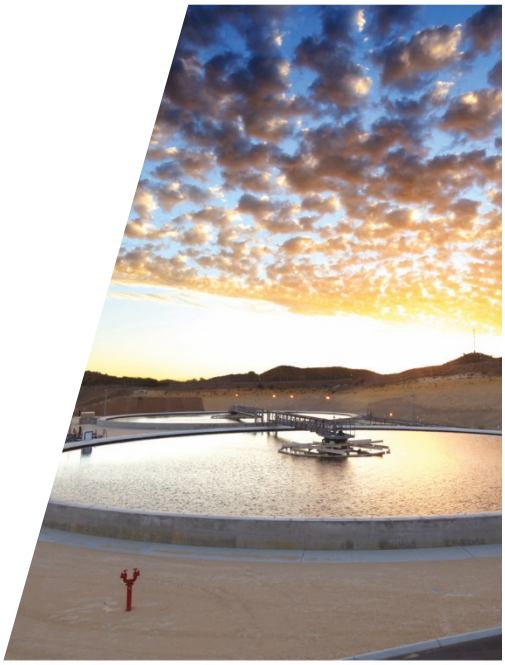
Appendix C.1

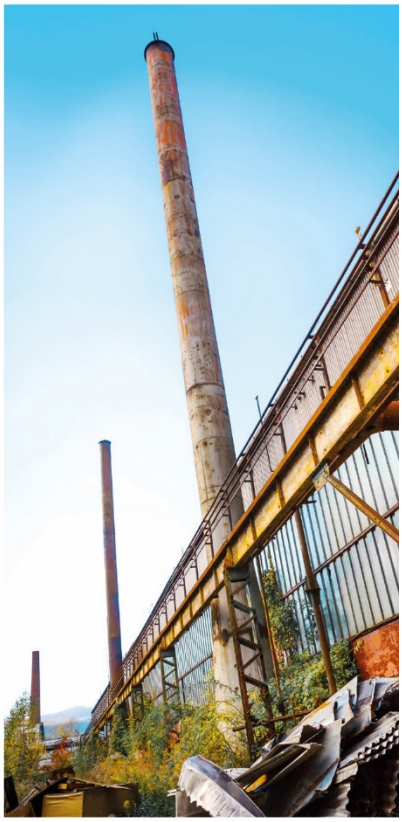
Air Emissions Assessment Technical report, February 16, 2021as
Completed for the Updated 2021 Beaver Dam Mine EIS



Air Emissions Assessment Technical Report

Beaver Dam Mine Project
Marinette, Nova Scotia

Atlantic Mining NS Inc.



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1. Introduction

GHD Limited (GHD) performed air emission estimates and dispersion modelling for the Atlantic Mining NS Inc. (AMNS) Beaver Dam Mine Project (Project), near Marinette, Nova Scotia. The Project is composed of the Beaver Dam Mine Site, the Touquoy Mine Site, and a connecting Haul Road. Figure 1 shows the locations of the two mine sites and the Haul Road.

This report is an update to Appendix C.1 Air Dispersion Modelling and Air Emission Estimate Technical Memorandum submitted as part of the Revised Environmental Impact Statement (EIS), February 2019 EIS (AMNS 2019) and provides assessment results designed to meet the Canadian Environmental Assessment Agency (CEAA) EIS Guidelines (2016). This updated report is based on the update to the Project Description (AMNS 2021a) as well as in response to Round 2, Information Requests submitted by CEAA, Nova Scotia Environment (NSE), and Eastern Shore Forest Watch Association (ESFWA), which are detailed in Table IR2.

The methodology used to estimate the air emissions and develop the dispersion models that were used to assess the impact of air emissions from the Project is provided in Section 2.

Air emissions compounds evaluated included total suspended particulates (TSP), particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$), nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO) and volatile organic compounds (VOC). The sources of emissions included the Beaver Dam Mine Site, Touquoy Mine Site, and the Haul Road.

Table IR2 Canadian Environmental Assessment Agency, Nova Scotia Environment, and Eastern Shore Forest Watch Association Round 2, Part 1 Information Requests

Information Request Reference Number	Regulatory Agency/ Indigenous Community/ Public Community	Revised EIS Reference	Context and Rationale	The Proponent is Required to …	Information Request Response Location
CEAA-2-25	ECCC	Section 6.2.6.2; Appendix C-1, Figure 5	The revised EIS (page 165) notes the potential of PM10 criteria being exceeded up to 57% of the time. Even given the conservative estimate of a background concentration, this is still a high frequency in an area with demonstrated Indigenous land and resource issues. The scale of Figure 5 in Appendix C and the limited description of the extent of the exceedances found on page 161 of the revised EIS make it difficult to identify any interactions between the higher ambient concentrations in the vicinity of the Haul Road and the identified sensitive receptors.	Provide a more detailed description of the geographical extent of any ambient air quality exceedances and their interaction with any potential sites important for use by Indigenous people.	Section 6. Updated emissions and dispersion modelling results show there will be no exceedances of PM10 criteria.
CEAA-2-28	CEAA, KMKNO, ESFW, Save Caribou	Section 8.5 Cumulative Effects Assessment of the Valued Components	A cumulative effects assessment for air is included in section 8.5 of the revised EIS. The proponent identified projects that are certain or reasonably foreseeable that would operate concurrently with the Beaver Dam Mine Project and use the same Haul Roads.	Provide modelling to support the cumulative effects assessment for air quality, including the reasonably foreseeable projects: Fifteen Mile Stream Gold and Cochrane Hill Gold Projects.	Sections 2 and 6. Fifteen Mile Stream and Cochrane Hill projects truck traffic have been added.
CEAA-2-31	HC	Section 6.1.6, p214; 6.1.7.3, p218; Table 6.14-1, p808; Figure 2.1-2 Appendix B.1, Figures 3 and 4	The locations of the nearest human receptors that were evaluated in the air and noise assessments are not clear. Several seasonal and permanent dwelling locations appear on the maps provided; however, it is not clear if all relevant receptors were identified. For example, the locations of traditional land use were not identified. Where traditional land use is practiced closer to the project site than the permanent/seasonal dwellings, these areas should also be evaluated for potential health impacts.	Provide all human receptor locations, including locations of traditional land use and recreational use which may be closer to the project area than seasonal and/or permanent dwellings (for both air quality and noise VCs) on maps and in summary tables. - there are comments in the word document.	Figure 3 and Section 5.7. The worst-case sensitive receptors have been modeled. All lands outside the property boundaries of the two mines and haul road have been modeled.
CEAA-2-31	HC	Section 6.1.6, p214; 6.1.7.3, p218; Table 6.14-1, p808; Figure 2.1-2 Appendix B.1, Figures 3 and 4	Same Rationale as above	Update the noise and air modelling and human health assessment as required.	See updated air, noise and human health reports. All relevant receptors and lands have been assessed.
NSE-2-24	NSE	6.2.2.3	“Due to a lack of other sources of data for ambient TSP, the background concentration for TSP is based on the maximum measured 24-hour TSP concentration (there are insufficient data to provide a meaningful 90th percentile value), and the average of all the TSP measurements. There is a great deal of uncertainty in how representative.”	If data is insufficient, is there a plan to sample more? Baseline TSP needs to be established as dust is going to be an issue.	Section 3.2 and Table 5. Relevant local TSP background data from 2007 to 2017 is summarized and the 90th percentile was used.

Table IR2 Canadian Environmental Assessment Agency, Nova Scotia Environment, and Eastern Shore Forest Watch Association Round 2, Part 1 Information Requests (continued)

Information Request Reference Number	Regulatory Agency/ Indigenous Community/ Public Community	Revised EIS Reference	Context and Rationale	The Proponent is Required to …	Information Request Response Location
NSE-2-27	NSE	Table 6.2-7 and Section 6.2.5.3		Needs to include dust from deposition of tailings in the Touquoy Pit.	Section 5.6. Deposition of TSP was modeled and used in the Human Health Risk Assessment.
NSE-2-128	NSE	Section 6.2.10, Appendix O.1 Appendix C.1	The Proponent was requested to "provide monitoring locations identified on a map along with seasonal wind roses. The proposed baseline monitoring locations should be informed, in part, by results of air dispersion modelling". This information has not been provided. The proponent has indicated that an operational methodology and protocols will be established following granting of the IA with NSE.	The proponent should submit a detailed ambient air monitoring plan for baseline, construction, operation and reclamation phase of the project, as part of their application for an Approval to Construct and Operate. The monitoring plan should include, but not be limited to, proposed parameters to be measured, details on proposed instrumentation, monitoring schedules, proposed monitoring locations, seasonal wind roses and proposed meteorological data to be measured.	The updated air modelling and Human Health Risk Assessment (AMNS 2021a) indicates there will be no air quality impacts above applicable criteria. Therefore, an ambient air monitoring plan is not proposed. A Fugitive Dust Control Plan (AMNS 2021a) is provided to ensure emissions are controlled.
NSE-2-129	NSE	Section 6.2 Appendix C.1	The Proponent was requested to complete an inventory of expected air contaminants from this project which includes both air contaminants regulated under the NS Air Quality Regulations and any others of concern (e.g. metals, volatile organic compounds etc.). The proponent provided air dispersion modelling of TSP, PM10, PM2.5, NOx, SO2 and total VOCs. The report was silent on metals.	1) Are air emissions of metals a concern for this project? If not, the report should justify why specific metals were not included in the modelling. 2) The modelling identified predicted exceedences for TSP, PM10 and PM2.5. The submitted dust control plan requires more definitive actions and commitment to address the modelling results (see comments below regarding dust control plan). 3) The consultant has assumed that the air dispersion modelling results are conservative and that the exceedences are an overprediction. Therefore, the proposed ambient air quality monitoring plan should be designed to confirm the consultant's assumptions that the air dispersion modelling is an overprediction. The level of monitoring proposed should reflect this concern.	1. Metals were assessed in the air emissions by modelling the worst case ambient air concentration and the deposition of metals contained in the total suspended particulate. This analysis is provided in the Human Health Risk Assessment (AMNS 2021a). 2. There are no exceedances of TSP, PM10 or PM2.5 predicted to occur outside the mine sites and haul road property boundaries, with the assumed mitigation of 80% dust control on the haul road. 3. The updated emissions and dispersion modeling shows that there are no exceedances predicted, therefore ambient air monitoring is not needed.

Table IR2 Canadian Environmental Assessment Agency, Nova Scotia Environment, and Eastern Shore Forest Watch Association Round 2, Part 1 Information Requests (continued)

Information Request Reference Number	Regulatory Agency/ Indigenous Community/ Public Community	Revised EIS Reference	Context and Rationale	The Proponent is Required to …	Information Request Response Location
ESFWA-2-31	ESFWA	Section 6.2, Table 6.2-19, Residual Environmental Effects for Air		Provide more information regarding the maximum wind speed to which this table applies.	Table 6.2-10 is not specific to a maximum wind speed. Wind is recognized as a potential cause of fugitive dust and mitigation measures to address fugitive emissions due to wind and other sources is provided in the Fugitive Dust Control Plan (AMNS 2021a).
ESFWA-2-33b	ESFWA		"monitoring will be carried out to confirm the assessment of non-significance provided by the definition above, and to determine if the proposed mitigation will be sufficient to ensure there are no adverse air quality effects as a result of Haul road operation." (p. 172). The Precautionary Principle would require that mitigation be carried out prior to 'in vivo' monitoring, which could have deleterious effects.	The Proponent should explain the reasoning behind allowing predictable exposure to elevated levels of dust before mitigation is contemplated.	A mitigation of 80% dust control on the haul road has been assumed. The updated emissions and dispersion modeling shows that there are no exceedances predicted,

Source: CEAA (2019), NSE (2019), ESFWA (2019), AMNS (2021b).

2. Air Emission Estimates

Emission rates from the Project-related sources were calculated using Compilation of Air Pollutant Emissions Factors USEPA AP-42, 5th Edition, (AP-42) emission factors for the Beaver Dam Mine Site and the Haul Road particulate emissions, and MOBILE6.2 (M6.2) for Haul Road vehicle tailpipe emissions. The operational phase is anticipated to be of longer duration (5 years) than the construction phase (1 year), and the number of vehicles, extraction rates, and material processing rates will be higher during operations than during construction. Operations therefore represents the worst case for air emissions, and air emission estimates were only completed for the operations phase.

2.1 Sources of Particulates

Haul Road emissions calculations assume that the roads are unpaved, and a road dust management plan will be applied (Environment Canada 2017b). AMNS aim is to achieve a minimum of 80% dust control and therefore 80% level of dust mitigation scenario was evaluated.

A summary of round trip truck traffic counts for the Haul Road between the Beaver Dam Mine and the Touquoy Mine are provided below:

- Beaver Dam to Touquoy Mine - 95
- Cochrane Mine vehicles - 11
- Fifteen Mile Stream vehicles - 11
- Service Trucks (3/4 tons trucks) - 20
- Forestry - 7

The total one way traffic trips are 190 for Beaver Dam Traffic and 288 for the Cumulative Traffic.

The roads are constructed using clean (non-acid generating) waste rock and therefore only road dust emissions were calculated and assessed. However, emissions of compounds contained in the rock dust, such as metals, were evaluated in the Beaver Dam Mine Project's Human Health Risk Assessment report (AMNS 2021a) using the rock chemical composition data.

Emissions calculations for Haul Road particulates are provided in Table 1, including all the assumptions, based on the AP-42 methodology and an 80% road dust mitigation scenario.

M6.2 can estimate the particulate matter emissions from diesel highway motor vehicles (exhaust particulate, tire wear particulate, and break wear particulate), however, these represent less than 1% of the particulate emitted from the road surfaces and so were considered insignificant and therefore not modelled.

Emission sources related to the Beaver Dam Mine Site consist of an onsite haul road, primary crushing of rock at the Mine Site surface processing area (Option A), blasting operations (Option B) as well as activities that occur within the mining pit such as transfer conveyors, truck loading at the working face and all other activities that occur within the mining pit.

AMNS has indicated that they are evaluating using either the crusher (Option A) or blasting to crush rock (Option B). GHD has therefore evaluated both options in this assessment. Emissions calculations for activities at the mine site processing area as well as within the mining pit (including blasting) are summarized in Tables 2A and 2B for Option A and Option B respectively. AP-42 standard calculations and assumptions, including controls where applicable, were used to generate these emissions estimates.

Particulate-generating processes related to the Touquoy Mine Site consist of transfer conveyors, material handling, loading and unloading operations at the Raw Material Storage Pile Transfer operations (ROMTRANS), and primary, secondary and tertiary ore crushing. These activities occur at grade. Emissions calculations for activities at the Touquoy Mine Site are summarized in Table 2C. AP-42 standard calculations and assumptions, including controls where applicable, were used to generate these values and are provided in the Table 2C.

Mine tailings are wet and are not anticipated to result in airborne emissions.

2.2 Sources of Gaseous Compounds

Tailpipe emissions from haul trucks along the Haul Road between the Beaver Dam Mine Site and the Touquoy Site include NOx, SO_2 and VOCs. These emissions were calculated using M6.2 which provides emission factors in a "grams-per-vehicle-mile-travelled" format. The tailpipe emissions estimates based on distance travelled are provided in Table 3.

Gaseous compound emissions also occur from blasting operations in the Mine pit. Blasting emissions from the Mine pit include NOx, SO_2 and CO. These emissions were estimated based on AP-42 Chapter 13.3 for Explosives Detonation using ANFO type explosive. The Material Safety Data Sheet provided by AMNS for the explosive is provided in Appendix A. Gaseous compound emission estimates from blasting are provided in Table 2B.

3. Background Air Quality Data

3.1 Regional Background

Appropriate background air quality data was investigated for the Project. The background air quality concentrations for the existing conditions were added to the modelled concentrations for the Project to obtain an estimate of the air quality conditions when the proposed operations commence. There are currently no permanent air monitoring stations near the Beaver Dam Mine Site.

The most recent three years (2014 to 2016) for which all ambient air quality data were available were obtained from the Government of Canada National Air Pollution Surveillance (NAPS) program. The NAPS data for 2014 to 2016 are summarized in Table 4.

The nearest representative stations which report substances of interest for this assessment are:

- Lake Major, Nova Scotia (station ID 030120) – $PM_{2.5}$, NO_2, SO_2
- Port Hawkesbury, Nova Scotia (station ID 030201) – $PM_{2.5}$, NO_2, SO_2
- Aylesford Mountain, Nova Scotia (station ID 030701) – $PM_{2.5}$, NO_2

- Pictou, Nova Scotia (station ID 030901) – $PM_{2.5}$, NO_2
- Halifax, Nova Scotia (station ID 030118) – NO_2, SO_2, CO
- Sydney, Nova Scotia (station ID 030118) – $PM_{2.5}$, NO_2, SO_2, CO

PM_{10} is not measured in many areas in Canada. Of the locations which do measure PM_{10}, most are in British Columbia urban centres, with four in Manitoba cities, one in Regina, Saskatchewan, and four in the Northwest Territories. In terms of locations that are somewhat comparable to the Project (human habitation, regional activities that may generate airborne particulate, etc.), Norman Wells NW Regional Office (Station ID 129102) is suitably rural and at a distance from significant human activities and industry and therefore appears appropriate and has recent data available. As such, this station has been included to provide context for PM_{10}, and comparison for the other species of interest ($PM_{2.5}$, NO_2, CO and SO_2) in this assessment. There is a great deal of uncertainty in how representative these values might be for background, but they represent the best available data at this time. Of particulate note is that the 75th percentile 24-hour PM_{10} value was reported at 14.0 µg/m^3, but the 90th percentile value jumped to 31.0 µg/m^3 and the maximum value was 176.0 µg/m^3. This indicates that there are a few very high concentrations being measured which are strongly influencing the maximum and the 90th percentile. Use of the 90th percentile concentration for PM_{10} at this location as "background" for the Project is therefore likely to be very conservative, a finding supported by the limited PM_{10} monitoring completed historically in the area (Section 3.2).

Total suspended particulates (TSP) are not reported routinely anywhere in Canada, and so cannot be represented by NAPS monitoring data.

The background air concentrations provided in Table 4 shows the 25th, 50th, 75th, and 90th percentile values for ½-hour, 1-hour and 24-hour CO, 1-hour and 24-hour NO_2, 1-hour and 24-hour SO_2, and 24-hour PM_{10} and $PM_{2.5}$ for the 2014 through 2016 period.

GHD has completed the air assessment using the 90th percentile measured concentration as "background" for all compounds except PM_{10}. This is a conservative approach but excludes extreme high values that are very rarely measured (the "maximum" values). Annual values for $PM_{2.5}$ are represented by the "Average" values for 24-hour. More representative background data for PM_{10} was obtained from Project monitoring data as discussed in Section 3.2.

For all species except TSP and PM_{10}, the location with the highest 90th percentile background concentration value for each contaminant has been selected as "background".

The Project plus background are the modelled concentrations from the Project activities plus the identified background air quality concentrations.

3.2 Project Monitoring

Particulate monitoring was undertaken for TSP and PM_{10} in the Project Area between 2007 and 2017. Air samples were collected at nine locations near the Beaver Dam Mine Site and along the proposed Haul Road, two locations near the Fifteen Mile Stream Site, two locations near the Cochrane Hill Site and at five additional locations on the Touquoy Site. Fifteen Mile Stream and Cochrane Hill are two additional mine projects proposed by AMNS in Nova Scotia located approximately 22 km north and 65 km northeast from the Project.

A summary of these measurements is presented in Table 5.

Total suspended particulate concentrations ranged from 1.7 to 41.7 µg/m^3, with the highest value obtained at Location #2 during monitoring in June 2008. This monitoring station was located in a recently clear-cut area, which may have contributed to higher particulate levels in comparison to the other locations. The 41.7 µg/m^3 concentration is considered to be an outlier but was kept in the data set when determining the 90th percentile. This area was resampled in 2014 (AN#2). The 2014 result for that area was 4.6 µg/m^3.

All samples collected were below the Nova Scotia *Air Quality Regulations* for TSP.

Due to a lack of other sources of data for ambient TSP, the background concentration for TSP is based on the 90th percentile of the measured 24-hour TSP concentrations (17.1 µg/m^3). Use of the 90th percentile value of the 24-hour concentrations measured is a conservative estimate.

Results for PM_{10} concentrations ranged from 7.1 to 13.1 µg/m^3, with the highest value also obtained at Location #2 during monitoring in June 2008. There is no Nova Scotia *Air Quality Regulations* for PM_{10} but the values measured were all less than 30% of the Ontario Interim guideline for PM_{10}.The maximum PM_{10} background air concentration value at Location #2 (13.1 µg/m^3) was selected as a conservative estimate. The maximum was selected instead of the 90th percentile because of the limited number of PM_{10} samples available, and the samples did not appear to have any significant outliers.

4. Air Quality Criteria

Where Nova Scotia has air quality criteria, these have been used as the Assessment Criteria. If there were no Nova Scotia criteria for compounds of interest, then Canada-wide standards have been assumed to apply.

PM_{10} is not regulated in either Nova Scotia or federally. Ontario has an Interim Ambient Air Quality Criteria (AAQC) for PM_{10}, but this value is not used to assess compliance for single facilities or operations and is therefore generally applied at the regional level.

Volatile organic compounds are not regulated as a group in any of the jurisdictions identified and PM_{10} is not regulated at the facility level in any of the jurisdictions identified. As noted above, Ontario has an interim AAQC PM_{10} ambient guideline of 50 µg/m^3 for the 24-hour averaging period. VOC and PM_{10} concentrations are therefore provided for informational purposes only, and PM_{10} will be compared to this interim standard for context but is not considered a regulated compound in Nova Scotia.

Table 6 provides a summary of the compounds of concern for this assessment, the identified air quality criteria and averaging periods, and the data source. The assessment criteria selected for this assessment are provided in the final column of Table 6. There are no criteria applicable for total VOCs.

The deposition of particulate was assessed as part of the Human Health Risk Assessment report (AMNS 2021a).

5. Air Dispersion Modelling

Dispersion modelling was performed using the United States Environmental Protection Agency (US EPA) multi-source dispersion model AERMOD, following a modified methodology as described in the Air Dispersion Modelling Guideline for Ontario and in Ontario Regulation 419/05 (O. Reg. 419/05).

There is currently no guidance on the use of air dispersion models in Nova Scotia, therefore the Ontario O. Reg. 419/05 requirements were used as a framework for this assessment. The air dispersion model and methodology used in this project are currently accepted in Ontario, and the AERMOD model is accepted in multiple provinces and territories, as well as in the United States. AERMOD is an advanced steady-state plume model that has the ability to incorporate building cavity downwash, actual source parameters, emission rates, terrain and historical meteorological information to predict ground level concentrations (GLCs) at specified locations and has been peer reviewed and compared both to other models and monitoring data (US EPA 2003).

Dispersion modelling was performed for 80% Road Dust Mitigation Scenarios.

5.1 Dispersion Modelling Executables

The following dispersion and pre-processor models were used in this assessment:

- AERMOD digital terrain pre-processor (AERMAP), version 11103
- American Meteorological Society/Environmental Protection Agency Regulatory Improvement Committee (AERMIC) air dispersion model (AERMOD), version 19219
- Building Profile Input Program (BPIP), version 04274
- AERMET meteorological preprocess (AERMET), version 19219

5.2 Meteorological Data

Five years of unprocessed hourly meteorological data for the Facility was obtained from Environment Canada (2017a). The surface data is from the Upper Stewiacke Research Climate Station (WMO ID 71753) with missing data either interpolated for short periods (6 hours or less) or filled in using data from another nearby meteorological station (Debert Airport; WMO ID 71317). Upper air data was retrieved from the NOAA radiosonde database for Yarmouth, NS (NOAA 2018). The meteorological data covers the dates from January 1, 2012 to December 31, 2016. The data was processed using AERMET version 19219 with land use characteristics representative of the Project's surroundings. The hourly data included many factors which affect the dispersion of air compounds including wind speed, wind direction, temperature, ceiling height, and atmospheric stability.

5.3 Averaging Periods

Air compounds were modelled with appropriate averaging periods based on their respective air quality criteria. The averaging periods of interest for each compound are provided in Table 6. Maximum predicted concentrations presented are exclusive of "meteorological anomalies". Under

Ontario dispersion modelling guidance, the highest 8 hours (for hourly results) or the highest 1 day (for 24-hour results) for each year modelled are considered to be attributable to meteorological anomalies, and so are not considered. Where "maximum concentrations" are reported, these are maximum concentrations after meteorological anomalies have been removed.

5.4 Digital Elevation Model Data

Digital elevation model (DEM) data was obtained from Natural Resources Canada through their geospatial data extraction tool (http://geogratis.gc.ca/site/eng/extraction). The DEM data was used to include the effects of terrain in the modelling.

DEM data was preprocessed with AERMAP version 11103 for use with AERMOD. Figure 2 shows a contour plot of the extracted terrain data for the modelling domain.

5.5 Source Input Parameters

Three sources were modelled to represent the Project: the Haul Road between the Beaver Dam Mine Site and the Touquoy Mine Site; the Beaver Dam Mine Site including the onsite haul road, and the Touquoy Mine Site.

5.5.1 Haul Road

The entire Haul Road, approximately 30 km in length between the two mine sites was modelled in AERMOD, however these AERMOD model runs require extensive computing time. GHD determined that there was no significant difference in the model results along the various sections of the Haul Road. Therefore, in order to facilitate the AERMOD model run time with the various model scenarios, GHD selected four haul road sections that have typical to worst case air impacts. The four haul road sections are located near the residential sensitive receptors that were assessed (Section 5.7). The selected four Haul Road sections that were modelled in AERMOD are presented on Figure 3.

The four Haul Road sections were modelled as line volume sources representing both road and tailpipe emissions from truck traffic. These haul road sections were assumed to have a targeted control efficiency of 80 percent of the re-suspended road dust. This control efficiency will be achieved through the implementation of a fugitive dust best management plan including dust suppressant applications on the road surface.

Project Only and Cumulative truck traffic scenarios were modelled. The Cumulative emissions scenario is the Project Only truck traffic emissions plus the Fifteen Mile Stream (FMS), Cochrane Hill (CH), and Forestry truck traffic emissions.

5.5.2 Beaver Dam Mine

Option A at the Beaver Dam Mine Site includes crushing operations that will occur at the Mine Site's surface along with the mining and transfer operations that will primarily operate from within an open pit. Option B at the Beaver Dam Mine Site includes blasting operations that will occur along with the mining and transfer operations from within an open pit. The blasting and mining and transfer operations in the pit were modelled as open pit sources. The crushing emissions were modelled as a

volume source on the Mine Surface, and the emissions from the section of haul road inside the mine site was assessed.

5.5.3 Touquoy Mine Site

The Touquoy Mine Site consisted of the crushers and mining sources as volume sources. Results from this Site have been included in this report as the Beaver Dam project will use Touquoy for its refining capabilities. The sources at Touquoy were previously modelled in AERMOD for an Emissions Summary and Dispersion Modelling assessment (GHD 2007). The Touquoy Site's assessment accounted for receiving the Beaver Dam Mine's ore bearing rock in its processing emissions.

5.6 Deposition

Deposition was modelled for TSP. For consistency, plume depletion was permitted for all three size fractions (including TSP, PM_{10} and $PM_{2.5}$), to ensure that predicted concentrations were consistent with each other. Plume depletion calculates the settling of particles from emitted plumes as a result of their mass and aerodynamic properties, and can provide the predicted deposition (in grams per square metre, g/m^2) that may be used further to estimate health risks based on biological intake (i.e., ingestion). Deposition was not modelled for the purposes of air quality assessment, but the results are included in Tables 7A, 7B and 8 for use in the Human Health Risk Assessment (AMNS 2021a).

5.7 Receptors

A series of discrete receptor grids and discrete receptors located at ground level were used to identify the maximum point of impingement (POI) outside the two mine sites and along the connecting Haul Road.

Around the Touquoy Mine Site, the receptor grids were set up with the following grid spacing:

- 20 m spacing within 200 m of the edge of a bounding box that encompassed all onsite facility sources
- 50 m spacing from 200 to 500 m
- 100 m spacing from 500 to 1,000 m
- 200 m spacing from 1,000 to 2,000 m
- 500 m spacing from 2,000 to 5,000 m

A property line ground level receptor grid with 10 m spacing was used to evaluate the maximum property boundary concentration. No receptors were placed inside either Mine's property line.

Around Beaver Dam Mine, the receptors were set up with the following spacing:

- 20 m spacing within 200 m of the edge of a bounding box that encompassed all onsite facility sources
- 50 m spacing from 200 to 500 m
- 100 m spacing from 500 to 1,000 m

- 200 m spacing from 1,000 to 2,000 m
- 300 m spacing from 2,000 to 3,000 m

No receptors were placed inside Beaver Dam Mine's property line.

Along the four modelled road sections, receptors were spaced at 40 m parallel to the road and at the following distances perpendicular to the road:

- 30 m from road centerline
- 45 m from road centerline
- 55 m from road centerline
- 65 m from road centerline
- 75 m from road centerline

Modelling was also completed for selected sensitive receptors that are near the Haul Road or mine sites and have the potential to be impacted by air emissions. The sensitive receptors that were considered are shown on Figure 3, as follows:

- Sensitive Receptor 1 (R1) – 9 Beaver Dam Mines Road (Marlborough/Goodland Property)
- Sensitive Receptor 2 (R2) – 4112 Highway 224 (Beaver Lake IR 17)
- Sensitive Receptor 3 (R3) – 4115 Highway 224 (Cottage on Crown land)
- Sensitive Receptor 4 (R4) – 3492 Highway 224 (Hobbs Property)
- Sensitive Receptor 5 (R5) – 3379 Highway 224 (McLeod Property)
- Sensitive Receptor 6 (R6) – 3373 Highway 224 (Smith Property)
- Sensitive Receptor 7 (R7) – Tangier River (Deepwood Estates Property)
- Sensitive Receptor 8 (R8) – Tangier River (Musquodoboit Lumber Co Ltd. Property/John Dickson Lease)
- Sensitive Receptor 9 (R9) – 5579 Mooseland Road (Lloy Property)

5.8 On-Site Building Data.

There are several buildings at the Touquoy Mine Site, however, point sources at this location were insignificant and not included in the dispersion modelling. There were no buildings identified for the Beaver Dam Mine Site. For these reasons, building downwash effects were not included in the modelling.

6. Results

6.1 Project Only Haul Road Truck Traffic Emissions Scenario

The modelled particulate concentration results of the Project only Haul Road emissions scenario for the four road sections modelled (Figure 3) are summarized in Table 7A for the 80% road dust

mitigation scenarios respectively. All predicted Project only maximum concentrations are well below the air quality assessment criteria with background added, as shown in Table 7A. The maximum particulate deposition along the Haul Road for the Project only truck traffic scenario ranged from 74.1 to 75.9 g/m^2/year. Table 7B summarizes the predicted maximum concentrations of the gaseous species (NO_2, SO_2 and VOCs). There are no exceedances of the air quality criteria for NO_2, and SO_2 and VOCs. There is no air quality criteria for total VOCs, and the predicted maximum concentrations of total VOCs in Table 7B are shown to be negligible.

The maximum concentrations for all contaminants occur at 30 m from the Haul Road centerline, which is the project boundary for the Haul Road.

6.2 Cumulative Haul Road Truck Traffic Emissions Scenario

The modelled particulate concentration results of the Cumulative Haul Road emissions scenario for the four road sections modelled (Figure 3) are summarized in Table 7A for the 80% road dust mitigation scenario. All predicted Cumulative maximum concentrations are well below the air quality assessment criteria with background added, as shown in Table 7A The maximum particulate deposition along the Haul Road for the Cumulative truck traffic scenario ranged from 78.9 to 81.6 g/m^2/year.

Table 7B summarizes the predicted maximum concentrations of the gaseous species (NO_2, SO_2 and VOCs). There are no exceedances of the air quality criteria for NO_2, and SO_2. There are no criteria applicable for total VOCs. The predicted concentrations of VOCs as presented in Table 7B show that the VOC concentrations are very low (less than 1 microgram per cubic metre) and are provided for reference only.

The maximum concentrations for all contaminants occur at 30 m from the Haul Road centerline, which is the project boundary for the Haul Road.

Figures 4A to 4E show the 30 km haul road contour plots for TSP, PM10 and PM2.5 modelled for the 80% dust mitigation scenario. As shown on these figures, there are no exceedances of the applicable criteria along the haul road.

6.3 Concentrations at Sensitive Receptors

Table 8 summarizes the 80% dust mitigation particulate modeling results at the sensitive (residential) receptors for the Project only and Cumulative Haul Road truck traffic scenarios. All predicted particulate concentrations are below the air quality assessment criteria with and without background air concentrations for 80% dust mitigation scenarios. There are also no exceedances of the air quality criteria for NO_2, and SO_2.

The predicted particulate deposition rates for the sensitive receptors ranged from 0.1 to 49.4 g/m^2/year for the Project only emissions scenario and from 0.2 to 74.8 g/m^2/year for the Cumulative emissions scenario for the 80% Dust mitigation scenario.

6.4 Beaver Dam Mine Site Operations

Tables 9A and 9B summarize the estimated particulate concentrations for Option A as well as particulate and gaseous concentrations for Option B at the Beaver Dam mine site boundary from the

Beaver Dam Mine Site operation sources. Modelling results for all contaminants resulting from on-site operations at Beaver Dam Mine Site were predicted to meet the identified assessment criteria for all averaging periods, from operations alone and when added to background concentrations.

6.5 Touquoy Mine Site Operations

Tables 9A and 9B summarize the particulate emissions modeling results at the Touquoy mine site boundary from the Touquoy Mine Site operation sources. Modelling results for all particulate size fractions resulting from on-site operations at the Touquoy Processing facility were predicted to meet the identified assessment criteria for all averaging periods, from operations alone and when added to background concentrations.

7. Conclusions

Modelling of sources at the Beaver Dam Mine Site and the Touquoy Mine Site showed maximum predicted concentrations at their respective fence lines well below applicable air quality criteria.

The Haul Road between the proposed Beaver Dam and the Touquoy Mine Sites is the source primarily responsible for the maximum predicted concentrations at both the gridded receptors and the sensitive (residential) receptors identified for this assessment.

Emissions of particulate from the Haul Road, including background concentrations, do not exceed the particulate air quality criteria at 30 metres from the road centerline for both the Project only and Cumulative Haul Road truck traffic scenarios for the 80% dust mitigation scenario.

There are no exceedances of the air quality assessment criteria at any of the residential receptors for both the Project only and Cumulative Haul Road truck traffic scenarios for 80% dust mitigation scenarios.

The particulate deposition (dust fall) results have been included for use in the Human Health Risk Assessment (AMNS 2021a).

Emissions of gaseous species from the Haul Road trucks as well as blasting operations are predicted to be well below the assessment criteria.

Details on proposed dust mitigation is provided in the Fugitive Dust Control Plan (AMNS 2021a).

The proponent is proposing the use of products to address concerns related to road dust, which can achieve 80% dust mitigation on the proposed Haul Road with the projected traffic volumes. These products can be used during the times of the year when the most dust is expected to be generated.

As a conservative measure, for the purposes of this assessment it has been assumed that a minimum 80% road dust mitigation will be achieved as the worst case. With 80% dust mitigation there are no predicted exceedances of any air quality criteria at the residential receptors. At 30 m from the road centerline there are no exceedances of any of the air quality criteria with 80% dust mitigation.

In the event of dust complaints, more aggressive application of dust mitigation plan will be undertaken in close proximity to the complainant, in order to further reduce road dust emissions and dust deposition at sensitive receptors. AMNS is also proposing to include a dust monitoring program to confirm the effectiveness of proposed dust mitigation measures to be implemented along the roadway. This can be implemented prior to the commencement of operations to provide additional background concentrations for particulates.

8. References

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BEAVER DAM MINE

Beaver Dam Mines Rd

TOUQUOY MINE

Moose River Rd

Mooseland Rd

Haul Route

224

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LEGEND

- HAUL ROUTE
- BEAVER DAM MINE PROPERTY BOUNDARY
- TOUQUOY MINE PROPERTY BOUNDARY

0 600 1200 1800m

N

GHD

ATLANTIC MINING NS INC.
BEAVER DAM MINE PROJECT
BEAVER DAM, NOVA SCOTIA
AIR EMISSIONS ASSESSMENT TECHNICAL REPORT

SITE AND HAUL ROAD LOCATION MAP

Project No. **88664**
Date **December 2020**

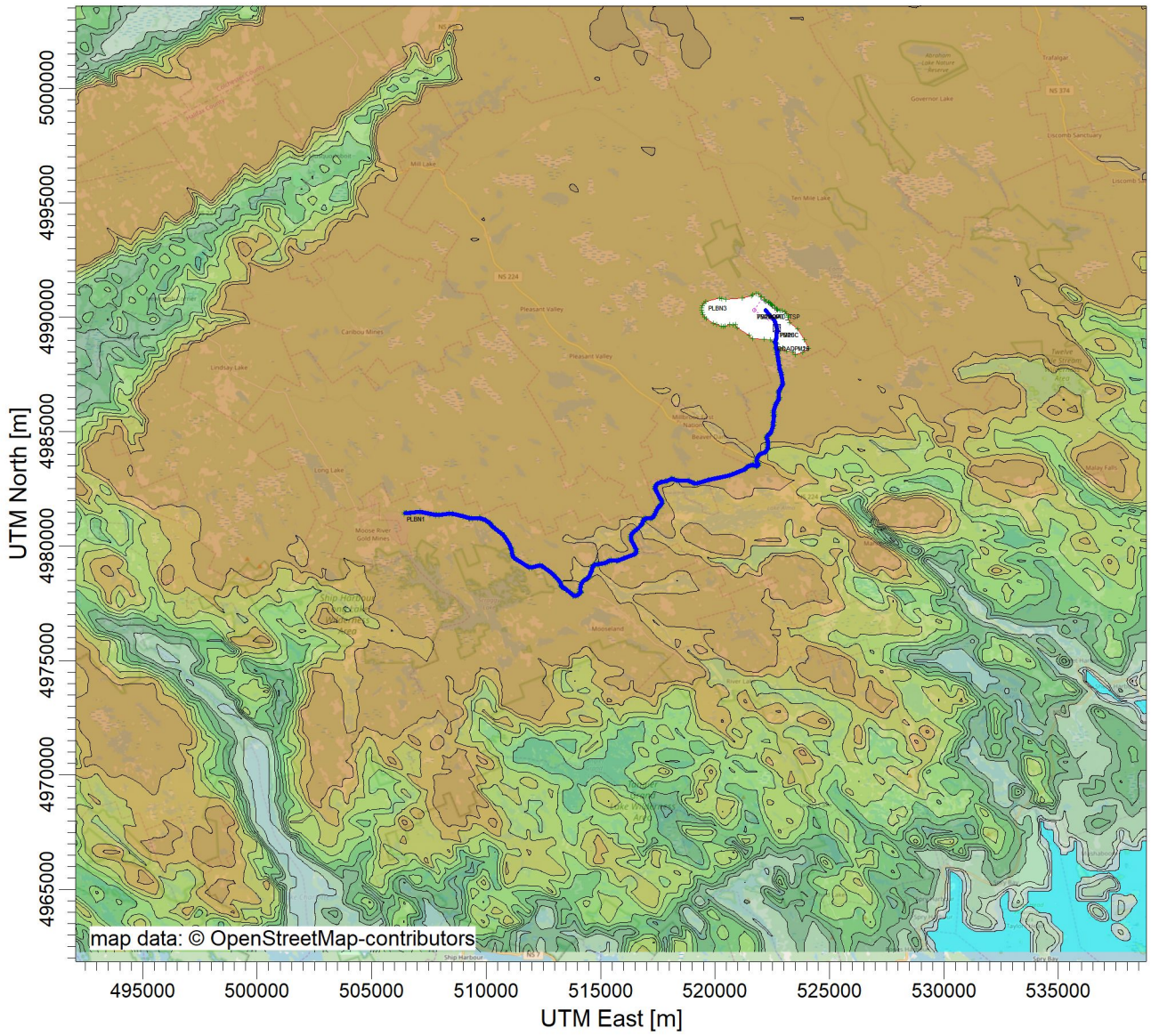
FIGURE 1

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\88000s\88664\88664-reports\88664-53(016)\88664-53(016)GN\88664-53(016)GN-WA001.DWG
Plot Date: 11 December 2020 4:29 PM

Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Accessed: 2019

PROJECT TITLE:

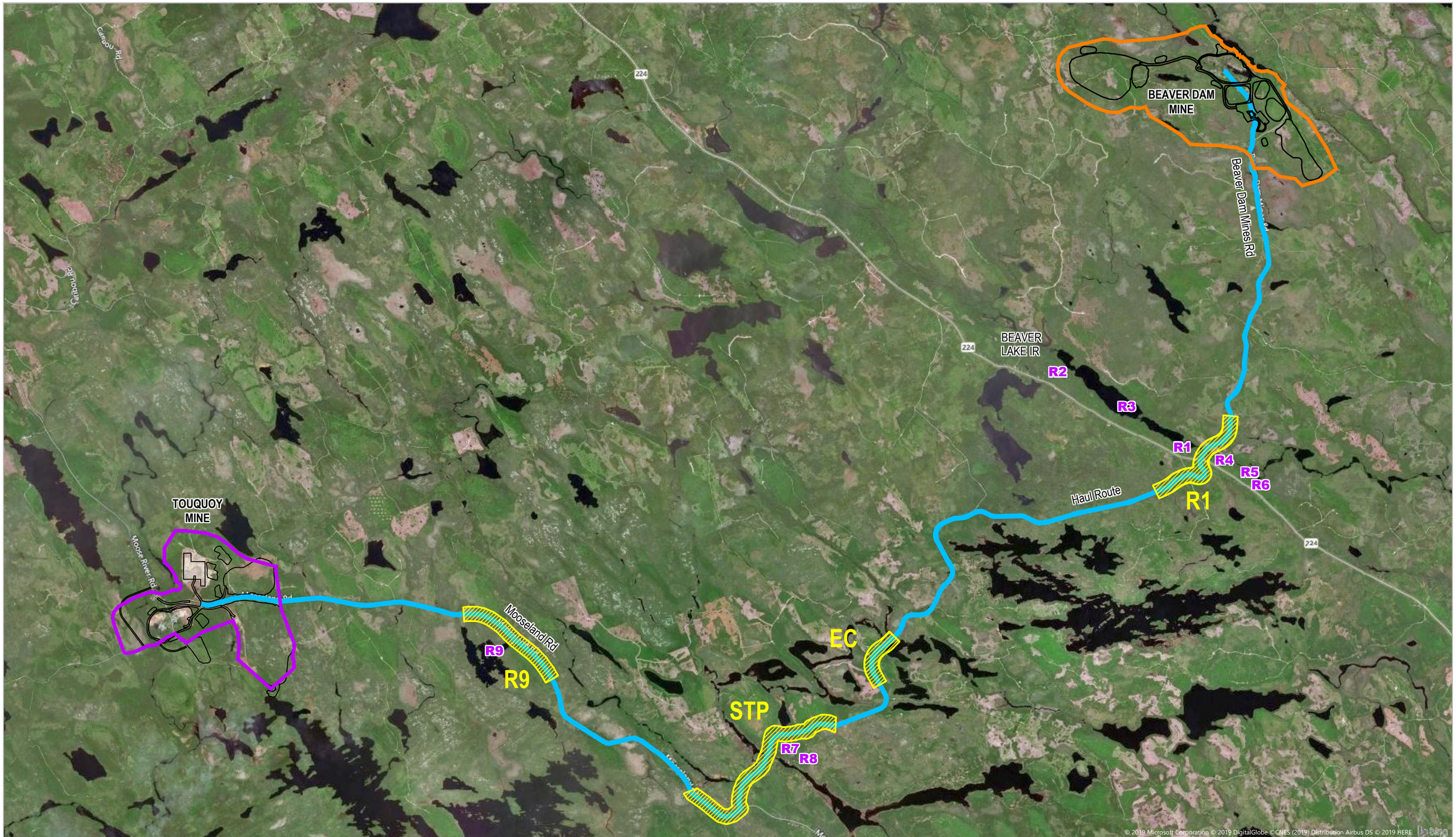
Figure 2 - Terrain Elevations



Terrain Contours — meters

0 1 5 10 30 40 50 60 70 80 90 100 200 231

COMMENTS:	SOURCES: **9**	COMPANY NAME: **Atlantic Gold**	
	RECEPTORS: **4800**	MODELER: **GHD**	
		SCALE: 1:294,220 — 0 — 10 km	
		DATE: **3/2/2020**	PROJECT NO.: **088664**



LEGEND

- HAUL ROUTE
- BEAVER DAM MINE PROPERTY BOUNDARY
- TOUQUOY MINE PROPERTY BOUNDARY

R1 POINT-OF-RECEPTION LOCATION

0 600 1200 1800m

N

GHD

ATLANTIC MINING NS INC.
BEAVER DAM MINE PROJECT
BEAVER DAM, NOVA SCOTIA
AIR EMISSIONS ASSESSMENT TECHNICAL REPORT

ROAD SECTIONS ASSESSED

Project No. **88664**
Date **January 2021**

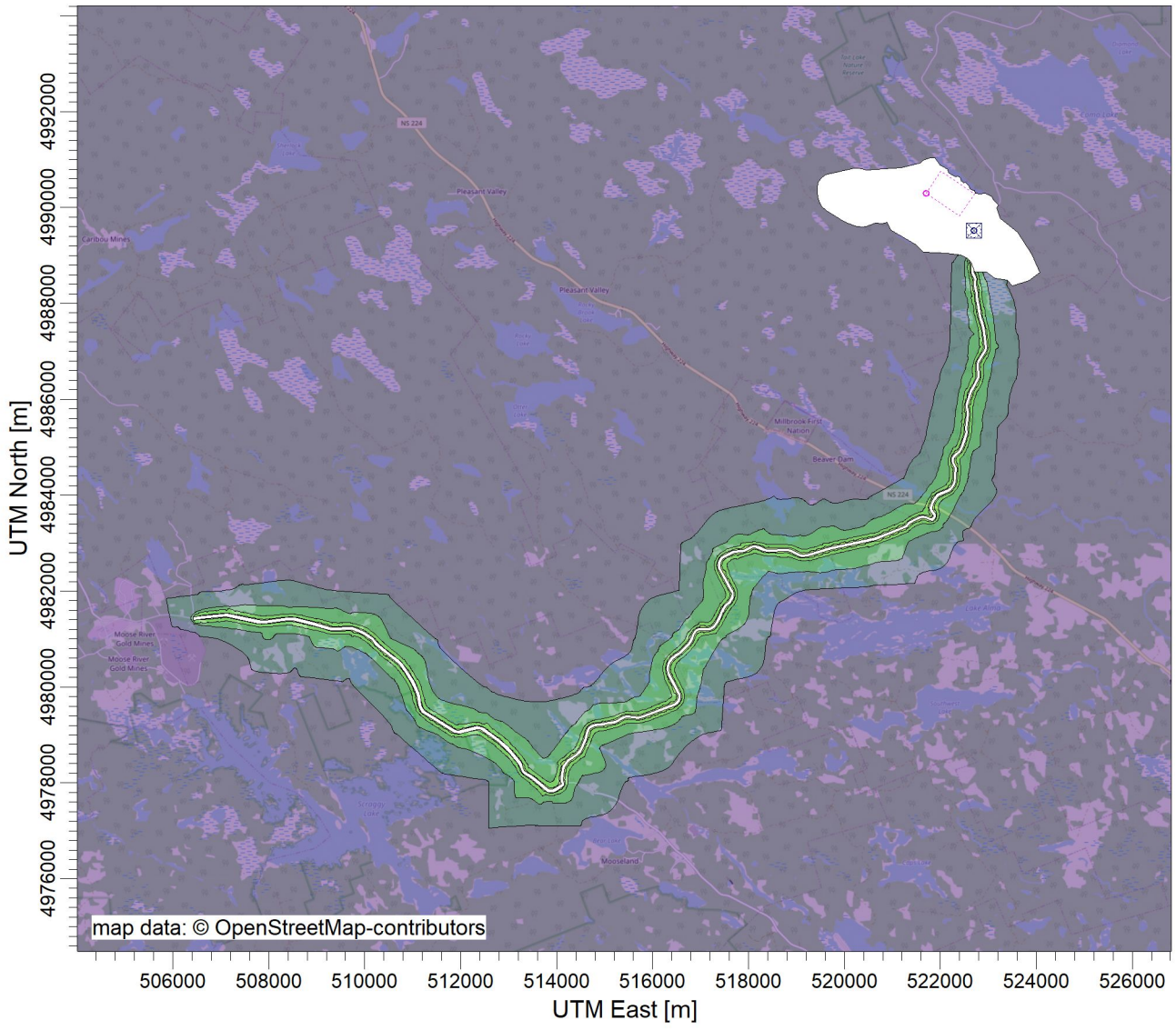
FIGURE 3

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\88000s\88664\88664-reports\88664-53(016)\88664-53(016)GN\88664-53(016)GN-WA002.DWG
Plot Date: 14 January 2021 10:10 AM

Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Accessed: 2019

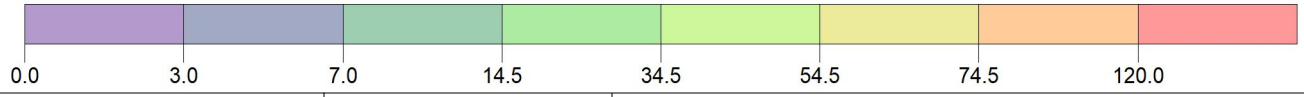
PROJECT TITLE:

Figure 4A - TSP, 24hour
Cumulative Truck Traffic Scenario, 80% Road Dust Mitigation



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL_TSP ug/m^3

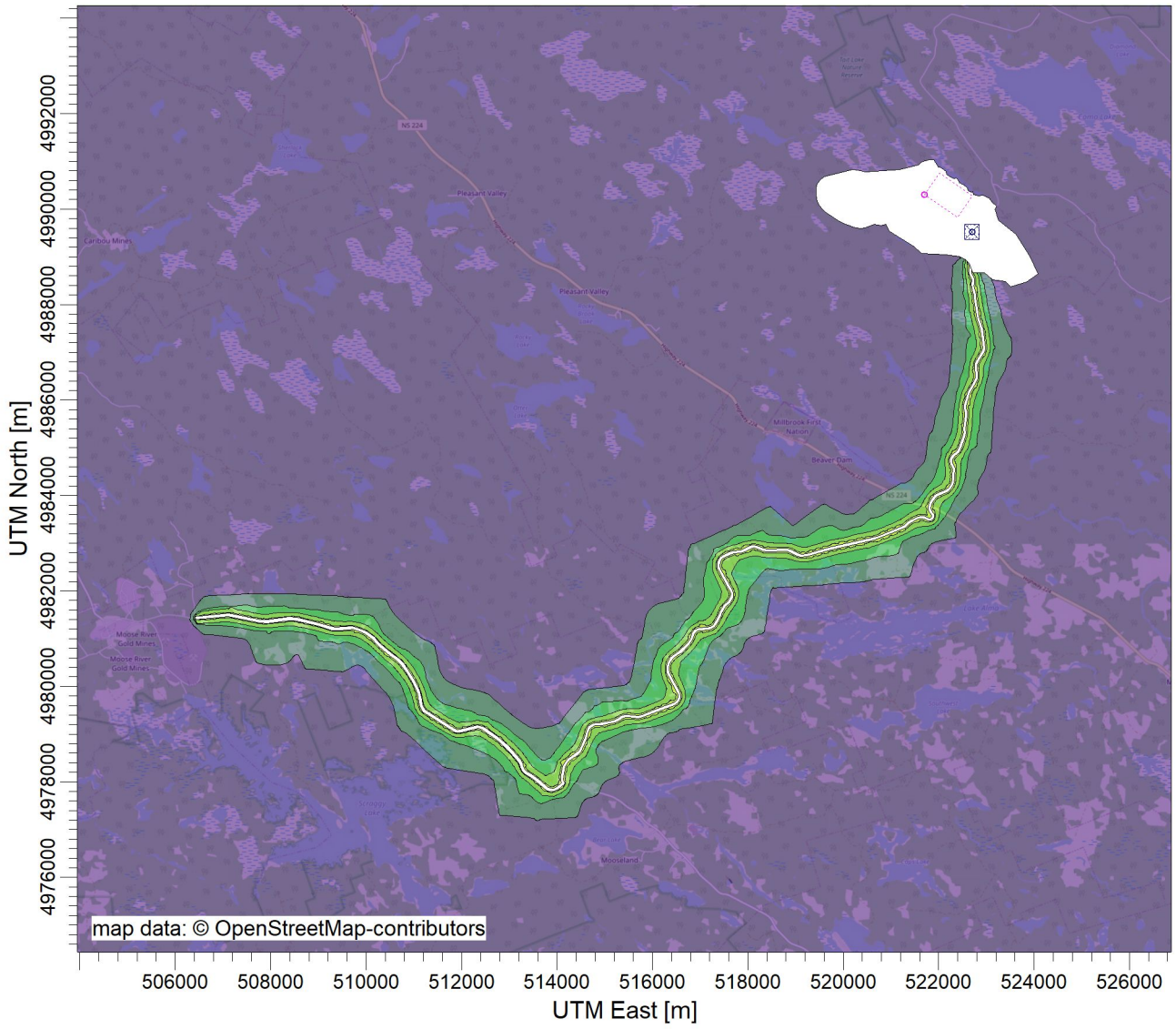
Max: 94.5 [ug/m^3] at (522682.40, 4988743.33)



COMMENTS: 24hour TSP Limit = 120 ug/m3	SOURCES: **9**	COMPANY NAME:	
	RECEPTORS: **4800**	MODELER: **GHD Limited**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:143,461 0 5 km	
	MAX:	DATE: **2/8/2021**	PROJECT NO.: **088664**

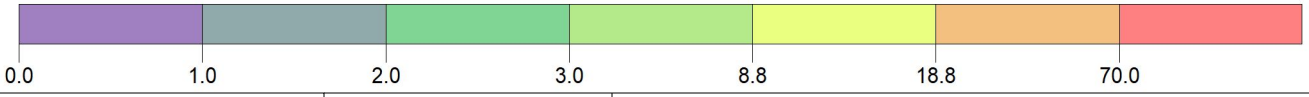
PROJECT TITLE:

Figure 4B - TSP, Annual
Cumulative Truck Traffic Scenario, 80% Road Dust Mitigation



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL_TSP ug/m^3

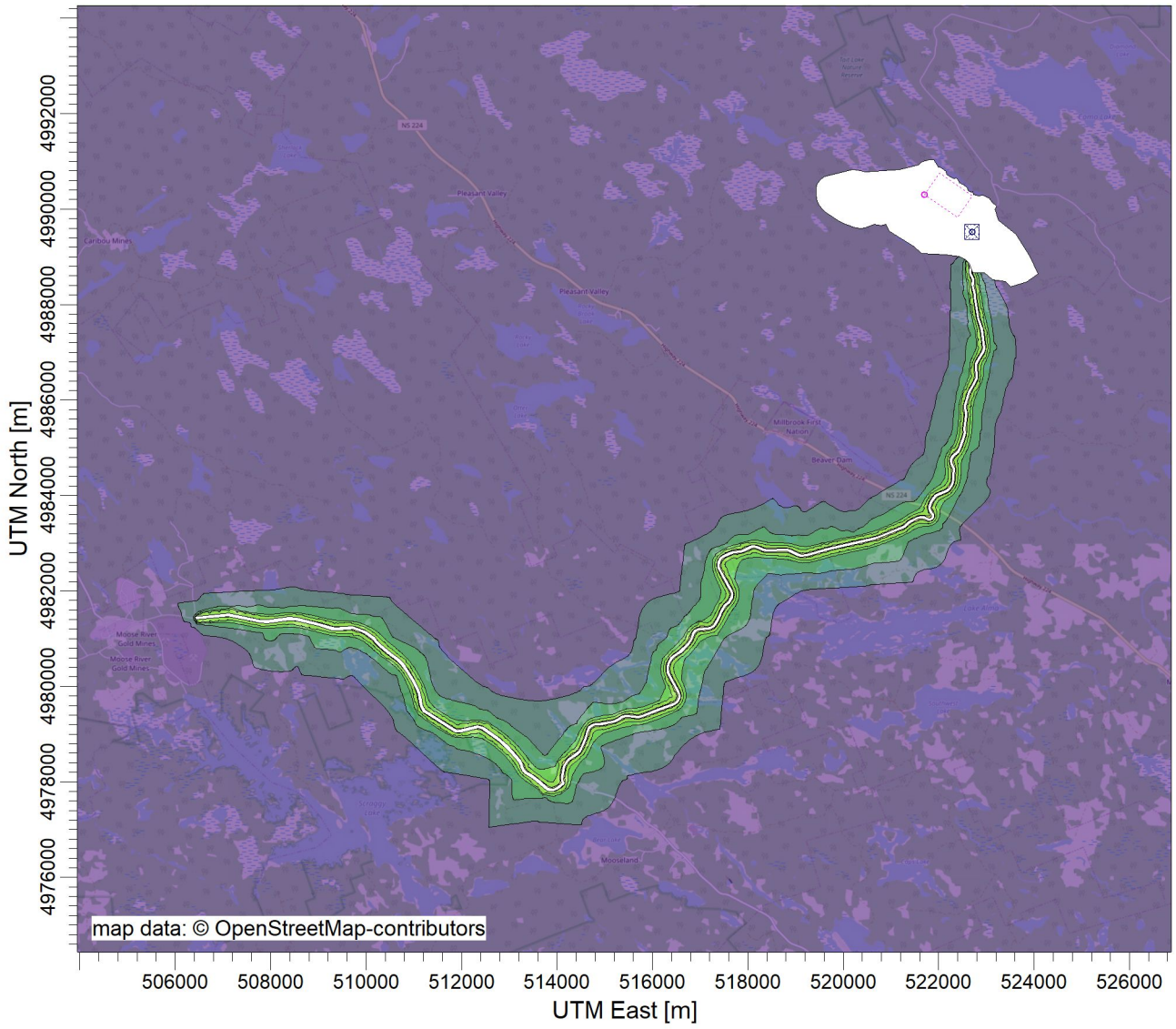
Max: 28.8 [ug/m^3] at (522682.40, 4988743.33)



COMMENTS: Annual TSP Limit = 70 ug/m3	SOURCES: **9**	COMPANY NAME:	
	RECEPTORS: **4800**	MODELER: **GHD Limited**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:144,229 0 5 km	
	MAX:	DATE: **2/8/2021**	PROJECT NO.: **088664**

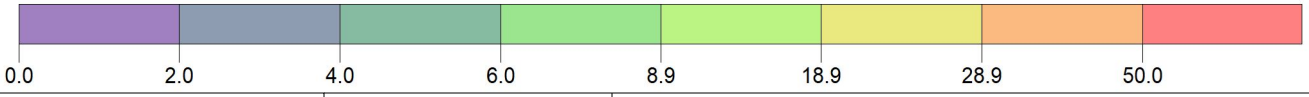
PROJECT TITLE:

Figure 4C - PM10, 24hour
Cumulative Truck Traffic Scenario, 80% Road Dust Mitigation



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL_PM10 ug/m^3

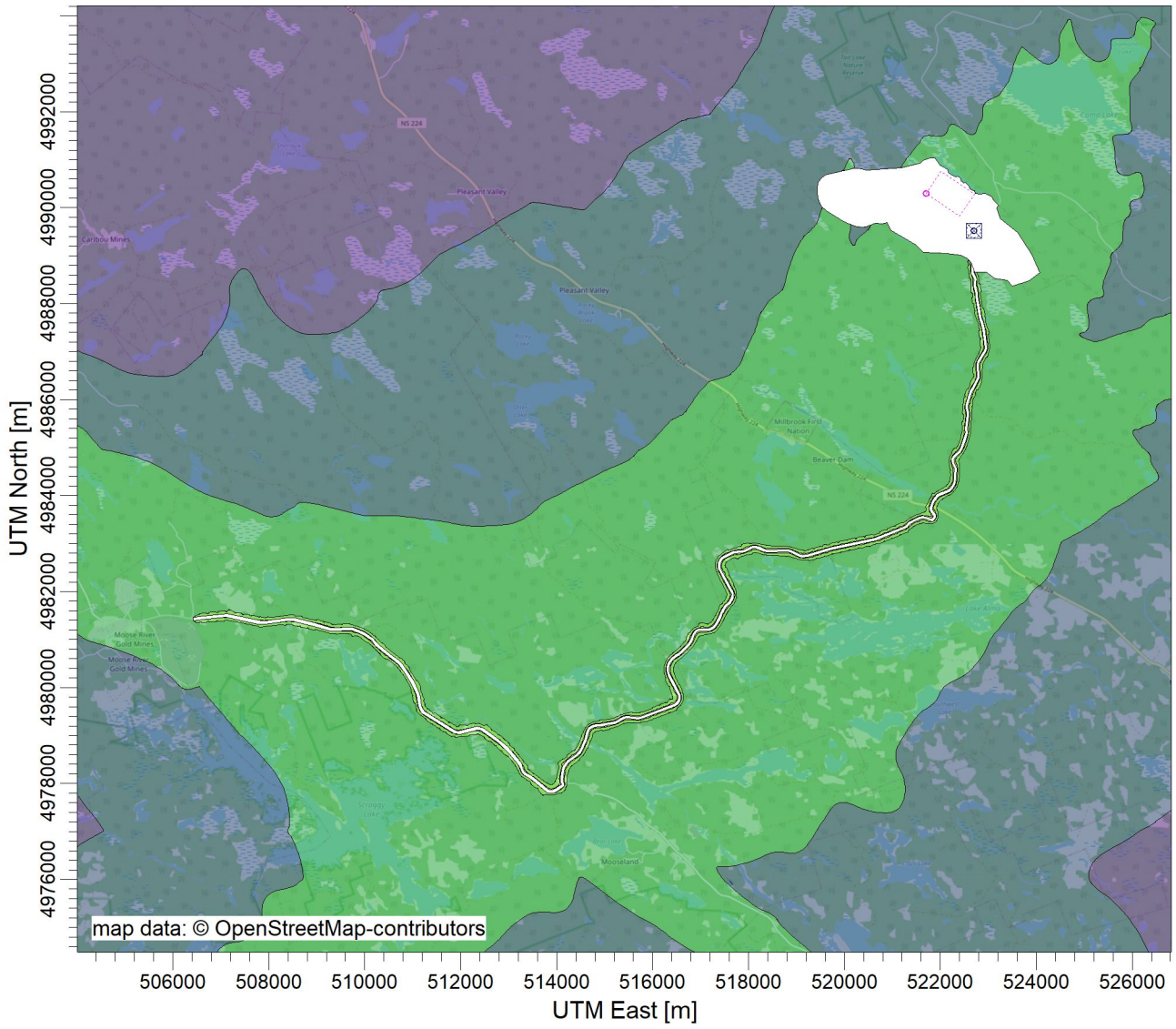
Max: 38.9 [ug/m^3] at (522682.40, 4988743.33)



COMMENTS: 24hour PM10 Limit = 50 ug/m3	SOURCES: **9**	COMPANY NAME:	
	RECEPTORS: **4800**	MODELER: **GHD Limited**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:144,229 0 5 km	
	MAX:	DATE: **2/8/2021**	PROJECT NO.: **088664**

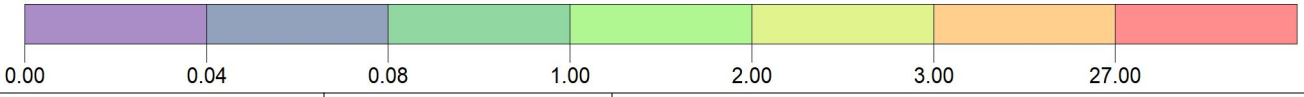
PROJECT TITLE:

Figure 4D - PM2.5, 24hour
Cumulative Truck Traffic Scenario, 80% Road Dust Mitigation



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL_PM25 ug/m^3

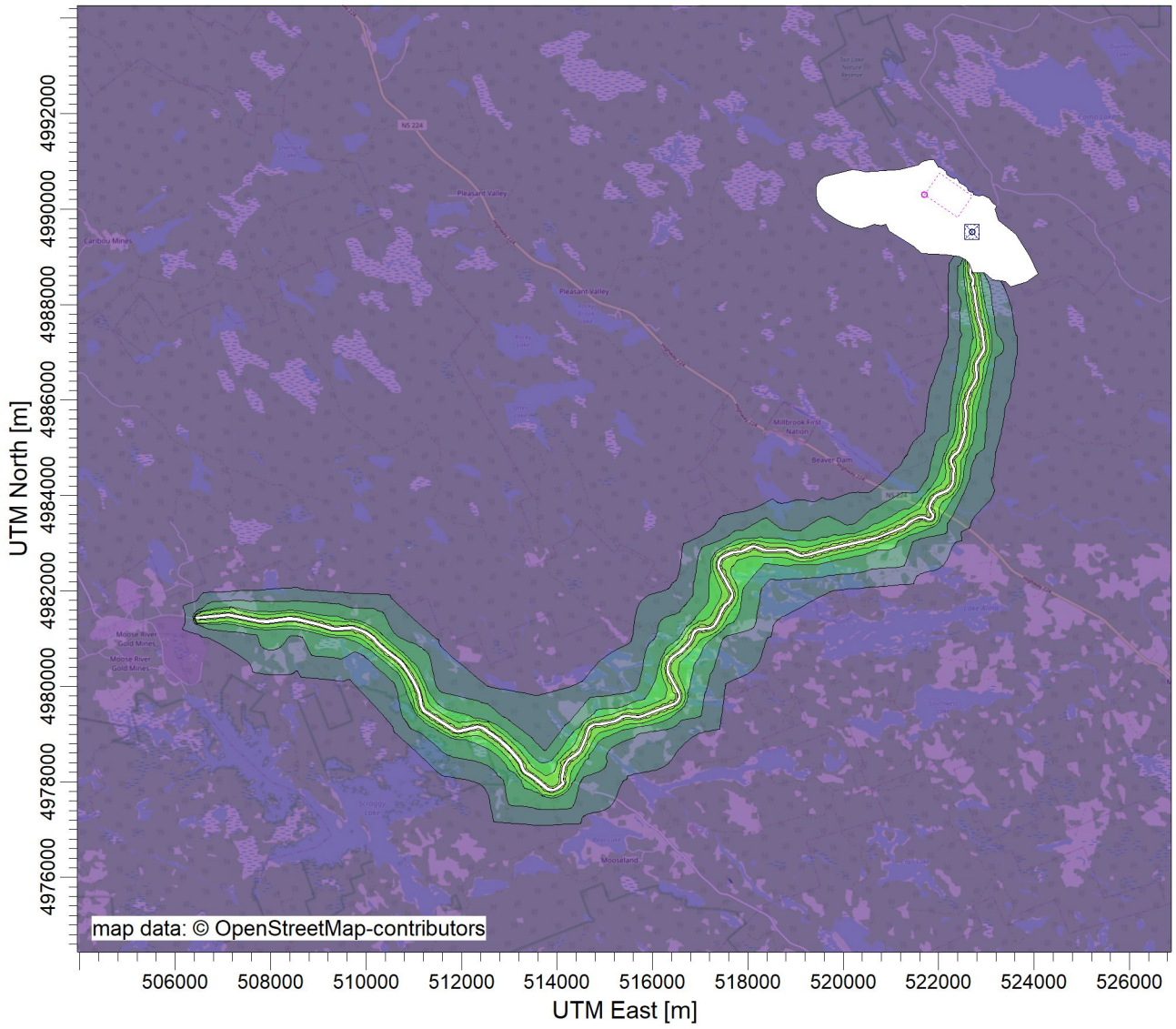
Max: 4.02 [ug/m^3] at (522682.40, 4988743.33)



COMMENTS: 24hour PM2.5 Limit = 27 ug/m3	SOURCES: **9**	COMPANY NAME:	
	RECEPTORS: **4800**	MODELER: **GHD Limited**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:143,461 0 5 km	
	MAX:	DATE: **2/8/2021**	PROJECT NO.: **088664**

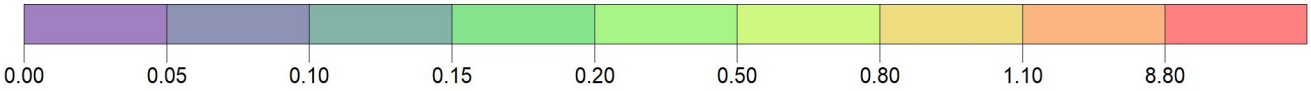
PROJECT TITLE:

Figure 4E - PM2.5, Annual
Cumulative Truck Traffic Scenario, 80% Road Dust Mitigation



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL_PM25 ug/m^3

Max: 1.40 [ug/m^3] at (522682.40, 4988743.33)



COMMENTS: Annual PM2.5 Limit = 8.8 ug/m3	SOURCES: **9**	COMPANY NAME:	
	RECEPTORS: **4800**	MODELER: **GHD Limited**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:144,229 0 5 km	
	MAX:	DATE: **2/8/2021**	PROJECT NO.: **088664**

Table 1

Estimated Particulate Emission Rates - Haul Route between Beaver Dam and Touquoy – 80% Road Dust Mitigation

Variable or Constant	PM2.5	PM10	TSP
k	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45
Surface material silt content (3)	6.4	6.4	6.4
Conversion from lb/VMT to g/VKT	281.9	281.9	281.9

Formula:
EF(g/VKT) = 281.9 (g/VKT / lb/VMT) * k * (S/12)^a * (M/3)^b
ER(g/s) = 281.9 (g/VKT / lb/VMT) * k * (S/12)^a * (M/3)^b * # of trips * Distance (km) / (# of hours per day) / (3600 s/hr)

Truck Counts by Operation:	2-way Trips per day	% of Total Trips
Beaver Dam to Touquoy Mine	95	66.1%
Cochrane Mine vehicles	11	7.7%
Fifteen Mile Stream vehicles	11	7.7%
Service Trucks (3/4 tons truck)	20	13.9%
Forestry	7	4.6%
TOTAL Beaver Dam Traffic	**190**	Sum of 2-way trips * 2 (to generate number of 1-way vehicle trips per day)
TOTAL Cumulative Traffic	**287**	Sum of 2-way trips * 2 (to generate number of 1-way vehicle trips per day)

Variable	Value	Comments
One-Way Road Length (km)	30.7	
Hours of Operation per day	16	7 AM to 11 PM
Weighted Average Vehicle Weight (tonnes)	25.1	Fleet average, all sources, empty and full
Weighted Average Vehicle Weight (tons)	27.6	
Emission Factors (g/VKT)		
TSP	2415.7	
PM10	652.1	
PM2.5	65.2	
% Dust Control	80%	
Site-Only Emission Rates (g/s)		
TSP	48.93	
PM10	13.21	
PM2.5	1.32	
Cumulative Emission Rates (g/s)		
TSP	73.99	
PM10	19.97	
PM2.5	2.00	
Particle Density	1.00	soil or light aggregate
TSP Mass Fraction (for AERMOD)		
TSP	0.73	
PM10	0.24	
PM2.5	0.03	
PM10 Mass Fraction (for AERMOD)		
PM10	0.9	
PM2.5	0.1	

Notes:

Mean Municipal Solid Waste Landfill surface silt loading (USEPA AP-42 Paved Roads Emissions Model - Chapter 13.2.1).

An estimated reduction was applied based on expected mitigation measures.

As noted in USEPA AP-42 Chapter 13.2.1 - Paved Roads and 13.2.2 - Unpaved Roads, 'W' is the mean weight of all vehicles travelling the road. Only one emission factor (E) is to be calculated to represent the 'fleet' average of all vehicles travelling each road.

Silt content used for all material types as a conservative estimate (USEPA AP-42 Unpaved Roads - Chapter 13.2.2).
Converted to g/VKT using a conversion factor of 281.9 as specified in USEPA AP-42 Chapter 13.2.2 - Unpaved roads.
Mean landfill surface silt loading (USEPA AP-42 Paved Roads Emissions Model - Chapter 13.2.1).
Equations used to estimate dust emissions are found in USEPA AP-42 (Chapters 13.2.2 - Unpaved Road).

Tailpipe emissions have not been included as they are insignificant.

November 2020 Update: vehicle trips and payload provided by email (Veronica Chisholm, November 12, 2020): 95 daily round trips

Hours of operation for the haul road are 7 AM to 11 PM.
Forestry truck count is based on 1000 trips per year, 80% of which occur in spring and fall (1000 trips * 80% divided by 120 days for daily average trips)
Service Trucks count is based on 3000 trips per year, 80% of which occur in spring and fall (3000 trips * 80% divided by 120 days for daily average trips)

Weighted average Vehicle weight calculated per the following formula:

$$\text{Weighted Average Vehicle Weight} = (((Average\ tons\ of\ Full\ Load\ vs. Empty\ Load\ Haul\ Trucks) * Number\ of\ Haul\ Trucks) + (3/4\ ton * number\ of\ 3/4\ ton\ trucks))/(Number\ of\ Haul\ Trucks + Number\ of\ 3/4\ ton\ Trucks)$$

Table 2A

Estimated Particulate Emissions from Material Handling - Beaver Dam Mine
Option A - With Crusher

Summary for Pit Emissions	**Emission Rate (g/s) Using AP-42**		
	TSP	**PM10**	**PM2.5**
Conveyors	2.87E-02	9.44E-03	2.67E-03
Truck Loading	6.57E-03	3.29E-03	1.64E-03
TOTAL	**3.53E-02**	**1.27E-02**	**4.31E-03**
Summary for Crusher Volume Source			
Crusher	2.46E-01	1.11E-01	2.05E-02

Open Pit - Conveyors

Source ID	**Max. Production Rate (tonnes/hour)**	**Controlled or Uncontrolled?**	**Species**	**USEPA AP-42 Emission Factor (kg/Mg) (1) (2)**	**Emission Rate (g/s)**
Primary Stacker Conveyor	1,478	Controlled	TSP	7.00E-05	2.87E-02
			PM10	2.30E-05	9.44E-03
			PM2.5	6.50E-06	2.67E-03

Notes
(1) Emission factors are from USEPA AP-42, Section 11.19.2 Crusher Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for controlled conveyor transfer points.
(2) It has been assumed there is only one transfer point.

Open Pit - Truck Loading

Source ID	**Max. Production Rate (tonnes/hour)**	**Controlled or Uncontrolled?**	**Species**	**USEPA AP-42 Emission Factor (kg/Mg)**	**TSP Emission Rate (g/s)**
Truck Loading at Working Face	1,478		TSP	1.60E-05 (1)	6.57E-03
			PM10	8.00E-06	3.29E-03
			PM2.5	4.00E-06 (2)	1.64E-03

Notes:
(1) Emission factors are from USEPA AP-42, Section 11.19.2 Crusher Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for truck unloading of fragmented stone. As the emission factors are given for PM-10 only, the total PM emission factors was assumed to be the PM-10 emission factor multiplied by 2.
(2) Emission factors are from USEPA AP-42, Section 11.19.2 Crusher Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for truck unloading of fragmented stone. As the emission factors are given for PM-10 only, the total PM emission factors was assumed to be the PM-10 emission factor divided by 2.

Crusher

Source ID	**Max. Production Rate (tonnes/hour)**	**Controlled or Uncontrolled?**	**Species**	**USEPA AP-42 Emission Factor (kg/Mg) (1)**	**Emission Rate (g/s)**
Crusher	1,478	Controlled	TSP	6.00E-04	2.46E-01
			PM10	2.70E-04	1.11E-01
			PM2.5	5.00E-05	2.05E-02

Note:

(1) Emission factors for Tertiary Crushing have been used due to a lack of Primary Crushing emission factors. This is a conservative assumption.

Table 2B

Estimated Particulate Emissions from Material Handling - Beaver Dam Mine
Option B - Blasting

Summary for Pit Emissions	**Emission Rate (g/s) Using AP-42**					
	TSP	**PM10**	**PM2.5**	NOx	CO	SO_2
Conveyors	2.87E-02	9.44E-03	2.67E-03	-	-	-
Truck Loading	6.57E-03	3.29E-03	1.64E-03	-	-	-
Blasting	3.77E-01	1.96E-01	1.13E-02	5.33E+01	2.27E+02	6.67E+00
TOTAL	**4.13E-01**	**2.09E-01**	**1.56E-02**	**5.33E+01**	**2.27E+02**	**6.67E+00**

Open Pit - Conveyors

Source ID	**Max. Production Rate (tonnes/hour)**	**Controlled or Uncontrolled?**	**Species**	**USEPA AP-42 Emission Factor (kg/Mg) (1) (2)**	**Emission Rate (g/s)**
Primary Stacker Conveyor	1,478	Controlled	TSP	7.00E-05	2.87E-02
			PM10	2.30E-05	9.44E-03
			PM2.5	6.50E-06	2.67E-03

Note: emission factors from 11.19.2 are for PM100 (see footnotes), this has been used f
Note: Particle density is for gold o

Notes
(1) Emission factors are from USEPA AP-42, Section 11.19.2 Crusher Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for controlled conveyo transfer points.
(2) It has been assumed there is only one transfer point

Open Pit - Truck Loading

Source ID	**Max. Production Rate (tonnes/hour)**	**Controlled or Uncontrolled?**	**Species**	**USEPA AP-42 Emission Factor (kg/Mg)**	**TSP Emission Rate (g/s)**
Truck Loading at Working Face	1,478		TSP	1.60E-05 (1)	6.57E-03
			PM10	8.00E-06	3.29E-03
			PM2.5	4.00E-06 (2)	1.64E-03

Notes:
(1) Emission factors are from USEPA AP-42, Section 11.19.2 Crusher Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for truck unloading of fragmented stone. As the emission factors are given for PM-10 only, the total PM emission factors was assumed to be the PM-10 emission factor multiplied by 2.
(2) Emission factors are from USEPA AP-42, Section 11.19.2 Crusher Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for truck unloading of fragmented stone. As the emission factors are given for PM-10 only, the total PM emission factors was assumed to be the PM-10 emission factor divided by 2.

Blasting

Source ID	**Blasting Rate (Blasts/hour)**	**Blasting Rate (Blasts/Day)**	**Blasting Rate (1) (Blasts/week)**	**(Weeks/Year)**	**Emulsion 100% mixed product Titan XL 1000 (tonnes/blast)**	**Contaminants (1) (2)**	**CAS Number**	**US EPA AP-42 (2) Emission Factor (kg/Mg)**	**Maximum Hourly Emissions (g/s)**	**Daily Average Emission Rate (g/s)**	**Annual Average Emission Rate (g/s)**
Blasting	1	1	3	52	2.40E+01	NOx	10102-44-0	8.00E+00	5.33E+01	2.22E+00	9.52E-01
						CO	630-08-0	3.40E+01	2.27E+02	9.44E+00	4.05E+00
						SO_2	7446--09-5	1.00E+00	6.67E+00	2.78E-01	1.19E-01
						TSP (3)	N/A	32.60 Kg/blast	9.05E+00	3.77E-01	1.62E-01
						PM10 (3)	N/A	16.95 Kg/blast	4.71E+00	1.96E-01	8.41E-02
						PM2.5 (3)	N/A	0.98 Kg/blast	2.72E-01	1.13E-02	4.85E-03

Blasting Details (1)		
Charge per hole	120	Kg/hole
Total Material Mined (Ore + Waste)	50	Mt (2022 - 2027 or 6 years)
Total Blasting amount (Ore + waste)	45	Mt
Number of Holes per Blast	200	Holes/Blast
A (Horizontal blast Area)	2,800	m^2

Sample calculations:
NOx Emission rate Calculaton: Blast/hour * Emulsion (tonnes/blast) * Emission Factor (Kg/Mg) * 1000 g/Kg * 1 hr/3600s = 3.93E+01

Notes:
(1) Information including MSDS received in e-mail dated November 12, 2020 from Veronica Chisholn
(2) AP-42, CH 13.3: Explosives Detonation, Table 13.3-1, ANFO, Construction work, blasting in mine
(3) Based on AP 42 Chapter 11.9 Western Surface Coal Mining - EPA, Table 11.9-2 B, Blasting Emissions

TSP Emission Factor = 0.00022 * (A)^1.5

TSP Emission Factor = 0.00022 * (2800)^1.5	32.60	Kg/blast
PM10 Emission Factor = TSP EF * 0.52	16.95	Kg/blast
PM2.5 Emission Factor = TSP EF * 0.03	0.98	Kg/blast

Table 2C

Estimated Particulate Emissions from Material Handling - Touquoy Processing Facility

Summary	**AP-42 Emission Rate (g/s)**		
	TSP	**PM10**	**PM2.5**
Crusher	9.38E-02	4.22E-02	7.81E-03
ROMTRANS	8.42E-02	3.17E-02	1.58E-02

Crushers

Source ID	**Max. Production Rate (tonnes/hour)**	**Controlled or Uncontrolled?**	**Species**	**USEPA AP-42 Emission Factor (kg/Mg) (1)**	**Emission Rate (g/s)**
Primary Crusher	187.5	Controlled	TSP	0.0006	3.13E-02
			PM10	0.00027	1.41E-02
			PM2.5	5.00E-05	2.60E-03
Secondary Crusher	187.5	Controlled	TSP	0.0006	3.13E-02
			PM10	0.00027	1.41E-02
			PM2.5	5.00E-05	2.60E-03
Tertiary Crusher	187.5	Controlled	TSP	0.0006	3.13E-02
			PM10	0.00027	1.41E-02
			PM2.5	5.00E-05	2.60E-03

Note:
(1) Emission factors for Tertiary Crushing have been used due to a lack of Primary Crushing and Secondary Crushing emission factors. This is a conservative assumption.

ROMTRANS (Transfer operations around Raw Material Storage Pile)

Source ID	**Max. Production Rate (tonnes/hour)**	**Controlled or Uncontrolled?**	**Species**	**USEPA AP-42 Emission Factor (kg/Mg)**	**TSP Emission Rate (g/s)**
Handling, Transfering and Conveying	187.5	Controlled	TSP	1.50E-03	7.81E-02
			PM10	5.50E-04	2.86E-02
			PM2.5	2.75E-04 (1)	1.43E-02
Loading ROM Stockpiles	187.5	Controlled	TSP	1.60E-05 (2)	8.33E-04
			PM10	8.00E-06	4.17E-04
			PM2.5	4.00E-06 (3)	2.08E-04
Unloading from ROM Stockpiles	187.5	Controlled	TSP	1.00E-04 (4)	5.21E-03
			PM10	5.00E-05	2.60E-03
			PM2.5	2.50E-05 (5)	1.30E-03

Notes:
(1) Emission factors are from USEPA AP-42, Section 11.19.1 Crushed Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for Conveyor Transfer Point. As there is no PM-2.5 emission factor, emission factors were assumed to be the PM-10 emission factor divided by 2.
(2) Emission factors are from USEPA AP-42, Section 11.19.1 Crushed Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for Truck Unloading Fragmented Stone. As the emission factors are given for PM-10 only, the total PM emission factors were assumed to be the PM-10 emission factor times 2.
(3) Emission factors are from USEPA AP-42, Section 11.19.1 Crushed Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for Truck Unloading Fragmented Stone. As the emission factors are given for PM-10 only, the PM2.5 emission factors were assumed to be the PM-10 emission factor divided by 2.
(4) Emission factors are from USEPA AP-42, Section 11.19.1 Crushed Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for Truck Loading Conveyor, crushed stone. As the emission factors are given for PM-10 only, the TSP emission factors were assumed to be the PM-10 emission factor times 2.
(5) Emission factors are from USEPA AP-42, Section 11.19.1 Crushed Stone Processing and Pulverized Mineral Processing, Table 11.19.2-1 for Truck Loading Conveyor crushed stone. As the emission factors are given for PM-10 only, the PM2.5 emission factors were assumed to be the PM-10 emission factor divided by 2.

Table 3

Estimated NOx, SO2, and VOC Emissions from Haul Road Truck Traffic

	Trips per Day (1-way)	Road Length (mi, 1-way)	Total Distance (mi/day)	Emission Rate (g/VMT)	Emission Rate (g/s)
Project Only					
NOx	190	19.2	7291.3	15.7	1.9874
SO_2				0.0151	0.0019
VOC				0.655	0.0829
Cumulative					
NOx	287	19.2	11026.4	15.7	3.0055
SO_2				0.0151	0.0029
VOC				0.655	0.1254

Notes:

Emission Rate determined from USEPA Mobile 6.1
Beaver Dam to Touquoy is 30.7 km or approximately 19.2 mi
VMT - Vehicle Miles traveled

Table 4

Background Ambient Air Monitoring Data (NAPS) 2014 - 2016

	Concentration (µg/m^3)					
	25th %ile	**50th %ile**	**75th %ile**	**90th %ile**	**Average**	**Maximum**
24-hour PM_{10}						
Lake Major (030120)	—	—	—	—	—	—
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	3.0	6.0	14.0	31.0	14.1	176.0
Halifax (030118)	—	—	—	—	—	—
Sydney (030310)	—	—	—	—	—	—
24-hour $PM_{2.5}$						
Lake Major (030120)	3.0	5.0	6.0	8.0	5.4	24
Port Hawkesbury (030201)	4.0	5.0	7.0	**9.0**	**5.7**	31
Aylesford Mountain (030701)	4.0	5.0	7.0	8.0	5.7	23
Pictou (030901)	4.0	5.0	8.0	12.0	6.7	37
Norman Wells, NWT (129102)	1.0	2.0	3.0	5.0	3.5	85
Halifax (030118)	—	—	—	—	—	—
Sydney (030310)	1.2	2.1	3.7	5.8	2.8	358.6
1-hour NO_2						
Lake Major (030120)	0.0	1.9	3.8	5.6	2.8	47.0
Port Hawkesbury (030201)	0.0	1.9	3.8	9.4	3.4	79.0
Aylesford Mountain (030701)	0.0	0.0	0.0	1.9	0.6	13.2
Pictou (030901)	0.0	1.9	1.9	5.6	2.2	39.5
Norman Wells, NWT (129102)	0.0	0.0	1.9	7.5	3.6	73.4
Halifax (030118)	11.3	18.8	28.2	**41.4**	21.4	131.6
Sydney (030310)	1.9	3.8	7.5	13.2	6.7	69.6
24-hour NO_2						
Lake Major (030120)	1.9	1.9	3.8	5.6	2.7	11.3
Port Hawkesbury (030201)	0.0	1.9	5.6	7.5	3.3	28.2
Aylesford Mountain (030701)	0.0	0.0	0.0	1.9	0.5	5.6
Pictou (030901)	0.0	1.9	3.8	3.8	2.2	13.2
Norman Wells, NWT (129102)	0.0	1.9	3.8	9.4	3.5	30.1
Halifax (030118)	4.6	7.7	11.6	**17.0**	8.8	54.1
Sydney (030310)	0.8	1.5	3.1	5.4	2.7	28.6
1-hour SO_2						
Lake Major (030120)	0.0	0.0	0.0	2.6	0.4	62.8
Port Hawkesbury (030201)	0.0	0.0	2.6	2.6	1.9	222.5
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	0.0	0.0	2.6	2.6	0.7	5.2
Halifax (030118)	2.6	5.2	5.2	**7.9**	4.8	70.7
Sydney (030310)	0.0	2.6	2.6	5.2	2.3	172.9
24-hour SO_2						
Lake Major (030120)	0.0	0.0	0.0	2.6	0.3	7.9
Port Hawkesbury (030201)	0.0	0.0	2.6	**5.2**	1.9	31.4
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	0.0	0.0	0.0	2.6	0.5	2.6
Halifax (030118)	1.1	2.2	2.2	3.2	2.0	29.1
Sydney (030310)	0.0	1.1	1.1	2.2	0.9	71.0
1/2-hour CO						
Lake Major (030120)	—	—	—	—	—	—
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	—	—	—	—	—	—
Halifax (030118)	306	389	487	**834**	420	6687
Sydney (030310)	264	334	417	695	397	2099
1-hour CO						
Lake Major (030120)	—	—	—	—	—	—
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	—	—	—	—	—	—
Halifax (030118)	252	321	401	**687**	346	5507
Sydney (030310)	218	275	344	573	327	1729
8-hour CO						
Lake Major (030120)	—	—	—	—	—	—
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	—	—	—	—	—	—
Halifax (030118)	141	179	224	**384**	193	3077
Sydney (030310)	122	154	192	320	183	966

Note:

Values in **BOLD** are the identified concentrations used to define "background" for this assessment

Table 5

Beaver Dam Area Background Air Quality Sampling Data

Location	Program Date	24-hour TSP (µg/m^3)	24-hour PM_{10} (µg/m^3)
Location #1	June 5-6, 2008	19.4	9.1
Location #2	June 5-6, 2008	41.7	**13.1**
Location #3	June 5-6, 2008	12.9	7.1
AN#1	October 20-21, 2014	6.9	—
AN#2	October 20-21, 2014	4.6	—
AN#3	October 20-21, 2014	1.7	—
AN#4	October 20-21, 2014	3.9	—
Beaver Dam Road	September 7-8, 2016	9.7	—
Mooseland Road	September 7-8, 2016	5.8	—
Location # 1 (Touquoy)	3-Jan-07	11.6	—
Location # 2 (Touquoy)	3-Jan-07	10.5	—
Location # 3 (Touquoy)	4-Jan-07	14	—
Location # 4 (Touquoy)	4-Jan-07	16.1	—
Location # 5 (Touquoy)	4-Jan-07	14.4	—
Fifteen Mile Stream	November 2017	9.6	9.2
Fifteen Mile Stream	November 2017	14	9.5
Cochrane Hill	November 2017	10.7	9.7
Cochrane Hill	1-Nov-17	10.7	10.5
Average		**12.1**	9.7
90th percentile		**17.1**	—

Notes:

Additional measurements of TSP and PM_{10} from similar sites Fifteen Mile Stream and Cochrane Hill in Nova Scotia have been obtained for this assessment

Values in **BOLD** are the identified concentrations used to define "background" for this assessment.

Table 6

Ambient Air Quality Criteria

Substance	Averaging Period	Nova Scotia (A) ($\mu g/m^3$)	Ontario (B) ($\mu g/m^3$)	CAAQS (C) ($\mu g/m^3$)	Selected for this Assessment ($\mu g/m^3$)
TSP	24-hour	120	120	—	120
	Annual (1)	70	—	—	70
PM_{10}	24-hour (2)	—	50	—	50
$PM_{2.5}$	24-hour (3)	—	—	28	27
	24-hour (2020) (3)	—	—	27	
	Annual (4)	—	—	10	8.8
	Annual (2020) (4)	—	—	8.8	
NO_2	1-hour	400	400	—	
	1-hour (2020) (5)	—	—	112.9	400
	1-hour (2025) (5)	—	—	79.0	
	24-hour	—	200	—	200
	Annual	100	—	—	
	Annual (2020)	—	—	32.0	100
	Annual (2025)	—	—	22.6	
SO_2	1-hour	900	690	—	
	1-hour (2020) (6)	—	—	183.2	900
	1-hour (2023)	—	100	—	
	1-hour (2025) (6)	—	—	170.1	
	24-hour	300	275	—	300
	24-hour (2023)	—	—	—	
	Annual	60	—	—	
	Annual (2020)	—	—	13.1	60
	Annual (2023)	—	10	—	
	Annual (2025)	—	—	10.5	
VOC	—	—	—	—	—
Deposition	Annual (7)	—	84	—	84
CO	1/2 hour	—	6000	—	6000
CO	1-hour	34600	—	22900	34600
CO	8-hour	12700	—	10305	12700

Notes:

(A) https://novascotia.ca/just/regulations/regs/envairqt.htm Accessed February, 2019.
(B) MECP (Ontario), 2018
(C) https://www.ccme.ca/en/resources/air Accessed February, 2019.
(1) Geometric mean.
(2) Interim standard, never implemented.
(3) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
(4) The 3-year average of the annual average concentrations.
(5) Three-year average of the annual 98th percentile of the NO2 daily-maximum 1-hour average concentrations
(6) The 3-year average of the annual 99th percentile of the SO2 daily-maximum 1-hour average concentrations.
(7) Ontario's 2018 ACB List Dustfall monthly Criteria of 7 ug/m3 annualized by multiplying by 12 months

Table 7A

Particulate Modeling Results for Project Only and Cumulative Truck Traffic Scenarios – 80% Road Dust Mitigation

Project Only Truck Traffic - Summary of Results from Road Sections Model Runs						
Road Section:		R1	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	54.64	17.10	71.74	120	59.78%
TSP	annual	17.46	12.10	29.56	70	42.23%
PM10	24 hour	23.41	13.10	36.51	50	73.03%
PM2.5	24 hour	2.51	9.00	11.51	27	42.61%
PM2.5	annual	0.96	5.70	6.66	8.8	75.73%
Deposition (g/m2/year)	annual	136.29	-	-	-	-
Road Section:		STP	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	53.93	17.10	71.03	120	59.19%
TSP	annual	17.35	12.10	29.45	70	42.08%
PM10	24 hour	23.59	13.10	36.69	50	73.38%
PM2.5	24 hour	2.52	9.00	11.52	27	42.68%
PM2.5	annual	0.98	5.70	6.68	8.8	75.90%
Deposition (g/m2/year)	annual	133.81	-	-	-	-
Road Section:		East Corner (EC)	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	46.93	17.10	64.03	120	53.36%
TSP	annual	15.25	12.10	27.35	70	39.07%
PM10	24 hour	20.35	13.10	33.45	50	66.89%
PM2.5	24 hour	2.16	9.00	11.16	27	41.35%
PM2.5	annual	0.82	5.70	6.52	8.8	74.12%
Deposition (g/m2/year)	annual	121.91	-	-	-	-
Road Section:		R9	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	44.25	17.10	61.35	120	51.13%
TSP	annual	14.89	12.10	26.99	70	38.56%
PM10	24 hour	19.86	13.10	32.96	50	65.92%
PM2.5	24 hour	2.12	9.00	11.12	27	41.18%
PM2.5	annual	0.83	5.70	6.53	8.8	74.18%
Deposition (g/m2/year)	annual	116.44	-	-	-	-
Cumulative Truck Traffic - Summary of Results from Road Sections Model Runs						
Road Section		R1	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	82.63	17.10	99.73	120	83.11%
TSP	annual	26.41	12.10	38.51	70	55.01%
PM10	24 hour	35.41	13.10	48.51	50	97.02%
PM2.5	24 hour	3.79	9.00	12.79	27	47.37%
PM2.5	annual	1.46	5.70	7.16	8.8	81.34%
Deposition (g/m2/year)	annual	206.10	-	-	-	-
Road Section		STP	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	81.55	17.10	98.65	120	82.21%
TSP	annual	26.25	12.10	38.35	70	54.78%
PM10	24 hour	35.68	13.10	48.78	50	97.55%
PM2.5	24 hour	3.82	9.00	12.82	27	47.46%
PM2.5	annual	1.48	5.70	7.18	8.8	81.61%
Deposition (g/m2/year)	annual	202.35	-	-	-	-
Road Section		East Corner (EC)	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	70.97	17.10	88.07	120	73.39%
TSP	annual	23.07	12.10	35.17	70	50.24%
PM10	24 hour	30.77	13.10	43.87	50	87.74%
PM2.5	24 hour	3.27	9.00	12.27	27	45.46%
PM2.5	annual	1.25	5.70	6.94	8.8	78.92%
Deposition (g/m2/year)	annual	184.36	-	-	-	-
Road Section		R9	Background	Maximum + Background	Assessment Criteria	% of criteria
		Max POI Concentration (ug/m3)	ug/m3	ug/m3	ug/m3	%
TSP	24 hour	66.92	17.10	84.02	120	70.02%
TSP	annual	22.52	12.10	34.62	70	49.46%
PM10	24 hour	30.04	13.10	43.14	50	86.27%
PM2.5	24 hour	3.20	9.00	12.20	27	45.20%
PM2.5	annual	1.25	5.70	6.95	8.8	79.00%
Deposition (g/m2/year)	annual	176.10	-	-	-	-

Max POI after Meteorological Anomalies removed.

Table 7B

NO2, SO2 and VOC Modeling Results for Project Only and Cumulative Truck Traffic Scenarios

Road Section - R1							
Project Only							
Contaminant	**Maximum Predicted Concentration (µg/m³)**	**Averaging Period**	**Assessment Criteria (µg/m³)**	**Percentage of Assessment Criteria (%)**	**Background Concentration (µg/m³)**	**Modelled Concentration and Background Concentration (µg/m³)**	**Percentage of Limit (%)**
NO_2	10.6	1-hour	400	3%	41.4	52.0	13%
	5.9	24-hour	200	3%	17.0	22.9	11%
	2.6	Annual	100	3%	3.3	5.9	6%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.4	1-hour	—	—	—	—	—
	0.2	24-hour	—	—	—	—	—
	0.1	Annual	—	—	—	—	—

Cumulative							
Contaminant	**Maximum Predicted Concentration (µg/m³)**	**Averaging Period**	**Assessment Criteria (µg/m³)**	**Percentage of Assessment Criteria (%)**	**Background Concentration (µg/m³)**	**Modelled Concentration and Background Concentration (µg/m³)**	**Percentage of Limit (%)**
NO_2	16.1	1-hour	400	4%	41.4	57.5	14%
	9.0	24-hour	200	4%	17.0	26.0	13%
	4.0	Annual	100	4%	3.3	7.3	7%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.7	1-hour	—	—	—	—	—
	0.4	24-hour	—	—	—	—	—
	0.2	Annual	—	—	—	—	—

Road Section - R9							
Project Only							
Contaminant	**Maximum Predicted Concentration (µg/m³)**	**Averaging Period**	**Assessment Criteria (µg/m³)**	**Percentage of Assessment Criteria (%)**	**Background Concentration (µg/m³)**	**Modelled Concentration and Background Concentration (µg/m³)**	**Percentage of Limit (%)**
NO_2	14.2	1-hour	400	4%	41.4	55.6	14%
	6.7	24-hour	200	3%	17.0	23.7	12%
	2.2	Annual	100	2%	3.3	5.5	6%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.6	1-hour	—	—	—	—	—
	0.3	24-hour	—	—	—	—	—
	0.1	Annual	—	—	—	—	—

Cumulative							
Contaminant	**Maximum Predicted Concentration (µg/m³)**	**Averaging Period**	**Assessment Criteria (µg/m³)**	**Percentage of Assessment Criteria (%)**	**Background Concentration (µg/m³)**	**Modelled Concentration and Background Concentration (µg/m³)**	**Percentage of Limit (%)**
NO_2	21.5	1-hour	400	5%	41.4	62.9	16%
	10.2	24-hour	200	5%	17.0	27.2	14%
	3.4	Annual	100	3%	3.3	6.7	7%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.9	1-hour	—	—	—	—	—
	0.4	24-hour	—	—	—	—	—
	0.1	Annual	—	—	—	—	—

Table 7B

NO2, SO2 and VOC Modeling Results for Project Only and Cumulative Truck Traffic Scenarios

Road Section - STP							
Project Only							
Contaminant	**Maximum Predicted Concentration ($\mu g/m^3$)**	**Averaging Period**	**Assessment Criteria ($\mu g/m^3$)**	**Percentage of Assessment Criteria (%)**	**Background Concentration ($\mu g/m^3$)**	**Modelled Concentration and Background Concentration ($\mu g/m^3$)**	**Percentage of Limit (%)**
NO_2	10.2	1-hour	400	3%	41.4	51.6	13%
	6.0	24-hour	200	3%	17.0	23.0	12%
	2.7	Annual	100	3%	3.3	5.9	6%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.4	1-hour	—	—	—	—	—
	0.3	24-hour	—	—	—	—	—
	0.1	Annual	—	—	—	—	—
Cumulative							
Contaminant	**Maximum Predicted Concentration ($\mu g/m^3$)**	**Averaging Period**	**Assessment Criteria ($\mu g/m^3$)**	**Percentage of Assessment Criteria (%)**	**Background Concentration ($\mu g/m^3$)**	**Modelled Concentration and Background Concentration ($\mu g/m^3$)**	**Percentage of Limit (%)**
NO_2	15.4	1-hour	400	4%	41.4	56.8	14%
	9.1	24-hour	200	5%	17.0	26.1	13%
	4.0	Annual	100	4%	3.3	7.3	7%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.6	1-hour	—	—	—	—	—
	0.4	24-hour	—	—	—	—	—
	0.2	Annual	—	—	—	—	—

Road Section - East Corner							
Project Only							
Contaminant	**Maximum Predicted Concentration ($\mu g/m^3$)**	**Averaging Period**	**Assessment Criteria ($\mu g/m^3$)**	**Percentage of Assessment Criteria (%)**	**Background Concentration ($\mu g/m^3$)**	**Modelled Concentration and Background Concentration ($\mu g/m^3$)**	**Percentage of Limit (%)**
NO_2	9.8	1-hour	400	2%	41.4	51.2	13%
	5.0	24-hour	200	3%	17.0	22.0	11%
	2.2	Annual	100	2%	3.3	5.5	6%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.4	1-hour	—	—	—	—	—
	0.2	24-hour	—	—	—	—	—
	0.1	Annual	—	—	—	—	—
Cumulative							
Contaminant	**Maximum Predicted Concentration ($\mu g/m^3$)**	**Averaging Period**	**Assessment Criteria ($\mu g/m^3$)**	**Percentage of Assessment Criteria (%)**	**Background Concentration ($\mu g/m^3$)**	**Modelled Concentration and Background Concentration ($\mu g/m^3$)**	**Percentage of Limit (%)**
NO_2	14.9	1-hour	400	4%	41.4	56.3	14%
	7.7	24-hour	200	4%	17.0	24.7	12%
	3.4	Annual	100	3%	3.3	6.7	7%
SO_2	0.0	1-hour	900	<1%	7.9	7.9	<1%
	0.0	24-hour	300	<1%	5.2	5.2	2%
	0.0	Annual	60	<1%	1.9	1.9	3%
VOC	0.6	1-hour	—	—	—	—	—
	0.3	24-hour	—	—	—	—	—
	0.1	Annual	—	—	—	—	—

Max POI after Meteorological Anomalies removed.

Table 8

Particulate Modeling Results at Sensitive Receptors for Project Only and Cummulative Truck Traffic Scenarios – 80% Road Dust Mitigation

80% Dust Mitigation

R1 - 9 Beaver Dam Mines Road

Project Only

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	9.1	24 hour	120	8%	17.1	26.2	22%
	13.0	Annual	70	19%	12.1	25.1	36%
PM_{10}	4.6	24 hour	50	9%	13.1	17.7	35%
$PM_{2.5}$	0.5	24 hour	27	2%	9.0	9.5	35%
	0.2	Annual	8.8	2%	5.7	5.9	66%
Deposition ($g/m^2/yr$)	16.9	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	13.8	24 hour	120	11%	17.1	30.9	26%
	19.7	Annual	70	28%	12.1	31.8	45%
PM_{10}	7.0	24 hour	50	14%	13.1	20.1	40%
$PM_{2.5}$	0.8	24 hour	27	3%	9.0	9.8	36%
	0.2	Annual	8.8	3%	5.7	5.9	67%
Deposition ($g/m^2/yr$)	25.5	Annual	—	—	—	—	—

R2 - 4112 Highway 224 (Beaver Lake IR)

Project Only

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	0.6	24 hour	120	<1%	17.1	17.7	15%
	0.1	Annual	70	<1%	12.1	12.2	17%
PM_{10}	0.4	24 hour	50	<1%	13.1	13.5	27%
$PM_{2.5}$	0.0	24 hour	27	<1%	9.0	9.0	33%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	0.1	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	0.9	24 hour	120	<1%	17.1	18.0	15%
	0.2	Annual	70	<1%	12.1	12.3	18%
PM_{10}	0.6	24 hour	50	1%	13.1	13.7	27%
$PM_{2.5}$	0.1	24 hour	27	<1%	9.0	9.1	34%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	0.2	Annual	—	—	—	—	—

R3 – 4115 Highway 224 (Cottage on Crown land)

Project Only

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	1.1	24 hour	120	<1%	17.1	18.2	15%
	0.4	Annual	70	<1%	12.1	12.5	18%
PM_{10}	0.6	24 hour	50	1%	13.1	13.7	27%
$PM_{2.5}$	0.1	24 hour	27	<1%	9.0	9.1	34%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	0.5	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	1.6	24 hour	120	1%	17.1	18.7	16%
	0.6	Annual	70	<1%	12.1	12.7	18%
PM_{10}	0.9	24 hour	50	2%	13.1	14.0	28%
$PM_{2.5}$	0.1	24 hour	27	<1%	9.0	9.1	34%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	0.7	Annual	—	—	—	—	—

Table 8

Particulate Modeling Results at Sensitive Receptors for Project Only and Cummulative Truck Traffic Scenarios – 80% Road Dust Mitigation

80% Dust Mitigation

R4 – 3492 Highway 224 (Hobbs Property)

Project Only

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	13.6	24 hour	120	11%	17.1	30.7	26%
	20.9	Annual	70	30%	12.1	33.0	47%
PM_{10}	7.1	24 hour	50	14%	13.1	20.2	40%
$PM_{2.5}$	0.8	24 hour	27	3%	9.0	9.8	36%
	0.2	Annual	8.8	3%	5.7	5.9	67%
Deposition ($g/m^2/yr$)	27.0	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	20.5	24 hour	120	17%	17.1	37.6	31%
	31.5	Annual	70	45%	12.1	43.6	62%
PM_{10}	10.7	24 hour	50	21%	13.1	23.8	48%
$PM_{2.5}$	1.1	24 hour	27	4%	9.0	10.1	38%
	0.3	Annual	8.8	4%	5.7	6.0	69%
Deposition ($g/m^2/yr$)	40.9	Annual	—	—	—	—	—

R5 – 3379 Highway 224 (McLeod Property)

Project Only

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	2.7	24 hour	120	2%	17.1	19.8	16%
	2.7	Annual	70	4%	12.1	14.8	21%
PM_{10}	1.4	24 hour	50	3%	13.1	14.5	29%
$PM_{2.5}$	0.2	24 hour	27	<1%	9.0	9.2	34%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	3.5	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	4.1	24 hour	120	3%	17.1	21.2	18%
	4.1	Annual	70	6%	12.1	16.2	23%
PM_{10}	2.2	24 hour	50	4%	13.1	15.3	31%
$PM_{2.5}$	0.2	24 hour	27	<1%	9.0	9.2	34%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	5.3	Annual	—	—	—	—	—

R6 - 3373 Highway 224

Project Only

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	2.3	24 hour	120	2%	17.1	19.4	16%
	2.3	Annual	70	3%	12.1	14.4	21%
PM_{10}	1.2	24 hour	50	2%	13.1	14.3	29%
$PM_{2.5}$	0.1	24 hour	27	<1%	9.0	9.1	34%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	3.0	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	3.5	24 hour	120	3%	17.1	20.6	17%
	3.4	Annual	70	5%	12.1	15.5	22%
PM_{10}	1.9	24 hour	50	4%	13.1	15.0	30%
$PM_{2.5}$	0.2	24 hour	27	<1%	9.0	9.2	34%
	0.0	Annual	8.8	<1%	5.7	5.7	65%
Deposition ($g/m^2/yr$)	4.5	Annual	—	—	—	—	—

Table 8

Particulate Modeling Results at Sensitive Receptors for Project Only and Cummulative Truck Traffic Scenarios – 80% Road Dust Mitigation

80% Dust Mitigation

R7 - Deepwood Estates Property

Project Only

Contaminant	Maximum Predicted Concentration (µg/m³)	Averaging Period	Assessment Criteria (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Modelled Concentration and Background Concentration (µg/m³)	Percentage of Limit (%)
Total Suspended Particulate	24.3	24 hour	120	20%	17.1	41.4	35%
	6.7	Annual	70	10%	12.1	18.8	27%
PM_{10}	12.4	24 hour	50	25%	13.1	25.5	51%
$PM_{2.5}$	1.3	24 hour	27	5%	9.0	10.3	38%
	0.4	Annual	8.8	5%	5.7	6.1	69%
Deposition (g/m²/yr)	49.4	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration (µg/m³)	Averaging Period	Assessment Criteria (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Modelled Concentration and Background Concentration (µg/m³)	Percentage of Limit (%)
Total Suspended Particulate	36.8	24 hour	120	31%	17.1	53.9	45%
	10.1	Annual	70	14%	12.1	22.2	32%
PM_{10}	18.7	24 hour	50	37%	13.1	31.8	64%
$PM_{2.5}$	2.0	24 hour	27	7%	9.0	11.0	41%
	0.6	Annual	8.8	7%	5.7	6.3	72%
Deposition (g/m²/yr)	74.8	Annual	—	—	—	—	—

R8 - Musqudoboit Lumber Co Ltd. Property

Project Only

Contaminant	Maximum Predicted Concentration (µg/m³)	Averaging Period	Assessment Criteria (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Modelled Concentration and Background Concentration (µg/m³)	Percentage of Limit (%)
Total Suspended Particulate	4.2	24 hour	120	4%	17.1	21.3	18%
	1.0	Annual	70	1%	12.1	13.1	19%
PM_{10}	2.4	24 hour	50	5%	13.1	15.5	31%
$PM_{2.5}$	0.3	24 hour	27	<1%	9.0	9.3	34%
	0.1	Annual	8.8	<1%	5.7	5.8	66%
Deposition (g/m²/yr)	7.0	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration (µg/m³)	Averaging Period	Assessment Criteria (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Modelled Concentration and Background Concentration (µg/m³)	Percentage of Limit (%)
Total Suspended Particulate	6.4	24 hour	120	5%	17.1	23.5	20%
	1.5	Annual	70	2%	12.1	13.6	19%
PM_{10}	3.6	24 hour	50	7%	13.1	16.7	33%
$PM_{2.5}$	0.4	24 hour	27	1%	9.0	9.4	35%
	0.1	Annual	8.8	1%	5.7	5.8	66%
Deposition (g/m²/yr)	10.5	Annual	—	—	—	—	—

R9 - 5579 Mooseland Road

Project Only

Contaminant	Maximum Predicted Concentration (µg/m³)	Averaging Period	Assessment Criteria (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Modelled Concentration and Background Concentration (µg/m³)	Percentage of Limit (%)
Total Suspended Particulate	11.4	24 hour	120	9%	17.1	28.5	24%
	3.0	Annual	70	4%	12.1	15.1	22%
PM_{10}	6.1	24 hour	50	12%	13.1	19.2	38%
$PM_{2.5}$	0.7	24 hour	27	2%	9.0	9.7	36%
	0.2	Annual	8.8	2%	5.7	5.9	67%
Deposition (g/m²/yr)	21.9	Annual	—	—	—	—	—

Cumulative

Contaminant	Maximum Predicted Concentration (µg/m³)	Averaging Period	Assessment Criteria (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Modelled Concentration and Background Concentration (µg/m³)	Percentage of Limit (%)
Total Suspended Particulate	17.2	24 hour	120	14%	17.1	34.3	29%
	4.6	Annual	70	7%	12.1	16.7	24%
PM_{10}	9.2	24 hour	50	18%	13.1	22.3	45%
$PM_{2.5}$	1.0	24 hour	27	4%	9.0	10.0	37%
	0.3	Annual	8.8	3%	5.7	6.0	68%
Deposition (g/m²/yr)	33.1	Annual	—	—	—	—	—

Table 9A

Estimated Maximum Particulate Concentrations at the Beaver Dam and Touquoy Mine Sites
Option A - Crusher - 80% Dust Mitigation on Road

Beaver Dam Mine Site

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	55.4	24 hour	120	46%	17.1	72.5	60%
	21.0	Annual	70	30%	12.1	33.1	47%
PM_{10}	25.9	24 hour	50	52%	13.1	39.0	78%
$PM_{2.5}$	2.9	24 hour	27	11%	9.0	11.9	44%
	1.2	Annual	8.8	14%	5.7	6.9	79%
Deposition (g/m2/year)	96.7	Annual	-	-	-	-	-

Touquoy Mine Site

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	3.1	24 hour	120	3%	17.1	20.2	17%
	1.1	Annual	70	2%	12.1	13.2	19%
PM_{10}	3.1	24 hour	50	6%	13.1	16.2	32%
$PM_{2.5}$	1.3	24 hour	27	5%	9.0	10.3	38%
	0.4	Annual	8.8	5%	5.7	6.1	70%

Table 9B

Estimated Maximum Particulate Concentrations at the Beaver Dam and Touquoy Mine Sites
Option B - Blasting - 80% Dust mitigation on road

Beaver Dam Mine Site

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	55.3	24 hour	120	46%	17.1	72.4	60%
	21.0	Annual	70	30%	12.1	33.1	47%
PM_{10}	25.9	24 hour	50	52%	13.1	39.0	78%
$PM_{2.5}$	2.9	24 hour	27	11%	9.0	11.9	44%
	1.2	Annual	8.8	14%	5.7	6.9	79%
Deposition (g/m2/year)	96.5	Annual	-	-	-	-	-
NO2	74.9	1-hour	400	19%	41.4	116.3	29%
NO2	0.5	24 hour	200	<1%	17.0	17.5	9%
NO2	0.2	Annual	100	<1%	3.3	3.4	3%
CO	386.6	1/2 hour	6000	6%	834	1220.8	20%
CO	318.4	1-hour	34600	<1%	687	1005.4	3%
CO	177.9	8-hour	12700	1%	384	561.7	4%
SO_2	9.4	1-hour	900	1%	7.9	17.3	2%
SO_2	0.1	24-hour	300	<1%	5.2	5.3	2%
SO_2	0.0	Annual	60	<1%	1.9	1.9	3%

Touquoy Mine Site

Contaminant	Maximum Predicted Concentration ($\mu g/m^3$)	Averaging Period	Assessment Criteria ($\mu g/m^3$)	Percentage of Assessment Criteria (%)	Background Concentration ($\mu g/m^3$)	Modelled Concentration and Background Concentration ($\mu g/m^3$)	Percentage of Limit (%)
Total Suspended Particulate	3.1	24 hour	120	3%	17.1	20.2	17%
	1.1	Annual	70	2%	12.1	13.2	19%
PM_{10}	3.1	24 hour	50	6%	13.1	16.2	32%
$PM_{2.5}$	1.3	24 hour	27	5%	9.0	10.3	38%
	0.4	Annual	8.8	5%	5.7	6.1	70%

Appendix A
Material Safety Data Sheet

DYNO
Dyno Nobel

MATERIAL SAFETY DATA SHEET
DYNO NOBEL INC.
11TH FLOOR CROSSROADS TOWER
SALT LAKE CITY, UTAH 84144
PHONE: 801-364-4800 FAX: 801-328-6452
E-MAIL: DNNA.HSE@AM.DYNONOBEL.COM
FOR 24 HOUR EMERGENCY CALL 800-424-9300

MSDS# 1052

DATE: 11/11/03

Supersedes MSDS
1052 05/09/03

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): DYNO GOLD® C, DYNOGOLD® C EXTRA
DYNO GOLD® C LITE, DYNO GOLD® C LITE SUPER
DYNO GOLD® CS LITE
DYNO GOLD®, DYNO GOLD® LITE
DYNO GOLD® B, DYNO GOLD® B LITE
HD
1116, 1126P, 1136P, 1146P
IREMEX 362, IREMEX 562, IREMEX 762, IREMEX 764
RJ5
RG1-A
RUG-1 (Canada Only)
DX 5007; DX 5010
TITAN® XL 1000
TITAN® 1000, TITAN® 1000 G

Product Class: Bulk Emulsion
Product Appearance & Odor: Translucent to opaque, viscous liquid. May be silvery in color. May have fuel odor.
DOT Hazard Shipping Description: As Transported:
Oxidizing Liquid, n.o.s. (Ammonium Nitrate) 5.1 UN3139 II
After Blending with Density Control Agent On-site:
Explosive, Blasting, Type E 1.5D UN0332 II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	TLV-ACGIH
Ammonium Nitrate	6484-52-2	30-80	No Value Established
Sodium Nitrate	7631-99-4	0-15	No Value Established
Calcium Nitrate	10124-37-5	0-35	No Value Established
Fuel Oil	68476-34-6	0-10	No Value Established
Mineral Oil	64742-35-4	0-7	5 mg/m^3
Aluminum *	7429-90-5	0-5	10 mg/m^3

* The hazardous ingredients marked with an asterisk are not found in the majority of listed products.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations.

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable

Vapor Pressure: Not Applicable

Vapor Density: (Air = 1) Not Applicable

Density: 0.8 - 1.5 g/cc

Percent Volatile by Volume: <30

Solubility in Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.

Evaporation Rate (Butyl Acetate = 1): <1

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable **Flammable Limits:** Not Applicable

Extinguishing Media: (See Special Fire Fighting Procedures Section)

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Unusual Fire and Explosion Hazards: May explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: Can cause irritation, redness and tearing.

Skin: Prolonged contact may cause irritation.

Ingestion: Large amounts may be harmful if swallowed.

Inhalation: May cause dizziness, nausea or intestinal upset.

Systemic or Other Effects: None known.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Remove contaminated clothing. Wash with soap and water.

Ingestion: Seek medical attention.

Inhalation: Remove to fresh air. If irritation persists, seek medical attention.

Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Conditions to Avoid: Keep away from heat, flame, ignition sources and strong shock.

Materials to Avoid (Incompatibility): Corrosives (strong acids and strong bases or alkalis).

Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO)

Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.

Respiratory Protection: None normally required.

Protective Clothing: Gloves and work clothing that reduce skin contact are suggested.

Eye Protection: Safety glasses are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State and local regulations. Keep away from heat, flame, ignition sources and strong shock.

Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.

Other Precautions: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

SECTION X - SPECIAL INFORMATION

The reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372 may become applicable if the physical state of this product is changed to an aqueous solution. If an aqueous solution of this product is manufactured, processed, or otherwise used, the nitrate compounds category and ammonia listings of the previously referenced regulation should be reviewed.

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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