C/015/032 Incoming

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SECRETARY, BOARD OF
OIL, GAS & MINING

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BEFORE THE BOARD OF OIL, GAS, AND MINING

STATE OF UTAH

IN THE MATTER OF THE PETITION OF GENWAL RESOURCES, INC., FOR REVIEW OF DIVISION ORDER 10-A	**SUBMISSION OF UPDATED HYDROLOGIC REPORT DATED JANUARY 9, 2017** Docket No. 2010-026 Cause No. C/015/0032

Genwal Resources, Inc. by and through its counsel of record hereby submits the Crandall Canyon Mine Hydrologic Update Report dated January 9, 2017, prepared by Petersen Hydrologic, attached as Exhibit A.

RESPECTFULLY SUBMITTED this 10th day of January, 2017.

BY: [signature]
ATTORNEYS FOR GENWAL RESOURCES, INC.
Denise A. Dragoo

25518240

CERTIFICATE OF SERVICE

I hereby certify that the original of the foregoing **SUBMISSION OF UPDATED HYDROLOGIC REPORT DATED JANUARY 9, 2017** was hand delivered to the Board of Oil, Gas and Mining and a true and correct copy was e-mailed on January 10, 2017, to the following:

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EXHIBIT A

PETERSEN HYDROLOGIC

9 January 2017

Ms. Denise Dragoo
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Denise,

At your request, we have evaluated recent total iron concentrations in the Genwal Resources, Inc. Crandall Canyon Mine discharge water for the six-month period from July 2016 through December 2016. The findings of our evaluation are presented in this letter report. The reader is referred to our previous report entitled *Investigation of Iron Concentrations in the Genwal Resources, Inc. Crandall Canyon Mine Discharge Water*, dated 7 November 2011, and also to our 10 January 2013, 11 July 2013, 16 December 2013, 9 June 2014, 15 January 2015, 9 July 2015, 7 January 2016, and 7 July 2016 update reports for additional supporting information in this regard.

Results of UPDES Monitoring Activities

Total and dissolved iron concentrations measured in both the untreated (PRE-002) and treated (UPDES 002) Crandall Canyon Mine discharge waters are presented in Table 1. Plots of total iron concentrations in Crandall Canyon Mine discharge waters through December 2016 are presented in Figure 1. A plot of monthly average total iron concentrations in untreated mine discharge water is presented in Figure 2. A plot of dissolved iron concentrations in untreated Crandall Canyon Mine discharge waters is presented in Figure 3. Sulfate concentrations in the untreated mine discharge water are

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plotted in Figure 4. Yearly average mine-water discharge rates at the Crandall Canyon Mine are plotted in Figure 5. A plot of the annual average pounds per day of iron produced from the Crandall Canyon Mine discharge water is presented in Figure 6. A plot of TDS concentrations in the Crandall Canyon Mine discharge water is presented in Figure 7. As specified in the Mining and Reclamation Plan for the Crandall Canyon Mine, the results of all required monitoring parameters have been regularly provided to the Utah Division of Oil, Gas and Mining. Historical UPDES discharge monitoring data are available from the Division of Oil, Gas and Mining on-line coal water quality database at: http://linux3.ogm.utah.gov/WebStuff/wwwroot/wqdb.html

Total Iron Concentration Trends

During the period from July 2016 through December 2016 the total iron concentrations in the mine discharge water were low (Table 1). Total iron concentrations of untreated mine discharge waters were below the 1.24 mg/L UPDES limit for five of the six months of the period. The average total iron concentration of all samples of untreated mine discharge water collected during the period was 1.04 mg/L. Since December 2015, the maximum monthly total iron concentrations have been below the 1.24 mg/L UPDES limit for 11 of those 13 months. The total iron concentration of all samples of untreated mine discharge water sampled during 2016 was 1.10 mg/L. It is noted that a total iron concentration of 1.33 mg/L was measured during the December 2016 monitoring event. Such total iron spikes have been observed periodically in the historic data, and these historic spikes have not been indicative of future total iron trends in the mine discharge water (Figure 1).

As noted in our previous reports, the underground mine iron geochemical regime is reactant limited. Therefore, over time, declines in total iron concentrations in the mine discharge water (such as have been observed) are anticipated. The observed behavior of the iron geochemistry in the untreated Crandall Canyon Mine discharge water (i.e. declining total and dissolved iron concentrations over time) are supportive of the correctness of the geochemical model we presented to the Division of Oil, Gas and Mining in February, 2010.

A plot of the annual average daily total iron production from the Crandall Canyon Mine discharge water is provided in Figure 6. The average daily iron production rate is calculated using the yearly average mine water discharge rate and the yearly average total iron concentration of the mine discharge water. From this information, the average amount of total iron that is produced daily in the mine discharge water has been calculated for each of the past seven years. It should be noted that the iron produced from the mine is removed from the water at the treatment facility and it is not discharged in appreciable quantities to Crandall Creek. It is apparent in Figure 6 that the iron production rate has decreased steadily from 2010 through 2016. The average daily iron production from the mine during 2016 (3.70 pounds per day) is 5.8 times less than the amount produced in 2010 (21.6 pounds per day). The total iron production during 2016 decreased by about 29 percent relative to the previous year 2015, which is reflective of the continuing decrease in the mass of iron coming from the Crandall Canyon Mine.

It is noteworthy that, because of both the decreasing total iron concentrations and the decreasing mine-water discharge rates at the Crandall Canyon Mine, the average iron production during 2013, 2014, 2015, and 2016 was less than that calculated for a UPDES compliant discharge of 1.24 mg/L at a mine-water discharge rate of 477 gpm (the average discharge rate for year the UPDES permit was issued). What this means is that if the average Crandall Canyon Mine discharge water during this most recent 4-year period had been allowed to flow untreated into Crandall Canyon Creek, the total iron loading to the creek would have been less than the amount allowed under the UPDES permit stipulation calculations at the time the UPDES permit was issued (i.e. a UPDES compliant water at 2011 mine water discharge rates).

It is apparent in Figure 1 that the magnitudes of the periodic upward spikes in the total iron concentration data since late 2009 have generally trended downward as the base condition, non-spike data has also trended downward. This observation is consistent with a declining supply of available iron in the flooded underground mine environment and a gradual sweeping of the residual iron hydroxide particulates from the underground workings over time (i.e. the flow of water through the mine is gradually cleaning out the system).

Other Chemical Trends

During the period from January 2016 through December 2016 dissolved iron concentrations in the Crandall Canyon Mine pre-treatment water were mostly low (below the lower laboratory detection limit of 0.03 mg/L – see Table 1; Figure 3). It is noted that there were two spikes in the dissolved iron concentration during the first half of 2016 (0.45 mg/L during April and 0.29 mg/L during June). Such upward spikes in the dissolved iron concentrations in the mine discharge have been measured periodically over the discharge history of the mine (Figure 3). The fact that the dissolved iron value measured during April (the month between these two monitoring events) was below the 0.03 mg/L laboratory detection limit suggests that the dissolved iron spikes measured in April and June were not indicative of a major change in the overall mine geochemical environment. During December of 2016 a dissolved iron concentration of 0.23 mg/L was measured in the untreated mine discharge water. It is notable that the dissolved iron concentrations measured in the three previous monitoring months (September, October, and November 2016) were below the laboratory detection limit of 0.03 mg/L. We suspect that the intermittent, shot-term spike values in dissolved iron are not reflective of major changes in the overall underground mine geochemistry. Future trends in dissolved iron concentrations in the Crandall Canyon Mine discharge water will continue to be monitored to verify this conclusion.

As shown on Figure 4, sulfate concentrations measured in the pre-treatment mine discharge water during this evaluation period were low. The declines in sulfate concentrations observed since 2011 are consistent with decreasing levels of pyrite oxidation in the underground mine environment.

As shown on Figure 7, total dissolved solids (TDS) concentrations of the Crandall Canyon Mine discharge water have declined markedly since the initial onset of gravity discharge from the mine in late 2007/early 2008. TDS concentrations spiked sharply with the onset of gravity discharge from the mine, likely in response to increased rates of chemical reactions with minerals in the mine environment that were brought into contact with mine waters in newly flooded portions of the mine (including iron-producing pyrite mineral oxidation and related cascading reactions). As reactants were consumed and the reaction products were flushed from the mine by the flowing mine waters, TDS concentrations declined markedly (Figure 7). Recent TDS concentrations are now equal to or lower than those observed in the mine discharge waters during operational conditions immediately prior to the mine collapse event of August 2007 and the cessation of mine water pumping in September 2007. The plot of declining TDS concentrations in Figure 7 shows that the chemical quality of the water emerging from the mine has improved in an orderly manner over time (i.e. a well-defined exponential decay curve). This observation provides support to the reactant-limited geochemical model presented previously to the Board, which predicts declines in total iron concentrations.

Mine Water Discharge Rates

An updated plot of average yearly mine water discharge rates from the Crandall Canyon Mine is presented as a bar graph in Figure 5. It is apparent from Figure 5 that, after peaking at 1,016 gpm in 2001, the rate of mine water discharge from the Crandall Canyon Mine has been gradually decreasing. The average mine-water discharge rate for 2016 (275 gpm) was the lowest of the previous 15 years since the mine water discharge rate exceeded 1,000 gpm during 2001. The effects of climatic variability are not apparent in the plot.

Operations at the Crandall Canyon Mine Iron Treatment Facility

The Crandall Canyon Mine iron treatment facility operated throughout 2016. The mine-water treatment has been successful at reducing total iron concentrations to levels below the 1.24 mg/L limit of the mine's UPDES discharge permit (see Table 1 and Figure 1). Total iron concentrations in the UPDES 002 discharge water (post-treatment) averaged 0.19 mg/L during 2016.

Future Total Iron Declines

Total iron concentrations in the untreated Crandall Canyon Mine discharge water were in compliance with the UPDES permit limitations during 11 of the most recent 13 months (Table 1). The magnitudes of the periodic upward spikes in total iron concentrations have continued to decline (Figure 1).

The information presented in this update continues to support our conclusions that the observed decreasing trends in total iron concentrations are likely a result of 1) the decreasing rate of production of aqueous dissolved iron from pyrite oxidation reactions in the underground mine environment as chemical reactants are consumed, and 2) the gradual flushing of solid iron hydroxide particulate matter from the mine which is transported away from source areas by the current in actively flushing portions of the mine. It is anticipated that continuing declines in total iron concentrations in the mine discharge will occur in the future by these same mechanisms.

Based on extrapolation of historical long-term trends in the total iron concentrations and the reactant-limited geochemical model of the geochemical environment, it is considered likely that total iron concentrations will remain low in the mine discharge water over the long term.

It is noted that while the total iron concentrations during the previous thirteen months were usually in compliance with the UPDES limit for total iron, there has historically been some temporal variability (upward and downward fluctuations) in total iron concentrations in the mine discharge water over time (Figure 1; Table 1). It is important to note that the magnitudes of upward spikes in the total iron concentrations have become increasingly smaller as the overall concentration has also trended downward (Figure 1). It is considered likely that there will continue to be some fluctuations and bounces in the total iron concentrations in the untreated mine discharge water in future months as the overall concentrations continue to decline. However, as the total iron concentrations continue to decline and the concentration spikes continue to decrease in magnitude, the total iron concentrations will likely remain consistently below the 1.24 mg/L total iron concentration in the near future. This conclusion is supported by the observation that the most recent upward spike in total iron concentration (1.33 mg/L in December 2016), while representing a notable increase in concentration relative to concentrations measured in the several previous months, is only 0.09 mg/L greater than the actual UPDES limit of 1.24 mg/L. In other words, the difference between the average and "spike" concentrations should soon be smaller than the difference between the long-term average total iron concentrations and the 1.24 mg/L UPDES limit for total iron assuming that recent concentration trends continue as anticipated. Under such conditions, the total iron concentrations under both the average and "spike" conditions will likely remain below the UPDES limit, resulting in continuous or nearly continuous compliance with UPDES standards in the untreated mine discharge water in the near future.

We recommend that monitoring of total iron concentrations in the mine discharge water be continued to evaluate future concentration trends and to verify that future concentrations remain low.

Conclusions

Total iron concentrations in the untreated Crandall Canyon Mine discharge water during the January 2016 – June 2016 evaluation period were low. During the period, total iron concentrations measured during five of the six months in the Crandall Canyon Mine untreated discharge water were below the 1.24 mg/L UPDES permit limits for total iron. Total iron concentrations in the untreated discharge water during 11 of the previous 13 months (December 2015 – December 2016) were in compliance with UPDES permit limits for total iron.

The observed chemical compositions and the documented temporal variability in the geochemistry of the mine discharge water are consistent with the hydrogeochemical - hydrogeologic model that describes the source and fate of the total iron in the Crandall Canyon Mine discharge water that we presented in February of 2010.

As stated in our previous reports and testimony before the Board, it remains my professional opinion that perpetual discharge of mine water containing elevated total iron concentrations at the Crandall Canyon Mine will not occur. Rather, continuing future declines from current levels are anticipated to occur in the future. This conclusion is supported by the combined evidence of the essential absence of a dissolved iron component (noting the one dissolved iron spike that was observed during the most recent 6-month period), the continuing decline/stabilization of sulfate and TDS concentrations in the water, the declining total iron production from the mine, and the previously discussed general absence of elevated total iron concentrations in gravity discharges of mine water from other coal mines in the region.

Genwal Resources, Inc. currently has a three-year bond in place for the future operation of the Crandall Canyon Mine treatment facility. In my professional opinion, there is a very high probability that the total iron concentration in the untreated Crandall Canyon Mine discharge water will decline to levels consistently below the 1.24 mg/L UPDES

limit within this three-year period. (Note that for the previous 13 month period, the total iron concentrations were below the 1.24 mg/L UPDES limit for 11 of those months).

To verify this conclusion, Genwal Resources, Inc. will continue to collect and analyze hydrologic data relating to the Crandall Canyon Mine discharge as required.

Please feel free to contact me should you have any questions in this regard.

Sincerely,

Erik C. Petersen, P.G.
Principal Hydrogeologist
Utah PG #5373615-2250

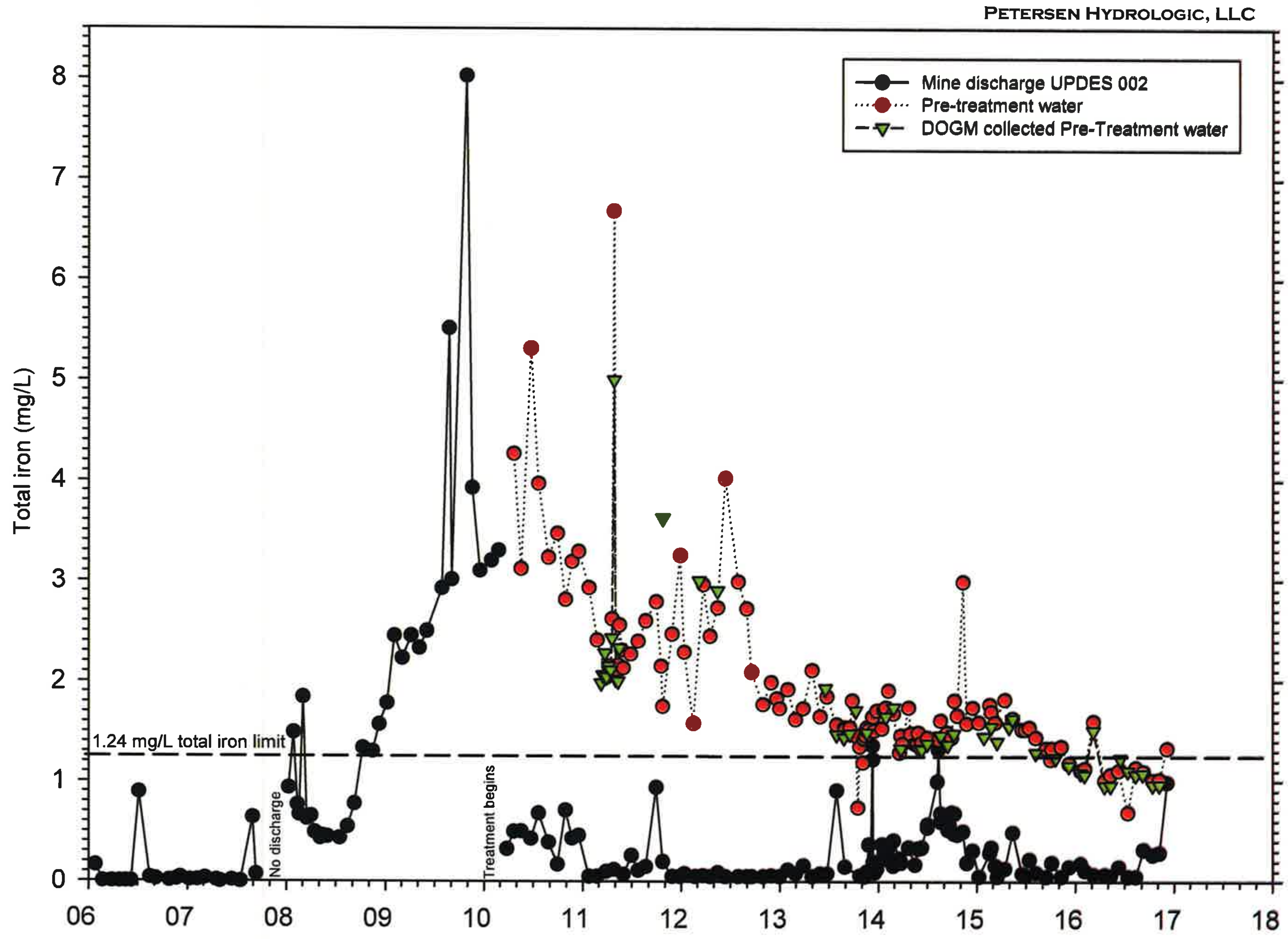


Figure 1 Plots of total iron concentrations in Crandall Canyon Mine discharge water and treated mine discharge water.

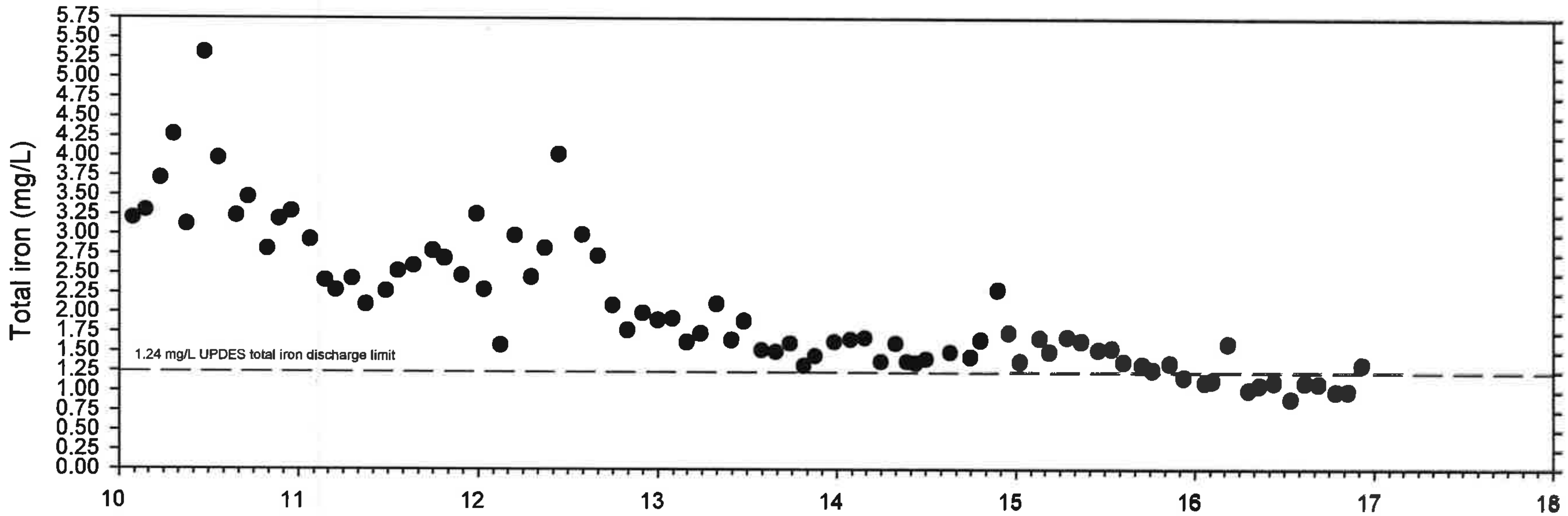
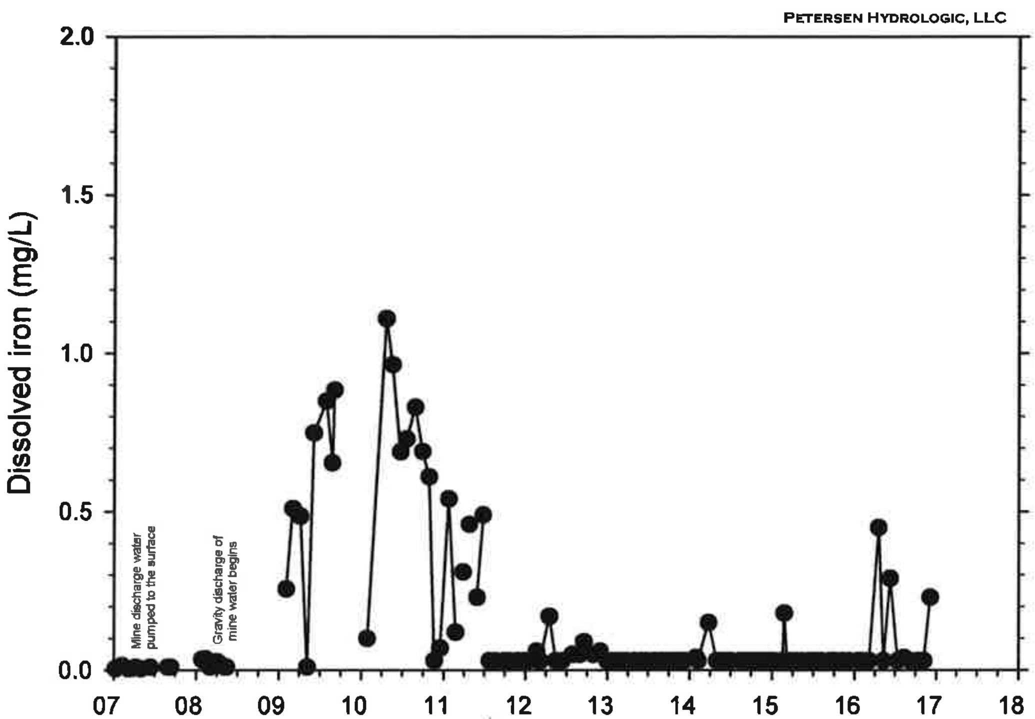


Figure 2 Plot of untreated Crandall Canyon Mine discharge water total iron concentrations (monthly averages) at PRE-002.



Note: The lower laboratory detection limits (plotted on this graph when "less than" results are reported by the analytical laboratory) have varied over time.

Figure 3 Dissolved iron concentrations in Crandall Canyon Mine pre-treatment discharge water, 2007-2016.

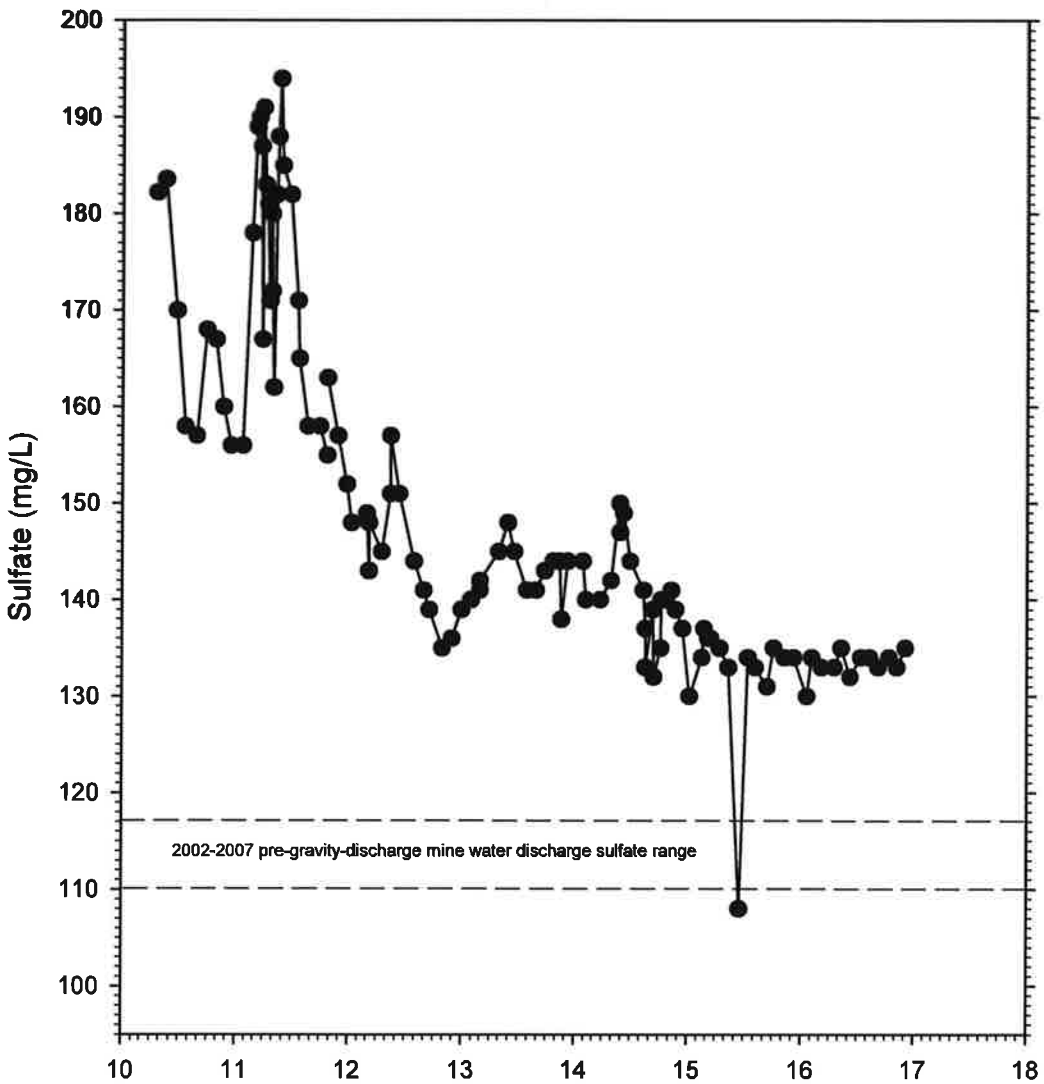
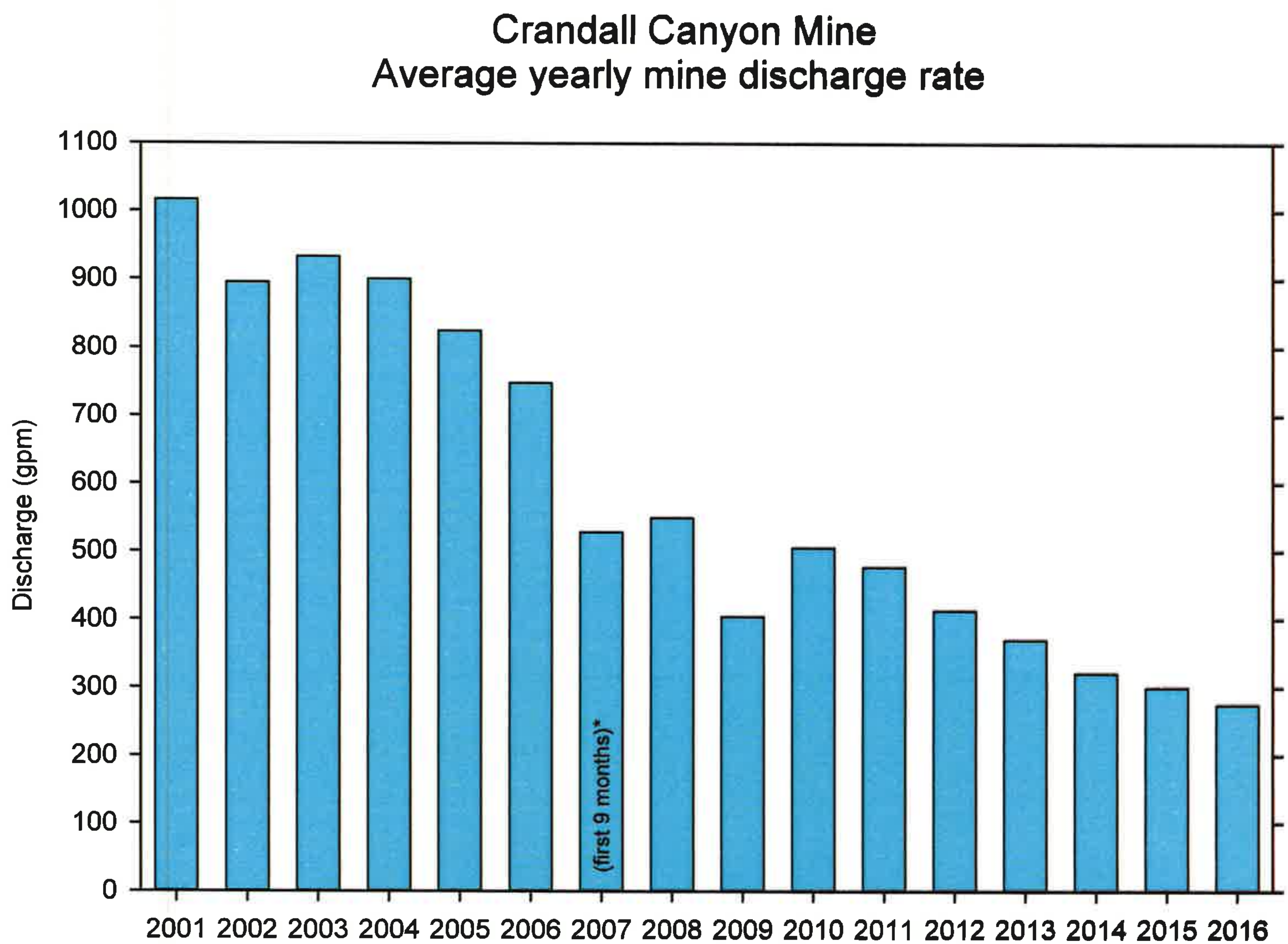


Figure 4 Sulfate concentrations in the Crandall Canyon Mine discharge water (site Pre-002).



*The average discharge rate for the first 9 months of 2007 is plotted because during the last 3 months of 2007 the mine pumps had been shut off but gravity discharge of mine water to the surface had not yet occurred.

Figure 5 Average yearly mine water discharge rates for the Crandall Canyon Mine.

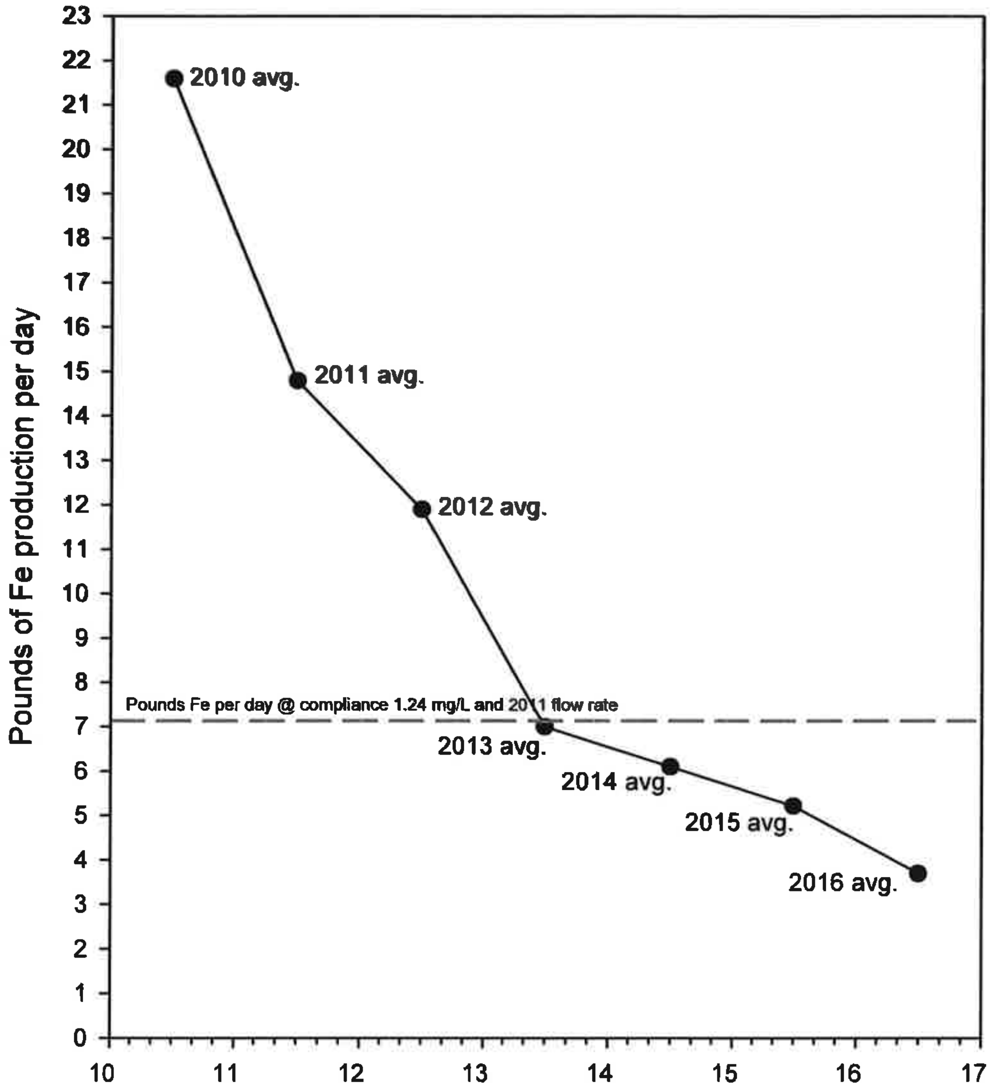


Figure 6 Daily quantity of iron produced by the Crandall Canyon Mine discharge water (calculated from annual average total iron concentration and average annual mine water discharge rate).

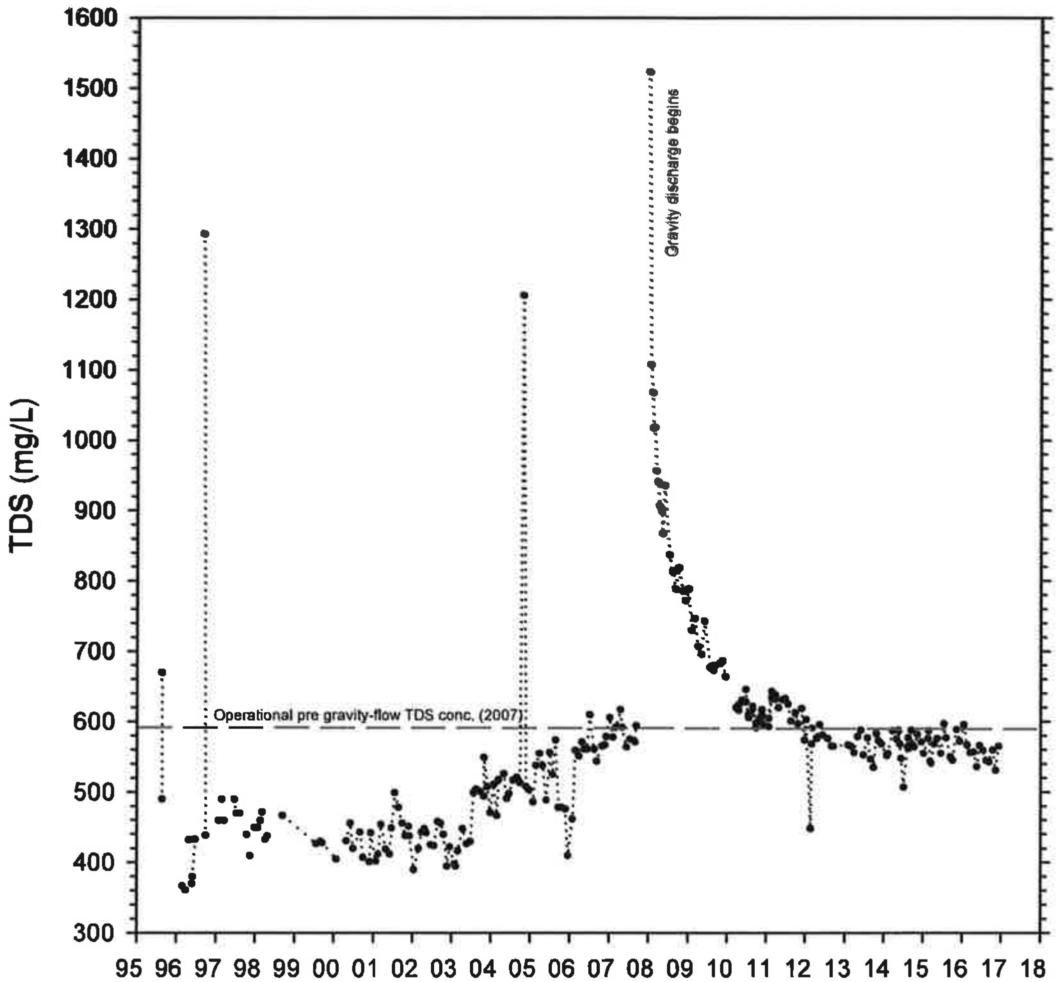


Figure 7 TDS concentrations of Crandall Canyon Mine discharge water.

Table 1 Total iron, dissolved iron, and sulfate concentrations in Crandall Canyon Mine discharge water

UPDES 002
treated mine water discharged to Crandall Creek

	Fe (total) mg/L	Fe (dissolved) mg/L
1/14/2014	0.37	—
1/22/2014	0.29	—
1/28/2014	0.23	<0.03
1/18/2014*	0.21	—
2/7/2014	0.34	<0.03
2/24/2014	0.16	—
2/26/2014	0.41	—
2/26/2014*	0.40	—
3/20/2014	0.23	—
3/25/2014	0.19	<0.03
3/25/2014*	0.17	—
4/30/2014	0.15	<0.03
4/23/2014	0.34	—
5/16/2014	0.17	—
5/28/2014*	0.33	—
6/10/2014	0.34	<0.03
6/10/2014*	0.34	—
7/1/2014	0.57	—
7/1/2014*	0.54	<0.03
8/7/2014	1.00	—
8/11/2014	1.32	<0.03
8/19/2014	0.68	<0.03
8/19/2014*	0.60	—
9/12/2014	0.61	<0.03
9/15/2014*	0.52	—
9/29/2014	0.69	—
10/7/2014*	0.48	—
10/9/2014	0.68	<0.03
10/20/2014	0.47	<0.03
11/10/2014	0.50	<0.03
11/24/2014	0.19	<0.03
12/16/2014	0.31	<0.03
1/8/2015	<0.05	0.12
1/27/2015*	0.28	—
2/17/2015	0.29	<0.03
2/23/2015	0.34	—
2/23/2015*	0.32	—
3/9/2015	0.16	—
3/17/2015	<0.05	<0.03
3/17/2015*	0.28	—
4/14/2015	0.13	<0.03
4/30/2015*	0.29	—
5/13/2015	0.49	<0.03
5/13/2015*	0.33	—
6/17/2015	0.08	<0.03
6/29/2015	0.06	—
7/14/2015	0.22	<0.03
8/7/2015	0.09	<0.03
8/7/2015*	0.12	—
9/14/2015	<0.05	<0.05
10/5/2015	0.19	<0.03
10/20/2015*	0.05	—
11/19/2015	<0.05	<0.03
12/8/2015	0.15	—
12/8/2015*	0.16	—
1/20/2016	0.18	<0.03
1/20/2016*	0.18	—
2/4/2016	0.11	<0.03
2/4/2016*	0.12	—
3/7/2016	0.07	<0.03
3/7/2016*	0.07	—
4/18/2016	0.07	<0.03
4/18/2016*	0.06	—
5/10/2016	0.06	<0.03
5/10/2016*	0.21	—
6/9/2016	0.15	<0.03
6/15/2016*	0.15	—
7/13/2016	<0.05	<0.03
7/13/2016*	<0.02	—
8/11/2016	<0.05	<0.03
8/11/2016*	<0.02	—
9/8/2016*	0.40	—
9/8/2016	0.32	<0.03
10/13/2016	0.27	<0.03
10/13/2016*	0.23	—
11/7/2016	0.29	<0.03
11/7/2016*	0.24	—
12/5/2016	0.99	<0.03

PRE-002
untreated mine discharge water

	Fe (total) mg/L	Fe (dissolved) mg/L	Sulfate mg/L
12/17/2013	1.51	—	—
12/26/2013	1.71	—	—
1/14/2014	1.53	—	—
1/22/2014	1.72	—	—
1/28/2014	1.74	0.04	144
1/28/2014*	1.65	—	—
2/7/2014	1.91	<0.03	140
2/26/2014	1.68	—	—
2/26/2014*	1.74	—	—
3/20/2014	1.29	—	—
3/25/2014	1.46	0.15	140
3/31/2014	1.38	—	—
4/23/2014	1.74	—	—
4/30/2014	1.48	<0.03	142
5/16/2014	1.38	—	—
5/23/2014	1.37	—	—
5/28/2014*	1.33	-	150
5/29/2014	1.49	<0.03	147
6/10/2014	1.39	<0.03	149
6/10/2014*	1.32	—	149
7/1/2014	1.44	<0.03	144
7/1/2014*	1.36	—	-
8/13/2014	1.42	<0.03	141
8/19/2014	1.61	<0.03	137
8/19/2014*	1.46	—	133
9/12/2014	1.49	<0.03	139
9/15/2014*	1.37	—	132
9/29/2014	1.44	—	-
10/7/2014*	1.48	—	135
10/9/2014	1.81	<0.03	140
10/20/2014	1.66	<0.03	140
11/10/2014	2.99	<0.03	141
11/24/2014	1.58	0.03	139
12/16/2014	1.74	<0.03	137
1/8/2015	1.59	<0.03	130
1/27/2015*	1.45	—	—
2/17/2015	1.77	<0.03	134
2/23/2015	1.70	0.18	137
2/23/2015*	1.55	—	—
3/9/2015	1.59	<0.03	136
3/17/15*	1.40	—	—
4/14/2015	1.82	<0.03	135
4/30/2015*	1.55	—	—
5/13/2015	1.63	<0.03	133
5/13/2015*	1.63	—	—
6/17/2015	1.52	<0.03	108
6/29/2015	1.52	—	—
7/14/2015	1.54	<0.03	134
8/7/2015	1.44	<0.03	133
8/7/2015*	1.29	—	—
9/14/2015	1.33	<0.03	131
10/1/2015	1.22	—	—
10/5/2015	1.33	<0.03	135
10/20/2015*	1.24	—	—
11/9/2015	1.45	<0.03	134
12/8/2015	1.18	<0.03	134
12/8/2015*	1.16	—	—
1/20/2016	1.11	<0.03	130
120/2016*	1.09	—	—
2/4/2016	1.13	<0.03	134
2/4/2016*	1.07	—	—
3/7/2016	1.60	<0.03	133
3/7/2016*	1.51	—	—
4/18/2016	1.01	0.45	133
4/18/2016*	0.961	—	—
5/10/2016	1.07	<0.03	135
5/10/2016*	0.963	—	—
6/9/2016	1.11	0.29	132
6/15/201*	1.23	—	—
7/13/2016	0.69	<0.03	134
7/13/2016*	1.11	—	—
8/11/2016	1.14	0.04	134
8/11/2016*	1.07	—	—
9/8/2016*	1.08	—	—
9/8/2016	1.10	<0.03	133
10/13/2016	1.01	<0.03	134
10/13/2016*	0.97	—	—
11/7/2016	1.02	<0.03	133
11/7/2016*	0.97	—	—
12/5/2016	1.33	0.23	135

* Sample collected by the Utah Division of Oil, Gas and Mining and analyzed by Utah State Department of Health laboratory