INFORMATION REQUEST –T(3)-01

AIR QUALITY AND HUMAN HEALTH

Source: Canadian Environmental Assessment Agency

Summary of Comment

(Provided January 29, 2016)

The air quality assessment and the human health and ecological risk assessment (HHERA) require revision. The air dispersion modeling results, which were submitted to respond to T(2)-02, produced concentrations for some compounds that far exceed ambient air quality criteria. Among these compounds are some that were not carried forward to the HHERA. The cumulative effects assessment, including Table 6-64, may also need to be updated to reflect the new results.

The maximum concentrations that were evaluated in the HHERA are much lower than the values produced by the modified air dispersion modeling, e.g. the PM10 concentration used in the HHERA was 146 µg/m3 while the recent modeling results predict a PM_{10} concentration of 491 $\mu g/m^3$.

In addition, watering and natural mitigation (e.g. rainfall or snow cover) are appropriate for annual average concentrations, not short term (i.e. 24-hour) maximum dust concentrations, as these types of mitigation are limited or not available on days without precipitation.

The information is required by the Agency, pursuant to Subsections 10.2.1, 10.3.1, 13.1.2, and Section 10.4 of the EIS Guidelines, to analyze the potential effects to human health, current use of lands and resources, and socio-economic conditions; the proposed mitigation; and monitoring requirements.

Reference to EIS/EA

Atmospheric Environment Technical Support Document (TSD)

Human Health and Ecological Risk Assessment TSD

EIS Subsection 6.8.3.9

Previous IR

T(2)-02

Request #1

Revise the air quality assessment with a new dispersion modelling scenario that uses emission scenarios under normal/representative operating conditions (i.e. based on an annual average production rate and average number of trucks and road distances). Avoid including natural mitigation when predicting the short term 24-hour dust concentrations.

Response

The emission predictions have been revised based on the maximum annual average production rate and the results of the updated dispersion modelling are summarized in the attached memorandum. Tables 1 and 2 in the

attached memorandum summarizes the revised assumptions. In the updated dispersion modelling, natural mitigation was not considered as a form of control on any emission sources.

Request #2

Provide an analysis of the results from the new modeling that includes the maximum ambient air concentrations for PM2.5, PM10 and TSP for 24-hour and annual averaging periods (where applicable). Describe the assumptions and input parameter values for the emission sources and estimates used in the new modeling. Add the final results to the baseline values to yield the maximum concentrations. The analysis should include maximum concentrations for the local study area (LSA), LSA with 500m buffer, the regional study area (RSA), and beyond RSA. Include a frequency analysis for cases of any predicted exceedance.

Response

Tables 3 and 4 in the attached memorandum summarize the results of the revised modelling. Table 3 provides the concentrations resulting from the Project alone and Table 4 includes the contribution from the baseline concentrations. Tables 1 and 2 in the attached memorandum summarize the revised assumptions and input parameters used in the updated modelling which were provided to the Government review Team (GRT) for comment prior to modelling. Page 6 of the attached memorandum includes an explanation of the frequency above ambient air criteria assessment that was completed. Figures 1-5 provide isopleths of parameters that were modelled to have concentrations above the ambient air criteria in the LSA.

Request #3

Provide a Source Summary Table with the corresponding emission rates for PM2.5, PM10 and TSP. Update tables MOE Air-2-1, MOE Air-2-2, MOE Air-2-3, MOE Air-2-4, and EMRB-NEW10 with the new modeling results, and include the PM2.5, PM10 and TSP background concentrations and information on predicted cumulative effects (modeled plus background concentrations) at the receptor locations.

Response

Appendix 3 of the attached memorandum contains a source summary table with the emission rates for TSP, PM10 and PM2.5. Tables 3 and 4 summarize the results of the revised modelling. Table 3 provides the concentrations resulting from the Project alone and Table 4 includes the contribution from the baseline concentrations. The attached memorandum also provides an assessment of potential human health and ecological risks based on the revised modelling results.

Request #4

Plot the locations of the maximum concentrations for all compounds, using single points (as opposed to a range) and include the locations of all known and possible sensitive receptors.

Response

Figure 6 in the attached memorandum shows the location of the maximum concentration for each compound and includes the receptor locations.

Request #5

Provide figures of isopleths to depict the geographic extent of the frequencies above the applicable criteria for all compounds that have the potential to exceed the criteria, and include the locations of all known and possible sensitive receptors.

Response

Figures 1-5 of the attached memorandum provide isopleths of the parameters that were modelled to have concentrations above the ambient air criteria in the LSA and include the receptor locations.

Request #6

Summarize in a table the mitigation measures used in the revised modeling and their control efficiencies; additional mitigation to further reduce potential effects of those compounds predicted to exceed air quality criteria; and measures for monitoring and the follow-up program to evaluate the effectiveness of the mitigation and contingency measures. Include the technical references for the measures.

Response

Table 2 in the attached memo includes the mitigation measures assumed in the revised modelling. A Best Management Practices Plan (BMPP) for the Project is also attached and includes details on measures for monitoring and follow-up measures to evaluate the effectiveness of the mitigation measures.

Request #7

Based on the new air dispersion modeling in item 1 above, update the human health and ecological risk assessment (HHERA) to include in the human health portion the predicted concentrations at all potentially relevant human receptor locations. Evaluate both acute and chronic exposure in the HHERA. If the substances are expected to deposit on soils, in addition to re-evaluating inhalation exposure, evaluate other exposure routes, including dermal contact with surface soils; dust deposition on soil, plants, and waterbodies; and uptake by terrestrial and aquatic species, and subsequent consumption of these foods by humans.

Response

Pages 6 and 7 of the attached memo provides an assessment of potential human health and ecological risks based on the revised modelling results.

Request #8

Describe the ambient air quality monitoring program that will be implemented, including monitoring parameters, sampling methods, duration, frequencies, number of sampling sites, sampling locations, and provide a rationale that takes into account the results of the new modeling results and updated HHERA. If monitoring is not proposed, provide the health-science based justification.

Response

Section 4.1.2 of the attached BMPP explains details pertaining to the monitoring program that will be implemented at the site.

Request #9

Update the summary of cumulative effects in Table 6-64, as required.

Response

Although the PM10 is predicted to exceed the ambient air quality guidelines outside the LSA, this is predicted to occur only one day per year or less and is not considered to be significant for the reasons discussed in the attached memorandum. With this single exception, the potential impacts are confined to within the LSA, therefore an update of the summary of cumulative effects in Table 6-64 is not considered to be required.

GRT Review Findings and Comments on above Responses

(Provided in letter to proponent dated October 16, 2016)

Part 1

The response provides results from a new air quality assessment that reflects a revised dispersion modeling scenario. While the modeling appears to have adhered to the scope of work that was approved by the federal reviewers on April 29, 2016, there are some clarifications required, as noted below.

Part 2

The response is missing annual averaging period results for total suspended particulates (TSP) and predicted concentrations for the area described as “LSA with 500 m buffer”. This information was part of the previous analysis done in October 2015 (Tables MOE Air-2-1 and MOE Air-2-2).

Required Clarification

Tables 3 (i.e., updated Table MOE Air-2-1) and 4 (i.e., updated Table MOE Air-2-2) require revisions to include results of the annual averaging period for TSP, as well as results of concentrations of all compounds in the area “LSA with 500 m buffer”.

CMC Response

Table 3 and 4 of the Technical Memorandum: *Revised Emission Rate Assumptions and Dispersion Modelling Results – Hammond Reef Gold Project* have been revised to include results of the annual averaging period for TSP and concentrations of all compounds in the area “LSA with 500 m buffer”. A revised version on the technical memorandum is attached.

Part 3

The response provides a source summary table (Appendix C of the technical memorandum on revised emission rates) for TSP, particulate matter and fine particulate matter and includes updated Tables MOE Air-2-1 and MOE Air-2-2. These tables need further revisions, as describe in the review findings, above.

According to the response, particle deposition was not included in the dispersion modeling, thereby adding to the conservatism of the model. By excluding particle deposition, Table EMRB-NEW10 is not required for the air quality analysis.

It is unclear why updated Tables MOE Air-2-3 and MOE Air-2-4 are missing from the response.

Required Clarification

a) Tables 3 (i.e., updated Table MOE Air-2-1) and 4 (i.e., updated Table MOE Air-2-2) require revisions to include results of the annual averaging period for TSP, as well as results of concentrations of all recorded compounds in the area "LSA with 500 m buffer".
b) Updated Tables MOE Air-2-3 and MOE Air-2-4 are required to summarize the predicted frequencies of contaminant concentration exceedance and cumulative ambient air quality concentrations.

CMC Response

a) See above response to Part 2.
b) The Technical Memorandum: *Revised Emission Rate Assumptions and Dispersion Modelling Results – Hammond Reef Gold Project* has been revised to include a new table (Table 5) which provide the predicted maximum frequency above ambient air criteria for all parameters that are predicted to have concentrations above ambient air criteria (i.e., an updated Table MOE Air-2-3) and an new appendix (Appendix D) which provides the cumulative air quality concentration at receptor locations (i.e., an updated Table MOE Air-2-4). A revised version on the technical memorandum is attached.

Part 4

Figure 6 in Appendix A of the technical memorandum shows the locations of the maximum concentrations for all compounds and includes locations identified as possible sensitive Non-Indigenous receptor locations among discrete locations for human activities as expressed in the socio-economic assessment work. It is unclear whether the locations appearing in Figure 6 reflect areas, or are proximate to areas, that may be used by Indigenous Peoples for traditional purposes. Please note that information requests T(3)-02, -03 and -04 require consideration of potential changes in the environment that may occur in areas Indigenous Peoples may use for traditional purposes.

Required Clarification (also linked to T(3)-02, -03 and -04)

Update Figure 6 or provide a new figure that depicts the locations of predicted concentrations of compounds above ambient air quality criteria in relation to areas that may be used by Indigenous Peoples for traditional purposes. (See also review findings for Part 7 of T(3)-01.)

CMC Response

Figure 6 as provided in Appendix A of the technical memorandum dated August 5, 2016 illustrates the locations of maximum concentrations relative to the site boundary and relative to receptor locations identified within the LSA. These receptor locations (i.e., tourism establishments and trapper cabins identified as receptor locations 20, 24, 25, 28, 29, 31, and 32) indicate known areas used by both Indigenous and Non-Indigenous receptors as described in the Human Health and Ecological Risk Assessment (HHERA) TSD in Section 4.2.1. The HHERA TSD evaluated each of these receptor locations with respect to changes in air quality (among other environmental changes) and the potential impact on human health. The HHERA TSD indicated that human health risks were expected to be negligible considering the changes in concentrations of air quality parameters predicted at those locations at the time.

The updated technical memorandum has refined some of the assumptions considered in the air quality predictions that were evaluated in the HHERA TSD, such that most predicted concentrations have decreased or remained unchanged. For those chemicals that did increase in concentration, the increases were less than air quality

standards at the assessed receptor locations with the exception of acrolein at receptor location 32. As a result, only acrolein at receptor location 32 was re-evaluated in the Human Health Risk Assessment section of the technical memorandum because the health risks associated with all other chemicals and receptor locations were not predicted to change (i.e., remain negligible). The re-evaluation concluded that health risks due to acrolein at receptor location 32 are considered to be negligible.

Other areas that may be used by Indigenous Peoples for traditional purposes are either unknown or cannot be disclosed in the EIS/EA at the request of the Aboriginal communities (see response to T(3)-03), therefore the new figure that has been requested by the GRT cannot be provided. However, it is acknowledged that Indigenous peoples may use areas in the LSA for traditional purposes and an assessment of potential effects on recreational receptors has been provided in the response to Part 7 below.

Part 5

The response includes figures of isopleths (Figures 1 to 5 in Appendix A of the technical memorandum) that depict the geographic extent of the frequencies above applicable criteria for the compounds that were predicted to exceed the ambient air quality criteria. No further clarification is needed.

Part 6

Table 2 of the technical memorandum includes mitigation measures proposed to address the predicted emissions. The response frequently makes reference to the best management practices plan (BMPP). The BMPP includes details for the construction and operation phases of the Project. Emissions could also occur during the decommissioning phase, for example; therefore, the BMPP should also incorporate measures and practices to address emissions during latter phases of the Project.

The BMPP focuses on one contaminant, TSP. Mitigation and contingency measures should be proposed to address all other potential contaminants, such as acrolein, diesel particulate matter, PM10, PM2.5 and SO2. The BMPP does not include contingency measures or corrective actions to respond to unintended conditions, particularly those that would affect ambient air quality and possibly pose human health risks from acute, chronic or incidental exposures. (See also review findings for Part 7 of T(3)-01.)

Required Clarification:

a) Expand the BMPP to apply during all phases of the Project in which there would be activities that involved air emission sources.
b) Update the BMPP to include measures and practices to mitigate and respond to scenarios in which emissions of any potential contaminant (e.g., acrolein, diesel particulate matter, PM10, PM2.5 and SO2) may occur during all phases of the Project. Indicate the contaminants that would be addressed by the measures and practices.
c) Update the BMPP to incorporate contingency measures to address events in which ambient air quality and possibly human health could be at risk. Include provisions to notify authorities, Indigenous groups and others, and to communicate contingency plans and results.

CMC Response

a) The Best Management Practices Plan (BMPP) for Control of Fugitive Dust has been revised to apply to all phases on the project where fugitive dust may be generated.
b) The BMPP is developed for the sole purpose of controlling fugitive dust, therefore it is only intended to focus on TSP. PM10 and PM2.5 are components of TSP and therefore are implicitly included in the BMPP. Control measures for process and tailpipe emissions such as acrolein, diesel particulate matter and SO2 do not belong in the BMPP for control of fugitive dust. Mitigation, monitoring and contingency measures for process and tailpipe emissions are summarized in Section 8.2.2 of the EIS/EA.
c) The BMPP outlines practices to minimize fugitive dust emissions. In general, contingency measures and notification procedures are not a component of BMPPs. The BMPP has been revised to include monitoring triggers and corrective actions if triggers are reached. A human health risk assessment has been completed using the predicted maximum concentrations and concluded that the potential risk to human health is negligible. CMC will carry out monitoring as indicated in the BMPP and in Section 8.2.2 of the EIS/EA. If monitoring indicates that air quality concentrations may exceed the maximum concentrations relied upon in the human health risk assessment, appropriate regulatory agencies, Indigenous groups and general public will be notified, a thorough assessment of potential risks to human health will be completed and the results will be communicated to the groups identified above. Corrective actions, such as those identified in the BMPP and in Section 8.2.2 of the EIS/EA, will be implemented as required to maintain emissions to acceptable levels. In addition, CMC will comply with the reporting requirements of all applicable Acts and approvals, including but not limited to Environmental Compliance Approvals and Ontario Regulation 419/05 which requires that an emission summary and dispersion modeling report be updated annually to assess compliance.

Part 7

The response includes an update on the human health and ecological risk assessment (HHERA) on pages 6 and 7 of the technical memorandum. The evaluation described in the update did not assess potential health risks at maximum points of impingement (MPOIs) outside the project footprint for each of the substances that were predicted to exceed ambient air quality criteria in the local study area. Figure 6 in the technical memorandum shows maximum points of impingement for several substances near Sawbill Bay and other areas.

Required Clarification:

a) Update the HHERA to include:
    (i) Evaluation of a recreational or transient human health receptor who could be present in the locations of the MPOIs for the substances that are predicted to exceed regulatory guideline levels outside the project footprint (see list below in (iv));
    (ii) Discussion about the expected exposure duration(s) for these receptors at the MPOIs and the potential for acute and chronic health effects to occur (both cancer and non-cancer effects) with the expected exposure duration for the individual receptors on a chemical-specific basis (e.g., recreational receptor may be present at the MPOI for SO2 while fishing in Sawbill Bay for multiple hours at a time over a specific season and the one-hour toxicity threshold for SO2 is predicted to be exceeded where the receptor may be present);
    (iii) Figures to support the discussion in (ii) that outline locations or areas people should avoid (on a chemical-specific basis) based on the potential for exceedances of applicable health-based

guideline values for the duration of exposure that may occur in these areas to assist in risk communication efforts;

(iv) Quantitative assessment of human health risks for the following substances at the MPOIs (given that some of the substances can have acute adverse health effects and people may be present for sufficient duration for an adverse effect to occur):

- PM2.5 (24 hour);
- PM10 (24-hour);
- TSP (24-hour);
- SO2 (1-hour);
- Acrolein (24-hour); and
- Diesel particulate matter (for carcinogenic and non-carcinogenic effects)

The selection of these substances is based on the concentrations predicted to exceed applicable regulatory guideline values in Tables 3 and 4 of the technical memorandum.

b) Revisions to the proposed ambient air quality monitoring program, based on the updated HHERA described in a), are required with respect to substances to be monitored, locations for monitoring and frequency of monitoring to protect human health. (See also the required clarification for Part 6.)

It is expected that the list of substances included in the monitoring program would be amended, as appropriate, if there are any changes to the list of substances at the MPOIs and to anticipated human health risks.

CMC Response

Part a)

(i) An evaluation of potential health risks to recreational human health receptors who could be present in the locations of the MPOIs for the substances that are predicted to have concentrations above regulatory guideline levels outside the project footprint has been completed and the results of this assessment for each chemical is provided below. This assessment considered the recreational user receptor characteristics defined in Section 4.4.3.2 of the HHERA TSD (i.e., a child or adult that may spend up to 12 hours per day and 30 days per year at the MPOI location). TSP was not included in the assessment because it is not considered for human health effects given that its criterion is based on visibility, which is not a human health concern, as discussed in Section 4.6.2 of the HHERA TSD.

PM2.5 (24-hour): Considering a recreational receptor at the location of the MPOI, when the recreational user's receptor characteristics are considered, its hazard quotient (HQ) is 0.07 compared to the acceptable HQ of 1. Therefore, health risks due to 24-hour PM2.5 in the LSA at the MPOI are considered to be negligible for recreational users and no restrictions on use are proposed.

PM2.5 (annual): Considering a recreational receptor at the location of the MPOI, when the recreational user's receptor characteristics are considered, its HQ is 0.04 compared to the acceptable HQ of 1. Therefore, health risks due to annual PM2.5 in the LSA at the MPOI are considered to be negligible and no restrictions on use are proposed.

PM10 (24-hour): Considering a recreational receptor at the location of the MPOI, when the recreational user's receptor characteristics are considered, its HQ is 0.2 compared to the acceptable HQ of 1. Therefore, health risks due to 24-hour PM10 in the LSA at the MPOI are considered to be negligible and no restrictions on use are proposed.

SO2 (1-hour): As indicated in the HHERA TSD, receptor characteristics are not incorporated into assessment of effects due to acute (1-hour) air concentrations. SO_2 was above the guideline value only one hour per year and, as indicated in the technical memorandum, concentrations above ambient air criteria that occur only one day per year or less are likely a result of the conservative assumptions (e.g. the worst meteorological conditions, maximum daily emission rates in Year 5, and baseline concentrations at or above the 90th percentile) all occurring simultaneously which, in reality, is unlikely to occur. It is noted that this 1-hour concentration is the peak predicted concentration, and all other 1-hour predictions (i.e., second highest concentration, third highest, etc.) were all below the selected health-based air quality criterion of 690 µg/m^3. As shown in the isopleth on Figure 4, the exceedances are localized immediately around the mine study area. As part of the Project monitoring plan, source testing will be conducted to confirm emissions and to confirm that the maximum concentrations estimated by the air quality modeling were over-predicted. No impacts associated with SO_2 are expected for recreational users within the LSA.

Acrolein (24-hour): Considering a recreational receptor at the location of the MPOI, when the recreational user's receptor characteristics are considered, its HQ is 1.6 compared to the acceptable HQ of 1. However, as shown in the isopleth on Figure 4 of the attached memo, the exceedances are localized immediately around the mine study area. The MPOI is located in very close proximity to the Mine Study Area boundary. During operations, this location will only be accessible by boat as land access would require passing through the active mine area and this will be restricted for safety reasons. Therefore, it is unlikely that this location will be used extensively for recreational purposes. As part of the Project monitoring plan, source testing will be conducted to confirm emissions and to confirm that the maximum concentrations estimated by the air quality modeling were over-predicted. No impacts associated with acrolein are expected for recreational users within the LSA.

DPM (24-hour): Considering a recreational receptor at the location of the MPOI, when the recreational user's receptor characteristics are considered, its HQ is 0.1 compared to the acceptable HQ of 1. Therefore, health risks due to 24-hour DPM in the LSA at the MPOI are considered to be negligible and no restrictions on use are proposed.

DPM (annual): Carcinogenic effects for recreational users were considered for DPM because this substance is classified as a Group 1 carcinogen, which follows the approach used in the HHERA TSD. Considering a recreational receptor at the location of the MPOI, when the recreational user's receptor characteristics are considered, its incremental lifetime cancer risk (ILCR) is 4.6E-06 compared to the acceptable ILCR of 1E-06. The magnitude of effects assessment indicates that the risk associated with annual DPM is likely to be low because of the conservative assumptions: assuming that the maximum annual concentration

is present throughout the life of the Project and that the receptor is present at the MPOI location for 12 hours per day and 30 days per year throughout the life of the Project. It is also noted that the predicted ILCR is lower than the federally accepted ILCR of 1E-05. For these reasons, no impacts are expected for recreational users within the LSA.

Furthermore, it is most likely that the recreational user, who will be exposed only for an intermittent exposure and not a continuous exposure over a long-term basis, would be more susceptible to non-carcinogenic health effects rather than carcinogenic health effects. Given that the predicted annual concentration at the MPOI is less than the annual screening guideline of 5 µg/m^3 which is protective of non-carcinogenic effects, non-carcinogenic health effects are considered to be negligible. Therefore, no impacts are expected for recreational users within the LSA.

(ii) The potential health risks to recreational receptors that may be present at the MPOI locations has been assessed assuming the recreational user receptor as defined in Section 4.4.3.2 of the HHERA TSD (i.e., a child or adult that may spend up to 12 hours per day and 30 days per year at the MPOI locations). Health risks to recreational receptors at the MPOI were determined to be negligible (see response to (i)).

(iii) As indicated in the response to (i), the MPOI locations were assessed and no health effects are anticipated. Therefore, figures illustrating areas that recreational users should avoid are not required.

(iv) All listed substances, with the exception of TSP, have been assessed in the response to (i). TSP was not assessed with respect to human health given that its criterion is based on visibility, which is not a human health concern, as discussed in Section 4.6.2 of the HHERA TSD. $PM_{2.5}$ and PM_{10} are typically used to assess potential health risks from particulate matter, given that particle sizes of 10 microns and smaller (represented by PM_{10}) are able to enter the respiratory tract (World Health Organization 2006) and are therefore a better indicator of potential human health risks.

Part b)

CMC will carry out monitoring as indicated in the BMPP and in Section 8.2.2 of the EIS/EA including source testing to confirm and updated as required the emissions assumptions used in the EIS/EA. Source testing will include all compounds that are predicted to be above ambient air quality criteria. In addition, CMC will comply with the monitoring requirements of all applicable Acts and approvals, including but not limited to, Environmental Compliance Approvals and Ontario Regulation 419/05 which requires that an emission summary and dispersion modeling report be updated annually to assess compliance.

Part 8

Section 4.1.2 of the BMPP provides an outline of ambient air quality monitoring measures for TSP. It is unclear what is proposed for all other compounds that are predicted to occur at levels that exceed criteria and whether the sampling and monitoring network will take into account locations in the local study area that represent areas where traditional activities by Indigenous Peoples could occur as well as local activities, such as fishing in Sawbill Bay.

Required Clarification:

a) Describe the ambient air quality monitoring measures for all compounds that are predicted to occur at levels that exceed ambient air quality criteria. Include information about the sampling and monitoring to

identify changes in ambient air quality that could affect health of persons using the lands and resources in the local study area.

b) See also the required clarification for Part 6.

CMC Response

See responses to Part 6(c) and Part 7(b).

Part 9

No further clarification is needed. The response indicates no update to Table 6-64 (Summary of Predicted Cumulative Environmental Effects) of the Environmental Impact Statement is required as the results of the revised air quality assessment predicts. The results of the revised air quality assessment predicts only PM10 would exceed ambient air quality guidelines outside the local study area, and the frequency of the exceedance would be one day per year or less.

GRT Review Findings and Comments on above Responses

(Provided in letter to proponent dated February 17, 2017)

Part 1

The response provides results from a new air quality assessment that reflects a revised dispersion modeling scenario.

No further clarification is needed.

Part 2

The revised Tables 3 (i.e., updated Table MOE Air-2-1) and 4 (i.e., updated Table MOE Air-2-2) are sufficient.

No further clarification is needed.

Part 3

The revised Tables 3 (i.e., updated Table MOE Air-2-1) and 4 (i.e., updated Table MOE Air-2-2), as well as the updated Tables MOE Air-2-3 and MOE Air-2-4 are sufficient.

No further clarification is needed.

Part 4

The updated Figure 6 shows two locations for maximum 1-hour concentration of NO2. The figure does not show the location for maximum 1-hour concentration of SO2. There appears to be a typo that should be corrected.

Required Clarification

Provide a new Figure 6 that depicts the locations of predicted maximum concentrations of compounds above ambient air quality criteria in relation to areas that may be used by Indigenous and non-Indigenous receptors.

CMC Response

The identified typo has been corrected. A revised Figure 6 is provided in the attached Technical Memorandum: Revised Emission Rate Assumptions and Dispersion Modelling Results. (Rev. 2)

Part 5

The response includes figures of isopleths (Figures 1 to 5 in Appendix A of the technical memorandum) that depict the geographic extent of the frequencies above applicable criteria for the compounds that were predicted to exceed the ambient air quality criteria.

No further clarification is needed.

Part 6

Table 2 of the technical memorandum includes mitigation measures proposed to address the predicted emissions. The response frequently makes reference to the best management practices plan (BMPP). The updated BMPP (December 2016 version) now adds details for likely activities during the decommissioning phase of the Project to those of the construction and operation phases.

Further, the Agency accepts the proponent's assertion that PM10 and PM2.5, which are components of TSP, could be implicitly covered by the BMPP. However, process and tailpipe emissions, which are predicted to emit acrolein, diesel particulate matter and SO2 levels that exceed air quality criteria, are not covered by the BMPP. The measures described in Sections 8.2.2 of the EIS/EA documentation also do not address acrolein, diesel particulate matter and SO2 levels. The proposed ambient air quality monitoring described in Section 8.2.2 focuses on TSP and suggests only one location for monitoring that would be based on the locations of mine activities.

A follow-up monitoring plan that includes monitoring and contingency measures to address TSP (including PM10 and PM2.5), acrolein, diesel particulate matter and SO2 levels within the local study area, particularly in the vicinity of known, suspected or foreseeable human receptor locations, is required. The locations identified should be both short-term and long-term exposure locations for Indigenous and non-Indigenous receptors. The detailed plan should be developed in consultation with relevant federal and provincial agencies (Environment and Climate Change Canada, Health Canada, Ontario Ministry of the Environment and Climate Change), Indigenous groups and the public. The plan should also include details about the monitoring parameters, methods, sampling locations, applicable standards, duration, frequencies (sampling and reporting), thresholds that trigger implementation of alternative or additional mitigation and a communication plan to notify Indigenous groups and the public (via local entities, such as the Atikokan/Canadian Malartic Corporation Committee) of potential poor air quality and address complaints.

The proponent has committed to erect signage at known or suspected human receptor locations to alert of possible elevated noise conditions. The same commitment should be implemented to alert of potential poor air quality.

Required Clarification:

a) Provide a framework for a separate monitoring plan for TSP, PM10, PM2.5, diesel particulate matter, acrolein and SO2 during construction, operation and decommissioning phases, which includes ambient air quality follow-up monitoring at known, suspected or foreseeable Indigenous and non-Indigenous receptor locations for short-term and long-term exposures within the local study area, as well as a communication plan to notify government agencies, Indigenous groups and the public (via local entities, such as the Atikokan/Canadian Malartic Corporation Committee).

b) Include in the commitments registry consultation with relevant federal and provincial agencies (Environment and Climate Change Canada, Health Canada, Ontario Ministry of the Environment and Climate Change) as well as Indigenous groups and the appropriate local entities on the details of the monitoring plan described in a). The details should include, at a minimum, monitoring parameters, methods, sampling locations, applicable standards, duration, frequencies (sampling and reporting), thresholds that trigger implementation of alternative or additional mitigation and a communication plan to notify the government agencies of monitoring results, inform Indigenous groups and the public of potential poor air quality; address complaints; and to report the findings and results.

c) Include in the commitments registry the installation of signage at known, suspected or foreseeable human receptor locations to alert of potential poor air quality (i.e., when ambient air quality criteria may be exceeded).

CMC Response

CMC is committed to implementing a monitoring program to confirm the findings of the EIS/EA for the Hammond Reef Gold Project and ensure that proposed mitigation measures for gaseous and particulate emissions are effective, allowing the project to meet MOECC and CCME air quality guidelines and standards within the Local Study Area. The original commitment in the EIS/EA was to periodically monitor for TSP, PM10, and PM2.5 on the National Air Pollutant Surveillance (NAPS) program 6-day cycle during operations [see Atmospheric Environment TSD].

Dust deposition monitoring will be carried out if measured TSP concentrations exceed predicted concentrations. The NAPS monitoring program for TSP will include trigger conditions (i.e., measured TSP concentrations) that would initiate dust deposition follow-up monitoring using dustfall jars. CMC will consult with relevant federal and provincial agencies as well as Indigenous groups and the appropriate local entities on dust deposition monitoring at locations where Indigenous and non-Indigenous users may collect vegetation for consumption (if any).

In response to Agency comments and to better gauge the possible influences of site construction, operation and decommissioning phases, the following monitoring framework is proposed for the additional compounds identified by CEAA. A detailed monitoring program will be developed during the permitting phase of the project in consultation with relevant federal and provincial agencies, Indigenous groups and the appropriate local entities. The detailed monitoring plan will specify monitoring parameters, methods, sampling locations, applicable standards, duration, frequencies (sampling and reporting), thresholds that trigger implementation of alternative or additional mitigation and a communication plan to notify the government agencies of monitoring results, inform Indigenous groups and the public of potential poor air quality; address complaints; and to report the monitoring results.

Monitoring location(s) would be selected based on the modelling undertaken for the EIS/EA and in consultation with relevant federal and provincial agencies, Indigenous groups and the appropriate local entities. Location

selection will consider possible short-term and long-term exposure locations for Indigenous and non-Indigenous receptors. It is anticipated that the selected location(s) would be at or near the maximum concentration predicted and where continuous power is available.

In all cases, a location within or near the Mine Study Area is recommended as this will be most protective of air quality and human health because measured concentrations are likely to be highest on-site. Additional monitoring at a further distances from the project site is not expected to be required because concentrations will reduce the further distance from the on-site project sources. Predicted air quality concentrations at community locations in the LSA or RSA, such as Atikokan, are well below relevant criteria. Further, the equipment identified requires continuous power, and an area of approximately 5 x 5 m for the installation, making this station too large for easy installation in a remote location.

Construction and Decommissioning:

A powered continuous monitoring station will be installed at an appropriate location in close proximity to construction and decommissioning activities for 1 month with the following equipment:

- PQ 200 sampler for PM2.5
- Hi-volume sampler for total suspended particulates (TSP)
- PUF sampler for polycyclic aromatic hydrocarbons (PAH) as a surrogate for diesel particulate matter

It is recommended that the PQ200 and hi-volume samplers be operated on the same 6-day schedule used in the NAPS program. The PUF sampler would be used on the same 12-day schedule used in the NAPS program. A 1-month program would capture products of combustion, two particulate size fractions (allowing PM10 to be calculated based on the TSP and PM2.5) and PAHs which are indicative of diesel particulate. Metals analysis could also be undertaken on the hi-volume filters to assess airborne metals. Measurement of both TSP and PM2.5 will allow CMC to infer the concentration of PM10 without direct measurement and therefore meet the requirements identified by CEAA.

Operations:

In addition to the planned monitoring program for TSP, PM10, and PM2.5, a one-month air quality monitoring program will be implemented early in the operations phase. During the operations phase only, the following would be added to the sampling program:

- TERMO Model 43i for continuous sulphur dioxide (SO2)

This unit would be used to confirm that the SO2 being emitted from the cyanide destruction tanks (the primary source of SO2 at the site) is adequately controlled. The only source of SO2 during the construction and decommissioning phase is the low sulphur diesel fuel use to power the mobile equipment. The emissions of sulphur are much lower in these phases and there are no available additional mitigation measures that can be put in place to reduce these emissions.

A one-month program, if properly installed and maintained, would be sufficient to obtain a good understanding of the air quality effects during each phase of the project, and allow CMC to adequately inform local stakeholders and the regulatory bodies. The results of the above described monitoring program, including comparison to predicted concentrations in the EIS/EA, will be provided to the federal and provincial agencies, Indigenous groups and the appropriate local entities for review. The detailed monitoring program will specify trigger conditions based on the

above described monitoring that will require alternative or additional mitigation, and/or additional follow-up monitoring.

It is proposed that acrolein not be included as a parameter of the monitoring program due to uncertainties in sampling methodology. The following link provides a US EPA document, "Data Quality Evaluation Guidelines for Ambient Air Acrolein Measurements", which discusses acrolein sampling methodology:

http://www.epa.gov/ttnamti1/files/ambient/airtox/20101217acroleindataqualityeval.pdf

The largest source of acrolein are tailpipe emissions from the mobile equipment. The monitoring program for PM2.5 and diesel particulate matter also targets these sources and therefore the results of the monitoring program for these compounds can be used to infer the impacts of acrolein.

CMC will include the following in the commitments registry for the project:

- A commitment to consult with relevant federal and provincial agencies, Indigenous groups and the appropriate local entities during the development of the detailed air quality monitoring plan; and,
- A commitment to erect signage at known or suspected human receptor locations to alert of potential for reduced air quality.

Part 7

The response includes clarification of the human health and ecological risk assessment (HHERA), including the proponent's view that TSP is a visibility, not human health, concern.

Small particulates within TSP (PM10, PM2.5 and diesel particulate matter) are potential human health concerns due to exposure via inhalation. TSP (or fugitive dust) could contain metals and become a human health concern via ingestion exposure due to deposition on vegetation. The Agency also notes that the air dispersion modeling assumed no particle deposition and the modeling results show TSP levels within the local study area could exceed air quality criteria at a frequency of 38%. Therefore, there could be metal-containing TSP at high levels in close proximity to the project boundary. For such an event, there should be dust deposition monitoring at locations where Indigenous and non-Indigenous users may collect vegetation for consumption to evaluate potential human health risk from ingestion exposure.

Required Clarification:

a) Include in the ambient air quality follow-up monitoring plan described in Part 6, a dust deposition monitoring plan that would be implemented if TSP levels exceed predicted concentrations.

b) Include in the commitments registry consultation with relevant federal and provincial agencies (Environment and Climate Change Canada, Health Canada, Ontario Ministry of the Environment and Climate Change) as well as Indigenous groups and the appropriate local entities on dust deposition monitoring at locations where Indigenous and non-Indigenous users may collect vegetation for consumption. The purpose of this monitoring should be to analyze soil and vegetation for elevated levels of metals that could pose a human health risk. The monitoring plan would also include alternative or additional mitigation that would be implemented and reporting of results through the communication plan described in Part 6.

CMC Response

The response to Part 6 includes a commitment to carry out dust deposition follow-up monitoring if measured TSP concentrations exceed trigger conditions to be developed as part of the detailing monitoring plan in consultation with relevant federal and provincial agencies, Indigenous groups and appropriate local entities.

Part 8

The response focuses on the content presented in the December 2016 version of the BMPP. As mentioned in the review findings for Part 6 of the T(3)-01 response, the updated BMPP does not include all contaminants that are predicted to exceed air quality criteria within the local study area, and subsequently not all potential human exposure risks are covered by the plan.

Required Clarification:

See the required clarification for Parts 6 and 7.

CMC Response

A monitoring framework for contaminants not included in the BMPP is presented in the response to Part 6.

Part 9

The response includes an updated Table MOE Air-2-4.

No further clarification is needed.

GRT Review Findings and Comments on above Responses

(Provided in letter to proponent dated May 26, 2017)

Part (I) – Review Findings on the Response to Information Request T(3)-01

Part (I)-1

[all parts of T(3)-01] New Canadian Ambient Air Quality Standards (CAAQS) for sulphur dioxide will be effective in 2020 (one-hour level of 70 ppb, annual level of 5.0 ppb) and in 2025 (one-hour level of 65 ppb, annual level of 4.0 ppb). As such, the Agency requires analysis that compares modeling results against the new standards. It is also recommended that CMC include emission predictions based on more realistic contributions by the emergency generators. More information about the updated standards is available on the Canadian Council of Ministers of the Environment website:

http://www.ccme.ca/en/resources/air/air/sulphur-dioxide.html

Required Clarification

Revise the response to T(3)-01, including figures and tables, to take into account the new CAAQS. Add to the analytical report, a table with the average distances between the mine study area and the isopleths; details on the

revised operating scenario for the emergency generators that explain their contributions to the new predicted concentrations; and best management practices to mitigate emissions.

Once these updates have been made review the effects analysis on Indigenous groups to determine whether any preferred sites for traditional activities occur in areas where there may be exceedances. If human receptors are present, please specify which Indigenous group(s) may be impacted so that the Agency can better characterize the severity of impacts to individual Indigenous groups.

CMC Response

As discussed in with the GRT, the current SO2 predictions are conservative, specifically with respect to the emissions associated with the cyanide destruction process. They were developed to demonstrate compliance with the current O. Reg. 419/05 standards and no potential impacts were predicted at the human health receptors. For this reason further refinement was not necessary.

At the time the EIS/EA was prepared, the new CAAQS was not available in draft form. Had this information been available, the approach to assess the SO2 emissions from the Project would have been modified to use less conservative emissions assumptions. Since the submission of the EIS/EA, emissions from cyanide destruction processes have been researched by gold mining companies as they were historically thought to emit a large amount of the SO2. During the cyanide destruction process, ionic cyanide reacts with SO2 in a one-to-one molar ratio. SO2 is added to the process to produce a complete reaction. Any excess SO2 added is emitted to the atmosphere. Assuming a 0.1% excess of SO2, which is a reasonable value based on Golder's experience with other gold mining operations, and 0.75 kg CN/tonne of ore processed, only ~1 g/s of SO2 would be released during the process. Compared to the ~19 g/s that was used in the current air quality assessment, this more representative emissions estimation approach would yield 95% less SO2. The resulting SO2 concentrations would likely be below the new CAAQS. CMC included a commitment with the EIS/EA that this source will be tested during the operations phase to document the lower emission rates.

The EIS/EA was developed in consideration of the applicable regulations and guidelines in place at the time. The EIS/EA assessment demonstrated compliance with these regulations and guidelines. The new CAAQS guidelines have only been proposed at present. Regardless, the more representative SO2 example calculation above indicates significant reduction compared to existing predictions. The project will comply with the guidelines in place when construction begins and the SO2 estimation approach will be updated during the permitting phase of the Project. For these reasons, CMC feels that re-doing the emissions modelling to evaluate compliance with guidelines that are not yet in effect is not warranted as part of this EIS/EA.

The potential effects to human health were evaluated at the maximum predicted SO2 concentration and no potential impacts were predicted. Based on the above response, if the emissions modelling were to be updated, the result would be a significantly reduced maximum SO2 concentration and the conclusion with respect to human health would not change. The dispersion modelling assessment will be updated during the permitting phase of the project and CMC is committing to update the dispersion modelling assessment with measured values from the operational phase and the updated values will be compared to the CAAQS.

Part (I)-2

[Parts 6, 7 and 8 of T(3)-01] The proposed monitoring program does not directly monitor PM10, acrolein or diesel particulate matter. Sulphur dioxide emissions would not be characterized using all emission sources, as the emergency generators and mobile emission sources for sulphur dioxide are excluded from the proposed program. Further, the program proposes a single, one-month monitoring cycle for each phase despite the intent to operate 24 hours per day, 365 days per year. As a result, it is unclear how this monitoring approach would provide accurate and sufficient data on the concentrations of each contaminant (TSP, PM10, PM2.5, acrolein, diesel particulate matter and sulphur dioxide) to verify effects on air quality and human receptors and features (such as plants identified for gathering, or water bodies used for recreation or fishing which may be exposed to deposition) due to contaminant exposures, throughout the construction, operation and decommissioning phases.

The response also indicates a communication plan is proposed; however it is unclear whether information would be shared at opportune times (i.e., to provide advance warning). A commitment is needed to incorporate mechanisms to communicate monitoring results, particularly poor air quality conditions, to all parties in a timely manner during the construction, operation and decommissioning phases. All parties should agree to these mechanisms.

Required Clarification

a) Revise the proposed monitoring program to ensure the program monitors directly TSP, PM10, PM2.5, diesel particulate matter, acrolein and SO2 levels at known, suspected or foreseeable Indigenous and non-Indigenous receptor locations for short-term and long-term exposures within the local study area. The monitoring would occur throughout construction, operation and decommissioning phases. The program details should include, at a minimum, monitoring parameters, methods, sampling locations, applicable standards, duration, frequencies (sampling and reporting), thresholds that trigger implementation of alternative or additional mitigation and a communication plan to notify the government agencies of monitoring results, inform Indigenous groups and the public of potential poor air quality; address complaints; and to report the findings and results.

b) Explain how the proposed communication plan of the monitoring program would provide timely reporting to federal and provincial agencies (Environment and Climate Change Canada, Health Canada, Ontario Ministry of the Environment and Climate Change) as well as Indigenous groups and the appropriate local entities. Specify the Indigenous groups that would be notified.

c) Include in the commitments registry a commitment to implement the revised air quality monitoring program described in a), with provisions for timely reporting of monitoring results, as agreed by the parties listed in b).

CMC Response

CMC commits to implementing a monitoring program to confirm the findings of the air quality assessment for the proposed facility and verify that proposed mitigation measures for gaseous and particulate emissions are effective, allowing the facility to meet MOECC Ontario Regulation 419/05 air quality standards and maintain CCME air quality guidelines as indicators of good air quality.

The original commitment proposed was monitoring for TSP on the NAPS program 6-day cycle using a high volume (hi-vol) sampler to be located in an area with power, likely close to or within the Mine Study Area boundary and

direct source measurement of SO2 from the exhaust of the cyanide destruction process. The details of this original monitoring plan would be developed at the time that the operating permits are issued for the site.

In response to Agency comments, further details pertaining to the proposed monitoring program have been provided along with the rationale demonstrating that the proposed program is sufficient to confirm the findings of the air quality assessment and verify that implemented mitigation measures are effective. The proposed revised ambient air monitoring program is summarized in Table T(3)-01-1 below.

As discussed with the GRT on numerous occasions, the conservative emission estimates were developed for the EIS/EA to demonstrate that the Project could obtain approval during the permitting phase. In addition, the predicted concentrations based on these conservative emission rates were provided to the Human Health Risk Assessment (HHRA) team and they concluded that there will be no significant effects on any receptors. The HRRA team further updated this assessment to address potential effects of the maximum predicted concentrations on recreational (i.e., transient) users in the area in the above previous response to T(3)-01. The approach followed in the EIS/EA used the maximum calculated emission during the mine life and predicted the maximum concentration using a 5 year meteorological data set. In reality, the maximum emission rate will not likely occur during the worst case meteorological conditions. Therefore, the purpose of the monitoring program is to confirm that the actual measured concentrations will be lower than the predicted concentrations that were assessed in the EIS/EA, to verify that implemented mitigation measures are effective and compare the monitored results to the indicators of good air quality. The proposed program as presently designed will accomplish this for the following reasons:

- For each of the monitored compounds there are additional controls or onsite measurements that will better assess the operations. For example the Fugitive Dust BMPP requires that on-site silt measurements be taken periodically on mine roads. The silt loading has the greatest influence on the fugitive dust emissions and measurements lower than the conservative values used in the emission estimates will result in lower emissions. In addition, the Fugitive Dust BMPP also requires visual observations of fugitive dust emissions and corrective action such as road watering can be implemented.
- For some of the monitored compounds there are no additional controls available to further reduce the emissions. For example the use of Tier 4 vehicles, with the lowest emissions of PM available is considered the best available control technology and it has been mandatory in Canada since 2012 that new vehicles conform to Tier 4 standards. Therefore, the majority of the off-road vehicles used in the future at the mine will likely meet Tier 4 limits. In addition to assuming the greatest vehicle use, the conservative emission estimates used in the EIS/EA assumed the vehicles were Tier 3 and therefore the actual tailpipe emissions will be lower than the conservative values used in the emission estimates which will result in lower measured concentrations.
- Once the detailed mine infrastructure design is completed and areas that can be serviced by electrical power are known, the location of the maximum predicted concentrations as well as prevailing wind directions will be considered to assess the appropriate location for the ambient air monitoring equipment. Due to the remote nature of the site, the monitors will be sited to collect the most useful data without adding equipment/infrastructure that, in of itself, would create additional potential impacts (i.e. generators for power, access roads, etc.). Concentrations of all compounds decrease as you move away from ground level-based sources therefore monitoring results at locations closer to the operations will be conservative for receptors that are further away. The location(s) of the monitoring sites will be selected in consultation with the MOECC.

- The ongoing high-vol and dustfall jar sampling will provide a baseline of monitoring data that can be used for comparison purposes throughout the project. After the baseline data trends are established, focused sampling programs can be scheduled during periods when higher results were observed in the past, likely to be the summer, or when onsite activities are known to be increasing. The measurements during the focused programs can be compared to the results during the baseline period. This comparison can then be used moving forward to indicate if future mitigation requirements are needed.
- Prior to the siting of the monitors, it is common practice in Ontario that the local MOECC will be provided the proposed monitoring locations for comment. CMC will provide an annual monitoring report to the local MOECC which summarizes the data collected for the previous year and any actions that were implemented based on the results. The report will also detail any proposed modifications to the monitoring program that will be implemented for the subsequent year for MOECC comment.

The conservative emission estimates used in the EIS/EA represented the worst case emissions from mining operations under full production and with the longest haul roads. The operations phase will not reach full production for some time and the haul roads will be shorter in the first years of production. The baseline program along with the on-site mitigation measures described above will provide feedback on the emissions from the operations phase once it starts.

The development of a detailed communications plan is not considered to be required at this time because the results of the HHRA indicates no health risk to recreational users. Further, CMC has committed to post signage informing recreational users that they are entering an area with an active mine.

CMC will update the dispersion modelling assessment during the permitting phase and the need for a communication plan will be evaluated in consultation with the MOECC during the detailed planning for the monitoring program. CMC has committed to the above described monitoring approach during the Operation phase and the dispersion modelling will be re-visited again using the accurate emission rates that will be available at this time and will compare updated predicted concentrations with the indicators of good air quality. Should predicted concentrations exceed those relied upon in the human health assessment, the need for additional mitigation will be evaluated and controls will be developed and implemented as needed.

Table T(3)-01 – 1: Proposed Ambient Air Monitoring Program

Compound	Duration	Potential Monitoring Equipment	Significant Sources	Implemented Mitigation Measures	Comments
TSP	all phases	Hi-vol	Mobile equipment – fugitive dust Material handling Process sources	Fugitive Dust BMPP Dust collectors on process sources	TSP is an indicator compound for metals
Dustfall	all phases	Dustfall jars at multiple locations	Mobile equipment – fugitive dust Material handling Process sources	Fugitive Dust BMPP Dust collectors on process sources	Dustfall is an indicator compound for fugitive dust emissions
$PM_{2.5}$	3 month period during site construction and operation	PQ200	Mobile equipment – tailpipe Process sources	—	The majority of equipment on site will be Tier 4 equipment which is the best available control technology
PM_{10}	3 month period during site construction and operation	Calculated based on $PM_{2.5}$ and TSP	Mobile equipment – tailpipe Process sources	—	The majority of equipment on site will be Tier 4 equipment which is the best available control technology
DPM	3 month period during site construction and operation	PUF sampler using Polycyclic Aromatic Hydrocarbons (PAH) as a surrogate	Mobile equipment – tailpipe	—	The majority of equipment on site will be Tier 4 equipment which is the best available control technology
Metals	3 month period during operation	Hi-vol	Mobile equipment –fugitive dust Material handling Process sources	Fugitive Dust BMPP Dust collectors on process sources	Metals are present in trace quantities in the ore and are not predicted at greater levels than MOECC limits at the MSA boundary
SO_2	3 month period during operation	THERMO 43i	cyanide destruction tanks	Source sampling on cyanide destruction tanks	There are no published emission factors for cyanide destruction.
Acrolein	Not included	Not applicable	Mobile equipment – tailpipe	Not applicable	Uncertain sampling methodologies - The following internet link provides a US EPA document, “Data Quality Evaluation Guidelines for Ambient Air Acrolein Measurements”, which discusses acrolein sampling methodology: http://www.epa.gov/ttnamti1/files/ambient/airtox/20101217acroleindataqualityeval.pdf

Part (I)-3

[Parts 7 and 8 of T(3)-01] The response includes dust deposition monitoring at locations where Indigenous and non-Indigenous users may collect vegetation for consumption, if TSP concentrations exceed predictions. Also, the response indicates that metals could be monitored as well. However there is no explicit commitment to monitor metals.

Required Clarification

Include within the commitments registry a commitment to monitor metals, if TSP concentrations exceed predictions, concurrently with dust deposition monitoring to evaluate human health concerns via ingestion exposure due to deposition on vegetation. Where ingestion exposure is possible, specify Indigenous groups at risk.

CMC Response

Monitoring for metals and dust deposition have been included in the proposed monitoring program described in Table T(3)-01-1. A commitment to implement the proposed monitoring program will be included in the commitments registry.

Part (II) – Greenhouse Gas Emissions [New Comments]

Part (II)-1

The emission factors used for the greenhouse gas (GHG) emission estimate were updated in 2014. Use of the updated emission factors is expected to increase the estimate of mobile source emissions, depending on the level of control (i.e., advanced controlled, moderate controlled, uncontrolled).

Required Clarification

Which emission factors and levels of control were used? What is the GHG emission estimate, based on the current emission factors and global warming potentials? Please provide the information in tabular form.

CMC Response

The maximum annual GHG emissions calculations were included in Appendix 6.III of the Hammond Reef Gold Project Atmospheric Environment TSD. From the TSD, Table 7 is reproduced below, summarizing the annual emissions of GHGs from sources anticipated at the Project site, including the diesel mobile fleet, stationary fuel combustion (heating, process sources), and blasting. The estimated mobile emissions (included in the “All Sources” section) are based on conservative calculations assuming that the maximum vehicle fleet is in use at all times (24 hours per day, 365 days per year), and therefore represents an upper limit of the maximum annual GHG emission rate for these sources.

Annual GHG Emissions for Maximum Operating Year by Emission Type

GHG	Emissions (t)	Emissions (tCO_2e)
Stationary and Process (no mobile)		
CH_4 (Methane)	0.391	8
N_2O (Nitrous Oxide)	1.742	540
CO_2 (Carbon Dioxide)	27,537	27,537
Total CO_2e		28,085
All Sources (Mobile, Stationary and Process)		
CH_4 (Methane)	7.186	151
N_2O (Nitrous Oxide)	11.07	3,432
CO_2 (Carbon Dioxide)	192,041	192,041
Total CO_2e		**195,624***

*Note the total may not add due to rounding

As noted above the calculations are based on fuel use and most of the emissions are in the form of CO_2 therefore any changes to the global warming potential for methane and nitrous oxide would not significantly change the total annual GHG emission estimates or the assessment of significance.

Part (II)-2

No information is provided on GHG emissions during construction and decommissioning phases.

Required Clarification

What are the GHG estimates for the construction and decommissioning phases? (If the annual emissions during these phases would be less than the maximum operating year, provide a detailed justification.)

CMC Response

The GHG assessment is based on the worst case operating year as described in Appendix 3.I of the TSD. In addition, further information was provided in Part B of the Version 2 Atmospheric Environment TSD in response to GRT information requests including a table with information pertaining to the estimated fuel use during the Construction and Operations Phase. This table is reproduced below.

Parameter	Construction Phase	Operations Phase
Diesel fuel consumption (L/yr) mobile sources	12,849,208	61,773,535
Diesel fuel consumption (L/yr) stationary sources	7,078,080	Emergency testing only
Total diesel fuel consumption (L/yr)	19,927,288	61,773,535

As shown in the table, the fuel use for the Operations Phase are higher than those for the Construction Phase. Based on this comparison, it can be clearly assumed that the maximum annual GHG emissions, if predicted for

the Construction Phase, would be lower than the values reported in the TSD for the Operations phase. Although not provided, the fuel use in the Decommissioning Phase would be lower than the Construction Phase because fewer pieces of mobile equipment will be in use during closure. This is consistent with the original assumptions presented in the TSD.

Part (II)-3

No comparison was made between GHG emissions of the Project and similar mining projects, as indicated in the EIS Guidelines (Section 10.2.1).

Required Clarification

How do the GHG emissions of the Project compare to emissions of existing and past mining projects, as well as other reasonably foreseeable mining projects, that are similar?

CMC Response

The equipment and processes planned for the Project are similar to other mining projects in Ontario and globally, therefore the GHG emission will also be similar to other mining projects. Most mining projects in Ontario and Canada do not report to the provincial or federal GHG reporting programs because they are below the programs reporting thresholds. Based on Golder's experience it is likely that the Project will also be below the reporting thresholds for most years. Based on the conservatism in the development of the maximum annual emission rate as outlined above this value will be greater than the actual emissions once the Operations Phase commences.

This is further discussed in section 8.2 of in Appendix 6.III of the Atmospheric TSD.

Part (II)-4

No details about mitigation measures to control GHG emissions have been specified. It is noted that there is a commitment to have a GHG management plan.

Required Clarification

What measures would be implemented to control GHG emissions? Please note the commitment to have a GHG management plan should be included in the commitments registry and clarified such that it indicates that the plan would be developed and implemented in accordance with Recommendation 415 under Section 4.4.6 of Environment and Climate Change Canada's Environmental Code of Practice for Metal Mines. The plan should describe:

- potential sources of releases of greenhouse gases;
- factors that may influence releases of greenhouse gases;
- measures to minimize releases of greenhouse gases;
- monitoring and reporting programs for releases of greenhouse gases;
- mechanisms to incorporate the results of monitoring programs into further improvements to measures to minimize releases; and
- mechanisms to periodically update the plans.

CMC Response

CMC has previously committed to follow Environment Canada's Environmental Code of Practice for Metal Mines. This commitment remains and will be reflected in the commitments registry. In addition, in the response to questions from the MOECC in December 2016, CMC confirmed their intent to follow these recommended best practices during all phases of the Project's life cycle and clarified that following these best practices, Project aspects that will be examined for opportunities to implement measures to control GHG emissions may include, but are not limited to the following:

- corporate strategies;
- project design (e.g., decreasing vehicle travel distances to reduce fuel use);
- operational practices;
- employee engagement (e.g., encouraging carpooling to reduce Scope 3 GHG emissions);
- use of alternative energy sources (e.g., "green" power);
- procurement protocols (e.g., use of fuel efficient equipment);
- vegetation recovery (e.g., revegetating areas as operations cease allowing for the renewal of GHG sinks); and
- research and development options.

The majority of GHG emissions will be from the mobile sources. Therefore, CMC also stated that they will consider the feasibility of electric or other alternative power equipment during detailed project planning, but cautioned that the state of the science for heavy-duty electric vehicles is still in early stages, and vehicle reliability and suitability for the Northern Ontario environment, and active mining operations, is still being assessed.

Part (III) – Noise Mitigation [New Comment]

Part (III)-1

The noise assessment is based on the operation phase, given that phase was identified as the bounding scenario. Elevated noise levels are expected during project construction and decommissioning. The mitigation identified in the Environmental Impact Statement does not include measures for elevated noise levels during construction and decommissioning phases.

Required Clarification

What mitigation measures would be implemented to minimize elevated noise levels during the construction and decommissioning phases? (Health Canada's guidance document[1] on environmental noise includes measures applicable to construction activities.) Please provide a brief description or explanation of the measures to be implemented and include all measures in the commitments registry.

[1]*Guidance for Evaluating Human Health Impacts in Environmental Assessments: Noise, January 2017*

CMC Response

The operations phase was used to predict noise levels at sensitive locations consistent with the guidelines that were available at the time that the assessment was complete in December 2013. Based on the same rational discussed above with regard to GHG emissions, when considering noise from construction, operations and decommissioning the type of equipment used during construction and decommissioning would be similar to that during operations, however, there is significantly more equipment used during the operations phase and as a result of having the lower noise emissions, the noise effects associated with construction and decommissioning phases will lower than the operations phase.

The same mitigation measures for the mobile equipment will be used in all phases.

Attachments

Technical Memorandum: Revised Emission Rate Assumptions and Dispersion Modelling Results. (Rev. 2) – Hammond Reef Gold Project

Best Management Practices Plan for the Control of Fugitive Dust – Hammond Reef Gold Project. Version 1.0

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