



**Lynn Lake Gold Project:
Air Quality Management
and Monitoring Plan**

Version 0

January 30, 2025

**LYNN LAKE GOLD PROJECT:
AIR QUALITY MANAGEMENT AND MONITORING PLAN**

Document History

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Acronyms and Abbreviations

AAQC	ambient air quality criteria
Alamos	Alamos Gold Inc.
ANFO	ammonium nitrate fuel oil
AQMMP	Air Quality Management and Monitoring Plan
BC MEMPR	British Columbia Ministry of Energy, Mines and Petroleum Resources
BC MOECCS	British Columbia Ministry of Environment and Climate Change Strategy
BMP	best management practice
CAAQS	Canadian Ambient Air Quality Standards
CACs	criteria air contaminants
CaCl ₂	calcium chloride
CCME	Canadian Council of Ministers of the Environment
CEMI	Centre for Excellence in Mining Innovation
CEPA	Canadian Environmental Protection Act
CIP	carbon-in-pulp
CO	carbon monoxide
DPM	diesel particulate matter
EAC	Environmental Advisory Committee
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMMP	Environmental Management and Monitoring Program
GHG	greenhouse gas
g/m ²	gram per square metre

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HC	hydrocarbons
HCN	hydrogen cyanide
hp	horsepower
IAAC	Impact Assessment Agency of Canada
kph	kilometres per hour
kW	kilowatt
LAA	Local Assessment Area
lpm	litres per minute
$\mu\text{g}/\text{m}^3$	microgram per cubic metre
m/s	meters per second
mg/L	milligram per litre
μm	micrometer
MECC	Manitoba Environment and Climate Change (formerly Manitoba Environment, Climate and Parks; formerly Manitoba Conservation and Climate; and formerly Manitoba Sustainable Development [MSD])
MgCl_2	magnesium chloride
MRSA	mine rock storage area
NaCN	sodium cyanide
NPRI	National Pollutant Release Inventory
NO	nitrous oxide
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
ON MECP	Ontario Ministry of the Environment, Conservation and Parks
PAH	polycyclic aromatic hydrocarbons
PDA	Project Development Area

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PM	particulate matter
PM _{2.5}	particulate matter with an aerodynamic diameter less than 2.5 µm
PM ₁₀	particulate matter with an aerodynamic diameter less than 10 µm
ppb	parts per billion
ppm	parts per million
PR	provincial road
The Project	Lynn Lake Gold Project
ROM	run-of-mine
SOP	standard operating procedure
SO ₂	sulphur dioxide
SAG	semi-autogenous grinding
TARP	Trigger Action Response Plan
TDR	technical data report
TMF	tailings management facility
TMR	technical modelling report
TSP	total suspended particulate
US EPA	United States Environmental Protection Agency
VOC	volatile organic compounds
VRU	vapour recovery unit
wad-CN	weak acid dissociable cyanide
WRAP	Western Regional Air Partnership

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1.0 INTRODUCTION

The following presents the Air Quality Management and Monitoring Plan ('AQMMP' or 'the Plan'), which considers the construction, operation, and decommissioning/closure phases of the Lynn Lake Gold Project ('LLGP' or 'the Project') and the mitigation, management, and monitoring of Project-related effects on air quality. It is one component of the overall Environmental Management and Monitoring Program ('EMMP') for the Project. For clarity, the term "follow-up programs" as stated in the federal Decision Statement refers to "management and monitoring programs" as outlined in the provincial Licences. Both terms are used interchangeably but refer to the same monitoring activities that extend over the life of mine through all phases.

1.1 PURPOSE

The purpose of the AQMMP is to:

- Identify the regulatory requirements, standards, and conditions relevant to air discharges from the Project.
- Identify and describe the sources of air emissions during Project construction, operation, and decommissioning/closure.
- Describe the management and mitigation measures for reducing gaseous and fugitive dust emissions associated with mine activities during Project construction, operation, and decommissioning/closure.
- Describe the ambient air quality monitoring during Project construction, operation, and decommissioning/closure to meet federal and provincial ambient air quality standards and criteria at human receptor locations and enable the implementation of an adaptive air quality management of dust emissions.
- Apply the principles of adaptive management to dust emissions based on the results of the ambient particulate matter (PM) monitoring program to determine the effectiveness of dust mitigation measures and the corrective actions to further reduce dust emissions (e.g., implementation of additional mitigation measures).
- Describe the mechanism to receive air quality-related complaints, investigate root cause, address issues/concerns and respond to complaints.
- Describe the requirements for provincial and federal emissions reporting and air quality monitoring reporting.

The AQMMP applies only to the Project activities and addresses only ambient air quality management and mitigation. Workplace (e.g., occupational) air quality and worker exposure assessments, controls, and mitigation measures will be addressed separately.

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The management and mitigation measures for reducing greenhouse gas (GHG) emissions are addressed in the Greenhouse Gas Management Plan.

1.2 OBJECTIVES

As part of Alamos Gold Inc.'s (Alamos') approach to environmental management, the company sets, implements, and maintains documented environmental objectives that consider the Project's environmental risks and compliance obligations. These obligations are aligned with the Project's Environmental Policy and are communicated to employees, contractors, and interested parties, regularly monitored, and updated as appropriate. Objectives are set to drive continuous improvement in environmental performance and are aligned with the overall strategic goals of the project. Objectives are measurable (where possible), monitored, communicated, and updated as appropriate.

Alamos' overarching environmental objective is to avert adverse effects, where technologically and economically feasible, and mitigate adverse effects that are unavoidable. In support of Alamos' underlying environmental objectives (i.e., to work to limit or mitigate adverse environmental effects, meet or surpass regulatory requirements, and strive to continually improve environmental practices and performance), Alamos has established the following performance objectives for the management of air quality that considers the Project's interactions and compliance obligations:

- Implement mitigation measures to reduce emissions from the Project activities to the extent feasible.
- Implement an ambient air quality monitoring program during Project construction and operation to monitor ambient PM concentrations at sensitive receptors relative to regulatory ambient air quality criteria.
- Use the ambient air quality monitoring results for PM to implement adaptive management for fugitive dust emissions.
- Implement a short-term ambient air quality monitoring program to measure nitrogen dioxide (NO₂) concentrations during Project operation to validate the predictions of the atmospheric dispersion model.
- Verify Project-related air quality compliance as committed to in the Environmental Impact Statement (EIS).

The applicable air quality regulatory requirements and conditions are outlined in Section 1.4, including:

- Federal and provincial air quality standards and objectives.
- Conditions and requirements in *The Environment Act* licences (Manitoba).

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1.3 RELATIONSHIP TO OTHER MANAGEMENT PLANS

Relevant management plans within the EMMP that contribute to the mitigation, management, or monitoring of ambient air quality, include the:

- Emergency Response and Spill Prevention and Contingency Plan
- Blasting Management and Monitoring Plan
- Explosives Management Plan
- Greenhouse Gas Management Plan
- Soil Management and Rehabilitation Plan
- Vegetation and Weed Management Plan
- Erosion and Sediment Control Plan
- Acid Rock Drainage and Metal Leaching Management and Monitoring Plan.

1.4 REGULATORY CONTEXT

The Project EIS was submitted to the Impact Assessment Agency of Canada (IAAC; formerly the Canadian Environmental Assessment Agency) pursuant to the *Canadian Environmental Assessment Act* (CEAA) 2012, and to Manitoba Environment and Climate Change (MECC; formerly Manitoba Environment, Climate and Parks and formerly Manitoba Conservation and Climate) as an Environment Act Proposal pursuant to *The Environment Act* of Manitoba. The relevant federal and provincial regulatory requirements related to air quality management and monitoring are outlined below.

1.4.1 Federal Regulatory Requirements

There are several federal regulatory requirements that provide the context for the AQMMP.

The *Canadian Environmental Protection Act, 1999* (CEPA) sets ambient air quality standards as environmental quality objectives specifying goals or purposes for pollution prevention or environmental control that have the ultimate goal to improved air quality, healthier communities, and the protection of the environment.

The Canadian Ambient Air Quality Standards (CAAQS; CCME 2017) were established under CEPA through a collaborative process involving the federal, provincial, and territorial governments and stakeholders under the direction of the Canadian Council of Ministers of the Environment (CCME). The CAAQS were developed as part of the Air Quality Management System (CCME 2012a) with the objective of driving continuous improvement of air quality in Canada. The CCME describes the process for selecting monitoring stations, measuring pollutant concentrations, and determining achievement of the CAAQS (CCME 2019; CCME 2012b). Determining achievement of the CAAQS is based upon the measured air quality concentrations at community monitoring stations with comparison to the CAAQS and assigning air quality status to one of four management levels (CCME 2019; CCME 2012b). The four air quality management levels (Table 1-1)

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require progressively more rigorous actions by jurisdictions as air quality approaches or exceeds the CAAQS, thereby allowing proactive management actions to be undertaken to reduce emissions and avoid exceedances of the CAAQS (CCME 2019).

The CAAQS are based on three interrelated elements: an averaging time, numerical value for each averaging time and the statistical form which sets the method of calculation to determine how the ambient air pollutant concentrations compare to the numerical value of the CAAQS to determine the achievement of the standard. The CAAQS and the year when each ambient standard comes into effect are presented in Table 1-1.

The CEPA also stipulates those owners or operators of facilities that meet published reporting requirements must report to the Environment and Climate Change Canada (ECCC) National Pollutant Release Inventory (NPRI) system. NPRI reporting applies to more than 300 substances and the amount that was released (to air, water, and land), disposed or recycled at the facility during each calendar year must be reported if the release is greater than a specified threshold. Reports are required to be submitted to the NPRI system for each calendar year by the end of May of the following year. The NPRI reporting thresholds for the criteria air contaminants (CACs) are:

- PM = 20 tonnes per year
- Particulate matter with an aerodynamic diameter less than 10 μm (PM_{10}) = 0.5 tonnes per year
- Particulate matter with an aerodynamic diameter less than 2.5 μm ($\text{PM}_{2.5}$) = 0.3 tonnes per year
- Sulphur dioxide (SO_2) = 20 tonnes per year
- Carbon monoxide (CO) = 20 tonnes per year
- Oxides of Nitrogen (NO_x) expressed as NO_2 = 20 tonnes per year.

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Table 1-1 Canadian Ambient Air Quality Standards Air Quality Management Levels

Air Quality Management Levels	8-hour Ozone ^a (µg/m ³)		24-hour PM _{2.5} ^b (µg/m ³)		Annual PM _{2.5} ^c (µg/m ³)		1-hour Sulphur Dioxide ^d (µg/m ³)		Annual Sulphur Dioxide ^e (µg/m ³)		1-hour Nitrogen Dioxide ^f (µg/m ³)		Annual Nitrogen Dioxide ^g (µg/m ³)	
	2020	2025	2015	2020	2015	2020	2020	2025	2020	2025	2020	2025	2020	2025
Red	>122	>118	>28	>27	>10.0	>8.8	>183	>170	>13	>10	>113	>79	>32	>23
Orange	>110 and ≤122	>110 and ≤118	>19 and ≤28	>19 and ≤27	>6.4 and ≤10.0	>6.4 and ≤8.8	>131 and ≤183	>131 and ≤170	>8 and ≤13	>8 and ≤10	>58 and ≤113	>58 and ≤79	>13 and ≤32	>13 and ≤23
Yellow	>98 and ≤110		>10 and ≤19		>4.0 and ≤6.4		>79 and ≤131		>5 and ≤8		>38 and ≤58		>4 and ≤13	
Green	≤98		≤10		≤4.0		≤79		≤5		≤38		≤4	

Notes:

- ^a Achievement based on the 3-year average of the annual 4th highest of the daily maximum 8-hour average ozone concentrations.
- ^b Achievement based on the 3-year average of the annual 98th percentile of PM_{2.5} daily 24-hour average concentrations
- ^c Achievement based on the 3-year average of the annual average of the PM_{2.5} daily 24-hour average concentrations
- ^d Achievement based on the 3-year average of the annual 99th percentile of the SO₂ daily maximum 1-hour average concentrations
- ^e Achievement based on the average over a single calendar year of all 1-hour average SO₂ concentrations
- ^f Achievement based on the 3-year average of the annual 98th percentile of the NO₂ daily maximum 1-hour average concentrations
- ^g Achievement based on the average over a single calendar year of all 1-hour average NO₂ concentrations

Source: Canadian Council of Ministers of the Environment (CCME) website: <https://ccme.ca/en/air-quality-report>

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1.4.2 Provincial Regulatory Requirements

The Environment Act of Manitoba outlines the environmental assessment and licensing process for developments in Manitoba that may have potential for significant environmental and human health effects. Mines are considered Class 2 and Class 3 developments under section 3(5) of the Classes of Development Regulation (Manitoba Regulation 164/88) pursuant to *The Environment Act* of Manitoba. Consequently, any mine development in Manitoba is subject to provincial assessment and licensing requirements. Air emissions from mines are assessed during the environmental assessment and licensing process. Licence conditions may include air quality monitoring, air quality modelling, ambient air monitoring and reporting. The specific air emissions licence conditions are decided on a project-by-project basis (there is not a group of air emissions licence conditions that are applicable to all mine developments in Manitoba).

MECC (formerly Manitoba Conservation and Climate and Manitoba Sustainable Development [MSD]) have established ambient air quality criteria for several substances to protect the receiving environment from potential adverse effects. They are referred to as Manitoba Ambient Air Quality Criteria (AAQC; MSD 2005). The Manitoba AAQC for CACs relevant to the Project are provided in Table 1-2.

The Manitoba AAQC include three concentration levels: Maximum Tolerable, Maximum Acceptable and Maximum Desirable. The most stringent Maximum Desirable Level Concentrations are applicable to this Project.

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Table 1-2 Summary of Manitoba Ambient Air Quality Criteria

Substance	Averaging Period	Manitoba Ambient Air Quality Criteria ^a (µg/m ³)		
		Maximum Tolerable Level Concentration	Maximum Acceptable Level Concentration	Maximum Desirable Level Concentration
Gaseous CACs				
NO ₂	1-hour	1,000	400	—
	24-hour	—	200	—
	Annual	—	100	60
CO	1-hour	—	35,000	15,000
	8-hour	—	15,000	6,000
SO ₂	1-hour	—	900	450
	24-hour	800	300	150
	Annual	—	60	30
Other Gaseous Species				
Hydrogen Cyanide (HCN)	1-hour	—	40	—
	Annual	—	3	—
Particulate Matter (PM) CACs				
Total Suspended Particulate (TSP)	24-hour	400	120	—
	Annual	—	70 ^b	60 ^b
PM ₁₀	24-hour	—	50	—
PM _{2.5}	24-hour	—	30 ^c	—
Metals				
Arsenic	24-hour	—	0.3	—
Cadmium	24-hour	—	2	—
Copper	24-hour	—	50	—
Lead	24-hour	—	2	—
	30-day	—	0.7	—
Nickel	24-hour	—	2	—
Zinc	24-hour	—	120	—
<p>Notes:</p> <p>^a Manitoba Ambient Air Quality Criteria (MSD 2005)</p> <p>^b Annual geometric mean</p> <p>^c Achievement based on the 3-year average of the annual 98th percentile of PM_{2.5} daily 24-hour average concentrations</p> <p>“—” Not available</p> <p>AAQC in bold font are used as benchmarks for the ambient air quality monitoring of particulate matter.</p> <p>Ambient air quality criteria (µg/m³) referenced at 25 °C and 101.325 kPa</p>				

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1.4.3 Corporate or Other Policies

As a member of the World Gold Council, Alamos Gold Inc. (Alamos) is a proud supporter of the Responsible Gold Mining Principles (the RGMPs). The ten RGMPs provide a framework that sets expectations for consumers, investors, and the downstream gold supply chain as to what constitutes responsible gold mining, addressing key environmental, social and governance issues for the gold mining sector. They are designed to provide confidence to governments, investors, employees and contractors, communities, supply chain partners and civil society that gold has been produced responsibly. Following the release of the RGMPs in September 2019, Alamos has implemented and aligned to the framework, and obtained external assurance to provide further confidence that the gold produced by Alamos is responsibly mined. In 2023, Alamos communicated its progress on implementing the RGMPs through Alamos’ 2022 RGMP Progress Report which received independent audit/assurance from EEM EHS Management Inc. (Alamos 2023). The 2022 RGMP Progress Report reflects Alamos’ third year reporting under the RGMP. Alamos will continue to implement the RGMPs through 2024 and beyond. The RGMPs are only applicable to operating mines. The Lynn Lake Gold Project will be incorporated as it transitions through construction into operation.

Working with its members, the World Gold Council has set out RGMPs to address key environmental, social and governance issues for the gold mining sector. One of the key principles is Water, Energy and Climate Change.

Alamos has a series of guiding corporate sustainability standards (Table 1-3), including:

- Environmental Monitoring
- Hazard Identification & Risk Management
- Incident Classification, Investigation & Reporting.

Those corporate standards that may be applicable specifically to the AQMMP include Air Quality, Noise & Vibration Management.

Alamos’ standards are regularly updated to reflect the latest developments. For the most current and up-to-date standards, please refer to the online version.

Table 1-3 Corporate Sustainability Standards

Corporate Policy	Requirement
Environmental Monitoring (CSS-ENV-10.1)	Sites shall develop and implement an environmental monitoring program. The site’s environmental monitoring program will be documented as to: list of points monitored, coordinates of points monitored, description of points (including the reason for monitoring (e.g., regulatory compliance, baseline, trend analysis, etc.), frequency of monitoring, anticipated duration of monitoring (e.g., the life of the mine), and parameters monitored. The monitoring program will be of sufficient scope to allow for the timely identification of potential environmental impacts prior to their migration offsite. Sites will regularly review their monitoring programs and update for and changes at the mine site as required. At a minimum, the program will meet all environmental regulatory requirements.

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Corporate Policy	Requirement
Environmental Monitoring (CSS-ENV-10.2)	Compliance monitoring data will be subject to Quality Assurance/Quality Control (QA/QC) verification. Sample results that do not meet QA/QC guidelines will be disregarded and sample collection repeated. Sites must use reliable and accredited labs.
Environmental Monitoring (CSS-ENV-10.3)	Monitoring data will be stored in an electronic database.
Environmental Monitoring (CSS-ENV-10.4)	When compliance monitoring results indicate exceedances of permit or regulatory requirements, or significant deviation from previous results, the results will be reconfirmed with the person or company that did the analysis, and a confirmatory monitoring or sample will be taken immediately if the result is reconfirmed. Sites will also follow any permit-specific or jurisdictional requirements.
Environmental Monitoring (CSS-ENV-10.5)	Monitoring data will be reviewed at least quarterly by the responsible manager to identify trends that may indicate potential for future exceedances of permit conditions or applicable standards, and potential risk. The site General Manager will be formally notified of any exceedances and emerging compliance issues. Refer to CSS-GOV-08 Incident Reporting Standard for any moderate, major, or catastrophic incidents.
Environmental Monitoring (CSS-ENV-10.6)	Sites will assess the need for a monitoring program involving external stakeholders.
Hazard Identification & Risk Management (CSS-GOV-2.1)	All Alamos locations shall maintain systems to identify, prevent and/or manage sustainability risks that face its operations and those which its activities may pose to others. This includes but is not limited to hazards and risks related to the: <ul style="list-style-type: none"> • Health and Safety of our workforce and communities, • Environmental impacts of our activities (local and downstream), • Societal and community impacts, and • Security and protection of people and property.
Hazard Identification & Risk Management (CSS-GOV-2.2)	Site Managers are responsible to ensure that appropriate resources, both internal and external, are available to identify, quantify, manage, and report sustainability hazards and risks. Assessments shall consider all site activities including: <ul style="list-style-type: none"> • Contractor works, • Regulatory requirements • Permit or licence requirements, • Alamos Sustainability Standards requirements, and • Other site-specific requirements.
Hazard Identification & Risk Management (CSS-GOV-2.3)	Sites shall maintain a risk registry of all site risks. The risk registry will be updated at least quarterly or when major changes/incidents occur. Clear responsibility and authority for implementing, managing, reporting, and coordinating updates to the risk registry shall be designated to a specific employee(s).
Hazard Identification & Risk Management (CSS-GOV-2.4)	All corporate, site and task-level risks shall be assessed against the Alamos Risk Matrix, including likelihood and consequence assessments.

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Corporate Policy	Requirement
Hazard Identification & Risk Management (CSS-GOV-2.5)	<p>Sites shall apply the hierarchy of controls considering (in order of priority):</p> <ol style="list-style-type: none"> 1. Elimination – Remove the hazard 2. Substitution – Replace the hazard 3. Engineering control – physically control or isolate the hazard (e.g., dikes, guarding, interlocks) 4. Administrative control – control response/avoidance of hazard (e.g., training, procedures, reducing employee exposure to hazards, signage) 5. PPE or Mitigation – Protect people (personal protective equipment) or the environment (spill kits) from the hazard. This is the last line of defense. <p>Extreme and high risks that exist after controls have been applied should go through a formal review with the Site Manager.</p>
Hazard Identification & Risk Management (CSS-GOV-2.6)	<p>Sites shall ensure effective communication of risks and controls to the workforce based on the nature of the activity and related risk. The nature of communication may change based on the risk frequency and consequence. For example, communication may include induction training, refresher training, policies, procedures, and/or signage.</p>
Hazard Identification & Risk Management (CSS-GOV-2.7)	<p>For each identified risk, management shall assess and manage the risk appropriately with consideration to the risk rating. In considering risk mitigation, management must evaluate the cost of controls versus the benefit derived and ensure the resultant control framework is effective.</p>
Hazard Identification & Risk Management (CSS-GOV-2.9)	<p>The Alamos Executive and Internal Audit Director shall review and verify enterprise risks on a quarterly basis.</p>
Incident Classification, Investigation & Reporting (CSS-GOV-8.3)	<p>The Corporate Sustainability Team shall maintain an Incident Alert email group user list comprised of, at a minimum:</p> <ul style="list-style-type: none"> • Alamos Executive and Management, • Country Managers, • General Managers; and • Project Managers.
Incident Classification, Investigation & Reporting (CSS-GOV-8.6)	<p>The Corporate Sustainability Team shall provide a report on significant incidents on a quarterly basis to senior management and the Technical & Sustainability Committee of the Board.</p>
Incident Classification, Investigation & Reporting (CSS-GOV-8.7)	<p>Corporate Sustainability and Risk Management teams shall annually review and revise the Alamos Risk Assessment Consequence Table to ensure thresholds are consistent with the Alamos Enterprise Risk Management system.</p>
Air Quality, Noise & Vibration Management (CSS-ENV-1.1)	<p>Before any new project is developed, baseline air quality, noise, and where appropriate, vibration monitoring at and in the vicinity of the site shall be undertaken to establish background levels.</p>
Air Quality, Noise & Vibration Management (CSS-ENV-1.2)	<p>Projects will be designed to ensure that emissions do not result in predicted pollutant concentrations that, when combined with baseline levels, result in ambient air quality concentrations in excess of jurisdictional ambient air quality standards or guidelines.</p>
Air Quality, Noise & Vibration Management (CSS-ENV-1.3)	<p>Sites will develop and implement a formal Air Quality Monitoring & Control Plan (AQMP) and include a noise monitoring and control plan. The AQMP is to be informed by baseline information, regulatory requirements and any predictive atmospheric dispersion modelling that is available.</p>
Air Quality, Noise & Vibration Management (CSS-ENV-1.4)	<p>Sites will develop and implement preventive maintenance programs for relevant equipment to ensure emissions are controlled for all fixed sources of air and noise emissions.</p>

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Corporate Policy	Requirement
Air Quality, Noise & Vibration Management (CSS-ENV-1.5)	A site Air Emission Inventory will be developed and updated at least annually and will quantify actual emissions from all active (both fixed and fugitive) air emission sources. The emission inventory will include at a minimum actual emissions of PM, PM ₁₀ , PM _{2.5} , CO, NO _x , and SO _x or as required by local regulatory requirement. The emission inventory will clearly note the activity rate (e.g. throughput) for each emission source and the source of emission factors used such as the EPA Compilation of Air Pollutant Emissions Factors (AP-42).
Air Quality, Noise & Vibration Management (CSS-ENV-1.8)	Mitigation measures shall be implemented in areas where non-compliance with the AQMP or other requirements exist.

1.4.4 Guideline and Reference Documents

The AQMMP follows recommended Best Management Practices (BMPs) to manage and reduce air emissions, and federal and provincial guidelines for conducting ambient air quality monitoring. Key reference documents include:

- British Columbia Ministry of Energy, Mines and Petroleum Resources (BC MEMPR) and British Columbia Ministry of Environment and Climate Change Strategy (BC MOECCS). 2018. Developing a Fugitive Dust Management Plan for Industrial Projects.
- Centre for Excellence in Mining Innovation (CEMI). 2010. Literature Review of Current Fugitive Dust Control Practices within the Mining Industry.
- ECCC. 2005. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities.
- Manitoba Transportation. 2019. Specifications for the Approval, Supply and Application of Dust Control. Specification No. 1280.
- United States Environmental Protection Agency (US EPA). 2002. Air Pollution Control Cost Manual.
- BC MOECCS. 2020. The British Columbia Field Sampling Manual. Part B: Air and Air Emissions Testing.
- Ontario Ministry of the Environment, Conservation and Parks (ON MECP). 2018. Operations Manual for Air Quality Monitoring in Ontario.
- US EPA. 2008. Quality Assurance Handbook for the Air Pollution Measurement Systems. Volume IV: Meteorological Measurements. Version 2.0 (Final).
- US EPA. 2017. Quality Assurance Handbook for the Air Pollution Measurement Systems. Volume II: Ambient Air Quality Monitoring Program.
- US EPA. 2020. Code of Federal Regulations, Title 40, Part 58 – Ambient Air Quality Surveillance, Appendix D - Network Design Criteria for Ambient Air Quality Monitoring.

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1.4.5 Approval Related Requirements

The conditions relating to air quality laid out in the federal Decision Statement issued under CEAA 2012, provincial Environment Act Licence No. 3390 (Gordon), and provincial Environment Act Licence No. 3391 (MacLellan) are outlined in Table 1-4 below.

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Table 1-4 Approval Related Requirements

Licence	Condition	Corresponding AQMMP Section
CEAA, 2012	<p>6.1.1 apply dust suppressants, including water, which do not contain chemicals and have the least potential for adverse environmental effects, on haul and access roads during periods when dust generation is expected or occurring, including periods of drought and high winds;</p> <p>6.1.2 locate all stationary machinery and equipment used for processing ore indoors, where technically and economically feasible, including the crushing plant and conveyors feeding into the ore milling and processing plant;</p> <p>6.1.3 ensure all equipment and vehicles used, including equipment and vehicles operated by third-party contractors, are serviced and maintained in accordance with the manufacturer’s maintenance guidelines to meet or exceed applicable emission standards, including Tier 4 emission standards for off-road equipment with off-road diesel engines, pursuant to the <i>Off-Road Compression-Ignition (Mobile and Stationary) and Large Spark Ignition Engine Emission Regulations and Off-Road Compression-Ignition Engine Emission Regulations</i>;</p> <p>6.1.4 develop and implement policies to reduce the fuel consumption of equipment and vehicles operating in the Project development areas, including no-idling, and limited cold start policies; and</p> <p>6.1.5 establish speed limits on the roads located in the Project development areas, taking into account the recommended speed limits in Environment and Climate Change Canada’s <i>Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities</i> and by requiring and ensuring that speed limits are respected, including by installing signs indicating speed limits.</p>	3.0 Mitigation and Management Measures

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Licence	Condition	Corresponding AQMMP Section
CEAA, 2012	<p>The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Health Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment as it pertains to adverse environmental effects from the Designated Project on air quality and country foods as it relates to the health of Indigenous peoples, taking into account available Indigenous knowledge provided by Indigenous groups related to current use of lands and resources for traditional purposes. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the implementation of the follow-up program, the Proponent shall:</p> <p>6.3.3 monitor, throughout construction and operation, ambient air concentrations of total suspended particulates, PM₁₀ and PM_{2.5} at locations identified in consultation with Indigenous groups, and upwind and downwind from the Project development areas, taking into account 24-hour and 1-hour thresholds in the Canadian Council of Ministers of the Environment's <i>Canadian Ambient Air Quality Standards</i>;</p> <p>6.3.4 monitor, during all phases of the Designated Project, dustfall at locations identified in consultation with Indigenous groups, and upwind and downwind from the Project development areas;</p> <p>6.3.5 monitor ambient air concentrations of nitrogen dioxide (NO₂) at locations identified in consultation with Indigenous groups and relevant authorities, for at least two consecutive months during year 2 of operation, and continue to monitor during all phases of the Designated Project if the monitoring results exceed predicted levels in the atmospheric dispersion model in Volume 1 Chapter 6 of the Environmental Impact Statement;</p> <p>6.3.6 monitor meteorological conditions (including wind speed, wind direction, temperature, and relative humidity) upwind and downwind of the Project development areas, during construction and operation; and</p> <p>6.3.7 if the monitoring results referred to in conditions 6.3.2 to 6.3.5 exceed predicted levels in the atmospheric dispersion model in Volume 1 Chapter 6 of the Environmental Impact Statement, taking into account the results of monitoring meteorological conditions pursuant to condition 6.3.6, the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement, or thresholds of the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards, modify or implement additional mitigation measures pursuant to condition 2.8, and update the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement. The Proponent shall submit any updates to the human health and ecological risk assessment to the Agency and relevant authorities.</p>	<p>4.0 Monitoring 5.0 Adaptive Management 6.0 Reporting</p>

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Licence	Condition	Corresponding AQMMP Section
Environment Act Licence No. 3390 (Gordon)	<p>53. The licensee shall submit, upon the written request and for the approval of the director, a program for:</p> <ul style="list-style-type: none"> a) the sampling, analysis, and reporting of levels of pollutants, as determined by the director, at a selected location(s) beyond the property boundaries of the development; and b) the location, installation, and operation of a meteorological monitoring station. <p>54. The licensee shall:</p> <ul style="list-style-type: none"> a) implement the program approved pursuant to clause 53 of this licence within a timeframe stipulated by the director; and b) submit a report within 60 days of the receipt of the analytical results of the sampling program pursuant to clause 53 of this licence for the approval of the director containing at minimum: <ul style="list-style-type: none"> a) the raw data collected; b) a discussion of the sampling and analytical portions of the program including any anomalies of sampling and analysis; and c) a discussion of the significance of the data gathered with specific attention to: <ul style="list-style-type: none"> i) the need for risk assessment of the impact of emissions; ii) the need for the establishment of ambient air monitoring stations; iii) results and conclusions of the QA/QC program; and iv) other issues as may be determined by the director. 	4.0 Monitoring 6.0 Reporting
Environment Act Licence No. 3391 (MacLellan)	<p>72. The licensee shall submit, upon the written request and for the approval of the director, a program for:</p> <ul style="list-style-type: none"> c) the sampling, analysis, and reporting of levels of pollutants, as determined by the director, at a selected location(s) beyond the property boundaries of the development; and d) the location, installation, and operation of a meteorological monitoring station. <p>73. The licensee shall:</p> <ul style="list-style-type: none"> c) implement the program approved pursuant to clause 72 of this licence within a timeframe stipulated by the director; and d) submit a report within 60 days of the receipt of the analytical results of the sampling program pursuant to clause 72 of this licence for the approval of the director containing at minimum: <ul style="list-style-type: none"> d) the raw data collected; e) a discussion of the sampling and analytical portions of the program including any anomalies of sampling and analysis; and f) a discussion of the significance of the data gathered with specific attention to: <ul style="list-style-type: none"> v) the need for risk assessment of the impact of emissions; vi) the need for the establishment of ambient air monitoring stations; vii) results and conclusions of the QA/QC program; and viii) other issues as may be determined by the director. 	4.0 Monitoring 6.0 Reporting

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2.0 ENVIRONMENTAL SETTING

The key features of the Environmental Setting that are relevant to this AQMMP are the meteorological conditions, baseline ambient air quality concentrations and the Project emission sources. These three key features are described below.

2.1 METEOROLOGICAL CONDITIONS

Local meteorological conditions are relevant because they govern the atmospheric dispersion of emissions and determine their ultimate dispersion in the environment. Site-specific wind direction data are required to identify the general upwind and downwind locations relative to the Project based on the predominant wind directions.

Wind data for 2015 to 2018 from Lynn Lake Airport, located approximately 7 kilometres (km) southwest of the Project, were analyzed to provide an understanding of the local winds. Given the proximity of Lynn Lake Airport to the Project and the relatively uniform topographical and ground cover conditions, the meteorological conditions at the airport are expected to be representative of the Local Assessment Area (LAA) for air quality. The full assessment of climate and meteorology baseline conditions is presented in the Climate and Meteorology Baseline Technical Data Report (TDR) and associated Validation Report in the EIS Volume 4, Appendix C (Stantec 2020).

A wind rose illustrating the annual wind speed and wind direction tendencies, and a histogram of wind speed frequency distribution are presented in Figure 2-1. Generally, winds prevail from the northwest quadrant with the most frequent and strongest winds (>6 metres per second (m/s) or 22 kilometres per hour [kph]) originating from that direction. Easterly and southerly winds are also common. Southwesterly and northeasterly winds are less common and generally less frequently strong. Winds can be expected to blow from any direction for a few percent of the year. Winds are between 2 m/s and 4 m/s (7 kph and 14 kph) for 41% of the time. Calm winds (<1 m/s or 3.6 kph) are experienced less than 1.85% of the time.

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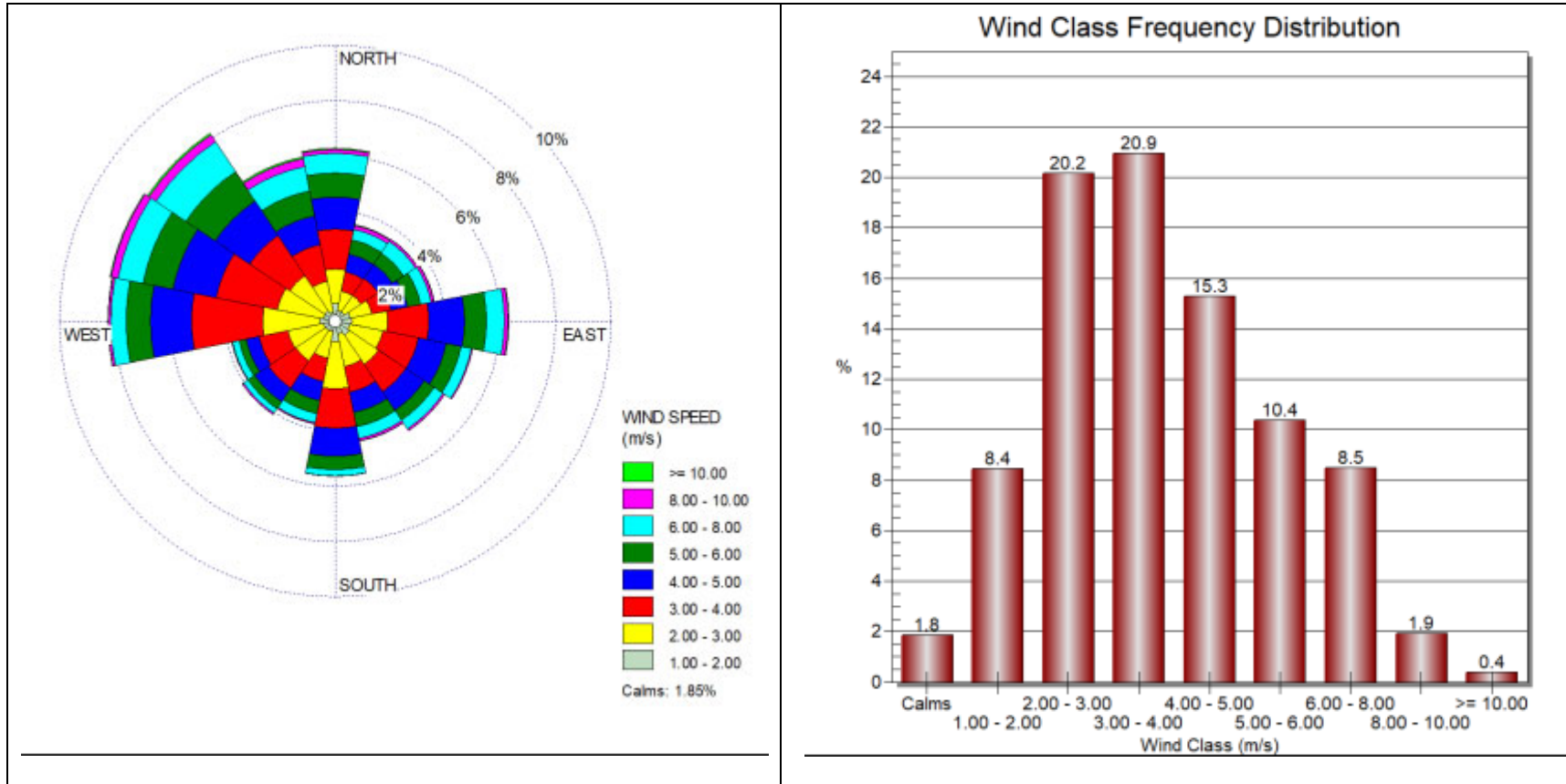


Figure 2-1 Wind Rose and Wind Frequency Distribution Diagram at Lynn Lake Airport, Manitoba (2015-2018)

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2.2 BASELINE AMBIENT AIR CONCENTRATIONS

Existing ambient air quality is relevant because it is the context into which the Project's emissions are added. Baseline ambient air quality is summarized below for NO₂, PM and dustfall because the air quality assessment (Chapter 6 of the EIS; Stantec 2020) resulted in model predicted 1-hour NO₂ concentrations and 24-hour PM₁₀ and TSP concentrations during Project operation greater than the Manitoba AAQC. Therefore, an ambient air quality monitoring program will be implemented to measure ambient TSP, PM₁₀ and PM_{2.5} concentrations during construction and operation, and a short-term (two-month) ambient air quality monitoring of ambient NO₂ concentrations will be conducted during Year 4 of mine operation at the MacLellan site that coincides with the highest truck traffic volume for ore haulage from the Gordon site to the ore milling and processing plant at the MacLellan site (Stantec 2024).

A local baseline ambient air quality monitoring program in 2015 and 2016 included data collection from two PM₁₀ and PM_{2.5} continuous monitoring stations and seven passive dustfall monitoring stations in the air quality LAA. Details of the local monitoring program are provided in the Air Quality Baseline TDR and associated Validation Report in the EIS, Volume 4, Appendix A (Stantec 2020).

Continuous ambient concentrations of PM_{2.5} and PM₁₀ were measured at the MacLellan site during 2015 and 2016, and at Black Sturgeon Reserve during 2015. The monitoring location at the MacLellan site was selected due to its proximity to the community of Lynn Lake. The monitoring location at Marcel Colomb First Nation's Black Sturgeon Reserve lands was selected to provide baseline data for that community, which is closer to the Gordon site.

Monthly dustfall amounts were measured at four sites in summer 2015 and 2016 (the MacLellan site, Burge Lake, Lynn Lake, and Farley Lake) and at three additional sites in 2016 (Cockeram Lake, Westdal Lake and Black Sturgeon Reserve Road) to gain additional understanding of baseline conditions along Provincial Road (PR) 391. Baseline PM concentrations and dustfall were derived from the baseline ambient air quality monitoring program in 2016 because the PM concentrations recorded in 2015 were influenced by forest fires.

Baseline ambient NO₂ concentrations were derived from ambient air monitoring data from the Fort Smith continuous monitoring station in the Northwest Territories because NO₂ concentrations were not measured during the field programs. The 90th percentile of hourly measurements from the most recent year with complete data record (2018) was selected to represent the NO₂ baseline air quality levels.

The representative baseline ambient NO₂ and PM concentrations and dustfall for the Project, are summarized in Table 2-1. Table 2-1 indicates that baseline ambient NO₂ concentrations range from 1.9% to 3.2% of the Manitoba AAQC, and PM concentrations and dustfall range from 8.8% to 21.5% of the Manitoba AAQC. Overall, the existing air quality in the LAA can be characterized as good because the measured concentrations are less than the Manitoba AAQC.

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Table 2-1 Summary of Baseline PM Ambient Air Concentrations and Dustfall

Substance	Averaging Period	Baseline Concentration (µg/m ³)	Manitoba AAQC ^a (µg/m ³)	Percent of AAQC (%)
NO ₂ ^b	1-hour	7.5	400	1.9
	24-hour	5.6	200	2.8
	Annual	1.9	60	3.2
TSP ^c	24-hour	10.5	120	8.8
	Annual	10.5	60	17.5
PM ₁₀ ^d	24-hour	4.6	50	9.2
PM _{2.5} ^d	24-hour	2.9	30	9.7
Dustfall ^d	30-day	0.99 g/m ²	7 g/m ² ^e	14.1
	Annual	0.99 g/m ²	4.6 g/m ² ^e	21.5

Notes:
^a Manitoba Ambient Air Quality Criteria (MSD 2005)
^b NO₂ baseline concentrations based on monitoring data from the Fort Smith continuous monitoring station in the Northwest Territories for 2018. The one-hour baseline concentration is based on the 90th percentile of hourly measurements. Baseline concentrations for averaging periods greater than one hour (24-hour, annual) are calculated from the hourly measurements after removing values greater than the 90th percentile.
^c TSP baseline concentrations were estimated using the PM₁₀ background concentration and correlation proposed by Brook et al. (1997)
^d Baseline concentrations based on the local ambient air quality monitoring program (2016)
^e Ontario Ambient Air Quality Criteria (ON MECP 2020)

2.3 PROJECT EMISSION SOURCES

The sources of air emissions during Project construction and operation are typical for an open pit mine and gold ore processing. Emissions from decommissioning/closure will be like those from construction, but lower in magnitude. Project construction and operation will release three types of air emissions:

- Exhaust emissions from construction and mining equipment that include but are not limited to drills, excavators, bulldozers, graders, and haul trucks. The off-road equipment and vehicles consume diesel fuel, and the products of combustion are released to the atmosphere. The exhaust emissions contain the by-products of diesel fuel combustion that include NO_x, SO₂, CO, hydrocarbons (HC), diesel particulate matter (DPM), polycyclic aromatic hydrocarbons (PAHs) and metals. DPM is respirable particulate matter that has an aerodynamic diameter less than 10 µm (PM₁₀). It is assumed that 97% of DPM is PM_{2.5} or respirable particulate matter that has an aerodynamic diameter less than 2.5 µm, based on the US EPA NONROAD model documentation (US EPA 2010).
- Exhaust emissions from the diesel power generator at the Gordon site. One 1,000-kilowatt (kW) diesel generator will provide power to the Gordon site during operation. The stack exhaust emissions from the diesel generator contain by-products of diesel fuel combustion that include NO_x, SO₂, CO, HC, DPM, PAHs and metals.

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- Explosives detonation emissions - blasting emissions which include emissions of NO_x, CO and SO₂ from the detonation of ammonium nitrate fuel oil (ANFO) emulsion explosives.
- Fugitive dust emissions from drilling and blasting, surface disturbance activities, loading and unloading of material, haul roads, access roads and wind erosion result in PM emissions of various size ranges (e.g., TSP, PM₁₀ and PM_{2.5}) that can also be deposited to off-site ground and water surfaces (i.e., dustfall). TSP includes larger particles, nominally up to 30 µm in diameter. The larger dust particles are removed near the disturbance area by gravitational settling and are the main contributor to dustfall. TSP, PM₁₀ and PM_{2.5} emissions are carried off-site by the wind; the smaller PM_{2.5} and PM₁₀ fractions tend to be transported further downwind than the TSP.

Additionally, the mill feed storage area and crushing plant, the ore milling and processing plant and the tailings management facility (TMF) at the MacLellan site are associated with the following air emissions:

- PM emissions from dust collectors and wet scrubbers at the primary crusher, secondary crusher and the ore milling and processing plant gold room. The crushing plant conveyors and the fine ore stockpile are fully covered and therefore, fugitive dust emissions from these areas are not expected. The ore milling in the semi-autogenous grinding (SAG) mill and ball mill in the ore milling and processing plant are wet processes and therefore, fugitive dust emissions from these areas are not expected.
- Fugitive HCN emissions from the carbon-in-pulp (CIP) adsorption tanks due to volatilization losses of sodium cyanide (NaCN) used in the leach and adsorption train.
- Fugitive HCN emissions from the TMF pond due to natural degradation and volatilization of a residual amount of cyanide contained in tailings (a maximum of 10 milligrams per litre (mg/L), by design, of weak acid dissociable cyanide (wad-CN) in wastewater discharged to the TMF) after cyanide detoxification. After gold extraction, the cyanide used in the processing plant is extracted in the cyanide detoxification area before tailings are pumped to the TMF. The wastewater discharge to the TMF after cyanide detoxification treatment might contain up to a maximum of 10 mg/L of wad-CN by design, which has the potential to volatilize from the TMF pond in the form of gaseous HCN.

The Gordon and MacLellan sites will operate 24 hours a day, 365 days a year. Construction activities at the Gordon and MacLellan sites will occur 10 hours a day during daylight hours. Preproduction at Gordon and MacLellan sites will start concurrently with construction activities. Preproduction will be continuous, 24 hours a day, 365 days a year. Blasting in the Gordon and MacLellan open pits will occur three to four times per week.

The Project emission sources during the lifetime of the Project are discussed separately for the Gordon site and the MacLellan site in the following sections.

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2.3.1 Gordon

Sources of gaseous and fugitive dust emissions at the Gordon site are summarized in Table 2-2 and Table 2-3, respectively, and are shown on Map 2-1 (Appendix B). The Gordon site emissions during operation include emissions associated with run-of-mine (ROM) ore haulage on PR 391 from Gordon site to the ore milling and processing plant at the MacLellan site. One stationary 1,000 kW diesel generator will provide power to the facilities at the Gordon site during operation only.

Table 2-2 and Table 2-3 describe for each source:

- The activities that will result in air emissions.
- The factors that influence the generation of air emissions.
- The dust generating material (for fugitive dust emissions only).
- The Project phase (construction, operation, and/or decommissioning/closure) during which emissions will be generated.

Details about the sources and quantities of air emissions at the Gordon site for each substance of interest are presented in Chapter 6 of the EIS and in Volume 5, Appendix A, Attachment C (Stantec 2020). The emissions have been updated based on information available for the final Project design (Alamos 2023). The updated emissions are similar to the emissions presented in Chapter 6 of the EIS.

The summary of the annual emissions during the worst-case year of operation (Year 3) at the Gordon site and PR 391 indicates that:

- Most of the gaseous emissions at the Gordon site are associated with mining off-road equipment exhaust and haul trucks on PR 391.
- Most of the fugitive dust emissions (TSP, PM₁₀ and PM_{2.5}) are associated with the haul roads and the mining off-road equipment movement at the site.

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Table 2-2 Sources of Gaseous Emissions at the Gordon Site

Emission Source	Location(s)	Activities Generating Emissions	Emissions Generation Factors	Project Phase		
				Con	Op	D/C
Construction Off-Road Diesel Equipment and Vehicles	Haul Roads, Ore Stockpile, Overburden Stockpile, Mine Rock Storage Area (MRSA), Facilities General Area	Construction off-road equipment diesel combustion exhaust	Operation of construction off-road equipment (10/7, daylight hours), engine type, fuel consumption rate	X		
Mining Off-Road Diesel Equipment and Vehicles	Open Pit, Haul Roads, Ore Stockpile, Overburden Stockpile, MRSA, Facilities general Area	Mining off-road equipment diesel combustion exhaust	Operation of mining off-road equipment (24/7), engine type, fuel consumption rate	X	X	
On-Highway Ore Haul Trucks	PR 391, Access Road	On-highway ore haul trucks diesel combustion exhaust	Operation of on-highway ore haul trucks (24/7), engine type, fuel consumption rate		X	
On-Highway Trucks and Vehicles	PR 391, Access Road	On-highway trucks and vehicles diesel combustion exhaust	Operation of on-highway delivery trucks and vehicles operation (12/7, daylight hours), engine type, fuel consumption rate	X	X	X
Blasting	Open Pit	Explosives detonation	Blasting frequency three to four times per week, amount of ANFO used	X	X	
One stationary 1,000 kW Diesel Generator	Facilities General Area	Generator diesel combustion exhaust (stack emissions)	Diesel generator operation (24/7), engine type, fuel consumption rate		X	
Notes: Con – Construction; Op – Operation; D/C – Decommissioning/Closure						

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Table 2-3 Sources of Fugitive Dust Emissions at the Gordon Site

Emission Source	Dust Generating Activities	Dust Generating Material	Dust Generation Factors	Project Phase		
				Con	Op	D/C
Haul Roads (Unpaved)	Haul truck traffic, vehicle traffic	Road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed	X	X	
Access Road (Unpaved)	Haul truck traffic, on-highway truck traffic, vehicle traffic	Road surface material	Material silt content, material moisture content, vehicle traffic volume, vehicle weight, vehicle speed, wind speed	X	X	X
PR 391 (Paved)	Haul truck traffic, on-highway truck traffic, vehicle traffic	Road surface material	Material silt content, material moisture content, traffic volume, vehicle weight, vehicle speed, wind speed	X	X	X
Open Pit	Drilling, blasting, truck loading/unloading, haul truck traffic, mechanically- generated dust from off-road equipment movement, bulldozing and grading	ROM ore, mine rock	Number of drill holes, blasting area, material silt content, material moisture content, truck traffic volume, truck/equipment weight, truck/equipment speed, wind speed	X	X	
Ore Stockpiles	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	ROM ore, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	
Overburden Stockpile	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	Overburden, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	X
MRSA	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	Mine rock, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	X
Facilities General Area	Mechanically generated dust from supporting off-road equipment movement, vehicle traffic	Road surface material	Material silt content, material moisture content, vehicle traffic volume, vehicle weight, vehicle speed, wind speed	X	X	X
Notes: Con – Construction; Op – Operation; D/C – Decommissioning/Closure						

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2.3.2 MacLellan

Sources of gaseous, PM and fugitive dust emissions at MacLellan site are summarized in Table 2-4, Table 2-5 and Table 2-6, respectively and are shown on Map 2-2 (Appendix B). Table 2-4, Table 2-5 and Table 2-6 describe for each source:

- The activities that will result in air emissions.
- The factors that influence the generation of emissions.
- The dust generating material (for fugitive dust emissions only).
- The Project phase (construction, operation, and decommissioning/closure) in which emissions will be generated.

Details about the sources and quantities of air emissions at the MacLellan site for each substance of interest are presented in the Chapter 6 of the EIS and in Volume 5, Appendix A, Attachment C (Stantec 2020). The emissions have been updated based on information available for the final Project design (Alamos 2023). The updated emissions are similar to the emissions presented in Chapter 6 of the EIS.

The summary of the annual emissions during the worst-case year of operation (Year 5) at the MacLellan site indicates that:

- Most of the gaseous emissions at the MacLellan site are associated with mining off-road equipment exhaust.
- Most of the fugitive dust emissions (TSP, PM₁₀ and PM_{2.5}) are associated with the haul roads and the mining off-road equipment movement at the site.

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Table 2-4 Sources of Gaseous Emissions at the MacLellan Site

Emission Source	Location(s)	Activities Generating Emissions	Emissions Generation Factors	Project Phase		
				Con	Op	D/C
Construction Off-Road Diesel Equipment and Vehicles	Haul Roads, Ore Stockpile, ROM Stockpile, Topsoil Stockpile, Overburden Stockpile, MRSA, TMF, Crushing Plant, Processing Plant, Processing Plant General Area	Construction off-road equipment diesel combustion exhaust	Operation of construction off-road equipment (10/7 daylight hours), engine type, fuel consumption rate	X		
Mining Off-Road Diesel Equipment and Vehicles	Open Pit, Haul Roads, Ore Stockpile, ROM Stockpile, Topsoil Stockpile, Overburden Stockpile, MRSA, Crushing Plant, Processing Plant General Area	Mining off-road equipment diesel combustion exhaust	Operation of mining off-road equipment (24/7), engine type, fuel consumption rate	X	X	
On-Highway Trucks and Vehicles	Access Roads	On-highway trucks and vehicles diesel combustion exhaust	Operation of on-highway trucks and vehicles (12/7 daylight hours), engine type, fuel consumption rate	X	X	X
Blasting	Open Pit	Explosives detonation	Blasting frequency three to four times per week, amount of ANFO used	X	X	
Portable Crusher	Temporary Crushing Facilities	Portable crusher diesel combustion exhaust	Operation of portable crusher (10/7), engine type, fuel consumption rate	X		
CIP Leach and Adsorption Tanks	Processing Plant	Fugitive HCN emissions due to volatilization losses of NaCN used in the leach and adsorption train	Mill feed rate, amount of NaCN used		X	
TMF Pond	TMF	Fugitive HCN emissions due to natural degradation and volatilization of a residual amount of cyanide contained in tailings (a maximum of 10 mg/L of wad-CN in wastewater discharged to the TMF) after cyanide detoxification	Wastewater discharge rate to the TMF, amount of wad-CN in wastewater, wastewater pH		X	

Notes:

Con – Construction; **Op** – Operation; **D/C** – Decommissioning/Closure

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Table 2-5 Point Sources of Air Emissions at the MacLellan Site

Emission Source	Dust Generating Activities	Dust Generating Material	Dust Generation Factors	Project Phase		
				Con	Op	D/C
Primary Crusher Dust Collector Stack	Crushing	ROM ore	Primary crusher operation (24/7), volumetric flow rate, inlet dust concentration, dust collector control efficiency		X	
Secondary Crusher Dust Collector Stack	Crushing	ROM ore	Secondary crusher operation (24/7), volumetric flow rate, inlet dust concentration, dust collector control efficiency		X	
Gold Room Drying Oven Fume Hood Stack	Metal sludge drying	Metal sludge	Gold room drying oven operation (batch production, 24/7), number of batches, feed rate		X	
Gold Room Electric Induction Furnace Dust Collector Stack	Metal sludge smelting	Metal sludge	Electric induction furnace operation (batch production, 24/7), number of batches, volumetric flow rate, inlet dust concentration, dust collector control efficiency		X	
Notes: Con – Construction; Op – Operation; D/C – Decommissioning/Closure						

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Table 2-6 Sources of Fugitive Dust Emissions at the MacLellan Site

Emission Source	Dust Generating Activities	Dust Generating Material	Dust Generation Factors	Project Phase		
				Con	Op	D/C
Haul Roads (Unpaved)	Haul truck traffic, vehicle traffic	Road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed	X	X	
Access Roads (Unpaved)	Haul truck traffic, on-highway truck traffic, vehicle traffic	Road surface material	Material silt content, material moisture content, vehicle traffic volume, vehicle weight, vehicle speed, wind speed	X	X	X
Open Pit	Drilling, blasting, truck loading/unloading, haul truck traffic, mechanically generated dust from off-road equipment movement, bulldozing and grading	ROM ore, mine rock	Number of drill holes, blasting area, material silt content, material moisture content, truck traffic volume, truck/equipment weight, truck/equipment speed, wind speed	X	X	
Ore Stockpile	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	ROM ore, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	
ROM Stockpile	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	ROM ore, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	
Topsoil Stockpile	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	Overburden, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	X
Overburden Stockpile	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	Overburden, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	X

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Emission Source	Dust Generating Activities	Dust Generating Material	Dust Generation Factors	Project Phase		
				Con	Op	D/C
MRSA	Truck loading/unloading, truck traffic, bulldozing and grading, wind erosion	Mine rock, road surface material	Material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed, frequency of disturbance	X	X	X
TMF Dry Banks	Wind erosion	Tailings	Material silt content, material moisture content, wind speed, frequency of disturbance		X	
Portable Crusher	Crushing, screening, material transfer (assumed two transfer points), truck loading/unloading	Aggregate, road surface material	Crusher feed rate, material silt content, material moisture content, truck traffic volume, truck weight, truck speed, wind speed	X		
Processing Plant General Area	Mechanically generated dust from supporting off-road equipment movement, vehicle traffic	Road surface material	Material silt content, material moisture content, vehicle traffic volume, vehicle weight, vehicle speed, wind speed	X	X	X
Notes: Con – Construction; Op – Operation; D/C – Decommissioning/Closure						

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2.4 RESIDUAL ENVIRONMENTAL EFFECTS

The potential effects of Project emissions on ambient air quality were evaluated by using the CALPUFF® numerical atmospheric dispersion model (Scire et al. 2000a; 2011), which simulated the transport, dispersion, and deposition of emissions during Project operation. The CALMET® model (Scire et al. 2000b) was used to provide three-dimensional hourly meteorological data for a five-year period (2012-2016) required for the CALPUFF® dispersion model. Construction and decommissioning emissions were not modelled as they are less than the worst-case (peak mining) year of operation. The model domain included Gordon and MacLellan sites. Concentrations and depositions for the substances of interest were predicted at a receptor grid covering the air quality LAA and at 160 human receptors including Potential Indigenous Receptor sites and the permanent work camp at the MacLellan site. Map 2-3 (Appendix B) shows the air quality LAA and human receptor locations in the LAA. A list of the 160 human receptor locations is provided in Appendix A. The full assessment of Project residual environmental effects on air quality is presented in Chapter 6 of the EIS (Stantec 2020). An updated air dispersion modelling was completed in 2024 (Stantec 2024) based on the final Project design (Alamos 2023). The results of the updated air dispersion modelling did not change the conclusions of the air quality assessment presented in Chapter 6 of the EIS.

The results of the dispersion modelling are described in detail in Chapter 6 of the EIS (Stantec 2020) and in the updated dispersion modelling assessment (Stantec 2024). A summary of the predicted Project residual effects on air quality are summarized below:

- Maximum model predicted 1-hour average NO₂ concentrations at Gordon site and maximum predicted 1-hour average NO₂ and CO concentrations at MacLellan site are greater than the Manitoba AAQC outside the Project boundary, but these occurrences are only predicted on the Project boundary and are limited to a maximum of one hour per year and are not near sensitive receptors.
- Maximum model predicted 24-hour TSP and PM₁₀ concentrations at Gordon and MacLellan sites are greater than the Manitoba AAQC outside the Project boundary due primarily to fugitive dust emissions.
- Maximum model-predicted concentrations for other substances of interest or/and averaging periods at Gordon and MacLellan sites, including NO₂ and CO for averaging periods other than 1-hour, SO₂, HCN, PM_{2.5}, dustfall and metals, are less than the applicable Manitoba AAQC outside the Project boundary.

Because 24-hour PM₁₀ and TSP concentrations during Project operation are predicted to be greater than the Manitoba AAQC, an ambient air quality monitoring program will be implemented to monitor ambient TSP, PM₁₀ and PM_{2.5} concentrations during construction and operation. The results of the ambient PM monitoring program will be used to assess the effectiveness of the dust mitigation and provide information for implementing adaptive management including the potential use of additional mitigations to reduce dust emissions.

A two-month ambient air quality monitoring program to measure ambient NO₂ concentrations will be conducted during Project operation at the MacLellan site work camp to validate the air dispersion model's NO₂ predictions.

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3.0 MITIGATION AND MANAGEMENT MEASURES

The air quality mitigation and management measures are described separately for the Gordon and MacLellan sites in the following sections. The air quality mitigation and management measures are generally the same for all phases of the Project.

3.1 GORDON

There are two main types of mitigation and management measures that will be implemented to reduce the potential Project-related air quality effects at the Gordon site: gaseous emission reduction measures, including preventive maintenance programs for stationary and mobile equipment, and fugitive dust reduction measures. Mitigation measures to reduce emissions for specific Project activities are described below. The mitigation measures applicable to each emission source are summarized in Table 3-1 for gaseous emissions and in Table 3-2 for fugitive dust emissions.

3.1.1 Gaseous Emissions

3.1.1.1 Construction and Mining Equipment and Vehicles

The operation of the construction and mining off-road diesel equipment, haul trucks and vehicles will generate diesel combustion exhaust emissions. Construction off-road equipment will be used for the construction of the haul roads, stockpile pads and facilities. Primary mining off-road equipment will be used in the open pit for drilling, excavation, loading ore and mine rock to haul trucks, bulldozing and grading. Mine haul trucks will transport ore and mine rock to the ore stockpile and MRSA. Supporting off-road equipment will be used at the facilities general area. Mitigation measures to reduce diesel exhaust emissions from the construction and mining equipment and vehicles include:

- Use of construction equipment, including equipment and vehicles operated by third-party contractors, which meets current Tier 4 engine emission standards and purchase of new mining equipment that meets Tier 4 emission standards. Tier 4 emission standards (Off-Road Compression-Ignition Engine Emission Regulations [SOR/2005-32]) are the most stringent emission standards for new manufactured equipment that came into effect in 2014. The following emission reduction efficiencies corresponding to using Tier 4 engines in the construction and mining equipment were estimated based on comparison of the Tier 4 to Tier 3 emission standards:
 - 42% for NO_x and 80% for DPM for diesel engines with power greater than 750 horsepower (hp) (majority of primary mining equipment).
 - 89% for NO_x and 93% for DPM for diesel engines with power between 175 hp and 600 hp (majority of construction equipment).
- Use of ultra-low sulphur diesel (sulphur content less than 15 parts per million [ppm]) in all equipment, as required by the Sulphur in Diesel Fuel Regulations [SOR/2002-254].

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- Optimization of haul roads and infrastructure to reduce transportation and haul distances.
- Reducing equipment and vehicle idling when not in use.
- Reducing cold starts to the extent possible.
- Completing regular servicing (preventative maintenance) of all mobile and stationary equipment to maintain efficiency.
- Operating equipment at rated load capacity.
- Adhering to posted on-site speed limits; haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty) and vehicle speed on the access road will be limited to 40 km/h.

Table 3-1 Summary of Mitigation Measures for Gaseous Emissions at Gordon Site

Emission Source	Location(s)	Mitigation Measures	Reduction Efficiency (%)
Construction Off-Road Diesel Equipment and Vehicles	Haul Roads, Ore Stockpile, Overburden Stockpile, MRSA, Facilities General Area	<ul style="list-style-type: none"> • Use construction equipment, including equipment and vehicles operated by third-party contractors, which meets Tier 4 emission standards • Use ultra-low sulphur diesel (< 15 ppm) • Optimize haul roads and infrastructure to reduce transportation and haul distances • Reduce equipment idling • Reduce cold starts • Regular servicing of all mobile and stationary equipment to maintain efficiency • Operate equipment at rated load capacity • Adhere to speed limits on the on-site haul roads (35 km/h loaded and 40 km/h empty) and the access road (40 km/h) 	<ul style="list-style-type: none"> • 89% for NO_x and 93% for DPM for 175-600 hp diesel engines (majority of construction equipment) • Efficiencies based on comparison of Tier 4 to Tier 3 emission standards.
Mining Off-Road Diesel Equipment and Vehicles	Open Pit, Haul Roads, Ore Stockpile, Overburden Stockpile, MRSA, Facilities General Area	<ul style="list-style-type: none"> • Purchase new mining equipment that meets Tier 4 emission standards • Use ultra-low sulphur diesel (< 15 ppm) • Optimize haul roads and infrastructure to reduce transportation and haul distances • Reduce equipment idling • Reduce cold starts • Regular servicing of all mobile and stationary equipment to maintain efficiency • Operate equipment at rated load capacity • Adhere to speed limits on the on-site haul roads (35 km/h loaded and 40 km/h empty) and the access road (40 km/h) 	<ul style="list-style-type: none"> • 42% for NO_x and 80% for DPM for diesel engines > 750 hp (majority of primary mining equipment) • Efficiencies based on comparison of Tier 4 to Tier 3 emission standards.

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Emission Source	Location(s)	Mitigation Measures	Reduction Efficiency (%)
On-Highway Ore Haul Trucks	PR 391, Access Road	<ul style="list-style-type: none"> • Purchase new on-highway haul trucks that meet the latest engine emission standards for on-road vehicles • Reduce trucks and vehicles idling • Use ultra-low sulphur diesel (<15 ppm) • Regular servicing of trucks to maintain efficiency and low emissions • Adhere to speed limit on the access road (40 km/h) and designated speed limit on PR 391 	N/A
On-Highway Trucks and Vehicles	PR 391, Access Road	<ul style="list-style-type: none"> • Reduce trucks and vehicles idling • Use ultra-low sulphur diesel (<15 ppm) • Regular servicing of all trucks and vehicles to maintain efficiency and low emissions • Adhere to speed limit on the access road (40 km/h) and designated speed limit on PR 391 	N/A
Blasting	Open Pit	<ul style="list-style-type: none"> • Optimize number of drill holes per blast (by design) • Optimize usage of ANFO per blast (by design) 	N/A
One 1,000 kW Diesel Generator	Facilities General Area	<ul style="list-style-type: none"> • Purchase diesel generator set that meet or exceed Tier 2 emission standards for stationary diesel equipment • Use ultra-low sulphur diesel (< 15 ppm) • Regular servicing and inspection to maintain efficiency 	<ul style="list-style-type: none"> • 88% for NO_x for stationary diesel generator sets with power greater than 1,200 hp • Efficiency based on comparison of Tier 4 to Tier 2 emission standards.
<p>Note: N/A – not applicable</p>			

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Table 3-2 Summary of Mitigation Measures for Fugitive Dust Emissions at the Gordon Site

Emission Source	Mitigation Measures	Frequency of Use	Reduction Efficiency^a (%)
Haul Roads (Unpaved)	<ul style="list-style-type: none"> • Reduce transportation and haul distances (by design) • Regular inspection and maintenance of unpaved roads • Apply water to unpaved road surfaces • Adhere to speed limits on the on-site haul roads (35 km/h loaded and 40 km/h empty) 	Road watering (Section 5.0, Table 5-1): <ul style="list-style-type: none"> • At a minimum 3 times a day during dry periods in summer • Increased water frequency during high winds and dry conditions 	<ul style="list-style-type: none"> • 75% for road watering • 44% for limiting vehicle speed to 40 km/h
Access Road (Unpaved)	<ul style="list-style-type: none"> • Regular inspection and maintenance of unpaved roads • Application of water to unpaved road surfaces • Adhere to speed limits on the access road (40 km/h) 	Road watering (Section 5.0, Table 5-1): <ul style="list-style-type: none"> • At a minimum 3 times a day during dry periods in summer • Increased water frequency during high winds and dry conditions 	<ul style="list-style-type: none"> • 75% for road watering • 44% for limiting vehicle speed to 40 km/h
PR 391 (Paved)	<ul style="list-style-type: none"> • Dust sweeping and truck wheel washing stations prior to entering onto PR 391 during non-winter months • Cover ore haul trucks transporting ROM ore from Gordon site to MacLellan site ore milling and processing plant. 	During Project operation	<ul style="list-style-type: none"> • 4 to 26% for sweeping paved surfaces • 40-80% for minimizing track out
Open Pit	<ul style="list-style-type: none"> • Optimize number of drill holes per blast (by design) • Optimize blasting area per blast (by design) • Reduce drop heights from loaders and excavators to 1 m 	Blasting: <ul style="list-style-type: none"> • 3-4 times per week • Avoid blasting during calm wind conditions (low wind speed), or blast more frequently but with smaller blast areas (Section 5.0, Table 5-1) 	N/A

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Emission Source	Mitigation Measures	Frequency of Use	Reduction Efficiency^a (%)
Stockpiles (Ore, Overburden, MRSA)	<ul style="list-style-type: none"> • Reduce drop height during truck unloading to 5 m • Contour stockpiles to reduce wind erosion potential, where feasible • Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces. 	During all phases of the Project During high winds and dry conditions (Section 5.0, Table 5-1): <ul style="list-style-type: none"> • Cover inactive stockpiles with a tarp • Apply water spray if visible dust events are observed • Build wind fences around stockpiles if visible dust events are observed 	<ul style="list-style-type: none"> • 15-64% for contouring surface • 90% for revegetation with cover crop • 90% for covering stockpiles with a tarp during high winds • 50-90% for wet suppression on stockpiles • 75% for 3-sided enclosure around stockpiles
Facilities General Area	<ul style="list-style-type: none"> • Application of water to unpaved arid surfaces 	Road watering (Section 5.0, Table 5-1): <ul style="list-style-type: none"> • At a minimum 3 times a day during dry periods in summer. • Increased water frequency during high winds and dry periods 	<ul style="list-style-type: none"> • 75% for water application • 44% for limiting vehicle speed to 40 km/h
Notes: ^a Reduction efficiency based on WRAP Fugitive Dust Handbook (WRAP 2006) N/A – not applicable			

3.1.1.2 On-Highway Trucks and Vehicles on PR 391

During Project operation, on-highway haul trucks will be used for ROM ore haulage along PR 391 from the Gordon site to the ore milling and processing plant at the MacLellan site. Additionally, on-highway trucks will travel along PR 391 from Thompson to Lynn Lake for the delivery of mine consumables such as fuel, explosives, grinding media and re-agents. Mitigation measures to reduce diesel exhaust emissions from on-highway trucks and vehicles on PR 391, include:

- Purchasing new on-highway haul trucks that meet the latest emission standards for on-road vehicles (On-Road Vehicle and Engine Emission Regulations [SOR/2003-2]).
- Reducing trucks and vehicles idling to the extent possible.
- Using ultra-low sulphur diesel (sulphur content less than 15 ppm), as required by the Sulphur in Diesel Fuel Regulations [SOR/2002-254].
- Completing regular servicing of all trucks and vehicles to maintain efficiency and low emissions.
- Adhering to designated speed limit on PR 391 (trucks and vehicles) .

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3.1.1.3 Blasting

Blasting in the Gordon open pit will occur three to four times per week. Design mitigation measures to reduce explosives detonation emissions from blasting during Project operation include:

- Optimizing number of drill holes per blast (by design).
- Optimizing usage of ANFO per blast (by design).

3.1.1.4 Diesel Generator

During Project operation, one stationary 1,000 kW diesel generator will provide power to the facilities at the Gordon site. Mitigation measures to reduce diesel exhaust emissions from the diesel generator during Project operation include:

- Purchasing diesel generator set that meets or exceeds Tier 2 engine emission standards for stationary diesel engines, as required by the Canadian Off-road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission Regulations [SOR/2020-258]. The diesel generator at Gordon site is classified as stationary diesel engine in a remote location because the Gordon site is not serviced by Manitoba Hydro power distribution grid, or a natural gas distribution network. Therefore, the generator is not required to meet the most stringent Tier 4 engine emission standards.
- The following emission reduction efficiency corresponding to using Tier 4 diesel generator set was estimated based on comparison of Tier 4 to Tier 2 emission standards:
 - 89% for NO_x for stationary diesel generator sets with power greater than 1,200 hp (the Gordon diesel generator has engine power of 1,000 kW, or 1,340 hp).
- Use of ultra-low sulphur diesel (sulphur content less than 15 ppm), as required by Canadian Off-road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission Regulations [SOR/2020-258] for stationary diesel engines with displacement less than 30 liters per cylinder.
- Completing regular servicing and inspection of the generator to maintain efficiency.

3.1.2 Fugitive Dust Emissions

3.1.2.1 Unpaved Roads

Fugitive dust emissions may be generated by haul trucks and other vehicles travelling on unpaved roads, such as the on-site haul roads and the access road. Mitigation measures to reduce fugitive dust from unpaved roads include:

- Optimizing haul roads and infrastructure to reduce transportation and haul distances (by design).
- Completing regular inspection and maintenance of unpaved roads.

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- Maintaining a buffer of existing vegetation on each side of unpaved haul roads where feasible, to act as a wind barrier.
- Applying water to unpaved road surfaces at a minimum of three times a day during dry periods in summer to maintain a 75% dust control efficiency (US EPA 2006). Dry periods are defined in the Trigger Action Response Plan (TARP; Section 5.0, Table 5-1) based on the results of the meteorological monitoring. The frequency of water application will be increased to several times per day during high winds and dry conditions (as defined in the TARP - Section 5.0, Table 5-1) to maintain a 75% control efficiency.
- A 75% dust control efficiency is based on increasing the moisture content of the haul roads and access roads by two times (US EPA 2006). Watering of the unpaved roads increases the moisture content, which in turn causes particles to agglomerate and reduces the likelihood of them becoming suspended when vehicles pass over the surface. The control efficiency depends on how fast the road dries after water is applied. Watering is most effective immediately after application and repeated watering several times a day might be required, depending on surface and meteorological conditions.
- Adhering to speed limits; haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty) and vehicle speed on the access road will be limited to 40 km/h.

3.1.1.2.2 PR 391

During Project operation, on-highway haul trucks will be used for ROM ore haulage along PR 391 from Gordon to the ore milling and processing plant at the MacLellan site. Additionally, on-highway trucks will travel along PR 391 from Thompson to Lynn Lake for the delivery of mine consumables such as fuel, explosives, grinding media and re-agents. Mitigation measures to reduce fugitive dust emissions from ore haul trucks and other delivery on-highway trucks and vehicles on PR 391 include:

- Sweeping dust and washing truck wheels (at designated wash stations) prior to entering onto PR 391 during non-winter months to reduce track out of material to PR 391
- Covering ore haul trucks transporting ROM ore from Gordon site to MacLellan site ore milling and processing plant.

3.1.1.2.3 Drilling and Blasting

Drilling and blasting create fugitive dust emissions by mechanical disturbance of the surface in the open pit. Blasting in the Gordon open pit will occur three to four times per week. Mitigation measures to reduce fugitive dust emissions from drilling and blasting in the open pit during Project operation include:

- Optimizing number of drill holes per blast (by design).
- Optimizing blasting area per blast (by design).
- Avoiding blasting during calm wind conditions (low wind speed), or blast more frequently but with smaller blast areas (as defined in the TARP – Section 5.0, Table 5-1).

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For more details on mitigations and monitoring associated with blasting activities see the Blasting Management and Monitoring Plan.

3.1.2.4 Material Handling

During construction, earth moving activities will occur for the site preparation. During operation, ore and mine rock will be excavated in the open pit, loaded on haul trucks, and unloaded at the ore stockpile and MRSA. Material handling activities will generate fugitive dust emissions. Mitigation measures to reduce fugitive dust emissions from material handling include:

- Reducing drop heights from loaders and excavators to 1 m.
- Reducing drop height during truck unloading to 5 m.

3.1.2.5 Stockpiles

Fugitive dust emissions may be generated by wind erosion of the overburden and ore stockpiles and the MRSA surfaces during high winds and dry conditions. Mitigation measures to reduce fugitive dust emissions from stockpiles wind erosion include:

- Contouring stockpiles to reduce wind erosion potential, where feasible.
- Applying water spray during high winds and dry conditions if visible dust events are observed (as defined in the TARP - Section 5.0, Table 5-1).
- Covering inactive stockpiles with a tarp during high winds and dry conditions (as defined in the TARP - Section 5.0, Table 5-1).
- Building wind fences around stockpiles if visible dust events are observed (as defined in the TARP - Section 5.0, Table 5-1) during high winds and dry conditions.
- Stabilizing surfaces of topsoil and overburden stockpiles during extended periods between usage, by means of vegetating or covering the exposed surfaces.

3.1.2.6 Facilities General Area

Fugitive dust emissions may be generated by wind erosion of arid surfaces such as the facilities general area and parking lot(s) at Gordon site. Mitigation measures to reduce fugitive dust emissions from wind erosion at arid surfaces include application of water to unpaved arid surfaces during dry periods in summer (as defined in the TARP - Section 5.0, Table 5-1). Increase frequency of water application to several times per day during high winds and dry conditions to maintain a 75% control efficiency (US EPA 2006) (as defined in the TARP - Section 5.0, Table 5-1).

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3.2 MACLELLAN

There are three main types of mitigation and management measures to reduce air quality effects at the MacLellan site associated with the Project: gaseous emission reduction measures, including preventive maintenance programs for stationary and mobile equipment, reduction measures for point sources of air emissions (stacks) and fugitive dust reduction measures. Mitigation measures to reduce emissions for specific Project activities are described below. The mitigation measures applicable to each emission source are summarized in Table 3-3 for gaseous emissions, in Table 3-4 for point sources of air emissions and in Table 3-5 for fugitive dust emissions. Most of these mitigation measures are relevant for all phases of the Project.

3.2.1 Gaseous Emissions

3.2.1.1 Construction and Mining Equipment and Vehicles

The operation of the construction and mining off-road diesel equipment, haul trucks and vehicles will generate diesel combustion exhaust emissions. Construction off-road equipment will be used for the construction of the haul roads, stockpile pads, the ore milling and processing plant and the TMF. Primary mining off-road equipment will be used in the open pit for drilling, excavation, loading ore and mine rock to haul trucks, bulldozing and grading. Mine haul trucks will transport ore and mine rock to the primary crusher, ore stockpiles and MRSA. Supporting off-road equipment will be used at the processing plant general area. Mitigation measures to reduce diesel exhaust emissions from the construction and mining equipment and vehicles will be implemented during all applicable phases of the Project and include:

- Use of construction equipment, including equipment and vehicles operated by third-party contractors, which meets current Tier 4 engine emission standards. Purchase new mining equipment that meets Tier 4 engine emission standards. Tier 4 engine emission standards (Off-Road Compression-Ignition Engine Emission Regulations [SOR/2005-32]) are the most stringent emission standards for new manufactured equipment that came into effect in 2014.
 - The following emission reduction efficiencies corresponding to using Tier 4 construction and mining equipment were estimated based on comparison of Tier 4 to Tier 3 engine emission standards:
 - 42% for NO_x and 80% for DPM for diesel engines with power greater than 750 hp (majority of primary mining equipment).
 - 89% for NO_x and 93% for DPM for diesel engines with power between 175 hp and 600 hp (majority of construction equipment).
- Use of ultra-low sulphur diesel (sulphur content less than 15 ppm) in all equipment, as required by the Sulphur in Diesel Fuel Regulations [SOR/2002-254].
- Optimizing haul roads and infrastructure to reduce transportation and haul distances.
- Reducing equipment and vehicle idling when not in use.
- Reducing cold starts to the extent possible.

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- Completing regular servicing of all mobile and stationary equipment to maintain efficiency.
- Operation equipment at rated load capacity.
- Adhering to posted on-site speed limits; haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty) and vehicle speed on the access road will be limited to 40 km/h.

3.2.1.2 Blasting

Blasting in the MacLellan open pit will occur three to four times per week. Design mitigation measures to reduce explosives detonation emissions from blasting during Project operation include:

- Optimizing number of drill holes per blast (by design).
- Optimizing usage of ANFO per blast (by design).

3.2.1.3 CIP Leach and Adsorption Tanks

Gold and silver are extracted in the processing plant by a cyanidation and CIP processes. NaCN and oxygen are added to the thickened ore slurry in four leach tanks to extract gold and silver to solution. The CIP process involves the removal of gold from solution by adsorption into activated carbon. Six CIP adsorption tanks recover dissolved gold to granular activated carbon.

Fugitive HCN emissions may result from the CIP leach and adsorption tanks due to volatilization losses of NaCN used in the leach and adsorption train. Design mitigation measures to reduce fugitive HCN emissions from the CIP leach and adsorption tanks during Project operation include:

- Equipping leach tanks with vapour recovery units (VRU) (by design).
- Enclosing adsorption tanks in the processing plant building (by design).
- Monitoring pH of cyanide mixing in leach tanks to maintain alkaline solution.
- Adhering to the Government of Canada (2002) Metal and Diamond Mining Effluent Regulations (MDMER; [SOR/2002-222]), the Environmental Code of Practice for Metal Mines (ECCC 2009) and International Cyanide Management Code (International Cyanide Management Institute, 2021) for the transportation, storage and disposal of cyanide and cyanide-related products.

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Table 3-3 Summary of Mitigation Measures for Gaseous Emissions at the MacLellan Site

Emission Source	Location(s)	Mitigation Measures	Reduction Efficiency (%)
Construction Off-Road Diesel Equipment and Vehicles	Open Pit, Haul Roads, Ore Stockpile, ROM Stockpile, Topsoil Stockpile, Overburden Stockpile, MRSA, TMF, Crushing Plant, Processing Plant, Processing Plant General Area	<ul style="list-style-type: none"> • Use construction equipment, including equipment and vehicles operated by third-party contractors, which meets Tier 4 emission standards. • Use ultra-low sulphur diesel (< 15 ppm) • Optimize haul roads and infrastructure to reduce transportation and haul distances • Reduce equipment idling • Reduce cold starts • Regular servicing of all mobile and stationary equipment to maintain efficiency • Operated equipment at rated load capacity • Adhere to speed limits on the on-site haul roads (35 km/h loaded and 40 km/h empty) and the access roads (40 km/h) 	<ul style="list-style-type: none"> • 89% for NO_x and 93% for DPM for 175-600 hp diesel engines (majority of construction equipment) <p>Efficiencies based on comparison of Tier 4 to Tier 3 emission standards.</p>
Mining Off-Road Diesel Equipment and Vehicles	Open Pit, Haul Roads, Ore Stockpile, ROM Stockpile, Topsoil Stockpile, Overburden Stockpile, MRSA, Crushing Plant, Processing Plant General Area	<ul style="list-style-type: none"> • Purchase new mining equipment that meets Tier 4 emission standards • Use ultra-low sulphur diesel (< 15 ppm) • Optimize haul roads and infrastructure to reduce transportation and haul distances • Reduce equipment idling • Reduce cold starts • Regular servicing of all mobile and stationary equipment to maintain efficiency • Operate equipment at rated load capacity • Adhere to speed limits on the on-site haul roads (35 km/h loaded and 40 km/h empty) and the access roads (40 km/h) 	<ul style="list-style-type: none"> • 42% for NO_x and 80% for DPM for diesel engines > 750 hp (majority of primary mining equipment) <p>Efficiencies based on comparison of Tier 4 to Tier 3 emission standards.</p>

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Emission Source	Location(s)	Mitigation Measures	Reduction Efficiency (%)
On-Highway Ore Haul Trucks	Access Road	<ul style="list-style-type: none"> • Purchase new on-highway haul trucks that meet the latest engine emission standards for on-road vehicles • Reduce trucks and vehicles idling • Use ultra-low sulphur diesel (<15 ppm) • Regular servicing of trucks to maintain efficiency and low emissions • Adhere to speed limit on the access road (40 km/h) and designated speed limit on PR 391 	N/A
On-Highway Trucks and Vehicles	Access Roads	<ul style="list-style-type: none"> • Reduce trucks and vehicles idling • Use ultra-low sulphur diesel (<15 ppm) • Regular servicing of all trucks and vehicles to maintain efficiency and low emissions • Adhere to speed limit on the access roads (40 km/h) and designated speed limit on PR 391 	N/A
Blasting	Open Pit	<ul style="list-style-type: none"> • Optimize number of drill holes per blast (by design) • Optimize usage of ANFO per blast (by design) 	N/A
Portable Crusher	Temporary Crushing Facilities	<ul style="list-style-type: none"> • Use construction equipment that meets Tier 4 emission standards, to the extent possible, as construction equipment will be rented • Use ultra-low sulphur diesel (< 15 ppm) • Regular servicing and inspection to maintain efficiency • The portable crusher will be operated at rated load capacity 	<ul style="list-style-type: none"> • 89% for NO_x and 93% for DPM for 300-600 hp diesel engines (portable crusher) <p>Efficiencies based on comparison of Tier 4 to Tier 3 engine emission standards.</p>

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Emission Source	Location(s)	Mitigation Measures	Reduction Efficiency (%)
CIP Leach and Adsorption Tanks	Processing Plant	<ul style="list-style-type: none"> • Leach tanks equipped with vapour recovery unit (VRU) (by design) • Adsorption tanks enclosed in the processing plant building (by design) • Monitor the pH of cyanide mixing in leach tanks to maintain an alkaline solution • Adhere to applicable regulations and codes of practice for the transportation, storage and disposal of cyanide and cyanide-related products 	N/A
TMF Pond	TMF	<ul style="list-style-type: none"> • Limit the concentration of wad-CN in discharged wastewater to the TMF to 10 mg/L (by design) • Maintain pH of discharged wastewater to the TMF above 8.5 (by design) • Adhere to applicable regulations and codes of practice for the transportation, storage and disposal of cyanide and cyanide-related products 	N/A
<p>Note: N/A – not applicable</p>			

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Table 3-4 Summary of Mitigation Measures for Point Sources of Air Emissions at the MacLellan Site

Emission Source	Mitigation Measures	Frequency of Use	Reduction Efficiency (%)
Primary Crusher Dust Collector Stack	<ul style="list-style-type: none"> • Baghouse dust collection system (reverse jet baghouse with a walk-in plenum) • Enclosed conveyor transfer points at the crushing plant (by design), including enclosed connecting conveyors • Regular servicing (preventative maintenance) of the dust collection system to maintain efficiency 	24 h/d, 7 d/w	Minimum 98% particulate collection efficiency
Secondary Crusher Dust Collector Stack	<ul style="list-style-type: none"> • Venturi wet scrubber and separator with mist eliminator • Enclosed fine ore stockpile and enclosed conveyor transfer points at the crushing plant (by design), including enclosed connecting conveyors • Regular servicing (preventative maintenance) of the wet scrubber to maintain efficiency 	24 h/d, 7 d/w	Minimum 98% particulate collection efficiency
Gold Room Drying Oven Fume Hood Stack	<ul style="list-style-type: none"> • Fume hood venting through a rooftop centrifugal fan 	24 h/d, 7 d/w	N/A
Electric Induction Furnace Dust Collector Stack	<ul style="list-style-type: none"> • Baghouse dust collection system (reverse pulse jet baghouse) • Regular servicing (preventative maintenance) of the dust collection system to maintain efficiency 	24 h/d, 7 d/w	Minimum 98% particulate collection efficiency
<p>Notes: N/A – not applicable h/d = hours per day; d/w = days per week</p>			

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Table 3-5 Summary of Mitigation Measures for Fugitive Dust Emissions at the MacLellan Site

Emission Source	Mitigation Measures	Frequency of Use	Reduction Efficiency^a (%)
Haul Roads (Unpaved)	<ul style="list-style-type: none"> • Reduce transportation and haul distances (by design) • Regular inspection and maintenance of unpaved roads • Application of water to unpaved road surfaces • Adhere to speed limits on the on-site haul roads (35 km/h loaded and 40 km/h empty) 	Road watering (Section 5.0, Table 5-1): <ul style="list-style-type: none"> • At a minimum 3 times a day during dry periods in summer • Increased water frequency during high winds and dry conditions 	<ul style="list-style-type: none"> • 75% for road watering • 44% for limiting vehicle speed to 40 km/h
Access Roads (Unpaved)	<ul style="list-style-type: none"> • Regular inspection and maintenance of unpaved roads • Application of water to unpaved road surfaces • Adhere to speed limit on the access roads (40 km/h) 	Road watering (Section 5.0, Table 5-1): <ul style="list-style-type: none"> • At a minimum 3 times a day during dry periods in summer • Increased water frequency during high winds and dry conditions 	<ul style="list-style-type: none"> • 75% for road watering • 44% for limiting vehicle speed to 40 km/h
Open Pit	<ul style="list-style-type: none"> • Optimize number of drill holes per blast (by design) • Optimize blasting area per blast (by design) • Reduce drop heights from loaders and excavators to 1 m 	Blasting: <ul style="list-style-type: none"> • 3-4 times per week • Avoid blasting during calm wind conditions (low wind speed), or blast more frequently but with smaller blast areas (Section 5.0, Table 5-1) 	N/A
Stockpiles (Ore, ROM, Topsoil, Overburden, MRSA)	<ul style="list-style-type: none"> • Reduce drop height during truck unloading to 5 m • Contour stockpiles to reduce wind erosion potential • Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces. 	During all phases of the Project. During high winds and dry conditions (Section 5.0, Table 5-1): <ul style="list-style-type: none"> • Cover inactive stockpiles with a tarp • Apply water spray if visible dust events are observed • Build wind fences around stockpiles if visible dust events are observed 	<ul style="list-style-type: none"> • 15-64% for contouring surface • 90% for revegetation with cover crop • 90% for covering stockpiles with a tarp during high winds • 50-90% for wet suppression on stockpiles • 75% for 3-sided enclosure around stockpiles

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Emission Source	Mitigation Measures	Frequency of Use	Reduction Efficiency ^a (%)
TMF Dry Banks	<ul style="list-style-type: none"> Progressively restore TMF areas to reduce dry banks area (by design) Contour TMF banks (by bulldozing) to reduce wind erosion potential, where feasible 	During Project operation During high winds and dry conditions (Section 5.0, Table 5-1): <ul style="list-style-type: none"> Apply water spray to maintain 75% mitigation efficiency if visible dust events are observed Build wind fences around TMF dry bank areas that have high potential to generate windblown dust if visible dust events are observed 	<ul style="list-style-type: none"> 15-64% for contouring surface 75% for water application
Portable Crusher	<ul style="list-style-type: none"> Avoid operation during high winds and dry conditions Maintain a 2 m high berm around the portable crusher to function as a wind barrier if visible dust events are observed 	During Project construction	<ul style="list-style-type: none"> 24-93% for creating crosswind ridges
Processing Plant General Area	<ul style="list-style-type: none"> Application of water to unpaved arid surfaces Adhere to designated speed limit 	Road watering (Section 5.0, Table 5-1): <ul style="list-style-type: none"> At a minimum 3 times a day during dry periods in summer Increased water frequency during high winds and dry conditions 	<ul style="list-style-type: none"> 75% for water application 44% for limiting vehicle speed to 40 km/h
Note: ^a Reduction efficiency based on the WRAP Fugitive Dust Handbook (WRAP 2006)			

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3.2.1.4 Tailings Management Facility

After gold extraction, the cyanide used in the processing plant is extracted in the cyanide detoxification area before tailings are pumped to the TMF. The wastewater discharge to the TMF after cyanide detoxification treatment might contain up to a maximum of 10 mg/L of wad-CN by design, which has the potential to volatilize from the TMF pond in the form of gaseous HCN. Design mitigation measures to reduce fugitive HCN emissions from the TMF pond (due to the natural degradation and volatilization of a residual amount of cyanide contained in tailings) include:

- Limiting the concentrations of wad-CN in discharged wastewater to the TMF to 10 mg/L (by design).
- Maintaining the pH of discharged wastewater to the TMF above 8.5 (by design).
- Adhering to the Government of Canada (2002) Metal and Diamond Mining Effluent Regulations (MDMER; [SOR/2002-222]), the Environmental Code of Practice for Metal Mines (ECCC 2009) and International Cyanide Management Code (International Cyanide Management Institute, 2021) for the transportation, storage and disposal of cyanide and cyanide-related products.

3.2.2 Point Sources of Air Emissions

3.2.2.1 Primary Crusher

The primary crusher is a jaw crusher enclosed in a building and equipped with a baghouse dust collection system. A baghouse is an air pollution control device that removes particulates by passing industrial air stream through a filtering media or bag with dust accumulating on the filter media surface. The primary crusher baghouse will collect airborne dust generated from the ore crushing and handling in the building. The collected dust will be discharged onto the primary crusher transfer conveyor. The primary crusher baghouse is a reverse jet baghouse with a walk-in plenum. The primary crusher baghouse will have at least 98% particulate collection efficiency by design.

The baghouse control system will be interlocked with the primary crusher equipment and a dust suppression failure will alarm the control system and trigger shutdown of the equipment. To confirm the baghouse is operating efficiently, pressure drop reading will be recorded on a regular basis.

3.2.2.2 Secondary Crusher

The secondary crusher is a cone crusher enclosed in a building and equipped with a wet scrubber. Wet scrubbers are air pollution control devices which remove particulates and/or gases from industrial exhaust streams. A wet scrubber operates by pushing the air stream through a “scrubbing” liquid, typically water, and in doing so removes particulates and/or gases from the air. The secondary crusher wet scrubber is a Venturi scrubber and separator with mist eliminator. The secondary crusher wet scrubber will have at least 98% particulate collection efficiency by design.

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The wet scrubber control system will be interlocked with the secondary crusher equipment and an operation failure will alarm the control system and trigger shutdown of the equipment. Regular daily visual inspections will be completed by the operator when the secondary crusher is in operation to verify that water is on, and the pressure differential is verified at the pick-up points.

3.2.2.3 Gold Room Drying Oven and Electric Induction Furnace

Material recovered from the electrowinning cells in the processing plant is dried, mixed with fluxes and smelted in the gold room. Gold doré is poured into 400 oz bars which are cleaned, assayed, weighed, and stored in the vault awaiting sale and transport to a bullion refinery.

The metal sludge recovered from the electrowinning cells will be dried in a drying oven equipped with a fume hood which will vent through a rooftop centrifugal fan. An electric induction furnace will be used to smelt the metal sludge into gold doré. The electric induction furnace will be equipped with a baghouse dust collection system (a reverse pulse jet baghouse) with at least 98% particulate collection efficiency by design.

3.2.2.4 Quick Lime Silo

The quick lime silo feeder adds lime to the SAG mill in the ore milling and processing plant. The quick lime silo will be equipped with a baghouse dust collection system (a reverse jet baghouse) with at least 98% particulate collection efficiency by design. The quick lime silo is a negligible source of dust emissions.

3.2.3 Fugitive Dust Emissions

3.2.3.1 Unpaved Roads

Fugitive dust emissions may be generated by haul trucks and other vehicles travelling on unpaved roads, such as the on-site haul roads and access roads. Mitigation measures to reduce fugitive dust from unpaved roads include:

- Optimizing haul roads and infrastructure to reduce transportation and haul distances (by design).
- Completing regular inspection and maintenance of unpaved roads.
- Maintaining a buffer of existing vegetation on each side of unpaved haul roads where feasible, to act as a wind barrier.
- Applying water to unpaved road surfaces at a minimum of three times a day during dry periods in summer to maintain a 75% dust control efficiency (US EPA 2006) (as defined in the TARP – Section 5.0, Table 5-1). The frequency of water application will be increased to several times per day during high winds and dry conditions to maintain a 75% control efficiency.
 - A 75% dust control efficiency is based on increasing the moisture content of the haul roads and access roads by two times (US EPA 2006). Watering of the unpaved roads increases the moisture content, which in turn causes particles to agglomerate and reduces the likelihood of them becoming suspended when vehicles pass over the surface. The control efficiency depends on how fast the

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road dries after water is applied. Watering is most effective immediately after application and repeated watering several times a day might be required, depending on surface and meteorological conditions.

- Adhering to speed limits; haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty) and vehicle speed on the access road will be limited to 40 km/h.

3.2.3.2 Drilling and Blasting

Drilling and blasting create fugitive dust emissions by mechanical disturbance of the surface in the open pit. Blasting in the MacLellan open pit will occur three to four times per week. Mitigation measures to reduce fugitive dust emissions from drilling and blasting in the open pit during Project operation include:

- Optimizing number of drill holes per blast (by design).
- Optimizing blasting area per blast (by design).
- Avoiding blasting during calm wind conditions (low wind speed), or blast more frequently but with smaller blast areas (as defined in the TARP – Section 5.0, Table 5-1).

For more details on mitigations and monitoring associated with blasting activities see the Blasting Management and Monitoring Plan.

3.2.3.3 Material Handling

During construction, earth moving activities will occur for the site preparation. During operation, ore and mine rock will be excavated in the open pit, loaded on haul trucks, and unloaded at the primary crusher, the ore stockpiles and MRSA. The crushing plant conveyors and the fine ore stockpile are fully covered and therefore, fugitive dust emissions from these areas are not expected. Mitigation measures to reduce fugitive dust emissions from material handling include:

- Enclosing fine ore stockpile and enclosed conveyor transfer points at the crushing plant (by design), including the connecting conveyors from the primary crusher to the secondary crusher, from the secondary crusher to the fine ore stockpile, and from the fine ore stockpile to the ore milling and processing plant.
- Reducing drop heights from loaders and excavators to 1 m.
- Reducing drop height during truck unloading to 5 m.

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3.2.3.4 Stockpiles

Fugitive dust emissions may be generated by wind erosion of the topsoil, overburden and ore stockpiles, and the MRSA during high winds and dry conditions. Mitigation measures to reduce fugitive dust emissions from stockpiles wind erosion include:

- Contouring stockpiles (by bulldozing) to reduce wind erosion potential, where feasible.
- Applying water spray during high winds and dry conditions if visible dust events are observed (as defined in the TARP – Section 5.0, Table 5-1).
- Covering inactive stockpiles with a tarp during high winds and dry conditions (as defined in the TARP – Section 5.0, Table 5-1).
- Building wind fences around stockpiles if visible dust events are observed (as defined in the TARP - Section 5.0, Table 5-1) during high winds and dry conditions.
- Stabilizing surfaces of topsoil and overburden stockpiles during extended periods between usage, by means of vegetating or covering the exposed surfaces.

3.2.3.5 Tailings Management Facility

The TMF will be the disposal area where tailings will be accumulated during Project operation. The dry tailings banks of the TMF may be exposed to wind erosion during high winds and dry conditions. Mitigation measures to reduce wind erosion emissions generated from the TMF dry banks include:

- Progressively restoring TMF areas to reduce dry banks area (by design).
- Contouring TMF banks to reduce wind erosion potential, where feasible.
- Applying water spray to maintain a 75% control efficiency during high winds and dry conditions if visible dust events are observed (as defined in the TARP – Section 5.0, Table 5-1).
- Building wind fences around TMF areas that have high potential to generate windblown dust if visible dust events are observed (as defined in the TARP – Section 5.0, Table 5-1) during high winds and dry conditions.

3.2.3.6 Portable Crusher

A portable crusher will be used during construction for crushing aggregate for the construction of haul roads, stockpile pads and the ore milling and processing plant site preparation. Fugitive dust emissions from the portable crusher will be managed using the following environmental management measures:

- Allowing for flexible operation of the portable crusher to avoid operation during high winds and dry conditions.
- Maintaining a 2-m high berm around the portable crusher to function as a wind barrier if visible dust events are observed.

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3.2.3.7 Processing Plant General Area

Fugitive dust emissions may be generated by wind erosion at arid surfaces such as the processing plant general area and parking lot at MacLellan site. Mitigation measures to reduce fugitive dust emissions from wind erosion at arid surfaces include:

- Applying water to unpaved arid surfaces during dry periods in summer (as defined in the TARP - Section 5.0, Table 5-1). Increase frequency of water application to several times per day during high winds and dry conditions to maintain a 75% control efficiency (US EPA 2006) (as defined in the TARP - Section 5.0, Table 5-1).

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4.0 MONITORING

Monitoring is the continuation of observation, measurement, or assessment of environmental conditions at and surrounding the Project, its components or activities. Two types of monitoring are typically undertaken for environmental assessments: environmental monitoring to verify the accuracy of predictions and implemented mitigation measures; and compliance monitoring for verification of practices or procedures to meet legislated requirements. Air quality monitoring will be carried out using the environmental indicators and measurable parameters identified in Chapter 6 of the EIS (Stantec 2020). Components to be monitored have been determined based on regulatory instrument requirements as per legislation, environmental importance, sensitivity and vulnerability, and licence requirements.

Monitoring plans describe sampling procedures, quality control and assurance programs, laboratory methods and protocols, laboratory accreditations, and reporting requirements where applicable.

This AQMMP provides details on the location, design, methods (e.g., parameters to be measured), applicable regulatory instruments, and schedule for the follow-up and monitoring programs. Engagement of Indigenous Nations in monitoring is incorporated where appropriate and applicable.

An ambient air quality monitoring program will be implemented during Project construction and operation to measure ambient PM concentrations at key locations on and adjacent to the Project. The ambient air quality monitoring program will not continue during decommissioning/closure because air emissions during this phase will be much lower in magnitude than construction or operation.

The program is designed to measure the effectiveness of dust mitigation measures, evaluate air quality at nearby sensitive receptors and verify compliance with relevant regulatory standards. Alamos may request modifications to the ambient air quality monitoring program from MECC if the monitoring data provides sufficient justification to change or discontinue monitoring. Changes to the monitoring program will be decided based on an annual review of the results of the monitoring program in consultation with MECC.

The ambient air quality monitoring program will include continuous meteorological monitoring (wind speed and wind direction), continuous (real time) monitoring of total suspended particulate (TSP), particulate matter with an aerodynamic diameter less than 10 µm (PM₁₀) and particulate matter with an aerodynamic diameter less than 2.5 µm (PM_{2.5}), and dustfall monitoring. Monitoring stations will be installed to measure both background ambient PM concentrations and dustfall (in an upwind location) and ambient PM concentrations and dustfall influenced by the Project (in downwind locations). The air quality assessment has identified fugitive dust from construction and mining activities as the major contributor to predicted high ambient PM concentrations and dustfall outside the Project boundary. Ambient PM concentrations and dustfall will be monitored in areas with predicted high PM concentrations and dustfall and in proximity to sensitive receptors, which include locations of (or protective of) traditional land use sites. The existing Lynn Lake Airport meteorological station operated by ECCC which is located predominantly upwind of the Project, will provide meteorological data to assist in data interpretation during periods of measured high PM concentrations. Meteorological monitoring stations will be installed at the Gordon and MacLellan sites to provide real time meteorological data to assist in the implementation of adaptive management for dust

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emissions. Due to the requirement for a concrete foundation for the meteorological 10 metre towers, the meteorological stations will be installed after the Gordon and MacLellan sites are cleared and the construction earthworks are completed. An Iridium satellite modem will be installed where other communication transmission is not possible, at the Gordon and MacLellan sites meteorological stations to transmit data at a frequency that it can be used for the adaptive management of dust emissions.

It is noted that the specified equipment in Section 4.4.2 has temperature-operating restrictions that may affect its use in winter given the location of the Project (e.g., equipment will not continuously operate at extreme cold temperatures) and monitoring will need to be adjusted accordingly (e.g., the capture of spot measurements only) as described in Section 4.4.

A short-term (two-months) ambient air quality monitoring program to measure NO₂ concentrations during Project operation at the MacLellan site will be conducted to validate the air dispersion model NO₂ predictions (Chapter 6 of the EIS (Stantec 2020) and the updated dispersion modelling assessment (Stantec 2024). The MacLellan site has greater NO₂ emissions than the Gordon site due to the higher level of mining activity and more mining equipment. Ambient NO₂ concentrations will be monitored at the work camp at the MacLellan site because the work camp is the closest human receptor to the site (located within the MacLellan site Project boundary) and ambient NO₂ concentrations at human receptors located further away from the Project boundary would be lower than the concentrations at the work camp. The two-month ambient air quality monitoring of NO₂ will be conducted during the winter (within the period November to January) to coincide with the highest concentrations predicted by the air dispersion model and to capture the effects of wintertime temperature inversions. The ambient NO₂ monitoring will be conducted during Year 4 of mine operation which coincides with the highest truck traffic volume for ore haulage from the Gordon site to the ore milling and processing plant at the MacLellan site (Stantec 2024).

The predicted air quality effects for other air contaminants associated with the Project are less than the Manitoba AAQC and therefore, ambient monitoring for substances other than PM and NO₂ is not proposed.

4.1 GENERAL SITING CONSIDERATIONS

The locations of the ambient air monitoring stations are selected based on consideration of:

- Spatial scale of representativeness.
- Recommended number of monitoring stations based on population density.
- Siting requirements.
- Areas of model-predicted elevated PM concentrations.
- Proximity to (or protective of) sensitive receptors, such as the communities of Lynn Lake and Black Sturgeon Reserve.
- Predominant wind direction to determine general upwind and downwind locations of the Project sites.
- Access to continuous electrical power.

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The final locations of the monitoring stations will be confirmed during construction based on regulatory siting requirements and accessibility to the monitoring sites.

4.2 SCALE OF REPRESENTATIVENESS

Appendix D (Network Design Criteria for Ambient Air Quality Monitoring) of the US Code of Federal Regulations (CFR), Title 40, Part 58 – Ambient Air Quality Surveillance (40 CFR Part 58) provides guidelines on the scales of representativeness required for specific monitoring objectives. Five spatial scales of representativeness are defined as follows:

- *Microscale* - defines concentrations in air volumes associated with area dimensions ranging from several metres up to about 100 m.
- *Middle scale* – defines the concentration typical of areas ranging in size from about 100 m to 0.5 km.
- *Neighborhood scale* – defines concentrations within extended areas with relatively uniform land use with dimensions from 0.5 to 4 km.
- *Urban scale* – defines overall city-wide conditions with dimensions in the order of 4 to 50 km.
- *Regional scale* – usually defines a rural area of reasonably homogeneous geography without large sources and extends from tens to hundreds of kilometers.

Table 4-1 summarizes the six general monitoring site types identified in Appendix D to 40 CFR Part 58 and their corresponding scales of representativeness. Based on this guidance, the representative scales for the monitoring objectives of the Project's ambient air quality program are:

- Neighborhood scale (0.5 to 4 km range) to determine the impact of significant sources on air quality (c). The Project's dispersion modelling results show that the maximum predicted PM and NO₂ concentrations occur within this range.
- Neighborhood (0.5 to 4 km range) to urban scale (4 to 50 km range) to evaluate the air quality at nearby communities (b), such as Lynn Lake and Marcel Colomb First Nation's Black Sturgeon Reserve lands.
- Urban (4 to 50 km range) to regional scale (ten to hundreds of kilometers) to determine general background concentration levels at upwind monitoring sites (d).

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Table 4-1 Site Types and Scales of Representativeness (from 40 CFR Part 58)

Site Type	Scales of Representativeness
(a) Sites located to determine the highest concentrations expected to occur in the area	Micro, middle, neighborhood
(b) Sites located to measure typical concentrations in areas of high population density	Neighborhood, urban
(c) Sites located to determine the impact of significant sources on air quality	Micro, middle, neighborhood
(d) Sites located to determine general background concentration levels	Urban, regional
(e) Sites located to determine the extent of regional pollutant transport among populated areas	Urban, regional
(f) Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts	Urban, regional

4.2.1 Number of Monitoring Sites

Appendix D to 40 CFR Part 58 provides criteria for the total number of monitoring sites that will serve specific data needs. Appendix D notes that the optimum size of a particular network involves trade-offs among data needs and available resources. The number of monitoring sites recommended in Appendix D are based on population levels and contaminant being monitored. The air quality LAA includes Lynn Lake with a population of 494 (2016 Census) and Marcel Colomb First Nation’s Black Sturgeon Reserve lands with a population of 290 (2016 Census). Appendix D indicates that to characterize national and regional PM₁₀ trends, no more than two monitoring stations are required for low population urban areas (100,000-250,000), with no monitoring specified for areas with a population less than 100,000. Although the population densities of Lynn Lake and Marcel Colomb First Nation’s Black Sturgeon Reserve lands are well below this threshold, ambient PM monitoring will be implemented to evaluate ambient air quality at these communities and, through various mitigation measures and adaptive management, maintain the ambient PM concentrations below the regulatory ambient air quality criteria.

4.2.2 Siting Requirements

Table 4-2 provides a summary of siting requirements for continuous monitoring of PM and NO₂ and dustfall monitoring listed in the Operations Manual for Air Quality Monitoring in Ontario (ON MECP 2018) and the British Columbia Field Sampling Manual (BC MOECCS 2020) that will guide the siting of the monitoring stations.

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Table 4-2 Summary of Siting Criteria for Ambient Air Quality Monitors

Monitored Substance	Height Above Ground (m)	Distance from Supporting Structure (m)		Other Spacing Criteria
		Vertical	Horizontal	
TSP, PM ₁₀ and PM _{2.5} (continuous monitors)	2 to 15	> 1	> 2	Greater than 20 m from trees
				Distance from sampler to air flow obstacle, i.e., buildings, terrain features, trees, must be > 2x height of obstacle above the sampler
				Distance from other inlets: > 1 m for sampler flow rates ≤ 20 litres per minute (lpm); > 2 m for sampler flow rates > 20 lpm;
				Unrestricted air flow in 3 of the 4 wind quadrants
				> 5 m from chimneys with natural gas combustion emissions
				> 20-25 m from major roadways
				Distance from sampler to roadway ≥ 10 m for ≤ 10,000 average vehicles/day
Distance from inlets of co-located instrumentation > 4 m				
Dustfall (passive samplers)	2 to 4			Open area with no structures higher than 1 m within a 20 m radius
				> 10 stack heights from an operating stack
				Higher objects such as trees and buildings should not exceed 30° from the horizontal as viewed from the monitoring location.
				> 20 m from buildings and trees
NO ₂ (continuous monitors)	3 to 15	> 1	> 1	Greater than 20 m from trees
				Distance from sampler to air flow obstacle, i.e., buildings, terrain features, trees, must be > 2x height of obstacle above the sampler
				Distance from other inlets: > 1 m for sampler flow rates ≤ 20 lpm; > 2 m for sampler flow rates > 20 lpm;
				Unrestricted air flow in 3 of the 4 wind quadrants
				Distance from analyzer to roadway ≥ 10 m for ≤ 10,000 average vehicles/day
				Distance from inlets of co-located instrumentation > 4 m
				No nearby furnace or incineration flues

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4.2.3 Areas of Predicted High PM and NO₂ Concentrations

Monitoring sites for PM and dustfall will be in areas of predicted elevated PM concentrations and dustfall near the Gordon and MacLellan site boundaries. These monitoring sites will be used to determine the effects of the Project's sources of dust emissions on ambient air quality and the need for adaptive management of dust emissions at the two sites.

The monitoring site for NO₂ will be located at the MacLellan site because the MacLellan site has greater NO₂ emissions than the Gordon site due to the higher level of mining activity and more mining equipment. Ambient NO₂ concentrations will be monitored at the work camp at the MacLellan site because the work camp is within the area of predicted elevated NO₂ concentrations near the MacLellan site and the work camp is the closest human receptor to the site (located within the MacLellan site boundary) and ambient NO₂ concentrations at human receptors located further away from the Project boundary would be lower than the concentrations at the work camp.

4.2.3.1 Gordon

The air quality assessment (Chapter 6 of the EIS (Stantec 2020) and the updated dispersion modelling assessment (Stantec 2024) predicted 1-hour average NO₂ concentrations and 24-hour average TSP and PM₁₀ concentrations greater than the Manitoba AAQC on and near the Gordon site boundary. The maximum predicted concentrations occur on the Gordon site boundary and reduce with increased distance from the boundary.

The model-predicted NO₂ concentrations greater than the 1-hour Manitoba AAQC (400 µg/m³) are limited to the northeast Project Boundary near the open pit and occur for one hour per year. There are no sensitive receptors (e.g., residences, trapping areas) on or near the Project Boundary at this location.

The model-predicted TSP concentrations greater than the 24-hour Manitoba AAQC (120 µg/m³) extend approximately 2.5 km from the Gordon site boundary. The maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC at three sensitive receptors (Receptor 73, Receptor 76 and Receptor 77 – potential Indigenous receptors, Table A-1 in Appendix A).

The model-predicted PM₁₀ concentrations greater than the 24-hour Manitoba AAQC (50 µg/m³) extend approximately 3.5 km from the Gordon site boundary. The maximum predicted PM₁₀ concentrations are greater than the Manitoba 24-hour AAQC at five sensitive receptors (Receptor 72, Receptor 73, Receptor 76, Receptor 77 and Receptor 132 – potential indigenous receptors, Table A-1 in Appendix A).

4.2.3.2 MacLellan

The air quality assessment (Chapter 6 of the EIS (Stantec 2020) and the updated dispersion modelling assessment (Stantec 2024) predicted 1-hour average NO₂ concentrations and 24-hour average TSP and PM₁₀ concentrations greater than the Manitoba AAQC near the MacLellan site boundary. The maximum predicted concentrations occur on the MacLellan site boundary and reduce with increased distance from the boundary.

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The model-predicted NO₂ concentrations greater than the 1-hour Manitoba AAQC (400 µg/m³) are limited to the west Project Boundary near the ore milling and processing plant and occur for one hour per year. There are no sensitive receptors on or near the Project Boundary at this location.

The model-predicted TSP concentrations greater than the 24-hour Manitoba AAQC (120 µg/m³) extend approximately 2.7 km from the MacLellan site boundary. The maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC at three sensitive receptors (Receptor 85 and Receptor 86 – potential Indigenous receptors, and Receptor 117 – Waste Disposal Site, Table A-1 in Appendix A).

The model-predicted PM₁₀ concentrations greater than the 24-hour Manitoba AAQC (50 µg/m³) extend approximately 4 km from the MacLellan site boundary. The maximum predicted PM₁₀ concentrations are greater than the Manitoba 24-hour AAQC at six sensitive receptors (Receptor 82, Receptor 85, Receptor 86 and Receptor 123 – potential Indigenous receptors, Receptor 135 – Remote Cottage and Receptor 117 – Waste Disposal Site, Table A-1 in Appendix A).

4.2.4 Nearby Communities

Lynn Lake, with a population of 494 (2016 Census), is located approximately 7 km south of the MacLellan site. A monitoring station will be situated in Lynn Lake to evaluate ambient PM concentrations in the community during Project construction and operation. Lynn Lake is predominantly upwind of Project emissions based on a dominant wind direction from northwest. Locating a monitoring station in Lynn Lake can serve as a background ambient PM station during predominant northwesterly winds.

Marcel Colomb First Nation's Black Sturgeon Reserve lands community is located approximately 10 km southwest of the Gordon site. Locating a monitoring station within a neighborhood scale range of 0.5 to 4 km from Gordon site (closer to the Project than Black Sturgeon Reserve lands) will be representative of the ambient air quality in Black Sturgeon Reserve lands and sensitive receptors close to Gordon site boundary (Receptor 57, Receptor 58, Receptor 72, Receptor 73, Receptor 74, Receptor 76 and Receptor 77 – potential Indigenous receptors, Receptor 131 – remote cottage and Receptor 132 – trapper cabin, Table A-1 in Appendix A).

4.2.5 Predominant Wind Direction

The predominant wind direction that could result in plume transport to nearby sensitive receptors is from the northwest (Figure 2-1). Easterly and southerly winds are also common. Southwesterly and northeasterly winds are less frequent and generally less frequently strong.

Based on the predominant wind direction, Lynn Lake is less frequently downwind of Project emissions at MacLellan site, and Black Sturgeon Reserve lands are less frequently downwind of Project emissions at Gordon site.

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4.2.6 Access to Continuous AC Power

The continuous ambient PM and NO₂ monitors require a continuous source of AC power and therefore, the monitoring location/siting will be restricted to areas where AC power is available. Power for the monitors at MacLellan site during operation and at Lynn Lake will be provided by Manitoba Hydro power grid. During construction, power to the meteorological monitoring station and the PM monitors at the MacLellan site will be provided by a propane generator connected to a propane tank.

The Gordon site will not be connected to Manitoba Hydro power grid and power for the facilities and the monitors at the site will be provided by one stationary 1,000 kW diesel generator during operation only. During construction, power for the meteorological monitoring station and the PM monitors at the Gordon site will be provided by a propane generator connected to a propane tank.

4.3 MONITORING SITES

The ambient air quality monitoring sites for PM, dustfall and NO₂ are described below and summarized in Table 4-3. The approximate locations of the stations are shown on Map 4-1 (Appendix B). The final locations of the monitoring stations will be confirmed during construction based on regulatory siting standards, accessibility to the monitoring sites, access to continuous AC power and engagement with Indigenous Nations.

- Station A (Upwind, Community) - Automated meteorological station at Lynn Lake Airport operated by ECCC that will provide meteorological data to assist in data interpretation during periods of measured high PM concentrations.
- Station B (Upwind, Community) – PM and dustfall monitoring stations in the residential area of Lynn Lake, approximately 7 km south of MacLellan site and in a predominantly upwind location from MacLellan site. The monitoring station will be used to determine background ambient PM concentrations and dustfall.
- Station C (Downwind) – PM, dustfall and NO₂ monitoring stations at the permanent work camp at MacLellan site. An automated meteorological monitoring station, including a 10-meter tower, is also proposed to be installed at this location after the MacLellan site is cleared and the construction earthworks are completed. Continuous PM monitoring data, transmitted via an Iridium satellite modem, will be used for adaptive management of dust emissions at the MacLellan site. A dustfall monitoring station will be collocated with the continuous PM monitoring station. Two-months of continuous NO₂ monitoring data will be used to validate the air dispersion model's NO₂ predictions.
- Station D (Downwind) – PM and dustfall monitoring stations at the Gordon site entry gate. The exact location of the monitoring stations will be determined based on access to continuous AC power during operation. An automated meteorological monitoring station, including a 10-metre tower, will be installed at this location after the Gordon site is cleared and the construction earthworks are completed. Continuous PM monitoring data from this station, transmitted via an Iridium satellite modem, will be used for adaptive management of dust emissions at the Gordon site. A dustfall monitoring station will

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be collocated with the continuous PM monitoring station. This station will record the ambient air quality conditions and dustfall that are representative of sensitive receptors in the vicinity of Gordon site.

- Station E (Downwind) – Dustfall monitoring station at Cockeram Lake, along PR 391. This station will measure dustfall along the PR 391 ore haul route from Gordon to MacLellan. The location coincides with the baseline dustfall monitoring station at Cockeram Lake (06 Cockeram Lake; EIS, Volume 4, Appendix A).
- Station F (Downwind) – Dustfall monitoring station at Black Sturgeon Reserve lands road, along PR 391. This station will measure dustfall along the PR 391 ore haul route from Gordon to MacLellan. The location coincides with the baseline dustfall monitoring station at Black Sturgeon Road (07 Black Sturgeon Road; EIS, Volume 4, Appendix A).
- Station G (Downwind) – Dustfall monitoring station at Westdal Lake, along PR 391. This station will measure dustfall along the PR 391 ore haul route from Gordon to MacLellan. The location coincides with the baseline dustfall monitoring station at Westdal Lake (08 Westdal Lake; EIS, Volume 4, Appendix A).

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Table 4-3 Ambient Air Quality and Meteorology Monitoring Station Locations

Monitoring Station	Parameters Measured	UTM Zone	Easting (m)	Northing (m)	Upwind (U)/ Downwind (D)/ Community (C)	Rationale for Selected Location
Station A	Automated Meteorological Station	14V	373,432	6,304,155	U	Automated meteorological station at Lynn Lake Airport operated by ECCC that will provide meteorological data to assist in data interpretation during periods of measured high PM concentrations.
Station B	TSP, PM ₁₀ and PM _{2.5} (continuous) Dustfall	14V	375,805	6,303,174	U/C	Community monitoring station in Lynn Lake, approximately 7 km south of MacLellan site in a predominantly upwind location from MacLellan site.
Station C	TSP, PM ₁₀ and PM _{2.5} (continuous) Dustfall Two-months NO ₂ (continuous)	14V	380,851	6,308,569	D	Monitoring station at the permanent work camp at MacLellan site. An automated meteorological monitoring station is also proposed to be installed at this location. Continuous PM monitoring data will be used for adaptive management of dust emissions at the MacLellan site. Two-months of continuous NO ₂ monitoring data will be used to validate the air dispersion model's predictions.
Station D	TSP, PM ₁₀ and PM _{2.5} (continuous) Dustfall Automated Meteorological Station	14V	412,536	6,307,031	D	Monitoring station at the entry gate of Gordon site. The air quality station will be representative of the ambient air quality at the Black Sturgeon Reserve. An automated meteorological monitoring station will also be installed at this location. Continuous PM monitoring data will be used for adaptive management of dust emissions at the Gordon site.

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Monitoring Station	Parameters Measured	UTM Zone	Easting (m)	Northing (m)	Upwind (U)/ Downwind (D)/ Community (C)	Rationale for Selected Location
Station E	Dustfall	14V	388,007	6,302,401	D	Dustfall monitoring station at Cockeram Lake, along PR 391. This station will measure dustfall along the PR 391 ore haul route from Gordon to MacLellan. The location coincides with the baseline dustfall monitoring station at Cockeram Lake.
Station F	Dustfall	14V	400,818	6,294,956	D	Dustfall monitoring station at Black Sturgeon Road, along PR 391. This station will measure dustfall along the PR 391 ore haul route from Gordon to MacLellan. The location coincides with the baseline dustfall monitoring station at Black Sturgeon Road.
Station G	Dustfall	14V	410,207	6,293,726	D	Dustfall monitoring station at Westdal Lake, along PR 391. This station will measure dustfall along the PR 391 ore haul route from Gordon to MacLellan. The location coincides with the baseline dustfall monitoring station at Westdal Lake.

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4.4 MONITORING METHODS

The monitoring stations will include continuous monitoring of meteorology, continuous monitors for TSP, PM₁₀ and PM_{2.5}, dustfall monitoring stations and two-months of continuous monitoring of NO₂. Monitoring will be conducted per the methods and analysis recommended by the US EPA Quality Assurance Handbook for Meteorological Measurements (US EPA 2008), the Operations Manual for Air Quality Monitoring in Ontario (ON MECP 2018) and the British Columbia Field Sampling Manual (BC MOECCS 2020). The following sections detail the monitoring stations for the ambient air quality monitoring program.

Construction activities are expected to begin in February 2025. During the months of February and March 2025, a source of continuous grid power is not available at the construction sites for an ambient air quality monitor that is widely recognized by regulators as a “standard reference method”. In addition, temporary or interim air quality monitoring station equipment may not operate properly in low temperatures (e.g., -20 C or below) without a source of continuous power available. Therefore, for the monthly construction phase monitoring during winter months (i.e., February and March in 2025) and until a reliable continuous source of power is available, short-term measurement for a continuous period of one to two hours can be conducted near the construction activities during early construction using a handheld battery-operated portable device. The air quality monitoring will be documented each day with a field data sheet will record the measured air quality values, the meteorological conditions, a description of the nearby construction activities and other field observations that would affect the ambient air quality. As much as possible there will be consistency in the field monitoring staff, locations and monitoring times to allow trend analysis and determine if additional mitigations are needed to improve the ambient air quality.

Alamos is procuring permanent ambient air quality monitoring stations that meet the regulatory definition of “standard reference methods” for long-term use. For the months of February and March 2025, two rented handheld battery operated portable air quality monitoring devices will be used before the permanent equipment is purchased.

4.4.1 Meteorology

Continuous meteorological monitoring stations (with a 10 m tower) will be installed at Station C (MacLellan site) at Station D (Gordon site) and will provide real time meteorological data to assist in the implementation of adaptive management for dust emissions. The siting of the meteorological stations will follow the requirements listed in the Quality Assurance Handbook for the Air Pollution Measurement Systems, Volume IV: Meteorological Measurements (US EPA 2008).

The meteorological parameters that will be measured are expected to include:

- Wind speed and wind direction.
- Ambient air temperature.
- Relative humidity.

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- Atmospheric pressure.
- Rainfall and snowfall.

Power for the meteorological towers during construction will be provided by propane generators connected to propane tanks. During operation, the meteorological stations will be connected to continuous AC power once available.

Meteorological monitoring data will be saved in a data logger and downloaded automatically via an Iridium satellite modem or other applicable communication transmission on an hourly basis. The data will be reviewed on a continuous basis for quality assurance and to inform the adaptive management of fugitive dust emissions (Section 5.0). Automatic alerts will be set to notify Alamos' environmental representatives of high winds (wind speed greater than 10 m/s) and dry conditions (less than 2.54 mm of precipitation per day has occurred for more than two days and the temperature is greater than 15°C), which will trigger the implementation of additional dust mitigation measures. The station will also notify Alamos' environmental representatives when a low battery warning has occurred to alert of a potential station malfunction and initiate an investigation and required follow up.

Equipment calibration, operation, service, and maintenance will be carried out following the manufacturer's operation manual.

4.4.2 Continuous Ambient Monitors for TSP, PM₁₀ and PM_{2.5}

4.4.2.1 GRIMM EDM 180

Continuous ambient air monitoring of TSP, PM₁₀ and PM_{2.5} will be conducted using GRIMM Environmental Dust Monitor (EDM) 180 with a multi-function meteorology sensor (wind speed, wind direction, relative humidity, air temperature, barometric pressure) and a weather protection enclosure GRIMM model 199 (or equivalent). The GRIMM EDM 180 analyzer can measure simultaneously particulate matter of different particulate sizes, including TSP, PM₁₀ and PM_{2.5}. A GRIMM EDM 180 analyzer will be installed at Stations B and C during construction and operation.

The GRIMM EDM 180 analyzers use light-scattering technology with semiconductor-laser as the light-source to measure particulate concentrations in ambient air. Air is drawn vertically into the analyzer at a rate of 1.2 lpm, where it passes through a semi-conductor laser beam. The scattered signal from the particle passing through the laser beam is collected at approximately 90-degree angle by a mirror and transferred to a laser diode detector, which passes the signal through a multi-channel size classifier, which classifies the signal into the proper particle size. The EDM 180 model uses 31 channels corresponding to particulate sizes ranging from 0.25 µm to 32 µm.

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The operating parameters of the GRIMM EDM 180 monitors (or equivalent) are summarized below:

- Principle of Operation: light-scattering technology with semiconductor-laser.
- Measurement Range: 0 milligram per cubic metre (mg/m^3) to $10 \text{ mg}/\text{m}^3$ (PM_{10}); $0 \text{ mg}/\text{m}^3$ to $6 \text{ mg}/\text{m}^3$ ($\text{PM}_{2.5}$).
- Measurement Cycle Time: 1 minute to 1 hour.

Each monitor will be equipped with a multi-function meteorology sensor (wind speed, wind direction, relative humidity, air temperature, barometric pressure) and contained in a fully climate-controlled enclosure (GRIMM model 199). Monitoring data will be saved in a datalogger and transmitted automatically via an Iridium satellite modem on an hourly basis. The data will be reviewed on a regular basis for quality assurance and to inform the adaptive management of fugitive dust emissions (Section 5.0). Automatic alerts will be set to notify Alamos' environmental representatives of 24-hour average TSP, PM_{10} and $\text{PM}_{2.5}$ concentrations greater than the Manitoba AAQC and/or 24-hour average $\text{PM}_{2.5}$ concentrations greater than the CAAQS, which will trigger the implementation of additional dust mitigation measures.

The GRIMM EDM 180 analyzer requires a continuous source of AC power (115 V, 60 Hz). During construction, power for the GRIMM EDM 180 analyzer at Station C and Station D will be provided by a propane generator connected to a propane tank. During operation, the GRIMM EDM 180 analyzer will be connected to continuous AC power once available.

The analyzers will be calibrated according to the manufacturer's specifications prior to their installation in the field. If required, the analyzers will be re-calibrated once installed, before their first use. Equipment operation, service and maintenance will be carried out following the manufacturer's operation manual and the Standard Operating Procedure (SOP) for the continuous measurement of ambient PM with GRIMM analyzer listed in the Operations Manual for Air Quality Monitoring in Ontario (ON MECP 2018).

4.4.3 Dustfall Monitoring

Dustfall monitoring will be conducted at the Gordon and MacLellan sites and along PR 391 using a passive sampling method.

Dustfall monitoring is a passive method for sampling particulate deposition (flux), using sample containers to collect airborne particles settling from the air column over a 30-day period. A weather resistant open top container of known dimensions is prepared by a laboratory. The containers are cleaned and sealed by the laboratory with a measured quantity of reagent water, which acts to prevent resuspension of any material that settles into the container. At the sampling location, the container is set up on a stand and opened so that particulate matter can deposit into the container. The container is left for a period of 30 days. At the end of the sampling period the container is sealed and returned to the laboratory for analysis. The laboratory analysis determines the total dustfall as the mass of the water soluble and insoluble material collected within the container. Dustfall results are reported in units of mass per area per time. Common units are milligrams per square decimeter per day ($\text{mg}/\text{dm}^2/\text{day}$). Additional analysis can be undertaken to determine the metals content in dustfall.

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The operating parameters of the dustfall monitoring are summarized below:

- Principle of Operation: Passive Sampling.
- American Standard Test Method (ASTM). 2017: Standard Test method for Collection and Measurement of Dustfall (Settleable Particulate Matter). Designation: D1739 – 98 (Reapproved 2017).
- Lower Range: 0.1 mg/dm²/day.
- Measurement Cycle Time: 30 days.

4.4.4 Continuous Ambient Monitor for NO₂

4.4.4.1 Thermo Electron Corporation 42i

Two months of continuous ambient air monitoring of NO₂ will be conducted using Thermo Electron Corporation (TECO) Model 42i analyzer with weather protection enclosure BX-902B (or equivalent). The TECO 42i analyzer measures simultaneously nitric oxide (NO), NO₂ and NO_x. A TECO 42i analyzer will be installed at Station C (permanent work camp at MacLellan site) during the winter of Year 4 of mine operation. The NO₂ analyzer at Stations C will be adjacent to the meteorological monitoring station and the PM ambient air quality monitoring station.

The TECO 42i analyzer uses chemiluminescence detection and quantification method to measure NO₂ concentrations in ambient air. Chemiluminescence uses a photomultiplier tube to measure the light emitted by the chemical reaction of NO and ozone (O₃). The concentration of NO₂ in an air sample is determined by two measurement processes. The first process measures the amount of NO in ambient air. The second process measures the amount of NO_x in ambient air. The NO₂ concentration is then calculated as the difference between these two measurements.

In the first process, NO concentration is determined by passing an ambient air sample through an ozone rich reaction chamber. Ozone is continuously generated within the analyzer at a concentration that far exceeds that of ambient NO levels. When exposed to O₃, NO is readily oxidized to NO₂ in a 1:1 relationship. As excited NO₂ molecules decay to a lower energy state they release infrared light at an intensity that is linearly proportional to the amount of NO present. The light emitted during this chemical reaction is measured using a photomultiplier tube. The infrared light measurement is used to determine the concentration of NO.

In the second process, the concentration of NO_x is determined by passing the ambient air sample through a molybdenum catalysis oven that is heated to approximately 325°C which converts NO_x to NO. A valve then directs the sample to the reaction chamber used in the first process, where total NO_x is measured as NO. The concentration of NO₂ is determined as the difference between concentrations of NO_x and NO.

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The operating parameters of the TECO 42i monitor (or equivalent) are summarized below:

- Principle of Operation: chemiluminescence.
- US EPA Designated Reference and Equivalent Method: Automated Reference Method (RFNA-1289-074) in the Federal Register Vol. 54, page 50820, December 11, 1989.
- Measurement Range: 0 parts per billion (ppb) to 500 ppb.
- Lower Detection Limit: 0.40 ppb.
- Measurement Cycle Time: 10 seconds to 5 minutes.

The monitor will be contained in a fully climate-controlled enclosure (BX-902B) and equipped with a data logger to store monitoring data. An automated software system will be used to download 1-hour and 24-hour rolling average NO₂ concentrations from the TECO 42i continuous ambient air monitor on an hourly basis.

The TECO 42i analyzer requires a continuous source of AC power (115 V, 60 Hz), and therefore, the monitoring location/siting will be restricted to areas where AC power is available.

The analyzer will be calibrated according to the manufacturer's specifications prior to installation in the field. If required, the analyzer will be re-calibrated once installed, before its first use. Equipment operation, service and maintenance will be carried out following the manufacturer's operation manual and the SOP for the continuous measurement of ambient NO₂ with TECO 42i analyzer listed in the Operations Manual for Air Quality Monitoring in Ontario (ON MECP 2018).

4.5 MONITORING SCHEDULE

The ambient air quality monitoring program will include continuous meteorological monitoring (wind speed and wind direction, ambient air temperature, relative humidity, atmospheric pressure, rainfall, and snowfall), continuous (real time) monitoring of TSP, PM₁₀ and PM_{2.5}, dustfall monitoring and two-months of continuous monitoring of NO₂. The ambient air quality monitoring stations and monitoring frequency are summarized in Table 4-4.

Ambient air quality monitoring for PM will be implemented during Project construction and operation. The ambient air quality monitoring for PM will not continue during decommissioning, closure and post-closure because air emissions during these phases will be much lower in magnitude than construction or operation. Dustfall monitoring will be implemented during all phases of the Project. Alamos may request modifications to the ambient air quality monitoring program from MECC if the monitoring data provides sufficient justification (measured PM concentrations are below the Manitoba AAQC) to change or discontinue monitoring. Changes to the monitoring program will be decided based on an annual review of the results of the monitoring program in consultation with MECC.

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The two-month ambient air quality monitoring of NO₂ will be conducted during the winter (within the period November to January) to coincide with the highest concentrations predicted by the air dispersion model and to capture the effects of wintertime temperature inversions. The air dispersion modelling for the MacLellan site was conducted to coincide with the worst-case/highest air emissions for the mine life. However, to allow for earlier validation of the model results, the ambient NO₂ monitoring will be conducted during Year 4 of mine operation, which coincides with the highest truck traffic volume for ore haulage from the Gordon site to the ore milling and processing plant at the MacLellan site. If the NO₂ monitoring results are greater than the predictions of the atmospheric dispersion model, and/or if the monitoring detects exceedances of the CAAQS for NO₂, NO₂ monitoring will be continued during mine operation to determine if additional mitigation measures are required to reduce NO₂ emissions.

The specific and measurable end points for concluding the monitoring program will be set to ensure the accuracy of the environmental assessment and the effectiveness of mitigation measures. These end points will be achieved either at permanent closure or earlier if it can be demonstrated that there are no further impacts warranting continued monitoring.

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Table 4-4 Ambient Air Quality and Meteorology Monitoring Schedule

Monitoring Station	General Location	Monitoring Activity	Monitoring Method	Frequency		
				Construction	Operation	Decommissioning/ Closure/ Post-Closure
Station A	Lynn Lake Airport ^a	Meteorological monitoring (wind speed and wind direction, ambient air temperature)	Automated Meteorological Station	Continuous	Continuous	N/A
Station B	Town of Lynn Lake	Ambient air monitoring of TSP, PM ₁₀ and PM _{2.5}	GRIMM EDM 180	Continuous	Continuous	N/A
		Dustfall monitoring	Passive Sampling	Every 30-days	Every 30-days	Every 30-days
Station C	Work camp at MacLellan site	Meteorological monitoring (wind speed and wind direction, ambient air temperature, relative humidity, atmospheric pressure, rainfall, and snowfall)	Automated Meteorological Station	Continuous	Continuous	N/A
		Ambient air monitoring of TSP, PM ₁₀ and PM _{2.5}	GRIMM EDM 180	Continuous ^c	Continuous ^d	N/A
		Dustfall monitoring	Passive Sampling	Every 30-days	Every 30-days	Every 30-days
		Ambient air monitoring for NO ₂	TECO 42i	N/A	Two-months (within the period of November to January) during Year 4 of mine operation ^b	N/A

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Monitoring Station	General Location	Monitoring Activity	Monitoring Method	Frequency		
				Construction	Operation	Decommissioning/ Closure/ Post-Closure
Station D	Entry gate at Gordon site	Meteorological monitoring (wind speed and wind direction, ambient air temperature, relative humidity, atmospheric pressure, rainfall, and snowfall)	Automated Meteorological Station	Continuous	Continuous	N/A
		Ambient air monitoring of TSP, PM ₁₀ and PM _{2.5}	GRIMM EDM 180	Continuous ^c	Continuous ^d	N/A
		Dustfall monitoring	Passive Sampling	Every 30-days	Every 30-days	Every 30-days
Station E	Cockeram Lake	Dustfall Monitoring	Passive Sampling	Every 30-days	Every 30-days	Every 30-days
Station F	Black Sturgeon Road	Dustfall Monitoring	Passive Sampling	Every 30-days	Every 30-days	Every 30-days
Station G	Westdal Lake	Dustfall Monitoring	Passive Sampling	Every 30-days	Every 30-days	Every 30-days
<p>Notes:</p> <p>^a Meteorological monitoring station operated by ECCC</p> <p>^b If the NO₂ monitoring results are greater than the predictions of the atmospheric dispersion model, and/or if the monitoring detects exceedances of the CAAQS for NO₂, NO₂ monitoring will be continued during mine operation</p> <p>^c During construction, the GRIMM EDM 180 monitors will be powered by a propane generator connected to a propane tank.</p> <p>^d During operation, the GRIMM EDM 180 monitors will be connected to AC power once continuous AC power is available at the Gordon and MacLellan sites.</p> <p>N/A – not applicable</p>						

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5.0 ADAPTIVE MANAGEMENT

Adaptive management is a planned process for responding to uncertainty or to an unanticipated or underestimated project effect. Information learned from monitoring actual project effects is applied and compared to predicted effects. Where a variance between the actual and predicted effects occurs, a determination is made as to whether modifications or other actions are necessary to revise the existing mitigation measures. As part of this commitment, we will implement technically and economically feasible mitigation measures if monitoring indicates that specified levels of environmental change have been reached or exceeded. Feasibility and implementation decisions will be made based on the circumstances and considerations at the time. Results from monitoring will be used through an adaptive management process to adjust mitigation measures and to modify plans on an ongoing basis, if required.

5.1 THRESHOLDS FOR ADAPTIVE MANAGEMENT

Error! Reference source not found. summarizes the TARP for the Gordon and MacLellan sites, developed following British Columbia's guidance for Developing a Fugitive Dust Management Plan for Industrial Projects (BC MOECCS 2018). The TARP identifies the specific measurable and reportable triggers that will require implementation of additional dust mitigation measures based on the results of the meteorological and PM and NO₂ ambient air quality monitoring, including:

- Increasing the watering frequency for on-site haul roads, access roads and arid surfaces during persistent high winds and extended dry conditions.
- Applying water spray on stockpiles and the TMF dry bank areas (MacLellan site) if visible dust events are observed.
- Covering inactive stockpiles with a tarp.
- Building wind fences around stockpiles and the TMF dry bank areas (MacLellan site) that have high potential to generate windblown dust if visible dust events are observed.

Once the additional mitigation measures are applied to the dust emission sources, the HSE Manager will conduct a follow-up visual inspection to assess the effectiveness of the additional dust mitigation and to confirm that the issue has been resolved. This will be documented and reported annually to the regulatory agencies. Further details related to reporting are discussed in Section 6.0 below.

The HSE manager will review the two-month NO₂ ambient air quality monitoring results with the Environmental Advisory Committee (EAC) and Project stakeholders. If the NO₂ monitoring results are greater than the model predictions, and/or if the monitoring detects exceedances of the CAAQS for NO₂, NO₂ monitoring will be continued during mine operation to determine if additional mitigations are required to reduce NO₂ emissions. As described in the air quality assessment (Chapter 6 of the EIS and in the updated dispersion modelling assessment [Stantec 2024]), the highest NO₂ emissions at the MacLellan site are associated with the operation of the haul trucks (16 haul trucks during Year 5 of operation). Additional mitigation measures to reduce NO₂ emissions from the haul trucks could include reducing the haul truck idling to the extent possible during loading and during prolonged waiting periods.

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Table 5-1 Trigger Action Response Plan

Activity	Trigger	Action/Response
Meteorological Monitoring	Dry Periods ^a: <ul style="list-style-type: none"> • Precipitation less than 0.1 inch (2.54 mm) per day for more than 1 day (24 hours), and • 24-hour average temperature greater than 15 °C 	<ul style="list-style-type: none"> • Apply water to on-site haul roads, access roads and arid surfaces at a minimum of 3 times a day to maintain a 75% dust control efficiency
	Extended Dry Periods ^a: <ul style="list-style-type: none"> • Precipitation less than 0.1 inch (2.54 mm) per day for more than 5 days (120 hours), and • 24-hour average temperature greater than 15 °C 	<ul style="list-style-type: none"> • Increase frequency of watering for on-site haul roads, access roads and arid surfaces
	High Winds and Dry Conditions ^b: <ul style="list-style-type: none"> • Hourly average wind speed greater than 10 m/s, and • Precipitation less than 0.1 inch (2.54 mm) per day for more than 1 day (24 hours), and • No snow cover on ground 	<ul style="list-style-type: none"> • Increase frequency of watering for on-site haul roads, access roads and arid surfaces • Apply water spray on stockpiles and the TMF dry bank areas (MacLellan site) if visible dust events are observed • Cover inactive stockpiles with a tarp • Build wind fences around stockpiles and the TMF dry bank areas (MacLellan site) if visible dust events are observed
	Calm Wind Conditions: <ul style="list-style-type: none"> • Hourly average wind speed less than 1 m/s 	<ul style="list-style-type: none"> • Avoid blasting, or • Blast more frequently with smaller blast areas

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Activity	Trigger	Action/Response
Ambient Air Quality Monitoring	<ul style="list-style-type: none"> • Measured 24-hour average TSP, PM₁₀ or PM_{2.5} concentrations are greater than the Manitoba AAQC, or/and • Measured 24-hour PM_{2.5} concentrations are greater than the CAAQS, or/and • Measured 24-hour TSP, PM₁₀ and PM_{2.5} concentrations exceed the predicted levels in the atmospheric dispersion model (Chapter 6 of the EIS and the updated dispersion modelling assessment [Stantec 2024]) 	<ul style="list-style-type: none"> • The HSE Manager will investigate the event and review the meteorological data to determine if the measured high PM concentrations are attributable to mine activities or other external sources such as forest fires • If mine activities are determined to contribute to the measured high PM concentrations, the HSE Manager will identify a suitable mitigation action, which could include supplementary monitoring. • If mine activities are determined to contribute to the measured high PM concentrations, increase frequency of watering for on-site haul roads, access roads and arid surfaces • If mine activities are determined to contribute to the measured high PM concentrations, the HSE Manager will update the human health and ecological risk assessment in consultation with the appropriate authorities
	<ul style="list-style-type: none"> • Measured 1-hour NO₂ concentrations are greater than the CAAQS, or/and • Measured 1-hour NO₂ concentrations exceed the predicted levels in the atmospheric dispersion model (Chapter 6 of the EIS and the updated dispersion modelling assessment [Stantec 2024]) 	<ul style="list-style-type: none"> • The HSE Manager will investigate the event and review the meteorological data to determine if the measured high NO₂ concentrations are attributable to mine activities or other external sources. • If mine activities are determined to contribute to the measured high NO₂ concentrations, the HSE Manager will identify a suitable mitigation action, which could include supplementary monitoring. • If mine activities are determined to contribute to the measured high NO₂ concentrations, monitoring will be continued during all phases of the Project. • Reducing the haul truck idling to the extent possible during loading and during prolonged waiting periods. • A review of established preventative maintenance plans will occur to check for deficiencies and potential improvements. • If mine activities are determined to contribute to the measured high NO₂ concentrations, the HSE Manager will update the human health and ecological risk assessment in consultation with the appropriate authorities

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Activity	Trigger	Action/Response
Public Outreach	Public complaint regarding dust	<ul style="list-style-type: none"> • The HSE Manager will investigate the site of concern and review the meteorological and ambient air quality monitoring data to determine if the complaint is attributable to mine activities or other external sources such as forest fires • If mine activities are determined to contribute to the complaint, the HSE Manager will identify a suitable mitigation action
<p>Notes:</p> <p>^a For the application of “Dry Periods” and “Extended Dry Periods” trigger levels, both triggers – precipitation and temperature, must be met simultaneously.</p> <p>^b For the application of “High Winds and Dry Conditions” trigger level, the three triggers – wind speed, precipitation, and snow cover, must be met simultaneously.</p>		

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6.0 REPORTING

Reports from the monitoring program will be submitted monthly within 60 days of the receipt of the analytical results of the monitoring program, and annually no later than March 31 following each reporting year, to regulatory authorities and shared with interested Indigenous Nations and stakeholders.

The meteorology and ambient air quality monitoring annual reports for each site will include the results of the ambient air quality monitoring program following a standardized format, including:

- A map showing the location of emitting sources, property boundary and ambient air quality monitoring stations.
- A summary of operations – parameters monitored, equipment model, frequency of site visits and calibrations, confirmation of data backups.
- A summary of audits and audit outcomes.
- Summary statistics for the meteorological monitoring data (e.g., ambient air temperature, precipitation, wind speed and direction [wind rose]).
- Summary statistics for the measured ambient PM concentrations (e.g., annual arithmetic mean, maximum and daily average 24-hour, percent of valid data).
- A summary of exceedances of the Manitoba AAQC, the CCME CAAQS, number of times that exceedances occurred, the meteorology conditions that coincided with the exceedances, and additional mitigation measures used during exceedance periods.

If the ambient air quality monitoring results for PM and NO₂ exceed predicted levels in the atmospheric dispersion model (Chapter 6 of the EIS and the updated dispersion modelling assessment [Stantec 2024]), or the applicable CCME CAAQS, the human health and ecological risk assessment in Volume 5 of the EIS will be updated and submitted to the regulatory authorities.

During the annual reporting of the monitoring program results to MECC (following each reporting year), Alamos may request modifications to the ambient air quality monitoring program or request to discontinue monitoring of PM (TSP, PM₁₀, PM_{2.5}) or/and NO₂ if the measured concentrations throughout the year have been below the Manitoba AAQC and CCME CAAQS as described in the TARP Table 5-1, or the monitoring data shows a steadily decreasing trend in the measured concentrations. Changes to the monitoring program will be decided in consultation with MECC, the EAC and Project stakeholders.

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6.1 RECORD KEEPING

Alamos will maintain a systematic record keeping process on-site that will provide documentation of dust control management actions. These records will be used for the annual review of the AQMMP and available for regulatory review. Record keeping activities will be undertaken daily and will include:

- Equipment Inspection forms.
- Meteorological monitoring data from the automated data acquisition system.
- Ambient air quality monitoring data from the automated data acquisition system.
- Summary of continuous improvement opportunities identified in the AQMMP annual review.
- A record of public complaints, actions taken to address issues, and follow-up.

A site Air Emission Inventory will be developed and updated at least annually and will quantify actual emissions from all active (both fixed and fugitive) air emission sources. The emission inventory will include, at a minimum, actual emissions of TSP, PM₁₀, PM_{2.5}, CO, NO_x, and SO₂ or as required by local regulatory requirement. The emission inventory will clearly note the activity rate (e.g. throughput) for each emission source and the source of emission factors used such as the US EPA Compilation of Air Pollutant Emission Factors (AP-42; US EPA 1995).

Records will be stored in either hardcopy and/or electronic formats and stored/archived in such a manner that they are readily retrievable and protected against damage, deterioration, or loss.

6.2 COMPLAINTS COMMUNICATIONS

During all phases of the Project, a Public Complaints Protocol will be implemented to address air quality complaints from the community in a timely manner. Complaints can be received formally or informally, following a process that will be posted on Alamos' website. A formal complaint will include correspondence, phone calls, comments posted to Alamos' web site, or emails sent to Alamos specifying a concern, making a claim or otherwise critical of the company's actions. Informal complaints will include issues or concerns expressed verbally to Alamos employees, as well as concerns raised by individuals through social media, including Facebook, X (formerly Twitter) and other online platforms. Complaints will be accepted anonymously, although Alamos notes that responses will only be provided to individuals who provide contact information.

In every instance, the receipt of a formal or informal complaint will require the employee who receives it to complete a Public Complaints and Grievances Form and deliver it promptly to the HSE Manager.

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The HSE Manager or his delegate(s) will confirm that public complaints are addressed. The HSE Manager will initiate and oversee a process that consists of the following steps:

- Registration.
- Initial assessment.
- Investigation.
- Resolution and recording of appropriate actions taken.
- Response to the complainant.
- Follow up, as required.

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Appendix A Human Receptor Locations

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Appendix A Human Receptor Locations
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Table A-1 Human Receptor Locations

Receptor ID	Model ID	Receptor Description	Receptor Category	UTM Easting (m)	UTM Northing (m)
50	15878	Potential Indigenous Receptor 1	Potential Indigenous Receptor	405,987	6,316,024
51	15879	Potential Indigenous Receptor 2	Potential Indigenous Receptor	401,539	6,310,530
52	15880	Potential Indigenous Receptor 3	Potential Indigenous Receptor	399,477	6,307,607
53	15881	Potential Indigenous Receptor 4	Potential Indigenous Receptor	404,680	6,306,824
54	15882	Potential Indigenous Receptor 5	Potential Indigenous Receptor	404,610	6,304,744
55	15883	Potential Indigenous Receptor 6	Potential Indigenous Receptor	402,911	6,303,848
56	15884	Potential Indigenous Receptor 7	Potential Indigenous Receptor	405,371	6,303,362
57	15885	Potential Indigenous Receptor 8	Potential Indigenous Receptor	410,297	6,303,663
58	15886	Potential Indigenous Receptor 9	Potential Indigenous Receptor	413,681	6,303,484
59	15887	Potential Indigenous Receptor 10	Potential Indigenous Receptor	411,326	6,299,050
60	15888	Potential Indigenous Receptor 11	Potential Indigenous Receptor	418,775	6,293,108
61	15889	Potential Indigenous Receptor 12	Potential Indigenous Receptor	407,246	6,297,860
62	15890	Potential Indigenous Receptor 13	Potential Indigenous Receptor	404,260	6,295,677
63	15891	Potential Indigenous Receptor 14	Potential Indigenous Receptor	393,110	6,290,821
64	15892	Potential Indigenous Receptor 15	Potential Indigenous Receptor	391,941	6,293,656
65	15893	Potential Indigenous Receptor 16	Potential Indigenous Receptor	386,085	6,295,686
66	15894	Potential Indigenous Receptor 17	Potential Indigenous Receptor	384,540	6,298,769
67	15895	Potential Indigenous Receptor 18	Potential Indigenous Receptor	385,862	6,301,026
68	15896	Potential Indigenous Receptor 19	Potential Indigenous Receptor	383,310	6,302,138
69	15897	Potential Indigenous Receptor 20	Potential Indigenous Receptor	390,169	6,304,646
70	15898	Potential Indigenous Receptor 21	Potential Indigenous Receptor	390,852	6,308,671
71	15899	Potential Indigenous Receptor 22	Potential Indigenous Receptor	372,879	6,313,259

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Receptor ID	Model ID	Receptor Description	Receptor Category	UTM Easting (m)	UTM Northing (m)
72	15900	Potential Indigenous Receptor 23	Potential Indigenous Receptor	413,807	6,304,728
73	15901	Potential Indigenous Receptor 24	Potential Indigenous Receptor	414,701	6,306,764
74	15902	Potential Indigenous Receptor 25	Potential Indigenous Receptor	415,713	6,309,172
75	15903	Potential Indigenous Receptor 26	Potential Indigenous Receptor	414,971	6,295,396
76	15904	Potential Indigenous Receptor 27	Potential Indigenous Receptor	413,079	6,309,406
77	15905	Potential Indigenous Receptor 28	Potential Indigenous Receptor	409,795	6,307,422
78	15906	Potential Indigenous Receptor 29	Potential Indigenous Receptor	390,569	6,306,510
79	15907	Potential Indigenous Receptor 30	Potential Indigenous Receptor	388,472	6,297,664
80	15908	Potential Indigenous Receptor 31	Potential Indigenous Receptor	381,958	6,298,715
81	15909	Potential Indigenous Receptor 32	Potential Indigenous Receptor	387,332	6,302,851
82	15910	Potential Indigenous Receptor 33	Potential Indigenous Receptor	385,174	6,306,484
83	15911	Potential Indigenous Receptor 34	Potential Indigenous Receptor	388,163	6,310,354
84	15912	Potential Indigenous Receptor 35	Potential Indigenous Receptor	385,216	6,312,749
85	15913	Potential Indigenous Receptor 36	Potential Indigenous Receptor	381,162	6,311,003
86	15914	Potential Indigenous Receptor 37	Potential Indigenous Receptor	377,971	6,306,944
87	15915	Black Sturgeon Reserve Residence 1	Black Sturgeon Reserve	405,449	6,297,916
88	15916	Black Sturgeon Reserve Residence 2	Black Sturgeon Reserve	405,476	6,297,893
89	15917	Black Sturgeon Reserve Residence 3	Black Sturgeon Reserve	405,503	6,297,862
90	15918	Black Sturgeon Reserve Residence 4	Black Sturgeon Reserve	405,527	6,297,835
91	15919	Black Sturgeon Reserve Residence 5	Black Sturgeon Reserve	405,554	6,297,805
92	15920	Black Sturgeon Reserve Residence 6	Black Sturgeon Reserve	405,654	6,297,681
93	15921	Black Sturgeon Reserve Residence 7	Black Sturgeon Reserve	405,720	6,297,721
94	15922	Black Sturgeon Reserve Residence 8	Black Sturgeon Reserve	405,738	6,297,699
95	15923	Black Sturgeon Reserve Residence 9	Black Sturgeon Reserve	405,753	6,297,679

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Receptor ID	Model ID	Receptor Description	Receptor Category	UTM Easting (m)	UTM Northing (m)
96	15924	Black Sturgeon Reserve Residence 10	Black Sturgeon Reserve	405,765	6,297,661
97	15925	Black Sturgeon Reserve Residence 11	Black Sturgeon Reserve	405,778	6,297,640
98	15926	Black Sturgeon Reserve Residence 12	Black Sturgeon Reserve	405,794	6,297,624
99	15927	Black Sturgeon Reserve Residence 13	Black Sturgeon Reserve	405,807	6,297,597
100	15928	Black Sturgeon Reserve Residence 14	Black Sturgeon Reserve	405,827	6,297,574
101	15929	Black Sturgeon Reserve Infrastructure	Black Sturgeon Reserve	405,437	6,298,013
102	15930	Black Sturgeon Reserve Potential Residence 1	Black Sturgeon Reserve	405,679	6,297,662
103	15931	Black Sturgeon Reserve Potential Residence 2	Black Sturgeon Reserve	405,817	6,297,522
104	15932	Remote Cottage	Human Receptors	400,748	6,295,006
105	15933	Remote Cottage	Human Receptors	387,607	6,298,666
106	15934	Remote Cottage	Human Receptors	377,549	6,294,140
107	15935	Float Plane	Human Receptors	376,983	6,299,203
108	15936	Admin Site	Human Receptors	376,689	6,299,267
109	15937	Fish Farm	Human Receptors	374,507	6,299,055
110	15938	Lagoon	Human Receptors	375,360	6,300,756
111	15939	Warehouse Site	Human Receptors	374,586	6,300,811
112	15940	Highway Maintenance Yard	Human Receptors	374,631	6,300,577
113	15941	Recreation Site	Human Receptors	375,594	6,303,042
114	15942	Dog Kennel	Human Receptors	373,388	6,302,976
115	15943	Museum Site	Human Receptors	375,014	6,302,733
116	15944	Communication Site	Human Receptors	376,000	6,303,559
117	15945	Waste Disposal Site	Human Receptors	379,757	6,304,945

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Receptor ID	Model ID	Receptor Description	Receptor Category	UTM Easting (m)	UTM Northing (m)
118	15946	Remote Cottage	Human Receptors	374,038	6,307,949
119	15947	Riding Stable	Human Receptors	374,369	6,307,586
120	15948	Recreation Lot	Human Receptors	375,069	6,307,961
121	15949	Recreation Lot	Human Receptors	375,124	6,308,104
122	15984	Remote Cottage	Human Receptors	375,165	6,307,773
123	15951	Potential Indigenous Receptor 38	Potential Indigenous Receptor	376,617	6,308,656
124	15952	Trapper Cabin	Human Receptors	392,947	6,312,606
125	15953	Recreation Lot	Human Receptors	404,536	6,296,516
126	15954	Recreation Lot	Human Receptors	404,567	6,296,540
127	15955	Remote Cottage	Human Receptors	404,780	6,296,541
128	15956	Remote Cottage	Human Receptors	404,865	6,296,554
129	15957	Remote Cottage	Human Receptors	404,882	6,296,557
130	15958	Remote Cottage	Human Receptors	404,909	6,296,538
131	15959	Remote Cottage	Human Receptors	410,520	6,303,729
132	15960	Trapper Cabin	Human Receptors	413,593	6,304,211
135	15951	Park Vacation Home	Human Receptors	376,478	6,308,281
139	15958	Park Vacation Home	Human Receptors	404,912	6,296,550
163	15991	Lynn Lake Friendship Centre	Lynn Lake Receptors	375,309	6,303,206
164	15992	Marcel Colomb First Nation Centre	Lynn Lake Receptors	374,748	6,302,611
165	15993	St. Simon's Church	Lynn Lake Receptors	374,934	6,301,646
166	15994	Lynn Lake Gospel Church	Lynn Lake Receptors	375,219	6,302,737
167	15995	St. Maria Goretti Catholic Church	Lynn Lake Receptors	374,949	6,302,645
168	15996	Misc. Commercial	Lynn Lake Receptors	375,877	6,303,715
169	15997	Lynn Lake Library	Lynn Lake Receptors	375,129	6,302,767

**LYNN LAKE GOLD PROJECT:
AIR QUALITY MANAGEMENT AND MONITORING PLAN**

Appendix A Human Receptor Locations
January 30, 2025

Receptor ID	Model ID	Receptor Description	Receptor Category	UTM Easting (m)	UTM Northing (m)
170	15998	Royal Canadian Mounted Police (RCMP)	Lynn Lake Receptors	375,194	6,302,913
171	15999	Town of Lynn Lake	Lynn Lake Receptors	375,137	6,302,770
172	16000	West Lynn Lake Heights School	Lynn Lake Receptors	374,770	6,302,635
173	16001	Lynn Lake Hospital	Lynn Lake Receptors	375,423	6,303,359
174	16002	Addictions Foundation-Manitoba	Lynn Lake Receptors	375,290	6,303,212
175	16003	The Bronx	Lynn Lake Receptors	375,318	6,303,254
176	16004	Lynn Lake Inn	Lynn Lake Receptors	375,188	6,302,784
177	16005	Residential 1 - Halstead Ave.	Lynn Lake Receptors	375,653	6,303,322
178	16006	Residential 2 - Halstead Ave.	Lynn Lake Receptors	375,648	6,303,244
179	16007	Residential 3 - Halstead Ave.	Lynn Lake Receptors	375,580	6,303,211
180	16008	Residential 4 - Halstead Ave.	Lynn Lake Receptors	375,564	6,303,122
181	16009	Residential 5 - Halstead Ave.	Lynn Lake Receptors	375,436	6,302,927
182	16010	Residential 6 - Halstead Ave.	Lynn Lake Receptors	375,356	6,302,854
183	16011	Residential 7 - Camp St.	Lynn Lake Receptors	375,492	6,303,237
184	16012	Residential 8 - Hales Ave.	Lynn Lake Receptors	375,395	6,303,225
185	16013	Residential 9 - Hales Ave.	Lynn Lake Receptors	375,345	6,303,102
186	16014	Residential 10 - Hales Ave.	Lynn Lake Receptors	375,278	6,303,050
187	16015	Residential 11 - Hales Ave.	Lynn Lake Receptors	375,273	6,302,997
188	16016	Residential 12 - Hales Ave.	Lynn Lake Receptors	375,232	6,302,932
189	16017	Residential 13 - Gordon Ave.	Lynn Lake Receptors	375,365	6,303,284
190	16018	Residential 14 - Gordon Ave.	Lynn Lake Receptors	375,277	6,303,205
191	16019	Residential 15 - Gordon Ave.	Lynn Lake Receptors	375,286	6,303,158
192	16020	Residential 16 - Highway 391	Lynn Lake Receptors	375,469	6,303,189
193	16021	Residential 17 - Highway 391	Lynn Lake Receptors	375,419	6,303,055

**LYNN LAKE GOLD PROJECT:
AIR QUALITY MANAGEMENT AND MONITORING PLAN**

Appendix A Human Receptor Locations
January 30, 2025

Receptor ID	Model ID	Receptor Description	Receptor Category	UTM Easting (m)	UTM Northing (m)
194	16022	Residential 18 - Highway 391	Lynn Lake Receptors	375,347	6,303,003
195	16023	Residential 19 - Highway 391	Lynn Lake Receptors	375,322	6,302,909
196	16024	Residential 20 - Highway 391	Lynn Lake Receptors	375,213	6,302,842
197	16025	Residential 21 - Highway 391	Lynn Lake Receptors	375,062	6,302,716
198	16026	Residential 22 - Halstead Ave.	Lynn Lake Receptors	375,328	6,302,773
199	16027	Residential 23 - Halstead Ave.	Lynn Lake Receptors	375,140	6,302,694
200	16028	Residential 24 - Halstead Ave.	Lynn Lake Receptors	375,064	6,302,622
201	16029	Residential 25 - Cobalt Pl	Lynn Lake Receptors	374,840	6,302,860
202	16030	Residential 26 - Silver St.	Lynn Lake Receptors	374,781	6,302,784
203	16031	Residential 27 - Silver St.	Lynn Lake Receptors	374,865	6,302,699
204	16032	Residential 28 - McVeigh Ave.	Lynn Lake Receptors	374,902	6,302,535
205	16033	Residential 29 - McVeigh Ave.	Lynn Lake Receptors	374,901	6,302,479
206	16034	Residential 30 - McVeigh Ave.	Lynn Lake Receptors	374,946	6,302,404
207	16035	Residential 31 - Sherritt Ave.	Lynn Lake Receptors	374,812	6,302,500
208	16036	Residential 32 - Sherritt Ave.	Lynn Lake Receptors	374,774	6,302,444
209	16037	Residential 33 - Sherritt Ave.	Lynn Lake Receptors	374,781	6,302,380
210	16038	Residential 34 - Sherritt Ave.	Lynn Lake Receptors	374,771	6,302,337
211	16039	Residential 35 - Sherritt Ave.	Lynn Lake Receptors	374,811	6,302,283
212	16040	Residential 36 - Sherritt Ave.	Lynn Lake Receptors	374,799	6,302,228
213	16041	Residential 37 - Sherritt Ave.	Lynn Lake Receptors	374,832	6,302,191
214	16042	Residential 38 - Sherritt Ave.	Lynn Lake Receptors	374,847	6,302,061
215	16043	Residential 39 - Sherritt Ave.	Lynn Lake Receptors	374,891	6,302,000
216	16044	Residential 40 - Sherritt Ave.	Lynn Lake Receptors	374,880	6,301,883
217	16045	Residential 41 - Sherritt Ave.	Lynn Lake Receptors	374,901	6,301,799

**LYNN LAKE GOLD PROJECT:
AIR QUALITY MANAGEMENT AND MONITORING PLAN**

Appendix A Human Receptor Locations
January 30, 2025

Receptor ID	Model ID	Receptor Description	Receptor Category	UTM Easting (m)	UTM Northing (m)
218	16046	Residential 42 - Sherritt Ave.	Lynn Lake Receptors	374,862	6,301,713
219	16047	Residential 43 - Sherritt Ave.	Lynn Lake Receptors	374,884	6,301,642
220	16048	Residential 44 - Edmon Ave.	Lynn Lake Receptors	374,846	6,302,446
221	16049	Residential 45 - Edmon Ave.	Lynn Lake Receptors	374,849	6,302,371
222	16050	Residential 46 - Edmon Ave.	Lynn Lake Receptors	374,867	6,302,297
223	16051	Residential 47 - Edmon Ave.	Lynn Lake Receptors	374,906	6,302,243
224	16052	Residential 48 - Edmon Ave.	Lynn Lake Receptors	374,901	6,302,177
225	16053	Residential 49 - Edmon Ave.	Lynn Lake Receptors	374,918	6,302,113
226	16054	Residential 50 - Edmon Ave.	Lynn Lake Receptors	374,958	6,301,988
227	16055	Residential 51 - Edmon Ave.	Lynn Lake Receptors	374,953	6,301,931
228	16056	Residential 52 - Edmon Ave.	Lynn Lake Receptors	374,963	6,301,833
229	16057	Residential 53 - Edmon Ave.	Lynn Lake Receptors	374,980	6,301,752
230	16058	Residential 54 - Edmon Ave.	Lynn Lake Receptors	374,947	6,301,686
231	16059	Residential 55 - Edmon Ave.	Lynn Lake Receptors	374,964	6,301,630
232	16060	Residential 56 - McVeigh Ave. S.	Lynn Lake Receptors	375,078	6,301,916
233	16061	Residential 57 - McVeigh Ave. S.	Lynn Lake Receptors	375,047	6,301,857
234	16062	Residential 58 - McVeigh Ave. S.	Lynn Lake Receptors	375,043	6,301,793
235	16063	Residential 59 - Halstead Ave. S.	Lynn Lake Receptors	375,129	6,301,986
236	16064	Residential 60 - Halstead Ave. S.	Lynn Lake Receptors	375,077	6,301,688
237	16065	Residential 61 - Zinc St.	Lynn Lake Receptors	375,032	6,301,617
238	16066	Residential 62 - Zinc St.	Lynn Lake Receptors	374,812	6,301,685
239	16070	Permanent Work Camp	Work Camp	380,916	6,308,622

Appendix B Maps

Project Infrastructure

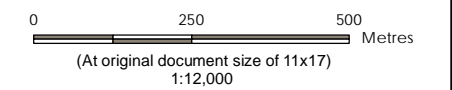
- Infrastructure Features
- Project Development Area (PDA)

Emission Source Type

- Point Source**
- Diesel Generator
- Volume Source**
- Material Handling at MRSA
 - Material Handling at Ore Stockpile
 - Material Handling at Overburden Stockpile
- Haul Road Source**
- Haul Road from the Open Pit to the MRSA
 - Haul Road from the Open Pit to the Ore Stockpile
 - Haul Road from the Open Pit to the Overburden Stockpile
- Access Road Source**
- Access Road to Gordon Site
- Open Pit Source**
- Open Pit at Gordon Site
- Area Source**
- Ore Stockpile Wind Erosion
 - Overburden Wind Erosion
 - MRSA Wind Erosion
 - General Area

Landbase

- Existing Access Road
- Waterbody
- Watercourse



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada.
 3. NOA Project Infrastructure features provided by Worley via Alamos.

Project Location Lynn Lake, Manitoba
 Prepared by ACampigotto on 2024-07-15
 Technical Review by Yankova on 2024-07-15

Client/Project ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473076

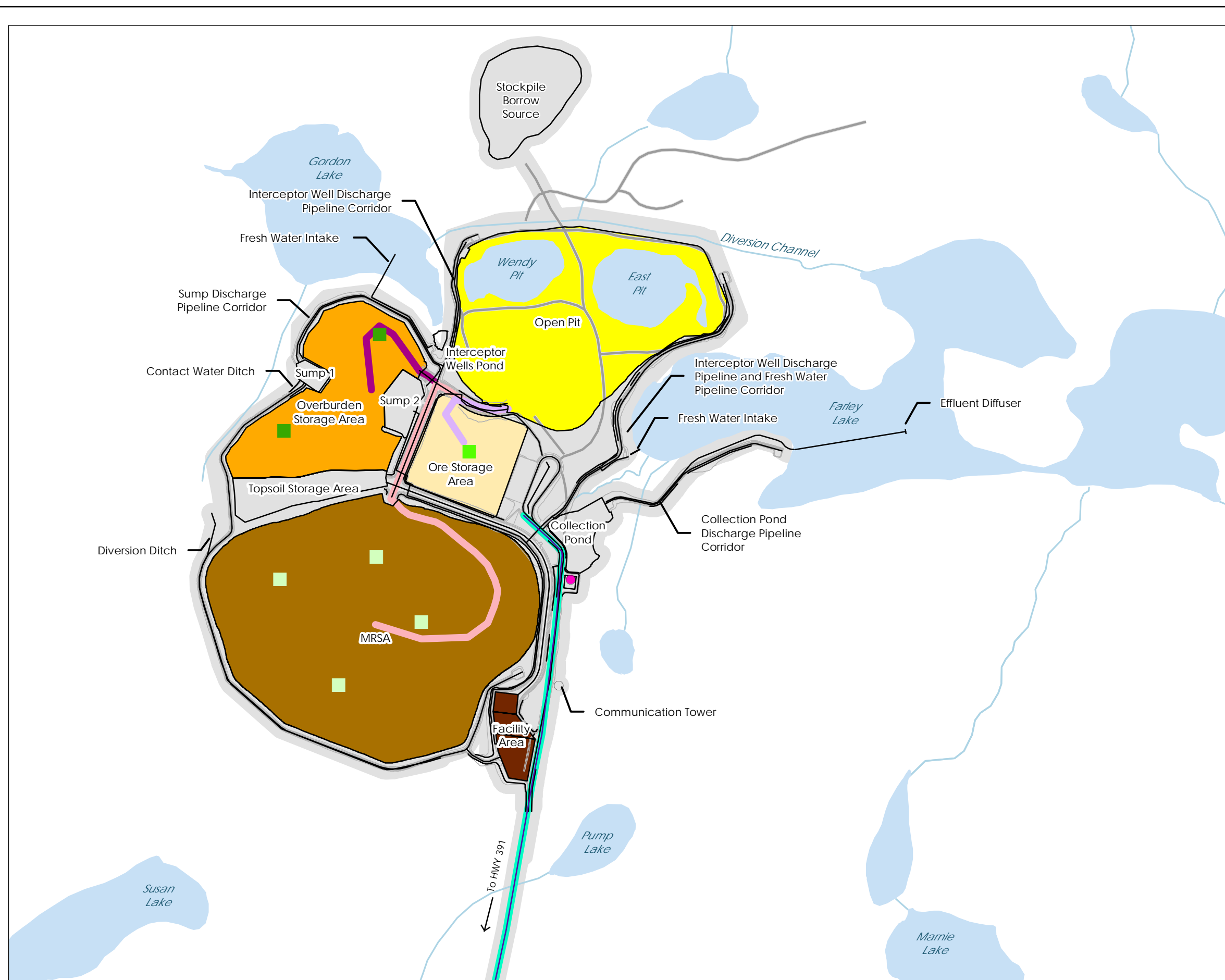
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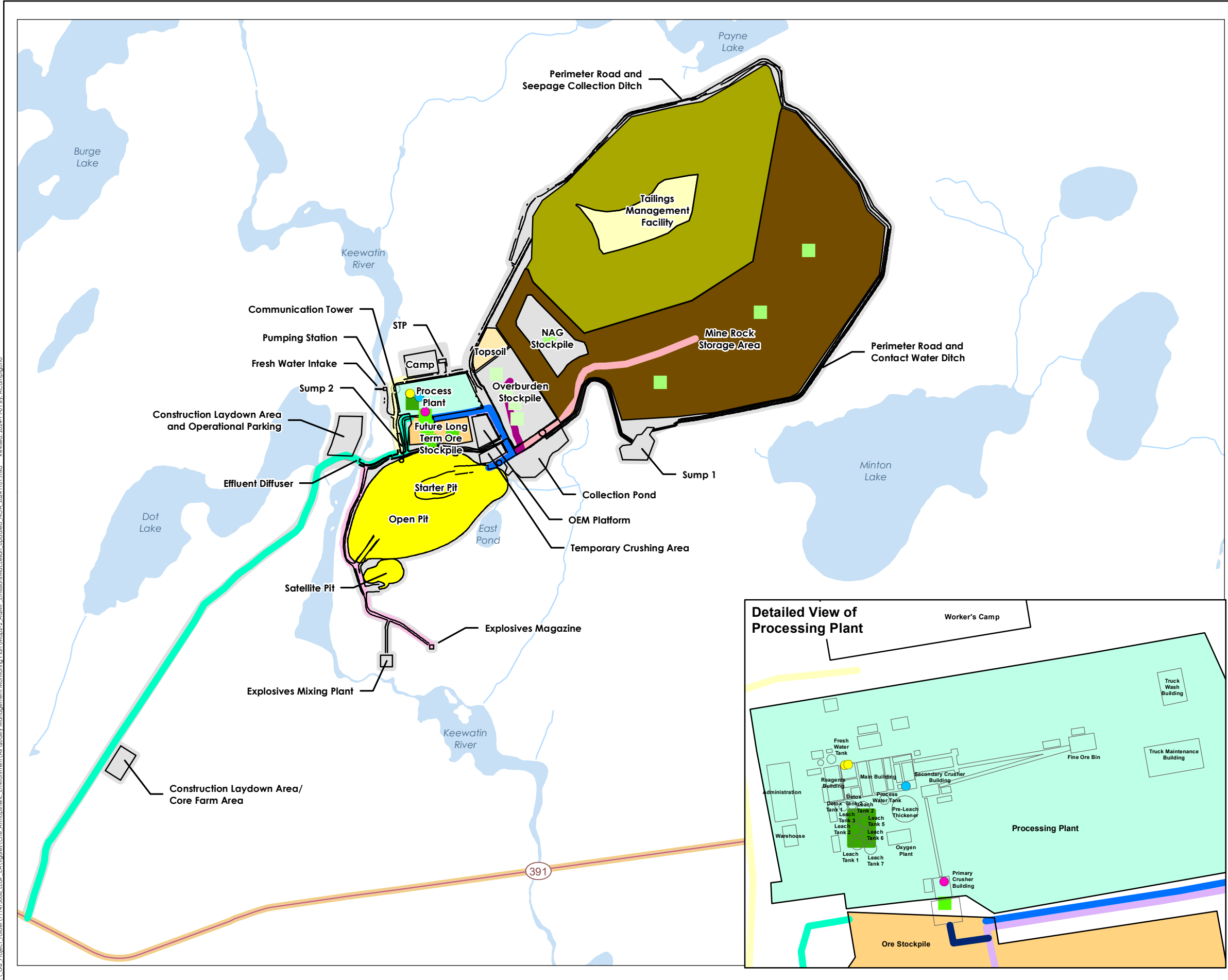
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Title

Modelled Emission Sources for Gordon Site Operation

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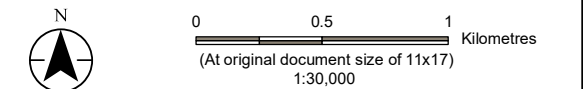


Project Infrastructure

- Infrastructure Features
- Project Development Area (PDA)

Emission Source Type

- Point Source**
- Gold Room Drying Oven Stack/Gold Room Dust Collector
 - Primary Crusher Dust Collector
 - Secondary Crusher Wet Scrubber
- Volume Source**
- Material handling at overburden stockpile
 - Material handling at MRSA
 - Material handling at primary crusher
 - Material handling at Ore Stockpile
 - Processing plant HCN fugitive emission
- Haul Road Source**
- Haul Road from Open Pit to MRSA
 - Haul Road from Open Pit to Ore Stockpile
 - Haul Road from Open Pit to Overburden Stockpile
 - Haul Road from Open Pit to the Primary Crusher
 - Haul Road from Ore Stockpile to the ROM Stockpile
- Access Road Source**
- Access Road to Mill at MacLellan Site
 - Access Road to Explosives Facilities
 - Access Road to Worker's Camp
- PR 391 Source**
- Provincial Road 391
- Open Pit Source**
- Open Pit and Satellite Pit
- Area Source**
- Topsoil Stockpile/ROM Wind Erosion
 - TMF Pond and HCN Fugitive Emissions
 - TMF Dry Banks Wind Erosion
 - MRSA Wind Erosion
 - Ore Stockpile Wind Erosion
 - General Area



Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.

Project Location Lynn Lake, Manitoba
 Prepared by ACampigotto on 2024-11-01
 Technical Review by Yankova on 2024-11-01

Client/Project ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473076

Map No. 2-2

Title Modelled Emission Sources for MacLellan Site Operation

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Project Infrastructure

- Proposed Open Pit
- Proposed Satellite Pit
- Project Development Area

Study Area

- Project Boundary
- Air Quality Local Assessment Area (LAA)

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

- Highway
- Access Road
- Rail
- Watercourse
- Waterbody
- First Nation Reserve



0 2.5 5 Kilometres
(At original document size of 11x17)
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Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada

Project Location
Lynn Lake, Manitoba
Prepared by ACampigotto on 2024-10-23
Technical Review by IYankova on 2024-10-23

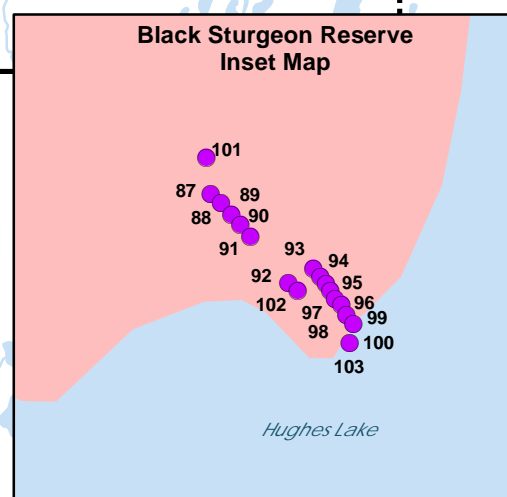
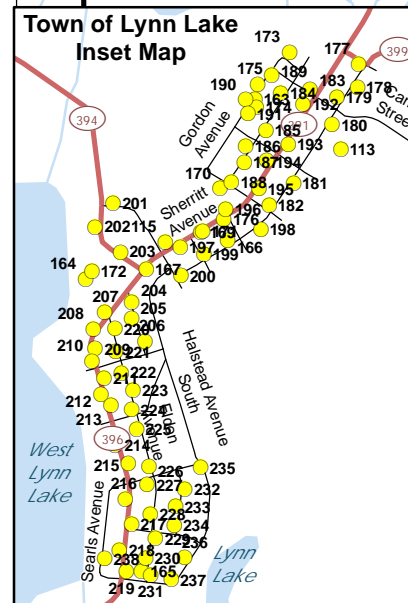
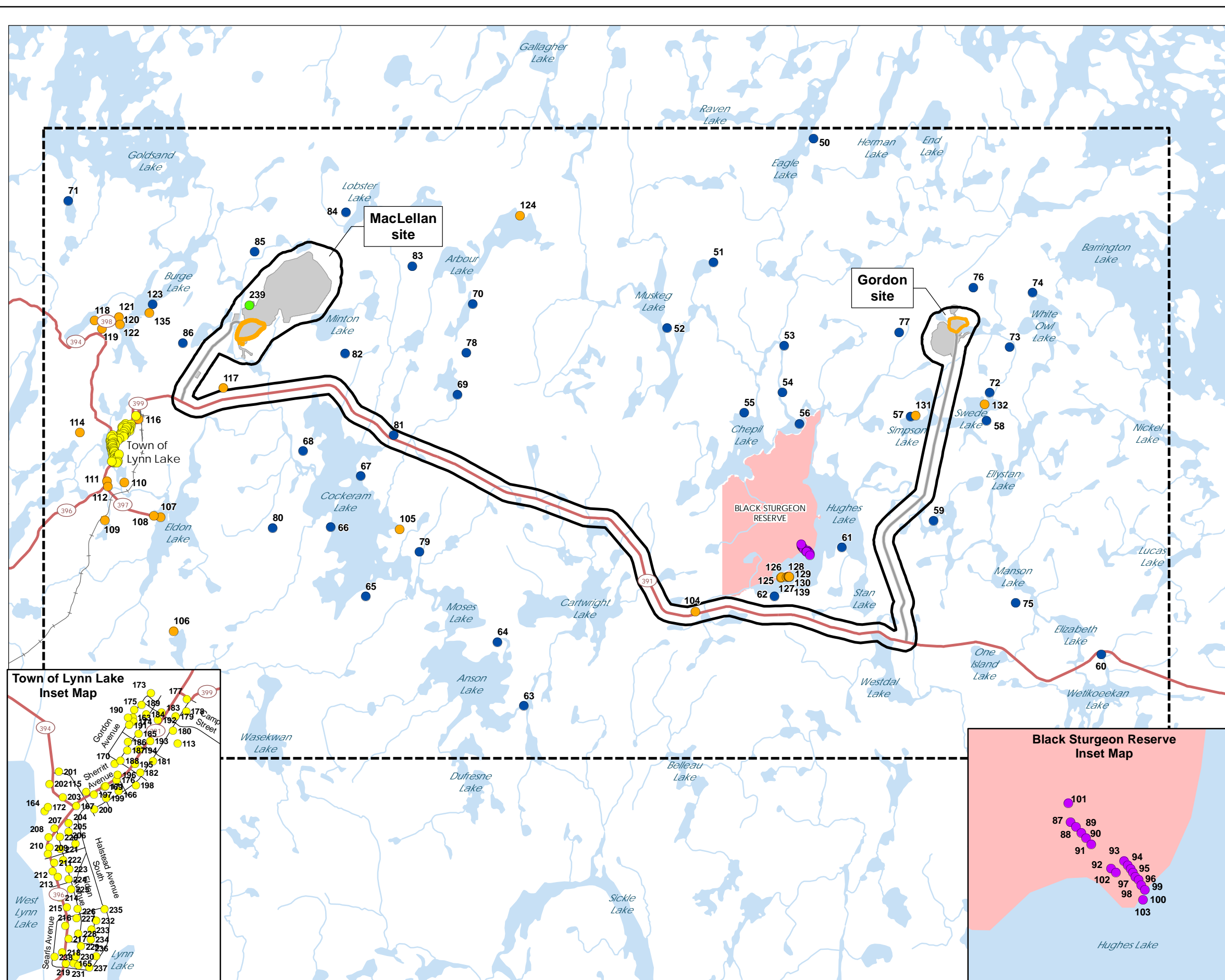
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project
111473076

Map No.

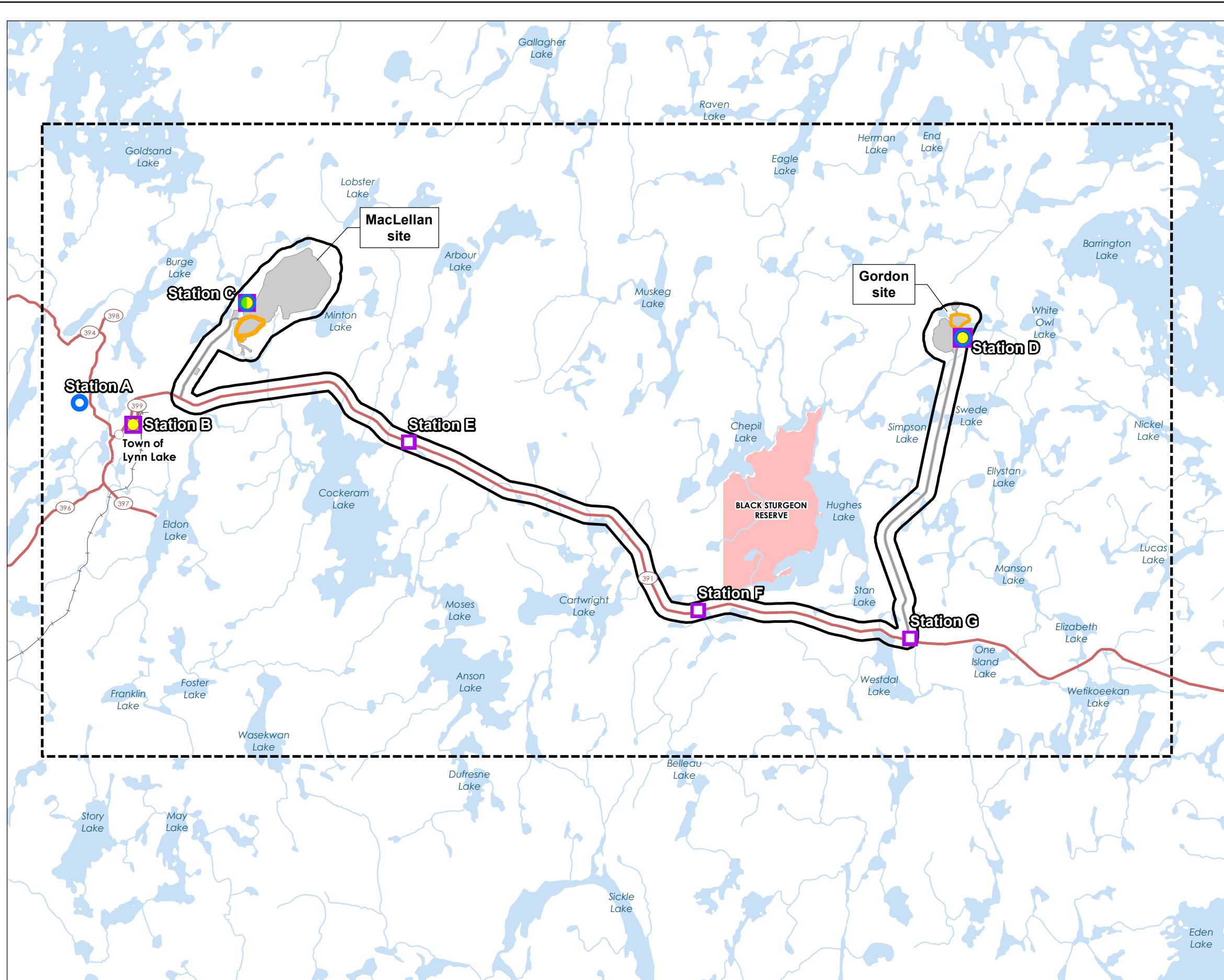
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Title

Air Quality Local Assessment Area and Human Receptor Locations



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Project Infrastructure

- Proposed Open Pit
- Proposed Satellite Pit
- Project Development Area

Proposed Monitoring Stations

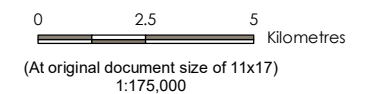
- Meteorological Monitoring Station
- Dustfall Monitoring Station
- TSP, PM₁₀ and PM_{2.5} Monitoring Station
- NO₂ Monitoring Station

Study Area

- Project Boundary
- Air Quality Local Assessment Area (LAA)

Landbase

- Highway
- Access Road
- Rail
- Watercourse
- Waterbody
- First Nation Reserve



Notes
 1. Coordinate System: NAD 1983 UTM Zone 14N
 2. Base Data Sources: Government of Manitoba and Government of Canada

Project Location Lynn Lake, Manitoba
 Prepared by A.Campigotto on 2024-10-30
 Technical Review by IYankova on 2024-10-30

Client/Project ALAMOS GOLD INC.
 Lynn Lake Gold Project
 111473076

Map No.

4-1

Title

Proposed Ambient Air Quality Monitoring Stations