

TECHNICAL MEMORANDUM

Utah Coal Regulatory Program

June 4, 2009

TO: Internal File

THRU: Jim Smith, Permit Supervisor *JS 06/08/09*

FROM: Steve Christensen, Hydrologist *SC*

RE: Water Aeration Treatment Area, Genwal Resources, Inc., Crandall Canyon Mine, C/015/0032, Task ID #3261, Outgoing File

SUMMARY:

On April 6th, 2009, the Division of Oil, Gas and Mining (the Division) received an application to amend the Crandall Canyon mining and reclamation plan (MRP) from Genwal Resources, Inc. (the Permittee). The Permittee wishes to construct a water aeration treatment system (treatment system) below the north portals. Due to elevated levels of iron in the in-mine water currently being discharged into the receiving undisturbed drainage, the Permittee has been issued a violation from the Department of Water Quality (DWQ). The treatment system will utilize an aeration method in order to reduce the elevated iron concentrations in the in-mine water discharge. The Permittee proposes to construct the treatment system immediately below the north portal bench (referred to as the 'old load out area' in several areas of the MRP).

The application outlines the extension of the existing French drain system near the old north portals to collect additional mine seepage water, which is currently discharging to the sediment pond. In addition, the Permittee proposes re-routing undisturbed watershed WSUD-3 to the existing surface drainage system for the mine-site. The diversion/pipe system that was collecting the undisturbed drainage was damaged during the sealing and deactivation of the Crandall Canyon Mine after the mine collapse in August of 2007.

The Permittee has requested an expedited review of this amendment due to the DWQ violation that requires abatement to occur as soon as possible.

Upon review of the amendment, the Division has determined that additional information is necessary in order to comply with the State of Utah R645-Coal Mining Rules. The Permittee must address the following deficiencies prior to Division approval:

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DEFICIENCIES:

R645-301-120- The Permittee must revise the last paragraph of page 5-33. The application refers to a Figure 7-14. It doesn't appear that a Figure 7-14 was submitted. Upon review of the application, it appears that Figures 7-13a thru 7-13d were submitted to depict the various design features of the proposed aeration treatment facility.

R645-301-751- The Permittee must provide a plan and discussion as to how the maintenance/clean-up of the aeration treatment facility will occur. The application does not provide a contingency or back-up system plan to the aeration treatment facility. If the intention is to route the in-mine water directly into the receiving drainage during maintenance of the aeration treatment facility, the Permittee must provide the Division with documentation from the Department of Water Quality (DWQ) that such a practice is acceptable per the terms of their UPDES permit and subsequent violation.

R645-301-751- The Permittee must provide additional information as to how the proposed aeration treatment facility will remove the iron from the mine water discharge. On page 5-34 and page 7-47, the Permittee discusses the low-lying baffle structures, their placement as well as the use of a 2"-3" gravel layer (potentially comprised of limestone and/or some chemical flocculent or coagulant. The Permittee must provide some scientific justification and/or supporting calculations that the proposed treatment can work (i.e. technical paper, guidance document etc.). The justification should demonstrate that, given the current flow volumes and iron concentrations at the mine site, the proposed aeration treatment can work.

R645-301-751- The Permittee should revise page 5-34 of the application to reflect that the proposed aeration treatment facility will be a temporary/operational structure. Once more information is obtained regarding the iron levels of the mine water discharge; a final reclamation plan will be revised accordingly. However, at this time, the application should make it clear that the proposed aeration treatment facility is a temporary measure to address the current DWQ violation.

R645-301-741 AND -742.300- The Permittee must revise Table 4, *Runoff Summary Drainage to Sediment Pond* so that it clearly identifies watershed WSUD-3 as contributing flow to the sediment pond. The additional 0.23 cubic feet per second (cfs) of flow (produced from the 10 year/6 hour design storm event for diversions) reporting to disturbed drainage ditch DD-8 from WSUD-3 is reflected in the WSDD-8 calculations on Table 4. However, as Table 4 lists each individual watershed that contributes flow to the sediment pond, watershed WSUD-3 should be a line item.

R645-301-741 AND -742.300- The Permittee must revise Table 5, *Runoff Control Structure Watershed Summary* of Appendix 7-4. For clarification, the 'Sediment Pond' entry at

the bottom of the table must identify watershed WSUD-3 as contributing watershed to the Sediment Pond.

R645-301-741 AND -742.300- The Permittee must revise the flow depths and flow areas identified in Figure 3 of Appendix 7-4 to reflect the additional flow being contributed to disturbed drainage ditches DD-8 and DD-5.

R645-301-742.300- The Permittee must provide additional information as to how the in-mine water will be routed to the proposed aeration treatment facility. Pages 5-33 and 7-47 of the application discuss how the distribution pipeline will be suspended either from off the existing concrete wall *or* suspended from rock anchors affixed to the ledgerrock. The Permittee should clarify (with narrative and design drawings) which method will be utilized. If during construction, problems arise and/or modifications need to be implemented on site, the Division will work with the Permittee and the MRP can be revised with an as-built submission following construction.

R645-301-742.300- The Permittee must provide additional discussion and design drawings that illustrate how the seepage from the Star Point Sandstone (located directly above the proposed aeration treatment facility) will be collected. Per Division Order #DO08A-2957 (Division Order), the Permittee was directed to revise the existing reclamation plan in the approved MRP to account for the encountered mine water. As part of the Division Order, it's been established that the seepage water emanating from the sandstone layer must be quantified in order to produce a long-term reclamation plan. As the seepage water is currently reporting to the area of the proposed aeration facility, the application must also include the design considerations and design drawings that demonstrate how that water will be contained and quantified prior to co-mingling with the in-mine water being treated in the proposed aeration facility.

R645-301-742- The Permittee must clarify what method(s) will be utilized to prevent the infiltration of the aeration water into the base material of the adjacent Forest Service road. On page 5-33, the Permittee states, "*The area will then be surfaced with a water-proof treatment (i.e. concrete, asphalt, impervious liner, etc.) to make certain that the water flow across the treatment pad does not saturate the underlying fill material.*" The application should specify the materials and methods that will be utilized.

R645-301-742- The Permittee must clarify what type of barricade would be constructed around the treatment facility to prevent disturbed area drainage from co-mingling with the aeration treatment facility. On page 5-33 and page 7-47, the Permittee refers to a "*suitably constructed barricade*". Figures 7-13c and 7-13d depict a "*typical jersey barrier*". If it is the intent of the Permittee to utilize jersey barriers to impede flow from both entering into and discharging from the aeration treatment facility, further details/designs must be submitted as to

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how this will be accomplished. Typical jersey barrier installations do not establish barrier that is impervious to water flow.

R645-301-742- The Permittee must provide additional information as to what the actual aeration treatment facility features/structures will be and how they will be constructed/installed. On page 5-34 of the application, the Permittee discusses the structures, "*As currently envisioned, these structures could be precast concrete parking curbs (wheel stops)...*" If during construction, problems arise and/or modifications need to be implemented on site, the Division will work with the Permittee and the MRP can be revised with an as-built submission following construction. However, in order for the Division to approve the proposed aeration treatment facility, specific design information is required.

R645-301-742.220- The Permittee must provide up to date survey information regarding the sediment level accumulation in the pond. The updated survey information is needed in order to determine whether the pond requires maintenance/cleaning. The application demonstrates that the sediment pond has adequate storage for the proposed re-routing of undisturbed watershed 3 (WSUD-3). However, that is based up on the sediment level in the pond being maintained below it's clean-out level. Based upon recent site visits/field inspections by Division staff, the water level in the pond has been observed less than 1 foot below the principal spillway. Annual reports submitted by the Permittee have provided estimated sediment accumulation elevations of 7,767' for 2006, 7,768' for 2007 and 7,768' for 2008 respectively. The sediment clean-out level for the pond is 7,769'. It is highly unlikely that the sediment level has remained constant. The updated survey information will determine if the pond needs to be cleaned out.

TECHNICAL ANALYSIS:

GENERAL CONTENTS

PERMIT APPLICATION FORMAT AND CONTENTS

Regulatory Reference: 30 CFR 777.11; R645-301-120.

Analysis:

The application does not meet the Permit Application Format and Contents requirements of the State of Utah R645-Coal Mining Rules.

The Permittee must revise the last paragraph of page 5-33. The application refers to a Figure 7-14. It doesn't appear that a Figure 7-14 was submitted. Upon review of the application, it appears that Figures 7-13a thru 7-13d were submitted to depict the various design features of the proposed aeration treatment facility.

Findings

The application does not meet the Permit Application Format and Contents requirements of the State of Utah R645-Coal Mining Rules. The following deficiency must be addressed prior to Division approval:

R645-301-120- The Permittee must revise the last paragraph of page 5-33. The application refers to a Figure 7-14. It doesn't appear that a Figure 7-14 was submitted. Upon review of the application, it appears that Figures 7-13a thru 7-13d were submitted to depict the various design features of the proposed aeration treatment facility.

OPERATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

Analysis:

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Topsoil Removal and Storage

The application meets the Topsoil Removal and Storage requirements of the State of Utah R645-Coal Mining Rules.

No topsoil removal or storage will be required with the proposed surface facility alterations.

Findings:

The application meets the Topsoil Removal and Storage requirements of the State of Utah R645-Coal Mining Rules.

HYDROLOGIC INFORMATION

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

Analysis:

Water-Quality Standards And Effluent Limitations

Currently, the water-quality standards and effluent limitations are not being met at the Crandall Canyon Mine. The Division of Water Quality (DWQ) has issued a violation to the Crandall Canyon Mine facility for exceeding the allowable iron concentrations as outlined in the UPDES Permit.

As water quality data demonstrates, the iron levels in the mine-water were historically low. It was not until after the collapse in 2007 and the subsequent closure of the mine that iron levels began to trend upward and out of compliance with the UPDES permit requirements.

As of now, it's unclear as to what is causing the elevated iron concentrations in the mine-water discharge. One possibility is that the iron concentrations are a result of dissolved pyrites in the coal. If that is the case, it's possible that as the pyrites are leached out, the iron levels will drop back to down to pre-existing compliance levels.

It is the hope that the construction and utilization of the aeration treatment facility under consideration with this permitting action will bring iron levels back into compliance with all federal and state water quality and effluent requirements. Monthly water monitoring (as required per UPDES requirements) of the aeration treatment facility's discharge will indicate whether it is effective.

On page 5-33 of the application, the Permittee discusses the distribution line that will be installed into the existing mine-water discharge pipeline. A tee and valve assembly will be installed to divert the water to the aeration treatment facility. The Permittee must provide a plan and discussion as to how the maintenance/clean-up of the aeration treatment facility will occur. The application does not provide a contingency or back-up system plan to the aeration treatment facility. If the intention is to route the in-mine water directly into the receiving drainage during maintenance of the aeration treatment facility, the Permittee must provide the Division with documentation from the Department of Water Quality (DWQ) that such a practice is acceptable per the terms of their UPDES permit and subsequent violation.

The Permittee must provide additional information as to how the proposed aeration treatment facility will remove the iron from the mine water discharge. On page 5-34 and page 7-47, the Permittee discusses the low-lying baffle structures, their placement as well as the use of a 2"-3" gravel layer (potentially comprised of limestone and/or some chemical flocculent or coagulant). The Permittee must provide some scientific justification and/or supporting calculations that the proposed treatment can work (i.e. technical paper, guidance document etc.). The justification should demonstrate that, given the current flow volumes and iron concentrations at the mine site, the proposed aeration treatment can work.

On page 5-34 of the application, the Permittee states, "It is not known at this time if the iron treatment facility will be a temporary structure or if it will be needed on a long-term (i.e., permanent) basis.". The Permittee should revise page 5-34 of the application to reflect that the proposed aeration treatment facility will be a temporary/operational structure. Once more information is obtained regarding the iron levels of the mine water discharge; a final reclamation plan will be revised accordingly. However, at this time, the application should make it clear that the proposed aeration treatment facility is a temporary measure to address the current DWQ violation.

Diversions: General Undisturbed drainage discussion

The application does not meet the Diversions: General requirements of the State of Utah R645-Coal Mining Rules.

Following the Crandall Canyon Mine disaster on August 6th, 2007, the mine was deactivated and the portals sealed. According to the Permittee, while constructing the portal seals, much of the UD-3 culvert diversion structure (See Plate 7-5, *Crandall Canyon Drainage Map*) was damaged beyond repair. The application proposes to route the undisturbed drainage from undisturbed watershed WSUD-3 (above the portals) into the existing disturbed drainage network rather than to try and re-establish the drainage back across the portals. The drainage from WSUD-3 will be routed to undisturbed drainage ditch UD-3, then to disturbed drainage

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ditch DD-8, then to culvert C-1, then to ditch DD-5, then to culvert C-12 and then into the primary sediment pond.

The application provides the updated routing and design calculations for disturbed drainage ditches DD-8 and DD-5 as well as culverts C-1 and C-12. The ditches and culverts are adequately sized to safely pass the 10-year/6-hour design storm event as required by R645-301-742.323.

The Permittee must revise Table 4, *Runoff Summary Drainage to Sediment Pond* so that it clearly identifies watershed WSUD-3 as contributing flow to the sediment pond. The additional 0.23 cubic feet per second (cfs) of flow (produced from the 10 year/6 hour design storm event for diversions) reporting to disturbed drainage ditch DD-8 from WSUD-3 is reflected in the WSDD-8 calculations on Table 4. However, as Table 4 lists each individual watershed that contributes flow to the sediment pond, watershed WSUD-3 should be a line item.

The Permittee must revise Table 5, *Runoff Control Structure Watershed Summary* of Appendix 7-4. For clarification, the 'Sediment Pond' entry at the bottom of the table must identify watershed WSUD-3 as contributing watershed to the Sediment Pond.

The Permittee must revise the flow depths and flow areas identified in Figure 3 of Appendix 7-4 to reflect the additional flow being contributed to disturbed drainage ditches DD-8 and DD-5.

Diversions: Miscellaneous Flows

The application does not meet the Diversions: Miscellaneous Flows requirements of the State of Utah R645-Coal Mining Rules

On pages 5-33 and 7-47 of the application, the Permittee discusses the routing of the in-mine water to the proposed aeration treatment facility. The application states, "*This distribution pipeline will be suspended either from off the existing concrete wall (left over from the old loadout facility) or suspended from rock anchors affixed to the solid ledgerrock.*"

The Permittee must provide additional information as to how the in-mine water will be routed to the proposed aeration treatment facility. Pages 5-33 and 7-47 of the application discuss how the distribution pipeline will be suspended either from off the existing concrete wall *or* suspended from rock anchors affixed to the ledgerrock. The Permittee should clarify (with narrative and design drawings) which method will be utilized. If during construction, problems arise and/or modifications need to be implemented on site, the Division will work with the Permittee and the MRP can be revised with an as-built submission following construction.

The Permittee must provide additional discussion and design drawings that illustrate how the seepage from the Star Point Sandstone (located directly above the proposed aeration treatment facility) will be collected. Per Division Order #DO08A-2957 (Division Order), the Permittee was directed to revise the existing reclamation plan in the approved MRP to account for the encountered mine water. As part of the Division Order, it's been established that the seepage water emanating from the sandstone layer must be quantified in order to produce a long-term reclamation plan. As the seepage water is currently reporting to the area of the proposed aeration facility, the application must also include the design considerations and design drawings that demonstrate how that water will be contained and quantified prior to co-mingling with the in-mine water being treated in the proposed aeration facility.

Sediment Control Measures

The proposed aeration treatment facility is being permitted as an Alternative Sediment Control Area (ASCA). As an ASCA, it is not required that the proposed aeration treatment facility adhere to the design and performance standards outlined for larger more robust sediment control measures (i.e. impoundments). However, additional information is necessary in order for the Division to approve the proposed aeration treatment facility. The application does not meet the Sediment Control Measure requirements of the State of Utah R645-Coal Mining Rules.

The Permittee must clarify what method(s) will be utilized to prevent the infiltration of the aeration water into the base material of the adjacent Forest Service road. On page 5-33, the Permittee states, "*The area will then be surfaced with a water-proof treatment (i.e. concrete, asphalt, impervious liner, etc.) to make certain that the water flow across the treatment pad does not saturate the underlying fill material.*" The application should specify the materials and methods that will be utilized.

The Permittee must clarify what type of barricade would be constructed around the treatment facility to prevent disturbed area drainage from co-mingling with the aeration treatment facility. On page 5-33 and page 7-47, the Permittee refers to a "*suitably constructed barricade*". Figures 7-13c and 7-13d depict a "*typical jersey barrier*". If it is the intent of the Permittee to utilize jersey barriers to impede flow from both entering into and discharging from the aeration treatment facility, further details/designs must be submitted as to how this will be accomplished. Typical jersey barrier installations do not establish barrier that is impervious to water flow.

The Permittee must provide additional information as to what the actual aeration treatment facility features/structures will be and how they will be constructed/installed. On page 5-34 of the application, the Permittee discusses the structures, "*As currently envisioned, these structures could be precast concrete parking curbs (wheel stops)...*" If during construction, problems arise and/or modifications need to be implemented on site, the Division will work with the Permittee and the MRP can be revised with an as-built submission following construction.

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However, in order for the Division to approve the proposed aeration treatment facility, specific design information is required.

Ponds, Impoundments, Banks, Dams, and Embankments

The application does not meet the Ponds, Impoundments, Banks, Dams and Embankment requirements of the State of Utah R645-Coal Mining Rules.

During the sealing and deactivation of the Crandall Canyon Mine following the disaster in August of 2007, undisturbed drainage culvert UD-3 was damaged beyond repair. As a result, the Permittee proposes to route the undisturbed drainage from undisturbed watershed 3 (WSUD-3) into the surface drainage system for the mine facility. The undisturbed flow would flow from culvert UD-3 to culvert C-1 to disturbed drainage ditch DD-5 to culvert C-12 and on to the sediment pond. Based upon the approved sediment pond information contained within the MRP and from field observations and recent Division field inspections, the Permittee must provide more information.

The Permittee must provide up to date survey (not estimated) information regarding the sediment level accumulation in the pond. The updated survey information is needed in order to determine whether the pond requires maintenance/cleaning. The application demonstrates that the sediment pond has adequate storage for the proposed re-routing of undisturbed watershed 3 (WSUD-3). However, that is based up on the sediment level in the pond being maintained below its clean-out level. Based upon recent site visits/field inspections by Division staff, the water level in the pond has been observed less than 1 foot below the principal spillway. Annual reports submitted by the Permittee have provided estimated sediment accumulation elevations of 7,767' for 2006, 7,768' for 2007 and 7,768' for 2008 respectively. The sediment clean-out level for the pond is 7,769'. It is highly unlikely that the sediment level has remained constant. The updated survey information will determine if the pond needs to be cleaned out.

Findings:

The application does not meet the Hydrologic Information requirements of the State of Utah R645-Coal Mining Rules. The following deficiencies must be addressed prior to Division approval:

R645-301-751-The Permittee must provide a plan and discussion as to how the maintenance/clean-up of the aeration treatment facility will occur. The application does not provide a contingency or back-up system plan to the aeration treatment facility. If the intention is to route the in-mine water directly into the receiving drainage during maintenance of the aeration treatment facility, the Permittee must provide the Division with documentation from the

Department of Water Quality (DWQ) that such a practice is acceptable per the terms of their UPDES permit and subsequent violation.

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clarify (with narrative and design drawings) which method will be utilized. If during construction, problems arise and/or modifications need to be implemented on site, the Division will work with the Permittee and the MRP can be revised with an as-built submission following construction.

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MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

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

Analysis:

Mining Facilities Maps

The application meets the Mining Facilities Maps requirements of the State of Utah R645-Coal Mining Rules.

Plate 5-3, Crandall Canyon Mine Surface Facilities and Plate 7-5, Crandall Canyon Mine Drainage Map have been revised to reflect the proposed aeration treatment facility as well as the re-routing of the undisturbed drainage from watershed WSUD-3.

Certification Requirements

The application meets the Certification Requirements of the State of Utah R645-Coal Mining Rules.

Revisions to Plates 5-3, Crandall Canyon Mine Surface Facilities and Plate 7-5, *Crandall Canyon Mine Drainage Map* were signed and stamped by Mr. David Hibbs (Utah registered professional engineer). In addition, Figures 7-13a thru 7-13d, *Mine-Water Discharge Treatment Facility*, were signed and stamped by Mr. Hibbs.

Findings:

The application meets the Maps, Plans and Cross Sections of Mining Operations requirements of the State of Utah R645-Coal Mining Rules.

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RECLAMATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 784.14, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-301-512, -301-513, -301-514, -301-515, -301-532, -301-533, -301-542, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-733, -301-742, -301-743, -301-750, -301-751, -301-760, -301-761.

Analysis:

Hydrologic Reclamation Plan

The application meets the Hydrologic Reclamation Plan requirements of the State of Utah R645-Coal Mining Rules.

On page 7-48 of the amendment, the Permittee discusses the reclamation of the proposed aeration treatment facility. As water quality data demonstrates, the iron levels in the mine-water were historically low. It was not until after the collapse in 2007 and the subsequent closure of the mine that iron levels began to trend upward and out of compliance with the UPDES permit requirements.

As of now, it's unclear as to what is causing the elevated iron concentrations in the mine-water discharge. One possibility is that the iron concentrations are a result of dissolved pyrites in the coal. If that is the case, it's possible that as the pyrites are leached out, the iron levels will drop back to down to pre-existing compliance levels. Until that is known, the treatment of the water must continue.

As a result, it is not known at this time as to whether the aeration treatment facility will be a temporary or a more permanent structure. The timing of reclamation of this facility is dependent upon whether or not the iron concentrations come back into compliance with UPDES requirements.

Findings:

The application meets the Hydrologic Reclamation Plan requirements of the State of Utah R645-Coal Mining Rules.

RECOMMENDATIONS:

The application does not meet the requirements of the State of Utah R645-Coal Mining Rules. The Permittee must address the aforementioned deficiencies prior to obtaining Division approval.

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