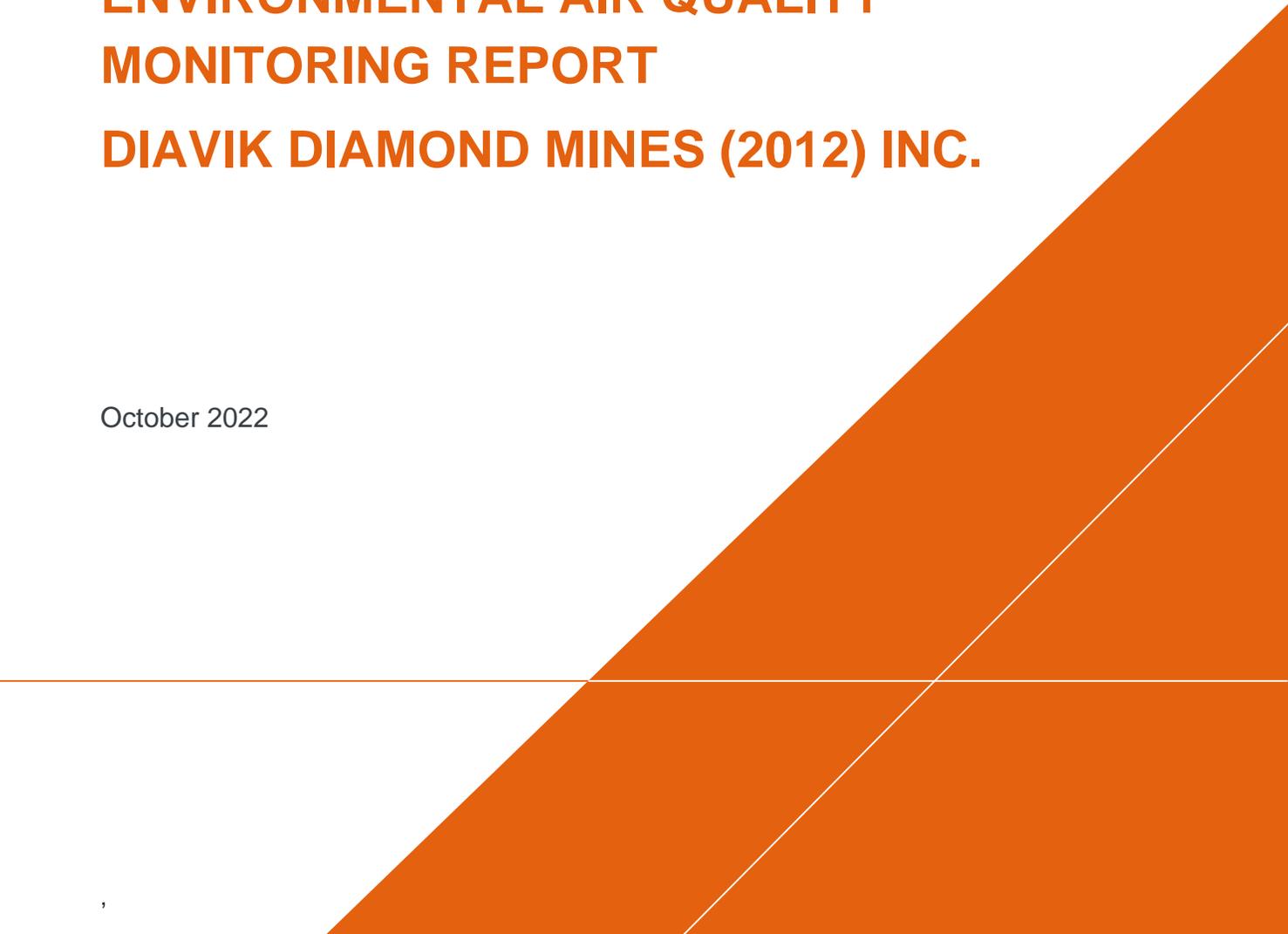# ENVIRONMENTAL MONITORING ADVISORY BOARD

PEER REVIEW OF THE 2021 ENVIRONMENTAL AIR QUALITY MONITORING REPORT

DIAVIK DIAMOND MINES (2012) INC.

October 2022

PEER REVIEW OF THE 2021 ENVIRONMENTAL AIR QUALITY MONITORING REPORT DIAVIK DIAMOND MINES (2012) INC.

DRAFT

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1   INTRODUCTION

As requested by the Environmental Monitoring Advisory Board (EMAB), Arcadis Canada Inc. (Arcadis) undertook a review of the *2021 Environmental Air Quality Monitoring Report* (AQMR) [ERM 2022] prepared by ERM Consultants Canada Ltd. (ERM) for Diavik Diamond Mines (2012) Inc. (DDMI), dated 20 July, 2022. The report summarizes the air quality monitoring activities conducted at the DDMI diamond mine during 2021. The components of DDMI's AQMR include the following:

- dustfall monitoring, as part of the Aquatic Effects Monitoring Program (AEMP);
- snow core sampling program as part of the AEMP
- emissions monitoring and reporting under National Pollutant Release Inventory (NPRI); and
- Greenhouse Gas (GHG) emissions monitoring and reporting.

The aspects of the AQMR contained within Arcadis' scope of review specifically included:

- implications resulting from A21 Kimberlite Pipe and associated construction and operational activities;
- adequacy of monitoring locations;
- effectiveness of dust suppression techniques;
- assessment of Quality Assurance/Quality Control (QA/QC) practices and Standard Operating Procedures (SOPs);
- integration of meteorological data and operational information;
- modelled data versus monitored dustfall; and
- how well DDMI addressed comments and recommendations on the 2020 AQMR.

Arcadis completed a review of each of the above components of the air quality monitoring program in place at the DDMI diamond mine, as described in the 2020 AQMR. The following sections outline the findings of the review. This current review concludes with a summary of key findings and recommendations.

2 DISCUSSION

2.1 Dustfall and Snow Core Sampling

The dustfall monitoring and snow core sampling programs were implemented in 2001 under the Aquatic Effects Monitoring Program (AEMP) as a means of collecting information on dust deposition with distance from mining activities. A summary of the 2021 AEMP results is provided in the AQMR, while details are provided in *Diavik Diamond Mine: 2021 Dust Deposition Report* (DDMDDR) prepared by ERM, dated July 2022. With no local guidance for dustfall, the AQMR compares DDMI dustfall levels to former objectives used by the the Alberta Ambient Air Quality Guidelines for dustfall (Table 2.1-2; Alberta Environment and Parks 2019). The Alberta Ambient Air Quality Guidelines for dustfall include a guideline for residential and recreation areas (53 mg/dm^2 per 30 days) and a guideline for commercial and industrial areas where higher dustfall rates are expected (158 mg/dm^2 per 30 days). To compare against the Alberta Ambient Air Quality Guidelines, the daily and annual thresholds are calculated based on the 30-day objectives.

In 2021, dustfall was monitored at 14 dustfall gauges and 27 snow survey stations located at varying distances and directions from the mine. Snow water chemistry was measured at 19 of the snow survey stations and compared to effluent quality criteria (EQC) set out in the Wek'èezhìi Land and Water Board (WLWB) Water Licence W2015L2-0001.

Our comments with respect to dustfall and snow core sampling are presented in Table 1.

Table 1. Review of Dustfall and Snow Core Sampling

No.	Comment
1.	**AQMR, Page 2-10:** *"The three highest estimated dustfall rates in 2021 measured using gauges occurred at Dust 3 (706 mg/dm2/y; 22 m from the Project), followed by Dust 10 (669 mg/dm2/y; 46 m from the Project) and Dust 11 (664 mg/dm2/y; 747 m from the Project). This is similar to 2020 and 2019 as the highest rates were recorded at the same three sites (Dust 3, Dust 10 and Dust 11). The elevated rate at Dust 3 site is explained by its proximity to the Project footprint, while the high rate at Dust 10 is due to its location adjacent to the A21 open pit. Dust 11 is located west of the Waste Rock Storage Area - South Country Rock Pile (WRSA-SCRP; Figure 2.1-1). The lowest dustfall rate was recorded at Dust 9 (50 mg/dm2/y; 3,796 m), lower than the control stations Dust C1 (98 mg/dm2/y; 4,646 m to the south) and Dust C2 (101 mg/dm2/y; 3,031 m; Table 2.1-1 and Figure 2.1-1). This is similar to 2020 results and is explained by the distance of the Dust 9 site from the Project footprint."* In comparison to the dustfall estimated data from 2020's, the dustfall estimated in 2020's is consistent for Dust 3, 10 and 11. The recorded measurements are due to the proximity of the stations in relation to the activities of the mining footprint. The AQMR indicated that the lower objective of 646 mg/dm^2/y that is applied to residential and recreational areas of the Alberta Ambient Quality Objectives was exceeded at three sites that recorded the highest dustfall rates in 2021 (Dust 3, Dust 10 and Dust 11).

	Given the exceedances as well as the fact that dustfall rates estimated from dustfall gauges in 2021 were slightly higher on average when compared to 2020 rates, Arcadis recommends inclusion of two (2) temporary stations to the north and east of the current Dust 11 location respectively, where the source of the dust can likely be verified and confirmed. Furthermore, as to previous years, Arcadis also strongly recommends that the 2012 modelling assessment be updated during the review of the EAQMP to reflect current operations and assess the observed dustfall observations with predicted concentrations within the updated assessment. This modelling assessment would generally provide correlation that the observed concentrations are within or below those of the conservatively model predicted concentrations and therefore confirm that the implemented mitigation measures employed at the mine are being effective.

2.2   NPRI and GHG Emission Inventories

Given the extension of the reporting deadline for 2020 reportable year submission to Environment and Climate Change Canada (ECCC) under the National Pollutant Release Inventory (NPRI) reporting program to September 30, the final evaluation for 2020 NPRI reporting has been included as an addendum in the AQMR on October 22, 2021..

Greenhouse Gas (GHG) emissions were calculated and reported to the federal system through ECCC.

Our comments with respect to NPRI and GHG emission inventories are presented in

Table 2.

Table 2. Review of NPRI and GHG Inventories

No.	Comment
2.	**AQMR, Section 3** The results of the GHG emissions inventories are discussed in Section 3 of the AQMR. As indicated in Arcadis' previous reviews, the AQMR does not include any detailed information about the emission factors or calculation methodologies used for the GHG inventories. On the basis of the limited information presented within the AQMR regarding operating conditions at the mine for the reportable year 2021, Arcadis considers the values reported by DDMI to be reasonable by comparison to previous years' submissions. However, it should be noted that the ECCC's 2021 Greenhouse Gas Quantification Requirements apply to mining operations and a detailed review of the methodologies used/calculations specifically conducted to derive these estimates would be required to confirm their appropriateness and completeness. The results of the NPRI and GHG reportable emissions inventories are discussed in the AQMR. The results compared 2020 NPRI Criteria Air Contaminant emission submission results against the 2020's NPRI submission. However, as indicated in Arcadis' previous reviews, the

	addendum did not include any detailed information about the emission factors or calculation methodologies used for the inventories. Without the review of the detailed methodologies employed for the NPRI reported emission calculations, the comprehensiveness and accuracy cannot be confirmed.

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

There are a few improvements that could be made as noted in the review of the DDMI *2021 Environmental Air Quality Monitoring Report* and some generalizations and comments made that are not supported by the data. Overall, Arcadis' comments on the aspects of the 2020 AQMR are provided below:

- Implications resulting from A21 Kimberlite Pipe and associated construction and operational activities: As to the components of this overall AQMR, DDMI demonstrated an effective monitoring program in 2021 similar to previous years, that included dust deposition (dustfall) monitoring, a snow core program and finally, reporting to the ECCC's national greenhouse gas reporting program. This report presented an update which is relatively similar to the historical years with some expected variations. This AQMR could have been improved further if the report demonstrated listed specific changes in the associated construction and operational activities in comparison to the previous year's and commented how those changes correlated with the overall objective for 2021.

- Adequacy of monitoring locations: Overall the monitoring locations are generally considered adequate as an effective means to correlate the contribution of the mining activities and the impacts considering the distances and the meteorological conditions typically observed within the Project area. However, some improvements could be made with the addition of temporary stations as noted in this Peer Review.

- Assessment of Quality Assurance/Quality Control (QA/QC) practices and Standard Operating Procedures (SOPs) – The AQMR demonstrated good QA practices through providing the detailed field notes generated from each of the collected dataset at the stations.

- Integration of meteorological data and operational information: The AQMR provided predominant wind directions based on the wind rose generated from the meteorological dataset collected at the mine. The AQMR did not include the precipitation data in correlating the overall dust fall impacts from the operations.

- Modelled data versus monitored dustfall: The AQMR did not provide any discussion with regards to an evaluation of the 2012 (or any recent) modelled dataset against the 2021 monitored dataset.

- How well DDMI addressed comments and recommendations on the 2021 AQMR: This 2021 AQMR included general comments about the applicability of the Province of Alberta's Ambient Air Guideline and accepted as suitable for the purpose of comparison of the results. However, other recommendations such as the relocation of the Dust stations, inclusion of a comprehensive NPRI and GHG report and finally, an update of the 2012 modelled dataset were not addressed as per the 2020's Peer Review appear to have not been addressed.

The main points of concern are summarized below:

Dustfall and Snow Survey Programs

- The results of the Dustfall and Snow core sampling program strongly indicate that that proximity to mining activity is a stronger indicator of dust deposition than the omnidirectional wind directional

pattern as noted in the AQMR. This is supported by the fact that the stations with the elevated dust deposition rates occurred in areas closest to the roads, the airstrip, and mine footprint such as near A21 during the summer months.

- Similar to 2020, the 2021 AQMR failed to make reasonable attempt for the evaluation of the effectiveness of the dust suppression/mitigative efforts, other than to make general statement that *"however, it is likely that road watering reduced the amount of dust generated at the mine"* and that the higher overall dust rates were likely a result of surface activity, particularly at A21 open pit.
- The 2021 AQMR indicated that the dust fall estimated at Dust 11 station is 664 mg/dm^2/y while being located at 747 metres from the Mine. Given the location of the station not relatively closer to the Mine and significant haul routes, the source of the elevated dust fall remains unexplained.

NPRI and GHG

- The evaluation of the reported amounts submitted to the ECCC's NPRI program was in this AQMR; however, there was not enough information to validate the accuracy and comprehensiveness of the stated emissions in the NPRI submission for 2021.
- There was not enough information provided within the AQMR to validate the reported values to the ECCC's GHG reporting program.

3.2   Recommendations

Based on the above conclusions of the review, Arcadis has the following recommendations for future EAQMP activities and reporting:

- With the unknown source for the elevated dustfall estimated at Dust 11, Arcadis recommends introduction of two (2) temporary stations to the north and east of the current Dust 11 station location, where the source of the dust can likely be verified.
- Data pertaining to meteorological observations and records of on-site activities, including any visual dust observation and mitigation logs, be used to document the cause/rationale for events of high dustfall values measured at the various stations.
- A detailed comparison of monitored and modelled dustfall be included within the AQMR.
- Details of the NPRI and GHG calculations be included, or a reference to an external document containing such details, to allow for validation of methods and quantities reported.
- The 2012 dispersion modelling assessment be updated to reflect current operations and be used to evaluate the appropriate locations for assessment of dustfall observations with predicted concentrations within the updated assessment.