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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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June 3, 1997

TO: File

THRU: Joe Helfrich, Permit Supervisor *JH*

FROM: James D. Smith, Reclamation Specialist *JDS*

RE: Chapter 7 Revision - Amendment to MRP, Canyon Fuel Company, SUFCO Mine, ACT/041/002, File 2, Sevier County, Utah.

SUMMARY

Canyon Fuel Company has submitted a new Chapter 7 for the SUFCO Mine MRP that contains proposed modifications of the monitoring program, a revised interpretation or model of the hydrogeology and ground water systems, and a revised PHC determination. The new work is based largely on a study of the SUFCO mine area by Mayo and Associates. A report on the study is submitted as Appendix 7-17. The outstanding feature of the Mayo and Associates study is the use of isotopes that occur in ground water in order to determine mean-residence time ("age") and other characteristics that might be used to differentiate ground-water systems.

The report in Appendix 7-17 contains an interpretation or model of the hydrogeology that appears to limit or eliminate vertical flow of ground water from the surface down to the coal seam and to isolate ground-water systems in the lower Blackhawk from shallower systems. However, the hydrogeologic model actually used in Chapter 7 is not as restrictive and discusses interception of ground and surface water by mining operations and by subsidence-induced fractures.

An amended Spill Prevention Control and Countermeasure (SPCC) plan is included as Appendix 7-6, and the UPDES permit renewal (effective May 1, 1996) as Appendix 7-7.

Comments on the Chapter 7 revision were received from the USFS on May 5, 1997. The USFS comments have been incorporated into this TA.

TECHNICAL ANALYSIS

ENVIRONMENTAL RESOURCE INFORMATION

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-724.

Analysis:

Sampling and analysis.

All water quality analyses have been conducted in accordance with the methodology in "Standard Methods for the Examination of Waste Water" or the methodology in CFR 40 Parts 136 and 434. When feasible, water-quality sampling has been conducted according to the methodologies in the same references.

Baseline information.

The USFS has pointed out that geologic information on page 41 of Appendix 7-17, Section 6.1.5.4 is titled as a summary of lower Blackhawk Formation groundwaters, but the discussion is of the Upper Blackhawk Formation.

The MRP includes the following baseline hydrologic information:

Ground-water information.

No water supply wells exist in the permit or adjacent areas. Water rights and seasonal usage of springs and other ground-water resources for the permit and adjacent areas are listed in Appendix 7-1. Baseline data on seasonal quality and quantity of ground water are in the current MRP, and updated information is included in the Chapter 7 amendment.

Water-quality descriptions generally include total dissolved solids or specific conductance corrected to 25°C, pH, total iron, and total manganese. Ground-water quantity descriptions generally include approximate rates of discharge and depths to water in the coal seam and each water-bearing stratum above and potentially impacted stratum below the coal.

Comments from the USFS point out that two different estimates for recharge are cited: 1.2 percent of total precipitation to the upper Price River Formation and Castlegate Sandstone on page 7-5 (Thiros and Cordy, 1991) and 3 to 8 percent of total precipitation in the region (Danielson and Sylla, 1983) on page 7-10. (See the MRP for complete reference citations.) There is some potential for confusion in citing two different estimates in different parts of the MRP, but the actual effect, for example in conceptualizing the hydrologic balance of the area or determining the PHC, appears to be inconsequential.

Paragraph 3 on page 7-34 states that a greater saturated thickness of the Blackhawk Formation is encountered as mining proceeds away from North Fork of Quitchipah Creek, and more water is available for discharge into the mine. The USFS feels further discussion is needed to establish the extent and location of this increase in saturated thickness in the Blackhawk Formation, especially considering that the rest of the proposed amendment presents the Blackhawk Formation as not being uniformly saturated.

Surface-water information.

Plate 2 shows the name and location of all streams. Water rights are listed in Appendix 7-1. There are several stock-watering ponds in and adjacent to the permit area. Names, locations, and ownership of these impoundments are not shown on Plate 7-2 nor described in the text of Chapter 7. There are three permitted discharge points for the Convulsion Canyon Mine; discharge points UPDES 001 and UPDES 002 are shown on Plate 7-2, but UPDES 003 is not shown. Baseline information on surface-water quality and quantity sufficient to demonstrate seasonal variation and water usage is in the current MRP. Surface water-quality descriptions generally include information on total suspended solids, total dissolved solids or specific conductance corrected to 25°C, pH, total iron, and total manganese. There is little potential for acid drainage from the proposed mining operation. Water-quantity descriptions include seasonal flow rates.

USFS comments point out that Stipulation 17 of the USFS lease requires that the lessee replace the loss of any surface water identified for protection, not just water covered by water rights. Commitments in the proposed permit that appear to limit the permittee to replacement of water rights only are not acceptable to the USFS and should be removed as they do not excuse the permittee from this lease obligation.

Baseline cumulative impact area information.

DOGM prepared a CHIA for the Quitchipah and Muddy Creek drainages in 1989. Information in the amended Chapter 7 does not present any reason to revise the determination that the Convulsion Canyon Mine is designed to prevent damage to the hydrologic balance outside the permit area.

Modeling.

No numerical modeling techniques were utilized in preparing the MRP or the Chapter 7 amendment.

Probable hydrologic consequences determination.

The application contains a determination of the probable hydrologic consequences (PHC) of the proposed operation based upon the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas. The PHC determination is based on baseline hydrologic, geologic, and other information collected for the permit application and on operational data. In addition, isotopes that occur in ground water naturally or as a result of human activity (but not deliberately introduced) have been measured at numerous locations in the permit area. Isotope data have been used to determine mean-residence time ("age") of the ground waters and other characteristics that might be used to differentiate between ground-water systems.

The PHC determination includes findings on whether adverse impacts may occur to the hydrologic balance. A potential exists for acid- or toxic-forming materials to be present in areas of the mine, but mine-water discharge data indicate there has been no known impact to surface or ground water in the permit and adjacent areas. Alkalinity of mine discharge water typically exceeds acidity by a factor of twenty. Sediment yield may increase locally because of subsidence, but any such increase will be minor and of short duration. Discharges from sediment ponds have exceeded standards for total suspended solids, but the average total suspended solids concentration has been less than the average daily standard and sediment control measures at the mine are considered effective in minimizing impacts of increased sediment yield to the streams. Mine discharges have the potential to increase total dissolved solids, particularly sulfate, in receiving streams; however, discharge standards have not been exceeded and the nature of the receiving waters is such that the impact of the increased dissolved-solids is not significant.

Perennial streams are not to be subsided. Ephemeral stream channels will be subsided but impacts are expected to be minimal because swelling and plastic flow of shales

and clays are expected to quickly heal fractures. Also, the sporadic flow typical of the ephemeral streams carries a large sediment load that will contribute to filling or healing of cracks.

Subsidence may decrease spring flow if fractures intercept ground water. Declines of flow from several springs and declines in water level in several wells are attributed to drought conditions. The drought conditions are supposed to be indicated by precipitation data in Appendix 7-5 and Figure 2 of Appendix 7-17, but these referenced sections do not contain data that clearly substantiate a drought over the period of time corresponding to the ground-water declines.

Fractures caused by subsidence are discussed on page 7-36. A concept that has been proposed for general application throughout the Wasatch Plateau has been cited, that is: when fractures intercept mudstone or shale units that contain montmorillonite clays, the fractures become sealed and vertical flow of intercepted surface and ground water ceases. Sealing of the fractures is described as occurring quickly. However, Castlegate Sandstone crops-out extensively in the area and cracks in this unit are not sealing quickly enough to prevent impacts to water resources, as documented in the draining of Rock Pond in 1995. Fracturing of more brittle strata, such as the Castlegate Sandstone, and potential impacts of such fracturing need to be discussed in the proposed amendment.

As of 1996, water is being discharged from the mine at the rate of approximately 1,600 gpm. Water being pumped from the mine is bypassing the normal flow path through the subsurface to the streams, but the overall hydrologic balance of the Quitchipah drainage is maintained. After cessation of mining, discharge from the mine will also cease and reclamation will return disturbed stream channels to a stable state. When mine discharge stops, Quitchipah Creek can be expected go dry in the summer.

The potential for hydrocarbon contamination is small. The mine road is not salted within the permit area so contamination from road salt is not a concern. Coal-hauling trucks are covered so fugitive dust is considered insignificant. Also, probable impacts from a spill of an entire truckload of coal are considered small.

The PHC in the currently approved MRP contains an estimate of ground water lost from the Quitchipah basin as moisture in the produced coal. This estimate of ground water lost from the basin has been removed from the proposed amendment, but there is no apparent reason to remove it. The water lost from the permit area as moisture in the coal is part of the information to be used in the CHIA preparation or update. If the information is out-of-date or inaccurate it should be updated or corrected, but nevertheless the information should not be deleted from the MRP.

Ground-water monitoring plan.

The application includes a ground-water monitoring plan based upon the PHC determination and the analysis of all baseline hydrologic, geologic, and other information in the application. The plan provides for the monitoring of parameters that relate to the suitability of the ground water for current and approved postmining land uses and to the objectives for protection of the hydrologic balance. It identifies the quantity and quality parameters to be monitored, sampling frequency, and site locations in Tables 7-2, 7-3, 7-4, and 7-5. The plan describes how the data may be used to determine the impacts of the operation upon the hydrologic balance. Monitoring data are to be submitted to the Division at least every 3 months and in an annual summary.

The proposed ground-water monitoring plan eliminates several springs and wells that are currently monitored. Not all of the proposed changes are acceptable.

Both water-quality and water-level monitoring are to be abandoned at the waste-rock-disposal site according to Table 7-2 of the proposed amendment. The proposed amendment contains no information or discussion to justify abandoning the monitoring of these wells. Boron and selenium concentrations are determined for water samples from these wells under the current MRP. Boron and selenium are not listed in Table 7-4 of the proposed amendment. The US Forest Service requested in a letter to DOGM (received May 5, 1997) that boron and selenium concentrations continue to be determined for water from these wells, which necessitates that ground-water quality monitoring continue at these wells.

The proposed ground water monitoring plan eliminates thirteen wells from water depth measurement. No new wells are proposed. The reason given for abandoning measurements at US-77-8, US-77-9, US-79-9, US-79-10, US-81-1, US-81-2, US-81-3, 89-20-2, and 89-21-1. (p. 66, Appendix 7-17) is that they are no longer available for monitoring because either the wells have been destroyed by mining or water is no longer accessible due to casing failure. The permittee recommends abandonment of wells US-77-7, US-79-12, US-79-13, and US-80-4 because they are located in areas that were mined before 1991 and far from current or projected mining.

Quarterly monitoring report on file with DOGM show US-77-8, US-81-1, US-81-2, 89-20-2, and 89-21-1 as failed wells, 89-21-1 apparently having been intercepted by mine operations in 1996. Records also show US-77-7, US-79-9, and US-79-12 have always been dry. Dropping these eight wells from the monitoring plan is reasonable and should cause no problem or loss of useful information related to protection of the hydrologic balance.

Of the other five wells proposed for abandonment, quarterly monitoring should be

continued at four, US-77-9, US-79-10, US-81-3, and US-80-4. The fifth, US-79-13 , should have at least annual monitoring.

US-77-9 is open to the lower Castlegate Sandstone and upper Blackhawk Formation, and US-79-10 is open to the upper Hiawatha Coal Seam. These two wells were dry up to 1994 and 1995, respectively, but since then water levels have been measured consistently (up to October 1996). US-81-3 was marked "inaccessible" in the fourth quarter 1996 and has apparently been inaccessible several times in the past, but otherwise it provides a good long-term record of water levels in the upper Hiawatha Coal Seam. These three wells, US-77-9, US-79-10, and US-81-3, are located in areas that have never been mined or that are not currently being mined and the probability of casing failure due to subsidence is minimal or non-existent. US-77-9 and US-81-3 monitor an area that has been a concern to water users in the past due to loss of flow at several nearby springs. The recent appearance of water in US-77-9 and US-79-10 may indicate a loss of integrity in the cement or casing, but may also result from adjustment of hydrologic systems to the effects of mining, a change in recharge and climatic conditions, or other factors important to understanding the hydrology and hydrogeology of the permit and adjacent areas and protection of the hydrologic balance. Quarterly measurement of ground-water levels at US-77-9, US-79-10, and US-81-3 should continue.

The water level in well US-80-4, open to the Castlegate Sandstone, rose six feet following first and second mining below the well in 1983. In August 1985 there was a twenty foot decline, following which water levels declined slowly through 1992. Data collected since 1993 appear to show that the water level has stabilized and may even be increasing. This well is near US-77-9, which is also showing possible recovery of ground water levels but is open to a different horizon. Quarterly monitoring of water levels in US-80-4 should continue in order to provide information on the adjustments of hydrologic systems to the effects of mining, responses of the hydrologic systems to changes in recharge and climatic conditions, or other factors important to understanding the hydrology and hydrogeology of the permit and adjacent areas and protection of the hydrologic balance.

A longwall entry was driven near the location of well US-79-13 in 1981 and a longwall panel passed nearby in 1988. The well is open to a sandstone unit that lies approximately two-hundred feet above the upper Hiawatha Coal Seam. Water levels have been measured in this well since 1982 and have shown no long-term change. Information from this well appears to support the concept of little to no hydrologic communication between the coal seam and overlying, saturated strata. Continued, long-term monitoring of this well would be worthwhile, but yearly rather than quarterly monitoring should be sufficient as long as water levels remain consistent with past measurements.

The USFS commented that data from the monitoring wells seems too variable to support the statement "dewatering effects seen in the lower Blackhawk have a limited temporal duration" that is found in the last paragraph on page 51 of Appendix 7. A similar statement is made in Conclusion 11 on page 53. The USFS recommends that these conclusions be refined to more accurately acknowledge the observed variability of the data.

The proposed amendment includes monitoring of seven springs; SUFCO 001, SUFCO 0047, SUFCO 047A, SUFCO 0089, GW-13, GW-20, and GW-21. With the exception of GW-20, these springs are monitored under the current MRP, although SUFCO 047A is currently listed as a surface-water monitoring site.

Spring 57A, which is currently monitored, is to be dropped in the proposed plan. Spring 57A has usually been dry during the period it has been monitored, but it had measurable flow in 1987 (the first year of monitoring), 1993, and 1995. Flow appears perhaps to be sensitive to the amount of precipitation. Spring 57A is the only spring that has been monitored in the Duncan Draw - Mud Spring Hollow area, which has been an area of concern to water users in the past due to loss of flow from several springs, including 57A. Quarterly measurement of flow at 57A should continue.

Under the water monitoring plan in the proposed amendment, monitoring of in-mine roof drip 062 is to be discontinued. Chemical characteristics of water from this roof drip are well established; water-quality analyses from 1983 to 1996 show little variation. This site is located in the main entry of the mine, and active mining in the vicinity has ceased. The volume of water flowing from this drip has been 0.4 gpm or less since 1986. Continued monitoring will probably yield no significant information.

Findings:

R645-301-121.200, -724.300, The USFS has pointed out that geologic information on page 41 of Appendix 7-17, Section 6.1.5.4 is titled as a summary of lower Blackhawk Formation groundwaters, but the discussion is of the Upper Blackhawk Formation. This discrepancy should be corrected.

R645-301-121.200, -724.100, Paragraph 3 on page 7-34 states that a greater saturated thickness of the Blackhawk Formation is encountered as mining proceeds away from North Fork of Quitchipah Creek, and more water is available for discharge into the mine. The USFS feels further discussion is needed to establish the extent and location of this increase in saturated thickness

in the Blackhawk Formation, especially considering that the rest of the proposed amendment presents the Blackhawk Formation as not being uniformly saturated. The increase in saturated thickness in the Blackhawk Formation should be further discussed to clarify the extent and location of this saturated zone.

R645-301-724, There are several stock-watering ponds in and adjacent to the permit area. Names, locations, and ownership of impoundments, such as Rock, Hans, and Johnson Ponds, are not described in Chapter 7 nor shown on a map. Names, locations, and ownership should be added to maps and discussed in the text.

R645-301-731, There are three permitted discharge points for the Convulsion Canyon Mine; discharge points UPDES 001 and UPDES 002 are shown on Plate 7-2, but UPDES 003 is not shown. It should be shown on Plate 7-2.

R645-301-121.200, -724.100, -727, -728, -731, -731.100, USFS comments point out that Stipulation 17 of the USFS lease requires that the lessee replace the loss of any surface water identified for protection, not just water covered by water rights. Commitments in the proposed permit that appear to limit the permittee to replacement of water rights only are not acceptable to the USFS and should be removed as they do not excuse the permittee from this lease obligation.

R645-301-724.400, -728, -731, -731.200, Declines of flow from several springs and declines in water level in several wells are attributed to drought conditions. The drought conditions are supposedly indicated by precipitation data in Appendix 7-5 and Figure 2 of Appendix 7-17, but these referenced sections do not contain data that clearly substantiate a drought over the period of time corresponding to the observed ground-water declines. Cessation of monitoring is proposed for several of the springs and wells involved. If data that clearly support the drought hypothesis and correlate with flow or water-level declines are available, they should be in the MRP. If such data are not available, the hypothesized drought should not be used to justify cessation of monitoring.

R645-301-724.300, Fracturing of strata that are more brittle or less amenable to sealing by clays, such as the Castlegate Sandstone, and potential impacts of such fracturing on surface and ground water need to be discussed in the proposed amendment.

R645-301-725, -728, -729, The PHC in the currently approved MRP contains an estimate of ground water lost from the Quitchipah basin as moisture in the

produced coal. This estimate of water removed from the permit area has been removed from the proposed amendment, but there is no apparent reason to remove it. If it is out-of-date or inaccurate it should be updated or corrected, but nevertheless the information should not be deleted from the MRP.

R645-301-731.210, There is no information or discussion that supports dropping the waste-rock-disposal-site wells from the ground water monitoring plan. The USFS has specifically requested that monitoring for boron and selenium be continued for ground-water samples from these wells. Boron and selenium are not listed in Table 7-4 of the proposed amendment. Monitoring should continue at the waste rock disposal site, and boron and selenium should remain on the list of monitoring parameters.

R645-301-722.100, -731.210, Water-level monitoring wells US-77-9, US-79-10, US-81-3, US-80-4, and US-79-13 are proposed for abandonment. However, examination of data presented in the MRP, the proposed amendment, and quarterly reports indicates these five wells are intact, currently monitored, and providing information that may be important to understanding the hydrology and hydrogeology of the permit and adjacent areas. Water-level monitoring in these five wells should continue. Annual monitoring should suffice for US-79-13.

R645-301-121.200, The USFS commented that data from the monitoring wells seems too variable to support the statement "dewatering effects seen in the lower Blackhawk have a limited temporal duration" that is found in the last paragraph on page 51 of Appendix 7. A similar statement is made in Conclusion 11 on page 53. The USFS recommends that these conclusions be refined to more accurately acknowledge the observed variability of the data.

R645-301-121.200, What is to be monitored at monitoring site 047A is unclear. Site 047A is identified as a spring in Table 7-2 and Table A-1 of Appendix 7-17 but shown as a surface-water monitoring site on Plate 7-3. It is listed as a surface-water monitoring site in the current MRP. It needs to be clarified whether 047A is a surface water or spring monitoring site.

R645-301-731, -731.211, Spring 57A is the only spring that has been monitored in the Duncan Draw - Mud Spring Hollow area, which has been an area of concern to water users in the past due to loss of flow from several springs, including 57A. Quarterly measurement of flow at 57A should continue.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.24, 783.25; R645-301-323, -301-411, -301-521, -301-622, -301-722, -301-731.

Analysis:

Affected Area Boundary Maps

The proposed amendment does not change the affected area boundary.

Archeological Site Maps

The proposed amendment does not require any changes to archeological site mapping.

Coal Resource and Geologic Information Maps

The proposed amendment does not require any changes to coal resource and geologic information maps.

Cultural Resource Maps

The proposed amendment does not require any changes to cultural resource maps.

Existing Structures and Facilities Maps

The proposed amendment does not require any changes to existing structures and facilities maps.

Existing Surface Configuration Maps

The proposed amendment does not require any changes to existing surface configuration maps.

Mine Workings Maps

The proposed amendment does not require any changes to mine workings maps.

Monitoring Sampling Location Maps

A new version of Plate 7-3 has been submitted as part of the proposed amendment to show locations and approximate elevations for monitoring stations used to gather data on water quality and quantity. However, the map isn't clear in its presentation of the information. UPDES 003 is not on this map. The "EXPLANATION" on Plate 7-3 distinguishes between "historic monitoring well" and "well monitoring site" but the reason for the distinction between these two types of well isn't clear: Table 7-2 lists five "well monitoring site" and two "historic monitoring well" sites for the proposed monitoring; three "well monitoring site" locations shown on Plate 7-3 are not listed in Table 7-2; and not all baseline monitoring wells are shown on Plate 7-3 (Table 7-1 lists all observation wells and refers to Plate 7-3 for locations). Stream monitoring sites 041 and 042 are not on Plate 7-3. Springs GW-13 and GW-20 are not on the map.

The proposed amendment does not require any changes to maps that show elevations and locations of sites for monitoring fish and wildlife and air quality.

Permit Area Boundary Maps

The proposed amendment does not require any changes to permit area boundary maps.

Subsurface Water Resource Maps

Text on p. 7-2 states that it is not possible to represent a potentiometric surface for the area because all aquifers are perched and a continuous aquifer does not exist in the strata down through the Blackhawk Formation. Several references to Plate 7-1 have been removed from the text. Nevertheless, the List of Plates on page 7-iv indicates Plate 7-1, which shows

elevations of ground water as measured in the observation wells, is to remain in the proposed plan, which appears to satisfy the requirements of R645-301-722.100.

The USFS commented that a schematic cross-section showing completion depths of the wells listed in Table 7-1 and formations monitored by those wells would be useful.

Surface and Subsurface Manmade Features Maps

The proposed amendment does not require any changes to surface and subsurface manmade features maps.

Surface and Subsurface Ownership Maps

The proposed amendment does not require any changes to surface and subsurface ownership maps.

Surface Water Resource Maps

There are no water-supply intakes for current users of surface waters flowing into, out of, and within a hydrologic area. Surface waters that will receive discharges from affected areas in the proposed permit area are shown on Plate 7-3. Location of surface water bodies such as streams and springs within the proposed permit and adjacent areas are shown on Plate 7-3. There are no known lakes, constructed or natural drains, and irrigation ditches within the proposed permit and adjacent areas. Names and locations of ponds, such as Rock, Hans, and Johnson Ponds, are not shown on Plate 7-3.

Vegetation Reference Area Maps

The proposed amendment does not require any changes to vegetation reference area maps.

Well Maps

There are no gas and oil wells within the proposed permit and adjacent areas. There

are no water supply wells in the permit and adjacent areas.

Contour Maps

The proposed amendment does not require any changes to contour maps.

Certification

Plates 7-3 and 7-15-1, the only cross sections, maps, and plans included in the proposed permit amendment to satisfy the requirements of the Rules, were prepared by and certified by a registered, professional engineer.

Findings:

R645-301-121.200, -731, UPDES 003 should be shown on Plate 7-3.

R645-301-121.200, -722.300, -731 The distinction between “historic monitoring well” and “well monitoring site” on Plate 7-3 isn’t clear and doesn’t correlate with the wells indicated for monitoring in Table 7-2. The meaning of the two different symbols should be clarified.

R645-301-121.200, -722.300, All baseline monitoring sites should be shown on Plate 7-3.

R645-301-121.200, -731, Operational stream monitoring sites 041 and 042 and springs GW-13 and GW-20 should be on Plate 7-3.

R645-301-722.100, Names and locations of ponds, such as Rock, Hans, and Johnson Ponds, should be on Plate 7-3.

OPERATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

Ground-water monitoring.

The application includes a ground-water monitoring plan based upon the PHC determination and the analysis of all baseline hydrologic, geologic, and other information in the application. The plan provides for the monitoring of parameters that relate to the suitability of the ground water for current and approved postmining land uses and to the objectives for protection of the hydrologic balance. It identifies the quantity and quality parameters to be monitored, sampling frequency, and site locations in Tables 7-2, 7-3, 7-4, and 7-5 and on Plate 7-3. The plan describes how the data may be used to determine the impacts of the operation upon the hydrologic balance. Ground-water monitoring data are to be submitted to the Division at least every 3 months - by the end of the quarter following sampling, and in an annual summary. Ground-water monitoring will continue through the mining and post-mining periods until bond release.

The proposed ground-water monitoring plan eliminates several springs and wells that are currently monitored. Not all of the proposed changes are acceptable.

Both water-quality and water-level monitoring are to be abandoned at the waste-rock-disposal site according to Table 7-2 of the proposed amendment. The proposed amendment contains no information or discussion to justify abandoning the monitoring of these wells. Boron and selenium concentrations are determined for water samples from these wells under the current MRP. Boron and selenium are not listed in Table 7-4 of the proposed amendment. The USFS requested in a letter to DOGM (April 29, 1997) that boron and selenium concentrations continue to be determined for water from these wells, which includes an implied request that ground-water quality monitoring continue at these wells.

The proposed ground water monitoring plan eliminates thirteen wells from water depth measurement. No new wells are proposed. The reason given for abandoning measurements at US-77-8, US-77-9, US-79-9, US-79-10, US-81-1, US-81-2, US-81-3, 89-20-2, and 89-21-1 (p. 66, Appendix 7-17) is that they are no longer available for monitoring because either they have been destroyed by mining or water is no longer accessible due to casing failure. The permittee recommends abandonment of wells US-77-7, US-79-12, US-79-13, and US-80-4 because they are located in areas that were mined before 1991 and far from current or projected mining.

Quarterly monitoring report on file with DOGM show US-77-8, US-81-1, US-81-2, 89-20-2, and 89-21-1 as failed wells, 89-21-1 apparently having been intercepted by mine operations in 1996. Records show US-77-7, US-79-9, and US-79-12 have always been dry. Dropping these eight wells from the monitoring plan is reasonable and should cause no problem or loss of useful information related to protection of the hydrologic balance.

Of the other five wells proposed for abandonment, quarterly monitoring should be continued at four, US-77-9, US-79-10, US-81-3, and US-80-4. The fifth, US-79-13, should have at least annual monitoring.

US-77-9 is open to the lower Castlegate Sandstone and upper Blackhawk Formation, and US-79-10 is open to the upper Hiawatha Coal Seam. These two wells were dry up to 1994 and 1995, respectively, but since then water levels have been measured consistently (up to October 1996). US-81-3 was marked "inaccessible" in the fourth quarter 1996 and has apparently been inaccessible several times in the past, but otherwise it provides a good long-term record of water levels in the upper Hiawatha Coal Seam. These three wells, US-77-9, US-79-10, and US-81-3, are located in areas that have never been mined or that are not currently being mined and the probability of casing failure due to subsidence is minimal or non-existent. US-77-9 and US-81-3 monitor an area that has been a concern to water users in the past due to loss of flow at several nearby springs. The recent appearance of water in US-77-9 and US-79-10 may indicate a loss of integrity in the cement or casing, but may also result from adjustment of hydrologic systems to the effects of mining, a change in recharge and climatic conditions, or other factors important to understanding the hydrology and hydrogeology of the permit and adjacent areas and protection of the hydrologic balance. Quarterly measurement of ground-water levels at US-77-9, US-79-10, and US-81-3 should continue.

The water level in well US-80-4, open to the Castlegate Sandstone, rose six feet following first and second mining below the well in 1983. In August 1985 there was a twenty foot decline, following which water levels declined slowly through 1992. Data collected since 1993 appear to show that the water level has stabilized and may even be increasing. This well

is near US-77-9, which is also showing possible recovery of ground water levels but is open to a different horizon. Quarterly monitoring of water levels in US-80-4 should continue in order to provide information on the adjustments of hydrologic systems to the effects of mining, responses of the hydrologic systems to changes in recharge and climatic conditions, or other factors important to understanding the hydrology and hydrogeology of the permit and adjacent areas and protection of the hydrologic balance.

A longwall entry was driven near the location of well US-79-13 in 1981 and a longwall panel passed nearby in 1988. The well is open to a sandstone unit that lies approximately two-hundred feet above the upper Hiawatha Coal Seam. Water levels have been measured in this well since 1982 and have shown no long-term change. Information from this well appears to support the concept of little to no hydrologic communication between the coal seam and overlying, saturated strata. Continued, long-term monitoring of this well would be worthwhile, but yearly rather than quarterly monitoring should be sufficient as long as water levels remain consistent with past measurements.

The proposed amendment includes monitoring of seven springs; SUFCO 001, SUFCO 0047, SUFCO 047A, SUFCO 0089, GW-13, GW-20, and GW-21. With the exception of GW-20, these springs are monitored under the current MRP, although SUFCO 047A is listed as a surface-water monitoring site.

Spring 57A, which is currently monitored, is to be dropped in the proposed plan. Spring 57A has usually been dry during the period it has been monitored, but it had measurable flow in 1987 (the first year of monitoring), 1993, and 1995. Flow appears perhaps to be sensitive to the amount of precipitation. Spring 57A is the only spring that has been monitored in the Duncan Draw - Mud Spring Hollow area, which has been an area of concern to water users in the past due to loss of flow from several springs, including 57A. Quarterly measurement of flow at 57A should continue.

Under the water monitoring plan in the proposed amendment, monitoring of in-mine roof drip 062 is to be discontinued. Chemical characteristics of water from this roof drip are well established; water-quality analyses from 1983 to 1996 show little variation. This site is located in the main entry of the mine, and active mining in the vicinity has ceased. The volume of water flowing from this drip has been 0.4 gpm or less since 1986. Continued monitoring will probably yield no significant information.

Equipment, structures, and other devices used in conjunction with monitoring the quality and quantity of ground water onsite and offsite have been properly installed, maintained, and operated. The proposed amendment states that where feasible, this equipment will be removed by the operator when no longer needed. USFS comments point out that

Stipulation 15 of the USFS lease unconditionally requires removal of this equipment and the phrase "where feasible" in the proposed permit should be removed as it does not excuse the permittee from this lease obligation.

Acid and toxic-forming materials.

The proposed amendment does not affect the manner in which earth materials and runoff are handled to minimize acidic, toxic, or other harmful infiltration to ground-water systems; or management of excavations and other disturbances to prevent or control the discharge of pollutants into the ground water.

Transfer of wells.

Ownership of wells will be transferred to another party for further use only with prior approval of the Division. The conditions of such transfer will comply with State and local laws and the permittee will remain responsible for the proper management of the well until bond release.

Discharges into an underground mine.

There are no planned discharges into an underground mine.

Gravity discharges from underground mines.

No discharges of surface water are being made into the underground mine and none are planned.

Water quality standards and effluent limitations.

UPDES reporting requirements will be met for the three UPDES discharge sites at the mine.

Casing and sealing of wells.

Before final release of bond, exploratory or monitoring wells will be sealed in a safe and environmentally sound manner.

Findings:

R645-301-731.215, The USFS has commented that Stipulation 15 of the USFS lease unconditionally requires removal of water monitoring equipment and that the phrase "where feasible" on page 7-48 in the proposed permit should be removed as it does not excuse the permittee from this lease obligation.

R645-301-731.210, There is no information or discussion that supports dropping the waste-rock-disposal-site wells from the ground water monitoring plan. The USFS has specifically requested that monitoring for boron and selenium be continued for ground-water samples from these wells. Boron and selenium are not listed in Table 7-4 of the proposed amendment. Monitoring should continue at the waste rock disposal site, and boron and selenium should remain on the list of monitoring parameters.

R645-301-722.100, -731.210, Water-level monitoring wells US-77-9, US-79-10, US-81-3, US-80-4, and US-79-13 are proposed for abandonment, with justification being that they are no longer usable because of casing failure or having been destroyed by mining or because they are located in areas that were mined before 1991 and far from current or projected mining. However, examination of data presented in the MRP, the proposed amendment, and quarterly reports indicates these five wells are intact, currently monitored, and providing information that may be important to understanding the hydrology and hydrogeology of the permit and adjacent areas. Water-level monitoring in these five wells should continue. US-79-13 should have at least annual monitoring.

R645-301-731, -731.211, Spring 57A is the only spring that has been monitored in the Duncan Draw - Mud Spring Hollow area, which has been an area of concern to water users in the past due to loss of flow from several springs, including 57A. Quarterly measurement of flow at 57A should continue.

R645-301-121.200, What is to be monitored at monitoring site 047A is unclear. Site 047A is identified as a spring in Table 7-2 and Table A-1 of Appendix 7-17 but shown as a surface-water monitoring site on Plate 7-3. It is listed as a surface-

water monitoring site in the current MRP. The MRP needs to indicate clearly whether 047A is a surface or spring monitoring site.

MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-512, -301-521, -301-542, -301-632, -301-731, -302-323.

Mine Workings Maps

The proposed amendment does not require any changes to mine workings maps.

Permit Area Boundary Maps

The proposed amendment does not require any changes to permit area boundary maps.

Surface Configuration Maps

The proposed amendment does not require any changes to existing surface configuration maps.

Structures and Facilities Maps

The proposed amendment does not require any changes to existing structures and facilities maps.

Monitoring Sampling Location Maps

A new version of Plate 7-3 has been submitted as part of the proposed amendment to show locations and approximate elevations for monitoring stations used to gather data on water quality and quantity. However, the map isn't clear in its presentation of the information. UPDES 003 is not on this map. Plate 7-3 distinguishes between "historic monitoring well" and "well monitoring site" in the Explanation, but the distinction between these two types of well isn't clear: Table 7-2 lists five "well monitoring site" and two "historic monitoring well"

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drainages. The CHIA determined that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area. The proposed amendment does not provide any information that indicate a need to change that determination. However, the CHIA needs to be updated to include recent information.

RECOMMENDATION

Prior to approval of the revised Chapter 7 of the Convulsion Canyon Mine MRP, the requirements of the Coal Mining Rules must be met as outlined above.

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