

**2000 SURFACE WATER AND  
GROUNDWATER MONITORING REPORT  
NEW WORLD MINING DISTRICT  
RESPONSE AND RESTORATION  
PROJECT**

*Prepared for:*

**USDA Forest Service  
Northern Region  
Missoula, Montana**

*Prepared by:*

Maxim Technologies, Inc.  
303 Irene Street  
P.O. Box 4699  
Helena, Montana 59604

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## **1.0 INTRODUCTION**

This document presents surface water and groundwater data collected during the 2000 calendar year in conjunction with response and restoration activities at the New World Mining District. To avoid redundancy, only generalized descriptions of the site, the study objectives, and the organization of the project are provided herein. The reader is encouraged to review the *Overall Project Work Plan* (Maxim, 1999a) to gain a better understanding of these aspects of the project.

### **1.1 PROJECT BACKGROUND**

The New World Mining District (District), which includes a mixture of National Forest Service and private lands, is a historic metals mining district located in the general vicinity of Cooke City, Montana in the Beartooth Mountains. This historic mining district, which is centered about four miles northeast of the northeast gate to Yellowstone National Park, contains hard rock mining wastes and acid discharges that impact the environment. Human health and environmental issues are related to elevated levels of heavy metals present in mine waste piles, open pits, acidic water discharging from mine openings, and stream sediments.

On August 12, 1996, the United States signed a Settlement Agreement (Agreement) with Crown Butte Mining, Inc. (CBMI) to purchase CBMI's interest in their District holdings. The resulting transfer of property to the U.S. government effectively ended CBMI's proposed mine development plans and provided \$22.5 million to cleanup historic mining impacts to specific properties in the District. In June 1998, a Consent Decree (Decree) was signed by all interested parties and CBMI, and approved by the United States District Court, that finalized the terms of the Agreement and made available the funds that will be used for mine cleanup.

The USDA-FS, as the lead agency responsible for implementing the cleanup of the District, has assembled an organization and guiding objectives to proceed with response actions and restoration of the historic mining impacts in the District. Under their Superfund authority, the USDA-FS will conduct the response and restoration project by following guidance provided by the EPA for Non-Time-Critical Removal Actions. As part of response and restoration activities, long-term surface water and groundwater monitoring is being conducted in the District.

### **1.2 PURPOSE**

The primary purpose of surface water and groundwater monitoring during 2000 was to collect data to document changes in water quality that result from response and restoration actions. Additionally, surface water quality monitoring was conducted in the District to comply with the requirements of the rule adopting temporary water quality standards for segments of Daisy Creek, the Stillwater River, and Fisher Creek in accordance with the Montana Water Quality Act (§ 75-5-201 *et seq.*)(Stanley and Maxim Technologies, 1998).

As in 1999, only site characterization work was conducted in 2000 and effects on water quality were not expected as a result of project activities. However, with considerable work completed in association with the reopening of the Glengarry underground workings, primarily the removal of sediment and impounded water in the underground tunnels, water quality changes in Fisher Creek downstream of the adit may have resulted (see Stanley, 2000).

### 1.3 SITE LOCATION AND DESCRIPTION

The New World Mining District is located in Park County in south central Montana. The District is bounded on the south by the Montana-Wyoming state line, on the west by Yellowstone National Park and on the north and east by the Absaroka-Beartooth Wilderness area boundary (Figure 1). The District is characteristic of subalpine regions of the northern Rocky Mountains with elevations that range from approximately 2,400 meters (7,900 feet) to over 7,900 meters (10,400 feet). Accumulated snow pack in the higher elevations range from 3 meters (10 feet) to over 6 meters (20 feet) deep where drifting occurs. The ground is generally snow covered from late October through mid May at the lower elevations and from early October through late July at the higher elevations. Perennial and semi-perennial snowfields occupy the north facing slopes of the highest mountain peaks.

Area streams are high energy, first and second order tributaries of the Yellowstone River system. These streams occupy glacially carved valleys and are fed largely by melting snow pack. Peak streamflow is characteristically reached by mid June or early July and may be several orders of magnitude higher than baseflow conditions, which typically occur in late winter or early spring. Three drainage basins have been identified as potentially being impacted by the proposed response and restoration actions: 1) Fisher Creek and the Clarks Fork of the Yellowstone River; 2) Daisy Creek and the Stillwater River drainage basin; and, 3) Miller Creek and Soda Butte Creek drainage basin.

The communities of Cooke City and Silver Gate, Montana are the only population centers near the District. The neighboring communities of Mammoth, Wyoming and Gardiner, Montana are located about 50 miles to the west. Red Lodge, Montana is located about 65 miles to the northeast, via the Beartooth Highway, and Cody, Wyoming is located 60 miles to the southeast.

As the District is located at an elevation that ranges from 7,900 feet to over 10,400 feet above sea level, the site is snow-covered for much of the year. Only two routes of travel are open on a year-round basis to the District: the Sunlight Basin road, which allows access to within a few miles of the District in the wintertime; and the highway between Mammoth and Cooke City. The Beartooth Highway is closed during the winter, as is Highway 212 from Cooke City to the Montana/Wyoming state line.

The District covers an area of about 100 square kilometers (40 square miles). Historic mining disturbances affect about 20 hectares (50 acres). The McLaren Tailings, located outside District Property, covers an additional 4.34 hectares (11 acres). Topography of the District is mountainous, with dominant glacial features. The stream valleys are U-shaped and broad while the ridges are steep, rock covered, and narrow. Much of the District is located at or near tree line, especially in the Fisher Mountain area where the major mining disturbances are located.

The district is situated at the headwaters of three river systems, which all eventually flow into the Yellowstone River. The three tributary rivers are the Clark's Fork of the Yellowstone, the Stillwater River and Soda Butte Creek (Figure 1).

Figure 1 - Project Vicinity Map

Figure 1. Back page

## 2.0 METHODS

Surface water and groundwater monitoring activities were conducted in general accordance with the *2000 Work Plan* (Maxim, 2000a) and the *Site-Wide Sampling Analysis Plan* (Site-Wide SAP) (Maxim 1999b). More detailed descriptions of our methods can be found in these plans. A summary of methods used to complete 2000 monitoring activities is provided in this section.

### 2.1 SURFACE WATER MONITORING

Surface water monitoring was conducted at 12 long-term stations and two additional stations during 2000 (Figure 2). Stations sampled, methods used to collect the samples, and the analytical methods used to analyze the samples are described in the *Long-Term Surface Water Quality Monitoring Plan* (Maxim 1999c).

#### 2.1.1 Long-Term Monitoring

Long-term surface water samples were collected in April, July, and October 2000. Sample locations in each of the three watersheds are listed in Table 1 and shown on Figure 2. Sampling occurred at or near low flow conditions (April), at or near high flow conditions (July), and at the end of the field season (October). All surface water samples were submitted to Northern Analytical Laboratories, Inc. in Billings, Montana for analysis of parameters listed in the Site-Wide SAP. Discharge measurements and sample notes were taken at all surface water monitoring stations before collecting samples.

#### 2.1.2 Supplemental Monitoring

Supplemental to long-term monitoring activities, samples were also collected at two of the long-term stations on three occasions during the runoff period. This sampling was done to better document diurnal fluctuations in flow and to obtain additional water quality data. These additional data were collected at stations SW-3 on Fisher Creek and DC-2 on Daisy Creek. Supplemental measurements included the following:

- *Flow data* were collected several times during the day from early morning to late evening. Field parameters including pH, specific conductance, and temperature were measured in conjunction with the flow monitoring. Total iron, copper, and sulfate were also measured in the field in conjunction with flow monitoring using a Hach DR 2000 spectrophotometer.
- & *Water quality samples* were collected during each flow measurement event described above. A limited suite of laboratory parameters including pH, specific conductance, total suspended solids, and total recoverable copper and zinc were analyzed at the laboratory for three of the four samples collected during each sampling episode. Analytical methods for the limited suite were the same as described in the Long-Term Surface Water Quality Monitoring Plan (Maxim, 1999c). The fourth sample set collected during each sampling episode was analyzed for the complete suite of water quality parameters listed in Table 3 of the Long-Term Surface Water Quality Monitoring Plan (Maxim, 1999c).

One additional station on Fisher Creek (station FC-SW-101, located between SW-3 and SW-4), was sampled during April and October and an additional station on Daisy Creek (station SW-DC-101, located upstream of DC-2), was sampled during October. These new stations were sampled to bracket previously

identified groundwater inflow areas and assist in determining metals loading from groundwater in these areas. The new stations were established at historic sample stations.

<b>TABLE 1 2000 SURFACE WATER SAMPLE SITES New World Mining District – Response and Restoration Project</b>						
Site Name	Location	April	May	June	July	October
<b>Clarks Fork Drainage</b>						
SW-6	Clarks Fork Yellowstone River at Saw Mill Road Crossing	✓	○	○	✓	✓
<b>Daisy Creek Drainage</b>						
DC-101	Approximately 2000 feet Upstream of DC-2	○	○	○	○	✓
DC-2	Daisy Creek Below Confluence of McLaren Tributaries	✓	✓	✓	✓	✓
DC-5	Daisy Creek Above Confluence with Stillwater River (DNRC-127)	✓	○	○	✓	✓
SW-7	Stillwater River at Stillwater Trail Crossing	✓	○	○	✓	✓
<b>Fisher Creek Drainage</b>						
CFY-2	Fisher Creek Above Confluence with Clarks Fork.	✓	○	○	✓	✓
SW-3	Fisher Creek at DNRC Gauging Station (DNRC-207)	✓	✓	✓	✓	✓
SW-101	Fisher Creek Between SW-3 And SW-4	✓	○	○	○	✓
SW-4	Fisher Creek at Lulu Road Crossing	✓	○	○	✓	✓
<b>Miller Creek Drainage</b>						
SW-2	Miller Creek below Miller Mountain Road crossing	✓	○	○	✓	✓
<b>Soda Butte Creek Drainage</b>						
SBC-1	Soda Butte Creek above confluence with Miller Creek	✓	○	○	✓	✓
SBC-2	Soda Butte Creek below McLaren Tailings	✓	○	○	✓	✓
SBC-4	Soda Butte Creek at Yellowstone Park Boundary	✓	○	○	✓	✓
RR-SBSW-102	Soda Butte Creek below confluence with Republic Creek	✓	○	○	✓	✓

Note: Sample locations shown on Figure 2.

- ✓ - sampled
- - not sampled

Figure 2

Figure 2 - back page

### *2.1.2 Deviations from 2000 Work Plan*

Samples were not collected from station DC-101 during the spring monitoring event because the station could not be located beneath the snowpack. Flow measurements had been made at this site in the winter during previous investigations, indicating perennial flow likely occurs at this station.

Statistical tests were developed to evaluate future water quality data and assess the effectiveness of response actions on water quality. Using Leiberman's One-Sided Tolerance Limit, it became apparent that sample population was not large enough to identify trends in the data with a reasonable degree of confidence. Therefore, results of the initial statistical evaluation of water quality data were not included in this report.

## **2.2 GROUNDWATER MONITORING**

One long-term groundwater monitoring event was completed in the District during July 2000. Monitoring activities included groundwater sampling, laboratory analysis, and water level measurement. Table 2 lists monitoring wells sampled during 2000 and Figure 3 shows locations of these wells.

Water samples were collected from monitoring wells using methods and procedures described in the Site-Wide SAP (Maxim, 1999c). All groundwater samples were submitted to Northern Analytical Laboratories in Billings, Montana for analysis of parameters listed in the Site-Wide SAP. Water levels were measured in each well immediately prior to purging the wells.

### *2.2.1 Deviation from 2000 Work Plan*

All monitoring wells except well EPA-7 were sampled during the July event. Well EPA-7 was not sampled because it did not recharge after it was purged.

**TABLE 2**  
**2000 GROUNDWATER SAMPLE SITES**  
**New World Mining District - Response and Restoration Project**

Well No.	Year Installed	2000 Monitoring (July)	Completion Formation
<b>McLaren Pit Area</b>			
EPA-1	1996	✓	Wolsey Shale
EPA-2	1996	✓	Fisher Mtn. Intrusive/Wolsey Shale
EPA-3	1996	✓	Waste Rock
EPA-4	1996	✓	Waste Rock
EPA-5	1996	✓	Fisher Mtn. Intrusive
EPA-6	1996	✓	Fisher Mtn. Intrusive
EPA-7	1996	Not Sampled	Waste Rock
EPA-8	1996	✓	Meagher Limestone
EPA-9	1996	✓	Wolsey Shale
EPA-10	1996	✓	Meagher Limestone
MW-2	1989	✓	Wolsey Shale
Tracer-2	1997	✓	Fisher Mtn. Intrusive
<b>Como Basin Area</b>			
EPA-11	1996	✓	Tertiary Intrusive Dike
EPA-12	1996	✓	Scotch Bonnet Diorite
MW-1	1989	✓	Wolsey Shale
MW-8	1989	✓	Lulu Pass Rhyodacite
Tracer-4	1997	✓	Fisher Mtn. Intrusive
Tracer-6	1997	✓	Scotch Bonnet Diorite
<b>Fisher Creek Area</b>			
MW-9A	1990	✓	Alluvium
MW-9B	1990	✓	Precambrian
MW-10A	1990	✓	Alluvium
MW-10B	1991	✓	Precambrian
MW-11	1990	✓	Precambrian
SB-16	1991	✓	Precambrian
Tracer-5	1997	✓	Fisher Mtn. Intrusive
<b>Miller Creek Area</b>			
MW-5A	1989	✓	Alluvium
MW-5P	1989	✓	Wolsey Shale
<b>Daisy Creek Area</b>			
MW-3	1989	✓	Wolsey Shale

Note: ✓ - sampled  
Well locations shown on Figure 3.

Figure 3

Figure 3 - back page

## 3.0 RESULTS

Pertinent surface water and groundwater data collected for the New World Mining District Response and Restoration Project during 2000 are summarized in this section. Field data sheets, laboratory analytical reports, and graphs of selected data are contained in appendices.

### 3.1 SURFACE WATER

This section presents a discussion of long-term surface water data collected during 2000. Laboratory analytical reports, chain of custody forms, and field notes for the 2000 surface water monitoring events are contained in Appendix A. Included in Appendix A is Table A-1 summarizing long-term surface water monitoring data collected during 2000. Additional surface water data were collected in conjunction with reopening the Glengarry Adit. These additional surface water data are presented in a separate report documenting the Glengarry work (Stanley, 2000).

#### 3.1.1 Discussion of Long-Term Surface Water Quality Data - Daisy Creek

Table 3 presents 2000 surface water analytical results with corresponding regulatory standards for Daisy Creek. The shading or color of the concentrations for each monitoring station indicates which regulatory standard the concentration exceeds (e.g. yellow shading indicates exceedance of the acute aquatic life standard).

Table 3 shows that all metals concentrations measured in samples collected from the three Daisy Creek stations in 2000 were below both temporary and narrative water quality standards except for cadmium at station DC-5 during the October event. Cadmium exceeded the standard by 0.0006 milligrams per liter on this date at DC-5.

Other results displayed in Table 3 shows aluminum and copper exceeded acute and chronic aquatic standards at upstream stations DC-2 and DC-5 during all three 2000 sampling events. This is similar to the data collected for these stations in 1999. Zinc also exceeded aquatic standards at these two stations, but only during the July and October events. Zinc was below detection at these stations during the April sampling event. Copper was the only metal to exceed acute aquatic standards at downstream station SW-7, and this exceedance only occurred during the high flow event in July. At DC-2, cadmium and copper exceeded human health standards. These standards were exceeded in April (low flow) and October (copper only).

Table A-1 (Appendix A-1) summarizes long-term surface water data collected at the New World study area during 2000. Table A-1 shows metals concentrations at station DC-101 during October 2000 were considerably higher than metals concentrations measured at downstream station DC-2. The apparent decrease in metals concentrations between these stations is probably attributable to precipitation, sorption, and/or dilution from numerous streamlets and/or groundwater that flow into Daisy Creek between these two stations. Comparison of metals concentrations at station DC-101 during October 2000 with historical data collected at this location (station DCT-8, URS 1998, Table 4) indicate total recoverable metals concentrations have decreased considerably since reclamation activities were completed in the McLaren Pit area. Total recoverable metals concentrations at stations DC-2 and DC-5 also appear to have decreased considerably since reclamation activities were completed.

Diurnal flow and water chemistry data collected at station DC-2 during May, June, and July 2000 are contained in Appendices A-3, A-4, and A-5, respectively. Graphs of flow and selected chemistry data collected at station DC-2 during the diurnal events are contained in Appendix A-7. During each of the three diurnal sampling events, flow at station DC-2 increased from 40 to 60 percent from mid-morning to early evening. It does not appear that peak daily flows were recorded during any of the three monitoring events, as flows appear to have been on the rise during the last recorded flow measurement for each day.

In general, concentrations of total recoverable copper and zinc decreased as flows increased, apparently due to dilution. In the first graph of the series in Appendix A-7, the diurnal data for total concentrations of copper and iron measured in the field are plotted on one graph (flow versus concentration). During the early stages of the melt out in May, copper shows an inverse relationship to flow, which is the dilution effect. Iron on the other hand is directly related to flow, which indicates a flushing effect occurs as flows increase. Over the course of the melt out (June), iron concentrations increase with flow, but show an inverse relationship to discharge on the diurnal scale as the melt out event nears completion (June data). This may be explained by the inflow of contaminated shallow groundwater to Daisy Creek that increases as the melt out event proceeds. Early in the melt out cycle, the flushing of iron oxidation products from near surface sources controls the levels of concentration of total iron in the upper reaches of Daisy Creek. These concentrations rise in proportion to the amount of surface run off originating from or flowing over areas of exposed sulfide bearing rock entering the stream. As the melt out progresses, contribution to upper Daisy Creek from shallow groundwater flow that has been in contact with or passes through sulfide rich rock dominates the water chemistry at low flow conditions. The surface source of iron oxidation products has been depleted during the early stages of the melt out. Near the end of the melt, diurnal changes in flow result in dilution of both copper and iron, although the discharge to concentration ratio remains dynamic through the melt event.

It appears peak copper loading in Daisy Creek did not occur at the time the last sample was collected on each of the three diurnal sampling events, as the graph shows concentrations increased in the final daily samples. This phenomenon demonstrates potential inaccuracies associated with calculating annual metal loads in Daisy Creek using periodic monitoring data.

### *3.1.2 Discussion of Long-Term Surface Water Quality Data – Fisher Creek*

Table 4 presents 2000 long-term surface water analytical results with corresponding regulatory standards for Fisher Creek. Table 4 shows that water quality in Fisher Creek generally improves downstream. At upstream station SW-3, aluminum and copper exceeded acute aquatic life standards during all three monitoring events and zinc exceeded acute aquatic standards during the July and October events. At station CFY-2, just upstream of the confluence of the Clarks Fork Yellowstone River, Copper slightly exceeded acute aquatic life standards during all three monitoring events. No temporary standards were exceeded at CFY-2. One exceedance of the narrative standard was exceeded at station SW-3 for zinc during October 2000.

Comparison of water chemistry data summarized in Table A-1 (Appendix A-1) with that collected on Fisher Creek during previous years (Maxim 2000; URS 1998), indicate concentrations of total recoverable metals have remained consistent over the course of the previous 10 years. Diurnal flow and water chemistry data collected at station SW-3 during May, June, and July 2000 are contained in appendices A-3, A-4, and A-5, respectively. Graphs of flow and selected chemistry data collected at station SW-3 during the diurnal monitoring events are contained in Appendix A-8.

TABLE 3  
COMPARISON OF SURFACE WATER RESULTS TO STANDARDS  
DAISY CREEK DRAINAGE SAMPLING STATIONS  
2000 MONITORING EVENTS

Parameter (mg/l)	Aquatic Life (acute)	Aquatic Life (chronic)	Human Health Standard	DC-2				DC-5			
				Narrative Water Quality Standard <sup>(1)</sup>	Apr-00	Jul-00	Oct-00	Temporary Water Quality Standard <sup>(2)</sup>	Apr-00	Jul-00	Oct-00
Aluminum	0.75	0.087	NA	28.4	10.7	6.1 J	14.0	9.510	2.9	1.6 J	2.7
Cadmium	0.002067 <sup>(3)</sup>	0.001429 <sup>(3)</sup>	0.005	0.009	0.0056	0.0009	0.0045	0.004	0.0014	0.0005	0.0046
Copper	0.0073 <sup>(3)</sup>	0.00529 <sup>(3)</sup>	1.3	8.064	2.51	2.01 J	3.77	3.530	1.04	0.54 J	0.61
Iron	NA	1	NA	29.649	13.5	8.55 J	6.54	6.830	1.38	2.11 J	1.3
Lead	0.082 <sup>(4)</sup>	0.0032 <sup>(4)</sup>	15	0.018	0.004	0.003	0.007	NA	0.004	< 0.001	< 0.003
Manganese	NA	NA	NA	4.088	2.02	0.72 J	2.23	1.710	0.041	0.19 J	0.23
Zinc	0.067 <sup>(3)</sup>	0.067 <sup>(3)</sup>	2.1	1.104	< 0.02	0.26 J	0.54	0.540	< 0.02	0.07 J	0.08
pH (s.u.)	NA	NA	NA	2.7	4.5	4.7	4.1	4.6	7.6	7.2	7.5
Flow (cfs)	NA	NA	NA	NA	0.012	2.4	0.2	NA	0.429	8.9	1.2

Parameter (mg/l)	Aquatic Life (acute)	Aquatic Life (chronic)	Human Health Standard	SW-7			
				Temporary Water Quality Standard <sup>(2)</sup>	Apr-00	Jul-00	Oct-00
Aluminum	0.75	0.087	NA	0.670	< 0.05	0.3 J	< 0.01
Cadmium	0.002067 <sup>(3)</sup>	0.001429 <sup>(3)</sup>	0.005	NA	<0.0001	< 0.0001	<0.0001
Copper	0.0073 <sup>(3)</sup>	0.00529 <sup>(3)</sup>	1.3	0.200	0.004	0.072 J	<0.001
Iron	NA	1	NA	1.320	0.43	0.36 J	0.22
Lead	0.082 <sup>(4)</sup>	0.0032 <sup>(4)</sup>	15	0.013	<0.001	<0.001	<0.003
Manganese	NA	NA	NA	0.086	0.066	0.029 J	< 0.02
Zinc	0.067 <sup>(3)</sup>	0.067 <sup>(3)</sup>	2.1	0.049	< 0.05	0.02 J	< 0.01
pH (s.u.)	NA	NA	NA	5.5	7.2	7.3	7.7
Flow (cfs)	NA	NA	NA	NA	0.405	32.25	1.81

**NOTES:** Shading/coloring indicates exceedance of respectively shaded/colored regulatory standard

\* - All metals are reported as Total Recoverable Metals

mg/l - Milligrams per liter

(s.u.) - Standard unit

(cfs) - Cubic feet per second

< - Indicates analyte not detected above laboratory Practical Quantitation Limit (PQL)

J - Indicates value is estimated

(1) - Narrative Water Quality Standards apply to **any point** in affected stream segments. Like the Temporary Water Quality Standards, the Narrative Water Quality Standards are calculated as the mean concentration plus two (2) standard deviations

(2) - Temporary Water Quality Standards are set in accordance to the rule adopted by the Board of Environmental Review. These standards apply to specific surface water sampling stations and shall not be exceeded more than 3% of the time

(3) - Based on 50 mg/l hardness

(4) - Based on 100 mg/l hardness

TABLE 4  
COMPARISON OF SURFACE WATER RESULTS TO STANDARDS  
FISHER CREEK DRAINAGE SAMPLING STATIONS  
2000 MONITORING EVENTS

Parameter (mg/l)	Aquatic Life (acute)	Aquatic Life (chronic)	Human Health Standard	SW-3				SW-4			
				Narrative Water Quality Standard <sup>(1)</sup>	Apr-00	Jul-00	Oct-00	Narrative Water Quality Standard <sup>(1)</sup>	Apr-00	Jul-00	Oct-00
Aluminum	0.75	0.087	NA	4.54	3.2	2.0 J	2.9	0.740	< 0.05	0.3 J	< 0.1
Cadmium	0.002067 <sup>(3)</sup>	0.001429 <sup>(3)</sup>	0.005	0.002	0.0014	< 0.0001	< 0.0001	0.001	0.0004	< 0.0001	< 0.0001
Copper	0.0073 <sup>(3)</sup>	0.00529 <sup>(3)</sup>	1.3	1.256	0.86	0.67	0.67	0.172	0.04	0.12 J	0.067
Iron	NA	1	NA	9.259	6.2	3.11	7.84	1.726	< 0.05	0.38 J	0.09
Lead	0.082 <sup>(4)</sup>	0.0032 <sup>(4)</sup>	15	0.01	0.008	0.002	0.007	0.005	<0.001	<0.001	<0.001
Manganese	NA	NA	NA	1.718	1.32	0.37 J	1.29	0.790	0.014	0.064 J	0.065
Zinc	0.067 <sup>(3)</sup>	0.067 <sup>(3)</sup>	2.1	0.225	< 0.02	0.07 J	0.39	0.660	< 0.02	0.03 J	0.04
pH (s.u.)	NA	NA	NA	2.1	3.4	3.7	2.9	5.241	6.7	7.0	6.2
Flow (cfs)	NA	NA	NA	NA	0.055	3.03		NA	0.837	15.48	1.39

Parameter (mg/l)	Aquatic Life (acute)	Aquatic Life (chronic)	Human Health Standard	CFY-2				SW-6			
				Temporary Water Quality Standard <sup>(2)</sup>	Apr-00	Jul-00	Oct-00	Narrative Water Quality Standard <sup>(1)</sup>	Apr-00	Jul-00	Oct-00
Aluminum	0.75	0.087	NA	0.470	< 0.05	0.2 J	< 0.1	0.763	< 0.05	0.1 J	<0.1
Cadmium	0.002067 <sup>(3)</sup>	0.001429 <sup>(3)</sup>	0.005	NA	< 0.0001	< 0.0001	< 0.0001	0.03472	<0.0001	<0.0001	<0.0001
Copper	0.0073 <sup>(3)</sup>	0.00529 <sup>(3)</sup>	1.3	0.110	0.008	0.068 J	0.008	0.076	0.004	0.032 J	0.005
Iron	NA	1	NA	0.750	< 0.05	0.24 J	< 0.05	1.132	< 0.05	0.145	< 0.05
Lead	0.082 <sup>(4)</sup>	0.0032 <sup>(4)</sup>	15	0.002	<0.001	<0.001	<0.001	ND	<0.001	<0.001	<0.001
Manganese	NA	NA	NA	0.082	< 0.005	0.035 J	0.004	0.03415	< 0.005	0.018	< 0.003
Zinc	0.067 <sup>(3)</sup>	0.067 <sup>(3)</sup>	2.1	0.044	< 0.02	0.02 J	< 0.01	0.11032	< 0.02	0.01 J	< 0.01
pH (s.u.)	NA	NA	NA	5.7	6.9	6.8	6.8	5.7	6.9	6.8	7.1
Flow (cfs)	NA	NA	NA	NA	0.658	20.55		NA	2.55	36.08	3.34

**NOTES:** Shading/coloring indicates exceedance of respectively shaded/colored regulatory standard

\* - All metals are reported as Total Recoverable Metals

mg/l - Milligrams per liter

(s.u.) - Standard unit

(cfs) - Cubic feet per second

< - Indicates analyte not detected above laboratory Practical Quantitation Limit (PQL)

J - Indicates value is estimated

(1) - Narrative Water Quality Standards apply to **any point** in affected stream segments. Like the Temporary Water Quality Standards, the Narrative Water Quality Standards are calculated as the mean concentration plus two (2) standard deviations

(2) - Temporary Water Quality Standards are set in accordance to the rule adopted by the Board of Environmental Review. These standards apply to specific surface water sampling stations and shall not be exceeded more than 3% of the time

(3) - Based on 50 mg/l hardness

(4) - Based on 100 mg/l hardness

Flow at station SW-3 increased 30 percent from mid-morning to early evening during both May and June diurnal monitoring events. Flow did not measurably increase at station SW-3 during the July diurnal event. With increasing flow, the dilution effect on concentrations of total recoverable copper and zinc was not as apparent in Fisher Creek as it was in Daisy Creek. In the first graph of the series in Appendix A-8, the diurnal data for total concentrations of copper and iron measured in the field are plotted on one graph (flow versus concentration). This graph shows that dilution in Fisher Creek proceeds rapidly during the initial stages of the melt out (May) but, after the midway point during melt out (June data), total iron and copper concentrations reach a more steady state condition with respect to flow and only minor dilution occurs in response to the diurnal fluctuations in discharge. As in Daisy Creek, copper loads had not yet peaked in Fisher Creek when the last sample was collected during the May and June diurnal monitoring events.

### *3.1.3 Discussion of Long-Term Surface Water Quality Data - Miller Creek*

Review of water chemistry data for Miller Creek show that no regulatory standard was exceeded at station SW-2 during April, July, or October 2000 (Table A-1).

### *3.1.4 Discussion of Long-Term Surface Water Quality Data - Soda Butte Creek*

Review of water chemistry data for Soda Butte Creek indicate that aluminum exceeded chronic aquatic life standards at station SBC-2 during the October event, and stations SBSW-102 and SBC-4 during the April, July, and October events (Table A-1). Total recoverable iron exceeded the chronic aquatic life standard at station SBC-2 during April and October and zinc exceeded the acute and chronic aquatic life standard at station SBC-1 during April 2000. Station SBC-1 is located upstream of the McLaren Tailings. Total recoverable iron concentrations in Soda Butte Creek typically increase from station SBC-1 to SBC-2 as a result of input from the McLaren Tailings. Iron concentrations then gradually decrease between station SBC-2 and SBC-4. Copper and lead concentrations were below detection limits in all water samples collected from Soda Butte Creek with the exception of lead at station SBC-4 during July. A total recoverable lead concentration of 0.058 mg/l was measured at station SBC-4 during the July event. The source of lead at this station during July is unknown at this time.

## 3.2 GROUNDWATER

Laboratory analytical reports, chain of custody forms, and field notes for the 2000 groundwater monitoring events are contained in Appendix B. Included in Appendix B is Table B-1, which summarizes groundwater monitoring data collected during 2000.

Tables 5 and 6 compare selected 2000 groundwater quality data to historical data for wells in the McLaren Pit area and Como Basin, respectively. Comparing the 2000 sample results to historic data, groundwater quality is generally within the historic range for each well.

Groundwater quality data for wells in the McLaren Pit area are summarized in Table 5. Review of these data show that, in general, groundwater intercepted by wells completed in waste rock is typically the most acidic, with average pH values ranging from 2.4 in well EPA-4 to 2.7 in well EPA-3. The average pH of water intercepted by wells screened in the Meagher Limestone ranged from 3.4 to 3.9. The average pH of Wolsey Shale wells (EPA-1, EPA-9, and MW-2) ranges from 3.2 in well EPA-2 to 6.6 in well EPA-9.

TABLE 5  
McLaren Pit Area  
2000 Groundwater Monitoring Data Comparison

Sample Location	Sample Date	Laboratory Parameters							
		pH (S.U)	Dissolved Metals						
			Aluminum (mg/l)	Cadmium (mg/l)	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)	Manganese (mg/l)	Zinc (mg/l)
<b>Waste Rock</b>									
EPA-3	07/11/00	2.7	24.60	0.0042	11.900	130.0	0.016	1.17	0.57
EPA-3	<b>MAX*</b>	3.0	31.20	0.0084	13.600	140.0	0.015	2.50	1.26
EPA-3	<b>MIN*</b>	2.7	0.52	0.0020	0.007	0.0	0.002	0.06	0.03
EPA-3	<b>MEAN*</b>	2.9	20.91	0.0047	8.736	91.7	0.008	1.29	0.67
EPA-4	07/12/00	2.4	91	0.0220	32.800	352.0	< 0.001	7.77	3.75
EPA-4	<b>MAX*</b>	2.4	111	0.0310	44.400	439.0	0.015	10.60	4.14
EPA-4	<b>MIN*</b>	2.3	81.7	0.0220	34.500	197.0	0.001	9.31	3.41
EPA-4	<b>MEAN*</b>	2.4	92.6	0.0252	38.600	329.6	0.005	9.86	3.78
EPA-7	07/11/00	Not Sampled							
<b>Fisher Mountain Intrusive</b>									
EPA-5	07/11/00	3.6	44.3	0.0010	7.460	65.2	0.003	0.42	0.18
EPA-5	<b>MAX*</b>	3.6	72.8	0.0050	11.900	78.7	0.003	0.54	0.23
EPA-5	<b>MIN*</b>	3.5	63.7	0.0010	2.750	70.7	0.002	0.48	0.18
EPA-5	<b>MEAN*</b>	3.6	66.3	0.0023	6.973	75.0	0.003	0.52	0.20
EPA-6	07/11/00	3.6	38.1	0.0005	0.730	64.5	0.002	0.49	0.21
EPA-6	<b>MAX*</b>	5.5	64.0	0.0200	6.090	69.5	0.006	0.74	0.22
EPA-6	<b>MIN*</b>	3.4	45.0	0.0001	0.001	0.0	0.001	0.01	0.01
EPA-6	<b>MEAN*</b>	4.1	40.0	0.0031	1.824	46.9	0.002	0.43	0.16
<b>Meagher Limestone</b>									
EPA-8	07/12/00	3.6	46.4	0.0200	26.200	78.4	0.005	8.43	3.08
EPA-8	<b>MAX*</b>	4.2	69.4	0.0380	40.400	94.0	0.030	13.00	3.20
EPA-8	<b>MIN*</b>	3.5	26.1	0.0225	16.000	43.8	0.003	11.30	2.48
EPA-8	<b>MEAN*</b>	3.9	52.5	0.0264	29.967	72.8	0.011	12.25	2.90
EPA-10	07/12/00	3.2	66.7	0.0210	23.400	370.0	0.022	7.30	3.69
EPA-10	<b>MAX*</b>	3.7	72.9	0.0448	34.800	448.0	0.046	11.90	3.77
EPA-10	<b>MIN*</b>	3	25.7	0.0140	5.000	237.0	0.009	5.41	1.97
EPA-10	<b>MEAN*</b>	3.4	52.6	0.0242	22.317	356.3	0.026	8.61	3.08

Note: \* Max, Min, and Mean are calculated using entire historical data for each sample location presented  
Metals data in milligrams per liter (mg/l); pH in standard units

TABLE 5 (Continued)  
McLaren Pit Area  
2000 Groundwater Monitoring Data Comparison

Sample Location	Sample Date	Laboratory Parameters							
		pH (S.U)	Dissolved Metals						
			Aluminum (mg/l)	Cadmium (mg/l)	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)	Manganese (mg/l)	Zinc (mg/l)
<b>Wolsey Shale</b>									
EPA-1	07/11/00	4.4	12.1	0.0078	1.020	248.0	0.072	5.66	2.40
EPA-1	<b>MAX*</b>	4.7	18.5	0.0250	2.230	449.0	0.112	11.70	3.16
EPA-1	<b>MIN*</b>	4.1	11.9	0.0080	0.180	163.0	0.044	5.13	1.78
EPA-1	<b>MEAN*</b>	4.5	15.6	0.0126	0.786	236.8	0.076	6.74	2.35
EPA-2	07/011/00	3.9	27	0.0079	1.180	149.0	0.090	2.42	1.20
EPA-2	<b>MAX*</b>	3.8	57.1	0.0223	23.500	292.0	0.204	5.36	3.71
EPA-2	<b>MIN*</b>	2.8	19.7	0.0056	1.440	129.0	0.020	2.68	1.17
EPA-2	<b>MEAN*</b>	3.2	34.38	0.0123	10.088	178.0	0.079	3.77	2.20
EPA-9	07/12/00	6.4	< 0.1	< 0.0010	< 0.005	39.0	< 0.001	1.24	0.13
EPA-9	<b>MAX*</b>	6.8	0.2	0.0050	0.010	48.0	0.003	1.49	0.19
EPA-9	<b>MIN*</b>	6.3	0.0	0.0001	0.001	21.9	0.001	0.90	0.05
EPA-9	<b>MEAN*</b>	6.6	0.1	0.0013	0.004	34.8	0.002	1.16	0.14
MW-2	07/11/00	3.5	32.6	0.0009	0.010	100.0	0.007	1.03	0.27
MW-2	<b>MAX*</b>	4	51.0	0.0060	0.910	131.0	0.030	1.20	0.91
MW-2	<b>MIN*</b>	2.8	34.4	0.0006	0.010	23.0	0.002	0.62	0.24
MW-2	<b>MEAN*</b>	3.5	42.8	0.0026	0.348	100.8	0.013	0.99	0.48

Note: \* Max, Min, and Mean are calculated using entire historical data for each sample location presented  
Metals data in milligrams per liter (mg/l); pH in standard units

TABLE 6  
Como Basin  
2000 Groundwater Monitoring Data Comparison

Sample Location	Sample Date	Laboratory Parameters							
		pH (S.U)	Dissolved Metals						Zinc (mg/l)
			Aluminum (mg/l)	Cadmium (mg/l)	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)	Manganese (mg/l)	
<b>Fisher Mountain Intrusive</b>									
EPA-11	07/13/00	4.2	6.7	0.0120	0.750	347.00	0.340	16.600	1.61
EPA-11	<b>MAX*</b>	4.3	5.2	0.0250	0.530	348.00	0.320	15.300	1.41
EPA-11	<b>MIN*</b>	3.6	1.0	0.0058	0.042	294.00	0.003	10.800	0.92
EPA-11	<b>MEAN*</b>	4.0	2.3	0.0148	0.202	314.60	0.147	12.820	1.23
TRACER-4	07/13/00	3.4	1.6	0.0006	0.520	92.00	0.019	7.060	1.55
TRACER-4	<b>MAX*</b>	3.7	0.8	0.0050	0.070	119.00	0.010	9.870	1.96
TRACER-4	<b>MIN*</b>	3.7	0.3	0.0004	0.010	107.00	0.001	7.720	0.98
TRACER-4	<b>MEAN*</b>	3.7	0.6	0.0027	0.040	113.00	0.006	8.795	1.47
TRACER-5	07/13/00	3.8	19.6	0.0016	4.300	54.90	0.005	0.800	0.32
TRACER-5	<b>MAX*</b>	3.6	25.1	0.0018	5.840	55.00	0.010	0.930	0.43
TRACER-5	<b>MIN*</b>	3.6	21.7	0.0010	0.830	44.90	0.003	0.660	0.23
TRACER-5	<b>MEAN*</b>	3.6	23.4	0.0014	3.335	49.95	0.007	0.795	0.33
<b>Wolsey Shale</b>									
MW-1	07/13/00	3.4	1.2	0.0005	0.240	42.80	0.014	2.920	0.10
MW-1	<b>MAX*</b>	4.5	2.3	0.0050	2.580	85.60	0.092	6.760	0.52
MW-1	<b>MIN*</b>	3.3	0.1	0.0005	0.010	11.50	0.000	0.990	0.05
MW-1	<b>MEAN*</b>	3.7	1.2	0.0022	0.410	37.15	0.021	3.324	0.23
<b>Scotch Bonnet Diorite</b>									
EPA-12	07/13/00	6.1	< 0.1	< 0.0001	< 0.005	0.03	< 0.001	< 0.005	< 0.01
EPA-12	<b>MAX*</b>	6.8	0.2	0.0050	0.010	30.50	0.003	1.860	0.07
EPA-12	<b>MIN*</b>	5.7	0.0	0.0001	0.001	9.22	0.001	1.170	0.01
EPA-12	<b>MEAN*</b>	6.3	0.1	0.0012	0.004	20.80	0.002	1.480	0.03
TRACER-6	07/13/00	6.0	< 0.1	0.0006	0.120	21.00	< 0.001	2.900	0.03
TRACER-6	<b>MAX</b>	6.2	0.4	0.0010	0.180	17.60	0.010	3.280	0.08
TRACER-6	<b>MIN</b>	6.2	0.1	0.0010	0.010	9.10	0.001	1.480	0.01
TRACER-6	<b>MEAN</b>	6.2	0.3	0.0010	0.095	13.35	0.006	2.380	0.05

Note: \* Max, Min, and Mean are calculated using entire historical data for each sample location presented  
Metals data in milligrams per liter (mg/l); pH in standard units

With the exception of well EPA-2 (completed in Fisher Mountain Intrusive and Wolsey Shale formations), dissolved metals concentrations in all McLaren Pit area wells decrease with depth. The highest concentrations of dissolved aluminum, copper, and zinc occur in well EPA-4, which is completed in waste rock. The highest dissolved iron concentrations occur in well EPA-10, completed in the Meagher Limestone. This well is screened in mineralized ore or sub-ore zones within the Meagher.

Groundwater quality data for Como Basin area wells are summarized in Table 6. In general, groundwater in Como Basin is of better quality than groundwater in the McLaren Pit area. Dissolved metals concentrations are typically lower, pH values are more basic, and sulfate concentrations are lower. Review of the data on Table 6 show that groundwater intercepted by wells EPA-12 and Tracer-6 (both completed in Scotch Bonnet diorite) is the best quality of that sampled in Como Basin. Average pH values of water sampled from EPA-12 and Tracer-6 range from 6.2 to 6.3 and concentrations of dissolved metals are considerably lower than metals concentrations in other Como Basin wells. Well MW-1, completed in the Wolsey Shale, has the lowest pH of any well in Como Basin.

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## 4.0 DATA VALIDATION

This section describes the data validation process used to determine the adequacy and quality of laboratory analytical data collected for long-term surface water and groundwater monitoring in 2000. The objective of data validation is to identify any unreliable or invalid measurements and qualify that data for interpretive use. These validations were performed according to guidelines prepared by US EPA (1994).

### 4.1 SURFACE WATER DATA VALIDATION

The 2000 surface water monitoring events were validated independently as separate sample matrices. Data qualifiers used to flag data are as follows: '<' indicates the material was analyzed for, but not detected above the level of the associated value practical quantitation limit (PQL); 'J' indicates the associated values are an estimated quantity; and, 'R' indicates the data are unacceptable.

#### 4.1.1 FIELD QA/QC

During the 2000 sampling events, field duplicates and deionized water blanks were prepared and containerized by Maxim field personnel in accordance to the Site-Wide SAP (Maxim, 1999c). Field QA/QC samples collected/prepared during the 2000 surface water monitoring events are summarized in Table 7.

Monitoring Event	QA/QC Sample	Sample Designation
April 2000	Deionized Water Blank	RR-SBC-2B
	Field Duplicate	RR-SBC-1X
July 2000	Field Duplicate	RR-DC-5X
October 2000	Field Duplicate	SBC-1X
	Field Duplicate	RR-SW-4X

Field duplicate results aid in the assessment of sampling and analytical accuracy. Analytical results for the original and duplicate samples collected from each sampling event were evaluated using RPD and absolute value difference. The RPD between the two samples was calculated when both values of the natural/duplicate pair were greater than five times the PQL for a given analyte. The absolute value difference between the natural and duplicate sample for a given analyte was calculated when one or both values were less than five times the PQL.

RPDs are calculated by dividing the difference between the two reported values for a given parameter by the average of the two parameters. Analytical results of parameters where the RPD was greater than 20 percent are considered estimated concentrations. Aluminum, copper, cadmium, iron, manganese and zinc in the duplicate sample pair RR-DC-5/RR-DC-5X exhibited a RPD greater than 20 percent for the July

2000 sample event. The natural samples associated with those parameters have been flagged as estimated. For the October sampling event, total recoverable iron exhibited a RPD greater than 20 percent in both duplicate sample pair (RR-SBC-1/RR-SBC-1X and RR-SW-4/RR-SW-4X); therefore, natural samples associated with total recoverable iron have been flagged as estimated.

Results from natural/duplicate pairs with values less than five times the PQL are considered estimated when the absolute value difference exceeds the PQL. No parameter exhibited differences greater than the PQL in the April, July, or October 2000 sample events.

#### *4.1.2 LABORATORY QA/QC*

Northern Analytical Laboratories received surface water samples from the New World Mining District on April 17, July 10, October 11 and October 20, 2000. All samples arrived at the laboratory cool (>2.8° C and <3.6° C) and all samples were analyzed within the required holding time for the parameters of interest.

Northern Analytical Laboratories' quality assurance coordinator reviewed calibration standards, calibration verification, laboratory controls, laboratory duplicates, and laboratory spikes on a daily basis. Review of these indicators showed that all inorganic analyses were in compliance with Northern's QA/QC criteria and within the precision and accuracy guidelines specified in Northern's *Laboratory Quality Assurance Plan* (submitted to MDEQ, June 1997).

Accuracy is measured as the ability of the analytical procedure to determine the actual or known quantity of a particular substance in a sample. Accuracy acceptance or rejection is based on the percent recovery (%R) of the laboratory matrix spike for water samples. To determine accuracy, the %R for each matrix spike is compared to the acceptable range as specified in the applicable laboratory method. Natural results associated with percent recoveries outside acceptable limits are considered estimated. Natural results associated with percent recoveries of less than 50% are considered rejected, as recommended by EPA (1988). An overall assessment of accuracy is made upon completion of the project. Overall accuracy is stated as the mean %R. Under this criterion, all surface water data collected in 2000 data are acceptable.

#### *4.1.3 DATA COMPLETENESS*

No data have been rejected on the basis of field QA/QC or laboratory QA/QC in any sampling event. Therefore, a data completeness of 100% was achieved for the 2000 surface water monitoring events.

## **4.2 GROUNDWATER DATA VALIDATION**

The July 2000 groundwater monitoring events were validated independently as separate sample matrices. Data flagging are the same as that used for surface water samples.

#### *4.2.1 FIELD QA/QC*

During the July 2000 sampling events, deionized water blanks, rinsate blanks, and field duplicates were prepared and containerized by Maxim field personnel in accordance with the Site-Wide SAP (Maxim, 1999c). Field QA/QC samples collected/prepared during the 2000 groundwater monitoring events are summarized in Table 8.

**TABLE 8**  
**2000 Groundwater Quality Control Samples**  
**New World Mining District - Response and Restoration Project**

Monitoring Event	QA/QC Sample	Sample Designation
July 2000	Field Duplicate	RR-EPA-1X
	Deionized Water Blank	RR-MW-9AB
	Rinsate Blank	RR-MW-9AR
	Field Duplicate	RR-MW-9AX
	Rinsate Blank	RR-EPA-12R
	Field Duplicate	RR-EPA-12X

During the July 2000 sampling event, duplicate samples were collected from wells EPA-1 (RR-EPA-1X), EPA-12 (RR-EPA-12X), and MW-9a (RR-MW-9AX). One rinsate blank and one deionized water blank were also prepared and containerized by field technicians while collecting a sample from well MW-9A and were labeled RR-MW-9AR and RR-MW9AB, respectively.

Field duplicate results aid in the assessment of sampling and analytical accuracy. Analytical results for the original and duplicate samples collected from each sampling event were evaluated using the RPD and absolute value difference. The RPD between the two samples was calculated when both values of the natural/duplicate pair were greater than five times the PQL for a given analyte. The absolute value difference between the natural and duplicate sample for a given analyte was calculated when one or both values were less than five times the PQL.

RPDs are calculated by dividing the difference between the two reported values for a given parameter by the average of the two parameters. Analytical results of parameters where the RPD was greater than 20 percent are considered estimated concentrations. No parameter exhibited an RPD greater than 20 percent in the July 2000 sample event.

Results from natural/duplicate pairs with values less than five times the PQL are considered estimated when the absolute value difference exceeds the PQL. Alkalinity as CaCO<sub>3</sub>, alkalinity as HCO<sub>3</sub> and dissolved iron in the duplicate pair sample MW-9A/MW-9AX exhibited absolute differences greater than the PQL. All natural samples associated with these parameters were flagged as estimated.

All blank results (rinsate blank and deionized water blank) for both sampling events were evaluated using the following criteria to determine if any parameter was measured in the samples at detectable concentrations. The blank with the highest detectable concentrations was used for further evaluation in instances where more than one type of blank was contaminated. All results greater than or equal to the PQL but less than five times the concentration of the contaminated blank are considered estimated and are likely biased towards the high end. Neither the rinsate nor the deionized blanks were contaminated during the July 2000 sampling event.

#### 4.2.2 LABORATORY QA/QC

Northern Analytical Laboratories received groundwater samples from the New World Mining District on July 14, 2000. All samples arrived at the laboratory cool ( $>1.0^{\circ}\text{C}$  and  $<10^{\circ}\text{C}$ ). All samples were analyzed within the required holding time for the parameters of interest with the exception of Acidity as  $\text{CaCO}_3$  in three wells, RR-EPA-3, TRACER-6, and RR-MW-9AR). Acidity in these samples was analyzed after the holding time had passed.

Northern Analytical Laboratories' quality assurance coordinator reviewed calibration standards, calibration verification, laboratory controls, laboratory duplicates, and laboratory spikes on a daily basis. Review of these quality indicators showed that all inorganic analyses were in compliance with Northern's QA/QC criteria and within the precision and accuracy guidelines specified in Northern's *Laboratory Quality Assurance Plan* (submitted to MDEQ, June 1997).

Accuracy is measured as the ability of the analytical procedure to determine the actual or known quantity of a particular substance in a sample. Accuracy acceptance or rejection is based on the percent recovery (%R) of the laboratory matrix spike for water samples. To determine accuracy, the %R for each matrix spike is compared to the acceptable range as specified in the applicable laboratory method. Natural results associated with percent recoveries outside acceptable limits will be considered estimated. Natural results associated with percent recoveries of less than 50% will be considered rejected, as recommended by EPA (1988). An overall assessment of accuracy will be made upon completion of the project. Overall accuracy will be stated as the mean %R. Under this criterion, all groundwater data collected in 2000 data are acceptable.

#### 4.2.3 DATA COMPLETENESS

No data have been rejected on the basis of field QA/QC or laboratory QA/QC in either sampling event. Therefore, a data completeness of 100% was achieved for the July 2000 groundwater monitoring event.

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**APPENDIX A**

**2000 SURFACE WATER DATA**

*New World Mining District Response and Restoration Project*

APPENDIX A-1

TABLE A-1 2000 SURFACE WATER SUMMARY  
*New World Mining District Response and Restoration Project*

APPENDIX A-2

APRIL 2000 SURFACE WATER  
LABORATORY REPORTS & FIELD NOTES  
*New World Mining District Response and Restoration Project*

APPENDIX A-3

MAY 2000 DIURNAL SURFACE WATER  
LABORATORY REPORTS & FIELD NOTES  
*New World Mining District Response and Restoration Project*

APPENDIX A-4

JUNE 2000 DIURNAL SURFACE WATER  
LABORATORY REPORTS & FIELD NOTES  
*New World Mining District Response and Restoration Project*

APPENDIX A-5

JULY 2000 SURFACE WATER  
LABORATORY REPORTS & FIELD NOTES  
*New World Mining District Response and Restoration Project*

APPENDIX A-6

OCTOBER 2000 SURFACE WATER  
LABORATORY REPORTS & FIELD NOTES  
*New World Mining District Response and Restoration Project*

APPENDIX A-7

Graphs of Selected Diurnal Data Collected at Station DC-2  
*New World Mining District Response and Restoration Project*

APPENDIX A-8

Graphs of Selected Diurnal Data Collected at Station SW-3  
*New World Mining District Response and Restoration Project*

**APPENDIX B**

**2000 GROUNDWATER DATA**

*New World Mining District Response and Restoration Project*

APPENDIX B-1

TABLE B-1 GROUDWATER DATA SUMMARY  
*New World Mining District Response and Restoration Project*

APPENDIX B-2

JULY 2000 GROUNDWATER  
LABORATORY DATA SHEETS & FIELD NOTES  
*New World Mining District Response and Restoration Project*