



BACK RIVER PROJECT
Air Quality Monitoring and Management Plan

July 2019

BACK RIVER PROJECT

AIR QUALITY MONITORING AND MANAGEMENT PLAN

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Document Revision Record

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Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

| | |
|-------------------------|--|
| ASTM | American Society for Testing and Materials. |
| CACs | Criteria air contaminants |
| CALA | Canadian Association for Laboratory Accreditation |
| EC | Environment Canada |
| ECCC | Environment and Climate Change Canada |
| GN-DOE | Government of Nunavut - Department of Environment |
| NAPS | National Air Pollution Surveillance |
| NIRB | Nunavut Impact Review Board |
| PM_{2.5} | Particulate matter with a aerodynamic diameter less than 2.5 microns |
| PM₁₀ | Particulate matter with a aerodynamic diameter less than 10 microns |
| TSP | Total suspended particulates |
| US EPA | United States Environmental Protection Agency |

1. Introduction

The Back River Project (the Project) is a gold project owned by Sabina Gold & Silver Corp. (Sabina) within the West Kitikmeot region of southwestern Nunavut. It is situated approximately 400 kilometres (km) southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories. The Project is located predominantly within the Queen Maud Gulf Watershed (Nunavut Water Regulations, Schedule 4).

The Project is comprised of two main areas, Goose Property and the Marine Laydown Area (MLA) with interconnecting winter ice roads. The majority of annual resupply will be completed using the MLA situated along the western shore of southern Bathurst Inlet, which is connected seasonally to Goose via an approximately 160 km long winter ice road.

The Air Quality Monitoring and Management Plan (AQMMP or Plan) describes how Sabina intends to implement a range of environmental monitoring and management measures related to air quality throughout the life of the Project. These measures demonstrate how Sabina will avoid, or minimize, mitigate and/or manage to an acceptable level, the potential adverse effects on the environment associated with air quality.

The Plan has been constructed to meet the requirements of Project Certificate No. 007 and in accordance with best management practices and in conformance with current Federal and Territorial statutory requirements.

This plan is a living document to be updated upon changes in related regulatory requirements, management reviews, incident investigations, changes to facility operation or maintenance, and environmental monitoring results, best practice updates or other Project specific protocols once construction starts through to Project closure activities. Any updates will be filed with the Annual Report submitted to the NIRB in accordance with Project Certificate No.007.

The information presented herein is current as of July 2019. The Plan will be reviewed as needed for changes in operation and technology and as directed by the NIRBs Monitoring Officer responsible for Project Certificate No. 007 or other regulatory authorization where appropriate. Completion of the updated Plan will be documented through signatures of the personnel responsible for reviewing, updating, and approving the Plan.

2. Scope and Objectives

The purpose of this plan is to outline the requirements for air quality monitoring, environmental protection and mitigation. The Air Quality Monitoring and Management Plan includes the following:

- Applicable legislation and guidelines (Section 4).
- Environmental protection measures that are already in place or that will be established to avoid, control, and mitigate potential adverse effects on air quality associated with all phases of the Project (Section 6)
- A monitoring program (Section 7) to collect on-site air quality, source

emissions and meteorological data to allow for an adaptive approach to air quality and emissions management.

The Plan includes quantification of the following pollutants:

- Nitrogen dioxide (NO₂).
- Total suspended particulates (TSP) matter.
- Respirable particulate matter (PM_{2.5}).
- Dust deposition.
- Greenhouse Gas (GHG).
- Air pollutants under other national or territorial regulations such as the National Pollutant Release Inventory (NPRI) and Greenhouse Gas Reporting Program (GHGRP) as prescribed. The annual report will confirm if reporting is performed for the NPRI or GHGRP.

With the implementation nationwide of ultra-low sulphur diesel (ULSD) fuel, sulphur dioxide (SO₂) emissions are assumed to be negligible, and so SO₂ is not included in this AQMMP.

3. Implementation

This document was developed based on baseline data collected from 2011 to 2013, input received during the Environmental Assessment process and Terms and Conditions outlined in the NIRB Project Certificate No. 007.

This Plan will continue to be developed and implemented from Project Construction through to Closure. Air quality management will be tracked, reviewed, and updated through ongoing maintenance of the Plan. Significance criteria have been developed that assist in identifying priority areas, management criteria and activity-specific mitigation measures. Future updates will continue to incorporate relevant feedback from review by stakeholders.

Monitoring will be the principal mechanism by which the effectiveness of this Plan is determined. In accordance with the Project Certificate, annual reporting of monitoring results will be provided to the NIRB.

Operational control is facilitated through the contractor job-specific standard operating procedures (SOP) work instructions, on-the-job instruction, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operational control will be reviewed according to preventative maintenance and review procedures and schedules.

3.1 RELATIONSHIP TO OTHER MANAGEMENT PLANS

This Plan is intended for use in conjunction with the following Plans:

- Incineration Management Plan
- Vegetation Management and Monitoring Plan

4. Applicable Legislation and Guidelines

4.1 AIR QUALITY

Canada's federal, provincial, and territorial governments have established ambient air quality thresholds for criteria air contaminants (CACs) that are intended to ensure long-term protection of public health and the environment. The Government of Nunavut has established standards for maximum concentrations of ambient NO₂, O₃, TSP and PM_{2.5}. The Canadian Council of Ministers of the Environment (CCME) have also produced Canadian Ambient Air Quality Standards for 2020 for PM_{2.5} and NO₂ (CCME 2012, 2019) which are intended for regional airshed management. While the CAAQS are not intended for comparison at a local project-level, they are included here for reference purposes.

There are no air quality standards for dustfall in Nunavut. Dustfall has been generally deprecated as a measurement standard (for example it has recently been removed from the British Columbia Ambient Air Quality Objectives), and it is recommended that dustfall is viewed as a management tool rather than a criterion. The guideline provided in the Alberta Ambient Air Quality Objectives is provided for reference purposes (AEP 2019). The fixed portion (non-organic) of dustfall which is caused by mechanical processes is of greater interest than total dustfall (fixed plus organic constituents such as pollen).

Table 4.1-1 summarizes the ambient air quality standards and guidelines relevant to the Project.

Table 4.1-1. Relevant Ambient Air Quality Standards and Guidelines

| Contaminant | Averaging Period | Nunavut Ambient Air Quality Standards (µg/m ³) ^(a) | Canadian Ambient Air Quality Standards (2020) (µg/m ³) ^(b) | Dust Deposition Guideline (mg/cm ²) ^(c) |
|--|------------------|---|---|--|
| Nitrogen dioxide (NO ₂) | 1-hour | 400 | 60ppb ^(e) | - |
| | 24-hour | 200 | - | - |
| | Annual | 60 | 17ppb | - |
| Total Suspended Particulate (TSP) | 24-hour | 120 | - | - |
| | Annual | 60 ^(d) | - | - |
| Fine Particulate Matter (PM _{2.5}) | 24-hour | 30 | 27 ^(f) | - |
| | Annual | - | 8.8 ^(g) | - |
| Dust deposition (mg/dm ²) | 30-day | - | - | 53(158) ^(h) |

Notes:

^a Government of Nunavut (2011).

^b CCME (2019).

^c AEP (2019).

^d As a geometric mean.

^e The 3-year average of the annual 98th percentile of the daily 1-hour maximum concentrations.

^f The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.

^g The 3-year average of the annual average concentrations.

^h In residential and recreational areas. The value in brackets represents industrial areas.

4.2 GREENHOUSE GASSES

Facilities emitting over 10,000 tonnes (t) of carbon dioxide equivalent (CO₂e) are required to report GHG emissions annually to the Greenhouse Gas Reporting Program (GHGRP), under the jurisdiction of Canadian Environmental Protection Act, 1999 (Government of Canada 2019). Note that mines under construction are not required to report to the GHGRP until operations commence.

4.3 NATIONAL POLLUTANT RELEASE INDEX

Facilities are required to report various pollutants to the National Pollutant Release Inventory (NPRI) when NPRI reporting criteria for contaminants of concern are met, under the jurisdiction of Canadian Environmental Protection Act, 1999 (Government of Canada 2018). Note that mines under construction are required to report to the NPRI if criteria are met, though mines in the pre-construction phase are not.

5. Roles and Responsibilities

The Construction Manager is responsible for the implementation of the management, mitigation, and adaptive management aspects of this plan and the ultimate success of the air quality protection measures.

The Vice President, Environment and Sustainability is ultimately responsible for the monitoring program (Section 7) and external reporting described in this plan. The Vice President, Environment and Sustainability will also ensure any concerning results are communicated to the Construction Manager for the implementation of adaptive management and will ensure this Plan is reviewed and revised as needed.

The Environmental Permitting Manager along with his/her direct reports are responsible for:

- Supporting Plan review and revision.
- Monitoring.
- Internal reporting.
- External reporting.
- Verifying compliance and application of adaptive management.

6. Environmental Protection Measures

6.1 EMISSIONS MANAGEMENT

In order to eliminate or reduce the potential for adverse effects on air quality during all phases of the Project, an Emissions and GHG Reduction Plan, Fugitive Dust Reduction Plan and Incineration Management Plan will be implemented. The Emissions and GHG Reduction Plan and Fugitive Dust Reduction Plan are discussed in the subsections that follow, and a summary of the Incineration Management Plan is also provided. For additional information on incineration practices refer to the stand-alone Incineration Management Plan.

6.1.1 Emissions and GHG Reduction Plan

An Emissions and GHG Reduction Plan will be implemented to reduce CAC and GHG emissions, including from sources such as:

- Combustion stacks, such as generators and incinerators.

- Equipment exhaust emissions from mine fleet vehicles such as dozers, haul trucks, graders, and other mobile fleet equipment.
- Explosives.

The plan includes the following:

- Preferentially selecting equipment with low emissions that meet latest applicable Canada emissions standards and guidelines, where economically and reasonably feasible.
- Implementation of energy efficiency and heat recovery measures.
- Procurement policies to identify fuel and equipment specifications.
- Minimization of vehicle and equipment idling, taking account of differing operational requirements in summer and winter.
- Use of large haul trucks for ore and waste transport to minimize the number of trips required between the source and the destination.
- Ensuring vehicles are driven at designated speeds on site roads.
- Ensure waste oil burner units are equipped with a settling tank and filter system for particulate removal from the waste oil.
- Use of emission control systems (e.g., wet scrubbers, baghouses, and filters) on stacks and relevant ventilation systems where appropriate.
- Regular servicing of all mobile and stationary equipment to maintain fuel efficiency.
- Necessary training and instruction for all on-site staff with duties related to the operation of equipment that emit air pollutants or controls air emissions (e.g., the required measures to be implemented during start-up, shut down, and emergency conditions):
 - The site operator will maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an effect on the environment.
 - These documents will be made available to the regulator on request.
- Adherence to all permits, authorizations and approvals, including NIRB Project Certificate No.007, Term and Condition #6 wherein Sabina is required to maintain a GHG Reduction Plan, which is provided above as the items to increase efficiency and reduce GHG combustion emissions.
 - Note that Term and Condition #6 includes an estimate of the baseline GHG emissions from the Project. Baseline GHG emissions are insignificant from fuel combustion at the existing exploration camp and associated infrastructure in the context of Project GHG emissions during construction and operations, so are considered to be “nil”.

6.1.2 Fugitive Dust Reduction Plan

A Fugitive Dust Reduction Plan will be implemented in order to minimize fugitive dust emissions. Fugitive dust emission sources from the Facility will include:

- Dust from baghouses and dust collectors.
- Fugitive dust on unpaved roads from fleet vehicles.

- Fugitive dust emissions from construction and mining activities such as bulldozing, grading, drilling and blasting.

The Plan includes the following:

- Ensuring all-weather roads (local site roads) are regularly compacted and kept in good repair.
- Ensuring vehicles will be driven at designated speeds on site roads.
- Use of large haul trucks for ore and waste transport to minimize the number of trips required between the source and destination.
- Application of dust suppression as needed when topping or capping the landfill.
- Application of water and/or approved chemical dust suppressants along the highest-use segment of roads.
- Use of water sprays or dust suppression fluids compatible with the ambient air temperatures to suppress dust generation from equipment in the crushing facility. Dust suppression methods should be approved by the Government of Nunavut as outlined in the Nunavut Environmental Guideline for Dust Suppression (GN 2002a) and should be suitable for use at below freezing temperatures.
- Minimize the discharge heights from the crushers onto conveyers, and conveyors onto stockpiles. In addition, the discharge from crushers onto conveyors or into other equipment should be enclosed as far as is practicable (e.g., free fall of materials from conveyors carrying material should be fitted with a full hood such as a plastic chute where possible).
- Storage areas should be kept in a condition that does not give rise to visible dust emissions.
- Erection of windbreaks or fences around known problem areas or stockpiles to limit the dispersion of dust emissions from equipment and stockpiles, or activities likely to generate dust.
- Necessary training and instruction for all on-site staff with duties related to activities that may cause fugitive dust:
 - The site operator will maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an effect on the environment.
 - These documents will be made available to the regulator on request.
- Adherence to all permits, authorizations and approvals including NIRB Project Certificate No. 007, Term and Condition #3.

Prior to use of a chemical dust suppressant, notification will be provided to the GN (specifically, the Environmental Protection Service of the Department of Sustainable Development), the landowner and the NIRB. As prescribed in the Nunavut Environmental Guideline for Dust Suppression (GN 2002a), application rate will follow the manufacturer's specifications and will be limited to the road surface. Application will be monitored to ensure there is no pooling or runoff and that the product is incorporated into the road surface. If a product not currently approved for use in Nunavut will be used, an application for approval will be made to the GN following the requirements for new product approval which are outlined in the Nunavut Environmental Guideline for Dust Suppression (GN 2002a).

6.1.3 Incineration Management Plan

An Incineration Management Plan will be implemented to minimize emissions from incineration activities. The Incineration Management Plan includes the following:

- Installation of an incinerators that comply with Nunavut standards (GN 2002b), Canada-Wide Standards for Dioxins and Furans (CCME 2000a) and Canada-Wide Standards for Mercury emissions (CCME 2000b).
- Stack testing of permanent incinerators to ensure compliance with standards.
- Operation of the incinerators include the following measures:
 - A waste segregation and recycling program (i.e., materials that are unsuitable for incineration, such as chlorinated plastics, will be diverted to alternate waste disposal facilities).
 - Training of personnel in incinerator operations including how to minimize pollutant emissions during operation of the incinerator.

The stand-alone Incineration Management Plan also addresses the NIRB Project Certificate No.007, Term and Condition #4, wherein Sabina shall develop and implement an Incineration Management Plan that demonstrates consideration for the recommendations provided in the Technical Document for Batch Waste Incineration (EC 2010).

6.2 SUMMARY

A summary of the various Project phases and relevant emissions management plan is shown in Table 6.2-1

Table 6.2-1. Mitigation Schedule

| | Baseline and Pre-construction | Construction | Operation | Temporary Closure | Care and Maintenance | Reclamation and Closure | Post-closure |
|----------------------------------|-------------------------------|--------------|-----------|-------------------|----------------------|-------------------------|--------------------------|
| Emissions and GHG Reduction Plan | Not considered necessary | Required | Required | Required | Required | Required | Not considered necessary |
| Fugitive Dust Reduction Plan | Not considered necessary | Required | Required | Required | Required | Required | Not considered necessary |

7. Monitoring Program

The Air Quality Monitoring Program consists of the following components:

- Passive air quality monitoring of NO₂ (baseline collection began in May 2011).
- Dustfall monitoring of particulates and metals (baseline collection began in May 2011).
- Particulate monitoring of TSP and PM_{2.5} (baseline collection began in summer 2013).
- Meteorological monitoring, which has been ongoing since 2004.
- Incinerator stack emissions testing.
- Emissions monitoring (e.g., annual fuel use for mobile and stationary equipment and fugitive emissions estimation) to assist in quantification for regulatory reporting (i.e. NPRI, GHGRP).

The design, installation, operation and certification of ambient air quality monitoring programs will comply with the principles contained in the National Air Pollution Surveillance Network Quality Assurance and Quality Control Guidelines (Environment Canada, 2004). The following sections provide further details of these monitoring components.

The air quality monitoring program has been designed to comply with NIRB Project Certificate No.007, Term and Condition #1 and where appropriate #2 through #8. Information from recent baseline plant community surveys, including lichens, are provided in the Vegetation Monitoring Program Technical Memorandum (Golder 2019). Similar surveys will be repeated periodically over the mine life under the vegetation monitoring program to monitor for project effects, including those related to air quality per NIRB Project Certificate No.007, Term and Condition #1d.

Air quality baseline information has not been repeated in this Plan but can be found in the Back River Project EIS and will be used, where appropriate, in the interpretation of monitoring program results.

7.1 PASSIVE AIR QUALITY MONITORING (NO₂)

Emissions of NO₂ are expected as a result of fuel combustion associated with the Project. NO₂ monitoring will be carried out during the construction and operation of the Project.

7.1.1 Sampling Methods

To facilitate comparison with baseline data, a Passive Air Sampling System (PASS) will be used to monitor NO₂. The PASS monitors NO₂ in the ambient air through the process of diffusion across a permeable membrane (Maxxam Analytics Inc. 2011), and can detect very low concentrations of the gas. The sample media are deployed in the field beneath protective shelters for a period of approximately 30 days. Following the exposure period the samples are retrieved and sent to the laboratory for analysis along with meteorological data including air temperature, wind speed and relative humidity, to allow the ambient air concentration of the compound over the sampling period to be determined.

7.1.2 Sample Locations

PASS monitoring will be carried out at off-site locations (nominally at or beyond the fenceline or operational boundary (e.g. Project Development Area (PDA))); one at the MLA and two at the Goose Project Area. The PDA is depicted in Figure 7.1-1. These stations will be located per Project activities and the predictions of highest impact from the EIS, and may be moved periodically during Project development to best monitor the Project component of highest activity and to facilitate comparison with predictions.

There will also be one additional monitoring site located further from the Goose Project Area, away from the project activities, for the purpose of measuring background concentrations. This background station

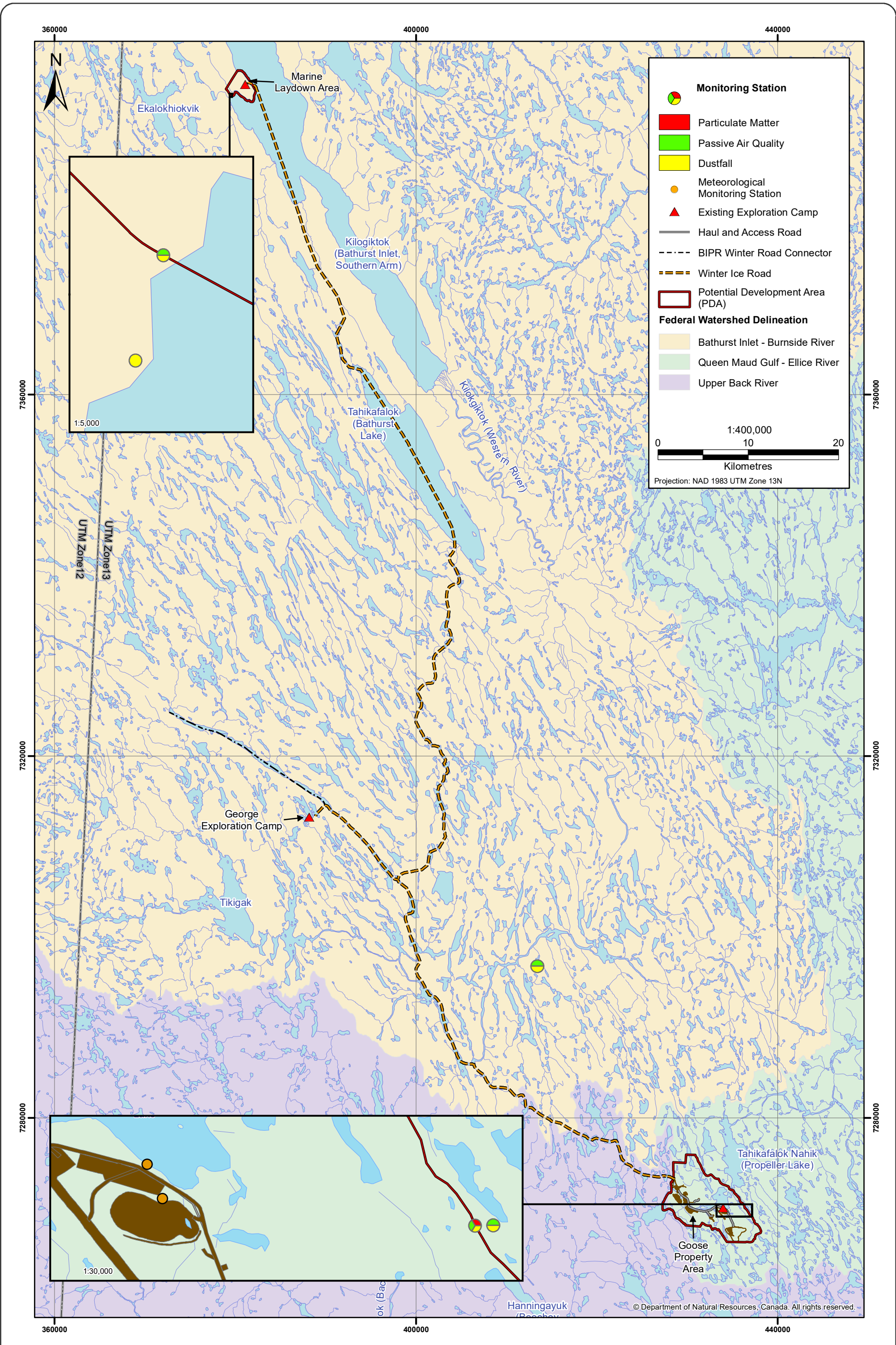


Figure 7.1-1 Meteorological Stations and Example Air Quality Monitoring Stations

Figure 7.1-1

will only be monitored for during summer months, due to the logistical difficulties of accessing distant locations in the winter.

The exact locations of the samplers will be determined in the field and will be based on predictions made in the EIS, mine activity, predominant winds, and accessibility. A summary of PASS station offsets from the nominal fenceline or PDA will be approximately:

- 0 m at the Goose Project Area;
- 150 m at the Goose Project Area;
- 10 to 20 km at the Goose Project Area (background station to be operated during the summer months only); and
- 0 m at the MLA.

7.1.3 Data Analysis.

The NO₂ sampling will provide an average concentration for each month period deployed. Compliance with the annual air quality standards will then be determined (Table 4.1-1). In addition, temporal trends of ambient NO₂ concentrations will be determined.

The monitoring results will be compared with annual average criteria and EIS predictions. If passive sampling should indicate levels above predictions or above compliance of the annual criteria, then the monitoring data will be used to provide feedback to modify the air quality management procedures incorporated at the site. This may consist of additional investigation and/or further mitigative efforts.

7.2 DUSTFALL MONITORING

The dustfall monitoring program will measure the quantities of dust deposited near the Project during construction and operation as generated by mine activities such as vehicle movements, blasting, and wind erosion of rock piles. Dustfall monitoring will be carried out during the construction and operation of the Project.

7.2.1 Sampling Methods

Dustfall collection is a passive monitoring method which provides a measure of particulates that would be directly deposited onto vegetation or soil. A dustfall jar of a known cross-sectional area is exposed in the field to collect ambient dustfall. The jars are then sent to a laboratory for analysis after their exposure period.

The dustfall monitoring program was developed in accordance with sampling method ASTM D1739-98 (ASTM Standard D1739-98 Reapproved 2010). The containers are installed on a tripod or pole, and exposed to the atmosphere for approximately 30 days during the summer months. Winter dustfall monitoring is difficult in northern climates and dustfall is minimal in the winter. As such, it is recommended that only a single dustfall station monitors during the winter.

Samples are sent to the laboratory for analysis of total and fixed particulate matter as well as metals. Each dustfall station is comprised of two sample jars. One of the containers is analysed for particulates, while the other is analysed for metals. The containers are partially filled with deionized water and algaecide to prevent growth of algae in the containers.

7.2.2 Sample Locations

Dustfall monitoring will be carried out at off-site locations (nominally at or beyond the fenceline or operational boundary (e.g. PDA depicted in Figure 7.1-1)); two at the MLA and two near the Goose Project Area. These stations will be located per Project activities and the predictions of highest impact from the EIS, and may be moved periodically during Project development to best monitor the Project component of highest activity and to facilitate comparison with predictions.

There will also be one additional monitoring site located further from the Goose Project Area, away from the project activities, for the purpose of measuring background concentrations.

The exact locations of the dustfall stations will be determined in the field and will be based on predictions made in the EIS, mine activity, predominant winds, and accessibility. A summary of dustfall station offsets from the nominal fenceline or operational boundary will be approximately:

- 0 m at the Goose Project Area;
- 150 m at the Goose Project Area;
- 10 to 20 km at the Goose Project Area (background station);
- 0 m at the MLA;
- 150 m at the MLA.

Dustfall stations will be co-located with the PASS stations where possible.

7.2.3 Data Analysis

The dustfall monitoring provides a 30-day average mass of deposited particulate. This is compared to the TSP deposition predictions in the EIS and referenced to the Alberta guideline, since Nunavut does not have dustfall standards (Table 4.1-1). In addition, analysis of temporal trends is undertaken, with consideration to the time of year and meteorological conditions. Care should be taken in comparing dustfall with TSP deposition, as dustfall is a more conservative measurement which includes size fractions larger than TSP.

The monitoring data will also be used to provide feedback to modify the dust management procedures incorporated at the site, if required.

7.3 PARTICULATE MONITORING (TSP AND PM_{2.5})

The generation of suspended particulate matter is expected as a result of the mine activities such as fuel combustion, movement of vehicles, crushing, blasting, wind erosion, bulk handling and storage and other associated mineral processing and construction activities. As particulate monitoring requires dedicated line voltage power and shelter, monitoring will commence during the construction phase when power and shelter becomes available.

7.3.1 Sampling Methods

TSP and PM_{2.5} measurements will be taken by using a Federal Reference (FRM) Sampler or similar active air sampling device. Due to the climate, the air samplers will be installed inside a shelter. The monitoring site location will be free from obstructions and nearby pollutant sources that may cause interference in suspended particulate monitoring.

7.3.2 Sample Locations

Ambient suspended particulate matter (TSP and PM_{2.5}) will be measured at the Goose Property at an appropriate off-site location (nominally the PDA). Monitoring will be carried out during the construction and operation of the Project. The location of the station may change with Project activity depending on which pit is operational, however, given that the station requires accessible line power and a shelter, mobility of the station will be limited. The exact location of the site will be selected in the field based on the EIS predictions, site accessibility, and feasible access to line power supply. The particulate monitoring station will be colocated with the 0 m dustfall and PASS stations, if possible.

7.3.3 Data Analysis

The particulate sampling will provide continuous concentration measurements for TSP and PM_{2.5} on an hourly basis. This will be compared to the relevant standards (Table 4.1-1) as well as the Project EIS predictions. In addition, temporal trends of the TSP and PM_{2.5} ambient concentrations will be examined, taking into consideration the time of year and meteorological conditions of the sampling period.

The monitoring data will also be used to provide feedback to modify the dust and air quality management procedures incorporated at the Project, if required.

7.4 METEOROLOGICAL MONITORING PROGRAM

Two meteorological stations will continue to be operated at Goose Lake. The 10 m tall Goose Lake meteorological station will continuously measure hourly meteorological parameters such as temperature, wind speed, wind direction, relative humidity, solar radiation and rainfall. The Goose Lake micro-met station measures air temperature, water temperature, rainfall, wind speed, wind direction and global radiation meteorological parameters to determine evaporation rates during the open water season.

Meteorological monitoring will occur at these locations during the construction and operation of the Project. The locations of the meteorological stations are shown in Figure 7.1-1.

7.5 INCINERATOR STACK TESTING

An Incinerator Stack Testing program will be implemented to measure emissions of dioxins, furans, and mercury from the waste incinerator(s). A stack test will be conducted on each permanent incinerator within the first year of operations.

The collection and analysis of samples will be conducted in compliance with appropriate stack test methods and undertaken by an accredited laboratory. Following each stack emissions testing program an Incinerator Stack Testing Compliance Report will be completed. This report will include a description of the incinerator and how it was being operated at the time of the stack emissions testing program, the methods used for sampling and analysis and a discussion of the results, including comparison with the Canada Wide Standards for Dioxins and Furans (CCME 2000a) and the Canada Wide Standards for Mercury (CCME 2000b). Stack test results will be reported to NIRB and Environment Canada within a year of collection.

7.6 FEDERAL REPORTING REQUIREMENTS

An assessment of NPRI and GHG emissions will be carried out annually to determine whether reporting to the NPRI or GHGRP is required. If so, the applicable reporting will be performed and required information submitted to ECCC through the established national reporting systems.

7.7 SUMMARY

Table 7.9-1 shows the monitoring schedule for emissions monitoring. Monitoring is not considered necessary during pre-construction, care and maintenance, or closure phases, as there are not expected to be significant air emissions during these phases.

8. Mitigation and Adaptive Management

One purpose of the AQMMP is to document the mitigation measures that will be implemented on site and to outline the monitoring programs that will be in place to confirm success of the mitigation. The plan is intended to ensure air quality levels remain within EIS predictions and/or applicable standards. Results from the monitoring programs will be reviewed annually to determine if any unanticipated trends are evident and if applicable criteria are being met. The need for any corrective actions to on-site emission management or installation of additional control measures will be determined on a case-by-case basis. Thresholds which trigger the need for response actions may include:

- Monitoring data showing concentrations greater than predictions and/or applicable standards.
- Monitoring data showing an un-anticipated significant increasing trend in contaminant concentrations.
- Issues raised by on-site staff, regulators, or local communities.

Discussions will be initiated to resolve any issues as soon as possible after the issue has been identified.

This plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the monitoring program (Section 7). The Management Plan is a “living document.” Components of the AQMMP may need to be revised over the life of the Project, based on field conditions, regulatory changes and/or technological advances. Any modifications made to the overall Plan will be communicated to regulatory authorities where applicable.

The monitoring program (Section 7) is intended to monitor the effectiveness of mitigation actions (Section 6). The results of mitigation activities will be reported in an annual report (Section 11). In addition, the results of facility-specific monitoring programs (e.g. incinerator testing) will be reported in the annual report, along with suggestions for further mitigation activities.

This circle of mitigation activities, monitoring and evaluation and new mitigation activities will adaptively manage air quality issues identified and arising as a result of the Project. For example, if dustfall shows an increasing trend, dust suppression improvement and/or road use modification options will be considered. These may include alterations to dust suppressant application rate, frequency, methodology or type, and/or modifications of road maintenance protocols, and/or reductions in road usage through personnel awareness or use of alternate vehicles.

Adaptive management response will also be triggered in real-time, based on site observations. This includes observations of unusual amounts of visible emissions from the incinerator (which may indicate inefficient incinerator performance), or unusual amounts of dust generated along roadways, airstrip or related to crushing activities (which may indicate dust suppression or alternate mitigation actions are needed). Such observances will trigger application of dust suppressants or a re-assessment of operating conditions by relevant personnel (e.g. incinerator or crusher operator) to re-optimize system performance.

Table 7.9-1. Air Quality Monitoring Schedule

| Monitoring Program | Pre-construction | Construction | Operation | Temporary Closure | Care and Maintenance | Reclamation and Closure | Post-Closure |
|---------------------------|------------------|-------------------------------------|-------------------------------------|---|----------------------|-------------------------|--------------|
| PASS | No | Yes | Yes | Monitoring is not considered necessary; however, the plan will be re-evaluated as required. | | | |
| Dustfall | No | Yes | Yes | | | | |
| Particulate Matter | No | Yes | Yes | | | | |
| Incinerator Stack Testing | No | within the first year of operations | within the first year of operations | | | | |
| NPRI | No | Yes | Yes | Yes ^(a) | Yes ^(a) | Yes ^(a) | No |
| GHGRP | No | No | Yes | Yes ^(a) | Yes ^(a) | Yes ^(a) | No |

(a) Internal assessment, and, if required, annual reporting through national reporting portals.

Table 7.9-2. Air Quality Monitoring Locations^(a)

| Monitoring Program | Goose Lake | MLA |
|--------------------|-------------------------------------|------------|
| PASS | 0 m, 150 m, 10-20 km ^(b) | 0 m |
| Dustfall | 0 m, 150 m, 10-20 km ^(b) | 0 m, 150 m |
| Particulate Matter | 0 m | None |

(a) Locations referenced to nominal fenceline or PDA.

(b) During summer months only.

9. Checking and Corrective Action

Checking and corrective action evaluates the predicted effects of the Project and evaluates the compliance of the Project with appropriate guidance. Evaluation of predicted effects will be conducted through facility-specific monitoring (Section 7). The monitoring, quality control, and reporting procedures detailed in this plan will be used to:

- Assess the effectiveness of mitigation and management measures.
- Identify Project effects requiring further mitigation efforts.
- Comply with requests from regulators and stakeholders.
- Adapt to changes in the regulations or the Project.

10. Record Keeping

Record keeping will be conducted by Sabina. Data will be entered into suitable electronic databases, checked for quality control (see Section 13) and stored by Sabina. Data summaries will be appended to the annual AQMMP report and the report will be transferred for storage with the Government of Nunavut, Department of Environment.

11. Environmental Reporting

AQMMP monitoring results will be reported annually to the NIRB, and will include information on:

- Annual meteorological monitoring
- Annual air quality monitoring
- Incinerator stack testing (when applicable).

GHGRP and NPRI reporting will be performed annually, when applicable, following national reporting procedures. Any incinerator stack testing results will also be reported to the Nunavut Water Board in the annual report for Water Licence 2AM-BRP1831 (per Schedule B Item 10).

Any exceedances of predictions or applicable guidelines and regulations will be identified in these reports, and an explanation and response actions will be outlined.

Air quality mitigation measures will be applied in all project phases and NPRI and GHGs will be evaluated annually for whether reporting is required (based on federal guidelines). It is not considered necessary to produce an annual monitoring report during pre-construction, care and maintenance, closure, periods of temporary closure and post closure. If significant sources are identified during these phases, reporting will be continued on an annual basis.

12. Plan Effectiveness

The AQMMP is intended to ensure that the Project is conducted as proposed, mitigation and management measures are effective at mitigating adverse air quality effects, and relevant laws and regulations are met. As part of environmental reporting, Sabina will make the annual report available to stakeholders. Sabina will also conduct an annual (or as necessary) evaluation of the efficacy of mitigation and management activities and of monitoring activities using relevant methods. This Plan will be updated as needed.

13. QAQC

Quality assurance and quality control (QAQC) measures will be undertaken at three key stages during monitoring activities: 1) during data gathering, 2) during data entry and analysis, and 3) during reporting.

The process of data gathering in the field will be QAQCed through the use of qualified personnel and standard operating procedures (SOP) to ensure that consistent, repeatable data is being gathered. SOPs will be established for all environmental data collection. All personnel will have necessary training. Data entry and analysis will be QAQCed through the use of standard data entry templates, by using certified laboratories, and checking results by a qualified person. Reporting will be QAQCed through the use of peer and senior review. SOPs and methods will be reassessed and updated when necessary.

These QAQC processes are important in accurately quantifying the overall Adaptive Management of Project effects, and will support the goals of the Project to minimise, mitigate and/or manage potential adverse effects.

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