

WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

November 29, 2005

TO: Internal File

THRU: D. Wayne Hedberg, Permit Supervisor *DWH*

FROM: *D* Dana Dean, P.E., Senior Reclamation Hydrologist

RE: 2005 First Quarter Water Monitoring, Canyon Fuel Company, Skyline Mine, C/007/0005, Task #2158

- 1. Was data submitted for all of the MRP required sites?** YES NO
- Identify sites not monitored and reason why, if known:*

The Permittee did not do any sampling at several sites listed in the MRP as being required during the first quarter (see Tables 2.3.7-1 and 2.3.7-2). The Permittee claims that there were typographical errors in the plan that made it confusing and that those sites are not required. The Division accepted the explanation and asked the Permittee in April of 2005 to fix the plan ASAP for future quarters, or the incorporated plan would be what the Division would have to check against for future quarters.

- 2. On what date does the MRP require a five-year resampling of baseline water data.**
See Technical Directive 004 for baseline resampling requirements. Consider the five-year baseline resubmittal when responding to question one above. Indicate if the MRP does not have such a requirement.

Resampling due date

There is no commitment in the MRP to resample for baseline parameters.

- 3. Were all required parameters reported for each site?** YES NO
- Comments, including identity of monitoring site:*

The Permittee did not sample for dissolved iron or manganese at any of the sites listed in the MRP as requiring those parameters (see Tables 2.3.7-1 and 2.3.7-2). The Permittee claims

that the dissolved iron and manganese requirements were placed into the plan in error. The Division accepted the explanation for this quarter and asked the Permittee in April of 2005 to fix the plan ASAP for future quarters, or the incorporated plan would be what the Division would have to check against for future quarters.

4. Were irregularities found in the data?

YES NO

Comments, including identity of monitoring site:

Several parameters fell outside of two standard deviations from the mean encountered at the respective sites. They were:

Site	Parameter	Value	Standard Deviations from Mean	Mean
CS-10	Chloride	17 mg/L	4.33	3.08 mg/L
CS-11	Conductivity	1602 µmhos/cm	4.29	516.51 µmhos/cm
CS-11	Dissolved Calcium	114 mg/L	2.44	76.66 mg/L
CS-11	Dissolved Sodium	186 mg/L	2.94	31.01 mg/L
CS-11	Chloride	246 mg/L	3.82	33.04 mg/L
CS-11	Total Dissolved Solids	917 mg/L	4.16	301.66 mg/L
CS-18	Dissolved Sodium	16 mg/L	9.99	3.19 mg/L
CS-18	Chloride	31 mg/L	9.99	4.64 mg/L
CS-18	Total Dissolved Solids	206 mg/L	3.99	146.9 mg/L
CS-2	Dissolved Calcium	145 mg/L	2.65	84.45 mg/l
CS-2	Total Dissolved Solids	1035 µmhos/cm	2.28	482.50 µmhos/cm
CS-2	Sulfate	456 mg/L	2.05	157.23 mg/L
CS-3	Dissolved Calcium	95.8 mg/L	2.36	73.63 mg/L
CS-3	Chloride	54 mg/L	3.14	12.11 mg/L
CS-4	Conductivity	1327 µmhos/cm	4.92	414.96 µmhos/cm
CS-4	Dissolved Sodium	179 mg/L	4.50	12.36 mg/L
CS-4	Chloride	267 mg/L	5.17	13.51 mg/L
CS-4	Total Dissolved Solids	760 mg/L	5.38	248.37 mg/L
CS-6	Dissolved Calcium	123 mg/L	3.93	75.05 mg/L
CS-6	Dissolved Magnesium	71.1 mg/L	3.08	35.52 mg/L
CS-6	Sulfate	434 mg/L	3.73	118.76 mg/L
CS-6	Total Dissolved Solids	922 mg/L	2.65	452.18 mg/L
CS-7	Turbidity	15 NTU	4.57	4.93 NTU
CS-8	Conductivity	679 µmhos/cm	3.24	321.81 µmhos/cm
CS-8	Dissolved Sodium	69.6 mg/L	9.99	7.13 mg/L
CS-8	Chloride	141 mg/L	9.99	10.29 mg/L

CS-8	Total Dissolved Solids	411 mg/L	4.51	201.13 mg/L
MC-2	Total Dissolved Solids	864 mg/L	5.04	420.60 mg/L
MC-3	Conductivity	1108 µmhos/cm	4.32	665.60 µmhos/cm
MC-3	Total Dissolved Solids	799 mg/L	4.87	413 mg/L
MC-4	Conductivity	1176 µmhos/cm	5.37	652.20 µmhos/cm
MC-4	Total Dissolved Solids	853 mg/L	5.44	408.40 mg/L
UPL-10	Dissolved Sodium	14.5 mg/L	4.05	4.87 mg/L
UPL-10	Chloride	37 mg/L	4.68	9.16 mg/L
VC-9	Dissolved Calcium	123 mg/L	2.48	78.21 mg/L
VC-9	Dissolved Magnesium	72.7 mg/L	2.36	36.97 mg/L
VC-9	Dissolved Potassium	10 mg/L	2.24	4.61 mg/L
VC-9	Sulfate	437 mg/L	3.58	120.88 mg/L
S13-2	pH	8.35 pH units	2.22	7.36 pH units
S15-3	Dissolved Sodium	24.2 mg/L	2.56	5.66 mg/L
S15-3	Chloride	47 mg/L	9.99	4.53 mg/L
S17-2	pH	7.96	2.39	7.17
S17-2	Turbidity	6 NTU	2.57	2.69 NTU
S22-5	Chloride	159 mg/L	2.57	41.95 mg/L
S22-5	Total Dissolved Solids	544 mg/L	3.02	296.44 mg/L
S35-8	Total Dissolved Solids	322 mg/L	2.31	246.54 mg/L
WQ3-6	Turbidity	14 NTU	3.46	5.42 NTU
WQ4-12	Total Suspended Solids	80 mg/L	9.99	17.20 mg/L
MD-1	Conductivity	1423 µmhos/cm	3.89	803.80 µmhos/cm
MD-1	Total Dissolved Solids	1055 mg/L	3.60	525.88 mg/L

The chloride at CS-10 actually has a slight downward trend, with only 6 of 50 samples above 5 mg/L. The chloride level is trending upward to differing degrees at each of the other sites. There is no real correlation to flow at CS-4, 8, 10, 18, or S15-3; but there is some correlation to flow (mostly negative) at CS-3, CS-11, UPL-10, and S22-5. The Permittee indicated that the increased chloride levels in November were most likely due to highway salting, which is possible, though some of the highest values occurred in the second and third quarters, when salting is infrequent. The drinking water criterion for chloride is 250 mg/L. The criteria for protection of aquatic life are 600 mg/L for short-term exposure, and 1200 mg/L for long-term exposure. The levels of chloride recorded at all but CS-11 and 4 are well below any of these levels. At CS-11 the chloride level has been above 250 mg/L 3 times (out of 89 samples), all in the fourth quarter; and above 100 a total of just 8 times, all in the third and fourth quarters. At CS-4 the chloride level has been above 250 mg/L just twice out of 87 samples, both in the fourth quarter. Those are the only two times it has even been above 100 mg/L. Regardless of the origin of the higher chloride values, they are not of concern at this time.

The high TDS and specific conductance values at many of the sites listed (CS-2, CS-6,

MC-2, MC-3, MC-4, and MD-1) are due to high mine-water discharge rates, including approximately 2,500 gpm from the sealed southwestern portion of Mine #1. The mine expects to pump approximately this same volume for the foreseeable future, and has entered into a salinity-offset program with the DWQ as described below, under "Were there irregularities in the DMR data?" At the other sites it is quite possible that the higher TDS is from road salting/sanding, since they are all located quite close to the highway. The TDS at each of those sites also has a negative correlation to flow.

The dissolved calcium has a slight upward trend at CS-11 ($R^2 = 0.37$), but the trend lines at the other sites are almost flat (all $R^2 < 0.025$). There is a slight negative correlation to flow at these sites. There are no criteria for this metal, but it does contribute to water hardness. The Permittee has not sampled for hardness at these sites since 1996, so the Division had to use calculated hardness for subsequent samples. The hardness at these sites has always fallen into the hard (150-300 mg/l) to very hard (>300 mg/l) classifications. It is not completely clear why the calcium level has been increasing (it is possible that it was highway salting as the Permittee indicated), but this does not represent a degradation of water quality.

There is a slight upward trend in dissolved sodium at each of the listed sites, except S15-3, where the trend is slightly downward. There is no strong correlation to flow. There is no water quality standard for sodium, but it does affect water hardness (making it "soft"), and water with more sodium than calcium + magnesium can negatively affect plant growth. This condition has never occurred (so far) at S15-3, UP&L 10, or CS-18. At CS-11 it has happened just 3 times (10/96, 11/03, and 11/04). It has happened at CS-4 just 2 times (11/03, and 11/04), and just once at CS-8 (11/04). Since this has occurred so seldom among so many samples (6 of 204), and it is likely that it was highway salting as the Permittee indicated, this is not a concern at this time.

There is a slight upward trend in sulfate at each of the listed sites, but no strong correlations to flow. The pH at each site has stayed within acceptable values (6.72-8.84). Sulfate is not toxic to plants or animals (even at very high concentrations), but has a laxative effect on humans in concentrations over 500 mg/L. For this reason, the EPA has set the secondary standard as 250 mg/L. There have been relatively few measurements over 250 mg/L at these sites (25 of 108 at CS-2, 12 of 123 at CS-6, and 15 of 130 at VC-9), and they have not necessarily been in consecutive samples.

There is a slight upward trend in dissolved magnesium at CS-6 and VC-9, but no strong correlations to flow. There is a slight negative correlation to flow at these sites. There are no criteria for this metal, but it does contribute to water hardness. The Permittee has not sampled for hardness at these sites since 1996, so the Division had to use calculated hardness for subsequent samples. The hardness at these sites has always fallen into the hard (150-300 mg/l) to very hard (>300 mg/l) classifications. It is not completely clear why the magnesium level has been increasing (it is possible that it was highway salting as the Permittee indicated), but this does not represent a degradation of water quality.

There are no real trends in turbidity at the listed sites, and the turbidity does not correlate to flow. The turbidity was high at CS-7 because snowmelt runoff was carrying sediment into the stream at that point. It is not clear why the turbidity was high at S17-2 and WQ3-6 this quarter. The total suspended solids at each site were below 15 mg/L.

The dissolved potassium at VC-9 has an upward trend, but there are no standards for this metal, and 10 mg/L is still a very low number.

The pH has a slight upward trend at S13-2 and S17-2 ($R^2=0.10$ and 0.22), but even the most extreme values recorded at these sites are within acceptable values even for fisheries.

The total suspended solids at WQ4-12 have an upward trend with a fairly strong negative correlation to flow. The number of samples at this site is quite small (9), and this site is not near any underground mining or surface disturbed area, so the value is not of concern at this time.

Several routine Reliability Checks were outside of standard values. They were:

Site	Reliability Check	Value Should Be...	Value is...
CS-1	K/(Na + K)	< 20%	28%
CS-10	K/(Na + K)	< 20%	26%
CS-10	Na/(Na + Cl)	> 50%	12%
CS-16	K/(Na + K)	< 20%	27%
CS-17	K/(Na + K)	< 20%	23%
CS-18	Na/(Na + Cl)	> 50%	44%
CS-20	TDS/Conductivity	>0.55 & <0.75	0.76
CS-20	K/(Na + K)	< 20%	23%
CS-3	Na/(Na + Cl)	> 50%	18%
CS-6	Mg/(Ca + Mg)	< 40 %	49%
CS-6	Ca/ (Ca + SO4)	> 50 %	40%
CS-7	K/(Na + K)	< 20%	42%
CS-8	Na/(Na + Cl)	> 50%	43%
F-10	TDS/Conductivity	>0.55 & <0.75	0.79
F-10	K/(Na + K)	< 20%	23%
UPL-10	Na/(Na + Cl)	> 50%	38%
VC-10	K/(Na + K)	< 20%	26%
VC-6	Mg/(Ca + Mg)	< 40 %	47%
VC-6	Ca/ (Ca + SO4)	> 50 %	43%
VC-9	TDS/Conductivity	>0.55 & <0.75	0.76
VC-9	Mg/(Ca + Mg)	< 40 %	50%
VC-9	Ca/ (Ca + SO4)	> 50 %	40%
92-91-03	TDS/Conductivity	>0.55 & <0.75	0.82
92-91-03	Conductivity/Cation s	> 90 & < 110	76

92-91-03	K/(Na + K)	< 20%	21%
S15-3	Na/(Na + Cl)	> 50%	44%
S17-2	Na/(Na + Cl)	> 50%	44%
S22-5	TDS/Conductivity	>0.55 & <0.75	0.80
S22-5	Na/(Na + Cl)	> 50%	22%
S24-12	TDS/Conductivity	>0.55 & <0.75	0.87
S24-12	K/(Na + K)	< 20%	28%
S34-12	K/(Na + K)	< 20%	22%
S35-8	TDS/Conductivity	>0.55 & <0.75	0.77
S35-8	K/(Na + K)	< 20%	30%
WQ3-26	TDS/Conductivity	>0.55 & <0.75	0.78
WQ3-26	K/(Na + K)	< 20%	23%
WQ4-12	K/(Na + K)	< 20%	28%
S24-1	Mg/(Ca + Mg)	< 40 %	43%
CS-14	Mg/(Ca + Mg)	< 40 %	48%
CS-14	Ca/ (Ca + SO4)	> 50 %	42%
CS-2	TDS/Conductivity	>0.55 & <0.75	0.76
CS-2	Mg/(Ca + Mg)	< 40 %	47%
CS-2	Ca/ (Ca + SO4)	> 50 %	43%

These inconsistencies do not necessarily mean that a sample is wrong, but it does indicate that something is unusual. An analysis and explanation of the inconsistencies by the Permittee would help to increase the Division's confidence in the samples. The Permittee should work with the lab to make sure that samples pass all quality checks so that the reliability of the samples does not come into question. The Permittee can learn more about these reliability checks and some of the geological and other factors that could influence them by reading Chapter 4 of *Water Quality Data: Analysis and Interpretation* by Arthur W. Hounslow.

5. Were DMR forms submitted for all required sites?

1st month, YES NO
 2nd month, YES NO
 3rd month, YES NO

6. Were all required DMR parameters reported?

YES NO

Comments, including identity of monitoring site:

7. Were irregularities found in the DMR data?

YES NO

Comments, including identity of monitoring site:

Because the Permittee had to increase mine discharge to keep up with inflows, the total dissolved solids (TDS) began to exceed the UPDES permit limit of 7.1 tons per day (tpd) in September. However, the discharge continued to comply with the 1310 mg/L limit for TDS.

Canyon Fuel worked closely with DWQ to remedy the situation, and after much study and effort, DWQ modified the Skyline Mine UPDES permit in May of 2003 to remove the 7.1 ton per day limit for TDS, unless the 30-day average were to exceed 500 mg/l.

The Utah Division of Water Quality (DWQ) issued the current permit on Nov. 23, 2004, it allows for a daily maximum of total dissolved solids discharged (TDS) of 1310 mg/l and a 30-day average of 500 mg/l. There is no tons per day (tpd) daily maximum, unless the 30-day average exceeds 500 mg/l; then a 7.1-tpd limit is imposed. The permit also states:

Upon determination by the Executive Secretary that the permittee is not able to meet the 500 mg/L 30-day average or the 7.1 tons per day loading limit, the permittee is required to participate in and/or fund a salinity offset project to include TDS offset credits, within six (6) months of the effective date of this permit.

In September of 2004, Skyline's mine discharge began averaging 850-950 mg/l TDS, and due to volume of water pumped (approx 3500 gpm) they routinely exceed the tons per day limit. Because the conditions at the mine will require such pumping for quite some time, Canyon Fuel Company prepared a salinity offset plan and submitted it as required to DWQ. The Division of Water Quality approved the plan on January 5, 2005, but is retroactive to September 2004. Canyon Fuel Company is in compliance with the salinity offset program.

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

No further actions are required at this time.