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State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

GARY R. HERBERT
Governor

GREGORY S. BELL
Lieutenant Governor

January 30, 2012

Dave Shaver, Manager
Genwal Resources, Inc
P.O. Box 910
East Carbon, Utah 84520-0910

Subject: Revised Probable Hydrologic Consequences Update, Genwal Resources, Inc., Crandall Canyon Mine, C/015/0032, Task ID #3983

Dear Mr. Shaver:

The Division has reviewed the revised Probable Hydrologic Consequences (PHC) determination for the Crandall Canyon Mine. The Division has determined that there are deficiencies that must be addressed before a determination can be made that the requirements of the R645 Coal Mining Rules have been met, and an approval can be granted. Those deficiencies are listed as an attachment to this letter.

Each deficiency identifies its author so you and your staff can directly communicate with that individual should any questions arise.

The plans as submitted are denied. Please resubmit the entire application by April 30, 2012.

Sincerely,

Daron Haddock
Coal Program Manager

DRH/SKC/sqs
cc: Price Field Office
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Deficiency List

Task No. #3983

Revised Probable Hydrologic Consequences

The members of the review team include the following individuals:
Steve Christensen (SC)
Ken Hoffman (KH)

R645-301-724, -724.500 and -728: The Permittee must provide additional isotopic analyses of the untreated minewater discharge (sample location Pre-002). Based on the magnitude of the 2007 collapse, additional age dating/testing must be performed in order to evaluate whether or not the more shallow/active groundwater systems overlying the mine workings have been impacted/intercepted. (SC)

R645-301-728: Please revise the 2nd to last paragraph of page 8 and the last sentence of page 8 to reflect that the work plan was not approved by the Division. The first submission (Task ID #3732) was returned deficient on February 7th, 2011. The second work plan submitted on February 24th, 2011 was never reviewed. (SC)

R645-301-728: The Monitoring of Surface Water section on page 10 indicates that "*An analysis of the current year's surface-water monitoring data together with data from previous years is provided.*" Upon review of the amendment, it appears that this analysis has not been provided. Please provide the analysis. (SC)

R645-301-728: Provide more discussion of potential impacts to state appropriated water rights on page 16. Potential impacts to surface water resources (specifically Indian Creek) must be more thoroughly addressed. Please provide supporting data. (SC)

R645-301-728: The Permittee must provide more discussion as to the potential impacts of state appropriated water rights associated with the Joe's Valley Fault. The 4th paragraph of page 2 states, "*The fracture systems from which the groundwater emanated are likely associated with synthetic faulting related to the Joes Valley Fault system.*" Please provide a more thorough discussion of the Joe's Valley Fault System. (SC)

R645-301-312, -333: Please remove the statement on Page 24 of the appendix 7-15, PHC determination, "the additional modest quantity of flow in the creek, particularly during the low-flow season, is likely beneficial to aquatic habitat rather than being detrimental to the overall aquatic habitat." This statement is incorrect and contrary to information in both the September 2009 and June 2010 macroinvertebrate reports for Crandall canyon.

Please address the potential impacts to fish and wildlife resources, specifically impacts to aquatic communities and aquatic habitat, due to an increased flow from the mine water discharge. Include names of professional persons or organizations that collected and analyzed the data, dates of the collection and analysis of the data, and descriptions of the methodology used to collect and analyze the data. (KH)

R645-301-122, R645-301-130, R645-301-728.200: The Permittee must supply supporting data providing a basis for these determinations, or modify/remove the following statements in Appendix 7-15: (KH)

- Interception, 1st paragraph, Page 2: Please support "*A limited potential exists for interception of groundwater..*" with the consideration groundwater is currently being intercepted.
- Groundwater Interception 1st paragraph, Page 2: clarify if the western portion of the mine is above or below the Blackhawk-Starpoint aquifer. 2nd paragraph: last sentence again clarify if the western portion of the mine is about the Blackhawk-Starpoint aquifer. Provide detailed information on the extent and elevations of the Blackhawk-Starpoint aquifer and if it is possible for this aquifer to upwell.
- Groundwater Interception, 3rd paragraph, Page 2: Provide data to support the observation that the source of groundwater intercepted by the mine in Section 26 & 35, T15S, R6E is release from storage.
- Spring and Seep Interception, 3rd paragraph, Page 7: Evaluate "*these springs do not appear to have any vertical communication with the Blackhawk or Star Point Sandstone formations even when subsidence has occurred. This is due to the extensive interbedded shale in the intervening strata.*" Please support with data examining an area of subsidence where there is no vertical communication of a surface spring and the mine.
- Spring and Seep Interception, 4th paragraph, Page 7: Define the dates for the "*period of active mining*" when inflows were "*modest in magnitude and of short duration*". Identify the date(s), flow rates and the specific locations within the mine where "*appreciable groundwater inflows were encountered*". Provide data to support the observation that the source of groundwater intercepted by the mine in Section 26 & 35, T15S, R6E is release from storage.
- Spring and Seep Interception: Identify when the flow meter used for Outfall 002 was first suspected or known to be malfunctioning. Further the Division database indicates that approximately 5,950,000,000 gallons have been discharged by the Permittee. Please include the corrected flow rates and estimate total volume discharged.
- Monitoring of Surface Water, 3rd paragraph, Page 10: The statement "*other than the effects of the permitted discharge of mine water to Crandall Creek, no detrimental impacts to water quantity or water quality in streams that could be attributed mining...have been identified*" should reference where the detrimental impacts of discharge are described in the PHC.
- Analysis of historic discharge data from Crandall Creek, 3rd paragraph, Page 12 & 1st paragraph, Page 15: It is not "*apparent that the rate of discharge is gradually declining.*" In addition, it is inappropriate to examine flow rate prior to the start of gravity discharge for current trending as pumping may have been affecting resulting discharge verses current flooded conditions. Further, yearly average mine discharge rates are an inappropriate method to evaluate for if discharge is responding to current climatic trends. The Permittee must examine the variation in flow since gravity discharge began in order to evaluate if flow rates are decreasing and to examine for seasonal variation.
- Discharge rates 4th paragraph, Page 12: To demonstrate if discharge rates are in relation to barometric pressure the Permittee shall prepare a graph showing data since 2008 with

barometric pressure on one y-axis and mine discharge rate on the other. In addition, climatic variation in discharge does not need to be in response to "*any potential nearly immediate infiltration of precipitation*" as changes in flow rate related to todays precipitation may not manifest for years

- Mine Water Discharge, 3rd paragraph, Page 24: Provide data, reports, field notes and/or observations from "*experiences at the Crandall Canyon Mine and other coal mining operations in the Wasatch Plateau*" which support the estimate that "*elevated iron concentrations will not persist more than about 10 years*". As the Division and the Permittee differ on the duration of the elevated iron concentration in the mine water discharge, please revise the discussion to reflect the ongoing nature of the monitoring. Additionally, the Permittee has provided a hydrologic evaluation that estimates the iron concentrations will lower to within compliant levels by 2013 which appears to be in conflict with the aforementioned statement.
- Pumping from Crandall Creek, Page 18: Provide the "*baseline water flow which needs to remain within Crandall Creek to sustain the existing flora and fauna*" which Genwal committed to have determined by August 31, 1995.
- Mine water discharge, 12th paragraph, Page 23: The statement "*it is considered very likely that iron concentrations will gradually decline over time.*" As the Division and the Permittee differ on the duration of the elevated iron concentration in the mine water discharge, please revise the discussion to reflect the ongoing nature of the monitoring.
- Mine water discharge, 3rd paragraph, Page 22: The statement "*Because there is not an unlimited supply of exposed and available sulfide mineral in the newly flooded portion of the mine, it can be stated with confidence that the discharge of iron from sulfide mineral oxidation cannot continue in perpetuity*". As the Division and the Permittee differ on the duration of the elevated iron concentration in the mine water discharge, please revise the discussion to reflect the ongoing nature of the monitoring.

R645-301-728.310: The Permittee must correct the following errors or deficiencies in Table 1 to describe whether adverse impacts may occur to the hydrologic balance: (KH)

- Acid-toxic Materials, Table 1, Page 31: The likelihood of toxic-forming materials must be shown as either "moderate" or "high". The elevated (greater than 1 mg/L) iron concentrations in the untreated mine water discharge are evidence that "*toxic-forming materials*" are present within the coal, overburden, or underburden at the Crandall Canyon mine.
- Groundwater Availability, Table 1, Page 31: The probability of occurrence for "*interception of groundwater by mine workings*" is high (observed) not "*low*". This table entry must be revised to agree with the groundwater discussion presented elsewhere in the PHC.
- Groundwater Quality, Table 1, Page 31: The quality of groundwater being discharged from the Crandall Canyon mine is degraded to the point that treatment is required; therefore, "*Elevated dissolved solids and iron concentrations*" must be added as a potential impact to groundwater quality with a probability of occurrence of "*high (observed)*".
- Surface Water Quality, Table1, Page 31: An entry is required identifying "*spilled or residual treatment chemicals*" as a potential impact to surface water quality.

- Surface Water Quantity, Table 1, Page 31: The Permittee must revise this table entry or explain how mine discharge treatment to reduce iron concentrations is a mitigation measure for surface water quantity.
- Surface Water Quantity, Table 1, Page 31: Toxicity was detected during WET testing from the treatment plant discharge on June 7 and 28, September 1, October 3, and October 11, 2011. The Permittee shall add an entry to the table for surface water quality toxicity with a probability of occurrence of "high (observed)".
- Surface Water Quantity, Table 1, Page 31: The August 22, 2011 *Crandall Canyon Mine Macroinvertebrate Study* states "*there continues to be a less healthy macroinvertebrate community at both CRANDMD-02 and CCRANDLWR-03, which are downstream of the discharge, than at CRANDUP-01, which is upstream of the discharge.*" The Permittee shall add an entry to the table for surface water quality damage to macroinvertebrate communities and habitat with a probability of occurrence of "*high (observed)*".

R645-301-728.320: The Permittee must address the following deficiencies relating to acid-forming or toxic forming materials resulting in contamination of surface- or ground-water: (KH)

- Whole effluent toxicity (WET) testing: The Permittee must complete and incorporate work plan studies. WET testing results conducted as part of the *Work Plan – Hydrogeologic Study* must be included. The Division understands the results of this testing initiated a toxicity identification evaluation (TIE) and results are pending. The PHC shall be updated to include at minimum the results of the *Work Plan* testing and it is recommended to include the result of the TIE if available.
- Acid-toxic Materials, 2nd paragraph, Page 27: The discussion of toxic-forming materials in the Findings Section 728.320 must be revised. The elevated (greater than 1 mg/L) iron concentrations in the untreated mine water discharge are evidence that "*toxic-forming materials*" are present within the coal, overburden, or underburden at the Crandall Canyon mine. Iron present at elevated concentrations (e.g., greater than 1 mg/L) in water or precipitated on stream substrate is likely to be detrimental to biota or uses of the water.
- Macroinvertebrate studies: The Permittee must complete and incorporate work plan studies including macroinvertebrate studies through the summer of 2011 as well as examine results of macroinvertebrate studies from 2009 and 2010. Results shall be incorporated throughout the PHC.

R645-301-728.330: The Permittee must address the following deficiencies relating to potential impacts from coal mining and reclamation operations: (KH)

- The Permittee must either modify or support the findings that it is "*unlikely*" that "*groundwater quantity or quality will be affected by the underground mining operation*" (PHC Section 728.332) and why the "*Crandall Canyon Mine is expected to have little impact on groundwater*" (PHC Section 728.334). The explanation must consider that the mine discharges approximately 500 gallons per minute of intercepted groundwater which requires treatment due to its poor water quality.
- The Permittee must address the impacts on the hydrologic balance of intercepting groundwater and discharging groundwater at approximately 500 gallons per minute.

- The Permittee fails to address potential impacts on surface water quality from utilizing water treatment chemicals, either resulting from either spills of unused chemical products or from residual chemicals in the treated mine water effluent. The Permittee must identify the specific chemicals being used to treat the water and the sampling and analytical methods used to monitor for residual treatment chemicals in the treated mine water discharge and/or the receiving water(s).
- In the section Mine Water Discharge section beginning on page 20, the Permittee must describe how monitoring the mine-water chemistry prior to treatment will support an evaluation of the effect of discharge of treated water to the receiving water (Crandall Canyon Creek). The Permittee must also describe procedures for monitoring the concentrations of residual water treatment chemicals being introduced to Crandall Canyon Creek.
- In numerous sections (such as Mine Water Discharge, Page 21), the Permittee references Figures PHC-2, PHC-3, and PHC-4 and PHC Attachment 1. Monitoring data graphs were submitted as part of Task ID #3724 which was returned deficient. All referenced attachments/figures not currently incorporated within the MRP must be submitted.
- In Table 1 of Appendix 66, the Permittee references "*Work Plan Table 1*". The work plan is not part of the MRP. Work Plan Table 1 is recommended for inclusion in Appendix 7-66.

R645-301-728.334: The Permittee must address the following deficiencies relating to ground-water and surface water availability: (KH)

- Since 1996, approximately, 5,950,000,000 gallons of ground-water has been discharged to Crandall Canyon Creek by the Permittee. The Permittee must address the impacts on the hydrologic balance (i.e. where this water came from). The Permittee shall identify the source of this water and changes to that watershed. If the Permittee contends the water is from a stored confined aquifer entering the mine through the roof then the Permittee shall identify based on an engineering estimation where above the mine might store 5,950,000,000 gallons of water. At 2,200 feet below ground there is a limited geographic extent where water could enter the mine from above from an ancient confined aquifer. The estimation shall include the size of the aquifer based on an estimation of storativity and knowledge of local geology. An estimation of time until the aquifer will be emptied and discharge will cease from the mine should also be provided. If the Permittee contends the water is from a stored confined aquifer upwelling into the mine then the Permittee shall identify based on an engineering estimation where below the mine might upwell 5,950,000,000 gallons of stored water. The estimation shall include the size of the aquifer based on an estimation of storativity based on knowledge of local geology. If the Permittee contends the water is from a mixed source the Permittee shall make an engineering estimation as described above of each sources size and contribution.

R645-301-120: The Permittee must address the following deficiencies to ensure the application contains current information which is clear and concise: (KH)

- Groundwater Interception, 1st paragraph, Page 3: Define the "*northwest portion of the Crandall Canyon mine*" and provide the date that the northwest portion of the mine was sealed.
- Groundwater Interception, last paragraph, Page 6: Update the tense used in this paragraph and provide date(s) that the CVSSD culinary water treatment plant was constructed.
- Increased Sediment Loading, 2nd paragraph, Page 11: The storage volume values provided for the discussion of the sediment pond do not agree with values provided in Appendix 7-4 Sediment and Drainage Control Plan, Table 11 Sediment Pond Design. Revise the text or Appendix 7-4 as appropriate.
- Figure PHC-1: Please include this figure with the amendment and correct the units shown for the y-axis of this figure, and add a footnote identifying that "*Flow measurements prior to 3/19/2010 are not accurate*" and identifying the date when the flow meter used for Outfall 002 was first suspected or known to be malfunctioning.