EAGLE MINE ANNUAL REPORT – 2008

EAGLE MINE SITE
MINTURN, COLORADO

Prepared for:
CBS Operations Inc.

March 2, 2009

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APPENDICES

1.0 INTRODUCTION

This Annual Site Monitoring and Activity Report (Annual Report) was prepared by NewFields on behalf of CBS Operations Inc. (CBS) and provides a summary of environmental data collected during the 2008 calendar year at the Eagle Mine site (Site) near Minturn, Colorado. The Site location and vicinity are shown on Figure 1-1. The Annual Report also summarizes design, construction, inspection, operation and maintenance, and community relation activities conducted in 2008 in connection with the Site. Data from January through April 2008 was previously submitted to the Colorado Department of Public Health and Environment (CDPHE) and U.S. Environmental Protection Agency (EPA) in the mid-year progress report dated June 23, 2008.

This Annual Report is a deliverable listed in Table A of the Final Statement of Work - Part A (Appendix B) for the Operable Unit No. 1 Partial Consent Decree, Civil Action No. 95-N-2360 (D. Colorado) (CD/SOW). The CD/SOW requires that the Annual Report provide a compilation of environmental data collected during the calendar year and include an interpretation and analysis of several required tasks. The following tasks are still active.

- **Task 3B and 8.** Report changes in water levels and groundwater quality associated with the Consolidated Tailings Pile (CTP) groundwater extraction trenches, and summarize annual performance of the CTP groundwater extraction system. These data are reported and the annual performance of the groundwater extraction system is discussed in Section 4.3.

- **Task 6A.** Report on the performance of the Rock Creek groundwater extraction system. The extracted volumes are reported and the system performance is discussed in Section 4.4.

- **Task 9.** Evaluate the reactivation or reconstruction of the Upgradient Groundwater Diversion Trench (UGDT). The UGDT was reactivated in 1999 and the UGDT's performance is discussed in Section 4.2.

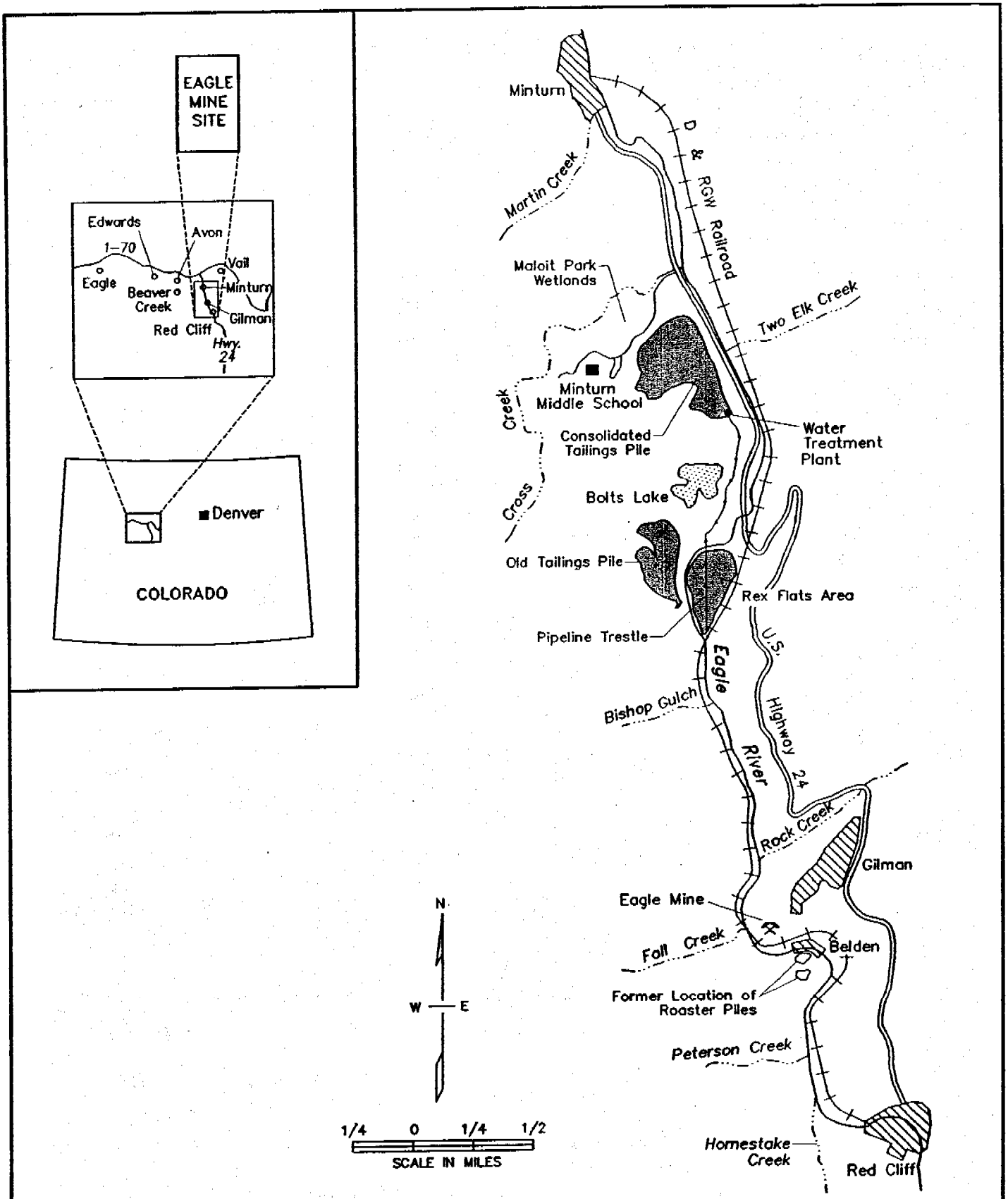
Performance Standards in the CD for the above-listed tasks require that the systems be operated and maintained for a period not to exceed ten (10) years after the effective date of the Consent Decree. The Performance Standards in the CD expired in 2006. Nonetheless, the Annual Reports will continue to present data and an evaluation of the systems listed above while they are in operation.

This Annual Report also satisfies the requirement for an annual monitoring report specified in the Consent Decree, Order, Judgment and Reference to the Special Master for Civil Action No. 83-C-2387 (D. Colorado), Remedial Action Plan, as amended (CD/RAP).

Monitoring activities, data summaries, interpretation and analysis of selected data, and summaries of Site activities are provided in the following:

- Section 2 Surface Water Monitoring and Data Summary
- Section 3 Eagle Mine Water Monitoring and Data Summary
- Section 4 Groundwater Monitoring and Data Summary
- Section 5 CTP Surface Settlement and Erosion Monitoring
- Section 6 Summary of Site Activities.

Figures and tables are presented at the end of each section.



Eagle Mine Site and Vicinity Map

Figure 1-1

EMS-VM.DWG

2.0 SURFACE WATER MONITORING AND DATA SUMMARY

Surface water monitoring is conducted in accordance with the requirements of the Surface Water Sampling and Analysis Plan (SWSAP, Dames & Moore 1996), with modifications pursuant to a letter agreement among CDPHE, EPA, and CBS. The modifications were clarified in a letter, dated June 17, 1997, and approved on July 8, 1997 (Letter Agreement). In a March 21, 2000 letter, and approved May 23, 2003, CBS proposed eliminating the August Eagle River and tributary sampling and replacing it with a May sampling event. The EPA- and CDPHE-approved changes made in 2003 in anticipation of approval of a Compliance Monitoring Plan (CMP) were to (1) discontinue laboratory analysis of the total recoverable metals fraction, (2) discontinue testing for water quality parameters specified in the Biological Monitoring Sampling Plan (BMSAP) due to completion of the monitoring requirements, and (3) substitute U.S. Geological Survey (USGS) gage measurements at station E-12A for manual Eagle River flow measurements, except during fall sampling, when standard SWSAP flow measurement methods will be used. In December 2004, the surface water monitoring was modified to include former biological monitoring station E-22 and to discontinue monitoring at tributary station T-6, near the mouth of the Roaster Drainage. In 2006, total iron was substituted for dissolved iron to make the surface water analysis list consistent with water quality standards for Eagle River and Cross Creek. Additionally in 2006, sampling at stations E-11 and E-13 was eliminated since there were multiple monitoring points in these segments. In 2007 and 2008, the May sampling event was eliminated due to high flow safety concerns weighed against the dilution effects also due to high flow.

This section provides a summary of surface water monitoring activities at the Site for the reporting period, October 2007 through October 2008.

2.1 Monitoring Stations

Surface water monitoring stations were established in 1985 at the outset of the remedial investigation, corresponding closely with locations used by the USGS in studies prior to 1985. The following Eagle River stations were monitored during the reporting period:

- E-3 Eagle River above Belden
- E-5 Eagle River above Fall Creek
- E-10 Eagle River above Rock Creek
- E-12A Eagle River below Old Tailings Pile/Rex Flats
- E-13B Eagle River above Cross Creek
- E-15 Eagle River below Cross Creek
- E-22 Eagle River above Dowds Junction.

Eagle River and tributary water quality samples were collected in the reporting period pursuant to the methods in the SWSAP. Surface water quality samples were collected in January, March, April, September, and October and were analyzed for the list of parameters shown in Table 2-1. Field measurements consisted of temperature, specific conductance, and pH. Stream flow in the Eagle River was monitored using the USGS gage at E-12A.

To describe zinc loading, the Eagle River between Red Cliff and Dowds Junction below Minturn (E-3 to E-22) has been separated into six segments. Each segment is defined by two sampling stations, as shown on Figure 2-1, and is described below.

- Belden (E-3 to E-5). This segment of the Eagle River is located within Belden beginning approximately 1,000 feet upstream of Belden, extending downstream to above the confluence with Fall Creek. Tributary inflow is primarily from the perennial Roaster Drainage, although small ephemeral drainages also enter the river in this segment.

- Fall Creek (E-5 to E-10). This Eagle River segment is immediately downstream of Belden. The perennial tributary Fall Creek enters the Eagle River in this segment and is the third largest tributary to the Eagle River within the Site.

- Rock Creek (E-10 to E-12A). This segment extends from approximately 400 feet upstream of Rock Creek to the stream gage downstream of Rex Flats. Inflow from small perennial tributaries Rock Creek and Bishop Gulch enter the Eagle River in this segment.

- Two Elk Creek (E-12A to E-13B). This segment of the Eagle River extends from the stream gage downstream to approximately 200 feet upstream of the Cross Creek confluence. Two Elk Creek, the second largest tributary at the Site, enters the Eagle River in this segment.

- Cross Creek (E-13B to E-15). This segment of the Eagle River extends from approximately 200 feet upstream of the Cross Creek confluence 3,000 feet downstream of Cross Creek. Cross Creek is the largest tributary entering the Eagle River at the Site.

- Segment 5c (E-15 to E-22). This segment of the Eagle River covers the area downstream of Cross Creek to downstream of Minturn at Dowds Junction. Station E-22 is the compliance station for Eagle River Main Stem Segment 5c discussed in the paragraphs that follow.

The following two tributaries to the Eagle River at the Site are monitored:

- T-10 Rock Creek at mouth
- T-18 Cross Creek near mouth.

Tributary water quality samples are analyzed for the list of parameters in Table 2-1, at the same frequency as the Eagle River. Field measurements consist of temperature, specific conductance, pH, and stream flow.

Other Eagle River tributaries at the Site are, in downstream order, Roaster Pile drainage, Fall Creek, Bishop Gulch, and Two Elk Creek. These tributaries enter the Eagle River between Red Cliff and Minturn but are no longer monitored for water quality or stream flow. Years of sampling data confirm that these tributaries are not metal loading sources to the Eagle River.

In December 2005, the Colorado Water Quality Control Commission (WQCC) established new temporary seasonal modifications to the water quality standards for Segment 5 of the Eagle River and Segment 7 (Cross Creek). The temporary seasonal modifications subdivided Segment 5, the "mainstem of the Eagle River, into the following three segments with the indicated monitoring stations as the compliance point for each segment:

- 5a – Mainstem of the Eagle River from the compressor house bridge at Belden to the Highway 24 Bridge near Tigiwon Road – compliance station is E-12A
- 5b – Mainstem of the Eagle River from Highway 24 Bridge near Tigiwon Road to the confluence with Martin Creek – compliance station is E-15
- 5c – Mainstem of the Eagle River from the confluence with Martin Creek to the confluence with Gore Creek – compliance station is E-22.

Additionally Segment 7, Cross Creek, was subdivided into the following two segments with the indicated monitoring station for the portion that flows through the Site:

- 7a – Cross Creek mainstem to the Minturn Middle School
- 7b – Cross Creek from the Minturn Middle School to the confluence with the Eagle River – compliance station is T-18.

2.2 Hydrology

Included in this section are background information on the hydrologic monitoring program, a comparison of 2007 and 2008 stream flow to historical conditions, and a discussion of stream flow during water quality sampling events.

The Eagle River and its tributaries at the Site exhibit a large seasonal fluctuation in stream flow each year that is typical of most high-elevation watersheds in the central Rocky Mountains. Eagle River stream flow at the Site is illustrated in the hydrograph shown in Figure 2-2.

Eagle River watershed topographic elevation ranges from 8000 feet mean sea level (MSL) at the Site to over 14,000 feet MSL at the headwaters of the Eagle River, with precipitation greater in the higher elevations. From November through April each year, a seasonal snowpack accumulates in the watershed with greater snow accumulation at higher elevations. During the winter, mean daily temperatures are typically below freezing and stream flow in the Eagle River and its tributaries is at a minimum. The Eagle River winter base flow period at the Site extends from November to March each year and stream flow typically ranges from about 30 to 40 cubic feet per second (cfs). Small fluctuations in Eagle River stream flow occur during winter because of ice freezing and thawing on the river channel bed and banks.

Site snowpack begins to melt in March and April, followed by snowmelt from progressively higher elevations in the watershed through June each year. In May, Eagle River flow is usually dominated by high-elevation basin-wide snowmelt upstream from the Site. Large diurnal flow fluctuations occur because of daily snowmelt during this period. Peak flows in excess of 800 cfs are common in the Eagle River at the Site during the spring runoff period. Stream flow recedes from July through October each year, with periodic flow increases resulting from summer rainfall-runoff events.

2.2.1 Eagle River

Instantaneous current meter discharge measurements and continuous stage height measurements are taken on the Eagle River at the Site. A continuous recording stream gage was installed on the Eagle River in 1989 to monitor stream flow patterns at the Site. The gage is located approximately in the middle of the Site at E-12A (see Figure 2-1). The gage is at an elevation of 8080 feet MSL and represents a drainage area of 186 square miles.

The gage is operational during ice-free periods (eight months each year) from about March 15 to November 15. The channel at the gage typically becomes ice-covered in November and ice on the control affects the stage height readings throughout the winter

months. According to USGS criteria, the gage records are considered good (90 percent of the daily discharges are within 10 percent of their true value) except for records estimated during ice periods, which are fair (within 15 percent). Discharge during ice periods is estimated from direct stream flow measurements and stage height measurements that are corrected for ice effect.

A preliminary discharge rating has been developed for the Eagle River at the E-12A stream gage and its accuracy is evaluated regularly using current discharge measurements. The USGS is involved in the operation and maintenance of the gage through a cooperative agreement with Eagle County and CBS. The USGS publishes mean daily discharge data on a real-time basis on their website http://waterdata.usgs.gov/co/nwis for USGS station 09064600.

Eagle River stream flow at the Site was above average during the high flow season in 2008. The high flow season ended approximately 3 weeks later than average (see Figure 2-2).

Stream flow at the Site was near normal (25 to 30 cfs) through the winter of 2007-2008. Flows remained at winter base flow levels until the mid-April 2008. On April 30, 2008, the Upper Colorado River Basin snowpack, as estimated by the Natural Resources Conservation Service, was 117 percent of normal compared to 85 percent in 2007 (ftp://ftp.wcc.nrcs.usda.gov/data/snow/basin_reports/colorado/wy2008/bassco4.txt). The snowmelt and subsequent runoff began later in mid-April rather than late March and with higher than normal flow conditions which peaked in early June and again in late June. By the last week of August the river had returned to normal flows. The E-12A mean daily peak flow was 1260 cfs on June 3, 2008 compared to a mean daily peak flow of 520 cfs on May 20, 2007. Stream flow continued below average after the peak and remained generally below or near average through October.

The times when samples were collected at E-12A during the winter, spring, and fall 2008 periods are labeled with an “S” on Figure 2-3.

2.2.2 Tributaries

Rock Creek is a perennial tributary entering the Eagle River between E-10 and E-11, draining approximately 1.5 square miles. Flow measurements are taken at a weir plate installed in the culvert at the base of Rock Creek (T-10), located at the confluence with the Eagle River. Rock Creek flows typically increase from snowmelt beginning in March or April with peak flows occurring in May or June. Rock Creek during low-flow periods typically contributes less than 200 gpm (0.45 cfs) or about one percent to the Eagle River flow; 2008 flow was approximately 0.2 percent of the Eagle River flow, with a maximum of 0.7 percent during the March snowmelt runoff season.

Cross Creek is a perennial tributary entering the Eagle River between E-13B and E-15. Cross Creek drains a comparatively large area of 34.2 square miles. For Cross Creek, the USGS stream gage "Cross Creek near Minturn" (09065100) discharge rating data are used to estimate flow for Station T-18. Instantaneous stream flow measurement results are presented with the associated water quality data in Appendix A. Stream flow ranges from less than 10 cfs during the winter season to peak flows over 200 cfs in June (Figure 2-4). Similar to the Eagle River, Cross Creek stream flow (measured at USGS station 09065100 or T-18) high flow period was higher and flowed longer than average in 2008. However, Cross Creek stream flow appeared to be average at the time of sample collection in September and October 2008.

2.3 Water Quality Trends

This section provides an evaluation of surface water quality at the Site. Dissolved metal concentrations are compared to hardness-based table value standards (TVS), the numeric standards for the Upper Colorado River Basin provided in Regulation No. 33. Also included are comparisons to the WQCC's seasonal temporary modifications (chronic) provided in Regulation No. 33 for Segments 5 and 7.

Segment (Monitoring Station)	**Chronic Seasonal Temporary Modifications, Dissolved Zinc (mg/L)**	
	March 1 through April 30	**May 1 through February 29**
5a (E-12A)	0.410	0.166
5b (E-15)	0.310	0.123
5c (E-22)	0.257	TVS (0.125 at average Hardness of 106.4)
7b (T-18)	0.193	0.116

Chronic standard not to be exceeded by a single representative sample within a 30-day period, or calculated as an average of multiple samples collected in a 30-day period. The new seasonal temporary modifications are effective December 2005 to January 1, 2009.

2.3.1 Eagle River Water Quality

Dissolved zinc concentrations are plotted for the Eagle River in Figure 2-5 for the reporting period October 2007 to October 2008. The seasonal temporary modifications to the water quality standards for the three segments of the Eagle River are plotted on Figure 2-6 and are compared to the monitoring station dissolved zinc concentrations.

Higher dissolved zinc concentrations are observed in the river during snowmelt periods in March and April. By May each year, warm temperatures generate snowmelt in the upper Eagle River basin above the Site and a large increase in stream flow occurs with

peak flows typically occurring in May or June. The high stream flow results in lower metal concentrations.

Table 2-2 presents data by station for March, April, September, and October for the five-year period 2004-2008. The streamflow measured at E-12A on the day of sample collection, dissolved zinc concentration, and the calculated dissolved zinc load in pounds per day are shown. Streamflow at non-E-12A stations are calculated using historical relationships developed over many years. These historical flow relationships were established between each station and the flow measurement recorded at the E-12A gage. These interpolated flow rates were used in the metal loading evaluation and equations are included in Appendix A.

Graphical representation of concentration data for dissolved cadmium, copper, and manganese and total iron are provided in Figure 2-7. These plots show concentrations for all Eagle River stations over the 2008 period. Dissolved concentrations remained at or below the TVS for metals during January, September and October 2008 sampling events. Dissolved cadmium and copper were below the respective TVS in all sampling events with the exception of April. Dissolved manganese concentrations were below TVS for all stations during all sampling events. Total iron was above the TVS in April at all stations with the exception of E-3 and was above the TVS at E-12A during the March sampling event.

2.3.2 Tributary Water Quality

Trends in dissolved zinc concentrations for Rock Creek (T-10) and Cross Creek (T-18) are discussed in the following sections. Flow and chemical results for the reporting period are provided in Appendix A.

Rock Creek

Water samples have been collected routinely from the mouth of Rock Creek (T-10) since March 1989. Dissolved zinc results for the last five years (2004-2008) are presented in Table 2-3. Dissolved zinc results for T-10 from March 1989 to October 2008 are presented in Figure 2-8.

Water quality in Rock Creek is influenced by large seasonal fluctuations in stream flow, seepage from the Eagle Mine, and waste-rock pile runoff. Concentrations typically increase in April during early spring snowmelt runoff and decrease rapidly in May and June as basin-wide stream flow increases. Concentrations typically remain low during the summer months except during rainfall-runoff events. Concentrations increase in fall and winter under reduced stream flow conditions.

Significant improvements in Rock Creek water quality have occurred since 1989. Factors contributing to the continued decrease in metals concentrations in Rock Creek include lowering the mine pool elevation, collection and treatment of mine seepage and groundwater in lower Rock Creek at the RX-3 well, and the diversion and treatment of runoff/seepage from the hillside below waste rock pile No. 8 (WRP-8).

Cross Creek

Dissolved metal concentrations have been routinely measured near the mouth of Cross Creek (T-18, see Figure 2-9) since September 1990. Dissolved zinc results for the last five years are presented in Table 2-3. The zinc concentration at T-18 dropped significantly in 1996 following the remediation of the Maloit Park wetlands. Since that time, dissolved zinc concentrations have generally remained below 0.2 mg/L, varying seasonally. Two sample results (Table 2-3) indicate that the seasonal temporary modification for zinc of 0.193 mg/L for March and April was not exceeded. The January dissolved zinc concentration at T-18 was 0.0696 mg/L exceeding the seasonal temporary modification for zinc of 0.116 mg/L that applies from May through February.

2.4 Load Source Evaluation

In this section, dissolved zinc load is used to assess potential metal sources related to past mining and other metal sources at the Site. Dissolved zinc load is calculated by multiplying the dissolved zinc concentration (in mg/L) by the flow (in cfs), and converting the units into pounds per day (lbs/day) using a conversion factor of 5.4. In this manner, the dissolved zinc load was calculated for each of the monitoring stations.

The Eagle River can be accessed for load gain and loss purposes under the following general conditions:

- During ice-free (open water) periods in March before the onset of flows in excess of 200 cfs,
- After flows drop below 200 cfs (typically August), and
- During low-flow conditions in September or October.

Inherent in each computation of load is the calculated error associated with the measurement of metal concentration and streamflow (up to ±25 percent analytical error and ±10 percent flow error). In the analysis of loading by stream segment, it is assumed the computed load incorporates these errors and, as such, retains a compounded error of at least ±20 percent.

This analysis utilizes data collected during September, which represents late summer and fall low-flow conditions. Table 2-4 provides a data summary of dissolved zinc loading by Eagle River segment for September 2007 and September 2008.

2.4.1 Eagle River

Sampling stations are located on the Eagle River to bracket, upstream and downstream, potential metal sources. These sources include tributary inflows from the Roaster Drainage, Rock Creek, and Cross Creek, in addition to inflow in the Belden, Old Tailings Pile (OTP)/Rex Flats, and CTP areas. Using discrete river segments, the difference in metal load between two stations can be calculated. The amount of load contributed by measured or "accounted" tributary inflows is known. In the absence of accounted tributary inflows, the entire load difference is referred to as the "unaccounted" load. A summary of the dissolved zinc load analysis based on data collected during the reporting period is presented in Table 2-4.

Each Eagle River segment can have an accounted load and/or unaccounted load. A positive unaccounted load (load increase) includes groundwater and/or diffuse surface-water inflow that are not measured. These are sometimes referred to as non-point source loads. A negative unaccounted load (load decrease) can result from losses of flow to groundwater, or from decreases in metal concentration through attenuation processes such as chemical precipitation or adsorption. An analysis of Eagle River loading by river segment is provided below for the September low-flow period.

Belden (E-3 to E-5)

The only perennial tributary inflow in this segment is the Roaster Drainage (T-6). During the September 2008 low-flow period, the dissolved zinc load was 9.1 lbs/day, 5.5 lbs/day less than September 2007. Unaccounted sources comprise over 94 percent of the dissolved zinc load increase during all flow regimes. Investigations in Belden indicate that the primary source of unaccounted load is groundwater perched in the waste rock and, secondarily, mine seepage. Runoff from the waste rock areas also contributes periodic metal loads during spring and summer.

Fall Creek (E-5 to E-10)

Fall Creek contributes on the order of 10 to 20 percent of the Eagle River flow in this segment. Past studies and historical data have documented that Fall Creek does not contribute significant quantities of metals, and this tributary metal load is assumed to be zero for purposes of load accounting (Dames & Moore 1998).

This segment typically exhibits a small change in load, sometimes increasing and sometimes decreasing. This year dissolved zinc load gain was 0.1 lbs/day within measurement error and 9.2 lbs/day less than September 2007.

Rock Creek (E-10 to E-12A)

This segment includes inflow from Rock Creek, Bishop Gulch, and the reach of the Eagle River upstream and downstream of the OTP/Rex Flats area. Historical data shows that Bishop Gulch does not contribute significant zinc load to the Eagle River.

During the September 2008 low-flow period, a typical gain of dissolved zinc load of 8.5 lbs/day was observed in this segment, in contrast to an unusual loss in load in September 2007. Of the September 2008 load gain observed in this segment, Rock Creek contributed an estimated 0.4 lbs/day.

CTP (E-12A to E-13B)

This segment includes the reach bracketing the CTP. Two Elk Creek, a perennial tributary, and the water treatment plant (WTP) also flow to the Eagle River in this segment; however, historical data show that dissolved zinc loads contributed by these sources are negligible. This segment experienced a small gain of dissolved zinc load of 1.2 lbs/day during September 2008, which is within measurement error.

Cross Creek (E-13B to E-15)

This segment includes Cross Creek, the largest tributary within the Site, which contributes substantial flow to this segment. Cross Creek contributed a 5.2 lbs/day zinc load in September 2008, as opposed to the typical average of 2 lbs/day. The Eagle River segment experienced a decrease in dissolved zinc load of –2.4 lbs/day in September 2008. While a loss in load is typical of this Eagle River section, it is usually within measurement error (*e.g.,* September 2007 0.9 lbs/day). Given the higher overall loss in the section plus the larger than average contribution from Cross Creek, the loss in this segment is significant relative to years past

2.4.2 Load Source Summary

The results of the Eagle River load source evaluation are summarized in Figure 2-10. Dissolved zinc loads for accounted tributary sources and unaccounted sources are shown for each of the Eagle River segments. September 2008 data were used to develop this plot. Low-flow results provide the best zinc load estimates as the flow measurement error load is the smallest and non-point runoff loading is not present.

Historically, the Belden and Rock Creek segments were the primary contributors of dissolved zinc to the Eagle River. This year only the Belden segment contributed to the dissolved zinc load to the Eagle River. The Belden segment zinc loading (9.2 lbs/day) is generally attributed to groundwater seepage from the waste rock and mine seepage in Belden. Low-flow zinc loading from Belden has not changed appreciably over the last three years. The Rock Creek segment loading to the river, from surface water and groundwater combined, typically ranges from 10 to 13 lbs/day in the fall. In September 2008, the zinc loading (8.5 lbs/day) shows a similar gain as in years past, with the exception of 2007, which showed a loss. However, the load is still reduced from years prior to the remedial actions, including lowering the mine pool and diverting and treating seepage and runoff from WRP-8.

Table 2-1 Surface Water Quality Monitoring Parameter Frequency

Parameter	January, March, April, May, September, October
Temperature (°C)	X
Specific Conductance (µmhos/cm)	X
pH (standard units)	X
Calcium, Dissolved (mg/L)	X
Magnesium, Dissolved (mg/L)	X
Iron, Total (mg/L)	X
Manganese, Dissolved (mg/L)	X
Cadmium, Dissolved (mg/L)	X
Copper, Dissolved (mg/L)	X
Lead, Dissolved (mg/L)	X
Zinc, Dissolved (mg/L)	X

Table 2-2
Eagle River Dissolved Zinc Summary
2004-2008

	Station E-3			
	March	**April**	**September**	**October**
---2004---				
Flow	63 e*	93 e*	26 e*	48 e*
Concentration	0.057	0.045	0.0084	NM
Load	19 e*	23 e*	1.2 e*	0.5 e***
---2005---				
Flow	26 e*	35 e*	29 e*	44.6
Concentration	0.15	0.093	0.016	0.0072
Load	21 e*	18 e*	2.5 e*	1.7
---2006---				
Flow	34 e*	192 e*	57.2	60 e*
Concentration	0.059	0.055	0.0047	0.0052
Load	11 e*	57 e*	1.5	1.7 e*
---2007---				
Flow	58 e*	96 e*	46.8 e*	43 e*
Concentration	0.0621	0.0443	0.00627	0.00837
Load	20 e*	23 e*	1.6 e*	2.0 e*
---2008---				
Flow	26 e*	107 e*	33 e*	28 e*
Concentration	0.024	0.208	0.0165	0.00446
Load	3.5 e*	120 e*	2.9 e*	0.7 e*
	Station E-5			
	March	**April**	**September**	**October**
---2004---				
Flow	65 e*	97 e*	26 e*	48.1
Concentration	0.220	0.150	0.140	0.044
Load	77 e*	78 e*	20 e*	11.4
---2005---				
Flow	25 e*	36 e*	29 e*	43.4
Concentration	0.370	0.480	0.120	0.12
Load	50 e*	92 e*	19 e*	28.1
---2006---				
Flow	35 e*	202 e*	60.6	62 e*
Concentration	0.570	0.210	0.060	0.12
Load	107 e*	230 e*	20	40.2 e*
---2007---				
Flow	60 e*	101 e*	47.9 e*	44 e*
Concentration	0.243	0.148	0.063	0.0614
Load	79 e*	80 e*	16 e*	14.6 e*
---2008---				
Flow	26 e*	112 e*	33 e*	28 e*
Concentration	0.443	1.050	0.0677	0.0626
Load	63 e*	635 e*	12 e*	9.5 e*
	Station E-10			
	March	**April**	**September**	**October**
---2004---				
Flow	73 e*	106 e*	32 e*	54.7
Concentration	0.210	0.130	0.12	0.044
Load	82 e*	75 e*	21 e*	13.0
---2005---				
Flow	31 e*	42 e*	35 e*	52.1
Concentration	0.290	0.370	0.12	0.099
Load	48 e*	83 e*	22 e*	27.9
---2006---				
Flow	41 e*	218 e*	68.8	70 e*
Concentration	0.470	0.190	0.048	0.09
Load	103 e*	224 e*	18	33.8 e*
---2007---				
Flow	68 e*	110 e*	54.6 e*	51 e*
Concentration	0.224	0.141	0.0865	0.0525
Load	82 e*	84 e*	26 e*	14.3 e*
---2008---				
Flow	32 e*	122 e*	39 e*	34 e*
Concentration	0.292	0.950	0.0581	0.062
Load	50 e*	628 e*	12 e*	11.3 e*

Units: Flow in cfs; Concentration in mg/L; Load in lbs/day.
e = estimated
e* = flow not measured at station but estimated using correlation charts with E-12A flow

Table 2-2 (Continued)
Eagle River Dissolved Zinc Summary
2004-2008

	Station E-12A			
	March	**April**	**September**	**October**
---2004---				
Flow	71.0 e	105 e	30.0	53.9
Concentration	0.360	0.220	0.130	0.066
Load	138.0	125	21.1	19.2
---2005---				
Flow	29.0 e	40 e	33.0	49.8
Concentration	0.330	0.500	0.150	0.130
Load	51.7	108	26.7	35.0
---2006---				
Flow	39.0 e	217	68.9	68.0
Concentration	0.520	0.270	0.071	0.100
Load	109.5	316	26.4	36.7
---2007---				
Flow	66.0 e	109	53.0	49.0
Concentration	0.310	0.187	0.076	0.068
Load	110.5	110	21.7	18.1
---2008---				
Flow	30.0 e	121	37.0	32.0
Concentration	0.283	1.000	0.103	0.095
Load	45.8	653	20.6	16.4
	Station E-13B			
	March	**April**	**September**	**October**
---2004---				
Flow	81 e*	119 e*	34 e*	56
Concentration	0.350	0.190	0.083	0.066
Load	152 e*	122 e*	15 e*	20.1
---2005---				
Flow	33 e*	45 e*	37 e*	56
Concentration	0.250	0.390	0.120	0.12
Load	44 e*	95 e*	24 e*	36.1
---2006---				
Flow	44 e*	247 e*	77.3	77 e*
Concentration	0.440	0.190	0.068	0.11
Load	105 e*	253 e*	28	45.8 e*
---2007---				
Flow	75 e*	124 e*	60.1 e*	56 e*
Concentration	0.296	0.178	0.067	0.0702
Load	120 e*	119 e*	21.8 e*	21.1 e*
---2008---				
Flow	34 e*	138 e*	42 e*	36 e*
Concentration	0.238	0.895	0.096	0.0774
Load	44 e*	665 e*	21.7 e*	15.1 e*
	Station E-15			
	March	**April**	**September**	**October**
---2004---				
Flow	112 e*	171 e*	41 e*	76
Concentration	0.230	0.130	0.067	0.053
Load	139.3 e*	120.1 e*	14.9 e*	21.9
---2005---				
Flow	39 e*	58 e*	46 e*	87
Concentration	0.210	0.340	0.080	0.079
Load	44.6 e*	107.2 e*	20.0 e*	37.2
---2006---				
Flow	57 e*	365 e*	108.5	107 e*
Concentration	0.370	0.240	0.048	0.082
Load	113.2 e*	473.3 e*	28.1	47.4 e*
---2007---				
Flow	103 e*	178 e*	80.9 e*	74 e*
Concentration	0.216	0.144	0.048	0.0511
Load	120.7 e*	138.4 e*	21.0 e*	20.4 e*
---2008---				
Flow	41 e*	199 e*	53 e*	45 e*
Concentration	0.206	0.661	0.068	0.073
Load	45.7 e*	709.6 e*	19.4 e*	17.6 e*

Units: Flow in cfs; Concentration in mg/L; Load in lbs/day
e = estimated
e* = flow not measured at station but estimated using correlation charts with E-12A flow

Table 2-3
Tributary Dissolved Zinc Summary
2003-2007

Station T-10	March	April	September	October
--- 2004 ---				
Flow	0.61	0.99	0.04	0.09
Concentration	16.0	11.0	2.4	3.2
Load	52.9 e	58.8	0.6	1.6
---2005---				
Flow	0.5 NM*	1.4 NM*	0.1 NM*	0.17
Concentration	7.3	9.6	3.4	1.6
Load	18.3 e	70.8 e	2.4 e	1.5
---2006---				
Flow	0.3	0.2	0.2	0.11 NM*
Concentration	6.0	4.9	1.5	1.8
Load	8.7	5.8	1.4	1.1 e
---2007---				
Flow	0.5 NM*	1.4 NM*	0.1 NM*	0.11 NM*
Concentration	2.0	2.0	1.1	1.5
Load	5.1 e	14.5 e	0.8 e	0.9 e
---2008---				
Flow	0.22	0.22	0.11	0.07
Concentration	2.0	2.8	0.6	0.8
Load	2.4	3.4	0.4	0.3

Station T-18	March	April	September	October
--- 2004 ---				
Flow	10.0 e	27.0 e	9.1	16.0 e
Concentration	0.063	0.016	0.026	0.025
Load	3.4 e	2.3 e	1.3	2.2 e
---2005---				
Flow	4.4 e	12.0 e	16.0	28.0
Concentration	0.120	0.180	0.016	0.016
Load	2.9 e	11.7 e	1.4	2.4
---2006---				
Flow	14.0 e	36.0 e	30.0	23
Concentration	0.110	0.023	0.014	0.045
Load	8.3 e	4.5 e	2.3	5.6
---2007---				
Flow	4.5 e (ice)	23.0 e	29.0	18
Concentration	0.056	0.037	0.019	0.023
Load	1.4 e	4.6 e	2.9	2.2
---2008---				
Flow	6.7 e (ice)	28.0 e	15.0	12
Concentration	0.066	0.055	0.065	0.091
Load	2.4 e	8.3 e	5.2	5.9

Units: Flow in CFS; Concentration in mg/L; Load in lbs/day.
"e" denotes estimated flow (cfs) and load (lbs/d).
NM - not measured; NM* - not measured flow based on average of previous years flows ND - load not determined

Table 2-4
Eagle River Dissolved Zinc Loading Analysis - lbs/day
2007 to 2008

Belden (Stations E-3 to E-5)							
Date	Station E-3	Station E-5	Difference E-3 & E-5	Roaster Drainage (T-6)		Unaccounted Sources*	
Sep-04	1.2	19.8	18.6	0.5	3%	18.1	97%
Sep-05	2.5	18.8	16.3	0.5	3%	15.8	97%
Sep-06	1.5	19.6	18.2	0.5	3%	17.7	97%
Sep-07	1.6	16.2	14.6	0.5	3%	14.1	97%
Sep-08	2.9	12.0	9.1	0.5	6%	8.6	94%
Fall Creek (Stations E-5 to E-10)							
Date	Station E-5	Station E-10	Difference E-5 & E-10	Fall Creek		Unaccounted Sources*	
Sep-04	19.8	20.5	0.7	N/A	0%	0.7	100%
Sep-05	18.8	22.4	3.6	N/A	0%	3.6	100%
Sep-06	19.6	17.8	(1.8)	N/A	0%	(1.8)	N
Sep-07	16.2	25.5	9.3	N/A	0%	9.3	100%
Sep-08	12.0	12.1	0.1	N/A	0%	0.1	100%
Rock Creek and OTP/Rex (Stations E-10 to E-12A)							
Date	Station E-10	Station E-12A	Difference E-10 & E-12A	Rock Creek (T-10)		Unaccounted Sources*	
Sep-04	20.5	21.1	0.6	0.6	104%	(0.0)	N
Sep-05	22.4	26.7	4.3	2.4	56%	1.9	44%
Sep-06	17.8	26.4	8.6	1.4	16%	7.2	84%
Sep-07	25.5	21.7	(3.8)	0.6	N	(4.4)	N
Sep-08	12.1	20.6	8.5	0.4	4%	8.1	96%
Two Elk and CTP (Stations E-12A to E-13B)							
Date	Station E-12A	Station E-13B	Difference E-12A & E-13B	Two Elk Creek		Unaccounted Sources	
Sep-04	21.1	15.2	(5.9)	N/A	0%	(5.9)	100%
Sep-05	26.7	24.2	(2.6)	N/A	0%	(2.6)	100%
Sep-06	26.4	28.4	2.0	N/A	0%	2.0	100%
Sep-07	21.7	21.8	0.1	N/A	0%	0.1	100%
Sep-08	20.6	21.7	1.2	N/A	0%	1.2	100%
Cross Creek (Stations E-13B to E-15)							
Date	Station E-13B	Station E-15	Difference E-13B & E-15	Cross Creek (T-18)		Unaccounted Sources*	
Sep-04	15.2	14.9	(0.3)	1.3	N	(1.6)	N
Sep-05	24.2	20.0	(4.2)	1.4	N	(5.6)	N
Sep-06	28.4	28.1	(0.3)	2.3	N	(2.5)	N
Sep-07	21.8	21.0	(0.9)	2.9	N	(3.8)	N
Sep-08	21.7	19.4	(2.4)	5.2	N	(7.6)	N

Notes:

"N" = net loss in load

"( )" denotes negative value

* "Difference" minus tributary sources

Load from T-6, Roaster Drainage based on previous years

Flow for T-10 in 2007 estimated from previous years

2007 flows not measured except at E-12A and T-18; flows estimated from historical correlations with E-12A flow

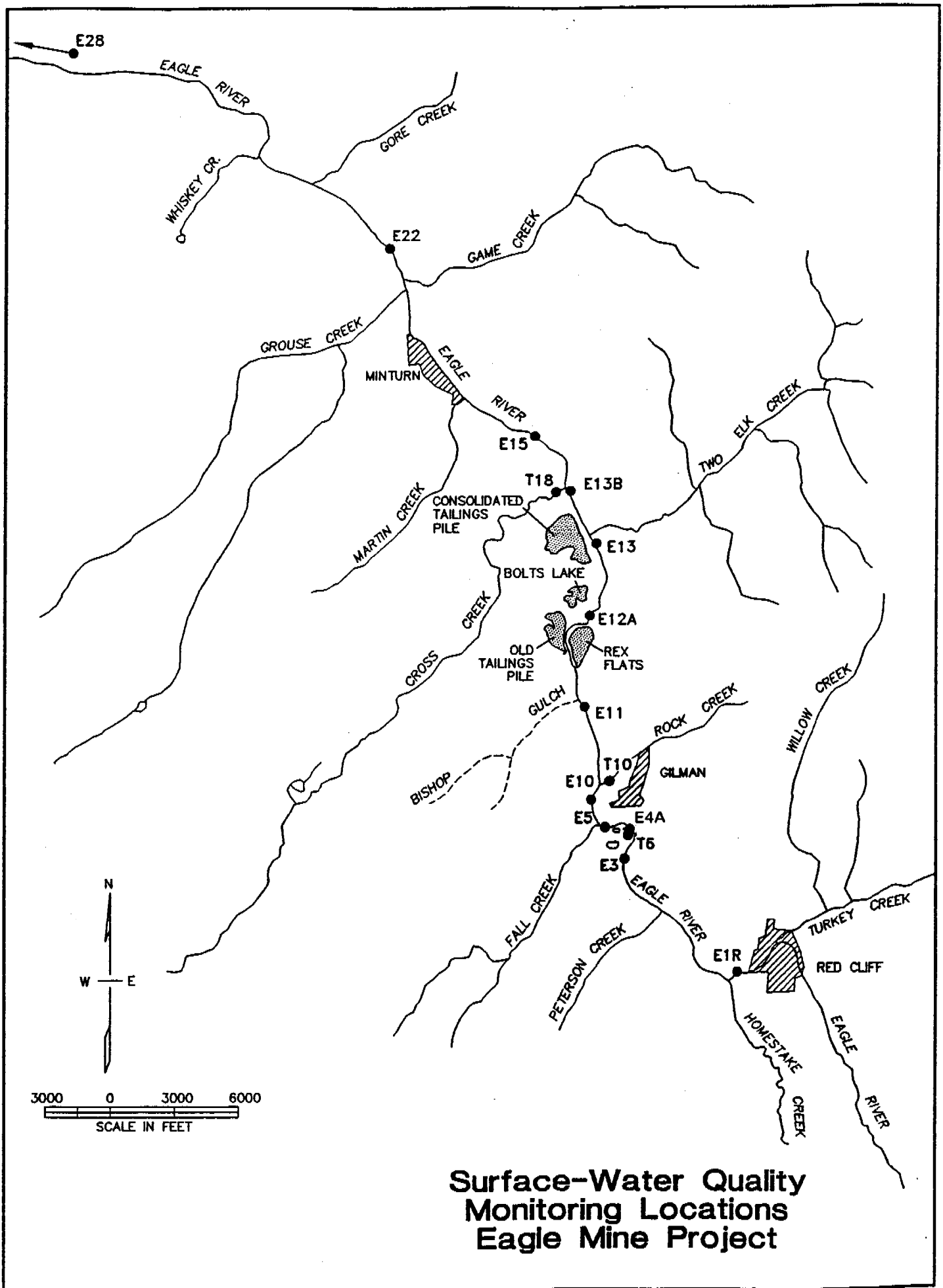

E28
EAGLE RIVER
GORE CREEK
WHISKEY CR.
E22
GAME CREEK
GROUSE CREEK
MINTURN
EAGLE RIVER
E15
T18
E13B
TWO ELK CREEK
CONSOLIDATED TAILINGS PILE
MARTIN CREEK
E13
BOLTS LAKE
E12A
CROSS CREEK
OLD TAILINGS PILE
REX FLATS
GULCH
E11
ROCK CREEK
WILLOW CREEK
BISHOP
T10
GILMAN
E10
E5
E4A
T6
E3
EAGLE RIVER
FALL CREEK
TURKEY CREEK
PETERSON CREEK
E1R
RED CLIFF
HOMESTAKE CREEK
EAGLE RIVER
N
W
E
3000 0 3000 6000
SCALE IN FEET
Surface-Water Quality Monitoring Locations Eagle Mine Project
SW-QM-LDWG

Figure 2-1

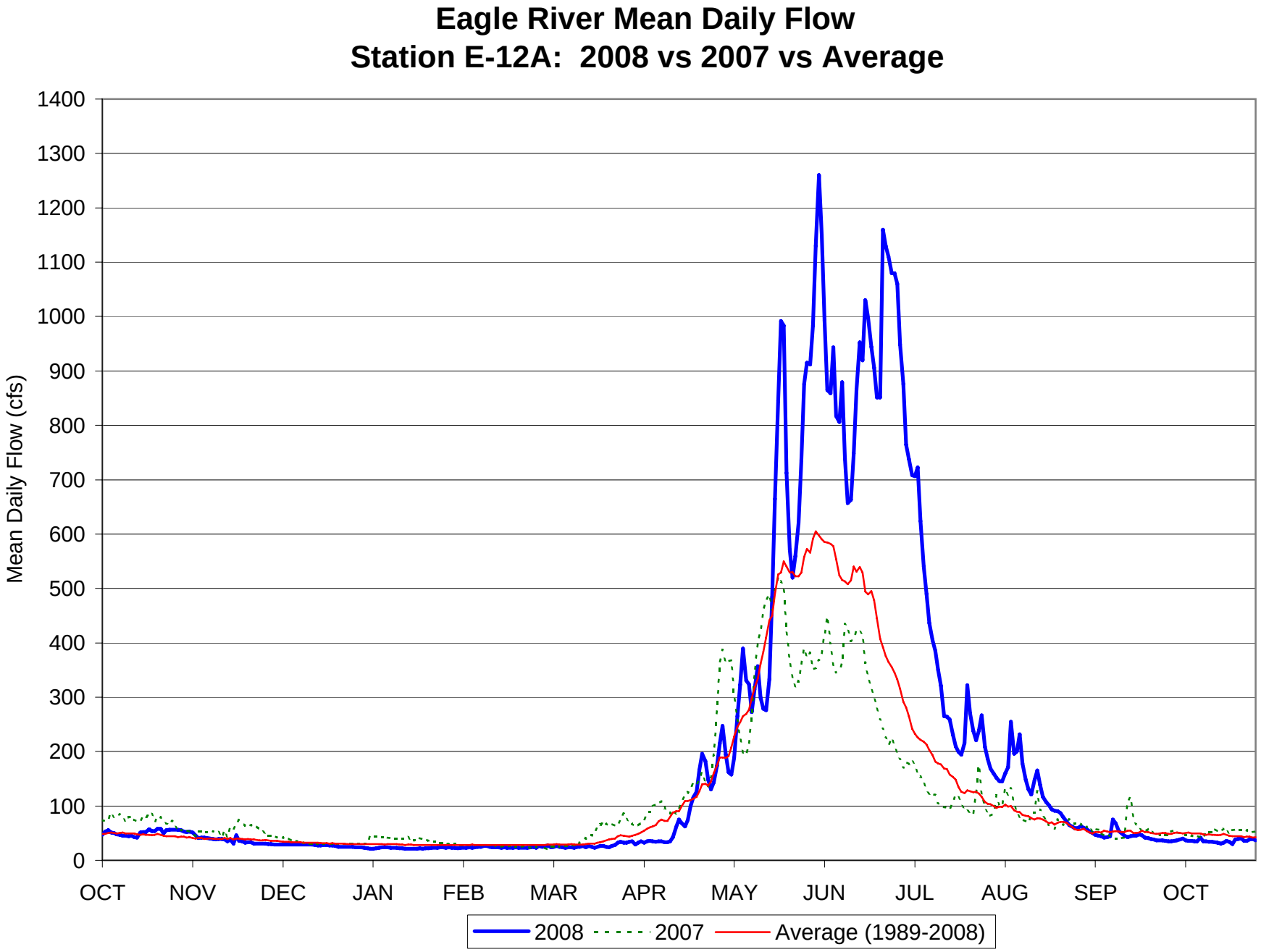
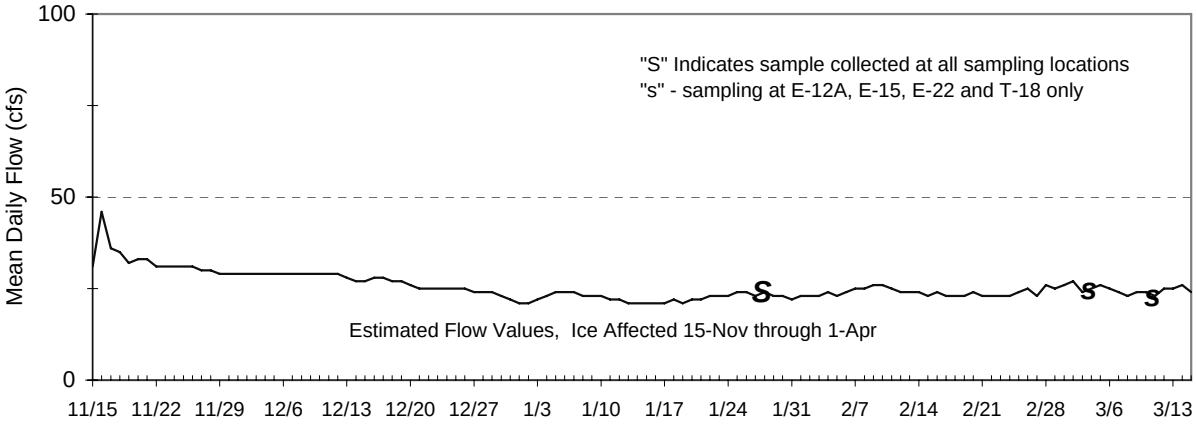

Eagle River Mean Daily Flow
Station E-12A: 2008 vs 2007 vs Average
Mean Daily Flow (cfs)
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
2008
2007
Average (1989-2008)

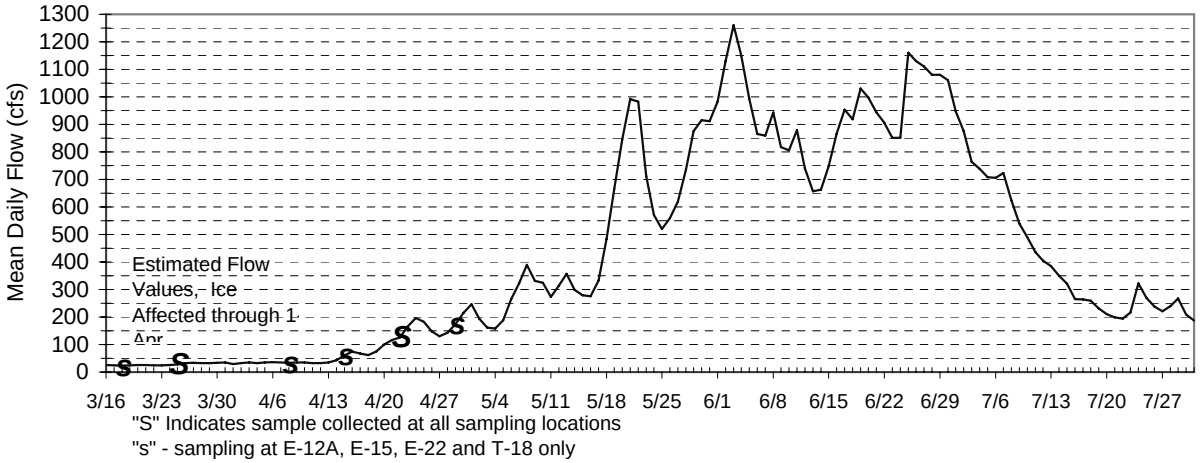
Figure 2-2

Eagle River Flow by Season at Station E-12A

Eagle River Winter Flow
Station E-12A: 15-Nov-07 to 15-Mar-08



Eagle River Spring Flow
Station E-12A: 16-Mar-08 to 31-Jul-08



Eagle River Fall Flow
Station E-12A: 1-Aug-08 to 31-Oct-08

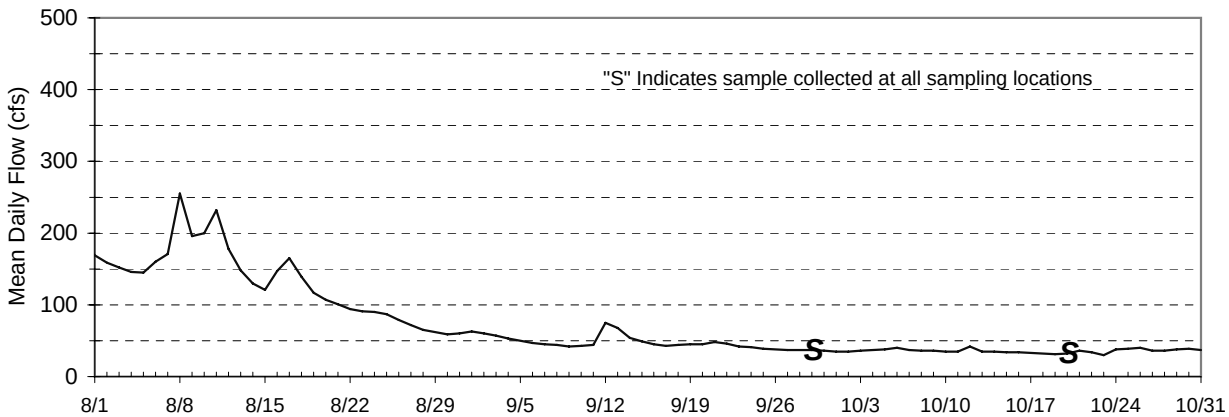


Figure 2-3

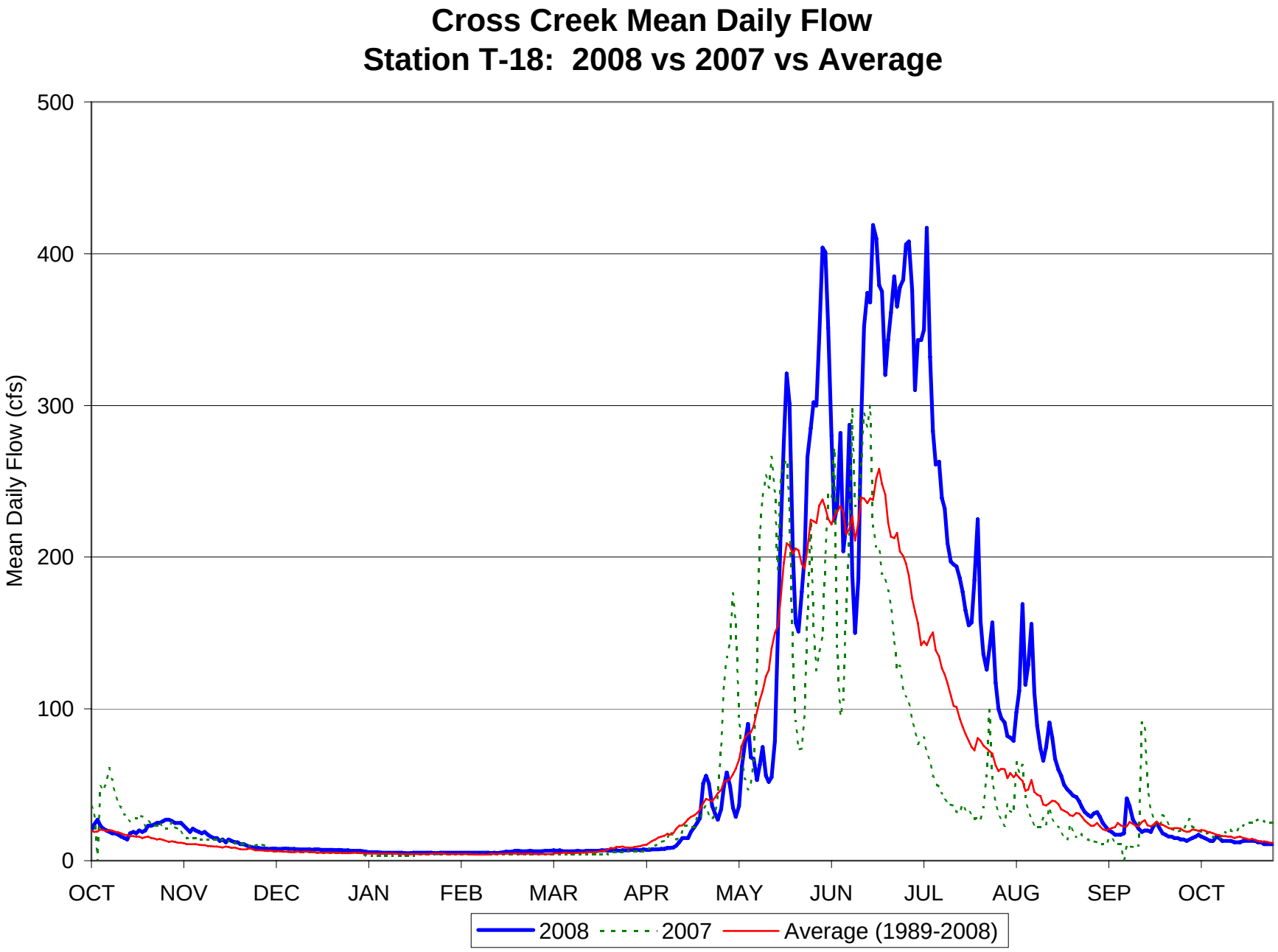

Cross Creek Mean Daily Flow
Station T-18: 2008 vs 2007 vs Average
Mean Daily Flow (cfs)
500
400
300
200
100
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
2008
2007
Average (1989-2008)

Figure 2-4

Eagle River Seasonal Water Quality
Dissolved Zinc: Oct-2007 to Oct-2008

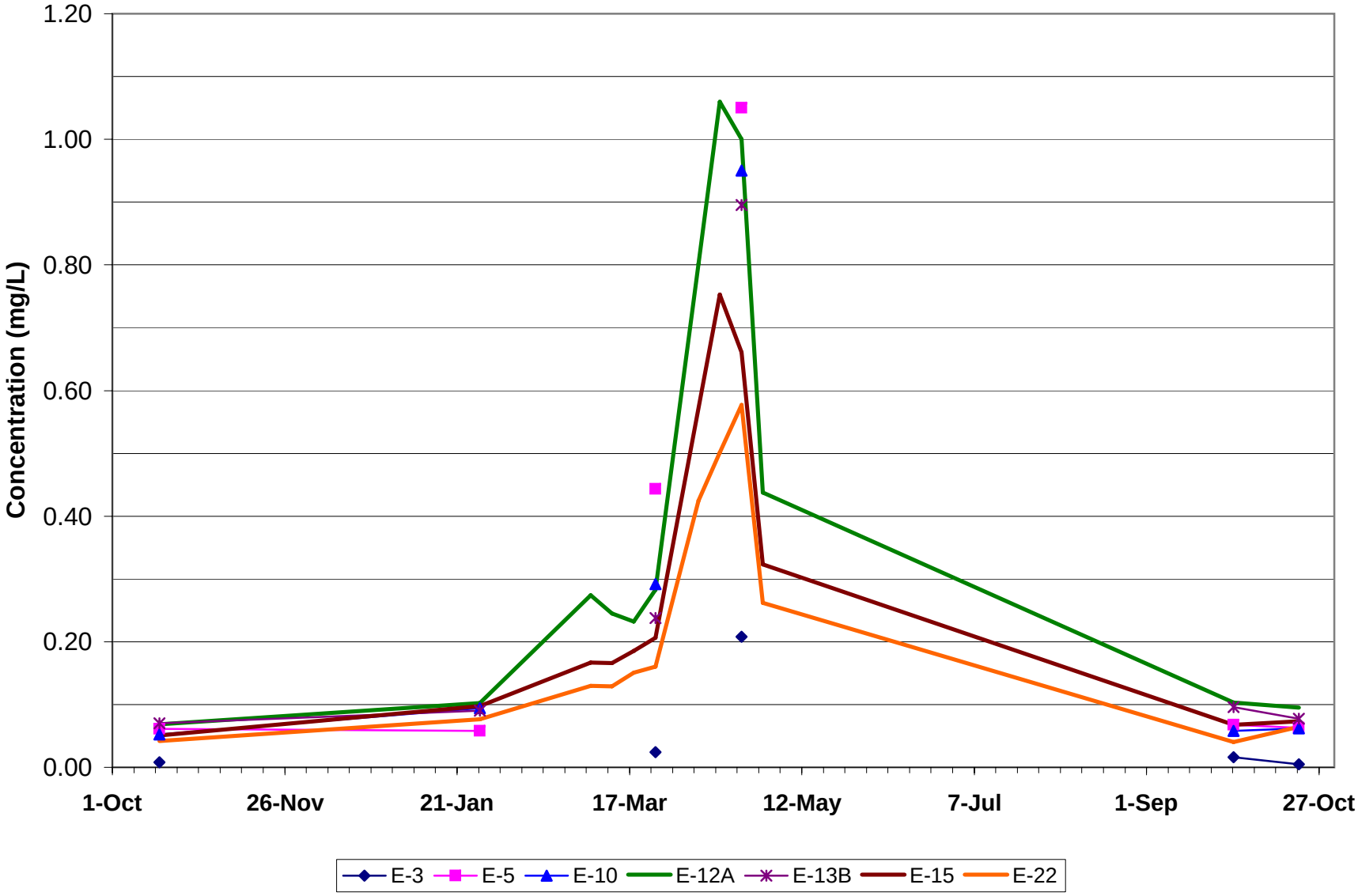
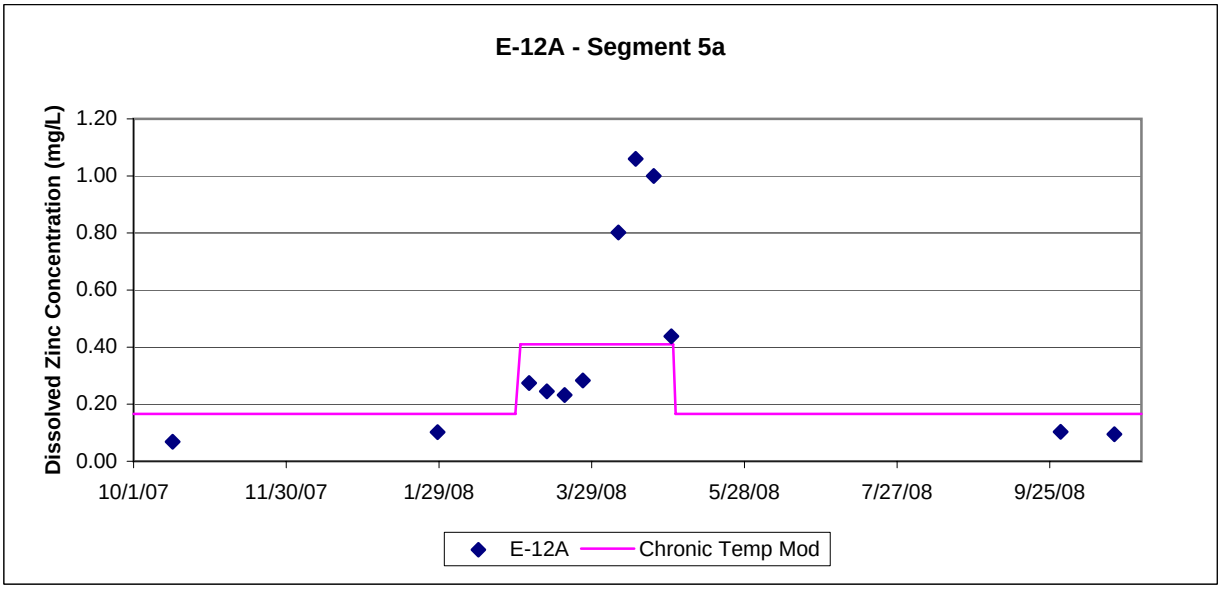
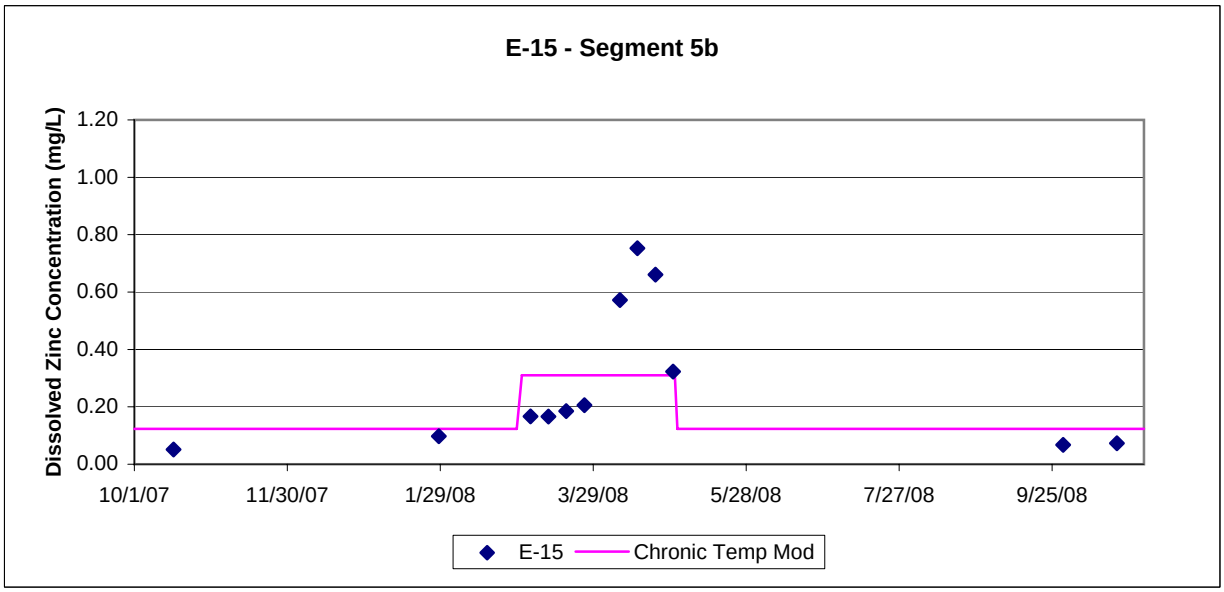


Figure 2-5

Dissolved Zinc Concentrations in Eagle River Segment 5





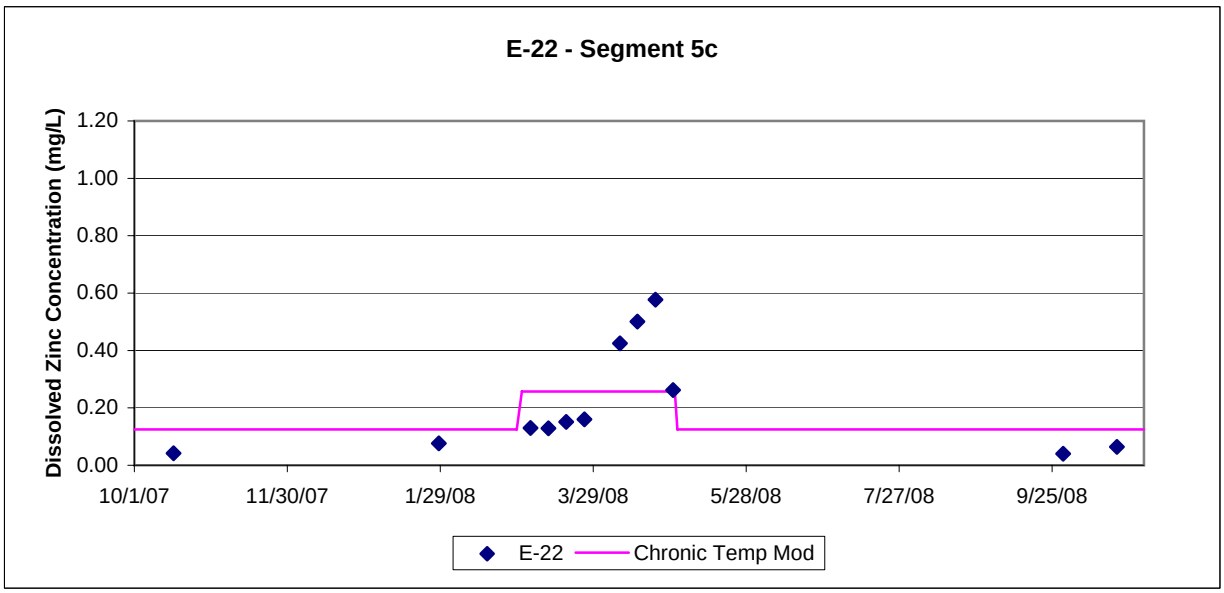
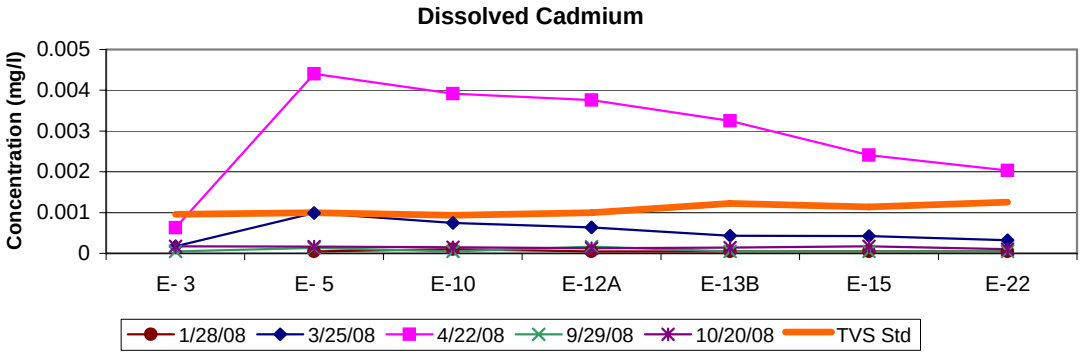
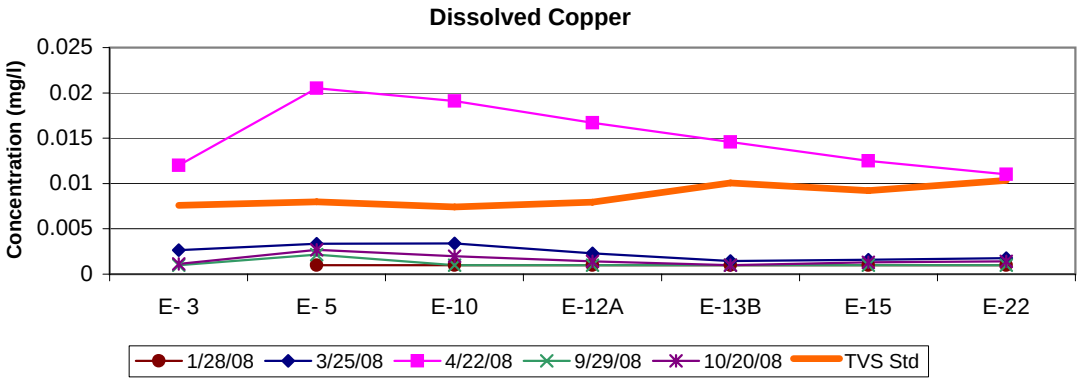
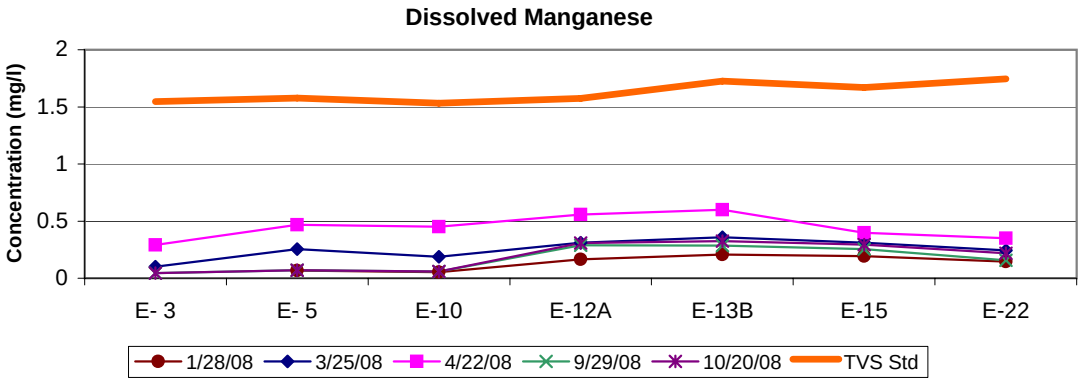


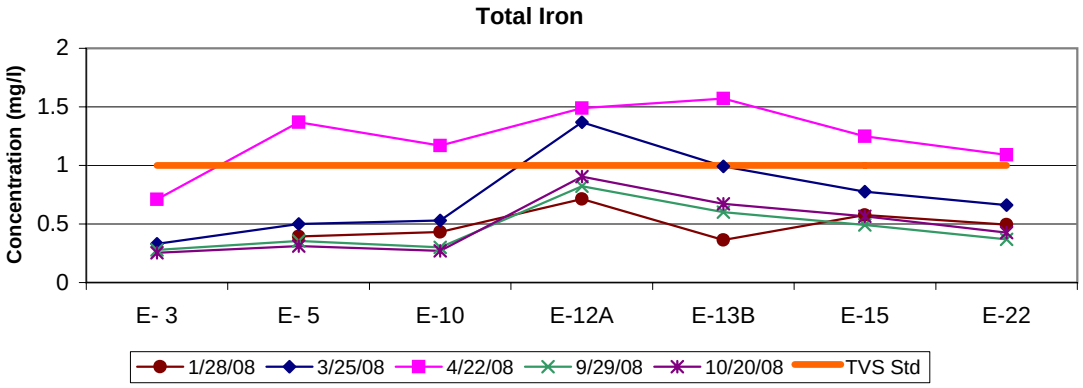
Figure 2-6

Comparisons of Dissolved Cadmium, Copper, and Manganese and Total Iron in the Eagle River to Chronic Ambient Water Quality Criteria









Average Hardness of 2008 for each station was calculated and used in TVS calculation; exception is total iron which TVS standard is 1 mg/L

Figure 2-7

Dissolved Zinc Concentration
Station T-10: Rock Creek

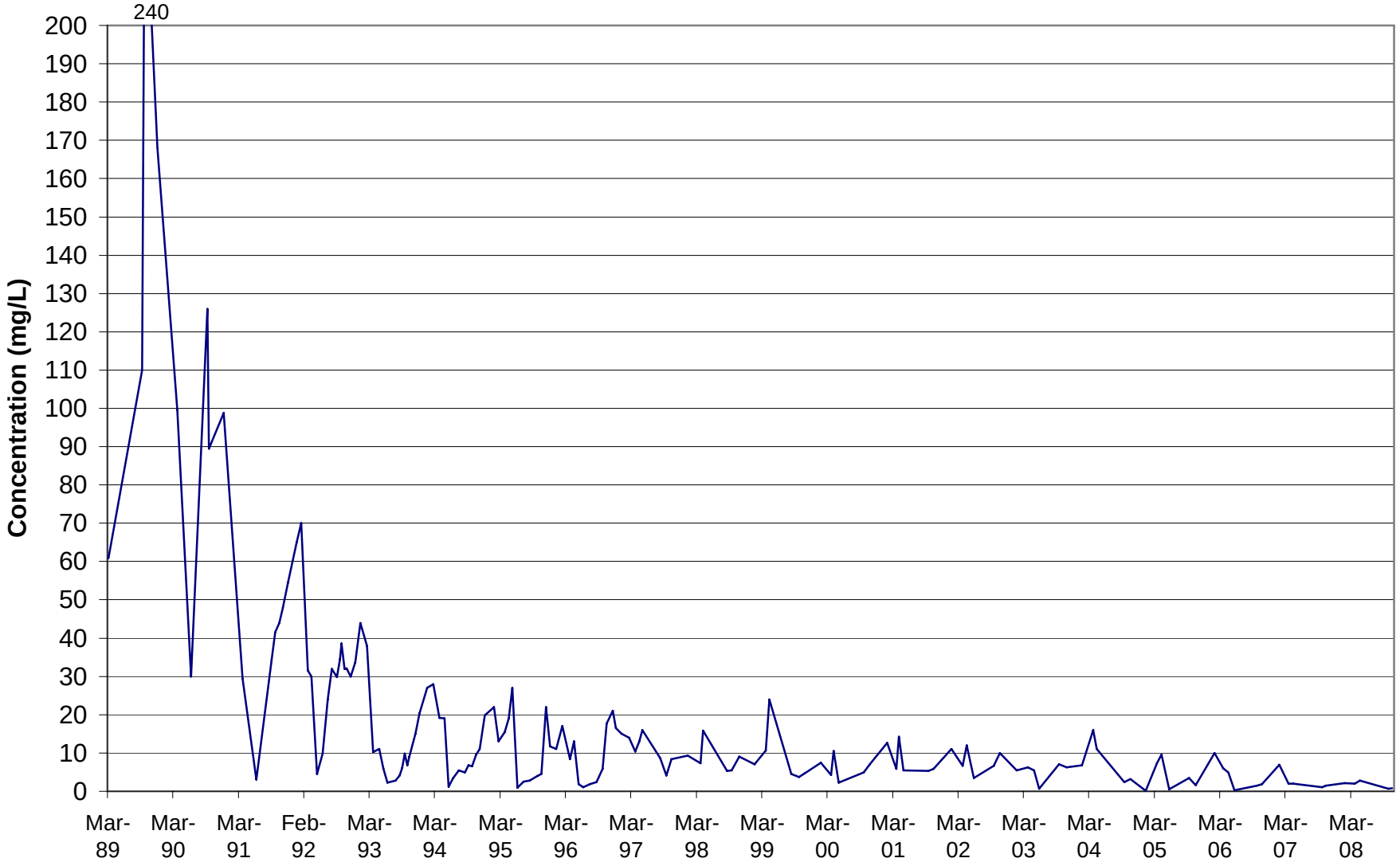


Figure 2-8

Dissolved Zinc Concentration
Station T-18: Cross Creek

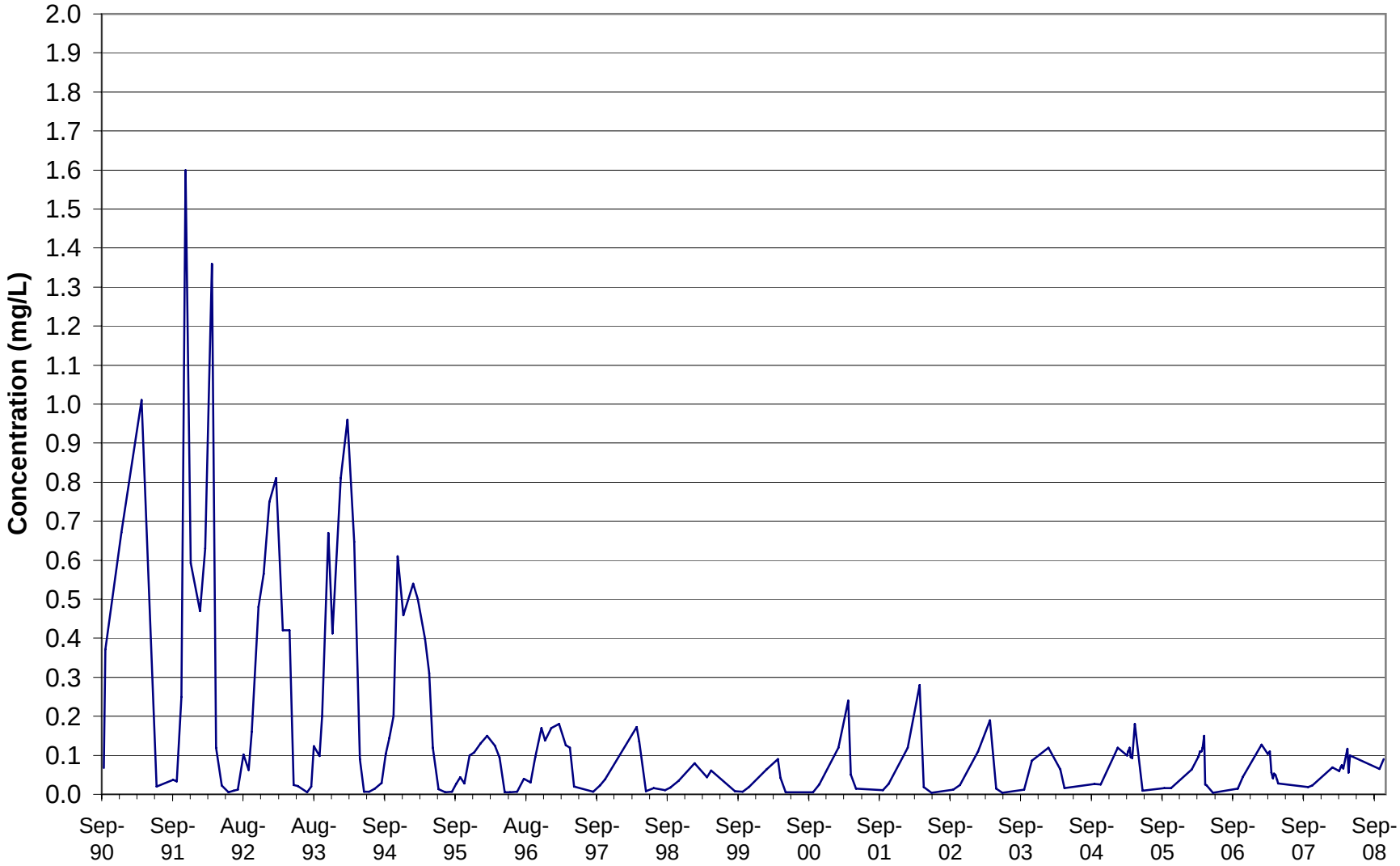
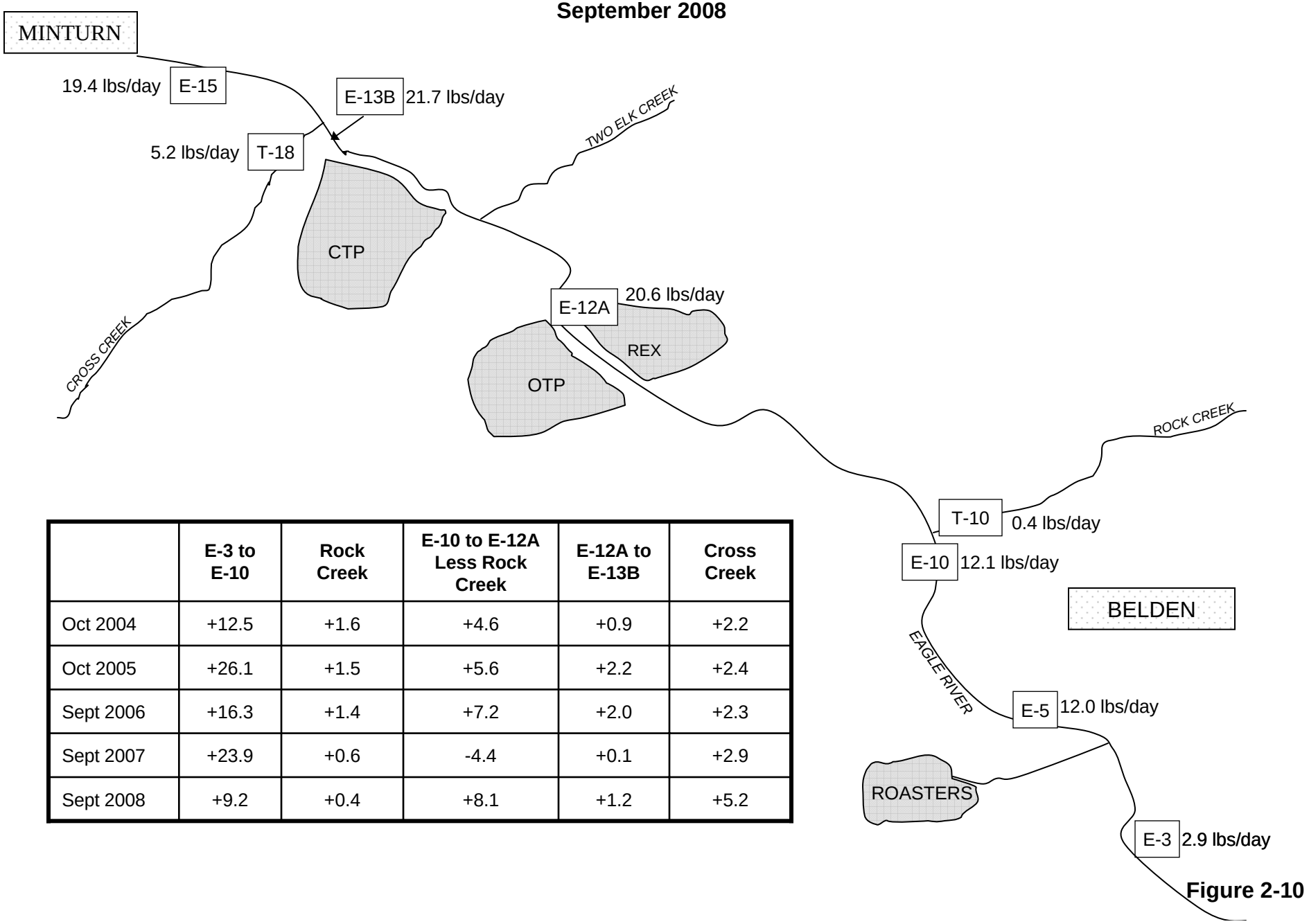


Figure 2-9

ZINC LOADING
September 2008



	E-3 to E-10	Rock Creek	E-10 to E-12A Less Rock Creek	E-12A to E-13B	Cross Creek
Oct 2004	+12.5	+1.6	+4.6	+0.9	+2.2
Oct 2005	+26.1	+1.5	+5.6	+2.2	+2.4
Sept 2006	+16.3	+1.4	+7.2	+2.0	+2.3
Sept 2007	+23.9	+0.6	-4.4	+0.1	+2.9
Sept 2008	+9.2	+0.4	+8.1	+1.2	+5.2

Figure 2-10

3.0 EAGLE MINE WATER MONITORING AND DATA SUMMARY

Eagle Mine water monitoring activities conducted in 2008 included the following:

- Monitoring flow and collecting samples of mine seepage if flow is 5 gpm or greater
- Measuring mine water levels
- Collecting mine water samples.

These monitoring activities and related data are summarized in this section. Activities conducted at the 19-5-E-3 Drift (the Liberty well), a source of recharge to the Eagle Mine, are also summarized in this section.

3.1 Eagle Mine Seeps

The Eagle Mine began filling with water in 1984 when the mine dewatering pumps were turned off. The mine filled and eventually began leaking water in the Rock Creek area in September 1989. Subsequently, monitoring stations were established. Since 1990, seepage has been collected and piped to the WTP for treatment. Seepage stations are listed below and shown on Figure 3-1:

- S-5 Adit No. 5, elevation 8436 feet, downstream of bulkhead
- S-7 North hillside 500 feet above Rock Creek mouth, elevation 8495 feet; typically flows during spring until dry in September
- S-NT Newhouse Tunnel (Adit No. 140, elevation 8496 feet), this seep dried up in 2001
- S-TT Tip-Top Adit, bulkhead elevation 8420 feet.

No seeps were sampled in 2008, as all observed flows were less than 5 gpm.

3.2 Mine Water Levels

Vertical control was established in Adit No. 8 and, starting on July 24, 1998, the mine water level has been measured from a control point set in the adjoining Bleakhouse Mine workings (elevation 8503.8 feet MSL). Since 1992, mine water has been released at the Adit No. 5 bulkhead and gravity drained through a pipeline to the WTP for treatment (the MDD). Since 2002, the mine water levels have been monitored using a

pressure transducer in the MDD pipeline. Graphical representation of the Eagle Mine water levels for 2004 through 2008 is presented in Figure 3-2.

In early 2008 the mine pool was maintained via the MDD at a winter level between 8446 to 8448 feet MSL. The typical spring rise began in mid-March. Similar to 2006, an increase in volume of low TSS water from the CTP extraction trenches overwhelmed the water treatment plant. The MDD flow rates were reduced to provide treatment capacity. The mine pool was allowed to rise until late July. At that time MDD flow rates were initially increased to 250 to 300 gpm with rates fluctuating between 100 to 250 gpm through October based on maintenance schedules and trench flow rates which continued to be high. The highest recorded mine pool level was at 8477.0 feet MSL on September 3, 2008. In early November the MDD flow rates were again increased to 300 gpm with mine pool reduction a priority for the winter pumping season.

3.3 Mine Water Sampling

A mine water sample (Adit No. 5 or MS-5) was collected in October 2008 from a port in the MDD pipeline at the bottom of Rock Creek. The mine water sample was tested for the parameters listed on Table 3-1. Results for selected metals for Adit No. 5 (MS-5) are shown in Figures 3-3 and 3-4. The 2008 analytical results and field measurements are provided in Appendix B.

A mine water sample from the Doghole adit, located upstream of the Tip Top mine in Belden was collected on May 9, 2008. Doghole adit flow was dammed and piped by EPA in the summer of 2008. EPA and CBS are negotiating the disposition of the adit flow.

3.4 19-5-E-3 Level and the Liberty Mine

Since 1990, investigations have been conducted to identify means to reduce inflow to the Eagle Mine, thereby allowing better control of the mine pool level and, eventually, reduce flow to the WTP. From these investigations, it was concluded that the most feasible method to reduce recharge to the mine is to stop or reduce flow entering on the 19 Level, via exploratory drift 19-5-E-3. It has been estimated that 200 gpm or more flows continuously in this drift that connects the Eagle Mine workings to the Turkey Creek and Willow Creek- watershed near Red Cliff. To intercept flow in the 19-5-E-3 drift, a 960-foot well (Liberty No. 4 or LIB-4) was installed near the drift in July 1998.

On September 1, 1999, EPA issued an Explanation of Significant Differences (ESD) describing EPA's decision regarding this mine pool component of the remedy for the Site. The ESD, which is an addition to the 1993 Record of Decision, required installation of a pumping system at the Liberty No. 4 well. After delays due to securing an easement

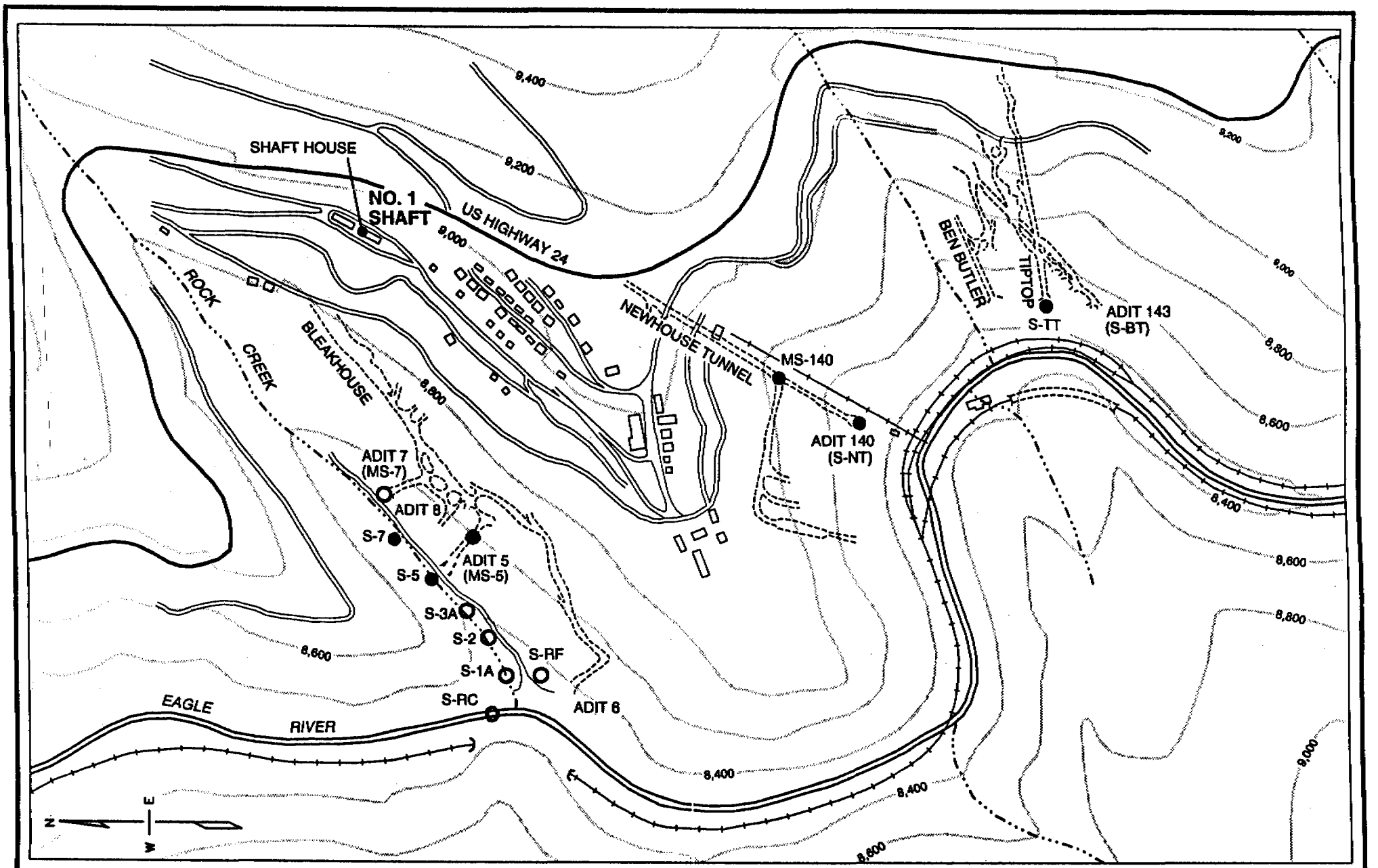
and pump problems, the Liberty No. 4 well began pumping on October 30, 2001. The well operated throughout 2008 with only minor interruptions due to power supply failures.

Discharge to Willow Creek is measured by a totalizing flow meter in the pump house. The well pumped at approximately 65 gpm during 2008. For 2008, approximately 30,800,000 gallons were pumped from the Liberty No. 4 well to Willow Creek.

Monthly samples are collected of the discharge in accordance with CDPHE Permit No. COG-600000. Field parameters and sample results are provided in Appendix B. All permit requirements were met.

Table 3-1 Water Quality Monitoring Parameter List for Mine and Groundwater

Parameter (mg/L) unless noted otherwise	Mine Pool and Seeps	Groundwater
Temperature (°C)	X	X
Specific Cond. (μmhos/cm)	X	X
pH (standard units)	X	X
Flow (cfs or gpm)/ Water Level (Ft-TOC)	X	X
Alkalinity	X	X
Calcium, Dissolved		X
Magnesium, Dissolved		X
Sodium, Dissolved		X
Potassium, Dissolved		X
Sulfate	X	X
Arsenic, Dissolved		X
Iron, Dissolved	X	X
Manganese, Dissolved	X	X
Cadmium, Dissolved	X	X
Copper, Dissolved	X	X
Lead, Dissolved	X	X
Zinc, Dissolved	X	X



Approximate Mine Seep/Adit Locations
Eagle Mine Project

Figure 3-1

SEEP-LOC.DWG

Eagle Mine Water Level 2004 through 2008

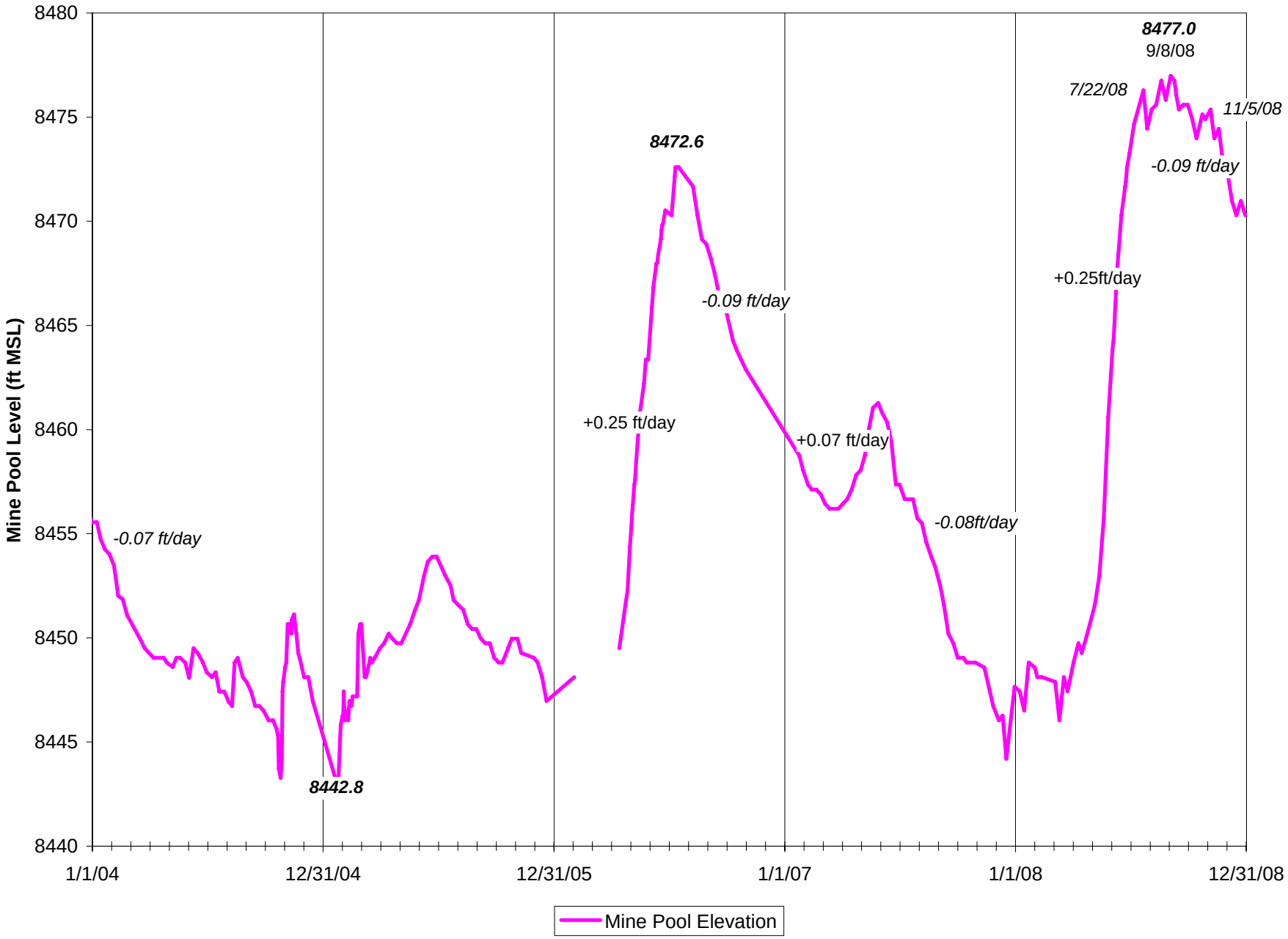
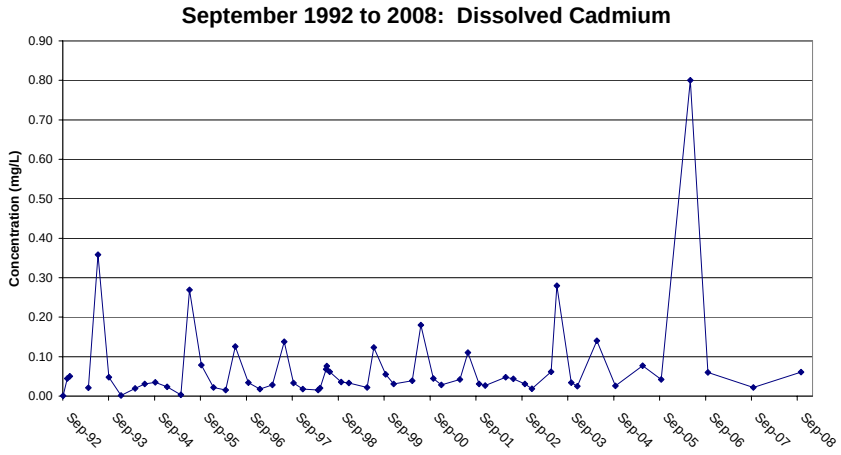
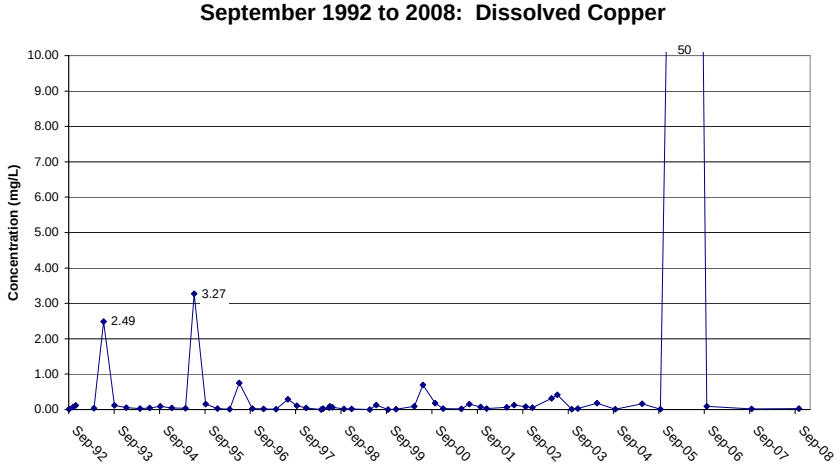


Figure 3-2

Adit No. 5, Dissolved Cadmium, Copper, and Iron





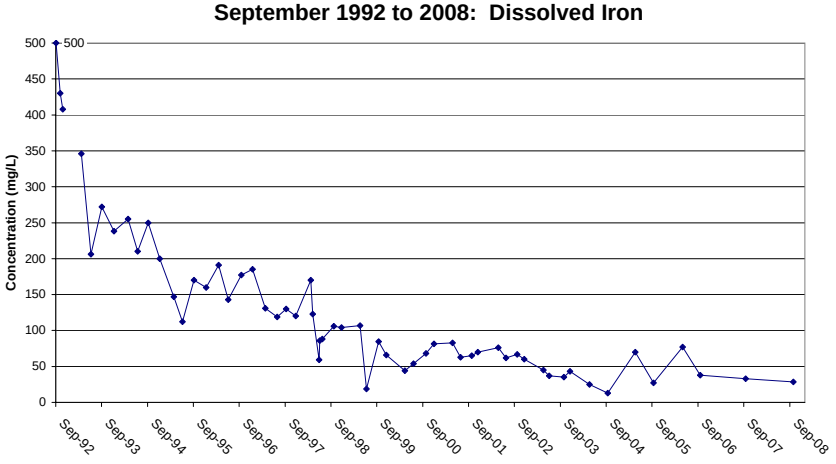
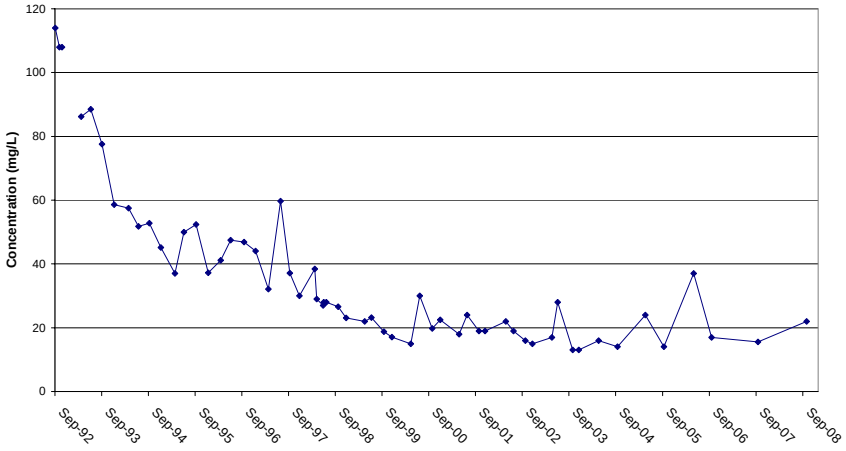


Figure 3-3

Adit No. 5, Dissolved Manganese and Zinc

September 1992 to 2008: Dissolved Manganese



September 1992 to 2008: Dissolved Zinc

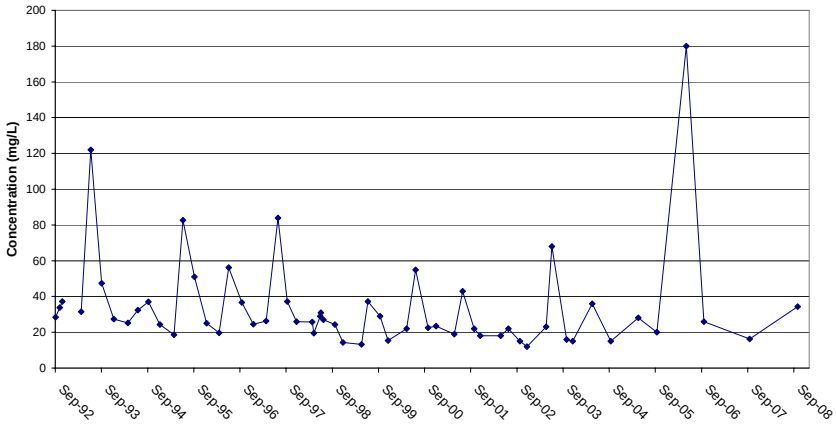


Figure 3-4

4.0 GROUNDWATER MONITORING AND DATA SUMMARY

Groundwater monitoring includes the following:

- Measuring water levels at Site monitoring wells and CTP piezometers and collecting groundwater samples at the monitoring wells
- Monitoring the flow rate and water quality of the UGDT discharge
- Monitoring water levels, flow rates, and water quality at the CTP groundwater extraction trenches
- Measuring flow rates at the Rock Creek groundwater extraction system (siphon).

These monitoring activities and related data are summarized in this section.

4.1 Monitoring Wells and CTP Piezometers

Twelve monitoring wells comprise the original groundwater monitoring network that was installed primarily to monitor changes in water quality downgradient of three areas: the OTP, Rex Flats, and the CTP. The monitoring well array was expanded in October 1990 to 23 monitoring wells under CD/RAP Amendment No. 1. In addition, five shallow wells (DT-1, DT-2, DT-3, DT-4, and DT-5) were installed along the UGDT west of the CTP in 1990. Piezometers that measure the height of water perched within the tailings at the CTP are also included in the groundwater monitoring program.

Site monitoring wells and DT wells were sampled and water levels were measured by CBS on October 1 and 2, 2008. Water levels, field measurements, and analytical results are included in Appendix C. The groundwater monitoring well locations are shown in Figures 4-1 and 4-2. Groundwater samples were analyzed for the parameters listed on Table 3-1.

Water levels were measured at 12 CTP piezometers in October 2008. The piezometer locations are shown on Figure 4-1. A fall potentiometric surface map (Figure 4-3) was prepared using water level data collected at the CTP standpipe piezometers, standpipe piezometers located near the north and east groundwater extraction trenches, and monitoring wells proximal to the CTP. Water level measurements are provided in Appendix C.

Some of the piezometers monitor the water level in the tailings only, which in places is over 50 feet thick. Completion of the CTP cap in 1996 effectively eliminated surface infiltration and the tailings were expected to continue to dewater over time. A graph of

water levels in the tailings piezometers is included as Figure 4-4, illustrating the gradual decline of the water table perched in the tailings. The decline appears to have generally reached equilibrium in 2003.

Results for three selected monitoring wells are included to illustrate graphically changes in water levels and water quality with time. These wells are located downgradient of the three remediated tailings sites, as described below.

- DAP-MW 3/ET-1 is located on the east side of the capped tailings within the CTP, downgradient of the east groundwater extraction trench between the CTP and the Eagle River.

- OTP-MW 2 is located on the east side of the OTP between the remediated tailings area and the Eagle River.

- REX-MW 2 is located in the northwest corner of Rex Flats between the remediated tailings area and the Eagle River.

The water levels and dissolved zinc concentration history for each of the three wells is presented in Figures 4-5 through 4-7, respectively. The scales on the three figures have been held constant to allow ease of comparison between the three areas.

4.2 UGDT Monitoring

The UGDT was originally installed in late 1980s, but its use was discontinued in 1990 due to elevated metals levels in the discharge. Section 9.0 of the CD/SOW required an analysis of the need to reactivate or reconstruct the UGDT. CBS requested reopening the UGDT in 1997 because the CTP cap was complete and water quality of the groundwater in the nearby DT wells was good. In March 1999, CDPHE and EPA agreed that operation of the UGDT benefited the reestablishment of wetland vegetation in Maloit Park and increased the efficiency of the north groundwater extraction trench. The UGDT has flowed seasonally since that time.

The UGDT started flowing in April 2008 and flowed through the summer. The UGDT dried up in early October 2008.

Seven monitoring wells are located along the UGDT; these are, from upgradient to downgradient, wells DT-1, DT-2, DT-3, DT-4, DT-5, NTP-MW1, and NTP-MW4 (Plot Plan, Figure 4-8). As shown on the Plot Plan, wells DT-1, DT-3, and DT-5 are positioned on the upgradient side of the UGDT, while the others are located close to and downgradient of the system. Selected well hydrographs depicting water level versus time are included in Figure 4-9.

The potentiometric map (Figure 4-3) graphically illustrates water levels on a larger scale. By drawing arrows perpendicular to the potentiometric contours shown on these two figures, one can roughly visualize that the flow direction in the UGDT area is to the northwest, down valley into the Maloit Park wetlands, and under the edge of the CTP to the north groundwater extraction trench. Because piezometers P-6-S and P-10-S measure the perched water table in the tailings above the glacial till, the higher potentiometric contours in the tailings give the false impression that there is a major component of flow from the CTP to the west, toward the UGDT. In reality, the westerly flow component is probably minor compared to the flow component to the northwest. This hypothesis is supported by the chemistry discussion in the following section.

Dissolved zinc trends for the five DT wells, well NTP-MW1, and well NTP-MW4 are shown in Figure 4-10. A trend toward lower dissolved zinc concentrations is readily apparent in the wells since the startup of the UGDT in 1994. The overall decrease in dissolved zinc concentrations is attributed to a combination of factors: (1) completion of the CTP cap has reduced infiltration to the tailings; therefore, the quality of the groundwater at the base of the tailings has improved with time and (2) with a reduced supply of mineralized groundwater from the tailings, the glacial till in the UGDT area is being flushed clean. Dissolved zinc concentrations have leveled off in most wells. Concentrations in well NTP-MW1, located at the western edge of the CTP, depict a decreasing trend as dissolved zinc concentrations have dropped from a maximum of 255 mg/L in 1990 to a low concentration measured this year of 3.31 mg/L.

4.3 CTP Groundwater Extraction

Two extraction trenches at the CTP intercept groundwater and route it to the WTP for treatment. Water level measurements were made in the trenches and in nearby piezometers, water samples were collected for metals analysis, and extraction flow rates to the WTP were measured during 2008.

As part of CD/RAP Amendment No. 3, five conventional standpipe piezometers, NT-1, NT-2, ET-1 (replacing DAP-MW3), ET-2, and ET-3, were installed in 1993 near the north and east groundwater extraction trenches. In 1997, four additional piezometers, ET-4, ET-5, ET-6, and ET-7, were installed near the east groundwater extraction trench. Water levels in these piezometers were measured in Fall 2008 to provide data for the potentiometric surface maps illustrating changes in groundwater levels in the tailings and in underlying glacial material and their relationship to the extraction trenches (see Figure 4-3).

Groundwater samples were collected from monitoring well DAP-MW 4R, piezometer ET-1, the well vault at the north groundwater extraction trench (N-Sump), and the well vault at the east groundwater extraction trench (E-Sump) in Fall 2008. These samples

were tested for the list of parameters shown in Table 3-1 and sample results are provided in Appendix C.

Flows from both the east groundwater extraction trench and north groundwater extraction trench are combined and pumped to the WTP surge ponds. Average combined daily flow rate of the two trenches is 23 gpm, with a maximum daily flow rate of 66 gpm. Flow run times are recorded for both the north and east groundwater extraction trenches. Combined, approximately 11,930,000 gallons of water were pumped from the trenches in 2008. Total gallons pumped by month are provided in Appendix C.

CTP groundwater extraction trench water level and water quality data are summarized and discussed in this section.

4.3.1 East Groundwater Extraction Trench Water Levels

The 1997-2008 water level information for wells ET-1, ET-2, and ET-3 in the vicinity of the east groundwater extraction trench is graphically illustrated in Figure 4-11. Well ET-1 monitors the saturated alluvial sand/gravel unit near the trench. Water level elevations at well ET-1 fluctuate between 7986 and 7984 feet MSL, with seasonal increases typically during the spring (Figure 4-11).

Well ET-2 monitors the 24- to 29-foot interval just above bedrock, in the glacial till that underlies the shallow alluvial sand/gravel unit. The fluctuation in water level in well ET-2 typically mimics well ET-1, but typically at an elevation approximately 2 feet higher. The vertical head difference indicates greater hydrostatic pressure in the deeper glacial unit, below the clay aquitard, and flow upward to the trench. Measurements in 2008 did not follow the typical trend and probably indicates a measurement error rather than a true change in the relative water levels

Well ET-3 is screened from 8 to 13 feet below ground surface (BGS) in the shallow alluvial sand/gravel unit near the east groundwater extraction trench. The fluctuation in water level in well ET-3 usually mimics well ET-1 as illustrated in Figure 4-11.

Water level measurements from wells ET-4, ET-5, ET-6, and ET-7 (not shown on Figure 4-11) were used to develop the Fall 2008 CTP potentiometric surface map of the shallow groundwater regime (Figure 4-3).

4.3.2 East Groundwater Extraction Trench Water Quality

Water samples are collected periodically from the sump (E-Sump) at the east groundwater extraction trench to characterize the groundwater chemistry. A plot of

dissolved zinc results for E-Sump samples collected from 1989 through 2008 directly from the well vault is included as Figure 4-12. Since 1995, the dissolved zinc concentrations in the east extraction trench sump have dropped from 665 mg/L to below 100 mg/L. The dissolved zinc concentrations in Fall 2008 E-Sump sample was 72.6 mg/L.

The plot of available dissolved zinc results for well ET-1 (includes original well DAP-MW3 results) located just downgradient of the east groundwater extraction trench is included as Figure 4-12. This plot illustrates a reduction in dissolved zinc concentrations, from a high of over 1,000 mg/L in 1991 to less than 80 mg/L since 1998. Zinc concentrations in September 2002 increased to 160 mg/L, but from 2003 through 2008 samples continued the previous trend with dissolved zinc concentrations of 9.5 mg/L in Fall 2008. Because the pump rates and water level measurements at the east groundwater extraction trench have not changed appreciably over time, the trend toward lower dissolved zinc concentrations is seen as evidence of a steady improvement in groundwater quality in this area downgradient of the CTP, rather than the effect of dilution.

4.3.3 North Groundwater Extraction Trench Water Levels

The 1997-2008 water level information for wells NT-2 and DAP-MW 4 in the vicinity of the north groundwater extraction trench is graphically illustrated in Figure 4-13. Well DAP-MW 4 was replaced by well DAP-MW 4R in late September 1999, and the water level measurements since November 1999 on Figure 4-13 are for well DAP-MW 4R. Well NT-2 monitors shallow glacial outwash sands and glacial till just downgradient of the north groundwater extraction trench. Well DAP-MW 4R is located approximately 100 feet downgradient from the north groundwater extraction trench between the CTP and Maloit Park. Well DAP-MW 4 was screened in glacial till at a depth of 2.3 feet to 21.6 feet BGS. Replacement well DAP-MW 4R is screened in glacial till at a depth of 12 feet to 22 feet BGS.

Because the above-listed wells monitor the shallow aquifer near the north groundwater extraction trench, they respond similarly to seasonal increases in recharge and groundwater extraction. The water level measurements for wells NT-2 and DAP-MW 4/4R show a general increase in the spring, as a result of snowmelt recharge.

4.3.4 North Groundwater Extraction Trench Water Quality

A plot of dissolved zinc results for samples collected from 1989 through 2008 directly from the north groundwater extraction trench sump (N-Sump) is included as Figure 4-14. Results indicate that the collected groundwater contains dissolved zinc concentrations ranging from approximately 310 mg/L to 8.3 mg/L, with little indication of seasonal

fluctuations (the value of 650 mg/L in September 1996 is considered an outlier). The dissolved zinc concentration in Fall 2008 was 21.7 mg/L.

The plot of available dissolved zinc results for well DAP-MW 4/4R located 100 feet downgradient of the trench is included as Figure 4-14. Historically, this older well produced little water when bailed and regularly dried out during sampling. Figure 4-14 illustrates an erratic but initially increasing and now decreasing dissolved zinc trend in well DAP-MW 4 samples since 1990. Well DAP-MW 4 was replaced with well DAP-MW 4R in September 1999 because it was believed that the well screen was encrusted. Since the well was replaced the dissolved zinc concentration has dropped from over 1200 mg/L in well DAP-MW 4R to less than 100 mg/L in the last three years (80.8 mg/L in Fall 2008 sample).

The water collected in the north groundwater extraction trench does not exhibit an increasing trend nor is it as mineralized as it is in well DAP-MW 4R. The dissimilarity in the N-Sump and DAP-MW4R dissolved zinc results suggests that they monitor two different groundwater sources.

4.4 Rock Creek Groundwater Extraction (Siphon) System

The CD/SOW required CBS to establish a seep collection system in the Rock Creek area that reduces surface and subsurface seepage flow to the Eagle River. CBS elected to meet the requirements by reducing the mine pool elevation beginning in 1991, supplemented later with groundwater extraction. Groundwater extraction by a gravity siphon began in early 1993 and has continued on a more or less continuous basis since that time. The CD/SOW required that CBS meet one of the following two performance standards for Rock Creek.

1. Extract and treat 90 percent of the subsurface seepage flow occurring prior to the start of mine drawdown and collect or eliminate all surface seepage flow, or

2. Reduce metals transport so that the water quality in Eagle River at Station E-11 meets ARARs (or until the incremental increase in load at Rock Creek does not cause surface water quality to fail ARARs).

Four, 4-inch diameter groundwater extraction wells were installed at a narrow bedrock constriction in lower Rock Creek Canyon near Seep S-2 in October 1992. These extraction wells are approximately 15 feet deep, completed in granite, and are spaced approximately 15 feet apart as shown in Figure 4-15. A gravity siphon was installed in one extraction well (RX-3) on June 23, 1993 to remove groundwater from Rock Creek colluvium. Extracted water is piped to the WTP for treatment.

In the *Final Rock Creek Extraction System Report* (Dames & Moore 1995a), it was demonstrated that Performance Standard No. 1 was met because a combination of the MDD and siphon extraction was reducing better than 90 percent of the subsurface seepage flow. This was demonstrated by conducting pump tests to estimate the volume of uncollected subsurface flow. In a letter, dated June 30, 1998, EPA agreed that Performance Standard No. 1 was met by operation of the siphon. In accordance with the CD/SOW, CBS installed an electric pump in RX-3 in 2000 as a contingency extraction system in case the siphon is interrupted.

The siphon typically produces 1 gpm. In 2008, approximately 500,000 gallons of groundwater were extracted from Rock Creek colluvium and treated at the WTP.

4.5 Belden Area Groundwater Extraction

Pursuant to the *Final Installation and Monitoring Plan for Belden Groundwater Monitoring Wells, Eagle Mine, Minturn, Colorado* (Dames & Moore 1995b), four monitoring wells were installed on the east bank of the Eagle River, below several waste rock piles, in railroad ballast at the Belden railroad siding. The wells were positioned to intercept groundwater moving to the Eagle River from suspected surface water recharge areas. Sample results from these wells were to be used to estimate metal loads in groundwater entering the river in this reach.

Results of the Belden groundwater studies suggest that the placement of wells BW-1 through BW-4 was inadequate to characterize groundwater conditions in the Belden area because the wells were not placed deep enough to monitor groundwater fluctuations. The *Belden Snowmelt Best Management Plan* or BMP (Dames & Moore 1999) called for installation of three new, deeper monitoring wells for use in hydraulic gradient measurements to assess the effectiveness of the BMP.

On September 23, 1999, three monitoring wells, BW-5, BW-6, and BW-7, were installed in the Belden area between the railroad tracks and the right bank of the Eagle River in accordance with the BMP (Figure 4-16).

On April 19, 2001, a well (BW-8) was drilled near the former zinc concentrate building, bottoming in granite at 32 feet BGS. Well BW-9 was drilled at the base of the old tramway, bottoming in granite at 29 feet BGS. In both holes, 4-inch diameter PVC wells were installed to allow for future groundwater extraction. A proposed plan for groundwater extraction in the Belden area was described in a letter, dated August 16, 2001, and accepted by EPA/CDPHE in a letter dated September 13, 2001. Four photovoltaic solar panels were installed in 2002 to power the submersible pumps. Well BW-8 produces very little water and well BW-9 was abandoned in 2004 due to broken casing.

In 2006, well BW-9R was drilled to replace well BW-9. Well BW-9R was installed to 39 feet BGS, or essentially to the top of the granite. Well BW-3R was installed replacing shallow well BW-3. Well BW-10 was drilled near well BW-3R but has produced very little water since development.

The *Belden Groundwater Extraction* trench was installed in October 2007 (see Figure 4-17 for location). The trench was dry when constructed. Water was observed in the trench in mid-April. A pumping test was conducted on May 9, 2008. The test was performed by pumping from the trench sump (BTS-1) at a constant rate and measuring groundwater levels in the trench piezometers (BPZ-1 and BPZ-2) and nearby wells BW-3R and BW-10 to monitor water level drawdown. Groundwater levels were also measured following pump shut-off to monitor water level recovery. The small amount of drawdown and slow hydraulic response indicates that the material is low in hydraulic conductivity. The *Belden Groundwater Extraction System Performance Report No. 3* was submitted to CDPHE on July 9, 2008, summarizing activities in relation to the extraction trench construction and performance testing. A copy of this report is included in Appendix C-4.

The pumps in the Belden wells operated in 2008 on a daily basis when the solar panels began receiving direct sun in the spring. BW-9R began pumping in mid-April and BW-10 began pumping in mid-May. The Belden extraction trench was tested on May 9, 2008 with a resulting static pump rate of 2.0 gpm. It was observed during the pump test that the trench was already beginning to dry up for the year. The two wells operated on a daily basis until mid-summer when theft of the copper wiring terminated the pumping activity. CBS removed the photovoltaic panels in late August to ensure their security.

Belden well water samples and water level measurements were collected during the pumping test. Sampling results and water level information are presented in Appendix C. Sample results indicate that the Belden area groundwater is likely the significant source of metal loading to Segment 5a of the Eagle River. Monitoring in 2009 has been proposed which will further delineate the groundwater.

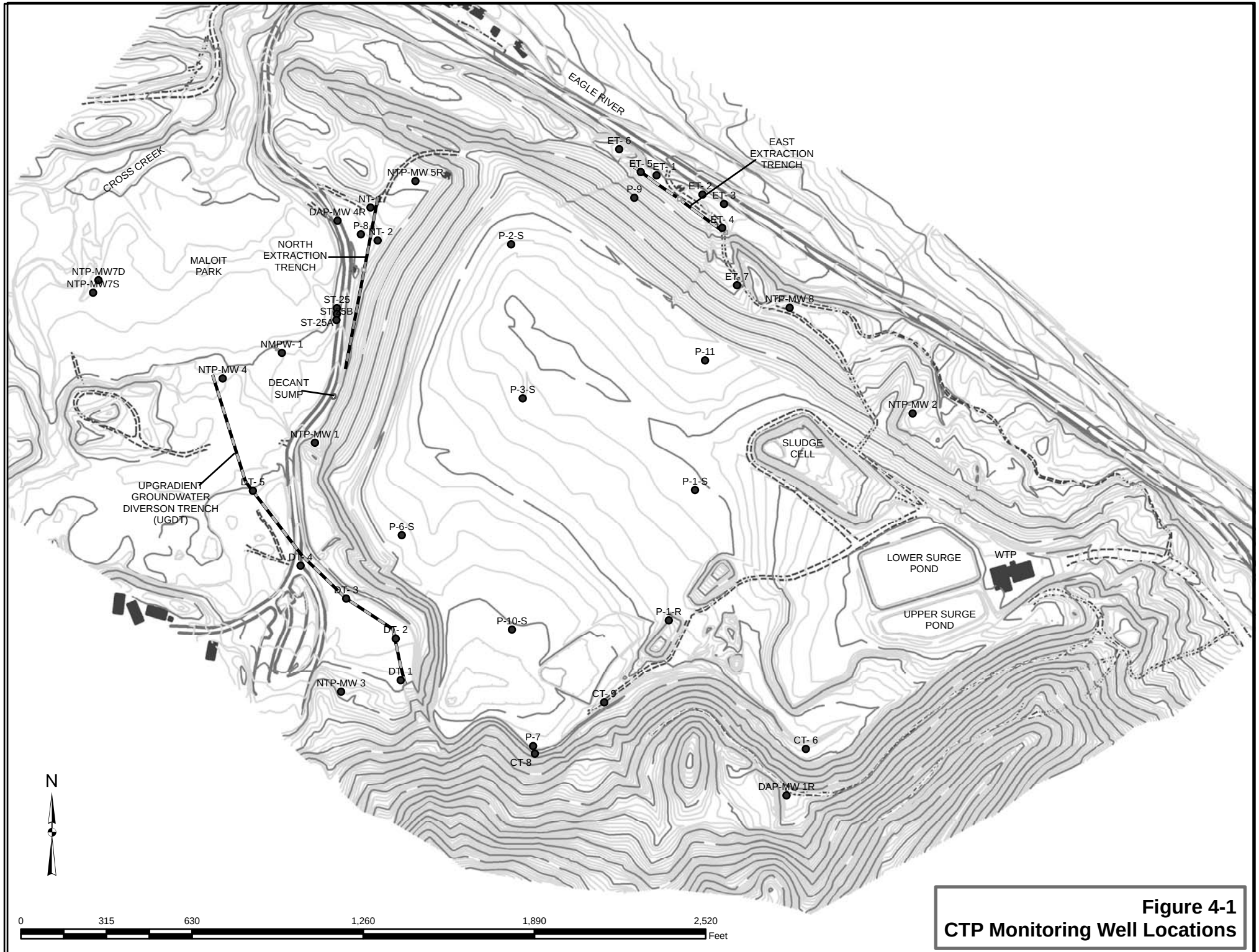
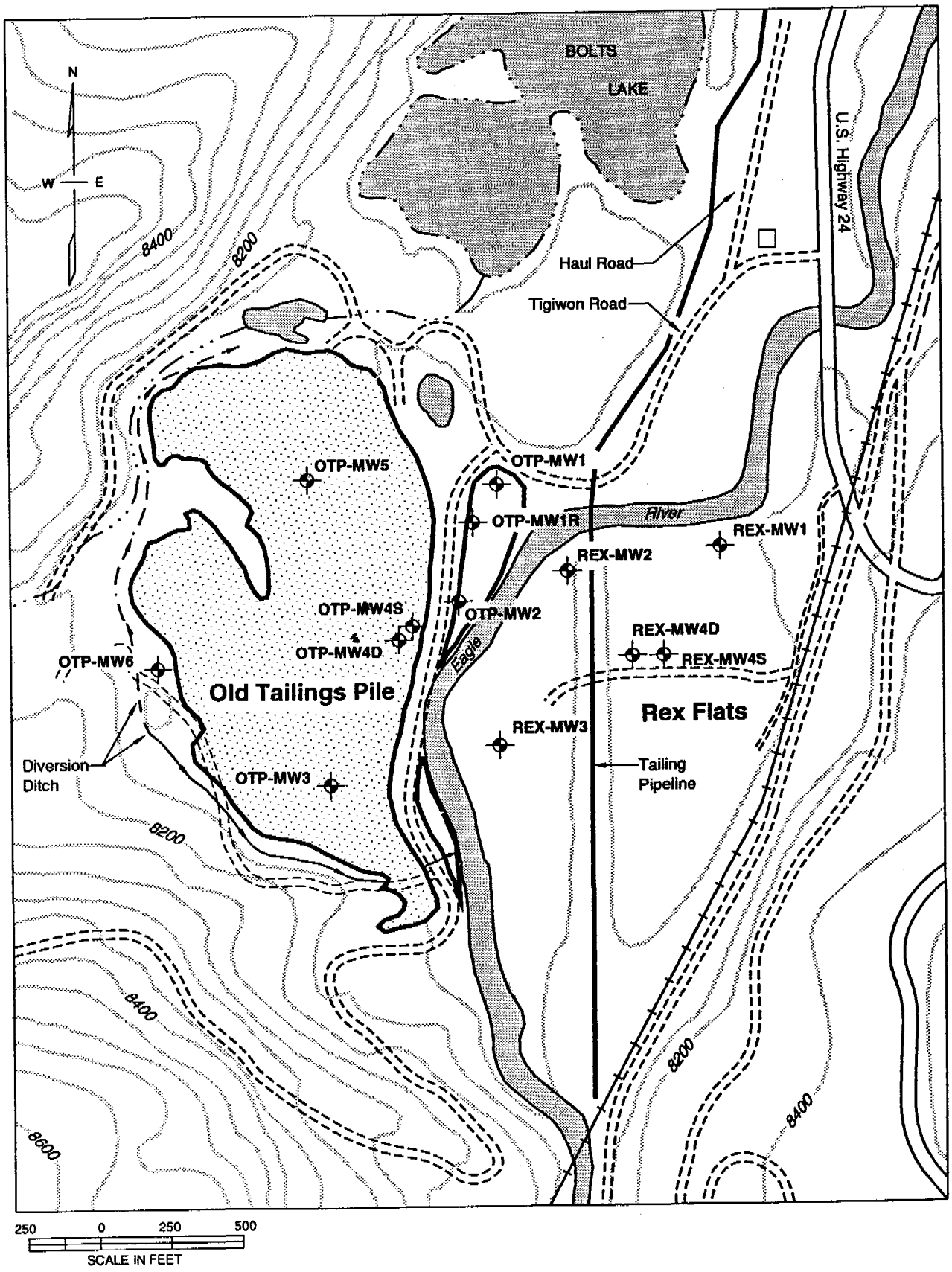


Figure 4-1
CTP Monitoring Well Locations



Old Tailings Pile/Rex Flats Monitoring Well Locations

OTP-WLS.DWG

Figure 4-2

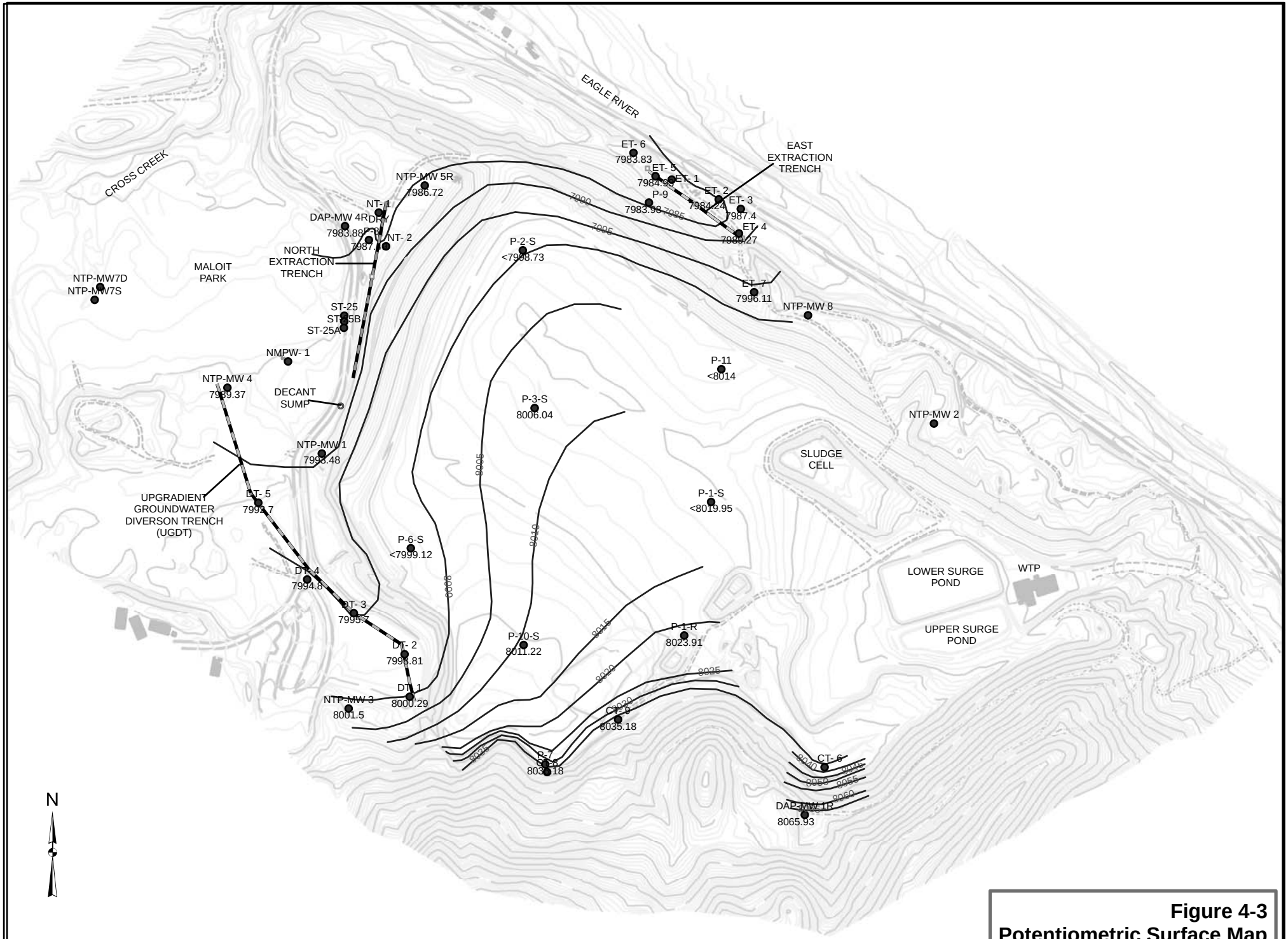


Figure 4-3
Potentiometric Surface Map
Shallow Aquifer, Fall 2008

CTP Piezometer Water Levels

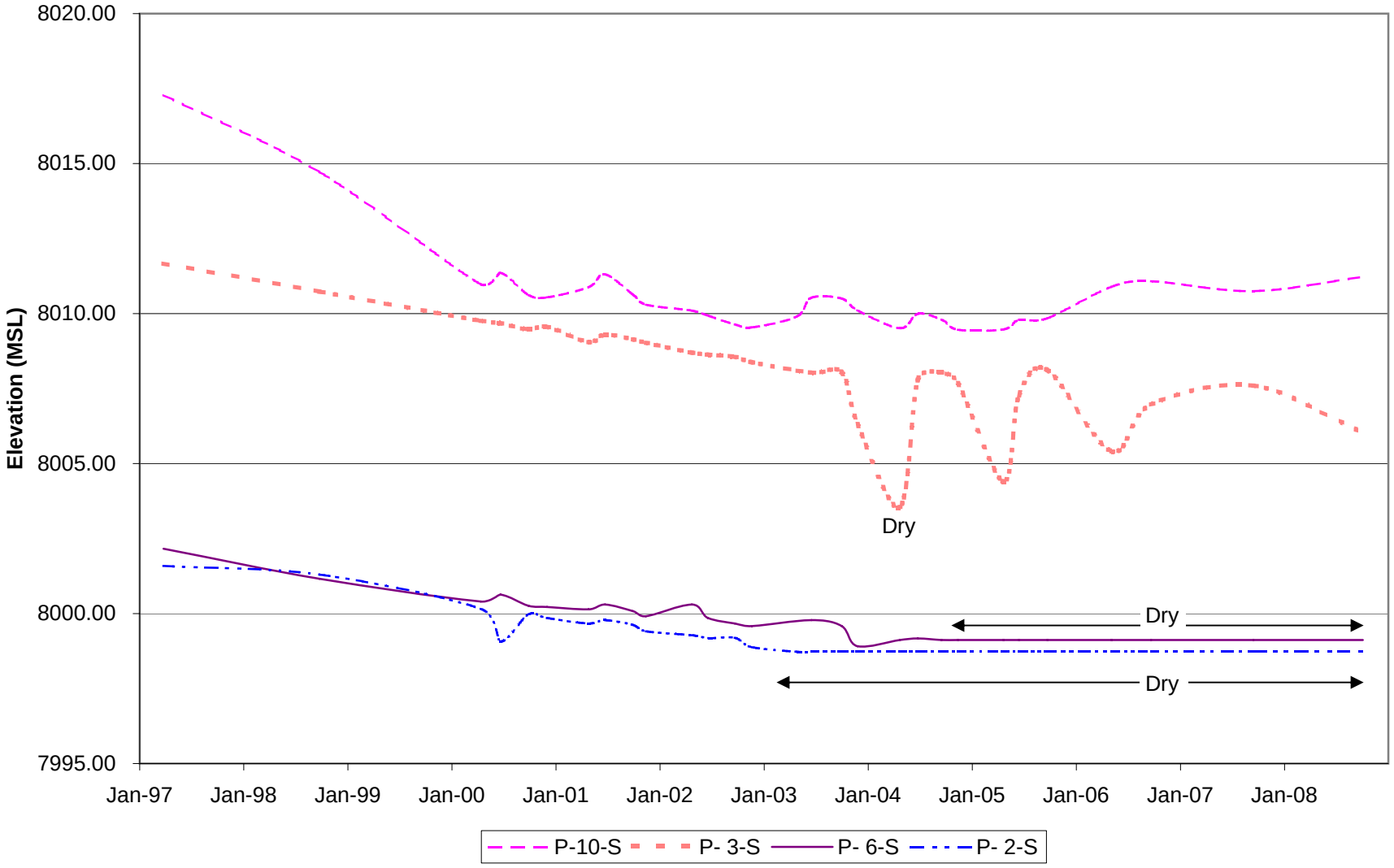
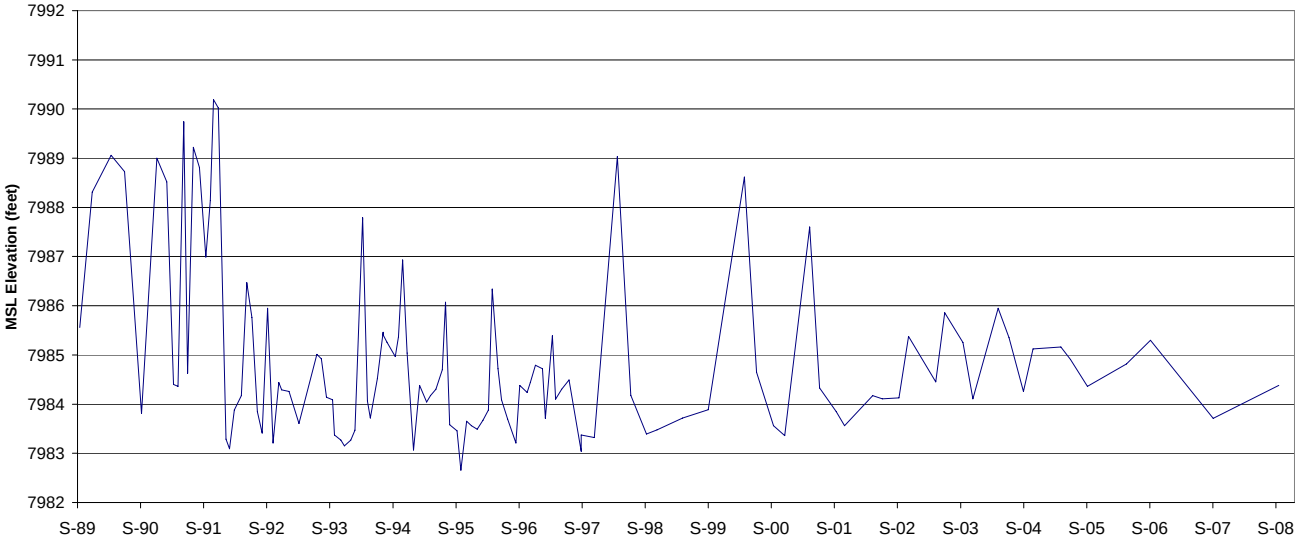


Figure 4-4

CTP Area
Monitoring Well DAP-MW 3/ET-1

Water Levels



Dissolved Zinc Concentrations

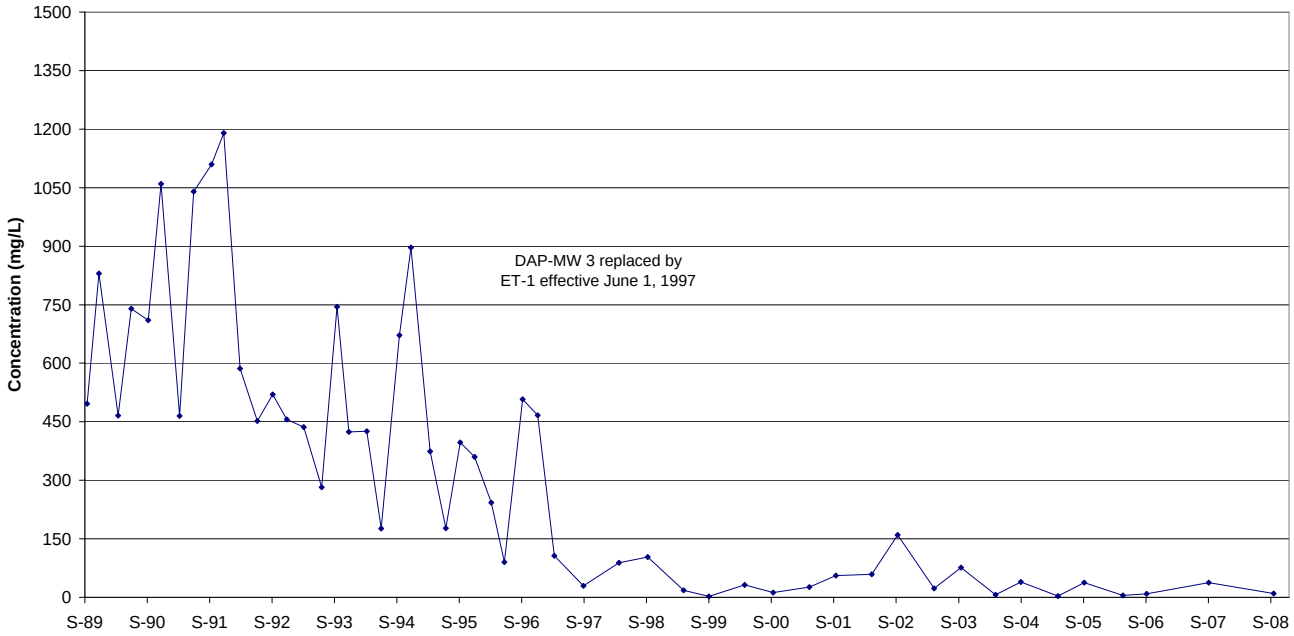
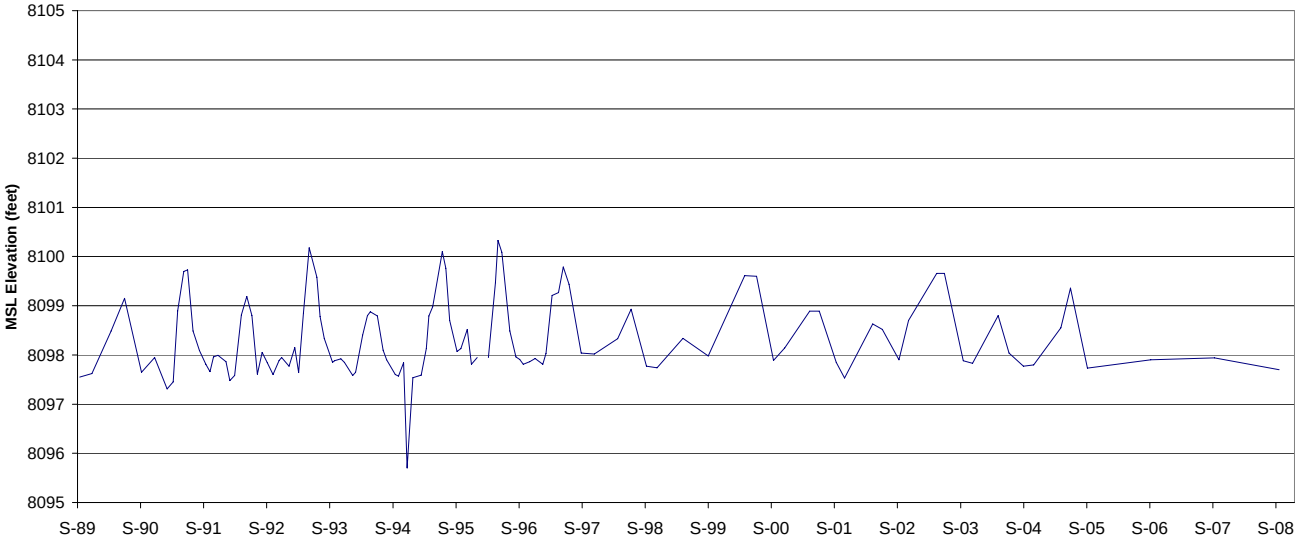


Figure 4-5

OTP Area
Monitoring Well OTP-MW 2

Water Levels



Dissolved Zinc Concentrations

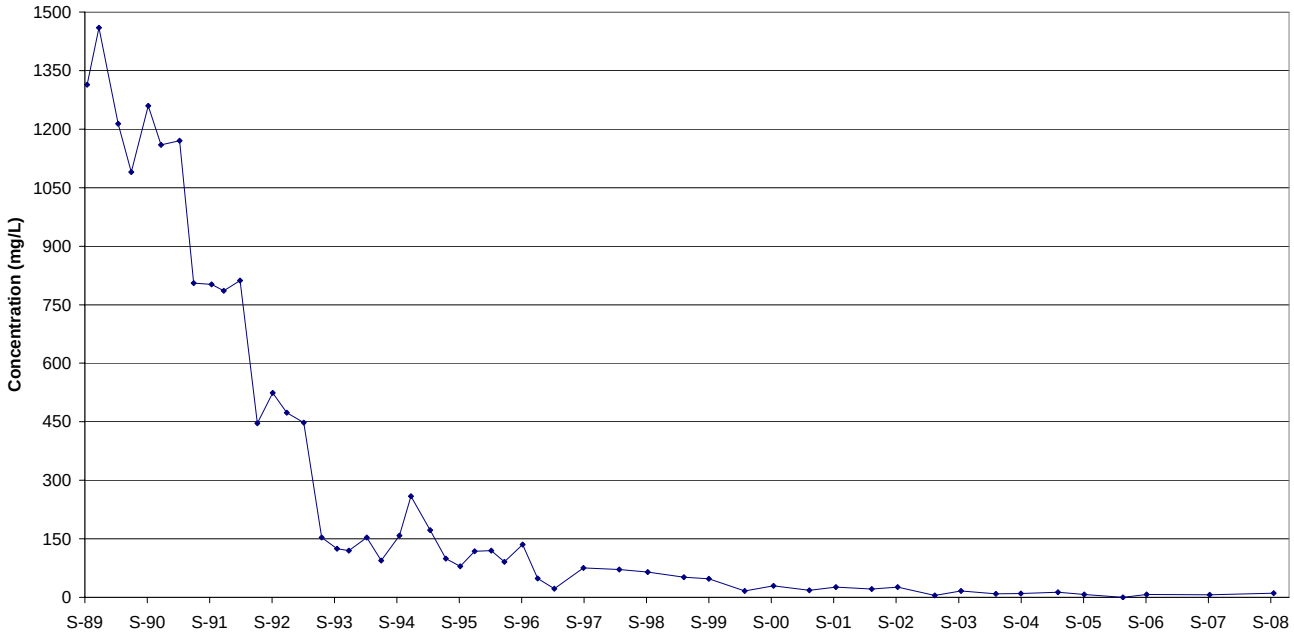
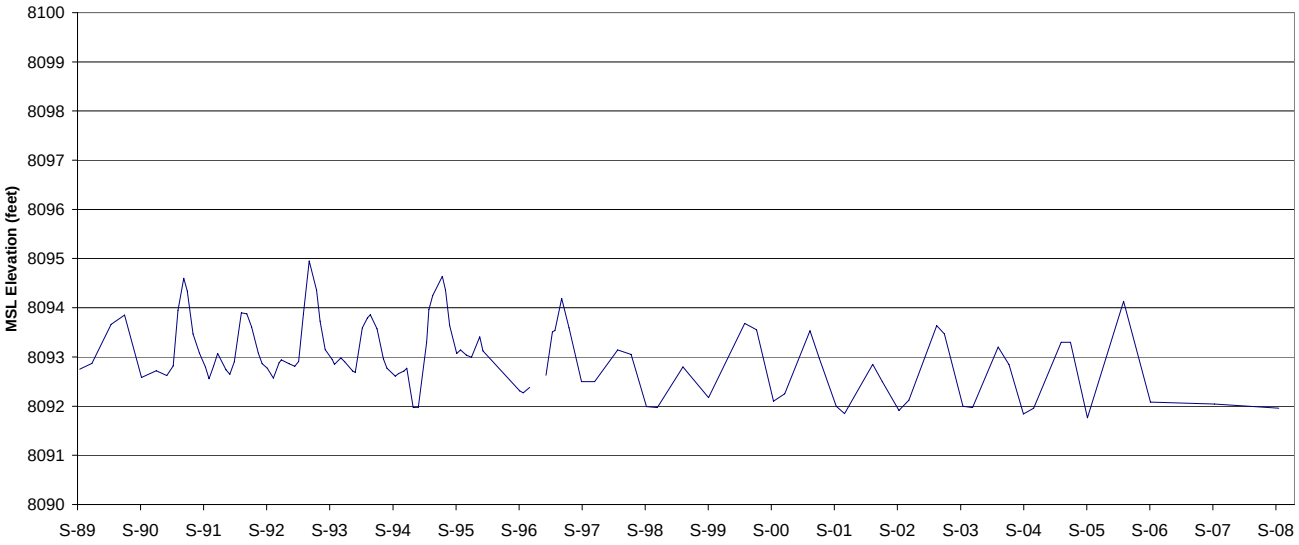


Figure 4-6

Rex Flats Area
Monitoring Well REX-MW 2

Water Levels



Dissolved Zinc Concentrations

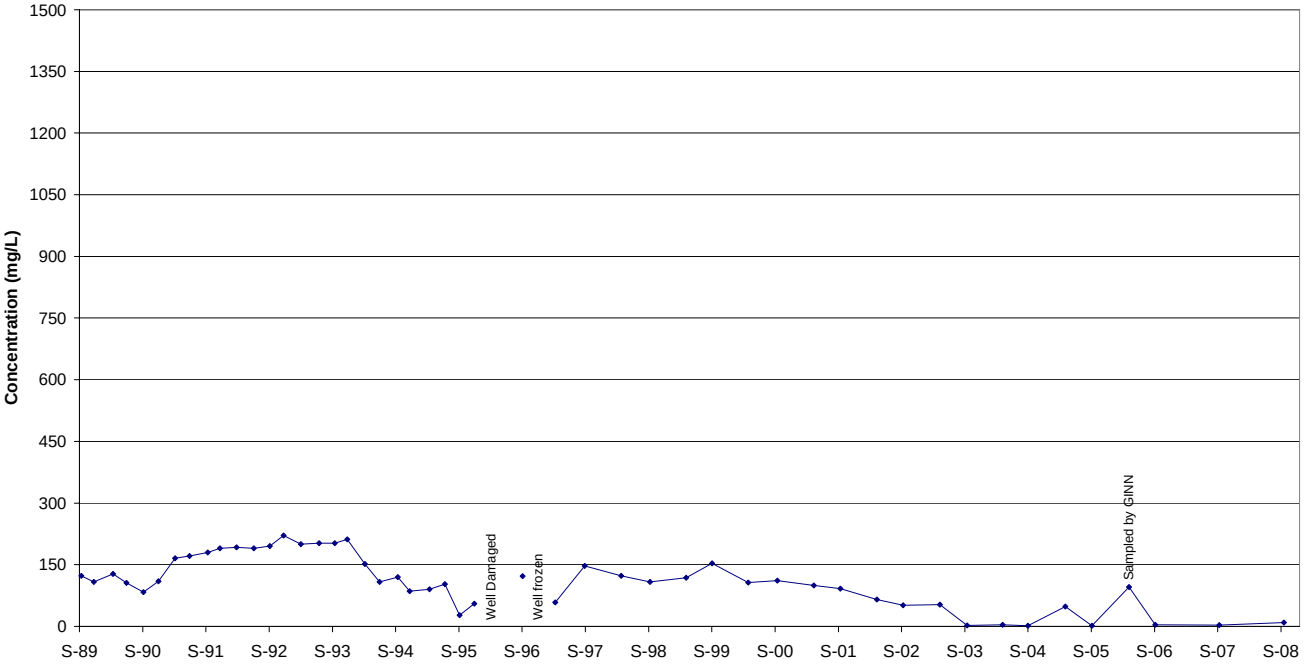
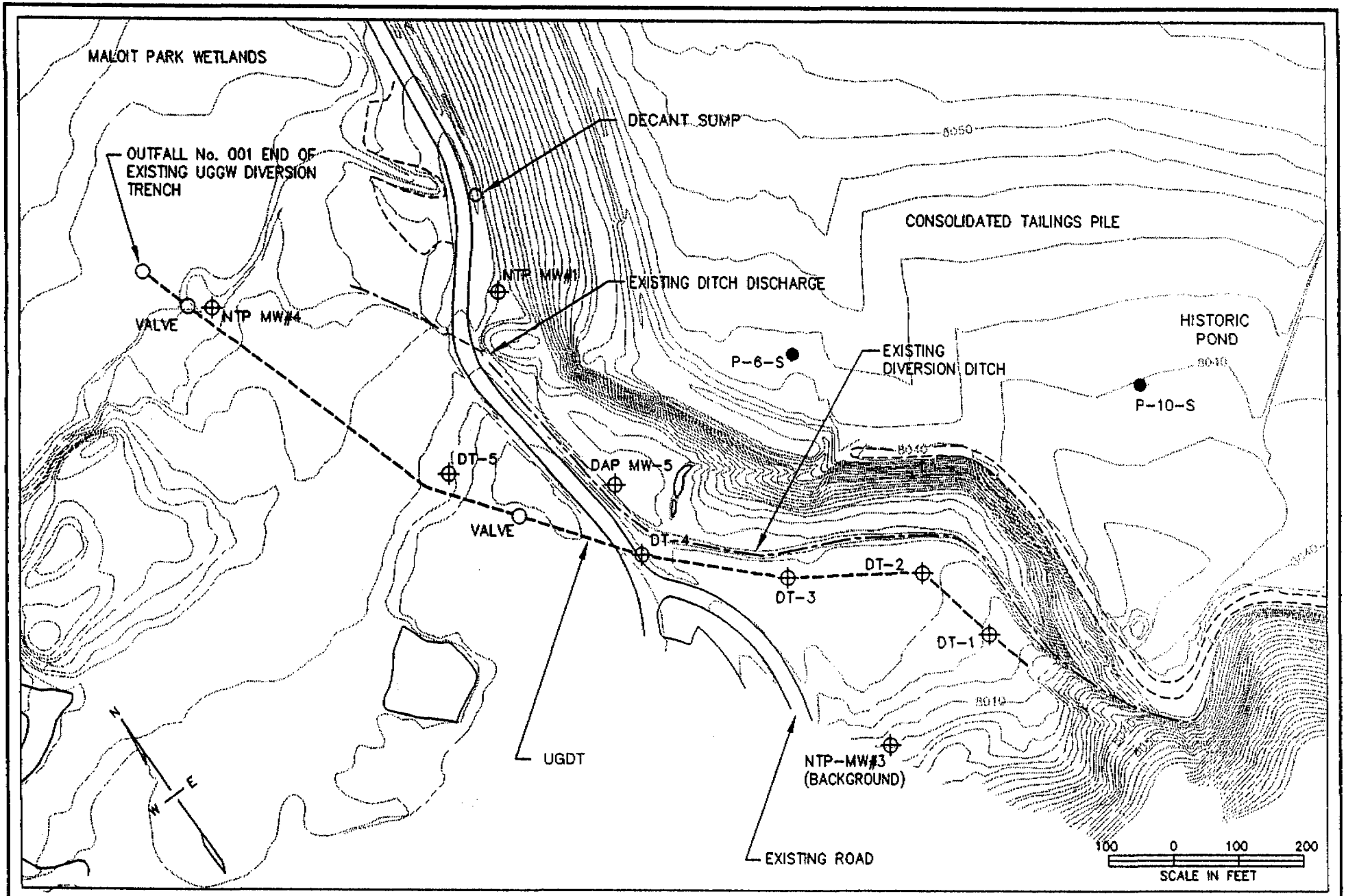


Figure 4-7

DV-PLAN.DWG



LEGEND

⊕ – MONITORING WELL

● – PIEZOMETER

Upgradient Groundwater Diversion Trench Plot Plan

Figure 4-8

Groundwater Elevations
Selected Wells in the UGDT Area

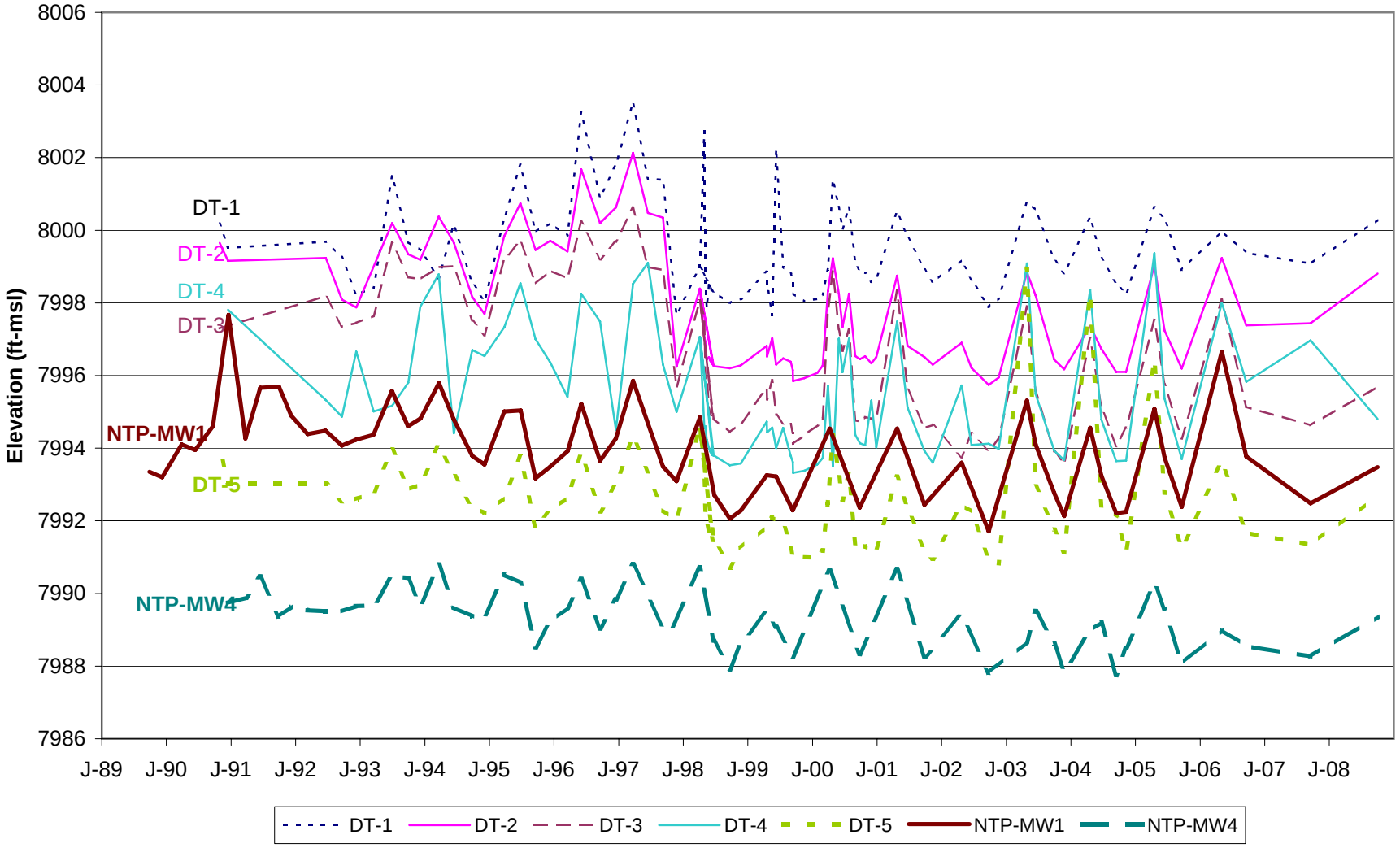
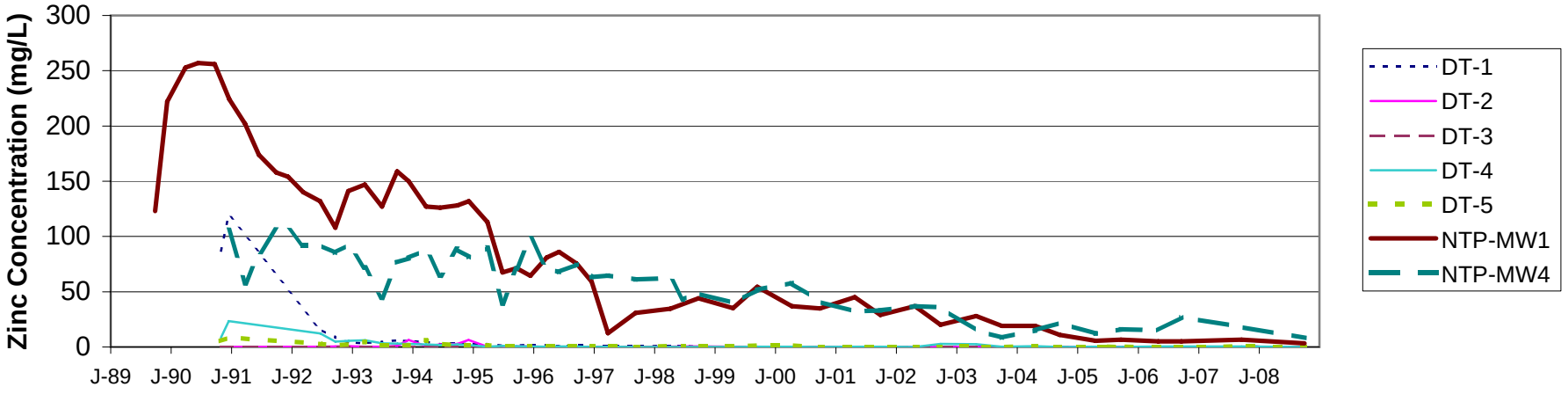


Figure 4-9

Dissolved Zinc Concentrations
Selected Wells in the UGDT Area



DT wells only at a smaller scale (with NTP-MW wells for scale):

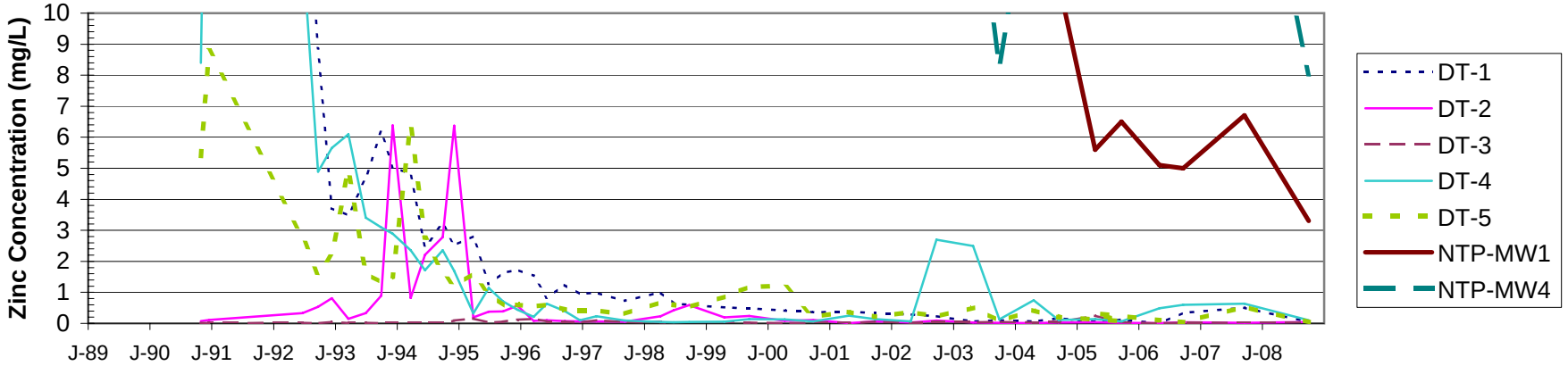


Figure 4-10

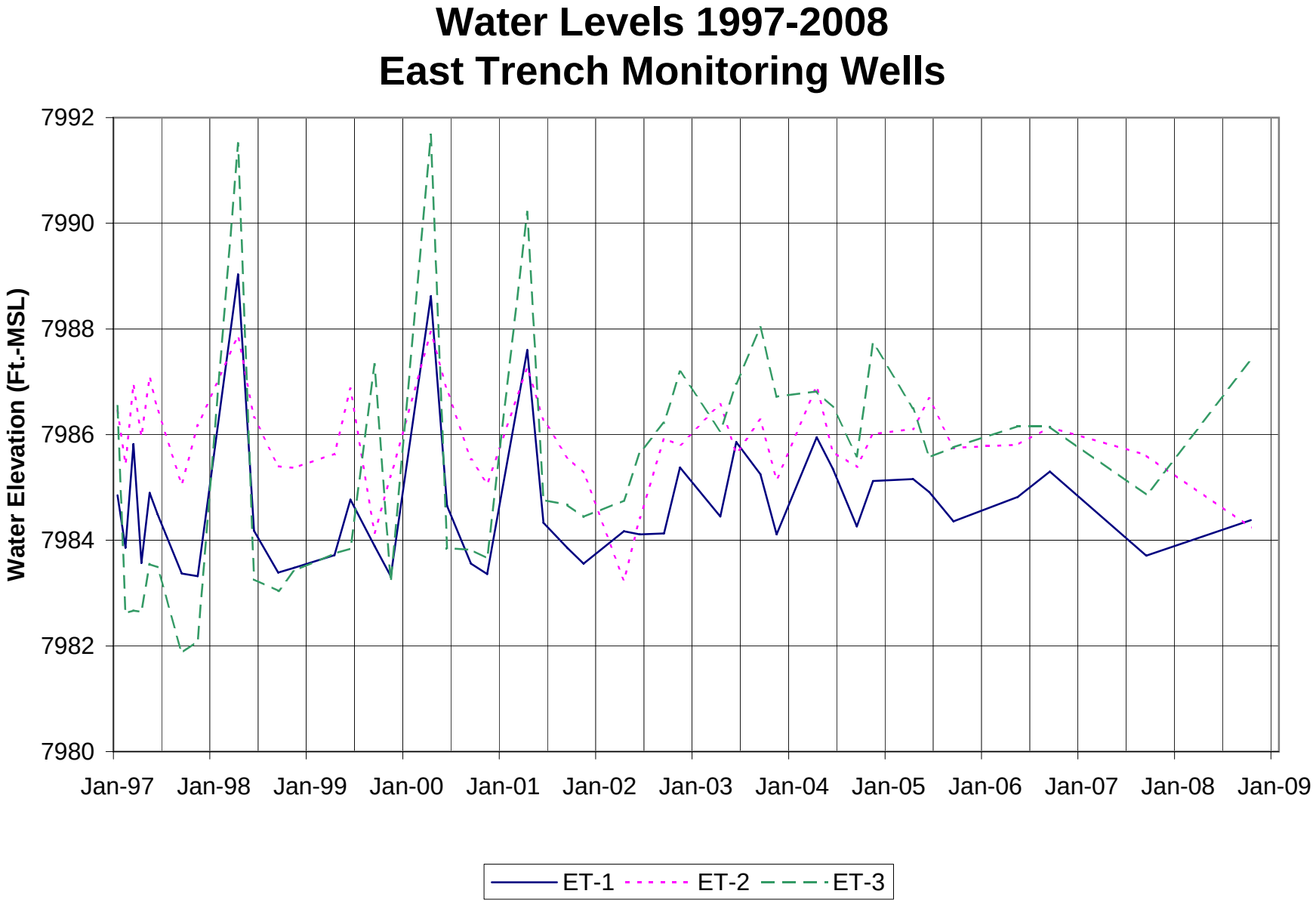
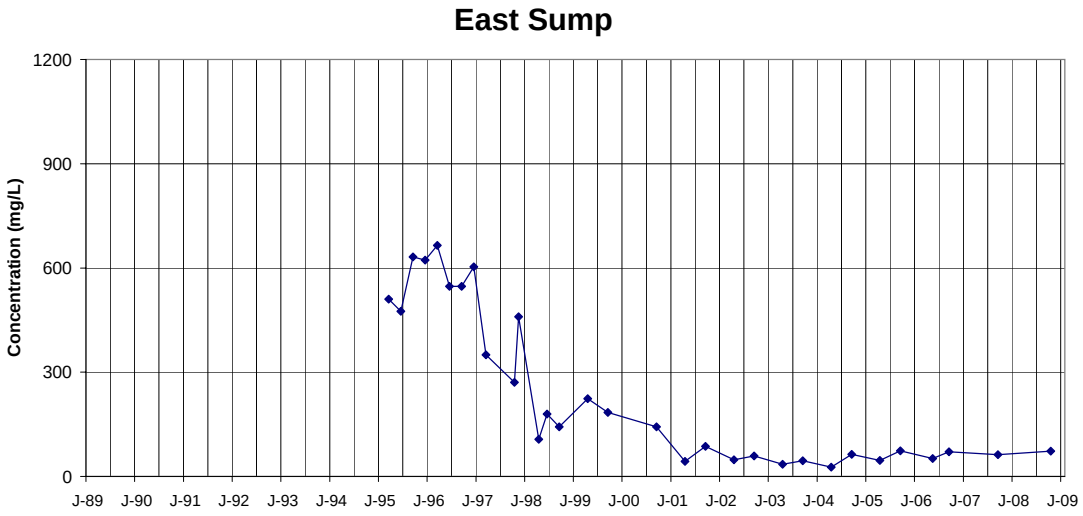

Water Levels 1997-2008
East Trench Monitoring Wells
Water Elevation (Ft.-MSL)
7992
7990
7988
7986
7984
7982
7980
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
ET-1
ET-2
ET-3

Figure 4-11

Dissolved Zinc Concentrations
East Trench Area



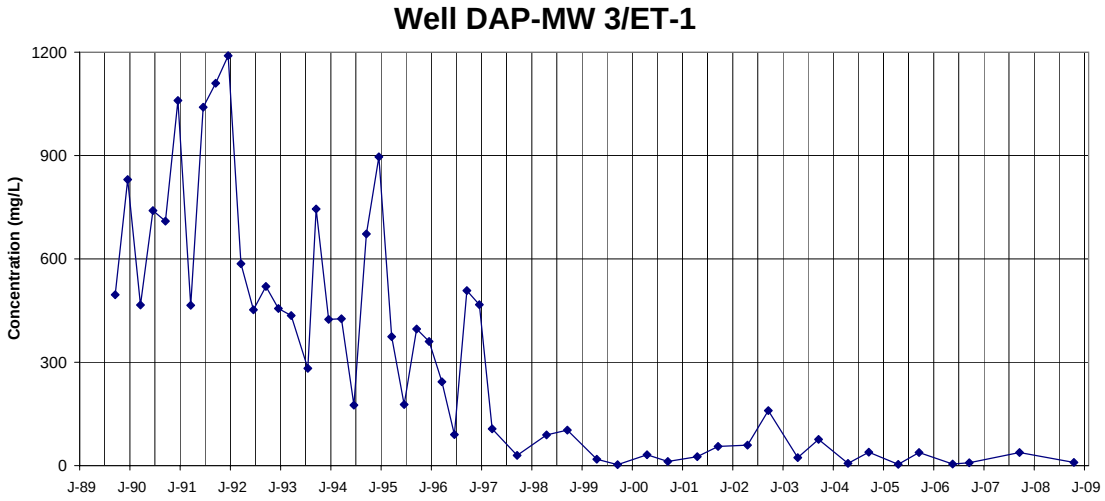


Figure 4-12

Water Levels 1997-2008
North Trench Monitoring Wells

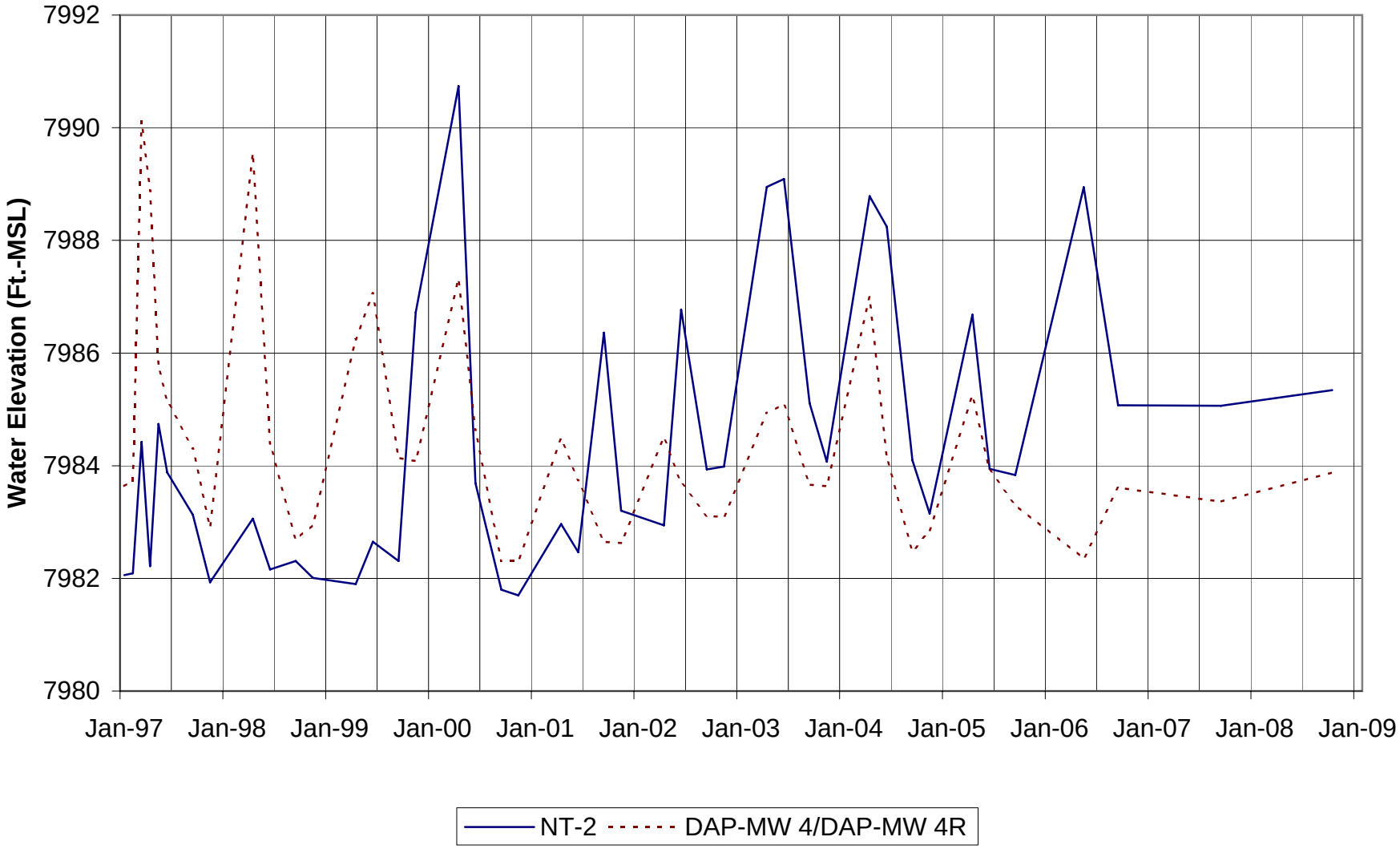
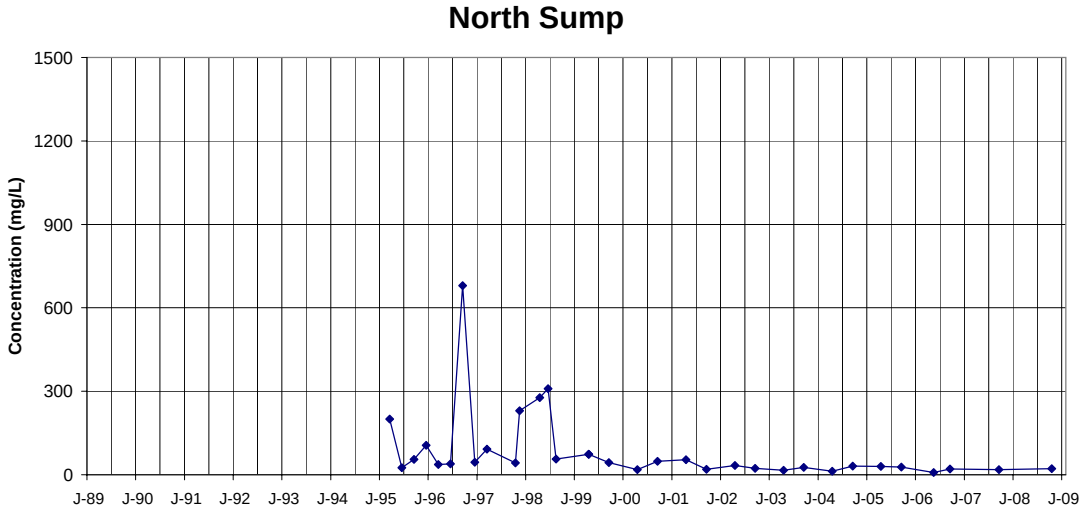


Figure 4-13

Dissolved Zinc Concentrations
North Trench Area



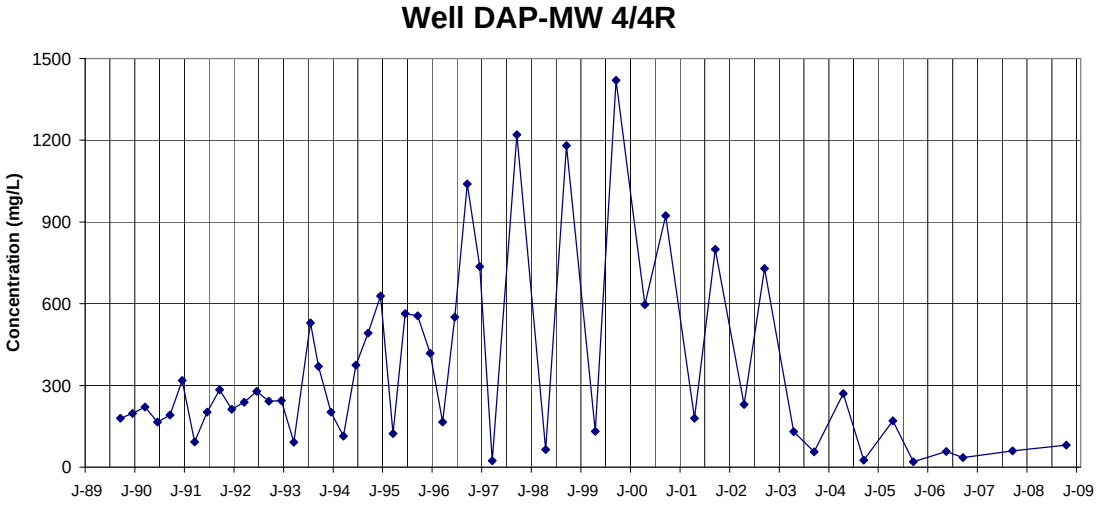
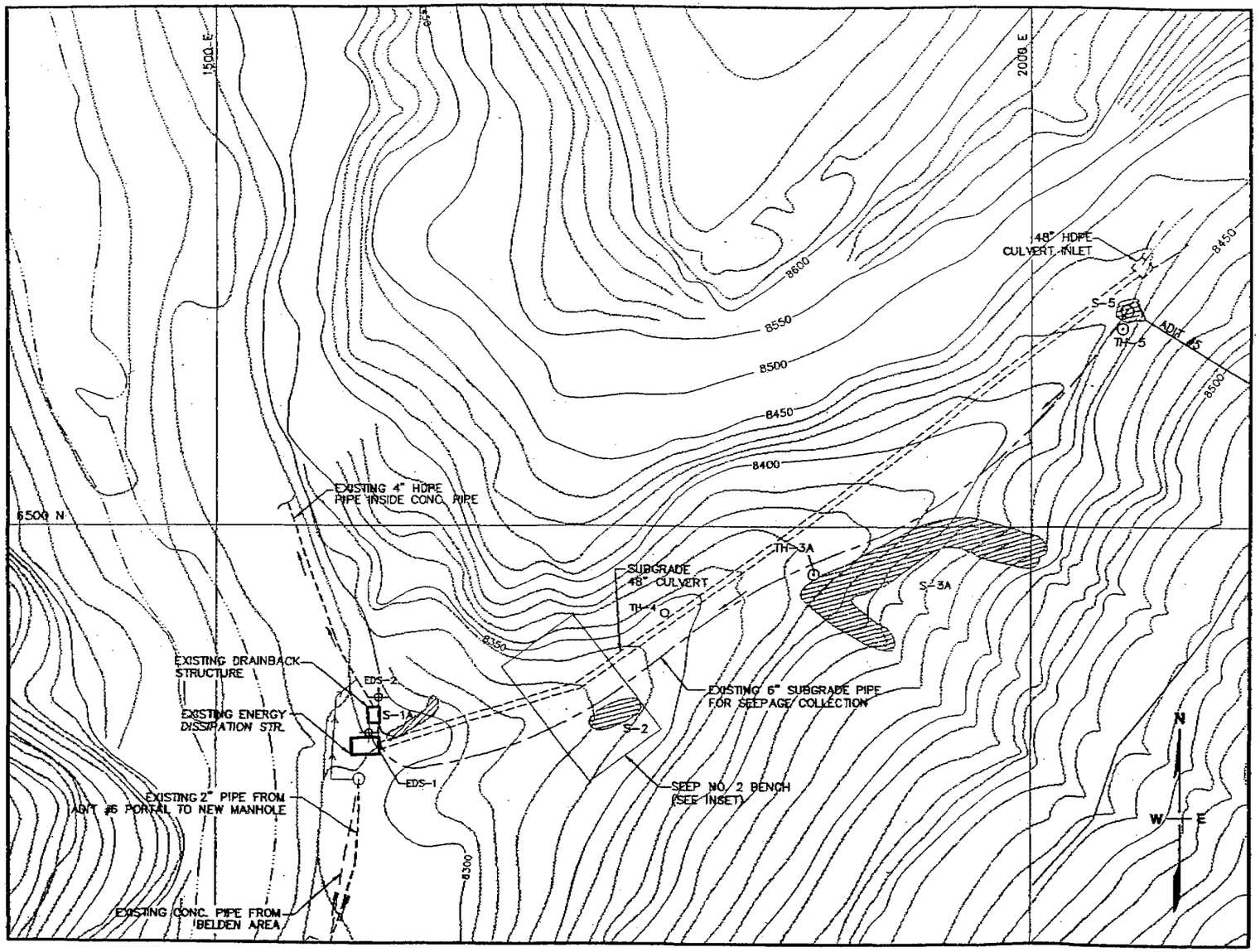


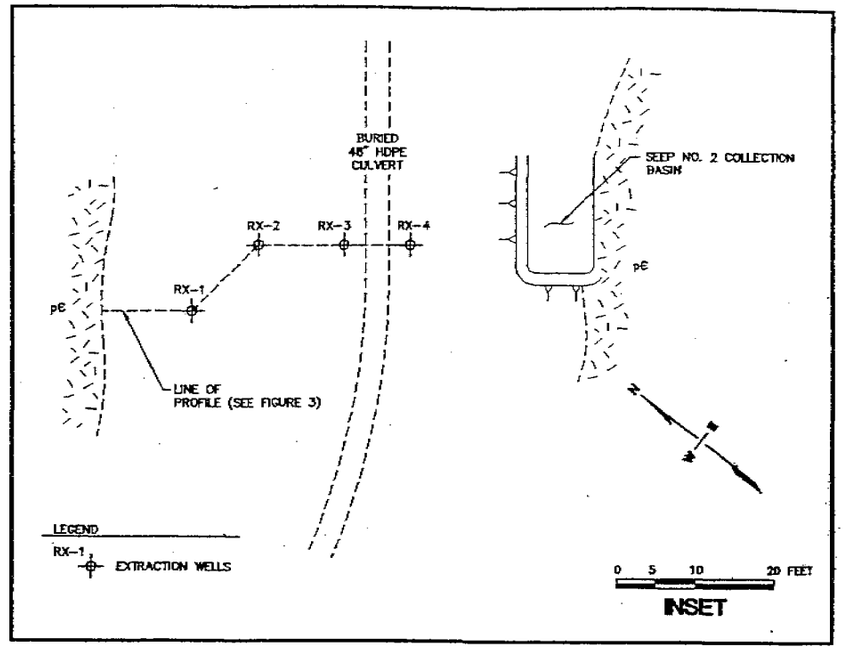
Figure 4-14

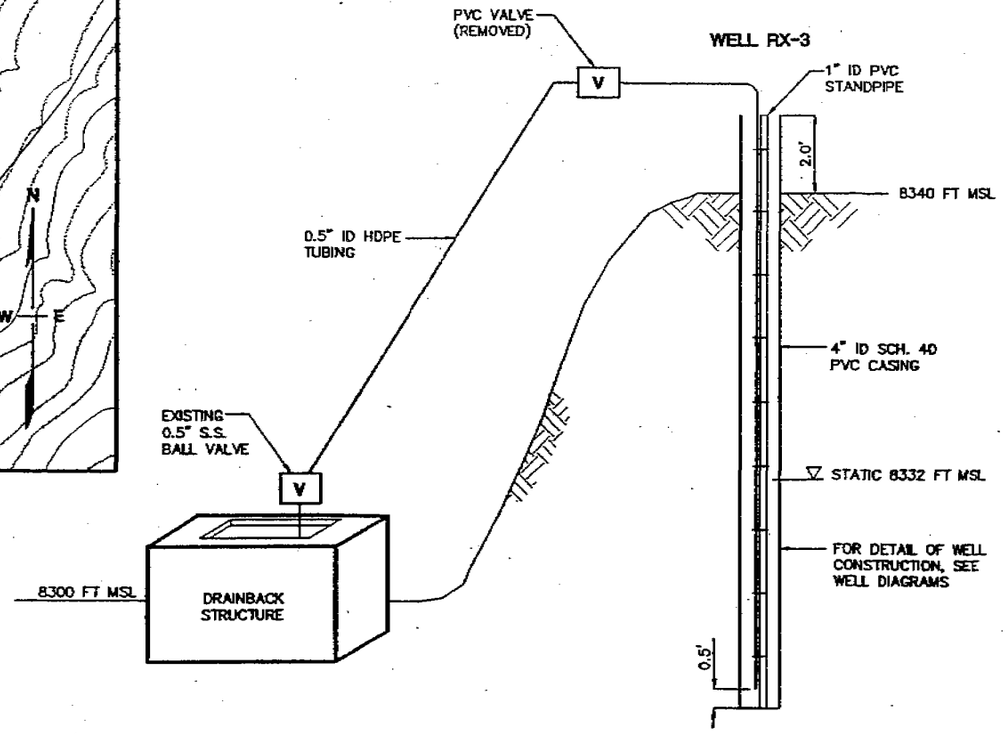


PLAN

LEGEND

- TH-5 ⊙ PHASE I WELLS
- TH-4 O PIEZOMETER
- S-2 SEEP LOCATION AND NAME
- EDS-2 ⊕ PHASE II WELLS





AS-BUILT - PIPING

NOT TO SCALE

REFERENCES	REVISIONS	REVISIONS
TITLE	NO. BY. DATE / DESCRIPTION	NO. BY. DATE / DESCRIPTION

DRAWING SCALE	1=1	
		DATE
DESIGNED BY:	D. HINRICHS	10/91
DRAWN BY:	D. HEDSTROM	10/91
CHECKED BY:	J. TRUDINGER	3/93
APPROVED BY:	---	---
FILE:	ROCKWELL.DWG	

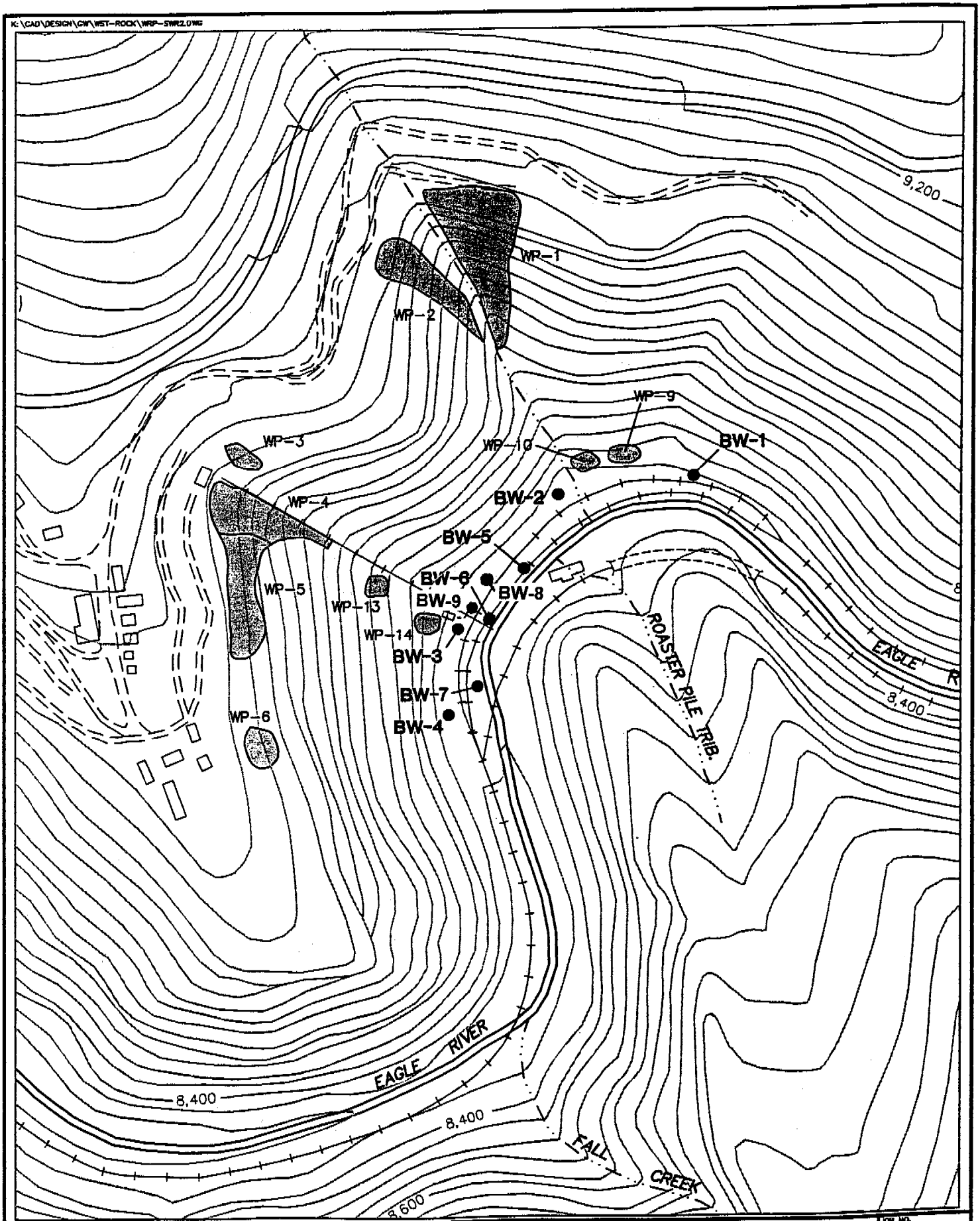
VIACOM INTERNATIONAL INC.
LOWER ROCK CREEK CANYON

JOB NO. 8800044555

REVISION

Test Well Plot Plan

Figure 4-15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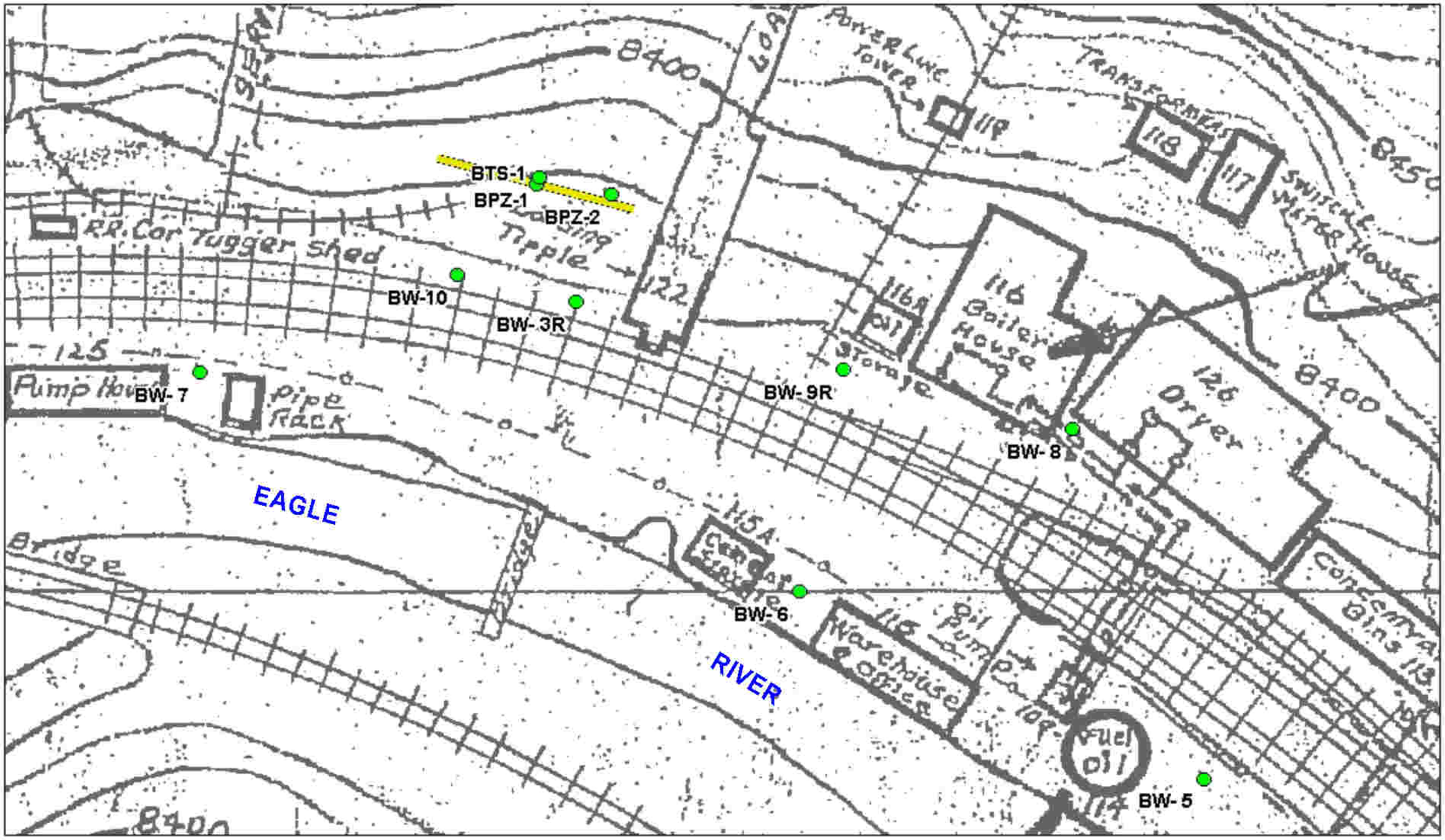
9,200
WP-1
WP-2
WP-3
WP-4
WP-5
WP-6
WP-9
WP-10
WP-13
WP-14
BW-1
BW-2
BW-3
BW-4
BW-5
BW-6
BW-7
BW-8
BW-9
ROASTER PILE TRIB.
EAGLE R
8,400
EAGLE RIVER
8,400
8,400
FALL
CREEK
8,600
LEGEND
BW-4 GROUND-WATER MONITORING WELL
WP-14 WASTE ROCK PILE
200 0 200 400
SCALE IN FEET
VIACOM INTERNATIONAL INC.
Eagle Mine – Minturn, Colorado
Belden Well
Monitoring Locations
Figure 4-16



Legend

- Wells
- Test Trench

N

0 50 Feet

Figure 4-17

Location of
Groundwater Interceptor Trench

Belden Interceptor Trench
Eagle Mine Site

NEWFIELDS

File: Location.srf

5.0 CTP SURFACE SETTLEMENT AND EROSION MONITORING

Locations of the surface settlement and erosion monuments are shown on Figure 5-1.

5.1 Erosion Monitoring

The Environmental Monitoring Plan (EMP, Dames & Moore 1989) required the installation and monitoring of at least ten erosion monuments to be "visually inspected annually for signs of erosion and slope stability" for a period of 15 years after completion of the cap, or until the Eagle River water quality objectives in the RAP are met, whichever is earlier. CBS's responsibility for environmental monitoring at the CTP continues for 15 years after completion of the cap, excluding the area under and adjacent to the WTP, surge ponds, sludge disposal cell and associated structures, or until the Eagle River water quality objectives as defined in Exhibit D, Section D-3.1 of the RAP are met, whichever is earlier. The cap was visually inspected site superintendent Joe Trujillo periodically throughout the year. No outward signs of erosion damage to the cap or damage to the cap vegetation were noted. A formal inspection with photographic documentation was not conducted. CBS's responsibility for erosion monitoring of the CTP cap will be discontinued if the cap is modified or developed by others.

5.2 Settlement Monitoring

According to RAP Exhibit A-4.7.3, at least 90 percent of the predicted or actual settlement of the materials placed at the CTP was to occur prior to placement of the cap. The settlement criteria for cap placement (of the RAP) were satisfied in 1996 and the cap was completed in 1997. The 1996 design package for construction included plans to abandon several settlement plates used in the geotechnical design of the cap and install ten surface movement monuments. The State approved the design package and the monuments were installed during the second quarter of 1997. The EMP states that the surface movement monuments "shall be measured annually for a period of 15 years after completion of the cap, or until settlement is within 10 percent of the estimated total settlement after cover placement, or until the Eagle River water quality objectives in the RAP are met, whichever is earlier". The surface movement monuments were surveyed annually during 1997-2001. Disregarding some survey errors in 2001, the measured top-of-pipe settlement values between 1997 and 2001 ranged from 0.68 foot at SS10 at the historic pond to 0.05 foot at SS8 (Figure 5-1).

Subsequent surveys will be conducted in 2010 and in 2015 unless this schedule is modified by EPA's 5-year review cycle or other agreement. CBS will discontinue settlement monitoring if the cap is modified or developed by others.

EXPLANATION

SS1 ● SURFACE SETTLEMENT PLATE

EM1 ○ EROSION MONUMENT

BASE CONTOURS ARE FROM AERIAL SURVEY JUNE, 1995 AND AERIAL SURVEY SEPTEMBER, 1997 OF HISTORIC POND, BORROW AND DIVERSION CHANNEL AREAS. CONTOUR INTERVAL = 2 FT.

DRAWING SCALE	1"=300'	
		DATE
DESIGNED BY:	-	-
DRAWN BY:	S. JACOBSON	10/97
CHECKED BY:	-	-
APPROVED BY:	-	-
FILE:	95-DL098	

VIACOM INTERNATIONAL INC.
Eagle Mine — Minturn, Colorado

JOB NO. 6800044556

REVISION

Surface Settlement Plate and Erosion Monument Locations

Figure 5-1

6.0 SUMMARY OF SITE ACTIVITIES

Section 6.0 contains a summary of the design, construction, inspection and maintenance, WTP operation, and community relation activities completed in 2008.

6.1 Design and Construction

Design and construction activities were conducted in the Belden area in 2008.

WTP Upgrades

- A sludge recycle system was added to the WTP treatment train to better allow the treatment of large volumes of low TSS influent.

Area Activities conducted by EPA

- EPA completed cribbing and stabilization activities upstream of the Belden area.
- EPA bulkheaded the Doghole Adit and installed pipe from the bulkhead to the existing line so that collected water could be treated by the WTP.

Belden Groundwater Extraction

- The *Belden Groundwater Extraction System Performance Report No. 3* was submitted to CDPHE on July 9, 2008, summarizing activities relating to the extraction trench construction and performance testing.

6.2 Inspection and Maintenance

- Mine water withdrawal was measured daily at the totalizing meter on the MDD pipeline located near the mouth of Rock Creek.
- The mine pool elevation was measured weekly using the MDD pressure transducer.
- General site inspections were performed daily. These inspections include monitoring flow in the RX-3 siphon and Rock Creek seeps, when accessible.
- Acid treatment of the pipeline to the WTP was performed to reduce scale formation.

- Accumulated debris at the Tramway culvert and Ben Butler culvert was periodically removed.

- Accumulated debris at seep 7 and the WRP-8 seep collection facilities was periodically removed.

- The Liberty No. 4 operated throughout 2008 with only minor interruptions due to power supply failures.

- EPA, CDPHE, and NewFields conducted an annual inspection of the Site on April 29, 2008. CDPHE submitted a Site Inspection report, detailing the results of the inspection. Actions recommended in the inspection report have been implemented or will be implemented in 2009.

6.3 WTP Operation

- In 2008, the WTP treated 107,604,691 gallons of water, generating approximately 687.5 cubic yards of dewatered sludge. The sludge was placed in the lined Sludge Cell.

6.4 Community Relations

- EPA and CDPHE conducted a public Site tour on July 29, 2008.

6.5 Planned 2008 Activities

- Mine water withdrawal will be measured daily at the totalizing meter on the MDD pipeline located near the mouth of Rock Creek. The mine pool will be maintained at a low level.

- The mine pool elevation will be measured periodically using the MDD pressure transducer.

- General site inspections will be performed by site personnel daily. These inspections include monitoring flow in the RX-3 siphon and in Rock Creek seeps.

- CBS will construction a overflow ditch from the Lower Surge Pond to the Sludge Cell.

- The CTP cap will be inspected for evidence of erosion.

- Accumulated water in the Temp Cell will be periodically pumped to the Surge Ponds for treatment.

- CDPHE, EPA and NewFields will perform a 2009 annual site inspection.

- Acid treatment of the seep pipelines and the main pipeline to the WTP will be performed to reduce scale formation.

- Accumulated debris at the Tramway and Ben Butler culverts in Belden will be periodically removed.

- Accumulated debris at seep 7 and the WRP-8 seep collection facilities will be periodically removed.

- Debris from the beaver dams in upper Rock Creek will be periodically removed.

- The Liberty No. 4 well will be operated on a full time basis. Samples will be collected to meet the permit requirements.

- The north groundwater extraction trench and east groundwater extraction trench will continue to operate.

- The siphon in Rock Creek will continue to operate.

- The WTP will continue to operate.

- Streamflow will not be determined using field measuring devices in September at Eagle River stations as in years past. Instead historical flow relationships established between each station and the stream gage at E-12A will be used. These projected flow rates will be used in the September metal loading evaluation.

- Surface water and groundwater monitoring will conducted as agreed to 1) by written letter agreement, or 2) by Consent Decree.

7.0 REFERENCES

Dames & Moore, 1989. Eagle Mine Site, Remedial Action Program, Environmental Monitoring Plan. October 1989.

Dames & Moore, 1995a. Final Rock Creek Extraction System Report.

Dames & Moore, 1995b. Final Installation and Monitoring Plan for Belden Groundwater Monitoring Wells, Eagle Mine, Minturn, Colorado.

Dames & Moore, 1996. Surface Water Sampling and Analysis Plan.

Dames & Moore, 1998. Eagle Mine Annual Site Monitoring and Activity Report 1997.

Dames & Moore, 1999. Belden Snowmelt Best Management Plan, Eagle Mine Site, Gilman, Colorado, August 2, 1999.

APPENDIX A

SURFACE WATER DATA

A-1 Eagle River Water Quality Data
Eagle Mine Site
January through December 2008

Eagle River Water Quality Report

Eagle Mine Site, January through December 2008

Station ID / Sample Date and Time	Flow (cfs)	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Cadmium Dissolved (mg/L)	Calcium Dissolved (mg/L)	Copper Dissolved (mg/L)	Iron Total (mg/L)	Magnesium Dissolved (mg/L)	Manganese Dissolved (mg/L)	Zinc Dissolved (mg/L)
E- 3 EAGLE RIVER ABOVE BELDEN											
3/25/08 11:00	--	7.21	5	105	0.000169	19.5	0.00265	0.33	9.01	0.102	0.0243
4/22/08 7:45	--	7.6	2	68	0.000625	15.7	0.012	0.71	7.72	0.292	0.208
9/29/08 7:45	--	7.33	7	146	0.0001 U	17.5	0.002 U	0.28	8.41	0.0453	0.0165
10/20/08 8:00	--	7.3	12	217	0.000174	21.3	0.00113 J	0.255	10.1	0.0446	0.00446
E- 5 EAGLE RIVER ABOVE FALL CREEK											
1/28/08 7:45	--	6.65	0	470	0.0001 U	20.9	0.002 U	0.393	9.45	0.0686	0.0579
3/25/08 11:15	--	7.28	4	103	0.000986	21.1	0.00336	0.499	9.94	0.254	0.443
4/22/08 8:00	--	7.6	2	67	0.0044	16.9	0.0205	1.37	8.4	0.469	1.05
9/29/08 8:15	--	7.27	6	136	0.000133	17.4	0.00217	0.356	8.84	0.0693	0.0677
10/20/08 8:20	--	7.5	12	215	0.000167	21.3	0.0027	0.311	10.4	0.0711	0.0626
E-10 EAGLE RIVER ABOVE ROCK CREEK											
1/28/08 8:30	--	7.45	0	166	0.000104	19.8	0.002 U	0.431	9.24	0.0544	0.094
3/25/08 11:45	--	7.29	3	98	0.000748	18.7	0.00339	0.529	9.01	0.188	0.292
4/22/08 8:30	--	7.21	2	67	0.00392	15.7	0.0191	1.17	7.94	0.451	0.95
9/29/08 8:30	--	6.75	6	125	0.0001 U	15.7	0.002 U	0.3	7.77	0.0584	0.0581
10/20/08 8:45	--	6.7	11	203	0.000147	18.9	0.00199 J	0.27	9.6	0.0592	0.062
E-12A EAGLE RIVER BELOW OLD TAILINGS											
1/28/08 9:15	24 Ice	7.33	0	166	0.0001 U	20.1	0.002 U	0.713	9.32	0.166	0.102
3/4/08 8:30	25 Ice	6.65	1	155	0.0217	18.9	0.0045	0.755	9.19	0.269	0.274
3/11/08 8:30	23 Ice	6.26	1	189	0.000533	20.8	0.00364	1.08	9.93	0.364	0.245
3/18/08 8:30	23 Ice	6.45	4	217	0.000444	20.2	0.00535	0.806	9.77	0.298	0.232
3/25/08 12:00	28 Ice	7.48	2	91	0.000636	20.4	0.0023	1.37	9.71	0.31	0.283
4/1/08 7:15	36 Ice	6.11	3	121	--	--	--	--	--	--	--
4/8/08 10:30	31	6.68	6	126	0.00245	20.8	0.00496	1.71	10.4	0.645	0.802

NM or "--" - Not Measured NA - Not Available Est/Ice - Estimated Flow U - Undetected at stated detection limit J - Estimated Concentration

Flow for E-12A and T-18 from USGS gages; Jan-April data revised by USGS since the Mid-Year Progress Report

Eagle River Water Quality Report

Eagle Mine Site, January through December 2008

Station ID / Sample Date and Time	Flow (cfs)	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Cadmium Dissolved (mg/L)	Calcium Dissolved (mg/L)	Copper Dissolved (mg/L)	Iron Total (mg/L)	Magnesium Dissolved (mg/L)	Manganese Dissolved (mg/L)	Zinc Dissolved (mg/L)
E-12A EAGLE RIVER BELOW OLD TAILINGS											
4/15/08 7:45	59	6.24	3	100	0.00316	21.2	0.00788	1.94	11.1	0.7	1.06
4/22/08 8:45	121	7.31	2	71	0.00376	18	0.0167	1.49	9.15	0.557	1
4/29/08 7:50	169	6.65	2	70	0.00146	13.6	0.013	1.14	6.8	0.292	0.438
9/29/08 9:15	37	6.87	7	133	0.000161	17.1	0.002 U	0.822	8.68	0.289	0.103
10/20/08 9:00	32	6.8	10	215	0.000122	20.6	0.00142 J	0.905	10.4	0.307	0.0948
E-13B EAGLE RIVER ABOVE CROSS CREEK											
1/28/08 9:45	--	7.01	0	174	0.0001 U	22.5	0.002 U	0.364	10.8	0.206	0.0903
3/25/08 12:30	--	7.48	1	115	0.000428	23.1	0.00146 J	0.993	15.6	0.359	0.238
4/22/08 9:15	--	7.6	1	7.31	0.00325	20.2	0.0146	1.57	11.8	0.599	0.895
9/29/08 9:30	--	6.87	7	156	0.0001 U	22.2	0.002 U	0.602	13.7	0.285	0.0962
10/20/08 9:10	--	7.5	10	263	0.000143	27.8	0.000985 J	0.673	16.9	0.324	0.0774
E-15 EAGLE RIVER BELOW CROSS CREEK											
1/28/08 10:00	--	7.22	1	167	0.0001 U	21.3	0.002 U	0.577	9.09	0.193	0.0977
3/4/08 9:15	--	6.65	1	198	0.000312	22.4	0.00258	0.581	14.3	0.365	0.167
3/11/08 9:00	--	6.68	1	102	0.000284	23.2	0.00332	0.696	15.6	0.366	0.166
3/18/08 9:00	--	7.11	0	260	0.000307	23.2	0.00388	0.636	14.6	0.33	0.185
3/25/08 12:45	--	7.51	1	114	0.000427	22.3	0.00158 J	0.777	13.7	0.31	0.206
4/1/08 8:15	--	6.38	0	143	--	--	--	--	--	--	--
4/8/08 11:15	--	6.75	5	116	0.00171	23.6	0.0035	1.18	14.3	0.518	0.572
4/15/08 7:25	--	6.78	0	79	0.00219	22.5	0.00643	1.38	13.2	0.561	0.753
4/22/08 9:30	--	7.3	1	71	0.00241	17.6	0.0125	1.25	9.38	0.397	0.661
4/29/08 7:00	--	6.81	0	55	0.00116	14.2	0.0103	0.933	7.1	0.244	0.323
9/29/08 10:00	--	7.11	7	146	0.0001 U	19.2	0.002 U	0.493	10.9	0.254	0.0675
10/20/08 9:25	--	7.7	10	242	0.000171	22.8	0.00129 J	0.566	13.6	0.295	0.073

NM or "--" - Not Measured NA - Not Available Est/Ice - Estimated Flow U - Undetected at stated detection limit J - Estimated Concentration

Flow for E-12A and T-18 from USGS gages; Jan-April data revised by USGS since the Mid-Year Progress Report

Eagle River Water Quality Report

Eagle Mine Site, January through December 2008

Station ID / Sample Date and Time	Station Description / Flow (cfs)	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Cadmium Dissolved (mg/L)	Calcium Dissolved (mg/L)	Copper Dissolved (mg/L)	Iron Total (mg/L)	Magnesium Dissolved (mg/L)	Manganese Dissolved (mg/L)	Zinc Dissolved (mg/L)
E-22	*EAGLE RIVER ABOVE DOWDS JUNCT.*										
1/28/08 10:45	--	7.41	1	180	0.0001 U	26	0.002 U	0.495	10.4	0.145	0.0764
3/4/08 9:45	--	6.82	1	135	0.000279	28.4	0.00248	0.461	15.6	0.268	0.13
3/11/08 9:30	--	7.24	1	183	0.000266	29.4	0.00315	0.469	16.1	0.23	0.129
3/18/08 9:25	--	7.24	0	264	0.000205	26.5	0.00281	0.479	14.7	0.238	0.151
3/25/08 13:00	--	7.65	3	133	0.000319	27.3	0.00176 J	0.661	14.8	0.243	0.16
4/1/08 8:45	--	6.82	0	109	--	--	--	--	--	--	--
4/8/08 11:45	--	6.89	6	127	0.00118	28.1	0.00297	0.948	14.5	0.361	0.425
4/15/08 7:00	--	7.02	0	89	0.00134	31.6	0.00507	1.14	14.2	0.374	0.501
4/22/08 9:45	--	7.61	2	77	0.00203	22.5	0.011	1.09	10.6	0.35	0.577
4/29/08 6:45	--	7.05	0	62	0.000886	18.3	0.00883	0.829	7.82	0.198	0.262
9/29/08 6:45	--	7.14	7	151	0.0001 U	22.1	0.002 U	0.37	11	0.158	0.0399
10/20/08 9:45	--	6.8	10	250	0.000101	24.9	0.00141 J	0.426	13.7	0.219	0.0643
T-10	*ROCK CREEK AT MOUTH*										
1/28/08 8:15	0.11	6.84	0	283	0.00243	46.3	0.002 U	0.162	41.8	0.224	2.15
3/25/08 11:30	0.22	6.91	3	208	0.00329	40.6	0.00238	0.348	35	0.285	2.04
4/22/08 8:15	0.22	7.4	3	103	0.00575	29	0.0242	0.188	26.6	0.5	2.84
9/29/08 8:45	0.11	6.66	6	177	0.00099	32.8	0.002 U	0.194	26.1	0.259	0.633
10/20/08 8:35	0.07	6.4	10	345	0.00122	39.5	0.000846 J	0.168	34.4	0.283	0.838
T-18	*CROSS CREEK NEAR MOUTH*										
1/28/08 9:30	5.2 est-ice	7.21	1	122	0.0001 U	10.2	0.002 U	0.365	3.73	0.361	0.0696
3/4/08 8:45	6.7 est-ice	7.01	1	190	0.000171	9.37	0.00318	0.337	3.56	0.298	0.0601
3/11/08 8:45	6.1 est-ice	6.35	1	137	0.000106	9.6	0.00366	0.373	3.63	0.361	0.0691
3/18/08 8:45	6.2 est-ice	6.42	2	107	0.000121	9.61	0.00329	0.261	3.67	0.3	0.0744
3/25/08 12:15	6.6 est	7.51	1	56	0.0001 U	9.74	0.00112 J	0.319	4.01	0.384	0.0659

NM or "--" - Not Measured NA - Not Available Est/Ice - Estimated Flow U - Undetected at stated detection limit J - Estimated Concentration

Flow for E-12A and T-18 from USGS gages; Jan-April data revised by USGS since the Mid-Year Progress Report

Eagle River Water Quality Report

Eagle Mine Site, January through December 2008

Station ID / Sample Date and Time	Station Description / Flow (cfs)	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Cadmium Dissolved (mg/L)	Calcium Dissolved (mg/L)	Copper Dissolved (mg/L)	Iron Total (mg/L)	Magnesium Dissolved (mg/L)	Manganese Dissolved (mg/L)	Zinc Dissolved (mg/L)
T-18	*CROSS CREEK NEAR MOUTH*										
4/1/08 7:45	7 est	6.35	0	67	--	--	--	--	--	--	--
4/8/08 11:00	7.6 est	6.84	7	77	0.0001 U	11.2	0.00142 J	0.359	5.16	0.39	0.0979
4/15/08 7:35	12 est	6.21	0	66	0.0001 U	13.4	0.00137 J	0.407	6.62	0.332	0.117
4/22/08 9:00	28 est	6.93	1	46	0.0001 U	8.28	0.00234	0.367	3.16	0.134	0.0551
4/29/08 7:15	34 est	6.61	0	34	0.0001 U	6.07	0.00248	0.293	2.29	0.164	0.1
9/29/08 9:45	15	7.28	7	96	0.0001 U	6.76	0.002 U	0.262	2.91	0.564	0.0647
10/20/08 9:15	12	5.9	10	137	0.0001 U	8.53	0.00153 J	0.332	3.64	0.539	0.0908

NM or "--" - Not Measured NA - Not Available Est/Ice - Estimated Flow U - Undetected at stated detection limit J - Estimated Concentration

Flow for E-12A and T-18 from USGS gages; Jan-April data revised by USGS since the Mid-Year Progress Report

A-2 Eagle River Flow Relationships

Appendix A-2

Interpolated Flow Rates from Historical Flow Records for Each Eagle River Monitoring Station to Monitoring Station E-12A

Eagle River Monitoring Station	Interpolated Flow Rates Equation
E-3 - above Belden	*E-3 Flow = 0.8855 (E-12A Flow) - 0.0872*
E-5 - above Fall Creek	*E-5 Flow = 0.9424 (E-12A Flow) - 2.0748*
E-10 - above Rock Creek	*E-10 Flow = 0.9979 (E-12A Flow) + 1.7100*
E-11 - below Rock Creek	*E-11 Flow = 1.0124 (E-12A Flow) + 1.7416*
E-12A - below Old Tailings Pile/Rex Flats	*E-12A Flow (measured at USGS station 09064600)*
E-13B - above Cross Creek	*E-13B Flow = 1.1390 (E-12A Flow) - 0.2774*
E-15 - below Cross Creek	*E-15 Flow = 1.7333 (E-12A Flow) - 10.918*

Graphs used to determine the equation are provided in *Eagle Mine Annual Report – 2007, Eagle Mine Site Minturn, Colorado*, prepared by NewFields, February 29, 2008 for CBS Operations Inc.

APPENDIX B

EAGLE MINE WATER DATA

B-1 Eagle Mine Drawdown
Eagle Mine Site, January – December 2008

Table B-1 Eagle Mine Drawdown

Eagle Mine Site, January - December 2008

Date	Discharge (gallons/day)	Cumulative Discharge (gallons)	Hours from Previous Reading	Average Discharge (gpm)	Eagle Mine Water Level (Ft. MSL)
1/2/08	177,291	334,268	45.3	123	
1/3/08	198,442	538,911	24.8	138	
1/4/08	187,857	738,509	25.5	130	
1/7/08	211,283	1,394,367	74.5	147	
1/8/08	208,104	1,576,458	21.0	145	8,447.43 *
1/9/08	156,416	1,744,279	25.7	109	
1/10/08	156,075	1,892,225	22.8	108	
1/11/08	158,632	2,037,638	22.0	110	
1/14/08	160,298	2,533,561	74.3	111	
1/15/08	164,126	2,684,010	22.0	114	8,446.50 *
1/16/08	180,156	2,866,043	24.3	125	
1/17/08	180,384	3,052,064	24.8	125	
1/18/08	177,589	3,224,103	23.3	123	
1/21/08	181,011	3,767,136	72.0	126	
1/22/08	184,584	3,955,566	24.5	128	8,448.81 *
1/23/08	249,128	4,196,909	23.3	173	
1/24/08	255,681	4,460,580	24.8	178	
1/25/08	258,328	4,718,908	24.0	179	
1/28/08	281,665	5,552,166	71.0	196	
1/29/08	284,796	5,848,829	25.0	198	8,443.73 *
1/30/08	288,451	6,128,266	23.3	200	
1/31/08	212,738	6,341,004	24.0	148	
2/1/08	214,035	6,557,269	24.3	149	8,448.58 *
2/4/08	255,230	7,322,959	72.0	177	
2/5/08	261,797	7,584,756	24.0	182	8,448.12 *
2/6/08	267,236	7,846,425	23.5	186	
2/7/08	274,993	8,127,147	24.5	191	
2/8/08	270,645	8,423,165	26.3	188	
2/11/08	265,509	9,192,036	69.5	184	
2/12/08	278,560	9,470,596	24.0	193	8,448.12 *
2/13/08	334,281	9,808,359	24.3	232	
2/14/08	340,410	10,141,677	23.5	236	
2/15/08	340,532	10,507,039	25.7	236	
2/18/08	310,835	11,410,403	69.8	216	
2/19/08	182,055	11,594,354	24.3	126	
2/20/08	181,922	11,780,066	24.5	126	
2/21/08	191,546	11,974,937	24.4	133	
2/22/08	162,523	12,139,717	24.3	113	
2/25/08	131,203	12,540,161	73.3	91	
2/26/08	118,669	12,660,066	24.2	82	
2/27/08	163,222	12,802,885	21.0	113	
2/28/08	162,394	12,970,354	24.8	113	
2/29/08	177,817	13,150,023	24.3	123	
3/3/08	110,039	13,475,555	71.0	76	

* Mine water level reading from pressure transducer

Table B-1 Eagle Mine Drawdown

Eagle Mine Site, January - December 2008

Date	Discharge (gallons/day)	Cumulative Discharge (gallons)	Hours from Previous Reading	Average Discharge (gpm)	Eagle Mine Water Level (Ft. MSL)
3/4/08	45,254	13,520,809	24.0	31	8,447.89 *
3/5/08	311,578	13,845,369	25.0	216	
3/6/08	260,056	14,100,007	23.5	181	
3/7/08	261,705	14,367,164	24.5	182	
3/10/08	271,686	15,176,561	71.5	189	
3/11/08	162,968	15,339,529	24.0	113	8,446.04 *
3/12/08	142,832	15,483,849	24.2	99	
3/13/08	138,723	15,619,682	23.5	96	
3/14/08	136,277	15,755,959	24.0	95	
3/17/08	132,411	16,157,331	72.8	92	
3/18/08	138,822	16,290,369	23.0	96	8,448.12 *
3/19/08	220,596	16,520,157	25.0	153	
3/20/08	224,442	16,742,261	23.7	156	
3/21/08	221,700	16,966,270	24.3	154	
3/24/08	231,433	17,658,159	71.7	161	8,447.43 *
3/25/08	193,100	17,845,225	23.3	134	
3/26/08	193,062	18,040,298	24.3	134	
3/27/08	187,706	18,228,004	24.0	130	
3/28/08	108,530	18,337,665	24.2	75	
3/31/08	245,530	19,092,159	73.7	171	
4/1/08	309,859	19,414,929	25.0	215	
4/2/08	201,331	19,591,094	21.0	140	8,448.81 *
4/3/08	196,929	19,816,742	27.5	137	
4/4/08	197,241	19,985,219	20.5	137	
4/7/08	191,313	20,565,136	72.8	133	
4/8/08	142,187	20,713,247	25.0	99	
4/9/08	143,450	20,846,237	22.3	100	
4/10/08	142,746	20,987,496	23.7	99	8,449.74 *
4/11/08	473,408	21,500,355	26.0	329	
4/14/08	327,469	22,469,116	71.0	227	
4/15/08	297,276	22,778,779	25.0	206	8,449.27 *
4/16/08	306,920	23,063,319	22.3	213	
4/17/08	305,499	23,384,729	25.2	212	
4/18/08	296,854	23,675,399	23.5	206	
4/21/08	311,755	24,604,168	71.5	216	
4/22/08	311,879	24,925,793	24.8	217	8,449.97 *
4/23/08	304,748	25,217,843	23.0	212	
4/24/08	324,089	25,548,684	24.5	225	
4/25/08	347,526	25,881,730	23.0	241	
4/28/08	343,252	26,929,365	73.3	238	
4/29/08	347,722	27,273,465	23.7	241	
4/30/08	368,018	27,633,816	23.5	256	8,450.89 *
5/1/08	296,743	27,930,559	24.0	206	
5/2/08	298,813	28,229,372	24.0	208	

* Mine water level reading from pressure transducer

Table B-1 Eagle Mine Drawdown

Eagle Mine Site, January - December 2008

Date	Discharge (gallons/day)	Cumulative Discharge (gallons)	Hours from Previous Reading	Average Discharge (gpm)	Eagle Mine Water Level (Ft. MSL)
5/5/08	297,322	29,124,434	72.2	206	
5/6/08	290,151	29,411,563	23.8	201	8,451.58 *
5/8/08	371,246	30,157,923	48.2	258	
5/9/08	363,332	30,521,255	24.0	252	
5/12/08	369,172	31,624,924	71.8	256	
5/13/08	214,442	31,837,132	23.7	149	8,452.97 *
5/14/08	217,732	32,054,864	24.0	151	
5/15/08	219,474	32,278,910	24.5	152	
5/16/08	218,092	32,494,730	23.8	151	
5/19/08	132,106	32,892,424	72.2	92	
5/20/08	124,647	33,014,474	23.5	87	8,455.74 *
5/21/08	120,028	33,135,752	24.3	83	
5/22/08	124,120	33,257,286	23.5	86	
5/23/08	122,712	33,382,555	24.5	85	
5/27/08	124,405	33,879,744	95.9	86	8,460.59 *
5/28/08	137,395	34,020,478	24.6	95	
5/29/08	143,618	34,168,584	24.8	100	
5/30/08	142,080	34,310,664	24.0	99	
6/2/08	143,605	34,735,496	71.0	100	
6/3/08	142,409	34,876,422	23.8	99	8,463.82 *
6/5/08	111,087	35,097,438	47.7	77	8,464.51 *
6/6/08	66	35,097,503	23.8	0	
6/9/08	87	35,097,765	72.5	0	8,467.05 *
6/10/08	0	35,097,765	25.7	0	8,467.51 *
6/11/08	0	35,097,765	25.0	0	
6/12/08	0	35,097,765	23.0	0	8,468.44 *
6/13/08	0	35,097,765	25.2	0	8,468.67 *
6/16/08	0	35,097,765	70.0	0	
6/17/08	1	35,097,766	23.8	0	8,470.29 *
6/18/08	312,132	35,409,898	24.0	217	
6/19/08	318,526	35,718,470	23.3	221	
6/20/08	235,272	35,953,742	24.0	163	
6/23/08	4,943	35,968,417	71.3	3	8,471.67 *
6/24/08	0	35,968,417	24.8	0	8,471.90 *
6/25/08	0	35,968,417	26.0	0	
6/26/08	0	35,968,417	22.3	0	8,472.59 *
6/27/08	68,620	36,042,041	25.7	48	
6/30/08	804	36,044,378	69.8	1	8,473.29 *
7/1/08	114,263	36,158,641	24.0	79	
7/2/08	115,345	36,275,188	24.3	80	
7/3/08	116,567	36,390,541	23.7	81	
7/7/08	1,044	36,394,726	96.3	1	8,474.67 *
7/8/08	0	36,394,726	23.7	0	
7/9/08	24,432	36,419,158	24.0	17	

* Mine water level reading from pressure transducer

Table B-1 Eagle Mine Drawdown

Eagle Mine Site, January - December 2008

Date	Discharge (gallons/day)	Cumulative Discharge (gallons)	Hours from Previous Reading	Average Discharge (gpm)	Eagle Mine Water Level (Ft. MSL)
7/10/08	23,140	36,442,298	24.0	16	
7/11/08	45,311	36,487,609	24.0	31	
7/15/08	44,931	36,670,609	97.8	31	
7/16/08	108,588	36,772,410	22.5	75	
7/17/08	167,119	36,958,678	26.7	116	
7/18/08	304,469	37,237,775	22.0	211	
7/21/08	308,474	38,150,343	71.0	214	
7/22/08	304,540	38,454,883	24.0	211	8,476.29 *
7/23/08	42,967	38,497,850	24.0	30	
7/24/08	183,622	38,681,472	24.0	128	
7/25/08	254,217	38,935,689	24.0	177	
7/28/08	251,394	39,695,108	72.5	175	8,474.44 *
7/29/08	381,048	40,072,187	23.8	265	
7/30/08	384,947	40,453,124	23.7	267	
7/31/08	378,381	40,827,564	23.8	263	
8/1/08	402,326	41,229,890	24.0	279	
8/4/08	400,873	42,432,508	72.0	278	8,475.37 *
8/5/08	391,707	42,832,376	24.5	272	
8/6/08	414,752	43,242,808	23.7	288	
8/7/08	418,481	43,661,289	24.0	291	
8/8/08	284,229	43,945,518	24.0	197	
8/11/08	176,861	44,476,102	72.0	123	8,475.60 *
8/12/08	165,824	44,647,108	24.8	115	
8/13/08	164,937	44,810,327	23.8	115	
8/14/08	167,627	44,974,462	23.5	116	
8/15/08	166,691	45,141,153	24.0	116	
8/18/08	166,951	45,642,007	72.0	116	
8/19/08	168,947	45,810,954	24.0	117	8,476.75 *
8/20/08	339,405	46,150,359	24.0	236	
8/21/08	386,220	46,536,579	24.0	268	
8/22/08	378,220	46,914,799	24.0	263	
8/25/08	382,892	48,067,464	72.3	266	
8/26/08	173,572	48,239,228	23.7	121	8,475.83 *
8/27/08	163,552	48,406,187	24.5	114	
8/28/08	164,135	48,566,903	23.5	114	
8/29/08	163,843	48,730,746	24.0	114	
9/2/08	163,883	49,386,278	96.0	114	
9/3/08	166,271	49,552,549	24.0	115	8,476.98 *
9/4/08	342,919	49,895,468	24.0	238	
9/5/08	344,186	50,239,654	24.0	239	
9/8/08	271,234	51,053,356	72.0	188	
9/9/08	408,513	51,466,124	24.3	284	8,476.75 *
9/10/08	429,457	51,900,055	24.2	298	
9/11/08	437,166	52,337,221	24.0	304	

* Mine water level reading from pressure transducer

Table B-1 Eagle Mine Drawdown

Eagle Mine Site, January - December 2008

Date	Discharge (gallons/day)	Cumulative Discharge (gallons)	Hours from Previous Reading	Average Discharge (gpm)	Eagle Mine Water Level (Ft. MSL)
9/12/08	Not Measured				8,476.06 *
9/16/08	393,959	54,302,911	119.8	274	8,475.37 *
9/17/08	201,370	54,502,183	23.7	140	
9/18/08	197,869	54,700,052	24.0	137	
9/19/08	248,267	54,948,319	24.0	172	
9/22/08	290,059	55,818,495	72.0	201	
9/23/08	291,002	56,109,497	24.0	202	8,475.60 *
9/24/08	288,023	56,397,520	24.0	200	
9/25/08	288,903	56,686,423	24.0	201	
9/26/08	289,372	56,975,795	24.0	201	
9/29/08	287,935	57,842,598	72.3	200	
9/30/08	292,456	58,132,008	23.7	203	8,475.60 *
10/1/08	274,202	58,406,210	24.0	190	
10/2/08	274,013	58,680,223	24.0	190	
10/3/08	315,101	58,995,324	24.0	219	
10/7/08	321,006	60,279,348	96.0	223	8,474.90 *
10/8/08	393,516	60,672,864	24.0	273	
10/9/08	393,691	61,070,656	24.3	273	
10/10/08	390,393	61,461,049	24.0	271	
10/13/08	391,330	62,626,886	71.5	272	
10/14/08	389,350	63,020,292	24.2	270	8,473.98 *
10/15/08	233,183	63,253,475	24.0	162	
10/16/08	232,814	63,486,289	24.0	162	
10/17/08	232,246	63,720,954	24.3	161	
10/20/08	232,444	64,420,708	72.2	161	
10/21/08	333,498	64,754,206	24.0	232	
10/22/08	297,491	65,045,499	23.5	207	
10/23/08	327,187	65,372,686	24.0	227	8,475.13 *
10/24/08	333,931	65,710,095	24.3	232	
10/27/08	336,907	66,713,798	71.5	234	
10/28/08	227,293	66,952,929	25.3	158	8,474.90 *
10/29/08	230,761	67,183,690	24.0	160	
10/30/08	229,125	67,412,815	24.0	159	
10/31/08	227,281	67,640,096	24.0	158	
11/3/08	230,279	68,345,324	73.5	160	
11/4/08	263,695	68,578,804	21.2	183	
11/5/08	250,340	68,878,690	28.7	174	8,475.37 *
11/6/08	386,221	69,309,165	26.8	268	
11/7/08	410,596	69,600,004	17.0	285	
11/10/08	403,476	70,802,027	71.5	280	
11/11/08	403,549	71,209,780	24.2	280	8,473.98 *
11/12/08	450,537	71,660,317	24.0	313	
11/13/08	455,266	72,115,583	24.0	316	
11/14/08	260,535	72,376,118	24.0	181	

* Mine water level reading from pressure transducer

Table B-1 Eagle Mine Drawdown

Eagle Mine Site, January - December 2008

Date	Discharge (gallons/day)	Cumulative Discharge (gallons)	Hours from Previous Reading	Average Discharge (gpm)	Eagle Mine Water Level (Ft. MSL)
11/17/08	224,207	73,046,404	71.8	156	
11/18/08	431,359	73,482,256	24.2	300	8,474.44 *
11/19/08	439,439	73,921,695	24.0	305	
11/20/08	440,313	74,362,008	24.0	306	
11/21/08	438,000	74,804,570	24.3	304	
11/24/08	434,091	76,120,409	72.8	301	
11/25/08	442,409	76,544,384	23.0	307	8,472.83 *
11/26/08	447,119	76,991,503	24.0	310	
12/1/08	313,914	78,583,964	121.8	218	
12/2/08	423,403	78,976,494	22.2	294	8,472.36 *
12/3/08	419,096	79,391,224	23.8	291	
12/4/08	428,045	79,828,187	24.5	297	
12/5/08	425,851	80,254,038	24.0	296	
12/8/08	410,321	81,480,728	71.7	285	
12/9/08	463,490	81,944,218	24.0	322	8,470.98 *
12/10/08	412,353	82,360,866	24.3	286	
12/11/08	397,942	82,758,808	24.0	276	
12/12/08	397,087	83,151,759	23.7	276	
12/15/08	400,757	84,362,380	72.5	278	
12/16/08	520,972	84,872,498	23.5	362	8,470.29 *
12/17/08	347,036	85,215,919	23.8	241	
12/18/08	361,490	85,581,175	24.2	251	
12/19/08	360,369	85,934,036	23.5	250	
12/23/08	327,928	87,290,156	99.2	228	8,470.98 *
12/24/08	105,104	87,383,217	21.2	73	
12/29/08	194,449	88,357,489	120.3	135	
12/30/08	362,586	88,716,298	23.7	252	8,470.29 *
12/31/08	303,399	89,022,857	24.3	211	

* Mine water level reading from pressure transducer

B-2 Mine Water Quality Report
Eagle Mine Site
January through December 2008

Mine Water Quality Report

Eagle Mine Site, January through December 2008

Sample Date and Time	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Alkalinity Total (mg/L)	Sulfate (mg/L)		Cadmium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Zinc (mg/L)
Dog Hole Offsite Unbulkheaded Adit												
5/9/08 16:45	--	--	--	--	--	Dissolved	--	--	--	--	--	--
						Total	0.0896 J	4.37	--	--	--	16.4
MS- 5 ADIT #5 AT BULKHEAD VALVE												
10/1/08 7:00	5.8	15	470	103	1960	Dissolved	0.0608	0.0307	28.7	0.365 U	22	34.4
						Total	--	--	--	--	--	--

U - Undetected at stated detection limit

B-3 Liberty Well No. 4 Water Quality Report
Eagle Mine Site
January-December 2008

Liberty Well No. 4 Water Quality Report

Eagle Mine Site, January - December 2008

Station ID	Station Description	Sample Date and Time	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Suspended Solids, Total (mg/L)	Copper Dissolved (mg/L)	Manganese Dissolved (mg/L)	Zinc Dissolved (mg/L)
LIB- 4	LIBERTY WELL AT WILLOW CREEK	1/15/08 12:00	6.98	7	207	5 U	0.002 U	0.0153	0.0655
		2/12/08 11:30	7.12	7	328	5 U	0.000327 J	0.0178	0.056
		3/10/08 10:30	6.98	11	279	2 J	0.00026 J	0.0138	0.0539
		4/2/08 8:45	7.05	12	265	5 U	0.00021 J	0.0274	0.0652
		5/5/08 10:30	7.30	12	282	5 U	0.002 U	0.016	0.0582
		6/9/08 9:45	7.30	11	202	5 U	0.000452 J	0.0276	0.0685
		7/15/08 8:15	7.6	14	212	5 U	0.000378 J	0.0138	0.0527
		8/11/08 9:00	7.39	14	201	5 U	0.000324 J	0.0141	0.0566
		9/15/08 9:00	6.82	12	238	5 U	0.000711 J	0.0134	0.06
		10/13/08 9:00	7.3	9	273	5 U	0.000446 J	0.0171	0.0576
		11/10/08 9:15	7.20	14	365	5 U	0.000334 J	0.012	0.0633
		12/8/08 10:45	7.00	7	188	5 U	0.000496 J	0.0163	0.0592

U - Undetected at stated detection limit

APPENDIX C

GROUNDWATER DATA

C-1 Groundwater Elevation Data
Eagle Mine Site, 2008

Groundwater Elevation Data

Eagle Mine Site, 2008

Well ID	DATE	Measuring Point Elevation (ft MSL)	Depth to Water (feet)	Elevation (ft MSL)	
BPZ-1	4/18/08	8,382.14	11.70	8,370.44	
	5/9/08	8,382.14	14.04	8,368.10	
BW- 3R	4/25/08	8,378.60	13.69	8,364.91	
BW- 9R	9/18/08	8,380.49	17.55	8,362.94	
BW-10	4/25/08	8,377.34	16.28	8,361.06	
CT- 6	10/2/08	8,056.43	21.11	8,035.32	
CT- 9	10/2/08	8,047.40	12.22	8,035.18	
DAP-MW 1R	10/2/08	8,101.15	35.22	8,065.93	
DAP-MW 4R	10/1/08	7,993.35	9.47	7,983.88	
DT- 1	10/1/08	8,006.48	6.19	8,000.29	
DT- 2	10/1/08	8,004.35	5.54	7,998.81	
DT- 3	10/1/08	8,003.35	7.65	7,995.70	
DT- 4	10/1/08	8,002.91	8.11	7,994.80	
DT- 5	10/1/08	8,002.25	9.55	7,992.70	
E-SUMP	10/1/08	7,993.54	7.55	7,985.99	
ET- 1	10/1/08	7,993.37	8.99	7,984.38	
ET- 2	10/1/08	7,992.56	8.32	7,984.24	
ET- 3	10/2/08	7,994.61	7.21	7,987.40	
ET- 4	10/2/08	7,999.38	10.11	7,989.27	
ET- 5	10/2/08	7,994.93	10.00	7,984.93	
ET- 6	10/2/08	8,004.06	20.23	7,983.83	
ET- 7	10/2/08	8,021.25	25.14	7,996.11	
NMPW- 1	10/1/08	0.00	2.12	-2.12	
N-SUMP	10/1/08	7,993.26	9.25	7,984.01	
NT- 1	10/1/08	7,999.37			DRY
NT- 2	10/1/08	7,993.45	8.11	7,985.34	
NTP-MW 1	10/1/08	8,003.25	9.77	7,993.48	
NTP-MW 3	10/1/08	8,011.49	9.99	8,001.50	
NTP-MW 4	10/1/08	7,996.62	7.25	7,989.37	
NTP-MW 5R	10/1/08	8,005.17	18.45	7,986.72	
OTP-MW 1R	10/2/08	8,101.15	6.75	8,094.40	
OTP-MW 2	10/2/08	8,107.05	9.35	8,097.70	
OTP-MW 3	10/2/08	8,115.61	11.85	8,103.76	

Well ID	DATE	Measuring Point Elevation (ft MSL)	Depth to Water (feet)	Elevation (ft MSL)	
OTP-MW 4D	10/2/08	8,115.71	18.55	8,097.16	
OTP-MW 4S	10/2/08	8,115.90	10.84	8,105.06	
OTP-MW 5	10/2/08	8,115.24	1.99	8,113.25	
OTP-MW 6	10/2/08	8,136.78	11.31	8,125.47	
P- 1-R	10/2/08	8,056.07	32.16	8,023.91	
P- 1-S	10/2/08	8,062.50			DRY
P- 2-S	10/2/08	8,056.73			DRY
P- 3-S	10/2/08	8,060.55	54.51	8,006.04	
P- 6-S	10/2/08	8,046.12			DRY
P- 7	10/2/08	8,043.67	7.49	8,036.18	
P- 8	10/1/08	7,996.10	8.61	7,987.49	
P- 9	10/1/08	7,999.97	15.99	7,983.98	
P-10-S	10/1/08	8,042.52	31.30	8,011.22	
P-11	10/1/08	8,056.06			DRY
REX-MW 1	10/1/08	8,096.03	5.18	8,090.85	
REX-MW 2	10/1/08	8,095.95	3.99	8,091.96	
REX-MW 3	10/2/08	8,103.36	7.81	8,095.55	
REX-MW 4D	10/1/08	8,100.83	6.41	8,094.42	
REX-MW 4S	10/1/08	8,101.04	6.56	8,094.48	

C-2 Groundwater Quality Data
Eagle Mine Site
January through December 2008

Groundwater Quality Data

Eagle Mine Site

January through December 2008

Station ID	Station Description	Sample Date and Time	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Alkalinity Total (mg/L)	Arsenic Dissolved (mg/L)	Cadmium Dissolved (mg/L)	Calcium Dissolved (mg/L)
DAP-MW 1R	DIAPPOLONIA MONITOR WELL - SOUTH	10/2/08 11:15	7.0	14	414	263	0.25 U	0.05 U	78.7
DAP-MW 4R	DIAPPOLONIA MONITOR WELL - NORTH	10/1/08 8:00	5.1	12	632	5 U	0.161	0.00818 J	529
DT- 1	DIVERSION TRENCH WELL #1 - SOUTH	10/1/08 9:00	6.9	15	279	201	0.05 U	0.01 U	50.1
DT- 2	DIVERSION TRENCH WELL #2-MIDDLE	10/1/08 9:15	6.9	15	280	169	0.05 U	0.01 U	53.7
DT- 3	DIVERSION TRENCH WELL #3-MIDDLE	10/1/08 9:30	6.8	15	318	221	0.05 U	0.01 U	66.3
DT- 4	DIVERSION TRENCH WELL #4-MIDDLE	10/1/08 9:45	6.9	15	305	229	0.05 U	0.01 U	62
DT- 5	DIVERSION TRENCH WELL #5 - NORTH	10/1/08 10:00	7.3	14	293	139	0.05 U	0.01 U	47.9
E-SUMP	SUMP OF EAST CTP EXTRACT. TRENCH	10/1/08 11:45	5.3	14	645	5.63	0.222 J	0.0134 J	446
ET- 1	EAST EXTRACTION TRENCH - N. WELL	10/1/08 11:00	6.2	14	685	134	0.25 U	0.0138 J	423
JTMW-1B	Equipment Blank	10/1/08 10:30	--	--	--	5 U	0.05 U	0.01 U	0.176 J
JTMW1D	Duplicate of NTP-MW 1	10/1/08 10:30	--	--	--	21.5	0.25 U	0.05 U	106
JT-MW2-B	Equipment Blank	10/2/08 9:45	--	--	--	5 U	0.25 U	0.05 U	1.94 U
JTMW2-D	Duplicate of DAP-MW 2	10/2/08 11:15	--	--	--	5 U	0.25 U	0.0313 J	148
N-SUMP	SUMP OF NORTH CTP EXTRACT TRENCH	10/1/08 8:15	6.2	12	538	128	0.161	0.01 U	277
NTP-MW 1	NEW TAILINGS PILE - NORTHWEST	10/1/08 10:30	5.5	15	451	24.6	0.25 U	0.05 U	106
NTP-MW 3	NEW TAILINGS PILE - WEST	10/1/08 8:45	6.4	15	176	73.6	0.05 U	0.01 U	20.1
NTP-MW 4	NEW TAILINGS PILE - MALOIT NORTH	10/1/08 10:15	6.3	14	416	5 U	0.25 U	0.05 U	108
NTP-MW 5R	NEW TAILINGS PILE - NORTH	10/1/08 7:45	5.1	12	632	5 U	0.113	0.0762	458
OTP-MW 1R	OLD TAILINGS PILE - NORTHEAST	10/2/08 9:50	6.8	14	474	5 U	0.25 U	0.0213 J	261
OTP-MW 2	OLD TAILINGS PILE - EAST	10/2/08 9:45	4.0	12	502	5 U	0.25 U	0.0325 J	148
OTP-MW 3	OLD TAILINGS PILE - SOUTH	10/2/08 10:30	5.5	14	655	5 U	0.25 U	0.0414 J	196
OTP-MW 4D	OLD TAILINGS PILE - EAST DEEP	10/2/08 10:15	4.0	14	866	5 U	0.25 U	0.05 U	419
OTP-MW 4S	OLD TAILINGS PILE - EAST SHALLOW	10/2/08 10:00	4.6	14	469	5 U	0.25 U	0.121	98.4

U - Undetected at stated detection limit J - Estimated

Station ID	Station Description	Sample Date and Time	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Alkalinity Total (mg/L)	Arsenic Dissolved (mg/L)	Cadmium Dissolved (mg/L)	Calcium Dissolved (mg/L)
OTP-MW 5	OLD TAILINGS PILE - NORTH	10/2/08 10:45	4.6	14	1005	5 U	0.25 U	0.05 U	168
OTP-MW 6	OLD TAILINGS PILE - WEST	10/2/08 11:00	5.1	14	225	47.4	0.25 U	0.05 U	14
REX-MW 1	REX FLATS WELL - NORTHEAST	10/1/08 9:00	6.5	11	454	103	0.25 U	0.05 U	540
REX-MW 2	REX FLATS WELL - NORTHWEST	10/1/08 8:30	6.6	11	371	12.1	0.25 U	0.0477 J	144
REX-MW 3	REX FLATS WELL - SOUTHWEST	10/2/08 8:15	7.4	11	202	127	0.25 U	0.05 U	25.1
REX-MW 4D	REX FLATS MONITOR WELL - DEEP	10/1/08 13:00	7.1	12	473	201	0.25 U	0.05 U	576
REX-MW 4S	REX FLATS MONITOR WELL - SHALLOW	10/1/08 13:15	5.2	14	492	118	0.25 U	0.0823	446

U - Undetected at stated detection limit J - Estimated

Groundwater Quality Data

Eagle Mine Site

January through December 2008

Station ID	Sample Date	Copper Dissolved (mg/L)	Iron Dissolved (mg/L)	Lead Dissolved (mg/L)	Magnesium Dissolved (mg/L)	Manganese Dissolved (mg/L)	Potassium Dissolved (mg/L)	Sodium Dissolved (mg/L)	Sulfate (mg/L)	Zinc Dissolved (mg/L)
DAP-MW 1R	10/2/08	0.025 U	0.35 U	0.365 U	30.5	0.0771	2.43	2.56	59.2	0.15 U
DAP-MW 4R	10/1/08	0.00705	339	0.073 U	875	471	19.3	50.7	6450	80.8
DT- 1	10/1/08	0.00205 J	0.07 U	0.073 U	25.8	0.0432	9.79	10.6	40.4	0.0459
DT- 2	10/1/08	0.00593	0.07 U	0.073 U	31.6	0.0537	2.23	4.27	82	0.046
DT- 3	10/1/08	0.005 U	0.156	0.073 U	31.6	8.74	1.97	13.2	113	0.03 U
DT- 4	10/1/08	0.005 U	0.07 U	0.073 U	24.7	0.1	3.79	19.8	51.3	0.0996
DT- 5	10/1/08	0.005 U	0.07 U	0.073 U	22.8	0.0282	2.29	13.2	77.5	0.0323
E-SUMP	10/1/08	0.025 U	1130	0.365 U	735	321	9.28	60.4	6770	72.6
ET- 1	10/1/08	0.025 U	30.1	0.365 U	215	36.4	11.2	27.6	1860	9.5
JTMW-1B	10/1/08	0.005 U	0.07 U	0.073 U	0.15 U	0.0102	0.34 U	0.321 J	0.5 U	0.0133 J
JTMW1D	10/1/08	0.025 U	82.1	0.365 U	88.6	30.1	4.71	14.9	789	3.32
JT-MW2-B	10/2/08	0.025 U	0.35 U	0.365 U	0.75 U	0.025 U	1.7 U	2 U	0.5 U	0.15 U
JTMW2-D	10/2/08	0.274	22.2	0.365 U	24.6	7.34	1.7 U	10.1	730	7.67
N-SUMP	10/1/08	0.005 U	114	0.073 U	287	88.3	11.9	101	2000	21.7
NTP-MW 1	10/1/08	0.025 U	81.9	0.365 U	88.4	30.1	4.8	14.9	794	3.31
NTP-MW 3	10/1/08	0.005 U	0.106	0.073 U	7.42	0.235	3.4	5.42	11.8	2.27
NTP-MW 4	10/1/08	0.025 U	35.7	0.365 U	98.3	32	4.31	30.6	824	8.03
NTP-MW 5R	10/1/08	0.255	501	0.073 U	455	282	8.43	14.9	5040	63.2
OTP-MW 1R	10/2/08	0.107	105	0.365 U	83.3	33	2.83	8.3	1310	15.4
OTP-MW 2	10/2/08	0.277	22.2	0.365 U	24.7	7.36	1.7 U	10.4	742	7.65
OTP-MW 3	10/2/08	0.517	1.7	0.365 U	55.8	5.66	5.75	9.18	854	8.55
OTP-MW 4D	10/2/08	0.025 U	950	0.365 U	208	245	4.85	8.16	4440	119
OTP-MW 4S	10/2/08	0.025 U	27.1	0.365 U	38.5	23.4	3.52	6.15	557	24.7

U - Undetected at stated detection limit J - Estimated

Station ID	Sample Date	Copper Dissolved (mg/L)	Iron Dissolved (mg/L)	Lead Dissolved (mg/L)	Magnesium Dissolved (mg/L)	Manganese Dissolved (mg/L)	Potassium Dissolved (mg/L)	Sodium Dissolved (mg/L)	Sulfate (mg/L)	Zinc Dissolved (mg/L)
OTP-MW 5	10/2/08	0.025 U	782	0.365 U	113	140	8.88	8.07	2760	37.7
OTP-MW 6	10/2/08	0.025 U	0.455	0.365 U	4.69	0.289	1.26 J	2.73	14	0.15 U
REX-MW 1	10/1/08	0.025 U	43.7	0.365 U	78.5	14.3	4.19	5.13	1620	0.422
REX-MW 2	10/1/08	0.025 U	103	0.365 U	56	37.7	3.1	5.11	858	9.16
REX-MW 3	10/2/08	0.025 U	0.35 U	0.365 U	10.6	0.0315	0.517 J	2.94	8.4	0.15 U
REX-MW 4D	10/1/08	0.025 U	0.35 U	0.365 U	64.9	5.89	3.04	4.17	1470	0.0619 J
REX-MW 4S	10/1/08	0.0166 J	0.3 J	0.365 U	158	28.8	2.26	6.99	1710	11.2

U - Undetected at stated detection limit J - Estimated

C-3 CTP Groundwater Extraction System
Eagle Mine Site, January – December 2008

CTP Groundwater Extraction System

Eagle Mine Site, 2008

Month	Tot. Gallons Pumped per Month	Cumulative Gallons Pumped per Year	Cumulative Gallons Pumped
January	644,116	644,116	294,320,937
February	619,167	1,263,283	294,940,104
March	721,749	1,985,032	295,661,853
April	1,148,852	3,133,884	296,810,705
May	1,407,800	4,541,684	298,218,505
June	1,332,121	5,873,805	299,550,626
July	1,221,149	7,094,954	300,771,775
August	1,057,980	8,152,934	301,829,755
September	991,141	9,144,075	302,820,896
October	1,019,299	10,163,374	303,840,195
November	913,502	11,076,876	304,753,697
December	853,234	11,930,110	305,606,931

Notes:

North and East Trenches combined total gallons is measured via a flow meter at the surge pond

C-4 Belden Groundwater Extraction System 2008 Performance Report and Water Quality

NEWFIELDS

July 9, 2008

Wendy Naugle
CDPHE
4300 Cherry Creek Drive South
Denver, CO 80246

Mike Holmes
USEPA, Region VIII
1595 Wynkoop
Denver, CO 80202-1129

Re: Eagle Mine Site - Belden Groundwater Extraction System Performance Report No. 3

Dear Wendy and Mike:

In a June 20, 2006 letter, CBS Operations Inc. (CBS) proposed additional testing in the Belden area of the Eagle Mine site to assess the feasibility of meeting proposed performance standards for reduced zinc loading to the Eagle River by extracting and treating groundwater. The Belden area has been identified as the largest remaining source of zinc loading to the river. The initial System Performance Report was provided to CDPHE and EPA on January 19, 2007. Performance Report No. 2, Revision 1 dated, August 21, 2007, provided additional water level data and presented a plan for installation of an interceptor trench. This No. 3 Report provides information on the installation of the trench and results of the testing of the as-built trench.

SOLAR PV PUMPING

Shurflow direct current (DC) submersible pumps were installed in BW-9R and BW-10 in 2006. The pumps are powered by 12-volt DC power from four 32-watt photovoltaic (PV) panels on the roof of the boiler house (building 116 in Figure 1). Single-well flow rates are on the order of 1.2 gpm. The pump rate is limited by the slow permeability of the talus and slope wash materials. Discharge piping connects the two wells to the existing pipeline carrying Tip Top mine water to the treatment plant. Both wells resumed operation in April 2008 when temperatures moderated.

WATER LEVELS IN BELDEN

Belden wells and piezometers are shown in Figure 1. During the mid-1990s, water levels were measured in the Belden area and are recorded in *Preliminary Data Interpretation Report No. 2, Belden Groundwater Monitoring Program* (Dames & Moore 1996). A compilation of older and recent water levels is presented in Table 1.

NEWFIELDS
730 17th Street — Suite 925
Denver, Colorado 80202
C:\Projects\CBS Eagle\Belden GW\performance reports\performance rpt 03.doc 303.294.0950 tel — 303.294.9220 fax
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Table 1 Selected Water Levels Near the Copper Tipple Building

Well or Piezometer	Measurement Date	Water Level (ft MSL)	Water Level (ft below TOC)	Notes
BW-3	August 1995	< 8365.9	Dry	2-inch piezometer
BW-3	March 1996	8367.2	8.38	
BW-3R	8-29-06	8359.3	19.3	4-inch well
BW-3R	3-2-07	8361.25	17.35	Static
BW-3R	7-11-07	8361.75	16.85	Static
BW-3R	4-25-08	8364.91	13.69	Static
BW-4	September 1995	8359	11.05	2-inch piezometer
BW-4	March 1996	8365	NA	
BW-5	11-17-99	8363.66	14.43	2-inch piezometer
BW-5	8-29-06	8363.84	14.25	
BW-5	3-2-07	8363.79	14.3	
BW-5	7-11-07	8364.55	13.54	
BW-6	11-17-99	8362.02	14.54	2-inch piezometer
BW-6	8-29-06	8362.19	14.37	
BW-6	7-11-07	8361.62	14.94	
BW-7	11-17-99	8359.52	15.64	2-inch piezometer
BW-7	8-29-06	8359.53	15.63	
BW-7	7-11-07	8360.27	14.89	
BW-8	8-29-06	8362.44	17.7	4-inch piezometer
BW-8	3-2-07	8362.49	17.65	
BW-9R	8-29-06	8360.69	19.8	4-inch well, pumping
BW-9R	3-2-07	8361.84	18.65	Static
BW-9R	7-11-07	8362.04	18.45	Static
BW-10	8-29-06	8359.84	17.5	4-inch well
BW-10	4-25-08	8361.06	16.28	
BPZ-1	4-18-08	8370.44	11.7	1.5-inch piezometer
BPZ-1	5-09-08	8368.10	14.04	1.5-inch piezometer

TOC = top of casing. Central Trench piezometer BPZ-1 TOC elevation = 8382.14 ft MSL.

BW-5, BW-6 and BW-7 were installed September 23, 1999 in accordance with the Belden Snowmelt Best Management Plan.

INTERCEPTOR TRENCH CONSTRUCTION

An interceptor trench was installed along the concrete loading dock downstream of the Copper Tipple Loading building and north of existing wells BW-3R and BW-10. The goal of the trench was to test conditions for constructing a low-maintenance system that will collect groundwater during March and April when groundwater levels are high, zinc concentrations in groundwater are elevated, and loading to the Eagle River by the discharge of groundwater is at a maximum. A 60-

foot long trench was completed in October 2007 (Figure 1) and a pumping test was conducted in May 2008. A summary of construction and testing is provided in the following paragraphs.

Excavation

Construction of the interceptor trench began on October 16, 2007. Trench excavation was initially performed by Custom Environmental Services using a John Deere 200C track-mounted excavator equipped with a 24-in wide bucket. Initial work at the site consisted of clearing debris from the loading dock area, preparing a working platform for the trench excavation and hauling material to the Temp Cell at the CTP. The loading dock consists of steel reinforced concrete and was used as a working platform on the south side of the trench. The trench excavation followed the northern edge of the loading dock and the loading dock surface, at an elevation of about 8379 ft., was used as a reference for trench depth measurements. Trench excavation commenced approximately 10 feet west of the Copper Tipple building foundation. The excavator encountered very hard consolidated conditions at a depth of approximately 10 feet digging at the east end of the trench. In addition, an abandoned and previously undiscovered adit was encountered at a depth of 7 feet and 21 feet from the foundation of the Copper Tipple. The adit is completely supported by timbers, is approximately 6 feet high and 3.5 feet wide, and runs roughly perpendicular to the direction of the trench. The adit had been partially backfilled with a gray silt material, most likely tailings. The excavator trenched across the adit, removing timbers and tailings. The presence of the hard zone at 10 feet prohibited further excavation at the west end of the trench. The excavator was moved to a point about 100 feet from the west end of the trench to test digging conditions near the center of the proposed trench. At this location, a number of granitic boulders were encountered and granitic bedrock was encountered at a depth of less than 10 feet. At this point the excavation operation was temporarily shut down to mobilize additional equipment capable of excavating in the consolidated material.

Excavation operations resumed on October 22 with the assistance of a CAT 315CL excavator equipped with a hydraulic chisel. The chisel began working at the western end of the trench and was successful in breaking up the consolidated material below 10 feet in this area. Excavation continued from west to east alternating use of the hydraulic chisel and the excavator to advance the length of the trench. The excavators have a maximum reach of about 22 feet and could achieve a maximum depth of about 17 feet (elevation approximately 8362 ft) along the trench. No groundwater was encountered during the excavation. The excavation was terminated when the trench length reached 60 feet.

Observed Hydrogeologic Conditions in Trench

The subsurface materials encountered during the excavation can be separated into four general groups. A description of each group is provided in the following paragraphs and a map of the north wall of the trench is shown in Figure 2.

- Unit 1 – Historic fill consisting mostly of orange-brown silt with yellow highly weathered granite cobbles and boulders to 1-ft diameter. Dense to cemented in places. Includes timbers and scrap wood. Very irregular lower contact with an underlying paleosol containing roots and stumps. 5 to 7 feet thick.

- Unit 2 – Brown silt and clay with cobbles and boulders. Very hard to consolidated. Large areas of iron oxide cementation resulting from weathering of pyrite. 10 to 15 feet thick

- Unit 3 – Dark brown to gray brown conglomerate. Gravel to cobble sized clasts of various types (mostly very fine sandstone and limestone, some black shale) cemented in fine-grained matrix. Approximately 3 feet thick, but trench not excavated to lower contact.

- Unit 4 – Granite and white quartzite boulders in black roaster fines. Loose. Approximately 12 feet thick on western end of trench pinching out and not present along most of trench.

- Unit 5 – Gray silt and clay tailing fill within exposed adit. Soft. About 2 feet thick.

The trench was dry when constructed. A small amount of seepage was observed at the contact with Units 1 and 2 and formed small icicles; however, no water accumulated in the trench. The deepest portion of the trench is 17.0 feet at the mid-point, which is an elevation of about 8362 ft.

Collection System Installation and Trench Backfilling

The collection system consists of perforated 6-in SDR 11 HDPE (6.625-in OD, 5.425-in ID) piping placed within ¾-in crushed granite (Figure 3). The HDPE piping was configured with a vertical riser from a T-fitting in the center and deepest portion of the trench from laterals that bend up to either end of the trench. The vertical riser provides access for a submersible pump. This riser has been designated BTS-1 for measurement and sampling purposes. The laterals provide for both collection and clean-out access if necessary. The upper 8 feet of each lateral and the vertical riser are unperforated. Perforations on the collection pipe are 3/8-in diameter on 5-in centers in two staggered rows 2-inches apart on each side of the pipe (4 rows of holes). About 5 to 7 feet of gravel was placed in the trench to cover the collection piping. Slightly more gravel was placed at the east end of the trench to cover the exposed adit. A total of 56.9 tons (42 cubic yards) of gravel were placed in the bottom of the trench. Prior to placing the gravel, two piezometers were fabricated from 1 ¼- in Schedule 40 PVC and placed to the bottom of the trench. The lower portion of the PVS was perforated with 4 rows of 3/16-in holes placed on 2-in centers. Piezometer BPZ-1 was placed 2 feet from BTS-1 in the center of the trench, and piezometer BPZ-2 was placed about 7.5 feet from the east end of the trench in the middle of the adit position in the north wall of the trench. Completion details are included in Table 2.

Table 2 Construction Details for Trench Sump and Piezometers

Piezometer	Type	Total Depth (TOC)	Top Perf. Interval (TOC)	Elev. TOC (ft MSL)	Elev. TD (ft MSL)
BTS-1	6-in HDPE collection system riser	18.50	8.0	8381.18 est.	8362.68 est.
BPZ-1	1 ¼-in PVC piezometer	19.60	14.6	8382.14	8362.54
BPZ-2	1 ¼-in PVC piezometer	16.65	14.1	8382.51 est.	8365.16 est.

The portion of the trench above the gravel was backfilled with material excavated from the trench. Clean fill was extended to about 1.5 feet above grade over the length of the trench and a drainage swale was provided on the northern side of the trench to direct runoff to the west and around the trench.

Best Management Practices (BMPs)

A 100-foot long berm was constructed of straw bales along the outboard edge of the Loading Dock to contain excavated materials and mud. Straw bales were installed per standard procedures at the downstream collection point for discharge, if any, to collect silt and minimize erosion. The weather was dry and no discharge occurred during construction.

TRENCH PERFORMANCE TESTING

A pumping test was conducted on May 9, 2008. The test was performed by pumping from the trench sump (BTS-1) at a constant rate and measuring groundwater levels in the trench piezometers (BPZ-1 and BPZ-2) and nearby wells BW-3R and BW-10 to monitor water level drawdown. Groundwater levels were also measured following pump shut-off to monitor water level recovery.

Prior to pumping water levels were measured in the trench wells and surrounding monitoring wells. A map of the potentiometric surface in the area in shown in Figure 4. The groundwater level in the trench was 8368.10 ft MSL, providing about 5 feet of groundwater at the sump (BTS-1). A Goulds Model 5GS05R was lowered to the bottom of BTS-1. The trench was pumped for 4 hours and 12 minutes, initially at 8.7 gpm, and finally at 7.7 gpm. The water level in the trench dropped below the bottom of BPZ-2 after about 2 hours of pumping. The pump was shut off as the water level reached the bottom of the BTS-1. A total of 2012 gallons were pumped from the trench and the drawdown at BPZ-1 was 4.58 feet. Water level recovery was monitored for 2 hours, at which time the water level in BPZ-1 had recovered 0.72 feet to a residual drawdown of 3.86 feet.

A graph of cumulative volume removed and drawdown in BTS-1 is shown in Figure 5 and a graph of the drawdown in BTS-1 and the piezometers BPZ-1 and BPZ-2 is shown in Figure 6. The water level decrease is directly related to the drainage of the trench, and the rate of the decrease indicates that contributions to the trench during pumping are much less than the pumping rate. During pumping about 240 gallons of water were removed from the trench in about 30 minutes to drop the water level from 3.86 feet to 4.58 feet and during recovery it took about 120 minutes to recover to 3.86 feet. As a result, the recovery rate at maximum drawdown was 2.0 gpm. During pumping at this level, an additional 6 gpm was derived from the drainage of the trench gravel. The 2.0 gpm inflow rate represents the maximum formation yield that could be obtained at this time of year.

The groundwater level did not change at BW-10 during pumping but dropped 0.10 foot at BW-3R indicating that there is a hydraulic connection between the trench and saturated materials outside the trench. The small amount of drawdown and slow hydraulic response indicates that the material is low in hydraulic conductivity.

Sample Results

The Gould pump was used to remove in excess of 1200 gallons from the trench and a water sample was collected on April 27, 2008. On May 9, 2008, a second sample was collected during the pump test described above. This sample represents water produced in the later stages of the test, near maximum draw down. Field parameters and laboratory results from Evergreen Analytical, Inc. are given in Table 3.

Table 3 Sample Results

Sample date	Field Temp (Deg. C)	Spec. Cond. Field @ 25C (umhos/cm)	Cadmium Total (mg/L)	Copper Total (mg/L)	Zinc Total (mg/L)
BPS-1 4-27-08	5	4531	0.81	10	217
BPS-1 5-09-08	8.1	3620	0.975	11.3	245

If you have questions, please feel free to call.

Very truly yours,

NEWFIELDS

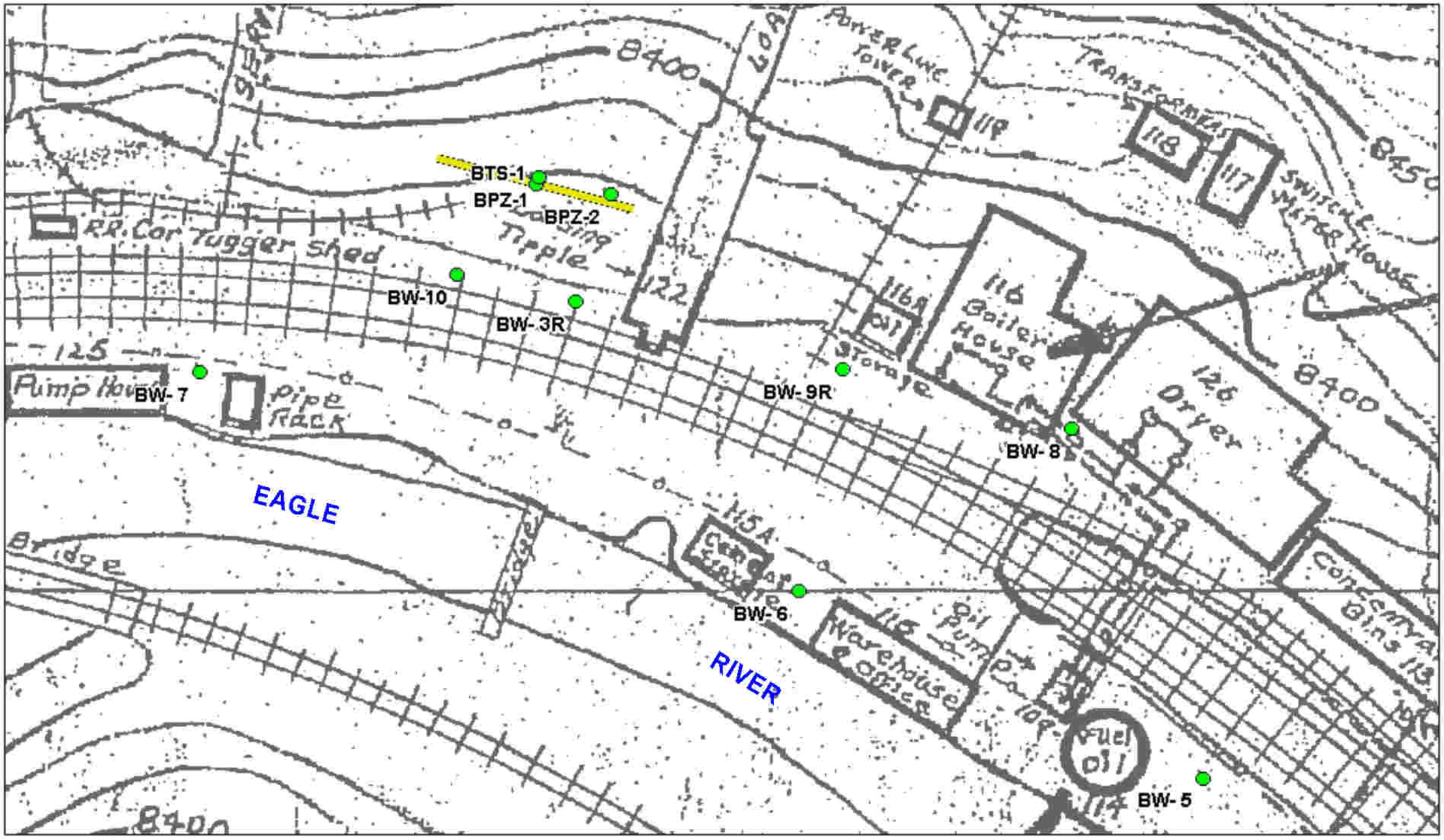
David R. Hinrichs
Project Manager

Attachments:

Figure 1 Location of Groundwater Interceptor Trench
Figure 2 Trench Geology, North Wall Groundwater Interceptor Trench
Figure 3 Construction Detail Groundwater Interceptor Trench
Figure 4 Groundwater Potentiometric Surface May 9, 2008
Figure 5 Cumulative Volume Removed and Drawdown at Trench Sump
Figure 6 Drawdown in Trench Wells During Pumping and Recovery

cc:

Jeff Groy, CBS Operations, Inc.
Hank Ipsen, HRO
Buz Cotton, NewFields



Legend

- Wells
- Test Trench

Figure 1

Belden GW Extraction System Performance Report 3

Location of
Groundwater Interceptor Trench

Belden Interceptor Trench
Eagle Mine Site

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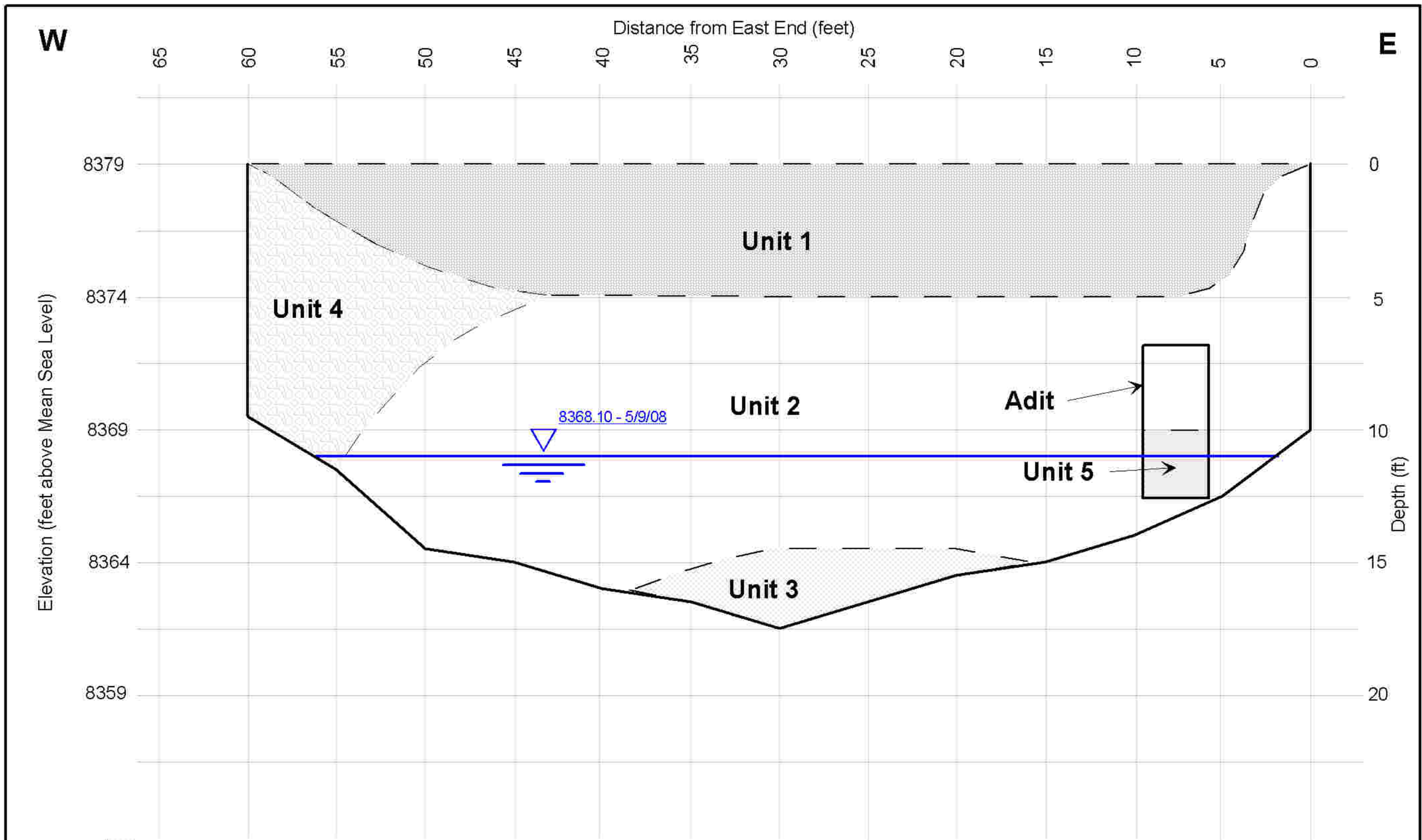
File: Location.srf



Unit 1 - Fill. Orange brown silt with cobbles and boulders. Dense to cemented.

Unit 2 - Brown silt with cobbles and boulders. Hard to consolidated.

Unit 3 - Dark brown to gray brown congolmerate.

Unit 4 - Granite and quartzite boulders in black roaster fines. Loose.

Unit 5 - Fill. Gray silt and clay tailing. Soft.

Figure 2

Belden GW Extraction System Performance Report 3

Trench Geology, North Wall Groundwater Interceptor Trench

Belden Interceptor Trench
Eagle Mine Site

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File: TrenchAsBuilt.srf

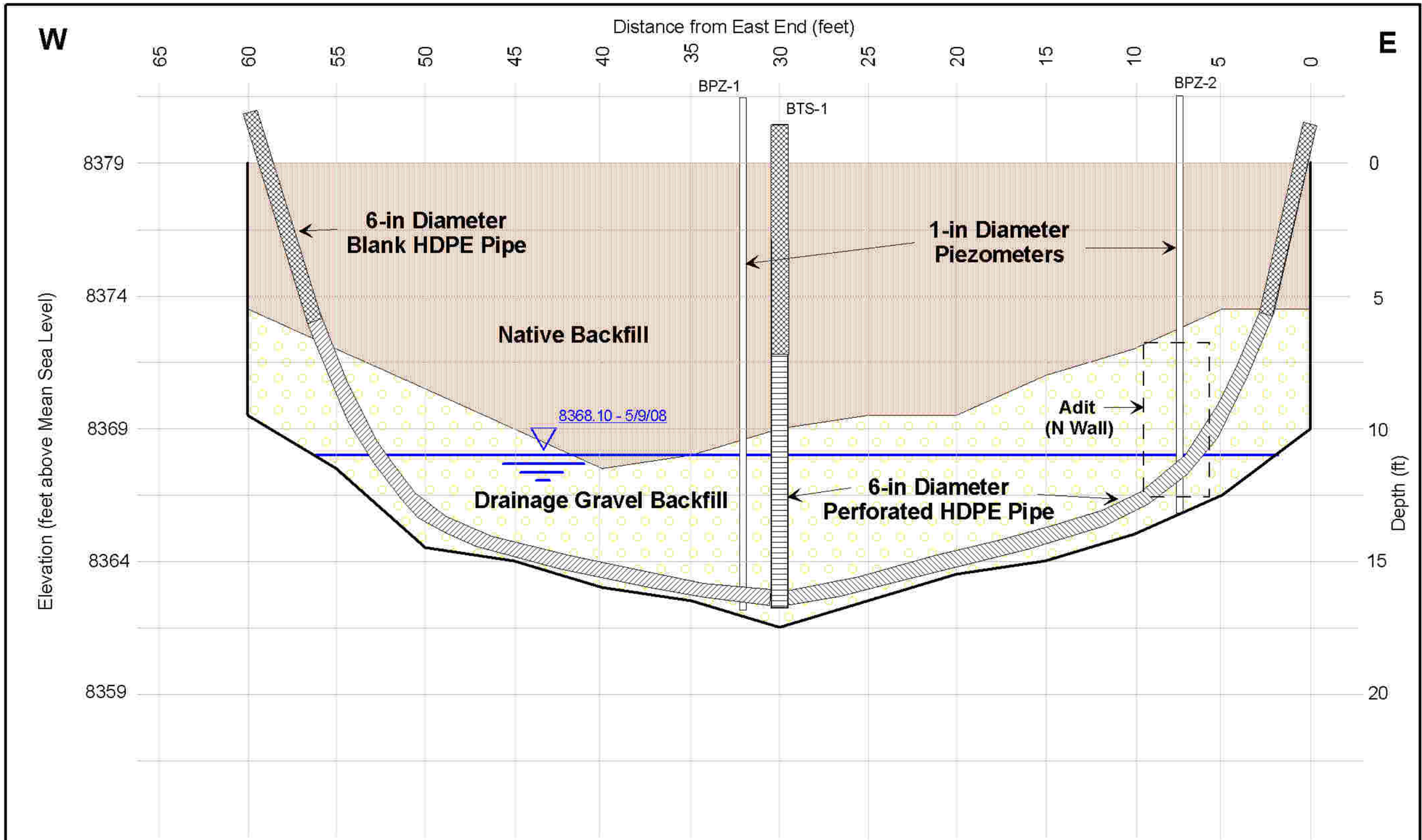

Figure 3

Belden GW Extraction System Performance Report 3

Construction Detail
Groundwater Interceptor Trench

Belden Interceptor Trench
Eagle Mine Site

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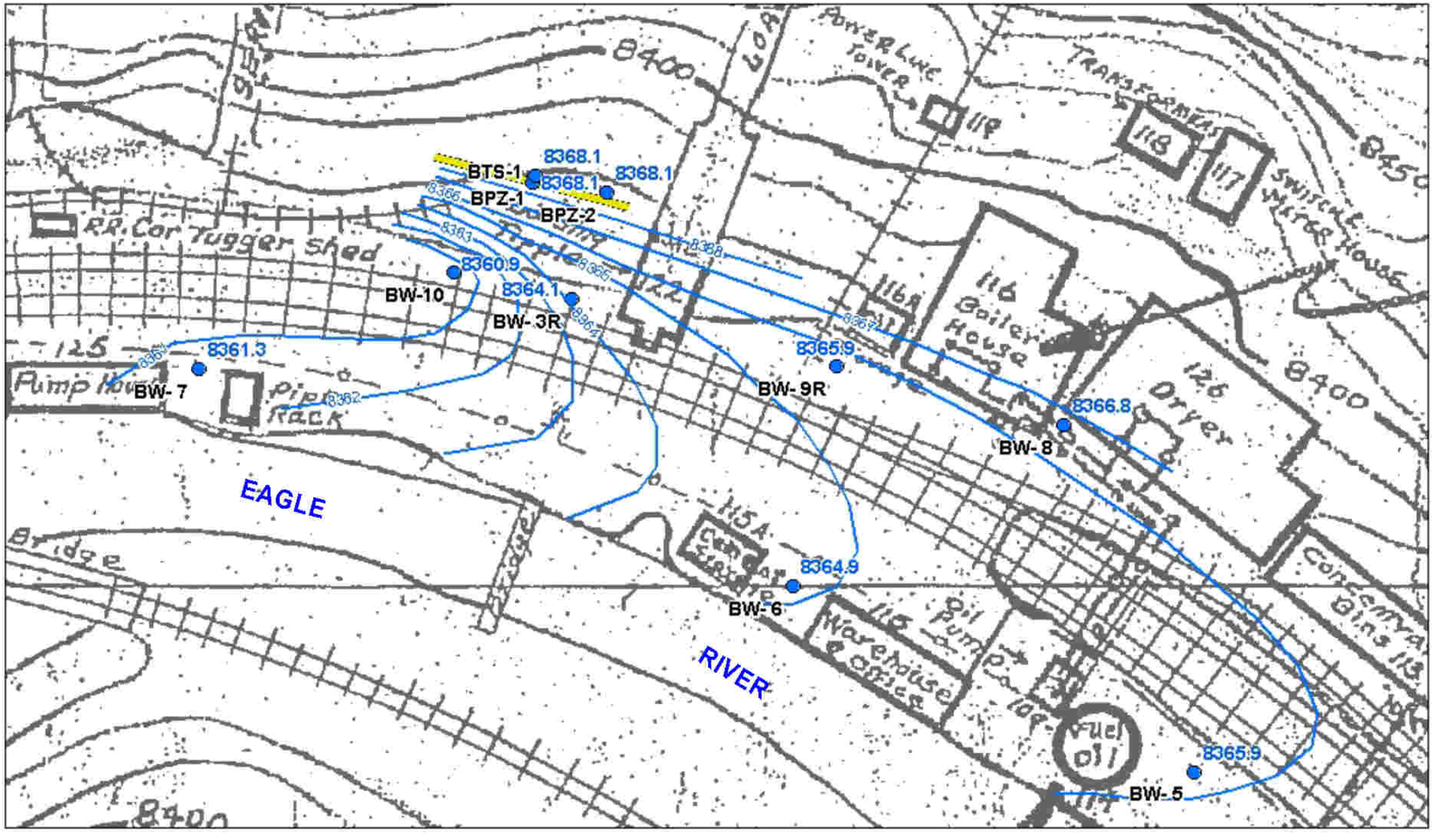
File: TrenchAsBuilt.srf



Legend

- GW Potential May 9, 2008
- GW Level Measurement
- Wells
- Test Trench

N

0 50 Feet

Figure 4

Belden GW Extraction System Performance Report 3

Groundwater Potentiometric Surface
May 9, 2008

Belden Interceptor Trench
Eagle Mine Site

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File: Location.srf

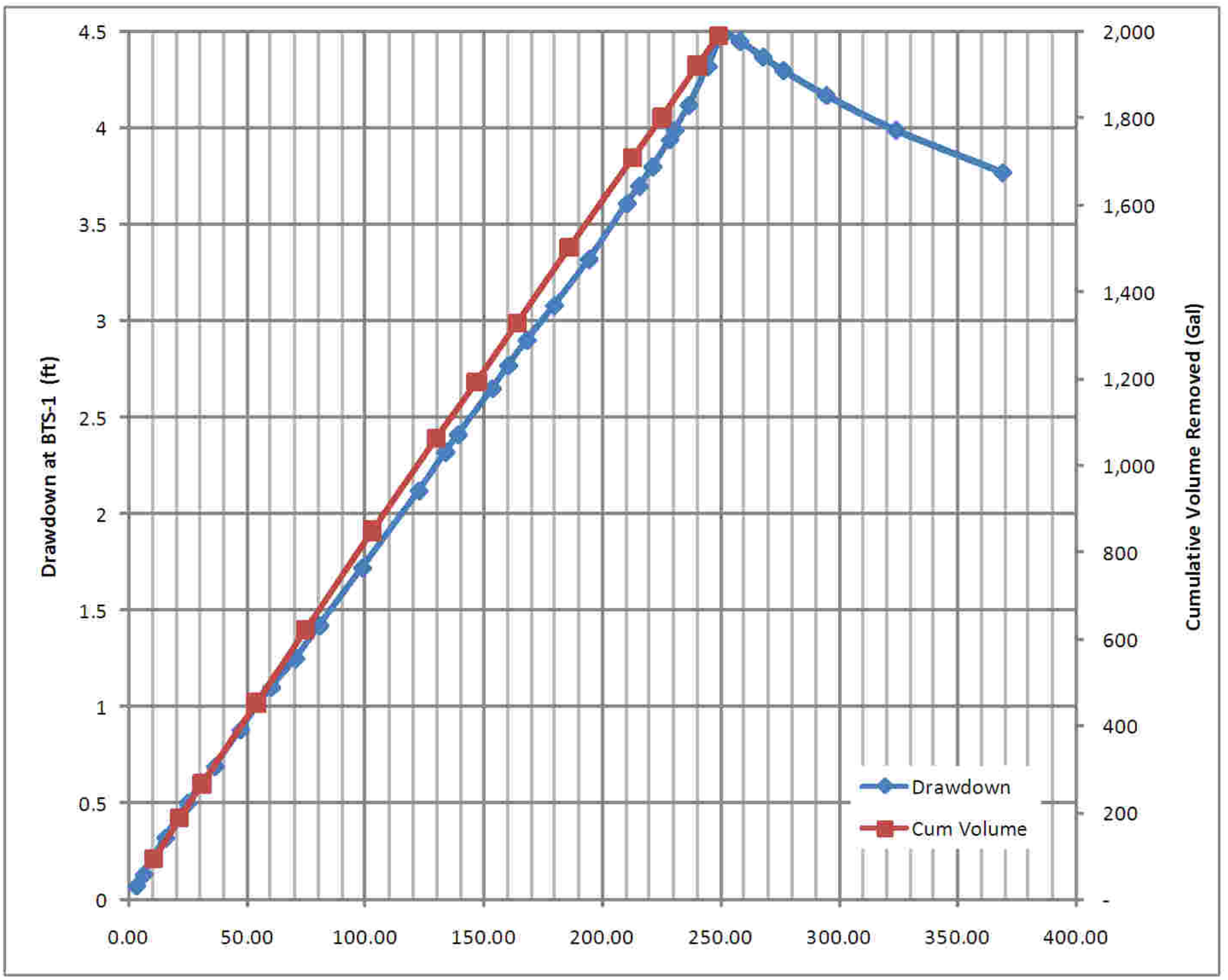

Figure 5

Belden GW Extraction System Performance Report 3

Cumulative Volume Removed and Drawdown at Trench Sump

Belden Interceptor Trench
Eagle Mine Site

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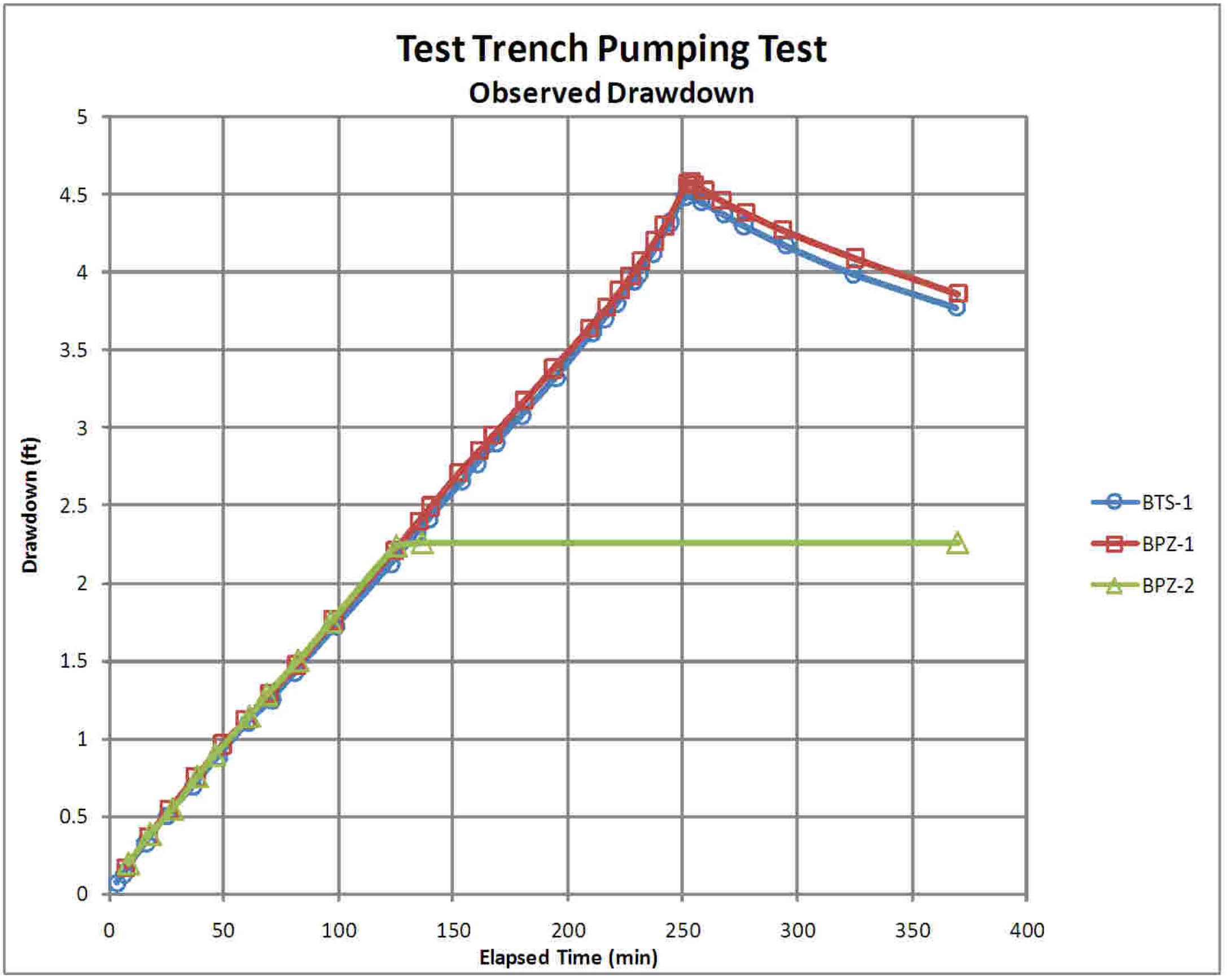

Figure 6

Belden GW Extraction System Performance Report 3

Drawdown in Trench Wells
During Pumping and Recovery

Belden Interceptor Trench
Eagle Mine Site

NEWFIELDS

File: AsSeg.srf

Belden Extraction System Water Quality Report

Eagle Mine Site, January - December 2008

Station ID	Station Description	Sample Date and Time	Field pH (Std. Units)	Field Temperature (Deg. C)	Spec. Cond. Field @25C (umhos/cm)	Copper Total (mg/L)	Cadmium Total (mg/L)	Zinc Total (mg/L)
BPS-1	Belden GWE Trench	4/27/08 14:35	--	5	4531	10	0.81	217
		5/9/08 15:42	--	8.1	3618	11.3	0.975	245
BPZ-1	Belden GWE Trench Piezo	4/25/08 17:40	--	3	3449	8.5	0.85	219

U - Undetected at stated detection limit

J - Estimated Concentration