	Operations	Construction
Blast locations – mark on site plan	Edge of footprint of open pits (North and South Pit)	PSMF and roads closest to the receptors
Hole depth	11.8 m	11.8 m
Hole diameter	0.229 m	0.229 m
Hole spacing (construction)	-	6.00 m x 7.00 m

Table 5.6: Updated Blasting Information

Blasting Input	Operations	Construction
Hole spacing (ore)	6.00 m x 6.00 m	-
Hole spacing (mine rock)	6.00 m x 7.00 m	-
Stemming Height	4.00 m	4.00m
Explosive Type	100% Emulsion (per air input table)	100% Emulsion (per air input table)
Explosive Charge	384.17 kg	12.2 kg
# holes detonated per blast	227	80
Is detonation cord covered in sand?	No	No

5.6.3 Air Blast Prediction

The previous blasting assessment completed for the Project adopted the USBM 8485 coal parting (less confined blast) and PCAO fully confined blast methods to determine the air blast noise impact. For this update, the MECP Blast analysis method (MOE BLASTING) was adopted, as it was considered most consistent with the NPC-119 guideline and is an approved blasting methodology developed by MECP.

The peak sound pressure from a blast (air blast) is a function of the Cube Root Scaled Distance (CRSD), as expressed in Equation 1.

Equation 1 Cube Root Scaled Distance

$$CRSD = \frac{D}{W^{\frac{1}{3}}}$$

Where:

D is the distance from the blast to the receptor (m)

W is the maximum weight of explosive (kg)

There are two air blast conditions (in front and behind the blast) that generate different blast levels. The predicted air blast noise levels for these conditions are determined from the MECP graphs in **Appendix B**.

5.6.4 Ground Vibration Prediction

The previous blasting assessment completed for the Project adopted the USBM 8507 method to determine the ground-borne vibration impact. For this update, the MECP Blast analysis method (MOE

BLASTING) was adopted, as it was considered most consistent with the NPC-119 guideline and is an approved blasting methodology developed by MECP.

The magnitude of ground vibration is expressed in Peak Particle Velocity (m/s) and is a function of the Square Root Scaled Distance (SRSD), as expressed in Equation 2.

Equation 2 Square Root Scaled Distance

$$SRSD = \frac{D}{W^{\frac{1}{2}}}$$

Where:

D is the distance from the blast to the receptor (m)

W is the maximum weight of explosive (kg)

The predicted ground vibration level for blasting is determined from the MECP graph in **Appendix B.**

5.7 HUMAN HEALTH

The noise assessment methodologies for construction and operational blasting activities noted above implicitly consider effects on human health. However, Health Canada has developed its own guidance on addressing human health concerns related to noise in the Health Canada 2017 Noise Guideline (HC NOISE); these include community annoyance and sleep disturbance related to noise, and are discussed below.

5.7.1 Community Annoyance

Community annoyance is addressed in HC NOISE through the % Highly Annoyed (%HA) metric. The %HA metric is derived based on research by Michaud that defined the percentage of highly annoyed residences in an average community as a function of the operational or long-term (greater than 1 year) construction noise level, as expressed in Equation 3.

Equation 4 Percent Highly Annoyed

$$\%HA = 100/[1 + e^{(10.4-0.132*LDN)}]$$

Where

Ldn is the Day-Night Noise Level (in dBA) for baseline, operations or construction.

Health Canada recommends noise mitigation when the change in %HA is greater than 6.5% for long-term operational or construction noise. Thus, the %HA is calculated for the baseline LDN, then for the operational or construction noise LDN (including baseline), to determine the increase in %HA.

Health Canada also identifies that Project levels (from construction or operations) greater than 75 dBA Ldn can expect strong opposition due to operational or construction noise. Also, Project levels greater than 62 dBA can expect "widespread complaints" from the community related to Project noise.

5.7.2 Sleep Disturbance

Health Canada identifies sleep disturbance as difficulty falling asleep, awakenings, curtailed sleep duration, alterations of sleep stages or depth, and increased body movements during sleep. Health Canada has adopted a noise limit of 60 dBA outside a residence for any Project-related instantaneous noise to address this. This is based on the WHO recommended maximum indoor sound level of 45 dBA, and the Health Canada recommendation to use an indoor-to-outdoor transmission loss of 15 dB for windows.

Further, this 60 dBA Lmax criteria for any Project-related instantaneous noise level has a frequency limit of no more than 10-15 exceedances per night.

5.8 WILDLIFE

5.8.1 Fish

Blasting generates ground vibration, which can impact fish habitat and spawning. To address this impact, the Fisheries and Oceans Canada (DFO) BLASTING guideline identifies a maximum overpressure of 100 kPa for fish habitats, and a maximum ground vibration of 13 mm/s for fish spawning habitats. On this basis, the DFO BLAST guideline provides setback distances (Table 5.7 and Table 5.8) for various charge sizes. These have been extrapolated for the blast charges identified in the DFO Blasting guideline. To present a conservative estimate of the blast setback distance the "rock-type substrate" is used to identify setback distances for the Project to address impacts on fish.

Table 5.7: Fish Habitats – Blasting Setback Distance

	Charge Size (kg)							
	0.5	**1**	**2**	**5**	**10**	**25**	**50**	**100**
Setback Distance (m)	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3

Note: Setback distances are based on rock type substrate.

Table 5.8: Fish Spawning – Blasting Setback Distance

	Charge Size (kg)						
	0.5	**1**	**5**	**10**	**25**	**50**	**100**
Setback Distance (m)	10.7	15.1	33.7	47.8	75.5	106.7	150.9

5.8.2 Birds

Environment Canada identifies a 50 dBA contour for noise impacts (operations, construction) on bird habitats. These have been prepared based on the noise modelling noted in Section 5.2. These contours are presented on Figure 6.2.7-4 of the EIS Addendum (Volume 2) (Section 6.2.7).

6.0 RESULTS AND DISCUSSION

6.1 FACILITY CONSTRUCTION

6.1.1 Steady-State Noise

The steady-state sound levels for the predictable worst-case hour (i.e. all significant noise sources operating in same one-hour period) during Project construction activities were determined at the representative NSRs closest to the Project site. Noise contours for the predictable worst-case daytime construction are shown on Figure 11 (Appendix A) and worst-case nighttime construction are shown on Figure 12 (Appendix A). An impact summary is provided in Table 6.1 below:

Table 6.1: Facility Construction Steady-State Noise Impact Table

NSR ID	NSR Description	Receptor Height	Predicted Sound Levels at NSR (dBA Leq,1hr)			MECP Criteria at NSR (dBA Leq,1hr)			Comply with Performance Limits? (Y/N)
			Daytime	Evening	Night	Daytime	Evening	Night	
PS_1	North Hare Lake Cottage	1.5 m	33	33	33	45	40	40	Y
PS_2	South Hare Lake Cottage	1.5 m	32	32	31	45	40	40	Y
PS_3	May's Gifts	1.5 m	46	46	43	50	50	45	Y
PS_4	Wayfare Inn	1.5 m	46	46	43	50	50	45	Y
		4.5 m	48	48	44	50	50	45	Y
PS_5	Peninsula Inn	1.5 m	47	47	44	50	50	45	Y
		4.5 m	49	49	45	50	50	45	Y
PS_6	Travelodge Hotel	1.5 m	39	39	39	50	50	45	Y
		4.5 m	40	40	39	50	50	45	Y
PS_7	Laughing Moose Restaurant and Residence	1.5 m	48	48	44	50	50	45	Y
PS_8	Residence	1.5 m	39	39	39	50	50	45	Y
		4.5 m	40	40	40	50	50	45	Y

The predicted construction sound level at the representative NSRs is in compliance with the applicable MECP criteria.

6.1.2 Traffic Noise

The baseline and Project traffic sound levels for predictable worst-case construction traffic were calculated at the representative NSRs closest to the Project construction activities. Noise contours for the daytime baseline traffic are shown on Figure 13 (Appendix A) and daytime Project traffic are shown on Figure 14 (Appendix A). An impact summary is provided in Table 6.2**,** below:

Table 6.2: Construction Traffic Noise Impact Table

NSR ID	NSR Description	Receptor Height	Predicted Daytime Sound Levels at NSR (dBA Leq, 16hr)		Project Increase Over Baseline (dB)	MECP Criteria at NSR (dBA Leq, 16hr)	Mitigation Requirement (Y/N)
			Project + Baseline	Baseline			
O_1	Pic Motel	1.5 m	50.8	50.2	0.6	55	N
O_2	Harbour Inn	1.5 m	55.1	54.6	0.5	55	N
O_4	OPP Station	1.5 m	52.1	51.5	0.6	55	N
PS_1	North Hare Lake Cottage	1.5 m	18.5	18.4	0.1	55	N
PS_2	South Hare Lake Cottage	1.5 m	25.3	25.2	0.1	55	N
PS_3	Mays Gift	1.5 m	54.3	54.3	0.0	55	N
PS_4	Wayfare_Inn	1.5 m	53.4	53.3	0.1	55	N
		4.5 m	55.2	55.1	0.1	55	N
PS_5	Peninsula Inn	1.5 m	54.5	54.5	0.0	55	N
		4.5 m	56.2	56.2	0.0	55	N
PS_6	Travelodge Hotel	1.5 m	52.6	52.4	0.2	55	N
		4.5 m	53.8	53.6	0.2	55	N
PS_7	Laughing Moose Restaurant and Residence	1.5 m	55.5	55.4	0.1	55	N
PS_8	Residence	1.5 m	51.4	51.3	0.1	55	N
		4.5 m	52.3	52.2	0.1	55	N
R_1	Residence	1.5 m	51.4	50.9	0.5	55	N
		4.5 m	57.4	56.9	0.5	55	N
R_3	Bergagnini Apartment Rental	1.5 m	58.0	57.5	0.5	55	N
		4.5 m	59.0	58.4	0.6	55	N

The predicted traffic noise level at the representative NSRs is below the sound level thresholds provided by the MECP or MTO requiring noise mitigation. Project traffic sound level increases over baseline traffic sound levels were less than 5 dB and do not warrant investigation into construction traffic noise mitigation.

6.2 FACILITY OPERATIONS

6.2.1 Steady-State Noise

The steady-state sound levels for the predictable worst-case hour during Project operations were determined at the representative NSRs closest to the Project site. Noise contours for the predictable worst-case daytime operations are shown on Figure 15, Appendix A and worst-case nighttime operations are shown on Figure 16, Appendix A. An impact summary is provided in Table 6.3 below:

Table 6.3: Facility Operations Steady Noise Impact Table

NSR ID	NSR Description	Receptor Height	Predicted Sound Levels at NSR (dBA Leq, 1hr)			MECP Criteria at NSR (dBA Leq, 1hr)			Comply with Performance Limits? (Y/N)
			Daytime	Evening	Night	Daytime	Evening	Night	
PS_1	North Hare Lake Cottage	1.5 m	34	34	33	45	40	40	Y
PS_2	South Hare Lake Cottage	1.5 m	33	33	31	45	40	40	Y
PS_3	May's Gifts	1.5 m	46	46	43	50	50	45	Y
PS_4	Wayfare Inn	1.5 m	46	46	42	50	50	45	Y
		4.5 m	47	47	44	50	50	45	Y
PS_5	Peninsula Inn	1.5 m	47	47	43	50	50	45	Y
		4.5 m	49	49	45	50	50	45	Y
PS_6	Travelodge Hotel	1.5 m	39	39	38	50	50	45	Y
		4.5 m	40	40	39	50	50	45	Y
PS_7	Laughing Moose Restaurant and Residence	1.5 m	47	47	43	50	50	45	Y
PS_8	Residence	1.5 m	39	39	38	50	50	45	Y
		4.5 m	40	40	39	50	50	45	Y

The predicted operational sound level at the representative NSRs was in compliance with the applicable MECP criteria.

The cumulative sound levels from the MWDS, when combined with the Project operations, were predicted to still be below the MECP criteria.

6.2.2 Traffic Noise

The background and Project traffic sound levels for predictable worst-case operations were calculated at the representative NSRs. Noise contours for the daytime baseline traffic are shown on Figure 17 (Appendix A) and daytime Project traffic are shown on Figure 18 (Appendix A). An impact summary is provided in Table 6.4 below.

Table 6.4: Operations Traffic Noise Impact Table

NSR ID	NSR Description	Receptor Height	Predicted Daytime Sound Levels at NSR (dBA Leq,16hr)		Project Increase Over Baseline (dB)	MECP Criteria at NSR (dBA Leq,16 hr)	Mitigation Requirement (Y/N)
			Project + Baseline	Baseline			
H_1	Hospital	1.5 m	55.2	54.8	0.6	55	N
		4.5 m	54.2	53.8	0.4	55	N
O_1	Pic Motel	1.5 m	51.3	50.2	1.1	55	N
O_2	Harbour Inn	1.5 m	55.7	54.6	1.1	55	N
O_3	Zero-100 Motor Inn	1.5 m	54.6	53.7	0.9	55	N
O_4	OPP Station	1.5 m	52.8	51.5	1.3	55	N
O_5	Library	1.5 m	50.7	50.3	0.4	55	N
		4.5 m	51.1	50.6	0.5	55	N
PS_1	North Hare Lake Cottage	1.5 m	18.8	18.4	0.4	55	N
PS_2	South Hare Lake Cottage	1.5 m	27.2	26.8	0.4	55	N
PS_3	May's Gifts	1.5 m	54.6	54.3	0.3	55	N
PS_4	Wayfare Inn	1.5 m	53.6	53.3	0.3	55	N
		4.5 m	55.4	55.1	0.3	55	N
PS_5	Peninsula Inn	1.5 m	54.8	54.5	0.3	55	N
		4.5 m	56.5	56.2	0.3	55	N
PS_6	Travelodge Hotel	1.5 m	52.8	52.4	0.4	55	N
		4.5 m	54.0	53.6	0.4	55	N
PS_7	Laughing Moose Restaurant and Residence	1.5 m	55.7	55.4	0.4	0.3	N
PS_8	Residence	1.5 m	51.6	51.3	0.3	55	N

Table 6.4: Operations Traffic Noise Impact Table

NSR ID	NSR Description	Receptor Height	Predicted Daytime Sound Levels at NSR (dBA Leq,16hr)		Project Increase Over Baseline (dB)	MECP Criteria at NSR (dBA Leq,16 hr)	Mitigation Requirement (Y/N)
			Project + Baseline	Baseline			
		4.5 m	52.5	52.2	0.3	55	N
PW_1	Kingdom Hall Church	1.5 m	53.1	52	1.1	55	N
PW_4	Catholic Church	1.5 m	53.9	51.7	2.2	55	N
R_1	Residence	1.5 m	51.9	50.9	1.0	55	N
		4.5 m	57.5	56.5	1.0	55	N
R_11	Residence	1.5 m	51.0	50.5	0.5	55	N
R_12	Residence	1.5 m	39.7	39.1	0.6	55	N
R_13	Residence	1.5 m	61.7	61.3	0.4	55	N
R_14	Residence	1.5 m	56.3	55.9	0.4	55	N
R_15	Residence	1.5 m	44.5	43.9	0.6	55	N
R_23	Residence	1.5 m	50.7	48.2	2.5	55	N
		4.5 m	51.4	49.1	2.3	55	N
R_3	Bergagnini Apartment Rental	1.5 m	58.5	57.5	1	55	N
		4.5 m	59.5	58.4	1.1	55	N
R_5	Condominium	1.5 m	55.8	54.8	1	55	N
		4.5 m	56.1	55.1	1	55	N
		7.5 m	56.1	55.1	1	55	N
R_7	I Sew Studio and Residence	1.5 m	54.1	50.9	3.2	55	N
R_8	Bayview Apartments	1.5 m	50.8	47.6	3.2	55	N
		4.5 m	51.2	48.1	3.1	55	N
		7.5 m	51.5	48.4	3.1	55	N
R_9	Residence	1.5 m	42.1	39.4	2.7	55	N
		4.5 m	42.4	39.9	2.5	55	N
RH_2	Seniors Centre	1.5 m	51.0	47.8	3.2	55	N
		4.5 m	52.4	49.2	3.2	55	N
R_25	Residence	1.5 m	39.9	37.0	2.9	55	N
R_24	Residence	1.5 m	40.2	36.9	3.3	55	N
		4.5 m	40.8	37.8	3.0	55	N
PW_5	Anglican Church-Trinity	1.5 m	54.5	52.2	2.3	55	N

The predicted operational traffic sound levels at the representative NSRs were below the sound level thresholds provided by the MECP or MTO requiring noise mitigation. Project traffic sound level increases over baseline were less than 5 dB and do not warrant investigation for operational traffic mitigation.

Background and Project traffic sound levels during operations were also predicted using TNM 3.0 and compared to TNM 2.5 results at two representative NSRs in the Town of Marathon (Residence and Senior's Centre) and one representative NSR along Highway 17 (May's Gifts). The results are provided in Table 6.5 below:

Table 6.5: TNM Results Comparison

NSR ID	NSR Description	TNM 2.5 Predicted Sound Levels at NSR (dBA)		Project Increase Over Baseline (dB)	TNM 3.0 Predicted Sound Levels at NSR (dBA)		Project Increase Over Baseline (dB)
		Project + Baseline	Baseline		Project + Baseline	Baseline	
R_1	Residence	57.5	56.5	1.0	57.1	56.3	0.8
RH_2	Seniors Centre	52.4	49.2	3.2	51.0	48.0	3.0
PS_3	May's Gifts	54.6	54.3	0.3	54.4	53.9	0.5

The predicted sound level increases for Project traffic over baseline between TNM 2.5 and TNM 3.0 generally show the same result (within 0.2 dB). Considering the TNM 2.5 and TNM 3.0 results (where applicable) show project increases are less than 5 dB and do not warrant investigation for traffic noise mitigation, the use of TNM 2.5 is considered comparable to TNM 3.0.

The Project traffic noise impact was lower (up to 1 dB) when considering the cumulative effect of the MWDS and MWTS. The inclusion of MWDS and MWTS traffic data increased the baseline traffic sound levels and lowered the Project sound level increase over baseline.

6.3 RAIL LOAD OUT

6.3.1 Steady-State Noise

The steady sound levels for the predictable worst-case operational activity for the rail loadout facility (assessed for the option 2 location) were determined at the representative NSRs closest to the facility. Noise contours for the predictable worst-case daytime operations are shown on Figure 19 and an impact summary is provided in Table 6.6 below:

Table 6.6: Rail Loadout Steady Noise Impact Table

NSR ID	NSR Description	Receptor Height	Predicted Sound Levels at NSR (dBA)		MECP Criteria at NSR (dBA)		Comply with Performance Limits? (Y/N)
			Daytime	Evening	Daytime	Evening	
PW_1	Kingdom Hall Church	1.5 m	42	42	50	50	Y
O_2	Harbour Inn	1.5 m	50	50	50	50	Y
R_25	Residence	1.5 m	38	38	50	50	Y
R_24	Residence	1.5 m	31	31	50	50	Y
		4.5 m	32	32	50	50	Y

The predicted rail loadout noise impact at the representative NSRs was in compliance with the applicable MECP criteria.

Cumulative sound level increases from the MWTS, when combined with the rail loadout operations, were predicted to still be below the MECP criteria.

6.3.2 Impulsive Noise

The impulsive sound levels for the predictable worst-case rail loadout facility were calculated at the representative NSRs using noise emissions from the rail car coupling. Noise contours for the predictable worst-case daytime operations are shown on Figure 20 (Appendix A) and an impact summary is provided in Table 6.7**,** below:

Table 6.7: Rail Loadout Impulsive Noise Impact Table

NSR ID	NSR Description	Receptor Height	Predicted Sound Levels at NSR (LLM, dBAI)		MECP Criteria at NSR (LLM, dBAI)		Comply with Performance Limits? (Y/N)
			Daytime	Evening	Daytime	Evening	
PW_1	Kingdom Hall Church	1.5 m	56	56	70	70	Y
O_2	Harbour Inn	1.5 m	69	69	70	70	Y
R_25	Residence	1.5 m	43	43	70	70	Y
R_24	Residence	1.5 m	42	42	70	70	Y
		4.5 m	42	42	70	70	Y

The predicted impulsive sound levels at the representative NSRs are in compliance with the applicable MECP criteria.

6.4 BLASTING

6.4.1 Air Blast

A setback analysis for the air blast has been completed in accordance with the MOE BLASTING method. The results are presented in Table 6.8. The construction setback distances are shown on Figure 21 (Appendix A) and operations setback distances are shown on Figure 22 (Appendix A).

Table 6.8: Air Blast Setback Distance

Type	Charge Size (kg)	Air Blast Setback Distance (m)
Construction	12.2	575
Operations	384.17	1820

Setback distances are based on a front-face blast, as this is a larger setback than behind the face of the blast. The 120 dB limit was used to define air blast setback, where no monitoring is required.

With these setback distances, we note the following:

- The following NSRs are within the 120 dB contour for construction air blast: North Lake Hare Cottage, Laughing Moose Eatery Restaurant and Residence, Peninsula Inn and May's Gifts. Other NSRs are outside this setback from construction activities.
- Operational blasting from the North, Central and South Pits show that the NSRs are outside the 120 dB contour setback distance.

Given that the construction air blast receptors identified above are at the edge of the setback distance, we expect that blasts can occur within the 575 m setback distance provided air blast noise is monitored to a limit of 128 dB. Blasting for operations does not require noise monitoring.

6.4.2 Ground Vibration

A setback analysis for the ground vibration has been completed in accordance with the MOE BLASTING method. The results are presented in Table 6.9. The construction setback distances are shown on Figure 23 (Appendix A) and operations setback distances are shown on Figure 24 (Appendix A).

Table 6.9: Ground Vibration Setback Distance

Type	Charge Size (kg)	Ground Vibration Setback Distance (m)
Construction	12.2	68
Operations	384.17	375

The 10 mm/s limit was used to define ground vibration setback, where no monitoring is required.

With these setback distances, construction and operational blasting show that the NSRs are outside the 10 mm/s contour setback distance. Blasting for construction or operations does not require vibration monitoring.

6.5 HUMAN HEALTH

6.5.1 Community Annoyance

Community annoyance analysis has been completed in accordance with HC NOISE, using the Percent Highly Annoyed (%HA) method. This requires determining the baseline Day-Night Noise Level (Ldn), the baseline + Project impact Ldn, and determining the %HA to identify whether the change is greater than 6.5%.

To assess the baseline Ldn at the Hare Lake NSRs, the document "Response to SIR2 Measuring Baseline Levels" (CIAR #577) has been referenced. Though Ldn noise levels were not presented, they have been extrapolated from the information provided to determine effective baseline noise levels for the purpose of assessing community annoyance as per HC NOISE. The baseline Ldn noise levels for the other NSRs were predicted based on the updated noise modelling. Receptor locations are taken at upper floors of the structure as the worst-case impact location for noise. The baseline Ldn noise levels are presented in Table 6.10 for representative NSRs at Hare Lake, along Highway 17 and within the Town of Marathon.

Table 6.10: Baseline Noise Level

NSR Grouping	Daytime Noise Level (Ld, dBA)	Nighttime Noise Level (Ln, dBA)	Estimated Baseline Noise Level (Ldn)
Hare Lake (South Hare Lake Cottage (PS_1) and North Hare Lake Cottage (PS_2))	31.9	32.0	48.0
NSRs along Highway 17 (North Building Façade of Laughing Moose Restaurant and Residence (PS_7))	33.5	28.5	35.9
NSRs along Highway 17 (South Building Façade of Laughing Moose Restaurant and Residence (PS_7))	55.4	50.4	57.8
NSRs within the Town of Marathon (Seniors Centre (RH-2))	49.2	44.2	51.6

Daytime (Ld) and nighttime (Ln) noise levels for the north and south Hare Lake cottages are based on the minimum 1-hr baseline measurement. This is considered a conservative baseline condition, as the daytime (16hr) and nighttime (8hr) noise levels would generally be higher than this. The Ldn for both cottages includes the +10 dB adjustment for "quiet rural" acoustical environment.

The Ld noise levels for NSRs along Highway 17 and in the Town of Marathon have been predicted from the updated noise modelling. The Ln noise levels along Highway 17 and in the Town of Marathon were considered to be 5 dB lower than the Ld.

The baseline noise levels for NSRs on the north side of Highway 17 vary between the north and south building facades. The north façade is shielded from Highway 17 traffic and the south façade is not shielded from Highway 17 traffic. Noise level increases from the Project are assessed at the north façade (closest to the Project) and noise level increases from Highway 17 are assessed at the south façade (closest to Highway 17).

6.5.1.1 Facility Construction

Ldn noise impacts for Project construction activities have been predicted from the noise modelling at the NSR (Table 6.11). The combined Ldn (Project + baseline) has been determined and the %HA calculated to assess the change in highly annoyed from the Project.

Table 6.11: Mining Construction Noise Community Annoyance

NSR Description	Baseline Ldn (dBA)	Project + Baseline Impact Ldn (dBA)	%HA		
			Baseline	Project + Baseline	% Change
North Hare Lake Cottage (PS_1)	48.0	48.5	1.7	1.8	0.1
South Hare Lake Cottage (PS_2)	48.0	48.3	1.7	1.8	0.1
May's Gifts (PS_3)	43.0	50.4	0.9	2.3	1.4
Wayfare Inn (PS_4)	57.5	58.4	5.6	6.3	0.7
Peninsula Inn (PS_5)	38.5	52.3	0.5	2.9	2.4
Travelodge Hotel (PS_6)	56.0	56.3	4.7	4.9	0.2
Laughing Moose Restaurant and Residence (PS_7)	35.9	50.9	0.3	2.5	2.2
Residence (PS_8)	54.6	55.1	3.9	4.2	0.3

PS_1 (North Hare Lake Cottage) and PS_2 (South Hare Lake Cottage) include the +10 dB adjustment for "quiet rural" acoustical environment. Receptor locations are taken at upper floors of the structure as the worst-case impact location for noise.

The predicted %HA for noise related to Project construction activities is generally insignificant (minimal change in %HA) for most of the NSRs. The highest predicted %HA is at Peninsula Inn (PS_5) with a 2.4%HA change from the Project. There is no expected noise impact on community annoyance related to Project construction activities since the change in %HA from baseline at the NSRs is less than 6.5%.

6.5.1.2 Facility Operations

Ldn noise impacts for Project operations have been predicted from the noise modelling at the NSR (Table 6.12). The combined Ldn (Project + baseline) has been determined, and the %HA calculated to assess the change in highly annoyed from the Project.

Table 6.12: Mining Operations Noise Community Annoyance

NSR Description	Baseline Ldn (dBA)	Project + Baseline Impact Ldn (dBA)	%HA		
			Baseline	Project + Baseline	% Change
North Hare Lake Cottage (PS_1)	48.0	48.5	1.7	1.8	0.1
South Hare Lake Cottage (PS_2)	48.0	48.4	1.7	1.8	0.1
May's Gifts (PS_3)	43.0	50.3	0.9	2.3	1.4
Wayfare Inn (PS_4)	57.5	58.3	5.6	6.3	0.7
Peninsula Inn (PS_5)	38.5	52.1	0.5	2.9	2.4
Travelodge Hotel (PS_6)	56.0	56.3	4.7	4 .9	0.2
Laughing Moose Restaurant and Residence (PS_7)	35.9	50.4	0.3	2.3	2.0
Residence (PS_8)	54.6	55.1	3.9	4.2	0.3

PS_1 (North Hare Lake Cottage) and PS_2 (South Hare Lake Cottage) include the +10 dB adjustment for "quiet rural" acoustical environment. Receptor locations are taken at upper floors of the structure as the worst-case impact location for noise.

The %HA for noise related to Project operational activities is generally insignificant (minimal change in %HA) for most of the NSRs. The highest predicted %HA is at Peninsula Inn (PS_5) with a 2.4% HA change from the Project. There is no expected noise impact on community annoyance related to Project operation activities since the change in %HA from baseline at the NSR is less than 6.5 %.

6.5.1.3 Traffic Noise

Ldn noise impacts for Project traffic have been predicted from the noise modelling at the NSR, as noted in Table 6.13 and Table 6.14. The combined Ldn (Project impact + baseline) has been determined, and the %HA calculated to assess the change in highly annoyed from the Project.

Table 6.13: Mining Construction Traffic Noise Community Annoyance

NSR Description	Baseline Ldn (dBA)	Project + Baseline Impact Ldn (dBA)	%HA		
			Baseline	Project + Baseline	% Change
North Hare Lake Cottage (PS_1)	48.0	48.0	1.7	1.7	0.0
South Hare Lake Cottage (PS_2)	48.0	48.0	1.7	1.7	0.0
May's Gifts (PS_3)	56.7	56.7	5.1	5.1	0.0
Wayfare Inn (PS_4)	57.5	57.5	5.6	5.6	0.0
Peninsula Inn (PS_5)	58.6	58.6	6.5	6.5	0.0
Travelodge Hotel (PS_6)	56.0	56.0	4.7	4.7	0.0
Laughing Moose Restaurant and Residence (PS_7)	57.8	57.8	5.9	5.9	0.0
Residence (PS_8)	54.6	54.6	3.9	3.9	0.0
Harbour Inn (O_2)	57.0	57.2	5.3	5.4	0.1
Pic Motel (O_1)	52.6	52.8	3.0	3.1	0.1
Residence (R_1)	58.9	59.2	6.7	7.0	0.3
OPP Station (O_4)	53.9	54.1	3.6	3.7	0.1
Bergagnini Apartment Rental (R_3)	60.8	61.0	8.5	8.7	0.2

PS_1 (North Hare Lake Cottage) and PS_2 (South Hare Lake Cottage) include the +10 dB adjustment for "quiet rural" acoustical environment. Receptor locations are taken at upper floors of the structure as the worst-case impact location for noise. Project noise levels (without baseline) are noted to be below 62 dBA at the NSRs.

The predicted %HA for noise related to construction traffic activities is generally insignificant (minimal change in %HA) for most of the NSRs. The highest predicted %HA is a 0.3% change at the residence on the corner of Peninsula Road and Industrial Park Road (R_1). As the change in %HA from baseline at the NSRs is less than 6.5% HA, there is no expected noise impact on community annoyance related to construction traffic activities.

Table 6.14: Mining Operations Traffic Noise Community Annoyance

NSR Description	Baseline Ldn (dBA)	Project + Baseline Impact Ldn (dBA)	%HA		
			Baseline	Project + Baseline	% Change
North Hare Lake Cottage (PS_1)	48.0	48.0	1.7	1.7	0.0
South Hare Lake Cottage (PS_2)	48.0	48.0	1.7	1.7	0.0
May's Gifts (PS_3)	56.7	56.8	5.1	5.2	0.1
Wayfare Inn (PS_4)	57.5	57.6	5.6	5.7	0.1
Peninsula Inn (PS_5)	58.6	58.7	6.5	6.6	0.1
Travelodge Hotel (PS_6)	56.0	56.1	4.7	4.8	0.1
Laughing Moose Restaurant and Residence (PS_7)	57.8	57.9	5.9	6.0	0.1
Residence (PS_8)	54.6	54.7	3.9	4.0	0.1
Anglican Church (PW_5)	54.6	55.6	3.9	4.5	0.6
Bayview Apartments (R_8)	50.8	52.2	2.4	2.9	0.5
Senior's Centre (RH_2)	51.6	53.1	2.7	3.3	0.6
Catholic Church (PW_4)	54.1	55.0	3.7	4.2	0.5
Condominium (R_5)	57.5	57.9	5.6	5.9	0.3
Harbour Inn (O_2)	57.0	57.4	5.3	5.6	0.3
Hospital (H_1)	57.2	57.3	5.4	5.6	0.2
Library (O_5)	53.0	53.2	3.2	3.3	0.1
Pic Motel (O_1)	52.6	53.0	3.0	3.2	0.2
Kingdom Hall Church (PW_1)	54.4	54.8	3.8	4.1	0.3
Zero-100 Motor Inn (O_3)	56.1	56.4	4.7	5.0	0.3
Residence (R_1)	58.9	59.3	6.7	7.1	0.4
Residence (R_14)	58.3	58.4	6.2	6.4	0.2
Residence (R_13)	63.7	63.8	11.9	12.2	0.3
Residence (R_15)	46.3	46.5	1.3	1.4	0.1
Residence (R_12)	41.5	41.7	0.7	0.7	0.0
Residence (R_11)	52.9	53.1	3.2	3.2	0.0
Residence (R_23)	51.5	52.5	2.6	3.0	0.4
Residence (R_9)	42.3	43.4	0.8	0.9	0.1
OPP Station (O_4)	53.9	54.4	3.6	3.8	0.2
I Sew Studio and Residence (R_7)	53.3	54.8	3.3	4.0	0.7
Bergagnini Apartment Rental (R_3)	60.8	61.2	8.5	9.0	0.5

Table 6.14: Mining Operations Traffic Noise Community Annoyance

NSR Description	Baseline Ldn (dBA)	Project + Baseline Impact Ldn (dBA)	%HA		
			Baseline	Project + Baseline	% Change
Residence (R_24)	40.2	41.6	0.6	0.7	0.1
Residence (R_25)	39.4	40.7	0.5	0.7	0.2

PS_1 (North Hare Lake Cottage) and PS_2 (South Hare Lake Cottage) include the +10 dB adjustment for "quiet rural" acoustical environment. Receptor locations are taken at upper floors of the structure as the worst-case impact location for noise. Project (without baseline) noise levels are noted to be below 62 dBA at the NSRs.

The predicted community annoyance (%HA) for noise related to operational traffic activities is generally insignificant (minimal change in %HA) for most of the NSRs. The highest predicted %HA is a 0.7 % change at the I Sew Studio and Residence (R_7). As the change in %HA from baseline at the NSRs is less than 6.5% HA, there is no expected noise impact on community annoyance related to operations traffic activities.

6.5.1.4 Rail Load Out Facility Noise

Ldn noise impacts for the rail load out facility operations related to the Project have been predicted from the noise modelling at the NSRs (**Table 6.15**). The combined Ldn (Project + baseline) has been determined, and the %HA calculated, to assess the change in highly annoyed from the Project.

Table 6.15: Rail Load Out Facility Community Annoyance

NSR Description	Baseline Ldn (dBA)	Project + Baseline Impact Ldn (dBA)	%HA		
			Baseline	Project+ Baseline	% Change
Harbour Inn (O_2)	35.8	48.6	0.3	1.8	1.5
Kingdom Hall Church (PW_1)	54.4	54.5	3.8	3.9	0.1
Residence (R_24)	40.2	40.5	0.6	0.6	0.0
Residence (R_25)	39.4	41.1	0.5	0.7	0.2

Receptor locations are taken at upper floors of the structure as the worst-case impact location for noise. Project noise level (without baseline) are noted to be below 62 dBA at the NSRs.

The predicted community annoyance (%HA) for noise related to rail load out facility activities is generally insignificant (minimal change in %HA) for most of the NSRs. The highest predicted %HA is 1.5% HA change at the Harbour Inn (R_2). As the change in %HA from baseline at the NSRs is less than 6.5% HA, there is no expected noise impact on community annoyance related to rail load out activities.

6.5.2 Sleep Disturbance

Sleep noise impacts, defined as a 60 dBA Lmax criteria for nighttime noise activities related to the Project, have been predicted from the noise modelling at the NSRs (Table 6.16).

Table 6.16: Sleep Disturbance

NSR Description	Sleep Disturbance Noise Level (dBA Lmax)	
	Facility Construction	Facility Operations
North Hare Lake Cottage (PS_1)	34.5	34.7
South Hare Lake Cottage (PS_2)	33.7	34.1
May's Gifts (PS_3)	50.7	50.7
Wayfare Inn (PS_4)	53.3	53.2
Peninsula Inn (PS_5)	54.4	54.3
Travelodge Hotel (PS_6)	54.1	54.1
Laughing Moose Restaurant and Residence (PS_7)	52.9	52.9
Residence (PS_8)	47.4	47.2

Project traffic on Highway 17 or in the Town of Marathon and rail load out activities do not occur during the night; therefore, sleep disturbance impact has not been included for these areas or activities. Receptor locations are taken at upper floors of the structure as the worst-case impact location for noise.

The highest predicted maximum nighttime noise level is 54.4 dBA Lmax at the Peninsula Inn (PS_5). As the maximum nighttime noise level for the Project activities do not exceed 60 dBA at the NSRs, there is no expected sleep disturbance noise impact on the community.

Sleep disturbance noise contours for construction and operations have also been prepared (Figure 25 and Figure 26, Appendix A). These contours further support the assessment above that there are no NSRs within the sleep disturbance 60 dBA Lmax contours and no expected sleep disturbance noise impact on the community.

6.6 WILDLIFE

6.6.1 Fish

A setback distance analysis has been completed in accordance with DFO guidelines and the results are presented in Table 6.17.

Table 6.17: Fish Blast Impact Setback Distance

Type	Charge Size (kg)	Fish Habitat Setback Distance (m)	Fish Spawning Setback Distance (m)
Construction	12.2	18	53
Operations	384.17	98	296

Construction setbacks were taken from the edge of the PSMF and road construction where blasting can occur. Operational setbacks were taken from the edge of the North, Central and South Pits.

A discussion of the impacts to fish habitat and spawning, based on these setback distance from blasting activity, is provided in Chapter 6 of the EIS Addendum (Volume 2).

6.6.2 Birds

An operational and construction noise contour for a 50 dBA noise impact has been prepared based on the noise modelling for the Project. This noise contour, and a discussion of noise impact to birds, is provided in Chapter 6 of the EIS Addendum (Volume 2).

7.0 SUMMARY AND CONCLUSIONS

A noise impact effects assessment (SID #17) (CIAR #233) was prepared in 2012 and was updated through the IR process with supporting analysis. SID #17 (CIAR #233) assessed noise and vibration impacts associated with Project construction and operations.

This Noise Updated Effects Assessment Report includes the updated project site layout and operating assumptions during the construction and operation phases. The blasting impact was also updated based on revised blast design and using the MECP blasting impact method. The human health effects were updated with respect to the Health Canada Guidelines. Further, an additional assessment for blasting impacts on fish habitat was completed.

Based on this updated noise effects assessment, applying a conservative approach and assuming worst case steady-state and maximum sound level scenarios, we conclude that:

1) Construction noise impacts (project area and traffic) will meet the applicable provincial noise criteria at the NSRs.

2) Operational noise impacts (project area, rail load out and traffic) will meet the applicable provincial noise criteria at the NSRs.

3) Construction and operational noise impacts for community annoyance will not exceed the Health Canada highly annoyed criteria at the NSRs.

4) Construction and operational noise impacts for sleep disturbance will not exceed the Health Canada sleep disturbance noise criteria at the NSRs.

5) Construction blasting vibration will not exceed the MECP blasting criteria at the NSRs. Construction blasting noise will be acceptable at most of the NSRs with no monitoring requirements, except at the North Lake Hare Cottage, Laughing Moose Eatery Restaurant and Residence, Peninsula Inn and May's Gifts if blasting is within 575 m. These locations will require monitoring if the blasting is within 575 m.

6) Operational blasting noise and vibration will not exceed the MECP blasting criteria at the NSRs.

7) Blasting noise and vibration impacts for fish habitats and spawning are provided in this report. Assessment of their impact is provided in Chapter 6 of the EIS Addendum (Volume 2).

8) Construction and operational noise impacts for birds has been provided in this report. Assessment of their impact is provided in Chapter 6 of the EIS Addendum (Volume 2).

When comparing the updated noise effect assessment results to SID #17 (CIAR #233) (original assessment), we note the following:

Table 7.1 Updated and Original Noise Impact Assessment Summary

Updated Assessment	Original Assessment	Description of Change
Sound levels from the Project site and rail load out comply with NPC-300 at the NSRs.	Sound levels from the Project site and rail load out comply with NPC-205 at the NSRs.	NPC-205 has been replaced by NPC-300, though the criteria are the same.
Sound level increases from Project traffic at the NSR are below the sound level thresholds provided by the MECP or MTO requiring noise mitigation	Sound level increases from Project traffic at the NSR are below the sound level thresholds provided by the MECP or MTO requiring noise mitigation	Baseline and Project traffic volumes have been revised and revised predictions still show compliance.
Project complies with Health Canada community annoyance and sleep disturbance criteria for noise impact at the NSRs.	Human health effects were qualitatively assessed using the noise impact assessment based on MECP NPC-300 guidelines.	Updated assessment now includes an assessment of Health Canada criteria for community annoyance and sleep disturbance for noise impact.
Blasting noise and vibration meet NPC-119 criteria for operations.	Blasting noise and vibration meet NPC-119 criteria for operations, except for Marathon Airport which triggers the requirement for monitoring. Blasting vibration meets NPC-119 criteria.	Revised blasting design and site layout in updated assessment supersede the blasting impact analysis in the original assessment.
Blasting vibration meets NPC-119 for construction; blasting noise exceeds NPC-119 criteria and NSRs require monitoring when construction is within 575 m.	Blasting noise for construction noted to exceed NPC-119 criteria at a number of locations (May's Gifts, Peninsula Inn, Wayfare Inn, Marathon Airport, North Hare Lake Cottage), and would require monitoring. Blasting vibration for construction meets NPC-119 criteria.	Revised blasting design and construction locations in updated assessment supersede the blasting impact analysis in the original assessment.
Blasting noise and vibration impacts assessed for fish habitat and spawning as per DFO guidelines.	No assessment of blasting impacts to fish habitat and spawning included.	Updated assessment now includes an assessment of blasting impacts to fish habitat and spawning.
MECP blasting prediction method used to assess noise and vibration impacts from blasting.	USBM blasting prediction methods used by Explotech for noise and vibration.	Both methods (MECP, USBM) use comparable prediction methods. MECP blasting prediction is considered more compatible with applying NPC-119 limits for blasting.

Table 7.1 Updated and Original Noise Impact Assessment Summary

Updated Assessment	Original Assessment	Description of Change
CADNA/A noise modelling software used for predicting construction and operations sound levels.	SoundPLAN noise modelling software used for predicting construction and operations sound levels.	Both CADNA/A and SoundPLAN use the ISO 9613 standard. No significant difference expected between software platforms for noise impact assessment. Differences in predicted sound levels was due to changes in the site layout and operating assumptions
TNM 2.5 noise model (in CADNA/A) was used for predicting baseline and Project traffic sound levels; results were compared to TNM 3.0.	TNM 2.5 noise model (in SoundPLAN) was used for predicting baseline and Project traffic sound levels.	TNM 2.5 (both CADNA/A and SoundPLAN) results show good comparison to TNM 3.0 results (now accepted by MECP).

8.0 REFERENCES

D.G. Wright G.E Hopky. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters, (DFO BLASTING)

Health Canada. 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: NOISE, (HC NOISE)

International Standards Organization. 2017. "ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation"

MECP publication NPC-104: Adjustments for Intermittency and Tonality (NPC-104).

MECP publication NPC-119: Blasting (NPC-119).

MECP publication NPC-233: Information to be Submitted for Approval of Stationary Sources of Sound (NPC-233).

MECP publication NPC-300; Stationary and Transportation Source – Approval and Planning (NPC-300)

MECP publication NPC-300; Stationary and Transportation Source – Approval and Planning (NPC-300)

MECP publication: Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT).

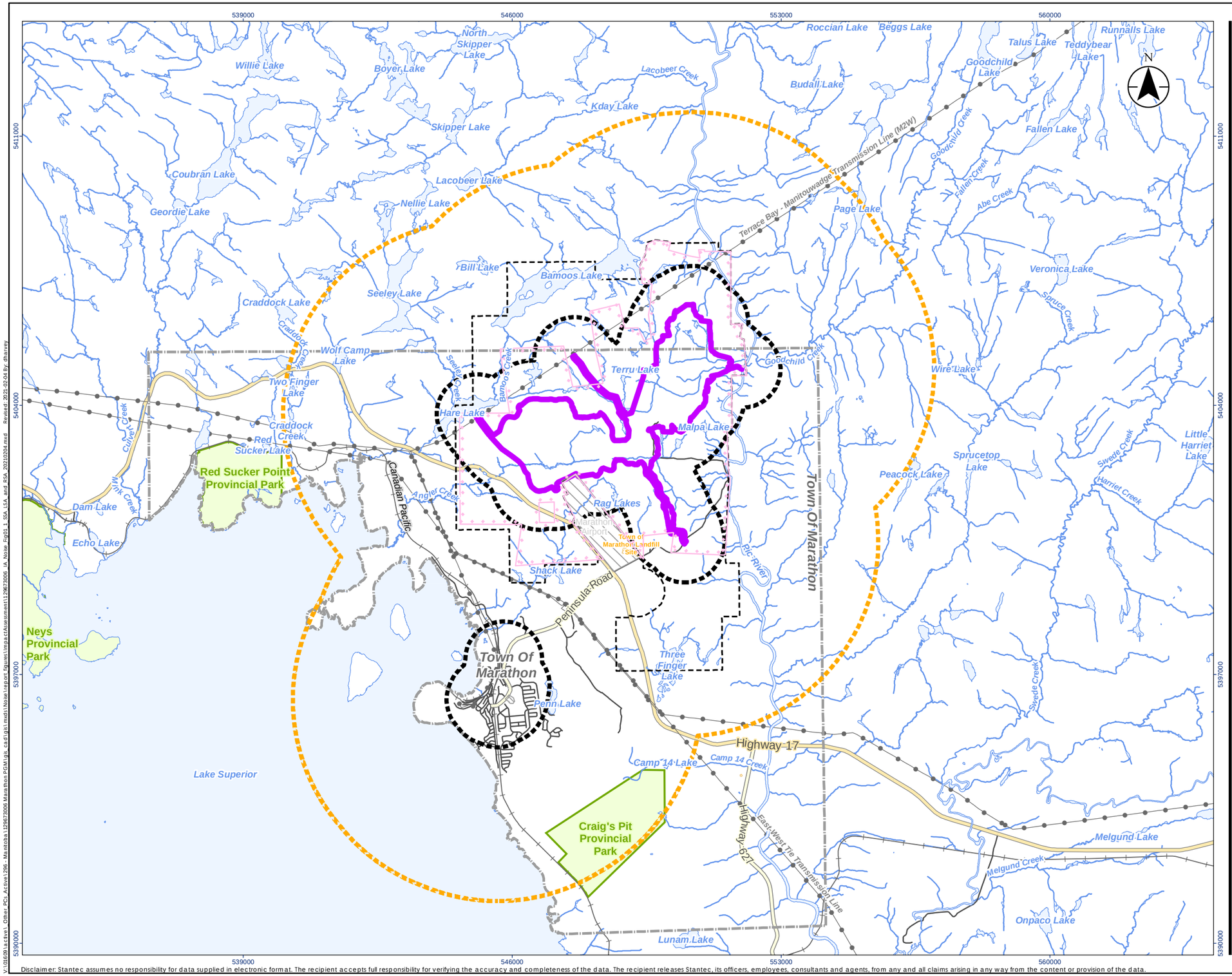
MECP. 1985. Guidelines on Information Required for the Assessment of Blasting Noise and Vibration, December (MOE BLASTING)

Ministry of Transportation (MTO). 2006. Environmental Guide for Noise (MTO Guide), dated October 2006.

Stantec Consulting Ltd. 2020. Marathon Palladium Project Environmental Noise Updated Baseline Report

True Grit Consulting Ltd. 2012. "Supporting Information Report #13: Baseline Technical Report – Noise Marathon PGM – Cu Project prepared by True Grit Consulting Ltd.", July 5, 2012

APPENDIX A:
Figures



Stantec

Legend

- Limit of Surface Rights Controlled by Generation Mining (Current or Pending)
- Project Boundary (MLAS, MENDM Changed 2017)
- Site Study Area Boundary
- Local Study Area
- Regional Study Area
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Provincial Park
- Waterbody
- Waste Management Site

Notes
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.

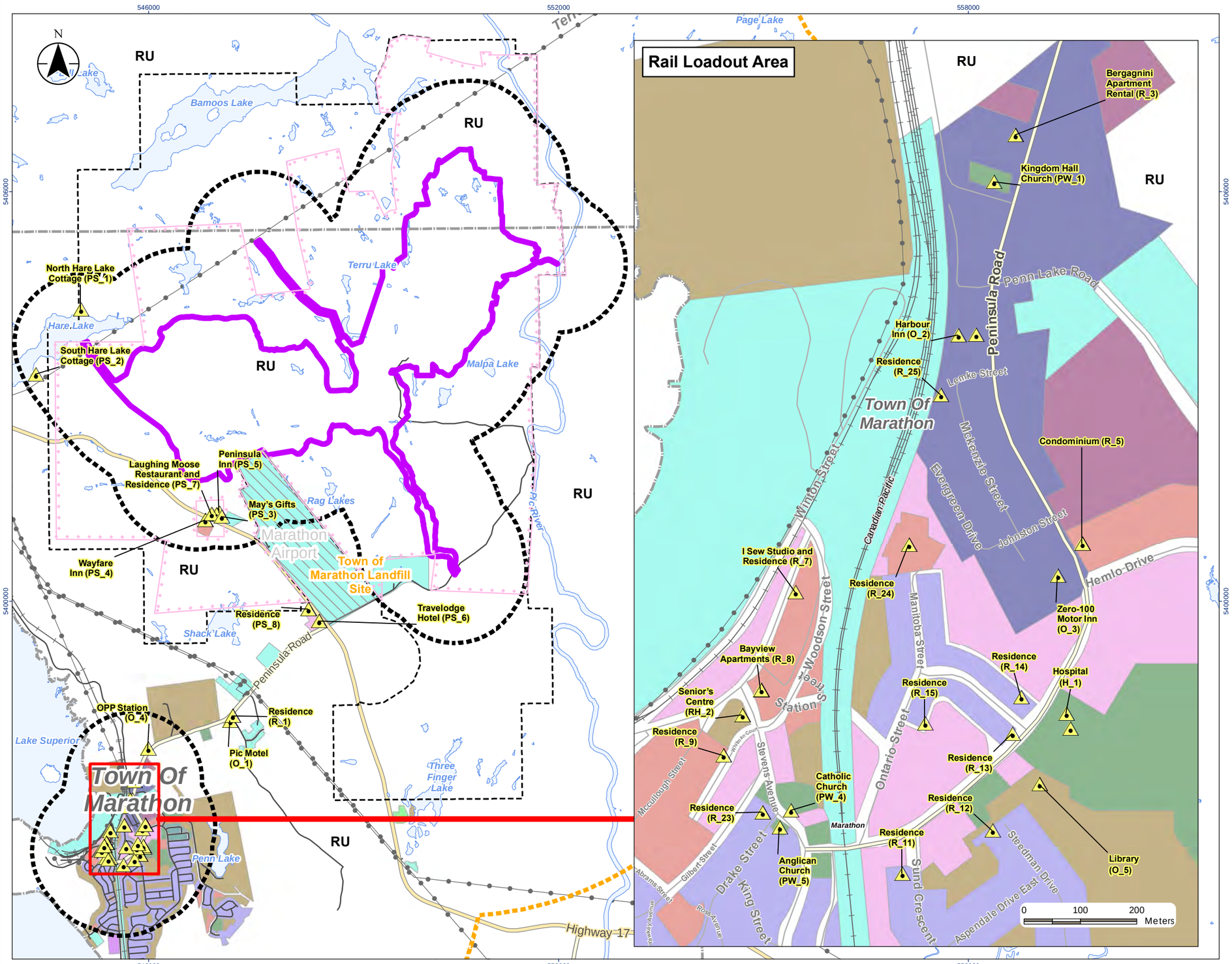
Project Location
Marathon

129673006 REVA
Prepared by SW on 2021-02-04
Technical Review by DH on 2021-02-04
Independent Review by M S on 2021-03-05

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
1

Title
Site, Local and Regional Study Area



Legend

- Receptor Location
- Project Boundary (MLAS, MENDM Changed 2017)
- Model Property Boundary
- Site Study Area Boundary
- Local Study
- Regional Study
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Airport
- Municipal Boundary, Lower Tier
- Waterbody

Town of Marathon Land Use Designations*

- Enterprise (E)
- General Commercial (C2)
- Heavy Industrial (M2)
- Highway Commercial (C3)
- Institutional (I)
- Light Industrial (M1)
- Mobile Home (R2)
- Neighbourhood Commercial (C1)
- Open Space (OS)
- Residential 1 (R1)
- Residential Multiple (RM-1)
- Residential Multiple (RM-2)
- RU Rural (RU)[3]

0 1 2 km

1:57,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
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3. All unclassified areas have a Rural zoning designation as per Schedule A of the Marathon Official Plan.

* Land Use Designations have been adapted from the Town of Marathon Official Plan- Schedule A and should be considered approximate.

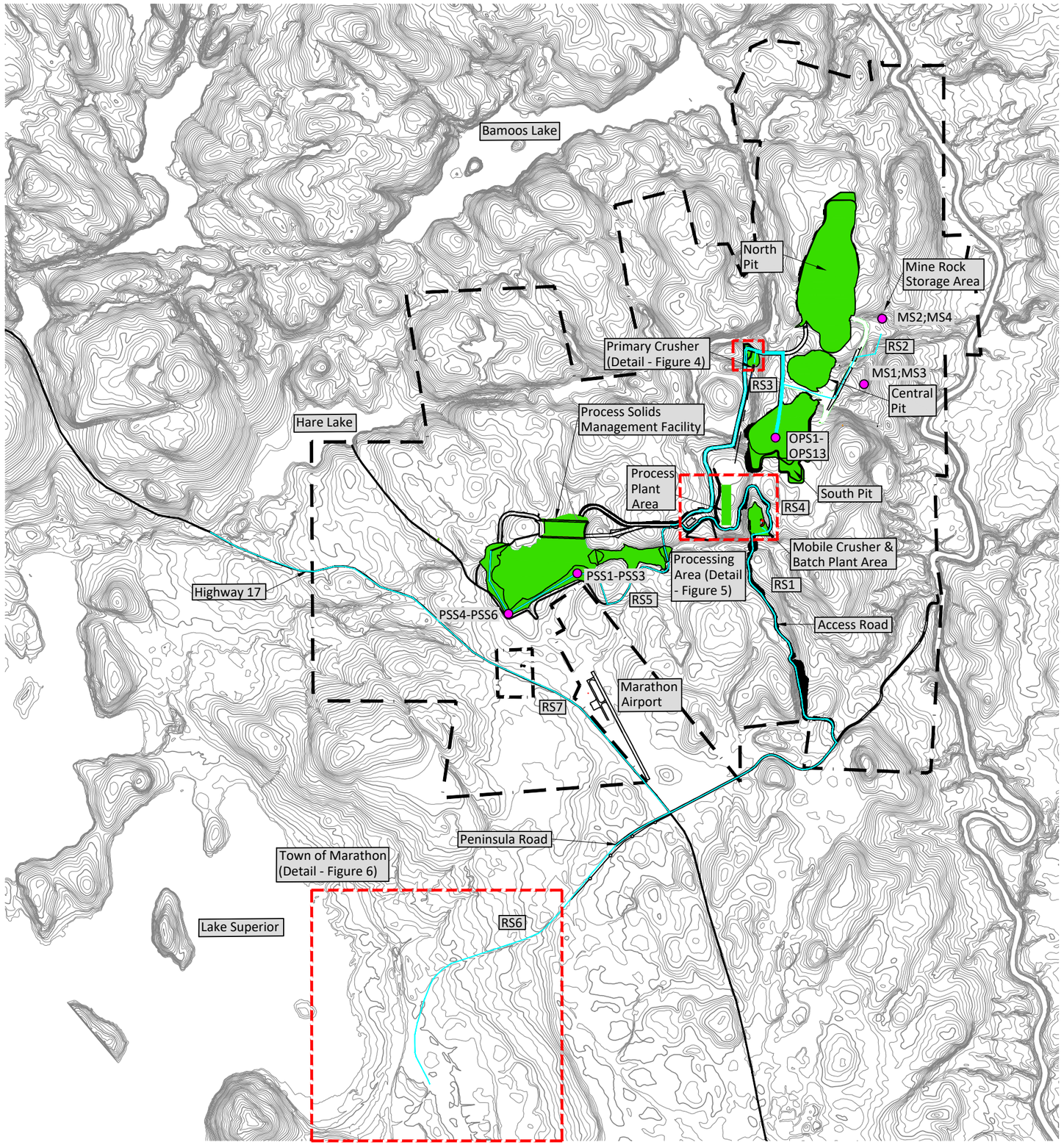
Project Location: Marathon

129673006 REVA
Prepared by SW on 2021-02-10
Technical Review by DH on 2020-09-16
Independent Review by MS on 2021-03-05

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
2

Title
Receptor and Zoning Plan



Stantec

Legend

- Significant Noise Source Location
- Insignificant Noise Source Location
- Access Road/Haul Routes
- Details Provided on Separate Drawing as Noted.
- Property Boundary

Scale

0 500 1000 m

SCALE 1:50000

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

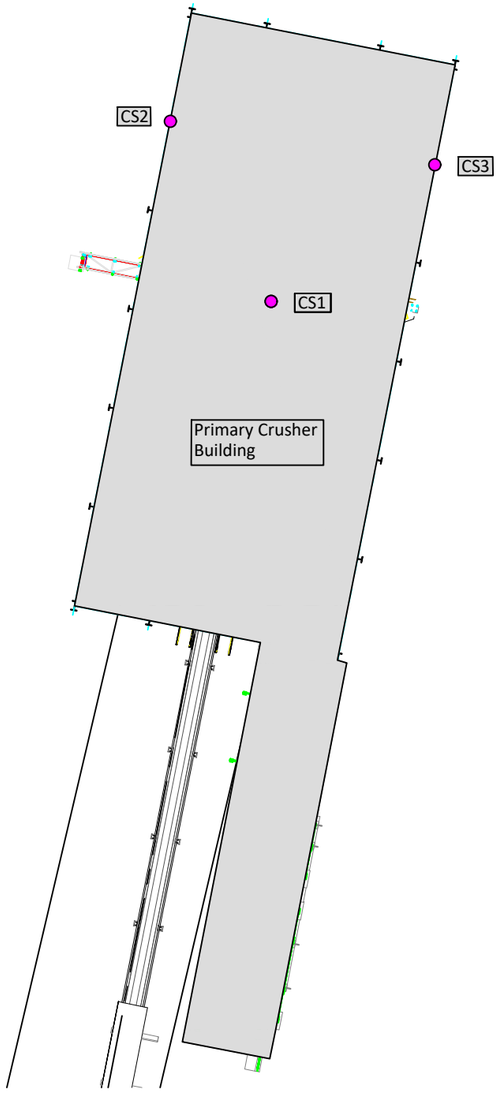
129673006
Prepared by MS on 2020-02-02
Technical Review by FB on 2020-02-03
Independent Review by FB on 2020-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
3

Title
Construction Source Location Plan - Overview

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_construction_south



Stantec

Legend

- Significant Noise Source Location

Scale

N

0 4 8 m

SCALE 1:400

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

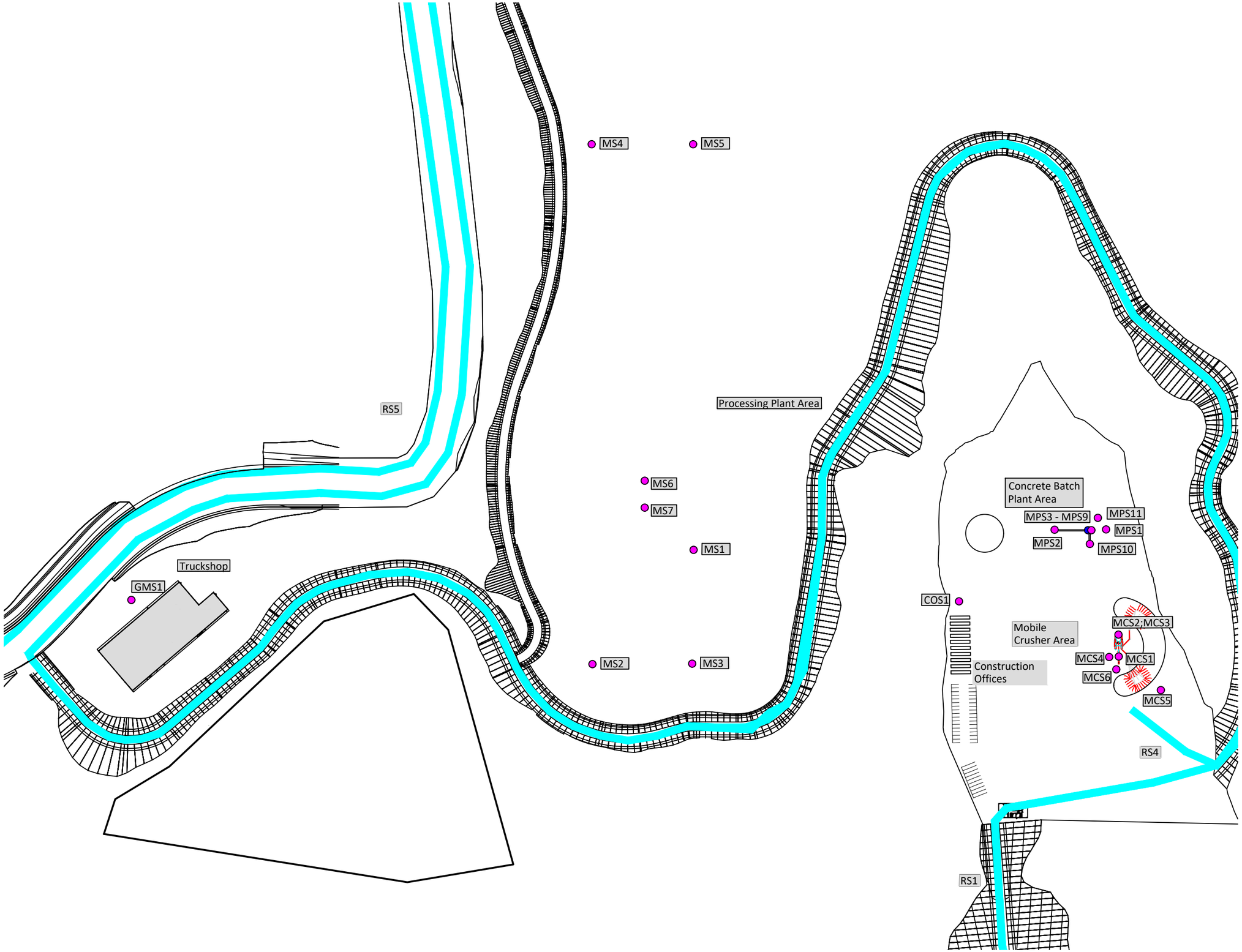
129673006
Prepared by MS on 2021-02-02
Technical Review by FB on 2021-02-03
Independent Review by FB on 2021-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
4

Title
Construction Source Location Plan - Primary Crusher Building

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_construction_south



Stantec

Legend

- Significant Noise Source Location
- Insignificant Noise Source Location
- Access Road/Haul Routes

N

Scale

0 30 60 m SCALE 1:3000

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

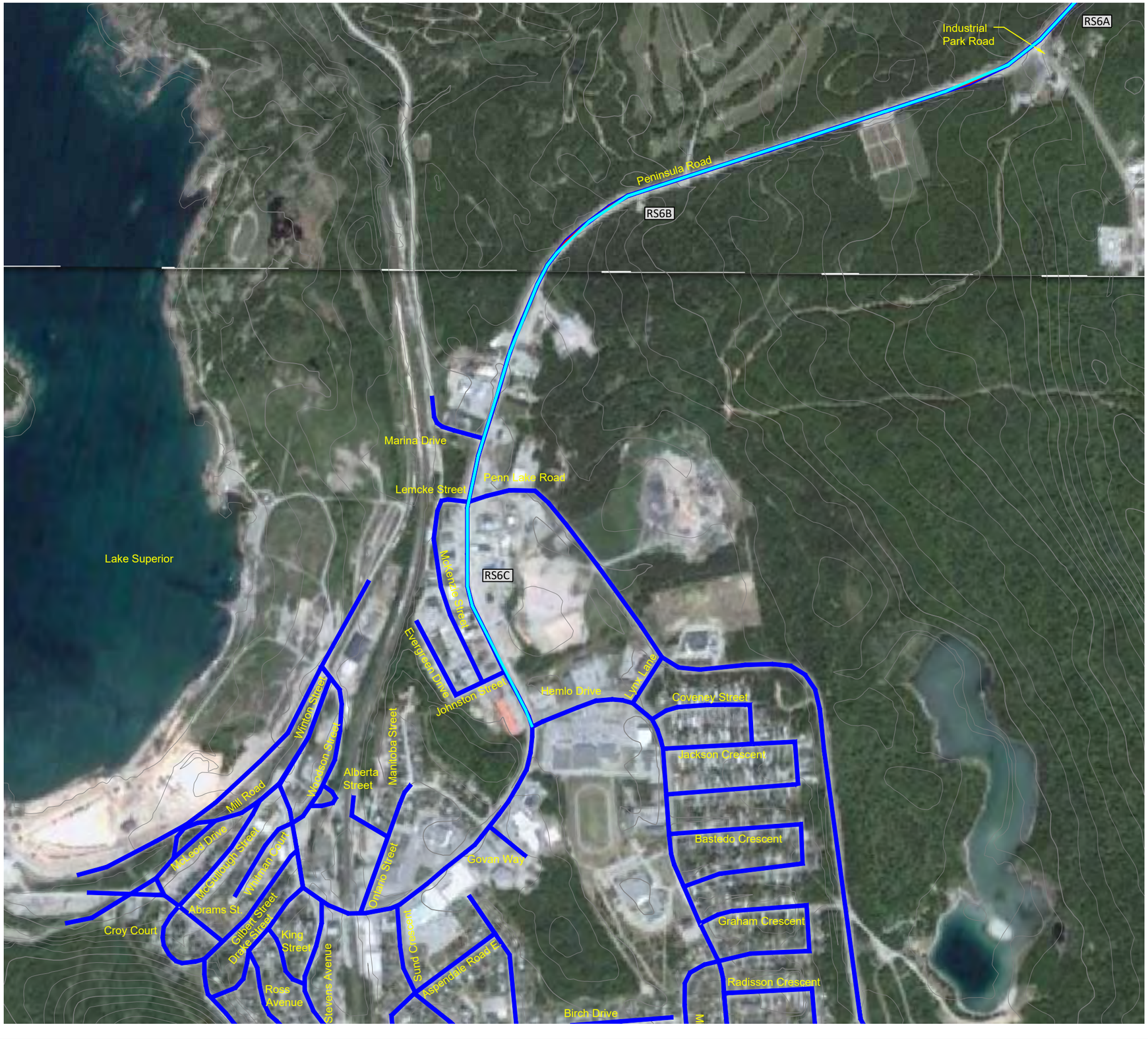
129673006
Prepared by MS on 2021-02-02
Technical Review by FB on 2021-02-03
Independent Review by FB on 2021-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
5

Title
Construction Source Location Plan - Processing Area

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_construction_south



Stantec

Legend

Access Road/Haul Routes

N

Scale

0 100 200 m

SCALE 1:10000

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

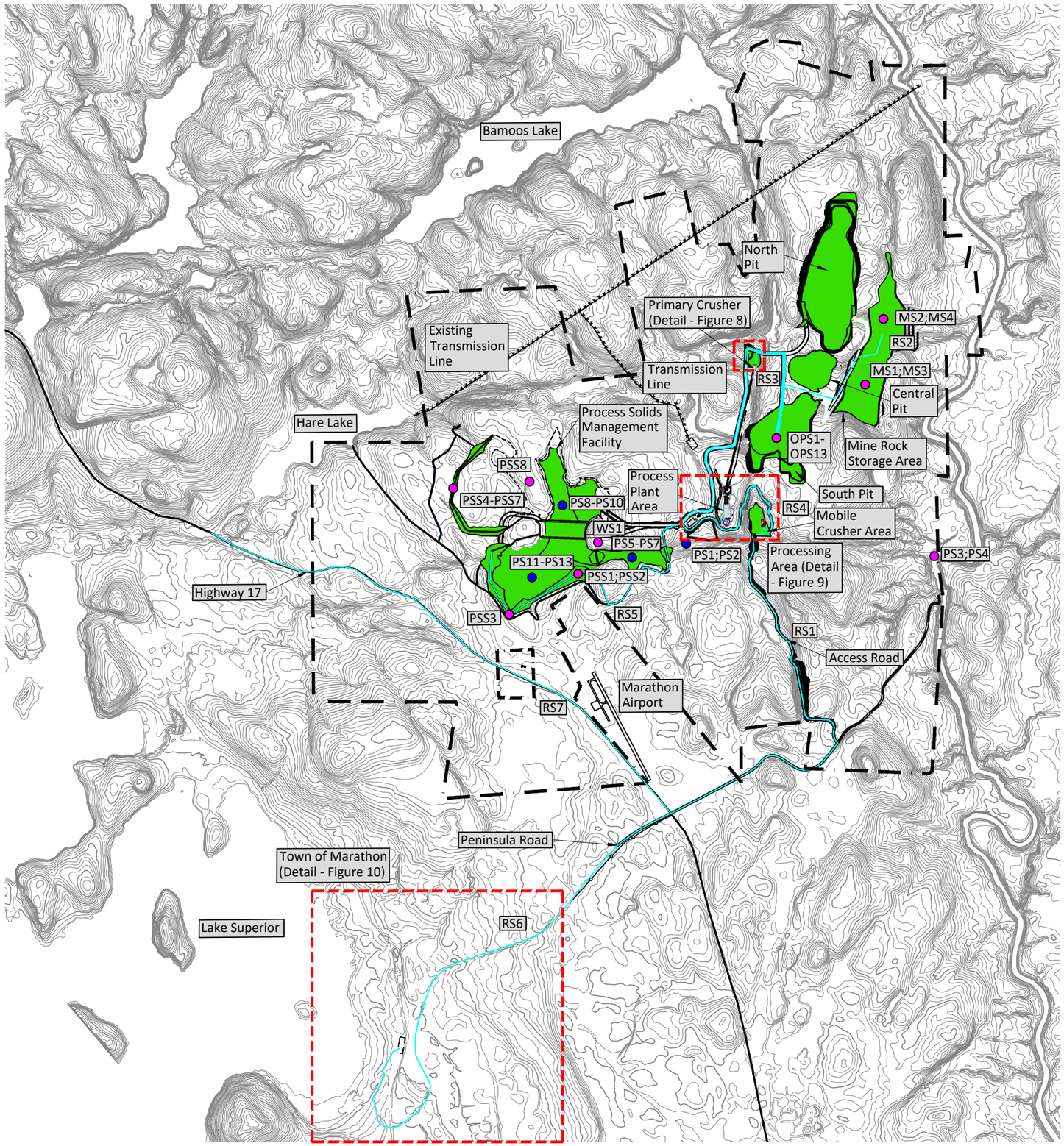
129673006
Prepared by MS on 2021-02-02
Technical Review by FB on 2021-02-03
Independent Review by FB on 2021-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
6

Title
Construction Source Location Plan - Town of Marathon

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_construction_south



Stantec

Legend

- Significant Noise Source Location
- Insignificant Noise Source Location
- Access Road/Haul Routes
- Details Provided on Separate Drawing as Noted.
- Property Boundary

Scale

N

0 500 1000 m

SCALE 1:50000

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

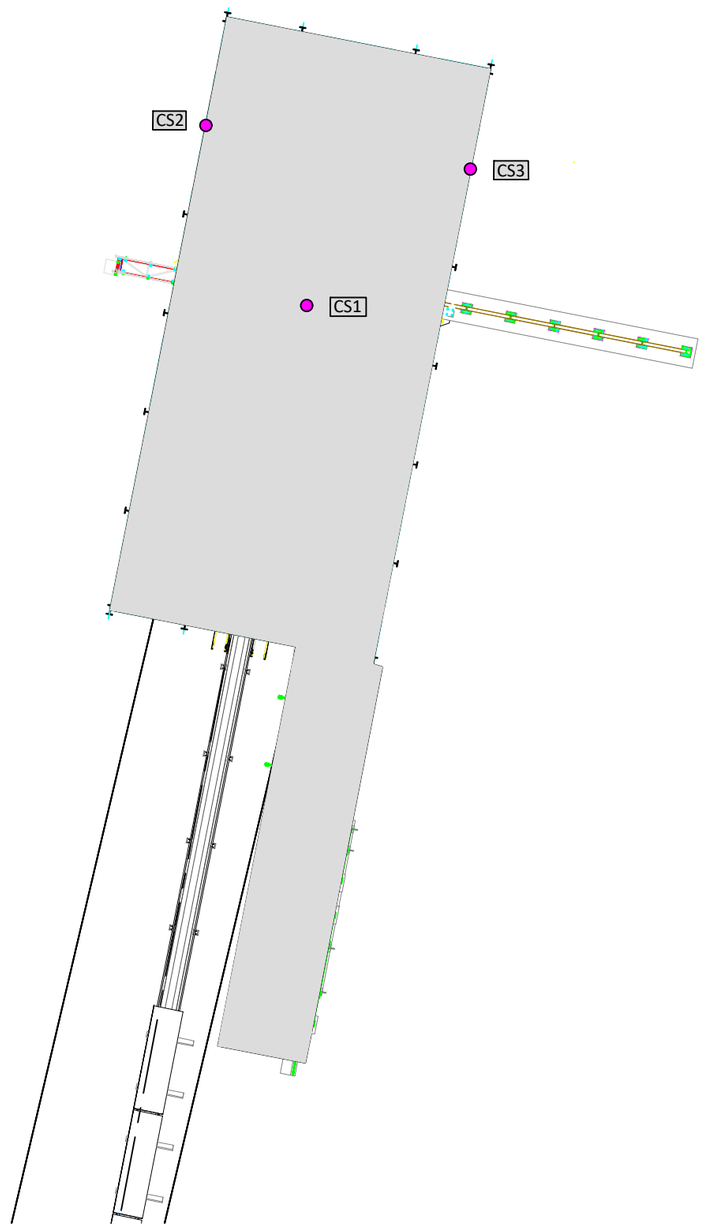
129673006
Prepared by MS on 2021-02-02
Technical Review by FB on 2021-02-03
Independent Review by FB on 2021-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
7

Title
Operations Source Location Plan - Overview

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_operations_south



Stantec

Legend

- Significant Noise Source Location

Scale

N

0 4 8 m

SCALE 1:400

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

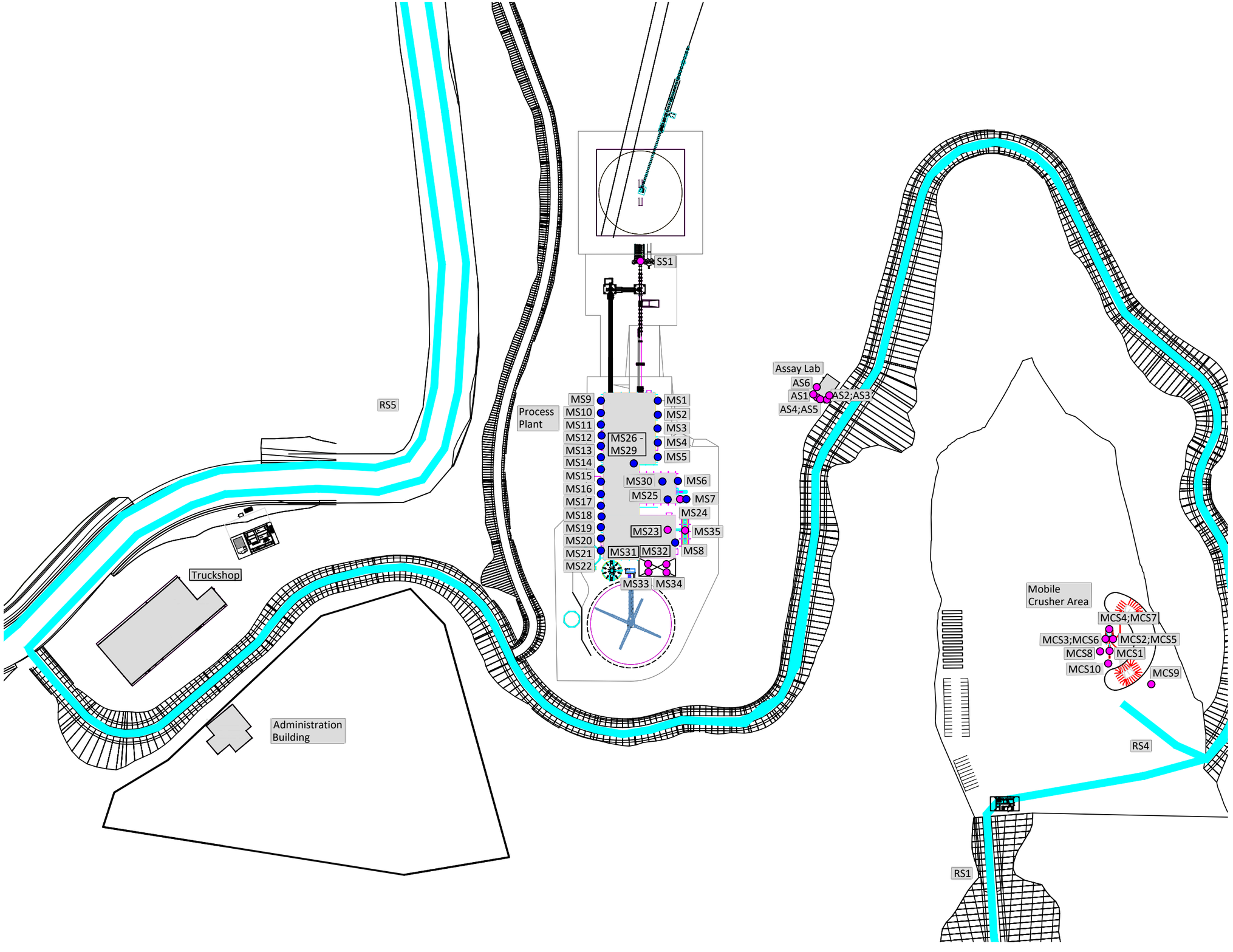
129673006
Prepared by MS on 2021-02-02
Technical Review by FB on 2021-02-03
Independent Review by FB on2021-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
8

Title
Operations Source Location Plan - Primary Crusher Building

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_operations_south_2



Stantec

Legend

- Signification Noise Source Location
- Insignificant Noise Source Location
- Access Road/Haul Routes

N

Scale

0 30 60 m SCALE 1:3000

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

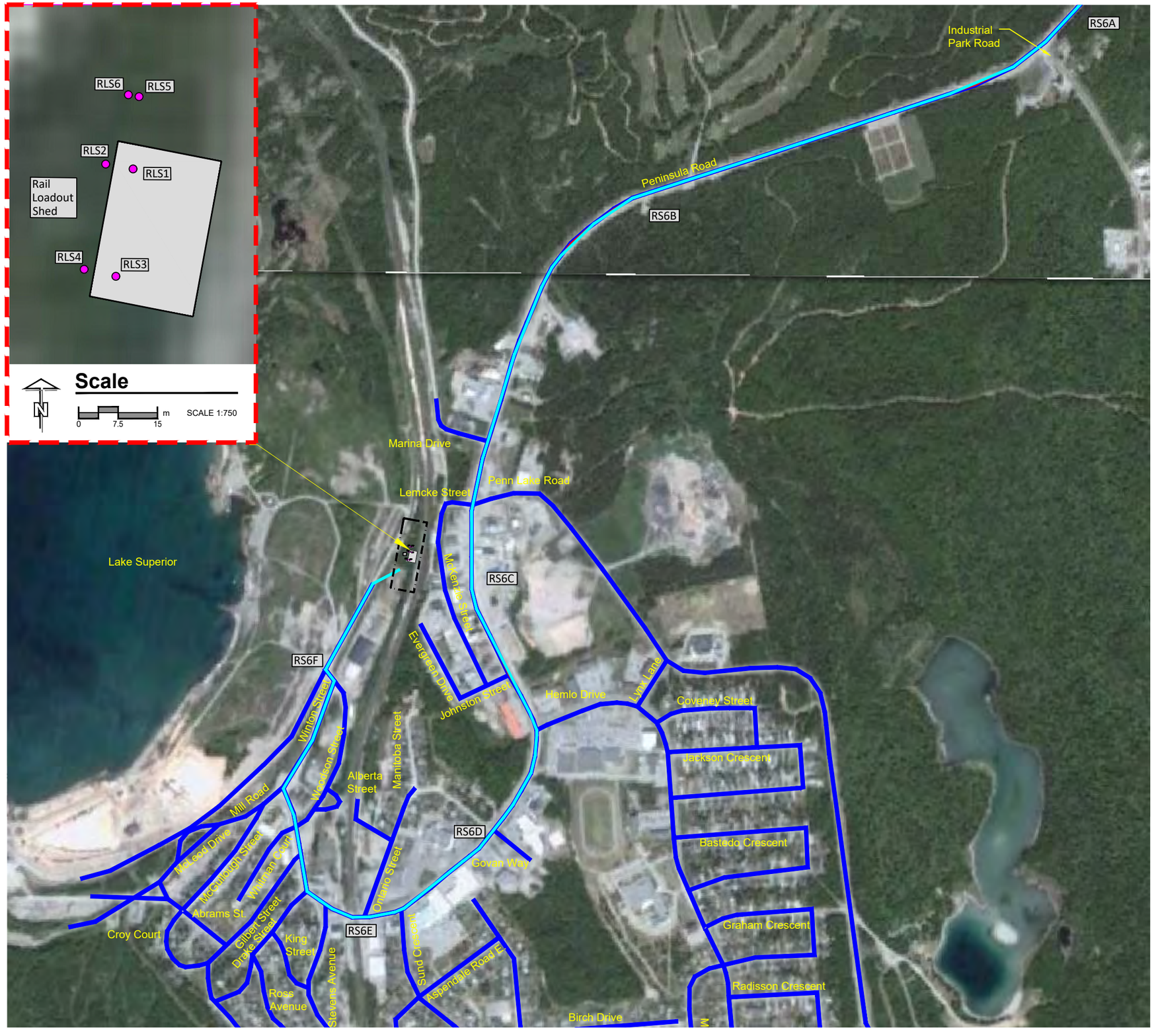
129673006
Prepared by MS on 2021-02-02
Technical Review by FB on 2021-02-03
Independent Review by FB on 2021-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
9

Title
Operations Source Location Plan - Processing Area

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_operations_south



Stantec

Legend

- Significant Noise Source Location
- Access Road/Haul Routes
- Property Boundary

Scale

N

m

0 100 200

SCALE 1:10000

(At original document size of 11x17)

Notes

1. Coordinate System: NAD 1927 UTM Zone Z16

Project Location
Marathon

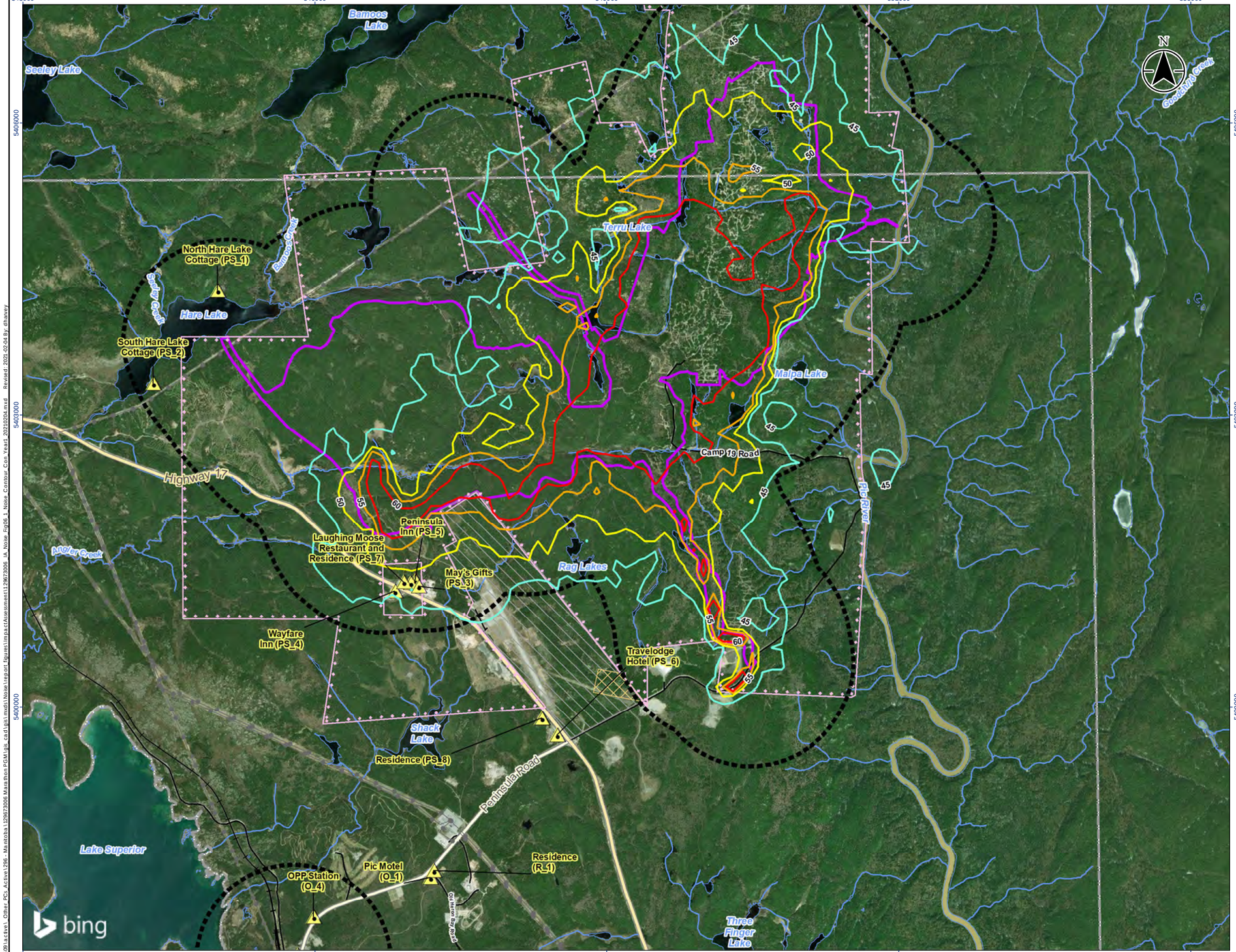
129673006
Prepared by MS on 2021-02-02
Technical Review by FB on 2021-02-03
Independent Review by FB on 2021-02-03

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
10

Title
Operations Source Location Plan - Rail Loadout

c:\users\mstachejczuk\desktop\generation pgm - noise\drawings\129673006_operations_south_2



Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 1 2 km

1:40,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

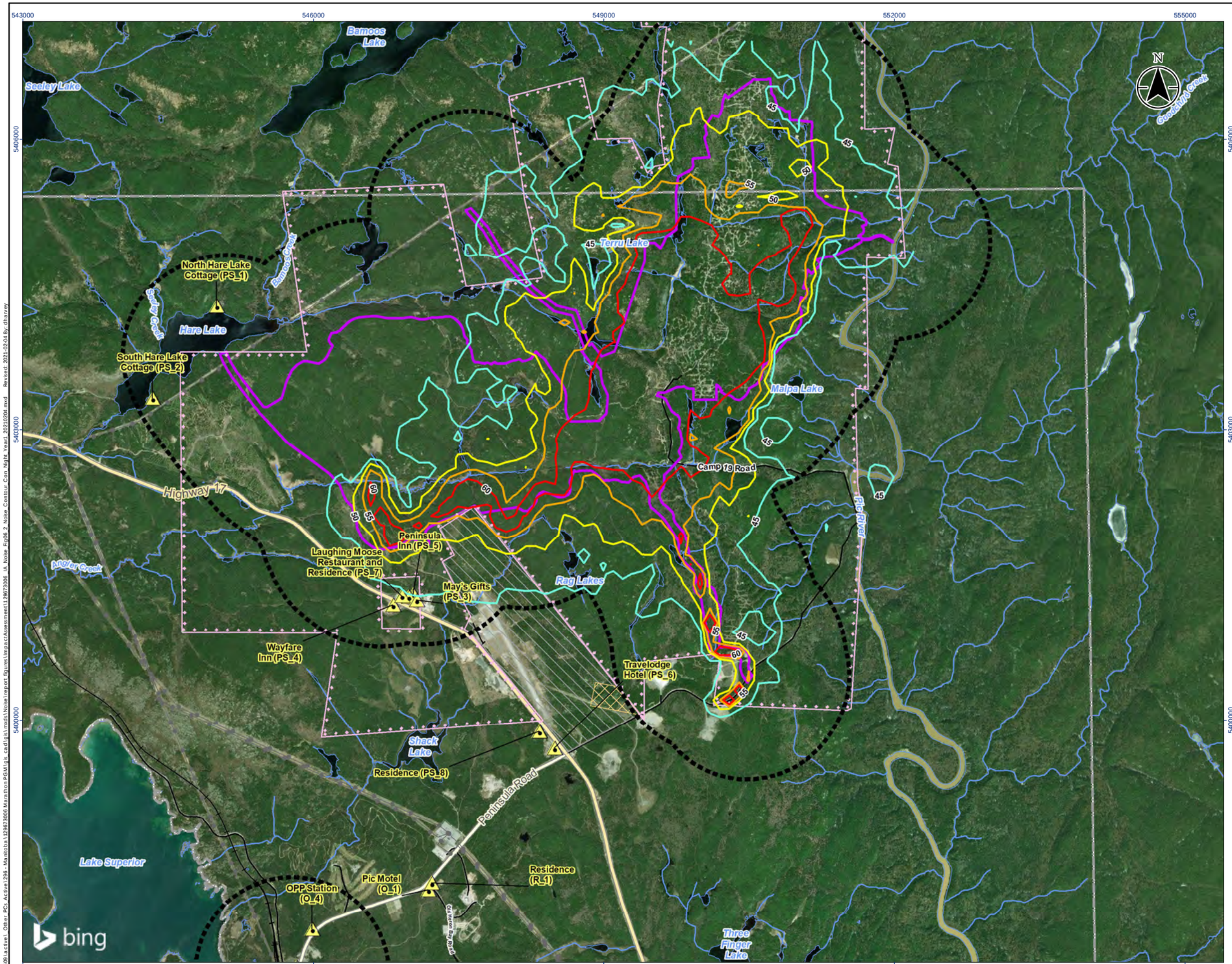
129673006 REVA
Prepared by DH on 2021-02-04

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
11

Title
Noise Contours for Construction (Year -1) - Daytime Project Noise ($L_{eq(1)}$)

V:\01689\active_Other_PCs_Active\296 - Manitoba\129673006 Marathon PGM\gis_cad\gis\mxds\Noise\report_figures\ImpactAssessment\129673006_IA_Noise_Fig06-1_Noise_Contour_Year1_20210204.mxd Revised: 2021-02-04 By: dharvey



Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 1 2 km

1:40,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

129673006 REVA
Prepared by DH on 2021-02-04

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
12

Title
Noise Contours for Construction (Year -1) - Nighttime Project Noise ($L_{eq(1)}$)

Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 0.5 1 km

1:27,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

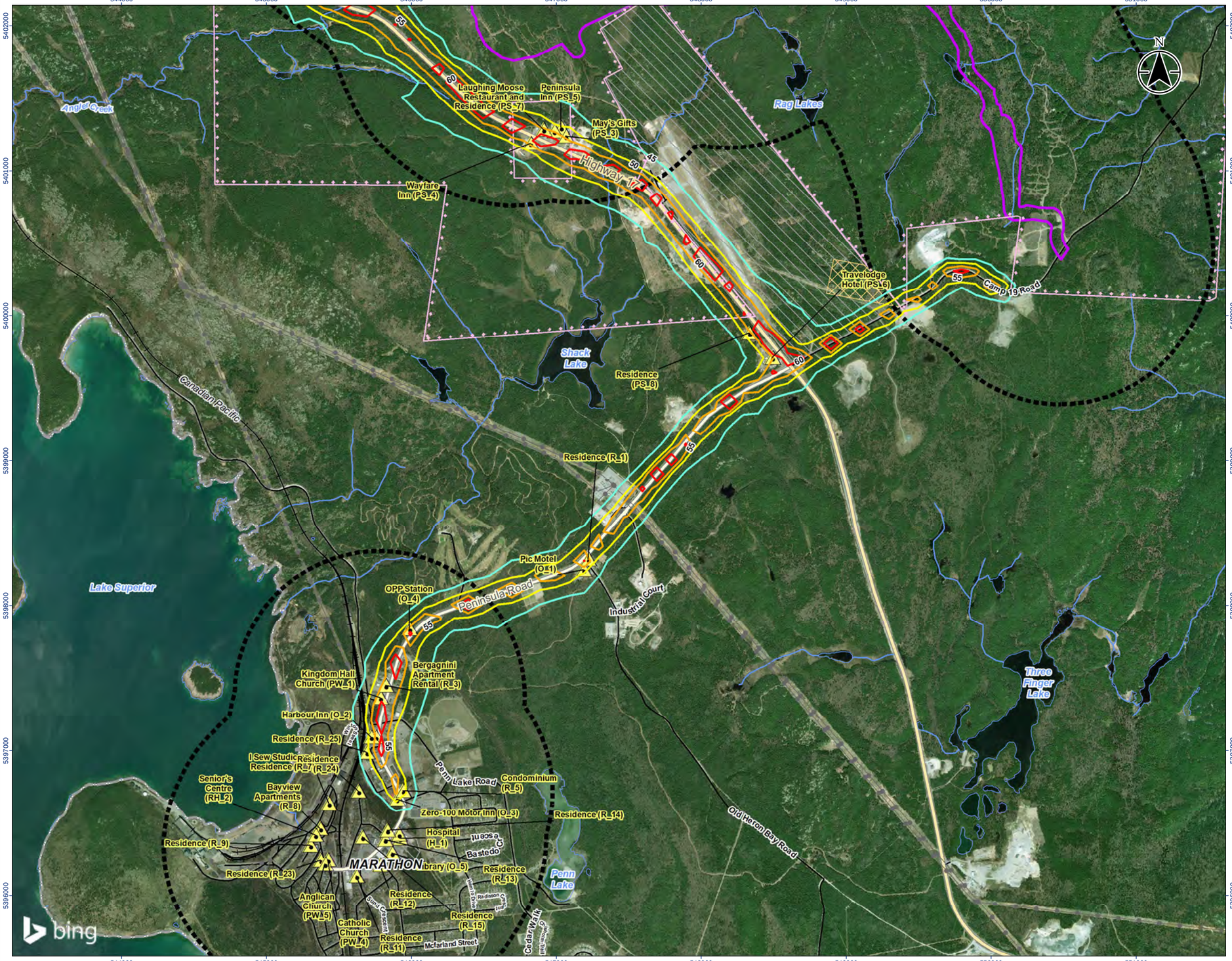
129673006 REVA
Prepared by DH on 2021-02-10

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
13

Title
Noise Contours for Construction (Year -1) - Daytime Background Traffic Noise ($L_{eq(16)}$)

V:\1016\91\active_Other PCs Active\296 - Manitoba\129673006 Marathon PGM\gis_cad\gis\mxds\Noise report figures\ImpactAssessment\129673006_IA_Noise_Fig06_3_Noise_Contour_Con_Daytime_BackgroundTraffic_20210204.mxd Revised: 2021-02-10 By: dhavey



Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 0.5 1 km

1:27,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

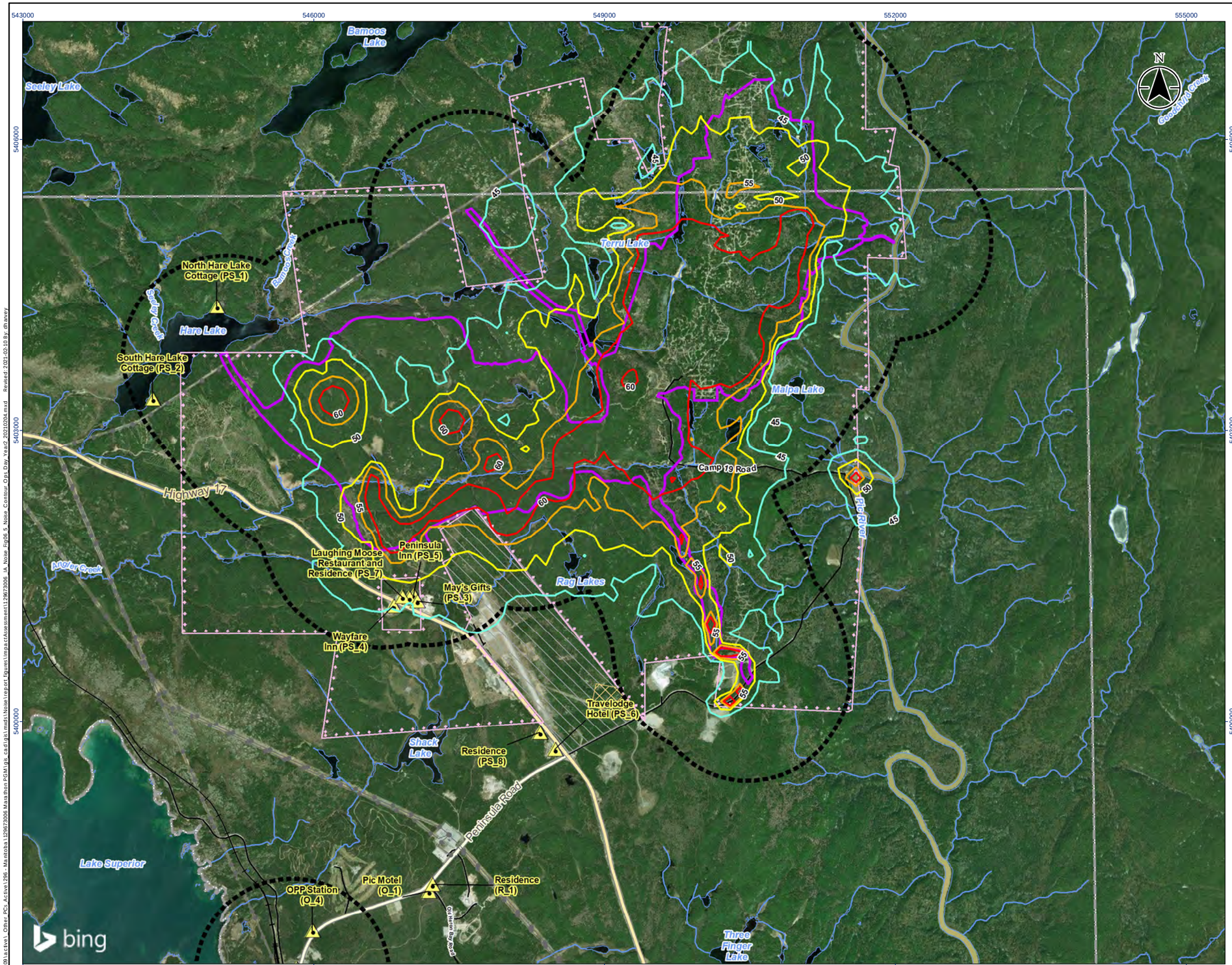
129673006 REVA
Prepared by DH on 2021-02-10

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
14

Title
Noise Contours for Construction (Year -1) - Daytime Project Traffic Noise ($L_{eq(16)}$)

V:\01069\active\ Other PCs Active\298 - Manitoba\129673006 Marathon PGM\gis_cad\gis\mxds\Noise\report figures\Impact\Assessment\129673006 -JA_Noise Fig06_4 Noise Contour_Con_Daytime_ProjectTraffic_20210204.mxd Revised: 2021-02-10 By: dharvey



Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 1 2 km

1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthographic Imagery Source: © 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS

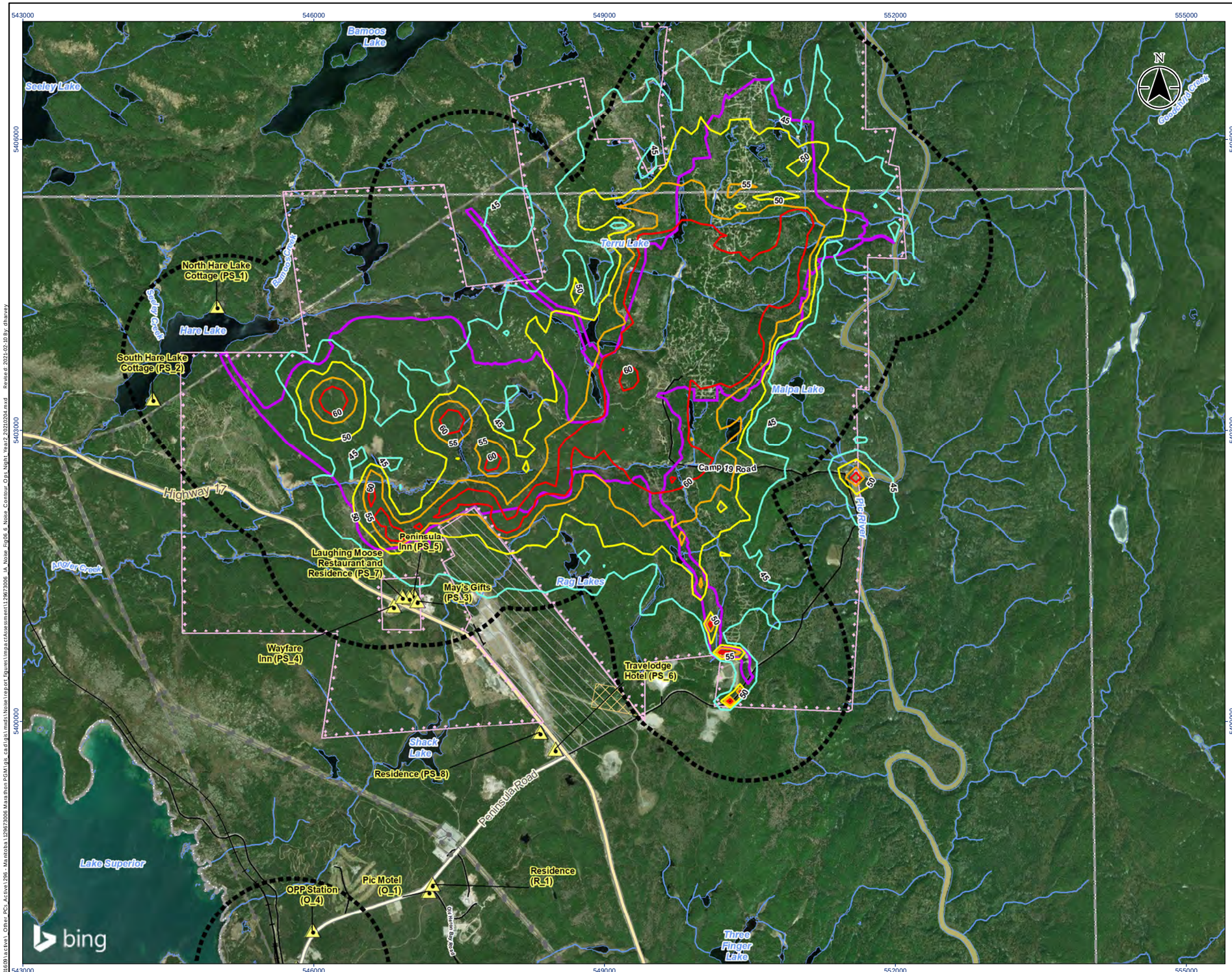
Project Location
Marathon

129673006 REVA
Prepared by DH on 2021-02-10

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
15

Title
Noise Contours for Operations (Year 2) - Daytime Project Noise ($L_{eq(1)}$)



Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 1 2 km

1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthographic Imagery Source: © 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS

Project Location
Marathon

129673006 REVA
Prepared by DH on 2021-02-10

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
16

Title
Noise Contours for Operations (Year 2) - Nighttime Project Noise ($L_{eq(1)}$)

V:\01699\active_Other_PCs_Active\295 - Manitoba\129673006 Marathon PGM\gis_cad\gis\mxds\NoiseReport\figures\impact\Assessment\129673006_IA_Noise_Fig06_6_Noise_Contour_Ops_Night_Year2_20210204.mxd Revised: 2021-02-10 By: dharvey

Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 0.5 1 km

1:27,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthographic Imagery Source: © 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS

Project Location
Marathon

129673006 REVA
Prepared by DH on 2021-02-10

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
17

Title
Noise Contours for Operations (Year 2) - Daytime Background Traffic Noise ($L_{eq(16)}$)

Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 45
- 50
- 55
- 60

0 0.5 1 km

1:27,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthographic Imagery Source: © 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS

Project Location
Marathon

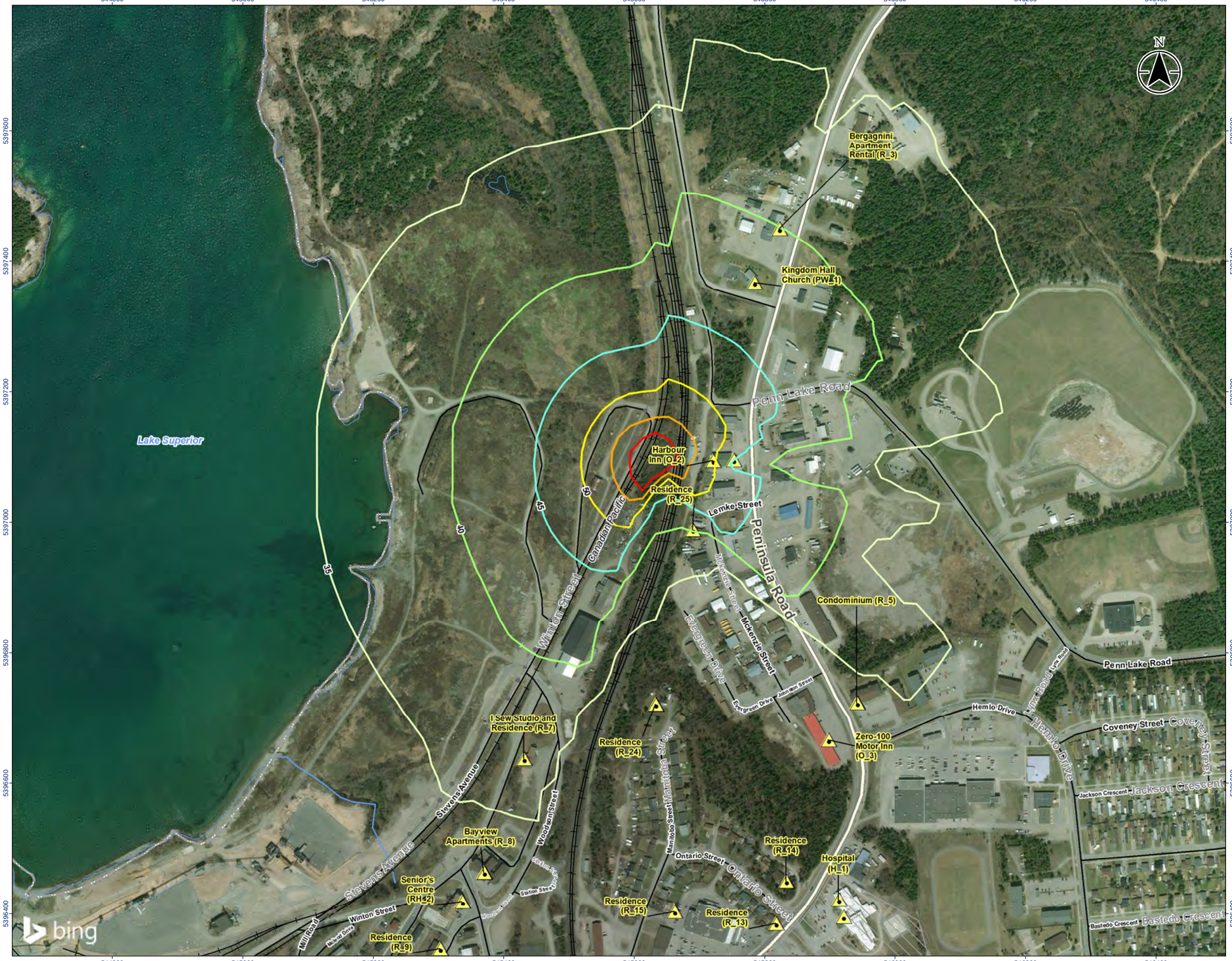
129673006 REVA
Prepared by DH on 2021-02-10

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
18

Title
Noise Contours for Operations (Year 2) - Daytime Project Traffic Noise ($L_{eq(16)}$)

V:\1016\9\active_Other_PCs_Active\296 - Manitoba\129673006 Marathon PGM\gis_cad\gis\mxds\Noise report figures\ImpactAssessment\129673006_IA_Noise_Fig06_8_Noise_Contour_Ops_Daytime_ProjectTraffic_20210204.mxd Revised 2021-02-10 By: dharvey



Stantec

Legend

- Receptor Location
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody

Noise Contour (dBA)

- 35
- 40
- 45
- 50
- 55
- 60

0 200 400 Meters

1:6,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 16N
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Project Location
Marathon

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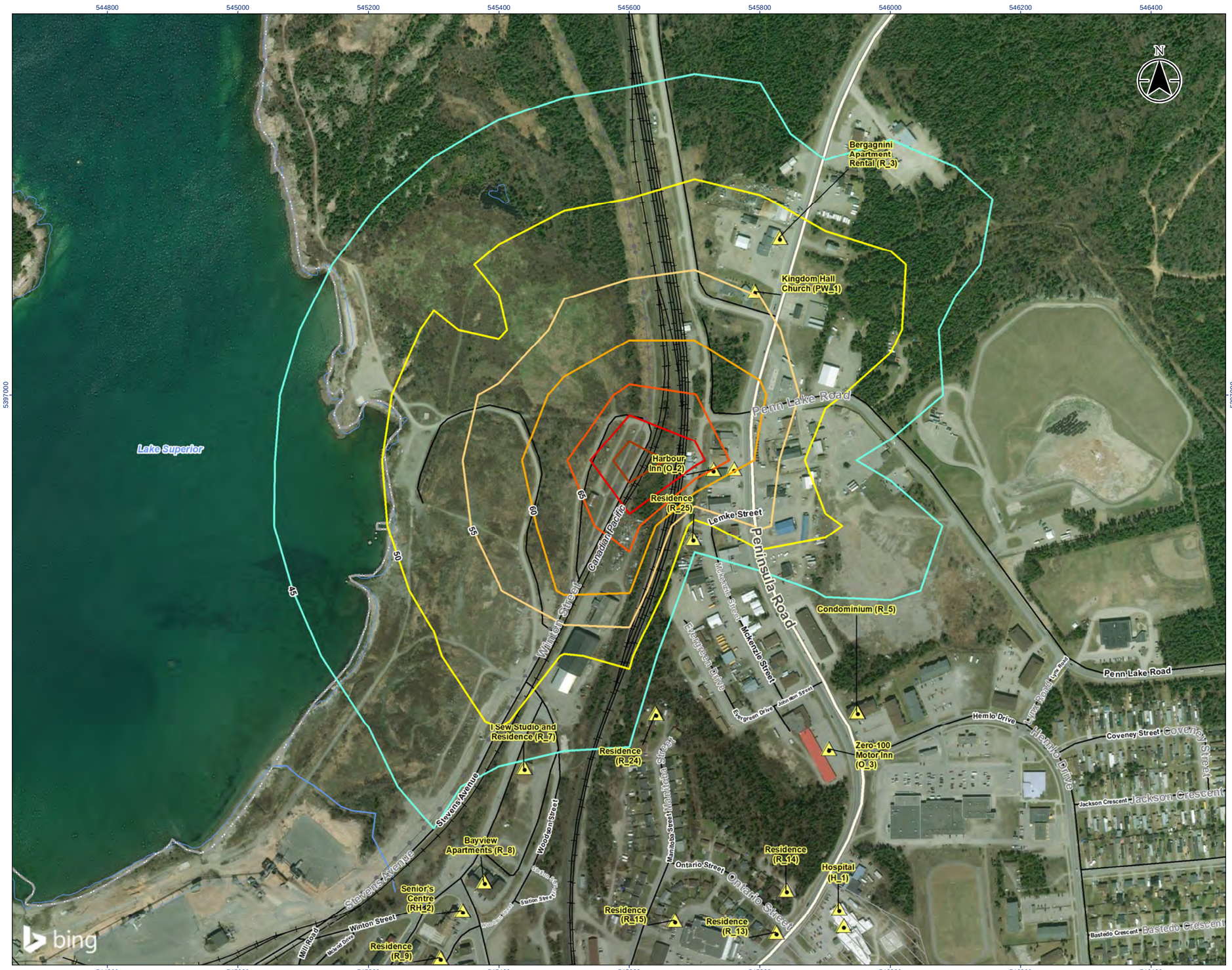
Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
19

Title
Noise Contours for Operations (Year 2) - Daytime Rail Loadout Noise ($L_{eq(1)}$)



Stantec

Legend

- Receptor Location
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody

Noise Contour (dBAI)

- 45
- 50
- 55
- 60
- 65
- 70
- 75

0 200 400 Meters

1:6,000 (At original document size of 11x17)

Notes

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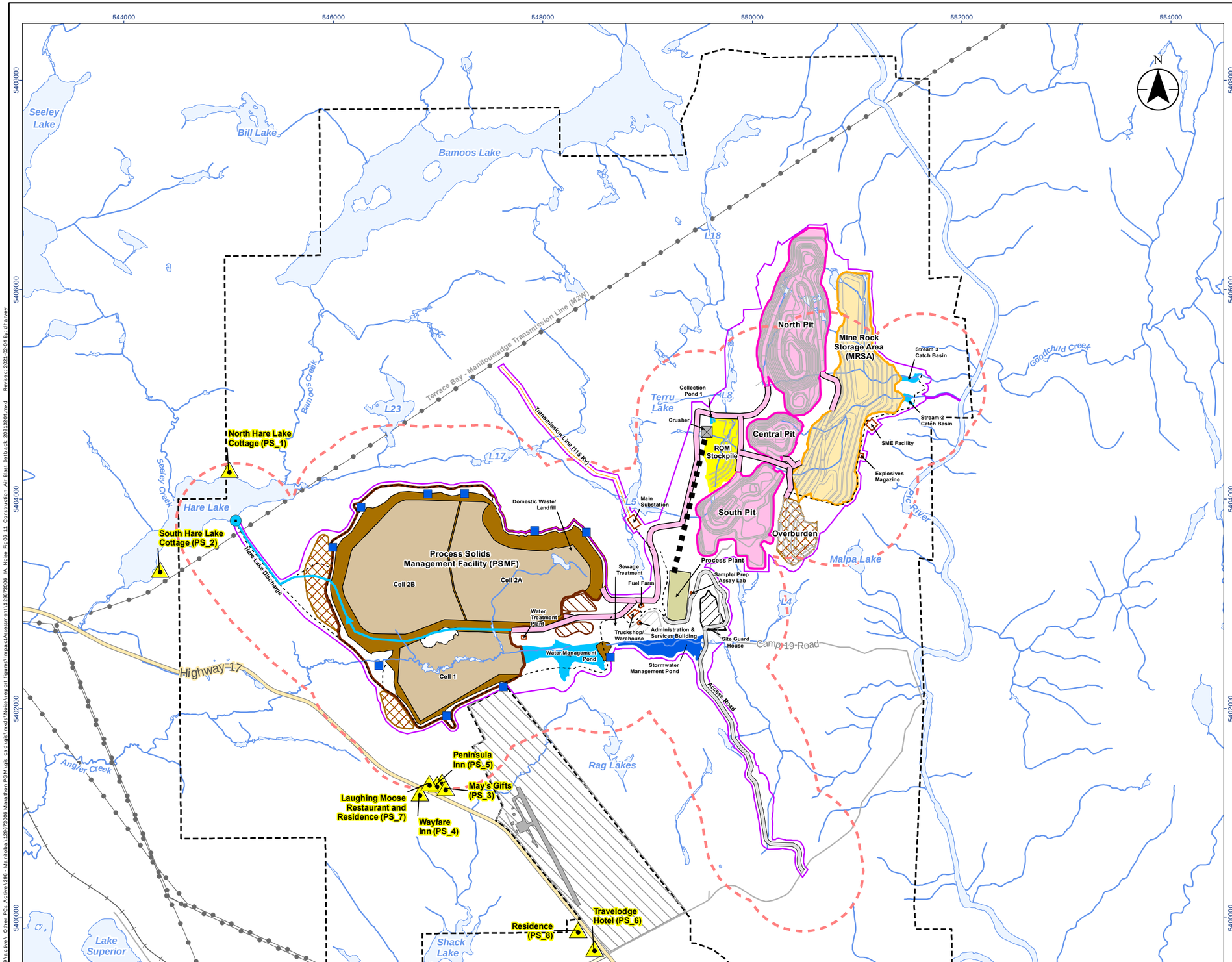
Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
20

Title
Noise Contours for Operations (Year 2) - Daytime Impulsive Rail Loadout Noise



Stantec

Legend

- Blasting Contour, 120 dB No Monitoring
- Noise Receptors
- Site Study Area Boundary
- Project Boundary (MLAS, MENDM Changed 2017)
- Highway
- Major Road
- Hydro Line
- Railway
- Watercourse
- Airport (Property Boundary)
- Airport Infrastructure
- Waterbody

Proposed Project Components

- Crusher
- Discharge Location
- Seepage Collection Basin
- Access Road
- Conveyor
- Discharge Line
- Haul Road
- Site Road
- Transmission Line (115 Kv)
- **Aggregate Site** (Aggregate Plant, Concrete Batch Plant, Diesel Generator)
- Building/ Facility Footprint
- Stormwater Management Pond
- Laydown Area
- Mine Rock Storage Area (MRSA)
- Open Pit
- Overburden Stockpile
- Process Soilds Manadement Facility (PSMF)
- PSMF Cell
- PSMF Embankment
- **Process Plant Area** (Bulk Reagent Storage, Live Ore Stockpile, Process Plant, Propane Storage Area, Concentrate Storage Building, Diesel Generators)
- ROM Stockpile
- Soil Stockpile
- Water Management Pond

0 0.5 1 km

1:37,000 (At original document size of 11x17)

Notes

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3. Mine plan as illustrated on this drawing is approximate and for illustrative purposes. Design details were provided by G Mining and Knight Piesold.

Project Location
Marathon

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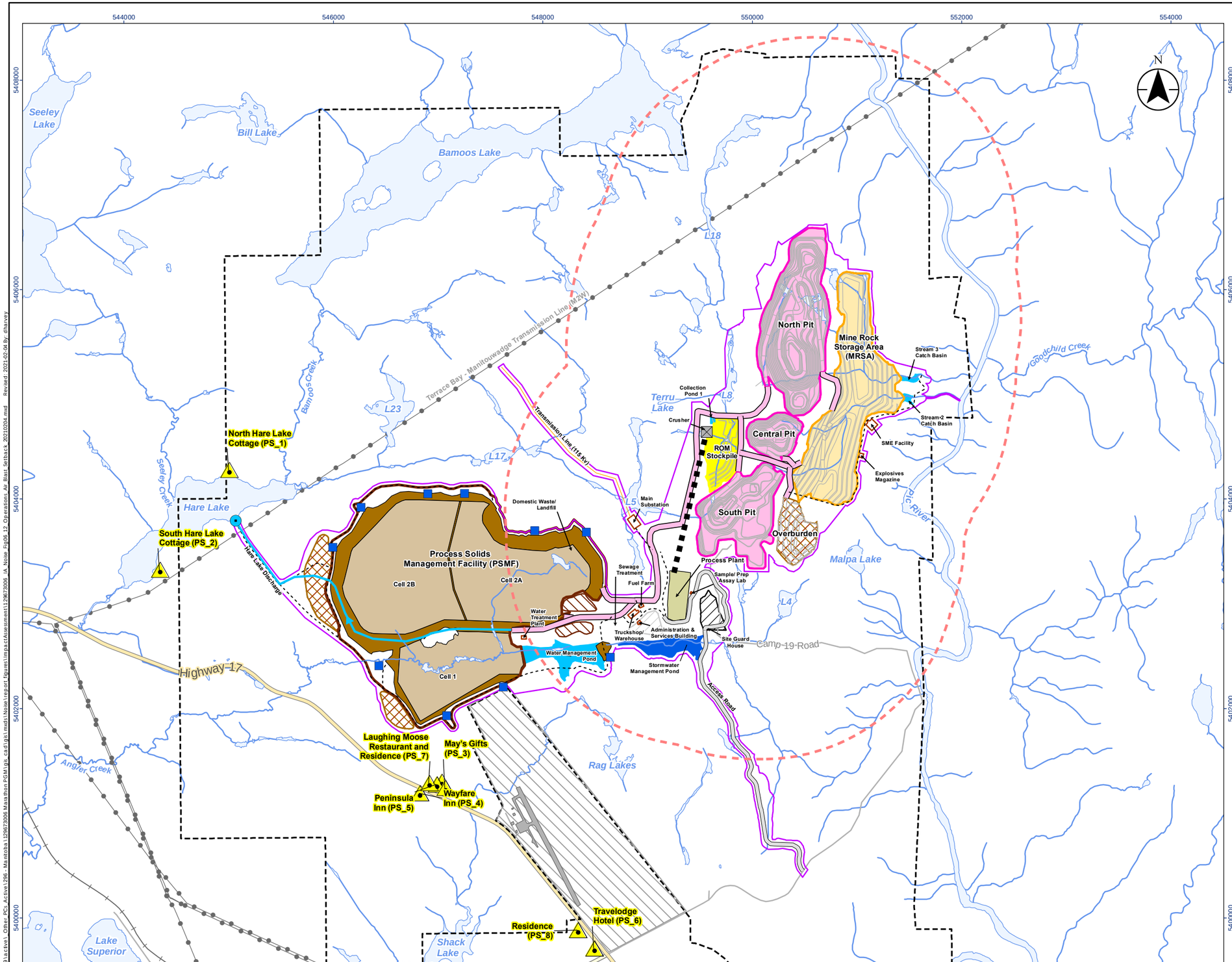
Prepared by DH on 2021-02-04

Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
21

Title
Construction Air Blast Setback



Stantec

Legend

- Blasting Contour, 120 dB No Monitoring
- Noise Receptors
- Site Study Area Boundary
- Project Boundary (MLAS, MENDM Changed 2017)
- Highway
- Major Road
- Hydro Line
- Railway
- Watercourse
- Airport (Property Boundary)
- Airport Infrastructure
- Waterbody

Proposed Project Components

- Crusher
- Discharge Location
- Seepage Collection Basin
- Access Road
- Conveyor
- Discharge Line
- Haul Road
- Site Road
- Transmission Line (115 Kv)
- **Aggregate Site** (Aggregate Plant, Concrete Batch Plant, Diesel Generator)
- Building/ Facility Footprint
- Stormwater Management Pond
- Laydown Area
- Mine Rock Storage Area (MRSA)
- Open Pit
- Overburden Stockpile
- Process Soilds Manadement Facility (PSMF)
- PSMF Cell
- PSMF Embankment
- **Process Plant Area** (Bulk Reagent Storage, Live Ore Stockpile, Process Plant, Propane Storage Area, Concentrate Storage Building, Diesel Generators)
- ROM Stockpile
- Soil Stockpile
- Water Management Pond

0 0.5 1 km

1:37,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

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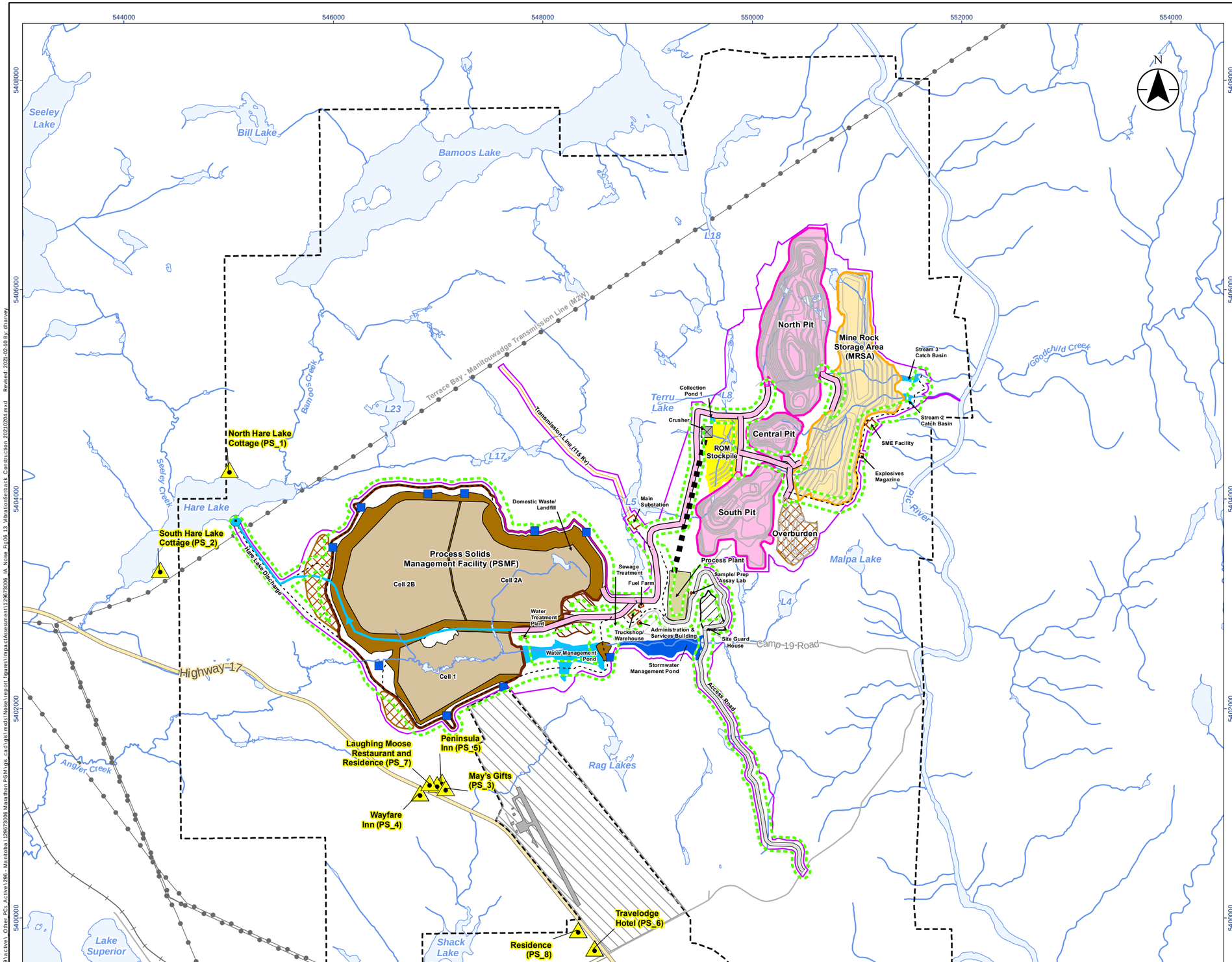
Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
22

Title
Operations Blasting Setback



Stantec

Legend

- Vibration Setback (No Monitoring)
- Noise Receptors
- Site Study Area Boundary
- Project Boundary (MLAS, MENDM Changed 2017)
- Highway
- Major Road
- Hydro Line
- Railway
- Watercourse
- Airport (Property Boundary)
- Airport Infrastructure
- Waterbody

Proposed Project Components

- Crusher
- Discharge Location
- Seepage Collection Basin
- Access Road
- Conveyor
- Discharge Line
- Haul Road
- Site Road
- Transmission Line (115 Kv)
- **Aggregate Site** (Aggregate Plant, Concrete Batch Plant, Diesel Generator)
- Building/ Facility Footprint
- Stormwater Management Pond
- Laydown Area
- Mine Rock Storage Area (MRSA)
- Open Pit
- Overburden Stockpile
- Process Soilds Manadement Facility (PSMF)
- PSMF Cell
- PSMF Embankment
- **Process Plant Area** (Bulk Reagent Storage, Live Ore Stockpile, Process Plant, Propane Storage Area, Concentrate Storage Building, Diesel Generators)
- ROM Stockpile
- Soil Stockpile
- Water Management Pond

0 0.5 1 km

1:37,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

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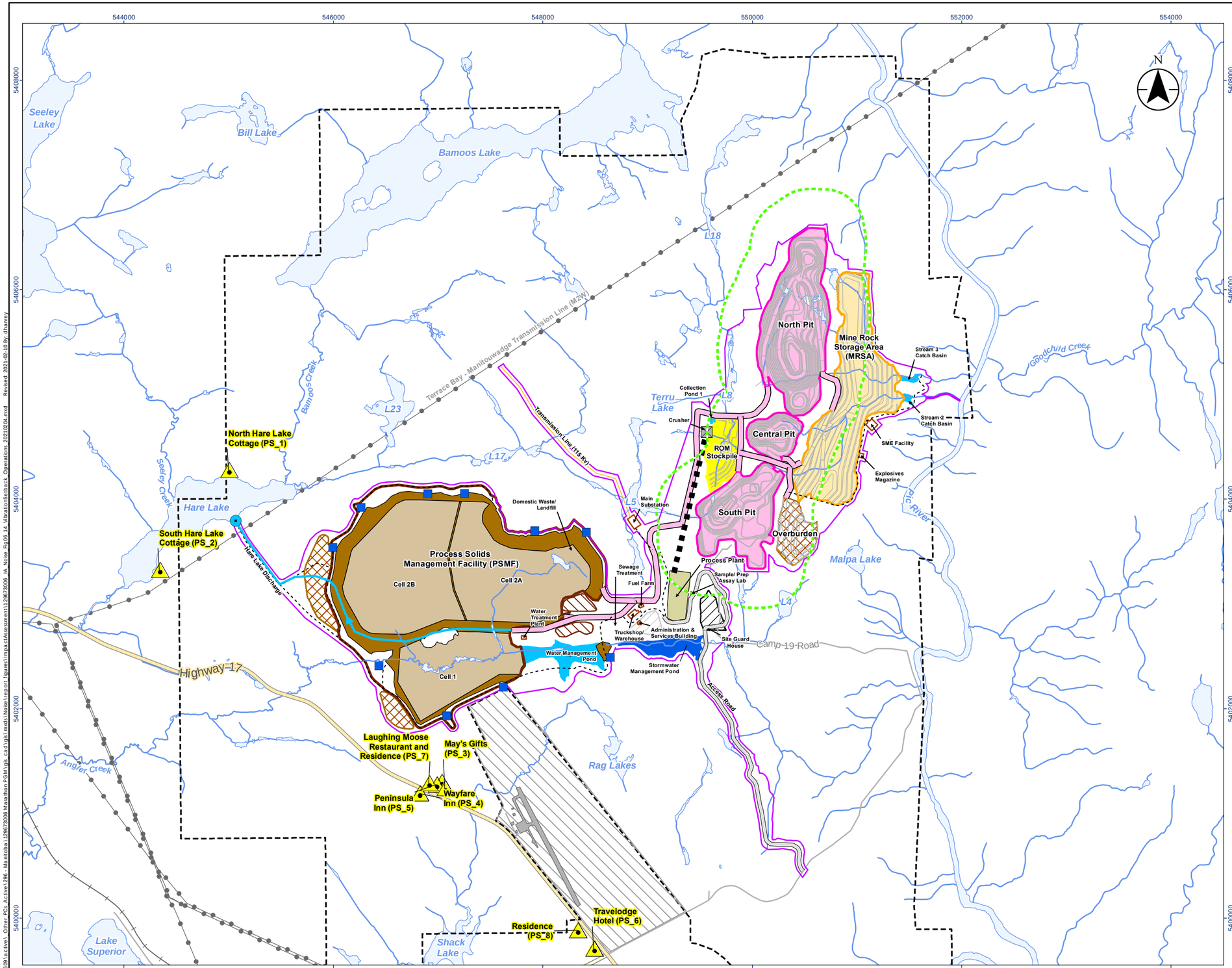
Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
23

Title
Construction Vibration Setback



Stantec

Legend

- Vibration Setback (No Monitoring)
- Noise Receptors
- Site Study Area Boundary
- Project Boundary (MLAS, MENDM Changed 2017)
- Highway
- Major Road
- Hydro Line
- Railway
- Watercourse
- Airport (Property Boundary)
- Airport Infrastructure
- Waterbody

Proposed Project Components

- Crusher
- Discharge Location
- Seepage Collection Basin
- Access Road
- Conveyor
- Discharge Line
- Haul Road
- Site Road
- Transmission Line (115 Kv)
- **Aggregate Site** (Aggregate Plant, Concrete Batch Plant, Diesel Generator)
- Building/ Facility Footprint
- Stormwater Management Pond
- Laydown Area
- Mine Rock Storage Area (MRSA)
- Open Pit
- Overburden Stockpile
- Process Soilds Manadement Facility (PSMF)
- PSMF Cell
- PSMF Embankment
- **Process Plant Area** (Bulk Reagent Storage, Live Ore Stockpile, Process Plant, Propane Storage Area, Concentrate Storage Building, Diesel Generators)
- ROM Stockpile
- Soil Stockpile
- Water Management Pond

0 0.5 1 km

1:37,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

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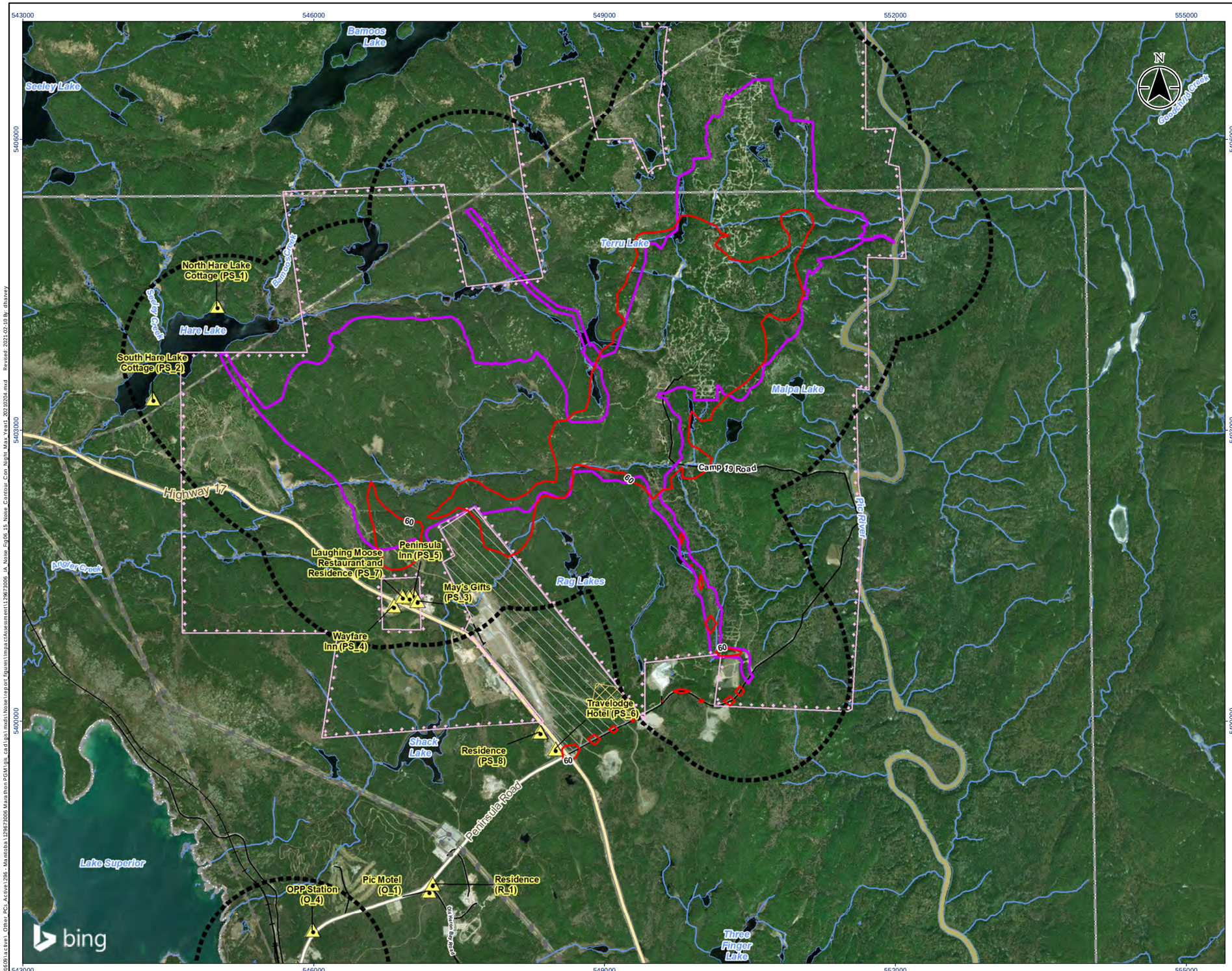
Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
24

Title
Operations Vibration Setback



Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 60

0 1 2 km

1:40,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

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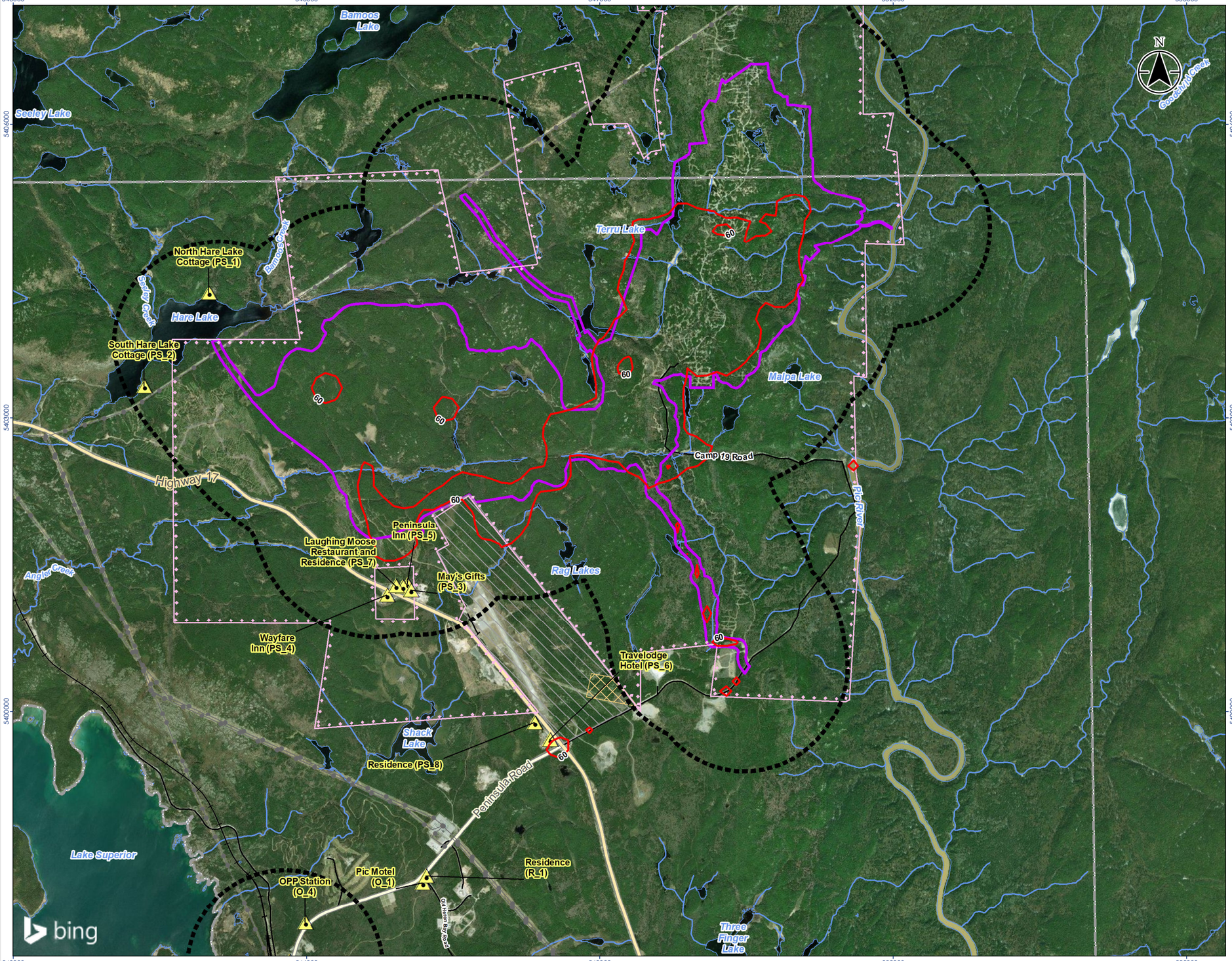
Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
25

Title
Noise Contours for Construction (Year -1) - Nighttime Project Noise (L_{max})



Stantec

Legend

- Receptor Location
- Local Study Area
- Model Property Boundary
- Site Study Area Boundary
- Highway
- Major Road
- Minor Road
- Hydro Line
- Railway
- Watercourse
- Airport
- Municipal Boundary, Lower Tier
- Waterbody
- Waste Management Site

Noise Contour (dBA)

- 60

0 1 2 km

1:40,000 (At original document size of 11x17)

Notes

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Project Location
Marathon

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Client/Project
GENERATION PGM INC.
MARATHON PALLADIUM PROJECT

Figure No.
26

Title
Noise Contours for Operations (Year 2) - Nighttime Project Noise (L_{max})

APPENDIX B:
Blasting Prediction Figure

FIGURE 1. BLASTING NOISE PREDICTION

Receptor location in front of quarry face.

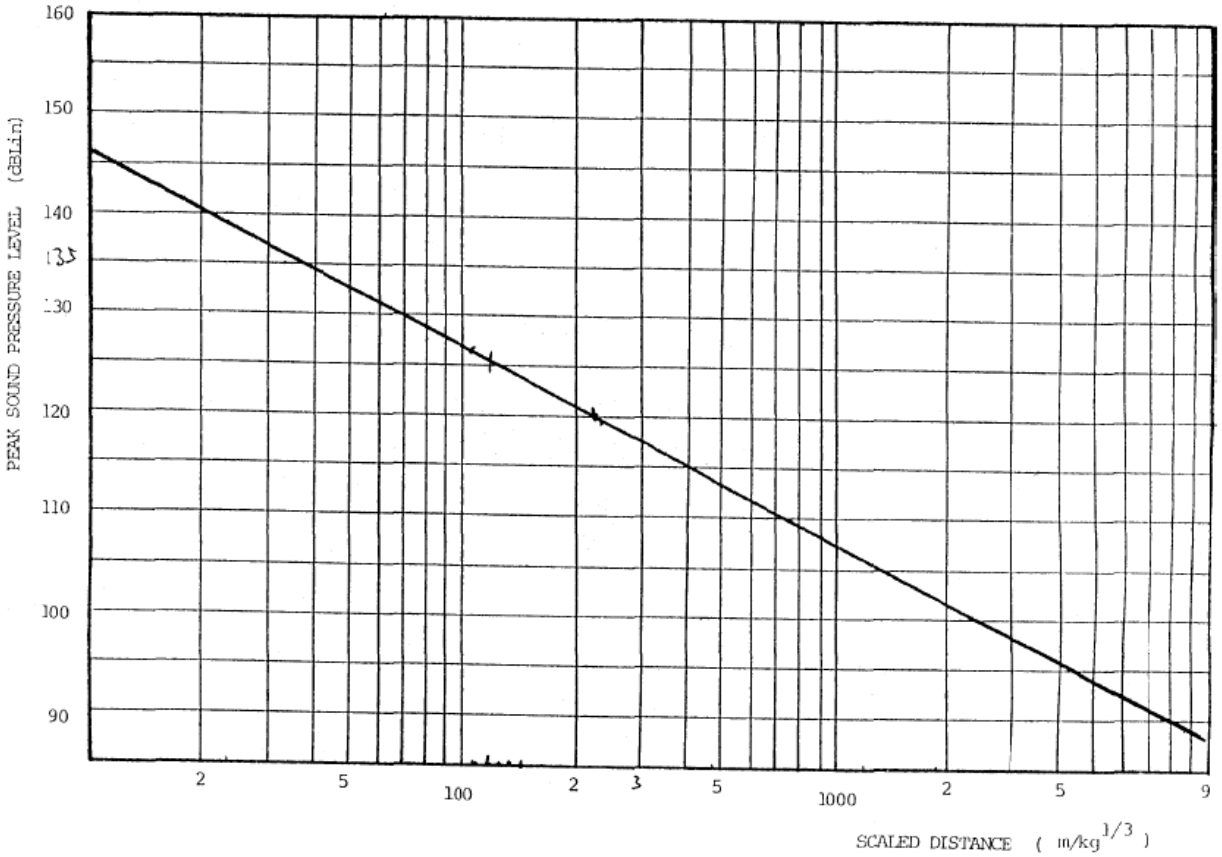


FIGURE 2. BLASTING NOISE PREDICTION

Receptor location behind quarry face.

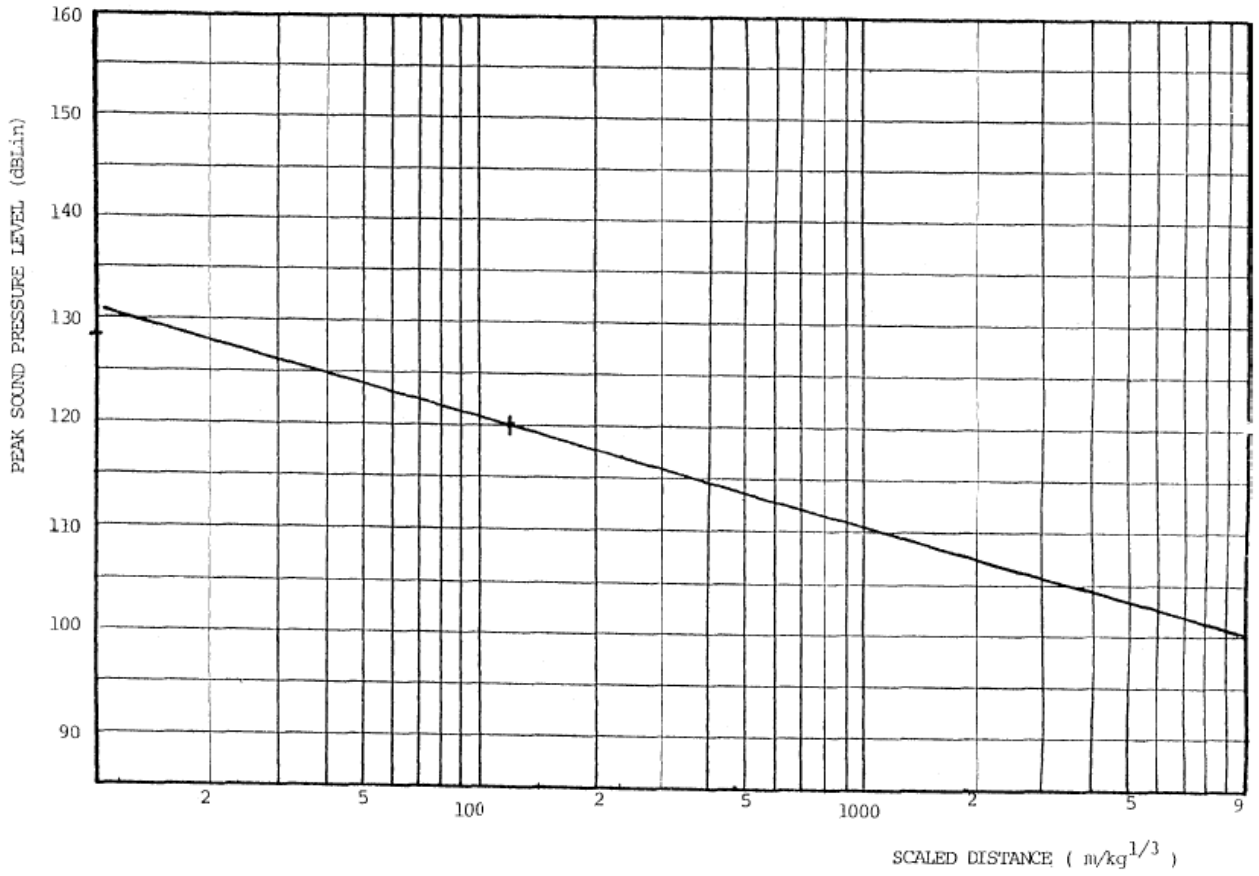
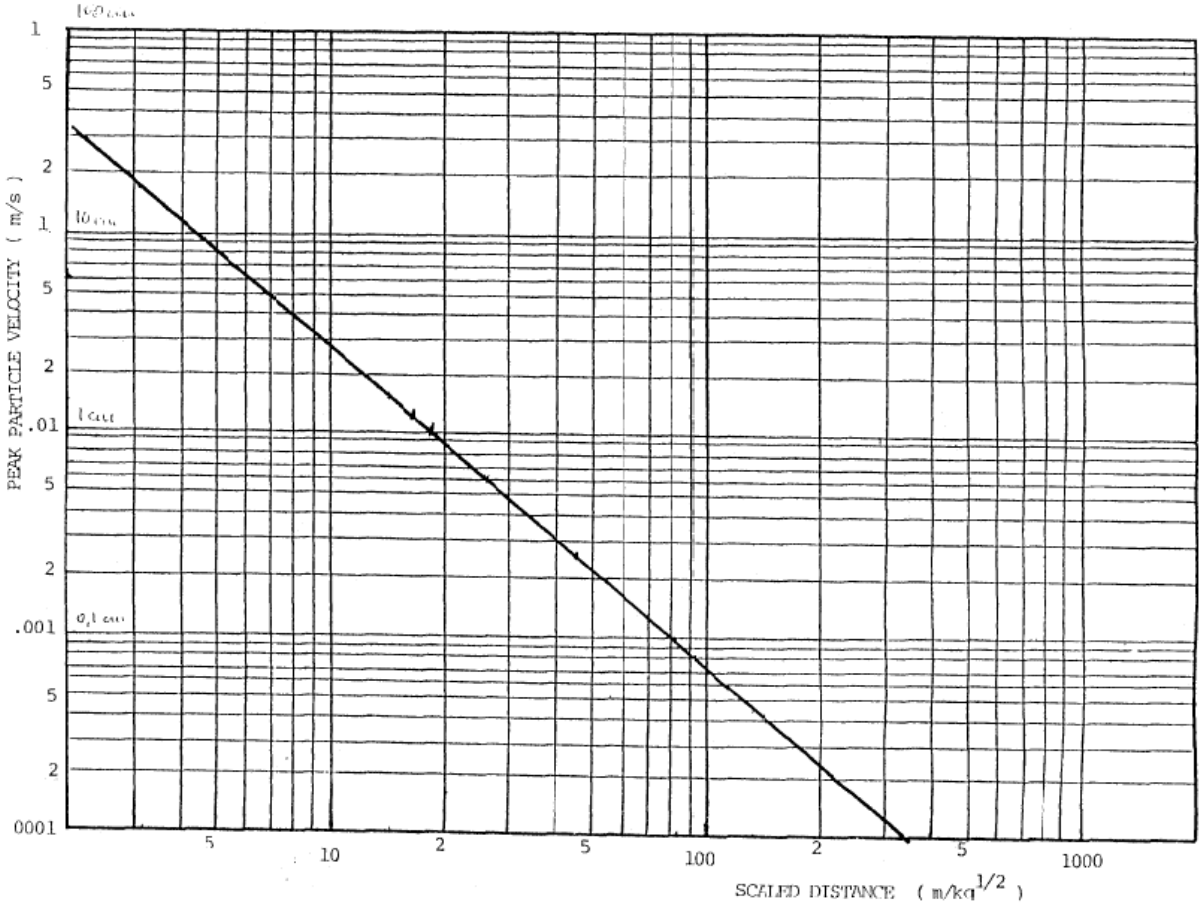


FIGURE 3. BLASTING VIBRATION PREDICTION



APPENDIX C:
Noise Source Summary Tables

Appendix C: Construction (Year -1) Noise Source Summary Table
Updated Noise Effects Assessment Report
Generation PGM Inc.
Marathon Palladium Project

Source ID	Equipment Description	Manufacturer Equipment Description	Location	Elevation Height Above Grade (m)	Type (Point, Line, or Area)	Sound Characteristics	Noise Control Measures	Octave Band Reference	Sound Power Level Data Reference	Sound Power Level Spectral Data (dB)									Overall Sound Power Levels	Overall Sound Power Levels	Duration of Sound in One hour (min)	Intermittant Adjustment (dBA)	Tonality Adjustment (dBA)	Adjusted Overall Sound Power Levels (dBA)
										32	63	125	250	500	1000	2000	4000	8000						
Primary Crusher Area																			dB	dBA				
CS1	Dust Collector Fan	Centrifugal, backward, 54" blade, 75,000 CFM @ 16 in H2O	Crusher Building	12.6	PT	Continuous	Uncontrolled	Engineering Toolbox	MECP Red Flag Tables	-	135	122	112	105	99	95	92	91	135	112	60	0	0	**112**
CS2	Building Opening West Side	Overall (Combined)	Crusher Building	10.0	A	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	Overall Combined (Sum of Sources)	-	119	120	117	117	114	113	108	99	125	120	60	0	0	**120**
		Truck Dumping	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Dump truck, dumping load	-	-	-	-	-	-	-	-	-	118	114	-	-	-	-
		Jaw Crusher	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	-	-	-	-	-	-	-	-	124	118	-	-	-	-
CS3	Building Opening East Side	Overall (Combined)	Crusher Building	10.0	A	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	Overall Combined (Sum of Sources)	-	119	120	117	117	114	113	108	99	125	120	60	0	0	**120**
		Truck Dumping	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Dump truck, dumping load	-	-	-	-	-	-	-	-	-	118	114	-	-	-	-
		Jaw Crusher	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	-	-	-	-	-	-	-	-	124	118	-	-	-	-
Mobile Crusher																			dB	dBA				
MCS1	Mobile Primary Crusher	188 kW electric	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	119	119	116	115	113	111	106	96	124	118	60	0	0	**118**
MCS2	Mobile Secondary Crusher	226 kW electric	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	119	119	116	115	113	111	106	96	124	118	60	0	0	**118**
MCS3	Mobile Screener	n/a	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	-	121	114	107	106	103	99	97	90	122	109	60	0	0	**109**
MCS4	Generator	1.275 MW Diesel Generator in a Weather Proof Enclosure	Mobile Crusher	2.8	PT	Continuous	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
MCS5	Wheeled Loader	CAT 834K (496 hp)	Mobile Crusher	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	Manufacturer Data for Comparable Equipment	-	113	114	110	106	107	101	99	88	118	110	60	0	0	**110**
MCS6	Excavator	CAT 390F	Mobile Crusher	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer	-	113	111	107	107	104	100	94	92	117	109	60	0	0	**109**
MCS6 Lmax	Truck Dumping	CAT 793F, 3 loads per hour, 10 seconds per dump	Mobile Crusher	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Dump truck, dumping load	BSI British Standards BS5228-1:2009: Dump truck, dumping load	-	107	112	109	112	109	108	103	96	118	114	0.5	21	0	**94**

Appendix C: Construction (Year -1) Noise Source Summary Table
Updated Noise Effects Assessment Report
Generation PGM Inc.
Marathon Palladium Project

Source ID	Equipment Description	Manufacturer Equipment Description	Location	Elevation Height Above Grade (m)	Type (Point, Line, or Area)	Sound Characteristics	Noise Control Measures	Octave Band Reference	Sound Power Level Data Reference	Sound Power Level Spectral Data (dB)									Overall Sound Power Levels	Overall Sound Power Levels	Duration of Sound in One hour (min)	Intermittant Adjustment (dBA)	Tonality Adjustment (dBA)	Adjusted Overall Sound Power Levels (dBA)
										32	63	125	250	500	1000	2000	4000	8000						
Mobile Concrete Batch Plant																			**dB**	**dBA**				
MPS1	Generator	1.275 MW Diesel Generator in a Weather Proof Enclosure	Mobile Concrete Batch Plant	2.8	PT	Continuous	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	--	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
MPS2	Wheeled Loader	n/a	Mobile Concrete Batch Plant	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	-	116	112	109	112	104	98	96	89	119	111	60	0	0	**111**
MPS3	Stacker Aggregate Vibrator	n/a	Mobile Concrete Batch Plant	1.2	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Vibratory Tamper	Manufacturer Data for Comparable Equipment	-	79	91	74	76	77	75	75	69	92	83	60	0	0	**83**
MPS4	Stacker Drop to Bins	n/a	Mobile Concrete Batch Plant	7.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Vibratory Tamper	Stantec Database	-	91	103	86	88	89	87	87	81	104	95	60	0	0	**95**
MPS5	Aggregate Vibrator 1	n/a	Mobile Concrete Batch Plant	3.5	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Vibratory Tamper	Manufacturer Data for Comparable Equipment	-	79	91	74	76	77	75	75	69	92	83	60	0	0	**83**
MPS6	Aggregate Vibrator 2	n/a	Mobile Concrete Batch Plant	3.5	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Vibratory Tamper	Manufacturer Data for Comparable Equipment	-	79	91	74	76	77	75	75	69	92	83	60	0	0	**83**
MPS7	Compressor	15 hp Air Compressor	Mobile Concrete Batch Plant	3.5	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Compressor	Manufacturer Data for Comparable Equipment	-	89	78	69	64	92	60	63	52	94	92	60	0	0	**92**
MPS8	Cement Vibrator	n/a	Mobile Concrete Batch Plant	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Vibratory Tamper	Manufacturer Data for Comparable Equipment	-	79	91	74	76	77	75	75	69	92	83	60	0	0	**83**
MPS9	Cement Silo Baghouse	Centrifugal, backward, 18" blade, 6,500 CFM @ 16 in H2O	Concrete Plant	24.0	PT	Continuous	Uncontrolled	Engineering Toolbox	MECP Red Flag Tables	-	127	114	104	97	91	87	84	83	127	104	60	0	0	**104**
MPS10	Concrete Truck Mixing	Standard Concrete Truck	Mobile Concrete Batch Plant	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Concrete Truck Mixing Concrete	BSI British Standards BS5228-1:2009: Concrete Truck Mixing Concrete	--	111	102	94	97	98	106	88	83	113	108	60	0	0	**108**
MPS11	Cement Truck Blower (Cement Deliveries)	Gardner Denver Model 4512	Mobile Concrete Batch Plant	1.2	PT	Continuous	Uncontrolled	Engineering Toolbox	Manufacturer Data	--	133	121	110	103	98	94	91	90	133	110	60	0	0	**110**
Construction Offices																			**dB**	**dBA**				
COS1	Generator	1.275 MW Diesel Generator in a Weather Proof Enclosure	Constuction Area	2.8	PT	Continuous	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
Truckshop Maintenance Equipment																			**dB**	**dBA**				
GMS1	Generator	1.275 MW Diesel Generator in a Weather Proof Enclosure	Maintenance Garage	2.8	PT	Continuous	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
Process Plant																			**dB**	**dBA**				
MS1	Generator	1.275 MW Diesel Generator in a Weather Proof Enclosure	Process Plant	2.8	PT	Continuous	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
MS2	Excavator	Cat 390DL, 600 hp	Process Plant	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	113	111	107	107	104	100	94	92	117	109	60	0	0	**109**
MS3	Excavator	Cat 390DL, 600 hp	Process Plant	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	113	111	107	107	104	100	94	92	117	109	60	0	0	**109**
MS4	Tracked Dozer	D11, 850 hp	Process Plant	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer	--	114	118	110	111	113	115	103	93	122	119	60	0	0	**119**
MS5	Mobile Crane	350 hp	Process Plant	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Mobile Telescopic Crane	BSI British Standards BS5228-1:2009: Mobile Telescopic Crane	--	118	109	106	102	105	104	97	89	119	109	60	0	0	**109**
MS6	Hammer	Hammer	Process Plant	10.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Lump Hammer	BSI British Standards BS5228-1:2009: Club Hammer	--	104	104	106	106	101	95	93	89	112	107	60	0	0	**107**
MS7	Drill	Drill	Process Plant	10.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Core Drill	BSI British Standards BS5228-1:2009: Electric Drill	--	103	103	105	105	100	94	92	88	111	106	60	0	0	**106**

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Source ID	Equipment Description	Manufacturer Equipment Description	Location	Elevation Height Above Grade (m)	Type (Point, Line, or Area)	Sound Characteristics	Noise Control Measures	Octave Band Reference	Sound Power Level Data Reference	Sound Power Level Spectral Data (dB)									Overall Sound Power Levels	Overall Sound Power Levels	Duration of Sound in One hour (min)	Intermittant Adjustment (dBA)	Tonality Adjustment (dBA)	Adjusted Overall Sound Power Levels (dBA)
										32	63	125	250	500	1000	2000	4000	8000						
Road Sources																			dB	dBA				
RS1	Main Access Road from Plant to Highway 17 (6.4 km)	Pick-up trucks (75 trucks/h, 150 segments/h @ 60 km/h) (150 trucks/16 h, 300 segments/16 h @ 60 km/h) Transport (1 truck/h, 2 segments/h @ 50 km/h) (8 trucks/16 h, 16 segments/16 h @ 50 km/h) Bus (1 bus/h, 2 segments/h @ 50 km/h) (1 bus/16 h, 2 segments/16 h @ 50 km/h) Dump Truck (14 trucks/h, 28 segments/h @ 50 km/h) (168 return trips/16 h, 336 segments/16 h @ 50 km/h) Water Truck (1 truck/h, 2 segments/h @ 15 km/h)(1 truck/16 h, 2 segments/ 16 h @ 15 km/h) Fuel Truck (1 truck/h, 2 segments/h @ 60 km/h) (1 truck/16 h, 2 segments/16 h @ 60 km/h) Grader (1 truck/h, 2 segments/h @ 5 km/h)(1 truck/16 hour, 2 segments/16 hour @ 5 km/h)	Project Site	--	L	Intermittent	Uncontrolled	FHWA Traffic Noise Model	FHWA Traffic Noise Model	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RS1 Lmax	Main Access Road from Plant to Highway 17 (6.4 km)	Passby, 30 seconds	Project Site	2.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Articulated Dump Truck (309 kW)	FHWA Traffic Noise Model	--	113	111	109	107	104	100	97	92	117	109	0.5	21	0	**89**
RS2	Haul Road From Pit to MRSA (1.5 km)	2 x Haul Trucks - 4 return trips, 8 segments/h @ 50 km/h	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS2 Lmax	Haul Road From Pit to MRSA (1.5 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**
RS3	Haul Road From Pit to Primary Crusher (1.6 km)	1 x Haul Trucks - CAT 793F, 2,650 hp (9 return trips, 18 segments/h @ 50 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS3 Lmax	Haul Road From Pit to Primary Crusher (1.6 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**
RS4A	Haul Road From Pit to Mobile Crusher (6.0 km)	4 x Haul Trucks - CAT 793F, 2,650 hp (4 return trips, 8 segments/h @ 50 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS4B		2 x Dozers (2 return trips, 4 segments/h @ 5 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer	--	114	118	110	111	113	115	103	93	122	119	60	0	0	**119**
RS4A Lmax	Haul Road From Pit to Mobile Crusher (6.0 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**
RS5	Haul Road From Pit to PSMF (7.8 km)	3 x Haul Trucks - Daytime/Evening (8 return trips, 16 segments/h @ 50 km/h) - Nighttime (4 return trips, 8 segments/h @ 50 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS5 Lmax	Haul Road From Pit to PSMF (7.8 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**

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										32	63	125	250	500	1000	2000	4000	8000						
Open Pit Sources																			**dB**	**dBA**				
OPS1	Production Drill	PV235	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Mobile Drilling Rig	Manufacturer	--	110	111	112	114	115	110	106	100	120	118	60	0	0	**118**
OPS2	Production Drill	PV235	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Mobile Drilling Rig	Manufacturer	--	110	111	112	114	115	110	106	100	120	118	60	0	0	**118**
OPS3	Pre-split Drill	SmartRoc D65	Operating at Pit	4.0	Pt	Continuous	Uncontrolled	Stantec Database	Manufacturer	--	134	126	117	121	122	121	117	114	135	127	60	0	0	**127**
OPS4	Pre-split Drill	SmartRoc D65	Operating at Pit	4.0	PT	Continuous	Uncontrolled	Stantec Database	Manufacturer	--	134	126	117	121	122	121	117	114	135	127	60	0	0	**127**
OPS5	Pre-split Drill	SmartRoc D65	Operating at Pit	4	PT	Continuous	Uncontrolled	Stantec Database	Manufacturer	--	134	126	117	121	122	121	117	114	135	127	60	0	0	**127**
OPS6	Pre-split Drill	SmartRoc D65	Operating at Pit	4	PT	Continuous	Uncontrolled	Stantec Database	Manufacturer	--	134	126	117	121	122	121	117	114	135	127	60	0	0	**127**
OPS7	Production Shovel	6060 FSD	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator	Manufacturer Data for Comparable Equipment	--	127	125	121	121	118	114	108	106	131	123	60	0	0	**123**
OPS8	Production Shovel	6060 FSD	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator	Manufacturer Data for Comparable Equipment	--	127	125	121	121	118	114	108	106	131	123	60	0	0	**123**
OPS9	Front End Loader	L1850	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator	Manufacturer	--	119	117	113	113	110	106	100	98	123	115	60	0	0	**115**
OPS10	Tracked Dozer	D10T	Operating at Pit	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
OPS11	Tracked Dozer	D10T	Operating at Pit	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
OPS12	Emulsion Truck	10Wheel Emulsion Truck	Operating at Pit	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Articulated Dump Truck	Sound Power Measurements on Heavy Vehicles to Study Propulsion Noise; Volvo Trucks	-	119	106	90	80	75	72	69	62	119	95	60	0	0	**95**
OPS13	Stemming Loader	950M	Operating at Pit	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	--	116	112	109	112	104	98	96	89	119	111	60	0	0	**111**
Mine Rock Storage Area Sources																			**dB**	**dBA**				
MS1	Tracked Dozer	D10T	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
MS2	Tracked Dozer	D10T	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
MS3	Excavator	CAT 349F	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	112	110	106	106	103	99	93	91	116	108	60	0	0	**108**
MS4	Excavator	CAT 349F	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	112	110	106	106	103	99	93	91	116	108	60	0	0	**108**
MS4 Lmax	Truck Dumping	CAT 793F, 14 loads per hour, 10 seconds per dump	Mine Rock Storage Area	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Dump truck, dumping load	BSI British Standards BS5228-1:2009: Dump truck, dumping load	--	108	112	104	105	107	109	97	87	116	114	2.3	14	0	**100**
Process Solids Management Facility Sources																			**dB**	**dBA**				
PSS1	Excavator	Cat 336EL, 315 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	109	107	103	103	100	96	90	88	113	105	60	0	0	**105**
PSS2	Tracked Dozer	D8T, 354 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer	--	108	112	104	105	107	109	97	87	116	113	60	0	0	**113**
PSS3	Compactor	CAT CS64B, 131 hp, Daytime/Evening only	Process Solids Management Facility	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	--	109	104	100	101	100	100	96	91	112	106	60	0	0	**106**
PSS4	Excavator	Cat 336EL, 315 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	109	107	103	103	100	96	90	88	113	105	60	0	0	**105**
PSS5	Tracked Dozer	D8T, 354 hp, Daytime/Evening only	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer	--	108	112	104	105	107	109	97	87	116	113	60	0	0	**113**
PSS6	Compactor	CAT CS64B, 131 hp, Daytime/Evening only	Process Solids Management Facility	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	--	109	104	100	101	100	100	96	91	112	106	60	0	0	**106**
PSS6 Lmax	Truck Dumping	CAT 793F - Daytime/Evening (8 loads per hour, 10 seconds per dump) - Nighttime (4 loads per hour, 10 seconds per dump)	Process Solids Management Facility	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Dump truck, dumping load	BSI British Standards BS5228-1:2009: Dump truck, dumping load	--	107	112	109	112	109	108	103	96	118	114	1.3	17	0	**98**

NOTES:
Sources highlighted orange are intermittent and were included (no reductions for intermittency) in Lmax Calculation
Sources highlighted green are insignificant

- Sources where the individual source sound power level was less than 100 dBA.

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										32	63	125	250	500	1000	2000	4000	8000						
Primary Crusher Area																			**dB**	**dBA**				
CS1	Dust Collector Fan	Centrifugal, backward, 54" blade, 75,000 CFM @ 16 in H2O	Crusher Building	12.6	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	116	116	118	110	106	99	95	93	122	113	60	0	0	**113**
CS2	Building Opening West Side	Overall (Combined)	Crusher Building	10.0	A	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	Overall Combined (Sum of Sources)	-	119	120	117	117	114	113	108	99	125	120	60	0	0	**120**
		Truck Dumping	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Dump truck, dumping load	-	-	-	-	-	-	-	-	-	118	114	-	-	-	-
		Jaw Crusher	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	-	-	-	-	-	-	-	-	124	118	-	-	-	-
CS3	Building Opening East Side	Overall (Combined)	Crusher Building	10.0	A	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	Overall Combined (Sum of Sources)	-	119	120	117	117	114	113	108	99	125	120	60	0	0	**120**
		Truck Dumping	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Dump truck, dumping load	-	-	-	-	-	-	-	-	-	118	114	-	-	-	-
		Jaw Crusher	Crusher Building	-	A	Continuous	Uncontrolled	-	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	-	-	-	-	-	-	-	-	124	118	-	-	-	-
Crushed Ore Stockpile/Reclaim Tunnel																			**dB**	**dBA**				
SS1	Dust Collector Fan	Centrifugal, backward, 30" blade, 25,000 CFM @ 16 in H2O	Crushed Ore Stockpile	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	116	116	117	110	105	99	95	90	122	112	60	0	0	**112**
Process Plant																			**dB**	**dBA**				
MS1	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS2	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS3	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS4	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS5	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS6	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS7	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS8	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (East Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS9	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS10	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS11	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS12	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS13	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS14	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS15	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS16	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS17	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS18	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS19	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS20	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS21	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**
MS22	Building Exhaust Fan	Sidewall Propeller, 60" blade, 20,000 CFM @ 0.37 in H2O	Process Plant (West Side)	5.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	90	88	95	93	92	89	83	79	100	97	60	0	0	**97**

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Source ID	Equipment Description	Manufacturer Equipment Description	Location	Elevation Height Above Grade (m)	Type (Point, Line, or Area)	Sound Characteristics	Noise Control Measures	Octave Band Reference	Sound Power Level Data Reference	Sound Power Level Spectral Data (dB)									Overall Sound Power Levels	Overall Sound Power Levels	Duration of Sound In One hour (min)	Intermittant Adjustment (dBA)	Tonality Adjustment (dBA)	Adjusted Overall Sound Power Levels (dBA)
										32	63	125	250	500	1000	2000	4000	8000						
MS23	Concentrate Area Loadout Baghouse	Centrifugal, backward, 27" blade, 20,500 CFM @ 16 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	116	116	117	110	105	99	95	90	122	112	60	0	0	**112**
MS24	Lime Delivery Baghouse	Centrifugal, backward, 20" blade, 10,000 CFM @ 16 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	116	116	117	110	105	99	95	90	122	112	60	0	0	**112**
MS25	Lime Slaking Mill Scrubber	Centrifugal, backward, 12" blade, 200 CFM @ 3.5 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	82	82	83	76	71	65	61	56	87	78	60	0	0	**78**
MS26	Reagent Ventilation Fan 1 - Frother (MIBC) Area	Centrifugal, backward, 12" blade, 250 CFM @ 3.5 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	83	83	84	77	72	66	62	57	88	79	60	0	0	**79**
MS27	Reagent Ventilation Fan 2 - Collector (PAX) Mixing Tank	Centrifugal, backward, 12" blade, 250 CFM @ 3.5 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	83	83	84	77	72	66	62	57	88	79	60	0	0	**79**
MS28	Reagent Ventilation Fan 3 - Collector (PAX) Distribution Tank	Centrifugal, backward, 12" blade, 250 CFM @ 3.5 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	83	83	84	77	72	66	62	57	88	79	60	0	0	**79**
MS29	Reagent Ventilation Fan 4 - Collector 2 (AERO 3501) Area	Centrifugal, backward, 12" blade, 250 CFM @ 3.5 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	83	83	84	77	72	66	62	57	88	79	60	0	0	**79**
MS30	Dust Collector CMC Feed Bin	Centrifugal, backward, 12" blade, 250 CFM @ 3.5 in H2O	Process Plant	10.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	83	83	84	77	72	66	62	57	88	79	60	0	0	**79**
MS31	Emergency Generator 1	1.275 MW Diesel Generator in a Weather Proof Enclosure	Process Plant	2.8	PT	Intermittent	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
MS32	Emergency Generator 2	1.275 MW Diesel Generator in a Weather Proof Enclosure	Process Plant	2.8	PT	Intermittent	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
MS33	Emergency Generator 3	1.275 MW Diesel Generator in a Weather Proof Enclosure	Process Plant	2.8	PT	Intermittent	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
MS34	Emergency Generator 4	1.275 MW Diesel Generator in a Weather Proof Enclosure	Process Plant	2.8	PT	Intermittent	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	120	122	116	111	108	104	107	110	125	116	60	0	0	**116**
MS35	Wheeled Loader	CAT 962 M, 271 hp	Process Plant	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	-	116	112	109	112	104	98	96	89	119	111	60	0	0	**111**
Assay Laboratory																			**dB**	**dBA**				
AS1	Assay Lab/Sample Prep Baghouse	Centrifugal, backward, 25" blade, 16,000 CFM @ 16 in H2O	Assay Laboratory	5.5	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	114	114	115	108	103	97	93	88	120	111	60	0	0	**111**
AS2	Assay Furnace Baghouse	Centrifugal, backward, 27" blade, 20,000 CFM @ 16 in H2O	Assay Laboratory	5.5	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	115	115	116	109	104	98	94	89	121	112	60	0	0	**112**
AS3	Assay Cupel Baghouse	Centrifugal, backward, 25" blade, 16,000 CFM @ 16 in H2O	Assay Laboratory	5.5	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	114	114	115	108	103	97	93	88	120	111	60	0	0	**111**
AS4	Assay Precious Metals Scrubber	Centrifugal, backward, 20" blade, 10,000 CFM @ 16 in H2O	Assay Laboratory	5.5	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	112	112	113	106	101	95	91	86	118	109	60	0	0	**109**
AS5	Assay Base Metals Scrubber	Centrifugal, backward, 20" blade, 10,000 CFM @ 16 in H2O	Assay Laboratory	5.5	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	112	112	113	106	101	95	91	86	118	109	60	0	0	**109**
AS6	Assay Lab AA Scrubber	Centrifugal, backward, 20" blade, 10,000 CFM @ 16 in H2O	Assay Laboratory	5.5	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	112	112	113	106	101	95	91	86	118	109	60	0	0	**109**
Waste Water Treatment Plant																			**dB**	**dBA**				
WS1	Scrubber	Centrifugal, backward, 27" blade, 20,000 CFM @ 16 in H2O	Waste Water Treatment Plant	11.0	PT	Continuous	Uncontrolled	ASHRAE Handbook of Fundamentals	ASHRAE Handbook of Fundamentals	-	115	115	116	109	104	98	94	89	121	112	60	0	0	**112**
Outdoor Pumps																			**dB**	**dBA**				
PS1	Fresh Water Pond Pump 1	Electric Centrifugal Pump 15 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	116	99	92	89	82	75	72	69	117	93	60	0	0	**93**
PS2	Fresh Water Pond Pump 2	Electric Centrifugal Pump 15 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	116	99	92	89	82	75	72	69	117	93	60	0	0	**93**
PS3	Fresh Water Pump 1	Electric Centrifugal Pump 200 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	124	107	99	97	90	83	80	77	124	101	60	0	0	**101**
PS4	Fresh Water Pump 2	Electric Centrifugal Pump 200 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	124	107	99	97	90	83	80	77	124	101	60	0	0	**101**
PS5	Process Water Pump 1	Electric Centrifugal Pump 75 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	122	105	98	95	88	81	78	75	122	99	60	0	0	**99**
PS6	Process Water Pump 2	Electric Centrifugal Pump 75 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	122	105	98	95	88	81	78	75	122	99	60	0	0	**99**
PS7	Process Water Barge De-Icing Pump	Electric Centrifugal Pump 15 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	116	99	92	89	82	75	72	69	117	93	60	0	0	**93**
PS8	North PSMF Reclaim Water Pump 1	Electric Centrifugal Pump 75 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	122	105	98	95	88	81	78	75	122	99	60	0	0	**99**
PS9	North PSMF Reclaim Water Pump 2	Electric Centrifugal Pump 75 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	122	105	98	95	88	81	78	75	122	99	60	0	0	**99**
PS10	North PSMF Reclaim Water Barge De-Icing Pump	Electric Centrifugal Pump 15 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	116	99	92	89	82	75	72	69	117	93	60	0	0	**93**
PS11	South PSMF Reclaim Water Pump 1	Electric Centrifugal Pump 75 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	122	105	98	95	88	81	78	75	122	99	60	0	0	**99**
PS12	South PSMF Reclaim Water Pump 2	Electric Centrifugal Pump 75 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	122	105	98	95	88	81	78	75	122	99	60	0	0	**99**
PS13	South PSMF Reclaim Water Barge De-Icing Pump	Electric Centrifugal Pump 15 hp, 1800 RPM, High Pressure Operation	Outdoor Ponds	1.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Electric Water Pump	MECP Red Flag Tables	-	116	99	92	89	82	75	72	69	117	93	60	0	0	**93**

Appendix C: Operations (Year 2) Noise Source Summary Table
Updated Noise Effects Assessment Report
Generation PGM Inc.
Marathon Palladium Project

Source ID	Equipment Description	Manufacturer Equipment Description	Location	Elevation Height Above Grade (m)	Type (Point, Line, or Area)	Sound Characteristics	Noise Control Measures	Octave Band Reference	Sound Power Level Data Reference	Sound Power Level Spectral Data (dB)									Overall Sound Power Levels	Overall Sound Power Levels	Duration of Sound In One hour (min)	Intermittant Adjustment (dBA)	Tonality Adjustment (dBA)	Adjusted Overall Sound Power Levels (dBA)
										32	63	125	250	500	1000	2000	4000	8000						
Mobile Crusher																			dB	dBA				
MCS1	Mobile Primary Crusher	188 kW electric	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	119	119	116	115	113	111	106	96	124	118	60	0	0	**118**
MCS2	Mobile Secondary Crusher	226 kW electric	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	119	119	116	115	113	111	106	96	124	118	60	0	0	**118**
MCS3	Mobile Tertiary Crusher	118 kW electric	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	119	119	116	115	113	111	106	96	124	118	60	0	0	**118**
MCS4	Mobile Fines Crusher	118 kW electric	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	BSI British Standards BS5228-1:2009: Tracked semi-mobile crusher, breaking boulders/oversized material	-	119	119	116	115	113	111	106	96	124	118	60	0	0	**118**
MCS5	Mobile Screener	n/a	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	-	121	114	107	106	103	99	97	90	122	109	60	0	0	**109**
MCS6	Mobile Screener	n/a	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	-	121	114	107	106	103	99	97	90	122	109	60	0	0	**109**
MCS7	Mobile Screener	n/a	Mobile Crusher	3.8	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	BSI British Standards BS5228-1:2009: Mobile Screen/Stockpiler	-	121	114	107	106	103	99	97	90	122	109	60	0	0	**109**
MCS8	Generator	1.275 MW Diesel Generator in a Weather Proof Enclosure	Mobile Crusher	2.8	PT	Continuous	Controlled	Manufacturer Data for Comparable Equipment	Manufacturer Data for Comparable Equipment	-	121	114	107	106	103	99	97	90	122	109	60	0	0	**109**
MCS9	Wheeled Loader	CAT 834K (496 hp)	Mobile Crusher	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	Manufacturer Data for Comparable Equipment	-	113	114	110	106	107	101	99	88	118	110	60	0	0	**110**
MCS10	Excavator	CAT 390F	Mobile Crusher	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer	-	113	111	107	107	104	100	94	92	117	109	60	0	0	**109**
MCS10 Lmax	Truck Dumping	CAT 793F, 3 loads per hour, 10 seconds per dump	Mobile Crusher	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Dump truck, dumping load	BSI British Standards BS5228-1:2009: Dump truck, dumping load	-	107	112	109	112	109	108	103	96	118	114	0.5	21	0	**94**
Rail Loadout																			dB	dBA				
RLS1	Dust Collection Exhaust Fan Outlet 1	Centrifugal with a backward inclined (35,000 CFM). Silenced by a Universal UCD Group Chamber Type Discharge Silencer	Rail Loadout	7.5	PT	Continuous	Controlled	Manufacturer	Manufacturer	-	87	83	81	79	77	74	70	64	90	82	60	0	0	**82**
RLS2	Dust Collection Exhaust Fan Housing 1	Centrifugal with a backward inclined (35,000 CFM). Silenced by a Universal UCD Group Chamber Type Discharge Silencer	Rail Loadout	1.0	PT	Continuous	Controlled	Manufacturer	Manufacturer	-	94	93	90	87	84	78	73	67	98	89	60	0	0	**89**
RLS3	Dust Collection Exhaust Fan Outlet 2	Centrifugal with a backward inclined (35,000 CFM). Silenced by a Universal UCD Group Chamber Type Discharge Silencer	Rail Loadout	7.5	PT	Continuous	Controlled	Manufacturer	Manufacturer	-	87	83	81	79	77	74	70	64	90	82	60	0	0	**82**
RLS4	Dust Collection Exhaust Fan Housing 2	Centrifugal with a backward inclined (35,000 CFM). Silenced by a Universal UCD Group Chamber Type Discharge Silencer	Rail Loadout	1.0	PT	Continuous	Controlled	Manufacturer	Manufacturer	-	94	93	90	87	84	78	73	67	98	89	60	0	0	**89**
RLS5	Trackmobile	Idling	Rail Loadout	3.0	PT	Continuous	Uncontrolled	Stantec Database	Stantec Database	114	79	108	103	104	101	93	86	79	116	105	15	6	0	**99**
RLS6	Rail Loadout Car Coupling	Three couples per hour	Rail Loadout	1.0	PT	Impulsive	Uncontrolled	Stantec Database	Stantec Database	108 dBi	108 dBi	97 dBi	93 dBi	100 dBi	95 dBi	113 dBi	117 dBi	108 dBi	119 dBi	119 dBAi	-	-	-	**119 dBAi**

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Source ID	Equipment Description	Manufacturer Equipment Description	Location	Elevation Height Above Grade (m)	Type (Point, Line, or Area)	Sound Characteristics	Noise Control Measures	Octave Band Reference	Sound Power Level Data Reference	Sound Power Level Spectral Data (dB)									Overall Sound Power Levels	Overall Sound Power Levels	Duration of Sound in One hour (min)	Intermittant Adjustment (dBA)	Tonality Adjustment (dBA)	Adjusted Overall Sound Power Levels (dBA)
										32	63	125	250	500	1000	2000	4000	8000						
Road Sources																			dB	dBA				
RS1	Main Access Road from Plant to Highway 17 (6.4 km)	Pick-up trucks (70 trucks/shift, 140 segments/h @ 60 km/h) (140 trucks/16 h, 280 segments/16 h @ 60 km/h) Transport (1 truck/h, 2 segments/h @ 50 km/h)(20 trucks/16 h, 40 segments/ 16 h @ 50 km/h) Bus (1 bus/h, 2 segments/h @ 50 km/h)(2 buses/16 h, 4 segments/16 h @ 50 km/h) Concentrate Truck (10 trucks/h, 20 segments/h @ 50 km/h)(30 trucks/16 hour, 60 segments/16 @ 50 km/h) Water Truck (1 truck/h, 2 segments/h@ 15 km/h) (1 truck/16 h, 2 segments/16 h @ 15 km/h) Fuel Truck (1 truck/h, 2 segments/h @ 60 km/h)(1 truck/16 h, 2 segments/16 h @ 60 km/h) Grader (1 truck/h, 2 segments/h @ 5 km/h)(1 truck/16 h, 2 segments/16 h @ 5 km/h)	Project Site	--	L	Intermittent	Uncontrolled	FHWA Traffic Noise Model	FHWA Traffic Noise Model	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RS1 Lmax	Main Access Road from Plant to Highway 17 (6.4 km)	Passby, 30 seconds	Project Site	2.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Articulated Dump Truck (309 kW)	FHWA Traffic Noise Model	--	113	111	109	107	104	100	97	92	117	109	0.5	21	0	**89**
RS2	Haul Road From Pit to MRSA (1.5 km)	3 x Haul Trucks (14 return trips, 28 segments/h @ 50 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS2 Lmax	Haul Road From Pit to MRSA (1.5 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**
RS3	Haul Road From Pit to Primary Crusher (1.6 km)	2 x Haul Trucks (12 return trips, 24 segments/h @ 50 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS3 Lmax	Haul Road From Pit to Primary Crusher (1.6 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**
RS4	Haul Road From Pit to Mobile Crusher (6.0 km)	2 x Haul Trucks (3 return trips, 6 segments/h @ 50 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS4 Lmax	Haul Road From Pit to Mobile Crusher (6.0 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**
RS5	Haul Road From Pit to PSMF (7.8 km)	3 x Haul Trucks - Daytime/Evening (8 return trips, 16 segments/h @ 50 km/h) - Nighttime (4 return trips, 8 segments/h @ 50 km/h)	Project Site	4.0	L	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	60	0	0	**120**
RS5 Lmax	Haul Road From Pit to PSMF (7.8 km)	Passby, 30 seconds	Project Site	4.0	PT	Intermittent	Uncontrolled	BSI British Standards BS5228-1:2009: Haul Truck (1417 kw)	Manufacturer	--	125	123	119	119	114	112	107	103	129	120	0.5	21	0	**100**
Open Pit Sources																			dB	dBA				
OPS1	Production Drill	PV235	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Mobile Drilling Rig	Manufacturer	--	110	111	112	114	115	110	106	100	120	118	60	0	0	**118**
OPS2	Production Drill	PV235	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Mobile Drilling Rig	Manufacturer	--	110	111	112	114	115	110	106	100	120	118	60	0	0	**118**
OPS3	Production Drill	PV235	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Mobile Drilling Rig	Manufacturer	--	110	111	112	114	115	110	106	100	120	118	60	0	0	**118**
OPS4	Production Drill	PV235	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Mobile Drilling Rig	Manufacturer	--	110	111	112	114	115	110	106	100	120	118	60	0	0	**118**
OPS5	Pre-split Drill	SmartRoc D65	Operating at Pit	4.0	PT	Continuous	Uncontrolled	Stantec Database	Manufacturer	--	134	126	117	121	122	121	117	114	135	127	60	0	0	**127**
OPS6	Pre-split Drill	SmartRoc D65	Operating at Pit	4.0	PT	Continuous	Uncontrolled	Stantec Database	Manufacturer	--	134	126	117	121	122	121	117	114	135	127	60	0	0	**127**
OPS7	Production Shovel	6060 FSD	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator	Manufacturer Data for Comparable Equipment	--	127	125	121	121	118	114	108	106	131	123	60	0	0	**123**
OPS8	Production Shovel	6060 FSD	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator	Manufacturer Data for Comparable Equipment	--	127	125	121	121	118	114	108	106	131	123	60	0	0	**123**
OPS9	Front End Loader	L1850	Operating at Pit	6.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator	Manufacturer	--	119	117	113	113	110	106	100	98	123	115	60	0	0	**115**
OPS10	Tracked Dozer	D10T	Operating at Pit	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
OPS11	Tracked Dozer	D10T	Operating at Pit	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
OPS12	Emulsion Truck	10Wheel Emulsion Truck	Operating at Pit	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Articulated Dump Truck	Sound Power Measurements on Heavy Vehicles to Study Propulsion Noise; Volvo Trucks	-	119	106	90	80	75	72	69	62	119	95	60	0	0	**95**
OPS13	Stemming Loader	950M	Operating at Pit	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	BSI British Standards BS5228-1:2009: Wheeled Loader (198kW) Loading Dump Trucks	--	116	112	109	112	104	98	96	89	119	111	60	0	0	**111**

Appendix C: Operations (Year 2) Noise Source Summary Table
Updated Noise Effects Assessment Report
Generation PGM Inc.
Marathon Palladium Project

Source ID	Equipment Description	Manufacturer Equipment Description	Location	Elevation Height Above Grade (m)	Type (Point, Line, or Area)	Sound Characteristics	Noise Control Measures	Octave Band Reference	Sound Power Level Data Reference	Sound Power Level Spectral Data (dB)									Overall Sound Power Levels	Overall Sound Power Levels	Duration of Sound In One hour (min)	Intermittant Adjustment (dBA)	Tonality Adjustment (dBA)	Adjusted Overall Sound Power Levels (dBA)
										32	63	125	250	500	1000	2000	4000	8000						
Mine Rock Storage Area Sources																			dB	dBA				
MS1	Tracked Dozer	D10T	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
MS2	Tracked Dozer	D10T	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer Data for Comparable Equipment	--	110	114	106	107	109	111	99	89	118	115	60	0	0	**115**
MS3	Excavator	CAT 349F	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	112	110	106	106	103	99	93	91	116	108	60	0	0	**108**
MS4	Excavator	CAT 349F	Mine Rock Storage Area	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	112	110	106	106	103	99	93	91	116	108	60	0	0	**108**
MS4 Lmax	Truck Dumping	CAT 793F, 14 loads per hour, 10 seconds per dump	Mine Rock Storage Area	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Dump truck, dumping load	BSI British Standards BS5228-1:2009: Dump truck, dumping load	--	107	112	109	112	109	108	103	96	118	114	2.3	14	0	**100**
Process Solids Management Facility Sources																			dB	dBA				
PSS1	Excavator	Cat 336EL, 315 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	109	107	103	103	100	96	90	88	113	105	60	0	0	**105**
PSS2	Compactor	CAT CS64B, 131 hp, Daytime/Evening only	Process Solids Management Facility	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	--	109	104	100	101	100	100	96	91	112	106	60	0	0	**106**
PSS3	Tracked Dozer	D8T, 354 hp, Daytime/Evening only	Process Solids Management Facility	4.0	L	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer	--	108	112	104	105	107	109	97	87	116	113	60	0	0	**113**
PSS4	Excavator	Cat 336EL, 315 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	109	107	103	103	100	96	90	88	113	105	60	0	0	**105**
PSS5	Excavator	Cat 336EL, 315 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Tracked Hydraulic Excavator (235 kW)	Manufacturer Data for Comparable Equipment	--	109	107	103	103	100	96	90	88	113	105	60	0	0	**105**
PSS6	Tracked Dozer	D8T, 354 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer	--	108	112	104	105	107	109	97	87	116	113	60	0	0	**113**
PSS7	Compactor	CAT CS64B, 131 hp, Daytime/Evening only	Process Solids Management Facility	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	BSI British Standards BS5228-1:2009: Hydraulic Vibratory Compactor	--	109	104	100	101	100	100	96	91	112	106	60	0	0	**106**
PSS8	Tracked Dozer	D8T, 354 hp	Process Solids Management Facility	4.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Crawler Mounted Dozer (354 kW)	Manufacturer	--	108	112	104	105	107	109	97	87	116	113	60	0	0	**113**
PSS8 Lmax	Truck Dumping	CAT 793F - Daytime/Evening (8 loads per hour, 10 seconds per dump) - Nighttime (4 loads per hour, 10 seconds per dump)	Process Solids Management Facility	3.0	PT	Continuous	Uncontrolled	BSI British Standards BS5228-1:2009: Dump truck, dumping load	BSI British Standards BS5228-1:2009: Dump truck, dumping load	--	107	112	109	112	109	108	103	96	118	114	1.3	17	0	**98**

NOTES:
Sources highlighted yellow are intermittent and need to be included (no reductions for intermittency) in Lmax Calculation
Sources highlighted green are insignificant

- Sources where the individual source sound power level was less than 100 dBA.

APPENDIX D:
Traffic Data

Appendix D: Construction (Year -1) Traffic Data
Updated Noise Effects Assessment Report
Generation PGM Inc.
Marathon Palladium Project

Source ID	Speed (km/h)	Relevant Roadway	Range	Stage	Vehicle Types	Hourly Traffic Volume / Lane of Traffic															
						7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM
RS7	90	Highway 17	Peninsula Road to Coldwell Road	Background	Passenger Vehicles	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3
				Impact	Passenger Vehicles	7.0												7.0			
				Total	**Passenger Vehicles**	**46.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**46.3**	**39.3**	**39.3**	**39.3**
				Background	Medium Trucks	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**
				Background	Heavy Trucks	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
				Impact	Heavy Trucks	1.0												1.0			
				Total	**Heavy Trucks**	**15.4**	**14.4**	**14.4**	**14.4**	**14.4**	**14.4**	**14.4**	**14.4**	**14.4**	**14.4**	**14.4**	**14.4**	**15.4**	**14.4**	**14.4**	**14.4**
				Background	Buses	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
				Impact	Buses																
				Total	**Buses**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	115.5															
					% Trucks/Buses	32.0%															
					Heavy Trucks %	78.1%															
					Medium Trucks/Buses %	21.9%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**117.5**															
					% Trucks/Buses	**31.7%**															
					Heavy Trucks %	**78.3%**															
					Medium Trucks/Buses %	**21.7%**															
RS1 (outside of modelling boundary) (16 hour)	60	Camp 19 Road	Camp 19 Road - Hwy 17 to the project modelling boundary	Impact	Pick-up trucks (60 km/h)	75.0												75.0			
				Impact	Transport (50 km/h)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0								
				Impact	Bus (50 km/h)	1.0															
				Impact	Dump Truck (50 km/h)	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0				
				Impact	Water Truck (15 km/h)	1.0															
				Impact	Fuel truck (60 km/h)	1.0															
				Impact	Grader (5 km/h)	1.0															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**41.3**															
					% Trucks/Buses	**54.5%**															
					Heavy Trucks %	**97.8%**															
					Medium Trucks/Buses %	**2.2%**															
RS1 (inside of modelling boundary) (1 hour)	60	Access Road	Access Road - modelling boundary to process plant	Impact	Pick-up trucks (60 km/h)	75.0															
				Impact	Transport (50 km/h)	1.0															
				Impact	Bus (50 km/h)	1.0															
				Impact	Dump Truck (50 km/h)	14.0															
				Impact	Water Truck (15 km/h)	1.0															
				Impact	Fuel truck (60 km/h)	1.0															
				Impact	Grader (5 km/h)	1.0															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**188.0**															
					% Trucks/Buses	**20.2%**															
					Heavy Trucks %	**78.9%**															
					Medium Trucks/Buses %	**21.1%**															

Source ID	Speed (km/h)	Relevant Roadway	Range	Stage	Vehicle Types	Hourly Traffic Volume / Lane of Traffic															
						7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM
RS6A	80	Peninsula Road	Hwy 17 to Industrial Park Road	Background	Passenger Vehicles	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
				Impact	Passenger Vehicles	68.0												68.0			
				Total	**Passenger Vehicles**	**143.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**143.5**	**75.5**	**75.5**	**75.5**
				Background	Medium Trucks	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**
				Background	Heavy Trucks	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
				Impact	Heavy Trucks	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
				Total	**Heavy Trucks**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**
				Background	Buses	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
				Impact	Buses	1.0															
				Total	**Buses**	**1.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	165.8															
					% Trucks/Buses	8.9%															
					Heavy Trucks %	33.8%															
					Medium Trucks/Buses %	66.2%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**184.2**															
					% Trucks/Buses	**8.8%**															
					Heavy Trucks %	**38.6%**															
					Medium Trucks/Buses %	**61.4%**															
RS6B	60	Peninsula Road	Industrial Park Road to Penn Lake Road	Background	Passenger Vehicles	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
				Impact	Passenger Vehicles	68.0												68.0			
				Total	**Passenger Vehicles**	**143.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**143.5**	**75.5**	**75.5**	**75.5**
				Background	Medium Trucks	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**
				Background	Heavy Trucks	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
				Impact	Heavy Trucks	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
				Total	**Heavy Trucks**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**
				Background	Buses	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
				Impact	Buses	1.0															
				Total	**Buses**	**1.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	165.8															
					% Trucks/Buses	8.9%															
					Heavy Trucks %	33.8%															
					Medium Trucks/Buses %	66.2%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**184.2**															
					% Trucks/Buses	**8.8%**															
					Heavy Trucks %	**38.6%**															
					Medium Trucks/Buses %	**61.4%**															
RS6C	50	Peninsula Road	Penn Lake Road to Hemlo Drive	Background	Passenger Vehicles	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
				Impact	Passenger Vehicles	68.0												68.0			
				Total	**Passenger Vehicles**	**143.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**143.5**	**75.5**	**75.5**	**75.5**
				Background	Medium Trucks	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**
				Background	Heavy Trucks	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
				Impact	Heavy Trucks	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
				Total	**Heavy Trucks**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**	**3.1**
				Background	Buses	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
				Impact	Buses	1.0															
				Total	**Buses**	**1.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	165.8															
					% Trucks/Buses	8.9%															
					Heavy Trucks %	33.8%															
					Medium Trucks/Buses %	66.2%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**184.2**															
					% Trucks/Buses	**8.8%**															
					Heavy Trucks %	**38.6%**															
					Medium Trucks/Buses %	**61.4%**															

Notes:
Project traffic is limited between the hours of 7:00 am to 11:00 pm.
Peak hours of traffic occur at 7 am and 7 pm.
Each direction of traffic has the same volume.

Appendix D: Operations (Year 2) Traffic Data
Updated Noise Effects Assessment Report
Generation PGM Inc.
Marathon Palladium Project

Source ID	Speed (km/h)	Relevant Roadway	Range	Stage	Vehicle Types	Hourly Traffic Volume / Lane of Traffic															
						7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM
RS7	90	Highway 17	Peninsula Road to Coldwell Road	Background	Passenger Vehicles	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3
				Impact	Passenger Vehicles	16.0												16.0			
				Total	**Passenger Vehicles**	**55.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**39.3**	**55.3**	**39.3**	**39.3**	**39.3**
				Background	Medium Trucks	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**
				Background	Heavy Trucks	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
				Impact	Heavy Trucks	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
				Total	**Heavy Trucks**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**
				Background	Buses	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
				Impact	Buses																
				Total	**Buses**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	115.5															
					% Trucks/Buses	32.0%															
					Heavy Trucks %	78.1%															
					Medium Trucks/Buses %	21.9%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**122.0**															
					% Trucks/Buses	**32.3%**															
					Heavy Trucks %	**79.5%**															
					Medium Trucks/Buses %	**20.5%**															
RS1 (outside of modelling boundary) (16 hour)	60	Camp 19 Road	Camp 19 Road - Hwy 17 to the project modelling boundary	Impact	Pick-up trucks (60 km/h)	70.0												70.0			
				Impact	Transport (50 km/h)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
				Impact	Bus (50 km/h)	1.0												1.0			
				Impact	Concentrate Truck (50 km/h)	10.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	10.0			
				Impact	Water Truck (15 km/h)	1.0															
				Impact	Fuel truck (60 km/h)	1.0															
				Impact	Grader (5 km/h)	1.0															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**24.4**															
					% Trucks/Buses	**28.2%**															
					Heavy Trucks %	**90.9%**															
					Medium Trucks/Buses %	**9.1%**															
RS1 (inside of modelling boundary) (1 hour)	60	Access Road	Access Road - modelling boundary to process plant	Impact	Pick-up trucks (60 km/h)	70.0															
				Impact	Transport (50 km/h)	1.0															
				Impact	Bus (50 km/h)	1.0															
				Impact	Concentrate Truck (50 km/h)	10.0															
				Impact	Water Truck (15 km/h)	1.0															
				Impact	Fuel truck (60 km/h)	1.0															
				Impact	Grader (5 km/h)	1.0															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**170.0**															
					% Trucks/Buses	**17.6%**															
					Heavy Trucks %	**73.3%**															
					Medium Trucks/Buses %	**26.7%**															

Source ID	Speed (km/h)	Relevant Roadway	Range	Stage	Vehicle Types	Hourly Traffic Volume / Lane of Traffic															
						7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM
RS6A	80	Peninsula Road	Hwy 17 to Industrial Park Road	Background	Passenger Vehicles	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
				Impact	Passenger Vehicles	54.0												54.0			
				Total	**Passenger Vehicles**	**129.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**129.5**	**75.5**	**75.5**	**75.5**
				Background	Medium Trucks	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**
				Background	Heavy Trucks	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
				Impact	Heavy Trucks	10.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	10.0	0.7	0.7	0.7
				Total	**Heavy Trucks**	**12.5**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**12.5**	**3.2**	**3.2**	**3.2**
				Background	Buses	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
				Impact	Buses	1.0												1.0			
				Total	**Buses**	**1.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**1.8**	**0.8**	**0.8**	**0.8**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	165.80															
					% Trucks/Buses	8.9%															
					Heavy Trucks %	33.8%															
					Medium Trucks/Buses %	66.2%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**183.3**															
					% Trucks/Buses	**10.3%**															
					Heavy Trucks %	**46.5%**															
					Medium Trucks/Buses %	**53.5%**															
RS6B	60	Peninsula Road	Industrial Park Road to Penn Lake Road	Background	Passenger Vehicles	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
				Impact	Passenger Vehicles	54.0												54.0			
				Total	**Passenger Vehicles**	**129.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**129.5**	**75.5**	**75.5**	**75.5**
				Background	Medium Trucks	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**
				Background	Heavy Trucks	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
				Impact	Heavy Trucks	10.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	10.0	0.7	0.7	0.7
				Total	**Heavy Trucks**	**12.5**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**12.5**	**3.2**	**3.2**	**3.2**
				Background	Buses	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
				Impact	Buses	1.0												1.0			
				Total	**Buses**	**1.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**1.8**	**0.8**	**0.8**	**0.8**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	165.8															
					% Trucks/Buses	8.9%															
					Heavy Trucks %	33.8%															
					Medium Trucks/Buses %	66.2%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**183.3**															
					% Trucks/Buses	**10.3%**															
					Heavy Trucks %	**46.5%**															
					Medium Trucks/Buses %	**53.5%**															
RS6C	50	Peninsula Road	Penn Lake Road to Hemlo Drive	Background	Passenger Vehicles	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
				Impact	Passenger Vehicles	54.0												54.0			
				Total	**Passenger Vehicles**	**129.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**75.5**	**129.5**	**75.5**	**75.5**	**75.5**
				Background	Medium Trucks	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**
				Background	Heavy Trucks	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
				Impact	Heavy Trucks	10.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	10.0	0.7	0.7	0.7
				Total	**Heavy Trucks**	**12.5**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**12.5**	**3.2**	**3.2**	**3.2**
				Background	Buses	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
				Impact	Buses	1.0												1.0			
				Total	**Buses**	**1.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**1.8**	**0.8**	**0.8**	**0.8**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	165.8															
					% Trucks/Buses	8.9%															
					Heavy Trucks %	33.8%															
					Medium Trucks/Buses %	66.2%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**183.3**															
					% Trucks/Buses	**10.3%**															
					Heavy Trucks %	**46.5%**															
					Medium Trucks/Buses %	**53.5%**															

Source ID	Speed (km/h)	Relevant Roadway	Range	Stage	Vehicle Types	Hourly Traffic Volume / Lane of Traffic															
						7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM
RS6D	40	Peninsula Road	Hemlo Drive to Sund Crescent	Background	Passenger Vehicles	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3	250.3
				Impact	Passenger Vehicles	54.0												54.0			
				Total	**Passenger Vehicles**	**304.3**	**250.3**	**250.3**	**250.3**	**250.3**	**250.3**	**250.3**	**250.3**	**250.3**	**250.3**	**250.3**	**250.3**	**304.3**	**250.3**	**250.3**	**250.3**
				Background	Medium Trucks	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**	**13.8**
				Background	Heavy Trucks	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
				Impact	Heavy Trucks	10.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	10.0	0.7	0.7	0.7
				Total	**Heavy Trucks**	**18.3**	**9.0**	**9.0**	**9.0**	**9.0**	**9.0**	**9.0**	**9.0**	**9.0**	**9.0**	**9.0**	**9.0**	**18.3**	**9.0**	**9.0**	**9.0**
				Background	Buses	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
				Impact	Buses	1.0												1.0			
				Total	**Buses**	**3.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**3.8**	**2.8**	**2.8**	**2.8**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	550.0															
					% Trucks/Buses	9.0%															
					Heavy Trucks %	33.3%															
					Medium Trucks/Buses %	66.7%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**567.5**															
					% Trucks/Buses	**9.4%**															
					Heavy Trucks %	**37.9%**															
					Medium Trucks/Buses %	**62.1%**															
RS6E	40	Peninsula Road	Sund Crescent to Steven's Avenue	Background	Passenger Vehicles	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5	221.5
				Impact	Passenger Vehicles	54.0												54.0			
				Total	**Passenger Vehicles**	**275.5**	**221.5**	**221.5**	**221.5**	**221.5**	**221.5**	**221.5**	**221.5**	**221.5**	**221.5**	**221.5**	**221.5**	**275.5**	**221.5**	**221.5**	**221.5**
				Background	Medium Trucks	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**	**12.2**
				Background	Heavy Trucks	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
				Impact	Heavy Trucks	10.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	10.0	0.7	0.7	0.7
				Total	**Heavy Trucks**	**17.3**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**	**17.3**	**8.0**	**8.0**	**8.0**
				Background	Buses	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
				Impact	Buses	1.0												1.0			
				Total	**Buses**	**3.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**3.4**	**2.4**	**2.4**	**2.4**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	486.8															
					% Trucks/Buses	9.0%															
					Heavy Trucks %	33.3%															
					Medium Trucks/Buses %	66.7%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**504.3**															
					% Trucks/Buses	**9.5%**															
					Heavy Trucks %	**38.4%**															
					Medium Trucks/Buses %	**61.6%**															
RS6F	50	Steven's Avenue	Steven's Avenue to Rail Load Out 2	Background	Passenger Vehicles	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
				Impact	Passenger Vehicles																
				Total	**Passenger Vehicles**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**	**17.5**
				Background	Medium Trucks	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
				Impact	Medium Trucks																
				Total	**Medium Trucks**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
				Background	Heavy Trucks	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
				Impact	Heavy Trucks	10.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	10.0	0.7	0.7	0.7
				Total	**Heavy Trucks**	**10.6**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**10.6**	**1.3**	**1.3**	**1.3**
				Background	Buses	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				Impact	Buses																
				Total	**Buses**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
				Background (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	38.5															
					% Trucks/Buses	9.0%															
					Heavy Trucks %	33.3%															
					Medium Trucks/Buses %	66.7%															
				Impact (Includes Two Lanes of Traffic)	**Number of vehicles/hr**	**42.3**															
					% Trucks/Buses	**17.1%**															
					Heavy Trucks %	**68.0%**															
					Medium Trucks/Buses %	**32.0%**															

Notes:
Project traffic is limited between the hours of 7:00 am to 11:00 pm.
Peak hours of traffic occur at 7 am and 7 pm.
Each direction of traffic has the same volume.