AGNICO EAGLE

April 25th, 2019

Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O Box 119
Gjoa Haven, NU X0B 1J0

<u>Re: Agnico Eagle Mines – Whale Tail Project Responses to East Diversion Channel Design Report Re-Comments</u>

Dear Mr. Dwyer,

As requested, the following responses are intended to address the comments made in the below letter:

- CIRNAC – April 18th, 2019, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) response to Agnico Eagle Mines Limited's (AEM's) East diversion Channel Design Report response to CIRNAC's original letter March 27th – Whale Tail Pit Project under AEM's Type "A" Water Licence No. 2AM-WTP1826.

Should you have any questions or require further information, please do not hesitate to contact us.

Best regards,

Marie-Pier Marcil

Marie-Pier Marcil
Marie-pier.marcil@agnicoeagle.com
819-759-3555 x 4105836
Senior Compliance Technician

1 Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)

1.1 Peak Flow Estimate

March 27th, 2019 - Original Comment 1: In the design report, peak discharge was estimated applying and using MTQ (2014) (i.e., Ministère des transports du Québec, Manuel de conception des ponceaux, Ouvrages routiers, Guides et manuels, Novembre 2014). Spring freshet is a hydrological event at the mine site. CIRNAC could not find clear information on whether or not consideration was given to the effects of freshet on the estimation of peak flow or discharge.

March 27th, 2019 - Recommendation 1: CIRNAC recommends that the effects of freshet on the estimation of peak flow or discharge should be considered by the licensee and explained or discussed in the design report.

April 8th, 2019 - Agnico Eagle's Response:

Spring freshet generally leads to more important volumes of runoff (due to snowmelt), but heavy summer-fall rainfalls generally lead to the most critical conditions in terms of peak discharges (due to rainfall higher intensities). For the design of channels, peak discharge is the most critical factor. For this reason, peak discharge, generated by a summer-fall storm, computed according to MTQ (2014) methodology, and assuming completely saturated soil conditions, was adopted for the design of the East channel.

April 18th, 2019 – Re-Comment 1: CIRNAC appreciates AEM's comment and response, however, designing the east diversion channel using heavy rainfall-storm events in summer or fall may not be the best criteria to use when designing the east diversion channel for peak discharge. During these periods the water levels tend to be low or may be at their lowest levels, therefore looking at a heavy-rainfall event during low water level times may lead to the insufficient design capacity of the east diversion channel. It is CIRNAC's opinion that this may be a critical factor to consider. Peak spring freshet coupled with heavy rainfall events would likely give greater peak discharges than just a heavy rainfall event in summer or fall.

April 18th, 2019 – Re-Recommendation 1: CIRNAC recommends AEM consider a heavy rainfall event during spring freshet for the design of the east diversion channel.

April 25th, 2019 - Agnico Eagle's Response:

Agnico understands CIRNAC concerns that a heavy rainfall event might occur during the freshet season leading to a high volume and flow of water in the channel. Nevertheless, this would not be the worst-case scenario as 1:100 yrs flood event in spring time (heavy rainfall coupled with snowmelt) produces a smaller peakflow than a 1:100 yrs flood event in summer-fall time (heavy rainfall only).

In fact, the methodology adopted to design the channel is:

- *To apply the rational method (a method known to result in conservative peak discharges):*
  *Q = C * I * A * F, with Q being the peak discharge, C the runoff coefficient, I the intensity corresponding to the watershed time of concentration, A the drainage area, and F the flood routing correction factor (function of Lake A53 area and location).*
- *To make the conservative assumption of a runoff coefficient equal to 1 (the largest possible value corresponding to a watershed entirely frozen or with its soil entirely saturated with water, resulting in no possible infiltration and 100% of rainfall transformed into runoff).*
- *To adopt a 100-yr summer-fall rainfall on top of watershed conditions corresponding to those at the end of the spring freshet described in the previous point, which is also conservative.*

*A 100-yr summer-fall rainfall would have a corresponding average intensity of approximately 12.5mm/h, which results in a higher peakflow than a 100-yr snowpack (226mm water equivalent) melting in 30 days (0.3mm/h) combined with a 1-yr spring rainfall (1.7mm/h) resulting in a total combined intensity of approximately 2.0mm/h (1/100*1/1=1/100 = combined flood return period). The same can be said from a 2-yr snowpack (105mm) melting in 30 days (0.1mm/h) combined with a 50-yr spring rainfall (4.8mm/h) for a total combined intensity of approximately 4.9mm/h (1/50*1/2=1/100 = combined flood return period).*

Because the intensity from the summer-fall 100-yr rainfall is larger than the one resulting from the combination of snowmelt and spring rainfall, and because parameters C, A, and F are the same for both spring and summer-fall floods in the rational method equation, the largest peak discharge is obtained using a summer-fall rainfall. Therefore, the methodology adopted is conservative and well adapted for this channel.