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DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

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February 15, 2000

TO: Internal File

THRU: Paul Baker, Team Lead *PKB*

FROM: Sharon Falvey, Reclamation Specialist *SFF*

RE: Deer Creek Reclamation Plan, Energy West Mining Co., Deer Creek Mine,  
ACT/015/018-AM99C-2

**SUMMARY:**

This analysis is conducted from the amendment submitted for the Deer Creek Reclamation Plan received by the Division December 8, 1999. The amendment responds to a technical analysis conducted on an earlier submittal received June 7, 1999. The amendment presents some changes to the reclamation drainage and grading plan and the applicant admits the submittal does not match information in the existing plan. The applicant relies on future commitments to definitively assess and delineate soil and waste locations while reclamation monitoring is proposed to be submitted in another amendment. Therefore, this amendment to the plan can not be considered clear and accurate; however, elements within the submittal bring the applicant closer to providing a plan they intend to implement to meet the regulatory requirements.

**RECLAMATION PLAN**

**HYDROLOGIC INFORMATION**

Regulatory Reference: 30 CFR Sec. 701.5, 784.14

**Analysis:**

**Ground-water Monitoring**

According to Table 3-2, Section 34, the applicant proposes to monitor the flow from the mine portal biannually during the spring and fall, and will monitor according to the UPDES permit for five years following reclamation. This is not adequate for bond release purposes for the following reasons.

1. The UPDES permit requirements do not monitor for water quality according to all Federal and State Standards (For Huntington Creek and tributaries these standards are: Class 2B, Class 3C and Class 4 criteria and any associated criteria for the post-mining land use); therefore, the proposal is not adequate for the Division to determine that the waters meet all state and federal water quality criteria.
2. Although the baseline parameters will provide analysis for most of the state standards, monitoring in the 5<sup>th</sup> and 10<sup>th</sup> years may fail to cover significantly different climatic periods. Obtaining 2 sets of data will **not** provide a statistically valid data set and it may be to the operators disadvantage if the final data set exceeds the water quality criteria for a particular parameter.
3. Biannual monitoring may not be adequate to show the seasonal variation that may exist.

The void created by mine workings may redirect water and result in new discharge locations within or below the mined seam at low points and outcrop locations. The plan provides for a spring survey to locate water that may issue from the areas down dip along and below the mined seam. The survey is proposed to be conducted during the 5th and 9th years following mine reclamation and is also stated to be conducted annually during the ground subsidence surveys. Commonly, subsidence surveys are conducted for two years following longwall mining but, the duration for subsidence monitoring over the reclamation period is not mentioned in this amendment. The amendment should include water quality and quantity monitoring for any springs that may issue from these areas along and below the mined seam which accumulate in a measurable stream.

This amendment also suggests water will be discharged through the Deer Creek Portal. Some reference points provided in Table 5-2 identify elevations which will act to control postmining groundwater flow gradients. Because numerous locations were identified in the plan to have a potential to receive minewater discharge, the Division requested the applicant to submit a map showing the flow directions and groundwater divides/watersheds for each mined seam.

The existing map CE-10478-EM does not differentiate between alluvial and groundwater aquifers or the changes in flow predicted to occur due from mining. Although some pertinent information is contained in the existing plan it is scattered and does not provide a clear picture of the potential ground water recharge and discharge zones. Where boundary faults were crossed by mining a pre-existing hydrologic barrier may now transmit water. The information presented on the maps should include existing mine floor elevations, in-mine water source locations, pertinent geologic controls, and other controls such as sealed mine sections and changes to any previously existing hydrologic barriers.

Volume 9, pg 17, states that a series of wells in the Deer Creek and Cotton Wood/Wilberg Mine (HM-2 and HM-3) will continue and be utilized to document potential impacts related to groundwater dewatering and recovery from mining. According to information included in the cover letter December 6, 1999, these areas are in-mine wells and access will be disrupted at the end of mining. It is not understood how water recovery following mining will be obtained from these sites.

Specific water monitoring points for sediment production are proposed for two locations above the mine and one location below the mine disturbance. The applicant proposed to report this information annually (page 3-7); however, regulatory requirements are to submit the data quarterly. Proposed locations should be provided on a water monitoring map.

In Volume 9, Appendix C the permittee provided a study conducted after dewatering the Roans Canyon Fault in the Cottonwood Canyon. The Cotton Wood Spring was suspected to be impacted by mining when water was intercepted along the fault: the water was believed to have previously provided recharge to Cottonwood Spring. Subsequent to minewater interception, the mine and consultants concluded that the hydrologic system in the lower Cottonwood Canyon and lower Blackhawk Formation were independent hydrologic systems. According to the application this finding was supported by the Division in a letter dated October 27, 1998. This letter was reviewed and no such confirmation could be found; however, the Division did indicate the citizens complaint from Mr. Peacock, was satisfied.

The information used to support the determination that the Star Point formation and the Cottonwood Spring are separate hydrologic groundwater systems was is obtained from well CCCW-1S. Although the information presented might adequately describe the current conditions, the elevation of water in this well was below and remained below the spring elevation over the study period. Additionally, the data was gathered after hydrologic changes from mining could have already occurred and the well water elevation does increase and decrease over the mine dewatering period similar to the inverse of the minewater discharge pattern. During mining, water is discharged through the portal or controlled by pumping to sumps, following mine closure these conditions will no longer exist. This well is located up-gradient from the trough of

the Straight Canyon Syncline and down-gradient from the mine. Similar fracture flow in the Star Point could occurred near the Cottonwood Spring. Because monitoring is conducted to determine whether effects from mining occur through the reclamation period and to further validate the applicants earlier findings monitoring of this area should continue.

During the monitoring period the Star Point Aquifer at well CCCW-1S increased and decreased inversely to the minewater discharge pattern. The applicant indicated the flow in this well is separate from the alluvium and the upper Blackhawk formation but, flow is fracture controlled. If a similar fracture in the Star Point formation was in hydrologic connection with the Roans Canyon Fault prior to mining, the fault may have contributed to the spring flow. The applicant needs to provide a water monitoring plan that: 1) determines whether changes in groundwater flow will occur during the time mining has idled, and 2) determines whether baseflow quantity and quality to the Cottonwood Canyon Stream varies with observed changes in groundwater over the reclamation period. In order to confirm conclusions made in the Cottonwood Canyon study, and to identify the difference between changes due to climate or from ground water discharge, the following age dating should be conducted in the Cottonwood Canyon wells every 2nd year during the low flow period; radio carbon dating, tritium dating, and stable hydrogen and oxygen isotopes (for meteoric waterline determinations). This should be completed in conjunction with streamflow quantity and quality monitoring.

### **Surface-water Monitoring**

The applicant needs to provide a surface water monitoring plan that determines whether changes in flow result during the time mining has idled. In order to identify the difference between changes due to climate, or from mine water discharge, the following age dating should be conducted every 2nd year during low flows; radio carbon dating, tritium dating, and stable hydrogen and oxygen isotopes (for meteoric waterline determinations) in Cottonwood Creek below well CCCW-1S. In conjunction a standard monitoring program for streamflow should be developed for the reclamation period.

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

According to the memo attached to this amendment, reclamation monitoring will be submitted as a separate amendment in Appendix A ,Volume 9.

### **Acid and Toxic-forming Materials**

The applicant has stated that no acid and toxic-forming materials are located at the site. Further discussion can be found in the soils technical analysis.

### **Transfer of Wells**

A discussion on the transfer of wells was not found in this amendment but might be located in other sections in the plan.

### **Discharges Into an Underground Mine**

No discharges into an underground mine are proposed by the applicant.

### **Gravity Discharges**

Water will be gravity discharged out of the Deer Creek Portal. The applicant designed this discharge with a french drain system using a sand filter behind the portal and four 6" pipes. A concern was raised about calcium carbonate precipitation from minewater and a potential for the discharge system to plug with precipitate; therefore, the applicant added additional pipes.

### **Water Quality Standards and Effluent Limitations**

The applicant has not described how the State Water Quality Standards for Deer Creek and Huntington Creek will be shown to meet water quality criteria. The applicant needs to provide a water monitoring plan that demonstrates that the water quality criteria for groundwater and surface water are met so the Division can make a finding for Bond release.

The applicant provided estimates for annual sediment contributions to Deer Creek from the watershed contributing runoff through the disturbed area. The K-factor used in table 7-4 and the K factor identified within the text are not the same value, and there are errors in addition in the table. Calculations and assumptions used to determine the K-factor in the disturbed area should be presented.

### **Diversions**

The ephemeral draws adjacent to the Elk Canyon drainage were developed with the grading plan and channel design (see: DS1797D). The ephemeral draw below the Terrace Enhancement Project area and adjacent to the South Fork Deer Creek drainage will probably collect and convey water. The drainage to this draw is not significant enough to require a diversion design but, land

form changes should be provided to minimize erosion and promote stability in this area. Areas that tend to collect water cause gully formation when the grading plan does not consider flows from these locations.

The design capacity for perennial and intermittent streams need to be demonstrated to be at least equal to the unmodified channel upstream and downstream from the diversion. This requirement can be met through providing channel cross sections upstream and downstream from the site and estimating channel forming flows. Channel cross sections were provided but, estimated channel forming flow was not. Designs for channel transitions between the upstream and downstream natural channel to the reclamation channels also need to be provided. A commitment was also made to use various soft bioengineering methods but, design and implementation information was not provided.

The applicant 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 applicant provided riprap and granular filter material designs for the riprapped reclamation channels. Maps were certified but designs were not. Design changes are commonly requested to be submitted with a cover page to certify the designs.

### **Stream Buffer Zones**

The applicant has to demonstrate that all other state requirements for stream channel reconstruction are met prior to reconstruction.

### **Sediment Control Measures**

The applicant proposes to begin reclamation at the upstream end of the site working downstream. In Deer Creek the culverts will be removed and water will be diverted around the construction area using a 12" flexible culvert and discharging to the downstream location. Roughening, mulching, and seeding will be conducted prior to routing the water to the completed channel and removing the next section (pg. 7-1). The activity will then be repeated in the next section. If water is present in Deer Creek Canyon, it will be routed around the construction with a flexible culvert to the undisturbed culvert drainage.

Disturbed runoff treatment measures below reclamation construction will remain intact to treat runoff. The application indicated a sediment trap would be used before the culvert inlet where water is routed to the disturbed area culvert. It is then treated by the pond. However the plan provides no treatment for areas going to the undisturbed bypass culvert (pages 7-1 and 7-2).

Specific information, maps, design detail, and maintenance information for the silt fences and other sediment control measures needs to be provided.

**Siltation Structures**

See sedimentation ponds.

**Sedimentation Ponds**

According to page 7-1, the applicant states the sediment pond will be removed after all other reclamation work is completed to ensure that runoff is treated before leaving the disturbed area. A maintenance plan and commitments need to be provided to assure BTCA measures are functioning during the reclamation period.

**Other Treatment Facilities**

No other treatment facilities are proposed for the reclamation phase.

**Exemptions for Siltation Structures**

No exemptions from sediment control measures were requested. BTCA measures will be used to control sediment. See sediment control measures above.

**Discharge Structures**

No discharge structures associated with impoundments are proposed for the reclamation period. The existing discharge structure associated with the sedimentation pond will be used temporarily during reclamation construction.

**Impoundments**

See sedimentation ponds.

**Casing and Sealing of Wells**

The applicant stated that each well will be cased, sealed or otherwise managed, as approved by the Division.

**Findings:**

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

**R645-301-731**, Provide a monitoring plan specific to reclamation that: 1) includes water quality and quantity monitoring, where flow accumulation is measurable, as determined by with the spring survey to be conducted in the 5th and 9th year following reclamation, 2) demonstrates mine water discharge will meet the criteria for water quality appropriate for the post-mining land use and in accordance with the state and federal standards (For Huntington Creek and tributaries the state standards are: Class 2B, Class 3C and Class 4 criteria), 3) commits to submit the water quality and quantity data quarterly.

**R645-301-731.221**, Provide a monitoring plan specific to reclamation that: 1) assures impacts to hydrologic balance are prevented, 2) clarifies how underground water recovery will be determined from the monitoring of HM-2 and HM-3, 3) describes how the State Water Quality Standards, Utah Administrative Code R317-8, for the Deer Creek, Huntington Creek, and any other stream receiving minewater discharge will be shown to meet federal and state water quality standards.(The Division recommends a minimum high and low flow season monitoring for selected parameters over the full period of reclamation. Parameters should be reflective of all potential in-mine contaminants), 4) includes a map that differentiates between alluvial and groundwater gradients and identifies; flow direction and groundwater divides in the permit and adjacent area for each mined seam, existing mine floor elevations, in-mine discharge locations, pertinent geologic controls, mine controls such as sealed mine sections, and changes to previously existing hydrologic barriers, 5) provides a water monitoring plan that; a) determines whether changes in groundwater hydrology will occur along the Straight Canyon Syncline during the time mining has idled, b) determines if the groundwater hydrology changes affects baseflows to the Cottonwood Canyon Stream, c) identifies the difference between changes due to climate, or from ground water discharge by including age dating to be conducted every 2nd year during the low flow period for; radio carbon dating, tritium dating, and stable hydrogen and oxygen isotopes (for meteoric waterline determinations) in the Cottonwood Canyon wells and Cottonwood Creek streamflow below well CCCW-1S, and d) identifies all reclamation monitoring sites on a map.

**R645-301-742.314**, 1) Provide designs for the channel transitions between the upstream and downstream natural channel and the reclaimed channel, and for the proposed soft bio-engineering methods, 2) demonstrate the design capacity for perennial and intermittent streams are at least equal to the unmodified channel upstream and downstream from the diversion.

**R645-301-512**, Provide certified designs: hydrologic designs can be certified in a cover page attached to the designs.

**R645-301-742**, Provide specific information, maps, design detail, and maintenance information for the silt fences and other sediment control measures and include a maintenance plan and commitments to assure BTCA measures are functioning during the reclamation period. Note: no treatment was provided for areas going to the undisturbed culvert during reclamation, pages 7-1 and 7-2.

**R645-301-512.200**, Correct or provide the following: 1) the K-factor used in Table 7-4 should be the same as the K-factor identified within the text, 2) correct the calculation errors in table 7-4, 3) present the calculations and assumptions used to determine the K-factor within the disturbed area, 4) present the calculations and assumptions used to determine Manning's 'n' for the riprap channel designs.

**RECOMMENDATION:**

It is recommended; the application be denied. A method or schedule to update the plan and provide the missing information which the applicant committed to submit in another amendment should be determined and resolved with the applicant. The application should not be determined complete or accurate until after all the issues are resolved.