

Rioux, Luke MEM:EX

From: Wallace-Deering, Eric MEM:EX
Sent: Thursday, December 17, 2015 11:59 AM
To: Petrie, Cynthia MEM:EX; Togneri, Sebastien MEM:EX
Subject: RE: For Final Review/Approval - MEM NR + BGs - DRAFT: Government takes action on Chief Inspector of Mines' recommendations

Hi,

Can you re-send with the attachment?

Thanks!

Eric

From: Petrie, Cynthia MEM:EX
Sent: Thursday, December 17, 2015 11:57 AM
To: Wallace-Deering, Eric MEM:EX; Togneri, Sebastien MEM:EX
Subject: Fwd: For Final Review/Approval - MEM NR + BGs - DRAFT: Government takes action on Chief Inspector of Mines' recommendations

This is the approved NR, can you connect with Ben James and let him know that this will be posted at approx 1:30

Thanks

Cynthia Petrie,
Chief of Staff to the Hon. Bill Bennett
Minister of Energy & Mines
250-882-4289

Begin forwarded message:

From: "Gilmore, Dan GCPE:EX" <Dan.Gilmore@gov.bc.ca>
To: "Petrie, Cynthia MEM:EX" <Cynthia.Petrie@gov.bc.ca>
Cc: "Haslam, David GCPE:EX" <David.Haslam@gov.bc.ca>, "Plummer, Glen GCPE:EX" <Glen.Plummer@gov.bc.ca>, "Grewar, Colin GCPE:EX" <Colin.Grewar@gov.bc.ca>, "Jacobs, Jake GCPE:EX" <Jake.Jacobs@gov.bc.ca>
Subject: FW: For Final Review/Approval - MEM NR + BGs - DRAFT: Government takes action on Chief Inspector of Mines' recommendations

Here is the draft V5. Will hold approval until we hear back from you.

Cheers,
Dan

Dan Gilmore
Communications Manager

Ministry of Energy and Mines
Office: 250-952-0667
Cell: 250-213-2302

-----Original Message-----

From: Stagg, Linda R GCPE:EX
Sent: Thursday, December 17, 2015 10:55 AM
To: Gilmore, Dan GCPE:EX
Cc: Haslam, David GCPE:EX; Plummer, Glen GCPE:EX; Jacobs, Jake GCPE:EX; Grewar, Colin GCPE:EX; Boudreau, Marc GCPE:EX; Chant, Jon GCPE:EX; Hayes, Dana GCPE:EX
Subject: FW: For Final Review/Approval - MEM NR + BGs - DRAFT: Government takes action on Chief Inspector of Mines' recommendations

Hi, Dan and Everyone -

Thank you for the opportunity go over this well-crafted science project! I did not mess with it much at all. Still, we're all available for edits. (I need to get re-java-nated now.)

It's got 1:30 on it now - but that can easily be changed.

Linda Stagg
Editor
Government Communications and Public Engagement
250 387-4534

-----Original Message-----

From: Stagg, Linda R GCPE:EX [<mailto:Linda.Stagg@gov.bc.ca>]
Sent: Thursday, December 17, 2015 10:52 AM
To: Stagg, Linda R GCPE:EX
Subject: DRAFT: Government takes action on Chief Inspector of Mines' recommendations

Please refer to the files attached to this email. The following is the summary of the News Release

NR Number: Not Approved
NR Type: News Release
State: Planned
Planned Release Date: December 17, 2015 at 1:30 pm No Lead Organization
Headline: Government takes action on Chief Inspector of Mines' recommendations

This email was auto-generated.

Not Approved
Dec. 17, 2015

Ministry of Energy and Mines

NEWS RELEASE

Government takes action on Chief Inspector of Mines' recommendations

VICTORIA - In response to the findings and recommendations of the Chief Inspector of Mines' (CIM) investigation into the tailings storage facility (TSF) at Mount Polley Mine in August 2014, Energy and Mines Minister Bill Bennett announced today that government will introduce new regulations and requirements that will make British Columbia a national and international leader in safety standards for tailings storage facilities.

The CIM report found, as did the Independent Expert Panel in January, that the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in the design or in subsequent dam raises. The chief inspector also found other factors including the slope of the perimeter embankment, inadequate water management, insufficient beaches and a sub-excavation at the outside toe of the dam exacerbated the collapse of the dam and the ensuing environmental damage.

While the breach would not have occurred had it not been for the undetected glaciolacustrine layer of soils (UGLU), the consequences of the breach were made worse by the other factors. Although operations on the mine site were not in contravention of any regulation, the chief inspector found that the mine failed to operate using best available practices.

The chief inspector of mines investigation team conducted approximately 100 interviews and reviewed over 100,000 pages of documents going back to 1989. This is the largest and most-complex investigation and analysis ever done in B.C.

The CIM made 19 recommendations in seven categories directed toward the mining operator, the mining industry, professional organizations and the government regulator to prevent such incidents in the future and build a safer, more sustainable industry. Government will be working to implement all of the recommendations. Key recommendations include:

- * All mines with TSFs will be required to have a designated mine dam safety manager and a designated individual to oversee the mine's water balance and water management plan.
- * Mines with TSFs will be required to have water management plans designed by a qualified professional.
- * Independent technical review boards will be required for all mines with TSFs.
- * Establish a dedicated investigation, compliance and enforcement team within the Ministry of Energy and Mines lead by a new deputy chief inspector of mines. This team will provide additional support and oversight of existing ministry investigation, compliance and enforcement functions.
- * To strengthen records management and improve openness and transparency around design, construction and operation, government will establish a formal documentation management system for all TSFs from development to post-closure.
- * Foster innovations in the mining sector that improve current technologies in tailings processing, dewatering and discharge water treatment.

Many of these recommendations will be addressed through the review of the Health, Safety and Reclamation Code for Mines in British Columbia. Government will also work with industry and

professional organizations to implement the other recommendations. It is anticipated this work will be completed by spring 2017.

Other actions will be taken to strengthen government's compliance and enforcement of mining. Bennett plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

The chief inspector found that the mine and its engineers employed weak practices on the mine site and many recommendations go to new standards and guidelines to improve these practices. Weak practices, however, do not constitute a legal contravention of existing mining legislation. The CIM, with advice from the Ministry of Justice, did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, the Chief Inspector of Mines determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.

The British Columbia Conservation Officer Service (COS) is still conducting its investigation into the Mount Polley accident. The COS investigation is based on compliance with the Ministry of Environment legislation. It is possible that this investigation may find non-compliance that warrants a report to Crown Counsel.

Quotes:

Minister of Energy and Mines Bill Bennett -

"We've learned from this investigation that in the case of Mount Polley, the allowable margin of risk around the design, construction and management of the tailings storage facility was too narrow to allow for an unknown factor, the layer of unstable soils below the dam embankment."

We've also learned that weak practices on the mine site increased the risk of dam failure and exacerbated environmental consequences from the breach."

"This is unacceptable. My commitment is to implement all recommendations, work with the MABC and MAC, the APEGBC and the CDA to ensure that risk of dam failure is reduced by better regulations, better policies and better professional guidelines."

Chief Inspector of Mines Al Hoffman -

"We conducted a very thorough and in-depth examination of the Mount Polley Mining Corporation's actions from its initial site investigations 26 years ago to present. Through our investigation, we determined that while the mine did not contravene any existing regulatory requirements, its management and operational practices failed in a number of areas such as water management and misplaced confidence in the TSF design."

"My recommendations address these issues and will strengthen British Columbia's regulatory framework and build a safer, more sustainable industry in B.C."

Learn More:

A copy of the Chief Inspector of Mines investigation is available here:
www.gov.bc.ca/mountpolleyinvestigation

Four backgrounders follow.

Media Contact:

Jake Jacobs
Media Relations
Ministry of Energy and Mines
250 952-0628

BACKGROUND 1

Findings of the Chief Inspector

The Chief Inspector of Mines (CIM) for British Columbia has completed a 16-month-long investigation into the Aug. 4, 2014 tailings pond breach at the Mount Polley Mine near Likely, B.C.

The CIM investigation team consisted of the chief inspector of mines, primary investigator, file co-ordinator, information analysts, technical writer, geotechnical engineers, geoscientists and hydrologists from Klohn Crippen Berger, and a retired RCMP investigator. The team was supported throughout the investigation by staff with the Ministry of Energy Mines (MEM).

The investigation determined that because of the undetected glaciolacustrine layer of soils (UGLU) Mount Polley Mining Corporation (MPMC) and its engineering consultants did not fully recognize and manage geotechnical and water management risks associated with the design, construction, factor of safety and operation of the tailings storage facility.

The following is a summary of the chief inspector's findings:

- * At approximately 11:40 p.m. on Aug. 3, 2014, a section of the Mount Polley Mine tailings storage facility (TSF) perimeter embankment failed and slumped roughly five metres. Water in the impoundment almost immediately overtopped the slumped crest. The failure led to a major and ongoing erosion breach at approximately 1:08 am on Aug. 4, 2014, which released tailings and process water into the environment beyond the mine site.
- * The mechanism of the structural failure was due to a lightly over-consolidated glaciolacustrine clay unit approximately 10 metres below the dam's foundation. This clay layer was not properly identified and accounted for in the design of the structure.
- * The investigation found that Mount Polley Mining Corporation and the engineers of record did not conduct adequate studies and site investigations of the perimeter embankment foundation. This was not a contravention of any existing regulatory requirements as there were no specific guidelines or regulatory requirements in place for foundation investigations.
- * To address this issue, the Association of Professional Engineers and Geoscientists of B.C. is developing professional practice guidelines for dam site characterization assessments for release in spring 2016. The guidelines will outline the standard of care and professional obligations professional engineers and geoscientists must uphold when conducting these assessments, and will define the roles and responsibilities of the various participants and stakeholders involved in

this process.

* Because the UGLU was not properly identified, it was not correctly factored in when determining the strength of the dam foundation. As a result, the structural failure occurred because of two additional conditions that contributed to the dam failure. One was an over-steepening of the downstream slope of the dam, coupled with the constructed height. The other was an unfilled sub-excavation for a buttress foundation at the toe of the embankment at the site of the failure.

* Neither of these conditions contravened existing regulatory requirements. The steepness of the downstream slope was approved by the engineer of record to meet Canadian Dam Association guidelines for safety, and the sub-excavation was in general conformance with the design intent.

* The structural failure of the embankment combined with the condition of the tailings pond - with insufficient beaches and too much supernatant water - led to an erosional failure of the embankment that rapidly widened into a complete breach and resulted in the release of tailings and water into the surrounding environment. Two investigations have now confirmed the breach would not have happened if details of the clay layer had been fully understood and factored into the design of the dam.

* These conditions occurred because MPMC failed to effectively manage water at the mine site and in the TSF. An adequate water management plan did not exist, there was no qualified individual responsible for water balance in the TSF, and MPMC did not adequately characterize the risk of surplus supernatant water, which had been compounding since the mine reopened in 2005.

* This was not a contravention of any existing regulatory requirements as there were no specific guidelines or regulatory requirements in place for water management for mine sites.

* There is a need for the Regulator (MEM) to formalize professional reliance guidelines for tailings storage facility design, construction and management in legislation, regulation and-or the Health, Safety and Reclamation Code for mines in British Columbia.

Media Contact:

Jake Jacobs
Media Relations
Ministry of Energy and Mines
250 952-0628

BACKGROUND 2

Chief Inspector of Mines' recommendations

The Chief Inspector of Mines for British Columbia has completed a 16-month long investigation into the Aug. 4, 2014, tailings pond breach at the Mount Polley Mine near Likely.

Based on the findings of this investigation, the chief inspector has made 19 recommendations in seven categories directed toward the mining operator - Mount Polley Mining Corporation (MPMC) - mining industry, professional organizations and the regulator - Ministry of Energy and Mines.

Many of these recommendations will be addressed through the review of the Health, Safety and Reclamation Code (the Code). Government will also work with industry and professional organizations to implement a number of other recommendations. It is anticipated this work will be completed by spring 2017.

This includes work the Association of Professional Engineers and Geoscientists of B.C. is undertaking to develop professional practice guidelines for dam site characterization assessments for release in spring 2016. Those guidelines will outline the standard of care and professional obligations professional engineers and geoscientists must uphold when conducting these assessments, and will define the roles and responsibilities of the various participants and stakeholders involved in this process.

Recommendations for the mining operator:

1. Proponent governance

- * Mine dam safety manager - any mine with a tailings storage facility (TSF) should have a qualified individual designated as a mine safety manager responsible for oversight of planning, design, operation, construction and maintenance, and surveillance of the TSF, and associated site-wide water management (aligns with independent panel recommendation).

- * Water balance management - water management and water balance issues for mining projects must be designed by a qualified professional (aligns with independent panel recommendation).

- * TSF operations manual - mine manager should ensure the operation, maintenance and surveillance manual required by the Code for all impoundments adheres to applicable Canadian Dam Association and Mining Association of Canada guidelines.

- * Mine emergency response plan - mine manager must ensure that the Mine Emergency Response Plan adheres to applicable regulations, is maintained on a regular basis for currency, incorporates appropriate response measures to emergencies including those involving the TSF, and is written and distributed in such format as to serve as a procedural guide during an emergency or other event.

- * Risk recognition and communication - all mine personnel have a role to play in recognizing and reporting risk conditions, especially those that could affect health, safety and environmental protection, and should be educated in the recognition of conditions and events that could impact TSF safety or contravene applicable permit conditions and regulations.

Recommendations for the mining industry:

2. TSF design

- * Tailings storage and water management systems and structures should be designed for worker and public safety and the protection of the environment (aligns with independent panel recommendation).

- * Mines with impoundments should each develop independent technical review boards to provide additional perspectives on site investigation, site selection, design, construction, maintenance, operations, surveillance, water management and closure (aligns with independent panel recommendation).

Recommendations for professional organizations:

3. Professional and association standards

- * The Association of Professional Engineers and Geoscientists of BC, The Mining Association of Canada, and the Canadian Dam Association should update and strengthen guidelines and standards of practice including those specific to TSF design and management, dam safety and construction (aligns with independent panel recommendation).
- * The Regulator (MEM) should consider and incorporate as appropriate guidelines from these external associations as applicable and consistent with MEM objectives (aligns with independent panel recommendation).

Recommendations for the regulator:

4. Regulator functions

- * The Regulator should undertake a comprehensive review of the Code to ensure that the lessons learned and recommendations from this report are fully considered and appropriately incorporated.
- * The Regulator should ensure a perspective that spans the life of the mine be considered for Mines Act permit applications, while acknowledging that the nature of mining frequently requires changes to the life-of-mine plan (aligns with independent panel recommendation).
- * The Regulator must enhance its investigative capacity, as well as its ability to exercise its existing compliance and enforcement authority under the Mines Act and Code. A supported director-equivalent position specific to investigation, compliance and enforcement should be established to evaluate and oversee these roles. To increase compliance and achieve greater safety at mines, a full range of regulatory tools, such as incentives, administrative penalties, outside agency collaboration and other best practices should be considered (aligns with independent panel recommendation).
- * A regulatory dam safety manager position dedicated to the coordinated regulatory oversight of tailings dams should be established (aligns with independent panel recommendation).
- * The Ministry of Energy and Mines should conduct an internal review of operational and business practices.

5. Strengthening records management

- * To support long-term integrated decision-making by the Regulator, (MEM) should establish a formal documentation management system for all mines from development to post-closure. This system will provide greater openness and transparency of MEM decisions.

6. Regulatory integration

- * Government should review the Ministries of Environment (MOE) and Energy and Mines and look for opportunities where processes and standards can be aligned to support timely and effective outcomes that meet agency objectives (environmental protection, worker health and

safety, facilities integrity).

* Government should review MEM and MOE permitting processes and look for opportunities to integrate and align them as appropriate to avoid duplication and increase efficiencies.

7. Fostering innovation:

* MEM, the industry, professional organizations, and educational institutions should continue to seek new collaborative opportunities to foster education. This initiative could include the availability of standards for education to better define the knowledge, skills and abilities for various accountabilities within mining, and to increase the knowledge base, information sharing and innovation.

* Government and industry should support research and development efforts to improve tailings processing, dewatering and discharge water treatment technologies (aligns with independent panel recommendation).

Media Contact:

Jake Jacobs
Media Relations
Ministry of Energy and Mines
250 952-0628

BACKGROUNDER 3

Mount Polley Mine tailings storage facility construction chronology

The Mount Polley Mine tailings storage facility (TSF) was designed to be built and permitted in stages over the life of the mine, with each stage driven by a number of variables, including mine plan, milling process water requirements, storage capacity for tailings and storage capacity for mine-influenced water.

The stages were also dependent on a sufficient supply of construction materials (quarry or run-of-mill rock) as well as construction capacity, including adequate time in a construction season and logistics limitations such as equipment availability or weather constraints.

The Ministry of Energy and Mines evaluated and issued permits under the Mines Act for each successive stage of construction. Periodic inspections by MEM geotechnical inspectors were conducted at the site.

Chronology of construction stages:

Stage 1a to 931 metres - 1995-96. The initial Mines Act permit for Mount Polley Mine, issued Aug. 3, 1995, approved the construction of a starter dam for the TSF to an elevation of 931 metres, an embankment with a maximum height of 11 metres.

Stage 1b to 934 metres - 1996-98. The planned raise to an elevation of 934 metres was approved on Sept. 23, 1996.

Stage 2 - 1998-2000. An application for a Mines Act permit amendment to raise the dam to 940 metres was approved on April 7, 1998.

Stage 3 - 2000-01. Stage 3 was approved on June 13, 2000, allowing a raise to 944 metres. An additional Mines Act permit amendment application for Stage 3 to increase the raise to 945 metres was approved May 30, 2001.

Care and maintenance - 2001- 05. Mine operations were suspended in October 2001 and the mine was placed in care-and-maintenance status. Over the course of the closure, substantial water accumulated in both the pits and the TSF.

Stage 4 - 2005-06. A restart permit was issued May 4, 2005. The accompanying application to raise the dam to 948 metres was approved on May 25, 2005.

Stage 5 - 2006-07. An application for a Stage 5 raise of the dam to 951 metres was approved on Aug. 2, 2006.

Stage 6a - 2007-08. The Stage 6 raise planned for an elevation of 958 metres was issued a Mines Act permit amendment on Feb. 9, 2008 and resulted in a raise to 954 metres.

Stage 6b - 2009-11. The second year of construction completed the Stage 6 raise to 958 metres.

Stage 7 - 2011-12. An amendment application to raise the dam to 960.5 metres was approved Aug. 15, 2011.

Stage 8 - 2012-13. The application for the Stage 8 raise to 963.5 metres was approved on June 29, 2012. In the same construction season, an additional application amending the Stage 8 raise to 965 metres was approved Oct. 15, 2012.

Stage 9 - 2013-14. The application for a Stage 9 raise to 970 metres was approved Aug. 9, 2013.

Stage 10 (planned) - 2014. A Stage 10 design was produced, and a Mines Act permit amendment application was submitted but no Stage 10 raise was commenced due to the failure of the TSF embankment. The Stage 10 raise was planned to achieve a crest elevation of 972.5 metres, raise the buttress along the main embankment and add a buttress along the full length of the perimeter embankment.

Media Contact:

Jake Jacobs
Media Relations
Ministry of Energy and Mines
250 952-0628

BACKGROUNDER 4

Government response to Mount Polley Mine tailings storage facility breach

On Aug. 4, 2014, a large and unprecedented breach occurred at the Mount Polley Mine tailings storage facility. Government took immediate steps to respond, addressing health and safety concerns and initiating three investigations.

Water sampling by Ministry of Environment (MOE) staff began on the evening of Aug. 4, 2014, and remains ongoing. The drinking water ban was lifted by Interior Health for Quesnel Lake,

outside the immediate area of impact - 100 metres from the mouth of Hazeltine Creek, on Aug. 13, 2014. To date, MOE has taken over 190 water samples and continues to monitor impacts on fish. MOE's sampling is in addition to the more than 3,800 water samples taken by the Mount Polley Mining Corporation (MPMC).

As part of the pollution abatement order issued by MOE on Aug. 5, 2014, MPMC was ordered to take immediate action to stop the further release of mine tailings into nearby waterways and to submit environmental impact assessments and clean-up action plans to the ministry, including plans to stabilize Hazeltine Creek.

In December 2014, the Ministry of Energy and Mines approved an amendment to the MPMC Mines Act permit to allow the company to begin repairs of the breach in its tailings storage facility dam. This work was completed in April 2015.

Throughout the response and remediation process, government and the Mount Polley Mining Corporation have held regular community meetings to keep residents up to date on efforts to address the breach and related issues. To date, more than 20 community meetings have been held for residents of Likely, Williams Lake and members of the Soda Creek Indian Band (Xats'ull First Nation) and Williams Lake Indian Band.

Since the August 2014 failure of the tailings pond at Mount Polley Mine, the provincial government has continued to oversee all environmental remediation work undertaken by the MPMC. Phase 1 of this work, which focused on stabilizing Hazeltine Creek so it would be safe over the winter months and through the higher water flows from spring freshet is now complete. To-date, the company has spent nearly \$70 million on remediation work.

Phase 2 of the remediation and restoration will run through the summer of 2016 and beyond. It will focus on repairing impacts of the breach and will also have active participation from area First Nations and local communities.

On June 5, 2015, MPMC released its Post Event Environmental Impact Assessment Report which provides detailed information on the physical, chemical and biological impacts of the spill and will inform future work in the area. This document is available at:
<http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley/>

On Jan. 30, 2015, the Independent Expert Engineering Investigation and Review Panel delivered a Final Report on its investigation into the cause of the failure of the tailings storage facility at the Mount Polley Mine. The report also included the release of 35,000 pages of documentation related to the panel's investigation. The panel concluded the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in its original design and made seven recommendations to prevent such incidents in the future.

Government committed to implement all of the panel's recommendations and on June 24, 2015, Energy and Mines Minister Bill Bennett appointed a Code Review Committee pursuant to section 34 of the Mines Act to determine how best to implement the panel's recommendations.

On July 9, 2015, statutory decision-makers with the ministries of Energy and Mines and Environment conditionally authorized the Mount Polley Mine Corporation to begin restricted operations. The amended Mines Act permit authorizes the company to operate at roughly half the rate of normal operations. The permit does not provide authorization for use of the tailings

facility during the operation. Mount Polley Mine will use Springer Pit, an existing open pit on the mine site, to manage the tailings.

On Nov. 30, 2015, the Province approved MPMC's application for a short-term permit to treat and then discharge water outside of the mine site. The permit is needed because it is estimated that, under normal precipitation conditions, water levels in Springer Pit will reach permitted capacity in April 2016.

Mount Polley Mining Corporation must submit a long-term water treatment and discharge plan to government by June 30, 2016, in order to continue operations.

A third independent investigation into the cause of the Mount Polley tailings pond breach is being led by British Columbia's Conservation Officer Service, and assisted by Environment Canada, Department of Fisheries and Oceans Canada and the RCMP.

Media Contact:

Jake Jacobs
Media Relations
Ministry of Energy and Mines
250 952-0628

Connect with the Province of B.C. at: www.gov.bc.ca/connect

Rioux, Luke MEM:EX

From: Wallace-Deering, Eric MEM:EX
Sent: Thursday, December 17, 2015 12:14 PM
To: James, Ben LASS:EX
Cc: Petrie, Cynthia MEM:EX; Togneri, Sebastien MEM:EX
Subject: MEM NR Government takes action on Chief Inspector of Mines' recommendations
Attachments: DRAFT.pdf

Importance: High

Hi Ben,

As discussed with Cynthia, attached is our NR regarding the Chief Inspector of Mines report that is being published today.

Cynthia is suggesting after 1:30 for timing.

The attachment says draft but it's final.

Eric

NEWS RELEASE

For Immediate Release
[release number]
[Date]

Ministry of Energy and Mines

Government takes action on Chief Inspector of Mines Recommendations

VICTORIA – In response to the findings and recommendations of the Chief Inspector of Mines (CIM) Investigation into the tailings storage facility (TSF) at Mount Polley Mine in August 2014, Energy and Mines Minister Bill Bennett announced today that government will introduce new regulations and requirements that will make British Columbia a national and international leader in safety standards for tailings storage facilities.

The CIM report found, as did the Independent Expert Panel in January, that the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in the design or in subsequent dam raises. The CIM found that the initial site investigations did not meet industry best practices, although that process is not currently prescribed. The chief inspector also found other factors including the slope of the perimeter embankment, inadequate water management, insufficient beaches and a sub excavation at the outside toe of the dam exacerbated the collapse of the dam and the ensuing environmental damage. While the breach would not have occurred had it not been for the undetected glaciolacustrine layer of soils, the consequences of the breach were made worse by the other factors.

The chief inspector of mines (CIM) investigation team conducted approximately 100 interviews and reviewed over 100,000 pages of documents going back to 1989. This is the largest and most complex investigation and analysis ever done in BC.

The CIM made 19 recommendations in seven categories directed toward the mining operator, the mining industry, professional organizations and the government regulator to prevent such incidents in the future and build a safer, more sustainable industry. Government will be working to implement all of the recommendations. Key recommendations include:

- All mines with TSFs will be required to have a designated mine dam safety manager and a designated individual to oversee the mine's water balance and water management plan.
- Mines with TSFs will be required to have water management plans designed by a qualified professional.
- Independent technical review boards will be required for all mines with TSFs.
- Establish a dedicated investigation, compliance and enforcement team within the Ministry of Energy and Mines lead by a new Deputy Chief Inspector of Mines. This team will provide additional support and oversight of existing ministry investigation, compliance and enforcement functions.

- To strengthen records management and improve openness and transparency around design, construction and operation, government will establish a formal documentation management system for all TSF from development to post-closure.
- Foster innovations in the mining sector that improve current technologies in tailings processing, dewatering and discharge water treatment.

Many of these recommendations will be addressed through the review of the code. Government will also work with industry and the professional organizations on implementing the other recommendations. It is anticipated this work will be completed by spring 2017.

Other actions will be taken to strengthen government's compliance and enforcement of mining. Minister Bennett plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

The CIM found that the company and its engineers employed weak practices on the mine site and many recommendations go to new standards and guidelines to improve these practices. Weak practices, however, do not constitute a legal contravention of existing mining legislation. The CIM, with advice from the Ministry of Justice, did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, the chief inspector of mines determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.

The CO Service is still conducting its investigation into the Mt Polley accident. Their investigation is based on compliance with the Ministry of Environment legislation. It is possible that this investigation may find non-compliance that warrants a report to Crown Counsel.

Quotes:

Minister of Energy and Mines Bill Bennett –

"We've learned from this investigation that in the case of Mount Polley, the allowable margin of risk around the design, construction and management of the tailings storage facility was too narrow to allow for an unknown factor, the layer of unstable soils below the dam embankment. We've also learned that weak practices on the mine site increased the risk of dam failure and exacerbated environmental consequences from the breach."

"This is unacceptable. My commitment is to implement all recommendations, work with the MABC and MAC, the APEGBC and the CDA to ensure that risk of dam failure is reduced by better regulations, better policies and better professional guidelines."

Chief Inspector of Mines Al Hoffman –

“We conducted a very thorough and in-depth examination of the Mount Polley Mine Corporation’s actions from its initial site investigations 26 years ago to present. Through our investigation we determined that while the mine did not contravene any existing regulatory requirements, its management and operational practices failed in a number of areas such as water management and misplaced confidence in the TSF design.

My recommendations address these issues and will strengthen British Columbia’s regulatory framework and build a safer, more sustainable industry in B.C.

Learn More:

A copy of the Chief Inspector of Mines investigation is available here:
www.gov.bc.ca/mountpolleyinvestigation

Four backgrounders follow.

BACKGROUND

Findings of the Chief Inspector

The Chief Inspector of Mines for British Columbia has completed a 16-month-long investigation into the Aug. 4, 2014 tailings pond breach at the Mount Polley Mine near Likely, B.C. The CIM investigation team consisted of the chief inspector of mines, primary investigator, file coordinator, information analysts, technical writer, geotechnical engineers, geoscientists and hydrologists from Klohn Crippen Berger, and a retired RCMP investigator. The team was supported throughout the investigation by staff with the Ministry of Energy Mines.

The investigation determined Mount Polley Mining Corporation (MPMC) and its engineering consultants did not fully recognize and manage geotechnical and water management risks associated with the design, construction, factor of safety and operation of the tailings storage facility because of the undetected UGLU.

The following is a summary of the chief inspector's findings:

- At approximately 11:40 pm on Aug. 3, 2014 a section of the Mount Polley Mine tailings storage facility (TSF) perimeter embankment failed and slumped roughly five metres. Water in the impoundment almost immediately overtopped the slumped crest. The failure led to a major and ongoing erosion breach at approximately 1:08 am on Aug. 4, 2014, which released tailings and process water into the environment beyond the mine site.
- The mechanism of the structural failure was due to a lightly overconsolidated glaciolacustrine clay unit (UGLU) approximately 10 metres below the dam's foundation. This clay layer was not properly identified and accounted for in the design of the structure.
- The investigation found that Mount Polley Mining Corporation and the engineers of record did not conduct adequate studies and site investigations of the perimeter embankment foundation. This was not a contravention of any existing regulatory requirements as there were no specific guidelines or regulatory requirements in place for foundation investigations.
- To address this issue, the Association of Professional Engineers and Geoscientists of B.C. is developing professional practice guidelines for dam site characterization assessments for release in spring 2016. The guidelines will outline the standard of care and professional obligations professional engineers and geoscientists must uphold when conducting these assessments, and will define the roles and responsibilities of the various participants and stakeholders involved in this process.
- Because the UGLU was not properly identified, it was not correctly factored in when determining the strength of the dam foundation. As a result, the structural failure occurred

because of two additional conditions that contributed to the dam failure. One was an over-steepening of the downstream slope of the dam, coupled with the constructed height. The other was an unfilled sub-excavation for a buttress foundation at the toe of the embankment at the site of the failure.

- Neither of these conditions contravened existing regulatory requirements. The steepness of the downstream slope was approved by the engineer of record to meet Canadian Dam Association (CDA) guidelines for safety, and the sub-excavation was in general conformance with the design intent.
- The structural failure of the embankment combined with the condition of the tailings pond — with insufficient beaches and too much supernatant water — led to an erosional failure of the embankment, that rapidly widened into a complete breach and resulted in the release of tailings and water into the surrounding environment. Two investigations have now confirmed the breach would not have happened if details of the clay layer had been fully understood and factored into the design of the dam.
- These conditions occurred because MPMC failed to effectively manage water at the mine site and in the TSF. An adequate water management plan did not exist, there was no qualified individual responsible for water balance in the TSF, and MPMC did not adequately characterize the risk of surplus supernatant water, which had been compounding since the mine reopened in 2005.
- This was not a contravention of any existing regulatory requirements as there were no specific guidelines or regulatory requirements in place for water management for mine sites.
- There is a need for the Regulator (MEM) to formalize professional reliance guidelines for tailings storage facility design, construction and management in legislation, regulation and/or the Health, Safety and Reclamation Code for Mines in British Columbia.

BACKGROUND

Chief Inspector of Mines recommendations

The Chief Inspector of Mines for British Columbia has completed a 16-month long investigation into the August 4, 2014 tailings pond breach at the Mount Polley Mine near Likely, B.C. Based on the findings of this investigation, the chief inspector has made 19 recommendations in seven categories directed toward the mining operator – Mount Polley Mining Corporation (MPMC) – mining industry, professional organizations and the regulator – Ministry of Energy and Mines (MEM).

Many of these recommendations will be addressed through the review of the Code. Government will also work with industry and the professional organizations to ensure a number of other recommendations. It is anticipated this work will be completed by spring 2017.

This includes work the Association of Professional Engineers and Geoscientists of B.C. is undertaking to develop professional practice guidelines for dam site characterization assessments for release in spring 2016. Those guidelines will outline the standard of care and professional obligations professional engineers and geoscientists must uphold when conducting these assessments, and will define the roles and responsibilities of the various participants and stakeholders involved in this process.

Recommendations for the mining operator:

1. Proponent Governance

- Mine dam safety manager – any mine with a tailings storage facility (TSF) should have a qualified individual designated as a mine safety manager responsible for oversight of planning, design, operation, construction and maintenance, and surveillance of the TSF, and associated site-wide water management. (Aligns with independent panel recommendation)
- Water balance management – water management and water balance issues for mining projects must be designed by a qualified professional. (Aligns with independent panel recommendation)
- TSF operations manual – mine manager should ensure the operation, maintenance and surveillance manual (OMS) required by the Code for all impoundments adheres to applicable CDA and MAC guidelines.
- Mine emergency response plan – mine manager must ensure that the Mine Emergency Response Plan (MERP) adheres to applicable regulations, is maintained on a regular basis for currency, incorporates appropriate response measures to emergencies

including those involving the TSF, and is written and distributed in such format as to serve as a procedural guide during an emergency or other event.

- Risk recognition and communication – all mine personnel have a role to play in recognizing and reporting risk conditions, especially those that could affect health, safety and environmental protection; and should be educated in the recognition of conditions and events that could impact TSF safety or contravene applicable permit conditions and regulations.

Recommendations for the mining industry:

2. TSF Design

- Tailings storage and water management systems and structures should be designed for worker and public safety and the protection of the environment. (Aligns with independent panel recommendation)
- Mines with impoundments should each develop independent technical review boards (ITRB) to provide additional perspectives on site investigation, site selection, design, construction, maintenance, operations, surveillance, water management and closure. (Aligns with independent panel recommendation)

Recommendations for professional organizations:

3. Professional and Association Standards

- The Association of Professional Engineers and Geoscientists of BC (APEGBC), The Mining Association of Canada (MAC), and the Canadian Dam Association (CDA) should update and strengthen guidelines and standards of practice including those specific to TSF design and management, dam safety and construction. (Aligns with independent panel recommendation)
- The Regulator should consider and incorporate as appropriate guidelines from these external associations as applicable and consistent with MEM objectives. (Aligns with independent panel recommendation)

Recommendations for the Regulator:

4. Regulator Functions

- The regulator should undertake a comprehensive review of the Code to ensure that the lessons learned and recommendations from this report are fully considered and appropriately incorporated.
- The regulator should ensure a perspective that spans the life of the mine be considered for Mines Act permit applications, while acknowledging that the nature of mining frequently requires changes to the life-of-mine plan. (Aligns with independent panel recommendation)
- The Regulator must enhance its investigative capacity, as well as its ability to exercise its existing compliance and enforcement authority under the Mines Act and Code. A supported director equivalent position specific to investigation, compliance and

enforcement should be established to evaluate and oversee these roles. To increase compliance and achieve greater safety at mines, a full range of regulatory tools, such as incentives, administrative penalties, outside agency collaboration and other best practices should be considered. (Aligns with independent panel recommendation)

- A regulatory dam safety manager position dedicated to the coordinated regulatory oversight of tailings dams should be established. (Aligns with independent panel recommendation)
- The Ministry of Energy and Mines (MEM) should conduct an internal review of operational and business practices.

5. Strengthening Records Management

- To support long-term integrated decision making by the regulator, MEM should establish a formal documentation management system for all mines from development to post-closure. This system will provide greater openness and transparency of MEM decisions.

6. Regulatory Integration

- Government should review the Ministries of Environment and Energy and Mines and look for opportunities where processes and standards can be aligned to support timely and effective outcomes that meet agency objectives (environmental protection, worker health and safety, facilities integrity).
- Government should review MEM and MOE permitting processes and look for opportunities to integrate and align them as appropriate to avoid duplication and increase efficiencies.

7. Fostering Innovation:

- MEM, the industry, professional organizations, and educational institutions should continue to seek new collaborative opportunities to foster education. This initiative could include the availability of standards for education to better define the knowledge, skills, and abilities for various accountabilities within mining; and to increase the knowledge base, information sharing, and innovation.
- Government and industry should support research and development efforts to improve tailings processing, dewatering, and discharge water treatment technologies. (Aligns with independent panel recommendation)

BACKGROUNDER

Mount Polley Mine tailings storage facility construction chronology

The Mount Polley Mine tailings storage facility (TSF) was designed to be built and permitted in stages over the life of the mine, with each stage driven by a number of variables, including mine plan, milling process water requirements, storage capacity for tailings, and storage capacity for mine-influenced water. The stages were also dependent on a sufficient supply of construction materials (quarry or run-of-mill rock) as well as construction capacity, including adequate time in a construction season and logistics limitations such as equipment availability or weather constraints.

The Ministry evaluated and issued permits under the *Mines Act* for each successive stage of construction. Periodic inspections by MEM geotechnical inspectors were conducted at the site.

Chronology of construction stages:

Stage 1a to 931 metres – 1995-1996. The initial *Mines Act* permit for Mount Polley Mine, issued Aug. 3, 1995, approved the construction of a starter dam for the TSF to an elevation of 931 metres, an embankment with a maximum height of 11 metres.

Stage 1b to 934 metres – 1996-1998. The planned raise to an elevation of 934 metres was approved on Sept. 23, 1996.

Stage 2 – 1998-2000. An application for a *Mines Act* permit amendment to raise the dam to 940 metres was approved on April 7, 1998.

Stage 3 – 2000-2001. Stage 3 was approved on Jun. 13, 2000, allowing a raise to 944 metres. An additional *Mines Act* permit amendment application for Stage 3, to increase the raise to 945 metres, was approved May 30, 2001.

Care and Maintenance – 2001- 2005. Mine operations were suspended in October 2001 and the mine was placed in care-and-maintenance status. Over the course of the closure, substantial water accumulated in both the pits and the TSF.

Stage 4 – 2005-2006. A restart permit was issued May 4, 2005. The accompanying application to raise the dam to 948 metres was approved on May 25, 2005.

Stage 5 – 2006-2007. An application for a Stage 5 raise of the dam to 951 metres was approved on Aug. 2, 2006.

Stage 6a – 2007-2008. The Stage 6 raise planned for an elevation of 958 metres was issued a Mines Act permit amendment on Feb. 9, 2008, and resulted in a raise to 954 metres.

Stage 6b – 2009-2011. The second year of construction completed the Stage 6 raise to 958 metres.

Stage 7 – 2011-2012. An amendment application to raise the dam to 960.5 metres was approved Aug. 15, 2011.

Stage 8 – 2012-2013. The application for the Stage 8 raise to 963.5 metres was approved on Jun. 29, 2012. In the same construction season, an additional application amending the Stage 8 raise to 965 metres was approved Oct. 15, 2012.

Stage 9 – 2013-2014. The application for a Stage 9 raise to 970 metres was approved Aug. 9, 2013.

Stage 10 (Planned) – 2014. A Stage 10 design was produced, and a Mines Act permit amendment application was submitted, but no Stage 10 raise was commenced due to the failure of the TSF embankment. The Stage 10 raise was planned to achieve a crest elevation of 972.5 metres, raise the buttress along the main embankment and add a buttress along the full length of the perimeter embankment.

BACKGROUND

Government response to Mount Polley Mine tailings storage facility breach

On Aug. 4, 2014, a large and unprecedented breach occurred at the Mount Polley Mine tailings storage facility. Government took immediate steps to respond, addressing health and safety concerns and initiating three investigations.

Water sampling by Ministry of Environment (MOE) staff began on the evening of Aug. 4, 2014, and remains ongoing. The drinking water ban was lifted by Interior Health for Quesnel Lake, outside the immediate area of impact -100 m from the mouth of Hazeltine Creek, on Aug. 13 2014. To date, MOE has taken over 190 water samples and continues to monitor impacts on fish. MOE's sampling is in addition to the more than 3,800 water samples taken by the Mount Polley Mining Corporation.

As part of the pollution abatement order issued by MOE on Aug. 5, 2014, the Mount Polley Mine Corporation was ordered to take immediate action to stop the further release of mine tailings into nearby waterways and to submit environmental impact assessments and clean-up action plans to the ministry, including plans to stabilize Hazeltine Creek.

In December 2014, the Ministry of Energy and Mines (MEM) approved an amendment to the Mount Polley Mine Corporation Mines Act permit to allow the company to begin repairs of the breach in its tailings storage facility dam. This work was completed in April 2015.

Throughout the response and remediation process, government and the Mount Polley Mining Corporation have held regular community meetings to keep residents up to date on efforts to address the breach and related issues. To date, more than 20 community meetings have been held for residents of Likely, Williams Lake and members of the Soda Creek Indian Band (Xats'ull First Nation) and Williams Lake Indian Band.

Since the August 2014 failure of the tailings pond at Mount Polley Mine, the provincial government has continued to oversee all environmental remediation work undertaken by the Mount Polley Mining Company. Phase 1 of this work, which focused on stabilizing Hazeltine Creek so it would be safe over the winter months and through the higher water flows from spring freshet, is now complete. To-date, the company has spent nearly \$70 million on remediation work.

Phase 2 of the remediation and restoration will run through summer of 2016 and beyond. It will focus on repairing impacts of the breach, and will also have active participation from area First Nations and local communities.

On June 5, 2015, Mount Polley Mining Company (MPMC) released their Post Event Environmental Impact Assessment Report which provides detailed information on the physical,

chemical and biological impacts of the spill and will inform future work in the area. This document is available at <http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley/>.

On Jan. 30, 2015, the Independent Expert Engineering Investigation and Review Panel delivered a Final Report on its investigation into the cause of the failure of the tailings storage facility at the Mount Polley Mine. The report also included the release of 35,000 pages of documentation related to the panel's investigation. The panel concluded the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in its original design and made seven recommendations to prevent such incidents in the future.

Government committed to implement all of the panel's recommendations and on June 24, 2015, Energy and Mines Minister Bill Bennett appointed a Code Review Committee pursuant to section 34 of the Mines Act to determine how best to implement the panel's recommendations.

On July 9, 2015, statutory decision makers with the ministries of Energy and Mines and Environment conditionally authorized the Mount Polley Mine Corporation to begin restricted operations. The amended Mines Act permit authorizes the company to operate at roughly half the rate of normal operations. The permit does not provide authorization for use of the tailings facility during the operation. Mount Polley Mine will use Springer Pit, an existing open pit on the mine site, to manage the tailings.

On Nov. 30, 2015, the Province approved Mount Polley Mining Corporation's application for a short-term permit to treat and then discharge water outside of the mine site. The permit is needed because it is estimated that, under normal precipitation conditions, water levels in Springer Pit will reach permitted capacity in April 2016.

Mount Polley Mine Corporation must submit a long-term water treatment and discharge plan to government by June 30, 2016 in order to continue operations.

A third independent investigation into the cause of the Mount Polley tailings pond breach is being led by British Columbia's Conservation Officer Service (COS), and assisted by Environment Canada, Department of Fisheries and Oceans Canada and the RCMP.

Contact:

Jake Jacobs
Media Relations
Ministry of Energy and Mines
250-952-0628



Mining and Mineral
Resources Division
Ministry of
Energy and Mines

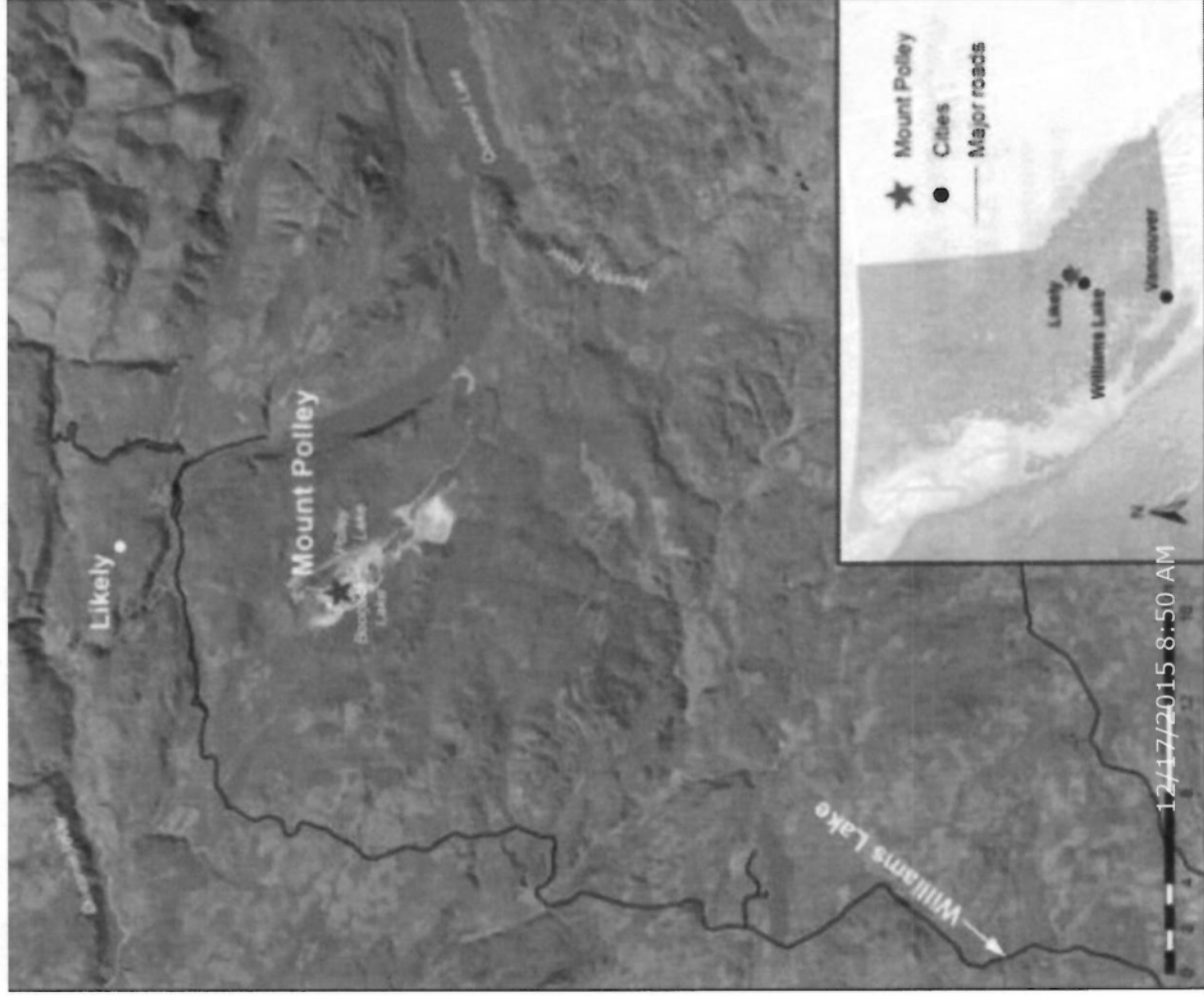
MOUNT POLLEY MINE TAILINGS STORAGE FACILITY BREACH

August 4, 2014

AL HOFFMAN, P.Eng.
CHIEF INSPECTOR OF MINES

Investigation Report
of the Chief Inspector of Mines

MOUNT POLLEY MINE
MOUNT POLLEY MINING CORPORATION
SUBSIDIARY OF
IMPERIAL METALS CORPORATION



12/17/2015 8:50 AM



MOUNT POLLEY TAILINGS STORAGE FACILITY BREACH, AUGUST 4, 2014

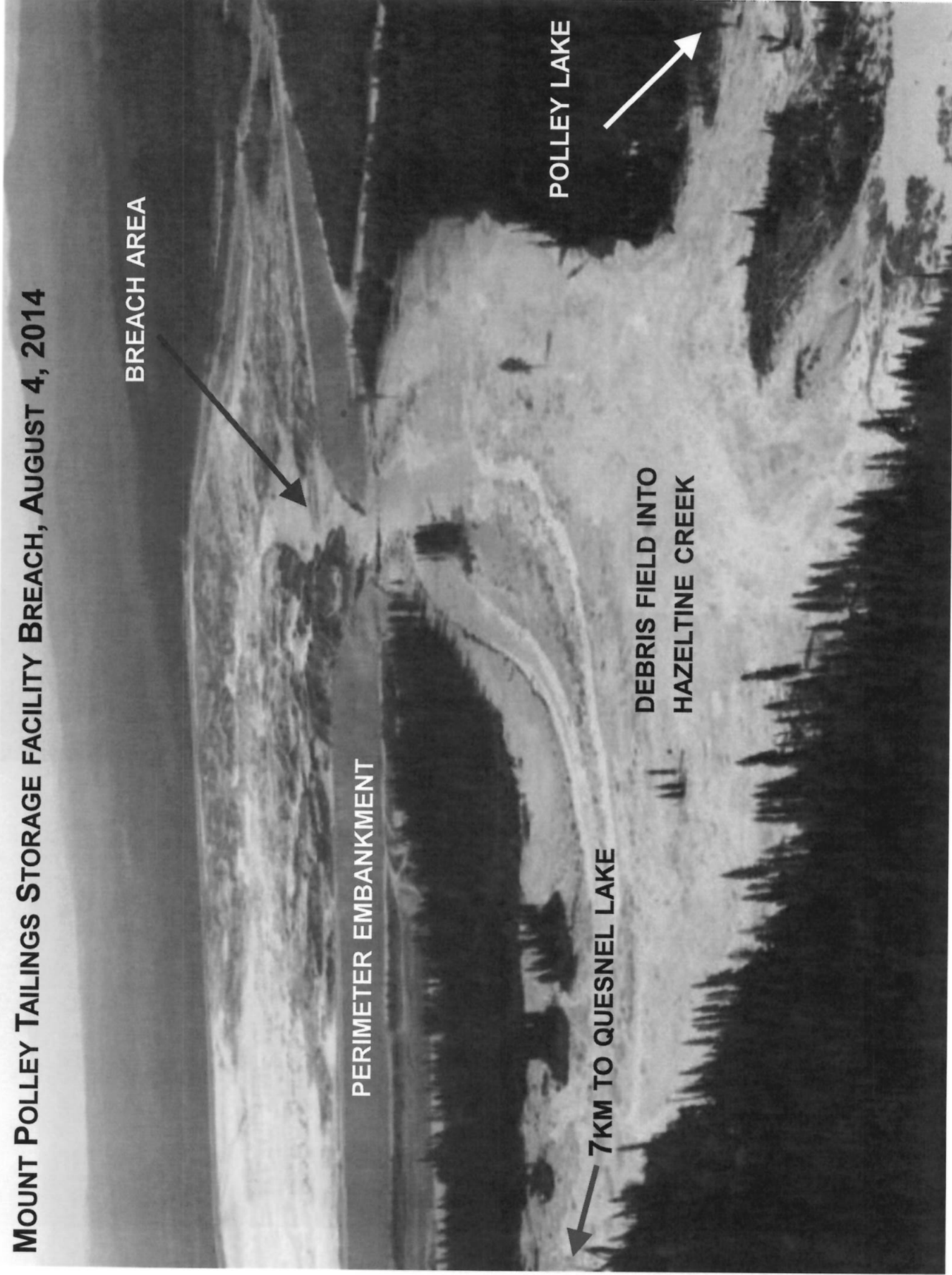
BREACH AREA

POLLEY LAKE

**DEBRIS FIELD INTO
HAZELTINE CREEK**

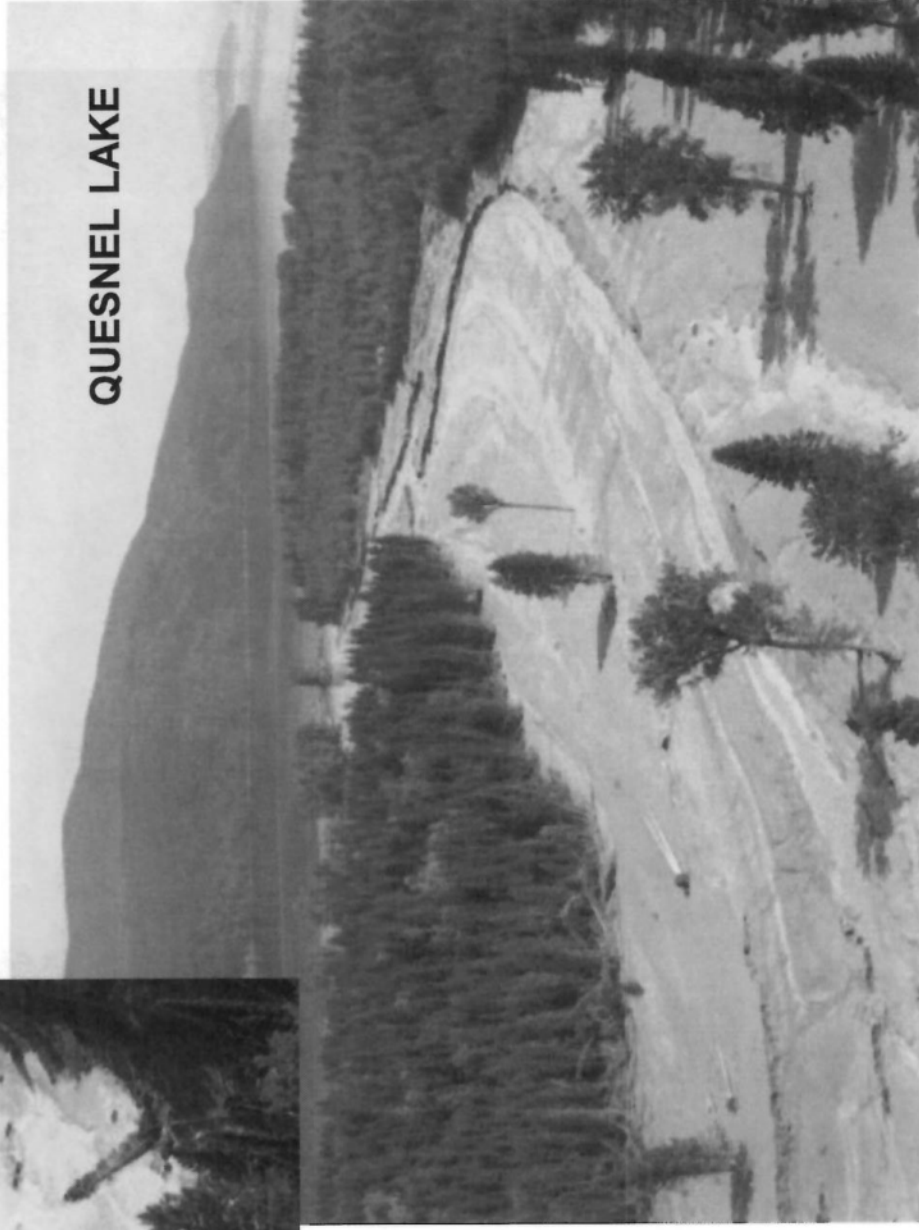
PERIMETER EMBANKMENT

7KM TO QUESNEL LAKE



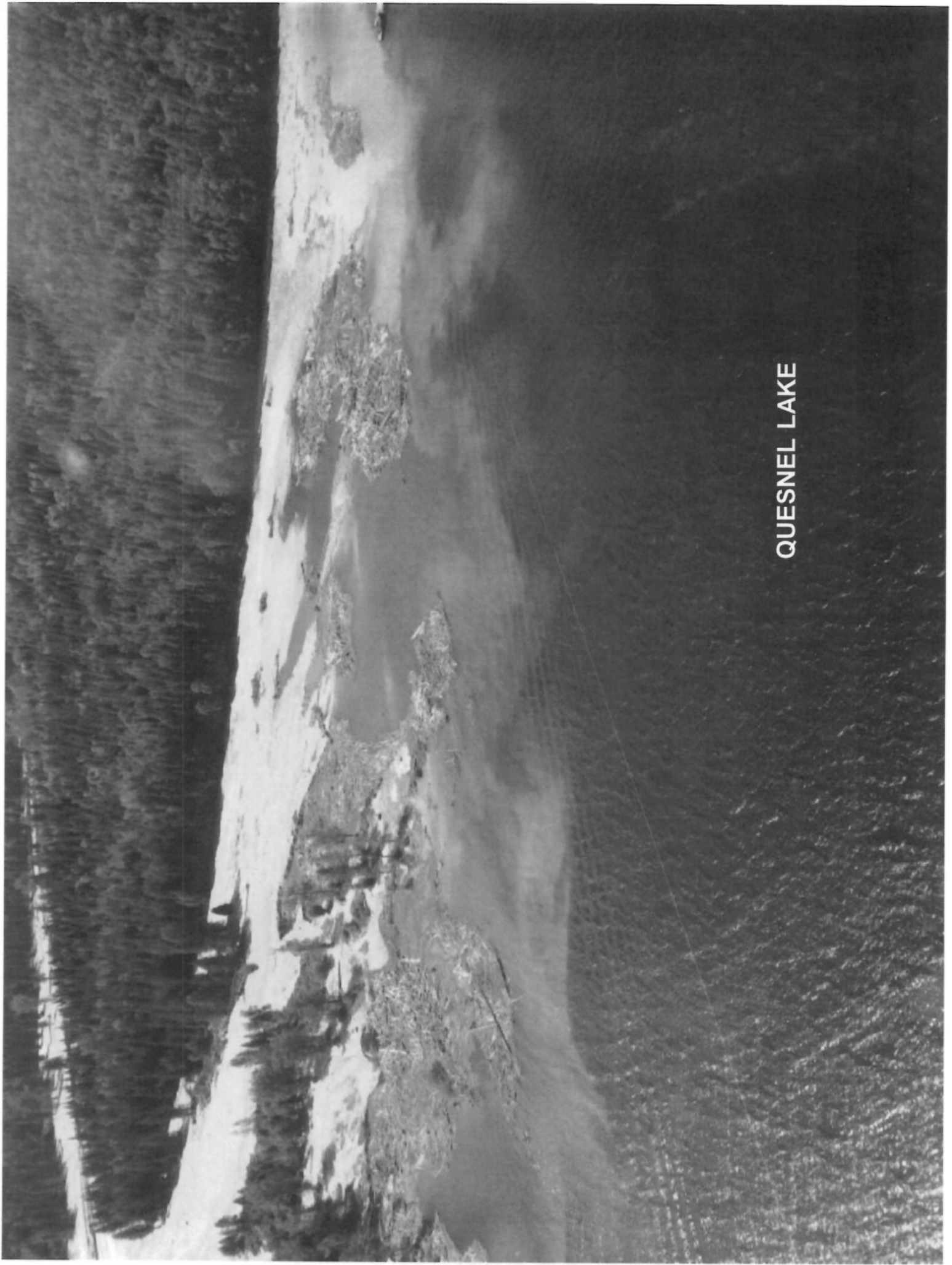


**DEBRIS FIELD THOUGH
HAZELTINE CREEK**



QUESNEL LAKE

QUESNEL LAKE





MOUNT POLLEY MINE

**TAILINGS STORAGE
FACILITY BREACH**



CONCURRENT INVESTIGATIONS

Chief Inspector of Mines

- investigation as per Section 7 of the *Mines Act*

Conservation Officer Service (COS), BC Ministry of Environment and Federal Fisheries and Oceans Canada

- conducting joint investigation pursuant to:
 - *Environmental Management Act*
 - *Federal Fisheries Act*

The Independent Expert Engineering Panel

- issued report January 30, 2015

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH

CHIEF INSPECTOR OF MINES INVESTIGATION

OBJECTIVES:

Determine:

- cause of the dam failure
- any contraventions of regulatory requirements
- orders pursuant to the *Mines Act and Code* as appropriate
- recommendations to prevent future occurrence
- if appropriate, a report to Crown Counsel for Crown's assessment of whether charges for contraventions pursuant to the *Mines Act*, should be laid.

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH



CHIEF INSPECTOR OF MINES INVESTIGATION

INCLUDED:

Largest, most complex in Mines Inspectorate history

- Adopted discipline of Major Case Management
- Review of documentation, for chronology of activities of mining company, engineering consultants and regulator
- ~100 interviews
- Geoforensic site investigations to determine *what* happened
 - “mechanism of failure”
- Root Cause Analysis to support *why* it happened, from NASA
 - “cause” of failure
- findings, lessons learned and recommendations

www.gov.bc.ca/mountpolleyinvestigation

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH



Mining and Mineral
Resources Division
**Ministry of
Energy and Mines**

MOUNT POLLEY MINE TAILINGS STORAGE FACILITY BREACH

August 4, 2014

HARVEY MCLEOD, P.Eng. P.Geo.
KLOHN CRIPPEN BERGER LTD.

Investigation Report
of the Chief Inspector of Mines

CHIEF INSPECTOR OF MINES INVESTIGATION GEOFORENSIC

Comprehensive geotechnical investigation to support Expert Panel and Chief Inspector:



- Contracted Klohn Crippen Berger
- Comprehensive site investigation and drilling program to characterize the foundation
- Field mapping, geophysics, test pits and trenches
- In situ and laboratory strength testing
- Instrumentation

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH

CHIEF INSPECTOR OF MINES INVESTIGATION

Three embankments:

- 4 km length
- 40 m to 50 m high

1. Assessed pre-breach knowledge;
2. Geoforensic investigation & analysis

Section-A

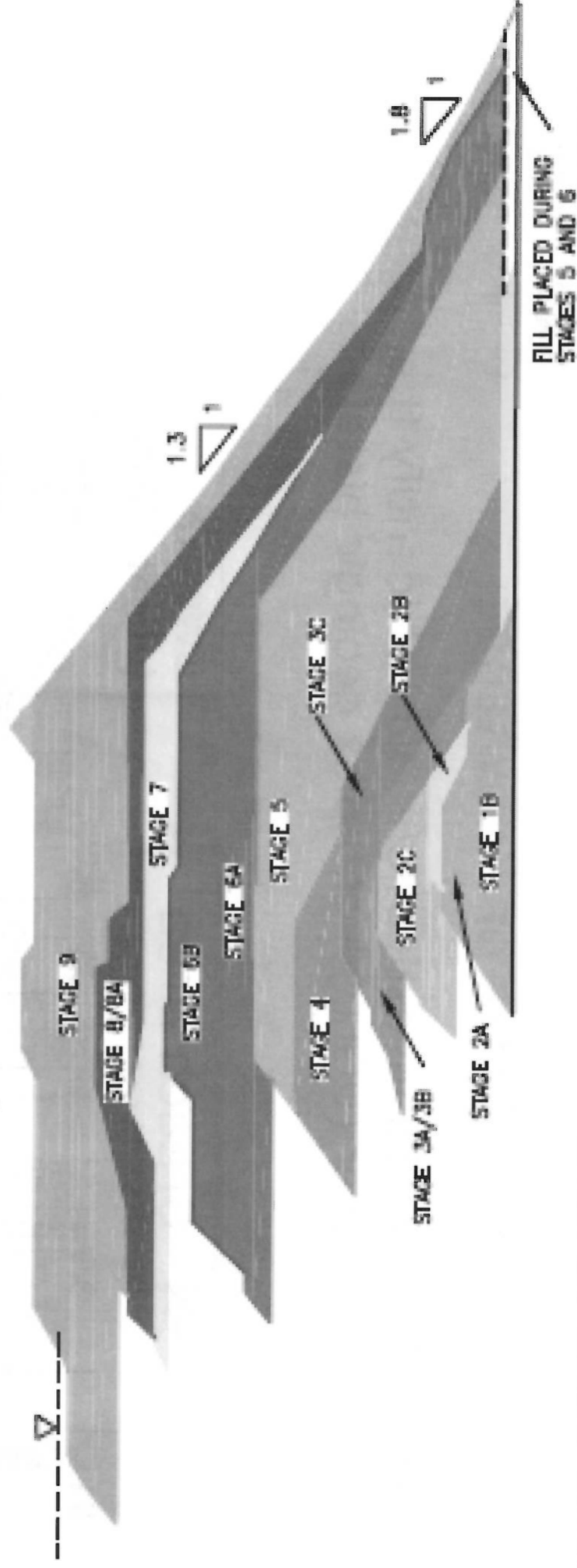


MOUNT POLLEY MINE

**TAILINGS STORAGE
FACILITY BREACH**

PRE-BREACH GEOTECHNICAL UNDERSTANDING

- Perimeter Embankment as-constructed condition
- Constructed in 9 stages (raises)
 - Modified centerline dam with low permeability core zone, downstream rockfill with filters

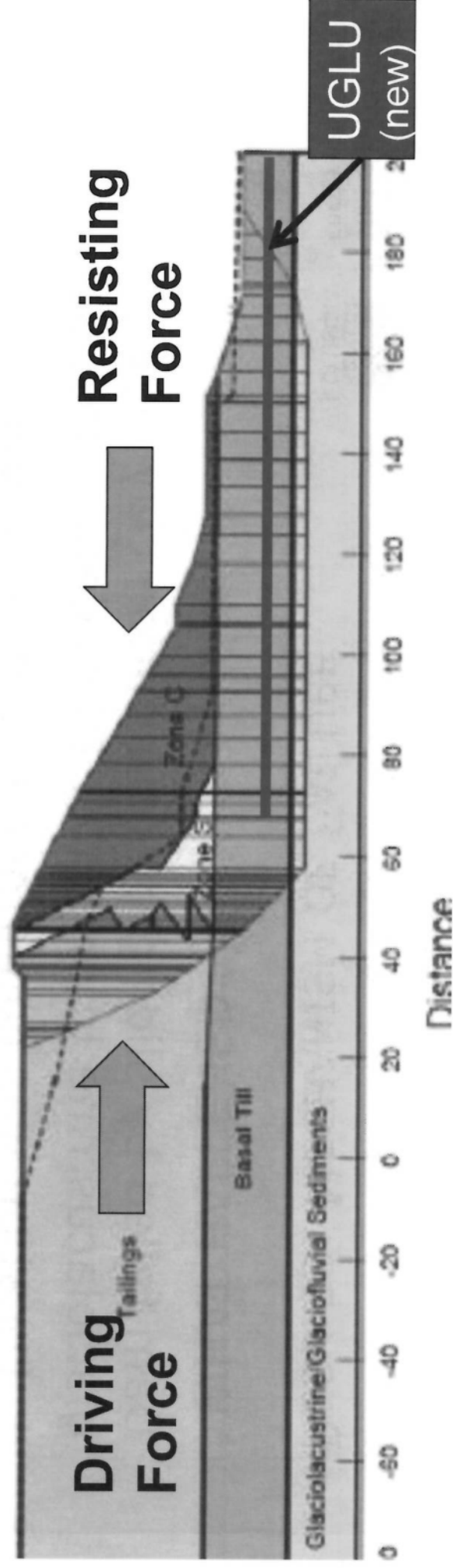


PRE-BREACH KNOWLEDGE

The soil foundation conditions did not include the UGLU.

- Purpose of stability analyses
- The expected Factor of Safety calculated for the stage 9 permit was 1.63

$$\text{Factor of Safety} = \frac{\text{Resisting Force}}{\text{Driving Force}}$$

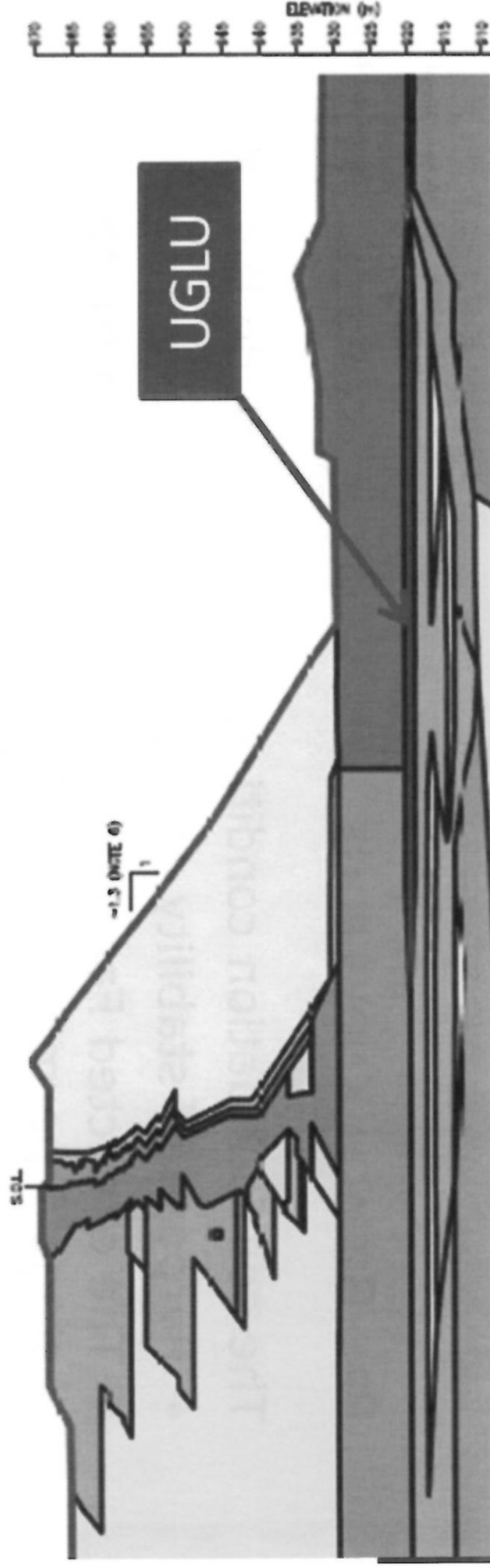


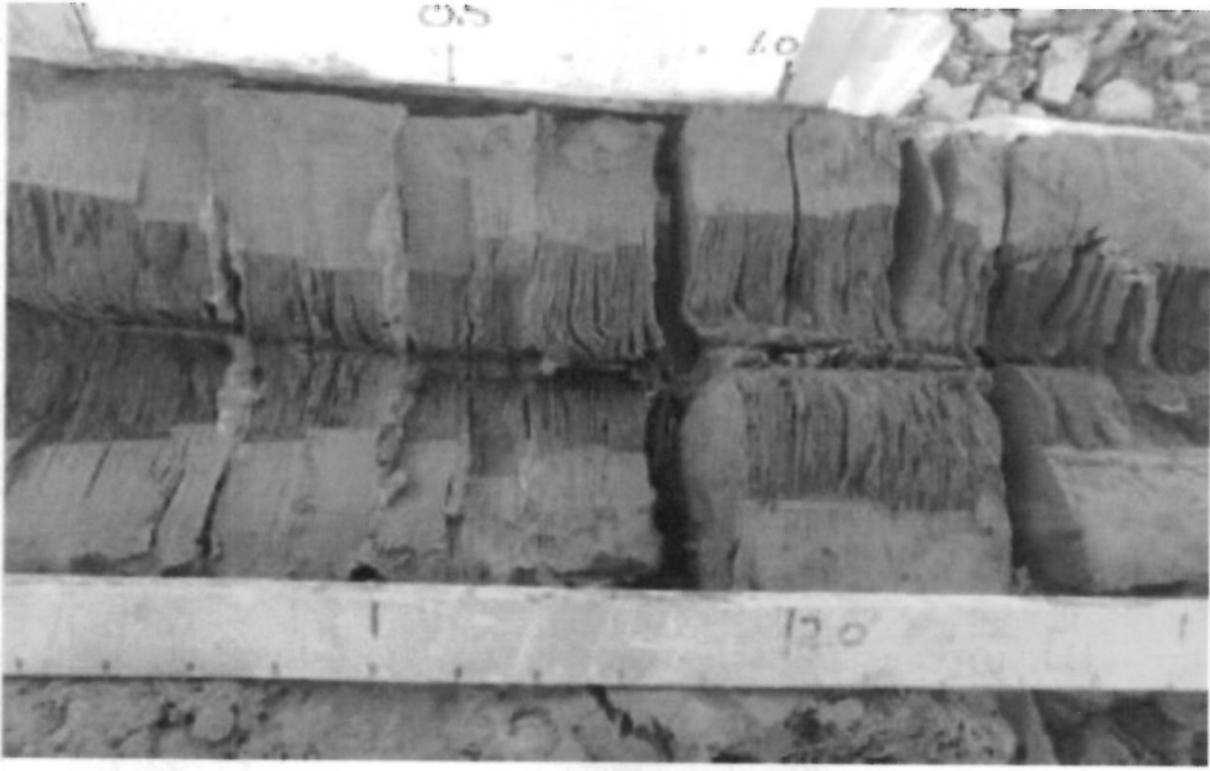
RESULTS: MECHANISM OF FAILURE

“WHAT HAPPENED”

Dam failed by sliding on foundation clay layer, glaciolacustrine in origin at 10 m depth (UGLU)

- Location was confirmed in area of breach
- 40 m high steep embankment subjected UGLU to stresses initiating progressive failure of dam
- Comprehensive analysis builds upon Expert Panel





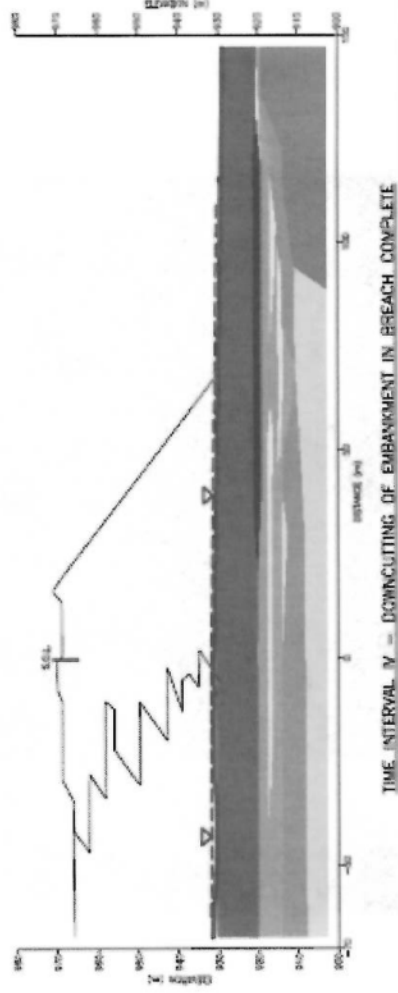
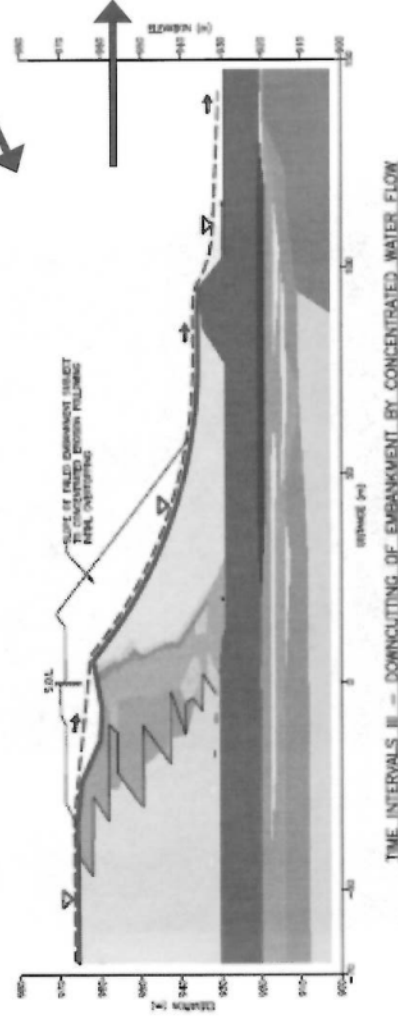
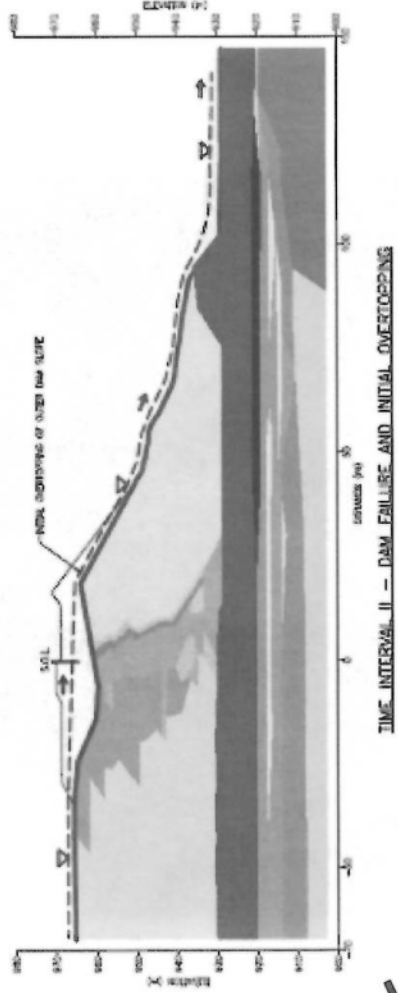
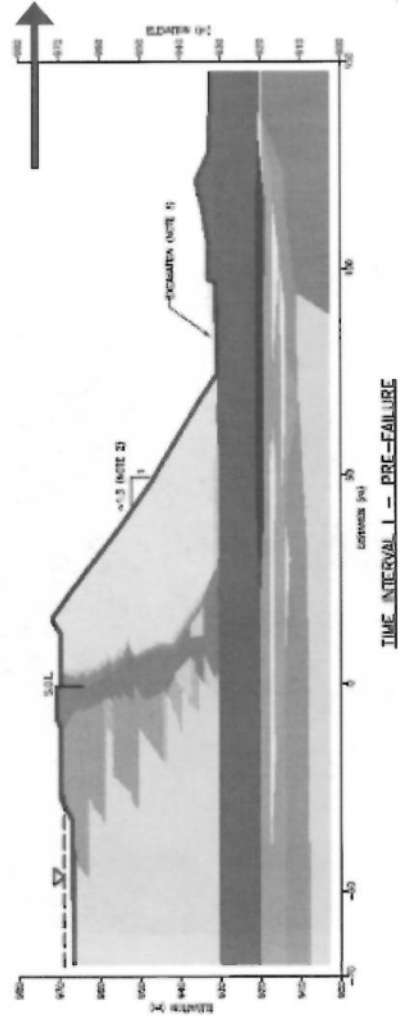
Undisturbed clay outside failed embankment area



Disturbed clay below failed embankment area

FAILURE PROGRESSION LED TO BREACH

Erosion followed the failure as the water overtopped the slumped crest of the embankment.



Conceptual Sequence of Dam Failure through Reconstructed Breach Section

Conceptual Sequence of Dam Failure through Reconstructed Breach Section

CAUSE SUMMARY

THE DAM FAILURE MECHANISM WAS **GEOTECHNICAL**:

- sliding failure on a weak clay layer 10 m below the surface

Once the embankment failed,

THE DAM BREACH MECHANISM WAS **HYDROLOGIC**:

- Water flowed over the crest and eroded the dam
- insufficient beaches did not protect the embankment from the surplus of water once embankment failed

THE ROOT CAUSES OF THE EVENT WERE **ORGANIZATIONAL**:

- absent foundation investigation standards of practice
- mistaken belief in foundation conditions
- misplaced faith in Factor of Safety
- narrow planning perspective of mine management
- failure to adequately understand and act on risk

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH

REPORT TO CROWN COUNSEL

There is not sufficient information to indicate a

contravention of existing regulatory requirements

- A sub-excavation at the toe and the over-steepened slope were in general conformance with the design
- There were no regulatory requirements for foundation characterization and beach design parameters or surplus water

There will be no Report to Crown Counsel for Crown's assessment of whether charges for contraventions pursuant to the *Mines Act*, should be laid.

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH

KEY RECOMMENDATIONS OF THE CHIEF INSPECTOR:

– MINING OPERATOR AND INDUSTRY

Mine Dam Safety Manager

- qualified individual to anticipate, recognize and prevent conditions from developing that could impact safety of TSF.

Water Management

- qualified professional design and qualified individual to oversee water balance and water management plan to anticipate and oversee the mine's water balance and water management plan.

Independent Technical Review Board

- strengthen oversight and risk management

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH



KEY RECOMMENDATIONS OF THE CHIEF INSPECTOR: -PROFESSIONAL ORGANIZATIONS

Professional Reliance Standards and Integration

The implementation of professional reliance is not adequately structured or formalized in policy

- APEGBC: foundation investigation, roles and responsibilities and transfer of EoR
- MAC: review of TSF management guidelines
- CDA: update to safety guidelines, roles, responsibilities

Then,

- MEM: Standards and guidelines to be considered and incorporated into the Code

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH



KEY RECOMMENDATIONS OF THE CHIEF INSPECTOR: -REGULATOR

Review of the Code

- Findings, lessons learned, recommendations and professional guidelines to be considered

Investigation, Compliance and Enforcement Review

- operational development and regulatory tools

Internal Records Management

- Records management system supports long-term, integrated decision making

Collaborative Education, Research & Development

- Both government and industry should support research and development efforts to improve current technologies

MOUNT POLLEY MINE

TAILINGS STORAGE
FACILITY BREACH

CONCLUSION

Findings and lessons learned confirm status quo no longer acceptable:

- complexities within mine operations need to be continuously anticipated, integrated and managed
- formalized policy, guidelines, and accountability is essential to design and management of tailing storage facilities

Continuous improvement by the mining industry, professional consultants and the Regulator will serve to meet the expectations of all British Columbians.



RECOMMENDATIONS OF THE CHIEF INSPECTOR:

19 recommendations, directed to:

- Mining Operator – MPMC
- Mining Industry
- Professional Organizations
- Regulator

For full report, visit:

www.gov.bc.ca/mountpolleyinvestigation

MOUNT POLLEY MINE

**TAILINGS STORAGE
FACILITY BREACH**

Rioux, Luke MEM:EX

From: Wallace-Deering, Eric MEM:EX
Sent: Thursday, December 17, 2015 5:28 PM
To: Petryshyn, Yarko SBRT:EX
Subject: News Alert: Taking Action on Chief Inspector of Mines' Recommendations

Hi Yarko,

Minister Bennett talked with MCO about this yesterday.

Let me know if you have any questions.

Eric

News Alert: Taking Action on Chief Inspector of Mines' Recommendations

Minister Bill Bennett has announced that government will introduce new regulations and requirements, in response to the findings and recommendations of the Chief Inspector of Mines' investigation into the tailings storage facility at Mount Polley Mine in August 2014. The Chief Inspector found that the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in the design or in subsequent dam raises, along with other factors that exacerbated the dam's collapse.

Key Messages:

- We want to make British Columbia a Canadian and international leader in safety standards for tailings storage facilities.
- While the Mt. Polley mine did not contravene existing regulations, the Chief Inspector found the mine failed to operate using best available practices.
- To build a safer, more sustainable industry and to prevent such incidents in the future, the Chief Inspector has made 19 recommendations in seven categories. Our government will work to implement all of these recommendations.
- Many of these recommendations will be addressed through the review of the Health, Safety and Reclamation Code for Mines in B.C. and government will work with industry and professional organizations to implement the other recommendations. It is anticipated this work will be completed by spring 2017.
- In 2016, government plans to introduce legislation to add administrative penalties under the Mines Act, empowering ministry staff the authority to issue penalties for non-compliance.
- Our government will continue to work with industry and regulatory bodies to ensure dam failure risks are reduced by better regulations, better policies and better professional guidelines.

Link to news release and backgrounders: <http://ow.ly/W32mh>

The Chief Inspector of Mines' investigation is available here: www.gov.bc.ca/mountpolleyinvestigation

Suggested tweets:

- Taking action – Government to implement all recommendations from the Chief Inspector of Mines: <http://ow.ly/W32mh>
- BC acting to make province an international leader for tailings storage facilities safety standards: <http://ow.ly/W32mh>

Ben James

Director of Communications

BC Liberal Government Caucus

250-356-9131 (office)

250-208-7052 (mobile)



Decision and Reasons for Decision of the Chief Inspector of Mines on whether to submit a Report to Crown Counsel to assess if charges should be laid and a prosecution commenced for contravention of the *Mines Act*.

Decision

Under my direction, Ministry of Energy and Mines (MEM) staff conducted a comprehensive and thorough investigation with respect to the understanding, operation, and ultimate failure of the Mount Polley Mine Tailings Storage Facility (TSF). The investigation showed that there was no significant contravention of the *Mines Act*, the Mines Regulation, Mines Act Permit M-200 or the Health, Safety and Reclamation Code for Mines in British Columbia (the Code). Together these documents will be referred to in this decision document as Regulatory Requirements. Although I have concerns about the oversight of the TSF activities on the mine site, orders pursuant to the BC Mines Act have been issued to address these concerns. For the reasons set out below, I do not believe there is sufficient evidence of a contravention with respect to the Regulatory Requirements. Therefore, I have decided not to submit a Report to Crown Counsel to assess whether charges should be laid and a prosecution commenced. As is our normal practice in these investigations, we sought legal advice throughout the investigation.

Background

On the night of August 3-4, 2014, the TSF at Mount Polley Mine, a copper and gold mine in interior British Columbia, failed. Over an approximately sixteen hour period, there was a progressive breach of the Perimeter Embankment (PE) of the TSF, which resulted in the release of over 21 million cubic metres of water and mine tailings into the surrounding environment and watercourses.

Section 7 of the *Mines Act* gives me the statutory authority to investigate and report on an accident that has caused serious personal injury, loss of life or property or environmental damage. The breach of the TSF at Mount Polley Mine caused environmental damage.

Section 37 of the *Mines Act* states that a person who contravenes a provision of the *Mines Act*, the Mines Regulation, the Code or an order made under any of them commits an offence.

One of the objectives of my investigation was to determine whether the Regulatory Requirements had been contravened, and if so, to determine whether to submit a Report to Crown Counsel to assess if charges should be laid.

Reasons

Root cause analysis (RCA) is a structured evaluation method which was applied to the analysis of information and determination of findings of my investigation. The details of the RCA are comprehensively described in my Investigation Report.

RCA applied in the investigation exposed the following proximate causes that led to the TSF failure. In RCA, proximate causes are those which, had they not occurred, would have prevented the undesired event from taking place.

In my investigation report, I found that the mechanism of the structural failure was a sliding of materials within the lightly overconsolidated glaciolacustrine clay unit located approximately ten metres below the foundation of the PE. The failure caused the embankment crest to drop approximately 5 metres and is considered the initiating event of the ultimate breach of the TSF. The structural failure of the embankment alone did not cause the breach but, coupled with the condition of insufficient beaches on the upstream side of the PE and too much supernatant water being stored within the TSF, a progressive erosional failure of embankment rapidly widened into a complete breach.

1) Structural failure of the PE occurred because of the following three conditions:

- a) Weak uncharacterized Upper Glaciolacustrine Unit (UGLU) underlying the foundation of the PE, confirmed in the area of the breach.

Criteria for TSF foundation investigation were not outlined by the Canadian Dam Association (CDA), Association of Professional Engineers and Geoscientists of BC (APEGBC) or formalized as Regulatory Requirements. In the absence of a regulatory requirement for foundation investigation, there is no contravention of the Regulatory Requirements.

My Investigation Report recommends that the APEGBC develop specific guidelines for TSF foundation investigation. As Chair of the Code Review Committee, the Committee is considering revisions to the Code and will incorporate as appropriate guidelines for foundation investigations developed by APEGBC.

- b) Open buttress sub-excavation of the PE downstream toe.

The sub-excavation at the toe of the downstream PE caused a reduction in the safety of the embankment. The sub-excavation at the toe of the embankment would not have caused the embankment to fail if the UGLU had been identified in the foundation and the embankment designed accordingly.

The sub-excavation at the toe of the embankment did not constitute a contravention of the Regulatory Requirement because it was in general conformance with design.

In my Investigation Report, I recommend that mine operators assign a mine dam safety manager to improve oversight of TSFs. One of the responsibilities of a mine dam safety manager will be to recognize and prevent conditions that could impact the safety of a tailings dam. I also recommend that professional organizations define the roles and responsibilities of the EoR and the mine dam safety manager. The on-going Code Review Committee is considering revisions to the Code to incorporate, as appropriate, guidelines to improve oversight of design, construction and operation of impoundments.

c) Over-steepened geometry and height of the PE.

The PE was built with an over-steepened slope and was approved by the EoR to meet the required CDA guidelines for safety of the dam. The UGLU underlying the PE was not identified in the foundation investigations on which the design was based. The professional judgment exercised by the EoR was based on a mistaken belief in the strength of the foundation.

There are no TSF foundation investigation guidelines or formalized Regulatory Requirements. An error in professional judgment is not a contravention of the Regulatory Requirements.

In my Investigation Report, I recommend that the CDA update their safety guidelines to reduce ambiguity, and develop specific guidelines for mining embankments which recognize the continued design changes and raises during the life of a TSF. The Code Review Committee is considering revisions to the Code to incorporate, as appropriate, revisions to the CDA guidelines.

2) The structural failure (consisting of three proximate causes outlined above) combined with insufficient beaches and too much supernatant water stored in the TSF led to the ultimate breach:

Mount Polley Mine management did not develop an adequate water management plan and did not adequately characterize the risk of surplus supernatant water in the TSF. There was an ongoing need for the storage of surplus supernatant water and an inability to obtain the appropriate authorizations for water treatment and discharge to the environment. Adequate beaches could not be continuously maintained primarily as a result of the surplus supernatant water.

Specific design parameters for the maintenance of beaches were not required by the EoR, and design parameters for storage of surplus supernatant water are not formalized as regulatory requirements. Therefore, these do not constitute a contravention of Regulatory Requirements.

In my Investigation Report, I recommend a qualified professional design and oversee the water balance and water management plan. Furthermore, to enhance oversight of TSFs, I recommend that the respective roles of the mine dam safety manager and EoR at mines be clearly defined with respect to the integration of water management and TSF design. This recommendation is being reviewed by the Code Review Committee, and will be incorporated as appropriate.

Conclusion

As outlined above, these proximate causes led to the breach of the TSF and the ultimate release of water and tailings to the environment. The analysis to determine the proximate causes, and root causes is fully described in my Investigation Report. In my opinion, there is not sufficient evidence of an offence of the Regulatory Requirements to warrant the submission of a Report to Crown Counsel.

I appreciate that the decision not to submit a Report to Crown Counsel is a significant one. However, a possible prosecution under the *Mines Act* is only one avenue to ensure compliance and enforcement. My decision does not preclude the issuance of future orders, revisions to the Code, review of MEM operational policy, or investigative processes by other agencies.

In my Investigation Report, I make numerous recommendations which I believe will significantly mitigate the risk of a similar occurrence. The recommended improvements to TSF safety in the future are directed towards the Mount Polley Mine, the mining industry generally, professional organizations and regulators.

A handwritten signature in black ink, appearing to read 'Al Hoffman', with a stylized, cursive script.

Al Hoffman, P.Eng.
Chief Inspector of Mines
December 8th, 2015

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Key Messages

Government Response:

- In response to the findings and recommendations of the Chief Inspector of Mines Investigation into the tailings storage facility at Mount Polley Mine in August government will introduce new regulations and requirements that will make British Columbia a national and international leader in safety standards for tailings storage facilities.
- The chief inspector's investigation was the largest and most complex of its kind in more than a century of regulated mining in British Columbia.
- We've learned from this investigation that in the case of Mount Polley, the allowable margin of risk around the design, construction and management of the tailings storage facility was too narrow to allow for an unknown factor, the layer of unstable soils below the dam embankment.
- We've also learned that weak practices on the mine site increased the risk of dam failure and exacerbated environmental consequences from the breach.
- This is unacceptable. My commitment is to implement all recommendations, work with the MABC and MAC, the APEGBC and the CDA to ensure that risk of dam failure is reduced by better regulations, better policies and better professional guidelines.
- The Chief Inspector made 19 recommendations in seven categories directed toward the mining operator, the mining industry, professional organizations and the government regulator to prevent such incidents in the future and build a safer, more sustainable industry.
- Many of these recommendations will be addressed through the review of the code. Government will also work with industry and the professional organizations on implementing the other recommendations. It is anticipated this work will be completed by spring 2017.
- Other actions will be taken to strengthen government's compliance and enforcement of mining. Minister Bennett plans to introduce legislation in 2016 to add administrative penalties under the Mines Act.

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Key Messages

Chief Inspector of Mines Investigation Findings:

- The CIM report found, as did the Independent Expert Panel in January, that the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in the design or in subsequent dam raises.
- The chief inspector also found other factors including the slope of the perimeter embankment, inadequate water management, insufficient beaches and a sub excavation at the outside toe of the dam exacerbated the collapse of the dam and the ensuing environmental damage.
- While the breach would not have occurred had it not been for the undetected glaciolaucustrine layer of soils, the consequences of the breach were made worse by the other factors.
- Although operations on the mine site were not in contravention of any regulation, the CIM found that the mine failed to operate using best available practices.
- The chief inspector of mines (CIM) investigation team conducted approximately 100 interviews and reviewed over 100,000 pages of documents going back to 1989. This is the largest and most complex investigation and analysis ever done in BC.
- The CIM found that the mine and its engineers employed weak practices on the mine site and many recommendations go to new standards and guidelines to improve these practices. Weak practices, however, do not constitute a legal contravention of existing mining legislation.
- The CIM, with advice from the Ministry of Justice, did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, the chief inspector of mines determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.
- The Conservation Officer Service is still conducting its investigation into the Mt Polley accident. Their investigation is based on compliance with the Ministry of Environment legislation. It is possible that this investigation may find non-compliance that warrants a report to Crown Counsel.

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Q&A

Chief Inspector of Mines Investigation

1. Why are no charges being laid?

The CIM found that the mine and its engineers employed weak practices on the mine site and many recommendations go to new standards and guidelines to improve these practices. Weak practices, however, do not constitute a legal contravention of existing mining legislation.

The CIM, with advice from the Ministry of Justice, did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, the chief inspector of mines determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.

The CO Service is still conducting its investigation into the Mt Polley accident. Their investigation is based on compliance with the Ministry of Environment legislation. It is possible that this investigation may find non-compliance that warrants a report to Crown Counsel.

2. How did the Chief Inspector of Mines come to this decision?

After much review and careful consideration of the information collected in the course of this investigation, along with legal advice provided throughout the investigation, the Chief Inspector of Mines determined there was not sufficient evidence of an offence under the Act, Mines Regulation, Mines Act Permit M-200 and-or the Health, Safety and Reclamation Code for Mines in British Columbia to warrant the submission of a Report to Crown Counsel.

3. What did the CIM investigation find? What were the overall causes for the breach and who is ultimately responsible?

The CIM report found, as did the Independent Expert Panel in January, that the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in the design or in subsequent dam raises. The chief inspector also found other factors including the slope of the perimeter embankment, inadequate water management, insufficient beaches and a sub excavation at the outside toe of the dam exacerbated the collapse of the dam and the ensuing environmental damage.

While the breach would not have occurred had it not been for the undetected glaciolaucustrine layer of soils, the consequences of the breach were made worse by the other factors. Although operations on the mine site were not in contravention of any regulation, the CIM found that the mine failed to operate using best available practices.

The CIM found that the mine and its engineers employed weak practices on the mine site and many recommendations go to new standards and guidelines to improve these practices. Weak practices, however, do not constitute a legal contravention of existing mining legislation. The CIM, with advice from the Ministry of Justice, did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, the chief inspector of mines

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determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.

The Conservation Officer Service is still conducting its investigation into the Mt Polley accident. Their investigation is based on compliance with the Ministry of Environment legislation. It is possible that this investigation may find non-compliance that warrants a report to Crown Counsel.

- 4. The CIM investigation concluded the sub-excavation was a factor in the failure of the dam. Why didn't the independent panel identify the sub-excavation as a factor?**

Both investigations identified the sub-excavation. The CIM investigation team identified additional information through interviews and geotechnical analysis, which provided a much more defined picture of what the excavation was and how it related to the failure.

- 5. What's the point of having penalties in place if you can't move forward with charges?**

First, I want to be very clear on this, the CIM investigation did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, along with legal advice provided throughout the investigation, the Chief Inspector of Mines determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.

Secondly, the CIM and the independent panel investigations both confirmed that on multiple occasions MEM posed questions to the mine and its engineers of record regarding the characterization of the foundation, the TSF slope geometry and the adequacy of the beaches. In all instances MEM's concerns were either discounted by the engineers of record, or MEM received assurances from the professional engineers that there were no dam stability concerns.

The CIM investigation also determined there is a need to address the current gap in the existing penalty structures and we plan to take the necessary steps to provide MEM inspectors with the tools they need for a more robust enforcement and compliance structure.

Other actions will be taken to strengthen government's compliance and enforcement of mining. Government plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

The Province will also establish a dedicated compliance and enforcement team within the Ministry of Energy and Mines to ensure the ministry has the resources it needs to fully implement and address these regulatory changes.

- 6. Given the findings of this investigation, how can you expect British Columbians to have any confidence the way that Imperial Metals runs its operations? Further, how can you expect British Columbians to have any faith that government is ensuring mining companies in this province are following best practices and complying with regulations?**

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B.C. has never before seen the size and scale of a Mount Polley tailings dam failure, but once is too often.

There are a number of hard-learned lessons that have come to light as a result of the Mount Polley incident. And while we can't turn back the clock, we are taking action to tackle these issues head-on.

To that end, we are taking the necessary steps to provide MEM inspectors with the tools they need for a more robust enforcement and compliance structure.

To further strengthen compliance and enforcement in B.C.'s mining industry, government plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

7. Will you implement all of the recommendations from the Chief Inspector of Mines?

My commitment is to implement all recommendations, work with the MABC and MAC, the APEGBC and the CDA to ensure that risk of dam failure is reduced by better regulations, better policies and better professional guidelines.

The CIM made 19 recommendations in seven categories directed toward the mining operator, the mining industry, professional organizations and the government regulator to prevent such incidents in the future and build a safer, more sustainable industry.

Many of these recommendations will be addressed through the review of the code. Government will also work with industry and the professional organizations on implementing the other recommendations. It is anticipated this work will be completed by spring 2017.

Other actions will be taken to strengthen government's compliance and enforcement of mining. Government plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

8. If MPMC is not being charged, doesn't that mean they are not being held accountable for this breach?

The CIM investigation did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, along with legal advice provided throughout the investigation, the Chief Inspector of Mines determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.

The environmental damage that resulted from the failure is not covered under MEM legislation or regulations. However, the Conservation Officer Service is still conducting its investigation into the Mt Polley accident. Their investigation is based on compliance with the Ministry of Environment

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legislation. It is possible that this investigation may find non-compliance that warrants a report to Crown Counsel.

That being said, as a result of the breach, MPMC has spent nearly \$70 million to date on remediation efforts including stabilizing Hazeltine Creek and remediating the surrounding area.

Additionally, the mine was shut down from August 4, 2014 to late July 2015, impacting the company's income and stock prices.

9. What about the crack in the dam – did that cause the breach?

The crack in the dam identified in 2010 was approximately 700m away from the site of the breach. The crack was addressed and recommendations were made to the mine by the Engineer of Record. Following this, no further issues were identified at this location.

Earlier this year, the independent panel investigation into the TSF breach concluded the dam failed because the strength and location of a layer of clay underneath the dam was not taken into account in the design.

The chief inspector of mines (CIM) investigation team, which conducted approximately 100 interviews and reviewed over 100,000 pages of documents going back to 1989, agreed with this conclusion. Two investigations have now confirmed the breach would not have happened if details of the clay layer had been fully understood and factored into the design of the dam.

10. Did the investigation find that inspectors or the Ministry were at fault?

No. The CIM found that the Regulator (inspectors and ministry) play an important role in compliance and enforcement, but cannot assume responsibility for neither the design of engineered structures such as tailings storage facilities nor construction oversight by approving or improving upon the work of the design engineers.

I'd also point out that this is very much the same conclusion reached by the independent panel in its investigation.

The independent panel even went further and expressed confidence in the Ministry's geotechnical inspectors and their work as regulators.

Investigation Overview

11. What were the objectives of the investigation?

The Chief Inspectors investigation mandate included determining the root and contributory cause(s) of the event and preparing findings to address the accountability of the industry, the Regulator, engineering practices, and any other contributors to the event.

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The investigation team also made recommendations for regulatory changes to British Columbia and the mining community to reduce the risk of such an event occurring again.

12. How long did the investigation take?

The investigation took approximately 16 months to complete.

The investigation team conducted a very thorough and in-depth examination of the Mount Polley Mine Corporation's actions from its initial site investigations 26 years ago to present. This included conducting over 100 interviews and reviewing over 100,000 pages of documents going back to 1989.

The CIM investigation team consisted of the Chief Inspector of Mines, Primary Investigator, File Coordinator, information analysts, technical writer, geotechnical engineers, geoscientists and hydrologists from Klohn Crippen Berger, and a retired RCMP inspector. The team was supported throughout the investigation by staff with the Ministry of Energy Mines.

13. How much did this CIM investigation cost??

The investigation cost \$2.6 million.

14. Who is paying for the CIM investigation?

The Chief Inspector of Mines has a statutory obligation to investigate incidents that cause personal injury, loss of life or property or environmental damage at mine sites such as the Mount Polley breach. All costs for such statutory investigations are generally managed within the ministry budget.

15. How many MEM staff were involved in the investigation?

The Chief Inspector, two full time Inspectors of Mines and two full time information analysts were dedicated to the investigation. Support for the team included geotechnical engineers, permitting personnel, quaternary geologist, administrative and file management support.

The Chief Inspector of Mines has a statutory obligation to investigate incidents that cause personal injury, loss of life or property or environmental damage at mine sites such as the Mount Polley breach. All costs for such statutory investigations are generally managed within the ministry budget.

16. Who were the seven members of the investigation team?

The members and roles of the investigation team include:

- Al Hoffman, Chief Inspector of Mines: Commander of Investigation
- Haley Kuppers, Provincial Health and Safety Specialist: Primary Investigator
- Cheryl Pocklington, Senior Inspector of Mines, Ergonomist: File Coordinator
- Harvey McLeod, Vice President Klohn Crippen Berger, Geotechnical Eng: Geotechnical Engineer, Investigator
- Doug Kiloh, retired RCMP superintendent detective: Case manager, gatekeeper legal and Conservation Officer Service Liaison
- Keith Elwood, professional technical writer: Investigation Report Writer
- Naomi Hemphill: Information Analyst

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- Matthew Parent: Information Analyst

17. This investigation carved out a great deal of MEM staff time, did this result in fewer inspections at other mines?

No. MEM conducted 1,227 inspections in 2014. 225 of these inspections took place at operating metal and coal mines, up from 145 in 2013.

18. What processes were used during the investigation?

The investigation adopted principles of major case management to organize the structure and decision making process of the investigation team. These are the same principles used by law enforcement for major investigations. For example, the investigation into Swissair Flight 111 crash near Peggy's Cove, Nova Scotia in 1998 followed the principles of major case management.

The RCMP supplied a relational database, which was implemented to manage, index and reference documentation in MEM's possession.

The investigation team also utilized a Root Cause Analysis Tool (RCAT) supplied by National Aeronautical and Space Administration (NASA) to assist with the formal, objective and structured analysis of all information collected through the investigation.

Geotechnical investigation was carried out by Kohn Crippen Berger including:

- Field observation and a drilling program.
- Laboratory analysis of drill-core samples;
- Investigation of the failure and events and conditions prior to the failure.

The investigation team gathered information and conducted approximately 100 interviews with Mount Polley mine employees and management, and their parent company Imperial Metals Corp; with the various engineering consultants (Knight Piesold, AMEC, BGC); internal MEM personnel; as well as members of the public and FN communities.

19. Why did the investigation take so long to complete?

This investigation was the largest and most complex of its kind in more than a century of regulated mining in British Columbia, and we wanted to ensure that it would be managed appropriately. The investigation team conducted approximately 100 interviews and reviewed over 100,000 pages of documents going back to 1989.

There were a number of phases to the investigation, starting with information gathering and interviewing, geotechnical forensic investigation, analysis of the facts and information, and the writing of the report.

Additionally, it was important to maintain, throughout the investigation, accurate and effective records management, and the independent conduct of the investigation in order to meet legal requirements for final decision and disclosure.

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20. Why are sections of appendix 3 in the Chief Inspectors investigation severed?

As I'm sure you're aware, a third independent investigation into the cause of the Mount Polley tailings pond breach is being led by British Columbia's Conservation Officer Service (COS), and assisted by Environment Canada, Department of Fisheries and Oceans Canada and the RCMP.

As that investigation is still ongoing, some parts of the appendix were redacted under section 15 of the Freedom of Information and Protection of Privacy Act – as being potentially harmful to an active investigation.

21. If the report was completed on November 30, why did you wait two weeks before releasing it?

As minister, I needed time to review the report with ministry executive so that we could fully understand the findings and respond appropriately to the chief inspector's recommendations.

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22. What is the difference between the Chief Inspector of Mines investigation and the Conservation Officer Service investigation:

The Chief Inspector of Mines and Conservation Officer Service investigations were conducted independently of each other in order to ensure integrity and separation.

The authorities of these investigations are different, Chief Inspector of Mines investigation is pursuant to Section 7 of the Mines Act, and Conservation Officer Service investigation is pursuant to the Federal fisheries act, and Environmental Management Act.

The independent investigation being led by British Columbia's Conservation Officer Service (COS), and assisted by Environment Canada, Department of Fisheries and Oceans Canada and the RCMP is still ongoing.

Permit Conditions and Inspections

23. Why didn't MEM identify the issues that led to the structural failure before the breach happened?

MEM did identify these issues and raised them with MPMC and its engineers of record. The EoRs reassured ministry staff and the responses to MEM concerns were provided by professional engineers.

Concerns raised by senior geotechnical engineer Chris Carr regarding glaciolacustrine deposits noted in borehole GW96-1A were discounted first by Knight Piesold (KP) and later by AMEC as not being applicable to the foundation within the dam footprint. MEM relied on the Engineer of Records' (both KP's and AMEC's) professional assessment of the significance of the UGLU encountered.

24. Would more inspections have prevented this failure?

It was determined by the Expert Panel, as well as the CIM investigation, that no inspections by MEM staff would have been able to identify all of the factors that caused the breach.

In 2014, prior to the breach in August, there were eight health and safety inspections completed by MEM staff and in 2013 there were 11 health and safety inspections. A geotechnical inspection was completed in Sept. 2013 and another geotechnical inspection was scheduled for Sept. 2014.

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25. Why were there no geotechnical inspections from 2009-2011?

In 2010 and 2011, there was a drop off in the number of geotechnical inspections completed by inspectors in the mining division.

This reduction was a result of declining revenues following the economic downturn as well as a high turnover of professional engineering and geotechnical staff.

Following the election of Premier Christy Clark, government increased funding to the resource ministries. As a result, geotechnical inspections increased to 26 in 2012, 31 in 2013, and 35 in 2014 as resources were re-focused and additional staff were hired.

Since 2012, the Ministry of Energy and Mines has conducted 30 geotechnical inspections on average per year at both operating and closed mine sites throughout the province.
This is a significant increase from the average of 20 from 2002 – 2011.

26. Government has said it is taking steps to improve compliance and enforcement including the creation of a new compliance and enforcement team. Does this mean you didn't have enough staff to ensure the industry was complying with regulations?

No. The independent panel and the CIM investigations both determined that no amount of inspections by MEM staff would have been able to identify all of the factors that caused the breach. Further, the independent panel expressed confidence in the Ministry's geotechnical inspectors and their work as regulators.

In 2010 and 2011, there was a drop off in the number of geotechnical inspections completed by inspectors in the mining division.

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Following the election of Premier Christy Clark, government increased funding to the resource ministries. As a result, geotechnical inspections increased to 26 in 2012, 31 in 2013, and 35 in 2014 as resources were re-focused and additional staff were hired.

Since 2012, the Ministry of Energy and Mines has conducted 30 geotechnical inspections on average per year at both operating and closed mine sites throughout the province.
This is a significant increase from the average of 20 from 2002 – 2011.

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- 27. The investigation shows a geotechnical inspection was carried out in September 2013 and no significant issues were found. When was the next geotechnical inspection for the mine scheduled for?**

The next scheduled geotechnical inspection for Mount Polley was to occur in September 2014.

- 28. How often are geotechnical inspections of TSFs conducted? Is there a schedule such as once a year?**

On average, geotechnical inspections are scheduled for major mines on an annual basis.

Water Management

- 29. According to the investigation, water management was one of the conditions that was a big factor in the TSF breach. Why didn't the Ministry of Environment authorize the mine to discharge water?**

The Mount Polley Mine initially operated from August 1997 to September 2001 without a permit to discharge mine contact water to the receiving environment. However, a permit was issued in May 1997 authorizing the discharge of tailings to the TSF. The mine was placed into care and maintenance from September 2001 to March 2005, and was re-opened in March 2005. During the care and maintenance period there was an allowance for a small discharge to the Edney Creek drainage.

In 2010 Mount Polley Mining Corporation submitted a permit amendment to enable discharge to Hazeltine Creek. Mount Polley Mining Corporation's permit (11678) under the Environmental Management Act was subsequently amended in November 2012 to allow a seasonal discharge (April – October, annually) of up to 1.4 million cubic metres per year of dam filtered mine water from the tailings pond to Hazeltine Creek.

In October 2013, Mount Polley Mining Corporation initiated a permit amendment process to get authorization for the discharge of 3,000,000 cubic metres per year of treated ditch water to Polley Lake. The Ministry of Environment received the final application for the permit amendment on July 9th, 2014 to increase discharge of treated effluent, and the necessary accompanying reports to support the amendment were submitted July 11th, 2014.

In September 2014 the application was withdrawn and Mt Polley initiated consideration of a short term discharge permit application to discharge up to 9,000,000 cubic metres per year of treated effluent to Quesnel Lake via (non-fish bearing) Hazeltine Creek with requirements for plans to develop a more permanent long term water discharge management system.

In addition to the permitting activity there was a compliance inspection in May 2014 that found water levels to be too high in the Tailings Storage Facility (inadequate freeboard) and the mine was directed to return levels to the minimum 1.0 m plus freeboard required. 1.0m plus freeboard was achieved in June 2014.

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- 30. The Independent Panel report and the Chief Inspector of Mines investigation both identify water management as a factor that needs to be addressed in order to avoid TSF failures. What is government doing to reduce the length of time it takes for mines to get the necessary permits for water discharge?**

In response to the Chief Inspector of Mines recommendations around regulatory integration, we will review the permitting processes, objectives and standards for the ministries of Energy and Mines, and Environment with the goal of better aligning these and, where possible, streamlining the permitting processes.

The goal is to ensure we meet our shared objectives – environmental protection, worker health and safety, facilities integrity – while improving our processes and reducing duplication.

- 31. To remove the issue of water management, why won't government move to requiring dry-stack technology for tailings storage as recommended by the independent panel?**

The independent panel recommended the adoption of best available technology, including filtered tailings (dry stack) technology where appropriate. The panel also noted that there are circumstances where other technologies are more appropriate due to the need to neutralize chemicals in the tailings or challenges with dewatering the tailings.

We are committed to implementing the recommendations of the independent panel and the chief inspector of mines.

Based on the recommendations developed by the Code Review committee this government will make the necessary changes to the code to address the recommendations from the panel and the chief inspector.

Recommendations

- 32. How do the CIM recommendations relate to the Expert Panel recommendations?**

While the Chief Inspector's Investigation was conducted in isolation from that of the Independent Expert Panel, a number of recommendations from both investigations overlap.

The Chief Inspector's recommendations align with the Expert panel with regards to oversight of TSFs and water management and defining role of the mine dam safety manager, and EoR. Also, the incorporation of BAP and BAP in TSF designs.

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33. Moving forward, will implementing the recommendations give the Ministry more options for compliance and enforcement of Orders?

The Chief Inspector recommended a review of compliance and enforcement function, including capacity and regulatory tools, which will increase compliance and achieve greater safety at mines, improve industry practices, and lead investigations in the future.

The Province will immediately take steps to establish a dedicated compliance and enforcement team within the Ministry of Energy and Mines. This team will provide additional support and oversight to existing ministry compliance and enforcement staff. Once in place, the team will consist of a new Deputy Chief Inspector of Mines for Compliance and Enforcement and up to four staff members. Along with overseeing compliance and enforcement across the ministry, the team's responsibilities will include:

- Developing and implementing an annual compliance and enforcement plan.
- Enhancing the framework and expertise for major investigations.
- Improving the compliance and enforcement tracking system.
- Coordinating compliance and enforcement with other government agencies and ministries.

To further strengthen government's compliance and enforcement of mining government plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

34. Will implementing the recommendations prevent events like this?

We've learned from this investigation that in the case of Mount Polley, the allowable margin of risk around the design, construction and management of the tailings storage facility was too narrow to allow for an unknown factor, the layer of unstable soils below the dam embankment.

We've also learned that weak practices on the mine site increased the risk of dam failure and exacerbated environmental consequences from the breach.

This is unacceptable. My commitment is to implement all recommendations, work with the MABC and MAC, the APEGBC and the CDA to ensure that risk of dam failure is reduced by better regulations, better policies and better professional guidelines.

Many of these recommendations will be addressed through the review of the code. Government will also work with industry and the professional organizations on implementing the other recommendations. It is anticipated this work will be completed by spring 2017.

Other actions will be taken to strengthen government's compliance and enforcement of mining. Minister Bennett plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing

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prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

Operations at Mount Polley and Red Chris Mine

35. Why is Mount Polley mine being allowed to continue to operate considering the findings of this investigation?

The mine site is under close observation by MEM and MOE staff members. It was also important to the community to ensure that families were able to continue to support themselves, government also wanted to make sure a continuation of operations is done in a way that protects the environment.

The authorizations that have been granted to the mine have been subject to highly technical reviews by scientists, engineers, First Nations and community members in order to make sure things are done right.

And to be clear, the CIM investigation did not find sufficient evidence that Mount Polley Mining Corporation contravened existing regulatory requirements. Based on these findings, along with legal advice provided throughout the investigation, the Chief Inspector of Mines determined there were no actions that would warrant a report to Crown Counsel pursuant to the Mines Act.

36. What impact will the investigation findings have on MPMC's application to return to full-production using the tailings storage facility (TSF)?

That is something that the statutory decision makers will determine as part of the application review process and I know the findings and recommendations from the independent panel and the chief inspector of mines investigations will be taken into consideration as part of the application process.

Mines Act permitting decisions are made by the Chief Inspector of Mines, or delegate, and are statutory decisions – completely independent of any political influence.

I know that the application has been received and staff with the ministries of Energy and Mines and Environment, along with representatives from the Soda Creek and Williams Lake Indian Bands, and the community of Likely, must complete a technical screening review of the application before it can move forward.

A key component of the application includes the mine's proposal to use the existing TSF for tailings storage going forward if the application is approved.

Geotechnical engineers at MEM are currently assessing the adequacy of the TSF design and associated best management practices as part of that technical screening process.

**Chief Inspector of Mines Investigation on Mount Polley
Questions and Answers
December 17, 2015**

37. What assurances do you have that the Mount Polley Mine TSF won't fail again in the future?

At this point, the mine is not authorized to use the TSF. The mine has submitted a permit application and there is a very thorough technical screening and review as part of that process.

As I said, as part of the technical screening, geotechnical engineers at MEM are currently assessing the adequacy of the TSF design and associated best management practices.

Once the technical screening review is complete, the mine will be asked to address any information gaps and then the Cariboo regional mine development review committee (MDRC) will be asked to complete a detailed technical review of the permit amendment application.

Based on the technical review, the MDRC chair will provide recommendations to the statutory decision makers at the ministry of Energy and Mines.

Mines Act permitting decisions are made by the Chief Inspector of Mines, or delegate, and are statutory decisions – completely independent of any political influence.

38. We've heard from the mine that by April 2016 they will max out the total amount of ore they are currently permitted to process and have to suspend operations. What are you doing to ensure operations continue at the mine and 100s of workers aren't laid-off?

To be frank, the ball is in MPMC's court on this. The mine is well-aware of its current permit conditions. It is also aware of the steps it is required to take as part of the permit application process in order to continue operations.

MPMC has submitted an application for amendment to its Mines Act permit to allow the mine to continue operations beyond the parameters authorized under its restricted re-start. This application was received for screening on Nov. 6.

Staff with the ministries of Energy and Mines and Environment, along with representatives from the Soda Creek and Williams Lake Indian Bands, and the community of Likely, must complete a technical screening review of the application before it can move forward.

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Based on the technical review, the MDRC chair will provide recommendations to the statutory decision makers at the ministry of Energy and Mines.

**Chief Inspector of Mines Investigation on Mount Polley
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Mines Act permitting decisions are made by the Chief Inspector of Mines, or delegate, and are statutory decisions – completely independent of any political influence.

39. What's government doing to address the long-term water treatment and discharge requirements for the mine?

The company is required to have its long-term water treatment and discharge proposal to government by June 30, 2016.

Once government has received the company's proposal, it will be subject to the same formal technical screening and review process just like any other proposal.

The final decision will be up to the appropriate statutory decision makers.

40. What are you doing to make sure this doesn't happen at Red Chris?

With respect to Red Chris mine, the tailings storage facility (TSF) at the mine has been the subject of three independent reviews to assess seepage and design considerations. The mine has also done an extensive review of their subsurface hydrogeology and has made adjustments as per third party review recommendations. The mine has successfully demonstrated to the Chief Inspector of Mines that the TSF has performed as designed.

Further, government will introduce new regulations and requirements that will make British Columbia a national and international leader in safety standards for tailings storage facilities.

The CIM made 19 recommendations in seven categories directed toward the mining operator, the mining industry, professional organizations and the government regulator to prevent such incidents in the future and build a safer, more sustainable industry. Government will be working to implement all of the recommendations. Key recommendations include:

- All mines with TSFs will be required to have a designated mine dam safety manager and a designated individual to oversee the mine's water balance and water management plan.
- Mines with TSFs will be required to have water management plans designed by a qualified professional.
- Independent technical review boards will be required for all mines with TSFs.
- Establish a dedicated compliance and enforcement team within the Ministry of Energy and Mines lead by a new Deputy Chief Inspector of Mines. This team will provide additional support and oversight to existing ministry compliance and enforcement staff.
- To strengthen records management and improve openness and transparency around design, construction and operation, government will establish a formal documentation management system for all TSF from development to post-closure.
- Foster innovations in the mining sector that improve current technologies in tailings processing, dewatering and discharge water treatment.

41. Why didn't MEM take steps to ensure the Mount Polley facility was designed properly and operated in accordance with that design?

**Chief Inspector of Mines Investigation on Mount Polley
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I want to refer you back to the independent panel report for a moment. In that report, the panel was clear: MEM is the regulator, not the operator. As the regulator, MEM must rely on the expertise of the engineers who design these facilities.

As the panel stated in its report, "The Engineer of Record (EoR) is responsible for the overall performance of the structure as well as the interpretation of site conditions. The Regulator has to rely on the expertise and the professionalism of the EoR as the Regulator is not the designer."

The panel also said that it took them four months to really understand the cause and that no inspections could have detected this issue. And the panel expressed confidence in the Ministry's geotechnical inspectors and their work as regulators. The CIM investigation findings in this area agree with those of the independent panel.

42. If the TSF design included beaches, why weren't beaches properly established and maintained?

The dam was built in general conformance with the design, and it is the responsibility of the mine manager and engineer of record to ensure the facility is constructed and maintained in accordance with the design and approved permits.

MEM raised concerns regarding beach establishment on a number of occasions. In 2006, MEM requested MPMC provide specification of the minimum design beach width required for construction and operation of the TSF (see Section 6.8.4). The response, prepared by Knight Piesold for MPMC, claimed that there was no requirement for maintenance of continuous beaches.

As the independent panel stated in its report, "The Engineer of Record (EoR) is responsible for the overall performance of the structure as well as the interpretation of site conditions. The Regulator has to rely on the expertise and the professionalism of the EoR as the Regulator is not the designer."

The CIM made 19 recommendations in seven categories directed toward the mining operator, the mining industry, professional organizations and the government regulator to prevent such incidents in the future and build a safer, more sustainable industry. Government will be working to implement all of the recommendations. Key recommendations include:

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- Mines with TSFs will be required to have water management plans designed by a qualified professional.
- Independent technical review boards will be required for all mines with TSFs.
- Establish a dedicated compliance and enforcement team within the Ministry of Energy and Mines lead by a new Deputy Chief Inspector of Mines. This team will provide additional support and oversight to existing ministry compliance and enforcement staff.
- To strengthen records management and improve openness and transparency around design, construction and operation, government will establish a formal documentation management system for all TSF from development to post-closure.
- Foster innovations in the mining sector that improve current technologies in tailings processing, dewatering and discharge water treatment.

**Chief Inspector of Mines Investigation on Mount Polley
Questions and Answers
December 17, 2015**

Other actions will be taken to strengthen government's compliance and enforcement of mining. Government plans to introduce legislation in 2016 to add administrative penalties under the Mines Act. Compliance and enforcement tools under the Mines Act are presently limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, or pursuing prosecutions. The proposed legislation would give ministry staff the power to issue penalties for non-compliance.

43. The buttress excavation was open for almost eight months, why didn't MEM inspectors notice it?

There were no construction procedures supplied in the construction manual for the buttress excavation. The actual construction did not include provisions for inspection and backfilling, which would normally be included in construction procedures. The excavation was left unfilled from the date of its construction to the failure of the dam, approximately eight months.

The sub-excavation at the toe of the embankment did not constitute a contravention of the Regulatory Requirement because it was in general conformance with design, as signed by the EoR.

MEM will be implementing the recommendations within the CIM report in order to ensure that compliance of permit conditions is maintained throughout the life of the mines. This, along with recommended changes to the Code will ensure that these types of incidents do not happen again.

44. KP sent a letter to the Chief Inspector of Mines in 2011 when it stopped being the EoR at MPMC and raised some concerns about the TSF, what did you do?

Knight Piesold designed and oversaw construction of the Mount Polley tailings storage facility in the mid-1990s. The company chose not to bid on the contract in 2010 and AMEC took over as the engineer of record from Knight Piesold in 2011.

A change of Engineer of Record is not unusual in mining industry. Knight Piesold sent a letter to Imperial Metals and copied to Chief Inspector. In the letter, Knight Piesold stated: "the embankments and the overall tailings impoundment are getting large and it is extremely important that they be monitored, constructed and operated properly to prevent problems in the future."

This is a fairly standard letter to send when an engineer of record at a mine changes. It's sent to avoid future liability. By way of the letter, the outgoing engineers want the record to show that they gave a heads up to incoming engineers on what the focus should be.

**Chief Inspector of Mines Investigation on Mount Polley
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45. Why was the original water balance so wrong?

The initial water balance was based on the mine operating in a net water deficit and a production rate of 13,425 tonnes per day (TPD). The calculation did not consider adequate long-term planning. Over the years the mine plans developed and as the mine footprint expanded water management requirements changed.

During care and maintenance, from 2001 to 2005, water accumulated on-site and was stored in the TSF and open pits. When the mine re-opened in 2005 water was transferred from the pits back into the TSF. Additionally, production levels in 2005 increased to approximately 18,000 TPD.

The responsibilities of water management shifted from the EoR to MPMC when the mine went into care and maintenance in 2001, and no qualified person was in an oversight position. Mount Polley management did not develop an adequate water management plan and did not adequately characterize the risk of surplus supernatant water in the TSF. There were a number of opportunities during that time that the mine could have but did not control the risk of surplus supernatant water. There was an ongoing need for the storage of surplus supernatant water and an inability to obtain the appropriate authorizations for water treatment and discharge to the environment.

46. Why didn't MEM take action when it became clear that water balance modeling was wrong?

Communications from MPMC and the EOR regarding TSF design during the permitting process did not identify water management issues.

Moving forward water management and operating freeboard are now recognized as opportunities for TSF designers to set quantifiable performance objectives (QPOs) which will be reviewed and considered by the Code review committee as well as incorporated into operations policies (permitting process).

47. Why did the overtopping earlier that year not trigger strong action from MEM about safety and mismanagement of the TSF?

The May 2014 overtopping was considered a dangerous occurrence (Part 1.7.3(2) of the Code), and MEM followed up to ensure appropriate response measures were taken by MPMC and their engineering consultant.

Minimum operating freeboard of 1.3 metres was re-established – freeboard is the distance between the surface of the water and the top of the dam – and MPMC and their engineering consultant completed embankment construction to address low points in the TSF.

**Chief Inspector of Mines Investigation on Mount Polley
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48. Why was BGC Memo regarding buttress foundation preparation not provided to MEM?

MPMC was using two engineering consultants for various activities related the TSF. Mine management did not communicate with MEM all of the details regarding planning or activities of their consultants, and therefore was not aware and did not receive the project memo regarding foundation stripping requirements outlined by BGC. Mount Polley mine management did not provide sufficient oversight and management of the work.

The recommendation will require mine managers to assign a mine dam safety manager. The roles and responsibilities of the mine dam safety manager will be clearly defined by the Code review committee (with the support of MAC). A qualified individual in this role will be responsible for coordinating relevant parties involved with the TSF; ensuring appropriate approval of all activities has been obtained; and maintaining compliance with applicable permit conditions, Mines Act, and Code.

Dam Safety Inspections and Tailings Storage Facilities - general

49. What is different from the MP failure and the Brazil failure?

Until a full investigation into the breach at Brazil is completed, we cannot know what the differences are.

50. Was the tailings storage facility in Brazil the same as the one at Mount Polley and other mines in British Columbia?

Until a full investigation in the incident in Brazil is concluded, the full determination on any similarities with the site there cannot be determined. We can say that the mine in Brazil was not a copper mine.

51. You have done province-wide dam safety inspections (DSI) for all mines with tailings storage facilities and collected all this data. How can you ensure that this information will prevent this from happening again?

During the review of the DSIs from 2014, no immediate safety concerns were identified in the over 330 engineering documents submitted. Overall, there was good compliance with order and most engineering documents submitted were of high quality.

Additionally, the Code Review is looking at the Canadian Dam Association's guidelines in order to better ensure their suitability for tailings dams. This includes reviewing dam safety inspections and dam safety reviews and how they can be improved.

**Chief Inspector of Mines Investigation on Mount Polley
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52. If it can happen in Brazil, in a large reputable company, what's preventing it from happening again here?

While eliminating risk is impossible, we can mitigate risk by taking steps to increase the safety and stability of the TSFs and dam structures in our province. The government has taken a number of steps to further understand the structures in our province.

Immediately following the release of the independent panel report and recommendations on the Mount Polley tailings storage facility failure, the Chief Inspector of Mines ordered 38 mines to undertake an assessment to determine if any of the dam(s) associated with their TSFs may be at risk due to:

- Undrained shear failure of silt and clay foundation (whether foundation materials similar to those at Mount Polley exist below any of their dams).
- Water balance adequacy (outline current and long-term water management plans).
- Filter adequacy (identify internal dam erosion prevention methods and other means to prevent piping and cracking)

This has been completed and no immediate safety concerns have been found. Additionally, under the order, mines were asked to provide a work-plan and schedule to address any information gaps identified during the assessment. Based on the reviews and findings provided by the professional engineers, 26 mines identified areas where more information should be compiled and all sites have committed to completing the work necessary – this work includes further analysis and information gathering on all three areas subject to the order (GLU, water balance and filter). The ministry will be following-up on the progress of these mines in January 2016.

Professional Reliance

53. Since the Expert Panel and the CIM identified that the site was not properly characterized by engineers, how are you going to make sure that the professional reliance model will be more effective in the future?

The Chief Inspector is recommending strengthening standards of practice and incorporating, as appropriate, guidelines from external associations including specific guidelines for foundation investigations. Strengthening standards of practice will enable better design, construction and operation of impoundments, improve governance, and establish benchmarks to evaluate these practices.

The Association of Professional Engineers and Geoscientists of B.C. is undertaking to develop professional practice guidelines for dam site characterization assessments for release in spring 2016. Those guidelines will outline the standard of care and professional obligations professional engineers and geoscientists must uphold when conducting these assessments, and will define the roles and responsibilities of the various participants and stakeholders involved in this process.

Additionally, the Canadian Dam Association is defining the roles and responsibilities of the Engineer of Record as it applies to dam design and the transfer of duties.

**Chief Inspector of Mines Investigation on Mount Polley
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Administrative Penalties

54. What are administrative penalties (AMP)?

AMPs are financial penalties that may be imposed for noncompliance with a provision of a statute or regulation, with an order issued by a Ministry official or with the terms of an authorization issued under a statutory scheme.

For minor to moderate violations, AMPs can be more cost-effective and likely to result in a more timely response to non-compliance than court-imposed penalties.

55. Why look at bringing in Administrative Penalties?

The proposed changes would bring the Act in line with the other natural resource legislation, including the Environmental Management Act (EMA), the Forest and Range Practices Act (FRPA) and the Oil and Gas Activities Act (OGAA), all of which include AMPs.

Compliance and enforcement under the Mines Act has not been modernized and the current fines for prosecution date back to at least 1989.

56. How would this help for compliance issues?

Current compliance and enforcement tools under the Mines Act (Act) are limited to shutting down a mine through the cancellation of a permit, issuance of stop-work orders, pursuing offence prosecutions that can lead to fines of up to \$100,000 or to imprisonment for not more than one year, or both. Tools for less serious non-compliance are very limited.

December 17, 2015

MEDIA ADVISORY - Ministry of Energy and Mines

VICTORIA – The Chief Inspector of Mines will release his findings and recommendations from his investigation into the tailings storage failure at the Mount Polley Mine today at the BC Legislature.

Following the announcement and technical briefing, Minister of Energy and Mines Bill Bennett and Chief Inspector of Mines Al Hoffman will be available to the media.

Province-wide media are invited to participate via conference call.

Event Date: Thursday, December 17, 2015

Time: 1 p.m.

Location:
Legislative Press Theatre
BC Legislature
Victoria, BC

Dial-in Numbers:

From Vancouver: 604 681-0260
1-877-353-9184 from Canada and USA
Pass code: 44333#

Special Instructions:

To avoid delays, media are asked to begin dialing at 12:50 p.m.

Contact:
Jake Jacobs
Media Relations
Ministry of Energy and Mines
250 952-0628

Time	Event Itinerary
10:00 a.m.	David Morel, Assistant Deputy Minister, MEM to brief First Nations stakeholders via telephone conference prior to event
12:00 p.m.	<p>Chief Inspector of Mines (CIM) and technical panel members arrive at the Legislature</p> <p>Proceed to the Minister Bennett's office for preparations</p> <ul style="list-style-type: none"> • Al Hoffman (CIM) • Harvey McLeod, Panel Member (VP Klohn Crippen Berger engineers) • Doug Kiloh, Panel Member (Former RCMP superintendent) TBC • Cheryl Pocklington (Senior Inspector of Mines) • Haley Kupperts (MEM Occupational Health Inspector) <p>**Opportunity to see the Press Theatre set-up and test power point presentation</p>
	<p>MEM briefing takes place in Minister's Office with:</p> <ul style="list-style-type: none"> • Hon. Bill Bennett, Minister of Energy and Mines • Al Hoffman, Chief Inspector and Executive Director, Health & Safety, MEM • David Morel, Assistant Deputy Minister, MEM
12:30 p.m.	Media begin to enter press theatre in Victoria
12:45 p.m.	<p>GCPE Events Lead on hand as of 12:15 p.m. to assist</p> <p>Technical Panel Members are escorted to the Press Theatre by Glen Plummer – Al Hoffman, Harvey McLeod and Doug Kiloh seated at table beside podium. Cheryl Pocklington and Haley Kupperts seated at table at the back of the theatre.</p>
12:55 p.m.	Minister Bennett is escorted to the Press Theatre
1:00 p.m.	<p>Podium into place with BC podium sign. CIM Investigation Report cover slide onto LCD screen</p> <p>Welcome by David Haslam, Communications Director, MEM.</p> <ul style="list-style-type: none"> • David will explain the format – Minister Bennett will introduce panel, CIM will present findings and recommendations and Minister Bennett will provide concluding remarks, after which David will moderate questions from media to Minister Bennett, CIM and technical panel members
1:02 p.m.	David Haslam to introduce Minister Bennett
1:05 p.m.	<p>Minister Bennett provides opening remarks and CIM and technical panel members.</p> <p>CIM PowerPoint Presentation loaded onto LCD screen</p>
1:15 p.m.	Al Hoffman, CIM, presents findings and recommendations and Harvey McLeod will speak to the geotechnical findings. (Al Hoffman will need laser pointer. Cheryl Pocklington will run PPT slideshow.)
1:45 p.m.	CIM presentation concludes

1:50 p.m.	Minister Bennett provides government response to recommendations and concluding remarks from the podium
2:05 p.m.	Minister Bennett, CIM and technical panel take questions from media—moderated by David Haslam Note: there will be a dial in and there will be questions from media from across the province
2:25 p.m.	Questions conclude. Event ends.

Chief Inspector of Mines Report – Mount Polley

December 17, 2015

MEM MEDIA PLAN

Media Plan:

December 17 (8/8:30am) - media advisory released province-wide

December 17 (1pm – 2:30pm) – News Conference – Legislative Press Theatre/Province-wide News Release/Media Conference Call

Objective – Optimize Media Coverage

Chief Inspector of Mines Al Hoffman releases details of the CIM report into the tailings storage facility failure at the Mount Polley mine to BC media. Minister Bennett responds to the report following the CIM news conference/power point presentation. Province wide media have access to the news conference via conference call.

- The investigation was the largest and most complex of its kind in more than a century of regulated mining in British Columbia.
- In response to the findings and recommendations of the Chief Inspector of Mines Investigation into the tailings storage facility at Mount Polley Mine in August 2014 , government will introduce new regulations and requirements that will make British Columbia a national and international leader in safety standards for tailings storage facilities.
- Media advisory follow ups to ensure full participation at the press conference & regional conference call coverage.
- Targeted follow up media interviews after the announcement to ensure same day message pickup during the drive home cycles.
- Sending a video clip of MBB (speaking to onsite reporters/province wide media) reacting to Chief Inspector of Mines Report to:
 - CKPG-TV – Prince George
 - CFJC TV – Kamloops
 - CFTK-TV - Terrace/Prince Rupert
 - CJDC-TV – Fort St. John/Dawson Creek

December 17 - Live/taped TV/Radio/Talk Show interviews (2:30pm – 4pm)

December 17 - Media: Press Theatre – 2pm

Victoria Legislative reporters – Q &A

Keith Baldrey – Global TV - 250 387-1572 - keith.baldrey@globaltv.ca
Bhinder Sajan - CTV - 250-418-5207 - Bhinder.sajan@bellmedia.ca
Tom Fletcher – Black Press -250 888-3438 – tfletcher@blackpress.ca
Dirk Meissner - Canadian Press – 250 384-4912 - Dirk.Meissner@thecanadianpress.com
Rob Shaw – Vancouver Sun - 250-893-0841 (cell) -250-953-5932 -
rshaw@vancouver.sun.com
Vaughn Palmer – Vancouver Sun - 250 920-6677 - vpalmer@shawlink.ca
(vpalmer@vancouver.sun.com)
Sean Leslie – CKNW - sleslie@cknw.com - 250 385-8622 (250-387-6084)
Dan Burritt – CBC Radio – (604) 354-6906 – dan.burritt@cbc.ca
Andrew McLeod – The Tyee - 250 885-7662 - amacleod@thetyee.ca
Justine Hunter – Globe & Mail – 250 857-4779 - JHunter@globeandmail.com
Les Leyne – Victoria Times Colonist - 250-889-41- lleyne@timescolonist.com
Sophie Rousseau - CBC Radio Canada - French – 250-380-3761 -
sophie.rousseau@cbc.ca
Mike Smyth – The Province - 250-812-6462 - msmyth@theprovince.com
Press gallery - (CKNW/CBC/CP) - 250-387-1591

Victoria Media

CHEK TV - Mary Griffin (Assignment Editor) - CHEK TV – (250) 480-3700 -
tips@cheknews.ca
CTV – Vancouver Island – (Assignment Editor) – 250 414 -6510
Victoria Times Colonist - Darron Kloster (Business Editor) - 250-380-5235 -
dkloster@timescolonist.com
CFAX Radio - Kyle Reynolds – 250 381-6397 - Kyle.Reynolds@bellmedia.ca

Vancouver ethnic media – Mary & Parm to make calls following MA release:

Fairchild TV - Theresa Zhang - 604-250-8015 - theresazhang@fairchildtv.com
Omni TV - Tim Chung - 604-678-3861 - tim.chung@rci.rogers.com
Ming Pao newspaper - Austin Feng - newsdesk@mingpaovan.com
Sing Tao - James Fung - 604-812-9403 - jamesfung@singtao.ca
AM1320 - Andy - 604-269-2035 - newsrm@am1320.com

December 17 – Targeted Media – 2:30pm-4pm

TBC – 2:30pm – Global BC/Global BC1 - Live/taped (Keith's office)

TBC – 2:50pm - Vancouver Sun - Gord Hoekstra – Vancouver Sun -604-605-2132

TBC – 3:05pm - Williams Lake Tribune – Monica Lamb-Yorski - 250 392-2331

TBC – 3:15pm - Caribou Radio – Goat FM - (Williams Lake) – Rebecca – 250 392-6551 (ext-224) - rdyok@vistaradio.ca

TBC – 3:15pm CKNW Radio - Charmaine DeSilva - 604 331-2766 - Charmaine.DeSilva@corusent.com

TBC – 3:20pm CBC Radio – Dan Burritt – (604) 354-6906 – dan.burritt@cbc.ca

TBC – 3:25pm CHNL Radio (Kamloops) – Jim Harrison - 250-374-1610 - nlnews@radionl.com

TBC – 3:30pm The Drive 102.9 FM (Cranbrook) - Jeff Johnson - The Drive 102.9 FM - 250 426-5000 – news@thedrivefm.ca

December 17 - Talk Shows

TBC – 3:40pm - CBC on the Coast — Host – Stephen Quinn - (producer – Jodie – 604 662-6923) call in number: 604 669-3733- (producer – Matthew Lazin-Ryder - matthew.lazin-ryder@cbc.ca) - Minister phones - or **CBC Radio West – PM - (Kelowna)** - Host - Rebecca Zandbergen - rebecca.zandbergen@cbc.ca

December 17 – 3pm - Jake sends b-roll/clip to regional TV (MBB speaking to onsite reporters/province wide media) reacting to Chief Inspector of Mines Report.

CKPG TV/Radio (Prince George) – Dave Barry – (250) 563-0111 - dbarry@ckpg.com

CFJC TV/Radio (Kamloops) - James Peters - 250 851-3277- jpeters@cfjctv.com

CFTK TV/Radio – (Terrace/Prince Rupert) - John Crawford (news director) – 250-638-6325 john.crawford@bellmedia.ca; cftknews@bellmedia.ca

CJDC TV/Energy FM/CKNL (Fort St.John/Dawson Creek) - Jeremy Keefe (News Director) – 250 782-6397/250 785-6397 - jeremy.keefe@bellmedia.ca

December 18 – Talk Shows – AM

TBD – 6:10am – CBC Daybreak South (Kelowna) – Host - Chris Walker – (producer – Christina Low - 250 861-3781 – Christina.lowe@cbc) – Minister phones - or **CBC Daybreak North** – (producer – Andrew Kurjata - 250-562-6701 ext. 222 - andrew.kurjata@cbc.ca)

TBD - 6:40am – Jon McComb Show – Host – Jon McComb - CKNW – (producer – Tim Dickert – 604 331-2795 - tim@cknw.com) - Minister phones -

TBD - 7:10am - CBC – Early Edition – Host: Rick Cluff – (producer – Theresa Duvall - Theresa.duvall@cbc.ca) Minister phones -

**Chief Inspector of Mines Investigation
Opening Remarks for Minister of Energy and Mines Bill Bennett
December 17, 2015**

- **Thank you David.**
- **Good afternoon to all of you joining us here today at the Legislature and good morning to those of you listening on the phone.**
- **Today, we will learn the findings and recommendations from the Chief Inspector of Mines investigation into the August 4, 2014 Mount Polley Mine tailings storage facility breach.**
- **Today's presentation will be led by Chief Inspector of Mines Al Hoffman, seated on my left.**
- **I'd also like to introduce members of the investigation team who are here with us today.**
- **At the table with Al are:**

**Chief Inspector of Mines Investigation
Opening Remarks for Minister of Energy and Mines Bill Bennett
December 17, 2015**

- **Harvey McLeod, Vice President Klohn Crippen Berger, Geotechnical Engineering Consultants. Harvey was the lead geotechnical engineer and investigator on the team.**
- **Doug Kiloh, retired RCMP superintendent detective. Doug was the team's case manager and worked with the investigative team to ensure the investigation was conducted in accordance with the applicable principles of Major Case Management.**
- **Also with us today, seated in the front row, are:**
 - **Senior Inspector of Mines Cheryl Pocklington, who was the team's file coordinator, and**
 - **Provincial Health and Safety Specialist Haley Kupperts, who was the team's primary investigator.**

**Chief Inspector of Mines Investigation
Opening Remarks for Minister of Energy and Mines Bill Bennett
December 17, 2015**

- And finally, the team's technical writer Keith Elwood.**
- At this time, I'll turn things over to Al and his team to walk you through his investigation.**

MBB's Summary of MT POLLEY CIM REPORT

Introduction

- The CIM took you through a relatively brief technical explanation of what his investigation found.
- I want now to go on the record with my reaction to the Report.
- Before I do, I want to sincerely thank Al Hoffman and all his MEM staff, Doug Kiloh, retired RCMP expert, and Harvey McLeod of Klone Crippen Berger, retained by MEM, for this important piece of work.
- To be clear on how this process works, Al Hoffman, the CIM, is a statutory decision-maker who is authorized by legislation to investigate and report out on that

investigation without advice from the executive branch of government.

- I did not talk to the CIM directly or indirectly during this 15 months about the investigation and when I saw the Report I did not discuss changing anything with them nor did they change anything in the Report after I saw it two weeks ago.

Minister's Response to Report

- My response to the Report is as follows:
 - The MP mine permit was issued on August 3, 1995, exactly 20 years to the day before the accident happened.
 - The dam at this TSF was always expected to be raised in stages over the life of the mine – nothing unusual about incremental lifts or height or size – p.29
 - A TSF dam can be designed and built to sit on top of this unstable soil IF the

engineers and company know it is there and understand its geotechnical characteristics.

- Companies cannot avoid the ultimate responsibility for the things that happen or don't happen on a mine site by pointing at their engineers or their contractors
- The collapse of the dam at the Mt Polley TSF on August 4th, 2014, may not have happened if the company & its engineers had followed better practices and done more site investigation both in the beginning while the TSF was being designed and throughout the 20 years when the Regulator asked specifically about sub surface soils.
- The CIM states in the Report that the company and engineers had opportunities to [quote] “review & characterize the foundation soils...but these opportunities were unnoticed,

ignored and/or discounted.” [end of quote]

- The UGLU caused the dam to slump, but the steep slope of the PE, the lack of beaches inside the TSF, too much water in the TSF and the excavation at the outside toe of the PE by the company, all combined to exacerbate the consequences to the environment from the structural failure of the dam
- A series of domino's with the unstable materials being the first domino that fell – over-steepened embankment; insufficient beaches/too much water; sub excavation at toe...
- The mine was not out of compliance for any of these factors for a variety of reasons – but generally, at every juncture during the life of the mine, the EOR and the company believed the FoS was appropriate, and their judgment was based on not knowing about or

understanding the significance of the UGLU

- The risk of an accident could have been reduced if stronger practices by the company & the engineer were in place, if the Associations who establish guidelines for best practices had evolved their guidelines and if the Regulator had better regulations and policies in place.
- “MPMC did not identify or manage risks associated with changing EOR at the TSF” – p.7
- MPMC did not listen to concerns about the TSF from employees – p.7
- The CIM decided that a report to the Crown Counsel could not be justified, after advice from the Ministry of Justice
- The Conservation Officer’s investigation is ongoing and it is Ministry of Environment legislation and regulation and federal laws that govern environmental compliance – charges

are possible under the Environmental legislation

Conclusion

- My commitment as minister is the same as the CIM's commitment in his Report – we will learn from this accident, we will change laws, regulations and policies so that this kind of profoundly tragic accident will never happen again.
- It is my goal that BC's regulatory regime for health & safety on mine sites is the best in the world and I believe and my staff believe that by implementing all recommendations from this Report, we will get there.

Recommendations

- **PROPONENT GOVERNANCE**
 - 1-1 – Mine Dam Safety Manager - should designate a qualified person to be specifically responsible for the TSF and site water management – p.8
 - 1-2 – Water Balance Management – “Water management and water balance issues for mining projects must be designed by a qualified professional” – p.8
 - 1-3 – TSF Operations, Maintenance & Surveillance Manual – such a manual must be developed and updated to ensure compliance with Mining Code, CDA and MAC guidelines, including an annual risk assessment/management plan – p.8
 - 1-4 – Mine Emergency Response Plan – the MPMC emergency response plan was not adequate and emergency response was as good as it was only because of the actions of those left on site during a holiday weekend – p.9
 - 1-5 – Risk Recognition & Communication – Everyone on a mine has a responsibility to recognize and report risk conditions; must be a “an effective reporting mechanism for employees” to report what they believe are risks, including direct reporting and anonymous reporting
- **RECOMMENDATIONS FOR THE MINING INDUSTRY**
 - 2-1 – Design Objectives – design must in at a level of detail, showing all alternatives for TSF’s are studied in depth and that the model chosen meets BAP’s – p.9 [EAO and MEM improvements already implemented – p.12]
 - 2-2 – Independent Technical Review Board – Mines with TSF’s must have “independent technical review boards to provide additional perspectives on site investigations, site selection, design, construction, maintenance, operations, surveillance, water management and closure.” – p.9
- **RECOMMENDATIONS FOR PROFESSIONAL ORGANIZATIONS**
 - 3-1 – Professional Reliance Standards – the regulator does not design the mine or associated structures, and thus is reliant on the professional practice of the designer.” APEG BC, CDA and MAC must provide guidelines and standards for engineers that incorporate BAP’s, including a better set of guidelines on how to manage transfer of responsibilities between E’s of Record – because there are obviously very serious consequences from not doing so - p.10

- 3-2 – Integration of Standards – The Regulator must incorporate guidelines from these external associations as applicable and consistent with MEM rules – p.10
- RECOMMENDATIONS FOR THE REGULATOR
 - 4-1 - Do a comprehensive review of the Mining Code to “ensure that the lessons learned...are fully considered and appropriately incorporated...” – p.10
 - 4-2 – Life-of-Mine Planning for Permitting – the MP TSF failure is in part the result of the company and its engineers not ensuring that a “perspective that spans the life of the mine be considered for Mines Act permit applications, while acknowledging that the nature of mining frequently requires changes to the life-of-mine plan.” – p.11
 - 4-3 – Investigation, Compliance & Enforcement Review – MEM needs to “enhance its investigative capacity, as well as its ability to exercise its existing compliance and enforcement authority...” including the creation of “a supported director-equivalent position specific to investigation, compliance and enforcement”; MEM needs to incorporate “incentives, administrative penalties, outside agency collaboration and other best practices” – p.11
 - 4-4 – Geotechnical Oversight – MEM has a responsibility to oversee the decisions of the EoR, which requires that MEM “maintain sufficient technical capacity to conduct appropriate oversight of the professional opinions on which it relies”; this means we should create a “Regulatory Dam Safety Manager dedicated to the coordinated regulatory oversight of the tailings dams in the Province” – p.11
 - 4-5 Organizational Review of Inspectorate – MEM needs a “comprehensive internal review of operational and business practices” – p.11
- STRENGTHENING RECORDS MANAGEMENT
 - 5-1 – Internal Records Management – MEM needs a “formal management system of documentation for all mines from development to post-closure”; this is need to allow transparency for the public but also so that “long term, integrated decision making by the Regulator, the permittee and consulting professionals” is based on an understanding of the full history of the mine – p.11
- REGULATORY INTEGRATION
 - 6-1 – Alignment of Regulatory Objectives – Government should review how we do business and ensure that we are aligned and communicating between agencies – p.12

- 6-2 – Permitting Process Alignment – Government should review the separate processes of agencies to ensure we identify “opportunities to integrate and align these processes – p.12
- FOSTERING INNOVATION
 - 7-1 – Collaborative Education – MEM, professional organizations and educational institutions should find ways to collaborate on finding new ways to ensure management, professionals and employees are well educated on how a TSF functions and how risk must be constantly evaluated – p.12
 - 7-2 – Research & Development – Government and industry must “support research and development efforts to improve these technologies for practical application” – p.12



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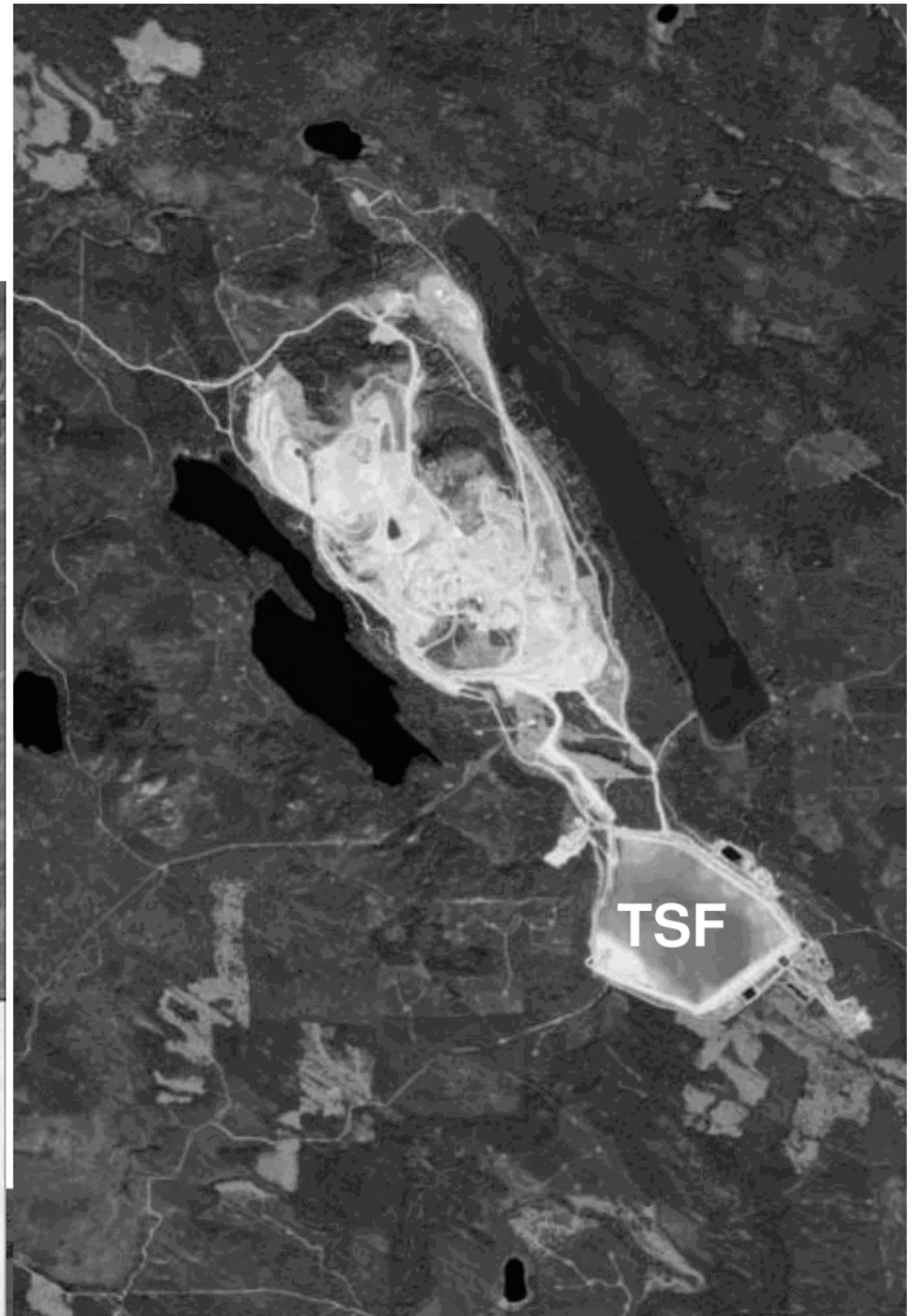
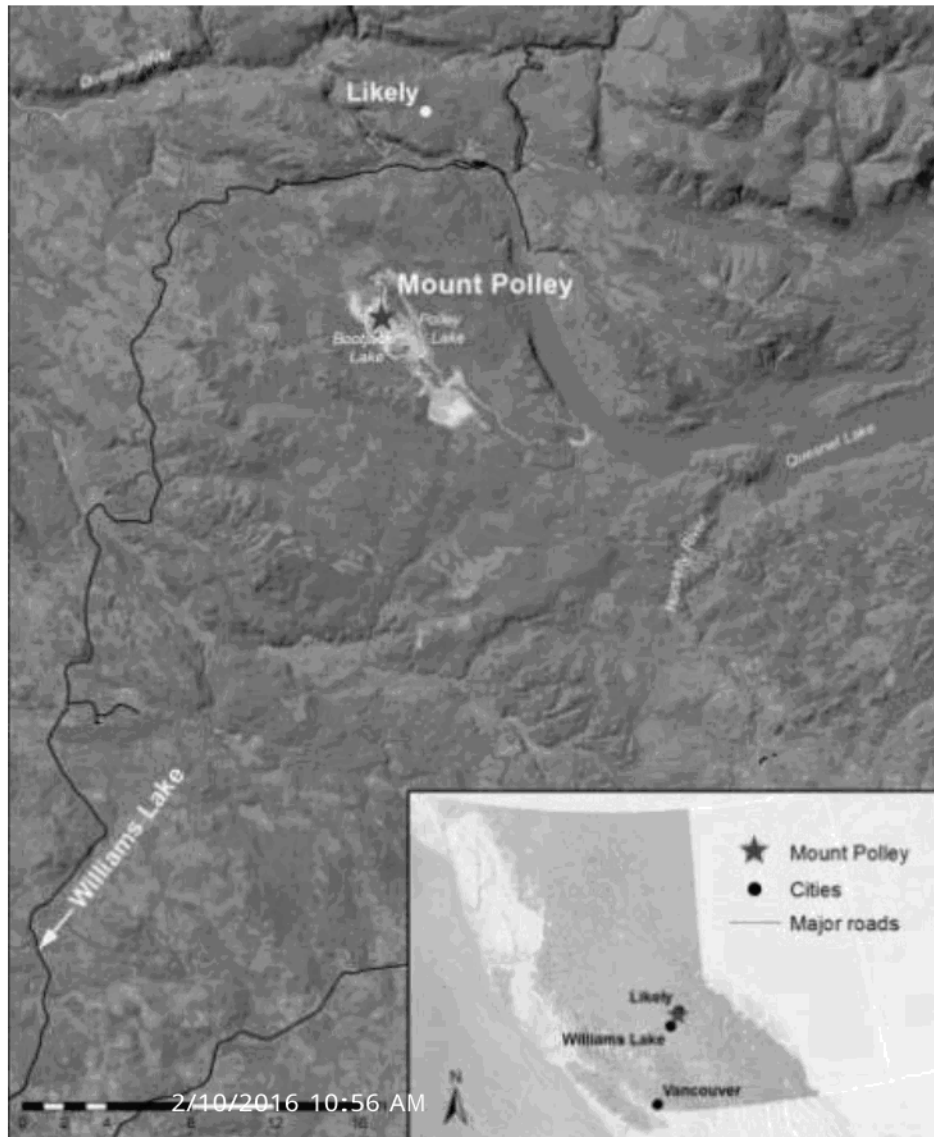
MOUNT POLLEY MINE TAILINGS STORAGE FACILITY BREACH

August 4, 2014

AL HOFFMAN, P.Eng.
CHIEF INSPECTOR OF MINES

Investigation Report
of the Chief Inspector of Mines

MOUNT POLLEY MINE
MOUNT POLLEY MINING CORPORATION
SUBSIDIARY OF
IMPERIAL METALS CORPORATION



MOUNT POLLEY TAILINGS STORAGE FACILITY BREACH, AUGUST 4, 2014





**DEBRIS FIELD THROUGH
HAZELTINE CREEK**



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QUESNEL LAKE



QUESNEL LAKE



MOUNT POLLEY MINE

**TAILINGS STORAGE
FACILITY BREACH**

CONCURRENT INVESTIGATIONS

Chief Inspector of Mines

- investigation as per Section 7 of the *Mines Act*

Conservation Officer Service (COS), BC Ministry of Environment and Federal Fisheries and Oceans Canada

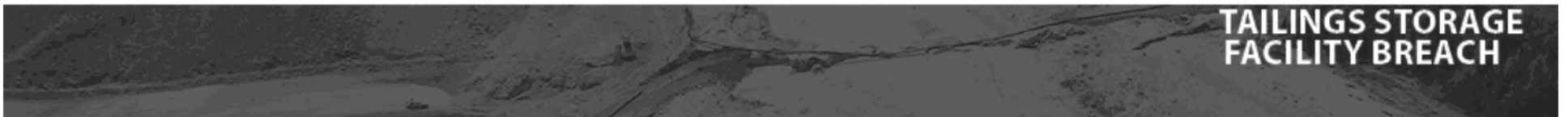
- conducting joint investigation pursuant to:
 - *Environmental Management Act*
 - *Federal Fisheries Act*

The Independent Expert Engineering Panel

- issued report January 30, 2015

MOUNT POLLEY MINE

**TAILINGS STORAGE
FACILITY BREACH**



CHIEF INSPECTOR OF MINES INVESTIGATION OBJECTIVES:



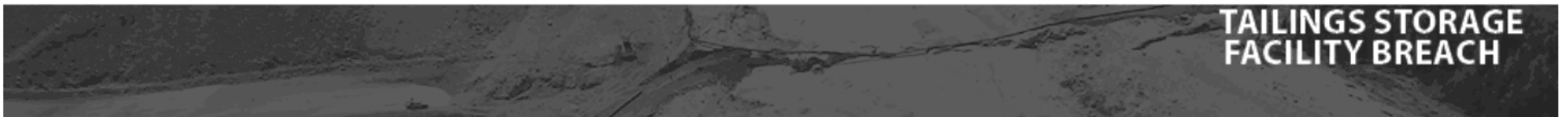
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Determine:

- cause of the dam failure
- any contraventions of regulatory requirements
- orders pursuant to the *Mines Act and Code* as appropriate
- recommendations to prevent future occurrence
- if appropriate, a report to Crown Counsel for Crown's assessment of whether charges for contraventions pursuant to the *Mines Act*, should be laid.

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CHIEF INSPECTOR OF MINES INVESTIGATION INCLUDED:



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Largest, most complex in Mines Inspectorate history

- Adopted discipline of Major Case Management
- Review of documentation, for chronology of activities of mining company, engineering consultants and regulator
- ~100 interviews
- Geoforensic site investigations to determine *what* happened
 - “mechanism of failure”
- Root Cause Analysis to support *why* it happened, from NASA
 - “cause” of failure
- findings, lessons learned and recommendations

www.gov.bc.ca/mountpolleyinvestigation

MOUNT POLLEY MINE

**TAILINGS STORAGE
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MOUNT POLLEY MINE TAILINGS STORAGE FACILITY BREACH

August 4, 2014

HARVEY MCLEOD, P.Eng. P.Geo.
KLOHN CRIPPEN BERGER LTD.

Investigation Report
of the Chief Inspector of Mines

CHIEF INSPECTOR OF MINES INVESTIGATION GEOFORENSIC



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Comprehensive geotechnical investigation to support
Expert Panel and Chief Inspector:

- Contracted Klohn Crippen Berger
- Comprehensive site investigation and drilling program to characterize the foundation
- Field mapping, geophysics, test pits and trenches
- In situ and laboratory strength testing
- Instrumentation



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**TAILINGS STORAGE
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Section-A

- # BREACH

PERIMETER



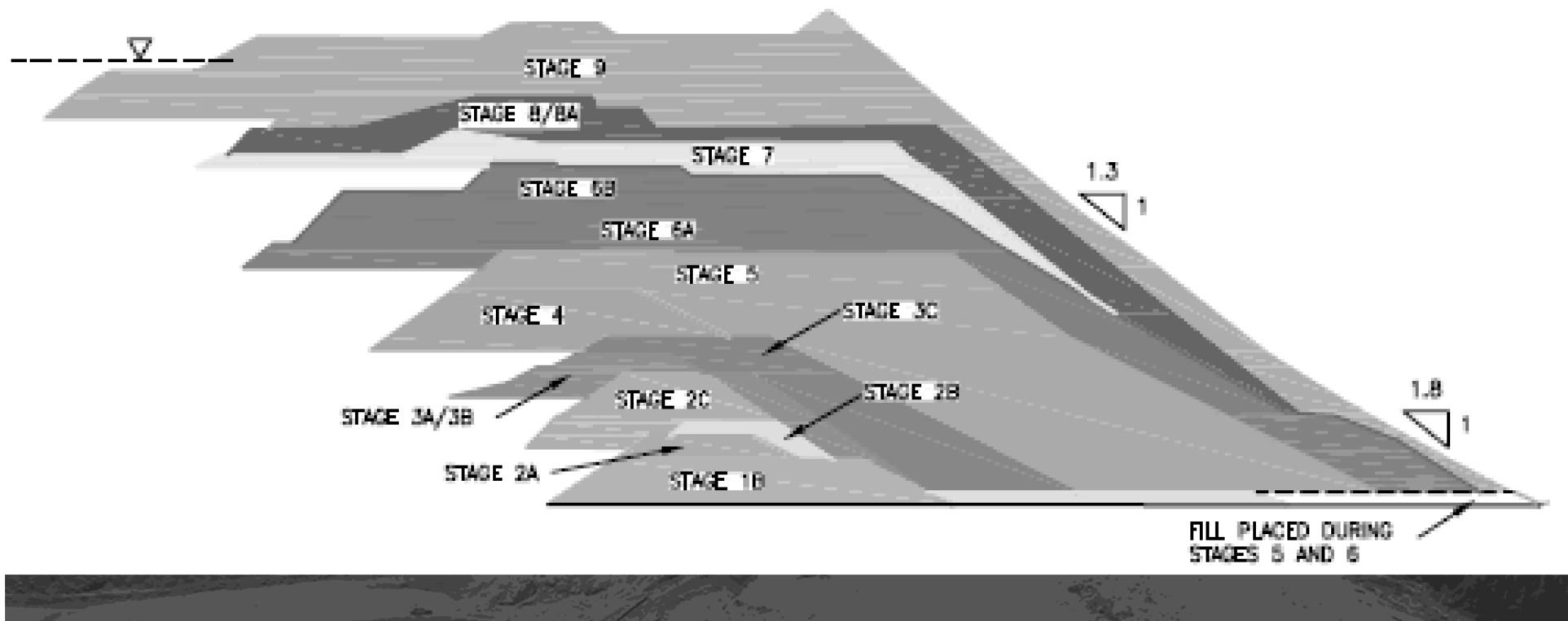
MAIN

TAILINGS STORAGE FACILITY BREACH

PRE-BREACH GEOTECHNICAL UNDERSTANDING

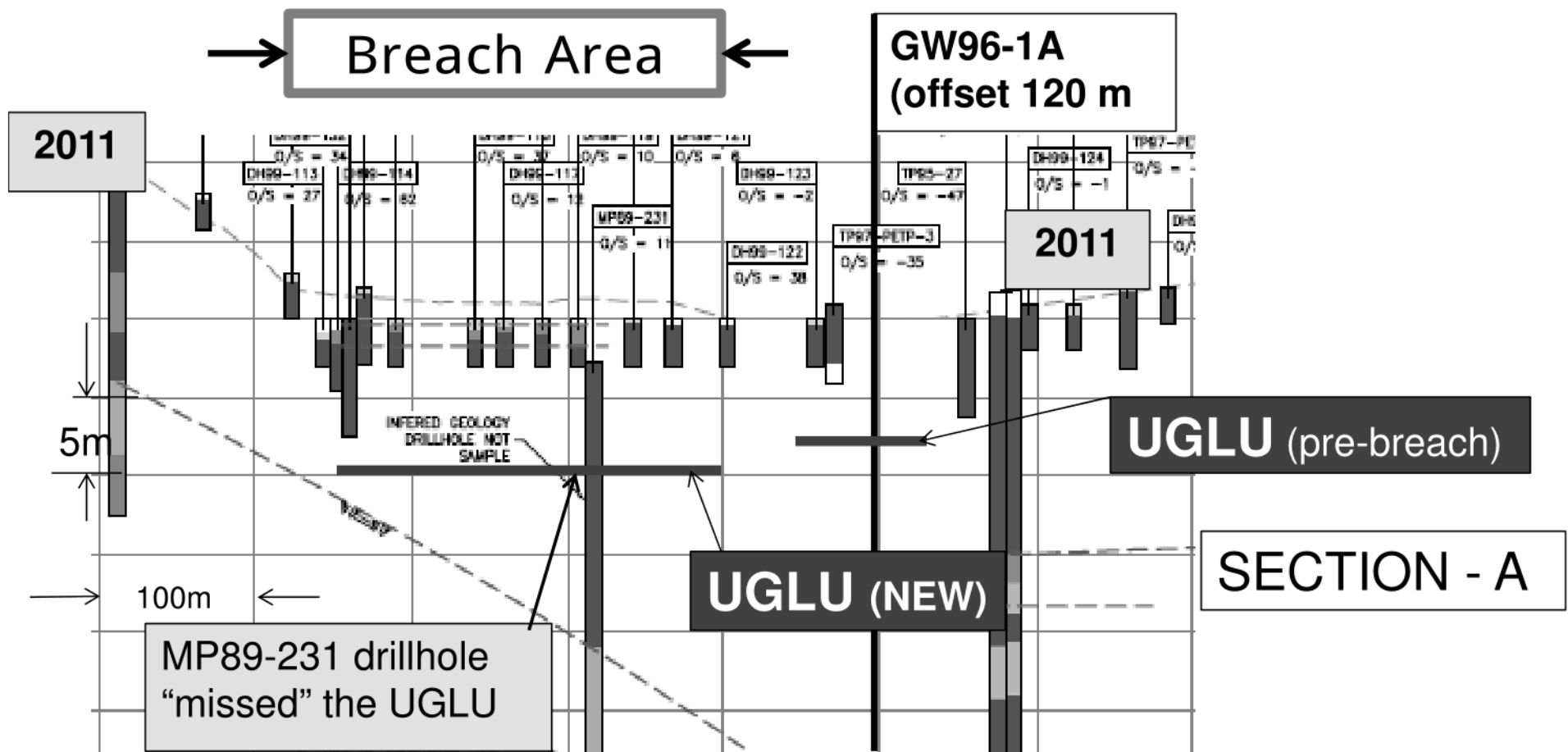
Perimeter Embankment as-constructed condition

- Constructed in 9 stages (raises)
- Modified centerline dam with low permeability core zone, downstream rockfill with filters



PRE-BREACH STATE OF KNOWLEDGE

Limited deep soil investigations did not identify the weak clay layer (UGLU) - complex geologic history

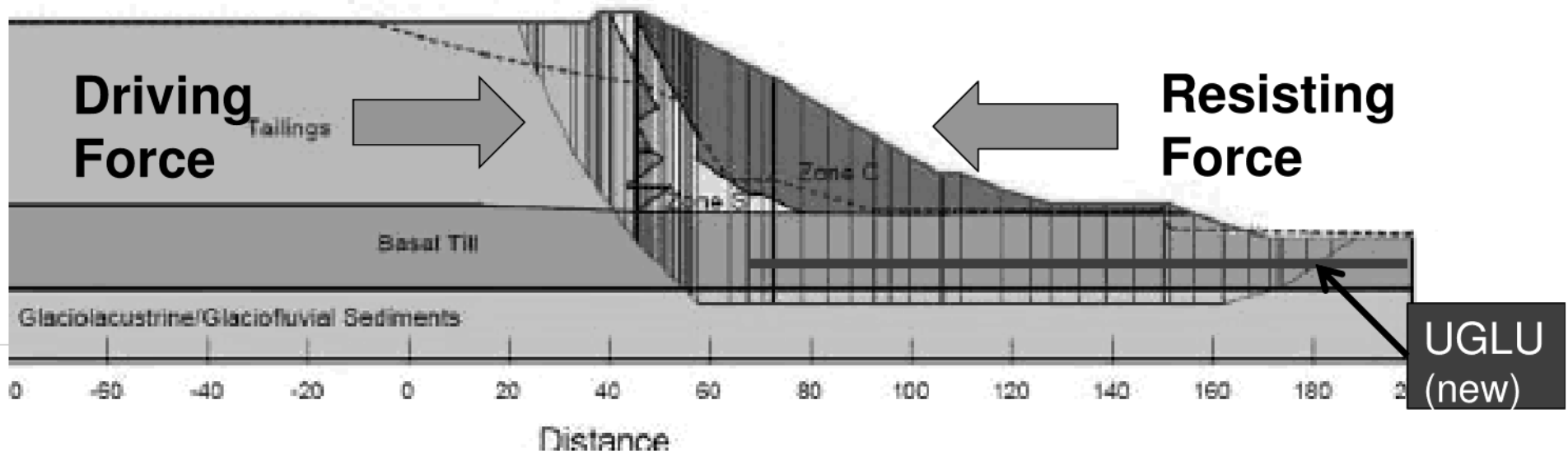


PRE-BREACH KNOWLEDGE

The soil foundation conditions did not include the UGLU.

- Purpose of stability analyses
- The expected Factor of Safety calculated for the stage 9 permit was 1.63

$$\text{Factor of Safety} = \frac{\text{Resisting Force}}{\text{Driving Force}}$$

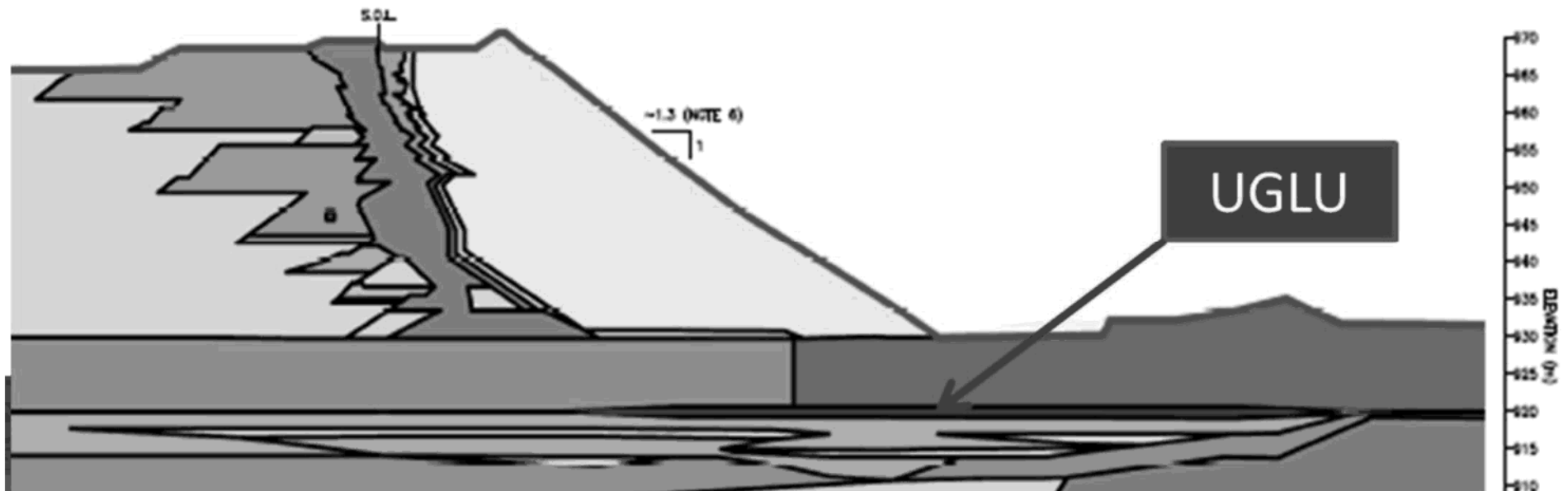


RESULTS: MECHANISM OF FAILURE

“WHAT HAPPENED”

Dam failed by sliding on foundation clay layer, glaciolacustrine in origin at 10 m depth (UGLU)

- Location was confirmed in area of breach
- 40 m high steep embankment subjected UGLU to stresses initiating progressive failure of dam
- Comprehensive analysis builds upon Expert Panel





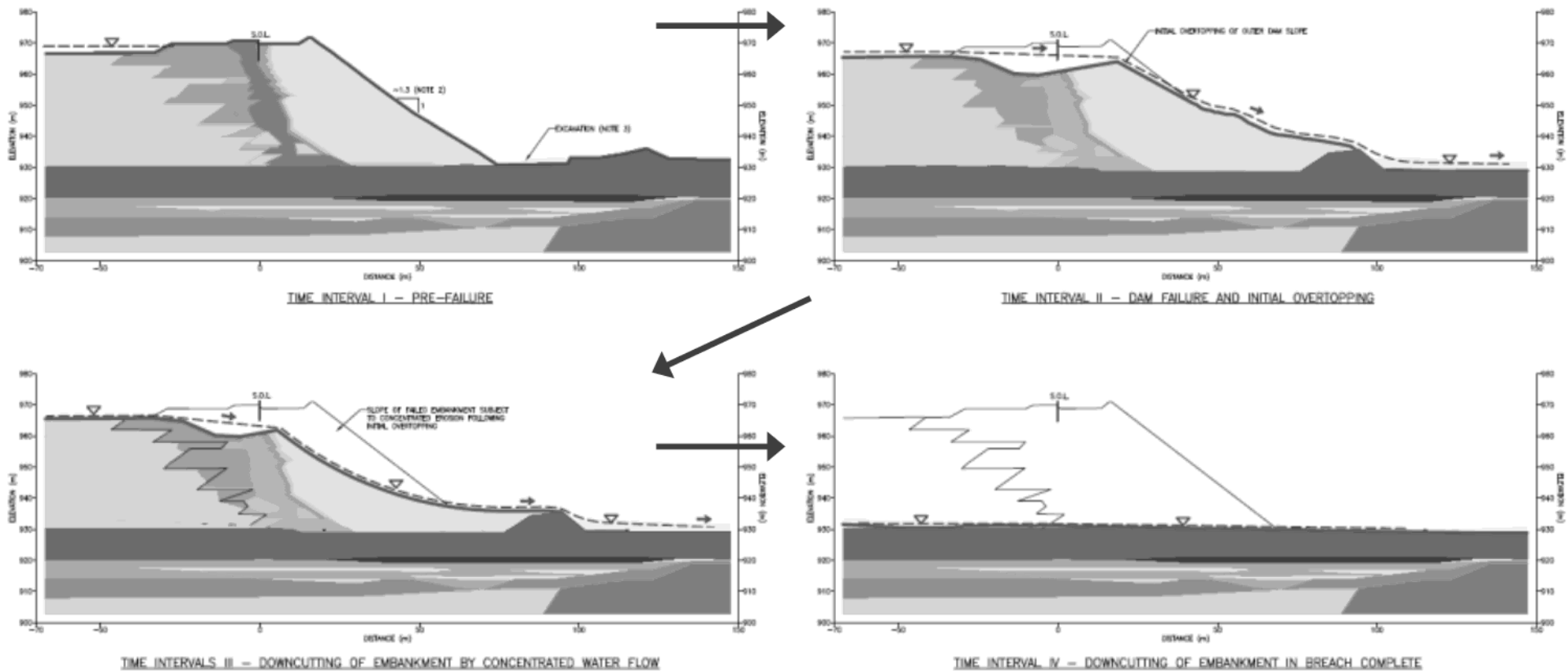
Undisturbed clay outside failed embankment area



Disturbed clay below failed embankment area

FAILURE PROGRESSION LED TO BREACH

Erosion followed the failure as the water overtopped the slumped crest of the embankment.



Conceptual Sequence of Dam Failure through Reconstructed Breach Section

CAUSE SUMMARY

THE DAM *FAILURE MECHANISM* WAS GEOTECHNICAL:

- sliding failure on a weak clay layer 10 m below the surface

Once the embankment failed,

THE DAM *BREACH MECHANISM* WAS HYDROLOGIC:

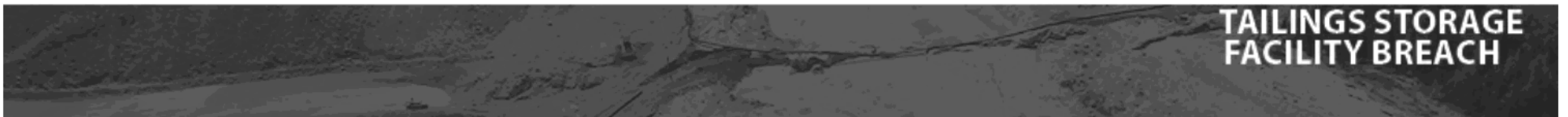
- Water flowed over the crest and eroded the dam
- insufficient beaches did not protect the embankment from the surplus of water once embankment failed

THE ROOT CAUSES OF THE EVENT WERE ORGANIZATIONAL:

- absent foundation investigation standards of practice
- mistaken belief in foundation conditions
- misplaced faith in Factor of Safety
- narrow planning perspective of mine management
- failure to adequately understand and act on risk

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FACILITY BREACH**



REPORT TO CROWN COUNSEL



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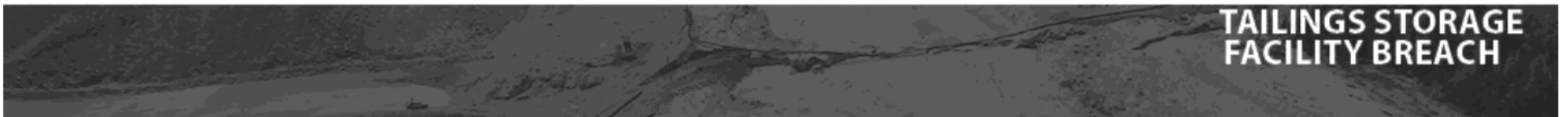
There is not sufficient information to indicate a contravention of existing regulatory requirements

- A sub-excavation at the toe and the over-steepened slope were in general conformance with the design
- There were no regulatory requirements for foundation characterization and beach design parameters or surplus water

There will be no Report to Crown Counsel for Crown's assessment of whether charges for contraventions pursuant to the *Mines Act*, should be laid.

MOUNT POLLEY MINE

**TAILINGS STORAGE
FACILITY BREACH**



KEY RECOMMENDATIONS OF THE CHIEF INSPECTOR: – MINING OPERATOR AND INDUSTRY

Mine Dam Safety Manager

- qualified individual to anticipate, recognize and prevent conditions from developing that could impact safety of TSF.

Water Management

- qualified professional design and qualified individual to oversee water balance and water management plan to anticipate and oversee the mine's water balance and water management plan.

Independent Technical Review Board

- strengthen oversight and risk management

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FACILITY BREACH**

KEY RECOMMENDATIONS OF THE CHIEF INSPECTOR: -PROFESSIONAL ORGANIZATIONS

Professional Reliance Standards and Integration

The implementation of professional reliance is not adequately structured or formalized in policy

- APEGBC: foundation investigation, roles and responsibilities and transfer of EoR
- MAC: review of TSF management guidelines
- CDA: update to safety guidelines, roles, responsibilities

Then,

- MEM: Standards and guidelines to be considered and incorporated into the Code

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FACILITY BREACH**

KEY RECOMMENDATIONS OF THE CHIEF INSPECTOR: -REGULATOR

Review of the Code

- Findings, lessons learned, recommendations and professional guidelines to be considered

Investigation, Compliance and Enforcement Review

- operational development and regulatory tools

Internal Records Management

- Records management system supports long-term, integrated decision making

Collaborative Education, Research & Development

- Both government and industry should support research and development efforts to improve current technologies

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CONCLUSION



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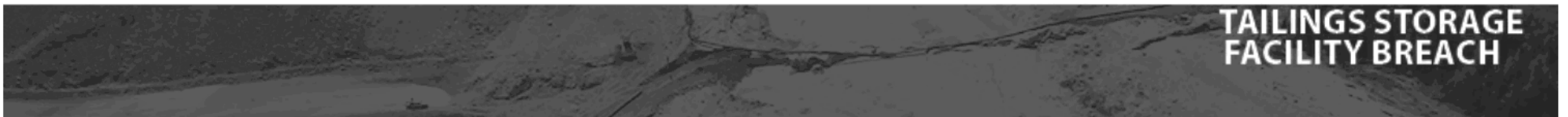
Findings and lessons learned confirm status quo no longer acceptable:

- complexities within mine operations need to be continuously anticipated, integrated and managed
- formalized policy, guidelines, and accountability is essential to design and management of tailing storage facilities

Continuous improvement by the mining industry, professional consultants and the Regulator will serve to meet the expectations of all British Columbians.

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FACILITY BREACH**





RECOMMENDATIONS OF THE CHIEF INSPECTOR:

19 recommendations, directed to:

- Mining Operator – MPMC
- Mining Industry
- Professional Organizations
- Regulator

For full report, visit:

www.gov.bc.ca/mountpolleyinvestigation

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