STATE OF COLORADO

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

# Bowie #2 - review of 2022 AHR

1 message

**Zuber - DNR, Rob** <rob.zuber@state.co.us> Mon, Jul 10, 2023 at 10:38 AM
To: Basil Bear <basilbear@wolverinefuels.com>, Tamme Bishop <tammekb@gmail.com>

Basil and Tamme -

Please see the attached review letter. While no issues were identified in terms of impacts on the hydrologic balance, some questions about the monitoring plan are identified in this letter. Let me know if you want to discuss these questions.

Thanks,
Rob

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

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

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**DRMS_review__2022_AHR_for_Bowie_2.pdf**
715K

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

July 10, 2023

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

**Re: Bowie No. 2 Mine, Permit C-1996-083,**
**Review of 2022 AHR**

Dear Mr. Bear:

The Division received the 2022 AHR for the Bowie No. 2 Mine on June 9, 2023. 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 2022 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 2022? |
|---|---|---|
| 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 surface water monitoring sites | Section 2.05 of PAP, pages 124 - 131 | **Not clear[2]** |
| Parameters sampled at surface water monitoring sites | Section 2.05 of PAP, page 135 | **Not clear[2]** |
| Sites sampled and sampling frequency at groundwater monitoring sites | Section 2.05 of PAP, pages 124 - 131 | **Not clear[2]** |
| Parameters sampled at groundwater monitoring sites | Section 2.05 of PAP, page 134 | Yes |

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

Table 1 in the AHR states that streams and ditches will be monitored for lab parameters semi-annually. However, for the Deer-low and Deer-up sites, lab data was only analyzed for one month. **Please explain why lab data was only analyzed for one month instead of two at these sites.**

The data for Spring S-2 appears to be missing. Figures 14 and 15 both contain data for Spring S-1. **Please explain.**

Names of some sites are unclear. The names in Table 5 of the AHR do not all match those in the PAP (e.g., page 2.05-128). **Please explain these discrepancies and, as necessary, submit a TR with revised pages in the PAP**.

Table 1 in the AHR states that Deer-low and Deer-up will be monitored for the parameters in List 2 of Table 2. However, for the Deer-up and Deer-low data (Figures 68 and 70), lab data does not include all of the samples in List 2. **Please explain why these sites were not sampled in August and the List 2 parameters are not included in the analysis.**

Table 1 in the 2022 AHR states that lab analyses will be conducted in the second and fourth quarters for drill holes and alluvial monitoring wells. However, none of the data tables for groundwater sites have more than one column of lab data. **Please explain.**

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 2022 AHR data and standards from Regulation No. 35 (Segment 2. for the North Fork of the Gunnison River Basin) of the CDPHE Water Quality Standards. For the sake of brevity, the table includes only parameters with data above the detection limit in 2022 that also have CDPHE standards.

**Table 2. 2022 AHR Data from NFG-low Sampling Site in the River**

| Parameter | Units | Worst Concentration in 2022 AHR[1] | CDPHE Standard | Comments |
|---|---|---|---|---|
| pH | su | 7.6 | 6.5 - 9.0 | Standard includes low limit and high limit. No values above 9.0 in 2022. |
| Temperature | deg C | 17.7 | 18.3 | Standard for non-winter months. Winter standard of 13.0 only exceeded in August. |
| **Dissolved Oxygen** | **mg/L** | **0.96** | **6.0** | Standard is low limit. Worst concentration in June 2022. Two other recorded values above limit. |
| Boron | mg/L | 0.035 | 0.75 | |
| Chloride | mg/L | 1.86 | 250 | |
| Sulfate | mg/L | 12.3 | 250 | |
| **Arsenic, TREC** | **mg/L** | **0.00137** | **0.00002** | |
| **Iron, TREC** | **mg/L** | **4.25** | **1.0** | |
| Lead, TREC | mg/L | 0.00239 | 0.05 | |

1. Maximum for most parameters. Minimum for pH and Dissolved Oxygen.

Because of the exceedances, further analysis was required.

To determine if the exceedances for other parameters 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 Dissolved Oxygen, the June value is 0.1 mg/L at NFG-up, suggesting that the low values are not caused by the Bowie No. 2 Mine.

For TREC arsenic, the concentrations in the 2022 AHR are 0.00221 mg/L and 0.00064 mg/L at NFG-up, which are similar to the maximum concentration at NFG-low in 2022 (0.00137 mg/L). Also, in the June 2022 data, the concentration at the upper site is greater than the concentration at the site below the Bowie No. 2 Mine.

For TREC iron, the concentrations in the 2022 AHR for NFG-up are 4.86 mg/L and 1.27 mg/L. The larger value, greater than the value of 4.25 mg/L for the lower site in the river, suggests that the exceedance is not caused by the Bowie No. 2 Mine.

The TDS values for the NFG-low samples from 2022 (maximum of 144 mg/L) are well below the guideline of 750 mg/L.

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 2022 AHR data and standards from Regulation No. 31 of the CDPHE Water Quality Standards.

**Table 3. 2022 AHR Data from Deer-low Sampling Site in Deer Trail Ditch**

| Parameter | Units | Maximum Concentration in 2022 AHR | CDPHE Agricultural Standard | Comments |
|---|---|---|---|---|
| Cyanide | mg/L | **Not analyzed** | 0.2 | |
| Nitrate | mg/L | < DL | 100 | |
| Nitrite | mg/L | **Not analyzed** | 10 | |
| Boron | mg/L | **Not analyzed** | 0.75 | |
| Arsenic, TREC | mg/L | 0.00057 | 0.1 | |
| Cadmium, TREC | mg/L | < DL | 0.01 | |
| Chromium III, TREC | mg/L | **Not analyzed** | 0.1 | |
| Chromium VI, TREC | mg/L | **Not analyzed** | 0.1 | |
| Copper, TREC | mg/L | < DL | 0.2 | |
| Lead, TREC | mg/L | 0.00055 | 0.1 | |
| Manganese, TREC | mg/L | 0.017 | 0.2 | |
| Nickel | mg/L | **Not analyzed** | 0.2 | |
| Selenium, TREC | mg/L | 0.00013 | 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 2022. Data for several parameters are missing, however. While historical data suggests that these parameters are not an issue in the Deer Trail Ditch, **these parameters should be included in the analysis in future years.**

The Total Dissolved Solids (TDS) value for Deer-low in 2022 is 100 mg/L. This value is 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 2022 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 2022 that also have CDPHE standards.

**Table 4. 2022 AHR Data from HUB-low Sampling Site in Hubbard Creek**

| Parameter | Units | Maximum Concentration in 2022 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 2022. |
| Winter Temp. | deg C | 2.9 | 13.0 | Acute standard Oct - May |
| Summer Temp. | deg C | 16.8 | 21.7 | Acute standard June – Sept |
| Chloride | mg/L | 3.72 | 250 | |
| Sulfate | mg/L | 12.4 | 250 | |
| **Arsenic, TREC** | **mg/L** | **0.00057** | **0.00002** | |
| Iron, dissolved | mg/L | 0.17 | 0.30 | Domestic Water Supply standard from CDPHE Regulation 31. |
| **Iron, TREC** | **mg/L** | **1.25** | **1.0** | |
| Lead, TREC | mg/L | 0.00054 | 0.05 | |

Because of the exceedance for arsenic and iron, further analysis was required. To determine if the high concentration was 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 2022 concentrations for D34-14 are 0.00052 mg/L and 0.00047 mg/L, which are very similar to the maximum concentration at HUB-low.

For TREC iron, the 2022 concentration for D34-14 are slightly lower than the maximum concentration at HUB-low. However, the baseline data for HUB-low is very similar to the 2022 data.

The TDS value for the HUB-low sample from August 2022 was 146 mg/L, well below the guideline of 750 mg/L.

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

Analysis of Groundwater Data

The Division review of alluvial groundwater data focused on three down-gradient sites: AW-1, AW-11, and AW-14, which are downgradient of a large portion of the site. The data were compared to 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 2022 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. 2022 AHR Data from Key Down-Gradient Alluvial Wells**

| Parameter | Units | AW-1[1] | AW-11[1] | AW-14[1] | CDPHE Standard | Comments |
|---|---|---|---|---|---|---|
| pH | su | 8.0 | 8.1 | 8.1 | 6.5 - 8.5 | Standard includes low limit and high limit. No values below 6.5 in 2022. |
| Chloride | mg/L | 152 | 38.2 | < DL | 250 | Drinking water standard |
| Nitrate-Nitrite | mg/L | 2.31 | 1.0 | 0.131 | 10.0 | |
| **Sulfate** | mg/L | **1,560** | **325** | **348** | **250** | |
| Arsenic, dissolved | mg/L | < DL | < DL | 0.00034 | 0.01 | |
| Cadmium, dissolved | mg/L | 0.0001 | < DL | 0.000146 | 0.005 | |
| Selenium, dissolved | mg/L | 0.0087 | 0.0144 | 0.0032 | 0.02 | |

1. Maximum concentrations from 2022 data in AHR.

High sulfate values (above the standard of 250 mg/L) were detected for AW-1, AW-11, and AW-14. However, the baseline data for AW-1 indicates extremely high sulfate values (average of 5,220 mg/L), and the sulfate value for AW-17, upgradient of mining activity, is 1,090 mg/L, well above the standard. These data indicate that high concentrations in AW-1, AW-11, and AW-14 are not the result of mining.

Regarding Total Dissolved Solids (TDS), baseline concentrations were very high in some alluvial wells. For AW-1, the baseline average is 8,200 mg/L, much higher than the value measured for the June 2022 sample, 3,170 mg/L. Baseline data for AW-6 was also very high with an average of 3,995 mg/L. Given the high baseline concentrations, it is not clear that mining has caused an increase in this parameter.

For deeper wells (in the Mesaverde formation), data from four down gradient wells, along the north end of the mine permit boundary, were reviewed for exceedances of groundwater standards: DH-67B, DH-67D, DH2010-1B, and DH2010-1SS. Some of the data exceeded standards, but baseline data revealed that there has not been an upward trend for concentrations or the baseline concentration already exceeded the standard. For example, the 2022 chloride concentration at DH-67B is 449 mg/L, but the maximum baseline concentration is 509 mg/L. Therefore, this parameter is not considered a problem at this location. None of the data suggested problems in the deeper wells in the context of Regulation 41.

The same deeper wells (DH-67B, DH-67D, DH2010-1B, and DH2010-1SS) were reviewed for water levels. Recorded water elevations in 2022 were all within the range of the baseline data for each of them, and no problems were identified.

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 September 1, 2023. 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,

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

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