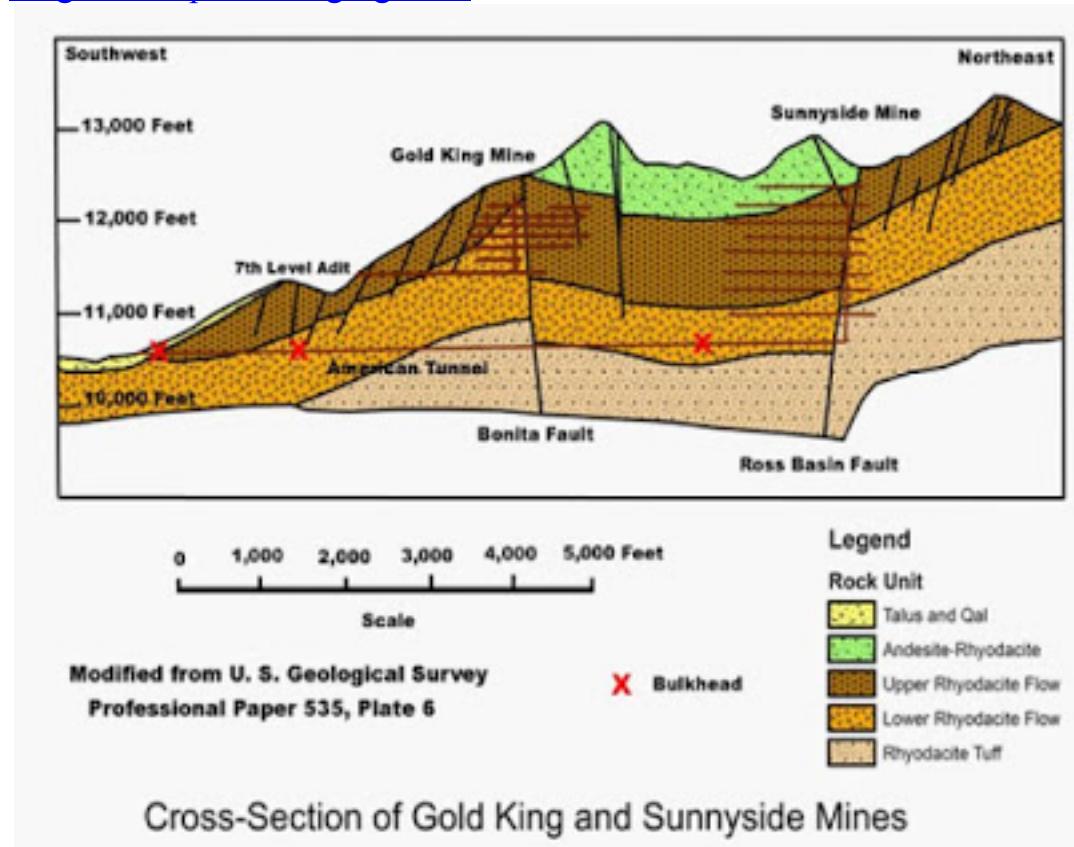


Sunday, August 23, 2015

Causes of Gold King mine spill emerging

Originally at: <http://arizonageology.blogspot.co.at/2015/08/causes-of-gold-king-mine-spill-emerging.html>

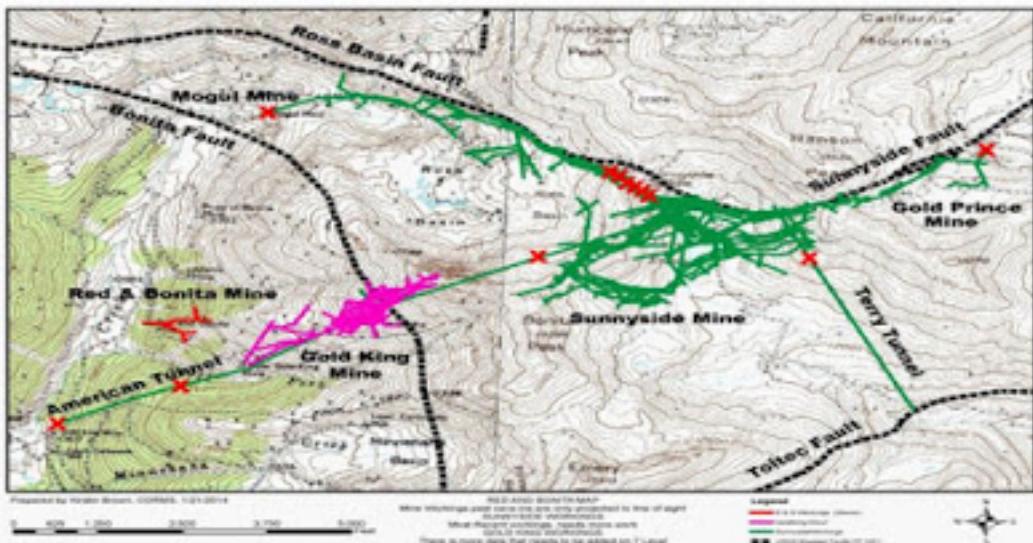


The causes of the Gold King mine waste water spill in Colorado are emerging from a variety of sources. Rather than simply a leak from the Gold King mine, it appears that the mine is part of a network of mines, adits, tunnels, and natural fractures and faults creating a complex system underlying much of the mountain. Work on other mines, combined with natural infiltration of rainwater and snowmelt, all appear to have contributed to the filling up of the Gold King mine tunnel with mineral-rich waters. EPA contractors punched through an adit of Gold King mine, unleashing the built-up waters.

Tucson-based consulting geologist David Briggs published an article in the *Arizona Daily Independent* describing the history of mines on the mountain including the closure of the Sunnyside mine in 1991. David reports that 12 bulkheads or engineered dams were built in underground tunnels, to control drainage of acid mine waters. David's interpretation is that groundwater flow through natural fractures and faults would discharge through these tunnels. But with them dammed and drainage halted, drainage in other mines, including the Red & Bonita and the Gold King 7th Level Adit, increased. [Right, geologic cross section of Gold King and Sunnyside mines, by David Briggs, modified from USGS Professional Paper 535]

David concludes "this is comparable to a bathroom sink that has a drain and overflow outlet. When the drain (i.e., American Tunnel) is open the water flows out the bottom of the sink. However, if you close the drain (i.e. wtih a bulkhead) the water will rise in the sink until it gets to the overflow outlet (i.e. Red and Bonita mine and Gold King 7th Level Adit)."

EPA was working on the nearby Red and Bonita mine since 2010. The summer 2015 work plan was to install a reinforced bulkhead and to remove debris from the Gold King Mine 7th Level Adit and observe "possible changes in the discharge resulting from the installation of the Red and Bonita mine bulkhead." David speculates on the nature what was plugging the Gold King entrance and comments on EPA and its contractor's culpability in not assessing the situation adequately, but his explanation of the events and processes that ponded the millions of gallons of waste water in the Gold King adit are compelling.



Map Showing the Surface Projection of Underground Mine Workings, Major Fault Zones and the Locations of Bulkheads (Red X's).

EPA

has fact sheets and photos posted about their work at the Red and Bonita mine which began in late July 2015, a couple of weeks prior to the Gold King spill on August 5. [Red and Bonita mine removal action [photo log](#), July 24, 2015; [Red and Bonita Mine Removal](#)]

[Bottom right, map of mine workings including Red & Bonita and Gold Mine King, with named faults. Credit, EPA with additions by David Briggs]

The January 2015 [Removal Action Community Involvement Plan](#) describes the proposed action on the Red and Bonita mine: "By installing a bulkhead, the mine water will fill the mine workings and eventually a relatively stable hydrostatic level will be reached above the level of the mine. ... It is anticipated that the contamination in the water from the mine will precipitate, while moving through the fractured bedrock along the pre-mining groundwater courses."

The May 22, 2015 EPA "Upper Animas Mining District Fact Sheet" starts off saying "The EPA Superfund Program is conducting a time-critical removal action at the Red and Bonita Mine site during the summer 2015. The action involves installing an engineered, reinforced bulkhead (i.e. massive plug) to control the discharge of contaminated water coming out of the mine adit (i.e. tunnel) and flowing into Cement Creek, a tributary of the Animas River."

Along with this work, EPA also plans to remove the blockage and reconstruct the portal at the Gold King Mine in order to best observe possible changes in discharge caused by the installation of Red and Bonita Mine bulkhead. The Gold King Mine is the closest mine to the Red and Bonita Mine and is

located higher on the mountain. Entry into the Gold King Mine workings will depend on the conditions encountered following portal construction."

However, a June 25, 2014 [Task Order Statement of Work](#) to EPA contractor Environmental Restoration, LLC, warns that "The Gold King Mine has not had maintenance of the mine working since 1991, and the workings have been inaccessible since 1995 when the mine portal collapsed. This condition has likely caused impounding of water behind the collapse. In addition, other collapses within the workings may have occurred creating additional water impounding conditions. **Conditions may exist that could result in a blow-out of the blockages and cause a release of large volumes of contaminated mine waters and sediment from inside the mine, which contain concentrated heavy metals.**" [emphasis added]

What's not clear is whether EPA's contractor actually starting (or even finished) the new bulkhead in the Red & Bonita mine. Their planning document said the work would be completed in September 2015. The photos of the work show only the external ponds and berms.

Was the waste water released from the Gold King filling up over the past 20 years or was it newly introduced?

If the bulkhead in the Red & Bonita were put in place in late July, it would take just about a week for the 300 gallons per minute flow out of that mine to back up and total the 3 million gallons spilled out of the Gold King. This is a question that needs to be clarified with EPA.