

March 29, 2022

Attention: Ms. Debra Sikora

Review Panel Chair
Marathon Palladium Project
Impact Assessment Agency of Canada
marathonminereview-examenminemarathon@iaac-aeic.gc.ca

Dear Ms. Sikora,

Reference: Marathon Palladium Project (Ref. Number 54755) – Undertaking #5

I am writing in response to Undertaking #5 from the Panel session held on March 19, 2022.

With respect to Undertaking #5, we enclose information relating to the existing water quality conditions within Hare Creek and Hare Creek (Subwatershed 105) and Angler Creek (Subwatershed 106).

Thank you for your consideration of these additional technical filings.

Regards,

Generation PGM

<Original signed by>

Drew Anwyll, P. Eng
Chief Operating Officer
Generation PGM Inc.

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removed>

Cc. Laurie Bruce, Joint Review Panel Member (by email)
Gay Drescher, Joint Review Panel Member (by email)
Jason Patchell, Panel Manager (by email)

Panel Information Session: March 19, 2022

Undertaking Request # 5

The Joint Review Panel (JRP) requested that Generation PGM (GenPGM) review baseline data for subwatersheds 105 and 106. For the purpose of the predictive water quality assessment presented in the EIS, existing water quality was defined based on a local background condition that combined data from subwatersheds 105 and 106. The JRP recommended that the data for the two subwatersheds be disaggregated and discussion be provided as to the consideration of the disaggregated data on the assessment.

PGM Response

This information is provided in response to the request from the Panel for further information on the baseline water quality conditions within Hare Creek and Hare Creek (Subwatershed 105) and Angler Creek (Subwatershed 106). This response builds on the information provided in the following documents:

- Water Quality Baseline Report (Supporting Information Document #3, CIAR #227)
- Surface Water Quality and COPC Fate Modelling Report (Supporting Information Document #6, CIAR #234)
- Water Quality Baseline Report Update (CIAR #722)
- Surface Water Quality Assessment Update (CIAR #724, Appendix D11)
- EIS Addendum, Section 6.2.3 (CIAR #727)
- Responses to the following IR:
 - IR5-2 (CIAR #950)
 - IR5-3 (CIAR #950)

Rationale for Current Approach

For the purpose of the predictive water quality assessment presented in the EIS, existing water quality was defined based on a local background condition that combined data from subwatersheds 105 and 106. This was deemed appropriate to provide a reasonable and representative description of existing conditions since the two subwatersheds are similar in terms of land use (i.e., are undisturbed), physiography, and land cover and vegetations. The approach taken is similar to the approach used during the original water quality assessment (see CIAR #234).

On-going Water Quality Monitoring Program

The surface water quality assessment presented in the EIS Addendum (CIAR #724, Appendix D11; CIAR # 727, Section 6.2.3) utilized data collected at the Project site up to and including 2019. In preparation for permitting, and as part of the on-going monitoring program, GenPGM has continued with the collection of water quality samples within the Local Study Area. Water quality sampling was conducted in both 2020 and 2021. Seasonal (ice-free) sampling was conducted in both years at select stations in the Local Study Area that included stations in subwatersheds 105 and 106. Samples were collected for analysis of physical parameters, anions, nutrients and metals.

Disaggregated Water Quality Information

In response to this request from the Panel, we have reviewed the information on the record, as well as additional information collected as part of the on-going water quality sampling in 2020 and 2021, and have assembled the information below to further describe baseline water quality within each of the requested water features.

Table 1 provides a comparison of the applicable baseline water quality parameters for each of Hare Creek (Subwatershed 105), Angler Creek (Subwatershed 106) and Hare Lake against the consolidated data set used in the surface water quality assessment (CIAR #727, EIS Addendum, Section 6.2.3; CIAR #724, Appendix D11). These concentrations are 75th percentile total concentrations for each constituent. For reference, the 75th percentile concentration is used as a conservative representation of existing conditions, since the assimilative capacity of a receiving water body is defined as the increment between the existing conditions and the relevant water quality objective when considering a point source discharge.

Briefly, for 15 of the 25 constituents, no differences between the consolidated background data set and the individual disaggregated data sets were noted. For an additional 7 of the 24 constituents, minor but not meaningful spatial variation between the consolidated background data set and the individual disaggregated data sets was noted. Overall, for each of these 22 constituents, there is no indication that water quality predictions for the operations or closure phases would be influenced by consideration of the combined or disaggregated data sets.

Greater spatial variability was seen with 3 of the 24 constituents, specifically aluminum, iron and manganese. In each case, the same pattern was evident: concentrations in subwatershed 106 > concentrations for combined data set > concentrations in Hare Creek > concentrations in Hare Lake.

With respect aluminum and iron each was identified as a Policy 2 constituent according to Provincial water quality management guidance – that is, their natural background concentrations are greater than the Provincial Water Quality Objectives (PWQOs; 0.075 mg/L for aluminum and 0.3 mg/L for iron) or other relevant objectives such as the federal guidelines. Policy 2 states water quality that presently does not meet the PWQOs shall not be degraded further. Despite the spatial variability noted above, both aluminum and iron are considered Policy 2 constituents within each of the data sets, as their concentrations are greater than their respective water quality objectives. The concentrations of aluminum and iron in the Water Management Pond that will be discharged to Hare Lake during operations are below the Hare Lake background. Therefore, consistent with the predictive effects assessment, no change in aluminum and iron concentrations in Hare Lake are predicted. The concentrations of aluminum and iron post closure in subwatershed 106 were predicted to not deviate from background in consideration of the lower background established by the combined data set. Given this, and consistent with the predictive effects assessment, no change in aluminum and iron concentrations in subwatershed 106 are predicted.

With respect to manganese, the concentration of manganese in the WMP discharge is predicted to be on average an order of magnitude below the Hare Lake specific baseline concentration, which is itself an order of magnitude below the federal water quality guideline (0.32 mg/L). In this context, consistent with the predictive effects assessment, concentrations of manganese will remain well below the PWQO during operations. For subwatershed 106, the long-term concentration of manganese was predicted to essentially be unchanged from the combined data set background. If no change in manganese concentration in consideration of the lower background concentration was predicted, similarly no change would be predicted at the subwatershed 106 specific background concentration that is well below the PWQO. In this context, consistent with the predictive effects assessment, concentrations of manganese will remain well below the PWQO during closure when the natural drainage patterns of the area are restored.

Conclusion

Based on the information provided herein, the results of the predictive water quality assessment are unchanged.

As stated in the EIS Addendum (Section 6.2.3, CIAR #727), some incremental change in constituent concentrations in local receiving environments may be predicted but concentrations of individual constituents are predicted to remain at or below their respective water quality objectives. Such a result is compatible with provincial water

quality management guidance, specifically Policy 1 that states, *"In areas which have water quality better than the Provincial Water Quality Objectives, water quality shall be maintained at or above the Objectives."*

Additionally, as stated in the EIS Addendum (Section 6.2.3, CIAR #727), where the background concentration of a constituent is greater than its relevant water quality benchmark no change (increase) from background levels is predicted. Such a result is compatible with provincial water quality management guidance, specifically Policy 2 that states, *"Water quality which presently does not meet the Provincial Water Quality Objectives shall not be degraded further"*

Table 1 Disaggregation of Baseline Water Quality Data for Angler Creek, Hare Creek, and Hare Lake

| Constituent | Updated Baseline Data Set | | | Consolidated Data Set Used in the Water Quality Assessment | Comments |
|-------------------------|---------------------------|----------------------|-----------|--|--|
| | Angler Creek (Sub 106) | Hare Creek (Sub 105) | Hare Lake | | |
| Aluminum (Al)-Dissolved | 0.33 | 0.14 | 0.10 | 0.17 | Some spatial variation seen between areas. Aluminum was identified as a Policy 2 constituent based on the consolidated data set and remains so in each area (Sub 106, Hare Lake, Hare Creek) based on data from the disaggregated data. Discharge to Hare Lake from WMP will on average be less than the Hare Lake baseline – no change from Hare Lake baseline will be measured during operations. No incremental change in aluminum predicted in Sub 106 post closure at the consolidated data set background and therefore no incremental change would be predicted at the Sub 106 background concentration. |
| Antimony (Sb) | 0.005 | 0.005 | 0.005 | 0.005 | No differences noted. |
| Arsenic (As) | 0.001 | 0.001 | 0.001 | 0.001 | No differences noted. |
| Boron (B) | 0.05 | 0.05 | 0.05 | 0.05 | No differences noted. |
| Cadmium (Cd) | 0.00009 | 0.00009 | 0.00009 | 0.00009 | No differences noted. |
| Chromium (Cr) | 0.0005 | 0.0005 | 0.0005 | 0.0005 | No differences noted. |
| Cobalt (Co) | 0.0005 | 0.0005 | 0.0005 | 0.0005 | No differences noted. |
| Copper (Cu) | 0.001 | 0.001 | 0.001 | 0.001 | No differences noted. |
| Iron (Fe) | 1.2 | 0.79 | 0.43 | 0.9 | Some spatial variation seen between areas. Iron was identified as a Policy 2 constituent based on the consolidated data set and remains so in each area (Sub 106, Hare Lake, Hare Creek) based on data from the disaggregated data sets. Discharge to Hare Lake from WMP will be less than the Hare Lake baseline – no change from Hare Lake baseline predicted during operations. No incremental change in iron was predicted in Sub 106 post closure at the consolidated data set background and therefore no incremental change would be predicted at the Sub 106 background concentration. |
| Lead (Pb) | 0.001 | 0.001 | 0.001 | 0.001 | No differences noted. |

| Constituent | Updated Baseline Data Set | | | Consolidated Data Set Used in the Water Quality Assessment | Comments |
|----------------------------------|---------------------------|----------------------|-----------|--|--|
| | Angler Creek (Sub 106) | Hare Creek (Sub 105) | Hare Lake | | |
| Manganese (Mn) | 0.14 | 0.07 | 0.03 | 0.08 | Some spatial variation seen between areas. Manganese concentrations are below the consolidated data set background level at Hare Creek and Hare Lake and above in Sub 106. Background concentrations in each area are below the CCME water quality objective. Manganese concentrations in WMP are predicted to be on average less than the Hare Lake baseline – no effect of Hare Lake expected during operations. No incremental change in manganese was predicted in Sub 106 post closure at the consolidated data set background and therefore no incremental change would be predicted at the Sub 106 background concentration. |
| Mercury (Hg)-Dissolved | 0.000005 | 0.000005 | 0.000005 | 0.000005 | No differences noted. |
| Molybdenum (Mo) | 0.001 | 0.001 | 0.001 | 0.001 | No differences noted. |
| Nickel (Ni) | 0.002 | 0.002 | 0.002 | 0.002 | No differences noted. |
| Selenium (Se) | 0.001 | 0.0004 | 0.0004 | 0.001 | No meaningful differences noted. Lower detection limit data for Hare Creek and Hare Lake provides for lower background concentration the consolidated data set background. No change in concentrations were predicted in Hare Lake predicted in Hare Lake or Sub 106 the consolidated data set background concentration. |
| Silver (Ag) | 0.0001 | 0.0001 | 0.0001 | 0.0001 | No differences noted. |
| Thallium (Tl) | 0.0001 | 0.0002 | 0.0003 | 0.0003 | No differences noted. |
| Uranium (U) | 0.005 | 0.005 | 0.005 | 0.005 | No differences noted. |
| Vanadium (V) | 0.001 | 0.001 | 0.001 | 0.001 | No differences noted. |
| Zinc (Zn) | 0.008 | 0.007 | 0.005 | 0.006 | Minor, but not meaningful spatial variation noted. Not significant from an effects assessment perspective – no change in water quality predictions as on average no change from background predicted. |
| Hardness (as CaCO ₃) | 25 | 15 | 13 | 20 | Minor, but not meaningful spatial variation noted. Not significant from an effects assessment perspective – no change in water quality predictions. |
| Sulphate (SO ₄) | 3.3 | 3.4 | 3.5 | 3.5 | Minor, but not meaningful spatial variation noted. Not significant from an effects assessment perspective – no change in water quality predictions. |

| Constituent | Updated Baseline Data Set | | | Consolidated Data Set Used in the Water Quality Assessment | Comments |
|-----------------------------------|---------------------------|----------------------|-----------|--|---|
| | Angler Creek (Sub 106) | Hare Creek (Sub 105) | Hare Lake | | |
| Nitrate-N (NO3-N) | 0.06 | 0.10 | 0.13 | 0.11 | Minor, but not meaningful spatial variation noted. Not significant from an effects assessment perspective – no change in water quality predictions. |
| Ammonia-N, Total | 0.05 | 0.05 | 0.03 | 0.06 | Minor, but not meaningful spatial variation noted. Not significant from an effects assessment perspective – no change in water quality predictions. |
| Phosphorus (P)-Total ² | 0.01 | 0.01 | 0.01 | 0.01 | No differences noted. |