

## Assessment, Review and Evaluation by Glenda Ferris:: January 30, 2015

Independent Expert Engineering Investigation and Review Panel

▣ February 2015

### THE REPORT

I found the report to be well-written and at the same time quite obstructive. The words and language are easily accessible and the presentation allows all of us to read the obvious contradictory statements. In fact, the Panel Report reads like a Chinese puzzle box; it is filled with dead-ends, hidden levers, false leads and so many contradictory statements that a solution of this puzzle is daunting. There is also the obvious problem of professional engineers commenting upon public policy and regulatory systems. The Panel process and their thinking are transparent; their lines of enquiry are listed. Several aspects of compelling need are revealed:

- The Minister's requirement for a "simple" answer.
- The mining industry's necessity for self-regulation to continue.
- The general public's demand for an "answer"....with an understanding that when

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experts “answer”, that is the end of inquiry.

- That the Panel was compelled, that Panel members had no alternative, except to provide an “answer”; they could have provided a listing of probable causes instead of “certainty”.

As a mine-industry person commented to me, “Well, we all want to know what happened.” I do not know that the Panel Report has comprehensively investigated evidence to support their opinion regarding “what happened”. But the information within their Report reveals that the Panel has provided some examination of alternative failure possibilities.

While the Panel retained the ability to interview employees of Mount Polley Mining Corporation/MPMC, there is little to none of this information and testimony quoted or evident in the report.

Also missing as a complete record, but referred to within sections, is the compliance record of MPMC as regards their Permits. That is, the proofs of legal compliance with the conditions set out within MEM and MoE Permits.

The panel begins by describing their findings (regarding the Dam Design and lacustrine tills) as a possibility that should not be discounted but by the final conclusions, they present their findings as final “proof” with no room for consideration of other contributing factors, even though their own report continues, within brief sentences, to contradict that imperative-single-cause theory.

My interests relate to the incremental and collective failures:

- Failure of the Perimeter Embankment Dam due to Mount Polley Mining Corporation/MPMC willful disregard for Permit compliance, Best Practices of Design and Construction and operation of the facility, and, a complete lack of consideration for the hazards and risks resulting from their decisions.

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- Failure of regulatory approach, at every stage of Mine Proposal (1994-95) to Mine Construction and Mine Operation, including episodes of major non-compliance, until the Perimeter Embankment dam collapse.

- Our collective failure to require more stringent regulatory requirements, adequate full-time staff at all levels of Ministry/s' and the failure to understand the capacity of Mine Development to destroy our lands, our watersheds and our public safety. As a society, we do not seem to consider the repeated "failures" of many mining operations and the loss of our lands to bad practices.

Page 11 of the Panel report, "Factors of Concern" is a very important page. We all should note that this list is not exhaustive but it is inclusive of probable causes and mechanisms of the dam collapse. However, it seems within an apparently fairly short period of time, all lines of intensive inquiry were dropped in favour of "ancient glacial lake" and lacustrine till.....that is, dam foundation failure due to glacial tills (clays) named "glaciolacustrine", a hard, compacted clay.

As an aside, the totally false statements, by Minister Bennett and others that since these till layers "could not be seen" there was no way that regulators could have prevented the dam collapse. This deception has since been revised to words...the foundations tills "were not understood". But the Report does state that "cause" was "hidden", since "no one could see" those compacted clays. A ridiculous assertion, since lab held samples of these clay layers since 1994 and earlier.

According to a Knight Piesold report dated March 14, 2005; "Design of the Tailings Storage Facility to Ultimate Elevation", 2.1.2 Foundation Conditions; "The foundation conditions at the Main Embankment consist of low permeability glacial till material (known inventory collected 1994-95) at surface underlain by fluvial and lacustrine silts up to 20m thick. The foundation conditions of the Perimeter Embankment (the dam that collapsed) consist of low permeability glacial till throughout that is generally in excess of 5m."

The conditions of foundation tills have been "known" for decades. That said, if the BC government and the Panel really believe that the only factor that caused dam collapse were those lacustrine foundation tills....those same tills exist under the entire TSF/Tailings Storage

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Facility at the Mount Polley Mine and its embankment dams. Rational thought would then require that this mine component/TSF be immediately and permanently de-commissioned. The embankments should be re-sloped, a Water Management Plan should be approved with Treatment Plant (and sludge disposal). This does not foreclose Mine operations; they simply need to build a water-recycle pond for their mill and to deposit mine waste into an empty open pit, already available at either Springer or Caribou pits.

If the Panel and BC government do not believe their own report, do not intend to reduce the foundation-tills-hazard described as a “loaded gun” by the Panel....then they will simply continue down the status-quo path of re-construction of the impoundment dams and mine operations continuing at the site. While stating that we cannot, as a society, continue the status-quo; that is exactly what they are doing in relation to the Mount Polley mine site. We should all remember that there are still approximately 44million cubic meters to 54million cubic meters of saturated tailings within the Mount Polley impoundment, and now there is also this winter’s substantial snowpack.

In Executive Summary; Conclusions: The generalized conclusion that “dam design” was the “dominant contribution to the failure” exemplifies the apparent inability of the Panel to state real world conditions. While then referencing the foundation till “un-drained failure”, the statement is made that, “The construction of....a rock-fill zone.....at steep slope.”.....caused the dam collapse. Several times within the report this “steep slope” is mentioned as the cause of the Perimeter Embankment failure, and yet, neither the geotechnical inspections (please note that some reports are being withheld) nor the regulatory assessments which are available, noted that this slope should be either altered or buttressed. The implication is that the displacement mechanism was “weight” with resulting dam failure and collapse; the failure identified by the Panel at foundation level of lacustrine “un-drained” and compacted tills (clay layer).

The Panel also states that a “buttress” construction may also have prevented dam failure. Did MEM/Ministry of Mines staff at any time recommendation or ask the company “to consider”, let alone “Order” that a buttress support be constructed at the Perimeter Embankment?

Page 11 states:

· “Details of filter and transition construction in as-built drawings indicated departure from intended design.” \*please note, at many sections within the report, disclosure remained that MPMC submitted Design, that was then approved by MEM, and then did not construct the

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approved design to any criteria or standard known, except the as-built drawings that the Panel members accessed to reveal this bad practice.

- “The (Perimeter Embankment) core had been over-topped in one location for a brief period in 2014 (in fact, May 24) resulting in softening and enhanced deformability.”
- “Much of the as-placed filter material failed to meet applicable filter criteria and requirements for internal stability of its grading.” ....and the downstream slope was really, really steep.

At any point in time, both the company and/or the regulatory agencies could have considered compliance to better standards. At every turn, the dam collapse became “inevitable” because of incremental decisions made over decades at Mount Polley Mine and through the ineffectual approach of non-regulation practices by the Ministry of Mines. While there is no coherent listing of assessment of MPMC management shortcomings, they are well documented within the Panel report.

If all of these Mount Polley Mine bad-practices (and there are many more) that have been documented by the Panel, and now distributed to the public, exist and have existed for years, then the Panel assertion that regulatory requirement could not have prevented the Perimeter Embankment collapses; as a “fact”, it falls apart.

## **DAM DESIGN AND CONSTRUCTION**

Almost throughout the entire Panel Report, they label the MPMC/Mount Polley Mining Corporation Tailings Storage Facility/TSF as “modified centreline construction” It is only on page 55 that we can read an accurate description of “upstream construction”, as in: “Rather than adhering to a “centreline configuration, raise 2 utilized entirely upstream construction. The same conditions prevailed for the Perimeter Embankment....” Now, we must all remember that this past construction is now within the lower levels of the dam/s’ interiors; a layer of

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non-performance and incompatible construction materials.

Not only were design standards not being met regarding as-built construction, but the design plans were being altered as the impoundment dams rose. For reference please note Will Koop's report "The Scene of the Crime" on behalf of the BC Tap Water Alliance; [www.bctwa.org](http://www.bctwa.org) ; December 1, 2014.

"Upstream" and even "modified Centreline" construction depend upon the vertical support of the tailings themselves...far cheaper than using quarry rock. That is why 10meter wide tailings beaches are required and those beach-areas are an absolute necessity for tailings consolidation (drying); that management aspect, even as a regulatory Permit compliance requirement was routinely violated. Surface water should never have been allowed to accumulate next to the dam upstream face. In addition, in the climate and weather pattern of the Mount Polley Dam region, in any case, the tailings may never have dried or consolidated due to precipitation, temperatures and winter conditions.

The 2005 Knight Piesold Report: Design; "Beached tailings, when left to drain and consolidate, form the competent foundation needed for the "modified Centreline" construction of embankments...."

And then, the Panel Report directly states, "The embankments do not rely on tailings mass for stability." This Panel assertion is refuted by the dam construction and design drawings presented throughout their own report....we can see the payers of tailings and filter-materials and the incline upstream of the dam itself. Why would Panel members make this statement? Are they merely recounting the construction of the foundation of the Embankment Dam complex? Or, are they misleading all of us?

Dam design modifications and as-built alterations (and additional drain systems) seem to have been a continuous feature of the operational approach at Mount Polley Mine.

Page 57: "...for Stage 3 design using only cyclone sand (see tailings) for the Perimeter Embankment....this was changed in April 2001...using rockfill sourced from a quarry."

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The history of design and construction only confirms that dam stability was at risk for many years; that comprehensive inspections and legal requirements could have, at any moment in time, remediated flaws and/or altered the engineering approach to a more robust design.

Instead, page 55: “The intended Zone C (this area is Main Embankment ) mine waste till was not added to the downstream slope and the berm along the toe was not constructed.” \*my emphasis. Now the puzzle becomes, why does the Panel mention these issues at all? ...except to reveal that MPMC did not complete dam construction to their own “approved” design standards? Please note that if a stabilizing berm (buttress) had been placed along the Perimeter Embankment dam, downstream face, the dam might not have collapsed, according to Panel findings.

## Page 53: Mine Construction

- Alterations of dam design
  
- Narrow chimney drains
  
- Four relief wells
  
- Longitudinal drain
  
- Cyclone sand deposition abandoned
  
- Water directly in contact with the embankments

## Page 64: Mine Management

- Buttress not constructed as designed
- Beach deposition and beach maintenance 10m not successful
- Water accumulation against embankments

Page 75: Mine Design

- Reduction of compacted core of dam width from 8meters to 5meters.
- Filter materials do not meet stability requirements.

I submit, these practices and non-compliances (and many others documented within the Panel Report) “set the stage for all that followed”.....not a simple misunderstanding regarding the un-drained strength of lacustrine tills under the dams’ foundations

I submit, the over-consolidated lacustrine till layer fractured, we can see the up-turned giant slabs, as a result of the dam collapsing due to bad construction practices, “upstream-incline dam instability” and internal erosion. The Panel has simply confused “cause” with “effect”.

**WATER**



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**Page 72: “For years, dam raising had managed to stay one step ahead of the rising water. But on May 24, 2014, the water caught up.”**

On pages 9 & 10 of the Panel Report, a sequence of events is described in detail, some of the information obtained through testimony of workers, not submission by the company. In addition to a storm events on July 27, a series of events occurs on August 3<sup>rd</sup>. The seepage pond alarm system and pumps are triggered, sequentially, from 11pm, to 1am (pond rising sharply) to 1:15am when the power goes out...and discovery of dam breach @ 2:05am. This is a water event....a failure of containment that is reporting to the Seepage Pond and representative of “internal erosion” and/or internal subsidence.

I have already reported upon the many aspects of Water Management and the implications of bad management practice upon dam stability. The water balance/mass balance issues at Mount Polley Mine had been an issue for years, especially since 2006. The company did nothing except to continue to raise the embankment dams. Recommendations were made for Discharge Permits (mine effluent discharge) from the impoundment, and these Permits were actually issued in 2014.

The government regulatory agency and the company knew, since 2006, that the water balance within the impoundment, even with increased Mill throughput, could not be discharged without Treatment. The MPMC did not want to build a Water Treatment Plant that would have enabled them to discharge up to 3million m3 annually, so they spent time “investigating” passive treatment systems, while the impoundment filled with water.

Page 87: “It is not clear to the Panel why it took so long to design and implement a water treatment strategy that would provide for a significant reduction in the amount of surplus water stored in the TSF.” Not only were “beaches” not being maintained to consolidate tailings but the entire impoundment structure was being “raised” to accommodate the water, supernatant accumulations.

Page 61: There are “chronic problems with maintaining the tailings beach.”

The dams at Mount Polley Mine were never designed nor constructed to hold water, page 87: “...the Mount Polley TSF embankments were not designed as water-retaining dam(s)...”

Where are the disconnect and dereliction of duty to social, economic and environmental safety? Why has there been no regulatory requirement imposed upon MPMC for safety? No regulatory use of “ACT” authority and power? No incentive for the MPMC-company to comply with any standard or criteria, or even to provide the capital funding for a water treatment plant?? This is an industrial and regulatory system’s failure of incredible scope and scale....and these discredited regulatory approaches combined with industry bad practice will continue because the Panel asserts, Executive Summary iv: “The Panel found that the performance of the Regulator was as expected.”

“Expected” by whom? The Panel members reveal deep ideological roots in their commentary. The Panel “answers” become a mechanism for avoiding questions, not communicating information. Engineers are not the group/sector from which we can expect solutions to public policy challenges.

As a society we entrust government as “caretakers” and legislated authorities and guardians of both civil laws and our collective public safety. Government has failed at every stage; now they must describe how improvement in regulatory process and outcomes will be framed. BC lands and watersheds are our collective interests; our interests are not valued by our own government.

Page 138: “By definition, no amount of inspection can discover a hidden flaw.” And, “It is not unreasonable to ask whether MEM could have acted sooner and more aggressively in these matters or even intervened in the design process...” Well, that would not have made much of a difference, since MPMC did not construct nor were they required by regulatory authority to construct the dam/s as-built to dam/s-design criteria.

## **REGULATORY OVERSIGHT**

Page 112: Regulatory Oversight: “The MOU clearly places the responsibility for the engineering aspects of the Mount Polley tailings storage facility (TSF), seepage collection

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ponds and diversions on the shoulders of MEM, while the water quality (and discharges from the Mill to the impoundment) of any discharges is the responsibility of MoE. Two permits are in place for the TSF and associated facilities: Permit M-200 from MEM and Permit 11678 from MoE.”

Then how did all of the Panel Report-documented MPMC failings above happen? There has been a massive downsizing of professional engineers within government regulatory agencies. At the same time, the mining industry as a whole and mine companies in particular have also downsized staff. There is now an excessive dependence upon “professional consultants” by both government and industry. What has been the result? There is no institutional memory; no continuity; not even consistent compliance to legal requirement.

How did even the hired help of Knight Piesold or AMEC approve as “safe” the embankment dams at Mount Polley Mine? Is the problem that hired professionals can only make “recommendations” that the company can then ignore? Maybe, but then we should have the safeguards of regulations and regulatory agencies to apply “legal remedy” when the company refuses to address issues that have been identified. The Panel answers that “Observational” approach may have some shortcomings. Well, regulatory agencies could see the water; geotechnical engineers could see the steep slope at the Perimeter Embankment; employees could see seepage-water flowing through the dam at various locations.

How can the Panel write, “The Panel found that inspections of the TSF would not have prevented failure and that regulatory staff are well qualified to perform their responsibilities.”???? The glaring inconsistency and contradictions within this quote represent ideology, not the practical application for the requirements of regulation. In absolute terms, conformity to the ideology of non-regulation is significant either from the Panel assertions or from government Ministers. This approach will simply entrench systems that are already failing to prevent disaster, but to also continue as policy without an opportunity for public examination or government reorganization.

The ideology represented is also about controlling the message; often within simple-minded talking points that are misleading.

What is the role of government?

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- To stand in front of microphones and provide cover for industry?
- To leave regulations and law in place, never to be enforced or to be used for control?
- Who speaks for our land, our water, for us?

Minister Bennett stated, as quoted in the Vancouver Sun, “he said he was glad the report confirmed the breach could not have been prevented by government employees doing surface inspections.” This is the worst type of deception; MEM employees could not “see” the steep slope? MEM employees could not “see” the impoundment supernatant? NO, because the hidden, single cause was a layer of lacustrine till, invisible to all but anyone that could access a file, read a diagram or a geotechnical report.

The Minister’s approach of providing “answers” has become a mechanism for avoiding questions, for not communicating information.

And then, also quoted in the Vancouver Sun, Mary Pollack, Minister of Environment, said that the scale of the disaster was tremendous and the every effort was being made to clean up the mess. Note that this is not necessarily a deception, it is not clever enough; this statement is a complete fabrication, bamboozle, hornswoggle. MoE have cleaned up or required to be “cleaned up”..... nothing. \*MoE “Order”-ing the MPMC to stop the Perimeter Embankment discharges AFTER the dam had failed was some of the most profoundly dishonest posturing I have ever witnessed....and I have seen a lot.

If there is never any social, financial or legal accountability for the destruction of places and of neighbors here in BC, the mining industry and mine companies have no incentive to build and operate mines that provide good outcomes.

How do we come to terms with our collective failures, if they are hidden and labeled as success? Success of regulatory practice falsely claimed in the face of this catastrophic failure. We have to identify systemic issues: lack of communication between ministries, new investigation techniques that will identify hazards and mine company’s bad practice. We have to

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do this now.

I do not understand why gems of real information continually surface within the Panel Report. Nor do I know why these instances of real knowledge and information clash so pervasively with many of the Panel's social-policy statements.

That said, I will give them the last word, Page 137: "The Panel's excavation of the failure surface showed that the crest (Perimeter Embankment Dam) dropped at least 3.3m, which allowed over flow (of supernatant) to begin and breaching (of the dam)to initiate. Had the water level been a metre lower and the tailings beach commensurately wider, this last link might have help until dawn the next morning allowing timely intervention and potentially turning a fatal condition into something survivable."

I will deal with the Panel "recommendations" in another report.

Best to all, Glenda Ferris