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"Technical Support for Grassroots Public Interest Groups"

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To: MiningWatch Canada

From: Center for Science in Public Participation

Re: **Sisson Project Consistency with Mount Polley Expert Panel Recommendations**

Amec Foster Wheeler Review (Amec 2016)

This report focuses on the report by Amec Foster Wheeler Environment & Infrastructure, Fredericton, New Brunswick, commissioned by the New Brunswick Department of Energy and Mines, of the proposed Tailings Storage Facility (TSF) design for the proposed Sisson Mine Project. Since this review was focused on the tailings storage facility, and it was conducted almost 2 years after the Mount Polley tailings storage facility failure and subsequent analyses, it is appropriate to review the evaluations in this report. It is also the most recent document/review of the proposed tailings dam.

Guidelines

Of the guidelines Amec used for its review, including the Canadian Dam Association and the International Commission on Large Dams, only the APEGBC Professional Practice Guidelines (APEGBC 2016) were written after the Mount Polley accident. However, the APEGBC Professional Practice Guidelines address site characterization and professional responsibilities, but do not address tailings dam safety.

This means that the Amec review did not use any guidelines that were written after the Mt Polly tailings storage facility failure, like the Mount Polley Expert Panel recommendations (Expert Panel 2015), the Investigation Report of the Chief Inspector of Mines (BCMEM 2015), and the Mining Association of Canada "Report of the TSM Tailings Review Task Force" (MAC, 2015).

Tailings Storage Facility Design

The tailings storage facility is a "modified centerline" design, and sections will be up to 90 meters in height (Amec 2016, pp. 13-14). Ninety meters is a large structure. Modified centerline is a code word for "partial upstream-type" design, which is generally cheaper, using tailings material as part of its support, but not as safe as true centerline or downstream designs. The Amec report does not present a figure with the cross section of the dam design, only cross sections of "Typical Cross-Section Through a Starter Dam" (Amec 2016, pp. 15-16). Amec expected that the next stage of the tailings storage facility design would be issued late in 2016 (Amec 2016, p. 1).

So, even though the dam design reviewed by Amec was only preliminary, the projected modified centerline dam design being proposed is essentially the same dam design which was used at Mount Polley.

A wet closure is also being planned for the tailings facility in order to minimize potential acid generation (Amec 2016, p. 30). This is a standard practice for mines with potentially acid-generating or metals-leaching waste. Water on the tailings was also the planned closure cover at Mount Polley, and when it failed the impoundment at Mount Polley was essentially full of water due to poor water management planning and excess stormwater runoff.

In summary, the Sisson Project tailings storage facility design is business-as-usual, using the same tailings storage facility design and water cover approach used at the failed Mount Polley tailings storage facility.

Site Characterization

Amec notes that:

> *"... the spacing for the boreholes that have been advanced is greater than would have been considered appropriate for this type of dam." (Amec 2016, p. 28)*

And that:

> *"There is no discussion about the potential for discrete clay layering. There is no mention whether or not a varved lacustrine deposit exists." (Amec 2016, p. 29)*

These are both conditions that led directly to the tailings storage facility failure at Mount Polley – the existence of a lacustrine glacial deposit below the Mount Polley dam. While the Province is requiring further site characterization studies to answer these questions (DELG 2015, p. 7), nonetheless it points to the lack of data available in guiding the proposed tailings storage facility design at a stage of the project where the environmental review is theoretically and practically completed, and permission has been given by the Provincial and Canadian governments to proceed.

Wet Closure

Post-closure the tailings storage facility will utilize a wet cover to inhibit acid generation from the molybdenum tailings and any waste rock that is potentially acid-generating. The water cover will dominate the surface area of the closed impoundment (Stantec 2015, Figure 3.4.6). Post-closure water treatment is also anticipated (Stantec 2015, p. 3-23).

The Mount Polley Expert Panel recommended (Expert Panel 2015, p. 121):

> *"The goal of BAT for tailings management is to assure physical stability of the tailings deposit. This is achieved by preventing release of impoundment contents, independent of the integrity of any containment structures. In accomplishing this objective, BAT has three components that derive from first principles of soil mechanics:*
>
> 1. *Eliminate surface water from the impoundment.*
> 2. *Promote unsaturated conditions in the tailings with drainage provisions.*
> 3. *Achieve dilatant conditions throughout the tailings deposit by compaction."*

Dry closure does not appear to have been considered as an option for the Sisson Project. Dry closure does not necessarily mean dry tailings. A drained impoundment is also an option. Draining the tailings will accomplish the most important two of the three principles recommended above. But even with dry closer, perpetual (or long-term?) water treatment would likely be required.

It also appears that alternate tailings management methods, such as desulfurization options to remove all or a portion of the acidic material from the tailings to manage it separately, potentially in smaller impoundments, have not been considered. All of these options would be safer, but likely more costly up-front.

Tailings Dam Design Safety

The Mount Polley Expert Panel recommends:

> *"For new tailings Facilities. … Safety attributes should be evaluated separately from economic considerations, and cost should not be the determining factor." (Expert Panel, 2015, p. 125)*

and;

> *"It is important that safety be enhanced by providing for robust outcomes in dam design, construction and operations." (Expert Panel, 2015, p. 126)*

The proposed Sisson Project dam has several aspects that do not reflect holding safety over economic considerations. These include:

(1) The modified centerline-type construction, the same type of construction used at Mount Polley, and next to upstream-type construction, the most problematic type of tailings dam construction. Downstream or true centerline-type construction methods would be safer.

(2) Wet closure instead of dry closure for the impoundment. The Mount Polley Expert Panel clearly says dry closure should be the goal, and dry closure was not evaluated for the Sisson Project.

(3) Amec recommends that the Maximum Credible Earthquake, generally accepted as the 1-in-10,000 year seismic event and the largest earthquake that could occur at a site, be used for tailings dam design instead of the 1-in-5,000 year seismic event proposed for the dam design (Amec 2016, p. 43).

Although the Mount Polley Expert Panel does not address the issue of seismic safety, the Amec recommendation is based on practical safety considerations. The seismic design recommendations proposed by the Canadian Dam Association were designed for water supply reservoir dams, which have a limited life. Tailings dams must maintain their integrity in perpetuity. As such, it is only reasonable that tailings dams be designed for the largest event they are likely to experience during their design life, the Maximum Credible Earthquake.

Using any other seismic event other than the Maximum Credible Earthquake as the design earthquake for a tailings dam is designing the dam to fail.

(4) The static Factor of Safety (FoS) that is currently proposed for construction and operation is 1.3. This FoS is intended for construction only (Expert Panel 2015, p. 132), and is dangerously insufficient.

Mount Polley was operating with a calculated FoS of 1.3 when the dam failed. The Mount Polley Expert Panel (Expert Panel 2015, p. 132) and Amec (Amec 2016, p. 43) recommend a FoS of 1.5 during operation and closure.

(5) Amec noted:

"*The dam geometry as shown has narrow core zones of 3 to 4 m during raisings and sophisticated downstream drains, which will create difficulty for the mine fleet to build*."

and;

"*The continuity of the narrow dam filters can be 'interrupted' by horizontal ground acceleration. Deformation analysis should be undertaken of the dam under high seismic events to determine the potential effect on the internal elements.*" (Amec 2016, p. 44)

The cautions about narrow dam filter and core zones are serious warnings, and should not be minimized. The suggestion to conduct "deformation analysis", which is essentially computer modeling of the dam under loading, although not called for by the Mount Polley Expert Panel, is a suggestion that should be undertaken.

While the regulatory agencies are requiring the Sisson Project to address the inadequate site characterization work with additional drilling along the dam location, and have required the formation of an Independent Tailings Review Board as recommended by the Mount Polley Expert Panel, none of the issues discussed above in (1) through (5) have been directly addressed by the conditions required of the Project by the Province of New Brunswick (DELG 2015) or the Canadian government (CEAA 2016).

The current design appears to prioritize economic considerations over safety, in direct contradiction to the overarching Mount Polley Expert Panel recommendation.

Respectfully

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References

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