WATER QUALITY
M E M O R A N D U M

Utah Coal Regulatory Program

March 26th, 2019

TO: Internal File

FROM: Steve Christensen, Environmental Scientist

RE: 2018 3rd Quarter Water Monitoring, Genwal Resources, Inc., Crandall Canyon Mine, Permit & Tracking #5787

Water monitoring requirements for the Crandall Canyon Mine can be found in Sections 7.31.21, *Ground Water Monitoring Plan* and 7.31.22, *Surface Water Monitoring Plan.* Additional information can be found in Tables 7-4, 7-5, 7-8, 7-9 and 7-10.

Water encountered during mining operations was pumped to the portals and discharged to Crandall Creek under UPDES Permit No. UTU0024368. Discharges to Crandall Creek were within the limitations established by the permit with rare exceptions. Prior to 2008 only one sample reported a total iron (T-Fe) concentration greater than 1 mg/L (July 26, 2004 -1.08 mg/L). UPDES Permit No. UTU0024368 was renewed on January 29th, 2018. The compliant concentration for T-Fe reporting to Crandall Creek is 1.24 mg/L.

Following the mine collapse in August 2007, the pumps were removed from the mine and discharge ceased temporarily. From September 2007 through December 2007 water pooled within the mine, flooding the underground workings. In January 2008 the mine began discharging by gravity flow and has been discharging continuously since. The temporary seals placed in the portals following the collapse required modification to control the mine water discharge. Iron concentrations in the mine water discharge occasionally exceeded 1 mg/L from January to November 2008; and have been greater than 1 mg/L continuously since December 2008. Construction of a mine water treatment system began in December 2009 and was approved by the Division in January of 2010.

Since April of 2010, the mine water treatment system has proven effective in reducing total iron concentrations to within the 1.24 mg/L UPDES limit. Additionally, the Permittee began sampling the pre-treatment raw mine water (Pre 002) in April of 2010. The sampling of the raw mine water is conducted primarily to establish the trend in total iron concentrations (T-Fe).

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The approved MRP requires the monitoring of 24 springs each quarter. Of these 24 springs, 9 require laboratory water quality analysis (See Table 7-4). The remaining 15 springs require quarterly monitoring of field parameters (flow, pH, specific conductance and temperature).

Data was submitted for all spring monitoring sites. Spring SP-22 did not produce a measurable flow this quarter.

Streams

The approved MRP requires the monitoring of 12 surface water/stream sites. Of these 12 surface water/stream sites, 9 require laboratory water quality analysis (See Table 7-8). The remaining 3 sites require quarterly monitoring of field parameters (flow, pH, specific conductance, temperature and dissolved oxygen).

Data was submitted for all stream monitoring sites. No observable flow was reported for IBC-1, Little Bear Creek, Section 4 Creek, Section 5 Creek, Shingle Creek, Upper Left Fork Section 5 Creek and Upper Right Fork Section 5 creek.

Wells

The approved MRP outlines monitoring of 7 wells. According to Table 7-4, all 7 wells required quarterly laboratory water quality analysis. However, due to the mine disaster on August 6th, 2007, the active mine-workings have been sealed thus rendering the wells inaccessible.

UPDES

The UPDES Permit/MRP (UT000024368) requires monthly monitoring of 2 outfalls: 001 and 002. Outfall 001 is associated with the discharge from the primary sediment pond at the main mine facility. Outfall 002 is associated with the mine-water discharge that reports directly to Crandall Creek.

Outfall 001 did not report a discharge for this quarter. The required data was submitted for both Pre-002 and Outfall 002.

Pre-Treatment Mine Water Discharge

As part of the permitting process for the mine-water treatment system (Task ID #3461, approved January 27th, 2010), the Permittee has committed to monthly sampling of the pre-treatment mine water discharge for the following parameters:

- Iron (total, dissolved and ferrous)
- Manganese (total and dissolved)
- Aluminum (total and dissolved)
- Alkalinity
- Sulfate
- TDS and TSS
- Chloride
- Calcium (dissolved)
- Potassium (dissolved)
- Sodium (dissolved)
- Magnesium (dissolved)
- Silica (dissolved)
- Hot Acidity
- Conductivity
- pH
- Dissolved Oxygen

The required Monthly data was collected for the pre-treatment mine water discharge.

2. Were all required parameters reported for each site? YES ☒ NO ☐

Springs

All required parameters were submitted for the spring monitoring sites.

Streams

All required parameters were reported for the surface water monitoring sites.

Wells

NA- Since the mine collapse in August of 2007, the monitoring wells are inaccessible.

UPDES

Outfall 001 did not report a discharge for this quarter. Outfall 002 was sampled each month of the quarter as required by the UPDES discharge permit. All required parameters were reported for Outfall 002.

As part of the approval for the mine-water treatment system (Task ID #3461), the Permittee committed to obtain additional monthly samples for Outfall 002. The parameters include (D-Fe, FE2+, T-Mn, D-Mn, T-Al, D-Al, Alkalinity and Sulfate). Concentrations were reported for each of the additional parameters at Outfall 002.

Pre-Treatment Mine Water Discharge

Monthly sampling of the Pre-treatment mine water discharge became a requirement with the approval of the mine-water discharge treatment system. Due to a pipe break in 2013, the sampling port location was changed and was re-located to a bend in the pipe 15' before the Maelstrom Unit. The required pre-treatment mine discharge parameters were reported for each month this quarter as required.

3. Were any irregularities found in the data? YES ☒ NO ☐

Springs

LB-12 had a slightly elevated temperature reading 3rd quarter 2018.

LB-5A reported elevated concentrations for water temperature, D-Mg and total hardness. A reduced D-Na concentration was also reported for 3rd quarter 2018.

SP-18 reported an elevated temperature reading for 3rd quarter 2018.

SP-47A reported an elevated temperature reading for 3rd quarter 2018.

SP1-33 reported a slightly elevated concentration for D-Mg for 3rd quarter 2018.

Spring SP-58 reported slightly elevated concentrations for D-Na, SO4, total hardness and bicarbonate 2nd quarter 2018. A slightly elevated SO4 concentration was reported for 3rd quarter 2018.

SP 1-19 reported an elevated temperature reading for 3rd quarter 2019.

SP 2-9 reported an elevated temperature and field conductivity for 3rd quarter 2019.

UPDES Sites (001 and 002)

Outfall 001 reported no observable flow for the quarter.

Outfall 002: October and November of 2017 reported elevated concentrations for total selenium (T-Se). Elevated T-Se was again reported for February and March in 2018. An elevated T-Se concentration was reported for April of 2018. May and June's T-Se concentrations were within historic ranges. It's unclear what could be causing this spike. A slightly elevated bicarbonate concentration was reported in June. For 3rd quarter 2018, all reported parameters were within historic ranges.

Pre-Treatment Mine Water Discharge

The T-Fe concentrations in the pre-treatment mine water were above the 1.24 ppm UPDES limit for October, November and December 2017. However; for 1st quarter 2018, all three months of the quarter produced T-Fe concentrations below the 1.24 UPDES limit 1.17 ppm, 1.07 ppm and 1.12 ppm respectively for January, February and March of 2018. The trend continued in 2nd and 3rd quarter 2018 with all three months within the quarters reporting a T-Fe concentration below the 1.24 UPDES limit.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

Page 7-33 of the MRP states that groundwater samples collected during the low flow period (typically the 4th quarter) every 5 years will be analyzed for baseline parameters (See Tables 7-5). Baseline sampling was conducted during the first quarter of 2016. The next sampling event will be the first quarter of 2021.

Page 7-35 of the MRP states that surface water samples collected during the low flow period every 5 years will be analyzed for baseline parameters (See Table 7-9). The 4th quarter of 2020 will be the next sampling event where baseline data will be required.

5. Based on your review, what further actions, if any, do you recommend?

NA