C/015/018 Incoming

September 15, 2015

Dear Sir;

I apparently failed to send the complete packet when I sent the memo from MSHA Technical Support, failing to also send the disapproval letter dated September 8, 2015, addressed to the mine operator for the Deer Creek Bulkhead Plan. Please find that letter enclosed.

I apologize for any inconvenience.

Sincerely,

Melodie Sproul

Ventilation Secretary

Mine Safety & Health Administration

303-231-5565

sproul.melodie@dol.gov

U.S. Department of Labor

Mine Safety and Health Administration
P O Box 25367
Denver, Colorado 80225

Coal Mine Safety and Health
District 9

SEP - 8 2015

Devin Jim LeRoy
Mine Manager
East Mountain Energy LLC
P.O. Box 611
Castle Dale, Utah 84513

RE: Deer Creek Mine
ID No. 42-00121
Site-specific Ventilation Plan:
Bulkheads and Portal Seals

Dear Mr. LeRoy:

The subject ventilation plan proposal dated July 14, 2015, consists of a cover letter and nine "transfers." The plan has been reviewed in accordance with 30 CFR §75.370(a)(1) and 30 CFR §75.1711 for compliance and for prudent engineering design considerations. The plan will not be approved.

The engineering analyses and planned procedures submitted to justify the designs of seals, bulkheads, and portal seals were reviewed in a coordinated effort with MSHA's Technical Support Groups. Please see the enclosed report of review dated August 21, 2015, by the Mine Waste and Geotechnical Engineering Division (MWGE). The proposed bulkhead structures were previously reviewed as seals by Mine Emergency Operations (MEO) for the prior plan; however, the changes did not warrant another review by MEO.

The May 6, 2015 report by MEO (enclosed with the disapproval letter dated June 11, 2015, for the previously proposed plan dated April 16, 2015) stated:

> According to this plan, all seals/bulkheads shall be monitored and examined until the plugs are completed at the Left Fork Rilda Canyon Portals. Upon completion of the plugs, the seals/bulkheads can no longer be examined. Once a seal/bulkhead can no longer be accessed, MSHA shall no longer recognize it as a functioning structure.

It should be emphasized that this review was performed primarily for compliance of existing standards for seals. Once a set of seals are encompassed with another sealed

area, the inby seals are not inspected and are not expected to impound water of any consequence because of the required drain pipes. Although the report states that all of the requirements have been met for the bulkheads *to function as seals*, District 9 is concerned with long-term stability when they impound water as bulkheads detailed in the report by MWGE report.

The enclosed August 21, 2015 report by MWGE contains the following conclusions and recommendations:

> The high water heads projected for the two internal sets of bulkheads are unprecedented, particularly for structures that will need to be there forever. Over time, the cementitious foam and polyurethane grout will likely deteriorate from mine water exposure and the vertical stress from rock creep.
>
> While it appears that the reinforced concrete portal plugs would have adequate structural capacity to hold back 305 feet of water, we cannot assure that the concrete plugs will not degrade over their infinite life span. If the portal plugs maintain their competency, the strata will likely be the weakest element. A blowout of the hillside from the high water pressures would have the same consequences as a bulkhead failure. It would be an environmental disaster and there could be loss of life or injury downstream. As recent as August 6, 2015, an earthen plug in an abandoned Colorado gold mine entry breached, causing millions of gallons of stained, polluted mine water to flow into waterways in Colorado and New Mexico.
>
> As indicated in my May 15, 2015, memorandum, it is not recommended that the internal bulkheads be constructed and that any concrete portal plugs should be equipped with free draining pipes so that high pressure does not exist against the plugs and surrounding strata, which will need to remain intact forever. The mine water can be redirected to the Deer Creek Portals and safely treated if need be after it leaves the abandoned mine.

District 9 agrees with MWGE that providing for free drainage over a half wall and out of the portal seals is a safer alternative. The system would prevent the gradual build-up of water pressure in the event that the system of drill holes fails to distribute water away from the area. In the interest of safety, bulkhead construction and the undraining portal plugs are disapproved.

If you have any further questions please contact either Sid Hansen at 303-231-5590, or this office at 303-231-5458.

Sincerely,

Russell J. Riley
District Manager

enclosure

cc: Louie Tonc

U.S. Department of Labor

Mine Safety and Health Administration
Pittsburgh Safety & Health Technology Center
P.O. Box 18233
Pittsburgh, PA 15236

August 21, 2015

MEMORANDUM FOR RUSSELL J. RILEY
District Manager, District 9
Coal Mine Safety and Health

THROUGH: WILLIAM J. FRANCART
Chief, Pittsburgh Safety and Health Technology Center

STANLEY J. MICHALEK
Chief, Mine Waste and Geotechnical Engineering Division

FROM: TERENCE M. TAYLOR
Senior Civil Engineer, Mine Waste and Geotechnical Engineering Division

SUBJECT: Evaluation of Revised Plans to Construct Two Sets of Bulkheads and One Set of Portal Plugs at the Deer Creek Mine, Mine I.D. No. 42-00121, Interwest Mining Company, Huntington, Utah

As requested, this office has reviewed the revised plans dated July 14, 2015, and supplemental materials – Appendix H (received via email on July 22, 2015) and Table 4 (received via email on July 28, 2015) for the construction of two sets of internal bulkheads and one set of portal plugs in the Hiawatha coal seam at the Deer Creek mine. The operator is closing the mine and has proposed these structures as a means to seal and isolate contaminated mine water so that outflow treatment can be minimized or eliminated.

BACKGROUND

The operator is proposing to construct the two in-mine bulkhead sets using JennChem cementitious foam seal material. The first set of bulkheads would consist of six structures in the Mill Fork Access #2 entries at XC-62, with the lowest constructed at floor elevation 7977. The second set of bulkheads would consist of five structures in the 1st Right entries at XC-4.5 location, with the lowest at floor elevation 7890.7 feet. The second set will be outby and downdip from the first set. These bulkheads would be plugs that now have a revised thickness of 17 to 26 feet, depending on the entry size and location. The cementitious material would have a 400 psi minimum compressive strength. A 2-foot-wide by 2-foot-deep keyway is proposed to be cut into the ribs and roof within the footprint of the bulkheads. The design plans show that four

grout curtains would be constructed at four locations at each bulkhead. Each curtain would consist of 12 grout holes, ranging from 15- to 30-feet deep, drilled into the surrounding strata and filled with polyurethane. Two curtains would be constructed immediately inby the bulkheads and two within the footprints of the bulkheads.

The operator is also proposing to construct two portal bulkheads at the Rilda Canyon Portals. They would be made with structural grade concrete having a 4,000 psi minimum compressive strength. Three mats of epoxy-coated reinforcing steel bars will be placed in the bulkheads. Each portal bulkhead would consist of a 25-foot-long plug. The Rilda Canyon Portals locations are at elevation 7705. These portals are outby and downdip of the XC-4.5 bulkheads, and therefore are also outby and downdip of the XC-62 bulkheads. No grouting or keying is specified for the portal bulkheads.

The Blind Canyon seam is located above the Hiawatha seam and the upper seam has been mined above the lower seam in some locations. Both seams contain longwall panels. The workings in each seam are connected via ramps that were mined between them. Water levels reaching the upper seam are the basis for the design heads on the XC-62 bulkheads, the XC-4.5 bulkheads, and the portal plugs. The XC-62 bulkheads were designed for the condition where the water is roofed in the overlying Blind Canyon seam. This corresponds to a water head of 147 feet, which is equivalent to a pressure of 63.6 psi. The XC-4.5 bulkheads were designed for the condition where the water head reaches an elevation in the upper seam where it would break-over and flow toward the 3rd North "B" Mains XC-138.5 seals. This break-over 8010 elevation corresponds to a maximum water head on the XC-4.5 bulkheads of 126 feet, which is equivalent to a pressure of 55 psi. The two plugs at the Rilda Canyon Portals are at elevation 7705 feet. The elevation difference between the portal plugs and the XC-4.5 bulkheads is 179 feet. Once this area is filled with water, the head would rise to the depth of water behind the XC-4.5 bulkheads, since water would seep around the XC-4.5 bulkheads and the two pressures would become cumulative, resulting in a total head on the portal plugs of 305 feet, or 132 psi. This total head would be limited to that elevation because the water would reach the break-over point above the XC-4.5 bulkheads and flow out the portals in the overlying Blind Canyon seam.

The operator has created a pressure relief for the XC-4.5 bulkheads in the form of a nearly one mile long cased drain hole with an inside diameter of 6 inches that was drilled immediately inby the XC-4.5 bulkheads. The drilled hole extends under the valley bottom and daylights in the workings in the Blind Canyon seam, which due to seam dip is 55 feet lower in elevation across the valley than where the hole starts in the Hiawatha seam. The drain hole will transport the water toward the Deer Creek portals, where the operator has a permit to discharge. If the drain works as planned and the XC-62 bulkheads never fail, then the XC-4.5 bulkheads should not have pressure acting on them. However, in determining the pressures on the XC-4.5 bulkheads and the portal plugs, it was assumed that this hole had either plugged (due to debris or a roof fall) or that it just did not have the capacity to keep up with inflows or a sudden inrush that would occur after a breach of the updip XC-62 bulkheads.

REVIEW COMMENTS

The following is a list of deficiencies with the proposed interior cementitious foam bulkheads at XC-4.5 and XC-62.

- Cementitious foam bulkheads do not have an established performance history of resisting high heads. Until there is an established track record at lower heads, it would not be conservative to use them in this type of extreme installation.

- Keystone Mining Services' arguments in Appendix F do not adequately refute the NIOSH research showing that size/scale affects the overall shear strength of the mass pour under sustained loading. The actual shear strength of the overall test plug was found to be only about 20 psi, not the near peak value of 81 psi used in the JennChem design.

- It is anticipated that the coal-measure strata and seam will not be able to hold back the pool and will fail even with grouting. In a meeting with the operator on July 16, 2015, MSHA shared a video showing extreme leakage around ventilation seals at a mine in West Virginia with only 36 feet of head. Although the strata at that mine were not grouted, the head on the two sets of interior bulkheads at Deer Creek will be approximately four times that value. In addition, NIOSH research (documented in U.S. Bureau of Mines IC 9020) found that a test bulkhead site in a coal mine had excessive strata leakage at 40 to 50 psi of water pressure despite an extensive grouting program using polyurethane.

- In the recent water immersion tests of the strata cores, there was no rubbing or agitation of the samples to show that they were not weakened. Also, the tests did not include the mudstone floor at 1st right.

- Polyurethane grout only has a limited lifespan of 75 to 100 years.

- There was no evaluation of hydraulic fracture or internal erosion (piping) potential. Note the average piping gradient is as high as 6.5 at the XC-62 bulkheads and 7.5 at the XC-4.5 bulkheads (assuming the drain is not effective at XC-4.5).

The following is a list of deficiencies with the proposed concrete portal plugs.

- The calculation quantifying the resisting capacity of the plug is overstated by a factor of 20. An error was made when comparing the load acting on a 1-foot-wide strip of plug to the capacity of the entire 20-foot-wide plug. The factor of safety changes from 32.6 down to only 1.63 when the numbers are revised.

- The design did not include: contact and strata grouting of the rock joints, tapered hitches to give the plug a cork-like shape, measures to prevent or control heat of hydration cracking and to provide for long-term chemical durability, and a pressure gauge.

- The strata evaluation did not include strata profiles above the two drifts (along the length of the drifts) and barrier length calculations on the two drifts (i.e., the distance to the nearest outside surface along the length of the drift, and consideration of the strata composition in the overlying formation).

- The depth of burn at the evaluated areas was not considered in the provided barrier calculations. Burned coal at the coal outcrops will be degraded and will not provide adequate protection against piping or a potential blowout.

- There was no evaluation of hydraulic fracture or piping potential. Note the average piping gradient is 12.2 at the portal plugs.

ALTERNATIVE SOLUTION TO IMPOUNDING EXCESSIVE WATER PRESSURES

If the portal plugs breech, there would be an environmental disaster and there could be loss of life or injury downstream. Rather than creating underground reservoirs with hazard potential, there are alternative solutions that would be free-draining. Specifically, instead of building bulkheads at XC-62 and XC-4.5, the operator could construct a half wall at XC-4.5 that would pool the mine water to a minimum depth so that it can then feed the mile-long drain hole that will direct the water to the Deer Creek side of the mine and out the Deer Creek portals where they have a discharge permit. If one hole does not have adequate capacity, an additional hole(s) can be drilled. In the event that these holes clog over time, the water will overtop the half wall and flow down to the Rilda Canyon Portals. At those portals, the operator could construct the proposed concrete plugs except that the drain pipes would be left open so that any water that might overtop the half wall would not build up in the mine. Post abandonment, if any other governing bodies having jurisdiction over the portal areas desire to temporarily or permanently stop the discharge, then they would need to evaluate the capacity of the strata to retain the potential pressures.

CONCLUSIONS AND RECOMMENDATIONS

The high water heads projected for the two internal sets of bulkheads are unprecedented, particularly for structures that will need to be there forever. Over time, the cementitious foam and polyurethane grout will likely deteriorate from mine water exposure and the vertical stress from rock creep.

While it appears that the reinforced concrete portal plugs would have adequate structural capacity to hold back 305 feet of water, we cannot assure that the concrete plugs will not degrade over their infinite life span. If the portal plugs maintain their competency, the strata will likely be the weakest element. A blowout of the hillside from the high water pressures would have the same consequences as a bulkhead failure. It would be an environmental disaster and there could be loss of life or injury downstream. As recent as August 6, 2015, an earthen plug in an abandoned Colorado gold mine entry breached, causing millions of gallons of stained, polluted mine water to flow into waterways in Colorado and New Mexico.

As indicated in my May 15, 2015, memorandum, it is not recommended that the internal bulkheads be constructed and that any concrete portal plugs should be equipped with free draining pipes so that high pressure does not exist against the plugs and surrounding strata, which will need to remain intact forever. The mine water can be redirected to the Deer Creek Portals and safely treated if need be after it leaves the abandoned mine.

cc: R. Richards, Acting Director, TS
S. Gigliotti, Chief, Safety Div., CMS&H
J. Urosek, Chief, MEO/Seals Div., TS
J. Calhoun, Safety Div., CMS&H
D. Braenovich – Safety Div., CMS&H