COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

January 2, 2020

Tom Bird
GCC Energy, LLC
6473 County Road 120
Hesperus, CO 81326

Re: King Coal Mine, Permit C-1981-035,
Review of the 2018 Annual Hydrology Report (Includes 2016 - 2018 Data)

Dear Mr. Bird:

The Division received the 2018 AHR for the King Coal Mine on December 31, 2018. The Division reviewed this AHR in the context of Rules 4.05.1, 4.05.6, 4.05.11, and 4.05.13 (Regulations of the Colorado Mined Land Reclamation Board for Coal Mining).

Table 1 lists important logistical requirements of the King Coal Mine water monitoring plan, and indicates if the requirement was met with the 2018 AHR.

Table 1 Requirements of the King Coal Mine Water Monitoring Plan

Requirement	Source of Requirement (Rule or Page in PAP)	Requirement met for 2018?
Filing frequency of AHR - annually	Rule 4.05.13(4)(c)	Yes
Timely filing of hydrology report – submitted by December 31st each year	Section 2.05.6 of the King Coal Mine PAP, page 11	Yes
Sites sampled and sampling frequency at surface water monitoring sites	Section 2.05.6 of the PAP, page 6	Yes
Parameters sampled at surface water monitoring sites	Section 2.05.6 of the PAP, Table 2	Yes
Sites sampled and sampling frequency at groundwater monitoring sites	Section 2.05.6 of the PAP, page 6	Yes
Parameters sampled at groundwater monitoring sites	Section 2.05.6 of the PAP, Table 1	Yes

Analysis of Surface Water Data – Hay Gulch

The source of the water quality standards within the Table of Contents in the AHR is unclear to the Division. **Please identify the source.**

It is the Division's opinion that Regulation #34 (CDPHE, 2019) is applicable, and the water standards in Regulation #34 include the following in Table 1 (parameters listed are those that are also in the King Coal 2018 AHR). The applicable segment within Regulation #34 for Hay Gulch is 3e.

Table 1. Water Quality Standards from CDPHE Regulation #34

Parameter	Standard	Comments
Temperature	24.3 deg C, April – Oct. 13.0 deg C, Nov. - March	Cold Stream, Tier 2
Dissolved Oxygen	5 mg/l	Minimum standard, Chronic standard
pH	6.5 – 9.0	Acute standard
Chloride (dissolved)	250 mg/l	Chronic standard
Sulfate as SO_4	250 mg/l	Chronic standard
Arsenic (dissolved)	0.34 mg/l	Acute standard
Cadmium (dissolved)	0.0017 mg/l	Acute standard, based on hardness of 59.1 mg/l (from AHR data)
Copper (dissolved)	0.008 mg/l	Acute standard, based on hardness of 59.1 mg/l (from AHR data)
Iron (dissolved)	0.3 mg/l	Chronic standard
Lead (dissolved)	0.036 mg/l	Acute standard, based on hardness of 59.1 mg/l (from AHR data)
Manganese (dissolved)	2.5 mg/l	Acute standard, based on hardness of 59.1 mg/l (from AHR data)
Manganese (dissolved)	0.05 mg/l	Chronic standard
Mercury (total)	0.00001 mg/l	Chronic standard
Selenium (dissolved)	0.0184 mg/l	Acute standard
Uranium (dissolved)	1.345 mg/l	Acute standard, based on hardness of 59.1 mg/l (from AHR data)
Zinc (dissolved)	0.099 mg/l	Acute standard, based on hardness of 59.1 mg/l (from AHR data)

Comparisons of these standards to the data for the downstream site, Hay Gulch Ditch Downgradient, are listed in Table 2.

Table 2. Exceedances of Water Quality Standards in Hay Gulch Ditch Downgradient

Parameter	Standard	Exceedances in Hay Gulch Ditch Downgradient
Temperature	24.3 deg C, April – Oct. 13.0 deg C, Nov. - March	None
Dissolved Oxygen	5 mg/l (minimum)	None
pH	6.5 – 9.0	None
Chloride(dissolved)	250 mg/l	None
Sulfate as SO_4	250 mg/l	None
Arsenic(dissolved)	0.34 mg/l	None
Cadmium(dissolved)	0.0017 mg/l	None
Copper(dissolved)	0.008 mg/l	None
Iron(dissolved)	0.3 mg/l	None
Lead(dissolved)	0.036 mg/l	None
Manganese(dissolved)	0.05 mg/l	Only one exceedance of chronic standard, and no exceedances of acute standard.
Mercury(total)	0.00001 mg/l	No data is above the laboratory reporting level.
Selenium(dissolved)	0.0184 mg/l	None
Uranium(dissolved)	1.345 mg/l	None
Zinc(dissolved)	0.099 mg/l	None

In addition to the parameters with CDPHE standards, listed above, the Division also looked at Total Dissolved Solids (TDS) data. A TDS guideline of 750 mg/L (Banta, 1988) is applicable to surface water, including Hay Gulch. None of the data from the Hay Gulch Ditch Downgradient site exceeds this concentration (the maximum was 630 mg/l on September 21, 2016).

None of the surface water data were found to be problematic.

Analysis of Groundwater Data

It is the Division's opinion that drinking water standards in Regulation #41 (CDPHE, 2016) are applicable to groundwater near the King Coal Mine, and Regulation #41 includes the parameters in Table 3 (parameters listed are those that are also in the King Coal 2018 AHR).

Table 3. Drinking Water Standards from CDPHE Regulation #41

Parameter	Standard
Chloride (dissolved)	250 mg/l
Copper (dissolved)	1 mg/l
Iron (dissolved)	0.3 mg/l
Manganese (dissolved)	0.05 mg/l
pH	6.5 – 8.5
Sulfate as SO_4 (dissolved)	250 mg/l
Zinc (dissolved)	5 mg/l

Comparisons of these standards to the data for bedrock wells are listed in Table 4.

Table 4. Exceedances of Drinking Water Standards in Downgradient Bedrock Wells (A Seam and Menefee Interburden)

Parameter	MW-3-A	MW-3-MI	MW-4-A	MW-4-MI
Chloride (dissolved)	None	None	None	None
Copper (dissolved)	None	None	None	None
Iron (dissolved)	None	None	None	None
Manganese (dissolved)	None	None	None	None
pH	**Several (high)**	**Several (high)**	None	**Several (high)**
Sulfate as SO_4 (dissolved)	**Several (max of 840 mg/l)**	**One exceedance (254 mg/l)**	**Several (max of 783 mg/l)**	None
Zinc (dissolved)	None	None	None	None

For the parameters with exceedances, pH and sulfate, comparisons were made to upgradient wells and wells in the formation above the coal seam to look for spatial trends. This included MW-1-A and MW-1-MI for upgradient wells and Cliff House Sandstone wells MW-3-C and MW-4-C.

The upgradient wells did not have high pH values, nor did MW-4-C. MW-3-C had only a small number of exceedances, far fewer than the wells in Table 4. This suggests that higher pH values are possibly caused by mining activity. **Please address this potential problem with an explanation and/or a plan to prevent high pH values in the future**.

High sulfate concentrations were recorded for the upgradient wells. All values for MW-1-A were over 400 mg/l, and the one recorded value for MW-1-MI (in June 2017) was 739 mg/l, well above the standard. High sulfate concentrations were also recorded in the formation above the coal seam: two values at MW-4-C in 2017 were approximately 500 mg/l. This suggests that higher sulfate values are <u>not</u> likely caused by mining activity.

Comparisons of groundwater quality standards to the data for alluvial wells are listed in Table 5.

Table 5. Exceedances of Drinking Water Standards in Downgradient Alluvial Wells (Well #2 and Wiltse Well)

Parameter	Well #2	Wiltse Well
Chloride (dissolved)	None	None
Copper (dissolved)	None	None
Iron (dissolved)	None	None
Manganese (dissolved)	**Several (max of 0.54 mg/l)**	**Several (max of 4.5 mg/l)**
pH	None	None
Sulfate as SO_4 (dissolved)	None	**Several (max of 832 mg/l)**
Zinc (dissolved)	None	None

For the parameters with exceedances, manganese and sulfate, comparisons were made to the upgradient well, Well #1.

The upgradient well did have high manganese values, including a maximum of 0.498, suggesting that high values for this parameter are not mining related. However, none of the concentrations recorded for sulfate in Well #1 exceeded the standard of 250 mg/l. This suggests that higher sulfate concentrations are possibly caused by mining activity. **Please address this potential problem with an explanation and/or a plan to prevent high sulfate concentrations in the future**.

References

- Banta, 1988, "A Description of the Material Damage Assessment Process Pertaining to Alluvial Valley Floors, Surface Water, Ground Water and Subsidence at Coal Mines."
- CDPHE, Regulation No. 34 - Classifications and Numeric Standards for San Juan River and Dolores River Basins, effective 30 June 2019.
- CDPHE, Regulation No. 41 - The Basic Standards for Groundwater, 5 CCR 1002-41, effective 30 December 2016.

Thank you,

Robert D. Zuber, P.E.
Environmental Protection Specialist II

Cc: Sarah Vance, GCC Energy, via e-mail