

Appendix D: Compliance Monitoring Reports

**APPENDIX D.1: Q1-Q3 2023 ATMOSPHERIC COMPLIANCE MONITORING
PROGRAM REPORT – DORIS AND MADRID PROJECTS**

Q1-Q3 2023 Atmospheric Compliance Monitoring Program Report

Doris and Madrid Projects

Final Report

March 2024

Prepared for:
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Project Number: 160930542





Executive Summary

This report presents the results of ambient air quality, dustfall, and meteorological monitoring conducted by Agnico Eagle Mines Limited (Agnico Eagle) at the Doris and Madrid sites (the Sites) from January 2023 to September 2023 as outlined under the Air Quality Management Plan (AQMP; TMAC 2017, 2019). To calculate annual average concentrations for requisite parameters, data from October to December 2022 (already reported by Agnico Eagle) were also utilized and are included in this report.

The 2023 monitoring program included the following:

- Dustfall sampling at six locations in the vicinity of the Doris site utilizing dustfall canisters for the period June - September 2023.
- Dustfall sampling at nine locations in the vicinity of the Madrid site utilizing dustfall canisters for the same period and methodology as for the Doris site.
- Snow core sampling for dustfall at six locations in the vicinity of the Doris site utilizing snow cores over the period October 18, 2022 (first snow fall) to April 14 – 16, 2023.
- Snow core sampling for dustfall at seven locations in the vicinity of the Madrid Site utilizing snow cores over the same period.
- Total Suspended Particulate (TSP) and particulate less than 2.5 microns (PM_{2.5}) using continuous monitors at one location at the Doris site.
- Monitoring of NO₂ using a continuous monitor at one location at the Doris site.
- Meteorological monitoring for wind speed, wind direction, temperature, relative humidity, snowfall, rainfall, solar radiation and barometric pressure at one location. The meteorological data were used in the interpretation of the air quality measurements.

The results of the Q1-Q3 2023 ambient monitoring program were compared to:

1. Relevant ambient air quality Standards, Objectives and Guidelines (SOGs)
2. Dustfall predictions downwind of the Tailings Impoundment Area included in the 2016 Doris North Project Certificate and Type A Water License Amendment Application (the 2016 Amendment, TMAC 2016)
3. The Madrid Project dispersion model predictions for dustfall presented in the Final Environmental Impact Statement (FEIS) Air Quality Assessment (Nunami Stantec, 2017)

A summary of the results and conclusions of the Q1-Q3 2023 compliance monitoring program are presented in Table ES-1-1.

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Table ES-1-1: Summary of Q1-Q3 Compliance Monitoring Results

Measurement Parameter	Monitoring Period	Averaging Period	Results	Report Section	Action
Dustfall using Snow Core Sampling – Doris Site	October 2022 - April 2023	30-day	<ul style="list-style-type: none"> All measurements are below the ambient air quality objective for industrial and commercial areas. Three measurements are above the maximum dustfall prediction in the 2017 FEIS for the Madrid-Boston Project (2017 FEIS) with two of these measurements within the expected range of variability for the dispersion modelling predictions and the third was likely contaminated, resulting in it being biased high. All other measurements are less than the relevant dustfall predictions in the 2016 Amendment/2017 FEIS. 	4.1.1	Results Satisfactory
Dustfall using Snow Core Sampling – Madrid Site	October 2022 - April 2023	30-day	<ul style="list-style-type: none"> All measurements are below the ambient air quality objective for industrial and commercial areas. All measurements are less than the maximum dustfall predictions in the 2017 FEIS for the Madrid-Boston Project (2017 FEIS). 	4.1.2	Results Satisfactory
Dustfall using Canisters – Doris Sites	June - September 2023	30-day	<ul style="list-style-type: none"> All dustfall measurements around the Doris site are below the ambient air quality objective for industrial and commercial areas. All measurements are below the maximum dustfall prediction in the 2016 Amendment. 	4.2.1	Results Satisfactory

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Measurement Parameter	Monitoring Period	Averaging Period	Results	Report Section	Action
Dustfall using Canisters – Madrid Sites	June - September 2023	30-day	<ul style="list-style-type: none"> All dustfall measurements around the Madrid site are below the ambient air quality objective for industrial and commercial areas. All measurements are below the maximum dustfall prediction in the 2017 FEIS for the Madrid Boston Project. 	4.2.2	Results Satisfactory
TSP	January - September 2023	24-hour	<ul style="list-style-type: none"> One measurement is above the ambient air quality objective. This exceedance is likely attributable to forest fires in the Northwest Territories. The same measurement is above the maximum 2017 FEIS prediction. 	4.3.1	Results Satisfactory
	October 2022 - September 2023	annual	<ul style="list-style-type: none"> A valid annual average could not be calculated due to monitor installation/operation complications resulting in the annual data recovery rate being less than the target level. 	4.3.1	Agnico Eagle is reviewing the monitoring data and instrument logs to assess potential causes and will implement remedial measures
PM _{2.5}	October 2022 - September 2023	24-hour	<ul style="list-style-type: none"> The measured 98th percentile concentration is below the Canadian Ambient Air Quality Standards (CAAQS). The measured 98th percentile concentration is above the maximum 2017 FEIS prediction but is within the expected range of variability for the dispersion modelling predictions and includes measurements likely influenced by forest fires. 	4.3.2	Results Satisfactory
	October 2022 - September 2023	annual	<ul style="list-style-type: none"> Measured annual average concentration is below the CAAQS. Measured annual average concentration is less than 	4.3.2	Results Satisfactory

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Measurement Parameter	Monitoring Period	Averaging Period	Results	Report Section	Action
			the maximum 2017 FEIS prediction.		
NO ₂	January - September 2023	1-hour	<ul style="list-style-type: none"> All measurements are below the ambient air quality objective. The 98th percentile of the measured daily maximum 1-hour average NO₂ concentrations from October 2022 to September 2023 is below the CAAQS. 	4.4	Results Satisfactory
	January - September 2023	24-hour	<ul style="list-style-type: none"> All measurements are below the ambient air quality objective. 	4.4	
	October 2022 - September 2023	annual	<ul style="list-style-type: none"> The annual average is below the Government of Nunavut (GN) ambient air quality objective and the CAAQS. 	4.4	

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Appendix A	Continuous Particulate Monitor Calibration Records
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Abbreviations

µg	Microgram
AAAQO	Alberta Ambient Air Quality Objective
Agnico Eagle	Agnico Eagle Mines Limited
ALS	ALS Laboratory Group
AMSL	Above Mean Sea Level
ASTM	ASTM International
AWR	All-weather road
BC	British Columbia
BC MOE	British Columbia Ministry of Environment
CAAQS	Canadian Ambient Air Quality Standards
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
cm	Centimetre
dm ²	Square decimetre (equal to 100 square centimetres)
ECCC	Environment and Climate Change Canada
ERM	ERM Consultants Canada Ltd.
FEIS	Final Environmental Impact Statement
GN	Government of Nunavut
hr	Hour
km	Kilometre
m	Metre
m ²	Square metre
m ³	Cubic metre
mg	Milligram

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mg/dm ² /d	Milligrams per square decimeter per day
mg/100-cm ² /30-days	Milligram per 100 square centimetres per 30-day period
mg/L	Milligram per Litre
NAPS	National Air Pollution Surveillance Program
NIRB	Nunavut Impact Review Board
Nunami Stantec	Nunami Stantec Ltd.
NWB	Nunavut Water Board
PM	Particulate Matter
PM ₁₀	Particulate Matter less than 10 µm in diameter
PM _{2.5}	Particulate Matter less than 2.5 µm in diameter
Project	Doris North Project or Site
Q1 – Q3 2023	January to September 2023
Sites	Doris and Madrid Sites
SOGs	Standards, Objectives and Guidelines
SWE	Snow-Water Equivalent
TIA	Tailings Impoundment Area (Doris)
TMAC	TMAC Resources Inc.
TSP	Total Suspended Particulate
US	United States
US EPA	United States Environmental Protection Agency

1 Introduction

This report presents the results of ambient air quality, dustfall, and meteorological monitoring conducted by Agnico Eagle Mines Limited (Agnico Eagle) at the Doris and Madrid Projects (the Sites) from January 2023 to September 2023 as outlined under the Air Quality Management Plan (AQMP; TMAC 2017/2019). To calculate annual average concentrations for requisite parameters, data from October to December 2022 (already reported by Agnico Eagle) were also utilized in this report.

Agnico Eagle commissioned new continuous monitors measuring Total Suspended Particulate (TSP) and particulate matter smaller than 2.5 microns (PM_{2.5}) in November 2021 and decommissioned the Partisol samplers previously used. Agnico Eagle commissioned a new continuous monitor measuring NO₂ at monitoring location DFA1 at the Doris site in October 2021. Monitoring for dustfall around the Doris and Madrid Sites continued using the same methods/locations as in previous years.

The 2023 monitoring program included the following:

- Dustfall sampling at six locations in the vicinity of the Doris site utilizing dustfall canisters for the period June - September 2023.
- Dustfall sampling at nine locations in the vicinity of the Madrid site utilizing dustfall canisters for June - September 2023.
- Snow core sampling for dustfall at six locations in the vicinity of the Doris site over the period October 18, 2022 (first snow fall) to April 14 – 16, 2023.
- Total Suspended Particulate (TSP) and particulate less than 2.5 microns (PM_{2.5}) using continuous particulate monitors at one location at the Doris site.
- Nitrogen Dioxide (NO₂) using a continuous monitor at one location at the Doris site.
- Meteorological monitoring for wind speed, wind direction, temperature, relative humidity, snowfall, rainfall, solar radiation, and barometric pressure at one location. The meteorological data were used in the interpretation of the air quality measurements.

The results of the Quarter 1 to Quarter 3 2023 (Q1-Q3 2023) ambient monitoring were compared to:

- Relevant ambient air quality Standards, Objectives and Guidelines (SOGs)
- Dustfall predictions downwind of the Tailings Impoundment Area included in the 2016 Doris North Project Certificate and Type A Water License Amendment Application (the 2016 Amendment, TMAC 2016)
- The Madrid Project dispersion model predictions for dustfall presented in the Final Environmental Impact Statement (FEIS) Air Quality Assessment (Nunami Stantec, 2017).

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Section 1: Introduction

March 2024

Madrid North construction in Q1-Q3 2023 corresponded with the operations phase air quality assessment presented in the Madrid-Boston Project 2017 FEIS (Nunami Stantec, 2017), so this study was used for comparison to the Madrid measurements. Activities at the Doris Site in Q1-Q3 2023 also most closely corresponded to the operations phase of the Madrid-Boston Project, so the Doris measurements were compared to the 2017 FEIS and the 2016 Amendment modelling of TIA deposition. Operations at both the Doris and Madrid North sites were reduced in 2023 due to the mine being placed in Care and Maintenance.

Dust suppression activities occurred on the Doris Camp roads, the tailings impoundment area road, the airstrip, the Roberts Bay Road, and the Windy Road during the summer months. Dust suppressants were applied on an as-needed basis between May 17, 2023, and September 19, 2023.

2 Ambient Monitoring Data Comparisons

The results of the Q1-Q3 2023 ambient monitoring program were compared to relevant air quality standards, objectives and guidelines and Doris / Madrid site dispersion modelling studies, as detailed in the following sections.

2.1 Air Quality Standards, Objectives and Guidelines

Ambient air quality Standards, Objectives and Guidelines (SOGs) have been developed by the Canadian federal government and individual provinces and territories to assist or mandate the management of common air contaminants.

The assessment incorporates the Nunavut Environmental Guideline for Ambient Air Quality (Government of Nunavut 2011). Nunavut does not have guidelines or standards for some of the air contaminants. In these cases, guidelines, objectives, or standards from the federal government (CCME 2020), British Columbia (BC) government (BC MOE 2020a) and Alberta government (Alberta Environment and Parks 2016) have been used.

The ambient air quality SOGs that are used in this report are summarized in Table 2-1.

2.2 Dispersion Model Prediction Comparisons

Air quality dispersion models employ assumptions to simplify the random behaviour of the atmosphere into short periods of average behaviour. These assumptions limit the capability of the model to replicate every individual meteorological event. To compensate for these simplifications, a full year of meteorological data are applied to evaluate a wide range of possible conditions. Regulatory models are also designed to have a bias toward over estimation of contaminant concentrations (e.g., to be conservative under most conditions).

The 2017 FEIS modelling is expected to be conservative because the emission rates used in the modeling were conservatively estimated based on a combination of emission factors, engineering estimates and maximum production levels, and the dispersion modeling is expected to be conservative. The dispersion modelling utilized a maximum emissions scenario that was expected to result in the maximum predicted concentration of each contaminant outside of the modelled property boundary. On a day-to-day basis, the actual Doris-Madrid operations will likely differ from the maximum emissions scenario and therefore measured concentrations may differ from the model predictions for the location of the monitor.

2.2.1 Doris Site

During Q1-Q3 2023, the Doris site had reduced operations. In October 2021 Agnico Eagle stopped Doris milling operations. In February 2022, Agnico Eagle announced its decision to place the Doris Mine into Care and Maintenance and suspend production at the Hope Bay Project. Of the scenarios assessed for the Doris site in the 2017 FEIS (construction and operation), these activities more closely correspond to the operations phase of the Madrid-Boston Project (as the construction scenario considered the Doris site operating plus construction activities that would generate additional emissions relative to the operations scenario). The 2017 FEIS predicted deposition rates in the vicinity of the monitors that varied between 7.4 and 25.7 mg/100-cm²/30-days.

The 2016 Doris North Project Certificate and Type A Water License Amendment Application (the 2016 Amendment) also contained predictions for dustfall. The Amendment predicted that Tailings Impoundment Area (TIA) maximum monthly dustfall contributions (modelled over three years) would be more than 53 mg/100-cm²/30-days up to 250 m from the TIA and would drop to 2.1 mg/100-cm²/30-days at approximately 1 km from the TIA (ERM 2016). These predictions were for dustfall resulting from the subaerial deposition of tailings in the TIA only and did not include dust emissions from any other sources (e.g., unpaved roads) or project phases (e.g., construction), nor did these predictions include background (non-project related) dust contributions.

Dustfall predictions for the Doris Site were compared to the 2016 Amendment/2017 FEIS modelling for dustfall locations downwind of the TIA and the 2017 FEIS modelling for all other dustfall locations.

Maximum Doris site FEIS predictions are presented in Table 2-1.

Table 2-1: Ambient Air Quality Standards, Objectives and Guidelines Compared to 2017 FEIS Predictions

Contaminant	Units	Averaging Period	Nunavut Ambient Air Quality Guidelines ^a	Guidelines or Standards from Other Government Agencies		Maximum 2017 FEIS Predictions at Monitoring Sites	
				Value	Agency	Doris	Madrid
Total Suspended Particulate (TSP)	µg/m ³	24-hour	120	-	-	69.9	-
		Annual (geometric mean)	60	-	-	13.3	-
Particulate Matter <2.5 µm diameter (PM _{2.5})	µg/m ³	24-hour	30	27 ^b	CAAQS ^d	12.1	-
	µg/m ³	Annual	-	8.8 ^c	CAAQS ^d	5.0	-
Dust deposition	mg/100-cm ² /30 days	30-day	-	158 (commercial and industrial areas)	Alberta Ambient Air Quality Objectives and Guidelines ^e	7.4 - 27.5	10.6 - 54

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Section 2: Ambient Monitoring Data Comparisons
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Contaminant	Units	Averaging Period	Nunavut Ambient Air Quality Guidelines ^a	Guidelines or Standards from Other Government Agencies		Maximum 2017 FEIS Predictions at Monitoring Sites	
				Value	Agency	Doris	Madrid
Nitrogen Dioxide	µg/m ³ (ppb)	1-hour	400 (212)	113 (60) ^f	CAAQS ^h	253 (134)	-
	µg/m ³ (ppb)	24-hour	200 (106)	-	-	174 (92)	-
	µg/m ³ (ppb)	Annual	60 (32)	23 (12) ^g	CAAQS ^h	65.4 (34.6)	-

NOTES:

Dash (-) = not applicable

a: Reference: Government of Nunavut 2011

b: The 24-hour PM_{2.5} value is calculated from the 3-year average of the annual 98th percentile of the daily 24-hour average concentration.

c: The annual PM_{2.5} value is calculated from the 3-year average of the annual average concentrations.

d: Canadian Ambient Air Quality Standards for O₃ and PM_{2.5}. Reference: CCME 2020.

e: Reference: Alberta Environment and Parks 2020.

f: The 1-hour NO₂ value is calculated from the 3-year average of the 98th percentile of the daily maximum 1-hour average concentrations over a calendar year.

g: The annual NO₂ value is calculated from the average of all 1-hour average concentrations over a single calendar year.

h: Canadian Ambient Air Quality Standard for NO₂. Reference: CCME 2020.

2.2.2 Madrid Site

Dustfall measurements made in the vicinity of the Madrid North site (under care and maintenance in Q1 – Q3 2023) were compared to operations predictions made in the air quality modelling study in the 2017 FEIS for the Madrid-Boston Project (Nunami Stantec, 2017). Operations phase dustfall predictions in the 2017 FEIS at the locations of the Madrid dust fall monitoring sites ranged from 10.6 to 54 mg/100-cm²/30-days.

3 Monitoring Program Description

3.1 Monitor Siting Criteria

Nunavut does not have established siting requirements for ambient air samplers. Therefore, the siting criteria from the BC MOE (BC MOE 2020b) and the United States Environmental Protection Agency (US EPA 2009) were used. The monitoring locations were selected based on the following criteria:

- A stable 120 VAC power source is available (for continuous monitoring)
- The sampler is not in an area of future infrastructure development
- The sampler inlet is mounted at a height of 2 to 15 m above ground level (for continuous monitoring)
- The locations are accessible year-round
- The sampler is away from structures, vegetation, and topographic features
- Dustfall samplers are sited up and down wind of the surface facilities and zones of high activity, considering the dominant wind direction during the summer months
- The samplers are more than 20 m away from structures, vegetation, and topographic features

3.2 Dustfall

Dustfall is the measure of airborne particulate that has settled onto a given surface. The main dust generation sources will be from wind erosion from tailings facilities, the use of the crushers, and the movement of vehicles and large equipment on site. The dustfall monitoring program measures the quantities of dust deposited near project sites. Dustfall is monitored using dustfall canisters in the summer and by snow core sampling in the winter. Results of the monitoring program can be used to modify dust management procedures at a site, if required. Since dustfall measurements are a non-continuous methodology requiring laboratory analysis, the sampling is only used to retroactively confirm the effectiveness of mitigation measures. Real-time dust management on the site is carried out through application of water or approved chemical dust suppressants based on on-site observations of dust generation.

3.2.1.1 *Doris Dustfall*

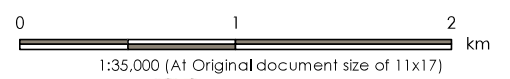
Dustfall monitoring at the Doris site is undertaken at six locations, including a control station. The reasons for each selected location are provided in Table 3-1 and shown in Figure 3-1.

Table 3-1: Reasons for Doris Site Dustfall Sampling Location Selection

Station	Reason for Selected Location	UTM Coordinates (Zone 13W)		Elevation (m above mean sea level)
		Easting (m)	Northing (m)	
DFA1	This location has historical data and represents dustfall from the general site area, is located downwind of crushing activities, and close to the camp and mill site.	433731	7559047	28
CDF4	This station is located approximately 200 m away from Quarry 2, where crushing activities occur, to monitor dustfall from crushing activities.	432616	7558982	80
TIA-DF1	This station is located approximately 250 m downwind of the TIA tailings beach at a distance which corresponds with the maximum predicted monthly Project-generated dustfall of 53 mg/100-cm ² /30-days in the 2016 Amendment.	435881	7556806	51
TIA-DF2	This station is located approximately 1.65 km downwind (east) of the TIA tailings beach. This location is approximately 300 m west (upwind) of the location predicted to have a maximum annual TIA-generated dustfall level of 23 mg/100-cm ² /year (1.9 mg/100-cm ² /30-days) in the 2016 Amendment.	437318	7557017	46
TIA-DF3	This station is located approximately 3 km downwind of the TIA tailings beach at a distance which corresponds with minimal annual predicted Project-generated dustfall.	438574	7557252	23
ControlDF	This station is located well away from potential project contributions and represents background conditions. The station is approximately 2 km southwest of Windy Camp.	430993	7549219	35



- Legend**
- Project Development Area (PDA)
 - Roads



Project Location: Hope Bay, Nunavut
 Prepared by BCC on 2020-10-28
 Technical Review by Greg Crooks on 2020-10-28

Client/Project: AGNICO EAGLE-HOPE BAY
 NUNAMI STANTEC LIMITED

Figure No.

3-1

Title

Locations of the Doris Ambient Monitoring Stations

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
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3.2.1.2 *Madrid Dustfall*

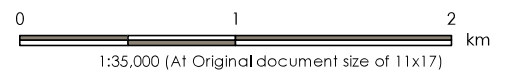
Dustfall monitoring stations around the Madrid site were installed in the spring of 2019. Dustfall monitoring was undertaken at nine locations around the Madrid North and Madrid South locations, including a control station in the predominantly upwind location and three locations to quantify dustfall with perpendicular distance from the Doris-Madrid Road. The reasons for each selected location are provided in Table 3-2 and are shown in Figure 3-2.

Table 3-2: Reasons for Madrid Site Dustfall Sampling Location Selection

Station	Reason for Selected Location	UTM Coordinates (Zone 13W)		Elevation (m above mean sea level)
		Easting (m)	Northing (m)	
M-DF01	Control station in a predominantly upwind location to the Madrid sites – in the vicinity of the Windy Radio Tower.	432840	7549835	26
M-DF02	This station is located in the vicinity of the predicted maximum dustfall along the property boundary for the overall Madrid operations – 2 km east of Madrid North processing plant.	435586	7550597	44
M-DF03	This station is located in the vicinity of the predicted maximum dustfall along the property boundary in the vicinity of Madrid South operations – 2 km east of the Madrid South Portal.	436338	7547550	45
M-DF04	Station is located to assess the maximum impact inside the property boundary but outside the PDA near the Madrid North operations – along vent raise pad access road east of the ore stockpile.	433848	7549908	44
M-DF05	Station is located to assess the maximum impact inside the property boundary but outside the PDA near the Madrid South operations – along shore of Patch Lake east of the waste rock pile.	435052	7547168	52
M-DF06	Upwind station for roadway dustfall study – 50 m west of Doris-Madrid All-Weather Road.	432661	7552874	62
M-DF07	Downwind station for roadway dustfall study – 50 m east of Doris-Madrid All-Weather Road (in a perpendicular line to road).	432768	7552891	62
M-DF08	Downwind station for roadway dustfall study 100 m east of Doris-Madrid All-Weather Road (in a perpendicular line to road).	432823	7552891	66
M-DF09	Downwind station for roadway dustfall study (200 m east of Doris-Madrid All-Weather Road (in a perpendicular line to road).	432922	7552895	45



- Legend**
- Project Development Area (PDA)
 - Roads



Project Location: Hope Bay, Nunavut
 160930343 REVA
 Prepared by BCC on 2020-10-28
 Technical Review by Greg Crooks on 2020-10-28

Client/Project: AGNICO EAGLE - RESOURCES-HOPE BAY
 NUNAMI STANTEC LIMITED

Figure No.

3-2

Title

Locations of the Madrid Ambient Monitoring Stations

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
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3.2.2 Methods

Dustfall collection is a passive monitoring method which provides a measure of particulates that would be directly deposited onto vegetation or soil. The basis of the methodologies is that field-deposited dust is collected in a manner that is quantifiable in terms of area (cm²) and exposure length (days), and that samples are then sent to a laboratory for analysis.

Dustfall is monitored at each station via dustfall canisters during summer and through snow core sampling in winter. The details of each methodology are provided below.

3.2.2.1 Summer Dustfall Sampling

Summer dustfall is quantified by the American Society for Testing and Materials (ASTM) D1739-98 sampling method (ASTM 2010). Two dustfall sample canisters were deployed at each station to act as a form of redundancy in case one of the samples became void and to provide sufficient sample material to analyze for a full range of parameters including metals. Laboratory cleaned canisters of standard size and shape containing a liquid sampling matrix (deionized water and algaecide) are attached to 2 m tall poles and are exposed to the atmosphere for an approximate 30-day period. Windscreens around the sample containers improves the dustfall collection efficiency. The samplers collect particles small enough to pass through a 1-millimetre (mm) screen and large enough to settle by their own weight.

During sampling periods when air temperatures were below 0 degrees Celsius (°C), an isopropyl alcohol solution was added to the dustfall monitoring station canisters to reduce the captured precipitation from freezing. The stations are checked regularly to ensure that the canisters did not overflow or evaporate.

Following exposure, the canisters are collected and sent to ALS Laboratory Group (ALS) – a Canadian Association for Laboratory Accreditation Quality Assurance (CALA) accredited laboratory (accreditation No. 1719) for analysis. The condition of the canisters was evaluated at the time of collection. If canisters were found to be full of precipitation upon collection, indicating the canister had overflowed, the dustfall canister was not sent for analysis because the sample was considered void.

At the laboratory, samples are analyzed for total particulates, anions, cations, and total metals. The data are standardized to units of (mg/100-cm²/30-days or kg/ha/year). For canister samples, this standardization is based on canister opening dimensions and the duration of exposure. Both containers were combined for each station and sampling period at the laboratory. The combined samples were then analyzed for particulates (total, soluble, and insoluble), anions (sulphate, nitrate, chloride, and ammonia) and total metals.

3.2.2.2 *Snow Core Sampling*

Snow core sampling for the Doris site was instituted in 2016 to record dustfall during the winter months due to issues with using the canister method during winter months. Snow core sampling was implemented at the new Madrid dustfall stations starting in winter 2019-2020. At each dustfall station, snow core subsamples are collected using a snow corer to retrieve a cylindrical snow core from the snowpack. A minimum of three snow cores are collected along a transect at each monitoring location. The samples are composited in the field to produce a single representative composite snow sample for the location. Composite samples are bagged, labelled, and shipped to an accredited laboratory (ALS) for processing. Processing of snow cores require filtration, drying and weighing in the laboratory. For quality assurance/quality control (QA/QC), a duplicate sample is collected from one of the snow core sampling locations.

In the event that the snow depth is insufficient at a location to collect a snow core sample, a bucket method is used. This entails collecting scoop samples through the entire depth of the snow and depositing them into a pre-weighed bucket of known dimensions, measuring the weight of the snow sample and then bagging, labelling and shipping the sample to the laboratory.

Snow core samples are analyzed by the laboratory as water samples and are reported in units of mg/L. These units are converted to dustfall units of mg/100-cm² and standardized to mg/100cm²/30-days over the monitoring period. The surface loading rate was calculated by multiplying the parameter concentration (mg/L or mg/1000 cm³) by the average snow-water-equivalent of the transect samples (measured in cm of water) and dividing by the number of days snow had accumulated (time from the first snowfall to the sampling day).

The accuracy of the snow core sampling method is dependent on a number of factors including; accurately determining the length of time over which the sampled snow on ground had been accumulating, snow drifting affecting particulate accumulations, and potential contamination/disturbance of the snowpack by wildlife or human activity. Dustfall measurements using snow core sampling should therefore be considered approximate with comparisons to regulatory criteria made for informational purposes only.

3.2.3 *Data Analysis*

Standardized dustfall is compared to the Alberta AAQO for dustfall (Table 2-1) as Nunavut does not currently have a dustfall standard. Analysis of temporal trends is undertaken to identify any trends in the measured dustfall levels with time of year or meteorological conditions. A qualitative comparison to the 2017 FEIS and 2016 Amendment predictions was also made. Review of dustfall levels with distance from the tailings management area was also made to determine spatial trends in dustfall.

3.2.4 Schedule

Summer dustfall canister samples are normally collected from May through September, inclusive, with access to the sampling locations being via helicopter.

Winter dustfall is collected at the end of winter (late April/early May). The snow core composite sample reflects cumulative winter dust deposition since the date of first snowfall (October) to the sampling period end (approximately October through April/May, inclusive).

3.3 Suspended Particulate Monitoring (PM_{2.5} and TSP)

Suspended particulate matter includes both airborne solid and low-vapour-pressure liquid particles having aerodynamic diameters ranging in size from 0.01 to about 44 µm. The generation of particulate matter results from the movement of vehicles, mobile equipment, crushing, blasting, bulk handling, and storage and other activities associated with mineral processing and construction. Wind erosion from sources such as tailings can also generate particulate emissions.

3.3.1 Sample Location

Sampling is conducted at monitoring location DFA1 in the Doris site. This location is free from obstructions that may cause interference in suspended particulate monitoring.

3.3.2 Sampling Methods

At the Doris site, ambient particulate monitoring for TSP and PM_{2.5} in Q1-Q3 2023 used Thermo Scientific 5014i continuous particulate monitors following the protocols described in the 2019 version of the Agnico Eagle AQMP (TMAC 2019). The Thermo Scientific monitors are housed inside a temperature-controlled shelter to ensure the monitors are maintained within their required operating temperature range.

The instruments are calibrated and maintained following Environment and Climate Change Canada (ECCC) protocols given in the document National Air Pollution Surveillance Network Quality Assurance and Quality Control Guidelines (CCME 2019).

Agnico Eagle technicians visit the stations bi-weekly and perform checks to ensure the equipment is working properly.

3.3.3 Data Analysis

Data collected from the continuous monitors were screened for any suspicious data including outliers, instrumentation drift and missing data. The particulate sampling provides 24-hour average ground-level concentrations for each size fraction. These were compared to the relevant 24-hour and annual standards (Table 2-1). In addition, temporal trends of the TSP and PM_{2.5} ambient concentrations were examined, taking into consideration the time of year and meteorological conditions during the sampling period.

3.3.4 Schedule

The Thermo Fisher Scientific Model 5014i Beta Monitors operate continuously, collecting hourly average particulate concentrations.

3.4 Nitrogen Dioxide (NO₂) Monitoring Program

3.4.1 Sampling Location

Sampling is conducted at monitoring location DFA1 in the Doris site. This location is free from obstructions and nearby pollutant sources that may cause interference in suspended particulate monitoring.

3.4.2 Sampling Methods

Ambient NO₂ is measured using a Thermo Scientific 42qi continuous NO_x monitor following the protocol described in the 2019 version of the Agnico Eagle AQMP (TMAC 2019). The NO₂ monitor is housed inside the same temperature-controlled shelter as the two continuous particulate monitors to ensure the monitors are maintained within their required operating temperature range.

The instrument is calibrated and maintained following ECCC protocols given in the document National Air Pollution Surveillance Network Quality Assurance and Quality Control Guidelines (ECCC 2004).

3.4.3 Data Analysis

Data collected from the continuous monitor was screened for any suspicious data including outliers, instrumentation drift and missing data. The NO₂ monitor currently records 5-minute average concentrations that were then averaged to produce hourly, daily, and annual average concentrations following ECCC protocols. The results were compared to the relevant 1-hour, 24-hour and annual standards (Table 2-1).

3.4.4 Schedule

The Thermo Scientific 42qi operates continuously, collecting 5-minute average NO₂ concentrations.

3.5 Meteorological Monitoring Program

The Doris meteorological station has recorded air temperature, relative humidity, wind speed and direction, precipitation, and solar radiation since 2004. Barometric pressure has been recorded since 2010. In September 2016, a Geonor T-200B all-weather precipitation gauge was installed to collect precipitation year-round. The Geonor gauge began to malfunction on October 10, 2022. After repair attempts by Agnico Eagle technicians were unsuccessful, the unit was replaced on July 3, 2023, and has been operational since that time. During this period no precipitation data was collected.

3.5.1 Sampling Location

The meteorological station was chosen in consultation with Environment Canada and Health Canada officials and is located at UTM coordinates 432840 E, 7549835 N (Zone 13W).

3.5.2 Sampling Methods

The meteorological station is a self-contained, solar/battery-powered system and includes instrumentation to measure hourly values of temperature, wind speed, wind direction, relative humidity, solar radiation, and rainfall. Data is recorded by a data logger located at the station and is downloaded manually.

3.5.3 Data Analysis

Meteorological data are analyzed on a monthly basis and compiled into summary tables. Data validity checks are conducted and missing / invalid data are flagged. For the Q1-Q3 2023 period, 39 hours of wind speed and wind direction data were invalidated due to calibration/maintenance activities or icing of the sensor. Total precipitation data for January – June 2023 were invalidated as the data recovery rate is less than 75%. The data recovery rates for all other meteorological instruments in this period are better than 75%.

3.5.4 Schedule

Meteorological data is collected continuously and is downloaded at the beginning of each month, or on an as-needed basis.

4 Monitoring Program Results and Discussion

4.1 Snow Core Dustfall Results

4.1.1 Doris Site

The measurement period for each snow core sample at the Doris is provided in Table 4-1. Measured dustfall rates estimated for each monitoring location in 2022 – 2023 are summarized in Table 4-2.

Table 4-1: Snow Core Sampling Periods – Doris Site

Snow Core Station	Date of First Snowfall ^a	Sample Retrieval Date	Sample Time (days)
CDF4	10/18/2022	4/16/2023	180
DFA1		4/16/2023	180
TIA-DF1		4/16/2023	180
TIA-DF2		4/16/2023	180
TIA-DF3		4/16/2023	180
ControlDF		4/16/2023	180

Note:

a: SOURCE: Environment and Climate Change Canada’s Cambridge Bay Meteorological Station

Table 4-2: Measured Deposition Rates from Snow Core Sampling – Doris Site

Snow Core Station	Alberta Ambient Air Quality Objective (AAAQO) (mg/100-cm ² /30-days)	Measured Dustfall Level (mg/100-cm ² /30-days)	Percentage of AAAQO (Commercial and Industrial Area)
CDF4	158 (commercial and industrial areas)	33.4	21%
DFA1		38.4	24%
TIA-DF1		5.9	4%
TIA-DF2		8.8	6%
TIA-DF3		3.6	2%
ControlDF		5.8	4%

Dustfall levels estimated from the snow core sampling ranged from 3.6 mg/100-cm²/30-days (at TIA-DF3) to 38.4 mg/100-cm²/30-days (at DFA1) during the October 2022 to April 2023 monitoring period (180 days). All measured dustfall levels are less than the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas. The maximum measured dustfall (38.4 mg/100-cm²/30 days) occurred at Station DFA1 which is located east of the mill site.

The dustfall measurements at locations TIA-DF1, TIA-DF2 and TIA-DF3 (monitoring locations downwind of the TIA) are consistent with the predicted dustfall level in the 2016 Amendment modelling of <53 mg/100 cm²/30-days outside of 250 m from the TIA. Dustfall rates at locations TIA-DF1, TIA-DF2, TIA-DF3, DFA1 and ControlDF were either below the 2017 FEIS predictions or within the expected range of variability for dispersion modelling predictions. The measurement at CDF4 is greater than the 2017 FEIS modelling however, the field records for this sample note that there were fox tracks and arctic hare feces in the vicinity of the station. The measured total suspended solids at CDF4 were anomalously high, which is consistent with the snow sample being contaminated by animal activities. The measurement at DFA1, while within the range of the 2017 FEIS model predictions, also appears to be anomalous as there have been reduced operations since the Facility was placed in care and maintenance and production suspended in February 2022.

4.1.2 Madrid Site

The measurement period for each snow core sample at the Madrid Site is provided in Table 4-3. Measured dustfall rates estimated for each monitoring location in 2022-2023 are summarized in Table 4-4. Snow core measurements were collected from all Madrid locations in 2022-2023.

Table 4-3: Snow Core Sampling Periods – Madrid Site

Snow Core Station	Date of First Snowfall ^a	Sample Date	Sample Time (days)
MDF01	10/18/2022	4/14/2023	178
MDF02		4/14/2023	178
MDF03		4/14/2023	178
MDF04		4/14/2023	178
MDF05		4/15/2023	179
MDF06		4/15/2023	179
MDF07		4/15/2023	179
MDF08		4/15/2023	179
MDF09		4/15/2023	179

Note:

a: SOURCE: Environment and Climate Change Canada's Cambridge Bay Meteorological Station

Table 4-4: Measured Deposition Rates from Snow Core Sampling – Madrid Site

Snow Core Station	Alberta Ambient Air Quality Objective (AAAQO) (mg/100-cm ² /30-days)	Measured Dustfall Level (mg/100-cm ² /30-days)	Percentage of AAAQO (Commercial and Industrial Area)
MDF01	158 (commercial and industrial areas)	8.9	6%
MDF02		2.8	2%
MDF03		3.8	2%
MDF04		6.8	4%
MDF05		2.4	2%
MDF06		4.0	3%
MDF07		16.3	10%
MDF08		4.4	3%
MDF09		14.6	9%

Dustfall levels estimated from the snow core sampling ranged from 2.4 mg/100-cm²/30-days (at MDF05) to 16.3 mg/100-cm²/30-days (MDF07) during the October 2022 to April 2023 monitoring period (178 – 179 days). All measured dustfall levels were less than the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas. The maximum deposition rate (16.3 mg/100-cm²/30-days) occurred at Station MDF07 which is 50 m east of the Doris-Madrid All-Weather Road.

The dustfall rates from all Madrid Site monitoring stations were less than the maximum predicted dustfall level at each location in the 2017 FEIS modelling.

4.2 Canister Sampling Dustfall Results

4.2.1 Doris Site

A summary of the measured monthly dustfall levels at each monitoring location using dustfall canisters in 2023 is presented in Table 4-5. Dustfall levels estimated from the canister sampling ranged from 2.7 mg/100-cm²/30-days (TIA-DF3) to 51.9 mg/100-cm²/30-days (DFA1). All measured dustfall levels are less than the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas. The maximum measured dustfall (51.9 mg/100-cm²/30 days) occurred at Station DFA1 which is located east of the mill site.

Table 4-5 also presents the predominant wind direction over each month based on the Doris meteorological data. Winds were predominantly blowing from easterly directions through the sampling period.

The measured monthly dustfall levels at locations TIA-DF1, TIA-DF2, and TIA-DF3 are plotted versus distance from the TIA in Figure 4-1.

All monthly dustfall rates from the Doris monitoring stations are less than the maximum predicted dustfall level of 53 mg/100-cm²/30-days (at 250-m from the TIA) in the 2016 Amendment modelling.

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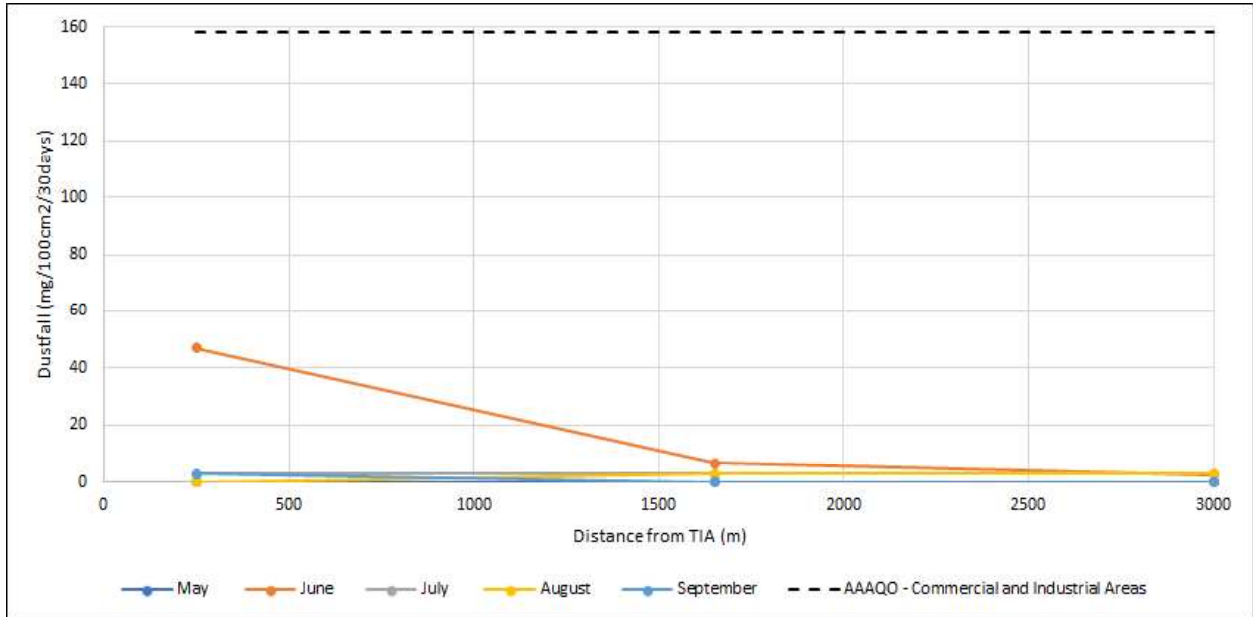
Table 4-5: Summary of Measured Dustfall Levels from Canister Sampling in 2023 – Doris Site

Sample Month	AAAQO	Units	Dustfall Location					Monthly Average	Prevailing Wind Direction	
			CDF4	DFA1	TIA-DF1	TIA-DF2	TIA-DF3			Control DF
May ^a	158 (commercial and industrial areas)	mg/100-cm ² /30-days	- ^a	- ^a	- ^a	- ^a	- ^a	- ^a	- ^a	ESE
June		mg/100-cm ² /30-days	2.9 ^b	51.9	47.1	6.6	2.7 ^b	9.9	22.2	W
July		mg/100-cm ² /30-days	9.3	3.0 ^b	3.0 ^b	3.0 ^b	3.0 ^b	3.0 ^b	4.3	ENE
August		mg/100-cm ² /30-days	- ^c	- ^c	- ^c	3.0 ^b	3.0 ^b	3.0 ^b	3.0	W
September		mg/100-cm ² /30-days	3.0 ^b	3.0 ^b	3.0 ^b	- ^c	- ^c	- ^c	3.0	E
Maximum		mg/100-cm ² /30-days	9.3	51.9	47.1	6.6	3.0	9.9		
Average		mg/100-cm ² /30-days	5.1	19.3	17.7	4.2	2.9	5.3		
Max Percentage of Alberta AAAQO for Commercial and Industrial Areas		%	5.9%	32.8%	29.8%	4.2%	1.9%	6.3%		

Notes:

- a. Dustfall jars were installed at the stations in mid-April, however they could not be collected in May due to adverse weather conditions.
- b. Measurement was below the laboratory minimum detection limit. A value of ½ the detection limit was used in the assessment.
- c. Samples were not submitted to the external laboratory for analysis as the jars had fallen from the stands either due to wind or bears.

Figure 4-1: Variation in Measured Monthly Dustfall Levels with Distance from the Doris TIA



4.2.2 Madrid Site

A summary of the estimated monthly dustfall levels at each monitoring location using dustfall canisters in 2023 is presented in Table 4-6. Dustfall levels estimated from the canister sampling ranged from 2.7 mg/100-cm²/30-days (at multiple sites due to the dust fall level being below the method detection limit) to 9.0 mg/100-cm²/30-days (M-DF07). All measured dustfall levels are less than the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas.

The measured monthly dustfall levels at locations M-DF06, M-DF07, M-DF08 and M-DF09 are plotted versus distance from the Doris-Madrid All Weather Road (AWR) in Figure 4-2. These monitoring locations were chosen to study the variation in dustfall levels with distance from the roadway. M-DF06 is located 50 m from the road in the predominantly upwind direction, while the other three stations are located 50 m, 100 m, and 200 m downwind. Dustfall levels were relatively consistent from June to September.

All dustfall measurements from June – September 2023 are less than the maximum predicted dustfall levels in the 2017 FEIS modelling for all monitoring stations.

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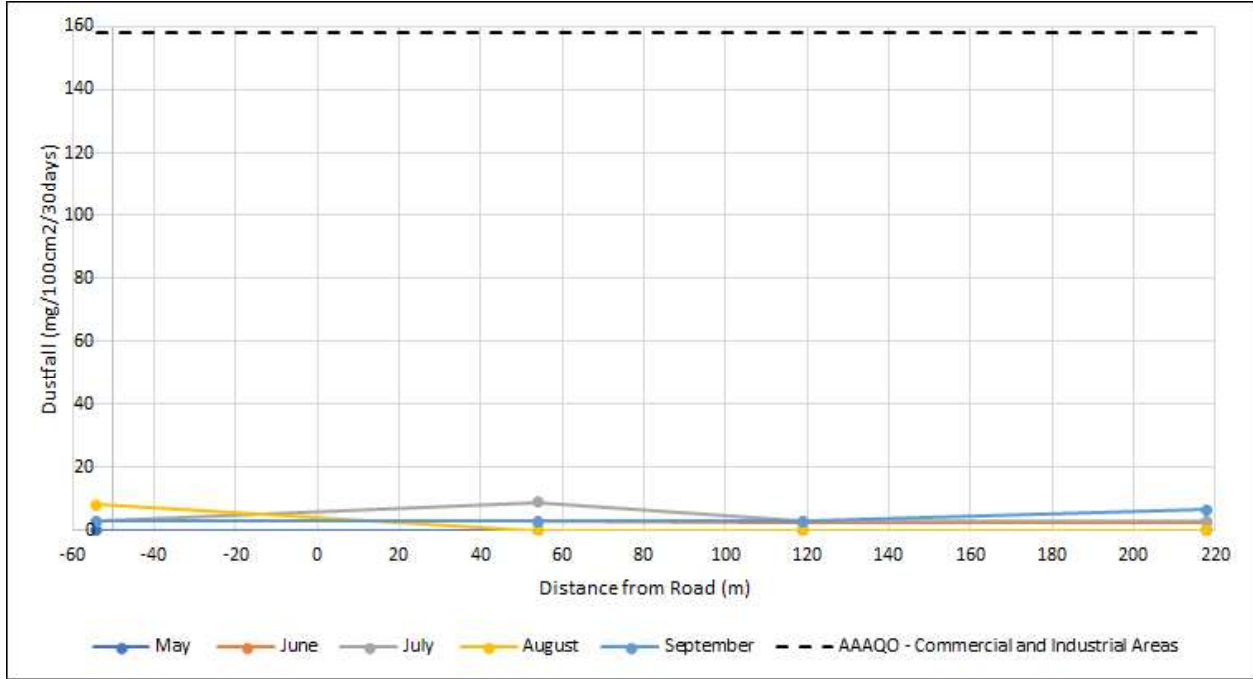
Table 4-6: Summary of Measured Dustfall Levels from Canister Sampling in 2023 – Madrid Site

Sample Month	AAAQO	Units	Dustfall Location									Monthly Average	Prevailing Wind Direction
			M-DF01	M-DF02	M-DF03	M-DF04	M-DF05	M-DF06	M-DF07	M-DF08	M-DF09		
May ^a	158 (commercial and industrial areas)	mg/100-cm ² /30-days	- ^a	- ^a	- ^a	- ^a	- ^a	- ^a	- ^a	- ^a	- ^a	-	ESE
June		mg/100-cm ² /30-days	2.7 ^b	2.7 ^b	2.7 ^b	2.7 ^b	2.7 ^b	2.9 ^b	2.9 ^b	2.7 ^b	2.7 ^b	2.7	W
July		mg/100-cm ² /30-days	3.0 ^b	3.0 ^b	3.0 ^b	3.0 ^b	3.0 ^b	3.0 ^b	9.0	3.0 ^b	3.0 ^b	3.7	ENE
August		mg/100-cm ² /30-days	3.0 ^b	3.0 ^b	3.0 ^b	3.0 ^b	3.0 ^b	8.1	- ^c	- ^c	- ^c	3.9	W
September		mg/100-cm ² /30-days	3.0 ^b	- ^c	- ^c	3.0 ^b	- ^c	3.0 ^b	3.0 ^b	3.0 ^b	6.6	3.6	E
Maximum		mg/100-cm ² /30-days	3.0	3.0	3.0	3.0	3.0	8.1	9.0	3.0	6.6		
Average		mg/100-cm ² /30-days	2.9	2.9	2.9	2.9	2.9	4.2	5.0	2.9	4.1		
Max Percentage of Alberta AAQO for Commercial and Industrial Areas		%	1.9%	1.9%	1.9%	1.9%	1.9%	5.1%	5.7%	1.9%	4.2%		-

Notes:

- a. Dustfall jars were installed at the stations in mid-April, however they could not be collected in May due to adverse weather conditions.
- b. Measurement was below the laboratory minimum detection limit. A value of ½ the detection limit was used in the assessment.
- c. Samples were not submitted to the external laboratory for analysis as the jars had fallen from the stands either due to wind or bears.

Figure 4-2: Variation in Measured Monthly Dustfall Levels with Distance from the Doris-Madrid Road



4.3 Particulate Matter Sampling

TSP and PM_{2.5} ambient monitoring in Q1-Q3 2023 was conducted at location DFA1 at the Doris site. A summary of the measured ambient TSP and PM_{2.5} concentrations for the study period are presented in Table 4-7. Data recovery rates are presented in Table 4-8. Calibration records are presented in Appendix A.

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Table 4-7: Summary of Ambient TSP and PM_{2.5} Measurements

Parameter	Air Quality Standard / Objective		24-Hour Average (µg/m ³)				Annual Average (µg/m ³) ²	
	24-Hour	Annual	Maximum ¹	98 th Percentile ²	Range	% of Criteria	Average	% of Criteria
TSP	120	60	155	-	1 - 155	129%	N/A ³	N/A
PM _{2.5}	27	8.8	148	16.5	0 - 148	61%	3.3	38%

Notes:

1 - Results reported for Jan 2023 to Sep 2023.

2 - Results reported for Oct 2022 to Sep 2023.

3 – Data recovery rate below target for calculating a valid annual average.

Table 4-8: Summary of Data Recovery Rates for Continuous Particulate Sampling (Jan - Sep 2023)

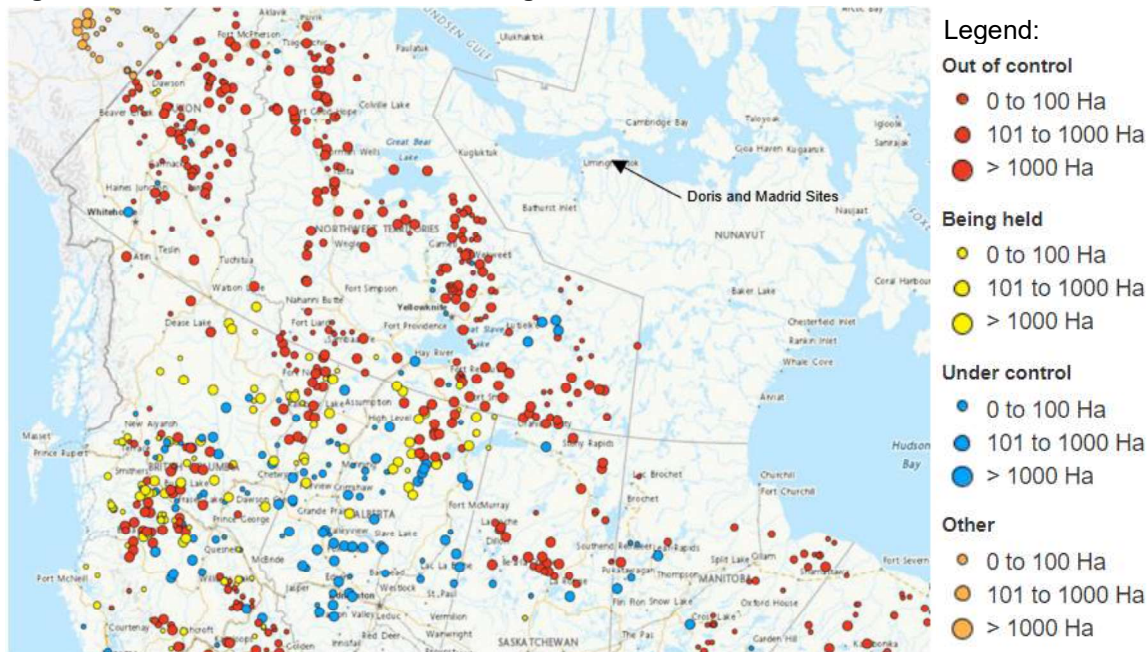
Month	Data Recovery Rate (%)	
	TSP	PM _{2.5}
January 2023	77%	77%
February 2023	71%	71%
March 2023	100%	81%
April 2023	87%	90%
May 2023	87%	100%
June 2023	80%	93%
July 2023	42%	90%
August 2023	26%	35%
September 2023	57%	57%
Annual (October 2022 – September 2023)	70%	77%

4.3.1 TSP

The annual (October 2022 to September 2023) data recovery rate for TSP is 70% which is slightly below the data recovery objective of 75% required for calculating an annual average concentration. The monthly recovery rates for the continuous TSP monitoring are above the data recovery objective of 75% for January, March, April, and May 2023, but below the objective for the other months due to intermittent downtimes as operational complications were addressed by Agnico Eagle.

The maximum measured 24-hour average TSP concentration in the January to September 2023 period was 155 µg/m³ which is 129% of the applicable Government of Nunavut (GN) air quality objective and is greater than the maximum predicted TSP concentration in the 2017 FEIS of 69.9 µg/m³. The 24-hour average PM_{2.5} concentration that was measured concurrently on this day (August 10, 2023) was 148 µg/m³ - indicating that the TSP was primarily composed of fine particulate matter. Due to its small diameter, fine particulate matter can remain suspended in the air and is readily able to be transported long distances. The Doris meteorological tower recorded wind directions on August 10, 2023, to initially be blowing from easterly directions in the morning, but then shifting through the south to blow from westerly directions by mid-day. On August 10, 2023, there were dozens of forest fires burning in the Northwest Territories to the southwest and west of the Sites, as shown in Figure 4-3. In this figure, each red dot indicates the location of an uncontrolled forest fire, with the largest dots representing forest fires greater than 1,000 hectares in size. The measured TSP exceedance is likely attributable to long-range transport of forest fire smoke by the westerly winds that occurred in the afternoon of August 10th.

Figure 4-3: Active Forest Fires on August 10, 2023



Ref: Natural Resources Canada, Canadian Wildland Fire Information System available at <https://cwffis.cfs.nrcan.gc.ca/home>

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TSP monitoring data for October - December 2022, which have been previously reported, were used in conjunction with the January - September 2023 TSP measurements to calculate an annual average concentration. To calculate a valid annual average concentration, a data recovery rate of 75% is required. Since the data recovery rate is less than this target, a valid annual average concentration could not be calculated. Agnico Eagle is reviewing the monitoring data and instrument logs to assess potential causes and will implement remedial measures.

A time history plot of measured 24-hour average TSP concentrations for the period October 2022 to September 2023 is presented in Figure 4-4. TSP concentrations were generally low throughout the monitoring period, with some higher levels seen during in August and September when forest fires were impacting air quality in many areas of Canada.

4.3.2 PM_{2.5}

The annual (October 2022 – September 2023) PM_{2.5} data recovery rate is 77% which is above the objective for calculating an annual average concentration. Monthly data recovery rates for the continuous sampling are above the objective of 75% for January and March to July 2023, but below the objective for the other months due to operational issues.

The calculated 98th percentile of the measured 24-hour average PM_{2.5} concentrations in the October 2022 to September 2023 period is 16.5 µg/m³ which is below the Canadian Ambient Air Quality Standard (CAAQS) of 27 µg/m³. An explicit comparison to the CAAQS for PM_{2.5} requires averaging the 98th percentile daily average levels in each of three consecutive calendar years, with a valid comparison requiring valid data for a minimum of two of the three years. Since the data presented in this report is for a single year and is not based on a calendar year, comparison to the CAAQS is provided for informational purposes only; not to assess compliance. The 98th percentile of the measured 24-hour average PM_{2.5} concentrations is greater than the maximum predicted 98th percentile PM_{2.5} concentration in the 2017 FEIS of 12.1 µg/m³ but is within the expected range of variability for dispersion models and includes some measurements likely influenced by forest fires.

The annual average of the measured PM_{2.5} concentrations for the period of October 2022 to September 2023 is 3.3 µg/m³, which is less than the annual CAAQS of 8.8 µg/m³. As with the 24-hour CAAQS, compliance with the annual average CAAQS requires averaging daily measurements in each of three consecutive calendar years, with a valid comparison requiring valid data for a minimum of two of the three years. Since the data presented in this report is for a single year and is not based on a calendar year, comparison to the annual CAAQS is provided for informational purposes only; not to assess compliance. The measured annual average concentration is below the maximum predicted annual average PM_{2.5} concentration in the 2017 FEIS of 5.0 µg/m³. A time history plot of measured 24-hour average PM_{2.5} concentrations for the period October 2022 to September 2023 is presented in Figure 4-6. PM_{2.5} concentrations were generally low through most of the monitoring period.

Figure 4-4: Summary of Measured 24-Hour Average TSP Concentrations (Oct 2022 - Sep 2023)

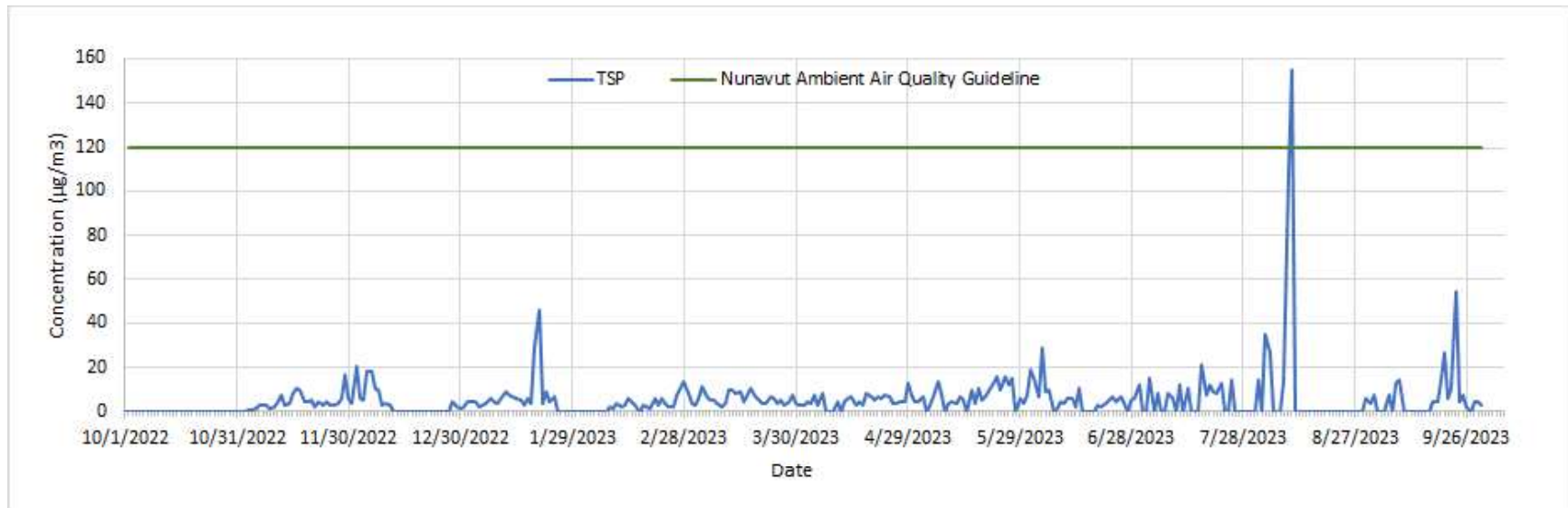
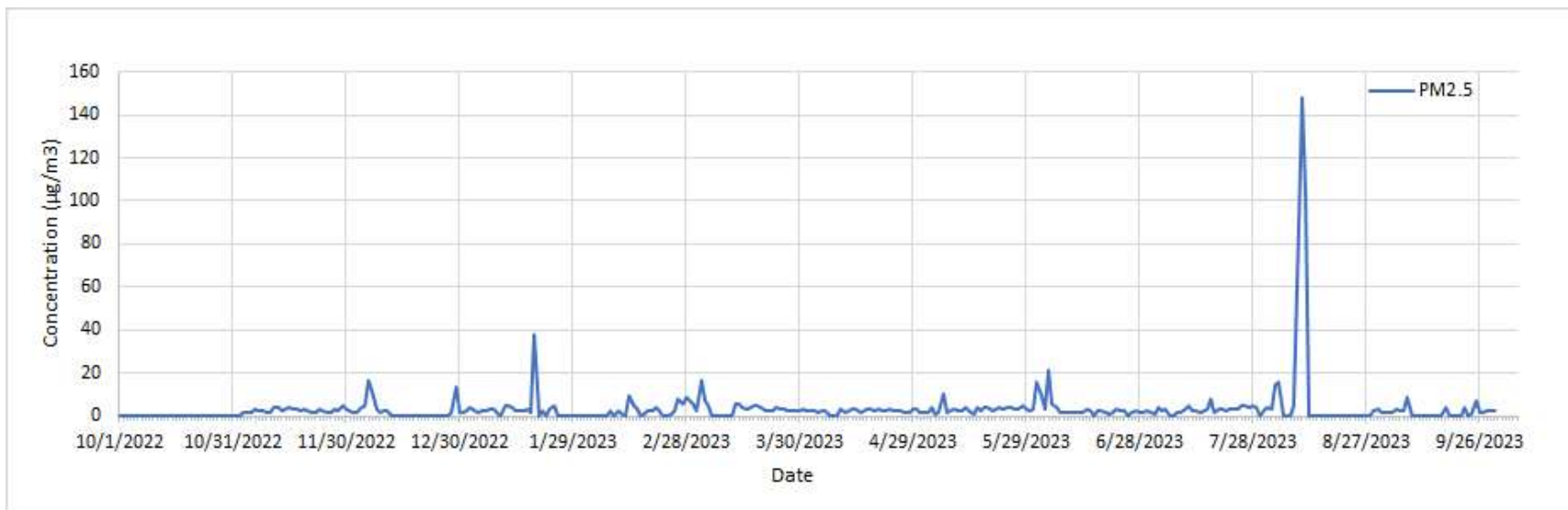


Figure 4-5: Summary of Measured 24-Hour Average PM_{2.5} Concentrations (Oct 2022 - Sep 2023)



4.3.3 Historical Trends in Ambient Particulate

4.3.3.1 January to September Reporting Period Trends

Table 4-9 below provides a comparison of maximum measured 24-hour and annual average TSP and PM_{2.5} measurements in the January to September period over the last 4 years. The highest 24-hour average TSP concentration was measured in 2020 and exceeded the guideline by 47%. One 24-hour average TSP exceedance was measured in 2023 which, as discussed in Section 4.3.1, is not likely attributable to the Agnico Eagle operations.

Measured 24-hour average PM_{2.5} concentrations were similar throughout the 2020 to 2021 period with higher concentrations measured in 2022 and 2023, which is likely attributable to transitioning from non-continuous (6-day) measurements to continuous monitoring with a larger number of measurements in 2022.

Table 4-9: Summary of Maximum Measured 24-Hour and Annual Average TSP and PM_{2.5} Concentrations for 2020-2023

Contaminant	Averaging Period	Criteria	Jan -Sep 2020	Jan -Sep 2021	Jan -Sep 2022	Jan -Sep 2023
TSP (µg/m ³)	24-hour	120	176	22.1	59.6	155
	Annual ⁽¹⁾	60	6.2	5.0	N/A	N/A
PM _{2.5} (µg/m ³)	24-hour ⁽²⁾	28-27 ⁽³⁾	7.3	5.4	15.2	16.5
	Annual ⁽¹⁾	10-8.8 ⁽⁴⁾	2.3	2.0	N/A	3.3

Notes:

- 1 Annual averages for the period Oct to Sep of the prior and subsequent year.
- 2 98th percentile of the period Oct to Sep of the prior and subsequent year.
- 3 CAAQS 24-hour criteria of 27 µg/m³ became effective in 2020. Prior to 2020, the criterion was 28 µg/m³.
- 4 CAAQS annual criterion of 8.8 µg/m³ became effective in 2020. Prior to 2020, the criterion was 10 µg/m³.

4.3.3.2 Four Year Trend in Air Quality

Time history plots of measured TSP and PM_{2.5} concentrations at DFA1 over the last 4 years are presented in Figure 4-6 and Figure 4-7, respectively. In Figure 4-6, the 24-hour average guideline of 120 µg/m³ for TSP is presented as a red line. There have been only two days (24-hour periods) of measured exceedances of the TSP guideline in the last 4 years. For PM_{2.5}, the current Canadian Ambient Air Quality Standard (CAAQS) is 27 µg/m³ and is based on the average of the 98th percentile concentration in each of three consecutive years (with at least two valid years of data available). As seen in Figure 4-7, measured PM_{2.5} concentrations at the station have been below this level except for one measurement which was likely influenced by forest fires.

Table 4-10 presents summary statistics from the last four years of particulate monitoring. The 90th percentile concentrations are well below the maximum measured levels, indicating that elevated particulate concentrations occur infrequently.

Table 4-10: Summary of Particulate Monitoring Measurement Statistics (2019-2023)

Statistic	TSP	PM _{2.5}
Maximum (ug/m ³)	176	148
90 th Percentile (ug/m ³)	16.0	7.1
Median (ug/m ³)	6.3	2.8
25 th Percentile (ug/m ³)	3.9	1.6

Figure 4-6: Four Year Time History Plot of Measured Ambient TSP Concentrations

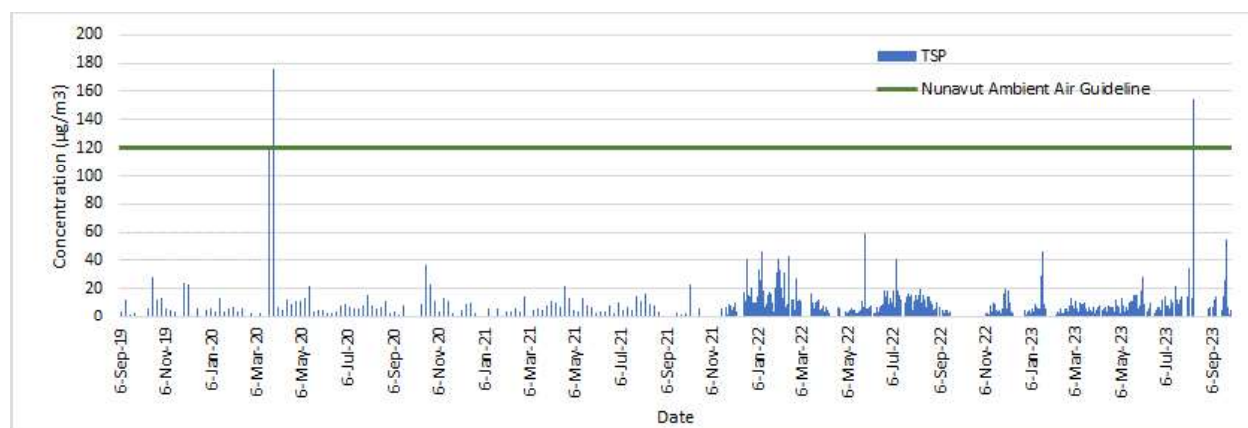
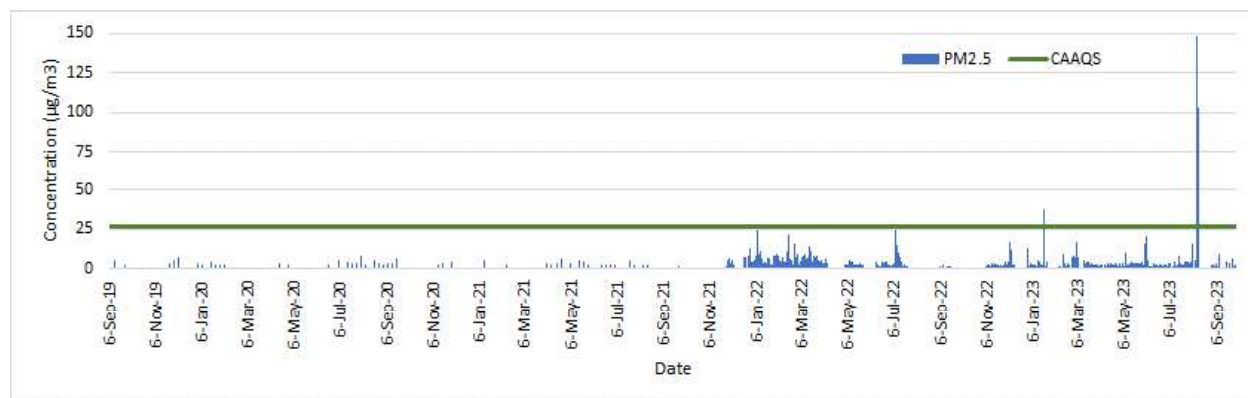


Figure 4-7: Four Year Time History Plot of Measured Ambient PM_{2.5} Concentrations



4.4 Nitrogen Dioxide

NO₂ ambient monitoring in Q1-Q3 2023 was conducted at location DFA1 at the Doris site. A summary of the measured ambient NO₂ concentrations for the study period are presented and compared to the relevant hourly, daily, and annual standards in Table 4-11. Data recovery rates are presented in Table 4-12. The annual data recovery rate for NO₂ is 94% which is above acceptable levels for calculating an annual average concentration. Calibration records are presented in Appendix A.

Table 4-11: Summary of NO₂ Monitoring Results

Averaging Period	Units	Air Quality Standard/Objective	Agency	Measured Value	% of Criteria
1-hour ^a	ppb	212	Nunavut Ambient Air Quality Guidelines	30	14%
24-hour ^a	ppb	106		16	15%
Annual ^b	ppb	32		2.8	9%
1-hour (98 th percentile) ^b	ppb	60	CAAQS	25	N/A ^c
Annual ^b	ppb	12		2.8	N/A ^d

Notes:

- a: Results reported for January to September 2023.
- b: Results reported for October 2022 to September 2023.
- c: Comparison to the CAAQS requires a minimum of two years of data over calendar years.
- d: Comparison to the CAAQS requires an average over a calendar year.

Table 4-12: Summary of Data Recovery Rates for Continuous NO₂ Sampling (Jan - Sep 2023)

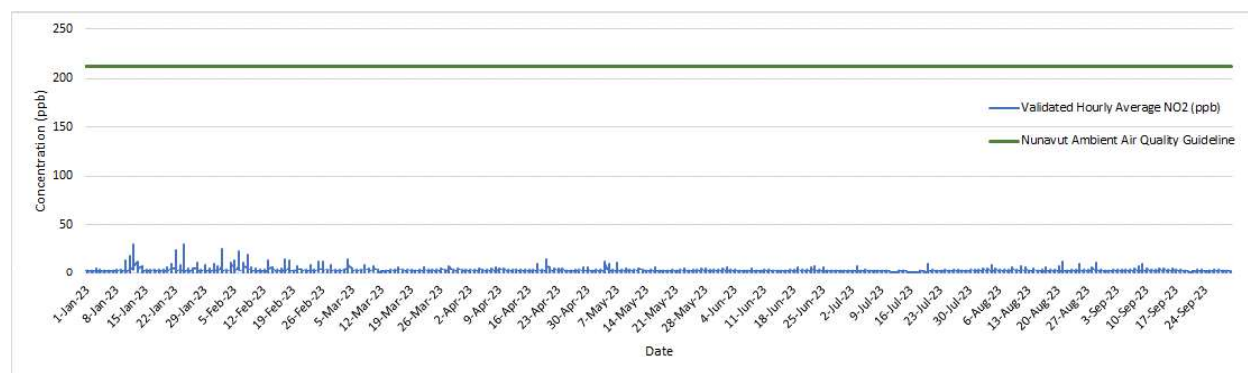
Month	NO ₂ Data Recovery Rate
January 2023	100%
February 2023	99%
March 2023	100%
April 2023	100%
May 2023	100%
June 2023	99%
July 2023	100%
August 2023	100%
September 2023	100%
Annual (October 2022 – September 2023)	94%

The maximum measured hourly average NO₂ concentration in the January to September 2023 period was 30 parts per billion (ppb) which is 14% of the applicable GN air quality objective and is less than the maximum predicted NO₂ concentration in the 2017 FEIS of 134 ppb. Likewise, measured daily and annual average NO₂ concentrations are well below the corresponding GN air quality objectives and FEIS predictions.

The calculated 98th percentile of the measured daily maximum 1-hour average NO₂ concentrations in the October 2022 to September 2023 period is 25 ppb which is below the Canadian Ambient Air Quality Standard (CAAQS) of 60 ppb. An explicit comparison to the CAAQS for NO₂ requires averaging the 98th percentile of the daily maximum 1-hour average levels in each of three consecutive calendar years, with a valid comparison requiring valid data for a minimum of two of the three years. Since the data presented in this report is for a single year and is not based on a calendar year, comparison to the CAAQS is provided for informational purposes only; not to assess compliance.

A time history plot of measured 1-hour average NO₂ concentrations for the period January to September 2023 is presented in Figure 4-8. NO₂ concentrations were generally low throughout the monitoring period.

Figure 4-8: Time History of Measured 1-Hour Average NO₂ Concentrations (Jan - Sep 2023)



4.5 Meteorology

A summary of the maximum, minimum, and average of the hourly average meteorological parameters in each month of January to September 2023 are presented in Table 4-13.

A wind rose showing the measured directionality and speed for the period January - September 2023 is presented in Figure 4-9. The length of the radial bars gives the total percent frequency of winds from the indicated direction, while portions of the barbs of different widths indicate the frequency associated with each wind speed category.

Winds over the nine-month period occurred predominantly from the west. Higher wind speeds occurred most frequently from the west.

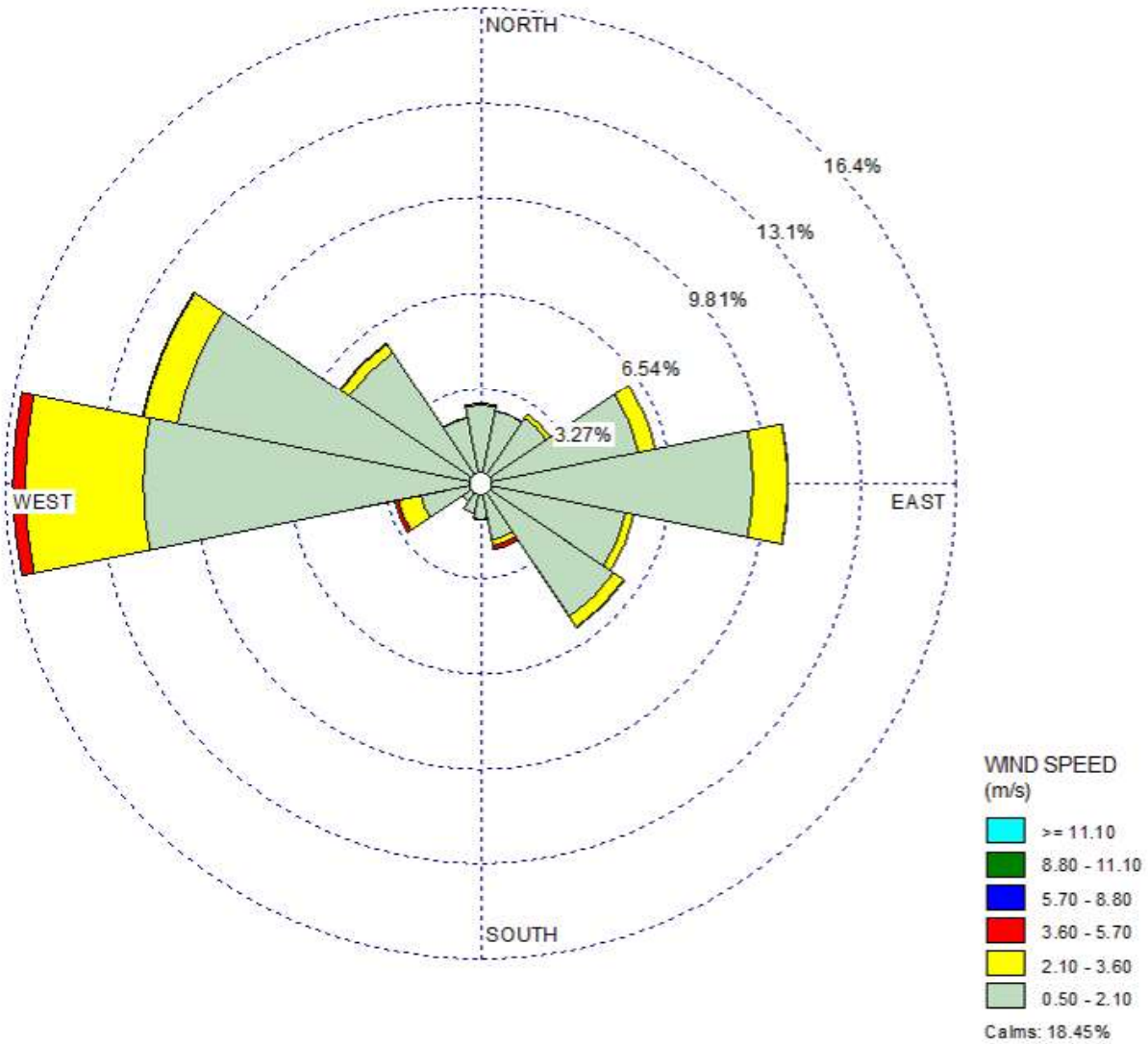
Table 4-13: Summary of Meteorological Measurements (Jan - Sep 2023)

Date	Average Air Temperature	Minimum Daily Air Temperature	Maximum Daily Air Temperature	Absolute Minimum Temperature	Absolute Maximum Temperature	Average Wind Speed	Maximum Instantaneous Wind Speed	Time of Maximum Instantaneous Wind Speed	Total Precipitation	Total Rainfall	Total SWE	Average Relative Humidity	Average Solar Radiation	Total Bright Sunshine Hours	Station Pressure
(mm-yy)	(°C)	(°C)	(°C)	(°C)	(°C)	(m/s)	(m/s)	(mm/dd/yyyy)	(mm)	(mm)	(mm)	(%)	(W/m ²)	(hours)	(kpa)
Jan-23	-28.7	-31.9	-25.0	-37.3	-13.3	5.8	19.4	1/28/2023 6:57	M ⁽¹⁾	M ⁽¹⁾	M ⁽¹⁾	76.4	2.3	0	101.1
Feb-23	-32.7	-35.8	-29.5	-40.3	-21.1	6.0	16.7	2/21/2023 2:09	M ⁽¹⁾	M ⁽¹⁾	M ⁽¹⁾	71.9	23.4	40	100.0
Mar-23	-28.1	-32.5	-22.9	-36.8	-12.3	2.7	19.0	3/2/2023 4:27	M ⁽¹⁾	M ⁽¹⁾	M ⁽¹⁾	74.3	95.0	242	102.1
Apr-23	-14.3	-19.3	-9.2	-33.2	1.7	3.9	15.0	4/20/2023 22:47	M ⁽¹⁾	M ⁽¹⁾	M ⁽¹⁾	83.5	172.7	332	101.6
May-23	0.0	-3.9	4.2	-9.6	13.0	5.4	20.9	5/4/2023 7:35	M ⁽¹⁾	M ⁽¹⁾	M ⁽¹⁾	81.8	221.7	398	100.9
Jun-23	7.5	3.0	12.1	-1.1	22.3	5.0	17.3	6/2/2023 6:39	M ⁽¹⁾	M ⁽¹⁾	M ⁽¹⁾	72.1	240.2	411	100.7
Jul-23	14.5	9.8	18.8	5.9	28.6	4.5	13.3	7/3/2023 13:52	3.5	3.5	0.0	63.3	265.7	459	101.1
Aug-23	10.3	7.3	13.4	0.5	26.8	5.8	29.3	8/14/2023 23:33	43.3	43.3	0.0	76.8	146.9	320	100.3
Sep-23	4.4	2.1	6.8	-2.1	16.5	6.3	20.9	9/23/2023 18:04	39.4	37.4	2.0	87.5	56.9	118	100.4
<i>Average</i>	-7.5	-11.2	-3.5	-17.1	6.9	5.0	19.1		28.7	28.1	0.7	76.4	136.1	257.8	100.9
<i>Maximum</i>	14.5	9.8	18.8	5.9	28.6	6.3	29.3		43.3	43.3	2.0	87.5	265.7	459.0	102.1
<i>Minimum</i>	-32.7	-35.8	-29.5	-40.3	-21.1	2.7	13.3		3.5	3.5	0.0	63.3	2.3	0.0	100.0
<i>Total</i>									86.2	84.2	2.0				

Notes:

1. Precipitation measurements when the Geonor gauge was not functioning are reported as missing 'M'.

Figure 4-9: Wind Rose for January to September 2023



5 Conclusions

This report presents the results of ambient air quality, dustfall, and meteorological monitoring conducted at the Doris and Madrid sites (the Sites) from January to September 2023 as outlined under the Air Quality Management Plan (AQMP; TMAC 2017, 2019). To calculate annual average concentrations for requisite parameters, data from October to December 2022 (already reported by Agnico Eagle) was also utilized and is included in this report.

The 2023 monitoring program included the following:

- Monthly dustfall sampling at six locations in the vicinity of the Doris site utilizing dustfall canisters for the period June - September 2023.
- Monthly dustfall sampling at nine locations in the vicinity of the Madrid site utilizing dustfall canisters for the same period and methodology as for the Doris site.
- Snow core sampling for dustfall at six locations in the vicinity of the Doris site utilizing snow cores over the period October 18, 2022 (first snow fall) to April 14 – 16, 2023.
- Snow core sampling for dustfall at seven locations in the vicinity of the Madrid Site utilizing snow cores over the same period.
- TSP and PM_{2.5} using continuous monitors at one location at the Doris site.
- Monitoring of NO₂ using a continuous monitor at one location at the Doris site.
- Meteorological monitoring for wind speed, wind direction, temperature, relative humidity, snowfall, rainfall, solar radiation, and barometric pressure at one location. The meteorological data were used in the interpretation of the air quality measurements.

The main results and findings of the report are presented below.

Snow Core Dustfall Sampling – Doris Site

- Dustfall levels estimated from the snow core sampling ranged from 3.6 mg/100-cm²/30-days (at TIA-DF3) to 38.4 mg/100-cm²/30-days (DFA1).
- The dustfall levels for all stations are below the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas.
- Dustfall rates at locations TIA-DF1, TIA-DF2, TIA-DF3, DFA1 and ControlDF were either below the 2017 FEIS predictions or within the expected range of variability for dispersion modelling predictions. The measurement at CDF4 is greater than the 2017 FEIS modelling however the snow sample was likely contaminated by animal activities.

Snow Core Dustfall Sampling – Madrid Site

- Dustfall levels estimated from the snow core sampling ranged from 2.4 mg/100-cm²/30-days (at MDF05) to 16.3 mg/100-cm²/30-days (at MDF07).

- All measured dustfall levels are less than the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas.
- The dustfall rates for all Madrid Site monitoring stations are less than their maximum predicted dustfall level at each location in the 2017 FEIS modelling.

Canister Dustfall Sampling – Doris Site

- Dustfall levels estimated from the canister sampling ranged from 2.7 mg/100-cm²/30-days (TIA-DF3) to 51.9 mg/100-cm²/30-days (DFA1). All measured dustfall levels are less than the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas.
- The estimated monthly dustfall rates at the monitoring stations are less than the maximum predicted dustfall level of 53 mg/100-cm²/30-days (at 250 m from the TIA) in the 2016 Amendment modelling.

Canister Dustfall Sampling – Madrid Site

- Dustfall levels estimated from the canister sampling ranged from 2.7 mg/100-cm²/30-days to 9.0 mg/100-cm²/30-days (M-DF07). All measured dustfall levels are less than the AAAQO of 158 mg/100-cm²/30-days for commercial and industrial areas.
- The estimated monthly dustfall rates at the monitoring stations are less than the maximum predicted dustfall at each location in the 2017 FEIS.

Particulate Monitoring – Doris Site

- The maximum measured 24-hour average TSP concentration was 155 µg/m³ which is 129% of the applicable GN air quality objective. The exceedance is likely attributable to forest fires in the Northwest Territories during August 2023.
- An annual average TSP concentration could not be calculated due to the annual data recovery rate being less than the required threshold.
- The calculated 98th percentile of the measured 24-hour average PM_{2.5} concentrations in the October 2022 to September 2023 period is 16.5 µg/m³ which is below the CAAQS of 27 µg/m³.
- The annual average of the measured PM_{2.5} concentrations is 3.3 µg/m³ which is less than the annual CAAQS of 8.8 µg/m³. Assessment with respect to the CAAQS is provided for informational purposes only, as a comparison to the CAAQS requires three calendar years of data.
- The maximum measured 24-hour average TSP concentration is greater than the maximum predicted concentration in the 2017 FEIS but was likely influenced by forest fires.
- The measured 98th percentile of the 24-hour average PM_{2.5} concentrations is greater than the maximum predicted 98th percentile PM_{2.5} concentration in the 2017 FEIS but is within the expected range of variability for dispersion models and includes some measurements likely influenced by forest fires.

Dust Mitigation

- Dust suppression activities occurred on the Doris Camp roads, the tailings impoundment area road, the airstrip, the Roberts Bay Road, and the Windy Road during the summer months. Dust suppressants were applied on an as-needed basis between May 17, 2023, and September 19, 2023.

Nitrogen Dioxide Monitoring – Doris Site

- The maximum measured 1-hour average NO₂ concentration was 30 ppb which is 14% of the applicable GN air quality objective. This concentration is below the maximum predicted NO₂ concentration in the 2017 FEIS of 134 ppb.
- The maximum measured daily and annual average NO₂ concentrations are well below the corresponding GN air quality objectives and 2017 FEIS predictions.
- The calculated 98th percentile of the measured daily maximum 1-hour average NO₂ concentrations in the one-year period of October 2022 to September 2023 is 25 ppb which is below the CAAQS of 60 ppb.

6 Closure


This document entitled Q1-Q3 2023 Atmospheric Compliance Monitoring Program Report was prepared by Nunami Stantec Ltd. for the account of Agnico Eagle Mines Limited. The material in it reflects Nunami Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Nunami Stantec Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Respectfully Submitted.

NUNAMI STANTEC LIMITED

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Q3_Report\Final\rpt_160930542_2023_Q1_Q3_AE_ambient_monitoring_2024-03-05_fin.docx

7 References

Definitions of the acronyms and abbreviations used in this reference list can be found in the list of Abbreviations.

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- TMAC. 2016. Revisions to TMAC Resources Inc. Amendment Application No. 1 of Project Certificate No. 003 and Water License 2AM-DOH1323. Submitted June 2015 with approval received in 2016.
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- TMAC. 2019. Hope Bay Project Air Quality Management Plan. Rev 6. April 2019.

US EPA. 2009. Title 40: Protection of Environment Part 58 -Ambient Air Quality Surveillance, Subpart G - Federal Monitoring Appendix E - Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring, Research Triangle Park, NC.

Appendix A Continuous Particulate and NO₂ Monitor Calibration Records

CD Nova Thermo 5014i Calibration Inspection

Work Order Number N230104

Customer Name Agnico Eagle Hope Bay

Instrument Part Number 5014i

Instrument Serial Number CM19221003

Date March 10 2023

Description	As found	Standard	As found		Adjusted to	Final
			variance	Allowable variance		
Ambient Air Temperature	20.2	20.4	0.20	+/- 2.0°C	20.2	0.20
Ambient Relative Humidity	64	66	-2.00	+/- 3%	64	-2.00
Flow Temperature	18	21.7	-3.70	2.0+/- 0.2°C	21.7	0.00
Barometer Pressure	768.5	765.9	-2.60	+/- 5 mmHg	768.5	-2.60
Vacuum Pressure Span	51.9	52	0.10	50-70 mmHg	59.1	Pass
Flow Pressure Span	19.9	19.6	-0.30	20-30 mmHg	19.9	Pass
Flow calibration	16.67	15.82	-5.10%	+/- 2%	15.82	0.00%
Mass Calibration	7156	6928	-3.19%	+/-5%	6928	0.00%

Auto Detector Calibration

Initial High Voltage	1400	Final High Voltage	1420
Initial Beta Count	320	Final Beta Count	360

Leak Test

Start Value VAC	54.1 mmHg	
Start Value FLOW	16.67 LPM	
Leak Check Adapter VAC	153 mmHg	
Leak Check Adapter FLOW	16.53 LPM	
Flow Variance	0.14 LPM +/-2.5% (0.42lpm)	

Standards Used	Description	S/N	Calibration Date
Flow	Streamline Pro	C220-102	January 31, 2022
Temperature	Streamline Pro	C220-102	January 31, 2022
Pressure	Streamline Pro	C220-102	January 31, 2022
Relative Humidity	Vaisala HM40	U0340443	January 16 2022
Manometer	Dwyer	N/A	December 14 2016
Technical Data	Thermo Manual Waver number W1903 dated October 1, 2018 Thermo Fisher Procedure Number 106430-00 revision A		

Firmware updated to:

Calibration Complete By

Dan Molloy, Service Manager, Western Region

Signature: _____

CD Nova Thermo 5014i Calibration Inspection

Work Order Number N230104

Customer Name Agnico Eagle Hope Bay

Instrument Part Number 5014i

Instrument Serial Number CM19221002

Date March 9 2023

Description	As found	Standard	As found		Adjusted to	Final
			variance	Allowable variance		
Ambient Air Temperature	-25	-26	-1.00	+/- 2.0°C	-25	-1.00
Ambient Relative Humidity	64	66	-2.00	+/- 3%	64	-2.00
Flow Temperature	22.3	19.2	3.10	+/- 3.0°C	19.2	0.00
Barometer Pressure	768.8	769.2	0.40	+/- 5 mmHg	769.2	0.00
Vacuum Pressure Span	56.6	53.4	-3.20	50-70 mmHg	53.4	Pass
Flow Pressure Span	25.9	26.1	0.20	20-30 mmHg	25.9	Pass
Flow calibration	16.7	15.7	-5.99%	+/- 2%	15.7	0.00%
Mass Calibration	7166.34	7078	-1.23%	+/-5%	7078	0.00%

Auto Detector Calibration

Initial High Voltage	1380	Final High Voltage	1380
Initial Beta Count	300	Final Beta Count	300

Leak Test

Start Value VAC	58.7 mmHg	
Start Value FLOW	16.68 LPM	
Leak Check Adapter VAC	107 mmHg	
Leak Check Adapter FLOW	16.5 LPM	
Flow Variance	0.18 LPM	+/-2.5% (0.42lpm)
		Pass

Standards Used	Description	S/N	Calibration Date
Flow	Streamline Pro	C220-102	31-Jan-22
Temperature	Streamline Pro	C220-102	31-Jan-22
Pressure	Streamline Pro	C220-102	31-Jan-22
Relative Humidity	Vaisala HM40	U0340443	Jan 16 2022
Manometer	Dwyer	N/A	Dec 14 2016
Technical Data	Thermo Manual Waver number W1903 dated October 1, 2018		
	Thermo Fisher Procedure Number 106430-00 revision A		

Firmware updated to:

Calibration Complete By

Dan Molloy, Service Manager, Western Region

Signature: _____



AND ASSOCIATED COMPANIES

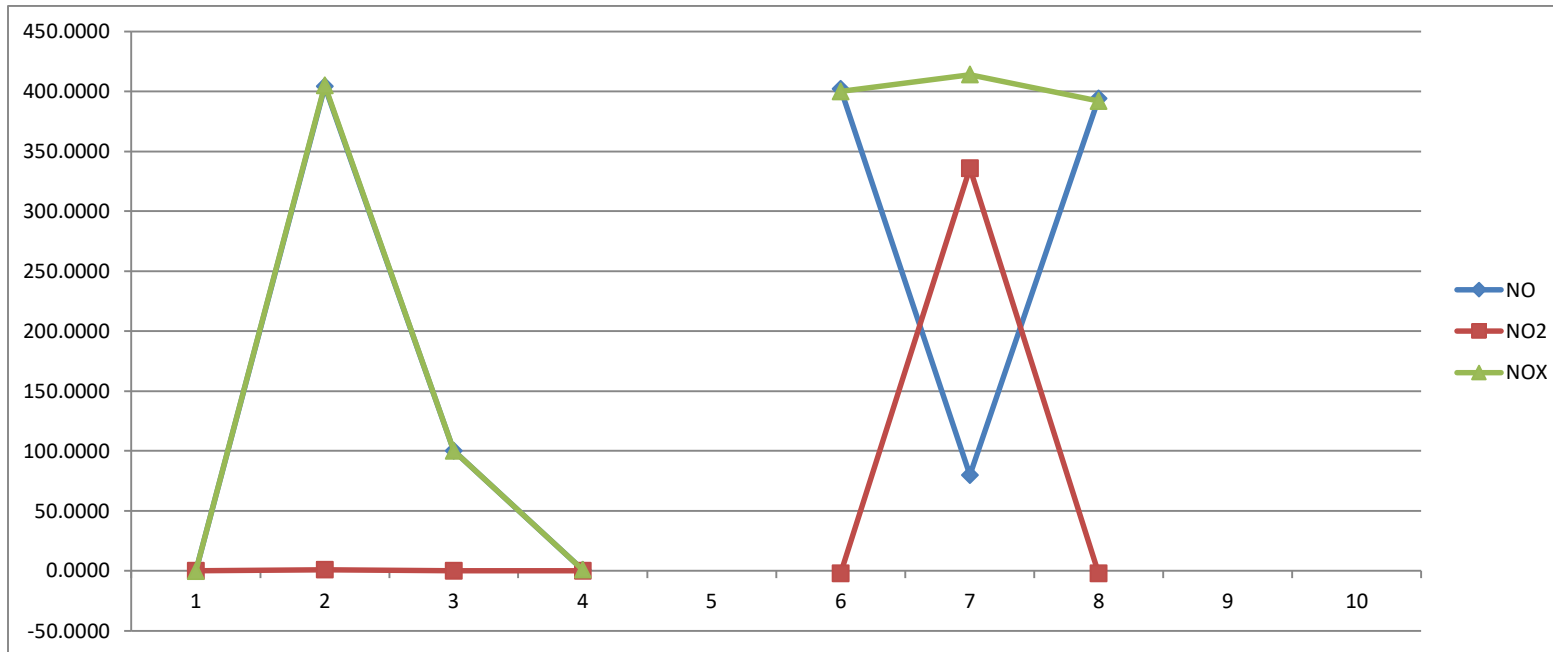
NO-NO2-NOX

Calibration form

Instrument		42iQ	Test Point	NO	NO2	NOX	ppb
Serial number	1191222768		1	-0.2000	-0.1000	-0.3000	ppb
Customer	Agnico Eagle Hope Bay		2	404.0000	1.0000	405.0000	ppb
Work order	N230104		3	100.0000	0.0000	100.0000	ppb
Date	March 11 2023		4	1.0000	0.0000	1.0000	ppb
Calibrator		Thermo 146iQ	GPT 1	402.0000	-2.0000	400.0000	ppb
Calibrator S/N	1191222770		GPT 2	80.0000	336.0000	414.0000	ppb
Test gas conc.	14.95		GPT 3	394.0000	-2.0000	392.0000	ppb
Test gas cert.	1505294						

Instrument Information	
Version	
Firmware	1.06.15.34700
PMT voltage	-830
NO background	2.7
NOX background	2.9
NO coef	1.048
NO2 coef	0.940
NOX coef	0.989

Convertor efficiency 104.3%



Completed by: Dan Molloy



AND ASSOCIATED COMPANIES

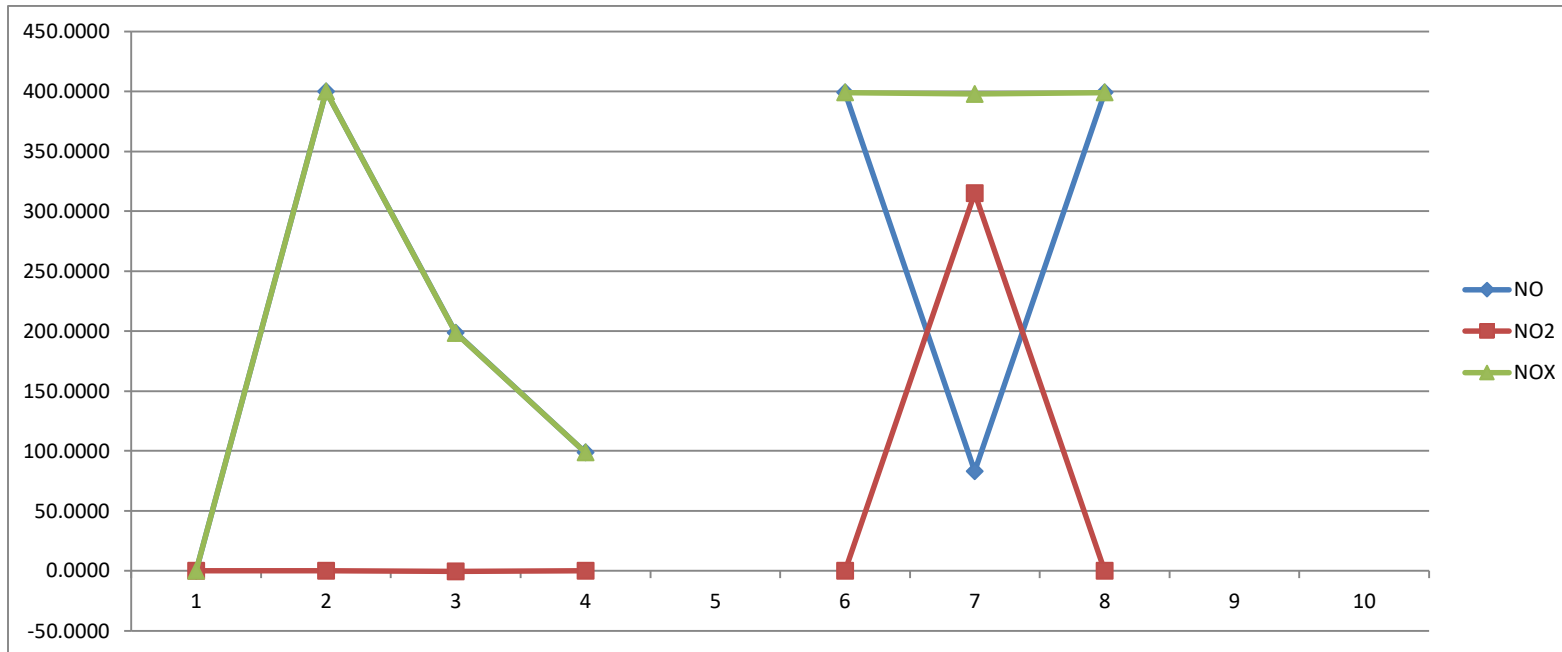
NO-NO2-NOX

Calibration form

Instrument		42iQ	Test Point	NO	NO2	NOX	ppb
Serial number	1191222768		1	0.0000	0.0000	0.0000	ppb
Customer	Agnico Eagle Hope Bay		2	400.0000	0.0000	400.0000	ppb
Work order	N230104		3	198.7000	-0.5000	198.3000	ppb
Date	March 12 2023		4	98.8000	-0.1000	98.7000	ppb
Calibrator		Thermo 146iQ	GPT 1	399.0000	0.0000	399.0000	ppb
Calibrator S/N	1191222770		GPT 2	83.0000	315.0000	398.0000	ppb
Test gas conc.	14.95		GPT 3	399.0000	0.0000	399.0000	ppb
Test gas cert.	1505294						

Instrument Information	
Version	N/A
Firmware	1.06.15.34700
PMT voltage	-830.4
NO background	4.0
NOX background	4.1
NO coef	0.992
NO2 coef	1.000
NOX coef	0.994

Convertor efficiency 99.7%



Completed by: Dan Molloy