0025

# State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

November 2, 2000

TO: [redacted]

THRU: Paul, Baker, Project Team Lead PB

FROM: Jim Smith, Reclamation Specialist JDS

RE: Deer Creek Reclamation Plan, Energy West Mining Co., Deer Creek Mine, [redacted]AM99C-3

**SUMMARY:**

An amendment for the Deer Creek Reclamation Plan that was received by the Division May 1999, and a TA was sent June 7, 1999. The response to the TA of that initial submittal was received by the Division on December 6, 1999, and a subsequent TA was sent to the operator on March 12, 2000.

This response to the March 2000 TA was submitted in two parts. The first, received August 31, 2000, was a revision of Chapter 9 - Hydrology that affects the reclamation plans for all the PacifiCorp mines on East Mountain: Des-Bee-Dove, Cottonwood - Wilberg, and Deer Creek. The second, received September 21, 2000, responded specifically to the TA of the Deer Creek reclamation plan revision, but refers to the Chapter 9 revision in response to many of the hydrology deficiencies.

**TECHNICAL ANALYSIS:**

# RECLAMATION PLAN

## HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14

**Analysis:**

**Ground-water Monitoring**

Ground-water monitoring points are described in Appendix A of Volume 9. Map HM-1 shows the location of all reclamation monitoring points.

Both baseline and operational ground-water monitoring parameters are listed in Table 2 of Appendix A, Volume 9: there is no separate list of reclamation parameters. This table is the same as Table 4 in the Division's Directive Tech 004 except that total alkalinity is not included: although total alkalinity is not listed in the operator's tables, this parameter has nonetheless been included on most water-quality reports submitted by the operator. (Also, total alkalinity is used to determine carbonate and bicarbonate and, if the need arises, it can be back-calculated from the reported values for those two parameters.)

There is no indication that monitoring for baseline parameters is to be done every five years at ground-water monitoring sites, as recommended in the Division's Directive Tech 004. Such a commitment is absent from both the operation monitoring plan and the reclamation monitoring plan.

According to pages 170 and 171 in Volume 9 of the MRP, there is a potential of post-mining discharge of up to 200 gpm from all portals, most of which will probably discharge from the Cottonwood Mine portal in Miller Canyon, which is at the lowest elevation of all the portals; however, the access and conveyor tube portals in Cottonwood Canyon - constructed in 1994 and 1995 - are at least 50 feet lower in elevation and the potential for gravity discharge from these portals is not discussed.

UPDES discharge permit 22896-004 was obtained for the Miller Canyon portals in 1982 and monitoring began in February 1983 (Appendix XXII - MRP). The three portals were temporarily sealed in 1984 following the Wilberg Mine fire and permanently sealed in 1987. A pipe was installed in the seal of the eastern (#1) portal and extended at least 500 feet down the canyon to facilitate the collection of water samples. Initially there were only sporadic discharges: 25 gpm in both October and November 1986, 12.5 gpm in June 1987, and 4 and 12 gpm in, respectively, September and November 1988. Consistent water flow began in April 1989 and discharge jumped to 70 gpm. The highest discharge was 78 gpm in August 1989, after which flow-volume trended downward. There were some high flows in the spring of 1991, but flow-volumes decreased significantly in 1994 and there has been no reported discharge since July 1996. In May 1999 it was discovered that the pipe had been pinched-off by caving of the portal openings and that water was flowing from the seals, over the rock ledge, and to the canyon floor where it dissipates within a few hundred feet: flow from portal #1 was estimated at 3 gpm. It is unknown how long the pipe was pinched-off and what effect this has had on the accuracy of flow measurements. Photos taken in June 1999 during backfilling of the portals show water seeping from the top of the Starpoint Sandstone ledge just below the portals: French drains were installed in 1999 in the base of the fill to prevent slope failure due to saturation. The water-sampling pipe was also removed at that time and the UPDES monitoring point is now in the stream bed of Miller Canyon near the confluence with Cottonwood Creek. Pinching-off of the pipe and moving of the monitoring point farther from the portals probably account for the consistency of recent "no-flow" reports.

The Deer Creek Mine portals in Deer Creek and Meetinghouse Canyons could potentially discharge after mining operations cease (pages 170 and 171, Volume 9). The Deer Creek portals are the lowest in the Deer Creek Mine and are down-dip from the mined-out areas. The reclamation design for one of the Deer Creek portals calls for a sand and gravel filter behind the seal and four 6-inch pipes to drain water through the seal and into a French drain system that will direct the water to the surface (page 5-4 and Drawing DS-1780-D - #5 of 5). Water discharged at the surface, if any, will be monitored for UPDES parameters. In the 5th year after reclamation begins, discharge will be analyzed for baseline parameters, and baseline monitoring will be repeated in the 10th year, before final bond release (pages 5-5 and 7-14). Tables in Appendix A should indicate this monitoring commitment. Baseline monitoring is not indicated for other UPDES discharge points during the reclamation period.

Current operational discharge from Deer Creek Canyon portals is under a UPDES permit. Deer Creek is a High Quality Water - Category 2, as defined in UAC R317-2. There is no UPDES permit for the potential discharge to Meetinghouse Canyon.

Currently, water samples collected for UPDES monitoring are analyzed monthly for both UPDES and operational parameters. According to Table 3-2 in Section R645-301-341, the operator proposes to monitor post-mining flow from portals according to the UPDES permit until the end of the Phase III ten-year vegetation-monitoring responsibility period. Details on reclamation monitoring have been added to Appendix A of Volume 9, where it states that UPDES monitoring will continue as needed according to the UPDES permit stipulations, and that after portals are sealed the operator will monitor downdip for development of seeps or springs as part of the annual subsidence reconnaissance survey (Groundwater Hydrology - Reclamation Sampling Table 2). UPDES permit requirements are the federal and state water quality standards for discharge into surface waters; therefore, the proposal is adequate for the Division to determine that the discharged waters meet all state and federal water quality criteria.

The tables in Appendix A indicate that in the 5th and 9th years after final reclamation, analyses are to be done for baseline parameters for all springs and well T-18 (Oliphant), but not for other wells. A commitment to monitor the Deer Creek portals for baseline parameters in the 5th and 10th year after final reclamation is discussed above. If any of the baseline analyses in either sample set exceed water-quality criteria, the Division may require additional sampling to establish that water quality-standards have been met. The current operational monitoring plan calls for baseline analyses every five years beginning in 1996. It would possibly be better to simply continue that five-year sequence from operations into reclamation rather than start a new sequence at final reclamation, although a final set of analyses should be made for final bond release determination.

Wells in Cottonwood and Rilda Canyons, except for TM-1B, will be monitored only for water levels and only in March and June through December according to the reclamation monitoring tables in Appendix A. Text on page 11 states that, subject to access, piezometric surface wells will be monitored monthly for level only. The monitoring frequency needs to be clarified.

Wells at the Cottonwood and Deer Creek waste rock sites and TM-1B at Trail Mountain will be monitored quarterly for operational parameters until bond release (page 14, Appendix A). No periodic monitoring for baseline parameters is indicated. Bond will be released only when state and federal and post-mining land use water-quality standards have been met.

Volume 9, page 17, states that monitoring of a series of in-mine wells in the Deer Creek and Cottonwood/Wilberg Mine, shown on Plates HM-2 and HM-3, will continue and data collected will be utilized to document potential impacts related to ground-water dewatering and to determine the rate of recovery "once mining has been terminated." Page 14 in Appendix A of the proposed amendment clarifies that quarterly monitoring will continue until the mine is sealed or the sites become inaccessible.

According to the reclamation monitoring tables in Appendix A, East Mountain and Trail Mountain springs will be monitored in July and August for operational parameters, and East Mountain - Rilda Canyon springs will be monitored quarterly for operational parameters. Text on page 10 states that East Mountain and Trail Mountain springs will be field monitored during July and August and does not mention Rilda Canyon springs. Both the monitoring frequency and the parameters to be measured need to be clarified.

Voids created by mine workings may redirect water and produce new discharge locations within or below the mined seam. The proposed reclamation plan provides for a survey, to be conducted during the Annual Subsidence Monitoring Surveys, to identify new discharge locations within or below sealed portals. (Groundwater Hydrology - Reclamation Sampling - Table 2). Commonly, subsidence surveys are conducted for two years following longwall mining, but the duration for monitoring for these new discharges is not mentioned. The operator should formulate a water-quality and -quantity monitoring plan for new, measurable flows that issue from these areas during the reclamation period.

The proposed amendment states that water will be discharged through the Deer Creek Portal during and possibly after reclamation. Some reference points provided in Table 5-2 identify elevations that might act to control postmining ground-water flow gradients. Where boundary faults were crossed by mining, a pre-existing hydrologic barrier may now transmit water. Maps HM-2 and HM-3 show mine floor elevations, in-mine water source locations, pertinent geologic controls, and other controls such as sealed mine sections. Interbasin diversion of flow between the Cottonwood and Huntington Creek drainages is discussed on pages 169 and 170 of Volume 9; the conclusion is that interbasin water probably be less than 1 percent of the annual discharge in either drainage.

In Volume 9, Appendix C the permittee provides a hydrogeologic investigation, initially done in 1992 and updated in 2000, that was prepared in response to a citizen complaint (July 31, 1991) that mining at Deer Creek Mine had dried up flow from Cottonwood Spring. Representatives for the complainant, the mine operator, the USFS, the Division of Water Rights, and the Division of Oil, Gas and Mining had an on-site meeting at the spring in August 1991. Questions were raised concerning the proximity of mining to the Roans Canyon Fault, in particular the 3rd North fault crossing and the longwall mining in 1st and 2nd Right off 4rd South, where it was suspected that the mine was intercepting water that had previously recharged Cottonwood Spring. The mine and its consultants have concluded that the hydrologic system in the lower Cottonwood Canyon and lower Blackhawk Formation were independent hydrologic systems. (In a letter dated October 27, 1998, the Division concluded that no definitive connection between the mine and the spring had been cited or proven and stated that the Division had made findings to conclude the citizen complaint.)

In response to three possible actions recommended by the USFS to resolve the Cottonwood Spring issue, the operator conducted gain/loss surveys along the Cottonwood drainage for two years, 1998 through 2000. These measurements indicate that:

- During drought periods, flow in Cottonwood Canyon Creek is limited to the discharge from the alluvium at the mouth of Roans Canyon;
- The stretch downstream from Roans Canyon for several miles is a losing reach where water enters the alluvium;
- Flow data correlate with climatic trends and compare directly with USGS data collected in 1978 and 1979.

Based on these two years of data collection and on information from the USGS (page 9, Volume 9), the operator concluded that baseline or historic flow data for Cottonwood Spring was obtained by measuring this gaining reach of the stream. Flow at Cottonwood Spring has proven not to be directly measurable as discharge from a pipe or other identifiable point source, and the flow from the PVC pipe that was measured for several years was not representative of Cottonwood Spring. The monitoring plan does not make it clear that the operator will continue to monitor Cottonwood Spring discharge by using weirs to measure this gaining reach on Cottonwood Creek.

Based on other information, the operator supports a conclusion that Cottonwood Spring flow has not been impaired by mining operations in their East Mountain mines.

- Geology and geomorphology indicate that:
  - In Cottonwood Canyon, the Roans Fault system consists of two or more fractures with little or no displacement;
  - Cottonwood Spring is on the north dipping limb of the Straight Canyon Syncline;
  - Cottonwood Spring flows from alluvium at the bottom of a glacially-formed U-shaped valley, just above where the canyon transitions to a stream-cut V-shaped valley.

- Drilling and well-completion data indicate that:
  - There is no connection between the lower Blackhawk Formation - Starpoint Sandstone and the upper Blackhawk - alluvium in Cottonwood Canyon;
  - Water elevations in the alluvium vary in direct response to precipitation;

- Resistivity and induced polarization surveys indicate that:
  - Depth of alluvium is fairly constant along the length of the canyon surveyed, from approximately 2 ½ miles north of Cottonwood Spring to approximately ½ mile south of the spring, but width of alluvial deposits increases from south to north to point just north of Cottonwood Spring;
  - A possible extension of the Mill Fork Canyon fault system was detected a little over one mile upstream of Cottonwood Spring;
  - Fractures and faults cut lower Cottonwood Canyon (apparently just below Cottonwood Spring);
  - The faults and fractures dam the flow of water through the alluvium and the water level rises in the vicinity of Cottonwood Spring. (The narrowing of the valley and the transition from glacial to non-glacial alluvium probably contribute to this also);
  - Seeps and springs along the east side of Cottonwood Canyon also contribute water to the alluvium.

Monitoring of Cottonwood Spring and other springs and wells in Cottonwood Canyon will be continued during reclamation, although less frequently than during mine operation. The Division previously recommended that analyses be done for carbon-14, tritium, deuterium, and oxygen-18 for the Cottonwood Canyon wells to differentiate level changes due to climate from those due to ground water discharge. Although there may be some intermixing of alluvial water and water from the Starpoint Sandstone, available information strongly indicate that ground-waters in the alluvium and consolidated rock are not related and there is little pertinent information to be gained from isotopic analyses.

**Surface-water Monitoring**

Both baseline and operational surface-water monitoring parameters are listed in Table 1 of Appendix A, Volume 9: there is no separate list of reclamation parameters. This table is the same as Table 3 in the Division's Directive Tech 004 except that total alkalinity is not included: although total alkalinity is not listed in the operator's tables, this parameter has nonetheless been included on most water-quality reports submitted by the operator. (Also, total alkalinity is used to determine carbonate and bicarbonate and, if the need arises, it can be back-calculated from the reported values for those two parameters.)

During reclamation, water samples will be collected and analyzed quarterly for operational parameters at surface monitoring sites listed in Appendix A, Volume 9 (except field parameters only at CCC01). Quarterly monitoring will include one sample at high flow and one at low flow. Streams receiving discharges from UPDES sites will be monitored quarterly for operational parameters both upstream and downstream of reclaimed disturbed areas and UPDES discharge points in Grimes Wash and Deer Creek and Cottonwood Canyons. Monitoring will be done only downstream of the Meetinghouse Canyon portals. Following Phase I reclamation backfilling and grading, monitoring will be done at points immediately above and below remaining sediment ponds (page 4, Appendix A). Water monitoring information will be reported to the Division quarterly (page 14 - Appendix A, Volume 9 revision). The operator proposes to report annually on sediment production information from points above and below the mine (page 3-7).

In the 5$^{th}$ and 9$^{th}$ years after final reclamation, analyses will be done for baseline parameters for all surface-water monitoring sites (Appendix A). If any of the analyses results exceed water-quality criteria, additional sampling may be needed to establish that water quality-standards have been met before final bond release can be made.

The Division recommended that the macro-invertebrate study conducted in 1991 be repeated in Deer Creek and Huntington Creek, in the spring and fall during the year before reclamation and in the 5th and final year prior to bond release, to allow assessment as to whether impacts to fisheries occur or remain insignificant over the reclamation period. The operator indicated in the December 6, 1999 cover letter to the application that the results from monitoring conducted in 1990, 1991, 1992 and 1994 showed no differences in macro-invertebrate densities in Huntington Creek and that additional studies are not warranted.

**Gravity Discharges**

According to pages 169 and 170 in Volume 9 of the MRP, there is a potential of post-mining discharge of up to 200 gpm from all portals, most of which will probably discharge from the Cottonwood Mine portal in Miller Canyon (UPDES permit 22896-004), which is at the lowest elevation of all the portals. However, the conveyor tube and access portals in Cottonwood Canyon - constructed in 1994 and 1995 - are at least 50 feet lower in elevation and the potential for gravity discharge from these portals is not discussed.

The three Miller Canyon portals were sealed in 1987, but French drains were installed to allow drainage from the mine, and a water-sampling pipe was installed in the seal of the eastern portal: there has been no reported discharge since July 1996. Water samples collected for UPDES monitoring are analyzed for both UPDES and operational parameters. The Deer Creek Mine portals in Deer Creek and Meetinghouse Canyons could potentially discharge after mining operations cease. Current operational discharge from Deer Creek Canyon portals is under a UPDES permit, but there is no UPDES permit for the potential discharge to Meetinghouse Canyon.

The operator designed the seal for the Deer Creek Portal with a French drain system, using a sand filter behind the portal and four 6-inch pipes. The operator planned for multiple pipes to decrease the possibility that calcium carbonate precipitation from minewater could plug the discharge system.

**Water Quality Standards and Effluent Limitations**

The operator has provided a water monitoring plan in Appendix A. The plan contains a commitment on page 1777 that discharges of water from areas disturbed by coal mining and reclamation operations will be made in compliance with all Utah and federal water-quality laws and regulations and with effluent limitations for coal mining promulgated by the EPA and set forth in 400CFR Part 434. UPDES information is in Appendix B, Volume 9.

In Tables 7-1a and 71b, the operator has provided the values for the parameters used in RUSLE to estimate annual sediment contributions to Deer Creek from reclaimed and undisturbed watersheds. A 3.5" computer disc with the information used to determine sediment loss for eleven of the fourteen areas, shown on Drawing DS-1795-D (Appendix R645-301-700-C), is included in Appendix 700-C: files for areas A1-1D, A1-1U, and A1-2U were not included on the disc, but one for area A2-5U, which is not on the map, was included.

It is stated on page 7-3 that the R-factor was determined using the data in the CITY database within RUSLE for the nearby Hiawatha area: data for Hiawatha could not be found in the version of the CITY database on the 3.5" disc provided in the submittal. Determination of the R-factor needs to be clarified.

It states on page 7-3 that NRCS soil survey data on pages 2-176 through 2-181 and 1-181.42 through 2-181.52 in the MRP were used to obtain physical properties of the soil for determining the K-factor. These pages contain a abundance of information with no way of distinguishing what the operator actually used to determine the K-factor: the actual parameter values and assumptions used to determine the K-factor for input to RUSLE should be identified. It is unclear where the CITY data used in RUSLE to determine the K-factor came from.

In determining the C-factor for the RUSLE calculations for the disturbed areas, maximum roughness was used because of the planned pocking, and entries for other ground covers such as rock fragments and vegetative residue were used conservatively because no data have been established. The C-factor for the undisturbed areas was determined using real data from past reference area vegetative monitoring, and Dr. Patrick Collins verified the cover entries that were used (pages 7-3 and 7-4).

The hillslope lengths and gradients used in determining the LS-factor for input to RUSLE are shown on Drawing DS-1795-D in Appendix R645-301-700-C (page 7-3).

The P-factor calculations in RUSLE yield not only the conservation planning value of the system (the P-factor itself), but also the sediment delivery ratio (SDR). Both values are calculated in RUSLE and shown in the RUSLE Spreadsheet Table. The P value in the table should be used for conservation planning, while the SDR (Sediment Delivery Ratio) should be used to estimate off-slope impact. When R * K * LS * C are multiplied by P, the result is the A value (estimated soil loss) in the RUSLE Spreadsheet Table, while multiplying R * K * LS * C by SDR gives an estimate of the sediment yield (SY).

$$R * K * LS * C * P = A \text{ (estimated soil loss)}$$

$$R * K * LS * C * SDR = SY \text{ (estimated sediment yield)}$$

The equation for estimating A is shown on page 7-2. It does not include SDR (the sediment delivery ratio) as a factor, which is correct. In Tables 7-1a and 7-1b the operator has multiplied the values for R, K, LS, and C by both P and SDR, which gives an erroneous and extremely small value for A in Table 7-1a: in Table 7-1b the value used for SDR is 1, so it does not effect the final result even though the process is incorrect. Correctly calculating the soil loss will still indicate a small loss of soil is expected, on the order of 4e-05 tons per acre per year for the reclaimed areas, but the calculation results in Tables 7-1a and 7-1b need to be corrected.

**Diversions**

Two ephemeral draws in Elk Canyon have been included in the channel design and grading plan shown on DS-1782-D and other maps. Small ephemeral draws between the Terrace Enhancement Project area and Deer Creek may collect and convey water. The drainage areas are not significant enough to require designed channels, but these are areas with the potential for gully formation.

On page 104 of Volume 9, Deer Creek is described as an ephemeral stream based on observations by the operator; however, because the stream drains an area of more than one square mile, it is an intermittent stream by the definition in the Coal Mining Rules. Considered separately from the Deer Creek drainage, Deer and Elk are each an ephemeral drainage.

Design capacity for permanent, intermittent stream-channel diversions needs to be at least equal to the unmodified channel upstream and downstream from the diversion and able to safely pass a 100-year, 6-hour event. Small-scale cross sections of the unmodified channel immediately upstream and downstream of the site are on Drawing DS-1783-D, along with design cross sections for the reclaimed channels. Based on the NOAA Precipitation Frequency Atlas, 2.4 inches is the value for the 100-year, 6-hour storm event. Flows that would result from such a storm event were determined for Deer Creek Canyon, Deer Canyon, and Elk Canyon using STORM. Calculated watershed hydrographs are in Appendix 700-A, and results are summarized in Table 7-2. Five storm hydrographs were constructed: three for each of the drainages, one for routing Deer Canyon into Deer Creek Canyon, and one for routing all three drainages together. The designed drainage channel characteristics are summarized in Table 7-3 and channel design results are in Appendix 700-D.

Designs for channel transitions between the upstream and downstream natural channel to the reclaimed channels are shown on Figure 7-1A. Soft bioengineering methods for channel reclamation are described in on page 7-13 and designs are included in Figure 7-2A. These are to be used on three reaches where slopes are less than 5%. Dick Rol of the Division's AML section reviewed these plans and the following evaluation is based on his comments.

1. The design for using root wads in the transition areas looks acceptable. Having log ends pointing downstream is acceptable, but it is imperative that the operator plant enough sedges and willows behind the logs.

2. The value of placing anything in the middle of the channel is questionable. Placing wattles in the middle of the stream is a practice with which Dick is not familiar. Wattles are mainly intended for streambank protection, not for trying to establish islands. Using them to establish islands might work in some situations, but this doesn't appear to be a good place; nevertheless, it might be worth trying with one or two as an experimental practice.

3. Rocks in the middle of the channel will impede the flow and tend to create scour points that could become nick points.

4. The base material for the channel is a concern. Sieve analysis is not discussed, and probably cannot be known until the channel is actually excavated. The operator needs to commit to do sieve analyses during reclamation to help determine a stable final channel design.

5. A riprap channel with lots of vegetation on the sides would be a reasonable design option.

Designs for the channel transitions between the upstream and downstream natural channel and the reclaimed channel are on Drawing 7-1A in Appendix 700-B. Locations are shown on Drawing DS-1782-D and several other drawings.

The operator adjusted the channel location to minimize the potential for destabilizing the cut slope across from the Mine Office and Bath House. This area was predisposed to failure in 1992 when a tension crack was developed due to ponding water along the diversion ditch.

The operator provided riprap and granular filter material designs for the riprapped reclamation channels. Riprap gradation calculations are in Appendix 700-E. Calculations and assumptions that were used to determine Manning's 'n' for the riprap channel have been included on page 11 in the proposed reclamation plan.

Maps are certified. Hydraulic analysis, calculations, designs and drawings in the Hydrology Section are certified by John Christensen, Licensed Professional Engineer.

**Sediment Control Measures**

The operator proposes to begin reclamation at the upstream end of the site and work downstream. If flow occurs in the undisturbed channels as the undisturbed bypass culverts are being removed, water from the channels will be diverted around the construction area using a sediment trap and a 12" flexible culvert and discharged back into the undisturbed drainage culvert below the work section (page 7-1).

Sediment control measures for treatment of runoff from the disturbed areas will remain intact below reclamation construction. During removal of the disturbed area culvert, runoff from the disturbed area will be directed by a berm to the remaining disturbed culvert segment. A sediment trap is to be used to remove sediment before the water enters the culvert, and the runoff will be treated again by the pond at the outlet of the culvert (page 7-2). The sediment pond will be removed as part of the final reclamation.

After each segment is backfilled and graded, sediment transport will be controlled as required by the Coal Mining Rules. Deep gouging or pocking of the surface is one BCTA that is specified for use to control sediment runoff (page. 7-1). Other methods are referred to on page 7-15 and design details for other sediment control measures such as berms, silt fences, and rock gabions are on Figure 7-4A. Straw bales are mentioned as an alternative sediment control measure and design details are on Plate 3-8 (GENS-1555-A). All sediment control structures will be removed by the time reclamation is complete. Because of the reclamation techniques being used, sediment will be retained within the disturbed area and no siltation structures will be needed after the completion of reclamation (page 7-15).

**Sedimentation Ponds**

The sediment pond and the undisturbed culvert at its north end will be removed after all other reclamation work is done (page 7-6). The pond will be removed by filling it and compacting the material to minimize settling. The designed Deer Creek channel will be routed across the fill material and tied to the existing drainage at a channel transition area (Drawing DS-1782-D). As the pond is being filled, any flows will be diverted to the remaining undisturbed culvert at the north end of the pond, and upon completion of the pond reclamation and channel restoration, flow will be turned into the new channel and the remainder of the undisturbed culvert will be removed.

**Findings:**

The plan does not meet minimum regulatory requirements for this section. The permittee must provide the following in accordance with:

**R645-301-731.210,** Flow at Cottonwood Spring has proven to be measurable as gain in stream flow in Cottonwood Creek, but not directly as discharge from a pipe or other identifiable point source. This is the measurement method used by the USGS. The monitoring plan does not make it clear that the operator will continue to monitor Cottonwood Spring discharge by using weirs to measure this gaining reach on Cottonwood Creek.

**R645-301-121.200,** The footnote to Table 7-2 states that Drawing CM-10529-EM is in Appendix 700-A, but that drawing is in Appendix 700-B.

**R645-301-121.200, -722,** Survey stations for stream channel profiles on Drawing DS-1780-D are the reverse of survey stations shown on Drawings DS-

1782-D and DS-1783-D.

**R645-301-121.200,** On page 5-12 of the proposed reclamation plan, reference is made to Plate 5-1, Drawing CM-10673-DR, in Volume 7 for the locations of all ASCAs in the Deer Creek disturbed area. Plate 5-1 in Volume 7 is Drawing CM-10584-DS, the Plan Sheet for the Deseret Coal Road to Wilberg Coal Road, and it shows no ASCAs for the Deer Creek Mine.

**R645-301-731,** In the operation monitoring plan in Volume 9, Appendix A, there is no indication that monitoring of ground-water for baseline parameters is to be done every five years during mine operation, as recommended in the Division's Directive Tech 004. There is such a commitment for surface-water monitoring sites during mine operation, and surface- and ground-water sites are to monitored for baseline parameters during the 5$^{th}$ and 9$^{th}$ year of reclamation.

**R645-301-121.200,** The tables in Appendix A indicate that in the 5$^{th}$ and 9$^{th}$ years after final reclamation, analyses are to be done for baseline parameters for all surface-water monitoring sites, springs, and well T-18 (Oliphant). There is a commitment in the plan to monitor the Deer Creek portals for baseline parameters in the 5$^{th}$ and 10$^{th}$ year after final reclamation. Identifying the 9$^{th}$ year for most cases and the 10$^{th}$ year for another is potentially confusing.

**R645-301-121.200,** It would possibly be better to simply continue the five-year sequence of analyses for baseline parameters from operations into reclamation rather than start a new sequence of 5$^{th}$ and 9$^{th}$ (10$^{th}$) year analyses at final reclamation. In the extreme case, there could be a ten-year gap between the last five-year baseline analyses during mine operation and the 5$^{th}$ year reclamation analyses: monitoring during the first year of reclamation would be another option that would eliminate such a situation. In any case, the commitment for a set of baseline analyses in the next-to-last or last year of reclamation should be maintained.

**R645-301-121.200, -731.214,** A commitment to monitor any discharge from the Deer Creek portals in the 5$^{th}$ and 10$^{th}$ year after final reclamation is made on pages 5-5 and 7-14. Ground-water Hydrology - Reclamation Sampling Table 2 in Appendix A of Volume 9 should indicate the commitment to baseline monitoring of the Deer Creek portal during reclamation.

**R645-301-121.200, -731.214,** According to the reclamation monitoring tables in Appendix A, East Mountain and Trail Mountain springs will be monitored in July and August for operational parameters, and East Mountain - Rilda Canyon springs will be monitored quarterly for operational parameters. Text on page 10 of Appendix A states that during reclamation East Mountain and Trail Mountain springs will be field monitored during July and August and does not mention Rilda Canyon springs. Both the monitoring frequency and the parameters to be measured need to be clarified.

**R645-301-121.200, -731.214,** Wells in Cottonwood and Rilda Canyons will be monitored for water levels in March and June through December according to the reclamation monitoring tables in Appendix A. Text on page 11 states that, subject to access, piezometric surface wells will be monitored monthly for level only. The monitoring frequency needs to be clarified.

**R645-301-731,** The proposed reclamation plan provides for a survey, to be conducted during the Annual Subsidence Monitoring Surveys, to identify new discharge locations within or below sealed portals. Commonly, subsidence surveys are conducted for two years following longwall mining, but the duration for monitoring for these new discharges is not mentioned. The operator should formulate a water-quality and -quantity monitoring plan for new, measurable flows that are found issuing from these areas during the reclamation period.

**R645-301-752,** It states on page 7-3 that the R-factor was determined using the data in the CITY database within RUSLE for the nearby Hiawatha area: no data for Hiawatha could be found in the version of the CITY database on the 3.5" disc provided in the submittal. The CITY database is also used in RUSLE to determine the K-factor. Source for rainfall and other data used in the determination of the R-factor needs to be clarified.

**R645-301-752,** It states on page 7-3 that NRCS soil survey data on pages 2-176 through 2-181 and 1-181.42 through 2-181.52 in the MRP were used to obtain physical properties of the soil for determining the K-factor. These pages contain a abundance of information with no way of distinguishing what the operator actually used to determine the K-factor: the actual parameter values and assumptions used to determine the K-factor for input to RUSLE (including rainfall and other data, as in the CITY database) should be identified.

**R645-301-752,** In Tables 7-1a and 7-1b, the operator has multiplied the values for R, K, LS, and C by both P and SDR, which gives an erroneous and extremely small value for A in Table 7-1a: in Table 7-1b the value used for SDR is 1, so it does not effect the final result even though the process is incorrect. Correctly calculating the soil loss will still indicate a small loss of soil is expected, on the order of 4e-05 tons per acre per year for the reclaimed areas, but Tables 7-1a and 7-1b need to be corrected.

**R645-301-731.520,** According to pages 169 and 170 in Volume 9 of the MRP, there is a potential of post-mining discharge of up to 200 gpm from all portals, most of which will probably discharge from the Cottonwood Mine portal in Miller Canyon, which is at the lowest elevation of all the portals; however, the access and conveyor tube portals in Cottonwood Canyon - constructed in 1994 and 1995 - are lower in elevation and the potential for gravity discharge from these portals is not discussed.

**R645-301-742.312,** For the bioengineered reaches of the reclaimed channels: **1.)** It is imperative that the operator plant enough sedges and willows behind the logs. **2.)** The value of placing anything, rocks or wattles, in the middle of the channel is questionable. Wattles are mainly intended for streambank protection, not for trying to establish islands; nevertheless, it might be worth trying one or two as an experimental practice. **3.)** Rocks in the middle of the channel will impede the flow and tend to create scour points that could become nick points. **4.)** The base material for the channel is a concern. Sieve analysis is not discussed, and probably cannot be known until the channel is actually excavated. The operator needs to commit to do sieve analyses during reclamation to help determine a stable final channel design.

## RECOMMENDATION:

Prior to approval, the requirements of the Coal Mining Rules must provided as outlined above.

sm
O:\015018.DER\Final\jdsAM99C3.wpd