

Update on Mine Tailings Dam Regulation in Alaska and North America

By Charles F. Cobb, PE

The contributions of mining to human advancement are taken for granted when people take off in their cars, talk on their cell phones, watch the television, cook on their stoves, and many other ordinary and extraordinary activities. Elements from the earth make our lives comfortable, healthy, and safe, but the investment in people, equipment, and infrastructure necessary to produce those elements in a safe, responsible way is often overlooked. Dams at mines are an important part of the infrastructure contributing to the well-being of society that are not overlooked.

The Alaska Dam Safety Program in the Alaska Department of Natural Resources (ADNR) is responsible for ensuring the safety of dams at mines in Alaska, similar to other state and provincial regulatory programs across the United States and Canada. The following information presents a brief review of the Alaska Dam Safety Program, the purposes of dams at mines in Alaska, and a broad overview of the industry response in North America to tailings dam failures at mines, from the Buffalo Creek Mine tailings dam failure in West Virginia in 1972 to the tailings dam failure at the Samarco Mine in Brazil in 2015.

Protecting Life and Property

The mission of the Alaska Dam Safety Program is to protect life and property in Alaska through the effective collection, evaluation, understanding, and sharing of the information necessary to identify, estimate, and mitigate the risks created by dams. The Dam Safety and Construction Unit (Dam Safety) within the Water Resources Section of the Division of Mining, Land and Water of ADNR administers the program under the authority of Alaska Statute 46.17 to “supervise the safety” of dams under state regulatory jurisdiction. This includes a variety of dams, from small, concrete dams for the water supply of villages to large, rockfill embankment dams used for tailings storage at hard rock mines in Alaska.

The Alaska Dam Inventory includes seventy-six dams under state regulatory authority. The National Inventory of Dams (NID) lists twenty-five dams in Alaska under federal authority. Federally owned and operated dams and dams regulated by the Federal Energy Regulatory Commission (i.e., most hydroelectric dams in Alaska) are exempt by statute from state dam safety authority to preclude redundant regulatory oversight. The Alaska Dam Inventory also

includes another seventy-five dams that are too small to meet the regulatory definition of a dam based on either state or federal criteria.

Several dams at mines are subject to regulation by ADNR Dam Safety. Both the Red Dog Mine and the Fort Knox Mine utilize large, rockfill embankment dams to store tailings. A relatively small, rockfill dam impounds tailings at the Kensington Mine. A small embankment dam stores tailings from previous operations at the Nixon Fork Mine. The Greens Creek Mine, the Pogo Mine, and the current operations at the Nixon Fork Mine (underground mines) utilize a tailings management method referred to as “dry stacking” for tailings disposed above ground. Greens Creek, Kensington, and Pogo also backfill mined out stopes with tailings. Water retention dams help manage storm and contact water at these mines, and water retention dams are utilized at Fort Knox and Red Dog Mines for fresh-water storage. A small diversion dam at Red Dog is also regulated, and the heap leach pad at Fort Knox is regulated as a dam, even though there is no open water pond behind the rockfill embankment dam that stabilizes the heap.

All of the dams at the hard rock mines in Alaska have current periodic safety inspection reports, appear to be in satisfactory condition, and are in general compliance with the Alaska dam safety regulations including emergency action plans. Satisfactory condition is the highest rating in a system developed by the US Corps of Engineers for dams on the NID and means that a dam is expected to demonstrate acceptable performance under all loading conditions including extreme earthquakes and floods.

Protecting Downstream Communities and Resources

The primary objective of ADNR Dam Safety is to protect the downstream communities and resources that may be affected by the operation or failure of a dam. To achieve the mutual goal of safe dams, effective communication and cooperative relationships are required between the various persons, businesses, agencies, and other interests that are involved in the permitting, design, construction, and operation of dams.

ADNR Dam Safety receives geotechnical investigation reports, design drawings, engineering evaluations, detailed design reports, construction specifications, quality assurance plans, emergency action plans, periodic safety inspection reports, and more. The level of detail in this information is dependent on the size, complexity, hazard potential classification, and risk of the dam.

Much of the work represents multi-million-dollar construction projects and requires highly specialized engineers for the technical design and analyses. Independent inspections and engineering evaluations are conducted by ADNR Dam Safety as necessary to confirm and monitor the condition and safety of the dam. After detailed technical reviews are completed on engineering submittals, ADNR Dam Safety issues a Certificate of Approval to Construct, Repair, Modify, Operate, Remove, or Abandon a Dam to indicate compliance with program objectives.

The “Guidelines for Cooperation with the Alaska Dam Safety Program” provide a detailed overview of the program. The Alaska dam safety regulations are flexible and generic in order to address a wide variety of projects, from small, water supply dams for villages to the large, tailings dams at mines. The Alaska dam safety regulations also include requirements that are unique for mine tailings dams in closure.

The National and International Mission Towards Safe Dams

The Buffalo Creek Mine Tailings Dam failed in 1972, killing 125 people, and led to the National Dam Inspection Act of 1972 and the first compilation of the NID. This tragedy raised the level of attention to the safety of dams in the United States and the world and set the stage for the advent of the national and state dam safety programs that followed the various enabling legislation.

In 1976, the Resource Conservation and Recovery Act addressed the management of hazardous and solid wastes. However, for various reasons including the broad regional diversity of mining, geology, and hydrology, the Solid Waste Amendment Act of 1980 included the Bevill Amendment which provided an exemption for certain mine wastes including tailings, resulting in exclusive state authority for regulating mine tailings dams (with some exceptions such as coal and uranium tailings).

The State of Alaska demonstrated leadership in dam safety with passage of the Alaska Water Use Act of 1966 (AS 46.15). In the early 1980s, the Alaska Dam Safety Program was organized by ADNR under Chapter 93 of Title 11 of the Alaska Administrative Code (11 AAC 93). The subsequent Alaska Dam Safety Act of 1987 improved and formalized the legislative authority for regulating dams.

The current dam safety regulations were promulgated in 1989 and revised in 2004. The Alaska Dam Safety Program was based on a model dam safety program developed in multi-agency committees including members of the Association of State Dam Safety Officials (ASDSO) and the Federal Emergency Management Agency (FEMA), the administrator of the National Dam Safety Program. While FEMA’s role is primarily to develop and promote consistent standards, as well as to support and strengthen state programs, the states retain the authority for ensuring the safety of 80 percent of the nation’s 84,000 dams.

ASDSO is an organization of state dam safety officials with over three thousand members at large that develops and disseminates information to promote the safe design, construction, and operation of the majority of the dams in the United States. In Canada, dams are regulated at the provincial and territorial level, and the Canadian Dam Association serves a similar role as ASDSO and part of FEMA’s.

In August 2014, a large tailings dam failed at the Mount Polley Mine in British Columbia. While the failure was spectacular, there were no human casualties and the environmental impacts were apparently not as severe as many feared. In November 2015, a large tailings dam

failed at the Samarco Mine in Brazil. In contrast, nineteen lives were lost, two villages were destroyed, and the outflow from the impoundment affected the turbidity in the Atlantic Ocean more than four hundred miles downstream.

These incidents increased the attention on tailings dams at mines around the world and caused mining companies, regulatory agencies, and engineering businesses to take a fresh look at policies, regulations, and business practices. For example, after the Mount Polley incident, the Mining Association of Canada reviewed their membership protocol "Towards Sustainable Mining" and published the "Report of the TSM Task Force: Recommendations to Strengthen the Mining Association of Canada's Tailings Management Requirements and Guidance" (2015).

Dam safety regulations applicable to mining across Canada are under review by respective agencies. In direct response to the investigation of the Mount Polley failure, the Association of Professional Engineers and Geoscientists of British Columbia published "Professional Practice Guidelines: Site Characterization for Dam Foundations in BC" (2016) which includes specific requirements for site investigations for dams, as well as guidelines on the responsibilities for the engineers involved with designing and operating dams at mines.

In the United States, the Montana Mining Association promoted significant revisions to the mining statutes which were adopted and promulgated by the State of Montana in 2015. The Tailings Dam Committee of the United States Society of Dams (USSD) held a workshop on tailings dams after mine closure at their 2015 annual conference.

In 2016, ASDSO formed a Tailings Dam Regulatory Workgroup led by the writer to develop an issue paper for the board of directors. This effort resulted in a resolution on tailings dam safety that was passed unanimously by the state representatives at the annual business meeting. The resolution directs the organization to support state dam safety programs with regulatory authority over tailings dams.

The workgroup conducted a survey of states and determined that 947 tailings dams listed on the NID are distributed across thirty-nine states, of which twenty-five state dam safety programs have jurisdiction over tailings dams, while several other states regulate tailings dams under other state programs. The workgroup also recommended the formalization of a Tailings Dam Regulatory Committee, in contrast to the technical committee sponsored by USSD, although there are many common interests.

The purposes recommended for this committee include assessing relevant information from organizations such as the International Commission on Large Dams and disseminating that information to the state dam safety programs that regulate tailings dams. In addition, the committee can facilitate a dialogue between the multitude of stakeholders in mine tailings management in order to advance common interests. (The ASDSO board is meeting to discuss the formation of the committee and the publication of the issue paper as this article goes to press.)

In January 2017, the Geoprofessional Business Association is holding a workshop in

Denver, Colorado to discuss the responsibilities of tailings dam engineers in the United States. Many other organizations are working on various related projects also.

Accurate understanding and effective communication of technical and operational requirements are paramount to ensuring that all dams are safe including mine tailings dams. The recent tailings dam failures increased awareness of the importance of safe tailings dams at an international level. ADNR Dam Safety reviewed the reports on the technical investigations of these incidents and is reviewing the current state regulations for opportunities for improvement.

In the meantime, all of the existing dams at hard rock mines in Alaska appear to be safe and the mining companies are actively engaged in

dialogue with ADNR Dam Safety. With the help of the engineering community, dam owners and operators, state and federal agencies, and many others, as well as the appropriate resources for all involved to do the necessary work, ADNR Dam Safety will continue to help bear the standard for safe tailings dams in Alaska and the nation.

For more information on the Alaska Dam Safety Program, visit dnr.alaska.gov/mlw/water/dams or contact ADNR Dam Safety at (907) 269-8636. Visit ASDSO at damsafety.org and USSD at ussdams.org.

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