APPENDIX 8-E

Addendums for Environmental Protection and Monitoring Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-E.1: Air Quality Monitoring Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Air Quality and Dustfall Monitoring Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 04
NWB Requirement:	2AM-MEA-1525	**Condition:** not applicable
Addendum:		

Section Change	**Specify: Update or New**	**Details**
1.2	Update	Updates provided in red text
	New	Addition provided in red text
Figure 2	New	

MEADOWBANK GOLD PROJECT

Air Quality and Dustfall Monitoring Plan

In Accordance with NIRB Project Certificate No.004

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

General Information

The Air Quality and Dustfall Monitoring Plan (AQDMP) describe the design features and operational procedures for the monitoring of air quality and dustfall at the Meadowbank Gold Project site.

Annual Review

The AQDMP will be reviewed and updated regularly if necessary. Completion of the review of the AQDMP will be documented through signatures of the personnel responsible for reviewing, updating and approving the AQDMP.

Record of Changes

A record will document all significant changes that have been incorporated in the AQDMP subsequent to the latest review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Distribution List

Agnico Eagle Mines Limited (AEM) will maintain a distribution list for the AQDMP providing information about all parties that receive the plan.

IMPLEMENTATION SCHEDULE

The proposed implementation schedule for this Plan is effective immediately (November 2013) subject to any modifications proposed by the NIRB as a result of the review and approval process.

DISTRIBUTION LIST

AEM - Environmental Superintendent

AEM – Environmental Coordinator (s)

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	10/2005			
Tech. Memo Addendum	16/05/2008	3.4		Update to air quality monitoring section of Version 1
2	10/2013	All		Revision
WT	06/2016	1.2		Update to include Whale Tail Pit

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1 INTRODUCTION

1.1 OBJECTIVES

In accordance with NIRB Project Certificate No.004, the objective of this program is to monitor ambient air quality and dustfall at the Meadowbank mine site perimeter, with the goals of verifying compliance with applicable standards, and mitigating potential environmental effects. The parameters to be measured are suspended particulates (total, PM_{10}, $PM_{2.5}$), NO_2 and dustfall (settleable particulate matter).

1.2 MONITORING LOCATIONS

Monitoring locations were determined in consultation with Environment Canada in 2011. One station was moved in 2012 due to changes in the location of the Vault Road (see Section 1.2.4). UTM coordinates are provided in Table 1, and locations are shown in relation to mine site features in Figure 1.

Table 1 - UTM coordinates for the Meadowbank air quality and dustfall monitoring locations.

Monitoring locations	Measured preferences	Easting	Northing
DF-1	TSP, PM_{10}, $PM_{2.5}$, NO_2, dustfall	636850	7217663
DF-2	TSP, PM_{10}, $PM_{2.5}$, NO_2, dustfall	637895	7213049
DF-3	Dustfall	639599	7213198
DF-4	Dustfall	639233	7217074
DF-5	TSP, PM_{10}, $PM_{2.5}$, passive NO_2, dustfall	608242	7255970

1.2.1 DF-1

Station DF-1 is located next to the explosive storage area (emulsion plant), and approximately 500 m north of the all-weather access road. TSP, PM_{10}, $PM_{2.5}$, NO_2 and dustfall are monitored at this location.

1.2.2 DF-2

Station DF-2 is located at the northern corner of South Camp Island, near the TCG contractor area. TSP, PM_{10}, $PM_{2.5}$, NO_2 and dustfall are monitored at this location.

1.2.3 DF-3

Station DF-3 is approximately 1,800 m east of the East Dike. Second Portage Lake is to the west and east. Dustfall only is monitored at this location.

1.2.4 DF-4

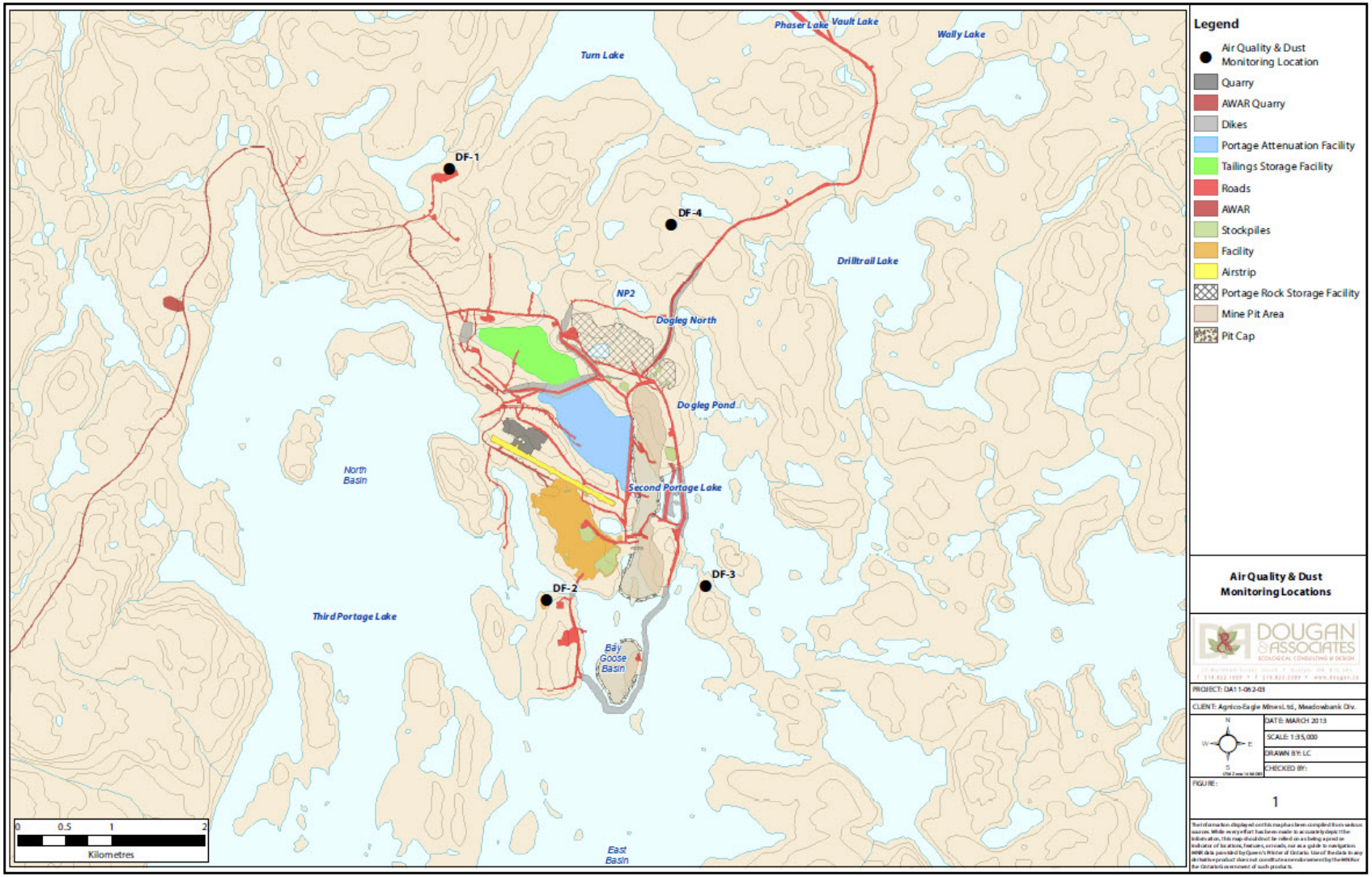
Station DF-4 is approximately 1,500 m southwest of the future location of Vault Pit. This monitoring station was installed before the construction of the Vault Road. Realignment of the road during construction placed the station within 10 feet of the road. Therefore, AEM re-positioned Station DF-4 approximately 480 m to the north-west on February 29, 2012 to be representative of the originally intended location relative to the road.

Dustfall only is monitored at this location.

1.2.5 DF-5

Station DF-5 (Figure 2) will be sited with the communications tower on the eastern boundary of the Whale Tail Pit in an area predicted to receive elevated concentrations of particulate matter (TSP, PM_{10} and $PM_{2.5}$) and NO_2 relative to concentrations predicted further from the project footprint. Monitoring at DF-5 will include TSP, PM_{10}, $PM_{2.5}$, passive NO_2, and dustfall.

Figure 1 - Meadowbank air quality and dustfall monitoring locations.



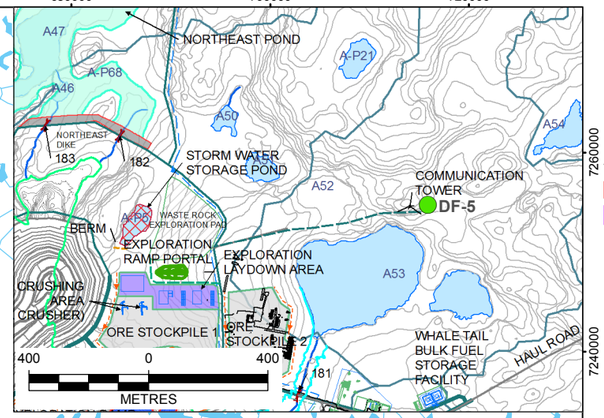
Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\4100_Air_Quality_Climate\Report\1541520_FIG_02_WHALE_TAIL_AIR_QUALITY_MONITORING_STATION.mxd

560000 580000 600000 620000 640000 660000 680000 700000 720000

7260000 7240000 7220000 7200000 7180000 7160000 7140000

N

Whale Tail Pit
DF-5
Meadowbank Mine to Whale Tail (71.5 km)
Between km 36 & km 37
Pipedream Lake
Vault Pit
DF-1
DF-4
DF-3
DF-2
Tehek Lake
km 78
km 76
Baker Lake to Meadowbank Mine (107.5 km)
Schultz Lake
km 18
Baker Lake
Baker Lake



LEGEND

AIR QUALITY MONITORING STATION
- MEASURED PARAMETER = DUSTFALL
- MEASURED PARAMETER = TSP, PM_{10}, $PM_{2.5}$, NO_2, DUSTFALL
- COMMUNITY
- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
MEADOWBANK MINE, AWAR, AND WHALE TAIL AIR QUALITY AND DUSTFALL MONITORING LOCATIONS

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	20 May 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	20 May 2016		
CHECK	JR	06 Jun. 2016	**FIGURE 2**	
REVIEW	LY	06 Jun. 2016		

2 METHODS

2.1 TSP, PM_{10}, $PM_{2.5}$

Suspended particulate matter will be generated by wind erosion of local landscapes, movement of vehicles/equipment, airstrip activities, construction activities, the combustion of diesel fuel, and solid waste incineration.

The monitoring program for suspended particulates will utilize Partisol Model 2025 sequential air samplers (single and dichotomous units) installed at two locations to measure:

- Total suspended particulates (TSP) – particulate matter less than 100 µm;
- PM_{10} – particulate matter less than 10 µm; and
- $PM_{2.5}$ – particulate matter less than 2.5 µm.

Partisol samplers operate on the principle that a stream of ambient air at a controlled flow rate is drawn through a size-selective inlet and then through a pre-weighed filter for a pre-determined time period. The exposed filter is shipped to a laboratory where it is re-weighed. The concentrations can be determined using the measured volume of air and the weight difference between the pre-weighed and exposed filter. The U.S. EPA has described standard methods for collection of PM air samples in section 40 CFR part 53 and 58 of the U.S. Code of federal Regulations (U.S. CFR, 1997a, 1997b, 1997c,).

The monitoring of TSP, PM_{10}, and $PM_{2.5}$ concentrations will be carried out according to the National Air Pollution Surveillance (NAPS) schedule. This schedule follows a monitoring cycle where a single 24-hour sample is collected every sixth day. Sampling in accordance with the NAPS schedule will provide consistency between the Meadowbank particulate monitoring stations and stations at the other facilities across the country. In addition, by operating stations on a six-day cycle, different days are sampled each week, which allows for the monitoring of differing production intensities or other variations. Monitoring of TSP and fine particulate matter will continue throughout the operations and closure phases of the Project.

Particulate sampling will be conducted year-round using the Partisol instruments' automated sampling function. However, sampling during extreme winter conditions (-20 degrees Celsius [°C] and colder with the potential for blowing snow) which frequently occur during winter months, allows the possibility for snow to be drawn through the inlet, resulting in a void sample and possible damage to the electronic components of the sampler. A small amount of data loss is expected during the winter as ambient conditions exceed the normal operating range expected for the equipment being used. Climate-controlled shelters are used to minimize those issues.

The collection of TSP provides a measure of airborne dust or dirt, which may present environmental issues such as reduced visibility, while $PM_{2.5}$ and PM_{10} (fine and coarse particulates) are regulated based on health-related concerns. TSP and $PM_{2.5}$ are subject to GN ambient air quality standards (GN,

2011). No standard is provided for PM_{10} in Nunavut, so these results will be compared to the BC air quality objective (BC, 2013) – see Section 3.

For comparison to Government of Nunavut Ambient Air Quality Standards (GN, 2011), concentrations of particulates must be calculated as:

$$C = M/V_{STD}$$

Where:

C = mass concentration of particulates ($\mu g/m^3$)

M = final mass of filter – initial mass of filter (μg)

V_{STD} = volume of air drawn in during the sampling period, normalized to 25°C and 101.3kPA (standard temperature and pressure; STP)

The Partisol instrument will be set to calculate and store the V_{STD} value for each filter.

2.2 DUSTFALL

Dustfall collection is a passive program that provides a measure of particulate deposition in the vicinity of the Project. The main dust generation processes at Meadowbank are wind erosion of site structures (e.g. the Rock Storage Facility), and fugitive sources from open pit mining, rock crushing and movement of vehicles/equipment/air traffic on site.

Dustfall is collected over monthly periods at four locations in open vessels containing a purified liquid matrix, supplied by an external accredited laboratory. Particles are deposited and retained in the liquid, which is then analyzed by the accredited laboratory for total and fixed (non-combustible) dustfall. Calculated dustfall rates are normalized to 30 days (mg/cm^2/30 days). Sampling is conducted over this period to allow for a sufficient sample size for analysis, and as a result it provides an indication of longer-term air quality trends.

The analysis of the fixed dustfall sampling results will include comparison with Alberta Environment's objectives since neither Nunavut nor the NWT have dustfall standards or guidelines (see Section 3).

2.3 NO_2

Concentrations of NO_2 by volume (ppb) are analyzed at two locations over monthly periods using a passive sampling device provided by an external accredited laboratory. No continuous monitoring is proposed for other gaseous pollutants because of low concentrations predicted in pre-construction dispersion modeling (Cumberland, 2005).

The passive NO_2 monitoring stations are co-located with dustfall stations to allow for the efficient collection of samples and the calculation of ambient secondary particulate (nitrate) concentrations (should this information be required at a later date).

The annual average NO_2 concentration by volume is calculated from the monthly data for comparison against the relevant standard.

2.4 WEATHER DATA

Weather data for the dustfall and air quality monitoring periods is collected using the mine site's permanent climate station. Daily averages for wind speed, wind direction and temperature are available from this station (see Meteorological Monitoring Plan).

2.5 GREENHOUSE GAS EMISSIONS

AEM is required by the Greenhouse Gas Emissions Reporting Program (GHGRP) to track greenhouse gas emissions based on annual fuel consumption, composition and the US EPA's AP-42 emission factors.

2.6 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

AEM will ensure that monitoring is conducted in accordance with the sampling reference methodology. In addition to standardized quality assurance/quality control requirements, such as instrument calibration, leak checks, review of data, and proper labeling of all sampling containers, field audits of Partisol samplers will be performed in accordance, where possible, with the Partisol Sampler Operating Manual, "Section 6 – Operations". See Section 4 for a detailed description of instrument management. Filters and dustfall samplers will be supplied and analyzed by a CALA-accredited external laboratory.

3 DATA ANALYSIS

3.1 REGULATORY STANDARDS

Data collected from the air quality and dustfall monitoring program at Meadowbank are compared to the applicable Government of Nunavut Environmental Standards for Ambient Air Quality (October, 2011). Standards for the measured parameters are provided in Table 2.

Table 2 - Government of Nunavut Environmental Standards for Ambient Air Quality (October, 2011) for the parameters of concern at Meadowbank. All values are for data normalized to standard conditions of 25°C and 101.3 kPa.

Parameter	Time frame	Standard	
		µg/m^3	ppb
Fine Particulate Matter ($PM_{2.5}$)	24-h average	30	
Total Suspended Particulate (TSP)	24-h average	120	
	Annual geometric mean	60	
Nitrogen Dioxide (NO_2)	1-h average	400	213
	24-h average	200	106
	Annual arithmetic mean	60	32

No standard is yet available for coarse particulate matter (PM_{10}), so results will be compared to the BC Air Quality Objective (August, 2013) of 50 µg/m^3.

Likewise, no standards for dustfall are available for Nunavut. Results of the dustfall analysis will be compared to the Alberta Environment Department recreational area guideline of 0.53mg/cm^2/30d, to provide context.

3.2 ANNUAL TRENDS

In addition, annual and year-over-year trends will be assessed, and results will be discussed in the context of mine site activity.

3.3 REPORTING

AEM will provide an annual air quality and dustfall monitoring report that summarizes the collected data. In addition, AEM will report annual emission estimates to the NPRI and GHG emissions to the appropriate federal program.

Annual monitoring reports will include the following:

- Description of the monitoring programs;

- Description of mitigation efforts undertaken in the previous year;
- Monitoring locations;
- Instrumentation;
- Weather conditions during sample collection;
- Time and duration of monitoring, including dates;
- Partisol sampler inspection reports;
- Relevant standards/guidelines;
- Results of monitoring (raw and averaged as appropriate for comparison to standards);
- Emission tracking data for SO_2 and greenhouse gases based on annual fuel consumption, composition, and AP-42 emission factors;
- Comparison of results to relevant standards, analysis of annual and year-over-year trends, and comparison to estimates in EIA dispersion modeling;
- Discussion of results, including possible reasons for non-compliance with standards; and
- Mitigation measures for reducing non-compliance incidents in the future.

4 OPERATION AND MAINTENANCE

4.1 MANAGEMENT RESPONSIBILITY

AEM will be responsible for managing and operating the stations. Operation and monitoring of the stations will come under the responsibility of the Environment Superintendent. Designation of training requirements is the responsibility of Meadowbank Environment Department.

4.2 OPERATION

The Environment Department will be responsible to ensure that the Partisol samplers are operated in accordance with the equipment operating manual and that samples will be collected by appropriately trained personnel consistent with detailed written operating instructions from qualified personnel (i.e. air quality specialist familiar with the equipment). An SOP will be kept up to date and communicated to personnel. It will also ensure that proper QAQC practices are followed.

4.3 MAINTENANCE

As recommended by the manufacturer and to ensure results are in compliance with good practices, the following items will be part of the regular maintenance and care of the Partisol sequential air samplers. This will allow flow values and temperature compensation to be constant with time.

Maintenance Procedures	**Interval**
Exchanging particle trap filter	6 months
Testing batteries–exchange if necessary	6 months
Exchanging fuses	As needed
Cleaning Air Intake Filters	6 months
Inspect “V” Seals and O-rings	3 months
Rebuilding piston pump(s)	18 months

Audit Procedures	**Interval**
Ambient Air Temperature audit	4 weeks
Filter Temperature(s) audit	4 weeks
Ambient Pressure audit	4 weeks
External Leak Check	4 weeks
Flow controller audit	4 weeks

Calibration Procedures	**Interval**
Analog I/O calibration	Automatic
Ambient Air Temperature calibration	1 year
Filter Compartment Temperature calibration	1 year
Filter Temperature(s) calibration	1 year
Ambient Pressure calibration	1 year
Ambient Relative humidity calibration	1 year
External Leak Check	1 year
Flow controller calibration	1 year

5 PLAN REVIEW

The Air Quality and Dustfall Monitoring Plan will be reviewed regularly by the Meadowbank Environmental Superintendent and be updated if any changes to the equipment or the program occur.

6 REFERENCE

AEM (2008) Agnico-Eagle Mines Limited. Technical Memo- Air Traffic Management- Meadowbank Gold Project (June 10, 2008)

BC 2013. British Columbia Ambient Air Quality Objectives. Provincial Air Quality Objective Information Sheet. August 12, 2013.

Cumberland Resources Ltd. 2005. Meadowbank Gold Project Air Quality Impact Assessment Report.

Golder Associates Ltd. (Golder) 2005 Air Quality and Noise Management. Meadowbank Gold Project.

Golder Associates Ltd. (Golder) 2008. Technical Memorandum. Addendum Report: Air Quality Monitoring Meadowbank Gold Project. Prepared for Agnico-Eagle Mines Ltd. May 16, 2008.

GN (Government of Nunavut) 2011. Environmental Guideline for Ambient Air Quality. Department of Environment, Government of Nunavut. October, 2011.