



STATE OF
COLORADO

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AHR review for Bowie 2 Mine

1 message

Zuber - DNR, Rob <rob.zuber@state.co.us>

Mon, Dec 13, 2021 at 2:07 PM

To: Basil Bear <basilbear@wolverinefuels.com>, Tamme Bishop <tamme.jestover@bresnan.net>

Hello -

Please see the attached review letter.

Rob

Rob Zuber, P.E.
Environmental Protection Specialist
Active Mines Regulatory Program



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DRMS_review__2020_AHR.pdf

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December 13, 2021

Basil Bear
Bowie Resources, LLC
P.O. Box 1488
Paonia, CO 81428

**Re: Bowie No. 2 Mine, Permit C-1996-083,
Review of 2020 AHR**

Dear Mr. Bear:

The Division received the 2020 AHR for the Bowie No. 2 Mine on June 14, 2021. 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 Bowie No. 2 Mine water monitoring plan, and indicates if the requirement was met with the 2020 AHR.

Table 1 Requirements of the Bowie No. 2 Mine Water Monitoring Plan

Requirement	Source of Requirement (Rule or Page in PAP)	Requirement met for 2020?
Filing frequency of AHR - annually	Rule 4.05.13(4)(c)	Yes
Timely filing of hydrology report – submitted by April 30th each year	Section 2.05 of the Bowie No. 2 Mine PAP, page 136	No ¹
Sites sampled and sampling frequency at <u>surface</u> water monitoring sites	Section 2.05 of PAP, pages 124 - 131	No
Parameters sampled at <u>surface</u> water monitoring sites	Section 2.05 of PAP, page 135	No
Sites sampled and sampling frequency at <u>groundwater</u> monitoring sites	Section 2.05 of PAP, pages 124 - 131	Yes
Parameters sampled at <u>groundwater</u> monitoring sites	Section 2.05 of PAP, page 134	Yes

1. The submittal was late, but this had been agreed upon with the Division.

The PAP indicates that Fire Mountain Canal (FMC) sites will be monitored three times per year, but there are only two columns in the data tables, for May and August (Figures 72 and 73). **Please explain why the FMC sites are not monitored three times per year. At the very least, the data tables should show a third column and include an explanation such as, “Site was not accessible.”**

The AHR includes two tables with data for Pond 7-7 (Figures 134 and 135), but there is no data for Pond 7-2. **Please provide the data for Pond 7-2 or explain why it is not included in the AHR.**



Names of some sites are unclear. On the page for S-2 (Figure 15), the name is Freeman Gulch rather than J&M Spring as in the PAP (page 2.05-128). Similar issues are apparent with other springs as well (e.g., S-4, S-5b, and S-16). **Please explain these discrepancies and, as necessary, revise any pages in the AHR or submit a TR with revised pages in the PAP.**

It is not clear why some parameters in the surface water list in the Hydrologic Monitoring Plan of the PAP (page 2.05-135) are not included in the 2020 AHR data. **Please explain why this data is missing from the AHR.** Examples include:

- The parameter Oil and Grease was not analyzed for many sites (Deer-up, Deer-low, FMC-up, FMC-low, NFG-up, NFG-low, D34-14, and HUB-LOW).
- Chromium III was not sampled for NFG-low (Figure 79).
- Bicarbonate, cadmium, and other parameters are missing from the dataset for SW-01 (Figure 86).
- Sulfate, mercury and zinc are missing from the dataset for AW-1 (Figure 107).

Key receiving waters at the Bowie No. 2 Mine are the North Fork of the Gunnison River, Deer Trail Ditch, and Hubbard Creek. These receiving waters are key because they contain significant flows (they are not ephemeral) and they are potentially impacted by the mine (CDPS outfalls drain to them). An analysis of water quality data for the downstream sampling locations for these receiving waters were a primary focus of this AHR review. The Division has made the assessment that flow data does not need to be reviewed for the purposes of this AHR, because the operation at the Bowie No. 2 Mine are highly unlikely to have a significant impact on water quantity in the tributaries, and certainly not on the river itself.

Analysis of Surface Water Data – North Fork of the Gunnison River

Data for the downstream sampling site, NFG-low, was reviewed to identify any potential water quality issues by comparing the data to CDPHE standards. The following table includes a comparison of 2020 AHR data and standards from Regulation No. 35 (Segment 2.) of the CDPHE Water Quality Standards. For the sake of brevity, the table includes only parameters with data above the detection limit in 2020 that also have CDPHE standards.

Table 2. 2020 AHR Data from NFG-low Sampling Site in the River

Parameter	Units	Worst Concentration in 2020 AHR ¹	CDPHE Standard	Comments
pH	su	8.8	6.5 - 9.0	Standard includes low limit and high limit. No values below 6.5 in 2020.
Temperature	deg C	16.4	18.3	Standard for non-winter months. Winter standard of 13.0 only exceeded in August.
Dissolved Oxygen	mg/L	8.99	6.0	Standard is low limit.
Chloride	mg/L	53.3	250	
Sulfate	mg/L	17.8	250	
Arsenic, TREC	mg/L	0.0006	0.00002	
Iron, TREC	mg/L	1.51	1.0	
Lead, TREC	mg/L	0.0009	0.05	
Manganese, dissolved	mg/L	0.01	0.05	
Selenium, TREC	mg/L	0.0002	0.0046	

1. Maximum for all parameters except Dissolved Oxygen (DO). Minimum for DO.

Because of the two exceedances, for arsenic and iron, further analysis was required. To determine if the high concentrations were possibly the result of activities at the Bowie No. 2 Mine, concentrations upstream of the mine on the North Fork of the Gunnison River (where Bowie No. 2 Mine impacts are unlikely) were reviewed. Site NFG-up is above the mine, approximately three miles northeast and 200 feet in elevation above NFG-low. For TREC arsenic, the concentrations in the 2020 AHR are 0.0006 mg/L and 0.0007 mg/L, which are equal to and greater than the maximum concentration at NFG-low, respectively. For TREC iron, the concentrations in the 2020 AHR are 0.99 mg/L and 1.29 mg/L. These concentrations are not as high as the maximum of 1.5 mg/L at NFG-low, but 1.29 is above the CDPHE standard of 1.0 mg/L. Also, the average concentration during the timeframe of operations for TREC iron at NFG-low is 2.06 mg/L (Figure 81), which is above the average at NFG-low and above the maximum concentration in the 2020 AHR.

The Division finds no concerns with any of the water quality concentrations in the North Fork of the Gunnison River.

Analysis of Surface Water Data – Deer Trail Ditch

Data for the downstream sampling site, Deer-low, was reviewed to identify any potential water quality issues. The data for this site was compared to CDPHE standards. Because Deer Trail is an irrigation ditch, rather than a natural receiving water, the emphasis is on agricultural standards rather than standards for fish, other aquatic life, recreation, or domestic water.

The following table includes a comparison of 2020 AHR data and standards from Regulation No. 31 of the CDPHE Water Quality Standards.

Table 3. 2020 AHR Data from Deer-low Sampling Site in Deer Trail Ditch

Parameter	Units	Maximum Concentration in 2020 AHR	CDPHE Agricultural Standard	Comments
Cyanide	mg/L	< DL	0.2	
Nitrate	mg/L	< DL	100	
Nitrite	mg/L	< DL	10	
Boron	mg/L	< DL	0.75	
Arsenic, TREC	mg/L	<0.0008	0.1	
Cadmium, TREC	mg/L	< DL	0.01	
Chromium III, TREC	mg/L	< DL	0.1	
Chromium VI, TREC	mg/L	< DL	0.1	
Copper, TREC	mg/L	< DL	0.2	
Lead, TREC	mg/L	0.0004	0.1	
Manganese, TREC	mg/L	< DL	0.2	
Molybdenum, TREC	mg/L	< DL	0.3	
Nickel, TREC	mg/L	< DL	0.2	
Selenium, TREC	mg/L	0.0001	0.02	
Zinc, TREC	mg/L	< DL	2.0	

1. “DL” equals detection limit.
2. “TREC” equals total recoverable.

Table 3 does not indicate any water quality problems in Deer Trail Ditch in 2020.

The Total Dissolved Solids (TDS) values for Deer-low in 2020 are 186 mg/L and 156 mg/L. These values are well below the commonly-used guideline of 750 mg/L (Banta, 1988).

Analysis of Surface Water Data – Hubbard Creek

Data for the downstream sampling site, HUB-low, was reviewed to identify any potential water quality issues by comparing the data to CDPHE standards. The following table includes a comparison of 2020 AHR data and standards from Regulation No. 35 (Segment 5a.) of the CDPHE Water Quality Standards. The table for Hubbard Creek includes only parameters with data above the detection limit in 2020 that also have CDPHE standards.

Table 4. 2020 AHR Data from HUB-low Sampling Site in Hubbard Creek

Parameter	Units	Maximum Concentration in 2020 AHR	CDPHE Standard	Comments
pH	su	8.6	6.5 - 9.0	Standard includes low limit and high limit. No values below 6.5 in 2020.
Temperature	deg C	11.3	17.0	Standard for non-winter months. Winter standard of 9.0 only exceeded in September.
Chloride	mg/L	1.5	250	
Arsenic, TREC	mg/L	0.0005	0.00002	
Iron, TREC	mg/L	1.26	1.0	
Iron, dissolved	mg/L	0.07	0.3	
Lead, TREC	mg/L	0.0005	0.05	
Selenium, TREC	mg/L	0.0001	0.0046	

Because of the two exceedances, for arsenic and iron, further analysis was required. To determine if the high concentrations were possibly the result of activities at the Bowie No. 2 Mine, concentrations upstream of the mine on Hubbard Creek (where mine impacts are unlikely) were reviewed. Site D34-14 is above the mine, four to five miles north and 680 feet in elevation above HUB-low. For TREC arsenic, the concentration in the 2020 AHR is 0.0006 mg/L, which is greater than the maximum concentration at HUB-low. For TREC iron, the concentration in the 2020 AHR is 2.0 mg/L, which is greater than the maximum concentration at HUB-low.

The Division finds no concerns with any of the water quality concentrations in Hubbard Creek.

The TDS value for the HUB-low sample from May 2020 was 84 mg/L, well below the guideline of 750 mg/L.

Analysis of Groundwater Data

The Division review of alluvial groundwater data focused on three down-gradient sites: AW-1, AW-11, and AW-14. The data were compared to water quality standards in Regulation No. 41 of the CDPHE Water Quality Standards. For the sake of brevity, the following table includes only parameters with data above the detection limit in 2020 that also have CDPHE standards.

Dissolved manganese values were not assessed because the standard is only applicable when irrigation water is applied to soils with pH values lower than 6.0, and it has been determined that soils adjacent to the North Fork of the Gunnison River typically have higher pH values, often over 7.0. This was based on an assessment of the Natural Resources Conservation Service (NRCS) Web Soil Survey.

Table 5. 2020 AHR Data from Key Down-Gradient Alluvial Wells

Parameter	Units	AW-1¹	AW-11¹	AW-14¹	CDPHE Standard	Comments
pH	su	7.69	7.59	7.67	6.5 - 8.5	Standard includes low limit and high limit. No values below 6.5 in 2020.
Chloride	mg/L	172	25.3	200	250	
Nitrate-Nitrite	mg/L	No data	0.59	0.08	10.0	
Sulfate	mg/L	No data	207	493	250	
Arsenic, dissolved	mg/L	< DL	< DL	0.0002	0.01	
Cadmium, dissolved	mg/L	141	< DL	0.0001	0.005	The extremely high value at AW-1 is possibly a typographical error.
Iron, dissolved	mg/L	0.9	< DL	0.21	0.3	
Mercury, dissolved	mg/L	No data	0.03	< DL	0.002	
Selenium, dissolved	mg/L	0.0067	0.0025	0.002	0.02	
Zinc, dissolved	mg/L	No data	< DL	< DL	2.0	

1. Maximum concentrations from 2020 data in AHR.

A high sulfate value (above the standard of 250 mg/L) were detected for AW-14. However, the baseline data for AW-1 (also a downgradient location) indicates extremely high sulfate values (average of 5,220 mg/L), indicating that these high values in recent data are not the result of mining.

Please explain if the extremely high value for dissolved cadmium at AW-1 is an error (e.g., typographical or lab error).

A dissolved iron value for AW-1, 0.9 mg/L, is above the drinking water standard of 0.3 mg/L. According to the AW-1 data in Table 107 of the 2020 AHR, this is not a common occurrence, as the average concentration during the period of operation of the mine is 0.12 mg/L. Also, at upgradient wells (AW-12, AW-15, AW-16), relatively high concentrations have also been detected. For example, at AW-12, the average concentration (0.63 mg/L) is above the CDPHE standard, and the maximum value (10.28 mg/L) is much higher than the standard. Therefore, the Division has determined that this is not currently a water quality issue caused by operations at the Bowie No. 2 Mine.

A dissolved mercury value for AW-11, 0.03 mg/L, is above the domestic use standard of 0.002 mg/L. According to the AW-11 data in Table 121 of the 2020 AHR, this is not a common occurrence, as the average concentration during the period of operation of the mine is 0.0016 mg/L. However, the baseline data in Table 121 shows all non-detect concentrations. Also, at upgradient wells (AW-12, AW-15, AW-16), only low concentrations have been detected. These are orders of magnitude lower than the value for AW-11. For example, at AW-12, the average concentration is 0.00008 mg/L. The next step in the Division analysis was to check for actual uses of the alluvial water in the area near the mine. A search of the DWR database indicated that there are wells downgradient of the Bowie No. 2 Mine that use the water for domestic use. Therefore, high dissolved mercury concentrations are a potential water quality issue caused by operations at the Bowie No. 2 Mine.

In the response to this review letter, please provide a discussion of dissolved mercury in the context of the data and the CDPHE standard.

For TDS, Regulation 41 states that concentrations should not exceed 1.25 times the background (for the purposes of this report, the terms background and baseline are considered synonymous). The following discusses baseline averages and 2020 sample values for the three key wells:

- For AW-1, no TDS data is provided. However, the baseline average for conductivity (sometimes used as proxy for TDS) is 9,100 umhos/cm, and the concentrations at AW-1 for 2020 are all well below baseline.
- For AW-11, the baseline average is 553 mg/L. For 2020, the concentration reported for June 10, 2020 is higher at 636 mg/L, but not 1.25 times higher than 553 mg/L. However, conductivity values at this well were much higher than background, and **conductivity and TDS values in the future should be closely scrutinized.**
- For AW-14, no baseline data is available because the area was disturbed by mining prior to establishment of the sampling location. Therefore, a comparison to baseline cannot be made for this well.

Based on past experience, bedrock wells were not analyzed due to a lack of potential mining impacts.

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. 31 – The Basic Standards and Methodologies for Surface Water.
- CDPHE, Regulation No. 35 - Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins.
- CDPHE, Regulation No. 41 - The Basic Standards for Groundwater.

Please respond to this report by March 1, 2022. This will help us move forward in addressing potential water quality issues and with adjusting your monitoring program, as necessary. If you, Tamme Bishop, or another BRL representative want to discuss this review letter, please do not hesitate to call (720-601-2276) or email me (rob.zuber@state.co.us).

Thank you,

A handwritten signature in blue ink, appearing to read "Robert D. Zuber".

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

Cc via email: Tamme Bishop, J.E. Stover & Associates, Inc.