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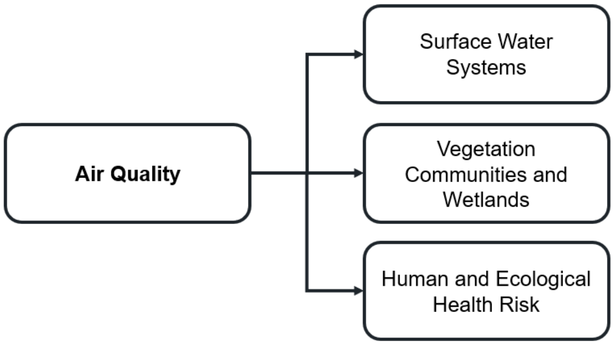
6.2 Air Quality

Air quality is included as a valued component (VC) since air quality parameters, such as excess dust and emissions from fuel combustion, can have an effect on the environment and humans if present in certain concentrations. Air quality has intrinsic importance to the health and well-being of humans, wildlife and vegetation.

In the absence of mitigation, the potential changes in air quality are directly linked to other VCs, and informs the following sections:



- **Surface water systems (Sections 6.6, 6.7, 6.8 and 6.9):** the assessment of potential effects on surface water systems is informed by changes in dust emissions from the Springpole Gold Project (Project) that may affect water quality in the adjacent surface waterbodies during the construction, operation and closure of the Project.
- **Vegetation communities and wetlands (Section 6.11):** the assessment of potential effects on vegetation communities and wetlands is informed by changes in emissions from the Project which may change the condition of adjacent vegetation communities during the construction, operation and closure of the Project.
- **Human and ecological health (Section 6.24):** the assessment of potential changes in human and ecological health is informed by changes in emissions from the Project which could potentially affect wildlife and human health through inhalation, and through ingestion of surface water and vegetation during the construction, operation and closure of the Project.

The assessment of the potential changes to air quality from the Project are compared to relevant provincial and federal criteria (Section 6.2.1.4). The air quality technical support documentation is presented in Appendix G, which includes the baseline air quality results (Appendix G-1), as well as the emission rate estimates and the results of the predictive air quality modelling (Appendix G-2).

6.2.1 Assessment Approach

The approach to the assessment of potential changes to air quality includes a description of the relevant regulatory and policy setting, a description of the input obtained through consultation specific to this VC, the identification of criteria and indicators along with the associated rationale, and a description of the spatial and temporal boundaries used for this VC and of the attributes used to determine the significance of any residual adverse effects. The assessment of potential effects is supported by a description of the existing conditions for the VC (Section 6.2.2), the identification and description of applicable pathways of potential effects on the VC (Section 6.2.3) and a description of applicable mitigation measures for the VC (Section 6.2.4). An outline of the analytical methods used for the assessment and the key assumptions and/or conservative approach is found in Section 6.2.5. With the application of mitigation measures to the potential effects on the VC, the residual effects are then characterized in Section 6.2.6 and the significance of the residual effects is determined in Section 6.2.7.

6.2.1.1 Regulatory and Policy Setting

The effects assessment for air quality has been prepared in accordance with the requirements of the federal Environmental Impact Statement (EIS) Guidelines (Appendix B-1) and the provincial approved Amended Terms of Reference (ToR; Appendix B-3). Concordance tables, indicating where EIS Guidelines and ToR requirements have been addressed, are provided in Appendix B-2 and B-5, respectively.

As the Project is located in the province of Ontario, it will need to meet applicable federal and provincial legislation and regulatory requirements; further information regarding anticipated approval requirements is provided in Section 11. Provincial and federal regulatory agencies have prescribed ambient air quality criteria (AAQC), benchmarks, and standards. Government policies, objectives, standards or guidelines most relevant to air quality are summarized below.

Federal Policies and Guidelines

The Canadian Ambient Air Quality Standards (CAAQS) for particulate matter less than 2.5 microns ($PM_{2.5}$), nitrogen dioxide, and sulphur dioxide have been adopted by the Canadian Council of Ministers of the Environment and were considered in this assessment. These CAAQS are intended as a measure of ambient air quality within each of Canada's air zones to determine appropriate air quality management actions; the CAAQS are not intended for the local assessment of specific emission sources or for enforcement. For the air quality effects assessment, the concentrations predicted by the air dispersion model were compared against the CAAQS to allow discussion of the modelled effects of air emissions on the air zone.

Provincial Regulations

The Ministry of the Environment, Conservation and Parks (MECP) Air Contaminant Benchmarks, prescribed under the Ontario regulation for Air Pollution – Local Air Quality (O.Reg. 419/05), are used for the assessment of stationary sources for the purposes of provincial permitting or to establish compliance with the regulation. The Air Contaminant Benchmarks include standards, guidelines and jurisdictional screening levels for more than 5,000 parameters. In many cases, the AAQCs and the Air Contaminant Benchmarks are numerically the same.

Provincial Policies and Guidelines

In addition to the federal criteria and benchmarks, the MECP has established AAQCs for various parameters, including most of the target parameters identified for this air quality assessment. An AAQC is set by the MECP as a concentration used to gauge air quality at a location, inclusive of all sources and baseline. The AAQCs levels are not compliance standards but set to provide guidance for decision-making and Project planning. AAQCs are the primary metrics used to assess effects in the environmental assessment process. As there is no AAQC for diesel particulate matter (DPM), Health Canada chronic and short-term exposure guidance values were used, as noted in Section 6.2.2.2. There is also no AAQC specific to copper sulphate; therefore, the AAQC for copper was used in Table 6.2-3.

A summary of the pertinent air quality criteria, benchmarks, and standards for key parameters in this study is presented in Appendix G-2.

6.2.1.2 Influence of Consultation with Indigenous Communities, Government and the Public

Consultation has been ongoing for several years prior to and throughout the environmental assessment process, and will continue with Indigenous communities, government agencies and the public through the life of the Project. Section 2 provides more detail on the extensive consultation process. The Record of

Consultation (Appendix D) includes detailed comments received, and responses provided, during the development of the final Environmental Impact Statement / Environmental Assessment (EIS/EA).

Feedback received through consultation has been addressed through direct responses (in writing and follow-up meetings) and incorporated into the final EIS/EA, as appropriate. The key comments that influenced the assessment for air quality between the draft and final EIS/EA are provided below:

Baseline Air Quality Conditions

Cat Lake First Nation (CLFN), Lac Seul First Nation (LSFN), Slate Falls Nation (SFN), Mishkeegogamang Ojibway Nation (MON), and the Impact Assessment Agency of Canada (IAAC), requested information on the use of regional air quality data as baseline data for the air quality assessment, as well as a description of how local data are considered. In addition, CLFN, LSFN and SFN requested clarification on representative data used to inform the assessment. CLFN, LSFN, and SFN also requested clarification on the relevant averaging periods for baseline parameters.

The assessment of air quality uses three to five years of data from the National Air Pollutant Surveillance (NAPS) program stations at Thunder Bay, Winnipeg, Pickle Lake and Simcoe to ensure a robust, long-term monitoring dataset has been considered with onsite Project data used preferentially. Although the selected NAPS locations are influenced by local urban sources, they are broadly reflective of regional air quality, and from an EA perspective they are expected to overestimate parameters relative to the Project site. This lends itself to a conservative approach when assessing the effects on air quality from the Project. The collected onsite data will provide a comparison against the regional NAPS data and will be used preferentially to characterize the existing air quality at the remote Project site. A discussion of this comparison has been added to the Baseline Air Quality Monitoring Data Summary Report (Appendix G-1) and Section 6.2.2.2 of the final EIS/EA.

Per standard practice, for air parameter criteria with averaging periods shorter than one year, the 90th percentile of the data are used to represent baseline conditions; for parameters with an annual averaging period, the average (mean) concentrations are used. Onsite data were supplemented by the regional data, and discussions include a comparison of onsite data to regional data. For parameters that were not measured on site and were not measured at the regional NAPS stations, such as silica, baseline concentrations have been established using appropriate methods, such as use of a particle size distribution, speciation of a measured parameter, or published values. This rationale has been described in the Baseline Air Quality Monitoring Data Summary Report (Appendix G-1, Section 5).

The Baseline Air Quality Monitoring Data Summary Report (Appendix G-1) and Air Quality Assessment Report (Appendix G-2, Section 4) include a summary of the meteorological data relevant to discussions of air quality modelling, a summary table of baseline concentrations and the rationale for the selection of the baseline concentrations used for the assessment of effects.

Additional Baseline Conditions

CLFN and LSFN requested clarification on the baseline emission sources in the area, including emissions from communities within the air quality study area. The regional airshed being characterized is influenced by local, regional, and long-range (e.g., international) sources. While it is not practical to identify sources on a map because sources such as forestry activity are transient, many of the stationary sources are located in the communities as identified in the Baseline Air Quality Report (Appendix G-1; Figure 1-1). The combined expected air parameter concentrations from these sources are what was measured by the air quality baseline program. The purpose of the baseline air quality monitoring program was to measure the cumulative effects of existing sources (local, regional and long-range) on the concentrations of air contaminants of concern to understand the cumulative background air quality that results from these sources. Seasonal variability and the influence of local sources are both captured by the monitoring program. The Air Quality Assessment (Appendix G-2, Section 1.3) of the final EIS/EA describes the existing local and regional conditions which includes consideration of roads, mining, wildfires, exploration, and forestry activities, power generators, recreational vehicles, and transboundary sources.

MECP requested clarification of the conservative assumption of particulate matter composition used to estimate background concentrations of metals. The concentration of trace metals on the particulate matter was estimated using geochemistry data for mine rock and ore samples, specifically the 90th percentile concentration for each metal, as described in Section 2.1.5 of the Air Quality Assessment (Appendix G-2).

MECP recommended additional data be collected to establish background concentrations, and the Northwestern Ontario Métis Community (NWOMC) requested opportunities to review the additional air quality data that has been collected since the draft EIS/EA was circulated. Further, CLFN and LSFN requested that additional sampling occur during wintertime. The additional baseline data collected since submission of the draft EIS/EA, including sampling during the wintertime is included in the Baseline Air Quality Report (Appendix G-1, Section 4) and is sufficient to establish background concentrations.

NWOMC requested a description of the existing conditions for dust within the Project site, local study area and regional study area in order to provide a baseline for comparative analysis. Table 6.2-3 provides the baseline concentrations for suspended particulate matter (SPM), particulate matter less than 10 microgram (PM_{10}), particulate matter less than 2.5 microgram ($PM_{2.5}$) and diesel particulate matter (DPM) which is further described in the Baseline Air Quality Report (Appendix G-1, Section 4).

Air Quality Criteria

CLFN, LSFN and IAAC requested that the 2025 CAAQS for 1-hour and annual nitrogen dioxide (NO_2) be included in the assessment. The CAAQS have been updated, as requested, to 79 micrograms per cubic metre ($\mu g/m^3$) and 23 $\mu g/m^3$, respectively in Table 6.2-3.

Control Efficiency and Silt Content

IAAC, Environment and Climate Change Canada (ECCC) and the MECP requested clarification on how a 95 percent (%) control efficiency and a 3.9% silt content on the haul roads will be achieved. Further, IAAC requested that silt content and dustfall sampling be carried out along the haul roads during the construction and operation phases.

For the assessment of air quality, a 95% control efficiency was selected as the haul roads are along the northern Project property line, near waterbodies, and therefore will require highly effective dust control measures (including a robust fugitive dust management plan and monitoring program with continuous particulate monitoring to allow a feedback loop). Control efficiencies of 85% to 95% have been successfully applied to other mining projects in northern Ontario. Since multiple control methods can be implemented and reinforce each other, an overall control efficiency of more than 95% is justified where an effective dust management and monitoring plan is implemented. The rationale for this control efficiency has been added to the Air Quality Assessment Report (Appendix G-2) and considered in Section 6.2.5 of the final EIS/EA. The rationale for 3.9% silt content is supported by the United States Environmental Protection Agency *AP-42: Compilation of Air Emissions Factors from Stationary Sources*, Chapter 13.2.2 (US EPA 2023), which provides a silt content range of 3.9% to 9.7% with a mean of 5.8% for Taconite (lean iron ore) mining and processing haul roads to and from the pit. It is feasible to maintain lower silt content levels using an onsite crusher and screening plant that can provide coarse aggregate product to an engineered specification with less than 3.9% silt for use as road surface. The rationale for the 95% control efficiency and 3.9% silt content has been added to the Air Quality Assessment Report (Appendix G-2) and considered in Section 6.2.5 of the final EIS/EA. However, considering the comments received, a sensitivity analysis using an 85% control efficiency, and 5.8% silt content, has been added to the Air Quality Assessment Report to provide a comparison. Although the geographic extent of the predicted air quality exceedances increases, the geographic extent remains localized and is predicted to occur for PM_{10} only 0.1% of the time (two days in a five-year period) during frozen conditions in November and December and no exceedances are predicted for $PM_{2.5}$.

First Mining Gold has committed to a follow-up program that will be initiated during construction and will include particulate monitoring to allow a feedback loop between conditions and mitigation measures; this will confirm the efficacy of controls at the property line. Further, a detailed air quality monitoring program will be prepared during the permitting process and is anticipated to include particulate matter. An air quality monitoring program building on the baseline program is described in Section 12 and will be refined during the permitting process.

Other Air Quality Parameters

IAAC and the MECP requested information on baseline concentrations for volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs), including a discussion of the use of the onsite passive VOC monitoring data. IAAC also requested information on an assessment of health risks due to incremental ozone exposure, including a discussion on the potential for ozone formation from Project emissions of gaseous precursors. Further, CLFN, LSFN, and SFN suggested mercury be included in the baseline air concentrations.

The onsite VOC monitoring data used in the air quality assessment serve as a screening for the presence of target species and as a general comparison of VOC concentrations to background values from regional NAPS program stations. Where the detection limits are low, concentrations were compared to the relevant provincial AAQC by using the averaging time conversion method of the MECP (2016) *Air Dispersion Modelling Guideline for Ontario* (Version 3.0). Data from the NAPS regional background station in Simcoe have been used to establish background concentrations for the final cumulative effects assessments. Further, 7 additional samples were taken (for a total of 10 on site) for comparison with the regional NAPS data since the draft EIS/EA. Baseline information for VOCs and PAHs has been considered in Section 6.2.2 and is provided in the Baseline Air Quality Monitoring Data Summary Report (Appendix G-1, Section 4.6), including a description of how the VOC data collected on site by passive sampling are used.

The Air Quality Assessment Report (Appendix G-2, Section 5) and Section 6.2.6 include an assessment of PAH and VOC concentrations for all phases and a qualitative assessment of ozone formation. There are no sources of ozone associated with the Project. While the Project emits compounds that could be considered precursors for ozone (i.e., NOx and small quantities of VOCs that may react in the presence of heat and sunlight to photochemically form ozone), there is no expectation that the amounts emitted will cause an increase in ozone on either a local or regional scale.

With respect to mercury, the total particulate sampling using a high-volume sampler included the analysis of filters for particle-bound mercury; the highest baseline mercury concentration measured was less than 0.01% of the MECP's AAQC.

Points of Reception

The Ministry of Citizenship and Multiculturalism requested further description of the type of points of reception (POR) in the draft EIS/EA. The PORs consist of residences, Indigenous points of interest identified through traditional land and resource use studies and engagement, and potential recreational, cabin, lodge and camp sites identified through a review of the Ministry of Natural Resources Land Information Ontario geographic datasets. In some cases where a land use covered a large area, representative points were selected. The selection of PORs is described in Section 6.2.5, and specific PORs are described in Figure 6.2-2 and further detailed in the Air Quality Assessment (Appendix G-2, Attachment D).

Co-disposal Facility Design

The Ministry of Mines requested further justification for the use of dry filtered tailings in the co-disposal facility (CDF). In response, additional engineering trade-off assessments were undertaken and resulted in the optimization of the CDF. The optimization included the production of thickened pumpable non-acid generating tailings as opposed to the filtered tailings that were proposed in the draft EIS/EA. The thickened tailings result in a considerable reduction of air emissions, including fugitive dust and greenhouse gases due to increased moisture content and far less transportation by trucks, while providing a more robust operation for co-mingling with mine rock.

Air Quality Modelling

IAAC, MECP and NWOMC requested further information on the air quality assessment for the construction phase of the Project, including the construction and operation of the mine access road, the transmission line and aggregate areas. The Air Quality Assessment (Appendix G-2, Section 5.1) and Section 6.2.5 have been updated and include an assessment of the construction phase activities, including the development of site infrastructure such as the aggregate areas, the construction of the transmission line, and the construction and operation of the mine access road. These activities are also considered as sources of dust and are similar in nature to those of the operation phase (e.g., diesel fleet and earth moving) with respect to the parameters emitted to the air.

MECP requested clarification on the assumptions used to assess the deposition of particulate matter and the rationale for the selection of parameters used to assess the deposition in the air dispersion modelling. The particle size distribution and characterization used in this assessment is based on the available data derived from the US EPA documents for ore processing and mining processes (AP-42; US EPA 2023). The deposition parameters were determined based on the type of sources (e.g., unpaved roads, blasting, ore handling and crushing) and the associated activities. The Air Quality Assessment (Appendix G-2, Section 3.5.1) includes the calculations used to determine the equivalent diameter and the basis for the particle density for each source or source type.

MECP requested the rationale for the selection of the ozone limiting method for the conversion of NO to NO_2, along with the associated supporting data and assumptions. The ozone limiting method was used to model NO/NO_2 conversion from sources emitting NOx from internal combustion engines using diesel fuels and is a preferred method when chemical transformation is required. Further details on the supporting data and assumptions are included in the Air Quality Assessment (Appendix G-2, Section 3.5.2).

MECP requested that sample calculations for emission estimates be provided in the final EIS/EA. The Air Quality Assessment (Appendix G-2, Section 3.51 and Attachment C) includes the emission calculation methods, emission factors used, and the associated calculations.

Dust Management and Mitigation

NWOMC and MON requested further clarification on the standard measures that would be implemented to manage dust from the mine access road and the aggregate areas, during all phases of the Project. Fugitive dusts generated during the construction phase will be managed with targeted mitigation to control dust emissions at the source, thereby reducing effects. A dust management plan to mitigate dust will be required to support the Provincial Environmental Compliance Approval (Air). This Plan will include all sources of dust and will address sources and activities. Mitigation measures are further described in Section 6.2.4 and in the Air Quality Assessment (Appendix G-2, Table 6-1).

NWOMC requested a description of the Project effects prior to mitigation to enable an evaluation of the effectiveness of proposed mitigation measures for air quality. Section 6.2.3 provides a description of the potential effects on air quality from the Project prior to the application of mitigation measures during construction, operations and closure phases. Section 6.2.4 and Table 6.2-5 provide a description and implementation of mitigation measures for the potential effects to air quality, and Section 6.2.6 provides a description of the residual effects after the application of mitigation measures.

Dust Deposition on Adjacent Waterbodies

SFN and MON requested further information on the predicted effect of dust deposition on adjacent waterbodies. The change in water quality parameters due to the deposition of dust on surface water and snow during winter in adjacent waterbodies is assessed in the Surface Water Quality Modelling Report (Appendix N-2, Section 4) and included in Section 6.9.6; it is based on the predicted changes in air quality parameters (dust) from the Project as described in the Air Quality Assessment (Appendix G-2). Based on the results in Section 6.9, the change in surface water quality parameters due to dust deposition on snow is negligible.

Monitoring Program

IAAC and MECP requested further detail on the ambient air quality monitoring program for all phases of the Project. Section 12.2 includes additional details of the follow up and monitoring program for air quality.

6.2.1.3 Spatial and Temporal Boundaries

The Project Development Area (PDA) is defined as the footprint of the Project including the mine site area, mine site access road and transmission line corridor, as well as a buffer to allow flexibility for design optimizations during Project permitting. The buffer includes approximately 250 metres (m) around the mine site area. The buffer for the transmission line is included within the 40 m wide corridor, and within the 30 m wide corridor for the mine access road. Where the mine access road and transmission line are aligned together, the buffer is included within a 60 m wide corridor.

The spatial boundaries used for the assessment of air quality are shown in Figure 6.2-1 and Figure 6.2-2 and are defined as follows:

- **Property boundary:** This boundary represents the extent of the mining claims to be brought to lease. For the mine access road and transmission line construction, the modelling boundary used a 140 m wide area, where the majority of the activity is expected to occur. This width includes a 50 m wide buffer on each side of the 40 m wide corridor that accounts for the low release heights of the emission sources proximate to the receptors.

- **Local Study Area (LSA):** The LSA for air quality corresponds to the area in the vicinity of the Project where most of the air quality effects of the Project are expected to occur and can be predicted or measured with a reasonable degree of accuracy; this is a square that extends 10 kilometres (km) from the centre of the mine site infrastructure. Along the transmission line and mine access road, the LSA extends 3 km from the PDA, given the lower intensity and frequency of activities.
- **Regional Study Area (RSA):** The RSA for air quality is defined as an area that extends approximately 20 km from the PDA. Air quality effects of the Project would not be measurable beyond the RSA.

The temporal boundaries for the assessment of air quality are defined as:

- **Construction phase:** Years -3 to -1, representing the construction period for the Project.
- **Operation phase:** Years 1 to 10, with the first year potentially representing a partial year as the Project transitions from construction into operation. Mining of the ore from the open pit will end in Year 10, at which time the pit will begin refilling with water.
- **Decommissioning and closure phase:**
    - **Active closure**: Years 11 to 15, when final decommissioning and the majority of active reclamation activities are carried out; and
    - **Post-closure**: Years 16+, corresponding to the post-closure monitoring period and when the filled open pit basin will be reconnected to Springpole Lake.

Effects on the air quality VC were assessed for each Project phase (i.e., construction, operation and closure).

6.2.1.4 Criteria and Indicators

In undertaking the assessment of air quality effects, the following criteria were used:

- Change in criteria air parameters;
- Change in metals;
- Change in VOCs;
- Change in PAHs; and
- Change in other parameters.

The specific criteria, measurable indicators and the rationale for the selection of criteria are described in Table 6.2-1.

Gaseous compounds potentially associated with projects of this nature but not chosen as air quality indicators for this assessment are ammonia and ozone. Ammonia is known to be released during explosive detonation; however, the quantities discharged during each blast are not substantial. Although ozone is monitored and regulated as an indicator of air quality in Canada, there are no anticipated sources of ozone associated with the Project. Ozone formed from the release of nitrogen dioxide and VOCs is expected to have minimal effect on ozone concentrations in the LSA and RSA.

6.2.1.5 Description of Residual Effect Attributes

The residual effects for air quality are characterized in terms of the following attributes:

- Magnitude;

- Geographic extent;
- Duration;
- Frequency; and
- Reversibility.

These attributes, along with the rankings, are further described in Table 6.2-2.

In addition, the residual effects for air quality were characterized according to the ecological and/or social context within which the VC is found. This is a qualitative measure of the sensitivity and/or resilience of the VC is to potential change. The following ranking is applicable:

- **Level I:** The VC may or may not be sensitive but is capable of supporting the predicted change with typical mitigation measures.
- **Level II:** The VC is sensitive and requires special measures to support the predicted change.
- **Level III:** The VC is sensitive and unable to support the predicted change even with special measures.

As noted in Section 6.1, a residual effect is defined as significant if both of the following criteria are satisfied:

- A Level II or III rating is attained for all of the attributes involving magnitude, extent, duration, frequency and reversibility.
- A Level II or III rating is attained for ecological and/or social context.

Conversely, if a Level I rating is achieved for any of the attributes involving magnitude, extent, duration, frequency or reversibility, or if a Level I rating is achieved for the ecological and/or social contexts, then the residual effect is considered to be not significant.

In the event there is a significant adverse effect, the likelihood of occurrence is further described.

6.2.2 Existing Conditions

A summary of the baseline conditions is presented below to characterize the existing conditions for air quality and is based on several years of study that has resulted in a comprehensive air quality dataset for this stage of project planning. The existing conditions are used to support the assessment of potential effects from the Project on air quality and will support long-term monitoring for the Project. Further baseline information on air quality can be found in the technical support documentation including the Baseline Air Quality Report (Appendix G-1).

6.2.2.1 Meteorological Conditions

The Project is located in a remote area, absent of nearby large urban centres and industrial sources. The climate in the study area is humid continental, with warm and often hot summers and long, cold, snowy winters (Koppen 2013).

The MECP provided a site-specific meteorological dataset for the Project which included hourly wind speed, wind direction, temperature and barometric pressure for a five-year period (2013 to 2017); this dataset is developed specifically as an input for dispersion modelling and includes variables and an extended record of data required by the model. The wind data from the site-specific dataset are presented for the entire five-year period (2013 to 2017) and for the summer months only, as wind roses shown in Figure 6.2-3 and Figure 6.2-4, respectively. A wind rose is a frequency distribution plot that shows the wind speed and direction data in one plot. The wind roses do not indicate any wind direction as prevalent; however, winds from the east and northeast were least common. The average wind speed for the dataset was 3.4 metres per second (m/s).

Precipitation data were acquired from Lakes Environmental as a Weather Research and Forecasting dataset, and included the average, minimum and maximum monthly rainfall data as shown in Figure 6.2-5.

6.2.2.2 Baseline Air Quality Concentrations

In order to establish baseline air quality at the Project, an onsite baseline air monitoring program was initiated in 2020 to measure air parameters including SPM, PM_{10}, $PM_{2.5}$, nitrogen dioxide, sulphur dioxide, VOCs, metals, and other parameters to establish existing conditions in the LSA. The program was expanded in 2021 to collect further data. In some cases, multiple concurrent monitoring methods were employed for a single parameter for redundancy given the logistical challenges at the site. The onsite data were preferentially used to establish baseline concentrations.

For some parameters (i.e., nitrogen dioxide, sulphur dioxide, carbon monoxide, ozone, VOCs and PAHs), air monitoring data from regional government stations were also used to supplement the onsite measurements for a robust baseline that is representative of conditions over the RSA and takes into account sections of the LSA, including the transmission line route and mine access road.

The ECCC NAPS network operates a number of monitoring stations across the country. The NAPS network reports baseline air concentration data collected for various gases and particulate matter, as well as various VOCs and semi-VOCs. Four NAPS stations were used to represent the regional air quality experienced at the Project:

- Pickle Lake (Station 640001), located approximately 145 km from the Project;
- Thunder Bay (Station 60809), located approximately 430 km from the Project;
- Winnipeg (Station 70119), located approximately 300 km from the Project; and
- Simcoe Experimental Farm (Station 62601), located 1,310 km from the Project.

The Thunder Bay and Winnipeg stations are population centres influenced by urban sources and will overestimate air quality concentrations at the Project. Because of prevailing southwesterly airflows, it is expected that measurements at the Simcoe station are more influenced by transboundary contributors such as the Ohio Valley (MECP 2022) than the Project, and the use of these data for baseline is also expected to be conservative.

For DPM, a regional average baseline of 1.8 $\mu g/m^3$ was used as a conservative baseline concentration, as this is the average baseline for $PM_{2.5}$ concentrations in Canada as recommended by Health Canada (2021).

The baseline concentrations that were used to assess potential effects on air quality for each parameter are shown in Table 6.2-3. The rationale used to determine the baseline concentrations for each air parameter and averaging period, as well as side-by-side comparisons of the onsite methods and ECCC NAPS data for each parameter, are provided in the Baseline Air Quality Monitoring Data Summary Report (Appendix G-1).

6.2.2.3 Traditional Knowledge

As part of the Project, all eight Indigenous communities were contacted to participate in the EA process, and to provide Traditional Knowledge and Traditional Land Use (TK/TLU) information. To date, six Indigenous communities, Cat Lake First Nation, Lac Seul First Nation, Mishkeegogamang Ojibway Nation, Slate Falls Nation, Wabauskang First Nation and the Northwestern Ontario Métis Community, have provided TK/TLU information. Specific TK/TLU information relevant to air quality was not identified.

6.2.3 Identification of Pathways to Potential Effects

The initial step in the assessment process is to identify interactions between the Project and the VC that can result in pathways to potential effects. These potential effects may be direct, indirect and/or positive effects, where applicable. Table 6.2-4 includes the potential interactions of the Project with air quality, prior to the application of the mitigation measures. The professional judgment of technical experts experienced with mining projects in Ontario and Canada, as well as input from Indigenous communities, government agencies and the public, informed the identification of those interactions that are likely to result in a pathway to a potential effect due to a measurable change to air quality. These pathways to potential effects are further described in Sections 6.2.3.1 to 6.2.3.3 for each phase of the Project, along with the rationale for those interactions excluded from further assessment. Section 6.2.4 and Table 6.2-5 provide a description of the mitigation measures applied to these pathways to potential effects during all phases of the Project. The residual effects, after the application of the mitigation measures, are then described and further evaluated in Section 6.2.6, using the criteria and indicators identified in Section 6.2.1.4.

6.2.3.1 Construction Phase

The construction phase of the Project is expected to occur over a three-year period and will include preparation of the site and the construction of mine infrastructure. The following interactions with the Project result in pathways to potential effects on the air quality as described below. After mitigation is applied to each pathway, as described in Table 6.2-5, the residual effects are assessed using the criteria identified for each pathway.

- Site preparation activities for the mine site area including clearing, grubbing and bulk earthworks interact with air quality and results in a pathway to a potential effect due to emissions from the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The construction of the mine access road including the aggregate resource areas, as well as the airstrip and transmission line interacts with air quality and results in a pathway to a potential effect on air quality due the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The development of the temporary construction camp and staging areas interacts with air quality and results in a pathway to a potential effect on air quality due to the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The construction of the central water storage pond interacts with air quality and results in a pathway to a potential effect on air quality due to the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The construction of the fish habitat development area results in a pathway to a potential effect due to Project emissions, and the assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.

- The construction of the onsite haul and access roads interacts with air quality and results in a pathway to a potential effect on air quality due to the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The interaction between the construction of the dikes in the north basin of Springpole Lake and air quality results in a pathway to a potential effect due to the operation of equipment, and the assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The controlled dewatering of the open pit basin interacts with air quality and results in a pathway to a potential effect on air quality due to the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The stripping of lake bed sediment and overburden at the open pit interacts with air quality and results in a pathway to a potential effect on air quality due to the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The development of the surficial soil stockpile interacts with air quality and results in a pathway to a potential effect on air quality due to the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The interaction between air quality and the development of the pit, including the commencement of mining for production, results in a pathway to a potential effect on air quality due to Project emissions. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The commissioning of the process plant interacts with air quality and results in a pathway to a potential effect due to Project emissions from the facility and the assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The interaction between the construction of the starter embankments for the CDF and air quality results in a pathway to a potential effect due to Project emissions, and the assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The initiation of stockpiling of ore interacts with air quality and results in a pathway to a potential effect on air quality due to the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.

These activities could result in fugitive air emissions such as SPM from the movement of materials by equipment on unpaved surfaces, and in combustion gas emissions such as nitrogen dioxide, carbon monoxide and sulphur dioxide in the exhaust of equipment used during this activity.

The potential effects on air quality associated with the construction of the mine access road and transmission line will be effectively limited to heavy equipment operation during the short-term construction phase that will move along the length of the route. As a result, the potential effects would be confined to a limited geographic area over a short duration. There are also two aggregate pits that will be developed to support the construction of mine infrastructure. Potential air quality effects associated with the construction of the mine access road, transmission line, and aggregate pit development will be mitigated per the dust management plan described in Section 6.2.4.

The construction of buildings and onsite infrastructure and the establishment and operation of the water management facilities and treatment facilities are not expected to have an interaction with air quality as the use of equipment and movement of materials will be immaterial. There is no plausible interaction between the employment and expenditures activities and air quality during any Project phase. In general, the potential effects during the construction phase will be lower magnitude and of shorter duration than for the operations phase.

6.2.3.2 Operation Phase

The operation phase is anticipated to occur over a 10-year period. The following interactions with the Project result in pathways to potential effects on the air quality as described below. After mitigation is applied to each pathway, as described in Table 6.2-5, the residual effects are assessed using the criteria identified for each pathway:

- The drilling, blasting, material handling and operation of mobile equipment associated with the open pit mining interact with air quality and results in a pathway to a potential effect due to the operation of equipment and blasting. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The interaction between the management of overburden, mine rock, tailings and ore in designated facilities and air quality results in a pathway to a potential effect due to material handling and increased susceptibility of areas to wind erosion. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The operation of mine site infrastructure including the combustion of fuel for heating of mine site infrastructure and the operation of the backup power generation and other diesel equipment and air quality results in a pathway to a potential effect due to Project emissions, and the assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The operation of the process plant interacts with air quality and results in a pathway to a potential effect due to the operation of equipment and blasting. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.

Air emissions will be most pronounced during the maximum operating scenario in the operations phase of the Project. The maximum operating scenario is a conservative estimate of the material movement during mine operation and includes a hybrid of Year 3 and Year 4, where Year 3 accounts for the maximum ore extracted and Year 4 accounts for the maximum mine rock extracted.

The emission of fugitive dust and combustion gases could result in potential effects on air quality during this phase. Further, air emissions such as hydrogen cyanide, copper sulphate and calcium oxide could occur from ore processing.

The operation of the water management and treatment facilities, airstrip, accommodations complex and the operation and maintenance of remaining mine site infrastructure is not expected to interact with air quality due to the limited use of equipment and movement of materials and was therefore not quantitatively assessed. Progressive reclamation activities would be captured under the management of the surficial soils stockpile, as this material would be used to support those activities.

There will also be periodic maintenance activities associated with the transmission line and mine access road; however, these are expected to be infrequent and of short duration, and therefore potential effects on air quality are unlikely.

6.2.3.3 Decommissioning and Closure Phase

Activities during the active closure phase, which is expected to occur over a five-year period, are similar to those during the construction phase and use similar mining and construction equipment but on a much smaller scale. The following interactions with the Project result in pathways to potential effects on air quality as described below. After mitigation is applied to each pathway, as described in Table 6.2-5, the residual effects are assessed using the criteria identified for each pathway:

- The removal of salvageable assets off site interacts with air quality and results in a pathway to a potential effect due to emissions from the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The interaction between air quality and the reclamation of impacted portions of the PDA, such as by regrading, placement of cover and revegetation, as applicable, results in a pathway to a potential effect on air quality due to emissions from the operation of equipment. The assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The demolition and recycling and/or disposal of remaining materials interacts with air quality and results in a pathway to a potential effect due to emissions from the operation of equipment, and the assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.
- The interaction between air quality and the removal and disposal of demolition-related wastes in approved facilities results in a pathway to a potential effect due to emissions from the operation of equipment, and the assessment of potential effects on air quality includes changes in criteria air parameters, metals, VOCs, PAHs and other parameters from this pathway.

During decommissioning and closure, the filling of the open pit basin with water and monitoring are not expected to have an interaction with air quality due to the limited use of equipment and movement of materials and potential effects on air quality are unlikely.

The post-closure period consists predominantly of monitoring activities, with occasional maintenance and limited equipment use. As a result, the potential for air quality effects associated with decommissioning and closure (and post-closure) are adequately assessed by the construction and operations phase evaluations.

6.2.4 Mitigation Measures

Measures to be implemented to avoid or minimize the effects of the Project on air quality include the following:

- During construction, operation and active closure, dust emissions from roads and mineral stockpiles will be controlled through the application of water spray and supplemented by dust suppressants if required.

- During construction, operation and active closure, site roads will be maintained in good condition, with regular inspections and timely maintenance completed to minimize the silt loading on the roads.
- Vehicle speeds will be limited during construction, operation and closure.
- During operation, the process plant emission sources will be enclosed where possible and be designed to allow good atmospheric dispersion. To reduce emissions, dust control equipment and best practices will be used, where necessary, as described below:
    - Conveyor transfer (drop) points will be controlled via enclosure or water spray;
    - Crushed ore stockpile will be enclosed, and emissions controlled by a baghouse;
    - A wet scrubber or equivalent will be used to control emissions in grinding (baghouse controlled);
    - Truck unloading at the primary crusher will be enclosed and emissions controlled by a baghouse;
    - Drill rigs will be equipped with a dust shroud on the drill and a wet suppression (spray) system will be used;
    - Truck placement of mine rock onto the CDF will be controlled using water sprays and surface wetting;
    - Travel surfaces will be maintained to minimize silt (fine material);
    - Crushing of ore materials and reclaim at stockpiles will be controlled by baghouses;
    - The vents from the lime silo will be controlled by a dust collector;
    - Areas for ore mixing and handling will be controlled by dust collectors; and
    - A regular maintenance schedule will be followed to ensure baghouses and dust collectors are functioning properly.
- During operation, air emissions from the use of diesel fuel for the mobile heavy equipment will be controlled through strategic mine scheduling to minimize the total distance travelled by haul trucks and other equipment and through the use of low sulphur diesel fuel.
- During operation, hydrogen cyanide emissions will be eliminated through the sulphur dioxide / oxygen cyanide treatment process to reduce cyanide in the tailings at the process plant and before deposition of tailings in the CDF. Excess sulphur dioxide used in this process will be recirculated (i.e., a closed-loop) without release to the air.
- During operation, PAG mine rock will be placed in the CDF with thickened tailings being deposited into the mine rock gaps and voids from the perimeter dam to minimize the exposure of tailings that could generate dust. Further, the mine rock level will be maintained above the tailings to minimize the exposed tailings surface area.
- During construction, operation and active closure, a preventative maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment and standby power generation) and all processes with the potential for air quality effects.

- Following completion of PAG mine rock disposal within the north cell of the CDF, NAG tailings will be deposited over the entire North Cell surface to fully cover the PAG mine rock and limit oxygen ingress. To minimize the exposure of tailings to winds generating dust, a vegetation cover will be established.
- During active closure, exposed dust sources will be revegetated, and progressive reclamation will be conducted wherever appropriate to better control dust emissions from the mineral waste stockpiles and CDF.

Air emissions are reduced due to optimization of the CDF through additional engineering and trade-off assessments carried out in response to feedback received on the draft EIS/EA, including the production of a thickened pumpable tailings instead of filtered tailings transported by truck.

During construction, operation and active closure, a dust management plan will be implemented to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed. Dust control measures will be developed based on best practices, that are predictably effective and are not prone to failure. The dust management plan will include opportunities for adaptive management, in which the intensity of the control measures may need to be increased if site inspections and monitoring indicate that current measures are insufficient to prevent offsite dust effects.

During construction and operation, a blasting plan will be implemented and include measures to minimize the length of time the blasting material is allowed to sit in a drill hole before blasting. The blast schedule will optimize air dispersion to minimize effects on air quality, including by avoiding blasting during unfavourable meteorological conditions as needed.

The application of mitigation measures for the pathways for potential effects is illustrated in Table 6.2-5. Mitigation measures described in this section are expected to be effective for their intended purposes given their effective implementation at similar projects.

Monitoring programs will be implemented to verify the accuracy of the predicted effects, assess the effectiveness of the implemented mitigation measures and may be further optimized in response to monitoring data. Extensive monitoring programs are in place for the Project, with several years of data collection completed. Monitoring for the Project going forward is further described in Section 12 and will be refined during the permitting phase to incorporate conditions of approvals and permits. Consultation on the monitoring programs is expected to continue through all phases of the Project.

6.2.5 Analytical Methods

The assessment of the potential air quality effects of the Project has been completed in accordance with standard air quality assessment methods.

The prediction of effects involved the following steps:

- Identify stationary and mobile emissions sources associated with the Project.
- Identify the parameters emitted to the atmosphere from the identified sources.
- Summarize the baseline ambient air quality conditions in the absence of the Project for each of the parameters emitted.
- Identify the relevant regulatory air quality standards and criteria, and establish the appropriate assessment criteria for a site in Ontario, noting that for some of the parameters there may be more than one applicable limit that depends upon the averaging period.

- Estimate the air emission rates for each of the parameters using appropriate estimation methods and established data sources.
- Prepare a source summary table that identifies sources at the Project site which may release one or more of the parameters emitted to the atmosphere in appreciable quantities and the corresponding emission rates.
- Perform the air dispersion modelling using the United States Environmental Protection Agency AERMOD version 22112, the current regulatory air dispersion model in Ontario.
- Compare the effects on ambient air quality predicted by the air dispersion modelling to the respective assessment criteria for each parameter and the relevant averaging periods with consideration of locations with potential human uses near the Project that were identified as PORs for the air quality assessment (Figure 6.2-2).

The dispersion model was used to determine the potential extent of parameters beyond the leased property boundary (modelling boundary), as shown in Figure 6.2-1. The concentration of a given parameter at the location of maximum offsite effect (i.e., the Point of Impingement [POI]) was compared to the Ontario AAQC. This included consideration of the maximum concentration, both with and without inclusion of the baseline concentration. The modelled changes in concentrations were also compared to the CAAQS as an indicator of the Project's potential influence on the air zone CAAQS achievement and management level.

See Section 6.2.1.1 for the applicable air quality criteria to be used for comparison to the predicted air quality concentrations from the dispersion modelling. A summary of the applicable AAQCs and CAAQS is provided in Table 6.2-3.

Operating mine equipment and process plant parameters used to develop the appropriate emissions factors, the source summary and emission summary for the construction and operation phases of the Project, and a summary of the emission calculation methods are included in Appendix G.

The PORs consist of residences, Indigenous points of interest identified through traditional land and resource use studies and engagement, and potential recreational, cabin, lodge and camp sites identified through a review of the Ministry of Natural Resources Geospatial Ontario (formerly Land Information Ontario) geospatial data. In some cases where a land use covered a large area, representative points were selected.

6.2.5.1 Assumptions and the Use of the Conservative Approach

Onsite data collected were used to establish baseline concentrations where robust datasets were available, with the 90th percentile statistics being used for shorter averaging periods and the average for annual averaging periods. Where onsite data did not provide a robust dataset, the use of urban-influenced NAPS stations (Thunder Bay, Winnipeg, Simcoe) will overestimate air concentrations at the Project as they are influenced by urban sources and are considered to be a conservatively high baseline; this is particularly true where the 90th percentile concentrations are used.

The prediction of effects encompasses the sources of air emissions that are associated with the maximum operating scenario in each phase of the Project.

A maximum emission scenario was developed for the construction phase which considered variability in the construction schedule and in the location of construction phase activities, including the mine access road and transmission line. The scenario combined the most intensive period of earthworks construction (i.e., Year 2) with other activities that, while not necessarily concurrent, were spatially offset. In some cases, modelling sequential tasks as concurrent resulted in double-counting of the emissions associated with certain construction equipment or activities, adding to the conservatism in the estimates and predictions. The two offsite aggregate pits were also considered as they would contribute to the cumulative air quality concentrations.

A conservative approach was taken to capture potential variation in material movement during operations The maximum emissions scenario for material movement considered the maximum movements for each activity (i.e., ore from pit, mine rock from pit, stockpile management) over the life of the Project. The scenario modelled was a conservative hybrid of Year 3 and Year 4, where Year 3 accounts for the maximum ore extracted and Year 4 the maximum mine rock extracted. Therefore, a hybrid of these two years provides a conservative scenario for material movement during operation of the mine. Other operational years are expected to have lower air emissions and effects.

A comparison of material movements in pre-production and the maximum operation year is provided in Table 6.2-6, with the lower material movements over the pre-production years translating into lower blasting, fugitive dust and exhaust emissions. Further, the maximum operating scenario included two backup diesel generators, crushing and screening, ore processing, vehicular traffic, and open pit mining all operating at maximum activity rates. The modelled results will over-predict the emissions and air quality effects for material handling operation and haul truck movements.

6.2.6 Characterization of Potential Residual Effects

Air dispersion modelling was used to determine the potential offsite changes in the criteria air parameters, metals and other parameters beyond the extent of the leased property boundary, as shown in Figure 6.2-1. Sources were considered in the air dispersion modelling to predict concentrations at the POI for comparison against AAQCs (with and without inclusion of baseline concentrations). The cumulative change in air parameters at the PORs (Figure 6.2-2) was also determined, and was based on the modelled concentration combined with the baseline concentration. The maximum modelled air concentrations at these PORs for the operation phase are presented in Table 6.2-7 and demonstrate that there are no predicted exceedances at the PORs associated with operations’ phase activities.

The results of the construction phase air dispersion modelling for the mine infrastructure, the mine access road, and the transmission line are presented in Table 6.2-8, Table 6.2-9 and Table 6.2-10, respectively. The operation phase assessment summary is provided in Table 6.2-11 for the maximum predicted concentrations on lands not taken to lease (the POIs), and in Table 6.2-7 for the maximum concentrations at identified PORs. The tables include the modelled concentrations, the baseline concentrations and their combined, cumulative effect.

As all concentrations were below their AAQCs at the property boundary and all PORs, contour plots were not provided herein however further details are available in the supporting technical document.

As the CAAQS are not intended for the assessment of specific emission sources but rather to characterize air quality within a broader air zone, comparison of predicted concentrations against the CAAQS was not used in the characterization of residual effects. However, comparison to the CAAQS is included in the air quality assessment (Appendix G-2) to allow for discussion of the predicted effects of air emissions on the air zone.

6.2.6.1 Particulate Matter

Construction

The modelled concentrations for particulate matter (SPM, PM_{10}, and $PM_{2.5}$) were determined for the construction of the mine (Table 6.2-8), the mine access road (Table 6.2-9) and the transmission line (Table 6.2-10) and combined with the baseline concentrations to determine the modelled cumulative concentration. The modelled cumulative concentrations for SPM, PM_{10} and $PM_{2.5}$ for all averaging periods are below the respective AAQC at the extent of the property boundary and at all PORs during construction.

Operation

The modelled concentrations for all three size fractions of particulate matter (SPM, PM_{10} and $PM_{2.5}$) during the maximum operating scenario were combined with the baseline concentrations to determine the modelled cumulative concentrations on lands not taken to lease for the operation of the mine (Table 6.2-11). The modelling identified fugitive dusts, primarily from the haul roads, as having the greatest influence on changes to particulate matter concentrations.

The modelled cumulative concentrations for all particulate fractions are below their respective AAQCs at both the property boundary and the PORs.

To assess the sensitivity of the silt content and control efficiency values used in the model, an additional modelling scenario was included that used a higher silt content (5.8%) and lower dust control efficiency (85%) in the determination of the emission rates. Although this resulted in a higher modelled cumulative concentration of particulate matter, the increase in the geographic extent of the exceedance outside the property boundary was minor. The modelled cumulative concentrations for SPM and $PM_{2.5}$ under this scenario do not exceed the AAQCs at any receptor. Only one receptor (POR05, which is a water-based traditional land use area) was determined to have a modelled cumulative concentration for PM_{10} that exceeded AAQC, but it is only predicted to occur 0.1% of the time (two days in a five-year period) and is predicted to occur during November and December when conditions are frozen. Note that the conservative nature of the model setup used for this scenario is expected to overestimate the concentrations of particulate matter. The model uses conservative inputs to determine emission rates, in which all emission sources are active and operated at maximum for all years. Furthermore, the model uses a conservative, worse case meteorological condition from the five years of meteorological data. In addition, the actual baseline conditions for SPM, PM_{10} and $PM_{2.5}$ are on average expected to be lower than those presented in Table 6.2-3.

Under the expected construction and operating scenarios, the increase will not exceed the AAQC, however there is an increase compared to baseline conditions in the concentration of particulate matter for both the construction and operation phases.

6.2.6.2 Nitrogen Oxides and Sulphur Dioxide

Construction

The modelled concentrations for nitrogen dioxide were determined for the construction of the mine (Table 6.2-8), the mine access road (Table 6.2-9), and the transmission line (Table 6.2-10). The modelled concentrations for sulphur dioxide were determined for the mine but not assessed for construction of the transmission line or mine access road as blasting is the main source of sulphur dioxide emissions. These modelled concentrations are combined with the baseline concentrations to determine the modelled cumulative concentration. The modelled cumulative concentrations for nitrogen dioxide and sulphur dioxide for all averaging periods are below the respective the AAQCs at the extent of the property boundary and all PORs during construction.

Operation

The modelled concentrations for nitrogen dioxide and sulphur dioxide were determined for the maximum operating scenario and combined with the baseline concentrations to determine the modelled cumulative concentrations for the operation of the mine (Table 6.2-11). The air quality concentrations for the one-hour averaging period for nitrogen dioxide and sulphur dioxide are dictated by in-pit blast emissions, even with all other fuel combustion sources included in the model (e.g., exhaust emissions, heating and diesel generator operation). The modelled cumulative concentrations for nitrogen dioxide and sulphur dioxide for all averaging periods are below the respective AAQC at the extent of the property boundary and all PORs during operation, including those located within the property boundary (Table 6.2-7) and noting that tabular values should be taken as final.

Under the expected construction and operating scenarios, the increase above baseline conditions in the modelled concentrations of nitrogen dioxide and sulphur dioxide will not exceed the AAQCs.

6.2.6.3 Metals

Construction

The maximum modelled concentrations for metals (including arsenic, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, titanium and zinc) were determined for the construction of the mine (Table 6.2-8), the mine access road (Table 6.2-9), and the transmission line (Table 6.2-10) and combined with the baseline concentrations to determine the modelled cumulative concentration. The modelled cumulative concentrations for these metals for all averaging periods are below the respective AAQC at the extent of the property boundary and all PORs during construction.

Operation

The modelled concentrations for metals during the maximum operating scenario were combined with the baseline concentrations to determine the modelled cumulative concentrations for the operation of the mine (Table 6.2-11). The maximum offsite change in the concentrations of these metals was determined through speciation of the modelled particulate matter concentrations, assuming that the dust is of the same composition as from samples of ore and mine rock at the Project. The modelled cumulative concentrations for these metals for all averaging periods are below the respective AAQC at the extent of the property boundary and all PORs during operation (Table 6.2-7).

Under the expected construction and operating scenarios, the increase above baseline conditions in the modelled concentrations of metals will not exceed the AAQCs.

6.2.6.4 Polycyclic Aromatic Hydrocarbons

The combustion of fuels results in trace emissions of PAHs to the air, for which benzo(a)pyrene (b(a)p) is used as a surrogate for PAHs in this air quality assessment.

The baseline data were obtained from Ontario’s only regional baseline station that measures VOCs and PAHs and is located in southwestern Ontario. Because of prevailing southwesterly airflows, it is expected that measurements at this station are more influenced by transboundary contributors such as the Ohio Valley (MECP 2022) and the more urbanized southern Ontario than the Project would be, and use of these data for baseline at the Project location is conservative. As a result, the baseline concentration for b(a)p (annual) is 0.000018 µg/m³, which exceeds the AAQC. The baseline concentration for b(a)p (24-hour) is 0.000036 µg/m³, which is 72% of the AAQC for this averaging period.

Construction

The modelled concentrations for b(a)p were determined for the construction of the mine (Table 6.2-8), the transmission line (Table 6.2-10), and the mine access road including the two offsite aggregate sources (Table 6.2-9) and was combined with the baseline concentrations to determine the modelled cumulative concentration. The modelled cumulative concentrations for b(a)p (24-hour) are below the respective AAQC at the extent of the property boundary during construction. However, the modelled cumulative concentration for b(a)p (annual) exceeds the AAQC due to the baseline concentration, which already exceeds the AAQC.

Operation

The modelled concentrations for b(a)p during the maximum operating scenario were combined with the baseline concentrations to determine the modelled cumulative concentrations for the operation of the mine (Table 6.2-11). The modelled b(a)p concentrations resulting from these Project-related emissions are below the AAQC (less than 20%) for both the 24-hour and the annual averaging period. However, the modelled cumulative concentrations for the operation of the mine exceed the AAQC at the extent of the property boundary during operation due to the baseline concentration already exceeding the AAQC. The modelled cumulative concentration for b(a)p (annual) exceeds the AAQC at all PORs (Table 6.2-7) due to the baseline concentration. The modelled Project concentrations have been carried forward into the Human and Ecological Health Risk Assessment (Section 6.2.4).

Under the expected construction and operating scenarios, the increase in the modelled concentrations of b(a)p due to the Project will not exceed AAQC; however, the modelled cumulative concentration will exceed AAQC due to the elevated baseline condition for b(a)p.

6.2.6.5 Volatile Organic Compounds and Other Parameters

Respirable silica, DPM, VOCs (including 1,3,-butadiene, acetaldehyde, benzene, and formaldehyde), hydrogen cyanide, carbon monoxide, calcium oxide and copper sulphate were also identified as air parameters associated with mining and construction activities. For DPM, $PM_{2.5}$ from combustion processes (including blasting) was considered in the air dispersion modelling as a surrogate for DPM.

The modelled concentrations for respirable silica, DPM, VOCs, hydrogen cyanide, carbon monoxide, calcium oxide and copper sulphate were determined for the construction of the mine (Table 6.2-8), the mine access road (Table 6.2-9) and the transmission line (Table 6.2-10). Further, the modelled concentrations for the maximum operating scenario were determined for the operation of the mine (Table 6.2-11). The modelled cumulative concentrations were determined by combining the baseline concentrations with the modelled concentrations from the Project. The modelled cumulative concentrations for respirable silica, DPM VOCs, hydrogen cyanide, carbon monoxide, calcium oxide and copper sulphate are below the respective AAQCs for all averaging periods at the extent of the property boundary and all PORs during construction and operation, including those located within the property boundary (Table 6.2-7).

Under the expected construction and operating scenarios, the increase above baseline conditions in the modelled cumulative concentrations of respirable silica, DPM, VOCs, hydrogen cyanide, carbon monoxide, calcium oxide and copper sulphate will not exceed the AAQCs.

6.2.7 Significance of Residual Effects

The existing airshed within the RSA is typical of a rural area in northern Ontario. The area is relatively undisturbed, and the VC can assimilate the predicted change of air quality with typical mitigation measures. As a result, the ecological and/or social context is low (Level I).

6.2.7.1 Change in Particulate Matter

With the appropriate mitigation measures, the magnitude of the residual effects on air quality is low (Level I) because the cumulative concentrations for the parameters are below the applicable criteria and/or standards at the extent of the leased property boundary. The duration of the residual effects on air quality is considered to be moderate (Level II), as there will be emissions to the atmosphere over the medium term, during the operation phase of the Project. However, the residual effects are fully reversible (Level I) as the air quality effects will cease and the previous ambient condition are expected to resume once the mining, ore processing and reclamation activities cease. The geographic extent of the residual effects is confined to the LSA (Level I) and predicted to occur frequently (Level III).

As the modelled cumulative concentrations for all particulate fractions (SPM, PM_{10}, and $PM_{2.5}$) are below their respective AAQCs at both the property boundary and the PORs during the construction and operations phases., and the residual effects on air quality will cease once mining ,ore processing and reclamation activities are completed, the adverse residual effect on air quality due to a change in the concentrations of particulate matter is predicted to be not significant.

6.2.7.2 Change in Nitrogen Oxides and Sulphur Dioxide

With the implementation of mitigation measures, the magnitude of the residual effects on air quality due to nitrogen oxides and sulphur dioxide is low (Level I) because the cumulative concentrations for both parameters are below the applicable criteria and/or standards at the extent of the leased property boundary. The duration of the residual effects on air quality is moderate (Level II), as there will be emissions to the atmosphere over the medium term, during the operation phase of the Project. However, the residual effects are fully reversible (Level I) as the air quality effects will cease and the previous ambient condition are expected to resume once the mining and ore processing activities cease and after reclamation. The geographic extent of the residual effects is confined to the LSA (Level I) and predicted to occur frequently (Level III).

Since the modelled cumulative concentrations for nitrogen dioxide and sulphur dioxide (for all averaging periods) are below their respective AAQCs at both the property boundary and the PORs during the construction and operations phases, and the residual effects on air quality will cease once mining, ore processing and reclamation activities are completed, the adverse residual effect on air quality due to a change in nitrogen oxides and sulphur dioxide is predicted to be not significant.

6.2.7.3 Change in Metals

With the implementation of mitigation measures, the magnitude of the residual effects on air quality due to metals is low (Level I) because the cumulative concentrations for all parameters are below the applicable criteria and/or standards at the extent of the leased property boundary. The duration of the residual effects on air quality is moderate (Level II) as there will be emissions to the atmosphere over the medium term, during the operation of the Project. However, the residual effects are fully reversible (Level I) as the air quality effects will cease and the previous ambient condition are expected to resume once the mining and ore processing activities cease and after reclamation. The geographic extent of the residual effects is confined to the LSA (Level I) and predicted to occur frequently (Level III).

As the modelled cumulative concentrations for all metals (for all averaging periods) are below their respective AAQCs at both the property boundary and the PORs during the construction and operations phases, and the residual effects on air quality will cease once mining, ore processing and reclamation activities are completed, the adverse residual effect on air quality due to a change in metals is predicted to be not significant.

6.2.7.4 Change in Polycyclic Aromatic Hydrocarbons

With the implementation of mitigation measures, the magnitude of the residual effects on air quality due to PAHs (as represented by b(a)p in this air quality assessment) is low (Level I) because the modelled Project concentrations are below the applicable criteria and/or standards at the extent of the leased property boundary. The duration of the residual effects on air quality is moderate (Level II) as there will be emissions to the atmosphere over the medium term, during the operation of the Project. However, the residual effects are fully reversible (Level I) as the air quality effects will cease and the previous ambient condition are expected to resume once the mining and ore processing activities cease and after reclamation. The geographic extent of the residual effects is confined to the LSA (Level I) and predicted to occur frequently (Level III).

Since the modelled cumulative concentrations for PAHs (in which b(a)p (24 hour) is used as a surrogate) is below the respective AAQC at the extent of the property boundary during construction, and the residual effects on air quality will cease once mining, ore processing and reclamation activities are completed, the adverse residual effect on air quality due to a change in PAHs is predicted to be not significant.

6.2.7.5 Change in Volatile Organic Compounds and Other Parameters

With the implementation of mitigation measures, the magnitude of the residual effects on air quality due to respirable silica, DPM, VOCs, hydrogen cyanide, carbon monoxide, calcium oxide and copper sulphate is low (Level I) because the modelled concentrations for these parameters are below the applicable criteria and/or standards at the extent of the leased property boundary. The duration of the residual effects on air quality is moderate (Level II), as there will be emissions to the atmosphere, over the medium term, during the operation phase of the Project. However, the residual effects are fully reversible (Level I) as the air quality effects will cease and the previous ambient condition are expected to resume once the mining and ore processing activities cease and after reclamation. The geographic extent of the residual effects is confined to the LSA (Level I) and predicted to occur frequently (Level III).

As the modelled concentrations for VOCs and respirable silica, DPM, hydrogen cyanide, carbon monoxide, calcium oxide and copper sulphate are below the respective AAQCs for all averaging periods at the extent of the property boundary and all PORs during construction and operation, including those located within the property boundary, and the residual effects on air quality will cease once mining, ore processing and reclamation activities are completed, the adverse residual effect on air quality due to a change in respirable silica, DPM, VOCs, hydrogen cyanide, carbon monoxide, calcium oxide and copper sulphate is predicted to be not significant.

6.2.8 Confidence Prediction

The level of confidence in the prediction is considered to be high. The effects are assessed based on the modelled values from the industry-standard AERMOD air dispersion model and the maximum operating scenario (Years 3 and 4). The modelled concentrations represent a conservative, worst-case approach that is expected to overestimate concentrations and considers a wide range of potential meteorological conditions. Further, when the model is used for regulatory purposes in Ontario, there is a bias towards overestimating parameter concentrations. It should be noted that if modelling uses a control efficiency of 85% and a silt content value of 5.8%, the geographic extent of the PM_{10} exceedances would still be confined to within the LSA, and is predicted to occur 0.1% of the time (up to two days over a five-year period) at the POR where predicted concentrations are highest.

6.2.9 References

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Table 6.2-1: Air Quality Criteria, Indicators and Rationale

Criteria	Indicator (2)	Rationale for the Selection of Criteria
Change in Criteria Air Parameters (1), including:		
Suspended particulate matter (SPM)	Air concentrations for the 24-hour and annual averaging periods	Emissions generated from Project material handling and blasting have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Particulate matter less than 10 microns (PM$_{10}$)	Air concentration for the 24-hour averaging period	
Particulate matter less than 2.5 microns (PM$_{2.5}$)	Air concentrations for the 24-hour and annual averaging periods	Emissions generated from Project material handling, blasting and fuel combustion have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Sulphur dioxide (SO$_2$)	Air concentrations for the 10-minute, 1-hour and annual averaging periods	Emissions generated from Project blasting, tailpipes and cyanide destruction have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Nitrogen dioxide (NO$_2$)	Air concentrations for the 1-hour and 24-hour averaging periods	Emissions generated from Project blasting and fuel combustion have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Change in Metals		
Arsenic (As), chromium (Cr), copper (Cu), iron (Fe), magnesium (Mg), manganese (Mn), mercury (Hg), titanium (Ti) and zinc (Zn)	Air concentration for a 24-hour averaging period	Emissions generated from mine rock handling have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Lead (Pb)	Air concentration for the 24-hour and 30-day averaging period	
Nickel (Ni)	Air concentration for the 24-hour and annual averaging periods	
Change in Volatile Organic Compounds (VOCs)		
Benzene,1-3,butadiene	Air concentration for a 24-hour and annual averaging period	Emissions generated from Project fuel combustion have the potential to result in changes to air quality and are assessed and compared to provincial and
Toluene, formaldehyde	Air concentration for a 24-hour averaging period	

Table 6.2-1: Air Quality Criteria, Indicators and Rationale (continued)

Criteria	Indicator [2]	Rationale for the Selection of Criteria
Ethylbenzene	Air concentrations for the 10-minute and 24-hour averaging periods	federal regulatory objectives, guidelines and/or standards.
Acetaldehyde	Air concentrations for the 0.5-hour and 24-hour averaging periods	
Change in Polycyclic Aromatic Hydrocarbons (PAHs)		
Benzo(a)pyrene	Air concentration for the 24-hour and annual averaging period	Emissions generated from Project fuel combustion have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards. B(a)p is an industry accepted surrogate for PAH.
Change in Other Parameters		
Diesel particulate matter (DPM)	Air concentrations for the 24-hour and annual averaging period	Emissions generated from Project fuel combustion have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Respirable silica (SiO_2)	Air concentration for the 24-hour averaging period	Emissions generated from mine rock handling have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Hydrogen cyanide (HCN)	Air concentration for the 24-hour averaging period	Emissions generated from Project ore cyanidation for gold recovery have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Carbon monoxide (CO)	Air concentrations for the 1-hour and 8-hour averaging period	Emissions generated from Project blasting and tailpipes have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.
Calcium oxide (CaO)	Air concentration for the 24-hour averaging period	

Table 6.2-1: Air Quality Criteria, Indicators and Rationale (continued)

Criteria	Indicator [2]	Rationale for the Selection of Criteria
Copper sulphate ($CuSO_4$)	Air concentration for the 24-hour averaging period	Emissions generated from Project reagent handling have the potential to result in changes to air quality and are assessed and compared to provincial and federal regulatory objectives, guidelines and/or standards.

Note:

(1) Also referred to as criteria air contaminants

(2) Measured as $\mu g/m^3$.

Table 6.2-2: Significance Determination Attributes and Rankings for Air Quality

Attribute	Description	Category
Magnitude	A qualitative or quantitative measure to describe the size or degree of the residual effects relative to baseline conditions	**Level I:** Predicted air concentrations meet applicable criteria and standards at extent of the leased property boundary. **Level II:** Predicted air concentrations are below the applicable criteria and/or standards at the extent of the LSA. **Level III:** Predicted air concentrations exceed the applicable criteria and/or standards at the extent of the LSA.
Geographic Extent	The spatial extent over which the residual effect will take place	**Level I:** Effect is restricted to the LSA. **Level II:** Effect extends beyond the LSA. **Level III:** Effect extends beyond the RSA.
Duration	The time period over which the residual effect will or is expected to occur	**Level I:** Effect occurs over the short term: less than or equal to 3 years. **Level II:** Effect occurs over the medium term: more than 3 years but less than 20 years. **Level III:** Effect occurs over the long term: greater than 20 years.
Frequency	The rate of occurrence of the residual effect	**Level I:** Effect occurs once, infrequently or not at all. **Level II:** Effect occurs intermittently or with a certain degree of regularity. **Level III:** Effect occurs frequently or continuously.
Reversibility	The extent to which the residual effect can be reversed	**Level I:** Effect is fully reversible. **Level II:** Effect is partially reversible or potentially reversible with difficulty. **Level III:** Effect is not reversible.

Table 6.2-3: Baseline Air Quality Concentrations

Parameter	Averaging Period	Baseline Concentration ($\mu g/m^3$)	Ambient Air Quality Criteria ($\mu g/m^3$)	Canadian Ambient Air Quality Standards (1) ($\mu g/m^3$)
Suspended particulate matter (SPM)	24-hour	14.1	120	—
	Annual	5.3	60	—
Particulate matter less than 10 µm (PM_{10})	24-hour	9.1	50 (Interim)	—
Particulate matter less than 2.5 µm ($PM_{2.5}$)	24-hour	9.1	27 (2)	27
	Annual	4.2	8.8	8.8
Diesel particulate matter (DPM)	24-hour	1.8	10 (3)	—
	Annual	1.8	5 (3)	—
Respirable silica (SiO_2, <10 µm)	24-hour	—	5	—
Nitrogen dioxide (NO_2) (4)	1-hour	30	400	79
	24-hour	28	200	—
	Annual	0.6	—	23
Carbon monoxide (CO)	0.5-hour	—	—	—
	1-hour	114	36,200	—
	8-hour	114	15,700	—
Sulphur dioxide (SO_2)	10-minute	1.7	175	—
	1-hour	1.0	105	170
	Annual	0.3	10	10
Hydrogen cyanide (HCN)	24-hour	—	8	—
Calcium oxide (CaO)	24-hour	0.12 (as Ca)	10	—
Arsenic (As)	24-hour	0.0010	0.3	—
Chromium (Cr)	24-hour	0.0012	0.5	—
Copper (Cu)	24-hour	0.14	50 (5)	
Iron (Fe)	24-hour	0.14	25	
Lead (Pb)	24-hour	0.0012	0.5	—
	30-day	0.0012	0.2	—
Magnesium (Mg)	24-hour	0.13	120 (6)	—
Manganese (Mn)	24-hour	0.0082	0.4 (as SPM)	—
		0.0082	0.2 (as PM_{10})	—
		0.0082	0.1 (as $PM_{2.5}$)	—
Mercury (Hg)	24-hour	0.000012	2	—

Table 6.2-1: Air Quality Criteria, Indicators and Rationale (continued)

Parameter	Averaging Period	Baseline Concentration (µg/m^3)	Ambient Air Quality Criteria (µg/m^3)	Canadian Ambient Air Quality Standards (1) (µg/m^3)
Nickel (Ni)	24-hour	0.0015	0.2 (as SPM)	—
		0.0015	0.1 (as PM_{10})	—
	Annual	0.00089	0.04 (as SPM)	—
		0.00089	0.02 (as PM_{10})	—
Titanium (Ti)	24-hour	0.0061	120	—
Zinc (Zn)	24-hour	0.010	120	—
Benzene	24-hour	0.49	0.45	—
	Annual	0.30	2.3	—
1,3-butadiene	24-hour	0.24	10	—
	Annual	0.26	2	—
Formaldehyde	24-hour	1.5	65	—
Acetaldehyde	0.5-hour	7.0	500	—
	24-hour		500	—
Benzo(a)pyrene (7)	24-hour	0.000036	0.00005	—
	Annual	0.000018	0.00001	—

Notes:

(1) 2025 CAAQS for NO_2 and SO_2. Note that the CAAQS are based on specific statistical forms and not for direct comparison of the maximum modelled effects.

(2) The MECP references the CAAQS for assessment of $PM_{2.5}$ effects.

(3) Acute and chronic criteria for diesel particulate matter (Health Canada 2016).

(4) Nitrogen oxides (NOx) expressed as NO_2.

(5) The copper fraction of copper sulphate was compared to the copper AAQC.

(6) Magnesium oxide as surrogate.

(7) Benzo(a)pyrene, as a surrogate for total PAHs.

< = less than; µm = micron; — = no criterion or standard for the respective parameter and/or averaging period.

Table 6.2-4: Potential Interactions of Project Components with Air Quality

Project Component / Activity	Air Quality
Construction Phase	
Site preparation activities including clearing, grubbing and bulk earthworks	Yes
Construction of the mine access road and airstrip, including the development and operation of aggregate resource areas	Yes
Development of temporary construction camp and staging areas	Yes
Construction of the fish habitat development area	Yes
Construction of the transmission line to the Project site	Yes
Construction of the onsite haul and access roads	Yes
Construction of the dikes in the north basin of Springpole Lake	Yes
Construction of buildings and onsite infrastructure	-
Construction of the central water storage pond	Yes
Controlled dewatering of the open pit basin	Yes
Construction of the starter embankments for the CDF	Yes
Stripping of lake bed sediment and overburden at the open pit	Yes
Development of the surficial soil stockpile	Yes
Initiation of pit development in rock	Yes
Initiation of stockpiling of ore	Yes
Establishment and operation of water management and treatment facilities	-
Commissioning of the process plant	Yes
Employment and expenditures	-
Operation Phase	
Operation of the process plant	Yes
Operation of open pit mine	Yes
Management of overburden, mine rock, tailings and ore in designated facilities	Yes
Operation of water management and treatment facilities	-
Accommodations complex operations	-
Operation and maintenance of mine site infrastructure	Yes
Progressive reclamation activities	Yes
Employment and expenditures	-
Decommissioning and Closure Phase	
Removal of assets that can be salvaged	Yes
Demolition and recycling and/or disposal of remaining materials	Yes
Removal and disposal of demolition-related wastes in approved facilities	Yes
Reclamation of impacted areas, such as by regrading, placement of cover, and revegetation	Yes
Filling the open pit with water	-
Monitoring and maintenance	-
Employment and expenditures	-

Note:
\- = The interaction is not expected, and no further assessment is warranted.

Table 6.2-5: Proposed Mitigation Measures for Potential Air Quality Effects

Pathways To Potential Effect / Criteria	Phase			Proposed Mitigation Measure
	Con.	Op.	Cl.	
Change in criteria air parameters	●	●	●	Dust emissions from roads and mineral stockpiles will be controlled through the application of water spray and supplemented by dust suppressants if required.
	●	●	●	Site roads will be maintained in good condition, with regular inspections and timely maintenance completed to minimize the silt loading on the roads.
	●	●	●	Vehicle speeds will be limited.
	–	●	–	The process plant emission sources will be enclosed where possible and designed to allow good atmospheric dispersion. To reduce emissions, dust control equipment and best practices will be used, where necessary, as described below: • Conveyor transfer (drop) points will be controlled via enclosure or water spray; • Crushed ore stockpile will be enclosed, and emissions controlled by a baghouse; • A wet scrubber or equivalent will be used to control emissions in grinding (baghouse controlled); • Truck unloading at the primary crusher will be enclosed and emissions controlled by a baghouse; • Drill rigs will be equipped with a dust shroud on the drill and a wet suppression (spray) system will be used; • Truck placement of mine rock onto the CDF will be controlled using water sprays and surface wetting; • Travel surfaces will be maintained to minimize silt (fine material); • Crushing of ore materials and reclaim at stockpiles will be controlled by baghouses; • The vents from the lime silo will be controlled by a dust collector; • Areas for ore mixing and handling will be controlled by dust collectors; and • A regular maintenance schedule will be followed to ensure baghouses and dust collectors are functioning properly.
	●	●	●	Air emissions from the use of diesel fuel for the mobile heavy equipment will be controlled through strategic mine scheduling to minimize the total distance travelled by haul trucks and other equipment and through the use of low sulphur diesel fuel.
	●	●	●	A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment and standby power generation) and all processes with the potential for air quality effects.
	–	–	●	Exposed dust sources will be revegetated, and progressive reclamation will be conducted wherever appropriate to better control dust emissions from the mineral waste stockpiles and CDF.

Table 6.2-5: Proposed Mitigation Measures for Potential Air Quality Effects (continued)

Pathways To Potential Effect / Criteria	Phase			Proposed Mitigation Measure
	Con.	Op.	Cl.	
	–	●	–	PAG mine rock will be placed in the CDF with thickened tailings being deposited into the mine rock gaps and voids from the perimeter dam to minimize the exposure of tailings that could generate dust. Further, the mine rock level will be maintained above the tailings to minimize the exposed tailings surface area.
	–	–	●	Following completion of PAG mine rock disposal within the north cell of the CDF, NAG tailings will be deposited over the entire North Cell surface to fully cover the PAG mine rock and limit oxygen ingress. To minimize the exposure of tailings to winds generating dust, a vegetation cover will be established.
	●	●	–	A dust management plan will be implemented to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed.
	●	●	–	A blasting plan will be implemented and include measures to minimize the length of time the blasting material is allowed to sit in a drill hole before blasting. The blast schedule will optimize air dispersion to minimize effects on air quality, including by avoiding blasting during unfavourable meteorological conditions as needed.
Change to metals	●	●	●	Dust emissions from roads and mineral stockpiles will be controlled through the application of water spray and supplemented by dust suppressants if required.
	●	●	●	Vehicle speeds will be limited.
	–	●	–	The process plant emission sources will be enclosed where possible and designed to allow good atmospheric dispersion. To reduce emissions, dust control equipment and best practices will be used, where necessary, as described below: • Conveyor transfer (drop) points will be controlled via enclosure or water spray; • Crushed ore stockpile will be enclosed, and emissions controlled by a baghouse; • A wet scrubber or equivalent will be used to control emissions in grinding (baghouse controlled); • Truck unloading at the primary crusher will be enclosed and emissions controlled by a baghouse; • Drill rigs will be equipped with a dust shroud on the drill and a wet suppression (spray) system will be used; • Truck placement of mine rock onto the CDF will be controlled using water sprays and surface wetting; • Travel surfaces will be maintained to minimize silt (fine material); • Crushing of ore materials and reclaim at stockpiles will be controlled by baghouses; • The vents from the lime silo will be controlled by a dust collector;

Table 6.2-5: Proposed Mitigation Measures for Potential Air Quality Effects (continued)

Pathways To Potential Effect / Criteria	Phase			Proposed Mitigation Measure
	Con.	Op.	Cl.	
				• Areas for ore mixing and handling will be controlled by dust collectors; and • A regular maintenance schedule will be followed to ensure baghouses and dust collectors are functioning properly.
	–	●	–	Air emissions from the use of diesel fuel for the mobile heavy equipment will be controlled through strategic mine scheduling to minimize the total distance travelled by haul trucks and other equipment and through the use of low sulphur diesel fuel.
	●	●	●	A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment and standby power generation) and all processes with the potential for air quality effects.
	–	–	●	Exposed dust sources will be revegetated, and progressive reclamation will be conducted wherever appropriate to better control dust emissions from the mineral waste stockpiles and CDF.
	–	●	–	PAG mine rock will be placed in the CDF with thickened tailings being deposited into the mine rock gaps and voids from the perimeter dam to minimize the exposure of tailings that could generate dust. Further, the mine rock level will be maintained above the tailings to minimize the exposed tailings surface area.
	–	–	●	Following completion of PAG mine rock disposal within the north cell of the CDF, NAG tailings will be deposited over the entire North Cell surface to fully cover the PAG mine rock and limit oxygen ingress. To minimize the exposure of tailings to winds generating dust, a vegetation cover will be established.
	●	●	–	A dust management plan will be implemented to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed.
	●	●	–	A blasting plan will be implemented and include measures to minimize the length of time the blasting material is allowed to sit in a drill hole before blasting. The blast schedule will optimize air dispersion to minimize effects on air quality, including by avoiding blasting during unfavourable meteorological conditions as needed.
Change in VOCs and PAHs	–	●	–	Air emissions from the use of diesel fuel for the mobile heavy equipment will be controlled through strategic mine scheduling to minimize the total distance travelled by haul trucks and other equipment and through the use of low sulphur diesel fuel.

Table 6.2-5: Proposed Mitigation Measures for Potential Air Quality Effects (continued)

Pathways To Potential Effect / Criteria	Phase			Proposed Mitigation Measure
	Con.	Op.	Cl.	
	●	●	●	A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment and standby power generation) and all processes with the potential for air quality effects.
Change to other parameters	●	●	●	Dust emissions from roads and mineral stockpiles will be controlled through the application of water spray as needed, supplemented by dust suppressants if required.
	●	●	●	Vehicle speeds will be limited.
	–	●	–	The process plant emission sources will be enclosed where possible and designed to allow good atmospheric dispersion. To reduce emissions, dust control equipment and best practices will be used, where necessary, as described below: • Conveyor transfer (drop) points will be controlled via enclosure or water spray; • Crushed ore stockpile will be enclosed, and emissions controlled by a baghouse; • A wet scrubber or equivalent will be used to control emissions in grinding (baghouse controlled); • Truck unloading at the primary crusher will be enclosed and emissions controlled by a baghouse; • Drill rigs will be equipped with a dust shroud on the drill and a wet suppression (spray) system will be used; • Truck placement of mine rock onto the CDF will be controlled using water sprays and surface wetting; • Travel surfaces will be maintained to minimize silt (fine material); • Crushing of ore materials and reclaim at stockpiles will be controlled by baghouses; • The vents from the lime silo will be controlled by a dust collector; • Areas for ore mixing and handling will be controlled by dust collectors; and • A regular maintenance schedule will be followed to ensure baghouses and dust collectors are functioning properly.
	–	●	–	Air emissions from the use of diesel fuel for the mobile heavy equipment will be controlled through strategic mine scheduling to minimize the total distance travelled by haul trucks and other equipment and through the use of low sulphur diesel fuel.
	–	●	–	Hydrogen cyanide emissions will be eliminated through the sulphur dioxide / oxygen cyanide treatment process to reduce cyanide in the tailings at the process plant and before deposition of tailings in the CDF. Excess sulphur dioxide used in this process will be recirculated (i.e., a closed-loop) without release to the air.

Table 6.2-5: Proposed Mitigation Measures for Potential Air Quality Effects (continued)

Pathways To Potential Effect / Criteria	Phase			Proposed Mitigation Measure
	Con.	Op.	Cl.	
	●	●	●	A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment and standby power generation) and all processes with the potential for air quality effects.
	–	●	–	PAG mine rock will be placed in the CDF with thickened tailings being deposited into the mine rock gaps and voids from the perimeter dam to minimize the exposure of tailings that could generate dust. Further, the mine rock level will be maintained above the tailings to minimize the exposed tailings surface area.
	–	–	●	Following completion of PAG mine rock disposal within the north cell of the CDF, NAG tailings will be deposited over the entire North Cell surface to fully cover the PAG mine rock and limit oxygen ingress. To minimize the exposure of tailings to winds generating dust, a vegetation cover will be established.
	●	●	–	A dust management plan will be implemented to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed.
	●	●	–	A blasting plan will be implemented and include measures to minimize the length of time the blasting material is allowed to sit in a drill hole before blasting. The blast schedule will optimize air dispersion to minimize effects on air quality, including by avoiding blasting during unfavourable meteorological conditions as needed.

Note:

Con = Construction; Op = Operation; Cl = Closure; ● = mitigation is applicable; – = mitigation is not applicable.

Table 6.2-6: Construction and Operation Phase Material Movements

	Construction Phase (Year -1)	Maximum Annual Operation Phase (Year 4)	Maximum Emission Scenario for Air Dispersion Modelling (hybrid of Years 3 and 4)$^{(1)}$
Material Movements (Tonnes)			
Ore	3,224,094	9,372,386	16,873,480
Overburden	3,450,702	5,321,071	3,404,235
Mine rock	13,329,204	45,306,543	37,222,286
Total material movements	20,004,000	60,000,000	57,500,000

Note:

(1) This scenario uses the average ore and mine rock moved from Year 3 (peak ore extraction) and Year 4 (peak mine rock extraction).

Table 6.2-7: Operation Phase – Emissions Summary Table with Maximum Concentration at a Point of Reception

Compound	CAS Number	Averaging Period	Receptor ID	Project Emission Rate (g/s)	Modelled POI Concentration (µg/m^3)	Baseline Concentration (µg/m^3)	Modelled + Baseline Concentration (µg/m^3)	AAQC (µg/m^3)	% of Criterion
Suspended particulate matter (SPM)	NA	24-hour	POR03	20.7	21.0	14.1	35.1	120	29%
		annual	POR05		2.1	5.3	7.4	60	12%
Inhalable particulate (PM$_{10}$)	NA	24-hour	POR03	8.46	21.0	9.1	30.1	50	60%
Respirable particulate (PM$_{2.5}$)	NA	24-hour	POR03	3.12	9.9	9.1	19.0	27	70%
		annual	POR05		0.6	4.2	4.8	8.8	55%
Diesel particulate matter (DPM)	NA	24-hour	POR02	0.48	2.5	1.8	4.31	10	43%
		annual	POR02		0.2	1.8	2.04	5	41%
Respirable silica (<10 µm)	various	24-hour	POR03	0.63	1.58	–	1.58	5	32%
Nitrogen dioxide (NO$_2$)	10102-44-0	1-hour	POR03	99	273.2	30.0	303.2	400	76%
		24-hour	POR02	33.8	56.5	28.0	84.5	200	42%
Carbon monoxide (CO)	630-08-0	1-hour	POR03	363	8458.5	114	8572	36200	24%
		8-hour	POR03	49.22	1093.0	114	1207	15700	7.7%
Sulphur dioxide (SO$_2$)	7446-09-5	10-minute	POR05	4.26	8.4	1.70	10.1	178	5.7%
		1-hour	POR05	4.26	5.1	1.00	6.1	100	6.1%
		annual	POR02	0.23	0.04	0.30	0.34	10	3.4%
Hydrogen cyanide (HCN)	74-90-8	24-hour	POR03	0.42	1.8	–	1.80	8	22%
Calcium oxide (CaO)	1305-78-8	24-hour	POR03	0.13	1.52	0.12	1.64	10	16%
Arsenic (As)	7440-38-2	24-hour	POR03	0.0035	0.0036	0.0010	0.0046	0.3	1.5%
Chromium (Cr)	7440-47-3	24-hour	POR03	0.0023	0.0024	0.0012	0.0036	0.5	0.7%
Copper (Cu)	7440-50-8	24-hour	POR03	0.003	0.0028	0.14	0.14	50	0.3%
Iron (Fe)	7439-89-6	24-hour	POR03	1.54	1.6015	0.14	1.74	25	7.0%
Lead (Pb)	7439-92-1	24-hour	POR03	0.0025	0.0026	0.0012	0.0038	0.5	0.8%
		30-day	POR03	0.0025	0.0026	0.0012	0.0038	0.2	1.9%
Magnesium (Mg)	1309-48-4	24-hour	POR03	0.60	0.63	0.13	0.76	120	0.6%
Manganese (Mn, as PM$_{2.5}$)	7439-96-5	24-hour	POR03	0.0031	0.019	0.0082	0.027	0.1	27%
Manganese (Mn, as PM$_{10}$)		24-hour	POR03	0.008	0.040	0.0082	0.048	0.2	24%
Manganese (Mn, as SPM)		24-hour	POR03	0.038	0.040	0.0082	0.048	0.4	12%
Mercury	7439-97-6	24-hour	POR03	0.000006	0.0000067	0.000012	0.000019	2	0.001%
Nickel (Ni, as SPM)	7440-02-0	24-hour	POR03	0.0018	0.0019	0.0015	0.0034	0.2	1.7%
		annual	POR05		0.00019	0.00089	0.0011	0.04	2.7%
Nickel (Ni, as PM$_{10}$)		24-hour	POR03	0.0007	0.0019	0.0015	0.0034	0.1	3.4%
		annual	POR05		0.00016	0.00089	0.0011	0.02	5.3%
Titanium (Ti)	7440-32-6	24-hour	POR03	0.039	0.04	0.0061	0.0462	120	0.04%

Table 6.2-7: Operation Phase – Emissions Summary Table with Maximum Concentration at a Point of Reception (continued)

Compound	CAS Number	Averaging Period	Receptor ID	Project Emission Rate (g/s)	Modelled POI Concentration (µg/m^3)	Baseline Concentration (µg/m^3)	Modelled + Baseline Concentration (µg/m^3)	AAQC (µg/m^3)	% of Criterion
Zinc (Zn)	7440-66-6	24-hour	POR03	0.0053	0.0055	0.0100	0.015	120	0.01%
Benzene	71-43-2	24-hour	POR02	0.80	0.32	0.49	0.811	2.3	35%
		annual	POR02		0.03	0.30	0.330	0.45	73%
1,3-butadiene	106-99-0	24-hour	POR02	0.033	0.01	0.24	0.25	10	2.5%
		annual	POR02		0.0013	0.26	0.26	2	13%
Formaldehyde	50-00-0	24-hour	POR02	1.6	2.05	1.50	3.55	65	5.5%
Acetaldehyde	75-07-0	0.5-hour	POR03	0.82	4.62	7	11.6	500	2.3%
		24-hour	POR02		0.73	7	7.73	500	1.5%
Benzo(a)pyrene	50-32-8	24-hour	POR02	0.0000043	0.000013	0.00004	0.00005	0.00005	97%
		annual	POR02		0.0000010	0.00002	0.00002	0.00001	**190%**

Notes:

CAS = Chemical Abstracts Service; g/s = grams per second; NA = not applicable; < = less than; µm = micron; – = no value for the respective parameter and/or averaging period.

Bolded text indicates that the modelled + baseline concentration are higher than the AAQC.

Table 6.2-8: Mine Infrastructure Construction Phase – Emissions Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration (µg/m^3)	Baseline Concentration (µg/m^3)	Modelled + Baseline Concentration (µg/m^3)	AAQC (µg/m^3)	% of Criterion
Suspended particulate matter (SPM)	NA	24-hour	5.9	7.3	14.1	21.4	120	18%
		annual		0.4	5.3	5.7	60	9%
Inhalable particulate (PM$_{10}$)	NA	24-hour	2.08	7.1	9.1	16.2	50	32%
Respirable particulate (PM$_{2.5}$)	NA	24-hour	1.25	5.1	9.1	14.2	27	53%
		annual		0.19	4.2	4.39	8.8	50%
Diesel particulate matter (DPM)	NA	24-hour	0.46	0.60	1.8	2.40	10	24%
		annual		0.03	1.8	1.83	5	37%
Respirable silica (<10 µm)	various	24-hour	0.16	0.53	–	0.53	5	11%
Nitrogen dioxide (NO$_2$)	10102-44-0	1-hour	8	139	30	169	400	42%
		24-hour	7	40	28	68	200	34%
Carbon monoxide (CO)	630-08-0	1-hour	3	78	114	192	36200	0.5%
		8-hour	3.34	15	114	129	15700	0.8%
Sulphur dioxide (SO$_2$)	7446-09-5	10-minute	0.39	21.5	1.7	23.2	178	13%
		1-hour	0.39	13.0	1.00	14.0	100	14%
		annual	0.39	0.05	0.30	0.35	10	3.5%
Arsenic (As)	7440-38-2	24-hour	0.0010	0.001	0.0010	0.002	0.3	0.8%
Chromium (Cr)	7440-47-3	24-hour	0.0007	0.001	0.0012	0.0020	0.5	0.4%
Copper (Cu)	7440-50-8	24-hour	0.0008	0.001	0.14	0.14	50	0.3%
Iron (Fe)	7439-89-6	24-hour	0.45	0.560	0.14	0.70	25	2.8%
Lead (Pb)	7439-92-1	30-day	0.0007	0.0009	0.0012	0.0021	0.5	0.4%
		24-hour	0.0007	0.0009	0.0012	0.0021	0.2	1.1%
Magnesium (Mg)	1309-48-4	24-hour	0.1760	0.22	0.13	0.35	120	0.3%
Manganese (Mn, as PM$_{2.5}$)	7439-96-5	24-hour	0.0024	0.010	0.0082	0.018	0.1	18%
Manganese (Mn, as PM$_{10}$)		24-hour	0.0039	0.013	0.0082	0.02	0.2	11%
Manganese (Mn, as SPM)		24-hour	0.0112	0.01	0.0082	0.02	0.4	5.5%
Mercury	7439-97-6	24-hour	0.0000019	0.0000023	0.000012	0.000014	2	0.001%
Nickel (Ni, as SPM)	7440-02-0	24-hour	0.0005	0.0006	0.0015	0.0021	0.2	1.1%
		annual		0.00003	0.00089	0.0009	0.04	2.3%
Nickel (Ni, as PM$_{10}$)		24-hour	0.0002	0.0006	0.0015	0.0021	0.1	2.1%
		annual		0.00003	0.00089	0.0009	0.02	4.6%
Titanium (Ti)	7440-32-6	24-hour	0.0113	0.01	0.0061	0.02	120	0.02%
Zinc (Zn)	7440-66-6	24-hour	0.0015	0.002	0.010	0.012	120	0.01%

Table 6.2-8: Mine Infrastructure Construction Phase – Emissions Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria (continued)

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration (µg/m³)	Baseline Concentration (µg/m³)	Modelled + Baseline Concentration (µg/m³)	AAQC (µg/m³)	% of Criterion
Benzene	71-43-2	24-hour	0.016	0.07	0.49	0.56	2.3	25%
		annual		0.002	0.30	0.30	0.45	67%
1,3-Butadiene	106-99-0	24-hour	0.0001	0.00040	0.24	0.24	10	2.4%
		annual		0.00002	0.26	0.26	2	13.0%
Formaldehyde	50-00-0	24-hour	0.01	0.03	1.50	1.53	65	2.4%
Acetaldehyde	75-07-0	0.5-hour	0.005	0.24	7.0	7.24	500	1.4%
		24-hour		0.02	7.0	7.02	500	1.4%
Benzo(a)pyrene	50-32-8	24-hour	0.0000005	0.000001	0.000036	0.00004	0.00005	75%
		annual		0.0000001	0.000018	0.00002	0.00001	**181%**

Notes:

CAS = Chemical Abstracts Service; g/s = grams per second; NA = not applicable; < = less than; µm = micron; – = no value for the respective parameter and/or averaging period.

Bolded text indicates that the modelled + baseline concentration are higher than the AAQC.

Table 6.2-9: Mine Access Road Construction Phase – Emissions Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)	Modelled + Baseline Concentration ($\mu g/m^3$)	AAQC ($\mu g/m^3$)	% of Criterion
Suspended particulate matter (SPM)	NA	24-hour	0.3	28.1	14.1	42.2	120	35%
		annual		5.4	5.3	10.7	60	18%
Inhalable particulate (PM_{10})	NA	24-hour	0.11	9.9	9.1	19.0	50	38%
Respirable particulate ($PM_{2.5}$)	NA	24-hour	0.08	6.9	9.1	16.0	27	59%
		annual		1.3	4.2	5.53	8.8	63%
Diesel particulate matter (DPM)	NA	24-hour	0.07	6.1	1.8	7.91	10	79%
		annual		1.2	1.8	2.97	5	59%
Respirable silica (<10 µm)	various	24-hour	0.01	0.74	–	0.74	5	15%
Nitrogen dioxide (NO_2)	10102-44-0	1-hour	2	129	30	159	400	40%
		24-hour	1.1	55	28	83	200	42%
Carbon monoxide (CO)	630-08-0	1-hour	0.9	360	114	474	36200	1.3%
		8-hour	0.9	129	114	243	15700	1.5%
Arsenic (As)	7440-38-2	24-hour	0.0001	0.005	0.0010	0.006	0.3	1.9%
Chromium (Cr)	7440-47-3	24-hour	0.00004	0.003	0.0012	0.0044	0.5	0.9%
Copper (Cu)	7440-47-3	24-hour	0.00004	0.004	0.14	0.14	50	0.3%
Iron (Fe)	7439-89-6	24-hour	0.02	2.144	0.14	2.28	25	9%
Lead (Pb)	7439-92-1	24-hour	0.00004	0.0035	0.0012	0.0047	0.5	0.9%
		30-day	0.00004	0.0035	0.0012	0.0047	0.2	2.3%
Magnesium (Mg)	1309-48-4	24-hour	0.0096	0.84	0.13	0.97	120	0.8%
Manganese (Mn, as $PM_{2.5}$)	7439-96-5	24-hour	0.0002	0.013	0.0082	0.021	0.1	21%
Manganese (Mn, as PM_{10})		24-hour	0.0002	0.019	0.0082	0.03	0.2	14%
Manganese (Mn, as SPM)		24-hour	0.0006	0.05	0.0082	0.06	0.4	15%
Mercury	7439-97-6	24-hour	0.0000001	0.0000089	0.000012	0.000021	2	0.001%
Nickel (Ni, as SPM)	7440-02-0	24-hour	0.00003	0.0025	0.0015	0.0040	0.2	2.0%
		annual		0.0005	0.00089	0.0014	0.04	3.4%
Nickel (Ni, as PM_{10})		24-hour	0.00001	0.0009	0.0015	0.0024	0.1	2.4%
		annual		0.00009	0.00089	0.0010	0.02	4.9%
Titanium (Ti)	7440-32-6	24-hour	0.0006	0.05	0.0061	0.06	120	0.05%
Zinc (Zn)	7440-66-6	24-hour	0.0001	0.007	0.010	0.017	120	0.01%

Table 6.2-9: Mine Access Road Construction Phase – Emissions Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria (continued)

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration (µg/m^3)	Baseline Concentration (µg/m^3)	Modelled + Baseline Concentration (µg/m^3)	AAQC (µg/m^3)	% of Criterion
Benzene	71-43-2	24-hour	0.003	0.26	0.49	0.75	2.3	33%
		annual	0.003	0.05	0.30	0.35	0.45	78%
1,3-butadiene	106-99-0	24-hour	0.0001	0.011	0.24	0.25	10	2.5%
		annual	0.0001	0.0022	0.26	0.26	2	13.1%
Formaldehyde	50-00-0	24-hour	0.02	1.62	1.50	3.12	65	4.8%
Acetaldehyde	75-07-0	0.5-hour	0.013	3.30	7	10.30	500	2.1%
		24-hour	0.013	0.58	7	7.58	500	1.5%
Benzo(a)pyrene	50-32-8	24-hour	0.0000004	0.000002	0.000036	0.00004	0.00005	75%
		annual	0.0000004	0.00000011	0.000018	0.00002	0.00001	**181%**

Notes:

CAS = Chemical Abstracts Service; g/s = grams per second; NA = not applicable; < = less than; µm = micron; – = no value for the respective parameter and/or averaging period.

Bolded text indicates that the modelled + baseline concentration are higher than the AAQC.

Table 6.2-10: Transmission Line Construction Phase – Emissions Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)	Modelled + Baseline Concentration ($\mu g/m^3$)	AAQC ($\mu g/m^3$)	% of Criterion
Suspended particulate matter (SPM)	NA	24-hour	0.12	5.4	14.1	19.5	120	16%
		annual		0.5	5.3	5.8	60	10%
Inhalable particulate (PM_{10})	NA	24-hour	0.10	4.4	9.1	13.5	50	27%
Respirable particulate ($PM_{2.5}$)	NA	24-hour	0.09	4.2	9.1	13.3	27	49%
		annual		0.42	4.2	4.62	8.8	52%
Diesel particulate matter (DPM)	NA	24-hour	0.09	4.11	1.8	5.91	10	59%
		annual		0.41	1.8	2.21	5	44%
Respirable silica (<10 µm)	various	24-hour	0.01	0.33	–	0.33	5	7%
Nitrogen dioxide (NO_2)	10102-44-0	1-hour	3	38	30	68	400	17%
		24-hour	1.3	7	28	35	200	17%
Carbon monoxide (CO)	630-08-0	1-hour	1.2	344	114	458	36200	1.3%
		8-hour	0.86	65	114	179	15700	1.1%
Arsenic (As)	7440-38-2	24-hour	0.00002	0.001	0.0010	0.002	0.3	0.6%
Chromium (Cr)	7440-47-3	24-hour	0.00001	0.001	0.0012	0.0018	0.5	0.4%
Copper (Cu)	7440-47-3	24-hour	0.00002	0.001	0.14	0.14	50	0.3%
Iron (Fe)	7439-89-6	24-hour	0.01	0.41	0.14	0.55	25	2%
Lead (Pb)	7439-92-1	24-hour	0.00001	0.0007	0.0012	0.0019	0.5	0.4%
		30-day	0.00001	0.0007	0.0012	0.0019	0.2	0.9%
Magnesium (Mg)	1309-48-4	24-hour	0.0035	0.16	0.13	0.29	120	0.2%
Manganese (Mn, as $PM_{2.5}$)	7439-96-5	24-hour	0.0002	0.008	0.0082	0.016	0.1	16%
Manganese (Mn, as PM_{10})		24-hour	0.0002	0.008	0.0082	0.02	0.2	8.3%
Manganese (Mn, as SPM)		24-hour	0.0002	0.01	0.0082	0.02	0.4	4.6%
Mercury	7439-97-6	24-hour	0.00000004	0.0000017	0.000012	0.000014	2	0.001%
Nickel (Ni, as SPM)	7440-02-0	24-hour	0.00001	0.0005	0.0015	0.0020	0.2	1.0%
		annual		0.0000	0.00089	0.0009	0.04	2.3%
Nickel (Ni, as PM_{10})		24-hour	0.00001	0.0004	0.0015	0.0019	0.1	1.9%
		annual		0.00004	0.00089	0.0009	0.02	4.6%
Titanium (Ti)	7440-32-6	24-hour	0.0002	0.01	0.0061	0.02	120	0.01%
Zinc (Zn)	7440-66-6	24-hour	0.0000	0.001	0.010	0.011	120	0.01%

Table 6.2-10: Transmission Line Construction Phase – Emissions Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria (continued)

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration (µg/m^3)	Baseline Concentration (µg/m^3)	Modelled + Baseline Concentration (µg/m^3)	AAQC (µg/m^3)	% of Criterion
Benzene	71-43-2	24-hour	0.004	0.16	0.49	0.65	2.3	28%
		annual	0.0002	0.016	0.30	0.32	0.45	70%
1,3-butadiene	106-99-0	24-hour	0.0002	0.008	0.24	0.25	10	2.5%
		annual	0.004	0.0008	0.26	0.26	2	13.0%
Formaldehyde	50-00-0	24-hour	0.03	1.22	1.50	2.72	65	4.2%
Acetaldehyde	75-07-0	0.5-hour	0.016	5.64	7.0	12.64	500	2.5%
		24-hour	0.016	0.75	7.0	7.75	500	1.5%
Benzo(a)pyrene	50-32-8	24-hour	0.0000004	0.000001	0.000036	0.00004	0.00005	74%
		annual	0.0000004	0.0000001	0.000018	0.00002	0.00001	**181%**

Notes:

CAS = Chemical Abstracts Service; g/s = grams per second; NA = not applicable; < = less than; µm = micron; – = no value for the respective parameter and/or averaging period.

Bolded text indicates that the modelled + baseline concentration are higher than the AAQC.

Table 6.2-11: Operation Phase – Emission Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)	Modelled + Baseline Concentration ($\mu g/m^3$)	AAQC ($\mu g/m^3$)	% of Criterion
Suspended particulate matter (SPM)	NA	24-hour	20.7	29.7	14.1	43.8	120	37%
		annual		2.4	5.3	7.7	60	13%
Inhalable particulate (PM$_{10}$)	NA	24-hour	8.46	29.7	9.1	38.8	50	78%
Respirable particulate (PM$_{2.5}$)	NA	24-hour	3.12	17.2	9.1	27.0	27	97%
		annual		1.07	4.2	5.27	8.8	60%
Diesel particulate matter (DPM)	NA	24-hour	0.48	2.55	1.8	4.35	10	44%
		annual		0.24	1.8	2.04	5	41%
Respirable silica (<10 µm)	various	24-hour	0.63	2.71	–	2.71	5	54%
Nitrogen dioxide (NO$_2$)	10102-44-0	1-hour	99	148	30	178	400	44%
		24-hour	33.8	57	28	85	200	42%
Carbon monoxide (CO)	630-08-0	1-hour	363	2150	114	2264	36200	6.3%
		8-hour	49.22	419	114	533	15700	3.4%
Sulphur dioxide (SO$_2$)	7446-09-5	10-minute	4.26	44.5	1.7	46.2	178	26%
		1-hour	4.26	26.9	1.0	27.9	100	28%
		annual	0.23	0.04	0.30	0.34	10	3.4%
Hydrogen cyanide (HCN)	74-90-8	24-hour	0.42	4.22	–	4.22	8	53%
Calcium oxide (CaO)	1305-78-8	24-hour	0.13	1.08	0.12	1.20	10	12%
Arsenic (As)	7440-38-2	24-hour	0.0035	0.005	0.0010	0.006	0.3	2.0%
Chromium (Cr)	7440-47-3	24-hour	0.0023	0.003	0.0012	0.0046	0.5	0.9%
Copper (Cu)	7440-50-8	24-hour	0.0027	0.004	0.14	0.14	50	0.3%
Iron (Fe)	7439-89-6	24-hour	1.54	2.26	0.14	2.40	25	10%
Lead (Pb)	7439-92-1	30-day	0.0025	0.0037	0.0012	0.0049	0.5	1.0%
		24-hour	0.0025	0.0037	0.0012	0.0049	0.2	2.4%
Magnesium (Mg)	1309-48-4	24-hour	0.60	0.89	0.13	1.02	120	0.8%
Manganese (Mn, as PM$_{2.5}$)	7439-96-5	24-hour	0.0031	0.033	0.0082	0.041	0.1	41%
Manganese (Mn, as PM$_{10}$)		24-hour	0.0085	0.056	0.0082	0.065	0.2	32%
Manganese (Mn, as SPM)		24-hour	0.038	0.056	0.0082	0.06	0.4	16%
Mercury	7439-97-6	24-hour	0.000006	0.0000094	0.000012	0.000021	2	0.001%
Nickel (Ni, as SPM)	7440-02-0	24-hour	0.0018	0.0026	0.0015	0.0041	0.2	2.1%
		annual		0.0002	0.00089	0.0011	0.04	2.7%
Nickel (Ni, as PM$_{10}$)		24-hour	0.0007	0.0026	0.0015	0.0041	0.1	4.1%
		annual		0.00019	0.00089	0.0011	0.02	5.4%

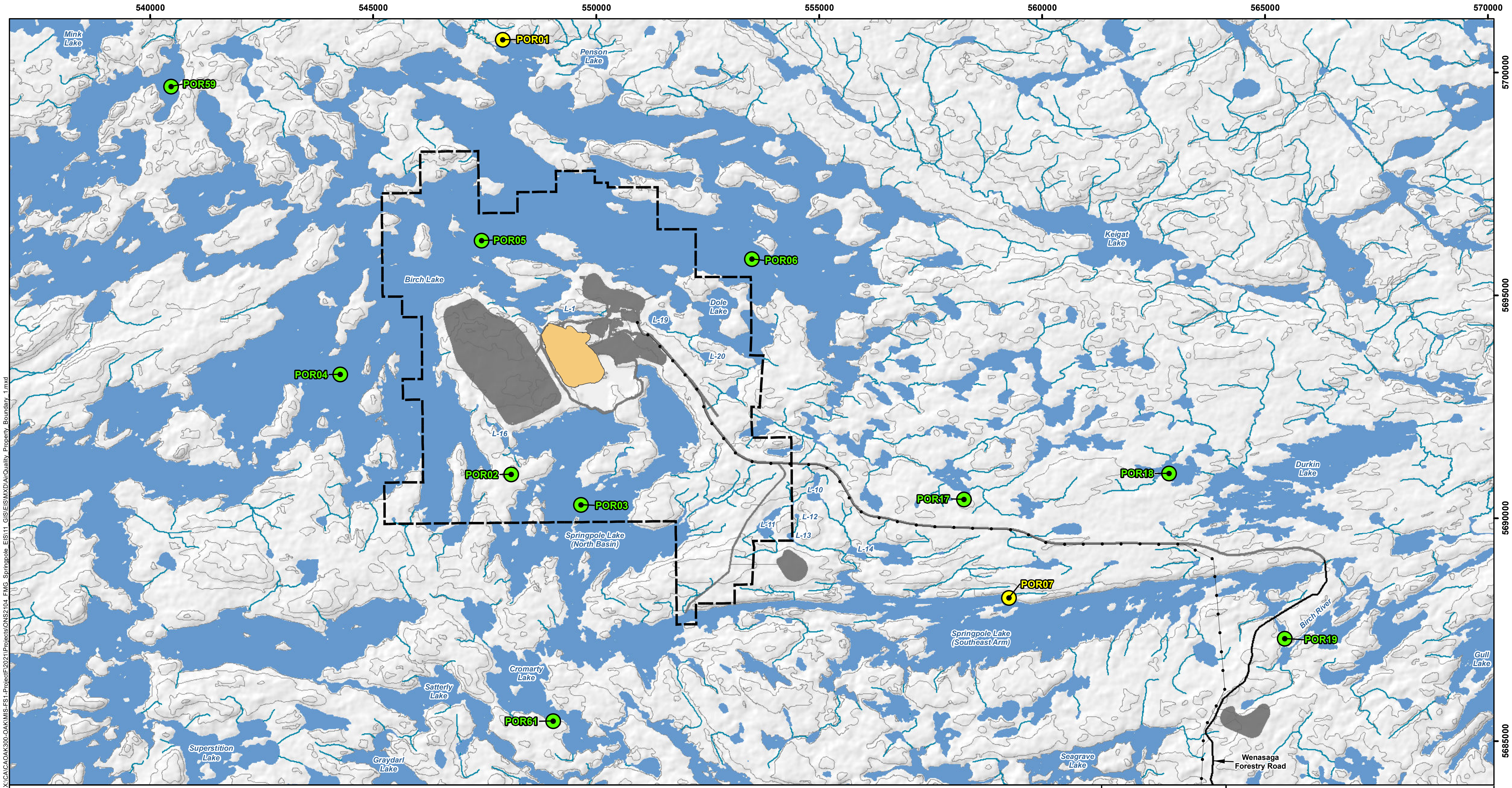
Table 6.2-11: Operation Phase – Emission Summary Table with Comparison of the Point of Impingement Concentrations to the Ambient Air Quality Criteria (continued)

Compound	CAS Number	Averaging Period	Project Emission Rate (g/s)	Modelled POI Concentration (µg/m³)	Baseline Concentration (µg/m³)	Modelled + Baseline Concentration (µg/m³)	AAQC (µg/m³)	% of Criterion
Titanium (Ti)	7440-32-6	24-hour	0.039	0.06	0.0061	0.06	120	0.1%
Zinc (Zn)	7440-66-6	24-hour	0.0053	0.008	0.010	0.018	120	0.01%
Benzene	71-43-2	24-hour	0.80	0.42	0.49	0.91	2.3	40%
		annual		0.03	0.30	0.33	0.45	74%
1,3-Butadiene	106-99-0	24-hour	0.033	0.019	0.24	0.26	10	2.6%
		annual		0.014	0.26	0.27	2	13.7%
Formaldehyde	50-00-0	24-hour	1.6	1.94	1.50	3.44	65	5.3%
Acetaldehyde	75-07-0	0.5-hour	0.82	4.78	7	11.78	500	2.4%
		24-hour		0.72	7	7.72	500	1.5%
Benzo(a)pyrene	50-32-8	24-hour	0.0000043	0.00001	0.000036	0.00005	0.00005	95%
		annual		0.000001	0.000018	0.00002	0.00001	**190%**

Notes:

CAS = Chemical Abstracts Service; g/s = grams per second; NA = not applicable; < = less than; µm = micron; – = no value for the respective parameter and/or averaging period.

Bolded text indicates that the modelled + baseline concentration are higher than the AAQC.



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LEGEND

- ⬚ Air Quality Modelling Boundary (First Mining Gold Patents and Leases)
- 🟧 Proposed Open Pit
- •—• Proposed 230 kV Transmission Line
- ▩ Other Proposed Mine Feature
- — Existing Road
- — Watercourse
- 🟦 Waterbody
- — Contour (10 m intervals)

Receptors within the Air Quality Local Study Area

- ● Cabin/Lodge/Camp
- ● TLRU

NOTES:
- Topographic information extracted from LIO, MNRF.
- Receptor locations provided by First Mining Gold, July 2021.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified
- 230 kV transmission line provided by First Mining Gold, April 2024. by WSP July 2023.

Datum: NAD83
Projection: UTM Zone 15N

N W E S

0 2.5 5 10 15 20 Kilometres

FIRST MINING GOLD

WSP

SPRINGPOLE GOLD PROJECT

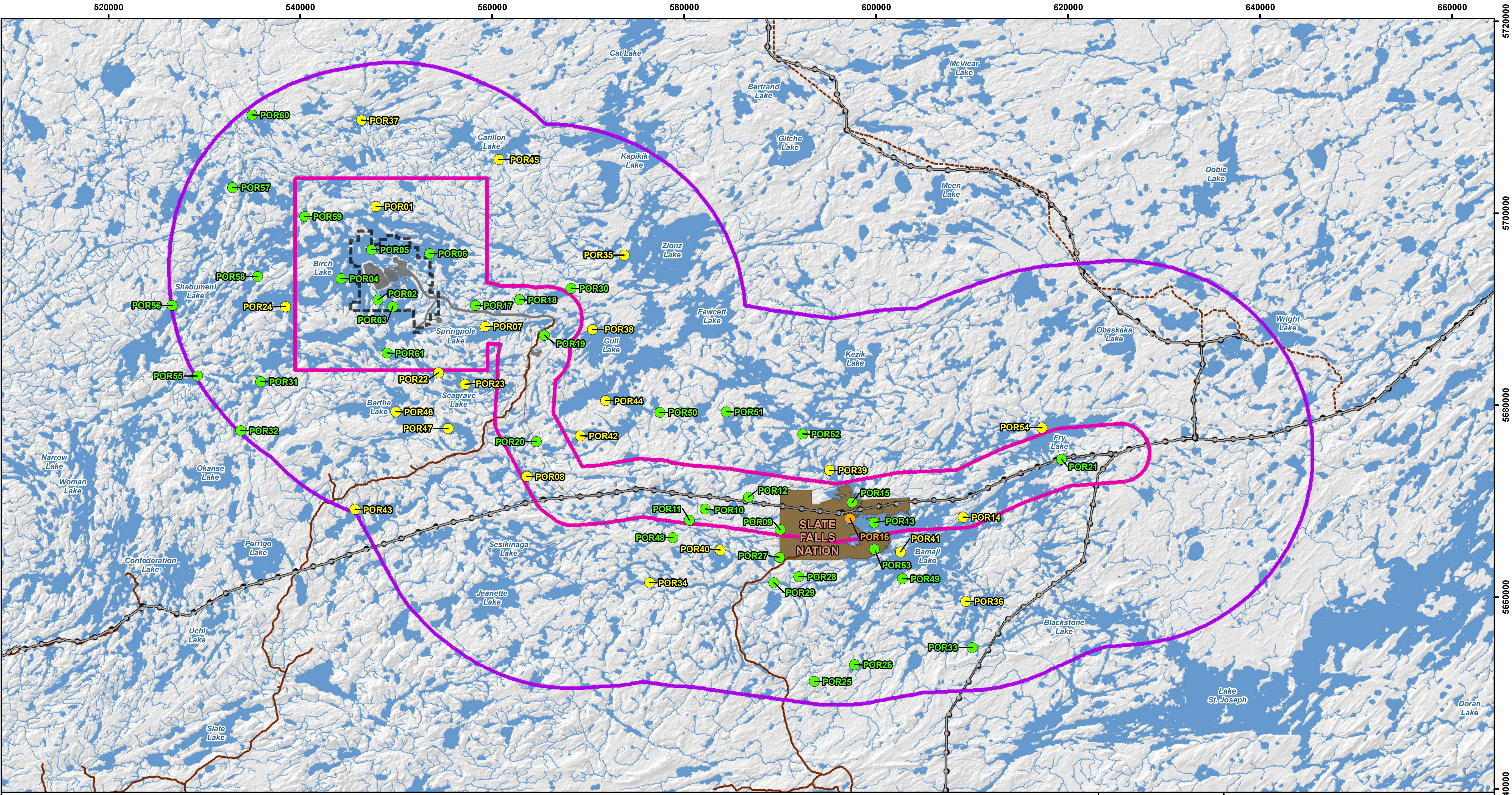
Property Boundary

PROJECT Nº: ONS2104

FIGURE: 6.2-1

SCALE: 1:80,000

DATE: August 2024



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LEGEND

- ▨ Property Boundary
- ▬ Proposed Mine Feature
- ☐ Local Study Area for Air Quality
- ☐ Regional Study Area for Air Quality
- ▬ First Nation Reserve
- ⁄\ Existing Road
- ⁄\ Existing Winter Road
- ○—○ Existing Transmission Line
- ~ Watercourse
- ● Waterbody

Potential Points of Reception

- ● Cabin/Lodge/Camp
- ● TLRU
- ● Residential

0 5 10 20 30 40 50 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.
- 230 kV transmission line provided by First Mining Gold, April 2024.

Datum: NAD83
Projection: UTM Zone 15N

N
W E
S

FIRST MINING GOLD

wsp

SPRINGPOLE GOLD PROJECT

Potential Points of Reception

PROJECT N°: ONS2104	**FIGURE: 6.2-2**
SCALE: 1:375,000	DATE: August 2024

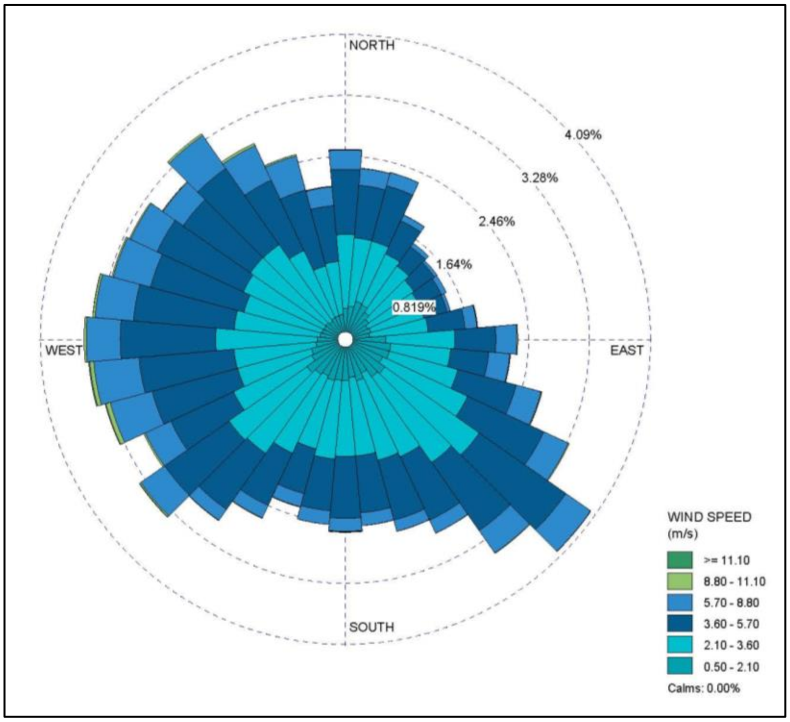

Figure 6.2-3: Springpole Gold Project Wind Rose (2013 to 2017)

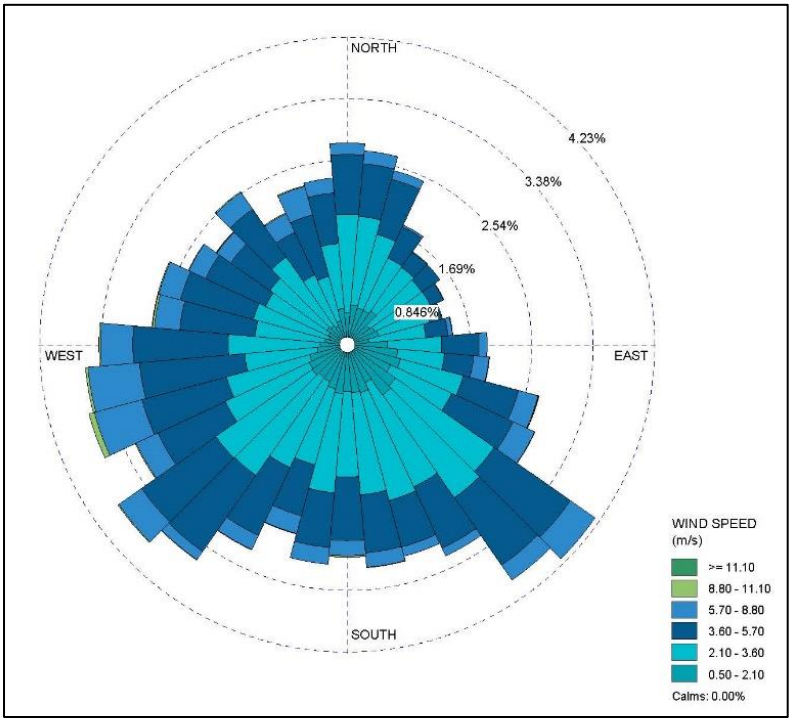

Figure 6.2-4: Springpole Gold Project Wind Rose (June to September, 2013 to 2017)

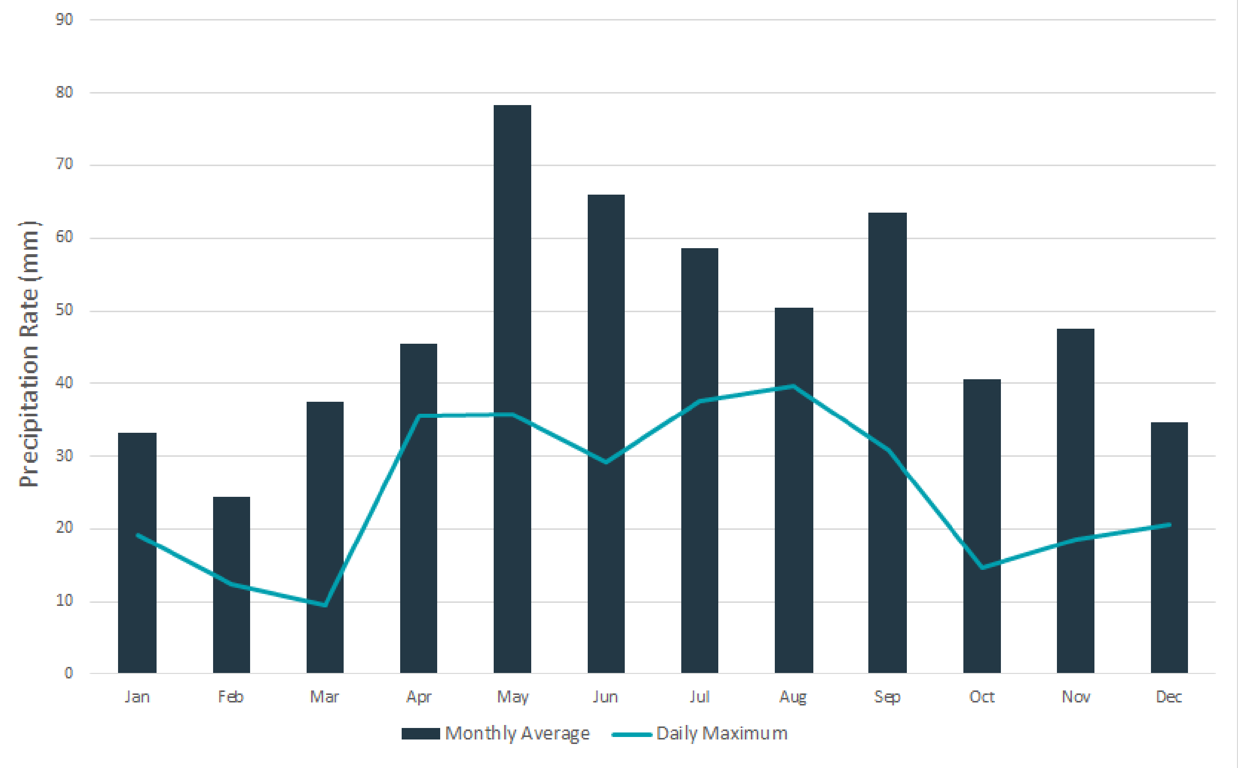

Figure 6.2-5: Monthly Precipitation (Red Lake, 2013 to 2017)