

Webequie Supply Road Project

Webequie First Nation

August 19, 2024

AtkinsRéalis Ref: 661910

APPENDIX G: AIR QUALITY IMPACT ASSESSMENT

AtkinsRéalis



WSR
WEBEQUIE
SUPPLY ROAD



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- B: Modelling Results for Sensitive Receptors



1 Introduction

Webequie First Nation is completing an Environmental Assessment (EA) under Ontario’s *Environmental Assessment Act* (EAA) and Impact Assessment (IA) under Canada’s *Impact Assessment Act* (IAA) for the proposed Webequie Supply Road (“the Project”, WSR). The proposed Project is a new all-season road of approximately 107 kilometres (km) in length, connecting Webequie First Nation and its airport to existing mineral exploration activities and proposed future mining development in the McFaulds Lake area. As part of both the provincial and federal assessments, the proponent (Webequie First Nation) must outline and discuss how the Project will impact the atmospheric environment during each phase of the Project. More specifically, this assessment is carried out to comply with the requirements from the Impact Assessment Agency of Canada (IAAC) in the Tailored Impact Statement Guidelines for the WSR (TISG Section 14.1 – Changes to the atmospheric, acoustic, and visual environment).

This report was prepared pursuant to the Climate Change and Air Quality Study Plan prepared by AtkinsRéalis (previously SNC-Lavalin) and submitted to the IAAC and the Ontario Ministry of the Environment, Conservation and Parks (MECP) in June 2020 for review and validation that it meets the federal requirements in the TISG and approved Terms of Reference for the provincial EA. The results of this air quality impact assessment were documented and summarized in the Environmental Assessment Report/Impact Statement (EAR/IS) for the Project and intended to meet the requirements of both the federal TISG and the provincially approved Terms of Reference.

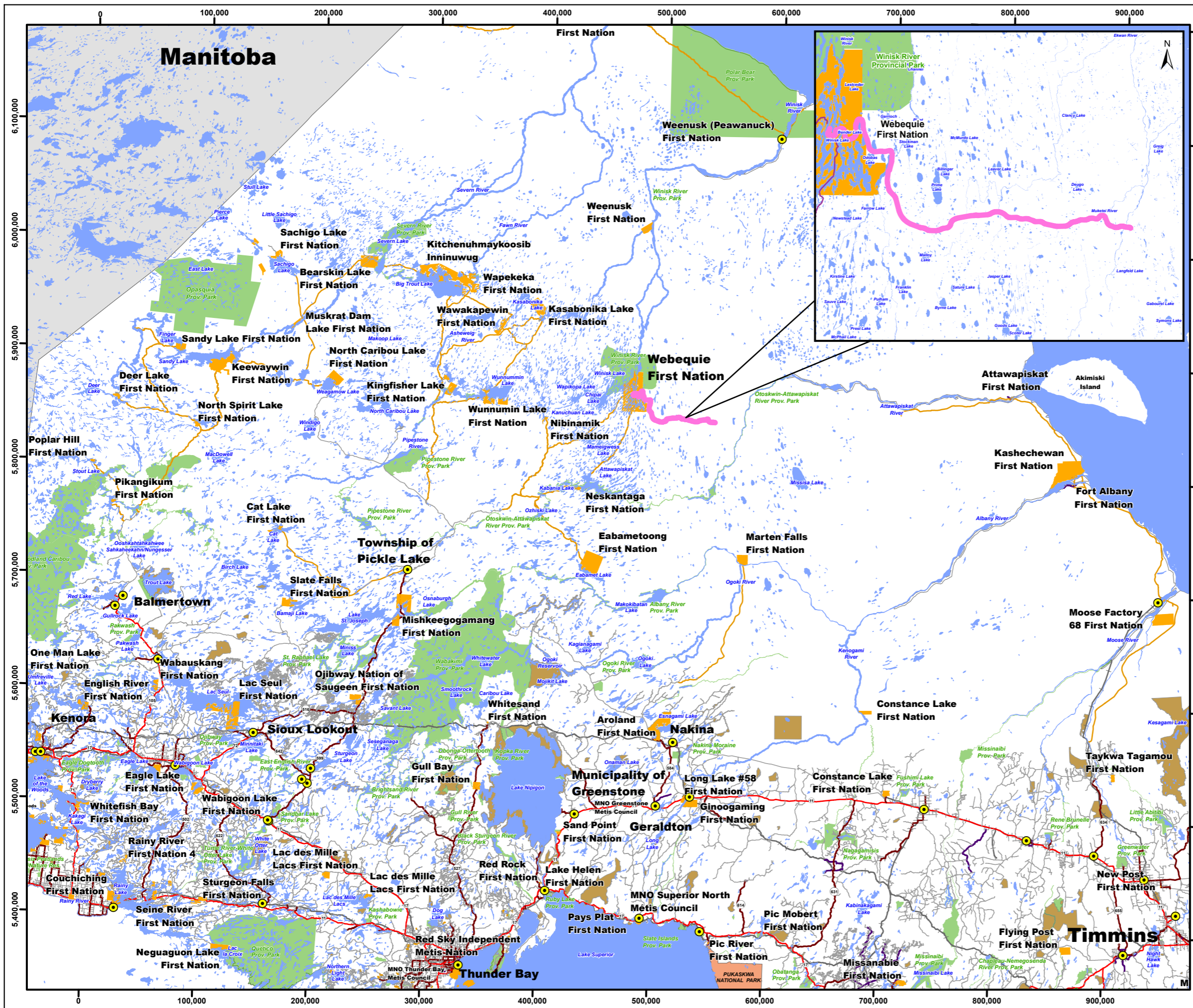
Following review of the Air Quality Impact Assessment (AQIA) dated of August 2024 (Appendix G of the EAR/IS), provincial regulators issued comments which justified a revision of the AQIA. This report provides the updated results with relevant description after consideration of the comments from the Drinking Water and Environmental Compliance Division (Technical Support Section) and the Environmental Monitoring and Report Branch of the MECP provided in November 2025.

1.1 Project Overview

The proposed WSR is a new two-lane all-season road within a cleared right-of-way (ROW) of approximately 35 metres (m) in width and approximately 107 km in length. The preliminary recommended preferred route for the road consists of a northwest-southeast segment running 51 km from the Webequie First Nation Reserve to a 56 km segment running east-west before terminating near the McFaulds Lake within the mineralized deposit area known as the Ring of Fire. A total of 17 km of the WSR is within the Webequie First Nation Reserve lands, with the remainder of the road located on un-surveyed Ontario Crown lands.

The proposed WSR is located in north-western Ontario on un-surveyed Ontario Crown lands and Webequie First Nation Reserve lands approximately 525 km northeast of the City of Thunder Bay as shown in **Figure 1.1**. The WSR is intended to facilitate the movement of materials, supplies and people from Webequie to the mineral exploration areas near McFaulds Lake area and to connect the community to the provincial road network to the south when the other two road projects (Northern Road Link – NRL; and Marten Falls Community Access Road – MFCAR) will be completed as well. It is expected to accommodate an annual average daily traffic of less than 500 vehicles consisting of light to medium personal vehicles, commercial vehicles and heavier trucks hauling industrial supplies and equipment.





Legend

- Preliminary Recommended Preferred Route
- First Nation Reserve
- Waterbody
- Provincial Park
- Conservation Reserve
- Federal National Park
- Rail
- Arterial Road
- Collector Road
- Expressway / Highway
- Local, Resource, Recreation, and Service Road
- Winter Road
- Cities/Towns

Webeque Supply Road (WSR)

Project Location

Figure Number:	1.1	REV	PA
Client:	Webeque First Nation	Project Number:	661910
		Date:	6/5/2024
DSC		DRN	CHK
		AD	VS

NOTES

1. Coordinate System: NAD 1983 Ontario MNR Lambert.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.io.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF) Download Date: 2021-02-04

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The northwest-southeast segment of the road (51 km) resting mostly over mineral soil will be cleared of all vegetation across the 35 m ROW to accommodate the two-lane all-season road. Shoulders, ditches, and berms of stripped organic materials on the outside will also be shaped along this segment.

The segment of the WSR running in an east-west direction is located within the Hudson Bay Lowlands Ecozone that includes James Bay ecoregion and is composed mostly of peatland (muskeg) having a depth of 2–4 m of waterlogged organic soil, which represents poor to very poor conditions for building a road. A floating road design is therefore considered by adding an underlying layer of aggregates (along with geotextile fabrics or geogrids) that will compress the peat resulting in settlement and consolidation. A surface layer of crushed stone will be added to complete the road that is expected to lay 1.2 m above the surrounding lowland areas.

For the west half of the WSR in stable soil conditions, the surface layer of the road that represents the driving surface for vehicles will be a chip seal treatment, which is similar to asphalt pavement, and consists of a tar slurry and gravel. For the east half of the road in the peatlands with poor soil conditions, it is proposed the driving surface be initially gravel. During the operation phase, monitoring of the east half of the WSR in the peatlands will be conducted to assess performance/settlement, serviceability, and safety issues/concerns related to dust along the corridor. Depending on the outcome of this monitoring, the gravel driving surface may be replaced in a timeframe of approximately 3 to 5 years with a surface treatment such as chip seal treatment, or asphalt pavement.

Other project components will include bridges and culverts to cross waterbodies, road cross-culverts for local drainage, aggregate pits/quarries, rest and maintenance areas along the WSR, and a permanent Maintenance and Storage Facility (MSF) for operation and maintenance of the WSR once operational.

1.2 Valued Component and Indicators

This report discusses air quality as a valued component (VC) that has been identified in the TISG and by the Project Team and is, in part, based on what Indigenous communities, the public and stakeholders have identified as valuable to them in the EA/IA for the Project. Emissions from the project activities during the construction and operation phases will have an impact on existing air quality conditions especially along the WSR to a spatial extent that will be established and discussed in this report. Indicators are used to assess potential effects to air quality. In general, indicators represent a resource, feature or issue related to a VC that if changed from the existing conditions may demonstrate a positive or negative effect. Compounds emitted during the construction and operation phases of the Project that have limits under Ontario Regulation 419/05 – General Air Quality and the Canadian Air Quality Standards (CAAQS) from the Canadian Council of Ministers of the Environment (CCME) are proposed as indicators of changes to air quality.

Table 1-1 presents the air quality valued component and indicators and rationale for their selection.

The MECP has issued guidelines related to ambient air concentrations that are summarized in Ontario's Ambient Air Quality Criteria (MECP, 2020). These guidelines represent indications of good air quality, based on protection against negative effects on health or the environment. The guidelines are not regulatory enforceable limits (MECP, 2020).

There are two sets of federal objectives and standards – the National Ambient Air Quality Objectives (NAAQOs) and the Canadian Ambient Air Quality Standards (CAAQSS) (formerly the National Ambient Air Quality Standards (NAAQS)). The NAAQOs are benchmarks that can be used to facilitate air quality management on a regional scale and provide goals for outdoor air quality that protect public health, the environment, or aesthetic properties of the environment (Canadian Council of Ministers of the Environment (CCME), 1999). The federal government has established the following levels of NAAQOs (Health Canada, 1994):

- The maximum desirable level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for unpolluted parts of the country and for the continuing development of control technology.



- The maximum acceptable level is intended to provide adequate protection against negative effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and well-being.
- The air quality criteria, objectives, or standards described above do not set regulatory limits. Their purpose is to serve as an indicator of good air quality and as a comparison benchmark for monitoring data. Monitoring data in Canada periodically exceeds these criteria, objectives, and standards at different locations. This does not result in an immediate effect to human health but serves as guidance for identifying areas where air quality could potentially be improved.

A detailed description of the relevant provincial and federal criteria, objectives and standards to the Project is provided in **Section 2.4**.

Table 1-1: Air Quality VC – Indicators and Rationale

Indicators	Rationale
Quantitative changes to ambient air contaminants in the study area, including: <ul style="list-style-type: none"> ▪ Particulates (total suspended matter (TSP), fine inhalable fraction of particulate matter (PM₁₀), and fine particulate matter (PM_{2.5})) ▪ Criteria air contaminants (sulphur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), and ground-level ozone (O₃)) ▪ Relevant volatile organic compounds (VOC) (1,3-butadiene, acetaldehyde, acrolein, benzene, ethylbenzene, formaldehyde, hexanes, propionaldehyde, toluene, xylenes) ▪ Benzo(a)pyrene as a surrogate to Polycyclic Aromatic Hydrocarbons (PAH) ▪ Diesel particulate matter (DPM) ▪ Dustfall 	<ul style="list-style-type: none"> ▪ Indigenous Knowledge and feedback from Indigenous communities regarding the importance of air quality ▪ Commitment to meet CCME’s Air Quality Management System requirements ▪ Commitment to avoid or minimize adverse effects to nearby receptors (residential homes) and culturally sensitive areas of value and interest to Indigenous peoples (e.g., spiritual sites, fish and hunting areas) ▪ Sensitivity of human health and the environment (e.g., soils, plants, animals) to air quality changes

1.3 Spatial and Temporal Boundaries

1.3.1 Spatial Boundaries

The spatial boundaries for the purpose of characterizing impacts of the Project on air quality include the following.

Local Study Area (LSA) is the area where largely direct, and indirect effects of the Project are likely to occur.

- The LSA extends 1 km from each side of the centerline of the WSR, and 500 m from temporary and permanent supportive infrastructure (construction camps, aggregate/rock source areas, access roads, MSF). This includes the road ROW or Project Footprint of the supportive infrastructure where the majority of sources that will impact air quality are likely to occur.

Regional Study Area (RSA) is the area where potential, largely indirect and cumulative effects of the Project in the broader, regional context may occur.

- The RSA extends 5 km from boundaries of the LSA.

In selecting the LSA and RSA boundaries, consideration was given to potential effects and effect pathways as a result of the Project. For air quality, the effects of the Project activities are considered to be constrained to the LSA spatial boundaries. Sensitive receptors and future land use were considered in the air quality impact assessment. The modelling approach for the assessment focuses on the western portion of the WSR from the community of Webequie to the point where the road intersects with the proposed permanent access road to the ARA-4 aggregate source area (41.5 km). The approach to focus on the impacts to sensitive receptors located in and near the community of Webequie was adopted because the construction and operation of the road is expected to be similar along the full length (i.e., the impacts assessed for the western part will be of similar nature for the eastern part). It was determined that modelling the full road (>100 km) would be computationally time consuming and not provide different results. The spatial assessment boundaries for the air dispersion modelling for the Project are presented in **Figures 1.2** and **1.3**.

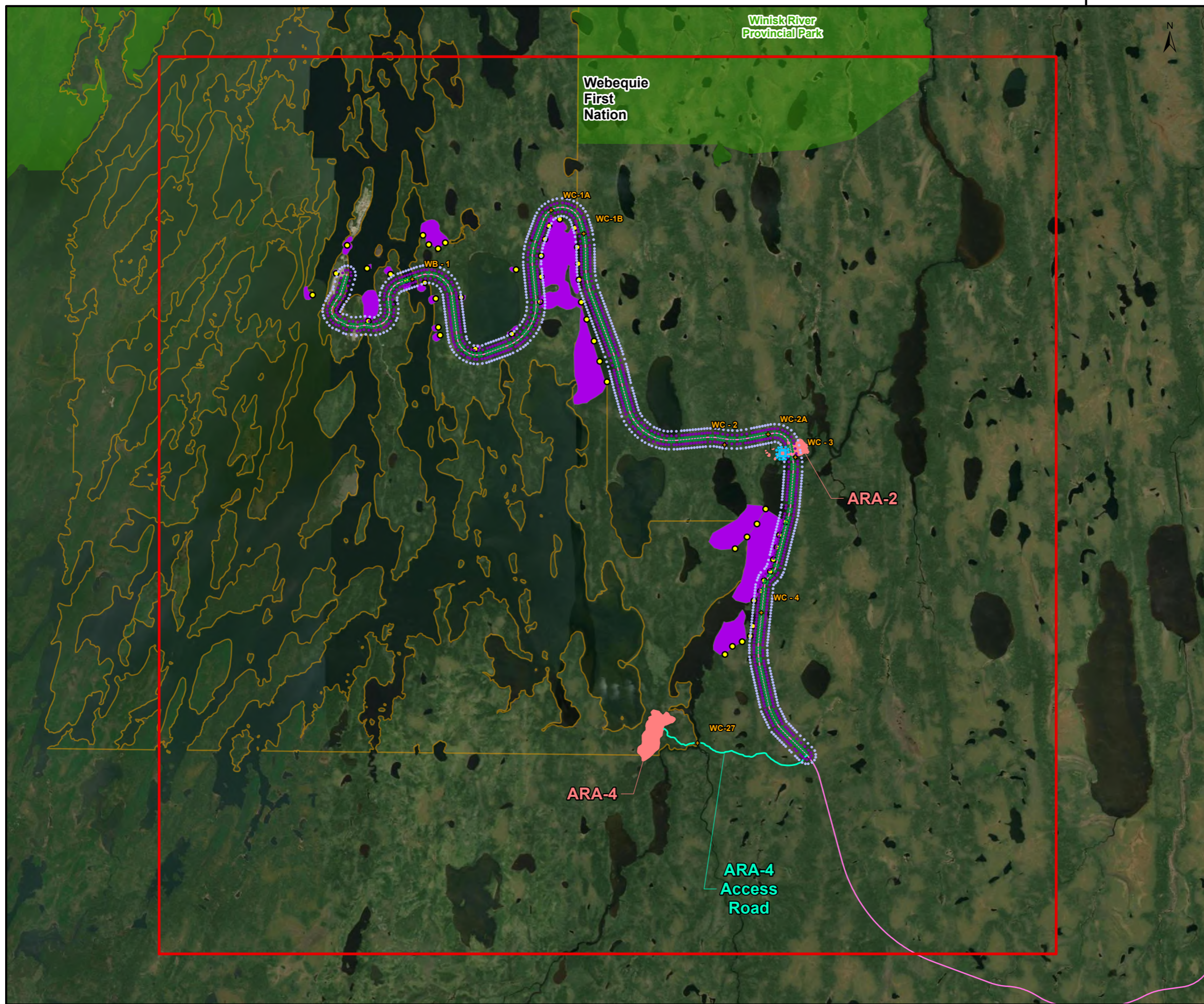
1.3.2 Temporal Boundaries

Temporal boundaries for the assessment address the potential effects of the Project over relevant timescales. The temporal boundaries for the Project comprise the following two main phases:

- **Construction Phase:** All activities associated with the initial development and construction of the road and supportive infrastructure from the start of the construction to the start of the operation and maintenance of the Project and is anticipated to be approximately 5 to 6 years in duration.
- **Operation Phase:** All activities associated with operation and maintenance of the road and permanent supportive infrastructure (e.g., operation and maintenance yard, aggregate extraction and processing areas) that will start after the construction activities are complete, including site restoration and decommissioning of temporary infrastructure (e.g., access roads, construction camps, etc.). The Operations Phase of the Project is anticipated to be 75 years based on the expected timeline when major refurbishment of road components (e.g., bridges) is deemed necessary.

The Project is expected to operate for an indeterminate period; therefore, future suspension, decommissioning and eventual abandonment is not evaluated in the EA/IA or this air quality assessment.





Legend

Dispersion Modeling

- Dispersion Domain
- Receptor grid at 50 m from road centerline
- Receptor grid at 150 m from road centerline
- Receptor grid at 300 m from road centerline
- Receptors surrounding the quarry sources

WSR Components

- Road Footprint
- ⊕ Waterbody Crossing
- Quarries
- ARA-4 Access Road

Sensitive Receptors

- Culturally Sensitive Receptors
- Culturally Sensitive Area

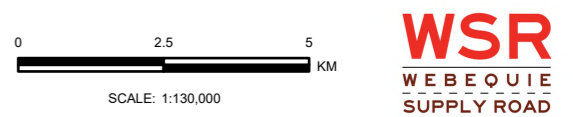
Limits

- First Nation Reserve
- Provincial Park

Webeque Supply Road (WSR)

Air Dispersion Modelling Domain

Figure Number:	1.2	REV	PA
Client:	Webeque First Nation	Project Number:	661910
		Date:	1/19/2026
DSC		DRN	CHK
		AD	SP



NOTES

- Coordinate System: NAD 1983 UTM Zone 16N.
- Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
- Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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Legend

Dispersion Modelling

- Zoomed Area
- Receptor grid at 50 m from road centerline
- Receptor grid at 150 m from road centerline
- Receptor grid at 300 m from road centerline

WSR Components

- Road Footprint
- + Waterbody Crossing

Sensitive Receptors

- ▲ Culturally Sensitive Areas
- ▲ Institutions
- ▲ Existing Residences
- ▲ Identified Future Residential Plots

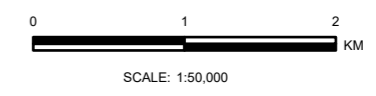
Limits

- First Nation Reserve
- Provincial Park

Webequie Supply Road (WSR)

**Air Dispersion Modelling Domain
(close-up near Webequie)**

Figure Number:	1.3	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC			DRN
			CHK
			APP
			AD
			SP
			SP



NOTES

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1.4 Identification of Project Interactions with Air Quality

Table 1-2 identifies each project activities that may interact with air quality VC to result in a potential effect. The identification of project interactions with air quality VC provides a basis for the subsequent assessment of the potential effects of the Project.

Table 1-2: Project Interactions with Air Quality VC

Project Activities	Potential Effects
	Change in Air Quality
CONSTRUCTION	
Mobilization of Equipment and Supplies: Transport of equipment, materials and supplies to the Project work areas using the winter road network and airport in the Webequie First Nation Reserve.	✓
Surveying: Ground surveys are conducted to stake (physically delineate) the road ROW and supportive infrastructure components of the Project (i.e., construction camps, access roads, laydown/storage yards, and aggregate pits).	—
Vegetation Clearing and Grubbing: Clearing and grubbing of vegetation (forest & wetland), including removal, chipping and/or disposal.	✓
Construction and Use of Supportive Infrastructure: This includes access roads, construction camps, laydown/storage yards, and aggregate pits including blasting.	✓
Construction of the Road: removal and stockpiling of organics, subgrade excavation, placement of fill and gravel, grading and drainage work (e.g., road ditches, erosion protection, etc.).	✓
Construction of Structures at Waterbody Crossings: Culverts and bridges – foundations (e.g., spread footings, piles, caissons), wing walls, girders, and decks, etc.	✓
Decommissioning / Closure of Temporary Aggregate Pits: Demobilization of extracting and processing equipment, grading and site reclamation/revegetation. This also includes formalizing / re-purposing select pits and quarries as permanent Project components for operations and maintenance.	✓
Decommissioning of Temporary Construction Camps, Access Roads, and Laydown / Storage Areas: Grading and site reclamation/revegetation. This also includes formalizing / re-purposing select access roads to permanent pits and quarries and a construction camp to an operations and maintenance facility as Project components for use during operations.	✓
Completion of Project-Wide Clean-up, Site Restoration / Reclamation and Demobilization: Clean-up of excess materials, site revegetation and demobilization of equipment and materials.	✓
Potential for Accidents and Malfunctions: Spills, vehicle collisions, flooding, forest fire and vandalism. ¹	✓
Employment and Expenditures. ²	—
Emissions, Discharges and Wastes: Embodies noise, air emissions / greenhouse gases, water discharge, and hazardous and non-hazardous wastes. ³	✓



Table 1-2 (cont'd): Project Interactions with Air Quality VC

Project Activities	Potential Effects
	Change in Air Quality
OPERATIONS	
Road Use: Light and heavy vehicles and maintenance equipment with average annual daily traffic volume of less than 500 vehicles.	✓
Maintenance and Repair of Road: Includes vegetation management and control within the road ROW; repairs/resurfacing of roads; dust control; winter/seasonal maintenance (i.e., snow clearing); road drainage cleanout, repairs of culverts, ditches, and drainage outfalls; rehabilitation and repairs of culverts and bridges; and road inspection.	✓
Operation of Quarries, and Maintenance Yards/Facilities: Includes periodic extraction and blasting and processing operations (i.e., crushing, screening) and stockpiling of rocks and aggregate materials. Also includes operation and repairs of maintenance yards/facilities and components (office buildings, parking lots, storage of equipment and materials).	✓
Potential for Accidents and Malfunctions: Spills, vehicle collisions, flooding, forest fire and vandalism. ¹	✓
Employment and Expenditures. ²	—
Emissions, Discharges and Wastes: Embodies noise, air emissions / greenhouse gases water discharge, and hazardous and non-hazardous wastes. ³	✓

Notes:

✓ = Potential interaction

— = No interaction

¹ Accidents and Malfunctions including spills, vehicle collisions, flooding, forest fire and vandalism may occur at any time during construction and operations of the Project. Rather than acknowledging this by placing a checkmark against each of these activities, “Potential for Accidents and Malfunctions” is an additional component under each project phase. The potential effects of accidental spills are assessed in Section 23 – Accidents and Malfunctions.

² Project employment and expenditures are related to most project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is an additional component under each project phase.

³ Emissions, Discharges, and Wastes (e.g., air, noise, light, solid wastes, and liquid effluents) can be generated by many project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Wastes and Emissions” is an additional component under each project phase.

1.5 Scope of the Air Quality Assessment

The objective of the air quality assessment is to verify how the Project would impact the ambient air quality around the road and near supportive infrastructure and if there is risk of exceeding a CAAQS or ambient air quality criteria (AAQC) applicable in the province of Ontario.

As required in the TISG, studied contaminants include the common air contaminants (CAC) as well as specific toxic contaminants from the volatile organic compound (VOC) category and polycyclic aromatic hydrocarbons (PAH). The CACs include the nitrogen oxides (NO_x, and more specifically nitrogen dioxide (NO₂)), carbon monoxide (CO), sulphur dioxide (SO₂), and particulate matter of different diameter classes (total suspended particulate (TSP), inferior to 10 µm (PM₁₀) and inferior to 2.5 µm (PM_{2.5})). The complete list of toxic contaminants covered in this assessment is presented in **Section 2.4** and includes DPM. The air dispersion modelling study will also assess the extent of dustfall during the construction and operation phases of the Project.



The emission sources covered in this assessment come essentially from the combustion of diesel fuel or gasoline from land mobile equipment, heavy-duty trucks and light-duty vehicles during the construction and operation phases of the WSR. **Table 1-2** has provided the project activities that may interact with air quality and result in a potential effect. The modelling exercise also considers fugitive dust emissions mostly from vehicular traffic on the road and the handling of aggregates and other earth materials during construction. The methods and inputs used in calculating emission rates are presented in **Section 3** and **4** of this report. Other than the usual air dispersion modelling requirements, specific instructions were also given in the TISG for this assessment, and include the following:

- Provide an assessment of the project's emissions potentially contributing or adding to existing ground ozone (O₃) levels.
- Assess the potential for emissions from the Project to contribute acid deposition and exceedances of critical loads for terrestrial and aquatic ecosystems.
- Provide emission rates for all project and regional sources within the study area, including emission factors (with methodology, uncertainty assessment and references) and all assumptions and related parameters that would enable calculations to be reproduced.
- Provide a comparison of predicted air quality concentration against the CAAQS for PM_{2.5}, SO₂ and NO₂, and O₃. Predicted concentrations for other air pollutants relevant to the project, such as dust resulting from construction activities and ongoing vehicle use during operations or maintenance of the road, should be compared with appropriate provincial and territorial guidelines.
- Provide a description of all methods and practices (e.g., dust suppression strategies and guidelines, control equipment) to be implemented to reduce and control emissions. If the best available technologies are not included in the Project design, the proponent needs to provide a rationale for the technologies selected.
- Provide details of the achievement of emission standards for all mobile and stationary engines used in the Project.

This report contains five sections including this introduction as follows:

- **Section 2** provides details on methods used for air dispersion modelling (meteorology, topography, receptors, etc.).
- **Section 3** and **Section 4** deal with the project's construction and operation phases respectively, by defining emission scenarios based on identified sources, calculation inputs and modelled emission sources configuration. Modelling results are presented at the end of each section and compared with AAQC and CAAQS.
- **Section 5** discusses about uncertainties associated with this work.
- **Section 6** discusses about the potential effects and interactions of the Project on air quality.
- **Section 7** discusses on the proposed mitigation measures and predicted net effects on air quality.
- **Section 8** provides concluding remarks.



2 Modelling Methodology

The method used for atmospheric dispersion modelling meets the requirements of the Atmospheric Dispersion Modelling Guide for Ontario (ADMGO) from the MECP (2017) and considers the recommendations of the US EPA (2017, 2023a) for the selected dispersion model. The following subsections present the technical details of the atmospheric dispersion study. Modelling details specific to the construction and operation phases, mainly the definition of sources and their emission parameters, are presented in **Sections 3** and **4**, respectively.

2.1 Air Dispersion Model

The choice of dispersion model used for this assessment is based on regulatory requirements (i.e., ADMGO), depending on the location of the project and the availability of specific data needed to feed the models. The American Meteorological Society and Environmental Protection Agency Regulatory Air Dispersion Model (AERMOD version 22112, the most recent adopted by MECP) was used for this assessment. This model is regularly used in air quality impact studies for industrial projects in Ontario and elsewhere in the world. This is in fact the regulatory model in the United States and several Canadian provinces, and the model usually used in Ontario. The MECP guide designates AERMOD as the preferred model for dispersion studies at the close or local scale (< 50 km).

The AERMOD model is updated regularly by US EPA. It is an advanced Gaussian-type steady-state plume model that considers two-dimensional meteorological fields (vertical variability and uniformity in the horizontal plane), as well as the interaction of the topography with the plumes of the sources of air contaminant emissions. AERMOD allows the building wake to be considered and integrates the elevation due to the amount of vertical movement and buoyancy of the hot gases escaping from sources. Finally, the model also takes into account hourly variation in meteorological parameters and temperature inversions on the ground or at altitude.

For the WSR Project, emission sources will be located close to the ground and therefore the maximum potential impacts on air quality will occur close to the project site (local scale). Given the absence of significant topography or very large bodies of water (such as the Great Lakes or an ocean) in the study area, the assumption of horizontal uniformity in the meteorological conditions is justified and therefore it is not required to use a dispersion model considering three-dimensional meteorology or for longer-range transport such as the CALPUFF model. The AERMOD model is also preferred for the following reasons:

- For most of the project's emission sources, the transport of air contaminants from the source and receptors will be over land in forested areas.
- The MECP's ADMGO requires that large water bodies with shoreline effects be accounted for with the use of an advanced model. However, the lakes and rivers along the WSR Project are not considered sufficient enough to impact the ground-level vehicle and construction equipment sources and does not justify the use of a more advanced dispersion model such as CALPUFF.

The model's input data includes:

- Emission characteristics (emission rate of various contaminants, exhaust flow rate, temperature, velocity, etc.).
- Characteristics of emission sources (location, stacks height and diameter, dimensions, etc.).
- The characteristic dimensions of the buildings if the effects of building wakes on the stack plumes are considered; however, there were no buildings considered in the WSR model.
- Hourly meteorological data (temperature, wind speed and direction, atmospheric stability, and turbulence indices, mixing height).



- The position and elevation of the receptors, i.e., the places where the atmospheric concentration of the contaminant is to be assessed.
- Parameters controlling the model options and statistical calculations to be performed on the concentrations or deposition rates calculated by the model.

For this assessment, the AERMOD model was used with the default "regulatory" options in rural mode for all sources, as required by the MECP for calculations of contaminant concentrations in ambient air. Land within a 3 km distance of the WSR comprises forests, shrublands, wetlands, and open water and is considered undeveloped, with forested wetlands and scattered small lakes more prevalent to the west and predominantly forested and vegetated land cover occurring along most of the Project alignment.

For NO₂, AERMOD simulations accounted for the progressive atmospheric conversion of nitrogen monoxide (NO) into NO₂ using the Ozone Limiting Method (OLM). More details are provided in **Section 2.6**.

Ambient air concentrations of TSP and particulate matter deposition (dustfall) from fugitive sources were modelled using plume depletion by deposition option. For PM₁₀ and PM_{2.5}, plume depletion by dry deposition was not applied, which represents a conservative assumption and has minimal impact on the modelled concentrations, as these finer particles deposit very gradually and over large distances. Wet deposition was intentionally excluded from TSP air concentration modelling to maintain a conservative assessment, as inclusion of wet removal would reduce predicted airborne concentrations. The dispersion model options used are summarized in **Table 2-1**.

Table 2-1: Options Used in AERMOD

Option Types or Simulated Phenomena	Notes	AERMOD Configuration Keywords
Calculations of PM₁₀, PM_{2.5} and other gaseous contaminants concentrations		
Default Regulatory Options	Calculation of concentrations Consideration of topography Dispersion in rural mode Treatment of calm winds Processing of missing weather data No exponential decay of contaminants in the atmosphere	RegDFault CONC ELEV RURAL
Calculation of NO₂ concentrations with the Ozone Limiting Method (OLM) method		
Default Regulatory Options	Concentration calculations as above	DEFAULT CONC
Conversion of NO into NO ₂	Refer to Section 2.6	OLM
Calculation of TSP concentrations and dustfall		
Default Regulatory Options	Concentration calculations as above	DEFAULT CONC
TSP concentrations	Calculation of TSP concentrations applying dry depletion phenomenon	DRYDPLT NOWETDLT
Dustfall	Calculation of total deposition applying dry and wet depletion phenomena	DEPOS DRYDPLT WETDPLT



2.2 Meteorological Dataset

Meteorological parameters affecting atmospheric dispersion considered by the AERMOD model include wind speed and direction, atmospheric stability indices (friction velocity, Monin-Obukov length, surface roughness length) and mixing height. These parameters, as well as the ambient temperature, are input to the model on an hourly basis for a period of 5 years. For estimating wet deposition of particulate matter, hourly precipitation data are also required.

The Site-Specific Meteorological Dataset (SSMD) used for this assessment was prepared by the MECP and provided to support the Webequie Supply Road Air Quality Impact Assessment. The dataset covers a continuous five-year period from 2019 to 2023 and reflects updates and clarifications communicated by MECP in supporting correspondence. The SSMD was developed using surface and upper air data derived from the NOAA Unrestricted Mesoscale Analysis (URMA 2.5 km) and Rapid Refresh (RAP 13 km) datasets, and meets the data quality and representativeness requirements outlined in the ADMGO.

The SSMD approach assumes that this processed dataset is more representative of meteorological conditions in the vicinity of the Webequie community and Project corridor than individual regional monitoring stations. This approach is consistent with the methodology applied in other remote northern Ontario assessments, including the Eagle's Nest Project Air Quality Technical Supporting Document (Knight Piésold, 2013).

One surface location was selected by MECP for generation of the SSMD and corresponding SFC and PFL input files used in AERMOD. This location is situated approximately 8 km east of Webequie on land southeast of Bender Lake and adjacent to the northern arm of Winisk Lake. The selected point is located approximately 350 m from the shoreline with waterbodies located in most directions. Within a 3 km radius of the selected location, land cover is estimated to be approximately 40% water, with the remainder consisting primarily of forested and wetland areas.

While it is recognized that selecting a single surface location presents challenges for representing spatially varying land use along long linear projects, the location selected by MECP represents a highly conservative assumption when applied across the entire Project corridor as it extends surface conditions intended to reflect the vicinity of the community of Webequie to all segments of the alignment, despite heterogeneity in land cover and terrain.

2.2.1 Surface Characteristics and Roughness Length

The AERMOD surface characteristics contained within the SFC portion of the SSMD were reviewed as part of this assessment. Surface roughness length represents the effective height of obstacles influencing wind flow and particle deposition near ground level and is generally proportional to the height and density of surrounding features such as vegetation and buildings. In AERMOD, surface roughness is calculated as an area-weighted average of land uses within a 3 km radius of the surface meteorological station.

Due to the proximity of the selected location to water bodies and relatively low terrain relief, the surface roughness values in the SSMD are relatively low, ranging from approximately 0.078 to 0.090 m. These values are characteristic of water or smooth rock surface roughness provided in the ADMGO (Table 5-1) and are significantly lower than surface roughness lengths typically associated with forested and vegetated areas, where values are generally an order of magnitude higher (0.9–1.3 m). The limited roughness range reflects the dominance of water and open terrain for the selected location.

Given the nature of the modeled sources, which include near-ground emissions from a narrow linear roadway, the selected surface roughness assumptions are expected to have a notable influence on predicted concentrations. This effect has been considered in the interpretation of model results.



2.2.2 Prevailing Wind Conditions

Figure 2.1 presents the annual wind rose for the 2019 to 2023 period based on the SSMD at a height of 10 m. Prevailing winds occur primarily from the west, northwest, and southwest, accounting for approximately 53% of observed wind directions. Winds from the western quadrant indicate that airflow is directed toward the north and east for a substantial portion of the year. Winds originating from the east and southeast sectors, representing transport toward the community, occur approximately 17% of the time, with higher frequencies observed during the summer and fall months from June through December (**Figure 2.2**). The figure also shows consistent directional trends throughout the year, with modest seasonal variability in wind speed and directional frequency.

The average wind speed over the five-year period is approximately 3.5 m/s (12.6 km/h). Calm conditions are rare, with no calm winds recorded, and less than 1% of the dataset is missing.

Figure 2.1: Annual Wind Rose 2019–2023 WSR1 Data Used in the Model

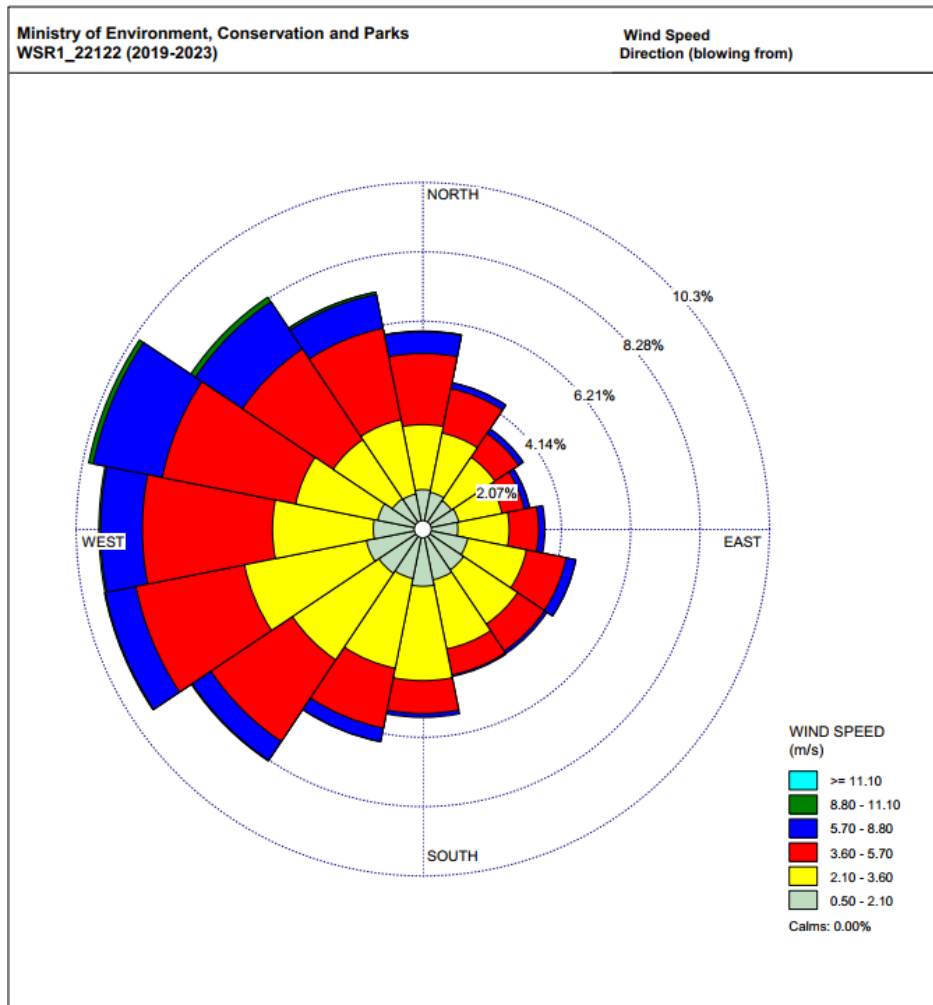
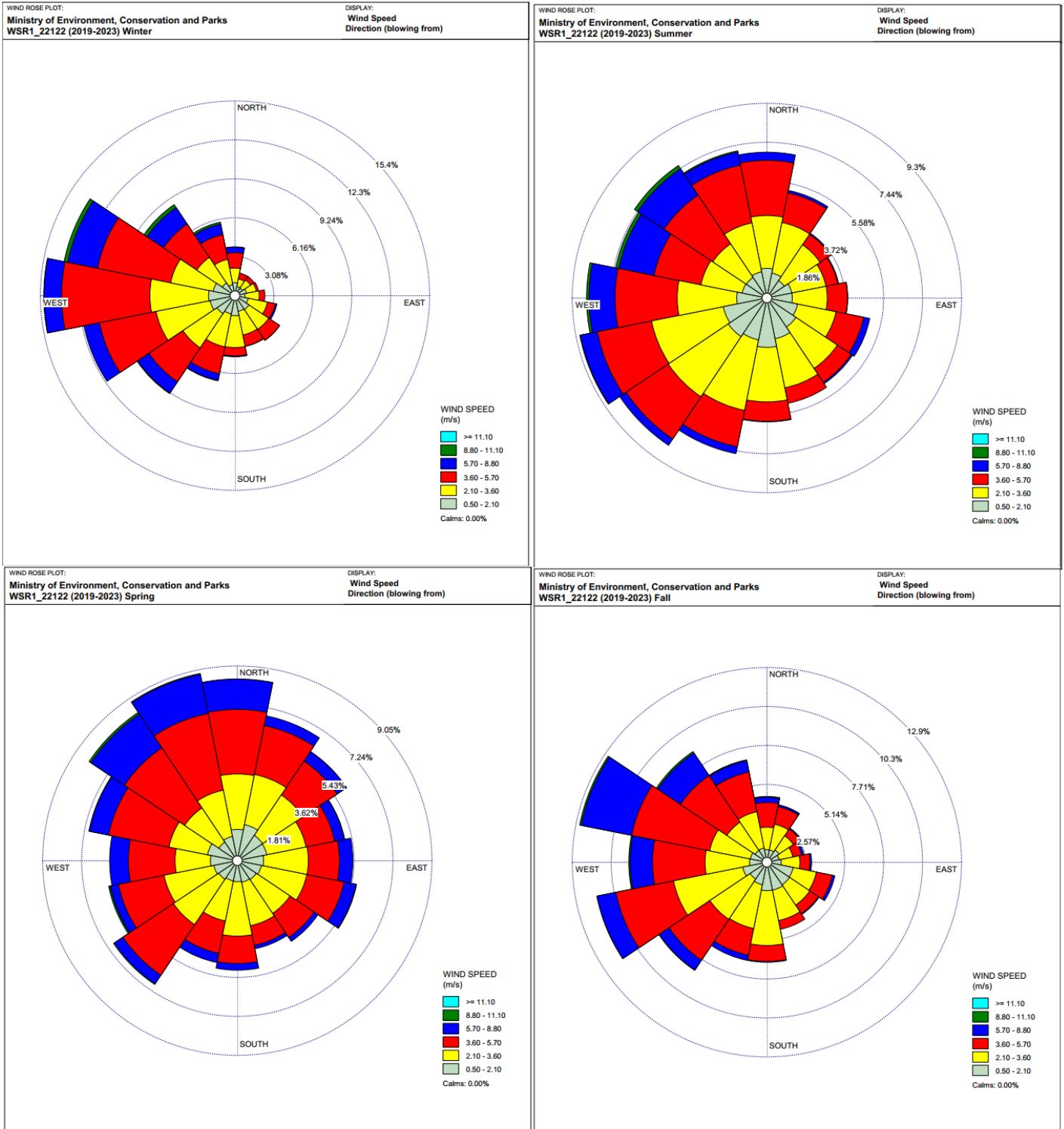


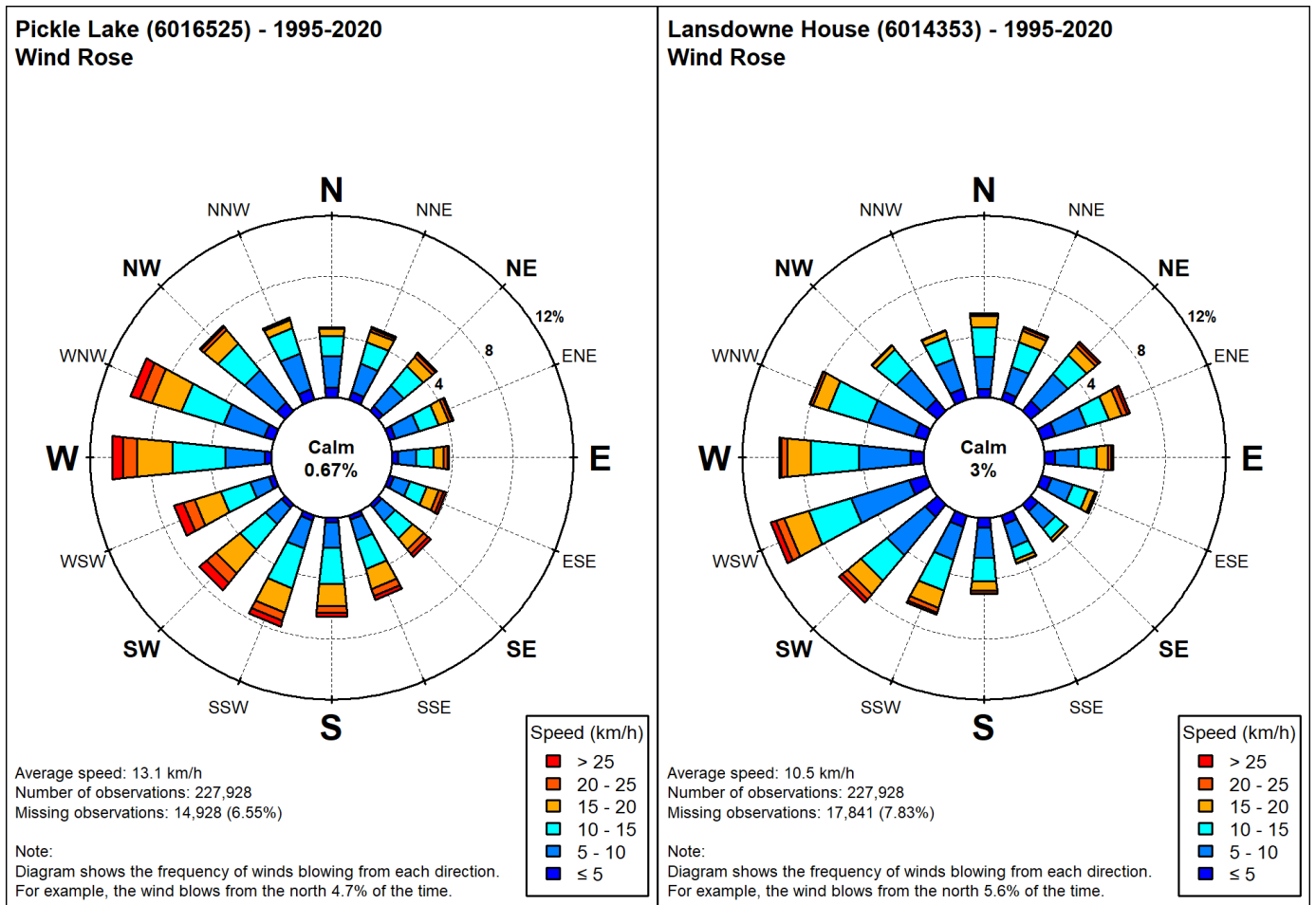
Figure 2.2: Seasonal Wind Rose 2019–2023 WSR1 Data



Although no nearby monitoring station provides a complete five-year dataset suitable for direct modeling use, wind data from the closest available stations were reviewed to assess regional consistency (**Figure 2.3**). Pickle Lake, located approximately 258 km southwest of Webequie, exhibits a similar average wind speed of approximately 13.1 km/h and prevailing winds from the western quadrant. Lansdowne House, approximately 91 km south of Webequie, shows slightly lower average wind speeds of approximately 10.5 km/h but also features prevailing westerly winds.

While differences in magnitude and direction are observed among these stations, the overall wind patterns are consistent with those represented in the SSMD and indicate that the dataset reasonably captures regional meteorological conditions. It is therefore expected that the SSMD represents the range of wind speeds and directions likely to occur along the length of the Project corridor, which extends approximately 100 km from Webequie to the proposed Mine Camp.

Figure 2.3: Annual Wind Roses at Meteorological Stations Closer to Site



2.3 Modelling Domain

Given the long road distance, the modelling domain was restricted within an area of about 20 km by 20 km that covers 40.5 km of the 107 km road from the community of Webequie to the point on the road where it intersects with the ARA-4 aggregate pit access road (refer to **Figure 1-2**). This representative modelling domain was selected to focus on the impacts within a corridor along the road but also in proximity to sensitive receptors (i.e., residences, institutional buildings, and culturally sensitive areas). In fact, the majority of sensitive receptors are located in the modelling domain and the impacts along the road are expected to be similar for the remaining length (i.e., ~66 km not included in the model). In addition, modelling the full length of the road at the proposed receptor resolution would have been computationally prohibitive; focusing on a representative portion of the alignment therefore allows the assessment to prioritize higher-resolution modelling in areas where local-scale air quality effects and interactions with sensitive receptors are most relevant to the objectives of the study.

For the construction and operation phases, the receptors, or points of impingement, for contaminant concentrations in ambient air, were arranged along the road with the resolution as follows (2,402 receptors):

1. Every 100 m (or 75–100 m due to road curvature) at 50 m distance from the road centerline (RCL) on either side;
2. Every 150 m (or 100–200 m due to road curvature) at 150 m distance from the RCL on either side;
3. Every 150 m (or 100–200 m due to road curvature) at 300 m distance from the RCL on either side;
4. Every 50 m at 100 m distance around the ARA-2 aggregate pit center (for construction phase only); and
5. Every 100 m at 200 m distance around the ARA-2 aggregate pit center (for construction phase only).

This initial receptor configuration allows generation of lateral concentration profiles up to a distance of 300 m from the RCL, capturing the zone where the majority of Project-related emissions are expected to occur.

This initial receptor grid was used as a screening tool to identify contaminants and averaging periods for which predicted concentrations approached or exceeded applicable criteria. For those cases, additional modelling was undertaken using a uniform Cartesian receptor grid to delineate the spatial extent of impacts and to define the maximum distance of exceedances from the road centerline (RCL).

Discrete receptors (147) were placed at the noise sensitive areas (NSAs) identified for the Project, which are also considered sensitive in terms of air quality and dustfall.

These locations include the following:

- **Twenty-four (24) existing residences or group of residences (RP)** including mostly homes within the community of Webequie.
- **Six (6) institutional buildings (I)** including two schools, a nursing station, a church, a community building, and business center.
- **Twenty-one (21) culturally sensitive areas (CHL)** including spiritual or sacred spaces for members of the Webequie First Nation and other Indigenous communities and/or stakeholders. It includes locations important for harvesting country-food/plans or hunting. Since being areas, receptors (**50 in total**) were placed at intervals along the closest edge of these areas to the WSR to assess potential impacts. The modelling results discussion will focus on the impacts at these discrete receptor groups and along the road.
- **Sixty-seven (67) locations for future residences (RPF)** per the Webequie First Nation On-Reserve Land Use Plan of 2019 distributed amongst four areas (Site A; Site West; Site C and Site D).

The receptors locations as part of the air quality assessment are illustrated in **Figure 1.2** and **1.3**.



Local topography was considered in the modelling. Pre-processed Canadian Digital Elevation Model (CDEM) data representative of the modeling domain in GeoTiff format (043D and 043E) available from the MECP were processed using the AERMAP processor to extract elevations for sources and receptors and to calculate terrain slopes.

2.4 Relevant Air Quality Criteria and Standards

The Ontario Ambient Air Quality Criteria (AAQC) and the Canadian Ambient Air Quality Standards (CAAQS) for contaminants relevant to the Project are presented in **Table 2-2**. The Nunavut Air Quality standards (NAAQS) are also shown for comparison purpose only. As shown, they are higher or at least equivalent to corresponding provincial and/or federal limits.

Studied contaminants include all the CACs as well as toxic contaminants like aldehydes, specific VOCs, and PAHs with an AAQC that can be found in exhaust gases from vehicles and mobile equipment. The AAQC dustfall limits are considered as a guideline in this assessment to inform the reader of the extent of dust deposition associated with the project on the surrounding environment. Metals were not modelled because information on their concentrations in site soils and aggregate materials to be handled during construction is not available. As requested by the TISG, DPM was modelled representing all PM_{2.5} generated by engines. There is no official criteria or standard associated with DPM. However, Health Canada (2016) provides guidance values for short-term and chronic exposures to DPM that have been used for information purpose.

Table 2-2: Ambient Air Quality Criteria and Standards for Studied Contaminants

Pollutant	Averaging Period	Ontario AAQC ⁽¹⁾		CAAQS ⁽¹⁾		Nunavut NAAQS	
		[ppb]	[µg/m ³]	[ppb]	[µg/m ³]	[ppb]	[µg/m ³]
Total suspended matter (TSP)	24-hour	—	120	—	—	—	120
	Annual	—	60 ⁽²⁾	—	—	—	60
Fine inhalable fraction of particulate (PM ₁₀)	24-hour	—	50	—	—	—	—
Fine particulate matter (PM _{2.5})	24-hour	—	27 ⁽³⁾	—	23 ⁽⁴⁾	—	30
	Annual	—	8.8 ⁽⁵⁾	—	8 ⁽⁶⁾	—	—
Sulphur dioxide (SO ₂)	10-minute	67	180	—	—	—	—
	1-hour	40	100	65 ⁽⁷⁾	173	172	450
	Annual	4	10	4 ⁽⁸⁾	10	11	30
Nitrogen dioxide (NO ₂)	1-hour	200	400	42 ⁽⁹⁾	79	200	400
	24-hour	100	200	—	—	100	200
	Annual	—	—	12 ⁽⁸⁾	22	30	60
Carbon monoxide (CO)	1-hour	30,000	36,200	—	—	—	—
	8-hour	13,000	15,700	—	—	—	—

Notes:

- (1) **Sources:** Ontario AAQC – MECP (2020); CAAQS – CCME (2025).
- (2) As the geometric mean of daily measurements over a year.
- (3) The 3-year average of the annual 98th percentile of the daily 24-hr average concentrations.
- (4) Applicable starting in 2030. Represent also a 3-year average of the annual 98th percentile of the daily 24-hr average concentrations.
- (5) The 3-year average of the annual average concentrations.
- (6) Applicable starting in 2030. Represent also a 3-year average of the annual average concentrations.
- (7) The 3-year average of the annual 99th percentile of the SO₂ daily maximum 1-hour average concentrations.
- (8) The average over a single year of all 1-hour average concentrations. The maximum result from the 5 years of meteorological data is applied.
- (9) The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations.



Table 2-2 (Cont'd): Ambient Air Quality Criteria and Standards for Studied Contaminants

Pollutant	Averaging Period	Ontario AAQC ⁽¹⁾		CAAQS ⁽¹⁾		Health Canada ⁽¹⁾	
		[ppb]	[µg/m ³]	[ppb]	[µg/m ³]	[ppb]	[µg/m ³]
1,3-butadiene	24-hour	4.5	10	—	—	—	—
	Annual	0.91	2	—	—	—	—
Acetaldehyde	30-minute	278	500	—	—	—	—
	24-hour	278	500	—	—	—	—
Acrolein	1-hour	2.0	4.5	—	—	—	—
	24-hour	0.17	0.4	—	—	—	—
Benzene	24-hour	0.72	2.3	—	—	—	—
	Annual	0,14	0.45	—	—	—	—
Ethylbenzene	10-minute	438	1,900	—	—	—	—
	24-hour	231	1,000	—	—	—	—
Formaldehyde	24-hour	53	65	—	—	—	—
Hexanes	24-hour	711	2,500	—	—	—	—
Propionaldehyde	10-minute	4.2	10	—	—	—	—
Toluene	24-hour	532	2,000	—	—	—	—
Xylenes	10-minute	692	3,000	—	—	—	—
	24-hour	168	730	—	—	—	—
Benzo(a)pyrene as a surrogate to PAHs	24-hour	—	0.00005	—	—	—	—
	Annual	—	0.00001	—	—	—	—
Diesel particulate matter (DPM)	2-hour	—	—	—	—	—	10 ⁽²⁾
	Annual	—	—	—	—	—	5 ⁽²⁾
Dustfall	30-day	—	7 g/m ²	—	—	—	—
	Annual	—	4.6 g/m ² ⁽³⁾	—	—	—	—

Notes:

- (1) **Sources:** Ontario AAQC – MECP (2020); CAAQS – CCME (2025); Health Canada (2016).
- (2) Health Canada does not provide any information regarding the statistical representation to consider for comparison with the guidance values. Hence, the maximum concentration calculated for the 2-hour exposure period and the annual period is considered in this study for information purpose.
- (3) Represents the arithmetic mean of 30-day periods over an annual averaging time.



2.5 Summary of Existing Conditions

The proposed WSR is located in a remote region of northern Ontario away from significant sources of human induced air emissions. For the study area, air emission sources are limited to the community of Webequie of which can be summarized with assumptions as follows:

- Electric power station with diesel generator sets having a capacity of 2 MW producing an estimated 3,000 MWh of electricity per year (Government of Canada, 2024). According to the National Pollutant Report Inventory (NPRI), the power plant generates a total of 50 to 70 tonnes of NO₂ annually and 1 tonne or less of micro particulates (PM₁₀ and PM_{2.5}).
- The combustion of wood residues in stoves or equipment alike for heating purposes in Webequie, generating particulates, NO₂ and VOCs from combusted wood. Natural gas and propane are not available in the community.
- Mobile vehicles (trucks, snowmobile, all-terrain vehicles, dozers, etc.) are most likely used within the community but the related emissions should be relatively low.
- Solid wastes are disposed in a nearby community landfill which can release greenhouse gases (GHG) but also an array of VOCs. Given the population number (and organic waste generation rate), the resulting fugitive emissions from the landfill are most likely very small. No open burning of wastes commonly occurs in Webequie.
- The Webequie airport links the community to other regions in Ontario providing air transportation services for the local population, including delivery of goods and services. Aircrafts will generate an array of air contaminants, although mostly in the upper atmosphere.

There are no industrial or mining activities in the study area presently. The closest installations that have reported emissions to the NPRI (and therefore have exceeded the reporting threshold) are other thermal power plants operated by Hydro One (in Kasabonika and Landsdowne House at 100 km from Webequie). The closest active mine (Musselwhite Mine, Goldcorp Canada Ltd.) that have reported emissions to the NPRI are located at over 200 km from Webequie. There are no large-scale agricultural activities, and the commercial forestry industry is not active within the LSA or RSA.

Local air quality data is not available with the exception of limited data collected from a station operated by the MECP (2019) as part of Ontario's Ring of Fire Baseline Monitoring Program (2015-2018) providing data on fine particulate matter (PM_{2.5}) and metals, the latest being excluded from this assessment. For the other contaminants, a combination of air quality monitoring stations located in remote non-urban areas similar to the Project were used to characterize and describe existing air quality conditions in the LSA and RSA (**Table 2-3**). The monitoring stations are part of the Réseau de surveillance de la qualité de l'air du Québec (RSQAQ) and the National Air Pollution Surveillance Network (NAPS).



Table 2-3: Air Quality Monitoring Stations Used to Set Up Background Concentrations

Contaminant	Station ID	Station Name	Rationale
TSP	10200	Radisson, QC	Station located in a remote region at about the same latitude than Webequie with limited activities nearby (presence of a small town and a hydroelectric plant). Between 2018 and 2020, it generated the highest 24-h average concentration of both stations.
	4750	Lac-Édouard, QC	Station located in the southern portion of Québec but still in a non urban remote area with forest land around, a lake and a larger town. Between 2018 and 2020, it generated the highest annual average concentrations which are used along with the Radisson station measurement to obtain a compounded annual average.
PM _{2.5}	MECP	Ring of Fire, ON	Short-lived station measuring PM _{2.5} concentrations from 2015 to 2018 in the Ring of Fire area (relatively close to Webequie) part of a monitoring program carried out by the MECP in the last ten years.
PM ₁₀ , CO	129601	Fort Smith, NWT	Station located in northern Canada (border of NWT and Alberta) with Fort Smith acting as a logistics and transportation hub towards northern mines. Due to the presence of a larger town than Webequie, the PM ₁₀ and CO background concentrations are most likely slightly over-estimated. The resulting PM ₁₀ background concentration from this station was used to align with the selected TSP and PM _{2.5} background concentrations.
SO ₂ , NO ₂	91801	Fort Chipewyan, AB	Station located in northern Alberta near the small town on Lake Athabasca with the overarching region known for bituminous oil extraction. Due to such activities, background concentration may be over-estimated compared to Webequie area.
VOCs, BaP	62601	Simcoe, ON	No monitoring stations in remote areas. Although in a non-urban setting without any significant emission sources nearby, data comes from a station located in southern Ontario which most likely over-estimate the actual background concentration of VOCs in the study area.
O ₃	55101	Senneterre, QC	Station located in a rural region of the province of Quebec east of Val-D'Or in a forested setting with some industrial activities in the region.

Table 2-4 lists the background concentrations selected as part of this assessment relevant to the AAQC or CAAQS averaging period. They are based on data that was presented in the Natural Environment Existing Conditions Report (hereafter referred to as the “Baseline Report”) prepared for the Project by AtkinsRéalis Canada Inc. (AtkinsRéalis, 2024) (formerly SNC-Lavalin Inc.). General remarks on the potential presence of contaminants in the RSA (within 6 km from the road on each side) are as follows:

- **Gaseous common air contaminants:** The annual average SO₂, CO and NO₂ background concentrations in remote areas without industrial or manufacturing installations are expected to be low (< 1 ppb for SO₂; 200 ppb for CO; and < 3 ppb for NO₂) compared to applicable air quality criteria and standards, but can still reach higher values and peaks especially during wildfires (near or from further away due to high atmosphere dispersion), prescribed agricultural or biomass burns in the area, or in the case of Webequie, in the direct vicinity of the diesel power plant.
- **Ground-level O₃:** Concentrations measured at regional background monitoring stations are all similar in range, with no exceedances observed in comparison to the applicable criteria and standards. Annual mean concentrations in Webequie can be expected to be similar to those reported at stations in remote area, that is in the 25 to 30 ppb range.

- **Particulate matter:** Like for gaseous contaminants, particulate matter in remote areas will come mostly from the combustion of trees and vegetation, from diesel fuel combustion at the power plant and also, depending on location, from wind lifting of naturally or anthropogenically eroded surfaces that tends to generate concentration peaks in the summer months. The use of wood stoves or equivalents is another source of particulates and micro-particulates that is limited to the community.
- **Toxic contaminants:** Carbonyls, VOCs and PAHs are also attributed to fuel and wood combustion. Higher concentrations will be observed during the cooler months which may be attributed to wood burning in the area but also by the fact that cooler air and inversions trap contaminants near the ground.

The atmospheric dispersion model provides estimates about the project's contribution to contaminant concentrations in ambient air. Background concentrations account for air contaminants already present in the environment or from other sources. The background concentrations presented in **Table 2-4** are therefore added to the model results so to compare the resulting concentrations with applicable air quality standards and criteria.

Table 2-4: Summary of Background Concentrations for Studied Contaminants

Pollutant	Applicable Standard	Averaging Period	Background Concentration		Representative NAPS or RSQAQ
			[ppb]	[µg/m ³]	
Total suspended matter (TSP)	AAQC	24-hour	—	45	Maximum 24-hour concentration in Radisson (QC) from 2018 to 2020.
	AAQC	Annual	—	4.0	Concentration representative of the study area based on measurements in Radisson (QC) and Lac Edouard (QC) from 2018 to 2020.
Inhalable fraction of particulate matter (PM ₁₀)	AAQC	24-hour	—	28	3-year average of the annual 98 th percentile of daily 24-hour average concentrations at Fort Smith (NWT) from 2017 to 2019.
Fine particulate matter (PM _{2.5})	AAQC & CAAQS	24-hour	—	13	3-year average of the annual 98 th percentile of daily 24-hour average concentration from 2015-2017 based on measurements at the Ring of Fire (ON) station.
		Annual	—	4.7	3-year average of annual concentrations at the Ring of Fire (ON) station from 2015 to 2017.
Sulphur dioxide (SO ₂)	AAQC	10-minute ⁽¹⁾	59	149	Maximum 1-hour concentration measured at Fort Chipewyan (AB) from 2017 to 2019.
	AAQC	1-hour	36	90	
	CAAQS		7.3	18	3-year average of the annual 99 th percentile of the daily maximum 1-hour average concentrations at Fort Chipewyan (AB) from 2017 to 2019.
	AAQC & CAAQS	Annual	0.20	0.50	Concentration representative of the study area based on measurements at Fort Chipewyan (AB) from 2017 to 2019.
Carbon monoxide (CO)	AAQC	1-hour	4,200	5,061	Maximum 1-hour and 8-hour concentrations measured at Fort Smith (NWT) from 2017 to 2019.
	AAQC	8-hour	2,700	3,253	

Notes:

(1) Background 1-hour concentration multiplied by 1.65 for the 10-minute averaging period or 1.2 for 30-minute averaging period.



Table 2-4 (Cont'd): Summary of Background Concentrations for Studied Contaminants

Pollutant	Applicable Standard	Averaging Period	Background Concentration		Representative NAPS or RSQAQ
			[ppb]	[µg/m³]	
Nitrogen dioxide (NO ₂)	AAQC	1-hour	27	51	Maximum 1-hour concentration measured at Fort Chipewyan (AB) from 2017 to 2019.
	CAAQS		15	28	3-year average of the annual 98 th percentile of daily maximum 1-hour average concentration from 2017 to 2019 at Fort Chipewyan (AB).
	AAQC	24-hour	12	23	Maximum 24-hour concentration measured at Fort Chipewyan (AB) from 2017 to 2019.
	CAAQS	Annual	1.4	2.6	Concentration representative of the study area based on measurements at Fort Chipewyan (AB) from 2017 to 2019.
1,3-butadiene	AAQC	24-hour	0.054	0.12	Maximum concentration measured in Simcoe (ON) from integrated air samples between 2017 to 2019.
	AAQC	Annual	0.005	0.010	Average concentration of measurements at Simcoe (ON) between 2017 to 2019.
Acetaldehyde	AAQC	30-minute ⁽¹⁾	8.0	14	Maximum concentration measured in Simcoe (ON) from integrated air samples between 2017 to 2019.
	AAQC	24-hour	6.6	12	
Acrolein	AAQC	1-hour	0.017	0.04	Maximum concentration measured in Simcoe (ON) from integrated air samples in 2019.
	AAQC	24-hour	0.017	0.04	
Benzene	AAQC	24-hour	0.28	0.90	Maximum concentration measured in Simcoe (ON) from integrated air samples between 2017 to 2019.
	AAQC	Annual	0.094	0.30	Average concentration measured in Simcoe (ON) from integrated air samples between 2017 to 2019.
Ethylbenzene	AAQC	10-minute ⁽¹⁾	0.065	0.28	Maximum concentration measured in Simcoe (ON) from integrated air samples between 2017 to 2019.
	AAQC	24-hour	0.039	0.17	
Formaldehyde	AAQC	24-hour	2.3	2.9	
Hexanes	AAQC	24-hour	0.13	0.45	
Propionaldehyde	AAQC	10-minute ⁽¹⁾	0.67	1.6	
Toluene	AAQC	24-hour	0.37	1.4	
Xylenes	AAQC	10-minute ⁽¹⁾	0.20	0.86	
	AAQC	24-hour	0.12	0.52	
Benzo(a)pyrene	AAQC	24-hour	—	1.2 x 10 ⁻⁴	
	AAQC	Annual	—	2.0 x 10 ⁻⁵	
Diesel particulate matter (DPM)	—	2-h Annual	—	0	Not applicable

Notes:

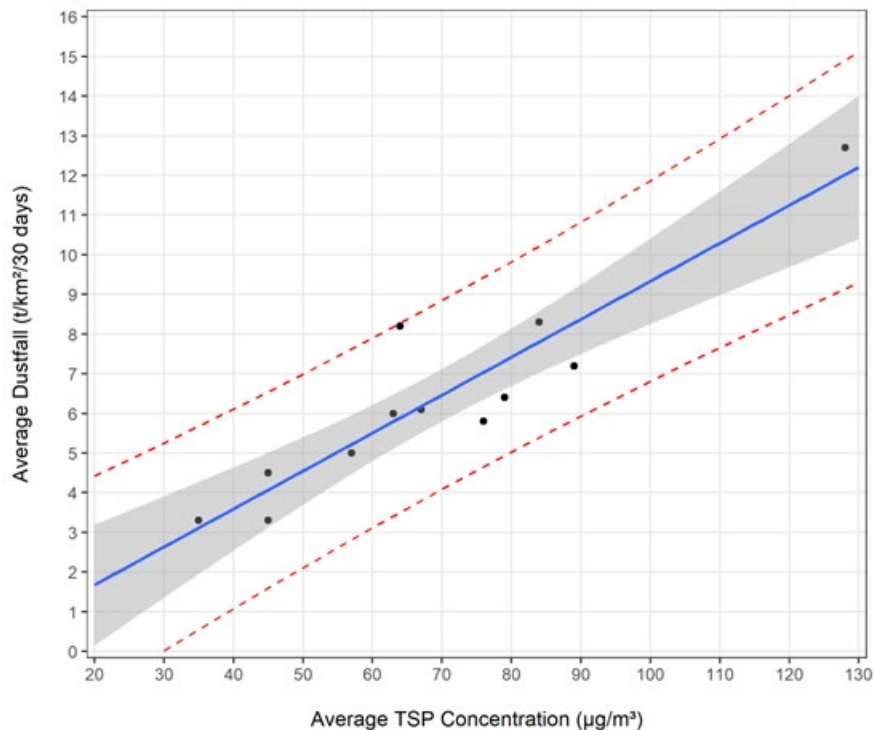
(1) Background 1-hour concentration multiplied by 1.65 for the 10-minute averaging period or 1.2 for 30-minute averaging period.



Dustfall

The TISG for the Project requires a description of background dust deposition conditions in the study area, but like air contaminants, no local measurements are available to our knowledge. Background dustfall (in $\text{t}/\text{km}^2/30\text{-days}$) can be broadly estimated by associating TSP concentrations in air with dust deposition on the ground at a same location. A study was carried out in the past (Roche, 1983) which presented average dustfall rates and TSP concentrations for several years at multiple stations within the City of Quebec. **Figure 2.4** illustrates the almost linear relationship between these two variables over several years. Assuming the average TSP concentration in the study area is $4.0 \mu\text{g}/\text{m}^3$ (**Table 2-4**), then it would be expected according to this correlation that dustfall would approach **$0.40 \text{ t}/\text{km}^2/30\text{-day}$** . This value is therefore considered as background dustfall for both exposure period (30-days and annual) in this assessment.

Figure 2.4: Relation between mean TSP concentrations measured in air and mean dust deposition measurements carried out at 12 stations in Quebec City from 1979 to 1982



(adapted from Roche, 1983)

Shaded: 95% confidence interval for average estimations

Red line: 95% confidence interval for single estimations

2.6 Nitrogen Dioxide: NO Conversion into NO_2

NO_x emissions consist of both NO_2 and NO with typical proportions from engine's exhaust gases of approximately 10% NO_2 and 90% NO . In the atmosphere, NO is progressively converted into NO_2 at rates that depend on O_3 availability and prevailing meteorological conditions. In contrast, NO_2 photodissociation from solar radiation will produce O_3 and NO . Since there are no air quality standards for NO , only NO_2 concentrations require assessment.

Considering that complete conversion of NO_x to NO₂ at the source is not realistic, the Ozone Limiting Method (OLM) is applied to calculate maximum NO₂ concentrations based on the dispersion model results and O₃ concentrations in air while assuming a fraction of total NO_x is release as NO₂. These fractions or ISR (in-stack ratios) considered in this study are provided in **Table 2-5** with respect to source type. The NO₂ background concentration is then added to the result. For a given source, the OLM method can be summarized as follows:

- If $[O_3] > (1 - \text{ISR}) \times [\text{NO}_x]$ then $[\text{NO}_2] = [\text{NO}_x]$ Total conversion
- Otherwise: $[\text{NO}_2] = [O_3] + \text{ISR} \times [\text{NO}_x]$ Partial conversion

with:

ISR : “in-stack ratio”: ratio NO₂ / NO_x (volume concentrations) from emitting source

[O₃] : ground-level ozone concentration in air (ppb)

[NO_x] : NO_x concentration calculated by the dispersion model (ppb)

[NO₂] : NO₂ concentration calculated by the dispersion model (ppb)

Although the OLM is considered a screening method by the US EPA given the persisting uncertainties with regard to the results accuracy, it still provides results more representative of reality than it would be with the total conversion approach which considers that all NO_x emitted at the source are NO₂ only. Applying the OLM across all averaging periods avoids unrealistically higher 24-hour NO₂ concentrations relative to 1-hour concentrations and provides a more physically representative assessment.

Table 2-5: ISR on NO_x Emissions per Source Category

Source Category	ISR	Source / Justification
Road vehicles	0.189	US EPA (2024a). Exhaust Emission Rates for Heavy-Duty Onroad Vehicles in MOVES5, Table 7-3 (running exhaust; 2010 – 2060). This value is applicable to heavy-duty trucks using diesel fuel. As simplification, this value is also applied for light-duty vehicles using gasoline (associated with the operations phase) although the suggested ISR value for these vehicles is lower (0.156 according to US EPA 2024b). This represents a conservative approach for modeling NO ₂ .
Off-road mobile equipment	0.12	Value determined based on the ISR database compiled by the US EPA (2020b) for different NO _x emission sources. By extracting measurements done on engines using diesel fuel (150 values in total), an average of 0.1 with a standard deviation of ±0.02 is obtained. An ISR of 0.12 is therefore considered representing the 85 th percentile of the 150 measurements available in the database.
Explosives for bedrock blasts	0.50	Undetermined. Represent the suggested value by the US EPA for such cases.

A constant hourly background O₃ concentration applied for OLM was set to 41 ppb (80 µg/m³) and was based on the 90th percentile of hourly O₃ concentrations measured at the Senneterre monitoring station (refer to **Table 2-3** for representativeness) from 2017 to 2019. This concentration was applied to calculate hourly, daily and annual NO₂ concentrations.

2.7 Dry Deposition Parameters for Dust Emissions

In this assessment, dustfall and TSP concentrations in air were calculated using the dry depletion mechanism for fugitive dust generated during construction activities and vehicle traffic on the road since these emissions contain large portions of coarse particulates (10 to 30 μm) for which deposition is an important phenomenon. Depletion of total particulate matter from engines was ignored since this type of emission generate fines particulates which fall very slowly and over long distances.

The dispersion model requires particle size distribution and density information for each particulate diameter class. Emission factors from the U.S. EPA AP-42 Compendium were therefore used to define three to four particulate size classes, depending on the emission source. Selected deposition parameters are presented along with the emission source parameters for the construction phase (**Section 3**) and operations phase (**Section 4**).

2.8 Averaging Conversion Factor

Some of the AAQC limits are less than an hour in duration (e.g., 10 minutes for SO_2) while the dispersion model results are representative of a duration of one hour or more. The formula specified in the ADMGO (MECP, 2017) is used to estimate the maximum concentrations over 10 minutes from the maximum hourly concentrations obtained from the dispersion model. The hourly maximum results will therefore be multiplied by a factor of 1.65 and 1.2 for the estimate of a maximum concentration over 10 minutes and 30 minutes (1/2 hour), respectively.

The following report sections apply these modelling choices to representative construction and operations scenarios, with an emphasis on segments of the corridor where sensitive receptors are most likely to experience the project's maximum short-term effects.

3 Construction Phase

The construction of the WSR will be conducted all-year round over an approximately 60-month period by team of workers that will set camp at one of four locations planned along the 107 km WSR. The detailed construction staging and sequencing of the Project will be determined in the Detail Design phase through discussions between Indigenous communities and the construction contractor. It is anticipated that road construction will be linear starting from the first construction camp (expected to be located at 15 km south-east from Webequie) running west towards Webequie and then running east towards McFaulds Lake. The workers will commute daily from the construction camp to location.

The WSR will consist of two distinct segments, one of 51 km from Webequie running south-easterly and then of 56 km running east until it terminates near the McFaulds Lake area. The first segment (western half of the WSR) resting mostly over mineral soil will be cleared of all vegetation within the 35 m ROW for the road to accommodate the two-lane all-season road. Shoulders, ditches (as enhanced grass swales) and berms of stripped organic materials on the outside will also be shaped along this segment. Cut and fill earthworks will be needed to adjust the vertical alignment by either lowering or raising the existing grades. An underlying layer of aggregates and a surface layer of crushed stone will then be conveyed by trucks from a nearby quarry and compacted on site by heavy machinery. A layer of chip seal or asphalt pavement will be also added onto the road surface.

The eastern segment of the WSR being located within the Hudson Bay Lowlands Ecozone is composed mostly of peatland (muskeg) having a depth of 2-4 m of waterlogged organic soil, which represents poor to very poor conditions for building a road. A floating road design is being recommended by adding an underlying layer of aggregates (along with geogrids) that will compress the peat resulting in settlement and consolidation. A surface layer of crushed stone will be added to complete the road that is expected to lay 1.2 m above the surrounding lowland areas. Cross-culverts will be integrated within the road structure at regular intervals to ensure that the hydraulic conductivity of the peatlands is maintained.

Some watercourse crossings will require steel-concrete bridges that will include a substructure composed of a foundation, abutments and piers supporting the superstructure consisting of steel plate girders, the deck and side barriers with railings. Natural revegetation, seeding and/or planting will be done on and around the embankments once the bridge is completed. Several culverts will also be fitted to cross minor watercourses.

Aggregates and crushed stones will come from two source locations, one of which will be used exclusively during the construction phase (ARA-2) and another (ARA-4) which lifespan will extend during the operation phase to provide aggregates for operations and maintenance of the road. Production activities will include hole drilling, blasting, and rock conveyance to a nearby crushing plant that should include a primary crusher, a secondary crusher, a screening plant, diesel generators, conveyors, a control tower and supporting mobile loaders. The ARA-4 quarry, being in an area far from the WSR, will necessitate the clearing and construction of an access road of 5 km, which will include the crossing of a waterbody.

Progressive rehabilitation work will be carried out along the WSR as well as at the ARA-2 quarry and the worker camps when construction work is completed or almost completed. The closure of temporary construction camps and laydown areas will involve its clean-up (material, waste, and contaminated soil removal) followed by the levelling and trimming of areas to encourage natural revegetation.



3.1 Modelled Emission Sources

The scope of work during the construction phase comprises all activities that will occur along the WSR, the aggregate pits and the access road (refer to **Table 1-2**). Construction activities that result in potential effects will mainly consist of:

- Vegetation clearing, grubbing and disposal.
- Setup of storage and laydown yards, and construction camps.
- Earth stripping along the ROW, the aggregate pits, and the access road.
- Aggregate production (crushing and screening) including hauling to site.
- Road construction including grading, aggregate placement, ditching, geotextile installation, and ditch seeding.
- Chip seal or asphalt placement of the road.
- Bridge construction and culvert installation including the operation of a concrete batching plant.
- Construction of buildings and storage areas at the MSF.
- Maintenance of environmental structures/measures (e.g., erosion and sediment control measures), including drainage management features on access roads.

Sigfusson Northern Ltd. as construction support to the EA/IA for the Project developed a preliminary plan of activities during a 60-month construction period, including a list of equipment and materials needed to complete the work (Sigfusson, 2023). **Table 3-1** shows the activities and areas of work presented in Sigfusson's assessment per phase and the planned realization and time required within that period to achieve the work.

Using this information an emission scenario was developed for the first year of construction (winter #1 + summer #1) selected amongst all years for the following reasons:

- Year 1 will operate the greatest number of mobile equipment (bulldozers, excavators, loaders, cranes, etc.) in terms of month-equipment on site.
- The majority of activities during Year 1 will be focused between the western terminus (Webequie) and the ARA-2 quarry which is close to the WC-3 water crossing, down to the access road/WSR intersection which represents the eastern point of the modelling domain. This area regroups the great majority of sensitive receptors (existing residences and institutional buildings, culturally sensitive areas, and future residences planned by the Webequie First Nation).
- Based on numbers from **Table 3-1**, aggregates trucking from ARA-2 and ARA-4 quarries will be more intensive during Year 2 compared to Year 1. However, a great majority of Year 2 trucks will travel east of the access road/WSR intersection (outside the modelling domain). Trucking along the modelling domain would remain slightly higher during Year 2 but not to a great extent. For that reason, Year 2 trucking was combined in the emission scenario along with the other Year 1 emission sources, as a cautious approach.

The impact of Year 2 to 5 activities during the construction phase was not assessed as they involve the same emission sources as modelled for Year 1 only at different locations and different extents (i.e., varying number of trucks, different number of equipment to carry out the work based on Sigfusson's planning). Since the emissions are limited along the WSR 35-m wide ROW, the concentrations in air will be of similar profile whether being on the western or eastern portion of the road. Also, as explained above, there are no sensitive receptors east of the WSR / access road intersection for ARA-4, with the exception of one location where potential impacts are discussed in **Section 5**.

Table 3-1: Preliminary WSR Construction Planning

Project Phase	Activity Type	Area of Activities ⁽¹⁾	Period ⁽²⁾	Month-Equipment ⁽³⁾	Hauled Material ⁽⁴⁾
Year #1 (Winter phase)	Preparation work	Setup of construction camps near Webequie and ARA-2 quarry	Feb.-March	4	13 200 m ³
		Clearing and development of ARA-2 quarry site	March		
		Installation of temporary bridge at WC-27	April-May		
		Subgrade material hauling from Webequie to WB-1	March-April		
	Clearing / grubbing	From Webequie to ARA-4	March-May	48	n/a
	Burning	Vegetation piles burning	May-June	n/a	n/a
Year #1 (Summer phase)	Aggregate production	ARA-2 quarry drilling and blasting	Feb.-August	57	n/a
		ARA-2 crushing and screening	March-Dec.		
	Grading / stripping	From WC-3 to WB-1, from Webequie to WB-1, and from WC-3 to ARA-4	April-August	12	n/a
	Ditching	From Webequie to WB-1, from WC-3 to WB-1, and from WC-3 to ARA-4 access road intersection	May-Jan.	21	n/a
	Geotextile installation	From Webequie to WB-1, from WC-3 to WB-1, from WC-3 to ARA-4 access road intersection and then to WC-27	May-Jan.	6	741,600 m ²
	Aggregate placement ⁽⁵⁾	From Webequie to WC-3 from ARA-2 quarry	May-Oct.	48	123,450 m ³
	Bridge construction	WB-1 bridge	June-March	20	Minimal
		WC-3 bridge	June-Dec.		
	Culvert installation	WC-2 culverts	August	8	Minimal
		WC-4 culvert	December		
Year #2 (Winter phase)	Preparation work	Setup of construction camp near ARA-4 quarry	Feb.-March	5	n/a
		Clearing and development of ARA-4 quarry site	March		
	Clearing / grubbing	From ARA-4 access road intersection to Camp 4B	Feb.-March	10	n/a
	Burning	Vegetation piles burning	March	0	n/a
	Aggregate production	ARA-2 crushing and screening	Dec.-March	30	n/a
	Culvert installation	WC-5 to WC-9 culverts	Feb.-April	10	Minimal



Table 3-1 (Cont'd): Preliminary WSR Construction Planning

Project Phase	Activity Type	Area of Activities ⁽¹⁾	Period ⁽²⁾	Month-Equipment ⁽³⁾	Hauled Material ⁽⁴⁾
Year #2 (Summer phase)	Aggregate production	ARA-4 crushing and screening	April-October	28	n/a
	Grading / stripping	From ARA-4 access road intersection to WC-6	April-June	10	n/a
	Ditching	From ARA-4 access road intersection to WC-6	April-May	2	n/a
	Geotextile installation	From ARA-4 access road intersection to WC-16	May-August	6	601,200 m ²
	Aggregate placement ⁽⁵⁾	From Webequie to WC-27 from ARA-2 quarry	April-August	88	904,235 m ³
		From WC-4 to WC-27, and from ARA-4 access road intersection to WC-16 from ARA-4 quarry	April-Dec.		
		From WC-6 to WC-16 from ARA-4 quarry (filling material)	May-Nov.		
	Bridge construction	WC-27 bridge	April-August	24	Minimal
WC-10 bridge		May-Dec.			
WC-13 bridge		June-Dec.			
Year #3 (Winter phase)	Preparation work	Setup of construction camp 4B	February	1	n/a
	Aggregate production	ARA-4 crushing and screening	Oct.-May	28	n/a
	Aggregate placement ⁽⁵⁾	From WC-6 to WC-16 from ARA-4 quarry (filling material)	Nov.-May	25	277,065 m ³
	Culvert installation	WC-11, 12, 14, 15, 16 culverts	Nov.-Jan.	6	Minimal
Year #3 (Summer phase)	Aggregate production	ARA-4 crushing and screening	May-Oct.	20	n/a
	Geotextile installation	From WC-16 to camp 4B	May-Nov.	12	1,004,400 m ²
	Aggregate placement ⁽⁵⁾	From ARA-4 to WC-16 from ARA-4 quarry	April-Sept.	66	562,420 m ³
		From WC-16 to camp 4B from ARA-4 quarry (filling material)	May-Nov.		
	Bridge construction	WC-26 bridge	April-Oct.	12	Minimal
	Culvert installation	WC-17 to WC-21 culverts	May-July	5	Minimal



Table 3-1 (Cont'd): Preliminary WSR Construction Planning

Project Phase	Activity Type	Area of Activities ⁽¹⁾	Period ⁽²⁾	Month-Equipment ⁽³⁾	Hauled Material ⁽⁴⁾
Year #4 (Winter phase)	Aggregate placement ⁽⁵⁾	From WC-16 to camp 4B from ARA-4 quarry (filling material)	Oct.-May	54	510 000 m ³
Year #4 (Summer phase)	Aggregate placement ⁽⁵⁾	From WC-16 to camp 4B from ARA-4 quarry	April-Oct.	60	198 250 m ³
Year #5 (Winter phase)	Culvert installation	WC-22 to WC-25 culverts	Oct.-Dec.	6	Minimal
Year #5 (Summer phase)	Aggregate placement ⁽⁵⁾	From WC-16 to camp 4B from ARA-4 quarry	April-Oct.	66	296 800 m ³

Notes:

- (1) **ARA-2:** site of a temporary quarry; **ARA-4:** site of the permanent quarry; **WB and WC:** water crossings where culverts or bridges will be constructed.
- (2) Monthly periods were inferred from Sigfusson's report schedule per activity.
- (3) Number of mobile equipment planned on site x the number of months projected to carry out the activity. Excludes crew support equipment and stationary combustion equipment which number is more or less constant throughout the construction phase.
- (4) Volume (m³) of aggregates and filling materials or surface area (m²) of geotextile (geogrids) that will be hauled to location.
- (5) Include loading of aggregates at the quarry, hauling and placement on site.

3.2 Modelling Approach for Assessment

A majority of emission sources will not be static and will move along the WSR during the construction phase. In order to verify the air quality impact of road construction activities between the western terminus (Webequie) and the eastern point within the modelling domain (intersection between the WSR and the ARA-4 access road), an approach combining emission rates from all equipment and activities that could occur within a specific area (as a volume source) was considered. The intent was to mimic this same volume along the road at 300 m intervals to verify the potential impact of these activities at all locations with regard to standards with an averaging period of 24-hours or less. For example, the exhaust gas emissions of all equipment expected during “clearing and grubbing” are combined within a single source (A1; see **Table 3-2**) and positioned at several locations (300 m interval) between Webequie and the WSR/access road intersection. This approach is applied for emissions that can occur at different locations. Otherwise, a single volume source is applied for fixed locations associated with aggregate production, culvert installation and bridge construction (**Table 3-2**). For monthly and annual averaging periods, the emission rates applied at each volume were weighted down to consider the fact that emissions will occur only for a short period at each location. More details on emission rates are presented in **Section 3.3** for each source.

Results were calculated based on a scenario without particular emission control measures and a similar scenario with control measures which, for the construction phase, concerns fugitive road dust control with a water truck (**Section 3.3.3**) and the operation of machinery with highest environmental standards (**Section 3.3.1**). **Table 3-2** provides an overview of equipment and activities including the model based on the construction planning during Year 1 (or Year 2 for trucking) that will result in atmospheric emissions. Calculation of emission rates is mostly based on these data. The distribution of emission sources within the modelling domain is shown in **Figure 3.1**.

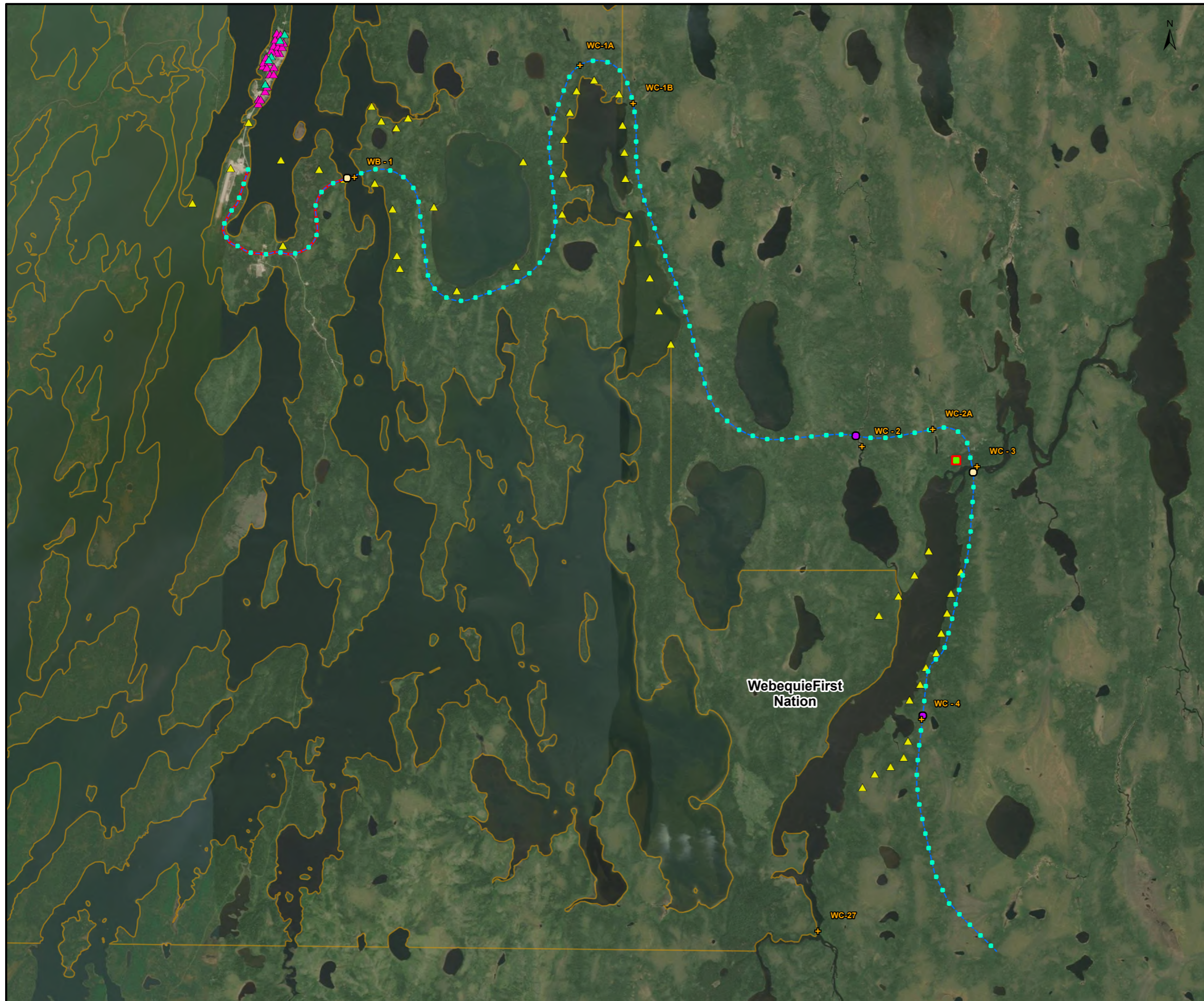
Table 3-2: Overview of Emission Sources Considered in the Construction Phase Model

Activity	Emission Location	Emission Period	Equipment	Emission Source ID (type) ⁽¹⁾			
				Exhaust Gas	Fugitive Dust		
Clearing and grubbing	Webequie to ARA-4 access road	February–April (7h to 19h)	CAT 329 excavator (x 2)	A1 (nonroad engines)	B1 (road dust emissions) ⁽²⁾		
			CAT 350 excavator (x 2)				
			CAT D5K dozer (x 2)				
			CAT D6R dozer (x 6)				
			CAT 140 grader				
			CAT D7 dozer (x 4)				
			CAT D8 dozer (x 2)				
			JD 843L feller buncher (x 3)				
			JD 648L skidder (x 3)				
Aggregate production	ARA-2 quarry	May–December (0h to 24h)	Light plants (x 5)	A2 (nonroad engines)	B4 (aggregate crushing and screening + aggregate loading in trucks)		
			CAT 329 excavator				
			CAT 980 loader				
			CAT 988 loader				
			Furukawa HCR900 drill (x2)				
			Scissor lift (x2)				
Crusher generator set	A8 (blasts)	B5 (blasts)					
Road construction (Grading and stripping)	Webequie to ARA-4 access road	May–December (0h to 24h)	CAT 329 excavator	A3 (nonroad engines)	B2a and B2b (road dust emissions)		
Road construction (Ditching)	Webequie to ARA-4 access road	May–December (0h to 24h)	CAT D6 dozer (x 2)				
			CAT 316 excavator				
			CAT D5K dozer				
Road construction (Geotextile installation)	Webequie to ARA-4 access road	May–December (0h to 24h)	JD 8760 tractor			A7a and A7b (aggregates trucking)	B3 (dozers, graders and aggregates unloading)
			CAT 325 excavator				
Road construction (Aggregate placement)	Webequie to ARA-4 access road	May–December (0h to 24h)	CAT D6R dozer (x 5)			A4a and A4b (nonroad engines)	None
			CAT 140 grader (x 2)				
			CAT D8 dozer (x 2)				
			Volvo SD150 compactor (x3)				
			Light plant (x 5)				
Road construction (Culvert installation)	WC-2 and WC-4	May–December (7h to 19h)	CAT 350 excavator	A5a and A5b (nonroad engines)	None		
			80T rough terrain crane				
			CAT 950 loader				
Road construction (Bridge construction)	WB-1 and WC-3	May–December (7h to 19h)	CAT 966 loader	A5a and A5b (nonroad engines)	None		
			80T rough terrain crane				
			CAT TH80 zoom boom				
			Concrete batching unit generator set				

Notes:

- (1) Refer to **Section 3.3** for details about these sources.
- (2) Dozers, graders, and excavators are not intended to handle bulk soil material during this activity.





Legend

Emission Sources

- A6/B1: Filling material trucking (Web to WB1)
- - - A7/B2: Aggregates trucking (Web to access road)
- A1: Clearing and grubbing
■ A3/B3: Road construction machinery
- A2/B4: Aggregates production
- A8/B5: Bedrock blasts
- A4: Culvert installation
- A5: Bridge construction

Sensitive Receptors

- ▲ Existing Residences
- ▲ Institutions
- ▲ Culturally Sensitive Area

WSR Components

- + Waterbody Crossing

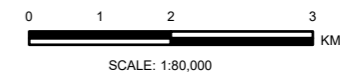
Limits

- First Nation Reserve

Webeque Supply Road (WSR)

Location of Emission Sources for the Construction Phase

Figure Number:	3.1	REV	PA
Client:	Webeque First Nation	Project Number:	661910
		Date:	1/20/2026
DSC			DRN AD
			CHK TE
			APP SP



NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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3.3 Emission Rate Calculations

The following subsections summarize the approach used to obtain emission rates for each contaminant covered in this assessment. The first two subsections deal with contaminants emitted from exhaust pipes on mobile equipment and trucks carrying aggregates, fill material, and material - geotextile (geogrid) along the road. The next subsections then present the methods to calculate fugitive dust emissions from the road, aggregate crushing at the quarry, aggregate loading and unloading with trucks, dozers and graders operation, and blasts at the quarry. The latter also includes the CAC emissions from explosives combustion. In this assessment, engine emissions and dust emissions from a same activity (e.g., trucking, bulldozing, grading) were modelled separately since they present different emission characteristics.

3.3.1 Mobile and Stationary Equipment

Compression-ignition engines on heavy machinery generate several air contaminants including CACs and VOCs. Their emission rates are conditioned by the engine applied power and the regulatory requirements when the equipment was put on the market (*Off-road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emissions Regulations*). These requirements set in 2005 vary according to the engine gross power and the year of fabrication (categorized in Tiers).

The emission factors for Tier 3 engines (typically constructed between 2006 and 2016) operating in equilibrium (g/hp-h) for the CACs (TSP, NO_x, CO, SO₂, and total hydrocarbons (THC)) were obtained from latest MOVES (Nonroad) model from the US EPA (2021) and applied to all equipment brought to site. This represents a worst-case (scenario without control measures) since it is expected that a large portion of engines will be certified Tier 4 by the time construction activities starts. In fact, considering the relative short lifespan of machinery, it is expected that Tier 4 equipment will represent at least 80% of all equipment. Given the great number of equipment that will be in operation (see **Table 3-2** for the list during Year 1), a second emission scenario for which 80% of the equipment were randomly specified to have Tier 4 engines was set up to verify the impact on air quality compared with the case with Tier 3 engines only.

The emission factors were corrected to integrate the engine's transient operating regime according to equipment type and a maximum deterioration factor as presented in US EPA (2021). Finally, TSP and SO₂ emission factors were corrected with respect to sulphur content in diesel fuel. In this assessment, a concentration of 15 mg/kg is used, which is equivalent to the maximum allowable in fuel for use in road and off-road vehicles (*Sulphur in Diesel Fuel Regulations*).

Table 3-3 provides an example of resulting emission factors based on the US EPA Nonroad model for Tier 3 and 4F engines. The emission factors for the other equipment are available in **Appendix A**. The emission factors for the other contaminants covered in this assessment were obtained as follow:

- PM₁₀: Equivalent to TSP according to US EPA (2021)
- PM_{2.5}: Equivalent to 97% of TSP according to US EPA (2021)
- DPM: Equivalent to PM_{2.5}
- VOCs: Calculated based on the THC emission factor multiplied by the fraction of the COV in THC. The fractions were inferred from data provided in **Table 3-4** (ratio of contaminant in total VOCs) and **Table 3-3** (ratio total VOCs in THC) of US EPA (2023b) technical document "Speciation profiles and toxic emission factors for Nonroad engines in MOVES4".
- B[a]P (as surrogate for PAHs): Calculated based on the THC emission factor multiplied by the fraction of the PAH in THC and the PM_{2.5} emission factor multiplied by the fraction of B[a]P in PM_{2.5} which is inferred from data provided in **Table 3-5** (ratio of PAH in PM_{2.5}) of US EPA (2023b) technical document "Speciation profiles and toxic emission factors for Nonroad engines in MOVES4".



Table 3-3: Emission Factors Obtained for CAT 329 Excavator

Contaminant	Applicable emission factor (g/hp-h)		Contaminant	Applicable emission factor (g/hp-h)
	Tier 3	Tier 4F		Tier 3 and 4F
Total suspended particulates (TSP)	0.27	0.0029	1,3-butidene	0.0021 x THC
Nitrogen oxides (NOx)	2.6	0.080	Acetaldehyde	0.12 x THC
Carbon monoxide (CO)	1.3	0.017	Acrolein	0.021 x THC
Total hydrocarbons (THC)	0.20	0.010	Benzene	0.060 x THC
Sulphur dioxide (SO ₂)	0.0049	0.0035	Ethylbenzene	0.011 x THC
Fine particulate matter (PM ₁₀)	TSP		Formaldehyde	0.32 x THC
Fine particulate matter (PM _{2.5})	0.97 x TSP		Isooctane	0.0087 x THC
Diesel particulate matter (DPM)	0.97 x TSP		n-hexane	0.0029 x THC
Benzo(a)pyrene (B[a]P)	6.7 x 10 ⁻⁶ x PM _{2.5}		Propanal	0.024 x THC
			Toluene	0.042 x THC
			Xylenes	0.082 x THC

The emission rates were calculated based on the emission factor, the gross engine power and an average engine load factor which was taken from US EPA (2010). Details about the applicable engine power and load factors are available in **Appendix A**.

$$E_x = FE_x \times P_N \times FC \div 3\,600 \tag{3-1}$$

- E_x: emission rate for contaminant X (g/s)
- FE_x: emission factor for contaminant X (g/hp-h)
- P_N: gross engine power in equipment X (hp)
- FC: average engine load factor (-)

During construction, the different equipment will operate at different time periods and not all the time. A distinction must therefore be made for emission rates intended to verify the compliance of construction activities with air quality standards having 1-hour (or less), 24-hour, or annual averaging exposure time. **Table 3-4** provides an overview of general hypotheses considered when developing emission rates per averaging period for each source of this category. It also specifies the emission period (month and hour) of the sources in the model which is also based on the construction planning by Sigfusson. The list of emission rates used in the calculation of global emission rates as described in the table are available in **Appendix A**.

Table 3-4: Emission Rate Derivation Approach for Each Source and Average Period

Source ID – Activity	Modelled Emission Period	Averaging Period	Emission Rate Calculation
A1 – Clearing and grubbing	February–April (7h to 19h) [84 days in activity during that time]	1-hour and less	Sum of emission rates for all equipment identified in Table 3-2 for this source.
		24-hour	Weighted sum of hourly emission rates multiplied by a daily usage factor (mostly 83% to consider intermittent stoppage during the day (2 hours over a 12-hour shift for example).
		annual	Weighted sum of 24-hour emission rates multiplied by 0.62 days of emissions (for each volume) divided by 89 days during the modelled emission period.
A2 – Aggregate production	May–December (0h to 24h) [in activity all the time]	1-hour and less	Sum of emission rates for all equipment identified in Table 3-2 for this source.
		24-hour	Weighted sum of hourly emission rates multiplied by a daily usage factor (83% to consider intermittent stoppage during the day, except for the crusher generator set kept at 100% of operation during a day).
		annual	Weighted sum of 24-hour emission rates multiplied by the expected monthly usage factor to consider the fact that the equipment will not be needed at all times. Expected time requirements specified in Sigfusson's report (i.e., 300 hours per month; or 40% of the time) are used in this case.
A3 – Road construction	May–December (0h to 24h) [110 days to 149 days depending on activity]	1-hour and less	Sum of emission rates for all equipment identified in Table 3-2 related to aggregate placement only which represents the highest density of equipment of all activities. It is expected that within a specific location of the road, stripping and grading, ditching and geotextile installation will not occur at the same time as aggregate placement.
		24-hour	Weighted sum of hourly emission rates related to aggregate placement as above multiplied by the daily usage factor of 83%.
		annual	Weighted sum of 24-hour emission rates multiplied by 0.82 days of emissions (for each volume) divided by 245 days during the modelled emission period.
A4a and A4b – Culvert installation	May–December (7h to 19h) [7 days in activities each during that time]	1-hour and less	Sum of emission rates for all equipment identified in Table 3-2 for this source.
		24-hour	Weighted sum of hourly emission rates multiplied by the daily usage factor of 83%.
		annual	Sum of 24-hour emission rates multiplied by 7 days of installation over 245 days during the modelled emission period.
A5a and A5b – Bridge construction	May–December (7h to 19h) [180 and 270 days in activity during that time]	1-hour and less	Sum of emission rates for all equipment identified in Table 3-2 for this source.
		24-hour	Weighted sum of hourly emission rates multiplied by the daily usage factor of 83%, except for the batching plant generator set kept at 100% of operation during the day.
		annual	Weighted sum of 24-hour emission rates multiplied by the expected monthly usage factor to consider the fact that the equipment will not be needed at all times. Expected time requirements specified in Sigfusson's report (i.e., 300 hours per month; or 40% of the time) are used in this case.

3.3.2 Trucking (Road Engines)

Trucking will be required to transfer aggregates or fill material from quarries and materials such as geotextile from the Webequie area to the road construction site. During winter period, a total of 13,200 m³ of fill material will be hauled during Year 1. For the summer, trucking during Year 2 is considered instead as more passages specifically along the Webequie to the intersection of the WSR/ARA-4 access road intersection will be required during that year. Three (3) routes with different emission rates were developed for this category:

- **A6:** 13,200 m³ of filling material hauled from Webequie to the WB-1 water crossing during the winter phase.
- **A7a:** 166,960 m³ of aggregates from ARA-2 to the construction site along the road towards Webequie.
- **A7b:** 124,330 m³ of aggregates from ARA-2 to the construction site along the road towards the WSR/ARA-4 access road intersection.

Table 3-5 provides an overview of parameters used to estimate the travelling distances expected from trucks. These distances are then combined with CACs emission factors (TSP, NOx, CO, SO₂, THC) applicable to on-road trucking (g/km). They were obtained from the US BTS (2025) compiling average emission factors according to the MOVES5 model by vehicle type and year of operation. The emission factors presented in **Table 3-6** relate to heavy-duty vehicles using diesel fuel for year 2025 (representing conservative values as average emission factors in future years tend to decrease). The emission factors for the other contaminants covered in this assessment were obtained as follow:

- PM₁₀: Equivalent to TSP
- PM_{2.5}: Equivalent to 92% of TSP
- DPM: Equivalent to PM_{2.5}
- SO₂: Estimated based on the energy consumption efficiency provided by the US BTS (2025) heavy-fuel trucks in 2025 using diesel fuel with a sulphur content of 15 ppm.
- VOCs: Calculated based on the THC emission factor multiplied by the fraction of the COV in THC. The fractions were inferred from data provided for vehicles constructed in 2017+ (ratio of contaminant in total VOCs) and a ratio of 1.285 COV/THC from the US EPA (2020) technical document “Air Toxic Emissions from On-Road Vehicles in MOVES3”.
- B[a]P (as surrogate to PAHs): Calculated based on the PM_{2.5} emission factor multiplied by the fraction of B[a]P in PM_{2.5} which is inferred from data provided for vehicles construction in 2017+ (ratio of PAH in PM_{2.5}) from US EPA (2020) technical document “Air Toxic Emissions from On-Road Vehicles in MOVES3”.

Table 3-5: Trucking Scenario Considered in the Model

Source ID - Activity	Modelled Emission Period	Road Length (km)	Number of Trips Per Averaging Period			
			Max 1-hour	Max 24-hour	Max 1-month	Annual
A6 – Trucking	February–April (7h to 19h) [29 days trucking in total]	5.1	8	46	880	880
A7a – Trucking	May–December (0h to 24h) [100 days trucking in total]	29.8	25	167	3,339	11,131
A7b – Trucking	May–December (0h to 24h) [76 days trucking in total]	10.8	25	164	3,271	8,287



Table 3-6: Emission Factors for Trucks Exhaust Gases

Contaminant	Applicable Emission Factor (g/km)	Contaminant	Applicable Emission Factor (g/km)
Total suspended particulates (TSP)	0.034	1,3-butidene	0.0010 x THC
Nitrogen oxides (NOx)	1.8	Acetaldehyde	0.089 x THC
Carbon monoxide (CO)	1.0	Acrolein	0.013 x THC
Total hydrocarbons (THC)	0.12	Benzene	0.017 x THC
Sulphur dioxide (SO ₂)	0.0078	Ethylbenzene	0.014 x THC
Fine particulate matter (PM ₁₀)	TSP	Formaldehyde	0.28 x THC
Fine particulate matter (PM _{2.5})	0.92 x TSP	Isooctane	0.0010 x THC
Diesel particulate matter (DPM)	0.92 x TSP	n-hexane	0.0069 x THC
Benzo(a)pyrene (B[a]P)	3.3 x 10 ⁻⁶ x PM _{2.5}	Propanal	0.040 x THC
		Toluene	0.039 x THC
		Xylenes	0.11 x THC

Table 3-6 emission factors provided by the US BTS based on MOVES are representative of engines operating in warm conditions (20–25 °C). It is however documented that colder temperatures, most notably below the freezing point, generate higher emissions from engines in general. Considering that the region can experience very cold weather especially during winter, variable correction factors were developed on a monthly basis (**Table 3-7**) to account for this phenomenon. The variable correction factors are differentiated per contaminant and per exposure period associated with the AAQC or CAAQS. For instance, the model considers an effective NO_x emission factor of 2.3 g/km for January (1.8 g/km x 1.3) to calculate 1-h and 24-hour NO₂ concentrations while for July, it uses 2.1 g/km (1.8 g/km x 1.2). The factors were determined as follow:

- A technical study from Choi et al. (2011) carried a temperature sensitivity analysis on MOVES results from which they presented percentage changes in emissions for a wide range of temperature (-40 to 50°C or -40 to 120°F) depending on the vehicles construction year and fuel type. The study presented figures for NO_x, CO, THC and PM_{2.5} which percentage change evolve differently with temperature. Data from the figures were extracted for vehicles constructed in 2020 (**Appendix A**).
- Specific to contaminants with a standard for short exposures (24 hours or less), the minimum hourly temperature for each month was extracted from the meteorological database used for dispersion modeling. For long-term exposure, the average temperature for the given month over five years was calculated. These temperatures were used to estimate a percentage change of emissions compared to standard temperature (20–25 °C or 68–77°F) from which the emission factors in **Table 3-6** were developed.
- The percentage change was then converted into a correction factor (i.e., for a percentage change of +50%, the correction factor corresponds to 1.5). It is worth noting that diesel engines are less sensitive to temperature than are gasoline engines, explaining why the correction factors remain relatively low and constant for some contaminants.

Table 3-7: Monthly Variable Correction Factors Per Contaminant Category

Month	Ambient Temperature (°C)		Exposure period ≤ 24-hour				Monthly / annual exposure			
	Minimum ⁽¹⁾	Average ⁽²⁾	PM ⁽³⁾	NOx	CO	THC ⁽⁴⁾	PM ⁽³⁾	NOx	CO	THC ⁽⁴⁾
January	-46	-19	1.0	1.3	1.4	2.0	1.0	1.3	1.1	1.6
February	-40	-19	1.0	1.3	1.4	2.0	1.0	1.3	1.1	1.7
March	-31	-6	1.0	1.3	1.3	1.8	1.0	1.2	1.0	1.5
April	-25	1	1.0	1.3	1.2	1.7	1.0	1.2	1.0	1.3
May	-12	20	1.0	1.2	1.1	1.5	1.0	1.0	1.0	1.1
June	1	17	1.0	1.2	1.0	1.3	1.0	1.1	1.0	1.1
July	3	19	1.0	1.2	1.0	1.3	1.0	1.0	1.0	1.1
August	5	17	1.0	1.2	1.0	1.3	1.0	1.1	1.0	1.1
September	0	12	1.0	1.2	1.0	1.4	1.0	1.1	1.0	1.2
October	-13	4	1.0	1.2	1.1	1.6	1.0	1.2	1.0	1.3
November	-22	-6	1.0	1.3	1.2	1.7	1.0	1.2	1.0	1.5
December	-36	-14	1.0	1.3	1.4	1.9	1.0	1.2	1.1	1.6

Notes:

- (1) Corresponds to the lowest hourly temperature during the month from the 5-year meteorological dataset used for dispersion modeling.
- (2) Corresponds to the average of hourly temperatures during the month from the 5-year meteorological dataset used for dispersion modeling.
- (3) Applies to all particulate matter sizes (TSP, PM₁₀, PM_{2.5}, DPM) as well as B[a]P (being mostly in particulate form).
- (4) Applies to all VOCs.

3.3.3 Vehicular Dust Emissions

The passage of vehicles will generate dust plumes in their wake. Although light-duty trucks transporting workers and tools will generate such emissions, it is not included in the model given that their frequency of passage cannot be properly determined and that their emissions will nonetheless be very small when compared to the recurring passage of heavy-duty trucks (12-wheelers) transporting aggregates and fill material. Dust emissions from the passage of heavy-duty trucks during the construction phase were therefore estimated according to the method suggested in the US EPA AP-42 Emission Factors Compendium Series for unpaved roads (US EPA, 2006a) for industrial roads.

$$EF = 281,9 \times k \times \left(\frac{S}{12}\right)^a \times \left(\frac{W}{3}\right)^b \times (1 - CF) \tag{3-2}$$

- EF: particulate matter emission factor (g/km)
- k, a, b: granulometric factors for TSP, PM₁₀ or PM_{2.5}
- S: silt content on road surface (%)
- W: average truck weight (tons)
- CF: dust emissions control factor (%)

Road silt (fine fraction < 75 µm) is set to 5.0% which represents 50% of the maximum allowed amount of fine aggregates in freshly crushed Granular A from quarried materials composing the road surface (maximum of 10% with diameter of 4,750 µm and less according to Ontario Provincial Standards Specifications). The average truck weight has been estimated to 25 tons considering a tare weight of 15 tons for heavy-duty trucks (typical maximum) and an average payload of 20 tons. Most of the time, the trucks will do round trips between the construction site and the quarry, hence an average payload of 10 tons.

Water trucks will be available on site to control dust emissions on roads and other working locations. The applied control factors were derived according to Environment and Climate Change Canada (ECCC, 2024) “Road dust emissions from unpaved surfaces: Guide to reporting” which considers overall control factors on a monthly and annual basis adjusted according to the number of days with precipitations greater than 0.2 mm and/or the number of days with frozen road surfaces. For both instances, 100% dust emissions control is considered by default.

Table 3-8 summarizes the control factors (CF) per month and exposure period considering that precipitations and freezing conditions vary according to the time of year. For dry days, the control factors without the use of water trucks are set to 0% during warmer months and 70% during cold months. It appears that freezing days occur the majority of the time in the region between December and March (90% of the time in average) and it can be reasonably thought that the road surface remains mostly frozen during that period. A CF value of 70% therefore appears to be a good compromise between 0% control during dry unfrozen days and 100% control during dry frozen days according to ECCC approach.

For the scenario with dust control using water trucks, a control factor of 55% is applied corresponding to the passage of the truck twice per day (ECCC, 2024). The fugitive dust emission rates (TSP, PM₁₀ and PM_{2.5}) were then derived from the emission factors (g/km) as explained above and the total distance travelled by trucks according to averaging period using inputs from **Table 3-5**.

Table 3-8: Dust Emissions Control Factors (CF) Per Month

Month	Wet Days (>0.2 mm) ⁽¹⁾	Days with max temperature below freezing point ⁽¹⁾	Exposure period ≤ 24-hour ⁽²⁾		Monthly / annual ⁽³⁾	
			No control	Water trucks	No control	Water trucks
January	15%	97%	70%	70%	75%	75%
February	22%	97%	70%	70%	77%	77%
March	19%	72%	70%	70%	76%	76%
April	21%	31%	0%	55%	21%	64%
May	7%	3%	0%	55%	7%	58%
June	29%	0%	0%	55%	29%	68%
July	12%	0%	0%	55%	12%	61%
August	25%	0%	0%	55%	25%	66%
September	40%	0%	0%	55%	40%	73%
October	35%	10%	0%	55%	35%	71%
November	23%	77%	0%	55%	23%	65%
December	4%	92%	70%	70%	71%	71%

Notes:

- (1) According to available (non missing) data from the 5-years meteorological dataset used for dispersion modelling.
- (2) Represent the control level expected during dry days.
- (3) Calculated using the control percentage for dry days x by the percentage of time of dry days + the percentage of time of wet days.

3.3.4 Aggregate Crushing Plant

An aggregate crushing plant will be set up at ARA-2 quarry during the first years of construction. Crushing following by screening have the potential to generate dust which emissions were estimated according to the emission factors provided in ECCC (2018) "Pits and Quarries Reporting Guide". Combined emission factors for crushing and screening without specific dust control measures in place were selected (15 g TPS per tonne of aggregates; 5.5 g PM₁₀/t; and 0.89 g PM_{2.5}/t), even though it is most likely that it will not be the case.

The fugitive dust emission rates (TSP, PM₁₀ and PM_{2.5}) were then derived from the emission factors and aggregate processing rate expected during Year 1 as specified in **Table 3-9**.

Table 3-9: Input Data for Dust Emissions from Aggregate Crushing

Source ID - Activity	Modelled Emission Period	Averaging Period	Aggregate processing rate (t/h)	Hypothesis
B4 – Crushing plant	May–April (0h to 24h) [242 days of crushing in total]	Max 24-hour	208	Represents the hourly average based on total aggregate production for Year 1 (447,120 m ³ x 1.8 t/m ³) over 242 days x 1.5 to consider potentially higher daily production rates.
		Max 1-month Annual	139	Represents the hourly average based on total aggregate production during Year 1 as above.

3.3.5 Aggregate Loading and Unloading

Dust emissions from aggregate loading at ARA-2 quarry and unloading along the road during aggregate placement are estimated using the method suggested in the US EPA AP-42 Emission Factor Compendium Series for bulk material handling (US EPA, 2006a).

$$EF = 1,6 \times k \times \left(\frac{U}{2,2}\right)^{1,3} \times \left(\frac{M}{2}\right)^{-1,4} \quad (3-3)$$

- EF: particulate matter emission factor (g/t transferred)
- k: granulometric multiplier (TSP = 0.74; PM₁₀ = 0.35; PM_{2.5} = 0.053)
- U: mean wind speed (m/s)
- M: moisture content of transferred material (%)

Aggregates, unless they are wetted by precipitations, usually contain small amounts of moisture (less than 2%). A value 1.5% is applied. The mean wind speed (5.7 m/s) was extracted from the meteorological dataset used for air dispersion modelling. No dust control measures are considered. The resulting emission factors are then applied with hourly transfer rates, as specified in **Table 3-10** according to the averaging period.

Table 3-10: Input Data for Dust Emissions from Aggregate Loading and Unloading

Source ID - Activity	Modelled Emission Period	Averaging Period	Aggregate transfer (t/h)	Hypothesis
B3 – Aggregate unloading	May–April (0h to 24h) [110 days of aggregate placement in total]	Max 24-hour	298	Represents the hourly average based on total aggregate transferred to the road for Year 2 (291,260 m ³ x 1.8 t/m ³) over 110 days x 1.5 to consider potentially higher daily transfer rates.
		Max 1-month Annual	199 ⁽¹⁾	Represents the hourly average based on total aggregate transferred to the road for Year 2 as above.
B4 – Aggregate loading	May–April (0h to 24h) [110 days of aggregate placement in total]	Max 24-hour	596	Same as above x 2 to consider the transfer of aggregates at the quarry from screener to pile.
		Max 1-month Annual	398	Same as above x 2 to consider the transfer of aggregates at the quarry from screener to pile.

Note:

(1) Source B3 is placed at multiple locations along the road. Since aggregate placement only occurs during 1 or 2 days at each location, the effective transfer rate needs to be weighed down to 1.5 t/h (applicable at all B3 volumes during the modelled emission period).

3.3.6 Operation of Dozers and Graders

Road construction will require dozers, among other equipment, to place fill materials and aggregates on the road. Graders will also be used to level and compact the aggregates. Both activities will generate dust emissions from their blades.

Three (3) dozers are expected to be used during road construction, especially during aggregate placement activities. Their combined dust emissions were inferred from the method suggested in ECCC (2018) “Pits and Quarries Reporting Guide” taken from the US EPA AP-42 Emission Factor Compendium Series for mining operations (US EPA, 1998).

$$E = 2,6 \times k \times s^{1,2} \times M^{-1,3} \times T \div 3,6 \quad \text{for TSP and PM}_{2.5} \quad (3-4)$$

$$E = 0,34 \times s^{1,5} \times M^{-1,4} \times T \div 3,6 \quad \text{for PM}_{10} \quad (3-5)$$

- E: particulate matter emission rate (g/s)
- k: granulometric multiplier (PM_T = 1; PM_{2.5} = 0,105)
- s: silt content in handled material (%)
- M: moisture content of handled material (%)
- T: fraction of time material is being displaced by the dozer (-)

Applied silt content (fine fraction < 75 µm) is the same as the one used for road emissions from trucking (5.0%) while moisture content is also the same used for aggregate loading and unloading emissions (1.5%). A T value of 0,5 is selected, meaning that the dozer is moving with the blade on the ground half of the time while being idle, moving to another area, or backing the remainder of the time.

One grader will also be in operation which dust-related emissions are calculated using the approach suggested in US EPA (1998) as below:

$$EF = 11.4 \times k \times S^{2.5} \times T \quad \text{for TSP and PM}_{2.5} \quad (3-6)$$

$$EF = 8.7 \times S^{2.0} \times T \quad \text{for PM}_{10} \quad (3-7)$$

- EF: particulate matter emission factor (g/km)
- k: granulometric multiplier (TSP = 1; PM_{2.5} = 0.031)
- S: grading speed (mph)
- T: fraction of time material is being displaced by the grader (-)

A grading speed of 6 mph (10 km/h) is selected which typically represents a maximum when heavy blading is undertaken by the grader (which is expected during the construction phase). A T value similar to dozers is also applied (0.5). The resulting emission factors are then multiplied by the distance travelled which is also based on grading speed. Finally, since source B3 is placed at multiple locations along the road (at 300 m intervals), the emission rates for the 1-month and annual averaging periods need to be weighted down since the dozers and grader will be at one location for only 1 or 2 days during the year (Table 3-11).

Table 3-11: Emission Rates Weighting per Averaging Period for Dozers and Graders

Source ID - Activity	Modelled Emission Period	Averaging Period	Emission rate weighting	Hypothesis
B3 – Dozers and graders	May–December (0h to 24h) [176 days of use in total]	Max 24-hour	83%	Represents the percentage of the time the dozers and graders will be in activity and not under breaks and shift changes (4 h / 24h).
		Max 1-month	3.6%	Each volume represents the equivalent of 1.3 days of use divided by 30 days and multiplied by the 24-hour weight (83%).
		Annual	0.44%	Each volume represents the equivalent of 1.3 days of use divided by 245 days (May to December) and multiplied by the 24-hour weight (83%).

3.3.7 Blasting

Some part of the bedrock at ARA-2 pit needs to be dislodged through blasting with explosives. It is expected that 5 blast events will be needed during Year 1. Each blast event will generate a dust plume that was estimated based on ECCC (2018) “Pits and Quarry Emissions Reporting Guide” as follow.

$$EF = 0,22 \times k \times A^{1.5} \quad (3-8)$$

- EF: total particulate matter emissions during a blast (g)
- k: granulometric multiplier (TSP = 1; PM₁₀ = 0.52; PM_{2.5} = 0.03)
- A: horizontal blast surface (m² / blast)

Being instantaneous, the total emissions of PST, PM₁₀ and PM_{2.5} (in grams) were brought back to one hour (divided by 3,600 seconds) in the model. Meanwhile, the horizontal surface area (5,861 m²) per blast was estimated based on the fact that 125,000 m³ of bedrock needs to be dislodged from a total of 1,500,000 m³ of rock available at the 35 ha ARA-2 pit (350,000 m² x (125,000 / 1,500,000) / 5 blasts).

Contaminants generated during the detonation of explosives from blasts are also integrated into the model. Without specific details about the type of explosive, it is assumed that ANFO (ammonium nitrate / fuel oil) will be used, which is often the case during construction work and mine blasting. The following emission factors were applied: 8.0 g NO_x / kg of ANFO; 34 g CO / kg of ANFO; and 1.0 g SO₂ / kg of ANFO taken from the US EPA AP-42 Emission Factor Compendium Series for explosives detonation (US EPA, 1980). TSP emissions were not calculated given that it would be overshadowed by the dust plume from the blast. A powder factor of 0.5 kg ANFO per m³ of rock (or 0.16 kg ANFO per tonne of rock) was applied to calculate emission rates which corresponds to an upper range value considering that the amount of explosives required depends of site conditions and bedrock density among other variables.

Since blasting will occur only occasionally, the emission rates applicable for 24-hour averaging period are weighted down for the other averaging periods, as presented in **Table 3-12**.

Table 3-12: Input Rates Weighting per Averaging Period for Blasts

Source ID - Activity	Modelled Emission Period	Averaging Period	Emission rate weighting	Hypothesis
A8 and B5 – Blasts	February–October (14 h) [176 days in total]	Max 1-hour Max 24-hour	100%	Not impacted.
		Max 1-month	17%	The 5 blasts are assumed to occur during the same month (5/30).
		Annual	1.8%	Ratio of the number of blasts and the number of days during the modelled emission period.

3.4 Emission Parameters Summary

Table 3-13 and **Table 3-14** summarize the emission sources included in the model for the construction phase of the Project. It provides an overview of emission parameters and emission rates for NO_x (exhaust gas) and TSP (fugitive dust) applicable to 1-hour, 24-hour, 30-day, and annual averaging periods, where applicable. The emission rates for the other contaminants and other parameters that needs to be specified in the model are available in the summary section of **Appendix A**. The parameters used for dry depletion on fugitive dust TSP based on the approach defined in **Section 2.7** are provided in **Table 3-15**.

These mitigation measures were applied in the assessment as they would have more significant impact to offset effects under the base case scenario. The Air Quality and Dust Control Management Plan will not limit itself to these measures as there are many other options to mitigate dust uplifting and exhaust emissions. Most of these options like idling minimization, limitation of unnecessary vehicle and heavy equipment movement, and the wetting of soil and aggregate stockpiles during dry days cannot however be properly translated into the dispersion model and so their potential impact is not calculated here.

Table 3-13: Summary of Exhaust Gas Emission Sources for the Construction Phase

Source Description		Source type	Location	Key Emission Parameters	Modelled Emission Period	NO _x Emission ⁽¹⁾ Rates (g/s)		
ID	Activities					1-h	24-h	An
A1	Clearing and grubbing	Volumes at 300 m intervals	From Webequie to WSR access road	Release height: 4 m Lateral dimension: 35 m	Feb – Apr (7h – 19h)	2.7	2.2	0.015
A2	Aggregate production	Volume	ARA-2 aggregate pit	Release height: 4 m Lateral dimension: 100 m	May – Dec (0h – 24h)	1.1	0.96	0.43
A3	Road construction	Volumes at 300 m intervals	From Webequie to WSR access road	Release height: 4 m Lateral dimension: 35 m	May – Dec (0h – 24h)	1.2	1.0	0.0048
A4a	Culvert installation	Volume	WC-2 crossing	Release height: 4 m Lateral dimension: 35 m	May – Dec (7h – 19h)	0.46	0.38	0.013
A4b	Culvert installation	Volume	WC-4 crossing		May – Dec (7h – 19h)	0.46	0.38	0.013
A5a	Bridge construction	Volume	WB-1 crossing	Release height: 4 m Lateral dimension: 35 m	May – Dec (7h – 19h)	0.13	0.12	0.031
A5b	Bridge construction	Volume	WC-3 crossing		May – Dec (7h – 19h)	0.13	0.12	0.021
A6	Filling material trucking	Line volume	From Webequie to WB-1 crossing	Plume height: 6.0 m Plume width: 14 m	Feb – Apr (7h – 19h)	0.042	0.020	0.0043
A7a	Aggregates trucking	Line volume	From Webequie to ARA-2 pit		May – Dec (0h – 24h)	0.76	0.21	0.058
A7b	Aggregates trucking	Line volume	From ARA-2 pit to WSR access road		May – Dec (0h – 24h)	0.28	0.075	0.016
A8	Blasts	Volume	ARA-2 aggregate pit	Release height: 7.5 m Lateral dimension: 75 m	Feb – Oct (14h)	28	28	0.51

Note:

(1) For the base scenario (Tier 3 engines only for sources A1 to A5b).



Table 3-14: Summary of Fugitive Dust Emission Sources for the Construction Phase

Source description		Source type	Location	Key Emission Parameters	Modelled Emission Period	TSP Emission ⁽¹⁾ Rates (g/s)		
ID	Activities					24-h	30-d	An
B1	Filling material trucking	Line volume	From Webequie to WB-1 crossing	Plume height: 6.0 m Plume width: 14 m	Feb – Apr (7h – 19h)	21	13	4.5
B2a	Aggregates trucking	Line volume	From Webequie to ARA-2 pit		May – Dec (0h – 24h)	223	149	61
B2b	Aggregates trucking	Line volume	From ARA-2 pit to WSR access road		May – Dec (0h – 24h)	79	53	16
B3	Road construction ⁽²⁾	Volumes at 300 m intervals	From Webequie to WSR access road	Release height: 0.5 m Lateral dimension: 35 m	May – Dec (0h – 24h)	5.3	0.21	0.027
B4	Aggregate production ⁽³⁾	Volume	ARA-2 aggregate pit	Release height: 5 m Lateral dimension: 150 m	May – Dec (0h – 24h)	1.9	1.3	0.88
B5	Blasts	Volume	ARA-2 aggregate pit	Release height: 7.5 m Lateral dimension: 75 m	Feb – Oct (14h)	27	4.6	0.50

Notes:

- (1) Corresponds to the base emission rates without dust control for sources B1, B2a and B2b.
- (2) Combines dust emissions from dozers, graders and aggregates unloading.
- (3) Combines dust emissions from the crusher/screener, and aggregates transfer on site (loading in trucks).

Table 3-15: Dry Depletion Parameters Applied for Dustfall and TSP Concentration Simulations

Particulate Classes and Average Diameter (µm)	< 2.5	2.5 – 10	10 – 15	> 10	> 15	Density (g/cm ³)
	1.25	6.25	12.5	20	22.5	
Source	Relative Proportion					
B1, B2a and B2b	0.03	0.23	—	0.74	—	2.5
B3	0.09	0.14	0.10	—	0.67	2.5
B4	0.06	0.30	—	0.64	—	2.5
B5	0.03	0.49	—	0.48	—	2.5

3.5 Mitigation Measures

An Air Quality and Dust Control Management Plan will be deployed during construction that will include typical mitigation measures such as:

- the use of water sprays from trucks to increase moisture levels in active areas during dry days (e.g., haul/access roads, temporary soil and aggregate stockpiles),
- the use of environmentally certified equipment (e.g. Tier 4 engines),
- the use of dust suppression systems at quarries,
- truck speed limitations for hauling, including vehicle and heavy equipment movement limitations to designated areas; and
- minimizing idling of vehicles and heavy equipment.

The emission scenario as previously described was first modelled without consideration of specific emission controls, so to verify the impact of the Project in base case conditions. The emission scenario was then re-assessed by considering the following quantifiable control measures that are expected to have most impact on fugitive dust and engine exhausts emissions:

- water-spraying on-road surface mitigating dust uplifting from heavy-duty trucks. The applied particulate emissions control factors were developed in **Section 3.3.3**.
- the use of at least 80% of mobile and stationary equipment having a Tier 4F engine, when the base scenario only considers Tier 3 engines (**Section 3.3.1**). The equipment units with Tier 4F engines were selected randomly given the large of number of units that will be required on site (over 50 units; see **Table 3-2**).

3.6 Air Dispersion Modelling Results

Air dispersion modelling results for the construction phase are presented in **Table 3-16**, **Table 3-17** and **Table 3-18** for all studied contaminants and in isocontour plots for contaminants which are significantly impacted by the Project relative to applicable AAQC and CAAQS. The tables present the maximum concentration calculated in air (or on the ground for dustfall) at any receptors in the modelling domain based on the 5-year meteorological dataset. They also provide the results with the background concentration, as determined in **Section 2.5**. Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold. More specifically, the tables provide the following results:

- **Table 3-16** – contaminants from engines having Tier 3 certification only.
- **Table 3-17** – contaminants from engines based on the Tier 4 (80%) / Tier 3 (20%) scenario for contaminants which maximum project contribution to the air concentrations according to the Tier 3 scenario (**Table 3-16**) is greater than 50% of the applicable AAQC, CAAQS, or HC guiding value.
- **Table 3-18** – particulates and dustfall from fugitive dust emissions based on the scenario without water dust control on the road and the scenario with water dust control.

The results presented in **Table 3-18** (for exhaust emissions according to the Tier 4 (80%) / Tier 3 (20%) scenario) and **Table 3-20** (for fugitive dust emissions using the scenario with water dust control) focus on maximum concentrations calculated at sensitive receptors for contaminants which are meaningfully impacted by the Project. Given the large number of sensitive receptors, only the ones that are closest to the RCL are presented in **Table 3-19** and **Table 3-20**. It includes existing residences, institutional buildings, and culturally sensitive areas. The results for the other receptors which are lower than the ones presented in **Table 3-19** and **Table 3-20** are available in Appendix B for reference.

Given the very large modelling domain, the isocontour plots illustrate the distribution of total concentrations of selected contaminants (project contribution + background) for the western segment of the road only (from Webequie to the south of Bender Lake) and the area surrounding ARA-2 quarry. To do so, the model was re-simulated using a denser array of receptors in these areas.

3.6.1 Particulates

Construction activities have the potential to create conditions that would exceed the standards for particulate matter (of all size), especially for short-term averaging periods (1-hour and 24-hour) outside the ROW (**Table 3-18**). When integrating the road dust control measure (use of water trucks), the results do not change significantly (i.e., max of 16,423 $\mu\text{g}/\text{m}^3$ at 50 m distance for TSP vs. 16,468 $\mu\text{g}/\text{m}^3$ without controls), meaning that road surface emissions are not the predominant source.

Dust emissions at the construction site due to bulldozing, road grading and aggregates unloading (source ID B3) are actually the main cause of these high concentrations. As mentioned previously, it is not possible to define the exact combination and space distribution of equipment and activities that will occur at individual sections of the road, and so all potential emissions were combined together in a single source as a simplified and conservative approach. All three dozers and graders available on site were considered in operation in the same close area which would probably not be the case in reality (or at least there would be some distance between each equipment).

When adding the background concentration, these conditions could lead to exceedances in TSP, PM_{10} and $\text{PM}_{2.5}$ concentrations up to at least 2.5 km from RCL (**Table 3-20** and **Table 3-21**). This covers all sensitive receptors included in the model. Although exceedances appear frequent in these conditions, it is important to note that in reality, it would only occur over a short period (i.e., less than a week) at each receptor given that the emission sources will be moving as road construction progresses. This fact is reflected in the maximum annual TSP and $\text{PM}_{2.5}$ concentrations which are lower than their respective standard with or without water dust control at 50 m from RCL. An exception concerns the annual $\text{PM}_{2.5}$ concentrations which exceeds the CAAQS 2030 target (but not the 2020 target) at the periphery of ARA-2 quarry where fugitive dust emissions occur more frequently (**Table 3-18**). If construction is completed prior to 2030, than it would not be an issue.

3.6.1.1 $\text{PM}_{2.5}$ Case

In absence of a highly specific construction schedule by day of year and sector of operation, it is impossible to properly verify the impact of construction activities with regard to the 24-h $\text{PM}_{2.5}$ CAAQS and AAQC. The $\text{PM}_{2.5}$ emission scenarios described herein were developed by modeling each source at all hours during specified periods (e.g., constant $\text{PM}_{2.5}$ emission rates applied for every hours between May and December from 8-h to 20-h for sources that are expected to be emitting during that period). This approach is however not well suited to demonstrate compliance with the 24-h $\text{PM}_{2.5}$ CAAQS when emissions occur only periodically during these modelled periods. The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations will be in reality much lower than values presented in tables considering that for a majority of days no emissions will be generated when looking at a specific location along the road. This concerns most importantly source B3 with dozers, graders and aggregates unloading that are expected to last a couple of days to a week for each road segment affecting nearby points of impingement. Taking that into consideration, the maximum 24-h $\text{PM}_{2.5}$ concentrations following CAAQS/AAQC statistical representation will be lower than what are presented in **Table 3-18** and **Table 3-20**, but to an extent that cannot be determined.



3.6.2 Gaseous Criteria Air Contaminants

AAQC / CAAQS with a very short-exposure period (1 hour or less) are exceeded to a great extent within the modeling domain for SO₂, NO₂ and CO (**Table 3-16**). For annual standards, no exceedances are calculated since construction activities at one specific location will not be continuous, lasting likely a couple of days to a week per road segment. The use of the Tier 4 (80%) / Tier (20%) improves the situation but the maximums within the modeling domain remain high due to the detonation of explosives during blasts at the quarry (**Table 3-17**). Otherwise, along the road (outside the area of influence of the quarry), the SO₂ and CO concentrations are much lower, with only SO₂ hourly concentrations exceeding the AAQC up to 200 m from RCL, including some sensitive receptors (**Table 3-19**).

Finally, the maximum hourly NO₂ concentrations based on the CAAQS statistical representation, being more restrictive than the corresponding AAQC, would exceed the limit value up to several kilometers from the RCL according to calculations. For example, for the closest existing residence (RP01) at over 1 km distance from the closest segment of the modeled WSR, the calculated maximum contribution of the Project is 95 µg/m³ (123 µg/m³ with background concentration) surpassing the CAAQS of 79 µg/m³. These results apply to the Tier 4 (80%) / Tier 3 (20%) scenario.

These very high resulting concentrations must however be put into perspective. Similarly to explanations provided in **Section 3.6.1.1**, the NO₂ emission scenarios were developed to calculate the maximum hourly or daily concentrations relevant to AAQC by modeling each source at all hours of the 5-years meteorological dataset during specified periods. The 3-year averages of the annual 98th percentile of daily maximum 1-hour average concentrations will be much lower in reality considering that for a majority of days no emissions will be generated when looking at specific location along the road. In absence of a complete and detailed construction schedule by day of year and sector of operation, it is impossible to properly verify the impact of construction activities with regard to CAAQS.

Figure 3.4 provides the isocontours plot with regard to the maximum NO₂ (1-hour) concentrations for the emission scenario using 80% of Tier 4 engines.

3.6.3 Toxic Contaminants

Exceedances were calculated for acrolein (1-hour and 24-hour), benzene (24-hour) and propionaldehyde (10-minutes) at 50 m from RCL for the emission scenario using emission factors for Tier 3 engines (>400% of the applicable AAQC, respectively including the background concentration; **Table 3-16**). When considering the scenario with 80% of Tier 4 engines, exceedances are still generated but to a lower extent (<400% of applicable AAQC; **Table 3-17**). The exceedance setbacks for these contaminants reach more or less 200 m from the RCL which include a culturally sensitive receptor. Otherwise, no exceedances were calculated for the other toxic contaminants at sensitive receptors, including existing residences, institutional buildings, and culturally sensitive areas (**Table 3-19**).

This excludes B[a]P (24-hour and annual exposure periods) since the selected background concentrations are already exceeding the AAQC as part of this assessment (**Table 3-17**). When excluding the background concentration, the Tier 4 (80%) / Tier 3 (20%) scenario cuts the Project's contribution by two on the maximum annual BaP concentration below the applicable AAQC but is not sufficient to comply with the 24-hour AAQC. Exceedances based on the Project's contribution only is still calculated at most culturally sensitive locations (CHL) but not at existing residences or institutions in contrast to the Tier 3 scenario results.

DPM emissions dispersion from engines were simulated and resulted in very high maximum 2-hour average concentrations in the modeling domain ($>1,000 \mu\text{g}/\text{m}^3$ for the Tier 3 scenario; and $275 \mu\text{g}/\text{m}^3$ for the Tier 3 and 4 scenario) which is at least 25 times higher than the recommended concentration by Health Canada. Exceedances would occur across most of the modeling domain including the large majority of culturally sensitive, existing residences and institutions receptors. That said, Health Canada does not provide any statistical representation to apply on their guidance value whereas this report presents the first maximum 2-hour average concentration over the 5 years of meteorological data. The use of a percentile approach (i.e., 98th of daily 24-hr average concentrations for the $\text{PM}_{2.5}$ CAAQS and AAQC) would have reduced that result accordingly. For annual DPM concentrations, the calculated maximum ($< 2 \mu\text{g}/\text{m}^3$) is lower than the recommended Health Canada guidance value ($5 \mu\text{g}/\text{m}^3$) since construction activities at one specific location will not be continuous lasting likely a couple of days or weeks, largely diluting the DPM emissions over a year.

Figure 3.5 provides the isocontours plots with regard to the maximum benzene (24-hour) concentrations for the emission scenario using 80% of Tier 4 engines.

3.6.4 Dust Deposition

A maximum dust deposition value of $10 \text{ g}/\text{m}^2$ over 30-days (including background dust deposition) was calculated at 50 m from RCL (corresponding to about **143%** of the AAQC) without the dust control measure (water trucks on-road). Like for particulate matter concentrations, the impact of water control on the results remains low and cannot be discerned from the maximum calculated at 50 m distance, which remains at $10 \text{ g}/\text{m}^2$ over 30-days only (**Table 3-18**). That said, the maximums obtained at 150 m ($5.0 \text{ g}/\text{m}^2$) and 300 m ($2.5 \text{ g}/\text{m}^2$) are lower than their counterpart without dust control ($8.9 \text{ g}/\text{m}^2$ and $4.6 \text{ g}/\text{m}^2$, respectively). In fact, the maximum calculated dustfall does not exceed the AAQC of $7.0 \text{ g}/\text{m}^2$ per 30-days at sensitive receptors, except for a single culturally sensitive location nearby the WSR footprint (**Table 3-20**).

A similar trend is observed with regard to the annualized dustfall calculations which maximum only exceeds the applicable AAQC of $4.6 \text{ g}/\text{m}^2$ outside the ARA-2 quarry (maximum of $4.7 \text{ g}/\text{m}^2$ per 30-days in average during the year). Otherwise, no exceedances are not at 50 m from RCL nor at sensitive receptors.

Figure 3.6 provides the isocontours plot for monthly dustfall results calculated through the depletion of particulate matter emissions.

The tables below present maximum predicted concentrations at any receptor within the modelling domain; totals include background concentrations from Section 2.5. Exceedances are **bolded**.

Table 3-16: Maximum Concentrations for Non-Particulate Contaminants Calculated in the Modeling Domain for the Construction Phase (Tier 3 only scenario)

Pollutant	Applicable Standard	Averaging Period	Maximum Project Contribution (A) ⁽¹⁾		Background Concentration (B) ⁽²⁾		Total (A+B)		Limit Value (µg/m ³)
			µg/m ³	% limit	µg/m ³	% limit	µg/m ³	% limit	
Sulphur dioxide (SO ₂)	AAQC	10-minute	14,023	7,791	149	83	14,172	7,873	180
	AAQC	1-hour	8,499	8,499	90	90	8,589	8,589	100
	CAAQS	1-hour ^{(3) (4)}	8,499	4,913	18	10	8,517	4,923	173
	AAQC	Annual	0.11	1.1	0.50	5.0	0.61	6.1	10
Nitrogen dioxide (NO ₂)	AAQC	1-hour	7,519	1,880	51	13	7,570	1,892	400
	CAAQS	1-hour ⁽¹⁾	2,902	3,673	28	35	2,930	3,709	79
	AAQC	24-hour	448	224	23	12	471	235	200
	AAQC	Annual	9.9	45	2.6	12	13	57	22
Carbon monoxide (CO)	AAQC	1-hour	62,703	173	5061	14	67,764	187	36,200
	AAQC	8-hour	7,924	50	3253	21	11,177	71	15,700
1,3-butadiene	AAQC	24-hour	0.52	5.2	0.12	1.2	0.64	6.4	10
	AAQC	Annual	0.0031	0.15	0.010	0.50	0.013	0.65	2.0
Acetaldehyde	AAQC	30-minute	146	29	14	2.8	160	32	500
	AAQC	24-hour	29	5.8	12	2.4	41	8.2	500
Acrolein	AAQC	1-hour	22	485	0.040	0.89	22	486	4.5
	AAQC	24-hour	5.3	1,314	0.040	10	5.3	1,324	0.40
Benzene	AAQC	24-hour	15	661	0.90	39	16	700	2.3
	AAQC	Annual	0.090	20	0.30	67	0.39	87	0.45
Ethylbenzene	AAQC	10-minute	20	1.0	0.28	0.015	20	1.0	1,900
	AAQC	24-hour	2.9	0.29	0.17	0.017	3.0	0.30	1,000
Formaldehyde	AAQC	24-hour	24	37	2.9	4.5	27	41	65
Hexanes	AAQC	24-hour	0.72	0.029	0.45	0.018	1.2	0.047	2,500
Propionaldehyde	AAQC	10-minute	42	424	1.6	16	44	440	10
Toluene	AAQC	24-hour	11	0.53	1.4	0.070	12	0.60	2,000
Xylenes	AAQC	10-minute	142	4.7	0.86	0.029	143	4.8	3,000
	AAQC	24-hour	21	2.8	0.52	0.071	21	2.9	730
Benzo(a)pyrene	AAQC	24-hour	2.3 x 10 ⁻³	4,574	1.2 x 10 ⁻⁴	240	2.4 x 10 ⁻³	4,814	5.0 x 10 ⁻⁵
	AAQC	Annual	1.2 x 10 ⁻⁵	117	2.0 x 10 ⁻⁵	200	3.2 x 10 ⁻⁵	317	1.0 x 10 ⁻⁵
Diesel particulate matter (DPM)	HC	2-hour	1,354	13,544	0	0	1,354	13,544	10
	HC	Annual	1.8	35	0	0	1.8	35	5

Notes:

Concentrations that are greater than the corresponding AAQC, CAAQS or Health Canada (HC) guiding value for DPM are denoted in bold.

(1) Maximum concentration calculated in the modelling domain (at 50 m from the road centerline or at the perimeter of the ARA-2 quarry).

(2) Background concentrations as established in **Section 2.5**.

(3) The result represents the 1st highest 1-hour concentration and not the 88th highest 1-hour concentration as required from the CAAQS.

(4) Cautions must be taken with the results obtained with regard to CAAQS (refer to **Section 3.6.1.1**).



Table 3-17: Maximum Concentrations for Non-Particulate Contaminants Calculated in the Modelling Domain for the Construction Phase (80% Tier 4F and 20% Tier 3 scenario)

Pollutant	Applicable Standard	Averaging Period	Maximum Project Contribution (A) ⁽¹⁾		Background Concentration (B) ⁽²⁾		Total (A+B)		Limit Value ($\mu\text{g}/\text{m}^3$)
			$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	
Sulphur dioxide (SO_2)	AAQC	10-minute	3,043	1,691	149	83	3,192	1,773	180
	AAQC	1-hour	1,844	1,844	90	90	1,934	1,934	100
	CAAQS	1-hour ^{(3) (4)}	1,844	1,066	18	10	1,862	1,076	173
Nitrogen dioxide (NO_2)	AAQC	1-hour	4,664	1,166	51	13	4,715	1,179	400
	CAAQS	1-hour ⁽⁴⁾	2,897	3,667	28	35	2,925	3,703	79
	AAQC	24-hour	321	161	23	12	344	172	200
Carbon monoxide (CO)	AAQC	1-hour	62,681	173	5,061	14	67,742	187	36,200
	AAQC	8-hour	7,840	50	3,253	21	11,093	71	15,700
Acrolein	AAQC	1-hour	4.6	102	0.040	0.89	4.6	103	4.5
	AAQC	24-hour	1.5	384	0.040	10	1.6	394	0.40
Benzene	AAQC	24-hour	4.4	193	0.90	39	5.3	232	2.3
Formaldehyde	AAQC	24-hour	24	37	2.9	4.5	27	41	65
Propionaldehyde	AAQC	10-minute	8.9	89	1.6	16	10	105	10
Benzo(a)pyrene	AAQC	24-hour	6.3×10^{-4}	1,260	1.2×10^{-4}	240	7.5×10^{-4}	1,500	0.000050
	AAQC	Annual	5.6×10^{-6}	56	2.0×10^{-5}	200	2.6×10^{-5}	256	0.000010
Diesel particulate matter (DPM)	HC	2-hour	275	2,748	0	0	275	2,748	10

Notes:

Concentrations that are greater than the corresponding AAQC, CAAQS or Health Canada (HC) guiding value for DPM are denoted in bold.

(1) Maximum concentration calculated in the modelling domain (at 50 m from the road centerline or at the perimeter of the ARA-2 quarry).

(2) Background concentrations as established in **Section 2.5**.

(3) The result represents the 1st highest 1-hour concentration and not the 88th highest 1-hour concentration as required from the CAAQS.

(4) Cautions must be taken with the results obtained with regard to CAAQS (refer to **Section 3.6.1.1**).



Table 3-18: Maximum Concentrations for Particulates and Dustfall Calculated in the Modeling Domain For the Construction Phase

Pollutant	Applicable Standard	Averaging Period	Maximum Project Contribution (A) ⁽¹⁾		Background Concentration (B) ⁽²⁾		Total (A+B)		Limit Value (µg/m ³)
			µg/m ³	% limit	µg/m ³	% limit	µg/m ³	% limit	
Scenario – unpaved surface (no control)									
Total suspended matter (TSP)	AAQC	24-hour	16,423	13,686	45	38	16,468	13,723	120
	AAQC	Annual ⁽³⁾	55	92	4.0	6.7	59	98	60
Fine inhalable fraction (PM ₁₀)	AAQC	24-hour	5,878	11,756	28	56	5,906	11,812	50
Fine particulate matter (PM _{2.5}) ⁽⁴⁾	CAAQS	24-hour ⁽⁵⁾	1,151	5,006	13	55	1,164	5,061	23
	AAQC	24-hour	1,151	4,264	13	47	1,164	4,311	27
	CAAQS	Annual ⁽⁵⁾	3.7	46	4.7	59	8.4	104	8.0
	AAQC	Annual	3.7	42	4.7	53	8.4	95	8.8
Dustfall	AAQC	30-days	10	143	0.40	5.7	10	148	7.0
	AAQC	Annual	5.2	114	0.40	8.7	5.6	123	4.6
Scenario – unpaved surface with road water control									
Total suspended matter (TSP)	AAQC	24-hour	16,211	13,510	45	38	16,256	13,547	120
	AAQC	Annual ⁽³⁾	53	89	4.0	6.7	57	96	60
Fine inhalable fraction (PM ₁₀)	AAQC	24-hour	5,752	11,505	28	56	5,780	11,561	50
Fine particulate matter (PM _{2.5}) ⁽⁴⁾	CAAQS	24-hour ⁽⁵⁾	1,141	4,961	13	55	1,154	5,016	23
	AAQC	24-hour	1,141	4,226	13	47	1,154	4,273	27
	CAAQS	Annual ⁽⁵⁾	3.4	43	4.7	59	8.1	102	8.0
	AAQC	Annual	3.4	39	4.7	53	8.1	93	8.8
Dustfall	AAQC	30-days	10	143	0.40	5.7	10	148	7.0
	AAQC	Annual	4.7	102	0.40	8.7	5.1	110	4.6

Notes:

Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold.

(1) Maximum concentration calculated in the modelling domain (at 50 m from the road centerline or at the perimeter of the ARA-2 quarry).

(2) Background concentrations as established in **Section 2.5**.

(3) Result based on the arithmetic mean of daily measurements and not the geometric mean. This represents a worst case since arithmetic means are always equal or greater than geometric means.

(4) The results are compared with the CAAQS applicable starting in 2030 while for the AAQC, it is compared with the 2020 targets.

(5) Cautions must be taken with the results obtained with regard to CAAQS (refer to **Section 3.6.1.1**).



Table 3-19: Maximum Concentrations in Areas of Interest For the Scenario with Tier 4 (80%) / Tier 3 (20%) Engines During the Construction Phase

Sector or Receptor	NO ₂			SO ₂		CO
	AAQC	CAAQS ⁽⁶⁾	AAQC	AAQC	AAQC	AAQC
	1-h	1-h	24-h	10-min	1-h	1-h
Limit value (µg/m³)	400	79	200	180	100	36,200
Project contribution (µg/m³)						
50 m from road centerline ⁽¹⁾	416	392	194	31	19	1,342
150 m from road centerline ⁽¹⁾	221	207	109	30	18	622
300 m from road centerline ⁽¹⁾	154	148	95	27	16	554
Quarry perimeter	4,664	2,897	321	3,043	1,844	62,681
Existing residences (RP01) ⁽²⁾	98	95	36	2.8	1.7	83
Institutional buildings (I01) ⁽³⁾	93	92	34	2.1	1.3	66
Culturally sensitive areas ⁽⁴⁾						
CHL25 (60 m from RCL)	265	250	134	36	22	757
CHL05 (150 m from RCL)	179	171	89	10	5.8	410
CHL14 (200 m from RCL)	138	132	77	6.9	4.2	241
CHL28 (240 m from RCL)	135	132	86	20	12	409
CHL02 (350 m from RCL)	139	127	68	4.6	2.8	252
Project contribution + background (µg/m³)						
50 m from road centerline ⁽¹⁾	467	420	217	180	109	6,403
150 m from road centerline ⁽¹⁾	272	235	132	179	108	5,683
300 m from road centerline ⁽¹⁾	205	176	118	176	106	5,615
Quarry perimeter	4,715	2,925	344	3,192	1,934	67,742
Existing residences (RP01) ⁽²⁾	149	123	59	152	92	5,144
Institutional buildings (I01) ⁽³⁾	144	120	57	151	91	5,127
Culturally sensitive area ⁽⁴⁾						
CHL25 (60 m from RCL)	316	278	157	185	112	5,818
CHL05 (150 m from RCL)	230	199	112	159	96	5,471
CHL14 (200 m from RCL)	189	160	100	156	94	5,302
CHL28 (240 m from RCL)	186	160	109	169	102	5,470
CHL02 (350 m from RCL)	190	155	91	154	93	5,313
Exceedance setback from RCL (m) ⁽⁵⁾	50–150	n/a	50–100	50–100	100–200	< 50
Exceedance setback from QCP (m) ⁽⁵⁾	500–700	n/a	100–200	500–2,000	500–2,000	100–200

Notes: Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold.

- (1) In order to demonstrate the impact of emission sources other than blasts at different setbacks along the WSR, receptors located in the area of influence of the ARA-2 quarry was not considered in determining the maximums at 50, 150 and 300 m.
- (2) Closest receptor of this category from the RCL at 1,350 m. Results for other receptors located further away are in **Appendix B**.
- (3) Closest receptor of this category from the RCL at 1,800 m.
- (4) Only the results for culturally sensitive receptors located within 400 m of the RCL are presented.
- (5) Qualifies the distance from the RCL and the quarry center point (QCP) where the standard including the background concentration is exceeded according to calculations.
- (6) Cautions must be taken with the results obtained with regard to CAAQS (refer to **Section 3.6.1.1**).

Table 3-19 (Cont'd): Maximum Concentrations in Areas of Interest For the Scenario with Tier 4 (80%) / Tier 3 (20%) Engines During the Construction Phase

Sector or Receptor	Acrolein		Benzene	Propanal	BaP	DPM
	AAQC	AAQC	AAQC	AAQC	AAQC	HC
	1-h	24-h	24-h	10-min	24-h	2-h
Limit value ($\mu\text{g}/\text{m}^3$)	4.5	0.40	2.3	10	0.000050	10
Project contribution ($\mu\text{g}/\text{m}^3$)						
50 m from road centerline ⁽¹⁾	4.4	1.5	4.4	8.6	0.00063	271
150 m from road centerline ⁽¹⁾	1.9	0.49	1.4	3.6	0.00020	116
300 m from road centerline ⁽¹⁾	1.0	0.27	0.79	2.0	0.00011	60
Quarry perimeter	1.7	0.58	1.7	3.3	0.00021	90
Existing residences (RP01) ⁽²⁾	0.27	0.063	0.18	0.52	0.000026	15
Institutional buildings (I01) ⁽³⁾	0.22	0.060	0.17	0.42	0.000025	12
Culturally sensitive areas ⁽⁴⁾						
CHL25 (60 m from RCL)	2.5	0.74	2.1	4.8	0.00030	147
CHL05 (150 m from RCL)	1.4	0.36	1.0	2.6	0.00015	83
CHL14 (200 m from RCL)	0.80	0.20	0.58	1.5	0.000082	44
CHL28 (240 m from RCL)	0.78	0.23	0.67	1.5	0.000095	45
CHL02 (350 m from RCL)	0.83	0.16	0.47	1.6	0.000067	50
Project contribution + background ($\mu\text{g}/\text{m}^3$)						
50 m from road centerline ⁽¹⁾	4.5	1.6	5.3	10.2	0.00075	271
150 m from road centerline ⁽¹⁾	1.9	0.53	2.31	5.2	0.00032	116
300 m from road centerline ⁽¹⁾	1.1	0.31	1.7	3.6	0.00023	60
Quarry perimeter	1.8	0.62	2.6	4.9	0.00033	90
Existing residences (RP01) ⁽²⁾	0.31	0.10	1.1	2.1	0.00015	15
Institutional buildings (I01) ⁽³⁾	0.26	0.10	1.1	2.0	0.00015	12
Culturally sensitive area ⁽⁴⁾						
CHL25 (60 m from RCL)	2.5	0.78	3.0	6.4	0.00042	147
CHL05 (150 m from RCL)	1.4	0.399	1.9	4.2	0.00027	83
CHL14 (200 m from RCL)	0.84	0.24	1.5	3.1	0.00020	44
CHL28 (240 m from RCL)	0.82	0.27	1.6	3.1	0.00022	45
CHL02 (350 m from RCL)	0.87	0.20	1.4	3.2	0.00019	50
Exceedance setback from RCL (m) ⁽⁵⁾	50–100	100–200	100–200	50–150	n/a	> 2,000
Exceedance setback from QCP (m) ⁽⁵⁾	< 100	150–250	100–200	< 100	n/a	> 2,000

Notes: Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold.

- (1) In order to demonstrate the impact of emission sources other than blasts at different setbacks along the WSR, receptors located in the area of influence of the ARA-2 quarry was not considered in determining the maximums at 50, 150 and 300 m.
- (2) Closest receptor of this category from the RCL at 1,350 m. Results for other receptors located further away are in **Appendix B**.
- (3) Closest receptor of this category from the RCL at 1,800 m.
- (4) Only the results for culturally sensitive receptors located within 400 m of the RCL are presented.
- (5) Qualifies the distance from the RCL and the quarry center point (QCP) where the standard including the background concentration is exceeded according to calculations.

Table 3-20: Maximum Particulate Concentrations and Dust Depositions in Areas of Interest For the Scenario with Water Dust Control on Road Surfaces During the Construction Phase

Sector or Receptor	TSP	PM ₁₀	PM _{2.5}		Dustfall	
	AAQC	AAQC	CAAQS ⁽⁵⁾	CAAQS ⁽⁵⁾	AAQC	AAQC
	24-h	24-h	24-h	Annual	30-days	Annual
Limit value (µg/m³)	120	50	23	8.0	7.0	4.6
Project contribution (µg/m³)						
50 m from road centerline ⁽¹⁾	16,211	5,752	1,141	1.5	10	3.8
150 m from road centerline ⁽¹⁾	2,610	1,283	189	0.49	5.0	1.1
300 m from road centerline ⁽¹⁾	1,102	672	96	0.35	2.5	0.64
Quarry perimeter	1,595	815	105	3.4	9.7	4.7
Existing residences (RP01) ⁽²⁾	140	141	24	0.061	0.24	0.048
Institutional buildings (I01) ⁽³⁾	135	130	20	0.052	0.20	0.040
Culturally sensitive areas ⁽⁴⁾						
CHL25 (60 m from RCL)	5,701	2,448	381	0.59	7.8	1.3
CHL05 (150 m from RCL)	1,828	934	146	0.45	3.3	0.82
CHL14 (200 m from RCL)	1,179	549	103	0.38	2.8	0.71
CHL28 (240 m from RCL)	1,068	587	88	0.20	1.7	0.24
CHL02 (350 m from RCL)	629	383	68	0.15	1.2	0.20
CHL06 (400 m from RCL)	601	406	75	0.20	1.3	0.25
Project contribution + background (µg/m³)						
50 m from road centerline ⁽¹⁾	16,256	5,780	1,154	6.2	10	4.2
150 m from road centerline ⁽¹⁾	2,655	1,311	201	5.2	5.4	1.5
300 m from road centerline ⁽¹⁾	1,147	700	108	5.0	2.9	1.0
Quarry perimeter	1,640	843	117	8.1	10	5.1
Existing residences (RP01) ⁽²⁾	185	169	37	4.8	0.64	0.45
Institutional buildings (I01) ⁽³⁾	180	158	33	4.8	0.60	0.44
Culturally sensitive area ⁽⁴⁾						
CHL25 (60 m from RCL)	5,746	2,476	394	5.3	8.2	1.7
CHL05 (150 m from RCL)	1,873	962	159	5.1	3.7	1.2
CHL14 (200 m from RCL)	1,224	577	116	5.1	3.2	1.1
CHL28 (240 m from RCL)	1,113	615	101	4.9	2.1	0.64
CHL02 (350 m from RCL)	674	411	80	4.8	1.6	0.60
CHL06 (400 m from RCL)	646	434	87	4.9	1.7	0.65

Notes: Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold.

- (1) In order to demonstrate the impact of emission sources other than blasts at different setbacks along the WSR, receptors located in the area of influence of the ARA-2 quarry was not considered in determining the maximums at 50, 150 and 300 m.
- (2) Closest receptor of this category from the RCL at 1,350 m. Results for other receptors located further away are in **Appendix B**.
- (3) Closest receptor of this category from the RCL at 1,800 m.
- (4) Only the results for culturally sensitive receptors located within 400 m of the RCL are presented.
- (5) Cautions must be taken with the results obtained with regard to CAAQS (refer to **Section 3.6.1.1**).

Table 3-21: Frequency of Exceedances of Applicable AAQC for Areas of Interest During the Construction Phase

Sector or Receptor	TSP	PM ₁₀	Dustfall
	AAQC	AAQC	AAQC
	24-h	24-h	30-days
Exceedance setback from RCL (m)	> 2,500	> 2,500	100–200
Exceedance setback from QCP (m)	> 2,500	> 2,500	100–200
Existing residences (RP01) ⁽¹⁾	35 (1.9%)	385 (21 %)	0
Institutional buildings (I01) ⁽²⁾	13 (0.7%)	330 (18%)	0
Culturally sensitive areas ⁽³⁾	1,044 (57%)	1,180 (65%)	0
CHL05 (150 m from RCL)	1,044 (57%)	1,144 (63%)	0
CHL14 (200 m from RCL)	1,020 (56%)	1,180 (65%)	0
CHL08 (280 m from RCL)	926 (51%)	1,115 (61%)	0
CHL06 (400 m from RCL)	511 (28%)	771 (42%)	0

Notes:

The values represent the number of days or months for dustfall (or the percentage of the time in parenthesis) for which the calculated concentration exceeded the AAQC based on the 5-years meteorological dataset.

- (1) Closest receptor of this category from the RCL at 1,350 m.
- (2) Closest receptor of this category from the RCL at 1,800 m.
- (3) Maximum results obtained at any CHL receptors.

3.6.5 Eastern Section of the WSR

As described in **Section 2.3**, a high-density receptor grid was applied in the western segment to characterize maximum near-corridor effects. The focus of the assessment and modelling on this area was due to the proximity of Webequie and the fact that a majority of culturally sensitive areas and land uses (including fishing areas, country-food) are located in this portion of the study area for the Project. That said, there is a culturally sensitive area in the east part of the road that is not covered in the modelling domain (at about chainage 70-71 km from Webequie corresponding to a hunting area at 1,000 m from the WSR at its closest location). Based on calculated results, TSP (24-h), PM₁₀ (24-h), PM_{2.5} (24-h) and DPM (2-h) concentrations can potentially exceed the respective AAQC (or guiding value from HC) at this distance (1,000 m) from the RCL based on the emission scenarios applied for the construction phase. Otherwise, the contribution of the Project on other CACs, toxic contaminants and dust deposition will not create issues for this particular culturally sensitive area since the impact of road construction activities are expected to be of similar nature along the way albeit most likely some differences with regard to planning of activities along the way to the east terminus of the road.

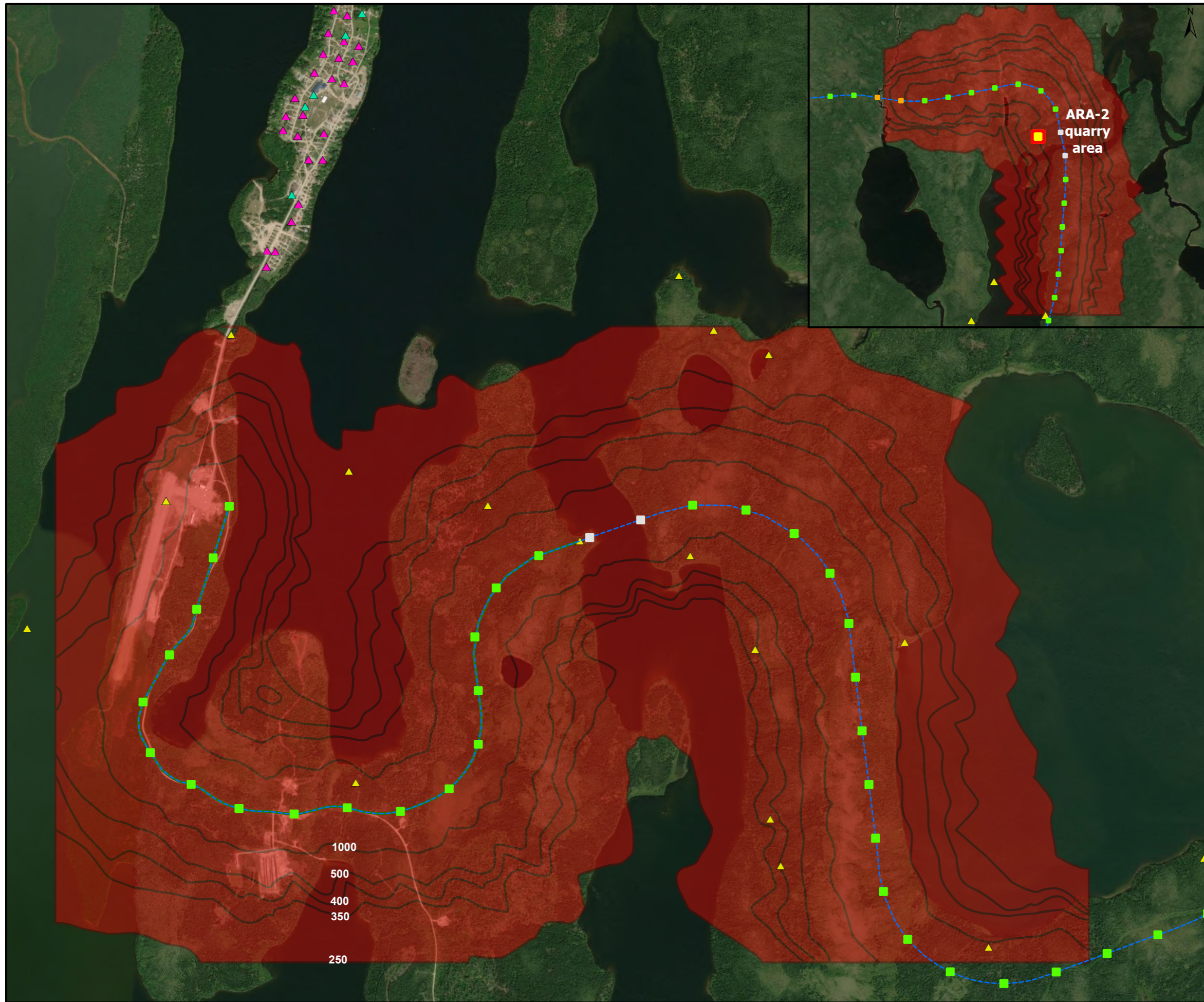
3.6.6 Ground-Level Ozone

Construction activities are not anticipated to emit ozone (O₃) but could still have the potential to add ground-level O₃ in air given that NO_x and VOCs, which are the precursors to O₃ along with sunlight, will be emitted by engines. CAAQS and AAQC exists for O₃ (60 ppb (8-hour average) and 80 ppb (1-hour average), respectively) and therefore, it should be examined if the Project could cause air quality problems on that respect. The Baseline Report on air quality established the background O₃ concentration at 28 ppb (or 58% of the 8-h AAQC) whereas the maximum (or rather 90th percentile) hourly concentration was set to 41 ppb (80 µg/m³) in **Section 2.6**.

According to the Empirical Kinetic Modelling Approach (EKMA) of the US EPA (1983), O₃ formation depends greatly on the relative concentration of VOCs (as carbon content; in ppmC) and NO_x (NO + NO₂ in ppm) in air. It suggests that in the absence of large transport of O₃ in the region, a VOC/NO_x concentration ratio of about 8:1 would be optimal for generating O₃ in air. A ratio that is much lower or much higher than this value should not generate O₃, or at least in non-negligible amount (aka VOC-limited and NO_x-limited formation). When calculating the ratio of the sum of all 1-hour THC (which is a surrogate to VOC) emission rates with the sum of all 1-hour NO_x emission rates from off-road equipment and vehicles, a VOC/NO_x ratio lower than 0.1 is obtained. Although all emissions obviously do not occur at the same location together, it outlines the relative input of VOCs and NO_x into the atmosphere from the Project's perspective.

Also, being in a remote area, the background NO_x and VOC concentrations in air are already low and not favourable to O₃ formation. For example, in **Section 2.5**, the background concentration for NO₂ was established at 1.4 ppb. When adding all studied VOCs, the background concentration is less than 7 ppbC, although it could be higher since not all potential VOCs in air were studied. Collectively, it is predicted that construction activities will not create conditions that would increase the ground-level O₃ concentration in ambient air or if it becomes the case, it would be short-lived since the emissions will be diluted in time and space along the road.



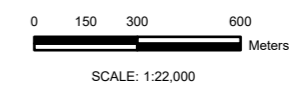


- Legend**
- Emission Sources**
- A6/B1: Filling material trucking (Web to WB1)
 - - - A7/B2: Aggregates trucking (Web to access road)
 - A2/B4: Aggregates production
 - A8/B5: Bedrock blasts
 - A3/B3: Road construction machinery
 - A5: Bridge construction
 - A1: Clearing and grubbing
- Sensitive Receptors**
- ▲ Existing Residences
 - ▲ Institutions
 - ▲ Culturally Sensitive Area
- Results – Project contribution including background concentration**
- Maximum calculated concentration(µg/m³) exceeding the AAQC
 - AAQC limit value: 120 (µg/m³)
 - Background concentration: 45 (µg/m³)

Webequie Supply Road (WSR)

Maximum total daily TSP concentrations (µg/m³)
calculated in air during the construction phase

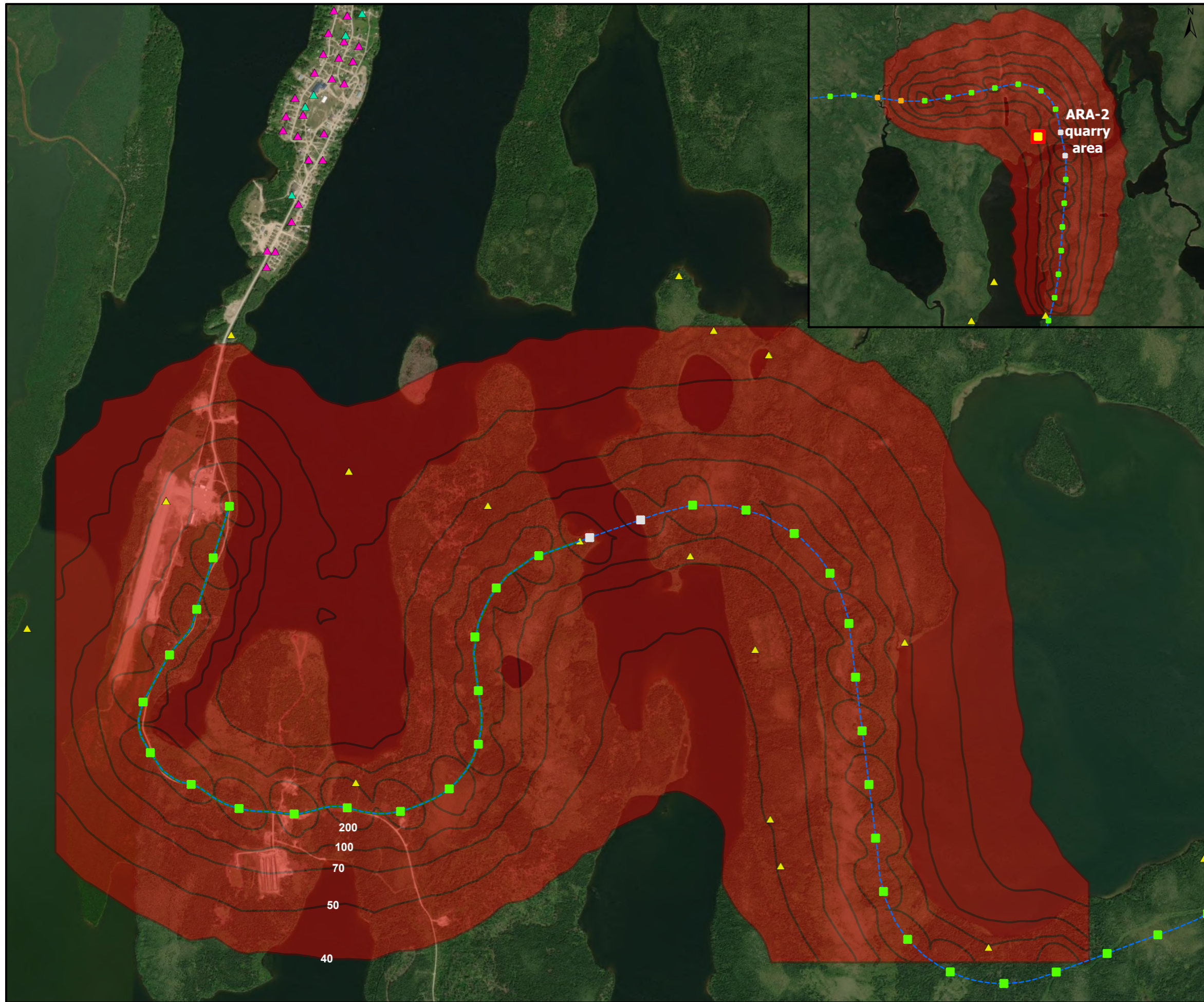
Figure Number:	3.2	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC			DRN
			CHK
			APP
			AD
			TE
			SP



- NOTES**
1. Coordinate System: NAD 1983 UTM Zone 16N.
 2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
 3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date : 2021-02-04

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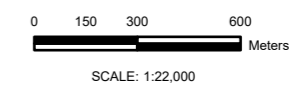


- Legend**
- Emission Sources**
- A6/B1: Filling material trucking (Web to WB1)
 - - - A7/B2: Aggregates trucking (Web to access road)
 - A2/B4: Aggregates production
 - ▲ A8/B5: Bedrock blasts
 - A3/B3: Road construction machinery
 - A5: Bridge construction
 - A1: Clearing and grubbing
- Sensitive Receptors**
- ▲ Existing Residences
 - ▲ Institutions
 - ▲ Culturally Sensitive Area
- Results – Project contribution including background concentration**
- Maximum calculated concentration (µg/m³) exceeding the CAAQS
CAAQS limit value (2030): 23 (µg/m³)
Background concentration: 13 (µg/m³)

Webequie Supply Road (WSR)

Total annual 98th percentile of daily 24-hr average PM_{2.5} concentrations (µg/m³) calculated in air during the construction phase for comparison with the CAAQS

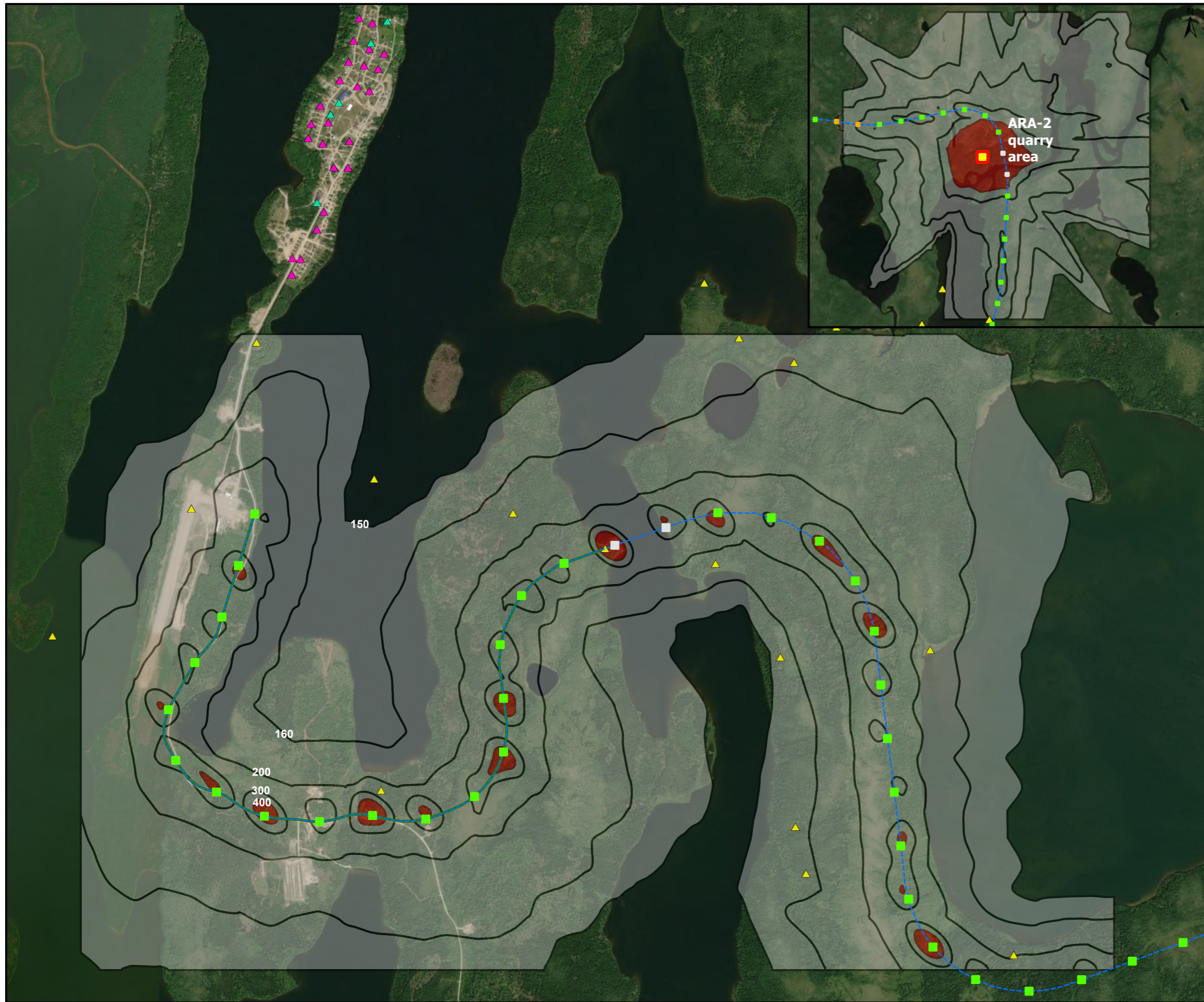
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Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC		DRN	CHK
		AD	TE
		APP	SP



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Legend

Emission Sources

- A6/B1: Filling material trucking (Web to WB1)
- - - A7/B2: Aggregates trucking (Web to access road)
- A2/B4: Aggregates production
- A8/B5: Bedrock blasts
- A3/B3: Road construction machinery
- A5: Bridge construction
- A1: Clearing and grubbing

Sensitive Receptors

- ▲ Existing Residences
- ▲ Institutions
- ▲ Culturally Sensitive Area

Results – Project contribution including background concentration

- Maximum calculated concentration (µg/m³)
- Maximum calculated concentration (µg/m³) exceeding the AAQC

AAQC limit value: 400 (µg/m³)
Background concentration: 51 (µg/m³)

Webequie Supply Road (WSR)

Maximum total hourly NO₂ concentrations (µg/m³)
calculated in air during the construction phase

Figure Number:	3.4	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC			DRN
			CHK
			APP
			AD
			TE
			SP

0 150 300 600 Meters

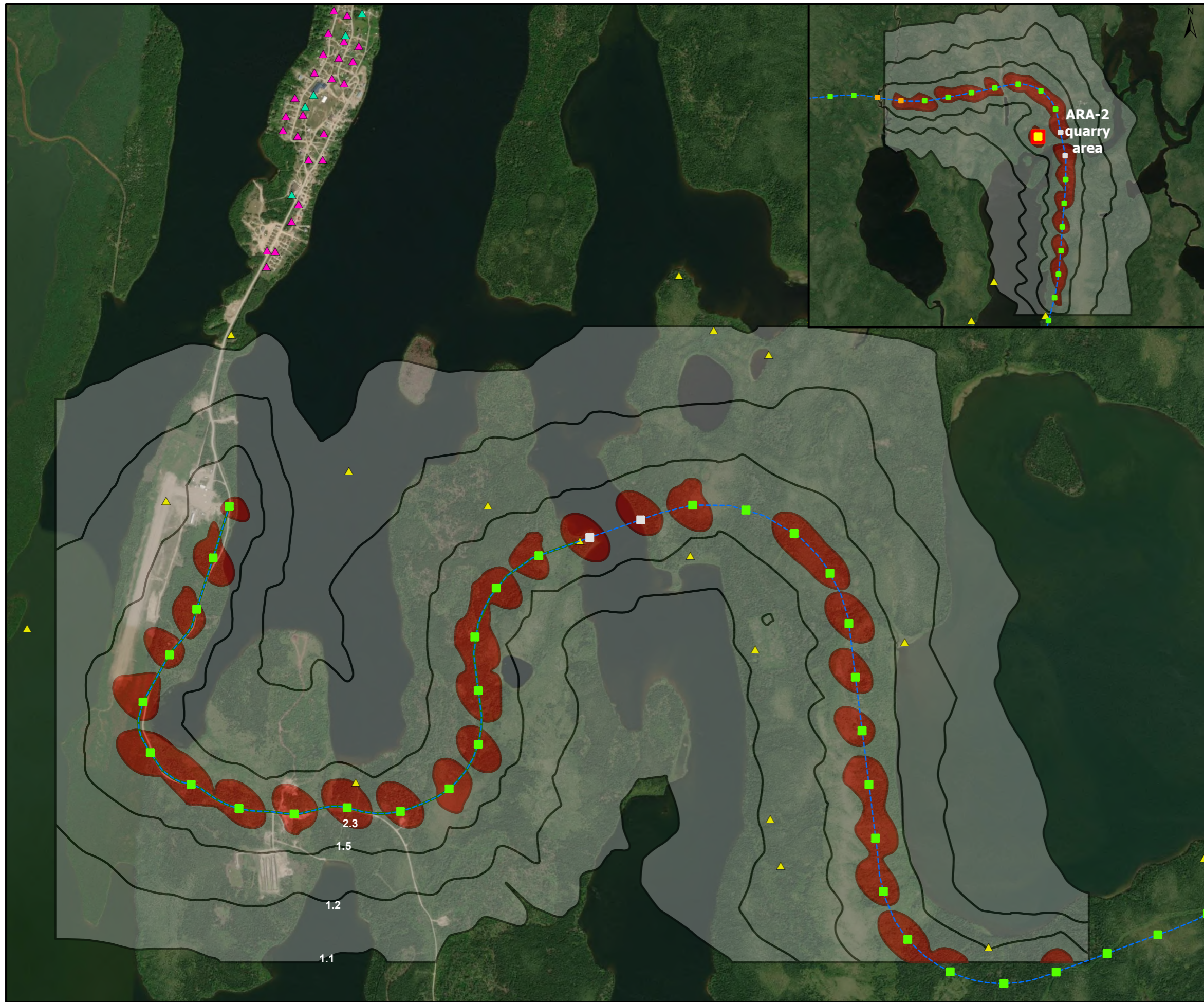
SCALE: 1:22,000

NOTES

- Coordinate System: NAD 1983 UTM Zone 16N.
- Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
- Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geo.hub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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Legend

Emission Sources

- A6/B1: Filling material trucking (Web to WB1)
- - - A7/B2: Aggregates trucking (Web to access road)
- A2/B4: Aggregates production
- A8/B5: Bedrock blasts
- A3/B3: Road construction machinery
- A5: Bridge construction
- A1: Clearing and grubbing

Sensitive Receptors

- ▲ Existing Residences
- ▲ Institutions
- ▲ Culturally Sensitive Area

Results – Project contribution including background concentration

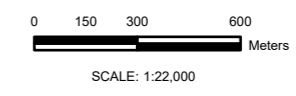
- Maximum calculated concentration ($\mu\text{g}/\text{m}^3$)
- Maximum calculated concentration ($\mu\text{g}/\text{m}^3$) exceeding the AAQC

AAQC limit value: $2.3 \mu\text{g}/\text{m}^3$
Background concentration: $0.9 \mu\text{g}/\text{m}^3$

Webequie Supply Road (WSR)

Maximum daily benzene concentrations ($\mu\text{g}/\text{m}^3$)
calculated in air during the construction phase

Figure Number:	3.5	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC		DRN	CHK
		AD	TE
		APP	SP

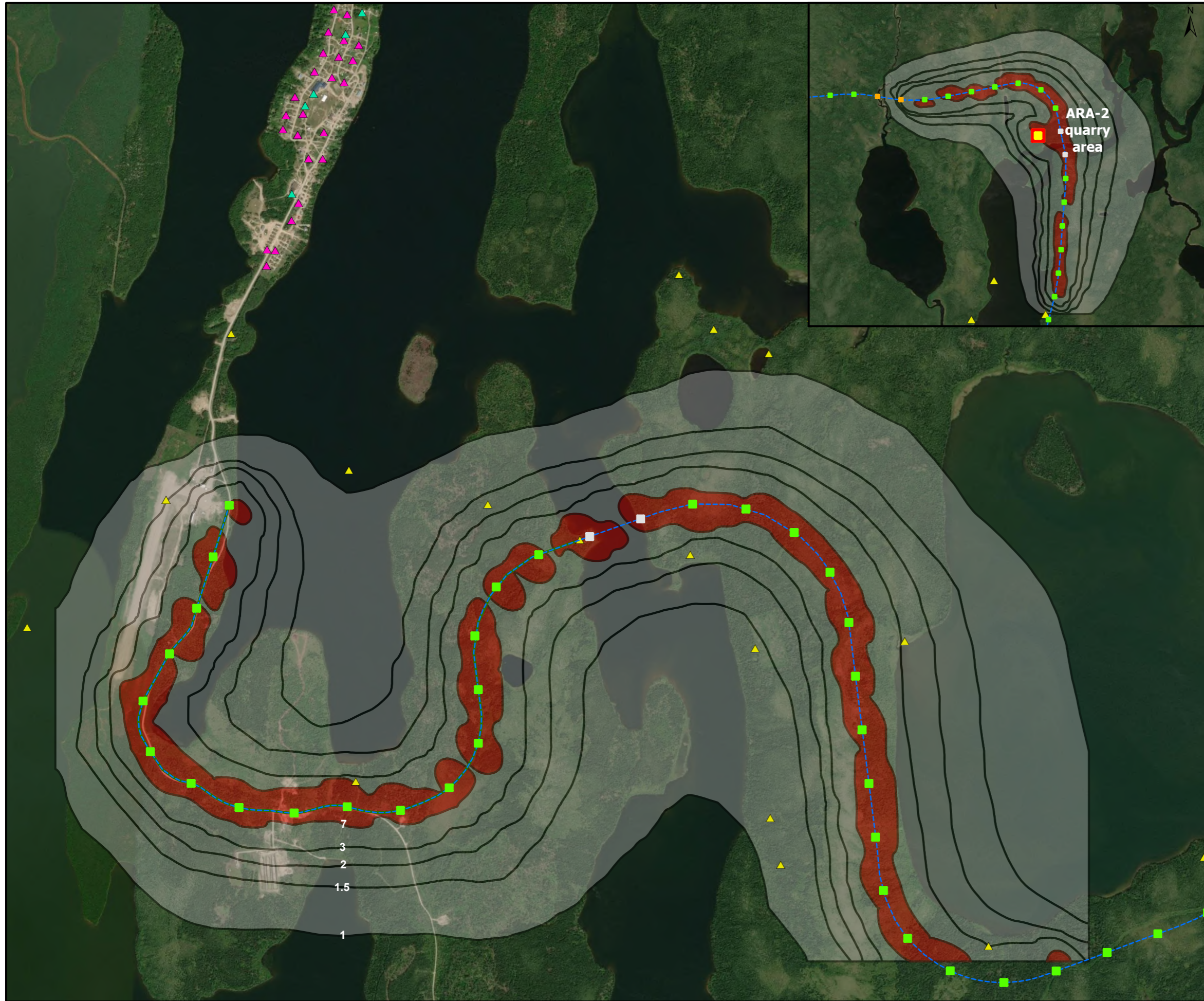


NOTES

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3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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Legend

Emission Sources

- A6/B1: Filling material trucking (Web to WB1)
- - - A7/B2: Aggregates trucking (Web to access road)
- A2/B4: Aggregates production
- A8/B5: Bedrock blasts
- A3/B3: Road construction machinery
- A5: Bridge construction
- A1: Clearing and grubbing

Sensitive Receptors

- ▲ Existing Residences
- ▲ Institutions
- ▲ Culturally Sensitive Area

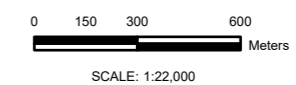
Results – Project contribution including background deposition

- Maximum dust deposition (g/m²)
- Maximum dust deposition (g/m²) exceeding the AAQC
AAQC limit value: 7 g/m²
Background concentration: 0.4 g/m²

Webequie Supply Road (WSR)

Maximum total dustfall over 30 days (g/m²/30 days)
calculated on ground during the construction phase

Figure Number:	3.6	REV	PA	
Client:	Webequie First Nation	Project Number:	661910	Date:
			1/22/2026	
DSC			DRN	CHK
			AD	SP



NOTES

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3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date : 2021-02-04

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4 Operation Phase

The operation phase of the WSR includes the vehicular traffic on the road as well as maintenance activities during the period generating both exhaust gas emissions and fugitive dust emissions. A permanent MSF will be erected near the WSR with the purpose of storing the equipment and materials used for inspection, maintenance, and repair activities. Activities occurring at the MSF will mainly include equipment maintenance and repair mostly inside garages. Otherwise, the maintenance team will regularly conduct inspections and maintenance work to ensure the road meets the minimum operational standards for roadside safety. Such activities will mainly include:

- Visual patrols and inspections of the road;
- Vegetation management (mowing, brush removal);
- Repair and/or rehabilitation of culverts and bridges at water crossings;
- Repair to road surface and shoulders;
- Dust control, if required;
- Road drainage system maintenance and repairs;
- Access road maintenance;
- Snow clearing;
- Spills and emergency response; and
- Waste and excess materials management.

4.1 Modelled Emission Sources

The emission sources include the regular daily passages of vehicles mainly from Webequie (less than 500 vehicles) to the eastern terminus of the road where proposed mineral exploration and developments are located and the proposed planned Northern Road Link to the south will connect with the WSR. In addition to vehicular traffic from and to Webequie, the types of vehicles using the road will also include heavy-duty trucks that will be used as part of maintenance activities like visual patrols, snow clearing, and aggregate hauling as part of road repairs. Although the road is expected to be surfaced with asphalt or chipseal, the emission scenario first considers an aggregate/gravel-surface as it is expected that part of the road will not be fully surfaced from the start (refer to **Section 1.1**). As a result, a second source is modelled to capture grading and maintenance activities along the road, and associated air quality concerns. This represents a conservative approach with regard to dust emissions. The application of asphalt or chip seal would obviously result in lower TSP, PM₁₀ and PM_{2.5} concentrations in air and dustfall on the ground in the immediate area of the road.

Other air emission sources associated with isolated road maintenance activities such as brush and vegetation removal/control within the ROW, and specific road, culvert, and bridge repairs requiring an excavator, a tractor, and a couple of graders for snow clearing are excluded considering that these activities are unspecific to a single location and will occur infrequently. Other emission sources that are excluded include the following:

- Diesel generator set(s) that will be installed at the MSF; however, the size and location are unknown at this time. The MSF is expected (although not confirmed) to be built near rehabilitated ARA-2 quarry adjacent to an area with no nearby sensitive receptors.
- Crushing and screening activities will occur at the ARA-4 quarry during a typical year but for a short period of time. The ARA-4 quarry is located at more than 2,500 m from the closest culturally sensitive area (refer to **Figure 1.2**).



4.2 Air Dispersion Modelling Approach

The emission scenario is composed of a linear volume source within the modelling domain between Webequie and the intersection of the WSR with ARA-4 quarry access road. Although emissions will also occur on the eastern part of the WSR, the concentration profile from road center will be of similar nature. The exhaust gas from vehicles and the fugitive dust emissions from the road and grading activities were combined together in a single source for simplification using the same emissions parameters.

In contrast with construction, operational emissions are driven primarily by traffic on the road surface and periodic maintenance. This section evaluates these conditions under unpaved with water control and paved surface (chip seal or asphalt) scenarios to clarify how surface type governs residual particulate effects near the road centerline.

4.3 Emission Rate Calculations

4.3.1 Vehicular Traffic (road engines)

Considering the low population density and the intended purpose of the WSR, a daily traffic of less than 500 vehicles is projected. It is expected that traffic will comprise primarily of light to medium personal vehicles, but also commercial vehicles and heavier trucks carrying industrial (mining) supplies. This category also includes the road maintenance vehicles. The WSR traffic operations will not include mineral ore or mine product hauling/transport. That said, the distribution per vehicle category (light vehicles, light trucks, and heavy trucks using either gasoline or diesel) is unspecified.

Table 4-1 provides an overview of parameters used to estimate the travelling distances expected from vehicles. Other than a maximum daily traffic of 500, the monthly and annual number of passages are based on an average daily traffic volume of 350 vehicles that will occur mainly during daytime.

Table 4-1: Vehicular Traffic Scenario Considered in the Model

Source ID - Activity	Modelled Emission Period	Road Length (km)	Number of passages per averaging period			
			Max 1-hour	Max 24-hour	Max 1-month	Annual
C1 – Vehicular traffic	January–December (6h to 20h)	40.6	54	500	10 646	127 750

Total distances are combined with CACs emission factors (TSP, NO_x, CO, SO₂, THC) applicable to on-road vehicles (g/km). They were obtained from the US BTS (2025) compiling average emission factors according to the MOVES5 model by vehicle type and year of operation. The emission factors presented in **Table 4-2** corresponds to a weighted average of the US BTS emission factors considering a fleet of diesel heavy-duty vehicles (50%), diesel light-duty trucks (25%), and gasoline light-duty trucks (25%). The US BTS emission factors for 2025 are used representing conservative values since the Project will start operate at a later year and that exhaust gas emission factors tend to decrease over time. The emission factors for the other contaminants covered in this assessment were obtained as follow:

- PM₁₀: Equivalent to TSP
- PM_{2.5}: Equivalent to 92% of TSP
- DPM: Equivalent to PM_{2.5}
- SO₂: Estimated based on the energy consumption efficiency provided in US BTS (2025) for the year 2025 using fuel containing 15 ppm of sulphur.

- VOCs: Calculated based on the THC emission factor multiplied by the fraction of the COV in THC. The fractions were inferred from data for vehicles constructed in 2017+ (ratio of contaminant in total VOCs) and a ratio of 1.285 COV/THC from US EPA (2020) technical document “Air Toxic Emissions from On-Road Vehicles in MOVES3”.
- B[a]P: Calculated based on the PM_{2.5} emission factor multiplied by the fraction of B[a]P in PM_{2.5} which is inferred from data for vehicles construction in 2017+ (ratio of PAH in PM_{2.5}) from US EPA (2020) technical document “Air Toxic Emissions from On-Road Vehicles in MOVES3”.

Table 4-2: Emission Factors for Vehicles Exhaust Gases

Contaminant	Applied Emission Factor (g/km)	Contaminant	Applied Emission Factor (g/km)
Total suspended particulates (TSP)	0.029	1,3-butidene	0.0010 x THC
Nitrogen oxides (NOx)	1.2	Acetaldehyde	0.089 x THC
Carbon monoxide (CO)	1.6	Acrolein	0.013 x THC
Total hydrocarbons (THC)	0.14	Benzene	0.017 x THC
Sulphur dioxide (SO ₂)	0.0054	Ethylbenzene	0.014 x THC
Fine particulate matter (PM ₁₀)	TSP	Formaldehyde	0.28 x THC
Fine particulate matter (PM _{2.5})	0.92 x TSP	Isooctane	0.0010 x THC
Diesel particulate matter (DPM)	0.92 x TSP	n-hexane	0.0069 x THC
Benzo(a)pyrene (B[a]P)	3.3 x 10 ⁻⁶ x PM _{2.5}	Propanal	0.040 x THC
		Toluene	0.039 x THC
		Xylenes	0.11 x THC

Table 4-2 emission factors provided by the US BTS based on MOVES are representative of engines operating in warm conditions (20–25 °C). It is however documented that colder temperatures, most notably below the freezing point, generate higher emissions from engines in general. Considering that the region can experience very cold weather especially during winter, variable correction factors were developed on a monthly basis (**Table 4-3**) to account for this phenomenon. The variable correction factors are differentiated per contaminant and per exposure period associated with the AAQC or CAAQS. For instance, the model considers an effective NO_x emission factor of 3.2 g/km for January (1.2 g/km x 2.7) to calculate 1-h and 24-hour NO₂ concentrations while for July, it uses 1.3 g/km (1.2 g/km x 1.1). The factors were determined as follow:

- A technical study from Choi et al. (2011) describes a temperature sensitivity analysis on MOVES results from which they presented percentage changes in emissions for a wide range of temperature (-40 to 50°C or -40 to 120°F) depending on the vehicles construction year and fuel type. The study presented figures for NO_x, CO, THC and PM_{2.5} which percentage change evolve differently with temperature. Data from the figures were extracted for vehicles constructed in 2020 (**Appendix A**).
- Specific to contaminants with a standard for short exposures (24 hours or less), the minimum hourly temperature for each month was extracted from the meteorological database used for dispersion modeling. For long-term exposure, the average temperature for the given month over five years was calculated. These temperatures were used to estimate a percentage change of emissions compared to standard temperature (20–25 °C or 68–77°F) from which the emission factors in **Table 4-2** were developed.
- For a given temperature, percentage changes were extracted for each vehicle category (diesel heavy-duty, diesel light-duty and gasoline light-duty) and converted into a single percentage change based on a weighted average based on the emission factors for each of these vehicle categories. The single percentage change was then converted into a correction factor (i.e., for a percentage change of +50%, the correction factor corresponds to 1.5).

Table 4-3: Monthly Variable Correction Factors Per Contaminant Category

Month	Ambient Temperature (°C)		Exposure period ≤ 24-h				Exposure period > 24-h			
	Minimum ⁽¹⁾	Average ⁽²⁾	PM ⁽³⁾	NOx	CO	THC ⁽⁴⁾	PM ⁽³⁾	NOx	CO	THC ⁽⁴⁾
January	-46	-19	2.8	2.7	1.3	2.5	1.8	1.7	1.2	1.3
February	-40	-19	2.8	2.7	1.3	2.5	1.9	1.8	1.3	1.4
March	-31	-6	2.3	2.2	1.3	1.8	1.5	1.3	1.2	1.1
April	-25	1	2.1	1.9	1.3	1.6	1.3	1.2	1.2	1.0
May	-12	20	1.6	1.5	1.2	1.2	1.0	1.0	1.0	1.0
June	1	17	1.3	1.2	1.2	1.0	1.1	1.0	1.1	1.0
July	3	19	1.3	1.1	1.2	1.0	1.1	1.0	1.0	1.0
August	5	17	1.2	1.1	1.2	1.0	1.1	1.0	1.1	1.0
September	0	12	1.3	1.2	1.2	1.1	1.1	1.0	1.1	1.0
October	-13	4	1.7	1.5	1.2	1.2	1.2	1.1	1.2	1.0
November	-22	-6	2.0	1.8	1.3	1.5	1.5	1.3	1.2	1.1
December	-36	-14	2.6	2.5	1.3	2.1	1.7	1.6	1.2	1.3

Notes:

- (1) Corresponds to the lowest hourly temperature during the month from the 5-year meteorological dataset used for dispersion modeling.
- (2) Corresponds to the average of hourly temperatures during the month from the 5-year meteorological dataset used for dispersion modeling.
- (3) Applies to all particulate matter sizes (TSP, PM₁₀, PM_{2.5}, DPM) as well as B[a]P (being mostly in particulate form).
- (4) Applies to all VOCs.

4.3.2 Vehicular Traffic Dust Emissions

The US EPA AP-42 Emission Factors Compendium Series for unpaved roads (US EPA, 2006a) provides two equations to estimate dust emissions from the passage of vehicles; one for industrial roads mostly used by heavy-duty trucks; and another for publicly accessible roads which usually see a larger proportion of light-duty vehicles like automobiles and pickup trucks. Although the WSR will become a publicly accessible road, the associated US EPA equation was not developed specifically for the passage of heavy vehicles. Knowing that the WSR will see a large share of heavy-duty trucks, it is likely that this equation will generate under-estimated emission rates. Considering this, the emission factors for TSP, PM₁₀ and PM_{2.5} were instead developed using the average of emission factors from industrial roads (refer to **Section 3.3.3**; more applicable to heavy trucks) and unpaved public roads (**Equation 4-1**; more applicable to light-duty vehicles).

$$EF = 281,9 \times k \times \left(\frac{S}{12}\right)^a \times \left(\frac{V}{3}\right)^b \times \left(\frac{M}{0,5}\right)^{-c} \times (1 - CF) \tag{4-1}$$

- EF: particulate matter emission factor (g/km)
- k, a, b, c: granulometric factors for TSP, PM₁₀ or PM_{2.5}
- S: silt content on road surface (%)
- V: vehicle speed (mph)
- M: road surface moisture content (%)
- CF: dust emissions control factor (%)

Road silt (fine fraction < 75 µm) is set to 6.0% which represents 60% of the maximum allowed fraction of fine aggregates in freshly crushed Granular A from quarried materials composing the road surface. Vehicle speed and road surface moisture are set to 50 mph (80 km/h) and 1.5%, respectively, the latter due to the fact that aggregates usually contain small amounts of moisture (1 to 2%) in dry conditions. The average truck weight (needed in **Equation 3-2; Section 3.3.3**) is set to 20 tons considering a tare weight of 15 tons for heavy-duty trucks (typical maximum) and an average payload of 5 tons.

Dust control with water trucks will be carried out by WSR maintenance crews. The applied control factors were derived according to Environment and Climate Change Canada (ECCC, 2024) “Road dust emissions from unpaved surfaces: Guide to reporting” which considers overall control factors on a monthly and annual basis adjusted according to the number of days with precipitations greater than 0.2 mm and/or the number of days with frozen road surfaces. For both instances, 100% dust emissions control is considered by default.

Table 4-4 summarizes the control factors (CF) per month and exposure period considering that precipitations and freezing conditions vary according to the time of year. For dry days, the control factors without the use of water trucks are set to 0% during warmer months and 70% during cold months. It appears that freezing days occur the majority of the time between December and March (90% of the time in average) and it can be reasonably assumed that the unpaved road surface would remain mostly frozen during that period. A CF value of 70% therefore appears to be a good compromise between 0% control during dry unfrozen days and 100% control during dry frozen days according to ECCC approach.

For the scenario with dust control using water trucks, a minimum control factor of 30% is applied considering the long distances to travel on the WSR by the water truck on a given day which may reduce its efficiency by half (as a hypothesis). The fugitive dust emission rates (TSP, PM₁₀ and PM_{2.5}) were then derived from the emission factors (g/km) as explained above and the total distance travelled by trucks according to averaging period (**Table 4-1**).

4.3.2.1 Scenario with Paved Surface

A third scenario was prepared representing dust emissions from paved surfaces as the WSR is expected to be surfaced with asphalt or chip seal at some point. The equation provided in the US EPA AP-42 Emission Factors Compendium Series for paved roads (US EPA, 2011) was employed to calculate relevant emission factors.

$$EF = 281,9 \times k \times S^{0.91} \times W^{1.02} \tag{4-2}$$

- EF: particulate matter emission factor (g/km)
- k: granulometric factors for TSP, PM₁₀ or PM_{2.5}
- S: silt content on road surface (g/m²)
- W: vehicle weight (tons)

A silt loading of 2.4 g/m² is applied which is equivalent to the silt loading suggested by the US EPA for low traffic roads (0.6 g/m²) times 4 during winter due to the presence of antiskid abrasives. Given the road's remoteness, this silt loading is applied throughout the year (not only during winter time) to obtain more conservative results. No additional silt loading due to mud/dirt track out on the road or mitigation due to precipitations are considered. An average vehicle weight of 12 tons is applied based on the following considerations: half the vehicles are supposed to be light-duty with a maximum weight of 4 tons (representative of large pick-up trucks) while the other half is considered to be heavy-duty trucks (tare weight of 15 tons) transporting a payload of 5 tons in average.

The fugitive dust emission rates (TSP, PM₁₀ and PM_{2.5}) were then derived from the emission factors (g/km) as explained above and the total distance travelled by trucks according to averaging period (**Table 4-1**).



Table 4-4: Dust Emissions Control Factors (CF) Per Month

Month	Wet Days (>0.2 mm) ⁽¹⁾	Days with max temperature below freezing point ⁽¹⁾	Exposure period ≤ 24-hour ⁽²⁾		Monthly / annual ⁽³⁾	
			No control	Water trucks	No control	Water trucks
January	15%	97%	70%	70%	75%	75%
February	22%	97%	70%	70%	77%	77%
March	19%	72%	70%	70%	76%	76%
April	21%	31%	0%	30%	21%	44%
May	7%	3%	0%	30%	7%	35%
June	29%	0%	0%	30%	29%	51%
July	12%	0%	0%	30%	12%	39%
August	25%	0%	0%	30%	25%	47%
September	40%	0%	0%	30%	40%	58%
October	35%	10%	0%	30%	35%	55%
November	23%	77%	0%	30%	23%	46%
December	4%	92%	70%	70%	71%	71%

Notes:

- (1) According to available (non missing) data from the 5-years meteorological dataset used for dispersion modelling.
- (2) Represent the control level expected during dry days.
- (3) Calculated using the control percentage for dry days x by the percentage of time of dry days + the percentage of time of wet days.

4.3.3 Grading Dust Emissions

It is expected that graders will be used for regular road maintenance during a typical year generating dust emissions from their blades. The same calculation approach as described in **Section 3.3.6** applies. A grading speed of 9.5 mph (15 km/h) is selected which typically represents a maximum when doing road maintenance with the blade always on the ground (T = 1). The resulting emission factors are then multiplied by the distance travelled which is also based on grading speed. **Table 4-5** finally presents the emission rate weights applied to the emission factor depending on averaging period.

Table 4-5: Emission Rates Weighting per Averaging Period for Graders during Operation Phase

Source ID - Activity	Modelled Emission Period	Averaging Period	Emission Rate Weighting	Hypothesis
D1 – Road Dust Emissions	January – December (6h to 20h)	Max 24-hour	86%	Assuming operation during a full day with the exception of breaks (2 h / 14h).
		Max 1-month	5.7%	Maximum of two days of grading per month (86% x 2/30).
		Annual	4.1%	Assuming one day of grading every three (3) weeks or so (86% x 1/21).



4.4 Emission Parameters Summary

Table 4-6 and **Table 4-7** summarize the emission sources included in the model for the operation phase of the Project. It provides an overview of emission parameters and emission rates for NO_x (exhaust gas) and TSP (fugitive dust) applicable to 1-hour, 24-hour, 30-day, and annual averaging periods, where applicable. The emission rates for the other contaminants and other parameters that needs to be specified in the model are available in the summary section of **Appendix A**. The parameters used for dry depletion on fugitive dust TSP are provided in **Table 4-8**.

Table 4-6: Summary of Exhaust Gas Emission Sources for the Operation Phase

Source Description		Source Type	Location	Key Emission Parameters	Modelled Emission Period	NO _x Emission Rates (g/s) ⁽¹⁾		
ID	Activities					1-h	24-h	An
C1	Vehicular traffic	Line volume	From Webequie to WSR access road	Plume height: 4.3 m Plume width: 14 m	Jan – Dec (6h – 20h)	0.72	0.48	0.33

Note:

(1) The emission rates for other contaminants are available in the Summary of **Appendix A**.

Table 4-7: Summary of Fugitive Dust Emission Sources for the Operation Phase

Source Description		Source Type	Location	Key Emission Parameters	Modelled Emission Period	TSP Emission Rates (g/s) ^{(1) (2)}		
ID	Activities					24-h	30-d	An
C1	Vehicular traffic and grading	Line volume	From Webequie to WSR access road	Plume height: 3.5 m Plume width: 14 m	Jan – Dec (6h – 20h)	556	382	382

Note:

(1) The emission rate relates to the base scenario without dust control with the water truck.

(2) The emission rates for other contaminants are available in the Summary of **Appendix A**.

Table 4-8: Dry Depletion Parameters Applied for Dustfall and TSP Concentration Simulations

Particulate Classes and Average Diameter (µm)	< 2.5	2.5 – 10	10 – 15	> 10	> 15	Density (g/cm ³)
	1.25	6.25	12.5	20	22.5	
Source	Relative proportion					
C1	0.03	0.26	—	0.71	—	2.5

4.5 Mitigation Measures

While direct control on emissions from vehicle engines is not possible dust emissions from the road surface can be effectively managed. Considering that part of the road will not be fully surfaced with asphalt or chip seal from the start, the maintenance crew will have available a water truck that will spray water over the gravel-surface road from April to November, when needed. As a result, the emission scenario described above was modelled first without and then with this control measure in place. The applicable control factors were developed in **Section 4.3**. When the road surface will be fully surfaced with asphalt or chipseal, it will result in much lower TSP, PM₁₀ and PM_{2.5} concentrations in air and dustfall on the ground in the immediate area of the road. The impact of flexible pavements on particulate emissions was also modeled accordingly.

As mentioned in **Section 4.1**, mobile equipment that will be used by the maintenance crew for specific road, culvert and bridge repairs was excluded from dispersion modelling since these activities are unspecific to a single location and will occur infrequently. Moreover, these units that should include, according to current projections, two excavators, two rubber tire loaders, two tractors, and three graders will be purchased as new and will be certified Tier 4F which greatly limits NOx, VOCs and fine particulate emissions from exhaust pipes.

4.6 Air Dispersion Modelling Results

Air dispersion modelling results for the operation phase are presented in **Table 4-9** and **Table 4-10** for all studied contaminants and in isocontour maps for contaminants which are significantly impacted by the Project relative to applicable AAQC or CAAQS. The tables present the maximum concentration calculated in air (or on ground for dustfall) anywhere along the WSR at 50 m on either side of the road centerline (RCL) based on the 5-year meteorological dataset. They also provide the results with the background concentration, as determined in **Section 2.5**. Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold. **Table 4-10** provides the results specifically for particulate emissions based on the three scenarios described in **Section 4.3**: unpaved surface without control including grading activities; unpaved surface with water control including grading activities; and paved surface.

The results presented in **Table 4-11** (for the scenario using unpaved surface with water control) and **Table 4-12** (for the scenario using paved surface) focus on maximum concentrations calculated at sensitive receptors for contaminants which are meaningfully impacted by the Project according to **Table 4-9** and **Table 4-10** (>10% of applicable standard at 50 m of the RCL). Given the large number of sensitive receptors, only those which are closest to the RCL are presented in **Table 4-11** and **Table 4-12** as an example of worst-case impacts. It includes existing residences, institutional buildings, culturally sensitive areas, and future residence plots. The results for the other receptors which are lower than the ones presented in **Table 4-11** and **Table 4-12** are available in **Appendix B** for reference.

Because the road extends over a large distance, applying a high-density receptor grid along its full length would be computationally challenging and unnecessary for assessing potential effects at sensitive locations. Accordingly, isocontour plots were developed for the western segment of the road, from Webequie to east of Bender Lake, where sensitive receptors are clustered. The model was re-run using a denser receptor configuration in this area to illustrate the spatial distribution of total contaminant concentrations (project contribution + background) relative to the RCL.

4.6.1 Particulates

Daily vehicular traffic and maintenance grading activities on the road will generate dust emissions mostly from the road surface. Maximum expected daily traffic on the road (less than 500 vehicles) would lead to TSP and PM₁₀ concentrations based on 24-hour average that would largely exceed the applicable AAQC if no dust control measures are in place (**Table 4-10**). The maintenance crew will have a water-spraying truck readily available to be used when needed, especially during dry summer months. This control measure would reduce the maximum expected concentrations by 25–30% but would not be enough to avoid exceeding the AAQC at 50 m distance. In fact, the AAQC would still be exceeded for most sensitive receptors that are located within 600 m (for TSP) and 2,000 m (for PM₁₀) from the RCL. For instance, the most impacted sensitive receptor (RPF42) could see TSP and PM₁₀ daily concentrations reach 675 µg/m³ and 243 µg/m³, respectively, due to the passage of vehicles on the road, excluding the background concentration. This would occur more or less 50% of the time at RPF42 according to modeling results (**Table 4-13**). The annual TSP AAQC is also exceeded although it would be limited to within 100 m of the RCL without reaching any sensitive receptors (**Table 4-11**).

With regard to PM_{2.5} AAQC/CAAQS, the impact of the unpaved road with water control on concentrations would be less substantial, at least when compared to the CAAQS 2030 target (maximum of 97% of the CAAQS for 24-hour PM_{2.5} concentrations and 46% of the CAAQS for annual concentrations at 50 m from the RCL; **Table 4-10**). When including the 24-hour background concentration, the exceedance setback reaches 150 m which includes the closest sensitive receptors (CHL25, RPF39, RPF42). For the annual concentrations, the exceedance is restricted within 100 m of the RCL and would not reach nearby receptors according to modeling results.

These results were obtained assuming a low 30% control factor for dust emissions (refer to **Section 4.3**) and there is still a margin for improvement by increasing the number of passages of water trucks during dry dust days. This would most likely reduce the calculated maximum concentrations but not enough in our opinion to eliminate the exceedances noted at receptors located nearby the WSR.

As mentioned, the WSR is expected to remain unpaved for a short while following its construction to ensure that the road subbase material is stabilized. The placement of asphalt or chip seal is then planned which will greatly mitigate dust generation during vehicle passages. For this scenario, the maximum PM_{2.5} concentrations would remain below the AAQC/CAAQS threshold at 50 m distance (**Table 4-10**). Exceedances of the TSP and PM₁₀ AAQC are still calculated up to about 100 m from RCL which includes a couple of sensitive receptors (for PM₁₀ at a frequency of 0.22% or less; **Table 4-12** and **Table 4-13**), namely future residential plots.

In conclusion, for the unpaved with water control case, short term TSP and PM₁₀ exceedances are confined within approximately 50 to 150 m of the road centerline and drop quickly beyond 150 m as deposition occurs. PM_{2.5} exceedances are limited to the receptors closest to the RCL and are less frequent due to lower fine fraction from road dust compared to construction handling sources. In the paved scenario, predicted particulate concentrations meet criteria at distances beyond very short setbacks, with dustfall remaining below guideline values along the corridor.

Note that the results presented in this section apply only to fugitive dust emissions and do not integrate particulates emissions from vehicle engines due their minor influence. In fact, the impact of DPM on maximum total PM_{2.5} concentrations would be at least an order-of-magnitude lower than PM_{2.5} concentration from fugitive dust emissions coming from a paved road surface (e.g., annual DPM concentration maximum of 0.0079 µg/m³ vs. 1.0 µg/m³ for fugitive PM_{2.5} concentrations at 50 m distance).

Figure 4.1, Figure 4.2, Figure 4.3 and **Figure 4.4** provides isocontour plots with regard to the maximum TSP (24-hour) and PM₁₀ (24-hour) concentrations for the emission scenarios using a gravel-based surface with water mitigation and the corresponding case using a paved surface.

4.6.2 Gaseous Criteria Air Contaminants

The road traffic is not expected to increase gaseous CACs (NO₂, SO₂, and CO) concentrations higher than 5% of the corresponding AAQC at 50 m from RCL. For the 1-hour NO₂ CAAQS, the relative impact is expected to be more significant with a maximum concentration, according to the CAAQS statistical representation, tantamount to 28% of the 2025 target value at 50 m distance. This percentage decreases with increasing distance from the RCL, as sensitive receptors are setback at varying distances. In fact, the maximum result at any sensitive receptor is 11 µg/m³ or 50% of the CAAQS including the background concentration (**Table 4-11**).

4.6.3 Toxic Contaminants

Based on maximum expected traffic, concentrations of VOCs at 50 m from RCL will remain very low (<5% of the applicable AAQC) and are therefore not a concern for sensitive receptors with regard to air quality (Table 4-9). No exceedances were calculated with or without background concentrations at existing residences, institutional buildings, culturally sensitive areas, and future residence plots except for benzo(a)pyrene which 24-hour and annual background concentrations already exceed the corresponding AAQC. That said, these background concentrations were inferred from a monitoring station in Simcoe, Ontario, which is not located in a remote area such as Webequie but is considered the most representative from all available data located in a non-urban setting that are not impacted by any significant emission sources nearby. Webequie has however a much smaller population than Simcoe, and there is little (e.g., temporary or short-term land use for traditional activities) or no human interaction along the WSR route, and potential emission sources are more limited. As such, the average B[a]P concentrations are expected to be significantly lower than those observed in Simcoe and thus, the background concentration may be over-estimated. It is also worth noting that the Project's contribution to B[a]P concentrations will represent less than 1% of the corresponding AAQC starting at 50 m distance.

Diesel particulate matter (DPM) emissions from vehicles traveling on the road were also simulated and generated maximum concentrations of 0.8 µg/m³ for the 2-h averaging period and 0.0079 µg/m³ for the annual average at 50 m from RCL. Those results are well within the recommended concentrations from Health Canada (2016) for short-term (10 µg/m³) and long-term (5 µg/m³) exposures.

4.6.4 Dust Deposition

A maximum dust deposition value of 27 g/m² over 30-days (including background dust deposition) was calculated at 50 m of the RCL (corresponding to 383% of the AAQC) without dust control. With water trucks in operation, this maximum decreases to 19 g/m². Given the depletion effect, dust surficial concentration decreases systematically outside 50 m reaching at maximum, 5.0 g/m² at 150 m distance and 2.6 g/m² at 300 m distance (Table 4-11). Maximum calculated dustfall concentrations at existing residences, institutional buildings, culturally sensitive areas, and future residences plots are 0.23, 0.21, 7.8 and 11 g/m² over 30-days of deposition, respectively. Hence, for some sensitive receptors, the criteria of 7.0 g/m² representing the accepted threshold in Ontario for soil and vegetation is exceeded for the scenario showcasing an unpaved road surface with water control. Dustfall calculations from particulate matter emissions are also illustrated in Figure 4.5.

When analysing the scenario using a paved surface, the maximum dust depositions at 50 m from RCL, including all sensitive receptors, comply with the applicable AAQC (Table 4-12).



The tables below present maximum predicted concentrations at any receptor at 50 m from the RCL; totals include background concentrations from Section 2.5. Exceedances are **bolded**.

Table 4-9: Maximum Concentrations for Non-Particulate Contaminants Calculated for the Operation Phase

Pollutant	Applicable Standard	Averaging Period	Maximum Project Contribution (A) ⁽¹⁾		Background Concentration (B) ⁽²⁾		Total (A+B)		Limit Value ($\mu\text{g}/\text{m}^3$)
			$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	
Sulphur dioxide (SO ₂)	AAQC	10-minute	0.31	0.17	149	83	149	83	180
	AAQC	1-hour	0.19	0.19	90	90	90	90	100
	CAAQS	1-hour ⁽³⁾	0.19	0.11	18	10	18	11	173
	AAQC & CAAQS	Annual	0.0020	0.020	0.50	5.0	0.50	5.0	10
Nitrogen dioxide (NO ₂)	AAQC	1-hour	18	4.5	51	13	69	17	400
	CAAQS	1-hour	18	23	28	35	46	59	79
	AAQC	24-hour	2.9	1.5	23	12	26	13	200
	AAQC & CAAQS	Annual	0.32	1.4	2.6	12	2.9	13	22
Carbon monoxide (CO)	AAQC	1-hour	55	0.15	5,061	14	5 116	14	36,200
	AAQC	8-hour	13	0.082	3,253	21	3 266	21	15,700
1,3-butadiene	AAQC	24-hour	0.00087	0.0087	0.12	1.2	0.12	1.2	10
	AAQC	Annual	0.000056	0.0028	0.010	0.50	0.010	0.50	2.0
Acetaldehyde	AAQC	30-minute	0.55	0.11	14	2.8	15	2.9	500
	AAQC	24-hour	0.076	0.015	12	2.4	12	2.4	500
Acrolein	AAQC	1-hour	0.066	1.5	0.040	0.89	0.11	2.4	4.5
	AAQC	24-hour	0.011	2.7	0.040	10	0.051	13	0.40
Benzene	AAQC	24-hour	0.014	0.61	0.90	39	0.91	40	2.3
	AAQC	Annual	0.00089	0.20	0.30	67	0.30	67	0.45
Ethylbenzene	AAQC	10-minute	0.13	0.0066	0.28	0.015	0.41	0.021	1,900
	AAQC	24-hour	0.012	0.0012	0.17	0.017	0.18	0.018	1,000
Formaldehyde	AAQC	24-hour	0.24	0.36	2.9	4.5	3.1	4.8	65
Hexanes	AAQC	24-hour	0.0059	<0.001	0.45	0.018	0.46	0.018	2,500
Propionaldehyde	AAQC	10-minute	0.034	0.34	1.6	16	1.6	16	10
Toluene	AAQC	24-hour	0.033	0.0016	1.4	0.070	1.4	0.072	2,000
Xylenes	AAQC	10-minute	0.92	0.031	1.6	0.053	2.5	0.084	3,000
	AAQC	24-hour	0.092	0.013	0.52	0.071	0.61	0.084	730
Benzo(a)pyrene	AAQC	24-hour	4.6 x 10 ⁻⁷	0.93	1.2 x 10 ⁻⁴	240	1.2 x 10 ⁻⁴	241	5.0 x 10 ⁻⁵
	AAQC	Annual	2.6 x 10 ⁻⁸	0.26	2.0 x 10 ⁻⁵	200	2.0 x 10 ⁻⁵	200	1.0 x 10 ⁻⁵
Diesel particulate matter (DPM)	HC	2-hour	0.80	8.0	0	0	0.80	8.0	10
	HC	Annual	0.0079	0.16	0	0	0.0079	0.16	5

Notes:

Concentrations that are greater than the corresponding AAQC, CAAQS or Health Canada (HC) guiding value for DPM are denoted in bold.

(1) Maximum concentration calculated at 50 m from the road centerline.

(2) Background concentrations as established in **Section 2.5**.

(3) The result represents the 1st highest 1-hour concentration and not the 88th highest 1-hour concentration as required from the CAAQS.



Table 4-10: Maximum Concentrations for Particulates and Dustfall Calculated For the Operation Phase

Pollutant	Applicable Standard	Averaging Period	Maximum Project Contribution (A) ⁽¹⁾		Background Concentration (B) ⁽²⁾		Total (A+B)		Limit Value (µg/m ³)
			µg/m ³	% limit	µg/m ³	% limit	µg/m ³	% limit	
Scenario – unpaved surface (no control)									
Total suspended matter (TSP)	AAQC	24-hour	1,392	1,160	45	38	1,437	1,197	120
	AAQC	Annual ⁽³⁾	100	167	4.0	6.7	104	173	60
Fine inhalable fraction (PM ₁₀)	AAQC	24-hour	506	1,013	28	56	534	1,069	50
Fine particulate matter (PM _{2.5}) ⁽⁴⁾	CAAQS	24-hour	31	135	13	57	44	191	23
	AAQC	24-hour	31	115	13	48	44	163	27
	CAAQS	Annual	4.7	59	4.7	59	9.4	118	8.0
	AAQC	Annual	4.7	54	4.7	53	9.4	107	8.8
Dustfall	AAQC	30-days	26	377	0.40	5.7	27	383	7.0
	AAQC	Annual	14	308	0.40	8.7	15	317	4.6
Scenario – unpaved surface (water control)									
Total suspended matter (TSP)	AAQC	24-hour	1,031	859	45	38	1,076	897	120
	AAQC	Annual ⁽³⁾	97	161	4.0	6.7	101	168	60
Fine inhalable fraction (PM ₁₀)	AAQC	24-hour	355	709	28	56	383	765	50
Fine particulate matter (PM _{2.5}) ⁽⁴⁾	CAAQS	24-hour	22	97	13	57	35	153	23
	AAQC	24-hour	22	82	13	48	35	131	27
	CAAQS	Annual	3.7	46	4.7	59	8.4	105	8.0
	AAQC	Annual	3.7	42	4.7	53	8.4	95	8.8
Dustfall	AAQC	30-days	19	264	0.40	5.7	19	270	7.0
	AAQC	Annual	11	234	0.40	8.7	11	243	4.6
Scenario – paved surface									
Total suspended matter (TSP)	AAQC	24-hour	97	81	45	38	142	118	120
	AAQC	Annual ⁽³⁾	16	26	4.0	6.7	20	33	60
Fine inhalable fraction (PM ₁₀)	AAQC	24-hour	45	89	28	56	73	145	50
Fine particulate matter (PM _{2.5}) ⁽⁴⁾	CAAQS	24-hour	4.6	20	13	57	18	76	23
	AAQC	24-hour	4.6	17	13	48	18	65	27
	CAAQS	Annual	1.0	13	4.7	59	5.7	71	8.0
	AAQC	Annual	1.0	12	4.7	53	5.7	65	8.8
Dustfall	AAQC	30-days	2.5	36	0.40	5.7	2.9	42	7.0
	AAQC	Annual	1.8	39	0.40	8.7	2.2	48	4.6

Notes:

Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold.

The results apply only to fugitive dust emissions and do not integrate particulates from vehicle engines. The impact of DPM, as shown in **Table 4-9**, is at least one order-of-magnitude lower than dust emissions from road surface.

(1) Maximum concentration calculated at 50 m from the road centerline.

(2) Background concentrations as established in **Section 2.5**.

(3) Result based on the arithmetic mean of daily measurements and not the geometric mean. This represents a worst case since arithmetic means are always equal or greater than geometric means.

(4) The results are compared with the CAAQS applicable starting in 2030 while for the AAQC, it is compared with the 2020 targets.



Table 4-11: Maximum Concentrations in Areas of Interest For the Scenario with Unpaved Surface and Water Control During the Operation Phase

Sector or Receptor	TSP		PM ₁₀	PM _{2.5}		Dustfall		NO ₂
	24-hour	An	24-hour	24-hour	An	30-day	An	1-hour
Limit value (µg/m³)	120	60	50	23	8.0	7.0	4.6	79
Project contribution (µg/m³)								
50 m from road centerline	1,031	97	355	22	3.7	19	11	18
150 m from road centerline	463	26	167	9.4	1.2	5.0	2.7	11
300 m from road centerline	329	16	114	5.8	0.77	2.6	1.5	7.3
Existing residences (RP01) ⁽¹⁾	43	1.6	28	1.5	0.11	0.23	0.11	1.9
Institutional buildings (I01) ⁽²⁾	35	1.4	24	1.5	0.10	0.21	0.10	1.7
Culturally sensitive areas ⁽³⁾								
CHL25 (60 m from RCL)	673	40	225	14	1.6	7.8	3.8	11
CHL05 (150 m from RCL)	231	19	114	6.9	0.93	2.6	1.7	5.0
CHL14 (200 m from RCL)	192	17	98	6.4	0.86	2.8	1.6	4.0
CHL28 (240 m from RCL)	190	8.6	92	5.0	0.48	1.3	0.69	5.8
Future residences ⁽⁴⁾								
RPF01 (site A) (1 km RCL)	43	1.6	29	1.5	0.11	0.23	0.12	1.9
RPF10 (site West) (2 km RCL)	38	1.2	25	1.3	0.085	0.17	0.082	1.5
RPF39 (site C) (100 m from RCL)	537	24	200	11	1.1	4.2	2.0	11
RPF42 (site D) (55 m from RCL)	675	54	243	15	2.1	11	5.8	11
Project contribution + background (µg/m³)								
50 m from road centerline	1,076	101	383	35	8.4	19	11	46
150 m from road centerline	508	30	195	22	5.9	5.4	3.1	39
300 m from road centerline	374	20	142	19	5.5	3.0	1.9	35
Existing residences (RP01) ⁽¹⁾	88	5.6	56	15	4.8	0.63	0.51	30
Institutional buildings (I01) ⁽²⁾	80	5.4	52	14	4.8	0.61	0.50	30
Culturally sensitive area ⁽³⁾								
CHL25 (60 m from RCL)	718	44	253	27	6.3	8.2	4.2	39
CHL05 (150 m from RCL)	276	23	142	20	5.6	3.0	2.1	33
CHL14 (200 m from RCL)	237	21	126	19	5.6	3.2	2.0	32
CHL28 (240 m from RCL)	235	13	120	18	5.2	1.7	1.1	34
Future residences ⁽⁴⁾								
RPF01 (site A) (1 km RCL)	88	5.6	57	15	4.8	0.63	0.52	30
RPF10 (site West) (2 km RCL)	83	5.2	53	14	4.8	0.57	0.48	30
RPF39 (site C) (100 m from RCL)	582	28	228	24	5.8	4.6	2.4	39
RPF42 (site D) (55 m from RCL)	720	58	271	28	6.8	11	6.2	39

Notes: Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold.

- (1) Closest receptor of this category from the RCL at 1,350 m. Results for other receptors located further away are in **Appendix B**.
- (2) Closest receptor of this category from the RCL at 1,800 m.
- (3) Only the results for culturally sensitive receptors located within 250 m of the RCL are presented.
- (4) Only the results for the receptors closest to the RCL for each future residence areas are provided.

Table 4-12: Maximum Concentrations in Areas of Interest For the Scenario with Paved Surface During the Operation Phase

Sector or Receptor	TSP		PM ₁₀	PM _{2.5}		Dustfall	
	24-hour	Annual	24-hour	24-hour	Annual	30-day	Annual
Limit value (µg/m³)	120	60	50	23	8.0	7.0	4.6
Project contribution (µg/m³)							
50 m from road centerline	97	16	45	4.6	1.0	2.5	1.8
150 m from road centerline	36	4.2	23	2.0	0.34	0.73	0.45
300 m from road centerline	25	2.5	17	1.3	0.22	0.42	0.26
Existing residences (RP01) ⁽¹⁾	3.1	0.25	3.0	0.35	0.033	0.028	0.019
Institutional buildings (I01) ⁽²⁾	3.0	0.22	2.9	0.30	0.029	0.023	0.016
Culturally sensitive areas ⁽³⁾							
CHL25 (60 m from RCL)	56	6.3	25	2.7	0.45	0.98	0.65
CHL05 (150 m from RCL)	20	3.1	12	1.5	0.27	0.46	0.30
CHL14 (200 m from RCL)	13	1.8	10	1.0	0.17	0.22	0.16
CHL28 (240 m from RCL)	15	1.4	10	1.2	0.14	0.18	0.12
Future residences ⁽⁴⁾							
RPF01 (site A) (1 km RCL)	3.4	0.26	3.0	0.35	0.033	0.028	0.019
RPF10 (site West) (2 km RCL)	2.7	0.18	2.5	0.29	0.024	0.020	0.013
RPF39 (site C) (100 m from RCL)	44	3.7	22	2.3	0.30	0.56	0.35
RPF42 (site D) (55 m from RCL)	60	8.5	23	3.1	0.58	1.4	0.97
Project contribution + background (µg/m³)							
50 m from road centerline	142	20	73	18	5.7	2.9	2.2
150 m from road centerline	81	8.2	51	15	5.0	1.1	0.85
300 m from road centerline	70	6.5	45	14	4.9	0.82	0.66
Existing residences (RP01) ⁽¹⁾	48	4.3	31	13	4.7	0.43	0.42
Institutional buildings (I01) ⁽²⁾	48	4.2	31	13	4.7	0.42	0.42
Culturally sensitive area ⁽³⁾							
CHL25 (60 m from RCL)	101	10	53	16	5.2	1.4	1.0
CHL05 (150 m from RCL)	65	7.1	40	14	5.0	0.86	0.70
CHL14 (200 m from RCL)	58	5.8	38	14	4.9	0.62	0.56
CHL28 (240 m from RCL)	60	5.4	38	14	4.8	0.58	0.52
Future residences ⁽⁴⁾							
RPF01 (site A) (1 km RCL)	48	4.3	31	13	4.7	0.43	0.42
RPF10 (site West) (2 km RCL)	48	4.2	31	13	4.7	0.42	0.41
RPF39 (site C) (100 m from RCL)	89	7.7	50	15	5.0	0.96	0.75
RPF42 (site D) (55 m from RCL)	105	13	51	16	5.3	1.8	1.4
Exceedance setback from RCL (m)	50–100	< 50	50–100	< 50	< 50	< 50	< 50

Notes: Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in bold.

(1) Closest receptor of this category from the RCL at 1,350 m. Results for other receptors located further away are in **Appendix B**.

(2) Closest receptor of this category from the RCL at 1,800 m.

(3) Only the results for culturally sensitive receptors located within 250 m of the RCL are presented.

(4) Only the results for the receptors closest to the RCL for each future residence areas are provided.

Table 4-13: Frequency of Exceedances of Applicable AAQC for Areas of Interest for the Operation Phase

Sector or Receptor	TSP (unpaved)	TSP (paved)	PM ₁₀ (unpaved)	PM ₁₀ (paved)	Dustfall (unpaved)
	24-hour	24-hour	24-hour	24-hour	30-days
Exceedance setback from RCL (m)	500–600 m	100–250 m	1–2 km	50–100 m	< 100 m
Existing residences (RP01) ⁽¹⁾	0	0	13 (0.71%)	0	0
Institutional buildings (I01) ⁽²⁾	0	0	8 (0.44%)	0	0
Culturally sensitive areas ⁽³⁾	277 (15%)	0	505 (28%)	0	0
CHL05 (150 m from RCL)	193 (11%)	0	505 (28%)	0	0
CHL14 (200 m from RCL)	95 (5.2%)	0	409 (22%)	0	0
CHL08 (280 m from RCL)	27 (1.5%)	0	232 (13%)	0	0
CHL06 (400 m from RCL)	23 (1.3%)	0	150 (8.2%)	0	0
CHL16 (550 m from RCL)	2 (0.11%)	0	91 (5.0%)	0	0
Future residences ⁽³⁾	891 (49%)	0	1 067 (58%)	5 (0.27%)	1 (1.7%)
RPF01 (site A) (1 km RCL)	0	0	13 (0.70%)	0	0
RPF10 (site West) (2 km RCL)	0	0	8 (0.44%)	0	0
RPF39 (site C) (100 m from RCL)	384 (21%)	0	558 (31%)	2 (0.11%)	0
RPF42 (site D) (55 m from RCL)	891 (49%)	0	1 067 (58%)	5 (0.27%)	1 (1.7%)

Notes:

The values represent the number of days or months for dustfall (or the percentage of the time in parenthesis) for which the calculated concentration exceeded the AAQC based on the 5-years meteorological dataset.

- (1) Closest receptor of this category from the RCL at 1,350 m.
- (2) Closest receptor of this category from the RCL at 1,800 m.
- (3) Maximum results obtained at any CHL receptors or at future residence plots

4.6.5 Eastern Section of WSR

As described in Section 2.3, a high-density receptor grid was applied in the western segment to characterize maximum near-corridor effects. The focus of the assessment and modelling on this area was due to the proximity of Webequie and the fact that a majority of culturally sensitive areas and land uses (including fishing areas, country-food) are located in this portion of the study area for the Project.

For the eastern section of the WSR, a culturally sensitive area is located in the eastern side (at about chain 70-71 km from Webequie) corresponding to a hunting area at 1,000 m from the WSR at its closest location. Given the absence of collector or distributor roads along the WSR (except for the future proposed Northern Road Link to the south that will link the WSR at its eastern terminus), the same traffic load is to be expected during an hour, day, or a year whether on the western or eastern section of the road. The impact of road dust and vehicular emissions are therefore expected to be of similar nature for the eastern and western section albeit minor differences due to road alignment and local topography. Hence, with the exception of PM₁₀ concentrations and possibly TSP concentrations which exceedance setbacks were estimated at 2 000 m and 600 m respectively, the maximum concentrations of other contaminants calculated in air will not exceed the corresponding standard at this receptor (except for B[a]P due to the background concentration already exceeding the limit values).



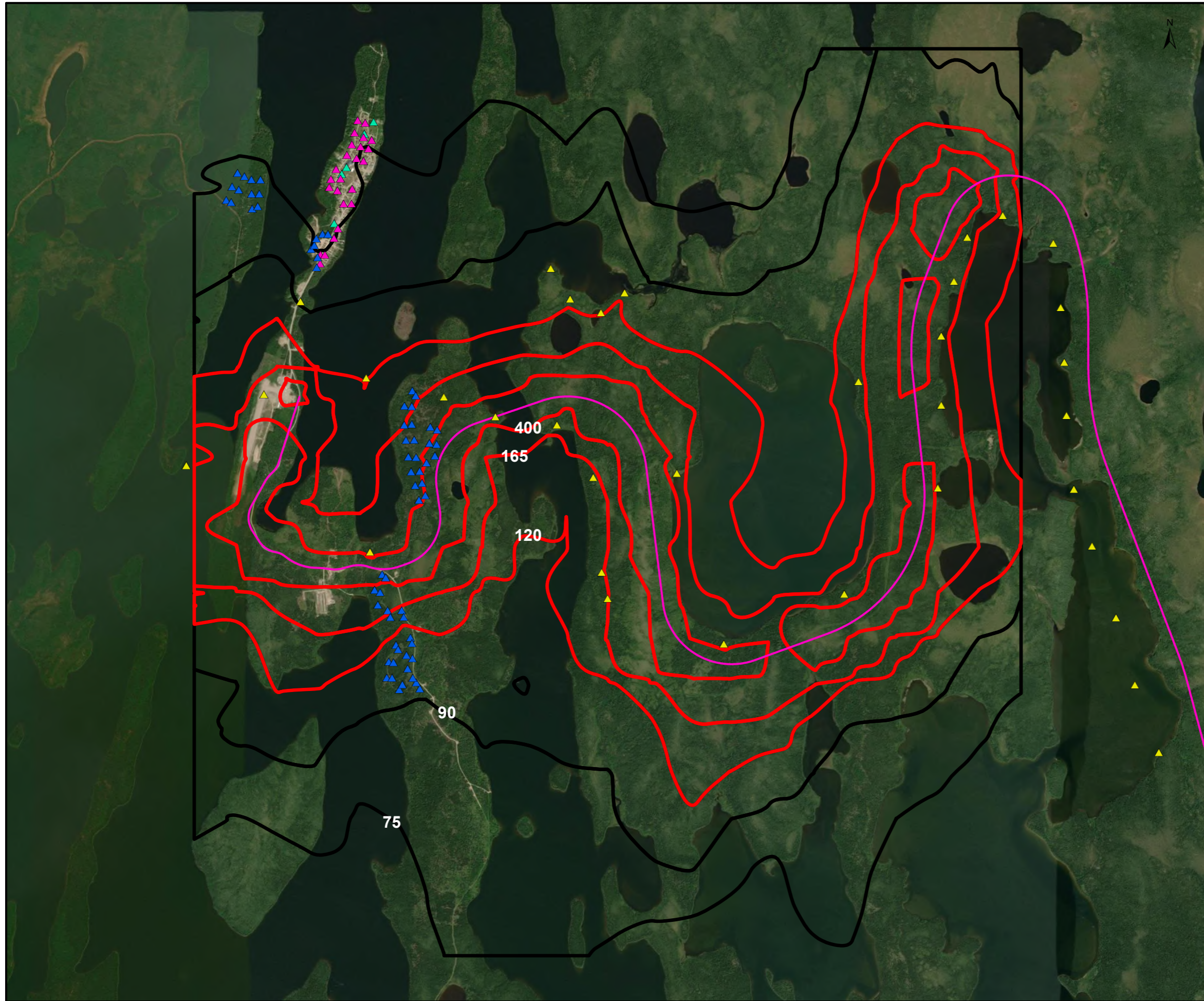
4.6.6 Ground-Level Ozone

The vehicles will not emit O₃ but could still have the potential to add ground-level O₃ in air given that NO_x and VOCs, which are the precursors to O₃ along with sunlight, will be emitted. CAAQS and AAQC exists for O₃ (60 ppb (8-hour average) and 80 ppb (1-hour average), respectively) and therefore, should be examined if it could cause air quality problems. The Baseline Report on air quality established the background O₃ concentration at 28 ppb whereas the maximum (or rather 90th percentile) hourly concentration was set to 41 ppb (80 µg/m³) in **Section 2.6**.

According to the EKMA of the US EPA (1983), O₃ formation depends greatly on the relative concentration of the VOCs (as carbon content; in ppmC) and NO_x (NO + NO₂ in ppm) in air. It suggests that, in the absence of large transport of O₃ in the region, the VOC/NO_x concentration ratio of about 8:1 would be optimal for generating O₃ in air. A ratio that is much lower or much higher than this value should not generate O₃, or at least in non-negligible amount (aka VOC-limited and NO_x-limited formation). When considering the THC (which is a surrogate to VOC) and NO_x emission rates from vehicles on the road, a VOC/NO_x ratio of 0.12 (or 1 : 8.3) is obtained, which is not in itself optimal for O₃ formation.

Also, in a remote area where the proposed WSR is located, the background NO_x and VOC concentrations in air are already low and not favourable to O₃ formation. For example, in **Section 2.5**, the background concentration for NO₂ was established at 1.4 ppb. When adding all studied VOCs, the background concentration is less than 7 ppbC, although it could be higher since not all potential VOCs in air were studied. Collectively, it is predicted that vehicular traffic will not create conditions that would increase the ground-level O₃ concentration in ambient air.





Legend

Emission Sources

— C1/D1: Road Traffic and Grading

Sensitive Receptors

▲ Culturally Sensitive Area

▲ Institutions

▲ Existing Residences

▲ Identified Future Residential

Results – Project contribution including background concentration

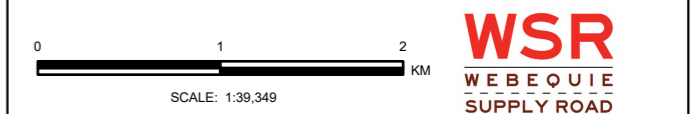
▭ Maximum Calculated Concentration ($\mu\text{g}/\text{m}^3$)

▭ Maximum Calculated Concentration ($\mu\text{g}/\text{m}^3$) exceeding the AAQC
 AAQC limit value: $120 \mu\text{g}/\text{m}^3$
 Background concentration: $45 \mu\text{g}/\text{m}^3$

Webequie Supply Road (WSR)

Maximum total daily TSP concentrations ($\mu\text{g}/\text{m}^3$)
 calculated in air associated with traffic and
 maintenance on the gravel-based road with
 dust mitigation measures

Figure Number:	4.1	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC		DRN	CHK
		AD	SP

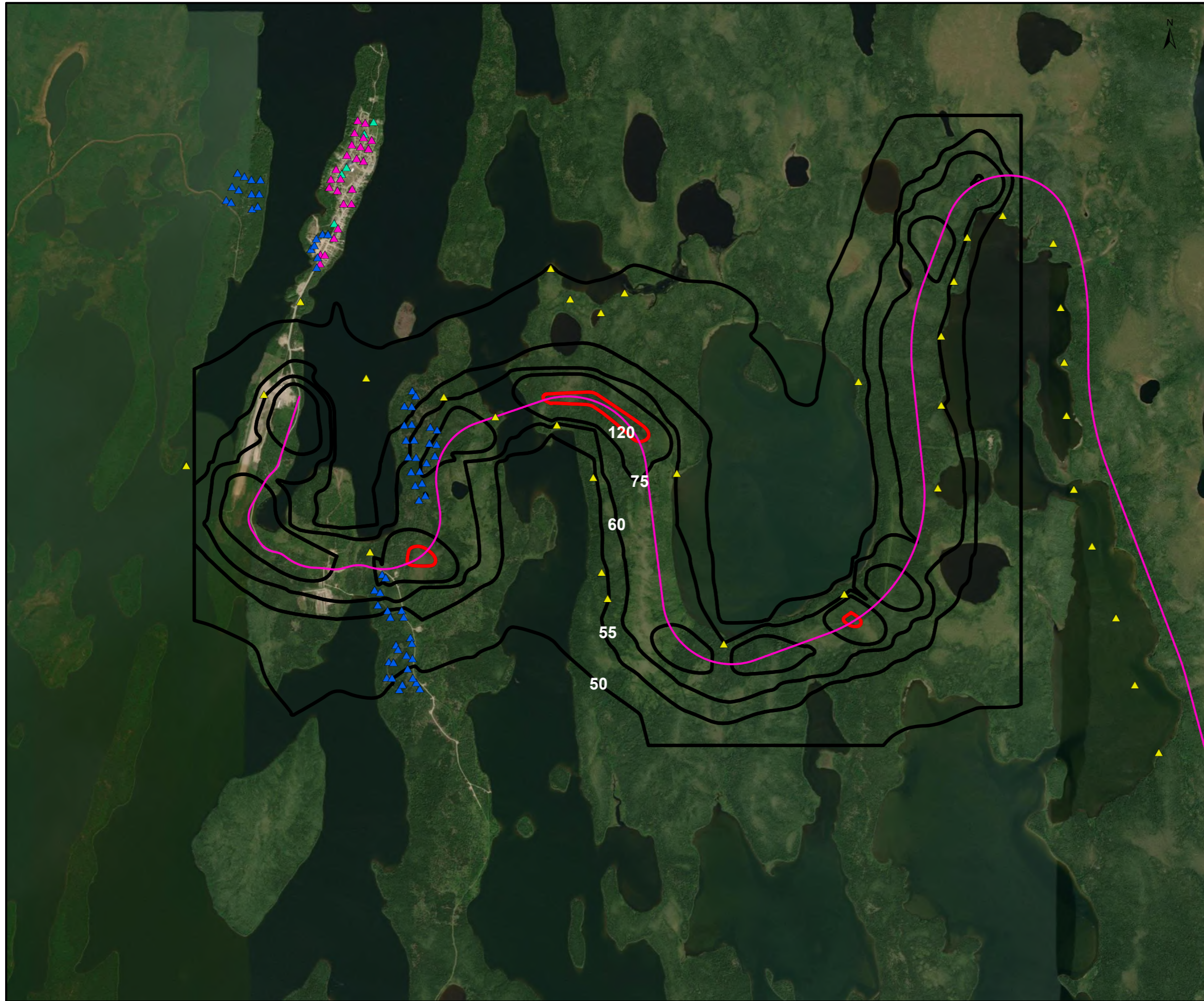


NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date: 2021-02-04

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Legend

Emission Sources

— C1/D1: Road Traffic and Grading

Sensitive Receptors

- ▲ Culturally Sensitive Area
- ▲ Institutions
- ▲ Existing Residences
- ▲ Identified Future Residential

Results – Project contribution including background concentration

- ▭ Maximum Calculated Concentration ($\mu\text{g}/\text{m}^3$)
- ▭ Maximum Calculated Concentration ($\mu\text{g}/\text{m}^3$) exceeding AAQC
AAQC limit value: $120 \mu\text{g}/\text{m}^3$
Background concentration: $45 \mu\text{g}/\text{m}^3$

Webequie Supply Road (WSR)

Maximum total daily TSP concentrations ($\mu\text{g}/\text{m}^3$)
calculated in air associated with traffic on a paved surface

Figure Number:	4.2	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC		DRN	CHK
		AD	SP

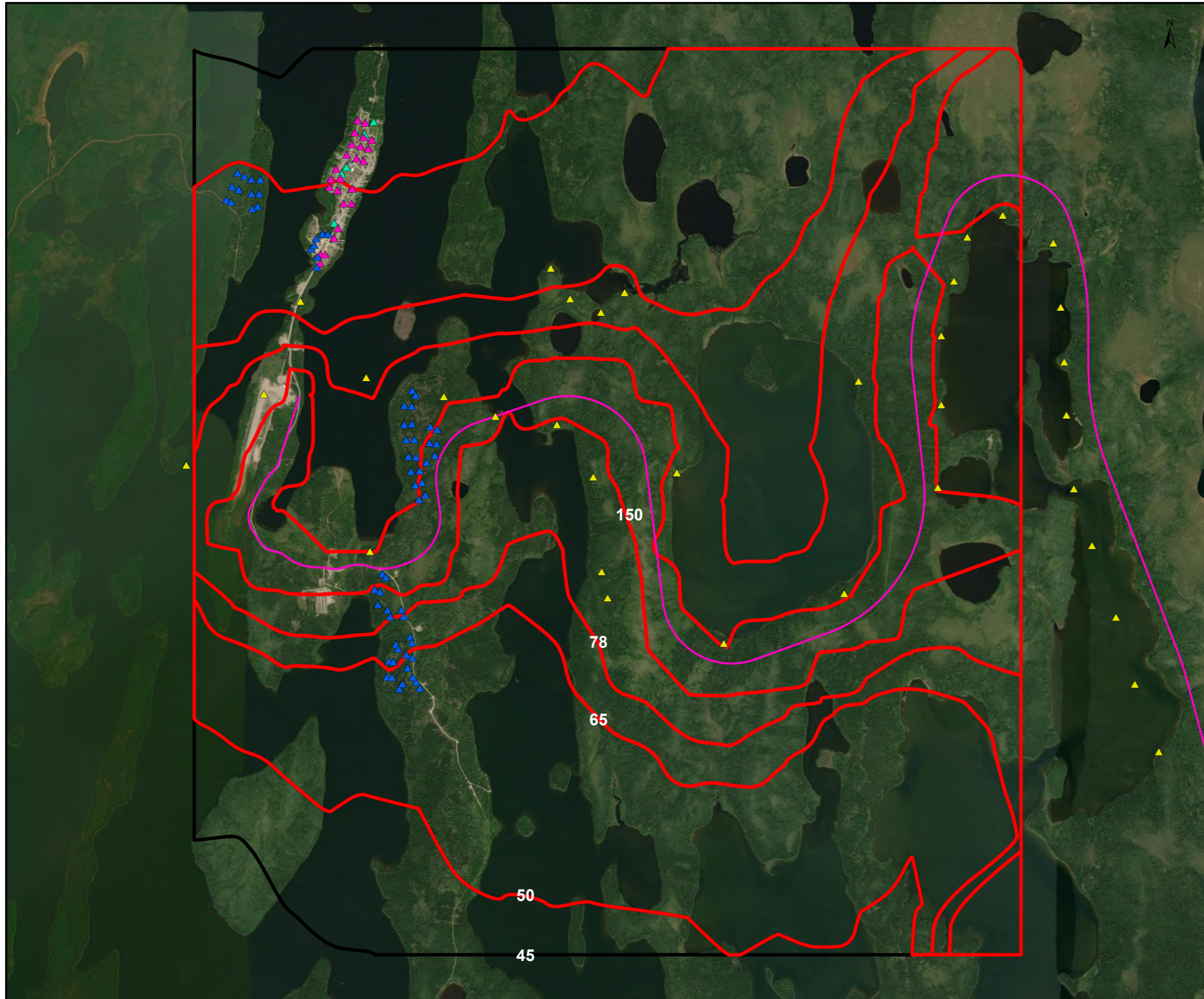


NOTES

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3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date : 2021-02-04

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Legend

Emission Sources

— C1/D1: Road Traffic and Grading

Sensitive Receptors

- ▲ Culturally Sensitive Area
- ▲ Institutions
- ▲ Existing Residences
- ▲ Identified Future Residential

Results – Project contribution including background concentration

- ▭ Maximum Calculated Concentration (µg/m³)
- ▭ Maximum Calculated Concentration (µg/m³) exceeding the AAQC
AAQC limit value: 50 µg/m³
Background concentration: 28 µg/m³

Webequie Supply Road (WSR)

Maximum total daily PM₁₀ concentrations (µg/m³)
calculated in air associated with traffic and
maintenance on the gravel-based road with
dust mitigation measures

Figure Number:	4.3	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC		DRN	CHK
		AD	SP

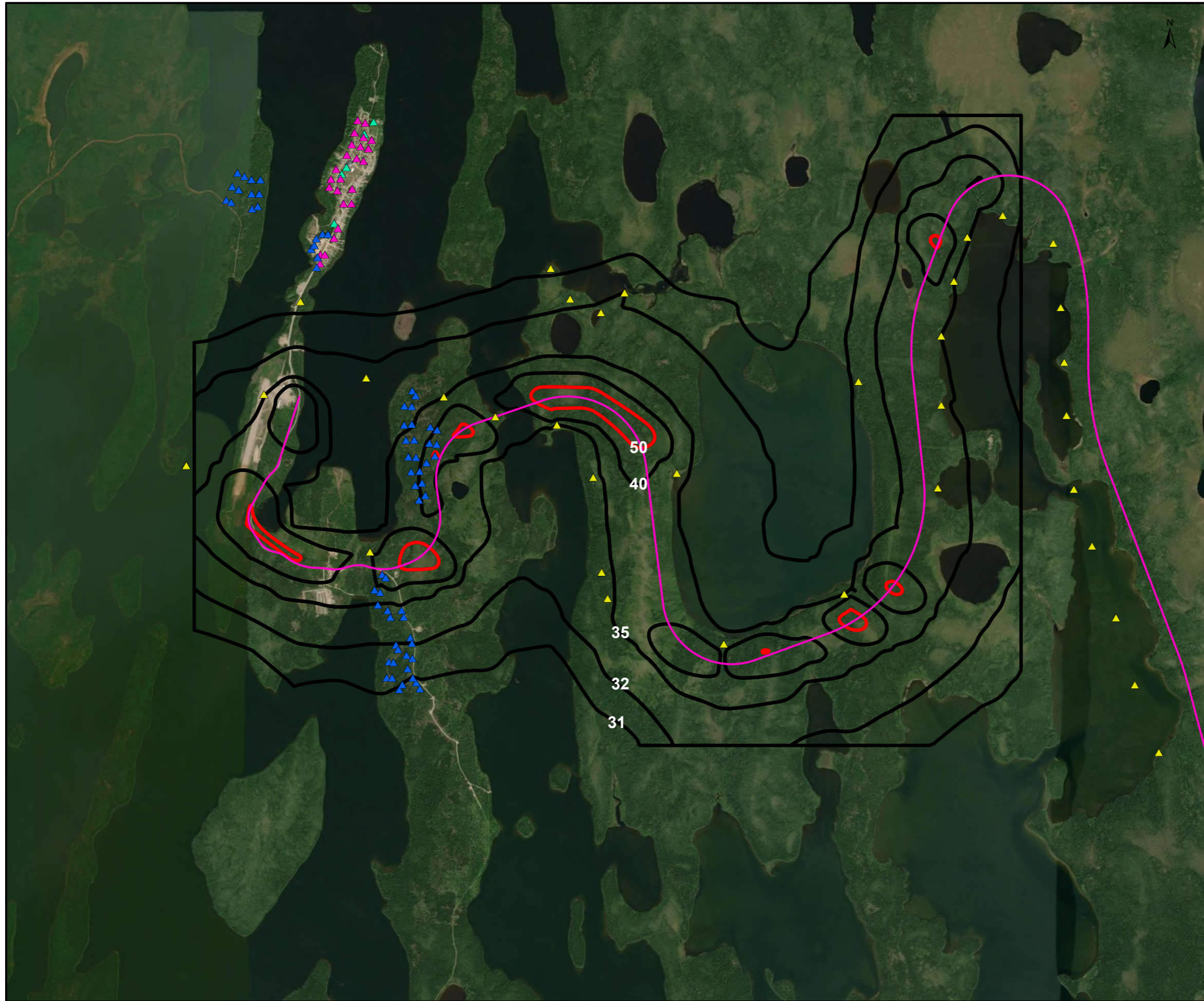


NOTES

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Legend

Emission Sources

— C1/D1: Road Traffic and Grading

Sensitive Receptors

- ▲ Culturally Sensitive Area
- ▲ Institutions
- ▲ Existing Residences
- ▲ Identified Future Residential

Results – Project contribution including background concentration

- Maximum Calculated Concentration ($\mu\text{g}/\text{m}^3$)
 - Maximum Calculated Concentration ($\mu\text{g}/\text{m}^3$) exceeding the AAQC
- AAQC limit value: $50 \mu\text{g}/\text{m}^3$
Background concentration: $28 \mu\text{g}/\text{m}^3$

Webequie Supply Road (WSR)

Maximum total daily PM_{10} concentrations ($\mu\text{g}/\text{m}^3$)
calculated in air associated with traffic on a paved surface

Figure Number:	4.4	REV	PA
Client:	Webequie First Nation	Project Number:	661910
		Date:	1/22/2026
DSC		DRN	CHK
		AD	SP

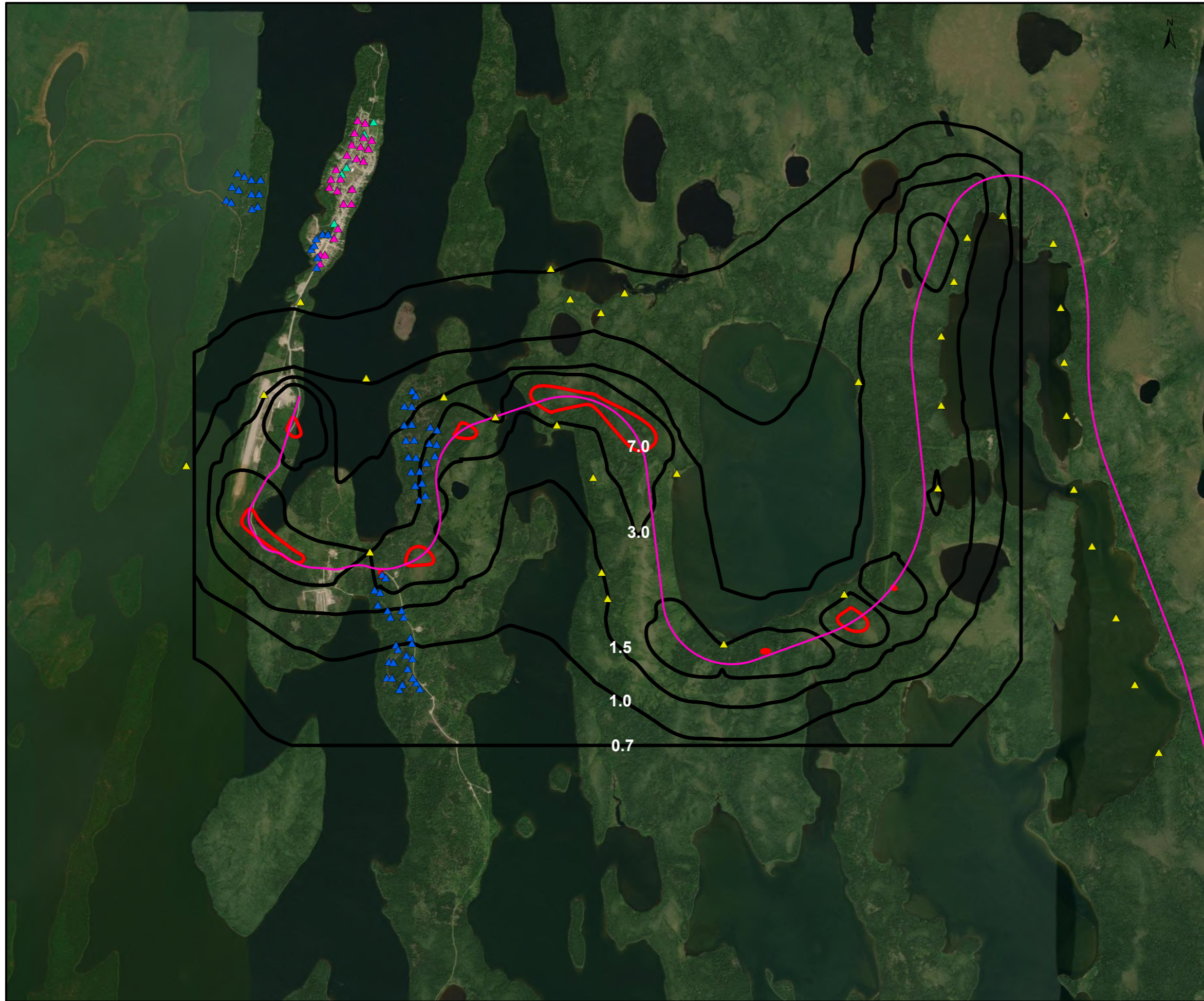


NOTES

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3. Topographic/landcover features obtained from CanVec v12.0 dataset, Natural Resources Canada Earth and Sciences Sector Centre for Topographic Information; and, Land Information Ontario (LIO) Warehouse Open Data (<https://geohub.lio.gov.on.ca/>), Ontario Ministry of Natural Resources and Forestry (OMNRF). Download Date : 2021-02-04

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Legend

Emission Sources

— C1/D1: Road Traffic and Grading

Sensitive Receptors

- ▲ Culturally Sensitive Area
- ▲ Institutions
- ▲ Existing Residences
- ▲ Identified Future Residential

Results – Project contribution including background concentration

- ▭ Maximum Calculated Dust Deposition (g/m^2)
 - ▭ Maximum Calculated Dust Deposition (g/m^2) exceeding the AAQC
- AAQC limit value: $7.0 g/m^2$
Background deposition: $0.4 g/m^2$

Webequie Supply Road (WSR)

Maximum total dustfall over 30 days ($g/m^2/30$ days)
calculated on ground associated with traffic
and maintenance on the gravel-based road with
dust mitigation measures

Figure Number:	4.5	REV	PA
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Client:	Project Number:	Date:
Webequie First Nation	661910	1/22/2026

DSC	DRN	CHK	APP
	AD	SP	SP



NOTES

1. Coordinate System: NAD 1983 UTM Zone 16N.
2. Cadastral boundaries are for informational purposes only and should not be considered suitable for legal, engineering, or surveying purposes.
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5 Uncertainty Analysis

5.1 Project Data

The quantification of air emissions preferably requires a detailed understanding of the operation activities that generate air contaminants. For the construction phase, a wide array of fugitive dust and exhaust emission sources are expected given the lengthy project. A large portion of input data were inferred from the information prepared by Sigfusson Northern Ltd. that provided a preliminary plan of activities during construction and a list of equipment and materials required to complete the work. This construction planning information provided a good basis to develop a scenario, but the level of detail remains insufficient to calculate emission rates with a high level of certainty for the following reasons:

- The construction plan was based on Sigfusson's experience but will not necessarily translate to the actual reality as the selected constructor(s) may have a different approach and details on-road design may evolve.
- The construction plan provides broad periods for each activity without going to the day-to-day planning. It is therefore difficult to establish representative conservative emission rates for short-term (1-hour and 24-hour) averaging periods as this can change widely during road construction and day-to-day planning.

Given these uncertainties, the assessment adopts a conservative approach intended to bound potential impacts rather than predict exact conditions. During construction, adjustments to equipment selection, work sequencing, or dust control practices can be more readily implemented if monitoring or field observations indicate that localized air quality effects are greater than anticipated. This flexibility allows mitigation to be adapted in real time to actual site conditions.

For the operation phase, the emission sources are limited to vehicular traffic and road grading and maintenance activities in the case of a gravel road surface. Required data is mostly limited to the traffic volume, grading frequency, and type of vehicles on the road. While the future vehicle composition represents the most uncertain parameter, the resulting emission estimates are considered representative and intentionally conservative for long-term operations.

5.2 Emissions Estimations

With the high number of diesel engines operating simultaneously during construction, the emission factors are considered representative, but also conservative given that the US EPA MOVES Nonroad emission factors represent standards to achieve (or maximum allowed emissions). For this assessment, it was assumed that 80% of all nonroad equipment brought to site will be certified Tier 4F, which reflects an average of the ratio of Tier 4F machinery currently available by constructors. In practice, this proportion will be higher once construction starts. As a result, some uncertainty remain in this assumption. To illustrate the potential implications, a bounding scenario assuming only Tier 3 engines was also evaluated.

For road vehicles, emission factors developed by US BTS are based on US EPA MOVES which is the standard model in that field. Some uncertainties can be attributed to these emission factors considering that they represent averages based on the US average age distributions, vehicle activity (speeds, operating mode, etc.), temperature, humidity, maintenance programs and fuel properties, and that the fleet of vehicles during construction and operations phases may deviate largely or slightly from these averages. Amongst these variables, ambient temperature is expected to be the factor that would result in the most uncertainty given the northern WSR location. **Section 4.3** describes how temperature was incorporated into the calculation of the exhaust gas emissions factors. Finally, the use of average emission factors representative of a vehicle may introduce bias relative to individual vehicle performance; however, this is not considered to be significant for the Project given the large number of vehicles expected during construction and operation phases.



The emission rates with the highest degree of uncertainty are fugitive dust, whether during the construction or the operation phases. They were estimated based on assumed project characteristics and emission factors from AP-42 Compendium for roads and other construction activities. These methods are based on empirical relationships establishing an average correlation between the emission factor and the properties of the bulk material or the road surface (silt content, humidity, etc.). In absence of data specific to the project site, these methods can be qualified as approximative and provide an order of magnitude emission rate, rather than a more precise estimate.

5.3 Emissions Scenarios

Some premises were considered in order to develop emission scenarios that represent, in most likelihood, worst-case situations based on the Project information available at this time. For example, the construction emission scenario:

- Was based on the construction year with highest density of mobile activities and material movement (Year 1) according to Sigfusson's construction planning.
- Applies emission rates at all hours during the modelled emission period.
- Averages the emission rates when dealing with 24-hour, monthly and annual averaging periods.
- Uses the same emission source volume distributed at 300 m distance to verify short-term nearby concentrations at all locations along the road. When taken altogether, it has the potential to over-estimate the concentration at a further distance due to the interactions of adjacent volumes that are modelled as emitting simultaneously when it will not be the case.

The hourly and daily variability of emissions for each activity during construction is obviously complex and cannot be integrated in a dispersion model. It is why typical emission rates are applied at all hours of the day even though there could be variations within a day and between days. Based on information at this time when preparing this assessment, a worst-case scenario was developed meaning that it should, in most likelihood, not be attained in reality.

Emissions were intentionally constructed as conservative bounding cases. Within each 300 m segment, equipment associated with the most intense activity at that location was assumed to operate concurrently for the full relevant averaging period, even though construction crews sequence activities and relocate equipment. For 24 hour and longer averaging periods, activity time weighting was applied, but the approach still treats emissions as continuous within the averaging window at the point of maximum impact. This results in predictions of protective upper bound concentrations near the road centerline and at the ARA-2 pit perimeter and should exceed actual short term conditions at any single receptor because the same set of equipment does not remain at one location for entire days.

This approach is acceptable to determine potential exceedances for the majority of AAQC for which the maximum potential hourly, daily or annual concentrations over the 5-years meteorological dataset need to be calculated. However, for the CAAQS including the PM_{2.5} AAQC, this emission scenario introduces substantial upward uncertainty because construction-related emissions along the road occur intermittently at any given location, while these standards rely on percentile statistics derived from hourly or daily concentrations. For example, the 3-year average of the annual 98th percentile of the daily 24-hour average concentrations will be in reality much lower than values presented in this report considering that for a majority of days no emissions will be generated when looking at a specific location along the road. This is driven primarily by emissions associated with dozers, graders and aggregate unloading that are expected to last a couple of days to a week for each road segment affecting nearby points of impingement. This would tend to push the 98th percentiles downward compared to the 98th percentiles obtained in this study based on emissions occurring at all hours within the modeled period for each source. In the absence of a highly specific construction schedule by day of year and sector of operation, it is impossible to properly verify the impact of construction activities with regard to the different CAAQS and PM_{2.5} AAQC.



5.4 Dispersion Model

Dispersion models integrate various phenomena affecting the physical transport and dispersion of contaminants in air. All models can under-estimate or over-estimate these phenomena, but a good model is expected to be representative of reality most of the time. The AERMOD model was developed from a regulatory standpoint to demonstrate the compliance of air quality standards for industrial projects. The US EPA therefore prefer a model that does not under-estimate the air concentrations rather than having a precise model, but that could still sometimes under-estimate the reality. From its development, AERMOD is considered conservative and so, it may have the tendency to over-estimate the air concentrations. The reliability of AERMOD is also better to estimate average concentrations over long periods than short-term concentrations.

That said, the uncertainty of a dispersion study is less caused by AERMOD performance or accuracy but more about the preciseness of input data like meteorological data, modelled phenomena, and information about the emission rates. With the objective to verify the compliance of Ontario's AAQC and Canadian CAAQS at all times, several conservative assumptions were considered which add to the conservative nature of AERMOD:

- The addition of elevated background concentrations with infrequent maximum concentrations calculated by the model, without knowing if it will occur simultaneously.
- The calculation of maximum hourly and daily concentrations supposes that all sources that can operate intermittently (i.e., dozers not required during a specific period) emit continuously altogether. This approach may generate concentration over-estimations as well as increasing the frequency of elevated daily and hourly concentrations.

AERMOD v22112 was applied in rural mode with near ground volume sources that maximize ground level concentration predictions close to sources. The single surface station selected for the SSMD is located near waterbodies and yields low roughness lengths in the SFC file, which increases modelled plume transport and surface concentrations compared to more forested terrain. Vegetation effects on coarse particle interception were not accounted for. Considering that large sections of the WSR is surrounded by forests, their presence will physically alter the dispersion of air contaminants. Collectively, these choices are conservative and contribute to higher short term particulate predictions at 50 to 150 m from the road and at the ARA-2 perimeter.

Finally, with regard to dust deposition, the particulate size classes distribution based on AP-42 emission factors remain approximative, especially for particulates subject to deposition ($> 10 \mu\text{m}$), which introduces additional uncertainties with regard to estimations of particulate matter in air and for which the actual bias (overestimation or underestimation) is undetermined.

5.5 Meteorological Dataset

Dispersion model predictions are inherently sensitive to the meteorological dataset applied, as meteorological conditions govern the transport, dilution, transformation, and removal of air contaminants. Parameters such as wind speed and direction, atmospheric stability, boundary layer height, surface roughness, and thermal structure directly influence plume behaviour, particularly for ground-level emission sources. As a result, differences in meteorological inputs can lead to measurable variations in predicted ambient air concentrations, especially for short-range dispersion assessments.



For long, narrow linear projects such as roads, dispersion modelling results are most sensitive to wind speed, atmospheric stability, and surface roughness assumptions. Lower wind speeds reduce advective dilution, stable atmospheric conditions limit vertical and lateral turbulent mixing, and smoother terrain generates less mechanical turbulence. Collectively, these conditions consistently produce higher, conservative concentration estimates and typically represent worst-case dispersion scenarios for ground-level roadway emissions.

The Webequie Supply Road Project represents a particularly sensitive configuration from a dispersion perspective, as emissions are predominantly released near ground level and receptors are located at short setback distances, generally within 50 m to 300 m of the sources. At these distances, the opportunity for plume dilution is limited and predicted concentrations are controlled primarily by near-surface turbulence and mixing rather than plume rise or long-range transport. Consequently, model results are especially sensitive to wind speed, atmospheric stability, surface roughness, and mechanically generated mixing height, all of which directly influence the strength of local turbulence and the volume available for dilution.

To evaluate the sensitivity of predicted concentrations to the meteorological dataset applied, key dispersion-controlling parameters from the WSR-specific meteorological dataset (WSR1) were compared against those from the International Falls dataset, which is commonly applied in regulatory air quality assessments for northern Ontario. **Table 5-1** summarizes the range and average values of the most influential parameters.

Table 5-1: Comparison of Key Meteorological Parameters Between Two Different Meteorological Datasets

Selected Parameters	Meteorological Database Range and (Average)		
	MECP WSR1	International Falls	Comments
Wind Speed (m/s)	14 – 1 (3.5)	14 – 0 (3.7)	Comparable ranges, averages, and prevailing wind direction; see Section 2.2 for the wind rose
Wind Direction (°)	360 – 1 (211)	360 – 0 (193)	
Mixing Height / Boundary Layer Height (m)	2,919 – 49 (417)	4,000 – 166 (2,159)	Substantially lower mixing height result in reduced vertical dispersion
Monin-Obukhov Length (m)	274 – -743 (-102)	8,888 – -6718 (627)	Lower average and narrower distribution indicate neutral to stable conditions and reduced turbulence
Surface Roughness Length (m)	0.09 – 0.08 (0.086)	1.3 – 0.9 (1.163)	Much smoother surface conditions result in significantly less mechanical turbulence
Temperature (K)	309 – 228 (274)	305 – 230 (277)	Similar range and mean values

The comparison indicates that while wind speed, wind direction, and temperature are broadly similar between the two datasets, the WSR1 dataset is characterized by substantially lower surface roughness, lower mechanically generated boundary layer heights, and a lower average Monin-Obukhov Length. These parameters collectively represent conditions with reduced turbulence, limited vertical mixing, and weaker dispersion, which are known to produce higher predicted concentrations for ground level sources.

To further evaluate the influence of meteorological inputs on predicted concentrations, a sensitivity modelling exercise was completed for benzene concentration during the construction phase using both the WSR1 and International Falls meteorological datasets. Benzene was selected as a representative non-reactive contaminant to isolate the effect of dispersion processes. Background concentrations were excluded to focus solely on the influence of the meteorological dataset on Project related contributions. **Table 5-2** summarizes the maximum predicted benzene concentrations for key receptors.

Table 5-2: Maximum 24-h benzene concentrations calculated at some sensitive receptors using the construction phase emissions scenario and two different meteorological datasets

Selected Sensitive Receptors	Maximum 24-h concentration ($\mu\text{g}/\text{m}^3$)		
	MECP WSR1	International Falls	WSR1/Intl Falls
Cultural areas – CHL05 (150 m from RCL)	1.036	0.1734	6.0
Cultural areas – CHL14 (200 m from RCL)	0.5279	0.1230	4.3
Cultural areas – CHL08 (280 m from RCL)	0.3842	0.1109	3.5
Cultural areas – CHL06 (400 m from RCL)	0.4520	0.0793	5.7
Cultural areas – CHL12 (875 m from RCL)	0.2239	0.0315	7.1
Institutional buildings – I01 (1,000 m from RCL)	0.1427	0.0148	9.6
Existing residences – RP01 (1,350 m from RCL)	0.1200	0.0182	6.6

For the selected sensitive receptors evaluated, predicted 24-hour benzene concentrations using the WSR1 meteorological dataset were approximately 3.5 to 9.6 times higher than those predicted using the International Falls dataset. The largest increases were observed at further distance (i.e., institutional and residential receptors; 6.6–9.6X), while closer cultural receptors within 150 to 875 m of the RCL exhibit generally lower increases at least for the cases shown in **Table 5-2** (3.5–7.1X). It appears that a reduction in turbulence and vertical mixing potential under the WSR1 meteorology has a pronounced effect on predicted concentrations, resulting in more conservative near-surface impact estimates. In fact, with substantially lower surface roughness, reduced mechanically generated mixing heights, and more persistent neutral to stable atmospheric conditions represented in the WSR1 dataset, the vertical dispersion of the contaminant plume is suppressed leading to high concentrations near the surface that can be pushed on long distance by wind.

The International Falls dataset is presented only to demonstrate the sensitivity of predicted concentrations to meteorological inputs and to contextualize the conservatism of the WSR1 dataset. While historically used in northern Ontario assessments, WSR1 is more representative of local conditions and provides a more conservative basis for impact evaluation.

The meteorological sensitivity analysis shows that predicted Project-related concentrations vary substantially depending on the meteorological dataset used. Although the modelling results indicate exceedances of applicable air quality criteria both with and without background concentrations, the magnitude of these exceedances is often similar to, or smaller than, the uncertainty associated with meteorological inputs. This indicates that while the Project contribution is high under conservative assumptions, predicted concentrations are strongly influenced by how meteorology is represented. Using meteorological data that better reflect conditions along different sections of the Project corridor would be expected to produce more representative results and reduce uncertainty in the assessment.

5.6 Background Concentrations

Background concentrations were added to the model results. Their purpose is to characterize the current air quality conditions which more or less represent the impact of local / regional emission sources unrelated to the Project. This approach tends to generate conservative results considering that:

- The selected background concentration which represents elevated and uncommon conditions is added to the maximum modelled concentration, without knowing if both situations occur simultaneously.
- With the exception of PM_{2.5}, no readings characterizing the air quality along the WSR route are available. Hence, the majority of background concentrations were derived from measurements at monitoring stations located in remote areas in Canada that can be considered somewhat representative of the actual conditions in the region. Uncertainties will always remain given that the sources of emissions that would impact the readings at these monitoring stations are unknown and could still be different from what is currently occurring in the Webequie area. That said, given the absence of anthropogenic emission sources along the road outside Webequie, the selected background concentrations remain in our opinion conservative.



6 Description of Potential Effects and Interactions

The potential effects described below are interpreted in the context of the conservative emission and meteorological assumptions outlined in Section 5. In particular, short-term construction scenarios assume concurrent equipment operation within localized segments and treat emissions as continuous over the averaging window at the point of maximum impact.

The objective of an air quality assessment is to verify how the Project would impact the ambient air quality around the road and near supportive infrastructure and if there is risk of exceeding a CAAQS or AAQC establishing thresholds against potential health effects and to a minor extent against odour, visibility and vegetation issues. Studied contaminants include the CACs (nitrogen dioxide (NO₂), carbon monoxide (CO), sulphur dioxide (SO₂), TSP, as well as particulates inferior to 10 µm (PM₁₀) and inferior to 2.5 µm (PM_{2.5})), ten (10) VOCs including carbonyls (i.e., formaldehyde) and aromatic compounds (i.e., benzene), and benzo(a)pyrene as a surrogate to PAHs. The impact of the Project on dustfall (in g/m² over 30-days) was also assessed which is represented by AAQC thresholds against dust soiling on the ground and vegetation. PM_{2.5} emissions from exhaust pipes were also modelled separately from total PM_{2.5}, as DPM, since it is recognized to be carcinogenic with the potential of long-term impact. Finally, no metals were included in the assessment as there is no information about their content in native soil and aggregates that will be handled on site.

These contaminants would come essentially from the combustion of diesel fuel or gasoline from land mobile and stationary equipment, heavy-duty trucks and light-duty vehicles during the construction and operation phases of the Project, and from dust uplifting mostly from vehicular traffic on the road and the handling of aggregates and other earth materials during construction.

The verification of potential exceedance of CAAQS or Ontario AAQC was carried out using atmospheric dispersion modelling based on the requirements of the Atmospheric Dispersion Modelling Guide for Ontario from the MECP which designate the AERMOD advanced Gaussian-type steady-state plume model as the preferred model for dispersion studies at the close or local scale (< 50 km). Given the long road distance, the modelling domain was restricted within an area of about 30 km by 30 km that covers 40.5 km of the 107 km road from the community of Webequie to the point on the road where it intersects with the ARA-4 aggregate pit access road. This modelling domain was selected to focus on the impacts within a corridor along the road but also on sensitive receptors (i.e., residences, institutional buildings, and culturally sensitive areas) that are more sizeable in this area.

The receptors, or points of impingement, for contaminant concentrations in ambient air, were arranged at 50 m, 150 m and 300 m distance from the road centerline and at about every 100 m on either side along the road. This configuration provides means to generate lateral concentration profile within a distance of 300 m from the road centerline where the bulk of emissions will occur. For the construction phase, two sets of receptors were also added at 100 m and 200 m distance from the ARA-2 quarry center point (based on the position of emission sources in the model) to account for dust and other contaminant emissions during aggregates processing and handling. Discrete receptors were also placed at the air sensitive locations in the area including:

- **Twenty-four (24) existing residences or group of residences** including mostly homes within the community of Webequie.
- **Six (6) institutional buildings** including two schools, a nursing station, a church, a community building, and business center.



- **Twenty-one locations in culturally sensitive areas** including spiritual or sacred spaces for members of the Webequie First Nation and other Indigenous communities and/or stakeholders and locations important for harvesting country foods or hunting.
- **Sixty-seven (67) locations for future residences** per the Webequie First Nation On-Reserve Land Use Plan of 2019 distributed amongst four areas (Site A; Site West; Site C and Site D).

6.1 Construction Phase

The construction of the WSR will be conducted all-year round over an approximately 60-month period. It will consist of two distinct segments, one of 51 km from Webequie running south-easterly and then of 56 km running east until it terminates near the McFaulds Lake area. The first segment (western half of the WSR) resting mostly over mineral soil will be cleared of all vegetation within the 35 m ROW for the road to accommodate the two-lane all-season road. Shoulders, ditches (as enhanced grass swales) and berms of stripped organic materials on the outside will also be shaped along this segment. Cut and fill earthworks will be needed to adjust the vertical alignment by either lowering or raising the existing grades. An underlying layer of aggregates and a surface layer of crushed stone will then be conveyed by trucks from a nearby quarry and compacted on site by heavy machinery. A layer of chip seal or asphalt will be also added onto the surface.

The eastern segment of the WSR being located within the Hudson Bay Lowlands Ecozone is composed mostly of peatland (muskeg) having a depth of 2-4 m of waterlogged organic soil, which represents poor to very poor conditions for building a road. A floating road design is being recommended by adding an underlying layer of aggregates (along with geogrids) that will compress the peat resulting in settlement and consolidation. A surface layer of crushed stone will be added to complete the road that is expected to lay 1.2 m above the surrounding lowland areas. Cross-culverts will be integrated within the road structure at regular intervals to ensure that the hydraulic conductivity of the peatlands is maintained. Hence, the construction activities that could potentially impact nearby air quality will include:

- Vegetation clearing, grubbing and disposal.
- Earth stripping along the ROW, the aggregate pits, and the access road.
 - Aggregate production (hole drilling, blasting, rock conveyance, crushing, screening, diesel generators and supporting mobile loaders) including hauling to site.
- Road construction including grading, aggregate placement, ditching, geotextile installation, and ditch seeding.
- Chip seal or asphalt placement on the road.
- Construction of steel-concrete bridges that will include a substructure composed of a foundation, abutments and piers supporting the superstructure consisting of steel plate girders, the deck and side barriers with railings. Natural revegetation, seeding and/or planting will be done on and around the embankments once the bridge is completed.
- Installation of major culverts crossing minor watercourses.
- Construction of buildings and storage areas at the MSF.
- Progressive rehabilitation work along the WSR, the ARA-2 quarry, and the worker camps when construction work is completed.
- Maintenance of environmental structures / measures (e.g., erosion and sediment control measures), including drainage management features on access roads.



A preliminary plan of activities during the 60-month construction period, including a list of equipment and materials needed to complete the work, was developed. Based on this plan, the first year of construction comes up as the year that should see the greatest number of mobile equipment on site and was selected as basis to assess the potential impact of construction activities on ambient air during the construction phase using air dispersion modelling. Moreover, the majority of activities during Year 1 will be focused between the western terminus (Webequie) and the ARA-2 quarry which is close to the WC-3 water crossing, down to the access road/WSR intersection. This area regroups the great majority of sensitive receptors described above.

Table 6-1 summarizes the construction activities along with the number of equipment and emission sources expected during the first year of construction. The emission rates (g/s) for each contaminant were estimated using for the most part the input data provided in the preliminary construction plan in recognized calculation methods from ECCC or the US EPA with regard to exhaust gas emissions and dust release from road surfaces, aggregate loading/unloading, dozing, grading, aggregate crushing and blasting. The resulting emission rates were also applied in accordance with the monthly and daily schedule from the preliminary construction plan.

The impact of Year 2 to 5 activities during the construction phase was not specifically assessed as they involve the same emission sources as modelled for Year 1 only at different locations and different extents (i.e., varying number of trucks, different number of equipment to carry out the work). Since the emissions are limited along the WSR 35-m wide ROW, the concentrations in air will be of similar profile whether being on the western or eastern portion of the road.

Table 6-1: Overview of Activities and Emission Sources during the First Year of Construction

Activity	Equipment	Emission Sources	Emission Location
Clearing and grubbing	Excavators (4); dozers (14); grader (1); feller bunchers (3); skidders (3); light plants (5)	<ul style="list-style-type: none"> ▪ Equipment engines ▪ Truck engines (material hauling) ▪ Road surface dust emissions 	Webequie to ARA-4 access road
Aggregate production	Excavator (1); loaders (2); drills (2); scissor lifts (2); crushing plant generator set (1)	<ul style="list-style-type: none"> ▪ Equipment engines ▪ Dust from aggregate crushing/screening + loading in trucks ▪ Dust release and explosives combustion from blasting 	ARA-2 quarry
Stripping and grading	Excavator (1); dozers (x 2)	<ul style="list-style-type: none"> ▪ Equipment engines ▪ Truck engines (material hauling) ▪ Road surface dust emissions ▪ Dust emissions from dozers, graders and aggregates unloading 	Webequie to ARA-4 access road
Ditching	Excavator (1); dozer (1); seeding tractor (1)		
Geotextile installation	Excavator (1)		
Aggregate placement	Dozers (x 7); graders (x 2); compactors (x3); light plants (x 5)		
Major culverts installation	Excavator (1); rough terrain crane (1); loaders (2)	<ul style="list-style-type: none"> ▪ Equipment engines 	WC-2 and WC-4
Bridges construction	Rough terrain crane (1); zoom boom (1); batch plant generator set (1)	<ul style="list-style-type: none"> ▪ Equipment engines 	WB-1 and WC-3

A majority of emission sources will not be static and will move along the WSR during the construction phase. In order to verify the air quality impact of road construction activities, an approach combining emission rates from all equipment and activities that could occur within a specific area (as a volume source) was considered. The intent was to mimic this same volume along the road to verify the potential impact of these activities at all locations. For example, the exhaust gas emissions of all equipment expected during “clearing and grubbing” was combined within a single source and positioned at several locations (300 m interval). This approach was applied for emissions that can occur at different locations (stripping and grading, ditching, geotextile installation, and aggregate placement from **Table 6-1**). Otherwise, a single volume emission source is applied for fixed locations associated with aggregate production, culvert installation and bridge construction.

6.1.1 Potential Impacts on Ambient Air

Air dispersion modelling of a conservative emission scenario representing the activities expected during the first year of road construction have provided the following outcomes which include the addition of background concentrations representative of the region as defined in **Section 2.5**. The following results do not consider any specific mitigation measures. The percentages in bold represent the maximum calculated concentration in air including background concentration relative to the applicable AAQC.

- Potential exceedances of 10-minutes and 1-hour SO₂ concentrations are calculated up to at least 300 m distance from the road centerline. These results were obtained by considering that all mobile equipment is certified Tier 3. CO (1-h) concentrations are also exceeding the corresponding AAQC but not along the road ROW but rather outside the ARA-2 quarry perimeter due mainly to explosives detonation. SO₂ concentrations are also high in this area for the same reason (> **7,000%** exceedance for 10-minutes and 1-hour SO₂ concentrations at 100 m distance from the quarry center point based on a conservative SO₂ emission factor for ANFO detonation).
- Potential exceedance of 1-hour NO₂ AAQC up to a distance of 400 m from the road centerline which comprises five (5) culturally sensitive areas, that is when 100% of the machinery brought to site uses Tier 3 engines. The maximum 1-hour NO₂ concentration at 50 m distance from the road centerline is 1,797 µg/m³ (**449%**).
- Potential exceedance of 24-hour NO₂ AAQC (**235%**) at 50 m distance from the road centerline but no exceedances are noted at 150 m distance. Exceedance was also calculated for the closest culturally sensitive area. Similarly to CO and SO₂, calculated 24-hour NO₂ concentrations are highest in the ARA-2 quarry area (**190%** at 100 m distance from the quarry center point).
- Compliance of several toxic contaminants (except for 1-hour acrolein (**486%**), 24-hour acrolein (**1,324%**), 24-hour benzene (**700%**), 10-minutes propionaldehyde (**440%**), 24-hour B[a]P (**4,814%**), and annual B[a]P (**317%**)) concentrations at 50 m distance from the road centerline. The exceedances for 24-hour and annual B[a]P (as surrogate to PAHs) are obtained whether the background concentration, which already exceeds the applicable AAQC, is included or not. These results were obtained by considering that all mobile equipment is certified Tier 3.
- Potential exceedance of AAQC related to particulate matter (as below), considering that all dust generating sources during road construction (dozers, graders, material unloading, trucking) are occurring at a single location. This represent a worst-case situation given that, in most likelihood, the equipment operating during a day will be more distributed along the road than confined into a small area. These potential exceedances would also occur for a short period (i.e., 1-2 days) at each receptor given that the emission sources will be moving as road construction progresses.
 - Potential exceedance of 24-hour TSP AAQC up to over 2,000 m distance from the road centerline comprising all culturally sensitive areas, and a portion of existing residences and institutional buildings.
 - Potential exceedance of 24-hour PM₁₀ AAQC up to over 2,000 m distance from the road centerline comprising all sensitive receptors.



- A maximum dust deposition of 10 g/m² over 30-days was calculated at 50 m distance from the road centerline corresponding to **148%** of the AAQC (7 g/m²) without road dust control with water trucks. At 150 m distance, the maximum dust deposition falls to 9.3 g/m² (**132%**) and then to 5.0 g/m² (**72%**) at 300 m. In fact, maximum calculated dustfall at existing residences, institutional buildings, and culturally sensitive areas are 0.85, 0.79, and 9.2 g/m² over 30-days of deposition, respectively. As such, exceedances are calculated for two (2) cultural sensitive areas (the closest of the ROW) for the case without road dust controls in place.
- Compliance with all long-term AAQC (annual averaging period) except for B[a]P (as surrogate for HAP) due to the already exceeding background concentration and annual dustfall (although limited at 50 m distance from the road centerline and 100 m from ARA-2 quarry center point; no sensitive receptors affected). It is tied to the fact that construction activities and associated emissions will not remain at a single location for long periods which greatly dilute the impact of emissions on the annual averages.
- Diesel particulate matter (DPM) emissions from hauling truck and Tier 3 mobile equipment engines have the potential to generate important 2-hour DPM concentrations along the ROW according to the modelled scenario (maximum over 1,000 µg/m³ at 50 m distance and 240 µg/m³ at 300 m).
- Construction activities will not create conditions that would increase ground-level O₃ concentration due to already low NO_x and VOC concentrations in the remote area or if it becomes the case, it would be short-lived since the emissions will be diluted in time and space along the road.

Short term exceedances of particulates are predicted near active work fronts and at the ARA-2 perimeter for the worst case scenarios. Exceedances are confined to the first 50 to 150 m for daily particulate averages and decline rapidly with distance due to dispersion and the intermittent nature of grading, aggregate placement, and unloading. Modeled exceedances for select VOCs and B[a]P occur under conservative activity overlap near sources and are not continuous at a given receptor. Annual particulate metrics meet criteria at community receptors because activities shift along the corridor and are not sustained at one location.

Although exceedances are a possibility outside the road's ROW for dustfall and many contaminants generated during activities, it is worth noting that it would be for a limited period of time at each location during the projected five-year construction phase. These results were also obtained using a conservative emission scenario that does not apply specific mitigation measures. The quantifiable impacts of such measures are discussed in **Section 7.1**.

6.2 Operation Phase

The operation phase of the WSR includes the vehicular traffic on the road as well as maintenance activities generating both exhaust gas emissions and fugitive dust emissions. The emission sources include the regular daily passages of vehicles mainly from Webequie (less than 500 vehicles) to the eastern terminus of the road. In addition to vehicular traffic from and to Webequie, the types of vehicles using the road will also include heavy-duty trucks that will be used as part of maintenance activities like visual patrols, snow clearing, and aggregate hauling as part of road repairs. Although the road is expected to be surfaced with asphalt or chipseal, the initial emission scenario considers an aggregate / gravel-surface as it is expected that part of the road will not be fully surfaced from the start. As a result, a second source was modelled to capture road grading and maintenance activities, and associated air quality concerns.

Other air emission sources associated with isolated road maintenance activities such as brush and vegetation removal/control, and specific road, culvert, and bridge repairs requiring an excavator, a tractor, and a couple of graders are excluded considering that these activities are unspecific to a single location and will occur infrequently. The emission scenario was composed of a linear volume source within the modelling domain between Webequie and the intersection of the WSR with ARA-4 quarry access road. Although emissions will also occur on the eastern part of the WSR, the concentration profile from road center will be very similar.



6.2.1 Potential Impacts on Ambient Air

The operation phase associated with the WSR Project includes mainly the dust and exhaust gas emissions from expected traffic on the road as well as road grading during maintenance work. Air dispersion modelling of an emission scenario from these sources on an annual basis provided the following results which include the addition of background concentrations representative of the region as defined in **Section 2.5**. The following results relate to the use of an unpaved surface without any specific mitigation measures. The percentages in bold represent the maximum calculated concentration in air including background concentration relative to the applicable AAQC or CAAQS.

- Exceedances of 24-hour TSP and PM₁₀ (>**1,000%**) concentrations in air with regard to the AAQC at 50 m distance from the road centerline (outside the ROW) were calculated. For TSP, this would extend to most culturally sensitive areas and all of future residential plots closest to the WSR located within Site C and D, but would not reach existing residences and institutional buildings. For PM₁₀, traffic over an unpaved surface without dust control measures could potentially exceed the AAQC for all sensitive receptors of this study when including the background concentration.
- For PM_{2.5}, the maximum 24-hour concentration at 50 m distance from the road centerline represents **163%** of the current CAAQS/AAQC and **191%** of the future CAAQS (2030 target). Potential exceedances are obtained for the closest culturally sensitive area (at 60 m distance from the road centerline) and several future residential plots located within 200 m from the road centerline. Like TSP, no exceedances are noted for existing residences and institutional buildings.
- A maximum dust deposition of 27 g/m² over 30-days was calculated at 50 m distance from the road centerline corresponding to **383%** of the AAQC (7 g/m²) in absence of dust control with water trucks. The maximum dust deposition falls to 7.5 g/m² (**107%**) at 150 m distance then 4.1 g/m² (**58%**) at 300 m distance. Maximum calculated dustfall at existing residences, institutional buildings, culturally sensitive areas, and future residence plots are 0.73, 0.71, 12 and 16 g/m² over 30-days of deposition, respectively. The exceedances noted for culturally sensitive areas and future residence plots only concern two (2) and one (1) receptors, respectively, which are the closest to the WSR ROW.
- Road traffic is not expected to increase gaseous CACs (NO₂, SO₂, and CO) concentrations above **5%** of the corresponding AAQC or CAAQS at 50 m distance from the road centerline (with the exception of the maximum 1-hour NO₂ concentration contributing to **23%** of CAAQS). This percentage is obviously lower at greater distances where sensitive receptors are located at different distances.
- Concentration of toxic contaminants (VOCs) at 50 m distance from the road centerline will remain low (<5% of applicable AAQC). As for B[a]P (as surrogate to PAHs), exceedances are obtained because the background concentration was set at values exceeding the applicable 24-hour and annual AAQC. In fact, the Project would only add a maximum of **1%** of the AAQC at 50 m distance. Short-term DPM concentrations remain also relatively low (< **10%** of Health Canada guiding value for 2-h average concentration).

The results presented above was based on a gravel-surface road design which has the highest potential of dust emissions from vehicular traffic. The quantifiable impact of dust control and pavement surfacing are discussed in **Section 7.2**.



7 Mitigations Measures and Net Effects

Section 6 presented and discussed the modelling results from emission scenarios that were developed based on expectations (via the preliminary construction plan and traffic projections) while considering typical but conservative inputs to calculate the emission rates which by extension did not include any specific mitigation measures. This section provides an overview of expected effects of mitigation measures on ambient air contaminant concentrations surrounding the WSR by targeting the dominant emission mechanisms identified in **Section 6**, with the objective reducing the frequency, spatial extent, and duration of short-term effects near the corridor.

7.1 Construction Phase

An Air Quality and Dust Control Management Plan will be deployed during construction that will include typical mitigation measures such as the use of water sprays from trucks to increase moisture levels in active areas during dry days (e.g., haul/access roads, temporary soil and aggregate stockpiles), the use of environmentally certified equipment (e.g. Tier 4 engines), the use of dust suppression systems at quarries, truck speed limitations, vehicle and heavy equipment movement limitations to designated areas, minimizing idling and so forth. As part of the air quality impact assessment, the following quantifiable control measures were integrated into the emission scenario:

- Water-spraying on-road surface mitigating dust uplifting from heavy-duty trucks.
- The use of at least 80% of mobile and stationary equipment having a Tier 4F engine, when the base scenario only considered Tier 3 engines.

The impact of these measures on the maximum concentrations calculated at 50, 150 and 300 m from RCL, at 100 m distance from ARA-2 quarry center point (QCP), and for three (3) culturally sensitive areas located within 200 m from the RCL is illustrated in **Table 7-1**. It covers the main contaminants and averaging periods for which the Project could potentially generate an exceedance of an AAQC within the modeling domain. Other contaminants and averaging periods, not shown in **Table 7-1**, also exceed their respective AAQC at 50 m from the RCL using the scenario with mitigation (80% Tier 4 and 20% Tier 3):

- SO₂ – 10-minutes (**100%** at 50 m)
- Acrolein – 1-hour (**100%**)
- Propionaldehyde – 10-minutes (**102%**)
- BaP – 24-hours (**1,500%**)
- DPM – 2-hours (**2,707%**)

For the remaining contaminants and averaging periods, no exceedances are obtained at 50 m and beyond with the scenario with mitigation. Observations taken from **Table 7-1** are as follows:

- Dust control over road surfaces would have a limited impact on the maximum TSP and PM₁₀ concentrations, meaning that road emissions are not the predominant source. Dust emissions at the construction site due to bulldozing and road grading are actually the main causes of these high concentrations.
- The maximum dust deposition at 50 m from RCL (**148%**) is equivalent for both scenarios without or with dust control. Improvements are obtained at further setbacks. Other than the 50 m mark, exceedances are also noted at the periphery of ARA-2 quarry and for one culturally sensitive location at 60 m from the RCL.



- The use of Tier 4F equipment would greatly limit the impact of exhaust emissions on 1-hour and 24-hour NO₂ concentrations confining a potential exceedance of the AAQC at 50 m from RCL and possibly a little beyond. The large concentrations noted outside the ARA-2 quarry are the result of the large instantaneous NO₂ emissions modeled for blasts (ANFO detonation was hypothesized).
- Exceedances are calculated at the periphery of the ARA-2 quarry for short-term SO₂ and CO concentrations due to ANFO detonation. Elsewhere, the impact of Tier 4F machinery would be relatively limited along the road for these contaminants. Exceedances of the SO₂ 1-hour AAQC are noted (100 µg/m³), caused to a large extent by the background concentration selected for this study (90 µg/m³). The maximum impact of the Project at 50 m from RCL represents in fact less than 20% of the AAQC.
- In a similar way, the use of Tier 4F equipment would significantly reduce the maximum concentrations of toxic contaminants, as shown for 24-hour acrolein and 24-hour benzene in **Table 7-1**. That said, based on modeled results for these two contaminants, exceedances are still obtained at 150 m from RCL and possibly a little beyond which comprise some of the closest culturally sensitive areas.

In conclusion, water application on active unpaved surfaces reduces the frequency and spatial extent of short-term TSP, PM₁₀, and PM_{2.5} exceedances adjacent to the ROW by lowering silt entrainment during high traffic periods. Deploying a fleet with at least 80 percent Tier 4 engines materially reduce NO_x, CO, and fine diesel particulate mass from exhaust at the source and reduces predicted 1-hour and 24-hour concentrations. Because construction activities are transient, these controls mainly affect the frequency of exceedances experienced by any single receptor and reduce the distance to criteria along the corridor. Residual short-term exceedances remain possible within the first 50 to 150 m during peak activity days, which aligns with modeled upper bounds.

As shown, exceedances of several Ontario AAQC remain a possibility at some culturally sensitive areas, even with the application of mitigation measures specified above. That said, there are elements to consider when analyzing the impact of the construction phase on air quality. For example:

- The potential exceedances mainly concern short-term AAQC (24-hours and less) and could only occur over a short period (i.e., 1-2 days) at each receptor given that the emission sources will be moving as road construction progresses.
- AERMOD integrates local topography into calculations, but it does not consider the presence of vegetation and trees that can act as physical barriers, especially against particulates dispersion further down-wind.
- It is not possible to define the exact combination and space distribution of equipment and activities that will occur at individual sections of the road, and so all potential emissions (dozers, excavators, loaders, etc.) were combined together in a single source as a simplified but conservative approach. For example, all three dozers and graders available on site were considered in operation at the same time and same close area which results in higher localized concentrations but would probably not be the case in reality (or at least there would be some distance between each equipment).
- There will be no long-term health impact based on AAQCs. Ground and vegetation soiling over the government set threshold would also be limited to the road ROW and slightly beyond. Exceedance of the AAQC for dustfall was calculated at only one culturally sensitive location even though high particulate matter concentrations were obtained. Soiling would also be of limited time given the short period of dust emissions in an area which deposition would most likely be washed away with precipitations and other natural phenomenon after a while.

The Air Quality and Dust Control Management Plan will not limit itself to the measures considered in this assessment as there are many other options to mitigate dust uplifting and exhaust emissions. Most of these options like idling minimization, limitation of unnecessary vehicle and heavy equipment movement, and the wetting of soil and aggregate during dry days cannot however be properly translated into the dispersion model and so their potential impact was not calculated here. Moreover, mitigation measures for dozers and graders, which are the main source of particulates near culturally sensitive areas, could include watering but it would not be practical. The management plan could therefore integrate a monitoring procedure with the intent of mitigating the impact of these emissions by controlling (limiting) their usage during unfavorable weather conditions for example.



Table 7-1: Air Dispersion Modelling Results for the Construction Phase

Contaminant	Averaging Period	Maximum Total Concentration Including Background				Limit Value	Selected Background	
		Location	Without Mitigation		With Mitigation			
			$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Total suspended matter (TSP)	Max 24-hour	50 m from RCL	16,468	13,723	16,256	13,547	120 (AAQC)	45
		150 m from RCL	2,761	2,301	2,655	2,212		
		300 m from RCL	1,208	1,007	1,147	956		
		100 m from QCP	1,733	1,445	1,640	1,367		
		CHL25 (60 m)	5,901	4,917	5,746	4,788		
		CHL05 (150 m)	1,873	1,561	1,873	1,561		
		CHL14 (200 m)	1,270	1,059	1,224	1,020		
Fine inhalable particulate fraction (PM ₁₀)	Max 24-hour	50 m from RCL	5,906	11,812	5,780	11,561	50 (AAQC)	28
		150 m from RCL	1,478	2,955	1,311	2,622		
		300 m from RCL	829	1,657	700	1,400		
		100 m from QCP	943	1,887	843	1,685		
		CHL25 (60 m)	2,566	5,131	2,476	4,952		
		CHL05 (150 m)	962	1,925	962	1,925		
		CHL14 (200 m)	614	1,229	577	1,154		
Dustfall	Max 30-days	50 m from RCL	10	148	10	148	7.0 (AAQC)	0.4
		150 m from RCL	9.3	132	5.4	78		
		300 m from RCL	5.0	72	2.9	42		
		100 m from QCP	10	147	10	144		
		CHL25 (60 m)	9.2	132	8.2	117		
		CHL05 (150 m)	6.1	87	3.7	52		
		CHL14 (200 m)	5.5	78	3.2	45		
Nitrogen dioxide (NO ₂)	Max 1-hour	50 m from RCL	1,797	449	467	117	400 (AAQC)	51
		150 m from RCL	859	215	272	68		
		300 m from RCL	502	125	205	51		
		100 m from QCP	7,570	1,892	4,715	1,179		
		CHL25 (60 m)	1,022	256	316	79		
		CHL05 (150 m)	650	163	230	58		
		CHL14 (200 m)	401	100	189	47		
Nitrogen dioxide (NO ₂)	Max 24-hour	50 m from RCL	458	229	217	109	200 (AAQC)	23
		150 m from RCL	179	90	132	66		
		300 m from RCL	146	73	118	59		
		100 m from QCP	380	190	344	172		
		CHL25 (60 m)	228	114	157	78		
		CHL05 (150 m)	154	77	112	56		
		CHL14 (200 m)	128	64	100	50		

Notes: RCL – road centerline; QCP – ARA-2 quarry center point
 Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in **bold**.

Table 7-1 (cont'd): Air Dispersion Modelling Results for the Construction Phase

Contaminant	Averaging Period	Maximum Total Concentration Including Background					Limit Value	Selected Background
		Location	Without Mitigation		With Mitigation			
			$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO ₂)	Max 1-hour	50 m from RCL	174	174	109	109	100 (AAQC)	90
		150 m from RCL	173	173	108	108		
		300 m from RCL	164	164	106	106		
		100 m from QCP	8,589	8,589	1,934	1,934		
		CHL25 (60 m)	190	190	112	112		
		CHL05 (150 m)	104	104	96	96		
		CHL14 (200 m)	109	109	94	94		
Carbon monoxide (CO)	Max 1-hour	50 m from RCL	12,611	35	6,403	18	36,200 (AAQC)	5,061
		150 m from RCL	8,369	23	5,683	16		
		300 m from RCL	6,751	19	5,615	16		
		100 m from QCP	67,764	187	67,742	187		
		CHL25 (60 m)	9,107	25	5,818	16		
		CHL05 (150 m)	7,424	21	5,471	15		
		CHL14 (200 m)	6,297	17	5,302	15		
Acrolein	Max 24-hour	50 m from RCL	5.1	1,284	1.6	394	0.40 (AAQC)	0.04
		150 m from RCL	1.3	335	0.53	132		
		300 m from RCL	0.68	169	0.31	78		
		100 m from QCP	1.1	275	0.62	156		
		CHL25 (60 m)	1.7	419	0.78	195		
		CHL05 (150 m)	0.83	208	0.40	100		
		CHL14 (200 m)	0.48	120	0.24	60		
Benzene	Max 24-hour	50 m from RCL	16	680	5.3	232	2.3 (AAQC)	0.9
		150 m from RCL	4.7	203	2.3	100		
		300 m from RCL	2.7	119	1.7	73		
		100 m from QCP	4.0	173	2.6	113		
		CHL25 (60 m)	5.6	245	3.0	132		
		CHL05 (150 m)	3.2	139	1.9	84		
		CHL14 (200 m)	2.2	94	1.5	64		
Benzo(a)pyrene (B[a]P) (as surrogate for PAHs)	Max annual	50 m from RCL	2.1×10^{-5}	213	2.1×10^{-5}	207	1.0×10^{-5} (AAQC)	2.0×10^{-5}
		150 m from RCL	2.0×10^{-5}	204	2.0×10^{-5}	202		
		300 m from RCL	2.0×10^{-5}	202	2.0×10^{-5}	201		
		100 m from QCP	3.2×10^{-5}	317	2.6×10^{-5}	256		
		CHL25 (60 m)	2.0×10^{-5}	204	2.0×10^{-5}	201		
		CHL05 (150 m)	2.0×10^{-5}	203	2.0×10^{-5}	201		
		CHL14 (200 m)	2.0×10^{-5}	202	2.0×10^{-5}	201		

Notes: RCL – road centerline; QCP – ARA-2 quarry center point
 Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in **bold**.

7.2 Operation Phase

While it is impossible to have a direct control on emissions from vehicle engines, it is possible to work on dust emissions from the road surface. Considering that part of the road will not be fully surfaced with asphalt or chip seal from the start, the maintenance crew will operate a truck that will spray water over the gravel-surface road from May to November, or when needed. Note that particulate matter in air comes almost exclusively from road dust emissions and less from exhaust gases (representing <1% of total particulates).

The impact of this measure on the maximum concentrations of TSP, PM₁₀, and PM_{2.5} along with dustfall calculated at 50, 150, and 300 m distance from the road centerline, as well as at the closest existing residence, culturally sensitive area and future residence plot is provided in **Table 7-2**. Results for the scenario where the vehicles are travelling on a paved surface instead of a gravel-based surface are also presented. For other contaminants like gaseous CACs and toxic contaminants, this mitigation measure has no impact but as mentioned in **Section 6.2** their maximum concentrations are already low, below any applicable AAQC and CAAQS. The outcome are as follows:

- Road watering during non-winter months slightly helps reduce the maximum projected TSP concentrations in air, although it would be far from enough to comply with the AAQC at 50 m distance from the road centerline (**897%**). The difference between both scenarios (unpaved no control vs. unpaved with control) is comparable to the dust control factor of 30% applied in the emissions scenario. This control factor could eventually be higher if the passage of water trucks is more frequent, especially during days with high dust uplift and dispersion potential. It would however be not enough to prevent exceedances up to at least 300 m distance from the road, according to the model that was developed as part of this study. The application of asphalt or chip seal would eventually remove these exceedances, at least beyond the 50 m mark from the road centerline.
- PM₁₀ concentrations follow a similar trend although in this case the exceedance setback could reach 150 m with a paved surface, comprising some culturally sensitive areas and future residential plots located close-by. That said, calculated exceedances at these sensitive locations remain close to the AAQC (**100–110%**).
- For PM_{2.5} based on CAAQS 2030 target of 23 µg/m³, exceedances are noted for the scenarios with unpaved surface but to a much lower extent than TSP and PM₁₀. In fact, based on modeling results, the exceedance setback only reaches 150 m and so. For the paved surface scenario, no exceedances are obtained even at 50 m distance from the road.
- With a gravel-based surface and water control, the maximum dust deposition at 50 m distance would decrease to 19 g/m² from 27 g/m² over 30-days without dust control corresponding to **270%** of the AAQC (7 g/m²). This value decreases rapidly with distance dropping to 5.4 g/m² (**76%**) and 2.8 g/m² (**43%**) at 150 and 300 m, respectively for the scenario with water control. With a paved surface, no issues are noted on that respect.
- With regard to annual air quality criteria (TSP, PM_{2.5}, and dust deposition), exceedances were calculated at 50 m distance only for the gravel-based surface scenario with water control with the exception of dustfall which AAQC is exceeded (**134%**) at one future residence location (RPF42).

Operations will manage dust through routine water application on unpaved segments and speed control. The potential transition to a chip seal or paved surface, subject to performance monitoring of settlement and serviceability in the peatland segment, is expected to materially reduce particulate concentrations and dust deposition near the corridor. With paving in place, predicted particulate concentrations meet criteria beyond very short setbacks, and residual operational effects are de minimis at community receptors.



Table 7-2: Air Dispersion Modelling Results for the Operation Phase

Contaminant	Averaging Period	Maximum Total Concentration Including Background							Limit Value	Selected Background
		Location from RCL ⁽¹⁾	Unpaved – No control		Unpaved – With control		Paved			
			$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	% limit	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Total Suspended Matter (TSP)	Max 24-hour	Max at 50 m	1,437	1,198	1,076	897	142	118	120 (AAQC)	45
		Max at 150 m	650	542	508	423	81	68		
		Max at 300 m	473	394	374	312	70	59		
		CHL25 at 60 m	957	798	718	598	101	84		
		RP01 at 1,350 m	98	82	80	67	48	40		
		RFP42 at 55 m	970	808	720	600	105	87		
Fine Inhalable Fraction (PM ₁₀)	Max 24-hour	Max at 50 m	534	1,069	383	765	73	145	50 (AAQC)	28
		Max at 150 m	266	533	195	390	51	102		
		Max at 300 m	190	381	142	283	45	90		
		CHL25 at 60 m	350	700	253	506	53	106		
		RP01 at 1,350 m	68	136	56	112	31	62		
		RFP42 at 55 m	376	752	271	542	51	103		
Fine Particulate Matter (PM _{2.5})	3-year average of annual 98 th percentile of daily 24-hour averages	Max at 50 m	44	191	35	152	18	76	23 (2030 CAAQS) 27 (AAQC)	13
		Max at 150 m	26	113	22	96	15	65		
		Max at 300 m	21	91	19	83	16	62		
		CHL25 at 60 m	32	139	27	117	16	68		
		RP01 at 1,350 m	15	65	15	65	13	58		
		RFP42 at 55 m	33	143	28	122	16	70		
Dustfall	Max 30-days	Max at 50 m	27	383	19	270	2.9	42	7.0 (AAQC)	0.4
		Max at 150 m	7.5	107	5.4	76	1.1	16		
		Max at 300 m	4.1	58	2.8	43	0.82	12		
		CHL25 at 60 m	12	165	8.2	117	1.4	20		
		RP01 at 1,350 m	0.73	10	0.63	9.0	0.43	6.1		
		RFP42 at 55 m	16	224	11	158	1.8	25		

Notes:

Concentrations that are greater than the corresponding AAQC or CAAQS are denoted in **bold**.

(1) Closest receptors from the road centerline (RCL25) for culturally sensitive areas (CHL), existing residences and institutions (RP01), and future residential plots (RFP42).



8 Concluding Remarks

A report dated of August 2024 (Appendix G of the EAR/IS) was prepared pursuant to the Climate Change and Air Quality Study Plan with the objective to verify how the Webequie Supply Road Project would impact the ambient air quality around the road and near supportive infrastructure and if there is risk of exceeding a CAAQS or an AAQC applicable in the province of Ontario. Studied air contaminants included the CACs (NO₂, CO, SO₂, TSP, PM₁₀, PM_{2.5}), ten (10) toxic contaminants from the VOC category (including carbonylic and aromatic compounds), benzo[a]pyrene as a surrogate to PAHs, and DPM. The extent of dustfall was also assessed.

Following review of the AQIA, provincial regulators issued comments which justified a revision of the AQIA. This report provides the updated results with relevant description after consideration of the comments from the Drinking Water and Environmental Compliance Division (Technical Support Section) and the Environmental Monitoring and Report Branch of the MECP provided in November 2025.

This air quality impact assessment was undertaken to conservatively evaluate the potential magnitude, spatial extent, and duration of air quality effects associated with construction and operation of the Webequie Supply Road, with particular focus on sensitive receptors located near the road corridor and associated supportive infrastructure.

Atmospheric dispersion modelling was carried out using conservative methods and emission scenarios during road construction and the operation phase considering adaptive construction strategies and controls for both phases. The emission sources covered in this assessment come essentially from the combustion of diesel fuel or gasoline from land mobile equipment, heavy-duty trucks and light-duty vehicles during the construction and operation phase of the WSR. The modelling exercise also considered fugitive dust emissions mostly from vehicular traffic on the road and the handling of aggregates and other earth materials during construction.

Ambient concentrations of emitted contaminants were calculated at points of impingement of interest including existing residences or group of residences within the community of Webequie, institutional buildings, culturally sensitive areas, and locations for future residences along the road. Overall, air quality effects are limited in spatial extent to areas immediately adjacent to the road during construction and are short in duration at any individual receptor due to the linear and progressive nature of construction activities. This report presented the maximum concentrations expected at these locations for contaminants emitted during each phase with and without mitigation measures in place. The main results of this air quality impact assessment are documented and summarized in the EAR/IS for the Project and is intended to meet the requirements of both the federal TISG and the provincially approved Terms of Reference.



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APPENDIX A

Calculation Note

Summary of modelled emission rates per source depending of averaging period

CONSTRUCTION PHASE - Source configuration (exhaust emissions)

Source N° ID	A1	A2	A3	A4a	A4b	A5a	A5b	A6	A7a	A7b	A8
Description	Clearing / grubbing	Aggregate production	Road construction	Culvert installation	Culvert installation	Bridge construction	Bridge construction	Filling material trucking	Aggregates trucking	Aggregates trucking	Bedrock blasts
Months	Feb - April	May - December	May - December	May - December	May - December	May - December	May - December	Feb - April	May - December	May - December	Feb - Oct
Hours of day	7h - 19h	0h - 24h	0h - 24h	7h - 19h	7h - 19h	7h - 19h	7h - 19h	7h - 19h	0h - 24h	0h - 24h	14h
Location	Web to ARA-4 access	West point of ARA-2	Web to ARA-4 access	WC-2	WC-4	West side of WC-1	South side of WC-3	Web to WC-1	Web to ARA-2	ARA-2 to ARA-4 access	West point of ARA-2
Source type	Volumes (300 m interval)	Volume	Volumes (300 m interval)	Volume	Volume	Volume	Volume	Line volume	Line volume	Line volume	Volume
Emission Parameters in AERMOD											
Elevation (m)	Base value	Base value	Base value	Base value	Base value	Base value	Base value	Base value	Base value	Base value	Base value
Release height (exhaust) (m)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	7.5
Lateral dimension (m)	35	100	35	35	35	35	35	---	---	---	75
Number of lanes	---	---	---	---	---	---	---	2	2	2	---
Vehicle height (m)	---	---	---	---	---	---	---	3.5	3.5	3.5	---
Plume height (m)	---	---	---	---	---	---	---	6.0	6.0	6.0	---
Plume width (m)	---	---	---	---	---	---	---	14	14	14	---
Initial Sigma-Y (m)	8.1	23	8.1	8.1	8.1	8.140	8.1	---	---	---	17
Initial Sigma-Z (m)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	2.8	2.8	2.8	7.0

CONSTRUCTION PHASE - Contaminants with standards / criteria of 1 hour or less (values in g/s) - NO CONTROL MEASURES

Source N° ID	A1	A2	A3	A4a	A4b	A5a	A5b	A6	A7a	A7b	A8
Nitrogen oxides (NOx)	2.7	1.1	1.2	0.46	0.46	0.13	0.13	0.042	0.76	0.28	28
Carbon monoxide (CO)	1.5	0.44	0.62	0.25	0.25	0.067	0.067	0.024	0.43	0.16	118
Sulfur dioxide (SO ₂)	0.0050	0.0017	0.0022	0.00087	0.00087	0.00022	0.00022	0.00018	0.0032	0.0012	3.5
Diesel particulate matter (DPM)	0.27	0.083	0.12	0.047	0.047	0.015	0.015	0.00077	0.014	0.0051	0
Acétaldéhyde	2.3E-02	7.9E-03	1.0E-02	3.8E-03	3.8E-03	1.2E-03	1.2E-03	2.4E-04	4.4E-03	1.6E-03	0
Acroléin	4.2E-03	1.4E-03	1.9E-03	6.8E-04	6.8E-04	2.2E-04	2.2E-04	3.5E-05	6.3E-04	2.3E-04	0
Ethylbenzene	2.3E-03	7.7E-04	1.0E-03	3.7E-04	3.7E-04	1.2E-04	1.2E-04	3.9E-05	7.1E-04	2.6E-04	0
Propanal (propionaldehyde)	4.9E-03	1.7E-03	2.2E-03	7.9E-04	7.9E-04	2.5E-04	2.5E-04	1.1E-05	2.0E-04	7.1E-05	0
Xylenes	1.6E-02	5.6E-03	7.3E-03	2.7E-03	2.7E-03	8.5E-04	8.5E-04	2.9E-04	5.4E-03	2.0E-03	0

CONSTRUCTION PHASE - Contaminants with standards / criteria of 8 hours or 24 hours (values in g/s) - NO CONTROL MEASURES

Source N° ID	A1	A2	A3	A4a	A4b	A5a	A5b	A6	A7a	A7b	A8
Nitrogen oxides (NOx)	2.2	0.96	1.0	0.38	0.38	0.12	0.12	0.020	0.21	0.075	28
Carbon monoxide (CO)	1.2	0.38	0.51	0.21	0.21	0.059	0.059	0.0112	0.12	0.043	118
1-3.butadiene	3.4E-04	1.2E-04	1.5E-04	5.6E-05	5.6E-05	1.9E-05	1.9E-05	1.3E-06	1.4E-05	5.0E-06	0
Acétaldéhyde	1.9E-02	6.9E-03	8.5E-03	3.1E-03	3.1E-03	1.1E-03	1.1E-03	1.1E-04	1.2E-03	4.3E-04	0
Acroléin	3.4E-03	1.2E-03	1.5E-03	5.6E-04	5.6E-04	1.9E-04	1.9E-04	1.6E-05	1.8E-04	6.3E-05	0
Benzene	9.9E-03	3.6E-03	4.4E-03	1.6E-03	1.6E-03	5.5E-04	5.5E-04	2.1E-05	2.3E-04	8.1E-05	0
Ethylbenzene	1.9E-03	6.8E-04	8.3E-04	3.1E-04	3.1E-04	1.0E-04	1.0E-04	1.8E-05	2.0E-04	7.0E-05	0
Formaldéhyde	5.3E-02	1.9E-02	2.4E-02	8.8E-03	8.8E-03	3.0E-03	3.0E-03	3.6E-04	3.8E-03	1.4E-03	0
n-hexane	4.7E-04	1.7E-04	2.1E-04	7.7E-05	7.7E-05	2.6E-05	2.6E-05	8.9E-06	9.5E-05	3.4E-05	0
Toluene	6.9E-03	2.5E-03	3.1E-03	1.1E-03	1.1E-03	3.8E-04	3.8E-04	4.9E-05	5.3E-04	1.9E-04	0
Xylenes	1.3E-02	4.9E-03	6.0E-03	2.2E-03	2.2E-03	7.5E-04	7.5E-04	1.4E-04	1.5E-03	5.3E-04	0
Benzo(a)pyrene (surrogate for PAHs)	1.5E-06	4.8E-07	6.7E-07	2.6E-07	2.6E-07	8.3E-08	8.3E-08	1.2E-09	1.3E-08	4.6E-09	0

CONSTRUCTION PHASE - Contaminants with annual standards / criteria (values in g/s) - NO CONTROL MEASURES

Source N° ID	A1	A2	A3	A4a	A4b	A5a	A5b	A6	A7a	A7b	A8
Diesel particulate matter (DPM)	0.0016	0.030	0.00052	0.0013	0.0013	0.0030	0.0020	0.000079	0.0011	0.00029	0
Nitrogen oxides (NOx)	0.015	0.43	0.0048	0.013	0.013	0.031	0.021	0.0043	0.058	0.016	0.51
Sulfur dioxide (SO ₂)	0.000029	0.00068	0.0000089	0.000025	0.000025	0.000048	0.000032	0.000018	0.00024	0.000066	0.064
1,3-butadiène	2.4E-06	5.2E-05	1.5E-06	1.9E-06	1.9E-06	5.0E-06	3.3E-06	2.9E-07	3.8E-06	1.0E-06	0
Benzene	6.9E-05	1.5E-03	4.3E-05	5.6E-05	5.6E-05	1.5E-04	9.7E-05	4.6E-06	6.2E-05	1.7E-05	0
Benzo(a)pyrene (surrogate for PAHs)	1.0E-08	2.0E-07	3.5E-09	8.9E-09	8.9E-09	2.0E-08	1.4E-08	2.6E-10	3.5E-09	9.4E-10	0

CONSTRUCTION PHASE - Contaminants with standards / criteria of 1 hour or less (values in g/s) - WITH CONTROL MEASURES (80% TIER 4)

Source N° ID	A1	A2	A3	A4a	A4b	A5a	A5b	A6	A7a	A7b	A8
Nitrogen oxides (NOx)	0.26	0.63	0.55	0.014	0.19	0.085	0.085	0.042	0.76	0.28	28
Carbon monoxide (CO)	0.10	0.22	0.26	0.0032	0.10	0.048	0.048	0.024	0.43	0.16	118
Sulfur dioxide (SO ₂)	0.0036	0.0015	0.0019	0.00062	0.00071	0.00020	0.00020	0.00018	0.0032	0.0012	3.5
Acrolein	4.7E-04	7.8E-04	8.6E-04	3.8E-05	2.8E-04	1.4E-04	1.4E-04	3.5E-05	6.3E-04	2.3E-04	0
Propanal (propionaldehyde)	5.6E-04	9.2E-04	1.0E-03	4.4E-05	3.3E-04	1.7E-04	1.7E-04	1.1E-05	2.0E-04	7.1E-05	0
Diesel particulate matter (DPM)	0.021	0.043	0.053	0.00048	0.018	0.0094	0.0094	0.00077	0.014	0.0051	0

CONSTRUCTION PHASE - Contaminants with standards / criteria of 8 hours or 24 hours (values in g/s) - WITH CONTROL MEASURES (80% TIER 4)

Source N° ID	A1	A2	A3	A4a	A4b	A5a	A5b	A6	A7a	A7b	A8
Nitrogen oxides (NOx)	0.17	0.59	0.44	0.012	0.16	0.077	0.077	0.020	0.21	0.075	28
Carbon monoxide (CO)	0.068	0.20	0.21	0.0027	0.085	0.043	0.043	0.011	0.12	0.043	118
Acrolein	3.4E-04	7.1E-04	6.9E-04	3.1E-05	2.3E-04	1.3E-04	1.3E-04	1.6E-05	1.8E-04	6.3E-05	0
Benzene	9.8E-04	2.1E-03	2.0E-03	9.1E-05	6.8E-04	3.7E-04	3.7E-04	2.1E-05	2.3E-04	8.1E-05	0
Formaldehyde	5.3E-03	1.1E-02	1.1E-02	4.9E-04	3.7E-03	2.0E-03	2.0E-03	3.6E-04	3.8E-03	1.4E-03	0
Benzo(a)pyrene (surrogate for PAHs)	9.0E-08	2.5E-07	2.8E-07	2.7E-09	1.0E-07	5.5E-08	5.5E-08	1.2E-09	1.3E-08	4.6E-09	0

CONSTRUCTION PHASE - Contaminants with annual standards (values in g/s) - WITH CONTROL MEASURES (80% TIER 4)

Source N° ID	A1	A2	A3	A4a	A4b	A5a	A5b	A6	A7a	A7b	A8
Benzo(a)pyrene (surrogate for PAHs)	6.3E-10	9.5E-08	1.1E-09	9.1E-11	3.5E-09	1.4E-08	9.4E-09	2.60E-10	3.50E-09	9.43E-10	0

CONSTRUCTION PHASE - Source configuration (fugitive dust emissions)

Source N° ID	B1	B2a	B2b	B3	B4	B5
Description	Filling material trucking	Aggregates trucking	Aggregates trucking	Dozers, graders and material unloading	Aggregate production	Bedrock blasts
Months	Feb - April	May - December	May - December	May - December	May - December	Feb - Oct
Hours of day	7h - 19h	0h - 24h	0h - 24h	0h - 24h	0h - 24h	14h
Location	Web to WC-1	Web to ARA-2	ARA-2 to ARA-4 access	Web to ARA-4 access	West point of ARA-2	West point of ARA-2
Source type	Line volume	Line volume	Line volume	Volumes (300 m interval)	Volume	Volume
Emission Parameters in AERMOD						
Elevation (m)	Base value	Base value	Base value	Base value	Base value	Base value
Release height (m)	3.0	3.0	3.0	0.50	5.0	7.5
Lateral dimension (m)	---	---	---	35	150	75
Number of lanes	2	2	2	---	---	---
Vehicle height (m)	3.5	3.5	3.5	---	---	---
Plume height (m)	5.95	6.0	6.0	---	---	---
Plume width (m)	14	14	14	---	---	---
Initial Sigma-Y (m)	---	---	---	8.1	35	17
Initial Sigma-Z (m)	2.8	2.8	2.8	0.47	4.7	7.0
Dry Deposition Parameters in AERMOD						
Grain density (g/cm3)	2.5	2.5	2.5	2.5	2.5	2.5
Diameter 1.25 um (%)	3%	3%	3%	9%	6%	3%
Diameter 6.25 um (%)	23%	23%	23%	14%	30%	49%
Diameter 12.5 um (%)	---	---	---	10%	---	---
Diameter 20 um (%)	74%	74%	74%	---	64%	48%
Diameter 22.5 um (%)	---	---	---	67%	---	---

CONSTRUCTION PHASE - Contaminants with standards / criteria of 24 hours (values in g/s)

Source N° ID	B1	B2a	B2b	B3	B4	B5
Total suspended particulates (TSP)	21	223	79	5.3	1.9	27
Fine particulate matter (PM ₁₀)	5.4	57	20	1.3	0.80	14
Fine particulate matter (PM _{2.5})	0.54	5.7	2.0	0.46	0.12	0.82

CONSTRUCTION PHASE - Dustfall (monthly basis) (values in g/s)

Source N° ID	B1	B2a	B2b	B3	B4	B5
Dustfall	13	149	53	0.21	1.3	4.6

CONSTRUCTION PHASE - Contaminants with annual standards / criteria (values in g/s)

Source N° ID	B1	B2a	B2b	B3	B4	B5
Total suspended particulates (TSP)	4.5	61	16	0.027	0.88	0.50
Dustfall	4.5	61	16	0.027	0.88	0.50
Fine particulate matter (PM _{2.5})	0.12	1.6	0.42	0.0023	0.056	0.015

OPERATION PHASE - Source configuration

Source N° ID	C1
Description	Vehicular traffic
Months	Jan-Dec
Hours of day	6h-20h
Location	Web to Access Road
Source type	Line volume (separated)
Emission Parameters in AERMOD	
Elevation (m)	Base value
Release height (exhaust) (m)	2.1
Lateral dimension (m)	---
Number of lanes	2
Vehicle height (m)	2.5
Plume height (m)	4.3
Plume width (m)	14
Initial Sigma-Y (m)	---
Initial Sigma-Z (m)	2.0

mix between heavy and light vehicles

OPERATION PHASE - Contaminants with standards / criteria of 2 hours or less

Source N° ID	C1
Nitrogen oxides (NOx)	0.72
Carbon monoxide (CO)	0.98
Sulfur dioxide (SO ₂)	0.0032
Diesel particulate matter (DPM)	0.016
Acétaldéhyde	7.8E-03
Acrolein	1.1E-03
Ethylbenzene	1.3E-03
Propanal (propionaldehyde)	3.5E-04
Xylenes	9.5E-03

OPERATION PHASE - Contaminants with standards / criteria of 8 hours or 24 hours

Source N° ID	C1
Total suspended particulates (TSP)	556
Fine particulate matter (PM ₁₀)	163
Fine particulate matter (PM _{2.5})	16
Nitrogen oxides (NOx)	0.48
Carbon monoxide (CO)	0.66
1-3.butadiene	6.0E-05
Acétaldéhyde	5.2E-03
Acrolein	7.5E-04
Benzene	9.6E-04
Ethylbenzene	8.4E-04
Formaldéhyde	1.6E-02
n-hexane	4.0E-04
Toluene	2.2E-03
Xylenes	6.3E-03
Benzo(a)pyrene (surrogate for PAHs)	3.6E-08

Fugitive dust only
Fugitive dust only
Fugitive dust only

OPERATION PHASE - Paved Surface Scenario

Source N° ID	C1
Total suspended particulates (TSP)	35
Fine particulate matter (PM ₁₀)	8.6
Fine particulate matter (PM _{2.5})	1.7

OPERATION PHASE - Contaminants with standards / criteria of 1 month

Source N° ID	C1
Dustfall	382

Fugitive dust only

OPERATION PHASE - Contaminants with annual standards / criteria

Source N° ID	C1
Total suspended particulates (TSP)	382
Dustfall	382
Diesel particulate matter (DPM)	0.0075
Fine particulate matter (PM _{2.5})	11
Nitrogen oxides (NOx)	0.33
Sulfur dioxide (SO ₂)	0.0015
1,3-butadiène	4.2E-05
Benzene	6.7E-04
Benzo(a)pyrene (surrogate for PAHs)	2.5E-08

Fugitive dust only

Fugitive dust only

OPERATION PHASE - Paved Surface Scenario

Source N° ID	C1
Dustfall	24

OPERATION PHASE - Paved Surface Scenario

Source N° ID	C1
Total suspended particulates (TSP)	24
Dustfall	24
Fine particulate matter (PM _{2.5})	1.2

WSR CONSTRUCTION PHASE - Off-road diesel engines (with control; worst-case scenario)

Reference: US EPA Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engine in MOVES4, 2023.

Technical Specifications

- [1] Based on Sigfusson's report calendar and work progress for the first year of construction when there will be more equipment in operation within the modeled domain.
- [2] Work duration based on Sigfusson's calendar. Work will be done around the clock except for land clearing, bridge construction and culvert installation (during day shifts only).
- [3] Corresponds to default values from US EPA according to the equipment type.
- [4] TIER classification is assumed 3 for all equipment (except generator set at 2) representing a conservative average from TIER 0 to 4 that could be used at the site.
- [5] For mobile equipment, it is assumed that they will all be operated at the same time while taking into considerations breaks and turnarounds (2h per 12h shift in average in most cases; except generator sets and light plants).
- [6] Represents an estimated percentage of the modelled emission period the equipment will be at one location.

Assumptions

Engine age factor	100%	
Diesel fuel density	850	g/L
Diesel sulfur content	15	ppm S
Distance Webequie to ARA-2 quarry	29.8	km
Distance ARA-2 quarry to ARA-4 access road intersection	10.8	km

Equipment			Operation [1]		Period of emissions [2]			Number of units	Rated engine power (hp)	Engine load factor [3]	Tier Classification [4]	Emission rate weighting	
N° ID	Description	Type	Activity	Sector	Monthly	Daily	Duration (days)					Daily [5]	Annual [6]
A1-1	300 size excavator (CAT 329)	Excavator	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	202	0.59	3	83%	0.58%
A1-2	400 size excavator (CAT 350)	Excavator	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	413	0.59	3	83%	0.58%
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	100	0.59	3	83%	0.58%
A1-4	850/D6R size dozer	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	6	179	0.59	3	83%	0.58%
A1-5	CAT 140 Grader	Grader	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	1	250	0.59	3	83%	0.58%
A1-6	CAT D7 size dozer	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	4	265	0.59	3	83%	0.58%
A1-7	CAT D8 size dozer	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	354	0.59	3	83%	0.58%
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	3	270	0.59	3	83%	0.58%
A1-9	Skidder (JD 648 L)	Forest logging equipment	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	3	237	0.59	3	83%	0.58%
A1-10	Light plants	Generator set	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	5	27	0.43	2	25%	0.17%
A2-1	300 size excavator (CAT 329)	Excavator	Aggregate production	ARA-2	May-December	0h-24h	242	1	202	0.59	3	83%	40%
A2-2	980 size loader (CAT 980)	Rubber tire loader	Aggregate production	ARA-2	May-December	0h-24h	242	1	393	0.59	3	83%	40%
A2-3	988 size loader (CAT 988)	Rubber tire loader	Aggregate production	ARA-2	May-December	0h-24h	242	1	541	0.59	3	83%	40%
A2-4	Furukawa HCR900 drill	Bore/drill rig	Aggregate production	ARA-2	May-December	0h-24h	176	2	225	0.43	3	83%	29%
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	Aggregate production	ARA-2	May-December	0h-24h	242	2	150	0.21	3	83%	8.1%
A2-6	Crusher power van 600 kW	Generator set	Aggregate production	ARA-2	May-December	0h-24h	242	1	804	0.43	2	100%	47%
A3-1	300 size excavator (CAT 329)	Excavator	Grading / stripping	Web to ARA-4 access	May-December	0h-24h	111	1	202	0.59	3	83%	0.28%
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	Grading / stripping	Web to ARA-4 access	May-December	0h-24h	111	2	215	0.59	3	83%	0.28%
A3-3	200 size excavator (CAT 316)	Excavator	Ditching	Web to ARA-4 access	May-December	0h-24h	149	1	105	0.59	3	83%	0.37%
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	Ditching	Web to ARA-4 access	May-December	0h-24h	149	1	100	0.59	3	83%	0.37%
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	Ditching	Web to ARA-4 access	May-December	0h-24h	149	1	240	0.21	3	83%	0.37%
A3-6	220 size excavator (CAT 325)	Excavator	Geotextile installation	Web to ARA-4 access	May-December	0h-24h	128	1	172	0.59	3	83%	0.32%
A3-7	850/D6R size dozer	Crawler dozer	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	5	179	0.59	3	83%	0.28%
A3-8	CAT 140 Grader	Grader	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	2	250	0.59	3	83%	0.28%
A3-9	CAT D8 size dozer	Crawler dozer	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	2	354	0.59	3	83%	0.28%
A3-10	IR SD150 Smoothdrum/padfoot	Roller	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	3	185	0.59	3	83%	0.28%
A3-11	Light plants	Generator set	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	5	27	0.43	2	58%	0.19%
A4-1	400 size excavator (CAT 350)	Excavator	Culvert installation	WC-2	May-December	7h-19h	7	1	413	0.59	3	83%	2.9%
A4-2	80 ton rough terrain crane	Crane	Culvert installation	WC-2	May-December	7h-19h	7	1	164	0.43	3	83%	2.9%
A4-3	950 size loader (CAT 950)	Rubber tire loader	Culvert installation	WC-2	May-December	7h-19h	7	1	225	0.59	3	83%	2.9%
A4-4	966 size loader (CAT 966)	Rubber tire loader	Culvert installation	WC-2	May-December	7h-19h	7	1	321	0.59	3	83%	2.9%
A4-5	400 size excavator (CAT 350)	Excavator	Culvert installation	WC-4	May-December	7h-19h	7	1	413	0.59	3	83%	2.9%
A4-6	80 ton rough terrain crane	Crane	Culvert installation	WC-4	May-December	7h-19h	7	1	164	0.43	3	83%	2.9%
A4-7	950 size loader (CAT 950)	Rubber tire loader	Culvert installation	WC-4	May-December	7h-19h	7	1	225	0.59	3	83%	2.9%
A4-8	966 size loader (CAT 966)	Rubber tire loader	Culvert installation	WC-4	May-December	7h-19h	7	1	321	0.59	3	83%	2.9%
A5-1	80 ton rough terrain crane	Crane	Bridge construction	WC-1	May-December	7h-19h	270	1	164	0.43	3	83%	18%
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	Bridge construction	WC-1	May-December	7h-19h	270	1	105	0.59	3	83%	18%
A5-3	Tria portable concrete batching unit	Generator set	Bridge construction	WC-1	May-December	7h-19h	270	1	67	0.43	2	100%	36%
A5-4	80 ton rough terrain crane	Crane	Bridge construction	WC-3	May-December	7h-19h	180	1	164	0.43	3	83%	12%
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	Bridge construction	WC-3	May-December	7h-19h	180	1	105	0.59	3	83%	12%
A5-6	Tria portable concrete batching unit	Generator set	Bridge construction	WC-3	May-December	7h-19h	180	1	67	0.43	2	100%	24%

Raw emission rate calculations for each equipment according to Nonroad model

Nitrogen Oxides (NOx)

Equipment			Base EF (EF _{ss} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h)	Emission rate (g/s)
N° ID	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	2.500	1.040	1.008	2.6	0.17
A1-2	400 size excavator (CAT 350)	Excavator	2.500	1.040	1.008	2.6	0.35
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	3.000	1.040	1.008	3.1	0.10
A1-4	850/D6R size dozer	Crawler dozer	2.500	1.040	1.008	2.6	0.46
A1-5	CAT 140 Grader	Grader	2.500	1.040	1.008	2.6	0.11
A1-6	CAT D7 size dozer	Crawler dozer	2.500	1.040	1.008	2.6	0.46
A1-7	CAT D8 size dozer	Crawler dozer	2.500	1.040	1.008	2.6	0.30
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	2.500	1.040	1.008	2.6	0.35
A1-9	Skidder (JD 648 L)	Forest logging equipment	2.500	1.040	1.008	2.6	0.31
A1-10	Light plants	Generator set	4.728	1.000	1.009	4.8	0.076
A2-1	300 size excavator (CAT 329)	Excavator	2.500	1.040	1.008	2.6	0.087
A2-2	980 size loader (CAT 980)	Rubber tire loader	2.500	1.040	1.008	2.6	0.17
A2-3	988 size loader (CAT 988)	Rubber tire loader	2.500	1.040	1.008	2.6	0.23
A2-4	Furukawa HCR900 drill	Bore/drill rig	2.500	1.000	1.008	2.5	0.14
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	2.500	1.210	1.008	3.0	0.053
A2-6	Crusher power van 600 kW	Generator set	4.100	1.000	1.009	4.1	0.40
A3-1	300 size excavator (CAT 329)	Excavator	2.500	1.040	1.008	2.6	0.087
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	2.500	1.040	1.008	2.6	0.18
A3-3	200 size excavator (CAT 316)	Excavator	2.500	1.040	1.008	2.6	0.045
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	3.000	1.040	1.008	3.1	0.052
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	2.500	1.210	1.008	3.0	0.043
A3-6	220 size excavator (CAT 325)	Excavator	2.500	1.040	1.008	2.6	0.074
A3-7	850/D6R size dozer	Crawler dozer	2.500	1.040	1.008	2.6	0.38
A3-8	CAT 140 Grader	Grader	2.500	1.040	1.008	2.6	0.21
A3-9	CAT D8 size dozer	Crawler dozer	2.500	1.040	1.008	2.6	0.30
A3-10	IR SD150 Smoothdrum/padfoot	Roller	2.500	1.040	1.008	2.6	0.24
A3-11	Light plants	Generator set	4.728	1.000	1.009	4.8	0.076
A4-1	400 size excavator (CAT 350)	Excavator	2.500	1.040	1.008	2.6	0.18
A4-2	80 ton rough terrain crane	Crane	2.500	1.000	1.008	2.5	0.049
A4-3	950 size loader (CAT 950)	Rubber tire loader	2.500	1.040	1.008	2.6	0.10
A4-4	966 size loader (CAT 966)	Rubber tire loader	2.500	1.040	1.008	2.6	0.14
A4-5	400 size excavator (CAT 350)	Excavator	2.500	1.040	1.008	2.6	0.18
A4-6	80 ton rough terrain crane	Crane	2.500	1.000	1.008	2.5	0.049
A4-7	950 size loader (CAT 950)	Rubber tire loader	2.500	1.040	1.008	2.6	0.10
A4-8	966 size loader (CAT 966)	Rubber tire loader	2.500	1.040	1.008	2.6	0.14
A5-1	80 ton rough terrain crane	Crane	2.500	1.000	1.008	2.5	0.049
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough	2.500	1.040	1.008	2.6	0.045
A5-3	Tria portable concrete batching unit	Generator set	4.700	1.000	1.009	4.7	0.038
A5-4	80 ton rough terrain crane	Crane	2.500	1.000	1.008	2.5	0.049
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough	2.500	1.040	1.008	2.6	0.045
A5-6	Tria portable concrete batching unit	Generator set	4.700	1.000	1.009	4.7	0.038

Total particulate matter (TSP)

N° ID	Equipment		Base EF (EF _{SS} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)
	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.150	1.470	1.473	0.27	0.018
A1-2	400 size excavator (CAT 350)	Excavator	0.150	1.470	1.473	0.27	0.037
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.200	1.470	1.473	0.37	0.012
A1-4	850/D6R size dozer	Crawler dozer	0.150	1.470	1.473	0.27	0.048
A1-5	CAT 140 Grader	Grader	0.150	1.470	1.473	0.27	0.011
A1-6	CAT D7 size dozer	Crawler dozer	0.150	1.470	1.473	0.27	0.047
A1-7	CAT D8 size dozer	Crawler dozer	0.150	1.470	1.473	0.27	0.032
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.150	1.470	1.473	0.27	0.036
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.150	1.470	1.473	0.27	0.032
A1-10	Light plants	Generator set	0.339	1.000	1.473	0.44	0.0071
A2-1	300 size excavator (CAT 329)	Excavator	0.150	1.470	1.473	0.27	0.0090
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.150	1.470	1.473	0.27	0.018
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.150	1.470	1.473	0.27	0.024
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.150	1.000	1.473	0.17	0.0091
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.220	2.370	1.473	0.71	0.012
A2-6	Crusher power van 600 kW	Generator set	0.132	1.000	1.473	0.14	0.014
A3-1	300 size excavator (CAT 329)	Excavator	0.150	1.470	1.473	0.27	0.0090
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.150	1.470	1.473	0.27	0.019
A3-3	200 size excavator (CAT 316)	Excavator	0.220	1.470	1.473	0.42	0.0073
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.200	1.470	1.473	0.37	0.0061
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.150	2.370	1.473	0.46	0.0065
A3-6	220 size excavator (CAT 325)	Excavator	0.220	1.470	1.473	0.42	0.012
A3-7	850/D6R size dozer	Crawler dozer	0.150	1.470	1.473	0.27	0.040
A3-8	CAT 140 Grader	Grader	0.150	1.470	1.473	0.27	0.022
A3-9	CAT D8 size dozer	Crawler dozer	0.150	1.470	1.473	0.27	0.032
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.150	1.470	1.473	0.27	0.025
A3-11	Light plants	Generator set	0.339	1.000	1.473	0.44	0.0071
A4-1	400 size excavator (CAT 350)	Excavator	0.150	1.470	1.473	0.27	0.018
A4-2	80 ton rough terrain crane	Crane	0.220	1.000	1.473	0.27	0.0053
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.150	1.470	1.473	0.27	0.010
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.150	1.470	1.473	0.27	0.014
A4-5	400 size excavator (CAT 350)	Excavator	0.150	1.470	1.473	0.27	0.018
A4-6	80 ton rough terrain crane	Crane	0.220	1.000	1.473	0.27	0.0053
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.150	1.470	1.473	0.27	0.010
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.150	1.470	1.473	0.27	0.014
A5-1	80 ton rough terrain crane	Crane	0.220	1.000	1.473	0.27	0.0053
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.220	1.470	1.473	0.42	0.0073
A5-3	Tria portable concrete batching unit	Generator set	0.240	1.000	1.473	0.30	0.0024
A5-4	80 ton rough terrain crane	Crane	0.220	1.000	1.473	0.27	0.0053
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.220	1.470	1.473	0.42	0.0073
A5-6	Tria portable concrete batching unit	Generator set	0.240	1.000	1.473	0.30	0.0024

Carbon monoxide (CO)

Equipment			Base EF (EF _{SS} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)
N° ID	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.748	1.530	1.151	1.3	0.087
A1-2	400 size excavator (CAT 350)	Excavator	0.843	1.530	1.151	1.5	0.20
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	2.366	1.530	1.151	4.2	0.14
A1-4	850/D6R size dozer	Crawler dozer	0.748	1.530	1.151	1.3	0.23
A1-5	CAT 140 Grader	Grader	0.748	1.530	1.151	1.3	0.054
A1-6	CAT D7 size dozer	Crawler dozer	0.748	1.530	1.151	1.3	0.23
A1-7	CAT D8 size dozer	Crawler dozer	0.843	1.530	1.151	1.5	0.17
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.748	1.530	1.151	1.3	0.17
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.748	1.530	1.151	1.3	0.15
A1-10	Light plants	Generator set	1.532	1.000	1.101	1.7	0.027
A2-1	300 size excavator (CAT 329)	Excavator	0.748	1.530	1.151	1.3	0.044
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.843	1.530	1.151	1.5	0.096
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.843	1.530	1.151	1.5	0.13
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.748	1.000	1.151	0.86	0.046
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.867	2.570	1.151	2.6	0.045
A2-6	Crusher power van 600 kW	Generator set	0.764	1.000	1.101	0.84	0.081
A3-1	300 size excavator (CAT 329)	Excavator	0.748	1.530	1.151	1.3	0.044
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.748	1.530	1.151	1.3	0.093
A3-3	200 size excavator (CAT 316)	Excavator	0.867	1.530	1.151	1.5	0.026
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	2.366	1.530	1.151	4.2	0.068
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.748	2.570	1.151	2.2	0.031
A3-6	220 size excavator (CAT 325)	Excavator	0.867	1.530	1.151	1.5	0.043
A3-7	850/D6R size dozer	Crawler dozer	0.748	1.530	1.151	1.3	0.19
A3-8	CAT 140 Grader	Grader	0.748	1.530	1.151	1.3	0.11
A3-9	CAT D8 size dozer	Crawler dozer	0.843	1.530	1.151	1.5	0.17
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.748	1.530	1.151	1.3	0.12
A3-11	Light plants	Generator set	1.532	1.000	1.101	1.7	0.027
A4-1	400 size excavator (CAT 350)	Excavator	0.843	1.530	1.151	1.5	0.10
A4-2	80 ton rough terrain crane	Crane	0.867	1.000	1.151	1.0	0.020
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.748	1.530	1.151	1.3	0.049
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.843	1.530	1.151	1.5	0.078
A4-5	400 size excavator (CAT 350)	Excavator	0.843	1.530	1.151	1.5	0.10
A4-6	80 ton rough terrain crane	Crane	0.867	1.000	1.151	1.0	0.020
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.748	1.530	1.151	1.3	0.049
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.843	1.530	1.151	1.5	0.078
A5-1	80 ton rough terrain crane	Crane	0.867	1.000	1.151	1.0	0.020
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.867	1.530	1.151	1.5	0.026
A5-3	Tria portable concrete batching unit	Generator set	2.366	1.000	1.101	2.6	0.021
A5-4	80 ton rough terrain crane	Crane	0.867	1.000	1.151	1.0	0.020
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.867	1.530	1.151	1.5	0.026
A5-6	Tria portable concrete batching unit	Generator set	2.366	1.000	1.101	2.6	0.021

Sulfur dioxide (SO₂)

Equipment			Base EF (EF _{SS} - g/hp-h)	TAF factor	Adjusted BSFC (g/hp-h)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)
N° ID	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.367	1.010	168	0.0049	3.3E-04
A1-2	400 size excavator (CAT 350)	Excavator	0.367	1.010	168	0.0049	6.7E-04
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.408	1.010	187	0.0055	1.8E-04
A1-4	850/D6R size dozer	Crawler dozer	0.367	1.010	168	0.0049	8.7E-04
A1-5	CAT 140 Grader	Grader	0.367	1.010	168	0.0049	2.0E-04
A1-6	CAT D7 size dozer	Crawler dozer	0.367	1.010	168	0.0049	8.6E-04
A1-7	CAT D8 size dozer	Crawler dozer	0.367	1.010	168	0.0049	5.7E-04
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.367	1.010	168	0.0049	6.5E-04
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.367	1.010	168	0.0049	5.7E-04
A1-10	Light plants	Generator set	0.408	1.000	185	0.0054	8.7E-05
A2-1	300 size excavator (CAT 329)	Excavator	0.367	1.010	168	0.0049	1.6E-04
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.367	1.010	168	0.0049	3.2E-04
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.367	1.010	168	0.0049	4.4E-04
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.367	1.000	166	0.0049	2.6E-04
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.367	1.180	196	0.0057	1.0E-04
A2-6	Crusher power van 600 kW	Generator set	0.367	1.000	166	0.0049	4.7E-04
A3-1	300 size excavator (CAT 329)	Excavator	0.367	1.010	168	0.0049	1.6E-04
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.367	1.010	168	0.0049	3.5E-04
A3-3	200 size excavator (CAT 316)	Excavator	0.367	1.010	168	0.0049	8.5E-05
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.408	1.010	187	0.0055	9.0E-05
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.367	1.180	196	0.0058	8.1E-05
A3-6	220 size excavator (CAT 325)	Excavator	0.367	1.010	168	0.0049	1.4E-04
A3-7	850/D6R size dozer	Crawler dozer	0.367	1.010	168	0.0049	7.2E-04
A3-8	CAT 140 Grader	Grader	0.367	1.010	168	0.0049	4.0E-04
A3-9	CAT D8 size dozer	Crawler dozer	0.367	1.010	168	0.0049	5.7E-04
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.367	1.010	168	0.0049	4.5E-04
A3-11	Light plants	Generator set	0.408	1.000	185	0.0054	8.7E-05
A4-1	400 size excavator (CAT 350)	Excavator	0.367	1.010	168	0.0049	3.3E-04
A4-2	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0049	9.6E-05
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.367	1.010	168	0.0049	1.8E-04
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.367	1.010	168	0.0049	2.6E-04
A4-5	400 size excavator (CAT 350)	Excavator	0.367	1.010	168	0.0049	3.3E-04
A4-6	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0049	9.6E-05
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.367	1.010	168	0.0049	1.8E-04
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.367	1.010	168	0.0049	2.6E-04
A5-1	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0049	9.6E-05
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.367	1.010	168	0.0049	8.5E-05
A5-3	Tria portable concrete batching unit	Generator set	0.408	1.000	185	0.0054	4.3E-05
A5-4	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0049	9.6E-05
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.367	1.010	168	0.0049	8.5E-05
A5-6	Tria portable concrete batching unit	Generator set	0.408	1.000	185	0.0054	4.3E-05

Total hydrocarbons (THC)

Equipment			Base EF (EF _{SS} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)
N° ID	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.184	1.050	1.027	0.20	0.013
A1-2	400 size excavator (CAT 350)	Excavator	0.167	1.050	1.027	0.18	0.025
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.184	1.050	1.027	0.20	0.0066
A1-4	850/D6R size dozer	Crawler dozer	0.184	1.050	1.027	0.20	0.036
A1-5	CAT 140 Grader	Grader	0.184	1.050	1.027	0.20	0.0083
A1-6	CAT D7 size dozer	Crawler dozer	0.184	1.050	1.027	0.20	0.035
A1-7	CAT D8 size dozer	Crawler dozer	0.167	1.050	1.027	0.18	0.021
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.184	1.050	1.027	0.20	0.027
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.184	1.050	1.027	0.20	0.024
A1-10	Light plants	Generator set	0.279	1.000	1.034	0.29	0.0047
A2-1	300 size excavator (CAT 329)	Excavator	0.184	1.050	1.027	0.20	0.0067
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.167	1.000	1.027	0.17	0.011
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.167	1.000	1.027	0.17	0.016
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.184	1.000	1.027	0.19	0.010
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.184	2.290	1.027	0.44	0.0077
A2-6	Crusher power van 600 kW	Generator set	0.167	1.000	1.034	0.18	0.017
A3-1	300 size excavator (CAT 329)	Excavator	0.184	1.050	1.027	0.20	0.0067
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.184	1.050	1.027	0.20	0.014
A3-3	200 size excavator (CAT 316)	Excavator	0.184	1.050	1.027	0.20	0.0035
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.184	1.050	1.027	0.20	0.0033
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.184	1.000	1.027	0.19	0.0027
A3-6	220 size excavator (CAT 325)	Excavator	0.184	1.050	1.027	0.20	0.0057
A3-7	850/D6R size dozer	Crawler dozer	0.184	1.050	1.027	0.20	0.030
A3-8	CAT 140 Grader	Grader	0.184	1.050	1.027	0.20	0.017
A3-9	CAT D8 size dozer	Crawler dozer	0.167	1.050	1.027	0.18	0.021
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.184	1.000	1.027	0.19	0.017
A3-11	Light plants	Generator set	0.279	1.000	1.034	0.29	0.0047
A4-1	400 size excavator (CAT 350)	Excavator	0.167	1.050	1.027	0.18	0.012
A4-2	80 ton rough terrain crane	Crane	0.184	1.000	1.027	0.19	0.0038
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.184	1.000	1.027	0.19	0.0071
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.167	1.000	1.027	0.17	0.0092
A4-5	400 size excavator (CAT 350)	Excavator	0.167	1.050	1.027	0.18	0.012
A4-6	80 ton rough terrain crane	Crane	0.184	1.000	1.027	0.19	0.0038
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.184	1.000	1.027	0.19	0.0071
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.167	1.000	1.027	0.17	0.0092
A5-1	80 ton rough terrain crane	Crane	0.184	1.000	1.027	0.19	0.0038
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.184	1.050	1.027	0.20	0.0035
A5-3	Tria portable concrete batching unit	Generator set	0.367	1.000	1.034	0.39	0.0031
A5-4	80 ton rough terrain crane	Crane	0.184	1.000	1.027	0.19	0.0038
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.184	1.050	1.027	0.20	0.0035
A5-6	Tria portable concrete batching unit	Generator set	0.367	1.000	1.034	0.39	0.0031

Engines emission rates

Hourly emission rates: sum of emission rates for all equipment included into the source.

Daily emission rates: weighted sum of emission rates for all equipment included into the source in accordance with selected daily emission rate weightings.

Annual emission rates: weighted sum of emission rates for all equipment included into the source in accordance with selected annual emission rate weightings.

N° ID	Description	Averaging period	Emission rates (g/s)									
			TSP	PM10	PM2.5	NOx	CO	SO2	HC	1,3-butadiene	Acéaldéhyde	Acrolein
A1 (Web-ARA-4 access)	Clearing / grubbing (February to April; 7h to 19h)	Hourly	0.28	0.28	0.27	2.7	1.5	5.0E-03	0.20	4.1E-04	2.3E-02	4.2E-03
		Daily	0.23	0.23	0.22	2.2	1.2	4.1E-03	0.16	3.4E-04	1.9E-02	3.4E-03
		Annually	0.0016	0.0016	0.0016	0.015	0.0084	2.9E-05	0.0011	2.4E-06	1.3E-04	2.4E-05
A2 (ARA-2)	Aggregate production (May to December; 0h-24h)	Hourly	0.086	0.086	0.083	1.1	0.44	1.7E-03	0.068	1.4E-04	7.9E-03	1.4E-03
		Daily	0.074	0.074	0.072	1.0	0.38	1.5E-03	0.060	1.2E-04	6.9E-03	1.2E-03
		Annually	0.031	0.031	0.030	0.43	0.16	6.8E-04	0.025	5.2E-05	2.9E-03	5.2E-04
A3 (Web-ARA-4 access)	Road construction (May to December; 0h-24h)	Hourly	0.13	0.13	0.12	1.2	0.62	2.2E-03	0.090	1.9E-04	1.0E-02	1.9E-03
		Daily	0.10	0.10	0.10	1.0	0.51	1.8E-03	0.074	1.5E-04	8.5E-03	1.5E-03
		Annually	0.00053	0.00053	0.00052	0.0048	0.0027	8.9E-06	0.00071	1.5E-06	8.2E-05	1.5E-05
A4a (WC-2)	Culvert installation (May to December; 7h-19h)	Hourly	0.048	0.048	0.047	0.46	0.25	8.7E-04	0.032	6.7E-05	3.8E-03	6.8E-04
		Daily	0.040	0.040	0.039	0.38	0.21	7.2E-04	0.027	5.6E-05	3.1E-03	5.6E-04
		Annually	0.0014	0.0014	0.0013	0.013	0.0070	2.5E-05	0.00093	1.9E-06	1.1E-04	1.9E-05
A4b (WC-4)	Culvert installation (May to December; 7h-19h)	Hourly	0.048	0.048	0.047	0.46	0.25	8.7E-04	0.032	6.7E-05	3.8E-03	6.8E-04
		Daily	0.040	0.040	0.039	0.38	0.21	7.2E-04	0.027	5.6E-05	3.1E-03	5.6E-04
		Annually	0.0014	0.0014	0.0013	0.013	0.0070	2.5E-05	0.00093	1.9E-06	1.1E-04	1.9E-05
A5a (WC-1)	Bridge construction (May to December; 7h-19h)	Hourly	0.015	0.015	0.015	0.13	0.067	2.2E-04	0.010	2.1E-05	1.2E-03	2.2E-04
		Daily	0.013	0.013	0.013	0.12	0.059	1.9E-04	0.0091	1.9E-05	1.1E-03	1.9E-04
		Annually	0.0031	0.0031	0.0030	0.031	0.016	4.8E-05	0.0024	5.0E-06	2.8E-04	5.1E-05
A5b (WC-3)	Bridge construction (May to December; 7h-19h)	Hourly	0.015	0.015	0.015	0.13	0.067	2.2E-04	0.010	2.1E-05	1.2E-03	2.2E-04
		Daily	0.013	0.013	0.013	0.12	0.059	1.9E-04	0.0091	1.9E-05	1.1E-03	1.9E-04
		Annually	0.0021	0.0021	0.0020	0.021	0.011	3.2E-05	0.0016	3.3E-06	1.9E-04	3.4E-05

Engines emission rates - cont'd

N° ID	Description	Averaging period	Emission rates (g/s)								
			Benzene	Ethylbenzene	Formaldehyde	i-octane	n-hexane	Propanal	Toluene	Xylenes	Benz(a)pyrene
A1 (Web-ARA-4 access)	Clearing / grubbing (February to April; 7h to 19h)	Hourly	1.2E-02	2.3E-03	6.5E-02	1.7E-03	5.7E-04	4.9E-03	8.4E-03	1.6E-02	1.8E-06
		Daily	9.9E-03	1.9E-03	5.3E-02	1.4E-03	4.7E-04	4.0E-03	6.9E-03	1.3E-02	1.5E-06
		Annually	6.9E-05	1.3E-05	3.7E-04	1.0E-05	3.3E-06	2.8E-05	4.8E-05	9.4E-05	1.0E-08
A2 (ARA-2)	Aggregate production (May to December; 0h-24h)	Hourly	4.1E-03	7.7E-04	2.2E-02	6.0E-04	2.0E-04	1.7E-03	2.9E-03	5.6E-03	5.5E-07
		Daily	3.6E-03	6.8E-04	1.9E-02	5.2E-04	1.7E-04	1.5E-03	2.5E-03	4.9E-03	4.8E-07
		Annually	1.5E-03	2.8E-04	8.2E-03	2.2E-04	7.2E-05	6.2E-04	1.1E-03	2.1E-03	2.0E-07
A3 (Web-ARA-4 access)	Road construction (May to December; 0h-24h)	Hourly	5.4E-03	1.0E-03	2.9E-02	7.8E-04	2.6E-04	2.2E-03	3.8E-03	7.3E-03	8.1E-07
		Daily	4.4E-03	8.3E-04	2.4E-02	6.4E-04	2.1E-04	1.8E-03	3.1E-03	6.0E-03	6.7E-07
		Annually	4.3E-05	8.0E-06	2.3E-04	6.2E-06	2.0E-06	1.7E-05	3.0E-05	5.8E-05	3.5E-09
A4a (WC-2)	Culvert installation (May to December; 7h-19h)	Hourly	2.0E-03	3.7E-04	1.1E-02	2.8E-04	9.3E-05	7.9E-04	1.4E-03	2.7E-03	3.1E-07
		Daily	1.6E-03	3.1E-04	8.8E-03	2.4E-04	7.7E-05	6.6E-04	1.1E-03	2.2E-03	2.6E-07
		Annually	5.6E-05	1.0E-05	3.0E-04	8.1E-06	2.7E-06	2.3E-05	3.9E-05	7.6E-05	8.9E-09
A4b (WC-4)	Culvert installation (May to December; 7h-19h)	Hourly	2.0E-03	3.7E-04	1.1E-02	2.8E-04	9.3E-05	7.9E-04	1.4E-03	2.7E-03	3.1E-07
		Daily	1.6E-03	3.1E-04	8.8E-03	2.4E-04	7.7E-05	6.6E-04	1.1E-03	2.2E-03	2.6E-07
		Annually	5.6E-05	1.0E-05	3.0E-04	8.1E-06	2.7E-06	2.3E-05	3.9E-05	7.6E-05	8.9E-09
A5a (WC-1)	Bridge construction (May to December; 7h-19h)	Hourly	6.2E-04	1.2E-04	3.4E-03	9.0E-05	3.0E-05	2.5E-04	4.3E-04	8.5E-04	9.7E-08
		Daily	5.5E-04	1.0E-04	3.0E-03	8.0E-05	2.6E-05	2.2E-04	3.8E-04	7.5E-04	8.3E-08
		Annually	1.5E-04	2.7E-05	7.9E-04	2.1E-05	6.9E-06	5.9E-05	1.0E-04	2.0E-04	2.0E-08
A5b (WC-3)	Bridge construction (May to December; 7h-19h)	Hourly	6.2E-04	1.2E-04	3.4E-03	9.0E-05	3.0E-05	2.5E-04	4.3E-04	8.5E-04	9.7E-08
		Daily	5.5E-04	1.0E-04	3.0E-03	8.0E-05	2.6E-05	2.2E-04	3.8E-04	7.5E-04	8.3E-08
		Annually	9.7E-05	1.8E-05	5.3E-04	1.4E-05	4.6E-06	4.0E-05	6.8E-05	1.3E-04	1.4E-08

WSR CONSTRUCTION PHASE - Off-road diesel engines (with control measures: at least 80% of mobile equipment Tier 4F)

Reference: US EPA Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engine in MOVES4, 2023.

Technical Specifications

- [1] Based on Sigfusson's report calendar and work progress for the first year of construction when there will be more equipment in operation within the modeled domain.
- [2] Work duration based on Sigfusson's calendar. Work will be done around the clock except for land clearing, bridge construction and culvert installation (during day shifts only).
- [3] Corresponds to default values from US EPA according to the equipment type.
- [4] TIER classification is assumed 3 for all equipment (except generator set at 2) representing a conservative average from TIER 0 to 4 that could be used at the site.
- [5] For mobile equipment, it is assumed that they will all be operated at the same time while taking into considerations breaks and turnarounds (2h per 12h shift in average in most cases; except generator sets and light plants).
- [6] Represents an estimated percentage of the modelled emission period the equipment will be at one location.

Assumptions

Engine age factor	100%	
Diesel fuel density	850	g/L
Diesel sulfur content	15	ppm S
Distance Webequie to ARA-2 quarry	29.8	km
Distance ARA-2 quarry to ARA-4 access road intersection	10.8	km

Equipment			Operation [1]		Period of emissions [2]			Number of units	Rated engine power (hp)	Engine load factor [3]	Tier Classification [4]	Emission rate weighting	
N° ID	Description	Type	Activity	Sector	Monthly	Daily	Duration (days)					Daily [5]	Annual [6]
A1-1	300 size excavator (CAT 329)	Excavator	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	202	0.59	4FD	83%	0.58%
A1-2	400 size excavator (CAT 350)	Excavator	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	413	0.59	4FD	83%	0.58%
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	100	0.59	4FB	83%	0.58%
A1-4	850/D6R size dozer	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	6	179	0.59	4FD	83%	0.58%
A1-5	CAT 140 Grader	Grader	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	1	250	0.59	3	83%	0.58%
A1-6	CAT D7 size dozer	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	4	265	0.59	4FD	83%	0.58%
A1-7	CAT D8 size dozer	Crawler dozer	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	2	354	0.59	4FD	83%	0.58%
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	3	270	0.59	4FD	83%	0.58%
A1-9	Skidder (JD 648 L)	Forest logging equipment	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	3	237	0.59	4FD	83%	0.58%
A1-10	Light plants	Generator set	Clearing / grubbing	Web to ARA-4 access	February-April	7h-19h	84	5	27	0.43	2	25%	0.17%
A2-1	300 size excavator (CAT 329)	Excavator	Aggregate production	ARA-2	May-December	0h-24h	242	1	202	0.59	4FD	83%	40%
A2-2	980 size loader (CAT 980)	Rubber tire loader	Aggregate production	ARA-2	May-December	0h-24h	242	1	393	0.59	3	83%	40%
A2-3	988 size loader (CAT 988)	Rubber tire loader	Aggregate production	ARA-2	May-December	0h-24h	242	1	541	0.59	4FD	83%	40%
A2-4	Furukawa HCR900 drill	Bore/drill rig	Aggregate production	ARA-2	May-December	0h-24h	176	2	225	0.43	4FD	83%	29%
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	Aggregate production	ARA-2	May-December	0h-24h	242	2	150	0.21	3	83%	8.1%
A2-6	Crusher power van 600 kW	Generator set	Aggregate production	ARA-2	May-December	0h-24h	242	1	804	0.43	2	100%	47%
A3-1	300 size excavator (CAT 329)	Excavator	Grading / stripping	Web to ARA-4 access	May-December	0h-24h	111	1	202	0.59	4FD	83%	0.28%
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	Grading / stripping	Web to ARA-4 access	May-December	0h-24h	111	2	215	0.59	4FD	83%	0.28%
A3-3	200 size excavator (CAT 316)	Excavator	Ditching	Web to ARA-4 access	May-December	0h-24h	149	1	105	0.59	4FD	83%	0.37%
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	Ditching	Web to ARA-4 access	May-December	0h-24h	149	1	100	0.59	4FB	83%	0.37%
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	Ditching	Web to ARA-4 access	May-December	0h-24h	149	1	240	0.21	3	83%	0.37%
A3-6	220 size excavator (CAT 325)	Excavator	Geotextile installation	Web to ARA-4 access	May-December	0h-24h	128	1	172	0.59	4FD	83%	0.32%
A3-7	850/D6R size dozer	Crawler dozer	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	5	179	0.59	4FD	83%	0.28%
A3-8	CAT 140 Grader	Grader	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	2	250	0.59	3	83%	0.28%
A3-9	CAT D8 size dozer	Crawler dozer	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	2	354	0.59	4FD	83%	0.28%
A3-10	IR SD150 Smoothdrum/padfoot	Roller	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	3	185	0.59	3	83%	0.28%
A3-11	Light plants	Generator set	Aggregate placement	Web to ARA-2	May-December	0h-24h	110	5	27	0.43	2	58%	0.19%
A4-1	400 size excavator (CAT 350)	Excavator	Culvert installation	WC-2	May-December	7h-19h	7	1	413	0.59	4FD	83%	2.9%
A4-2	80 ton rough terrain crane	Crane	Culvert installation	WC-2	May-December	7h-19h	7	1	164	0.43	4FD	83%	2.9%
A4-3	950 size loader (CAT 950)	Rubber tire loader	Culvert installation	WC-2	May-December	7h-19h	7	1	225	0.59	4FD	83%	2.9%
A4-4	966 size loader (CAT 966)	Rubber tire loader	Culvert installation	WC-2	May-December	7h-19h	7	1	321	0.59	4FD	83%	2.9%
A4-5	400 size excavator (CAT 350)	Excavator	Culvert installation	WC-4	May-December	7h-19h	7	1	413	0.59	3	83%	2.9%
A4-6	80 ton rough terrain crane	Crane	Culvert installation	WC-4	May-December	7h-19h	7	1	164	0.43	4FD	83%	2.9%
A4-7	950 size loader (CAT 950)	Rubber tire loader	Culvert installation	WC-4	May-December	7h-19h	7	1	225	0.59	4FD	83%	2.9%
A4-8	966 size loader (CAT 966)	Rubber tire loader	Culvert installation	WC-4	May-December	7h-19h	7	1	321	0.59	4FD	83%	2.9%
A5-1	80 ton rough terrain crane	Crane	Bridge construction	WC-1	May-December	7h-19h	270	1	164	0.43	4FD	83%	18%
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	Bridge construction	WC-1	May-December	7h-19h	270	1	105	0.59	3	83%	18%
A5-3	Tria portable concrete batching unit	Generator set	Bridge construction	WC-1	May-December	7h-19h	270	1	67	0.43	2	100%	36%
A5-4	80 ton rough terrain crane	Crane	Bridge construction	WC-3	May-December	7h-19h	180	1	164	0.43	4FD	83%	12%
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	Bridge construction	WC-3	May-December	7h-19h	180	1	105	0.59	3	83%	12%
A5-6	Tria portable concrete batching unit	Generator set	Bridge construction	WC-3	May-December	7h-19h	180	1	67	0.43	2	100%	24%

Raw emission rate calculations for each equipment according to Nonroad model

Nitrogen Oxides (NOx)

N° ID	Equipment		Base EF (EF _{ss} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h)	Emission rate (g/s)
	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.079	1.000	1.008	0.080	0.0053
A1-2	400 size excavator (CAT 350)	Excavator	0.079	1.000	1.008	0.080	0.011
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.136	1.000	1.008	0.14	0.0045
A1-4	850/D6R size dozer	Crawler dozer	0.079	1.000	1.008	0.080	0.014
A1-5	CAT 140 Grader	Grader	2.500	1.040	1.008	2.6	0.11
A1-6	CAT D7 size dozer	Crawler dozer	0.079	1.000	1.008	0.080	0.014
A1-7	CAT D8 size dozer	Crawler dozer	0.079	1.000	1.008	0.080	0.0092
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.079	1.000	1.008	0.080	0.011
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.079	1.000	1.008	0.080	0.0093
A1-10	Light plants	Generator set	4.728	1.000	1.009	4.8	0.076
A2-1	300 size excavator (CAT 329)	Excavator	0.079	1.000	1.008	0.080	0.0026
A2-2	980 size loader (CAT 980)	Rubber tire loader	2.500	1.040	1.008	2.6	0.17
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.079	1.000	1.008	0.080	0.0071
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.079	1.000	1.008	0.080	0.0043
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	2.500	1.210	1.008	3.0	0.053
A2-6	Crusher power van 600 kW	Generator set	4.100	1.000	1.009	4.1	0.40
A3-1	300 size excavator (CAT 329)	Excavator	0.079	1.000	1.008	0.080	0.0026
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.079	1.000	1.008	0.080	0.0056
A3-3	200 size excavator (CAT 316)	Excavator	0.096	1.000	1.008	0.097	0.0017
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.136	1.000	1.008	0.14	0.0022
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	2.500	1.210	1.008	3.0	0.043
A3-6	220 size excavator (CAT 325)	Excavator	0.096	1.000	1.008	0.10	0.0027
A3-7	850/D6R size dozer	Crawler dozer	0.079	1.000	1.008	0.080	0.012
A3-8	CAT 140 Grader	Grader	2.500	1.040	1.008	2.6	0.21
A3-9	CAT D8 size dozer	Crawler dozer	0.079	1.000	1.008	0.080	0.0092
A3-10	IR SD150 Smoothdrum/padfoot	Roller	2.500	1.040	1.008	2.6	0.24
A3-11	Light plants	Generator set	4.728	1.000	1.009	4.8	0.076
A4-1	400 size excavator (CAT 350)	Excavator	0.079	1.000	1.008	0.080	0.0054
A4-2	80 ton rough terrain crane	Crane	0.096	1.000	1.008	0.10	0.0019
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.079	1.000	1.008	0.080	0.0029
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.079	1.000	1.008	0.080	0.0042
A4-5	400 size excavator (CAT 350)	Excavator	2.500	1.040	1.008	2.6	0.18
A4-6	80 ton rough terrain crane	Crane	0.096	1.000	1.008	0.10	0.0019
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.079	1.000	1.008	0.080	0.0029
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.079	1.000	1.008	0.080	0.0042
A5-1	80 ton rough terrain crane	Crane	0.096	1.000	1.008	0.10	0.0019
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough	2.500	1.040	1.008	2.6	0.045
A5-3	Tria portable concrete batching unit	Generator set	4.700	1.000	1.009	4.7	0.038
A5-4	80 ton rough terrain crane	Crane	0.096	1.000	1.008	0.097	0.0019
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough	2.500	1.040	1.008	2.6	0.045
A5-6	Tria portable concrete batching unit	Generator set	4.700	1.000	1.009	4.7	0.038

Total particulate matter (TSP)

N° ID	Equipment		Base EF (EF _{SS} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)
	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.002	1.000	1.473	0.0029	0.00020
A1-2	400 size excavator (CAT 350)	Excavator	0.002	1.000	1.473	0.0029	0.00040
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.015	1.000	1.473	0.022	0.00072
A1-4	850/D6R size dozer	Crawler dozer	0.002	1.000	1.473	0.0029	0.00052
A1-5	CAT 140 Grader	Grader	0.150	1.470	1.473	0.27	0.011
A1-6	CAT D7 size dozer	Crawler dozer	0.002	1.000	1.473	0.0029	0.00051
A1-7	CAT D8 size dozer	Crawler dozer	0.002	1.000	1.473	0.0029	0.00034
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.002	1.000	1.473	0.0029	0.00039
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.002	1.000	1.473	0.0029	0.00034
A1-10	Light plants	Generator set	0.339	1.000	1.473	0.44	0.0071
A2-1	300 size excavator (CAT 329)	Excavator	0.002	1.000	1.473	0.0029	0.00010
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.150	1.470	1.473	0.27	0.018
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.002	1.000	1.473	0.0029	0.00026
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.002	1.000	1.473	0.0029	0.00016
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.220	2.370	1.473	0.71	0.012
A2-6	Crusher power van 600 kW	Generator set	0.132	1.000	1.473	0.14	0.014
A3-1	300 size excavator (CAT 329)	Excavator	0.002	1.000	1.473	0.0029	0.00010
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.002	1.000	1.473	0.0029	0.00021
A3-3	200 size excavator (CAT 316)	Excavator	0.001	1.000	1.473	0.0015	0.000025
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.015	1.000	1.473	0.022	0.00036
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.150	2.370	1.473	0.46	0.0065
A3-6	220 size excavator (CAT 325)	Excavator	0.001	1.000	1.473	0.0015	0.000042
A3-7	850/D6R size dozer	Crawler dozer	0.002	1.000	1.473	0.0029	0.00043
A3-8	CAT 140 Grader	Grader	0.150	1.470	1.473	0.27	0.022
A3-9	CAT D8 size dozer	Crawler dozer	0.002	1.000	1.473	0.0029	0.00034
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.150	1.470	1.473	0.27	0.025
A3-11	Light plants	Generator set	0.339	1.000	1.473	0.44	0.0071
A4-1	400 size excavator (CAT 350)	Excavator	0.002	1.000	1.473	0.0029	0.00020
A4-2	80 ton rough terrain crane	Crane	0.001	1.000	1.473	0.0015	0.000029
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.002	1.000	1.473	0.0029	0.00011
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.002	1.000	1.473	0.0029	0.00015
A4-5	400 size excavator (CAT 350)	Excavator	0.150	1.470	1.473	0.27	0.018
A4-6	80 ton rough terrain crane	Crane	0.001	1.000	1.473	0.0015	0.000029
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.002	1.000	1.473	0.0029	0.00011
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.002	1.000	1.473	0.0029	0.00015
A5-1	80 ton rough terrain crane	Crane	0.001	1.000	1.473	0.0015	0.000029
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.220	1.470	1.473	0.42	0.0073
A5-3	Tria portable concrete batching unit	Generator set	0.240	1.000	1.473	0.30	0.0024
A5-4	80 ton rough terrain crane	Crane	0.001	1.000	1.473	0.0015	0.000029
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.220	1.470	1.473	0.42	0.0073
A5-6	Tria portable concrete batching unit	Generator set	0.240	1.000	1.473	0.30	0.0024

Carbon monoxide (CO)

Equipment			Base EF (EF _{SS} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)
N° ID	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.015	1.000	1.151	0.017	0.0011
A1-2	400 size excavator (CAT 350)	Excavator	0.015	1.000	1.151	0.017	0.0023
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.101	1.000	1.151	0.12	0.0038
A1-4	850/D6R size dozer	Crawler dozer	0.015	1.000	1.151	0.017	0.0030
A1-5	CAT 140 Grader	Grader	0.748	1.530	1.151	1.3	0.054
A1-6	CAT D7 size dozer	Crawler dozer	0.015	1.000	1.151	0.017	0.0030
A1-7	CAT D8 size dozer	Crawler dozer	0.015	1.000	1.151	0.017	0.0020
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.015	1.000	1.151	0.017	0.0023
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.015	1.000	1.151	0.017	0.0020
A1-10	Light plants	Generator set	1.532	1.000	1.101	1.7	0.027
A2-1	300 size excavator (CAT 329)	Excavator	0.015	1.000	1.151	0.017	0.00057
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.843	1.530	1.151	1.5	0.096
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.015	1.000	1.151	0.017	0.0015
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.015	1.000	1.151	0.017	0.00093
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.867	2.570	1.151	2.6	0.045
A2-6	Crusher power van 600 kW	Generator set	0.764	1.000	1.101	0.84	0.081
A3-1	300 size excavator (CAT 329)	Excavator	0.015	1.000	1.151	0.017	0.00057
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.015	1.000	1.151	0.017	0.0012
A3-3	200 size excavator (CAT 316)	Excavator	0.023	1.000	1.151	0.026	0.00046
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.101	1.000	1.151	0.12	0.0019
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.748	2.570	1.151	2.2	0.031
A3-6	220 size excavator (CAT 325)	Excavator	0.023	1.000	1.151	0.026	0.00075
A3-7	850/D6R size dozer	Crawler dozer	0.015	1.000	1.151	0.017	0.0025
A3-8	CAT 140 Grader	Grader	0.748	1.530	1.151	1.3	0.11
A3-9	CAT D8 size dozer	Crawler dozer	0.015	1.000	1.151	0.017	0.0020
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.748	1.530	1.151	1.3	0.12
A3-11	Light plants	Generator set	1.532	1.000	1.101	1.7	0.027
A4-1	400 size excavator (CAT 350)	Excavator	0.015	1.000	1.151	0.017	0.0012
A4-2	80 ton rough terrain crane	Crane	0.023	1.000	1.151	0.026	0.00052
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.015	1.000	1.151	0.017	0.00064
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.015	1.000	1.151	0.017	0.00091
A4-5	400 size excavator (CAT 350)	Excavator	0.843	1.530	1.151	1.5	0.10
A4-6	80 ton rough terrain crane	Crane	0.023	1.000	1.151	0.026	0.00052
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.015	1.000	1.151	0.017	0.00064
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.015	1.000	1.151	0.017	0.00091
A5-1	80 ton rough terrain crane	Crane	0.023	1.000	1.151	0.026	0.00052
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.867	1.530	1.151	1.5	0.026
A5-3	Tria portable concrete batching unit	Generator set	2.366	1.000	1.101	2.6	0.021
A5-4	80 ton rough terrain crane	Crane	0.023	1.000	1.151	0.026	0.00052
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.867	1.530	1.151	1.5	0.026
A5-6	Tria portable concrete batching unit	Generator set	2.366	1.000	1.101	2.6	0.021

Sulfur dioxide (SO₂)

Equipment			Base EF (EF _{SS} - g/hp-h)	TAF factor	Adjusted BSFC (g/hp-h)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)
N° ID	Description	Type					
A1-1	300 size excavator (CAT 329)	Excavator	0.367	1.000	166	0.0035	2.3E-04
A1-2	400 size excavator (CAT 350)	Excavator	0.367	1.000	166	0.0035	4.7E-04
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.408	1.000	185	0.0039	1.3E-04
A1-4	850/D6R size dozer	Crawler dozer	0.367	1.000	166	0.0035	6.2E-04
A1-5	CAT 140 Grader	Grader	0.367	1.010	168	0.0049	2.0E-04
A1-6	CAT D7 size dozer	Crawler dozer	0.367	1.000	166	0.0035	6.1E-04
A1-7	CAT D8 size dozer	Crawler dozer	0.367	1.000	166	0.0035	4.1E-04
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.367	1.000	166	0.0035	4.6E-04
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.367	1.000	166	0.0035	4.1E-04
A1-10	Light plants	Generator set	0.408	1.000	185	0.0054	8.7E-05
A2-1	300 size excavator (CAT 329)	Excavator	0.367	1.000	166	0.0035	1.2E-04
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.367	1.010	168	0.0049	3.2E-04
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.367	1.000	166	0.0035	3.1E-04
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.367	1.000	166	0.0035	1.9E-04
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.367	1.180	196	0.0057	1.0E-04
A2-6	Crusher power van 600 kW	Generator set	0.367	1.000	166	0.0049	4.7E-04
A3-1	300 size excavator (CAT 329)	Excavator	0.367	1.000	166	0.0035	1.2E-04
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.367	1.000	166	0.0035	2.5E-04
A3-3	200 size excavator (CAT 316)	Excavator	0.367	1.000	166	0.0035	6.0E-05
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.408	1.000	185	0.0039	6.4E-05
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.367	1.180	196	0.0058	8.1E-05
A3-6	220 size excavator (CAT 325)	Excavator	0.367	1.000	166	0.0035	9.9E-05
A3-7	850/D6R size dozer	Crawler dozer	0.367	1.000	166	0.0035	5.1E-04
A3-8	CAT 140 Grader	Grader	0.367	1.010	168	0.0049	4.0E-04
A3-9	CAT D8 size dozer	Crawler dozer	0.367	1.000	166	0.0035	4.1E-04
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.367	1.010	168	0.0049	4.5E-04
A3-11	Light plants	Generator set	0.408	1.000	185	0.0054	8.7E-05
A4-1	400 size excavator (CAT 350)	Excavator	0.367	1.000	166	0.0035	2.4E-04
A4-2	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0035	6.8E-05
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.367	1.000	166	0.0035	1.3E-04
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.367	1.000	166	0.0035	1.8E-04
A4-5	400 size excavator (CAT 350)	Excavator	0.367	1.010	168	0.0049	3.3E-04
A4-6	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0035	6.8E-05
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.367	1.000	166	0.0035	1.3E-04
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.367	1.000	166	0.0035	1.8E-04
A5-1	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0035	6.8E-05
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.367	1.010	168	0.0049	8.5E-05
A5-3	Tria portable concrete batching unit	Generator set	0.408	1.000	185	0.0054	4.3E-05
A5-4	80 ton rough terrain crane	Crane	0.367	1.000	166	0.0035	6.8E-05
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.367	1.010	168	0.0049	8.5E-05
A5-6	Tria portable concrete batching unit	Generator set	0.408	1.000	185	0.0054	4.3E-05

Total hydrocarbons (THC)

Equipment		Base EF (EF _{SS} - g/hp-h)	TAF factor	Deterioration factor (DF)	Adjusted EF (EF _{adj} - g/hp-h) [1]	Emission rate (g/s)	
N° ID	Description						Type
A1-1	300 size excavator (CAT 329)	Excavator	0.010	1.000	1.027	0.010	0.00068
A1-2	400 size excavator (CAT 350)	Excavator	0.010	1.000	1.027	0.010	0.0014
A1-3	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.012	1.000	1.027	0.012	0.00040
A1-4	850/D6R size dozer	Crawler dozer	0.010	1.000	1.027	0.010	0.0018
A1-5	CAT 140 Grader	Grader	0.184	1.050	1.027	0.20	0.0083
A1-6	CAT D7 size dozer	Crawler dozer	0.010	1.000	1.027	0.010	0.0018
A1-7	CAT D8 size dozer	Crawler dozer	0.010	1.000	1.027	0.010	0.0012
A1-8	Feller Buncher (JD 843L)	Forest logging equipment	0.010	1.000	1.027	0.010	0.0014
A1-9	Skidder (JD 648 L)	Forest logging equipment	0.010	1.000	1.027	0.010	0.0012
A1-10	Light plants	Generator set	0.279	1.000	1.034	0.29	0.0047
A2-1	300 size excavator (CAT 329)	Excavator	0.010	1.000	1.027	0.010	0.00034
A2-2	980 size loader (CAT 980)	Rubber tire loader	0.167	1.000	1.027	0.17	0.011
A2-3	988 size loader (CAT 988)	Rubber tire loader	0.010	1.000	1.027	0.010	0.00091
A2-4	Furukawa HCR900 drill	Bore/drill rig	0.010	1.000	1.027	0.010	0.00055
A2-5	SCISSOR LIFT 35' Rough Terrain	Aerial lift	0.184	2.290	1.027	0.44	0.0077
A2-6	Crusher power van 600 kW	Generator set	0.167	1.000	1.034	0.18	0.017
A3-1	300 size excavator (CAT 329)	Excavator	0.010	1.000	1.027	0.010	0.00034
A3-2	750/D6N size dozer (CAT D6)	Crawler dozer	0.010	1.000	1.027	0.010	0.00072
A3-3	200 size excavator (CAT 316)	Excavator	0.010	1.000	1.027	0.010	0.00018
A3-4	650/D5K size dozer LGP (CAT D5K)	Crawler dozer	0.012	1.000	1.027	0.012	0.00020
A3-5	Seeding tractor (JD8760)	Tractor / loader / backhoe	0.184	1.000	1.027	0.19	0.0027
A3-6	220 size excavator (CAT 325)	Excavator	0.010	1.000	1.027	0.010	0.00029
A3-7	850/D6R size dozer	Crawler dozer	0.010	1.000	1.027	0.010	0.0015
A3-8	CAT 140 Grader	Grader	0.184	1.050	1.027	0.20	0.017
A3-9	CAT D8 size dozer	Crawler dozer	0.010	1.000	1.027	0.010	0.0012
A3-10	IR SD150 Smoothdrum/padfoot	Roller	0.184	1.000	1.027	0.19	0.017
A3-11	Light plants	Generator set	0.279	1.000	1.034	0.29	0.0047
A4-1	400 size excavator (CAT 350)	Excavator	0.010	1.000	1.027	0.010	0.00070
A4-2	80 ton rough terrain crane	Crane	0.010	1.000	1.027	0.010	0.00020
A4-3	950 size loader (CAT 950)	Rubber tire loader	0.010	1.000	1.027	0.010	0.00038
A4-4	966 size loader (CAT 966)	Rubber tire loader	0.010	1.000	1.027	0.010	0.00054
A4-5	400 size excavator (CAT 350)	Excavator	0.167	1.050	1.027	0.18	0.012
A4-6	80 ton rough terrain crane	Crane	0.010	1.000	1.027	0.010	0.00020
A4-7	950 size loader (CAT 950)	Rubber tire loader	0.010	1.000	1.027	0.010	0.00038
A4-8	966 size loader (CAT 966)	Rubber tire loader	0.010	1.000	1.027	0.010	0.00054
A5-1	80 ton rough terrain crane	Crane	0.010	1.000	1.027	0.010	0.00020
A5-2	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.184	1.050	1.027	0.20	0.0035
A5-3	Tria portable concrete batching unit	Generator set	0.367	1.000	1.034	0.39	0.0031
A5-4	80 ton rough terrain crane	Crane	0.010	1.000	1.027	0.010	0.00020
A5-5	CAT TH 83 zoom boom	Forklift (industrial and rough)	0.184	1.050	1.027	0.20	0.0035
A5-6	Tria portable concrete batching unit	Generator set	0.367	1.000	1.034	0.39	0.0031

Engines emission rates

Hourly emission rates: sum of emission rates for all equipment included into the source.

Daily emission rates: weighted sum of emission rates for all equipment included into the source in accordance with selected daily emission rate weightings.

Annual emission rates: weighted sum of emission rates for all equipment included into the source in accordance with selected annual emission rate weightings.

N° ID	Description	Averaging period	Emission rates (g/s)									
			TSP	PM10	PM2.5	NOx	CO	SO2	HC	1,3-butadiene	Acéaldéhyde	Acrolein
A1 (Web-ARA-4 access)	Clearing / grubbing (February to April; 7h to 19h)	Hourly	0.02	0.022	0.021	0.26	0.10	3.6E-03	0.023	4.7E-05	2.6E-03	4.7E-04
		Daily	0.014	0.014	0.013	0.17	0.068	3.0E-03	0.016	3.4E-05	1.9E-03	3.4E-04
		Annually	0.00010	0.00010	0.00009	0.0012	0.00047	2.1E-05	0.00011	2.3E-07	1.3E-05	2.4E-06
A2 (ARA-2)	Aggregate production (May to December; 0h-24h)	Hourly	0.044	0.044	0.043	0.63	0.22	1.5E-03	0.038	7.8E-05	4.4E-03	7.8E-04
		Daily	0.039	0.039	0.038	0.59	0.20	1.3E-03	0.034	7.1E-05	4.0E-03	7.1E-04
		Annually	0.015	0.015	0.014	0.27	0.082	5.9E-04	0.014	2.9E-05	1.6E-03	2.9E-04
A3 (Web-ARA-4 access)	Road construction (May to December; 0h-24h)	Hourly	0.055	0.055	0.053	0.55	0.26	1.9E-03	0.041	8.6E-05	4.8E-03	8.6E-04
		Daily	0.044	0.044	0.043	0.44	0.21	1.5E-03	0.033	6.9E-05	3.9E-03	6.9E-04
		Annually	0.00017	0.00017	0.00017	0.0017	0.00083	7.2E-06	0.00015	3.0E-07	1.7E-05	3.0E-06
A4a (WC-2)	Culvert installation (May to December; 7h-19h)	Hourly	0.00049	0.00049	0.00048	0.014	0.0032	6.2E-04	0.0018	3.8E-06	2.1E-04	3.8E-05
		Daily	0.00041	0.00041	0.00040	0.012	0.0027	5.1E-04	0.0015	3.1E-06	1.7E-04	3.1E-05
		Annually	0.000014	0.000014	0.000014	0.00041	0.00009	1.8E-05	0.000052	1.1E-07	6.0E-06	1.1E-06
A4b (WC-4)	Culvert installation (May to December; 7h-19h)	Hourly	0.019	0.019	0.018	0.19	0.10	7.1E-04	0.014	2.8E-05	1.6E-03	2.8E-04
		Daily	0.016	0.016	0.015	0.16	0.085	6.0E-04	0.011	2.3E-05	1.3E-03	2.3E-04
		Annually	0.00053	0.00053	0.00052	0.0053	0.0029	2.0E-05	0.00039	8.0E-07	4.5E-05	8.0E-06
A5a (WC-1)	Bridge construction (May to December; 7h-19h)	Hourly	0.010	0.010	0.0094	0.085	0.048	2.0E-04	0.0068	1.4E-05	7.8E-04	1.4E-04
		Daily	0.0085	0.008	0.0082	0.077	0.043	1.7E-04	0.0062	1.3E-05	7.1E-04	1.3E-04
		Annually	0.0022	0.0022	0.0021	0.022	0.012	4.3E-05	0.0018	3.7E-06	2.1E-04	3.7E-05
A5b (WC-3)	Bridge construction (May to December; 7h-19h)	Hourly	0.010	0.010	0.0094	0.085	0.048	2.0E-04	0.0068	1.4E-05	7.8E-04	1.4E-04
		Daily	0.0085	0.0085	0.0082	0.077	0.043	1.7E-04	0.0062	1.3E-05	7.1E-04	1.3E-04
		Annually	0.0015	0.0015	0.0014	0.015	0.0082	2.9E-05	0.0012	2.5E-06	1.4E-04	2.5E-05

Engines emission rates - cont'd

N° ID	Description	Averaging period	Emission rates (g/s)								
			Benzene	Ethylbenzene	Formaldehyde	i-octane	n-hexane	Propanal	Toluene	Xylenes	Benz(a)pyrene
A1 (Web-ARA-4 access)	Clearing / grubbing (February to April; 7h to 19h)	Hourly	1.4E-03	2.6E-04	7.4E-03	2.0E-04	6.5E-05	5.6E-04	9.6E-04	1.9E-03	1.4E-07
		Daily	9.8E-04	1.8E-04	5.3E-03	1.4E-04	4.6E-05	4.0E-04	6.8E-04	1.3E-03	9.0E-08
		Annually	6.8E-06	1.3E-06	3.7E-05	9.9E-07	3.2E-07	2.8E-06	4.8E-06	9.3E-06	6.3E-10
A2 (ARA-2)	Aggregate production (May to December; 0h-24h)	Hourly	2.3E-03	4.3E-04	1.2E-02	3.3E-04	1.1E-04	9.2E-04	1.6E-03	3.1E-03	2.8E-07
		Daily	2.1E-03	3.9E-04	1.1E-02	3.0E-04	9.8E-05	8.4E-04	1.4E-03	2.8E-03	2.5E-07
		Annually	8.3E-04	1.6E-04	4.5E-03	1.2E-04	4.0E-05	3.4E-04	5.8E-04	1.1E-03	9.5E-08
A3 (Web-ARA-4 access)	Road construction (May to December; 0h-24h)	Hourly	2.5E-03	4.7E-04	1.3E-02	3.6E-04	1.2E-04	1.0E-03	1.7E-03	3.4E-03	3.6E-07
		Daily	2.0E-03	3.8E-04	1.1E-02	2.9E-04	9.5E-05	8.2E-04	1.4E-03	2.7E-03	2.8E-07
		Annually	8.8E-06	1.6E-06	4.7E-05	1.3E-06	4.2E-07	3.6E-06	6.1E-06	1.2E-05	1.1E-09
A4a (WC-2)	Culvert installation (May to December; 7h-19h)	Hourly	1.1E-04	2.0E-05	5.9E-04	1.6E-05	5.2E-06	4.4E-05	7.6E-05	1.5E-04	3.2E-09
		Daily	9.1E-05	1.7E-05	4.9E-04	1.3E-05	4.3E-06	3.7E-05	6.4E-05	1.2E-04	2.7E-09
		Annually	3.1E-06	5.9E-07	1.7E-05	4.5E-07	1.5E-07	1.3E-06	2.2E-06	4.2E-06	9.1E-11
A4b (WC-4)	Culvert installation (May to December; 7h-19h)	Hourly	8.2E-04	1.5E-04	4.4E-03	1.2E-04	3.9E-05	3.3E-04	5.7E-04	1.1E-03	1.2E-07
		Daily	6.8E-04	1.3E-04	3.7E-03	9.8E-05	3.2E-05	2.8E-04	4.7E-04	9.2E-04	1.0E-07
		Annually	2.3E-05	4.4E-06	1.3E-04	3.4E-06	1.1E-06	9.5E-06	1.6E-05	3.2E-05	3.5E-09
A5a (WC-1)	Bridge construction (May to December; 7h-19h)	Hourly	4.1E-04	7.7E-05	2.2E-03	5.9E-05	1.9E-05	1.7E-04	2.8E-04	5.5E-04	6.3E-08
		Daily	3.7E-04	7.0E-05	2.0E-03	5.4E-05	1.8E-05	1.5E-04	2.6E-04	5.0E-04	5.5E-08
		Annually	1.1E-04	2.0E-05	5.8E-04	1.6E-05	5.1E-06	4.4E-05	7.5E-05	1.5E-04	1.4E-08
A5b (WC-3)	Bridge construction (May to December; 7h-19h)	Hourly	4.1E-04	7.7E-05	2.2E-03	5.9E-05	1.9E-05	1.7E-04	2.8E-04	5.5E-04	6.3E-08
		Daily	3.7E-04	7.0E-05	2.0E-03	5.4E-05	1.8E-05	1.5E-04	2.6E-04	5.0E-04	5.5E-08
		Annually	7.2E-05	1.3E-05	3.9E-04	1.0E-05	3.4E-06	2.9E-05	5.0E-05	9.7E-05	9.4E-09

WSR CONSTRUCTION PHASE - Trucking (exhaust)

Reference: US Bureau of Statistics (2025), Table 4-43: Estimated National Average Vehicle Emissions Rates per Vehicle by Vehicle Type using Gasoline and Diesel

Technical Specifications

- [1] Work duration and hauled volumes based on Sigfusson's calendar for year 2 as more hauling (only aggregates) is planned at that period with the modeled perimeter.
- [2] Based on the number of side dump trucks or lowbed trucks on site and passing once per hour maximum for A7 and four per hour for A6 (given the short distance)
- [3] Estimated based on total number of trips annually divided by the number of days on site multiplied by 1.5 (hypothesis) to take into account high intensity days.
- [4] Estimated based on total volume of material to be hauled and an average payload of 15 m3 (25-30 tonnes) for aggregates.

Activity			Period of emissions [1]			Truck trips				Travelled distance round-trip (km)			
N° ID	Description	Sector [1]	Monthly	Daily	Duration (days)	Amount (m ³)	Hourly [2]	Daily [3]	Annually [4]	Road length	Hourly	Daily	Annually
A6	Hauling of filling material	Web to WC-1	February-April	7h-19h	29	13 200	8	46	880	5.1	82	464	8 976
A7a	Hauling of aggregates	Web to ARA-2	May-December	0h-24h	100	166 960	25	167	11 131	29.8	1 490	9 951	663 388
A7b	Hauling of aggregates	ARA-2 to ARA-4 access	May-December	0h-24h	76	124 300	25	164	8 287	10.8	540	3 533	178 992

Engine Emission Factors - Base Values with Influence of Ambient Temperature

- [1] PM2.5, NOx, CO et HC: Extracted from the 'US Bureau of Transportation Statistics (2025) compiling average emission factors at 75 deg F according to the MOVES model by vehicle type and year of operation. Emissions factors provided are for emissions year 2025.
- [2] SO₂: Estimated based on the energy consumption efficiency provided by the US BTS for diesel heavy-duty trucks and sulfur concentration of 15 ppm in diesel.
- [3] PM₁₀: Estimated using the following relationship from MOVES3: PM2.5 = 0.92 x PM10 (TPM)
- [4] COVs: Estimated based on the HC emission factor x the COV fraction in HC (see tab "Toxics").
- [5] PAH: Estimated according to the HC emission factor x the mass fraction of PAHs in exhaust gas (see tab "Toxics"). Particulate PAHs are also included (based on PM2.5 emission factor).

N° ID	Description	Emission factors (g/km)									
		TPM	PM10	PM2.5	NOx	CO	SO2	THC	1,3-butadiene	Acetaldehyde	Acrolein
A6 and A7	Hauling of aggregates and geotextile	0.037	0.037	0.034	1.8	1.0	0.0078	0.12	1.2E-04	1.1E-02	1.5E-03

Engine Emission Factors - cont'd

N° ID	Description	Emission factors (g/km)								
		Benzene	Ethylbenzene	Formaldehyde	i-octane	n-hexane	Propanal	Toluene	Xylenes	Benz(a)pyrene
A6 and A7	Hauling of aggregates and geotextile	2.0E-03	1.7E-03	3.3E-02	1.2E-03	8.3E-04	4.8E-04	4.6E-03	1.3E-02	1.1E-07

Engine emission rates

N° ID	Description	Averaging period	Emission rates (g/s)									
			TPM	PM10	PM2.5	NOx	CO	SO2	THC	1,3-butadiene	Acetaldehyde	Acrolein
A6	Hauling of filling material (February - April; 7h - 19h)	Hourly	0.00083	0.00083	0.00077	0.042	0.024	1.8E-04	0.0027	2.8E-06	2.4E-04	3.5E-05
		Daily	0.00039	0.00039	0.00036	0.020	0.011	8.4E-05	0.0013	1.3E-06	1.1E-04	1.6E-05
		Annual	0.000086	0.000086	0.000079	0.0043	0.0024	1.8E-05	0.00028	2.9E-07	2.5E-05	3.6E-06
A7a (Web-ARA-2)	Hauling of aggregates (May - December; 0h - 24h)	Hourly	0.015	0.015	0.014	0.76	0.43	3.2E-03	0.049	5.1E-05	4.4E-03	6.3E-04
		Daily	0.0042	0.0042	0.0039	0.21	0.12	9.0E-04	0.014	1.4E-05	1.2E-03	1.8E-04
		Annual	0.0011	0.0011	0.0011	0.058	0.033	2.4E-04	0.0037	3.8E-06	3.3E-04	4.8E-05
A7b (ARA-2-ARA-4 access)	Hauling of aggregates (May - December; 0h - 24h)	Hourly	0.0055	0.0055	0.0051	0.28	0.16	1.2E-03	0.018	1.8E-05	1.6E-03	2.3E-04
		Daily	0.0015	0.0015	0.0014	0.075	0.043	3.2E-04	0.0049	5.0E-06	4.3E-04	6.3E-05
		Annual	0.00031	0.00031	0.00029	0.016	0.009	6.6E-05	0.0010	1.0E-06	9.0E-05	1.3E-05

Engine emission rates - cont'd

N° ID	Description	Emission rates (g/s)									
		Benzene	Ethylbenzene	Formaldehyde	i-octane	n-hexane	Propanal	Toluene	Xylenes	Benz(a)pyrene	
A6	Hauling of filling material (February - April; 7h - 19h)	Hourly	4.5E-05	3.9E-05	7.6E-04	2.7E-05	1.9E-05	1.1E-05	1.0E-04	2.9E-04	2.5E-09
		Daily	2.1E-05	1.8E-05	3.6E-04	1.3E-05	8.9E-06	5.1E-06	4.9E-05	1.4E-04	1.2E-09
		Annual	4.6E-06	4.0E-06	7.8E-05	2.8E-06	1.9E-06	1.1E-06	1.1E-05	3.0E-05	2.6E-10
A7a (Web-ARA-2)	Hauling of aggregates (May - December; 0h - 24h)	Hourly	8.2E-04	7.1E-04	1.4E-02	5.0E-04	3.4E-04	2.0E-04	1.9E-03	5.4E-03	4.6E-08
		Daily	2.3E-04	2.0E-04	3.8E-03	1.4E-04	9.5E-05	5.5E-05	5.3E-04	1.5E-03	1.3E-08
		Annual	6.2E-05	5.4E-05	1.0E-03	3.7E-05	2.6E-05	1.5E-05	1.4E-04	4.1E-04	3.5E-09
A7b (ARA-2-ARA-4 access)	Hauling of aggregates (May - December; 0h - 24h)	Hourly	3.0E-04	2.6E-04	5.0E-03	1.8E-04	1.2E-04	7.1E-05	6.9E-04	2.0E-03	1.7E-08
		Daily	8.1E-05	7.0E-05	1.4E-03	4.9E-05	3.4E-05	1.9E-05	1.9E-04	5.3E-04	4.6E-09
		Annual	1.7E-05	1.5E-05	2.8E-04	1.0E-05	7.0E-06	4.0E-06	3.9E-05	1.1E-04	9.4E-10

Variable Emission Factor per Month for Onroad Vehicles

References: Choi et al., MOVES sensitivity analysis: The impacts of Temperature and Humidity on Emissions

Variable Exhaust Emissions Factors due to Temperature for Exposure Period of 24 hours or less

- [1] Based on the meteorological dataset used for Air Dispersion Modeling.
- [2] Applicable for all VOCs and SO₂ (assuming VOC variation is somewhat correlated with fuel usage)
- [3] Applicable for TSP, PM₁₀, PM_{2.5} and BaP (BaP being mostly in particulate form).

Road traffic vehicle distribution

Heavy-duty trucks - diesel	50%
Light-duty trucks - diesel	25%
Light-duty trucks - gasoline	25%

Month	Minimum Temperature (°F) [1]	Heavy-duty trucks (construction)				Road traffic (operation)			
		THC [2]	CO	NOx	PM [3]	THC [2]	CO	NOx	PM [3]
January	-50	2.0	1.4	1.3	1.0	2.8	2.7	1.3	2.5
February	-40	2.0	1.4	1.3	1.0	2.8	2.7	1.3	2.5
March	-23	1.8	1.3	1.3	1.0	2.3	2.2	1.3	1.8
April	-12	1.7	1.2	1.3	1.0	2.1	1.9	1.3	1.6
May	11	1.5	1.1	1.2	1.0	1.6	1.5	1.2	1.2
June	35	1.3	1.0	1.2	1.0	1.3	1.2	1.2	1.0
July	38	1.3	1.0	1.2	1.0	1.3	1.1	1.2	1.0
August	41	1.3	1.0	1.2	1.0	1.2	1.1	1.2	1.0
September	31	1.4	1.0	1.2	1.0	1.3	1.2	1.2	1.1
October	9	1.6	1.1	1.2	1.0	1.7	1.5	1.2	1.2
November	-7	1.7	1.2	1.3	1.0	2.0	1.8	1.3	1.5
December	-32	1.9	1.4	1.3	1.0	2.6	2.5	1.3	2.1

Variable Exhaust Emissions Factors due to Temperature for Annual Exposure

Month	Mean Temperature (°F) [1]	Heavy-duty trucks (construction)				Road traffic (operation)			
		THC [2]	CO	NOx	PM [3]	THC [2]	CO	NOx	PM [3]
January	-1	1.6	1.1	1.3	1.0	1.8	1.7	1.2	1.3
February	-3	1.7	1.1	1.3	1.0	1.9	1.8	1.3	1.4
March	21	1.5	1.0	1.2	1.0	1.5	1.3	1.2	1.1
April	34	1.3	1.0	1.2	1.0	1.3	1.2	1.2	1.0
May	67	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
June	63	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0
July	66	1.1	1.0	1.0	1.0	1.1	1.0	1.0	1.0
August	63	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0
September	53	1.2	1.0	1.1	1.0	1.1	1.0	1.1	1.0
October	39	1.3	1.0	1.2	1.0	1.2	1.1	1.2	1.0
November	21	1.5	1.0	1.2	1.0	1.5	1.3	1.2	1.1
December	6	1.6	1.1	1.2	1.0	1.7	1.6	1.2	1.3

Emission factors change for 2020 gasoline vehicles (extracted from figures)

Temperature (°F)	Approx % change according to Choi et al figures			
	THC	CO	NOx	PM
-40	380	345	25	5 200
-30	300	290	23	3 500
-20	220	235	21	2 300
-10	180	190	19	1 800
0	130	150	17	1 100
10	90	110	15	800
20	50	75	12	500
30	25	50	10	200
40	10	25	8	100
50	5	10	4	50
60	0	5	-2	0
70	0	0	-4	0

Emission factors change for 2020 diesel vehicles (extracted from figures)

Temperature (°F)	Approx % change according to Choi et al figures			
	THC	CO	NOx	PM
-40	100	36	33	0
-30	91	30	31	0
-20	81	23	29	0
-10	72	17	27	0
0	63	13	25	0
10	55	9	23	0
20	46	5	21	0
30	38	2	19	0
40	29	0	17	0
50	20	-3	14	0
60	11	-4	8	0
70	5	-3	2	0

Figure 3. Sensitivity to temperature for gasoline vehicles in calendar years 2005, 2015, and 2020.

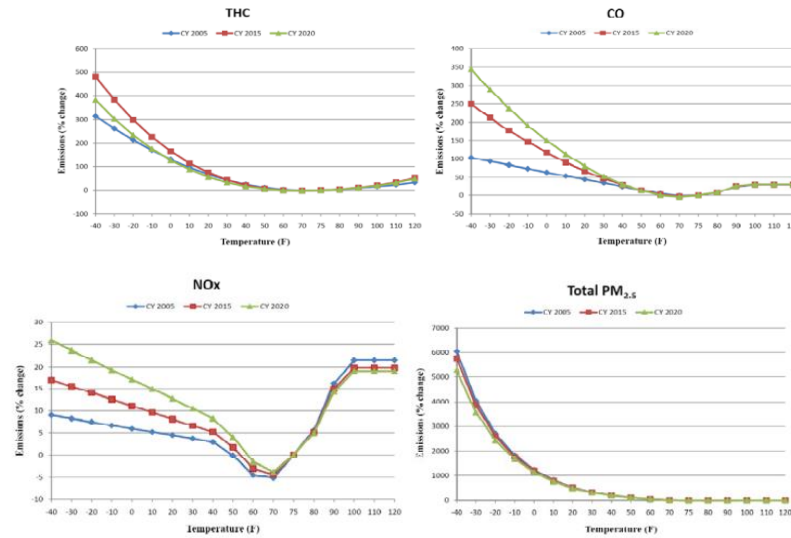
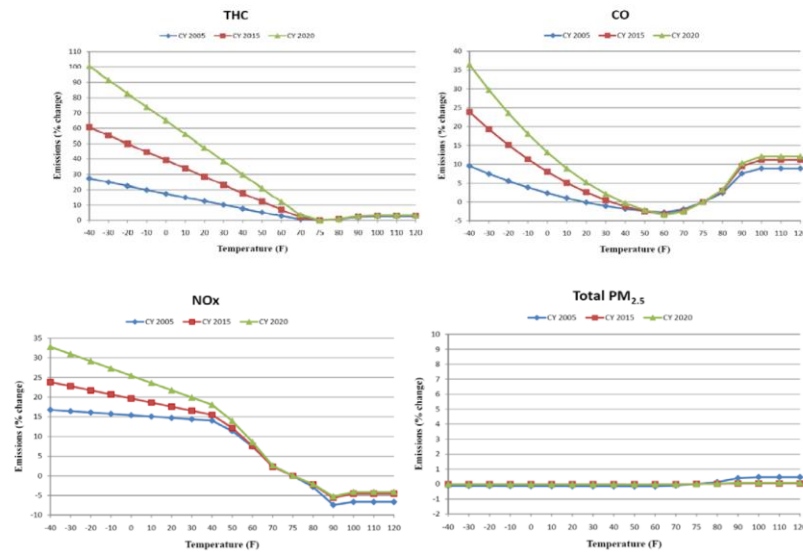


Figure 4. Sensitivity to temperature for diesel vehicles in calendar years 2005, 2015, and 2020.



WSR CONSTRUCTION PHASE - Trucking (road dust)

Reference: US EPA AP-42 Section 13.2.1 - Paved Road, Novembre 2006
 US EPA AP-42 Section 13.2.2 - Unpaved Road, Janvier 2011

Industrial roads

$$FE = 281,9 \times k \times \left(\frac{s}{12}\right)^a \times \left(\frac{W}{3}\right)^b \times (1 - \%EC)$$

FE: Emission factor (g/VKT)

281.9: Conversion factor: lb/VMT to g/VKT

s : Silt content on road surface (%)

W: Average truck weight (in tons)

k, a, b, c et d: Empirical constants

%EC: Emission control efficiency

S: Truck speed (mph)

M: Moisture on road surface (%)

Unpaved public roads

$$FE = 281,9 \times k \times \left(\frac{s}{12}\right)^a \times \left(\frac{S}{30}\right)^d \times \left(\frac{M}{0,5}\right)^{-c} \times (1 - \%EC)$$

Paved roads

$$FE = 281,9 \times k \times s^{0,91} \times W^{1,02} \times (1 - \%EC)$$

	Industrial roads			Unpaved public roads			Paved roads			
Constants	PM _T	PM ₁₀	PM _{2,5}	PM _T	PM ₁₀	PM _{2,5}	PM _T	PM ₁₅	PM ₁₀	PM _{2,5}
k (lb/miles)	4.9	1.5	0.15	6	1.8	0.18	0.011	0.0027	0.0022	0.00054
a	0.7	0.9	0.9	1	1	1	---	---	---	---
b	0.45	0.45	0.45	---	---	---	---	---	---	---
c	---	---	---	0.3	0.2	0.2	---	---	---	---
d	---	---	---	0.3	0.5	0.5	---	---	---	---

Technical Specifications

- [1] Work duration and hauled volumes based on Sigfusson's calendar for year 2 as more hauling (only aggregates) is planned at that period with the modeled perimeter.
- [2] Estimated based on total number of trips annually divided by the number of days on site multiplied by 1.5 (hypothesis) to take into account high-work intensity days.
- [3] Estimated based on total volume of material to be hauled and an average payload of 15 m3 (25-30 tonnes) for aggregates.

N° ID	Activity	Sector [1]	Period of emissions [1]			Number of trips			Travelled distance round-trip (km)			
			Monthly	Daily	Duration (days)	Volume (m ³)	Daily [2]	Annually [3]	Road length	Daily	Monthly	Annually
B1	Hauling of filling material	Web to WC-1	February-April	7h-19h	29	13 200	46	880	5.1	464	8 976	8 976
B2a	Hauling of aggregates	Web to ARA-2	May-December	0h-24h	100	166 960	167	11 131	29.8	9 951	199 016	663 388
B2b	Hauling of aggregates	ARA-2 to ARA-4 access	May-December	0h-24h	76	124 300	164	8 287	10.8	3 533	70 655	178 992

Road Specifications

- [1] Representing the maximum allowed amount of fines (4750 microns max diameter) in freshly crushed Granular A (road surface) from quarried materials (10 %). Silt (< 75 microns) is assumed to represent 50% of the fines at maximum when the road is used initially.
- [2] Aggregates on which trucks will be travelling contains usually small amounts of humidity (1 - 2 %)
- [3] Weight and payload typical for side dump trucks resulting in total weight of 35 t (usually a max); a speed of 50 km/h in average is considered

N° ID	Description	Roads		Trucks [5]		
		Silt (%) [1]	Moisture (%) [2]	Weight (tons)	Payload (tons)	Speed (mph)
B1	Hauling of filling material	5.0	1.5	15	20	31
B2	Hauling of aggregates	5.0	1.5	15	20	31

Fugitive Dust Emissions

N° ID	Description	Averaging period	Emission Factors (g/km) - Industrial-type surface			Emission Rates (g/s)		
			TSP	PM ₁₀	PM _{2.5}	TSP	PM ₁₀	PM _{2.5}
B1	Hauling of filling material (February - April; 7h - 19h)	Daily	1 940	498	50	21	5.4	0.54
		Monthly	1 940	498	50	13	3.5	0.35
		Annually	1 940	498	50	4.5	1.2	0.12
B2a (Web-ARA-2)	Hauling of aggregates (May - December; 0h - 24h)	Daily	1 940	498	50	223	57	5.7
		Monthly	1 940	498	50	149	38	3.8
		Annually	1 940	498	50	61	16	1.6
B2b (ARA-2-ARA-4 access)	Hauling of aggregates (May - December; 0h - 24h)	Daily	1 940	498	50	79	20	2.0
		Monthly	1 940	498	50	53	14	1.4
		Annually	1 940	498	50	16	4.2	0.42

Dry Depletion Parameters

N°	Average diameter (um)	Mass fraction per diameter			Density (g/cm ³)
		1.25	6.25	20	
B1 and B2	Hauling of filling material and aggregates	3%	23%	74%	2.5

Variable Dust Emissions Factors due to dust control measures - Construction Phase

[1] No water spraying during warmer months but during wintertime, the presence of snow and frost naturally mitigates dust emissions during dry days. A conservative value of 70% (equivalent to watering more than twice per day) is applied, although studies have shown the mitigation can be higher than that. Also, temperatures will remain below freezing point for the majority of time during these months.

[2] Based on ECCC Method in Road Surface Dust Emissions Guide: adjusting the total dust emissions in accordance with the number of days with precipitations greater than 0.2 mm (i.e. 100% control during these days). For the other days, the daily control factor is applied in the calculation of the weighted control factor.

[3] Water trucks will be present for dust control during dry days spraying amount of water with at least two passages per days (55 %).

Month	Dust Control Factors				Variable Emission Factors			
	No dust abatement		With dust abatement		No dust abatement		With dust abatement	
	Daily [1]	Month / annual [2]	Daily [3]	Month / annual [2]	Daily	Month / annual	Daily	Month / annual
January	70%	75%	70%	75%	0.30	0.25	0.30	0.25
February	70%	77%	70%	77%	0.30	0.23	0.30	0.23
March	70%	76%	70%	76%	0.30	0.24	0.30	0.24
April	0%	21%	55%	64%	1.00	0.79	0.45	0.36
May	0%	7%	55%	58%	1.00	0.93	0.45	0.42
June	0%	29%	55%	68%	1.00	0.71	0.45	0.32
July	0%	12%	55%	61%	1.00	0.88	0.45	0.39
August	0%	25%	55%	66%	1.00	0.75	0.45	0.34
September	0%	40%	55%	73%	1.00	0.60	0.45	0.27
October	0%	35%	55%	71%	1.00	0.65	0.45	0.29
November	0%	23%	55%	65%	1.00	0.77	0.45	0.35
December	70%	71%	70%	71%	0.30	0.29	0.30	0.29

WSR CONSTRUCTION PHASE - Crushing and screening

Reference: Facteurs d'émissions d'ECCC Pits and quarries reporting guide, section 8.5

Emission Factors for uncontrolled sources (kg/t)

Activity	PM _T	PM ₁₀	PM _{2.5}
Crushing	0.0027	0.0012	0.00060
Screening [1]	0.0125	0.0043	0.00029

[1] Undetermined for PM_{2.5}. Estimated based on the EF for controlled emissions and the ratio of PM10 Efs for incontrolled and controlled emissions.

Technical Specifications

[1] Work duration based on Sigfusson's calendar for Year 1.

[2] Takes the total expected volume to be produced having a density of 1.8 t/m³ for crushed aggregates.

[3] No control measure considered although it will most likely have one in place.

Activity			Period of emissions [1]			Crushed material tonnage (t) [2]	Control measures [3]	
N° ID	Description	Sector	Monthly	Daily	Duration (days)		Type	Control %
B4	Aggregates crushing and screening	ARA-2	May-December	0h-24h	242	804 816	No control	0

Fugitive Dust Emissions

[1] Estimated based on total amount of crushed material divided by the number of days on site multiplied by 1.5 (hypothesis) to take into account high-work intensity days.

[2] Based on total amount of crushed material divided by the number of days on site.

N° ID	Description	Averaging period	Emission Rates (g/s)		
			TSP	PM10	PM2.5
B4	Aggregate crushing and screening (January-December; 0h-24h)	Daily [1]	0.88	0.32	0.051
		Monthly [2]	0.59	0.21	0.034
		Annually [2]	0.58	0.21	0.034

Dry Depletion Parameters

N°	Average diameter (um)	Mass fraction per diamètre			Density (g/cm ³)
		1.25	6.25	20	
B4	Aggregates loading and unloading	5.9%	30%	64%	2.5

WSR CONSTRUCTION PHASE - Loading / unloading of materials

Reference: ECCC "Pits and quarries reporting guide" Section 8.8 (équivalent à AP-42, section 13.2.4 Aggregate Handling and Storage Piles)

$$FE = k \times 0,0016 \times \left(\frac{U}{2,2}\right)^{1,3} \times \left(\frac{M}{2}\right)^{-1,4}$$

FE: emission factor (kg/t)

U: average wind speed (m/s)

M: Material moisture (%)

k: Granulometric constant

Constant k

PM _T	PM ₁₅	PM ₁₀	PM ₅	PM _{2.5}
0.74	0.48	0.35	0.2	0.053

Wind speed (m/s)

Average of wind speeds from met dataset from May to December

Technical Specifications

- [1] Work duration based on Sigfusson's calendar for Year 2.
- [2] Aggregates on which trucks will be travelling contains usually small amounts of humidity (1 - 2 %)
- [3] Tonnage based on total aggregate transferred to road for Year 2 according to Sigfusson's report.
- [4] Estimated based on total tonnage loaded in trucks divided by the number of days of activity multiplied by 1.5 (hypothesis) to take into account high-work intensity days.
- [5] Represents the number of time the material is being transferred. The aggregates are loaded and unloaded once from trucks, but an extra transfer is added at the quarry (from transferring to piles for example).

Activity			Period of emissions [1]			Transferred material (t)				
N° ID	Description	Sector	Monthly	Daily	Duration (days)	Moisture (%) [2]	Annually [3]	Daily [4]	Monthly	Transfers [5]
B4	Aggregates loading	ARA-2	May-December	0h-24h	110	1.5	524 268	7 149	142 982	2
B3	Aggregates unloading	Web to ARA-4	May-December	0h-24h	110	1.5	524 268	7 149	142 982	1

Fugitive Dust Emissions

N° ID	Description	Averaging period	Emission Rates (g/s)				
			TSP	PM15	PM10	PM5	PM2.5
B4	Aggregates loading (May-December; 0h-24h)	Daily	1.0	0.66	0.48	0.27	0.072
		Monthly	0.67	0.44	0.32	0.18	0.048
		Annually	0.30	0.20	0.14	0.082	0.022
B3	Aggregates unloading (May-December; 0h-24h)	Daily	0.51	0.33	0.24	0.14	0.036
		Monthly	0.0025	0.0016	0.0012	0.00067	0.00018
		Annually	0.0011	0.00073	0.00053	0.00030	0.000080

Dry Depletion Parameters

N°	Average diameter (um)	Mass fraction per diameter					Density (g/cm ³)
		1.25	3.75	7.5	12.5	22.5	
B4 and B3	Aggregates loading and unloading	7.2%	20%	20%	18%	35%	2.5

WSR CONSTRUCTION PHASE - Bulldozer / aggregates leveling

Reference: ECCC Pits and quarries reporting guide, section 8.1 (équivalent à AP-42, section 11.9 Western Surface Coal Mining)

$$PM_T = \frac{2,6 \times s^{1,2}}{M^{1,3}} \quad PM_{15} = \frac{0,45 \times s^{1,5}}{M^{1,4}} \quad PM_{10} = 0,75 \times PM_{15} \quad PM_{2,5} = 0,105 \times PM_T$$

TPM: Total particulates emission factor (kg/h)

M: Moisture content (%)

s: Silt content (%)

Technical Specifications

- [1] Work duration based on Sigfusson's calendar.
- [2] Considering that 3 dozers will be used to place aggregates at the same time and same location generating dust.
- [3] Representing the maximum allowed amount of fines (4750 microns max diameter) in freshly crushed Granular A (road surface) quarried material (10%). Silt (< 75 microns) is assumed to represent 50% of the fines at maximum when the road is used initially.
- [4] Aggregates on which trucks will be travelling contains usually small amounts of humidity (1 - 2 %)
- [5] Represents the fraction of time the blade is used generating dust plumes. Equivalent to back and forth type of work.
- [6] It is assumed that all dozers will be operated at the same time while taking into considerations breaks and turnarounds (2h per 12h shift in average).
- [7] Estimated percentage of time during the placement period that the dozers will be at a single location on a monthly or annual basis.

Activity			Period of emissions [1]			Dozers activity				Emission rate weighting		
N° ID	Description	Sector	Monthly	Daily	Duration (days)	Number [2]	Silt (%) [3]	Moisture (%) [4]	Blade usage (%) [5]	Daily [6]	Monthly [7]	Annual [7]
B3	Aggregate placement	Web to ARA-4 access	May-December	0h-24h	176	3	5.0	1.5	50%	83%	3.6%	0.44%

Fugitive Dust Emissions

N° ID	Description	Averaging period	Emission Rates (g/s)			
			TSP	PM15	PM10	PM2.5
B3	Aggregate placement (May-December; 0h-24h)	Daily	3.7	0.99	0.74	0.39
		Monthly	0.16	0.043	0.032	0.017
		Annually	0.020	0.0053	0.0039	0.0020

Dry Depletion Parameters

N°	Average diameter (um)	Mass fraction per diameter				Density (g/cm ³)
		1.25	6.25	12.5	22.5	
B3	Aggregate placement (May-December; 0h-24h)	11%	9.7%	6.7%	73%	2.5

WSR CONSTRUCTION PHASE - Road Grading

Reference: US EPA, AP-42 Compendium, 11.9 Western Surface Coal Mining, Table 11.9.1

$$\text{Grading} \quad \left| \quad \left| \quad 0.040 (S)^{2.5} \quad 0.051 (S)^{2.0} \quad \left| \quad 0.60 \quad 0.031 \quad \left| \quad \text{lb/VMT} \right. \right. \right.$$

Emission factors in lb/miles

S: Grading speed (mph)

Technical Specifications

- [1] Work duration based on Sigfusson's calendar.
- [2] Considering one grader at one location at a time with maximum grading speed of 10 km/h when dealing with heavy blading, ditch construction or finish grading.
- [3] Represents the fraction of time the blade is used generating dust plumes. Considering some back and forth type of work.
- [4] It is assumed that all graders will be operating at the same time while taking into considerations breaks and turnarounds (2h per 12h shift in average).
- [5] Estimated percentage of time during the placement period that the grader will be at a single location on a monthly or annual basis.

Activity			Period of emissions [1]			Graders activity [2]			Emission rate weighting		
N° ID	Description	Sector	Monthly	Daily	Duration (days)	Number	Speed (mph)	Blade usage (%) [3]	Daily [4]	Monthly [5]	Annual [5]
B3	Road grading	Web to ARA-4 access	May-December	0h-24h	176	1	6.0	50%	83%	3.6%	0.44%

Fugitive Dust Emissions

N° ID	Description	Averaging period	Emission Rates (g/s)			
			TSP	PM15	PM10	PM2.5
B3	Road grading (May-December; 0h-24h)	Daily	1.1	0.58	0.35	0.035
		Monthly	0.048	0.025	0.015	0.0015
		Annually	0.0059	0.0031	0.0018	0.00018

Dry Depletion Parameters

N°	Average diameter (um)	Mass fraction per diameter				Density (g/cm ³)
		1.25	6.25	12.5	22.5	
B3	Road grading (May-December; 0h-24h)	3.1%	28%	21%	48%	2.5

WSR CONSTRUCTION PHASE - Blasts

Reference ECCC "Pits and quarries reporting guide", Section 8.4.

US EPA, AP-42 Compendium Section 13.3 "Explosives Detonation".

$$FE = k \times 0,00022 \times A^{1,5}$$

FE: Emission factor (kg/blast)

A: Horizontal blast surface (m²)

k: Granulometric constant

Constants k

PM _T	PM ₁₀	PM _{2.5}
1	0.52	0.030

ANFO Explosive emission factors (g / kg of explosive) according to AP-42

NO _x	CO	SO ₂
8.0	34	1.0

Technical Specifications

[1] Based on Sigfusson's report calendar for year 2.

[2] Five (5) blasts are expected to recover about 125,000 m³ of bedrock (375,000 t). It is assumed that it would occur in the afternoon at 14h each time

[3] Estimation based on the ratio of bedrock to total aggregates available at ARA-2 x the total surface area of ARA-2 divided by the number of blasts

[4] Powder factors can be variable depending on site conditions and bedrock strength. A value in the upper range of expected amount of explosives required is selected.

Activity			Period of emissions [2]			Quantities per blast [3]		Powder factor (kg/t) [4]
N° ID	Description	Sector [1]	Monthly	Daily	Duration (days)	Surface area (m ²)	Tonnage	
B5	Blasts	ARA-2	February-October	14h	5	5 861	75 000	0.17

Fugitive Dust Emissions

N° ID	Description	Averaging period	Emission Rates (g/s)		
			TSP	PM10	PM2.5
B5	Blasts (February-October; 14h)	Daily	27	14	0.82
		Monthly	4.6	2.4	0.14
		Annually	0.50	0.26	0.015

Combustion Gas Emissions

N° ID	Description	Averaging period	Emission Rates (g/s)		
			NO _x	CO	SO ₂
A8	Blasts (February-October; 14h)	Hourly	28	118	3.5
		Daily	28	118	3.5
		Annually	0.51	2.2	0.064

Dry Depletion Parameters

N°	Average diameter (um)	Mass fraction per diameter			Density (g/cm ³)
		1.25	6.25	20	
B5	Blasts	3%	49%	48%	2.5

WSR OPERATION PHASE - Vehicular traffic (exhaust)

Reference: US Bureau of Statistics (2025), Table 4-43: Estimated National Average Vehicle Emissions Rates per Vehicle by Vehicle Type using Gasoline and Diesel

Technical Specifications

[1] Circulation of vehicles is assumed all year long. Traffic will occur mainly during the day.

[2] A maximum of 500 vehicles is expected on the road per day starting from Webequie towards the mine at the end of the road. The annual traffic is based on 350 vehicles per day in average while the max 1-hour is estimated as 1.5 times the hourly average based on maximum daily traffic.

Activity			Period of emissions [1]			Vehicle traffic [2]			Travelled distance (km)			
N° ID	Description	Sector	Monthly	Daily	Duration (days)	Hourly	Daily	Annually	Road length	Hourly	Daily	Annually
C1	Vehicular traffic (citizens and maintenance)	Web to access road	January-December	6h-20h	365	54	500	127 750	40.6	2 175	20 300	5 186 650

Vehicle Engine Emission Factors

[1] PM_{2.5}, NOx, CO et HC: Extracted from the 'US Bureau of Transportation Statistics (2025) compiling average emission factors at 75 deg F according to the MOVES model by vehicle type and year of operation. Emissions factors provided are for the year 2025.

[2] SO₂: Estimated based on the energy consumption efficiency provided by the US BTS per vehicle category and sulfur concentration of 15 ppm in fuel

[3] PM₁₀: Estimated using the following relationship from MOVES: PM2.5 = 0.92 x PM10 (TSP)

[4] COVs: Estimated based on the THC emission factor x the COV fraction in HC (see tab "Toxics").

[5] PAH: Estimated according to the THC emission factor x the mass fraction of PAHs in exhaust gas (see tab "Toxics"). Particulate PAHs are also included (based on PM_{2.5} emission factor).

N° ID	Description	Emission factors (g/km)									
		TSP	PM10	PM2.5	NOx	CO	SO2	THC	1,3-butadiene	Acetaldehyde	Acrolein
C1-a	Diesel heavy-duty vehicles / 50% of all traffic	0.037	0.037	0.034	1.8	1.0	0.0078	0.12	1.2E-04	1.1E-02	1.5E-03
C1-b	Diesel light-duty trucks / 25% of all traffic	0.039	0.039	0.036	0.94	1.7	0.0032	0.17	1.7E-04	1.5E-02	2.2E-03
C1-c	Gasoline light-duty trucks / 25% of all traffic	0.0034	0.0034	0.0031	0.14	2.7	0.0027	0.17	1.7E-04	1.5E-02	2.2E-03
C1	Weighted average	0.029	0.029	0.027	1.2	1.6	0.0054	0.14	1.5E-04	1.3E-02	1.9E-03

Vehicle Engine Emission Factors - cont'd

N° ID	Description	Emission factors (g/km)								
		Benzene	Ethylbenzene	Formaldehyde	i-octane	n-hexane	Propanal	Toluene	Xylenes	Benz(a)pyrene
C1-a	Diesel heavy-duty vehicles / 50% of all traffic	2.0E-03	1.7E-03	3.3E-02	1.2E-03	8.3E-04	4.8E-04	4.6E-03	1.3E-02	1.1E-07
C1-b	Diesel light-duty trucks / 25% of all traffic	2.8E-03	2.4E-03	4.7E-02	1.7E-03	1.2E-03	6.7E-04	6.5E-03	1.8E-02	1.2E-07
C1-c	Gasoline light-duty trucks / 25% of all traffic	2.8E-03	2.4E-03	4.7E-02	1.7E-03	1.2E-03	6.8E-04	6.6E-03	1.9E-02	1.0E-08
C1	Weighted average	2.4E-03	2.1E-03	4.0E-02	1.4E-03	1.0E-03	5.8E-04	5.6E-03	1.6E-02	8.8E-08

Vehicle Engine Emission Rates

[1] Calculated considering the following vehicle distribution as hypothesis given the lack of details on that respect: 50% heavy-duty vehicles; 50% light-duty vehicles (50/50 between diesel and gasoline).

N° ID	Description	Averaging period [1]	Emission rates (g/s)									
			TSP	PM10	PM2.5	NOx	CO	SO2	THC	1,3-butadiene	Acetaldehyde	Acrolein
C1	Vehicular traffic (January - December; 6h - 20h)	Hourly	0.018	0.018	0.016	0.72	1.0	0.0032	0.087	9.0E-05	7.8E-03	1.1E-03
		Daily	0.012	0.012	0.011	0.48	0.66	0.0022	0.058	6.0E-05	5.2E-03	7.5E-04
		Annual	0.0082	0.0082	0.0075	0.33	0.46	0.0015	0.041	4.2E-05	3.6E-03	5.2E-04

Vehicle Engine Emission Rates - cont'd

N° ID	Description	Emission rates (g/s)									
		Benzene	Ethylbenzene	Formaldehyde	i-octane	n-hexane	Propanal	Toluene	Xylenes	Benz(a)pyrene	
C1	Vehicular traffic (January - December; 6h - 20h)	Hourly	1.4E-03	1.3E-03	2.4E-02	8.7E-04	6.1E-04	3.5E-04	3.4E-03	9.5E-03	5.3E-08
		Daily	9.6E-04	8.4E-04	1.6E-02	5.8E-04	4.0E-04	2.3E-04	2.2E-03	6.3E-03	3.6E-08
		Annual	6.7E-04	5.9E-04	1.1E-02	4.1E-04	2.8E-04	1.6E-04	1.6E-03	4.4E-03	2.5E-08

WSR OPERATION PHASE - Vehicular traffic (road dust)

Reference: US EPA AP-42 Section 13.2.1 - Paved Road, Novembre 2006
 US EPA AP-42 Section 13.2.2 - Unpaved Road, Janvier 2011

Industrial roads
 $FE = 281.9 \times k \times \left(\frac{S}{12}\right)^a \times \left(\frac{W}{3}\right)^b \times (1 - \%EC)$

Unpaved public roads
 $FE = 281.9 \times k \times \left(\frac{S}{12}\right)^a \times \left(\frac{S}{30}\right)^d \times \left(\frac{M}{0.5}\right)^{-c} \times (1 - \%EC)$

Paved roads
 $FE = 281.9 \times k \times s^{0.91} \times W^{1.02} \times (1 - \%EC)$

FE: Emission factor (g/VKT)
 281.9: Conversion factor: lb/VMT to g/VKT
 s : Silt content on road surface (%)
 W: Average truck weight (in tons)
 k, a, b, c et d: Empirical constants
 %EC: Emission control efficiency
 S: Truck speed (mph)
 M: Moisture on road surface (%)

	Industrial roads			Unpaved public roads			Paved roads			
Constants	PM _T	PM ₁₀	PM _{2.5}	PM _T	PM ₁₀	PM _{2.5}	PM _T	PM ₁₀	PM ₁₀	PM _{2.5}
k (lb/miles)	4.9	1.5	0.15	6	1.8	0.18	0.011	0.0027	0.0022	0.00054
a	0.7	0.9	0.9	1	1	1	---	---	---	---
b	0.45	0.45	0.45	---	---	---	---	---	---	---
c	---	---	---	0.3	0.2	0.2	---	---	---	---
d	---	---	---	0.3	0.5	0.5	---	---	---	---

Technical Specifications

- [1] Circulation of vehicles is assumed all year long. Traffic will occur mainly during the day.
- [2] A maximum of 500 vehicles is expected on the road per day starting from Webequie towards the mine at the end of the road. The annual traffic is based on 350 vehicles per day in average while the max 1-hour is estimated as 1.5 times the hourly average based on maximum daily traffic.

N° ID	Activity	Sector	Period of emissions [1]			Vehicle traffic [2]			Travelled distance (km)			
			Monthly	Daily	Duration (days)	Hourly	Daily	Annually	Road length	Hourly	Daily	Mo. / annual
D1	Vehicular traffic (citizens and maintenance)	Web to ARA-4 access road	January-December	6h-20h	365	54	500	127 750	40.6	2 175	20 300	5 186 650

Road Specifications

- [1] Representing the maximum allowed amount of fines (4750 microns max diameter) in freshly crushed Granular A (road surface) materials (8%). Silt (< 75 microns) is assumed to represent 50% of the fines at maximum when the road is used initially x 50% (hypothesis) to consider the continuous crushing of gravel with trucks.
- [2] Aggregates on which trucks will be travelling contains usually small amounts of humidity (1 - 2 %)
- [3] For low traffic volumes (< 500 daily), a 0.6 g/m2 silt loading is suggested by the US EPA which is multiplied by 4 to represent winter conditions due to abrasives. Given the road's remoteness, this silt loading is considered constant throughout the year to obtain conservative results.
- [4] Hypothesis. Represent a maximum for Class 7 trucks and minimum for Class 8 trucks. Payload = estimated average.
- [5] A max speed of 80 km/h is considered.
- [6] Corresponds to a maximum for large light-duty trucks.
- [7] Average emission factor for industrial roads and unpaved public roads without any natural or added dust controls. Monthly dust control factors are specified below

N° ID	Description	Unpaved roads		Paved roads		Heavy-duty trucks [4]			Ligth-duty [6]
		Silt (%) [1]	Moisture (%) [2]	Silt (g/m ²) [3]	Tare weight (ton)	Average payload	Speed (mph) [5]	Tare weight (ton)	
D1	Vehicular traffic (December - April)	6.0	1.5	2.4	15	5	50	4.0	

Fugitive Road Dust Emissions - no control (unpaved surfaces)

N° ID	Description	Averaging period	Emission Factors (g/km) [7]			Emission Rates (g/s)		
			TSP	PM10	PM2.5	TSP	PM10	PM2.5
D1	Vehicular traffic (December - April; 6h - 20h)	Daily	1 353	398	40	545	160	16
		Monthly / annual	1 353	398	40	381	112	11

Fugitive Road Dust Emissions - control (paved surface)

N° ID	Description	Averaging period	Emission Factors (g/km) [1]			Emission Rates (g/s)		
			TSP	PM10	PM2.5	TSP	PM10	PM2.5
D1	Vehicular traffic (December - April; 6h - 20h)	Daily	87	21	4.3	35	8.6	1.7
		Monthly / annual	87	21	4.3	24	6.0	1.2

Dry Depletion Parameters

N°	Average diameter (um)	Mass fraction per diameter			Density (g/cm ³)
		1.25	6.25	20	
D1	Vehicular traffic - unpaved roads	3%	26%	71%	2.5
D1	Vehicular traffic - paved roads	5%	20%	75%	2.5

Variable Dust Emissions Factors - Unpaved surfaces

[1] Number of precipitation days per month in average according to the meteorological dataset used for modeling.

[2] No water spraying during warmer months but during wintertime, the presence of snow and frost naturally mitigates dust emissions during dry days. A conservative value of 70% (equivalent to watering more than twice per day) is applied, although studies have shown the mitigation can be higher than that.

[3] Based on ECCM Method in Road Surface Dust Emissions Guide: adjusting the total dust emissions in accordance with the number of days with precipitations greater than 0.2 mm (i.e. 100% control during these days). For the other days, the daily control factor is applied in the calculation of the weighted control factor.

[3] Water trucks will be available on site. Due to long distances, passage of water trucks once per day is considered during summer time (vs. 55% for twice per day). During wintertime, the presence of snow and frost naturally mitigates dust emissions during dry days. A conservative value of 70% (equivalent to watering more than twice per day) is applied, although studies have shown the mitigation can be higher than that.

Month	Precipitation dataset [1]			Dust Control Factors				Variable Emission Factors			
				No dust abatement		With dust abatement		No dust abatement		With dust abatement	
	Days > 0.2 mm	Missing data	% month	Daily [2]	Month / an [3]	Daily [4]	Month / an [3]	Daily	Month / an	Daily	Month / an
January	5	0	15%	70%	75%	70%	75%	0.30	0.25	0.30	0.25
February	7	0	22%	70%	77%	70%	77%	0.30	0.23	0.30	0.23
March	6	0	19%	70%	76%	70%	76%	0.30	0.24	0.30	0.24
April	8	2	21%	0%	21%	30%	44%	1.00	0.79	0.70	0.56
May	7	5	7%	0%	7%	30%	35%	1.00	0.93	0.70	0.65
June	11	3	29%	0%	29%	30%	51%	1.00	0.71	0.70	0.49
July	10	6	12%	0%	12%	30%	39%	1.00	0.88	0.70	0.61
August	11	4	25%	0%	25%	30%	47%	1.00	0.75	0.70	0.53
September	12	0	40%	0%	40%	30%	58%	1.00	0.60	0.70	0.42
October	11	0	35%	0%	35%	30%	55%	1.00	0.65	0.70	0.45
November	9	2	23%	0%	23%	30%	46%	1.00	0.77	0.70	0.54
December	6	5	4%	70%	71%	70%	71%	0.30	0.29	0.30	0.29

WSR OPERATION PHASE - Road Grading

Reference: US EPA, AP-42 Compendium, 11.9 Western Surface Coal Mining, Table 11.9.1

$$\text{Grading} \quad \left| \quad \left| \quad 0.040 (S)^{2.5} \quad 0.051 (S)^{2.0} \quad \left| \quad 0.60 \quad 0.031 \quad \left| \quad \text{lb/VMT} \right. \right. \right.$$

Emission factors in lb/miles

S: Grading speed (mph)

Technical Specifications

- [1] Expecting graders to be used all year around during daytime.
- [2] Typical maximum grading speed when doing road maintenance.
- [3] Represents the fraction of time the blade is used generating dust plumes. Considering constant grading (100%).
- [4] It is assumed that the grader would be operated all day long while taking some breaks (2h per 14h shift in average).
- [5] Assuming road grading once every 3 weeks for optimal maintenance (hence maximum 2 days per month).

Activity			Period of emissions [1]			Graders activity		Emission rate weighting			
N° ID	Description	Sector	Monthly	Daily	Duration (days)	Number	Speed (mph) [2]	Blade usage (%) [3]	Daily [4]	Monthly [5]	Annual [5]
D1	Road grading	Web to ARA-4 access road	January - December	6h-20h	365	1	9.5	100%	86%	5.7%	4.1%

Fugitive Road Dust Emissions

N° ID	Description	Averaging period	Emission Rates (g/s)			
			TSP	PM15	PM10	PM2.5
D1	Road grading (January-December; 6h-20h)	Daily	11	4.7	2.8	0.35
		Monthly	0.76	0.32	0.19	0.024
		Annually	0.54	0.23	0.14	0.017

Dry Depletion Parameters

N° ID	Average diameter (um)	Mass fraction per diameter				Density (g/cm ³)
		1.25	6.25	12.5	22.5	
D1	Road grading (January-December; 6h-20h)	3.1%	22%	17%	59%	2.5

Toxic Pollutant Speciation in Exhaust Gas

- References:**
- US EPA (2020), Air Toxic Emissions from on-road vehicles in MOVES3.
 - US EPA (2022), Port Emissions Inventory Guidance (PEIG): Methodologies for estimating port-related and goods movement mobile source emissions.
 - US EPA (2023), Speciation of total organic gas and particulate matter emissions from on-road vehicles in MOVES4
 - Liu et al (2015), Mitigation of PAH and nitro-PAH Emissions from Nonroad Diesel Engines, Environmental Science and Technology
 - US EPA (2023b), Speciation Profiles and Toxic Emission Factors for Nonroad Engines in MOVES4
 - SNC-Lavalin (2010), National Marine Emissions Inventory for Canada.
 - US EPA (1994), Development and selection of ammonia emission factors

Volatile Organic Compounds (VOC) Speciation

Species	Maritime (-) [1]	On-road (-) [2]	Off-Road (-) [3]
1,3-butadiene	0.0011	0.0010	0.0021
Acetaldehyde	0.010	0.089	0.12
Acrolein	0.0019	0.013	0.021
Benzene	0.0050	0.017	0.060
Ethylbenzene	0.00046	0.014	0.011
Formaldehyde	0.045	0.28	0.32
i-octane	0.0075	0.010	0.0087
n-hexane	0.0029	0.0069	0.0029
Propanal	0.0016	0.0040	0.024
Styrene	0.0014		
Toluene	0.0021	0.039	0.042
Xylenes	0.0015	0.11	0.082

[1] Corresponds to the fraction in THC. Values are extracted from US EPA (2022) Appendix D as a fraction in total COV multiplied by a ratio of 1.053 COV/THC according to section 4.5.4 of the same document.

[2] Corresponds to the fraction in THC. Values are extracted from Table 3-2 of USP EPA (2020) as fraction of total VOCs for vehicles built in 2010 and after multiplied by a ratio of 1.285 VOC/THC extracted from US EPA (2023) in Table 3-2.

[3] Corresponds to the fraction in THC. Values are extracted from Table 3-4 of US EPA (2023b) as a fraction of total VOCs multiplied by a ratio VOC/THC of 1,11 (Tiers 2,3 and 4 No DPF), 0,53 (Tier4, no SCR) or 0,97 (Tier 4, DFP+SCR) from Table 3-3 of the same document. The highest fraction amongsts the engine classes (Tier 2 to Tier 4) is used.

Polycyclic Aromatic Hydrocarbons Speciation

Species	Toxicity Equivalency Factor (TEF)	Maritime		Road		Off road	
		THC [2]	PM _{2.5} [3]	THC [4]	PM _{2.5} [5]	THC [6]	PM _{2.5} [7]
Benzo(a)pyrene	1	0	4.2E-06	0	3.3E-06	0	6.7E-06
Dibenz(a,h)anthracene	5	0	8.7E-07	0	1.0E-06	0	1.0E-06
Benz(a)anthracene	0.1	0	8.8E-06	8.9E-07	4.3E-06	6.7E-07	1.9E-05
Acenaphthene	0.001	5.4E-05	0	6.8E-05	0	6.7E-04	0
Phenanthrene	0.001	1.4E-03	0	1.1E-03	4.3E-04	1.4E-03	2.4E-04
Fluorene	0.001	1.7E-04	0	2.5E-04	5.4E-03	8.8E-04	8.0E-05
Naphtalene	0.001	3.3E-02	0	2.1E-02	3.0E-06	8.6E-03	0
Anthracene	0.01	3.6E-04	0	3.9E-05	2.7E-05	9.8E-05	2.9E-05
Pyrene	0.001	0	3.4E-05	4.9E-05	4.7E-05	1.4E-04	6.2E-05
Benzo(ghi)perylene	0.01	0	1.3E-04	2.6E-07	2.0E-07	6.3E-06	7.6E-06
Indeno(1,2,3-cd)pyrene	0.1	0	8.4E-06	0	5.0E-07	0	6.7E-06
Benzo(b)fluoranthene	0.1	0	8.4E-06	0	1.4E-06	0	1.1E-05
Fluoranthene	0.001	0	9.0E-05	5.9E-05	4.9E-05	1.6E-04	5.6E-05
Benzo(k)fluoranthene	0.1	0	4.2E-06	0	1.4E-06	0	8.1E-06
Acenaphtylene	0.001	1.2E-04	0	1.1E-04	2.9E-07	1.4E-03	0
Chrysene	0.01	0	1.6E-05	6.4E-07	2.5E-06	8.5E-06	1.3E-05
Total PAH	s. o.	3.5E-02	3.1E-04	2.3E-02	6.0E-03	1.3E-02	5.4E-04
Total PAH (eq. BaP) [1]	s. o.	3.8E-05	1.3E-05	2.3E-05	1.5E-05	1.4E-05	1.7E-05

[1] Total PAH calculated as a surrogate of benzo(a)pyrene.

[2] Corresponds to the fraction in THC. Values are extracted from US EPA (2022) Appendix D as a fraction in total VOCs multiplied by a ratio of 1.053 VOC/THC according to section 4.5.4 of the same document.

[3] Extracted from US EPA (2022) Appendix D for PAH presented as a fraction in PM2.5.

[4] Corresponds to the fraction in THC. Values are extracted from Table 3-5 of US EPA (2022) as a fraction of total VOCs for vehicles built in 2017 and after multiplied by a ratio of 1.285 VOC/THC from Table 3-2 of US EPA (2023).

[5] Corresponds to the fraction in PM_{2.5}. Values are extracted from table 3-5 of US EPA (2020) as a fraction in organic carbon (OC_{2.5}) for vehicles built in 2017 and after multiplied by a ratio of 0.2233 OC_{2.5}/PM_{2.5} from Appendix E of US EPA (2023).

[6] Corresponds to the fraction in THC. Values are extracted from table 3-5 of US EPA (2023b) as fraction in total VOCs multiplied by a ratio VOC/THC of 1.11 (Tiers 2,3 and 4 No DPF), 0,53 (Tier4, no SCR) or 0,97 (Tier 4, DFP+SCR) from table 3-3 of the same document. The highest fraction amongsts the engine classes (Tier 2 to Tier 4) is used.

[7] Corresponds to the fraction in PM_{2.5}. Values are extracted from table 3-5 of US EPA (2023b).

APPENDIX B

Modelling Results for Sensitive Receptors

Results summary at 50, 150 and 300 m from road center (max values), 100 and 200 m from ARA-2 quarry center point, and each sensitive receptor - CONSTRUCTION PHASE

Sector or receptor				TSP (AAQC) - no dust control			TSP (AAQC) - with dust control			TSP (AAQC) - no control		
				24-hour			24-hour			Annual		
Limit value (µg/m ³)				120			120			60		
Baseline concentration (µg/m ³)				45			45			4.0		
Project contribution	Distance from road center (note)	UTM Coordinates (zone 16)		Project only			Project only			Project only		
		Northing	Easting	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	n/a	n/a	16 423	13686%	13723%	16 211	13510%	13547%	55	92%	98%
	50 m	n/a	n/a	16 423	13686%	13723%	16 211	13510%	13547%	54	89%	96%
	150 m	n/a	n/a	2 716	2264%	2301%	2 610	2175%	2212%	17	29%	35%
	300 m	n/a	n/a	1 163	969%	1007%	1 102	919%	956%	10	17%	24%
	Quarry - 100 m	n/a	n/a	1 688	1407%	1445%	1 595	1329%	1367%	55	92%	98%
	Quarry - 200 m	n/a	n/a	3 136	2613%	2651%	3 065	2554%	2592%	27	45%	52%
Culturally sensitive areas												
CHL01	800 m	474 132	5 867 532	364	303%	340%	364	303%	340%	2	3%	10%
CHL02	350 m	474 919	5 868 252	665	554%	592%	629	525%	562%	4	6%	13%
CHL03	950 m	475 287	5 869 192	209	174%	211%	195	163%	200%	1	2%	9%
CHL04	700 m	475 953	5 868 419	303	253%	290%	274	229%	266%	3	4%	11%
CHL05	150 m	475 993	5 866 659	1 828	1523%	1561%	1 828	1523%	1561%	14	24%	30%
CHL06	400 m	476 740	5 868 227	664	553%	591%	601	501%	539%	5	8%	15%
CHL07	< 50 m (1)	477 261	5 868 026	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	477 886	5 867 941	610	508%	545%	555	463%	500%	8	13%	19%
CHL09	550 m	478 253	5 867 412	521	434%	471%	475	396%	433%	5	8%	14%
CHL10	575 m	478 338	5 866 452	509	424%	462%	467	389%	426%	4	6%	13%
CHL11	550 m	478 398	5 866 187	561	467%	505%	513	428%	465%	3	6%	12%
CHL12	875 m (2)	478 018	5 869 218	297	248%	285%	271	226%	263%	3	5%	11%
CHL13	305 m	479 100	5 867 453	620	517%	555%	574	478%	516%	8	13%	20%
CHL14	200 m	479 574	5 865 726	1 225	1021%	1059%	1 179	983%	1020%	12	20%	26%
CHL15	275 m	480 794	5 866 229	757	630%	668%	711	593%	630%	8	13%	20%
CHL16	550 m	480 939	5 868 381	417	348%	385%	375	312%	350%	4	6%	13%
CHL17	130 m (2)	481 775	5 868 842	1 105	921%	958%	1 104	920%	958%	16	26%	33%
CHL18	420 m (2)	483 545	5 865 991	558	465%	502%	515	429%	467%	4	7%	14%
CHL24 (gooseberries)	800 m (2)	488 262	5 859 049	304	253%	291%	279	233%	270%	2	4%	10%
CHL25 (fishing area)	60 m (2)	489 746	5 859 503	5 856	4880%	4917%	5 701	4751%	4788%	20	33%	40%
CHL28 (gooseberries)	240 m (2)	488 770	5 856 128	1 126	938%	976%	1 068	890%	928%	5	8%	15%
Institutional buildings												
I01 (Business center)	1,800 m	475 630	5 869 983	148	124%	161%	135	113%	150%	1	2%	8%
I02 (Nursing station)	2,000 m	475 677	5 870 213	151	126%	163%	138	115%	152%	1	1%	8%
I03 (School)	2,350 m	475 754	5 870 550	143	119%	157%	131	109%	146%	1	1%	8%
I04 (Future school)	2,300 m	475 706	5 870 482	135	113%	150%	123	102%	140%	1	1%	8%
I05 (Church)	2,700 m	475 935	5 870 887	131	109%	147%	119	99%	137%	1	1%	8%
I06 (Community bldg)	2,900 m	476 028	5 871 010	122	101%	139%	110	92%	130%	1	1%	8%
Existing residences												
RP01	1,350 m	475 487	5 869 576	154	128%	166%	140	117%	154%	1	2%	9%
RP02	1,450 m	475 491	5 869 668	150	125%	162%	137	114%	151%	1	2%	8%
RP03	1,450 m	475 537	5 869 663	153	128%	165%	140	117%	154%	1	2%	8%
RP04	1,650 m	475 629	5 869 833	153	127%	165%	139	116%	154%	1	2%	8%
RP05	1,750 m	475 669	5 869 931	152	127%	164%	139	116%	153%	1	2%	8%
RP06	2,150 m	475 580	5 870 349	135	112%	150%	123	102%	140%	1	1%	8%
RP07	2,250 m	475 597	5 870 429	131	109%	147%	119	99%	137%	1	1%	8%
RP08	2,250 m	475 694	5 870 436	135	112%	150%	123	102%	140%	1	1%	8%
RP09	2,350 m	475 648	5 870 532	129	108%	145%	117	98%	135%	1	1%	8%
RP10	2,150 m	475 663	5 870 316	143	119%	157%	130	109%	146%	1	1%	8%
RP11	2,000 m	475 725	5 870 183	149	124%	162%	136	114%	151%	1	1%	8%
RP12	2,150 m	475 812	5 870 331	136	113%	151%	124	103%	141%	1	1%	8%
RP13	2,000 m	475 806	5 870 181	140	117%	154%	128	107%	144%	1	1%	8%
RP14	2,500 m	475 926	5 870 615	136	113%	151%	124	103%	140%	1	1%	8%
RP15	2,500 m	475 858	5 870 641	136	113%	151%	124	103%	141%	1	1%	8%
RP16	2,500 m	475 759	5 870 675	134	111%	149%	122	102%	139%	1	1%	8%
RP17	2,600 m	475 808	5 870 781	132	110%	148%	120	100%	138%	1	1%	8%
RP18	2,600 m	475 897	5 870 759	135	112%	150%	123	102%	140%	1	1%	8%
RP19	2,600 m	475 976	5 870 740	131	109%	146%	119	99%	136%	1	1%	8%
RP20	2,700 m	476 010	5 870 826	126	105%	143%	115	96%	133%	1	1%	8%
RP21	2,700 m	475 926	5 870 853	132	110%	147%	120	100%	137%	1	1%	8%
RP22	2,700 m	475 837	5 870 900	127	106%	143%	115	96%	134%	1	1%	8%
RP23	2,900 m	475 868	5 871 026	125	104%	142%	113	95%	132%	1	1%	8%
RP24	2,900 m	475 944	5 870 999	128	107%	144%	116	97%	135%	1	1%	8%

NOTE 1: Identified sensitive receptor was not analysed since it is located inside the road right-of-way.
NOTE 2: Large sensitive areas with several receptors distributed along the perimeter. Distance corresponds to the closest point
NOTE 3: Closest future residence expected for these areas (Site West = west of Webequie; Site A = north of air strip).
NOTE 4: Closest future residences expected for these areas (Site C = area south of the WSR; Site D = area north-west of the WSR).

Sector or receptor		TSP (AAQC) - with dust control			PM10 (AAQC) - no dust control			PM10 (AAQC) - with dust control		
		Annual			24-hour			24-hour		
Limit value (µg/m ³)		60			50			50		
Baseline concentration (µg/m ³)		4			28			28		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	53	89%	96%	5 878	11756%	11812%	5 752	11505%	11561%
	50 m	39	65%	72%	5 878	11756%	11812%	5 752	11505%	11561%
	150 m	13	21%	28%	1 450	2899%	2955%	1 283	2566%	2622%
	300 m	8	13%	20%	801	1601%	1657%	672	1344%	1400%
	Quarry - 100 m	53	89%	96%	915	1831%	1887%	815	1629%	1685%
	Quarry - 200 m	23	38%	45%	1 472	2944%	3000%	1 376	2752%	2808%
Culturally sensitive areas										
CHL01	800 m	1	2%	9%	331	663%	719%	292	584%	640%
CHL02	350 m	3	5%	11%	430	859%	915%	383	765%	821%
CHL03	950 m	1	2%	8%	178	355%	411%	152	304%	360%
CHL04	700 m	2	3%	10%	273	546%	602%	229	458%	514%
CHL05	150 m	10	17%	24%	934	1869%	1925%	934	1869%	1925%
CHL06	400 m	4	6%	13%	478	955%	1011%	406	811%	867%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	6	9%	16%	464	928%	984%	388	775%	831%
CHL09	550 m	3	6%	12%	427	855%	911%	357	713%	769%
CHL10	575 m	3	4%	11%	433	867%	923%	365	730%	786%
CHL11	550 m	3	4%	11%	469	938%	994%	393	786%	842%
CHL12	875 m (2)	2	3%	10%	231	462%	518%	192	384%	440%
CHL13	305 m	6	10%	16%	407	813%	869%	354	708%	764%
CHL14	200 m	9	14%	21%	586	1173%	1229%	549	1098%	1154%
CHL15	275 m	6	10%	16%	522	1044%	1100%	453	906%	962%
CHL16	550 m	3	5%	11%	384	768%	824%	312	625%	681%
CHL17	130 m (2)	11	19%	26%	717	1435%	1491%	628	1256%	1312%
CHL18	420 m (2)	3	5%	12%	440	880%	936%	371	743%	799%
CHL24 (gooseberries)	800 m (2)	2	3%	9%	256	512%	568%	218	436%	492%
CHL25 (fishing area)	60 m (2)	15	24%	31%	2 538	5075%	5131%	2 448	4896%	4952%
CHL28 (gooseberries)	240 m (2)	3	6%	12%	647	1293%	1349%	587	1175%	1231%
Institutional buildings										
I01 (Business center)	1,800 m	1	1%	8%	156	313%	369%	130	259%	315%
I02 (Nursing station)	2,000 m	1	1%	8%	158	317%	373%	131	261%	317%
I03 (School)	2,350 m	1	1%	8%	135	269%	325%	113	226%	282%
I04 (Future school)	2,300 m	1	1%	8%	140	280%	336%	116	232%	288%
I05 (Church)	2,700 m	1	1%	8%	119	239%	295%	99	198%	254%
I06 (Community bldg)	2,900 m	1	1%	8%	112	224%	280%	93	186%	242%
Existing residences										
RP01	1,350 m	1	1%	8%	170	339%	395%	141	283%	339%
RP02	1,450 m	1	1%	8%	161	322%	378%	134	268%	324%
RP03	1,450 m	1	1%	8%	161	323%	379%	134	269%	325%
RP04	1,650 m	1	1%	8%	158	316%	372%	131	261%	317%
RP05	1,750 m	1	1%	8%	160	321%	377%	133	266%	322%
RP06	2,150 m	1	1%	8%	147	295%	351%	122	244%	300%
RP07	2,250 m	1	1%	8%	146	291%	347%	121	242%	298%
RP08	2,250 m	1	1%	8%	145	290%	346%	120	241%	297%
RP09	2,350 m	1	1%	8%	137	275%	331%	114	228%	284%
RP10	2,150 m	1	1%	8%	155	310%	366%	129	257%	313%
RP11	2,000 m	1	1%	8%	158	316%	372%	131	262%	318%
RP12	2,150 m	1	1%	8%	148	296%	352%	123	247%	303%
RP13	2,000 m	1	1%	8%	157	315%	371%	131	262%	318%
RP14	2,500 m	1	1%	8%	121	242%	298%	100	201%	257%
RP15	2,500 m	1	1%	8%	125	250%	306%	104	208%	264%
RP16	2,500 m	1	1%	8%	128	256%	312%	107	214%	270%
RP17	2,600 m	1	1%	8%	123	246%	302%	102	205%	261%
RP18	2,600 m	1	1%	8%	122	243%	299%	101	202%	258%
RP19	2,600 m	1	1%	8%	117	235%	291%	97	195%	251%
RP20	2,700 m	1	1%	8%	114	229%	285%	95	190%	246%
RP21	2,700 m	1	1%	8%	119	239%	295%	99	198%	254%
RP22	2,700 m	1	1%	8%	118	235%	291%	98	196%	252%
RP23	2,900 m	1	1%	8%	119	239%	295%	99	198%	254%
RP24	2,900 m	1	1%	8%	119	238%	294%	98	197%	253%

Sector or receptor		PM2.5 (CAAQS) - no dust control			PM2.5 (CAAQS) - with dust control			PM2.5 (AAQC) - no dust control		
		24-hour			24-hour			24-hour		
Limit value (µg/m ³)		23			23			27		
Baseline concentration (µg/m ³)		13			13			13		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	1 151	5006%	5061%	1 141	4961%	5016%	1 151	4264%	4311%
	50 m	1 151	5006%	5061%	1 141	4961%	5016%	1 151	4264%	4311%
	150 m	193	838%	893%	189	820%	874%	193	714%	760%
	300 m	100	435%	490%	96	416%	470%	100	370%	417%
	Quarry - 100 m	108	469%	524%	105	456%	511%	108	400%	447%
	Quarry - 200 m	232	1008%	1062%	228	993%	1048%	232	858%	905%
Culturally sensitive areas										
CHL01	800 m	45	195%	250%	43	185%	240%	45	166%	213%
CHL02	350 m	71	308%	362%	68	295%	349%	71	262%	309%
CHL03	950 m	33	143%	197%	31	135%	189%	33	121%	168%
CHL04	700 m	40	173%	227%	38	163%	218%	40	147%	194%
CHL05	150 m	150	653%	708%	146	636%	690%	150	557%	603%
CHL06	400 m	79	345%	400%	75	325%	380%	79	294%	341%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	73	317%	372%	68	298%	352%	73	270%	317%
CHL09	550 m	57	246%	301%	54	233%	288%	57	210%	256%
CHL10	575 m	53	229%	283%	50	215%	270%	53	195%	241%
CHL11	550 m	54	236%	291%	51	222%	276%	54	201%	248%
CHL12	875 m (2)	42	182%	237%	40	175%	229%	42	155%	202%
CHL13	305 m	71	307%	361%	69	299%	353%	71	261%	308%
CHL14	200 m	108	468%	523%	103	448%	502%	108	399%	446%
CHL15	275 m	82	355%	410%	78	340%	395%	82	302%	349%
CHL16	550 m	52	226%	280%	49	215%	270%	52	192%	239%
CHL17	130 m (2)	110	477%	532%	105	455%	510%	110	407%	453%
CHL18	420 m (2)	57	246%	301%	54	235%	290%	57	209%	256%
CHL24 (gooseberries)	800 m (2)	34	148%	203%	33	143%	198%	34	126%	173%
CHL25 (fishing area)	60 m (2)	388	1687%	1742%	381	1657%	1712%	388	1437%	1484%
CHL28 (gooseberries)	240 m (2)	92	399%	454%	88	384%	438%	92	340%	386%
Institutional buildings										
I01 (Business center)	1,800 m	22	94%	148%	20	88%	143%	22	80%	126%
I02 (Nursing station)	2,000 m	21	91%	146%	20	86%	141%	21	77%	124%
I03 (School)	2,350 m	19	82%	137%	18	78%	132%	19	70%	117%
I04 (Future school)	2,300 m	18	80%	135%	18	77%	131%	18	68%	115%
I05 (Church)	2,700 m	18	79%	134%	17	76%	131%	18	67%	114%
I06 (Community bldg)	2,900 m	17	74%	129%	16	71%	126%	17	63%	110%
Existing residences										
RP01	1,350 m	26	111%	166%	24	105%	159%	26	94%	141%
RP02	1,450 m	24	105%	160%	23	99%	154%	24	90%	136%
RP03	1,450 m	24	105%	159%	23	98%	153%	24	89%	136%
RP04	1,650 m	22	98%	152%	22	94%	148%	22	83%	130%
RP05	1,750 m	22	96%	151%	21	92%	147%	22	82%	129%
RP06	2,150 m	20	86%	140%	19	81%	136%	20	73%	120%
RP07	2,250 m	19	84%	138%	18	79%	134%	19	71%	118%
RP08	2,250 m	19	81%	136%	18	78%	133%	19	69%	116%
RP09	2,350 m	18	79%	134%	17	76%	131%	18	68%	114%
RP10	2,150 m	20	86%	141%	19	82%	136%	20	73%	120%
RP11	2,000 m	21	92%	147%	20	88%	143%	21	79%	125%
RP12	2,150 m	20	88%	143%	19	83%	138%	20	75%	122%
RP13	2,000 m	21	93%	147%	20	88%	143%	21	79%	125%
RP14	2,500 m	19	81%	136%	18	79%	134%	19	69%	116%
RP15	2,500 m	18	80%	135%	18	78%	132%	18	68%	115%
RP16	2,500 m	18	78%	132%	17	74%	129%	18	66%	113%
RP17	2,600 m	18	76%	131%	17	73%	128%	18	65%	112%
RP18	2,600 m	19	81%	136%	18	78%	133%	19	69%	116%
RP19	2,600 m	18	80%	135%	18	76%	131%	18	68%	115%
RP20	2,700 m	18	78%	133%	17	73%	128%	18	66%	113%
RP21	2,700 m	18	80%	134%	17	76%	131%	18	68%	114%
RP22	2,700 m	17	75%	130%	16	70%	125%	17	64%	110%
RP23	2,900 m	17	74%	129%	16	71%	125%	17	63%	110%
RP24	2,900 m	18	77%	132%	17	73%	128%	18	66%	113%

Sector or receptor		PM2.5 (AAQC) - with dust control			PM2.5 (CAAQS) - no dust control			PM2.5 (CAAQS) - with dust control		
		24-hour			Annual			Annual		
Limit value (µg/m ³)		27			8.0			8.0		
Baseline concentration (µg/m ³)		13			4.7			4.7		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	1 141	4226%	4273%	3.7	46%	104%	3.4	43%	102%
	50 m	1 141	4226%	4273%	2.3	28%	87%	1.5	19%	78%
	150 m	189	698%	745%	0.8	11%	69%	0.5	6%	65%
	300 m	96	354%	401%	0.6	7%	66%	0.3	4%	63%
	Quarry - 100 m	105	388%	435%	3.7	46%	104%	3.4	43%	102%
	Quarry - 200 m	228	846%	892%	1.8	23%	82%	1.5	19%	77%
Culturally sensitive areas										
CHL01	800 m	43	158%	205%	0.14	2%	61%	0.08	1%	60%
CHL02	350 m	68	251%	298%	0.26	3%	62%	0.15	2%	61%
CHL03	950 m	31	115%	161%	0.12	2%	60%	0.07	1%	60%
CHL04	700 m	38	139%	186%	0.21	3%	61%	0.12	2%	60%
CHL05	150 m	146	541%	588%	0.76	10%	68%	0.45	6%	64%
CHL06	400 m	75	277%	324%	0.35	4%	63%	0.20	3%	61%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	68	254%	300%	0.48	6%	65%	0.28	3%	62%
CHL09	550 m	54	198%	245%	0.33	4%	63%	0.19	2%	61%
CHL10	575 m	50	183%	230%	0.27	3%	62%	0.15	2%	61%
CHL11	550 m	51	189%	236%	0.26	3%	62%	0.15	2%	61%
CHL12	875 m (2)	40	149%	195%	0.21	3%	61%	0.12	2%	60%
CHL13	305 m	69	254%	301%	0.46	6%	65%	0.27	3%	62%
CHL14	200 m	103	381%	428%	0.66	8%	67%	0.38	5%	64%
CHL15	275 m	78	290%	337%	0.50	6%	65%	0.29	4%	62%
CHL16	550 m	49	183%	230%	0.29	4%	62%	0.17	2%	61%
CHL17	130 m (2)	105	387%	434%	0.76	9%	68%	0.43	5%	64%
CHL18	420 m (2)	54	200%	247%	0.33	4%	63%	0.19	2%	61%
CHL24 (gooseberries)	800 m (2)	33	122%	168%	0.18	2%	61%	0.11	1%	60%
CHL25 (fishing area)	60 m (2)	381	1412%	1458%	0.96	12%	71%	0.59	7%	66%
CHL28 (gooseberries)	240 m (2)	88	327%	373%	0.33	4%	63%	0.20	2%	61%
Institutional buildings										
I01 (Business center)	1,800 m	20	75%	122%	0.09	1%	60%	0.05	1%	59%
I02 (Nursing station)	2,000 m	20	73%	120%	0.08	1%	60%	0.05	1%	59%
I03 (School)	2,350 m	18	66%	113%	0.08	1%	60%	0.04	1%	59%
I04 (Future school)	2,300 m	18	65%	112%	0.08	1%	60%	0.05	1%	59%
I05 (Church)	2,700 m	17	65%	111%	0.07	1%	60%	0.04	1%	59%
I06 (Community bldg)	2,900 m	16	61%	107%	0.07	1%	60%	0.04	1%	59%
Existing residences										
RP01	1,350 m	24	89%	136%	0.10	1%	60%	0.06	1%	60%
RP02	1,450 m	23	85%	131%	0.10	1%	60%	0.06	1%	59%
RP03	1,450 m	23	84%	131%	0.10	1%	60%	0.06	1%	59%
RP04	1,650 m	22	80%	126%	0.10	1%	60%	0.06	1%	59%
RP05	1,750 m	21	79%	125%	0.09	1%	60%	0.05	1%	59%
RP06	2,150 m	19	69%	116%	0.08	1%	60%	0.05	1%	59%
RP07	2,250 m	18	67%	114%	0.08	1%	60%	0.05	1%	59%
RP08	2,250 m	18	66%	113%	0.08	1%	60%	0.05	1%	59%
RP09	2,350 m	17	65%	111%	0.08	1%	60%	0.04	1%	59%
RP10	2,150 m	19	69%	116%	0.08	1%	60%	0.05	1%	59%
RP11	2,000 m	20	75%	122%	0.09	1%	60%	0.05	1%	59%
RP12	2,150 m	19	71%	117%	0.08	1%	60%	0.05	1%	59%
RP13	2,000 m	20	75%	121%	0.09	1%	60%	0.05	1%	59%
RP14	2,500 m	18	68%	114%	0.08	1%	60%	0.04	1%	59%
RP15	2,500 m	18	66%	113%	0.08	1%	60%	0.04	1%	59%
RP16	2,500 m	17	63%	110%	0.07	1%	60%	0.04	1%	59%
RP17	2,600 m	17	63%	109%	0.07	1%	60%	0.04	1%	59%
RP18	2,600 m	18	66%	113%	0.07	1%	60%	0.04	1%	59%
RP19	2,600 m	18	65%	112%	0.07	1%	60%	0.04	1%	59%
RP20	2,700 m	17	63%	109%	0.07	1%	60%	0.04	1%	59%
RP21	2,700 m	17	65%	111%	0.07	1%	60%	0.04	1%	59%
RP22	2,700 m	16	60%	107%	0.07	1%	60%	0.04	1%	59%
RP23	2,900 m	16	60%	107%	0.07	1%	60%	0.04	0%	59%
RP24	2,900 m	17	62%	109%	0.07	1%	60%	0.04	1%	59%

Sector or receptor		PM2.5 (AAQC) - no dust control			PM2.5 (AAQC) - with dust control			SO2 (AAQC) - Tier 3		
		Annual			Annual			10 minutes		
Limit value (µg/m ³)		8.8			8.8			180		
Baseline concentration (µg/m ³)		4.7			4.7			149		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	3.7	42%	95%	3.4	39%	93%	14 023	7791%	7873%
	50 m	2.3	26%	79%	1.5	17%	71%	139	77%	160%
	150 m	0.8	10%	63%	0.5	6%	59%	138	76%	159%
	300 m	0.6	7%	60%	0.3	4%	57%	123	68%	151%
	Quarry - 100 m	3.7	42%	95%	3.4	39%	93%	14 023	7791%	7873%
	Quarry - 200 m	1.8	21%	74%	1.5	17%	70%	5 160	2867%	2950%
Culturally sensitive areas										
CHL01	800 m	0.14	2%	55%	0.08	1%	54%	22	12%	95%
CHL02	350 m	0.26	3%	56%	0.15	2%	55%	20	11%	94%
CHL03	950 m	0.12	1%	55%	0.07	1%	54%	13	7%	90%
CHL04	700 m	0.21	2%	56%	0.12	1%	55%	16	9%	92%
CHL05	150 m	0.76	9%	62%	0.45	5%	58%	23	13%	96%
CHL06	400 m	0.35	4%	57%	0.20	2%	56%	16	9%	91%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.48	5%	59%	0.28	3%	57%	15	8%	91%
CHL09	550 m	0.33	4%	57%	0.19	2%	56%	19	11%	93%
CHL10	575 m	0.27	3%	56%	0.15	2%	55%	25	14%	97%
CHL11	550 m	0.26	3%	56%	0.15	2%	55%	28	16%	98%
CHL12	875 m (2)	0.21	2%	56%	0.12	1%	55%	11	6%	89%
CHL13	305 m	0.46	5%	59%	0.27	3%	56%	16	9%	92%
CHL14	200 m	0.66	8%	61%	0.38	4%	58%	31	17%	100%
CHL15	275 m	0.50	6%	59%	0.29	3%	57%	25	14%	97%
CHL16	550 m	0.29	3%	57%	0.17	2%	55%	10	6%	89%
CHL17	130 m (2)	0.76	9%	62%	0.43	5%	58%	54	30%	113%
CHL18	420 m (2)	0.33	4%	57%	0.19	2%	56%	41	23%	105%
CHL24 (gooseberries)	800 m (2)	0.18	2%	55%	0.11	1%	55%	136	75%	158%
CHL25 (fishing area)	60 m (2)	0.96	11%	64%	0.59	7%	60%	164	91%	174%
CHL28 (gooseberries)	240 m (2)	0.33	4%	57%	0.20	2%	56%	90	50%	133%
Institutional buildings										
I01 (Business center)	1,800 m	0.09	1%	54%	0.05	1%	54%	9	5%	88%
I02 (Nursing station)	2,000 m	0.08	1%	54%	0.05	1%	54%	9	5%	88%
I03 (School)	2,350 m	0.08	1%	54%	0.04	1%	54%	9	5%	88%
I04 (Future school)	2,300 m	0.08	1%	54%	0.05	1%	54%	9	5%	88%
I05 (Church)	2,700 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
I06 (Community bldg)	2,900 m	0.07	1%	54%	0.04	0%	54%	8	5%	87%
Existing residences										
RP01	1,350 m	0.10	1%	55%	0.06	1%	54%	13	7%	90%
RP02	1,450 m	0.10	1%	55%	0.06	1%	54%	12	7%	90%
RP03	1,450 m	0.10	1%	55%	0.06	1%	54%	12	7%	89%
RP04	1,650 m	0.10	1%	54%	0.06	1%	54%	11	6%	89%
RP05	1,750 m	0.09	1%	54%	0.05	1%	54%	10	5%	88%
RP06	2,150 m	0.08	1%	54%	0.05	1%	54%	9	5%	88%
RP07	2,250 m	0.08	1%	54%	0.05	1%	54%	9	5%	88%
RP08	2,250 m	0.08	1%	54%	0.05	1%	54%	9	5%	88%
RP09	2,350 m	0.08	1%	54%	0.04	1%	54%	9	5%	88%
RP10	2,150 m	0.08	1%	54%	0.05	1%	54%	9	5%	88%
RP11	2,000 m	0.09	1%	54%	0.05	1%	54%	9	5%	88%
RP12	2,150 m	0.08	1%	54%	0.05	1%	54%	9	5%	88%
RP13	2,000 m	0.09	1%	54%	0.05	1%	54%	9	5%	88%
RP14	2,500 m	0.08	1%	54%	0.04	1%	54%	9	5%	88%
RP15	2,500 m	0.08	1%	54%	0.04	0%	54%	9	5%	88%
RP16	2,500 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP17	2,600 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP18	2,600 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP19	2,600 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP20	2,700 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP21	2,700 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP22	2,700 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP23	2,900 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%
RP24	2,900 m	0.07	1%	54%	0.04	0%	54%	9	5%	88%

Sector or receptor		SO2 (AAQC) - Tier 4			SO2 (AAQC) - Tier 3			SO2 (AAQC) - Tier 4		
		10 minutes			1 hour			1 hour		
Limit value (µg/m ³)		180			100			100		
Baseline concentration (µg/m ³)		149			90			90		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	3 043	1691%	1773%	8 499	8499%	8589%	1 844	1844%	1934%
	50 m	31	17%	100%	84	84%	174%	19	19%	109%
	150 m	30	17%	100%	83	83%	173%	18	18%	108%
	300 m	27	15%	98%	74	74%	164%	16	16%	106%
	Quarry - 100 m	3 043	1691%	1773%	8 499	8499%	8589%	1 844	1844%	1934%
	Quarry - 200 m	1 120	622%	705%	3 127	3127%	3217%	679	679%	769%
Culturally sensitive areas										
CHL01	800 m	5	3%	86%	13	13%	103%	3	3%	93%
CHL02	350 m	5	3%	85%	12	12%	102%	3	3%	93%
CHL03	950 m	3	2%	84%	8	8%	98%	2	2%	92%
CHL04	700 m	4	2%	85%	10	10%	100%	2	2%	92%
CHL05	150 m	10	5%	88%	14	14%	104%	6	6%	96%
CHL06	400 m	4	2%	85%	9	9%	99%	2	2%	92%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	4	2%	85%	9	9%	99%	2	2%	92%
CHL09	550 m	4	2%	85%	12	12%	102%	3	3%	93%
CHL10	575 m	6	3%	86%	15	15%	105%	3	3%	93%
CHL11	550 m	6	3%	86%	17	17%	107%	4	4%	94%
CHL12	875 m (2)	2	1%	84%	7	7%	97%	1	1%	91%
CHL13	305 m	4	2%	85%	10	10%	100%	2	2%	92%
CHL14	200 m	7	4%	87%	19	19%	109%	4	4%	94%
CHL15	275 m	6	3%	86%	15	15%	105%	4	4%	94%
CHL16	550 m	3	2%	84%	6	6%	96%	2	2%	92%
CHL17	130 m (2)	12	7%	89%	33	33%	123%	7	7%	97%
CHL18	420 m (2)	9	5%	88%	25	25%	115%	5	5%	95%
CHL24 (gooseberries)	800 m (2)	30	16%	99%	82	82%	172%	18	18%	108%
CHL25 (fishing area)	60 m (2)	36	20%	103%	100	100%	190%	22	22%	112%
CHL28 (gooseberries)	240 m (2)	20	11%	94%	55	55%	145%	12	12%	102%
Institutional buildings										
I01 (Business center)	1,800 m	2	1%	84%	6	6%	96%	1	1%	91%
I02 (Nursing station)	2,000 m	2	1%	84%	5	5%	95%	1	1%	91%
I03 (School)	2,350 m	2	1%	84%	6	6%	96%	1	1%	91%
I04 (Future school)	2,300 m	2	1%	84%	6	6%	96%	1	1%	91%
I05 (Church)	2,700 m	2	1%	84%	5	5%	95%	1	1%	91%
I06 (Community bldg)	2,900 m	2	1%	84%	5	5%	95%	1	1%	91%
Existing residences										
RP01	1,350 m	3	2%	84%	8	8%	98%	2	2%	92%
RP02	1,450 m	3	2%	84%	7	7%	97%	2	2%	92%
RP03	1,450 m	3	2%	84%	7	7%	97%	2	2%	92%
RP04	1,650 m	2	1%	84%	6	6%	96%	1	1%	91%
RP05	1,750 m	2	1%	84%	6	6%	96%	1	1%	91%
RP06	2,150 m	2	1%	84%	5	5%	95%	1	1%	91%
RP07	2,250 m	2	1%	84%	5	5%	95%	1	1%	91%
RP08	2,250 m	2	1%	84%	6	6%	96%	1	1%	91%
RP09	2,350 m	2	1%	84%	6	6%	96%	1	1%	91%
RP10	2,150 m	2	1%	84%	5	5%	95%	1	1%	91%
RP11	2,000 m	2	1%	84%	5	5%	95%	1	1%	91%
RP12	2,150 m	2	1%	84%	6	6%	96%	1	1%	91%
RP13	2,000 m	2	1%	84%	5	5%	95%	1	1%	91%
RP14	2,500 m	2	1%	84%	6	6%	96%	1	1%	91%
RP15	2,500 m	2	1%	84%	6	6%	96%	1	1%	91%
RP16	2,500 m	2	1%	84%	6	6%	96%	1	1%	91%
RP17	2,600 m	2	1%	84%	6	6%	96%	1	1%	91%
RP18	2,600 m	2	1%	84%	6	6%	96%	1	1%	91%
RP19	2,600 m	2	1%	84%	6	6%	96%	1	1%	91%
RP20	2,700 m	2	1%	84%	5	5%	95%	1	1%	91%
RP21	2,700 m	2	1%	84%	5	5%	95%	1	1%	91%
RP22	2,700 m	2	1%	84%	5	5%	95%	1	1%	91%
RP23	2,900 m	2	1%	84%	5	5%	95%	1	1%	91%
RP24	2,900 m	2	1%	84%	5	5%	95%	1	1%	91%

Sector or receptor		SO2 (CAAQS) - Tier 3			SO2 (CAAQS) - Tier 4			SO2 (AAQC & CAAQS) - Tier 3		
		1 hour			1 hour			Annual		
Limit value (µg/m ³)		173			173			10		
Baseline concentration (µg/m ³)		18			18			0.50		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	8 499	4913%	4923%	1 844	1066%	1076%	0.114	1.1%	6.1%
	50 m	84	49%	59%	19	11%	21%	0.004	0.0%	5.0%
	150 m	83	48%	59%	18	11%	21%	0.001	0.0%	5.0%
	300 m	74	43%	53%	16	9%	20%	0.001	0.0%	5.0%
	Quarry - 100 m	8 499	4913%	4923%	1 844	1066%	1076%	0.114	1.1%	6.1%
	Quarry - 200 m	3 127	1808%	1818%	679	392%	403%	0.034	0.3%	5.3%
Culturally sensitive areas										
CHL01	800 m	13	8%	18%	3	2%	12%	0.0002	0.002%	5.0%
CHL02	350 m	12	7%	17%	3	2%	12%	0.0003	0.003%	5.0%
CHL03	950 m	8	5%	15%	2	1%	11%	0.0002	0.002%	5.0%
CHL04	700 m	10	6%	16%	2	1%	12%	0.0003	0.003%	5.0%
CHL05	150 m	14	8%	19%	6	3%	14%	0.0009	0.009%	5.0%
CHL06	400 m	9	5%	16%	2	1%	12%	0.0004	0.004%	5.0%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	9	5%	16%	2	1%	12%	0.0006	0.006%	5.0%
CHL09	550 m	12	7%	17%	3	2%	12%	0.0004	0.004%	5.0%
CHL10	575 m	15	9%	19%	3	2%	12%	0.0003	0.003%	5.0%
CHL11	550 m	17	10%	20%	4	2%	13%	0.0003	0.003%	5.0%
CHL12	875 m (2)	7	4%	14%	1	1%	11%	0.0002	0.002%	5.0%
CHL13	305 m	10	6%	16%	2	1%	12%	0.0006	0.006%	5.0%
CHL14	200 m	19	11%	21%	4	2%	13%	0.0007	0.007%	5.0%
CHL15	275 m	15	9%	19%	4	2%	12%	0.0006	0.006%	5.0%
CHL16	550 m	6	4%	14%	2	1%	11%	0.0003	0.003%	5.0%
CHL17	130 m (2)	33	19%	29%	7	4%	15%	0.0008	0.008%	5.0%
CHL18	420 m (2)	25	14%	25%	5	3%	14%	0.0004	0.004%	5.0%
CHL24 (gooseberries)	800 m (2)	82	48%	58%	18	10%	21%	0.0005	0.005%	5.0%
CHL25 (fishing area)	60 m (2)	100	58%	68%	22	13%	23%	0.0015	0.015%	5.0%
CHL28 (gooseberries)	240 m (2)	55	32%	42%	12	7%	17%	0.0005	0.005%	5.0%
Institutional buildings										
I01 (Business center)	1,800 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
I02 (Nursing station)	2,000 m	5	3%	13%	1	1%	11%	0.0001	0.001%	5.0%
I03 (School)	2,350 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
I04 (Future school)	2,300 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
I05 (Church)	2,700 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
I06 (Community bldg)	2,900 m	5	3%	13%	1	1%	11%	0.0001	0.001%	5.0%
Existing residences										
RP01	1,350 m	8	4%	15%	2	1%	11%	0.0001	0.001%	5.0%
RP02	1,450 m	7	4%	15%	2	1%	11%	0.0001	0.001%	5.0%
RP03	1,450 m	7	4%	15%	2	1%	11%	0.0001	0.001%	5.0%
RP04	1,650 m	6	4%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP05	1,750 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP06	2,150 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP07	2,250 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP08	2,250 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP09	2,350 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP10	2,150 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP11	2,000 m	5	3%	13%	1	1%	11%	0.0001	0.001%	5.0%
RP12	2,150 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP13	2,000 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP14	2,500 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP15	2,500 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP16	2,500 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP17	2,600 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP18	2,600 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP19	2,600 m	6	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP20	2,700 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP21	2,700 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP22	2,700 m	5	3%	14%	1	1%	11%	0.0001	0.001%	5.0%
RP23	2,900 m	5	3%	13%	1	1%	11%	0.0001	0.001%	5.0%
RP24	2,900 m	5	3%	13%	1	1%	11%	0.0001	0.001%	5.0%

Sector or receptor		NO2 (AAQC) - Tier 3			NO2 (AAQC) - Tier 4			NO2 (CAAQS) - Tier 3		
		1 hour			1 hour			1 hour		
Limit value (µg/m ³)		400			400			79		
Baseline concentration (µg/m ³)		51			51			28		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	7 519	1880%	1892%	4 664	1166%	1179%	2 902	3673%	3709%
	50 m	1 746	436%	449%	416	104%	117%	1 120	1418%	1454%
	150 m	808	202%	215%	221	55%	68%	390	494%	529%
	300 m	451	113%	125%	154	39%	51%	254	322%	357%
	Quarry - 100 m	7 519	1880%	1892%	4 664	1166%	1179%	2 902	3673%	3709%
	Quarry - 200 m	2 822	706%	718%	1 717	429%	442%	1 161	1470%	1505%
Culturally sensitive areas										
CHL01	800 m	210	53%	65%	104	26%	39%	140	177%	213%
CHL02	350 m	325	81%	94%	139	35%	48%	200	253%	289%
CHL03	950 m	202	51%	63%	102	25%	38%	129	163%	198%
CHL04	700 m	190	48%	60%	100	25%	38%	137	173%	209%
CHL05	150 m	599	150%	163%	179	45%	58%	312	394%	430%
CHL06	400 m	275	69%	82%	121	30%	43%	174	220%	255%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	284	71%	84%	122	31%	43%	193	245%	280%
CHL09	550 m	255	64%	76%	112	28%	41%	162	205%	241%
CHL10	575 m	234	58%	71%	108	27%	40%	154	195%	231%
CHL11	550 m	247	62%	75%	114	29%	41%	161	204%	239%
CHL12	875 m (2)	208	52%	65%	108	27%	40%	143	180%	216%
CHL13	305 m	294	74%	86%	122	31%	43%	207	262%	297%
CHL14	200 m	350	88%	100%	138	34%	47%	219	277%	313%
CHL15	275 m	344	86%	99%	130	33%	45%	197	249%	284%
CHL16	550 m	226	57%	69%	106	27%	39%	163	207%	242%
CHL17	130 m (2)	440	110%	123%	149	37%	50%	284	360%	396%
CHL18	420 m (2)	224	56%	69%	109	27%	40%	165	209%	245%
CHL24 (gooseberries)	800 m (2)	178	45%	57%	106	26%	39%	129	163%	199%
CHL25 (fishing area)	60 m (2)	971	243%	256%	265	66%	79%	480	608%	643%
CHL28 (gooseberries)	240 m (2)	367	92%	105%	135	34%	47%	212	269%	304%
Institutional buildings										
I01 (Business center)	1,800 m	171	43%	56%	93	23%	36%	111	141%	176%
I02 (Nursing station)	2,000 m	179	45%	57%	96	24%	37%	114	145%	180%
I03 (School)	2,350 m	169	42%	55%	95	24%	36%	110	140%	175%
I04 (Future school)	2,300 m	161	40%	53%	93	23%	36%	109	138%	173%
I05 (Church)	2,700 m	153	38%	51%	93	23%	36%	109	138%	173%
I06 (Community bldg)	2,900 m	150	37%	50%	91	23%	35%	106	134%	169%
Existing residences										
RP01	1,350 m	182	46%	58%	98	24%	37%	120	151%	187%
RP02	1,450 m	175	44%	56%	96	24%	37%	119	151%	186%
RP03	1,450 m	177	44%	57%	96	24%	37%	118	150%	185%
RP04	1,650 m	172	43%	56%	95	24%	36%	113	143%	178%
RP05	1,750 m	173	43%	56%	95	24%	36%	112	142%	177%
RP06	2,150 m	151	38%	51%	93	23%	36%	109	139%	174%
RP07	2,250 m	150	37%	50%	92	23%	36%	108	137%	173%
RP08	2,250 m	163	41%	53%	93	23%	36%	109	138%	174%
RP09	2,350 m	153	38%	51%	92	23%	36%	108	136%	172%
RP10	2,150 m	173	43%	56%	95	24%	37%	112	142%	177%
RP11	2,000 m	168	42%	55%	96	24%	37%	112	142%	177%
RP12	2,150 m	162	40%	53%	94	23%	36%	109	138%	174%
RP13	2,000 m	154	39%	51%	92	23%	36%	108	137%	172%
RP14	2,500 m	156	39%	52%	92	23%	36%	106	135%	170%
RP15	2,500 m	152	38%	51%	94	23%	36%	109	137%	173%
RP16	2,500 m	155	39%	52%	92	23%	36%	107	135%	171%
RP17	2,600 m	156	39%	52%	92	23%	36%	106	135%	170%
RP18	2,600 m	154	38%	51%	94	23%	36%	110	139%	174%
RP19	2,600 m	152	38%	51%	91	23%	35%	105	133%	168%
RP20	2,700 m	148	37%	50%	90	23%	35%	104	132%	168%
RP21	2,700 m	153	38%	51%	93	23%	36%	109	138%	173%
RP22	2,700 m	153	38%	51%	91	23%	36%	106	134%	170%
RP23	2,900 m	155	39%	52%	92	23%	36%	107	135%	171%
RP24	2,900 m	147	37%	50%	93	23%	36%	109	138%	173%

Sector or receptor		NO2 (CAAQS) - Tier 4			NO2 (AAQC) - Tier 3			NO2 (AAQC) - Tier 4		
		1 hour			24-hours			24-hours		
Limit value (µg/m ³)		79			200			200		
Baseline concentration (µg/m ³)		28			23			23		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	2 897	3667%	3703%	448	224%	235%	321	161%	172%
	50 m	392	496%	531%	435	218%	229%	194	97%	109%
	150 m	207	262%	297%	156	78%	90%	109	55%	66%
	300 m	148	187%	222%	123	62%	73%	95	47%	59%
	Quarry - 100 m	2 897	3667%	3703%	357	179%	190%	321	161%	172%
	Quarry - 200 m	1 159	1467%	1502%	168	84%	95%	133	66%	78%
Culturally sensitive areas										
CHL01	800 m	102	129%	165%	97	48%	60%	73	36%	48%
CHL02	350 m	127	160%	196%	98	49%	61%	68	34%	46%
CHL03	950 m	98	124%	159%	71	35%	47%	39	20%	31%
CHL04	700 m	99	125%	161%	84	42%	53%	55	27%	39%
CHL05	150 m	171	217%	252%	131	66%	77%	89	45%	56%
CHL06	400 m	117	149%	184%	101	51%	62%	78	39%	50%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	116	147%	182%	103	51%	63%	75	37%	49%
CHL09	550 m	103	131%	166%	101	50%	62%	73	36%	48%
CHL10	575 m	106	134%	169%	104	52%	64%	80	40%	51%
CHL11	550 m	111	141%	177%	106	53%	65%	83	42%	53%
CHL12	875 m (2)	105	133%	168%	79	39%	51%	46	23%	35%
CHL13	305 m	117	149%	184%	94	47%	59%	68	34%	46%
CHL14	200 m	132	168%	203%	105	53%	64%	77	38%	50%
CHL15	275 m	125	158%	194%	106	53%	65%	73	37%	48%
CHL16	550 m	103	130%	165%	98	49%	61%	74	37%	49%
CHL17	130 m (2)	140	178%	213%	116	58%	70%	84	42%	54%
CHL18	420 m (2)	105	133%	168%	101	50%	62%	76	38%	49%
CHL24 (gooseberries)	800 m (2)	96	122%	157%	87	43%	55%	51	26%	37%
CHL25 (fishing area)	60 m (2)	250	316%	352%	205	102%	114%	134	67%	78%
CHL28 (gooseberries)	240 m (2)	132	167%	202%	113	56%	68%	86	43%	55%
Institutional buildings										
I01 (Business center)	1,800 m	92	116%	152%	58	29%	40%	34	17%	29%
I02 (Nursing station)	2,000 m	93	117%	153%	56	28%	40%	34	17%	29%
I03 (School)	2,350 m	91	116%	151%	54	27%	39%	30	15%	26%
I04 (Future school)	2,300 m	90	114%	150%	54	27%	38%	30	15%	26%
I05 (Church)	2,700 m	91	115%	150%	53	27%	38%	26	13%	25%
I06 (Community bldg)	2,900 m	86	108%	144%	53	26%	38%	25	12%	24%
Existing residences										
RP01	1,350 m	95	120%	155%	63	32%	43%	36	18%	30%
RP02	1,450 m	94	119%	154%	62	31%	43%	35	18%	29%
RP03	1,450 m	94	119%	155%	62	31%	43%	36	18%	29%
RP04	1,650 m	93	118%	153%	59	30%	41%	35	18%	29%
RP05	1,750 m	92	117%	152%	58	29%	41%	35	18%	29%
RP06	2,150 m	90	114%	150%	54	27%	38%	31	16%	27%
RP07	2,250 m	90	114%	149%	53	27%	38%	31	15%	27%
RP08	2,250 m	91	115%	150%	54	27%	38%	31	15%	27%
RP09	2,350 m	88	112%	147%	53	26%	38%	29	15%	26%
RP10	2,150 m	92	116%	151%	55	28%	39%	33	17%	28%
RP11	2,000 m	92	117%	152%	56	28%	40%	34	17%	29%
RP12	2,150 m	91	115%	150%	55	27%	39%	31	16%	27%
RP13	2,000 m	91	115%	150%	55	28%	39%	33	17%	28%
RP14	2,500 m	90	113%	149%	54	27%	39%	26	13%	25%
RP15	2,500 m	90	114%	150%	54	27%	39%	27	13%	25%
RP16	2,500 m	90	113%	149%	53	27%	38%	26	13%	25%
RP17	2,600 m	90	114%	149%	53	26%	38%	26	13%	25%
RP18	2,600 m	91	115%	150%	54	27%	38%	26	13%	25%
RP19	2,600 m	89	113%	148%	54	27%	38%	25	13%	24%
RP20	2,700 m	85	108%	144%	53	26%	38%	25	12%	24%
RP21	2,700 m	90	114%	150%	53	27%	38%	26	13%	25%
RP22	2,700 m	89	112%	148%	52	26%	37%	26	13%	24%
RP23	2,900 m	88	112%	147%	52	26%	38%	26	13%	25%
RP24	2,900 m	89	113%	148%	53	26%	38%	26	13%	25%

Sector or receptor		NO2 (CAAQs) - Tier 3			CO (AAQC) - Tier 3			CO (AAQC) - Tier 4		
		Annual			1 hour			1 hour		
Limit value (µg/m ³)		22			36200			36200		
Baseline concentration (µg/m ³)		2.6			5061			5061		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	10	45%	57%	62 703	173%	187%	62 681	173%	187%
	50 m	2.0	9%	21%	7 550	21%	35%	1 342	4%	18%
	150 m	0.6	3%	15%	3 308	9%	23%	622	2%	16%
	300 m	0.3	1%	13%	1 690	5%	19%	554	2%	16%
	Quarry - 100 m	9.9	45%	57%	62 703	173%	187%	62 681	173%	187%
	Quarry - 200 m	6.9	31%	43%	23 103	64%	78%	23 066	64%	78%
Culturally sensitive areas										
CHL01	800 m	0.08	0.3%	12%	603	2%	16%	112	0.3%	14%
CHL02	350 m	0.13	0.6%	12%	1 120	3%	17%	252	0.7%	15%
CHL03	950 m	0.07	0.3%	12%	566	2%	16%	101	0.3%	14%
CHL04	700 m	0.12	0.5%	12%	512	1%	15%	95	0.3%	14%
CHL05	150 m	0.43	1.9%	14%	2 363	7%	21%	410	1.1%	15%
CHL06	400 m	0.19	0.9%	13%	897	2%	16%	176	0.5%	14%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.28	1.3%	13%	937	3%	17%	185	0.5%	14%
CHL09	550 m	0.18	0.8%	13%	803	2%	16%	145	0.4%	14%
CHL10	575 m	0.14	0.6%	12%	710	2%	16%	121	0.3%	14%
CHL11	550 m	0.14	0.6%	12%	770	2%	16%	151	0.4%	14%
CHL12	875 m (2)	0.12	0.5%	12%	591	2%	16%	126	0.3%	14%
CHL13	305 m	0.26	1.2%	13%	982	3%	17%	185	0.5%	14%
CHL14	200 m	0.34	1.5%	13%	1 236	3%	17%	241	0.7%	15%
CHL15	275 m	0.27	1.2%	13%	1 208	3%	17%	212	0.6%	15%
CHL16	550 m	0.15	0.7%	13%	674	2%	16%	118	0.3%	14%
CHL17	130 m (2)	0.39	1.8%	14%	1 641	5%	19%	288	0.8%	15%
CHL18	420 m (2)	0.19	0.8%	13%	665	2%	16%	185	0.5%	14%
CHL24 (gooseberries)	800 m (2)	0.20	0.9%	13%	638	2%	16%	608	1.7%	16%
CHL25 (fishing area)	60 m (2)	0.67	3.0%	15%	4 046	11%	25%	757	2.1%	16%
CHL28 (gooseberries)	240 m (2)	0.22	1.0%	13%	1 313	4%	18%	409	1.1%	15%
Institutional buildings										
I01 (Business center)	1,800 m	0.05	0.2%	12%	427	1%	15%	66	0.2%	14%
I02 (Nursing station)	2,000 m	0.05	0.2%	12%	461	1%	15%	79	0.2%	14%
I03 (School)	2,350 m	0.04	0.2%	12%	415	1%	15%	72	0.2%	14%
I04 (Future school)	2,300 m	0.04	0.2%	12%	381	1%	15%	66	0.2%	14%
I05 (Church)	2,700 m	0.04	0.2%	12%	342	1%	15%	66	0.2%	14%
I06 (Community bldg)	2,900 m	0.04	0.2%	12%	329	1%	15%	57	0.2%	14%
Existing residences										
RP01	1,350 m	0.06	0.3%	12%	476	1%	15%	83	0.2%	14%
RP02	1,450 m	0.06	0.3%	12%	443	1%	15%	78	0.2%	14%
RP03	1,450 m	0.06	0.3%	12%	451	1%	15%	77	0.2%	14%
RP04	1,650 m	0.05	0.2%	12%	430	1%	15%	71	0.2%	14%
RP05	1,750 m	0.05	0.2%	12%	433	1%	15%	70	0.2%	14%
RP06	2,150 m	0.04	0.2%	12%	336	1%	15%	63	0.2%	14%
RP07	2,250 m	0.04	0.2%	12%	329	1%	15%	62	0.2%	14%
RP08	2,250 m	0.04	0.2%	12%	387	1%	15%	67	0.2%	14%
RP09	2,350 m	0.04	0.2%	12%	343	1%	15%	63	0.2%	14%
RP10	2,150 m	0.05	0.2%	12%	432	1%	15%	76	0.2%	14%
RP11	2,000 m	0.05	0.2%	12%	413	1%	15%	77	0.2%	14%
RP12	2,150 m	0.05	0.2%	12%	384	1%	15%	67	0.2%	14%
RP13	2,000 m	0.05	0.2%	12%	349	1%	15%	59	0.2%	14%
RP14	2,500 m	0.04	0.2%	12%	359	1%	15%	61	0.2%	14%
RP15	2,500 m	0.04	0.2%	12%	339	1%	15%	66	0.2%	14%
RP16	2,500 m	0.04	0.2%	12%	353	1%	15%	61	0.2%	14%
RP17	2,600 m	0.04	0.2%	12%	357	1%	15%	62	0.2%	14%
RP18	2,600 m	0.04	0.2%	12%	347	1%	15%	67	0.2%	14%
RP19	2,600 m	0.04	0.2%	12%	339	1%	15%	57	0.2%	14%
RP20	2,700 m	0.04	0.2%	12%	321	1%	15%	58	0.2%	14%
RP21	2,700 m	0.04	0.2%	12%	342	1%	15%	66	0.2%	14%
RP22	2,700 m	0.04	0.2%	12%	342	1%	15%	59	0.2%	14%
RP23	2,900 m	0.04	0.2%	12%	353	1%	15%	62	0.2%	14%
RP24	2,900 m	0.04	0.2%	12%	317	1%	15%	65	0.2%	14%

Sector or receptor		CO (AAQC) - Tier 3			CO (AAQC) - Tier 4			1,3-butadiene (AAQC) - Tier 3		
		8 hour			8 hour			24-hour		
Limit value (µg/m ³)		15700			15700			10		
Baseline concentration (µg/m ³)		3253			3253			0.12		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	7 924	50%	71%	7 840	50%	71%	0.52	5.2%	6.4%
	50 m	2 665	17%	38%	775	5%	26%	0.51	5.1%	6.3%
	150 m	683	4%	25%	282	2%	23%	0.13	1.3%	2.5%
	300 m	357	2%	23%	148	1%	22%	0.07	0.7%	1.9%
	Quarry - 100 m	7 924	50%	71%	7 840	50%	71%	0.11	1.1%	2.3%
	Quarry - 200 m	2 952	19%	40%	2 887	18%	39%	0.10	1.0%	2.2%
Culturally sensitive areas										
CHL01	800 m	164	1.0%	22%	68	0.4%	21%	0.03	0.3%	1.5%
CHL02	350 m	267	1.7%	22%	110	0.7%	21%	0.04	0.4%	1.6%
CHL03	950 m	94	0.6%	21%	38	0.2%	21%	0.02	0.2%	1.4%
CHL04	700 m	120	0.8%	21%	50	0.3%	21%	0.02	0.2%	1.4%
CHL05	150 m	489	3.1%	24%	202	1.3%	22%	0.08	0.8%	2.0%
CHL06	400 m	220	1.4%	22%	92	0.6%	21%	0.04	0.4%	1.6%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	205	1.3%	22%	85	0.5%	21%	0.04	0.4%	1.6%
CHL09	550 m	174	1.1%	22%	72	0.5%	21%	0.03	0.3%	1.5%
CHL10	575 m	183	1.2%	22%	76	0.5%	21%	0.03	0.3%	1.5%
CHL11	550 m	185	1.2%	22%	77	0.5%	21%	0.04	0.4%	1.6%
CHL12	875 m (2)	134	0.9%	22%	50	0.3%	21%	0.02	0.2%	1.4%
CHL13	305 m	243	1.5%	22%	74	0.5%	21%	0.04	0.4%	1.6%
CHL14	200 m	268	1.7%	22%	111	0.7%	21%	0.04	0.4%	1.6%
CHL15	275 m	263	1.7%	22%	92	0.6%	21%	0.04	0.4%	1.6%
CHL16	550 m	149	0.9%	22%	62	0.4%	21%	0.03	0.3%	1.5%
CHL17	130 m (2)	377	2.4%	23%	118	0.7%	21%	0.06	0.6%	1.8%
CHL18	420 m (2)	170	1.1%	22%	65	0.4%	21%	0.03	0.3%	1.5%
CHL24 (gooseberries)	800 m (2)	125	0.8%	22%	78	0.5%	21%	0.02	0.2%	1.4%
CHL25 (fishing area)	60 m (2)	998	6.4%	27%	412	2.6%	23%	0.16	1.6%	2.8%
CHL28 (gooseberries)	240 m (2)	281	1.8%	23%	109	0.7%	21%	0.05	0.5%	1.7%
Institutional buildings										
I01 (Business center)	1,800 m	87	0.6%	21%	29	0.2%	21%	0.01	0.1%	1.3%
I02 (Nursing station)	2,000 m	86	0.5%	21%	30	0.2%	21%	0.01	0.1%	1.3%
I03 (School)	2,350 m	71	0.5%	21%	27	0.2%	21%	0.01	0.1%	1.3%
I04 (Future school)	2,300 m	71	0.5%	21%	26	0.2%	21%	0.01	0.1%	1.3%
I05 (Church)	2,700 m	72	0.5%	21%	27	0.2%	21%	0.01	0.1%	1.3%
I06 (Community bldg)	2,900 m	68	0.4%	21%	24	0.2%	21%	0.01	0.1%	1.3%
Existing residences										
RP01	1,350 m	108	0.7%	21%	31	0.2%	21%	0.01	0.1%	1.3%
RP02	1,450 m	99	0.6%	21%	30	0.2%	21%	0.01	0.1%	1.3%
RP03	1,450 m	103	0.7%	21%	31	0.2%	21%	0.01	0.1%	1.3%
RP04	1,650 m	96	0.6%	21%	30	0.2%	21%	0.01	0.1%	1.3%
RP05	1,750 m	95	0.6%	21%	30	0.2%	21%	0.01	0.1%	1.3%
RP06	2,150 m	70	0.4%	21%	27	0.2%	21%	0.01	0.1%	1.3%
RP07	2,250 m	70	0.4%	21%	26	0.2%	21%	0.01	0.1%	1.3%
RP08	2,250 m	71	0.5%	21%	26	0.2%	21%	0.01	0.1%	1.3%
RP09	2,350 m	71	0.5%	21%	25	0.2%	21%	0.01	0.1%	1.3%
RP10	2,150 m	74	0.5%	21%	29	0.2%	21%	0.01	0.1%	1.3%
RP11	2,000 m	89	0.6%	21%	29	0.2%	21%	0.01	0.1%	1.3%
RP12	2,150 m	83	0.5%	21%	29	0.2%	21%	0.01	0.1%	1.3%
RP13	2,000 m	82	0.5%	21%	29	0.2%	21%	0.01	0.1%	1.3%
RP14	2,500 m	72	0.5%	21%	26	0.2%	21%	0.01	0.1%	1.3%
RP15	2,500 m	71	0.5%	21%	26	0.2%	21%	0.01	0.1%	1.3%
RP16	2,500 m	70	0.4%	21%	25	0.2%	21%	0.01	0.1%	1.3%
RP17	2,600 m	67	0.4%	21%	26	0.2%	21%	0.01	0.1%	1.3%
RP18	2,600 m	72	0.5%	21%	27	0.2%	21%	0.01	0.1%	1.3%
RP19	2,600 m	69	0.4%	21%	25	0.2%	21%	0.01	0.1%	1.3%
RP20	2,700 m	66	0.4%	21%	25	0.2%	21%	0.01	0.1%	1.3%
RP21	2,700 m	71	0.5%	21%	26	0.2%	21%	0.01	0.1%	1.3%
RP22	2,700 m	62	0.4%	21%	25	0.2%	21%	0.01	0.1%	1.3%
RP23	2,900 m	61	0.4%	21%	25	0.2%	21%	0.01	0.1%	1.3%
RP24	2,900 m	69	0.4%	21%	26	0.2%	21%	0.01	0.1%	1.3%

Sector or receptor		1,3-butadiene (AAQC) - Tier 3			Acetaldehyde (AAQC) - Tier 3			Acetaldehyde (AAQC) - Tier 3			Acrolein (AAQC) - Tier 3		
		Annual			30-minutes			24-hour			1-hour		
Limit value (µg/m ³)		2.0			500			500			4.5		
Baseline concentration (µg/m ³)		0.010											
Project contribution	Distance from road center (note)	Project only			+ Base			Project only			+ Base		
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	0.0031	0.15%	0.65%	146	29%	32%	29	5.8%	8.2%	22	485%	486%
	50 m	0.00047	0.023%	0.52%	143	29%	31%	28	5.7%	8.1%	21	476%	477%
	150 m	0.00013	0.006%	0.51%	63	13%	15%	7	1.4%	3.8%	9	209%	209%
	300 m	0.00008	0.004%	0.50%	32	6%	9%	4	0.7%	3.1%	5	107%	107%
	Quarry - 100 m	0.00310	0.155%	0.65%	28	6%	8%	6	1.2%	3.6%	4	93%	94%
	Quarry - 200 m	0.00104	0.052%	0.55%	61	12%	15%	6	1.1%	3.5%	9	204%	204%
Culturally sensitive areas													
CHL01	800 m	0.00002	0.001%	0.50%	11	2%	5%	2	0.3%	2.7%	2	38%	39%
CHL02	350 m	0.00003	0.002%	0.50%	21	4%	7%	2	0.4%	2.8%	3	71%	72%
CHL03	950 m	0.00002	0.001%	0.50%	11	2%	5%	1	0.2%	2.6%	2	36%	37%
CHL04	700 m	0.00003	0.001%	0.50%	10	2%	5%	1	0.2%	2.6%	1	32%	33%
CHL05	150 m	0.00010	0.005%	0.51%	45	9%	12%	4	0.9%	3.3%	7	149%	150%
CHL06	400 m	0.00005	0.002%	0.50%	17	3%	6%	2	0.4%	2.8%	3	57%	57%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.00007	0.003%	0.50%	18	4%	6%	2	0.4%	2.8%	3	59%	60%
CHL09	550 m	0.00004	0.002%	0.50%	15	3%	6%	2	0.4%	2.8%	2	51%	52%
CHL10	575 m	0.00004	0.002%	0.50%	13	3%	5%	2	0.4%	2.8%	2	45%	46%
CHL11	550 m	0.00003	0.002%	0.50%	15	3%	6%	2	0.4%	2.8%	2	49%	49%
CHL12	875 m (2)	0.00003	0.001%	0.50%	11	2%	5%	1	0.2%	2.6%	2	37%	38%
CHL13	305 m	0.00006	0.003%	0.50%	19	4%	7%	2	0.4%	2.8%	3	62%	63%
CHL14	200 m	0.00008	0.004%	0.50%	23	5%	7%	2	0.5%	2.9%	4	78%	79%
CHL15	275 m	0.00007	0.003%	0.50%	23	5%	7%	2	0.5%	2.9%	3	76%	77%
CHL16	550 m	0.00004	0.002%	0.50%	13	3%	5%	2	0.4%	2.8%	2	43%	43%
CHL17	130 m (2)	0.00009	0.005%	0.50%	31	6%	9%	3	0.6%	3.0%	5	103%	104%
CHL18	420 m (2)	0.00004	0.002%	0.50%	13	3%	5%	2	0.4%	2.8%	2	42%	43%
CHL24 (gooseberries)	800 m (2)	0.00004	0.002%	0.50%	9	2%	5%	1	0.2%	2.6%	1	29%	30%
CHL25 (fishing area)	60 m (2)	0.00016	0.008%	0.51%	77	15%	18%	9	1.8%	4.2%	11	255%	256%
CHL28 (gooseberries)	240 m (2)	0.00006	0.003%	0.50%	25	5%	8%	3	0.6%	3.0%	4	83%	84%
Institutional buildings													
I01 (Business center)	1,800 m	0.00001	0.001%	0.50%	8	2%	4%	1	0.2%	2.6%	1	27%	28%
I02 (Nursing station)	2,000 m	0.00001	0.001%	0.50%	9	2%	5%	1	0.1%	2.5%	1	29%	30%
I03 (School)	2,350 m	0.00001	0.001%	0.50%	8	2%	4%	1	0.1%	2.5%	1	26%	27%
I04 (Future school)	2,300 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	24%	25%
I05 (Church)	2,700 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	22%	22%
I06 (Community bldg)	2,900 m	0.00001	0.000%	0.50%	6	1%	4%	1	0.1%	2.5%	1	21%	22%
Existing residences													
RP01	1,350 m	0.00001	0.001%	0.50%	9	2%	5%	1	0.2%	2.6%	1	30%	31%
RP02	1,450 m	0.00001	0.001%	0.50%	8	2%	4%	1	0.2%	2.6%	1	28%	29%
RP03	1,450 m	0.00001	0.001%	0.50%	9	2%	5%	1	0.2%	2.6%	1	28%	29%
RP04	1,650 m	0.00001	0.001%	0.50%	8	2%	4%	1	0.2%	2.6%	1	27%	28%
RP05	1,750 m	0.00001	0.001%	0.50%	8	2%	4%	1	0.2%	2.6%	1	27%	28%
RP06	2,150 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	21%	22%
RP07	2,250 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	21%	22%
RP08	2,250 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	24%	25%
RP09	2,350 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	22%	22%
RP10	2,150 m	0.00001	0.001%	0.50%	8	2%	4%	1	0.1%	2.5%	1	27%	28%
RP11	2,000 m	0.00001	0.001%	0.50%	8	2%	4%	1	0.1%	2.5%	1	26%	27%
RP12	2,150 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	24%	25%
RP13	2,000 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	22%	23%
RP14	2,500 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	23%	24%
RP15	2,500 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	21%	22%
RP16	2,500 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	22%	23%
RP17	2,600 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	23%	23%
RP18	2,600 m	0.00001	0.001%	0.50%	7	1%	4%	1	0.1%	2.5%	1	22%	23%
RP19	2,600 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	21%	22%
RP20	2,700 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	20%	21%
RP21	2,700 m	0.00001	0.001%	0.50%	6	1%	4%	1	0.1%	2.5%	1	22%	22%
RP22	2,700 m	0.00001	0.000%	0.50%	6	1%	4%	1	0.1%	2.5%	1	22%	22%
RP23	2,900 m	0.00001	0.000%	0.50%	7	1%	4%	1	0.1%	2.5%	1	22%	23%
RP24	2,900 m	0.00001	0.000%	0.50%	6	1%	4%	1	0.1%	2.5%	1	20%	21%

Sector or receptor		Acrolein (AAQC) - Tier 4			Acrolein (AAQC) - Tier 3			Acrolein (AAQC) - Tier 4			Benzene (AAQC) - Tier 3		
		1-hour			24-hour			24-hour			24-hour		
Limit value (µg/m ³)		4.5			0.40			0.40			2.3		
Baseline concentration (µg/m ³)		0.040			0.040			0.040			0.90		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	4.6	102%	103%	5.3	1314%	1324%	1.5	384%	394%	15	661%	700%
	50 m	4.4	99%	100%	5.1	1274%	1284%	1.5	384%	394%	15	641%	680%
	150 m	1.9	42%	43%	1.3	325%	335%	0.5	122%	132%	4	164%	203%
	300 m	1.0	23%	24%	0.6	159%	169%	0.3	68%	78%	2	80%	119%
	Quarry - 100 m	1.7	38%	39%	1.1	265%	275%	0.6	146%	156%	3	133%	173%
	Quarry - 200 m	2.0	45%	46%	1.0	258%	268%	0.5	118%	128%	3	130%	169%
Culturally sensitive areas													
CHL01	800 m	0.4	8%	9%	0.3	76%	86%	0.14	34%	44%	0.9	38%	77%
CHL02	350 m	0.8	19%	19%	0.4	90%	100%	0.16	41%	51%	1.0	45%	84%
CHL03	950 m	0.3	7%	8%	0.2	38%	48%	0.07	17%	27%	0.4	19%	58%
CHL04	700 m	0.3	7%	8%	0.2	54%	64%	0.10	25%	35%	0.6	27%	66%
CHL05	150 m	1.4	30%	31%	0.8	198%	208%	0.36	90%	100%	2.3	100%	139%
CHL06	400 m	0.6	13%	14%	0.4	99%	109%	0.18	45%	55%	1.1	50%	89%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.6	14%	14%	0.4	91%	101%	0.17	42%	52%	1.1	46%	85%
CHL09	550 m	0.5	11%	12%	0.3	85%	95%	0.16	39%	49%	1.0	43%	82%
CHL10	575 m	0.4	9%	10%	0.4	88%	98%	0.16	40%	50%	1.0	44%	83%
CHL11	550 m	0.5	11%	12%	0.4	94%	104%	0.17	43%	53%	1.1	47%	86%
CHL12	875 m (2)	0.4	9%	10%	0.2	54%	64%	0.08	21%	31%	0.6	27%	66%
CHL13	305 m	0.6	14%	14%	0.4	93%	103%	0.15	38%	48%	1.1	47%	86%
CHL14	200 m	0.8	18%	19%	0.4	110%	120%	0.20	50%	60%	1.3	55%	94%
CHL15	275 m	0.7	16%	16%	0.4	107%	117%	0.20	49%	59%	1.2	54%	93%
CHL16	550 m	0.4	9%	10%	0.3	83%	93%	0.15	38%	48%	1.0	42%	81%
CHL17	130 m (2)	0.9	21%	22%	0.6	144%	154%	0.24	59%	69%	1.7	72%	111%
CHL18	420 m (2)	0.4	10%	10%	0.3	85%	95%	0.16	39%	49%	1.0	43%	82%
CHL24 (gooseberries)	800 m (2)	0.3	7%	8%	0.2	49%	59%	0.09	22%	32%	0.6	25%	64%
CHL25 (fishing area)	60 m (2)	2.5	56%	57%	1.6	409%	419%	0.74	185%	195%	4.7	206%	245%
CHL28 (gooseberries)	240 m (2)	0.8	17%	18%	0.5	128%	138%	0.23	58%	68%	1.5	64%	103%
Institutional buildings													
I01 (Business center)	1,800 m	0.2	5%	6%	0.1	35%	45%	0.06	15%	25%	0.4	18%	57%
I02 (Nursing station)	2,000 m	0.3	6%	7%	0.1	33%	43%	0.06	15%	25%	0.4	17%	56%
I03 (School)	2,350 m	0.2	5%	6%	0.1	28%	38%	0.05	13%	23%	0.3	14%	53%
I04 (Future school)	2,300 m	0.2	5%	6%	0.1	29%	39%	0.05	13%	23%	0.3	14%	54%
I05 (Church)	2,700 m	0.2	5%	6%	0.1	25%	35%	0.05	11%	21%	0.3	13%	52%
I06 (Community bldg)	2,900 m	0.2	4%	5%	0.1	25%	35%	0.04	11%	21%	0.3	13%	52%
Existing residences													
RP01	1,350 m	0.3	6%	7%	0.1	37%	47%	0.06	16%	26%	0.4	19%	58%
RP02	1,450 m	0.3	6%	7%	0.1	37%	47%	0.06	16%	26%	0.4	19%	58%
RP03	1,450 m	0.3	6%	7%	0.1	37%	47%	0.06	16%	26%	0.4	19%	58%
RP04	1,650 m	0.2	5%	6%	0.1	37%	47%	0.06	15%	25%	0.4	19%	58%
RP05	1,750 m	0.2	5%	6%	0.1	36%	46%	0.06	15%	25%	0.4	18%	57%
RP06	2,150 m	0.2	5%	6%	0.1	30%	40%	0.06	14%	24%	0.3	15%	54%
RP07	2,250 m	0.2	5%	5%	0.1	30%	40%	0.05	13%	23%	0.3	15%	54%
RP08	2,250 m	0.2	5%	6%	0.1	30%	40%	0.05	13%	23%	0.3	15%	54%
RP09	2,350 m	0.2	5%	6%	0.1	28%	38%	0.05	13%	23%	0.3	14%	53%
RP10	2,150 m	0.2	6%	6%	0.1	32%	42%	0.06	14%	24%	0.4	16%	55%
RP11	2,000 m	0.3	6%	7%	0.1	33%	43%	0.06	15%	25%	0.4	16%	56%
RP12	2,150 m	0.2	5%	6%	0.1	30%	40%	0.05	14%	24%	0.3	15%	54%
RP13	2,000 m	0.2	4%	5%	0.1	32%	42%	0.06	14%	24%	0.4	16%	55%
RP14	2,500 m	0.2	4%	5%	0.1	26%	36%	0.05	11%	21%	0.3	13%	52%
RP15	2,500 m	0.2	5%	6%	0.1	26%	36%	0.05	12%	22%	0.3	13%	52%
RP16	2,500 m	0.2	4%	5%	0.1	26%	36%	0.05	12%	22%	0.3	13%	52%
RP17	2,600 m	0.2	5%	5%	0.1	25%	35%	0.05	11%	21%	0.3	13%	52%
RP18	2,600 m	0.2	5%	6%	0.1	26%	36%	0.05	12%	22%	0.3	13%	52%
RP19	2,600 m	0.2	4%	5%	0.1	25%	35%	0.04	11%	21%	0.3	13%	52%
RP20	2,700 m	0.2	4%	5%	0.1	24%	34%	0.04	11%	21%	0.3	12%	51%
RP21	2,700 m	0.2	5%	6%	0.1	25%	35%	0.05	11%	21%	0.3	13%	52%
RP22	2,700 m	0.2	4%	5%	0.1	25%	35%	0.05	11%	21%	0.3	12%	52%
RP23	2,900 m	0.2	5%	5%	0.1	25%	35%	0.05	11%	21%	0.3	13%	52%
RP24	2,900 m	0.2	5%	6%	0.1	25%	35%	0.05	12%	22%	0.3	13%	52%

Sector or receptor		Benzene (AAQC) - Tier 4			Benzene (AAQC) - Tier 3			Ethylbenzene (AAQC) - Tier 3			Ethylbenzene (AAQC) - Tier 3		
		24-hour			Annual			10-minutes			24-hour		
Limit value (µg/m ³)		2.3			0.45			1900			1000		
Baseline concentration (µg/m ³)		0.90			0.30			0.28			0.17		
Project contribution	Distance from road center (note)	Project only			+ Base			Project only			+ Base		
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	4.4	193%	232%	0.090	20%	87%	20	1%	1%	2.9	0%	0%
	50 m	4.4	193%	232%	0.014	3%	70%	19	1.0%	1.0%	2.8	0.28%	0.29%
	150 m	1.4	61%	100%	0.004	1%	67%	8	0.4%	0.5%	0.7	0.07%	0.09%
	300 m	0.8	34%	73%	0.002	0%	67%	4	0.2%	0.2%	0.4	0.04%	0.05%
	Quarry - 100 m	1.7	74%	113%	0.090	20%	87%	12	0.6%	0.7%	0.6	0.06%	0.07%
	Quarry - 200 m	1.4	59%	98%	0.030	7%	73%	8	0.4%	0.4%	0.6	0.06%	0.07%
Culturally sensitive areas													
CHL01	800 m	0.4	17%	56%	0.001	0.1%	67%	2	0.1%	0.1%	0.2	0.02%	0.03%
CHL02	350 m	0.5	20%	60%	0.001	0.2%	67%	3	0.1%	0.2%	0.2	0.02%	0.04%
CHL03	950 m	0.2	9%	48%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.03%
CHL04	700 m	0.3	12%	52%	0.001	0.2%	67%	1	0.1%	0.1%	0.1	0.01%	0.03%
CHL05	150 m	1.0	45%	84%	0.003	0.6%	67%	6	0.3%	0.3%	0.4	0.04%	0.06%
CHL06	400 m	0.5	23%	62%	0.001	0.3%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.5	21%	60%	0.002	0.4%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL09	550 m	0.4	19%	59%	0.001	0.3%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL10	575 m	0.5	20%	59%	0.001	0.2%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL11	550 m	0.5	21%	61%	0.001	0.2%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL12	875 m (2)	0.2	11%	50%	0.001	0.2%	67%	2	0.1%	0.1%	0.1	0.01%	0.03%
CHL13	305 m	0.4	19%	58%	0.002	0.4%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL14	200 m	0.6	25%	64%	0.002	0.5%	67%	3	0.2%	0.2%	0.2	0.02%	0.04%
CHL15	275 m	0.6	24%	64%	0.002	0.4%	67%	3	0.2%	0.2%	0.2	0.02%	0.04%
CHL16	550 m	0.4	19%	58%	0.001	0.2%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL17	130 m (2)	0.7	30%	69%	0.003	0.6%	67%	4	0.2%	0.2%	0.3	0.03%	0.05%
CHL18	420 m (2)	0.4	19%	59%	0.001	0.3%	67%	2	0.1%	0.1%	0.2	0.02%	0.04%
CHL24 (gooseberries)	800 m (2)	0.3	11%	50%	0.001	0.2%	67%	1	0.1%	0.1%	0.1	0.01%	0.03%
CHL25 (fishing area)	60 m (2)	2.1	93%	132%	0.005	1.1%	68%	10	0.5%	0.6%	0.9	0.09%	0.11%
CHL28 (gooseberries)	240 m (2)	0.7	29%	68%	0.002	0.4%	67%	3	0.2%	0.2%	0.3	0.03%	0.04%
Institutional buildings													
I01 (Business center)	1,800 m	0.2	8%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
I02 (Nursing station)	2,000 m	0.2	8%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
I03 (School)	2,350 m	0.1	6%	46%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
I04 (Future school)	2,300 m	0.2	7%	46%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
I05 (Church)	2,700 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
I06 (Community bldg)	2,900 m	0.1	5%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
Existing residences													
RP01	1,350 m	0.2	8%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.03%
RP02	1,450 m	0.2	8%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.03%
RP03	1,450 m	0.2	8%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.03%
RP04	1,650 m	0.2	8%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.03%
RP05	1,750 m	0.2	8%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
RP06	2,150 m	0.2	7%	46%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP07	2,250 m	0.2	7%	46%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP08	2,250 m	0.2	7%	46%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
RP09	2,350 m	0.1	6%	46%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP10	2,150 m	0.2	7%	46%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
RP11	2,000 m	0.2	7%	47%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
RP12	2,150 m	0.2	7%	46%	0.000	0.1%	67%	1	0.1%	0.1%	0.1	0.01%	0.02%
RP13	2,000 m	0.2	7%	46%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP14	2,500 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP15	2,500 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP16	2,500 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP17	2,600 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP18	2,600 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP19	2,600 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP20	2,700 m	0.1	5%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP21	2,700 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP22	2,700 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP23	2,900 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%
RP24	2,900 m	0.1	6%	45%	0.000	0.1%	67%	1	0.0%	0.1%	0.1	0.01%	0.02%

Sector or receptor		Formaldehyde (AAQC) - Tier 3			Formaldehyde (AAQC) - Tier 4			Hexane (AAQC) - Tier 3		
		24-hour			24-hour			24-hour		
Limit value (µg/m ³)		65			65			2500		
Baseline concentration (µg/m ³)		2.9			2.9			0.45		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	82	126%	131%	24	37%	41%	0.72	0%	0%
	50 m	80	122%	127%	24	37%	41%	0.70	0.028%	0.046%
	150 m	20	31%	36%	8	12%	16%	0.18	0.007%	0.025%
	300 m	10	15%	20%	4	7%	11%	0.09	0.004%	0.022%
	Quarry - 100 m	17	25%	30%	9	14%	19%	0.15	0.006%	0.024%
	Quarry - 200 m	16	25%	29%	7	11%	16%	0.14	0.006%	0.024%
Culturally sensitive areas										
CHL01	800 m	5	7%	12%	2	3%	8%	0.04	0.002%	0.020%
CHL02	350 m	6	9%	13%	3	4%	8%	0.05	0.002%	0.020%
CHL03	950 m	2	4%	8%	1	2%	6%	0.02	0.001%	0.019%
CHL04	700 m	3	5%	10%	2	2%	7%	0.03	0.001%	0.019%
CHL05	150 m	12	19%	23%	6	9%	13%	0.11	0.004%	0.022%
CHL06	400 m	6	10%	14%	3	4%	9%	0.05	0.002%	0.020%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	6	9%	13%	3	4%	8%	0.05	0.002%	0.020%
CHL09	550 m	5	8%	13%	2	4%	8%	0.05	0.002%	0.020%
CHL10	575 m	5	8%	13%	2	4%	8%	0.05	0.002%	0.020%
CHL11	550 m	6	9%	14%	3	4%	9%	0.05	0.002%	0.020%
CHL12	875 m (2)	3	5%	10%	1	2%	6%	0.03	0.001%	0.019%
CHL13	305 m	6	9%	13%	2	4%	8%	0.05	0.002%	0.020%
CHL14	200 m	7	11%	15%	3	5%	9%	0.06	0.002%	0.020%
CHL15	275 m	7	10%	15%	3	5%	9%	0.06	0.002%	0.020%
CHL16	550 m	5	8%	12%	2	4%	8%	0.05	0.002%	0.020%
CHL17	130 m (2)	9	14%	18%	4	6%	10%	0.08	0.003%	0.021%
CHL18	420 m (2)	5	8%	13%	2	4%	8%	0.05	0.002%	0.020%
CHL24 (gooseberries)	800 m (2)	3	5%	9%	1	2%	7%	0.03	0.001%	0.019%
CHL25 (fishing area)	60 m (2)	26	39%	44%	12	18%	22%	0.22	0.009%	0.027%
CHL28 (gooseberries)	240 m (2)	8	12%	17%	4	6%	10%	0.07	0.003%	0.021%
Institutional buildings										
I01 (Business center)	1,800 m	2	3%	8%	1	1%	6%	0.02	0.001%	0.019%
I02 (Nursing station)	2,000 m	2	3%	8%	1	1%	6%	0.02	0.001%	0.019%
I03 (School)	2,350 m	2	3%	7%	1	1%	6%	0.02	0.001%	0.019%
I04 (Future school)	2,300 m	2	3%	7%	1	1%	6%	0.02	0.001%	0.019%
I05 (Church)	2,700 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
I06 (Community bldg)	2,900 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
Existing residences										
RP01	1,350 m	2	4%	8%	1	2%	6%	0.02	0.001%	0.019%
RP02	1,450 m	2	4%	8%	1	1%	6%	0.02	0.001%	0.019%
RP03	1,450 m	2	4%	8%	1	2%	6%	0.02	0.001%	0.019%
RP04	1,650 m	2	4%	8%	1	1%	6%	0.02	0.001%	0.019%
RP05	1,750 m	2	3%	8%	1	1%	6%	0.02	0.001%	0.019%
RP06	2,150 m	2	3%	7%	1	1%	6%	0.02	0.001%	0.019%
RP07	2,250 m	2	3%	7%	1	1%	6%	0.02	0.001%	0.019%
RP08	2,250 m	2	3%	7%	1	1%	6%	0.02	0.001%	0.019%
RP09	2,350 m	2	3%	7%	1	1%	6%	0.02	0.001%	0.019%
RP10	2,150 m	2	3%	8%	1	1%	6%	0.02	0.001%	0.019%
RP11	2,000 m	2	3%	8%	1	1%	6%	0.02	0.001%	0.019%
RP12	2,150 m	2	3%	7%	1	1%	6%	0.02	0.001%	0.019%
RP13	2,000 m	2	3%	8%	1	1%	6%	0.02	0.001%	0.019%
RP14	2,500 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP15	2,500 m	2	3%	7%	1	1%	6%	0.01	0.001%	0.019%
RP16	2,500 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP17	2,600 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP18	2,600 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP19	2,600 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP20	2,700 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP21	2,700 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP22	2,700 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP23	2,900 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%
RP24	2,900 m	2	2%	7%	1	1%	6%	0.01	0.001%	0.019%

Sector or receptor		Propionaldehyde (AAQC) - Tier 3			Propionaldehyde (AAQC) - Tier 4			Toluene (AAQC) - Tier 3		
		10-minutes			10-minutes			24-hour		
Limit value (µg/m ³)		10			10			2000		
Baseline concentration (µg/m ³)		1.6			1.6			1.4		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	42	424%	440%	8.9	89%	105%	11	0.53%	0.60%
	50 m	42	416%	432%	8.6	86%	102%	10	0.51%	0.58%
	150 m	18	182%	198%	3.6	36%	52%	3	0.13%	0.20%
	300 m	9	93%	109%	2.0	20%	36%	1	0.06%	0.13%
	Quarry - 100 m	8	81%	97%	3.3	33%	49%	2	0.11%	0.18%
	Quarry - 200 m	18	178%	194%	3.9	39%	55%	2	0.10%	0.17%
Culturally sensitive areas										
CHL01	800 m	3	33%	49%	0.7	7%	23%	1	0.03%	0.10%
CHL02	350 m	6	62%	78%	1.6	16%	32%	1	0.04%	0.11%
CHL03	950 m	3	31%	47%	0.6	6%	22%	0	0.02%	0.09%
CHL04	700 m	3	28%	44%	0.6	6%	22%	0	0.02%	0.09%
CHL05	150 m	13	130%	146%	2.6	26%	42%	2	0.08%	0.15%
CHL06	400 m	5	49%	65%	1.1	11%	27%	1	0.04%	0.11%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	5	52%	68%	1.2	12%	28%	1	0.04%	0.11%
CHL09	550 m	4	44%	60%	0.9	9%	25%	1	0.03%	0.10%
CHL10	575 m	4	39%	55%	0.8	8%	24%	1	0.04%	0.11%
CHL11	550 m	4	42%	58%	1.0	10%	26%	1	0.04%	0.11%
CHL12	875 m (2)	3	33%	49%	0.8	8%	24%	0	0.02%	0.09%
CHL13	305 m	5	54%	70%	1.2	12%	28%	1	0.04%	0.11%
CHL14	200 m	7	68%	84%	1.5	15%	31%	1	0.04%	0.11%
CHL15	275 m	7	67%	83%	1.4	14%	30%	1	0.04%	0.11%
CHL16	550 m	4	37%	53%	0.7	7%	23%	1	0.03%	0.10%
CHL17	130 m (2)	9	90%	106%	1.8	18%	34%	1	0.06%	0.13%
CHL18	420 m (2)	4	37%	53%	0.8	8%	24%	1	0.03%	0.10%
CHL24 (gooseberries)	800 m (2)	3	25%	41%	0.6	6%	22%	0	0.02%	0.09%
CHL25 (fishing area)	60 m (2)	22	223%	239%	4.8	48%	64%	3	0.17%	0.24%
CHL28 (gooseberries)	240 m (2)	7	72%	88%	1.5	15%	31%	1	0.05%	0.12%
Institutional buildings										
I01 (Business center)	1,800 m	2	24%	40%	0.4	4%	20%	0	0.01%	0.08%
I02 (Nursing station)	2,000 m	3	25%	41%	0.5	5%	21%	0	0.01%	0.08%
I03 (School)	2,350 m	2	23%	39%	0.5	5%	21%	0	0.01%	0.08%
I04 (Future school)	2,300 m	2	21%	37%	0.4	4%	20%	0	0.01%	0.08%
I05 (Church)	2,700 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
I06 (Community bldg)	2,900 m	2	18%	34%	0.4	4%	20%	0	0.01%	0.08%
Existing residences										
RP01	1,350 m	3	26%	42%	0.5	5%	21%	0	0.02%	0.09%
RP02	1,450 m	2	24%	40%	0.5	5%	21%	0	0.02%	0.09%
RP03	1,450 m	2	25%	41%	0.5	5%	21%	0	0.02%	0.09%
RP04	1,650 m	2	24%	40%	0.5	5%	21%	0	0.01%	0.08%
RP05	1,750 m	2	24%	40%	0.4	4%	20%	0	0.01%	0.08%
RP06	2,150 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP07	2,250 m	2	18%	34%	0.4	4%	20%	0	0.01%	0.08%
RP08	2,250 m	2	21%	37%	0.4	4%	20%	0	0.01%	0.08%
RP09	2,350 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP10	2,150 m	2	24%	40%	0.5	5%	21%	0	0.01%	0.08%
RP11	2,000 m	2	23%	39%	0.5	5%	21%	0	0.01%	0.08%
RP12	2,150 m	2	21%	37%	0.4	4%	20%	0	0.01%	0.08%
RP13	2,000 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP14	2,500 m	2	20%	36%	0.4	4%	20%	0	0.01%	0.08%
RP15	2,500 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP16	2,500 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP17	2,600 m	2	20%	36%	0.4	4%	20%	0	0.01%	0.08%
RP18	2,600 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP19	2,600 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP20	2,700 m	2	18%	34%	0.4	4%	20%	0	0.01%	0.08%
RP21	2,700 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP22	2,700 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP23	2,900 m	2	19%	35%	0.4	4%	20%	0	0.01%	0.08%
RP24	2,900 m	2	17%	33%	0.4	4%	20%	0	0.01%	0.08%

Sector or receptor		Xylenes (AAQC) - Tier 3			Xylenes (AAQC) - Tier 3			Benzo(a)pyrene (AAQC) - Tier 3			Benzo(a)pyrene (AAQC) - Tier 4		
		10-minutes			24-hour			24-hour			24-hour		
Limit value (µg/m ³)		3000			730			5.0E-05			5.0E-05		
Baseline concentration (µg/m ³)		0.86			0.52			1.2E-04			1.2E-04		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	142	5%	5%	21	3%	3%	2.3E-03	4574%	4814%	6.3E-04	1260%	1500%
	50 m	139	4.6%	4.7%	20	2.7%	2.8%	2.2E-03	4434%	4674%	6.3E-04	1260%	1500%
	150 m	61	2.0%	2.1%	5	0.7%	0.8%	5.7E-04	1132%	1372%	2.0E-04	400%	640%
	300 m	31	1.0%	1.1%	3	0.3%	0.4%	2.8E-04	554%	794%	1.1E-04	224%	464%
	Quarry - 100 m	27	0.9%	0.9%	4	0.6%	0.6%	4.2E-04	832%	1072%	2.1E-04	424%	664%
	Quarry - 200 m	59	2.0%	2.0%	4	0.6%	0.6%	4.5E-04	898%	1138%	1.9E-04	384%	624%
Culturally sensitive areas													
CHL01	800 m	11	0.4%	0.4%	1	0.2%	0.2%	1.3E-04	262%	502%	5.6E-05	112%	352%
CHL02	350 m	21	0.7%	0.7%	1	0.2%	0.3%	1.6E-04	312%	552%	6.7E-05	134%	374%
CHL03	950 m	10	0.3%	0.4%	1	0.1%	0.2%	6.6E-05	132%	372%	2.8E-05	56%	296%
CHL04	700 m	9	0.3%	0.3%	1	0.1%	0.2%	9.4E-05	188%	428%	4.0E-05	80%	320%
CHL05	150 m	44	1.5%	1.5%	3	0.4%	0.5%	3.4E-04	688%	928%	1.5E-04	294%	534%
CHL06	400 m	17	0.6%	0.6%	2	0.2%	0.3%	1.7E-04	346%	586%	7.4E-05	148%	388%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	17	0.6%	0.6%	1	0.2%	0.3%	1.6E-04	318%	558%	6.8E-05	136%	376%
CHL09	550 m	15	0.5%	0.5%	1	0.2%	0.3%	1.5E-04	296%	536%	6.3E-05	126%	366%
CHL10	575 m	13	0.4%	0.5%	1	0.2%	0.3%	1.5E-04	306%	546%	6.5E-05	130%	370%
CHL11	550 m	14	0.5%	0.5%	1	0.2%	0.3%	1.6E-04	328%	568%	7.0E-05	140%	380%
CHL12	875 m (2)	11	0.4%	0.4%	1	0.1%	0.2%	9.4E-05	188%	428%	3.4E-05	68%	308%
CHL13	305 m	18	0.6%	0.6%	1	0.2%	0.3%	1.6E-04	322%	562%	6.2E-05	124%	364%
CHL14	200 m	23	0.8%	0.8%	2	0.2%	0.3%	1.9E-04	382%	622%	8.2E-05	164%	404%
CHL15	275 m	22	0.7%	0.8%	2	0.2%	0.3%	1.9E-04	372%	612%	8.0E-05	160%	400%
CHL16	550 m	12	0.4%	0.4%	1	0.2%	0.3%	1.4E-04	288%	528%	6.2E-05	124%	364%
CHL17	130 m (2)	30	1.0%	1.0%	2	0.3%	0.4%	2.5E-04	500%	740%	9.6E-05	192%	432%
CHL18	420 m (2)	12	0.4%	0.4%	1	0.2%	0.3%	1.5E-04	296%	536%	6.3E-05	126%	366%
CHL24 (gooseberries)	800 m (2)	8	0.3%	0.3%	1	0.1%	0.2%	8.5E-05	170%	410%	3.6E-05	72%	312%
CHL25 (fishing area)	60 m (2)	75	2.5%	2.5%	6	0.9%	1.0%	7.1E-04	1424%	1664%	3.0E-04	608%	848%
CHL28 (gooseberries)	240 m (2)	24	0.8%	0.8%	2	0.3%	0.3%	2.2E-04	446%	686%	9.5E-05	190%	430%
Institutional buildings													
I01 (Business center)	1,800 m	8	0.3%	0.3%	1	0.1%	0.1%	6.1E-05	122%	362%	2.5E-05	50%	290%
I02 (Nursing station)	2,000 m	8	0.3%	0.3%	1	0.1%	0.1%	5.8E-05	116%	356%	2.5E-05	50%	290%
I03 (School)	2,350 m	8	0.3%	0.3%	0	0.1%	0.1%	4.9E-05	98%	338%	2.1E-05	42%	282%
I04 (Future school)	2,300 m	7	0.2%	0.3%	0	0.1%	0.1%	5.0E-05	100%	340%	2.1E-05	42%	282%
I05 (Church)	2,700 m	6	0.2%	0.2%	0	0.1%	0.1%	4.4E-05	88%	328%	1.9E-05	38%	278%
I06 (Community bldg)	2,900 m	6	0.2%	0.2%	0	0.1%	0.1%	4.3E-05	86%	326%	1.8E-05	36%	276%
Existing residences													
RP01	1,350 m	9	0.3%	0.3%	1	0.1%	0.2%	6.5E-05	130%	370%	2.6E-05	52%	292%
RP02	1,450 m	8	0.3%	0.3%	1	0.1%	0.2%	6.5E-05	130%	370%	2.5E-05	50%	290%
RP03	1,450 m	8	0.3%	0.3%	1	0.1%	0.2%	6.5E-05	130%	370%	2.6E-05	52%	292%
RP04	1,650 m	8	0.3%	0.3%	1	0.1%	0.2%	6.4E-05	128%	368%	2.5E-05	50%	290%
RP05	1,750 m	8	0.3%	0.3%	1	0.1%	0.1%	6.2E-05	124%	364%	2.5E-05	50%	290%
RP06	2,150 m	6	0.2%	0.2%	0	0.1%	0.1%	5.3E-05	106%	346%	2.3E-05	46%	286%
RP07	2,250 m	6	0.2%	0.2%	0	0.1%	0.1%	5.1E-05	102%	342%	2.2E-05	44%	284%
RP08	2,250 m	7	0.2%	0.3%	0	0.1%	0.1%	5.1E-05	102%	342%	2.2E-05	44%	284%
RP09	2,350 m	6	0.2%	0.2%	0	0.1%	0.1%	4.9E-05	98%	338%	2.1E-05	42%	282%
RP10	2,150 m	8	0.3%	0.3%	1	0.1%	0.1%	5.5E-05	110%	350%	2.4E-05	48%	288%
RP11	2,000 m	8	0.3%	0.3%	1	0.1%	0.1%	5.7E-05	114%	354%	2.4E-05	48%	288%
RP12	2,150 m	7	0.2%	0.3%	0	0.1%	0.1%	5.2E-05	104%	344%	2.2E-05	44%	284%
RP13	2,000 m	6	0.2%	0.2%	1	0.1%	0.1%	5.5E-05	110%	350%	2.4E-05	48%	288%
RP14	2,500 m	7	0.2%	0.2%	0	0.1%	0.1%	4.5E-05	90%	330%	1.9E-05	38%	278%
RP15	2,500 m	6	0.2%	0.2%	0	0.1%	0.1%	4.6E-05	92%	332%	1.9E-05	38%	278%
RP16	2,500 m	7	0.2%	0.2%	0	0.1%	0.1%	4.5E-05	90%	330%	1.9E-05	38%	278%
RP17	2,600 m	7	0.2%	0.2%	0	0.1%	0.1%	4.4E-05	88%	328%	1.9E-05	38%	278%
RP18	2,600 m	6	0.2%	0.2%	0	0.1%	0.1%	4.5E-05	90%	330%	1.9E-05	38%	278%
RP19	2,600 m	6	0.2%	0.2%	0	0.1%	0.1%	4.3E-05	86%	326%	1.8E-05	36%	276%
RP20	2,700 m	6	0.2%	0.2%	0	0.1%	0.1%	4.2E-05	84%	324%	1.8E-05	36%	276%
RP21	2,700 m	6	0.2%	0.2%	0	0.1%	0.1%	4.4E-05	88%	328%	1.9E-05	38%	278%
RP22	2,700 m	6	0.2%	0.2%	0	0.1%	0.1%	4.3E-05	86%	326%	1.8E-05	36%	276%
RP23	2,900 m	7	0.2%	0.2%	0	0.1%	0.1%	4.4E-05	88%	328%	1.9E-05	38%	278%
RP24	2,900 m	6	0.2%	0.2%	0	0.1%	0.1%	4.4E-05	88%	328%	1.9E-05	38%	278%

Sector or receptor		Benzo(a)pyrene (AAQC) - Tier 3			Benzo(a)pyrene (AAQC) - Tier 4			DPM (HC) - Tier 3			DPM (HC) - Tier 4		
		Annual			Annual			2-hour			2-hour		
Limit value (µg/m ³)		1.0E-05			1.0E-05			10			10		
Baseline concentration (µg/m ³)		2.0E-05			2.0E-05			0			0		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	All	1.2E-05	117%	317%	5.6E-06	56%	256%	1 354	13544%	13544%	275	2748%	2748%
	50 m	1.3E-06	13%	213%	6.8E-07	7%	207%	1354	13544%	13544%	271	2707%	2707%
	150 m	4.0E-07	4%	204%	1.7E-07	2%	202%	463	4628%	4628%	116	1155%	1155%
	300 m	2.1E-07	2%	202%	7.3E-08	1%	201%	242	2420%	2420%	60	598%	598%
	Quarry - 100 m	1.2E-05	117%	317%	5.6E-06	56%	256%	229	2294%	2294%	90	903%	903%
	Quarry - 200 m	3.8E-06	38%	238%	1.8E-06	18%	218%	469	4690%	4690%	108	1076%	1076%
Culturally sensitive areas													
CHL01	800 m	5.0E-08	1%	201%	1.4E-08	0%	200%	101	1013%	1013%	19	195%	195%
CHL02	350 m	8.8E-08	1%	201%	2.5E-08	0%	200%	179	1788%	1788%	50	496%	496%
CHL03	950 m	4.5E-08	0%	200%	1.3E-08	0%	200%	64	643%	643%	19	192%	192%
CHL04	700 m	7.7E-08	1%	201%	2.2E-08	0%	200%	84	844%	844%	17	167%	167%
CHL05	150 m	2.6E-07	3%	203%	7.0E-08	1%	201%	295	2954%	2954%	83	827%	827%
CHL06	400 m	1.3E-07	1%	201%	4.2E-08	0%	200%	138	1382%	1382%	33	335%	335%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	1.8E-07	2%	202%	5.3E-08	1%	201%	124	1238%	1238%	34	343%	343%
CHL09	550 m	1.2E-07	1%	201%	3.3E-08	0%	200%	100	997%	997%	24	238%	238%
CHL10	575 m	9.6E-08	1%	201%	2.6E-08	0%	200%	121	1208%	1208%	23	233%	233%
CHL11	550 m	9.2E-08	1%	201%	2.5E-08	0%	200%	107	1070%	1070%	27	273%	273%
CHL12	875 m (2)	7.3E-08	1%	201%	2.2E-08	0%	200%	96	955%	955%	23	230%	230%
CHL13	305 m	1.7E-07	2%	202%	4.4E-08	0%	200%	165	1654%	1654%	33	329%	329%
CHL14	200 m	2.2E-07	2%	202%	5.9E-08	1%	201%	168	1679%	1679%	44	444%	444%
CHL15	275 m	1.7E-07	2%	202%	4.6E-08	0%	200%	174	1744%	1744%	37	373%	373%
CHL16	550 m	1.0E-07	1%	201%	2.8E-08	0%	200%	99	989%	989%	21	209%	209%
CHL17	130 m (2)	2.4E-07	2%	202%	6.3E-08	1%	201%	281	2810%	2810%	58	582%	582%
CHL18	420 m (2)	1.2E-07	1%	201%	3.2E-08	0%	200%	117	1174%	1174%	24	244%	244%
CHL24 (gooseberries)	800 m (2)	1.1E-07	1%	201%	3.9E-08	0%	200%	61	613%	613%	17	173%	173%
CHL25 (fishing area)	60 m (2)	4.4E-07	4%	204%	1.2E-07	1%	201%	544	5438%	5438%	147	1471%	1471%
CHL28 (gooseberries)	240 m (2)	1.5E-07	1%	201%	4.1E-08	0%	200%	173	1735%	1735%	45	449%	449%
Institutional buildings													
I01 (Business center)	1,800 m	3.3E-08	0%	200%	9.9E-09	0%	200%	50	502%	502%	12	117%	117%
I02 (Nursing station)	2,000 m	3.1E-08	0%	200%	9.2E-09	0%	200%	48	478%	478%	14	136%	136%
I03 (School)	2,350 m	2.9E-08	0%	200%	8.5E-09	0%	200%	52	520%	520%	12	121%	121%
I04 (Future school)	2,300 m	2.9E-08	0%	200%	8.6E-09	0%	200%	49	490%	490%	12	116%	116%
I05 (Church)	2,700 m	2.7E-08	0%	200%	8.0E-09	0%	200%	55	551%	551%	11	114%	114%
I06 (Community bldg)	2,900 m	2.6E-08	0%	200%	7.9E-09	0%	200%	46	457%	457%	10	102%	102%
Existing residences													
RP01	1,350 m	3.8E-08	0%	200%	1.1E-08	0%	200%	64	641%	641%	15	149%	149%
RP02	1,450 m	3.7E-08	0%	200%	1.1E-08	0%	200%	61	608%	608%	14	139%	139%
RP03	1,450 m	3.7E-08	0%	200%	1.1E-08	0%	200%	60	600%	600%	14	140%	140%
RP04	1,650 m	3.5E-08	0%	200%	1.0E-08	0%	200%	53	531%	531%	13	129%	129%
RP05	1,750 m	3.4E-08	0%	200%	1.0E-08	0%	200%	51	513%	513%	13	132%	132%
RP06	2,150 m	3.0E-08	0%	200%	8.8E-09	0%	200%	45	447%	447%	11	108%	108%
RP07	2,250 m	2.9E-08	0%	200%	8.6E-09	0%	200%	46	459%	459%	11	106%	106%
RP08	2,250 m	2.9E-08	0%	200%	8.7E-09	0%	200%	49	486%	486%	12	118%	118%
RP09	2,350 m	2.8E-08	0%	200%	8.5E-09	0%	200%	47	475%	475%	11	109%	109%
RP10	2,150 m	3.0E-08	0%	200%	9.0E-09	0%	200%	47	471%	471%	13	132%	132%
RP11	2,000 m	3.2E-08	0%	200%	9.4E-09	0%	200%	48	475%	475%	13	135%	135%
RP12	2,150 m	3.1E-08	0%	200%	9.1E-09	0%	200%	50	499%	499%	13	125%	125%
RP13	2,000 m	3.2E-08	0%	200%	9.5E-09	0%	200%	49	486%	486%	11	112%	112%
RP14	2,500 m	2.9E-08	0%	200%	8.5E-09	0%	200%	51	510%	510%	11	112%	112%
RP15	2,500 m	2.8E-08	0%	200%	8.4E-09	0%	200%	53	529%	529%	12	116%	116%
RP16	2,500 m	2.8E-08	0%	200%	8.3E-09	0%	200%	50	504%	504%	11	106%	106%
RP17	2,600 m	2.7E-08	0%	200%	8.1E-09	0%	200%	52	516%	516%	10	104%	104%
RP18	2,600 m	2.7E-08	0%	200%	8.2E-09	0%	200%	55	550%	550%	12	118%	118%
RP19	2,600 m	2.8E-08	0%	200%	8.3E-09	0%	200%	50	495%	495%	10	104%	104%
RP20	2,700 m	2.7E-08	0%	200%	8.2E-09	0%	200%	48	478%	478%	10	98%	98%
RP21	2,700 m	2.7E-08	0%	200%	8.0E-09	0%	200%	54	542%	542%	11	115%	115%
RP22	2,700 m	2.6E-08	0%	200%	7.9E-09	0%	200%	50	501%	501%	10	99%	99%
RP23	2,900 m	2.6E-08	0%	200%	7.7E-09	0%	200%	51	511%	511%	10	101%	101%
RP24	2,900 m	2.6E-08	0%	200%	7.8E-09	0%	200%	54	537%	537%	11	108%	108%

Sector or receptor		DPM (HC) - Tier 3			Dustfall (AAQC) - no dust control			Dustfall (AAQC) - with dust control		
		Annual			30-days			30-days		
Limit value (µg/m ³)		5.0			7.0			7.0		
Baseline concentration (µg/m ³)		0			0.4			0.40		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	All	1.8	35%	35%	10	143%	148%	10	143%	148%
	50 m	0.20	3.9%	3.9%	10	143%	148%	10	143%	148%
	150 m	0.06	1.2%	1.2%	8.9	127%	132%	5	72%	78%
	300 m	0.03	0.6%	0.6%	4.6	66%	72%	3	36%	42%
	Quarry - 100 m	1.76	35.1%	35.1%	10	142%	147%	10	139%	144%
	Quarry - 200 m	0.58	11.5%	11.5%	8	115%	120%	8	108%	113%
Culturally sensitive areas										
CHL01	800 m	0.01	0.2%	0.2%	1.1	15%	21%	1	8%	14%
CHL02	350 m	0.01	0.3%	0.3%	2.2	31%	37%	1	16%	22%
CHL03	950 m	0.01	0.1%	0.1%	0.6	9%	14%	0	5%	10%
CHL04	700 m	0.01	0.2%	0.2%	1.2	17%	22%	1	9%	14%
CHL05	150 m	0.04	0.8%	0.8%	5.7	82%	87%	3	47%	52%
CHL06	400 m	0.02	0.4%	0.4%	2.6	37%	42%	1	19%	25%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.03	0.6%	0.6%	3.7	53%	58%	2	28%	34%
CHL09	550 m	0.02	0.4%	0.4%	2.0	29%	34%	1	15%	21%
CHL10	575 m	0.01	0.3%	0.3%	1.6	23%	29%	1	12%	18%
CHL11	550 m	0.01	0.3%	0.3%	1.6	23%	29%	1	12%	18%
CHL12	875 m (2)	0.01	0.2%	0.2%	0.9	13%	18%	1	8%	13%
CHL13	305 m	0.03	0.5%	0.5%	4.5	64%	70%	2	35%	40%
CHL14	200 m	0.03	0.7%	0.7%	5.1	73%	78%	3	39%	45%
CHL15	275 m	0.03	0.5%	0.5%	3.3	47%	53%	2	24%	30%
CHL16	550 m	0.02	0.3%	0.3%	1.6	23%	28%	1	12%	17%
CHL17	130 m (2)	0.04	0.7%	0.7%	8.8	126%	132%	4	63%	69%
CHL18	420 m (2)	0.02	0.4%	0.4%	1.9	28%	33%	1	14%	20%
CHL24 (gooseberries)	800 m (2)	0.02	0.3%	0.3%	1.1	15%	21%	1	8%	14%
CHL25 (fishing area)	60 m (2)	0.07	1.3%	1.3%	8.8	126%	132%	8	111%	117%
CHL28 (gooseberries)	240 m (2)	0.02	0.4%	0.4%	3.0	43%	49%	2	24%	29%
Institutional buildings										
I01 (Business center)	1,800 m	0.01	0.1%	0.1%	0.39	6%	11%	0	3%	9%
I02 (Nursing station)	2,000 m	0.00	0.1%	0.1%	0.37	5%	11%	0	3%	8%
I03 (School)	2,350 m	0.00	0.1%	0.1%	0.33	5%	10%	0	2%	8%
I04 (Future school)	2,300 m	0.00	0.1%	0.1%	0.33	5%	10%	0	2%	8%
I05 (Church)	2,700 m	0.00	0.1%	0.1%	0.31	4%	10%	0	2%	8%
I06 (Community bldg)	2,900 m	0.00	0.1%	0.1%	0.29	4%	10%	0	2%	8%
Existing residences										
RP01	1,350 m	0.01	0.1%	0.1%	0.45	6%	12%	0	3%	9%
RP02	1,450 m	0.01	0.1%	0.1%	0.43	6%	12%	0	3%	9%
RP03	1,450 m	0.01	0.1%	0.1%	0.44	6%	12%	0	3%	9%
RP04	1,650 m	0.01	0.1%	0.1%	0.41	6%	12%	0	3%	9%
RP05	1,750 m	0.01	0.1%	0.1%	0.40	6%	11%	0	3%	9%
RP06	2,150 m	0.00	0.1%	0.1%	0.34	5%	11%	0	3%	8%
RP07	2,250 m	0.00	0.1%	0.1%	0.34	5%	11%	0	2%	8%
RP08	2,250 m	0.00	0.1%	0.1%	0.34	5%	11%	0	3%	8%
RP09	2,350 m	0.00	0.1%	0.1%	0.33	5%	10%	0	2%	8%
RP10	2,150 m	0.00	0.1%	0.1%	0.35	5%	11%	0	3%	8%
RP11	2,000 m	0.00	0.1%	0.1%	0.37	5%	11%	0	3%	8%
RP12	2,150 m	0.00	0.1%	0.1%	0.35	5%	11%	0	3%	8%
RP13	2,000 m	0.00	0.1%	0.1%	0.37	5%	11%	0	3%	8%
RP14	2,500 m	0.00	0.1%	0.1%	0.32	5%	10%	0	2%	8%
RP15	2,500 m	0.00	0.1%	0.1%	0.32	5%	10%	0	2%	8%
RP16	2,500 m	0.00	0.1%	0.1%	0.32	5%	10%	0	2%	8%
RP17	2,600 m	0.00	0.1%	0.1%	0.31	4%	10%	0	2%	8%
RP18	2,600 m	0.00	0.1%	0.1%	0.31	4%	10%	0	2%	8%
RP19	2,600 m	0.00	0.1%	0.1%	0.31	4%	10%	0	2%	8%
RP20	2,700 m	0.00	0.1%	0.1%	0.30	4%	10%	0	2%	8%
RP21	2,700 m	0.00	0.1%	0.1%	0.31	4%	10%	0	2%	8%
RP22	2,700 m	0.00	0.1%	0.1%	0.30	4%	10%	0	2%	8%
RP23	2,900 m	0.00	0.1%	0.1%	0.29	4%	10%	0	2%	8%
RP24	2,900 m	0.00	0.1%	0.1%	0.30	4%	10%	0	2%	8%

Sector or receptor		Dustfall (AAQC) - no dust control			Dustfall (AAQC) - with dust control		
		Annual			Annual		
Limit value ($\mu\text{g}/\text{m}^3$)		4.6			4.6		
Baseline concentration ($\mu\text{g}/\text{m}^3$)		0.40			0.40		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base
		($\mu\text{g}/\text{m}^3$)	% limit	% limit	($\mu\text{g}/\text{m}^3$)	% limit	% limit
Max modeling domain	All	5.2	114%	123%	4.7	102%	110%
	50 m	5.2	114%	123%	3.8	82%	91%
	150 m	1.5	33%	42%	1.1	24%	33%
	300 m	0.9	19%	28%	0.6	14%	23%
	Quarry - 100 m	4.8	105%	114%	4.7	102%	110%
	Quarry - 200 m	2.3	50%	59%	2.0	43%	51%
Culturally sensitive areas							
CHL01	800 m	0.1	3%	11%	0.1	2%	11%
CHL02	350 m	0.3	6%	15%	0.2	4%	13%
CHL03	950 m	0.1	2%	10%	0.1	1%	10%
CHL04	700 m	0.2	4%	13%	0.1	3%	12%
CHL05	150 m	1.1	24%	33%	0.8	18%	27%
CHL06	400 m	0.3	7%	16%	0.2	5%	14%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.7	14%	23%	0.5	11%	19%
CHL09	550 m	0.4	8%	16%	0.3	6%	14%
CHL10	575 m	0.3	5%	14%	0.2	4%	13%
CHL11	550 m	0.2	5%	14%	0.2	4%	13%
CHL12	875 m (2)	0.2	4%	12%	0.1	3%	11%
CHL13	305 m	0.7	15%	24%	0.5	11%	20%
CHL14	200 m	1.0	21%	30%	0.7	15%	24%
CHL15	275 m	0.6	12%	21%	0.4	9%	18%
CHL16	550 m	0.2	5%	14%	0.2	4%	13%
CHL17	130 m (2)	1.4	31%	40%	1.0	23%	32%
CHL18	420 m (2)	0.3	7%	16%	0.2	5%	14%
CHL24 (gooseberries)	800 m (2)	0.1	3%	12%	0.1	2%	11%
CHL25 (fishing area)	60 m (2)	1.8	39%	47%	1.3	28%	37%
CHL28 (gooseberries)	240 m (2)	0.3	7%	16%	0.2	5%	14%
Institutional buildings							
I01 (Business center)	1,800 m	0.1	1%	10%	0.0	1%	10%
I02 (Nursing station)	2,000 m	0.1	1%	10%	0.0	1%	9%
I03 (School)	2,350 m	0.0	1%	10%	0.0	1%	9%
I04 (Future school)	2,300 m	0.0	1%	10%	0.0	1%	9%
I05 (Church)	2,700 m	0.0	1%	10%	0.0	1%	9%
I06 (Community bldg)	2,900 m	0.0	1%	10%	0.0	1%	9%
Existing residences							
RP01	1,350 m	0.1	1%	10%	0.0	1%	10%
RP02	1,450 m	0.1	1%	10%	0.0	1%	10%
RP03	1,450 m	0.1	1%	10%	0.0	1%	10%
RP04	1,650 m	0.1	1%	10%	0.0	1%	10%
RP05	1,750 m	0.1	1%	10%	0.0	1%	10%
RP06	2,150 m	0.0	1%	10%	0.0	1%	9%
RP07	2,250 m	0.0	1%	10%	0.0	1%	9%
RP08	2,250 m	0.0	1%	10%	0.0	1%	9%
RP09	2,350 m	0.0	1%	10%	0.0	1%	9%
RP10	2,150 m	0.0	1%	10%	0.0	1%	9%
RP11	2,000 m	0.1	1%	10%	0.0	1%	10%
RP12	2,150 m	0.0	1%	10%	0.0	1%	9%
RP13	2,000 m	0.1	1%	10%	0.0	1%	10%
RP14	2,500 m	0.0	1%	10%	0.0	1%	9%
RP15	2,500 m	0.0	1%	10%	0.0	1%	9%
RP16	2,500 m	0.0	1%	10%	0.0	1%	9%
RP17	2,600 m	0.0	1%	10%	0.0	1%	9%
RP18	2,600 m	0.0	1%	10%	0.0	1%	9%
RP19	2,600 m	0.0	1%	10%	0.0	1%	9%
RP20	2,700 m	0.0	1%	10%	0.0	1%	9%
RP21	2,700 m	0.0	1%	10%	0.0	1%	9%
RP22	2,700 m	0.0	1%	10%	0.0	1%	9%
RP23	2,900 m	0.0	1%	10%	0.0	1%	9%
RP24	2,900 m	0.0	1%	10%	0.0	1%	9%

Results summary at 50, 150, and 300 m from road center (max values) and each sensitive receptor - OPERATION PHASE

Sector or receptor				TSP (AAQC) - no control			TSP (AAQC) - with control			TSP (AAQC) - no control		
				24-hour			24-hour			Annual		
Limit value (µg/m ³)				120			120			60		
Baseline concentration (µg/m ³)				45			45			4		
Project contribution	Distance from road center (note)	UTM Coordinates (zone 16)		Project only			Project only			Project only		
		Northing	Easting	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	n/a	n/a	1 392	1160%	1197%	1 031	859%	897%	100	167%	173%
	150 m	n/a	n/a	605	504%	542%	463	386%	423%	33	56%	62%
	300 m	n/a	n/a	428	356%	394%	329	274%	312%	20	33%	40%
Culturally sensitive areas												
CHL01	800 m	474 132	5 867 532	119	99%	137%	93	77%	115%	3	5%	12%
CHL02	350 m	474 919	5 868 252	209	174%	212%	159	133%	170%	7	11%	18%
CHL03	950 m	475 287	5 869 192	62	52%	90%	50	42%	79%	3	4%	11%
CHL04	700 m	475 953	5 868 419	106	88%	126%	84	70%	107%	5	8%	15%
CHL05	150 m	475 993	5 866 659	298	249%	286%	231	192%	230%	24	40%	47%
CHL06	400 m	476 740	5 868 227	211	176%	213%	161	134%	172%	9	14%	21%
CHL07	< 50 m (1)	477 261	5 868 026	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	477 886	5 867 941	179	150%	187%	137	114%	151%	16	27%	34%
CHL09	550 m	478 253	5 867 412	151	126%	163%	118	99%	136%	9	15%	21%
CHL10	575 m	478 338	5 866 452	144	120%	158%	115	96%	133%	7	11%	18%
CHL11	550 m	478 398	5 866 187	164	136%	174%	130	108%	146%	6	11%	17%
CHL12	875 m (2)	478 018	5 869 218	101	84%	121%	77	64%	102%	5	8%	14%
CHL13	305 m	479 100	5 867 453	189	157%	195%	145	121%	159%	16	26%	33%
CHL14	200 m	479 574	5 865 726	247	206%	243%	192	160%	198%	22	37%	43%
CHL15	275 m	480 794	5 866 229	226	188%	226%	176	147%	184%	14	23%	30%
CHL16	550 m	480 939	5 868 381	146	122%	159%	116	97%	134%	7	11%	18%
CHL17	130 m (2)	481 775	5 868 842	314	262%	299%	236	197%	234%	33	54%	61%
CHL18	420 m (2)	483 545	5 865 991	152	127%	164%	119	99%	137%	9	15%	22%
CHL24 (gooseberries)	800 m (2)	488 262	5 859 049	94	78%	116%	73	61%	98%	5	8%	15%
CHL25 (fishing area)	60 m (2)	489 746	5 859 503	912	760%	798%	673	561%	599%	52	87%	93%
CHL28 (gooseberries)	240 m (2)	488 770	5 856 128	249	208%	245%	190	158%	196%	11	19%	25%
Institutional buildings												
I01 (Business center)	1,800 m	475 630	5 869 983	46	38%	75%	35	29%	67%	2	3%	10%
I02 (Nursing station)	2,000 m	475 677	5 870 213	44	37%	74%	34	29%	66%	2	3%	10%
I03 (School)	2,350 m	475 754	5 870 550	44	36%	74%	34	28%	66%	2	3%	9%
I04 (Future school)	2,300 m	475 706	5 870 482	42	35%	72%	33	27%	65%	2	3%	9%
I05 (Church)	2,700 m	475 935	5 870 887	42	35%	72%	33	27%	65%	2	3%	9%
I06 (Community bldg)	2,900 m	476 028	5 871 010	39	32%	70%	30	25%	63%	2	3%	9%
Existing residences												
RP01	1,350 m	475 487	5 869 576	53	44%	81%	43	35%	73%	2	4%	10%
RP02	1,450 m	475 491	5 869 668	50	42%	79%	40	34%	71%	2	3%	10%
RP03	1,450 m	475 537	5 869 663	50	42%	79%	40	34%	71%	2	3%	10%
RP04	1,650 m	475 629	5 869 833	48	40%	78%	37	31%	68%	2	3%	10%
RP05	1,750 m	475 669	5 869 931	46	39%	76%	36	30%	68%	2	3%	10%
RP06	2,150 m	475 580	5 870 349	41	34%	72%	32	27%	64%	2	3%	9%
RP07	2,250 m	475 597	5 870 429	40	34%	71%	32	26%	64%	2	3%	9%
RP08	2,250 m	475 694	5 870 436	41	34%	72%	32	27%	65%	2	3%	9%
RP09	2,350 m	475 648	5 870 532	41	34%	71%	32	27%	64%	2	3%	9%
RP10	2,150 m	475 663	5 870 316	43	36%	73%	33	28%	65%	2	3%	9%
RP11	2,000 m	475 725	5 870 183	44	36%	74%	34	28%	66%	2	3%	10%
RP12	2,150 m	475 812	5 870 331	43	36%	73%	34	28%	65%	2	3%	10%
RP13	2,000 m	475 806	5 870 181	43	36%	74%	34	28%	66%	2	3%	10%
RP14	2,500 m	475 926	5 870 615	44	37%	74%	34	29%	66%	2	3%	9%
RP15	2,500 m	475 858	5 870 641	44	37%	74%	34	29%	66%	2	3%	9%
RP16	2,500 m	475 759	5 870 675	43	36%	73%	33	28%	65%	2	3%	9%
RP17	2,600 m	475 808	5 870 781	43	36%	73%	33	28%	65%	1	2%	9%
RP18	2,600 m	475 897	5 870 759	43	36%	74%	34	28%	66%	2	3%	9%
RP19	2,600 m	475 976	5 870 740	43	35%	73%	33	28%	65%	2	3%	9%
RP20	2,700 m	476 010	5 870 826	41	34%	72%	32	27%	64%	2	3%	9%
RP21	2,700 m	475 926	5 870 853	42	35%	73%	33	27%	65%	2	3%	9%
RP22	2,700 m	475 837	5 870 900	41	34%	72%	32	27%	64%	1	2%	9%
RP23	2,900 m	475 868	5 871 026	40	33%	71%	31	26%	64%	1	2%	9%
RP24	2,900 m	475 944	5 870 999	41	34%	71%	32	27%	64%	1	2%	9%
Future residences												
RFP01 (site A)	1,300 m (3)	475 453	5 869 538	54	45%	82%	43	36%	74%	2	4%	10%
RFP10 (site West)	1,950 m (3)	474 800	5 870 130	48	40%	77%	38	31%	69%	2	3%	9%
RFP21 (Site C)	125 m (4)	476 553	5 867 230	493	411%	448%	373	311%	349%	24	40%	47%
RFP23 (Site C)	140 m (4)	476 521	5 867 353	438	365%	403%	336	280%	318%	19	32%	39%
RFP25 (Site C)	180 m (4)	476 495	5 867 473	376	313%	350%	285	237%	275%	17	28%	34%
RFP36 (Site C)	115 m (4)	476 564	5 867 560	523	436%	473%	391	325%	363%	23	39%	46%
RFP39 (Site C)	95 m (4)	476 668	5 867 748	721	601%	638%	537	448%	485%	31	51%	58%
RFP41 (Site C)	180 m (4)	476 672	5 867 893	403	336%	373%	304	253%	291%	17	28%	35%
RFP42 (Site D)	55 m (4)	476 115	5 866 431	925	771%	808%	675	562%	600%	70	117%	123%
RFP44 (Site D)	200 m (4)	476 039	5 866 272	300	250%	288%	228	190%	228%	16	27%	33%

NOTE 1: Identified sensitive receptor was not analysed since it is located inside the road right-of-way.

NOTE 2: Large sensitive areas with several receptors distributed along the perimeter. Distance corresponds to the closest point

NOTE 3: Closest future residence expected for these areas (Site West = west of Webequie; Site A = north of air strip).

NOTE 4: Closest future residences expected for these areas (Site C = area south of the WSR; Site D = area north-west of the WSR).

Sector or receptor		TSP (AAQC) - with control			PM10 (AAQC) - no control			PM10 (AAQC) - with control		
		Annual			24-hour			24-hour		
Limit value (µg/m ³)		60			50			50		
Baseline concentration (µg/m ³)		4			28			28		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	97	161%	168%	506	1013%	1069%	355	709%	765%
	150 m	26	44%	50%	238	477%	533%	167	334%	390%
	300 m	16	26%	33%	162	325%	381%	114	227%	283%
Culturally sensitive areas										
CHL01	800 m	2	4%	11%	75	150%	206%	53	105%	161%
CHL02	350 m	5	9%	15%	103	206%	262%	72	144%	200%
CHL03	950 m	2	3%	10%	46	92%	148%	32	64%	120%
CHL04	700 m	4	6%	13%	65	131%	187%	46	91%	147%
CHL05	150 m	19	32%	38%	163	326%	382%	114	228%	284%
CHL06	400 m	7	11%	18%	108	217%	273%	76	152%	208%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	13	21%	28%	112	225%	281%	79	157%	213%
CHL09	550 m	7	12%	18%	94	188%	244%	66	132%	188%
CHL10	575 m	5	9%	15%	91	183%	239%	64	128%	184%
CHL11	550 m	5	8%	15%	91	182%	238%	64	128%	184%
CHL12	875 m (2)	4	6%	13%	62	125%	181%	45	90%	146%
CHL13	305 m	12	21%	27%	101	202%	258%	71	141%	197%
CHL14	200 m	17	29%	35%	140	281%	337%	98	197%	253%
CHL15	275 m	11	18%	25%	120	240%	296%	84	168%	224%
CHL16	550 m	5	9%	15%	92	184%	240%	64	129%	185%
CHL17	130 m (2)	26	43%	49%	155	310%	366%	109	217%	273%
CHL18	420 m (2)	7	12%	19%	94	187%	243%	65	131%	187%
CHL24 (gooseberries)	800 m (2)	4	6%	13%	58	117%	173%	41	82%	138%
CHL25 (fishing area)	60 m (2)	40	67%	73%	322	644%	700%	225	451%	507%
CHL28 (gooseberries)	240 m (2)	9	14%	21%	131	263%	319%	92	184%	240%
Institutional buildings										
I01 (Business center)	1,800 m	1	2%	9%	34	69%	125%	24	48%	104%
I02 (Nursing station)	2,000 m	1	2%	9%	34	69%	125%	24	48%	104%
I03 (School)	2,350 m	1	2%	9%	30	60%	116%	21	42%	98%
I04 (Future school)	2,300 m	1	2%	9%	30	61%	117%	21	43%	99%
I05 (Church)	2,700 m	1	2%	9%	30	60%	116%	21	42%	98%
I06 (Community bldg)	2,900 m	1	2%	9%	28	56%	112%	20	39%	95%
Existing residences										
RP01	1,350 m	2	3%	9%	40	80%	136%	28	56%	112%
RP02	1,450 m	2	3%	9%	38	77%	133%	27	54%	110%
RP03	1,450 m	2	3%	9%	39	77%	133%	27	54%	110%
RP04	1,650 m	1	2%	9%	36	72%	128%	25	50%	106%
RP05	1,750 m	1	2%	9%	35	69%	125%	24	49%	105%
RP06	2,150 m	1	2%	9%	32	63%	119%	22	44%	100%
RP07	2,250 m	1	2%	9%	31	62%	118%	22	43%	99%
RP08	2,250 m	1	2%	9%	31	62%	118%	22	43%	99%
RP09	2,350 m	1	2%	9%	30	59%	115%	21	42%	98%
RP10	2,150 m	1	2%	9%	33	66%	122%	23	46%	102%
RP11	2,000 m	1	2%	9%	34	68%	124%	24	47%	103%
RP12	2,150 m	1	2%	9%	31	63%	119%	22	44%	100%
RP13	2,000 m	1	2%	9%	33	66%	122%	23	46%	102%
RP14	2,500 m	1	2%	9%	30	60%	116%	21	42%	98%
RP15	2,500 m	1	2%	9%	30	59%	115%	21	41%	97%
RP16	2,500 m	1	2%	9%	29	58%	114%	20	40%	96%
RP17	2,600 m	1	2%	9%	29	58%	114%	20	40%	96%
RP18	2,600 m	1	2%	9%	30	60%	116%	21	42%	98%
RP19	2,600 m	1	2%	9%	30	59%	115%	21	41%	97%
RP20	2,700 m	1	2%	9%	29	58%	114%	20	40%	96%
RP21	2,700 m	1	2%	9%	30	60%	116%	21	42%	98%
RP22	2,700 m	1	2%	9%	29	57%	113%	20	40%	96%
RP23	2,900 m	1	2%	9%	29	59%	115%	21	41%	97%
RP24	2,900 m	1	2%	9%	30	60%	116%	21	42%	98%
Future residences										
RFP01 (site A)	1,300 m (3)	2	3%	9%	41	82%	138%	29	57%	113%
RFP10 (site West)	1,950 m (3)	1	2%	9%	35	71%	127%	25	50%	106%
RFP21 (Site C)	125 m (4)	19	31%	38%	219	438%	494%	153	307%	363%
RFP23 (Site C)	140 m (4)	15	25%	32%	205	410%	466%	143	287%	343%
RFP25 (Site C)	180 m (4)	13	21%	28%	163	326%	382%	117	233%	289%
RFP36 (Site C)	115 m (4)	18	30%	37%	212	423%	479%	151	302%	358%
RFP39 (Site C)	95 m (4)	24	39%	46%	285	571%	627%	200	399%	455%
RFP41 (Site C)	180 m (4)	13	22%	28%	185	370%	426%	129	259%	315%
RFP42 (Site D)	55 m (4)	54	90%	97%	348	696%	752%	243	487%	543%
RFP44 (Site D)	200 m (4)	12	21%	27%	133	267%	323%	93	187%	243%

Sector or receptor		PM2.5 (CAAQS) - no control			PM2.5 (CAAQS) - with control			PM2.5 (AAQC) - no control		
		24-hour			24-hour			24-hour		
Limit value (µg/m ³)		23			23			27		
Baseline concentration (µg/m ³)		13			13			13		
Project contribution	Distance from road center (note)	Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	50 m	31	135%	191%	22	97%	153%	31	115%	163%
	150 m	13	56%	112%	9	41%	97%	13	47%	96%
	300 m	8	35%	91%	6	25%	82%	8	30%	78%
Culturally sensitive areas										
CHL01	800 m	4	16%	73%	3	13%	69%	4	14%	62%
CHL02	350 m	6	25%	82%	4	18%	75%	6	22%	70%
CHL03	950 m	3	11%	68%	2	8%	65%	3	9%	58%
CHL04	700 m	4	15%	72%	3	12%	68%	4	13%	61%
CHL05	150 m	10	42%	98%	7	30%	86%	10	35%	84%
CHL06	400 m	6	26%	83%	4	19%	76%	6	22%	71%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	6	27%	84%	5	20%	76%	6	23%	71%
CHL09	550 m	5	24%	80%	4	18%	75%	5	20%	68%
CHL10	575 m	5	22%	78%	4	16%	72%	5	19%	67%
CHL11	550 m	5	22%	79%	4	16%	73%	5	19%	67%
CHL12	875 m (2)	3	15%	71%	2	11%	67%	3	13%	61%
CHL13	305 m	6	24%	81%	4	18%	74%	6	21%	69%
CHL14	200 m	9	39%	95%	6	28%	84%	9	33%	81%
CHL15	275 m	7	31%	88%	5	22%	79%	7	27%	75%
CHL16	550 m	5	22%	79%	4	16%	73%	5	19%	67%
CHL17	130 m (2)	10	43%	99%	7	31%	88%	10	36%	85%
CHL18	420 m (2)	5	24%	80%	4	17%	73%	5	20%	68%
CHL24 (gooseberries)	800 m (2)	3	13%	70%	2	10%	66%	3	11%	60%
CHL25 (fishing area)	60 m (2)	19	83%	139%	14	59%	116%	19	70%	119%
CHL28 (gooseberries)	240 m (2)	7	30%	87%	5	22%	78%	7	26%	74%
Institutional buildings										
I01 (Business center)	1,800 m	2	8%	65%	1	6%	63%	2	7%	55%
I02 (Nursing station)	2,000 m	2	8%	65%	1	6%	63%	2	7%	55%
I03 (School)	2,350 m	2	8%	64%	1	6%	62%	2	7%	55%
I04 (Future school)	2,300 m	2	8%	64%	1	6%	62%	2	6%	55%
I05 (Church)	2,700 m	2	8%	64%	1	6%	62%	2	6%	55%
I06 (Community bldg)	2,900 m	2	7%	64%	1	5%	62%	2	6%	54%
Existing residences										
RP01	1,350 m	2	9%	66%	2	7%	63%	2	8%	56%
RP02	1,450 m	2	9%	65%	1	6%	63%	2	8%	56%
RP03	1,450 m	2	9%	66%	2	7%	63%	2	8%	56%
RP04	1,650 m	2	9%	66%	2	7%	63%	2	8%	56%
RP05	1,750 m	2	9%	66%	2	7%	63%	2	8%	56%
RP06	2,150 m	2	7%	64%	1	6%	62%	2	6%	55%
RP07	2,250 m	2	7%	64%	1	6%	62%	2	6%	54%
RP08	2,250 m	2	8%	64%	1	6%	62%	2	6%	55%
RP09	2,350 m	2	7%	64%	1	6%	62%	2	6%	54%
RP10	2,150 m	2	8%	64%	1	6%	63%	2	7%	55%
RP11	2,000 m	2	9%	65%	2	7%	63%	2	7%	55%
RP12	2,150 m	2	8%	65%	1	6%	63%	2	7%	55%
RP13	2,000 m	2	8%	65%	1	6%	63%	2	7%	55%
RP14	2,500 m	2	8%	64%	1	6%	62%	2	7%	55%
RP15	2,500 m	2	8%	64%	1	6%	62%	2	7%	55%
RP16	2,500 m	2	7%	64%	1	5%	62%	2	6%	54%
RP17	2,600 m	2	7%	64%	1	5%	62%	2	6%	54%
RP18	2,600 m	2	8%	64%	1	6%	62%	2	6%	55%
RP19	2,600 m	2	7%	64%	1	5%	62%	2	6%	54%
RP20	2,700 m	2	7%	64%	1	5%	62%	2	6%	54%
RP21	2,700 m	2	8%	64%	1	6%	62%	2	6%	55%
RP22	2,700 m	2	7%	64%	1	5%	62%	2	6%	54%
RP23	2,900 m	2	7%	64%	1	5%	62%	2	6%	54%
RP24	2,900 m	2	7%	64%	1	6%	62%	2	6%	54%
Future residences										
RFP01 (site A)	1,300 m (3)	2	9%	66%	2	7%	63%	2	8%	56%
RFP10 (site West)	1,950 m (3)	2	8%	64%	1	6%	62%	2	7%	55%
RFP21 (Site C)	125 m (4)	12	51%	108%	9	38%	94%	12	44%	92%
RFP23 (Site C)	140 m (4)	11	46%	103%	8	34%	91%	11	39%	88%
RFP25 (Site C)	180 m (4)	9	40%	96%	7	30%	86%	9	34%	82%
RFP36 (Site C)	115 m (4)	12	54%	111%	9	39%	95%	12	46%	94%
RFP39 (Site C)	95 m (4)	15	67%	124%	11	48%	105%	15	57%	105%
RFP41 (Site C)	180 m (4)	11	46%	103%	8	35%	92%	11	39%	87%
RFP42 (Site D)	55 m (4)	20	89%	146%	15	65%	121%	20	76%	124%
RFP44 (Site D)	200 m (4)	7	31%	87%	5	24%	80%	7	26%	74%

Sector or receptor		PM2.5 (AAQC) - with control			PM2.5 (CAAQS) - no control			PM2.5 (CAAQS) - with control		
		24-hour			Annual			Annual		
Limit value (µg/m ³)		27			8.0			8.0		
Baseline concentration (µg/m ³)		13			4.7			4.7		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	22	82%	131%	4.7	59%	118%	3.7	46%	105%
	150 m	9	35%	83%	1.5	19%	78%	1.2	15%	74%
	300 m	6	21%	70%	1.0	12%	71%	0.8	10%	68%
Culturally sensitive areas										
CHL01	800 m	3	11%	59%	0.2	2%	61%	0.2	2%	61%
CHL02	350 m	4	15%	64%	0.4	4%	63%	0.3	4%	62%
CHL03	950 m	2	7%	55%	0.2	2%	61%	0.1	2%	60%
CHL04	700 m	3	10%	58%	0.3	4%	62%	0.2	3%	62%
CHL05	150 m	7	25%	74%	1.2	15%	74%	0.9	12%	70%
CHL06	400 m	4	17%	65%	0.5	6%	65%	0.4	5%	63%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	5	17%	65%	0.8	10%	69%	0.6	8%	67%
CHL09	550 m	4	16%	64%	0.5	6%	65%	0.4	5%	64%
CHL10	575 m	4	14%	62%	0.4	5%	64%	0.3	4%	63%
CHL11	550 m	4	14%	62%	0.4	5%	63%	0.3	4%	62%
CHL12	875 m (2)	2	9%	57%	0.3	4%	62%	0.2	3%	62%
CHL13	305 m	4	15%	63%	0.8	10%	68%	0.6	8%	66%
CHL14	200 m	6	24%	72%	1.1	14%	72%	0.9	11%	69%
CHL15	275 m	5	19%	67%	0.7	9%	68%	0.6	7%	66%
CHL16	550 m	4	14%	62%	0.4	5%	64%	0.3	4%	63%
CHL17	130 m (2)	7	26%	75%	1.4	18%	77%	1.1	14%	73%
CHL18	420 m (2)	4	14%	63%	0.5	6%	65%	0.4	5%	64%
CHL24 (gooseberries)	800 m (2)	2	8%	56%	0.3	4%	62%	0.2	3%	62%
CHL25 (fishing area)	60 m (2)	14	50%	99%	2.1	27%	85%	1.6	21%	79%
CHL28 (gooseberries)	240 m (2)	5	19%	67%	0.6	8%	66%	0.5	6%	65%
Institutional buildings										
I01 (Business center)	1,800 m	1	5%	54%	0.1	2%	60%	0.1	1%	60%
I02 (Nursing station)	2,000 m	1	5%	54%	0.1	1%	60%	0.1	1%	60%
I03 (School)	2,350 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
I04 (Future school)	2,300 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
I05 (Church)	2,700 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
I06 (Community bldg)	2,900 m	1	4%	53%	0.1	1%	60%	0.1	1%	60%
Existing residences										
RP01	1,350 m	2	6%	54%	0.1	2%	61%	0.1	1%	60%
RP02	1,450 m	1	6%	54%	0.1	2%	60%	0.1	1%	60%
RP03	1,450 m	2	6%	54%	0.1	2%	60%	0.1	1%	60%
RP04	1,650 m	2	6%	54%	0.1	2%	60%	0.1	1%	60%
RP05	1,750 m	2	6%	54%	0.1	2%	60%	0.1	1%	60%
RP06	2,150 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP07	2,250 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP08	2,250 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP09	2,350 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP10	2,150 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP11	2,000 m	2	6%	54%	0.1	2%	60%	0.1	1%	60%
RP12	2,150 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP13	2,000 m	1	5%	54%	0.1	2%	60%	0.1	1%	60%
RP14	2,500 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP15	2,500 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP16	2,500 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP17	2,600 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP18	2,600 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP19	2,600 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP20	2,700 m	1	4%	53%	0.1	1%	60%	0.1	1%	60%
RP21	2,700 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP22	2,700 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP23	2,900 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RP24	2,900 m	1	5%	53%	0.1	1%	60%	0.1	1%	60%
Future residences										
RFP01 (site A)	1,300 m (3)	2	6%	54%	0.1	2%	61%	0.1	1%	60%
RFP10 (site West)	1,950 m (3)	1	5%	53%	0.1	1%	60%	0.1	1%	60%
RFP21 (Site C)	125 m (4)	9	32%	80%	1.2	15%	73%	0.9	11%	70%
RFP23 (Site C)	140 m (4)	8	29%	77%	1.0	12%	71%	0.8	10%	68%
RFP25 (Site C)	180 m (4)	7	25%	73%	0.8	10%	69%	0.6	8%	67%
RFP36 (Site C)	115 m (4)	9	33%	81%	1.1	14%	72%	0.8	11%	69%
RFP39 (Site C)	95 m (4)	11	41%	89%	1.4	18%	76%	1.1	14%	72%
RFP41 (Site C)	180 m (4)	8	30%	78%	0.9	11%	69%	0.7	8%	67%
RFP42 (Site D)	55 m (4)	15	55%	103%	2.7	34%	93%	2.1	26%	85%
RFP44 (Site D)	200 m (4)	5	20%	68%	0.8	10%	68%	0.6	7%	66%

Sector or receptor		PM2.5 (AAQC) - no control			PM2.5 (AAQC) - with control			SO2 (AAQC)		
		Annual			Annual			10 minutes		
Limit value (µg/m ³)		8.8			8.8			180		
Baseline concentration (µg/m ³)		4.7			4.7			149		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	4.7	54%	107%	3.7	42%	95%	0.31	0.17%	83%
	150 m	1.5	17%	71%	1.2	14%	67%	0.19	0.11%	83%
	300 m	1.0	11%	65%	0.8	9%	62%	0.13	0.07%	83%
Culturally sensitive areas										
CHL01	800 m	0.2	2%	56%	0.2	2%	55%	0.05	0.03%	83%
CHL02	350 m	0.4	4%	57%	0.3	3%	57%	0.06	0.03%	83%
CHL03	950 m	0.2	2%	55%	0.1	1%	55%	0.04	0.02%	83%
CHL04	700 m	0.3	3%	57%	0.2	3%	56%	0.04	0.02%	83%
CHL05	150 m	1.2	13%	67%	0.9	11%	64%	0.08	0.04%	83%
CHL06	400 m	0.5	5%	59%	0.4	4%	58%	0.08	0.04%	83%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.8	9%	63%	0.6	7%	61%	0.05	0.03%	83%
CHL09	550 m	0.5	6%	59%	0.4	4%	58%	0.05	0.03%	83%
CHL10	575 m	0.4	4%	58%	0.3	4%	57%	0.06	0.03%	83%
CHL11	550 m	0.4	4%	58%	0.3	3%	57%	0.06	0.04%	83%
CHL12	875 m (2)	0.3	3%	57%	0.2	3%	56%	0.06	0.03%	83%
CHL13	305 m	0.8	9%	62%	0.6	7%	60%	0.08	0.04%	83%
CHL14	200 m	1.1	12%	66%	0.9	10%	63%	0.06	0.03%	83%
CHL15	275 m	0.7	8%	62%	0.6	7%	60%	0.06	0.03%	83%
CHL16	550 m	0.4	5%	58%	0.3	4%	57%	0.05	0.03%	83%
CHL17	130 m (2)	1.4	16%	70%	1.1	13%	66%	0.12	0.07%	83%
CHL18	420 m (2)	0.5	6%	59%	0.4	5%	58%	0.06	0.03%	83%
CHL24 (gooseberries)	800 m (2)	0.3	3%	57%	0.2	3%	56%	0.04	0.02%	83%
CHL25 (fishing area)	60 m (2)	2.1	24%	78%	1.6	19%	72%	0.22	0.12%	83%
CHL28 (gooseberries)	240 m (2)	0.6	7%	60%	0.5	5%	59%	0.09	0.05%	83%
Institutional buildings										
I01 (Business center)	1,800 m	0.1	1%	55%	0.1	1%	55%	0.03	0.02%	83%
I02 (Nursing station)	2,000 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
I03 (School)	2,350 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
I04 (Future school)	2,300 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
I05 (Church)	2,700 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
I06 (Community bldg)	2,900 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
Existing residences										
RP01	1,350 m	0.1	2%	55%	0.1	1%	55%	0.04	0.02%	83%
RP02	1,450 m	0.1	2%	55%	0.1	1%	55%	0.03	0.02%	83%
RP03	1,450 m	0.1	2%	55%	0.1	1%	55%	0.03	0.02%	83%
RP04	1,650 m	0.1	1%	55%	0.1	1%	55%	0.03	0.02%	83%
RP05	1,750 m	0.1	1%	55%	0.1	1%	55%	0.03	0.02%	83%
RP06	2,150 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP07	2,250 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP08	2,250 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP09	2,350 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP10	2,150 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP11	2,000 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP12	2,150 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP13	2,000 m	0.1	1%	55%	0.1	1%	55%	0.03	0.02%	83%
RP14	2,500 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP15	2,500 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP16	2,500 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP17	2,600 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP18	2,600 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP19	2,600 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP20	2,700 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP21	2,700 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP22	2,700 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP23	2,900 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
RP24	2,900 m	0.1	1%	55%	0.1	1%	54%	0.03	0.02%	83%
Future residences										
RFP01 (site A)	1,300 m (3)	0.1	2%	55%	0.1	1%	55%	0.04	0.02%	83%
RFP10 (site West)	1,950 m (3)	0.1	1%	55%	0.1	1%	54%	0.03	0.01%	83%
RFP21 (Site C)	125 m (4)	1.2	13%	67%	0.9	10%	64%	0.13	0.07%	83%
RFP23 (Site C)	140 m (4)	1.0	11%	65%	0.8	9%	62%	0.12	0.07%	83%
RFP25 (Site C)	180 m (4)	0.8	9%	63%	0.6	7%	61%	0.14	0.08%	83%
RFP36 (Site C)	115 m (4)	1.1	12%	66%	0.8	10%	63%	0.16	0.09%	83%
RFP39 (Site C)	95 m (4)	1.4	16%	69%	1.1	12%	66%	0.18	0.10%	83%
RFP41 (Site C)	180 m (4)	0.9	10%	63%	0.7	8%	61%	0.15	0.08%	83%
RFP42 (Site D)	55 m (4)	2.7	31%	84%	2.1	24%	77%	0.21	0.12%	83%
RFP44 (Site D)	200 m (4)	0.8	9%	62%	0.6	7%	60%	0.10	0.06%	83%

Sector or receptor		SO2 (AAQC)			SO2 (CAAQS)			SO2 (AAQC & CAAQS)		
		1 hour			1 hour			Annual		
Limit value (µg/m ³)		100			173			10		
Baseline concentration (µg/m ³)		90			18			0.5		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	0.19	0.19%	90%	0.19	0.11%	11%	0.0020	0.020%	5%
	150 m	0.12	0.12%	90%	0.12	0.07%	10%	0.0007	0.007%	5%
	300 m	0.08	0.08%	90%	0.08	0.05%	10%	0.0004	0.004%	5%
Culturally sensitive areas										
CHL01	800 m	0.03	0.03%	90%	0.03	0.02%	10%	0.0001	0.001%	5%
CHL02	350 m	0.04	0.04%	90%	0.04	0.02%	10%	0.0002	0.002%	5%
CHL03	950 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
CHL04	700 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
CHL05	150 m	0.05	0.05%	90%	0.05	0.03%	10%	0.0005	0.005%	5%
CHL06	400 m	0.05	0.05%	90%	0.05	0.03%	10%	0.0002	0.002%	5%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.03	0.03%	90%	0.03	0.02%	10%	0.0004	0.004%	5%
CHL09	550 m	0.03	0.03%	90%	0.03	0.02%	10%	0.0002	0.002%	5%
CHL10	575 m	0.03	0.03%	90%	0.03	0.02%	10%	0.0002	0.002%	5%
CHL11	550 m	0.04	0.04%	90%	0.04	0.02%	10%	0.0002	0.002%	5%
CHL12	875 m (2)	0.03	0.03%	90%	0.03	0.02%	10%	0.0001	0.001%	5%
CHL13	305 m	0.05	0.05%	90%	0.05	0.03%	10%	0.0004	0.004%	5%
CHL14	200 m	0.04	0.04%	90%	0.04	0.02%	10%	0.0005	0.005%	5%
CHL15	275 m	0.03	0.03%	90%	0.03	0.02%	10%	0.0004	0.004%	5%
CHL16	550 m	0.03	0.03%	90%	0.03	0.02%	10%	0.0002	0.002%	5%
CHL17	130 m (2)	0.07	0.07%	90%	0.07	0.04%	10%	0.0007	0.007%	5%
CHL18	420 m (2)	0.04	0.04%	90%	0.04	0.02%	10%	0.0002	0.002%	5%
CHL24 (gooseberries)	800 m (2)	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
CHL25 (fishing area)	60 m (2)	0.13	0.13%	90%	0.13	0.08%	10%	0.0009	0.009%	5%
CHL28 (gooseberries)	240 m (2)	0.06	0.06%	90%	0.06	0.03%	10%	0.0003	0.003%	5%
Institutional buildings										
I01 (Business center)	1,800 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
I02 (Nursing station)	2,000 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
I03 (School)	2,350 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
I04 (Future school)	2,300 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
I05 (Church)	2,700 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
I06 (Community bldg)	2,900 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
Existing residences										
RP01	1,350 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP02	1,450 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP03	1,450 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP04	1,650 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP05	1,750 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP06	2,150 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP07	2,250 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP08	2,250 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP09	2,350 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RP10	2,150 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP11	2,000 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP12	2,150 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP13	2,000 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP14	2,500 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP15	2,500 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP16	2,500 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RP17	2,600 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RP18	2,600 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RP19	2,600 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP20	2,700 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RP21	2,700 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RP22	2,700 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RP23	2,900 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RP24	2,900 m	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
Future residences										
RFP01 (site A)	1,300 m (3)	0.02	0.02%	90%	0.02	0.01%	10%	0.0001	0.001%	5%
RFP10 (site West)	1,950 m (3)	0.02	0.02%	90%	0.02	0.01%	10%	0.0000	0.000%	5%
RFP21 (Site C)	125 m (4)	0.08	0.08%	90%	0.08	0.05%	10%	0.0005	0.005%	5%
RFP23 (Site C)	140 m (4)	0.07	0.07%	90%	0.07	0.04%	10%	0.0004	0.004%	5%
RFP25 (Site C)	180 m (4)	0.08	0.08%	90%	0.08	0.05%	10%	0.0004	0.004%	5%
RFP36 (Site C)	115 m (4)	0.10	0.10%	90%	0.10	0.06%	10%	0.0005	0.005%	5%
RFP39 (Site C)	95 m (4)	0.11	0.11%	90%	0.11	0.06%	10%	0.0006	0.006%	5%
RFP41 (Site C)	180 m (4)	0.09	0.09%	90%	0.09	0.05%	10%	0.0004	0.004%	5%
RFP42 (Site D)	55 m (4)	0.13	0.13%	90%	0.13	0.07%	10%	0.0011	0.011%	5%
RFP44 (Site D)	200 m (4)	0.06	0.06%	90%	0.06	0.04%	10%	0.0003	0.003%	5%

Sector or receptor		NO2 (AAQC)			NO2 (CAAQS)			NO2 (AAQC)		
		1 hour			1 hour			24 hours		
Limit value (µg/m ³)		400			79			200		
Baseline concentration (µg/m ³)		51			28			23		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	18	4%	17%	18	23%	59%	2.9	1.5%	13%
	150 m	11	3%	15%	11	13%	49%	1.5	0.8%	12%
	300 m	8	2%	15%	7	9%	45%	1.1	0.6%	12%
Culturally sensitive areas										
CHL01	800 m	3	1%	13%	3	4%	39%	0.4	0.2%	12%
CHL02	350 m	3	1%	14%	4	5%	40%	0.5	0.3%	12%
CHL03	950 m	2	1%	13%	2	3%	38%	0.2	0.1%	12%
CHL04	700 m	2	1%	13%	2	3%	39%	0.4	0.2%	12%
CHL05	150 m	4	1%	14%	5	6%	42%	0.8	0.4%	12%
CHL06	400 m	4	1%	14%	4	5%	41%	0.6	0.3%	12%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	3	1%	13%	3	4%	40%	0.5	0.3%	12%
CHL09	550 m	3	1%	13%	3	4%	39%	0.5	0.2%	12%
CHL10	575 m	3	1%	14%	3	4%	40%	0.5	0.3%	12%
CHL11	550 m	4	1%	14%	4	5%	40%	0.6	0.3%	12%
CHL12	875 m (2)	3	1%	14%	3	4%	39%	0.4	0.2%	12%
CHL13	305 m	4	1%	14%	4	5%	40%	0.6	0.3%	12%
CHL14	200 m	3	1%	14%	4	5%	40%	0.7	0.3%	12%
CHL15	275 m	3	1%	14%	3	4%	40%	0.6	0.3%	12%
CHL16	550 m	3	1%	14%	3	4%	39%	0.5	0.2%	12%
CHL17	130 m (2)	7	2%	14%	6	8%	44%	0.9	0.4%	12%
CHL18	420 m (2)	3	1%	14%	3	4%	40%	0.5	0.2%	12%
CHL24 (gooseberries)	800 m (2)	2	1%	13%	2	3%	38%	0.3	0.1%	12%
CHL25 (fishing area)	60 m (2)	12	3%	16%	11	14%	50%	1.6	0.8%	12%
CHL28 (gooseberries)	240 m (2)	5	1%	14%	6	7%	43%	0.6	0.3%	12%
Institutional buildings										
I01 (Business center)	1,800 m	2	0%	13%	2	2%	38%	0.2	0.1%	12%
I02 (Nursing station)	2,000 m	2	0%	13%	2	2%	38%	0.2	0.1%	12%
I03 (School)	2,350 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
I04 (Future school)	2,300 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
I05 (Church)	2,700 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
I06 (Community bldg)	2,900 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
Existing residences										
RP01	1,350 m	2	1%	13%	2	2%	38%	0.2	0.1%	12%
RP02	1,450 m	2	0%	13%	2	2%	38%	0.2	0.1%	12%
RP03	1,450 m	2	0%	13%	2	2%	38%	0.2	0.1%	12%
RP04	1,650 m	2	0%	13%	2	2%	38%	0.2	0.1%	12%
RP05	1,750 m	2	1%	13%	2	2%	38%	0.2	0.1%	12%
RP06	2,150 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP07	2,250 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP08	2,250 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP09	2,350 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP10	2,150 m	2	0%	13%	2	2%	37%	0.2	0.1%	12%
RP11	2,000 m	2	0%	13%	2	2%	38%	0.2	0.1%	12%
RP12	2,150 m	2	0%	13%	2	2%	37%	0.2	0.1%	12%
RP13	2,000 m	2	0%	13%	2	2%	37%	0.2	0.1%	12%
RP14	2,500 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP15	2,500 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP16	2,500 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP17	2,600 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP18	2,600 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP19	2,600 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP20	2,700 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP21	2,700 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP22	2,700 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP23	2,900 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
RP24	2,900 m	2	0%	13%	1	2%	37%	0.2	0.1%	12%
Future residences										
RFP01 (site A)	1,300 m (3)	2	1%	13%	2	2%	38%	0.2	0.1%	12%
RFP10 (site West)	1,950 m (3)	2	0%	13%	2	2%	37%	0.2	0.1%	12%
RFP21 (Site C)	125 m (4)	7	2%	15%	7	9%	44%	1.1	0.6%	12%
RFP23 (Site C)	140 m (4)	7	2%	15%	6	8%	43%	1.1	0.6%	12%
RFP25 (Site C)	180 m (4)	8	2%	15%	6	7%	43%	1.1	0.6%	12%
RFP36 (Site C)	115 m (4)	9	2%	15%	7	9%	45%	1.4	0.7%	12%
RFP39 (Site C)	95 m (4)	12	3%	16%	11	14%	49%	1.5	0.7%	12%
RFP41 (Site C)	180 m (4)	9	2%	15%	8	10%	45%	1.0	0.5%	12%
RFP42 (Site D)	55 m (4)	12	3%	16%	11	15%	50%	1.5	0.8%	12%
RFP44 (Site D)	200 m (4)	6	1%	14%	6	7%	43%	0.7	0.3%	12%

Sector or receptor		NO2 (CAAQS)			CO (AAQC)			CO (AAQC)		
		Annual			1 hour			8 hour		
Limit value (µg/m ³)		22			36200			15700		
Baseline concentration (µg/m ³)		2.6			5061			3253		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	0.32	1.4%	13%	55	0.15%	14%	13	0.082%	21%
	150 m	0.11	0.5%	12%	34	0.09%	14%	7	0.043%	21%
	300 m	0.07	0.3%	12%	24	0.07%	14%	5	0.031%	21%
Culturally sensitive areas										
CHL01	800 m	0.01	0.1%	12%	9	0.02%	14%	2	0.014%	21%
CHL02	350 m	0.03	0.1%	12%	10	0.03%	14%	3	0.016%	21%
CHL03	950 m	0.01	0.1%	12%	7	0.02%	14%	1	0.009%	21%
CHL04	700 m	0.02	0.1%	12%	7	0.02%	14%	2	0.010%	21%
CHL05	150 m	0.08	0.4%	12%	14	0.04%	14%	3	0.022%	21%
CHL06	400 m	0.03	0.2%	12%	14	0.04%	14%	3	0.018%	21%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.06	0.3%	12%	9	0.03%	14%	2	0.014%	21%
CHL09	550 m	0.04	0.2%	12%	8	0.02%	14%	2	0.014%	21%
CHL10	575 m	0.03	0.1%	12%	10	0.03%	14%	2	0.016%	21%
CHL11	550 m	0.03	0.1%	12%	11	0.03%	14%	3	0.017%	21%
CHL12	875 m (2)	0.02	0.1%	12%	10	0.03%	14%	2	0.016%	21%
CHL13	305 m	0.06	0.3%	12%	14	0.04%	14%	3	0.016%	21%
CHL14	200 m	0.08	0.4%	12%	11	0.03%	14%	3	0.020%	21%
CHL15	275 m	0.06	0.3%	12%	10	0.03%	14%	2	0.016%	21%
CHL16	550 m	0.03	0.1%	12%	10	0.03%	14%	2	0.013%	21%
CHL17	130 m (2)	0.11	0.5%	12%	21	0.06%	14%	4	0.027%	21%
CHL18	420 m (2)	0.04	0.2%	12%	10	0.03%	14%	2	0.015%	21%
CHL24 (gooseberries)	800 m (2)	0.02	0.1%	12%	7	0.02%	14%	2	0.012%	21%
CHL25 (fishing area)	60 m (2)	0.14	0.6%	12%	39	0.11%	14%	8	0.051%	21%
CHL28 (gooseberries)	240 m (2)	0.04	0.2%	12%	16	0.05%	14%	4	0.024%	21%
Institutional buildings										
I01 (Business center)	1,800 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
I02 (Nursing station)	2,000 m	0.01	0.0%	12%	6	0.02%	14%	1	0.008%	21%
I03 (School)	2,350 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
I04 (Future school)	2,300 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
I05 (Church)	2,700 m	0.01	0.0%	12%	6	0.02%	14%	1	0.008%	21%
I06 (Community bldg)	2,900 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
Existing residences										
RP01	1,350 m	0.01	0.0%	12%	6	0.02%	14%	1	0.007%	21%
RP02	1,450 m	0.01	0.0%	12%	6	0.02%	14%	1	0.007%	21%
RP03	1,450 m	0.01	0.0%	12%	6	0.02%	14%	1	0.007%	21%
RP04	1,650 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP05	1,750 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP06	2,150 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
RP07	2,250 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
RP08	2,250 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
RP09	2,350 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
RP10	2,150 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
RP11	2,000 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP12	2,150 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP13	2,000 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP14	2,500 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP15	2,500 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP16	2,500 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
RP17	2,600 m	0.01	0.0%	12%	5	0.01%	14%	1	0.007%	21%
RP18	2,600 m	0.01	0.0%	12%	5	0.01%	14%	1	0.008%	21%
RP19	2,600 m	0.01	0.0%	12%	6	0.02%	14%	1	0.008%	21%
RP20	2,700 m	0.01	0.0%	12%	6	0.02%	14%	1	0.007%	21%
RP21	2,700 m	0.01	0.0%	12%	6	0.02%	14%	1	0.008%	21%
RP22	2,700 m	0.01	0.0%	12%	6	0.02%	14%	1	0.007%	21%
RP23	2,900 m	0.01	0.0%	12%	6	0.02%	14%	1	0.007%	21%
RP24	2,900 m	0.01	0.0%	12%	5	0.02%	14%	1	0.008%	21%
Future residences										
RFP01 (site A)	1,300 m (3)	0.01	0.0%	12%	6	0.02%	14%	1	0.008%	21%
RFP10 (site West)	1,950 m (3)	0.01	0.0%	12%	4	0.01%	14%	1	0.006%	21%
RFP21 (Site C)	125 m (4)	0.08	0.4%	12%	23	0.06%	14%	5	0.031%	21%
RFP23 (Site C)	140 m (4)	0.07	0.3%	12%	21	0.06%	14%	5	0.032%	21%
RFP25 (Site C)	180 m (4)	0.06	0.3%	12%	24	0.07%	14%	6	0.035%	21%
RFP36 (Site C)	115 m (4)	0.07	0.3%	12%	29	0.08%	14%	7	0.043%	21%
RFP39 (Site C)	95 m (4)	0.09	0.4%	12%	31	0.09%	14%	6	0.039%	21%
RFP41 (Site C)	180 m (4)	0.06	0.3%	12%	26	0.07%	14%	5	0.031%	21%
RFP42 (Site D)	55 m (4)	0.18	0.8%	13%	37	0.10%	14%	10	0.062%	21%
RFP44 (Site D)	200 m (4)	0.06	0.3%	12%	18	0.05%	14%	4	0.025%	21%

Sector or receptor		1,3-butadiene (AAQC)			1,3-butadiene (AAQC)			Acetaldehyde (AAQC)			Acetaldehyde (AAQC)		
		24-hour			Annual			30-minutes			24-hour		
Limit value (µg/m ³)		10			2.0			500			500		
Baseline concentration (µg/m ³)		0.12			0.010			14			12		
Project contribution	Distance from road center (note)	Project only			Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	50 m	0.00087	0.0087%	1.2%	0.000056	0.0028%	0.50%	0.55	0.11%	2.9%	0.076	0.015%	2%
	150 m	0.00045	0.0045%	1.2%	0.000020	0.0010%	0.50%	0.34	0.07%	2.9%	0.039	0.008%	2%
	300 m	0.00033	0.0033%	1.2%	0.000013	0.0006%	0.50%	0.24	0.05%	2.8%	0.028	0.006%	2%
Culturally sensitive areas													
CHL01	800 m	0.00012	0.0012%	1.2%	0.000003	0.0001%	0.50%	0.09	0.02%	2.8%	0.011	0.002%	2%
CHL02	350 m	0.00015	0.0015%	1.2%	0.000005	0.0002%	0.50%	0.10	0.02%	2.8%	0.013	0.003%	2%
CHL03	950 m	0.00007	0.0007%	1.2%	0.000002	0.0001%	0.50%	0.07	0.01%	2.8%	0.006	0.001%	2%
CHL04	700 m	0.00011	0.0011%	1.2%	0.000004	0.0002%	0.50%	0.07	0.01%	2.8%	0.009	0.002%	2%
CHL05	150 m	0.00023	0.0023%	1.2%	0.000015	0.0008%	0.50%	0.14	0.03%	2.8%	0.020	0.004%	2%
CHL06	400 m	0.00015	0.0015%	1.2%	0.000006	0.0003%	0.50%	0.13	0.03%	2.8%	0.013	0.003%	2%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.00015	0.0015%	1.2%	0.000011	0.0005%	0.50%	0.09	0.02%	2.8%	0.013	0.003%	2%
CHL09	550 m	0.00014	0.0014%	1.2%	0.000007	0.0003%	0.50%	0.08	0.02%	2.8%	0.012	0.002%	2%
CHL10	575 m	0.00016	0.0016%	1.2%	0.000005	0.0003%	0.50%	0.10	0.02%	2.8%	0.014	0.003%	2%
CHL11	550 m	0.00017	0.0017%	1.2%	0.000005	0.0002%	0.50%	0.11	0.02%	2.8%	0.014	0.003%	2%
CHL12	875 m (2)	0.00011	0.0011%	1.2%	0.000004	0.0002%	0.50%	0.10	0.02%	2.8%	0.009	0.002%	2%
CHL13	305 m	0.00018	0.0018%	1.2%	0.000011	0.0005%	0.50%	0.13	0.03%	2.8%	0.015	0.003%	2%
CHL14	200 m	0.00019	0.0019%	1.2%	0.000014	0.0007%	0.50%	0.11	0.02%	2.8%	0.016	0.003%	2%
CHL15	275 m	0.00016	0.0016%	1.2%	0.000010	0.0005%	0.50%	0.10	0.02%	2.8%	0.014	0.003%	2%
CHL16	550 m	0.00013	0.0013%	1.2%	0.000005	0.0003%	0.50%	0.09	0.02%	2.8%	0.011	0.002%	2%
CHL17	130 m (2)	0.00026	0.0026%	1.2%	0.000019	0.0009%	0.50%	0.21	0.04%	2.8%	0.023	0.005%	2%
CHL18	420 m (2)	0.00012	0.0012%	1.2%	0.000007	0.0003%	0.50%	0.10	0.02%	2.8%	0.010	0.002%	2%
CHL24 (gooseberries)	800 m (2)	0.00008	0.0008%	1.2%	0.000004	0.0002%	0.50%	0.07	0.01%	2.8%	0.007	0.001%	2%
CHL25 (fishing area)	60 m (2)	0.00044	0.0044%	1.2%	0.000024	0.0012%	0.50%	0.38	0.08%	2.9%	0.038	0.008%	2%
CHL28 (gooseberries)	240 m (2)	0.00016	0.0016%	1.2%	0.000007	0.0004%	0.50%	0.16	0.03%	2.8%	0.014	0.003%	2%
Institutional buildings													
I01 (Business center)	1,800 m	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
I02 (Nursing station)	2,000 m	0.00005	0.0005%	1.2%	0.000002	0.0001%	0.50%	0.06	0.01%	2.8%	0.005	0.001%	2%
I03 (School)	2,350 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
I04 (Future school)	2,300 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
I05 (Church)	2,700 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.06	0.01%	2.8%	0.005	0.001%	2%
I06 (Community bldg)	2,900 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
Existing residences													
RP01	1,350 m	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.06	0.01%	2.8%	0.005	0.001%	2%
RP02	1,450 m	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.06	0.01%	2.8%	0.005	0.001%	2%
RP03	1,450 m	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.06	0.01%	2.8%	0.005	0.001%	2%
RP04	1,650 m	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP05	1,750 m	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP06	2,150 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP07	2,250 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP08	2,250 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP09	2,350 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP10	2,150 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP11	2,000 m	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP12	2,150 m	0.00005	0.0005%	1.2%	0.000002	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP13	2,000 m	0.00005	0.0005%	1.2%	0.000002	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP14	2,500 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP15	2,500 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP16	2,500 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP17	2,600 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP18	2,600 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP19	2,600 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.06	0.01%	2.8%	0.004	0.001%	2%
RP20	2,700 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.06	0.01%	2.8%	0.004	0.001%	2%
RP21	2,700 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
RP22	2,700 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.004	0.001%	2%
RP23	2,900 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.06	0.01%	2.8%	0.004	0.001%	2%
RP24	2,900 m	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.05	0.01%	2.8%	0.005	0.001%	2%
Future residences													
RFP01 (site A)	1,300 m (3)	0.00006	0.0006%	1.2%	0.000002	0.0001%	0.50%	0.06	0.01%	2.8%	0.005	0.001%	2%
RFP10 (site West)	1,950 m (3)	0.00005	0.0005%	1.2%	0.000001	0.0001%	0.50%	0.04	0.01%	2.8%	0.004	0.001%	2%
RFP21 (Site C)	125 m (4)	0.00034	0.0034%	1.2%	0.000014	0.0007%	0.50%	0.23	0.05%	2.8%	0.030	0.006%	2%
RFP23 (Site C)	140 m (4)	0.00034	0.0034%	1.2%	0.000012	0.0006%	0.50%	0.21	0.04%	2.8%	0.030	0.006%	2%
RFP25 (Site C)	180 m (4)	0.00033	0.0033%	1.2%	0.000010	0.0005%	0.50%	0.24	0.05%	2.8%	0.029	0.006%	2%
RFP36 (Site C)	115 m (4)	0.00041	0.0041%	1.2%	0.000013	0.0006%	0.50%	0.29	0.06%	2.9%	0.035	0.007%	2%
RFP39 (Site C)	95 m (4)	0.00043	0.0043%	1.2%	0.000016	0.0008%	0.50%	0.31	0.06%	2.9%	0.037	0.007%	2%
RFP41 (Site C)	180 m (4)	0.00027	0.0027%	1.2%	0.000011	0.0005%	0.50%	0.26	0.05%	2.9%	0.023	0.005%	2%
RFP42 (Site D)	55 m (4)	0.00045	0.0045%	1.2%	0.000031	0.0016%	0.50%	0.37	0.07%	2.9%	0.039	0.008%	2%
RFP44 (Site D)	200 m (4)	0.00019	0.0019%	1.2%	0.000010	0.0005%	0.50%	0.18	0.04%	2.8%	0.016	0.003%	2%

Sector or receptor		Acrolein (AAQC)			Acrolein (AAQC)			Benzene (AAQC)			Benzene (AAQC)		
		1-hour			24-hour			24-hour			Annual		
Limit value (µg/m ³)		4.5			0.40			2.3			0.45		
Baseline concentration (µg/m ³)		0.04			0.040			0.90			0.30		
Project contribution	Distance from road center (note)	Project only			Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	50 m	0.066	1.5%	2%	0.011	2.7%	13%	0.014	0.61%	40%	0.00089	0.20%	67%
	150 m	0.040	0.9%	2%	0.006	1.4%	11%	0.007	0.32%	39%	0.00032	0.07%	67%
	300 m	0.028	0.6%	2%	0.004	1.0%	11%	0.005	0.23%	39%	0.00020	0.04%	67%
Culturally sensitive areas													
CHL01	800 m	0.011	0.2%	1%	0.002	0.4%	10%	0.002	0.09%	39%	0.00004	0.01%	67%
CHL02	350 m	0.012	0.3%	1%	0.002	0.5%	10%	0.002	0.10%	39%	0.00007	0.02%	67%
CHL03	950 m	0.009	0.2%	1%	0.001	0.2%	10%	0.001	0.05%	39%	0.00003	0.01%	67%
CHL04	700 m	0.008	0.2%	1%	0.001	0.3%	10%	0.002	0.08%	39%	0.00006	0.01%	67%
CHL05	150 m	0.017	0.4%	1%	0.003	0.7%	11%	0.004	0.16%	39%	0.00024	0.05%	67%
CHL06	400 m	0.016	0.4%	1%	0.002	0.5%	10%	0.002	0.11%	39%	0.00010	0.02%	67%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.011	0.2%	1%	0.002	0.5%	10%	0.002	0.11%	39%	0.00017	0.04%	67%
CHL09	550 m	0.010	0.2%	1%	0.002	0.4%	10%	0.002	0.10%	39%	0.00011	0.02%	67%
CHL10	575 m	0.012	0.3%	1%	0.002	0.5%	10%	0.003	0.11%	39%	0.00008	0.02%	67%
CHL11	550 m	0.013	0.3%	1%	0.002	0.5%	11%	0.003	0.12%	39%	0.00008	0.02%	67%
CHL12	875 m (2)	0.012	0.3%	1%	0.001	0.3%	10%	0.002	0.07%	39%	0.00006	0.01%	67%
CHL13	305 m	0.016	0.4%	1%	0.002	0.6%	11%	0.003	0.12%	39%	0.00017	0.04%	67%
CHL14	200 m	0.013	0.3%	1%	0.002	0.6%	11%	0.003	0.13%	39%	0.00023	0.05%	67%
CHL15	275 m	0.012	0.3%	1%	0.002	0.5%	11%	0.003	0.12%	39%	0.00016	0.04%	67%
CHL16	550 m	0.011	0.3%	1%	0.002	0.4%	10%	0.002	0.09%	39%	0.00009	0.02%	67%
CHL17	130 m (2)	0.025	0.6%	1%	0.003	0.8%	11%	0.004	0.18%	39%	0.00030	0.07%	67%
CHL18	420 m (2)	0.012	0.3%	1%	0.001	0.4%	10%	0.002	0.08%	39%	0.00011	0.02%	67%
CHL24 (gooseberries)	800 m (2)	0.009	0.2%	1%	0.001	0.2%	10%	0.001	0.05%	39%	0.00006	0.01%	67%
CHL25 (fishing area)	60 m (2)	0.046	1.0%	2%	0.006	1.4%	11%	0.007	0.31%	39%	0.00038	0.09%	67%
CHL28 (gooseberries)	240 m (2)	0.019	0.4%	1%	0.002	0.5%	10%	0.003	0.11%	39%	0.00012	0.03%	67%
Institutional buildings													
I01 (Business center)	1,800 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
I02 (Nursing station)	2,000 m	0.007	0.2%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.01%	67%
I03 (School)	2,350 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
I04 (Future school)	2,300 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.03%	39%	0.00002	0.01%	67%
I05 (Church)	2,700 m	0.007	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
I06 (Community bldg)	2,900 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
Existing residences													
RP01	1,350 m	0.007	0.2%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RP02	1,450 m	0.007	0.2%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RP03	1,450 m	0.007	0.2%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RP04	1,650 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RP05	1,750 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RP06	2,150 m	0.006	0.1%	1%	0.001	0.1%	10%	0.001	0.03%	39%	0.00002	0.01%	67%
RP07	2,250 m	0.006	0.1%	1%	0.001	0.1%	10%	0.001	0.03%	39%	0.00002	0.01%	67%
RP08	2,250 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.01%	67%
RP09	2,350 m	0.006	0.1%	1%	0.001	0.1%	10%	0.001	0.03%	39%	0.00002	0.00%	67%
RP10	2,150 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.01%	67%
RP11	2,000 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RP12	2,150 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.01%	67%
RP13	2,000 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RP14	2,500 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.01%	67%
RP15	2,500 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
RP16	2,500 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.03%	39%	0.00002	0.00%	67%
RP17	2,600 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.03%	39%	0.00002	0.00%	67%
RP18	2,600 m	0.006	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
RP19	2,600 m	0.007	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.01%	67%
RP20	2,700 m	0.007	0.2%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
RP21	2,700 m	0.007	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
RP22	2,700 m	0.007	0.1%	1%	0.001	0.2%	10%	0.001	0.03%	39%	0.00002	0.00%	67%
RP23	2,900 m	0.007	0.1%	1%	0.001	0.2%	10%	0.001	0.03%	39%	0.00002	0.00%	67%
RP24	2,900 m	0.007	0.1%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00002	0.00%	67%
Future residences													
RFP01 (site A)	1,300 m (3)	0.007	0.2%	1%	0.001	0.2%	10%	0.001	0.04%	39%	0.00003	0.01%	67%
RFP10 (site West)	1,950 m (3)	0.005	0.1%	1%	0.001	0.2%	10%	0.001	0.03%	39%	0.00002	0.00%	67%
RFP21 (Site C)	125 m (4)	0.027	0.6%	1%	0.004	1.1%	11%	0.006	0.24%	39%	0.00023	0.05%	67%
RFP23 (Site C)	140 m (4)	0.025	0.5%	1%	0.004	1.1%	11%	0.006	0.24%	39%	0.00019	0.04%	67%
RFP25 (Site C)	180 m (4)	0.028	0.6%	2%	0.004	1.0%	11%	0.005	0.23%	39%	0.00016	0.04%	67%
RFP36 (Site C)	115 m (4)	0.034	0.8%	2%	0.005	1.3%	11%	0.007	0.29%	39%	0.00020	0.05%	67%
RFP39 (Site C)	95 m (4)	0.037	0.8%	2%	0.005	1.3%	11%	0.007	0.30%	39%	0.00026	0.06%	67%
RFP41 (Site C)	180 m (4)	0.031	0.7%	2%	0.003	0.8%	11%	0.004	0.19%	39%	0.00017	0.04%	67%
RFP42 (Site D)	55 m (4)	0.044	1.0%	2%	0.006	1.4%	11%	0.007	0.32%	39%	0.00050	0.11%	67%
RFP44 (Site D)	200 m (4)	0.021	0.5%	1%	0.002	0.6%	11%	0.003	0.13%	39%	0.00015	0.03%	67%

Sector or receptor		Ethylbenzene (AAQC)			Ethylbenzene (AAQC)			Formaldehyde (AAQC)			Hexane (AAQC)		
		10-minutes			24-hour			24-hour			24-hour		
Limit value (µg/m ³)		1900			1000			65			2500		
Baseline concentration (µg/m ³)		0.28			0.17			2.9			0.45		
Project contribution	Distance from road center (note)	Project only		+ Base	Project only		+ Base	Project only		+ Base	Project only		+ Base
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	0.13	0.0066%	0.021%	0.012	0.0012%	0.018%	0.24	0.36%	4.8%	0.0059	0.00024%	0.018%
	150 m	0.08	0.0041%	0.019%	0.006	0.0006%	0.018%	0.12	0.19%	4.7%	0.0031	0.00012%	0.018%
	300 m	0.05	0.0028%	0.018%	0.005	0.0005%	0.017%	0.09	0.14%	4.6%	0.0022	0.00009%	0.018%
Culturally sensitive areas													
CHL01	800 m	0.02	0.0011%	0.016%	0.002	0.0002%	0.017%	0.03	0.05%	4.5%	0.0008	0.00003%	0.018%
CHL02	350 m	0.02	0.0012%	0.016%	0.002	0.0002%	0.017%	0.04	0.06%	4.5%	0.0010	0.00004%	0.018%
CHL03	950 m	0.02	0.0009%	0.016%	0.001	0.0001%	0.017%	0.02	0.03%	4.5%	0.0005	0.00002%	0.018%
CHL04	700 m	0.02	0.0008%	0.016%	0.002	0.0002%	0.017%	0.03	0.04%	4.5%	0.0007	0.00003%	0.018%
CHL05	150 m	0.03	0.0017%	0.016%	0.003	0.0003%	0.017%	0.06	0.10%	4.6%	0.0015	0.00006%	0.018%
CHL06	400 m	0.03	0.0016%	0.016%	0.002	0.0002%	0.017%	0.04	0.06%	4.5%	0.0010	0.00004%	0.018%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.02	0.0011%	0.016%	0.002	0.0002%	0.017%	0.04	0.06%	4.5%	0.0010	0.00004%	0.018%
CHL09	550 m	0.02	0.0010%	0.016%	0.002	0.0002%	0.017%	0.04	0.06%	4.5%	0.0009	0.00004%	0.018%
CHL10	575 m	0.02	0.0012%	0.016%	0.002	0.0002%	0.017%	0.04	0.07%	4.5%	0.0011	0.00004%	0.018%
CHL11	550 m	0.03	0.0013%	0.016%	0.002	0.0002%	0.017%	0.05	0.07%	4.5%	0.0011	0.00005%	0.018%
CHL12	875 m (2)	0.02	0.0012%	0.016%	0.001	0.0001%	0.017%	0.03	0.04%	4.5%	0.0007	0.00003%	0.018%
CHL13	305 m	0.03	0.0016%	0.016%	0.002	0.0002%	0.017%	0.05	0.07%	4.5%	0.0012	0.00005%	0.018%
CHL14	200 m	0.02	0.0013%	0.016%	0.003	0.0003%	0.017%	0.05	0.08%	4.5%	0.0013	0.00005%	0.018%
CHL15	275 m	0.02	0.0012%	0.016%	0.002	0.0002%	0.017%	0.04	0.07%	4.5%	0.0011	0.00004%	0.018%
CHL16	550 m	0.02	0.0011%	0.016%	0.002	0.0002%	0.017%	0.03	0.05%	4.5%	0.0009	0.00003%	0.018%
CHL17	130 m (2)	0.05	0.0025%	0.017%	0.004	0.0004%	0.017%	0.07	0.11%	4.6%	0.0018	0.00007%	0.018%
CHL18	420 m (2)	0.02	0.0012%	0.016%	0.002	0.0002%	0.017%	0.03	0.05%	4.5%	0.0008	0.00003%	0.018%
CHL24 (gooseberries)	800 m (2)	0.02	0.0009%	0.016%	0.001	0.0001%	0.017%	0.02	0.03%	4.5%	0.0005	0.00002%	0.018%
CHL25 (fishing area)	60 m (2)	0.09	0.0046%	0.019%	0.006	0.0006%	0.018%	0.12	0.18%	4.6%	0.0030	0.00012%	0.018%
CHL28 (gooseberries)	240 m (2)	0.04	0.0019%	0.017%	0.002	0.0002%	0.017%	0.04	0.07%	4.5%	0.0011	0.00004%	0.018%
Institutional buildings													
I01 (Business center)	1,800 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.02	0.02%	4.5%	0.0004	0.00002%	0.018%
I02 (Nursing station)	2,000 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
I03 (School)	2,350 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
I04 (Future school)	2,300 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
I05 (Church)	2,700 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
I06 (Community bldg)	2,900 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
Existing residences													
RP01	1,350 m	0.01	0.0008%	0.015%	0.001	0.0001%	0.017%	0.02	0.02%	4.5%	0.0004	0.00002%	0.018%
RP02	1,450 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.02	0.02%	4.5%	0.0004	0.00002%	0.018%
RP03	1,450 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.02	0.03%	4.5%	0.0004	0.00002%	0.018%
RP04	1,650 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.02	0.03%	4.5%	0.0004	0.00002%	0.018%
RP05	1,750 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.02	0.02%	4.5%	0.0004	0.00002%	0.018%
RP06	2,150 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP07	2,250 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP08	2,250 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP09	2,350 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP10	2,150 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP11	2,000 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.02	0.02%	4.5%	0.0004	0.00002%	0.018%
RP12	2,150 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
RP13	2,000 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
RP14	2,500 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP15	2,500 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
RP16	2,500 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP17	2,600 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP18	2,600 m	0.01	0.0006%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
RP19	2,600 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP20	2,700 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP21	2,700 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
RP22	2,700 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP23	2,900 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RP24	2,900 m	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0004	0.00001%	0.018%
Future residences													
RFP01 (site A)	1,300 m (3)	0.01	0.0007%	0.015%	0.001	0.0001%	0.017%	0.02	0.02%	4.5%	0.0004	0.00002%	0.018%
RFP10 (site West)	1,950 m (3)	0.01	0.0005%	0.015%	0.001	0.0001%	0.017%	0.01	0.02%	4.5%	0.0003	0.00001%	0.018%
RFP21 (Site C)	125 m (4)	0.05	0.0027%	0.017%	0.005	0.0005%	0.017%	0.09	0.14%	4.6%	0.0023	0.00009%	0.018%
RFP23 (Site C)	140 m (4)	0.05	0.0025%	0.017%	0.005	0.0005%	0.017%	0.09	0.14%	4.6%	0.0023	0.00009%	0.018%
RFP25 (Site C)	180 m (4)	0.05	0.0029%	0.018%	0.005	0.0005%	0.017%	0.09	0.14%	4.6%	0.0023	0.00009%	0.018%
RFP36 (Site C)	115 m (4)	0.07	0.0035%	0.018%	0.006	0.0006%	0.018%	0.11	0.17%	4.6%	0.0028	0.00011%	0.018%
RFP39 (Site C)	95 m (4)	0.07	0.0037%	0.018%	0.006	0.0006%	0.018%	0.12	0.18%	4.6%	0.0029	0.00012%	0.018%
RFP41 (Site C)	180 m (4)	0.06	0.0031%	0.018%	0.004	0.0004%	0.017%	0.07	0.11%	4.6%	0.0018	0.00007%	0.018%
RFP42 (Site D)	55 m (4)	0.08	0.0044%	0.019%	0.006	0.0006%	0.018%	0.12	0.19%	4.7%	0.0030	0.00012%	0.018%
RFP44 (Site D)	200 m (4)	0.04	0.0021%	0.017%	0.003	0.0003%	0.017%	0.05	0.08%	4.5%	0.0013	0.00005%	0.018%

Sector or receptor		Propionaldehyde (AAQC)			Toluene (AAQC)			Xylenes (AAQC)			Xylenes (AAQC)		
		10-minutes			24-hour			10-minutes			24-hour		
Limit value (µg/m ³)		10			2000			3000			730		
Baseline concentration (µg/m ³)		1.6			1.4			1.6			0.52		
Project contribution	Distance from road center (note)	Project only			+ Base			Project only			+ Base		
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	0.034	0.34%	16%	0.033	0.0016%	0.072%	0.92	0.031%	0.084%	0.092	0.013%	0.084%
	150 m	0.021	0.21%	16%	0.017	0.0008%	0.071%	0.57	0.019%	0.072%	0.048	0.007%	0.078%
	300 m	0.015	0.15%	16%	0.012	0.0006%	0.071%	0.39	0.013%	0.066%	0.034	0.005%	0.076%
Culturally sensitive areas													
CHL01	800 m	0.005	0.05%	16%	0.005	0.0002%	0.070%	0.15	0.005%	0.058%	0.013	0.002%	0.073%
CHL02	350 m	0.006	0.06%	16%	0.006	0.0003%	0.070%	0.17	0.006%	0.059%	0.016	0.002%	0.073%
CHL03	950 m	0.004	0.04%	16%	0.003	0.0001%	0.070%	0.12	0.004%	0.057%	0.008	0.001%	0.072%
CHL04	700 m	0.004	0.04%	16%	0.004	0.0002%	0.070%	0.11	0.004%	0.057%	0.011	0.002%	0.073%
CHL05	150 m	0.009	0.09%	16%	0.009	0.0004%	0.070%	0.23	0.008%	0.061%	0.024	0.003%	0.075%
CHL06	400 m	0.008	0.08%	16%	0.006	0.0003%	0.070%	0.23	0.008%	0.061%	0.016	0.002%	0.073%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	0.006	0.06%	16%	0.006	0.0003%	0.070%	0.15	0.005%	0.058%	0.016	0.002%	0.073%
CHL09	550 m	0.005	0.05%	16%	0.005	0.0003%	0.070%	0.14	0.005%	0.058%	0.015	0.002%	0.073%
CHL10	575 m	0.006	0.06%	16%	0.006	0.0003%	0.070%	0.16	0.005%	0.059%	0.017	0.002%	0.074%
CHL11	550 m	0.007	0.07%	16%	0.006	0.0003%	0.070%	0.18	0.006%	0.059%	0.018	0.002%	0.074%
CHL12	875 m (2)	0.006	0.06%	16%	0.004	0.0002%	0.070%	0.16	0.005%	0.059%	0.011	0.002%	0.073%
CHL13	305 m	0.008	0.08%	16%	0.007	0.0003%	0.070%	0.23	0.008%	0.061%	0.019	0.003%	0.074%
CHL14	200 m	0.006	0.06%	16%	0.007	0.0003%	0.070%	0.18	0.006%	0.059%	0.020	0.003%	0.074%
CHL15	275 m	0.006	0.06%	16%	0.006	0.0003%	0.070%	0.16	0.005%	0.059%	0.017	0.002%	0.074%
CHL16	550 m	0.006	0.06%	16%	0.005	0.0002%	0.070%	0.16	0.005%	0.059%	0.013	0.002%	0.073%
CHL17	130 m (2)	0.013	0.13%	16%	0.010	0.0005%	0.070%	0.35	0.012%	0.065%	0.028	0.004%	0.075%
CHL18	420 m (2)	0.006	0.06%	16%	0.004	0.0002%	0.070%	0.17	0.006%	0.059%	0.013	0.002%	0.073%
CHL24 (gooseberries)	800 m (2)	0.004	0.04%	16%	0.003	0.0001%	0.070%	0.12	0.004%	0.057%	0.008	0.001%	0.072%
CHL25 (fishing area)	60 m (2)	0.024	0.24%	16%	0.017	0.0008%	0.071%	0.64	0.021%	0.075%	0.047	0.006%	0.078%
CHL28 (gooseberries)	240 m (2)	0.010	0.10%	16%	0.006	0.0003%	0.070%	0.27	0.009%	0.062%	0.017	0.002%	0.074%
Institutional buildings													
I01 (Business center)	1,800 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.08	0.003%	0.056%	0.006	0.001%	0.072%
I02 (Nursing station)	2,000 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
I03 (School)	2,350 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
I04 (Future school)	2,300 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
I05 (Church)	2,700 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
I06 (Community bldg)	2,900 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
Existing residences													
RP01	1,350 m	0.004	0.04%	16%	0.002	0.0001%	0.070%	0.10	0.003%	0.057%	0.006	0.001%	0.072%
RP02	1,450 m	0.004	0.04%	16%	0.002	0.0001%	0.070%	0.10	0.003%	0.057%	0.006	0.001%	0.072%
RP03	1,450 m	0.004	0.04%	16%	0.002	0.0001%	0.070%	0.10	0.003%	0.057%	0.006	0.001%	0.072%
RP04	1,650 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP05	1,750 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP06	2,150 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.08	0.003%	0.056%	0.005	0.001%	0.072%
RP07	2,250 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP08	2,250 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP09	2,350 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP10	2,150 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP11	2,000 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP12	2,150 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP13	2,000 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP14	2,500 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP15	2,500 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP16	2,500 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP17	2,600 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP18	2,600 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP19	2,600 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP20	2,700 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP21	2,700 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
RP22	2,700 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP23	2,900 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.005	0.001%	0.072%
RP24	2,900 m	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.09	0.003%	0.056%	0.006	0.001%	0.072%
Future residences													
RFP01 (site A)	1,300 m (3)	0.004	0.04%	16%	0.002	0.0001%	0.070%	0.10	0.003%	0.057%	0.006	0.001%	0.072%
RFP10 (site West)	1,950 m (3)	0.003	0.03%	16%	0.002	0.0001%	0.070%	0.07	0.002%	0.056%	0.005	0.001%	0.072%
RFP21 (Site C)	125 m (4)	0.014	0.14%	16%	0.013	0.0006%	0.071%	0.38	0.013%	0.066%	0.036	0.005%	0.076%
RFP23 (Site C)	140 m (4)	0.013	0.13%	16%	0.013	0.0006%	0.071%	0.34	0.011%	0.065%	0.036	0.005%	0.076%
RFP25 (Site C)	180 m (4)	0.015	0.15%	16%	0.013	0.0006%	0.071%	0.40	0.013%	0.067%	0.036	0.005%	0.076%
RFP36 (Site C)	115 m (4)	0.018	0.18%	16%	0.015	0.0008%	0.071%	0.48	0.016%	0.069%	0.043	0.006%	0.077%
RFP39 (Site C)	95 m (4)	0.019	0.19%	16%	0.016	0.0008%	0.071%	0.52	0.017%	0.071%	0.045	0.006%	0.077%
RFP41 (Site C)	180 m (4)	0.016	0.16%	16%	0.010	0.0005%	0.070%	0.43	0.014%	0.068%	0.028	0.004%	0.075%
RFP42 (Site D)	55 m (4)	0.023	0.23%	16%	0.017	0.0008%	0.071%	0.62	0.021%	0.074%	0.048	0.007%	0.078%
RFP44 (Site D)	200 m (4)	0.011	0.11%	16%	0.007	0.0004%	0.070%	0.30	0.010%	0.063%	0.020	0.003%	0.074%

Sector or receptor		Benzo(a)pyrene (AAQC)			Benzo(a)pyrene (AAQC)			DPM (HC)			DPM (HC)		
		24-hour			Annual			2-hour			Annual		
Limit value (µg/m ³)		5.0E-05			1.0E-05			10			5.0		
Baseline concentration (µg/m ³)		1.2E-04			2.0E-05			0			0		
Project contribution	Distance from road center (note)	Project only			Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	50 m	4.6E-07	0.93%	241%	2.6E-08	0.26%	200%	0.80	8.0%	8.0%	0.0079	0.16%	0.16%
	150 m	2.4E-07	0.48%	240%	9.3E-09	0.09%	200%	0.50	5.0%	5.0%	0.0028	0.06%	0.06%
	300 m	1.7E-07	0.35%	240%	5.8E-09	0.06%	200%	0.36	3.6%	3.6%	0.0018	0.04%	0.04%
Culturally sensitive areas													
CHL01	800 m	6.6E-08	0.13%	240%	1.2E-09	0.01%	200%	0.10	1.0%	1.0%	0.0003	0.01%	0.01%
CHL02	350 m	7.5E-08	0.15%	240%	2.1E-09	0.02%	200%	0.14	1.4%	1.4%	0.0006	0.01%	0.01%
CHL03	950 m	3.9E-08	0.08%	240%	1.0E-09	0.01%	200%	0.07	0.7%	0.7%	0.0003	0.01%	0.01%
CHL04	700 m	5.7E-08	0.11%	240%	1.7E-09	0.02%	200%	0.10	1.0%	1.0%	0.0005	0.01%	0.01%
CHL05	150 m	1.2E-07	0.24%	240%	7.1E-09	0.07%	200%	0.20	2.0%	2.0%	0.0021	0.04%	0.04%
CHL06	400 m	8.1E-08	0.16%	240%	2.8E-09	0.03%	200%	0.16	1.6%	1.6%	0.0009	0.02%	0.02%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	8.0E-08	0.16%	240%	5.0E-09	0.05%	200%	0.13	1.3%	1.3%	0.0015	0.03%	0.03%
CHL09	550 m	7.4E-08	0.15%	240%	3.0E-09	0.03%	200%	0.11	1.1%	1.1%	0.0009	0.02%	0.02%
CHL10	575 m	8.4E-08	0.17%	240%	2.4E-09	0.02%	200%	0.14	1.4%	1.4%	0.0007	0.01%	0.01%
CHL11	550 m	8.9E-08	0.18%	240%	2.3E-09	0.02%	200%	0.14	1.4%	1.4%	0.0007	0.01%	0.01%
CHL12	875 m (2)	5.0E-08	0.10%	240%	1.8E-09	0.02%	200%	0.10	1.0%	1.0%	0.0005	0.01%	0.01%
CHL13	305 m	9.4E-08	0.19%	240%	4.9E-09	0.05%	200%	0.15	1.5%	1.5%	0.0015	0.03%	0.03%
CHL14	200 m	9.9E-08	0.20%	240%	6.6E-09	0.07%	200%	0.15	1.5%	1.5%	0.0020	0.04%	0.04%
CHL15	275 m	8.7E-08	0.17%	240%	4.6E-09	0.05%	200%	0.14	1.4%	1.4%	0.0014	0.03%	0.03%
CHL16	550 m	6.7E-08	0.13%	240%	2.5E-09	0.03%	200%	0.10	1.0%	1.0%	0.0008	0.02%	0.02%
CHL17	130 m (2)	1.4E-07	0.28%	240%	8.8E-09	0.09%	200%	0.26	2.6%	2.6%	0.0026	0.05%	0.05%
CHL18	420 m (2)	6.3E-08	0.13%	240%	3.2E-09	0.03%	200%	0.12	1.2%	1.2%	0.0010	0.02%	0.02%
CHL24 (gooseberries)	800 m (2)	3.8E-08	0.08%	240%	1.8E-09	0.02%	200%	0.08	0.8%	0.8%	0.0005	0.01%	0.01%
CHL25 (fishing area)	60 m (2)	2.1E-07	0.43%	240%	1.1E-08	0.11%	200%	0.47	4.7%	4.7%	0.0034	0.07%	0.07%
CHL28 (gooseberries)	240 m (2)	8.4E-08	0.17%	240%	3.5E-09	0.03%	200%	0.18	1.8%	1.8%	0.0010	0.02%	0.02%
Institutional buildings													
I01 (Business center)	1,800 m	3.0E-08	0.06%	240%	7.6E-10	0.01%	200%	0.06	0.6%	0.6%	0.0002	0.00%	0.00%
I02 (Nursing station)	2,000 m	2.9E-08	0.06%	240%	7.1E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
I03 (School)	2,350 m	2.8E-08	0.06%	240%	6.5E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
I04 (Future school)	2,300 m	2.6E-08	0.05%	240%	6.6E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
I05 (Church)	2,700 m	2.9E-08	0.06%	240%	6.3E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
I06 (Community bldg)	2,900 m	2.7E-08	0.05%	240%	6.3E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
Existing residences													
RP01	1,350 m	3.1E-08	0.06%	240%	8.6E-10	0.01%	200%	0.07	0.7%	0.7%	0.0003	0.01%	0.01%
RP02	1,450 m	3.2E-08	0.06%	240%	8.2E-10	0.01%	200%	0.06	0.6%	0.6%	0.0002	0.00%	0.00%
RP03	1,450 m	3.2E-08	0.06%	240%	8.3E-10	0.01%	200%	0.06	0.6%	0.6%	0.0002	0.00%	0.00%
RP04	1,650 m	3.2E-08	0.06%	240%	8.0E-10	0.01%	200%	0.06	0.6%	0.6%	0.0002	0.00%	0.00%
RP05	1,750 m	3.1E-08	0.06%	240%	7.8E-10	0.01%	200%	0.06	0.6%	0.6%	0.0002	0.00%	0.00%
RP06	2,150 m	2.5E-08	0.05%	240%	6.8E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP07	2,250 m	2.5E-08	0.05%	240%	6.6E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP08	2,250 m	2.7E-08	0.05%	240%	6.7E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP09	2,350 m	2.5E-08	0.05%	240%	6.5E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP10	2,150 m	2.7E-08	0.05%	240%	6.9E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP11	2,000 m	3.0E-08	0.06%	240%	7.3E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP12	2,150 m	2.9E-08	0.06%	240%	7.1E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP13	2,000 m	2.9E-08	0.06%	240%	7.4E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP14	2,500 m	2.7E-08	0.05%	240%	6.7E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP15	2,500 m	2.8E-08	0.06%	240%	6.5E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP16	2,500 m	2.6E-08	0.05%	240%	6.3E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP17	2,600 m	2.6E-08	0.05%	240%	6.2E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP18	2,600 m	2.8E-08	0.06%	240%	6.4E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP19	2,600 m	2.7E-08	0.05%	240%	6.6E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP20	2,700 m	2.7E-08	0.05%	240%	6.5E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP21	2,700 m	2.8E-08	0.06%	240%	6.3E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
RP22	2,700 m	2.6E-08	0.05%	240%	6.1E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP23	2,900 m	2.6E-08	0.05%	240%	6.0E-10	0.01%	200%	0.04	0.4%	0.4%	0.0002	0.00%	0.00%
RP24	2,900 m	2.8E-08	0.06%	240%	6.2E-10	0.01%	200%	0.05	0.5%	0.5%	0.0002	0.00%	0.00%
Future residences													
RFP01 (site A)	1,300 m (3)	3.1E-08	0.06%	240%	8.6E-10	0.01%	200%	0.07	0.7%	0.7%	0.0003	0.01%	0.01%
RFP10 (site West)	1,950 m (3)	2.6E-08	0.05%	240%	6.5E-10	0.01%	200%	0.06	0.6%	0.6%	0.0002	0.00%	0.00%
RFP21 (Site C)	125 m (4)	1.8E-07	0.36%	240%	6.6E-09	0.07%	200%	0.24	2.4%	2.4%	0.0020	0.04%	0.04%
RFP23 (Site C)	140 m (4)	1.8E-07	0.36%	240%	5.6E-09	0.06%	200%	0.26	2.6%	2.6%	0.0017	0.03%	0.03%
RFP25 (Site C)	180 m (4)	1.8E-07	0.36%	240%	4.7E-09	0.05%	200%	0.29	2.9%	2.9%	0.0014	0.03%	0.03%
RFP36 (Site C)	115 m (4)	2.2E-07	0.43%	240%	6.0E-09	0.06%	200%	0.35	3.5%	3.5%	0.0018	0.04%	0.04%
RFP39 (Site C)	95 m (4)	2.3E-07	0.45%	240%	7.7E-09	0.08%	200%	0.38	3.8%	3.8%	0.0023	0.05%	0.05%
RFP41 (Site C)	180 m (4)	1.4E-07	0.28%	240%	4.9E-09	0.05%	200%	0.27	2.7%	2.7%	0.0015	0.03%	0.03%
RFP42 (Site D)	55 m (4)	2.4E-07	0.48%	240%	1.5E-08	0.15%	200%	0.49	4.9%	4.9%	0.0044	0.09%	0.09%
RFP44 (Site D)	200 m (4)	9.9E-08	0.20%	240%	4.5E-09	0.04%	200%	0.20	2.0%	2.0%	0.0013	0.03%	0.03%

Sector or receptor		Dustfall (AAQC) - no control			Dustfall (AAQC) - with control			Dustfall (AAQC) - no control			Dustfall (AAQC) - with control		
		30-days			30-days			Annual			Annual		
Limit value (µg/m ³)		7.0			7.0			4.6			4.6		
Baseline concentration (µg/m ³)		0.40			0.40			0.40			0.40		
Project contribution	Distance from road center (note)	Project only			+ Base			Project only			+ Base		
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	26.4	377%	383%	19	264%	270%	14	308%	317%	11	234%	243%
	150 m	7.1	101%	107%	5.0	71%	76%	3	76%	85%	3	58%	67%
	300 m	3.7	53%	58%	2.6	37%	43%	2	43%	52%	2	33%	42%
Culturally sensitive areas													
CHL01	800 m	1	11%	16%	1	8%	13%	0	6%	14%	0	4%	13%
CHL02	350 m	1	19%	25%	1	13%	19%	1	11%	20%	0	9%	17%
CHL03	950 m	0	6%	11%	0	4%	10%	0	4%	13%	0	3%	12%
CHL04	700 m	1	10%	16%	1	7%	13%	0	9%	17%	0	7%	15%
CHL05	150 m	4	53%	59%	3	37%	43%	2	49%	58%	2	38%	47%
CHL06	400 m	2	23%	28%	1	16%	22%	1	15%	23%	1	11%	20%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	3	43%	48%	2	30%	36%	2	35%	44%	1	27%	36%
CHL09	550 m	2	22%	27%	1	15%	21%	1	18%	26%	1	14%	22%
CHL10	575 m	1	17%	22%	1	12%	17%	1	13%	21%	0	10%	18%
CHL11	550 m	1	16%	22%	1	11%	17%	1	12%	21%	0	9%	18%
CHL12	875 m (2)	1	9%	15%	0	6%	12%	0	8%	16%	0	6%	15%
CHL13	305 m	4	52%	58%	3	37%	42%	2	36%	45%	1	28%	37%
CHL14	200 m	4	57%	62%	3	40%	45%	2	46%	55%	2	35%	44%
CHL15	275 m	2	31%	36%	1	21%	27%	1	26%	35%	1	20%	29%
CHL16	550 m	1	15%	21%	1	11%	16%	1	12%	20%	0	9%	18%
CHL17	130 m (2)	7	95%	101%	5	66%	72%	4	77%	86%	3	59%	68%
CHL18	420 m (2)	1	20%	26%	1	14%	20%	1	17%	26%	1	13%	22%
CHL24 (gooseberries)	800 m (2)	1	10%	16%	1	7%	13%	0	8%	17%	0	6%	15%
CHL25 (fishing area)	60 m (2)	11	159%	165%	7.8	111%	117%	5	109%	118%	4	83%	91%
CHL28 (gooseberries)	240 m (2)	2	28%	33%	1	19%	25%	1	20%	28%	1	15%	24%
Institutional buildings													
I01 (Business center)	1,800 m	0.31	4%	10%	0	3%	9%	0	3%	12%	0	2%	11%
I02 (Nursing station)	2,000 m	0.29	4%	10%	0	3%	9%	0	3%	11%	0	2%	11%
I03 (School)	2,350 m	0.27	4%	10%	0	3%	8%	0	2%	11%	0	2%	11%
I04 (Future school)	2,300 m	0.27	4%	10%	0	3%	8%	0	2%	11%	0	2%	11%
I05 (Church)	2,700 m	0.24	3%	9%	0	2%	8%	0	2%	11%	0	2%	10%
I06 (Community bldg)	2,900 m	0.24	3%	9%	0	2%	8%	0	2%	11%	0	2%	10%
Existing residences													
RP01	1,350 m	0.33	5%	10%	0.23	3%	9.0%	0	3%	12%	0	2%	11%
RP02	1,450 m	0.32	5%	10%	0	3%	9%	0	3%	12%	0	2%	11%
RP03	1,450 m	0.32	5%	10%	0	3%	9%	0	3%	12%	0	2%	11%
RP04	1,650 m	0.31	4%	10%	0	3%	9%	0	3%	12%	0	2%	11%
RP05	1,750 m	0.31	4%	10%	0	3%	9%	0	3%	12%	0	2%	11%
RP06	2,150 m	0.28	4%	10%	0	3%	8%	0	2%	11%	0	2%	11%
RP07	2,250 m	0.28	4%	10%	0	3%	8%	0	2%	11%	0	2%	11%
RP08	2,250 m	0.28	4%	10%	0	3%	8%	0	2%	11%	0	2%	11%
RP09	2,350 m	0.27	4%	10%	0	3%	8%	0	2%	11%	0	2%	10%
RP10	2,150 m	0.28	4%	10%	0	3%	8%	0	3%	11%	0	2%	11%
RP11	2,000 m	0.29	4%	10%	0	3%	9%	0	3%	11%	0	2%	11%
RP12	2,150 m	0.28	4%	10%	0	3%	8%	0	3%	11%	0	2%	11%
RP13	2,000 m	0.29	4%	10%	0	3%	9%	0	3%	11%	0	2%	11%
RP14	2,500 m	0.26	4%	9%	0	3%	8%	0	2%	11%	0	2%	11%
RP15	2,500 m	0.26	4%	9%	0	3%	8%	0	2%	11%	0	2%	10%
RP16	2,500 m	0.26	4%	9%	0	3%	8%	0	2%	11%	0	2%	10%
RP17	2,600 m	0.25	4%	9%	0	3%	8%	0	2%	11%	0	2%	10%
RP18	2,600 m	0.25	4%	9%	0	3%	8%	0	2%	11%	0	2%	10%
RP19	2,600 m	0.25	4%	9%	0	3%	8%	0	2%	11%	0	2%	10%
RP20	2,700 m	0.25	4%	9%	0	3%	8%	0	2%	11%	0	2%	10%
RP21	2,700 m	0.25	4%	9%	0	2%	8%	0	2%	11%	0	2%	10%
RP22	2,700 m	0.24	3%	9%	0	2%	8%	0	2%	11%	0	2%	10%
RP23	2,900 m	0.24	3%	9%	0	2%	8%	0	2%	11%	0	2%	10%
RP24	2,900 m	0.24	3%	9%	0	2%	8%	0	2%	11%	0	2%	10%
Future residences													
RFP01 (site A)	1,300 m (3)	0.33	5%	10%	0	3%	9%	0	3%	12%	0	3%	11%
RFP10 (site West)	1,950 m (3)	0.24	3%	9%	0	2%	8%	0	2%	11%	0	2%	10%
RFP21 (Site C)	125 m (4)	4.38	63%	68%	3	44%	49%	2	45%	54%	2	34%	43%
RFP23 (Site C)	140 m (4)	3.64	52%	58%	3	36%	42%	2	36%	45%	1	28%	36%
RFP25 (Site C)	180 m (4)	3.01	43%	49%	2	30%	36%	1	30%	39%	1	23%	32%
RFP36 (Site C)	115 m (4)	4.43	63%	69%	3	44%	50%	2	44%	53%	2	34%	42%
RFP39 (Site C)	95 m (4)	6.05	86%	92%	4	60%	66%	3	58%	66%	2	44%	53%
RFP41 (Site C)	180 m (4)	3.33	48%	53%	2	33%	39%	1	30%	39%	1	23%	32%
RFP42 (Site D)	55 m (4)	15.27	218%	224%	10.7	152%	158%	8	166%	174%	6	126%	134%
RFP44 (Site D)	200 m (4)	3.13	45%	50%	2	31%	37%	2	34%	43%	1	26%	35%

Sector or receptor		TSP (AAQC) - pavement			TSP (AAQC) - pavement			PM10 (AAQC) - pavement			PM2.5 (CAAQs) - pavement		
		24-hour			Annual			24-hour			24-hour		
Limit value (µg/m ³)		120			60			50			23		
Baseline concentration (µg/m ³)		45			4			28			13		
Project contribution	Distance from road center (note)	Project only			+ Base			Project only			+ Base		
		(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit	(µg/m ³)	% limit	% limit
Max modeling domain	50 m	97	81%	118%	16	26%	33%	45	89%	145%	4.6	20%	76%
	150 m	36	30%	68%	4	7%	14%	23	46%	102%	2.0	9%	65%
	300 m	25	21%	59%	3	4%	11%	17	34%	90%	1.3	6%	62%
Culturally sensitive areas													
CHL01	800 m	8	7%	45%	0	1%	7%	6	13%	69%	0.6	3%	59%
CHL02	350 m	13	11%	48%	1	1%	8%	8	16%	72%	0.9	4%	60%
CHL03	950 m	5	4%	41%	0	1%	7%	4	7%	63%	0.4	2%	58%
CHL04	700 m	6	5%	43%	1	1%	8%	6	11%	67%	0.6	2%	59%
CHL05	150 m	20	17%	54%	3	5%	12%	12	24%	80%	1.5	6%	63%
CHL06	400 m	13	10%	48%	1	2%	8%	8	17%	73%	1.0	4%	61%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	12	10%	47%	2	3%	10%	8	15%	71%	1.0	5%	61%
CHL09	550 m	10	8%	46%	1	2%	9%	7	14%	70%	0.8	3%	60%
CHL10	575 m	10	8%	46%	1	1%	8%	8	16%	72%	0.7	3%	60%
CHL11	550 m	11	9%	47%	1	1%	8%	9	17%	73%	0.8	3%	60%
CHL12	875 m (2)	8	6%	44%	1	1%	8%	6	12%	68%	0.6	3%	59%
CHL13	305 m	15	12%	50%	2	3%	10%	9	18%	74%	1.1	5%	61%
CHL14	200 m	16	13%	51%	3	5%	11%	10	21%	77%	1.3	6%	62%
CHL15	275 m	13	11%	49%	2	3%	10%	10	19%	75%	1.0	4%	61%
CHL16	550 m	9	7%	45%	1	1%	8%	7	15%	71%	0.8	3%	60%
CHL17	130 m (2)	25	21%	59%	4	7%	14%	13	27%	83%	1.8	8%	64%
CHL18	420 m (2)	10	8%	46%	1	2%	9%	7	14%	70%	0.9	4%	60%
CHL24 (gooseberries)	800 m (2)	6	5%	43%	1	1%	8%	4	9%	65%	0.5	2%	59%
CHL25 (fishing area)	60 m (2)	56	46%	84%	6	10%	17%	25	50%	106%	2.7	12%	68%
CHL28 (gooseberries)	240 m (2)	15	12%	50%	1	2%	9%	10	19%	75%	1.2	5%	62%
Institutional buildings													
I01 (Business center)	1,800 m	3	2%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
I02 (Nursing station)	2,000 m	3	2%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
I03 (School)	2,350 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
I04 (Future school)	2,300 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
I05 (Church)	2,700 m	3	2%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
I06 (Community bldg)	2,900 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
Existing residences													
RP01	1,350 m	3	3%	40%	0	0%	7%	3	6%	62%	0.3	2%	58%
RP02	1,450 m	3	3%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
RP03	1,450 m	3	3%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
RP04	1,650 m	3	3%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
RP05	1,750 m	3	3%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
RP06	2,150 m	3	2%	40%	0	0%	7%	2	5%	61%	0.3	1%	58%
RP07	2,250 m	3	2%	40%	0	0%	7%	2	5%	61%	0.3	1%	58%
RP08	2,250 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP09	2,350 m	3	2%	40%	0	0%	7%	2	5%	61%	0.3	1%	58%
RP10	2,150 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP11	2,000 m	3	2%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
RP12	2,150 m	3	2%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
RP13	2,000 m	3	2%	40%	0	0%	7%	3	6%	62%	0.3	1%	58%
RP14	2,500 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP15	2,500 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP16	2,500 m	3	2%	40%	0	0%	7%	2	5%	61%	0.3	1%	58%
RP17	2,600 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP18	2,600 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP19	2,600 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP20	2,700 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP21	2,700 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP22	2,700 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP23	2,900 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RP24	2,900 m	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
Future residences													
RFP01 (site A)	1,300 m (3)	3	3%	40%	0	0%	7%	3	6%	62%	0.4	2%	58%
RFP10 (site West)	1,950 m (3)	3	2%	40%	0	0%	7%	3	5%	61%	0.3	1%	58%
RFP21 (Site C)	125 m (4)	32	26%	64%	3	5%	12%	17	35%	91%	1.9	8%	65%
RFP23 (Site C)	140 m (4)	29	24%	61%	2	4%	11%	18	35%	91%	1.7	7%	64%
RFP25 (Site C)	180 m (4)	30	25%	62%	2	3%	10%	17	34%	90%	1.5	7%	63%
RFP36 (Site C)	115 m (4)	41	34%	72%	3	5%	11%	21	42%	98%	2.0	8%	65%
RFP39 (Site C)	95 m (4)	44	36%	74%	4	6%	13%	22	45%	101%	2.3	10%	67%
RFP41 (Site C)	180 m (4)	26	21%	59%	2	3%	10%	15	30%	86%	1.7	7%	64%
RFP42 (Site D)	55 m (4)	60	50%	87%	9	14%	21%	23	47%	103%	3.1	13%	70%
RFP44 (Site D)	200 m (4)	18	15%	52%	2	3%	10%	11	21%	77%	1.2	5%	62%

Sector or receptor		PM2.5 (AAQC) - pavement			PM2.5 (CAAQS) - pavement			PM2.5 (AAQC) - pavement			Dustfall (AAQC) - pavement		
		24-hour			Annual			Annual			30-days		
Limit value (µg/m ³)		27			8.0			8.8			7.0		
Baseline concentration (µg/m ³)		13			4.7			4.7			0.40		
Project contribution	Distance from road center (note)	Project only			Project only			Project only			Project only		
		(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit	(µg/m ³)	% limit	+ Base % limit
Max modeling domain	50 m	4.6	17%	65%	1.0	13%	71%	1.0	12%	65%	2.5	36%	42%
	150 m	2.0	8%	56%	0.3	4%	63%	0.3	4%	57%	0.73	10%	16%
	300 m	1.3	5%	53%	0.2	3%	62%	0.2	3%	56%	0.42	6%	12%
Culturally sensitive areas													
CHL01	800 m	0.6	2%	50%	0.0	1%	59%	0.0	1%	54%	0.1	1%	7%
CHL02	350 m	0.9	3%	51%	0.1	1%	60%	0.1	1%	54%	0.1	2%	7%
CHL03	950 m	0.4	2%	50%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
CHL04	700 m	0.6	2%	50%	0.1	1%	60%	0.1	1%	54%	0.1	1%	7%
CHL05	150 m	1.5	5%	54%	0.3	3%	62%	0.3	3%	56%	0.5	7%	12%
CHL06	400 m	1.0	4%	52%	0.1	1%	60%	0.1	1%	55%	0.1	2%	8%
CHL07	< 50 m (1)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CHL08	280 m	1.0	4%	52%	0.2	2%	61%	0.2	2%	56%	0.3	4%	10%
CHL09	550 m	0.8	3%	51%	0.1	1%	60%	0.1	1%	55%	0.2	2%	8%
CHL10	575 m	0.7	3%	51%	0.1	1%	60%	0.1	1%	54%	0.1	2%	7%
CHL11	550 m	0.8	3%	51%	0.1	1%	60%	0.1	1%	54%	0.1	2%	7%
CHL12	875 m (2)	0.6	2%	50%	0.1	1%	60%	0.1	1%	54%	0.1	1%	7%
CHL13	305 m	1.1	4%	52%	0.2	2%	61%	0.2	2%	55%	0.4	5%	11%
CHL14	200 m	1.3	5%	53%	0.2	3%	62%	0.2	3%	56%	0.4	6%	12%
CHL15	275 m	1.0	4%	52%	0.2	2%	61%	0.2	2%	55%	0.2	3%	9%
CHL16	550 m	0.8	3%	51%	0.1	1%	60%	0.1	1%	55%	0.1	2%	7%
CHL17	130 m (2)	1.8	7%	55%	0.3	4%	63%	0.3	4%	57%	0.7	11%	16%
CHL18	420 m (2)	0.9	3%	51%	0.1	2%	60%	0.1	1%	55%	0.2	2%	8%
CHL24 (gooseberries)	800 m (2)	0.5	2%	50%	0.1	1%	60%	0.1	1%	54%	0.1	1%	7%
CHL25 (fishing area)	60 m (2)	2.7	10%	58%	0.5	6%	64%	0.5	5%	59%	1.0	14%	20%
CHL28 (gooseberries)	240 m (2)	1.2	4%	52%	0.1	2%	60%	0.1	2%	55%	0.2	3%	8%
Institutional buildings													
I01 (Business center)	1,800 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
I02 (Nursing station)	2,000 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
I03 (School)	2,350 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
I04 (Future school)	2,300 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
I05 (Church)	2,700 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
I06 (Community bldg)	2,900 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
Existing residences													
RP01	1,350 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.028	0%	6.1%
RP02	1,450 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP03	1,450 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP04	1,650 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP05	1,750 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP06	2,150 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP07	2,250 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP08	2,250 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP09	2,350 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP10	2,150 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP11	2,000 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP12	2,150 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP13	2,000 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP14	2,500 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP15	2,500 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP16	2,500 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP17	2,600 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP18	2,600 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP19	2,600 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP20	2,700 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP21	2,700 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP22	2,700 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP23	2,900 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RP24	2,900 m	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
Future residences													
RFP01 (site A)	1,300 m (3)	0.4	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RFP10 (site West)	1,950 m (3)	0.3	1%	49%	0.0	0%	59%	0.0	0%	54%	0.0	0%	6%
RFP21 (Site C)	125 m (4)	1.9	7%	55%	0.3	3%	62%	0.3	3%	56%	0.4	6%	12%
RFP23 (Site C)	140 m (4)	1.7	6%	54%	0.2	3%	62%	0.2	3%	56%	0.4	5%	11%
RFP25 (Site C)	180 m (4)	1.5	6%	54%	0.2	2%	61%	0.2	2%	56%	0.3	5%	10%
RFP36 (Site C)	115 m (4)	2.0	7%	55%	0.2	3%	62%	0.2	3%	56%	0.5	7%	12%
RFP39 (Site C)	95 m (4)	2.3	9%	57%	0.3	4%	63%	0.3	3%	57%	0.6	8%	14%
RFP41 (Site C)	180 m (4)	1.7	6%	54%	0.2	2%	61%	0.2	2%	56%	0.3	5%	10%
RFP42 (Site D)	55 m (4)	3.1	11%	60%	0.6	7%	66%	0.6	7%	60%	1.4	19%	25%
RFP44 (Site D)	200 m (4)	1.2	4%	53%	0.2	2%	61%	0.2	2%	55%	0.3	4%	10%

Sector or receptor		Dustfall (AAQC) - pavement		
		Annual		
Limit value ($\mu\text{g}/\text{m}^3$)		4.6		
Baseline concentration ($\mu\text{g}/\text{m}^3$)		0.40		
Project contribution	Distance from road center (note)	Project only		+ Base
		($\mu\text{g}/\text{m}^3$)	% limit	% limit
Max modeling domain	50 m	1.8	39%	48%
	150 m	0.4	10%	18%
	300 m	0.3	6%	14%
Culturally sensitive areas				
CHL01	800 m	0.0	1%	9%
CHL02	350 m	0.1	1%	10%
CHL03	950 m	0.0	0%	9%
CHL04	700 m	0.1	1%	10%
CHL05	150 m	0.3	6%	15%
CHL06	400 m	0.1	2%	11%
CHL07	< 50 m (1)	n/a	n/a	n/a
CHL08	280 m	0.2	5%	13%
CHL09	550 m	0.1	2%	11%
CHL10	575 m	0.1	2%	10%
CHL11	550 m	0.1	2%	10%
CHL12	875 m (2)	0.0	1%	10%
CHL13	305 m	0.2	5%	13%
CHL14	200 m	0.3	6%	15%
CHL15	275 m	0.2	3%	12%
CHL16	550 m	0.1	2%	10%
CHL17	130 m (2)	0.5	10%	19%
CHL18	420 m (2)	0.1	2%	11%
CHL24 (gooseberries)	800 m (2)	0.0	1%	10%
CHL25 (fishing area)	60 m (2)	0.6	14%	23%
CHL28 (gooseberries)	240 m (2)	0.1	3%	11%
Institutional buildings				
I01 (Business center)	1,800 m	0.0	0%	9%
I02 (Nursing station)	2,000 m	0.0	0%	9%
I03 (School)	2,350 m	0.0	0%	9%
I04 (Future school)	2,300 m	0.0	0%	9%
I05 (Church)	2,700 m	0.0	0%	9%
I06 (Community bldg)	2,900 m	0.0	0%	9%
Existing residences				
RP01	1,350 m	0.0	0%	9%
RP02	1,450 m	0.0	0%	9%
RP03	1,450 m	0.0	0%	9%
RP04	1,650 m	0.0	0%	9%
RP05	1,750 m	0.0	0%	9%
RP06	2,150 m	0.0	0%	9%
RP07	2,250 m	0.0	0%	9%
RP08	2,250 m	0.0	0%	9%
RP09	2,350 m	0.0	0%	9%
RP10	2,150 m	0.0	0%	9%
RP11	2,000 m	0.0	0%	9%
RP12	2,150 m	0.0	0%	9%
RP13	2,000 m	0.0	0%	9%
RP14	2,500 m	0.0	0%	9%
RP15	2,500 m	0.0	0%	9%
RP16	2,500 m	0.0	0%	9%
RP17	2,600 m	0.0	0%	9%
RP18	2,600 m	0.0	0%	9%
RP19	2,600 m	0.0	0%	9%
RP20	2,700 m	0.0	0%	9%
RP21	2,700 m	0.0	0%	9%
RP22	2,700 m	0.0	0%	9%
RP23	2,900 m	0.0	0%	9%
RP24	2,900 m	0.0	0%	9%
Future residences				
RFP01 (site A)	1,300 m (3)	0.0	0%	9%
RFP10 (site West)	1,950 m (3)	0.0	0%	9%
RFP21 (Site C)	125 m (4)	0.3	6%	15%
RFP23 (Site C)	140 m (4)	0.2	5%	13%
RFP25 (Site C)	180 m (4)	0.2	4%	13%
RFP36 (Site C)	115 m (4)	0.3	6%	14%
RFP39 (Site C)	95 m (4)	0.3	8%	16%
RFP41 (Site C)	180 m (4)	0.2	4%	13%
RFP42 (Site D)	55 m (4)	1.0	21%	30%
RFP44 (Site D)	200 m (4)	0.2	4%	13%

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