Marathon
Palladium
Project
Joint Review Panel

July 30, 2021

Jamie Levy
CEO Generation PGM Inc.
100 King St West
Toronto, ON M5X 1B1

Re: Request for Additional Information from the Joint Review Panel for the Marathon Palladium Project

Dear Mr. Levy,

As you are aware, the public comment period on the EIS Addendum for the proposed Marathon Palladium Project (the Project) ended on July 26, 2021. The Joint Review Panel (the Panel) has reviewed the EIS Addendum submitted by Generation PGM Inc. (GenPGM) and comments received from interested parties, Indigenous communities, organizations and government agencies during the public comment period.

In accordance with Section 3.4 of the Panel's Terms of Reference, the Panel is required to determine if sufficient information has been provided by GenPGM to proceed to a public hearing within 30 days of the completion of the comment period.

Taking into consideration its own review of the EIS and EIS Addendum and the comments received during the public comment period, the Panel has determined that the EIS and EIS Addendum do not contain sufficient information to proceed to the public hearing at this time.

In order to ensure that it has information to allow a review that complies with the Panel's Terms of Reference, the Panel has determined that GenPGM must provide additional information as requested in the attached letter. This document contains the Panel's information requests on water quality and quantity, hydrogeology and geochemistry. Additional information requests may be issued to GenPGM in the coming weeks.

The Panel asks that, where practical, Generation PGM Inc. provide an anticipated timeline for the provision of responses to information requests to assist in planning for the anticipated public hearing.

If you have any questions regarding the information requests or any other aspect of the environmental assessment you are encouraged to contact the Joint Review Panel through the Co-Panel Manager, Cindy Parker, at iaac.marathonminereview-examenminemarathon.aeic@canada.ca.

Sincerely,

<Original signed by>

Debra Sikora, Panel Chair

Cc Laurie Bruce, Panel Member
Gay Drescher, Panel Member
Tabatha LeBlanc, Generation PGM Inc.

Attachment 1: Information Requests Package 4

IR4 – 1. Water Balance Model

Reference:
EIS Addendum, Appendix D5 - *Site Water Balance Summary* (CIAR# 727)

Rationale*:*

In reviewing Figure 2 of Appendix D5, it appears that there are variances between entrained pore water in Cell 1, Cell 2A and Cell 2B of the Process Solids Management Facility (PSMF). Figure 2 shows that Cell 2A and Cell 2B will have more than 1 500 000 m^3/year of entrained water. However, it shows that Cell 1 will have no entrained water.

Section 3 of Appendix D5 states that "PSMF Cell 1 embankments with HDPE geomembrane will be completed in Year -1 up to El. 320 m to accumulate water in Cell 1 for commissioning of the Process Plant". It is not clear if the bottom of Cell 1 of the PSMF will also be equipped with HDPE geomembrane.

Information Request:

Clarify the design of Cell 1 and explain the variances between entrained pore water in Cell 1, Cell 2A and Cell 2B.

IR4 – 2. Precipitation and Discharge of Stormwater

References:
EIS Addendum, Chapter 6.3 to 6.7, Sections 6.4.2.1 and 6.3.2.10 (CIAR# 727)
2020 Water Quality Baseline Report Update (CIAR# 722)
Supplemental Information Request (SIR) #9 - *Environmental Design Storm* (CIAR# 587)

Related comments:
CIAR# 906 (Ministry of the Environment Conservation and Parks)
CIAR# 893 (Environment and Climate Change Canada)

Rationale:

In Section 6.4.2.1 of Chapter 6.3 to 6.7 of the EIS Addendum, GenPGM indicated that the environmental risks associated with having to manage increased run-off volumes over shorter durations have been mitigated by the water management measures included in the design of the Process Solids Management Facility (PSMF) and the Mine Rock Storage Area (MRSA).

GenPGM proposed to size the PSMF so that it could contain storm events up to the Inflow Design Flood, which consists of the 24-hour Probable Maximum Precipitation (PMP) of 328 mm. GenPGM also indicated that the "*PSMF will have sufficient capacity to store (i) operational water needs, plus (ii) volumes derived from natural run-off and snow-melt resulting from Environmental Design Storm (EDS; 1 in 100-year 24-hour precipitation and 30-day spring snowmelt (408 mm)"*. This statement is not consistent with information in SIR#9 which states that EDS for the PSMF was selected as the Timmins storm event (193 mm resulting from 1 in 1000-year storm), which is above the 1 in 100-year storm (98 mm). GenPGM did not provide the reason for the deviation from the EDS reported in SIR#9. It is also not clear how a PSMF sized for a PMP of 328 mm rainfall will be able to handle 408 mm.

GenPGM proposed to size the MRSA catch basins to contain an EDS of 1 in 25-year (81 mm) and equip it with (i) a pumping system capable of conveying 750 m^3/hr of flows to the water management pond (WMP), and (ii) overflow spillways for 1 in 100-year storm events. Nevertheless, discharge to the Pic River would occur via the overflow spillways in the event that inflows exceed the capacity of the catch basins and water transfer system. GenPGM has estimated that the peak discharge from stream catch basins would be 350 m^3/hr (section 6.3.2.10). The reason why direct discharge to Pic River was retained as the preferred option has not been provided.

In Section 1.2, Project Overview, Geological Conditions Baseline Report Update, 2020 Water Quality Baseline Report Update, it is indicated that "*Drainage from the MRSA will be collected in a series of collection basins and treated, as necessary, to meet applicable water quality criteria prior to discharge to Pic Rive*r". However, in Section 6.3.2.10 of Chapter 6.3 to 6.7, it is indicated that under normal operations drainage from the MRSA will be collected and transferred to the water management pond.

In addition, there is an offsite aggregate pit near the project site. It is not clear if stormwater from this offsite pit will be included in the design considerations of the onsite stormwater management pond or if it will be managed by an offsite pond.

Information Request:

1. Clarify why overflow from the MRSA catch basins is being directed to Pic River rather than using the overland drainage to convey the overflow towards the PSMF (designed to handle up to PMP events) or the stormwater management pond.

2. Analytical measurements may take several hours or even days prior to receiving the results. In addition to that, an overflow may happen late in the night when fewer staff are onsite. If your plan is to monitor the overflow, what additional measures will be in place to ensure that, prior to receiving the results of monitoring, the overflow from MRSA catch basins is safe for discharge to Pic River?

3. Clarify why the EDS for the PSMF was changed from the Timmins storm event to 1 in 100-year storm event.

4. Clarify how the PSMF, sized for a PMP of 328 mm rainfall, will be able to handle 408 mm.

5. Clarify the correct discharge path for the MRSA drainage during mine operations.

6. Confirm if the design and sizing of the MRSA catch basins will be a 1 in 100-year 24-hr rainfall event consistent with current best practice. If not, provide supporting rationale for designing and sizing catch basins to manage a 1 in 25 year 24-hr rainfall event including:

    a. Probability that events exceeding the capacity of the MRSA basins would occur during the life of the mine. This shall include 24-hr rainfall event, 30-day rainfall events, and snowmelt events.
    b. Description of the effect of a 1 in a 100-year 24-hr rainfall event.

7. Describe the risk and potential effects associated with a pumping failure within the MRSA basins including any monitoring and mitigation measures being proposed to limit this risk.

8. Clarify and discuss how stormwater from the offsite aggregate pit will be managed.

IR4 – 3. Surface Water Quality and Quantity

Reference:
EIS Addendum, Chapter 6, Section 6.2.3.6.4 (CIAR# 727)
2021 Feasibility Study (CIAR# 741)

Related comments:
CIAR# 893 (Environment and Climate Change Canada)

Rationale*:*

GenPGM indicates in the Feasibility Study (Section 20.5) that the volume of mine water that will be discharged in Hare Lake will vary between 0.6 million and 1.9 million m^3/year. Appendix D11 of the EIS Addendum (Executive Summary) indicates that "*between 1 and 2*10^6 m^3*" of treated water will be discharged to Hare Lake per year. Appendix 11 (Section 3.0) also indicates that during the operational period of the mine "*600,000*10^6 to 2*10^6 m^3*" of mine water will be annually discharged to Hare Lake. It appears that the amounts of treated mine water that will be annually discharged to Hare Lake are inconsistent.

Further, as noted by ECCC (CIAR# 893), Section 6.3.1 in Appendix D3 describes the project effects on Hare Lake on an annual basis using mean annual flow (MAF). The EIS Addendum presents a rating curve, a relationship between the water level and the flow exiting Hare Lake; it compares the water level that would occur at the baseline MAF versus the MAF with the Project at a single mean value. Discharges to Hare Lake from the water treatment plant will only occur during part of the year (April to November) and the water level in Hare Lake will vary seasonally. ECCC notes that discharges occurring at the same time as low lake levels (such as late summer or during a drought) could have a higher effect than the annual values suggested.

Information Request:

1. Confirm the quantity of treated effluent used in the modeling process and explain if the variation in effluent flows (i.e. 1 million to 2 million) has any incident on the result of the modeling.

2. Assess the hydrological effects to Hare Lake on a monthly basis. Provide the water level changes for each month based on the expected (average) monthly water levels.

3. Compare the discharge rate of the water treatment plant against the full distribution of discharges from Hare Lake from April to November.

4. Update effects predictions and mitigation measures, where required.

IR4 – 4. Groundwater Modelling

References:
EIS Guidelines, Section 2.7.2.3.1 (CIAR# 150)
EIS Addendum Vol. 2 Appendix D4 – *Hydrogeology Updated Effects Assessment* (CIAR# 727)
EIS SD 02 Soil Conditions (CIAR# 227)

Contributing IRs:
EIS Addendum Vol. 2 Appendix D4 - *Hydrogeology Updated Effects Assessment* (CIAR# 727)
Additional Information Request (AIR) 8 - *Groundwater Seepage from the PSMF and MRSA* (CIAR# 613)

Related comments:
CIAR# 901 (Natural Resources Canada)
(CIAR# 906) (Ministry of Environment, Conservation and Parks)

Rationale:

The EIS Guidelines indicate that the proponent must, "Provide the conceptual design features of all collector and diversion ditches, culverts, bridges, and water storage facilities (including sediment ponds and seepage collection ponds). Cross-sections of the ditches and water storage facilities will be provided and include the run-off flow return period to which the works can convey all flows, and to which the works can withstand flows without significant damage;"

The predicted groundwater flow directions presented in Appendix D4, Figure 11 and Figure 13 show groundwater flow northwards towards the Process Solids Management Facility (PSMF) during operations. The figures appear to support the conclusion that "There are no groundwater users located within the flow path of groundwater recharge associated with Project facilities and, therefore, an effect on the quality for groundwater users is not predicted."

The topography and ground water contours presented are inconsistent with the groundwater flow directions presented in Appendix D4, Figures 11 and 13 and Cross Section B-B' presented in Figure 4. Additionally, there is a surface watercourse which transects the groundwater flow direction presented.

In the response to Additional Information Request #8 the proponent indicates that the PSMF dams will be constructed on bedrock and the High Density Poly Ethylene liner keyed into bedrock. Consequently, the proponent appears to anticipate that any seepage from the PSMF will be primarily along the bedrock/soil interface. Although the proponent intends to collect seepage at various points along the perimeter of the PSMF dams it is not clear, based on the

information provided, that it will be possible to key the entire dam perimeter into bedrock in the manner envisaged and there could be fugitive seepage through deeper and coarse grained soils to reduce seepage.

Surficial geology maps and the cross sections provided in Appendix D4 indicate that the area to the southeast of the PSMF, between the Highway 17 and the PSMF, is underlain by ground moraine deposits consisting of relatively coarse sand and gravel, creating possible contaminant migration pathways towards the domestic and commercial water wells located along Highway 17. While the overburden thickness at the PSMF site was generally shallow, with a typical overburden cover of 0.3 m, the overburden cover was thicker at the southernmost end of the PSMF site where overburden thickness was greater than 11 m. The shallow overburden soils sampled at the PSMF location were reddish-brown to light brown to grey in colour and were described to be predominately sandy with some traces of silt, clay and gravels.
It also does not appear that the groundwater model has included influence of pumping from the domestic/commercial wells along the corridor.

It is not clear if dam construction and seepage collection have been adequately incorporated into the groundwater flow model. Nor is it clear that the interpretation of groundwater flow in the area between Highway 17 and the PSMF north of the domestic and commercial wells has been properly captured in the model. This makes it difficult to support the contention that there will be no impacts to water supplies associated with the PSMF.

Comments from participants and government agencies indicate that the groundwater model needs to be further refined in order to determine impacts of groundwater drawdown from the open pits and recharge from the PSMF and MRSA on surface water bodies (e.g., NRCan, CIAR# 901; MECP, CIAR 906).

It also appears that the seepage collection systems around the PSMF have not been included in the groundwater model, and the model appears to assume a lower recharge rate through the PSMF relative to baseline conditions while also predicting an increase in groundwater elevation.

There are also concerns related to the particle tracking presented in the ground water model and more information is required to ensure that groundwater flow is adequately monitored.

Information Request:

Considering the topography of the Project area and the proposed design of the PSMF dams:

1. Clarify that the groundwater flow directions and elevations presented in Appendix D4 are reflective of both surface topography and subsurface characteristics.

2. Clarify what assumptions and factors were considered and were incorporated into the groundwater model:
   a. Provide a rationale for excluding seepage collection systems.
   b. Explain the reason the model indicates that there will be an increase in ground water elevations under the PSMF while assuming lower recharge rates than baseline.
   c. Explain the rationale for modelling the PSMF and the WMP as river boundaries.
   d. Provide clarification why the ground water model shows baseline water elevations of 340 masl, for the north pit, 280 masl for the central pit, and 320-340 masl for the south pit as a baseline water table while the post closure pit lake elevations are modelled much lower.
   e. Provide details on the groundwater flux to individual surface water features under baseline, end of operations, and post-closure conditions. Should any of these features be represented using river or constant head boundaries, the flow of groundwater to the boundary and the flow from the boundary to the groundwater system should be reported.

3. Provide details of the three dimensional particle tracking including:
   a. Cross sections through the PSMF and MRSA showing vertical distribution of ground water heads;
   b. A discussion regarding how the recharge rate for the PSMF was calculated;
   c. A discussion of the effect of vertical hydraulic conductivity distribution on particle tracking in the model; and
   d. Details on how the ground water monitoring plan is designed to incorporate these three dimensional aspects of the model with specific reference to vertical and horizontal distribution of monitoring wells.

4. For sub-watersheds 102, 103, 104,106, 108, and 116 provide a clear rationale supported by the conceptual model, simulation methods, and modelling results for the changes in groundwater flux that appear to be counter to those that would be expected based on simulated changes in groundwater elevation

5. Clarify and provide additional details regarding seepage losses from the PSMF, how these will affect ground water quality and quantity and identify potential risks to surface waters.

6. Clarify the potential risks to the domestic and commercial wells along Highway 17 southeast of the PSMF.

7. Develop a contingency plan with appropriate triggers for action should unanticipated groundwater impacts threaten surface water and/or ground water resources.

IR4 – 5. MRSA and Pit Lake Discharge to Pic River

References:
EIS Guidelines Section 2.81, 2.82 (CIAR# 150)
EIS Main Report, Section 6 (CIAR# 224)
EIS Addendum Volume 2, Chapter 6.2.3 (CIAR # 727)
IR 9.7 - *Geological Cross Sections of PSMF and MRSA and Separation of Process Solids* (CIAR# 372)
IR 24.15 - *Groundwater Leachate from the PSMF and MRSA* (CIAR# 470)
IR 24.17 - *Site Water Management Plan* (CIAR# 470)

Related comments:
CIAR# 893 (Environment and Climate Change Canada)
CIAR# 868 (Michipicoten First Nation)
CIAR# 894 (Pays Plat First Nation)
CIAR# 906 (Ministry of the Environment Conservation and Parks)

Rationale:

The EIS (2012) and the EIS Addendum indicates that following closure, once the pit lakes fill (up to 30+ years post-closure), drainage from the north pit will be directed into Stream 2, which drains eastward into the Pic River. Based on the proposed location and structure of the Mine Rock Storage Area (MRSA), it appears that a significant portion of Stream 2 will be covered with mine waste rock. Prior to the construction of the MRSA and in preparation for receiving the outflow from the pit lake following closure, GenPGM plans to place coarse rock into the streambed (Figures 9.7-11 and 9.7-13). Seepage from the MRSA will be collected into ponds and transferred to the Water Management Pond for treatment, but these ponds will be decommissioned after closure and MRSA seepage will flow to the Pic River.

Chapter 6, Table 6.1-4 of the EIS (2012) states that no mitigation during operation is planned but drainage in Stream 2 and 3 will be restored at closure. The former Panel requested additional information regarding proposed mitigation and contingency measures of the pit lake overflow and seepage/drainage from the MRSA (IR 24.17). In response the proponent indicated that “coarse Type 1 mine rock will be placed in the original stream structures to facilitate a

return to natural flow conditions in association with open pit filling and overflow conditions (estimated at 40 years post closure). No stream re-routing is contemplated at this time."

Mitigation and contingency measures for seepage from the MRSA were also included in response to IR 24.15, however these do not appear to be related to the proposed drainage feature for the pit lake discharge or consider challenges associated with the proposed plan to direct pit lake overflow to the Stream 2 channel under the MRSA. These may include:

- Potential biofouling of the drainage channel (e.g. generation of slimes due to iron reducing bacteria)
- Potential scaling and occlusion of drainage due to mineral precipitation
- Potential infilling of the drainage channel due to migration of fines from the overlying waste rock
- Potential subsidence of the waste rock into the drainage channel

A response to concerns regarding pit lake discharge water quality modelling, the efficacy of the drainage channels in Streams 2 and 3, discharge system design and capacity as well as the hydrogeological characteristics affecting infiltration, seepage fluxes and ground water elevation is required.

Information Request:

1. Provide further details regarding options for MRSA seepage collection and treatment to ensure that no contact water enters the Pic River

2. Provide details of modelling related to pit lake water quality in each pit during the post closure period and provide details on the discharge water quality.

3. Discuss the conceptual design and function of the proposed pit lake drainage through the base of the MRSA and into Streams 2 and 3 in the context of a 1 in 100yr 24 hr rainfall event

4. Discuss potential effects on pit lake discharge and MRSA drainage (i.e. flow) if the course rockfill channel is blocked or restricted and how outflow and water quality will be managed in the long-term.

5. Clarify how extreme precipitation and flooding events have been considered in the design.

6. Provide clarification of the simulated footprint of the MRSA, the predicted seepage and flux rates as well as the rationale for increased groundwater elevations within the MRSA.

7. Develop and provide a contingency plan with appropriate triggers for mitigation should pit lake and/or drainage from the MRSA develop unacceptable water quality issues.

IR4 – 6. Scaling Factors and Water Quality Model (MineMod)

References:
Supplemental Information Request #5 – Hare Lake Hydrology and Water Quality Predictions (CIAR # 582)
EIS Addendum, Appendix D11, Surface Water Quality Effects Assessment Update (CIAR # 727)

Related comments:
CRINO/Mining Watch Report on the EIS Addendum (CIAR #869)

Rationale:

The proponent has used a number of scaling factors to determine impacts of the project to water chemistry. As scaling factors can both increase and decrease predicted contaminant loadings, more information regarding the rational for selection of the scaling factors that were applied in order to avoid the appearance that only scaling factors which reduced predicted contaminant loading were selected.

The proprietary model used by the proponent (MindMod) has not been peer reviewed and the proponent has not adequately explained how the model works, what the key assumptions are and no information as to how the model has been calibrated and the results validated has been provided.

Information Request:

1. Provide a table outlining potential scaling factors which can be used for predicting impacts to water quality along with a rational explaining why specific scaling factors were selected and others not included in the modeling.

2. Provide additional details regarding MineMod:
    a. Describe how the model was calibrated,

b. Provide the key assumptions used in the model,
c. Provide the inputs necessary to run the model, and
d. Provide the key outputs of the model.

IR4 – 7. Overburden samples exceedances of Provincial Water Quality Guidelines

References:
Supporting Information Document #2 on soil conditions, Section 4 (CEAR# 227)
Updated Baseline Study – Soils Baseline report update, Executive summary, Table 2-2 and 2-3 (CIAR# 722)
EIS Addendum, Chapter 6.2.5, Section 6.2.5.6.1 (CIAR # 727)
EIS Addendum Chapter 7, Table 7.3-1 (CIAR# 727)

Rationale:

Table 2-3 of the Updated baseline study for soil (CIAR# 722) identifies that some overburden samples exceeded Provincial Water Quality Guidelines for copper, cadmium, cobalt and zinc at various project areas. Table 2-2 of the Updated baseline study for soil identifies the following:

- Antimony exceedances for overburden samples in the Mine Rock Storage Area,
- Cobalt, mercury, molybdenum and selenium exceedances for overburden samples in the Primary Open Pit,
- Cadmium, cobalt, copper, molybdenum and zinc exceedances for overburden samples in the Satellite open pits,
- Molybdenum and selenium exceedances for overburden samples in the mill site, and
- Molybdenum and selenium exceedances for overburden samples in the Process Solids Management Facility.

Despite these exceedance measurements, in Section 6.2.5.6.1 of Chapter 6.2.5 of the EIS addendum (CIAR # 727), GenPGM states that material in the soil and overburden stockpiles that remains at closure will be used for site reclamation purposes. It also stated that baseline soil quality characterization indicates that overburden material would be suitable for reclamation purposes.

In the EIS Addendum Chapter 7, Table 7.3-1 (CIAR# 727) GenPGM indicates that a soils salvage and storage plan will be developed to identify the suitability of materials stockpiled during stripping for reclamation purposes. In Section 4 of Supporting Document #2 on soil conditions (2012), GenPGM indicated that consideration of monitoring the run-off from the excavated main pit overburden material may be warranted, as soluble loads were measured at levels in excess of the Provincial Water Quality Objective for copper. However, in Chapter 7 of the EIS addendum, monitoring of run-off from the excavated material is not proposed.

In the executive summary of the updated baseline study for soil (CIAR# 722), GenPGM indicated that additional soil quality information will be collected during geotechnical studies that will be executed in 2021 related to the new road alignment and mill site and that these data are not expected to influence the outcome of the assessment of potential effects associated with the project. GenPGM added that the geochemical properties of overburden materials will be reported in the updated EIS addendum as it represents a change to the "terrain and soils" Valued Ecosystem Component.

Information request:

1. Include a summary of the additional soil quality information that was collected during geotechnical studies that were executed in 2021 related to the new road alignment and mill site. Identify and describe the soil samples results and any samples that exceeded Provincial Water Quality Guidelines. Consider this new information when responding to the following questions:

    a. Estimate how much overburden or topsoil would produce run-off that exceeds Provincial Water Quality Guidelines.

    b. Describe how GenPGM plans to manage the drainage around overburden storage piles.

    c. Clarify how GenPGM plans to monitor runoff from the overburden storage piles to determine if it exceeds Provincial Water Quality Guidelines.

    d. Clarify how GenPGM will manage any overburden that is not expected to produce run-off that meets Provincial Water Quality Guidelines.

    e. Clarify whether GenPGM estimates it will have enough overburden that does not produce run-off that exceeds Provincial Water Quality Guidelines to meet reclamation targets.

    f. Confirm that the effluent treatment plant design will be suitable for elevated metals received to the water management pond from all sources.