

CASINO



Tailings Dam Questions and Answers

1. What is a tailings dam?

A tailings dam is a structure built for the purposes of storing mine waste and water from the milling process. Where water retention dams are constructed to full height before any discharge to the impoundment, tailings dams increase in size as storage requirements increase¹.

2. Why do we need tailings dams?

Tailings dams, or tailings management facilities (TMF), are required for the long term deposition of mine waste such as tailings and waste rock. Tailings are generated from the mined ore that has been ground during mine processing, and must be kept behind a dam to prevent them from flowing into waterways.

3. Why can't you use another technology like dry stack tailings to manage the tailings?

Mine waste that has a high sulphide content and low neutralization potential (called Potentially Acid Generating or PAG material) such as at Casino, has the potential to react with oxygen in the air and, if not stored under water which prevents it from coming in contact with air, will leach acid and metals into the environment.

Dry stack tailing technology is appropriate for waste that has low sulphide content and high neutralization potential, as the waste is continuously exposed to air.

Conservative approaches and current best practices dictate that, for Casino's waste, co-disposal of the PAG waste rock and tailings under a constant water cover is the best technology to prevent the formation of acidic drainage.

4. What is contained in the tailings dam? What is the water quality like?

The Casino tailings dam will store non-PAG tailings adjacent to the dam and PAG tailings further upstream. Waste rock generated in the mining process will be stored further upstream of the PAG tailings. Upon closure of the facility, all PAG materials in the TMF will be covered with a non-PAG tailings cover and a continual water cover.

¹ <http://www.tailings.info/disposal/conventional.htm>

Water quality in the TMF pond during operations is predicted to be similar to other copper mining operations and close to drinking water guidelines. During closure, the water quality in the TMF pond is predicted to improve over time.

5. How are tailings dams regulated in the Yukon?

Regulation of dams in Canada is a provincial/territorial responsibility. Canada does not have a federal regulatory agency. YESAB and Yukon regulatory bodies apply the latest version of the *Dam Safety Guidelines*, developed by the Canadian Dam Association (CDA) for the design, monitoring and maintenance of dams.

The Yukon Water Use Licence for Casino will outline requirements for monitoring and reporting on the status of the dam, including, but not limited to: monthly and annual reports, an annual geotechnical inspection, periodic dam safety reviews, and monitoring of piezometers, water levels and outflows. CDA guidelines are used to help set license conditions².

6. What inspections are conducted and at what frequency?

The Yukon government conducts routine inspections of dams and works with dam owners to ensure compliance with water use license conditions. At a minimum, tailings dams require an annual geotechnical inspection and periodic dam safety reviews (every five years depending on the consequences of failure and changes in the dam or surroundings). However, monitoring of dam instrumentation, such as piezometers, inclinometers and survey monuments may be conducted much more frequently, and usually is required at least monthly.

7. What design standards are used for tailings dams in Canada and the Yukon? How has this been applied to Casino?

Dams in Canada are expected to meet the guidelines published by the CDA. The CDA guidelines are comprehensive design standards that include a Consequence of Failure classification that considers loss of life, economic losses, environmental losses, cultural losses and incremental and total consequences. Dams are rated according to the potential effect of failure on the above, and dams are assigned risk ratings of low, medium, high, very high or extreme. Design standards vary by the risk rating.

Based on current information and conditions, the Casino Project TMF dam has been assigned a Consequence of Failure classification of High; however, to ensure maximum protection and sufficient storage capacity, the design standards (e.g. design flood and earthquake) for an Extreme classification were used in the design of the final dam.

² http://www.imis100ca1.ca/cda/Main/Dams_in_Canada/Regulation/CDA/Dams_In_Canada_Pages/Regulation.aspx?hkey=2bee099d-1234-4be2-8d92-a3527e0cd8fe

8. How many tailing dams and earth filled dams are there in Canada?

There are over 10,000 dams in Canada, of which 933 are categorized as “large” dams under the ICOLD definition³. There are 1,650 water supply dams, and 118 tailings dams in BC. In the Yukon there is one operating tailings pond impoundment at the Wolverine Mine, and one at the closed Ketzia mine.

9. How high is the tailings dam? Why can't it be shorter?

The main embankment will be 286 m at the deepest point of the Casino Creek valley at the end of mine life. The height of the dam is needed to accommodate storage of all the tailings and waste rock produced during mining at the Casino Project, as well as the non-PAG tailings cover and water cover, and to allow freeboard for extreme flood events. The height of the embankment is designed taking into account the maximum supernatant pond level, plus capacity to store the Inflow Design Flood, plus an additional 2m of freeboard.

During the design of the Casino Project, several sites for deposition of tailings were examined, some with lower embankments. The current site was chosen as it was considered the safest and had the lowest impact on the environment.

10. What happens when mining stops?

At the cessation of mining, the TMF will be closed in a method that will ensure protection of the downstream receiving environment and will minimize long term maintenance requirements. This will be achieved by decommissioning of the water management infrastructure (pumps, pipes, access roads), construction of a spillway to allow surface water to discharge downstream of the TMF once desired water quality has been established, and the construction of engineered wetlands within the TMF to passively treat water stored in the TMF and overflow from the open pit. The PAG waste rock and PAG tailings will be completely covered by non-PAG tailings and the supernatant pond in Year 20 of operations.⁴

11. What if the mine lasts longer than you planned? Could you hold additional tailings in the current facility?

The tailings facility has the potential to hold at least another 25 years of mine production over the 22 years that is planned.

³ http://www.imis100ca1.ca/cda/Main/Dams_in_Canada/Dams_in_Canada/CDA/Dams_In_Canada.aspx?hkey=2f98be19-d947-4aa2-9b2e-16a5202fe919

⁴ Casino Project Conceptual Closure and Reclamation Plan, Brodie Consulting, 2013.

12. How is the Casino tailings dam different than Mount Polley?

As current information on the design, construction and operation of the Mt. Polley mine is not publicly available at this time, it is difficult to compare Casino with Mount Polley. A request has been submitted to the British Columbia Ministry of Energy and Mines for the 1998-2014 Annual Dam Safety Inspection Reports, geotechnical reports and inspection reports for the Mount Polley mine. Assessment of the Mount Polley reports, along with conclusions and recommendations from the pending assessment of the Mount Polley failure, will aide in ensuring that the Casino Project tailings dam does not succumb to the same failure as the Mount Polley tailings dam.

13. How will CMC ensure that there are no unauthorized releases from the tailings dam?

Regular monitoring, as dictated by the *Tailings and Infrastructure Design and Construction Plan, Operation, Maintenance and Surveillance Manual*, required to be submitted to the Yukon Government, Department of Energy, Mines and Resources as part of the Quartz Mining License issued under the Quartz Mining Act, will ensure that the dam is operating in accordance with the design standards. The Casino Project operates under a deficiency of water and requires fresh water inputs from the Yukon River to meet processing requirements. Regular updates to the water balance will be undertaken and will provide early indications to the monitoring engineers if water levels are rising faster than predicted and if changes to the water management regime are required.

14. What would happen if the Casino tailings dam broke?

Ideally, monitoring of the tailings dam conditions and rigid adherence to construction standards will prevent the Casino tailings dam from ever breaking. However, should a breach occur, depending on the size of the breach, and at what point in the mining operation the breach occurs, generally tailings and mine waste water could discharge from the tailings dam into the headwaters of Casino Creek. Casino Creek is a contributing stream to Dip Creek, which flows into the Klotassin River then the Donjek River, then into the White River and ultimately discharges to the Yukon River upstream of Stewart, YT some 200 km away from the dam. Currently, a dam breach and tailings water inundation study is being conducted, to determine the downstream impact of a sudden full storage dam breach.

Casino Mining Corp will develop and implement an *Emergency Response Plan*, which will contain details for the emergency response procedures that are to be followed in the event of a sudden dam breach. The plan will include details for the mechanisms and processes for addressing potential or actual failures of structures, equipment and material stockpiles and programs for the training of employees. The plan will also include details of a response to a catastrophic event and all the external agencies and services that will likely be involved.

While water quality in the TMF supernatant pond is close to drinking water standards, the deposition of tailings into Casino Creek and the downstream rivers would affect fish habitat. Risk

assessments would have to be conducted following the dam breach to determine if removal of the tailings from the waterways would be necessary, or if the tailings could be remediated in place.

15. How will climate change affect the tailings dam management?

Regardless of environmental conditions, regular monitoring, as dictated by the *Tailings and Infrastructure Design and Construction Plan, Operation, Maintenance and Surveillance Manual*, will indicate early to the monitoring engineers if there are changes in the tailings management conditions, and if changes to the water management regime are required.