



Business Interruption Issues and Downtimes Related to Tailings Dam Failures

by Gavin Rowatt, Gen Re, Toronto

When estimating loss scenarios for tailings facilities, we've seen varying numbers. Recently, large failures have caused severe business interruption issues at mines in Canada and Brazil. A look at what's happened can provide insurers guidance in estimating consequences of future loss incidents.

Tailings dams store waste products of mining operations after separating the valuable minerals from the rock. The facility is filled and raised throughout the life of the mine, and then usually covered when the mining operation closes. The largest tailings dams are taller than the 221-meter (727-foot) Hoover Dam.

Among the loss estimates we've seen, downtime ranges from three to six months—and longer. For example, a recent mining risk submission for a large iron ore mine suggests that after a tailings incident, the mine could be operating on a limited basis within two months, and the Maximum Foreseeable Loss (MFL) was estimated at three and a half months down.

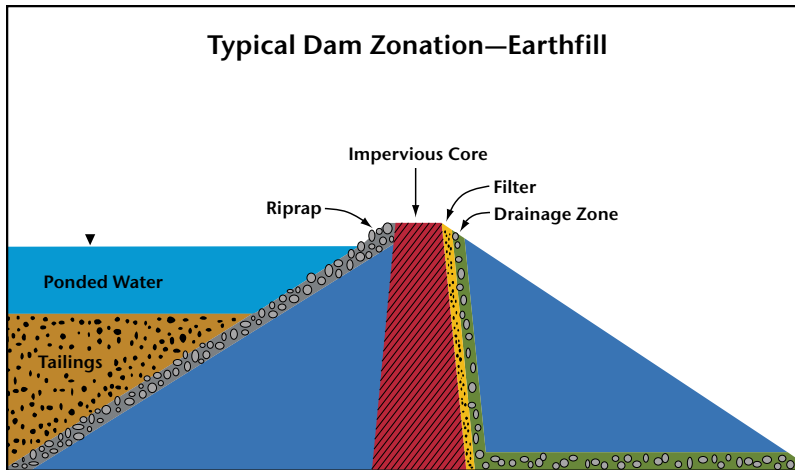
Perhaps the shorter downtimes reflect estimates only of rebuilding time, without considering external factors, such as environmental impacts and subsequent regulatory and government intervention. Other factors could aggravate the

problem—such as topography, remoteness of the mine site, or critical downslope exposures, including mining operations, or cities and towns.

We contend that to be more accurate, a downtime of at least 12 months should be used in calculating a tailings breach loss scenario, and a case can be made that a worst-case scenario should be longer. Insurance companies should assume worst-case possibilities when calculating Maximum Foreseeable Losses, and insurance buyers should do the same when considering how much insurance to purchase to protect themselves against the possibility of a large tailings dam failure.

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Typical Dam Zonation—Earthfill

Loss Examples

In the past few years, we have seen two examples of worst-case scenario tailings losses—Imperial Metals’ Mount Polley mine in British Columbia, Canada and the Samarco iron ore mine located in Minas Gerais State, Brazil.

- > The **Mount Polley** mine is an open pit and underground copper/gold mine located in south central British Columbia, approximately 8.5 km southwest of the town of Likely. In August 2014 a massive tailings breach occurred there, releasing about 17 million cubic meters of water, and 8 million cubic meters of tailings and other materials, downstream into Polley Lake, Hazeltine Creek and Quesnel Lake.
- > **Samarco Mineracao S.A.** is a Brazilian mining company operating an iron ore mining, concentration, pelletizing and export operation. Samarco is owned equally by VALE S.A., a Brazilian multinational mining company, and BHP Billiton, one of the largest mining companies in the world and headquartered in Australia. At the time of the accident, Samarco was the second largest producer of iron ore pellets in the world.¹

In November 2015 Samarco’s Fundão tailings dam failed, releasing 32.4 million cubic meters of tailings downstream. It overtopped the downstream Santarem water control dam; it inundated Bento Rodrigues, a small town nearby where 19 people were killed; and it entered the Rio Doce river where the tailings plume ran downstream, eventually entering the Atlantic Ocean 18 days later.

In both instances, the impact of this event affected the mines’ operations for longer than 12 months: Mount Polley for almost 23 months and Samarco has been completely shut down for 16 months and counting. As of this writing, the mine is still not in operation.

In Conclusion

When calculating Maximum Foreseeable Loss scenarios for tailings facilities, insurers and reinsurers should assume a minimum downtime scenario of 12 months; a longer period can be argued if the terms and conditions of the insurance policy, such as the Period of Indemnity, allow it. Furthermore, underwriters need to consider the effects of external factors on the rebuilding time following a tailings facility failure. ■

About the Author

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Mount Polley Timeline

British Columbia, Canada

2014

2014 August 04

- > Initial breach at 1:00 a.m.²
- > The breach had a severe physical impact on the downstream environment:³
 - The dam that separated the tailings storage facility from Polley Lake, as well as along Hazeltine Creek, breached. Hazeltine Creek, originally four feet wide, was 150 feet wide after the tailings event.⁴
 - Trees and woody debris piled up in Polley Lake, Hazeltine Creek and Quesnel Lake.
 - Tailings and eroded earth ended up in Polley Lake, Hazeltine Creek and Quesnel Lake.

2014 August 05

- > Mine shut down. Received pollution abatement order from provincial government.
- > Emergency measures commenced to plug the dam breach and contain pollution.

2014 November 24

- > Substantial completion of Phase 1 of the remediation to ensure:⁵
 - No unauthorized discharges enter into Hazeltine Creek
 - Impact zone is stabilized to manage seasonal events
 - Water quality entering Quesnel Lake meets provincial water quality guidelines
 - Ministry of the Environment announces Phase 2, extending from July 2015 to August 2016, and focusing on remediating impacts of the breach

BREACH Mount Polley Mine Spill



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TODAY Mount Polley Tailings Storage Facility



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2015

2015 April 05

- > Dam breach repairs completed.

2015 July 09

- > Province authorizes a restricted mine restart.
 - Allows Mount Polley to deposit tailings into Springer Pit, an existing open pit on the mine site
 - Allows the company to start operations at around 50% of capacity, 11 months after the incident occurred⁶

2016

2016 June 23

- > Mine receives permission from the British Columbia government to return to normal operations using the repaired tailings storage facility.⁷
 - Total and partial downtime period of nearly 23 months
 - 100% down for 11 months
 - 50% down for another 11 months
 - Overall average impact: 75% production capacity for almost two years

Samarco Timeline: Fundão Tailings Dam

Minas Gerais, Brazil

2015

- 2015 November 05
 - > Fundão dam at the Samarco iron ore mine fails in the afternoon, all operations halted.⁸
 - > Two remaining control structures are at inadequate safety levels post-failure.
 - > Minimum Factor of Safety (FoS) required by regulation is 1.5.
 - Selinha dike at FoS of 1.2 post failure
 - Santarem dam at 1.37 FoS post failure
 - > Post failure, Samarco begins work to reinforce existing structures to the required level of safety.

2016

- 2016 January 18
 - > Construction of a protective dike between Samarco's unit and the town of Bento Rodrigues.⁹
- 2016 January 27
 - > Construction of a containment barrier below Santarem dam to halt erosion process.
 - > Dikes S1 and S2 complete (near Fundão).
 - Dikes built to increase retention capacity of the remaining sediments
- 2016 February 19
 - > Conclusion of Santarem dam reinforcement project.
- 2016 February 21
 - > Dike S3 (phase 1) complete (near Bento and Santarem Creek).

- 2016 September 21
 - > Start of construction of dike S4.
 - Delayed because this structure requires appropriation of 55 properties in Bento Rodrigues

2016 July 12

- 2016 July 12
 - > Samarco proposes a new tailings system—seeking approval from State Environmental Agency to dispose tailings in nearby Alegria Sul open pit.
 - Will allow resumption of operations at 60% production capacity
 - Will require construction of a compacted earth dike
 - Will store 17 million cubic meters of tailings—good for two years of operation
 - Has approval of Ministry of Mines and Energy

2016 November

- 2016 November
 - > Raising Dike S3 (phase 2) complete.
 - Conclusion of first containment barriers.

2016 December 20

- 2016 December 20
 - > Samarco, VALE and BHP Billiton sign a preliminary agreement to use the open pit at VALE's Timbopeba mine for tailings disposal, should the company resume operations.
 - Depends on successful negotiation between the parties, due diligence and government approvals
 - > Nova Santarém dam complete (in Germano mining complex).
 - Conclusion of all containment barrier construction

2017

2017 January 12

- > Filed Plan for Recovery of Degraded Areas of Fundão tailings facility.¹⁰
 - Includes environmental reclamation, stabilization of embankments and remaining structures, tailings and revegetation
 - Filling the Fundão complex with sandy material
 - When complete, it won't be a tailings disposal site

2017 January 19

- > Mine will probably be operational again in two months, according to Brazil's mines and energy minister, Fernando Coelho Filho.¹¹
- > Minas Gerais state regulator still working with Samarco on the two licenses necessary to resume operations.
- > Dike S4 complete.
 - Temporary structure built in Bento Rodrigues prevents solids from being carried from the affected area of Bento Rodrigues to the Gualaxo River

2017 March

- > Still in discussion with regulatory authorities and not in operation. The company is under criminal investigation in Brazil.¹²
- > 100% down for 16 months and counting.

BEFORE FAILURE Fundão Tailings Dam in 2013



Source: Google Earth

AFTER FAILURE



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For more information and diagrams on the Samarco structures built after the failure, visit <http://www.samarco.com/en/2016/09/21/decreto-do-governo-estadual-viabiliza-obras-do-dique-s4>

Endnotes

- 1 *The Sydney Morning Herald*, <http://www.smh.com.au/business/mining-and-resources/samaco-could-be-operational-in-two-months-says-brazil-minister-20170118-gtu6kx>.
- 2 <http://www2.gov.bc.ca/gov/content/environment/air-land-water/spills-environmental-emergencies/spill-incidents/past-spill-incidents/mt-polley>.
- 3 <https://www.imperialmetals.com/our-operations-and-projects/operations/mount-polley-mine/mount-polley-updates/remediation-and-monitoring>.
- 4 British Columbia factsheet, August 9, 2014, https://archive.news.gov.bc.ca/releases/news_releases_2013-2017/2014ENV0059-001159.pdf.
- 5 British Columbia News Release, November 24, 2014, https://archive.news.gov.bc.ca/releases/news_releases_2013-2017/2014ENV0101-001763.htm.
- 6 British Columbia News Release, July 9, 2015, <https://www.imperialmetals.com/assets/docs/mt-polley/07.09.15.Province-Authorizes-Restart.pdf>.
- 7 <https://www.imperialmetals.com/our-operations-and-projects/operations/mount-polley-mine/overview>.
- 8 <http://www.samarco.com/en/2016/11/04/ainda-ha-muito-ser-feito-nas-comunidades-impactadas>.
- 9 “One Year After the Fundão Dam Failure,” http://www.samarco.com/wp-content/uploads/2015/12/Book-Samarco_Ingles_v1.pdf.
- 10 <http://www.samarco.com/en/comunicados>.
- 11 <http://www.smh.com.au/business/mining-and-resources/samaco-could-be-operational-in-two-months-says-brazil-minister-20170118-gtu6kx>.
- 12 <https://www.wsj.com/articles/brazils-samarco-disaster-mining-dams-grow-to-colossal-heights-and-so-do-the-risks-1459782411>.

FURTHER INFORMATION

Presentations on results of Mount Polley expert engineering investigation

https://www.mountpolleyreviewpanel.ca/sites/default/files/MountPolley_Media%20Briefing%20Presentation_Jan%2030_Final_2.pdf



Video of results of Fundão Tailings Dam investigation

<http://fundãoinvestigation.com/video-presentation>



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