EMISSION SUMMARY AND DISPERSION MODELLING REPORT
REVISION 1

GOLDCORP CANADA LTD.
PORCUPINE GOLD MINES

HOLLINGER PROJECT

Submitted to:

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Executive Summary

This Emission Summary and Dispersion Modelling (ESDM) Report was prepared to support an application for a Certificate of Approval (Air and Noise) for Porcupine Gold Mines (PGM) for the open pit mining at the Hollinger Project.

Porcupine Gold Mines (PGM) is a joint venture between Goldcorp Canada Ltd. and Goldcorp Inc.

The ESDM Report was prepared in accordance with s.26 of O. Reg. 419/05 to support the CofA application. In addition, guidance in the Ministry publication "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated February 2009 (ESDM Procedure Document) was followed as appropriate.

PGM proposes to redevelop the former Hollinger Mine in Timmins, Ontario as a new open pit. For the purpose of this application, this undertaking is hereafter referred to as the “Hollinger Project”. The local Project area is shown in Figure B-1.

Porcupine Gold Mines is seeking an approval for all sources associated with the open pit activities, specifically ore and mine rock handling within the open pit and haulage along the dedicated transportation corridor. There will be no processing of the ore within the pit; crushing and ore processing will be carried out at the Dome Mill. The Dome Mill is managed under an independent Certificate of Approval (Air & Noise), and is not included in the scope of this ESDM report.

The NAICS code for gold mining and milling is 21222, described as “Gold Ore and Silver Ore Mining” (NAICS, 2007). Facilities classified under this NAICS codes have been included on Schedule 4 of O.Reg. 419/05. As such, Porcupine Gold Mines Hollinger Project is currently subject to s. 20 of O. Reg. 419/05.

The assessment of modelled effects of contaminant emissions was therefore carried out using the relevant averaging periods of Schedule 3 of the Regulation using an approved dispersion model. AERMOD, an approved dispersion model, was used for the assessment, and the modelling was conducted in accordance with the requirements of the Ministry’s Air Dispersion Modelling Guideline for Ontario, Version 2.0, July 2009 (the “ADMGO” Guideline).

The sources and activities associated with the Hollinger Project Open Pit Mining include the following:

- Drilling and Blasting
- Ore and mine rock loading into haul trucks
- Ore and mine rock handling within open pit using typical mining equipment that is expected to include loaders, hydraulic excavators, bulldozers, graders, and other ancillary equipment
- Hauling ore along dedicated transportation corridor to Dome Mill
- Hauling mine rock to storage areas.

Total particulate matter emissions would be the result of fugitive dusts from blasting, material handling, and road dust from the haul trucks on the transportation corridor. Fugitive dusts will be managed in accordance with a Best Management Practices Plan. This ESDM report quantifies the POI concentrations of the trace metals present on the materials being handled that would be entrained and carried off-site with the fugitive dusts (including roadways and stockpiles), as well as total suspended particulate matter released from other process activities carried out within the open pits. As per guidance provided by MOE (Meeting Oct 18, 2011) blasting is not considered a process emission and therefore not subject to the Certificate of Approval assessment.

The Maximum POI concentrations were calculated based on the Maximum Operating Scenario where all significant sources are operating simultaneously at their individual maximum rates of production or maximum activity rate.

Fugitive dusts from blasting, surface activities, and roadways at the Hollinger Project will be minimized through effective implementation of a Fugitive Dust Best Management Practices (BMP) Plan consistent with best management practices detailed by the Ministry (Section 7.4 of the ESDM Procedure Document). Therefore, quantifying the fugitive dust emission rates, and predicting the off-site effects at the Point of Impingement of the total suspended particulate matter for roadways and stockpiles, has not been carried out, but as required, the metal emissions and TSP emissions from other sources have been assessed. A copy of the BMP plan is included as Appendix I of the ESDM report.

The trace metal content of the fugitive dust has been assessed in this ESDM report as several of the metals have air quality standards and guidelines based upon their potential health effects.

The maximum emission rates for each significant contaminant emitted from the significant sources were calculated in accordance with S.11 of O. Reg. 419/05 and the data quality assessment follows the process outlined in the requirements of the ESDM Procedure Document.

A POI concentration for each significant contaminant emitted from the Site was calculated based on the calculated emission rates and the output from the approved dispersion model; the results are presented in the following Emission Summary Table (Table E1) in accordance with

s.26 of O.Reg. 419/05. The POI concentrations listed in the Emission Summary Tables were compared against criteria listed in the Ministry publication "Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality" dated February 2008.

Of the contaminants listed in the Emission Summary Table (Table E1) that have limits in the List of Ministry POI Limits all the predicted POI concentrations are below the corresponding limits. At 51.5%, cobalt has the highest concentration relative to the corresponding Ministry POI Limit for the 24-hour averaging time. The next highest contaminant is arsenic at 18.1%. The POI concentration for total suspended particulate matter was 45.2 µg/m^3, 38% of the Schedule 3 standard.

The significant emissions anticipated from the open pit mining and material handling did not include any contaminant(s) that do not have corresponding criteria limits in the Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution – Local Air Quality published by the Standards Development Branch, Ontario Ministry of the Environment (February 2008, PIBS # 6569e). Therefore there are no contaminants considered to be Contaminants with No Ministry POI Limits.

The ESDM Report demonstrates that the Hollinger Project open pit mining activities can operate in compliance with O. Reg. 419/05.

Table E1: Emission Summary Table with Ministry of the Environment Point of Impingement (POI) Limits

	CAS Number	Facility Emission Rate (g/s)	Model Used	Modelled Concentration (µg/m^3)	Averaging Period (hour)	MOE POI Limit (µg/m^3)	Limiting Effect	Schedule	% of Criteria
Antimony	7440-36-0	4.15E-05	AERMOD	1.41E-03	24	25	Health	3	0.0%
Arsenic	7440-38-2	1.60E-03	AERMOD	5.43E-02	24	0.3	Health	Guideline	18.1%
Cobalt	7440-48-4	1.52E-03	AERMOD	5.15E-02	24	0.1	Health	Guideline	51.5%
Copper	7440-50-8	9.09E-03	AERMOD	3.07E-01	24	50	Health	3	0.6%
Lead	7439-92-1	6.45E-04	AERMOD	2.18E-02	24	0.5	Health	3	4.4%
					30-day	0.2	Health	3	10.9%
Molybdenum	7439-98-7	6.83E-05	AERMOD	2.31E-03	24	120	Particulate	Guideline	0.0%
Nickel	7440-02-0	2.81E-03	AERMOD	9.50E-02	24	2	Vegetation	3	4.7%
Selenium	7782-49-2	1.16E-04	AERMOD	3.94E-03	24	10	Health	Guideline	0.0%
Total Suspended Particulate	n/a	4.67	AERMOD	45.2	24	120	Visibility	3	37.7%
Zinc	7440-66-6	3.80E-02	AERMOD	1.28	24	120	Particulate	3	1.1%

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APPENDICES

TABLES (IN MAIN TEXT)

TABLES (IN APPENDIX A)

FIGURES (IN APPENDIX B)

1. Introduction and Site Description

1.1 Purpose and Scope of ESDM Report

This Emission Summary and Dispersion Modelling (ESDM) Report was prepared to support an application for a Certificate of Approval (Air and Noise) for Porcupine Gold Mines (PGM) for the open pit mining at the Hollinger Project.

Porcupine Gold Mines (PGM) is a joint venture between Goldcorp Canada Ltd. and Goldcorp Inc.

Porcupine Gold Mines is seeking an approval from the Ontario Ministry of the Environment (the Ministry) for all sources associated with the open pit activities, specifically ore and mine rock handling within the open pit and haulage along the dedicated transportation corridor. There will be no processing of the ore within the pit; crushing and ore processing will be carried out at the Dome Mill. The Dome Mill is managed under an independent Certificate of Approval (Air & Noise), and is not included in the scope of this ESDM report. These sites are sufficiently separated (5 km) that they are not considered “adjacent properties” under O. Reg. 419.

The ESDM report was prepared in accordance with s.26 of O. Reg. 419/05 to support the CofA application.

1.2 General Site Description

PGM proposes to redevelop the former Hollinger Mine in Timmins, Ontario as a new open pit mining complex. For the purpose of this application, this undertaking is hereafter referred to as the “Hollinger Project”. The local Project area is shown in Figure B-1.

Development of the Hollinger Project would require comparatively limited new infrastructure, as ore from the Project Site would be transported to and processed at the existing Dome ore processing facility (commonly referred to as the ‘Dome Mill’), with tailings from ore processing to be discharged to the existing Dome Mine tailings deposition area (Figure 1-2).

Open pit operations are expected to extend for approximately 6 to 7 years.

There will be no processing at the Hollinger Site. All ore will be transported off-site via the Transportation Corridor and processed at the Dome Mill, located approximately 5 km east of the Hollinger Site (Figure 1-2).

1.2.1 Location of the Site

The project site is located in Timmins, Ontario as depicted in Figure B-1 in Appendix B.

1.2.2 Land Use Information

The Timmins area is characterized by a mix of urban and industrial development superimposed on a forested background. The City consists of a major downtown urban area, as well as a number of other smaller urban centres scattered throughout the area, with Schumacher, South Porcupine, and Porcupine being the more prominent of these smaller centres. Various other smaller hamlets also occur throughout the area. These areas were amalgamated in 1973 to form the City of Timmins.

South Porcupine and other communities to the east are linked to Timmins by Highway 101, with a commercial strip occurring along this highway between downtown Timmins and Schumacher. Highway 655 extends north from Highway 101, with linkages to the Timmins airport via Airport and Laforest Roads, and linkages further north to Xstrata Copper's Kidd Mine site and Highway 11. Several major transmission, gas, water and sewer lines pass through the area, as well as local services.

Topography in the Timmins area is variable reflecting its location at the transition of Precambrian Shield terrain to the south and southwest, and by flat-lying glaciolacustrine silt and clay plains to the north and east. Extensive glaciolacustrine sand plains and eskers also occur in the area, together with frequent and widespread bedrock exposures.

Coniferous and mixed forest communities in the area are virtually all second growth as a result of past logging activities and fires, and virtually all major forest blocks are transected by roads, transmission lines, trails, or other such linear features.

1.2.3 Site Layout

Two figures depicting the Hollinger Project site layout, identified as Figures B-2 and B-3, are included in Appendix B of this report.

1.3 Description of Processes and NAICS Code(s)

The NAICS code for gold mining and milling is 21222, described as "Gold Ore and Silver Ore Mining". This industry comprises establishments primarily engaged in developing the mine site, mining, and/or beneficiating ores valued chiefly for their gold and or silver content. Establishments primarily engaged in the transformation of the gold and silver into bullion or dore bar, in combination with mining activities, are included in this industry (NAICS, 2007).

Facilities classified under this NAICS codes have been included on Schedule 4 of O.Reg. 419/05. As such, Porcupine Gold Mines Hollinger Project is currently subject to s. 20 of O. Reg. 419/05.

The assessment of modelled effects of contaminant emissions was therefore carried out using the relevant averaging periods of Schedule 3 of the Regulation using an approved dispersion model. AERMOD, an approved dispersion model, was used for the assessment, and the modelling was conducted in accordance with the requirements of the Ministry's *Air Dispersion Modelling Guideline for Ontario, Version 2.0, July 2009* (the "ADMGO" Guideline).

Approval for the sources and activities associated with the Hollinger Project Open Pit Mining, which include the following:

- Drilling
- Ore and mine rock loading into haul trucks
- Ore and mine rock handling within open pit using typical mining equipment that is expected to include loaders, hydraulic excavators, bulldozers, graders, and other ancillary equipment
- Hauling ore along dedicated transportation corridor to Dome Mill
- Hauling mine rock to storage areas.

1.4 Description of Products and Raw Materials

Ore and mine rock production for the open pit operations are expected to average approximately 40,000 tonnes per day (tpd). The maximum production rate for the open pit gold mine will be up to 60,000 tonnes of ore and mine rock per day.

Unit operations and activity rates are provided in greater detail in Appendix D: Supporting Calculations. Refer to Table A1 - Sources and Contaminants Identification Table, for a tabulation of the individual sources of emissions at the Site.

1.5 Process Flow Diagram

Approval is sought for sources associated with the open pit activities, specifically ore and mine rock handling within the open pit and haulage along the dedicated transportation corridor.

1.6 Operating Schedule

The Site intends to operate 24 hours per day, seven days per week, for 52 weeks per year, with variable operating times for the mining activities.

1.7 Site Operating Envelope

The Hollinger Project will operate with a maximum production rate of up to 60,000 tonnes of ore and mine rock per day.

1.8 Other Approvals for the Site

Goldcorp completed an Environmental Review process as part of the permitting phase of the Hollinger Project, which included preparation of an Environmental Review Report (ERR).

In addition to this ERR, the following approvals have been issued, or sought, pertaining to the Hollinger Project:

Ministry of the Environment (the Ministry)

- Permit to Take Water Amendment and Certificate of Approval Amendment – Mine Dewatering
- Certificate of Approval Amendment – Dome Mill and Tailings Facility

Ministry of Natural Resources (MNR)

- Work Permit – Little Pearl Tailings Pond Discharge
- Rights to Crown Timber

Ministry of Northern Development and Mines and Forestry (MNDMF)

- Hollinger Mine Industrial Site Closure Plan amendment
- Little Pearl Tailings Pond Closure Plan amendment

Federal Government Agencies

- Letters of Advice – Department of Fisheries and Oceans (DFO)

City of Timmins

- Site Plan Control Agreement

2. Initial Identification of Contaminants and Sources

The emission sources associated with the Open Pit activities at the Hollinger Project are described in Section 2.1.

2.1 Source and Contaminants Identification Table

Table A-1: Sources and Contaminants Identification Table tabulates all the emission sources associated with the Project. Table A-1 provides the information required by sub-paragraphs 2 to 4 of s.26(1) of O.Reg. 419/05.

The expected contaminants emitted from each source are also identified in Table A-1; for example the expected contaminant emitted from material handling is fugitive dust.

2.2 Source Descriptions

The current mine plan is for open pit mining.

The planned open pit operations involve the development of an open pit, consisting of several staged phases generally referenced as the 92 Pit, Millerton Pit, Central Pit and Vipond Pit sub-pits (Figure B-3). The current pit design envisions a large excavation at the top of the deposit, which will eventually focus down into these smaller sub-pits towards the bottom of the deposit.

Ore and mine rock production for the open pit operations are expected to extend for approximately 6 to 7 years, with production expected to average approximately 40,000 tonnes per day (tpd), with a maximum of up to 60,000 tpd

The open pit would be mined in a series of pushbacks with some overlap in the pit mining schedules, such that more than one pushback could be in operation at any one time. Current plans call for the ultimate pit to reach a depth of approximately 112 m above mean sea level (amsl). The existing ground surface at the Hollinger Project Site averages approximately 335 m amsl, and varies from approximately 315 to 355 m amsl.

Open Pit Mining Activities

Overburden removal will be conducted using an excavator-truck combination, and/or loader-truck combination, as appropriate.

The majority of the blasting within the Pit will be carried out using emulsion or emulsion blend explosives, delivered from the Dome site. Blast mats and other appropriate measures, such as designing small blast patterns, limiting charge size per hole, control and perimeter blasting, and using electronic detonators, will be implemented to minimize any negative effects of mining during the early development of each phase. Particulate emissions from blasting will be managed through Best Management Practices.

Typical mining equipment used in ore and mine rock removal is expected to include Caterpillar 992 or equivalent sized loaders and Caterpillar 385 or equivalent sized hydraulic excavators, together with Caterpillar 785 or Caterpillar 777 or equivalent sized haul trucks. Other equipment would include drills, dozers (likely D9 sized), graders, and other ancillary equipment.

There will be no crushing or processing at the Hollinger Site. All recovered ore will be transported off-site via the Transportation Corridor and processed at the Dome Mill, located approximately 5 km east of the Hollinger Site (Figure B-2). The Dome Mill is rated at a maximum throughput of 13,000 tpd and approximately 8,500 tpd ore from the Hollinger Project will be combined with ore from other PGM sources. Tailings from processing at the Dome Mill will be discharged to the existing Dome Mine tailings deposition area. No changes are anticipated at the Dome Mill that would require a change to their existing approvals.

Transportation Corridor

Current plans call for the ore (and possibly some mine rock) to be hauled by truck from the Hollinger Project Site to the existing nearby Dome Mill. To accommodate haulage a designated Transportation Corridor will be constructed and maintained, as shown in Figure B-2. The Transportation Corridor will be constructed of rock fill and gravel to a width of approximately 30 m.

It is expected that during the operations phase up to 7 truck trips per hour will occur to and from the Dome Mill, operating on a 24 hour, 7 days a week (24/7) basis, will be required to transport ore to the Mill. An additional 15 trucks per hour may be required should the mine rock also be transported to the Dome Mill instead of being retained in the pit (backfill “stockpile”) or for berm construction. Trucks used are currently expected to be 150 tonne trucks (Caterpillar 785 or similar).

3. Assessment of the Significance of Contaminants and Sources

3.1 Identification of Negligible Contaminants and Sources

Of the sources listed in Table A1 - Sources and Contaminants Identification Table, none have been identified as negligible. All listed sources are considered significant, and were included in the dispersion modelling for the site.

3.2 Rationale for Assessment

All sources identified in Table 1 were considered significant, and were included in the dispersion modelling.

3.3 Fugitive Dust (Open Pit Mining Activities and Roadways)

As noted in Section 1.3, the NAICS code for the Goldcorp Project is 21222. This sector is identified in the ESDM Procedure Document as one in which the Metal Content within Fugitive Particulate must be considered, unless the nature of the fugitive dust emissions is such that they are not likely to pose a health risk to humans.

Fugitive dusts from surface activities and roadways at the Hollinger Project will be minimized through effective implementation of a Fugitive Dust Best Management Practices (BMP) Plan consistent with best management practices detailed by the Ministry (Section 7.4 of the ESDM Procedure Document). Therefore, quantifying the fugitive dust emission rates, and predicting the off-site effects at the Point of Impingement of the total suspended particulate matter, has been carried out for operations other than roadways and stockpiles. As per guidance provided by MOE (Meeting Oct 18, 2011) blasting is not considered a process emission and therefore not subject to the Certificate of Approval assessment. A copy of the BMP plan is included as Appendix E of the ESDM report.

The trace metal content of the fugitive dust has been considered significant in this ESDM report as several of the metals have air quality standards and guidelines based upon their potential health effects. The point of impingement concentration of each metal identified in the mine rock was determined and compared with the respective standard or guideline. Metal emissions from roadways and stockpiles were included in the assessment.

The majority of the material handled within the pit is mine rock and the locations of maximum impact are along the haul route; therefore the metal content of the mine rock (used in road and berm construction) was used to determine the maximum POI concentration for each of the metals in the dust.

4. Operating conditions, Emission Estimating and Data Quality

This section provides a description of the operating conditions used in the calculation of the emission estimates and an assessment of the data quality of the emission estimates for each significant contaminant from the Site as required by sub paragraphs 6 and 7 of s.26(1) of O. Reg. 419/05.

4.1 Description of Operating Conditions

As noted in Section 1.5, the NAICS code for the Hollinger Project is 21222, described as "Gold Ore and Silver Ore Mining". This code is listed in Schedule 4 of Regulation 419/05.

Therefore, Section 20 of O. Reg. 419/05 applies to the Site as of 2010. The modelled effects were assessed using AERMOD, and the predicted POI concentrations were compared to the Schedule 3 standards.

Section 10 of O. Reg. 419/05 states that an acceptable operating condition is a scenario that assumes operating conditions for the Site that would result in the highest concentration of a contaminant at POI that the Site is capable of; the operating condition described in this ESDM Report meets this requirement.

As the Schedule 3 standards were used for the assessment, the averaging times for the operating conditions ranged from 24-hours to 30-days, depending upon the contaminant.

The individual maximum operating conditions for each significant source of emissions correspond to the maximum emission rate during any hourly period, and are described in the Supporting Calculations (Appendix C).

4.2 Explanation of the Methods Used to Calculate Emission Rates

The maximum hourly emission rates for each significant contaminant emitted from the significant sources were calculated in accordance with requirements of the ESDM Procedure Document.

The emission rate for each significant contaminant emitted from a significant source was estimated and the methodology for the calculation is documented in *Table A3.2: Source Summary Table - Data Quality and Estimating Methods* (Appendix A). For example, the fugitive dust emission from haul trucks travelling the transportation corridor (used to estimate the trace metal effects) were calculated using US EPA AP-42 Emission Factors for Unpaved Road Dust, indicated as EF in Table A3.1: Source Summary - Emission Reference Data Summary.

4.3 Sample Calculations

The technical rationale, including sample calculations, required to substantiate the emission rates presented in the Source Summary Tables is documented in *Appendix C – Supporting Calculations for Emission Rate Estimates*.

4.4 Assessment of Data Quality

This section provides a description of the assessment of the data quality of the emission estimates for each significant contaminant from the Site, as required by sub paragraph 7iii of s.26 (1) of O. Reg. 419/05.

The assessment of the data quality of the emission rate estimates for each significant contaminant emitted from the significant sources was performed in accordance with the requirements of sub paragraph 7iii of s26(1) of the O.Reg.419/05.

For example, the use of US EPA emission factors (EF) for calculating road dust emissions from the haul roads (transportation corridor) was based on the assumption that the peak truck volumes were considered travelling the corridor.

The emission rate estimates are, therefore, likely to overestimate the actual emission rate, and use of these emission rates will result in a modelled concentration at a POI greater than the actual concentrations. This source was documented as having a Data Quality of "Average", as the emission factors were assigned an emission factor quality rating of B by the US EPA. For each emission rate estimate, the data quality of the estimate is documented in *Table A3.2: Source Summary Table - Data Quality and Estimating Methods*.

5. Source Summary Table and Site Plan

This section provides the table required by sub paragraph 8 and the site plan required by subparagraph 9 of s.26(1) O. Reg. 419/05.

5.1 Source Summary Table

The emission rate estimates for each source of significant contaminants are documented in the Source Summary Tables A3.1 to A3.6, in accordance with requirements of sub paragraph 8 of s.26(1) of O. Reg. 419/05.

For each source of significant contaminants the following parameters are referenced:

- Contaminant Name and Chemical Abstract Society (CAS) reference number,
- source reference number and description,
- location in UTM co-ordinates,
- maximum emission rate,

- averaging period,
- emission estimating technique,
- estimation data quality, and
- percentage of overall emission.

All the emission rates listed in the Source Summary Table correspond to the operating scenario where all significant sources are operating simultaneously at their individual maximum rates of production. The emission rate estimates listed in the Source Summary Table are, therefore, likely to be overestimates of the actual emission rates, and use of these emission rates will result in a modelled concentration at the POI which are greater than the actual concentrations.

5.2 Site plan

The locations of the emission sources listed in the Source Summary Table are presented in *Figure B-3: Detailed Site Plan*. The location of each source is provided in UTM Co-ordinates in *Table A-2: Source Summary Table – Source Parameters*.

A site plan indicating the locations of each of the air emissions sources considered in the dispersion modelling assessment is provided as Figure B-5.

6. Dispersion Modelling

This section provides a description of how the dispersion modelling was conducted in order to determine the maximum concentration at a POI, as required by sub paragraphs 10 to 13 of s.26(1) of O. Reg. 419/05.

The dispersion modelling was conducted in accordance with the Ministry's "Air Dispersion Modelling Guideline for Ontario" PIBS 5165e02 (ADMGO).

The Site is subject to s. 20 of O. Reg. 419/05, therefore the modelled impact of contaminant emissions must be assessed for each relevant averaging time for the contaminants in Schedule 3; the *relevant averaging times* are those for which there is a standard or guideline.

AERMOD, an approved dispersion model, was used for the assessment, and the modelling was conducted in accordance with the requirements of the Ministry's Air Dispersion Modelling Guideline for Ontario, Version 2.0, July 2009 (the "ADMGO" Guideline).

A five-year meteorological data set for the Timmins, Ontario airport was provided by the Ministry Standards Development Branch for 1996-2000. This data set was used in conjunction with the Upper Air data for White Lake, Michigan for the same years.

The emission rates used in the dispersion model meet the requirements of Section 11(1)1 of O. Reg. 419/05, which requires that the emission rate used in the dispersion model is at least as high as the maximum emission rate that the source of contaminant is reasonably capable of for the relevant contaminant. These emission rates are detailed in *Appendix C: Supporting Calculations for Emission Rate Estimates*.

6.1 Dispersion Modelling Input Summary Table

Table 1 - Dispersion Modelling Input Summary Table provides a description of the parameters used for the approved dispersion modelling. This table meets both the requirements of s.26 (1) 11 and sections 8-17 of O. Reg. *419/05* and follows the format provided in the ESDM Procedure Document.

Table 1: Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Description of how the Approved Dispersion Model was Used
Section 8	Negligible Sources	As per Section 7.0 of ESDM Procedure Document (MOE, 2009)
Section 9	Same Structure Contamination	Not applicable
Section 10	Operating Conditions	As per Section 8.1 of ESDM Procedure Document (MOE, 2009)
Section 11	Source of Contaminant Emission Rates	As per Section 8.2 of ESDM Procedure Document (MOE, 2009)
Section 12	Combined Effect of Assumptions for Operation Conditions and Emission Rates	Emission estimation methodology consistent with the operating condition.

Section 13	Meteorological Conditions	Meteorological Data Set for Timmins Ontario, 1996-2000
Section 14	Area of Modelling Coverage	As per Air Dispersion Modelling Guideline for Ontario (MOE, 2009)
Section 15	Stack Height for Certain New Sources of Contaminant	Not applicable
Section 16	Terrain Data	Yes
Section 17	Averaging Periods	As per Ontario Regulation 419/05 Schedule 3 Standards

6.2 Land Use Zoning Designation Plan

Sub paragraph 10 of s.26(1) of O. Reg. 419/05 requires a description of the local land use conditions if meteorological data described in paragraph 2 of s.l3(1) of O. Reg. 419/05 was used.

Details of the local land use conditions are provided in Appendix B with an accompanying aerial photograph of the dispersion modelling area of coverage.

6.3 Dispersion Modelling Input and Output Files

An excerpt of the input and the output generated by the approved dispersion model (AERMOD) is provided in *Appendix D: Dispersion Modelling Input and Output.* An electronic copy of the complete input and output files is included in this submission (enclosed DVD).

6.4 Point-Of-Impingement Criteria

The Ministry has point-of-impingement (POI) standards or guidelines for each of the compounds identified for a number of averaging times. The relevant criteria were obtained from the Ministry publication *Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality, PIBS # 6569e (2008*).

The POI criterion for applicable compounds is shown in the Emission Summary Table (Table 2).

7. Emission Summary Table and Conclusions

7.1 Emission Summary Table

This section provides the table required by sub paragraph 14 of s.26(1) of O. Reg. 419/05 and provides an interpretation of the results as required by the ESDM Procedure Document.

A POI concentration for each significant contaminant emitted from the Site was calculated based on the emission rates listed in the Source Summary Table (*Table A-3.6 Source Summary Table - Emissions (g/s))* and the output from the approved dispersion model AERMOD presented in Appendix D.

The results are presented in Table 2 Emission Summary Table. This Table follows the format provided in the ESDM Procedure Document. For each source of significant contaminants the following parameters are referenced:

- contaminant name and Chemical Abstract Society (CAS) reference number,
- Total aggregate Site emission rate,
- approved dispersion model used,
- maximum POI concentration
- averaging period for the dispersion modeling,
- Ministry POI limit,
- indication of the limiting effect,
- schedule in Regulation 419/05, and
- the percentage of standard or indication of the likelihood of an adverse effect.

The POI concentrations listed in Table 2 were compared against criteria listed in the Ministry publication "*Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality, PIBS # 6569e" (2008).*

Of the contaminants listed in the Emission Summary Table (Table 2) that have limits in the List of Ministry POI Limits all the predicted POI concentrations are below the corresponding limits. At 51.5%, cobalt has the highest concentration relative to the corresponding Ministry POI Limit for the 24-hour averaging time. The next highest contaminant is arsenic at 18.1%. The POI concentration for total suspended particulate matter was 45.2 µg/m^3, 38% of the Schedule 3 standard.

Table 2: Emission Summary Table with Ministry POI Limits

	CAS Number	Facility Emission Rate (g/s)	Model Used	Modelled Concentration (µg/m^3)	Averaging Period (hour)	MOE POI Limit (µg/m^3)	Limiting Effect	Schedule	% of Criteria
Antimony	7440-36-0	4.15E-05	AERMOD	1.41E-03	24	25	Health	3	0.0%
Arsenic	7440-38-2	1.60E-03	AERMOD	5.43E-02	24	0.3	Health	Guideline	18.1%
Cobalt	7440-48-4	1.52E-03	AERMOD	5.15E-02	24	0.1	Health	Guideline	51.5%
Copper	7440-50-8	9.09E-03	AERMOD	3.07E-01	24	50	Health	3	0.6%
Lead	7439-92-1	6.45E-04	AERMOD	2.18E-02	24	0.5	Health	3	4.4%
					30-day	0.2	Health	3	10.9%
Molybdenum	7439-98-7	6.83E-05	AERMOD	2.31E-03	24	120	Particulate	Guideline	0.0%
Nickel	7440-02-0	2.81E-03	AERMOD	9.50E-02	24	2	Vegetation	3	4.7%
Selenium	7782-49-2	1.16E-04	AERMOD	3.94E-03	24	10	Health	Guideline	0.0%
Total Suspended Particulate	n/a	4.67	AERMOD	45.2	24	120	Visibility	3	37.7%
Zinc	7440-66-6	3.80E-02	AERMOD	1.28	24	120	Particulate	3	1.1%

7.2 Assessment of Contaminants with no Ministry of the Environment POI Limits

Sub paragraph 14 subsection viii of s.26(1) O. Reg. 419/05 requires an indication of the likelihood, nature, and location of any adverse effect if the contaminant is not listed in any of Schedules 1, 2 and 3.

The significant emissions anticipated from the open pit mining and material handling did not include any contaminant(s) that do not have corresponding criteria limits in the Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution – Local Air Quality published by the Standards Development Branch, Ontario Ministry of the Environment (February 2008, PIBS # 6569e). Therefore there are no contaminants considered to be Contaminants with No Ministry POI Limits.

Therefore the Supporting Information for a Maximum Ground Level Concentration Acceptability Request Supplement", is not required as part of the application for a Certificate of Approval (Air).

7.3 Conclusions

This ESDM Report was prepared in accordance with s.26 of O. Reg. 419/05. In addition, guidance in the ESDM Procedure Document was followed as appropriate.

The Hollinger Project is subject to s. 20 of O. Reg. 419/05, therefore the modelled effects of contaminant emissions must be assessed according to the relevant averaging periods of Schedule 3 of the Regulation using an approved dispersion model. The AERMOD dispersion model was used for the assessment, and conducted in accordance with the requirements of the Ministry's Air Dispersion Modelling Guideline for Ontario, Version 2.0, July 2009 (the "ADMGO" Guideline).

The emission rate estimates for each source of significant contaminants are documented in Summary Tables included in Appendix A. All the emission rates listed in these tables correspond to the operating scenario where all significant sources are operating simultaneously at their individual maximum activity rates. Therefore these emission rate estimates listed in *Table A1: Source Summary Table – Emissions (g/s)* are not likely to be an underestimate of the actual emission rates.

A POI concentration for each significant contaminant emitted from the Hollinger Project was calculated based on the calculated emission rates and the output from the AERMOD dispersion model; the results are presented in Table 2 - Emission Summary Table The POI concentrations listed in Table 2 were compared against criteria listed in the Ministry publication "Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality, PIBS # 6569e" (2008)."

Of the contaminants listed in the Emission Summary Table (Table 2) that have limits in the List of Ministry POI Limits all the predicted POI concentrations are below the corresponding limits. At 51.5%, cobalt has the highest concentration relative to the corresponding Ministry POI Limit for the 24-hour averaging time. The next highest contaminant is arsenic at 18.1%. The POI concentration for total suspended particulate matter was 45.2 µg/m^3, 38% of the Schedule 3 standard.

The significant emissions anticipated from the open pit mining and material handling did not include any contaminant(s) that do not have corresponding criteria limits in the Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution – Local Air Quality published by the Standards Development Branch, Ontario Ministry of the Environment (February 2008, PIBS # 6569e). Therefore there are no contaminants considered to be Contaminants with No Ministry POI Limits. Therefore the Supporting Information for a Maximum Ground Level Concentration Acceptability Request Supplement", is not required as part of the application for a Certificate of Approval (Air).

The ESDM Report demonstrates that the Hollinger Project open pit mining activities can operate in compliance with O. Reg. 419/05.

8. References

NAICS US Census Bureau (2007) North American Industry Classification System

Ontario Ministry of the Environment (MOE). (2009). Guideline A-10: Procedure for Preparing and Emission Summary Dispersion Modelling Report, PIBS #3614e03.

Ontario Ministry of the Environment (MOE). (2008). Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality, PIBS # 6569e.

Ontario Ministry of the Environment (MOE) (2009). Air Dispersion Modelling Guideline for Ontario, Version 2.0 PIBs # 5165e02.

Appendices

Appendix A:
Emission Summary Dispersion Modelling Report Tables

Source and Contaminant Identification Table

Emission Summary Table

Source Summary Tables

Appendix B: Figures

Figures

Appendix C:
Supporting Calculations for Emission Rate Estimates

Appendix D:
Dispersion Modelling Input and Output

Appendix E:
Fugitive Dust Best Management Practices Plan