AIR QUALITY SPECIFIC COMMENTS

Final Report - Section 3.3

Health Canada appreciates that the air quality modelling results for the 4.6 ha area enclosing the campsite and ore processing facilities are presented. Within the campsite, the workers/residents will continuously be exposed to NO_2 over a period of 24 hours, which at the levels predicted, could result in deleterious health effects. Short term NO_2 exposure causes decreases in lung function and increase in airway responsiveness, while long term exposures produce pulmonary irritation and respiratory illness. Due to the potential of high concentrations of NO_2 produced by the power generators and the mine fleet exhaust, an NO_2 monitoring program should be established.

Response

In the April 2004 supplemental questions submitted to NIRB by Health Canada, mention was made of the 1-hour NO_2 guideline of 200 µg/m^3 recommended by the World Health Organization. It is our understanding that Health Canada is in the process of examining the latest scientific evidence regarding health risks associated with exposure to NO_2, and may recommend a decrease in the acceptable 1-hour guideline to 200 µg/m^3. Since this 1-hour NO_2 guideline is only proposed, it is Golder's position that it not be used for determining impacts due to the Project. However, if this limit was considered, the following table indicates that the maximum 1-hour NO_2 concentration inside the plant area is below 200 µg/m^3. The maximum 1-hour NO_2 concentration is above 200 µg/m^3 outside the plant area; however, concentrations above this level only occur about 0.2% of the time.

Compound	*Maximum Predictions*		*Environmental Guidelines or Criteria*
	Outside Plant Area	*Inside Plant Area*	
1-hour NO_2 [µg/m^3]	*306.7*	*177.3*	*400*
24-hour NO_2 [µg/m^3]	*126.4*	*118.7*	*200*
annual NO_2 [µg/m^3]	*47.7*	*57.9*	*60*

Note: Predictions summarized from Supporting Document F2 (Human and Ecological Risk Assessment), Tables 3.11 and 3.12.

Since predictions within the plant area are within the Environment Canada desirable levels and the proposed 1-hour level of 200 µg/m^3, workers/residents should not be continuously exposed to NO_2 levels that would result in deleterious effects. Since NO_2 concentrations are within desirable levels, there would seem to be no requirement to investigate potential mitigation measures for NO_2 emissions or to develop an NO_2 monitoring program at the Doris North Project.

Atmospheric Environment - Section 9.1.1.2

With respect to MHBL's baseline and continued air quality program:

a) MHBL should focus its efforts on fine (2.5 µm) and coarse (10 µm) particulate matter (PM). Based on their penetration and deposition rates into the alveoli in the lungs, $PM_{2.5}$ and PM_{10} affect the human system to different degrees; the risk associated with fine particles is higher than the risk to coarse PM or TSP.

b) A commitment to establishing an air quality program requires that a representative number of samples be taken, over different seasons.

Response

As discussed in Section 9.3.6, MHBL has committed to installing an air quality monitoring station during operation of the Doris North Project. This station will include equipment to monitor TSP, PM_{10}, $PM_{2.5}$ and dustfall at the Project site. The TSP, PM_{10} and $PM_{2.5}$ samples will be collected for a 24-hour period every sixth day, as per the federally mandated National Air Pollution Surveillance (NAPS) schedule. Dustfall samples will be collected over a nominal 30-day period and submitted monthly to a certified independent laboratory for analysis. MHBL has described its monitoring and follow-up plan in Chapter 5 (Section 5.15).

Atmospheric Environment - Section 9.1.1.4

Chapter 9 (Atmospheric Environment) states that, during the summer months, smoke [and pollutants from forest fires] may combine with project emissions and dust. How have the potential cumulative effects of the project air emissions and of pollutants from forest fires been addressed within the assessment?

Response

Forest fires are natural events and their effects are out of the control of MHBL. Since the effects of the Project on air quality are localized (within 5 km of the plant area), the magnitude of the cumulative effects of the Project during forest fire events would be negligible further than 5 km from the Project and minor to high in the vicinity of the Project, depending on the severity of the forest fire on local air quality. MHBL may consider reducing production during significant forest fire events if it would improve local air quality.

Atmospheric Environment - Section 9.1.2.1

a) It is noted that there is a significant reduction in expected (modelled) emissions due to the introduction of a load factor of 0.59 for the vehicle fleet. Please provide additional details supporting the choice of this load factor value.

b) The construction and operation emission rates (Tables 9.4 & 9.5) were both estimated "assuming a high level of mitigation" on dust emissions from vehicle traffic (and from bulldozing and grading during construction activities). Please describe how these estimates were derived (ie. Provide the numerical values for the assumptions used to obtain these emissions rates). What are the construction and operation emission rates in the absence of high levels of mitigation for dust emissions?

Response

a) In the 2003 EIS, a load factor was not applied to the vehicle emissions. The approach used for estimating emission rates for a single vehicle in the 2003 EIS was based on the following equation:

$$Vehicle\,Emissions = Emission\,Standard \times Gross\,Operating\,Hours \times Vehicle\,Horsepower$$

In this equation, the emission standard was based on the U.S. EPA standard for the specific vehicle, the gross operating hours were based on the number of hours the vehicle operated per day or year (including idling) and the vehicle horsepower was based on the vehicle's rated maximum horsepower. This approach assumed that the vehicle was constantly operating at its maximum rated horsepower and was emitting at the emission standard allowed by the U.S. EPA. Since mine vehicles spend some of their time idling (e.g., waiting to be loaded and loading) and at lower horsepowers (e.g., travelling unloaded, travelling at cruising speed), the assumption that the vehicle constantly operates at maximum horsepower was very conservative.

The U.S. EPA recently released a draft version of an emission inventory model titled NONROAD (U.S. EPA 2004a), which estimates non-road vehicle emissions for use in regional emission inventories. The NONROAD model uses an approach similar to the above approach for estimating emissions, but with some key differences. NONROAD estimates emission rates for a single vehicle are based on the following equation:

$$Vehicle\,Emissions = Emission\,Factor \times Gross\,Operating\,Hours \times Vehicle\,Horsepower \times Load\,Factor$$

One of the main differences between the NONROAD approach and the approach used in the 2003 EIS is the use of a load factor account for the fact that vehicles do not operate at their maximum rated horsepower the entire time that they are in operation. For instance, if a vehicle only operates at one-half of its rated horsepower while it is typically operating, the load factor would be 0.5 or 50%.

Based on a review of the NONROAD methodology, the 2003 EIS approach was revised to include a load factor. The use of the load factor provides a more realistic representation of vehicle emissions from the Project. This revised approach used the following equation to estimate vehicle emission rates:

$$Vehicle\,Emissions = Emission\,Standard \times Gross\,Operating\,Hours \times Vehicle\,Horsepower \times Load\,Factor$$

The following information was obtained regarding potential load factors for mine fleet haul trucks:

- 20 to 50% - provided in the Caterpillar Handbook as the “high” range for large haul trucks, with the disclaimer that higher values may be experienced in some applications (Caterpillar 2002).

- 59% - highest load factor for diesel-fuelled vehicles recommended by U.S. EPA when on-site data is unavailable (U.S. EPA 2004b).

The load factor values listed above have a level of uncertainty, mainly because of the limited number of data points, the variability in the data sources and potential inconsistencies in the definition of load factor. Due to these uncertainties, the conservative U.S. EPA recommended value of 59% was chosen as the load factor for this project.

b) A discussion of the dust emissions without mitigation is not warranted since MHBL has committed to dust mitigation measures in the EIS. The dust suppression control efficiencies used in determining dust emissions were assumed to 80% for outside roads and 90% for the underground haul road (Supporting Document B3, Section 3.2, Table 3.2).

References

Caterpillar (Caterpillar Inc.). 2002. Caterpillar Performance Handbook. Edition 33. October 2002.

U.S. EPA (United States Environmental Protection Agency). 2004a. Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression Ignition. Prepared by the Office of Transportation and Air Quality, Research Triangle Park, NC. Report No. NR-009c.

U.S. EPA. 2004b. Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling. Prepared by the Office of Transportation and Air Quality, Research Triangle Park, NC. Report No. NR-005c.