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October 9, 2002

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TO: Internal File

FROM: James D. Smith, Senior Reclamation Specialist/Team Lead JDS

RE: Mill Fork Lease Extension of the Deer Creek Mine, Energy West Mining, PacifiCorp, Deer Creek Mine, C/015/018-PM01I-1

SUMMARY:

The Mill Fork Lease (Utah State Lease ML-48258) adds approximately 5,563 acres to the Deer Creek Mine permit area, bringing total acreage to approximately 24, 500 acres. Energy West acquired the lease on April 12, 1999. The Permit Application Package (PAP) to add the Mill Fork Lease to the Deer Creek permit was received by the Division on October 10, 2001. This PAP is formatted to be added as Volume 12 of the Deer Creek Mine MRP.

TA C/015/018-PM01I, sent to the operator in January 2002, identified numerous deficiencies. The operators response to that TA was received April 18, 2002, and this technical memorandum applies to that response.

Entry to the Mill Fork Lease from the existing permit area will be by entries in the Hiawatha Seam, advanced from the current permit area by way of Lease Modification #3, a 65.7-acre area that has been added to Lease U-06039 for this purpose. The only potential surface facility associated with this Mill Fork Lease permit extension is the possible ventilation breakout in Crandall Canyon, upstream of the existing Crandall Canyon Mine. The need for these portals will be evaluated and the design will be made based on future coal exploration. If these portals are needed, they will be permitted in a separate application. All currently planned coal mine operations in the Mill Fork Lease will be underground.

Coal will be mined in both the Blind Canyon and Hiawatha Seams. The Blind Canyon is to be mined first, accessed from the Hiawatha through rock slopes that are to be built within the Mill Fork Lease area. Total cumulative vertical extraction from both seams will not exceed 20 feet. The full extraction methods to be used are anticipated to cause subsidence that can be planned and controlled.

The PAP refers to data in Annual Reports and other sources for the required information for adequate and complete baseline water-quantity and –quality data.

Because of recent changes regarding water replacement in the Coal Mining Rules, a new deficiency requiring a plan for replacement of water supplies is included in this technical analysis.

TECHNICAL ANALYSIS:

ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: Pub. L 95-87 Sections 507(b), 508(a), and 516(b); 30 CFR 783., et. al.

GENERAL

Regulatory Reference: 30 CFR 783.12; R645-301-411, -301-521, -301-721.

Analysis:

The application for the proposed Mill Fork Lease area contains a description of the existing, pre-mining environmental resources within the proposed permit area and adjacent areas that may be affected or impacted by the proposed underground mining activities.

Findings:

Environmental Resource Information in some sections of the Mill Fork Lease PAP is not adequate to meet the requirements of the Coal Mining Rules and for incorporation of the Mill Fork Lease Extension into the Deer Creek Mine MRP. Prior to approval the Applicant must provide information listed below in various sections of this Technical Memo.

HYDROLOGIC RESOURCE INFORMATION

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

Analysis:

Appendix A of the Mill Fork Lease PAP Hydrology section an update of the current monitoring plan in Volume 9 of the Deer Creek, Des-Bee-Dove, Cottonwood-Wilberg PAP.

Appendix B is a report by Mayo and Associates, *Surface-water and ground-water investigation of the Mill Fork Lease area, Emery County, Utah*, which includes a PHC determination.

Appendix C to the Mill Fork Lease PAP has been submitted with information on springs and seeps in the Mill Fork Lease. There is an interesting section with photos and descriptions of the sites; details on location and elevation, geology and stratigraphic position, and water rights and development information; relationships to other springs; and a determination of the probable recharge area. This appendix also contains data report sheets for select seeps and springs – including isotope data for select springs, and water rights in the Mill Fork Lease area. Other baseline information for the Mill Fork Lease is in the PAP; and some is in the Annual Reports.

Jointing, which affects hydrologic characteristics, is significant in the rocks of the Mill Fork Lease area. The dominant joints in the area parallel the Joes Valley Fault, trending predominantly north-south to north 10^0 east, and a few secondary fracture sets follow other orientations (R845-301-624). Geology is described in R645-301-600-Geology of the Mill Fork Lease PAP, and because geology relates to ground and surface water, it is further discussed in R645-310-700-Hydrology.

Water Replacement

Because of recent changes regarding water replacement in the Coal Mining Rules, a deficiency requiring a plan for replacement of water supplies is included in this technical analysis. As defined in R645-301-100 of the Coal Mining Rules,

> "Water Supply", "State-appropriated Water", and "State-appropriated Water Supply" are all synonymous terms and mean, for the purposes of the R645 Rules, state appropriated water rights which are recognized by the Utah Constitution or Utah Code.

Under rule R645-301-525.400, if the Division determines that subsidence could adversely affect state-appropriated water supplies through damage, diminution in value or foreseeable use; or that contamination, diminution, or interruption could occur, the application must include a subsidence control plan that contains information in accordance with:

> R645-301-525.400 ... measures to be taken in accordance with R645-301-731.530 and R645-301- 525.500 to replace adversely affected State-appropriated water supplies ....
>
> R645-301-525.480. A description of the measures to be taken in accordance with R645-301-731.530 and R645-301- 525.500 to replace adversely affected State-appropriated water supplies ...
>
> R645-301-731.530. State-appropriated water supply. The permittee will promptly replace any State-appropriated water supply that is contaminated, diminished or

> interrupted by UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES conducted after October 24, 1992, if the affected water supply was in existence before the date the Division received the permit application for the activities causing the loss, contamination or interruption. The baseline hydrologic and geologic information required in R645-301-700. will be used to determine the impact of mining activities upon the water supply.

The probability of subsidence causing such impacts or adverse affects in and adjacent to the Mill Fork Lease is small (PAP, section R645-301-728, E.; and R645-301-728, I. 2.), but because a possibility exists, the water replacement rules apply.

Little Bear Spring is of particular concern. Direct impacts are not likely, but the primary source of recharge to this spring is the runoff from upper Mill Fork Canyon, which flows to Little Bear Spring by way of the creek in Mill Fork Canyon and the Mill Fork Graben. The report by Mayo and Associates in Appendix B (PAP, section R645-301-700) concludes that Mill Fork is the primary source of recharge to Little Bear Spring. (Based on an AquaTrack™ survey that is not cited in the PAP, it has been estimated that 60 to 70 percent of the Little Bear Spring discharge comes from upper Mill Fork Canyon through Mill Fork Graben.)

Between Mill Fork and Little Bear Canyons, the down-plunge end of the Crandall Canyon Syncline intercepts the Mill Fork Graben and may provide part of the recharge to Little Bear Spring. When operations in the Trail Mountain Mine exposed the Spring Canyon Member in the down-plunge end of the Straight Canyon Syncline, ground water under pressure entered the mine at a rate of 200 to 300 gpm until the Spring Canyon Member was depressurized (PAP, section R645-301-700, Appendix B, page 72). The possibility exists that mining in the Mill Fork tract could depressurize the water in this syncline and impact some portion of the flow at Little Bear Spring.

Although the potential is low, subsidence could intercept or interrupt flow from upper Mill Fork Canyon, where precipitation and runoff are greatest, and produce a proportional decrease in the flow at Little Bear Spring (PAP, section R645-301-700, Appendix B, page 127). Going on the basis that 65 percent of Little Bear Spring flow is from Mill Fork, then a 20 to 25 percent reduction of flow in Mill Fork could produce a reduction of flow at Little Bear Spring on the order of 10 to 15 percent. The potential impact from depressurization of the Crandall Canyon Syncline is not as readily estimated, but could be equally significant. Because of these possible impacts to Little Bear Spring, areas within the Mill Fork tract are "renewable resource land" under the Coal Mining Rules and subject to specific regulations and protection. Therefore, the PAP needs to include a water replacement plan for Little Bear Spring. There are also other state-appropriated water supplies in and adjacent to the Mill Fork Lease, identified in R645-301-600, Appendix C of the PAP, that should also be covered by the water replacement plan. The plan should identify potential sources for replacement water and how water will be delivered to the water users. The plan should provide for both immediate short-term replacement and long-term replacement.

Baseline Information

Ground-water Information

Although some (for example *Lines, G. C.,1985, The ground-water system and possible effects of underground coal mining in the Trail Mountain area, central Utah, USGS Water-Supply Paper 2259*) describe the Blackhawk and Star Point strata as a regional aquifer, water intercepted in the Deer Creek and Cottonwood/Wilberg Mine workings is usually perched water from tabular or stream-channel sandstones that have moderate porosity but low permeability and poor interconnectivity. A potentiometric surface can be mapped in the Spring Canyon Member of the Star Point Sandstone in the Mill Fork tract (PAP, Figure MFHF-6), but as with other units of the Star Point, this unit generally has low permeability and produces water only where permeability has been enhanced by fracturing, erosion, or weathering (PAP, section R645-301-721, A. 3. f.); however, MW-1 at the Crandall Canyon Mine flows 0.5 to 1 gpm from apparently unfractured Star Point Sandstone, from a zone noted by the driller as being coarser-grained than the rest of the unit (Crandall Canyon Mine MRP, p. 7-7). Water is also encountered in open joint-systems in these rocks, in some fault zones - mainly the Roan Canyon fault zone, and the Straight Canyon Syncline (PAP, section R645-301-624).

The North Horn and Price River Formations also contain localized, perched water tables or saturated zones (PAP, section R645-301-721, A. 3.), although the Price River Formation is generally devoid of water because of a lack of recharge (PAP, section R645-301-721, A. 3. c.).

The locations of known seeps and springs within the Mill Fork Lease area are shown on the Pre-Subsidence Survey Map (MFS1839D). Ground-water rights are described in some detail at R645-301-721, A. 15 of the PAP. No wells with water rights are mentioned, and the Division has no knowledge of water wells or ground-water resources other than seeps and springs in this area.

Reports covering field parameters go back to 1980 for a few springs. A summary of historic water-quality data for the area, mainly collected for the NEPA analysis process prior to leasing of the coal, is in Appendix C of section R645-301-700.

Under existing mine permits, Energy West collects operational water-monitoring data at high flow (May or June) and low flow (August, September, or October). Baseline data collection for the Mill Fork Lease has generally followed the same schedule. Laboratory reports for 39 seeps and springs from the 3rd and 4th quarter 2000 are in Appendix C of the PAP: this includes EM POND, a spring fed pond used by cattle and wildlife. Reports for 53 seeps and springs from the 2nd, 3rd, and 4th quarters 2001 are also in Volume 12. Altogether, 30 seeps and springs were sampled more than once during the two-year period, and 10 were sampled three times.

Baseline data in the PAP for the 18 springs that are to be added to the operational monitoring are summarized in Table TM-1 below. Three of these springs (EM-216, RR-5, and

MF-19B) had only field parameters measured during this baseline period. - and measured during one quarter only. Of the other 15 springs, two had water quality determined by lab analyses for one quarter only, seven had it determined for two quarters, and six had it determined for three quarters. It is not clear why adequate baseline data have not been collected for EM-216, RR-5, and MF-19B; otherwise, baseline data submitted with the PAP meet the minimum standard in directive Tech 004 that the Division needs one-year of baseline data to initiate a Technical Analysis. The Division has received no indication that additional high-flow and low-flow data have been collected while the PAP has been under review.

According to the table in section R645-731-200 A. 1. of the PAP, there are water rights on seven of these 18 springs that are to be monitored. This table indicates RR-5 has a water right, but RR-5 is not listed with the water rights in Table MFHT-2. Including spring RR-5, three of the seven springs with water rights that are to be monitored have only field data for baseline.

R645-301-525.130 of the Coal Mining Rules requires a survey of the quality and quantity of all state appropriated water supplies in the permit and adjacent area that could be contaminated, diminished, or interrupted by subsidence. All springs with water rights that are located within the permit and adjacent area have at least one flow measurement, and most have pH and TDS or electric conductivity measurements. Print-outs of water-rights information from the Division of Water Rights are in Appendix C: these provide the information on quality and quantity needed for the pre-subsidence survey. This water-rights information will determine the quality and quantity to be replaced under Water Replacement Rules unless the Permittee collects baseline data at the water-right points of diversion: baseline data collected for water quantity should be correlated to variations in precipitation, if possible

Ten of the springs in the area that have water rights (PAP, section R645-301-700, Table MFHT-2) are not being proposed for operational monitoring (see Table TM-2 below). Information on why these springs do not have baseline and why they will not be monitored was included in the cover-letter sent with the April 18, 2002 submittal: the springs with water rights that are not being proposed for monitoring are either outside both the permit area and the area where the Permittee expects impacts (EM-215, JV-26, JV-36, and JV-43), or within the permit area but outside the area where the Permittee expects impacts (RR-14A, UJV-204, UJV-207, UJV-209A, UJV-213, and UJV-214). For each spring in the second group, an offsetting spring with a history of reliable flow measurement is being monitored. The rationale for selecting springs for monitoring is tabulated in the unnumbered table in Section R645-731-200 (PAP, section approximately page 101 of Section R645-301-700).

Genwal conducted a baseline spring and seep survey in 1994, 1995, and 1996 in the Mill Fork lease-by-application (LBA) tract to meet NEPA requirements (the northern portion of the tract had been surveyed in 1989 and 1990). The connection between these data and the pre-lease hydrology evaluation for the USFS by Genwal is briefly explained in section R645-301-721, A. 4 of the PAP. The USFS determined these Genwal data met Data Adequacy Standards. These data, along with other data from 1980, 1981, 1982, 1991, 1992, and 1993 are presented in Appendix C and Table MFHT-2 of the PAP. Appendix C and Table MFHT-2 do not adequately identify when these data were collected or who collected the data, and these data do not meet the requirements of determining seasonal variations of quality and quantity for the purposes of the Coal Mining Rules.

The Permittee initiated a re-evaluation of ground-water resources in 2000, but found inconsistencies between their field observations and the older data. Because of this, the Permittee has placed little confidence in information from the previous surveys. Springs and seep locations were resurveyed, and new baseline data were collected in 2000 and 2001 and correlated with the older data where possible.

The 2000 and 2001 data tabulated in Tables MFHT-3 and MFHT-4 of the PAP indicate that the response of the Mill Fork seeps and springs to seasonal and climatic changes is similar to that of the other seeps and springs on East Mountain, which have been monitored by the Permittee for more than twenty years.

Water-quality descriptions include those parameters required by the Coal Mining Rules: total dissolved solids (TDS) or specific conductance corrected to $25^{O}C$, pH, total iron, and total manganese. In addition, baseline and operational parameters have been determined for the samples submitted for laboratory analysis: these parameters correspond with those in DOGM directive Tech 004.

Monitoring parameters include approximate rates of discharge from the seeps and springs. Usage is given in the water-rights print-outs in Appendix C and locations of the water rights are shown on Drawing MFS1832D- Water Rights of the PAP.

The Permittee states that extensive research has established that the surface- and ground-water systems are not hydraulically connected, so no impacts to surface waters are anticipated from dewatering of perched systems in the coal seams and adjacent strata (PAP, section R645-301-624). Much of the information from this research is summarized in Appendix B, *Surface-water and ground-water investigation of the Mill Fork Lease area, Emery County, Utah*, by Mayo and Associates, October 24, 2001 (PAP, section R645-301-700, Appendix B). This lack of interconnectivity does not apply to impacts to surface or ground water due to subsidence, nor where fractures link the surface and subsurface systems.

Table TM-1 – Baseline for Operational Monitoring Springs										
Spring Water Right	1982	1993	1994	1995	1996	2000 3rd quarter	2000 4th quarter	2001 2nd quarter	2001 3rd quarter	2001 4th quarter
EM-216 93-3399			field			field				
EM POND							field, lab		field, lab	
JV-9						field, lab		field, lab		field, lab
JV-34							field, lab	field, lab		field, lab
MF-7		field	field		field	field, lab		field, lab		field, lab
MF-10 93-1412		field	field	field	field		field, lab		field, lab	field, lab
MF-19B 93-1413			field	field	field	field				
MF-213 93-259	field					field, lab		field, lab		field, lab
MF-219 93-1410						field		field, lab		field, lab
MFR-10								field, lab		field, lab
MFR-30								field, lab		
RR-5			field		field	field				
RR-15			field	field	field		field, lab			field, lab
RR-23A				field	field		field, lab			field, lab
SP1-26 SP-1-26							field, lab			field, lab
SP1-29									field, lab	
UJV-101		field		field	field		field, lab			field, lab
UJV-206 93-3400					field	field, lab		field, lab		field, lab

Table TM-2 – Baseline Monitoring of Springs with Water Rights Based on Table MFHT-2 of the PAP (M) = Proposed for Operational Monitoring										
Spring Water Right	1982	1993	1994	1995	1996	2000 3rd quarter	2000 4th quarter	2001 2nd quarter	2001 3rd quarter	2001 4th quarter
EM-215 93-1254			field							
EM-216 (M) 93-3399			field			field				
JV-26 93-998										
JV-36 a23164										
JV-43 93-1572										
MF-10 (M) 93-1412		field	field	field	field		field, lab		field, lab	field, lab
MF-19B (M) 93-1413			field	field	field	field				
MF-213 (M) 93-259	field					field, lab		field, lab		field, lab
MF-219 (M) 93-1410						field		field, lab		field, lab
RR-14A 93-1414			field	field	field					
UJV-204 93-810		field	field	field	field					
UJV-206 (M) 93-3400					field	field, lab		field, lab		field, lab
UJV-207 93-821		field	field	field	field	field, lab		field, lab		
UJV-209A 93-102			field	field	field	field, lab		field, lab		
UJV-213 a21560										
UJV-214 93-811										

Little Bear Spring

Little Bear Spring in Little Bear Canyon, east of the Mill Fork Lease, is an important source of water for the Castle Valley Special Services District (CVSSD), supplying 65 percent of the culinary water to the residents of Huntington, Cleveland, and Elmo. The only treatment required before use is chlorination. It is probably the largest and most consistently flowing spring in the region.

Little Bear Spring flows from the bounding fault zone on the west side of the Mill Fork Graben. Isotope analyses, geophysical investigations, dye-tracer tests, and comparisons of flow in Mill Fork with other Huntington Creek tributaries indicate that the ultimate recharge area for Little Bear Spring is upper Mill Fork Canyon. Precipitation runoff, snowmelt, and discharge from numerous springs collect in both the channel and alluvium of Mill Fork, and the water is diverted to Little Bear Spring through the Mill Fork Graben (PAP, section R645-301-721, A. 15. b. (1)). An additional stream-monitoring point has been added upstream of the Mill Fork Graben at the request of the USFS. The proposed location is shown on Drawing MFS1851D.

When operations in the Trail Mountain Mine exposed the Spring Canyon Member in the down-plunge end of the Straight Canyon Syncline, ground water under pressure entered the mine at a rate of 200 to 300 gpm until the Spring Canyon Member was depressurized (PAP, section R645-301-700, Appendix B, page 72). Although recharge to Little Bear Spring from the Star Point Sandstone and Blackhawk Formation is generally discounted in the PAP because of low permeabilities, the down-plunge end of the Crandall Canyon Syncline intercepts the Mill Fork Graben between Mill Fork and Little Bear Canyons and may provide part of the recharge to Little Bear Spring. The possibility exists that mining in the Mill Fork tract could depressurize the water in this syncline and impact some portion of the flow at Little Bear Spring.

Baseline data have not been collected by the Permittee, but CVSSD has measured flow since 1982 and documented quality for a number of years. Flow varies seasonally, one indication of a shallowly circulating ground-water system, but minimum flows have not dropped below approximately 200 gpm, indicating there is also storage capacity in the ground-water system: much of this storage is probably in the channel-bottom alluvium of Mill Fork Canyon. Average flow has been approximately 340 gpm. Isotopes indicate modern water, and quality is similar to surface waters in Huntington and Little Bear Creeks (PAP, section R645-301-721, A. 15. b.). The Permittee needs to add CVSSD's data, or their own equivalent data, for Little Bear Spring to the baseline data in Appendix C and add Little Bear Spring to the monitoring plan.

The Huntington #4 Mine crossed the Mill Fork Graben. Offset is approximately 25 to 30 feet on both sides (PAP, section R645-301-721, A. 3. g.). Within the graben and at the bounding faults, only minor amounts of ground water were encountered, and flow at Little Bear Spring was not measurably impacted (PAP, section R645-301-721, A. 15. b.). Either the mine is above the potentiometric surface or there is an aquitard – perhaps one of the coal seams – isolating the mine from the water.

Joes Valley Fault.

Three samples of water associated with the fault were collected in the Crandall Canyon Mine, and radiocarbon age and tritium content were measured. There was a minor amount of tritium in one sample, indicating some recharge of modern water, but radiocarbon dating indicated all three samples were 2,500 to 5,000 years old (PAP, section R645-301-700, Appendix B, page 78). Drill-holes adjacent to the fault indicated limited lateral hydrologic communication. Mining within 200 to 300 feet of the Joes Valley Fault could intercept modern water, recharged from the surface, but the "active" zone near the fault may include deeper, older water. A stipulation in the coal lease does not allow full extraction-mining within a 22 degree angle-of-draw of the fault (PAP, section R645-301-728, I. 4. a. (2); and Appendix B, page 126).

Joes Valley Fault separates Joes Valley from East Mountain and the Mill Fork Lease. This fault runs generally north-south. It is a normal fault with up to 2,300 feet of vertical offset, downthrown on the west side: the PAP gives the offset as 1,500 feet adjacent to the Mill Fork Lease (PAP, section R645-301-721, A. 3. g.). The fault forms the eastern edge of Joes Valley Graben and the steep escarpment along the western flank of East Mountain. (The fault and graben are regional features that extend both south and north of the East Mountain area.) North Horn and Upper Price River Formations are exposed on the floor of Joes Valley, with thick alluvium and colluvium deposits overlying these formations adjacent to the fault and escarpment. Most of the springs in Joes Valley flow from the alluvium along Indian Creek or from the North Horn Formation exposed west of the creek. Springs also flow in the small canyons that have been eroded into the fault scarp: these springs appear to be less numerous in the northern part of the Mill Fork tract where the fault and the mountain ridge are close to each other, and to become more numerous towards the south as the distance between the scarp and ridge increases (PAP, Plate 1 and Drawing MFU1823D).

Surface Water Information

Crandall Canyon, Rilda Canyon, Mill Fork, and Indian Creek are the main surface drainages in and adjacent to the Mill Fork Lease area. A number of small unnamed tributaries to Indian Creek flow from the west side of East Mountain. Only Crandall Creek is perennial. Crandall, Rilda, and Mill Fork are tributary to Huntington Creek; Indian Creek is tributary to Cottonwood Creek by way of Lowry Water. Little Bear Canyon was excluded from the Mill Fork Lease to protect Little Bear Spring.

Crandall Creek has been monitored for a number of years by Genwall Resources. The Applicant will not monitor this stream unless Genwall terminates monitoring (PAP, section R645-301-721, B. 1. b. 1. (b)).

Rilda Canyon has been monitored downstream of the Mill Fork Lease since 1989. Baseline quality analysis monitoring was done in 1989-1990, and is to be repeated every five years (PAP, section R645-301-721, B. 1. b. 1. (d)).

Data for Mill Fork have been submitted with Energy West's quarterly reports since 1997. Information on flow, pH, conductivity, and dissolved oxygen is summarized in Appendix C of the PAP. Flows have been monitored monthly since January 1997, but it is common for these monitoring sites to have no flow. Laboratory reports for 1997 through 2001 are in Appendix C. Parameters from DOGM directive Tech 004 have been determined for the samples submitted for laboratory analysis. Only one baseline analyses was done at MFA1 (June 1999) and this site was either dry or inaccessible due to snow the rest of the 1998 through 2001 baseline period. Baseline quality analyses were done November 1998, June 1999, September 2000, and September 2001 at MFB2, but for unexplained reasons, only operational parameters were done December 1998 and September 1999. Baseline analyses will be repeated every five years (PAP, section R645-301-721, B. 1. b. 1. (c)). Based on a request from the USFS, an additional monitoring site is to be added upstream of the Mill Fork Graben in 2002; the location is on Map MFS1851D.

Indian Creek was monitored for baseline parameters in 2000 and 2001. Flow and water-quality parameters will be measured during base-flow conditions at ICA, ICB, ICF, and ICD (PAP, section R645-301-721, B. 1. b. 2. (b)). These sites are marked on Map MFS1851D. Water-quality data for October 2000 and 2001 are in Appendix C of section R645-301-600 of the PAP. Genwal has monitored flow and water-quality at ICF since 1996, and the data have been incorporated into the Permittee's hydrologic database and summarized in Appendix C. The Permittee will continue with operational monitoring during base flow only at ICA, ICB, and ICD, but Genwal is currently committed to continue monitoring at ICF. (The ICF flume has a continuous recorder but because of poor access it is typically operational only from June through October; however, water samples are collected quarterly when the site is accessible.)

There are no known water-supply intakes for current users of surface waters flowing into, out of, and within the Mill Fork Lease hydrologic area (the creek in Mill Fork Canyon is a source of recharge to Little Bear Spring). The water supply system in Rilda Canyon is shown on maps and drawings in the existing Deer Creek Mine MRP.

No surface waters will receive discharges from affected areas in the proposed Mill Fork Lease area. Locations for Deer Creek Mine UPDES discharge points are shown on maps in the existing MRP.

Names and locations of surface water bodies within the proposed Mill Fork Lease permit and adjacent areas are shown on several maps in the PAP, including Plate 1; Drawing MFS1830D – Hydrologic Map; and Drawing MFS1839D - Pre-subsidence Survey Map. Water rights are listed in water-rights print-outs in Appendix C and locations are shown on Drawing MFS1832D - Water Rights of the PAP. Surface-water bodies are described in R645-301-721, B.

Baseline and operational data have been collected since 1997 at MFA01 and MFB02 in Mill Fork. Data are summarized in Appendix C of the PAP. Locations are shown on Drawing MFS1851D – Hydrologic Monitoring Map.

Information from ICA, ICB, and ICD in the Mill Fork Lease PAP, when combined with data from ICF, is sufficient to demonstrate seasonal variations of flow and water quality. Water-quality descriptions include baseline information on total suspended solids, total dissolved solids or specific conductance corrected to 25° C, pH, total iron, and total manganese. In addition, baseline and operational parameters from DOGM directive Tech 004 have been determined for the samples submitted for laboratory analysis.

There will be no new mine openings under the Mill Fork Lease extension and no potential for acid drainage from the proposed mining operation in the Mill Fork Lease area. Nevertheless, the Applicant has included information on baseline acidity and alkalinity in the ground-water quality analyses.

Streams in Mill Fork and Crandall Canyons flow from spring snowmelt and heavy thundershowers. In addition to the seasonal surface flow, alluvium transports a significant amount of water throughout the year. After surface runoff has ceased, water from the alluvium may surface over short reaches of the streambed and then percolate into the alluvium again as it continues its flow down the canyon (PAP, section R645-301-624).

Baseline Cumulative Impact Area Information

The Mill Fork Lease is in the cumulative impact area (CIA) for the East Mountain Cumulative Hydrologic Impact Assessment (CHIA) prepared by the Division in 1994. Mining will be done beneath the Mill Fork, Rilda Canyon, and Indian Creek watersheds. The Mill Fork Lease area is between Joes Valley Fault and the Mill Fork graben. The Joes Valley Fault is especially important as it is a hydrologic barrier between the mine and Indian Creek in Joes Valley in the subsurface; shallow ground-water flows through alluvium in the bottoms of the canyons that descend from East Mountain to Joes Valley and then flows into Joes Valley through the alluvial fans that cross the fault (PAP, section R645-301-624, p. 6-18).

Although the areas of impact will shift within the CIA, there should be no change to cumulative impacts outside the CIA. The main hydrologic impact will be removal of water from storage in the Blackhawk Formation and Star Point Sandstone, which will have no impact on the hydrologic balance outside the CIA. The quantity of discharges from the mine to surface waters should continue at rates similar to those from other recent mine operations, and water quality of the discharges should also be similar, so surface water will not be further impacted or materially damaged.

Hydrological Reports

Hydrologic and geologic information for the cumulative impact area have been obtained by the Division from federal or state agencies. Additional information has been included with the PAP. Other information has been provided by the Crandall Canyon Mine.

Groundwater Monitoring Plan

The water-monitoring plans are in Volume 9 of the MRP. The Mill Fork PAP modifies the plans to include the Mill Fork tract.

Surface-Water Monitoring Plan

The water-monitoring plans are in Volume 9 of the MRP. The Mill Fork PAP modifies the plans to include the Mill Fork tract.

Probable Hydrologic Consequences Determination

A Probable Hydrologic Consequences report was compiled by Mayo and Associates for Energy West. The report is submitted in Appendic B of section R645-301-700 of the PAP. The geologic information presented in the PAP is sufficient to establish the hydrologic activities and functions for a probable hydrologic consequence determination.

The planned subsidence from full-extraction mining should result in a generally uniform lowering of the surface over broad areas, and that will limit the extent of material damage to the surface lands, with no appreciable change to land uses and renewable resources, including seeps, springs, and streams. Experience in the Deer Creek Mine area shows that subsidence occurs within two months of coal extraction, and the land is stable after two years. Predicted subsidence is 0 to15 feet, based on total cumulative extraction not exceeding 20 feet.

Full-extraction mining will be done beneath the headwaters of Rilda, Mill Fork, and Crandall Canyons. There will be no full-extraction mining beneath and no subsidence of the stream channels in those canyons. The PAP discusses the PHC in section R645-728 (pages 79 – 97) and in Appendix B.

The Coal Mining Rules require the permit application to contain a determination of the PHC of the proposed coal mining and reclamation operation upon the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas. Complete and adequate seasonal baseline data, upon which the PHC is to be based, are not in the PAP. Nevertheless, the determination of the PHC on pages 123 – 130 of Appendix B includes findings - based upon the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas - on:

1. *Whether adverse impacts may occur to the hydrologic balance;*
    a. Mining in the current Energy West permit areas has not affected surface- and ground-water flows.

i. Most springs identified in the Deer Creek Mine and Mill Fork Lease areas occur in the Price River, North Horn, and Flagstaff formations;
   1. The layout of the past and future mines is designed to minimize subsidence impacts to the steep cliffs of the Castlegate Sandstone.
   2. Nearly all observed subsidence has occurred in the Price River, North Horn, and Flagstaff formations that overlie the Castlegate.
   3. Springs in the Price River, North Horn, and Flagstaff formations are isolated from subsidence related fracturing because of :
      a. the thickness of overburden; and
      b. clayey units that deform plastically and swell when wetted.
   4. Numerous springs have been undermined on East and Trail Mountains, and those that are on areas that have subsided show no evidence of discharge declines attributable to subsidence or fracturing.

ii. Ephemeral and intermittent reaches or Deer Creek and Grimes Wash have been subsided, with no discharge declines attributable to mining-induced subsidence.

iii. Waters encountered underground by mining are from strata immediately above and below the mined horizon and from faults.
   1. Water in strata above the coal are from isolated, inactive systems that are not in connection with the near-surface spring waters.
   2. Inflows into the Deer Creek and Crandall Canyon Mines have occurred from faults.
      a. In general, these waters do not appear to be tied to modern, active ground-water systems; however
      b. Tritium data indicate that some ground-water inflows from these faults are local and in hydraulic communication with modern near-surface water.
   3. In the Straight Canyon Syncline, substantial volumes of ground water have flowed into the Deer Creek Mine from the underlying Star Point Sandstone.

b. By analogy with currently mined areas:
   i. Reduction of surface-water flows in Mill Fork, Crandall, and Rilda Canyons is not anticipated.
   ii. The potential for adverse affects to headwater reaches of Mill Fork that overlie planned full-extraction mining areas is minimal because these channel reaches are separated from the coal by the

thick sequence of low-permeability North Horn and Price River Formations.

iii. The Mill Fork Lease area has no structure analogous to the Straight Canyon Syncline, so inflows to the mine from the underlying Star Point Sandstone are not anticipated.

iv. Mining within 200 to 300 feet of the Joes Valley Fault system could intercept appreciable quantities of modern near-surface water.

c. The potential for adverse impacts to Little Bear Spring is small because:

i. It is 1.5 miles from the lease boundary and 2 miles from the nearest proposed mining; and

ii. It discharges from an active ground-water system that is in good communication with shallow recharge sources.

2. *Whether acid-forming or toxic-forming materials are present that could result in the contamination of surface- or ground-water supplies;*

a. Pyrite has been identified in the PacifCorp mines.

i. The pyrite oxidizes to produce acid.

ii. Acidic waters and iron have not been observed in the PacifiCorp mines.

1. Acid produced by pyrite oxidation is quickly neutralized by naturally occurring carbonate minerals.

2. Iron is precipitated as iron hydroxide.

b. No other acid-forming material than pyrite and no toxic-forming materials have been found or are suspected to exist in strata to be disturbed by mining.

c. Extensive testing of overburden strata, coal, and surrounding rocks has shown that there are no potentially acid- and toxic-forming materials (R645-301-623.100). Details of yearly analyses (1993 to 1999) of coal, floor, and roof are in R645-301-600-Geology - Appendix C of the Mill Fork Lease PAP. Analyses of overburden material are presented in Table G-1 in Volume 8 of the Deer Creek, Des-Bee-Dove, Cottonwood-Wilberg MRP, and summarized in Appendix A of the Mill Fork Lease PAP.

3. *What impact the proposed coal mining and reclamation operation will have on:*

a. *sediment yield from the disturbed area;*

i. Sediment yield from disturbed surface areas is minimized by sediment control structures;

ii. Sediment in mine discharge water is minimized by sedimentation ponds;

iii. Subsidence can increase or decrease sediment load in streams;

1. Increased stream gradient;

a. Higher flow velocities;

b. Greater sediment entrainment.

c. Extent this will occur in the Mill Fork Lease area is not known, but this is typically local and short-lived.

2. Decreased stream gradient, stream impoundment;
   a. Sediment deposited in the impoundment;
   b. Extent this will occur in the Mill Fork Lease area is not known, but this is typically local and short-lived.

b. acidity, total suspended and dissolved solids and other important water quality parameters of local impact;

i. Most springs occur in strata above the coal seam and mine, so a mechanism for impact is unlikely.

ii. Past monitoring at the Deer Creek, Des-Bee-Dove, Cottonwood-Wilberg Mines has detected no impacts to quality of water in springs and streams.

iii. Water discharged from the Mill Fork Lease will be subject to UPDES standards.

iv. Water discharged should be similar to that discharged from the Deer Creek and Cottonwood-Wilberg Mines, which:
   1. Meets secondary drinking water quality standards, and
   2. Has not had identifiable detrimental impacts on the quality of water in the receiving streams

c. flooding or streamflow alteration;

i. Expected discharge, although impossible to predict, will probably be much less than the maximum runoff during spring snowmelt or summer thundershowers;

ii. Flooding and streamflow alteration are not expected from mine discharge waters.

d. ground-water and surface-water availability;

i. Mining will not significantly affect availability of ground water
   1. Ground water in the Blackhawk is compartmentalized and the formation is not a hydraulically continuous aquifer
   2. Ground water in the Blackhawk is isolated from overlying, modern ground waters;
   3. Local effects of dewatering will have no effects on the ground-water availability in the surrounding region.

ii. No water supplies will be impacted by removal of water from strata immediately above and below the coal seams.

e. *other characteristics as required by the Division;* The Division has required the evaluation of no other characteristics.

4. *Whether the UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES conducted after October 24, 1992 may result in contamination,*

diminution or interruption of State-appropriated Water in existence within the proposed permit or adjacent areas at the time the application is submitted.

a. There are no ground-water supply wells in the Mill Fork Lease area. No water supplies will be impacted by removal of water from strata immediately above and below the coal seams.

Drawing MFU1823D shows the Crandall Canyon Syncline passing right through the heart of the projected Mill Fork Lease projected mine workings, and it intercepts the Mill Fork Graben just upgradient of Little Bear Spring. Why the Permittee does not consider this as an analogous structure to the Straight Canyon Syncline is not clear. The Crandall Canyon Syncline, and the potential that mining in this syncline will impact the hydrologic balance in and adjacent to the Mill Fork Lease, Little Bear Spring in particular, need to be discussed in the PHC.

The Permittee has discussed the expected duration of flow and the volume of water expected to be encountered in section R645-301-728. I. 4. c. Additional information is provided in R645-301-721, A. 9. and R645-301-721, A. 10. Discharge is expected to be similar to that in the Deer Creek Mine and adjacent Crandall Canyon Mine, but discharge per acre mined is not estimated because interception of water varies depending on several factors, and flow from any given area is expected to decline rapidly after the initial encounter and to decrease over time.

Findings:

Hydrologic Resource Information is not considered adequate to meet the requirements of this section. Prior to approval the Applicant must provide the following information for the Mill Fork Lease PAP in accordance with:

R645-301-525.400, -731.530, The Permittee needs to include a plan for water replacement for Little Bear Spring, and also for other state-appropriated water supplies in and adjacent to the Mill Fork Lease. The plan should identify potential sources for replacement water and how water will be delivered to the water users. The plan should provide for both immediate short-term replacement and long-term replacement.

R645-301-731.530, The Permittee needs to add CVSSD's data, or their own equivalent data, for Little Bear Spring to the baseline data in Appendix C and add Little Bear Spring to the monitoring plan.

R645-301-724.100, -121.200, The Permittee needs to rectify the discrepancy between the table in Section R645-301-200 – Water Monitoring that indicates RR-5 has a water right, and Table MFHT-2 that does not list RR-5 as having a water right.

R645-301-724.100, The Permittee needs to explain why only one set of field parameters have been collected as baseline data for EM-216, RR-5 and MF-19B – sites with

water rights; why the Division should accept this as acceptable and adequate baseline; and how these monitoring points are going to provide useful operational information without adequate baseline data.

R645-301-724.100, The Permittee needs to provide the second year of baseline data collected for the springs proposed for operational monitoring, in particular MFR-30 and SP1-29, which have only one baseline point each.

R645-301-728.200, -728.350, The Permittee must explain why it does not consider the Crandall Canyon Syncline as an analogous structure to the Straight Canyon Syncline. The Crandall Canyon Syncline, and the potential that mining in this syncline will impact the hydrologic balance in and adjacent to the Mill Fork Lease, Little Bear Spring in particular, needs to be discussed in the PHC.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

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

Analysis:

Subsurface Water Resource Maps

Although Lines (*Lines, G. C., 1985, The ground-water system and possible effects of underground coal mining in the Trail Mountain area, central Utah, USGS Water-Supply Paper 2259*) described the Blackhawk and Star Point strata as a regional aquifer, water intercepted in the Deer Creek and Cottonwood/Wilberg Mine workings is usually perched water from tabular or stream-channel sandstones that have moderate porosity but low permeability and poor interconnectivity. Water is also encountered in open joint-systems in these rocks, in some fault zones - mainly the Roan Canyon fault zone, and the Straight Canyon Syncline (PAP, section R645-301-624). The North Horn and Price River Formations also contain localized, perched aquifers or saturated zones (PAP, section R645-301-624). Hydrographs of spring and seep discharge rates, such as Figure 12 of Appendix B (PAP, section R645-301-700, Appendix B), show seasonal and climatic differences of head.

Areal and vertical distribution of the formations that contain these perched waters are shown on Drawings MFU1823D and MFU1829D in the Geology section of the Mill Fork Lease PAP. There are no maps or cross-sections of individual aquifers nor of seasonal differences of head in different aquifers, and the Division does not routinely require such detailed description or mapping of these localized, discontinuous perched ground-water zones.

Findings:

Maps, plans, and cross sections of resource information are considered adequate to meet the requirements of this section.

RECOMMENDATIONS:

Prior to approval, the requirements of R645-301-700 must be provided as outlined above.

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