

Version 3 Hammond Reef Gold Project EIS/EA – Addendum (Part B)
Responses to Provincial Information Requests

1656263

Identifier	Topic	Reference to EIS/EA Report	Summary of Previous Comment	Summary of Proponent's Response to Previous Comment	Follow-up comment/ Request for Information	New Proponent Response	Subsequent Comment
			<i>Date: August 2015</i> MOE Hydrology-4	<i>Date: October 2015</i>	<i>Date: January 2016</i>	<i>Date:</i>	
MOE Hydrology-4B	Upper Marmion Reservoir water balance modelling		<p>Upper Marmion Reservoir's long-term water balance was modelled using spreadsheet based accounting at monthly and annual scales considering average, wet and dry climatic conditions. In addition to long-term water balance modelling, potential changes in the outflows and water levels in Upper Marmion Reservoir were assessed during specific low water years of 1998 and 2010.</p> <p>The following influencing factors were considered during water balance calculations:</p> <ul style="list-style-type: none"> inflows to Upper Marmion Reservoir from regulated and unregulated watersheds; outflows and minimum flows from the Upper Marmion Reservoir; precipitation directly falling on the reservoir; evaporation loss from the reservoir; loss of reservoir water to the mining open pits through seepage (estimated using groundwater modelling); inflows from Lower Marmion Reservoir for certain months of the year (May - October); reservoir's regulatory levels as per Seine River WMP; water taking for the processing plant; water taking for the workers' camp; <ul style="list-style-type: none"> treated effluent discharge from the workers' camp; and treated effluent discharge from the mining sewage work. <p>It appears, all major influencing factors were considered in water balance modelling. The modeling results can be considered reasonable at monthly and annual scales, but at daily scale that estimates would be crude</p>	<p>Golder has simulated reservoir performance at a monthly time step using spreadsheet lake water balances under baseline conditions and with the project influences for a meeting minutes), in order to assess the possible changes in reservoir storage and outflows.</p> <p>The estimated maximum change in outflows from Raft Lake Dam lies within the error of flow measurement and calibration/validation of more detailed hydrologic models. Changes in Seine River flows downstream of Raft Lake Dam will be smaller due to additional inflows to the river system downstream of the dam.</p> <p>Continuous lake water balance modelling indicated an increase in the occurrence of the lower compliance level for Raft Lake Dam (defined in the SRWMP) from 65 to 66 months in a 27-year period, between baseline and project scenario (an increase of 2%). It was concluded that there was effectively no increase in the frequency occurrence of the lower compliance limit.</p> <p>The scale of modelling being requested in the comment will require significant effort, cost, and data that are not currently available, without the expectation that the certainty or accuracy of the predicted changes will be improved (see item 8 in the attached meeting minutes).</p> <p>Rather than complete additional modelling work, CMC proposes to identify contingency measures to reduce or</p>	<p>The spreadsheets as received from Golder on October 27, 2015 on Upper Marmion Reservoir water balance modelling, have been reviewed by me, appeared reasonable. The results can be used for decision making.</p> <p>In my earlier comments, I recommended modelling at daily and hourly time scales to better predict Project's effects on water levels and flows considering hydraulic routing of flows. Given the amount of water CMC will be taking (on average 0.071 m³/s, roughly in the range of 0.09 to 0.54% of reservoir inflows over twelve months period) that type of precise analysis will not be required.</p> <p>In addition, there is no reliable hourly water level and flow data available that could be used for precise water balance modelling.</p> <p>Under worst case scenario it has been predicted that the reduction in existing conditions monthly mean water levels of the Upper Marmion Reservoir will not exceed 9 cm, and the percentage reduction in existing conditions monthly mean outflows from the reservoir will not exceed 5% where worst case was modelled considering the following:</p> <ul style="list-style-type: none"> Modelling the end of mining operations, when the Project footprint is greatest. <ul style="list-style-type: none"> Modelling the predicted seepage from Marmion Reservoir into the ultimate configuration of the open pits, when seepage is expected to be at a maximum. 	Thank you for your comment.	

Version 3 Hammond Reef Gold Project EIS/EA – Addendum (Part B)
Responses to Provincial Information Requests

1656263

Identifier	Topic	Reference to EIS/EA Report	Summary of Previous Comment	Summary of Proponent's Response to Previous Comment	Follow-up comment/ Request for Information	New Proponent Response	Subsequent Comment
			<p><i>Date: August 2015</i> MOE Hydrology-4</p>	<p><i>Date: October 2015</i></p>	<p><i>Date: January 2016</i></p>	<p><i>Date:</i></p>	
			<p>as flow routings were not considered in the analysis. Seine River water management compliance is applicable at daily scale for flows and levels at each waterpower facility and control dam. Therefore, uncertainty exists about how the proposed mining work and its water takings would impact reservoir's water levels and outflows at daily scale. This uncertainty was noted when observed and modelled outflows for the Upper Marmion Reservoir were plotted for the year 1998 and 2010, not a perfect match was found. It is recommended to remodel the Upper Marmion Reservoir's water balance considering flow routings.</p> <ul style="list-style-type: none"> Produce the results (reservoir water levels and outflows) at daily time scale, particularly for 2010 and 1998 dry years. Compare the results with the reservoir's operational rule curve and minimum flow constrains. Let us know, in a very dry year, if mining company continues to take water from the reservoir in addition to existing users' intake, how many days the reservoir would be outside of the compliance band and would not be able to release required minimum flows downstream. How that effects would cascade to other downstream reservoirs and headponds? Excel spreadsheet would not be able to handle this type of analysis, a precise hydraulic modelling would be required. 		<ul style="list-style-type: none"> Evaluating Project water takings and discharges during a dry year with a return period of 100 years (90% probability of exceedance in any given year) and applying these throughout the 27-year continuous lake water balances. In reality, Project water takings and discharges will vary from year to year depending on hydrologic conditions. Selecting target operating water levels, based on a review of the compliance bands and the objectives of the Seine River Water Management Plan, that were at the lower end of the compliance band during April when reservoir storage would be at a minimum. Modelling year-round water taking rather than the option to take water at certain times of the year under high flow conditions. <p>The predicted maximum monthly reduction in outflows and water levels of the Upper Marmion Reservoir appeared to be within the margin of errors of flow and water level measurements and the errors of most hydraulic and hydrologic modelling results.</p> <p>This flow reduction could be an issue for losing hydropower revenues if the operations were run-of- river. In that case, when river flows are between minimum and maximum turbine capacities, and if CMC takes water during that time, there is a likelihood of losing some hydropower revenues due to flow reduction in the river system. But that is not the case here. All three</p>		

Version 3 Hammond Reef Gold Project EIS/EA – Addendum (Part B)
 Responses to Provincial Information Requests

1656263

Identifier	Topic	Reference to EIS/EA Report	Summary of Previous Comment	Summary of Proponent's Response to Previous Comment	Follow-up comment/ Request for Information	New Proponent Response	Subsequent Comment
			<p>Date: August 2015 MOE Hydrology-4</p>	<p>Date: October 2015</p>	<p>Date: January 2016</p>	<p>Date:</p>	
					<p>downstream generating stations are daily peaking operation, water mostly being taken from 7 am to 7 pm each day for power production.</p> <p>Therefore, if CMC harmonizes timing of their water takings with the timing of hydropower generation along with due consideration of reservoir inflows and water levels, impact of mine water takings on the downstream hydropower generations would be indiscernible.</p> <p>A formal real time data sharing agreement and communication protocol should be established between CMC and hydropower operators. Based on that information CMC will adjust their time of water takings and hydropower operators will manage their headponds to optimize power production while satisfying environmental constraints.</p> <p>This, along with the contingency measures (currently being developed by CMC) would be helpful to manage the risk and mitigate impacts.</p> <p>Considering all the points stated above, it is my determination, a precise water balance modeling at hourly and daily time scales will not be required for this project to predict impacts on water levels and flows.</p> <ul style="list-style-type: none"> Decisions can be made based on the monthly modeling results Golder produced, which, according to my opinion are reasonable predictions. 		