Comparison of Dam Break Assessment Methods, using Gold Mine Tailings Storage Facility in Western Australia as a Case Study

Pouyan Abbasimaedeh1, Chris Hogg2 and Prasudi Atmajaya3

1. Principal Geotechnical Engineer, CMW Geoscience, 6155. Email: pouyan.abbasi@cmwgeo.com

2. Senior Principal Tailings Engineer, CMW Geoscience, 6155. Email: chrish@cmwgeo.com

3. Senior Geotechnical Engineer, CMW Geoscience, 6155. Email: prasudia@cmwgeo.com

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# ABSTRACT

This research presents a comparative analysis of two methodologies for assessing the impacts of a worst-case dam breach scenario involving an above-ground TSF constructed by downstream methodology and containing gold mine tailings in Western Australia. The study evaluates the potential inundation and flow behaviour resulting from a breach, focusing on its impact on a neighbouring active mine pit. HEC-RAS employs a finite volume method, providing detailed outputs such as flow velocity and time of arrival, which are critical for dynamic hazard assessments and emergency response planning. In contrast, MUCK3D utilizes a geometrical analysis approach combined with engineering interpretation, offering a user-friendly interface for the rapid development of inundation maps, particularly advantageous in highly complex terrains. The breaching geometry was derived using established empirical relationships in industry and insights from previous studies on dam breach mechanisms, ensuring realistic initial conditions for both models. Both methodologies assumed an identical breach volume and Newtonian behaviour for the tailings material to maintain comparability in the results. While HEC-RAS delivers high-resolution outputs that facilitate in-depth hazard analysis, MUCK3D demonstrates efficiency in generating preliminary inundation maps, making it suitable for rapid assessments where time constraints exist. This comparison emphasizes the complementary nature of these tools, depending on the specific requirements of the analysis, such as the complexity of the terrain and the level of detail needed. The findings contribute to a better understanding of the strengths and limitations of these methods, offering insights for engineers and researchers in selecting suitable tools for TSF breach analysis.