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

Utah Coal Regulatory Program

September 25, 2014

TO: Internal File

THRU: Daron Haddock, Permit Supervisor

FROM: Steve Christensen, Environmental Scientist

RE: 2014 1st Quarter Water Monitoring, West Ridge Resources, West Ridge Mine, Task ID #4525

The West Ridge Mine is currently operational in the Book Cliff Mountain range of Carbon County, UT. Water monitoring data is submitted quarterly to the Division EDI database. Beginning on page 7-36 of the approved Mining and Reclamation Plan (MRP), water monitoring protocols and sampling requirements are provided for surface water, ground water, monitoring wells and UPDES outfalls in Tables 7-1, 7-2, 7-3 and 7-4 respectively.

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

Springs

The approved MRP outlines the monitoring of 8 springs (SP-8, SP-12, SP-13, SP-101, SP-0102, Road Spring, Section 5 Spring and SP-80). Two of the monitored springs (SP-12 and SP-13) discharge from the lower slopes of West Ridge in Whitmore Canyon. Spring SP-8 discharges in the upper drainage of C Canyon. Hanging Rock Spring (S-80) is located near the northwest corner of the permit area and discharges from the east slopes of Whitmore Canyon.

None of the 8 spring monitoring sites could be accessed this quarter due to snow cover.

Streams

The approved MRP outlines the monitoring of nine stream sites (ST-3, ST-6, ST-8, ST-15, Patterfore, LF-1, LF-2, RF-1 and RF-2). Until the 2nd quarter of 2011, the surface water monitoring plan had included twelve stream monitoring sites; however, an amendment was submitted and approved by the Division (Task ID #3738) in March of 2011 that eliminated five of the sites. The amendment eliminated the monitoring of ST-5, ST-6A, ST-7, ST-11, ST-12 and ST-13. As a result, the monitoring of these stream sites was discontinued the 2nd quarter of 2011.

Grassy Trail Creek is the only intermittent/perennial stream in the permit and adjacent areas. The upper drainages of Grassy Trail Creek (i.e. the Left and Right Fork) are monitored quarterly. Four monitoring sites have been established on the Left Fork (LF-1, LF-2, ST-3 and ST-15). Monitoring sites LF-1 and LF-2 are flume sites where continuous monitoring data is obtained during

mid- to high-flow periods. During the late summer months, the flows of the Left and Right Forks of Whitmore Canyon decrease to a volume that cannot be measured accurately by the flumes. Site ST-15 monitors flow from the Spring Canyon drainage (tributary to the Left Fork).

Three monitoring sites have been established on the Right Fork (RF-1, RF-2 and Patterfore Stream). RF-1 and RF-2 are flume sites where continuous monitoring data is obtained during mid- to high-flow periods. The Patterfore Stream is a tributary to the Right Fork and was established as a monitoring site in the spring of 2011 in order to obtain additional data on the Right Fork drainage.

Data was submitted for one of the required stream/surface water monitoring points. Only surface water monitoring point ST-6 could be accessed due to snow cover.

Continuous flow readings on the Left and Right Forks of Whitmore Canyon (LF-1, LF-2, RF-1 and RF-2) could not be obtained this quarter. Flows are typically obtained during the high-flow (late spring/early summer months i.e. 2nd quarter) and during the summer (3rd quarter) when flows are of sufficient volume to produce an accurate measurement (given the limitations of the flume). During the winter months, access to the sites is not possible due to snow cover.

Wells

Quarterly operational sampling is required for one groundwater-monitoring well (Site DH 86-2). Monitoring well DH 86-2 was sampled during this quarter.

Underground Mine-Water Sample

Monthly samples of the underground, pre-treatment mine water are required. The requirement was established on August 24th, 2010.

The required monthly samples were submitted for this quarter.

UPDES

Operational sampling is required monthly for two active UPDES sites (Permit # UT0025640). Site D001 is the mine sites primary sediment pond discharge to the ephemeral ‘C’ Canyon drainage. Site D002 is the mine-water discharge to the ephemeral ‘C’ Canyon drainage.

Specific limitations and self-monitoring requirements as outlined in the UPDES permit are presented in the table below:

Effluent Characteristics	Effluent Limitations
Flow, MGD (million gallons per day)	1.0
Total Suspended Solids (TSS), ppm	70
Total Iron, ppm	1.0
Oil & Grease, ppm	10
Total Dissolved Solids (TDS), ppm	2,000
pH	9

Outfall 001 did not report a discharge this quarter. Data was submitted for UPDES Outfall 002.

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

Spring Monitoring Sites: None of the spring monitoring sites were accessible this quarter.

Surface Water Monitoring Sites: Only one of the 9 stream monitoring sites was accessible this quarter (ST-6). All required data was submitted to the Division.

Well Monitoring Site DH 86-2: The monitoring well was sampled this quarter. The required data was submitted.

UG-1: All required parameters were reported for underground mine-water monitoring site UG-1.

UPDES: Outfall 001 did not report a discharge this quarter. The required water quality data was reported for Outfall 002 was reported.

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

Surface Water Monitoring Sites-

As discussed above, only surface water monitoring site ST-6 could be accessed this quarter and it was frozen (unable to sample).

For several consecutive quarters, several surface water monitoring sites have been exhibiting fairly significant fluctuations for a numerous parameters: notably surface water monitoring sites ST-3 and ST-6.

In the case of ST-3, there has been a strong upward trend in concentrations for dissolved magnesium (D-Mg), dissolved sodium (D-Na), sulfate (SO4), total hardness (T-Hdns), total dissolved solids (TDS) and total anions and total cations (T-Cats/T-Anis). Surface water monitoring site ST-3 showed an increase in concentration for numerous parameters for 2nd quarter 2013 (continuing the trend from the last sampling event). ST-3 could not be accessed this quarter so continued monitoring of these trends will be conducted in subsequent quarters.

The data for surface water monitoring site ST-6 has exhibited a wide fluctuation in numerous parameters. In the 2nd quarter of 2012, the data showed a significant drop (well outside 2 standard deviations from the mean) for field conductivity, dissolved calcium (D-Ca), D-Mg, dissolved potassium (D-K), D-Na, Cl, SO4, T-Alk, T-Hdns, TDS, Bcrb, T-Cats and T-Anis. The following quarter (3rd quarter 2012), the data showed elevated concentrations for D-Ca, D-Mg, SO4, T-Alk, T-Hdns, TDS, Bcrb, T-Anis and T-Cats. ST-6 could not be accessed during the 4th quarter of 2012, 1st quarter of 2013 and 2nd quarter 2013. During the 3rd quarter of 2014, the site reported 13 parameters outside of two standard deviations from the mean. Site ST-6 could not be accessed due to snow cover during the 4th quarter of 2014.

The following irregularities were identified for the surface water monitoring sites that were accessible and sampled 1st quarter of 2014. As access to the stream monitoring sites was not possible due to snow-cover, no data is available to determine if the concentrations below are developing a trend. Continued monitoring will be conducted.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
ST-6	Stream	3/31/2014	F-Cond	1015 umhos/cm	3.59	2076.05 umhos/cm
ST-6	Stream	3/31/2014	Flow	1,978 gpm	2.43	390.98 gpm
ST-6	Stream	3/31/2014	D-Ca	28.53 ppm	2.80	72.84 ppm
ST-6	Stream	3/31/2014	D-Mg	28.71 ppm	3.26	63.38 p pm
ST-6	Stream	3/31/2014	D-K	6.95 ppm	2.91	11.15 ppm
ST-6	Stream	3/31/2014	D-Na	164.76 ppm	3.04	341.35 ppm
ST-6	Stream	3/31/2014	Cl	20 ppm	2.13	29.00 ppm
ST-6	Stream	3/31/2014	SO4	296 ppm	2.98	699.18 ppm
ST-6	Stream	3/31/2014	T-Alk	281 ppm	3.14	427.29 ppm
ST-6	Stream	3/31/2014	T-Hdns	189 ppm	3.20	438.75 ppm
ST-6	Stream	3/31/2014	TDS	738 ppm	2.97	1,499.97 ppm
ST-6	Stream	3/31/2014	Bcrb	260 ppm	3.38	429.21 ppm
ST-6	Stream	3/31/2014	CaCO3	22 ppm	2.89	11.50 ppm
ST-6	Stream	3/31/2014	T-Cats	11.91 meq/L	3.06	23.82 meq/L
ST-6	Stream	3/31/2014	T-Anis	12.35	3.09	23.87

				meq/L		meq/L

For the purposes of comparison in subsequent quarters/monitoring events, the following irregular parameters were reported to the Division for various stream water monitoring sites.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
RF-1	Stream	9/30/2013	f-cond	387 umhos/cm	2.22	608.43 umhos/cm
Patterfore	Stream	9/30/2013	f-cond	470 umhos/cm	3.22	662.60 umhos/cm
Patterfore	Stream	9/30/2013	TDS	372 ppm	3.38	417.6 ppm
Patterfore	Stream	9/30/2013	Bcrb	230 ppm	3.22	270 ppm
LF-1	Stream	9/29/2013	TSS	36 ppm	2.31	16.4 ppm
ST-3	Stream	9/29/2013	D-Mg	58.6 ppm	2.99	40.7 ppm
ST-3	Stream	9/29/2013	D-Na	47.04 ppm	3.86	24.9 ppm
ST-3	Stream	9/29/2013	Cl	5 ppm	2.37	2.77 ppm
ST-3	Stream	9/29/2013	SO4	124 ppm	4.19	54.9 ppm
ST-3	Stream	9/29/2013	T-Hdns	381 ppm	2.76	293.80 ppm
ST-3	Stream	9/29/2013	TDS	509 ppm	3.25	364.63 ppm
ST-3	Stream	9/29/2013	T-Cats	9.71 ppm	3.20	7.03 ppm
ST-3	Stream	9/29/2013	T-Anis	9.55 ppm	2.19	7.13 ppm
ST-6	Stream	9/27/2013	f-cond	982 umhos/cm	3.7	2076 umhos/cm
ST-6	Stream	9/27/2013	Flow	2100 gpm	2.62	390.98
ST-6	Stream	9/27/2013	D-Ca	28.35 ppm	2.81	72.84 ppm
ST-6	Stream	9/27/2013	D-Mg	29.99 ppm	3.14	62.38 ppm
ST-6	Stream	9/27/2013	D-K	6.38 ppm	3.31	11.15 ppm
ST-6	Stream	9/27/2013	D-Na	152.47 ppm	3.25 ppm	341.35 ppm
ST-6	Stream	9/27/2013	SO4	306 ppm	2.91	699.18 ppm
ST-6	Stream	9/27/2013	T-Alk	231 ppm	4.21	427.29 ppm
ST-6	Stream	9/27/2013	T-Hdns	194 ppm	3.13	438.75 ppm
ST-6	Stream	9/27/2013	TDS	687 ppm	3.16	1499.97 ppm
ST-6	Stream	9/27/2013	Bcrb	221 ppm	4.16	429.21 ppm
ST-6	Stream	9/27/2013	T-Cats	10.68 meq/l	3.38	23.82 meq/l
ST-6	Stream	9/27/2013	T-Anis	11.6 meq/l	3.29	23.87 meq/l

UPDES Sites- (UPDES Permit #UT0025640)

Site D001- UPDES outfall D001 (primary sediment pond at mine site) did not report a discharge this quarter.

Site D002- UPDES Outfall 002 water quality data was obtained each month this quarter. The average flow value for the quarter was 2,024 gpm. All of the reported concentrations were within the established limits of the UPDES permit.

The following irregularities were identified at Outfall 002 for 4th quarter 2013.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
002	UPDES outfall	1/31/2014	TDS	510 ppm	2.30	1,414.52 ppm

Spring Monitoring Sites

The following data irregularities were identified with the spring monitoring sites during the 3rd quarter of 2013. As access to the spring monitoring sites was not possible for the 4th quarter of 2013 and the 1st quarter of 2014, due to snow-cover, no data is available to determine if the concentrations below are developing a trend. Continued monitoring will be conducted.

Site	Type	Date	Parameter	Value	Std. Dev.	Average
SP-101	Spring	9/29/2013	f-cond	433 umhos/cm	4.59	724.18 umhos/cm
SP-101	Spring	9/29/2013	D-Mg	87.38 ppm	7.53	53.55 ppm
SP-101	Spring	9/29/2013	D-K	2.28 ppm	2.37	1.68 ppm
SP-101	Spring	9/29/2013	D-Na	69.82 ppm	9.99	35.45 ppm
SP-101	Spring	9/29/2013	Cl	8 ppm	9.99	2.99 ppm
SP-101	Spring	9/29/2013	SO4	241 ppm	9.99	93.36 ppm
SP-101	Spring	9/29/2013	T-Alk	395 ppm	3.06	343 ppm
SP-101	Spring	9/29/2013	T-Hdns	497 ppm	5.33	365.51 ppm
SP-101	Spring	9/29/2013	TDS	712 ppm	7.9	464.06 ppm
SP-101	Spring	9/29/2013	Bcrb	395 ppm	3.06	343 ppm
SP-101	Spring	9/29/2013	T-Cats	13.02 meq/l	6.21	8.89 meq/l
SP-101	Spring	9/29/2013	T-Anis	13.14 meq/l	3.8	8.89 meq/l
SP-80	Spring	9/27/2013	SO4	182 ppm	2.32	118.84 ppm
SP-80	Spring	9/27/2013	T-Alk	323	3.09	425.94 ppm
SP-80	Spring	9/27/2013	Bcrb	283 ppm	3.47	408.73
SP-102	Spring	9/29/2013	f-cond	488 umhos/cm	3.3	674.65 umhos/cm
SP-102	Spring	9/29/2013	D-Ca	54.57 ppm	9.9	36.13 ppm
SP-102	Spring	9/29/2013	D-Mg	87.23 ppm	9.99	54.58 ppm
SP-102	Spring	9/29/2013	D-Na	69.85 ppm	6.76	43.87 ppm
SP-102	Spring	9/29/2013	Cl	8 ppm	3.07	5.51 ppm

SP-102	Spring	9/29/2013	SO4	240 ppm	9.99	87.19 ppm
SP-102	Spring	9/29/2013	T-Alk	39.2 ppm	7.25	314.29 ppm
SP-102	Spring	9/29/2013	T-Hdns	495 ppm	9.99	315 ppm
SP-102	Spring	9/29/2013	TDS	704 ppm	9.99	426.06 ppm
SP-102	Spring	9/29/2013	Bcrb	392 ppm	7.88	308.24 ppm
SP-102	Spring	9/29/2013	T-Cats	13 meq/l	9.99	8.25 meq/l
SP-102	Spring	9/29/2013	T-Anis	13.07 meq/l	5.67	8.25 meq/l
SP-8	Spring	9/27/2013	f-cond	933 umhos/cm	2.07	1,685.5 umhos/cm
SP-8	Spring	9/27/2013	D-Ca	59.53 ppm	2.32	76.22 ppm
SP-8	Spring	9/27/2013	D-Mg	61.74 ppm	3.93	140.03 ppm
SP-8	Spring	9/27/2013	D-K	1.62 ppm	3.38	4.08 ppm
SP-8	Spring	9/27/2013	D-Na	48.36 ppm	3.18	181.94 ppm
SP-8	Spring	9/27/2013	Cl	6 ppm	2.6	15.64 ppm
SP-8	Spring	9/27/2013	SO4	182 ppm	3.22	542.45 ppm
SP-8	Spring	9/27/2013	T-Alk	403 ppm	3.3	583.366 ppm
SP-8	Spring	9/27/2013	T-Hdns	403 ppm	3.85	767 ppm
SP-8	Spring	9/27/2013	TDS	560 ppm	3.6	1,328.03 ppm
SP-8	Spring	9/27/2013	Bcrb	292 ppm	2.71	578.78 ppm
SP-8	Spring	9/27/2013	T-Cats	10.19 meq/l	3.66	23.34 meq/l
SP-8	Spring	9/27/2013	T-Anis	10.43 meq/l	3.31	23.36 meq/l

Monitoring well DH 86-2 had produced elevated D-K concentrations for the 2nd and 3rd quarter of 2013 quarters. The well was frozen the 4th quarter of 2013 and could not be sampled. The D-K concentration returned to within normal values this quarter.

The following irregularities were reported at underground water monitoring point UG-1 for the quarter:

Site	Type	Date	Parameter	Value	Std. Dev.	Average
UG-1	Underground monitoring	1/31/2014	T-Alk	552 ppm	2.44	476.79 ppm
UG-1	Underground monitoring	1/31/2014	Bcrb	552 ppm	2.26	477.17 ppm
UG-1	Underground monitoring	2/27/2014	T-Alk	564 ppm	2.83	476.79 ppm
UG-1	Underground monitoring	2/27/2014	Bcrb	564 ppm	2.62	477.17 ppm

UG-1	Underground monitoring	3/31/2014	T-Alk	561 ppm	2.74	476.79 ppm
UG-1	Underground monitoring	3/31/2014	Bcrb	561	2.53	477.17 ppm

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

On page 7-36 of the approved MRP, the Permittee commits to collecting baseline samples "from each spring in the monitoring program during the low flow (fall) sampling and from each stream monitoring sites during low flow every five years beginning with the first mid-term review."

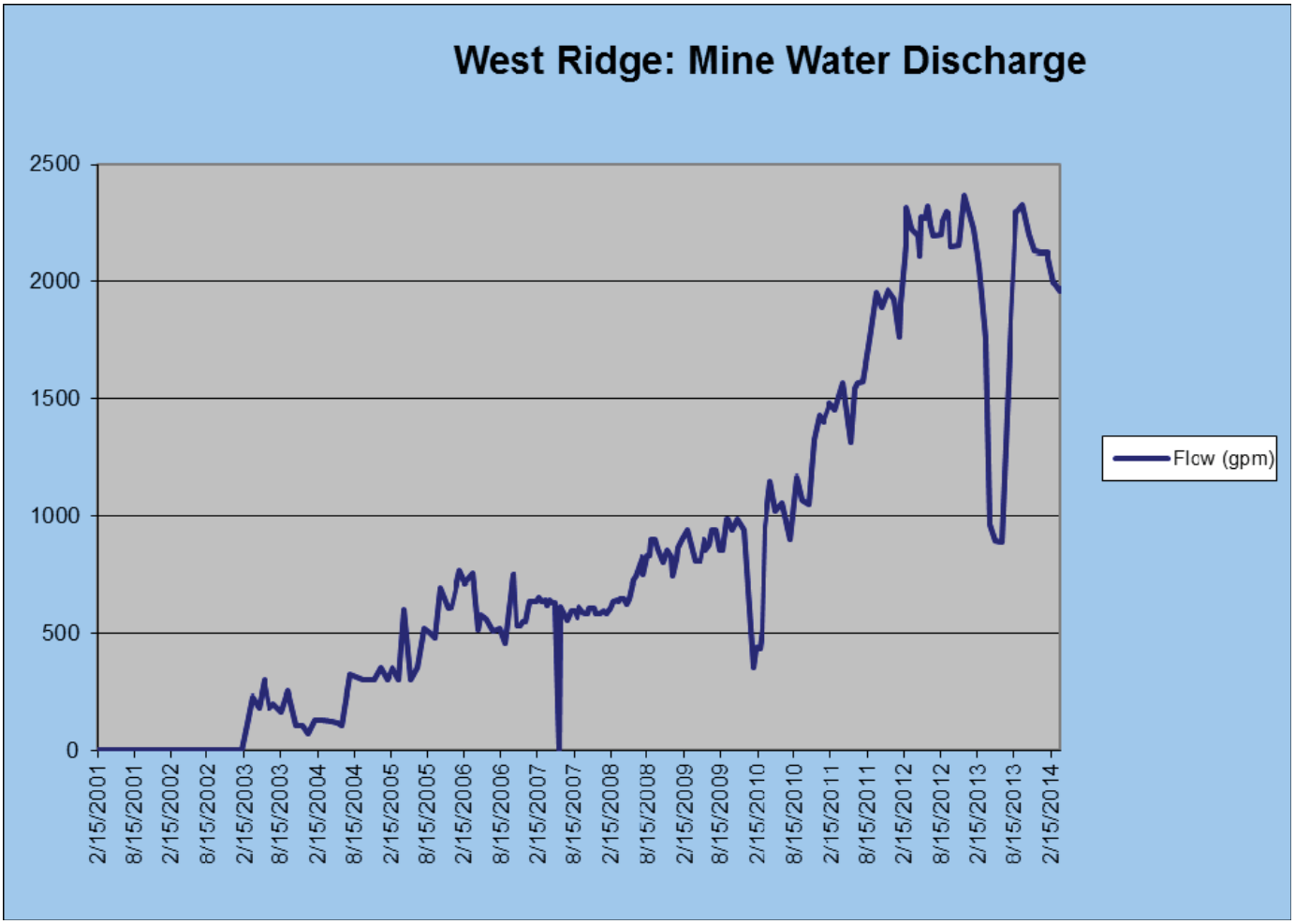
Baseline sampling of ground and surface water sites will be required during the 3rd quarter *of 2016.*

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

Continue to monitor the data irregularities cited above for any trends.

6. Does the Mine Operator need to submit more information to fulfill this quarter's monitoring requirements? YES ☐ NO ☒

7. Follow-up from last quarter, if necessary. YES ☐ NO ☒


West Ridge: Mine Water Discharge
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