

**CONSULTANT REVIEW BOARD
EXECUTIVE SUMMARY OF THE
DRAFT REVIEW OF LEADVILLE MINE DRAINAGE TUNNEL RISK ASSESSMENT**

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The independent Consultant Review Board consists of experts in geology, mining engineering, and geotechnical engineering. We thoroughly reviewed the three component reports that make up the Bureau of Reclamation risk assessment of the Leadville Mine Drainage Tunnel (LMDT): (1) Existing Conditions of the Leadville Mine Drainage Tunnel (Existing Conditions report), (2) Results of the Geotechnical and Structural Analysis, Leadville Mine Drainage Tunnel (Results report), and (3) Potential Failure Modes and Effects Analysis, Leadville Mine Drainage Tunnel (PFMEA report).

The overall interpretations regarding the existing conditions in and around the LMDT appear reasonable and sound. Reclamation's review of the history of the LMDT is detailed and complete, and it provided a valuable framework for the review. The description of the difficult conditions encountered during construction and the intermittent efforts to rehabilitate the tunnel provides a basis for understanding the structural geology and how the current hydrogeologic condition has developed. A critical piece of information needed for future decision-making is the maximum possible level of the impounded mine pool, and several lines of evidence could be pursued to evaluate this.

The critical potential failure modes are adequately identified, and the associated risks are, in general, rationally assessed and portrayed. Further refinement of the early warning system (EWS) is needed (1) to assure that qualified personnel are on call to evaluate potentially hazardous situations and (2) to integrate local emergency-response personnel. Some additional refinements to the analysis of seismic conditions will strengthen the overall analysis.

In general, the analyses adequately model the expected behavior of the tunnel and portal slopes. The inability to directly observe and sample the collapse bulkheads limits the ability to characterize the materials and groundwater flow paths accurately. The use of conservative assumptions regarding these factors should adequately bracket the actual conditions. Addition of a simplified seismic deformation analysis will better characterize seismic conditions.

The conclusions and recommendations of the risk analysis are reasonable and well supported. While the volume of water in the mine pool could be very large and the pool could be well integrated, the main issue is the stability of the lower collapse bulkhead, which the analyses show to be quite stable. Also, a hypothetical failure of the upper collapse bulkhead (below the Pendery fault) would most likely occur very slowly, which would retard a rapid draining of the Mine Pool. Conservative to very conservative assumptions were made at every step of the geotechnical and risk analyses. The cumulative conservatism of the overall analysis supports the conclusion that rapid, catastrophic failure of the collapse bulkheads and resulting rapid drainage of the Mine Pool through the portal are extremely unlikely events.