JAY PROJECT

REGULATORY ENGAGEMENT FOLLOW-UP RESPONSES

FROM MAY 7, 2015 AIR QUALITY REGULATORY MEETING

Prepared for: Dominion Diamond Ekati Corporation

Prepared by: Golder Associates Ltd.

May 2015

Follow-up Item: 1

Source: Meeting with the GNWT-ENR and Environment Canada (May 7) regarding the Air Quality Assessment

Subject: Air Quality

DAR Section(s): 7, 7B

Request:

Dominion Diamond to confirm if geochemistry data were used in the determination of source terms for metals emissions.

Response:

Geochemistry data from Misery Pit rock samples at the Ekati Mine were used to determine metals speciation for a number of emission sources in the air quality assessment. Granitic samples from the Project were used to determine the metal composition of fugitive dust emissions from waste rock sources, and kimberlite samples from the Project were used to determine the metal composition of fugitive dust emissions from kimberlite sources.

The metal composition of waste rock was used for calculating metal emissions from:

- Drilling;
- Blasting;
- Bulldozing;
- Grading;
- Road dust;
- Wind erosion of the waste rock storage areas and Jay dry lake bed; and,
- Loading/unloading at the Misery Pit, Misery quarry, Pigeon Pit, Lynx Pit, Jay Pit, and waste rock storage areas (WRSAs).

The metal composition of kimberlite was used for calculating metal emissions from:

- Loading/unloading at the Ekati stockpile and coarse processed kimberlite waste areas, Jay transfer area,and Misery stockpile;
- Crushing/screening/conveying; and,
- Wind erosion of the Ekati stockpile and coarse processed kimberlite waste areas, Long Lake Containment Facility area, Jay transfer pad, and Misery stockpile.

Follow-Up Item: 2

Source: Meeting with the GNWT-ENR and Environment Canada (May 7) regarding the Air Quality Assessment

Subject: Air Quality

DAR Section(s): 7

Request:

Dominion Diamond to provide a description of the receptor nomenclature used in the dispersion modelling.

Response:

The following table lists receptor ID prefixes and their description for receptors in the CALPUFF model input files.

Receptor Prefix	Description
G	Regional grid receptor
F	Fenceline receptor (Disturbed Area Boundary)
L	Lake receptor
H	Health receptor

DOMINION DIAMOND

Follow-Up Item:	3
Source:	Meeting with the GNWT-ENR and Environment Canada (May 7) regarding the Air Quality Assessment
Subject:	Air Quality
DAR Section(s):	7

Request:

Dominion Diamond to confirm if observations data were used in the development of the CALMET model.

Response:

Observations were not used in the development of the CALMET model. One year of meteorological data was used in the dispersion modelling; this dataset was developed from the 2002 MM5 data provided by Environment Canada and further processed using CALMET in no observation mode (NOOBS=2).

Precipitation was considered to be high in the initial MM5 data, and was adjusted using a comparison to the Diavik Mine meteorological station precipitation data as discussed in the DAR Section 7C4.1.2, prior to input into the CALMET model. Surface meteorological observation data were also used to evaluate the CALMET data set from local stations such as the Ekati Mine Koala Station.

DOMINION DIAMOND

Follow-up Item:	4
Source:	Meeting with the GNWT-ENR and Environment Canada (May 7) regarding the Air Quality Assessment
Subject:	Air Quality
DAR Section(s):	7, 7B

Request:

Dominion Diamond to provide an explanation for Tier selection of fleet vehicle emissions in the Base Case and Application Case.

Response:

A conservative approach was taken for the air quality assessment with respect to diesel engine Tiers. By taking a conservative approach, the air quality assessment would not be expected to under predict emissions from fleet exhaust. The air quality assessment for the DAR made the following assumptions for the engine Tier rating for the vehicles at the mine:

- Base Case vehicles were assumed to be pre-Tier; and,
- Application Case vehicles were assumed to be pre-Tier for existing fleet and Tier 2 for the new CAT 777F, CAT 789C, and 240T Roadtrains slated for the Project fleet.

Tier 1 standards were phased in for new nonroad diesel engines over the period of 1996 to 2000. Tier 2 standards were phased in from 2000 to 2008. Tier 4 standards are phased in over the period of 2008 to 2015.

The Base Case assumption of the fleet being pre-Tier is conservative, as it is possible that existing fleet at the Ekati Mine has been purchased or upgraded with engines that fall under one of the Tier standards. The Application Case assumption of the mix of pre-Tier is conservative, as it is possible that new equipment for the Project could be Tier 4 rated, and existing fleet could have engines that fall under one of the Tier standards.

Note that correlating vehicle purchase date with engine Tier rating is not necessarily accurate, as the phase in periods for Tiers cover a number of years, engine date is more relevant to the Tier rating of the vehicle (it is the engine that defines Tier), and rebuilds or replacements of engines to higher Tiers could have been performed on existing vehicles. Only engines manufactured after a Tier period was phased in could be guaranteed to meet that Tier rating. A purchase of stock equipment would not preclude that stock from being from a lower Tier than the purchase date reference.

Monitoring data of NO_2 from the Continuous Air Monitoring Station (CAMS) at the Ekati Mine do show a decreasing trend of ambient NO_2 concentrations over the last six years. It is noted in the last two Air Quality Monitoring Program reports that monthly mean NO_2 values have been decreasing since 2008 (BHP Billiton 2012; ERM 2015). This could be attributed in part to engine Tier ratings for the fleet as

increased Tier ratings should result in a decrease of NO_2 emissions at the Mine, assuming that fleet engines have been upgrading over time.

References:

ERM (ERM Consultants Ltd.). 2015. Ekati Diamond Mine: 2014 Air Quality Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

BHP Billiton (BHP Billiton Canada Inc.). 2012. EKATI Diamond Mine: 2011 Air Quality Monitoring Program. Prepared by Rescan Environmental Services Ltd., Yellowknife, NWT, Canada.

Follow-up Item: 5

Source: Meeting with the GNWT-ENR and Environment Canada (May 7) regarding the Air Quality Assessment

Subject: Air Quality

DAR Section(s): 7

Request:

In effort to understand the emission estimates for the mine fleet EC/GNWT requested the year and model the each of the trucks currently operating at the mine. Ekati provided model and year of acquisition of each truck. In addition, please provide the year that the engines of the mine haul trucks were manufactured.

Response:

Dominion Diamond assumes that the engine manufacture date of the haul trucks is one year prior to the year of acquisition of the equipment. A discussion of engine Tier rating is also provided above as part of Follow-up Item 4. As noted in Item 4, the correlation between engine manufacture date and engine Tier rating is not exact.

Follow-up Item: 6

Source: Meeting with the GNWT-ENR and Environment Canada (May 7) regarding the Air Quality Assessment

Subject: Air Quality

DAR Section(s): 7

Request:

EC/GNWT questioned Ekati on its assumption that the effectiveness of its dust control was continuously 80%. Ekati said that its dust control assumption was justified based on its 2014 report on the effectiveness of dust suppression.

Response:

Road dust control efficiency was discussed in DAR-MVEIRB-UT-21. A control efficiency of 80% during the summer season was assumed for haul road fugitive dust emissions for the air quality modelling in the DAR.

The Ekati Diamond Mine 2014 Air Quality Monitoring Program Report (ERM 2015) was recently released which includes a discussion on the use of DL-10 and water as dust suppressants on haul roads at the site and the effectiveness of this mitigation. This report has been submitted to Environment Canada (Dave Fox) and GNWT (Matt Seaboyer and Kate Witherly). As well, a status report was issued in 2012 evaluating the effectiveness of DL-10 on the Misery Haul Road (BHP 2012).

Dustfall station transects aligned with the dominant upwind/downwind direction monitored for dustfall along the Fox Haul Road and the Misery Haul Road during the 2012 to 2014 reporting period. DL-10 was applied to the haul roads, except in areas around the main camp and 30 metres (m) from waterbodies and crossings where water was applied instead. The results of the haul road dustfall monitoring program show that dustfall measurements are below the British Columbia Pollution Objective goal of 2.9 milligrams per decimeter squared per day ($mg/dm^2/d$) (BC MOE 2014) at 300 m downwind of the haul roads, and at 1,000 m downwind, dustfall measurements were at background levels. This showed that the use of DL-10 and water on roads to mitigate dust release was effective. The status report issued in 2012 also came to the conclusion that dust suppression of DL-10 was effective, although this report was more anecdotal in nature than the data from the dustfall transects.

The duration of effectiveness of petroleum based road dust control surfactants has been studied and yields similar mitigation effectiveness as assumed for the air quality assessment. For instance, PetroTac®, another oil-based dust suppressant similar to DL-10, has been shown to have a control efficiency of 94% at 79 days and 74% at 105 days (EPA 2006).

De Beers Canada Inc. performed a road dust emission study which included the effectiveness of watering on haul roads in northern mining locations (Golder 2012). It was shown in the study that watering on haul roads at the Snap Lake Mine had a mitigation effectiveness of 80% at four hours after watering. While the mitigation effectiveness would degrade after four hours, it also ranged from 100% immediately after

watering down to 80% at four hours. Thus, the watering cycle can be longer than four hours to maintain an 80% average control efficiency. As well, the dust study showed a strong correlation with the increase in relative humidity which occurs after sunset and the suppression of fugitive dust being emitted from the haul roads. The particular goal of the dust study was not to determine the ratio of pre-sunset to post-sunset natural mitigation due to the rise in damping road humidity, and so a specific mitigation effectiveness was not calculated for this effect; however, nighttime fugitive dust emissions from the haul roads during summer decreased on the order of one to two magnitudes as compared to the daytime, which would correspond to a high level of natural control efficiency at nighttime.

As the majority of the length of the haul roads use DL-10 for dust suppression, the 80% control efficiency is a reasonable mitigation estimate, and road dust control on the haul roads has been shown to be effective in the 2014 Air Quality Monitoring Program Report. This is also discussed in greater detail in DAR-MVEIRB-UT-21. For the portions of the haul road which are watered, 80% control efficiency is also reasonable, as the conservative estimate for control efficiency is 70% as indicated in DAR-MVEIRB-UT-21 based on Environment Canada's National Pollutant Release Inventory; while the dust study at northern mines performed by De Beers Canada Inc. and Golder Associates Ltd. showed that dust mitigations of 80% and above could be achieved with watering.

References:

ERM (ERM Consultants Ltd.). 2015. Ekati Diamond Mine: 2014 Air Quality Monitoring Program. Prepared for Dominion Diamond Ekati Corporation by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

Golder (Golder Associates Ltd.). 2012. Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada. Submitted to De Beers Canada Inc. Available at http://www.reviewboard.ca/upload/project_document/EIR0607-001_Road_Dust_Emission_Study_-_De_Beers_Canada.PDF.

BC MOE (British Columbia Ministry of the Environment). 2014. British Columbia Ambient Air Quality Objectives. http://www.bcairquality.ca/reports/pdfs/aqotable.pdf

BHP (BHP Billiton Canada Inc.). 2012. Re: Status Report Evaluating the Effectiveness of DL10 as a Dust Suppressant on the Misery Haul Road. Yellowknife, Northwest Territories. November 2012. http://www.mvlwb.ca/Boards/WLWB/Registry/2009/W2009L2-0001/W2009L2-0001%20-%20BHP%20-%20Effectiveness%20of%20DL10%20on%20Misery%20Road%20-%20Nov%209_12.pdf

EPA (United States Environmental Protection Agency). 2006. Environmental Technology Verification. Dust Suppression Products. January 2006. http://nepis.epa.gov/Adobe/PDF/P1001PUE.pdf

Follow-up Item:	7
Source:	Meeting with the GNWT-ENR and Environment Canada (May 7) regarding the Air Quality Assessment
Subject:	Air Quality
DAR Section(s):	7

Request:

EC/GNWT noted that other mines have included adaptive management triggers levels in their air quality management plans. Please include adaptive management trigger levels and associated actions to the Ekati Air Quality Management Plan.

Response:

Dominion Diamond will include adaptive management trigger levels and associated actions in the draft Air Quality Monitoring and Management Plan, which will be provided to the Mackenzie Valley Review Board public registry by June 1, 2015.