From: Elizabeth Busby <ebusby@alexcoresource.com>
Date: March 6, 2019 at 8:24:49 AM MST
To: "Cunningham - DNR, Michael" <michaela.cunningham@state.co.us>
Cc: CLL- Jim Harrington <Jim@ColoradoLegacy.Land>, "CLL - Paul Newman (Paul@ColoradoLegacy.Land)" <Paul@ColoradoLegacy.Land>, Eric Williams <eric@coloradolegacy.land>, Billy Ray <bray@alexcoresource.com>
Subject: Schwartzwalder Mine - Corrective Action Plan

Dear Mr. Cunningham,

The attached memo documents operations, problems, and solutions encountered at the Schwartzwalder Mine water treatment plant in late January 2019. Please contact Billy or I if you have any additional questions or comments regarding this memo or if you require additional means of delivery.

Respectfully, Liz Busby

Elizabeth Busby, PE

Project Manager / Environmental Engineer
Alexco Water & Environment Inc.
171 North College Ave
Fort Collins, CO 80524
C. 303-941-6689 | T. 970-632-2240
www.alexcoenv.com | ebusby@alexcoresource.com

Memorandum

To:	Michael Cunningham, Division of Reclamation, Mining and Safety (DRMS)
From:	Billy Ray, Alexco Water and Environment Inc.
CC:	Jim Harrington, Eric Williams, and Paul Newman; Colorado Legacy Land, LLC
Date:	March 6, 2019
Re:	System Integrity Corrective Action Plan, Schwartzwalder Mine, Golden, Colorado

1 INTRODUCTION

On January 27, 2019, operators at the Schwartzwalder Mine located in Golden, Colorado were unable to start the Reverse Osmosis Water Treatment Plant due to the inability to pump water. This was the result of frozen intake pipelines and subsequently broken pipeline components. As discussed with DRMS prior to approaching the permitted elevation, due to the extended shutdown the mine pool exceeded the permit required water level (6,452 feet above mean sea level) on January 27th. Plant operations resumed on January 29, 2019, and the mine pool elevation decreased below the required permit level the following morning, January 30th, 2019 with a total duration over permit elevation of about 84 hours.

In response to these events, the plant operator has explored the series of challenges that were encountered during the system start up. Each instance was assessed for points of improvement that will minimize the effect of adverse circumstances in the future. The intention is to eliminate the potential for system failures by identifying the areas of deficiency and providing proactive solutions.

A concise corrective action plan was developed to ensure that the level of preventative scrutiny is increased. The corrective action plan that is proposed will be absorbed into the overall operation and maintenance program with a larger focus on static conditions when the infrastructure is more susceptible to weather and material fatigue.

2 SUMMARY OF EVENTS

On January 21, 2019, the operator engaged the mine dewatering pump to begin the process of treating water. Following a short run time, it was determined that there was no evidence of water inside the water treatment plant plumbing. The pump was disengaged, and a series of diagnostic steps were taken to confirm that the pump was receiving electrical power and controls.

On January 22, 2019, pump was started again, and the surface plumbing was inspected. While conducting the line inspection, there was a pipe rupture located at the bulk head inside the Steve adit. The cause of the line rupture was believed to be from the over pressure and hammer pressure due to frozen water in the line. The heating elements and insulation were inspected to verify that all systems were working properly. One section was identified as having malfunctioning heater lines and it was confirmed that the line in this area was frozen. Replacement heating elements were installed to begin thawing the frozen pipe. Another attempt was made to start the pump again on January 23, 2019 and it was again confirmed that the line was still frozen.

On January 27, 2019 an attempt was made to start the plant following an extended heating period. It was determined that the line was still frozen. As an immediate solution, temporary line was installed on January 27, 2019 to bypass the frozen line and begin the process of treating water. The operator attempted to run the mine pump following the installation of the temporary line. However, there was no evidence of water inside the plant. A line inspection was conducted, and there were no line breaks noted on the surface side of the bulkhead. The presence of water at the bulkhead inside the adit indicated that there was a substantial leak in the feed line on the mine side of the bulkhead.

The team entered the mine on January 28, 2019 to inspect the mine pump discharge pipeline. A line break was discovered near mine shaft two and the line was repaired. The mine pump was activated to begin treating water. Following this startup attempt no water was present and is was suspected that the repair that was made was damaged and the team entered the mine to confirm. It was discovered that the initial repair was defective, and the piping was properly fixed and modified.

On January 29, 2019 the mine pump was activated, and water became influent to the water treatment plant. Following the successful startup of the pump, the water treatment system was put into full operation and the operator began to dewater the mine.

It should be noted that a new system for influent mine water is currently underway and is expected to be operational by the end of March 2019. This new system will provide a permanent solution for the site, as it is designed to operate seasonally on a 6-month on, 6-month off schedule eliminating the frozen pipe possibility. The current system will remain in-place as a duplicate, back-up system.

3 CORRECTIVE ACTION PLAN

The operator identified three key preventative measures which will be implemented onsite to circumvent this scenario in the future:

- Operators will revise shutdown procedures to include an equipment and piping check list to ensure all water is removed and drained from the systems and infrastructure. This will be applied to piping that is located both inside the water treatment plant and outside as well. In addition to draining the pipes the check list will incorporate a verification that all winterization methods are

in place and effective. Winterization systems will include heating elements and insulation and making checks on all existing heating elements and insulation prior to seasonal changes.

- Operators will revise maintenance and system integrity checks to include detailed winterization procedures. This measure will be carried out specifically for when the system is placed into hibernation for several months. This system check will allow the water treatment plant to be started and the operator to verify all components are in good working order and identify any potential issues before it is a critical failure. The proposed system check can be conducted without discharging to the creek by running the discharge directly into the storage tanks until all operational capabilities can be realized.
- The operator will revise the start up plan to include a “soft start” procedure. The proposed plan will incorporate elements from the shut down plan and the integrity check list. The start up plan will require the operator to conduct a soft start up, which will identify troubled areas through proper sequencing. All lines will be inspected to ensure that they are free from ice and other debris. All valves will be checked as well to confirm that they are in the proper orientation.