



CANADA NICKEL
COMPANY



Stantec

Crawford Nickel Project Impact Statement

Chapter 13 Assessment of Potential Effects on the Acoustic Environment



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Canada Nickel Company

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Acronyms and Abbreviations

ANSI	American National Standards Institute
dB	Un-weighted decibels
dBA	A-weighted Decibels
dBAI	Impulsive A-weighted Decibels
dB L	Linear (unweighted) Decibels
FTA	Federal Transit Administration
HA	Highly Annoyed
Hz	Hertz
ISO	International Organization for Standardization
kt/d	kilotonne per day
L _d	Daytime sound level (defined as 07:00 – 22:00 by Health Canada)
L _{dn}	Day-night sound level
L _{eq} (n-hour)	Equivalent sound level over 'n' hour(s)
L _{LM}	Logarithmic Mean Sound Level
L _{max}	Maximum sound level
L _n	Nighttime sound level (defined as 22:00 to 07:00 by Health Canada)
LSA	Local Study Area
MECP	Ministry of Environment, Conservation and Parks
MTO	Ontario Ministry of Transportation
NPC	Noise Pollution Control
PA	Project Area
PPV	Peak Particle Velocity

RMS	Root Mean Square
RSA	Regional Study Area
UTM	Universal Transverse Mercator
VC	Valued Component
ZOI	Zone of Influence

Glossary of Technical Terms

Air Overpressure	Pressure wave caused by explosion during blasting, also called a blast wave.
A-weighted Decibel	A decibel measurement that is adjusted for the distribution of sound energy across different frequencies to more accurately resemble the human perception of sound loudness.
Decibel	Unit of measurement for sound pressure, intensity, or power, which in turn are different ways of describing sound energy in a given environment. Decibels are logarithmic ratios of two values: ratio between overall sound energy and a reference value (sound pressure), ratio between sound energy per unit area and a reference value (sound intensity), or ratio between sound energy per unit time and a reference value (sound power).
Linear, Flat, or Unweighted Decibel	A decibel measurement that is not adjusted for the distribution of sound energy across different frequencies.
Noise	Unwanted sound.
Peak Particle Velocity	The peak level of vibration velocity occurring at any instant, quantified in millimetres per second (mm/s).
Vibration, or Ground-borne Vibration	Oscillatory motion, which can be measured in terms of displacement, velocity, or acceleration.

13 Assessment of Potential Effects on the Acoustic Environment

The Acoustic Environment was selected as a Valued Component (VC) for assessment because noise and vibration resulting from the Crawford Nickel Project ('the Project') have the potential to affect human health and well-being, land and resource use, wildlife and wildlife habitat, and fish and fish habitat. Noise and vibration have been identified as topics of concern by regulators, Indigenous nations, stakeholders, and the public. The Tailored Impact Statement Guidelines require consideration of effects to the Acoustic Environment from the Project where there is public or Indigenous community concern associated with an increase in sound levels during construction and operations.

For the purpose of this assessment, 'noise' is defined as unwanted sound (Health Canada 2023). In excess amounts, noise from construction equipment and other project activities has the potential to affect the health and well-being of humans. Humans and infrastructure may also be impacted by vibration caused by blast-induced ground movement and air overpressure, as well as vibration from construction equipment and piling.

Ground vibration is an oscillatory motion, which can be measured in terms of displacement, velocity, or acceleration. Because of the oscillatory nature of vibration, the average of the motion descriptors (i.e., displacement, velocity, or acceleration) is zero. The ground vibration level in this assessment is defined in terms of peak particle velocity (PPV) and root mean square (RMS) and is measured in millimeters per second (mm/s). The PPV is the highest instantaneous positive or negative peak of the vibration signal. The RMS amplitude is a value averaged signal for one-second period to describe the vibration amplitude for human responses.

Air overpressure from blasting is measured in linear decibels (dBL). Air overpressure is the additional pressure above normal atmospheric pressure that is generated from a blast. Air overpressure often feels like a gust of wind by a receptor because a confined blast will generally result in inaudible air overpressure.

Although air overpressure and sound are different phenomena, both are measured in units of decibels. An event with an air overpressure value of 115 dBL, which may be inaudible due to the low frequency content, is entirely different from a sound event with the level of 115 dBA. The metrics used for community noise assessment are based on A-weighted decibels (dBA), an adjustment scale that accounts for human ear sensitivity to different frequencies (i.e., less at lower frequencies). The A-weighted noise metric is not used for assessing air overpressure from blasting.

The Acoustic Environment is linked to other VCs, including:

- Fish and Fish Habitat (Chapter 17), whereby changes in overpressures or peak particle velocities from blasting may affect the health and survival of fish and fish eggs in nearby waterbodies.

- Wildlife and Wildlife Habitat (Chapter 19), whereby changes in noise and vibration (e.g., blasting) have the potential to affect wildlife behaviour and use of habitat.
- Health (Chapter 21), whereby noise may affect human health by increasing levels of sleep disturbance compared to existing conditions.
- Social Conditions (Chapter 22), whereby changes in noise and vibration may cause disturbance to land and resource users.
- Indigenous Interests (Chapters 25-28), whereby changes in noise and vibration may affect the use of lands by Indigenous nations through sensory disturbance.

This assessment is based on professional judgment of engineers and scientists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection.

13.1 Scope of Assessment

This section defines and describes the scope of the assessment of potential effects to the Acoustic Environment, including noise and vibration.

13.1.1 Regulatory and Policy Setting

Noise and vibration effects are typically assessed quantitatively through comparison of predicted project noise and vibration levels to regulatory guidelines limits and/or changes in existing levels. Applicable federal, provincial, and municipal guidelines for noise and vibration are considered for the Project noise and vibration assessment.

Blasting activities from the Project construction and operations are impulsive noise and transient vibration, and their effects are assessed separately as required by the guidelines.

The effect of traffic noise associated with the realigned Highway 655 is assessed separately from the Project activities, as required by the applicable guidelines. Similarly, noise and vibration impact associated with the rail corridor is assessed separately, as required by the applicable guidelines.

13.1.1.1 Federal

The requirements to consider potential Project effects on the Acoustic Environment are described in Section 8.5 of the Tailored Impact Statement Guidelines (Appendix A.1 of the Impact Statement) for the Project.

The acoustic impact assessment considers noise and vibration standards adopted by Environment and Climate Change Canada (ECCC). There are no federally regulated noise criteria/ limits from ECCC; however, Health Canada provides guidance in the document “Guidance for Evaluating Human Health Effects in Impact Assessment: Noise” (Health Canada 2023). The predicted effects are assessed relative to this guidance.

Table 13.1 provides a summary of the applicable federal guidelines and standards considered for assessing potential effects on the acoustic environment.

Table 13.1 Summary of Federal Regulatory Guidance and Standards Considered for the Acoustic Environment

Regulatory Guidance and Standards	Project Components and Activities	Descriptions
Health Canada “Guidance for Evaluating Human Health Effects in Impact Assessment: Noise” (Health Canada 2023)	Project construction and operations noise	The guidance prescribes evaluation of: <ul style="list-style-type: none"> • Day-night equivalent sound levels, L_{dn}, in A-weighted decibels (dBA) • Community annoyance in % Highly Annoyed (%HA) • Sleep disturbance in nighttime sound level, L_n, in dBA, and maximum sound level, L_{max}, in dBA, with consideration of the number of events (occurrences) per night • Low-frequency noise (LFN) by limiting sound levels at 16 Hz, 31.5 Hz, and 63 Hz octave bands for potential vibrations and rattles within buildings
	Road traffic noise from Highway 655 realignment	The guidance prescribes evaluation of: <ul style="list-style-type: none"> • L_{dn} in dBA • Community annoyance in %HA • Sleep disturbance in nighttime sound level, L_n, in dBA, and maximum sound level, L_{max}, in dBA, with consideration of the number of events (occurrences) per night
	Rail spur line noise	The guidance prescribes evaluation of: <ul style="list-style-type: none"> • L_{dn} in dBA • Community annoyance in %HA • Sleep disturbance in nighttime sound level, L_n, in dBA, and maximum sound level, L_{max}, in dBA, with consideration of the number of events (occurrences) per night

13.1.1.2 Provincial and Municipal

Various provincial, municipal, and other regulatory requirements and guidance have been considered for assessing Acoustic VC. Guidelines and criteria vary depending on the nature of the activity (i.e., mine construction, mine operation, Highway 655 construction, rail spur line construction) and the location of the activity (on-site versus outside of the PA). In instances where more than one guideline is applicable, all must be followed, unless stated otherwise. Applicable noise and vibration guidelines are summarized in Table 13.2.

Table 13.2 Summary of Provincial and Municipal Regulatory Guidance and Standards Considered for the Acoustic Environment

Regulatory Guidance and Standards	Project Components and Activities	Descriptions
Provincial		
Ontario Ministry of the Environment, Conservation and Parks (MECP) Publication Noise Pollution Control NPC-300, Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning, August 2013 (MOE 2013)	Project construction and operations noise	The guideline prescribes evaluation of: <ul style="list-style-type: none"> Hourly steady and impulsive sound levels for daytime, evening, and nighttime against the higher of the minimum background hourly sound level ($L_{eq(1-hour)}$) or the exclusion limits presented in the guidelines Hourly sound level from non-emergency operation of emergency equipment (e.g., standby generators) against provincial sound level limits (5 dB higher than normal operations)
Ontario Ministry of Transportation (MTO) Environmental Guide for Noise (MTO 2022)	Road traffic noise from Highway 655 realignment	The guide prescribes evaluation of road traffic noise for future horizon year (i.e., minimum 10 years after the completion of the highway) for the highway by comparing against the provincial limits.
MECP Publications NPC-115 “Model Municipal Noise Control By-law (MOE 1978b) and NPC-118 “Motorized Conveyances” (MOE 1982a)	Construction noise from Highway 655 realignment	The guidelines prescribe evaluation of construction equipment noise emission against the provincial limits published in the guidelines.
MECP Publication Blasting, Model Municipal Noise Control By-Law NPC-119 (MOE 1982b)	Project blasting noise (overpressure) and vibration	The guideline prescribes evaluation of blasting noise (overpressure) in linear decibels (dBL) and ground-borne vibration in terms of Peak Particle Velocity in millimetre per second (mm/s) against the published provincial limits.
Municipal		
City of Timmins By-Law 2006-6339 (Amended 2007-6420) (City of Timmins 2006)	Construction noise within the City of Timmins (southern portion of Highway 655)	The by-law prohibits any noise from any excavation or construction work except in the case of urgent necessity under special permit between the hours of 22:00 and 07:00. A by-law exemption and/or special permit is required from the municipality for conducting construction outside of the prohibited periods. Due to the extents of the City of Timmins, this by-law is relevant only to Highway 655 realignment and rail spur line construction activity for the southernmost portion of the PA.
Other		
The City of Toronto By-law No.514-2008 (City of Toronto 2008)	Construction vibration	The by-law prescribes evaluation of construction vibration in terms of PPV in mm/s against the City limits for structural damage.
American National Standard Institute (ANSI) S3.29-1983, Guide to Evaluation of Human Exposure to Vibration in Buildings” (ANSI 1983)	Rail spur line vibration	The standard prescribes evaluation of vibration impact from the rail spur line on the nearby receptors with ANSI limits for human perception.

13.1.2 The Influence of Consultation and Engagement on the Assessment

Canada Nickel Company (Canada Nickel) has engaged with potentially affected Indigenous nations, regulators, the public, and other stakeholders. Table 13.3 provides a summary of the topics, key information including Indigenous knowledge, and concerns that Canada Nickel identified as part of their engagement efforts that relate to the Acoustic Environment, as well as a summary of the influence that the outcomes of this engagement had on the assessment.

Overall, comments and information related to the Acoustic Environment have been received throughout engagement activities to date. Concerns related to potential effects from increased noise levels on recreational activities, impacts of noise from rail, and how impacts will be mitigated and monitored. This information was considered when evaluating whether Canada Nickel's planned mitigation will effectively manage the identified potential interactions, or whether additional or refined mitigation is warranted. Additional and specific mitigation measures were added to address one or more of the concerns, as described in Table 13.3.

Table 13.3 Summary of Key Information, Indigenous Knowledge, and Concerns for the Project Related to the Acoustic Environment

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
Noise and Vibration from Construction, Traffic and Ancillary Infrastructure	<ul style="list-style-type: none"> • Members of the public and other stakeholders expressed concern regarding: <ul style="list-style-type: none"> - noise from traffic and equipment in the PA - methods to monitor noise emissions, and thresholds beyond which additional measures would be implemented to manage noise • Apitipi Anicinapek Nation recommends participation in assessment methodology for the Acoustic Environment. • Flying Post First Nation, Matachewan First Nation and Mattagami First Nation recommend vibration and noise emission mitigation and monitoring measures throughout all phases of the Project, including a method to address noise complaints. • Matachewan First Nation expressed concern regarding noise impacts from the railway. • Métis Nation of Ontario – Region 3 expressed concern regarding additional flights at the Timmins Victor M Power Municipal Airport that may increase noise pollution in the region. 	<ul style="list-style-type: none"> • Consultation and engagement contributed to an understanding of existing conditions and the identification of receptors for noise and vibration and informed the assessment of Indigenous Interests in Chapters 25 to 28 of the Impact Statement (Assessment of Potential Effects on Indigenous Interests) • Project noise and vibration effects are predicted, and the extent of the effects are presented on noise contour figures and via vibration zones of influence. Noise and vibration mitigation and monitoring commitments for the Project are presented in Chapter 13 of the Impact Statement (Assessment of Potential Effects on the Acoustic Environment). • A process to address noise and vibration complaints is included in the Conceptual Noise and Vibration Management Plan. • A follow-up and monitoring plan will be developed which will include monitoring, thresholds, and adaptive management details. • Project traffic and equipment within the PA are included in the noise model. Additionally, Highway 655 noise due to the re-alignment is assessed separately as required by the guidelines. • The Timmins Victor M Power Municipal Airport falls outside of the RSA. No Project-specific flights are proposed as part of the Project. • Canada Nickel’s responses to mitigation recommendations made by the Indigenous nations are provided in Chapters 25 to 28 of the Impact Statement (Assessment of Potential Effects on Indigenous Interests). 	<ul style="list-style-type: none"> • Chapter 13 (Assessment of Potential Effects on the Acoustic Environment), Sections 13.5, 13.10.2 • Chapters 25 to 28 (Assessment of Potential Effects on Indigenous Interests)

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
<p>Effects of Noise and Vibration on Wildlife and Fish</p>	<ul style="list-style-type: none"> • Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, and Taykwa Tagamou Nation expressed concern regarding sensory disturbances related to noise and traffic resulting in the displacement or declining populations of important species (e.g., moose, lynx, bear). • Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, and Taykwa Tagamou Nation expressed concern regarding impacts to migratory birds and their habitat from disturbance activities, such as noise and blasting, and the timing of these activities. • Flying Post First Nation, Matachewan First Nation and Mattagami First Nation expressed concerns regarding effects to fish populations, specifically lake sturgeon, due to noise and vibrations from blasting. • Flying Post First Nation and Matachewan First Nation recommend characterization of baseline and any modelling for the acoustic environment be informed by diet and harvest studies. • Taykwa Tagamou Nation recommends: <ul style="list-style-type: none"> - providing a breakdown of expected impacts on rail traffic (frequency) as a result of ore concentrate transportation - characterizing the impacts of noise and vibration on wildlife disturbance 	<ul style="list-style-type: none"> • Consultation and engagement contributed to the identification of receptors for noise and vibration and informed the assessment of Indigenous Interests in Chapters 25 to 28 of the Impact Statement (Assessment of Potential Effects on Indigenous Interests). • Concerns were considered in the development of mitigation and management measures. • Potential effects due to blasting (usage of explosives near water bodies) on fish habit are assessed under the Fish and Fish Habitat VC chapter (Chapter 17 of the Impact Statement [Assessment of Potential Effects on Fish and Fish Habitat]). • Noise and vibration effects from the Project and associated highway and rail components were modelled (Appendix C.3 of the Impact Statement [Noise and Vibration Assessment]). Potential effects of noise and vibration on wildlife is assessed in the Wildlife VC chapter (Chapter 19 of the Impact Statement [Assessment of Potential Effects on Wildlife and Wildlife Habitat]). • Project noise effects are assessed, and the extent of their effects are presented on noise contour figures (Figures A.5.1-A.5.5 in the Noise and Vibration Assessment [Appendix C.3 of the Impact Statement]). Potential noise effects on wildlife are addressed in the Wildlife VC chapter (Chapter 19 Chapter 19 of the Impact Statement [Assessment of Potential Effects on Wildlife and Wildlife Habitat]). • Canada Nickel’s responses to mitigation recommendations made by the Indigenous nations are provided in Chapters 25 to 28 of the Impact Statement (Assessment of Potential Effects on Indigenous Interests). 	<ul style="list-style-type: none"> • Chapter 13 (Assessment of Potential Effects on the Acoustic Environment), Sections 13.3, 13.5 • Chapter 17 (Assessment of Potential Effects on Fish and Fish Habitat) • Chapter 19 (Assessment of Potential Effects on Wildlife and Wildlife Habitat) • Chapters 25 to 28 (Assessment of Potential Effects on Indigenous Interests) • Noise and Vibration Assessment (Appendix C.3 of the Impact Statement), Figures A.5.1-A.5.5

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
Land and Resource Use, and Sense of Place	<ul style="list-style-type: none"> Members of the public and other stakeholders expressed concern regarding potential effects from increased noise levels and vibration from the Project on recreational activity, including camping areas, such as Big Water Campground. Apitipi Anicinapek Nation and Flying Post First Nation expressed concern regarding effects to water and cultural continuity due to noise and vibration from Project activities. Flying Post First Nation, Matachewan First Nation, Mattagami First Nation, and Taykwa Tagamou Nation expressed concern regarding potential effects to current and future use of lands and resources due to noise and vibration. Mattagami First Nation expressed concern due to reduced sense of place from sensory disturbance. 	<ul style="list-style-type: none"> Consultation and engagement led to the inclusion of representative noise-sensitive receptors surrounding the Project, including the Big Water Campground and the Mattagami River Indigenous site, in the assessment for compliance. Project noise from mining activities (extraction, processing) is not expected to be perceptible at the Big Water Campground as it is over 5 km away from the mine site and the predicted sound level is lower than the existing background sound levels. However, the impacts of rail noise attributed to the movement of concentrate by rail along the rail spur were considered. Effects at the Big Water Campground are expected to be slightly above¹ background sound levels but remain within applicable limits during operations. Project noise is not expected to be perceptible at the Mattagami River Indigenous site as it is approximately seven kilometres away from the PA and the predicted sound level is lower than the existing background noise levels. However, sensory disturbance is expected in proximity to the PA and is assessed in Chapters 25 to 28 of the Impact Statement (Assessment of Potential Effects on Indigenous Interests). 	<ul style="list-style-type: none"> Chapter 13 (Assessment of Potential Effects on the Acoustic Environment), Sections 13.2, 13.3, 13.5 Chapter 22 (Assessment of Potential Effects on Social Conditions) Chapters 25 to 28 (Assessment of Potential Effects on Indigenous Interests)

¹Day-night sound level (L_{dn}) from rail spur line at the Big Water Lake receptor R06 is predicted to be approximately 3 dB higher than background sound level during operations.

Topic	Key Information, Indigenous Knowledge, and Concerns	Influence on the Assessment	Where Information is Addressed in the Impact Statement
Human Health	<ul style="list-style-type: none"> • Apitipi Anicinapek Nation, Flying Post First Nation, and Taykwa Tagamou Nation expressed concern regarding effects to human health, including actual and perceived risks at key receptors due to changes to noise levels. 	<ul style="list-style-type: none"> • Consultation and engagement contributed to the identification of receptors, informed the health assessment discussed in Chapter 21 of the Impact Statement (Assessment of Potential Effects on Health), and informed the assessment on Indigenous Interests in Chapters 25 to 28 of the Impact Statement (Assessment of Potential Effects on Indigenous Interests). • Concerns are considered in the development of mitigation and management measures and supported scope of assessed issues. • Representative noise-sensitive receptors surrounding the Project, including the First Nation receptors within the Local Study Area, are included in the assessment. 	<ul style="list-style-type: none"> • Chapter 21 (Assessment of Potential Effects on Health) • Chapters 25 to 28 (Assessment of Potential Effects on Indigenous Interests)

Indigenous knowledge has been considered and incorporated into the Impact Statement, as applicable, where made available by Indigenous nations through engagement, information gathering, and voluntary information sharing. Refer to the Description of Engagement with Indigenous Peoples (Chapter 7 of the Impact Statement) for detailed methods regarding the incorporation of Indigenous knowledge to the Impact Statement.

13.1.3 Potential Effects, Pathways and Measurable Parameters

Table 13.4 summarizes the potential environmental effects of the Project on the acoustic environment, specifically from noise and vibration, as well as the effect pathways and measurable parameters. The potential environmental effects, effect pathways, and measurable parameters used in the assessment of effects on noise and vibration are selected based on professional judgement, understanding of the Project, recent environmental assessments for mining projects in Canada, and comments provided during engagement.

Table 13.4 Potential Effects, Effect Pathways and Measurable Parameters for the Acoustic Environment

Potential Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in noise	Noise emissions from Project equipment and activities, including from: <ul style="list-style-type: none"> • Project construction • Project operations • Blasting • Vehicle traffic along realigned Highway 655 • Train traffic along new rail spur line and existing spur line 	<ul style="list-style-type: none"> • Predicted hourly equivalent sound level, $L_{eq, 1-hour}$, in A-weighted decibels, dBA • Predicted impulsive noise level, L_{imp}, in dBA • Predicted daytime equivalent sound level, L_d, in dBA • Predicted nighttime equivalent sound level, L_n, in dBA • Predicted day-night average sound level, L_{dn}, in dBA • Predicted blasting overpressure noise level in linear decibels, dBL
Change in vibration	Vibration emissions from Project equipment and activities, including from: <ul style="list-style-type: none"> • Project construction • Project operations • Blasting • Train traffic along new rail spur line and existing spur line 	<ul style="list-style-type: none"> • Predicted peak particle velocity, PPV, in millimetres per second • Predicted root mean square, RMS, velocity, in millimetres per second

13.1.4 Boundaries

13.1.4.1 Spatial Boundaries

The **Project Area (PA)** encompasses the Project footprint and is the anticipated area of physical disturbance associated with the construction, operations, and decommissioning/closure of the Project. The PA includes the Open Pit, Stockpiles, Impoundment Facility, Tailings Management Facility (TMF), two ore Processing Plants, and other mine-related infrastructure, as well as a new rail spur line and the relocation of Highway 655 and the existing 500 kilovolt transmission line. The extent of the PA for the Project is shown on Figure 13.1.

The **Local Study Area (LSA)** encompasses the area in which Project-related effects (direct or indirect) were predicted or measured with a level of confidence appropriate for the assessment and in which there is a reasonable expectation that the potential effects in the LSA are of public interest. The LSA includes the PA and the existing rail spur line, as well as a buffer of approximately four kilometres around the PA and the existing rail spur line. The extent of the LSA for the assessment of the Acoustic Environment is shown on Figure 13.1.

The **Regional Study Area (RSA)** includes the area within which cumulative effects on the Acoustic Environment are likely to occur, depending on the location of other past, present, or reasonably-foreseeable future projects or activities. The RSA for the Project includes a buffer of approximately eight kilometres around the PA and is shown on Figure 13.1.

13.1.4.2 Temporal Boundaries

The temporal boundary of the assessment includes all Project phases from the start of construction through to the end of closure. Based on the current Project schedule, the Project phases include:

- Construction (Year -3 to Year -1)
- Operations
 - Operations phase 1 (Year 1 to Year 5); 60 kilotonnes per day (kt/d) milling capacity with ore extraction
 - Operations phase 2 (Year 5 to Year 30); 120 kt/d milling capacity with ore extraction
 - Operations phase 3 (Year 30 to Year 41); 120 kt/d milling capacity with no ore extraction
- Decommissioning and closure
 - Active closure (Year 41 to Year 46)
 - Passive closure (Year 46+)

13.1.5 Residual Effects Characterization

The characterizations used to assess residual effects on the acoustic environment are provided in Table 13.5.

Table 13.5 Characterization of Residual Effects on the Acoustic Environment

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	<p>Positive – a residual effect that moves measurable parameters in a direction beneficial to acoustic environment relative to baseline</p> <p>Adverse – a residual effect that moves measurable parameters in a direction detrimental to acoustic environment relative to baseline</p> <p>Neutral – no net change in measurable parameters for the acoustic environment relative to baseline</p>
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	<p>Negligible – no measurable change relative to baseline conditions</p> <p>Low – a measurable change in acoustic environment can be noted but within normal variability of baseline conditions</p> <p>Moderate – measurable change with regard to the baseline conditions but within applicable regulatory limits</p> <p>High – substantial contributor in combination with other sources causing exceedances of applicable regulatory criteria beyond the PA</p>
Geographic Extent	The geographic area in which a residual effect occurs	<p>PA – residual effects are restricted to the PA</p> <p>LSA – residual effects extend into the LSA</p> <p>RSA – residual effects extend into the RSA</p>
Timing	Considers when the residual effect is expected to occur, where relevant to the VC	<p>No sensitivity – timing does not affect VC.</p> <p>Moderate sensitivity – timing may affect VC during lower sensitivity period, but the effects are manageable with proper planning and mitigation measures.</p> <p>High sensitivity – residual effects occur during high sensitivity period.</p>
Duration	The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	<p>Negligible – residual effect is restricted to a single event</p> <p>Short-term – residual effect is restricted to no more than the duration of the Construction phase</p> <p>Medium-term – residual effect extends through Operations</p> <p>Long-term – residual effect extends beyond Operations and the life of the Project</p>
Frequency	Identifies how often the residual effect occurs and how often during the project or in a specific phase	<p>Single event – occurs only once</p> <p>Multiple irregular event – occurs at no set schedule</p> <p>Multiple regular event – occurs at regular intervals</p> <p>Continuous – occurs continuously</p>

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	<p>Reversible – the residual effect is likely to be reversed after activity completion and reclamation</p> <p>Irreversible – the residual effect is unlikely to be reversed</p>

13.2 Existing Conditions for the Acoustic Environment

This section summarizes the existing acoustic environment in the vicinity of the Project. Acoustic baseline measurements were conducted by WSP Canada Inc. (WSP), the results of which are documented within the Noise and Vibration Conditions Report (Appendix B.4 of the Impact Statement).

No existing vibration sources were identified in the PA and surrounding area, except for the existing rail spur line for the Kidd Creek Mine. The closest receptor to the Kidd Creek Mine spur line was outside the vibration zone of influence from the proposed spur line. Therefore, no vibration baseline measurements were conducted by WSP for the Project or reported in the Noise and Vibration Conditions Report (Appendix B.4 of the Impact Statement), henceforth referred to as the WSP Baseline Report.

13.2.1 Methods

Baseline noise monitoring data was collected by WSP and presented in the WSP Baseline Report. The baseline noise monitoring for the Project was conducted for two seasons (Leaves-On and Leaves-Off) and considered both long-term (48 hours) and short-term (20 minutes) monitoring. The short-term monitoring data was used to supplement the data collected from the long-term monitoring. The WSP baseline monitoring data was vetted for applicability, including removal of results for inclement weather (rain, snow, high winds, etc.).

Long term noise monitoring was conducted at five representative locations (ML1 through ML 5) within the RSA, and they are shown on Figure 13.2.

13.2.2 Overview

The hourly baseline sound levels from the WSP Baseline Report were used to calculate day-night sound levels, L_{dn} , for this assessment.

Table 13.6 presents the minimum hourly sound levels, $L_{eq(1-hour)}$, reported in the WSP Baseline Report for both Leaves-On and Leaves-Off monitoring periods. Table 13.7 presents the calculated L_d , L_n , and resulting minimum L_{dn} , along with the minimum hourly sound levels for all monitoring locations presented in the baseline report. Further detail on calculation methodology can be found within the Noise and Vibration Assessment (Appendix C.3 of the Impact Statement).

Table 13.6 Measured Minimum L_{eq} (1-hour) Baseline Sound Levels

Monitoring Location	Measured Daytime (7:00 to 19:00) Minimum L_{eq} (1-hour) Sound Level (dBA)	Measured Evening (19:00 to 23:00) Minimum L_{eq} (1-hour) Sound Level (dBA)	Measured Nighttime (23:00 to 7:00) Minimum L_{eq} (1-hour) Sound Level (dBA)
ML1	23	19	16
ML2	23	20	19
ML3	27	21	22
ML4	22	18	17
ML5	29	24	20

Table 13.7 Calculated Minimum L_{dn} from Baseline Measurements

Monitoring Location	Daytime (07:00 to 22:00) Sound Levels, L_d^a (dBA)	Nighttime (22:00 to 07:00) Sound Levels, L_n^a (dBA)	Day-Night Sound Levels, L_{dn}^a (dBA)
ML1	33	26	35
ML2	32	23	33
ML3	37	27	37
ML4	32	20	31
ML5	34	27	35

Note:
 a. Calculated from hourly noise data reported in the WSP Baseline Report

13.2.3 Receptors

As defined in the MECP NPC-300 (MOE 2013) noise guidelines, noise and vibration effects are assessed at sensitive land uses, such as residences, campgrounds, schools, churches, or hospitals. Additionally, Health Canada (Health Canada 2023) requires consideration of noise effects at recreation areas, such as Indigenous hunting and fishing cabins, or cultural or religious gathering areas.

Thirteen representative receptors (R01 through R13) were identified for assessing noise and vibration effects and are illustrated on Figure 13.3 and summarized in Table 13.8. The receptors identified include existing dwellings, camps or cottages, habitation structures or locations of overnight areas, Indigenous sites (overnight Indigenous locations), a representative location along the Mattagami River, and another representative location at the Big Water Campground.

The receptors are modelled at 1.5 m above grade as they are single-story camps, cottages, dwellings, and Indigenous sites.

Table 13.8 Receptor List

Receptor Description	Receptor ID	Coordinates (UTM Zone 17N)	
		Easting (m)	Northing (m)
House South of Site, At Lake 300m East of Highway 655	R01	473500.1	5398566
Camp/Cottage on Davis Lake	R02	471449.9	5403929
Camp on the West Buskegau River	R03	477544.4	5408361
Camp/Cottage East of Site	R04	477052.3	5403390
Camp/Cottage Near Highway 655 South of Site	R05	475946.3	5387777
Campground at Big Water Lake – Indigenous Site	R06	479442	5384066
Mattagami River – Indigenous Site	R07	.. ^a	.. ^a
Overnight Indigenous Location	R08	.. ^a	.. ^a
Overnight Indigenous Location	R09	.. ^a	.. ^a
Overnight Indigenous Location	R10	.. ^a	.. ^a
Overnight Indigenous Location	R11	.. ^a	.. ^a
Camp/Cottage North of Existing Rail Corridor	R12	484849.9	5384101
Camp/Cottage North of Existing Rail Corridor	R13	485094.5	5383767
Note:			
a. To protect confidentiality, geographic coordinates for Indigenous receptors, other than that at Big Water Lake, are not provided.			

The identified Indigenous receptors are representative locations, to protect confidentiality, where overnight stays were noted through engagement with the Indigenous nations. This assessment does not consider Indigenous hunting and/or fishing cabins or structures within the LSA that the Indigenous nations reported as not having been in use for over 10 years. There are, however, expansive areas within the LSA where Indigenous nations have reported engaging in fishing, hunting, trapping, and/or gathering activities. Although these activities may involve overnight stays at times, they are not within established buildings and were not included as identified receptors.

Due to the large size of the Project and associated study areas, all receptors are not expected to experience noise or vibration effects to the same degree from each piece of equipment at the site and/or from all Project components. For example, receptors R12 and R13 are not expected to experience noise or vibration effects from activities occurring within the PA. Conversely, receptors R12 and R13 are among the closest receptors to the rail spur line and are expected to experience noise effects solely from the rail spur line, without being impacted by the Project construction and operations. Therefore, receptors R12 and R13 are not included in assessment of the Project noise and vibration assessment but are included in the assessment of rail spur line. Similarly, not all receptors are impacted by the highway realignment. See Table 13.9 for a list of applicable receptors for each assessment scenario.

Table 13.9 Applicable Receptors for each Assessment Scenario

Assessment Scenario	Applicable Receptors
Project Construction, Operations, and Blasting	R01-R11
Rail Spur Line	R05, R06, R10-R13
Highway Realignment	R01 for assessment per MTO, R01, R02, R07, and R08 for assessment per Health Canada

13.3 Project Interactions with the Acoustic Environment

Table 13.10 identifies, for each potential effect, the physical activities that might interact with the VC and result in the identified effect. These interactions are indicated by a check mark (✓) and are discussed in detail in Section 13.4, in the context of effects pathways, standard and project-specific mitigation or enhancement, and residual effects.

Table 13.10 Project Interactions with the Acoustic Environment

Physical Activities	Effects	
	Change to noise	Change to vibration
Construction		
Mobilization of construction equipment and materials on site.	✓	–
Vegetation clearing, including the removal and disposal of trees, brush, shrubs, and other foliage.	✓	✓
Stripping, including the removal of topsoil and other organic materials, as well as storing of some materials for use in reclamation.	✓	✓
Grading of overburden to be used as fill.	✓	✓
Handling and use of explosives, including blasting.	✓	✓
Excavating and pre-stripping of mine rock from the Open Pit and surrounding area.	✓	✓
Development of the Impoundment Facility for storage of rock, clay, sand, and till.	✓	✓
Preparation of construction surfaces, including hauling reclaimed graded material and crushed mine rock to construction locations.	✓	✓
Construction of water management systems to collect, manage, treat, and discharge contact water from mine components to the receiving waterbodies via collection ponds, ditches, and water treatment plants.	✓	✓
Construction of minor water diversions around perimeter of the mine site to collect and divert flows.	✓	✓
Dewatering of natural water bodies within the PA.	✓	–
Waste management, including collection and temporary storage.	–	–
Construction of mine infrastructure, including crusher facilities, process plant and TMF, as well as the potable water well, and ancillary infrastructure (e.g., offices, workshop, fuel farm, magazine storage and explosives pad).	✓	✓

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Physical Activities	Effects	
	Change to noise	Change to vibration
Construction of internal haul roads and internal access roads, including water crossings.	✓	✓
Construction of power supply and distribution systems.	✓	✓
Construction of temporary Highway 655 by-pass and overpass.	✓	✓
Construction of the rail spur.	✓	✓
Vehicle operation within the PA.	✓	–
Employment and expenditures ¹ .	–	–
Operations (Mining and Processing)		
Construction of Project infrastructure, including the expansion of ore processing components.	✓	✓
Relocation and decommissioning of Highway 655 and associated infrastructure.	✓	✓
Relocation of 500 kilovolt transmission line.	✓	✓
Construction of the North Driftwood Diversion Channel.	✓	✓
Handling and use of explosives.	✓	✓
Ore extraction in the Main Zone and East Zone of the Open Pit, including drilling, loading, and hauling of mine rock from the pits.	✓	✓
Maintenance and management of mine rock stockpiles, overburden, and TMF.	✓	✓
Ore processing, including conveyor, crushing and processing activities with and between the stockpiles, crusher facilities and process plant.	✓	✓
Operation of water management systems, including the collection, management, treatment, and discharge of contact water from mine components to the receiving waterbodies via collection ponds, ditches and water treatment plants.	✓	–
Transportation of Ore via the rail spur line.	✓	✓
Waste management, including collection and temporary storage.	–	–
Vehicle operation within the PA.	✓	–
Progressive reclamation of disturbed areas.	✓	–
Employment and expenditures ¹ .	–	–
Decommissioning and Closure		
Pit flooding through the creation of channels from the collection ponds towards the Open Pit.	✓	–
Water management, including groundwater and surface water.	✓	–
Decommissioning, dismantling and/or disposal of buildings and mine infrastructure.	✓	✓
Removal of power lines and electrical equipment.	✓	✓
Decommissioning of potable water and sewage systems.	✓	–
Vehicle operation within the PA.	✓	–

Physical Activities	Effects	
	Change to noise	Change to vibration
Reclamation, including the placement of overburden, seeding and re-grading.	✓	✓
Monitoring and maintenance.	✓	–
Employment and expenditures ¹ .	–	–
Notes: ✓ = Potential interaction – = No interaction 1. Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and expenditures” is listed as a separate item under each phase of the Project.		

While most Project activities will generate noise and vibration, not all Project components result in substantial noise and vibration effects. As such, the following Project components and activities were deemed to not directly change noise or vibration:

- Waste management is not anticipated to affect noise or vibration, as any noise/vibration associated with this activity is anticipated to be incidental.
- Employment and expenditure will not directly result in changes to the physical environment, including noise and vibrations, during any Project phase.

13.4 Assessment of Residual Effects on the Acoustic Environment

The potential residual effects of the Project on the Acoustic Environment associated with the construction, operations, and decommissioning of the project are described in the section below. Each potential effect is characterized by a change in noise and a change in vibration.

13.4.1 Analytical Assessment Technique

13.4.1.1 Noise

13.4.1.1.1 Construction and Operations Noise

Potential Project construction and operations noise was quantitatively assessed using the commercially available and widely accepted software package CADNA/A, published by Datakustik GmbH and configured to implement the ISO 9613-2 (ISO 1996) environmental sound propagation algorithms. The CADNA/A noise modelling considered source sound power level and directivity, distance attenuation, source-receptor geometry, including heights and elevations, barrier effects of the building and surrounding topography, and ground and air (atmospheric) attenuation.

Based on the activities occurring at the site, the predictable worst-case scenario for construction was identified as Year -1 and operations as Year 7. The quantity of construction equipment operating in these years were calculated based on the mining activities and material movement expected per the Project

Feasibility Study (Ausenco Engineering Canada ULC 2023). Simultaneous operation of haul trucks and other mining equipment were considered in the assessment.

The following activities/types of noise sources are anticipated during the construction phase, contributing to change in noise levels due to the Project:

- Aggregates for construction - primary and secondary roadstone crushers and associated baghouses, and vibrating screens
- Plant construction - cranes, loaders, telehandlers, boom trucks, forklifts, tractors, air compressors, tire handler, lube trucks, utility excavator, track dozers, etc.
- Rail spur line construction - backhoe, chainsaw, compactor, compressor, concrete saw, crane, dozer, dump truck, jack hammer, etc.
- Open Pit development - mining equipment and trucks (3 types of haul trucks)
- Stockpiling of material - trucks and dozers (3 types of haul trucks)
- Power – generators, transformers
- Grading and watering - grader and water trucks
- Water pump and pond construction - excavator

For the operations phase, construction equipment for the process plant, ponds and rail spur line, power generators are removed from the list of equipment noted above for construction phase. The following additional activities/type of noise sources are anticipated during the operations phase, contributing to change in noise levels due to the Project:

- Crushing - primary and secondary crushers and associated baghouses and conveyors
- Process plant - 2 sets of process plant equipment (e.g., ball mills, SAG mill, deslime cyclones, water pumps, compressors, coarse cleaners) noise breakout through the openings and doors, as well as In-process Tailings equipment
- Ore extraction - additional mining equipment and trucks at the site
- Train - rail car movements and idling locomotives and coupling/decoupling near the plant
- Power - additional transformers and emergency generators near the Process Plant

A source summary table with sound power levels for construction and operations assessment scenarios are provided in the Noise and Vibration Assessment (Appendix C.3 of the Impact Statement). The sound power levels for the noise sources were based on equipment manufacturers' datasheets, where available. Where these were not available, data from Stantec's sound power database was used.

Noise modelling was conducted as per the Health Canada noise guideline (Health Canada 2023) and MECP NPC-300 (MOE 2013) noise modelling approach. Mitigation measures are based on the most restrictive of the two guidelines such that implementation of mitigation measures is expected to result in residual effects that do not exceed either the Health Canada or the NPC-300 criteria.

The Project noise was modelled in accordance with the Health Canada noise guidelines with day-night noise levels (L_{dn}) predicted at receptors. L_{dn} reflects 24-hour sound exposure by combining daytime sound levels with nighttime sound levels. Since humans are more sensitive to nighttime sound levels, a 10 dB penalty was applied to nighttime sound levels in L_{dn} calculations. Similarly, clearly distinct noise events, known as impulsive sounds, such as a collision or horn blast, are generally more intrusive than non-distinct sources, such as the sound of distant vehicle traffic. An impulsive noise penalty of 5 dB for baghouse pulses and railcar coupling/decoupling was applied as required by the guidelines. Therefore, the L_{dn} metric incorporates human response to sound and can be used to predict community annoyance, as recommended by Health Canada. The metric used to evaluate community annoyance from noise effects as a result of implementation of the Project is % Highly Annoyed, or %HA. The %HA indicator is a measure of the percentage of people who are predicted to experience high noise annoyance. For both baseline conditions and for noise effects from Project activities, %HA was calculated and the change in %HA was computed to compare with the Health Canada criteria limit of 6.5 %HA for consideration of mitigation.

L_n and L_{max} sound levels were calculated at receptors for assessing sleep disturbance. Similarly, Low-frequency Noise (LFN) was assessed for Project activities. The potential source of LFN from the Project is locomotive idling near the processing plant. Octave band sound levels were calculated at each receptor at the 16 Hz, 31.5 Hz, and 63 Hz octave bands and the energy sum of the 16 Hz, 31.5 Hz, and 63 Hz octave band sound levels was calculated for the LFN assessment.

The applicable MECP NPC-300 guideline requires that the predictable worst-case hourly noise ($L_{eq(1-hour)}$) from the Project be compared with the quietest hour or the exclusion limit where background noise was lower. The worst-case hourly noise for daytime, evening and night-time was modelled and assessed against the applicable limits.

As required by NPC-300, testing and maintenance of emergency sources during the operations phase were assessed separately from rest of the steady noise sources for predictable worst-case (i.e., simultaneous testing of all emergency generators) hourly noise level ($L_{eq(1-hour)}$).

Similarly, impulsive noise sources were assessed separately from the rest of the operational sources and their assessment was based on the hourly logarithmic mean sound levels (L_{LM}). Impulsive sources assessed include coupling/decoupling noise from rail cars at the site, and pulses from the baghouses associated with primary and secondary crushers.

Transformers associated with the Project are expected to exhibit tonality. As such, a tonal penalty of 5 dB was applied to transformers as per MECP NPC-104 guideline (MOE 1978a).

13.4.1.1.2 Decommissioning and Closure Noise

There may be acoustic effects associated with the decommissioning and closure phase of the Project, mainly due to demolition of existing mine infrastructure and operation of equipment. However, any acoustic effects are expected to be lower than those experienced during the construction phase. To be conservative, it is assumed that noise effects during decommissioning and closure will not exceed those

experienced during the construction phase. As such, a detailed noise assessment of the decommissioning and closure phase was not completed.

13.4.1.1.3 Blasting Noise (Overpressure)

Blasting will occur within the Open Pit, with most of it taking place below ground level as the Open Pit is excavated deeper. Receptors surrounding the PA could be impacted by noise from blasting.

Blasting was modelled and assessed separately from other Project noise sources as required by the applicable MECP NPC-119 guideline (MOE 1982b). The assessment considered blast charge size per delay and distance to the receptors. The predicted blasting noise level in dBL for the maximum charge size of 2,088 kg per delay (interval between the initiation of successive detonations of explosive charges) was calculated at the representative receptors for assessing blasting noise.

13.4.1.1.4 Highway 655 Construction and Traffic Noise

Construction Noise

The assessment of construction noise was performed by comparison of typical construction equipment sound levels to NPC-115 and NPC-118 criteria. Table 13.23 lists typical construction equipment, based on Stantec’s database of field measurements of construction equipment, considered for this assessment and it also presents the applicable NPC-115 and NPC-118 noise limits.

Table 13.11 Construction Equipment Sound Level Assessment - MECP

Type of Equipment	Typical Range of Maximum Sound Levels at 15 m (dBA)	NPC-115/118 Sound Level at 15 m (dBA)
Front-End Loader	77 – 85	85
Backhoe	66 – 80	85
Auger	76 – 84	85
Dump Truck	76 – 88	95 ^b
Concrete Truck	77 – 85	85
Concrete Pump and Boom	77 – 82	85
Vibratory Compactor	79 – 83	85
Paving Machine ^a	77 – 89	85
Crane	73 – 83	85
Grader	79 – 85	85
Hoe Ram ^a	90	85
Notes:		
a. These equipment units have potential to exceed the applicable MECP limits and precautions/noise control feasibility should be investigated if they are used near sensitive receptors.		
b. Refers to the NPC-118 Sound Level at 15 m.		

Traffic Noise

Noise effects from the Highway 655 realignment are assessed separately, as required by the applicable guidelines. Highway realignment traffic noise modelling was completed using US Federal Highway Administration Traffic Noise Model version 3.1, as recommended by the MTO Environmental Guide for Noise (MTO 2022). Health Canada noise guideline (Health Canada 2023) does not provide direction on traffic noise modelling requirements.

Highway realignment noise was assessed for traffic volume at a minimum 10-year future horizon year (i.e., traffic data 10 year after the date of completion of the highway). The road traffic noise levels for Highway 655 were predicted for the 2040 horizon year for both Future No-build (without the highway realignment) and Future Build (with the highway realignment) scenarios.

Methodology provided in the Health Canada noise guidelines (Health Canada 2023), as described Section 13.1.1.1 is used for assessing noise impact due to Highway 655 realignment. However, given the steady nature of traffic noise and the distance between the receptors and the proposed Highway 655 realignment, sleep disturbance was not assessed for highway traffic. Low-frequency noise is not generally associated with road traffic, and therefore, was also not assessed for the highway.

Per MTO, noise mitigation is warranted when sound levels are increased to 65 dBA or 5 dB over the “no-build” ambient. Noise mitigation, where applied, must be administratively, economically, and technically feasible, and must provide at least 5 dB of reduction averaged over the first row of receptors. Mitigation measures are restricted to within the roadway right-of-way. As per the MTO Guide, use of L_{eq} (16-hour) sound levels to assess noise effects from the Highway 655 realignment is appropriate.

13.4.1.1.5 Rail Spur Line Operations Noise

Rail noise effects from the new spur line within the PA were assessed as part of the Project operations scenario. Rail noise effects from beyond the PA were assessed separately and compared with the noise levels from the existing Kidd Creek Mine spur line. Day-night noise (L_{dn}) effects were modelled using the Federal Transit Administration FTA rail noise implementation (FTA 2018) within CADNA/A.

Methodology provided in the Health Canada noise guidelines (Health Canada 2023), as described in Section 13.1.1.1, is used for assessing noise impact due to rail spur line. However, LFN from rail traffic along the rail spur line was not a concern, so was not completed. LFN typically is a concern only where locomotives are idling within the PA, so is assessed within the Project operations scenario.

Construction of the new spur line was included with the Project construction scenario as it is located within the PA and the new rail construction is happening simultaneously with other Project construction activities.

13.4.1.1.6 Transmission Line Relocation Noise

The transmission line relocation is being completed by other parties (i.e., Hydro One) and is subject to a separate approvals process. For the purpose of this assessment, it was assumed that work would be carried out by small vehicles or equipment. Most of the tower construction is expected to occur from the ground. In some rare cases, where specific tower locations are inaccessible by ground vehicles, there may be some helicopter noise (over a single day) associated with the final erection of each tower. Construction at any given location along the transmission line corridor will also only be for a short period of time. Therefore, noise generated due to the construction of the transmission line is expected to be negligible.

With regards to the transmission line operation noise, corona noise is the most common noise associated with AC transmission lines due to foul weather conditions and is heard as a crackling or hissing sound. However, during detriment weather conditions, other noises, such as wind and/or rain, will likely be more audible than the corona noise. AC transmission lines are not known to generate audible noise issues associated with them during fair-weather conditions (Chartier and Stearns 1981). Therefore, operational noise associated with the transmission line is not expected to exceed baseline conditions at receptor locations along the transmission line corridor.

13.4.1.2 Vibration

13.4.1.2.1 Construction and Operations Vibration

Vibration in terms of Peak Particle Velocity (PPV) from the Project construction and operations equipment was modelled using the method described in the US FTA Manual (FTA 2018). The vibration assessment for the Project was conducted through developing the vibration zone of influence (ZOI) for the equipment used for Project construction and operations.

13.4.1.2.2 Decommissioning and Closure Vibration

There may be vibration effects associated with the decommissioning and closure phase of the Project, mainly due to demolition. However, they are expected to be lower than the effects during the construction phase. To be conservative, it is assumed that vibration effects during decommissioning and closure will not exceed those experienced during the construction phase. As such, a vibration assessment of the decommissioning and closure phase was not completed.

13.4.1.2.3 Blasting Vibration

Blasting vibration was modelled and assessed in accordance with the applicable MECP NPC-119 guideline (MOE 1982b). The assessment considered blast charge size per delay and distance to the receptors. The predicted blasting vibration in terms of PPV in mm/s for the maximum charge size of 2,088 kg per delay was calculated at the representative receptors for assessing blasting vibration.

13.4.1.2.4 Highway 655 Realignment Vibration

Rubber tires and suspension systems typically provide vibration isolation for vehicles, and it is not typical for them to cause ground-borne vibration from road traffic. For construction of the realigned Highway 655, the equipment employed is expected to be similar to that considered for Project construction in Section 13.4.1.2.1. Therefore, the vibration Zone of Influence (ZOI) for overall Project construction is expected to apply for Highway 655 realignment construction as well.

13.4.1.2.5 Rail Spur Line Vibration

The distance between the rail line and the closest receptor is greater than the vibration screening distance of 75 m identified in the Guidelines for New Development in Proximity to Railway Operation published by the Federation of Canadian Municipalities and the Railway Association of Canada (2013). As such, no vibration assessment was conducted for the Project rail spur line.

13.4.1.2.6 Transmission Line Relocation Vibration

Transmission line relocation is expected to be carried out by small vehicles or equipment and no receptors are identified within the vibration screening distance of 75 m to the relocated transmission line. As such, vibration generated due to the construction of the transmission line is expected to be negligible.

13.4.2 Change in Noise

13.4.2.1 Project Pathways

During construction, noise emissions from activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in noise levels. Some blasting will occur during construction for the construction of roads and initial pit development. During operations, noise emitted from the processing facilities and mobile equipment (i.e., haul trucks) will result in a change in noise levels. Blasting will continue during operations to further develop the pit, and locomotives will be used to ship concentrate along the rail spur line. In the decommissioning and closure phase, noise emissions from excavation and reclamation activities will result in a change in noise levels, albeit to a lesser degree than that expected during construction.

Noise emissions during Highway 655 realignment and from traffic movement along the realigned Highway 655 will also result in a change in noise levels.

13.4.2.2 Mitigation Measures

The following mitigation measures have been incorporated into the design of the Project and/or will be implemented as needed to avoid or reduce noise effects from the Project:

- Canada Nickel will develop and implement a Noise and Vibration Management Plan for the Project which will describe:
 - requirements for the routine management/maintenance of sources of noise and vibration during construction and operations.
 - communication protocol requirements and a procedure for verifying and addressing complaints.
- Canada Nickel will impose the following restrictions within the Modelled Mine Boundary (controlled property) as presented in Figure 13.4 and also at R01 and R05 through the following controls:
 - Agreements with property owners within the restricted area to remove buildings through acquisition of the property or other arrangements
 - Agreements with other individual landowners to prevent construction of any seasonal or permanent housing either through acquisition or specific agreements to defer any construction until after mine operations are completed
 - Crown Leases to be obtained on Crown lands, to restrict access
 - In addition to the receptor-specific mitigations listed above, the following general mitigations are proposed:
 - Install signage and/or gates on trails to restrict access into the modelled mine boundary (agreement with landowners if needed to place the signs)
 - Prohibit overnight stays in warming huts along the snowmobile trail, except in emergencies (signage for warming huts to be installed)
- Canada Nickel and its contractors will maintain mobile equipment and vehicles in good working order
- Where possible, large stationary machinery (e.g., crushers) will be located inside buildings and primary crushers will be located below grade
- For the Highway 655 realignment, specific construction equipment that could potentially be used has been identified to be louder than permissible MECP limits (NPC-115/118). Once equipment and construction schedules are finalized, Canada Nickel will review equipment noise to confirm that noise emissions are within the applicable MECP limits. If the sound levels are higher than the limits, Canada Nickel will explore noise control options for the associated equipment.

13.4.2.3 Project Residual Effects

The Project construction, operations, Highway 655 Realignment, and spur line construction and operations will result in noise emissions; however, the magnitude of the releases will be limited and managed through the implementation of noise mitigation and control measures.

The predicted noise levels at receptors are within the applicable limits.

13.4.2.3.1 Project Construction

Construction-related noise emissions will result from the operation of heavy machinery, earth moving and material handling, site preparation and material handling, power generation, and vehicle and haul truck traffic.

Residual Effects Based on a Federal (Health Canada) Guidelines

The Health Canada noise assessment and compliance status for the representative receptors are presented in Table 13.12 (L_{dn} and % HA), Table 13.13 (Sleep Disturbance), and Table 13.14 (LFN). L_{dn} noise contours for construction are provided in Figure 13.5.

At all receptors, the predicted sound levels from Project construction are within the following limits:

- Maximum L_{dn} noise limit of 75 dBA
- The 6.5% limit for change in %HA
- Sleep disturbance L_n limit of 40 dBA
- Sleep disturbance L_{max} limit of 60 dBA
- LFN limits of 65 dB at 16 Hz, 65 dB at 31.5 Hz, and 70 dB at 63 Hz
- LFN energy sum limit of 70 dB

Figure 13.5 shows that no area outside the PA is expected to experience L_{dn} sound levels exceeding 75 dBA.

Table 13.12 Construction Noise (L_{dn}) and %HA Assessment (Health Canada)

Receptor ID	Representative Baseline Noise Monitor	Baseline L _{dn} Sound Level (dBA)	Adjusted ^a Baseline L _{dn} Sound Level (dBA)	Baseline %HA	Predicted Project L _d Sound Level (dBA)	Predicted Project L _n Sound Level (dBA)	Predicted Project L _{dn} Sound Level (dBA)	Adjusted ^a Project L _{dn} Sound Level (dBA)	Cumulative Adjusted ^a L _{dn} Sound Level (dBA)	Cumulative %HA	Change in %HA	Compliance With Limit? ^b
R01	ML-3	37	47	1.5	44	44	51	61	61	8.4	6.9	N/A ^c
R02	ML-3	37	47	1.5	43	43	49	59	60	7.4	5.9	N/A ^c
R03	ML-2	33	43	0.8	47	47	53	63	63	11.5	10.7	N/A ^c
R04	ML-2	33	43	0.8	39	39	45	55	56	4.4	3.6	N/A ^c
R05	ML-3	37	47	1.5	41	41	47	57	57	5.6	4.1	N/A ^c
R06	ML-5	35	45	1.2	16	16	22	32	46	1.2	0.0	Yes
R07	ML-4	31	41	0.7	16	16	23	33	42	0.7	0.1	Yes
R08	ML-4	31	41	0.7	26	26	33	43	45	1.1	0.4	Yes
R09	ML-3	37	47	1.5	36	36	42	52	53	3.3	1.8	Yes
R10	ML-5	35	45	1.2	16	16	22	32	46	1.2	0.0	Yes
R11	ML-5	35	45	1.2	16	16	22	32	46	1.2	0.0	Yes

Notes:

- a. 10 dB penalty is applied to baseline and predicted L_{dn} sound levels to account for the receptor location in a quiet rural area, per Health Canada.
- b. Compliance limit is a 6.5% threshold for Change in %HA.
- c. R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Table 13.13 Construction Sleep Disturbance Assessment (Health Canada)

Receptor ID	Predicted Project L _n Sound Level (dBA)	Compliance With 40 dBA L _n Limit?	Predicted Project L _{max} Sound Level (dBA)	Compliance With 60 dBA L _{max} Limit?
R01	44	N/A ^a	51	N/A ^a
R02	43	N/A ^a	44	N/A ^a
R03	47	N/A ^a	44	N/A ^a
R04	39	N/A ^a	37	N/A ^a
R05	41	N/A ^a	54	N/A ^a
R06	16	Yes	24	Yes
R07	16	Yes	17	Yes
R08	26	Yes	26	Yes
R09	36	Yes	38	Yes
R10	16	Yes	23	Yes
R11	16	Yes	23	Yes

Note:
 a. R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Table 13.14 Construction Low Frequency Noise Assessment (Health Canada)

Receptor ID	Predicted ^a 16-Hz Octave Band Sound Level (dB)	Predicted 31.5-Hz Octave Band Sound Level (dB)	Predicted 63-Hz Octave Band Sound Level (dB)	Compliance with Limits (16 Hz: 65 dB, 31.5 Hz: 65 dB, 63 Hz: 70 dB)?	"Rattle" Energy Sum of Individual Frequency Band (dB)	Compliance with 70 dB Energy Sum Limit?
R01	52	52	59	N/A ^b	61	N/A ^b
R02	58	58	62	N/A ^b	65	N/A ^b
R03	62	62	64	N/A ^b	68	N/A ^b
R04	57	57	59	N/A ^b	63	N/A ^b
R05	49	49	55	N/A ^b	57	N/A ^b
R06	31	31	37	Yes	39	Yes
R07	31	31	39	Yes	40	Yes
R08	38	38	48	Yes	49	Yes
R09	48	48	54	Yes	56	Yes
R10	30	30	38	Yes	39	Yes
R11	31	31	38	Yes	40	Yes

Notes:

- Sound levels in the 16 Hz octave band were not available and instead set to be equal to that of the 31.5 Hz band, as they are not expected to be higher than that in the 31.5 Hz octave band.
- R01 – R05 are no longer considered receptors after mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Residual Effects Based on Provincial (MECP NPC-300) Guidelines

Predicted Project construction noise results per MECP guidelines and compliance status for the representative receptors are presented in Table 13.15. $L_{eq(1-hour)}$ noise contours for construction are provided in Figure 13.6.

Predicted sound levels from construction activity are equivalent during the daytime, evening, and nighttime periods, as presented in Table 13.15. Therefore, a comparison to the nighttime 40 dBA $L_{eq(1-hour)}$ criterion is appropriate. As presented in Table 13.15, residual effects from modelled construction activity are predicted to be within MECP NPC-300 limits at all modelled representative receptors.

For all areas other than receptor locations, noise effects are presented in Figure 13.6.

Table 13.15 Construction Steady Noise (L_{eq} (1-hour)) Assessment (MECP)

Receptor ID	NPC-300 L_{eq} (1-hour) Sound Level Criteria (dBA)			Predicted L_{eq} (1-hour) Sound Levels (dBA)			Compliance With Limits?
	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)	
R01	45	40	40	44	44	44	N/A ^a
R02	45	40	40	43	43	43	N/A ^a
R03	45	40	40	47	47	47	N/A ^a
R04	45	40	40	39	39	39	N/A ^a
R05	45	40	40	40	40	40	N/A ^a
R06	45	40	40	17	17	17	Yes
R07	45	40	40	19	19	19	Yes
R08	45	40	40	27	27	27	Yes
R09	45	40	40	36	36	36	Yes
R10	45	40	40	17	17	17	Yes
R11	45	40	40	17	17	17	Yes

Note:
 a. R01 – R05 are no longer considered receptors after mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

13.4.2.3.2 Project Operations

Emissions during the operations phase are expected to be similar to those from construction activities and will also include emissions from the Process Plant and concentrate shipments via rail.

Residual Effects Based on a Federal (Health Canada) Guidelines

The Health Canada noise assessment and compliance status for the representative receptors are presented in Table 13.16 (L_{dn} and %HA), Table 13.17 (Sleep Disturbance), and Table 13.18 (LFN). L_{dn} noise contours for construction are provided in Figure 13.7.

At all receptors, the predicted sound levels from Project operations are within the following limits with the proposed mitigation:

- Maximum L_{dn} noise limit of 75 dBA
- The 6.5% limit for change in %HA
- Sleep disturbance L_n limit of 40 dBA
- Sleep disturbance L_{max} limit of 60 dBA
- LFN limits of 65 dB at 16 Hz, 65 dB at 31.5 Hz, and 70 dB at 63 Hz
- LFN energy sum limit of 70 dB

Table 13.16 Operations Noise (L_{dn}) and %HA Assessment (Health Canada)

Receptor ID	Representative Baseline Noise Monitor	Baseline L _{dn} Sound Level (dBA)	Adjusted ^a Baseline L _{dn} Sound Level (dBA)	Baseline %HA	Predicted Project L _d Sound Level (dBA)	Predicted Project L _n Sound Level (dBA)	Predicted Project L _{dn} Sound Level (dBA)	Adjusted ^a Project L _{dn} Sound Level (dBA)	Cumulative Adjusted ^a L _{dn} Sound Level (dBA)	Cumulative %HA	Change in %HA	Compliance With Limit? ^b
R01	ML-3	37	47	1.5	38	40	47	57	57	5.4	3.9	N/A ^c
R02	ML-3	37	47	1.5	47	47	53	63	63	11.6	10.1	N/A ^c
R03	ML-2	33	43	0.8	47	47	53	63	63	11.0	10.2	N/A ^c
R04	ML-2	33	43	0.8	50	50	57	67	67	16.7	15.9	N/A ^c
R05	ML-3	37	47	1.5	35	37	44	54	54	3.8	2.3	N/A ^c
R06	ML-5	35	45	1.2	13	15	22	32	46	1.2	0.0	Yes
R07	ML-4	31	41	0.7	10	12	18	28	41	0.7	0.0	Yes
R08	ML-4	31	41	0.7	35	35	41	51	52	2.7	2.0	Yes
R09	ML-3	37	47	1.5	33	35	41	51	52	2.9	1.4	Yes
R10	ML-5	35	45	1.2	15	17	23	33	46	1.2	0.0	Yes
R11	ML-5	35	45	1.2	18	20	26	36	46	1.3	0.1	Yes

Notes:

- a. A 10 dB penalty is applied to baseline and predicted L_{dn} sound levels to account for the receptor location in a quiet rural area, per Health Canada.
- b. Compliance limit is a 6.5% threshold for Change in %HA.
- c. R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Table 13.17 Operations Sleep Disturbance Assessment (Health Canada)

Receptor ID	Predicted Project L _n Sound Level (dBA)	Compliance With 40 dBA L _n Limit?	Predicted Project L _{max} Sound Level (dBA)	Compliance With 60 dBA L _{max} Limit?
R01	40	N/A ^a	62	N/A ^a
R02	47	N/A ^a	50	N/A ^a
R03	47	N/A ^a	42	N/A ^a
R04	50	N/A ^a	60	N/A ^a
R05	37	N/A ^a	61	N/A ^a
R06	15	Yes	34	Yes
R07	12	Yes	24	Yes
R08	35	Yes	38	Yes
R09	35	Yes	47	Yes
R10	17	Yes	36	Yes
R11	20	Yes	39	Yes

Note:

a. R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Table 13.18 Operations Low Frequency Noise Assessment (Health Canada)

Receptor ID	Predicted ^a 16-Hz Octave Band Sound Level ^b (dB)	Predicted 31.5-Hz Octave Band Sound Level ^b (dB)	Predicted 63-Hz Octave Band Sound Level ^b (dB)	Compliance with Limits (16 Hz: 65 dB, 31.5 Hz: 65 dB, 63 Hz: 70 dB)?	"Rattle" Energy Sum of Individual Frequency Band (dB)	Compliance with 70 dB Energy Sum Limit?
R01	46	46	58	N/A ^c	47	N/A ^c
R02	65	65	58	N/A ^c	66	N/A ^c
R03	65	65	60	N/A ^c	66	N/A ^c
R04	66	66	61	N/A ^c	67	N/A ^c
R05	-	-	-	N/A	-	N/A
R06	-	-	-	N/A	-	N/A
R07	-	-	-	N/A	-	N/A
R08	46	46	55	Yes	56	Yes
R09	38	38	47	Yes	48	Yes
R10	-	-	-	N/A	-	N/A
R11	-	-	-	N/A	-	N/A

Notes:

- Sound levels in the 16 Hz octave band were not available and instead set to be equal to that of the 31.5 Hz band, as they are not expected to be higher than that in the 31.5 Hz octave band.
- Where predicted sound levels are expected to be imperceptible, the cell is populated with a "-".
- R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

As shown in Figure 13.7, no area outside of the PA is predicted to experience L_{dn} sound levels exceeding 75 dBA.

Residual Effects Based on a Provincial (MECP NPC-300) Guidelines

Predicted Project operations noise results per the MECP guideline and compliance status are presented in Table 13.19, Table 13.20, and Table 13.21. $L_{eq(1-hour)}$ steady noise contours for this scenario are provided in Figure 13.8. $L_{eq(1-hour)}$ steady noise contours for emergency sources in this scenario are provided in Figure 13.9.

Predicted sound levels from operational activities are consistent across the daytime, evening, and nighttime periods, as presented in Table 13.19. Therefore, a comparison to the nighttime 40 dBA $L_{eq(1-hour)}$ criterion is appropriate. As presented in Table 13.19, residual effects from modelled operations activity are predicted to be within MECP NPC-300 limits at all modelled representative receptors.

For all areas other than receptor locations, noise effects are presented in Figure 13.9.

Emergency testing activities during operations are expected to occur only during the daytime period, for which the $L_{eq(1-hour)}$ 50 dBA criterion is applicable. As presented in Table 13.20, residual effects from modelled operations activity are predicted to be within MECP NPC-300 limits at all modelled representative receptors. For all areas other than receptor locations, noise effects are presented in .

Predicted sound levels from impulsive activity for operations are consistent across the daytime, evening, and nighttime periods, as presented in Table 13.21. Therefore, a comparison to the nighttime 40 dBA L_{LM} criterion is appropriate. As presented in Table 13.21, residual effects from modelled operations impulsive activity are predicted to be within MECP NPC-300 limits at all modelled representative receptors.

Table 13.19 Operations Steady Noise ($L_{eq(1-hour)}$) Assessment (MECP)

Receptor ID	NPC-300 $L_{eq(1-hour)}$ Sound Level Criteria (dBA)			Predicted $L_{eq(1-hour)}$ Sound Level at Receptor (dBA)			Compliance With Limits?
	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)	
R01	45	40	40	44	44	44	N/A ^a
R02	45	40	40	47	47	47	N/A ^a
R03	45	40	40	47	47	47	N/A ^a
R04	45	40	40	51	51	51	N/A ^a
R05	45	40	40	41	41	41	N/A ^a
R06	45	40	40	19	19	19	Yes
R07	45	40	40	16	16	16	Yes
R08	45	40	40	36	36	36	Yes
R09	45	40	40	37	37	37	Yes
R10	45	40	40	21	21	21	Yes
R11	45	40	40	24	24	24	Yes

Note:
a. R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Table 13.20 Noise ($L_{eq(1-hour)}$) Assessment for Emergency Generator Testing (MECP)

Receptor ID	NPC-300 $L_{eq(1-hour)}$ Daytime Sound Level Criteria (dBA)	Predicted Daytime $L_{eq(1-hour)}$ Sound Levels at Receptor ^a (dBA)	Compliance With Limit?
R01	50	-	N/A ^b
R02	50	29	N/A ^b
R03	50	23	N/A ^b
R04	50	23	N/A ^b
R05	50	-	N/A ^b
R06	50	-	N/A
R07	50	-	N/A
R08	50	22	Yes
R09	50	-	N/A
R10	50	-	N/A
R11	50	-	N/A

Notes:

- Where predicted sound levels are low enough to be considered inconsequential, the cell is populated with a "-".
- R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Table 13.21 Impulsive Noise (L_{LLM}) Assessment (MECP)

Receptor ID	NPC-300 L_{LLM} Sound Level Criteria (dBAI)			Predicted L_{LLM} Sound Level at Receptor (dBAI)			Compliance With Limits?
	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)	
R01	45	40	40	-	-	-	N/A ^a
R02	45	40	40	29	29	29	N/A ^a
R03	45	40	40	19	19	19	N/A ^a
R04	45	40	40	15	15	15	N/A ^a
R05	45	40	40	-	-	-	N/A ^a
R06	45	40	40	-	-	-	N/A
R07	45	40	40	-	-	-	N/A
R08	45	40	40	21	21	21	Yes
R09	45	40	40	-	-	-	N/A
R10	45	40	40	-	-	-	N/A
R11	45	40	40	-	-	-	N/A

Note:

- R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

13.4.2.3.3 Project Blasting

Predicted sound levels (overpressure) from Project blasting activities during operations are determined using the MECP NPC-119 methodology for two blast conditions, in front and behind the blast. The predicted blasting noise for the maximum charge size of 2,088 kg per delay was calculated at the representative receptors identified for the Project, and the results are presented in Table 13.22. Residual effects from modelled blasting activity are predicted to be within MECP limits at all modelled representative receptors.

Table 13.22 Project Blasting Noise Assessment (MECP)

Receptor ID	Predicted Peak Blasting Noise Level - Behind Working Face (dBL)	Predicted Peak Blasting Noise Level - In Front of Working Face (dBL)	Cautionary Blasting Noise Limit (dBL) ^b	Compliance with Limit?
R01	112	107	120	N/A ^a
R02	116	113	120	N/A ^a
R03	120	117	120	N/A ^a
R04	114	111	120	N/A ^a
R05	109	102	120	N/A ^a
R06	108	101	120	Yes
R07	111	106	120	Yes
R08	113	108	120	Yes
R09	112	107	120	Yes
R10	108	101	120	Yes
R11	108	100	120	Yes

Notes:

- R01 – R05 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.
- Although the absolute limit of 128 dBL is applicable for the Project, the cautionary limit provided in the MECP NPC-119 guideline has been applied conservatively in this assessment.

13.4.2.3.4 Highway 655 Construction

Table 13.23 lists typical construction equipment, as initially presented in Table 13.11, and provides a comparison of their residual noise effects to the applicable NPC-115 and NPC-118 noise limits. Residual effects from equipment construction activity are predicted to be within MECP limits.

Table 13.23 Construction Equipment Post-Mitigation Sound Level Assessment

Type of Equipment	Range of Maximum Sound Levels at 15 m (dBA)	NPC-115/118 Sound Level at 15 m (dBA)	Comply with NPC-115/118 Limit?
Front-End Loader	77 – 85	85	Yes
Backhoe	66 – 80	85	Yes
Auger	76 – 84	85	Yes
Dump Truck	76 – 88	95 ^a	Yes
Concrete Truck	77 – 85	85	Yes
Concrete Pump and Boom	77 – 82	85	Yes
Vibratory Compactor	79 – 83	85	Yes
Paving Machine	77 – 85	85	Yes
Crane	73 – 83	85	Yes
Grader	79 – 85	85	Yes
Hoe Ram	Up to 85	85	Yes
Note:			
a. Refers to the NPC-118 Sound Level at 15 m.			

13.4.2.3.5 Highway 655 Traffic Noise

Residual Effects Based on a Federal (Health Canada) Guidelines

The Health Canada noise assessment and compliance status for the representative receptors are presented in Table 13.24.

Predicted sound levels from Highway 655 traffic are within the maximum L_{dn} noise limit of 75 dBA and within the 6.5% limit for change in %HA at all the modelled receptors.

Table 13.24 Highway 655 Realignment Noise Assessment (Health Canada)

Receptor ID	Baseline (Existing) L _{dn} Sound Level (dBA)	Adjusted ^a Baseline (Existing) L _{dn} Sound Level (dBA)	Baseline (Existing) %HA	Predicted Project L _d Sound Level (dBA)	Predicted Project L _n Sound Level (dBA)	Predicted Project L _{dn} Sound Level (dBA)	Adjusted ^a Project L _{dn} Sound Level (dBA)	Cumulative Adjusted ^a L _{dn} Sound Level (dBA)	Cumulative %HA	Change in %HA	Compliance with Limits? ^b
R01	39	49	1.9	34	31	38	48	51	2.6	0.7	N/A ^c
R02	27	37	0.4	32	29	36	46	47	1.4	1.0	N/A ^c
R07	14	24	0.1	18	15	22	32	32	0.2	0.1	Yes
R08	16	26	0.1	21	18	25	35	35	0.3	0.2	Yes

Notes:

- a. A 10 dB penalty is applied to baseline and predicted L_{dn} sound levels to account for the receptor location in a quiet rural area, per Health Canada.
- b. Compliance limit is a 6.5% threshold for Change in %HA.
- c. R01 and R02 are no longer considered receptors once mitigation measures are applied. While noise effects may still persist at these locations, an assessment of compliance is no longer relevant.

Residual Effects Based on a Provincial (MTO) Guidelines

Predicted Highway 655 traffic noise results per the MTO Environmental Guide for Noise (MTO 2022) and compliance status are presented in Table 13.25. Predicted $L_{eq(16-hour)}$ sound levels from the Highway 655 Future Build scenario are compared to the Future No Build scenario. However, R01 is no longer considered a receptor due to the mitigation noted in Section 13.4.2.2. Therefore, an assessment of compliance is not applicable.

Table 13.25 Highway 655 Traffic Noise Assessment (MTO)

Receptor ID	Future No Build Daytime Sound Levels (dBA)	Future Build Daytime Sound Levels (dBA)	Is Future Build Sound Level ≥ 65 dBA?	Increase in Sound Levels (dB)	Predicted Increase Greater than 5 dB?	Should Mitigation be Investigated?	Compliance with MTO Limits? ^b
R01	38	33	No	-5	No	No	N/A ^a
Notes: a. R01 is no longer considered a receptor once mitigation measures are applied. While noise effects may still persist at this location, an assessment of compliance is no longer relevant. b. If the Future Build sound level is not greater than 65 dBA and the predicted increase in sound level at the receptor is not greater than 5 dB, then the MTO limits are met.							

13.4.2.3.6 Rail Spur Line Operations

The Health Canada noise assessment and compliance status for the representative receptors are presented in Table 13.26 (L_{dn} and %HA) and Table 13.27 (Sleep Disturbance).

At all receptors, predicted sound levels from rail spur line operation are within the maximum L_{dn} noise limit of 75 dBA, within the 6.5% limit for change in %HA, within the sleep disturbance L_n limit of 40 dBA, and within the sleep disturbance L_{max} limit of 60 dBA. LFN is not assessed for rail spur line operations, as the engine idling, which is expected at the CNC site, is accounted for within the Project operations.

Table 13.26 Rail Spur Noise (L_{dn}) and %HA Assessment (Health Canada)

Receptor ID	Baseline (Existing) L_{dn} Sound Level (dBA)	Adjusted ^a Baseline (Existing) L_{dn} Sound Level (dBA)	Baseline (Existing) %HA	Predicted Project L_d Sound Level (dBA)	Predicted Project L_n Sound Level (dBA)	Predicted Project L_{dn} Sound Level (dBA)	Adjusted ^a Project L_{dn} Sound Level (dBA)	Cumulative Adjusted ^a L_{dn} Sound Level (dBA)	Cumulative %HA	Change in %HA	Compliance with Limit? ^b
R05	47	47	1.6	43	45	51	51	52	3.0	1.4	N/A ^c
R06	35	45	1.1	30	32	38	48	50	2.1	1.0	Yes
R10	35	45	1.2	30	33	39	49	50	2.3	1.1	Yes
R11	36	46	1.3	31	33	39	49	51	2.4	1.1	Yes
R12	37	47	1.5	32	34	40	50	52	2.8	1.3	Yes
R13	35	45	1.1	30	32	38	48	50	2.2	1.1	Yes

Notes:

- A 10 dB penalty is applied to baseline and predicted L_{dn} sound levels to account for the receptor location in a quiet rural area, per Health Canada, for all locations except R05. At R05, existing rail traffic in the area results in sound levels at that do not meet Health Canada's criteria for a quiet rural area.
- Compliance limit is a 6.5% threshold for Change in %HA.
- R05 is no longer considered a receptor once mitigation measures are applied. While noise effects may still persist at this location, an assessment of compliance is no longer relevant.

Table 13.27 Rail Spur Line Sleep Disturbance Assessment (Health Canada)

Receptor ID	Predicted Project L _n Sound Level (dBA)	Compliance With 40 dBA L _n Limit?	Predicted L _{max} Sound Level (dBA)	Compliance With 60 dBA L _{max} Limit?
R05	45	N/A ^a	66	N/A ^a
R06	32	Yes	45	Yes
R10	33	Yes	45	Yes
R11	33	Yes	45	Yes
R12	34	Yes	52	Yes
R13	32	Yes	49	Yes

Note:

a. R05 is no longer considered a receptor once mitigation measures are applied. While noise effects may still persist at this location, an assessment of compliance is no longer relevant.

13.4.3 Change in Vibration

13.4.3.1 Project Pathways

During construction, vibration from activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in vibration levels. Some blasting will occur during construction for the construction of roads and initial pit development. During operations, vibration from mobile equipment will result in a change in vibration levels. Blasting will continue during operations to further develop the pit, and locomotives will be used to ship concentrate along the rail spur line. In the decommissioning and closure phase, vibration from excavation and reclamation activities will result in a change in vibration levels, albeit to a lesser degree than that expected during construction.

13.4.3.2 Mitigation Measures

The predicted vibration levels were within the applicable limits, or no receptors were identified within the vibration ZOI established for the construction/mining equipment.

A maximum charge size of 2,088 kg per delay was considered for the blasting vibration assessment. Therefore, the charge size for the Project blasting must not exceed 2,088 kg per delay. If the Project ever considered a larger charge size, it will be reviewed and assessed to ensure that vibration levels at the receptors do not exceed the threshold.

Canada Nickel will develop and implement a Noise and Vibration Management Plan for the Project which will describe:

- requirements for the routine management/maintenance of sources of noise and vibration during construction and operations
- communication protocol requirements and a procedure for verifying and addressing complaints

13.4.3.3 Project Residual Effects

The Project construction, operations, blasting, Highway 655 Realignment, and rail spur line construction and operations will result in ground-borne vibration; however, the magnitude of the releases will be limited and appropriately managed.

13.4.3.3.1 Construction and Operations

Vibration from the Project construction and operations equipment are anticipated to contribute to a change in vibration levels. Vibration ZOIs for the construction and mining equipment were calculated, based on US FTA methodology, to assess the potential construction and operations vibration effects from the Project. The vibration ZOI for the Project construction and mining equipment are provided in Table 13.28.

Table 13.28 Vibration ZOI for Construction and Mining Equipment

Equipment	ZOI (m) ^a
Vibratory Roller	8
General Equipment (e.g., Excavator, Dozer)	5
Note:	
a. Setback distances are established based on 5 mm/s PPV limit for non-heritage structures.	

Based on a review of aerial imagery, no structures/buildings on the ground within the vibration ZOI are identified within the vibration ZOI. Thus, residual vibration effects are not expected to exceed the PPV threshold of 5 mm/s.

13.4.3.3.2 Blasting

Blasting is mainly anticipated within the Open Pit, with most of it taking place below ground level as the Open Pit is excavated deeper. Vibration levels, based on PPV, due to Project blasting are determined as per MECP methodology. The predicted blasting vibration for the maximum charge size of 2,088 kg per delay was calculated at the representative receptors, and the results are presented in Table 13.29. Predicted residual vibration effects are within the cautionary limit of 10 mm/s recommended by the MECP.

Table 13.29 Project Blasting Vibration Assessment (MECP)

Receptor ID	Predicted Blasting Vibration (PPV) Level (mm/s)	Cautionary Blasting Vibration (PPV) Limit (mm/s) ^b	Comply with Limit?
R01	0.3	10	N/A ^a
R02	0.9	10	N/A ^a
R03	3.5	10	N/A ^a
R04	0.6	10	N/A ^a
R05	0.1	10	N/A ^a
R06	0.1	10	Yes
R07	0.2	10	Yes
R08	0.3	10	Yes
R09	0.3	10	Yes
R10	0.1	10	Yes
R11	0.1	10	Yes

Notes:

- R01 – R05 are no longer considered receptors once mitigation measures are applied. While vibration effects may still persist at these locations, an assessment of compliance is no longer relevant.
- Although the absolute limit of 12.5 mm/s is applicable for the Project, the cautionary limit provided in the MECP NPC119 has been applied conservatively in this assessment.

13.4.4 Summary of Project Residual Effects

The residual noise and vibration effects that are likely to occur as a result of the Project are summarized in Table 13.30.

Table 13.30 Project Residual Effects on the Acoustic Environment

Residual Effect	Residual Effects Characterization							
	Project Phase	Direction	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Change in Noise Levels Related to PA Construction, Operations, and Decommissioning Activity, including Blasting	C, O, D	A	M	LSA	NS	ST, MT	R, C	R
Change in Noise Levels Related to Highway 655 Realignment Construction	C	A	L, M	LSA	NS	MT	C	R
Change in Noise Levels Related to Realigned Highway 655 Traffic	O, D	A	L, M	LSA	NS	LT	C	I
Change in Noise Levels Related to Rail Spur Line Traffic Away from the PA	C, O, D	A	M	LSA	NS	LT	C	R
Change in Ground Vibration Levels Related to PA Construction, Operations, and Decommissioning Activity	C, O, D	A	L	LSA	NS	ST, MT	C	R
Change in Ground Vibration Levels Related to Blasting	C, O, D	A	M	LSA	NS	ST, MT	R	R
<p>KEY See Table 13.5 for detailed definitions</p> <p>Project Phase C: Construction O: Operations D: Decommissioning and Closure</p> <p>Direction: P: Positive A: Adverse N: Neutral</p> <p>Magnitude: N: Negligible L: Low M: Moderate H: High</p> <p>Geographic Extent: PA: Project Area LSA: Local Study Area RSA: Regional Study Area</p> <p>Timing NS: No sensitivity MS: Moderate sensitivity HS: High sensitivity</p> <p>Duration: N: Negligible ST: Short-term MT: Medium-term LT: Long-term</p> <p>Frequency: S: Single event IR: Multiple Irregular event R: Multiple Regular event C: Continuous</p> <p>Reversibility: R: Reversible I: Irreversible</p> <p>N/A: Not applicable</p>								

13.4.4.1 Summary of Adverse Effects

The residual environmental effects on a change in noise for Project activities, including blasting, during Project construction, operations, and decommissioning are predicted to be adverse, as Project activities are predicted to increase noise levels compared to baseline conditions. The magnitude is predicted to be moderate, i.e., noticeable above baseline conditions but will still meet federal and provincial criteria at receptors and the effects will be confined to the PA and LSA. The duration is short-term for construction, as construction is expected to last no more than a few years, and medium-term for operations and decommissioning, as activity will continue through these phases but will not extend past the life of the Project. The frequency of the effects will be continuous when non-blasting activities are occurring and regular for blasting activities. The residual effect on change in noise levels during construction, operations, and decommissioning is predicted to be reversible, as the increase in sound levels due to Project PA activities will end once the activities cease.

The residual environmental effects on a change in noise related to Highway 655 during the realignment construction are predicted to be adverse, as Highway 655 realignment construction results in a predicted increase of noise levels compared to baseline conditions. Realignment construction is expected to occur during the operations phase of the Project. The magnitude is predicted to be low at most receptors, with the closest receptors to the new alignment experiencing moderate magnitudes. The change in noise will be confined to the PA and LSA. The duration is moderate, as Highway 655 realignment construction is expected to occur during, but not beyond, the operations phase. The frequency is continuous when activities are occurring, and the residual effect on change in noise levels is predicted to be reversible as the predicted increase in sound levels due to Highway 655 realignment construction will end when construction is completed.

The residual environmental effects on a change in noise related to Highway 655 traffic are predicted to be adverse, as Highway 655 traffic results in a predicted increase of noise levels compared to baseline conditions. Highway 655 traffic noise is expected from the end of construction during the operations phase and beyond. The magnitude is predicted to be low at most receptors, with the closest receptors to the new alignment experiencing moderate magnitudes. The change in noise will be confined to the PA and LSA. The duration is long-term, as Highway 655 traffic is expected to continue use of the road past the Project life. The frequency is continuous when activities are occurring, and the residual effect on change in noise levels is predicted to be irreversible as the predicted increase in sound levels due to Highway 655 realignment are expected to persist past the Project lifetime and for as long as the realigned Highway 655 is operational.

The residual environmental effects on a change in noise related to rail spur line traffic outside of the PA are predicted to be adverse, as rail traffic is predicted to increase noise levels compared to baseline conditions. Rail traffic is expected during the operations phase of the Project. The magnitude is predicted to be low at most receptors, with the closest receptors to the rail spur line experiencing moderate magnitudes. The change in noise will be confined to the PA and LSA. The duration is long-term, as rail spur line traffic is expected to continue beyond the life of the Project. The frequency is continuous when activities are occurring, and the residual effect on change in noise levels is predicted to be reversible as the predicted increase in sound levels due to rail traffic will end when rail traffic ceases.

The residual environmental effects on a change in vibration for Project activities, not including blasting, during Project construction, operations, and decommissioning are predicted to be adverse, as the activities are predicted to increase vibration levels compared to baseline conditions. The magnitude is predicted to be low and will be confined to the PA and LSA. The duration is short-term for construction, as construction is expected to last no more than a few years, and medium-term for operations and decommissioning, as activity will continue through these phases but will not extend past the life of the Project. The frequency is continuous and the residual effect on change in vibration levels during construction, operations, and decommissioning is predicted to be reversible, as the increase in vibration levels due to Project activities will end once the activities cease.

The residual environmental effects on a change in vibration for blasting activities during Project construction, operations, and decommissioning are predicted to be adverse, as the blasting activities are predicted to increase vibration levels compared to baseline conditions. The magnitude is predicted to be moderate, i.e., noticeable above baseline conditions but meeting limits at receptors, and will be confined to the PA and LSA. The duration is short-term for construction, as construction is expected to last no more than a few years, and medium-term for operations and decommissioning, as activity will continue through these phases but will not extend past the life of the Project. The frequency is regular and the residual effect on change in vibration levels during construction, operations, and decommissioning is predicted to be reversible, as the increase in vibration levels due to blasting activities will end once the activities cease.

13.4.4.2 Summary of Positive Effects

The Project is not predicted to produce any positive residual effects on the acoustic environment.

13.5 Potential Effects on Federal Lands

There are no federal lands within the LSA and RSA. The closest Federal lands are the Taykwa Tagamou Nation Reserve lands located approximately 37 kilometres away (straight line) from the Project site (14 kilometres southeast of Cochrane). As such, no changes to the environment on Federal Lands as a result of changes to acoustic conditions are anticipated.

No additional mitigation measures beyond those identified are specifically required for federal lands.

13.6 Prediction Confidence

The estimation of noise and vibration emissions associated with Project activities depends on the final design, processing approach, intensity of mining activity and required supporting infrastructure. The prediction confidence for noise and vibration emissions is based on uncertainty in the available data, existing environment, and prediction methodology, and is rated as high due to the following reasons:

- Emissions for the proposed equipment are well-understood and are based on equipment totals and published and measured sound power levels for similar equipment
- Existing noise levels (baseline noise) are based on monitored sound levels collected near the PA

- Approved and verified methods are applied to predict noise and vibration effects:
 - Sound pressure levels at receptors are predicted via industry-standard software implementing international standards (i.e., ISO 9613)
 - Vibration levels are predicted using the widely adopted methods described in the US FTA Manual
 - Blasting overpressure and vibration are modelled using the approved MECP NPC-119 method
 - Traffic noise from Highway 655 is calculated using Traffic Noise Model version 3.1 software, the industry standard in North America for traffic noise calculation
 - Rail noise from train operation is modelled using a 3D noise model with US FTA rail noise implementation. The FTA methodology is the industry standard in North America for calculation of rail noise

13.7 Assumptions

The assessment was completed based on available design information (including project layouts and operational conditions) and is subject to change if significant modifications to the Project design are implemented.

The following assumptions were used when assessing noise and vibration for the Project and associated components:

1. Project construction and operations:
 - a. Year -1 is the worst impactful construction year and Year 7 is the worst impactful operations year for the Project
 - b. Simultaneous operation of all construction equipment considered
 - c. Simultaneous operation of all operations equipment considered
 - d. The model considers a conservative downwind condition, in which the wind direction is always oriented from each source location towards each receptor
 - e. A ground absorption factor of 0.7 considered in the model to represent the combination of vegetation, forested areas, waterbodies and compacted ground between the Project site and receptors
 - f. No foliage accounted in the model for forested areas, as a conservative approach
 - g. Any equipment and/or activities within the PA and the equipment generating highest vibration are used for the purposes of the worst-case vibration impact assessment
 - h. The assessment adopts the FTA Manual for construction equipment vibration levels and method
 - i. ZOI presented is for the most impactful equipment

2. Decommissioning and Closure: Noise and vibration from decommissioning and closure are expected to be lower than those experienced during the construction phase. To be conservative, it is assumed that the noise and vibration effects during decommissioning and closure will not exceed those experienced during the construction phase
3. Blasting: The blasting overpressure and vibration impact for the maximum charge size per delay is assessed for the Project. It is expected that if the impact due to the maximum charge size per delay is in compliance, then the impact from smaller charge sizes per delay for the same setback distance will also be in compliance
4. Highway 655 Realignment:
 - j. L_{eq} (16-hour) sound level metric considered for the assessment of Highway 655 realignment is appropriate for the provincial assessment (MTO), given that the highway is not uniformly busy like freeways, such as 400 series major highways and Queen Elizabeth Way in Ontario. A 90% / 10% day/night traffic volume split considered for road traffic noise assessment for the highway
 - k. Typical heavy/medium truck split of 75%/25% for highway considered for the road traffic noise assessment
 - l. An annual traffic growth rate of approximately 0.7% calculated from 2020-2030 traffic data is used to calculate overall 2040 traffic volumes for this assessment, in addition to the Project traffic for the highway traffic noise assessment
 - m. Traffic speed for the highway remains the same at 90 kph
 - n. Ground-borne vibration from road traffic is not a concern as rubber tires and suspension systems typically provide vibration isolation for vehicles
 - o. Any equipment and/or activities within the right-of-way and the equipment generating highest vibration are used for the purposes of the worst-case vibration impact assessment
 - p. The assessment adopts the FTA Manual for construction equipment vibration levels and assessment method
5. Rail Spur Line:
 - a. Number of trains:
 - 2 existing trains each during daytime (07:00-23:00) and night-time (23:00-07:00) for Kidd Creek Mine
 - 4 trains each during daytime and night-time for Crawford Nickel
 - b. Train composition:
 - 2 locomotives and 24 cars for Crawford Nickel
 - 2 locomotives and 18 cars for Kidd Creek Mine
 - c. Train speed: 50 kph for both existing and proposed trains

6. Transmission Line Relocation: Corona noise associated with the transmission line is insignificant and not expected to exceed baseline noise levels. Considering the small vehicles or equipment used for transmission line relocation and distance to the closest receptors, vibration generated due to the construction of the transmission line is not a concern

13.8 Follow-up and Monitoring

Canada Nickel will implement follow-up and monitoring programs to verify the accuracy of effects and to evaluate the effectiveness of mitigation measures, the results of which will be used to identify and implement adaptive management measures, as appropriate. As it relates noise and vibration, Canada Nickel will develop a follow-up and monitoring program to monitor noise at key Project locations during various project phases and activities. Monitoring data will be used to verify and confirm the predicted effects identified in Section 13.4.2.3 and Section 13.4.3.3 and to meet regulatory requirements related to specific permits or conditions of approval. See Chapter 34 of the Impact Statement for additional information on Follow-up Programs.

13.9 References

ANSI. 1983. ANSI S3.29-1983: Guide to Evaluation of Human Exposure to Vibration in Buildings. Standard, ANSI.

Ausenco Engineering Canada ULC. 2023. "Technical Reports." Canada Nickel Company. Accessed February 2024. https://canadanickel.com/wp-content/uploads/2023/11/Crawford-NI-43-101-FINAL-REPORT_Nov24_R2.pdf.

Bonneville Power Administration. 2016. I-5 Corridor Reinforcement Project Final EIS: Chapter 9 Noise. Vancouver, Washington: Bonneville Power Administration.

Chartier, V-L., and R-D Stearns. 1981. "Formulas for Predicting Audible Noise From Overhead High Voltage AC and DC Lines." IEEE Transactions on Power Apparatus and Systems Issue 1, 121-130.

City of Timmins. 2006. A by-law to provide for the Prohibition and Regulation of Certain Noises By-Law 2006-6339. Timmins, August 18. Accessed May 7, 2024. <https://timmins.civicweb.net/document/20703/>.

City of Toronto. 2008. By-Law No. 514-2008. By-Law, Toronto: City of Toronto.

Federation of Canadian Municipalities and the Railway Association of Canada. 2013. "Guidelines for New Development in Proximity to Railway Operations."

FTA (Federal Transit Administration). 2018. Transit Noise and Vibration Impact Assessment. FTA Report No. 0123, John A. Volpe National Transportation Systems Center.

FTA. 2018. Transit Noise and Vibration Impact Assessment Manual. FTA Report No. 0123, FTA.

Health Canada. 2023. Guidance for Evaluating Human Health Effects in Impact Assessment: NOISE.
Ottawa: Health Canada.

ISEE. 2011. International Society of Explosive Engineers Blasters' Handbook. 18th Edition, ISEE.

ISO. 1996. ISO 9613-2 Acoustics - Attenuation of sound during propagation outdoors - Part 2:
Engineering method for the prediction of sound pressure levels outdoors. International Standard,
Geneva: ISO.

MOE (Ministry of the Environment). 1989. Ontario Road Noise Analysis Method for Environment and
Transportation. Technical Document, MOE.

MOE. 1978a. Publication NPC-104 - Sound Level Adjustments. MOE.

MOE. 1978b. Publication NPC-115 - Construction Equipment. MOE.

MOE. 1982a. Publication NPC-118 - Motorized Conveyances. MOE.

MOE. 1982b. Publication NPC-119 - Blasting. MOE.

MOE. 2013. Publication NPC-300 - Stationary and Transportation Sources - Approval and Planning.
MOE.

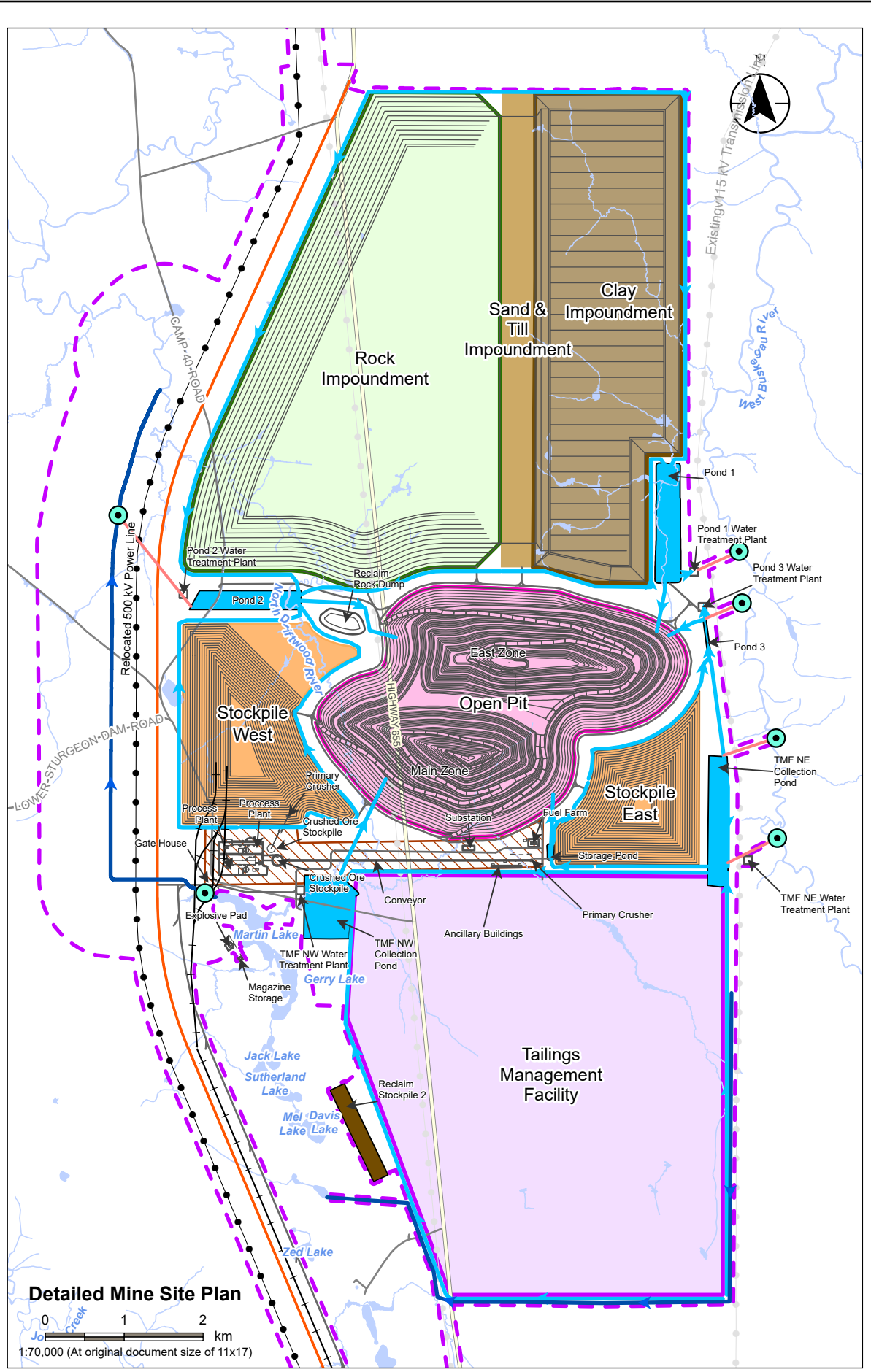
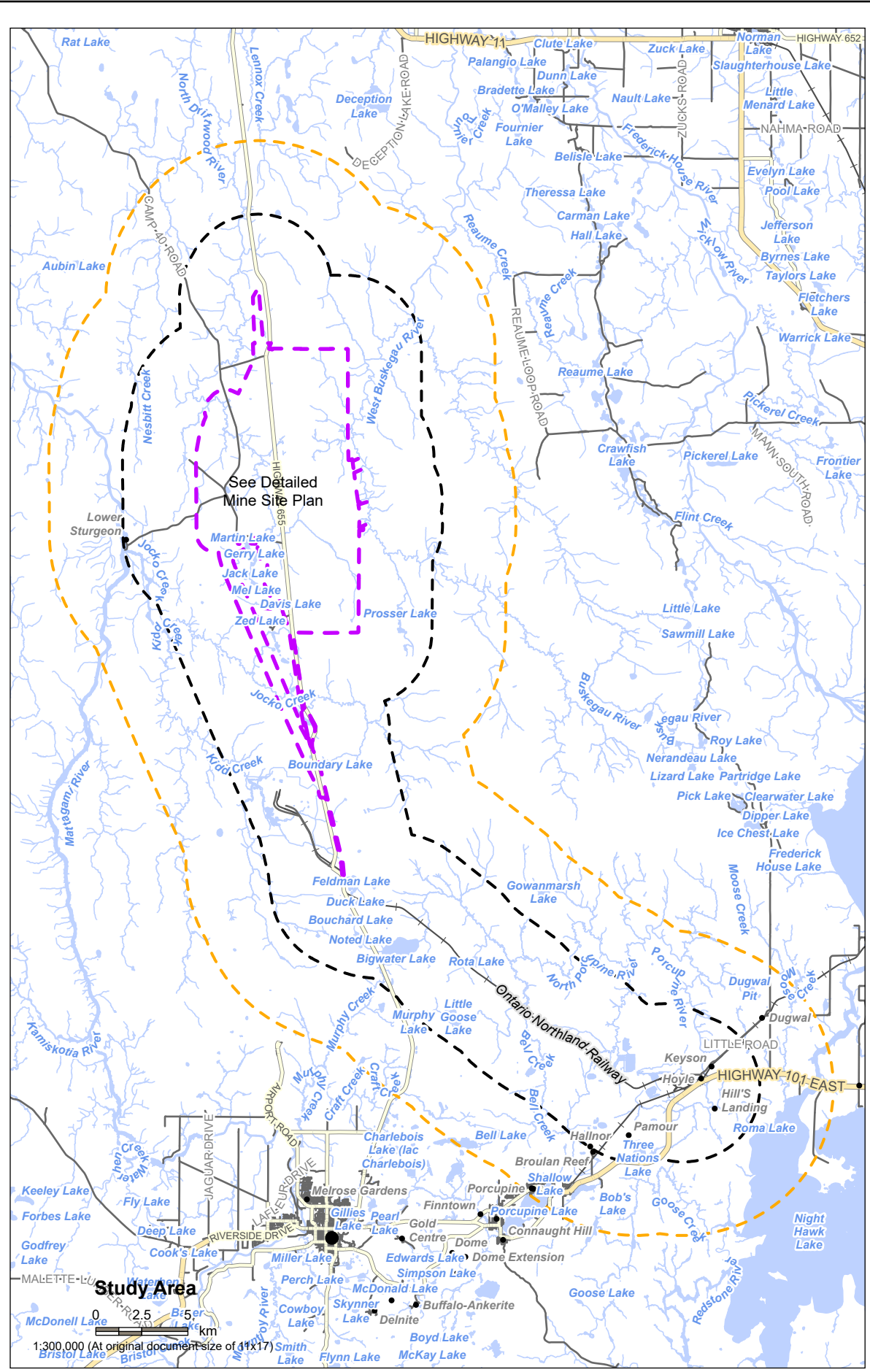
MTO. 2022. Environmental Guide for Noise. MTO.

Ontario Provincial Standard Specification. 2014. OPSS.MUNI 120, Ontario Provincial Standard
Specification.

United States Environmental Protection Agency. 1974. Information on Levels of Environmental Noise
Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. United States
Environmental Protection Agency. .

13.10 Figures

V:\1004-10109\active\160930456\gis_data\mxd\160930456_IS_VC_Noise_Fig13.01_StudyArea
 Revised: 2024-09-10 By: toghlan



- Legend**
- Project Area
 - Local Study Area (4km Buffer of PA)
 - Regional Study Area (8km Buffer of PA)
- Base Features**
- Expressway / Highway
 - Major Road
 - Minor Road
 - Railway
 - Watercourse
 - Waterbody
- Ancillary Infrastructure**
- Relocated Hwy 655
 - Rail Spur Line
 - Transmission Line
- Proposed Project Components**
- Discharge Route
 - Non-Contact Water Channel
 - Contact Water Channel
 - Site Road
 - Discharge Location
 - Ore Stockpile
 - Open Pit
 - Clay Impoundment
 - Pond
 - Tailings Management Facility
 - Rock Impoundment
 - Reclaim Stockpile
 - Sand & Till Impoundment
 - Process Plant Area

Notes

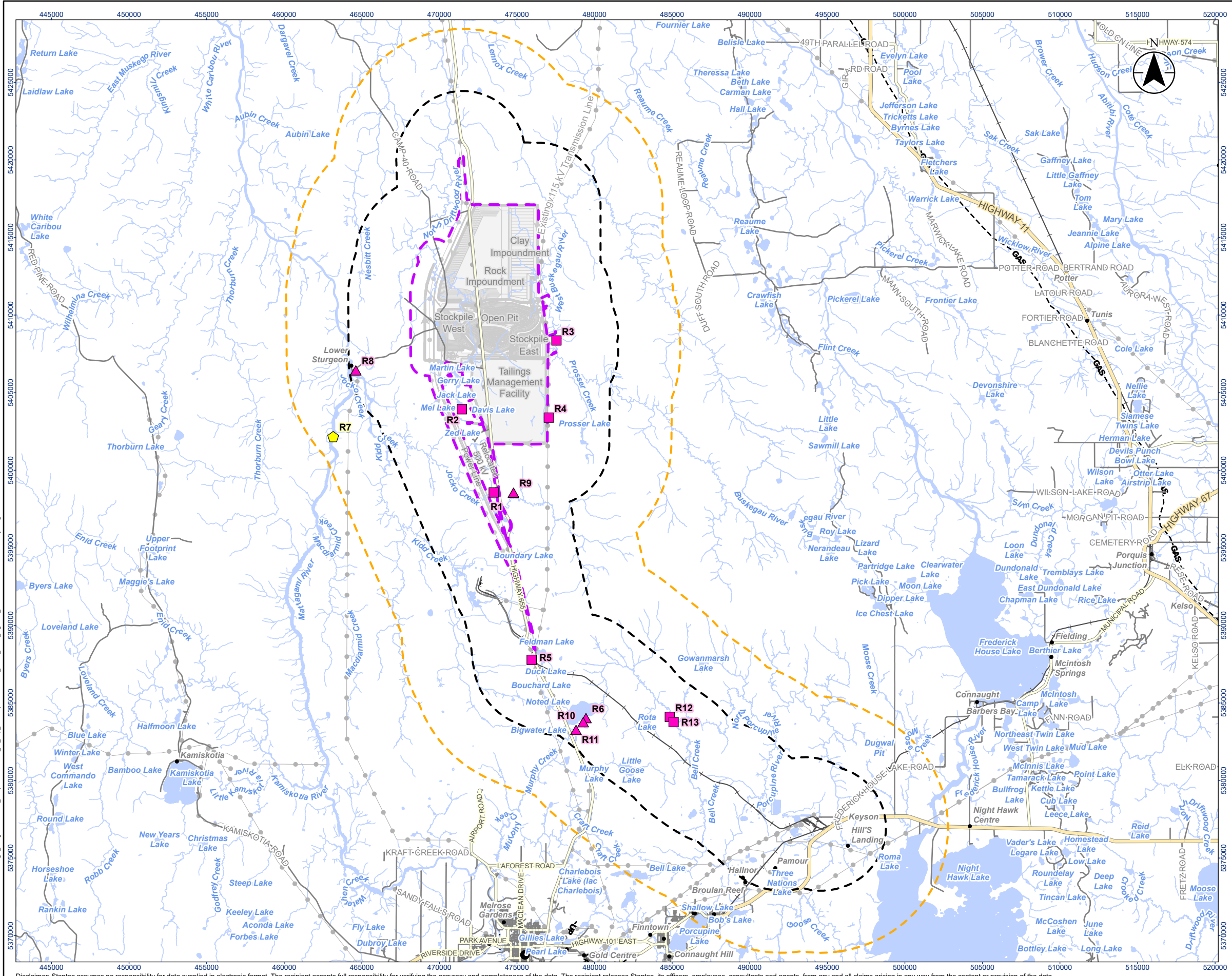
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.



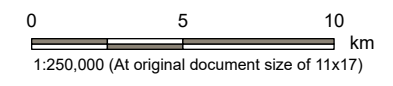
Project Location: Timmins, Ontario
 160930456 REVA
 Prepared by toghlan on 2024-09-10

Client/Project: Canada Nickel Company (CNC) Crawford Nickel Project

Figure No. **13.1**
 Title **Project Components and Study Area**



- Legend**
- Project Area
 - Local Study Area
 - Regional Study Area
 - Base Features**
 - Expressway / Highway
 - Major Road
 - Minor Road
 - Railway
 - Existing Transmission Line
 - Submerged Communication Line
 - GAS- Natural Gas Pipeline
 - WA- Water Pipeline
 - UP- Unknown Pipeline
 - Watercourse
 - Waterbody
 - Proposed Project Components
 - Sensitive Receptor - Non-Indigenous
 - ▲ Sensitive Receptor - Indigenous
 - Representative Receptor - Indigenous



Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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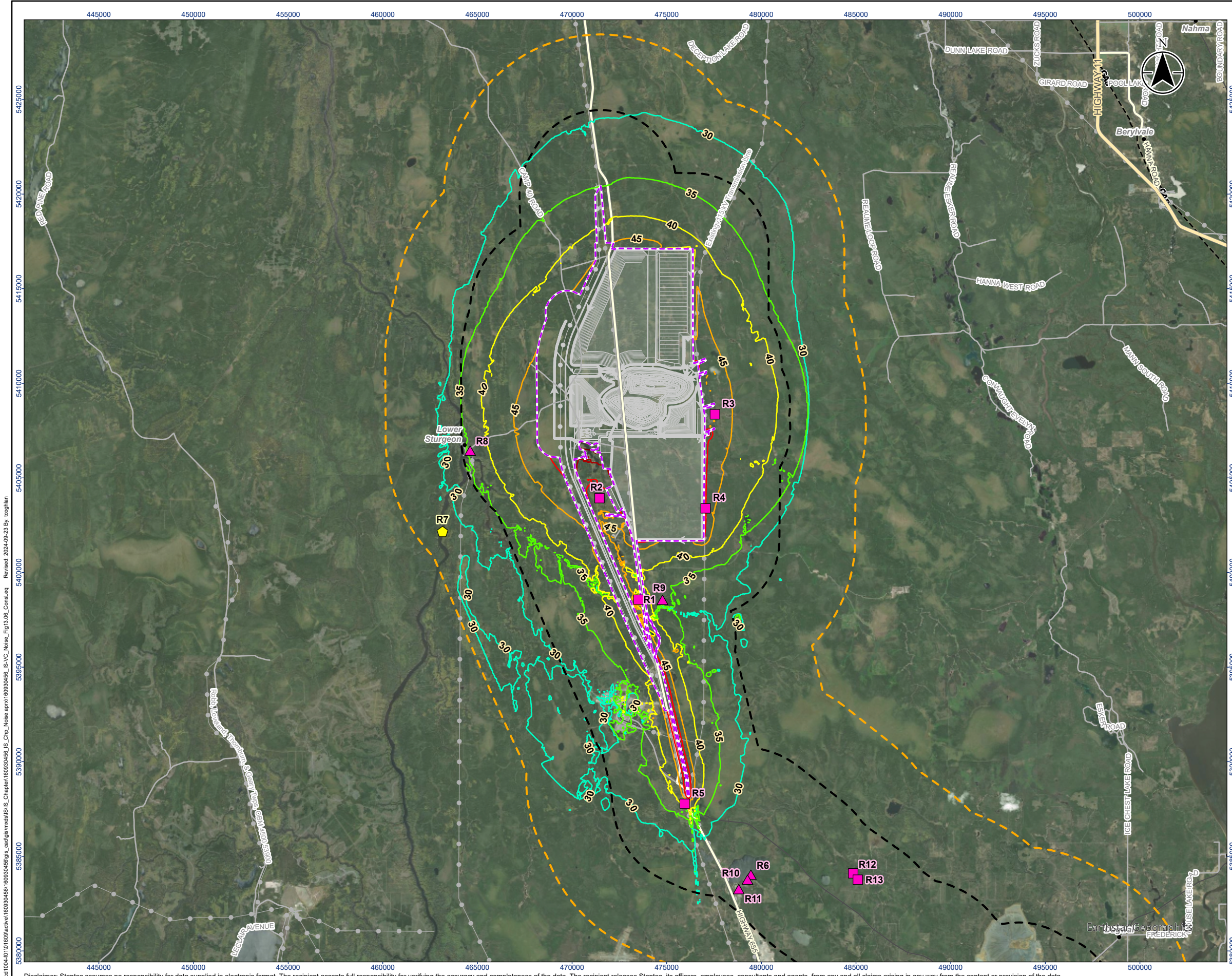
Project Location: Timmins, Ontario
 Prepared by: tcoghlan on 2024-09-11

Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No.: **13.3**

Title: **Receptor Locations**

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 Reviewed: 2024-09-11 By: tcoghan



Legend

- Project Area
- Local Study Area
- Regional Study Area

Base Features

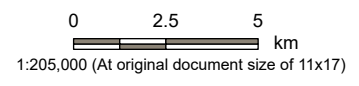
- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- GAS- Natural Gas Pipeline
- UP- Unknown Pipeline

Proposed Project Components

- Sensitive Receptor - Non-Indigenous
- Sensitive Receptor - Indigenous
- Representative Receptor - Indigenous

Leq(1-hour) Noise Contour (dBA)

- 30
- 35
- 40
- 45
- 50
- 55
- 60



Notes

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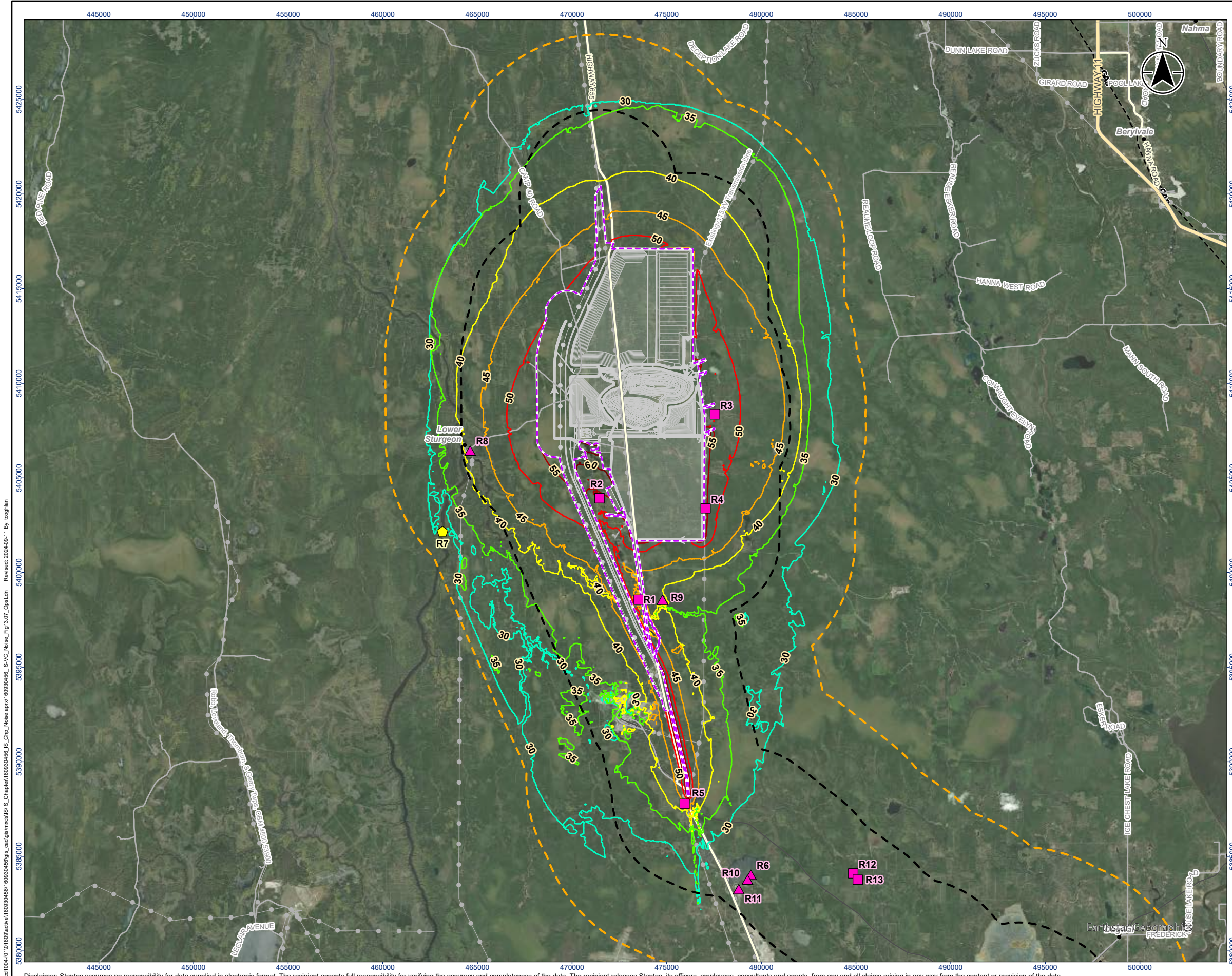
Project Location: Timmins, Ontario
 160930456 REVA
 Prepared by toghlan on 2024-09-23

Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No. **13.6**

Title: **Leq (1-hour) Noise Contours for Construction**

V:\1004-10\1009\active\160930456\160930456\gis_data\gis_data\160930456_160930456_IS_VC_Noise_Fig13.06_ConstrLeq
 Revised: 2024-09-23 By: toghlan
 5380000 5385000 5390000 5395000 5400000 5405000 5410000 5415000 5420000 5425000



Legend

- Project Area
- Local Study Area
- Regional Study Area

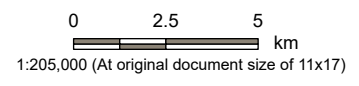
Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- GAS- Natural Gas Pipeline
- UP- Unknown Pipeline

- Proposed Project Components
- Sensitive Receptor - Non-Indigenous
- Sensitive Receptor - Indigenous
- Representative Receptor - Indigenous

L_{dn} Noise Contour (dBA)

- 30
- 35
- 40
- 45
- 50
- 55
- 60



Notes

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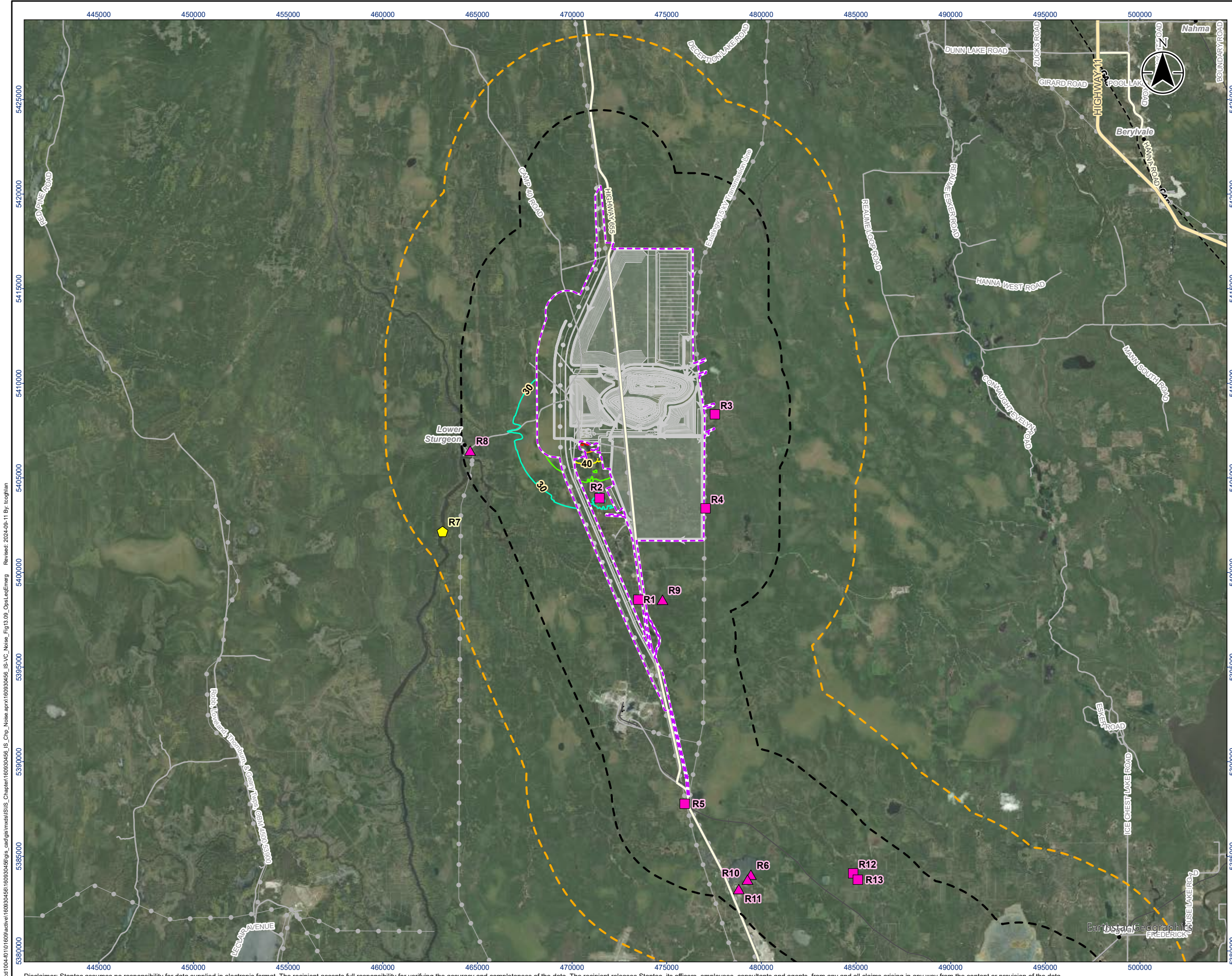
Project Location: Timmins, Ontario
 160930456 REVA
 Prepared by tcoglan on 2024-09-11

Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No. **13.7**

Title: **L_{dn} Noise Contours for Operation**

V:\1004-10\160930456\160930456\GIS_Chp_Noise.aprx\160930456_IS_VC_Noise_Fig13.07_OpsLdn
 Revised: 2024-09-11 By: toghlan
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Legend

- Project Area
- Local Study Area
- Regional Study Area

Base Features

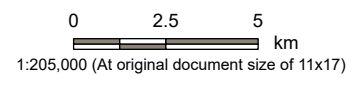
- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- GAS- Natural Gas Pipeline
- UP- Unknown Pipeline

Proposed Project Components

- Sensitive Receptor - Non-Indigenous
- Sensitive Receptor - Indigenous
- Representative Receptor - Indigenous

Leq(1-hour) Noise Contour (dBA)

- 30
- 35
- 40
- 45
- 50
- 55



Notes

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Project Location: Timmins, Ontario
 160930456 REVA
 Prepared by tcoglan on 2024-09-11

Client/Project: Canada Nickel Company (CNC)
 Crawford Nickel Project

Figure No. **13.9**
 Title: **Leq (1-hour) Noise Contours for Operation (Emergency Sources)**

V:\11004-10\160930456\160930456\GIS_Chp_Noise\apr160930456_IS_VC_Noise_Fig13.09_CstLeqEmerg_Revise2_2024-09-11 by: tcoglan
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