

Central Valley Regional Water Quality Control Board

15 December 2015

Mr. Michael Miller, President
Original Sixteen to One Mine, Inc.
P.O. Box 909
Alleghany, CA 95910

MEETING AND TOUR OF THE SIXTEEN TO ONE MINE, SIERRA COUNTY

Thank you for your time in meeting with me and describing the current situation at the Sixteen to One Mine on 6 January 2014. Enclosed is a copy of a memorandum describing our meeting and tour of the mine. I have also included some thoughts and ideas that might be explored to help reduce the discharge of mineral constituents from the mine.

If you have any questions, please contact me at the footer address, or by e-mail at pwoodward@waterboards.ca.gov, or phone at (530) 224-4853.

A handwritten signature in cursive script, appearing to read "Philip V. Woodward".

PHILIP V. WOODWARD, C.E.G.
Senior Engineering Geologist

PVW:lmw


Enclosure: Memorandum

cc w encl.: Ms. Gayleen Perreira, CVRWQCB, Rancho Cordova

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Central Valley Regional Water Quality Control Board

TO: Gayleen Perreira
Senior Water Resources Control Engineer
NPDES Permitting
Sacramento Office

FROM: Philip Woodward 
Senior Engineering Geologist
Mining Program Manager
Redding Office

DATE: 15 January 2015

SUBJECT: SITE INSPECTION, SIXTEEN TO ONE MINE, SIERRA COUNTY

In response to your 18 December 2014 e-mail to Mr. Mike Miller, Mr. Miller contacted me and requested I meet with him at the Sixteen to One Mine for a tour of the mine and discussion of the regulatory issues he is facing relating to the discharges from the mine and water quality. I arranged to meet with Mr. Miller at the mine on 6 January 2015.

I arrived at the Sixteen to One Mine office at 10:00 and met Mr. Miller. After showing me some of the gold specimens that had been obtained from the mine, we discussed the underground mine workings, his method of mining, and plans for the future. The underground workings are extensive, (approximate 35 miles of adits, tunnels etc.). Mr. Miller expressed his belief that the regulatory constraints contained within the past and proposed NPDES permits for the mine were unreasonable and unnecessary.

To help support his position and to familiarize me with the specifics of the mine, Mr. Miller offered to show me some of the underground workings and the 21 level portal where mine drainage enters Kanaka Creek.

The 21 level portal is in close proximity to Kanaka Creek. At the time of the inspection, I visually estimated it was discharging 100 gpm +/- . The discharge directly enters Kanaka Creek. I did not observe any attempt at collection or treatment.

We then entered the main portal and walked to where the mine dewatering pump discharges from the conveyance pipe and eventually flows to the 21 level adit. The volume of this pumped water appeared to be approximately the same as that volume discharged at the 21 level portal. The dewatering activities are necessary to allow access to the lower levels of the mine.

Mr. Miller explained his belief that the discharge from the mine was not increasing the concentrations of mineral constituents (specifically arsenic) or impacting the beneficial uses in Kanaka Creek. He believes that regardless of if the mine was there or not, the existing natural mineralization would result in similar concentrations of arsenic in entering Kanaka Creek.

I do not agree with Mr. Miller's conclusions. The very nature of mining an ore body results in the exposure of a larger surface area of the natural mineral deposits to oxygen and water. The ensuing chemical reaction and mechanical breakdown of the rock material can result in significant increases of mineral constituents in mine drainage. The underground passages and drainage system also provides a conduit for the mineral laden water to discharge directly to surface waters.

Upon review of the data provided by Regional Board staff, the arsenic concentrations downstream of the mine are significantly higher than upstream concentrations. Further, the arsenic concentrations in the creek often exceed the maximum contaminant level (MCL) of 10 ppb, for a drinking water supply. Kanaka Creek is currently listed on the 303(d) list of impaired water bodies. While the Sixteen to One mine discharge is not solely the source of arsenic concentrations in Kanaka Creek, it appears to be a significant contributor.

I explained that the discharge of mine drainage from a portal to surface waters is considered a "point source discharge" by the US EPA and therefore subject to regulation under the Federal Clean Water Act and required a NPDES permit.

I described several mine examples that I was familiar with to Mr. Miller and suggested he evaluate similar or other non-conventional means to reduce the concentration of minerals in the mine drainage. For example, the Washington Mine in Shasta County is an old mine that is currently in production. Arsenic laden mine drainage discharges from the old mine portals as well as from dewatering pumps, similar to the Sixteen to One Mine. The operator collects the mine drainage and treats the water in commercial filters. The resulting arsenic concentration of the effluent is below 10 ppb. While the Washington mine is permitted to discharge this effluent to surface waters in compliance with a NPDES permit, they have chosen to discharge the effluent to the hillside where it can evaporate, infiltrate into the subsurface, and provide much needed water for tree growth. Mr. Miller explained that he owned several hundred acres of forested land in the area and land application could be an option.

Mr. Miller also explained that he had water rights on a spring in the area and that they had investigated the idea of generating hydropower to sell to PG&E. That project could be revisited and the power generated could be used to power pumps needed for a treatment and disposal system for the mine drainage.

Another possibility that could be investigated is sealing off portions of the extensive underground workings with concrete bulkhead seals. If sections of the workings that produce significant volumes of water and that would not be actively mined for several years could be isolated, perhaps the volume of water discharged from the mine portals could be reduced. Further, flooding the mineral deposits would reduce their exposure to oxygen and may reduce the chemical reaction that releases arsenic from the mineral deposits. Valves in the seals could be opened and the workings drained when mining activities were to resume in the sealed off sections. While flooding the mine workings has proven effective in reducing mineral solubility in the copper sulfide deposits in the Shasta Copper Mining District, I am not sure how effective it would be regarding arsenic solubility, but it may be worth exploring.

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The conclusion from my visit to the mine and discussions with Mr. Miller is that 1) the mine discharge can be treated to meet regulatory standards and the effluent limitations in the draft NPDES permit, 2) there may be non-conventional engineering options available that can be explored given the situation of the mine, and 3) both Mr. Miller and Water Board staff should continue to work together to attempt to resolve the discharge issues. In the meantime, I am not recommending any changes to the draft NPDES permit based on my inspection