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WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

March 15, 2010

TO: Internal File

THRU: James D. Smith, Permit Supervisor 05/18/10

FROM: Steve Christensen, Environmental Scientist SC

RE: 2009 Second Quarter Water Monitoring, Genwal Resources, Inc., Crandall Canyon Mine, Permit & Tracking #3335

Water monitoring requirements for the Crandall Canyon Mine can be found in Sections 7.31.21, *Ground Water Monitoring Plan* and 7.31.22, *Surface Water Monitoring Plan.* Additional information can be found in Tables 7-4, 7-5, 7-8, 7-9 and 7-10.

On August 6th, 2007, a major mine bump/bounce occurred in the Main West pillar section causing much of the working area of the mine to collapse. As a result, mining operations at the mine have ceased. The in-mine dewatering pumps were removed and temporary concrete block seals were constructed in the north portals.

Based on Division of Oil, Gas and Mining records (the Division), the mine encountered significant amounts of ground water and began pumping activities in 1996. Over a 14-year period, the mine pumped an average of 742 gallons of water from the mine workings. Following the mine collapse and subsequent sealing of the portals, the mine did not discharge for the months of October, November and December of 2007. However, by mid January of 2008 the mine had filled to the extent that the mine-water had found it's way around the temporary seals and began to discharge uncontrolled to the surface.

During the 1st quarter of 2008, spikes in Total Dissolved Solids (TDS) and Total Iron (T-Fe) were detected during Utah Pollutant Discharge Elimination System (UPDES) sampling of the mine water discharge (Outfall 002). The analytical results for both TDS and T-Fe for both the 2nd and 3rd quarter of 2008 were within the compliance limits established in the Permittee's UPDES discharge permit. However, analytical results for the 4th quarter of 2008 as well as the 1st quarter of 2009 produced elevated levels of T-Fe while TDS levels stayed within compliance levels. See '*data irregularity*' section below for more discussion.

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

Springs

The approved MRP requires the monitoring of 24 springs each quarter. Of these 24 springs, 9 require laboratory water quality analysis (See Table 7-4). The remaining 15 springs require quarterly monitoring of field parameters (flow, pH, specific conductance and temperature).

The Permittee submitted all required samples for the spring monitoring sites.

Streams

The approved MRP requires the monitoring of 12 surface water/stream sites. Of these 12 surface water/stream sites, 9 require laboratory water quality analysis (See Table 7-8). The remaining 3 sites require quarterly monitoring of field parameters (flow, pH, specific conductance, temperature and dissolved oxygen).

The Permittee submitted all required samples for the stream sites.

Wells

The approved MRP outlines monitoring of 7 wells. According to Table 7-4, all 7 wells required quarterly laboratory water quality analysis. However, due to the mine disaster on August 6th, 2007, the active mine-workings have been temporarily sealed off thus rendering the wells inaccessible.

UPDES

The UPDES Permit/MRP (UT000024368) requires monthly monitoring of 2 outfalls: 001 and 002. Outfall 001 is associated with the discharge from the primary sediment pond at the main mine facility. Outfall 002 is associated with the mine-water discharge that reports directly to Crandall Creek.

The Permittee submitted all required samples per the terms of the UPDES discharge permit.

Outfall 001 (primary sediment pond) produced measurable flows for 2 of the 3 sampling events this quarter with an average of 18.7 gallons per minute (gpm). The Permittee submitted the required samples per the terms of the UPDES discharge permit.

Outfall 002 discharged an average of 297 gallons per minute (gpm) based on 3 sampling events conducted during the quarter. The Permittee submitted the required samples per the terms of the UPDES discharge permit.

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

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

Three months following the sealing of the north portals, the mine water discharge began to exhibit fluctuating levels of T-Fe and TDS at UPDES Outfall 002. The 1st quarter of 2008 produced analytical results that were outside the Permittee's UPDES compliances levels for both TDS and T-Fe.

However, during the 2nd and 3rd quarters of 2008, analytical results obtained for TDS and T-Fe from the mine-water discharge were within the compliance levels established by the UPDES discharge permit (1.0 ppm for T-Fe and 1,200 ppm for TDS).

The results from the 4th quarter of 2008 again produced levels of TDS below the UPDES standard of 1,200 ppm. However, T-Fe values had increased to levels beyond the 1.0 ppm range established in the UPDES permit (1.59 and 1.335 ppm respectively for 4th qtr., 2008).

Mine-water analytical results for the 1st quarter of 2009 were again a mixed bag of compliant TDS levels with elevated T-Fe levels (1.783 ppm, 2.454 ppm and 2.23 ppm for T-Fe).

The sampling results for the 2nd quarter of 2009 followed the same pattern as produced during the previous quarter: compliant TDS levels combined with three samples producing T-Fe levels well over the 1.0 ppm criteria established in the UPDES permit. Sampling events on April 6th, May 6th and June 3rd produced T-Fe levels of 2.455 ppm, 2.331 ppm and 2.501 ppm respectively.

The Division of Water Quality (DWQ) issued a violation to the Permittee on February 26th, 2009 for violation of their UPDES discharge permit by not meeting the effluent limits established in their permit. To that end, the Division has been working with the Permittee in trying to determine a treatment method for the mine-water discharge given the physical constraints of the site and the relatively low T-Fe levels that must be reduced.

T-Fe levels measured below the mine facilities within Crandall Creek (Site LOF-1) dropped for the first time in two quarters. The previous two quarters had shown elevated levels of T-Fe (1.438 ppm 4th Qtr. 2008 and 1.432 pm 1st Qtr. 2009). However, the T-Fe levels obtained from Site LOF-1 within Crandall Creek for the 2nd quarter of 2009 was 0.679 ppm.

On June 23rd, 2009, the Division issued a revised Division Order DO08A. The revised Division Order establishes a final due date for the Permittee to produce a final reclamation plan that takes into consideration post-reclamation mine-water discharge of August 1st, 2010.

Spring SP-58 had produced several analytical results that were outside 2 standard deviations: D-Na (2.72 standard deviations), SO4 (2.41 standard deviations) and TDS (2.01 standard deviations) during the 4th Quarter of 2008. However, the site was inaccessible due to snow conditions during the 1st quarter of 2009.

Analytical results obtained during the 2nd quarter of sampling for 2009 produced D-NA, SO4 and TDS values that were again within 2 standard deviations as established by the data set. At this time, the exact cause for the elevated values during the 4th quarter of 2008 is unknown. Particular attention will be paid to this site and these parameters in future quarters.

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

Page 7-33 of the MRP states that groundwater samples collected during the low flow period (typically the 4th quarter) every 5 years will be analyzed for baseline parameters (See Tables 7-5). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

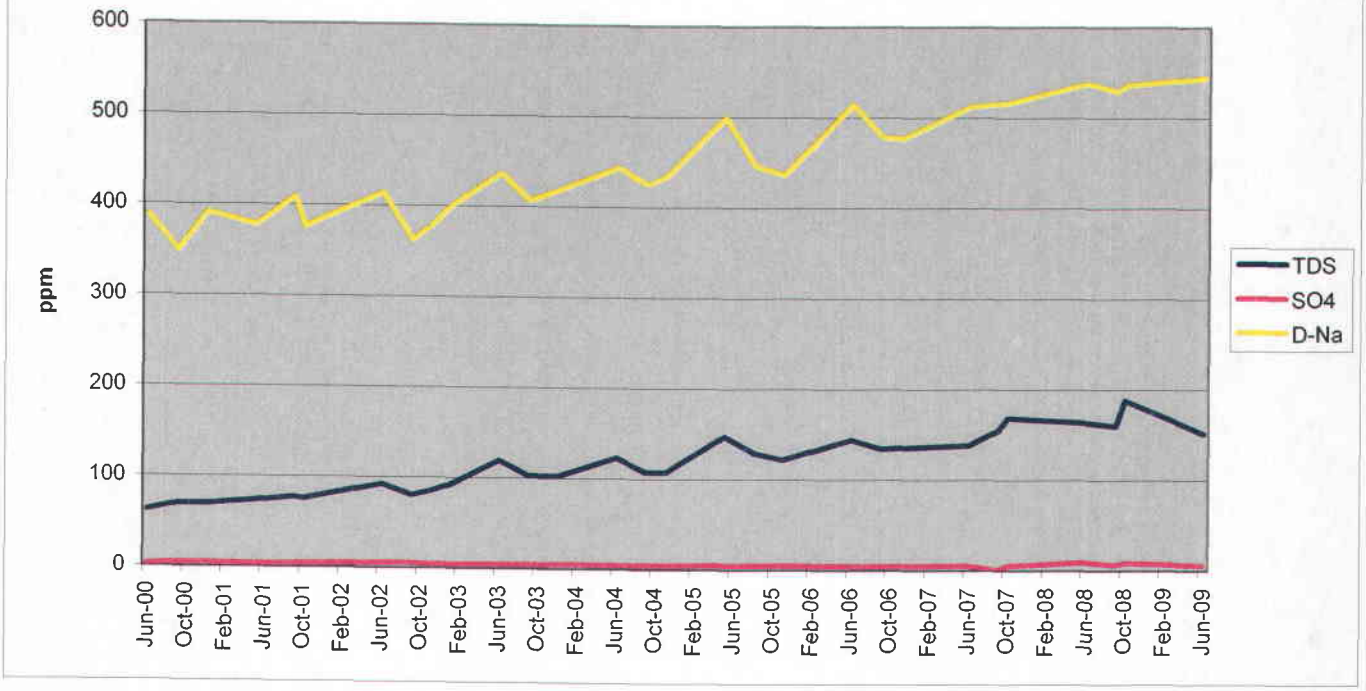
Page 7-35 of the MRP states that surface water samples collected during the low flow period every 5 years will be analyzed for baseline parameters (See Table 7-9). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

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

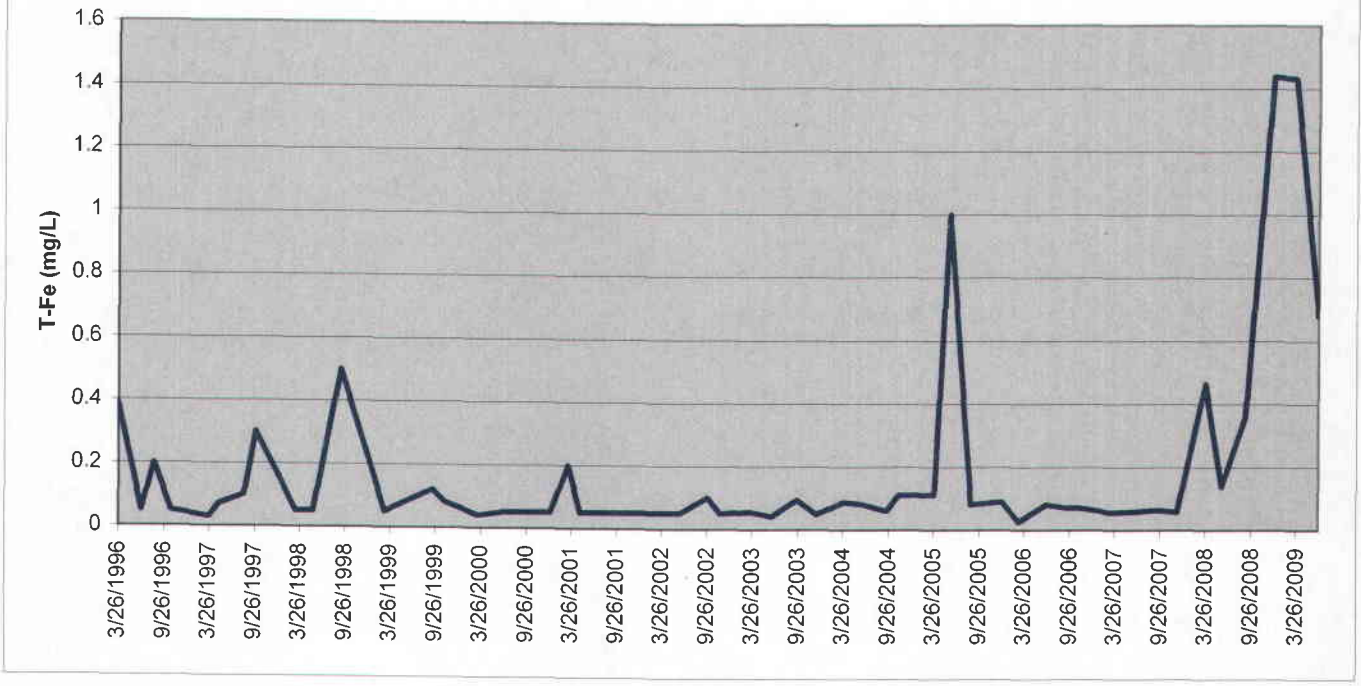
Continued data collection and monitoring of the mine-water discharge will be necessary to evaluate the T-Fe levels.

Continue to work with the Permittee in identifying a mine-water treatment system that will effectively lower the T-Fe concentrations to compliant UPDES levels.

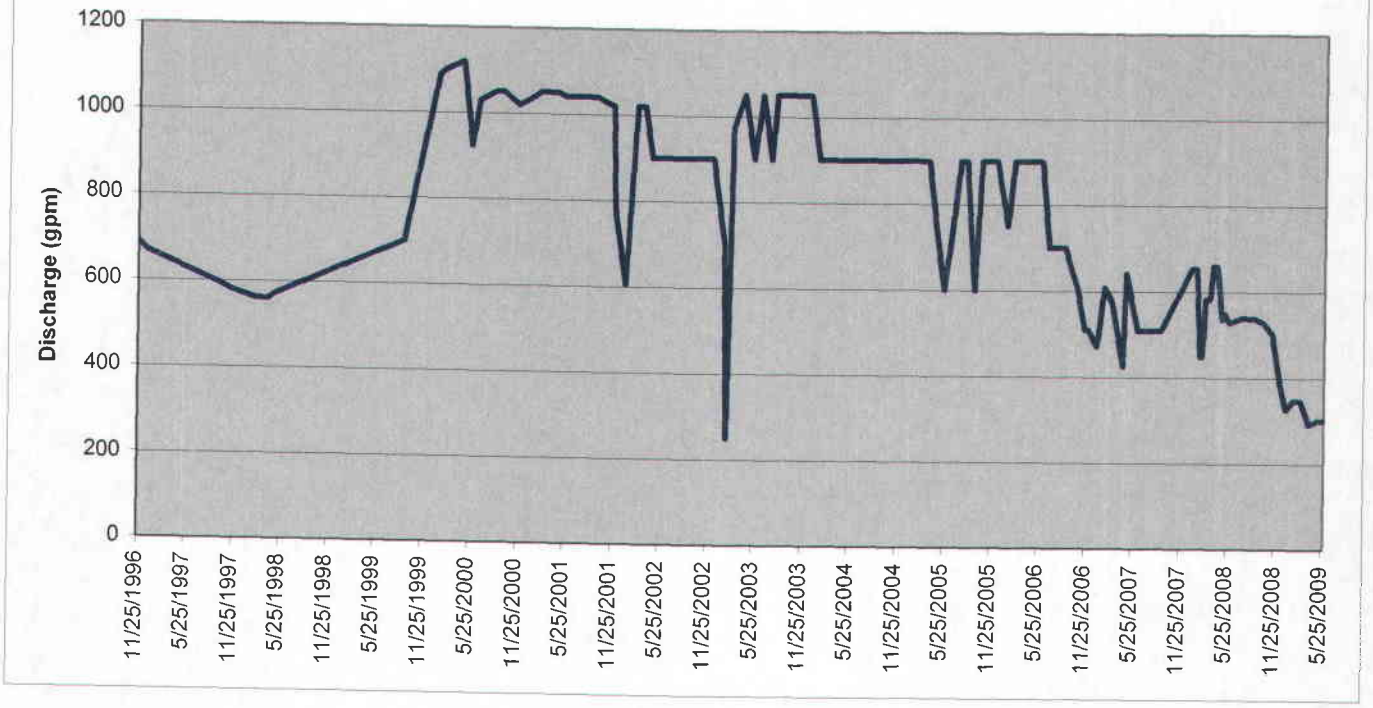
Spring SP-58 Water Quality



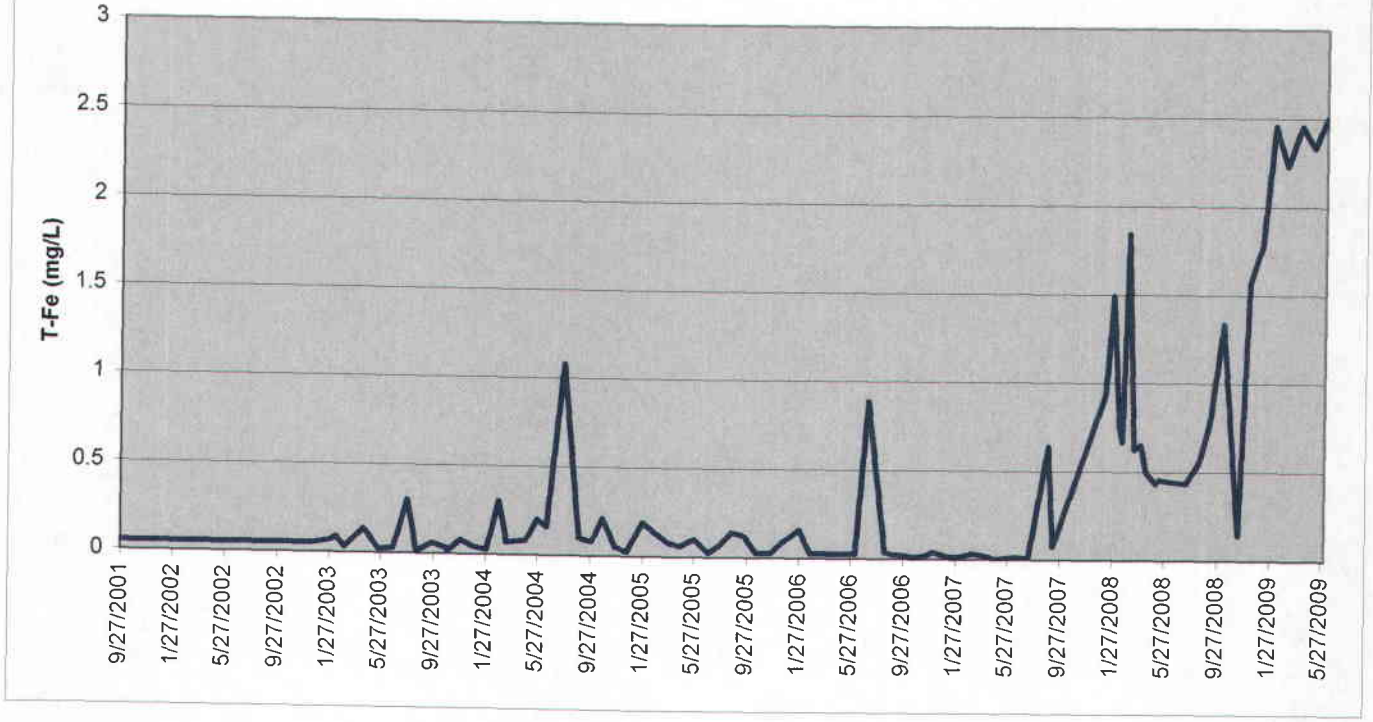
Crandall Creek Lower Flume (LOF-1): Total Iron Levels

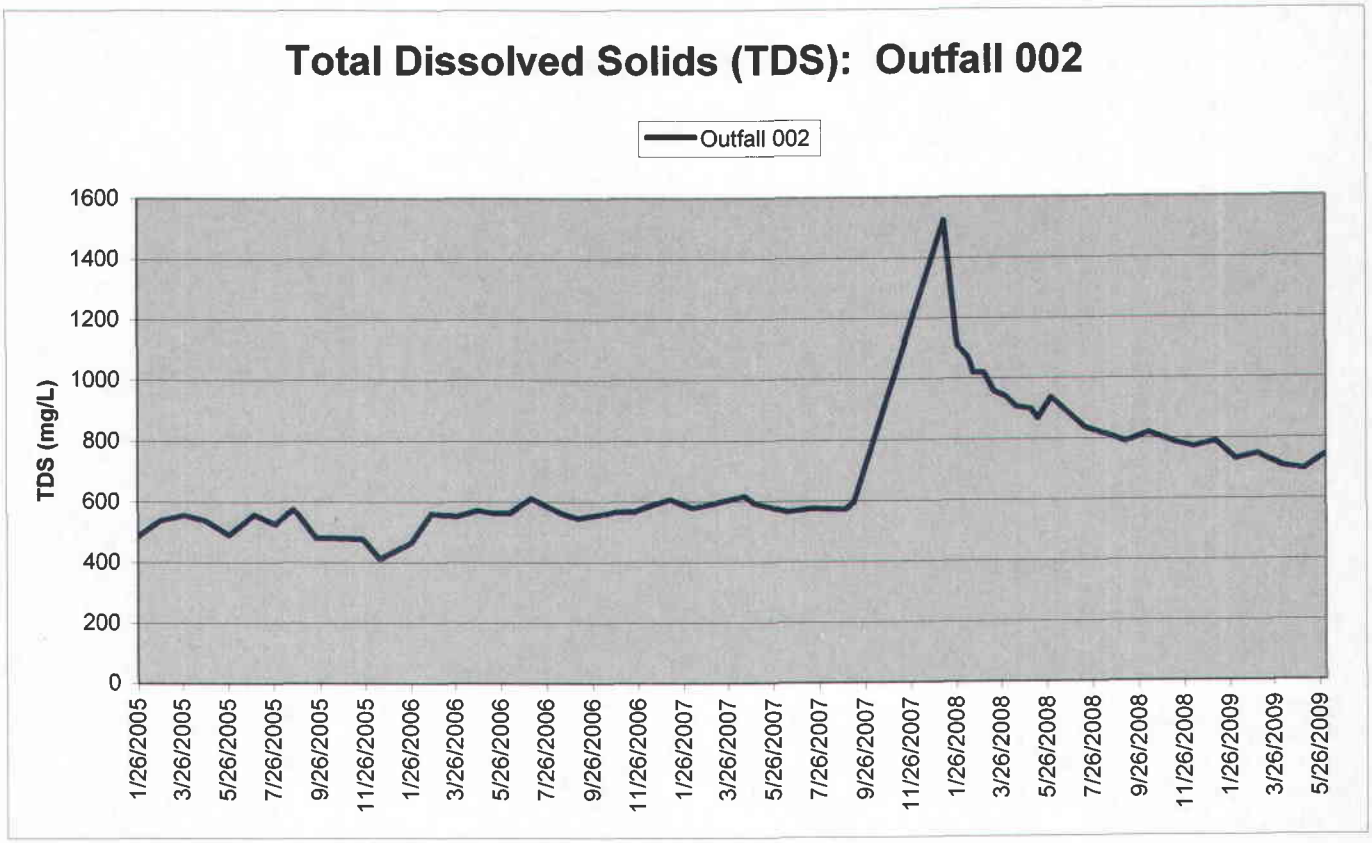


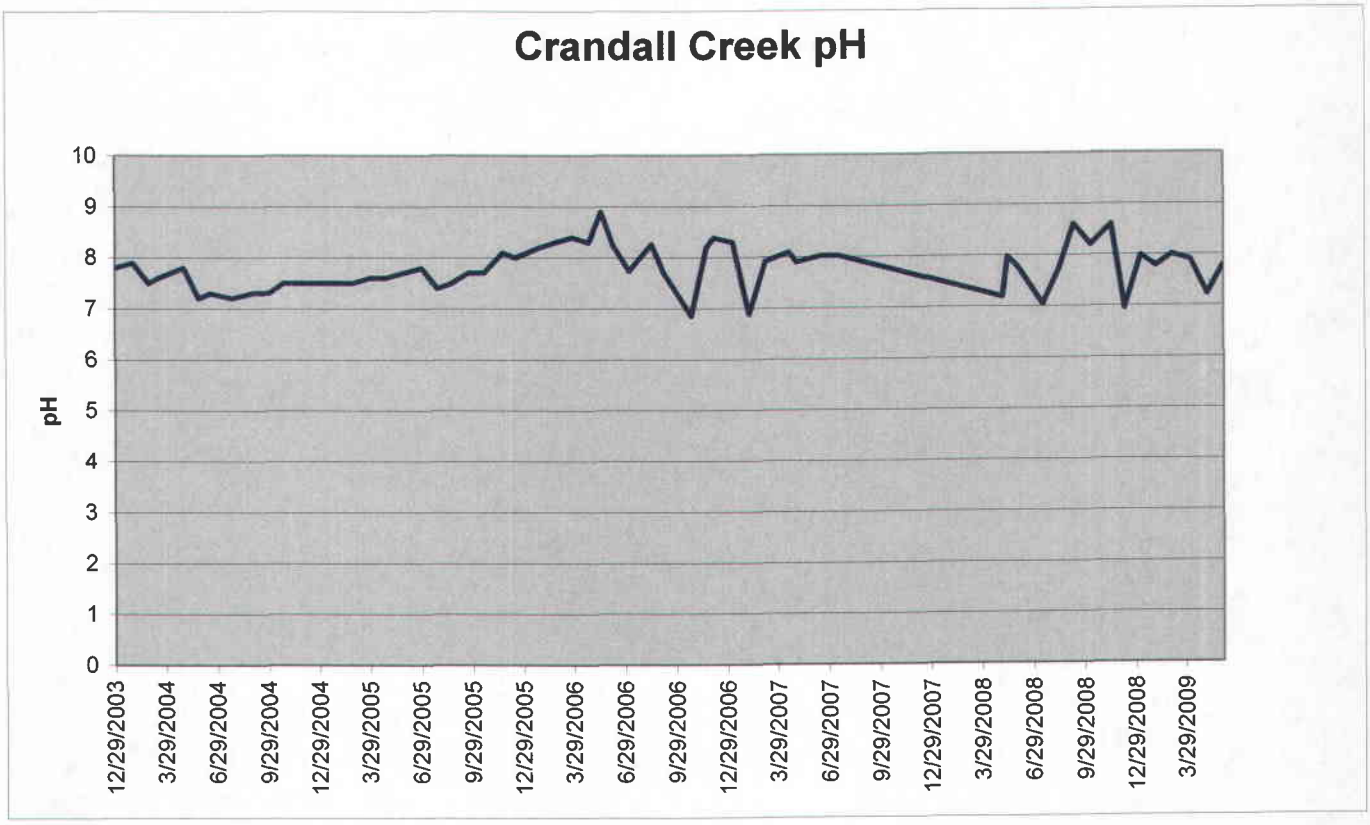
Mine Water Discharge (Outfall 002)



Total Iron (T-Fe): Outfall 002




Total Dissolved Solids (TDS): Outfall 002
Outfall 002
TDS (mg/L)
1600
1400
1200
1000
800
600
400
200
0
1/26/2005
3/26/2005
5/26/2005
7/26/2005
9/26/2005
11/26/2005
1/26/2006
3/26/2006
5/26/2006
7/26/2006
9/26/2006
11/26/2006
1/26/2007
3/26/2007
5/26/2007
7/26/2007
9/26/2007
11/26/2007
1/26/2008
3/26/2008
5/26/2008
7/26/2008
9/26/2008
11/26/2008
1/26/2009
3/26/2009
5/26/2009


Crandall Creek pH
pH
10
9
8
7
6
5
4
3
2
1
0
12/29/2003
3/29/2004
6/29/2004
9/29/2004
12/29/2004
3/29/2005
6/29/2005
9/29/2005
12/29/2005
3/29/2006
6/29/2006
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12/29/2008
3/29/2009