GREAT FALLS COAL FIELD
WATER TREATMENT ASSESSMENT

Prepared For:

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Hydrometrics, Inc.
Consulting Scientists and Engineers

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

GREAT FALLS COAL FIELD

WATER TREATMENT ASSESSMENT

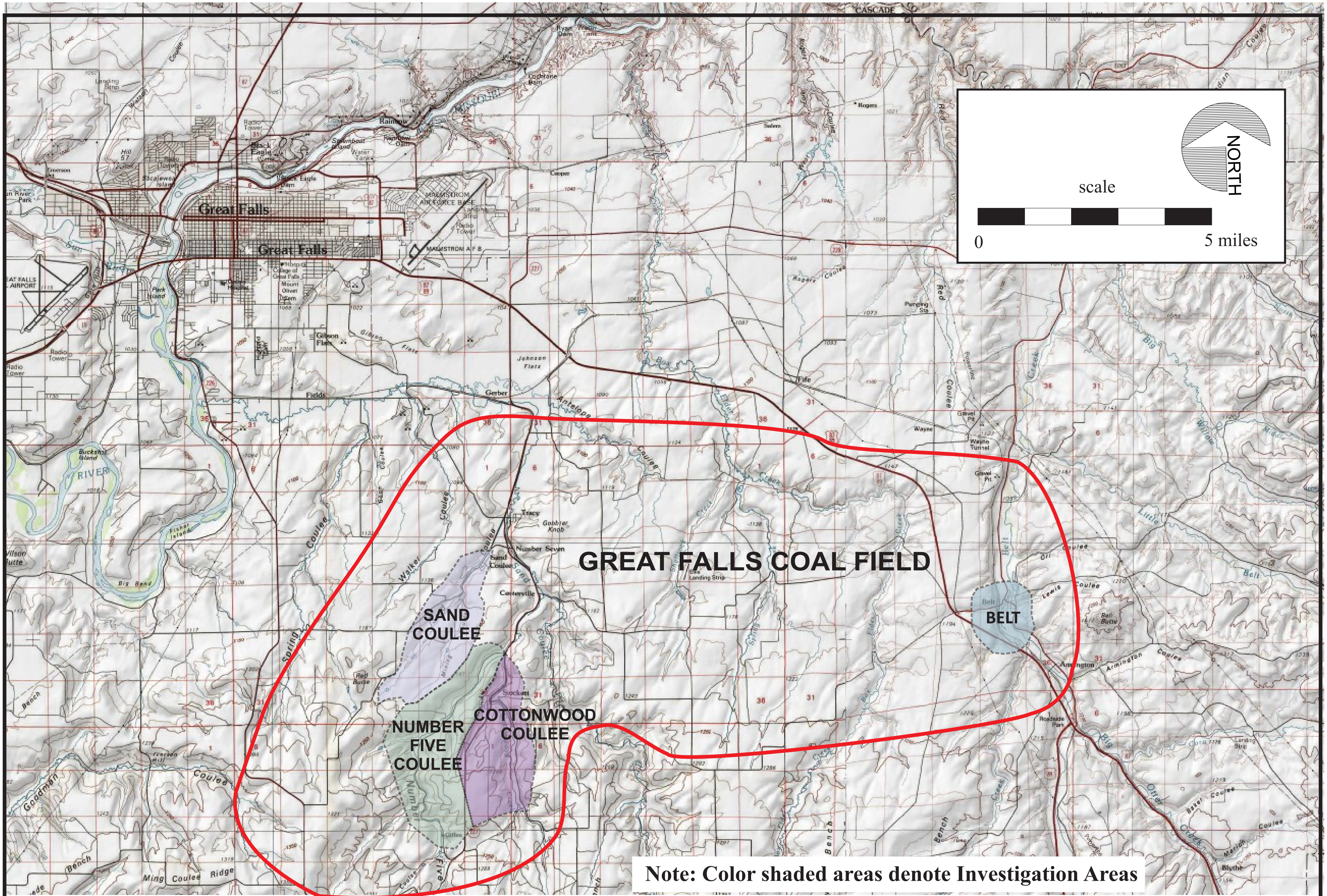
1.0 INTRODUCTION

The Montana Department of Environmental Quality (DEQ) Abandoned Mines Section contracted Hydrometrics, Inc. (Hydrometrics) to evaluate water treatment alternatives for abandoned coal mine discharges in the Great Falls Coal Field in Cascade County, Montana (Figure 1-1). The abandoned mine discharges are located within the Sand Coulee Creek drainage, which includes Mining Coulee, Sand Coulee, Kate's Coulee, and Straight Creek near the community of Sand Coulee; Cottonwood Coulee, Ladd Coulee and Number Five Coulee near Stockett, and the Belt Creek drainage including French Coulee and Lewis Coulee near Belt, Montana. The four general investigation areas are shown in Figure 1-1 with more detailed maps provided in Figures 1-2 and 1-3.

1.1 PURPOSE AND SCOPE

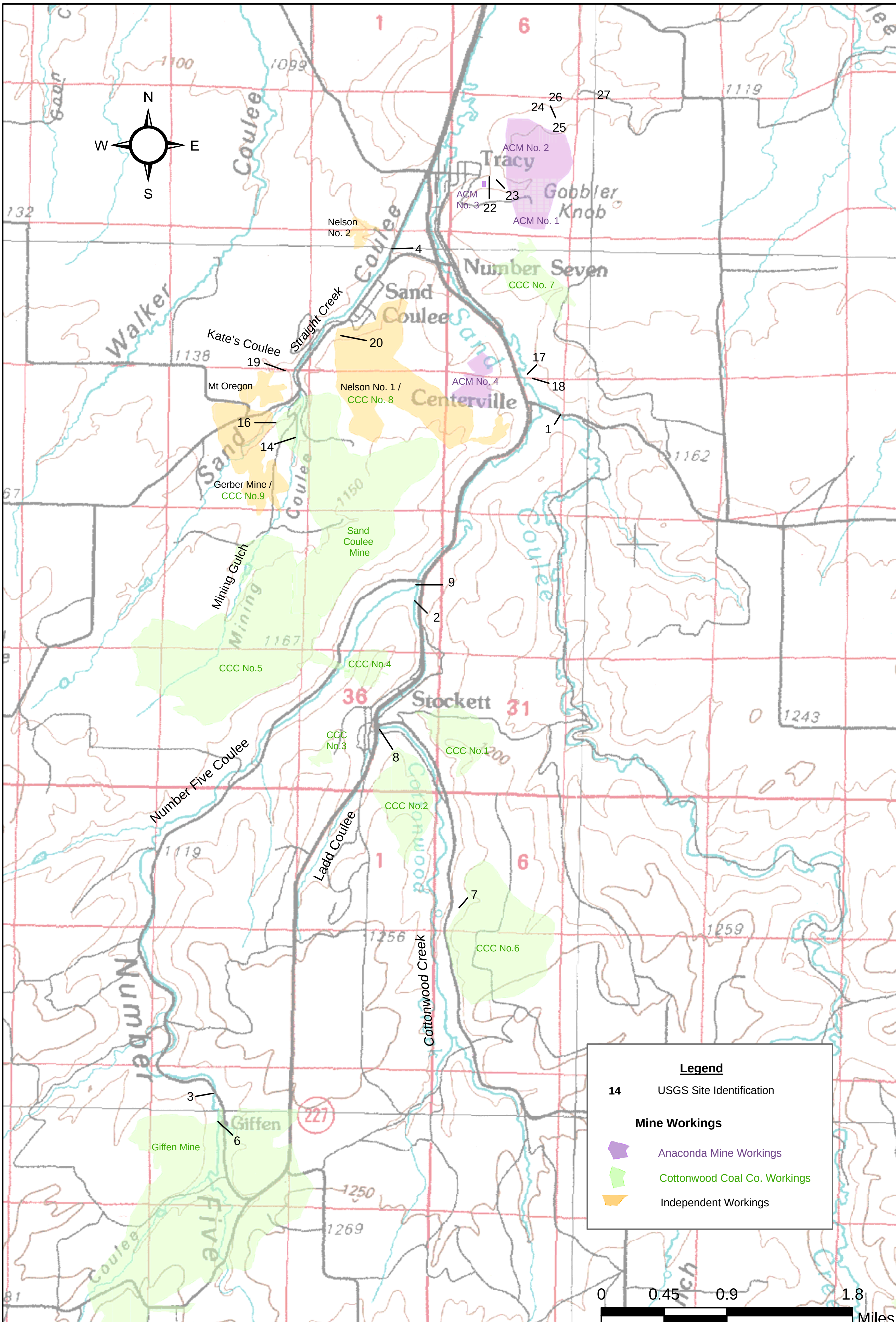
The purpose of this investigation is to evaluate options and costs for active treatment of acid mine drainage (AMD) from abandoned coal mines in the Sand Coulee/Stockett and Belt areas. A prioritization matrix was developed to compare and rank the potential treatment sites with regard to their current environmental and human health impacts and estimated treatment costs. The following tasks were performed to address project objectives:

1. A site reconnaissance was conducted on July 13 and 14, 2011 to identify the locations of abandoned coal mines, point and non-point AMD discharges, and the hydrologic basins impacted by AMD.
2. Historical data were compiled into a Geographic Information System (GIS) database, including water quality data, measured flow rates, sampling location coordinates, previously mapped abandoned mine workings, and other relevant project data. The



Hydrometrics, Inc. Consulting Scientists and Engineers **TKT** *Consulting, LLC*	**GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT**	**MAP OF GREAT FALLS COAL FIELD**	**FIGURE** **1-1**

K:\PROJECT\11033 GFCF\REPORT\FIG 1-GFCF MAP



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	COTTONWOOD CREEK, SAND COULEE & NUMBER FIVE COULEE USGS SAMPLING SITES	FIGURE 1-2

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GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	**BELT CREEK USGS SAMPLING SITES**	FIGURE 1-3

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database was used to assess AMD sources and associated surface water impacts, and to identify data gaps.

3. Synoptic stream flow and water quality data were collected on August 31 and September 1, 2011 at representative AMD discharge points and at select locations within the receiving waters for quantitative contaminant loading analyses.
4. AMD discharges were grouped based on the potential for combined treatment, and the treatability of combined discharges was assessed. The treatment assessment included bench scale testing of two prospective water treatment technologies.
5. The AMD discharges in the study area were assigned a prioritization ranking based on contaminant loads, receiving water impacts, potential for human health exposure, resource potential of the impacted water bodies, AMD treatability, and cost considerations.

1.2 HISTORICAL BACKGROUND

The communities of Belt, Sand Coulee, and Stockett were established as coal mining towns within the Great Falls Coal Field, with extensive underground mines developed around these communities. The mines were a primary source of coal for operation of the Great Northern Railway, and for the Anaconda Copper Company's mining and beneficiation operations in Butte, Anaconda and Great Falls, Montana. The coal mines operated from the late-1870s to the mid-1940s with limited operations continuing into the 1950s (Renewable Technologies Inc., 2009).

The mining activity left miles of abandoned underground workings in the Sand Coulee/Stockett and Belt areas (Figures 1-2 and 1-3). AMD is generated from the abandoned mines as groundwater seeps into the underground workings and reacts with metal-sulfide minerals under oxidized aqueous conditions. AMD discharges from the mines have contaminated adjacent streams and their underlying alluvial groundwater systems. The 2012 DEQ 303(d) list of impaired water bodies identifies metals impairment of Lower Belt Creek, Cottonwood Creek, Number Five Coulee, Sand Coulee Creek, and Sand Coulee due to AMD discharges.

The Mine Waste Clean-up Bureau of the Montana Department of Environmental Quality (formerly part of the Department of State Lands) has carried out numerous mine reclamation projects in the area since the 1980s. Most of the reclamation measures have been directed at removing mine wastes, closing mine portals, implementing drainage improvements, and reclaiming disturbed lands. DEQ has implemented constructed wetland-based water treatment methodologies to treat AMD discharges, but these techniques were not successful due to high metal and acidity loadings and extended winter season in the area. The current investigation focuses on assessing options for active treatment of the AMD discharges.

1.3 DESCRIPTION OF MINE DISCHARGE SITES AND RECEIVING WATERS

The U.S. Geological Survey (USGS) established 27 AMD monitoring sites in the Sand Coulee/Stockett and Belt areas during water quality investigations performed from 1994 through 1996 (Figures 1-2 and 1-3). Fourteen of these monitoring sites are AMD discharges from abandoned mine workings, with the remaining 13 sites located along discharge conveyances, within receiving streams, or at former wetland treatment sites. All of the AMD discharge sites identified by the USGS were evaluated for treatment in this study with the exception of two mine discharge sites and former wetland treatment sites in Tracy that have already been assessed for treatment (TtEMI, 2007). The discharge sites and receiving waters were inspected, photographed and mapped for GPS coordinates during the site reconnaissance conducted July 13-14, 2011. A photo log is included as Appendix A to this report.

1.3.1 Sand Coulee

The drainage that runs through the community of Sand Coulee is an unnamed tributary to Sand Coulee Creek. This drainage has been referred to in previous documents as Unnamed Creek, Rusty Ditch, Sand Coulee Tributary, and Straight Creek, (the name used in this report). Straight Creek exhibits ephemeral or intermittent flow over most of its length; however, the section through the community of Sand Coulee is perennial due to discharges from abandoned mine sites in the area. The headwaters of Straight Creek include three tributaries previously monitored by the USGS. From east to west, the tributaries are Mining

Coulee, Sand Coulee, and Kate's Coulee. Straight Creek is constrained in a ditch through the community of Sand Coulee. The water and creek bed are bright red due to AMD; the AMD sources account for virtually all of the stream flow in the creek except during brief seasonal periods of high runoff. Consequently, water quality in Sand Coulee is highly impacted by AMD (photos on pages 8-10 of Appendix A).

The USGS monitoring sites include five AMD discharge sources along this short perennial reach of Straight Creek and its three tributaries. Perennial stream flow begins upstream (south) of the community of Sand Coulee at two mine discharge sites, one in Mining Coulee (USGS Site No. 14, Figure 1-2) and one in adjacent Sand Coulee (USGS Site No. 16). Average discharge rates at these sites range from 6.6 to 12.7 gallons per minute (gpm) (Table B-1, Appendix B). Additional AMD discharge enters Straight Creek at Kate's Coulee (USGS site No. 19). This discharge is comprised primarily of AMD from the Mt. Oregon Mine that mixes with seasonal flow originating from the overlying Kootenai Formation. Mixing of AMD from the Mt Oregon mine with the higher pH Kootenai Formation water causes iron and aluminum hydroxides to precipitate and form thick deposits in the downgradient stream channel in Kate's Coulee.

Straight Creek collects additional AMD discharge from the Nelson mine, which borders the community of Sand Coulee to the east (USGS Site No. 20, Figure 1-2). A series of drains were installed on the hillside above Sand Coulee to collect AMD from the Nelson Mine. The AMD is conveyed through a lined ditch and buried drainpipe to Straight Creek; however the pipeline has become plugged causing flow in the collection ditch to surface and flow down the hillside. A shallow unlined ditch at the base of the hill collects this discharge and routes it to Straight Creek approximately 700 feet downstream. Below the community of Sand Coulee the creek begins to lose water and typically goes dry a short distance downstream except during periods of seasonal high runoff.

1.3.2 Cottonwood Coulee

Cottonwood Creek joins Sand Coulee Creek at Centerville. Cottonwood Creek has intermittent flow in its upper reaches, but becomes perennial approximately three miles upstream (south) of the town of Stockett. An infiltration gallery collects water for Stockett's public water supply from a perennial spring in Cottonwood Coulee, which is adjacent to the creek approximately $1^{3}/_{4}$ miles south of the town. A short distance north of the infiltration gallery is an AMD discharge from the Cottonwood Coal No. 6 Mine (USGS Site No. 7). The majority of this discharge is captured and routed through a limestone channel and roadside drainage ditch where it discharges to Cottonwood Creek approximately one mile to the north. There is evidence of seasonal AMD seeps from the Cottonwood Coal No. 1 and No. 2 mines along the lower reach of Cottonwood Coulee. The primary discharge from the Cottonwood No. 2 mine (USGS Site No. 8) flows into a collection ditch and runs down the hillside and into Ladd Coulee just upstream of the confluence with Cottonwood Coulee. There are significant accumulations of orange iron hydroxides in the stream channel below the confluence of these two coulees within the town of Stockett.

Cottonwood Creek receives additional inflow north (downstream) of Stockett from Number Five Coulee (USGS Site No. 9) and then gradually loses flow downstream becoming seasonally intermittent by the time it reaches Centerville where it joins Sand Coulee Creek.

1.3.3 Number Five Coulee

Number Five Coulee contains no communities and only a few homes. Number Five Coulee has a small creek that has perennial flow beginning in the vicinity of the Giffen Mine and extending approximately one mile downstream of the mine where the creek reportedly begins to dry up seasonally (Gammons et al., 2010). While there is some groundwater discharge to the creek in a wetland area within the mine footprint, the primary source of flow is AMD from a constructed drain outfall from the Giffen mine referred to as the Giffen Spring (USGS Site No. 6).

Giffen Spring discharges from an 8-inch diameter PVC pipe that flows at a rate of 100 to 250 gpm on a year-round basis. The discharge from Giffen Spring mixes with neutral pH stream water resulting in precipitation of iron hydroxides in the downstream channel. Stream flow within the coulee during wetter periods extends 4½ miles downstream to the confluence with Cottonwood Creek. The Cottonwood Coal No. 4 and No. 5 mines border Number Five Coulee along its lower reach; however, no point source mine discharges have been identified along this lower reach.

1.3.4 Belt

The Anaconda Mine is the largest mine in the Belt area and is immediately southwest of the town of Belt (Figure 1-3). Although there were several smaller mines that were developed to the east of the town, the Anaconda Mine is the primary source of AMD discharge in this area. Most of the discharge from the Anaconda Mine (average of 105 gpm) originates at the Anaconda Mine drain (USGS Site No. 5), which was installed by the Montana Department of State Lands when the mine portal was closed in the 1980s. AMD also discharges from the French Coulee collection system to the south of the Anaconda Mine drain. When the Montana Department of Transportation (MDT) constructed the earthen embankment for the U.S. Highway 87 crossing at French Coulee, a collection system was installed for AMD discharging from abandoned mines in French Coulee, which were covered by the embankment. The USGS identified this discharge as the French Coulee Wetlands inflow (USGS Site No 11). The USGS monitored a second inflow into the French Coulee wetlands (Site No 12), which apparently discharged from additional backfilled mine adits in the area. Mean discharges from sites 11 and 12 have been approximately 22 and 13 gpm, respectively. AMD from the Anaconda Mine drain and both USGS sites discharge to a common collection ditch, referred to in this report as Flat Ditch. Flat Ditch is an open, unlined ditch approximately 1600 feet in length. It runs over Coke Oven Flats, which contains buried coal waste from mining operations. Flat Ditch discharges to Belt Creek approximately 500 feet northeast of the Anaconda Mine drain outfall (Figure 1-3). Diffuse AMD seepage to Belt Creek is evident along the stream banks on the west side of Belt Creek immediately upstream and downstream of the Flat Ditch outfall (Reiten et al., 2006).

There are two AMD discharges that originate from mines on the east side of Belt. There is a closed adit in Lewis Coulee (USGS Site No. 21) that was reclaimed in 1985. The average flow rate of the Lewis Coulee AMD has been estimated to be approximately 18 gpm, however flow rates of 30 to 100 gpm have been reported in Lewis Coulee after precipitation events (Reiten et al., 2006).

There is a second mine drain that discharges approximately 5 gpm of AMD to a shallow open swale just south of Lewis Coulee (USGS Site No. 13). This discharge site is referred to in the USGS study as "Lewis Coulee above Castner Park." The AMD appears to originate from the location of the former Millard Mine, which was reclaimed in 1986 (Reiten et al., 2006). AMD from this source flows through a series of culverts and open unlined ditches to Castner Park where it infiltrates into the ground in an open unlined ditch.

Belt Creek, which ultimately receives the AMD discharges, has high flows in the runoff season but low flow late in the year and reportedly goes dry during some years in winter months. Over a two-year monitoring period, Reiten et al (2006) reported an average annual flow rate in Belt Creek of 130 cfs (measured at the Belt Bridge) with flows ranging seasonally from 0 to 800 cfs. During low flow periods Reiten indicates that the only source of flow in Belt Creek at Belt is AMD discharges.

2.0 COMPILATION OF WATER QUALITY DATA

2.1 DATA SOURCES

Numerous investigations have been conducted assessing AMD impacts from the Great Falls Coal Field. Much of the work was done under the direction of the Department of State Lands (DSL) Abandoned Mines Reclamation Bureau (now MDEQ Remediation Division-Abandoned Mine Section). Earlier investigations include studies by McArthur (1970), Hydrometrics and Westech (1982), the Bureau of Mines and Geology (Osborne et al, 1983; Osborne et al, 1987), and Schaefer and Associates (1989). Peccia and Associates (1991) summarized data presented in these earlier reports and made recommendations for remedial alternatives.

In 1994, the USGS established a series of AMD monitoring sites in the Sand Coulee/Stockett and Belt drainages and collected monthly flow and water quality data from July 1994 to September 1996. In 1997 Maxim Technologies was contracted by DSL to conduct supplemental water quality monitoring at the USGS sites. Maxim collected four rounds of water quality monitoring in 1997 and 1998. Maxim generated water quality statistics for each of the sampling sites based on the USGS and Maxim monitoring data (Maxim, 1998).

Additional investigation of AMD discharges in Belt was undertaken by the Montana Bureau of Mines and Geology (Reiten et al., 2006) and most recently DEQ published the results of a Total Maximum Daily Load (TMDL) assessment for the Missouri-Cascade and Belt Planning Areas which include DEQ water quality sampling results for each of the drainages covered in this investigation (DEQ, 2011).

2.2 SUMMARY OF HISTORICAL DATA

Hydrometrics has compiled data from investigations from 1994 to present into a GIS database as part of this water treatment assessment. A statistical summary of the historical data is in Appendix B and the complete historical database is in included in electronic version of the report (Appendix H). A statistical summary of principal AMD constituents from the mine discharge sites in each of the investigation areas is provided in Table 2-1.

The pH of the majority of the AMD discharges falls in the 2.5 to 3.1 range, and the discharges contain extremely high concentrations of acidity, iron, aluminum and sulfate. Three mine discharges, Giffen Spring, Mt. Oregon mine, and Lewis Coulee had slightly higher average pH values, ranging from 3.1 to 3.7. This condition has been attributed to more complete flooding of the mine workings at these locations, thus limiting the rate of pyrite oxidation (Osborne et al., 1987; Gammons et al., 2010).

TABLE 2-1. STATISTICAL SUMMARY OF HISTORICAL FLOW AND WATER QUALITY DATA FOR SELECTED PARAMETERS: MINE DISCHARGE SITES

Site		Flow (gpm)	Lab pH (SU)	Field pH (SU)	Acidity (as CaCO3) (mg/L)	Sulfate (mg/L)	Aluminum TRC (mg/L)	Aluminum DIS (mg/L)	Iron TRC (mg/L)	Iron DIS (mg/L)
USGS Site 5 Anaconda Mine Drain	No. of Samples	29	44	41	29	44	4	44	4	44
	No. Below Detection	NA	NA	NA	0	0	0	0	0	0
	Minimum Value	67.3	2.6	2.5	36	1420	92	68	152	83.1
	Average	104.9	2.83	2.9	1008	1874	111	105.09	189	164.1
	Maximum Value	155	3.34	3.1	1240	2700	120	126.25	212	206
USGS Site 6 Giffen Spring in Number Five Coulee	No. of Samples	29	27	29	29	29	4	29	4	29
	No. Below Detection	NA	NA	NA	1	0	0	0	0	0
	Minimum Value	128	2.8	3.7	2	469	2.1	1.1	43.6	14.9
	Average	208.2	3.7	5.06	187	695	2.5	10.45	50	67.9
	Maximum Value	246.8	6.1	6.08	472	1000	2.8	35	56.5	110
USGS Site 7 Cottonwood Mine No.6	No. of Samples	22	22	22	22	22	4	22	4	22
	No. Below Detection	NA	NA	NA	0	0	0	0	0	0
	Minimum Value	8	2.5	2.26	1010	4440.0	300	300	680	646
	Average	19.3	2.7	2.66	3890	5817.7	372	389	769	756
	Maximum Value	67.3	2.9	3.8	4320	7200.00	457	450	860	840
USGS Site 8 Cottonwood Mine No.2	No. of Samples	28	28	28	28	28	3	28	3	28
	No. Below Detection	NA	NA	NA	0	0	0	0	0	0
	Minimum Value	0	2.4	1.98	969	8600	1200	712	1280	720
	Average	9.4	2.5	2.52	9734	13028	1473	1181	1670	1391
	Maximum Value	44.9	2.7	3.65	13600	16000	1900	1720	2260	2200
USGS Site 10 Discharge from French Coulee Wetlands	No. of Samples	24	20	20	20	20	--	20	--	19
	No. Below Detection	NA	NA	NA	0	0	--	0	--	0
	Minimum Value	0	2.50	2.50	1140	2200	--	100	--	170
	Average	11.6	2.70	2.96	3156	5005	--	371	--	471
	Maximum Value	44.9	3.10	3.90	4470	6800	--	570	--	770
USGS Site 11 French Coulee Discharge Site	No. of Samples	19	19	19	19	19	--	19	--	18
	No. Below Detection	NA	NA	NA	0	0	--	0	--	0
	Minimum Value	13.5	2.5	2.5	1090	2000	--	100	--	170
	Average	24.3	2.7	2.7	3634	4947	--	366	--	709
	Maximum Value	53.9	2.8	2.9	5960	7400	--	640	--	1300
USGS Site 12 French Coulee Discharge # 2	No. of Samples	6	6	6	6	6	--	6	--	6
	No. Below Detection	NA	NA	NA	0	0	--	0	--	0
	Minimum Value	13.5	2.5	3	2230	3300	--	214	--	440
	Average	14.2	2.6	3	3417	4550	--	337	--	693
	Maximum Value	18.0	2.7	3	4870	6000	--	480	--	1000
USGS Site 13 Belt above Castner Park	No. of Samples	28	29	29	28	29	--	29	4	29
	No. Below Detection	NA	NA	NA	0	0	--	0	0	0
	Minimum Value	0	1.3	1.8	89	3290	--	182	496	322
	Average	4.8	2.7	2.7	2798	4168	--	292	534	503
	Maximum Value	13.5	3.1	3.7	6220	5700	--	530	580	572
USGS Site 14 Mining Gulch above Sand Coulee	No. of Samples	28	28	28	28	28	3	28	3	28
	No. Below Detection	NA	NA	NA	0	0	0	0	0	0
	Minimum Value	0.2	2.5	2.2	181	7790	780	780	930	891
	Average	6.6	2.6	2.6	7212	9661	893	887	1080	1048
	Maximum Value	18.0	3.1	3.0	7940	12000	960	990	1260	1200
USGS Site 16 Sand Coulee above Sand Coulee	No. of Samples	27	21	21	21	21	2	21	2	21
	No. Below Detection	NA	NA	NA	0	0	0	0	0	0
	Minimum Value	0	2.6	2.83	627	2700	227	121	366	290
	Average	12.7	2.8	3.14	1997	3029	284	227	477	354
	Maximum Value	49.4	3.2	3.4	2680	3600	340	300	587	515
USGS Site 19 Mt Oregon Mine at Kate's Coulee	No. of Samples	29	27	29	29	29	4	29	4	28
	No. Below Detection	NA	NA	NA	0	0	0	0	0	0
	Minimum Value	9.0	2.6	3.93	232	2130	16	14	33.8	28
	Average	30.1	3.1	4.18	1418	2633	119	156	231	284
	Maximum Value	80.8	4.2	5.02	1640	3700	180	180	327	340
USGS Site 20 Nelson Mine at Sand Coulee	No. of Samples	29	31	28	31	30	6	31	6	30
	No. Below Detection	NA	NA	NA	0	0	0	0	0	0
	Minimum Value	4.5	2.5	2.24	71	8490	880	740	1490	1200
	Average	11.5	2.6	2.64	8219	10562	1026	901	1638	1525
	Maximum Value	35.9	2.9	3.69	9930	14000	1200	1040	1860	2000
USGS Site 21 Lewis Coulee below Mine Adit at Belt	No. of Samples	29	30	30	29	30	4	30	4	30
	No. Below Detection	NA	NA	NA	2	0	0	0	0	0
	Minimum Value	0	2.6	3.0	5	180	106	0.02	221	2.2
	Average	17.5	3.4	3.9	1806	2946	217	202.914	464	394.2
	Maximum Value	134.6	7.2	7.4	2730	5100	300	436.295	591	672
DEQ Site BCAMD Flat Ditch outfall to Belt Creek	No. of Samples	2	2	--	--	--	2	2	2	2
	No. Below Detection	NA	NA	--	--	--	0	0	0	0
	Minimum Value	98.5	2.85	--	--	--	127	134	177	175
	Average	113.7	2.90	--	--	--	132	141	179	186
	Maximum Value	128.88	2.95	--	--	--	137	147	180	197

NOTES:

gpm = gallons per minute; mg/L = milligrams per liter; SU = standard units

TRC = total recoverable; DIS = dissolved; --- = no data available

3.0 FIELD INVESTIGATION

3.1 SCOPE AND OBJECTIVES

Hydrometrics assessed flow rates and water quality of mine discharges and receiving waters on August 31 and September 1, 2011 as part of the water treatment assessment. Objectives of the field-sampling program included:

1. Providing flow measurements and water quality data at each of the AMD discharge sites and in receiving waters so that compliance with applicable DEQ water quality standards can be assessed to the required reporting limits.
2. Determining contaminant loading rates within individual mine discharges and in receiving waters upstream and downstream of AMD discharges. The resulting loading analysis provides the basis for assessing the relative importance of point source(s) to a given stream segment versus diffuse sources. The loading data were also a factor in prioritizing the treatment of mine discharges.
3. Providing supplemental water quality information necessary to assess water treatment options. The evaluation of feasibility and cost of treatment required a detailed understanding of the water chemistry including the redox state of iron.

Hydrometrics measured flows and conducted synoptic sampling of water quality on August 31 and September 1, 2011, which included 50 sites in the Sand Coulee/Stockett and Belt Creek drainages. The sampling sites included springs, ditches, creeks and mine discharges throughout the study area. Sampling sites were selected to coincide with previous USGS sampling stations where present in the area. Sampling locations are described in Table 3-1 and are shown on Figures 3-1, 3-2 and 3-3.

The timing of the sampling event was intended to document conditions after spring runoff had occurred, but prior to dry season conditions when several discharge sites typically go dry. Surface water monitoring was conducted in a synoptic fashion in each of the drainages, measuring stream flow and sampling from downstream to upstream in a single day. This provided information on stream flow gains and losses, and in-stream parameter loading

TABLE 3-1. HYDROMETRICS' MONITORING SITES

Count	Name	Type	USGS Site No.	Drainage	Sample Type	Description	Coordinates[1] Longitude WGS84	Latitude WGS84
1	SC-1	Mine Discharge	14	Sand Coulee	TRC + DIS	Mining Coulee Adit Discharge	-111.177368	47.38557497
2	SC-2	Surface Water	---	Sand Coulee	TRC + DIS [2]	Mining Coulee above Sand Coulee confluence	-111.17711	47.39017102
3	SC-3	Mine Discharge	16	Sand Coulee	TRC + DIS	Sand Coulee at Adit Discharge Site upstream of Mining Coulee	-111.180955	47.38709201
	SC-3A	Surface Water	---	Sand Coulee	None	Spring below SC-3	-111.178379	47.38852297
4	SC-4	Surface Water	---	Sand Coulee	TRC + DIS [2]	Sand Coulee immediately above confluence with Mining Coulee	-111.177201	47.39009097
5	SC-5	Surface Water	---	Sand Coulee	TRC	Sand Coulee below Mining/Sand Coulee Confluence; upstream of Kate's Gulch	-111.17757	47.39075499
6	SC-6	Surface Water	---	Sand Coulee	None[3]	Straight Ck above Kate's Coulee	---	---
7	SC-7	Surface Water	---	Sand Coulee	TRC	Kate's Coulee above Mt Oregon discharge	-111.179835	47.39295004
8	SC-8	Mine Discharge	19	Sand Coulee	TRC + DIS	Mt Oregon discharge at Portal	-111.179646	47.39282104
9	SC-9	Surface Water	---	Sand Coulee	TRC + DIS	Kate's Coulee above Straight Ck	-111.177975	47.39280797
10	SC-10	Surface Water	---	Sand Coulee	TRC	Straight Ck below Kate's Coulee	-111.177205	47.39309203
11	SC-11	Surface Water	---	Sand Coulee	TRC	Straight Ck above Nelson Mine Outfall Pipe	-111.174179	47.395978
	SC-11A	Mine Discharge	---	Sand Coulee	None	Nelson Mine Outfall Pipe below Manhole	111.174086	47.396031
12	SC-12	Mine Discharge	20	Sand Coulee	TRC + DIS	Nelson No.1 Discharge at source	-111.171901	47.39616198
13	SC-13	Mine Discharge	---	Sand Coulee	TRC + DIS	Nelson No.1 Drainage Ditch Discharge to Straight Ck	-111.171302	47.39782403
14	SC-14	Surface Water	---	Sand Coulee	TRC	Straight Ck below Nelson No.1	-111.169533	47.39883296
15	SC-15	Surface Water	4	Sand Coulee	TRC	Straight Ck below Sand Coulee	-111.164287	47.404017
16	NF-1	Surface Water	---	Number Five Coulee	TRC	No.5 Coulee above Giffin, wetlands, and confluence of two unnamed drainages	-111.188533	47.30887603
17	NF-2	Surface Water	---	Number Five Coulee	TRC	No.5 Coulee above Giffin Spring	-111.187072	47.31403702
18	NF-3	Mine Discharge	6	Number Five Coulee	TRC + DIS	Giffin Spring upstream of No. 5 Coulee confluence	-111.186957	47.31408698
19	NF-4	Surface Water	3	Number Five Coulee	TRC	No.5 Coulee below Giffin Spring	-111.188028	47.31720496
20	NF-5	Surface Water	---	Number Five Coulee	TRC	No.5 Coulee 1.5 mi downstream from Giffin Spring at road crossing	-111.198357	47.33775596
21	NF-6	Surface Water	9	Number Five Coulee	TRC	No.5 Coulee above confluence with Cottonwood Ck	-111.159511	47.37046097
22	CW-1	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck above CMC No. 6 discharge	-111.155316	47.33611403
23	CW-2	Mine Discharge	7	Cottonwood Ck	TRC + DIS	Discharge from CMC No.6 at source	-111.151577	47.33645501
	CW-2A	Mine Discharge	---	Cottonwood Ck	None	Mine No. 6 discharge within ditch alongside road, downstream of CW-2	-111.152977	47.34011899
24	CW-3	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck downstream of AMD seep from CMC No. 6 Mine	-111.154291	47.33897
25	CW-4	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck above confluence with CMC No. 6 limestone (L.S.) channel outfall	-111.154613	47.349297
26	CW-5	Mine Discharge	---	Cottonwood Ck	TRC + DIS	CMC No.6 discharge from L.S. Channel at road culvert upstream of Cottonwood Ck	-111.154341	47.34946297
27	CW-6	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck below culvert/seepage from Mine #1 south discharge	-111.156076	47.35210503
	CW-6A	Mine Discharge	---	Cottonwood Ck	None	Mine #1 discharge upstream of Cottonwood Ck	-111.155866	47.35190696
28	CW-7	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck above No.1 mine discharge culvert	-111.160978	47.355911
29	CW-8	Mine Discharge	---	Cottonwood Ck	TRC + DIS	Mine Discharge from No.1 at Road Culvert	-111.161081	47.356022
30	CW-9	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck upstream of Ladd Coulee confluence	-111.16459	47.35566499
31	CW-10	Mine Discharge	---	Cottonwood Ck	TRC + DIS	No.2 Mine at source collection ditch immediately downstream of 3 inlets	-111.160393	47.35370899
	CW-10A	Mine Discharge	---	Cottonwood Ck	None	No. 2 Mine drain pipe inflow into collection ditch	-111.161144	47.354203
32	CW-11	Surface Water	---	Cottonwood Ck	TRC	Ladd Coulee above Mine Drainage #2 and seepage off hill upstream of culvert	-111.166233	47.35087104
	CW-11A	Surface Water	---	Cottonwood Ck	None	Seepage from hillside into Ladd Coulee	-111.165647	47.351956

NOTES:

Monitoring sites established on August 31 and September 1, 2011.

1 Coordinates collected from handheld GPS in the field.

2 TRC and DIS samples collected since not commingled with receiving water.

3 SC6 and SC5 were very close together; SC6 not sampled as a result.

4 No flow, few depressions in channel with water.

5 No upstream flow so water quality same as B-12 on downstream side of culvert.

6 USGS 5 located at lower end of flat ditch now also receives water seasonally from French Coulee sources, which discharged to alternate location during USGS study

TRC = total recoverable

DIS = dissolved

--- = No Information

TABLE 3-1. HYDROMETRICS' MONITORING SITES

Count	Name	Type	USGS Site No.	Drainage	Sample Type	Description	Coordinates[1] Longitude WGS84	Latitude WGS84
33	CW-12	Mine Discharge	8	Cottonwood Ck	TRC + DIS	Mine #2 Drainage upstream of Ladd Coulee confluence	-111.164688	47.35352098
34	CW-13	Surface Water	---	Cottonwood Ck	TRC	Ladd Coulee upstream of Cottonwood Ck confluence below USGS 8 confluence	-111.164639	47.35558201
35	CW-14	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck below Ladd Coulee	-111.164699	47.35590898
36	CW-15	Surface Water	2	Cottonwood Ck	TRC	Cottonwood Ck upstream of No.5 Coulee	-111.158806	47.36891703
37	CW-16	Surface Water	---	Cottonwood Ck	TRC	Cottonwood Ck downstream of No.5 Coulee confluence	-111.15846	47.37090999
38	B-1	Surface Water	---	Belt Ck	None[4]	Lewis Coulee upstream of discharge	-110.919657	47.38617897
39	B-2	Mine Discharge	21	Belt Ck	TRC + DIS	Mine Portal Discharge to Lewis Coulee	-110.919766	47.38614997
40	B-3	Mine Discharge	---	Belt Ck	TRC + DIS	Lewis Coulee above collection drain	-110.920412	47.38596397
41	B-4	Mine Discharge	---	Belt Ck	TRC + DIS	Lewis Coulee outfall to Belt Ck	-110.924286	47.38804696
42	B-5	Mine Discharge	13	Belt Ck	TRC + DIS	Upstream of Castner Park	-110.922263	47.38491104
43	B-6	Mine Discharge	---	Belt Ck	TRC + DIS	Open ditch at Castner Park	-110.924543	47.38417301
44	B-7	Mine Discharge	11	Belt Ck	TRC + DIS	Pipe Discharge Above French Coulee Wetlands	-110.929312	47.37779397
45	B-8	Mine Discharge	12	Belt Ck	TRC + DIS	MDT outfall adjacent to French Coulee wetlands	-110.929159	47.37787996
46	B-9	Mine Discharge	---	Belt Ck	TRC + DIS	Flat Ditch below USGS 11&12	-110.928425	47.37885
47	B-10	Mine Discharge	---	Belt Ck	TRC + DIS	Flat Ditch upstream of Anaconda Drain	-110.929092	47.38096199
48	B-11	Mine Discharge	---	Belt Ck	None[5]	Anaconda Mine Drain	-110.929149	47.38102997
49	B-12	Mine Discharge	---	Belt Ck	TRC + DIS	Flat Ditch below Anaconda Drain after Culvert at Road Crossing	-110.929064	47.38131302
50	B-13	Mine Discharge	56	Belt Ck	TRC + DIS	Flat Ditch Outfall to Belt Ck	-110.928111	47.38231399
51	B-14	Surface Water	---	Belt Ck	TRC	Belt Ck upstream of Belt	-110.922236	47.37775298
52	B-15	Surface Water	---	Belt Ck	TRC	Belt Ck below footbridge	-110.927991	47.38597596
53	B-16	Surface Water	---	Belt Ck	TRC	Belt Ck downstream of Belt and Lewis Coulee	-110.924124	47.39100401

NOTES:
Monitoring sites established on August 31 and September 1, 2011.
1 Coordinates collected from handheld GPS in the field.
2 TRC and DIS samples collected since not commingled with receiving water.
3 SC6 and SC5 were very close together; SC6 not sampled as a result.
4 No flow, few depressions in channel with water.
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6 USGS 5 located at lower end of flat ditch now also receives water seasonally from French Coulee sources, which discharged to alternate location during USGS study

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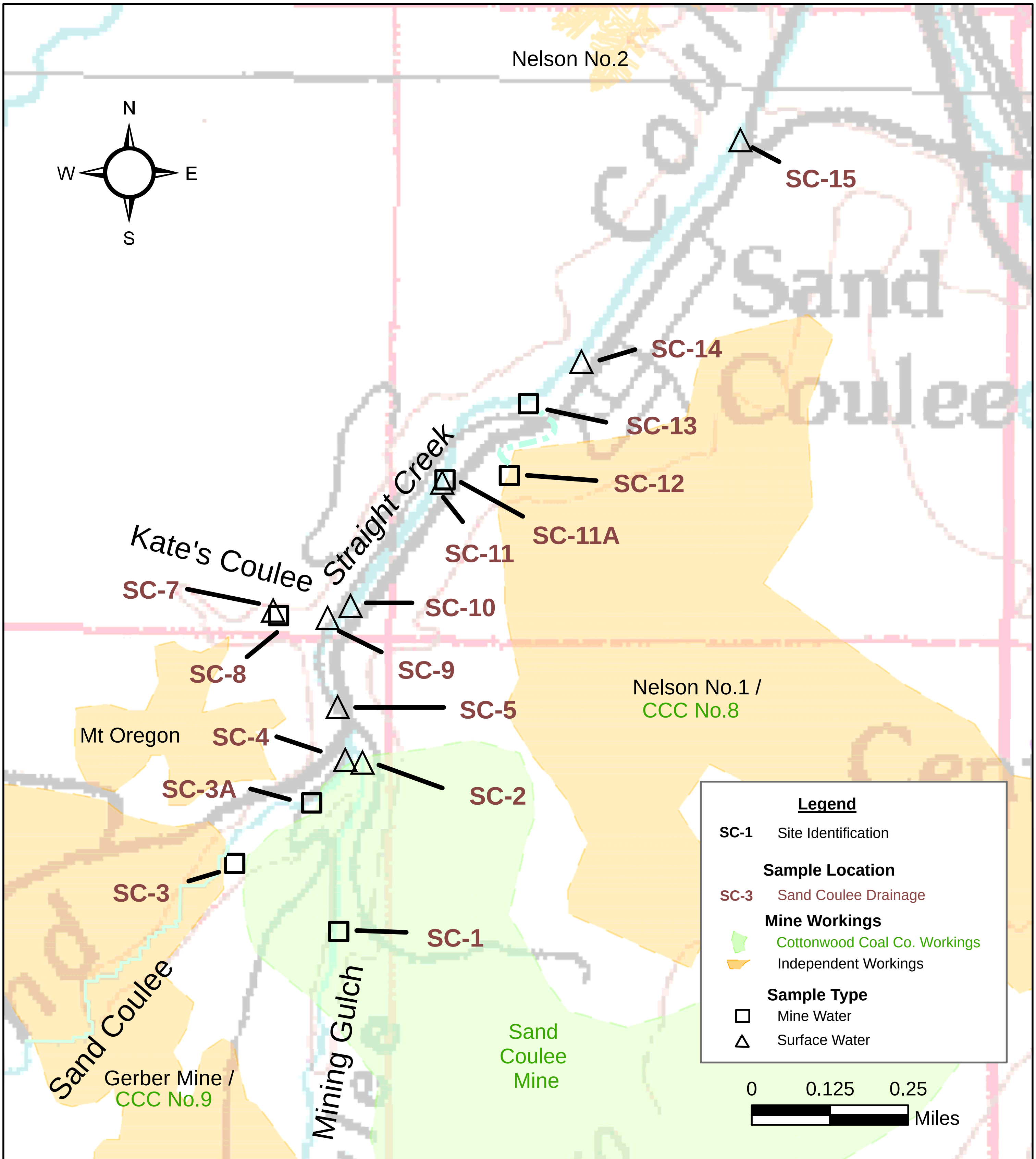

GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	AUGUST / SEPTEMBER 2011 SAMPLING LOCATIONS SAND COULEE AREA	FIGURE 3-1

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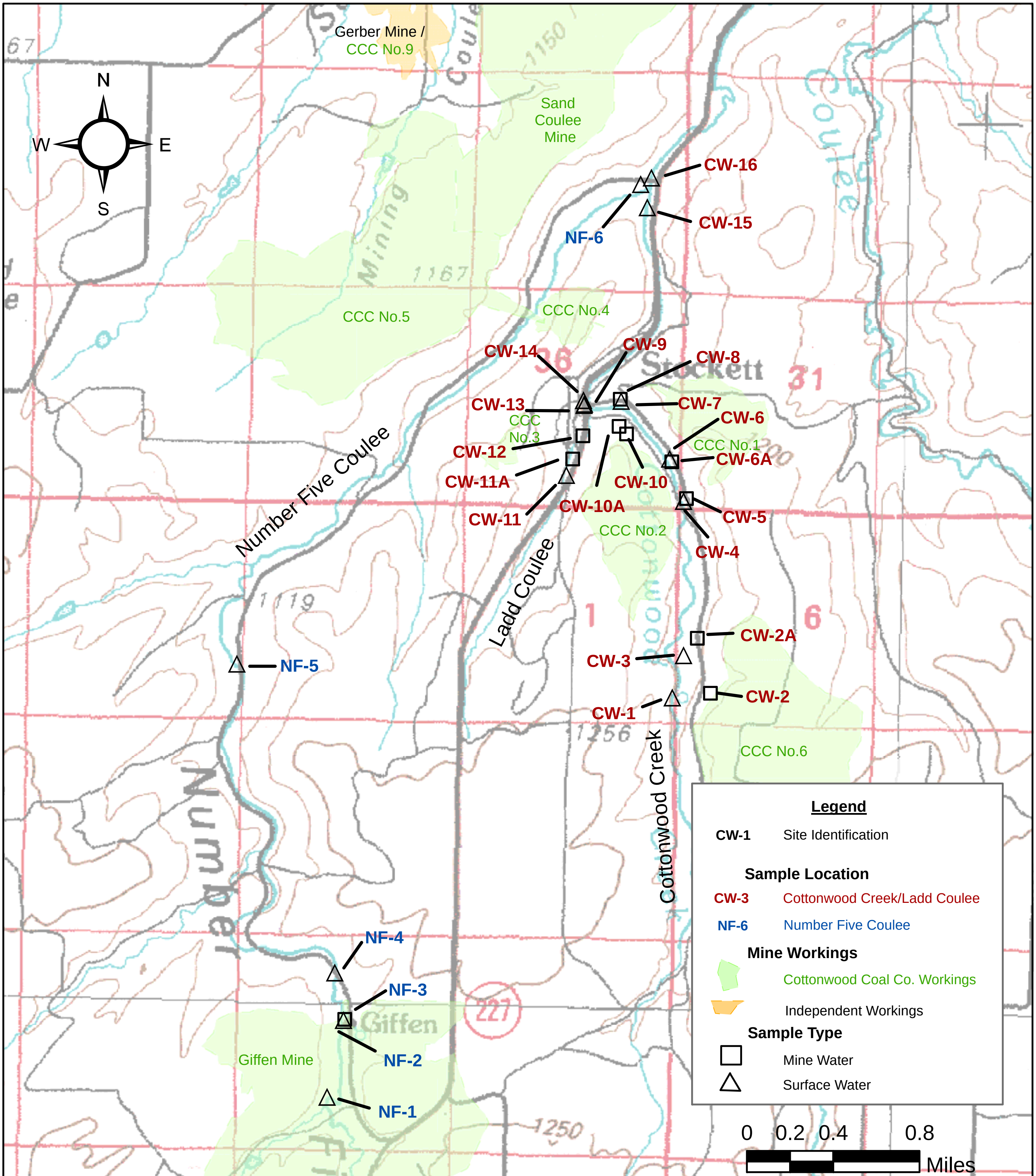

GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	AUGUST/SEPTEMBER 2011 SAMPLING LOCATIONS COTTONWOOD COULEE AND NUMBER FIVE COULEE	FIGURE 3-2

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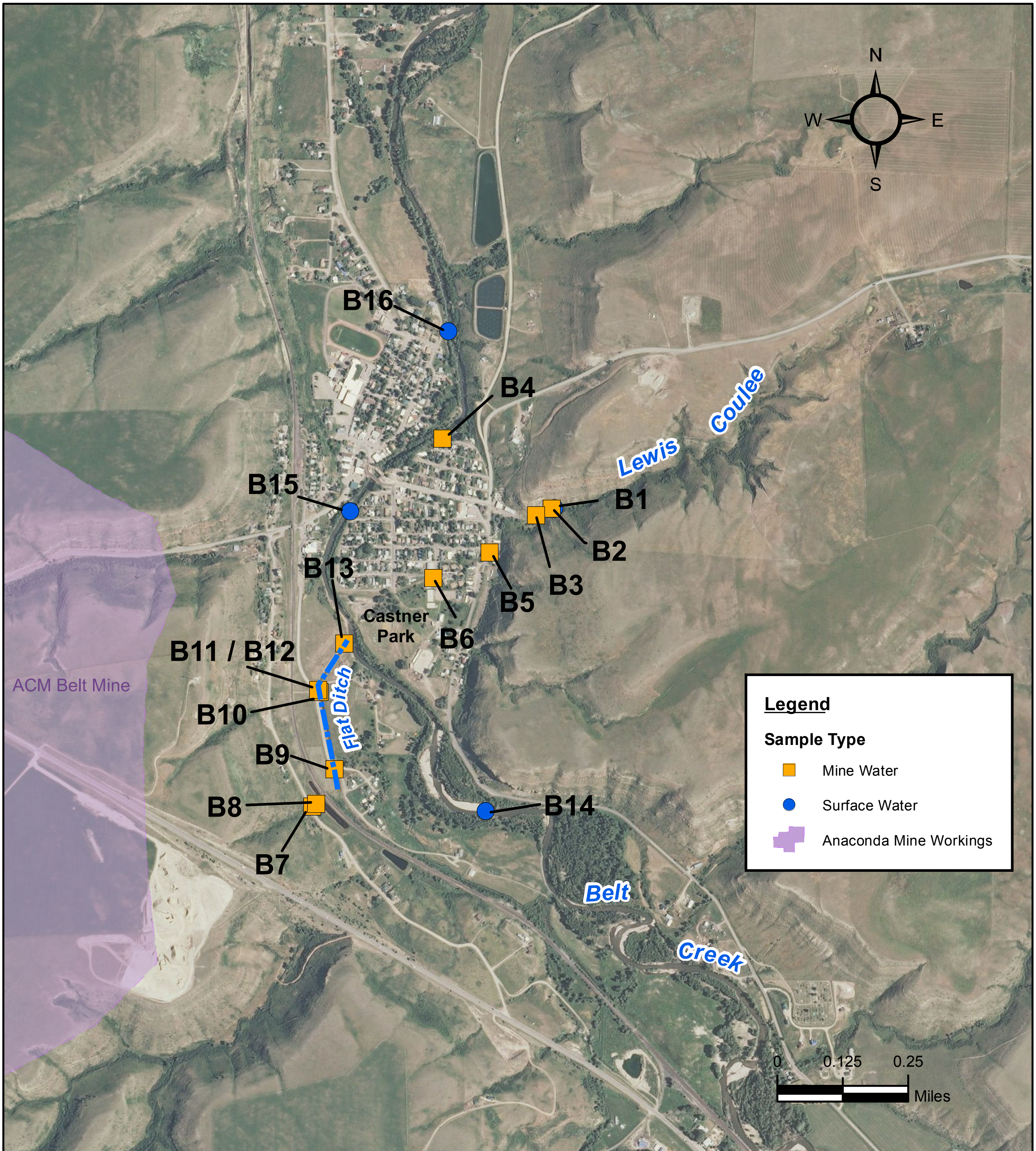
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD
WATER TREATMENT ASSESSMENT

AUGUST / SEPTEMBER 2011
SAMPLING LOCATIONS
BELT AREA

FIGURE
3-3

V:\11033\GIS\Fig 3-3 Belt Sites.mxd

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trends while minimizing the effects of temporal variability. Field parameters were sampled at the downstream sampling location at the beginning and end of each day to assess the amount of temporal variability over the course of the day.

Flow data were collected using a range of techniques depending on site conditions at individual sampling sites and included: Marsh-McBirney current meter and wading rod, culvert area and velocity calculations (area-velocity method), a flume or weir (stage-discharge), a stopwatch and bucket (volumetric method), or visual estimation. In the case of site B-16 (downstream monitoring site in Belt Creek), the water was too deep for safe wading, therefore a combination of velocity measurements near the bank with the Marsh McBirney and estimation of depths and widths were used to derive a reasonable flow estimate. The sampling and analysis plan (SAP) for this project (Hydrometrics, 2011) provides additional detail regarding flow measurement techniques. The SAP is included in electronic format on a compact disk in Appendix H.

Water quality monitoring consisted of the measurement of field parameters, including flow, water temperature, pH, oxidation-reduction potential (ORP), specific conductance (SC) and iron speciation (Fe^{2+}/Fe^{3+}). Water quality samples were collected at each site identified in the SAP for laboratory analysis of pH, SC, total dissolved solids (TDS), total suspended solids (TSS), common ions, and total recoverable (TRC) metals. Samples from the mine water discharge sites were also analyzed for dissolved (DIS) metals. The analytical parameter list and specified detection limits are summarized in Table 3-2.

Flow data was collected at six additional sites which are designated on Table 3-1 with an A after the site name. These sites were not identified in the original SAP but were included to assess whether there were any significant changes in flow rates between established monitoring sites. Water quality data was not collected at these locations. Sampling protocol is described in detail in the SAP.

TABLE 3-2. PARAMETER LIST FOR WATER SAMPLES

Parameter (1)	Analytical Method (2)	Project-Required Detection Limit (mg/L)	DEQ-7 Chronic Aquatic Life Standard (mg/L) (3)	DEQ-7 Human Health Standard (mg/L)
Physical Parameters				
pH		--	--	--
SC		--	--	--
TDS	SM 2540C	--	--	--
TSS		--	--	--
Common Ions				
Total Alkalinity	SM 2320B	4	--	--
Total Acidity		--	--	--
Sulfate	300.0	1	--	--
Chloride	300.0/SM 4500CL-B	1	--	--
Fluoride	A4500-F C	0.1	--	4.0
Calcium	215.1/200.7	1	--	--
Magnesium	242.1/200.7	1	--	--
Sodium	273.1/200.7	1	--	--
Potassium	258.1/200.7	1	--	--
Trace Metals (Total Recoverable)				
Aluminum (Al)	200.7/200.8	0.03	--	--
Antimony (Sb)	200.7/200.8	0.003	--	0.0056
Arsenic (As)	200.8/SM 3114B	0.003	0.150	0.01
Barium (Ba)	200.7/200.8	0.005	--	1.0
Beryllium (Be)	200.7/200.8	0.001	--	0.004
Cadmium (Cd)	200.7/200.8	0.00008	0.0005 +	0.005
Chromium (Cr)	200.7/200.8	0.001	--	0.1
Copper (Cu)	200.7/200.8	0.001	0.0204 +	1.3
Iron (Fe)	200.7/200.8	0.03	1.0	0.3 #
Lead (Pb)	200.7/200.8	0.0005	0.0102 +	0.015
Manganese (Mn)	200.7/200.8	0.005	--	0.05 #
Mercury (Hg)	245.2/245.1/200.8/SM 3112B	0.00001	0.00091	0.00005
Nickel (Ni)	200.7/200.8	0.01	0.1132 +	0.1
Selenium (Se)	200.7/200.8/SM 3114B	0.001	0.005	0.05
Silver (Ag)	200.7/200.8	0.0005	--	0.1
Strontium (Sr)	200.7/200.8	0.1	--	4.0
Thallium (Tl)	200.7/200.8	0.0002	--	0.00024
Zinc (Zn)	200.7/200.8	0.01	0.2604 +	2.0
Trace Metals (Dissolved) (4)				
Aluminum (Al)	200.7/200.8	0.03	0.087 (5)	--
Arsenic (As)	200.8/SM 3114B	0.003	--	--
Copper (Cu)	200.7/200.8	0.001	--	--
Iron (Fe)	200.7/200.8	0.03	--	--
Nickel (Ni)	200.7/200.8	0.01	--	--
Zinc (Zn)	200.7/200.8	0.01	--	--

(1) Mine water samples analyzed for full parameter list; Surface water samples analyzed for all parameters but dissolved metals.
(2) Analytical methods are from Standard Methods for the Examination of Water and Wastewater (SM) or EPA's Methods for Chemical Analysis of Water and Waste (1983).
(3) Surface water standards for metals and metalloids are based on total recoverable concentrations, except aluminum, which is based on dissolved concentrations.
(4) Samples analyzed for dissolved constituents field-filtered through a 0.45 μm filter.
(5) Dissolved aluminum standards are applicable to pH 6.5 to 9.0 only.
 # = narrative standard (guidance level given based on Secondary Federal MCL).
+ = hardness dependent parameter; values shown for a hardness of 250 mg/L.
mg/L = milligrams per liter

3.2 MONITORING RESULTS

3.2.1 Flow

Flow measurements from mine discharges collected during the August/September 2011 sampling event are summarized in Table 3-3 where they are compared to historical flow data. As shown in the table, measured mine discharge rates at most sites were higher than the historical data, due to above average precipitation in the late spring of 2011. Five monitoring sites had discharge rates above the maximum values shown in the historical data set (Table 3-3, Appendix B), including the Anaconda Mine Drain at Belt, Giffen Spring in Number Five Coulee, and Mining Coulee in Sand Coulee. In contrast, mine discharges from both the Lewis Gulch mine site and the mine discharge site above Castner Park in Belt had flow rates at or below the historical average.

The drainage with the greatest discharge rate of AMD was Number Five Coulee (Giffen Spring) at 256 gpm, followed by Belt at 241 gpm, Sand Coulee at 214 gpm and finally Cottonwood Coulee at 50 gpm. Mine discharges in the Sand Coulee area were particularly high during the August/September 2011 sampling event compared to historical averages with a total measured discharge rate of approximately 3.5 times the historical average. Table 3-4 presents the flow data from mine discharges and receiving waters measured during the August/September 2011 sampling event. Measured flows are also depicted on the site maps in Appendix C – Figures C-1, C-6, and C-11.

3.2.2 Water Quality

Water quality results for the August/September 2011 sampling event are tabulated in Table 3-4 with applicable water quality standards provided in Table 3-5. All mine discharge water quality is characterized by low pH (typically in the 2.5 range) with elevated iron, aluminum and sulfate concentrations. Iron is typically present in reduced form (Fe^{+2}) within the mine discharges, but is rapidly oxidized to Fe^{+3} in receiving waters. For example, during the August/September 2011 sampling event the majority of the dissolved iron in the Sand Coulee mine discharges was present in the form of Fe^{+2} (64-96%), but the percentage of Fe^{+2}

TABLE 3-3. SUMMARY OF MINE DISCHARGE FLOW RESULTS (GPM)

Site No.	Description	Measured Flow Rate	Historical Flow Rate[1] Min	Avg	Max	75th Percentile Flow
SC-1	Mining Coulee above Sand Coulee (USGS 14)	65	0.2	6.6	18	9
SC-3	Sand Coulee above Sand Coulee (USGS 16)	35	0	13	49	20
SC-3A	Unnamed Discharge site below SC-3	42	NM	NM	NM	NM
SC-8	Oregon Mine in Kate's Coulee (USGS 19)	50	9	30	81	36
SC-12	Nelson Mine at Sand Coulee	22	5	12	36	14
Sand Coulee Total		**214**	**14**	**61**	**184**	**79**
CW-2	Cottonwood No.2 Drain (USGS 7)	38	8	19	67	21
CW-8	Cottonwood No.1 Seepage	1.3	NM	NM	NM	NM
CW-12	Cottonwood No.2 Discharge	11	0	9	45	14
Cottonwood Coulee Total		**50**	**8**	**28**	**112**	35
NF-3	Giffen Spring in No.5 Coulee	256	128	208	247	238
Number 5 Coulee Total		**256**	**128**	**208**	**247**	**238**
B-2	Lewis Gulch (USGS 21)	3	0	18	135	4
B-5	Mine drain above Castner Park (USGS 13)	5	0	5	14	5
B-7	French Coulee Wetlands Inflow (USGS 11)	6	14	24	54	27
B-8	French Coulee Wetlands Inflow #2 (USGS 12)	19	14	24	54	14
B-11	Anaconda Mine Drain	208	67	105	155	126
B-13 [2]	Flat Ditch Outfall (USGS 5)	135	99	114	129	121
Belt Creek Total		**241**	**95**	**176**	**411**	**176**

Notes
(1) See Historical Data Set in Appendix B
(2) B-13 is fed by B-7, B-8, and B-11
NM = Not Measured

TABLE 3-4. FLOW, WATER QUALITY RESULTS AND REGULATORY EXCEEDENCES FOR AUGUST/SEPTEMBER 2011

Site Code	Sample Number	Lab ID	Date	Time	Flow (gpm)	Field Water Temp	Field SC	Field Dissolved Oxygen	Field pH	Field Oxidation Reduction Potential	Field FE +2	Field TOTAL FE	Lab pH (SU)	Conductivity (umhosmos/cm)	Solids, Total Suspended TSS @ 105 C	Solids, Total Dissolved TDS @ 180 C	Acidity, Total as CaCO3	Alkalinity, Total as CaCO3	Chloride	Sulfate	Fluoride	Calcium	Magnesium	Hardness (calculated)	Potassium
B-1	Not Sampled	Not Sampled	9/1/2011		0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-2	GFCF-1108-223	H11090035-024	9/1/2011	13:15	3	11.81	4428	0.05	2.93	359.1	375	390	3	3020	84	4800	2200	4 <	20	3300	3	192	131	1019	7
B-3	GFCF-1108-222	H11090035-023	9/1/2011	12:50	5[e]	15.49	4109	6.14	3.12	401.9	380	420	3	3380	14	5490	2500	4 <	13	3700	3	199	133	1044	6
B-4	GFCF-1108-226	H11090035-027	9/1/2011	14:50	6	14.28	4117	7.43	2.81	480.9	74	286	2.8	3390	26	5630	2600	4 <	15	3900	4	214	140	1111	6
B-5	GFCF-1108-224	H11090035-025	9/1/2011	13:50	5[e]	11.73	4953	0.84	2.4	437	370	510	2.5	4000	10 <	5490	3200	4 <	10	3900	3	133	93	715	1 <
B-6	GFCF-1108-225	H11090035-026	9/1/2011	14:10	5[e]	18.9	4522	3.16	2.46	592.9	40	270	2.4	3720	68	5360	2900	4 <	11	3800	3	140	95	741	1 <
B-7	GFCF-1108-220	H11090035-021	9/1/2011	10:35	6	10.88	5633	2.68	2.3	471	220	600	2.5	4480	14	7110	3700	4 <	23	4800	6	239	97	996	1 <
B-8	GFCF-1108-219	H11090035-020	9/1/2011	9:20	19	11.2	5483	0.12	2.49	423.7	930	1200	2.7	4340	28	7330	4100	4 <	20	5000	3	153	79	707	3
B-9	GFCF-1108-218	H11090035-019	9/1/2011	9:30	15	11.23	5001	5.25	2.59	450	520	900	2.6	4000	10 <	7260	4200	4 <	28	4900	4	162	81	738	2
B-10	GFCF-1108-217	H11090035-018	9/1/2011	8:40	0	12.65	4922	6.86	2.44	609.2	166	1040	2.4	4080	18	7940	4200	4 <	32	5100	4	175	87	795	2
B-11	Not Sampled	Not Sampled	9/1/2011	8:30	208	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-12	GFCF-1108-216	H11090035-017	9/1/2011	8:15	Note [1]	10.1	3325	1.95	2.48	446.5	174	222	2.6	2680	10 <	3140	1500	4 <	7	2200	4	152	66	651	1
B-13	GFCF-1108-214	H11090035-015	9/1/2011	7:30	135	10.04	3215	5.47	2.47	458.8	140	190	2.8	2610	14	3270	1700	4 <	6	2200	4	153	66	654	1
B-13 DUPLICATE	GFCF-1108-215	H11090035-016	9/1/2011	7:40	135	--	--	--	--	--	--	--	2.8	2610	12	3160	1600	4 <	6	2200	4	155	67	663	1
B-14	GFCF-1108-221	H11090035-022	9/1/2011	11:30	38047	13.02	591	8.87	7.8	316	0.03 <	0.11	7.4	509	10	362	4 <	190	2	120	0.2	79	22	288	2
B-15	GFCF-1108-227	H11090035-028	9/1/2011	16:30	41379	15.74	591	8.62	8.01	280	0.03 <	0.73	7.6	511	14	366	4 <	190	2	120	0.2	74	21	271	2
B-16	GFCF-1108-228	H11090035-029	9/1/2011	17:00	43800[e]	15.6	595	8.47	7.98	261.9	0.27	0.74	8.1	516	18	380	4 <	190	2	130	0.2	76	22	280	2
CW-1	GFCF-1108-114	H11090034-015	8/31/2011	20:00	309	13.23	593	8.9	8.23	312	0.08	0.34	8.6	513	56	354	4 <	300	5	25	0.5	57	32	274	3
CW-2	GFCF-1108-112	H11090034-013	8/31/2011	18:45	38	9.98	6495	13.6	2.51	408.3	720	800	2.7	5110	18	8340	4000	4 <	2 <	6000	9	351	141	1457	6
CW-2A	Not Sampled	Not Sampled	8/31/2011	19:00	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-3	GFCF-1108-113	H11090034-014	8/31/2011	19:30	243	13.52	679	10.91	7.97	368.4	0.09	1.07	8.4	557	102	370	4 <	310	5	46	0.5	61	34	292	3
CW-4	GFCF-1108-111	H11090034-012	8/31/2011	18:00	192	14.87	659	9.71	8.43	418.7	0.04	0.48	8.6	555	60	346	4 <	310	5	39	0.5	63	36	306	3
CW-5	GFCF-1108-110	H11090034-011	8/31/2011	17:30	31	17.54	5649	9.42	2.66	560.7	19	680	2.7	4580	18	8870	4500	4 <	6	6100	9	362	134	1456	4
CW-6	GFCF-1108-109	H11090034-010	8/31/2011	16:45	234	16.05	1271	12.09	4.23	426.8	2.04	93.67	4.2	1040	346	1070	290	4 <	5	760	2	94	48	432	3
CW-6A	Not Sampled	Not Sampled	8/31/2011	17:00	0.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-7	GFCF-1108-108	H11090034-009	8/31/2011	16:50	179	15.87	1182	10.35	4.36	464.2	1.34	89	4.3	982	424	988	250	4 <	4	680	1	93	48	430	3
CW-8	GFCF-1108-107	H11090034-008	8/31/2011	16:20	1	16.36	13637	8.96	2.22	550.6	830	1960	2.2	12700	237	29300	17000	4 <	10 <	21000	15	279	265	1788	1 <
CW-9	GFCF-1108-102	H11090034-003	8/31/2011	11:30	195	13.97	1332	10.02	4.37	340.8	6.5	100.5	4.2	1080	430	1120	320	4 <	4	800	2	103	52	471	4
CW-10	GFCF-1108-104	H11090034-005	8/31/2011	13:40	11	12.48	10962	10.43	2.03	474.9	550	1670	2.2	12100	67	16900	11000	4 <	7	13000	13	275	151	1308	1 <
CW-10 DUPLICATE	GFCF-1108-105	H11090034-006	8/31/2011	13:50	11	--	--	--	--	--	--	--	2.2	11900	53	16800	10000	4 <	5 <	13000	9	248	148	1229	1 <
CW-10A	Not Sampled	Not Sampled	8/31/2011	13:00	3[e]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-11	GFCF-1108-106	H11090034-007	8/31/2011	14:45	11	14.6	925	9.53	8.14	386.4	0.32	2.16	7.9	763	168	534	4 <	290	16	140	0.7	70	60	422	4
CW-11A	Not Sampled	Not Sampled	8/31/2011	14:40	5[e]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-12	GFCF-1108-103	H11090034-004	8/31/2011	12:30	11	19.23	9753	7.03	2.31	508.4	220	1840	2.3	11000	127	18100	10000	4 <	13	13000	15	295	164	1412	1 <
CW-13	GFCF-1108-101	H11090034-002	8/31/2011	11:15	33	17.41	5809	9.28	2.62	518.1	90	770	2.6	4640	26	9440	5000	4 <	6	6600	9	173	101	848	2
CW-14	GFCF-1108-100	H11090034-001	8/31/2011	9:50	215	12.99	1984	9.21	3.18	497	14	145	3	1730	524	1860	790	4 <	4	1400	2	109	53	490	3
CW-15	GFCF-1108-117	H11090034-018	9/1/2011	9:15	180	11.92	1875	17.04	3.09	484.6	18	176	3.3	1570	496	1700	670	4 <	4	1300	2	104	53	478	4
CW-16	GFCF-1108-115	H11090034-016	9/1/2011	7:30	423	12.08	1604	10.4	3.37	438.1	10	94.5	3.6	1300	298	1410	440	4 <	4	1000	2	113	51	492	4
NF-1	GFCF-1108-123	H11090034-024	9/1/2011	13:30	201	17.41	598	12.23	8.68	120.8	0.02	0.12	8.6	508	10 <	350	4 <	320	4	24	0.5	48	32	252	4
NF-2	GFCF-1108-122	H11090034-023	9/1/2011	12:30	403	12.92	1152	12.16	7.1	-67.4	5.3	13.5	7.7	969	42	792	4 <	250	5	410	0.8	139	47	541	5
NF-3	GFCF-1108-120	H11090034-021	9/1/2011	12:00	256	9.46	2023	14.93	3.17	365	180	202	3.2	1660	10 <	1970	790	4 <	4	1400	3	143	49	559	4
NF-3 DUPLICATE	GFCF-1108-121	H11090034-022	9/1/2011	12:10	256	--	--	--	--	--	--	--	3.3	1710	10 <	1970	810	4 <	4	1400	3	142	49	556	5
NF-4	GFCF-1108-119	H11090034-020	9/1/2011	11:00	463 [2]	11.32	1268	13.67	6.52	-22	40.5	52	6.9	1060	136	994	11	52	4	660	0.6	137	46	531	5
NF-5	GFCF-1108-118	H11090034-019	9/1/2011	10:00	810	11.36	1163	13.18	6.72	64.1	1.2	33	7.2	972	176	886	27	23	5	620	0.6	138	48	542	5
NF-6	GFCF-1108-116	H11090034-017	9/1/2011	8:30	191	12.4	1269	11.98	4.38	289.8	17	40	4.5	1080	128	1090	130	4 <	4	770	2	126	48	512	5
SC-1	GFCF-1108-213	H11090035-014	8/31/2011	18:45	65	12.42	9704	0.19	2.37	434.7	1210	1900	2.5	11200	63	19200	12000	4 <	10 <	13000	15	236	195	1392	1 <
SC-2	GFCF-1108-212	H11090035-013	8/31/2011	18:05	70	15	8617	4.31	2.53	451.4	1040	2090	2.5	9430	33	18300	11000	4 <	13	12000	17	232	179	1316	1 <
SC-3	GFCF-1108-200	H11090035-001	8/31/2011	11:15	35	10.76	6706	0.28	2.34	397	410	540	2.5	5640	10	9790	5500	4 <	10	6800	8	223	141	1137	1 <
SC-3A	Not Sampled	Not Sampled	8/31/2011	11:30	42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SC-4	GFCF-1108-211	H11090035-012	8/31/2011	17:55	81	13.1	5703	4.5	2.62	436.1	740	770	2.7	4860	12	9380	4800	4 <	10	6200	8	239	142	1181	1 <
SC-5	GFCF-1108-210	H11090035-011	8/31/2011	17:30	155	14.4	6980	4.15	2.62	447.5	640	1360	2.6	5760	14	13500	7300	4 <	5 <	8800	9	205	152	1138	1 <
SC-7	GFCF-1108-208	H11090035-009	8/31/2011	16:20	3	15.15	859	6.49	7.78	221	0.27	0.3	8.5	768	80	494	4 <	470	18	33	1	51	77	444	12
SC-8	GFCF-1108-209	H11090035-010	8/31/2011	16:30	50	11.84	2947	0.8	3.76	327	220	230	3.6	2580	10	4060	1900	4 <	7	2600	4	171	121	925	4
SC-9	GFCF-1108-207	H11090035-008	8/31/2011	16:10	46	13.06	2774	8.06	3.85	351.8	160	170	3.4	2470	30	3620	1500	4 <	7	2400	2	166	120	909	4
SC-10	GFCF-1108-206	H11090035-007	8/31/2011	15:20	208	15.14	6014	4.57	2.69	454.2	440	980	2.7	5070	24	10700	6200	4 <	10	7000	9	174	123	941	1
SC-11	GFCF-1108-205	H11090035-006	8/31/2011	14:30	173	17.78	5930	3.26	2.65	469.6	290	1010	2.6	4600	42	11100	5900	4 <	5 <	7300	9	205	147	1117	1
SC-11A	Not Sampled	Not Sampled	8/31/2011	14:45	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SC-12	GFCF-1108-204	H11090035-005	8/31/2011	14:10	22	11.25	9176	1.55	2.28	425.3	1590	2060	2.5	9740	50	16500	9200	4 <	5 <	11000	16	221	188	1326	1 <
SC-13	GFCF-1108-203	H11090035-004	8/31/2011	13:40	8	20.5	8125	4.37	2.57	452.5	710	1630	2.6	9880	54	17500	9100	4 <	5	11000	18	278	217	1588	1 <
SC-14	GFCF-1108-202	H11090035-003	8/31/2011	13:00	186	16.83	5879	3.34	2.66	476.5	250	1110	2.6	5020	32	11500	6300	4 <	5 <	7700	9	184	134	1011	1 <
SC-15	GFCF-1108-201	H11090035-002	8/31/2011	12:40	186	15.2	5776	5.87	2.58	533.4	80	1100	2.6	4930	32	11500	6400	4 <	5 <	7700	9	201	150	1119	1

Notes:
DEQ-7 dissolved Aluminum apply to pH between 6.5 and 9.0 only.
Values highlighted in yellow represent DEQ-7 Human Health Exceedences.
Bold values represent DEQ-7 Aquatic Life Exceedences.
Results are in milligrams / liter (mg/L) unless otherwise indicated.

1 Flow and Water Quality are the same as B-11
2 Flow may be underestimated due to poor gaging conditions.
e = estimate
SU = Standard Units

umhosmos/cm = micromhos per centimeter
DIS = dissolved
TRC = total recoverable
gpm = gallons per minute

Notes:
DEQ-7 dissolved Aluminum apply to pH between 6.5 and 9.0 only.
Values highlighted in yellow represent DEQ-7 Human Health Exceedences.
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gpm = gallons per minute

TABLE 3-4. FLOW, WATER QUALITY RESULTS AND REGULATORY EXCEEDENCES FOR AUGUST/SEPTEMBER 2011

Site Code	Sodium	Aluminum DIS	Aluminum TRC	Antimony TRC	Arsenic DIS	Arsenic TRC	Barium TRC	Beryllium TRC	Cadmium TRC	Chromium TRC	Copper DIS	Copper TRC	Iron DIS	Iron TRC	Lead TRC	Manganese TRC	Mercury TRC	Nickel DIS	Nickel TRC	Selenium TRC	Silver TRC	Strontium TRC	Thallium TRC	Zinc DIS	Zinc TRC
B-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-2	27	244	242	0.003 <	0.004	0.006	0.016	0.019	**0.0268**	0.1	0.31	**0.332**	339	**359**	0.0082	1.94	0.00001	1.19	**1.19**	0.002	0.0005 <	1.3	0.0017	3.56	**3.56**
B-3	24	289	289	0.003 <	0.005	0.005	0.013	0.017	**0.0302**	0.098	0.355	**0.352**	358	**363**	0.0057	1.92	0.00001	1.37	**1.38**	0.002	0.0005 <	1.3	0.002	4.1	**4.15**
B-4	24	298	299	0.003 <	0.004	0.004	0.015	0.024	**0.0291**	0.078	0.333	**0.325**	263	**272**	0.0068	2.47	0.00001 <	1.41	**1.43**	0.002	0.0005 <	1.3	0.0018	4.22	**4.3**
B-5	22	279	270	0.003 <	0.004	0.004	0.005 <	0.022	**0.0612**	0.187	0.234	**0.232**	439	**433**	0.0005 <	0.685	0.00001	1.74	**1.73**	0.003	0.0005 <	1.1	0.0008	6.2	**5.39**
B-6	22	274	278	0.003 <	0.004	0.004	0.005 <	0.023	**0.0625**	0.187	0.208	**0.211**	328	**354**	0.0006	0.733	0.00001	1.67	**1.65**	0.003	0.0005 <	1.1	0.0007	5.54	**5.49**
B-7	14	363	354	0.003 <	0.006	0.005	0.005 <	0.038	**0.013**	0.158	0.166	**0.161**	566	**558**	0.0005 <	0.734	0.00001	0.94	**0.89**	0.004	0.0005 <	2.2	0.0007	4.16	**4.21**
B-8	15	364	360	0.003 <	0.053	0.052	0.005 <	0.035	**0.0106**	0.152	0.12	**0.122**	798	**800**	0.0086	0.481	0.00001	0.69	**0.68**	0.004	0.0006 <	1.2	0.0026	2.94	**2.94**
B-9	15	360	362	0.003 <	0.047	0.047	0.005 <	0.035	**0.011**	0.158	0.13	**0.133**	764	**764**	0.0076	0.506	0.00001	0.75	**0.75**	0.004	0.0006 <	1.3	0.0024	3.32	**3.34**
B-10	16	384	381	0.003 <	0.027	0.027	0.005 <	0.037	**0.0116**	0.16	0.144	**0.142**	692	**685**	0.0068	0.541	0.00001 <	0.76	**0.75**	0.004	0.0006 <	1.4	0.0021	3.55	**3.78**
B-11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-12	10	147	135	0.003 <	0.005	0.005	0.005 <	0.022	**0.0198**	0.081	0.133	**0.132**	198	**179**	0.0012	0.504	0.00001	1.24	**1.31**	0.002 <	0.0005 <	1.3	0.0009	5.17	**5.38**
B-13	10	147	136	0.003 <	0.005	0.005	0.005 <	0.021	**0.0196**	0.082	0.13	**0.134**	199	**180**	0.0012	0.504	0.00001 <	1.17	**1.05**	0.002 <	0.0006 <	1.3	0.0009	5.21	**5.41**
B-13 DUPLICATE	10	149	135	0.003 <	0.004	0.005	0.005 <	0.021	**0.0192**	0.081	0.129	**0.132**	200	**178**	0.0012	0.5	0.00001 <	1.2	**1.32**	0.002 <	0.0006 <	1.3	0.0009	5.07	**5.13**
B-14	6		0.15	0.003 <		0.003 <	0.104	0.001 <	0.00008 <	0.001 <		0.001		0.19	0.0006	0.014	0.00001 <		0.01 <	0.001 <	0.0005 <	1.3	0.0002 <		0.01 <
B-15	6		0.88	0.003 <		0.003 <	0.109	0.001 <	0.00013	0.001 <		0.002		0.86	0.0005 <	0.014	0.00001 <		0.01 <	0.001 <	0.0005 <	1.2	0.0002 <		0.03
B-16	6		0.94	0.003 <		0.003 <	0.11	0.001 <	0.00016	0.001		0.006		0.98	0.0007	0.018	0.00001 <		0.01 <	0.001 <	0.0005 <	1.2	0.0002 <		0.03
CW-1	10		0.84	0.003 <		0.003 <	0.304	0.001 <	0.00008 <	0.001		0.003		0.95	0.001	0.059	0.00001 <		0.01 <	0.001 <	0.0005 <	0.3	0.0002 <		0.01 <
CW-2	14	390	384	0.003 <	0.01	0.01	0.005 <	0.105	**0.119**	0.07	0.246	**0.248**	854	**848**	0.0005	2.64	0.00002	11.4	**11.2**	**0.007**	0.0006 <	1.4	0.0033	49.5	**47.6**
CW-2A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-3	10		2.46	0.003 <		0.003 <	0.329	0.001 <	0.00026	0.001		0.003		**2.35**	0.0018	0.345	0.00001 <		0.03	0.001 <	0.0005 <	0.3	0.0002 <		0.11
CW-4	11		1.29	0.003 <		0.003 <	0.302	0.001 <	0.00012	0.001 <		0.002		**1.34**	0.0009	0.103	0.00001 <		0.01	0.002 <	0.0006 <	0.3	0.0002 <		0.04
CW-5	13	435	436	0.003 <	0.01	0.016	0.009	0.111	**0.136**	0.075	0.334	**0.336**	680	**726**	0.0031	2.72	0.00002	11.7	**12.5**	**0.009**	0.0006 <	1.3	0.003	51.4	**52.7**
CW-6	11		55.6	0.003 <		0.003 <	0.254	0.017	**0.0216**	0.01		**0.045**		**94.7**	0.0016	0.466	0.00001 <		**1.53**	0.002 <	0.0006 <	0.4	0.0005		**6.6**
CW-6A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-7	11		50.9	0.003 <		0.003 <	0.256	0.015	**0.0192**	0.01		**0.041**		**89.3**	0.0013	0.41	0.00001 <		**1.37**	0.002	0.0006 <	0.4	0.0004		**5.76**
CW-8	4	1660	1850	0.003 <	0.147	**0.152**	0.056	0.174	**0.49**	0.388	3.17	**3.26**	2140	**2400**	0.0034	20.6	0.00002	7.89	**8.78**	**0.055**	0.0006 <	0.9	0.0004	32.1	**35.3**
CW-9	11		54.9	0.003 <		0.003	0.232	0.013	**0.0202**	0.011		**0.052**		**105**	0.0014	0.475	0.00001 <		**1.29**	0.002 <	0.0006 <	0.5	0.0005		**5.44**
CW-10	7	944	1030	0.003 <	0.082	0.083	0.005 <	0.129	**0.308**	0.226	1.04	**1.05**	1380	**1460**	0.0048	3.05	0.00001	9.94	**10.9**	**0.02**	0.0006 <	0.7	0.003	44.2	**45.9**
CW-10 DUPLICATE	7	1040	1040	0.003 <	0.081	0.081	0.005 <	0.135	**0.298**	0.219	1.01	**1.03**	1370	**1470**	0.0047	3	0.00001	9.85	**10.9**	**0.019**	0.0006 <	0.7	0.0029	43.8	**45.8**
CW-10A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-11	17		1.69	0.003 <		0.003	0.188	0.001 <	0.00019	0.002		0.004		**3.35**	0.0029	0.369	0.00001		0.01 <	0.001 <	0.0005 <	0.4	0.0002 <		0.02
CW-11A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CW-12	7	975	1060	0.003 <	0.075	0.074	0.006	0.119	**0.298**	0.221	0.993	**1.02**	1390	**1450**	0.0042	3.67	0.00001	10.3	**11**	**0.02**	0.0006 <	0.8	0.0026	46.1	**47.2**
CW-13	12		495	0.003 <		0.04	0.062	0.069	**0.157**	0.114		**0.532**		**748**	0.003	2.05	0.00001		**5.12**	**0.011**	0.0006 <	0.6	0.0012		**21.8**
CW-14	11		98.2	0.003 <		0.007	0.224	0.02	**0.0374**	0.022		**0.103**		**175**	0.0019	0.624	0.00001 <		**1.62**	0.003	0.0006 <	0.5	0.0004		**6.9**
CW-15	11		90.7	0.003 <		0.006	0.24	0.019	**0.0333**	0.02		**0.088**		**158**	0.0021	0.7	0.00001 <		**1.47**	0.003	0.0006 <	0.4	0.0006		**6.22**
CW-16	14		58.8	0.003 <		0.005	0.153	0.011	**0.0157**	0.011		**0.064**		**100**	0.001	0.806	0.00001 <		**0.94**	0.002 <	0.0006 <	0.4	0.0005		**3.79**
NF-1	20		0.15	0.003 <		0.003 <	0.226	0.001 <	0.00008 <	0.001 <		0.001		0.22	0.0005 <	0.014	0.00001 <		0.01 <	0.001 <	0.0006 <	0.3	0.0002 <		0.01 <
NF-2	17		1.57	0.003 <		0.003 <	0.117	0.001 <	0.00057	0.001 <		0.001 <		**14.3**	0.0005 <	1.35	0.00002		**0.15**	0.001 <	0.0005 <	0.4	0.0002 <		**0.47**
NF-3	11	63.7	61.9	0.003 <	0.005	0.007	0.031	0.022	**0.0144**	0.007	0.133	**0.137**	198	**197**	0.0013	0.852	0.00001	0.94	**0.96**	0.002 <	0.0006 <	0.4	0.0011	4	**4.06**
NF-3 DUPLICATE	11	63.6	62.9	0.003 <	0.005	0.007	0.031	0.023	**0.0147**	0.008	0.139	**0.137**	196	**199**	0.0015	0.857	0.00001	0.92	**0.92**	0.002 <	0.0006 <	0.4	0.0012	4.08	**4.08**
NF-4	15		15.5	0.003 <		0.003 <	0.089	0.006	0.0039	0.002		**0.031**		**52.9**	0.0008	1.32	0.00001 <		**0.33**	0.002 <	0.0006 <	0.4	0.0005		**1.22**
NF-5	17		14.5	0.003 <		0.003 <	0.09	0.005	0.0036	0.002		0.027		**40.5**	0.0007	1.27	0.00001		**0.31**	0.002 <	0.0006 <	0.4	0.0005		**1.15**
NF-6	17		25.9	0.003 <		0.005	0.099	0.005	**0.0054**	0.005		**0.045**		**43.1**	0.0007	0.983	0.00001		**0.35**	0.002 <	0.0006 <	0.4	0.0004		**1.12**
SC-1	15	1140	1130	0.003 <	0.026	0.026	0.005 <	0.093	**0.097**	0.547	0.566	**0.555**	1520	**1520**	0.0005 <	3.55	0.00002	8.49	**8.62**	**0.007**	0.0006 <	1.1	0.0005	34	**34.6**
SC-2	15	1100	1130	0.003 <	0.024	0.025	0.005 <	0.095	**0.1**	0.529	0.605	**0.622**	1430	**1460**	0.0006	3.97	0.00002	8.44	**8.43**	**0.007**	0.0006 <	1.1	0.0006	34	**34**
SC-3	19	521	515	0.003 <	0.082	0.084	0.005 <	0.057	**0.086**	0.29	0.498	**0.487**	850	**862**	0.0055	2.39	0.00002	4.73	**4.82**	**0.006**	0.0006 <	1.3	0.009	19.7	**19.4**
SC-3A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SC-4	20	426	420	0.003 <	0.033	0.032	0.005 <	0.053	**0.07**	0.234	0.34	**0.334**	681	**720**	0.0032	2.33	0.00002	4.15	**4.46**	**0.006**	0.0006 <	1.2	0.0042	18.1	**18.3**
SC-5	17		716	0.003 <		0.028	0.005 <	0.074	**0.093**	0.367		**0.466**		**1080**	0.002	4.04	0.00002		**6.97**	**0.007**	0.0006 <	1.4	0.0027		**27.6**
SC-7	17		1.13	0.003 <		0.006	0.284	0.001 <	0.00011	0.001		0.007		**2.05**	0.0035	0.133	0.00002		0.01 <	0.002	0.0006 <	0.6	0.0002 <		0.02
SC-8	23	188	190	0.003 <	0.013	0.014	0.015	0.023	**0.0153**	0.023	0.015	0.015	251	**259**	0.0043	1.23	0.00002	1.35	**1.36**	0.002 <	0.0006 <	1.1	0.002	5.33	**6.12**
SC-9	23	179	176	0.003 <	0.007	0.01	0.027	0.022	**0.0139**	0.018	0.014	0.014	220	**222**	0.0035	1.19	0.00001 <	1.27	**1.26**	0.002 <	0.0006 <	1.1	0.0018	5.12	**5.5**
SC-10	17		531	0.003 <		0.022	0.009	0.064	**0.066**	0.283		**0.376**		**815**	0.0023	2.57	0.00002		**4.25**	**0.005**	0.0026	1	0.0024		**17.2**
SC-11	18		534	0.003 <		0.019	0.01	0.065	**0.066**	0.281		**0.356**		**769**	0.0024	2.6	0.00002		**4.27**	0.004	0.0006 <	1	0.002		**17.3**
SC-11A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SC-12	19	924	920	0.003 <	0.118	0.116	0.005 <	0.09	**0.073**	0.345	0.757	**0.761**	1460	**1570**	0.0005	6.5	0.00004	4.28	**4.72**	**0.006**	0.0006 <	1.2	0.0026	15.3	**16.1**
SC-13	20	960	984	0.003 <	0.084	0.087	0.005 <	0.096	**0.086**	0.332	0.776	**0.796**	1400	**1450**	0.0007	9.45	0.00003	4.75	**4.85**	**0.006**	0.0006 <	1.5	0.0021	17.6	**18.2**
SC-14	18		654	0.003 <		0.028	0.01	0.068	**0.078**	0.326		**0.428**		**851**	0.0024	3.64	0.00002		**5.16**	**0.006**	0.0006 <	1.2	0.0022		**20.6**
SC-15	18		646	0.003 <		0.023	0.008	0.065	**0.075**	0.277		**0.386**		**813**	0.0019	3.89	0.00002		**5.49**	**0.005**	0.0006 <	1.3	0.002		**21**

Notes:
DEQ-7 dissolved Aluminum apply to pH between 6.5 and 9.0 only.
Values highlighted in yellow represent DEQ-7 Human Health Exceedences.
Bold values represent DEQ-7 Aquatic Life Exceedences.
Results are in milligrams / liter (mg/L) unless otherwise indicated.

1 Flow and Water Quality are the same as B-11
2 Flow may be underestimated due to poor gaging conditions.
e = estimate
SU = Standard Units

umhosmos/cm = micromhos per centimeter
DIS = dissolved
TRC = total recoverable
gpm = gallons per minute

Notes:
DEQ-7 dissolved Aluminum apply to pH between 6.5 and 9.0 only.
Values highlighted in yellow represent DEQ-7 Human Health Exceedences.
Bold values represent DEQ-7 Aquatic Life Exceedences.
Results are in milligrams / liter (mg/L) unless otherwise indicated.

1 Flow and Water Quality are the same as B-11
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e = estimate
SU = Standard Units

umhosmos/cm = micromhos per centimeter
DIS = dissolved
TRC = total recoverable
gpm = gallons per minute

TABLE 3-5. STATE OF MONTANA NUMERICAL STANDARDS

PARAMETER	HUMAN HEALTH STANDARD (mg/L)		AQUATIC LIFE STANDARD (mg/L)		TRIGGER VALUE (mg/L)	REQUIRED REPORTING VALUE (mg/L)
	SURFACE WATER	GROUND WATER	ACUTE	CHRONIC		
Aluminum (Al)	--	--	0.750	0.087	0.03	0.03
Antimony (Sb)	0.0056	0.006	--	--	0.0004	0.003
Arsenic (As)	0.01	0.010	0.340	0.150	NAI	0.003
Barium (Ba)	1.0	1.0	--	--	0.002	0.005
Beryllium (Be)	0.004	0.004	--	--	NAI	0.001
Cadmium (Cd)	0.005	0.005	0.00541+	0.00053+	0.0001	0.00008
Chromium (Cr)	0.1	0.1	--	--	0.001	0.001
Chromium (III) (Cr (III))	--	--	3.82+	0.183+	0.001	--
Chromium (VI) (Cr (VI))	--	--	0.016	0.011	--	0.005
Copper (Cu)	1.3	1.3	0.0332+	0.0204+	0.0005	0.001
Fluoride (F)	4.0	4.0	--	--	0.005	0.1
Iron (Fe)	0.3#	0.3#	--	1.0	--	0.05
Lead (Pb)	0.015	0.015	0.262+	0.01021+	0.0001	0.0005
Manganese (Mn)	0.05#	0.05#	--	--	--	0.005
Mercury (Hg)	0.00005	0.002	0.0017	0.00091	NAI	0.00001
Nickel (Ni)	0.1	0.1	1.019+	0.113+	0.0005	0.01
Selenium (Se)	0.05	0.05	0.02	0.005	0.0006	0.001
Silver (Ag)	0.1	0.1	0.0196+	--	0.0002	0.0005
Strontium (Sr)	4.0	4.0	--	--	0.1	--
Thallium (Tl)	0.00024	0.002	--	--	0.0003	0.0002
Zinc (Zn)	2.0	2.0	0.260+	0.260+	0.005	0.01

All information summarized from MDEQ Circular DEQ-7 (August 2010).

= narrative standard (guidance level given based on Secondary Federal MCL).

+ = hardness dependent parameter; values shown for a hardness of 250 mg/L as CaCO3.

NAI = no allowable increase

declined to only 7% of the total by the time these discharges reached SC-15 in Straight Creek, downstream of Sand Coulee.

Sites where field parameters were measured at the beginning and end of each day (SC-15 and CW-14) showed minimal temporal variability in water quality during this sampling event (Table 3-6). Gammons (2010) had reported encountering diel fluctuations in the concentration and speciation of iron which he associated with daily fluctuations in stream temperatures during summer months. The absence of notable diel fluctuations during the August/September sampling event is attributable to the cool overcast conditions with a daytime high of only 61°F.

During the August/September sampling event DEQ-7 Human Health and aquatic life standards were exceeded for at least one constituent at all AMD discharge sites and in all downgradient-receiving waters (Table 3-4). Most of the AMD discharges exceed both human health and/or aquatic life standards for pH, fluoride and several metals, including beryllium, cadmium, nickel, thallium, and zinc, while iron and manganese consistently exceeded secondary drinking water standards. The arsenic human health standard (0.01 mg/L) was exceeded at many of the AMD discharge sites.

Water quality impacts to receiving waters from the mine discharges varied from drainage to drainage and were largely a function of the mine discharge characteristics and receiving water assimilative capacity (i.e., dilution potential and alkalinity). The water quality results are discussed below by drainage.

Sand Coulee

A total of 14 surface water samples were collected from the Sand Coulee investigation area, including five mine discharge samples and nine samples from Straight Creek and its tributaries. Mine discharges in the Straight Creek drainage had pHs ranging from of 2.3 to 3.7, specific conductivity (SC) values of 2,774 to 9,176 uS/cm, hardness of 925 to 15,887 mg/L and sulfate concentrations of 2,600 to 13,000 mg/L (Table 3-4). Measured water

TABLE 3-6. DIEL MONITORING RESULTS

Site	SC-15			CW-14		
Date	8/31/2011			8/31/2011		
Field Parameters Time	12:40	19:30	Variation	9:50	20:15	Variation
Water Temp. (^{o}C)	14.72	15.2	3%	12.99	14.35	10%
SC (µmhos/cm)	5847	5776	-1%	1984	1936	-2%
DO (mg/L)	3.69	5.87	59%	9.21	10.47	14%
pH (S.U.)	2.66	2.58	-3%	3.18	3.19	0.3%
ORP (mvolts)	512	533	4%	497	512	3%

quality in Straight Creek was very similar to the mine discharge samples, reflecting the fact that mine water discharges accounted for over 98% of the flow rate in the creek based on discharge measurements during the August/September 2011 sampling event.

The poorest water quality originates from the Sand Coulee Mine (SC-1) and the Nelson Mine (SC-12) with low pH (<2.4), high acidity, high metals and high sulfate (Figure 3-1, Table 3-4). In contrast, the Mt. Oregon Mine (SC-8) discharge to Kate's Coulee has a higher pH (3.75) with lower sulfate and total recoverable metals concentrations.

Both mine discharges and sampling sites on Straight Creek exceed human health standards for fluoride, arsenic, beryllium, cadmium, chromium, iron, manganese, nickel, thallium and zinc. Aquatic life standards were exceeded for pH, cadmium, copper, iron, nickel, selenium and zinc.

Cottonwood Coulee

A total of 17 surface water samples were collected from the Cottonwood Coulee investigation area, including 5 mine discharge samples, 11 samples from Cottonwood Creek and its tributaries, and one duplicate sample. Mine water discharges in Cottonwood Coulee were similar to Sand Coulee in water quality but were characterized by slightly lower pH and slightly higher metals concentrations (particularly cadmium). Mine discharge pH ranged from 2.0 to 2.5, SC values ranged from approximately 5,600 to 13,600 uS/cm, hardness ranged from 925 to 1,325 mg/L and sulfate concentrations ranged from 13,000 to 21,000 mg/L. Upgradient water quality in Cottonwood Coulee (CW-1, Figure 3-2) did not indicate AMD impacts, with a pH of 8.23, SC of 593 uS/cm, a hardness of 274 mg/L and sulfate of 25 mg/L. In contrast, the upgradient sample collected in Ladd in Coulee (CW-11) just above the outfall from the No. 2 mine had a near neutral pH, higher SC (924 uS/cm), higher hardness (421 mg/L) and higher sulfate (140 mg/L) indicating AMD influence. Stream water quality downgradient of the Cottonwood mines is impacted although not impacted to the degree observed in Sand Coulee, likely due to greater dilution with unimpacted stream water. Downgradient Cottonwood Creek site CW-14 through CW-16 (Figure 3-2) had pH ranging from 3.1 to 3.4, SC ranging from 1,604 to 1,984 uS/cm, hardness ranging from 477 to 492 mg/L and sulfate ranging from 1,000 to 1,400 mg/L. Spatial water quality trends in Cottonwood Creek indicate increased AMD impacts from upstream to downstream throughout the investigation area.

Cottonwood Creek in the vicinity of Stockett exceeded DEQ-7 Human Health standards for beryllium, cadmium, iron, manganese, nickel, thallium and zinc and exceeded DEQ-7 chronic aquatic life standards for pH, cadmium, copper, iron, nickel, and zinc.

Number Five Coulee

A total of seven surface water samples were collected from the Number Five Coulee investigation area, including one mine discharge sample, five samples from Number Five Coulee upstream and downstream of Giffen Spring AMD discharge, and one duplicate sample. Water quality at upstream monitoring site NF-1 (Figure 3-2) appears to be unimpacted by AMD based on the measured pH (8.6), SC (598 uS/cm), hardness (252 mg/L) and sulfate (24 mg/L) levels consistent with background water quality. The creek gains flow through a natural wetland area upstream of Giffen Spring, with the pH at site NF-2 (downstream of the wetland but upstream of the spring) decreasing to 7.1 and SC, hardness and sulfate (410 mg/L) all increasing relative to site NF-1. The Giffen Spring discharge (NF-3) had a pH of 3.2, SC of 1,660 uS/cm, 559 uS/cm hardness and 1,400 mg/L sulfate. The Giffen Spring water quality is better than the discharges in Sand Coulee and Cottonwood Coulee, likely due to a higher degree of mine flooding and the presence of anaerobic conditions in the Giffen Mine workings. The pH of the creek downstream of Giffen Spring (NF-4) is near neutral (pH 6.5) with SC of 1080 uS/cm, 531 mg/L hardness and 660 mg/L sulfate. Samples taken midway down the drainage (NF-5) and near the mouth of Number Five Coulee (NF-6, Figure 3-2) are similar in quality but the lower station showed a decrease in the pH (6.72 to 4.4), and increased acidity (27 to 132 mg/l), Fe^{+2} (1.2 to 17 mg/L), aluminum (14 to 26 mg/L) and several trace metals (Table 3-4). Although additional investigation of this stream reach would be required to draw definitive conclusions, the data indicate that the lower half of Number Five Coulee may be impacted by non-point source (s) of AMD.

To summarize water quality in Number Five Coulee, all of the sample parameters at the upstream monitoring site NF-1 were below DEQ-7 water quality standards. NF-2 below the wetlands only exceeded water quality standards for iron, manganese (human health only), nickel and zinc (aquatic life only). Below Giffen Spring DEQ-7 standards were exceeded for beryllium, cadmium, copper, iron, manganese, nickel, thallium and zinc.

Belt

A total of 15 surface water samples were collected from the Belt Creek investigation area, including nine mine discharge samples, five samples from Lewis Gulch and Belt Creek, and one duplicate sample. The pH of AMD discharges at Belt range from 2.3 to 3.1, with SCs ranging from 4,109 to 4,953 uS/cm, hardness ranging from 795 to 1,044 mg/L and sulfate ranging from 3,300 to 5,100 mg/L. Stream flow at Belt Creek monitoring sites was approximately 85 to 100 cfs at the time of the sampling event. Samples collected from Belt Creek upstream and downstream of AMD discharges indicated minimal changes in the water quality associated with AMD discharges, attributable to dilution provided by Belt Creek at the time of sampling. There was no measured decrease in the pH of Belt Creek between upstream sampling site B-14 and downstream sampling site B-16 (pH increased slightly), SC increased from 591 to 595 uS/cm, hardness decreased from 287 to 280 mg/L and sulfate increased from 120 to 130 mg/L.

AMD discharge sites exceeded water quality standards for arsenic (sites B-8, B-9, and B-10 located on the west side of Belt Creek), beryllium, cadmium, chromium, iron, manganese, nickel, thallium and zinc. The only water quality standard exceedance in Belt Creek was the aquatic life standard for iron at downstream locations B-15 and B-16. The historical sampling indicates that pH and metals (Fe and Al) in Belt Creek exceed DEQ-7 standards under low flow conditions (Reiten et al, 2006).

3.2.3 Loading Analysis

A loading analysis was conducted examining both discharge loads and receiving water loads within each drainage for iron, sulfate and acidity. These constituents were selected as representative AMD indicators. Flow rates and water quality concentrations during the August/September 2011 sampling event were used to calculate the load for each parameter in pounds per day. Results for each parameter are tabulated in Table 3-7. In general, loading results show very similar trends for iron and aluminum, and for sulfate and acidity. The following discussion of loading sources and receiving water trends for each basin focus on iron and sulfate as representative indicators of the loading results; however, the comparative trends for iron, aluminum, sulfate and acidity are illustrated in Figures 3-4 through 3-8 with individual loads for each parameter depicted on maps in Appendix C.

Sand Coulee

The highest loads to Straight Creek in the Sand Coulee area originated from mine discharges at the two upstream tributaries on Mining Coulee and Sand Coulee (Figure 3-5). The discharge at Mining Coulee (SC-1) accounted for approximately one half of the total iron and sulfate loads to Straight Creek. Comparable trends were observed for aluminum and acidity. Two separate discharge sites (SC-3 and SC-3A) on the upstream Sand Coulee tributary accounted for approximately 28% of the total iron and sulfate loads. The load contribution from the Mt Oregon Mine on Kate's Coulee was small in comparison (8% of iron and 2% of the sulfate) and the remaining iron load (17%) and sulfate load (14%) originated from the Nelson Mine. There was about a 20% loss in flow in Straight Creek from upstream (SC-5) to downstream (SC-15), with a similar percent decrease in sulfate load, but a greater (38%) decrease in iron load, likely attributable to precipitation of iron hydroxides in Straight Creek.

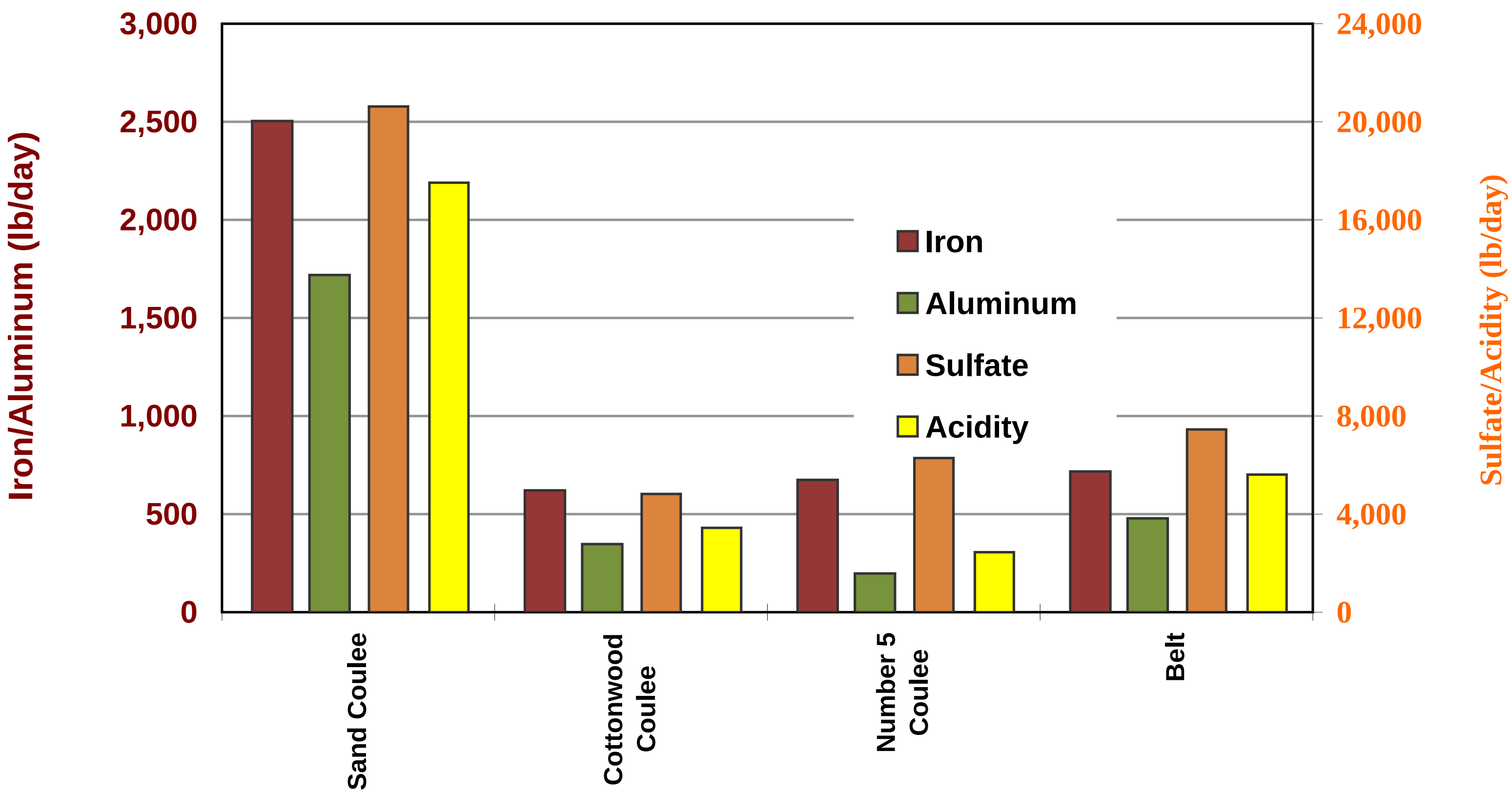
A stream flow loss of approximately 35 gpm (17%) was measured in Straight Creek between Kate's Coulee (SC-10) and the Nelson Mine outfall (SC-11). Iron loads decreased by a slightly higher percentage (21%) whereas the change in sulfate load was slightly lower (13%). There was no measurable decrease in flow in Straight Creek downstream of the Nelson Mine from SC-14 to SC-15.

TABLE 3-7. SUMMARY OF DISCHARGE LOADS FOR SELECTED PARAMETERS

Site	Load lb/day			
	Fe (TRC)	**Al (TRC)**	**SO4**	**Acidity**
Sand Coulee				
SC-1	1,179	876	10,082	9,306
SC-2	1,227	949	10,082	9,242
SC-3	357	214	2,820	2,281
SC-4	698	407	6,010	4,653
SC-5	2,007	1,331	16,356	13,568
SC-6	--	--	--	--
SC-7	0.1	0.05	1.4	0.2
SC-8	156	115	1568	1146
SC-9	123	98	1331	832
SC-10	2,035	1,326	17,480	15,483
SC-11	1,599	1,110	15,180	12,269
SC-12	423	248	2962	2477
SC-13	141	95	1066	882
SC-14	1,900	1,461	17,196	14,069
SC-15	1,818	1,445	17,221	14,313
Mine Discharge Total (SC-2, SC-4, SC-8, SC-12)	2,504	1,719	20,623	17,518
Cottonwood Creek				
CW-1	3.5	3.1	93	15
CW-2	388	176	2,747	1,831
CW-3	6.9	7.2	134	12
CW-4	3.1	3.0	90	9.2
CW-5	270	162	2,267	1,672
CW-6	266	156	2,137	815
CW-7	192	109	1,461	537
CW-8	37	29	326	264
CW-9	246	129	1,874	750
CW-10	197	139	1,750	1,481
CW-11	0.5	0.2	19	0.5
CW-12	195	143	1,750	1,346
CW-13	296	196	2,608	1,976
CW-13+CW-9	542	324	4,482	2,726
CW-14	452	254	3,620	2,043
CW-15	340	195	2,801	1,443
CW-15+NF-6	439	255	4,570	1,742
CW-16	508	299	5,078	2,234
Mine Discharge Total (CW-2, CW-8, CW-12)	621	347	4,823	3,442
Number Five Coulee				
NF-1	0.5	0.4	58	10
NF-2	69	7.6	1,983	19
NF-3	605	190	4,302	2,427
NF-4	294	86	3,668	61
NF-5	393	141	6,023	262
NF-6	99	60	1,769	299
Mine Discharge Total (NF-2, NF-3)	674	198	6,285	2,447
Belt Creek				
B-1	--	--	--	--
B-2	12	8	114	76
B-3	23	19	239	162
B-4	20	22	293	195
B-5	26	16	234	192
B-6	21	17	228	174
B-7	40	26	346	267
B-8	184	83	1,148	941
B-7+B-8	224	108	1,494	1,208
B-9	140	66	897	769
B-10	--	--	--	--
B-11	447	337	5,500	3,750
B-12	949	715	11,659	7,950
B-13	291	220	3,554	2,747
B-14	87	68	54,788	1,826
B-15	427	437	59,586	1,986
B-16	517	496	68,613	2,111
Mine Discharge Total (B-5, B-6, B-7, B-8, B-11)	718	478	7,455	5,609

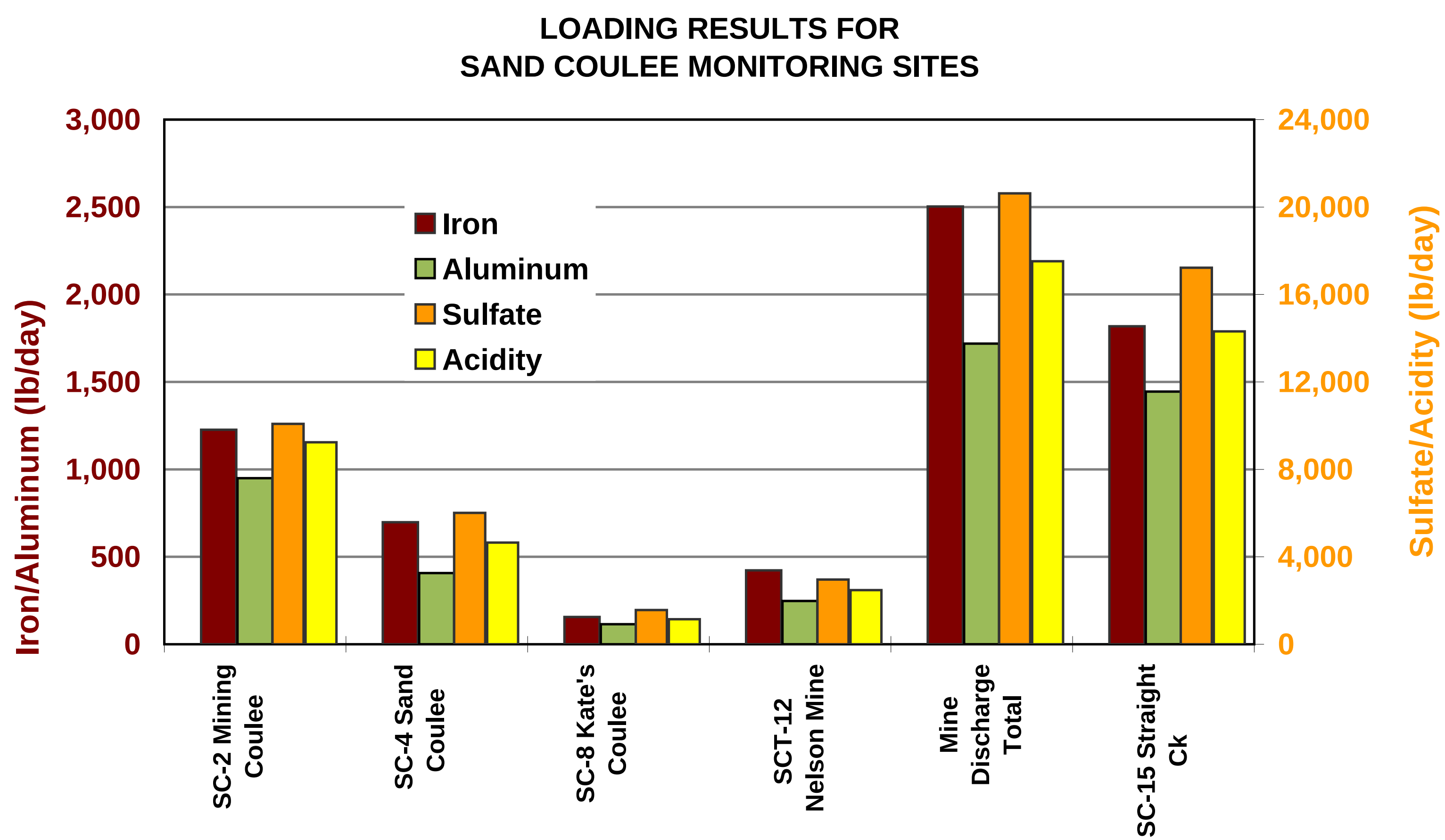
August 31 and September 1, 2011 Sampling Results

"--"indicates no measurable load due to negligible flow at the time of sampling



Note: Tabulated load data is presented in Table 3-7. See Table 3-4 for flow rate and water quality assumptions.

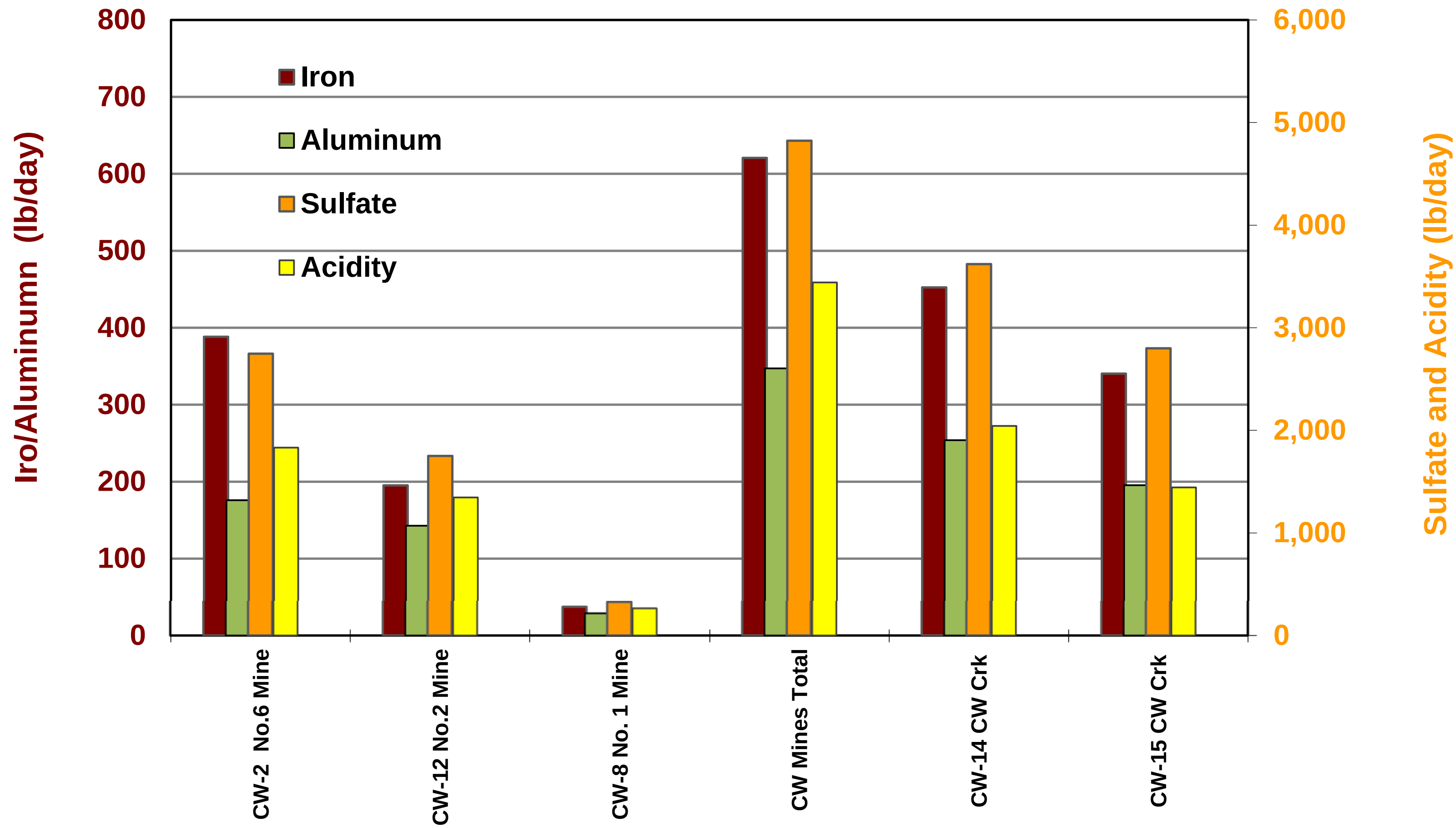
GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	**SUMMARY OF AMD DISCHARGE LOADS**	**FIGURE** **3-4**



Notes: Stream flow losses and Fe precipitation account for decrease in metals load at downstream monitoring site SC-15.
Tabulated load data is presented in Table 3-7. See Table 3-4 for flow rate and water quality assumptions.

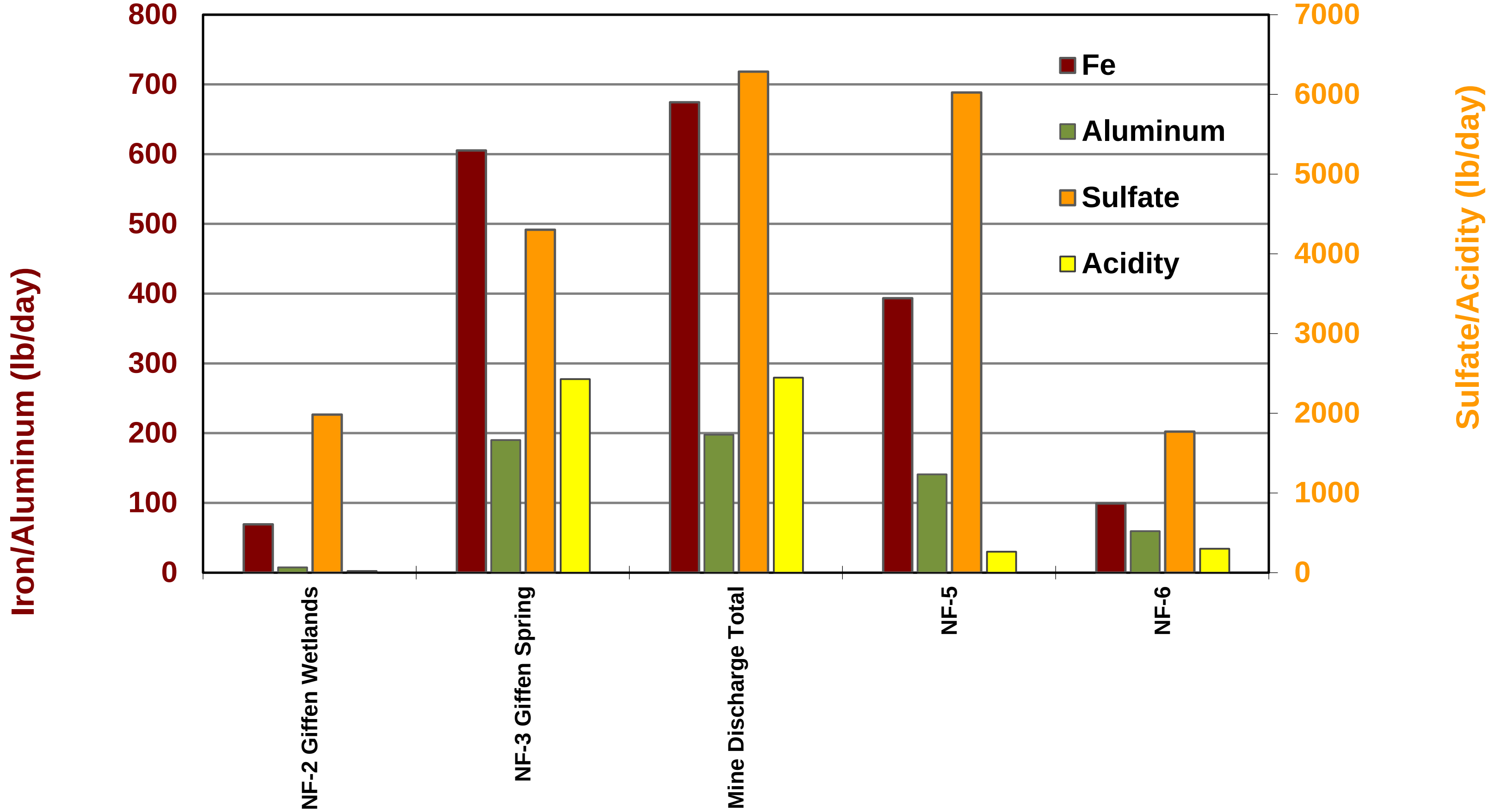
GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	**LOADING RESULTS FOR SAND COULEE**	**FIGURE** **3-5**

load summary1.xls Sand Coulee



Note: Tabulated load data is presented in Table 3-7. See Table 3-4 for flow rate and water quality assumptions.

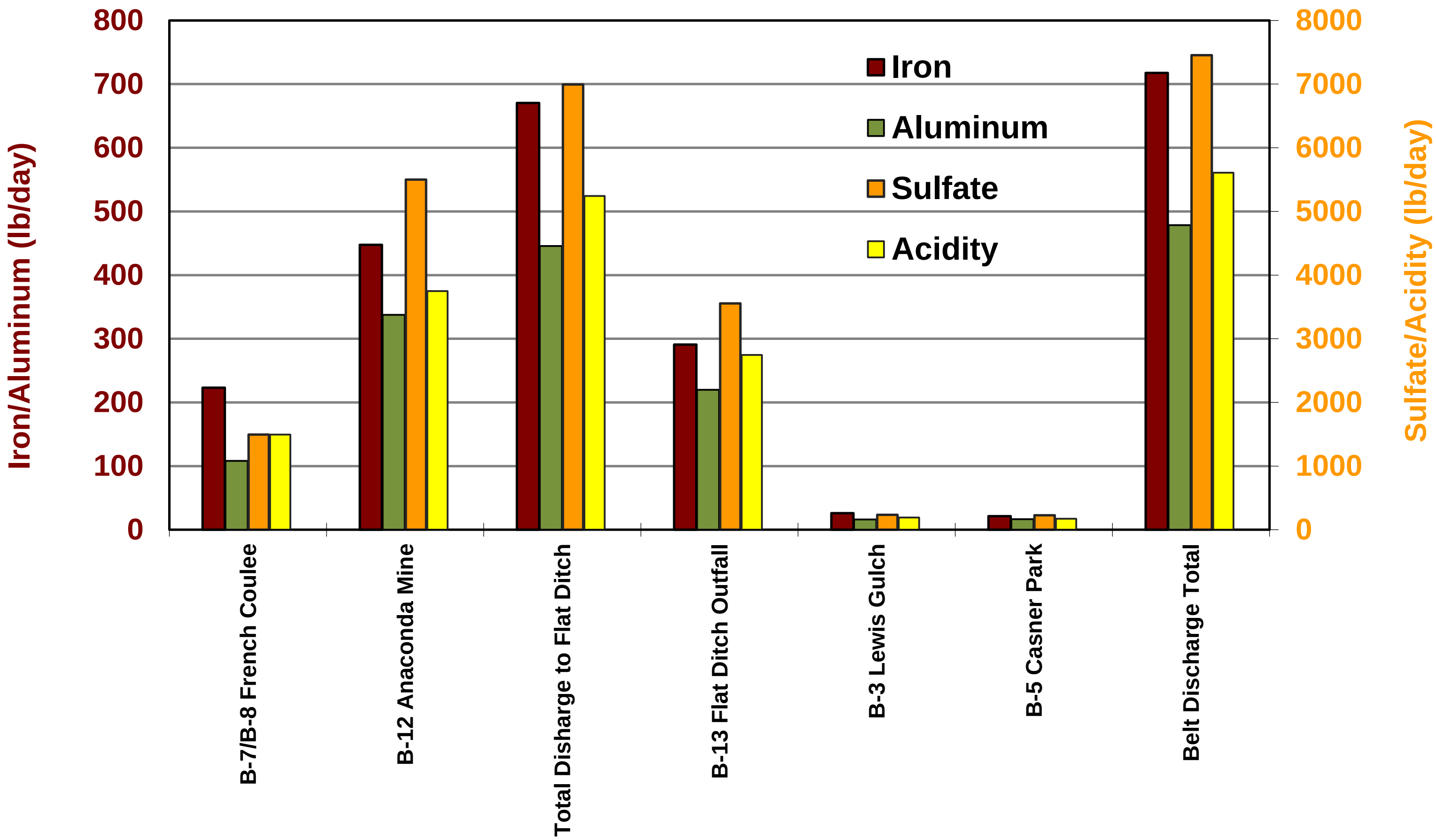
GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	**LOADING RESULTS FOR COTTONWOOD COULEE**	**FIGURE** **3-6**



Note: Tabulated load data is presented in Table 3-7. See Table 3-4 for flow rate and water quality assumptions.

GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	**LOADING RESULTS FOR NUMBER FIVE COULEE**	**FIGURE** **3-7**

load summary1.xls Stockett



Note: Tabulated load data is presented in Table 3-7. See Table 3-4 for flow rate and water quality assumptions.

GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	**LOADING RESULTS FOR BELT**	**FIGURE** **3-8**

Cottonwood Coulee

In Cottonwood Coulee, No. 6 Mine is the largest loading source accounting for 63% of the total iron and 57% of the total sulfate load to Cottonwood Creek in the Stockett area (Figure 3-6). Discharge from the No. 2 Mine accounts for 31% of the measured iron load and 36% of the sulfate load to Cottonwood Creek. The load contribution from the No. 1 Mine accounted 6% of the total iron load and 7% of the total sulfate load to Cottonwood Creek. There was no evidence of significant load increases in Cottonwood Creek due to nonpoint source(s).

Cottonwood Creek loses about half of its flow between the upstream monitoring site (CW-1) and the town of Stockett (CW-9) when adjusted for mine inflows. Flow measurements suggest it loses another 17% from Stockett (CW-13) to the confluence with Number Five Coulee (CW-14). Metals loading decrease proportionally with stream flow losses and the point discharges appear to account for virtually the entire AMD load observed in Cottonwood Creek.

Number Five Coulee

The wetlands above Giffen Spring contribute a moderate sulfate load but relatively low metals and little acidity (Figure 3-7). Giffen Spring accounts for approximately 65% of the total sulfate load and 90% of the total iron load in the Number Five Coulee drainage (Figure 3-7). Flow increases by about 20% between Giffen Spring and Station NF-5 located about 1 mile downstream. Iron and acidity loads decrease substantially over this reach but the sulfate decreases only slightly suggesting neutralization of the water and precipitation of iron hydroxide. About 75% of the stream flow is lost between NF-5 and NF-6 at the mouth of Number Five Coulee and there is a corresponding decrease in both metals load and sulfate loads, however the acidity load increases 14% in the lower reach.

Belt

The Anaconda mine accounted for 85% of the total AMD discharge flow in the Belt area, 63% of the iron load, and 73% of the sulfate load (Figure 3-8). French Coulee outfalls accounted for 10% of the remaining discharge flow, 30% of the iron load and 20% of the sulfate load. The remaining iron load (5%) and AMD sulfate load (7%) is accounted for by Lewis Gulch and Castner Park discharges. Flat Ditch, which receives inflow from French Coulee and the Anaconda Mine, lost approximately 100 gpm (43% of its inflow) prior to discharging at Belt Creek. The direct discharge from Flat Ditch to Belt Creek accounted for 85% of the increase in iron load in Belt Creek over this reach and 75% of the sulfate load.

Seepage losses (approximately 100 gpm) on Flat Ditch would more than account for the remaining metals load in Belt Creek. The flow at the downstream Belt Creek site (B-16) was too deep on this reach to measure flows directly, therefore flows were estimated based on one measured flow velocity taken approximately 4 feet from the stream bank and using an estimated stream width and average depth for the remaining channel cross section. Based on the flow estimate there is an additional increase in metals load on this lower reach of about 20% (about 90 lb/day of iron). Discharge from Lewis Gulch does not account for the estimated increase in flow and load on this lower reach, indicating that seepage losses from Flat Ditch may be contributing to the metals load.

4.0 WATER TREATMENT ASSESSMENT

Metals are generally precipitated and removed as hydroxide, sulfide or carbonate complexes in water treatment. The appropriate treatment process can be selected based on the chemistry of the constituents of the water of concern. Most metals are removed effectively by neutralization and precipitation as metal hydroxides/oxides. Lime is commonly used as the neutralizing agent because of its low cost, favorable settling properties, ability to remove sulfate and because it does not add detrimental ions (such as sodium). This process, typically referred to as lime precipitation or lime treatment utilizes a lime product (CaO or $Ca(OH)_2$) to increase the pH of the contaminated water and facilitate the precipitation of dissolved metals. Although lime precipitation has many inherent advantages, these systems are difficult to operate remotely and therefore, when alkalinity demands are low, sodium hydroxide, magnesium hydroxide or ammonia may be chosen. Limestone is sometimes used primarily because it is inexpensive but it has limited effectiveness on water containing high concentrations of metals.

4.1 PREVIOUS DEQ ASSESSMENT

In 2007 DEQ contracted Tetra Tech EM Inc. (TtEMI) to develop cost estimates for AMD treatment facilities at three sites in the Great Falls Coal Field, consisting of the Belt AMD discharges located on the west side of Belt Creek (USGS sites 5, 11, and 12), the Tracy No. 1 Coal Mine (USGS sites 22 and 23) and the Tracy No. 2 Coal Mine (USGS sites 24, 25, and 27). The cost estimates included Net Present Value (NPV) analysis of capital to fund the construction, including engineering and project management, and operation and maintenance of the three water treatment facilities for a 100 year period. The three sites were selected to assess treatment costs for a range of flow conditions. Average flow rates at these sites were 135 gpm (Belt), 40 gpm (Tracy No. 1) and 10 gpm (Tracy No. 2). No bench-scale or pilot testing was conducted, so the design of the treatment systems was primarily conceptual in nature. For all three sites, the water treatment design utilized pH adjustment in two separate stages to precipitate the dissolved metals in the AMD. Estimated treatment costs included capital costs, annual operation and maintenance (O&M) expenses, and periodic costs for critical component replacement. Cost estimates were prepared using cost estimating software, engineer's estimates, historic costs for similar projects, and vendor quotes. The 100 year present values calculated at a three (3) percent discount rate were $27,778,500 for Belt, $14,902,200 for Tracy No. 1, and $8,724,600 for Tracy No. 2 (TtEMI, 2007). A copy of the final report documenting the water treatment cost estimates is included in electronic format in Appendix H.

4.2 SCOPE AND OBJECTIVES

Lime-based treatment represents a well documented and effective technology for AMD treatment and was the focus of the current assessment. The scope of the assessment included the following issues:

1. Estimation of basin-wide costs for AMD treatment. This work included the identification of groupings of AMD sources which could be treated by centralized treatment facilities.
2. Evaluation of lime-based methods to treat AMD constituents to DEQ-7 water quality standards.
3. Estimation of the amount of sludge which will require handling and disposal.
4. Identification of primary system operational processes.

Given the low pH of the AMD discharges, the lime requirement for water treatment is expected to be significant. The assessment of lime utilization efficiency was included in the bench testing. In addition, the AMD contains elevated concentrations of dissolved iron and manganese, indicating that oxidation of these metals is potentially beneficial to achieving water quality standards. The two treatment processes investigated were the rotating cylinder treatment system (RCTS) and conventional tank reactor treatment. As tested, both methods utilized lime and oxygen to increase pH, oxidize dissolved metals, and treat the AMD through the precipitation and removal of metal oxides and hydroxides.

4.3 COMBINING SITES FOR TREATMENT

The cost associated with construction and operation of an active water treatment system precludes individually treating AMD at each mine site. After examining the sites in the field, the most logical configuration for treatment is the construction of a centralized treatment plant in each of the identified drainages. This would allow AMD to be collected at the individual sources and routed to a central location while minimizing the transport distances and need for pumping the water. Maintaining pumps and pipelines over longer distances for low pH and metals laden water would be operationally difficult and expensive.

A suitable treatment site requires year-round accessibility for large trucks, level open land for sludge settling ponds and utility access. All of the drainages contain open land in nearby areas that could potentially meet these criteria; however, suitable sites in Sand Coulee and Stockett are the most limited due to the narrow confines of the coulees. In both cases there is open land in the vicinity that could be reached by a gravity drainage collection system. Giffen Spring has suitable sites in surrounding open meadows and Belt Creek has a large field adjacent to the Anaconda Mine Drain owned by MDT that could provide a treatment site.

4.4 BENCH TESTING COMBINED DISCHARGES

Samples from the primary AMD discharge sites in Sand Coulee, Cottonwood Coulee, Number Five Coulee and Belt drainages were taken by DEQ on November 9 and 11, 2011 and sent to TKT's laboratory in Reno, Nevada for bench scale treatment testing. All samples were contained in flexible plastic sample containers that were filled with no air-filled headspace present. The samples were prepared by bubbling nitrogen gas at a rate of approximately 10 ml/min for a minimum of five minutes and were capped immediately to exclude oxygen. The following sites were sampled:

- Sand Coulee – Sampling sites SC-1, SC-3, SC-8 and SC-12 that correspond to mine discharge sites in Mining Coulee, Sand Coulee, Kate's Coulee and the Nelson Mine, respectively.

- Cottonwood Coulee – Sampling sites CW-2 and CW-10, which correspond to mine discharges from Cottonwood Coal Company No. 6 and No. 2 mine discharge sites, respectively. There was no discharge from Cottonwood Coal Company No. 1 on November 9, 2011, so sampling was limited to Cottonwood No. 6 and No. 2 discharges.
- Number Five Coulee – Sampling site NF-3 from Giffen Springs.
- Belt – Sampling sites B-3, B-5, B-7, B-8, and B-11, which correspond to AMD discharges from Lewis Coulee, Castner Park, French Coulee Inflow #2, French Coulee Inflow, and the Anaconda Mine Drain, respectively.

Samples from individual drainages were composited in the laboratory by TKT on a flow proportional basis and tested with a bench scale RCTS and with a bench scale tank reactor to evaluate the effectiveness of each treatment system. Photographs of both units can be found in the Bench Testing Report, included in Appendix D. Each unit operated with a 1 liter fluid capacity. The bench scale RCTS was constructed by TKT to simulate a full scale RCTS and turns at speed that produces a comparable oxidation rate to a full sized unit.

A 2-liter beaker equipped with a 2-inch stir bar turning at 600 rpm was utilized to simulate the tank reactor. Air was pumped into the beaker at 6.5 liters per minute to mimic the addition of compressed air that is common to tank reactor systems. Bench testing was conducted with a ten percent lime slurry composed of high calcium-calcium hydroxide ($Ca(OH)_2$) and distilled water. Titration tests were conducted to assess lime requirements for neutralization of the AMD samples using the RCTS and tank reactor. Treatability tests were conducted at six pH values (pH 7.5, 8.0, 8.5, 9.0, 9.5 and 10.0) using the RCTS and the tank reactor to establish optimum operational pHs. Operational requirements at each treatment site were assessed based on these results, which included an estimate of lime requirements, the volume of sludge that would be generated, and sludge settling properties for both RCTS and tank reactor treatment.

The following parameters were noted for each treatment.

1. Chemical consumption rates were determined using sodium hydroxide (caustic) and calcium hydroxide (hydrated lime).
2. The optimum pH for metals removal was determined. Metals and sulfate concentrations were determined following 1 hour, 24 hours and 48 hours of settling. Samples were analyzed for sulfate, total and dissolved aluminum, cadmium, copper, iron, manganese, nickel, and zinc in TKT's laboratory by atomic absorption spectrophotometry. Samples were also taken following 72 hours of settling to explore benefits of increased system settling time, to provide better sensitivity and lower detection limits for cadmium, copper, manganese and nickel, and to determine treated concentrations of arsenic, beryllium, chromium, lead, mercury, selenium and thallium. These samples included the following treatments:

    a. RCTS and Beaker: Sand Coulee and Cottonwood Coulee water at pH 9.0, 9.5, and 10.0 (12 samples total).
    b. RCTS only: Number Five and Belt water at pH 9.0 and 9.5 (four samples total).

    The 16 samples described above were submitted to Energy Laboratories of Helena, MT for analysis of arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and thallium by ICP/ICP-MS.
3. Sludge settling rates and volumes were determined utilizing Imhoff cones.
4. Photos were taken following treatment to document the extent of scaling.

A copy of the Bench Testing Report is included in Appendix D to this report and provides a detailed description of the testing protocol and results. The following is a summary of the findings:

AMD Treatability

Lime-based treatment was able to meet DEQ-7 water quality targets for all constituents with the exception of thallium (all four sites) and fluoride (Sand Coulee and Cottonwood Coulee sites). The two treatment methods achieved comparable improvements in water quality, but the RCTS treatment generally achieved lower metals concentrations. With the exception of thallium and fluoride, the RCTS treatment combined with 72 hours settling of suspended solids achieved DEQ-7 standards at all four sites at a treatment pH of 9.0. The testing results indicated that the pH range in which cadmium, nickel, manganese, and aluminum were effectively treated occurred in a narrow interval around pH 9.0. Analysis of the bench testing results indicates that two-stage treatment is desirable in order to improve effectiveness in removing metals, and enhance the ability of the treatment system to treat AMD with temporal variability in water quality. The first stage would increase pH in the range of 6.5-8.0, resulting in the precipitation of the majority of the dissolved metals, including iron and aluminum. A target pH of 9.5 is recommended for the second stage of treatment to ensure removal of cadmium, nickel, and manganese.

Treatment Efficiency

Titrations on the AMD from each site were conducted using 1.175 N sodium hydroxide (NaOH) and hydrated lime to pH 9.5. The Sand Coulee AMD had an initial pH of 2.78 and required 4756 mg/L NaOH to reach pH of 9.5. Lime amounts of 5360 and 5340 mg/L $Ca(OH)_2$ were required to achieve a pH of 9.5 with the RCTS and the tank reactor unit, corresponding to 82.1 and 82.4 percent lime efficiency, respectively. The Cottonwood Coulee AMD had an initial pH of 2.51 and required 5555 mg/L NaOH to reach pH of 9.5. Lime amounts of 5700 and 6035 mg/L $Ca(OH)_2$ were required to achieve a pH of 9.5 with the RCTS and the tank reactor unit, corresponding to 90.2 and 85.2 percent efficiency, respectively. The Number Five Coulee combined AMD had an initial pH of 2.80 and required 705 mg/L NaOH to reach pH of 9.5. Lime amounts of 790 and 860 mg/L $Ca(OH)_2$ were required to achieve a pH of 9.5 with the RCTS and the tank reactor unit, corresponding to 82.6 and 75.9 percent efficiency, respectively. The Belt Creek combined AMD had an initial pH of 2.73 and required 1528 mg/L NaOH to reach pH of 9.5. Lime amounts of 1600 and 1645 mg/L $Ca(OH)_2$ were required to achieve a pH of 9.5 with the RCTS and the tank reactor unit, corresponding to 88.4 and 86.0 percent efficiency, respectively. Titration results are displayed in Figures 1.1 through 1.4 and Table 1.1 in Appendix D – Bench Testing

Results. The estimated hydrated lime demands needed to adjust discharges to pH 9.5 for the observed flow rates are summarized in Table 4-1.

Sludge Generation and Scaling

The volume and settling rates of lime neutralized sludge were measured using 1 liter Imhoff cones at all six treatment pH values (7.5, 8.0, 8.5, 9.0, 9.5, and 10.0) for all four sites (see Appendix D – Figures 3.1 through 3.21). At pH 9.5, 290 mL of wet sludge per liter water was generated for the Sand Coulee AMD by the RCTS, while 300 mL sludge was generated by the tank reactor following 72 hours of settling. For Cottonwood Coulee, 360 and 280 mL wet sludge per liter water were generated by the RCTS and tank reactor at pH 9.5. For Number Five Coulee, 48 and 60 mL sludge were generated, and at Belt Creek, 84 and 100 mL sludge were generated per liter water. Photos were taken after 72 hours of settling to display the amount of scaling that occurs following treatment (Appendix D – Figures 4.1 through 4.4). The most scale was observed on Cottonwood Coulee, followed by Sand Coulee, Belt, and then Number Five. Easy access to equipment was incorporated in treatment assessment to accommodate for removal of scaling.

4.5 TREATMENT ASSESSMENT

TKT prepared a treatment assessment report that evaluates treatment options considering a separate treatment system within each off the four drainage reaches. The report is included as Appendix E of this report and the assessment and design recommendations and costs are summarized below.

The State of Montana water quality criteria in Circular DEQ-7 were utilized as treatment targets (Table 3-5). Aquatic life standards for cadmium, chromium (III), copper, lead, nickel, and zinc are based on the hardness of the receiving water. Hardness values ranging from 252 mg/L to 287 mg/L were observed in receiving waters at monitoring sites upstream of impacted reaches (see Section 3.4). A hardness of 250 mg/L was used for determining hardness-based aquatic life standards for the purposes of this assessment.

TABLE 4-1. ESTIMATED LIME DEMAND AT PH 9.5

AND DESIGNATED FLOW RATES

	Sand Coulee (79 gpm)	**Cottonwood Coulee (35 gpm)**	**Number Five (238 gpm)**	**Belt (162 gpm)**
Pounds per day	5100	2410	2260	3120
Tons per 30 days	76	36	34	47
Tons per Year	930	440	430	570

4.5.1 Metals Precipitation and Treatment Processes

All of the treatment sites evaluated have high acidity, negligible alkalinity, and high metals concentrations. Lime precipitation is recommended as the primary treatment method to remove the metals and reduce the amount of sulfate. Based on the bench testing results, two-stage treatment utilizing a combination of RCTS and tank reactor treatment has been selected to provide the advantages of both system types. High-density lime precipitation was ruled out due to the higher operational and capital costs associated with the technology. However, if available space is extremely limited for sludge management, high-density technology should be considered, which could reduce the space required for sludge dewatering by as much as a factor of 2, but would increase capital and operation and maintenance costs significantly, particularly if variable treatment flows and chemistry are encountered.

Additional treatment for fluoride and thallium will require an additional stage of treatment. Potential treatment options for these constituents are identified in this report along with estimated costs based on representative data from other sites.

RCTS Technology

The RCTS provides aeration/oxidizing and mixing in a lime precipitation system. The RCTS is implemented to lower lime consumption and sludge production and to reduce energy costs. Comparisons on similar projects have demonstrated a 20%-40% reduction in lime usage, reduced sludge production and reduced energy requirements when compared to tank reactor lime treatment systems with compressed air aeration. Bench testing results indicate that reductions in lime usage using the RCTS were primarily achieved below pH 8.0. As designed, the RCTS would be incorporated in the first stage of a two stage pH adjustment process, operating between pH 6.5 and pH 8.0.

Bench scale testing confirmed that lime treatment combined with aeration effectively removed iron and manganese in the four source waters tested. Arsenic and chromium (III) are commonly removed from water through co-precipitation and sorption with iron hydroxide precipitates. The AMD source water in all four investigation areas contains elevated concentrations of iron and relatively low concentrations of chromium and arsenic. Arsenic and chromium were removed effectively by neutralization during lime precipitation treatment and removal rates would likely be further enhanced using two-stage treatment. Aluminum, cadmium, chromium (III), copper, nickel and zinc are all precipitated and removed effectively as metal hydroxide complexes during neutralization. Aluminum typically has a minimum solubility between pH 6 and 7, while cadmium and nickel require a higher pH for removal. This condition will be addressed by utilizing two operating treatment pH levels to sequentially remove metals.

4.6 TREATMENT SYSTEM EVALUATION AND DESIGN

The Treatment Assessment Report (Appendix E) provides an evaluation of alternatives for treatment and based on selected technologies develops conceptual designs for the treatment system and costs.

The primary basis for the conceptual designs is the August/September 2011 sampling results, the bench testing (Appendix D), and monthly monitoring results documented by the USGS (Karper, 1998). A lack of space for the treatment system footprint could be a limiting factor at the Sand Coulee and the Cottonwood Coulee sites. The extended winter season and low winter temperatures are considerable factors in the design of the system. The system evaluated in this report requires a heated building to house the oxidation, mixing and primary sludge separation components. Space must be maximized to house these components and reduce heating costs. The system evaluated also utilizes sludge dewatering by sand filtration, which requires enough space to contain sludge during the winter months so that dewatering can occur in the summer months.

Based on the chemistry, flow, and space available the most viable option for primary treatment of the AMD in the Great Falls Coal Fields is lime precipitation. Further treatment for fluoride (Sand Coulee and Cottonwood Coulee) and thallium (all four sites) will be required.

The technology evaluated for fluoride removal was absorption onto activated alumina. EPA has developed generalized flow-based treatment costs to achieve secondary maximum drinking water standards. These EPA data were used to develop capital costs and operational and maintenance costs for this analysis. Zeolites are low cost sorbants that have been used successfully for treatment of thallium. Approximate cost estimates are included using zeolites for thallium removal based on observed concentration ranges and representative adsorption rates. Costs are based on capital costs for installation of counter-current columns and zeolite replacement costs.

This evaluation focuses on treatability by lime precipitation using a combination of RCTS and traditional tank style reactors. An emphasis was placed on operational simplicity and maintenance labor control, which is intended to limit operator labor requirements, with oversight monitoring for quality control. The operational labor components are estimated with the assumption that personnel will be available to work at multiple treatment system sites based on their proximity to each other.

This evaluation provides conceptual design options and explains the challenges and benefits of the proposed systems. Included are:

- Estimated capital equipment costs +50%/-30%;
- Operational and monitoring methodology and labor estimates; and
- Continued operation and maintenance estimates including +25% contingency.

Considering the comparable chemistry, expected discharge requirements, flow rates and lime feed rates, the four proposed water treatment sites would utilize similar water treatment systems. This provides redundancy of system components with the goal of minimizing long term operational costs.

Two-stage lime addition is recommended for all four sites due to the presence of cadmium, nickel, manganese and aluminum in the AMD. The first stage at each site will utilize the RCTS to maximize lime efficiency and oxidation. The majority of the lime will be added in the first stage of treatment to a pH of 6.5-8.0, which will target iron, aluminum and arsenic removal. The majority of the sludge will also be generated in this stage and must be removed from the treatment stream to prevent aluminum from re-dissolving from suspended particles in the second stage. Clarification with the use of flocculent addition and fabricated plate clarifiers will be followed by a second stage pH adjustment to 9.5-10.5. Additional oxidation and mixing will be provided by a compressed air system. The second stage will be followed by a similar clarification step. A polishing pond will be utilized to provide additional treatment residence time. Bench testing indicates that even at a treatment pH of 10, the final pH of the water will be less than 9 after 48 hours of settling.

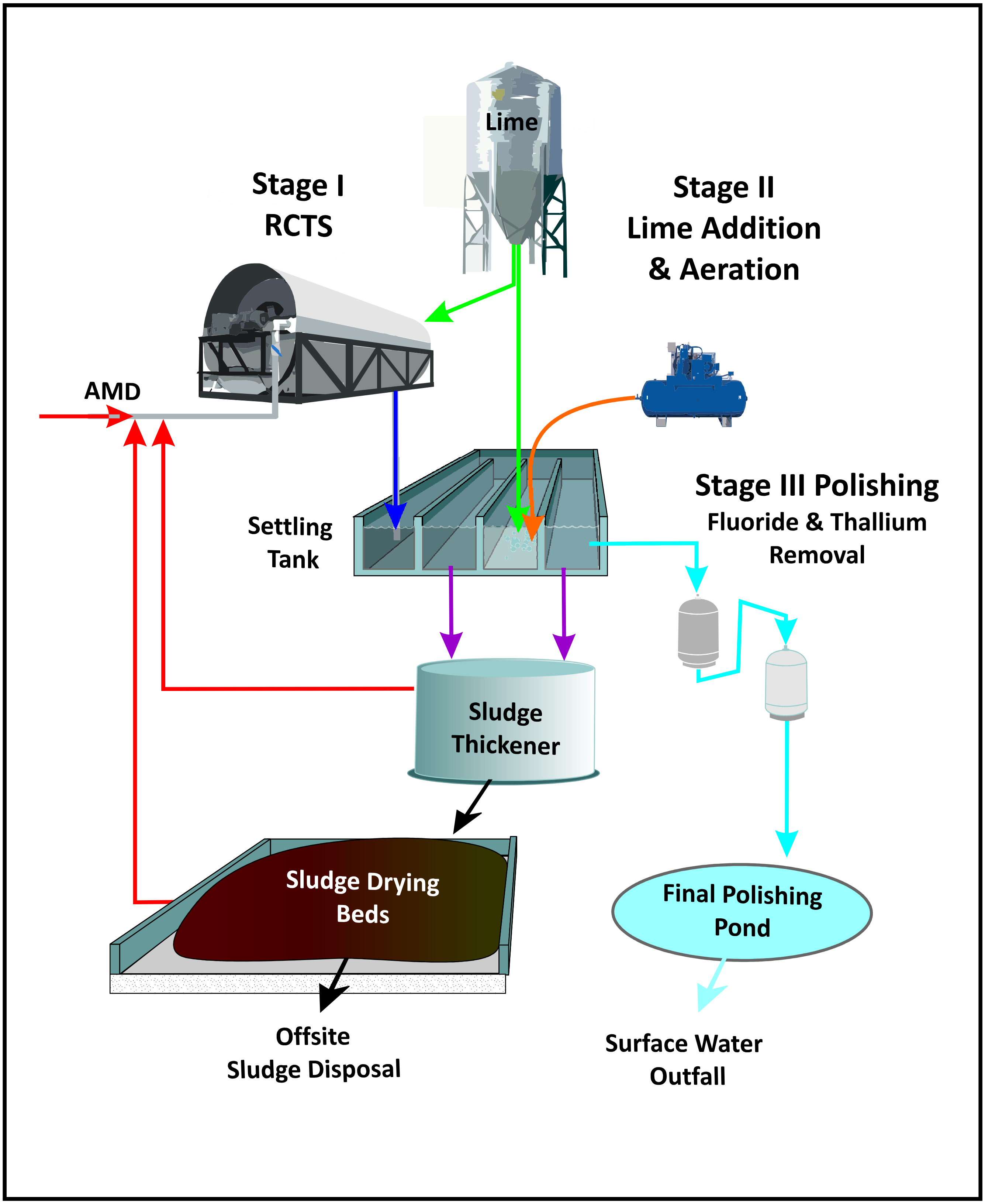
A sludge drying system consisting of primary sludge settling, secondary sludge thickening and final sludge dewatering will be utilized as components of the total system. This is a low cost, low labor alternative to an active filtering process, but requires a substantially larger treatment site to implement. The space requirements for sludge drying relative to space available at potential treatment sites are discussed further below. A schematic diagram outlining the treatment steps is shown in Figure 4-1.

Sand Coulee

Systems were sized based on the 2012 measured flow rates, which were at the high end of historical flow ranges. Long-term treatment costs were based on 75^{th} percentile flow rates calculated from historical measurements, which provide a conservative estimate of average treatment requirements based on historical flows. The following assumptions are taken from Sand Coulee bench testing:

1. Lime consumption will be approximately 5100 lbs/day at 79 gpm.
2. Significant oxidation and system residence time will be required. A minimum reaction time of 12 minutes is recommended with RCTS treatment and 90 minutes with tank reactor system.
3. Sludge settling followed by sludge thickening and passive drying will be required.
4. Sludge production will be extensive, requiring active sludge management and removal. Based on bench testing, more than 45,000 gallons per day of primary

FIGURE 4-1. TREATMENT SYSTEM SCHEMATIC DIAGRAM



k:\project\11033 GFCF\Water Treatment\Treatment Schematic1.cdr settled sludge generation can be expected. Following thickening and dewatering the final volume of sludge can be expected to be reduced to 60 to 85% of the volume of primary sludge.

5. Additional treatment will likely be required for removal of fluoride and thallium. Preliminary cost estimates are included in Section 4.7.

Space will likely be a limiting factor at the Sand Coulee site, and if the treatment site is limited in size, use of an active sludge dewatering system such as a filter press could be required. A simple sludge management system would require a minimum area of 60,000 to 100,000 square feet (approximately 1.4 to 2.3 acres) for treatment and sludge drying. Although open space within Sand Coulee is extremely limited, there is some open land at the south end of Sand Coulee and in the lower end of Mining Coulee that may be adequate for the proposed treatment method which includes a 1 million gallon, 72-hour pond for polishing and a 3 million gallon sand filter system for sludge drying.

For the purposes of this evaluation it is assumed that a treatment site can be obtained with large enough area to employ the simpler sludge management system to reduce costs. Other options short of active filtration, may still be feasible if the treatment site has marginal space, but would require additional evaluation based on space available.

Calcium Oxide vs. Calcium Hydroxide

Based on the bench testing results, a 5100 lb/day lime delivery rate at Sand Coulee is required for the design flow rate of 79 gpm, which is nearly 40% of the lime required on all four sites. An immediate design decision is whether to use calcium oxide (quicklime, CaO) or calcium hydroxide (hydrated lime, $Ca(OH)_2$) in the treatment process. While calcium oxide has higher alkalinity and lower cost by weight, several factors favor the use of calcium hydroxide. The use of calcium oxide would require a slaker processing plant to produce the calcium hydroxide required for each water treatment system. The plant would require capital and labor to operate and generated calcium hydroxide slurry will have to be transported from the plant to the individual treatment systems. Based on a preliminary analysis, it appears likely that much of the initial savings associated with the use of calcium oxide would be consumed by O&M costs associated with the slaker system. In addition, the operation of all four treatment systems would be dependent on the successful continuous operation of the slaker plant, a process generally considered to be maintenance intensive. The redundancy and reliability that can be realized with individual hydrated lime delivery systems at the four sites justifies the additional chemical costs. Therefore, hydrated lime systems are proposed (Appendix E).

Lime Addition

Bench testing showed that the RCTS was more efficient with regard to lime utilization in the pH range of 4.0–8.0 s.u., particularly in the Sand Coulee and Cottonwood Coulee samples (Appendix D, Figures 1-1 and 1-2).

Above pH 8.0, the RCTS was no more effective than the tank reactor system with regards to lime efficiency. Therefore the preliminary design incorporates the RCTS as the primary component of the first stage pH adjustment to improve lime efficiency at each of the sites while reducing system footprint. Specifically, the design incorporates the RCTS for first stage treatment followed by a clarification/settling system to remove sludge containing iron and aluminum. This will be followed by second stage pH adjustment for manganese, nickel and cadmium removal, which will utilize compressed air for oxidation.

Bench testing showed that removal of cadmium, nickel, manganese and aluminum may be possible in a single stage, however the pH would have to be maintained precisely and changes in chemistry and flow could result in inefficient treatment and discharge exceedences. By treating in two stages, the greatest lime efficiency will be realized and the system will be more robust allowing for a broader treatment pH range and a greater capacity to treat variable influent water quality. Although the capital cost of treating in two stages will likely be more than if single stage treatment were utilized, the single stage treatment would require a higher level of pH control with more expensive system programming and more frequent monitoring.

Clarification and Sludge Separation

Given the high metals loads, a key element to the design of the treatment system at these sites will be the clarification, separation, and management of sludge. Bench testing revealed that following 72 hours of settling a volume of 275 to 400 milliliters of sludge per liter of water treated will be produced at the Sand Coulee site. This equates to a system that will be required to clarify, separate, and thicken, in two stages, an anticipated volume of 21-31 gallons per minute of sludge continuously. Given the large sludge volume generated and the cold winter temperatures in the area, the system was designed to provide the most storage volume in the least amount of space to be heated.

As a solution to the limited space available and the necessity to operate year round in cold conditions, this design includes the use of the foundations of the treatment system buildings as a 1st stage clarifier, 2nd stage pH adjustment cell, and 2nd stage clarifier systems. This design, based on municipal wastewater treatment oxidation loops, would result in a maximized settling volume with a small footprint. Air operated diaphragm sludge pumps will pump settled sludge to thickener tanks, and then thickened sludge will be pumped to a sand drain passive sludge drying system. The sludge pumps will operate on the compressed air system used for oxidation in the 2nd stage pH adjustment.

The foundation cells will be constructed to accommodate light equipment for periodic maintenance. Scale removal from the foundation would likely not require confined space entry permitting. Another benefit is that flow through the system would be driven entirely by gravity. There is no pumping of treatment water in the system design, simplifying the system, which accommodates management plans for system upset scenarios. In combination with a polishing pond this design is the most accommodating system with regard to operator simplicity. Due to the extended residence time required for treatment and the volume of flow, a two building system is recommended.

Sludge Drying System and Polishing Pond

The recommended volume for the sludge drying system is 3 million gallons and a 1 million gallon polishing pond is recommended for the Sand Coulee site. However, passive sludge drying with sand filtration may require upwards of 4 million gallons of volume to contain sludge during the extreme cold winter months and dry sludge during the warmer months, depending upon the duration of extreme cold conditions and how much reduction in volume can be achieved during sludge thickening.

Each of the remaining sites also has a sludge drying system and polishing pond as a component of the treatment system. The volume of the polishing pond is proportional to the flow and required settling times from testing. The sludge drying system is proportional to the sludge volume generated. If space is available, larger ponds will reduce sludge maintenance intervals and increase treatment effectiveness.

Each treatment building will have a 30 ton hydrated lime silo and lime delivery system, which will allow a two to three week delivery interval. The 1st stage building will include two RCTS units, a flocculent addition system, foundation clarifier and sludge thickening and pumping system. The 2nd stage building will house the second stage clarification, air compressor and diffuser system, and second stage sludge thickening and pumping systems.

4.6.1 Cottonwood Coulee

High metals concentrations in Cottonwood Coulee will result in similar sludge management challenges although flows are significantly lower than at Sand Coulee. In order to reduce costs a larger single building design is proposed.

Based on the bench testing, the system will require a 2410 lb/day lime feed rate at 35 gpm, which again was utilized based on the 75th percentile flow rate. A single 30-ton silo will allow a two to three week delivery interval.

Again the system utilizes RCTS for 1st stage pH adjustment and aeration, used in combination with 2nd stage compressed air delivery. With a slower feed rate this system may utilize a lime slurry pump delivery system for finer pH control throughout the treatment.

4.6.2 Number Five and Belt

The treatment systems at Number Five and at the Belt site will be virtually identical to the system at Sand Coulee, utilizing the same process flow and components. Belt treatment costs assume treatment of all of the AMD sources including discharges from Lewis Coulee and from the outfall above Castner Park. Estimated costs are included for piping these discharges to a treatment site on the opposite side of Belt Creek. However, this could be a potentially complex task depending on the pipeline route and consequently costs could vary substantially.

4.7 TREATMENT COSTS

4.7.1 Capital Costs

The Water Treatment Assessment Report (Appendix E) provides a detailed breakdown of estimated capital costs for construction of the treatment facilities. Estimated totals for capital costs are summarized in Table 4-2. Capital costs have been developed utilizing the peak flow rates for each treatment site.

4.7.2 Operational Costs

This system is designed based in large part on the principle that it can be operated with a 4 hour per day operator with qualified monitoring and oversight. Daily operations would include system monitoring and sampling, with 80% operator time dedicated to sludge system management. This is expected to entail a two-man crew, servicing all four sites on a rotating interval to coincide with lime delivery and maintenance requirements. It is anticipated that with the proper instrumentation monitoring capabilities these sites can operate without daily site work for extended periods.

The oversight-monitoring budget represents involvement from qualified technical personnel for operations directives and instruction on system operation.

TABLE 4-2. ESTIMATED WATER TREATMENT COSTS

CAPITAL COST FOR CONSTRUCTION OF TREATMENT SYSTEMS				
Description	**Sand Coulee**	**Cottonwood Coulee**	**Number Five Coulee**	**Belt**
Collection System	$ 301,000	$ 282,000	$ 10,000	$ 220,000
Treatment System Foundation and Installation	$ 243,000	$ 135,000	$ 243,000	$ 243,000
Treatment System Building and Construction	$ 450,000	$ 337,500	$ 450,000	$ 450,000
Sludge Drying Construction and Installation	$ 160,000	$ 80,000	$ 80,000	$ 80,000
Polishing Pond Construction	$ 70,000	$ 40,000	$ 70,000	$ 70,000
30 Ton Lime Silo	$ 160,000	$ 90,000	$ 160,000	$ 160,000
Lime Delivery System	$ 69,500	$ 38,500	$ 69,500	$ 69,500
Lime Slurry Tank and Pump System	$ 10,500	$ 10,500	$ 10,500	$ 10,500
Dosing Tank and Mixer	$ 12,000	$ 7,000	$ 12,000	$ 12,000
RCTS	$ 155,000	$ 78,000	$ 155,000	$ 155,000
Compressed Air System 30HP	$ 32,000	$ 17,000	$ 32,000	$ 32,000
Fabricated Plate Clarifiers	$ 90,000	$ 90,000	$ 90,000	$ 90,000
2nd Stage Mixers	$ 18,000	$ 18,000	$ 18,000	$ 18,000
Sludge Thickening Tank	$ 45,500	$ 45,500	$ 45,500	$ 45,500
Sludge Pumps	$ 37,000	$ 28,000	$ 37,000	$ 37,000
Electrical	$ 45,000	$ 45,000	$ 45,000	$ 45,000
Piping	$ 38,000	$ 38,000	$ 38,000	$ 38,000
Electrical Controls and Monitoring	$ 80,000	$ 80,000	$ 80,000	$ 80,000
Removable Floor Fabrication	$ 92,000	$ 92,000	$ 92,000	$ 92,000
Bobcat	$ 25,000		$ 25,000	$ 25,000
Thallium treatment	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Fluoride treatment	$ 161,500	$ 47,500		
Parking Landscaping Fencing, Etc.	$ 125,000	$ 125,000	$ 125,000	$ 125,000
Subtotal	$ 2,470,000	$ 1,774,500	$ 1,937,500	$ 2,147,500
Construction Contingencies (25%)	$ 617,500	$ 443,625	$ 484,375	$ 536,875
Subtotal	$ 3,087,500	$ 2,218,125	$ 2,421,875	$ 2,684,375
Project Admin (5%)	$ 154,375	$ 110,906	$ 121,094	$ 134,219
Design and Engineering (8%)	$ 247,000	$ 177,450	$ 193,750	$ 214,750
Construction Management and Facility Startup (6%)	$ 185,250	$ 133,088	$ 145,313	$ 161,063
Subtotal	$ 586,625	$ 421,444	$ 460,156	$ 510,031
Total Capital Costs	**$ 3,674,125**	**$ 2,639,569**	**$ 2,882,031**	**$ 3,194,406**

ANNUAL O&M COSTS				
Description	**Sand Coulee**	**Cottonwood Coulee**	**Number Five Coulee**	**Belt**
Lime Delivered	$ 139,613	$ 65,974	$ 64,500	$ 85,500
Power 60KW	$ 21,000	$ 42,000	$ 57,000	$ 38,400
Chemical, Other	$ 17,500	$ 17,500	$ 23,800	$ 16,000
Sludge Disposal (includes labor)	$ 87,500	$ 105,000	$ 142,500	$ 96,000
Treatment and Discharge Monitoring	$ 19,200	$ 19,200	$ 19,200	$ 19,200
Site Monitoring	$ 23,000	$ 23,000	$ 23,000	$ 23,000
Site Operator 1/4 -1/2 Time	$ 46,800	$ 46,800	$ 46,800	$ 46,800
Site Maintenance	$ 20,000	$ 20,000	$ 20,000	$ 20,000
Thallium Treatment	$ 43,500	$ 19,500	$ 130,500	$ 89,000
Fluoride Treatment	$ 25,600	$ 13,600		
EPA and Safety	$ 4,200	$ 4,200	$ 4,200	$ 4,200
Subtotal	$ 447,913	$ 376,774	$ 531,500	$ 438,100
O&M Contingency (25%)	$ 111,978	$ 94,193	$ 132,875	$ 109,525
Total yearly O&M Costs	**$ 559,891**	**$ 470,967**	**$ 664,375**	**$ 547,625**
Periodic Replacement Costs				
Five year Periodic Cost	$ 187,080	$ 138,060	$ 163,800	$ 180,600
Periodic contingencies cost (25%)	$ 46,770	$ 34,515	$ 40,950	$ 45,150
Subtotal	$ 233,850	$ 172,575	$ 204,750	$ 225,750
30 year periodic costs	$ 3,674,125	$ 2,639,569	$ 2,882,031	$ 3,194,406
Periodic contingencies cost (25%)	$ -	$ -	$ -	$ -
Subtotal	$ 3,674,125	$ 2,639,569	$ 2,882,031	$ 3,194,406
NVP 3% (100 yrs)	**$ 24,999,731**	**$ 20,156,359**	**$ 26,838,829**	**$ 23,776,893**
Captal construction costs determined using peak flows	Qpeak~250 gpm	Qpeak~50 gpm	Qpeak~ 250 gpm	Qpeak~ 250 gpm
O&M costs determined by using 75th percentile values	Q_{75Th}~79 gpm	Q_{75Th}~35 gpm	Q_{75Th}~238 gpm	Q_{75Th}~162 gpm

Site maintenance budget represents an annual maintenance overhaul and yearly maintenance requirements. While on-site daily labor is expected to be low, annual maintenance of the system should be anticipated and scheduled accordingly.

Estimated annual O&M costs from the Treatment Evaluation Report (Appendix E) are summarized in Table 4-2. O&M costs have been developed using the 75^{th} percentile flow value. The 75^{th} percentile value is the upper bound of the mean flow value. This value is a conservative value to prevent underestimation of annual operation and maintenance costs.

4.7.3 Replacement Costs

Table 4-2 above includes yearly costs to maintain and replace critical components (see line item maintenance). An additional 20 to 30 percent of total capital costs should be expected for items like the building, concrete and controls upgrades as a replacement cost over a period of 30 years.

Periodic replacement costs have also been included for critical equipment replacement due to continual service or harsh conditions of the raw influent. Periodic periods have been broken down into a five-year period, for more routine equipment replacement and a 30-year period for complete treatment works replacement activities.

4.7.4 Net Present Value (NPV) Costs

Based on the capital costs, O&M costs and periodic replacement costs a NPV evaluation has been completed. NPV results are summarized in Table 4-2 and the NPV calculations for individual sites are included in Appendix F. The NPV calculation returns a present day monetary amount to fund a potential project for a fixed return period using a constant discount rate. A NPV amount has been calculated for each treatment site using a discount interest rate of 3% and a return period of 100 years. The estimated NPV amounts to construct, operate and maintain treatment systems at each of the sites is approximately 25 million dollars for Sand Coulee, 20 million for Cottonwood Coulee, 27 million for Number Five Coulee and 24 million dollars for Belt.

5.0 TREATMENT PRIORITIZATION

Due to the considerable expenses associated with water treatment, a ranking system for prioritization of AMD sources for treatment was developed. An evaluation matrix was developed as a framework for ranking individual sites based on six site characteristics. The evaluation characteristics include:

1. Pollutant Load
   a. Iron load
   b. Sulfate load
   c. Acidity load

2. Receiving Water Impacts
   a. Human Health Standards
   b. Aquatic Life Standards

3. Exposure Potential
   a. Population in Impacted Drainage
   b. Existing Containment
   c. Proximity to High Risk Zones (schools, parks, recreation sites, etc)

4. Resource Potential
   a. Water Supply
   b. Aquatic Life
   c. Recreation

5. Treatment Feasibility
   a. Proximately of Adequate Area for Treatment Site
   b. Site Utilities and Access
   c. Required Length of Water Collection Conveyance
   d. Treatability of Water

6. Treatment Cost
   a. Capital Cost
   b. Operational Costs
   c. Long Term Replacement Cost.

Each of these characteristics was evaluated based on a number of criteria (as listed above), for which numeric scores were assigned. The numeric scoring system is based on a rating of 1 to 5, where 1 represents a lower pollution load, better receiving water quality, less opportunity for exposure, lower resource value of the impacted water body, lower treatment feasibility and a higher treatment cost (i.e., lower prioritization for treatment). The scores for individual criteria were averaged to derive a numeric score for each characteristic and then the six characteristics were summed for each treatment site and an average total score determined. A higher score generally indicates treatment would achieve greater reduction in pollutant load and exposure and restoration of beneficial use relative to treatment cost.

A weighting variable has been included in the matrix for each characteristic to facilitate variable weighting of each of the five individual characteristics. Two characteristics, Exposure and Resource Potential, were assigned a weighting factor of 2.0, while the remaining four characteristics received a weighting factor of 1.0. This weighting emphasizes DEQ's identified objectives for water treatment on protection of human health and restoration of beneficial uses of the water bodies impacted by AMD. The decision matrix worksheets with the ranking information for each of the criteria and characteristics are presented in Appendix G. The results are summarized in Table 5-1 and discussed below.

5.1 POLLUTANT LOAD

Sand Coulee had the highest AMD load by a factor of 4 over the other drainages which is attributable to four mine discharges over a short reach, three of which have very high acidity, metals and sulfate concentrations. Belt Creek has the next highest pollutant load followed by Cottonwood Coulee and Number Five Coulee. Cottonwood Coulee and Number Five Coulee had the same ranking score based on the similar load ranges.

5.2 RECEIVING WATER IMPACTS

Sand Coulee also scored highest for impacts to receiving waters as a result of both the high concentrations of AMD parameters in the mine discharges and the absence of any dilution flows in the creek. Numerous standards for human health and aquatic life are exceeded

TABLE 5-1. SUMMARY OF DECISION MATRIX RANKING

FACTOR		Drainage			
		Sand Coulee	**Number 5**	**Cottonwood Ck**	**Belt Ck**
Pollutant Load	Initial Score	4.3	0.7	0.7	1.3
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**4.3**	**0.7**	**0.7**	**1.3**
Receiving Water Impacts	Initial Score	5.0	3.5	4.5	2.5
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**5.0**	**3.5**	**4.5**	**2.5**
Exposure	Initial Score	4.0	2.5	4.0	4.5
	Weight	2.0	2.0	2.0	2.0
	Weighted Score	**8.0**	**5.0**	**8.0**	**9.0**
Resource Potential	Initial Score	**1.7**	**2.3**	**2.3**	**4.3**
	Weight	2.0	2.0	2.0	2.0
	Weighted Score	**3.3**	**4.7**	**4.7**	**8.7**
Treatment Feasibility	Initial Score	2.5	4.0	2.8	3.8
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**2.5**	**4.0**	**2.8**	**3.8**
Treatment Cost	Initial Score	2.0	2.7	3.3	2.3
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**2.0**	**2.7**	**3.3**	**2.3**
TOTAL		**4.2**	**3.4**	**4.0**	**4.6**

along the entire length of Straight Creek. Cottonwood Coulee was next highest, followed by Number Five Coulee and Belt Creek. Receiving water quality in these three drainages is primarily a function of the amount of in stream dilution. It should be noted that Belt Creek has high seasonal flows that improve water quality in the creek substantially. During low flow periods Belt Creek would rank higher due to minimal dilution of the AMD.

5.3 EXPOSURE

Belt Creek rated highest for exposure due to greater population density and proximity to high-risk areas. Although the mine discharges are largely restricted to constructed conveyances, the majority of these are open ditches that run through parks and residential areas. The primary outfall discharges immediately downstream of an established swimming hole. While conducting the August/September 2011 sampling, a teen on a four-wheeler was observed recreating in Flat Ditch, and a pair of muddy child's tennis shoes were present on the edge of the conveyance ditch in Castner Park where pH 2.5 AMD is present (Appendix A - Page 25).

While there has been some effort to limit the extent of AMD discharges with constructed conveyances in Sand Coulee and Stockett, the efforts have not been completely successful (see Appendix A – Page 14) and both have high AMD concentration discharges present in the middle of the community. Number Five Coulee is relatively remote with few residences and no parks or recreation facilities in the vicinity of the discharge sites.

5.4 RESOURCE POTENTIAL

All of the impacted streams have a B classification, which reflects the beneficial uses they are intended to support. B classification streams should be capable of supporting domestic uses, agricultural and industrial water supplies, recreational uses and aquatic life and wildlife. The streams in each of the basins investigated are listed as impaired for one or more of these uses based on nonattainment of water quality standards (MDEQ, 2011). Treatment of AMD sources would potentially allow the streams to achieve a broader range of beneficial uses, however their comparative value for water supply, recreational use and fishery habitat varies therefore an examination of resource potential is useful in assessing prioritization of treatment sites.

The resource potential of the streams within each of the subject basins was ranked to reflect potential use as a water supply, as aquatic life habitat and for recreational uses. The streams in these drainages have potential to supply water for stock water and agricultural use. None of the streams have a high potential for direct use as a potable water supply, however all of the streams recharge underlying aquifers and treatment would decrease the potential for impacts to nearby water supply wells. All of the sites were given comparable rankings in this category.

Belt Creek was given the highest ranking for aquatic life resource potential since it is a larger stream that has a long perennial downstream reach, it has more diverse stream habitat (riffles, runs, pools, etc.) and is connected to a significant downstream fishery (the Missouri River). Straight Creek in Sand Coulee was given the lowest ranking for aquatic habitat due to the limited reach with perennial flow and the severely altered channel morphology associated with channelization.

Belt Creek was also given the highest ranking as a recreational resource because of greater potential to support fishing, boating and swimming activities due to higher flows and greater water depths.

5.5 TREATMENT FEASIBILITY

A large site with a relatively flat area is required for settling ponds since the high AMD loads associated with these sites will generate large volumes of sludge. The first criteria was availability of suitable area for a treatment site and the next criteria was suitable access for trucks and the proximity of utilities. Belt Creek rated the highest since a large open field is present in the vicinity of Flat Ditch and is currently owned by MDT. This is an ideal site in terms of size, access and utilities and therefore was ranked the highest. Number Five Coulee was next highest. It has a large open area surrounding Giffen Spring with nearby electrical lines. Suitable treatment sites are much more restricted in Sand Coulee and Stockett due to the narrow confines of the Coulees. Both have open land in the upstream areas that may still support gravity flow conveyances from the AMD sources.

The length of the conveyances required to route water from the AMD sources to the treatment plant were also considered, not just due to costs of installation, more significant is long term maintenance costs since these pipelines can be prone to plugging and deterioration. The sites were ranked based on minimum pipeline distances. These may vary based on the final site selection. Number Five Coulee required the least collection conveyances followed by Belt (with collection of east side AMD sources), Sand Coulee and Cottonwood Coulee.

Treatability rankings reflect differences in the level of treatment or propensity for more complex maintenance or water handling requirements due to specific treatment or site characteristics. Based on the initial treatment tests all of the AMD has similar characteristics and will require similar levels of treatment. Sand Coulee and Cottonwood Coulee discharges have a slightly greater likelihood of scaling and require greater removal rates to meet water quality objectives. In general, these two sources also contain higher concentrations of fluoride, which may require an additional step in the treatment process. Number Five Coulee and Belt Creek have been ranked slightly higher since lower removal rates are necessary to meet in stream water quality objectives.

5.6 TREATMENT COST

Potential costs for treatment are developed and discussed in Section 4.5. Lower costs result in a higher ranking. Cottonwood Coulee has the highest ranking followed by Sand Coulee, then Belt, then Number Five Coulee.

5.7 OVERALL RANKING RESULTS

Belt Creek has the highest final prioritization ranking with a score of 4.6, followed by Sand Coulee with 4.2, Cottonwood Coulee with 4.0 and then Number Five Coulee with 3.4. While this ranking compares the sites based on a range of factors it is only intended to provide an initial framework for examining treatment prioritization and may be modified as the process moves forward.

6.0 REFERENCES

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APPENDIX A

PHOTO LOG

Seep from Cottonwood No.6

Limestone Channel from No.6

Discharge from No.6 Mine above Stockett (USGS 7)

Cottonwood No.6 at Source

Seepage Below Cottonwood No.6

Seepage below No.6

Seepage From Cottonwood No.6 at Cottonwood Creek

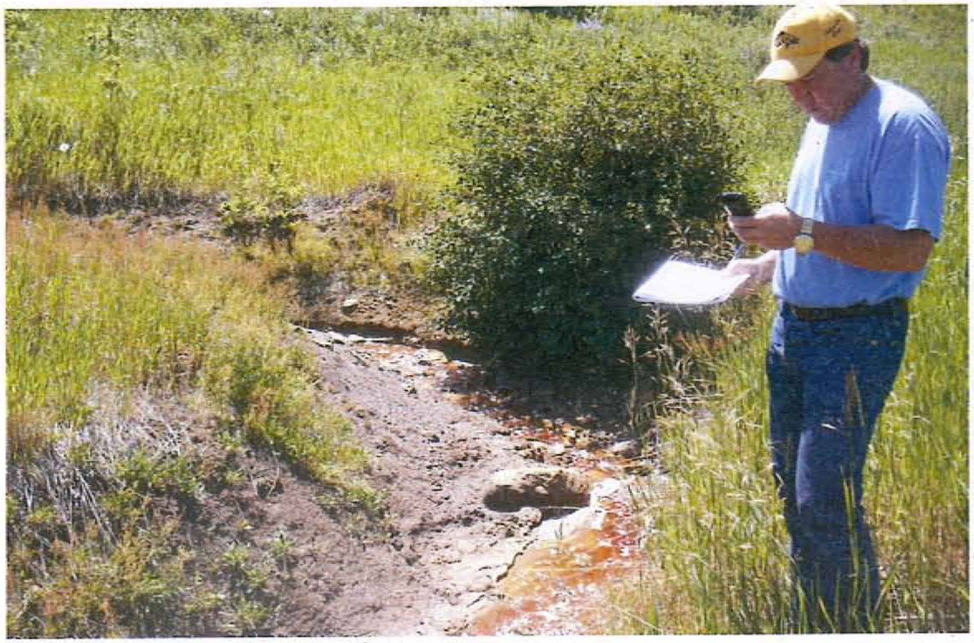
Ponded area alond Ditch from No.6 Mine

Ditch from Cottonwood No.6

No.1 Mine Discharge

Unnamed discharge from No.1 Mine above...

Ditch from Cottonwood No.6



Discharge from No.2 Mine at Stockett

Looking acros at burns from No.2 Mine Seepage

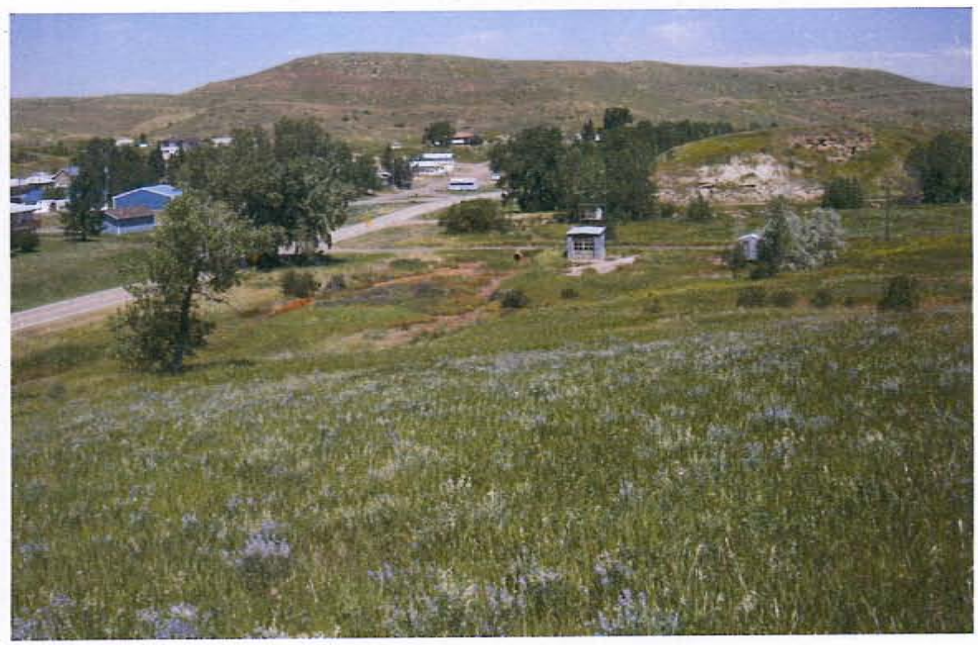
Collection Ditch Stockett No.2 Mine

Discharge from Cottonwood No.2 Mine above Stockett

Discharge from No.2 Mine

Collection Ditch at Stockett No.2 Mine

Ladd Coulee upstream of No.2 discharge



At Cottonwood No.2 looking towards Stockett

Confluence of Giffen Discharge with Number 5 coulee

Giffen Spring

Upstream of Giffen Spring and Giffen Wetlands

Number 5 Coulee at Giffen

Confluence of discharges from USGS 14 & 16

West trib above Giffen

Channel below USGS 14

USGS 3 Below Giffin

Confluence of discharges from USGS sites 14 & 16

USGS 14 Mining Coulee

USGS 16 with Landowner improvements

Creek channel below USGS 14

Kate's Coulee immediately above Rusty Ditch

USGS 16 upstream Sand Coulee Trib

Outfall from Kate's Coulee to Rusty Ditch

Kate's Coulee confluence with Rusty Ditch

Kate's Coulee Discharge w/play area in background

Kate's Coulee

Kate's Coulee discharge w/Trampoline in...

Kate's Coulee, Sand Coulee MT

Kate's Coulee Discharge from Mt Oregon Mine

Kate's Coulee stressed vegetation

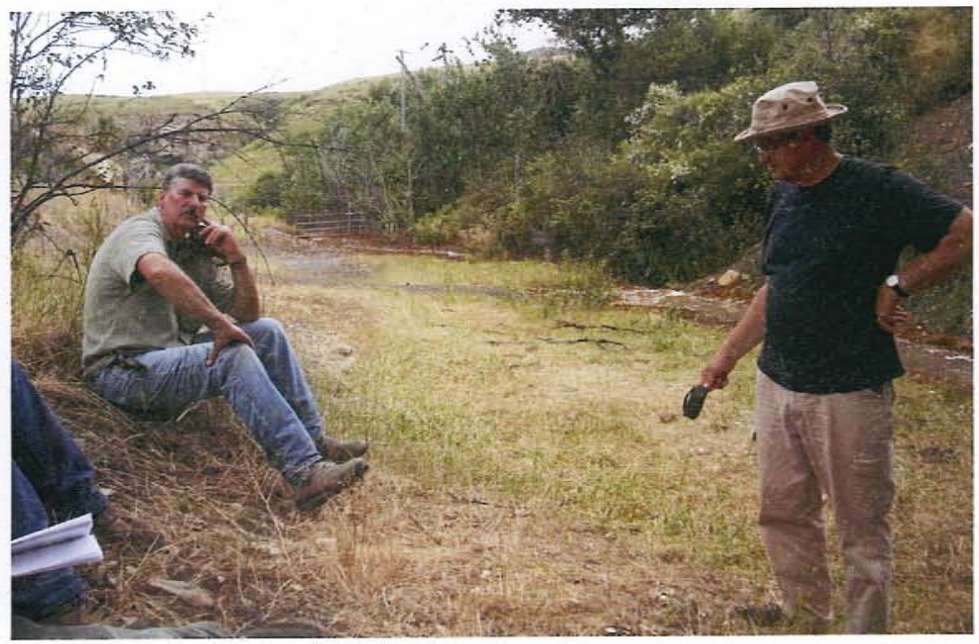
Adit Portal at Kate's Coulee

Kate's Coulee discharge from Mt Oregon Mine

Plugged Manhole at Nelson Mine

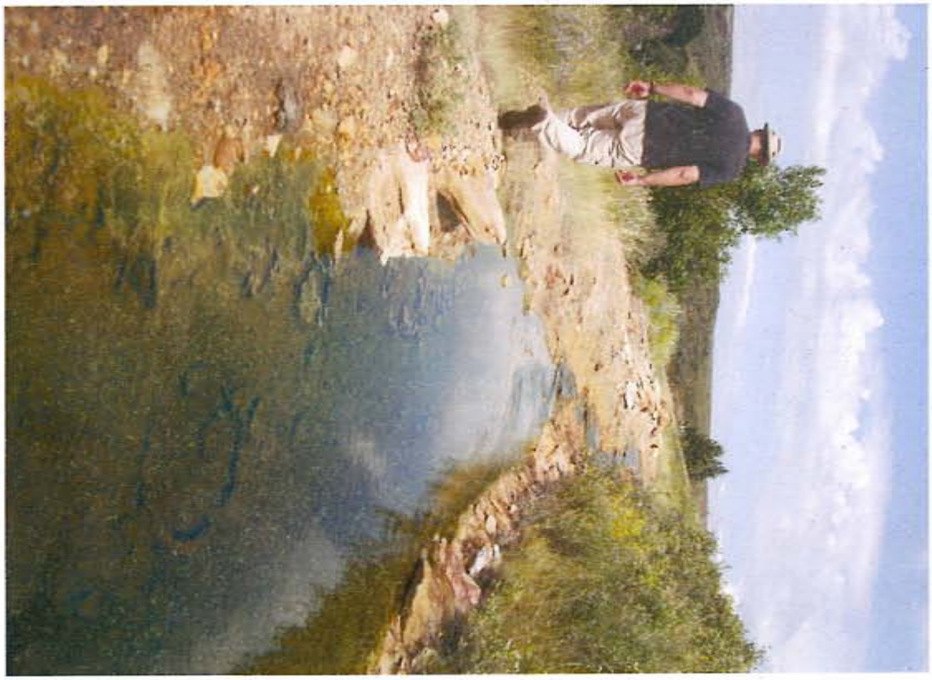
Adit Portal at Kate's Coulee

Nelson mine dsicharge



Kate's Coulee, Sand Coulee

Collection Ditch at Nelson Mine



Corroded Manhole at Nelson Mine

Drain pipe from Nelson Mine

Discharge at Nelson Mine, Sand Coulee MT

Discharge from Nelson Mine at Sand Coulee

Seepage from Nelson Mine to Residential Yard

Sand Coulee Creek above Centerville

Nelson Mine Drain Pipe

unnamed mine discharge site to Sand Coulee Ck above centerville

Sand Coulee Ck above centerville

MDT Embankment drain at French Coulee

Sand Coulee Ck above mine discharges...

USGS 11

Upstream French Coulee Embankment...

MDT upwelling discharge above Flume...

USGS 11 & 12 discharge sites

Anaconda Mine Discharge to Flat Ditch

French Coulee Wetland Cell

Flat Ditch, Belt MT

Anaconda Mine Discharge to Flat Ditch

Bank Seepage to Belt Ck

Potential Treatment Site at Belt

Bank seepage to Belt Creek

Belt Creek looking downstream at Anacondaa Mine Discharge

Anaconda Mine Discharge to Belt Creek

Flat Ditch flume

Anaconda Mine Discharge to Belt Ck

Anaconda Mine Discharge to Belt Creek

Seeps to Belt Creek

Stained Bank Seeps on Belt Creek

Anaconda Mine Discharge to Belt Creek &...

Ferricrete on stream bank downstream of...

Tim Tsukamoto at Belt Creek downstream...

Stained Seeps from Stream Bank on Belt...

Lewis Gulch below adit

Seeps from bank below Anaconda Mine discharge site to Belt...

Lewis Gulch at former mine portal

Seepage to Lewis Gulch

Lewis Gulch upstream of portal discharge

Seepage to Lewis Gulch

Ditch leading to Castner Park

Lewis Gulch Outfall structure to Belt Creek

Lewis Gulch Above Castner Park

Lewis Gulch DIscharge Point to Belt Ck

Belt Creek, Flat Ditch recreational activity.

Belt Creek, Castner Park (B-6) recreational activity.

APPENDIX B

HISTORICAL WATER QUALITY DATABASE AND SUMMARY STATISTICS

Table B-1 : Historic Water Quality Summary

	BCAMD (B13)					USGS/Maxim Site 5 & MBMG 200616 (B11)				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	2	NA	98.5	113.7	128.88	29	NA	67.3	104.9	155.0
Lab Specific Conductivity (umhoscm)	2	NA	2523	2747	2970	44	NA	2080	2405	2770
Field Specific Conductivity (umhoscm)[2]	--	--	--	--	--	42	NA	1040	2292	2580
Lab pH (SU)	2	NA	2.85	2.90	2.95	44	NA	2.60	2.83	3.34
Field pH (SU)	--	--	--	--	--	41	NA	2.51	2.89	3.10
Total Dissolved Solids[3]	--	--	--	--	--	15	NA	2003	2346	2620
Total Suspended Solids	2	NA	5.0	27.9	50.8	--	--	--	--	--
Total Hardness (as CaCO3)	2	NA	740	756	772	25	0	611	668	723
Alkalinity	--	--	--	--	--	4	4	1	1	1
Acidity (as CaCO3)	--	--	--	--	--	29	0	36	1008	1240
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	40	0	140	157	177
Carbonate (CO3)	--	--	--	--	--	15	0	0	0	0
Fluoride	--	--	--	--	--	38	6	0.25	1.75	5
Magnesium	--	--	--	--	--	40	0	63	68.3	73.5
Sodium	--	--	--	--	--	40	0	9.4	10.2	11.0
Potassium	--	--	--	--	--	40	0	2.5	3.01	3.7
Bicarbonate (HCO3)	--	--	--	--	--	19	4	0	0.2	1
Chloride	--	--	--	--	--	40	10	2.2	6.71	50
Bromide	--	--	--	--	--	15	15	0.25	0.95	5
Sulfate (SO4)	--	--	--	--	--	44	0	1420	1874	2700
Silica	--	--	--	--	--	40	0	49.9	187.1	5302
Nitrate	--	--	--	--	--	15	15	0.25	1.13	5
Orthophosphate	--	--	--	--	--	15	15	0.25	0.95	5
Aluminum TRC	2	0	127	132	137	4	0	92	111	120
Aluminum DISS	2	0	134	141	147	44	0	68	105.09	126.25
Antimony TRC	2	2	0.00025	0.00025	0.00025	--	--	--	--	--
Antimony DISS	--	--	--	--	--	15	15	0.01	0.011	0.02
Arsenic TRC	2	0	0.0037	0.0070	0.0102	4	4	0.003	0.003	0.003
Arsenic DISS	--	--	--	--	--	44	25	0.001	0.003	0.01
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	--	--	--	--	--	40	17	0.002	0.006	0.02
Beryllium TRC	--	--	--	--	--	4	4	0.05	0.05	0.05
Beryllium DISS	--	--	--	--	--	44	5	0.01	0.0201	0.05
Boron TRC	--	--	--	--	--	4	3	0.2	0.2	0.2
Boron DISS	--	--	--	--	--	44	8	0.056	0.145	0
Cadmium TRC	2	0	0.0131	0.0134	0.0137	4	4	0.005	0.005	0.005
Cadmium DISS	--	--	--	--	--	39	5	0.0035	0.0076	0.026
Chromium TRC	2	0	0.0151	0.0328	0.0505	4	2	0.01	0.02	0.03
Chromium DISS	--	--	--	--	--	44	3	0.01	0.035	0.05
Cobalt DISS	--	--	--	--	--	36	0	0.222	0.308	0.5
Copper TRC	2	0	0.058	0.062	0.066	4	3	0.01	0.01	0.01
Copper DISS	2	0	0.0545	0.0608	0.067	44	27	0.01	0.023	0.05
Iron TRC	2	0	177	179	180	4	0	152	189	212
Iron DISS	2	0	175	186	197	44	0	83.1	164.1	206
Lead TRC	2	0	0.0011	0.0012	0.0013	4	4	0.003	0.003	0.003
Lead DISS	2	0	0.0011	0.0016	0.002	44	35	0.001	0.009	0.03
Lithium DISS	--	--	--	--	--	40	0	0.17	0.200	0.219
Manganese TRC	--	--	--	--	--	4	0	0.32	0.4	0.45
Manganese DISS	--	--	--	--	--	44	0	0.19	0.412	0.5
Molybdenum DISS	--	--	--	--	--	40	38	0.001	0.011	0.1
Nickel TRC	2	0	1.06	1.07	1.07	4	0	0.75	0.83	0.91
Nickel DISS	--	--	--	--	--	44	0	0.3	0.682	0.88
Selenium DISS	--	--	--	--	--	27	27	0.001	0.004	0.01
Silver TRC	2	1	0.00025	0.00039	0.00052	--	--	--	--	--
Silver DISS	--	--	--	--	--	40	37	0.002	0.004	0.010
Strontium DISS	--	--	--	--	--	40	0	1.4	1.623	1.969
Thallium DISS	--	--	--	--	--	15	15	0.02	0.025	0.05
Titanium DISS	--	--	--	--	--	15	11	0.001	0.0014	0.005
Uranium DISS	--	--	--	--	--	14	4	0.0025	0.0029	0.0035
Vanadium TRC	--	--	--	--	--	4	4	0.2	0.2	0.2
Vanadium DISS	--	--	--	--	--	44	25	0.01	0.0442	0.2
Zinc TRC	2	0	4.41	4.49	4.57	4	0	3.09	3.58	3.86
Zinc DISS	2	0	4.48	4.53	4.57	44	0	1.9	3.31	3.8
Zircon DISS	--	--	--	--	--	15	5	0.002	0.0039	0.01

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

All units are in mg/L unless otherwise indicated. Detection limits were used to calculate statstics when values below detection.

Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Table B-1 : Historic Water Quality Summary

	USGS/Maxim Site 6 (NF3)					USGS/Maxim Site 7 (CW2)				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	29	NA	128.0	208.2	246.8	22	NA	8	19.3	67.3
Lab Specific Conductivity (umhoscm)	27	NA	916	1228	1630	22	NA	3780	5050	5330
Field Specific Conductivity (umhoscm)[2]	28	NA	710	1354	6400	21	NA	2550	5709	8860
Lab pH (SU)	27	NA	2.8	3.7	6.1	22	NA	2.5	2.7	2.9
Field pH (SU)	29	NA	3.70	5.06	6.08	22	NA	2.26	2.66	3.80
Total Dissolved Solids[3]	--	--	--	--	--	2	NA	7830	8000	8170
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	25	0	436	459	481	18	0	1320	1421	1530
Alkalinity	4	0	43	64	85	4	4	1	1	1
Acidity (as CaCO3)	29	1	2	187	472	22	0	1010	3890	4320
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	2	NA	1	1	1
Calcium	25	0	110	115	120	18	0	330	348	380
Carbonate (CO3)	--	--	--	--	--	--	--	--	--	--
Fluoride	24	0	0.2	0.9	1.5	15	4	1	2.5	5.6
Magnesium	25	0	39	42	44	18	0	120	133	140
Sodium	25	0	11	14	17	18	0	13	14	15
Potassium	25	0	4.4	5.3	6.3	18	0	0.5	2.7	5.7
Bicarbonate (HCO3)	4	0	52	78	104	4	4	1	1	1
Chloride	--	--	--	--	--	--	--	--	--	--
Bromide	--	--	--	--	--	--	--	--	--	--
Sulfate (SO4)	29	0	469	695	1000	22	0	4440	5818	7200
Silica	25	0	16	20	25	18	0	83	93	100
Nitrate	--	--	--	--	--	--	--	--	--	--
Orthophosphate	--	--	--	--	--	--	--	--	--	--
Aluminum TRC	4	0	2.1	2.5	2.8	4	0	300	372	457
Aluminum DISS	29	0	1.1	10.45	35	22	0	300	389	450
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	--	--	--	--	--
Arsenic TRC	4	4	0.003	0.003	0.003	4	4	0.003	0.003	0.003
Arsenic DISS	29	4	0.001	0.001	0.003	22	22	0.001	0.005	0.025
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	25	0	0.023	0.028	0.04	11	0	0.1	0.12	0.13
Beryllium TRC	4	4	0.05	0.05	0.05	4	0	0.1	0.1	0.11
Beryllium DISS	29	4	0.0022	0.0114	0.05	22	0	0.09	0.114	0.13
Boron TRC	4	4	0.2	0.2	0.2	4	2	0.2	0.3	0.5
Boron DISS	28	4	0.05	0.103	0.2	19	2	0.2	0.46	0.57
Cadmium TRC	4	4	0.005	0.005	0.005	4	1	0.005	0.019	0.036
Cadmium DISS	29	4	0.001	0.007	0.018	22	1	0.005	0.071	0.11
Chromium TRC	4	4	0.01	0.01	0.01	4	3	0.01	0.01	0.02
Chromium DISS	29	4	0.005	0.006	0.01	22	12	0.01	0.046	0.083
Cobalt DISS	--	--	--	--	--	--	--	--	--	--
Copper TRC	4	3	0.01	0.01	0.02	4	1	0.01	0.10	0.33
Copper DISS	29	4	0.01	0.02	0.08	22	7	0.01	0.10	0.21
Iron TRC	4	0	43.6	50.0	56.5	4	0	680	769	860
Iron DISS	29	0	14.9	67.9	110	22	0	646	756	840
Lead TRC	4	4	0.003	0.003	0.003	4	4	0.003	0.003	0.003
Lead DISS	29	4	0.001	0.003	0.01	22	22	0.001	0.002	0.004
Lithium DISS	25	0	0.06	0.073	0.086	18	0	0.55	0.65	0.73
Manganese TRC	4	0	0.28	0.31	0.33	4	0	1.92	2.05	2.19
Manganese DISS	29	0	0.11	0.37	0.51	22	0	1.48	2.27	2.5
Molybdenum DISS	25	0	0.001	0.004	0.01	18	7	0.001	0.0018	0.0046
Nickel TRC	4	0	0.21	0.22	0.23	4	0	8.94	9.56	10.7
Nickel DISS	29	0	0.21	0.35	0.57	22	0	7.30	10.46	12
Selenium DISS	--	--	--	--	--	--	--	--	--	--
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	25	0	0.001	0.001	0.002	18	17	0.003	0.009	0.011
Strontium DISS	--	--	--	--	--	--	--	--	--	--
Thallium DISS	--	--	--	--	--	--	--	--	--	--
Titanium DISS	--	--	--	--	--	--	--	--	--	--
Uranium DISS	--	--	--	--	--	--	--	--	--	--
Vanadium TRC	4	4	0.2	0.2	0.2	4	3	0.2	0.2	0.2
Vanadium DISS	29	4	0.006	0.036	0.2	22	5	0.06	0.147	0.24
Zinc TRC	4	0	0.74	0.81	0.9	4	0	43.7	49.9	56.9
Zinc DISS	29	0	0.28	1.37	2.5	22	0	40.7	49.7	56
Zircon DISS	--	--	--	--	--	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

All units are in mg/L unless otherwise indicated. Detection limits were used to calculate statstics when values below detection.

Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Table B-1 : Historic Water Quality Summary

	USGS/Maxim Site 8 (CW12)					USGS Site 10 (B9)				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	28	NA	0	9.4	44.9	24	NA	0	11.6	44.9
Lab Specific Conductivity (umhoscm)	28	NA	6080	8452	11100	20	NA	2770	4552	6130
Field Specific Conductivity (umhoscm)[2]	27	NA	6470	8891	10800	20	NA	2880	4601	6180
Lab pH (SU)	28	NA	2.4	2.5	2.7	20	NA	2.5	2.7	3.1
Field pH (SU)	28	NA	1.98	2.52	3.65	20	NA	2.5	3.0	3.9
Total Dissolved Solids[3]	8	NA	10800	15963	18900	--	--	--	--	--
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	25	0	1620	2299	3070	20	0	810	1336	2040
Alkalinity	3	3	1	1	1	--	--	--	--	--
Acidity (as CaCO3)	28	0	969	9734	13600	20	0	1140	3156	4470
Acid Neutral Capacity (as CaCO3)	8	NA	1	1	1	--	--	--	--	--
Calcium	25	0	320	425	520	20	0	200	324	490
Carbonate (CO3)	--	--	--	--	--	--	--	--	--	--
Fluoride	20	8	1	3.1	8.5	18	8	1	2	5
Magnesium	25	0	200	300	430	20	0	75	128	210
Sodium	25	0	4.7	8.8	12	20	0	12	23	44
Potassium	25	0	0.3	2.2	5.7	20	0	3	12	33
Bicarbonate (HCO3)	3	3	1	1	1	--	--	--	--	--
Chloride	--	--	--	--	--	20	0	8	18	29
Bromide	--	--	--	--	--	--	--	--	--	--
Sulfate (SO4)	28	0	8600	13028	16000	20	0	2200	5005	6800
Silica	25	0	38	97	140	20	0	55	92	130
Nitrate	--	--	--	--	--	--	--	--	--	--
Orthophosphate	--	--	--	--	--	--	--	--	--	--
Aluminum TRC	3	0	1200	1473	1900	--	--	--	--	--
Aluminum DISS	28	0	712	1181	1720	20	0	100	371	570
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	--	--	--	--	--
Arsenic TRC	3	2	0.003	0.004	0.006	--	--	--	--	--
Arsenic DISS	28	23	0.001	0.006	0.025	20	20	0.001	0.001	0.002
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	25	15	0.11	0.18	0.2	20	3	0.004	0.021	0.1
Beryllium TRC	3	0	0.18	0.21	0.27	--	--	--	--	--
Beryllium DISS	28	0	0.11	0.18	0.30	20	0	0.015	0.04	0.062
Boron TRC	3	2	0.2	0.7	1.6	--	--	--	--	--
Boron DISS	26	2	0.2	0.7	1.2	20	0	0.15	0.28	0.51
Cadmium TRC	3	0	0.078	0.171	0.235	--	--	--	--	--
Cadmium DISS	27	0	0.056	0.289	0.51	20	7	0.002	0.005	0.01
Chromium TRC	3	1	0.01	0.06	0.1	--	--	--	--	--
Chromium DISS	28	7	0.01	0.13	0.27	20	1	0.016	0.058	0.11
Cobalt DISS	--	--	--	--	--	15	0	0.091	0.261	0.42
Copper TRC	3	0	0.18	0.25	0.34	--	--	--	--	--
Copper DISS	28	1	0.18	0.43	0.82	20	13	0.03	0.07	0.14
Iron TRC	3	0	1280	1670	2260	--	--	--	--	--
Iron DISS	28	0	720	1391	2200	19	0	170	471	770
Lead TRC	3	2	0.003	0.009	0.02	--	--	--	--	--
Lead DISS	27	25	0	0.002	0.01	20	13	0.001	0.005	0.01
Lithium DISS	25	0	1.1	1.5	2	20	0	0.2	0.48	0.75
Manganese TRC	3	0	8.01	9.28	10.7	--	--	--	--	--
Manganese DISS	27	0	5.38	8.46	17	20	0	0.79	2.77	6.4
Molybdenum DISS	24	14	0.001	0.002	0.006	20	20	0.001	0.004	0.01
Nickel TRC	3	0	11.3	14.6	20.8	--	--	--	--	--
Nickel DISS	26	0	8.5	12.6	17.6	20	0	0.23	0.67	1.1
Selenium DISS	--	--	--	--	--	12	12	0.001	0.003	0.01
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	25	25	0.001	0.014	0.04	20	16	0.001	0.005	0.018
Strontium DISS	--	--	--	--	--	20	0	1.1	2.0	2.9
Thallium DISS	--	--	--	--	--	--	--	--	--	--
Titanium DISS	--	--	--	--	--	--	--	--	--	--
Uranium DISS	--	--	--	--	--	--	--	--	--	--
Vanadium TRC	3	2	0.2	0.2	0.2	--	--	--	--	--
Vanadium DISS	22	17	0.006	0.136	0.24	18	16	0.012	0.053	0.1
Zinc TRC	3	0	57.1	73.7	101	--	--	--	--	--
Zinc DISS	28	0	42	63.6	96.8	17	0	0.81	3.02	7.4
Zircon DISS	--	--	--	--	--	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

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Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

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Table B-1 : Historic Water Quality Summary

	USGS Site 11 (B7)					USGS Site 12 (B8)				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	19	NA	13.5	24.3	53.9	6	NA	13	14	18
Lab Specific Conductivity (umhoscm)	18	NA	2450	4343	6000	6	NA	3420	4273	5470
Field Specific Conductivity (umhoscm)[2]	19	NA	2300	4733	6550	6	NA	3640	4433	5550
Lab pH (SU)	19	NA	2.5	2.7	2.8	6	NA	2.5	2.6	2.7
Field pH (SU)	19	NA	2.5	2.7	2.9	6	NA	2.6	2.8	2.8
Total Dissolved Solids[3]	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	19	0	547	893	1120	6	0	660	831	1030
Alkalinity	--	--	--	--	--	--	--	--	--	--
Acidity (as CaCO3)	19	0	1090	3634	5960	6	0	2230	3417	4870
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	--	--	--	--	--
Calcium	19	0	110	199	250	6	0	140	183	230
Carbonate (CO3)	--	--	--	--	--	--	--	--	--	--
Fluoride	17	8	1.0	1.5	3.6	6	1	1	2.7	3.9
Magnesium	19	0	66	96	120	6	0	75	90	110
Sodium	19	0	11	14	17	6	0	12	13	13
Potassium	19	0	2.8	4.6	5.9	6	0	0.8	4.3	5.8
Bicarbonate (HCO3)	--	--	--	--	--	--	--	--	--	--
Chloride	19	0	4.5	15.2	38	6	0	9.1	11	13
Bromide	--	--	--	--	--	--	--	--	--	--
Sulfate (SO4)	19	0	2000	4947	7400	6	0	3300	4550	6000
Silica	19	0	41	87	120	6	0	70	88	100
Nitrate	--	--	--	--	--	--	--	--	--	--
Orthophosphate	--	--	--	--	--	--	--	--	--	--
Aluminum TRC	--	--	--	--	--	--	--	--	--	--
Aluminum DISS	19	0	100	366	640	6	0	214	337	480
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	--	--	--	--	--
Arsenic TRC	--	--	--	--	--	--	--	--	--	--
Arsenic DISS	19	0	0.002	0.019	0.039	6	1	0.002	0.009	0.022
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	19	11	0.003	0.008	0.017	6	0	0.008	0.013	0.019
Beryllium TRC	--	--	--	--	--	--	--	--	--	--
Beryllium DISS	19	0	0.012	0.040	0.064	6	0	0.026	0.041	0.056
Boron TRC	--	--	--	--	--	--	--	--	--	--
Boron DISS	19	0	0.09	0.32	0.47	4	0	0.23	0.3	0.39
Cadmium TRC	--	--	--	--	--	--	--	--	--	--
Cadmium DISS	15	4	0.001	0.007	0.011	6	0	0.005	0.008	0.01
Chromium TRC	--	--	--	--	--	--	--	--	--	--
Chromium DISS	19	0	0.027	0.135	0.21	6	0	0.1	0.13	0.19
Cobalt DISS	12	0	0.099	0.253	0.44	6	0	0.22	0.32	0.48
Copper TRC	--	--	--	--	--	--	--	--	--	--
Copper DISS	19	13	0.03	0.07	0.15	6	6	0.05	0.1	0.12
Iron TRC	--	--	--	--	--	--	--	--	--	--
Iron DISS	18	0	170	709	1300	6	0	440	693	1000
Lead TRC	--	--	--	--	--	--	--	--	--	--
Lead DISS	19	11	0.001	0.005	0.01	6	1	0.001	0.002	0.004
Lithium DISS	19	0	0.17	0.45	0.67	6	0	0.32	0.46	0.65
Manganese TRC	--	--	--	--	--	--	--	--	--	--
Manganese DISS	19	0	0.20	0.67	1.10	6	0	0.43	0.65	0.93
Molybdenum DISS	19	19	0.001	0.004	0.01	6	5	0.001	0.001	0.002
Nickel TRC	--	--	--	--	--	--	--	--	--	--
Nickel DISS	19	0	0.23	0.79	1.3	6	0	0.49	0.78	1.1
Selenium DISS	12	10	0.001	0.004	0.01	--	--	--	--	--
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	19	18	0.003	0.007	0.015	6	4	0.005	0.015	0.029
Strontium DISS	19	0	0.89	1.82	2.4	6	0	1.2	1.7	2.3
Thallium DISS	--	--	--	--	--	--	--	--	--	--
Titanium DISS	--	--	--	--	--	--	--	--	--	--
Uranium DISS	--	--	--	--	--	--	--	--	--	--
Vanadium TRC	--	--	--	--	--	--	--	--	--	--
Vanadium DISS	19	3	0.018	0.127	0.29	6	2	0.06	0.07	0.087
Zinc TRC	--	--	--	--	--	--	--	--	--	--
Zinc DISS	19	0	1.2	3.7	5.8	6	0	2.3	3.6	5.1
Zircon DISS	--	--	--	--	--	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

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Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Table B-1 : Historic Water Quality Summary

Parameter[1]	USGS/Maxim Site 13 (B5) Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	USGS/Maxim Site 14 (SCT1) Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	28	NA	0	4.8	13.5	28	NA	0.2	6.6	18.0
Lab Specific Conductivity (umhoscm)	29	NA	3660	4632	23700	28	NA	6340	6790	6970
Field Specific Conductivity (umhoscm)[2]	29	NA	2020	4417	9500	27	NA	4366	7134	7620
Lab pH (SU)	29	NA	1.3	2.7	3.1	28	NA	2.5	2.6	3.1
Field pH (SU)	29	NA	1.8	2.7	3.7	28	NA	2.2	2.6	3.0
Total Dissolved Solids[3]	1	NA	4873	4873	4873	11	NA	11800	12691	14600
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	24	0	854	935	1040	25	0	1310	1537	1640
Alkalinity	4	4	1	1	1	3	3	1	1	1
Acidity (as CaCO3)	28	0	89	2798	6220	28	0	181	7212	7940
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	11	NA	1	1	1
Calcium	25	0	110	123	203	25	0	210	281	310
Carbonate (CO3)	1	0	0	0	0	--	--	--	--	--
Fluoride	22	12	1	1.27	2.91	20	9	1	2.4	8.4
Magnesium	25	0	24	31	147	25	0	190	202	220
Sodium	25	0	0.35	1.36	25.1	25	0	17	20	23
Potassium	25	0	4.3	8.61	26	25	0	0.1	0.2	0.4
Bicarbonate (HCO3)	5	4	0	1	1	3	3	1	1	1
Chloride	25	1	4.3	9.3	26	11	0	1	1	1
Bromide	1	1	2.5	2.5	2.5	--	--	--	--	--
Sulfate (SO4)	29	0	3290	4168	5700	28	0	7790	9661	12000
Silica	25	0	70	82	88	24	0	55	118	140
Nitrate	1	1	2.5	2.5	2.5	--	--	--	--	--
Orthophosphate	1	1	2.5	2.5	2.5	--	--	--	--	--
Aluminum TRC	--	--	--	--	--	3	0	780	893	960
Aluminum DISS	29	0	182	292	530	28	0	780	887	990
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	1	1	0.02	0.02	0.02	--	--	--	--	--
Arsenic TRC	4	4	0.003	0.003	0.003	3	2	0.003	0.003	0.004
Arsenic DISS	29	22	0.001	0.003	0.025	28	14	0.001	0.005	0.012
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	25	14	0.003	0.011	0.02	25	14	0.072	0.09	0.1
Beryllium TRC	4	4	0.05	0.05	0.05	3	0	0.09	0.09	0.09
Beryllium DISS	29	5	0.02	0.026	0.05	28	0	0.04	0.086	0.1
Boron TRC	4	2	0.2	0.3	0.4	3	1	0.2	0.7	1.2
Boron DISS	26	5	0.2	0.26	0.32	28	1	0.2	0.662	0.89
Cadmium TRC	4	0	0.021	0.029	0.038	3	0	0.021	0.079	0.192
Cadmium DISS	29	3	0.005	0.039	0.065	27	1	0.005	0.078	0.098
Chromium TRC	4	1	0.01	0.04	0.11	3	0	0.04	0.12	0.25
Chromium DISS	29	3	0.01	0.11	0.19	28	2	0.01	0.29	0.4
Cobalt DISS	25	0	0.52	1.42	5.9	25	0	2.9	4.1	9.5
Copper TRC	4	1	0.01	0.03	0.04	3	1	0.01	0.17	0.42
Copper DISS	29	4	0.01	0.08	0.2	28	17	0.01	0.13	0.25
Iron TRC	4	0	496	534	580	3	0	930	1080	1260
Iron DISS	29	0	322	503	572	28	0	891	1048	1200
Lead TRC	4	4	0.003	0.003	0.003	3	2	0.003	0.028	0.07
Lead DISS	29	23	0.001	0.004	0.02	28	27	0.001	0.002	0.01
Lithium DISS	25	0	0.39	0.45	0.52	25	0	1.1	1.2	1.5
Manganese TRC	4	0	0.64	0.7	0.74	3	0	2.85	2.89	2.97
Manganese DISS	29	0	0.11	0.88	1.23	27	0	2.58	3.32	3.9
Molybdenum DISS	25	24	0.001	0.007	0.1	25	10	0.001	0.0022	0.01
Nickel TRC	4	0	1.55	1.88	2.08	3	0	6.56	7.88	9.43
Nickel DISS	29	0	1.3	2.0	2.2	28	0	6.56	7.77	8.7
Selenium DISS	25	1	0	0	0.01	12	11	0.001	0.003	0.01
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	25	23	0.003	0.007	0.011	25	23	0.001	0.013	0.054
Strontium DISS	25	0	1.3	1.508	1.888	25	0	1.1	1.2	1.3
Thallium DISS	1	1	0.1	0.05	0.05	--	--	--	--	--
Titanium DISS	1	1	0.01	0.01	0.01	--	--	--	--	--
Uranium DISS	1	0	0.024	0.024	0.024	--	--	--	--	--
Vanadium TRC	4	4	0.2	0.2	0.2	3	0	0.2	0.3	0.4
Vanadium DISS	29	12	0.031	0.09	0.2	20	2	0.12	0.33	0.49
Zinc TRC	4	0	6.21	6.83	7.22	3	0	29.1	32.7	34.8
Zinc DISS	29	0	1.07	7.06	8.3	28	0	27.6	33.4	38.0
Zircon DISS	1	1	0.02	0.02	0.02	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

All units are in mg/L unless otherwise indicated. Detection limits were used to calculate statstics when values below detection.

Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Table B-1 : Historic Water Quality Summary

Parameter[1]	USGS/Maxim Site 16 (SCT3) Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	USGS/Maxim Site 19 (SCT8) Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	27	NA	0	12.7	49.4	29	NA	9.0	30.1	80.8
Lab Specific Conductivity (umhoscm)	21	NA	2990	3312	3720	28	NA	2600	2946	3350
Field Specific Conductivity (umhoscm)[2]	20	NA	2800	3262	3480	27	NA	2040	2949	6800
Lab pH (SU)	21	NA	2.6	2.8	3.2	27	NA	2.6	3.1	4.2
Field pH (SU)	21	NA	2.83	3.14	3.4	29	NA	3.93	4.18	5.02
Total Dissolved Solids[3]	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	19	0	792	850	945	25	0	895	938	961
Alkalinity	2	2	1	1	1	4	4	1	1	1
Acidity (as CaCO3)	21	0	627	1997	2680	29	0	232	1418	1640
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	--	--	--	--	--
Calcium	19	0	160	167	180	25	0	160	166	170
Carbonate (CO3)	--	--	--	--	--	--	--	--	--	--
Fluoride	19	7	1	1.6	3.1	24	5	1	1.9	3.4
Magnesium	19	0	95	105	120	25	0	120	127	130
Sodium	19	0	18	19	21	25	0	22	24	25
Potassium	19	0	1.6	1.8	2.0	24	0	4.1	4.6	5.2
Bicarbonate (HCO3)	2	2	1	1	1	4	4	1	1	1
Chloride	19	0	3.9	7.4	15	25	0	3	6.2	17
Bromide	--	--	--	--	--	--	--	--	--	--
Sulfate (SO4)	21	0	2700	3029	3600	29	0	2130	2633	3700
Silica	19	0	53	64	71	25	0	34	38	41
Nitrate	--	--	--	--	--	--	--	--	--	--
Orthophosphate	--	--	--	--	--	--	--	--	--	--
Aluminum TRC	2	0	227	284	340	4	0	16	119	180
Aluminum DISS	21	0	121	227	300	29	0	14	156	180
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	--	--	--	--	--
Arsenic TRC	2	0	0.016	0.024	0.032	4	0	0.017	0.029	0.044
Arsenic DISS	21	2	0.001	0.005	0.013	29	0	0.006	0.016	0.044
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	19	1	0.003	0.018	0.03	25	0	0.012	0.018	0.028
Beryllium TRC	2	2	0.05	0.05	0.05	4	4	0.05	0.05	0.05
Beryllium DISS	21	2	0.026	0.032	0.05	29	4	0.023	0.029	0.05
Boron TRC	2	1	0.2	0.4	0.5	4	2	0.2	0.2	0.3
Boron DISS	20	1	0.129	0.266	0.36	25	3	0.2	0.25	0.31
Cadmium TRC	2	0	0.007	0.046	0.084	4	3	0.005	0.009	0.022
Cadmium DISS	20	0	0.007	0.029	0.05	22	3	0.005	0.008	0.009
Chromium TRC	2	1	0.01	0.05	0.08	4	2	0.01	0.02	0.02
Chromium DISS	21	1	0.01	0.073	0.10	29	2	0.01	0.030	0.047
Cobalt DISS	19	0	0.8	1.3	2.3	18	0	0.51	0.65	0.74
Copper TRC	2	1	0.01	0.10	0.18	4	4	0.01	0.01	0.01
Copper DISS	21	21	0.01	0.04	0.06	29	29	0.01	0.03	0.06
Iron TRC	2	0	366	477	587	4	0	33.8	231.2	327
Iron DISS	21	0	290	354	515	28	0	28	284	340
Lead TRC	2	2	0.003	0.003	0.003	4	3	0.003	0.004	0.006
Lead DISS	21	21	0.001	0.003	0.01	29	23	0.001	0.004	0.01
Lithium DISS	19	0	0.31	0.36	0.4	25	0	0.38	0.42	0.47
Manganese TRC	2	0	1.23	1.37	1.5	4	0	1.06	1.07	1.09
Manganese DISS	21	0	1.1	1.28	1.49	29	0	0.62	1.20	1.3
Molybdenum DISS	19	16	0.001	0.003	0.01	25	7	0.0085	0.0161	0.03
Nickel TRC	2	0	2.77	2.87	2.96	4	0	1.4	1.70	2.44
Nickel DISS	21	0	2.00	2.38	2.88	29	0	1.39	1.52	1.6
Selenium DISS	6	6	0.001	0.003	0.005	12	12	0.001	0.002	0.005
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	18	17	0.003	0.004	0.006	25	21	0.003	0.004	0.01
Strontium DISS	19	0	0.94	1.03	1.1	25	0	1.1	1.2	1.3
Thallium DISS	--	--	--	--	--	--	--	--	--	--
Titanium DISS	--	--	--	--	--	--	--	--	--	--
Uranium DISS	--	--	--	--	--	--	--	--	--	--
Vanadium TRC	2	2	0.2	0.2	0.2	4	4	0.2	0.2	0.2
Vanadium DISS	21	3	0.036	0.111	0.2	29	5	0.024	0.115	0.2
Zinc TRC	2	0	11.1	12.4	13.7	4	0	5.36	5.79	6.24
Zinc DISS	21	0	9.2	10.5	13.9	29	0	3.36	5.91	6.6
Zircon DISS	--	--	--	--	--	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

All units are in mg/L unless otherwise indicated. Detection limits were used to calculate statstics when values below detection.

Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Table B-1 : Historic Water Quality Summary

	USGS/Maxim Site 20 (SCT12)					USGS/Maxim Site 21[4] (B2)				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	29	NA	4.5	11.5	35.9	29	NA	0	17.5	134.6
Lab Specific Conductivity (umhoscm)	31	NA	6640	7397	8010	30	NA	796	3208	4300
Field Specific Conductivity (umhoscm)[2]	26	NA	6810	7842	9000	30	NA	818	2971	3810
Lab pH (SU)	31	NA	2.5	2.6	2.9	30	NA	2.6	3.4	7.2
Field pH (SU)	28	NA	2.24	2.64	3.69	30	NA	3.0	3.9	7.4
Total Dissolved Solids[3]	7	NA	11900	14400	17200	5	NA	484	1860	6728
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	25	0	1420	1578	1810	25	0	368	879	1040
Alkalinity	6	6	1	1	1	4	4	1	1	1
Acidity (as CaCO3)	31	0	71	8219	9930	29	2	5	1806	2730
Acid Neutral Capacity (as CaCO3)	8	NA	1	1	1	4	NA	179	222	265
Calcium	25	0	190	249	280	26	0	58	170	226
Carbonate (CO3)	--	--	--	--	--	1	0	0	0	0
Fluoride	18	7	1	2.8	7.3	22	15	1	1.27	2.2
Magnesium	25	0	210	232	270	26	0	54	113	152
Sodium	25	0	16	20	24	26	0	19	25.3	60
Potassium	25	0	0.3	0.8	2	26	0	0.523	5.591	7.7
Bicarbonate (HCO3)	6	6	1	1	1	5	4	0	1	1
Chloride	8	0	1	1	1	26	1	7.2	10.9	17
Bromide	--	--	--	--	--	1	1	1.25	1.25	1.25
Sulfate (SO4)	30	0	8490	10562	14000	30	0	180	2946	5100
Silica	24	0	59	126	150	26	0	7.9	60.7	105
Nitrate	--	--	--	--	--	1	1	2.5	2.5	2.5
Orthophosphate	--	--	--	--	--	1	1	2.5	2.5	2.5
Aluminum TRC	6	0	880	1026	1200	4	0	106	217	300
Aluminum DISS	31	0	740	901	1040	30	0	0.02	202.914	436.295
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	1	1	0.01	0.01	0.01
Arsenic TRC	6	0	0.046	0.096	0.13	4	3	0.003	0.004	0.007
Arsenic DISS	30	0	0.016	0.06	0.11	30	29	0.001	0.002	0.005
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	25	15	0.01	0.049	0.1	26	1	0.009	0.028	0.13
Beryllium TRC	6	0	0.09	0.10	0.11	4	4	0.05	0.05	0.05
Beryllium DISS	31	0	0.04	0.097	0.14	30	4	0.0005	0.0215	0.05
Boron TRC	6	3	0.2	0.6	1.2	4	2	0.2	0.3	0.4
Boron DISS	27	3	0.2	0.70	1	27	4	0.04	0.22	0.3
Cadmium TRC	6	0	0.06	0.092	0.141	4	2	0.005	0.008	0.017
Cadmium DISS	30	1	0.005	0.100	0.12	28	9	0.001	0.0124	0.0774
Chromium TRC	6	3	0.01	0.16	0.31	4	3	0.01	0.01	0.02
Chromium DISS	31	3	0.01	0.29	0.40	30	11	0.005	0.035	0.143
Cobalt DISS	25	0	1.7	2.5	5.6	26	0	0.016	0.862	3.3
Copper TRC	6	0	0.19	0.23	0.3	4	2	0.01	0.03	0.06
Copper DISS	31	1	0.01	0.34	0.65	30	20	0.01	0.048	0.1
Iron TRC	6	0	1490	1638	1860	4	0	221	464	591
Iron DISS	30	0	1200	1525	2000	30	0	2.2	394.2	672
Lead TRC	6	4	0.003	0.009	0.020	4	4	0.003	0.003	0.003
Lead DISS	31	30	0.001	0.002	0.01	30	17	0.001	0.004	0.01
Lithium DISS	25	0	0.88	1.01	1.4	26	0	0.047	0.373	0.701
Manganese TRC	6	0	6.3	7.78	8.62	4	0	0.6	1.01	1.23
Manganese DISS	31	0	3.74	8.39	12	30	0	0.056	1.269	2.1
Molybdenum DISS	25	7	0.001	0.0035	0.01	26	21	0.001	0.0054	0.05
Nickel TRC	6	0	4.21	5.11	6.98	4	0	1.05	1.34	1.55
Nickel DISS	31	0	4.16	4.80	6.6	30	0	0.02	1.235	2.975
Selenium DISS	12	12	0.002	0.006	0.025	13	10	0.001	0.002	0.005
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	24	24	0.001	0.014	0.025	26	21	0.001	0.005	0.018
Strontium DISS	25	0	1.4	1.6	1.8	26	0	0.4	1.193	2.227
Thallium DISS	--	--	--	--	--	1	1	0.025	0.025	0.025
Titanium DISS	--	--	--	--	--	1	1	0.01	0.01	0.01
Uranium DISS	--	--	--	--	--	1	0	0.127	0.127	0.127
Vanadium TRC	6	0	0.4	0.5	0.6	4	4	0.2	0.2	0.2
Vanadium DISS	24	3	0.12	0.39	0.66	30	15	0.006	0.072	0.2
Zinc TRC	6	0	18.5	19.3	19.8	4	0	2.07	3.91	4.77
Zinc DISS	30	0	9.82	17.56	19.5	30	0	0.032	3.995	7.823
Zircon DISS	--	--	--	--	--	1	1	0.01	0.01	0.01

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

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SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Table B-1 : Historic Water Quality Summary

	USGS/Maxim Site 22					USGS/Maxim Site 23				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	29	NA	13.5	41.4	273.8	24	NA	0	0.1	1.1
Lab Specific Conductivity (umhoscm)	30	NA	1360	1976	13900	29	NA	745	799	952
Field Specific Conductivity (umhoscm)[2]	28	NA	1410	1840	7880	28	NA	54	966	6400
Lab pH (SU)	30	NA	1.6	2.9	3.1	29	NA	6.8	7.2	7.5
Field pH (SU)	29	NA	2.25	2.91	3.53	29	NA	6.24	7.29	7.80
Total Dissolved Solids[3]	--	--	--	--	--	24	NA	425	478	622
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	25	0	413	461	541	25	0	355	406	505
Alkalinity	5	5	1	1	1	4	0	220	224	225
Acidity (as CaCO3)	29	0	209	313	645	28	4	2	7.2	20
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	24	NA	216	229	239
Calcium	25	0	63	75	91	25	0	56	65	84
Carbonate (CO3)	--	--	--	--	--	--	--	--	--	--
Fluoride	25	0	0.5	1.2	2.5	24	0	0.4	1.0	1.2
Magnesium	25	0	57	66	76	25	0	52	59	72
Sodium	25	0	19	22	25	25	0	13	15	17
Potassium	25	0	1.7	2.5	4.9	24	0	1.8	2.1	2.7
Bicarbonate (HCO3)	5	5	1	1	1	4	0	268	273	275
Chloride	25	0	5.4	6.2	8.1	24	0	4.9	5.9	6.5
Bromide	--	--	--	--	--	--	--	--	--	--
Sulfate (SO4)	30	0	640	856	1300	28	0	140	179	300
Silica	25	0	38	46	54	25	0	9.6	10.8	13
Nitrate	--	--	--	--	--	--	--	--	--	--
Orthophosphate	--	--	--	--	--	--	--	--	--	--
Aluminum TRC	5	0	37	50	61	4	4	0.1	0.1	0.1
Aluminum DISS	30	0	21.9	34.5	67	28	3	0.005	0.024	0.1
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	--	--	--	--	--
Arsenic TRC	5	5	0.003	0.003	0.003	4	4	0.003	0.003	0.003
Arsenic DISS	30	5	0.001	0.001	0.005	28	4	0.001	0.001	0.003
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	25	0	0.002	0.004	0.007	25	0	0.041	0.047	0.056
Beryllium TRC	5	5	0.05	0.05	0.05	4	4	0.05	0.05	0.05
Beryllium DISS	30	5	0.004	0.0133	0.05	29	4	0.0005	0.0073	0.05
Boron TRC	5	5	0.2	0.2	0.2	4	4	0.2	0.2	0.2
Boron DISS	30	3	0.13	0.164	0.2	28	4	0.05	0.092	0.2
Cadmium TRC	5	1	0.005	0.012	0.019	4	4	0.005	0.005	0.005
Cadmium DISS	30	1	0.005	0.009	0.016	27	4	0.001	0.002	0.005
Chromium TRC	5	5	0.01	0.01	0.01	4	4	0.01	0.01	0.01
Chromium DISS	30	5	0.005	0.006	0.015	29	4	0.005	0.006	0.01
Cobalt DISS	25	30	0.15	0.19	0.32	23	0	0.001	0.003	0.003
Copper TRC	5	0	0.01	0.03	0.04	4	4	0.01	0.01	0.01
Copper DISS	30	1	0.01	0.02	0.06	29	4	0.01	0.01	0.01
Iron TRC	5	0	4.47	8.68	13.4	4	1	0.05	0.12	0.19
Iron DISS	30	0	3.4	6.87	39	29	2	0.003	0.019	0.19
Lead TRC	5	5	0.003	0.003	0.003	4	4	0.003	0.003	0.003
Lead DISS	30	5	0.001	0.003	0.01	27	4	0.001	0.009	0.03
Lithium DISS	25	0	0.11	0.14	0.16	25	0	0.032	0.035	0.039
Manganese TRC	5	0	0.66	0.83	0.95	4	2	0.005	0.013	0.033
Manganese DISS	30	0	0.48	0.60	0.93	29	2	0.001	0.002	0.006
Molybdenum DISS	25	0	0.001	0.0036	0.01	23	0	0.0017	0.0102	0.02
Nickel TRC	5	0	0.42	0.50	0.63	4	3	0.02	0.03	0.05
Nickel DISS	30	0	0.28	0.37	0.6	29	4	0.01	0.01	0.05
Selenium DISS	12	0	0.001	0.002	0.005	12	0	0.002	0.003	0.005
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	25	0	0.001	0.001	0.003	25	0	0.001	0.001	0.002
Strontium DISS	25	0	0.49	0.59	0.68	25	0	0.46	0.51	0.66
Thallium DISS	--	--	--	--	--	--	--	--	--	--
Titanium DISS	--	--	--	--	--	--	--	--	--	--
Uranium DISS	--	--	--	--	--	--	--	--	--	--
Vanadium TRC	5	5	0.2	0.2	0.2	4	4	0.2	0.2	0.2
Vanadium DISS	30	5	0.006	0.039	0.2	29	4	0.006	0.033	0.2
Zinc TRC	5	0	1.23	1.47	1.77	4	0	0.02	0.03	0.05
Zinc DISS	30	0	0.81	1.12	1.9	29	0	0.007	0.015	0.07
Zircon DISS	--	--	--	--	--	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

All units are in mg/L unless otherwise indicated. Detection limits were used to calculate statstics when values below detection.

Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

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--- = Not Applicable

1 Total Recoverable metals include Total (Maxim) and Total Recoverable.

2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Table B-1 : Historic Water Quality Summary

	USGS/Maxim Site 24					USGS/Maxim Site 25				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	29	NA	4.0	4.5	4.9	29	NA	0	4.3	4.8
Lab Specific Conductivity (umhoscm)	29	NA	1870	2279	2620	29	NA	3020	3583	4110
Field Specific Conductivity (umhoscm)[2]	28	NA	870	2295	6530	28	NA	1790	4001	4520
Lab pH (SU)	29	NA	2.7	3.1	3.9	30	NA	2.5	2.7	2.8
Field pH (SU)	29	NA	2.81	3.78	4.36	29	NA	2.27	2.63	3.39
Total Dissolved Solids[3]	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	25	NA	845	938	1030	25	0	911	1056	1150
Alkalinity	4	4	1	1	1	5	5	1	1	1
Acidity (as CaCO3)	29	NA	424	555	695	30	0	638	2043	2580
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	--	--	--	--	--
Calcium	25	0	140	166	180	25	0	150	170	190
Carbonate (CO3)	--	--	--	--	--	--	--	--	--	--
Fluoride	25	0	3.2	6.1	8.3	24	4	1	3.1	6.1
Magnesium	25	0	120	127	140	25	0	130	154	170
Sodium	25	0	22	24	26	25	0	23	25	27
Potassium	25	0	6	7.1	7.5	25	0	1	1.5	2.3
Bicarbonate (HCO3)	4	4	1	1	1	5	5	1	1	1
Chloride	25	NA	5.4	6.9	9.8	25	0	4.9	8.2	21
Bromide	--	--	--	--	--	--	--	--	--	--
Sulfate (SO4)	29	NA	1250	1582	2000	30	0	2330	3378	4700
Silica	25	0	47	49	52	25	0	71	76	87
Nitrate	--	--	--	--	--	--	--	--	--	--
Orthophosphate	--	--	--	--	--	--	--	--	--	--
Aluminum TRC	4	0	38	43	48	5	0	170	191	220
Aluminum DISS	29	0	34	50.2	57	30	0	150	211	253
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	--	--	--	--	--
Arsenic TRC	4	4	0.003	0.003	0.003	5	5	0.003	0.003	0.003
Arsenic DISS	29	28	0.001	0.001	0.003	30	30	0.001	0.002	0.005
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	25	0	0.008	0.011	0.015	25	17	0.002	0.009	0.023
Beryllium TRC	4	4	0.05	0.05	0.05	5	5	0.05	0.05	0.05
Beryllium DISS	29	4	0.019	0.028	0.05	30	5	0.021	0.034	0.05
Boron TRC	4	0	0.2	0.3	0.4	5	3	0.2	0.2	0.3
Boron DISS	29	2	0.198	0.280	0.5	27	2	0.2	0.29	0.38
Cadmium TRC	4	4	0.005	0.005	0.005	5	0	0.044	0.050	0.06
Cadmium DISS	25	7	0.002	0.003	0.005	30	0	0.043	0.073	0.1
Chromium TRC	4	4	0.01	0.01	0.01	5	3	0.01	0.01	0.02
Chromium DISS	29	28	0.01	0.014	0.021	30	7	0.01	0.031	0.057
Cobalt DISS	18	0	0.4	0.45	0.52	25	0	0.75	1.31	3.8
Copper TRC	4	4	0.01	0.01	0.01	5	0	0.05	0.07	0.08
Copper DISS	29	29	0.01	0.03	0.04	29	0	0.05	0.13	0.2
Iron TRC	4	0	106	111	119	5	0	230	277	337
Iron DISS	29	0	99	123	135	30	0	170	318	410
Lead TRC	4	4	0.003	0.003	0.003	5	5	0.003	0.003	0.003
Lead DISS	29	29	0.001	0.003	0.01	30	22	0.001	0.004	0.01
Lithium DISS	25	0	0.32	0.37	0.39	25	0	0.33	0.42	0.49
Manganese TRC	4	0	0.79	0.94	1.29	5	0	1.06	1.13	1.2
Manganese DISS	29	0	0.7	0.92	1	30	0	0.82	1.40	1.7
Molybdenum DISS	25	23	0.001	0.0035	0.01	25	23	0.001	0.0036	0.01
Nickel TRC	4	0	0.82	0.89	0.93	5	0	1.78	1.86	1.91
Nickel DISS	29	0	0.54	0.95	1.10	30	0	1.2	2.05	2.5
Selenium DISS	12	12	0.001	0.001	0.005	12	11	0.001	0.002	0.005
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	24	21	0.002	0.003	0.004	25	23	0.002	0.005	0.01
Strontium DISS	25	0	1	1.2	1.3	25	0	0.91	1.04	1.2
Thallium DISS	--	--	--	--	--	--	--	--	--	--
Titanium DISS	--	--	--	--	--	--	--	--	--	--
Uranium DISS	--	--	--	--	--	--	--	--	--	--
Vanadium TRC	4	4	0.2	0.2	0.2	5	5	0.2	0.2	0.2
Vanadium DISS	29	17	0.006	0.043	0.2	30	16	0.018	0.079	0.2
Zinc TRC	4	0	2.54	2.97	4.16	5	0	6.31	7.11	8.54
Zinc DISS	29	0	1.95	2.84	3.3	30	0	4.83	8.12	10
Zircon DISS	--	--	--	--	--	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

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Site IDs indicate historical data tabulated and summarized, and the corresponding Hydrometrics Site ID in parentheses.

SU = Standard pH units

DISS = Dissolved

TRC = Total Recoverable

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2 Eight anomolous values for field conductivity were removed from 12/16/97 Maxim data prior to calculating statistics.

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Table B-1 : Historic Water Quality Summary

	USGS/Maxim Site 26					USGS/Maxim Site 27				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	27	NA	0	1.2	4.5	29	1	0	2.5	9.0
Lab Specific Conductivity (umhoscm)	23	NA	2050	2421	2690	29	NA	1000	1170	1280
Field Specific Conductivity (umhoscm)[2]	22	NA	670	2383	2780	28	NA	900	1295	4800
Lab pH (SU)	23	NA	2.8	3.2	4.5	29	NA	6.6	7.1	7.8
Field pH (SU)	23	NA	2.6	3.31	5.9	29	NA	5.99	7.12	7.90
Total Dissolved Solids[3]	--	--	--	--	--	25	NA	640	812	912
Total Suspended Solids	--	--	--	--	--	--	--	--	--	--
Total Hardness (as CaCO3)	19	0	514	1133	1670	25	0	524	642	733
Alkalinity	4	4	1	1	1	4	0	182	195	204
Acidity (as CaCO3)	23	0	99	382	596	29	11	2	12.1	84
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--	25	NA	174	235	281
Calcium	19	0	100	224	370	25	0	80	103	130
Carbonate (CO3)	--	--	--	--	--	--	--	--	--	--
Fluoride	19	0	2.7	6.2	9.2	25	0	1.1	1.3	1.6
Magnesium	19	0	64	139	200	25	0	72	93	100
Sodium	19	0	11	26	33	25	0	15	18	19
Potassium	19	0	2.4	7.5	9.3	25	0	4.1	4.7	5.5
Bicarbonate (HCO3)	4	4	1	1	1	4	0	222	237	249
Chloride	19	0	4.8	7.2	10	25	0	6.2	7.2	8.8
Bromide	--	--	--	--	--	--	--	--	--	--
Sulfate (SO4)	23	0	1270	1773	2500	29	0	270	438	538
Silica	18	0	24	42	52	25	0	7.7	9.9	12
Nitrate	--	--	--	--	--	--	--	--	--	--
Orthophosphate	--	--	--	--	--	--	--	--	--	--
Aluminum TRC	4	0	27	42	50	4	3	0.1	0.1	0.2
Aluminum DISS	23	0	3	41	61	27	16	0.01	0.03	0.1
Antimony TRC	--	--	--	--	--	--	--	--	--	--
Antimony DISS	--	--	--	--	--	--	--	--	--	--
Arsenic TRC	4	4	0.003	0.003	0.003	4	4	0.003	0.003	0.003
Arsenic DISS	23	23	0.001	0.001	0.003	29	29	0.001	0.001	0.003
Barium TRC	--	--	--	--	--	--	--	--	--	--
Barium DISS	19	0	0.004	0.010	0.016	25	0	0.018	0.023	0.028
Beryllium TRC	4	4	0.05	0.05	0.05	4	4	0.05	0.05	0.05
Beryllium DISS	23	4	0.0032	0.0245	0.05	29	4	0.0005	0.0074	0.05
Boron TRC	4	1	0.2	0.3	0.4	4	4	0.2	0.2	0.2
Boron DISS	23	1	0.19	0.27	0.33	29	4	0.09	0.13	0.2
Cadmium TRC	4	4	0.005	0.005	0.005	4	3	0.005	0.006	0.01
Cadmium DISS	23	9	0.001	0.003	0.005	29	28	0.001	0.002	0.006
Chromium TRC	4	3	0.01	0.01	0.01	4	4	0.01	0.01	0.01
Chromium DISS	23	22	0.005	0.012	0.017	29	29	0.005	0.006	0.015
Cobalt DISS	19	0	0.2	0.40	0.67	25	16	0.001	0.006	0.038
Copper TRC	4	4	0.01	0.01	0.01	4	4	0.01	0.01	0.01
Copper DISS	23	23	0.01	0.02	0.03	29	29	0.01	0.01	0.03
Iron TRC	4	0	13.9	22.2	30	4	0	0.06	0.11	0.18
Iron DISS	23	0	2.9	26.8	60	29	6	0.003	0.319	3.2
Lead TRC	4	4	0.003	0.003	0.003	4	4	0.003	0.003	0.003
Lead DISS	23	22	0.001	0.003	0.01	29	23	0.001	0.01	0.04
Lithium DISS	19	0	0.11	0.34	0.42	25	0	0.067	0.090	0.097
Manganese TRC	4	0	0.82	1.21	1.9	4	1	0.005	0.010	0.018
Manganese DISS	23	0	0.38	1.01	1.5	29	1	0.002	0.038	0.17
Molybdenum DISS	19	19	0.001	0.0029	0.01	25	24	0.001	0.010	0.03
Nickel TRC	4	0	0.79	0.88	0.97	4	0	0.04	0.06	0.08
Nickel DISS	23	0	0.2	0.80	1.1	29	6	0.01	0.03	0.08
Selenium DISS	9	9	0.001	0.001	0.002	12	1	0.001	0.002	0.005
Silver TRC	--	--	--	--	--	--	--	--	--	--
Silver DISS	19	15	0.001	0.003	0.007	25	20	0.001	0.001	0.003
Strontium DISS	19	0	0.53	1.33	1.9	25	0	0.49	0.63	0.69
Thallium DISS	--	--	--	--	--	--	--	--	--	--
Titanium DISS	--	--	--	--	--	--	--	--	--	--
Uranium DISS	--	--	--	--	--	--	--	--	--	--
Vanadium TRC	4	4	0.2	0.2	0.2	4	4	0.2	0.2	0.2
Vanadium DISS	23	23	0.006	0.047	0.2	29	29	0.006	0.033	0.2
Zinc TRC	4	0	2.26	2.58	2.88	4	0	0.08	0.08	0.09
Zinc DISS	23	0	0.53	2.27	3.4	29	1	0.01	0.055	0.14
Zircon DISS	--	--	--	--	--	--	--	--	--	--

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

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Table B-1 : Historic Water Quality Summary

	200615				
Parameter[1]	Number of Samples	Number of Samples Below Detection	Minimum Value	Average	Maximum Value
Flow (gpm)	--	--	--	--	--
Lab Specific Conductivity (umhoscm)	14	NA	3960	4955	5760
Field Specific Conductivity (umhoscm)[2]	10	NA	4080	5079	6230
Lab pH (SU)	14	NA	2.40	2.85	4.10
Field pH (SU)	10	NA	1.75	2.65	3.99
Total Dissolved Solids[3]	14	NA	5814	8566	10491
Total Suspended Solids	--	--	--	--	--
Total Hardness (as CaCO3)	--	--	--	--	--
Alkalinity	--	--	--	--	--
Acidity (as CaCO3)	--	--	--	--	--
Acid Neutral Capacity (as CaCO3)	--	--	--	--	--
Calcium	14	0	198	274	436
Carbonate (CO3)	14	0	0	0	0
Fluoride	14	7	2.5	6.33	13.3
Magnesium	14	0	103	125	177
Sodium	14	0	10.8	14.0	19.3
Potassium	14	2	0.5	7.71	58.4
Bicarbonate (HCO3)	14	0	0	0	0
Chloride	14	11	12.5	38.5	125
Bromide	14	14	0.25	4.38	12.5
Sulfate (SO4)	14	0	4400	6691	8694
Silica	14	0	83.2	104.3	160
Nitrate	14	14	1	4.54	12.5
Orthophosphate	14	14	1	4.54	12.5
Aluminum TRC	--	--	--	--	--
Aluminum DISS	14	0	304	467.79	600.6
Antimony TRC	--	--	--	--	--
Antimony DISS	14	14	0.01	0.019	0.02
Arsenic TRC	--	--	--	--	--
Arsenic DISS	14	2	0.01	0.03	0.1
Barium TRC	--	--	--	--	--
Barium DISS	14	14	0.01	0.02	0.02
Beryllium TRC	--	--	--	--	--
Beryllium DISS	14	1	0.02	0.038	0.057
Boron TRC	--	--	--	--	--
Boron DISS	14	13	0.15	0.3	0.3
Cadmium TRC	--	--	--	--	--
Cadmium DISS	14	7	0.01	0.025	0.1
Chromium TRC	--	--	--	--	--
Chromium DISS	14	0	0.0477	0.1155	0.182
Cobalt DISS	14	0	0.227	0.320	0.406
Copper TRC	--	--	--	--	--
Copper DISS	14	1	0.0246	0.0592	0.2
Iron TRC	--	--	--	--	--
Iron DISS	14	0	665	961	1227
Lead TRC	--	--	--	--	--
Lead DISS	14	14	0.01	0.019	0.02
Lithium DISS	14	0	0.415	0.646	0.967
Manganese TRC	--	--	--	--	--
Manganese DISS	14	0	0.528	0.900	1.52
Molybdenum DISS	14	14	0.01	0.086	0.1
Nickel TRC	--	--	--	--	--
Nickel DISS	14	0	0.344	0.677	1.08
Selenium DISS	14	14	0.005	0.010	0.02
Silver TRC	--	--	--	--	--
Silver DISS	14	14	0.005	0.01	0.01
Strontium DISS	13	0	1.962	3.024	5.42
Thallium DISS	14	14	0.01	0.045	0.05
Titanium DISS	14	13	0.005	0.235	3.058
Uranium DISS	13	1	0.0122	0.0196	0.05
Vanadium TRC	--	--	--	--	--
Vanadium DISS	14	13	0.014	0.053	0.1
Zinc TRC	--	--	--	--	--
Zinc DISS	14	0	1.84	4.67	8.4
Zircon DISS	14	11	0.01	0.0193	0.0283

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

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3 Includes Calculated Dissolved Solids and Total Dissolved Solids

4 Includes USGS and MBMG sites that may not be identical locations along Lewis Coulee.

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
MAXIM	Site 1	--	SAND COULEE CK AB COTTONWOOD CR AT CENTERVILLE	Sand Coulee Creek		7/7/1997	1200	N	47.38916667	-111.1380556	River/Stream		2545.0				470		473	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		7/19/1994	18:45		47.38916667	-111.1380556	River/Stream	WS	175.0				399		401	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		10/14/1994	11:35		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		11/14/1994	15:15		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		12/15/1994	10:00		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		1/11/1995	11:10		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		2/22/1995			47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		3/15/1995	18:00		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		4/12/1995	12:15		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		5/16/1995	14:55		47.38916667	-111.1380556	River/Stream	WS	6732.0				322		327	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		6/7/1995	12:55		47.38916667	-111.1380556	River/Stream	WS	13464.0		2.9	0.88	310			
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		6/12/1995	15:00		47.38916667	-111.1380556	River/Stream	WS	8976.0		2.61	0.8	377		375	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		7/12/1995	10:50		47.38916667	-111.1380556	River/Stream	WS	10771.2		2.85	0.87	336		346	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		8/16/1995	8:45		47.38916667	-111.1380556	River/Stream	WS	2827.4		1.89	0.58	485		476	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		9/13/1995	14:20		47.38916667	-111.1380556	River/Stream	WS	1525.9		1.65	0.5	469		456	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		10/10/1995	15:30		47.38916667	-111.1380556	River/Stream	WS	1077.1		1.3	0.4	442		427	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		11/27/1995	10:30		47.38916667	-111.1380556	River/Stream	WS	210.9		1.14	0.35	475		497	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		1/10/1996	9:10		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		2/8/1996	12:00		47.38916667	-111.1380556	River/Stream	WS	4936.8		2.16	0.66	348			
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		2/20/1996	10:15		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		4/2/1996	16:00		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		5/7/1996	7:10		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		6/3/1996	14:45		47.38916667	-111.1380556	River/Stream	WS	1525.9		1.25	0.38	378		389	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		7/1/1996	13:30		47.38916667	-111.1380556	River/Stream	WS	94.2		0.67	0.2	409		414	
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		8/6/1996	13:30		47.38916667	-111.1380556	River/Stream	WS	0.0							
USGS	Site 1	--	06078230 Sand Coulee Ck ab Cottonwood Cr at Centerville	Sand Coulee Creek		9/3/1996	11:30		47.38916667	-111.1380556	River/Stream	WS	0.0							
MAXIM	Site 2	CW15	COTTONWOOD CREEK NEAR STOCKETT MT	Cottonwood Creek		7/7/1997	1445	N	47.36833333	-111.1583333	River/Stream		373.0						719	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		7/20/1994	17:25		47.36833333	-111.1583333	River/Stream	WS	40.4				874		874	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		10/14/1994	14:00		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		11/14/1994	15:05		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		12/15/1994	10:30		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		1/11/1995	11:00		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		2/22/1995			47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		3/16/1995	12:00		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		4/12/1995			47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		5/8/1995	12:20		47.36833333	-111.1583333	River/Stream	WS	1660.6		1.15	0.35	834			
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		5/16/1995	18:00		47.36833333	-111.1583333	River/Stream	WS	7629.6		220	67.06	656		655	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		6/7/1995	14:55		47.36833333	-111.1583333	River/Stream	WS	2468.4		1.52	0.46				
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		6/13/1995	16:40		47.36833333	-111.1583333	River/Stream	WS	2333.8		1.34	0.41	825		804	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		7/12/1995	15:50		47.36833333	-111.1583333	River/Stream	WS	2468.4		1.38	0.42	887		875	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		7/26/1995	15:15		47.36833333	-111.1583333	River/Stream	WS	1166.9		1.01	0.31	1000			
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		8/15/1995	13:40		47.36833333	-111.1583333	River/Stream	WS	448.8		0.73	0.22	1210		1170	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		9/12/1995	12:45		47.36833333	-111.1583333	River/Stream	WS	318.6		0.54	0.16	1360		1370	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		10/11/1995	12:00		47.36833333	-111.1583333	River/Stream	WS	215.4		0.48	0.15	1330		1350	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		11/27/1995	13:10		47.36833333	-111.1583333	River/Stream	WS	67.3		0.31	0.09	924		945	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		1/10/1996	10:30		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		2/20/1996	11:30		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		4/2/1996	14:30		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		5/6/1996	13:00		47.36833333	-111.1583333	River/Stream	WS	98.7		0.34	0.1	1240		1220	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		6/3/1996	16:50		47.36833333	-111.1583333	River/Stream	WS	103.2		0.33	0.1	1080		1080	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		7/1/1996	14:50		47.36833333	-111.1583333	River/Stream	WS	44.9		0.19	0.06	1020		984	
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		8/6/1996	13:10		47.36833333	-111.1583333	River/Stream	WS	0.0							
USGS	Site 2	CW15	06078250 Cottonwood Creek near Stockett MT	Cottonwood Creek		9/3/1996	9:20		47.36833333	-111.1583333	River/Stream	WS	0.0							
MAXIM	Site 3	NF4	NUMBER FIVE COULEE BL GIFFEN SPRING, NEAR STOCKETT	NumBer Five Coulee		9/29/1997	1745	N	47.31722222	-111.1872222	River/Stream		324.0				800		982	
MAXIM	Site 3	NF4	NUMBER FIVE COULEE BL GIFFEN SPRING, NEAR STOCKETT	NumBer Five Coulee		12/15/1997	1610	N	47.31722222	-111.1872222	River/Stream		324.0				1440		996	
MAXIM	Site 3	NF4	NUMBER FIVE COULEE BL GIFFEN SPRING, NEAR STOCKETT	NumBer Five Coulee		7/7/1997	1630	N	47.31722222	-111.1872222	River/Stream		470.0						905	
MAXIM	Site 3	NF4	NUMBER FIVE COULEE BL GIFFEN SPRING, NEAR STOCKETT	NumBer Five Coulee		3/10/1998	1400	N	47.31722222	-111.1872222	River/Stream		324.0				6530		1020	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		7/21/1994	8:25		47.31722222	-111.1872222	River/Stream	WS	394.9				1080		1050	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		8/17/1994	8:40		47.31722222	-111.1872222	River/Stream	WS	345.6				1200		1140	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		9/6/1994	14:45		47.31722222	-111.1872222	River/Stream	WS	390.5				1180		1170	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		10/13/1994	16:20		47.31722222	-111.1872222	River/Stream	WS	341.1		0.56	0.17	1180		1130	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		11/14/1994	13:20		47.31722222	-111.1872222	River/Stream	WS	323.1		0.54	0.16	1210		1130	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		12/15/1994	11:35		47.31722222	-111.1872222	River/Stream	WS	314.2		0.53	0.16	1180		1130	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		1/11/1995	9:55		47.31722222	-111.1872222	River/Stream	WS	269.3		0.52	0.16	1190		1160	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		2/21/1995	15:05		47.31722222	-111.1872222	River/Stream	WS	287.2		0.51	0.16	1170		1140	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		3/16/1995	13:05		47.31722222	-111.1872222	River/Stream	WS	278.3				1160		1090	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		4/11/1995	15:00		47.31722222	-111.1872222	River/Stream	WS	300.7		0.55	0.17	1170		1080	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		5/8/1995	13:00		47.31722222	-111.1872222	River/Stream	WS	1795.2		1.25	0.38	714			
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		5/16/1995	18:35		47.31722222	-111.1872222	River/Stream	WS	3366.0				727		696	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		6/7/1995	14:00		47.31722222	-111.1872222	River/Stream	WS	3231.4		1.58	0.48	731			
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		6/12/1995	18:45		47.31722222	-111.1872222	River/Stream	WS	2872.3		1.52	0.46	737		713	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		7/12/1995	17:30		47.31722222	-111.1872222	River/Stream	WS	3725.0		1.71	0.52	727		719	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		8/15/1995	10:30		47.31722222	-111.1872222	River/Stream	WS	1256.6		1.02	0.31	919		854	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		9/12/1995	10:20		47.31722222	-111.1872222	River/Stream	WS	852.7		0.86	0.26	1040		919	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		10/11/1995	10:00		47.31722222	-111.1872222	River/Stream	WS	673.2		0.78	0.24	1140		1050	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		11/28/1995	8:40		47.31722222	-111.1872222	River/Stream	WS	538.6		0.71	0.22	1190		1440	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		11/30/1995	11:30		47.31722222	-111.1872222	River/Stream	WS	448.8		0.71	0.22	1140			
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		1/10/1996	13:00		47.31722222	-111.1872222	River/Stream	WS	394.9		0.6	0.18	1250		1250	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		2/8/1996	13:00		47.31722222	-111.1872222	River/Stream	WS	942.5		0.9	0.27	758			
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		2/20/1996	12:30		47.31722222	-111.1872222	River/Stream	WS	314.2		0.55	0.17	1250		1180	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		4/2/1996	13:00		47.31722222	-111.1872222	River/Stream	WS	386.0		0.59	0.18	1230		1150	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		5/6/1996	10:20		47.31722222	-111.1872222	River/Stream	WS	372.5		0.59	0.18	1170		1050	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		6/4/1996	14:30		47.31722222	-111.1872222	River/Stream	WS	394.9		0.62	0.19	1040		1020	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		7/1/1996	16:00		47.31722222	-111.1872222	River/Stream	WS	350.1		0.56	0.17	1100		1030	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		8/6/1996	11:10		47.31722222	-111.1872222	River/Stream	WS	309.7		0.54	0.16	1110		1050	
USGS	Site 3	NF4	06078260 Number Five Coulee bl Giffen Spring nr Stockett	NumBer Five Coulee		9/3/1996	10:00		47.31722222	-111.1872222	River/Stream	WS	273.8		0.51	0.16	1150		1070	
MAXIM	Site 4	SCT15	SAND COULEE AT SAND COULEE MT	Sand Coulee		7/7/1997	1830	N	47.405	-111.1627778	River/Stream		60.1						3490	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		7/20/1994	12:00		47.405	-111.1627778	River/Stream	WS	13.5				4770		4660	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		8/17/1994	10:10		47.405	-111.1627778	River/Stream	WS	9.0				4660		4880	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		9/6/1994	17:00		47.405	-111.1627778	River/Stream	WS	4.5				5460		5220	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		10/13/1994	10:35		47.405	-111.1627778	River/Stream	WS	4.5		0.07	0.02	4770		4810	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		11/15/1994	8:30		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		12/15/1994	14:00		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		1/11/1995	14:00		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		2/22/1995	6:07		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		3/15/1995	15:00		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		4/12/1995	11:50		47.405	-111.1627778	River/Stream	WS	22.4		0.19	0.06	3930		3570	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		5/8/1995	14:05		47.405	-111.1627778	River/Stream	WS	493.7		0.7	0.21	1460			
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		5/16/1995	12:20		47.405	-111.1627778	River/Stream	WS	1122.0		1.04	0.32	1020		992	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		6/13/1995	11:50		47.405	-111.1627778	River/Stream	WS	493.7		0.68	0.21	1730		1720	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		7/11/1995	14:30		47.405	-111.1627778	River/Stream	WS	278.3		0.59	0.18	2470		2690	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		7/27/1995	9:15		47.405	-111.1627778	River/Stream	WS	157.1		0.42	0.13	3920			
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		8/16/1995	10:10		47.405	-111.1627778	River/Stream	WS	80.8		0.32	0.1	4880		4600	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		9/13/1995	10:00		47.405	-111.1627778	River/Stream	WS	76.3				4750		4710	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		10/10/1995	16:50		47.405	-111.1627778	River/Stream	WS	67.3		0.28	0.09	4650		4590	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		1/11/1996	10:00		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		2/21/1996	17:30		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		4/3/1996	12:00		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		5/7/1996	10:30		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		6/4/1996	15:50		47.405	-111.1627778	River/Stream	WS	62.8		0.27	0.08	2750		2720	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		7/2/1996	8:20		47.405	-111.1627778	River/Stream	WS	13.5		0.16	0.05	3270		3220	
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		8/7/1996	7:40		47.405	-111.1627778	River/Stream	WS	0.0							
USGS	Site 4	SCT15	06078270 Sand Coulee at Sand Coulee MT	Sand Coulee		9/3/1996	14:30		47.405	-111.1627778	River/Stream	WS	0.0							
MAXIM	Site 5	B11	ANACONDA DRAIN AT BELT MT			9/29/1997	1100	N	47.38361111	-110.9286111	Mine Adit/Mine Discharge		127.0				1998		2450	
MAXIM	Site 5	B11	ANACONDA DRAIN AT BELT MT			12/15/1997	1200	N	47.38361111	-110.9286111	Mine Adit/Mine Discharge		140.0				1828		2360	
MAXIM	Site 5	B11	ANACONDA DRAIN AT BELT MT			7/2/1997	1100	N	47.38361111	-110.9286111	Mine Adit/Mine Discharge		155.0				2580		2270	
MAXIM	Site 5	B11	ANACONDA DRAIN AT BELT MT			3/10/1998	920	N	47.38361111	-110.9286111	Mine Adit/Mine Discharge		148.0				1040		2340	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			7/19/1994	15:35		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	76.3				2460		2660	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			8/17/1994	15:10		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	80.8				2420		2630	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			9/6/1994	10:30		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	94.2				2380		2540	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			10/14/1994	9:55		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	98.7		0.36	0.11	2400		2480	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			11/14/1994	11:10		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	89.8		0.34	0.1	2420		2520	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			12/15/1994	15:25		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	89.8		0.34	0.1	2440		2470	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			1/12/1995	10:10		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	98.7		0.35	0.11	2390		2520	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			2/22/1995	8:20		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	94.2		0.35	0.11	2400		2770	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			3/16/1995	9:35		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	98.7		0.35	0.11	2370		2650	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			4/12/1995	17:45		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	107.7		0.38	0.12	2380		2500	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			5/17/1995	8:25		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	125.7				2300		2370	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			6/13/1995	9:40		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	130.2		0.43	0.13	2290		2350	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			7/13/1995	9:20		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	125.7		0.42	0.13	2310		2330	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			8/17/1995	11:00		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	125.7		0.42	0.13	2330		2430	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			9/14/1995	11:00		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	116.7		0.4	0.12	2390		2370	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			10/12/1995	11:45		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	98.7				2420		2330	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			11/29/1995	12:00		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	85.3		0.37	0.11	2430		2460	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			1/12/1996	10:10		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	71.8		0.32	0.1	2340		2520	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			2/21/1996	11:00		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	67.3		0.34	0.1	2380		2430	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			4/4/1996	13:30		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	89.8		0.37	0.11	2440		2550	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			5/7/1996	16:10		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	107.7		0.41	0.12	2350		2580	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			5/8/1996	15:30		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS			0.41	0.12	2350			
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			6/5/1996	12:30		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	103.2		0.39	0.12	2280		2450	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			7/3/1996	8:40		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	85.3		0.36	0.11	2340		2480	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			8/8/1996	10:50		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	107.7		0.4	0.12	2440		2600	
USGS	Site 5	B11	06090590 Anaconda Drain at Belt MT			9/4/1996	10:10		47.38361111	-110.9286111	Mine Adit/Mine Discharge	WS	103.2		0.39	0.12	2460		2600	
MAXIM	Site 6	NF3	GIFFEN SPRING NEAR STOCKETT MT	Giffen Spring		9/29/1997	1730	N	47.31416667	-111.1863889	Mine Adit/Mine Discharge		128.0				710		946	
MAXIM	Site 6	NF3	GIFFEN SPRING NEAR STOCKETT MT	Giffen Spring		12/15/1997	1555	N	47.31416667	-111.1863889	Mine Adit/Mine Discharge		144.0				1749		949	
MAXIM	Site 6	NF3	GIFFEN SPRING NEAR STOCKETT MT	Giffen Spring		7/7/1997	1605	N	47.31416667	-111.1863889	Mine Adit/Mine Discharge		180.0						965	
MAXIM	Site 6	NF3	GIFFEN SPRING NEAR STOCKETT MT	Giffen Spring		3/10/1998	1345	N	47.31416667	-111.1863889	Mine Adit/Mine Discharge		128.0				6400		974	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		7/21/1994	845		47.314167	-111.186389	Mine Adit/Mine Discharge		206.4				1250		1520	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		8/17/1994	800		47.314167	-111.186389	Mine Adit/Mine Discharge		219.9				1210			
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		9/6/1994	1445		47.314167	-111.186389	Mine Adit/Mine Discharge		242.4				1190			
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		10/13/1994	1600		47.314167	-111.186389	Mine Adit/Mine Discharge		237.9				1130		1350	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		11/14/1994	1400		47.314167	-111.186389	Mine Adit/Mine Discharge		224.4				1140		1150	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		12/15/1994	1120		47.314167	-111.186389	Mine Adit/Mine Discharge		215.4				1100		1080	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		1/11/1995	1020		47.314167	-111.186389	Mine Adit/Mine Discharge		219.9				1100		1220	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		2/21/1995	1525		47.314167	-111.186389	Mine Adit/Mine Discharge		193.0				1090		1220	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		3/16/1995	1250		47.314167	-111.186389	Mine Adit/Mine Discharge		188.5				1070		1120	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		4/11/1995	1445		47.314167	-111.186389	Mine Adit/Mine Discharge		179.5				1060		1100	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		5/16/1995	1820		47.314167	-111.186389	Mine Adit/Mine Discharge		170.5				1130		1000	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		6/12/1995	1835		47.314167	-111.186389	Mine Adit/Mine Discharge		179.5				982		916	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		7/12/1995	1745		47.314167	-111.186389	Mine Adit/Mine Discharge		242.4				1200		1440	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		8/15/1995	1110		47.314167	-111.186389	Mine Adit/Mine Discharge		246.8				1260		1490	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		9/12/1995	845		47.314167	-111.186389	Mine Adit/Mine Discharge		224.4				1400		1580	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		10/11/1995	1040		47.314167	-111.186389	Mine Adit/Mine Discharge		237.9				1380		1380	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		11/28/1995	915		47.314167	-111.186389	Mine Adit/Mine Discharge		242.4				1320		1440	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		1/10/1996	1340		47.314167	-111.186389	Mine Adit/Mine Discharge		246.8				1270		1630	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		2/20/1996	1310		47.314167	-111.186389	Mine Adit/Mine Discharge		193.0				1220		1440	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		4/2/1996	1330		47.314167	-111.186389	Mine Adit/Mine Discharge		224.4				1170		1360	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		5/6/1996	1110		47.314167	-111.186389	Mine Adit/Mine Discharge		184.0				1120		1290	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		6/4/1996	1520		47.314167	-111.186389	Mine Adit/Mine Discharge		246.8				1070		1170	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		7/1/1996	1700		47.314167	-111.186389	Mine Adit/Mine Discharge		224.4				1120		1310	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		8/6/1996	1145		47.314167	-111.186389	Mine Adit/Mine Discharge		237.9				1040		1100	
USGS	Site 6	NF3	471851111111101 Giffen Spring Near Stockett	Giffen Spring		9/3/1996	1015		47.314167	-111.186389	Mine Adit/Mine Discharge		228.9				1040		1020	
MAXIM	Site 7	CW2	COTTONWOOD MN NO.6 DRN TO COTTONWD CR NR STOCKETT			7/7/1997	1515	N	47.33777778	-111.1491667	Mine Adit/Mine Discharge		8.0						5270	
MAXIM	Site 7	CW2	COTTONWOOD MN NO.6 DRN TO COTTONWD CR NR STOCKETT			3/10/1998	1250	N	47.33777778	-111.1491667	Mine Adit/Mine Discharge		11.3				2550		4980	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
MAXIM	Site 7	CW2	COTTONWOOD MN NO.6 DRN TO COTTONWD CR NR STOCKETT			9/29/1997	1700	N	47.33777778	-111.1491667	Mine Adit/Mine Discharge		12.7				4290		4640	
MAXIM	Site 7	CW2	COTTONWOOD MN NO.6 DRN TO COTTONWD CR NR STOCKETT			12/15/1997	1530	N	47.33777778	-111.1491667	Mine Adit/Mine Discharge		10.2				8860		5200	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			2/21/1995	17:20		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	13.5		0.11	0.03	6020		4920	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			3/16/1995	12:15		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	9.0				5940		5130	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			4/11/1995	14:00		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	9.0				5960		5150	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			5/17/1995	13:45		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	22.4				5620		4960	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			6/12/1995	17:50		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	67.3		0.38	0.12	5610		4920	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			7/12/1995	16:10		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	53.9				5580		4950	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			8/15/1995	11:50		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	40.4		0.28	0.09	5730		5150	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			9/12/1995	11:00		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	26.9		0.21	0.06	5770		5000	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			10/11/1995	11:30		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	22.4		0.19	0.06	5790		5070	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			11/28/1995	10:00		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	18.0		0.15	0.05	5880		3780	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			1/10/1996	14:50		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	13.5		0.13	0.04	5870		5310	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			2/20/1996	14:00		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	13.5		0.12	0.04	5980		5230	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			4/2/1996	14:10		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	9.0				5890		5240	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			5/6/1996	11:45		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	13.5		0.12	0.04	5820		5190	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			6/3/1996	17:10		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	13.5		0.11	0.03	5790		5330	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			7/1/1996	15:10		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	13.5		0.11	0.03	5570		5210	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			8/6/1996	12:20		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	13.5		0.11	0.03	5680		5250	
USGS	Site 7	CW2	472016111085701 Cottonwood Mn No.6 Drn to Cottonwd Cr nr Stockett			9/3/1996	11:10		47.337778	-111.149167	Mine Adit/Mine Discharge	WS	9.0		0.11	0.03	5680		5210	
MAXIM	Site 8	CW12	COTTONWOOD MINE NO.2 DR TO LADD CL AT STOCKETT			9/29/1997	1640	N	47.35388889	-111.1638889	Mine Adit/Mine Discharge		1.0				8500		11100	
MAXIM	Site 8	CW12	COTTONWOOD MINE NO.2 DR TO LADD CL AT STOCKETT			7/7/1997	1540	N	47.35388889	-111.1638889	Mine Adit/Mine Discharge		1.0						8940	
MAXIM	Site 8	CW12	COTTONWOOD MINE NO.2 DR TO LADD CL AT STOCKETT			3/10/1998	1315	N	47.35388889	-111.1638889	Mine Adit/Mine Discharge		1.8				8670		8480	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			7/21/1994	7:20		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				9610		9440	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			8/17/1994	7:20		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				9780		9360	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			9/6/1994	14:20		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				9860		9440	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			10/13/1994	15:25		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				9120		8710	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			11/14/1994	14:50		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				9430		8770	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			12/15/1994	11:00		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	0.0				10100		9570	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			1/11/1995	11:05		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				8650		8040	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			2/21/1995	17:10		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				7770		7300	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			3/16/1995	12:30		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				8680		8270	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			4/11/1995	14:30		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	22.4				6470		6080	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			5/17/1995	13:15		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	9.0				7270		6730	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			6/12/1995	18:15		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	31.4				8390		7450	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			7/12/1995	16:30		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	44.9				8170		7280	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			8/15/1995	11:30		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	26.9				8530		7760	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			9/12/1995	10:40		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	18.0				8530		7710	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			10/11/1995	11:00		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	13.5				8800		8130	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			11/28/1995	9:30		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	13.5				8750		8170	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			1/10/1996	14:20		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	0.0				8620		8270	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			2/20/1996	13:30		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	9.0				8490		7610	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			4/2/1996	13:45		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	18.0				7040		6310	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			5/6/1996	11:30		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				9200		8400	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			6/3/1996	17:50		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				9820		9180	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			7/1/1996	15:40		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	0.0				10400		9850	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			8/6/1996	12:00		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5		17	5.18	10800		10300	
USGS	Site 8	CW12	472114111095001 Cottonwood Mine No.2 Dr to Ladd Cl at Stockett			9/3/1996	10:45		47.353889	-111.163889	Mine Adit/Mine Discharge	WS	4.5				10600		10000	
MAXIM	Site 9	NF6	NUMBER FIVE COULEE MOUTH NEAR STOCKETT MT	NumBer Five Coulee		7/7/1997	1400	N	47.37	-111.1591667	River/Stream		1.6						742	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		7/20/1994	17:45		47.37	-111.159167	River/Stream	WS	4.5				1010		1010	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		10/14/1994	11:35		47.37	-111.159167	River/Stream	WS	0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		11/14/1994	15:00		47.37	-111.159167	River/Stream	WS	0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		12/15/1994	10:25		47.37	-111.159167	River/Stream	WS	0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		1/11/1995	11:55		47.37	-111.159167	River/Stream	WS	53.9				964		963	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		2/22/1995			47.37	-111.159167	River/Stream	WS	0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		3/16/1995	14:30		47.37	-111.159167	River/Stream	WS	0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		4/11/1995	18:00		47.37	-111.159167	River/Stream	WS	179.5				845		846	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		5/17/1995	14:05		47.37	-111.159167	River/Stream	WS	4263.6				645		630	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		6/13/1995	16:00		47.37	-111.159167	River/Stream	WS	2333.8				660		633	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		7/12/1995	15:10		47.37	-111.159167	River/Stream	WS	3186.5				698		694	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		8/15/1995	14:30		47.37	-111.159167	River/Stream	WS	673.2				899		855	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		9/12/1995	13:15		47.37	-111.159167	River/Stream	WS	359.0				1000		954	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		10/11/1995	12:50		47.37	-111.159167	River/Stream	WS	363.5				1080		1020	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		11/27/1995	11:45		47.37	-111.159167	River/Stream	WS	323.1				998		1110	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		1/10/1996	11:00		47.37	-111.159167	River/Stream	WS	233.4				1160		1200	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		2/20/1996	11:20		47.37	-111.159167	River/Stream	WS	9.0				1040		1020	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		4/2/1996	15:00		47.37	-111.159167	River/Stream	WS	89.8				924		907	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		5/6/1996	13:30		47.37	-111.159167	River/Stream	WS	4.5				1130		1100	
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		6/4/1996			47.37	-111.159167	River/Stream		0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		7/1/1996			47.37	-111.159167	River/Stream		0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		8/6/1996			47.37	-111.159167	River/Stream		0.0							
USGS	Site 9	NF6	472212111093301 Number Five Coulee near Stockett MT	NumBer Five Coulee		9/3/1996			47.37	-111.159167	River/Stream		0.0							
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		7/19/1994	11:45		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	9.0				5780		5720	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		8/17/1994	16:30		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	4.5				6090		6130	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		9/6/1994	10:10		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	9.0				6180		6130	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		10/14/1994	9:40		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	13.5				5610		5540	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		11/14/1994	10:40		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	13.5				5450		5300	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		12/15/1994	15:05		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	13.5				5570		5530	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		1/12/1995	9:50		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	9.0				5140		5190	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		2/22/1995	8:00		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	9.0				4140		4450	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		3/16/1995	9:10		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	9.0				4730		4720	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		4/12/1995	17:10		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	13.5				4580		4440	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		5/17/1995	7:50		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	22.4				4220		4120	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		6/13/1995	9:10		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	26.9				3570		3540	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		7/13/1995	8:20		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	44.9				2880		2770	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		8/17/1995	12:50		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	31.4				3270		3170	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		9/14/1995	9:30		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	18.0				3610		3500	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		10/12/1995	11:00		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	22.4				3580		3350	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		11/29/1995	9:50		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	4.5				4210		4050	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		1/12/1996	8:00		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	0.0				4690		4700	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		2/21/1996	12:00		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	0.0				4040		4060	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		4/4/1996	11:00		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	4.5				4680		4630	
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		5/7/1996	17:00		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		6/5/1996	11:00		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		7/3/1996	10:10		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 10	B9	472233110552601 French Coulee Wetlands Outflow at Belt MT	French Coulee Wetlands		9/4/1996	11:20		47.375833	-110.923889	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			7/19/1994	13:15		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0				5970		5440	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			8/17/1994	16:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0				5750		5430	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			9/6/1994	10:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0		0.25	0.08	5640		5420	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			10/14/1994	9:30		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0		0.25	0.08	5630		5220	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			11/14/1994	10:35		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0		0.26	0.08	5630		5110	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			12/15/1994	15:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0		0.25	0.08	5530			
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			1/12/1995	9:45		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	22.4		0.29	0.09	5620		5160	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			2/22/1995	7:55		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0		0.24	0.07	5680		4620	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			3/16/1995	9:05		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	13.5		0.19	0.06	5690		5090	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			4/12/1995	17:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	13.5		0.22	0.07	3230		3150	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			5/17/1995	7:45		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	31.4		0.38	0.12	2440		2530	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			6/13/1995	9:05		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	53.9		0.51	0.16	2300		2450	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			7/13/1995	8:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	49.4		0.49	0.15	2730		2670	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			8/17/1995	12:30		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	40.4				3350		3140	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			9/14/1995	10:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	26.9				3560		3510	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			10/12/1995	10:30		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	22.4				3830		3580	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			11/29/1995	10:15		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	26.9				5040		4480	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			1/12/1996	8:30		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0				6550		6000	
USGS	Site 11	B7	472235110553201 French Coulee Wetlands Inflow at Belt MT			2/21/1996	11:30		47.376389	-110.925556	Mine Adit/Mine Discharge	WS	18.0				5760		5170	
USGS	Site 12	B8	472235110553202 French Coulee Wetlands Inflow no. 2 at Belt MT			4/4/1996	11:30		47.376389	-110.925556	Mine Adit/Mine Discharge	WS					5050		4620	
USGS	Site 12	B8	472235110553202 French Coulee Wetlands Inflow no. 2 at Belt MT			5/7/1996	16:30		47.376389	-110.925556	Mine Adit/Mine Discharge	WS					3640		3440	
USGS	Site 12	B8	472235110553202 French Coulee Wetlands Inflow no. 2 at Belt MT			6/5/1996	12:50		47.376389	-110.925556	Mine Adit/Mine Discharge	WS					3660		3420	
USGS	Site 12	B8	472235110553202 French Coulee Wetlands Inflow no. 2 at Belt MT			7/3/1996	9:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS					4160		4110	
USGS	Site 12	B8	472235110553202 French Coulee Wetlands Inflow no. 2 at Belt MT			8/8/1996	11:00		47.376389	-110.925556	Mine Adit/Mine Discharge	WS					4540		4580	
USGS	Site 12	B8	472235110553202 French Coulee Wetlands Inflow no. 2 at Belt MT			9/4/1996	10:40		47.376389	-110.925556	Mine Adit/Mine Discharge	WS					5550		5470	
MAXIM	Site 13	B5	LEWIS COULEE ABOVE CASTNER PARK AT BELT MT	Lewis Coulee		9/29/1997	1355	N	47.38472222	-110.9213889	Mine Adit/Mine Discharge		7.1				3400		23700	
MAXIM	Site 13	B5	LEWIS COULEE ABOVE CASTNER PARK AT BELT MT	Lewis Coulee		12/15/1997	1325	N	47.38472222	-110.9213889	Mine Adit/Mine Discharge		3.3				9500		3790	
MAXIM	Site 13	B5	LEWIS COULEE ABOVE CASTNER PARK AT BELT MT	Lewis Coulee		7/7/1997	1115	N	47.38472222	-110.9213889	Mine Adit/Mine Discharge		5.0				4410		4260	
MAXIM	Site 13	B5	LEWIS COULEE ABOVE CASTNER PARK AT BELT MT	Lewis Coulee		3/6/1998	1015	N	47.38472222	-110.9213889	Mine Adit/Mine Discharge		2.8				2020		3860	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		7/19/1994	15:00		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	9.0				3890		3710	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		9/6/1994	11:00		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				3940		3790	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		10/14/1994	9:10		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4100		3840	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		11/14/1994	11:45		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	0.0				4170		3940	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		12/15/1994	15:45		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	0.0				4130		3860	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		1/12/1995	10:20		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4250		3980	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		2/22/1995	9:00		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4360		4290	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		3/16/1995	10:00		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4340		4070	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		4/12/1995	18:10		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4660		4120	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		5/17/1995	8:45		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4750		4070	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		6/13/1995	10:15		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	13.5				4850		4160	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		7/13/1995	9:50		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4820		4080	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		8/17/1995	10:00		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4550		4050	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		9/14/1995	11:20		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4550		4220	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		10/12/1995	10:10		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4500		4130	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		11/29/1995	11:20		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4500		4040	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		1/12/1996	9:45		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4240		3970	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		2/21/1996	9:25		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4190		3880	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		4/4/1996	12:00		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	9.0				4090		3760	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		5/7/1996	15:00		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4210		3860	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		6/5/1996	13:10		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4180		3820	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		7/3/1996	9:20		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4050		3750	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		8/8/1996	11:30		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4040		3840	
USGS	Site 13	B5	472305110551701 Lewis Coulee ab Castner Park at Belt MT	Lewis Coulee		9/4/1996	9:20		47.384722	-110.921389	Mine Adit/Mine Discharge	WS	4.5				4070		3820	
MAXIM	Site 14	SCT1	MINE DRAIN TO MINING COULEE NEAR SAND COULEE MT			9/30/1997	0940	N	47.385	-111.1766667	Mine Adit/Mine Discharge		1.0				5550		6860	
MAXIM	Site 14	SCT1	MINE DRAIN TO MINING COULEE NEAR SAND COULEE MT			12/16/1997	0830	N	47.385	-111.1766667	Mine Adit/Mine Discharge		0.2						6710	
MAXIM	Site 14	SCT1	MINE DRAIN TO MINING COULEE NEAR SAND COULEE MT			7/7/1997	1725	N	47.385	-111.1766667	Mine Adit/Mine Discharge		0.7						6860	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			7/20/1994	14:55		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				6680		6880	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			8/17/1994	13:00		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7520		6950	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			9/6/1994	17:50		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7410		6810	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			10/13/1994	11:50		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7400		6940	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			11/14/1994	16:20		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7620		6970	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			12/15/1994	12:55		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7250		6800	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			1/11/1995	15:40		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7250		6820	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			2/21/1995	14:10		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7280		6620	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			3/15/1995	15:30		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7310		6680	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			4/12/1995	13:50		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7260		6740	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			5/16/1995	10:50		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7290		6520	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			6/13/1995	15:20		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7210		6720	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			7/11/1995	17:30		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7390		6640	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			8/16/1995	15:50		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7290		6580	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			9/13/1995	8:30		47.385	-111.176667	Mine Adit/Mine Discharge	WS	13.5				7300		6340	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			10/11/1995	16:30		47.385	-111.176667	Mine Adit/Mine Discharge	WS	18.0				7430		6510	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			11/28/1995	14:30		47.385	-111.176667	Mine Adit/Mine Discharge	WS	13.5				7240		6970	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			1/11/1996	8:00		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7280		6910	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			2/22/1996	9:00		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7320		6890	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			4/3/1996	13:10		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7240		6870	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			5/7/1996	8:50		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7300		6900	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			6/4/1996	16:20		47.385	-111.176667	Mine Adit/Mine Discharge	WS	9.0				7340		6910	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			7/2/1996	9:10		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7230		6950	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			8/6/1996	17:15		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7500		6920	
USGS	Site 14	SCT1	472306111103601 Mine Drain to Mining Coulee nr Sand Coulee MT			9/3/1996	15:10		47.385	-111.176667	Mine Adit/Mine Discharge	WS	4.5				7350		6860	
MAXIM	Site 15	B1	LEWIS COULEE ABOVE MINE ADIT AT BELT MT	Lewis Coulee		7/7/1997	1030	N	47.38611111	-110.9188889	River/Stream		22.4				995		982	
USGS	Site 15	B1	472310110550801 Lewis Coulee above Mine Adit at Belt MT	Lewis Coulee		4/12/1995	18:40		47.386111	-110.918889	River/Stream	WS	98.7				735		740	
USGS	Site 15	B1	472310110550801 Lewis Coulee above Mine Adit at Belt MT	Lewis Coulee		5/17/1995	9:20		47.386111	-110.918889	River/Stream	WS	98.7				818		787	
USGS	Site 15	B1	472310110550801 Lewis Coulee above Mine Adit at Belt MT	Lewis Coulee		6/13/1995	10:40		47.386111	-110.918889	River/Stream	WS	49.4				905		867	
USGS	Site 15	B1	472310110550801 Lewis Coulee above Mine Adit at Belt MT	Lewis Coulee		7/13/1995	10:30		47.386111	-110.918889	River/Stream	WS	125.7				1300		1250	
USGS	Site 15	B1	472310110550801 Lewis Coulee above Mine Adit at Belt MT	Lewis Coulee		10/12/1995	9:50		47.386111	-110.918889	River/Stream	WS	0.0							
USGS	Site 15	B1	472310110550801 Lewis Coulee above Mine Adit at Belt MT	Lewis Coulee		4/4/1996	12:15		47.386111	-110.918889	River/Stream	WS	0.0							
MAXIM	Site 16	SCT3	MINE DRAIN TO SAND COULEE NEAR SAND COULEE MT			9/30/1997	0915	N	47.386944	111.180278	Mine Adit/Mine Discharge		3.0				2800		3720	
MAXIM	Site 16	SCT3	MINE DRAIN TO SAND COULEE NEAR SAND COULEE MT			7/7/1997	1705	N	47.386944	111.180278	Mine Adit/Mine Discharge		2.2						3340	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			7/20/1994	14:30		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	13.5				3340		3450	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			8/17/1994	12:20		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	9.0				3390		3400	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			9/6/1994	17:30		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	4.5				3220		3230	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			10/13/1994	11:30		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	4.5				3110		3150	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			11/14/1994	15:50		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			12/15/1994	12:00		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			1/11/1995	12:30		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			2/21/1995	14:00		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			3/15/1995	15:15		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			4/12/1995	13:40		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			5/16/1995	11:15		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	26.9				3100		2990	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			6/13/1995	15:00		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	49.4				3420		3360	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			7/11/1995	17:00		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	49.4				3480		3410	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			8/16/1995	15:20		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	35.9				3410		3680	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			9/13/1995	8:50		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	26.9				3400		3310	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			10/11/1995	16:15		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	22.4				3410		3130	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			11/28/1995	14:50		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	13.5				3290		3290	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			1/11/1996	8:30		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	9.0				3240		3250	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			2/22/1996	8:15		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	9.0				3160		3150	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			4/3/1996	13:30		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	4.5				3140		3170	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			5/7/1996	9:20		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	4.5				3160		3210	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			6/4/1996	16:45		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	22.4				3340		3390	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			7/2/1996	8:50		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	18.0				3360		3410	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			8/6/1996	16:50		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	9.0				3280		3280	
USGS	Site 16	SCT3	472313111104901 Mine Drain to Sand Coulee nr Sand Coulee MT			9/3/1996	14:45		47.386944	-111.180278	Mine Adit/Mine Discharge	WS	4.5				3180		3240	
MAXIM	Site 17	--	CENTERVILLE WETLANDS INFLOW AT CENTERVILLE MT	Centerville Wetlands		9/29/1997	1545	N	47.39166667	-111.1411111			6.1				2580		3180	
MAXIM	Site 17	--	CENTERVILLE WETLANDS INFLOW AT CENTERVILLE MT	Centerville Wetlands		12/15/1997	1440	N	47.39166667	-111.1411111			5.4				44100		3000	
MAXIM	Site 17	--	CENTERVILLE WETLANDS INFLOW AT CENTERVILLE MT	Centerville Wetlands		7/7/1997	1255	N	47.39166667	-111.1411111			6.0				3220		3190	
MAXIM	Site 17	--	CENTERVILLE WETLANDS INFLOW AT CENTERVILLE MT	Centerville Wetlands		3/10/1998	1135	N	47.39166667	-111.1411111			5.1				7350		3100	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		7/20/1994	15:50		47.391667	-111.141111		WS	4.5				3220		3350	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		8/16/1994	17:35		47.391667	-111.141111		WS	9.0				3330		3340	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		9/6/1994	13:40		47.391667	-111.141111		WS	4.5				3170		3260	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		10/13/1994	14:55		47.391667	-111.141111		WS	4.5				3300		3190	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		11/14/1994	15:30		47.391667	-111.141111		WS	4.5				3380		3170	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		12/15/1994	10:05		47.391667	-111.141111		WS	4.5				3290		3190	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		1/11/1995	12:20		47.391667	-111.141111		WS	4.5				3390		3300	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		2/22/1995	10:55		47.391667	-111.141111		WS	4.5				3270		3480	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		3/15/1995	17:00		47.391667	-111.141111		WS	4.5				3360		3390	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		4/12/1995	12:30		47.391667	-111.141111		WS	9.0				3690		3550	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		5/16/1995	14:30		47.391667	-111.141111		WS	9.0				3650		3470	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		6/12/1995	16:45		47.391667	-111.141111		WS	9.0				3530		3410	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		7/12/1995	9:50		47.391667	-111.141111		WS	9.0				3100		2920	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		8/16/1995	9:00		47.391667	-111.141111		WS	9.0				2970		2880	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		9/13/1995	15:00		47.391667	-111.141111		WS	9.0				2990		2840	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		10/10/1995	15:50		47.391667	-111.141111		WS	9.0				3140		2950	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		11/27/1995	10:45		47.391667	-111.141111		WS	9.0				3270		3090	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		1/10/1996	9:45		47.391667	-111.141111		WS	9.0				3350		3200	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		2/20/1996	10:45		47.391667	-111.141111		WS	9.0				3360		3140	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		4/2/1996	16:30		47.391667	-111.141111		WS	9.0				3560		3350	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		5/7/1996	7:50		47.391667	-111.141111		WS	4.5				3410		3410	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		6/3/1996	15:30		47.391667	-111.141111		WS	9.0				3440		3340	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		7/1/1996	14:20		47.391667	-111.141111		WS	4.5				3240		3350	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		8/6/1996	13:50		47.391667	-111.141111		WS	4.5				3160		3130	
USGS	Site 17	--	472330111082801 Centerville Wetlands Inflow at Centerville MT	Centerville Wetlands		9/3/1996	12:00		47.391667	-111.141111		WS	4.5				3160		3050	
MAXIM	Site 18	--	CENTERVILLE WETLANDS OUTFLOW AT CENTERVILLE MT	Centerville Wetlands		9/29/1997	1600	N	47.39194444	-111.1416667			1.5				3480		4550	
MAXIM	Site 18	--	CENTERVILLE WETLANDS OUTFLOW AT CENTERVILLE MT	Centerville Wetlands		12/15/1997	1450	N	47.39194444	-111.1416667			0.5				6190		3360	
MAXIM	Site 18	--	CENTERVILLE WETLANDS OUTFLOW AT CENTERVILLE MT	Centerville Wetlands		7/7/1997	1320	N	47.39194444	-111.1416667			1.0				3560		3430	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		7/20/1994	16:05		47.391944	-111.141667		WS	0.0				4530		4520	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		8/16/1994	17:45		47.391944	-111.141667		WS	0.0				4600		4610	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		9/6/1994	13:45		47.391944	-111.141667		WS					4360		4410	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		10/13/1994	15:00		47.391944	-111.141667		WS	4.5				3650		3530	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		11/14/1994	15:35		47.391944	-111.141667		WS	4.5				3400		3340	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		12/15/1994	10:10		47.391944	-111.141667		WS	0.0							
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		1/11/1995	12:30		47.391944	-111.141667		WS	9.0				3590		3680	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		2/22/1995	11:00		47.391944	-111.141667		WS	4.5				2390		2590	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		3/15/1995	17:15		47.391944	-111.141667		WS	4.5				2820		2850	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		4/12/1995	12:40		47.391944	-111.141667		WS					2710		2620	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		5/16/1995	14:35		47.391944	-111.141667		WS	9.0				3430		3250	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		6/12/1995	17:00		47.391944	-111.141667		WS					3380		3140	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		7/12/1995	10:00		47.391944	-111.141667		WS					3320		3080	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		8/16/1995	9:15		47.391944	-111.141667		WS	4.5				3680		3440	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		9/13/1995	15:10		47.391944	-111.141667		WS	9.0				3420		3230	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		10/10/1995	16:10		47.391944	-111.141667		WS	9.0				3360		3120	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		11/27/1995	11:00		47.391944	-111.141667		WS	9.0				3330		3180	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		1/10/1996	10:00		47.391944	-111.141667		WS					3320		3290	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		2/20/1996	11:00		47.391944	-111.141667		WS					1760		1810	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		4/2/1996	16:45		47.391944	-111.141667		WS					3400		3210	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		5/7/1996	8:10		47.391944	-111.141667		WS	4.5				3720		3560	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		6/3/1996	15:00		47.391944	-111.141667		WS	4.5				3620		3520	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		7/1/1996	14:00		47.391944	-111.141667		WS	0.0				4070		4060	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		8/6/1996	14:00		47.391944	-111.141667		WS					5080		4940	
USGS	Site 18	--	472331111083001 Centerville Wetlands Outflow at Centerville MT	Centerville Wetlands		9/3/1996	12:20		47.391944	-111.141667		WS					5370		5100	
MAXIM	Site 19	SCT8	MOUNT OREGON MINE DR TO KATES CL AT SAND COULEE			9/30/1997	0850	N	47.39277778	-111.1788889	Mine Adit/Mine Discharge		14.3				2040		2910	
MAXIM	Site 19	SCT8	MOUNT OREGON MINE DR TO KATES CL AT SAND COULEE			12/16/1997	0850	N	47.39277778	-111.1788889	Mine Adit/Mine Discharge		13.8						2600	
MAXIM	Site 19	SCT8	MOUNT OREGON MINE DR TO KATES CL AT SAND COULEE			7/7/1997	1750	N	47.39277778	-111.1788889	Mine Adit/Mine Discharge		36.0						2720	
MAXIM	Site 19	SCT8	MOUNT OREGON MINE DR TO KATES CL AT SAND COULEE			3/10/1998	1555	N	47.39277778	-111.1788889	Mine Adit/Mine Discharge		15.2				6800		2780	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			7/20/1994	13:50		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	35.9				2920			
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			8/17/1994	11:15		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	13.5				3010		3190	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			9/7/1994	7:10		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	35.9				2940		3080	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			10/13/1994	12:50		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	9.0				2880		3060	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			11/15/1994	8:10		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	9.0				2900		2990	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			12/15/1994	13:20		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	22.4				2790		2940	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			1/11/1995	16:45		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	31.4				2780		2950	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			2/21/1995	13:30		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	26.9				2870		3350	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			3/15/1995	15:50		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	18.0		0.14	0.04	2870		3170	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			4/12/1995	14:10		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	80.8				2860		3050	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			5/16/1995	11:35		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	44.9		0.23	0.07	2860		2920	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			6/13/1995	14:35		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	49.4				2950		3050	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			7/12/1995	8:00		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	40.4				2970		3060	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			8/16/1995	14:40		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	35.9				2890		2930	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			9/13/1995	8:00		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	22.4				2880		2970	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			10/11/1995	15:30		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	40.4				2850		2790	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			11/28/1995	11:00		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	31.4				2770		2920	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			1/11/1996	9:00		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	31.4				2750		2940	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			2/22/1996	8:00		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	31.4				2700		2830	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			4/3/1996	14:00		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	26.9				2690		2850	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			5/7/1996	9:40		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	31.4				2700		2920	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			6/4/1996	17:10		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	44.9				2730		2860	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			7/2/1996	9:45		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	31.4				2740		2880	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			8/7/1996	8:10		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	18.0				2720		2890	
USGS	Site 19	SCT8	472334111104401 Mount Oregon Mine Dr to Kates Cl at Sand Coulee			9/3/1996	15:30		47.392778	-111.178889	Mine Adit/Mine Discharge	WS	31.4				2770		2880	
MAXIM	Site 20	SCT12	NELSON MINE DRAIN TO SAND COULEE AT SAND COULEE			9/30/1997	0815	N	47.39611111	-111.1733333	Mine Adit/Mine Discharge		9.2						7590	
MAXIM	Site 20	SCT12	NELSON MINE DRAIN TO SAND COULEE AT SAND COULEE			9/30/1997	0830	D	47.39611111	-111.1733333	Mine Adit/Mine Discharge								7820	
MAXIM	Site 20	SCT12	NELSON MINE DRAIN TO SAND COULEE AT SAND COULEE			12/16/1997	0905	N	47.39611111	-111.1733333	Mine Adit/Mine Discharge		8.0						7420	
MAXIM	Site 20	SCT12	NELSON MINE DRAIN TO SAND COULEE AT SAND COULEE			7/7/1997	1815	N	47.39611111	-111.1733333	Mine Adit/Mine Discharge		9.2						7890	
MAXIM	Site 20	SCT12	NELSON MINE DRAIN TO SAND COULEE AT SAND COULEE			3/10/1998	1525	N	47.39611111	-111.1733333	Mine Adit/Mine Discharge		6.1				9000		7620	
MAXIM	Site 20	SCT12	NELSON MINE DRAIN TO SAND COULEE AT SAND COULEE			3/10/1998		D	47.39611111	-111.1733333	Mine Adit/Mine Discharge								7520	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			7/20/1994	12:50		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	13.5				8090		7600	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			8/17/1994	10:45		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	13.5				8020		7500	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			9/7/1994	7:35		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	13.5				8060		7540	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			10/13/1994	11:05		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	13.5				8140		7580	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			11/14/1994	16:40		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	9.0				8120		7440	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			12/15/1994	13:40		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	9.0				7600		7400	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			1/11/1995	15:00		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	9.0				7620		7410	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			2/21/1995	13:10		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				8610		7860	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			3/15/1995	16:25		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				8310		7620	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			4/12/1995	13:15		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				8010		7590	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			5/16/1995	12:05		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				7470		7030	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			6/13/1995	14:20		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	26.9				8110		7620	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			7/11/1995	17:50		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	35.9				8980		7990	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			8/16/1995	14:20		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	26.9				8520		8010	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			9/13/1995	9:10		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	22.4				8430		7590	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			10/11/1995	17:00		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	18.0				7970		7100	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			11/28/1995	10:30		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	13.5				7360		6980	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			1/11/1996	9:40		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	13.5				7240		6920	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			2/22/1996	9:30		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	9.0				6970		6640	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			4/3/1996	14:15		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	9.0				6840		6650	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			5/7/1996	10:00		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				7670		7430	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			6/4/1996	17:30		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				7430		7300	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			7/2/1996	10:00		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				6810		6750	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			8/6/1996	17:30		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	9.0				7290		6980	
USGS	Site 20	SCT12	472346111102401 Nelson Mine Drain to Sand Coulee at Sand Coulee			9/3/1996	15:45		47.396111	-111.173333	Mine Adit/Mine Discharge	WS	4.5				7230		6920	
MAXIM	Site 21	B2	LEWIS COULEE BELOW MINE ADIT AT BELT MT			9/29/1997	1335	N	47.38583333	-110.92	Mine Adit/Mine Discharge		5.0				3000		3720	
MAXIM	Site 21	B2	LEWIS COULEE BELOW MINE ADIT AT BELT MT			12/15/1997	1300	N	47.38583333	-110.92	Mine Adit/Mine Discharge		1.0				1200		3610	
MAXIM	Site 21	B2	LEWIS COULEE BELOW MINE ADIT AT BELT MT			7/7/1997	1045	N	47.38583333	-110.92	Mine Adit/Mine Discharge		37.7				2170		2340	
MAXIM	Site 21	B2	LEWIS COULEE BELOW MINE ADIT AT BELT MT			3/10/1998	955	N	47.38583333	-110.92	Mine Adit/Mine Discharge		1.3				1270		2640	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			7/19/1994	14:05		47.385833	-110.92	Mine Adit/Mine Discharge	WS	0.0				3390		3500	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			8/17/1994	14:30		47.385833	-110.92	Mine Adit/Mine Discharge	WS	0.0				3510		3630	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			9/6/1994	11:20		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3460		3580	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			10/14/1994	10:20		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3450		3580	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			11/14/1994	12:00		47.385833	-110.92	Mine Adit/Mine Discharge	WS	0.0				3510		3550	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			12/15/1994	16:15		47.385833	-110.92	Mine Adit/Mine Discharge	WS	0.0				3430		3480	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			1/12/1995	10:40		47.385833	-110.92	Mine Adit/Mine Discharge	WS	0.0				3380		3440	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			2/22/1995	8:50		47.385833	-110.92	Mine Adit/Mine Discharge	WS	0.0				3360		3680	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			3/16/1995	10:15		47.385833	-110.92	Mine Adit/Mine Discharge	WS	0.0				3330		3560	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			4/12/1995	18:20		47.385833	-110.92	Mine Adit/Mine Discharge	WS	103.2				818		796	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			5/17/1995	9:00		47.385833	-110.92	Mine Adit/Mine Discharge	WS	116.7				874		840	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			6/13/1995	10:30		47.385833	-110.92	Mine Adit/Mine Discharge	WS	40.4				1040		987	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			7/13/1995	10:10		47.385833	-110.92	Mine Adit/Mine Discharge	WS	134.6				1330		1270	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			8/17/1995	10:15		47.385833	-110.92	Mine Adit/Mine Discharge	WS	9.0				2270		2390	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			9/14/1995	11:40		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3610		3420	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			10/12/1995	9:30		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3650		3610	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			11/29/1995	11:00		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3750		4040	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			1/12/1996	9:10		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3660		3810	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			2/21/1996	9:45		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3810		3780	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			4/4/1996	12:30		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3670		3780	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			5/7/1996	15:20		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3660		3790	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			6/5/1996	13:30		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3550		3670	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			7/3/1996	9:50		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3670		3720	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			8/8/1996	11:45		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3750		3870	
USGS	Site 21	B2	472309110551201 Lewis Coulee below Mine Adit at Belt MT			9/4/1996	9:40		47.385833	-110.92	Mine Adit/Mine Discharge	WS	4.5				3780		3860	
MAXIM	Site 22	--	PIPE SPRING AT TRACY MT	Pipe Spring		9/30/1997	1015	N	47.41277778	-111.1475	Mine Adit/Mine Discharge		22.5				1480		1820	
MAXIM	Site 22	--	PIPE SPRING AT TRACY MT	Pipe Spring		12/16/1997	0930	N	47.41277778	-111.1475	Mine Adit/Mine Discharge		20.0						1590	
MAXIM	Site 22	--	PIPE SPRING AT TRACY MT	Pipe Spring		7/10/1997	1030	N	47.41277778	-111.1475	Mine Adit/Mine Discharge		85.0				1550		2030	
MAXIM	Site 22	--	PIPE SPRING AT TRACY MT	Pipe Spring		7/10/1997	1035	D	47.41277778	-111.1475	Mine Adit/Mine Discharge								2050	
MAXIM	Site 22	--	PIPE SPRING AT TRACY MT	Pipe Spring		3/11/1998	915	N	47.41277778	-111.1475	Mine Adit/Mine Discharge		14.8				7880		1590	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		7/20/1994	1105		47.412778	-111.1475	Mine Adit/Mine Discharge		26.9				1680		1580	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		8/16/1994	1640		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1620		1570	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		9/7/1994	955		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1610		1530	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		10/14/1994	800		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1670		1560	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		11/15/1994	855		47.412778	-111.1475	Mine Adit/Mine Discharge		18.0				1720		1560	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		12/15/1994	1415		47.412778	-111.1475	Mine Adit/Mine Discharge		18.0				1710		1570	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		1/11/1994	1610		47.412778	-111.1475	Mine Adit/Mine Discharge		18.0				1700		1570	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		2/22/1995	1155		47.412778	-111.1475	Mine Adit/Mine Discharge		18.0				1730		1570	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		3/15/1995	1310		47.412778	-111.1475	Mine Adit/Mine Discharge		13.5				1710		1590	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		4/12/1995	900		47.412778	-111.1475	Mine Adit/Mine Discharge		13.5				1750		1590	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		5/17/1995	1255		47.412778	-111.1475	Mine Adit/Mine Discharge		44.9				1770		1670	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		6/12/1995	1335		47.412778	-111.1475	Mine Adit/Mine Discharge		273.8				2360		2200	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		7/12/1995	900		47.412778	-111.1475	Mine Adit/Mine Discharge		152.6				1880		13900	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		8/16/1995	1100		47.412778	-111.1475	Mine Adit/Mine Discharge		80.8				1660		1530	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		9/13/1995	1600		47.412778	-111.1475	Mine Adit/Mine Discharge		49.4				1550		1460	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		10/10/1995	1000		47.412778	-111.1475	Mine Adit/Mine Discharge		40.4				1520		1410	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		11/28/1995	1530		47.412778	-111.1475	Mine Adit/Mine Discharge		31.4				1470		1390	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		1/1/1996	1045		47.412778	-111.1475	Mine Adit/Mine Discharge		31.4				1450		1370	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		2/20/1996	1500		47.412778	-111.1475	Mine Adit/Mine Discharge		26.9				1480		1370	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		4/3/1996	845		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1430		1360	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		5/7/1996	1100		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1430		1360	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		6/4/1996	830		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1440		1380	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		7/2/1996	1030		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1420		1370	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		8/7/1996	910		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1410		1380	
USGS	Site 22	--	472446111085101 Pipe Spring at Tracy MT	Pipe Spring		9/3/1996	1630		47.412778	-111.1475	Mine Adit/Mine Discharge		22.4				1440		1360	
MAXIM	Site 23	--	STOCK TANK SPRING AT TRACY MT	Stock Tank Spring		9/30/1997	1030	N	47.41305556	-111.1480556	Mine Adit/Mine Discharge		0.2				600		803	
MAXIM	Site 23	--	STOCK TANK SPRING AT TRACY MT	Stock Tank Spring		12/16/1997	0920	N	47.41305556	-111.1480556	Mine Adit/Mine Discharge		1.0						745	
MAXIM	Site 23	--	STOCK TANK SPRING AT TRACY MT	Stock Tank Spring		7/10/1997	1025	N	47.41305556	-111.1480556	Mine Adit/Mine Discharge		0.8				54		778	
MAXIM	Site 23	--	STOCK TANK SPRING AT TRACY MT	Stock Tank Spring		3/11/1998	925	N	47.41305556	-111.1480556	Mine Adit/Mine Discharge		1.1				6400		771	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		7/20/1994	1055		47.413056	-111.148056	Mine Adit/Mine Discharge						782		795	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		8/16/1994	1630		47.413056	-111.148056	Mine Adit/Mine Discharge						788		790	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		9/7/1994	945		47.413056	-111.148056	Mine Adit/Mine Discharge						782		783	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		10/14/1994	750		47.413056	-111.148056	Mine Adit/Mine Discharge						785		810	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		11/15/1994	910		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				798		801	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		12/15/1994	1405		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				780		793	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		1/1/1995	1620		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				781		776	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		2/22/1995	1145		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				777		776	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		3/15/1995	1305		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				785		782	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		4/12/1995	850		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				848		844	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		5/17/1995	1250		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				820		820	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		6/12/1995	1325		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				967		941	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		7/12/1995	830		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				938		952	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		8/16/1995	1045		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				883		854	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		9/13/1995	1550		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				836		813	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		10/10/1995	940		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				824		797	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		11/28/1995	1520		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				761		797	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		1/11/1996	1030		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				736		769	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		2/20/1996	1450		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				755		760	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		4/3/1996	830		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				740		765	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		5/7/1996	1050		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				742		754	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		6/4/1996	820		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				756		773	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		7/2/1996	1020		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				769		768	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		8/7/1996	900		47.413056	-111.148056	Mine Adit/Mine Discharge		0.0				764		772	
USGS	Site 23	--	472447111085301 Stock Tank Spring at Tracy MT	Stock Tank Spring		9/3/1996	1615		47.413056	-111.148056	Mine Adit/Mine Discharge						791		785	
MAXIM	Site 24	--	JOHNSON BADWATER MINE SM WTLNDS INFLOW NR TRACY			9/30/1997	1143	N	47.42027778	-111.1402778	Mine Adit/Mine Discharge		4.8				2220		2030	
MAXIM	Site 24	--	JOHNSON BADWATER MINE SM WTLNDS INFLOW NR TRACY			12/16/1997	1010	N	47.42027778	-111.1402778	Mine Adit/Mine Discharge		4.9						1870	
MAXIM	Site 24	--	JOHNSON BADWATER MINE SM WTLNDS INFLOW NR TRACY			7/10/1997	1155	N	47.42027778	-111.1402778	Mine Adit/Mine Discharge		4.0				870		1980	
MAXIM	Site 24	--	JOHNSON BADWATER MINE SM WTLNDS INFLOW NR TRACY			3/10/1998	1650	N	47.42027778	-111.1402778	Mine Adit/Mine Discharge		4.8				6530		2020	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			7/20/1994	7:30		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2270		2540	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			8/16/1994	14:25		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2290		2500	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			9/7/1994	8:45		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2240		2340	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			10/13/1994	17:55		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2260		2380	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			11/15/1994	10:10		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2300		2370	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			12/16/1994	8:30		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2270		2360	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			1/12/1995	8:05		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2210		2410	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			2/22/1995	13:45		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2260		2620	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			3/15/1995	11:45		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2230		2560	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			4/12/1995	7:55		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2250		2450	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			5/17/1995	16:35		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2260		2300	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			6/12/1995	12:30		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2180		2250	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			7/11/1995	12:00		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2110		2260	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			8/15/1995	17:40		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2140		2240	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			9/12/1995	16:45		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2120		2190	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			10/10/1995	10:50		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2120		2200	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			11/27/1995	13:50		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2110		2190	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			1/11/1996	14:20		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2110		2310	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			2/21/1996	13:10		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2160		2240	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			4/3/1996	7:30		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2100		2260	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			5/6/1996	16:30		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2150		2390	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			6/4/1996	7:15		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2120		2240	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			7/2/1996	14:30		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2180		2200	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			8/7/1996	10:00		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2100		2210	
USGS	Site 24	--	472513111082501 Johnson Badwater Mine Sm Wtlnds Inflow nr Tracy			9/4/1996	12:20		47.420278	-111.140278	Mine Adit/Mine Discharge	WS	4.5				2100		2170	
MAXIM	Site 25	--	JOHNSON BADWATER MINE LG WTLNDS INFLOW NR TRACY			9/30/1997	1055	N	47.42027778	-111.1413889	Mine Adit/Mine Discharge		4.4				3190		3270	
MAXIM	Site 25	--	JOHNSON BADWATER MINE LG WTLNDS INFLOW NR TRACY			12/16/1997	0955	N	47.42027778	-111.1413889	Mine Adit/Mine Discharge		4.8						3330	
MAXIM	Site 25	--	JOHNSON BADWATER MINE LG WTLNDS INFLOW NR TRACY			12/16/1997	0955	D	47.42027778	-111.1413889	Mine Adit/Mine Discharge								3350	
MAXIM	Site 25	--	JOHNSON BADWATER MINE LG WTLNDS INFLOW NR TRACY			7/10/1997	1125	N	47.42027778	-111.1413889	Mine Adit/Mine Discharge		2.4				2400		3430	
MAXIM	Site 25	--	JOHNSON BADWATER MINE LG WTLNDS INFLOW NR TRACY			3/10/1998	1630	N	47.42027778	-111.1413889	Mine Adit/Mine Discharge		4.8				1790		3610	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			7/20/1994	8:40		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4330			
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			8/16/1994	14:50		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4350		3810	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			9/7/1994	9:15		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4240		3690	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			10/13/1994	18:20		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	0.0				4430		4110	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			11/15/1994	10:40		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4520		3810	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			12/16/1994	8:55		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4380		3820	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			1/12/1995	8:30		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4380		3720	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			2/22/1995	14:05		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4320		3860	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			3/15/1995	12:05		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4350		3810	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			4/12/1995	8:20		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4380		3710	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			5/17/1995	16:50		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4320		3600	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			6/12/1995	13:00		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4050		3650	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			7/11/1995	11:40		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				3620		3240	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			8/15/1995	18:10		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				3620		3020	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			9/12/1995	17:20		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				3560		3240	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			10/10/1995	11:30		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				3640		3040	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			11/27/1995	14:10		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				3890		3460	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			1/11/1996	14:45		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4110		3440	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			2/21/1996	13:40		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4280		3560	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			4/3/1996	8:00		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4340		3550	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			5/6/1996	17:00		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4390		3800	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			6/4/1996	8:00		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4340		3800	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			7/2/1996	15:00		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4440		3880	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			8/7/1996	10:30		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4180		3720	
USGS	Site 25	--	472513111082901 Johnson Badwater Mine Lg Wtlnds Inflow nr Tracy			9/4/1996	12:40		47.420278	-111.141389	Mine Adit/Mine Discharge	WS	4.5				4190		3590	
MAXIM	Site 26	--	JOHNSON BADWATER MINE SM WTLNDS OUTFLOW NR TRACY			9/30/1997	1120	N	47.42055556	-111.1397222	Mine Adit/Mine Discharge		0.5				2630		2440	
MAXIM	Site 26	--	JOHNSON BADWATER MINE SM WTLNDS OUTFLOW NR TRACY			12/16/1997	1020	N	47.42055556	-111.1397222	Mine Adit/Mine Discharge		1.8						2170	
MAXIM	Site 26	--	JOHNSON BADWATER MINE SM WTLNDS OUTFLOW NR TRACY			7/10/1997	1145	N	47.42055556	-111.1397222	Mine Adit/Mine Discharge		0.4				2100		2530	
MAXIM	Site 26	--	JOHNSON BADWATER MINE SM WTLNDS OUTFLOW NR TRACY			3/10/1998	1705	N	47.42055556	-111.1397222	Mine Adit/Mine Discharge		2.3				670		2050	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			9/7/1994	8:55		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2580		2510	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			10/13/1994	18:05		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2610		2530	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			11/15/1994	10:20		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	4.5				2610		2620	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			12/15/1994	8:40		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			1/12/1995	8:10		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2390		2530	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			2/22/1995	13:50		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	4.5				2220		2340	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			3/15/1995	11:50		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2530		2590	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			4/12/1995	8:10		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	4.5				2510		2540	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			5/17/1995	16:45		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2780		2610	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			6/12/1995	12:40		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2550		2470	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			7/11/1995	12:10		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2530		2420	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			8/15/1995	17:50		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2690		2440	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			9/12/1995	17:00		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2490		2380	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			10/10/1995	11:00		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2450		2310	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			11/27/1995	14:00		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	4.5				2340		2390	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			1/11/1996	14:30		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2170		2280	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			2/21/1996	13:20		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	4.5				2110		2100	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			4/3/1996	7:50		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	4.5				2100		2130	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			5/6/1996	16:40		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2650		2620	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			6/4/1996	7:30		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0				2720		2690	
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			7/2/1996	14:45		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			8/7/1996	10:15		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0							
USGS	Site 26	--	472514111082301 Johnson Badwater Mine Sm Wtlnds Outflow nr Tracy			9/4/1996	12:15		47.420556	-111.139722	Mine Adit/Mine Discharge	WS	0.0							
MAXIM	Site 27	--	JOHNSON GOODWATER MINE SM WTLNDS INFLOW NR TRACY			9/30/1997	1205	N	47.42138889	-111.1361111	Mine Adit/Mine Discharge		3.2				930		1120	
MAXIM	Site 27	--	JOHNSON GOODWATER MINE SM WTLNDS INFLOW NR TRACY			12/16/1997	1035	N	47.42138889	-111.1361111	Mine Adit/Mine Discharge		3.4						1170	
MAXIM	Site 27	--	JOHNSON GOODWATER MINE SM WTLNDS INFLOW NR TRACY			7/10/1997	1225	N	47.42138889	-111.1361111	Mine Adit/Mine Discharge		3.8				900		1110	
MAXIM	Site 27	--	JOHNSON GOODWATER MINE SM WTLNDS INFLOW NR TRACY			3/10/1998	1720	N	47.42138889	-111.1361111	Mine Adit/Mine Discharge		2.6				4800		1220	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			7/20/1994	8:10		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.1	<			1290		1280	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			8/16/1994	14:10		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1240		1230	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			9/7/1994	8:15		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1210		1210	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			10/13/1994	17:45		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1210		1230	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			11/15/1994	9:45		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1230		1220	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			12/16/1994	8:10		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1260		1260	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			1/12/1995	7:40		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1220		1240	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			2/22/1995	13:20		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1250		1230	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			3/15/1995	11:25		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1250		1240	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			4/12/1995	7:30		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1250		1240	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			5/17/1995	16:15		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1280		1220	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			6/12/1995	11:25		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1060		1020	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			7/11/1995	12:40		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	0.0				1010		1000	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			8/15/1995	17:20		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	9.0				1200		1130	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			9/12/1995	16:20		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1180		1120	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			10/10/1995	10:30		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1190		1120	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			11/27/1995	13:30		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1110		1130	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			1/11/1996	14:00		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1120		1140	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			2/21/1996	13:00		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1160		1140	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			4/3/1996	7:10		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1140		1160	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			5/6/1996	16:00		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1170		1160	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			6/4/1996	7:00		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1170		1180	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			7/2/1996	14:00		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1150		1140	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			8/7/1996	9:45		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1140		1140	
USGS	Site 27	--	472517111081001 Johnson Goodwater Mine Sm Wtlnds Inflow nr Tracy			9/4/1996	11:50		47.421389	-111.136111	Mine Adit/Mine Discharge	WS	4.5				1140		1130	
MAXIM	Site 28	--	BELT CREEK AT ARMINGTON	Belt Creek		9/29/1997	1450	N	47.36555556	-110.9055556	River/Stream		15750.0				495		559	
MAXIM	Site 28	--	BELT CREEK AT ARMINGTON	Belt Creek		12/15/1997	1355	N	47.36555556	-110.9055556	River/Stream		0.0	frozen			1043		840	
MAXIM	Site 28	--	BELT CREEK AT ARMINGTON	Belt Creek		7/2/1997	1900	N	47.36555556	-110.9055556	River/Stream		167000.0				426		338	
MAXIM	Site 28	--	BELT CREEK AT ARMINGTON	Belt Creek		3/11/1998	1145	N	47.36555556	-110.9055556	River/Stream		12900.0				7720		861	
MAXIM	Site 29	B15	BELT CREEK AT BELT	Belt Creek		9/29/1997	1220	N	47.38694444	-110.9258333	River/Stream		18400.0				605		588	
MAXIM	Site 29	B15	BELT CREEK AT BELT	Belt Creek		12/15/1997	1245	N	47.38694444	-110.9258333	River/Stream		5650.0				891		787	
MAXIM	Site 29	B15	BELT CREEK AT BELT	Belt Creek		7/2/1997	1600	N	47.38694444	-110.9258333	River/Stream		175000.0				416		337	
MAXIM	Site 29	B15	BELT CREEK AT BELT	Belt Creek		3/11/1998	1100	N	47.38694444	-110.9258333	River/Stream		6200.0				7250		846	
MBMG	200615		French Coulee Mine	AMD		1/29/2003	14:00		47.3722	110.93	Mine Adit/Mine Discharge	Water					5620		5625	
MBMG	200615		French Coulee Mine	AMD		3/15/2003	10:45		47.3722	110.93	Mine Adit/Mine Discharge	Water					5030		5150	
MBMG	200615		French Coulee Mine	AMD		4/22/2003	14:55		47.3722	110.93	Mine Adit/Mine Discharge	Water					4660		4800	
MBMG	200615		French Coulee Mine	AMD		5/28/2003	18:00		47.3722	110.93	Mine Adit/Mine Discharge	Water					4410		3960	
MBMG	200615		French Coulee Mine	AMD		6/18/2003			47.3722	110.93	Mine Adit/Mine Discharge	Water							4030	
MBMG	200615		French Coulee Mine	AMD		7/17/2003	17:10		47.3722	110.93	Mine Adit/Mine Discharge	Water							4400	
MBMG	200615		French Coulee Mine	AMD		8/19/2003	16:00		47.3722	110.93	Mine Adit/Mine Discharge	Water					5180		4810	
MBMG	200615		French Coulee Mine	AMD		9/18/2003	19:05		47.3722	110.93	Mine Adit/Mine Discharge	Water					5690		5080	
MBMG	200615		French Coulee Mine	AMD		10/23/2003	15:50		47.3722	110.93	Mine Adit/Mine Discharge	Water					5800		5600	
MBMG	200615		French Coulee Mine	AMD		4/24/2004	15:45		47.3722	110.93	Mine Adit/Mine Discharge	Water					4080		4070	
MBMG	200615		French Coulee Mine	AMD		6/24/2004	16:00		47.3722	110.93	Mine Adit/Mine Discharge	Water					4090		5510	
MBMG	200615		French Coulee Mine	AMD		8/12/2004	15:15		47.3722	110.93	Mine Adit/Mine Discharge	Water					6230		5180	
MBMG	200615		French Coulee Mine	AMD		2/3/2005	16:45		47.3722	110.93	Mine Adit/Mine Discharge	Water							5760	
MBMG	200615		French Coulee Mine	AMD		4/8/2005	15:15		47.3722	110.93	Mine Adit/Mine Discharge	Water							5400	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		1/30/2003	11:30		47.3788	110.931	Mine Adit/Mine Discharge	Water					2290		2285	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		3/15/2003	11:15		47.3788	110.931	Mine Adit/Mine Discharge	Water					2220		2279	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		4/22/2003	15:45		47.3788	110.931	Mine Adit/Mine Discharge	Water					2260		2265	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		5/28/2003	18:30		47.3788	110.931	Mine Adit/Mine Discharge	Water					2350		2120	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		6/18/2003	11:50		47.3788	110.931	Mine Adit/Mine Discharge	Water					1425		2080	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		7/17/2003	17:45		47.3788	110.931	Mine Adit/Mine Discharge	Water							2090	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		8/19/2003	16:30		47.3788	110.931	Mine Adit/Mine Discharge	Water					2355		2290	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		9/18/2003	18:45		47.3788	110.931	Mine Adit/Mine Discharge	Water					2390		2350	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		10/23/2003	16:20		47.3788	110.931	Mine Adit/Mine Discharge	Water					2300		2290	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		4/24/2004	15:20		47.3788	110.931	Mine Adit/Mine Discharge	Water					2275		2280	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		6/24/2004	16:50		47.3788	110.931	Mine Adit/Mine Discharge	Water					2120		2230	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		8/12/2004	14:30		47.3788	110.931	Mine Adit/Mine Discharge	Water					2465		2280	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		10/28/2004	11:30		47.3788	110.931	Mine Adit/Mine Discharge	Water					2470		2390	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		2/3/2005	16:25		47.3788	110.931	Mine Adit/Mine Discharge	Water							2340	
MBMG	200616	B11	Anaconda Mine Drain at culvert	AMD		4/8/2005	12:45		47.3788	110.931	Mine Adit/Mine Discharge	Water							2220	
MBMG	205508		Belt Creek E of Town Well #2	Belt Crk @ City Well		8/20/2003	12:30		47.3812	110.926	River/Stream	Water					460		552	
MBMG	205836		Belt Creek	Belt Creek		8/27/2003	10:50		47.3636	110.906	River/Stream	Water					297		428	
MBMG	205838		Belt Creek	Belt Creek		8/27/2003			47.3753	110.918	River/Stream	Water					371		415	
MBMG	205838	--	BC02	Lower Belt Creek	MT41U001_012	8/27/2003			47.37530	110.91830	River/Stream	Water							415	
MBMG	205839	--	BC03	Lower Belt Creek	MT41U001_012	8/27/2003			47.38080	110.92530	River/Stream	Water	80.8				372		403	
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		5/31/2002			47.38700	110.92690	River/Stream	Water	275114.4		18.57		144			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		7/9/2002			47.38700	110.92690	River/Stream	Water	27735.8		19.77		270			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		7/17/2002			47.38700	110.92690	River/Stream	Water	26165.0		20.1		300			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		9/23/2002			47.38700	110.92690	River/Stream	Water	6956.4		20.6		615			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		10/7/2002			47.38700	110.92690	River/Stream	Water					768			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		10/22/2002			47.38700	110.92690	River/Stream	Water	4308.5		20.9		979			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		3/27/2003			47.38700	110.92690	River/Stream	Water	8213.0		20.5					
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		4/24/2003			47.38700	110.92690	River/Stream	Water	125843.5		18.9		174			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		5/14/2003			47.38700	110.92690	River/Stream	Water	102461.0		19.32		213			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		6/20/2003			47.38700	110.92690	River/Stream	Water	62248.6		19.3		231			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		7/23/2003			47.38700	110.92690	River/Stream	Water	4308.5		20.4					
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		8/19/2003			47.38700	110.92690	River/Stream	Water								
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		9/23/2003			47.38700	110.92690	River/Stream	Water	0							
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		10/21/2003			47.38700	110.92690	River/Stream	Water	0							
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		11/25/2003			47.38700	110.92690	River/Stream	Water	0							
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		3/12/2004			47.38700	110.92690	River/Stream	Water	3814.8		20.5		587			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		4/7/2004			47.38700	110.92690	River/Stream	Water	26658.7		20		348			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		5/5/2004			47.38700	110.92690	River/Stream	Water	88368.7		19.1		163			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		6/15/2004			47.38700	110.92690	River/Stream	Water	328387.0		18		176			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		7/14/2004			47.38700	110.92690	River/Stream	Water	54394.6		19.8		278			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		8/19/2004			47.38700	110.92690	River/Stream	Water	11399.5		20.3		439			
MBMG	214387	B15	Belt Creek at Belt Bridge	Belt Creek		9/15/2004			47.38700	110.92690	River/Stream	Water	8302.8		20.5		572			
MBMG	214911	B14	BELT CR AL ABOVE SWIM	Lower Belt Creek	MT41U001_012	10/28/2004	14:00		47.38200	110.92770	River/Stream	Water					637		737	
MBMG	214913	--	BELT CREEK N SLAG	Lower Belt Creek	MT41U001_012	10/28/2004	16:00		47.38430	110.92890	River/Stream	Water					645		639	
MBMG	214914		AMD 3rd and Lewis St in Belt	AMD		10/28/2004	17:30		47.3848	110.922	Mine Adit/Mine Discharge	Water					5319		3660	
MBMG	214915	B2	AMD at Lewis Coulee	AMD		10/28/2004	16:00		47.386	110.92	Mine Adit/Mine Discharge	Water					3791		4300	
MBMG	214916	--	BELT CR AFTER LEWIS DRAIN	Lower Belt Creek	MT41U001_012	10/29/2004			47.38840	110.92360	River/Stream	Water					665		674	
DEQ WQB	BCAMD	B13	Adit discharge from abandoned mine into Belt Creek	Lower Belt Creek	na	6/10/2009			47.38283	110.92751	Mine Adit/Mine Discharge	Water	128.88						2523	
DEQ WQB	BCAMD	B13	Adit discharge from abandoned mine into Belt Creek	Lower Belt Creek	na	8/11/2009			47.38283	110.92751	Mine Adit/Mine Discharge	Water	98.5						2970	
DEQ WQB	CTWDC02	--	Cottonwood Creek just downstream of Stockett at Dewey Ave	Cottonwood Creek	MT41Q002_020	6/9/2009			47.35906	111.16105	River/Stream	Water	175.9						990	
DEQ WQB	CTWDC02	--	Cottonwood Creek just downstream of Stockett at Dewey Ave	Cottonwood Creek	MT41Q002_020	8/10/2009			47.35906	111.16105	River/Stream	Water	12.9						1936	
DEQ WQB	CTWDC03	CW14	Cottonwood Creek upstream of Stockett at Cottonwood Coulee Rd	Cottonwood Creek	MT41Q002_020	6/9/2009			47.35574	111.16449	River/Stream	Water	294.1						893	
DEQ WQB	CTWDC03	CW14	Cottonwood Creek upstream of Stockett at Cottonwood Coulee Rd	Cottonwood Creek	MT41Q002_020	8/10/2009			47.35574	111.16449	River/Stream	Water	41.9						1400	
DEQ WQB	CTWDC03A	CW14	Cottonwood Creek triButary upstream of Stockett at Cottonwood Coulee Rd	Cottonwood Creek	MT41Q002_020	6/9/2009			47.35574	111.16449	River/Stream	Water	21.9						1527	
DEQ WQB	CTWDC03A	CW14	Cottonwood Creek triButary upstream of Stockett at Cottonwood Coulee Rd	Cottonwood Creek	MT41Q002_020	8/10/2009			47.35574	111.16449	River/Stream	Water	4.7						3594	
DEQ WQB	CTWDC04	--	Cottonwood Creek Below fork, Below large instream pond	Cottonwood Creek	MT41Q002_020	6/9/2009			47.33383	111.15514	River/Stream	Water	545.6						516	
DEQ WQB	CTWDC04	--	Cottonwood Creek Below fork, Below large instream pond	Cottonwood Creek	MT41Q002_020	8/10/2009			47.33383	111.15514	River/Stream	Water	117.1						684	
DEQ WQB	LBLTC03	--	Lower Belt Creek at Ewing Road crossing	Lower Belt Creek	MT41U001_012	6/10/2009			47.41812	110.92489	River/Stream	Water	149824.7						346	
DEQ WQB	LBLTC03	--	Lower Belt Creek at Ewing Road crossing	Lower Belt Creek	MT41U001_012	8/11/2009			47.41812	110.92489	River/Stream	Water	10535.0						526	
DEQ WQB	LBLTC03A	--	Lower Belt Creek at Bridge Street crossing in Belt	Lower Belt Creek	MT41U001_012	6/10/2009			47.38701	110.92638	River/Stream	Water	177964.9						303	
DEQ WQB	LBLTC03A	--	Lower Belt Creek at Bridge Street crossing in Belt	Lower Belt Creek	MT41U001_012	8/11/2009			47.38701	110.92638	River/Stream	Water	17113.1						513	

Originator	Station_ID	Hydro Station ID	StationDesc	WaterBodyName	WBSEGID	SampleDate	SampleTime	QC	Latitude	Longitude	WaterBdyID	Medium	Flow_gpm	Flow_Q	GageHeight_ft	GageHeight_m	Cond_Fld_umhoscm	Cond_Fld_Q	Cond_Lab_umhoscm	Cond_Lab_Q
DEQ WQB	NO5CL01	--	NumBer Five Coulee downstream of Griffin Road crossing (NO3CL02)	NumBer Five Coulee	MT41Q002_030	6/9/2009			47.34600	111.19114	River/Stream	Water	13.7						599	
DEQ WQB	NO5CL02	--	NumBer Five Coulee at Griffin Road crossing	NumBer Five Coulee	MT41Q002_030	6/9/2009			47.32137	111.19606	River/Stream	Water	194.9						1005	
DEQ WQB	NO5CL02	--	NumBer Five Coulee at Griffin Road crossing	NumBer Five Coulee	MT41Q002_030	8/10/2009			47.32137	111.19606	River/Stream	Water	31.8						1350	
DEQ WQB	SNDCC01	--	Sand Coulee Creek at Missouri River Marine Road crossing	Sand Coulee Creek	MT41Q002_040	6/9/2009			47.44938	111.29583	River/Stream	Water	0.0						2738	
DEQ WQB	SNDCC01	--	Sand Coulee Creek at Missouri River Marine Road crossing	Sand Coulee Creek	MT41Q002_040	8/10/2009			47.44938	111.29583	River/Stream	Water	0.0						4979	
DEQ WQB	SNDCC02	--	Sand Coulee Creek at road crossing upstream from SNDCC01 on Fields Road	Sand Coulee Creek	MT41Q002_040	6/9/2009			47.45038	111.23379	River/Stream	Water	0.0						1399	
DEQ WQB	SNDCC03	--	Sand Coulee Creek at Meyer Ave crossing, 0.5 mile upstream from Brown Road	Sand Coulee Creek	MT41Q002_040	6/9/2009			47.39715	111.14697	River/Stream	Water	411.9						492	
DEQ WQB	SNDCC04	--	Sand Coulee Creek at Spring Creek Road crossing east of Centerville	Sand Coulee Creek	MT41Q002_040	6/9/2009			47.38830	111.13717	River/Stream	Water	599.3						526	
DEQ WQB	SNDCL02	SCT5	Sand Coulee at East Hunter Road crossing	Sand Coulee	MT41Q002_060	6/9/2009			47.39025	111.17754	River/Stream	Water	16.1						3983	
DEQ WQB	SNDCL02	SCT5	Sand Coulee at East Hunter Road crossing	Sand Coulee	MT41Q002_060	8/10/2009			47.39025	111.17754	River/Stream	Water	2.2						7059	
DEQ AM		--	Cottonwood Coulee #1	Cottonwood Coulee		7/1/2011	12:05				River/Stream	WS								

Source: Data from Montana Department of Environmental Quality Water Quality Bureau (DEQ WQB) and Abandoned Mines (DEQ AM), Maxim, and the United States Geological Survey (USGS) compiled by Hydrometrics (Database_GrFllsCoalfield.xls).

Period of Record: January 1994 - July 2011

Notes:

The following MAXIM 12/16/1997 values for Field Conductivity were removed as anomolous since all flagged as x1.02: Site 14 - 4365.6, Site 19 - 1907.4, Site 20 - 3916.8, Site 22 - 1183.2, Site 23 - 497.7, Site 24 - 1387.2, Site 25 - 2539.8, Site 26 - 1254.6, Site 27 - 816.

Total Recoverable metals include Total (Maxim) and Total Recoverable.

c = Calculated Dissolved Solids

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	AcidityasCaCO3_mgL	AcidityasCaCO3_Q	AcidNeutCapacityCaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 1	8.45		8.5		23.5				77								2	<		229				188	
Site 1	8.3		7.7		25		238		83		2.3				193		5	<	128						
Site 1																									
Site 1																									
Site 1																									
Site 1																									
Site 1																									
Site 1																									
Site 1																									
Site 1	8		7.8		17.5		184		24		2				160		5	<	140						
Site 1					10																				
Site 1	8.2		7.6		22		215		28		1.5				192		5	<	169						
Site 1	8.3		6.9		14.5		210		39		2				171		5	<	153						
Site 1	8.5		7.4		15.5		284		52		2.1				253		5	<	208						
Site 1	8.7		7		20.5		270		59		2.2				240		5	<	187						
Site 1	8.8		8.1		10.5		251		62		2.4				229		5	<	164						
Site 1	8.4		7.8		0		282		64		2.3				251		5	<	196						
Site 1																									
Site 1					2.5																				
Site 1																									
Site 1																									
Site 1																									
Site 1	8.4		7.8		21		223		41		1.5				204		5	<	157						
Site 1	8.5		7.7		30.5		241		88		2.1				196		5	<	120						
Site 1																									
Site 1																									
Site 2	8.48		8.3		23.5				171								2	<		294				241	
Site 2	8		7.7		21		585		330		4.4				443		5	<	142						
Site 2																									
Site 2																									
Site 2																									
Site 2																									
Site 2																									
Site 2																									
Site 2																									
Site 2					10																				
Site 2	7.5		7.5		16.5		366		97		4.7				318		5	<	229						
Site 2					11																				
Site 2	6.9		7		20		530		320		4				406		9.9		80						
Site 2	7		6.6		16		604		390		4.6				448		5	<	56						
Site 2					17																				
Site 2	4.2		4		15				780		5.2				485		283								
Site 2	4		3.7		14				950		4.4				522		367								
Site 2	4.2		3.8		9.5				860		4.6				568		382								
Site 2	7.7		7.6		0		646		340		4.3				510		60		185						
Site 2																									
Site 2																									
Site 2																									
Site 2	7.6		7.6		13		901		550		5.6				701		5	<	153						
Site 2	8.2		7.3		18.5		705		370		5				572		5		205						
Site 2	8.3		8		28		683		350		4				564		5	<	206						
Site 2																									
Site 2																									
Site 3	5.77		6.3		12.6				542								2	<		52				43	
Site 3	6.91		6.6		5.8				540								6			85				70	
Site 3	7.02		6.9		19.2				328								2	<		157				129	
Site 3	6.1		6.7		3.5				519								2	<		59				48	
Site 3	6.4		5.2		10		842		570		3.9				515		20		8						
Site 3	6.5				9.5				670		3.8				540		159								
Site 3	6				13				720		3.4				539		84								
Site 3	6.7		3.7		9.5				650		3.8				531		45								
Site 3	6.3		4.9		7.5				670		3.4				560		74								
Site 3	6.2		4.3		6.5				630		3.3				552		74								
Site 3	6.4		3.5		7.5				610		3.4				531		65								
Site 3	6.4		3.7		9.5				680		4.5				527		40								
Site 3	6.7		3.9		10				590		3.8				527		74								
Site 3	6.6		4.9		10.5		935		660		4.6				552		30		4						
Site 3					8																				
Site 3	7.3		7.2		16.5		415		110		5				333		5	<	257						
Site 3					10																				
Site 3	7.9		7.2		18		437		130		4				360		5	<	252						
Site 3	7.5		6.9		14.5		450		140		4.5				357		5	<	252						
Site 3	7		6.3		11		661		380		3.6				444		5	<	148						
Site 3	6.5		6.5		10		771		500		4.3				506		5	<	67						
Site 3	6.5		5.7		8.5		833		560		4.7				523		25		27						
Site 3	6.5		4.3		5.5				700		3.8				573		55								
Site 3					8.5																				
Site 3	6		3.8		6.5				790		5.6				602		104								
Site 3					4.5																				
Site 3	6.2		4.7		7.5				680		3.9				602		79								
Site 3	6.1		4.5		9				700		4.5				589		55								
Site 3	6.5		5.4		8.5		958		680		5.6				560		15		2						
Site 3	6.6		6.1		15		844		570		7.3				515		5	<	56						
Site 3	6.3		4.9		16		934		680		4.3				510		30		6						
Site 3	6.2		4.9		11		898		630		5.3				548		30		4						
Site 3	6.5		4.9		9.5				600		5.2				531		25								
Site 4	2.33		2.7		24				2800								135			1	<			1	<
Site 4	2.6		2.5		30				4500		7.7				1260		1540								
Site 4	2.6		2.4		17				4800		6.3				1210		3820								
Site 4	2.2		2.4		20.5				6800		3.8				1370		4170								
Site 4	2.8		2.5		3				5900		3.1				1230		3870								

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	AcidityasCaCO3_mgL	AcidityasCaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 4																									
Site 4																									
Site 4																									
Site 4																									
Site 4																									
Site 4	2.6		2.7		11.5				4200		8.6				1180		1890								
Site 4					14																				
Site 4	6.1		6.5		19		683		470		11				483		5	<	13						
Site 4	4.2		3.4		24				1700		8.5				626		546								
Site 4	3.9		2.8		17				2400		7.1				721		1290								
Site 4																									
Site 4	2.7		2.6		19				5800		21				1210		3820								
Site 4	2.7		2.5		11.5				5800		8.2				1210		4170								
Site 4	2.7		2.6		13				5100		4.3				1210		3920								
Site 4					6																				
Site 4																									
Site 4																									
Site 4																									
Site 4	2.7		2.7		23				2100		9.6				895		1090								
Site 4	2.8		2.7		14.5				2700		7.1				945		1640								
Site 4																									
Site 4																									
Site 5	2.88		2.9		14.8				1680								945			1	<			1	<
Site 5	3.1		3.2		8.9				1720								966			1	<			1	<
Site 5	2.57		2.8		17.1				1680								36			1	<			1	<
Site 5	3		3.2		6.7				1420								867			1	<			1	<
Site 5	2.9		2.6		16.5				1800		2.6				681		1090								
Site 5	3		3		18.5				1900		6				673		1090								
Site 5	2.9		2.6		14				1800		5.6				673		1040								
Site 5	2.9		2.6		9.5				1900		7.4				677		993								
Site 5	3		2.7		9				1900		3.2				706		1090								
Site 5	3		2.7		6.5				1900		2.3				690		1090								
Site 5	3		2.7		8				1800		2.4				719		1140								
Site 5	3		2.6		8				2700		6.3				669		1040								
Site 5	2.9		2.6		10				1800		6.4				677		1040								
Site 5	2.9		2.7		12				2000		5.4				636		943								
Site 5	2.8		2.7		12				1900		7.9				640		943								
Site 5	2.9		2.8		15				1700		3.9				644		894								
Site 5	3		2.7		14				2000		2.3				636		894								
Site 5	3		2.7		15.5				2100		7.6				611		993								
Site 5	3		2.7		14				1700		2.7				644		993								
Site 5	2.9		2.8		10				1900		2.5				652		1140								
Site 5	3		2.8		8.5				1900		2.2				656		1090								
Site 5	2.9		2.7		7.5				2000		7.1				686		1040								
Site 5	3		2.7		11				2000		2.5				677		1140								
Site 5	2.8		2.7		14				2400		4.8				681		1190								
Site 5	2.9		2.6		14.5				2000		4.8				648		1090								
Site 5					10.5																				
Site 5	2.8		2.7		17.5				2400		4.5				656		1040								
Site 5	2.8		2.7		14				1700		2.7				723		1040								
Site 5	2.9		2.7		16				1900		4.5				656		1240								
Site 5	3		2.7		13				1900		4.9				686		1140								
Site 6	5.53		5.6		11.5				513								52			52				43	
Site 6	6.08		5.6		8				478								30			85				70	
Site 6	5.7		6.1		10.6				483								19			72				59	
Site 6	5.84		6.1		3.9				469								2	<		104				85	
Site 6	4.6		2.8		9				740		3.1				448		223								
Site 6	4.8				9				750		3.3				473		258								
Site 6	4.5				10				790		3.4				444		238								
Site 6	5.1		2.9		9				700		3.1				448		194								
Site 6	5		3.7		9.5				700		3.3				473		228								
Site 6	5.2		4		10				610		3.2				461		154								
Site 6	5.4		3.1		10				610		3.2				473		243								
Site 6	5.6		3.1		9				743		4.4				473		94								
Site 6	5.6		3.3		11				540		3.4				440		74								
Site 6	5.6		3.3		9				530		3.7				469		65								
Site 6	5.8		5.3		9				630		4.5				473		30								
Site 6	5.8		4		8.5				480		4.7				436		79								
Site 6	4.6		2.9		9				760		4.7				448		263								
Site 6	4.2		2.9		9				1000		4.7				440		288								
Site 6	3.7		2.9		9				900		2.9				477		412								
Site 6	4		3.7		9				920		3				456		472								
Site 6	4.5		3.3		9				930		2.7				452		402								
Site 6	4.6		2.9		9				900		5				481		362								
Site 6	4.7		3		9				820		3.1				473		268								
Site 6	4.6		3		9				790		4.7				473		238								
Site 6	5		3		9				750		4.7				448		174								
Site 6	5.1		3.1		9				670		4.3				448		189								
Site 6	4.8		3.1		9				780		4				481		189								
Site 6	5.3		3.4		9				630		6.1				444		104								
Site 6	5.5		3.7		9				550		4				452		74								
Site 7	2.26		2.7		15.5				5180								1010			1	<			1	<
Site 7	3.8		2.8		5.6				4750								3690			1	<			1	<

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	Acidityas CaCO3_mgL	Acidityas CaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 7	2.75		2.7		14				4440								3880			1	<			1	<
Site 7	2.39		2.9		7.7				4820								3640			1	<			1	<
Site 7	2.6		2.5		9				7200		14				1320		4020								
Site 7	2.6		2.6		9.5				5900		15				1410		3820								
Site 7	2.6		2.7		9.5				6800		20				1340		4020								
Site 7	2.5		2.7		11.5				5500		1.3				1390		3820								
Site 7	2.7		2.7		10				5600		3.8				1410		3670								
Site 7	2.8		2.8		10				5800		3.3				1480		3720								
Site 7	2.7		2.7		11				6600		18				1450		4120								
Site 7	2.6		2.7		10.5				5600		1.5				1500		4170								
Site 7	2.6		2.8		10				5800		1.3				1430		4120								
Site 7	2.6		2.9		6				5600		12				1430		4120								
Site 7	2.6		2.8		8		8170		6200		1				1530		4320		1						
Site 7	2.6		2.8		8		7830		5900		1				1450		4270		1						
Site 7	2.6		2.8		8				6000		4.8				1440		4170								
Site 7	2.7		2.7		9				6500		2				1410		4220								
Site 7	2.7		2.7		10				7200		3.8				1450		4220								
Site 7	2.7		2.8		11				5800		13				1390		4070								
Site 7	2.5		2.8		11				5400		2.3				1360		4270								
Site 7	2.7		2.8		10.5				5400		3.4				1390		4220								
Site 8	2.63		2.5		16				14900								13400			1	<			1	<
Site 8	1.98		2.4		25.2				11600								969			1	<			1	<
Site 8	3.65		2.7		0				9990								10100			1	<			1	<
Site 8	2.7		2.4		11				14000						2660		11400								
Site 8	2.6		2.4		12				13000						2640		11400								
Site 8	2.4		2.4		19				15000						2900		12100								
Site 8	2.5		2.4		11		16600		13000		1				2390		10400		1						
Site 8	2.6		2.5		0		17800		14000		1				2360		10900		1						
Site 8	2.6		2.6		0				16000						2650		11900								
Site 8	2.8		2.6		1				11000						2180		9430								
Site 8	2.6		2.5		3				11000						2090		4960								
Site 8	2.5		2.5		4.5		18200		15000		1				2340		9430		1						
Site 8	2.6		2.5		10.5		10800		8600		1				1750		5960		1						
Site 8	2.3		2.6		22				9700						2260		6450								
Site 8	2.4		2.5		25.5				15000						2020		8940								
Site 8	2.4		2.5		25.5				12000						1800		8440								
Site 8	2.4		2.4		20.5				14000						1840		9930								
Site 8	2.4		2.4		15		15600		12000		1				2020		9930		1						
Site 8	2.4		2.4		11.5		16600		13000		1				1960		10400		1						
Site 8	2.5		2.6		0.5				14000						1910		10400								
Site 8	2.6		2.6		0				11000						2000		9430								
Site 8	2.5		2.6		2.5		13200		10000		1				1960		9430		1						
Site 8	2.5		2.6		7.5				10000						1620		7450								
Site 8	2.5		2.5		11				15000						2350		10200								
Site 8	2.5		2.5		17		18900		15000		1				2710		10400		1						
Site 8	2.2		2.5		26				16000						2990		12400								
Site 8	2.2		2.6		20				16000						3010		13600								
Site 8	2.5		2.6		15				15000						3070		12800								
Site 9	8.04		8.2		28.8				215								2	<		275				225	
Site 9	8.4		8		29		726		500		4.3				485		5	<	49						
Site 9																									
Site 9																									
Site 9																									
Site 9	6.8		6.7		0.5		727		500		3.9				502		5		27						
Site 9																									
Site 9																									
Site 9	7.6		6.4		11		574		380		4.4				389		5	<	33						
Site 9	8.2		8		17		371		77		4.7				295		5	<	259						
Site 9	8.4		7.8		22.5		374		100		4.2				309		5	<	230						
Site 9	8.2		7.6		16.5		414		120		4.7				337		5	<	238						
Site 9	7.8		7.4		19		585		330		4.4				429		5	<	126						
Site 9	6.9		6.8		18		704		490		4.8				469		5	<	32						
Site 9	6.5		6.4		13		782		550		5				531		20		13						
Site 9	6.8		5.5		0		896		650		4.2				581		9.9		5						
Site 9	5.3		3.8		0		1030		750		5.7				589		74		1						
Site 9	5.1		5.1		0		772		550		3.6				527		25		2						
Site 9	6.1		5		3		674		470		3.1				469		15		2						
Site 9	7.5		7.4		22		861		590		5.3				623		5	<	21						
Site 9																									
Site 9																									
Site 9																									
Site 9																									
Site 10	2.8		2.6		17				5700		22				2010		3530								
Site 10	2.8		3.1		20				6400		24				2040		4420								
Site 10	2.8		2.6		10				6800		29				1990		4470								
Site 10	3		2.6		5.5				6400		19				1730		4170								
Site 10	3.2		2.8		1				6000		16				1590		3920								
Site 10	3.6		2.9		0.5				6700		14				1690		4420								
Site 10	3.9		2.8		0.5				5700		10				1540		4170								

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	Acidityas CaCO3_mgL	Acidityas CaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 10	3.5		2.5		1				6000		17				1160		2880								
Site 10	3.5		2.6		6				5700		13				1450		3280								
Site 10	3		3		8.5				5800		22				1250		2930								
Site 10	2.5		2.6		11.5				4900		26				1280		2630								
Site 10	2.7		2.7		15.5				3200		19				1050		1840								
Site 10	2.7		2.6		16				2200		24				810		1140								
Site 10	2.7		2.6		18.5				2900		26				880		1540								
Site 10	2.8		2.7		12.5				2900		17				1000		1890								
Site 10	2.7		2.7		8.5				3400		16				992		2130								
Site 10	2.7		2.7		2.5				4600		10				1040		3180								
Site 10	2.8		2.7		0				5100		13				1080		3920								
Site 10	2.8		2.6		0				4500		7.8				860		3230								
Site 10	2.6		2.6		4				5200		13				1270		3430								
Site 10																									
Site 10																									
Site 10																									
Site 10																									
Site 11	2.7		2.6		11.5				6000		7.9				1050		4920								
Site 11	2.7		2.5		12.5				6000		8.3				1030		4870								
Site 11	2.5		2.6		12.5				6100		4.5				1000		4870								
Site 11	2.6		2.6		11				6100		9.1				1120		4670								
Site 11	2.7		2.7		10				6000		9.7				1050		4520								
Site 11	2.6		2.7		9.5				6300		5.7				1010		4620								
Site 11	2.6		2.7		9				5900		4.9				1080		4820								
Site 11	2.6		2.5		8				7100		20				1050		4520								
Site 11	2.7		2.6		7.5				6700		38				1080		4570								
Site 11	2.7		2.6		9				2800		24				693		1590								
Site 11	2.6		2.7		10				2100		31				577		1140								
Site 11	2.9		2.7		10.5				2000		23				547		1090								
Site 11	2.8		2.6		10				2300		23				618		1340								
Site 11	2.7		2.6		11				3100		22				664		1990								
Site 11	2.7		2.7		11				2900		13				722		2280								
Site 11	2.7		2.7		10.5				3700		12				747		2680								
Site 11	2.6		2.8		9.5				5000		8.2				864		3870								
Site 11	2.5		2.8		8.5				7400		18				1070		5960								
Site 11	2.6		2.7						6500		7.3				989		4720								
Site 12	2.6		2.7		8.5				5300		9.6				864		3920								
Site 12	2.8		2.6		10.5				3300		13				689		2380								
Site 12	2.8		2.5		11				3800		13				660		2230								
Site 12	2.7		2.6		12				4300		9.1				855		3180								
Site 12	2.8		2.7		13				4600		10				889		3920								
Site 12	2.8		2.7		12				6000		11				1030		4870								
Site 13	2.72		1.3		15.6				3290								6220			1	<			1	<
Site 13	2.83		3		7				3570								2720			1	<			1	<
Site 13	1.84		2.5		14.8				3820								89			1	<			1	<
Site 13	3.7		3		6.2				3580								2630			1	<			1	<
Site 13	2.8		2.6		12.5				3600		6.4				879		2380								
Site 13	2.7		2.6		12				3500		14				854		2530								
Site 13	2.8		2.6		9				3700		7.1				920		2680								
Site 13	2.8		2.7		7.5				4000		7.5				945		2780								
Site 13	2.8		2.6		6.5				4000		5.7				904		2830								
Site 13	2.8		2.7		7				4100		5.1				945		2730								
Site 13	2.8		2.5		7.5				5700		16				945		2830								
Site 13	2.7		2.6		7.5				4700		26				970		2880								
Site 13	2.6		2.6		9				5600		13				904		2980								
Site 13	2.4		2.7		10.5				5100		14				1010		3080								
Site 13	2.6		2.7		13				5000		4.6				970		3130								
Site 13	2.6		2.7		14				4800		5.2				970		3130								
Site 13	2.6		2.7		11.5				5100		15				945		3030								
Site 13	2.6		2.7		12.5				4000		4.7				1040		2930								
Site 13	2.6		2.7		10				4200		4.5				920		2980								
Site 13	2.6		2.9		8				4200		4.3				921		2980								
Site 13	2.6		2.8		7				3800		9				920		2830								
Site 13	2.7		2.8		6.5				4200		5.8				945		2880								
Site 13	2.7		2.7		7.5				4200		7.5				920		2630								
Site 13	2.7		2.6		10.5				4300		6.3				920		2730								
Site 13	2.5		2.8		9				4300		5.6				920		1740								
Site 13	2.7		2.7		11				3800		5.2				920		2580								
Site 13	2.7		2.8		13				3500		7.3				895		2830								
Site 13	2.8		2.7		10				3600		8.5				962		2580								
Site 14	2.81		2.7		12.6				7790								7180			1	<			1	<
Site 14	2.69		2.8		4.1				7960								7640			1	<			1	<
Site 14	2.24		2.6		12.8				8270								181			1	<			1	<
Site 14	2.6		2.5		10.5		11800		9200		1				1440		7550		1						
Site 14	2.6		3.1		11				8900						1570		7890								
Site 14	2.4		2.5		11				9800						1540		7650								
Site 14	3		2.6		10		12400		9800		1				1520		7450		1						
Site 14	2.6		2.6		9		12100		9400		1				1630		7450		1						
Site 14	2.6		2.6		7.5				9800						1500		7450								
Site 14	2.6		2.6		8				9600						1520		7450								
Site 14	2.6		2.5		8				11000						1460		7450								
Site 14	2.6		2.5		9		14600		12000		1				1570		7450		1						
Site 14	2.6		2.6		8		14600		12000		1				1570		7450		1						
Site 14	2.6		2.7		14.5				11000						1550		7450								
Site 14	2.7		2.7		9		12300		9600		1				1600		7450		1						
Site 14	2.7		2.7		9.5				9500						1510		7450								
Site 14	2.6		2.6		10.5				9700						1550		7450								
Site 14	2.6		2.6		11		12300		9800		1				1310		6950		1						
Site 14	2.5		2.6		11		11900		9400		1				1500		7450		1						
Site 14	2.5		2.7		9				8900						1500		7450								
Site 14	2.6		2.6		9		12100		9300		1				1640		7940		1						

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	Acidityas CaCO3_mgL	Acidityas CaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 14	2.5		2.6		8		12800		10000		1				1590		7450		1						
Site 14	2.5		2.7		7.5		12700		10000		1				1550		7450		1						
Site 14	2.6		2.5		8.5				10000						1600		7600								
Site 14	2.6		2.6		9.5				11000						1620		7250								
Site 14	2.6		2.6		10				9200						1570		7450								
Site 14	2.5		2.7		10.5				8900						1500		7600								
Site 14	2.7		2.7		10				8700						1520		7300								
Site 15	8.21		8.4		16				568								2	<		471				386	
Site 15	8.1		7.7		8.5		413		100		12				347		5	<	271						
Site 15	8.3		8.1		9.5		453		100		14				399		5	<	313						
Site 15	8.6		8.1		14.5		516		130		17				451		5	<	325						
Site 15	8.6		8.2		14		877		390		17				601		5	<	335						
Site 15																									
Site 15																									
Site 16	3.32		3.2		11.7				3200								2680			1	<			1	<
Site 16	2.83		3.2		16.2				3010								627			1	<			1	<
Site 16	3.1		2.6		12.5				3000		3.9				945		2090								
Site 16	3		2.6		13				3000		4.4				879		2130								
Site 16	2.9		2.7		11.5				3200		15				812		2090								
Site 16	3.3		2.7		9.5				3000		9.6				812		1840								
Site 16																									
Site 16																									
Site 16																									
Site 16																									
Site 16																									
Site 16																									
Site 16	3		2.9		11				3000		12				792		1740								
Site 16	3.2		2.9		11.5				3500		13				863		2180								
Site 16	3.4		2.8		10				3400		4.2				904		2130								
Site 16	3.3		2.9		10.5				3600		13				904		2130								
Site 16	3.2		2.8		10				3100		4.8				879		2130								
Site 16	3.2		3.2		10				3000		4.4				854		2180								
Site 16	3.2		2.9		9				2900		4.7				854		2130								
Site 16	3.1		2.9		9				2900		8.8				813		1990								
Site 16	3.1		2.9		7.5				2700		5.2				812		1940								
Site 16	3		2.8		12.5				2800		5.5				837		1890								
Site 16	3.2		2.7		8.5				2900		5.7				813		1840								
Site 16	3.1		2.7		11				2900		4.9				837		2040								
Site 16	3.2		2.8		9.5				3000		4.6				879		2130								
Site 16	3.2		2.8		11.5				2800		5.2				854		2180								
Site 16	3.1		2.7		23				2700		12				813		1840								
Site 17	2.78		2.7		16.3				2450								1810			1	<			1	<
Site 17	1.85		2.8		7.6				2520								1920			1	<			1	<
Site 17	1.89		2.6		15.7				2850								140			1	<			1	<
Site 17	3.94		2.9		4.3				2590								2070			1	<			1	<
Site 17	2.7		2.5		11.5				2800		2.2				792		2090								
Site 17	2.6		2.5		12.5				2900		7.5				763		2040								
Site 17	2.5		2.5		12				3100		8.1				755		1990								
Site 17	2.6		2.5		11				3000		3.5				792		1990								
Site 17	2.6		2.7		9				2900		3.2				813		2090								
Site 17	2.6		2.6		8.5				2900		2.2				738		2090								
Site 17	2.8		2.6		8				2900		1.8				763		2090								
Site 17	2.6		2.6		7.5				3600		9.1				788		2130								
Site 17	2.6		2.6		7.5				3700		3.2				784		2090								
Site 17	2.6		3.3		8				4000		5.4				921		2230								
Site 17	2.6		2.7		11				4400		9.7				1060		2180								
Site 17	2.7		2.7		12				3300		2.4				967		2180								
Site 17	2.7		2.7		10.5				2500		2.4				676		1690								
Site 17	2.7		2.7		10.5				2500		9.4				709		1640								
Site 17	2.7		2.6		11.5				2400		2.8				614		1740								
Site 17	2.6		2.7		10.5				2500		2.1				684		1840								
Site 17	2.6		2.7		9				2700		2.5				689		2090								
Site 17	2.6		2.7		8				2900		7.2				709		2180								
Site 17	2.6		2.6		7.5				2700		2.8				718		2130								
Site 17	2.5		2.6		7.5				3200		3.3				772		3820								
Site 17	2.6		2.5		8				3100		2.1				726		2180								
Site 17	2.6		2.8		9.5				2900		2.6				796		2180								
Site 17	2.5		2.6		10				2800		1.4				714		2280								
Site 17	2.5		2.7		11				2700		4				651		1940								
Site 17	2.6		2.7		11.5				2500		2.9				672		1890								
Site 18	2.86		2.8		19.9				3600								1780			1	<			1	<
Site 18	2.66		3.1		3.5				2820								2060			1	<			1	<
Site 18	2		2.8		21.2				2950								54			1	<			1	<
Site 18	3.1		2.9		20				3600		40				2120		1190								
Site 18	3.1		2.8		22				3700		42				2160		1390								
Site 18	2.8		2.7		15				3900		36				1830		1840								
Site 18	2.7		2.7		8.5				3100		16				1250		1590								
Site 18	2.8		2.7		1.5				2900		12				1100		1590								
Site 18																									
Site 18	4.3		3		0.5				2800		44				1570		1140								
Site 18	3.3		3		1.5				2600		17				985		695								
Site 18	2.9		2.8		7				3300		26				868		1340								

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	Acidityas CaCO3_mgL	Acidityas CaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 18	2.7		2.7		8				3500		21				677		1190								
Site 18	2.5		2.8		20				3000		20				1100		1490								
Site 18	2.7		2.7		22.5				3000		8.9				1030		1590								
Site 18	2.7		2.7		14				2600		11				934		1440								
Site 18	2.8		2.9		15				3100		20				1250		1540								
Site 18	2.9		2.8		17				2800		10				1050		1540								
Site 18	2.7		2.7		11				2600		9.3				913		1590								
Site 18	2.6		2.7		0				2800		6.2				909		1740								
Site 18	2.6		2.7		0				2800		9.9				813		1940								
Site 18	2.9		2.8		0				1100		2.4				365		794								
Site 18	2.6		2.7		4				2900		5.8				830		1940								
Site 18	2.6		2.6		7.5				3200		8.9				1110		2090								
Site 18	2.6		2.6		20.5				3100		7.9				967		1890								
Site 18	2.5		2.6		27.5				3500		12				1390		2180								
Site 18	2.4		2.6		22				4600		22				1850		2730								
Site 18	2.5		2.6		18				4600		25				1940		2580								
Site 19	4.17		4		12.9				2130								1360			1	<			1	<
Site 19	4.24		4.2		7.1				2180								1270			1	<			1	<
Site 19	3.93		4		14.6				2240								232			1	<			1	<
Site 19	5.02		4.2		3.9				2200								1310			1	<			1	<
Site 19	4				12				2500		4.4				961		1540								
Site 19	4.1				12				2700		4.3				961		1640								
Site 19	4		2.9		11				2900		8.3				961		1590								
Site 19	4.7		2.9		11				2900		8.5				961		1540								
Site 19	4.1		3		11.5				2700		4.6				961		1590								
Site 19	4.2		3		12				2500		3.7				920		1540								
Site 19	4.2		2.9		12				2400		3				936		1390								
Site 19	4.1		2.6		11.5				3300		9.4				895		1440								
Site 19	4.2		2.7		10				3700		6.3				895		1440								
Site 19	4.1		2.7		11.5				3100		17				920		1490								
Site 19	4		3		15				2800		10				920		1390								
Site 19	4		2.9		11				3500		4.4				961		1540								
Site 19	4.2		2.9		11				2700		3.5				961		1590								
Site 19	4.1		3		11.5				2800		10				961		1490								
Site 19	4.1		2.9		11				2500		4				936		1440								
Site 19	4.2		3.2		10				2400		3.5				936		1590								
Site 19	4.3		3.1		11				2400		3.7				936		1490								
Site 19	4.3		3		11				2500		8				961		1440								
Site 19	4.3		3		11				2300		4				936		1390								
Site 19	4.2		3		11				2400		4.5				895		1490								
Site 19	4.3		2.8		11				2500		11				920		1340								
Site 19	4.1		2.9		11				3100		4.2				936		1340								
Site 19	4		3		11.5				2300		3.3				961		1440								
Site 19	4		3		11.5				2200		5				895		1440								
Site 19	4.2		2.9		11				2500		6.4				961		1340								
Site 20			2.7						9140								9090			1	<			1	<
Site 20			2.7						9530								8940			1	<			1	<
Site 20	3.16		2.9		5.6				9920								9390			1	<			1	<
Site 20	2.24		2.5		17.7				8490								71			1	<			1	<
Site 20	3.69		2.9		2.8				9290								9000			1	<			1	<
Site 20			2.9						9500								9150			1	<			1	<
Site 20	2.7		2.5		17				10000						1600		8490								
Site 20	2.6		2.5		15						1				1570		8390		1						
Site 20	2.3		2.6		12				11000						1590		8590								
Site 20	3		2.5		10				11000						1600		8440								
Site 20	2.6		2.6		8		13000		10000		1				1630		8440		1						
Site 20	2.6		2.6		5.5				10000						1550		8440								
Site 20	2.6		2.6		8				11000						1570		8440								
Site 20	2.6		2.5		8				13000						1810		9430								
Site 20	2.7		2.5		8		16300		13000		1				1710		9040		1						
Site 20	2.6		2.5		11.5		17200		14000		1				1660		8440		1						
Site 20	2.5		2.6		14.5				12000						1530		7940								
Site 20	2.6		2.6		15		14300		11000		1				1620		8940		1						
Site 20	2.8		2.6		11.5				13000						1690		9930								
Site 20	2.7		2.6		15				13000						1710		9430								
Site 20	2.6		2.6		11.5		14400		11000		1				1420		8940		1						
Site 20	2.6		2.6		11.5				10000						1510		8440								
Site 20	2.5		2.7		8.5				9600						1420		7940								
Site 20	2.6		2.6		6		11900		9100		1				1470		7940		1						
Site 20	2.5		2.6		6.5		13700		11000		1				1510		7450		1						
Site 20	2.4		2.6		12				9500						1470		6950								
Site 20	2.6		2.5		9				11000						1660		8190								
Site 20	2.6		2.5		16.5				11000						1680		8140								
Site 20	2.6		2.5		15				9000						1420		7450								
Site 20	2.4		2.5		17				8900						1480		7940								
Site 20	2.6		2.6		17.5				8900						1570		7400								
Site 21	3.42		3.1		15				2990								2220			1	<			1	<
Site 21	3.59		3.2		5.7				3440								2470			1	<			1	<
Site 21	3.6		4		18.2				1910								222			1	<			1	<
Site 21	5.3		3.5		2.1				2860								1720			1	<			1	<
Site 21	3.1		2.6		22				3000		11				929		2040								
Site 21	3		3.2		24				3000		11				904		2230								
Site 21	3.1		2.6		15.5				3200		15				904		2130								
Site 21	3.2		2.6		7.5				3200		10				945		2130								
Site 21	3.3		2.8		0.5				2700		8.9				995		2090								
Site 21	3.3		2.8		1				3200		9.1				929		2280								
Site 21	3.2		2.7		3				3000		8.6				995		2090								
Site 21	3.2		2.6		4				3500		11				995		1840								
Site 21	3.1		2.6		6				3300		10				970		745								

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	AcidityasCaCO3_mgL	AcidityasCaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 21	7.1		7.1		8.5		484		200		12				368		5	<	197						
Site 21	7.2		7.1		9.5		503		180		14				411		5	<	246						
Site 21	6.8		6.8		15		670		340		17				499		25		179						
Site 21	7.4		7.2		14		913		470		17				601		15		265						
Site 21	4.2		2.9		14.5				2100		16				738		943								
Site 21	3.2		2.8		14.5				3200		7.8				995		2230								
Site 21	3.2		2.9		8				3700		7.4				945		2430								
Site 21	3.2		2.9		6.5				3800		7.2				986		2630								
Site 21	3.6		2.9		4				3600		11				1040		2580								
Site 21	3.5		2.8		3.5				4000		7.9				1040		2580								
Site 21	3.6		2.9		11.5				4000		10				1040		2430								
Site 21	3.2		2.7		18				4000		9.8				986		2380								
Site 21	3		2.7		21				3900		9.9				945		2380								
Site 21	3		2.8		20.5				3400		8				904		2330								
Site 21	3.1		2.8		21				3500		9.4				920		2730								
Site 21	3.2		2.7		12				3600		11				986		2480								
Site 22	3.04		3		14.1				921								483			1	<			1	<
Site 22	3.53		3		9.9				872								346			1	<			1	<
Site 22	2.25		2.8		13.9				1140								456			1	<			1	<
Site 22			2.8						1170								464			1	<			1	<
Site 22	3.46		3.1		6.6				818								282			1	<			1	<
Site 22	2.9		2.8		10.5				790		5.6				483		318								
Site 22	3		2.8		11				810		5.6				462		313								
Site 22	2.7		2.9		10.5				890		5.4				480		308								
Site 22	2.9		2.8		11				910		5.6				478		303								
Site 22	2.9		3		11.5				830		5.6				488										
Site 22	2.8		2.9		11				830		5.6				484		323								
Site 22	2.8		3		11				860		5.7				503		318								
Site 22	2.8		3		10.5				970		5.9				481		313								
Site 22	2.9		3		10.5				950		8				492		328								
Site 22	2.8		3		10.5				950		8.1				512		313								
Site 22	2.7		2.9		10.5				1000		7.2				513		377								
Site 22	2.4		2.7		11				1300		5.9				541		645								
Site 22	2.8		1.6		11				1000		6.6				463		377								
Site 22	2.9		2.9		11				910		7.9				431		288								
Site 22	3		2.9		11				800		6.3				413		263								
Site 22	2.9		3		10.5				700		6.3				422		258								
Site 22	2.9		3.1		10.5				720		5.8				422		218								
Site 22	2.9		3.1		10.5				710		5.5				428		223								
Site 22	2.9		3		10.5				640		6.2				415		223								
Site 22	2.9		3.1		10.5				720		7.1				428		218								
Site 22	3		3		8.5				710		6.5				415		218								
Site 22	3		3		11				670		5.8				444		218								
Site 22	3.1		3.1		10.5				780		5.6				446		209								
Site 22	3.1		3.1		11				670		6.2				427		223								
Site 22	3.1		3.1		10.5				650		6				463		248								
Site 23	6.24		7.4		13.1				166								2	<		275				225	
Site 23	7.46		7.3		4.7				158								2	<		268				220	
Site 23	7.14		7.4		15.5				173								2	<		275				225	
Site 23	6.5		7.4		2.6				149								2	<		273				224	
Site 23	7.3		7.2		13		463		170		5.7				401		15		230						
Site 23	7.8		7.3		16		461		170		5.9				392		9.9		229						
Site 23	7.2		7.2		12		465		170		5.7				398		9.9		233						
Site 23	7.3		7		9.5		490		190		6.4				403		5		237						
Site 23	7.3		7.2		7		483		180		6.4				413		5		233						
Site 23	7.5		7.3		4.5		463		170		6.1				402		9.9		227						
Site 23	7.2		7.2		4		462		170		6.5				403		15		225						
Site 23	7.5		7.5		5		428		140		5.6				393		5		226						
Site 23	7.5		7.5		5.5		425		140		5.5				379		5		227						
Site 23	7.2		7.2		5		481		170		6.1				434		5		235						
Site 23	7.1		7.3		10.5		492		190		6.4				418		5		231						
Site 23	7.1		7.1		12		612		290		5.7				505		5		217						
Site 23	7.3		7.2		10.5		622		300		5.4				499		5		216						
Site 23	7.4		7.2		11.5		546		240		5.8				444		9.9		222						
Site 23	7.4		7		12.5		513		210		5.8				426		5		226						
Site 23	7.4		7.3		9		499		200		6				413		5		227						
Site 23	7.4		7.2		6										388										
Site 23	7.5		7.3		4.5		442		160		5.3				376		20		222						
Site 23	7.6		6.8		6		447		160		5.9				388		15		225						
Site 23	7.4		7.4		4		445		160		5.9				379		5		224						
Site 23	7.4		7.3		6.5		446		160		5.9				374		9.9		228						
Site 23	7.3		7.4		9.5		456		160		5.5				393		5		234						
Site 23	7.5		7.4		12.5		441		150		4.9				385		9.9		235						
Site 23	7.2		7.2		11		434		150		5.7				355		5		239						
Site 23	7.3		7		13.5		456		160		6.3				390		5		236						
Site 24	2.81		3.8		13.5				1280								424			1	<			1	<
Site 24	4.36		3.9		8.6				1250								466			1	<			1	<
Site 24	3.53		3.8		13.8				1380								426			1	<			1	<
Site 24	4.21		3.9		4.1				1380								486			1	<			1	<
Site 24	3.8		2.7		11				1500		6.1				961		596								
Site 24	3.9		2.8		11				1600		5.9				961		645								
Site 24	3.7		3		11.5				1700		6.2				1000		645								
Site 24	3.9		3		10.5				2000		6.6				986		546								
Site 24	3.7		3.1		10				1800		6.8				986		596								
Site 24	4		3.1		9				1600		6.3				986		596								
Site 24	3.8		2.9		9.5				1700		5.6				1030		695								
Site 24	3.7		2.8		9				1600		6.2				961		546								
Site 24	3.9		2.8		8				2000		8.1				961		546								
Site 24	3.8		2.9		9				1800		8.9				986		546								
Site 24	3.6		3.1		10				1700		9.2				961		596								
Site 24	3.5		3.2		10				1900		6				920		546								

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	Acidityas CaCO3_mgL	Acidityas CaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 24	3.8		3		10.5				1600		6.4				895		546								
Site 24	3.8		2.9		11				1600		8.3				895		546								
Site 24	3.8		3		11				1400		6				845		496								
Site 24	3.8		3.1		10				1500		5.4				870		596								
Site 24	3.8		3.3		9.5				1600		5.5				936		596								
Site 24	3.8		3		9				1700		9.8				920		596								
Site 24	3.8		3.1		8.5				1400		6.1				936		546								
Site 24	3.8		3.1		8.5				1500		7.6				920		546								
Site 24	3.8		2.8		9.5				1600		8.2				895		546								
Site 24	3.8		3.1		10				1400		6.3				895		546								
Site 24	3.9		3.2		10.5				1500		5.8				936		546								
Site 24	3.7		3.2		11				1500		7.2				870		596								
Site 24	3.8		3.1		11				1400		8.5				936		482								
Site 25	2.79		2.7		15.8				2680								1630			1	<			1	<
Site 25	3.16		2.7		9.2				2330								1550			1	<			1	<
Site 25			2.8						2410								1570			1	<			1	<
Site 25	2.27		2.7		12.6				2670								638			1	<			1	<
Site 25	3.39		2.8		4.3				2840								2030			1	<			1	<
Site 25	2.7		2.5		10				3200		6.7				1040		2380								
Site 25	2.8		2.6		11				3300		6.7				1020		2380								
Site 25	2.3		2.7		11.5				3800		7.1				1080		2580								
Site 25	2.7		2.6		11				4000		7.2				1040		2280								
Site 25	2.5		2.7		11				3900		6				1070		2330								
Site 25	2.7		2.7		10				3400		6.1				1070		2330								
Site 25	2.6		2.8		10.5				3700		5.4				1130		2280								
Site 25	2.4		2.6		9				4700		21				1040		2330								
Site 25	2.6		2.6		9				4600		7.6				1110		2180								
Site 25	2.6		2.7		9				4700		20				1130		2180								
Site 25	2.4		2.8		9				4300		14				1110		2090								
Site 25	2.6		2.8		9				4200		5.7				1110		2090								
Site 25	2.7		2.8		9.5				2800		5.6				977		1590								
Site 25	2.7		2.7		10.5				2800		12				911		1490								
Site 25	2.7		2.7		10.5				2600		6.3				911		1490								
Site 25	2.6		2.8		10.5				2600		6.1				952		1590								
Site 25	2.5		2.8		10				2900		5.7				993		1890								
Site 25	2.5		2.8		9.5				3400		9.8				1020		2180								
Site 25	2.6		2.8		9				3500		6.2				1080		2280								
Site 25	2.5		2.8		8.5				3200		8.2				1040		2230								
Site 25	2.6		2.7		9				3500		7.2				1150		2280								
Site 25	2.5		2.7		9				3300		5.8				1060		2330								
Site 25	2.6		2.7		9.5				3500		4.9				1150		2380								
Site 25	2.6		2.8		10.5				3200		5.9				1080		2580								
Site 25	2.6		2.8		11				3300		8.5				1130		2130								
Site 26	2.68		3		16.7				1400								364			1	<			1	<
Site 26	4.1		3.4		1.1				1400								315			1	<			1	<
Site 26	2.96		3.2		18.6				1700								255			1	<			1	<
Site 26	3.83		3.3		-0.2				1270								310			1	<			1	<
Site 26	2.8		3		12				1800		6.1				1170		467								
Site 26	3		2.8		7.5				2100		7.9				1080		546								
Site 26	3		2.9		1.5				2000		7.5				1140		596								
Site 26																									
Site 26	3.2		2.9		1				1700		5.8				1150		546								
Site 26	3		2.9		2.5				2500		4.8				945		477								
Site 26	3		2.9		4				2500		7.8				1080		487								
Site 26	3.1		3		1.5				2000		7.3				1190		417								
Site 26	2.6		3		19				2100		10				1240		412								
Site 26	2.7		3		19.5				2000		6.9				1150		437								
Site 26	3		3		19.5				1700		6.1				1040		437								
Site 26	5.9		4.5		17				1700		7.6				1630		99								
Site 26	3.1		3		16.5				1600		6.6				1170		422								
Site 26	2.9		2.9		8				1500		6.1				961		496								
Site 26	3		3		0				1700		5.6				961		596								
Site 26	3.6		3.3		0.5				1600		9.8				1210		273								
Site 26	3.5		3.3		1.5				1300		5.5				1090		273								
Site 26	3.7		3.5		0.5				1400		7.6				1140		223								
Site 26	3.5		3.9		10				1900		9.7				514		179								
Site 26	3.9		3.8		13.5				1900		7.6				1670		169								
Site 26																									
Site 26																									
Site 26																									
Site 27	5.99		7		12.8				427								2	<		249				204	
Site 27	7.34		6.8		8.7				475								2	<		229				188	
Site 27	6.62		7		13.6				459								2	<		249				204	
Site 27	7.04		6.8		0.2				538								2	<		222				182	
Site 27	7.3		7.4		13.5		912		480		7.7				721		20		270						
Site 27	7.8		7.6		16.5		863		450		8.1				671		9.9		264						
Site 27	7.2		7.1		13		846		430		7.5				671		9.9		270						
Site 27	7.8		7.2		10		871		450		8.1				675		5		275						
Site 27	7.2		7.1		7		848		430		7.6				671		20		274						
Site 27	7.3		7.1		4.5		879		450		7.7				712		9.9		267						
Site 27	7.2		7		4.5		869		450		7.2				696		30		266						
Site 27	7.5		7.8		4.5		877		460		7.6				688		5	<	265						
Site 27	7.8		7.6		6		823		420		8.3				646		5	<	264						
Site 27	7.1		7.2		5		854		420		6.3				733		5		268						
Site 27	7.4		7.4		11		829		420		8.8				679		5	<	255						
Site 27	7.8		7.6		11.5		668		290		6.7				561		5	<	270						
Site 27	7.9		7.8		13.5		640		270		6.4				524		5	<	281						
Site 27	7		7		10		787		450		6.9				631		20		174						
Site 27	6.9		6.6		10		811		480		6.9				610		5		180						
Site 27	6.8		6.8		10		810		470		7.4				632		5		184						
Site 27	7		6.7		9.5		782		440		7.1				595		84		208						

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	Acidityas CaCO3_mgL	Acidityas CaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
Site 27	6.8		6.6		9		810		460		6.2				634		5		200						
Site 27	6.8		6.7		12		783		440		7.2				603		20		202						
Site 27	6.6		6.9		8.5		803		450		7				641		20		199						
Site 27	6.8		6.9		9		799		450		6.9				626		15		201						
Site 27	6.9		6.7		9.5		818		460		6.8				650		5	<	203						
Site 27	6.9		6.9		9.5		769		420		6.5				615		9.9		211						
Site 27	6.8		6.7		10		764		430		6.9				567		5	<	211						
Site 27	7		6.7		10		774		430		7.1				598		15		213						
Site 28	6.49		8.4		17.5				136								2	<		189				155	
Site 28	7.39		8.2		1.3				277								2	<		229				188	
Site 28	7.52		7.8		14.1				53								2	<		138				113	
Site 28	8.06		8		2.5				284								2	<		215				176	
Site 29	6.72		8.1		16				140								2	<		177				145	
Site 29	6.55		7.6		4.7				258								2	<		222				182	
Site 29	8.29		8.4		15.1				57								2	<		157				129	
Site 29	6.12		6.9		3.7				290								2	<		137				112	
200615	2.7		2.75		7		10057	c	7990		50	<								0		0			
200615	2.68		2.71		7.2		8960	c	6975		50.0	<								0		0			
200615	2.68		2.7		9.7		7877	c	6198		125	<								0		0			
200615	2.62		2.78		12.2		5814	c	4400		16.3									0		0			
200615			2.66				6824	c	5226		50.0	<								0		0			
200615			2.4				7523	c	5750		25.0	<								0		0			
200615	2.36		2.54		14.3		8770	c	6891		29.6									0		0			
200615	2.41		2.76		11.3		9072	c	7133		25.0	<								0		0			
200615	2.73		2.71		10.3		10491	c	8152		25.0	<								0		0			
200615	2.57		2.95		10.2		6190	c	4799		63.0	<								0		0			
200615	1.75		3.14		12.23		9697	c	7350		25.0	<								0		0			
200615	3.99		4.1		12.2		8373	c	6244		17.3									0		0			
200615			2.9				10198	c	7878		12.5	<								0		0			
200615			2.84				10082	c	8694		25.0	<								0		0			
200616	2.99		3.01		9.8		2471	c	1920		10.0	<								0		0			
200616	3.01		2.97		10.7		2521	c	1934		5.8									0		0			
200616	2.89		2.95		7.5		2430	c	1900		10.0	<								0		0			
200616	2.84		3.03		11.3		2043	c	1523		7.51									0		0			
200616	2.51		2.88		9.9		2184	c	1606		4.65									0		0			
200616			2.79				2180	c	1610		12.5	<								0		0			
200616	2.58		2.8		9.9		2434	c	1851		8.6									0		0			
200616	2.7		2.93		9.94		2496	c	1905		5.0	<								0		0			
200616	2.99		3.01		9.91		2620	c	2025		5.0	<								0		0			
200616	2.8		3.19		9.8		2475	c	1916		10.0	<								0		0			
200616	2.75		3.34		11.91		2003	c	1510		6.7									0		0			
200616	2.68		2.8		9.9		2094	c	1580		5.0	<								0		0			
200616	2.83		3.09		9.94		2264	c	1663		5.0	<								0		0			
200616			3.13				2514	c	1921		50.0	<								0		0			
200616			3.16				2456	c	2099		10.0	<								0		0			
205508	7.48		7.83		20.9		281	c	64.8		1.85									227.2		0			
205836	7.79		7.83		17.9		213	c	54.7		0.823									157.4		0			
205838	7.22		7.67		18.4		242	c	46.5		1.45									217.9		0			
205838															216										
205839	7.48		7.82		19.2		249		49.9						213										
214387	8.04				13.2																				
214387	8.24				14.2																				
214387	8.14				24.4																				
214387					11																				
214387	7.21				15																				
214387	6.4				4.6																				
214387																									
214387	8.08				11.3																				
214387	7.67				14.2																				
214387	8.28				14.3																				
214387	7.9				25																				
214387																									
214387																									
214387																									
214387																									
214387	6.28				4.52																				
214387	7.4				6.47																				
214387	7.76				11.08																				
214387	8.33				8.09																				
214387	7.41				21.87																				
214387	8.05				18.88																				
214387	7.95				11.57																				
214911	6.64		5.83		10.38		505		344		1.75				373					32.9		0			
214913	6.55		7.31		11.29		413		193		1.69				337					148.7		0			
214914	2.77		3.1		9.04		4873	c	3618		25.0	<								0		0			
214915	3.78		3.01		9.25		6728	c	5100		12.5	<								0		0			
214916	7.23		7.28		8.47		414		201		2.11				354					134.8		0			
BCAMD			2.95										5.0		740										
BCAMD			2.85										50.8		772										
CTWDC02			7.52										99.6		505										
CTWDC02			4.47										137.0		905										
CTWDC03			7.49										10.3		497										
CTWDC03			6.39										384.0		816										
CTWDC03A			4.38										309.0		713										
CTWDC03A			3.16										491.0		1090										
CTWDC04			8.06										12.8		310										
CTWDC04			7.74										69.9		338										
LBLTC03			7.83										8.7		113										
LBLTC03			8.26										2.7		245										
LBLTC03A			7.7										5.9		111										
LBLTC03A			7.88										4.0		243										

Station_ID	pH_Fld_su	pH_Fld_Q	pH_Lab	pH_Lab_Q	WtrTemp_degC	WtrTemp_Q	TDS_mgL	TDS_Q	sulfate_mgL	sulfate_Q	Cl_mgL	Cl_Q	TSS_mgL	TSS_Q	Hrdnes_mgL	Hrdnes_Q	AcidityasCaCO3_mgL	AcidityasCaCO3_Q	AcidNeut Capacity CaCO3_mgL	AlkBiCarb_mgL	AlkBiCarb_Q	AlkCarb_mgL	AlkCarb_Q	Alk_T_mgL	Alk_T_Q
NO5CL01			8.55										2	<	283										
NO5CL02			7.45										4.2	<	445										
NO5CL02			6.35										0.7	J	717										
SNDCC01			7.69										5.7		1270										
SNDCC01			6.42										99.5		1750	J									
SNDCC02			7.74										4.2	<	577										
SNDCC03			8.46										13.8		223										
SNDCC04			8.54										77.0		230										
SNDCL02			2.77										20.5		1440										
SNDCL02			2.67										41.3		1970										
			2.1						19000																
rom Montana I																									
rd: January 19																									
MAXIM 12/16/1																									
able metals inc																									
Dissolved Soli																									

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 1																					0.9		0.1	<	0.003	<	0.003	<
Site 1	3.2		39		0.3		3.5		23		5.9								0.001	<			0.4				0.002	
Site 1																												
Site 1																												
Site 1																												
Site 1																												
Site 1																												
Site 1																												
Site 1																												
Site 1	11		44		0.3		2.4		12		3.3								0.001	<			0.13				0.001	<
Site 1																												
Site 1	10		52		0.2		2		15		4								0.001	<			0.1				0.001	
Site 1	11		45		0.2		3.2		14		3.7								0.001	<			0.05				0.001	
Site 1	11		63		0.3		2.1		23		5.2								0.001	<			0.04				0.001	
Site 1	6.6		56		0.6		2.4		24		5.5								0.001				0.06				0.001	
Site 1	3.8		50		0.3		2.3		25		5.4								0.001	<			0.09				0.001	<
Site 1	3.7		59		0.5		2.6		25		5.9								0.001	<			0.14				0.001	<
Site 1																												
Site 1																												
Site 1																												
Site 1																												
Site 1																												
Site 1	8.8		55		0.5		2		16		3.7								0.001	<			0.02				0.001	
Site 1	3.3		42		0.4		4.2		22		5.6								0.001	<			0.43				0.002	
Site 1																												
Site 1																												
Site 2																					0.8		0.1	<	0.003	<	0.003	<
Site 2	3		90		0.7		4		53		13								0.001	<			0.46				0.001	<
Site 2																												
Site 2																												
Site 2																												
Site 2																												
Site 2																												
Site 2																												
Site 2																												
Site 2																												
Site 2	6.4		71		0.5		4.2		34		10								0.001				0.09				0.001	<
Site 2																												
Site 2	6.7		88		0.4		3.4		45		13								0.001	<			0.06				0.001	<
Site 2	8.3		100		0.3		4.1		48		12								0.001	<			0.02				0.003	
Site 2																												
Site 2	16		100		0.3		3.5		57		13								0.001	<			41				0.001	<
Site 2	17		110		1.7		3.7		60		13								0.001				6.1				0.001	<
Site 2	17		120		1.5		4		65		13								0.001	<			54				0.001	<
Site 2	6.2		110		0.6		3.8		57		12								0.001	<			0.07				0.001	<
Site 2																												
Site 2																												
Site 2																												
Site 2	3.5		160		0.8		4.4		73		11								0.001	<			0.21				0.001	<
Site 2	2.6		120		0.7		4.7		66		12								0.001	<			0.01	<			0.001	<
Site 2	2.9		120		0.8		5		64		11								0.001	<			1.17				0.001	<
Site 2																												
Site 2																												
Site 3																					1.7		0.2		0.003	<	0.003	<
Site 3																					1.4		0.2		0.003	<	0.003	<
Site 3																					0.8		0.1	<	0.003	<	0.003	<
Site 3																					1.4		1		0.22		0.003	<
Site 3	14		130		0.6		5.2		46		18								0.001	<			0.06				0.001	<
Site 3	14		140		0.2		5.5		46		17								0.001	<			0.19				0.001	<
Site 3	15		140		0.3		6.1		46		16								0.001	<			0.16				0.001	<
Site 3	14		140		0.5		6.2		44		16								0.001	<			0.17				0.001	<
Site 3	14		150				5.9		45		16								0.001	<			0.31				0.001	<
Site 3	15		150		0.5	<	5.9		43		14								0.001	<			0.29				0.001	<
Site 3	14		140		0.7		5.8		44		15								0.001	<			0.22				0.001	<
Site 3	14		140		0.2		4.9		43		15								0.001	<			0.15				0.001	<
Site 3	14		140		0.3		5.1		43		16								0.001	<			0.13				0.001	<
Site 3	13		150		0.3		5.8		43		15								0.001	<			0.06				0.001	<
Site 3																												
Site 3	9.2		74		0.6		5.3		36		20								0.001	<			0.06				0.001	<
Site 3																												
Site 3	8.3		83		0.6		4.1		37		18								0.001	<			0.07				0.001	<
Site 3	11		80		0.5		4.4		38		19								0.001	<			0.03				0.001	<
Site 3	10		110		0.6		4.1		41		16								0.001	<			0.03				0.001	<
Site 3	11		130		0.3		5.7		44		16								0.001				0.05				0.002	<
Site 3	13		130		0.4		5.7		48		17								0.001	<			0.07				0.001	<
Site 3	14		150		1.2		5.3		48		16								0.001	<			0.14				0.001	<
Site 3																												
Site 3	17		160		1.3		7		49		15								0.001	<			0.40				0.002	<
Site 3																												
Site 3	15		160		0.2		5.9		49		15								0.002				0.22				0.001	<
Site 3	15		160		0.8		5.5		46		15								0.001	<			0.10				0.001	<
Site 3	13		150		0.8		6.1		45		15								0.001	<			0.05				0.001	<
Site 3	11		130		0.9		5.7		46		19								0.001	<			0.03				0.001	<
Site 3	13		130		0.8		5.9		45		16								0.001	<			0.03				0.001	<
Site 3	13		140		0.7		6.5		48		15								0.001	<			0.02				0.001	<
Site 3	14		140		0.8		5.7		44		15								0.001	<			0.04				0.001	<
Site 4																					183		138		0.02		0.003	<
Site 4	78		240		0.2		2.7		160		25								0.001	<			410				0.004	
Site 4	77		220		0.1	<	3		160		24								0.003	<			410				0.006	
Site 4	86		250		0.2		3		180		26								0.003	<			490				0.004	
Site 4	79		230		2.4		2.6		160		22								0.005	<			470				0.007	

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 4																												
Site 4																												
Site 4																												
Site 4																												
Site 4																												
Site 4	50		240		1.8		2.5		140		23								0.003	<			230				0.001	<
Site 4																												
Site 4	9.9		86		0.2		7.1		65		16								0.001	<			0.03				0.001	<
Site 4	26		110		1.7		3.5		85		20								0.001	<			73				0.001	<
Site 4	39		130		1.2		3.4		96		20								0.003	<			170				0.003	
Site 4																												
Site 4	81		220				2.9		160		23								0.01	<			440				0.007	
Site 4	84		220		0.2		2.2		160		24								0.006	<			480				0.011	
Site 4	81		220		1.9		2.8		160		24								0.005	<			420				0.006	
Site 4																												
Site 4																												
Site 4																												
Site 4																												
Site 4	42		160		1		3.8		120		23								0.004	<			127				0.001	<
Site 4	57		180		0.7		2.6		120		22								0.01	<			186				0.002	
Site 4																												
Site 4																												
Site 5																					120		110		0.003	<	0.003	<
Site 5																					110		110		0.003	<	0.003	<
Site 5																					92		68		0.003	<	0.003	<
Site 5																					120		120		0.003	<	0.003	<
Site 5	57		160				3.2		68		9.7								0.003	<			110				0.001	
Site 5	56		160				3.7		66		9.8								0.003	<			110				0.001	
Site 5	57		160		0.8		3.4		66		10								0.003	<			110				0.002	
Site 5	60		160		1.3		3.2		67		9.5								0.003	<			100				0.001	
Site 5	57		170		2		3.1		68		10								0.004				110				0.001	
Site 5	59		170		0.6		3.3		64		9.4								0.003	<			110				0.001	
Site 5	58		170		2.1		3		71		10								0.003	<			100				0.001	
Site 5	56		160		2.7		2.9		65		9.6								0.005				110				0.001	<
Site 5	56		160		2.2		3		67		10								0.003	<			110				0.001	
Site 5	51		150		1.7		3.2		63		9.6								0.005				100				0.001	
Site 5	53		150		2.4		2.6		64		9.8								0.003	<			95				0.001	
Site 5	54		150		0.9		2.5		65		10								0.003	<			94				0.001	<
Site 5	56		150		0.6		2.6		63		10								0.003	<			92				0.003	
Site 5	56		140		1.4		2.7		63		9.7								0.002	<			100				0.001	
Site 5	57		150		1.7		2.7		65		10								0.002	<			110				0.002	<
Site 5	58		150		1.5		2.7		67		9.7								0.003	<			110				0.001	
Site 5	57		150		1.6		2.6		68		9.8								0.003	<			110				0.001	<
Site 5	60		160		1.3		3.1		69		10								0.003	<			120				0.002	<
Site 5	59		160		1.9		3.1		67		10								0.002	<			110				0.002	
Site 5	59		160		2.1		2.8		68		11								0.002	<			120				0.003	
Site 5	56		150		1.9		2.9		66		10								0.003	<			110				0.003	
Site 5																												
Site 5	53		150		1.9		2.8		68		10								0.003	<			100				0.001	<
Site 5	59		170		0.9		3.1		72		11								0.003	<			106				0.002	
Site 5	54		150		2.2		3.5		68		10								0.003	<			104				0.002	
Site 5	55		160		2		3.1		69		10								0.003	<			108				0.002	
Site 6																					2.7		1.8		0.003	<	0.003	<
Site 6																					2.1		1.3		0.003	<	0.003	<
Site 6																					2.3		2		0.003	<	0.003	<
Site 6																					2.8		2.7		0.003	<	0.003	<
Site 6	21		110		0.4		5.4		42		14								0.002				15				0.001	
Site 6	20		120		0.2		6.3		42		14								0.001				14				0.001	
Site 6	20		110		1		5.7		41		14								0.001				12				0.001	
Site 6	19		110		1		6		42		15								0.001				8.2				0.001	
Site 6	18		120				5.7		42		15								0.001				6.5				0.001	
Site 6	18		120		0.6		5.6		39		14								0.001				4.6				0.001	
Site 6	17		120		0.6		5.4		42		15								0.001				3.4				0.001	
Site 6	18		120		0.6		5.6		42		16								0.001				2.5				0.001	
Site 6	17		110		0.5		5.6		40		15								0.001				2				0.001	
Site 6	18		120		0.9		5.6		41		15								0.001				1.9				0.001	
Site 6	16		120		1		5.9		42		17								0.001				1.1				0.001	
Site 6	17		110		0.2		5.3		39		15								0.001				1.5				0.001	
Site 6	23		110		0.8		4.7		42		13								0.001				19				0.001	
Site 6	21		110		0.4		4.8		40		11								0.001				23				0.001	
Site 6	24		120		1.3		4.5		43		12								0.002				33				0.002	
Site 6	23		110		1.2		4.6		44		12								0.001				35				0.001	
Site 6	23		110		1.4		4.4		43		12								0.001				30				0.001	
Site 6	25		120		1.5		5		44		13								0.001				30				0.002	
Site 6	22		120		1.4		5.4		42		13								0.001				19				0.001	
Site 6	22		120		1.3		4.9		42		15								0.001				13				0.001	
Site 6	19		110		1.2		5.5		42		15								0.001				6.1				0.001	
Site 6	18		110		1.1		5.1		42		15								0.001				3.6				0.001	
Site 6	21		120		1		5.5		44		14								0.001				6.87				0.001	
Site 6	17		110		0.9		5.9		41		14								0.001				1.90				0.001	
Site 6	18		110		0.8		5.3		43		15								0.001				1.96				0.001	
Site 7																					457		334		0.003	<	0.003	<
Site 7																					330		320		0.003	<	0.003	<

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 7																					400		390		0.003	<	0.003	<
Site 7																					300		300		0.003	<	0.003	<
Site 7	93		330		3.7		2.1		120		13								0.003	<			410				0.01	<
Site 7	100		350		2.8		2.1		130		14								0.003	<			410				0.005	<
Site 7	96		340		4		2.3		120		13								0.003	<			410				0.01	<
Site 7	97		340		5.6		1.7		130		13								0.01	<			380				0.001	<
Site 7	83		350		1	<	3.9		130		15								0.01	<			350				0.001	<
Site 7	83		360		1	<	5.7		140		15								0.01	<			350				0.005	<
Site 7	87		350				3.7		140		14								0.01	<			390				0.005	<
Site 7	87		370				0.5		140		14								0.01	<			430				0.025	<
Site 7	86		340		1.6		2.1		140		14								0.01	<			380				0.005	<
Site 7	86		340		1.5		2.1		140		14								0.01	<			410				0.001	<
Site 7	99		380				2.4		140		13								0.01	<			450				0.002	<
Site 7	97		350		1.3		2.6		140		14								0.01	<			440				0.005	<
Site 7	99		360		2.9		2.7		130		14								0.01	<			420				0.001	<
Site 7	98		350		2.8		0.6		130		13								0.01	<			400				0.005	<
Site 7	98		350		1	<	3		140		14								0.01	<			416				0.01	<
Site 7	97		340		1	<	3.6		130		13								0.01	<			393				0.005	<
Site 7	94		330		4.1		4		130		14								0.01	<			388				0.005	<
Site 7	92		340		3.9		3.6		130		13								0.011				378				0.005	<
Site 8																					1900		1720		0.003	<	0.003	<
Site 8																					1320		712		0.003	<	0.003	<
Site 8																					1200		1100		0.006		0.003	<
Site 8	60		470		1	<	5.7		360		10								0.001	<			1300				0.002	<
Site 8	41		480		1	<	5		350		12								0.001	<			1400				0.001	<
Site 8	39		450		1	<	4.4		430		11								0.001	<			1300				0.001	<
Site 8	110		430		1	<	4.8		320		8.9								0.02	<			1200				0.002	<
Site 8	66		400				2.7		330		4.7								0.001	<			1300				0.001	<
Site 8	56		450		1	<	1.2		370		9.8								0.001	<			1600				0.001	<
Site 8	38		360		8.5		1.9		310		7.3								0.001	<			910				0.001	<
Site 8	73		390		3.2		0.3		270		6.9								0.01	<			980				0.01	<
Site 8	92		410		6.6		1		320		8.8								0.005	<			1300				0.01	<
Site 8	68		370		3.4		0.8		200		5.9								0.004	<			740				0.01	<
Site 8	91		460		3.7		1.7		270		9								0.01	<			830				0.001	<
Site 8	130		460		2.1		2.2		210		9.5								0.02	<			990				0.008	
Site 8	130		390		1	<	1.9		200		9.1								0.02	<			980				0.009	
Site 8	140		390				1.6		210		9.2								0.02	<			1100				0.025	<
Site 8	140		430				1.7		230		9.8								0.02	<			1200				0.025	<
Site 8	130		390		4.9		1.9		240		8.9								0.01	<			1200				0.011	
Site 8	120		370		1	<	1.8		240		8.4								0.01	<			1200				0.005	
Site 8	100		370				2.1		260		8.5								0.015	<			1200				0.002	<
Site 8	90		370				0.3		250		7.4								0.01	<			1100				0.002	
Site 8	79		320		5		0.7		200		6.4								0.01	<			830				0.002	<
Site 8	110		430		1.1		1.2		310		8.6								0.01	<			1300				0.005	<
Site 8	120		490		2		0.3		360		8.9								0.03	<			1220				0.01	<
Site 8	130		520		1	<	1.1		410		9.4								0.04	<			1370				0.005	<
Site 8	130		510		6.2		4.4		420		10								0.03	<			1520				0.01	<
Site 8	130		520		6.6		4.2		430		11								0.04	<			1460				0.005	<
Site 9																					2.2		0.2		0.003	<	0.003	<
Site 9	1.4		120		0.7		5.7		45		19								0.001				0.3				0.001	<
Site 9																												
Site 9																												
Site 9																												
Site 9	7.7		140		0.4		6.2		37		14								0.001	<			0.04				0.001	<
Site 9																												
Site 9																												
Site 9	6.2		98		0.4		5.4		35		24								0.001	<			0.07				0.001	<
Site 9	7.4		62		0.6		4.6		34		25								0.001	<			0.08				0.001	<
Site 9	5.6		61		0.4		4.1		38		22								0.001	<			0.13				0.001	<
Site 9	8.2		72		0.6		4.1		38		23								0.001	<			0.31				0.001	<
Site 9	4.6		99		0.8		4.7		44		21								0.001				0.24				0.001	<
Site 9	4.3		110		0.5		5.4		47		20								0.001	<			0.05				0.001	<
Site 9	5.1		130		0.5		5.8		50		20								0.001	<			0.04				0.001	<
Site 9	6.9		150		0.4		5.4		50		19								0.001	<			0.06				0.001	<
Site 9	12		160		0.7		6.9		46		14								0.001	<			0.50				0.002	<
Site 9	8.2		140		0.6		5.4		43		14								0.001				1.70				0.001	<
Site 9	9.2		130		0.6		4.8		35		11								0.001	<			0.15				0.001	<
Site 9	6.6		170		1		6.9		48		19								0.002				0.03				0.001	<
Site 9																												
Site 9																												
Site 9																												
Site 9																												
Site 10	110		490		1	<	33		190		38								0.01	<			410				0.001	<
Site 10	55		470		1	<	29		210		44								0.001	<			460				0.001	<
Site 10	88		450		1	<	27		210		37								0.001	<			530				0.001	<
Site 10	130		410		1	<	18		170		26								0.005	<			560				0.001	<
Site 10	110		390		1.6		15		150		23								0.018				540				0.001	<
Site 10	120		410		1	<	17		160		25								0.005	<			570				0.001	<
Site 10	110		370		2.9		13		150		24								0.005	<			470				0.001	<

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 10	82		300		3.5		9.6		100		16								0.004				340				0.001	<
Site 10	91		350		3.3		17		140		26								0.003	<			380				0.001	<
Site 10	89		320		3.7		12		110		18								0.003	<			370				0.001	<
Site 10	100		330		3.9		7.2		110		19								0.003				300				0.001	<
Site 10	87		270		1	<	5.8		92		19								0.007				190				0.001	<
Site 10	65		200		1	<	4.7		75		18								0.003	<			100				0.001	<
Site 10	71		210				4.8		86		19								0.002	<			160				0.001	<
Site 10	86		250		1.8		3.8		92		18								0.002	<			240				0.002	<
Site 10	87		240		1.7		3.8		95		18								0.003	<			250				0.001	<
Site 10	98		250		1	<	3		100		17								0.005	<			370				0.001	<
Site 10	94		250				5.6		110		14								0.01	<			440				0.002	<
Site 10	78		200		1.8		5.5		87		12								0.005	<			350				0.001	<
Site 10	97		310		4.5		6.7		120		23								0.01	<			390				0.002	<
Site 10																												
Site 10																												
Site 10																												
Site 10																												
Site 11	100		240		1	<	5.6		110		13								0.01	<			500				0.023	
Site 11	100		230		1	<	5.6		110		13								0.003	<			460				0.016	
Site 11	99		220		1	<	5.6		110		12								0.003	<			490				0.018	
Site 11	110		250		1	<	5.07		120		12								0.01	<			480				0.032	
Site 11	100		240				5.2		110		12								0.01	<			420				0.017	
Site 11	100		240		1	<	5.9		100		11								0.005	<			480				0.018	
Site 11	110		250		1.4		5.4		110		12								0.01	<			450				0.039	
Site 11	100		240		3.6		5.8		110		11								0.004	<			470				0.032	
Site 11	110		250		2.2		5.8		110		12								0.004	<			480				0.039	
Site 11	64		150		1.7		3.8		77		17								0.003	<			180				0.008	
Site 11	45		120		2.4		3.5		67		17								0.003	<			110				0.005	
Site 11	41		110		1	<	3.6		66		17								0.003	<			100				0.004	
Site 11	50		130		1	<	3.4		71		17								0.003	<			140				0.003	
Site 11	64		140		1	<	3.3		76		15								0.004	<			190				0.011	
Site 11	70		160		1.6		3.1		78		15								0.007				230				0.016	
Site 11	75		160		1.6		2.8		84		14								0.01	<			250				0.014	
Site 11	90		190		1.1		3		94		13								0.01	<			390				0.002	
Site 11	120		230				5.7		120		12								0.015	<			640				0.037	
Site 11	110		230		1.1		5.2		100		12								0.01	<			490				0.032	
Site 12	100		190		3.9		5.3		94		13								0.01	<			430				0.002	<
Site 12	79		150		2.2		0.8		76		13								0.005	<			230				0.005	
Site 12	70		140		1.6		3.9		75		13								0.029				214				0.005	
Site 12	84		190		1	<	4.2		92		12								0.01	<			312				0.014	
Site 12	95		200		3.5		5.6		94		12								0.01	<			358				0.022	
Site 12	100		230		3.7		5.8		110		12								0.028				480				0.008	
Site 13																					320		270		0.003	<	0.003	<
Site 13																					270		270		0.003	<	0.003	<
Site 13																					288		182		0.003	<	0.003	<
Site 13																					300		300		0.003	<	0.003	<
Site 13	76		110		1	<	6.4		25		0.37								0.005	<			250				0.001	<
Site 13	79		110		1	<	14		26		0.39								0.003	<			270				0.002	
Site 13	87		120		1	<	7.1		25		0.36								0.005	<			280				0.002	
Site 13	83		120				7.5		26		0.37								0.01	<			290				0.002	
Site 13	85		110		1	<	5.7		25		0.36								0.003	<			260				0.001	
Site 13	86		120		1	<	5.1		26		0.37								0.004	<			250				0.002	
Site 13	84		120		2.1		16		25		0.35								0.003	<			310				0.001	
Site 13	86		120		1.6		26		26		0.36								0.003	<			310				0.001	
Site 13	83		110		1.2		13		24		0.35								0.003	<			330				0.001	<
Site 13	85		130		1.6		14		26		0.36								0.01	<			320				0.001	<
Site 13	88		120		1		4.6		26		0.36								0.011				340				0.001	<
Site 13	87		120		1	<	5.2		27		0.38								0.01				320				0.005	<
Site 13	84		120		1	<	15		26		0.37								0.01	<			320				0.005	<
Site 13	87		130		1	<	4.7		27		0.37								0.01	<			320				0.025	<
Site 13	80		120				4.5		26		0.37								0.01	<			290				0.005	<
Site 13	80		120		1	<	4.3		26		0.37								0.005	<			530				0.001	<
Site 13	83		120				9		26		0.37								0.005	<			310				0.002	<
Site 13	84		120		1	<	5.8		26		0.37								0.005	<			310				0.001	<
Site 13	83		120		1.2		7.5		27		0.39								0.005	<			280				0.001	<
Site 13	82		120		1.2		6.3		27		0.39								0.005	<			280				0.001	<
Site 13	74		120		1	<	5.6		26		0.37								0.008	<			258				0.001	<
Site 13	77		120		1	<	5.2		26		0.37								0.008	<			258				0.001	<
Site 13	74		120		1.6		7.3		26		0.38								0.008	<			252				0.005	<
Site 13	82		130		1.6		8.5		26		0.37								0.008	<			269				0.001	<
Site 14																					960		920		0.003	<	0.003	<
Site 14																					780		780		0.004		0.007	
Site 14																					939		813		0.003	<	0.003	<
Site 14	71		230		1	<	0.2		210		19								0.001	<			900				0.002	
Site 14	55		280		1	<	0.2		210		19								0.001	<			910				0.002	
Site 14	72		270		1	<	0.1		210		20								0.001	<			920				0.002	
Site 14	130		280		1.4		0.2		200		19								0.01	<			880				0.001	
Site 14	98		290				0.1		220		20								0.001	<			890				0.001	
Site 14	93		270				0.2		200		20								0.001	<			890				0.001	<
Site 14	57		280		8.4		0.4		200		17								0.001	<			910				0.003	
Site 14	120		270		2.6		0.2		190		19								0.004	<			860				0.01	<
Site 14	130		300		1	<	0.3		200		20								0.01	<			890				0.01	<
Site 14	130		300		3.7		0.2		200		20								0.01	<			880				0.01	<
Site 14	130		290		2.6		0.3		200		19								0.01	<			870				0.005	<
Site 14	130		310		1	<	0.3		200		22								0.02	<			910				0.005	
Site 14	140		290		1	<	0.2		190		20								0.02	<			860				0.005	<
Site 14	140		290		1.7		0.4		200		21								0.02	<			880				0.01	
Site 14			210				0.4		190		23								0.02	<			890				0.012	
Site 14	130		270		5		0.2		200		20								0.01	<			870				0.005	<
Site 14	130		270		1	<	0.2		200		21								0.01	<			900				0.004	
Site 14	140		310				0.1		210		21								0.012				990				0.002	<

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 14	140		290				0.2		210		21								0.054				930				0.003	
Site 14	140		290		4.1		0.1		200		21								0.01	<			920				0.002	<
Site 14	140		310		1.8		0.2		200		20								0.01	<			880				0.005	<
Site 14	140		300		1	<	0.1		210		21								0.025	<			880				0.01	<
Site 14	130		280		1	<	0.2		210		22								0.025	<			894				0.005	<
Site 14	120		270		3.8		0.2		200		19								0.025	<			865				0.004	
Site 14	130		280		3.7		0.2		200		21								0.02	<			860				0.001	
Site 15																					0.1	<	0.1	<	0.003	<	0.003	<
Site 15	8.5		53		0.4		6.2		52		18								0.002				0.02				0.001	
Site 15	7.6		59		0.5		4.3		61		18								0.001	<			0.02				0.001	<
Site 15	8.1		65		0.5		4.9		70		25								0.001	<			0.01	<			0.001	<
Site 15	12		100		0.3		7.9		85		62								0.001	<			0.02				0.001	
Site 15																												
Site 15																												
Site 16																					340		300		0.016		0.013	
Site 16																					227		121		0.032		0.005	
Site 16	53		180		1	<	1.6		120		19								0.004	<			250				0.004	
Site 16	70		170		1	<	1.8		110		18								0.003				240				0.005	
Site 16	66		160		1	<	1.7		100		18								0.003	<			220				0.004	
Site 16	65		160		2.2		1.7		100		18								0.003	<			200				0.004	
Site 16																												
Site 16																												
Site 16																												
Site 16																												
Site 16																												
Site 16																												
Site 16	63		160		3.1		1.8		95		18								0.003	<			180				0.001	<
Site 16	71		180		2.8		2		100		20								0.004	<			250				0.011	
Site 16	70		180		1	<	1.9		110		21								0.005	<			270				0.004	
Site 16	69		180		1	<	2		110		20								0.005	<			250				0.005	<
Site 16	66		170		1	<	1.7		110		20								0.004	<			250				0.008	
Site 16	64		160		1.6		1.6		110		20								0.005	<			230				0.004	
Site 16	61		160		1	<	1.6		110		19								0.005	<			250				0.002	
Site 16	64		160		1.3		1.7		100		19								0.005	<			250				0.008	
Site 16	64		160		1.8		1.8		100		19								0.005	<			210				0.004	
Site 16	65		170		2.1		1.8		100		19								0.003	<			210				0.005	
Site 16	63		160		1.8		2		100		19								0.003	<			210				0.008	
Site 16	63		170		1.1		1.7		100		19								0.006	<			216				0.001	
Site 16	69		170		1		2		110		18								0.006	<			242				0.008	
Site 16	60		160		2.4		1.9		110		19												213				0.001	
Site 16	59		160		2.2		1.9		100		19								0.006	<			205				0.003	
Site 17																					240		220		0.003	<	0.003	<
Site 17																					210		220		0.003	<	0.003	<
Site 17																					193		188		0.003	<	0.003	<
Site 17																					220		220		0.003	<	0.003	<
Site 17	86		180		1	<	1		83		14								0.003	<			230				0.001	<
Site 17	87		170		1	<	1.1		82		15								0.003				220				0.001	<
Site 17	86		170		1	<	1		80		15								0.003	<			220				0.001	<
Site 17	89		180		1.5		1		83		14								0.003	<			210				0.001	<
Site 17	86		190		1.3		1.1		82		15								0.003	<			230				0.001	<
Site 17	85		170		1	<	1		76		14								0.003	<			220				0.001	<
Site 17	83		170		1.5		1		82		14								0.003	<			230				0.001	<
Site 17	86		180		1.4		0.8		82		15								0.003	<			230				0.001	<
Site 17	87		180		1	<	1		81		14								0.003	<			220				0.001	<
Site 17	88		220		1.6		1.2		90		14								0.003	<			250				0.001	<
Site 17	93		260		2.4		1.9		100		13								0.003	<			250				0.001	<
Site 17	94		230		1		1.7		95		15								0.004	<			250				0.001	<
Site 17	75		150		1	<	1.1		73		15								0.003	<			190				0.003	
Site 17	74		160		1	<	1.3		75		15								0.002	<			190				0.001	<
Site 17	67		130		1.3		1.4		70		15								0.002	<			200				0.001	<
Site 17	72		150		1		1		75		15								0.003	<			190				0.001	<
Site 17	74		150		1	<	0.9		76		15								0.003	<			230				0.001	<
Site 17	79		160				0.9		75		15								0.003	<			250				0.002	<
Site 17	79		160		1	<	0.9		77		15								0.005	<			220				0.001	<
Site 17	85		180		1		0.8		78		14								0.003	<			260				0.001	<
Site 17	80		170		1		1.1		73		13								0.003	<			240				0.001	<
Site 17	82		180		1	<	0.9		84		14								0.005	<			234				0.001	<
Site 17	84		160		1	<	0.2		76		14								0.005	<			226				0.002	<
Site 17	76		140		1.3		1.2		73		15								0.005	<			200				0.001	<
Site 17	78		140		1		1		78		16								0.005	<			191				0.001	<
Site 18																					320		300		0.01		0.003	<
Site 18																					220		220		0.003	<	0.003	<
Site 18																					165		131		0.003	<	0.003	<
Site 18	65		550		1	<	140		180		37								0.003	<			170				0.001	<
Site 18	56		550		1	<	120		190		45								0.003	<			180				0.001	<
Site 18	48		470		1	<	99		160		35								0.003	<			260				0.001	<
Site 18	64		320		1.4		45		110		23								0.003	<			210				0.001	<
Site 18	73		280		1.2		36		97		20								0.003	<			200				0.001	<
Site 18																												
Site 18	70		380		1.2		140		150		41								0.003	<			150				0.001	<
Site 18	38		280		1	<	46		69		16								0.003	<			94				0.001	<
Site 18	51		230		1	<	37		71		16								0.003	<			140				0.001	<

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 18	49		170		1.2		13		61		12								0.003	<			140				0.001	<
Site 18	70		280		1.4		36		96		18								0.003	<			180				0.005	<
Site 18	60		260		1	<	22		92		17								0.004	<			180				0.001	<
Site 18	46		230		1	<	27		87		18								0.003	<			170				0.003	
Site 18	34		320		1	<	36		110		24								0.003	<			220				0.001	<
Site 18	42		260		1.3		25		96		21								0.003	<			230				0.001	<
Site 18	61		220		1		17		88		19								0.003	<			200				0.001	<
Site 18	65		220		1	<	13		87		18								0.003	<			200				0.001	<
Site 18	72		190				21		82		18								0.003	<			230				0.002	<
Site 18	28		90		1	<	4.2		34		7								0.002				84				0.001	<
Site 18	70		200		1		7.2		80		17								0.002	<			220				0.001	<
Site 18	75		280		1.1		13		99		19								0.003	<			230				0.001	<
Site 18	65		230		1	<	9.9		95		19								0.008	<			211				0.001	<
Site 18	63		340		1	<	22		130		24								0.008	<			240				0.002	
Site 18	26		460		1.5		34		170		35								0.008	<			273				0.001	<
Site 18			480		1	<	30		180		39								0.008	<			277				0.002	<
Site 19																					180		150		0.022		0.015	
Site 19																					140		140		0.017		0.018	
Site 19																					139		120		0.044		0.044	
Site 19																					16		14		0.032		0.035	
Site 19	40		170		1	<	4.7		130		24								0.004				170				0.012	
Site 19	39		170		1	<	5.2		130		24								0.003	<			170				0.014	
Site 19	37		170		1	<	4.9		130		24								0.003	<			180				0.015	
Site 19	39		170		2.3		4.7		130		23								0.003	<			170				0.016	
Site 19	37		170		1.8		4.3		130		24								0.005	<			170				0.012	
Site 19	36		170		1.5		4.8		120		23								0.003	<			150				0.013	
Site 19	34		160		2.4		4.6		130		24								0.003	<			170				0.018	
Site 19	35		160		2.3		4.8		120		24								0.003	<			170				0.012	
Site 19	35		160		2.3		4.1		120		24								0.003	<			160				0.013	
Site 19	36		170		2.2		4.7		120		25								0.003	<			170				0.013	
Site 19	37		170		3.4		4.5		120		23								0.003	<			160				0.012	
Site 19	39		170		2.7		4.8		130		25								0.004	<			170				0.016	
Site 19	41		170		1	<	4.5		130		25								0.004	<			170				0.012	
Site 19	40		170		1.4				130		24								0.004	<			160				0.02	
Site 19	39		160		2.5		4.8		130		25								0.003	<			180				0.007	
Site 19	38		160		1.7		4.5		130		23								0.003	<			160				0.014	
Site 19	37		160		1.4		4.2		130		24								0.003	<			180				0.011	
Site 19	40		170				4.6		130		24								0.003	<			180				0.022	
Site 19	38		160		2.1		4.4		130		24								0.005	<			160				0.019	
Site 19	37		160		2.4		4.1		120		24								0.003	<			160				0.024	
Site 19	38		170		2.1		4.4		120		24								0.005				150				0.016	
Site 19	35		160		1.7		4.4		130		24								0.004	<			141				0.022	
Site 19	40		170		1	<	5.1		130		25								0.01				159				0.014	
Site 19	36		160		2.5		4.8		120		22								0.004	<			145				0.009	
Site 19	37		170		2.5		4.6		130		24								0.008				152				0.006	
Site 20																					1200		1040		0.1		0.08	
Site 20																					1200		960		0.1		0.08	
Site 20																					880		860		0.046		0.044	
Site 20																					925		907		0.13		0.096	
Site 20																					970		970		0.1		0.11	
Site 20																					980		980		0.1		0.11	
Site 20	87		260		1	<	1.4		230		20								0.001	<			910				0.075	
Site 20	84		250		1	<	1.5		230		20								0.001	<			910				0.019	
Site 20	88		240		1	<	2		240		20								0.001	<			910				0.067	
Site 20	140		260		1.4		0.6		230		19								0.02	<			930				0.038	
Site 20	100		240				0.7		250		20								0.001	<			890				0.016	
Site 20	75		240				0.9		230		20								0.001	<			860					
Site 20	59		250		7.3		0.9		230		16								0.001	<			920				0.063	
Site 20	140		280		4.5		1.1		270		19								0.01	<			1000				0.076	
Site 20	140		270		5.4		0.7		250		20								0.01	<			970				0.075	
Site 20	140		270		4.5		0.8		240		20								0.01	<			940				0.074	
Site 20	140		250		5.7		0.9		220		19								0.02	<			870				0.051	
Site 20	140		270		1	<	0.6		230		20								0.02	<			1000				0.045	
Site 20	140		280		1	<	0.6		240		21								0.02	<			1000				0.027	
Site 20	140		270				0.8		250		21								0.025	<			870				0.065	
Site 20			190				0.4		230		24								0.02	<			960				0.065	
Site 20	130		240				0.6		220		20								0.01	<			850				0.073	
Site 20	130		220		1	<	0.5		210		20								0.01	<			830				0.06	
Site 20	140		240				0.3		210		19								0.02	<			880				0.05	
Site 20	140		240				0.4		220		21								0.02	<			740				0.048	
Site 20	140		240		4.4		0.5		210		21								0.012	<			790				0.029	
Site 20	150		270		1.6		0.7		240		19								0.025	<			910				0.046	
Site 20	140		260		2.4		0.5		250		20								0.025	<			883				0.051	
Site 20	140		220		1	<	0.5		210		23								0.025	<			765				0.051	
Site 20	140		230		3.4		0.7		220		21								0.02	<			805				0.065	
Site 20	150		250		3.5		0.8		230		21												822				0.051	
Site 21																					300		270		0.003	<	0.003	<
Site 21																					250		240		0.007		0.003	<
Site 21																					106		92		0.003	<	0.003	<
Site 21																					210		220		0.003	<	0.003	<
Site 21	70		190		1	<	6.3		110		26								0.004	<			220				0.001	<
Site 21	70		180		1	<	6.2		110		26								0.003				220				0.001	<
Site 21	68		180		1	<	5.9		110		26								0.003	<			230				0.001	<
Site 21	70		180		1	<	5.55		120		27								0.005	<			230				0.001	<
Site 21	67		200				5.2		120		26								0.005	<			208				0.001	<
Site 21	66		190		1	<	5.9		110		24								0.003	<			230				0.001	<
Site 21	65		200		1	<	5.7		120		26								0.004	<			200				0.001	<
Site 21	65		200		2.2		6		120		26								0.004				200				0.001	<
Site 21	62		190		1.8		5.7		120		26								0.003	<			200				0.001	<

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 21	9		58		1	<	5		54		19								0.001				0.03				0.001	<
Site 21	7.9		62		1	<	4.4		62		19								0.001	<			0.04				0.001	<
Site 21	9.6		76		1	<	5		75		26								0.001	<			0.02				0.001	<
Site 21	11		100		1	<	7.7		85		60								0.001	<			0.02				0.001	<
Site 21	42		130				6.2		100		25								0.003	<			110				0.001	<
Site 21	75		200				5.9		120		24								0.005	<			250				0.005	<
Site 21	72		180		1.1		5.5		120		23								0.01	<			240				0.005	<
Site 21	70		180		1	<	5.2		130		23								0.005	<			260				0.001	<
Site 21	76		200				5.8		130		22								0.006				280				0.002	<
Site 21	75		200		1	<	5.8		130		22								0.005	<			280				0.002	<
Site 21	71		200		1.7		5.5		130		23								0.005	<			260				0.001	<
Site 21	70		180		1.6		6.2		130		23								0.005	<			250				0.001	<
Site 21	66		180		1	<	6		120		24								0.006	<			227				0.001	<
Site 21	69		180		1	<	6.2		110		21								0.006	<			224				0.001	<
Site 21	71		170		2.1		6.2		120		22								0.018				250				0.002	
Site 21	75		180		2.1		5.8		130		22								0.008	<			260				0.001	<
Site 22																					51		49		0.003	<	0.003	<
Site 22																					37		34		0.003	<	0.003	<
Site 22																					61		56		0.003	<	0.003	<
Site 22																					60		56		0.003	<	0.003	<
Site 22																					41		42		0.003	<	0.003	<
Site 22	49		81		0.9		2.6		68		22								0.002				36				0.001	
Site 22	47		76		0.8		2.7		66		22								0.001				36				0.001	
Site 22	47		78		0.6		2.5		69		22								0.002				36				0.001	
Site 22	50		79		2		2.5		68		21								0.001				35				0.001	
Site 22	49		83		2		2.5		68		22								0.001				36				0.001	
Site 22	51		83		0.6		2.5		67		22								0.001				36				0.001	
Site 22	51		84		2.1		2.4		71		22								0.001				37				0.001	
Site 22	50		80		1.6		2.6		68		23								0.001				34				0.005	
Site 22	51		83		1.7		2.6		69		23								0.001				36				0.001	
Site 22	54		86		1.7		2.6		72		22								0.001				36				0.001	
Site 22	54		88		1.6		2.5		71		22								0.001				41				0.001	
Site 22	54		91		1.8		1.7		76		25								0.003				67				0.001	
Site 22	42		73		2		2.1		68		25								0.001				38				0.001	
Site 22	39		67		1.2		4.9		64		24								0.001				31				0.001	
Site 22	38		63		1		2.2		62		23								0.001				28				0.001	
Site 22	39		65		1.2		2.2		63		23								0.002				25				0.001	
Site 22	38		65		0.8		2.2		63		24								0.001				23				0.001	
Site 22	41		69		0.5		2.4		62		21								0.001				25				0.001	
Site 22	41		67		2.5		2.3		60		23								0.001				26				0.001	
Site 22	43		69		0.6		2.3		62		23								0.001				23				0.001	
Site 22	41		72		0.6		2.6		57		19								0.001				23				0.001	
Site 22	44		72		0.7		2.5		64		23								0.001				21.9				0.001	
Site 22	45		71		0.8		2.7		65		21								0.001				22				0.001	
Site 22	41		67		0.6		2.8		63		21								0.001				22.5				0.001	
Site 22	44		73		0.9		2.5		68		23								0.001				23.6				0.001	
Site 23																					0.1	<	0.1	<	0.003	<	0.003	<
Site 23																					0.1	<	0.1		0.003	<	0.003	<
Site 23																					0.1	<	0.1	<	0.003	<	0.003	<
Site 23																					0.1	<	0.1	<	0.003	<	0.003	<
Site 23	10		63		0.8		2.1		59		14								0.001				0.01				0.001	
Site 23	9.6		61		1		2.1		58		15								0.001				0.01				0.001	
Site 23	10		62		0.8		2		59		15								0.001				0.01				0.001	
Site 23	11		64		0.9		2		59		14								0.001				0.01				0.001	
Site 23	11		68		1.2		2.1		59		15								0.001				0.01				0.001	
Site 23	10		65		1		2		58		14								0.001				0.01				0.001	
Site 23	10		64		1.1		1.9		59		14								0.001				0.01				0.001	
Site 23	10		63		0.8		1.8		57		14								0.001				0.01				0.001	
Site 23	9.6		61		0.9		2		55		14								0.001				0.01				0.001	
Site 23	11		73		0.9		2.4		61		15								0.001				0.01				0.001	
Site 23	10		68		1		2.1		60		15								0.001				0.01				0.001	
Site 23	11		83		0.4		2.3		72		17								0.001				0.04				0.001	
Site 23	13		84		0.8		2.7		70		16								0.001				0.01				0.001	
Site 23	12		72		1		2.3		64		15								0.001				0.01				0.001	
Site 23	12		68		1		2.4		62		16								0.001				0.01				0.001	
Site 23	12		66		1		2.5		60		15								0.001				0.02				0.001	
Site 23	11		61						57		15								0.001				0.01					
Site 23	11		58		1.1		1.9		56		15								0.001				0.01				0.002	
Site 23	11		61		0.5		1.9		57		14								0.001				0.01				0.001	
Site 23	11		61		1.2		2		55		14								0.001				0.01				0.001	
Site 23	11		59		1.1		2		55		15								0.001				0.01				0.001	
Site 23	11		63		1.1		2		57		15								0.001								0.001	
Site 23	11		60		1.1		1.8		57		14								0.002				0.005				0.001	
Site 23	9.7		56		1.1		2.3		52		13								0.001				0.005				0.001	
Site 23	11		62		1		2.7		57		14								0.001				0.01				0.001	
Site 24																					48		46		0.003	<	0.003	<
Site 24																					42		44		0.003	<	0.003	<
Site 24																					38		34		0.003	<	0.003	<
Site 24																					44		43		0.003	<	0.003	<
Site 24	49		170		7.4		7.5		130		24								0.003	<			57				0.001	<
Site 24	48		170		5.1		7		130		26								0.003	<			55				0.001	<
Site 24	48		170		6.6		7.5		140		25								0.004				55				0.001	<
Site 24	51		180		7		7.1		130		24								0.003	<			55				0.001	<
Site 24	48		180		6.3		7.4		130		25								0.003	<			54				0.001	<
Site 24	49		180		4.6		7.5		130		24								0.003	<			56				0.001	<
Site 24	49		180		6.8		6.8		140		25								0.003	<			54				0.001	<
Site 24	49		170		6.1		7.4		130		24												52				0.001	<
Site 24	47		170		5.6		7.4		130		25								0.003	<			51				0.001	<
Site 24	49		180		6.2		7		130		25								0.003	<			50				0.001	<
Site 24	49		170		5.6		7		130		24								0.003	<			50				0.001	<
Site 24	48		170		5.7		6.9		120		25								0.003	<			52				0.001	

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 24	50		160		3.2		7.2		120		24								0.003	<			48				0.001	<
Site 24	50		160		5.8		7.5		120		24								0.002	<			49				0.001	<
Site 24	47		140		5.9		6		120		23								0.002	<			52				0.001	<
Site 24	48		150		5.4		6.9		120		24								0.003	<			49				0.001	<
Site 24	47		160		7.4		6.4		130		24								0.003	<			51				0.001	<
Site 24	50		170		5.4		7.1		120		22								0.003	<			57				0.002	<
Site 24	51		160		8.3		6.6		130		25								0.003				56				0.001	<
Site 24	50		170		6.7		6.8		120		25								0.002	<			49				0.001	<
Site 24	49		160		6.3		6.8		120		24								0.003	<			46				0.001	<
Site 24	49		160		7		6.7		120		23								0.004	<			47.6				0.001	<
Site 24	52		160		5.6		7.4		130		25								0.003	<			49.5				0.001	<
Site 24	47		150		6.4		7.4		120		24								0.002	<			47.5				0.001	<
Site 24	49		160		6.4		7.1		130		24								0.003				47.6				0.001	<
Site 25																					220		200		0.003	<	0.003	<
Site 25																					170		160		0.003	<	0.003	<
Site 25																					170		170		0.003	<	0.003	<
Site 25																					193		192		0.003	<	0.003	<
Site 25																					200		200		0.003	<	0.003	<
Site 25	77		170		1	<	1.4		150		24								0.003	<			230				0.001	<
Site 25	76		160		1	<	1.3		150		25								0.003	<			230				0.001	<
Site 25	76		170		2.9		1.3		160		25								0.004				242				0.001	<
Site 25	81		170		3.9		1.3		150		24								0.004	<			240				0.001	<
Site 25	76		180		2.8		1.2		150		25								0.01	<			230				0.001	<
Site 25	77		180				1.5		150		24								0.003	<			230				0.001	<
Site 25	77		190		3.4		1.1		160		25								0.004	<			230				0.001	<
Site 25	74		170		5		1.8		150		26								0.003	<			220				0.001	<
Site 25	74		180		5.1		1.7		160		26								0.003	<			200				0.001	<
Site 25	74		190		5.1		1.9		160		27								0.003	<			210				0.001	<
Site 25	74		180		5.1		2		160		25								0.01	<			210				0.001	<
Site 25	74		180		6.1		2.3		160		26								0.004	<			230				0.001	<
Site 25	72		160		2.2		1.9		140		25								0.003	<			170				0.001	<
Site 25	73		150		1	<	1		130		24								0.002	<			150				0.001	<
Site 25	71		150		3.2		1.1		130		24								0.003	<			170				0.002	<
Site 25	73		150		1.8		1.5		140		24								0.003	<			160				0.001	<
Site 25	73		150		3.1		1.2		150		25								0.003	<			190				0.001	<
Site 25	79		160		1.9		1.2		150		24								0.003	<			230				0.002	<
Site 25	83		170		3.7		1.3		160		25								0.005	<			230				0.001	<
Site 25	79		170		1	<	1.4		150		25								0.005	<			250				0.001	<
Site 25	87		180		3.3		1.6		170		27								0.005	<			240				0.001	<
Site 25	74		160		2.4		1.5		160		23								0.01	<			229				0.001	<
Site 25	84		180		1.1		1.7		170		23								0.01	<			253				0.001	<
Site 25	75		170		4.3		2		160		25								0.006	<			222				0.005	<
Site 25	77		170		4.6		1.8		170		26								0.009				213				0.001	<
Site 26																					50		45		0.003	<	0.003	<
Site 26																					45		44		0.003	<	0.003	<
Site 26																					27		25		0.003	<	0.003	<
Site 26																					46		43		0.003	<	0.003	<
Site 26	52		220		9.2		8.3		150		28								0.007				61				0.001	<
Site 26	50		200		8		8.1		140		26								0.003	<			59				0.001	<
Site 26	50		210		6.7		8		150		28								0.004				57				0.001	<
Site 26																												
Site 26	43		230		6.8		7.1		140		26								0.003	<			48				0.001	<
Site 26	37		180		5.9		6.5		120		22								0.003	<			42				0.001	<
Site 26	44		200		8		7.6		140		26								0.003	<			50				0.001	<
Site 26	39		230		5.9		8		150		28								0.003	<			43				0.001	<
Site 26	42		250		6.5		8.7		150		28								0.003	<			41				0.001	<
Site 26	45		230		7.1		8		140		27								0.003				44				0.001	<
Site 26	52		200		5.5		8.2		130		26								0.003	<			43				0.001	<
Site 26	24		370		2.7		2.4		170		31								0.002	<			3				0.001	<
Site 26	49		220		4.8		8.3		150		29								0.002	<			46				0.001	<
Site 26	48		170		5.8		7.4		130		25								0.003	<			47				0.001	<
Site 26	46		170		7.6		6.5		130		26								0.001	<			48				0.001	<
Site 26	32		270		4.8		7.6		130		23								0.003	<			33				0.001	<
Site 26	33		220		6.5		6.3		130		23								0.003				34				0.001	<
Site 26	34		240		5.5		6.5		130		24								0.001	<			32				0.001	<
Site 26			100		5.5		9.3		64		11								0.001	<			33				0.001	<
Site 26	33		340		4.5		9.2		200		33								0.003	<			26				0.001	<
Site 26																												
Site 26																												
Site 26																												
Site 27																					0.1	<	0.1	<	0.003	<	0.003	<
Site 27																					0.1	<	0.1	<	0.003	<	0.003	<
Site 27																					0.1	<	0.1	<	0.003	<	0.003	<
Site 27																					0.2		0.1		0.003	<	0.003	<
Site 27	12		130		1.2		5.5		96		17								0.001	<			0.01	<			0.001	<
Site 27	11		120		1.1		5.3		90		18								0.001	<			0.02				0.001	<
Site 27	11		120		1.2		5.3		90		18								0.001	<			0.01	<			0.001	<
Site 27	12		120		1.2		5.1		91		18								0.001	<			0.01	<			0.001	<
Site 27	11		120		1.4		5.1		90		18								0.001				0.02				0.001	<
Site 27	12		130		1.3		5.3		94		18								0.001	<			0.01	<			0.001	<
Site 27	11		120		1.2		4.8		96		18								0.001	<			0.01				0.001	<
Site 27	11		120		1.2		5		94		18								0.001	<			0.01	<			0.001	<
Site 27	11		110		1.3		5		90		18								0.001	<			0.01	<			0.001	<
Site 27	12		130		1.2		4.8		99		19								0.001				0.01	<			0.001	<
Site 27	11		120		1.2		4.9		92		17								0.001	<			0.01	<			0.001	<
Site 27	11		99		1.6		5		76		16								0.001	<			0.03				0.001	<
Site 27	10		91		1.5		5.1		72		15								0.001	<			0.01	<			0.001	<
Site 27	9.1		89		1.4		4.5		99		18								0.002				0.03				0.001	<
Site 27	8.4		84		1.2		4.6		97		18								0.001	<			0.03				0.001	<
Site 27	8.4		88		1.3		4.3		100		18								0.003				0.05				0.001	<
Site 27	8.3		83		1.5		4.2		94		18								0.001	<			0.03				0.001	<

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
Site 27	8.7		92		1.5		4.4		98		18								0.001	<			0.01	<			0.001	<
Site 27	8.4		88		1.4		4.1		93		18								0.001	<			0.01				0.001	<
Site 27	8.8		93		1.5		4.2		99		19								0.001	<			0.01				0.001	<
Site 27	8.6		92		1.5		4.4		96		18								0.001	<			0.01	<			0.001	<
Site 27	8.8		95		1.3		4.5		100		18								0.003	<			0.03				0.001	<
Site 27	8.7		86		1.4		4.3		97		17								0.001	<				M			0.001	<
Site 27	7.7		80		1.3		4.8		89		17								0.001	<				M			0.001	<
Site 27	7.9		84		1.3		4.2		94		17								0.002				0.01				0.001	<
Site 28																					0.1	<	0.2		0.003	<	0.003	<
Site 28																					0.1	<	0.1	<	0.003	<	0.003	<
Site 28																					0.2		0.1	<	0.003	<	0.003	<
Site 28																					0.1	<	0.1	<	0.003	<	0.003	<
Site 29																					0.4		0.1	<	0.003	<	0.003	<
Site 29																					1.9		0.4		0.003	<	0.003	<
Site 29																					0.9		0.1	<	0.003	<	0.003	<
Site 29																					4.7		4.6		0.003	<	0.003	<
200615	101		271		5.0	<	58.4		117		11.7		5.0	<	5.0	<			0.010	<			505				0.0656	
200615	97.6		284		5.0	<	5.37		122		12.2		5.0	<	5.0	<			0.010	<			470				0.0518	
200615	90		246		12.5	<	4.2		111		13.5		12.5	<	12.5	<			0.010	<			402				0.0295	
200615	85.2		208		5.84		3.38		103		17.6		1.0	<	1.0	<			0.010	<			305.844				0.0241	
200615	89.8		241		5.0	<	3.34		114		16.6		5.0	<	5.0	<			0.005	<			368.398				0.0275	
200615	103		275		3.46		2.82		126		14.4		2.50	<	2.50	<			0.010	<			422.685				0.0283	
200615	106		277		9.91		4.15		122		13.8		2.5	<	2.5	<			0.010	<			467.327				0.0317	
200615	105.4		279		6.79		5	<	126		13.2		2.5	<	2.5	<			0.010	<			473.245				0.0277	
200615	109		293		7.94		3.65		127		10.8		2.5	<	2.5	<			0.010	<			595.625				0.0451	
200615	83.2		198		6.3	<	3.28		108		19.3		6.3	<	6.3	<			0.010	<			304.001				0.010	<
200615	160		436		2.5	<	0.5	<	177		12.9		2.5	<	2.5	<			0.010	<			600.602				0.010	<
200615	108		262		2.57		3.75		129		14.7		1.25	<	1.25	<			0.010	<			506.913				0.0359	
200615	117		292		13.3		4.47		138		12.5		12.5	<	12.5	<			0.010	<			566.482				0.0461	
200615	105		270		2.5	<	5.59		135		12.6		2.5	<	2.5	<			0.010	<			560.947				0.0485	
200616	52.6		148		1.0	<	3.24		68.6		10.3		1.0	<	1.0	<			0.005	<			99				0.005	<
200616	52.5		164		1.83		3.3		70.4		10.5		0.5	<	0.5	<			0.010	<			102				0.010	<
200616	49.9		153		1.0	<	2.83		69.7		10.9		1.0	<	1.0	<			0.005	<			90.7				0.005	<
200616	52.5		140		1.87		2.8		67.5		10.8		0.50	<	0.50	<			0.005	<			90.85				0.005	<
200616	5302		156		0.549		2.92		72.5		10.7		0.25	<	0.25	<			0.005	<			106.252				0.002	<
200616	53		162		2.18		2.98		73.3		10.5		1.25	<	1.25	<			0.005	<			107.767				0.005	<
200616	53.8		150		3.71		3.15		72		10.5		0.5	<	0.5	<			0.005	<			108.575				0.005	<
200616	57.3		155		2.15		3.16		69.3		10.2		0.5	<	0.5	<			0.005	<			116.063				0.005	<
200616	58.5		168		1.78		3.14		71.2		9.9		0.5	<	0.5	<			0.005	<			105.949				0.005	<
200616	54.9		163		4.23		2.93		73.5		11		1.0	<	1.0	<			0.010	<			126.252				0.005	<
200616	56.3		154		1.92		2.85		72.3		10.5		2.5	<	0.50	<			0.005	<			101.577				0.005	<
200616	58.5		163		0.25	<	3.28		72.3		11		0.25	<	0.25	<			0.005	<			98.934				0.005	<
200616	59.1		177		0.50	<	3.21		72.9		10.8		1.25	<	0.50	<			0.005	<			102.846				0.005	<
200616	56.9		167		5.0	<	3.08		72.6		10.8		5.0	<	5.0	<			0.005	<			105.027				0.005	<
200616	54		150		1.0	<	2.88		68.3		10.1		1.0	<	1.0	<			0.005	<			95.278				0.005	<
205508	9.27		69.1		0.161		1.79		17.1		5.15		0.112		0.05	<			0.010	<			0.030	<			0.001	<
205836	7.07		51.8		0.077		1.61		14.6		4.4		0.092		0.05	<			0.010	<			0.0407				0.001	<
205838	8.39		56.3		0.159		1.85		15		5.27		0.05	<	0.05	<			0.010	<			0.0365				0.001	<
205838																	0.001	<	0.001	<			0.037		0.001	<	0.001	<
205839	9.52		60.5		0.07		1.67		15.1		4.97						0.001	<	0.001	<			0.0712		0.001	<	0.001	<
214387																												
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214911	8.35		90.4		0.14		1.78		35.8		6.04		0.532		0.05	<			0.001	<			0.568				0.001	<
214913	11.9		92.5		0.195		1.88		25.8		6.47		0.25	<	0.05	<			0.001	<			0.017				0.001	<
214914	69.9		203		2.91		6.97		147		25.1		2.50	<	2.50	<			0.010	<			236.6				0.010	<
214915	105		226		1.25	<	0.523		152		27.6		2.50	<	2.50	<			0.005	<			436.295				0.005	<
214916	9.49		97		0.242		2.45		27.2		6.77		0.25	<	0.05	<			0.001	<			0.016				0.001	<
BCAMD																	0.00025	<			127		134		0.0037			
BCAMD																	0.00052				137		147		0.0102			
CTWDC02																	0.00025	<			15.6		0.107	B	0.0006			
CTWDC02																	0.00025	<			57.4		55.5		0.0057			
CTWDC03																	0.00025	<			0.431		0.130	B	0.0004	J		
CTWDC03																	0.00025	<			20.9		0.179	B	0.0117			
CTWDC03A																	0.00025	<			113		80.6		0.0021			
CTWDC03A																	0.00025	<			267		329		0.0151			
CTWDC04																	0.00025	<			0.178	B	0.043	B	0.0006			
CTWDC04																	0.00025	<			1.46		0.024	B	0.0014			
LBLTC03																	0.00025	<			0.302	B	0.102	B	0.0007			
LBLTC03																	0.00025	<			0.297		0.128	B	0.0004	J		
LBLTC03A																	0.00025	<			0.188	B	0.057	B	0.0007			
LBLTC03A																	0.00025	<			0.608		0.110	B	0.0006			

Station_ID	SiO2_D_mgL	SiO2_D_Q	Ca_D_mgL	Ca_D_Q	F_D_mgL	F_D_Q	K_D_mgL	K_D_Q	Mg_D_mgL	Mg_D_Q	Na_D_mgL	Na_D_Q	NO3_mgL	NO3_Q	OPO_mgL	OPO_Q	Ag_T_mgL	Ag_T_Q	Ag_D_mgL	Ag_D_Q	Al_T_mgL	Al_T_Q	Al_D_mgL	Al_D_Q	As_T_mgL	As_T_Q	As_D_mgL	As_D_Q
NO5CL01																	0.00025	<			0.121	B	0.029	B	0.0006			
NO5CL02																	0.00025	<			0.0489	B	0.030	B	0.00025	<		
NO5CL02																	0.00025	<			0.0226	B	0.017	B	0.00025	<		
SNDCC01																	0.00025	<			0.122	B	0.065	B	0.0024			
SNDCC01																	0.00025	<			0.0307	JB	0.025	JB	0.0109	J		
SNDCC02																	0.00025	<			0.0305	B	0.068	B	0.0026			
SNDCC03																	0.00025	<			0.602		0.022	B	0.0011			
SNDCC04																	0.00025	<			2.35		0.261	B	0.0019			
SNDCL02																	0.00025	<			273		251		0.0024			
SNDCL02																	0.0005	<			820		706		0.0095			
																	0.005	<			1590	D			0.232			
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Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 1	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	1.72		0.05	<		
Site 1			0.04				0.15				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.24			
Site 1																																				
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Site 1																																				
Site 1			0.03				0.15				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.081			
Site 1																																				
Site 1			0.02				0.18				0.0005						0.001				0.003	<			0.005	<			0.01	<			0.069			
Site 1			0.02				0.15				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.057			
Site 1			0.03				0.21				0.0005						0.002				0.003	<			0.005	<			0.01	<			0.031			
Site 1			0.05				0.19				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.023			
Site 1			0.04				0.16				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.071			
Site 1			0.03				0.17				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.058			
Site 1																																				
Site 1																																				
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Site 1																																				
Site 1																																				
Site 1			0.024				0.15				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.006			
Site 1			0.042				0.16				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.057			
Site 1																																				
Site 1																																				
Site 2	0.2	<	0.2	<					0.05	<	0.05	<			0.033		0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.12		0.05	<		
Site 2			0.12				0.11				0.0005	<					0.001	<			0.044				0.005	<			0.01	<			0.006			
Site 2																																				
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Site 2																																				
Site 2																																				
Site 2			0.05				0.13				0.0005	<					0.001	<			0.006				0.005	<			0.01	<			0.004			
Site 2																																				
Site 2			0.06				0.22				0.0005	<					0.005				0.14				0.005	<			0.01	<			0.13			
Site 2			0.06				0.18				0.0005	<					0.002				0.19				0.005	<			0.01	<			0.83			
Site 2																																				
Site 2			0.1				0.21				0.0099						0.011								0.005	<			0.05				5.3			
Site 2			0.11				0.19				0.012						0.008				0.56				0.005	<			0.05				2.9			
Site 2			0.09				0.18				0.011						0.005								0.005	<			0.03				7.4			
Site 2			0.06				0.055				0.0005	<					0.001	<			0.047				0.005	<			0.01	<			0.005			
Site 2																																				
Site 2																																				
Site 2																																				
Site 2			0.08				0.024				0.0005	<					0.001	<			0.063				0.005	<			0.01	<			0.003	<		
Site 2			0.08				0.048				0.0005	<					0.001	<			0.03				0.005	<			0.01	<			0.003	<		
Site 2			0.097				0.049				0.0005	<					0.002				0.016				0.005	<			0.01	<			0.003	<		
Site 2																																				
Site 2																																				
Site 3	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.02		0.01	<	39.1		37.7			
Site 3	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	35.6		35			
Site 3	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	18.1		10.6			
Site 3	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.03		0.01	<	0.01	<	0.01	<	38.7		38.4			
Site 3			0.08				0.048				0.0005	<					0.006				0.33				0.005	<			0.01	<			46			
Site 3			0.09				0.04				0.0005	<					0.013				0.15				0.005	<			0.01	<			55			
Site 3			0.1				0.035				0.0011						0.014				0.27				0.005	<			0.01	<			57			
Site 3			0.09				0.032				0.0005						0.005				0.26				0.005	<			0.01	<			50			
Site 3			0.1				0.026				0.0012						0.009				0.27				0.005	<			0.01	<			56			
Site 3			0.09				0.022				0.0013						0.003				0.41				0.005	<			0.01	<			53			
Site 3			0.09				0.022				0.0013						0.009				0.3				0.005	<			0.01	<			48			
Site 3			0.08				0.022				0.0012						0.002				0.17				0.005	<			0.01	<			45			
Site 3			0.08				0.022				0.001						0.002				0.18				0.005	<			0.01	<			44			
Site 3			0.08				0.022				0.0007						0.002				0.15				0.005	<			0.01	<			38			
Site 3																																				
Site 3			0.05				0.14				0.0005	<					0.001	<			0.013				0.005	<			0.01	<			0.4			
Site 3																																				
Site 3			0.05				0.21				0.0005	<					0.001	<			0.015				0.005	<			0.01	<			0.3			
Site 3			0.06				0.17				0.0005	<					0.001	<			0.023				0.005	<			0.01	<			0.4			
Site 3			0.06				0.12				0.0005	<					0.001				0.095				0.005	<			0.01	<			5.6			
Site 3			0.08				0.087				0.0005	<					0.003				0.14				0.005	<			0.01	<			17			
Site 3			0.08				0.07				0.0005	<					0.003				0.19				0.005	<			0.01	<			35			
Site 3			0.08				0.05				0.0005	<					0.004				0.23				0.005	<			0.01	<			51			
Site 3																																				
Site 3			0.08				0.039				0.0009						0.005				0.25				0.005	<			0.01	<			63			
Site 3																																				
Site 3			0.09				0.035				0.0009						0.004				0.29				0.005	<			0.01	<			53			
Site 3			0.09				0.034				0.0006						0.003				0.22				0.005	<			0.01	<			50			
Site 3			0.08				0.032				0.0014						0.002				0.2				0.005	<			0.01	<			38			
Site 3			0.065				0.046				0.0005	<					0.001				0.16				0.005	<			0.01	<			18			
Site 3			0.065				0.035				0.0005	<					0.002				0.17				0.005	<			0.01	<			33			
Site 3			0.066				0.028				0.001						0.002				0.16				0.005	<			0.01	<			34			
Site 3			0.06				0.025				0.0009						0.002				0.19				0.005	<			0.01	<			40			
Site 4	0.2	<	0.2	<					0.05	<	0.05	<			0.014		0.005	<					0.05		0.03		0.02		0.03		173		98			
Site 4			0.43				0.009				0.049										2.6				0.11				0.11				360			
Site 4			0.42				0.007				0.049						0.034				3				0.12				0.11				469			
Site 4			0.49				0.006				0.057						0.019				2				0.13				0.13				429			
Site 4			0.44				0.006				0.052										2.9				0.12				0.13				480			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 4																																				
Site 4																																				
Site 4																																				
Site 4																																				
Site 4																																				
Site 4			0.25				0.008				0.03						0.027				1				0.054				0.07				120			
Site 4																																				
Site 4			0.08				0.12				0.0005						0.002				0.11				0.005	<			0.01	<			8			
Site 4			0.14				0.12				0.011						0.009				0.27				0.005	<			0.02				86			
Site 4			0.19				0.088				0.019						0.015				0.52				0.016				0.03	<			200			
Site 4																																				
Site 4			0.46				0.01	<			0.056						0.047				1.4				0.15				0.13				600			
Site 4			0.44				0.013				0.06						0.049				1.6				0.16				0.16				600			
Site 4			0.44				0.04				0.052						0.048				1.5				0.13				0.13				490			
Site 4																																				
Site 4																																				
Site 4																																				
Site 4																																				
Site 4			0.21				0.069				0.019						0.016				0.6				0.042								64			
Site 4			0.197				0.011				0.026						0.021				0.79				0.06				0.08	<			150			
Site 4																																				
Site 4																																				
Site 5	0.2		0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01		202		195			
Site 5	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01		0.01	<	0.01		0.01	<	190		190			
Site 5	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.03		0.03		0.01	<	0.01	<	152		116			
Site 5	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	212		206			
Site 5			0.17				0.003	<			0.02														0.048				0.04				176			
Site 5			0.18				0.003				0.017														0.049				0.03	<			174			
Site 5			0.17				0.003	<			0.018						0.013				0.39				0.04				0.03	<			180			
Site 5			0.17				0.003	<			0.018														0.041				0.03	<			163			
Site 5			0.16				0.003	<			0.017										0.47				0.05				0.03	<			179			
Site 5			0.17				0.004				0.017														0.041				0.03	<			174			
Site 5			0.15				0.004				0.019						0.011				0.5				0.048				0.03	<			180			
Site 5			0.15				0.003	<			0.017						0.007				0.31				0.038				0.03	<			170			
Site 5			0.16				0.003	<			0.017						0.008				0.35				0.038				0.03				170			
Site 5			0.16				0.003	<			0.016						0.008				0.33				0.036				0.03				150			
Site 5			0.13				0.01				0.017						0.008				0.31				0.043				0.04				150			
Site 5			0.14				0.003				0.015						0.008				0.28				0.032				0.04				150			
Site 5			0.14				0.003	<			0.015						0.008				0.29				0.041				0.03	<			150			
Site 5			0.15				0.002	<			0.017						0.009				0.37				0.038				0.03				160			
Site 5			0.16				0.002				0.018						0.009				0.35				0.043				0.03				170			
Site 5			0.18				0.011				0.016						0.01				0.36				0.048				0.04				180			
Site 5			0.15				0.011				0.017						0.009				0.31				0.043				0.03				180			
Site 5			0.15				0.012				0.018						0.009				0.31				0.049				0.03	<			180			
Site 5			0.15				0.01				0.017						0.009				0.31				0.047				0.03				180			
Site 5			0.14				0.011				0.018						0.008				0.36				0.050				0.02				190			
Site 5			0.15				0.009				0.02						0.009				0.31				0.045				0.03	<			170			
Site 5																																				
Site 5			0.316				0.01				0.016						0.008				0.33				0.037				0.03	<			150			
Site 5			0.077				0.003				0.019						0.01				0.33				0.041				0.03				170			
Site 5			0.111				0.011				0.023						0.008				0.36				0.048				0.03	<			170			
Site 5			0.056				0.011				0.018						0.008				0.35				0.041				0.03	<			170			
Site 6	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.02		0.01	<	56.5		51.9			
Site 6	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	49		48			
Site 6	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	43.6		14.9			
Site 6	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	51		49.3			
Site 6			0.09				0.024				0.0062						0.008				0.38				0.005				0.02				81			
Site 6			0.09				0.025				0.0057						0.018				0.48				0.006				0.02				83			
Site 6			0.11				0.024				0.006						0.018				0.26				0.005				0.01				80			
Site 6							0.024				0.0038						0.006				0.26				0.005				0.01				73			
Site 6			0.11				0.024				0.0037						0.009				0.25				0.005				0.01				71			
Site 6			0.1				0.023				0.0036						0.009				0.51				0.005				0.01				64			
Site 6			0.09				0.025				0.0033						0.012				0.24				0.005				0.01				63			
Site 6			0.07				0.024				0.0024						0.002				0.28				0.005				0.01				63			
Site 6			0.08				0.023				0.0024						0.003				0.15				0.005				0.01				54			
Site 6			0.08				0.025				0.0023						0.002				0.14				0.005				0.01				58			
Site 6			0.08				0.024				0.0024						0.001				0.11				0.005				0.01				55			
Site 6			0.07				0.027				0.0022						0.002				0.12				0.005				0.01				40			
Site 6			0.09				0.035				0.0067						0.006				0.2				0.005				0.04				86			
Site 6			0.09				0.04				0.0089						0.008				0.24				0.005				0.06				81			
Site 6			0.12				0.037				0.011						0.01				0.3				0.010				0.08				110			
Site 6			0.12				0.039				0.0099						0.008				0.31				0.005				0.06				100			
Site 6			0.11				0.036				0.0087						0.01				0.35				0.007				0.04				99			
Site 6			0.08				0.035				0.0077						0.01				0.29				0.007				0.03				93			
Site 6			0.08				0.032				0.0065						0.011				0.26				0.005				0.01				81			
Site 6			0.09				0.03				0.0063						0.01				0.28				0.005				0.01				73			
Site 6			0.08				0.027				0.0052						0.005				0.2				0.005				0.01				61			
Site 6			0.068				0.029				0.0039						0.004				0.16				0.005				0.01				60			
Site 6			0.064				0.026				0.0048						0.004				0.2				0.005				0.01				70			
Site 6			0.065				0.026				0.0031						0.003				0.15				0.005				0.01				53			
Site 6			0.05				0.025				0.0028						0.003				0.13				0.005				0.01				54			
Site 7	0.2	<	0.2	<					0.1		0.09				0.017		0.014						0.02		0.01		0.01	<	0.01	<	860		646			
Site 7	0.2	<	0.2	<					0.1		0.11				0.019		0.017						0.01	<	0.01	<	0.01		0.01	<	722		696			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 7	0.5		0.4						0.11		0.12				0.036		0.019						0.01	<	0.01	<	0.33		0.06		812		689			
Site 7	0.4		0.3						0.1		0.1				0.005	<	0.005	<					0.01	<	0.01	<	0.05		0.04		680		670			
Site 7			0.48								0.12						0.082				6				0.043				0.08				690			
Site 7			0.5								0.12						0.079				6				0.041				0.08				750			
Site 7			0.52								0.12						0.079				6				0.039				0.08				700			
Site 7			0.47				0.1				0.094						0.073				5.7				0.05	<			0.10	<			660			
Site 7			0.49								0.11						0.11				3.9				0.054				0.21				740			
Site 7			0.48								0.1						0.08				5.1				0.05	<			0.14				830			
Site 7			0.57								0.11						0.1				6.6				0.062				0.18				810			
Site 7			0.5								0.12						0.1				6.9				0.05	<			0.17				840			
Site 7			0.52				0.11				0.11						0.081				6				0.05	<			0.13				800			
Site 7			0.52				0.11				0.11						0.082				6.3				0.063				0.11				790			
Site 7			0.53				0.13				0.12						0.072								0.061				0.10	<			810			
Site 7			0.49				0.12				0.12						0.079				9.7				0.06				0.14				810			
Site 7			0.52				0.12				0.12						0.075				6.5				0.05	<			0.10				810			
Site 7			0.54				0.12				0.13						0.098				6.6				0.05	<			0.10	<			780			
Site 7							0.12				0.13						0.084				6.2				0.075	<			0.11				840			
Site 7							0.12				0.11						0.083				6.3				0.083				0.11				770			
Site 7							0.11				0.12						0.078				5.8				0.05	<			0.10	<			770			
Site 7			0.51				0.12				0.12						0.077				6.2				0.05	<			0.10	<			740			
Site 8	1.6		1.2						0.27		0.29				0.235		0.219						0.01	<	0.01	<	0.34		0.39		2260		2200			
Site 8	0.2	<	0.2	<					0.18		0.14				0.078		0.056						0.06		0.05		0.22		0.19		1280		875			
Site 8	0.2	<	0.2	<					0.18		0.19				0.2		0.19						0.1		0.01	<	0.18		0.18		1470		1290			
Site 8			0.93				0.2	<			0.11						0.29				9.1				0.13				0.42				1700			
Site 8			0.96				0.2	<			0.14						0.3				9				0.12				0.42				1600			
Site 8			1				0.2	<			0.13						0.31				9.3				0.17				0.43				1600			
Site 8			0.9				0.2	<			0.19										8.4				0.10	<			0.36				1410			
Site 8			0.85				0.2	<			0.17						0.24				6.6				0.16				0.31				1600			
Site 8			0.73				0.2	<			0.16						0.32				9.5				0.11				0.32				2000			
Site 8			0.63				0.2	<			0.14						0.24				7.8				0.09				0.27				1000			
Site 8			0.5				0.2	<			0.16						0.19				6.6				0.059				0.30				840			
Site 8			0.63				0.2	<			0.2						0.23				8.2				0.093				0.33				1000			
Site 8			0.39				0.2	<			0.13						0.16				4.9				0.07				0.21				720			
Site 8			0.5				0.2	<			0.15						0.2				5.4				0.074				0.20				720			
Site 8			0.79				0.2	<			0.17						0.29				8.4				0.17				0.60				1200			
Site 8			0.76				0.2	<			0.15						0.31				6.2				0.14				0.66				1200			
Site 8			0.95				0.2	<			0.17						0.35				7.3				0.27				0.82				1400			
Site 8			0.91				0.2	<			0.18						0.37				7.4				0.17				0.78				1500			
Site 8			0.95				0.14				0.18						0.32				7.4				0.16				0.66				1500			
Site 8			0.76				0.13				0.16						0.31				7.6				0.18				0.51				1500			
Site 8			0.75				0.14				0.17						0.51				7				0.15				0.47				1500			
Site 8			0.63				0.13				0.16						0.36								0.10				0.41				1300			
Site 8			0.47				0.11				0.14						0.51				6.7				0.10				0.30				980			
Site 8			0.77				0.15				0.2						0.31				8.7				0.15				0.35				1300			
Site 8			0.53				0.17				0.22						0.29				8.6				0.2	<			0.57				1600			
Site 8							0.19				0.25						0.31				11				0.2	<			0.57				1600			
Site 8			0.417				0.2				0.27						0.32				11				0.2	<			0.57				1900			
Site 8							0.18				0.3						0.31				11				0.2	<			0.40	<			1900			
Site 9	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	2.54		0.05			
Site 9			0.08				0.068				0.0005	<					0.001	<			0.007				0.005	<			0.01	<			0.009			
Site 9																																				
Site 9																																				
Site 9																																				
Site 9			0.06				0.071				0.0005	<					0.001	<			0.078				0.005	<			0.01	<			0.007			
Site 9																																				
Site 9																																				
Site 9			0.06				0.12				0.0005	<					0.001	<			0.02				0.005	<			0.01	<			0.006			
Site 9			0.05				0.13				0.0005	<					0.001	<			0.003	<			0.005	<			0.01	<			0.043			
Site 9			0.04				0.16				0.0005	<					0.001	<			0.003	<			0.005	<			0.01	<			0.1			
Site 9			0.05				0.14				0.0005	<					0.001	<			0.007				0.005	<			0.01	<			0.008			
Site 9			0.08				0.1				0.0005	<					0.001	<			0.031				0.005	<			0.01	<			0.006			
Site 9			0.08				0.098				0.0005	<					0.001				0.1				0.005	<			0.01	<			1.2			
Site 9			0.08				0.079				0.0005	<					0.001								0.005	<			0.01	<			5.8			
Site 9			0.1				0.059				0.0005	<					0.003				0.21				0.005	<			0.01	<			4.1			
Site 9			0.08				0.043				0.0005	<					0.009				0.17				0.005	<			0.01	<			27			
Site 9			0.07				0.041				0.0009						0.003				0.2				0.005	<			0.01	<			1.2			
Site 9			0.06				0.032				0.0005	<					0.003								0.005	<			0.01	<			6.1			
Site 9			0.08				0.037				0.0005	<					0.001	<			0.056				0.007				0.01	<			0.003	<		
Site 9																																				
Site 9																																				
Site 9																																				
Site 9																																				
Site 10			0.44				0.019				0.062						0.01	<							0.05	<			0.10	<			650			
Site 10			0.51				0.1	<			0.04						0.005	<			0.41				0.016				0.05	<			770			
Site 10			0.49				0.1	<			0.04						0.005	<			0.42				0.035				0.05	<			770			
Site 10			0.37				0.015				0.062						0.005	<							0.045				0.05	<			500			
Site 10			0.31				0.014				0.049						0.005	<							0.082				0.10	<			500			
Site 10			0.41				0.019				0.05						0.005	<							0.059				0.05	<						
Site 10			0.31				0.021				0.05						0.005	<							0.059				0.05	<			710			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 10			0.2				0.012				0.037						0.003				0.26				0.040				0.05	<			490			
Site 10			0.27				0.014				0.045						0.003				0.3				0.037				0.10	<			540			
Site 10			0.25				0.012				0.044						0.003				0.28				0.042				0.05				430			
Site 10			0.23				0.014				0.039						0.004				0.28				0.076				0.07				280			
Site 10			0.21				0.01				0.027						0.002				0.16				0.045				0.04	<			240			
Site 10			0.15				0.008				0.015						0.002				0.091				0.024				0.03	<			180			
Site 10			0.18				0.008				0.021						0.003				0.15				0.037				0.03				170			
Site 10			0.17				0.004				0.026						0.003				0.18				0.047				0.03				170			
Site 10			0.19				0.009				0.029						0.005				0.19				0.079				0.07				180			
Site 10			0.21				0.011				0.037						0.009				0.24				0.11				0.14				380			
Site 10			0.29				0.014				0.038						0.009				0.36				0.11				0.10	<			770			
Site 10			0.21				0.013				0.039						0.006				0.25				0.10				0.07				610			
Site 10			0.26				0.01	<			0.045						0.003				0.35				0.076				0.10	<			610			
Site 10																																				
Site 10																																				
Site 10																																				
Site 10																																				
Site 11			0.42				0.01	<			0.058						0.01	<							0.21				0.10	<			1000			
Site 11			0.43				0.003	<			0.052														0.18				0.06				900			
Site 11			0.43				0.003	<			0.05														0.16				0.06				900			
Site 11			0.43				0.01	<			0.049						0.01	<							0.17				0.10	<			1000			
Site 11			0.44				0.01	<			0.05														0.21				0.10	<			900			
Site 11			0.47				0.005	<			0.049						0.005	<							0.17				0.06							
Site 11			0.37				0.01	<			0.055														0.19				0.10	<			920			
Site 11			0.35				0.004	<			0.052						0.011				0.42				0.17				0.10	<			910			
Site 11			0.38				0.004				0.052						0.011				0.44				0.18				0.04				960			
Site 11			0.17				0.003	<			0.02						0.001	<			0.15				0.055				0.04				300			
Site 11			0.11				0.009				0.014						0.004				0.11				0.039				0.03	<			190			
Site 11			0.09				0.009				0.012						0.004				0.099				0.027				0.03	<			170			
Site 11			0.13				0.007				0.016						0.005				0.12				0.045				0.03	<			220			
Site 11			0.21				0.004	<			0.023						0.006				0.18				0.078				0.04				360			
Site 11			0.2				0.007				0.026						0.007				0.21				0.085				0.05	<			460			
Site 11			0.26				0.01	<			0.031						0.006				0.24				0.098				0.10	<			520			
Site 11			0.33				0.011				0.034						0.008				0.3				0.14				0.10	<			760			
Site 11			0.47				0.017				0.064						0.01				0.42				0.2				0.15	<			1300			
Site 11			0.36				0.014				0.051						0.011				0.35				0.16				0.10	<			1000			
Site 12			0.33				0.013				0.048						0.007				0.35				0.14				0.10	<			870			
Site 12			0.23				0.008				0.033						0.007				0.22				0.1				0.05	<			440			
Site 12							0.011				0.026						0.005				0.22				0.12				0.10	<			450			
Site 12			0.24				0.011				0.038						0.008				0.32				0.1				0.10	<			640			
Site 12							0.013				0.046						0.008				0.35				0.13				0.10	<			760			
Site 12			0.39				0.019				0.056						0.01				0.48				0.19				0.12	<			1000			
Site 13	0.4		0.2	<					0.05	<	0.05	<			0.03		0.034						0.02		0.01	<	0.04		0.05		540		497			
Site 13	0.3		0.2	<					0.05	<	0.05	<			0.038		0.029						0.02		0.01	<	0.04		0.03		520		540			
Site 13	0.2	<	0.2	<					0.05	<	0.05	<			0.026		0.005	<					0.11		0.02		0.03		0.01	<	496		322			
Site 13	0.2	<	0.2	<					0.05	<	0.05	<			0.021		0.016						0.01	<	0.01	<	0.01	<	0.01	<	580		572			
Site 13			0.22				0.005	<			0.021						0.029				2.2				0.11				0.08				447			
Site 13			0.27				0.003	<			0.02						0.05				1.1				0.1				0.05				460			
Site 13			0.27				0.005	<			0.021						0.011	<			5.9				0.11				0.06				473			
Site 13			0.29				0.01	<			0.021						0.05				1.3				0.15				0.10	<			530			
Site 13			0.31				0.003	<			0.021						0.009				4.4				0.13				0.06				492			
Site 13			0.25				0.004	<			0.023						0.058				1.7				0.13				0.06				520			
Site 13			0.25				0.003	<			0.022						0.038				0.98				0.12				0.06				510			
Site 13			0.25				0.003	<			0.022						0.038				1				0.12				0.04				530			
Site 13			0.27				0.003	<			0.024						0.044				1				0.13				0.09				490			
Site 13			0.26				0.017				0.031						0.05				1				0.12				0.12				500			
Site 13			0.29				0.01	<			0.028						0.062				1.1				0.18				0.20				550			
Site 13			0.27				0.01	<			0.021						0.063				0.95				0.17				0.15				560			
Site 13			0.32				0.01	<			0.026						0.064				1				0.19				0.18				530			
Site 13			0.27				0.01	<			0.024						0.065				0.95				0.15				0.15				560			
Site 13			0.29				0.013				0.023						0.048				0.95				0.13				0.10				530			
Site 13			0.27				0.017				0.022						0.046				0.77				0.12				0.10				520			
Site 13			0.26				0.02				0.022						0.033				0.91				0.13				0.07				520			
Site 13			0.25				0.017				0.02						0.037				2.4				0.12				0.07				510			
Site 13			0.25				0.018				0.021						0.039				0.75				0.10				0.06				490			
Site 13			0.26				0.015				0.024						0.044				1				0.13				0.07				460			
Site 13							0.016				0.022						0.042				0.9				0.14				0.07				480			
Site 13							0.017				0.021						0.039				0.9				0.11				0.08				470			
Site 13							0.016				0.022						0.038				0.91				0.11				0.08				470			
Site 13			0.23				0.014				0.024						0.045				0.79				0.1				0.08	<			500			
Site 14	1.2		0.7						0.09		0.1				0.192		0.054						0.04		0.01	<	0.42		0.06		1260		1100			
Site 14	0.8		0.3						0.09		0.09				0.023		0.025						0.06		0.01		0.09		0.09		930		930			
Site 14	0.2	<	0.2	<					0.09		0.07				0.021		0.005	<					0.25		0.26		0.01	<	0.01	<	1050		891			
Site 14			0.77				0.1				0.05						0.083				3.5				0.3				0.12				1100			
Site 14			0.76				0.1	<			0.06						0.087				3.6				0.28				0.11				1200			
Site 14			0.85				0.1	<			0.06						0.086				3.4				0.34				0.10				1200			
Site 14			0.71				0.1	<			0.092										4.8				0.28				0.11				1000			
Site 14			0.8				0.1	<			0.08						0.075				2.9				0.39				0.08				1100			
Site 14			0.89				0.1	<			0.07						0.074				3				0.37				0.08				1200			
Site 14			0.86				0.1	<			0.08						0.098				3.5				0.32				0.08				1100			
Site 14			0.72				0.1	<			0.095						0.083				3.3				0.31				0.10				950			
Site 14			0.73				0.1	<			0.094						0.088				3.2				0.32				0.10	<			1000			
Site 14			0.74				0.1	<			0.092						0.084				3.2				0.32				0.10	<			1000			
Site 14			0.73				0.074				0.097						0.087				3.1				0.34				0.10	<			970			
Site 14			0.73				0.1	<			0.099						0.085				4.5				0.36				0.20	<			1100			
Site 14			0.71				0.1	<			0.071						0.086				3.7				0.34				0.20	<			980			
Site 14			0.83				0.1	<			0.1						0.083				3.7				0.37				0.20	<			990			
Site 14			0.73				0.1	<			0.04						0.085				3.8				0.31				0.20	<			1100			
Site 14			0.73				0.072				0.095						0.077				3.4				0.33				0.12				940			
Site 14			0.66				0.074				0.085						0.086				3.7				0.32				0.10	<			990			
Site 14			0.74				0.085				0.097						0.073				7.6				0.35				0.10	<			1100			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 14			0.68				0.1	<			0.1						0.088				9.5				0.40				0.20	<			1100			
Site 14			0.76				0.08				0.099						0.071				5.4				0.32				0.10	<			1100			
Site 14			0.84				0.078				0.097						0.09				3.8				0.31				0.10	<			990			
Site 14			0.451				0.074				0.1						0.09				3.6				0.30				0.25	<			1100			
Site 14			0.374				0.073				0.093						0.09				3.6				0.18				0.25	<			1100			
Site 14			0.322				0.077				0.097						0.087				3.9				0.13	<			0.25	<			1000			
Site 14			0.222				0.075				0.097						0.083				3.9				0.29				0.20	<			1000			
Site 15	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.15		0.05	<		
Site 15			0.04				0.093				0.0005	<					0.001	<			0.001	<			0.005	<			0.01	<			0.018			
Site 15			0.05				0.11				0.0005	<					0.001	<			0.003	<			0.005	<			0.01	<			0.005			
Site 15			0.05				0.11				0.0005	<					0.002				0.003				0.005	<			0.01	<			0.13			
Site 15			0.11				0.17				0.0005	<					0.001	<			0.003	<			0.005	<			0.01	<			0.048			
Site 15																																				
Site 15																																				
Site 16	0.5		0.2						0.05	<	0.05	<			0.084		0.028						0.01	<	0.01	<	0.18		0.01	<	587		515			
Site 16	0.2	<	0.2	<					0.05	<	0.05	<			0.007		0.007						0.08		0.04		0.01	<	0.01	<	366		299			
Site 16			0.31				0.004	<			0.034						0.018				2				0.098				0.04	<			340			
Site 16			0.27				0.003				0.03						0.05				2.3				0.088				0.03	<			335			
Site 16			0.32				0.004				0.028						0.039				1.5				0.075				0.03	<			317			
Site 16			0.25				0.003				0.027										1.4				0.067				0.03	<			290			
Site 16																																				
Site 16																																				
Site 16																																				
Site 16																																				
Site 16																																				
Site 16																																				
Site 16			0.25				0.025				0.026						0.025				0.8				0.059				0.03	<			290			
Site 16			0.3				0.008				0.034						0.033				1.1				0.081				0.04	<			390			
Site 16			0.3				0.011				0.033						0.03				1.1				0.086				0.05	<			410			
Site 16			0.36				0.008				0.034						0.031				1.2				0.100				0.05	<			390			
Site 16			0.3				0.008				0.034						0.031				1.2				0.089				0.04	<			390			
Site 16			0.31				0.029				0.031						0.029				1.1				0.087				0.05	<			370			
Site 16			0.29				0.028				0.029						0.03				1.1				0.079				0.05	<			360			
Site 16			0.26				0.028				0.028						0.03				1.7				0.076				0.05	<			360			
Site 16			0.27				0.025				0.029						0.025				1.9				0.074				0.05	<			330			
Site 16			0.27				0.026				0.028						0.024				1.6				0.066				0.03	<			320			
Site 16			0.33				0.023				0.031						0.027				1				0.055				0.03	<			320			
Site 16			0.227				0.027				0.029						0.03				1				0.091				0.06	<			360			
Site 16							0.03				0.034						0.031				1.1				0.087				0.06	<			390			
Site 16			0.166				0.027				0.032						0.027				1				0.068				0.06	<			350			
Site 16			0.129				0.026				0.029						0.027				1				0.055				0.06	<			310			
Site 17	0.6		0.2	<					0.05	<	0.05	<			0.014		0.014						0.01	<	0.01	<	0.09		0.1		322		286			
Site 17	0.2		0.2	<					0.05	<	0.05	<			0.02								0.01	<	0.01	<	0.09		0.09		270		280			
Site 17	0.2	<	0.2	<					0.05	<	0.05	<			0.023		0.022						0.01		0.01		0.06		0.05		217		215			
Site 17	0.2	<	0.2	<					0.05	<	0.05	<			0.058		0.064						0.01	<	0.01	<	0.09		0.08		273		262			
Site 17			0.2				0.006				0.033														0.022				0.11				242			
Site 17			0.21				0.007				0.031						0.011								0.021				0.11				246			
Site 17			0.21				0.006				0.03						0.014								0.015				0.10				234			
Site 17			0.18				0.007				0.031										0.51				0.016				0.10				225			
Site 17			0.21				0.006				0.031						0.014								0.025				0.11				234			
Site 17			0.22				0.006				0.03														0.020				0.11				253			
Site 17			0.22				0.005				0.03						0.013								0.015	<			0.11				228			
Site 17			0.17				0.006				0.031						0.029				0.44				0.015	<			0.10				260			
Site 17			0.18				0.005				0.031						0.032				0.47				0.015	<			0.11				250			
Site 17			0.2				0.007				0.034						0.032				0.52				0.022				0.10				220			
Site 17			0.19				0.012				0.036						0.031				0.48				0.023				0.11				190			
Site 17			0.19				0.007				0.037						0.032				0.49				0.020	<			0.11				230			
Site 17			0.14				0.005				0.025						0.023				0.31				0.015	<			0.08				190			
Site 17			0.17				0.007				0.027						0.023				0.35				0.011				0.09				170			
Site 17			0.18				0.007				0.024						0.023				0.36				0.021				0.08				180			
Site 17			0.18				0.011				0.026						0.025				0.36				0.030				0.10				200			
Site 17			0.19				0.011				0.028						0.027				0.44				0.015	<			0.11				220			
Site 17			0.19				0.012				0.029						0.03				0.46				0.027				0.12				260			
Site 17			0.18				0.009				0.031						0.027				0.45				0.036				0.12				260			
Site 17			0.2				0.012				0.034						0.025				0.43				0.024				0.13				290			
Site 17			0.21				0.011				0.03						0.031				0.44				0.024				0.11				250			
Site 17			0.131				0.011				0.033						0.032				0.47				0.025	<			0.11				250			
Site 17							0.01	<			0.034						0.031				0.45				0.036	<			0.11				260			
Site 17							0.011				0.03						0.028				0.36				0.025	<			0.11				240			
Site 17							0.008				0.03						0.027				0.35				0.025	<			0.10				250			
Site 18	0.4		0.4						0.05	<	0.05	<			0.026		0.015						0.01	<	0.01	<	0.05		0.05		89		83			
Site 18	0.3		0.2						0.05	<	0.05	<			0.024								0.01	<	0.01	<	0.09		0.1		180		180			
Site 18	0.2	<	0.2	<					0.05	<	0.05	<			0.016		0.005	<					0.01		0.01		0.06		0.01	<	150		123			
Site 18			0.36				0.035				0.03										0.48				0.015	<			0.03	<			51			
Site 18			0.41				0.032				0.032										0.64				0.015	<			0.03	<			63			
Site 18			0.35				0.015				0.038										0.54				0.015				0.06				100			
Site 18			0.22				0.011				0.032										0.44				0.015	<			0.10				100			
Site 18			0.2				0.007				0.027						0.019				0.61				0.016				0.11				130			
Site 18																																				
Site 18			0.21				0.039				0.023										0.59				0.015	<			0.05				110			
Site 18			0.11				0.016				0.013						0.012				0.19				0.015	<			0.04				50			
Site 18			0.14				0.014				0.019						0.019				0.31				0.015	<			0.07				73			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 18			0.13				0.004				0.019						0.017				0.26				0.015	<			0.07				98			
Site 18			0.18				0.015				0.028						0.021				0.34				0.024				0.09				100			
Site 18			0.18				0.004				0.029						0.02				0.37				0.02	<			0.08				120			
Site 18			0.19				0.003	<			0.025						0.017				0.37				0.015	<			0.04				130			
Site 18			0.23				0.009				0.032						0.018				0.4				0.015	<			0.04				86			
Site 18			0.23				0.009				0.028						0.019				0.39				0.024				0.05				64			
Site 18			0.19				0.01				0.027						0.03				0.36				0.017				0.13				100			
Site 18			0.19				0.007				0.027						0.026				0.38				0.015	<			0.11				160			
Site 18			0.18				0.009				0.026						0.025				0.34				0.015	<			0.11				220			
Site 18			0.06				0.003				0.011						0.014				0.19				0.008				0.04				83			
Site 18			0.18				0.006				0.029						0.026				0.4				0.019				0.11				210			
Site 18			0.21				0.008				0.032						0.028				0.46				0.030				0.12				190			
Site 18			0.137				0.008				0.031						0.027				0.42				0.036				0.11				190			
Site 18			0.134				0.008				0.037						0.028				0.52				0.040	<			0.07				210			
Site 18			0.254				0.008				0.034						0.026				0.55				0.030				0.07				240			
Site 18			0.205				0.008	<			0.044						0.024				0.57				0.040	<			0.08	<			220			
Site 19	0.3		0.2						0.05	<	0.05	<			0.022		0.008						0.01	<	0.01	<	0.01	<	0.01	<	327		302			
Site 19	0.2		0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	290					
Site 19	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.02		0.02		0.01	<	0.01	<	274		230			
Site 19	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.02		0.02		0.01	<	0.01	<	33.8		28.4			
Site 19			0.26				0.012				0.027														0.041				0.04	<			330			
Site 19			0.27				0.014				0.026														0.033				0.03	<			325			
Site 19			0.31				0.013				0.025														0.032				0.03	<			310			
Site 19			0.24				0.014				0.025														0.026				0.03	<			298			
Site 19			0.27				0.012				0.025														0.046				0.05	<			300			
Site 19			0.31				0.013				0.024														0.032				0.03	<			281			
Site 19			0.28				0.013				0.024														0.021				0.03	<			230			
Site 19			0.24				0.013				0.024						0.008				0.74				0.024				0.03	<			280			
Site 19			0.24				0.014				0.023						0.008				0.7				0.026				0.03	<			280			
Site 19			0.26				0.014				0.025						0.008				0.71				0.020				0.03	<			280			
Site 19			0.26				0.027				0.025						0.009				0.61				0.037				0.03	<			280			
Site 19			0.25				0.015				0.026						0.006				0.51				0.029				0.04	<			330			
Site 19			0.26				0.014				0.024						0.009				0.73				0.030				0.04	<			340			
Site 19			0.27				0.014				0.026						0.009				0.68				0.041				0.04	<			320			
Site 19			0.27				0.015				0.025						0.009				0.73				0.036				0.03	<			310			
Site 19			0.27				0.027				0.025						0.009				0.65				0.039				0.03	<			290			
Site 19			0.26				0.027				0.023						0.008				0.67				0.021				0.03	<			290			
Site 19			0.25				0.028				0.024						0.008				0.58				0.030				0.03	<			310			
Site 19			0.24				0.014				0.025						0.008				0.6				0.033				0.05	<			280			
Site 19			0.26				0.027				0.024						0.007				0.51				0.026				0.03	<			280			
Site 19			0.3				0.027				0.024						0.007				0.65				0.025				0.03	<			280			
Site 19							0.026				0.035						0.007				0.67				0.047				0.06	<			280			
Site 19							0.015				0.028						0.008				0.65				0.044				0.06	<			310			
Site 19							0.026				0.023						0.008				0.66				0.031				0.04	<			280			
Site 19							0.028				0.024						0.008				0.67				0.035				0.04	<			290			
Site 20	1.2		0.9						0.1		0.12				0.12		0.1						0.01	<	0.01	<	0.25		0.29		1860		1720			
Site 20	1		0.6						0.1		0.12				0.141		0.097						0.01	<	0.01	<	0.26		0.3		1820		1620			
Site 20	0.7		0.5						0.1		0.1				0.06		0.053						0.01	<	0.01	<	0.3		0.29		1500					
Site 20	0.2	<	0.2	<					0.09		0.06				0.064		0.005	<					0.31		0.18		0.19		0.01	<	1490		1470			
Site 20	0.2	<	0.2	<					0.11		0.11				0.082		0.088						0.3		0.3		0.19		0.2		1580		1620			
Site 20	0.2	<	0.2	<					0.11		0.11				0.084		0.091						0.3		0.3		0.19		0.19		1580		1620			
Site 20			0.75				0.1	<			0.06						0.1				2.2				0.31				0.31				1600			
Site 20			0.8				0.1	<			0.07						0.11				2				0.29				0.30				1600			
Site 20			0.85				0.1	<			0.06						0.11				2.1				0.35				0.31				1700			
Site 20			0.73				0.02	<			0.11										5.6				0.32				0.38				1490			
Site 20			0.83				0.1	<			0.08						0.11				1.7				0.40				0.29				1500			
Site 20			0.9				0.1	<			0.07						0.1				1.9				0.37				0.29				1500			
Site 20			0.83				0.1	<			0.08						0.11				2.2				0.32				0.30				1400			
Site 20			0.79				0.01	<			0.14						0.12				2.2				0.32				0.43				1600			
Site 20			0.77				0.01	<			0.12						0.12				2.2				0.31				0.37				1600			
Site 20			0.77				0.01	<			0.12						0.11				1.9				0.32				0.33				1500			
Site 20			0.71				0.04				0.11						0.096				1.7				0.33				0.26				1400			
Site 20			0.81				0.02	<			0.11						0.11				2.7				0.33				0.31				1600			
Site 20			0.84				0.02	<			0.12						0.1				2				0.28				0.23				1900			
Site 20			1				0.025	<			0.13						0.11				2.2				0.40				0.41				1900			
Site 20			0.86				0.1	<			0.04						0.11				2.4				0.36				0.43				2000			
Site 20			0.78				0.035				0.099						0.11				2				0.28				0.45				1500			
Site 20			0.62				0.037				0.083						0.1				2.1				0.30				0.39				1300			
Site 20			0.66				0.038				0.091						0.097				3.9				0.33				0.39				1300			
Site 20			0.63				0.02	<			0.098						0.084				5.2				0.39				0.40				1300			
Site 20			0.66				0.037				0.095						0.087				4.9				0.29				0.38				1300			
Site 20			0.82				0.041				0.1						0.11				2.4				0.30				0.33				1400			
Site 20							0.041				0.1						0.12				2.2				0.30				0.48				1400			
Site 20							0.038				0.095						0.11				2				0.27				0.65				1200			
Site 20							0.038				0.11						0.11				2				0.28				0.34				1300			
Site 20							0.044				0.1						0.11				1.9				0.38				0.46				1400			
Site 21	0.4		0.3						0.05	<	0.05	<			0.017		0.014						0.01	<	0.01	<	0.06		0.07		591		569			
Site 21	0.3		0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.02		0.02		550		540			
Site 21	0.2	<	0.2	<					0.05	<	0.05	<			0.006		0.005	<					0.02		0.02		0.01	<	0.03		221		202			
Site 21	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	492		504			
Site 21			0.23				0.015				0.021						0.004	<			2				0.033				0.05				383			
Site 21			0.27				0.012				0.019										1.9				0.04				0.04				412			
Site 21			0.29				0.011				0.019										0.94				0.036				0.03	<			431			
Site 21			0.28				0.01				0.016						0.008				1.6				0.025	<			0.05	<			451			
Site 21			0.26				0.023				0.019						0.005				1				0.038				0.05	<			452			
Site 21			0.29				0.01				0.018						0.003	<			3.3				0.030				0.03	<			382			
Site 21			0.23				0.011				0.019						0.009				1.1				0.036				0.04	<			380			
Site 21			0.22				0.012				0.017						0.008				0.71				0.026				0.04	<			370			
Site 21			0.22				0.01				0.017						0.01				0.66				0.025				0.04	<			370			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 21			0.05				0.07				0.0005						0.001	<			0.018				0.005	<			0.01	<			8.4			
Site 21			0.04				0.075				0.0005						0.001	<			0.017				0.005	<			0.01	<			5.5			
Site 21			0.06				0.077				0.0005						0.001	<			0.045				0.005	<			0.01	<			13			
Site 21			0.1				0.13				0.0005						0.001	<			0.016				0.005	<			0.01	<			2.2			
Site 21			0.2				0.044				0.011						0.009				0.37				0.025				0.03				230			
Site 21			0.25				0.009				0.021						0.021				0.77				0.051				0.08				470			
Site 21			0.26				0.019				0.023						0.017				0.75				0.045				0.06				490			
Site 21			0.27				0.02				0.02						0.017				0.76				0.051				0.06				480			
Site 21			0.27				0.022				0.021						0.017				0.7				0.063				0.05	<			530			
Site 21			0.25				0.021				0.025						0.015				0.66				0.048				0.05	<			560			
Site 21			0.25				0.022				0.021						0.014				0.63				0.047				0.05	<			530			
Site 21			0.27				0.019				0.024						0.016				0.8				0.041				0.05	<			440			
Site 21							0.021				0.02						0.015				0.71				0.030	<			0.10	<			440			
Site 21							0.021				0.02						0.017				0.73				0.030	<			0.10	<			470			
Site 21							0.02				0.032						0.016				0.8				0.050	<			0.10	<			490			
Site 21			0.27				0.019				0.024						0.015				0.77				0.054				0.08	<			550			
Site 22	0.2	<	0.2						0.05	<	0.05	<			0.019		0.014						0.01	<	0.01	<	0.02		0.01		6.7		6.48			
Site 22	0.2	<	0.2						0.05	<	0.05	<			0.008		0.009						0.01	<	0.01	<	0.02		0.01	<	4.47		4.33			
Site 22	0.2	<	0.2	<					0.05	<	0.05	<			0.015		0.007						0.01	<	0.01	<	0.04		0.02		13.4		9.87			
Site 22	0.2	<	0.2	<					0.05	<	0.05	<			0.011		0.008						0.01	<	0.01	<	0.04		0.02		13.2		10.2			
Site 22	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01		0.01		5.61		5.3			
Site 22			0.17				0.003				0.0069						0.01				0.2				0.005				0.02				6.6			
Site 22			0.17				0.003				0.0045						0.01				0.17				0.005				0.01				6.3			
Site 22			0.16				0.003				0.0066						0.01				0.19				0.005				0.01				6.2			
Site 22			0.17				0.003				0.0067						0.01				0.2				0.005				0.02				5.9			
Site 22			0.16				0.003				0.0068						0.01				0.19				0.005				0.01				6.1			
Site 22			0.16				0.003				0.0068						0.01				0.2				0.005				0.01				6			
Site 22			0.17				0.004				0.0073						0.01				0.21				0.005				0.02				6			
Site 22			0.16				0.004				0.0067						0.008				0.21				0.005				0.01				5.9			
Site 22			0.17				0.004				0.0072						0.008				0.21				0.005				0.01				6			
Site 22			0.17				0.004				0.0073						0.009				0.22				0.005				0.02				6.4			
Site 22			0.18				0.007				0.0081						0.009				0.22				0.007				0.02				8			
Site 22			0.18				0.003				0.012						0.016				0.32				0.015				0.06				39			
Site 22			0.14				0.002				0.0066						0.012				0.22				0.005				0.02				12			
Site 22			0.13				0.002				0.0058						0.01				0.18				0.005				0.02				6.4			
Site 22			0.15				0.002				0.0046						0.01				0.19				0.005				0.02				5.0			
Site 22			0.15				0.005				0.0045						0.009				0.16				0.005				0.01				4.7			
Site 22			0.14				0.005				0.004						0.008				0.15				0.005				0.01				4.2			
Site 22			0.15				0.006				0.0046						0.007				0.19				0.005				0.01				4.0			
Site 22			0.15				0.005				0.0047						0.007				0.15				0.005				0.01				3.7			
Site 22			0.15				0.006				0.0046						0.007				0.15				0.005				0.01				3.7			
Site 22			0.16				0.005				0.0042						0.007				0.15				0.005				0.01				3.4			
Site 22			0.146				0.004				0.005						0.007				0.17				0.005				0.01				3.8			
Site 22			0.149				0.004				0.0049						0.008				0.17				0.005				0.01				3.5			
Site 22			0.143				0.006				0.0049						0.007				0.15				0.005				0.01				3.5			
Site 22			0.154				0.006				0.005						0.007				0.15				0.005				0.01				3.7			
Site 23	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.12		0.05	<		
Site 23	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.19		0.19			
Site 23	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.1		0.12			
Site 23	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.05	<	0.05	<		
Site 23			0.09				0.051				0.0005						0.001				0.003				0.005				0.01				0.023			
Site 23			0.08				0.051				0.0005						0.001				0.003				0.005				0.01				0.028			
Site 23			0.08				0.051				0.0005						0.001				0.003				0.005				0.01				0.006			
Site 23			0.07				0.048				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.07				0.048				0.0005						0.002				0.003				0.005				0.01				0.003			
Site 23			0.08				0.046				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.07				0.048				0.0005						0.001				0.003				0.005				0.01				0.007			
Site 23			0.06				0.046				0.0005						0.001				0.001				0.005				0.01				0.003			
Site 23			0.07				0.044				0.0005						0.001				0.001				0.005				0.01				0.003			
Site 23			0.06				0.048				0.0005						0.001				0.001				0.005				0.01				0.003			
Site 23			0.08				0.048				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.07				0.056				0.0005														0.005				0.01				0.004			
Site 23			0.08				0.05				0.0005						0.001				0.003				0.005				0.01				0.008			
Site 23			0.1				0.049				0.0005						0.004				0.003				0.005				0.01				0.004			
Site 23			0.09				0.049				0.0005						0.001				0.003				0.005				0.01				0.009			
Site 23			0.07				0.046				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23							0.044				0.0005														0.005				0.01				0.003			
Site 23			0.06				0.043				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.08				0.042				0.0005						0.001				0.003				0.005				0.01				0.007			
Site 23			0.05				0.041				0.0005						0.001				0.003				0.005				0.01				0.006			
Site 23			0.07				0.045				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.072				0.045				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.075				0.047				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.074				0.046				0.0005						0.001				0.003				0.005				0.01				0.003			
Site 23			0.077				0.051				0.0005						0.002				0.003				0.005				0.01				0.010			
Site 24	0.4		0.5						0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	119		122			
Site 24	0.2		0.2						0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	110		120			
Site 24	0.2		0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	106		99			
Site 24	0.2		0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	110		104			
Site 24			0.28				0.009				0.027						0.003	<							0.015	<			0.03	<			132			
Site 24			0.32				0.009				0.019														0.015	<			0.03	<			133			
Site 24			0.31				0.009				0.025														0.015	<			0.03	<			133			
Site 24			0.32				0.009				0.026						0.003	<							0.015	<			0.03	<			130			
Site 24			0.3				0.008				0.025														0.015	<			0.03	<			135			
Site 24			0.32				0.009				0.025						0.003	<							0.015	<			0.03	<			129			
Site 24			0.3				0.009				0.027														0.015	<			0.03	<			130			
Site 24			0.27				0.009				0.024						0.003				0.52				0.015	<			0.03	<			130			
Site 24			0.28				0.008				0.024						0.003				0.43				0.015	<			0.03	<			130			
Site 24			0.29				0.009				0.024						0.003				0.49				0.015	<			0.03	<			130			
Site 24			0.29				0.015				0.025						0.002				0.47				0.015	<			0.03	<			120			
Site 24			0.26				0.008				0.026						0.002				0.48				0.015	<			0.03	<			130			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 24			0.27				0.008				0.023						0.003				0.44				0.015	<			0.03	<			120			
Site 24			0.27				0.009				0.025						0.002				0.45				0.010	<			0.02	<			120			
Site 24			0.29				0.008				0.023						0.002				0.5				0.010	<			0.02	<			110			
Site 24			0.29				0.015				0.023						0.002				0.44				0.021				0.03	<			120			
Site 24			0.28				0.014				0.023						0.002				0.4				0.015	<			0.03	<			120			
Site 24			0.28				0.015				0.023						0.002				0.45				0.015	<			0.03	<			120			
Site 24			0.27				0.01				0.026						0.002				0.42				0.010	<			0.02	<			120			
Site 24			0.3				0.015				0.024						0.002				0.4				0.010	<			0.02	<			120			
Site 24			0.3				0.014				0.023						0.002				0.43				0.015	<			0.03	<			120			
Site 24			0.252				0.014				0.023						0.002				0.45				0.020	<			0.04	<			120			
Site 24			0.229				0.009				0.026						0.002				0.44				0.015	<			0.03	<			130			
Site 24			0.245				0.015				0.024						0.002				0.44				0.010	<			0.02	<			120			
Site 24			0.198				0.015				0.024						0.002				0.44				0.010	<			0.02	<			120			
Site 25	0.2	<	0.3						0.05	<	0.05	<			0.06		0.058						0.01	<	0.01	<	0.08		0.1		288		286			
Site 25	0.2		0.2						0.05	<	0.05	<			0.045		0.043						0.01	<	0.01	<	0.08		0.06		230		220			
Site 25	0.3		0.2						0.05	<	0.05	<			0.053		0.053						0.01	<	0.01	<	0.08		0.06		230		230			
Site 25	0.2	<	0.2	<					0.05	<	0.05	<			0.046		0.043						0.02		0.01		0.05		0.05		299		250			
Site 25	0.2	<	0.2	<					0.05	<	0.05	<			0.044		0.045						0.02		0.02		0.06		0.07		337		334			
Site 25			0.28				0.003	<			0.029						0.061				2.4				0.036				0.19				345			
Site 25			0.35				0.003	<			0.021						0.1				1.1				0.036				0.20				359			
Site 25			0.38				0.003	<			0.03						0.095				1.8				0.027				0.18				361			
Site 25			0.38				0.004	<			0.032						0.058				3.8				0.029				0.18				358			
Site 25			0.36				0.01	<			0.032						0.1				2				0.050	<			0.16				387			
Site 25			0.38				0.003	<			0.032						0.07				2.4				0.037				0.15				363			
Site 25			0.33				0.004	<			0.036						0.095				2				0.034				0.14				370			
Site 25			0.3				0.003	<			0.034						0.081				1.1				0.022				0.13				350			
Site 25			0.31				0.003	<			0.034						0.08				0.92				0.023								350			
Site 25			0.31				0.003	<			0.035						0.08				1				0.024				0.13				360			
Site 25			0.32				0.01	<			0.04						0.069				0.86				0.050	<			0.12				340			
Site 25			0.28				0.004	<			0.037						0.07				1				0.031				0.12				360			
Site 25			0.25				0.003	<			0.025						0.063				0.81				0.018				0.10				240			
Site 25			0.24				0.002	<			0.024						0.068				0.78				0.019				0.11				180			
Site 25			0.24				0.003	<			0.022						0.074				0.75				0.037				0.12				170			
Site 25			0.26				0.017				0.024						0.077				0.83				0.015	<			0.12				210			
Site 25			0.29				0.018				0.026						0.08				0.94				0.027				0.14				240			
Site 25			0.28				0.009				0.028						0.067				0.94				0.036				0.14				300			
Site 25			0.29				0.005	<			0.033						0.069				0.93				0.044				0.16				350			
Site 25			0.3				0.021				0.031						0.086				1.2				0.040				0.14				350			
Site 25			0.35				0.021				0.034						0.085				0.99				0.054				0.16				340			
Site 25			0.265				0.023				0.032						0.087				1.1				0.057				0.12				380			
Site 25							0.01	<			0.037						0.083				1.1				0.050	<			0.15				410			
Site 25							0.021				0.036						0.076				1.1				0.043				0.11				370			
Site 25							0.02				0.032						0.071				0.96				0.033				0.13				370			
Site 26	0.3		0.3						0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	17.7		17.4			
Site 26	0.3		0.3						0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	30		28			
Site 26	0.4	<	0.3						0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	13.9		11.4			
Site 26	0.2		0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01		0.01	<	0.01	<	0.01	<	27.1		25.3			
Site 26			0.33				0.014				0.027						0.003	<			0.52				0.015	<			0.03	<			17			
Site 26			0.31				0.009				0.027						0.003	<			0.67				0.015	<			0.03	<			38			
Site 26			0.29				0.007				0.027						0.005				0.66				0.015	<			0.03	<			60			
Site 26																																				
Site 26			0.25				0.008				0.023						0.003	<			0.54				0.015	<			0.03	<			47			
Site 26			0.22				0.006				0.018						0.002				0.39				0.015	<			0.03	<			37			
Site 26			0.27				0.007				0.022						0.002				0.44				0.015	<			0.03	<			41			
Site 26			0.25				0.007				0.02						0.002				0.4				0.015	<			0.03	<			40			
Site 26			0.29				0.015				0.022						0.002				0.28				0.015	<			0.03	<			27			
Site 26			0.26				0.01				0.022						0.002				0.35				0.015	<			0.03	<			32			
Site 26			0.28				0.009				0.02						0.002				0.39				0.015	<			0.03	<			32			
Site 26			0.3				0.014				0.0032						0.001	<			0.2				0.010	<			0.02	<			4.8			
Site 26			0.29				0.013				0.023						0.002				0.41				0.010	<			0.02	<			22			
Site 26			0.28				0.013				0.024						0.002				0.43				0.017				0.03	<			39			
Site 26			0.27				0.012				0.023						0.002				0.4				0.005	<			0.01	<			50			
Site 26			0.2				0.012				0.015						0.001				0.4				0.015	<			0.03	<			22			
Site 26			0.19				0.008				0.016						0.002				0.33				0.005	<			0.01	<			12			
Site 26			0.21				0.011				0.014						0.001				0.21				0.005	<			0.01	<			5.9			
Site 26			0.27				0.004				0.0046						0.001				0.34				0.005	<			0.01	<			4.2			
Site 26			0.28				0.016				0.013						0.001	<			0.32				0.015	<			0.03	<			2.9			
Site 26																																				
Site 26																																				
Site 26																																				
Site 27	0.2	<	0.2	<					0.05	<	0.05	<			0.01		0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.08		0.05			
Site 27	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.006						0.01	<	0.01	<	0.01	<	0.01	<	0.06		0.07			
Site 27	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.18		0.1			
Site 27	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.12		0.12			
Site 27			0.14				0.028				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.003	<		
Site 27			0.13				0.026				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.01			
Site 27			0.11				0.027				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.013			
Site 27			0.12				0.026				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.004			
Site 27			0.12				0.026				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.003	<		
Site 27			0.12				0.027				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.003	<		
Site 27			0.12				0.028				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.01			
Site 27			0.1				0.025				0.0005						0.001	<			0.001				0.005	<			0.01	<			0.004			
Site 27			0.11				0.024				0.0005						0.001	<			0.001	<			0.005	<			0.01	<			0.003	<		
Site 27			0.11				0.027				0.0005						0.001	<			0.001	<			0.005	<			0.01	<			0.01			
Site 27			0.11				0.025				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.007			
Site 27			0.09				0.024				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.003	<		
Site 27			0.09				0.023				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.003	<		
Site 27			0.12				0.023				0.0005						0.001	<			0.038				0.005	<			0.01	<			3.2			
Site 27			0.13				0.021				0.0005						0.001	<			0.027				0.005	<			0.01	<			1.6			
Site 27			0.13				0.022				0.0005						0.001	<			0.016				0.005	<			0.01	<			0.92			
Site 27			0.1				0.02				0.0005						0.001	<			0.008				0.005	<			0.01	<			0.41			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
Site 27			0.12				0.019				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.47			
Site 27			0.13				0.019				0.0005						0.001	<			0.008				0.005	<			0.01	<			0.68			
Site 27			0.13				0.018				0.0005						0.001	<			0.006				0.005	<			0.01	<			0.43			
Site 27			0.11				0.019				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.25			
Site 27			0.122				0.019				0.0015						0.003	<			0.009	<			0.015	<			0.03	<			0.41			
Site 27			0.106				0.018				0.0005						0.001	<			0.004				0.005	<			0.01	<			0.16			
Site 27			0.105				0.018				0.0005						0.001	<			0.003	<			0.005	<			0.01	<			0.15			
Site 27			0.119				0.018				0.0005						0.001	<			0.004				0.005	<			0.01	<			0.16			
Site 28	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.09		0.14			
Site 28	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01		0.01	<	0.1		0.16			
Site 28	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.28		0.05	<		
Site 28	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.05	<	0.05	<		
Site 29	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.6		0.05	<		
Site 29	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	2.92		1.52			
Site 29	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	0.62		0.05	<		
Site 29	0.2	<	0.2	<					0.05	<	0.05	<			0.005	<	0.005	<					0.01	<	0.01	<	0.01	<	0.01	<	6.6		6.41			
200615			0.300	<			0.020	<			0.045		5.000	<			0.0168				0.368				0.131				0.200	<			1050			
200615			0.178				0.020	<			0.0565		5.000	<			0.0107				0.363				0.1300				0.0975				989			
200615			0.300	<			0.020	<			0.020	<	12.500	<			0.010	<			0.287				0.0954				0.0939				808			
200615			0.300	<			0.020	<			0.0207		1.000	<			0.010	<			0.240				0.0803				0.0429				665			
200615			0.150	<			0.010	<			0.0259		5.000	<			0.0337				0.227				0.0807				0.0313				761			
200615			0.300	<			0.020	<			0.0342		0.250	<			0.010	<			0.240				0.092				0.031				821			
200615			0.300	<			0.020	<			0.0425		2.500	<			0.0545				0.330				0.123				0.0416				843			
200615			0.300	<			0.020	<			0.0458		2.500	<			0.055				0.339				0.125				0.0412				929			
200615			0.300	<			0.020	<			0.0408		2.500	<			0.010	<			0.406				0.152				0.0267				1185			
200615			0.300	<			0.020	<			0.0286		6.300	<			0.010	<			0.239				0.0477				0.0388				973			
200615			0.300	<			0.020	<			0.0514		2.500	<			0.100	<			0.401				0.182				0.0853				950			
200615			0.300	<			0.020	<			0.0381		1.250	<			0.010	<			0.337				0.128				0.0388				1078			
200615			0.300	<			0.020	<			0.0439		12.500	<			0.0118				0.339				0.132				0.0354				1169			
200615			0.300	<			0.020	<			0.0447		2.500	<			0.010				0.362				0.118				0.0246				1227			
200616			0.150	<			0.010	<			0.0166		1.000	<			0.00659				0.265				0.0283				0.050	<			166			
200616			0.111				0.020	<			0.0188		0.500	<			0.010	<			0.292				0.0315				0.0157				173			
200616			0.118				0.010	<			0.0163		1.000	<			0.00396				0.222				0.0233				0.010	<			150			
200616			0.095				0.010	<			0.011		0.500	<			0.00352				0.245				0.027				0.0114				143			
200616			0.102				0.00286				0.0203		0.250	<			0.026				0.250				0.0277				0.0109				168			
200616			0.0966				0.002	<			0.019		1.250	<			0.00413				0.255				0.0277				0.010	<			155			
200616			0.105				0.00227				0.0197		0.500	<			0.00468				0.264				0.030				0.010	<			169			
200616			0.109				0.00301				0.0152		0.500	<			0.00533				0.260				0.0384				0.010	<			174			
200616			0.150	<			0.0022				0.0149		0.500	<			0.00439				0.265				0.0295				0.010	<			173			
200616			0.0825				0.002	<			0.0154		1.000	<			0.00557				0.254				0.0241				0.010	<			120			
200616			0.102				0.002	<			0.0189		0.500	<			0.00397				0.247				0.0223				0.0109				83.1			
200616			0.116				0.00245				0.0127		0.250	<			0.00505				0.253				0.0278				0.010	<			103			
200616			0.150	<			0.00427				0.0195		0.500	<			0.00526				0.250				0.0266				0.010	<			171			
200616			0.150	<			0.010	<			0.0151		5.000	<			0.00625				0.239				0.0263				0.010	<			174			
200616			0.109				0.00459				0.010	<	1.000	<			0.0058				0.24				0.0182				0.010	<			156			
205508			0.030	<			0.0777				0.002	<	0.050	<			0.001	<			0.002	<			0.002	<			0.002	<			0.036			
205836			0.030	<			0.0741				0.002	<	0.050	<			0.00145				0.002	<			0.002	<			0.00626				0.027			
205838			0.030	<			0.0661				0.002	<	0.050	<			0.001	<			0.002	<			0.002	<			0.002	<			0.04			
205838															0.001	<	0.001	<					0.002	<	0.002	<	0.002	<	0.002	<	0.02		0.040			
205839			0.03	<	0.0757		0.0775		0.002	<	0.002	<	0.05	<	0.001	<	0.001	<			0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.045		0.028			
214387																																				
214387																																				
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214387																																				
214387																																				
214387																																				
214911			0.0474				0.0713				0.002	<	0.05	<			0.00136				0.0451				0.002	<			0.002	<			0.169			
214913			0.03	<			0.0636				0.002	<	0.05	<			0.001	<			0.0282	<			0.002	<			0.002	<			6.01			
214914			0.300	<			0.020	<			0.020	<	2.500	<			0.010	<			0.517				0.0338				0.0481				558			
214915			0.150	<			0.010	<			0.016		1.250	<			0.0774				0.661				0.143				0.0986				672			
214916			0.0314				0.0599				0.002	<	0.05	<			0.001	<			0.0251				0.002	<			0.002	<			1.93			
BCAMD															0.0137								0.015				0.066		0.0545		180		175			
BCAMD															0.0131								0.0505				0.058		0.067		177		197			
CTWDC02															0.0027								0.0019				0.007		0.0013		15.1		0.69			
CTWDC02															0.013								0.006				0.022		0.0222		37		20.1			
CTWDC03															0.0004								0.003				0.003		0.0009		0.453		0.025	<		
CTWDC03															0.0026								0.0153				0.030		0.0036		5.63		0.135			
CTWDC03A															0.018								0.0077				0.038		0.032		132		32.2			
CTWDC03A															0.0417								0.032				0.074		0.0853		241		147			
CTWDC04															0.00004	<							0.00041	J			0.002		0.0019		0.242		0.037	J		
CTWDC04															0.0001								0.002				0.004		0.0009		1.49		0.025	<		
LBLTC03															0.0002								0.0007				0.003		0.0016		0.338		0.025	<		
LBLTC03															0.0001	J							0.00025	<			0.002		0.0012		0.372		0.047	J		
LBLTC03A															0.0002								0.0003	J			0.003		0.0017		0.208		0.025	<		
LBLTC03A															0.0002								0.0004	J			0.002		0.0013		0.679		0.115			

Station_ID	B_T_mgL	B_T_Q	B_D_mgL	B_D_Q	Ba_T_mgL	Ba_T_Q	Ba_D_mgL	Ba_D_Q	Be_T_mgL	Be_T_Q	Be_D_mgL	Be_D_Q	Br_D_mgL	Br_D_Q	Cd_T_mgL	Cd_T_Q	Cd_D_mgL	Cd_D_Q	Co_T_mgL	Co_T_Q	Co_D_mgL	Co_D_Q	Cr_T_mgL	Cr_T_Q	Cr_D_mgL	Cr_D_Q	Cu_T_mgL	Cu_T_Q	Cu_D_mgL	Cu_D_Q	Fe_T_mgL	Fe_T_Q	Fe_D_mgL	Fe_D_Q	Hg_T_mgL	Hg_T_Q
NO5CL01															0.00004	<							0.00025	<			0.002		0.0012		0.104		0.025	<		
NO5CL02															0.00004	<							0.00025	<			0.002		0.0006		0.06		0.03	J		
NO5CL02															0.0001								0.00025	<			0.0003	J	0.0025		0.308		0.191			
SNDCC01															0.0001	J							0.0004	J			0.004		0.0012		0.476		0.057			
SNDCC01															0.00004	<							0.00025	<			0.001	J	0.0045	J	0.789	J	0.073	J		
SNDCC02															0.00004	<							0.0003	J			0.0024		0.0025		0.154		0.045	J		
SNDCC03															0.0001	J							0.0005	J			0.0023		0.0014		0.587		0.025	<		
SNDCC04															0.0001								0.002				0.0043		0.0014		2.87		0.038	J		
SNDCL02															0.0665								0.012				0.273		0.2030		153		157			
SNDCL02															0.139								0.014				0.835		0.8270		577		442			
	0.1	<													0.548	D			4.15				0.34				2.98				2640	D			0.001	<
rom Montana I																																				
rd: January 19																																				
MAXIM 12/16/1																																				
able metals inc																																				
Dissolved Soli																																				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 1					0.027		0.005	<					0.09		0.09		0.003	<	0.003	<				
Site 1			0.008				0.009				0.01	<			0.01	<			0.01	<				
Site 1																								
Site 1																								
Site 1																								
Site 1																								
Site 1																								
Site 1																								
Site 1																								
Site 1			0.005				0.006				0.01				0.01	<			0.01	<				
Site 1																								
Site 1			0.008				0.008				0.01	<			0.01	<			0.01	<				
Site 1			0.006				0.013				0.01	<			0.01	<			0.01	<				
Site 1			0.005				0.003				0.01	<			0.02				0.01	<				
Site 1			0.008				0.023				0.01	<			0.01				0.01					
Site 1			0.01				0.01				0.01	<			0.01	<			0.01	<				
Site 1			0.012				0.01				0.01	<			0.01	<			0.01	<				
Site 1																								
Site 1																								
Site 1																								
Site 1																								
Site 1																								
Site 1			0.004				0.004				0.01	<			0.01	<			0.01	<				
Site 1			0.012				0.003				0.01	<			0.01	<			0.01	<				
Site 1																								
Site 1																								
Site 2					0.039		0.012						0.03		0.02	<	0.003	<	0.003	<				
Site 2			0.043				0.1				0.01	<			0.07				0.01	<				
Site 2																								
Site 2																								
Site 2																								
Site 2																								
Site 2																								
Site 2																								
Site 2																								
Site 2																								
Site 2			0.016				0.025				0.01	<			0.02				0.01	<				
Site 2																								
Site 2			0.046				0.2				0.01	<			0.23				0.01	<				
Site 2			0.058				0.38				0.01	<			0.31				0.01	<				
Site 2																								
Site 2			0.096				0.38				0.01	<			0.81				0.01	<				
Site 2			0.11				0.43				0.01	<			1				0.01	<				
Site 2			0.11				0.42				0.01	<			1				0.01	<				
Site 2			0.03				0.069				0.01	<			0.08				0.01	<				
Site 2																								
Site 2																								
Site 2																								
Site 2			0.046				0.15				0.01	<			0.12				0.01	<				
Site 2			0.038				0.089				0.01	<			0.05				0.01	<				
Site 2			0.033				0.05				0.01	<			0.03				0.01	<				
Site 2																								
Site 2																								
Site 3					0.75		0.71						0.22		0.21		0.003	<	0.003	<				
Site 3					0.79		0.83						0.25		0.25		0.003	<	0.003	<				
Site 3					0.47		0.44						0.22		0.15		0.003	<	0.003	<				
Site 3					0.72		0.66						0.23		0.2		0.003	<	0.003	<				
Site 3			0.059				0.74				0.01	<			0.32				0.01	<				
Site 3			0.066				0.85				0.01	<			0.34				0.01	<				
Site 3			0.069				0.8				0.01	<			0.36				0.01	<				
Site 3			0.065				0.83				0.01	<			0.31				0.01	<				
Site 3			0.068				0.93				0.01	<			0.34				0.01	<				
Site 3			0.067				0.92				0.01	<			0.33				0.01	<				
Site 3			0.068				0.87				0.01	<			0.32				0.01	<				
Site 3			0.062				0.82				0.001	<			0.29				0.001	<				
Site 3			0.068				0.78				0.001	<			0.28				0.001	<				
Site 3			0.063				0.86				0.001	<			0.26				0.001	<				
Site 3																								
Site 3			0.026				0.13				0.0014				0.03				0.001	<				
Site 3																								
Site 3			0.024				0.17				0.001	<			0.03				0.001	<				
Site 3			0.011				0.18				0.001	<			0.03				0.001	<				
Site 3			0.036				0.49				0.001	<			0.15				0.001	<				
Site 3			0.047				0.74				0.001	<			0.25				0.001	<				
Site 3			0.054				0.89				0.001	<			0.31				0.001	<				
Site 3			0.061				0.99				0.001	<			0.38				0.001	<				
Site 3																								
Site 3			0.069				1.3				0.001	<			0.47				0.001	<				
Site 3																								
Site 3			0.062				1.3				0.001	<			0.43				0.001	<				
Site 3			0.066				1.2				0.001	<			0.4				0.001	<				
Site 3			0.059				0.93				0.001	<			0.33				0.001	<				
Site 3			0.055				0.73				0.001	<			0.26				0.001	<				
Site 3			0.058				0.73				0.001				0.29				0.001	<				
Site 3			0.067				0.87				0.001	<			0.29				0.001	<				
Site 3			0.067				0.83				0.001	<			0.32				0.001	<				
Site 4					2.38		1.5						1.85		1.4		0.003	<	0.003	<				
Site 4			0.63				4				0.01	<			2.8				0.01	<				
Site 4			0.63				4.1				0.01	<			2.8				0.01	<				
Site 4			0.7				4.9				0.01	<			3.2				0.01	<				
Site 4			0.61				4.7				0.01	<			2.9				0.01	<				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 4																								
Site 4																								
Site 4																								
Site 4																								
Site 4																								
Site 4			0.43				4.1				0.001	<			2.1				0.001	<				
Site 4																								
Site 4			0.085				0.45				0.0019				0.24				0.001	<				
Site 4			0.19				1.1				0.001	<			0.75				0.001	<				
Site 4			0.26				2				0.001	<			1.2				0.001	<				
Site 4																								
Site 4			0.63				4.4				0.001	<			3.0				0.001	<				
Site 4			0.64				4.1				0.001	<			3.4				0.001	<				
Site 4			0.65				3.7				0.001				3.3				0.001	<				
Site 4																								
Site 4																								
Site 4																								
Site 4																								
Site 4			0.28				2				0.001	<			1.1				0.002					
Site 4			0.38				2.6				0.001	<			1.6				0.001					
Site 4																								
Site 4																								
Site 5					0.45		0.4						0.81		0.82		0.003	<	0.003	<				
Site 5					0.4		0.4						0.91		0.83		0.003	<	0.003	<				
Site 5					0.32		0.19						0.75		0.3		0.003	<	0.003	<				
Site 5					0.4		0.41						0.85		0.88		0.003	<	0.003	<				
Site 5			0.2				0.43				0.03	<			0.85				0.03	<				
Site 5			0.2				0.43				0.03	<			0.81				0.03	<				
Site 5			0.2				0.43				0.03	<			0.79				0.03	<				
Site 5			0.18				0.42				0.03	<			0.77				0.03	<				
Site 5			0.21				0.45				0.03	<			0.81				0.03	<				
Site 5			0.19				0.44				0.03	<			0.77				0.03	<				
Site 5			0.21				0.44				0.03	<			0.85				0.03	<				
Site 5			0.21				0.42				0.001	<			0.76				0.001					
Site 5			0.2				0.42				0.001	<			0.79				0.001					
Site 5			0.18				0.39				0.001	<			0.70				0.001	<				
Site 5			0.19				0.38				0.001	<			0.78				0.001	<				
Site 5			0.18				0.38				0.001	<			0.74				0.001	<				
Site 5			0.18				0.4				0.001	<			0.70				0.001	<				
Site 5			0.17				0.39				0.001	<			0.81				0.001					
Site 5			0.18				0.42				0.001	<			0.82				0.001	<				
Site 5			0.19				0.41				0.001	<			0.82				0.001	<				
Site 5			0.2				0.43				0.001	<			0.82				0.001					
Site 5			0.19				0.44				0.001	<			0.84				0.001	<				
Site 5			0.2				0.41				0.001	<			0.81				0.002					
Site 5			0.21				0.44				0.001	<			0.77				0.001					
Site 5			0.2				0.39				0.001				0.73				0.001					
Site 5																								
Site 5			0.18				0.41				0.001	<			0.74				0.001					
Site 5			0.19				0.44				0.001	<			0.85				0.001	<				
Site 5			0.2				0.42				0.001	<			0.77				0.001					
Site 5			0.21				0.43				0.001				0.73				0.002	<				
Site 6					0.32		0.31						0.21		0.22		0.003	<	0.003	<				
Site 6					0.29		0.29						0.23		0.23		0.003	<	0.003	<				
Site 6					0.28		0.11						0.22		0.21		0.003	<	0.003	<				
Site 6					0.33		0.3						0.23		0.22		0.003	<	0.003	<				
Site 6			0.068				0.37				0.01				0.39				0.01					
Site 6			0.079				0.39				0.01				0.4				0.01					
Site 6			0.076				0.38				0.01				0.39				0.01					
Site 6			0.086				0.35				0.01				0.34				0.01					
Site 6			0.069				0.37				0.01				0.33				0.01					
Site 6			0.069				0.34				0.01				0.31				0.01					
Site 6			0.074				0.35				0.01				0.31				0.01					
Site 6			0.073				0.35				0.001				0.27				0.001					
Site 6			0.07				0.33				0.001				0.25				0.001					
Site 6			0.069				0.35				0.001				0.26				0.001					
Site 6			0.068				0.49				0.0017				0.27				0.001					
Site 6			0.06				0.32				0.001				0.23				0.001					
Site 6			0.073				0.37				0.001				0.40				0.001					
Site 6			0.069				0.43				0.001				0.45				0.001					
Site 6			0.077				0.51				0.001				0.57				0.001					
Site 6			0.08				0.48				0.001				0.54				0.001					
Site 6			0.081				0.44				0.001				0.55				0.001					
Site 6			0.08				0.43				0.001				0.54				0.001					
Site 6			0.081				0.39				0.001				0.45				0.001					
Site 6			0.078				0.39				0.001				0.4				0.001					
Site 6			0.073				0.37				0.001				0.35				0.001					
Site 6			0.071				0.35				0.001				0.34				0.001					
Site 6			0.07				0.38				0.001				0.34				0.001					
Site 6			0.071				0.34				0.001				0.27				0.001					
Site 6			0.067				0.34				0.001				0.27				0.001					
Site 7					1.92		1.48						9.23		7.3		0.003	<	0.003	<				
Site 7					2.19		2.27						9.35		9.04		0.003	<	0.003	<				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 7					2.09		1.96						10.7		10.4		0.003	<	0.003	<				
Site 7					2		1.98						8.94		8.75		0.003	<	0.003	<				
Site 7			0.66				2.1				0.0021				10.0				0.001	<				
Site 7			0.69				2.3				0.002	<			11.0				0.001	<				
Site 7			0.73				2.2				0.002	<			10.0				0.001	<				
Site 7			0.67				2.2				0.002				10.0				0.001	<				
Site 7			0.57				2.3				0.0046				10.0				0.001	<				
Site 7			0.55				2.5				0.0025				9.7				0.001	<				
Site 7			0.62				2.4				0.001	<			11.0				0.001	<				
Site 7			0.58				2.5				0.0018				11.0				0.001	<				
Site 7			0.63				2.4				0.0012				10.0				0.001	<				
Site 7			0.66				2.4				0.001	<			11.0				0.001	<				
Site 7			0.67				2.5				0.002				12.0				0.001	<				
Site 7			0.71				2.3				0.0015				11.0				0.001	<				
Site 7			0.7				2.5				0.001	<			12.0				0.001	<				
Site 7			0.68				2.4				0.0015				12.0				0.001	<				
Site 7			0.7				2.4				0.001	<			11.0				0.001	<				
Site 7			0.55				2.3				0.0012				11.0				0.001	<				
Site 7			0.71				2.3				0.002	<			11.0				0.001	<				
Site 7			0.65				2.3				0.0017				11.0				0.004	<				
Site 8					10.7		10.4						20.8		17.6		0.02		0.01	<				
Site 8					8.01		5.38						11.6		9.3		0.003	<	0.003	<				
Site 8					9.13		9.04						11.3		10.6		0.003	<	0.003	<				
Site 8			1.7				8.3				0.005	<							0.001	<				
Site 8			1.7				8.1				0.001	<			15				0.001	<				
Site 8			1.9				7.7				0.001	<							0.001	<				
Site 8			1.8				7.3								13									
Site 8			1.7								0.001	<			13				0.001	<				
Site 8			2				17				0.001				15				0.001	<				
Site 8			1.4				11				0.002	<			13				0.001	<				
Site 8			1.3				12				0.002	<			10				0.001	<				
Site 8			1.6				12				0.0015				13				0.001	<				
Site 8			1.1				5.9				0.002	<			8.5				0.001					
Site 8			1.2				7.9				0.0023				9.4				0.001	<				
Site 8			1.5				7.2				0.002	<			11				0.001	<				
Site 8			1.2				6.7				0.0012				10				0.001	<				
Site 8			1.4				5.6				0.006				12				0.001	<				
Site 8			1.4				5.6				0.0018				13				0.001	<				
Site 8			1.5				5.4				0.0036				12				0.001	<				
Site 8			1.5				5.6				0.001	<			12				0.001	<				
Site 8			1.3				7.6				0.001	<			12				0.001	<				
Site 8			1.3				7.9				0.0034				11				0.001	<				
Site 8			1.1				6.3				0.001	<			9				0.001	<				
Site 8			1.5				8.5				0.0014				13				0.001	<				
Site 8			1.6				9.1				0.002	<			14				0					
Site 8			1.8				10				0.001	<			16				0.001	<				
Site 8			2				11				0.002	<			17				0.001	<				
Site 8			2				9.9				0.0025				17				0.004	<				
Site 9					0.054		0.005						0.09		0.02	<	0.003	<	0.003	<				
Site 9			0.062				0.033				0.01	<			0.01				0.01					
Site 9																								
Site 9																								
Site 9																								
Site 9			0.051				0.73				0.01	<			0.13				0.01	<				
Site 9																								
Site 9																								
Site 9			0.049				0.27				0.001	<			0.04				0.001	<				
Site 9			0.023				0.025				0.01	<			0.02				0.01	<				
Site 9			0.024				0.009				0.01	<			0.01	<			0.01	<				
Site 9			0.016				0.061				0.01	<			0.02				0.01	<				
Site 9			0.041				0.22				0.01	<			0.06				0.01	<				
Site 9			0.049				0.5				0.01	<			0.17				0.01	<				
Site 9			0.058				0.66				0.01	<			0.24				0.01	<				
Site 9			0.06				0.96				0.01	<			0.35				0.01	<				
Site 9			0.063				1.5				0.01	<			0.45				0.01	<				
Site 9			0.052				1.2				0.01	<			0.35				0.01	<				
Site 9			0.056				1				0.01	<			0.29				0.01	<				
Site 9			0.066				0.34				0.01	<			0.14				0.01					
Site 9																								
Site 9																								
Site 9																								
Site 9																								
Site 10			0.66				5.6				0.01	<			0.75				0.01	<				
Site 10			0.74				6.4				0.01	<			0.76				0.01	<				
Site 10			0.75				5.6				0.01	<			0.72				0.01	<				
Site 10			0.63				4.5				0.01	<			0.82				0.01	<				
Site 10			0.6				3.9				0.01	<			0.84				0.01	<				
Site 10			0.59				3.9				0.01	<			1.1				0.01	<				
Site 10			0.56				3.3				0.01	<			1				0.01	<				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 10			0.42				2				0.001	<			0.68				0.001	<				
Site 10			0.47				3.8				0.001	<			0.69				0.001	<				
Site 10			0.46				2.4				0.001	<			0.67				0.001	<				
Site 10			0.43				1.7				0.001	<			0.68				0.002					
Site 10			0.35				1.2				0.001	<			0.41				0.002					
Site 10			0.2				0.79				0.001	<			0.23				0.001	<				
Site 10			0.26				0.87				0.001	<			0.27				0.001					
Site 10			0.28				1.1				0.001	<			0.35				0.001	<				
Site 10			0.31				1				0.001	<			0.41				0.001					
Site 10			0.44				1.2				0.001	<			0.67				0.003					
Site 10			0.45				1.6				0.001	<			0.89				0.004					
Site 10			0.41				1.4				0.001	<			0.78				0.006					
Site 10			0.51				3.1				0.001	<			0.7				0.001	<				
Site 10																								
Site 10																								
Site 10																								
Site 10																								
Site 11			0.56				0.91				0.01	<			1.1				0.01	<				
Site 11			0.59				0.87				0.01	<			1.0				0.01	<				
Site 11			0.56				0.83				0.01	<			1.0				0.01	<				
Site 11			0.65				0.89				0.01	<			0.98				0.01	<				
Site 11			0.57				0.88				0.01	<			1.1				0.01	<				
Site 11			0.54				0.83				0.01	<			1				0.01	<				
Site 11			0.59				0.88				0.01	<			1.1				0.01	<				
Site 11			0.58				0.86				0.001	<			1.0				0.001	<				
Site 11			0.58				0.9				0.002	<			0.95				0.002					
Site 11			0.26				0.34				0.001	<			0.37				0.001	<				
Site 11			0.18				0.21				0.001	<			0.26				0.001					
Site 11			0.17				0.2				0.001	<			0.23				0.001	<				
Site 11			0.2				0.28				0.001	<			0.32				0.001	<				
Site 11			0.26				0.37				0.001	<			0.45				0.002					
Site 11			0.27				0.43				0.001	<			0.53				0.002					
Site 11			0.34				0.47				0.001	<			0.54				0.002					
Site 11			0.46				0.67				0.001	<			0.76				0.002					
Site 11			0.67				1.1				0.001	<			1.30				0.002					
Site 11			0.6				0.87				0.001	<			1				0.003					
Site 12			0.52				0.75				0.001	<			0.87				0.002					
Site 12			0.34				0.45				0.001	<			0.56				0.002					
Site 12			0.32				0.43				0.001	<			0.49				0.002					
Site 12			0.41				0.62				0.001	<			0.85				0.002					
Site 12			0.51				0.72				0.001	<			0.83				0.001					
Site 12			0.65				0.93				0.0016				1.1				0.004	<				
Site 13					0.74		0.67						2.08		1.73		0.003	<	0.003	<				
Site 13					0.72		0.7						1.95		1.86		0.003	<	0.003					
Site 13					0.64		0.11						1.55		1.3		0.003	<	0.003	<				
Site 13					0.68		0.72						1.92		1.9		0.003	<	0.003	<				
Site 13			0.39				0.84				0.01	<			1.8				0.01	<				
Site 13			0.42				0.88				0.01	<			1.8				0.01	<				
Site 13			0.43				0.9				0.01	<			2.0				0.01	<				
Site 13			0.52				0.96				0.01	<			2.1				0.01	<				
Site 13			0.47				0.92				0.01	<			2.1				0.01	<				
Site 13			0.48				0.96				0.01	<			2.2				0.01	<				
Site 13			0.47				0.93				0.001	<			2.1				0.003					
Site 13			0.45				0.96				0.001	<			2.1				0.002					
Site 13			0.5				0.92				0.001	<			2.0				0.001	<				
Site 13			0.48				0.95				0.001	<			2.2				0.001	<				
Site 13			0.47				1				0.0014				2.2				0.001					
Site 13			0.47				1				0.001	<			2.1				0.001	<				
Site 13			0.43				0.98				0.001	<			2.2				0.001	<				
Site 13			0.45				1				0.001	<			2.2				0.001	<				
Site 13			0.44				0.92				0.001	<			2.1				0.001	<				
Site 13			0.46				0.92				0.001	<			2.1				0.001	<				
Site 13			0.44				0.91				0.001	<			2.2				0.001	<				
Site 13			0.46				0.88				0.001	<			2.1				0.002					
Site 13			0.45				0.9				0.001	<			2.1				0.001	<				
Site 13			0.47				0.88				0.001	<			2.1				0.001	<				
Site 13			0.43				0.87				0.001	<			1.9				0.001	<				
Site 13			0.43				0.88				0.001	<			2.0				0.001	<				
Site 13			0.41				0.85				0.001	<			2.0				0.001	<				
Site 13			0.42				0.94				0.001	<			2.1				0.001					
Site 14					2.97		2.9						7.66		7.5		0.07		0.003	<				
Site 14					2.86		2.79						6.56		6.56		0.01	<	0.01	<				
Site 14					2.85		2.58						9.43		7.8		0.003	<	0.003	<				
Site 14			1.2				3.4				0.005	<			7.7				0.001					
Site 14			1.2								0.001	<			8.1				0.001	<				
Site 14			1.2				3				0.001	<			7.8				0.001	<				
Site 14			1.2				3.4				0.01	<			7.5				0.01	<				
Site 14			1.3				3.3				0.001	<			7.2				0.001	<				
Site 14			1.2				2.9				0.002				8.1				0.001	<				
Site 14			1.2				3.4				0.001				8.7				0.001	<				
Site 14			1.2				3.2				0.002	<			7.3				0.001	<				
Site 14			1.2				3.4				0.002				7.6				0.001	<				
Site 14			1.2				3.4				0.002	<			7.3				0.001	<				
Site 14			1.2				3.4				0.0026				7.9				0.001	<				
Site 14			1.3				3.5				0.002	<			8.0				0.001	<				
Site 14			1.2				3.3				0.0024				7.3				0.001	<				
Site 14			1.1				3.5				0.0013				7.8				0.001	<				
Site 14			1.5				2.9				0.0011				7.6				0.001	<				
Site 14			1.1				3.3				0.0022				7.4				0.001	<				
Site 14			1.2				3.4				0.0016				7.6				0.001	<				
Site 14			1.2				3.9				0.002				8.7				0.001	<				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 14			1.1				3.6				0.0025				8.2				0.001	<				
Site 14			1.2				3.6				0.001	<			8.0				0.001	<				
Site 14			1.2				3.7				0.002				8.3				0.001	<				
Site 14			1.2				3.6				0.001	<			8.1				0.001	<				
Site 14			1.2				3.4				0.0019				8				0.001	<				
Site 14			1.2				3.4				0.003				7.6				0.001	<				
Site 14			1.3				3.4				0.0014				7.9				0.008	<				
Site 15					0.084		0.019						0.02	<	0.02	<	0.003	<	0.003	<				
Site 15			0.035				0.004				0.0015				0.01	<			0.001	<				
Site 15			0.043				0.002				0.01	<			0.01	<			0.01					
Site 15			0.054				0.001	<			0.01	<			0.01	<			0.01	<				
Site 15			0.11				0.005				0.01	<			0.01	<			0.01	<				
Site 15																								
Site 15																								
Site 16					1.5		1.49						2.77		2.88		0.003	<	0.003	<				
Site 16					1.23		1.17						2.96		2		0.003	<	0.003	<				
Site 16			0.39				1.3				0.01	<			2.6				0.01	<				
Site 16			0.37				1.3				0.01	<			2.4				0.01	<				
Site 16			0.36				1.2				0.01	<			2.3				0.01	<				
Site 16			0.33				1.1				0.01	<			2.2				0.01	<				
Site 16																								
Site 16																								
Site 16																								
Site 16																								
Site 16																								
Site 16																								
Site 16			0.33				1.1				0.001	<			2.1				0.001	<				
Site 16			0.4				1.4				0.001	<			2.5				0.001	<				
Site 16			0.38				1.4				0.001	<			2.6				0.001	<				
Site 16			0.4				1.4				0.001	<			2.6				0.001	<				
Site 16			0.38				1.4				0.001	<			2.5				0.001	<				
Site 16			0.37				1.3				0.001				2.5				0.001	<				
Site 16			0.37				1.3				0.001	<			2.3				0.001	<				
Site 16			0.35				1.3				0.001	<			2.4				0.001	<				
Site 16			0.31				1.2				0.001	<			2.3				0.001	<				
Site 16			0.35				1.2				0.001	<			2.2				0.001	<				
Site 16			0.36				1.2				0.002				2.2				0.001	<				
Site 16			0.38				1.3				0.001	<			2.3				0.001	<				
Site 16			0.36				1.4				0.001	<			2.5				0.001	<				
Site 16			0.37				1.3				0.001	<			2.3				0.001	<				
Site 16			0.36				1.2				0.001				2.2				0.002	<				
Site 17					1.34		1.24						0.81		0.72		0.003	<	0.003	<				
Site 17					1.3		1.21						0.74		0.73		0.003	<	0.004					
Site 17					1.28		1.25						0.78		0.5		0.003	<	0.003	<				
Site 17					1.46		1.48						0.88		0.8		0.003		0.003	<				
Site 17			0.34				1.4				0.01	<			0.82				0.01	<				
Site 17			0.34				1.4				0.01	<			0.81				0.01	<				
Site 17			0.34				1.4				0.01	<			0.79				0.01	<				
Site 17			0.32				1.4				0.01	<			0.75				0.01	<				
Site 17			0.37				1.5				0.01	<			0.79				0.01	<				
Site 17			0.32				1.3				0.01	<			0.78				0.01	<				
Site 17			0.35				1.4				0.01	<			0.81				0.01	<				
Site 17			0.35				1.5				0.001	<			0.76				0.002					
Site 17			0.34				1.5				0.001	<			0.80				0.003					
Site 17			0.43				1.9				0.001	<			0.85				0.002					
Site 17			0.59				2.2				0.001	<			0.95				0.001	<				
Site 17			0.55				2				0.001	<			0.87				0.004					
Site 17			0.31				1.2				0.001	<			0.65				0.003					
Site 17			0.34				1.2				0.001	<			0.65				0.002					
Site 17			0.27				1.1				0.001	<			0.64				0.002					
Site 17			0.3				1.2				0.001	<			0.63				0.002					
Site 17			0.32				1.3				0.001	<			0.74				0.001					
Site 17			0.31				1.3				0.001	<			0.81				0.001					
Site 17			0.3				1.3				0.001	<			0.81				0.003					
Site 17			0.35				1.5				0.001	<			0.93				0.001					
Site 17			0.32				1.4				0.001	<			0.80				0.003					
Site 17			0.38				1.6				0.001	<			0.79				0.002					
Site 17			0.29				1.4				0.001	<			0.80				0.002					
Site 17			0.31				1.2				0.001	<			0.68				0.004					
Site 17			0.29				1.2				0.001				0.77				0.003					
Site 18					3.97		4.16						0.73		0.8		0.003	<	0.003	<				
Site 18					2.05		2.04						0.76		0.72		0.003	<	0.003	<				
Site 18					3.12		0.48						0.81		0.8		0.003	<	0.003	<				
Site 18			0.55				6				0.01	<			0.68				0.01	<				
Site 18			0.59				6.1				0.01	<			0.71				0.01	<				
Site 18			0.53				4.8				0.01	<			0.87				0.01	<				
Site 18			0.37				3.2				0.01	<			0.69				0.01	<				
Site 18			0.38				3				0.01	<			0.73				0.01	<				
Site 18																								
Site 18			0.43				5.3				0.01	<			0.65				0.01	<				
Site 18			0.22				3.2				0.001	<			0.36				0.001	<				
Site 18			0.26				2				0.001				0.48				0.001	<				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 18			0.25				1.6				0.001	<			0.49				0.001	<				
Site 18			0.4				2.6				0.0011				0.73				0.001					
Site 18			0.45				2.3				0.001	<			0.65				0.001	<				
Site 18			0.35				2.1				0.001	<			0.60				0.001	<				
Site 18			0.44				2.5				0.001	<			0.65				0.001	<				
Site 18			0.37				2				0.001	<			0.62				0.001	<				
Site 18			0.33				1.8				0.001	<			0.65				0.001	<				
Site 18			0.34				2.1				0.001	<			0.70				0.001	<				
Site 18			0.31				1.7				0.001	<			0.74				0.001	<				
Site 18			0.12				0.74				0.001	<			0.30				0.001	<				
Site 18			0.32				1.7				0.001	<			0.80				0.001	<				
Site 18			0.39				2.5				0.001	<			0.87				0.001	<				
Site 18			0.38				2.2				0.001	<			0.85				0.001	<				
Site 18			0.41				3.5				0.001	<			0.93				0.001	<				
Site 18			0.64				4.7				0.002	<			1.00				0.001	<				
Site 18			0.65				4.9				0.001	<			0.93				0.004	<				
Site 19					1.06		1.06						1.51		1.52		0.003	<	0.003	<				
Site 19					1.08		1.07						1.4		1.39		0.006		0.003	<				
Site 19					1.09		0.62						2.44		1.6		0.003	<	0.003	<				
Site 19					1.06		1.06						1.43		1.39		0.003	<	0.003	<				
Site 19			0.38				1.2				0.03	<			1.60				0.01	<				
Site 19			0.44				1.3				0.03	<			1.60				0.01	<				
Site 19			0.44				1.3				0.03	<			1.50				0.01	<				
Site 19			0.43				1.3				0.03	<			1.60				0.01	<				
Site 19			0.47				1.3				0.03	<			1.60				0.01	<				
Site 19			0.42				1.2				0.03	<			1.60				0.01	<				
Site 19			0.44				1.2				0.03	<			1.50				0.01	<				
Site 19			0.43				1.2				0.0098				1.40				0.001	<				
Site 19			0.44				1.2				0.012				1.50				0.001	<				
Site 19			0.45				1.2				0.012				1.50				0.001	<				
Site 19			0.43				1.2				0.012				1.60				0.001	<				
Site 19			0.42				1.2				0.009				1.60				0.002					
Site 19			0.4				1.3				0.0098				1.50				0.002					
Site 19			0.41				1.3				0.011				1.60				0.001	<				
Site 19			0.41				1.3				0.011				1.50				0.001	<				
Site 19			0.41				1.2				0.01				1.50				0.001					
Site 19			0.43				1.2				0.01				1.50				0.001	<				
Site 19			0.42				1.3				0.01				1.60				0.001	<				
Site 19			0.4				1.2				0.0095				1.50				0.001	<				
Site 19			0.42				1.2				0.012				1.50				0.002					
Site 19			0.42				1.2				0.012				1.50				0.002					
Site 19			0.38				1.2				0.0085				1.50				0.001	<				
Site 19			0.39				1.3				0.012				1.60				0.001					
Site 19			0.39				1.2				0.01				1.40				0.001	<				
Site 19			0.39				1.2				0.011				1.50				0.002	<				
Site 20					8.62		8.51						4.99		4.74		0.02		0.003	<				
Site 20					8.51		8.35						4.87		4.72		0.015		0.003	<				
Site 20					7.3		7.2						4.21		4.16		0.01	<	0.01	<				
Site 20					6.3		3.74						6.98		6.6		0.003	<	0.003	<				
Site 20					8.03		8						4.8		4.83		0.003	<	0.003	<				
Site 20					7.92		7.89						4.81		4.62		0.003	<	0.003	<				
Site 20			0.9				7.8				0.005	<			4.90				0.001					
Site 20			0.91				7.7				0.001	<			5.00				0.001	<				
Site 20			0.97				7.1				0.001				4.70				0.001	<				
Site 20			0.93				8.7				0.01	<			4.40				0.01	<				
Site 20			0.93				8				0.001	<			4.60				0.001	<				
Site 20			1				7.1				0.004				4.30				0.001	<				
Site 20			0.94				8.5				0.003				5.10				0.001	<				
Site 20			1.4				11				0.0051				5.50				0.001	<				
Site 20			1.1				9.9				0.0059				5.20				0.001	<				
Site 20			1.1				9.4				0.002	<			4.80				0.001	<				
Site 20			1				8.2				0.0045				4.70				0.001	<				
Site 20			1				8.8				0.004	<			5.00				0.001	<				
Site 20			1.1				12				0.0026				5.00				0.001	<				
Site 20			1				11				0.002				5.10				0.001	<				
Site 20			1.4				8.2				0.0038				4.90				0.001	<				
Site 20			0.95				8.2				0.004				4.40				0.001	<				
Site 20			0.92				7.9				0.0035				4.30				0.001	<				
Site 20			0.9				8				0.001				4.50				0.001	<				
Site 20			0.88				8				0.004				4.70				0.001	<				
Site 20			0.91				8.3				0.003				4.40				0.001	<				
Site 20			1.1				10				0.0028				5.10				0.001	<				
Site 20			0.99				9.6				0.0035				5.00				0.001	<				
Site 20			0.89				7.6				0.001	<			4.40				0.001	<				
Site 20			0.97				7.5				0.0038				4.30				0.001	<				
Site 20			0.99				7.8				0.0048				4.80				0.004	<				
Site 21					1.18		1.14						1.55		1.46		0.003	<	0.004					
Site 21					1.23		1.15						1.48		1.42		0.003	<	0.003	<				
Site 21					0.6		0.6						1.05		1		0.003	<	0.003	<				
Site 21					1.03		1.05						1.26		1.3		0.003	<	0.003	<				
Site 21			0.39				1.7				0.01				1.30				0.01	<				
Site 21			0.43				1.6				0.01	<			1.30				0.01	<				
Site 21			0.41				1.5				0.01	<			1.30				0.01	<				
Site 21			0.48				1.5				0.01	<			1.30				0.01	<				
Site 21			0.44				1.9				0.01	<			1.40				0.01	<				
Site 21			0.38				1.7				0.01	<			1.30				0.01	<				
Site 21			0.4				2.1				0.01	<			1.30				0.01	<				
Site 21			0.4				1.9				0.001	<			1.30				0.002					
Site 21			0.4				1.6				0.001	<			1.20				0.002					

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 21			0.047				0.068				0.0018				0.02				0.001	<				
Site 21			0.054				0.056				0.0015				0.03				0.001	<				
Site 21			0.082				0.16				0.0012				0.06				0.001	<				
Site 21			0.12				0.085				0.001	<			0.02				0.001	<				
Site 21			0.24				1				0.001	<			0.76				0.001	<				
Site 21			0.39				1.5				0.001	<			1.50				0.002					
Site 21			0.42				1.5				0.001	<			1.40				0.002					
Site 21			0.43				1.5				0.001	<			1.50				0.001	<				
Site 21			0.41				1.6				0.001	<			1.60				0.001					
Site 21			0.44				1.5				0.001	<			1.60				0.002					
Site 21			0.42				1.6				0.001	<			1.50				0.001					
Site 21			0.44				1.4				0.001				1.40				0.002					
Site 21			0.42				1.4				0.001	<			1.40				0.002					
Site 21			0.44				1.4				0.001	<			1.40				0.002					
Site 21			0.46				1.3				0.001	<			1.40				0.002					
Site 21			0.45				1.5				0.001	<			1.60				0.002					
Site 22					0.86		0.86						0.43		0.49		0.003	<	0.003	<				
Site 22					0.66		0.64						0.42		0.39		0.003	<	0.003	<				
Site 22					0.93		0.66						0.6		0.58		0.003	<	0.003	<				
Site 22					0.95		0.68						0.63		0.54		0.003	<	0.003	<				
Site 22					0.74		0.71						0.44		0.42		0.003	<	0.003	<				
Site 22			0.14				0.6				0.01				0.36				0.01					
Site 22			0.14				0.59				0.01				0.35				0.01					
Site 22			0.14				0.6				0.01				0.36				0.01					
Site 22			0.14				0.58				0.01				0.36				0.01					
Site 22			0.15				0.63				0.01				0.38				0.01					
Site 22			0.15				0.61				0.01				0.38				0.01					
Site 22			0.15				0.63				0.01				0.40				0.01					
Site 22			0.16				0.6				0.001				0.36				0.001					
Site 22			0.16				0.62				0.001				0.37				0.001					
Site 22			0.16				0.65				0.001				0.40				0.001					
Site 22			0.16				0.66				0.001				0.45				0.001					
Site 22			0.16				0.93				0.001				0.60				0.001					
Site 22			0.13				0.65				0.001				0.38				0.001					
Site 22			0.12				0.57				0.001				0.33				0.001					
Site 22			0.11				0.53				0.002				0.29				0.001					
Site 22			0.12				0.52				0.001				0.31				0.001					
Site 22			0.12				0.5				0.001				0.28				0.001					
Site 22			0.11				0.51				0.001				0.29				0.001					
Site 22			0.12				0.5				0.001				0.29				0.001					
Site 22			0.13				0.5				0.001				0.28				0.001					
Site 22			0.11				0.48				0.0016				0.28				0.001					
Site 22			0.13				0.5				0.001				0.29				0.002					
Site 22			0.12				0.5				0.001				0.29				0.001					
Site 22			0.13				0.48				0.001				0.28				0.001					
Site 22			0.13				0.52				0.001				0.3				0.001					
Site 23					0.033		0.005	<					0.02	<	0.02	<	0.003	<	0.003	<				
Site 23					0.005	<	0.006						0.02	<	0.02	<	0.003	<	0.003	<				
Site 23					0.005	<	0.005	<					0.02		0.02	<	0.003	<	0.003	<				
Site 23					0.008		0.006						0.05	<	0.05	<	0.003	<	0.003	<				
Site 23			0.033				0.001				0.01				0.01				0.01					
Site 23			0.035				0.001				0.01				0.01				0.01					
Site 23			0.037				0.001				0.01				0.01				0.01					
Site 23			0.033				0.001				0.01				0.01				0.01					
Site 23			0.034				0.001				0.01				0.01				0.01					
Site 23			0.035				0.001				0.02				0.01				0.01					
Site 23			0.036				0.001				0.01				0.01				0.01					
Site 23			0.033				0.001				0.0022				0.01				0.001					
Site 23			0.032				0.001				0.0017				0.01				0.001					
Site 23			0.035				0.004				0.0018				0.01				0.001					
Site 23			0.038				0.001				0.01				0.01				0.01					
Site 23			0.039				0.001								0.01									
Site 23			0.037				0.003				0.01				0.01				0.01					
Site 23			0.036				0.001				0.02				0.01				0.01					
Site 23			0.037				0.003				0.01				0.01				0.01					
Site 23			0.037				0.002				0.01				0.01				0.01					
Site 23			0.037				0.001								0.01									
Site 23			0.035				0.001				0.02				0.01				0.01					
Site 23			0.034				0.001				0.01				0.01				0.01					
Site 23			0.033				0.001				0.01				0.02				0.01					
Site 23			0.034				0.001				0.01				0.01				0.01					
Site 23			0.037				0.001				0.01				0.01				0.02					
Site 23			0.036				0.001				0.01				0.01				0.01					
Site 23			0.033				0.001				0.01				0.01				0.03					
Site 23			0.034				0.005				0.01				0.01				0.01					
Site 24					0.86		0.79						0.93		0.81		0.003	<	0.003	<				
Site 24					0.83		0.83						0.91		0.91		0.003	<	0.003	<				
Site 24					1.29		0.7						0.88		0.54		0.003	<	0.003	<				
Site 24					0.79		0.78						0.82		0.8		0.003	<	0.003	<				
Site 24			0.36				0.98				0.01	<			1.1				0.01	<				
Site 24			0.38				0.97				0.01	<			0.98				0.01	<				
Site 24			0.38				0.99				0.01	<			1.1				0.01	<				
Site 24			0.36				0.97				0.01	<			1				0.01	<				
Site 24			0.39				1				0.01	<			1.1				0.01	<				
Site 24			0.37				0.97				0.01	<			0.98				0.01	<				
Site 24			0.38				1				0.01	<			1.1				0.01	<				
Site 24			0.37				0.97				0.0012				1				0.001	<				
Site 24			0.38				0.95				0.001	<			0.96				0.001	<				
Site 24			0.37				0.98				0.001	<			1				0.001	<				
Site 24			0.38				0.97				0.001	<			1				0.001	<				
Site 24			0.38				0.96				0.001	<			0.98				0.001	<				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 24			0.36				0.94				0.001	<			0.89				0.001	<				
Site 24			0.36				0.89				0.001	<			0.92				0.001	<				
Site 24			0.34				0.84				0.001	<			0.91				0.001	<				
Site 24			0.36				0.89				0.001	<			0.88				0.001	<				
Site 24			0.37				0.92				0.001	<			0.94				0.001	<				
Site 24			0.32				0.97				0.001				0.98				0.001	<				
Site 24			0.37				0.94				0.001	<			0.97				0.001	<				
Site 24			0.37				0.94				0.001	<			0.97				0.001	<				
Site 24			0.38				0.91				0.001	<			0.97				0.001	<				
Site 24			0.36				0.91				0.001	<			0.96				0.001	<				
Site 24			0.36				0.93				0.001	<			0.97				0.001	<				
Site 24			0.37				0.86				0.001	<			0.9				0.001	<				
Site 24			0.36				0.9				0.001	<			0.93				0.001	<				
Site 25					1.2		1.19						1.91		1.76		0.003	<	0.003	<				
Site 25					1.06		1.03						1.78		1.76		0.003	<	0.003	<				
Site 25					1.09		1.12						1.88		1.83		0.003	<	0.003	<				
Site 25					1.09		0.82						1.89		1.2		0.003	<	0.003	<				
Site 25					1.2		1.18						1.86		1.92		0.003	<	0.003	<				
Site 25			0.39				1.4				0.01	<			2.2				0.01	<				
Site 25			0.42				1.5				0.01	<			2.2				0.01	<				
Site 25			0.42				1.5				0.01	<			2.2				0.01	<				
Site 25			0.4				1.5				0.01	<			2.3				0.01	<				
Site 25			0.47				1.6				0.01	<			2.3				0.01	<				
Site 25			0.44				1.5				0.01	<			2.2				0.01	<				
Site 25			0.45				1.6				0.01	<			2.4				0.01	<				
Site 25			0.45				1.5				0.0013				2.1				0.001	<				
Site 25			0.45				1.5				0.001	<			2.1				0.001	<				
Site 25			0.46				1.6				0.001	<			2.1				0.001	<				
Site 25			0.46				1.5				0.001	<			2.1				0.001	<				
Site 25			0.46				1.6				0.001	<			2.2				0.001					
Site 25			0.39				1.3				0.001	<			1.7				0.001					
Site 25			0.35				1.1				0.001	<			1.6				0.001	<				
Site 25			0.33				1.1				0.001	<			1.6				0.001	<				
Site 25			0.36				1.2				0.001	<			1.7				0.002					
Site 25			0.39				1.3				0.001	<			1.9				0.001	<				
Site 25			0.39				1.4				0.001	<			2.1				0.001					
Site 25			0.41				1.5				0.001	<			2.3				0.001	<				
Site 25			0.42				1.5				0.001	<			2.2				0.001					
Site 25			0.49				1.7				0.0015				2.5				0.002					
Site 25			0.42				1.5				0.001	<			2.2				0.001					
Site 25			0.38				1.7				0.001	<			2.4				0.001					
Site 25			0.44				1.5				0.001	<			2.1				0.001	<				
Site 25			0.45				1.6				0.001	<			2.2				0.002	<				
Site 26					1.11		1.08						0.97		0.83		0.003	<	0.003	<				
Site 26					1.01		1.01						0.87		0.87		0.003	<	0.003	<				
Site 26					1.9		1.01						0.87		0.6		0.003	<	0.003	<				
Site 26					0.82		0.81						0.79		0.82		0.003	<	0.003	<				
Site 26			0.42				1.3				0.01	<			1.1				0.01	<				
Site 26			0.37				1.1				0.01	<			1				0.01	<				
Site 26			0.41				1.1				0.01	<			1.1				0.01	<				
Site 26																								
Site 26			0.37				1.1				0.01	<			1				0.0100	<				
Site 26			0.32				0.89				0.001	<			0.81				0.001	<				
Site 26			0.38				0.97				0.001	<			0.95				0.001	<				
Site 26			0.36				0.94				0.001	<			0.83				0.001	<				
Site 26			0.37				1				0.001	<			0.93				0.001	<				
Site 26			0.37				1				0.001	<			0.87				0.001	<				
Site 26			0.36				1.1				0.001	<			0.86				0.001	<				
Site 26			0.3				1.5				0.001	<			0.40				0.001	<				
Site 26			0.38				1.3				0.001	<			0.87				0.001	<				
Site 26			0.37				0.99				0.001	<			0.86				0.001	<				
Site 26			0.38				0.93				0.001	<			0.89				0.001	<				
Site 26			0.28				1				0.001	<			0.71				0.001	<				
Site 26			0.29				0.96				0.001	<			0.67				0.001	<				
Site 26			0.29				0.67				0.001	<			0.57				0.001	<				
Site 26			0.11				0.38				0.001	<			0.23				0.001					
Site 26			0.35				1.1				0.001	<			0.61				0.001	<				
Site 26																								
Site 26																								
Site 26																								
Site 27					0.007		0.008						0.04		0.02	<	0.003	<	0.003	<				
Site 27					0.005	<	0.005						0.06		0.06		0.003	<	0.003	<				
Site 27					0.009		0.005	<					0.04		0.02	<	0.003	<	0.003	<				
Site 27					0.018		0.016						0.08		0.07		0.003	<	0.003	<				
Site 27			0.095				0.005				0.01	<			0.01	<			0.01	<				
Site 27			0.094				0.003				0.01	<			0.02				0.01	<				
Site 27			0.092				0.004				0.01	<			0.02				0.01	<				
Site 27			0.089				0.013				0.01	<			0.01				0.01	<				
Site 27			0.092				0.032				0.01	<			0.03				0.01	<				
Site 27			0.094				0.032				0.01	<			0.03				0.01	<				
Site 27			0.094				0.03				0.01	<			0.02				0.01	<				
Site 27			0.089				0.023				0.001	<			0.02				0.001	<				
Site 27			0.086				0.017				0.001	<			0.02				0.001	<				
Site 27			0.094				0.032				0.001	<			0.01	<			0.001	<				
Site 27			0.089				0.007				0.01	<			0.01				0.01	<				
Site 27			0.077				0.004				0.01	<			0.01	<			0.01	<				
Site 27			0.067				0.002				0.01	<			0.01	<			0.01					
Site 27			0.097				0.17				0.01				0.1				0.02					
Site 27			0.094				0.11				0.01	<			0.1				0.01	<				
Site 27			0.095				0.099				0.01	<			0.06				0.01					
Site 27			0.088				0.071				0.01	<			0.05				0.01	<				

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
Site 27			0.088				0.064				0.01	<			0.05				0.01	<				
Site 27			0.09				0.087				0.01	<			0.04				0.02					
Site 27			0.092				0.078				0.01	<			0.05				0.02					
Site 27			0.093				0.048				0.01	<			0.05				0.01	<				
Site 27			0.092				0.061				0.03	<			0.04				0.04					
Site 27			0.091				0.041				0.01	<			0.04				0.01	<				
Site 27			0.084				0.023				0.01	<			0.04				0.01	<				
Site 27			0.086				0.025				0.01	<			0.06				0.01	<				
Site 28					0.006		0.006						0.02	<	0.02	<	0.003	<	0.003	<				
Site 28					0.005		0.005	<					0.02	<	0.02	<	0.003	<	0.003	<				
Site 28					0.018		0.011						0.02	<	0.02	<	0.009		0.003	<				
Site 28					0.005	<	0.005	<					0.05	<	0.05	<	0.003	<	0.003	<				
Site 29					0.007		0.011						0.04		0.02	<	0.003	<	0.003	<				
Site 29					0.027		0.028						0.02	<	0.02	<	0.003	<	0.003	<				
Site 29					0.039		0.026						0.02	<	0.02	<	0.004		0.003	<				
Site 29					0.044		0.048						0.06		0.05	<	0.003	<	0.003	<				
200615			0.684				0.963				0.010	<			0.974				0.020	<			0.020	<
200615			0.659				0.988				0.100	<			1.080				0.020	<			0.020	<
200615			0.547				0.703				0.050	<			0.819				0.020	<			0.020	<
200615			0.415				0.531				0.100	<			0.356				0.020	<			0.020	<
200615			0.488				0.65				0.100	<			0.778				0.010	<			0.010	<
200615			0.589				0.833				0.050	<			0.344				0.020	<			0.020	<
200615			0.640				0.888				0.100	<			1.074				0.020	<			0.020	<
200615			0.667				0.902				0.100	<			0.539				0.020	<			0.020	<
200615			0.714				1.03				0.100	<			0.556				0.020	<			0.020	<
200615			0.436				0.528				0.100	<			0.399				0.020	<			0.020	<
200615			0.967				1.52				0.100	<			0.781				0.020	<			0.020	<
200615			0.692				0.959				0.100	<			0.589				0.020	<			0.020	<
200615			0.796				1.08				0.100	<			0.588				0.020	<			0.020	<
200615			0.751				1.02				0.100	<			0.600				0.020	<			0.020	<
200616			0.208				0.403				0.010	<			0.618				0.010	<			0.010	<
200616			0.219				0.5				0.010	<			0.777				0.020	<			0.020	<
200616			0.192				0.363				0.050	<			0.398				0.010	<			0.010	<
200616			0.190				0.375				0.050	<			0.416				0.010	<			0.010	<
200616			0.206				0.426				0.010	<			0.450				0.010	<			0.010	<
200616			0.210				0.426				0.010	<			0.438				0.010	<			0.010	<
200616			0.212				0.435				0.010	<			0.485				0.010	<			0.010	<
200616			0.217				0.412				0.010	<			0.454				0.010	<			0.010	<
200616			0.217				0.411				0.010	<			0.430				0.010	<			0.010	<
200616			0.198				0.406				0.010	<			0.456				0.010	<			0.010	<
200616			0.210				0.406				0.010	<			0.452				0.010	<			0.010	<
200616			0.218				0.428				0.010	<			0.487				0.010	<			0.010	<
200616			0.216				0.433				0.010	<			0.760				0.010	<			0.010	<
200616			0.212				0.44				0.010	<			0.445				0.010	<			0.010	<
200616			0.207				0.395				0.010	<			0.473				0.010	<			0.010	<
205508			0.011				0.005				0.010	<			0.002	<			0.002	<			0.002	<
205836			0.00814				0.095				0.010	<			0.002	<			0.002	<			0.002	<
205838			0.0107				0.003				0.010	<			0.002	<			0.002	<			0.002	<
205838													0.00264		0.002	<	0.002	<	0.002	<	0.002	<	0.002	<
205839	0.0108		0.0104				0.006		0.01	<	0.01	<	0.00298		0.002	<	0.002	<	0.002	<	0.002	<	0.002	<
214387																								
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214911			0.0852				0.375				0.01	<			0.0745				0.002	<			0.002	<
214913			0.0349				0.074				0.01	<			0.0771				0.002	<			0.002	<
214914			0.495				1.23				0.100	<			1.377				0.020	<			0.020	<
214915			0.701				1.07				0.050	<			2.975				0.010	<			0.010	<
214916			0.035				0.075				0.01	<			0.0615				0.002	<			0.002	<
BCAMD													1.07				0.0011		0.002		0.00025	<		
BCAMD													1.06				0.0013		0.0011		0.00025	<		
CTWDC02													0.128				0.0002		0.00005	<	0.00025	<		
CTWDC02													0.638				0.0016		0.0001	J	0.00025	<		
CTWDC03													0.0196				0.0002		0.00005	<	0.00025	<		
CTWDC03													0.0536				0.0172		0.0001	J	0.00029	J		
CTWDC03A													1.36				0.0003		0.0001	J	0.00025	<		
CTWDC03A													2.42				0.0014		0.0003		0.00025	<		
CTWDC04													0.0012				0.0003		0.0002		0.00025	<		
CTWDC04													0.0034				0.0014		0.00005	<	0.00046	J		
LBLTC03													0.0013				0.0038		0.0001	J	0.00025	<		
LBLTC03													0.0045				0.0006		0.0001	J	0.00025	<		
LBLTC03A													0.0006				0.0031		0.00011		0.00025	<		
LBLTC03A													0.005				0.0004		0.00005	<	0.00025	<		

Station_ID	Li_T_mgL	Li_T_Q	Li_D_mgL	Li_D_Q	Mn_T_mgL	Mn_T_Q	Mn_D_mgL	Mn_D_Q	Mo_T_mgL	Mo_T_Q	Mo_D_mgL	Mo_D_Q	Ni_T_mgL	Ni_T_Q	Ni_D_mgL	Ni_D_Q	Pb_T_mgL	Pb_T_Q	Pb_D_mgL	Pb_D_Q	Sb_T_mgL	Sb_T_Q	Sb_D_mgL	Sb_D_Q
NO5CL01													0.0038				0.0001		0.000052	J	0.00025	<		
NO5CL02													0.0298				0.00005	<	0.00005	<	0.00025	<		
NO5CL02													0.05				0.00005	<	0.00005	<	0.00025	<		
SNDCC01													0.0215				0.0005		0.0021	J	0.00025	<		
SNDCC01													0.0105	J			0.0001	J	0.00005	<	0.00025	<		
SNDCC02													0.0088				0.0001	J	0.000067	J	0.00025	<		
SNDCC03													0.0024				0.0004		0.00005	<	0.00025	<		
SNDCC04													0.0044				0.002		0.00006	J	0.00025	<		
SNDCL02													2.4				0.0008		0.0018		0.00025	<		
SNDCL02													6.39				0.0008		0.0012		0.00050	<		
					8.70								8.31				0.01				0.005	<		
rom Montana I																								
rd: January 19																								
MAXIM 12/16/1																								
able metals inc																								
Dissolved Soli																								

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 1																					0.2	<	0.2	<	0.03		0.01	<				
Site 1			0.001	<			0.64																0.006	<			0.003	<				
Site 1																																
Site 1																																
Site 1																																
Site 1																																
Site 1																																
Site 1																																
Site 1																																
Site 1			0.001	<			0.3																0.006	<			0.008					
Site 1																																
Site 1			0.001	<			0.4																0.006	<			0.003	<				
Site 1							0.33																0.006				0.003	<				
Site 1							0.69																0.006	<			0.003					
Site 1							0.72																0.006	<			0.004					
Site 1							0.68																0.006	<			0.004					
Site 1							0.63																0.006	<			0.005					
Site 1																																
Site 1																																
Site 1																																
Site 1																																
Site 1																																
Site 1							0.49																0.006	<			0.004					
Site 1							0.69																0.006	<			0.003	<				
Site 1																																
Site 1																																
Site 2																					0.2	<	0.2	<	0.03		0.01	<				
Site 2			0.001	<			0.36																0.006	<			0.008					
Site 2																																
Site 2																																
Site 2																																
Site 2																																
Site 2																																
Site 2																																
Site 2																																
Site 2																																
Site 2			0.001	<			0.3																0.006	<			0.012					
Site 2																																
Site 2			0.001	<			0.38																0.006	<			0.21					
Site 2			0.001	<			0.38																0.006	<			0.53					
Site 2																																
Site 2							0.44																0.006	<			3.7					
Site 2							0.45																0.006	<			4.4					
Site 2							0.48																0.006	<			4.8					
Site 2							0.37																0.006	<			0.068					
Site 2																																
Site 2																																
Site 2																																
Site 2							0.45																0.006	<			0.022					
Site 2							0.44																0.006	<			0.012					
Site 2							0.44																0.006	<			0.007					
Site 2																																
Site 2																																
Site 3																					0.2	<	0.2	<	0.94		0.8					
Site 3																					0.2	<	0.2	<	0.89		0.91					
Site 3																					0.2	<	0.2	<	0.57		0.55					
Site 3																					0.2	<	0.2	<	0.84		0.82					
Site 3			0.001	<			0.37																0.006	<			1.1					
Site 3							0.39																0.012				1.3					
Site 3			0.001	<			0.38																0.01				1.4					
Site 3			0.001	<			0.36																0.009				1.2					
Site 3			0.001	<			0.38																0.009				1.4					
Site 3			0.001	<			0.37																0.009				1.3					
Site 3			0.001	<			0.39																0.008				1.2					
Site 3			0.001	<			0.38																0.006	<			1					
Site 3			0.001	<			0.38																0.006	<			1					
Site 3			0.001	<			0.38																0.006	<			0.9					
Site 3																																
Site 3			0.001				0.29																0.006	<			0.03					
Site 3																																
Site 3			0.001	<			0.32																0.006	<			0.05					
Site 3							0.3																0.006	<			0.06					
Site 3							0.33																0.006	<			0.38					
Site 3							0.34																0.006	<			0.75					
Site 3							0.37																0.006	<			1.1					
Site 3							0.39																0.006	<			1.5					
Site 3																																
Site 3							0.43																0.006	<			1.9					
Site 3																																
Site 3							0.39																0.006	<			1.7					
Site 3							0.4																0.006	<			1.5					
Site 3							0.38																0.006	<			1.2					
Site 3							0.38																0.006	<			0.75					
Site 3							0.36																0.006	<			1					
Site 3							0.36																0.006	<			1.1					
Site 3							0.37																0.006	<			1.1					
Site 4																					0.2	<	0.2	<	6.3		3.75					
Site 4			0.002	<			1.3																0.07				11					
Site 4			0.005	<			1.3																0.13				11					
Site 4			0.005	<			1.4																0.097				12					
Site 4			0.002	<			1.2																0.12				12					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 4																																
Site 4																																
Site 4																																
Site 4																																
Site 4																																
Site 4			0.001	<			1.1																0.006	<			8.6					
Site 4																																
Site 4			0.001				0.53																0.006	<			0.42					
Site 4			0.001	<			0.73																0.006	<			3					
Site 4							0.78																0.018	<			4.8					
Site 4																																
Site 4							1.3																0.1				12					
Site 4							1.3																0.06				14					
Site 4							1.3																0.057				13					
Site 4																																
Site 4																																
Site 4																																
Site 4																																
Site 4							0.93																0.024	<			4.8					
Site 4							0.95																0.048	<			6.8					
Site 4																																
Site 4																																
Site 5																					0.2	<	0.2	<	3.86		3.55					
Site 5																					0.2	<	0.2	<	3.65		3.4					
Site 5																					0.2	<	0.2	<	3.09		1.9					
Site 5																					0.2	<	0.2	<	3.7		3.7					
Site 5			0.001	<			1.6																0.06	<			3.8					
Site 5			0.005	<			1.6																0.06	<			3.5					
Site 5			0.001	<			1.6																0.06	<			3.5					
Site 5			0.001	<			1.6																0.06	<			3.6					
Site 5			0.001	<			1.6																0.06	<			3.6					
Site 5			0.001	<			1.5																0.06	<			3.5					
Site 5			0.001	<			1.7																0.06	<			3.6					
Site 5			0.001	<			1.5																0.025				3.4					
Site 5			0.001	<			1.6																0.022				3.4					
Site 5			0.001	<			1.4																0.02				3.1					
Site 5			0.001	<			1.4																0.019				3.3					
Site 5			0.002	<			1.5																0.018	<			3.2					
Site 5							1.4																0.022				3.3					
Site 5							1.4																0.023				3.3					
Site 5							1.4																0.023				3.5					
Site 5							1.5																0.018	<			3.6					
Site 5							1.6																0.022				3.6					
Site 5							1.6																0.018	<			3.7					
Site 5							1.6																0.023				3.5					
Site 5							1.5																0.022				3.5					
Site 5							1.5																0.024				3.1					
Site 5																																
Site 5							1.5																0.024				3.3					
Site 5							1.6																0.018	<			3.7					
Site 5							1.6																0.018	<			3.4					
Site 5							1.6																0.018	<			3.3					
Site 6																					0.2	<	0.2	<	0.9		0.79					
Site 6																					0.2	<	0.2	<	0.77		0.78					
Site 6																					0.2	<	0.2	<	0.81		0.28					
Site 6																					0.2	<	0.2	<	0.74		0.7					
Site 6			0.001				0.35																0.02				1.6					
Site 6			0.005				0.37																0.02				1.6					
Site 6			0.001				0.37																0.02				1.6					
Site 6			0.001				0.36																0.02				1.3					
Site 6			0.001				0.35																0.02				1.3					
Site 6			0.001				0.33																0.02				1.2					
Site 6			0.001				0.37																0.02				1.2					
Site 6			0.001				0.37																0.006				1					
Site 6			0.001				0.35																0.006				0.92					
Site 6			0.001				0.36																0.006				1					
Site 6			0.001				0.32																0.006				0.87					
Site 6			0.001				0.31																0.006				0.83					
Site 6							0.34																0.006				1.7					
Site 6							0.32																0.006				1.8					
Site 6							0.34																0.012				2.5					
Site 6							0.35																0.008				2.3					
Site 6							0.37																0.006				2.3					
Site 6							0.38																0.006				2.2					
Site 6							0.37																0.006				1.9					
Site 6							0.36																0.007				1.6					
Site 6							0.35																0.006				1.4					
Site 6							0.35																0.006				1.3					
Site 6							0.38																0.006				1.5					
Site 6							0.33																0.006				1.1					
Site 6							0.34																0.006				1.1					
Site 7																					0.2		0.2		51		41.9					
Site 7																					0.2	<	0.2	<	48.1		49.5					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 7																					0.2	<	0.2	<	56.9		52.3					
Site 7																					0.2	<	0.2	<	43.7		40.7					
Site 7			0.002	<			1.1																0.11				51					
Site 7			0.001				1.2																0.11				51					
Site 7			0.002	<			1.1																0.24				51					
Site 7			0.001	<			1.2																0.136				45					
Site 7			0.004				1.3																0.14				46					
Site 7							1.5																0.12				44					
Site 7							1.3																0.15				49					
Site 7							1.3																0.14				53					
Site 7							1.3																0.18				48					
Site 7							1.3																0.098				48					
Site 7							1.3																0.13				56					
Site 7							1.3																0.15				52					
Site 7							1.2																0.14				54					
Site 7							1.2																0.17				53					
Site 7							1.2																0.15				55					
Site 7							1.2																0.15				53					
Site 7							1.2																0.06	<			50					
Site 7							1.2																0.06	<			50					
Site 8																					0.2	<	0.2		101		96.8					
Site 8																					0.2		0.2	<	63		46.8					
Site 8																					0.2	<	0.2	<	57.1		55.9					
Site 8			0.01	<			2.1																				70					
Site 8			0.01	<			2.1																				70					
Site 8			0.004				2.2																				77					
Site 8			0.01	<			2																0.23				62					
Site 8			0.01	<			2																				67					
Site 8			0.005	<			2.2																				78					
Site 8			0.002	<			1.9																				62					
Site 8			0.002	<			1.6																0.006	<			51					
Site 8			0.002	<			1.9																0.12	<			67					
Site 8			0.001	<			1.5																0.006	<			42					
Site 8			0.001	<			1.8																0.06	<			44					
Site 8			0.005	<			1.4																0.12	<			52					
Site 8							1.2																0.12	<			48					
Site 8							1.3																0.12	<			53					
Site 8							1.4																0.12	<			62					
Site 8							1.5																0.13				59					
Site 8							1.5																0.099				58					
Site 8							1.6																0.09	<			59					
Site 8							1.6																0.06	<			57					
Site 8							1.3																0.06	<			47					
Site 8							1.9																0.089				65					
Site 8							2																0.24	<			75					
Site 8							2.1																0.24	<			83					
Site 8							2.5																0.24	<			87					
Site 8							2.4																0.24	<			86					
Site 9																					0.2	<	0.2	<	0.15		0.01	<				
Site 9			0.001	<			0.35																0.006	<			0.003	<				
Site 9																																
Site 9																																
Site 9																																
Site 9			0.001	<			0.34																0.006	<			0.25					
Site 9																																
Site 9																																
Site 9			0.001	<			0.26																0.006	<			0.02					
Site 9			0.001				0.25																0.006	<			0.007					
Site 9			0.001	<			0.29																0.006	<			0.004					
Site 9							0.28																0.006	<			0.003					
Site 9							0.33																0.006	<			0.013					
Site 9							0.35																0.006	<			0.17					
Site 9							0.37																0.006	<			0.38					
Site 9							0.4																0.006	<			0.97					
Site 9							0.4																0.006	<			1.9					
Site 9							0.35																0.006	<			1.2					
Site 9							0.3																0.006	<			1.2					
Site 9							0.41																0.006	<			0.066					
Site 9																																
Site 9																																
Site 9																																
Site 9																																
Site 10			0.01	<			2.9																0.1	<								
Site 10			0.005	<			2.9																									
Site 10			0.005	<			2.9																									
Site 10			0.001	<			2.6																0.1	<			3.1					
Site 10			0.001	<			2.3																0.1	<			7.4					
Site 10			0.002	<			2.5																0.1	<			6.8					
Site 10			0.001	<			2.6																0.1	<			4.6					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 10			0.001	<			1.9																0.03	<			2.5					
Site 10			0.001	<			2.2																0.1	<			2.4					
Site 10			0.001	<			2																0.03	<			2.3					
Site 10			0.001	<			1.9																0.012				1.9					
Site 10			0.005	<			1.5																0.024	<			1					
Site 10							1.1																0.018	<			0.81					
Site 10							1.2																0.012	<			1.1					
Site 10							1.3																0.012	<			1.3					
Site 10							1.4																0.018	<			1.9					
Site 10							1.8																0.03	<			3.7					
Site 10							1.6																0.06	<			5.1					
Site 10							1.6																0.04				3.1					
Site 10							2																0.06	<			2.3					
Site 10																																
Site 10																																
Site 10																																
Site 10																																
Site 11			0.01	<			2.2																0.25				5.1					
Site 11			0.005	<			2.3																0.29				4.8					
Site 11			0.005	<			2.2																0.25				4.6					
Site 11			0.002	<			2.3																0.22				5					
Site 11			0.01	<			2.2																0.22				4.8					
Site 11			0.002	<			2.1																0.22				4.6					
Site 11			0.001	<			2.4																0.27				5					
Site 11			0.001	<			2.3																0.068				4.8					
Site 11			0.001	<			2.4																0.06				4.8					
Site 11			0.002	<			1.2																0.02				1.8					
Site 11			0.002				0.93																0.018	<			1.3					
Site 11			0.002				0.89																0.018	<			1.2					
Site 11							1																0.018	<			1.6					
Site 11							1.2																0.032				2					
Site 11							1.2																0.048				2.4					
Site 11							1.4																0.13				2.7					
Site 11							1.8																0.068				3.7					
Site 11							2.3																0.12				5.8					
Site 11							2.2																0.093				4.8					
Site 12							1.8																0.072				4					
Site 12							1.4																0.069				2.5					
Site 12							1.2																0.087				2.3					
Site 12							1.7																0.062				3.4					
Site 12							1.9																0.06	<			4					
Site 12							2.3																0.072	<			5.1					
Site 13																					0.2	<	0.2	<	7.22		6.75					
Site 13																					0.2	<	0.2	<	7.11		6.87					
Site 13																					0.2	<	0.2	<	6.21		1.07					
Site 13																					0.2	<	0.2	<	6.77		6.96					
Site 13			0				1.3																0.11				6.5					
Site 13			0				1.4																0.13				6.5					
Site 13			0				1.4																0.13				7.3					
Site 13			0				1.4																0.14				7.6					
Site 13			0				1.4																0.13				7.3					
Site 13			0				1.6																0.15				7.7					
Site 13			0				1.5																0.06	<			8					
Site 13			0				1.6																0.06	<			8.1					
Site 13			0				1.4																0.038				8					
Site 13			0				1.6																0.06	<			7.6					
Site 13			0				1.5																0.06	<			8					
Site 13			0				1.5																0.06	<			7.7					
Site 13			0				1.6																0.092				7.5					
Site 13			0				1.5																0.072				8.3					
Site 13			0				1.5																0.1				7.4					
Site 13			0				1.6																0.042				7.4					
Site 13			0				1.5																0.04				7.7					
Site 13			0				1.5																0.038				7.6					
Site 13			0				1.5																0.041				7.4					
Site 13			0				1.5																0.031				7					
Site 13			0				1.5																0.048	<			7					
Site 13			0				1.5																0.043				7.1					
Site 13			0				1.5																0.047				6.8					
Site 13			0				1.5																0.048	<			7.2					
Site 14																					0.3		0.3		34.8		34					
Site 14																					0.2		0.3		29.1		29.6					
Site 14																					0.4		0.2	<	34.2		27.6					
Site 14			0.01				1.1																				32					
Site 14			0.005	<			1.2																				32					
Site 14			0.01	<			1.2																				34					
Site 14			0.002	<			1.2																0.49				33					
Site 14			0.002	<			1.3																				35					
Site 14			0.001	<			1.2																				34					
Site 14			0.002	<			1.3																				36					
Site 14			0.002	<			1.2																0.32				33					
Site 14			0.001	<			1.2																0.32				32					
Site 14			0.001	<			1.2																0.32				32					
Site 14			0.002	<			1.2																				32					
Site 14			0.002	<			1.3																0.4				35					
Site 14							1.2																0.35				32					
Site 14							1.2																0.37				33					
Site 14							1.2																				33					
Site 14							1.2																0.24				32					
Site 14							1.2																0.23				32					
Site 14							1.3																0.34				38					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 14							1.2																0.45				35					
Site 14							1.3																0.34				34					
Site 14							1.2																0.33				35					
Site 14							1.3																0.39				36					
Site 14							1.2																0.37				35					
Site 14							1.2																0.38				35					
Site 14							1.2																0.12	<			33					
Site 15																					0.2	<	0.2	<	0.01	<	0.01	<				
Site 15			0.002				0.38																0.006	<			0.003	<				
Site 15			0.003				0.46																0.006	<			0.006					
Site 15			0.002				0.54																0.006	<			0.01					
Site 15							1																0.006	<			0.003	<				
Site 15																																
Site 15																																
Site 16																					0.2	<	0.2		13.7		13.9					
Site 16																					0.2	<	0.2	<	11.1		10.6					
Site 16			0.002	<			1.1																0.16				12					
Site 16			0.005	<			1																0.16				11					
Site 16			0.005	<			0.99																0.15				10					
Site 16			0.002	<			0.94																0.13				9.5					
Site 16																																
Site 16																																
Site 16																																
Site 16																																
Site 16																																
Site 16																																
Site 16			0.001	<			0.95																0.072				9.2					
Site 16			0.002	<			1.1																0.12				11					
Site 16							1.1																0.097				11					
Site 16							1.1																0.11				11					
Site 16							1.1																0.11				11					
Site 16							1.1																0.11				11					
Site 16							1.1																0.11				10					
Site 16							1																0.092				10					
Site 16							0.97																0.094				10					
Site 16							1																0.068				9.8					
Site 16							1																0.08				9.2					
Site 16							1																0.095				11					
Site 16							1																0.098				11					
Site 16							1																0.036	<			9.7					
Site 16							1																0.036	<			9.6					
Site 17																					0.2	<	0.2	<	2.28		2.14					
Site 17																					0.2	<	0.2	<	2.17		2.02					
Site 17																					0.2	<	0.2	<	2.1		2.05					
Site 17																					0.2	<	0.2	<	2.55		2.56					
Site 17			0.005	<			0.9																0.047				2.4					
Site 17			0.005	<			0.93																0.071				2.4					
Site 17			0.002	<			0.9																0.056				2.3					
Site 17			0.002	<			0.88																0.053				2.3					
Site 17			0.002				0.89																0.059				2.4					
Site 17			0.002				0.85																0.057				2.3					
Site 17			0.002				0.94																0.051				2.2					
Site 17			0.002				0.94																0.012				2.3					
Site 17			0.002				0.91																0.017				2.4					
Site 17			0.002				1																0.011				2.3					
Site 17			0.002				1.1																0.018	<			2.5					
Site 17			0.001				1.1																0.024	<			2.5					
Site 17							0.81																0.018	<			1.9					
Site 17							0.84																0.012	<			1.8					
Site 17							0.76																0.013				1.7					
Site 17							0.81																0.018	<			2					
Site 17							0.86																0.018	<			2.1					
Site 17							0.86																0.018	<			2.3					
Site 17							0.82																0.035				2.3					
Site 17							0.91																0.018	<			2.5					
Site 17							0.82																0.02				2.3					
Site 17							0.89																0.03	<			2.4					
Site 17							0.88																0.03	<			2.3					
Site 17							0.81																0.03	<			2.1					
Site 17							0.83																0.03	<			2					
Site 18																					0.2	<	0.2	<	1.87		1.84					
Site 18																					0.2	<	0.2	<	2.07		2.07					
Site 18																					0.2	<	0.2	<	1.77		0.27					
Site 18			0.001	<			2.1																0.018	<			0.82					
Site 18			0.005	<			2.2																0.024				0.84					
Site 18			0.001	<			1.9																0.019				1.6					
Site 18			0.002	<			1.2																0.018	<			2					
Site 18			0.001	<			1.1																0.03				2.4					
Site 18																																
Site 18			0.002	<			1.9																0.018	<			1.7					
Site 18			0.001	<			1.1																0.018	<			0.97					
Site 18			0.001	<			0.89																0.008				1.4					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 18			0.001				0.73																0.018	<			1.3					
Site 18			0.002	<			1.1																0.018	<			1.7					
Site 18			0.002	<			1.1																0.024	<			1.7					
Site 18							0.98																0.018	<			1.5					
Site 18							1.3																0.018	<			1.6					
Site 18							1.1																0.018	<			1.5					
Site 18							0.96																0.018	<			2.1					
Site 18							1																0.018	<			2.1					
Site 18							0.95																0.018	<			2.5					
Site 18							0.39																0.006	<			0.88					
Site 18							0.92																0.012	<			2.2					
Site 18							1.1																0.018	<			2.3					
Site 18							1																0.048	<			2.1					
Site 18							1.4																0.048	<			2.3					
Site 18							1.8																0.048	<			2.3					
Site 18							2																0.048	<			2.1					
Site 19																					0.2	<	0.2	<	6.07		5.28					
Site 19																					0.2	<	0.2	<	5.36		5.27					
Site 19																					0.2	<	0.2	<	6.24		3.36					
Site 19																					0.2	<	0.2	<	5.48		5.51					
Site 19			0.002	<			1.2																0.13				6.5					
Site 19			0.005	<			1.3																0.16				6.4					
Site 19			0.002	<			1.2																0.15				6.1					
Site 19			0.002	<			1.2																0.14				6.2					
Site 19			0.002	<			1.1																0.15				6.3					
Site 19			0.001	<			1.1																0.13				5.9					
Site 19			0.001	<			1.2																0.14				5.6					
Site 19			0.001	<			1.1																0.092				5.7					
Site 19			0.001	<			1.1																0.093				5.5					
Site 19			0.001	<			1.2																0.086				5.7					
Site 19			0.001	<			1.2																0.097				6.1					
Site 19			0.002	<			1.2																0.093				6.5					
Site 19							1.2																0.089				6.3					
Site 19							1.2																0.1				6.1					
Site 19							1.2																0.094				6					
Site 19							1.2																0.094				6					
Site 19							1.2																0.088				5.9					
Site 19							1.2																0.086				6.6					
Site 19							1.1																0.095				6.1					
Site 19							1.2																0.086				5.9					
Site 19							1.2																0.1				6					
Site 19							1.2																0.048				5.9					
Site 19							1.3																0.1				6.5					
Site 19							1.1																0.024	<			5.8					
Site 19							1.2																0.084				6.4					
Site 20																					0.4		0.6		19.8		19.2					
Site 20																					0.5		0.6		19.4		18.8					
Site 20																					0.4		0.4		19.7							
Site 20																					0.6		0.3		19.2		9.82					
Site 20																					0.4		0.4		18.5		19.5					
Site 20																					0.4		0.4		19.1		18.5					
Site 20			0.025	<			1.5																				16					
Site 20			0.01	<			1.6																				18					
Site 20			0.01	<			1.6																				19					
Site 20			0.005	<			1.5																0.66				18					
Site 20			0.005	<			1.6																				19					
Site 20			0.002	<			1.5																				18					
Site 20			0.005	<			1.6																				19					
Site 20			0.002	<			1.6																0.42				19					
Site 20			0.002	<			1.6																0.36				19					
Site 20			0.002	<			1.6																0.33				18					
Site 20			0.002	<			1.6																0.41				17					
Site 20			0.005	<			1.6																0.43				19					
Site 20							1.7																0.52				19					
Site 20							1.8																0.65				18					
Site 20							1.8																				18					
Site 20							1.6																0.42				16					
Site 20							1.5																0.34				15					
Site 20							1.5																0.32				16					
Site 20							1.4																0.38				17					
Site 20							1.5																0.29				16					
Site 20							1.4																0.35				18					
Site 20							1.5																0.15	<			18					
Site 20							1.5																0.15	<			17					
Site 20							1.5																0.12	<			16					
Site 20							1.5																0.36				18					
Site 21																					0.2	<	0.2	<	4.77		4.62					
Site 21																					0.2	<	0.2	<	4.77		4.2					
Site 21																					0.2	<	0.2	<	2.07		2.09					
Site 21																					0.2	<	0.2	<	4.04		4.08					
Site 21			0.005	<			1.2																0.082				4.6					
Site 21			0.005	<			1.2																0.11				4.4					
Site 21			0.001	<			1.2																0.1				4.4					
Site 21			0.001	<			1.2																0.071				4.4					
Site 21			0.002	<			1.2																0.084				4.7					
Site 21			0.001	<			1.1																0.067				4.5					
Site 21			0.001	<			1.3																0.082				4.4					
Site 21			0.001	<			1.3																0.064				4.2					
Site 21			0.001	<			1.2																0.068				4.2					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 21			0.002				0.4																0.006	<			0.055					
Site 21			0.002				0.47																0.006	<			0.046					
Site 21			0.002				0.59																0.006	<			0.11					
Site 21							0.98																0.006	<			0.032					
Site 21							0.95																0.018	<			2.3					
Site 21							1.2																0.03	<			5					
Site 21							1.3																0.095				4.8					
Site 21							1.3																0.03	<			5					
Site 21							1.3																0.062				5.4					
Site 21							1.4																0.059				5.6					
Site 21							1.4																0.061				5					
Site 21							1.4																0.03				4.8					
Site 21							1.3																0.042				4.5					
Site 21							1.3																0.036	<			4.5					
Site 21							1.3																0.06	<			4.8					
Site 21							1.3																0.048	<			5.3					
Site 22																					0.2	<	0.2	<	1.38		1.38					
Site 22																					0.2	<	0.2	<	1.23		1.31					
Site 22																					0.2	<	0.2	<	1.66		1.59					
Site 22																					0.2	<	0.2	<	1.77		1.59					
Site 22																					0.2	<	0.2	<	1.32		1.22					
Site 22			0.001				0.61																0.006				1.2					
Site 22			0.005				0.61																0.006				1.1					
Site 22			0.001				0.61																0.006				1.1					
Site 22			0.002				0.6																0.006				1.1					
Site 22			0.001				0.61																0.006				1.2					
Site 22			0.001				0.62																0.006				1.1					
Site 22			0.002				0.67																0.006				1.2					
Site 22			0.001				0.65																0.006				1.1					
Site 22			0.001				0.66																0.006				1.1					
Site 22			0.001				0.67																0.006				1.2					
Site 22			0.001				0.68																0.006				1.3					
Site 22			0.001				0.67																0.018				1.9					
Site 22							0.54																0.006				1.2					
Site 22							0.53																0.006				1					
Site 22							0.5																0.006				0.89					
Site 22							0.51																0.006				0.93					
Site 22							0.54																0.006				0.84					
Site 22							0.53																0.006				0.91					
Site 22							0.55																0.006				0.85					
Site 22							0.55																0.006				0.82					
Site 22							0.49																0.006				0.86					
Site 22							0.55																0.006				0.86					
Site 22							0.58																0.006				0.88					
Site 22							0.55																0.006				0.81					
Site 22							0.58																0.006				0.92					
Site 23																					0.2	<	0.2	<	0.02		0.03					
Site 23																					0.2	<	0.2	<	0.02		0.07					
Site 23																					0.2	<	0.2	<	0.02		0.01					
Site 23																					0.2	<	0.2	<	0.05		0.01					
Site 23			0.002				0.51																0.006				0.007					
Site 23			0.005				0.52																0.006				0.012					
Site 23			0.003				0.52																0.006				0.007					
Site 23			0.002				0.5																0.006				0.009					
Site 23			0.002				0.5																0.006				0.014					
Site 23			0.002				0.49																0.006				0.011					
Site 23			0.002				0.52																0.006				0.009					
Site 23			0.003				0.49																0.006				0.01					
Site 23			0.002				0.47																0.006				0.007					
Site 23			0.003				0.52																0.006				0.011					
Site 23			0.003				0.53																0.006				0.014					
Site 23			0.003				0.66																0.006				0.019					
Site 23							0.6																0.006				0.017					
Site 23							0.57																0.006				0.015					
Site 23							0.54																0.006				0.018					
Site 23							0.51																0.006				0.025					
Site 23							0.5																0.006				0.01					
Site 23							0.49																0.006				0.013					
Site 23							0.46																0.006				0.015					
Site 23							0.46																0.006				0.01					
Site 23							0.51																0.006				0.013					
Site 23							0.49																0.006				0.014					
Site 23							0.51																0.006				0.009					
Site 23							0.48																0.006				0.013					
Site 23							0.51																0.006				0.009					
Site 24																					0.2	<	0.2	<	2.54		2.42					
Site 24																					0.2	<	0.2	<	2.62		2.63					
Site 24																					0.2	<	0.2	<	4.16		1.95					
Site 24																					0.2	<	0.2	<	2.54		2.47					
Site 24			0.001	<			1.2																0.019				3.1					
Site 24			0.005	<			1.2																0.032				2.9					
Site 24			0.001	<			1.2																0.033				3.2					
Site 24			0.001	<			1.2																0.026				3.2					
Site 24			0.001	<			1.2																0.025				3.3					
Site 24			0.001	<			1.2																0.021				3					
Site 24			0.001	<			1.3																0.034				3.2					
Site 24			0.001	<			1.2																0.021				3.1					
Site 24			0.001	<			1.2																0.006				2.8					
Site 24			0.001	<			1.2																0.006	<			3					
Site 24			0.001	<			1.2																0.01				2.9					
Site 24			0.001	<			1.2																0.018	<			3					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 24							1.1																0.018	<			2.8					
Site 24							1.1																0.013				2.7					
Site 24							1																0.012	<			2.5					
Site 24							1.1																0.018	<			2.8					
Site 24							1.2																0.018	<			2.8					
Site 24							1.1																0.018	<			3.2					
Site 24							1.1																0.015				2.8					
Site 24							1.2																0.012	<			2.8					
Site 24							1.1																0.018	<			2.7					
Site 24							1.1																0.024	<			2.8					
Site 24							1.2																0.018	<			2.9					
Site 24							1.1																0.012	<			2.6					
Site 24							1.1																0.012	<			2.8					
Site 25																					0.2	<	0.2	<	8.54		7.74					
Site 25																					0.2	<	0.2	<	6.76		6.74					
Site 25																					0.2	<	0.2	<	6.83		6.68					
Site 25																					0.2	<	0.2	<	6.31		4.83					
Site 25																					0.2	<	0.2	<	7.13		6.93					
Site 25			0.002	<			0.98																0.1	<			9					
Site 25			0.005	<			1																0.1	<			8.4					
Site 25			0.002	<			1																0.1	<			8.9					
Site 25			0.002	<			1																0.1	<			9.4					
Site 25			0.002	<			1																0.1	<			9.9					
Site 25			0.001	<			1																0.1	<			8.9					
Site 25			0.002	<			1.1																0.1	<			9.4					
Site 25			0.001				1.1																0.03				8.8					
Site 25			0.001	<			1.1																0.043				8.8					
Site 25			0.002	<			1.2																0.038				8.8					
Site 25			0.002	<			1.1																0.06	<			7.9					
Site 25			0.005	<			1.1																0.044				8.6					
Site 25							0.98																0.025				6.8					
Site 25							0.96																0.018				6.2					
Site 25							0.91																0.022				6.2					
Site 25							0.98																0.024				6.8					
Site 25							1																0.024				7.2					
Site 25							1																0.027				8.3					
Site 25							1																0.047				8.9					
Site 25							1																0.034				8.4					
Site 25							1.2																0.042				9.1					
Site 25							1																0.064				8.9					
Site 25							1.1																0.06	<			10					
Site 25							1.1																0.036	<			8.6					
Site 25							1.1																0.036	<			8.4					
Site 26																					0.2	<	0.2	<	2.88		2.48					
Site 26																					0.2	<	0.2	<	2.26		2.18					
Site 26																					0.2	<	0.2	<	2.75		1.72					
Site 26																					0.2	<	0.2	<	2.41		2.35					
Site 26			0.001	<			1.5																0.018	<			3.3					
Site 26			0.001	<			1.3																0.018	<			3.1					
Site 26			0.001	<			1.3																0.018	<			3.4					
Site 26																																
Site 26			0.001	<			1.4																0.018	<			2.9					
Site 26			0.001	<			1.1																0.018	<			2.3					
Site 26			0.001	<			1.3																0.018	<			2.6					
Site 26			0.001	<			1.4																0.018	<			2.3					
Site 26			0.001	<			1.4																0.018	<			2.4					
Site 26			0.002	<			1.4																0.018	<			2.6					
Site 26							1.3																0.018	<			2.5					
Site 26							1.9																0.012	<			0.69					
Site 26							1.4																0.012	<			2.3					
Site 26							1.2																0.018	<			2.7					
Site 26							1.2																0.006	<			2.6					
Site 26							1.4																0.018	<			2					
Site 26							1.2																0.006	<			1.9					
Site 26							1.2																0.006	<			1.7					
Site 26							0.53																0.006	<			0.53					
Site 26							1.9																0.018	<			1.6					
Site 26																																
Site 26																																
Site 26																																
Site 27																					0.2	<	0.2	<	0.08		0.11					
Site 27																					0.2	<	0.2	<	0.08		0.08					
Site 27																					0.2	<	0.2	<	0.09		0.01	<				
Site 27																					0.2	<	0.2	<	0.08		0.09					
Site 27			0.001				0.68																0.006	<			0.031					
Site 27			0.005	<			0.66																0.006	<			0.022					
Site 27			0.002				0.63																0.006	<			0.039					
Site 27			0.002				0.62																0.006	<			0.04					
Site 27			0.002				0.61																0.006	<			0.036					
Site 27			0.002				0.64																0.006	<			0.034					
Site 27			0.002				0.68																0.006	<			0.034					
Site 27			0.002				0.64																0.006	<			0.029					
Site 27			0.002				0.61																0.006	<			0.023					
Site 27			0.003				0.67																0.006	<			0.033					
Site 27			0.003				0.64																0.006	<			0.019					
Site 27			0.003				0.55																0.006	<			0.015					
Site 27							0.49																0.006	<			0.013					
Site 27							0.66																0.006	<			0.14					
Site 27							0.63																0.006	<			0.1					
Site 27							0.64																0.006	<			0.12					
Site 27							0.62																0.006	<			0.073					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
Site 27							0.64																0.006	<			0.073					
Site 27							0.66																0.006	<			0.066					
Site 27							0.64																0.006	<			0.065					
Site 27							0.67																0.006	<			0.057					
Site 27							0.69																0.018	<			0.082					
Site 27							0.65																0.006	<			0.065					
Site 27							0.61																0.006	<			0.061					
Site 27							0.64																0.006	<			0.048					
Site 28																					0.2	<	0.2	<	0.02		0.04					
Site 28																					0.2	<	0.2	<	0.03		0.01	<				
Site 28																					0.2	<	0.2	<	0.02		0.03					
Site 28																					0.2	<	0.2	<	0.04		0.04					
Site 29																					0.2	<	0.2	<	0.02		0.04					
Site 29																					0.2	<	0.2	<	0.08		0.07					
Site 29																					0.2	<	0.2	<	0.03		0.04					
Site 29																					0.2	<	0.2	<	0.13		0.13					
200615			0.010	<			2.720				0.050	<			0.010	<			0.016				0.050	<			5.12				0.020	<
200615			0.010	<			2.880				0.050	<			0.025	<							0.050	<			4.09				0.010	<
200615			0.010	<			2.520				0.050	<			0.010	<			0.0122				0.050	<			3.82				0.020	<
200615			0.010	<			2.119				0.050	<			0.010	<			0.014				0.050	<			2.845				0.0218	
200615			0.005	<			2.592				0.025	<			0.005	<			0.0155				0.025	<			3.446				0.0105	
200615			0.010	<			2.974				0.050	<			0.010	<			0.0163				0.100	<			4.245				0.0283	
200615			0.010	<			3.035				0.050	<			0.010	<			0.0159				0.050	<			4.819				0.020	<
200615			0.010	<			3.154				0.050	<			0.100	<			0.0164				0.050	<			5.082				0.020	<
200615			0.010	<			3.410				0.050	<			0.010	<			0.0195				0.050	<			5.787				0.020	<
200615			0.010	<			1.962				0.050	<			0.010	<			0.016				0.100	<			1.835				0.020	<
200615			0.010	<			5.420				0.050	<			0.010	<			0.0266				0.050	<			8.401				0.020	<
200615			0.010	<			2.926				0.050	<			0.010	<			0.0211				0.050	<			5.275				0.020	<
200615			0.010	<			3.600				0.050	<			0.010	<			0.0156				0.050	<			5.982				0.020	<
200615			0.020	<							0.010	<			3.058				0.050	<			0.0138				4.568				0.020	<
200616			0.005	<			1.630				0.025	<			0.00184				0.00279				0.025	<			3.28				0.002	<
200616			0.010	<			1.780				0.050	<			0.005	<							0.050	<			2.8				0.0024	
200616			0.005	<			1.510				0.025	<			0.001	<			0.0025	<			0.025	<			2.79				0.00449	
200616			0.005	<			1.598				0.025	<			0.001	<			0.00294				0.0173				2.817				0.00282	
200616			0.005	<			1.930				0.025	<			0.001	<			0.00301				0.025	<			3.121				0.00266	
200616			0.005	<			1.700				0.025	<			0.001	<			0.00273				0.0227				3.171				0.00301	
200616			0.005	<			1.876				0.025	<			0.001	<			0.00274				0.0266				3.249				0.00339	
200616			0.005	<			1.806				0.020	<			0.001	<			0.0029				0.0186				3.283				0.0031	
200616			0.005	<			1.873				0.025	<			0.001	<			0.00264				0.0163				3.229				0.00332	
200616			0.005	<			1.864				0.025	<			0.001	<			0.00267				0.025	<			3.1				0.010	<
200616			0.005	<			1.773				0.020	<			0.001	<			0.00313				0.025	<			3.261				0.010	<
200616			0.005	<			1.743				0.020	<			0.0015				0.00346				0.010	<			3.339				0.00411	
200616			0.005	<			1.969				0.025	<			0.001	<			0.003	<			0.0212				3.299				0.002	<
200616			0.005	<			1.832				0.020	<			0.00208				0.0030	<			0.025	<			3.333				0.00316	
200616			0.005	<			1.633				0.020	<			0.001				0.003	<			0.0165				2.715				0.002	<
205508			0.001	<			0.714				0.005	<			0.001	<			0.00117				0.005	<			0.00775				0.002	<
205836			0.001	<			0.639				0.005	<			0.001	<			0.00305				0.005	<			0.029				0.002	<
205838			0.001	<			0.644				0.005	<			0.001	<			0.00113				0.005	<			0.0103				0.002	<
205838																									0.01298		0.0103					
205839	0.001	<	0.001	<	0.667		0.673		0.005	<	0.005	<	0.001	<	0.001	<	0.001	<	0.00107		0.005	<	0.005	<	0.0193		0.0104		0.002	<	0.002	<
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214911			0.001	<			0.734				0.005	<			0.001	<			0.001	<			0.005	<			0.145				0.002	<
214913			0.001	<			0.814				0.005	<			0.001	<			0.001	<			0.005	<			0.212				0.002	<
214914			0.010	<			1.888				0.050	<			0.010	<			0.0242				0.050	<			4.376				0.020	<
214915			0.005	<			2.227				0.025	<			0.010	<			0.127				0.025	<			7.823				0.010	<
214916			0.001	<			0.799				0.005	<			0.001	<			0.001	<			0.005	<			0.104				0.002	<
BCAMD																									4.57		4.57					
BCAMD																									4.41		4.48					
CTWDC02																									0.626		0.0812					
CTWDC02																									2.77		2.86					
CTWDC03																									0.0367		0.0307					
CTWDC03																									0.227		0.0352					
CTWDC03A																									4.55		4.12					
CTWDC03A																									9.52		11.2					
CTWDC04																									0.0048	J	0.0085					
CTWDC04																									0.0146		0.0025	<				
LBLTC03																									0.0407		0.02					
LBLTC03																									0.0122		0.0053					
LBLTC03A																									0.042		0.0288					
LBLTC03A																									0.0253		0.0121					

Station_ID	Se_T_mgL	Se_T_Q	Se_D_mgL	Se_D_Q	Sr_T_mgL	Sr_T_Q	Sr_D_mgL	Sr_D_Q	Th_T_mgL	Th_T_Q	Th_D_mgL	Th_D_Q
NO5CL01												
NO5CL02												
NO5CL02												
SNDCC01												
SNDCC01												
SNDCC02												
SNDCC03												
SNDCC04												
SNDCL02												
SNDCL02												
	0.070				0.8							
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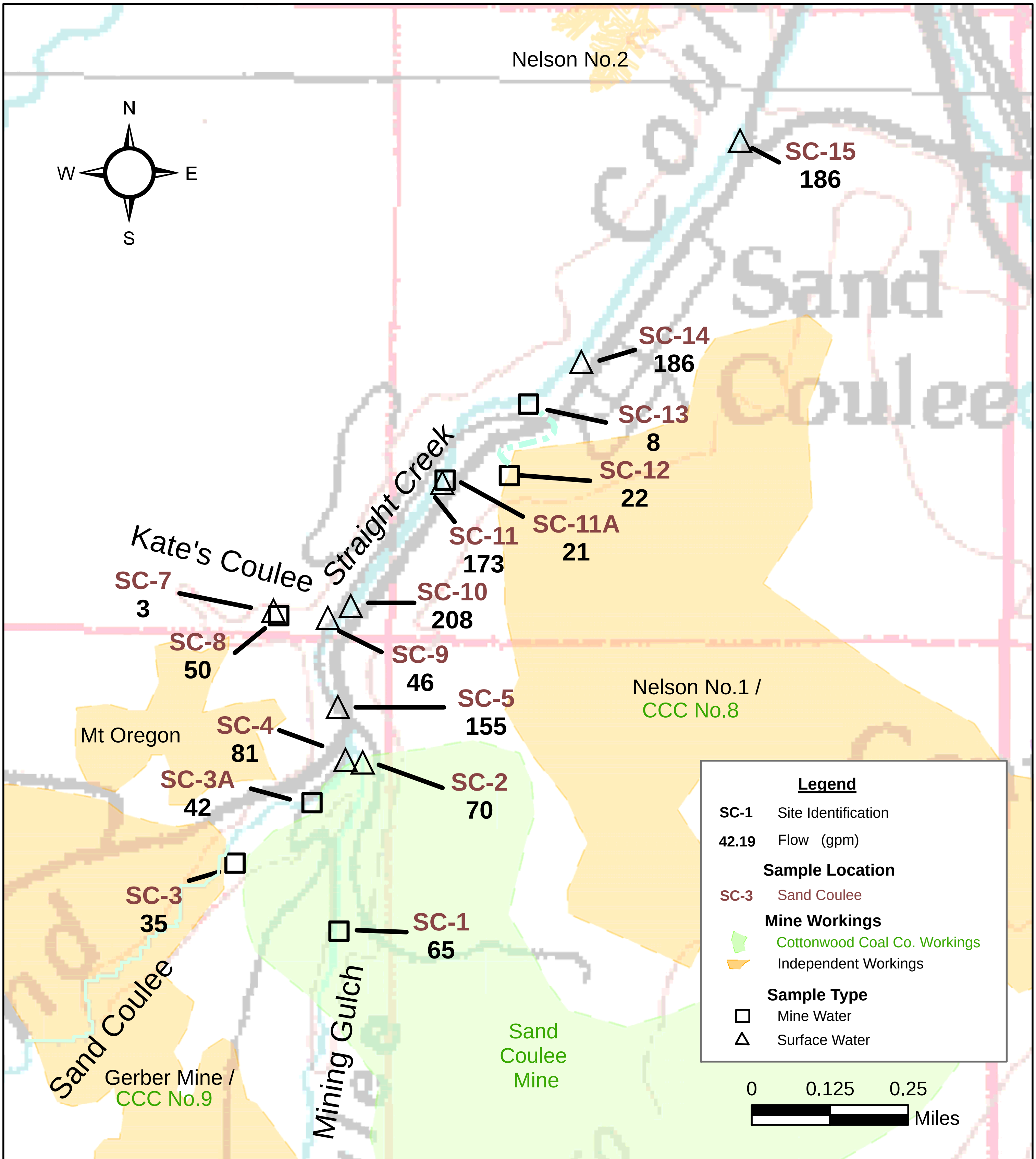
rd: January 19												
MAXIM 12/16/1												
able metals inc												
Dissolved Soli												

Station_ID	Ti_T_mgL	Ti_T_Q	Ti_D_mgL	Ti_D_Q	U_T_mgL	U_T_Q	U_D_mgL	U_D_Q	V_T_mgL	V_T_Q	V_D_mgL	V_D_Q	Zn_T_mgL	Zn_T_Q	Zn_D_mgL	Zn_D_Q	Zr_T_mgL	Zr_T_Q	Zr_D_mgL	Zr_D_Q
NO5CL01													0.0097		0.0037	J				
NO5CL02													0.0151		0.0207					
NO5CL02													0.0583		0.0648					
SNDCC01													0.0057		0.0152					
SNDCC01													0.0025	<	0.007	J				
SNDCC02													0.0025	<	0.0064					
SNDCC03													0.0034	J	0.0025	<				
SNDCC04													0.0138		0.0025	<				
SNDCL02													9.68		9.68					
SNDCL02													24.7		24.1					
													36.6	D						
rom Montana I																				
rd: January 19																				
MAXIM 12/16/1																				
able metals inc																				
Dissolved Soli																				

APPENDIX C

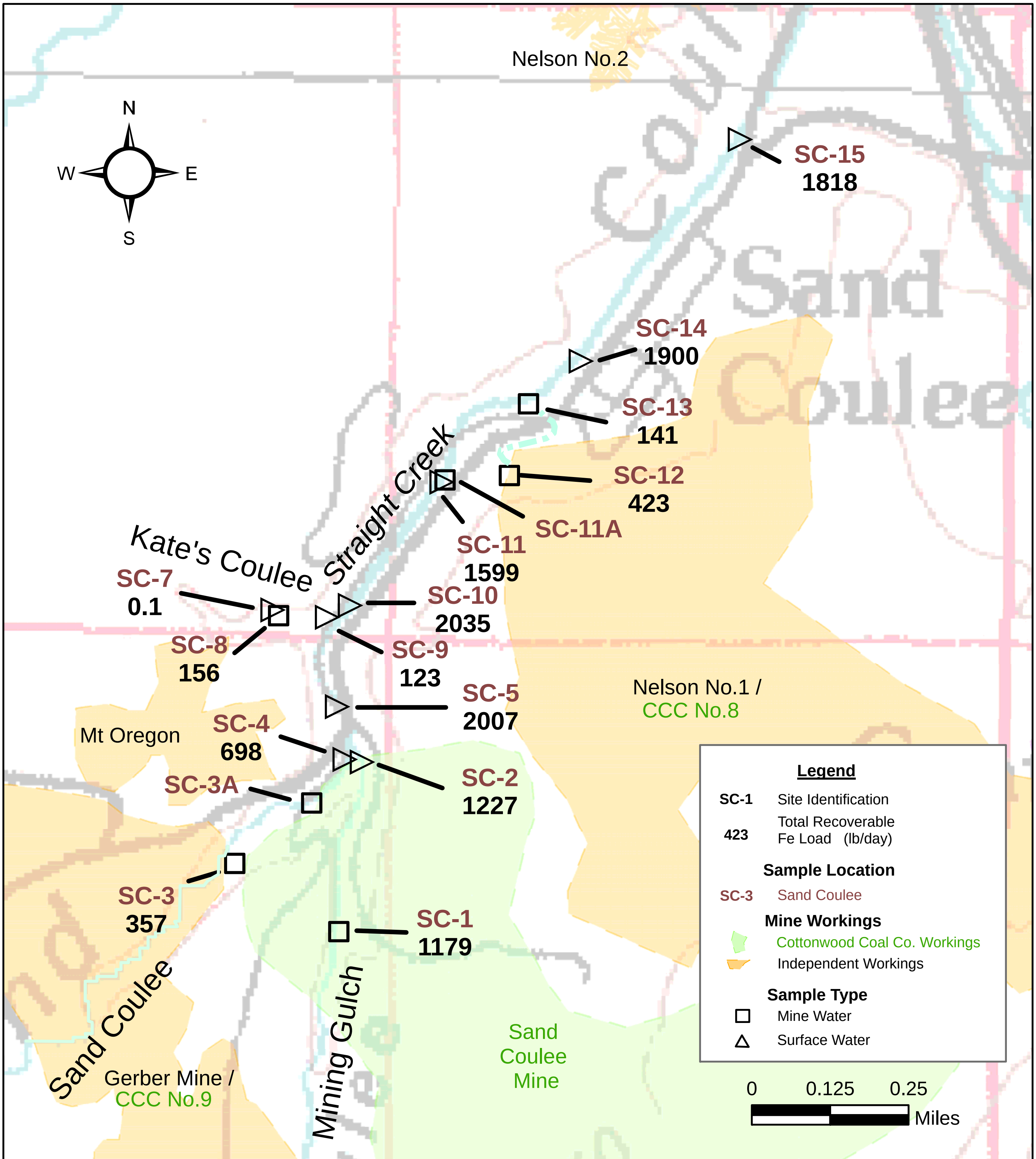
LOADING ANALYSIS MAPS



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	SAND COULEE FLOW DATA (gpm)	FIGURE C-1

V:\11033\GIS\C-1_SndCouleeSampling8X11.mxd

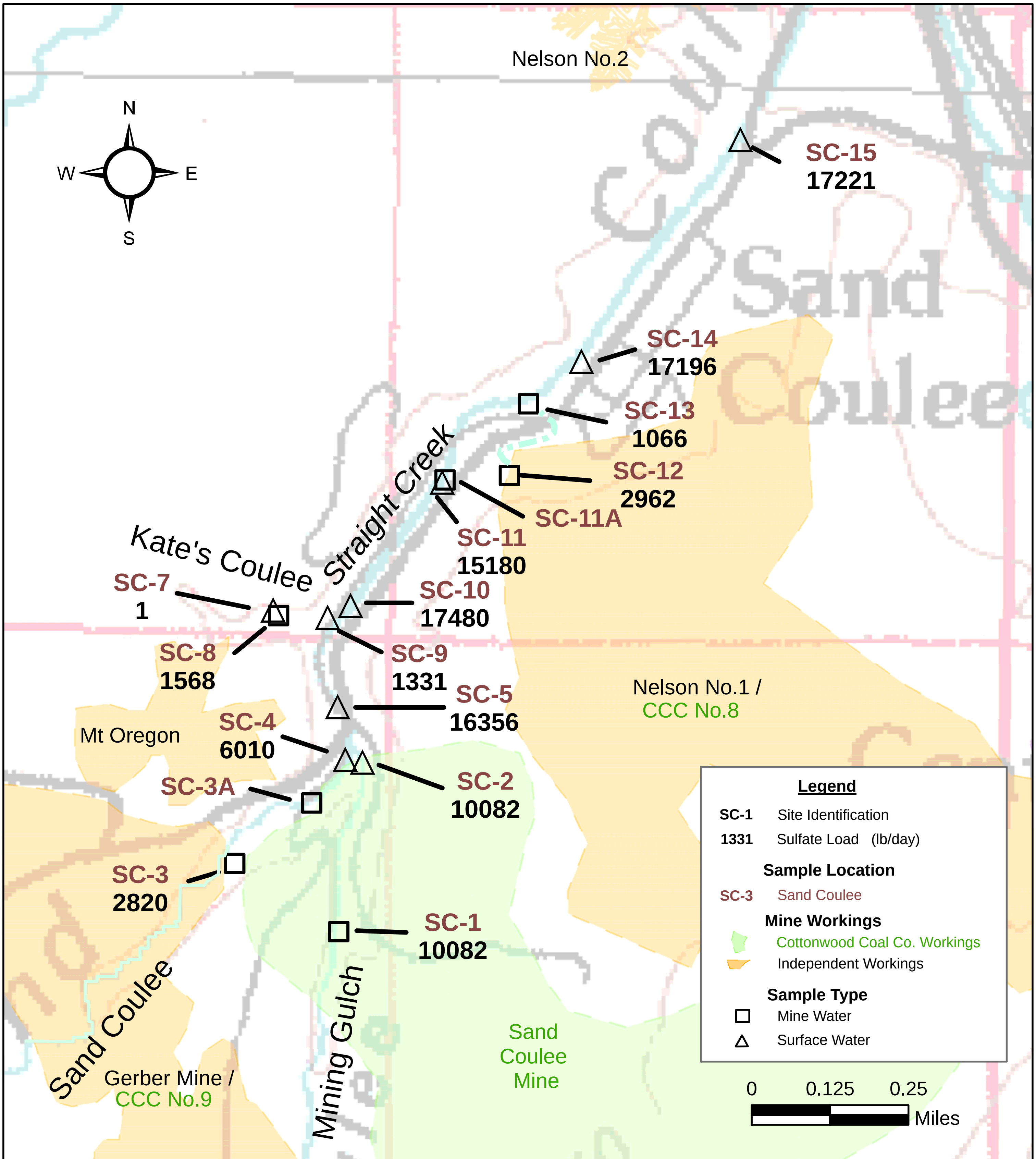
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	SAND COULEE TOTAL RECOVERABLE IRON LOAD (lb/day)	FIGURE C-2

V:\11033\GIS\C-2_SndCouleeSampling8X11.mxd

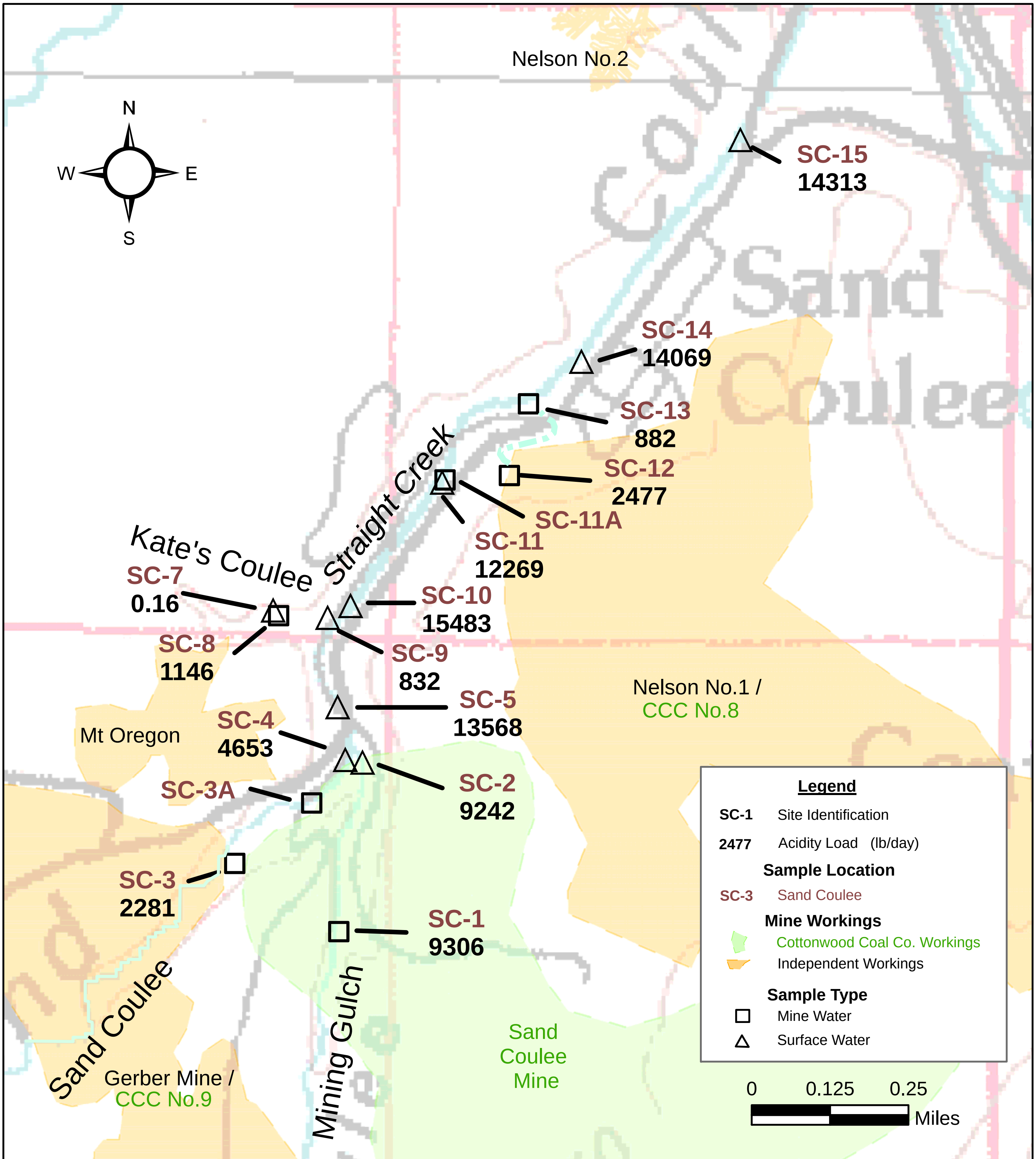
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	SAND COULEE SULFATE LOAD (lb/day)	FIGURE C-3

V:\11033\GIS\C-3_SndCouleeSampling8X11.mxd

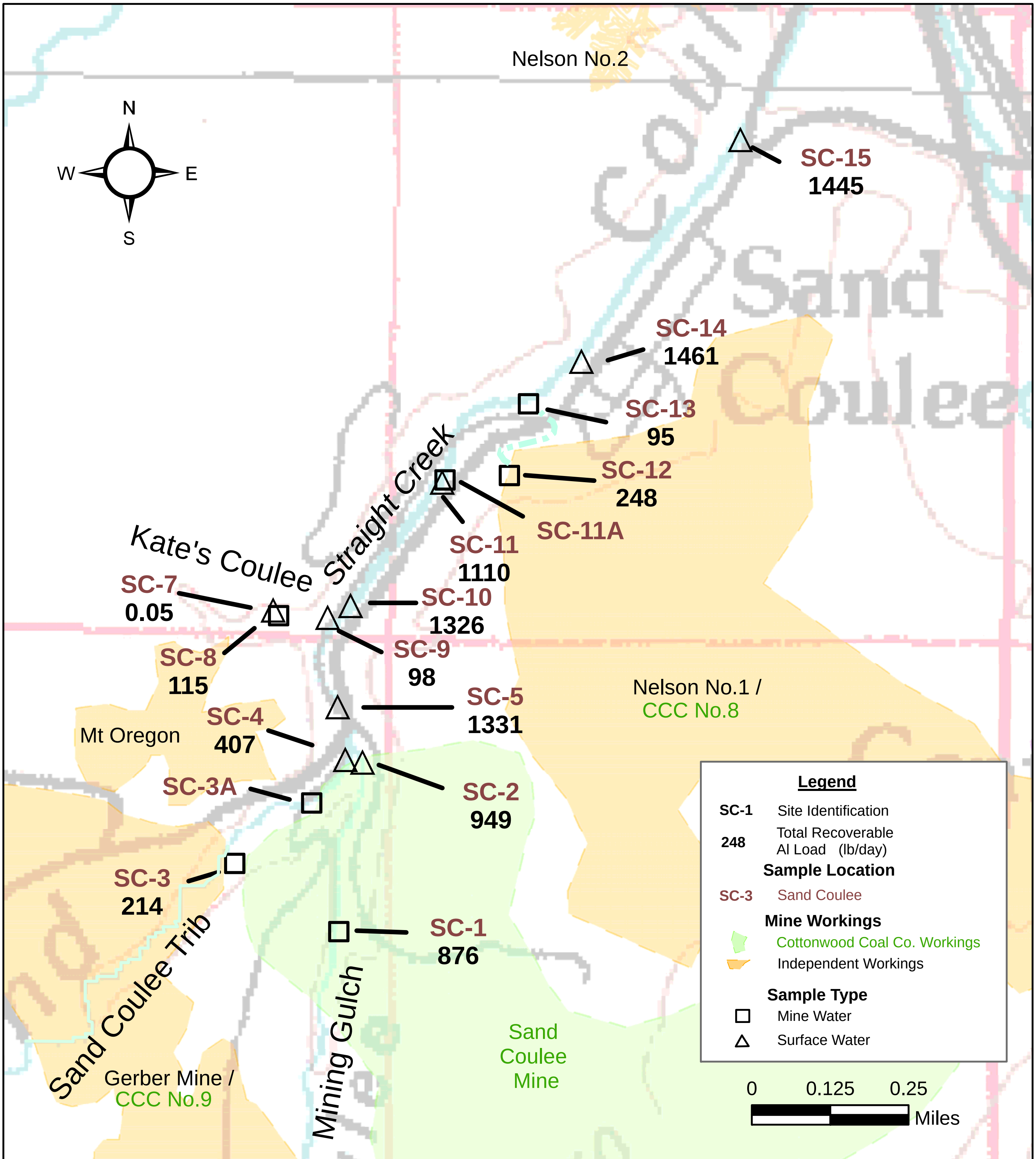
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	SAND COULEE ACIDITY LOAD (lb/day)	FIGURE C-4

V:\11033\GIS\C-4_SndCouleeSampling8X11.mxd

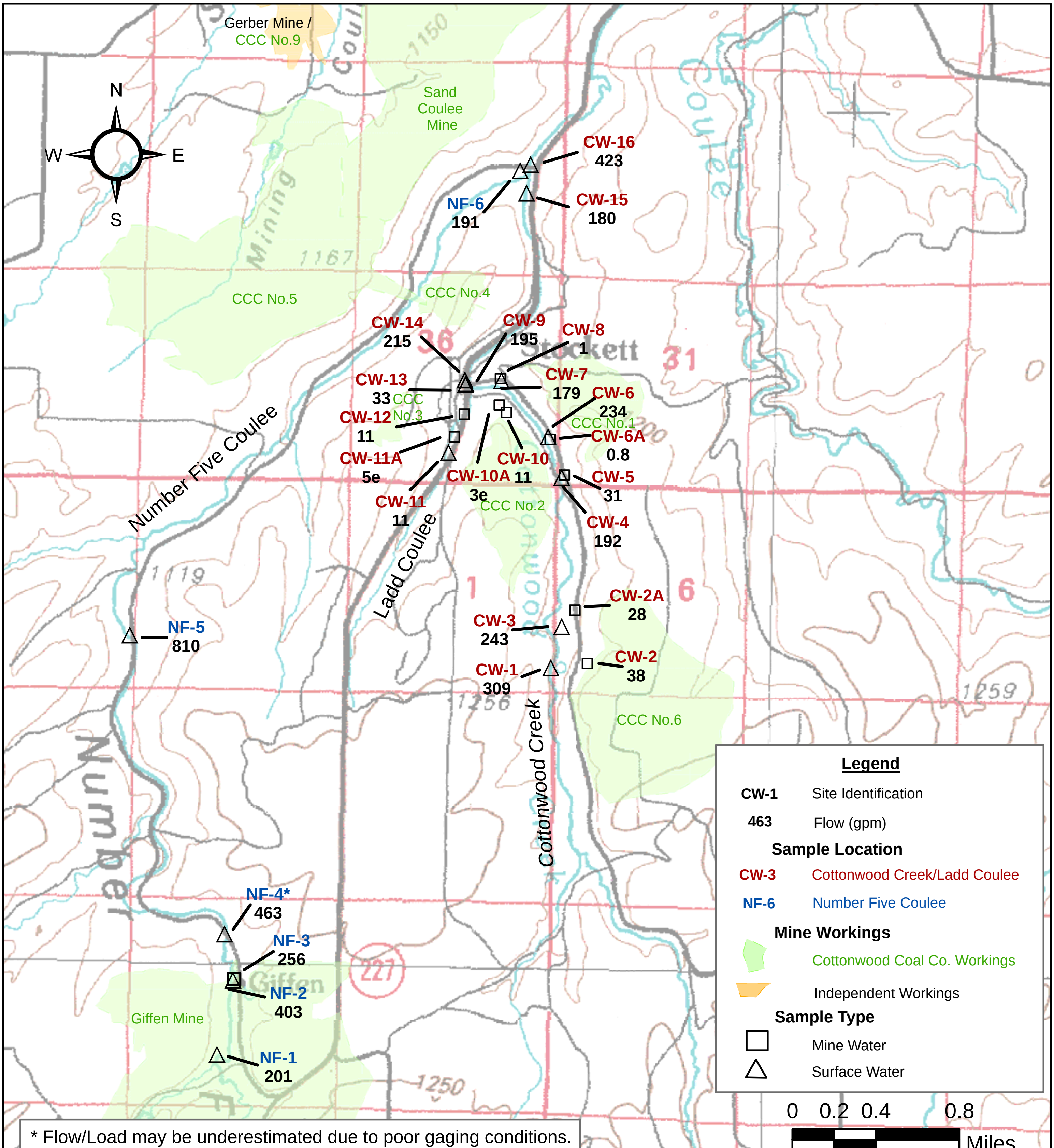
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	SAND COULEE TOTAL RECOVERABLE ALUMINUM LOAD (lb/day)	FIGURE C-5

V:\11033\GIS\C-5_SndCoulleeSampling8X11.mxd

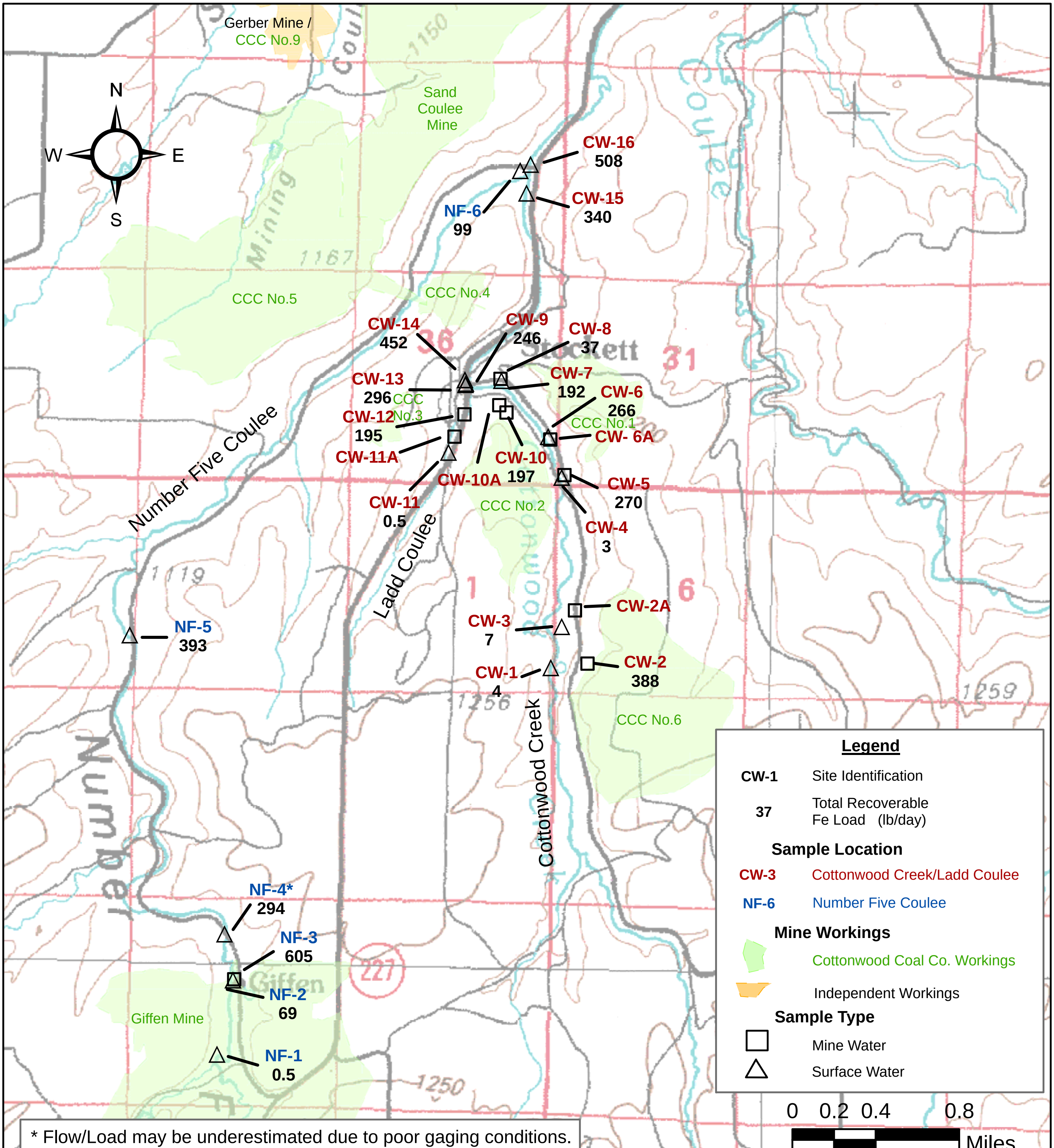
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	COTTONWOOD CREEK & NUMBER FIVE COULEE FLOW DATA (gpm)	FIGURE C-6

V:\11033\GIS\C-6 Cttnwd&No5 Sampling.mxd

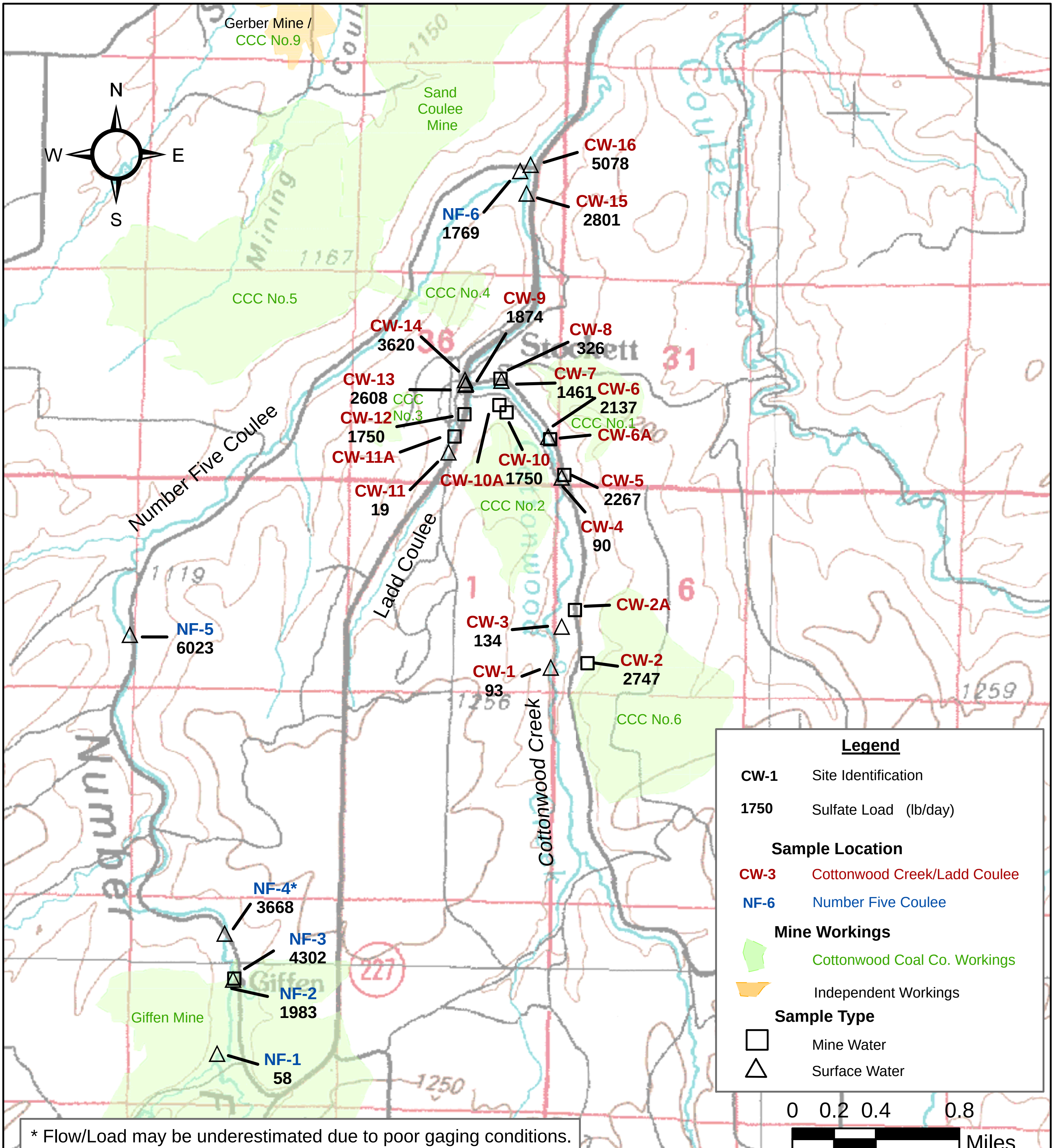
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	COTTONWOOD CREEK & NUMBER FIVE COULEE TOTAL RECOVERABLE IRON LOAD (lb/day)	FIGURE C-7

V:\11033\GIS\C-7 Cttnwd&No5 Sampling.mxd

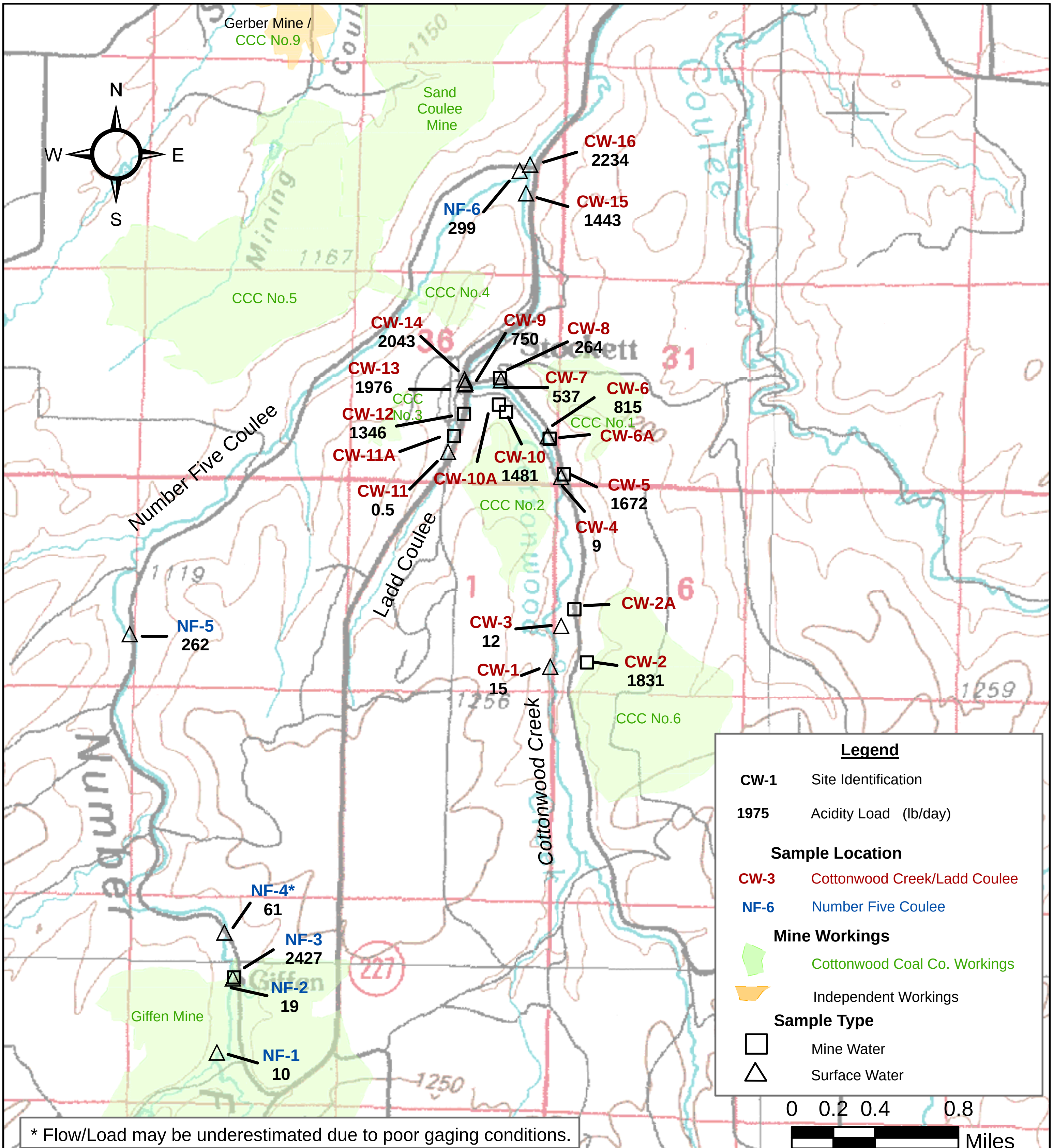
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	COTTONWOOD CREEK & NUMBER FIVE COULEE SULFATE LOAD (lb/day)	FIGURE C-8

V:\11033\GIS\C-8 Cttnwd&No5 Sampling.mxd

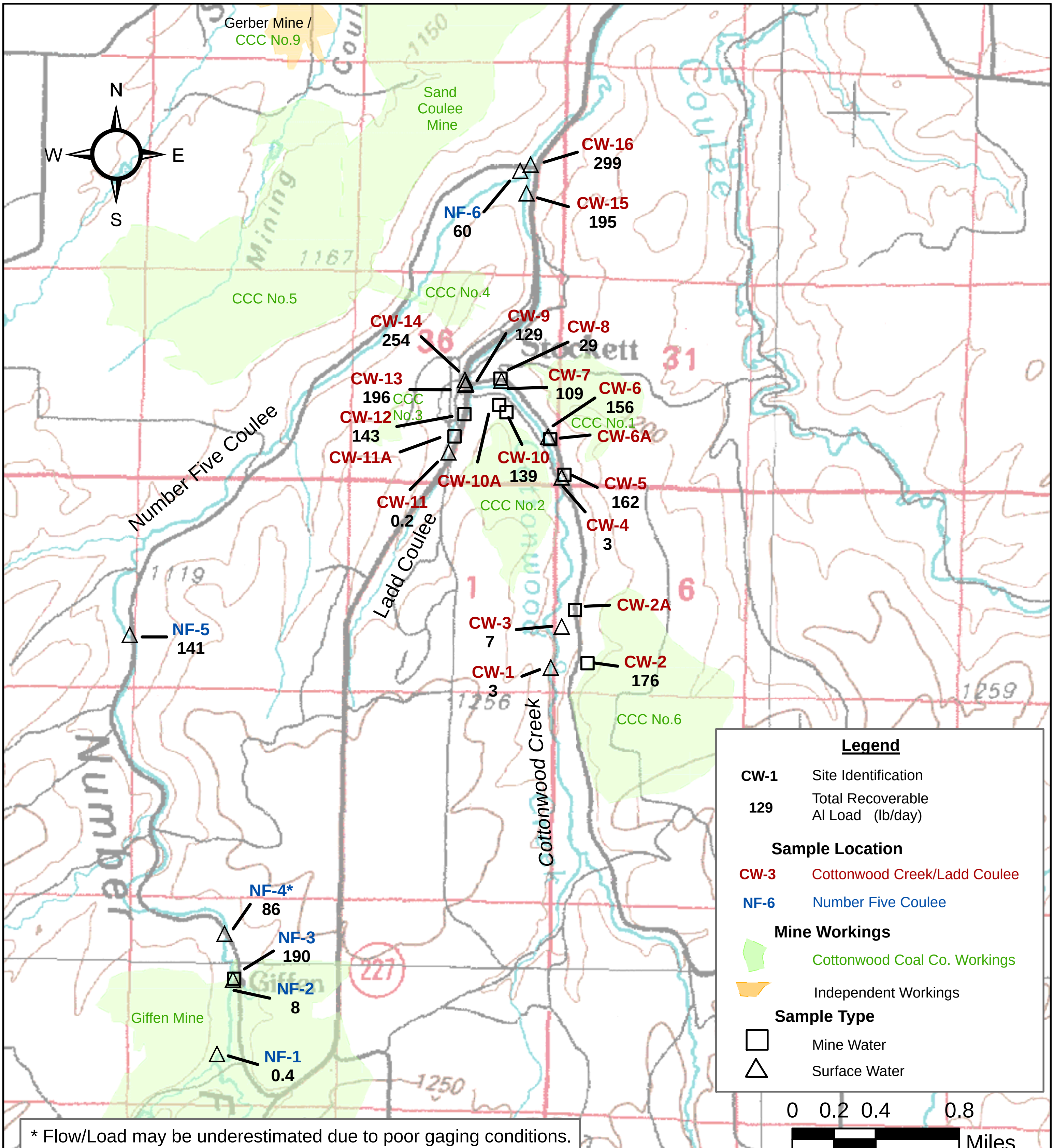
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	COTTONWOOD CREEK & NUMBER FIVE COULEE ACIDITY LOAD (lb/day)	FIGURE C-9

V:\11033\GIS\C-9 Cttnwd&No5 Sampling.mxd

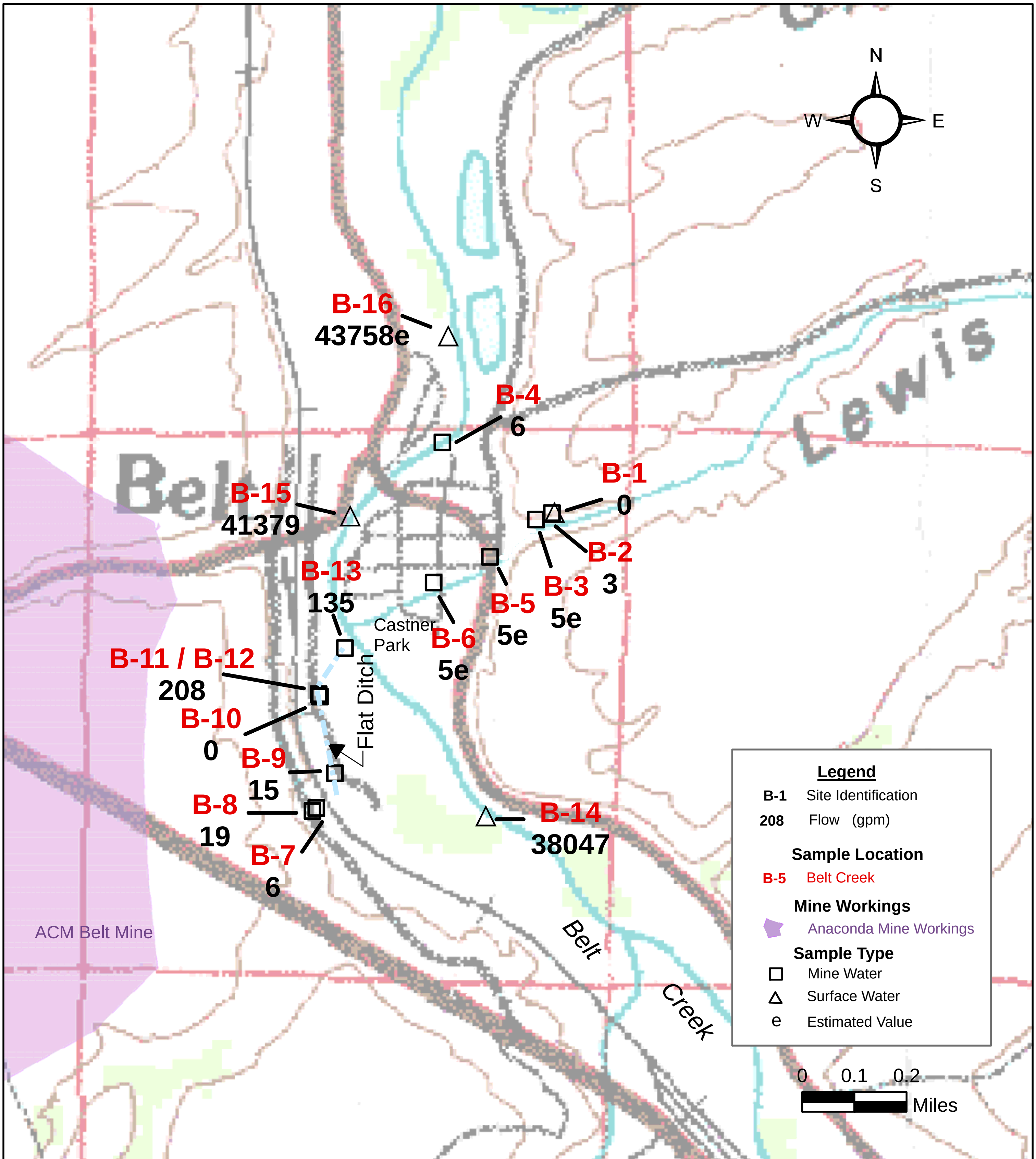
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	COTTONWOOD CREEK & NUMBER FIVE COULEE TOTAL RECOVERABLE ALUMINUM LOAD (lb/day)	FIGURE C-10

V:\11033\GIS\C-10 Cttnwd&No5 Sampling.mxd

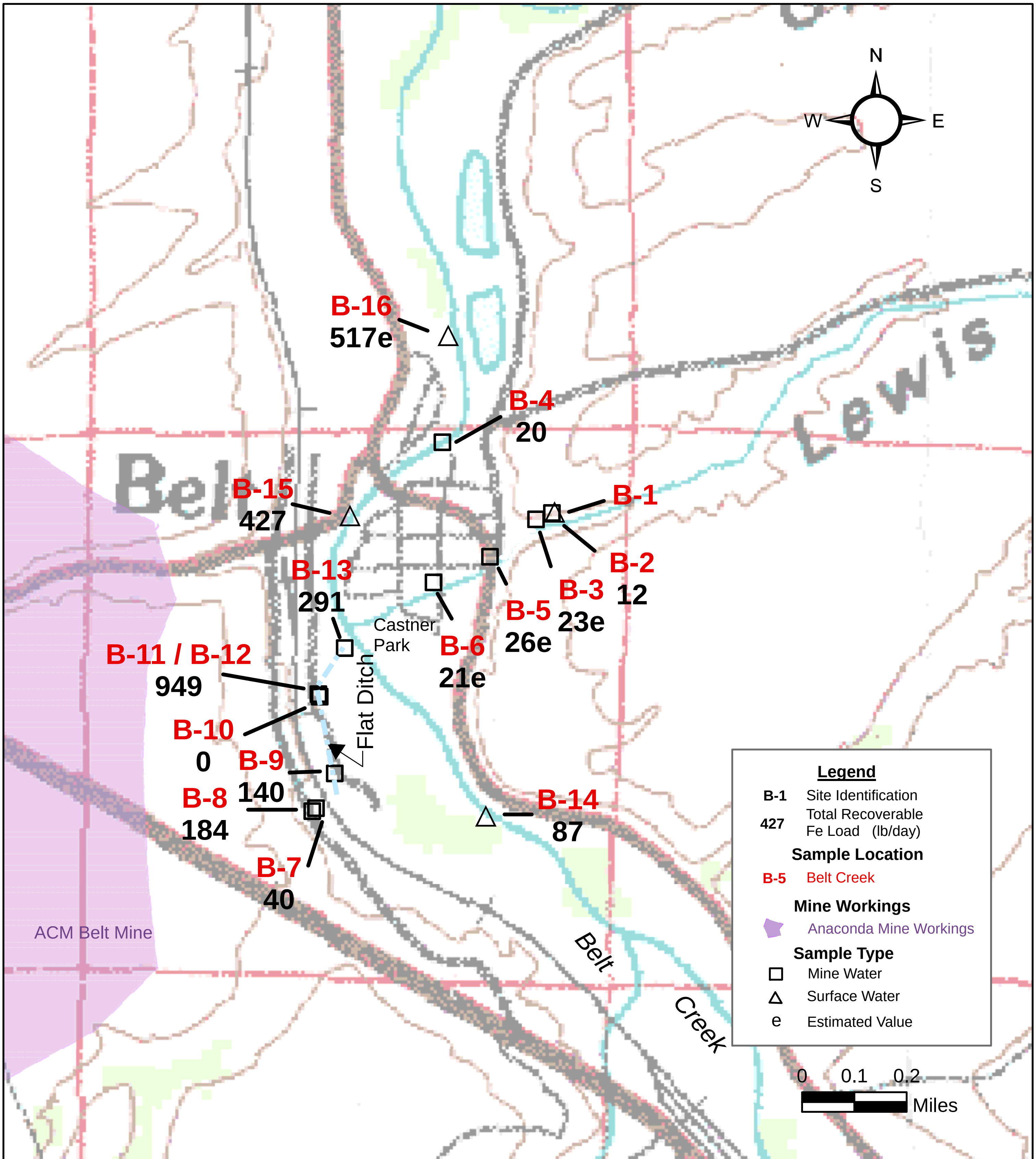
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	BELT CREEK FLOW DATA (gpm)	FIGURE C-11

V:\11033\GIS\C-11_Belt Sampling8X11.mxd

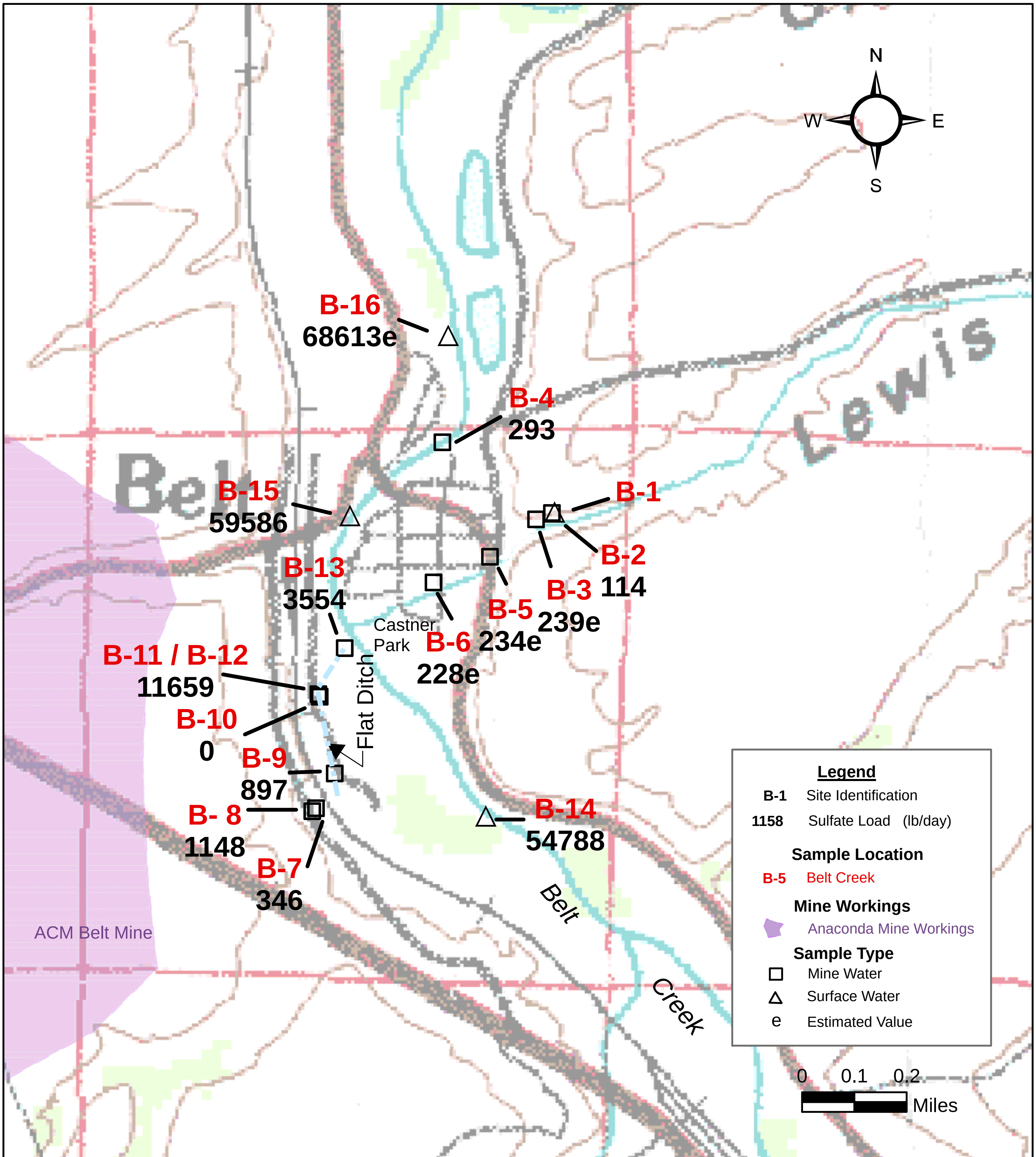
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	BELT CREEK TOTAL RECOVERABLE IRON LOAD (lb/day)	FIGURE C-12

V:\11033\GIS\C-12_Belt Sampling8X11.mxd

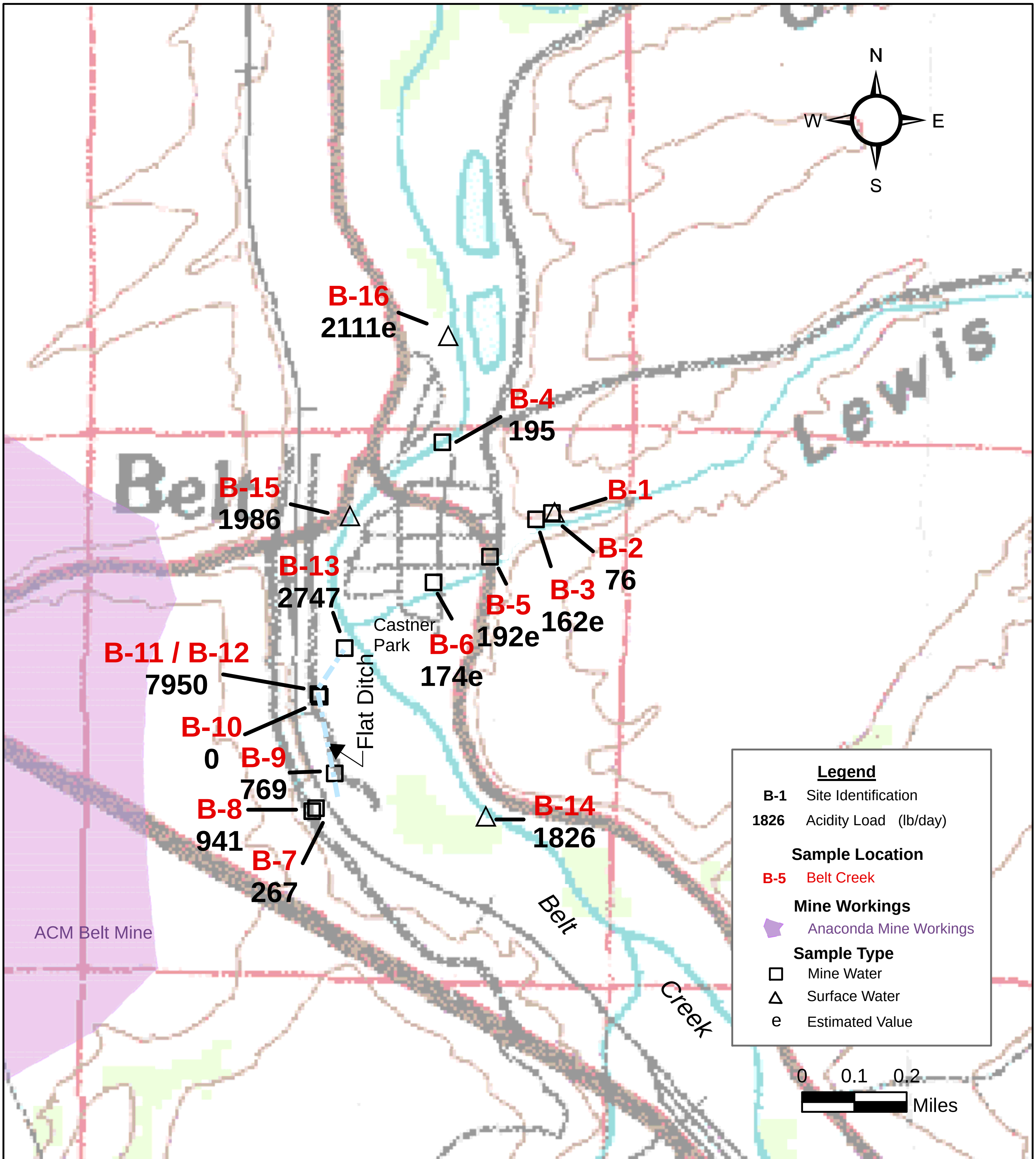
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	BELT CREEK SULFATE LOAD (lb/day)	FIGURE C-13

V:\11033\GIS\C-13_Belt Sampling8X11.mxd

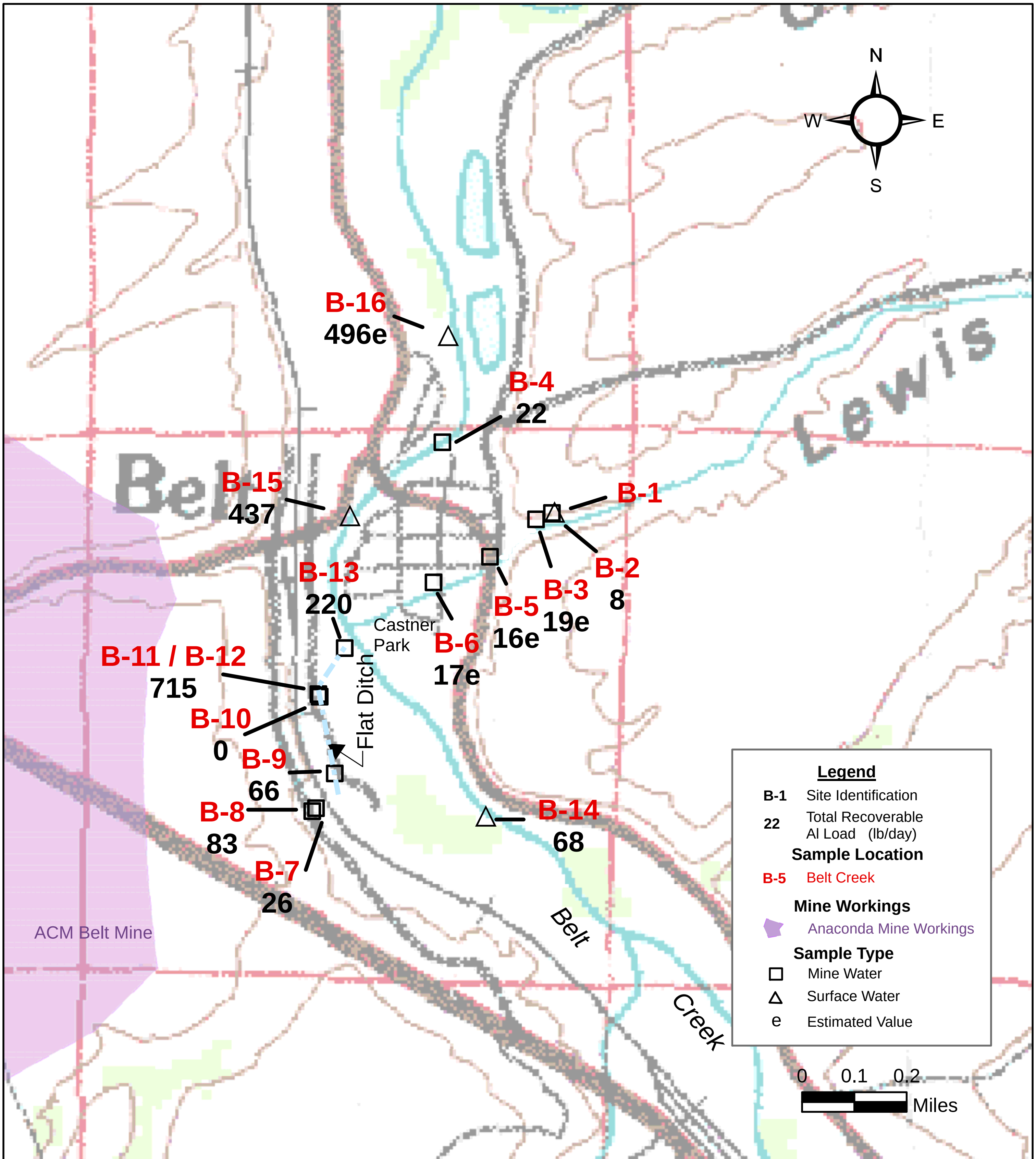
Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	BELT CREEK ACIDITY LOAD (lb/day)	FIGURE C-14

V:\11033\GIS\C-14_Belt Sampling8X11.mxd

Hydrometrics, Inc.
Consulting Scientists and Engineers



GREAT FALLS COAL FIELD WATER TREATMENT ASSESSMENT	BELT CREEK TOTAL RECOVERABLE ALUMINUM LOAD (lb/day)	FIGURE C-15

V:\11033\GIS\C-15_Belt Sampling8X11.mxd

Hydrometrics, Inc.
Consulting Scientists and Engineers

APPENDIX D

BENCH TESTING REPORT

TKT *Consulting, LLC*

Bench Testing Report

Great Falls Coal Fields Acid Mine Drainage

January 2012

TKT Consulting, LLC

Project Background and Requirements

Hydrometrics, Inc. (Hydrometrics) and the Montana Department of Environmental Quality (MDEQ) requested that TKT Consulting conduct bench testing on water from the Great Falls Coal Field for the purpose of determining acid mine drainage (AMD) treatment effectiveness and requirements.

Background

The DEQ abandoned mine lands (AML) program is exploring treatment alternatives for the AMD that is present in the Great Falls Coal Field near Belt, Stockett and Sand Coulee, Montana. The lime demand is expected to be extremely large therefore a system that can reduce lime requirements will be beneficial and provide cost savings. The site will also benefit from a system that can provide enhanced oxidation due to the relatively high iron and manganese concentrations. Therefore, TKT proposed testing with a bench scale rotating cylinder treatment system (RCTS) and with conventional tank reactor treatment methods to determine the benefits that may be achieved with each.

The testing determined an optimum operating pH (or target pH) within the acceptable pH range for discharge. It also provided an estimate of lime requirements and sludge generation and settling properties with both RCTS and tank reactor treatment methods.

Sand Coulee

Following review of the initial sampling, TKT and Hydrometrics recommended bench testing a combination of water from Hydrometrics' sampling sites SC-1, SC-3, SC-8 and SC-12, which correspond to mine discharge sites in Mining Coulee, the upstream Sand Coulee tributary drainage, Kate's Coulee and Nelson Mine, respectively
All four sites were sampled by DEQ on November 9, 2011.

Cottonwood Creek

TKT and Hydrometrics recommended bench testing a combination of water from Hydrometrics sampling sites CW-2, CW-8 and CW-10, which correspond to mine discharges from Cottonwood No.6, No. 1 and No. 2, respectively. There was no discharge from Cottonwood No. 1 on November 9, 2011, so sampling was limited to Cottonwood No. 6 and No. 2 discharges.

Number Five Coulee

AMD contamination to the Number Five Coulee emanates almost exclusively from Giffen Springs. TKT and Hydrometrics recommended bench testing water from Giffen Springs. Giffen Springs was sampled on November 9, 2011.

Belt

TKT and Hydrometrics recommended bench testing a combination of water from Hydrometrics sampling sites B-3, B-5, B-7, B-8, and B-11, which correspond to AMD discharges from Lewis Coulee, Castner Park, French Coulee Inflow, French Coulee Inflow #2 and the Anaconda Mine Drain, respectively. All five sites were sampled by DEQ on November 11, 2011.

Scope of Work

A total of 5 gallons of water was required for each test. Appropriate volumes of water were sampled from each of the sources by MDEQ on November 9 and 11, 2011. Care was taken to introduce as little oxygen to the samples as possible. Sample containers were filled as full as possible taking care to exclude air from the sample container. Samples were fixed by bubbling nitrogen gas through them at a rate of approximately 10 ml/min for 5 minutes and capped quickly to exclude oxygen. The samples were then shipped to TKT in Reno, NV for bench scale testing. All samples arrived in good condition. Upon receipt in Reno, samples were again purged with nitrogen. At the time of testing the combined Belt water and Number 5 water appeared to be oxidized. (ie. Sand Coulee and Cottonwood Coulee samples turned green in the beaker testing as it was neutralized, while Belt and Number Five turned orange).

Prior to treatment, the samples from each site (Sand Coulee, Cottonwood Creek, Number Five and Belt) were mixed in the appropriate ratios to mimic mixed treatment at each of these 4 proposed treatment sites. All samples were treated to pH 7.5, 8.0, 8.5, 9.0, 9.5 and 10.0 with a bench scale RCTS reactor and with a bench scale tank reactor system.

The following parameters were noted for each treatment.

1. Chemical consumption rates were determined using sodium hydroxide (caustic) and calcium hydroxide (hydrated lime).

2. The optimum pH for metals removal was determined. Metals and sulfate concentrations were determined immediately after sampling and following 24 and 48 hours of settling. Samples were analyzed for sulfate, total and dissolved aluminum, cadmium, copper, iron, manganese, nickel, and zinc in TKT's laboratory by atomic absorption spectrophotometry.

Samples were also taken following 72 hours of settling to explore benefits of increased system settling time, to provide better sensitivity and lower detection limits for cadmium, copper, manganese and nickel and to determine treated concentrations of arsenic, beryllium, chromium, lead, mercury, selenium and thallium. These samples included the following treatments:

RCTS and Beaker: Sand Coulee and Cottonwood Coulee pH 9.0, 9.5, and 10.0.
RCTS only: Number Five and Belt pH 9.0 and 9.5.

TKT Consulting, LLC

These samples were submitted to Energy Laboratory of Helena, MT for analysis of arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and thallium by ICP/ICP-MS.

Table 1.

PARAMETER	HUMAN HEALTH STANDARD (mg/L)		AQUATIC LIFE STANDARD (mg/L)		TRIGGER VALUE (mg/L)	REQUIRED REPORTING VALUE (mg/L)
	SURFACE WATER	GROUND WATER	ACUTE	CHRONIC		
Aluminum (Al)	--	--	0.750	0.087	0.03	0.03
Antimony (Sb)	0.0056	0.006	--	--	0.0004	0.003
Arsenic (As)	0.01	0.010	0.340	0.150	NAI	0.003
Barium (Ba)	1.0	1.0	--	--	0.002	0.005
Beryllium (Be)	0.004	0.004	--	--	NAI	0.001
Cadmium (Cd)	0.005	0.005	0.00541+	0.00053+	0.0001	0.00008
Chromium (Cr)	0.1	0.1	--	--	0.001	0.001
Chromium (III) (Cr (III))	--	--	3.82+	0.183+	0.001	--
Chromium (VI) (Cr (VI))	--	--	0.016	0.011	--	0.005
Copper (Cu)	1.3	1.3	0.0332+	0.0204+	0.0005	0.001
Cyanide (CN), Total	0.14	0.2	0.022	0.0052	--	0.005
Fluoride (F)	4.0	4.0	--	--	0.005	0.1
Iron (Fe)	0.3#	0.3#	--	1.0	--	0.05
Lead (Pb)	0.015	0.015	0.262+	0.01021+	0.0001	0.0005
Manganese (Mn)	0.05#	0.05#	--	--	--	0.005
Mercury (Hg)	0.00005	0.002	0.0017	0.00091	NAI	0.00001
Nickel (Ni)	0.1	0.1	1.019+	0.113+	0.0005	0.01
Selenium (Se)	0.05	0.05	0.02	0.005	0.0006	0.001
Silver (Ag)	0.1	0.1	0.0196+	--	0.0002	0.0005
Thallium (Tl)	0.00024	0.002	--	--	0.0003	0.0002
Zinc (Zn)	2.0	2.0	0.260+	0.260+	0.005	0.01

All information summarized from MDEQ Circular DEQ-7 (August 2010).
= narrative standard (guidance level given based on Secondary Federal MCL).
+ = hardness dependent parameter; values shown for a hardness of 250 mg/L as CaCO3.
NAI = no allowable increase

3. Sludge settling rates and volumes were determined utilizing Imhoff cones.

4. Photos were taken following treatment to document the extent of scaling following treatment.

Bench Testing

RCTS Bench Unit

A 1 L capacity RCTS™ bench unit was utilized for the bench testing.

Photo 1.1 One Liter capacity RCTS Bench Unit

Beaker Bench Unit

A 1L capacity Beaker bench unit consisting of a 2L Beaker and 2" stir bar turning at 600 rpm was utilized for the bench testing. Air was also pumped into the beaker at 6.5 liters per minute to mimic the addition of compressed air that is common to tank reactor systems..

Photo 1.2 One Liter capacity Beaker Bench Unit

RCTS Test Procedure

1. A 1L volume of water was poured into the RCTS™ bench testing unit.
2. Lime slurry or sodium hydroxide was added incrementally to a predetermined pH.
3. The reaction time was based on the amount of time it took for lime to dissolve in the bench unit. The reaction times varied from 6 to 11 minutes and were longer for Sand Coulee and Cottonwood Coulee do to higher metals concentrations.
4. Water was transferred from the bench unit to 1L Imhoff cones.
5. Settling was observed and samples were taken following 1, 24 and 48 hours of settling.

Beaker Test Procedure

1. A 1L volume of water was poured into the Beaker bench testing unit.
2. Lime slurry or sodium hydroxide was added incrementally to a predetermined pH.
3. The reaction time was based on the amount of time it took for lime to dissolve in the bench unit. The reaction times varied from 12 to 16 minutes and were longer for Sand Coulee and Cottonwood Coulee do to higher metals concentrations.
4. Water was transferred from the bench unit to 1L Imhoff cones.
5. Settling was observed and samples were taken following 1, 24 and 48 hours of settling.

Chemical Consumption

An initial titration was conducted using sodium hydroxide to determine the acidity. Titrations were performed with 1.175 N sodium hydroxide (NaOH). Bench testing was conducted with 10% lime slurry composed of high calcium-calcium hydroxide ($Ca(OH)_2$) and distilled water.

Results

The results from the titration with 1.175 N sodium hydroxide and 10% high calcium-calcium hydroxide are displayed in Figures 1.1 to 1.4 and Table 1.1 below.

The Sand Coulee combined water had an initial pH of 2.78. and 4756 mg/L NaOH (5946 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5; while 5360 mg/L $Ca(OH)_2$ (7236 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the RCTS and 5340 mg/L $Ca(OH)_2$ (7209 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the Beaker Test unit. This reflects 82.1% efficiency with the RCTS and 82.4% efficiency in the Beaker test.

The Cottonwood Coulee combined water had an initial pH of 2.51 and 5555 mg/L NaOH (6944 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5; while 5700 mg/L $Ca(OH)_2$ (7695 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the RCTS and 6035 mg/L $Ca(OH)_2$ (8147 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the Beaker Test unit. This reflects 90.2% efficiency with the RCTS and 85.2% efficiency in the Beaker test.

The Number Five combined water had an initial pH of 2.80 and 705 mg/L NaOH (881 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5; while 790 mg/L $Ca(OH)_2$ (1067 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the RCTS and 860 mg/L $Ca(OH)_2$ (1161 mg/L

$CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the Beaker Test unit. This reflects 82.6% efficiency with the RCTS and 75.9% efficiency in the Beaker test.

The Belt combined water had an initial pH of 2.73. and 1528 mg/L NaOH (1909 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5; while 1600 mg/L $Ca(OH)_2$ (2160 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the RCTS and 1645 mg/L $Ca(OH)_2$ (2221 mg/L $CaCO_{3\ equiv}$) was required to achieve a pH of 9.5 with the Beaker Test unit. This reflects 88.4% efficiency with the RCTS and 86.0% efficiency in the Beaker test.

Figure 1.1. Titration curves for 1.175 N sodium hydroxide and 10% hydrated lime on Sand Coulee water sample.

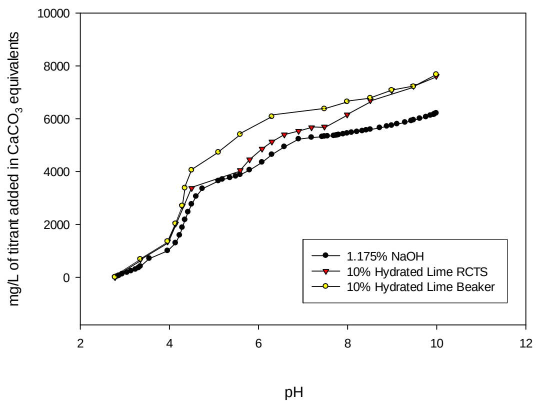


Figure 1.2. Titration curves for 1.175 N sodium hydroxide and 10% hydrated lime on Cottonwood Coulee water sample.

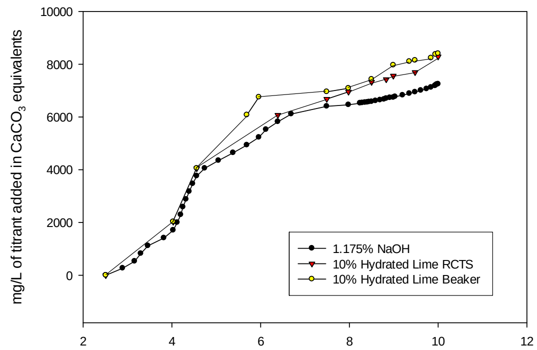


Figure 1.3. Titration curves for 1.175 N sodium hydroxide and 10% hydrated lime on Number Five water sample.

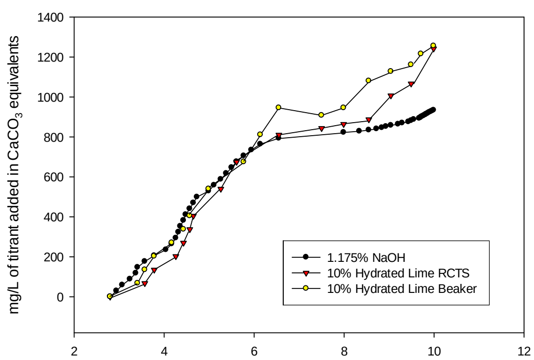


Figure 1.4. Titration curves for 1.175 N sodium hydroxide and 10% hydrated lime on Belt water sample.

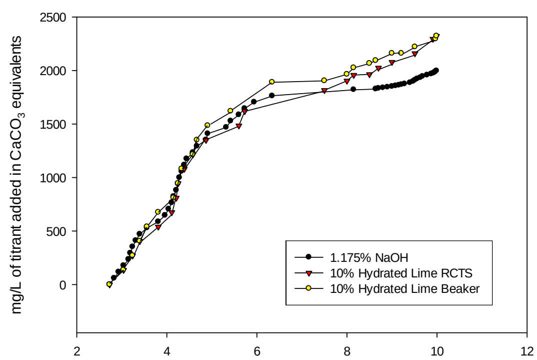


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Table 1.1 Lime and sodium hydroxide required to achieve pH values between 7.5 and 10.0.

Amount of titrant added to achieve desired pH									
Sand Coulee									
pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5	90700	4263	**5329**	42200	4220	**5697**	47200	4720	**6372**
8.0	92700	4357	**5446**	45600	4560	**6156**	49200	4920	**6642**
8.5	95200	4474	**5593**	49600	4960	**6696**	50200	5020	**6777**
9.0	97700	4592	**5740**	52400	5240	**7074**	52400	5240	**7074**
9.5	101200	4756	**5946**	53600	5360	**7236**	53400	5340	**7209**
10.0	105600	4963	**6204**	56400	5640	**7614**	56800	5680	**7668**
Cottonwood Coulee									
pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5	109000	5123	**6404**	49500	4950	**6683**	51500	5150	**6953**
8.0	110000	5170	**6463**	51500	5150	**6953**	52500	5250	**7088**
8.5	112000	5264	**6580**	54250	5425	**7324**	55000	5500	**7425**
9.0	114700	5390.9	**6739**	56000	5600	**7560**	59000	5900	**7965**
9.5	118200	5555.4	**6944**	57000	5700	**7695**	60350	6035	**8147**
10.0	123300	5795.1	**7244**	61400	6140	**8289**	62250	6225	**8404**
Number Five									
pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5				6250	625	**844**	6725	672.5	**908**
8.0	14000	658	**823**	6400	640	**864**	7000	700	**945**
8.5	14200	667.4	**834**	6575	657.5	**888**	8000	800	**1080**
9.0	14600	686.2	**858**	7460	746	**1007**	8350	835	**1127**
9.5	15000	705	**881**	7900	790	**1067**	8600	860	**1161**
10.0	15900	747.3	**934**	9200	920	**1242**	9300	930	**1256**
Belt									
pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5				13450	1345	**1816**	14100	1410	**1904**
8.0				14100	1410	**1904**	14550	1455	**1964**
8.5				14550	1455	**1964**	15300	1530	**2066**
9.0	31500	1480.5	**1851**	15400	1540	**2079**	16000	1600	**2160**
9.5	32500	1527.5	**1909**	16000	1600	**2160**	16450	1645	**2221**
10.0	34000	1598	**1998**	17200	1720	**2322**	17200	1720	**2322**

Metals Removal

Sand Coulee

Metals concentrations versus treatment pH for the Sand Coulee tests are displayed in Figures 2.1 through 2.23 below.

Aluminum

Figure 2.1. Sand Coulee RCTS Treatment Aluminum Concentrations at Time 24 Hours.

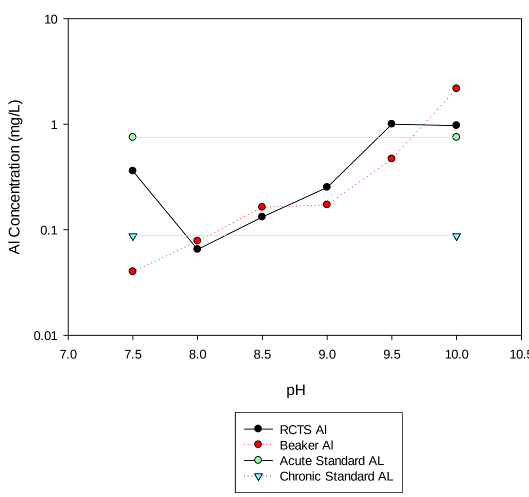
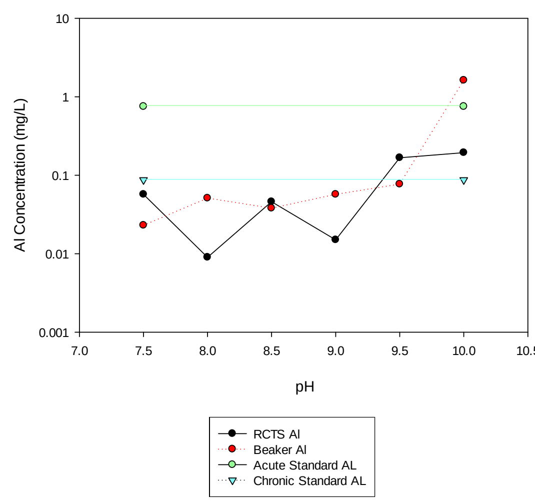


Figure 2.2. Sand Coulee RCTS Treatment Aluminum Concentrations at Time 48 Hours.



Cadmium

Figure 2.3. Sand Coulee Treatment Cadmium Concentrations at Time 1 Hour.

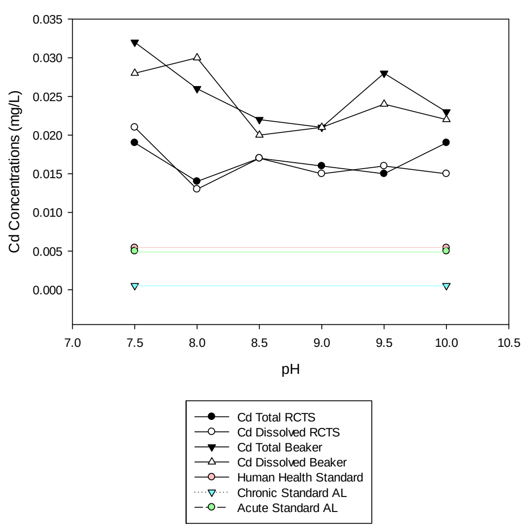


Figure 2.4. Sand Coulee Treatment Cadmium Concentrations at Time 24 Hour.

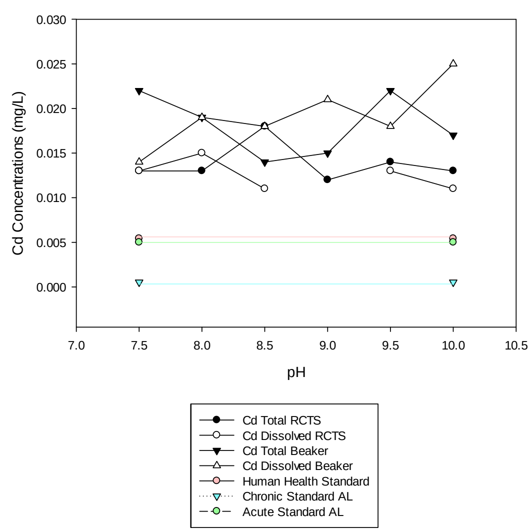


Figure 2.5. Sand Coulee Treatment
Cadmium Concentrations at Time 48 Hour.

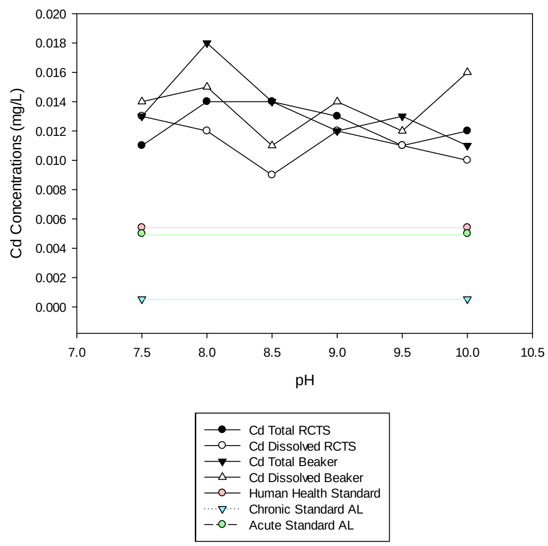
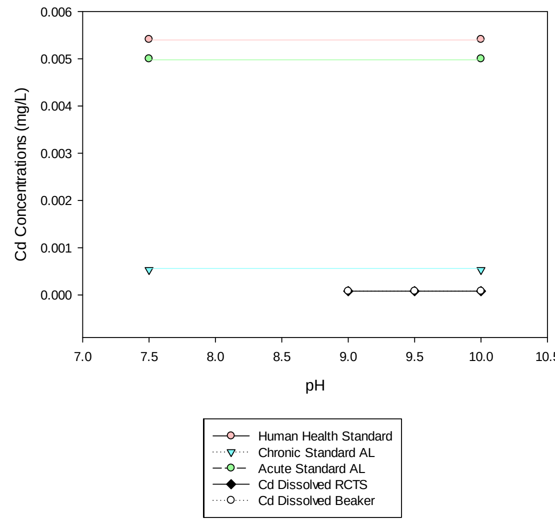


Figure 2.6. Sand Coulee Treatment
Cadmium Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Copper

Figure 2.7. Sand Coulee Treatment
Copper Concentrations at Time 1 Hour.

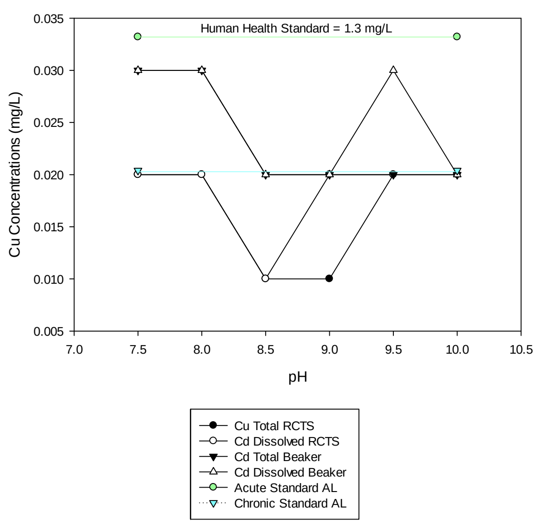


Figure 2.8. Sand Coulee Treatment
Copper Concentrations at Time 24 Hour.

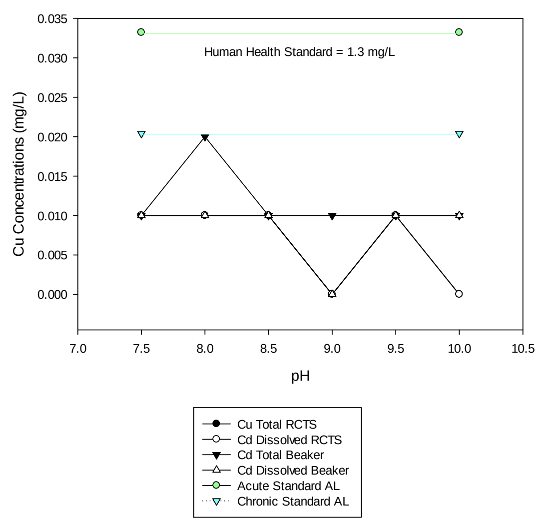


Figure 2.9. Sand Coulee Treatment
Copper Concentrations at Time 48 Hour.

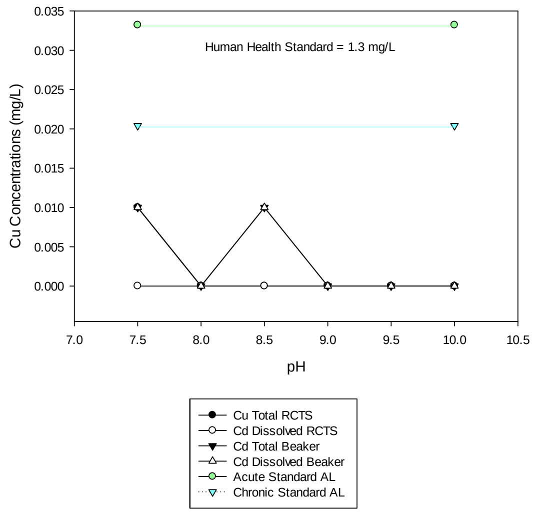
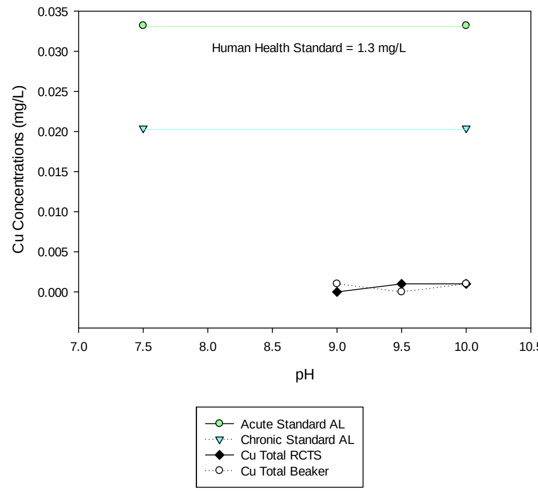


Figure 2.10. Sand Coulee Treatment
Copper Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Iron

Figure 2.11. Sand Coulee Treatment
Iron Concentrations at Time 1 Hour.

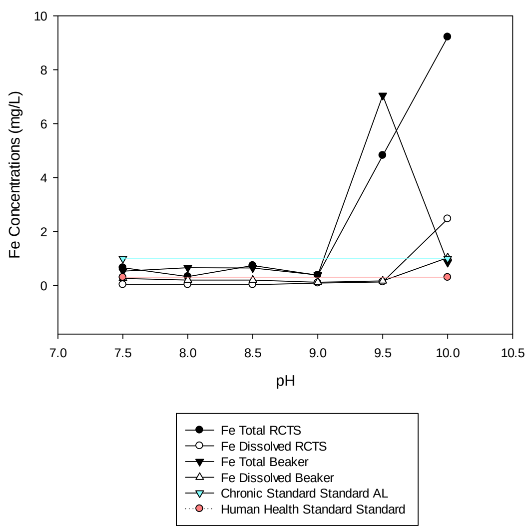


Figure 2.12. Sand Coulee Treatment
Iron Concentrations at Time 24 Hour.

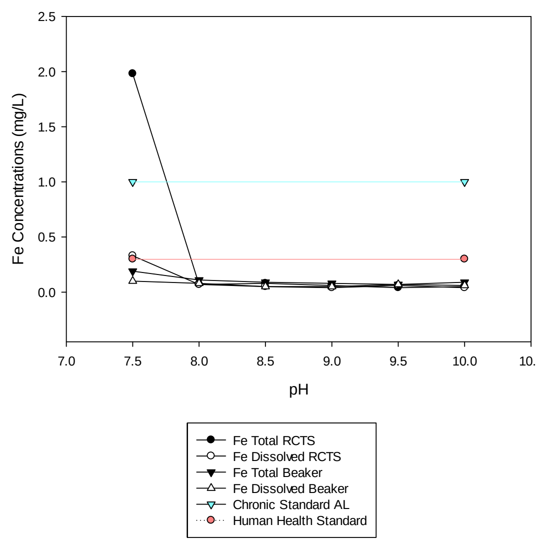
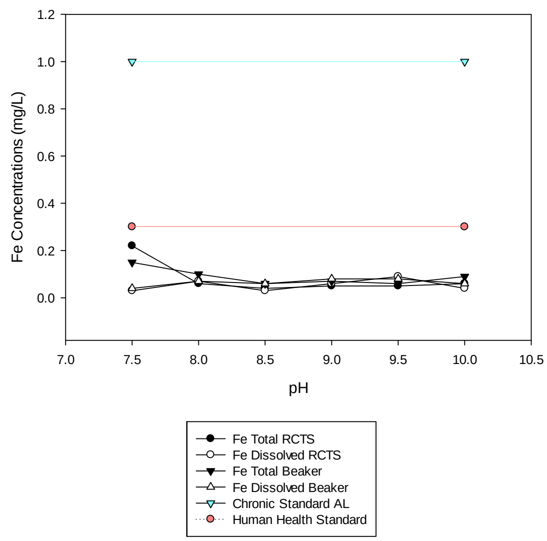


Figure 2.13. Sand Coulee Treatment
Iron Concentrations at Time 48 Hour.



Manganese

Figure 2.14. Sand Coulee Treatment
Manganese Concentrations at Time 1 Hour.

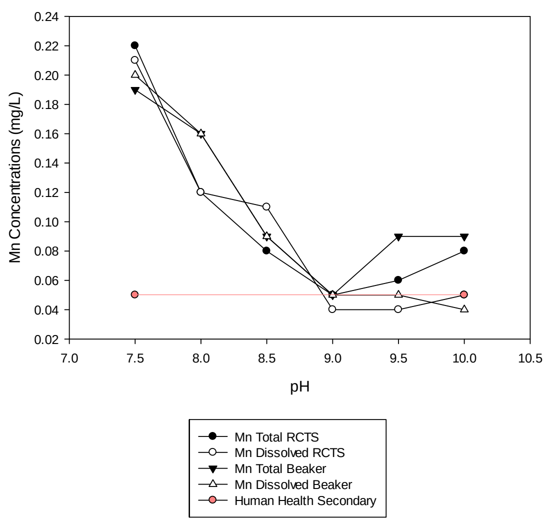


Figure 2.15. Sand Coulee Treatment
Manganese Concentrations at Time 24 Hour.

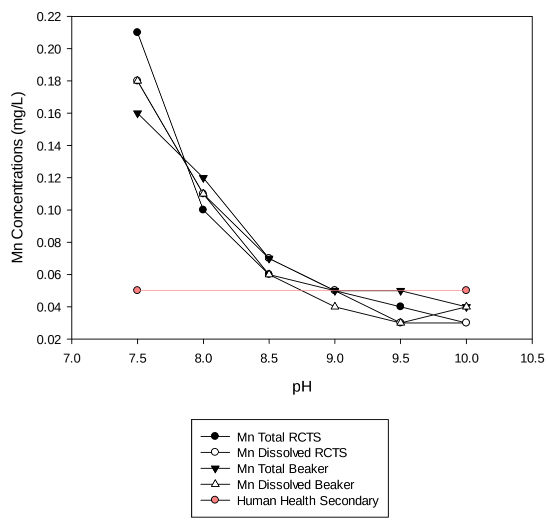
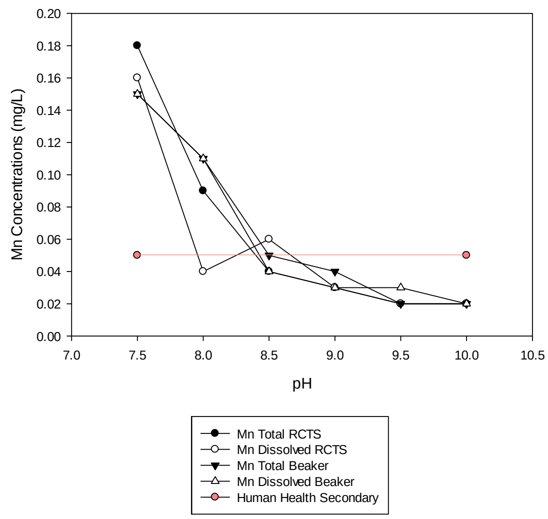


Figure 2.16. Sand Coulee Treatment
Manganese Concentrations at Time 48 Hour.



Nickel

Figure 2.17. Sand Coulee Treatment
Nickel Concentrations at Time 1 Hour.

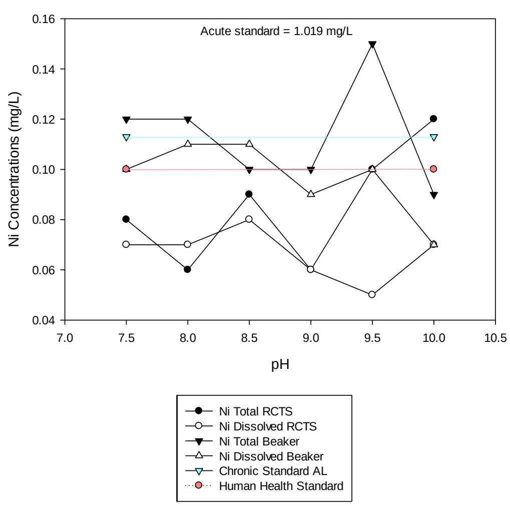


Figure 2.18. Sand Coulee Treatment
Nickel Concentrations at Time 24 Hour.

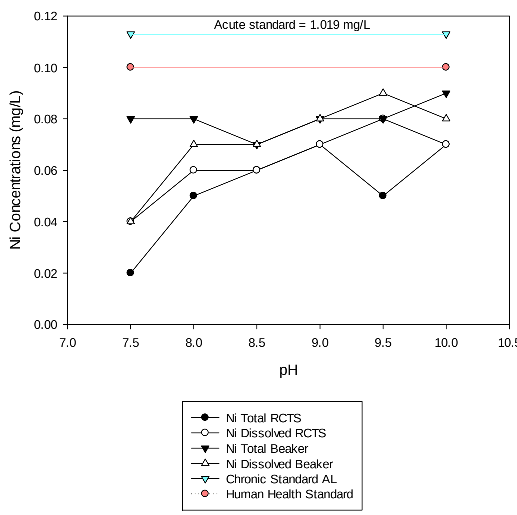


Figure 2.19. Sand Coulee Treatment
Nickel Concentrations at Time 48 Hour.

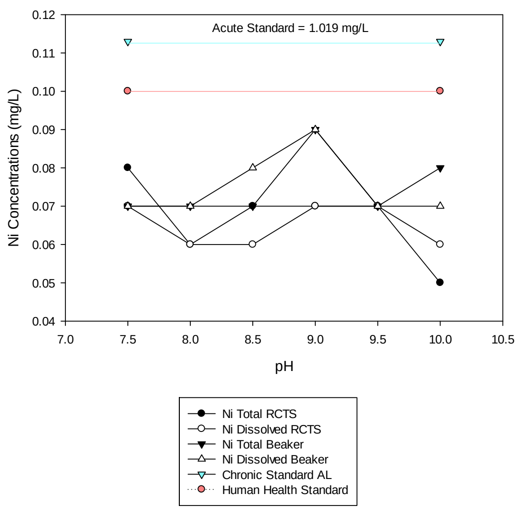
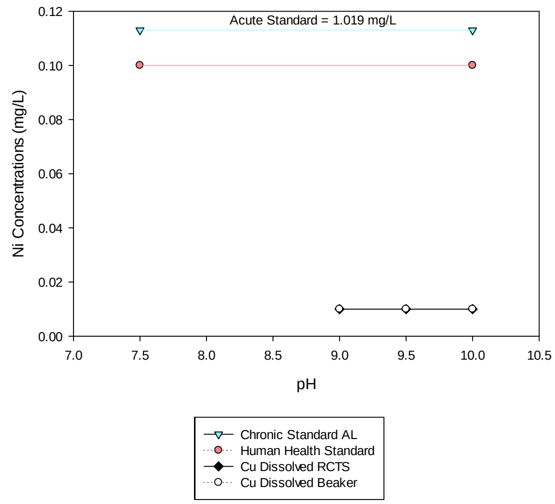


Figure 2.20. Sand Coulee Treatment
Nickel Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Zinc

Figure 2.21. Sand Coulee Treatment
Zn Concentrations at Time 1 Hour.

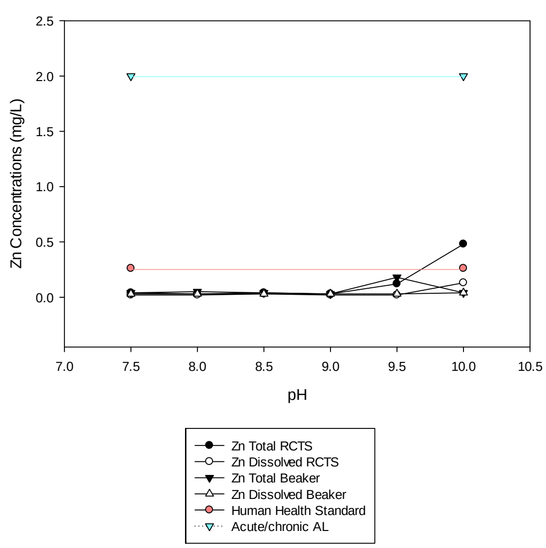


Figure 2.22. Sand Coulee Treatment
Zn Concentrations at Time 24 Hour.

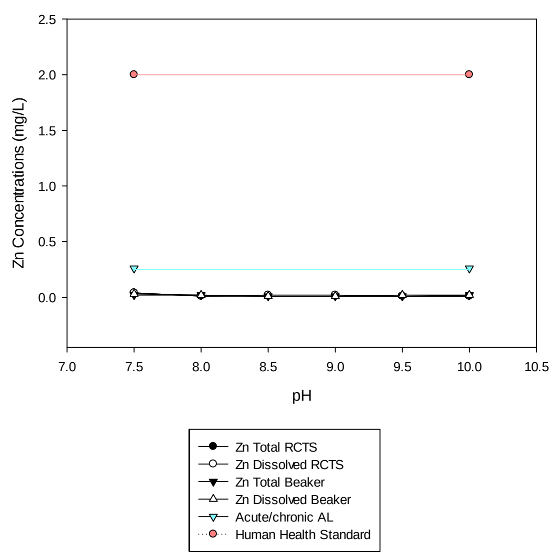


Figure 2.23. Sand Coulee Treatment
Zn Concentrations at Time 48 Hour.

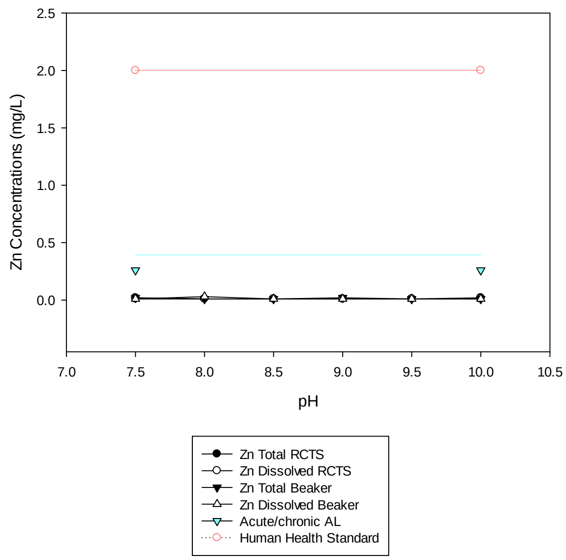


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Table 2.4 Sand Coulee Metals RCTS

Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	*0.087*		*0.00541*		*0.020*		*1*		*NA*		*0.113*		*0.26*				
Aquatic Life Acute	*0.75*		*0.00053*		*0.0332*		*NA*		*NA*		*1.019*		*0.26*				
Human Health	*NA*		*0.005*		*1.30*		*0.30*		*0.05*		*0.1*		*2*				
7.50			0.019	0.021	0.02	0.02	0.66	0.03	0.22	0.21	0.08	0.07	0.04	0.02			1399
8.00			0.014	0.013	0.02	0.02	0.33	0.03	0.12	0.12	0.06	0.07	0.03	0.02			1319
8.50			0.017	0.017	0.01	0.01	0.74	0.03	0.09	0.11	0.09	0.08	0.04	0.03			1255
9.00			0.016	0.015	0.01	0.02	0.38	0.09	0.05	0.04	0.06	0.06	0.03	0.02			1329
9.50			0.015	0.016	0.02	0.02	4.82	0.13	0.06	0.04	0.10	0.05	0.12	0.02			1259
10.00			0.019	0.015	0.14	0.02	9.21	2.47	0.08	0.05	0.12	0.07	0.48	0.13			1003
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.360	0.013	0.013	0.06	0.01	1.98	0.33	0.21	0.18	0.02	0.04	0.04	0.04	270	6.22	1470
8.00		0.065	0.013	0.015	0.01	0.01	0.07	0.07	0.1	0.11	0.05	0.06	0.01	0.01	275	6.87	1373
8.50		0.132	0.018	0.011	0.01	0.01	0.08	0.05	0.06	0.07	0.06	0.06	0.01	0.02	400	7.20	1345
9.00		0.252	0.012	0.009	<0.01	<0.01	0.06	0.04	0.05	0.05	0.07	0.07	0.01	0.02	350	7.84	1413
9.50		1.000	0.014	0.013	0.01	0.01	0.04	0.06	0.04	0.03	0.05	0.08	0.01	0.01	350	8.47	1348
10.00		0.970	0.013	0.011	<0.01	<0.01	0.05	0.04	0.03	0.03	0.07	0.07	0.01	0.01	520	8.85	1526
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.057	0.011	0.013	0.01	<0.01	0.22	0.03	0.18	0.16	0.08	0.07	0.02	0.01	250	7.84	2040
8.00		0.009	0.014	0.012	<0.01	<0.01	0.06	0.07	0.09	0.04	0.06	0.06	0.01	0.01	270	7.86	1913
8.50		0.046	0.014	0.009	<0.01	<0.01	0.04	0.03	0.04	0.06	0.07	0.06	0.01	0.01	325	7.88	1907
9.00		0.015	0.013	0.012	<0.01	<0.01	0.05	0.06	0.03	0.03	0.07	0.07	0.01	0.01	300	8.05	1910
9.50		0.167	0.011	0.011	<0.01	<0.01	0.05	0.09	0.02	0.02	0.07	0.07	0.01	0.01	300	8.43	1855
10.00		0.194	0.012	0.010	<0.01	<0.01	0.06	0.04	0.02	0.02	0.06	0.06	0.02	0.01	480	8.68	1725
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	*0.15*	*NA*	*0.00541*	*NA*	*0.020*	*0.0102*	*NA*	*0.0009*	*0.113*	*0.005*	*NA*						
Aquatic Life Acute	*0.34*	*NA*	*0.00053*	*NA*	*0.0332*	*0.262*	*NA*	*0.0017*	*1.019*	*0.02*	*NA*						
Human Health	*0.01*	*0.004*	*0.005*	*0.1*	*1.30*	*0.015*	*0.05*	*0.00005*	*0.1*	*0.05*	*0.0002*						
7.50															240	7.73	
8.00															265	7.91	
8.50															320	8.00	
9.00	<0.003	<0.001	<0.00008	<0.001	<0.001	<0.0005	0.015	<0.00001	<0.01	0.002	0.0012				300	8.10	
9.50	<0.003	<0.001	<0.00008	<0.001	0.001	<0.0005	<0.005	<0.00001	<0.01	0.002	0.0009				290	8.21	
10.00	<0.003	<0.001	<0.00008	0.001	0.001	<0.0005	<0.005	<0.00001	<0.01	0.001	0.0008				400	8.32	
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
Combined			0.105	0.100	0.36	0.37	898	888	3.2	3.1	4.24	4.19	18.8	18.5			2437
sct1			0.176	0.166	0.49	0.48	1381	1323	4.1	3.9	8.60	8.10	30.3	28.8			
sct3			0.096	0.100	0.35	0.35	67.1	63.1	2.1	2.1	4.10	4.40	15.6	16.8			
sct8			0.026	0.026	0.02	0.02	19.2	19.3	1.15	1.3	1.60	1.60	5.5	5.5			
sct12			0.143	0.139	0.70	0.67	1404	1334	7.3	6.9	4.60	4.50	15.3	14.8			

Exceeds Human Health Standard | **Exceeds Aquatic Life Standard** | Exceeds Both Standards

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Table 2.2 Sand Coulee Metals Beaker

Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.087***		***0.00541***		***0.020***		***1***		***NA***		***0.113***		***0.26***				
Aquatic Life Acute	***0.75***		***0.00053***		***0.0332***		***NA***		***NA***		***1.019***		***0.26***				
Human Health	***NA***		***0.005***		***1.30***		***0.30***		***0.05***		***0.1***		***2***				
7.50			0.032	0.028	0.03	0.03	0.53	0.26	0.19	0.2	0.12	0.10	0.04	0.03			1367
8.00			0.026	0.030	0.03	0.03	0.66	0.20	0.16	0.16	0.12	0.11	0.05	0.03			1263
8.50			0.022	0.020	0.02	0.02	0.65	0.20	0.09	0.09	0.10	0.11	0.04	0.03			1284
9.00			0.021	0.021	0.02	0.02	0.39	0.12	0.05	0.05	0.10	0.09	0.03	0.02			1212
9.50			0.028	0.024	0.02	0.03	7.05	0.17	0.09	0.05	0.15	0.10	0.18	0.03			1227
10.00			0.023	0.022	0.02	0.02	0.85	1.03	0.04	0.04	0.09	0.07	0.04	0.04			1232
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.040	0.022	0.014	0.01	0.01	0.19	0.10	0.16	0.18	0.08	0.04	0.02	0.03	270	6.47	1334
8.00		0.780	0.019	0.019	0.02	0.01	0.11	0.08	0.13	0.11	0.08	0.07	0.02	0.02	275	7.01	1386
8.50		0.163	0.014	0.018	0.01	0.01	0.09	0.05	0.07	0.06	0.07	0.07	0.01	0.01	350	7.37	1421
9.00		0.172	0.015	0.021	0.01	<0.01	0.08	0.05	0.05	0.04	0.08	0.08	0.01	0.01	320	8.07	1352
9.50		0.469	0.022	0.018	0.01	0.01	0.07	0.07	0.05	0.03	0.08	0.09	0.01	0.02	320	8.75	1264
10.00		2.168	0.017	0.025	0.01	0.01	0.09	0.06	0.04	0.04	0.09	0.08	0.02	0.02	320	9.15	2124
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.023	0.013	0.014	0.01	0.01	0.15	0.04	0.15	0.15	0.07	0.07	0.02	0.01	270	7.88	2259
8.00		0.051	0.018	0.015	<0.01	<0.01	0.10	0.07	0.11	0.11	0.07	0.07	0.01	0.03	265	7.91	2303
8.50		0.038	0.014	0.011	0.01	0.01	0.06	0.06	0.04	0.04	0.07	0.08	0.01	0.01	300	7.94	2209
9.00		0.057	0.012	0.014	<0.01	<0.01	0.07	0.08	0.03	0.03	0.09	0.09	0.02	0.01	290	8.12	2160
9.50		0.077	0.013	0.012	<0.01	<0.01	0.06	0.08	0.03	0.03	0.07	0.07	0.01	0.01	300	8.56	2257
10.00		1.620	0.011	0.016	<0.01	<0.01	0.09	0.06	0.02	0.02	0.08	0.07	0.01	0.01	280	9.02	2152
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.15***	***NA***	***0.00541***	***NA***	***0.020***	***0.0102***	***NA***	***0.0009***	***0.113***	***0.005***	***NA***						
Aquatic Life Acute	***0.34***	***NA***	***0.00053***	***NA***	***0.0332***	***0.262***	***NA***	***0.0017***	***1.019***	***0.02***	***NA***						
Human Health	***0.01***	***0.004***	***0.005***	***0.1***	***1.30***	***0.015***	***0.05***	***0.00005***	***0.1***	***0.05***	***0.0002***						
7.50															270	7.83	
8.00															265	7.93	
8.50															290	8.05	
9.00	<0.003	<0.001	<0.00008	<0.001	0.001	<0.0005	0.020	<0.00001	<0.01	0.002	0.0013				290	8.16	
9.50	<0.003	<0.001	<0.00008	<0.001	<0.001	<0.0005	0.006	<0.00001	<0.01	0.002	0.0011				300	8.27	
10.00	<0.003	<0.001	<0.00008	<0.001	0.001	<0.0005	<0.005	<0.00001	<0.01	0.002	0.0008				275	8.42	
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
Combined			0.105	0.100	0.36	0.37	898	888	3.2	3.1	4.24	4.19	18.8	18.5			2437
sct1			0.176	0.166	0.49	0.48	1381	1323	4.1	3.9	8.60	8.10	30.3	28.8			
sct3			0.096	0.100	0.35	0.35	67.1	63.1	2.1	2.1	4.10	4.40	15.6	16.8			
sct8			0.026	0.026	0.02	0.02	19.2	19.3	1.15	1.3	1.60	1.60	5.5	5.5			
sct12			0.143	0.139	0.70	0.67	1404	1334	7.3	6.9	4.60	4.50	15.3	14.8			

Exceeds Human Health Standard | **Exceeds Aquatic Life Standard** | Exceeds Both Standards

Metals removal by lime neutralization with RCTS and Beaker treatments were effective with the Sand Coulee water. In general, increased settling time resulted in lower metals concentrations and RCTS Treatment resulted in slightly lower metals concentrations than the beaker treatment. The highest treatment pH of 10.0 resulted in a solution pH of 8.32 with RCTS treatment and 8.42 with beaker treatment following 72 hours. A treatment pH of 8.5 or greater was effective at achieving discharge targets, with the exception of cadmium (1 hr to 48 hours analyzed by AA), and iron, nickel and zinc at several pH values at one hour of settling time. However, the analysis within 48 hours was analyzed by atomic absorption spectrophotometry (AA) which does not provide the sensitivity and low detection limits that are provided by inductively coupled plasma-mass spectrometry (ICP-MS). Samples taken at 72 hours were analyzed by ICP-MS and reveal that indeed nickel and cadmium limits are achieved at the pH values analyzed.

Aluminum concentrations increased with increasing pH. At a treatment pH of 10.0, TKT predicts that there may be sufficient aluminum remaining in solution to cause white staining in the discharge. The threshold for staining will depend on the flows of the effluent and the receiving stream and the extent of contamination already present in the receiving water and the sediment.

Cottonwood Coulee

Metals concentrations plotted versus treatment pH for the Cottonwood Coulee tests are displayed in Figures 2.24 through 2.46.

Aluminum

Figure 2.24. Cottonwood Coulee RCTS Treatment Aluminum Concentrations at Time 24 Hours.

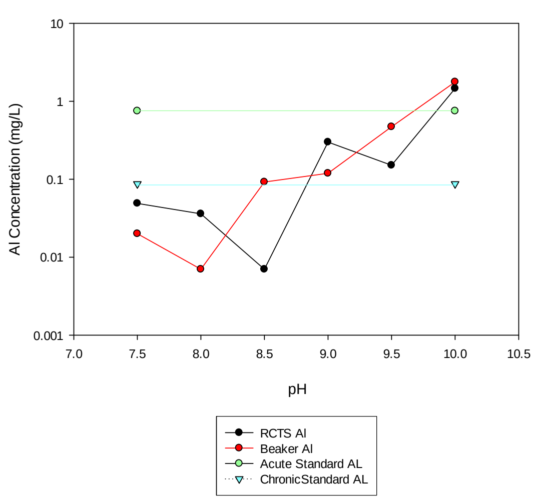
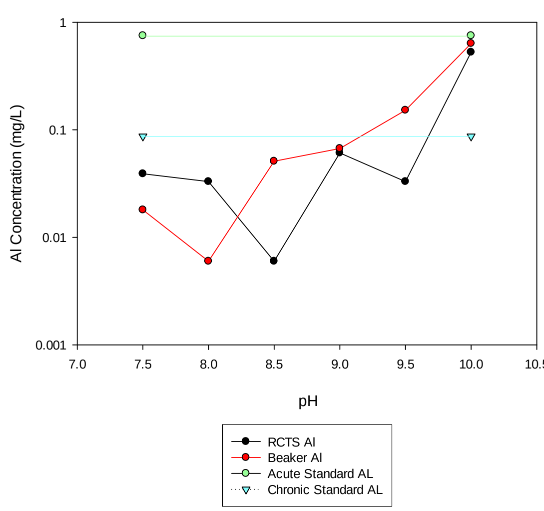


Figure 2.25. Cottonwood Coulee RCTS Treatment Aluminum Concentrations at Time 48 Hours.



Cadmium

Figure 2.26. Cottonwood Coulee Treatment
Cadmium Concentrations at Time 1 Hour.

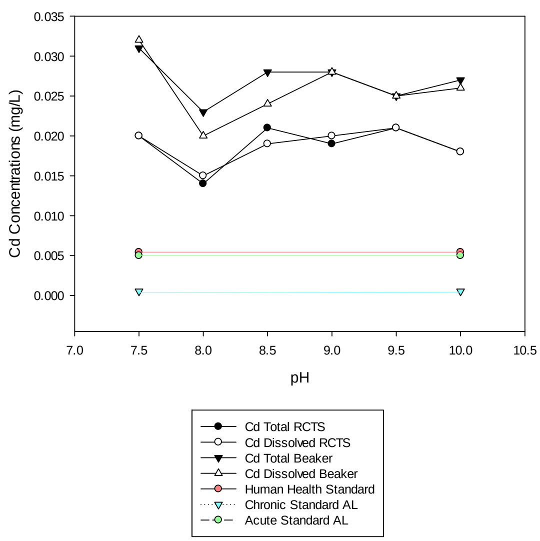


Figure 2.27. Sand Coulee Treatment
Cadmium Concentrations at Time 24 Hour.

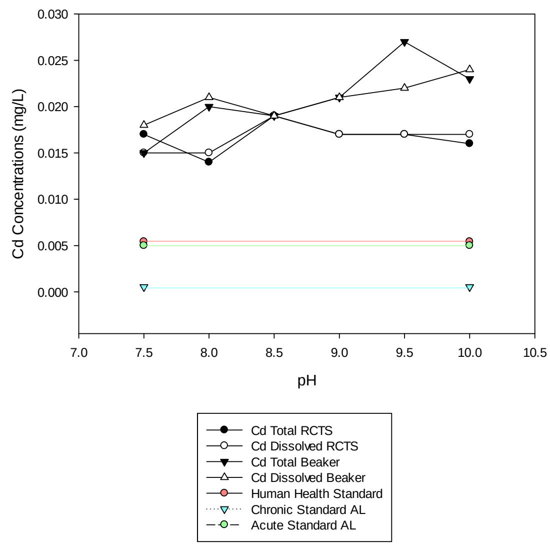


Figure 2.28. Cottonwood Coulee Treatment
Cadmium Concentrations at Time 48 Hour.

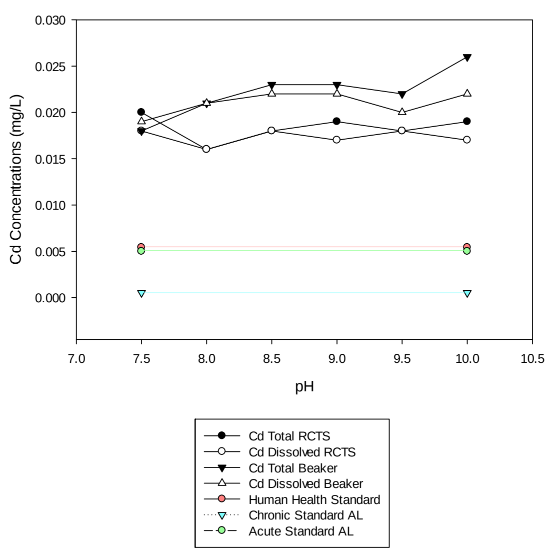
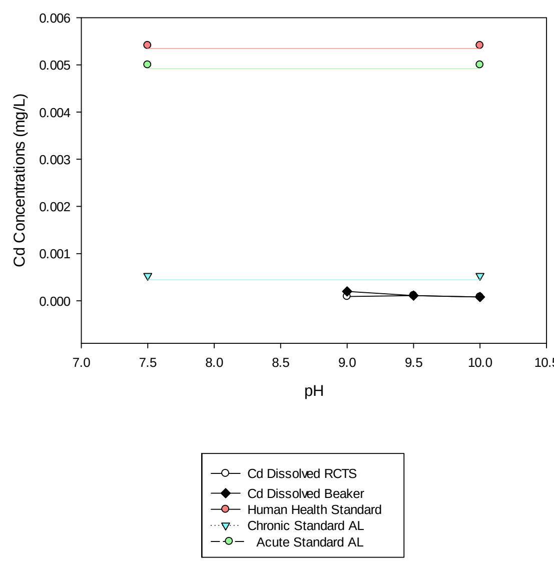


Figure 2.29. Cottonwood Coulee Treatment
Cadmium Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Copper

Figure 2.30. Cottonwood Coulee Treatment
Copper Concentrations at Time 1 Hour.

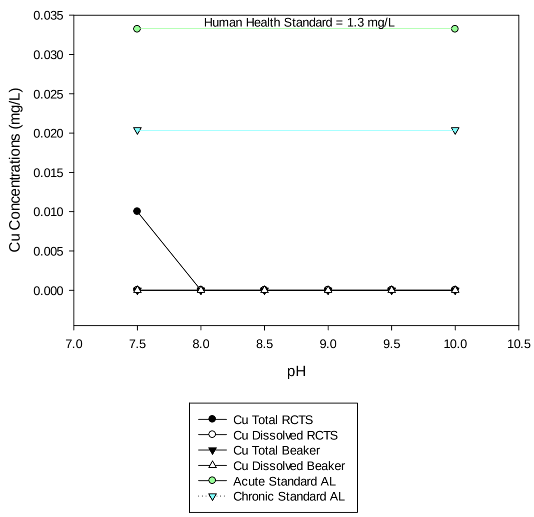


Figure 2.31. Cottonwood Coulee Treatment
Copper Concentrations at Time 24 Hour.

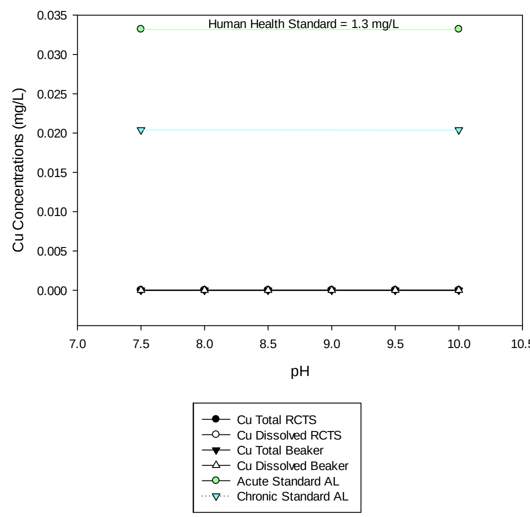


Figure 2.32. Cottonwood Coulee Treatment
Copper Concentrations at Time 48 Hour.

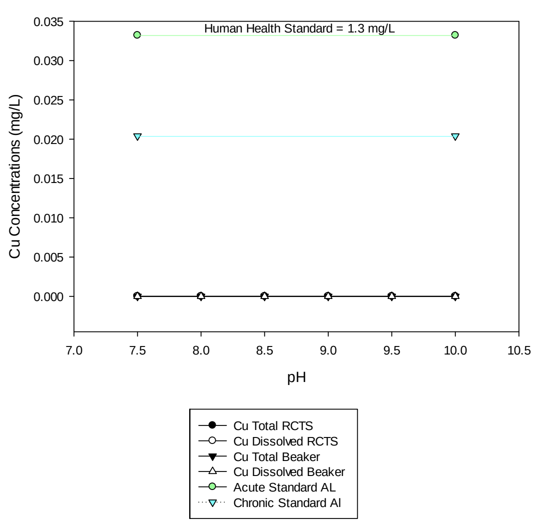
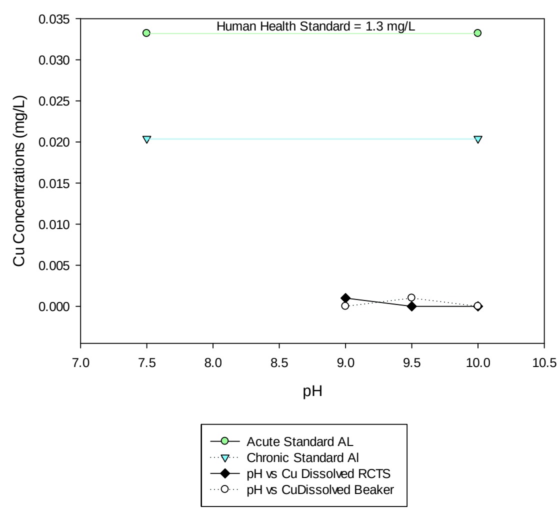


Figure 2.33. Cottonwood Coulee Treatment
Copper Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Iron

Figure 2.34. Cottonwood Coulee Treatment
Iron Concentrations at Time 1 Hour.

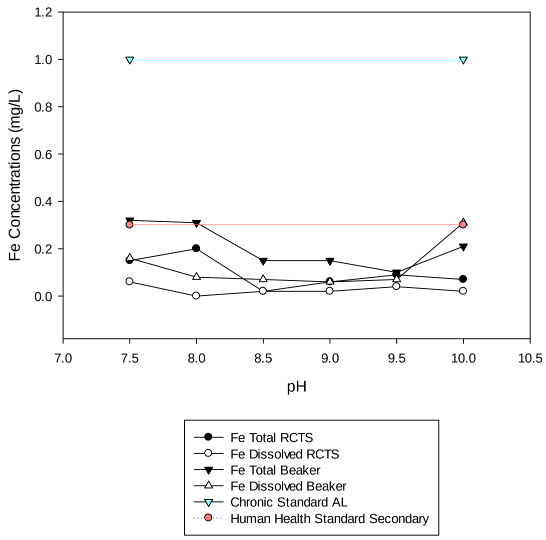


Figure 2.35. Cottonwood Coulee Treatment
Iron Concentrations at Time 24 Hour.

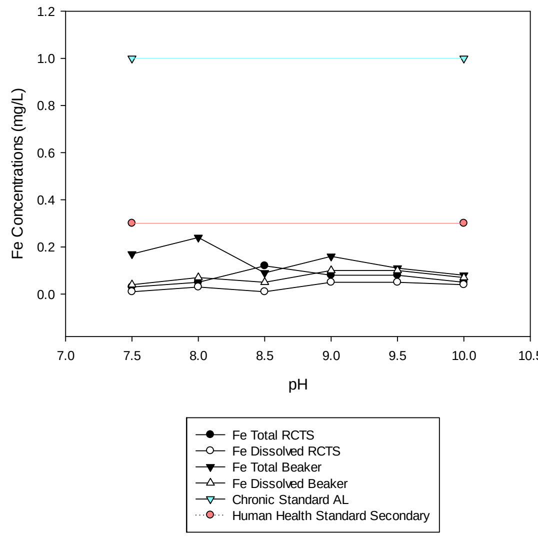
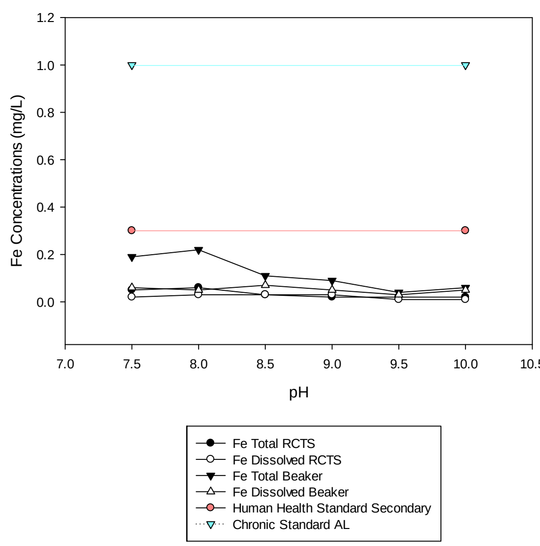


Figure 2.36. Cottonwood Coulee Treatment
Iron Concentrations at Time 48 Hour.



Manganese

Figure 2.37. Cottonwood Coulee Treatment
Manganese Concentrations at Time 1 Hour.

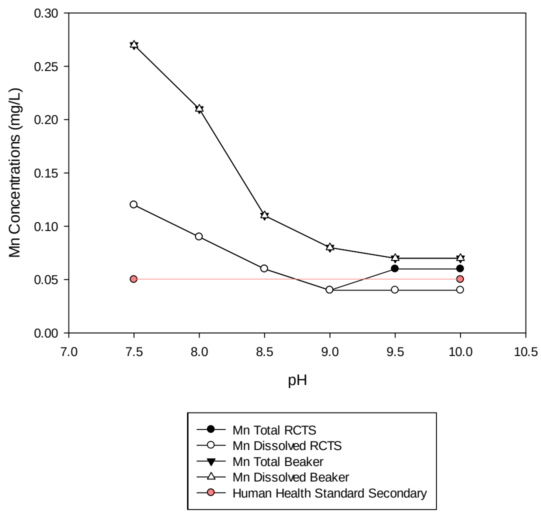


Figure 2.38. Cottonwood Coulee Treatment
Manganese Concentrations at Time 24 Hour.

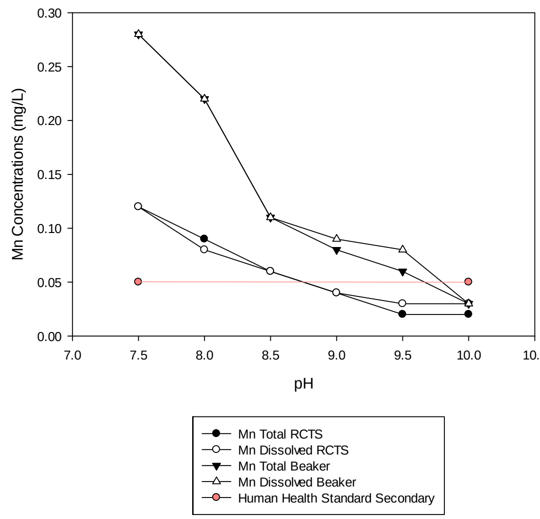
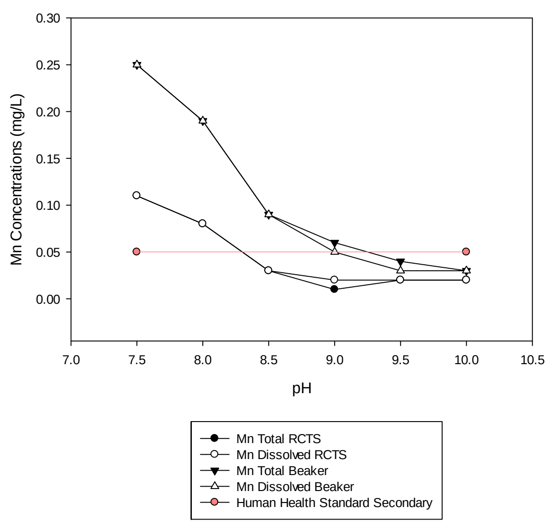


Figure 2.39. Cottonwood Coulee Treatment
Manganese Concentrations at Time 48 Hour.



Nickel

Figure 2.40. Cottonwood Coulee Treatment
Nickel Concentrations at Time 1 Hour.

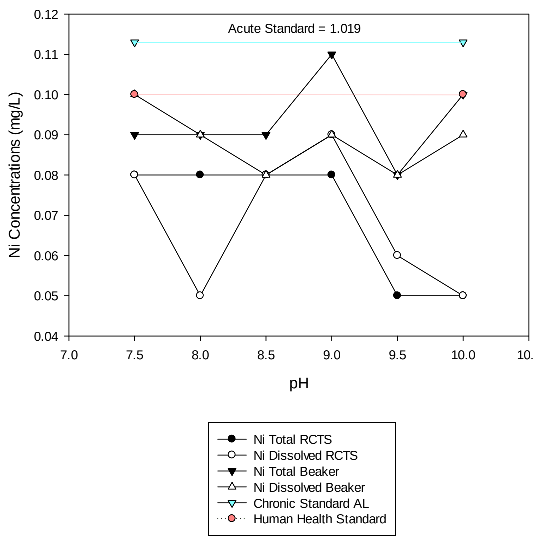


Figure 2.41. Cottonwood Coulee Treatment
Nickel Concentrations at Time 24 Hour.

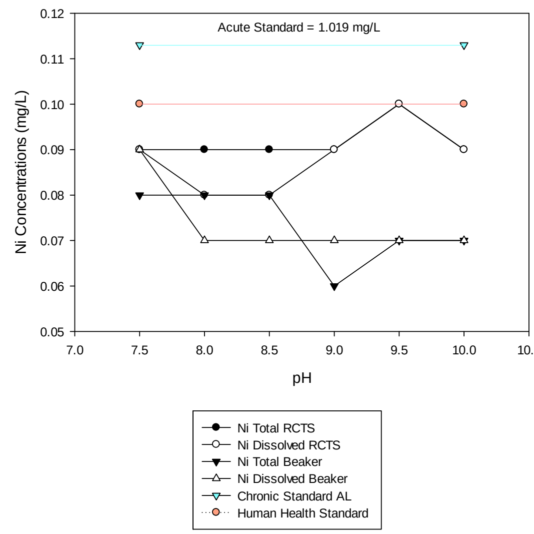


Figure 2.42. Cottonwood Coulee Treatment
Nickel Concentrations at Time 48 Hour.

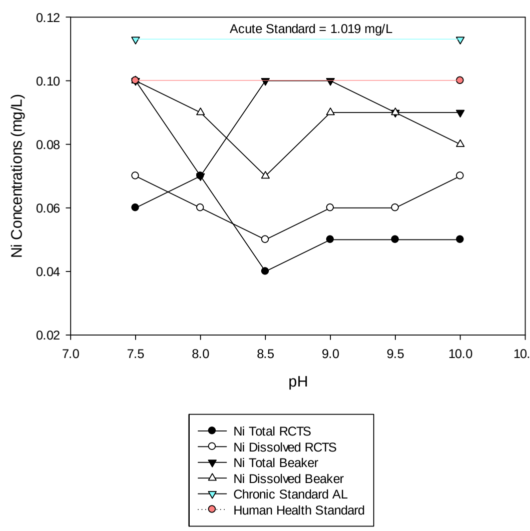
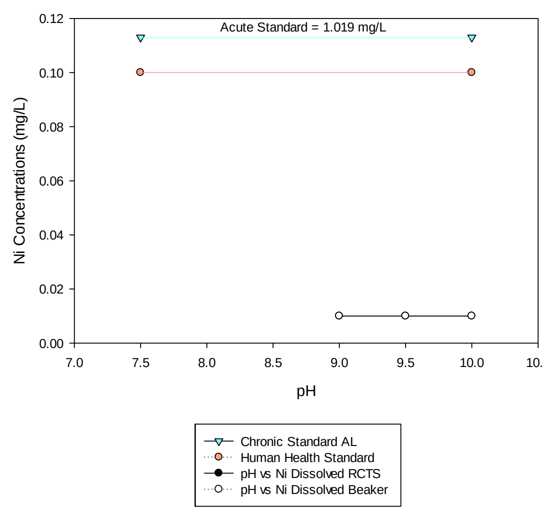


Figure 2.43. Cottonwood Coulee Treatment
Nickel Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Zinc

Figure 2.44. Cottonwood Coulee Treatment
Zinc Concentrations at Time 1 Hour.

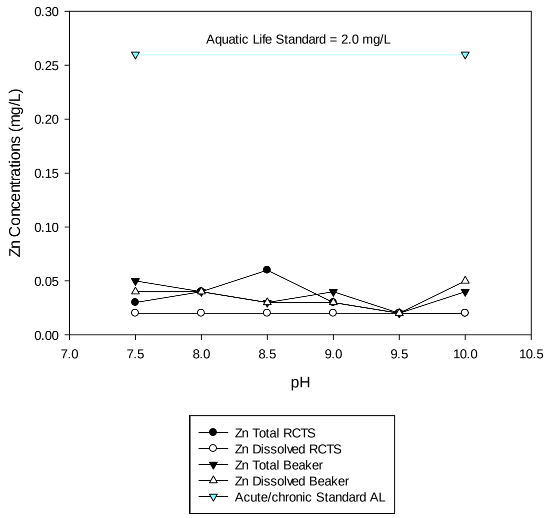


Figure 2.45. Cottonwood Coulee Treatment
Zinc Concentrations at Time 24 Hour.

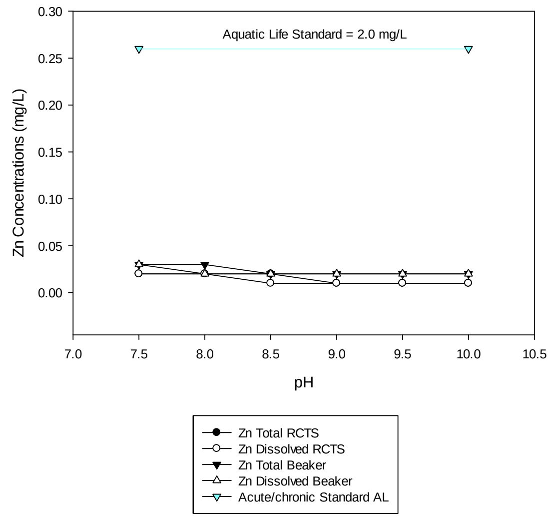
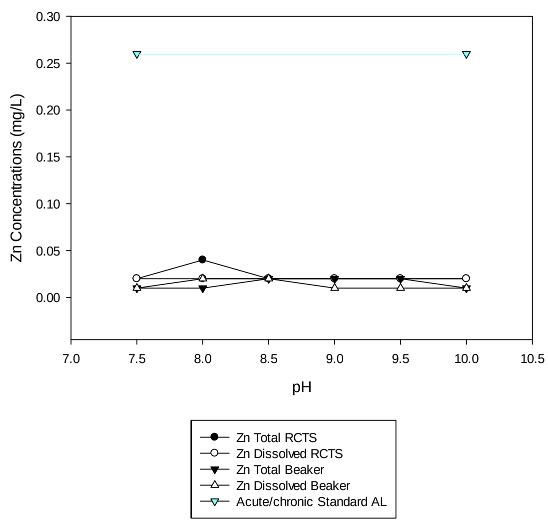


Figure 2.46. Cottonwood Coulee Treatment
Zinc Concentrations at Time 48 Hour.



TKT Consulting, LLC

Table 2.3 Cottonwood Coulee Metals RCTS																	
Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.087***		***0.00541***		***0.020***		***1***		***NA***		***0.113***		***0.26***				
Aquatic Life Acute	***0.75***		***0.00053***		***0.0332***		***NA***		***NA***		***1.019***		***0.26***				
Human Health	***NA***		***0.005***		***1.30***		***0.30***		***0.05***		***0.1***		***2***				
7.50			0.020	0.020	<0.01	<0.01	0.15	0.06	0.12	0.12	0.08	0.08	0.03	0.02			1923
8.00			0.014	0.015	<0.01	<0.01	0.20	<0.01	0.09	0.09	0.08	0.06	0.04	0.02			1913
8.50			0.021	0.019	<0.01	<0.01	0.02	0.02	0.06	0.06	0.08	0.08	0.06	0.02			1813
9.00			0.019	0.020	<0.01	<0.01	0.06	0.02	0.04	0.04	0.08	0.09	0.03	0.02			2088
9.50			0.021	0.021	<0.01	<0.01	0.09	0.04	0.06	0.04	0.05	0.06	0.02	0.03			1943
10.00			0.018	0.018	<0.01	<0.01	0.07	0.02	0.06	0.04	0.05	0.05	0.02	0.02			1956
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.049	0.017	0.015	<0.01	<0.01	0.03	0.01	0.12	0.12	0.08	0.09	0.02	0.02	400	7.94	1890
8.00		0.036	0.014	0.015	<0.01	<0.01	0.05	0.03	0.09	0.08	0.08	0.07	0.02	0.02	380	8.01	1791
8.50		0.007	0.019	0.019	<0.01	<0.01	0.12	0.01	0.06	0.06	0.08	0.07	0.02	0.01	500	8.19	1763
9.00		0.029	0.017	0.017	<0.01	<0.01	0.08	0.05	0.04	0.04	0.06	0.07	0.01	0.01	440	8.51	1716
9.50		0.151	0.017	0.017	<0.01	<0.01	0.08	0.05	0.02	0.03	0.07	0.07	0.01	0.01	480	8.52	1711
10.00		1.460	0.016	0.017	<0.01	<0.01	0.05	0.04	0.02	0.03	0.07	0.07	0.01	0.01	400	8.82	1762
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.039	0.020	0.018	<0.01	<0.01	0.05	0.02	0.11	0.11	0.06	0.07	0.01	0.01	325	7.83	1897
8.00		0.033	0.016	0.016	<0.01	<0.01	0.06	0.03	0.08	0.08	0.07	0.06	0.01	0.02	325	7.87	1819
8.50		0.006	0.018	0.018	<0.01	<0.01	0.03	0.03	0.03	0.03	0.04	0.05	0.02	0.02	480	8.04	1748
9.00		0.061	0.019	0.017	<0.01	<0.01	0.02	0.03	0.01	0.02	0.05	0.06	0.02	0.01	350	8.28	1684
9.50		0.033	0.018	0.018	<0.01	<0.01	0.02	0.01	0.02	0.02	0.05	0.06	0.02	0.01	360	8.39	1631
10.00		0.527	0.019	0.017	<0.01	<0.01	0.02	0.01	0.02	0.02	0.05	0.07	0.01	0.01	300	8.79	1712
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.15***	***NA***	***0.00541***	***NA***	***0.020***	***0.0102***	***NA***	***0.0009***	***0.113***	***0.005***	***NA***						
Aquatic Life Acute	***0.34***	***NA***	***0.00053***	***NA***	***0.0332***	***0.262***	***NA***	***0.0017***	***1.019***	***0.02***	***NA***						
Human Health	***0.01***	***0.004***	***0.005***	***0.1***	***1.30***	***0.015***	***0.05***	***0.00005***	***0.1***	***0.05***	***0.0002***						
7.50															325	8.09	
8.00															325	8.12	
8.50															480	8.22	
9.00	<0.003	<0.001	0.00009	<0.001	0.001	<0.0005	<0.005	<0.00001	<0.01	0.005	0.0007				350	8.36	
9.50	<0.003	<0.001	0.00011	<0.001	<0.001	<0.0005	<0.005	0.00001	<0.01	0.005	0.0008				360	8.51	
10.00	<0.003	<0.001	<0.00008	<0.001	<0.001	<0.0005	<0.005	<0.00001	<0.01	0.005	0.0006				300	8.73	
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
Combined	229	222	0.212	0.208	0.41	0.41	1031	1034	2.59	2.56	13.90	14.00	57.5	57.6			6886
CW2	168	160	0.166	0.167	0.28	0.28	931	931	2.45	2.46	14.30	14.10	59.3	58.7			
CW10	461	432	0.376	0.374	0.88	0.88	1477.0	1442.0	2.87	2.83	13.40	13.20	55.5	54.4			
Exceeds Human Health Standard						**Exceeds Aquatic Life Standard**							Exceeds Both Standards				

TKT Consulting, LLC

Table 2.4 Cottonwood Coulee Metals Beaker

Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.087***		***0.00541***		***0.020***		***1***		***NA***		***0.113***		***0.26***				
Aquatic Life Acute	***0.75***		***0.00053***		***0.0332***		***NA***		***NA***		***1.019***		***0.26***				
Human Health	***NA***		***0.005***		***1.30***		***0.30***		***0.05***		***0.1***		***2***				
7.50			0.031	0.032	<0.01	<0.01	0.32	0.16	0.27	0.27	0.09	0.10	0.05	0.04			2288
8.00			0.023	0.020	<0.01	<0.01	0.31	0.08	0.21	0.21	0.09	0.09	0.04	0.04			2305
8.50			0.023	0.024	<0.01	<0.01	0.15	0.07	0.11	0.11	0.09	0.08	0.03	0.03			2316
9.00			0.028	0.028	<0.01	<0.01	0.15	0.06	0.08	0.08	0.11	0.09	0.04	0.03			2707
9.50			0.025	0.025	<0.01	<0.01	0.10	0.07	0.07	0.07	0.08	0.08	0.02	0.02			2766
10.00			0.027	0.026	<0.01	<0.01	0.21	0.31	0.07	0.07	0.10	0.09	0.04	0.05			2717
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.020	0.015	0.018	<0.01	<0.01	0.17	0.04	0.28	0.28	0.09	0.09	0.03	0.03	250	7.93	2162
8.00		0.007	0.020	0.021	<0.01	<0.01	0.24	0.07	0.22	0.22	0.09	0.08	0.03	0.02	250	8.04	2208
8.50		0.092	0.019	0.019	<0.01	<0.01	0.09	0.05	0.11	0.11	0.09	0.08	0.02	0.02	250	8.26	2188
9.00		0.119	0.021	0.021	<0.01	<0.01	0.16	0.10	0.08	0.09	0.09	0.09	0.02	0.02	270	8.41	2511
9.50		0.470	0.027	0.022	<0.01	<0.01	0.11	0.10	0.06	0.08	0.10	0.10	0.02	0.02	280	8.68	2509
10.00		1.770	0.023	0.024	<0.01	<0.01	0.08	0.07	0.03	0.03	0.09	0.09	0.02	0.02	370	8.71	2464
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.018	0.018	0.019	<0.01	<0.01	0.19	0.06	0.25	0.25	0.10	0.10	0.02	0.02	250	7.84	2140
8.00		0.006	0.021	0.021	<0.01	<0.01	0.22	0.05	0.19	0.19	0.07	0.09	0.04	0.02	250	7.92	2138
8.50		0.051	0.023	0.022	<0.01	<0.01	0.11	0.07	0.09	0.09	0.10	0.07	0.02	0.02	260	8.11	2183
9.00		0.067	0.023	0.022	<0.01	<0.01	0.09	0.05	0.06	0.05	0.10	0.09	0.02	0.02	270	8.26	2336
9.50		0.152	0.022	0.020	<0.01	<0.01	0.04	0.03	0.04	0.03	0.09	0.09	0.02	0.02	280	8.52	2308
10.00		0.634	0.026	0.022	<0.01	<0.01	0.06	0.05	0.03	0.03	0.09	0.08	0.02	0.02	285	8.82	2241
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.15***	***NA***	***0.00541***	***NA***	***0.020***	***0.0102***	***NA***	***0.0009***	***0.113***	***0.005***	***NA***						
Aquatic Life Acute	***0.34***	***NA***	***0.00053***	***NA***	***0.0332***	***0.262***	***NA***	***0.0017***	***1.019***	***0.02***	***NA***						
Human Health	***0.01***	***0.004***	***0.005***	***0.1***	***1.30***	***0.015***	***0.05***	***0.00005***	***0.1***	***0.05***	***0.0002***						
7.50															250	8.09	
8.00															250	8.13	
8.50															260	8.14	
9.00	<0.003	<0.001	0.00020	<0.001	<0.001	<0.0005	0.047	<0.00001	<0.01	0.004	0.0012				270	8.41	
9.50	<0.003	<0.001	0.00011	<0.001	0.001	<0.0005	0.02	<0.00001	<0.01	0.004	0.0011				280	8.58	
10.00	<0.003	<0.001	<0.00008	<0.001	<0.001	<0.0005	<0.005	<0.00001	<0.01	0.004	0.0008				285	8.75	
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
Combined	229	222	0.212	0.208	0.41	0.41	1031	1034	2.59	2.56	13.90	14.00	57.5	57.6			6886
CW2	168	160	0.166	0.167	0.28	0.28	931	931	2.45	2.46	14.30	14.10	59.3	58.7			
CW10	461	432	0.376	0.374	0.88	0.88	1477.0	1442.0	2.87	2.83	13.40	13.20	55.5	54.4			

Exceeds Human Health Standard | **Exceeds Aquatic Life Standard** | Exceeds Both Standards

Metals removal by lime neutralization with RCTS and Beaker treatments were effective with the Cottonwood Coulee water. In general, increased settling time resulted in lower metals concentrations and RCTS treatment resulted in slightly lower metals concentrations than the Beaker treatment. The highest treatment pH of 10.0 resulted in a solution pH of 8.73 with RCTS treatment and 8.32 with Beaker treatment following 72 hours. A treatment pH of 8.5 or greater was effective at achieving discharge targets with RCTS treatment and 9.5 or greater with Beaker treatment. Cadmium targets were not achieved at the treatment pHs tested (1 hr to 48 hours analyzed by AA), and iron, nickel and zinc at several pH values at one hour of settling time. However, the analysis within 48 hours was analyzed by atomic absorption spectrophotometry (AA) which does not provide the sensitivity and low detection limits that are provided by inductively coupled plasma-mass spectrometry (ICP-MS). Samples taken at 72 hours were analyzed by ICP-MS and reveal that indeed nickel and cadmium limits are achieved at the pH values analyzed.

Aluminum concentrations increased with increasing pH. At a treatment pH of 9.5 and higher, TKT predicts that there may be sufficient aluminum remaining in solution to cause white staining in the discharge. The threshold for staining will depend on the flows of the effluent and the receiving stream and the extent of contamination already present in the receiving water and the sediment.

Number Five

Metals concentrations plotted versus treatment pH for the Number Five Coulee tests are displayed in Figures 2.47 through 2.68 below.

Aluminum

Figure 2.47. Number Five Coulee RCTS Treatment Aluminum Concentrations at Time 24 Hours.

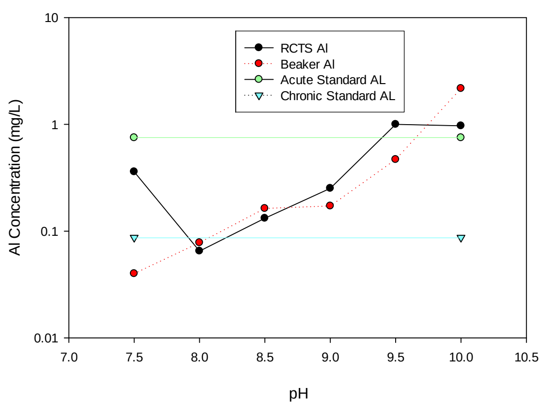
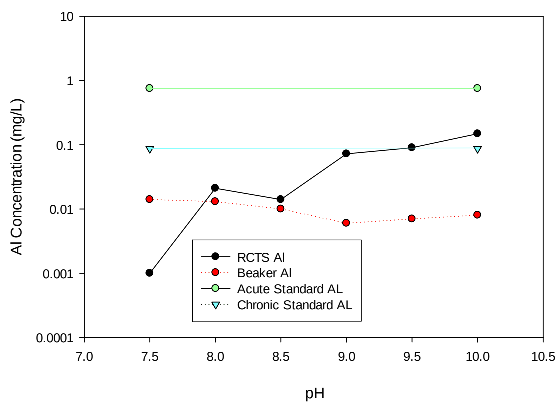


Figure 2.48. Number Five Coulee RCTS Treatment Aluminum Concentrations at Time 48 Hours.



Cadmium

Figure 2.49. Number Five Coulee Treatment
Cadmium Concentrations at Time 1 Hour.

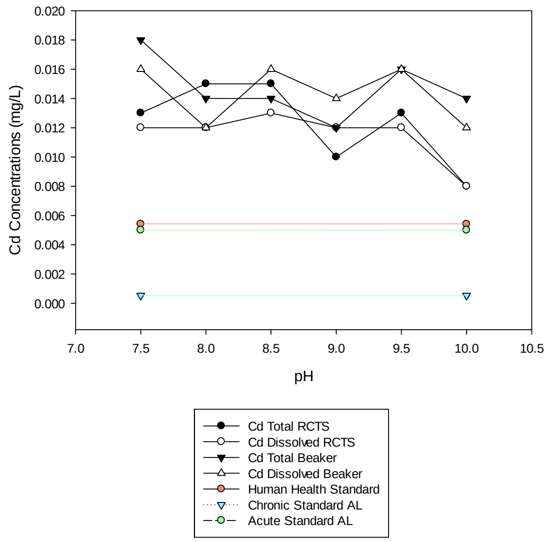


Figure 2.49. Number Five Coulee Treatment
Cadmium Concentrations at Time 24 Hour.

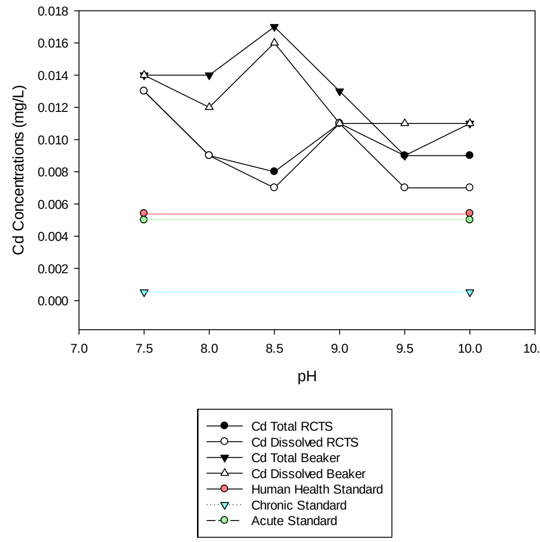


Figure 2.50. Number Five Coulee Treatment
Cadmium Concentrations at Time 48 Hour.

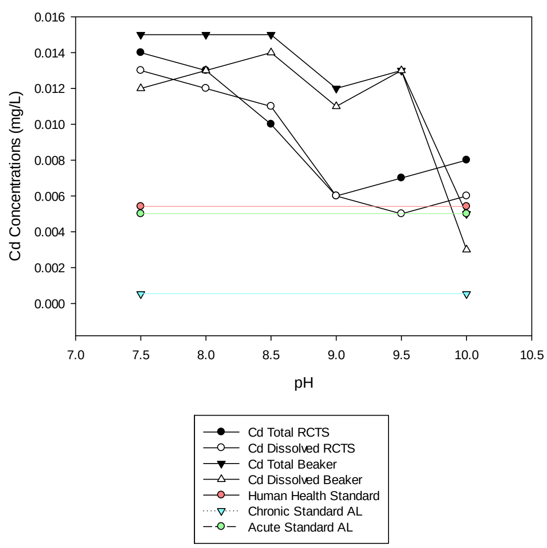
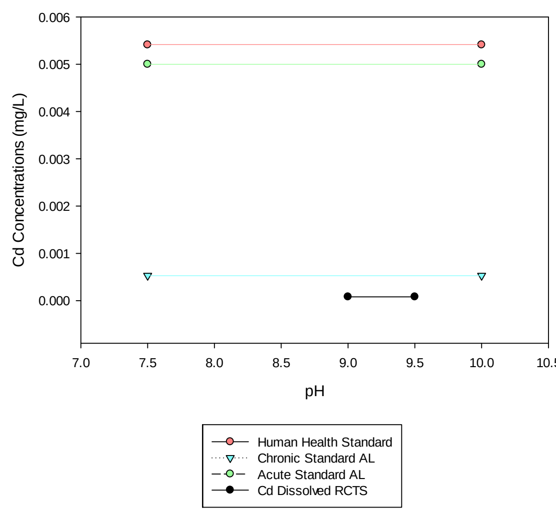


Figure 2.51. Number Five Coulee Treatment
Cadmium Concentrations at Time 72 Hour.
(Sample analyzed by ICP-MS)



Copper

Figure 2.52. Number Five Coulee Treatment
Copper Concentrations at Time 1 Hour.

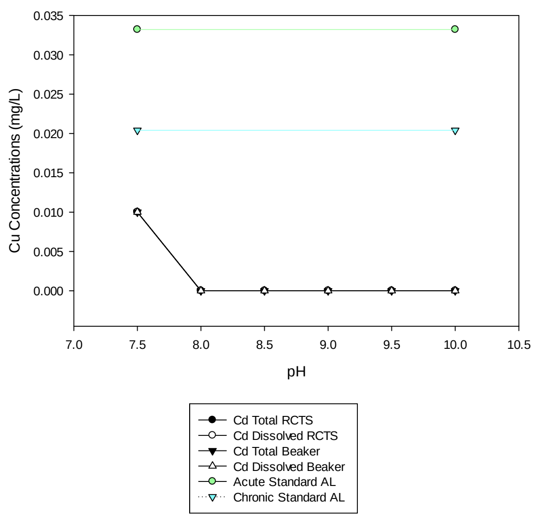


Figure 2.53. Number Five Coulee Treatment
Copper Concentrations at Time 24 Hour.

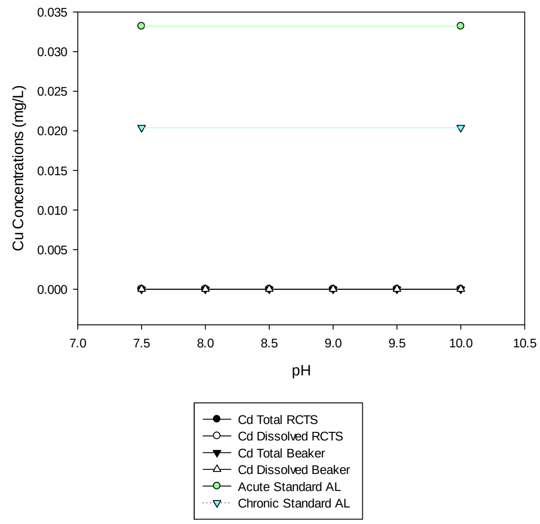


Figure 2.54. Number Five Coulee Treatment
Copper Concentrations at Time 48 Hour.

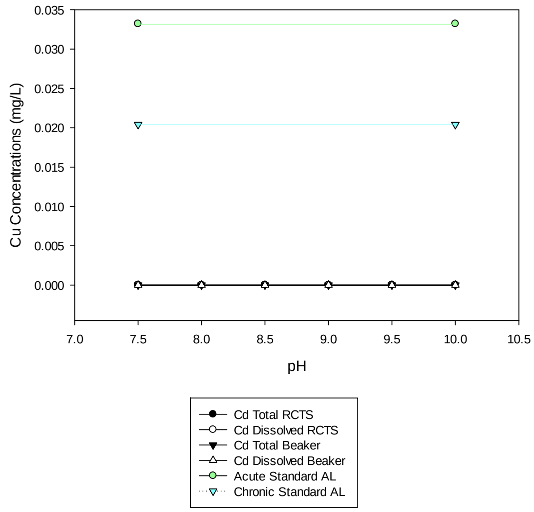
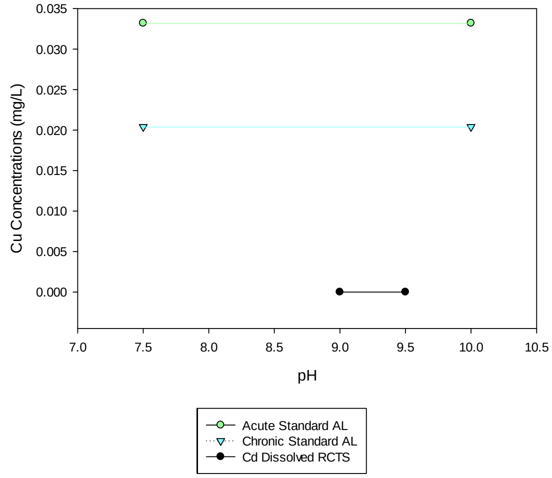


Figure 2.55. Number Five Coulee Treatment
Copper Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Iron

Figure 2.56. Number Five Coulee Treatment
Iron Concentrations at Time 1 Hour.

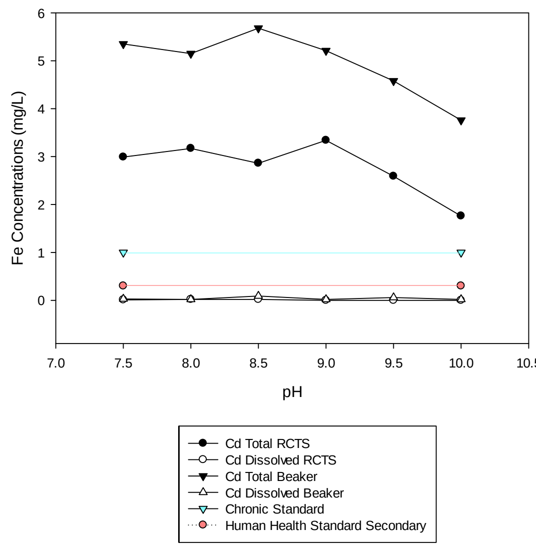


Figure 2.57. Number Five Coulee Treatment
Iron Concentrations at Time 24 Hour.

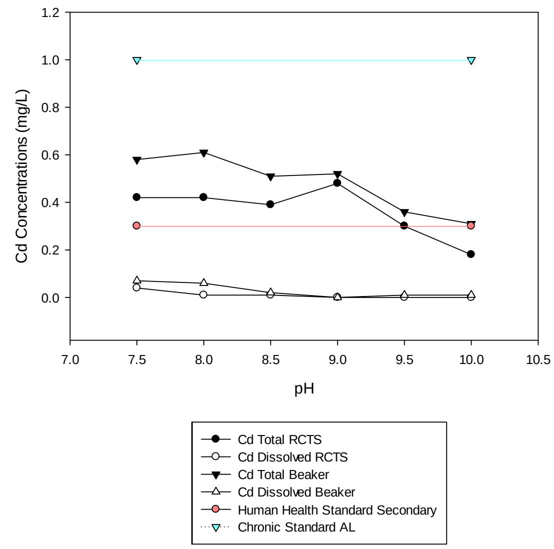
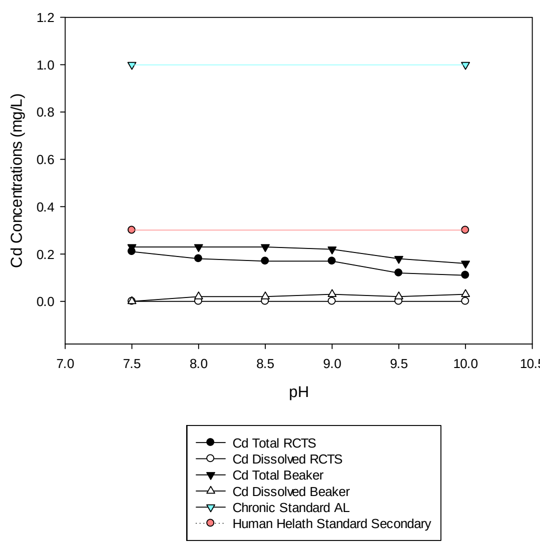


Figure 2.58. Number Five Coulee Treatment
Iron Concentrations at Time 48 Hour.



Manganese

Figure 2.59. Number Five Coulee Treatment Manganese Concentrations at Time 1 Hour.

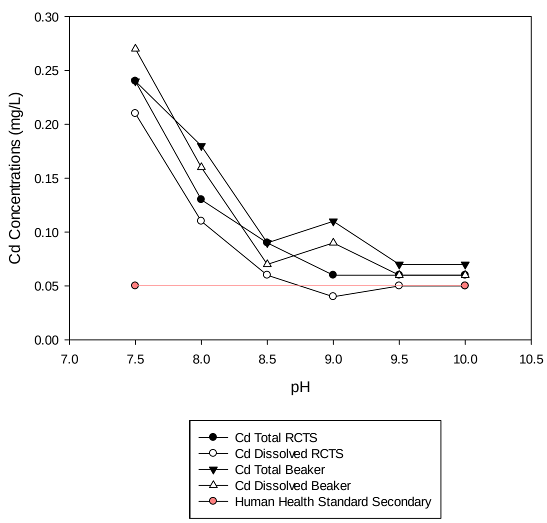


Figure 2.60. Number Five Coulee Treatment Manganese Concentrations at Time 24 Hour.

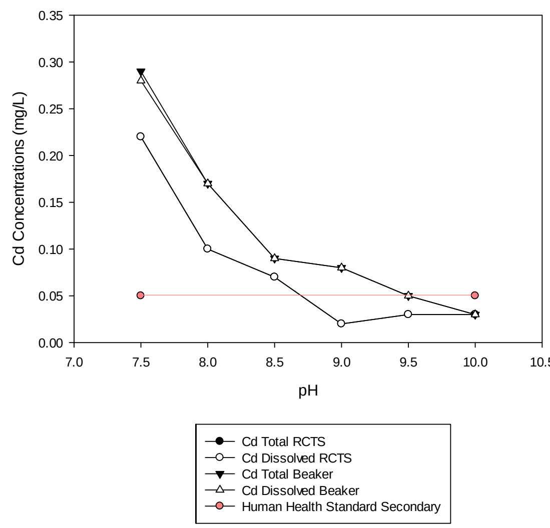
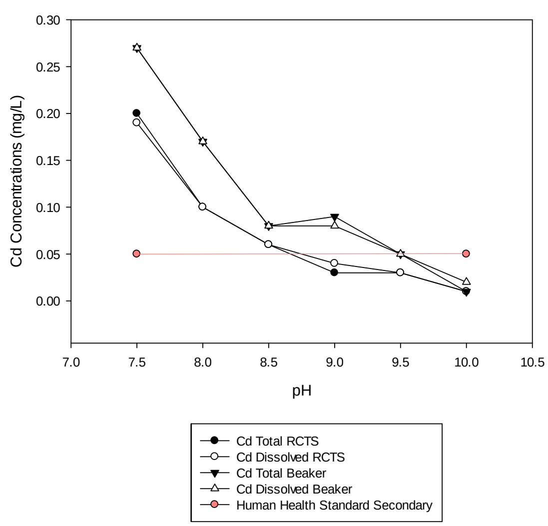


Figure 2.61. Number Five Coulee Treatment Manganese Concentrations at Time 48 Hour.



Nickel

Figure 2.62. Number Five Coulee Treatment
Nickel Concentrations at Time 1 Hour.

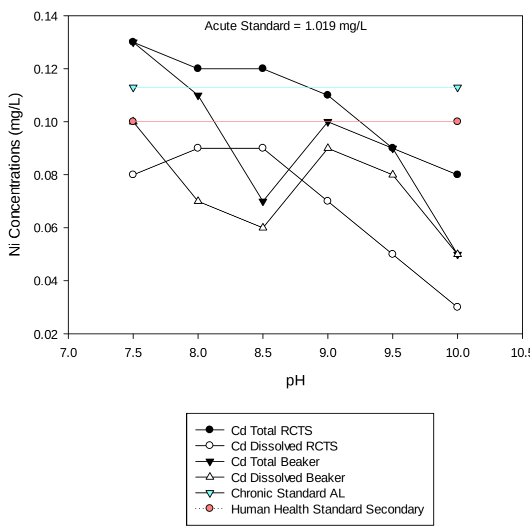


Figure 2.63. Number Five Coulee Treatment
Nickel Concentrations at Time 24 Hour.

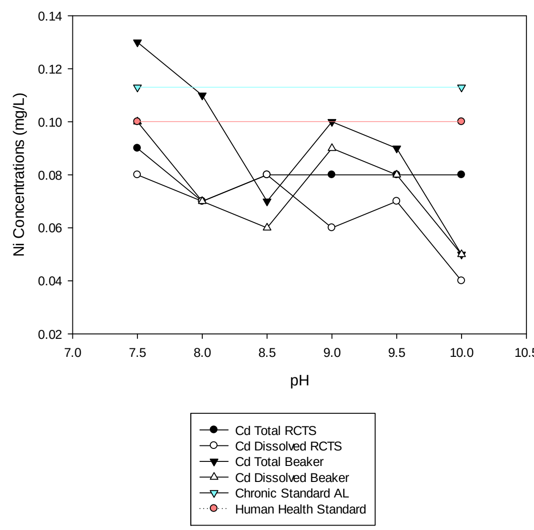


Figure 2.64. Number Five Coulee Treatment
Nickel Concentrations at Time 48 Hour.

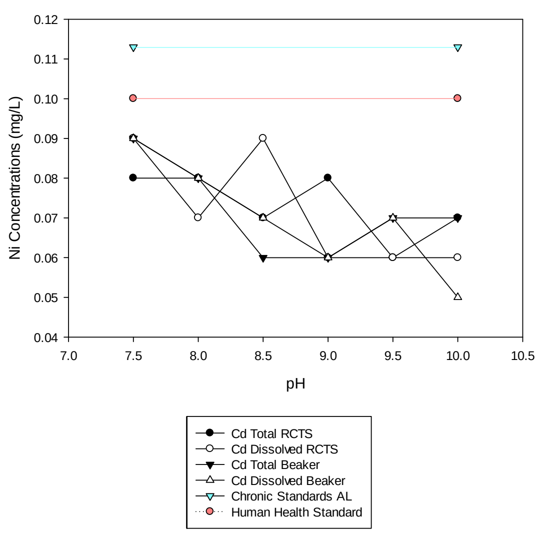
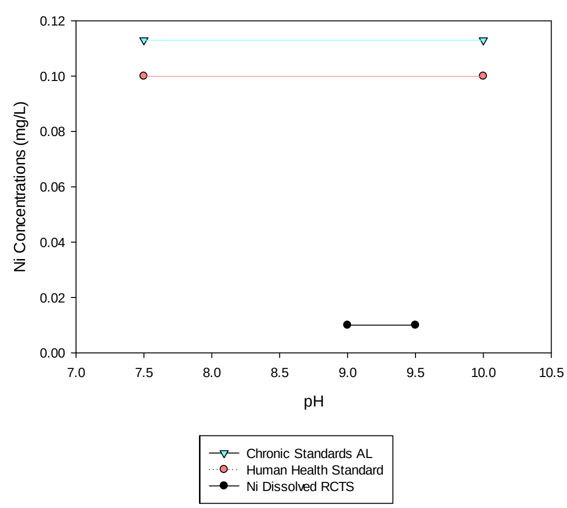


Figure 2.65. Number Five Coulee Treatment
Nickel Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Zinc

Figure 2.66. Number Five Coulee Treatment
Zinc Concentrations at Time 0 Hour.

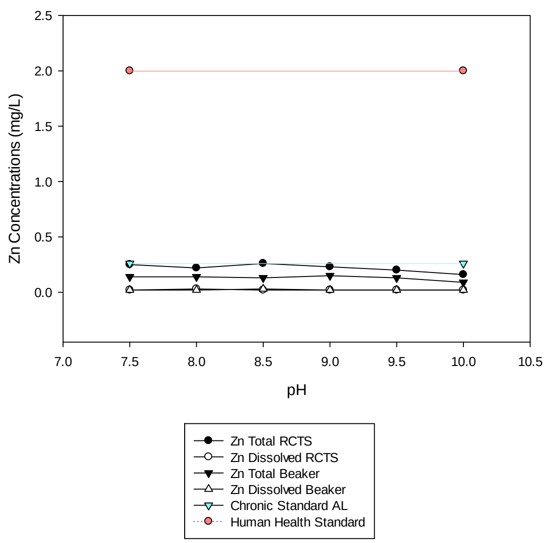


Figure 2.67. Number Five Coulee Treatment
Zinc Concentrations at Time 24 Hour.

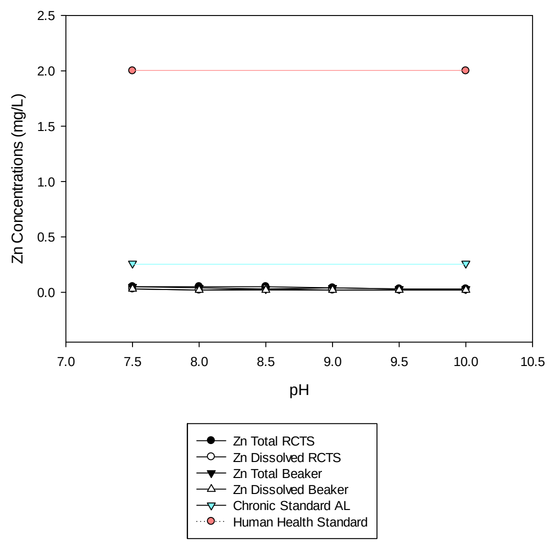


Figure 2.68. Number Five Coulee Treatment
Zinc Concentrations at Time 48 Hour.

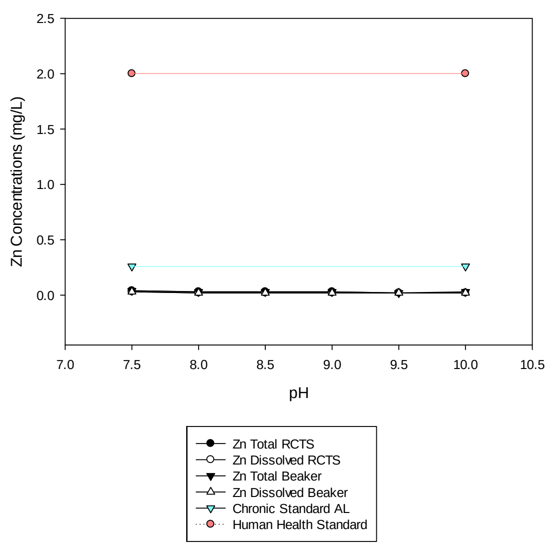


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Table 2.5 Number Five Metals RCTS																	
Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	*0.087*		*0.00541*		*0.020*		*1*		*NA*		*0.113*		*0.26*				
Aquatic Life Acute	*0.75*		*0.00053*		*0.0332*		*NA*		*NA*		*1.019*		*0.26*				
Human Health	*NA*		*0.005*		*1.30*		*0.30*		*0.05*		*0.1*		*2*				
7.50			0.013	0.012	0.01	<0.01	2.79	0.01	0.24	0.21	0.13	0.08	0.25	0.02	115		
8.00			0.015	0.012	<0.01	<0.01	3.17	0.02	0.13	0.11	0.12	0.09	0.22	0.03	108		
8.50			0.015	0.013	<0.01	<0.01	2.86	0.02	0.09	0.06	0.12	0.09	0.26	0.03	100		
9.00			0.010	0.012	<0.01	<0.01	3.34	<0.01	0.06	0.04	0.11	0.07	0.23	0.02	105		
9.50			0.013	0.012	<0.01	<0.01	2.59	<0.01	0.06	0.05	0.09	0.05	0.2	0.02	130		
10.00			0.008	0.008	<0.01	<0.01	1.76	0.01	0.06	0.05	0.08	0.03	0.16	0.02	130		
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.065	0.013	0.013	<0.01	<0.01	0.42	0.04	0.22	0.22	0.09	0.08	0.05	0.03	98	8.11	1590
8.00		0.098	0.009	0.009	<0.01	<0.01	0.42	0.01	0.1	0.1	0.07	0.07	0.05	0.02	96	8.31	1492
8.50		0.171	0.009	0.007	<0.01	<0.01	0.39	0.01	0.07	0.07	0.08	0.08	0.05	0.03	89	8.48	1669
9.00		0.224	0.011	0.011	<0.01	<0.01	0.48	<0.01	0.02	0.02	0.08	0.06	0.04	0.02	82	8.71	1414
9.50		0.349	0.009	0.007	<0.01	<0.01	0.30	<0.01	0.03	0.03	0.08	0.07	0.03	0.02	102	8.80	1332
10.00		0.493	0.009	0.007	<0.01	<0.01	0.18	<0.01	0.03	0.03	0.08	0.04	0.03	0.02	104	8.92	1291
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.001	0.014	0.013	<0.01	<0.01	0.21	<0.01	0.2	0.19	0.08	0.09	0.04	0.03	74	7.93	1579
8.00		0.021	0.013	0.012	<0.01	<0.01	0.18	<0.01	0.1	0.1	0.08	0.07	0.03	0.02	70	8.08	1525
8.50		0.014	0.010	0.011	<0.01	<0.01	0.17	<0.01	0.06	0.06	0.07	0.09	0.03	0.02	70	8.23	1711
9.00		0.072	0.006	0.006	<0.01	<0.01	0.17	0.01	0.03	0.04	0.08	0.06	0.03	0.02	62	8.41	1421
9.50		0.090	0.007	0.005	<0.01	<0.01	0.12	<0.01	0.03	0.03	0.06	0.06	0.02	0.02	64	8.48	1357
10.00		0.148	0.008	0.006	<0.01	<0.01	0.11	<0.01	0.01	0.01	0.07	0.06	0.02	0.02	82	8.55	1311
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	*0.15*	*NA*	*0.00541*	*NA*	*0.020*	*0.0102*	*NA*	*0.0009*	*0.113*	*0.005*	*NA*						
Aquatic Life Acute	*0.34*	*NA*	*0.00053*	*NA*	*0.0332*	*0.262*	*NA*	*0.0017*	*1.019*	*0.02*	*NA*						
Human Health	*0.01*	*0.004*	*0.005*	*0.1*	*1.30*	*0.015*	*0.05*	*0.00005*	*0.1*	*0.05*	*0.0002*						
7.50															68	7.98	1597
8.00															68	8.05	1530
8.50															58	8.15	1678
9.00	<0.003	<0.001	<0.00008	<0.001	<0.001	<0.0005	0.012	<0.00001	<0.01	<0.001	0.0007				65	8.28	1396
9.50	<0.003	<0.001	<0.00008	<0.001	<0.001	<0.0005	0.006	<0.00001	<0.01	<0.001	0.0006				60	8.43	1367
10.00															80	8.53	1294
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
No 5	47	47	0.031	0.029	0.16	0.14	165	136	0.81	0.82	1.07	1.04	4.55	4.47			1342
Exceeds Human Health Standard						**Exceeds Aquatic Life Standard**						Exceeds Both Standards					

TKT Consulting, LLC

Table 2.6 Number Five Metals Beaker																	
Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.087***		***0.00541***		***0.020***		***1***		***NA***		***0.113***		***0.26***				
Aquatic Life Acute	***0.75***		***0.00053***		***0.0332***		***NA***		***NA***		***1.019***		***0.26***				
Human Health	***NA***		***0.005***		***1.30***		***0.30***		***0.05***		***0.1***		***2***				
7.50			0.018	0.016	0.01	0.01	5.35	0.03	0.24	0.27	0.13	0.10	0.14	0.02	200		1350
8.00			0.014	0.012	<0.01	<0.01	5.15	0.02	0.18	0.16	0.11	0.07	0.14	0.02	190		1370
8.50			0.014	0.016	<0.01	<0.01	5.68	0.09	0.09	0.07	0.07	0.06	0.13	0.03	180		1347
9.00			0.012	0.014	<0.01	<0.01	5.21	0.01	0.11	0.09	0.10	0.09	0.15	0.02	170		1297
9.50			0.016	0.016	<0.01	<0.01	4.58	0.06	0.07	0.06	0.09	0.08	0.13	0.02	190		1291
10.00			0.014	0.017	<0.01	<0.01	3.76	0.02	0.07	0.06	0.05	0.05	0.09	0.02	200		1256
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.059	0.014	0.014	<0.01	<0.01	0.58	0.07	0.29	0.28	0.12	0.10	0.05	0.03	78	8.14	1345
8.00		0.034	0.014	0.012	<0.01	<0.01	0.61	0.06	0.17	0.17	0.08	0.08	0.04	0.02	74	8.34	1399
8.50		0.178	0.017	0.016	<0.01	<0.01	0.50	0.02	0.09	0.09	0.06	0.08	0.03	0.02	74	8.55	1328
9.00		0.245	0.013	0.011	<0.01	<0.01	0.52	<0.01	0.08	0.08	0.07	0.07	0.04	0.02	70	8.56	1353
9.50		0.466	0.009	0.011	<0.01	<0.01	0.36	0.01	0.05	0.05	0.08	0.07	0.03	0.02	70	8.72	1306
10.00		0.778	0.011	0.011	<0.01	<0.01	0.31	0.01	0.03	0.03	0.06	0.05	0.03	0.02	88	8.87	1256
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
		0.043	0.015	0.012	<0.01	<0.01	0.23	<0.01	0.27	0.27	0.09	0.09	0.04	0.03	44	7.97	1398
8.00		0.050	0.015	0.013	<0.01	<0.01	0.23	0.02	0.17	0.17	0.08	0.08	0.03	0.02	42	8.17	1408
8.50		0.088	0.015	0.014	<0.01	<0.01	0.23	0.02	0.08	0.08	0.06	0.07	0.03	0.02	40	8.32	1353
9.00		0.123	0.012	0.011	<0.01	<0.01	0.22	0.03	0.09	0.08	0.06	0.06	0.03	0.02	42	8.33	1334
9.50		0.149	0.013	0.013	<0.01	<0.01	0.18	0.02	0.05	0.05	0.07	0.07	0.02	0.02	50	8.44	1312
10.00		0.207	0.013	0.003	<0.01	<0.01	0.16	0.03	0.01	0.02	0.07	0.05	.03.	0.02	52	8.47	1253
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.15***	***NA***	***0.00541***	***NA***	***0.020***	***0.0102***	***NA***	***0.0009***	***0.113***	***0.005***	***NA***						
Aquatic Life Acute	***0.34***	***NA***	***0.00053***	***NA***	***0.0332***	***0.262***	***NA***	***0.0017***	***1.019***	***0.02***	***NA***						
Human Health	***0.01***	***0.004***	***0.005***	***0.1***	***1.30***	***0.015***	***0.05***	***0.00005***	***0.1***	***0.05***	***0.0002***						
7.50															30	8.00	
8.00															36	8.09	
8.50															34	8.20	
9.00															30	8.35	
9.50															48	8.49	
10.00															50	8.54	
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
No 5	47	47	0.031	0.029	0.16	0.14	165	136	0.81	0.82	1.07	1.04	4.55	4.47			1342
Exceeds Human Health Standard							**Exceeds Aquatic Life Standard**						Exceeds Both Standards				

Metals removal by lime neutralization with RCTS and Beaker treatments were effective with the Number Five water. In general, increased settling time resulted in lower metals concentrations and RCTS treatment resulted in slightly lower metals concentrations than the Beaker treatment. The highest treatment pH of 10.0 resulted in a solution pH of 8.53 with RCTS treatment and 8.54 with Beaker treatment following 72 hours. A treatment pH of 9.0 or greater was effective at achieving discharge targets with RCTS treatment and 10 or greater with Beaker treatment. Cadmium targets were not achieved at the treatment pHs tested (1 hr to 48 hours analyzed by AA), and iron and nickel at several pH values at one hour of settling time. However, the analysis within 48 hours was analyzed by atomic absorption spectrophotometry (AA) which does not provide the high sensitivity and low detection limits that are provided by inductively coupled plasma-mass spectrometry (ICP-MS). Samples taken at 72 hours were analyzed by ICP-MS and reveal that indeed cadmium limits are achieved at the pH values analyzed.

Aluminum concentrations increased with increasing pH. At a treatment pH of 9.0 and higher, TKT predicts that there may be sufficient aluminum remaining in solution to cause white staining in the discharge. The threshold for staining will depend on the flows of the effluent and the receiving stream and the extent of contamination already present in the receiving water and the sediment.

Belt

Metals concentrations plotted vs pH for the 1L Belt test are displayed in Figures 2.69 through 2.80 below.

Aluminum

Figure 2.69. Belt Treatment Aluminum Concentrations at Time 24 Hours.

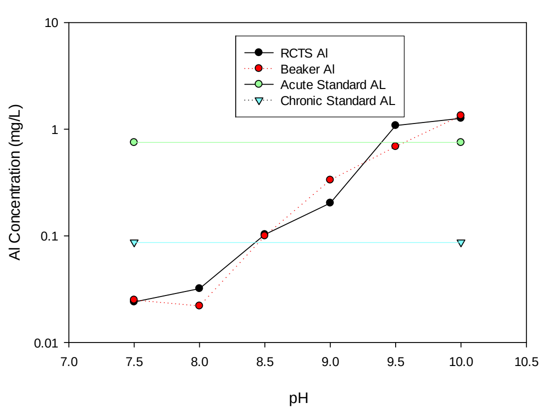
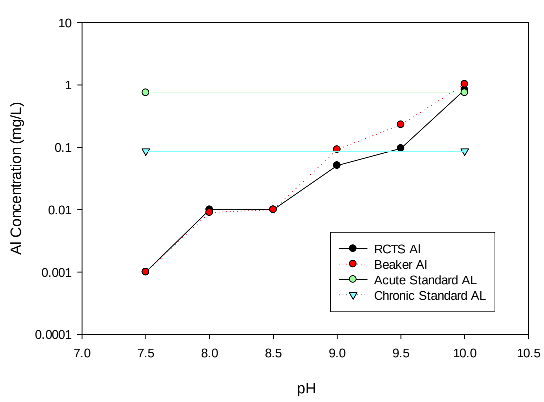


Figure 2.70. Belt Treatment Aluminum Concentrations at Time 48 Hours.



Cadmium

Figure 2.71. Belt Treatment
Cadmium Concentrations at Time 1 Hour.

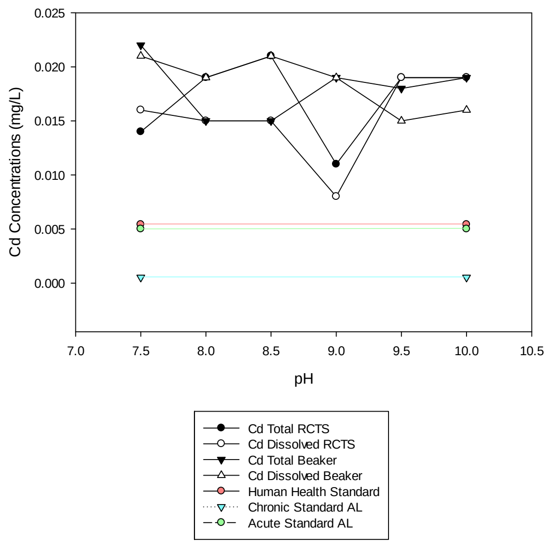


Figure 2.72. Belt Treatment
Cadmium Concentrations at Time 24 Hour.

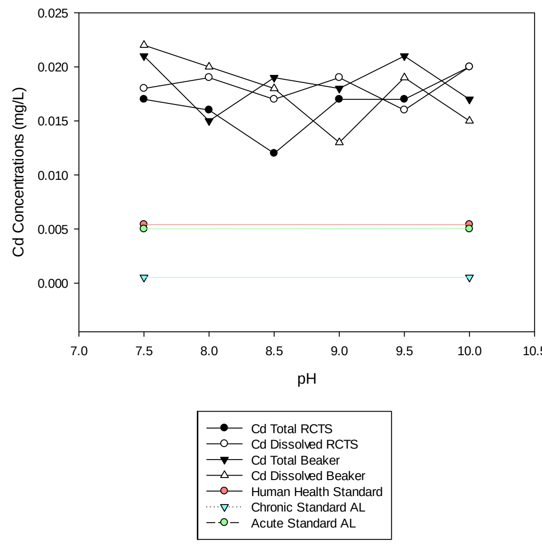


Figure 2.73. Belt Treatment
Cadmium Concentrations at Time 48 Hour.

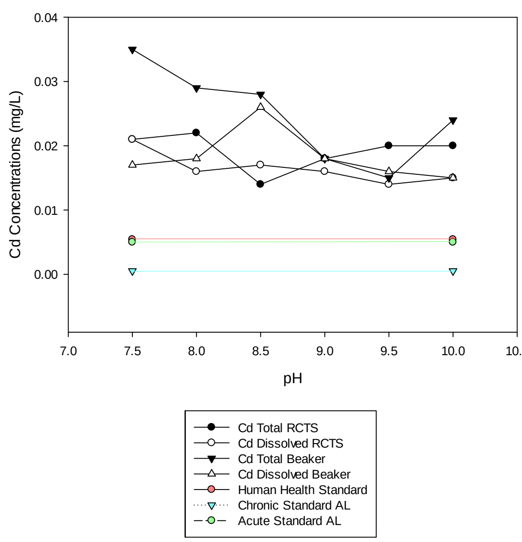
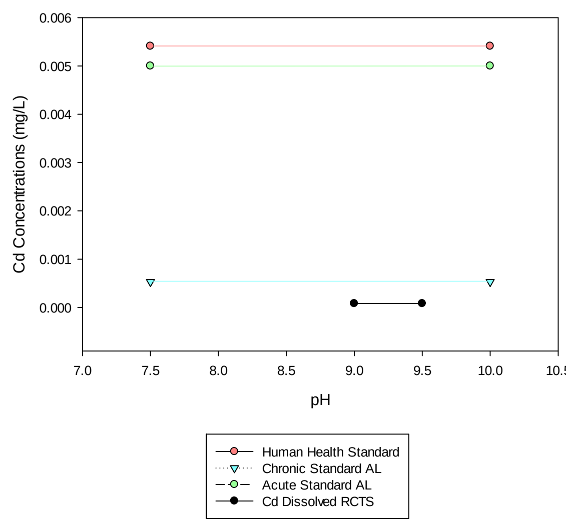


Figure 2.74. Belt Treatment
Cadmium Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Copper

Figure 2.75. Belt Treatment
Copper Concentrations at Time 1 Hour.

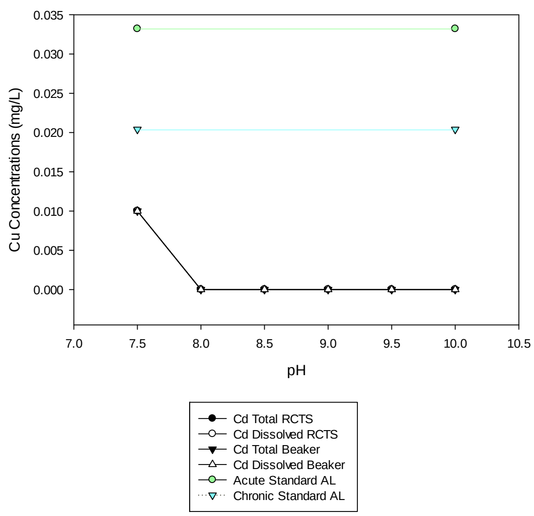


Figure 2.76. Belt Treatment
Copper Concentrations at Time 24 Hour.

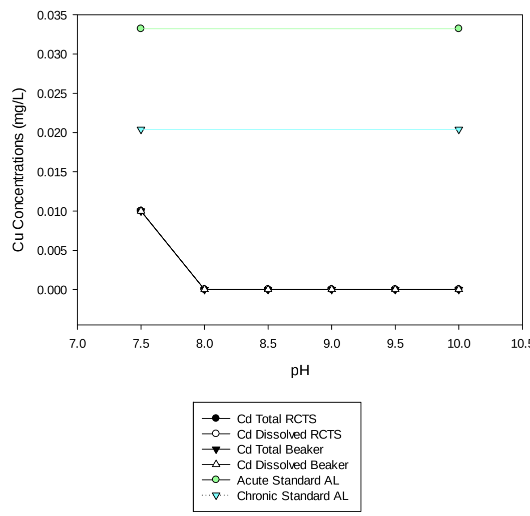


Figure 2.77. Belt Treatment
Copper Concentrations at Time 48 Hour.

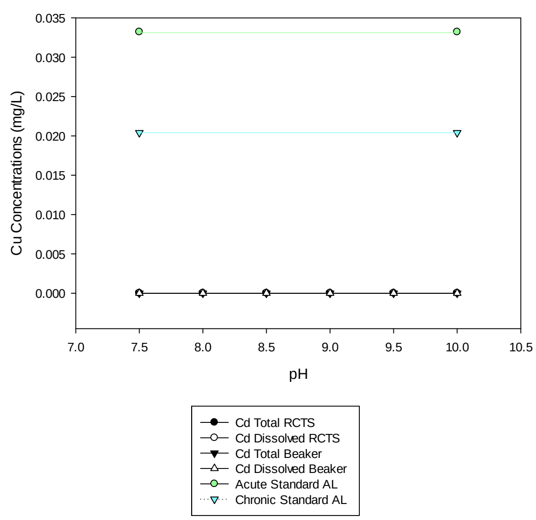
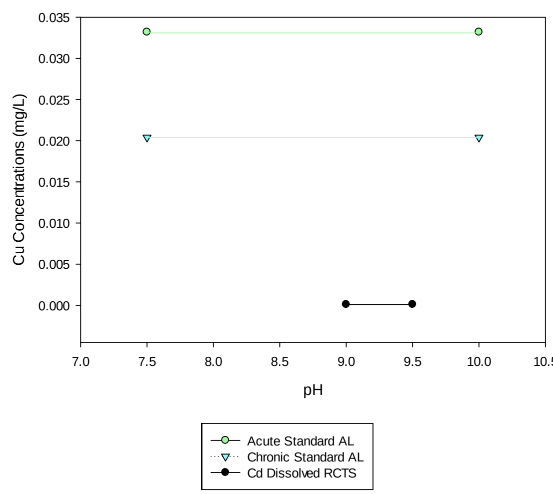


Figure 2.78. Belt Treatment
Copper Concentrations at Time 72 Hour.
(Samples analyzed by ICP-ms)



Iron

Figure 2.79. Belt Treatment
Iron Concentrations at Time 1 Hour.

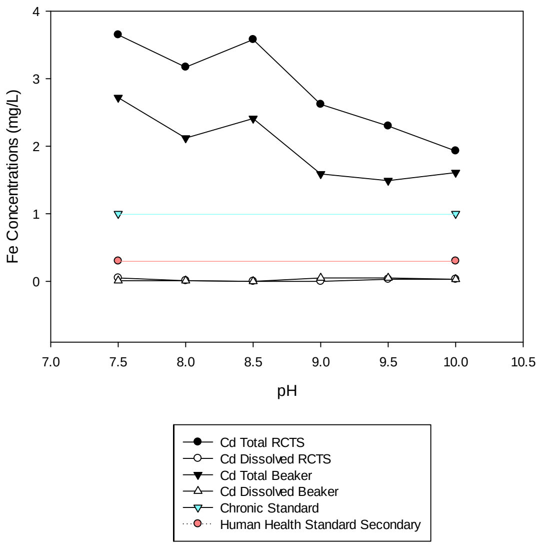


Figure 2.80. Belt Treatment
Iron Concentrations at Time 24 Hour.

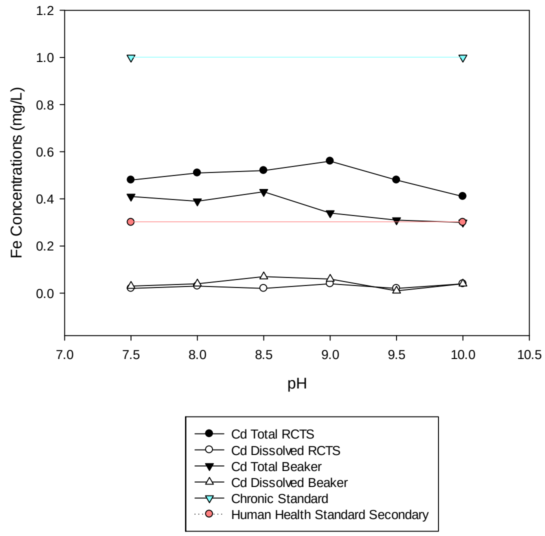
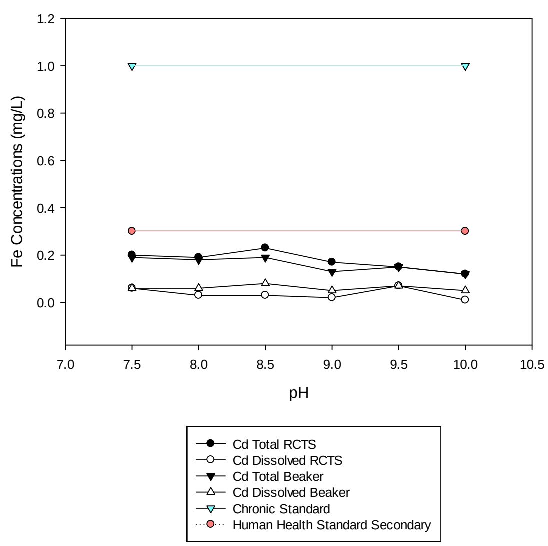


Figure 2.81. Belt Treatment
Iron Concentrations at Time 48 Hour.



Manganese

Figure 2.82. Belt Treatment
Manganese Concentrations at Time 1 Hour.

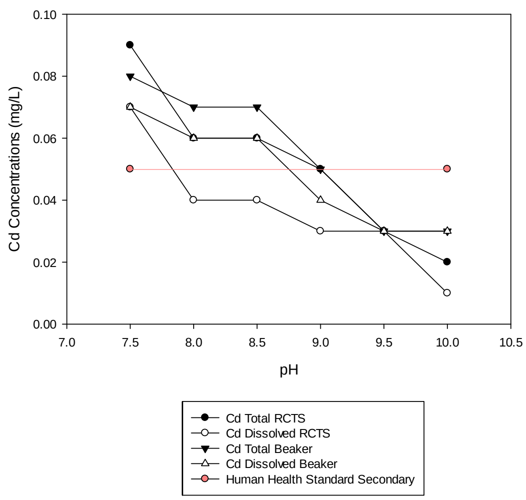


Figure 2.83. Belt Treatment
Manganese Concentrations at Time 24 Hour.

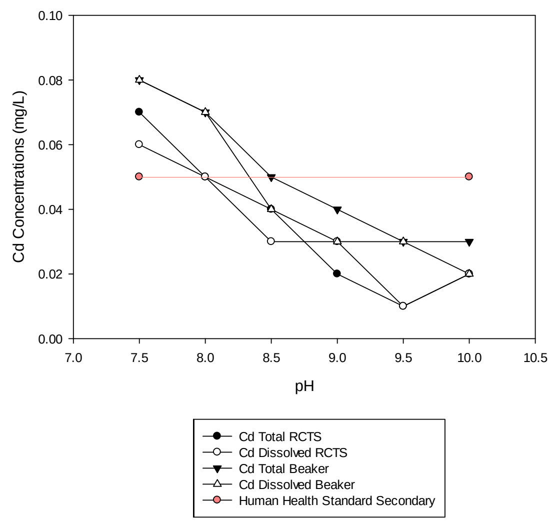
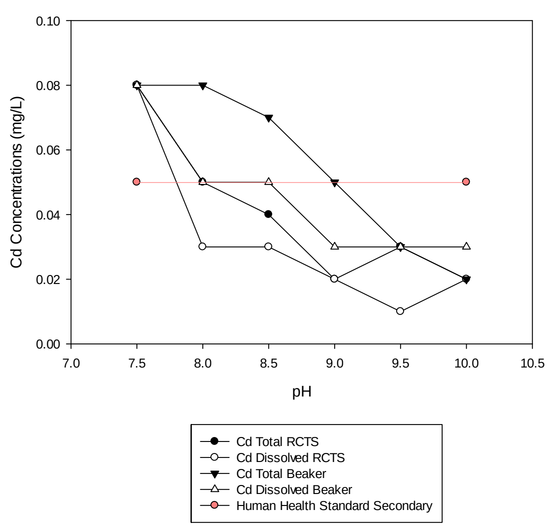


Figure 2.84. Belt Treatment
Manganese Concentrations at Time 48 Hour.



Nickel

Figure 2.85. Belt Treatment
Nickel Concentrations at Time 1 Hour.

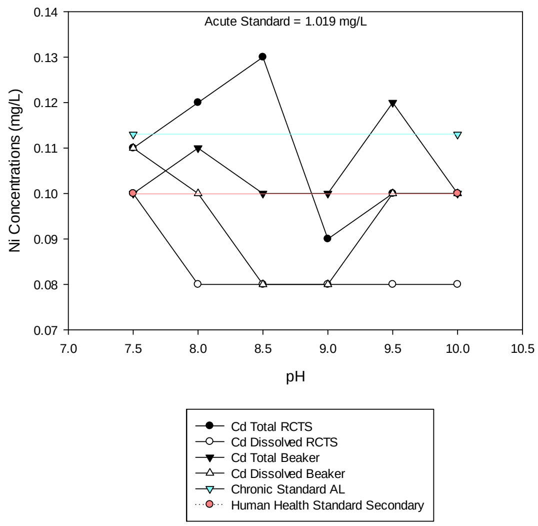


Figure 2.86. Belt Treatment
Nickel Concentrations at Time 24 Hour.

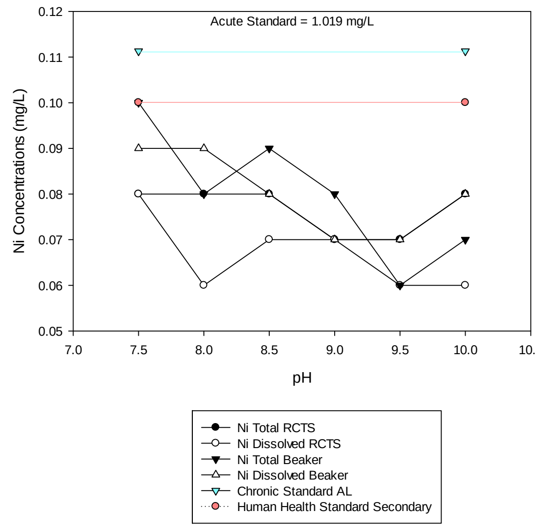


Figure 2.87. Belt Treatment
Nickel Concentrations at Time 48 Hour.

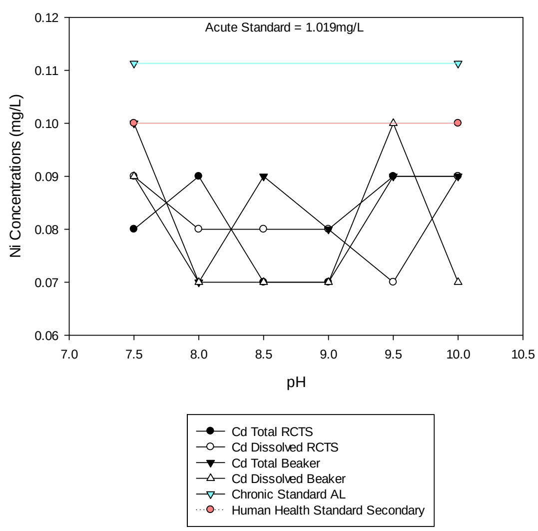
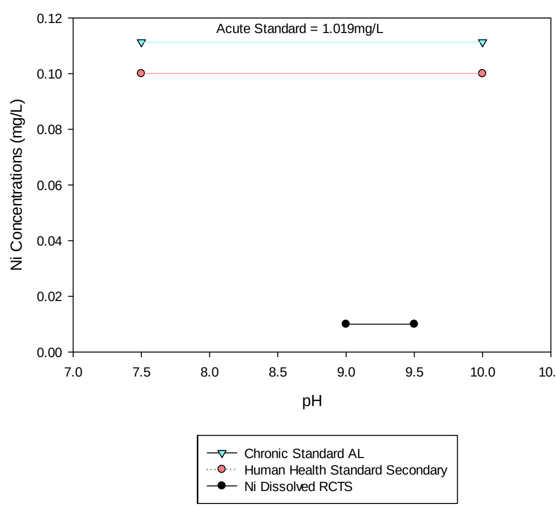


Figure 2.88. Belt Treatment
Nickel Concentrations at Time 72 Hour.
(Samples analyzed by ICP-MS)



Zinc

Figure 2.89. Number Five Coulee Treatment
Zinc Concentrations at Time 0 Hour.

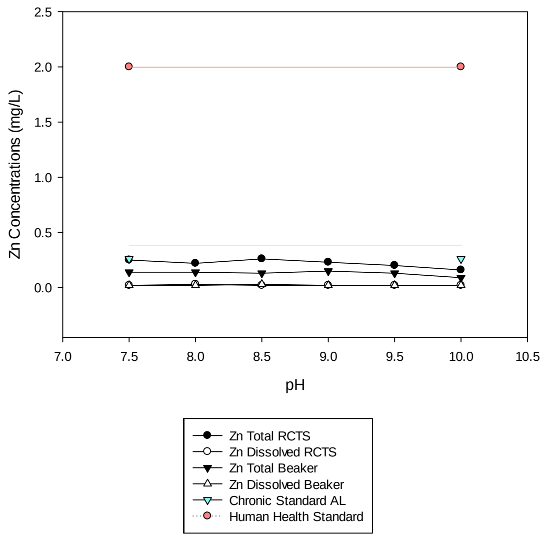


Figure 2.90. Belt Treatment
Zinc Concentrations at Time 24 Hour.

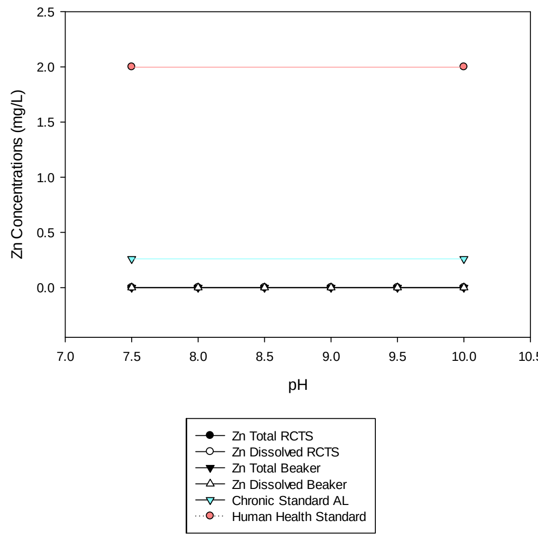


Figure 2.91. Belt Treatment
Zinc Concentrations at Time 48 Hour.

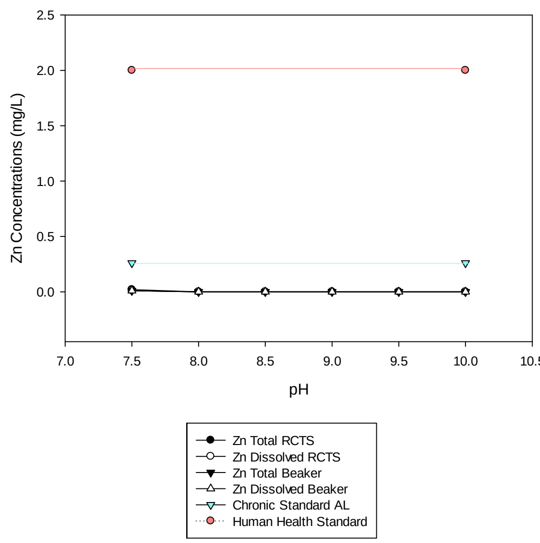


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Table 2.7 Belt Metals RCTS

Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.087***		***0.00541***		***0.020***		***1***		***NA***		***0.113***		***0.26***				
Aquatic Life Acute	***0.75***		***0.00053***		***0.0332***		***NA***		***NA***		***1.019***		***0.26***				
Human Health	***NA***		***0.005***		***1.30***		***0.30***		***0.05***		***0.1***		***2***				
7.50			0.014	0.016	0.01	0.01	3.65	0.05	0.09	0.07	0.11	0.10	0.13	0.02	230		2211
8.00			0.019	0.015	<0.01	<0.01	3.17	0.01	0.06	0.04	0.12	0.08	0.12	0.02	220		2175
8.50			0.021	0.015	<0.01	<0.01	3.58	<0.01	0.06	0.04	0.13	0.08	0.12	0.02	205		2203
9.00			0.011	0.008	<0.01	<0.01	2.62	<0.01	0.05	0.03	0.09	0.08	0.08	0.01	230		2112
9.50			0.019	0.019	<0.01	<0.01	2.30	<0.01	0.03	0.03	0.10	0.08	0.07	0.01	245		2150
10.00			0.019	0.019	<0.01	<0.01	1.93	0.03	0.02	0.01	0.10	0.08	0.08	0.01	235		2086
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.024	0.017	0.018	0.01	0.01	0.48	0.02	0.07	0.06	0.08	0.08	0.02	0.01	100	8.06	2244
8.00		0.032	0.016	0.019	<0.01	<0.01	0.51	0.03	0.05	0.05	0.08	0.06	0.02	0.01	92	8.16	2265
8.50		0.103	0.012	0.017	<0.01	<0.01	0.52	0.02	0.04	0.03	0.08	0.07	0.02	0.01	85	8.39	2242
9.00		0.203	0.017	0.019	<0.01	<0.01	0.56	0.04	0.02	0.03	0.07	0.07	0.02	0.01	88	8.85	2242
9.50		1.083	0.017	0.016	<0.01	<0.01	0.48	0.02	0.01	0.01	0.07	0.06	0.01	0.01	100	9.15	2208
10.00		1.265	0.020	0.020	<0.01	<0.01	0.41	0.04	0.02	0.02	0.08	0.06	0.01	0.01	105	9.45	2186
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.001	0.021	0.021	<0.01	<0.01	0.20	0.06	0.08	0.08	0.08	0.09	0.02	0.01	80	7.76	2338
8.00		0.010	0.022	0.016	<0.01	<0.01	0.19	0.03	0.05	0.03	0.09	0.08	<0.01	<0.01	70	7.84	2242
8.50		0.010	0.014	0.017	<0.01	<0.01	0.23	0.05	0.04	0.03	0.07	0.08	<0.01	<0.01	60	8.01	2287
9.00		0.051	0.018	0.016	<0.01	<0.01	0.17	0.02	0.02	0.02	0.07	0.08	<0.01	<0.01	80	8.52	2219
9.50		0.096	0.020	0.014	<0.01	<0.01	0.15	0.07	0.03	0.01	0.09	0.07	<0.01	<0.01	86	8.80	2246
10.00		0.835	0.020	0.015	<0.01	<0.01	0.12	0.01	0.02	0.02	0.09	0.09	<0.01	<0.01	86	9.08	2204
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.15***	***NA***	***0.00541***	***NA***	***0.020***	***0.0102***	***NA***	***0.0009***	***0.113***	***0.005***	***NA***						
Aquatic Life Acute	***0.34***	***NA***	***0.00053***	***NA***	***0.0332***	***0.262***	***NA***	***0.0017***	***1.019***	***0.02***	***NA***						
Human Health	***0.01***	***0.004***	***0.005***	***0.1***	***1.30***	***0.015***	***0.05***	***0.00005***	***0.1***	***0.05***	***0.0002***						
7.50															70	7.65	
8.00															58	7.70	
8.50															50	7.83	
9.00	<0.003	<0.001	<0.00008	0.001	<0.001	<0.0005	<0.005	<0.00001	<0.01	<0.001	0.0007				78	8.04	
9.50	<0.003	<0.001	<0.00008	0.001	<0.001	<0.0005	<0.005	<0.00001	<0.01	<0.001	0.0007				84	8.29	
10.00															76	8.61	
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
Combined	168	155	0.032	0.031	0.12	0.12	265	230	0.64	0.63	1.25	1.26	5.08	5.01			2285
B3	264	247	0.041	0.039	0.20	0.20	301	273	1.74	1.67	.1.66	1.61	4.96	4.9			3443
B5	236	253	0.062	0.063	0.23	0.24	446	450	0.73	0.74	1.93	1.94	5.85	5.85			3732
B7	347	347	0.042	0.036	0.17	0.18	688	679	0.98	0.96	1.34	1.33	5.4	5.43			4946
B8	324	285	0.028	0.026	0.11	0.10	858	745	0.47	0.43	0.80	0.73	3.66	3.4			
B11	127	130	0.018	0.023	0.11	0.10	201	176	0.48	0.48	1.27	1.23	5.1	5.1			1989

Exceeds Human Health Standard | **Exceeds Aquatic Life Standard** | Exceeds Both Standards

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Table 2.8 Belt Metals Beaker

Time 1 hr																	
Test pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.087***		***0.00541***		***0.020***		***1***		***NA***		***0.113***		***0.26***				
Aquatic Life Acute	***0.75***		***0.00053***		***0.0332***		***NA***		***NA***		***1.019***		***0.26***				
Human Health	***NA***		***0.005***		***1.30***		***0.30***		***0.05***		***0.1***		***2***				
7.50			0.022	0.021	0.01	0.01	2.72	0.01	0.08	0.07	0.10	0.11	0.11	0.02	250		2239
8.00			0.015	0.019	<0.01	<0.01	2.12	0.01	0.07	0.06	0.11	0.10	0.09	0.02	255		2195
8.50			0.015	0.021	<0.01	<0.01	2.41	<0.01	0.07	0.06	0.10	0.08	0.1	0.02	245		2208
9.00			0.019	0.019	<0.01	<0.01	1.59	0.05	0.05	0.04	0.10	0.08	0.06	0.02	260		2195
9.50			0.018	0.015	<0.01	<0.01	1.49	0.05	0.03	0.03	0.12	0.10	0.05	0.02	265		2189
10.00			0.019	0.016	<0.01	<0.01	1.61	0.03	0.03	0.03	0.10	0.10	0.05	0.02	255		2053
Time 24 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.025	0.021	0.022	0.01	0.01	0.41	0.03	0.08	0.08	0.10	0.09	0.02	0.01	125	8.08	2269
8.00		0.022	0.015	0.020	<0.01	<0.01	0.39	0.04	0.07	0.07	0.08	0.09	0.02	0.01	140	8.17	2198
8.50		0.100	0.019	0.018	<0.01	<0.01	0.43	0.07	0.05	0.04	0.09	0.08	0.02	0.01	115	8.38	2252
9.00		0.334	0.018	0.013	<0.01	<0.01	0.34	0.06	0.04	0.03	0.08	0.07	0.02	0.01	105	8.84	2267
9.50		0.688	0.021	0.019	<0.01	<0.01	0.31	0.01	0.03	0.03	0.06	0.07	0.01	<0.01	115	9.15	2239
10.00		1.340	0.017	0.015	<0.01	<0.01	0.30	0.04	0.03	0.02	0.07	0.08	0.01	<0.01	120	9.46	2150
Time 48 hr																	
Resulting pH	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**	**Sludge level**	**pH**	**SO4**
7.50		0.001	0.035	0.017	<0.01	<0.01	0.19	0.06	0.08	0.08	0.10	0.09	0.01	0.01	100	7.76	2303
8.00		0.009	0.029	0.018	<0.01	<0.01	0.18	0.06	0.08	0.05	0.07	0.07	<0.01	<0.01	105	7.84	2275
8.50		0.010	0.028	0.026	<0.01	<0.01	0.19	0.08	0.07	0.05	0.09	0.07	<0.01	<0.01	80	8.04	2284
9.00		0.092	0.018	0.018	<0.01	<0.01	0.13	0.05	0.05	0.03	0.08	0.07	<0.01	<0.01	80	8.54	2282
9.50		0.230	0.015	0.016	<0.01	<0.01	0.15	0.07	0.03	0.03	0.09	1.00	<0.01	<0.01	100	8.84	2249
10.00		1.028	0.024	0.015	<0.01	<0.01	0.12	0.05	0.02	0.03	0.09	0.07	<0.01	<0.01	100	9.11	2226
Time 72 hr																	
Resulting pH	**As dis**	**Be dis**	**Cd dis**	**Cr dis**	**Cu dis**	**Pb dis**	**Mn dis**	**Hg dis**	**Ni dis**	**Se dis**	**Tl dis**				**Sludge level**	**pH**	**SO4**
Aquatic Life Chronic	***0.15***	***NA***	***0.00541***	***NA***	***0.020***	***0.0102***	***NA***	***0.0009***	***0.113***	***0.005***	***NA***						
Aquatic Life Acute	***0.34***	***NA***	***0.00053***	***NA***	***0.0332***	***0.262***	***NA***	***0.0017***	***1.019***	***0.02***	***NA***						
Human Health	***0.01***	***0.004***	***0.005***	***0.1***	***1.30***	***0.015***	***0.05***	***0.00005***	***0.1***	***0.05***	***0.0002***						
7.50															90	7.65	
8.00															95	7.73	
8.50															68	7.82	
9.00															80	8.11	
9.50															100	8.39	
10.00															98	8.74	
Untreated Samples	**Al**	**Al dis**	**Cd**	**Cd dis**	**Cu**	**Cu dis**	**Fe**	**Fe dis**	**Mn**	**Mn dis**	**Ni**	**Ni Dis**	**Zn**	**Zn dis**			**SO4**
Combined	168	155	0.032	0.031	0.12	0.12	265	230	0.64	0.63	1.25	1.26	5.08	5.01			2285
B3	264	247	0.041	0.039	0.20	0.20	301	273	1.74	1.67	.1.66	1.61	4.96	4.9			3443
B5	236	253	0.062	0.063	0.23	0.24	446	450	0.73	0.74	1.93	1.94	5.85	5.85			3732
B7	347	347	0.042	0.036	0.17	0.18	688	679	0.98	0.96	1.34	1.33	5.4	5.43			4946
B8	324	285	0.028	0.026	0.11	0.10	858	745	0.47	0.43	0.80	0.73	3.66	3.4			
B11	127	130	0.018	0.023	0.11	0.10	201	176	0.48	0.48	1.27	1.23	5.1	5.1			1989

Exceeds Human Health Standard | **Exceeds Aquatic Life Standard** | Exceeds Both Standards

Metals removal by lime neutralization with RCTS and Beaker treatments were effective with the Belt water. In general, increased settling time resulted in lower metals concentrations and RCTS treatment resulted in slightly lower metals concentrations than the Beaker treatment. The highest treatment pH of 10.0 resulted in a solution pH of 8.61 with RCTS treatment and 8.74 with Beaker treatment following 72 hours. A treatment pH of 8.5 or greater was effective at achieving discharge targets with RCTS treatment and 9.5 or greater with Beaker treatment. Cadmium targets were not achieved at the treatment pHs tested (1 hr to 48 hours analyzed by AA), and iron and nickel at several pH values at one hour of settling time. However, the analysis within 48 hours was analyzed by atomic absorption spectrophotometry (AA) which does not provide the high sensitivity and low detection limits that are provided by inductively coupled plasma-mass spectrometry (ICP-MS). Samples taken at 72 hours were analyzed by ICP-MS and reveal that indeed nickel and cadmium limits are achieved at the pH values analyzed.

Aluminum concentrations increased with increasing pH. At a treatment pH of 9.0 and higher, TKT predicts that there may be sufficient aluminum remaining in solution to cause white staining in the discharge. The threshold for staining will depend on the flows of the effluent and the receiving stream and the extent of contamination already present in the receiving water and the sediment.

Sludge Settling Rates and Volumes

TKT determined settling rates of lime neutralized sludge by pouring the treated water into 1L Imhoff cones and measuring the sludge/water interface as the sludge settled.

Sand Coulee

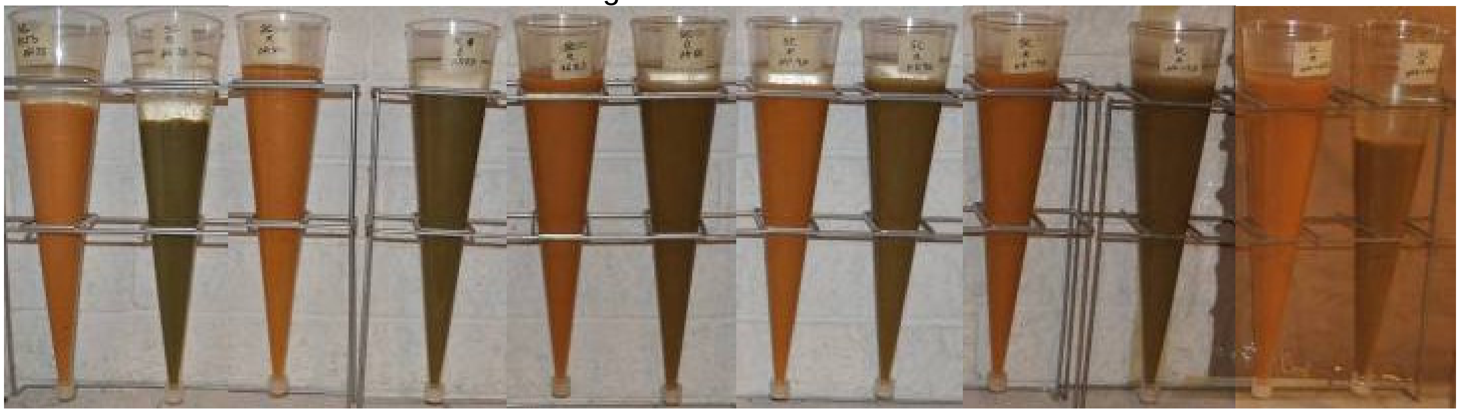
Figures 3.1 to 3.5 display the Imhoff cones over time for the RNSP10 treated water. Table 3.1 shows the settled sludge volume over time for the Sand Coulee treated water.

Figure 3.1 - Time 0

R B R B R B R B R B R B

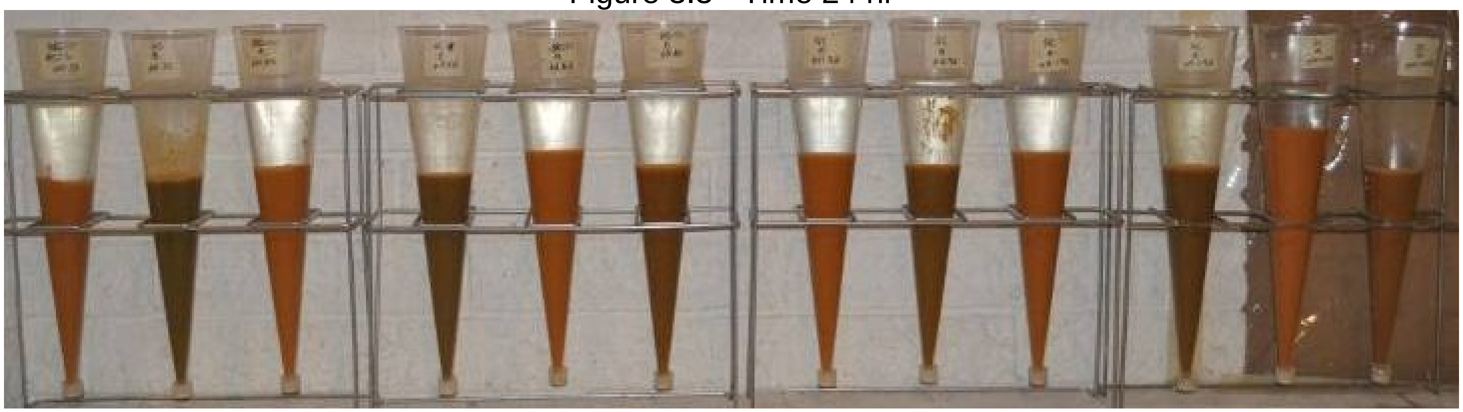
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.2 - Time 1 hr



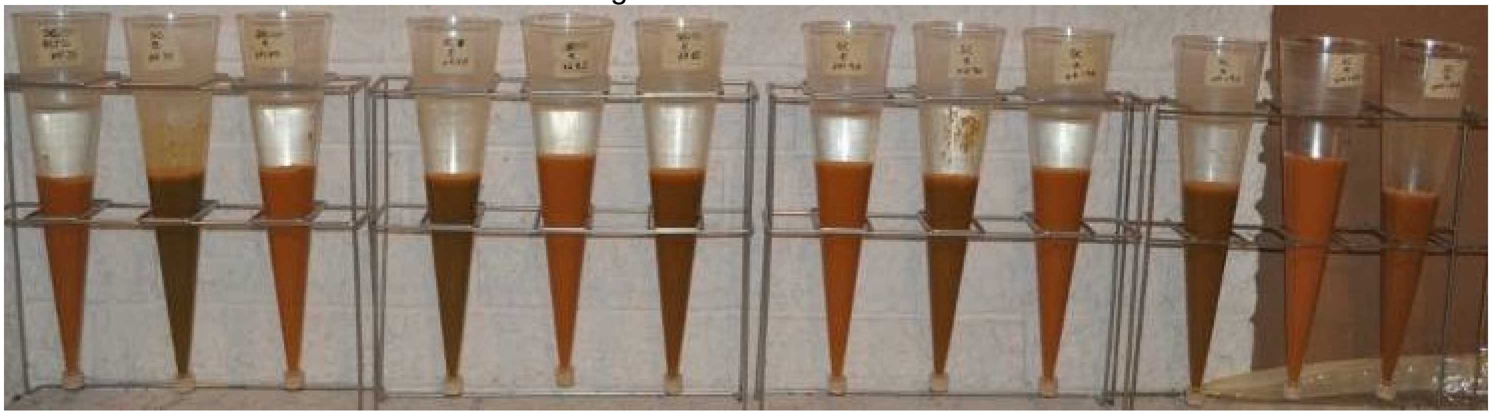
R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.3 - Time 24 hr



R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

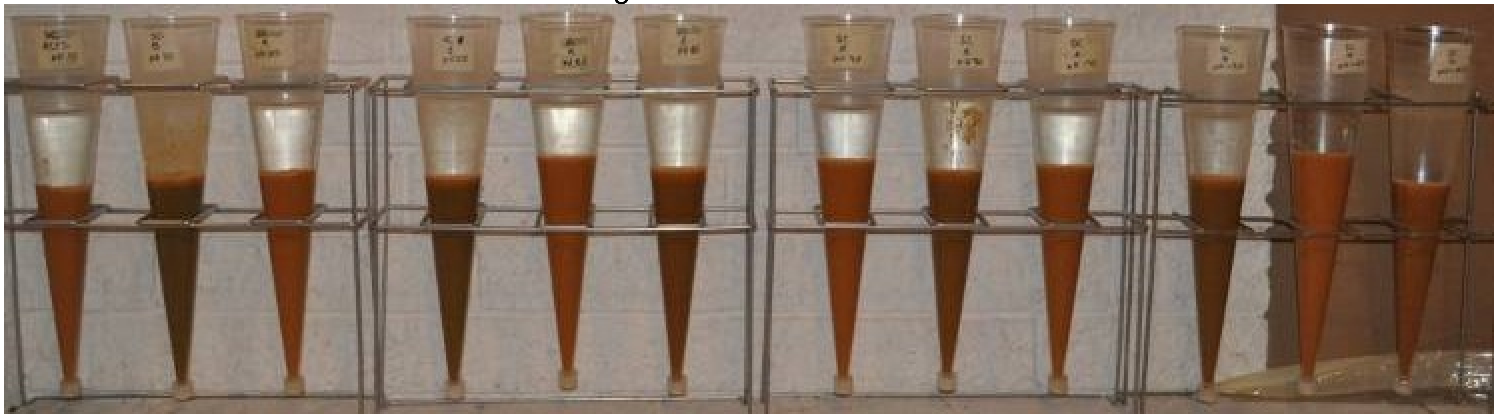
Figure 3.4 - Time 48 hr



R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.5 - Time 72 hr



R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Table 3.1 - Sludge levels over time Sand Coulee						
RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	270	275	400	350	350	520
48 hr	250	270	325	300	300	480
72 hr	240	265	320	300	290	400
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	270	275	350	320	320	320
48 hr	270	265	300	290	300	280
72 hr	270	265	290	290	300	275

The Sand Coulee sludge settled at a rate of 0.25” to 3.5” per hour over the first 60 minutes of settling. Following 72 hours of settling a 1L sample settled to a volume of 240 to 400 cc. This would result in 77,800 to 129,600 gallons of wet sludge per day.

Cottonwood Coulee

Figures 3.6 to 3.10 display the Imhoff cones over time for the Cottonwood Coulee treated water. Table 3.2 shows the settled sludge volume over time for the Cottonwood Coulee treated water.

Figure 3.6 - Time 0

R B R B R B R B R B R B

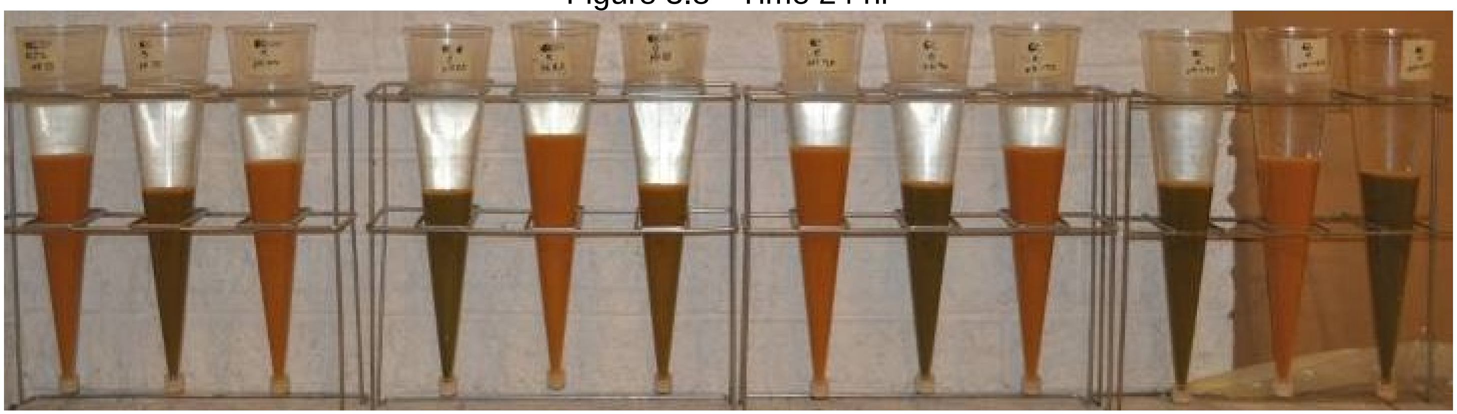
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.7 - Time 1 hr

R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.8 - Time 24 hr



R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.9 - Time 48 hr

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.10 - Time 72 hr

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Table 3.2 - Sludge levels over time Cottonwood Coulee RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	400	380	500	440	480	400
48 hr	325	325	480	350	360	300
72 hr	325	325	480	350	360	300
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	250	250	250	270	280	370
48 hr	250	250	260	270	280	285
72 hr	250	250	260	270	280	285

The Cottonwood Coulee sludge settled at a rate of 0.25" to 4.5" per hour over the first 60 minutes of settling. Following 72 hours of settling a 1L sample settled to a volume of 250 to 480 cc. This would result in 18,000 to 34,600 gallons of wet sludge per day.

Number Five

Figures 3.11 to 3.15 display the Imhoff cones over time for the Cottonwood Coulee treated water. Table 3.3 shows the settled sludge volume over time for the Cottonwood Coulee treated water.

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Figure 3.11 - Time 0

R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.12 - Time 15 min

R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.13 - Time 1 hr

R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.14 - Time 24 hr

R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.15 - Time 48 hr

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.16 - Time 72 hr

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Table 3.3 - Sludge levels over time Number Five RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	115	108	100	105	130	130
24hr	78	74	74	70	70	88
48 hr	44	42	40	42	50	52
72 hr	30	36	34	30	48	50
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	200	190	180	170	190	200
24hr	98	96	89	82	102	104
48 hr	74	70	70	62	64	82
72 hr	68	68	58	65	60	80

The Number 5 sludge settled at a rate of 8” to 10” per hour over the first 60 minutes of settling. Following 72 hours of settling a 1L sample settled to a volume of 30 to 80 cc. This would result in 10,800 to 28,800 gallons of wet sludge per day.

Belt

Figures 3.17 to 3.21 display the Imhoff cones over time for the Cottonwood Coulee treated water. Table 3.3 shows the settled sludge volume over time for the Cottonwood Coulee treated water.

Figure 3.17 - Time 0

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.18 - Time 15 min

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

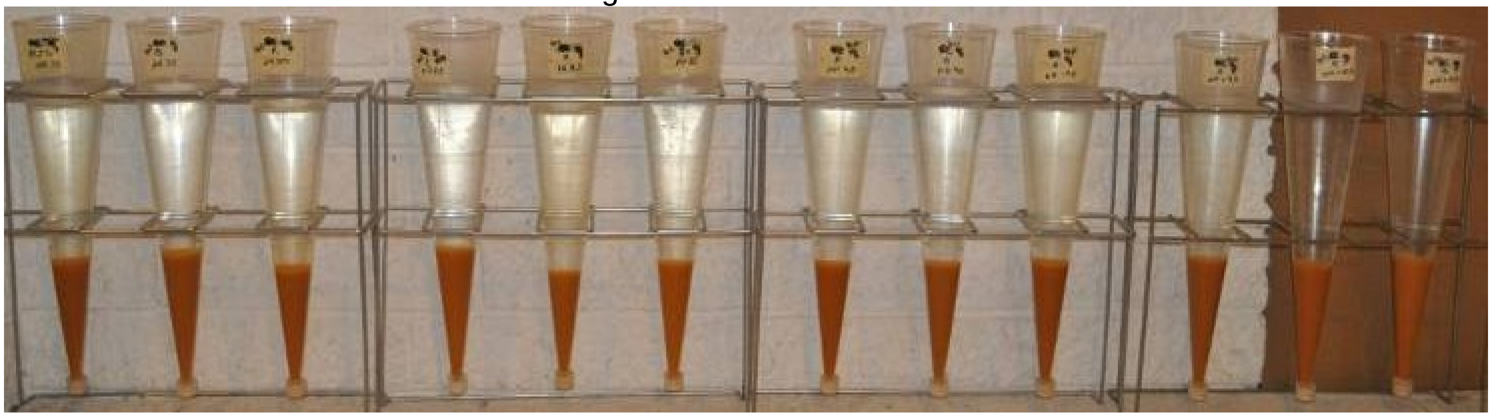
Figure 3.19 - Time 1 hr

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.20 - Time 24 hr

R B R B R B R B R B R B
pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

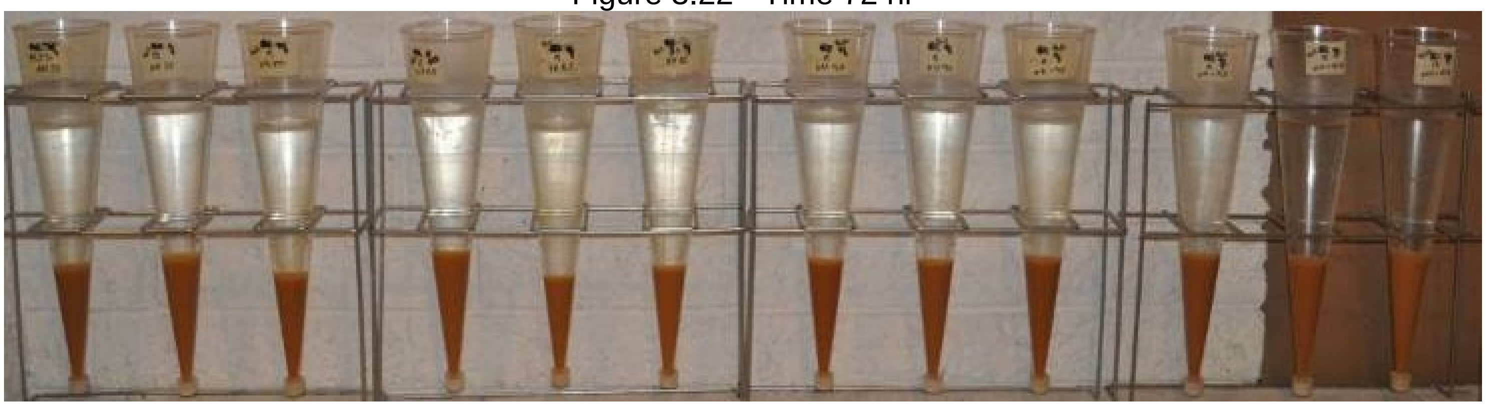
Figure 3.21 - Time 48 hr



R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Figure 3.22 - Time 72 hr



R B R B R B R B R B R B

pH=7.5 pH=8.0 pH=8.5 pH=9.0 pH=9.5 pH=10

Table 3.4 - Sludge levels over time Belt RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	230	220	205	230	245	235
24hr	100	92	85	88	100	105
48 hr	80	70	60	80	86	86
72 hr	70	58	50	78	84	76
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	250	255	245	260	265	255
24hr	125	140	115	1058	115	120
48 hr	100	105	80	80	100	100
72 hr	90	95	68	80	100	98

The Belt sludge settled at a rate of 6” to 7” per hour over the first 60 minutes of settling. Following 72 hours of settling a 1L sample settled to a volume of 50 to 100 cc. This would result in 18,000 to 36,000 gallons of wet sludge per day

Table 3.5 Estimated volume (gallons) of wet primary sludge generated at designated flows.				
	Sand Coulee (225 gpm)	Cottonwood Coulee (50 gpm)	Number Five (250 gpm)	Belt (250gpm)
Low	77,800	18,000	10,800	18,000
High	129,600	34,600	28,800	36,000

Scale

Photos were taken after 72 hours of settling to display the amount of scaling that occurs post treatment. Higher pH values resulted in more scale observed. The most scale was observed on Cottonwood Coulee, followed by Sand Coulee, Belt, and then Number Five. More scale was observed on the Beaker treatments than the RCTS treatments. Figures 4.1 through 4.4 display photos of the Imhoff Cones for the pH 9.5 RCTS and Beaker treatments for each treatment site tested.

Figure 4.1 Sand Coulee scale at pH 9.5 following 72 hours (RCTS left Beaker Right)

Figure 4.2 Cottonwood Coulee scale at pH 9.5 following 72 hours (RCTS left, Beaker Right)

Figure 4.3 Number Five scale at pH 9.5 following 72 hours (RCTS left, Beaker right)

Figure 4.4 Number Five scale at pH 9.5 following 72 hours (RCTS left, Beaker right)

Reaction Times

The reaction time is important for iron and manganese oxidation and for lime efficiency. The extent of iron oxidation can be observed during treatment by watching the treated water turn from green (reduced) to orange (oxidized). Although complete oxidation of iron is not always absolutely necessary it is preferred particularly for sludge stability.

The Number Five and Belt combined samples appeared to be oxidized prior to treatment. The Sand Coulee and Cottonwood Coulee samples were minimally oxidized prior to treatment.

All samples were treated for a period of 6-16 minutes. At this rate the lime dissolved effectively and the majority of the ferrous iron was oxidized in the RCTS treatment. The reaction time required in bench testing with the RCTS is typically applicable in the field. Sand Coulee and Cottonwood coulee samples required more reaction time for oxidation and lime dissolution due to the relatively high metals concentrations. Recommended reaction times are provided in the conclusions below. Additional manganese removal can be achieved by extending the reaction time.

Conclusions

Bench scale RCTS lime treatment was able to meet targets for all metals except cadmium and nickel. (1 hr to 48 hours analyzed by AA), and nickel at several pH values at one hour of settling time. However, the analysis within 48 hours was analyzed by atomic absorption spectrophotometry (AA) which does not provide the high sensitivity and low detection limits that are provided by inductively coupled plasma-mass spectrometry (ICP-MS). Samples taken at 72 hours were analyzed by ICP-MS and reveal that indeed nickel and cadmium limits are achieved at the pH values analyzed.

Aluminum concentrations increased with increasing pH. At a treatment pH of 9.0 to 10.0, TKT predicts that there may be sufficient aluminum remaining in solution to cause white staining in the discharge. The threshold for staining will depend on the flows of the effluent and the receiving stream and the extent of contamination already present in the receiving water and the sediment. A dual stage treatment may be necessary to cadmium to discharge targets and aluminum to a sufficient concentration not to cause staining in the discharge.

Sulfate concentrations were typically reduced to between 1200 and 2200 mg/L. Additional treatment would be required to remove sulfate further.

Some differences in sludge settling rates were observed at different pH values and between the two different treatment methods. However, treatment at a lower pH resulted in slightly less sludge generated in almost all cases.

RCTS treatment resulted in less sludge generated and faster settling rates than Beaker treatment with Number Five and Belt water. With Sand Coulee and Cottonwood Coulee water the opposite was observed, which is contrary to virtually every site that has been tested previously. These results will be confirmed/refuted if a pilot test is conducted.

The Sand Coulee sample required 5360 mg/L (14,550 lbs/day at 225 gpm), Cottonwood Coulee required 5700 mg/L (3440 lbs/day at 50 gpm), Number Five required 790 mg/L (2380 lbs/day at 250 gpm)and Belt required 1600 mg/L (4830 lbs/day at 250 gpm)of hydrated lime to pH 9.5.

Table 4.1. Estimated lime demand at pH 9.5 and designated flow rates.

	Sand Coulee (225 gpm)	Cottonwood Coulee (50 gpm)	Number Five (250 gpm)	Belt (250 gpm)
Pounds per day	14,550	3,440	2,380	4,830
Tons per 30 days	218.25	36.6	35.7	72.45

RCTS treatment resulted in better lime efficiency particularly at lower pH values. The reduction in lime efficiency at higher pH values is likely due to enhanced precipitation of magnesium hydroxide and calcium carbonate at pH values greater than 9 with the RCTS unit. All RCTS treatments resulted in greater than 80% lime efficiency and better lime efficiency can be expected in the field particularly if an RCTS treatment at pH values less than 9.0 is utilized.

Large amounts of scale were present following 72 hours particularly in the Cottonwood Coulee and Sand Coulee treatments. Scaling will be a factor in the design of a treatment system on these two sites in particular.

Recommended reaction times are given for both RCTS and tank reactor treatments for Sand Coulee and Cottonwood Coulee due to the uncertainty of sludge generation and scaling maintenance requirements. A minimum reaction time of 12 minutes is recommended for the Sand Coulee with RCTS treatment and 90 minutes with Tank reactor system. A minimum reaction time of 15 minutes is recommended for the Cottonwood Coulee with RCTS treatment and 120 minutes with Tank reactor system.

A minimum reaction time of 6 minutes is recommended for the Number Five with RCTS treatment, tank reactor treatment is not recommended. A minimum reaction time of 8 minutes is recommended for Belt with RCTS treatment, tank reactor treatment is not recommended.

Shorter reaction times may result in a loss in lime efficiency and potentially a decrease in metals removal efficiency. Because Belt and Number Five appeared oxidized prior to treatment extended reaction times may be necessary. Pilot testing will provide a better estimate at each of these sites.

APPENDIX E

TREATMENT EVALUATION REPORT

Appendix E

Treatment Evaluation

Great Falls Coal Fields

Montana-DEQ AML

February 2012

prepared by

TKT ***Consulting, LLC***

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Treatment Evaluation

Great Falls Coal Fields, Montana

Background

The Montana DEQ AML program requested that TKT Consulting, LLC (TKT) and Hydrometrics, Inc. identify and evaluate potential active water treatment options capable of meeting the DEQ water quality objectives for several treatment sites in the Great Falls Coal Fields near Belt, Stockett and Sand Coulee, MT.

This document provides an evaluation of treatment options and recommendations for systems to address acid mine discharges from abandoned coal mines in Sand Coulee, Cottonwood Coulee, Number five Coulee and Belt, Montana. For the purposes of this evaluation the following criteria are utilized as treatment targets:

Table 1. State of Montana numerical water quality standards

	HUMAN HEALTH STANDARD (mg/L)		AQUATIC LIFE STANDARD (mg/L)			
PARAMETER	SURFACE WATER	GROUND WATER	ACUTE	CHRONIC	TRIGGER VALUE (mg/L)	REQUIRED REPORTING VALUE (mg/L)
Aluminum (Al)	--	--	0.750	0.087	0.03	0.03
Antimony (Sb)	0.0056	0.006	--	--	0.0004	0.003
Arsenic (As)	0.01	0.010	0.340	0.150	NAI	0.003
Barium (Ba)	1.0	1.0	--	--	0.002	0.005
Beryllium (Be)	0.004	0.004	--	--	NAI	0.001
Cadmium (Cd)	0.005	0.005	0.00541+	0.00053+	0.0001	0.00008
Chromium (Cr)	0.1	0.1	--	--	0.001	0.001
Chromium (III) (Cr (III))	--	--	3.82+	0.183+	0.001	--
Chromium (VI) (Cr (VI))	--	--	0.016	0.011	--	0.005
Copper (Cu)	1.3	1.3	0.0332+	0.0204+	0.0005	0.001
Cyanide (CN), Total	0.14	0.2	0.022	0.0052	--	0.005
Fluoride (F)	4.0	4.0	--	--	0.005	0.1
Iron (Fe)	0.3#	0.3#	--	1.0	--	0.05
Lead (Pb)	0.015	0.015	0.262+	0.01021+	0.0001	0.0005
Manganese (Mn)	0.05#	0.05#	--	--	--	0.005
Mercury (Hg)	0.00005	0.002	0.0017	0.00091	NAI	0.00001
Nickel (Ni)	0.1	0.1	1.019+	0.113+	0.0005	0.01
Selenium (Se)	0.05	0.05	0.02	0.005	0.0006	0.001
Silver (Ag)	0.1	0.1	0.0196+	--	0.0002	0.0005
Thallium (Tl)	0.00024	0.002	--	--	0.0003	0.0002
Zinc (Zn)	2.0	2.0	0.260+	0.260+	0.005	0.01

+ Hardness based aquatic life standards calculated utilizing an assumed receiving water hardness of 250 mg/L.
 # Secondary drinking water standard

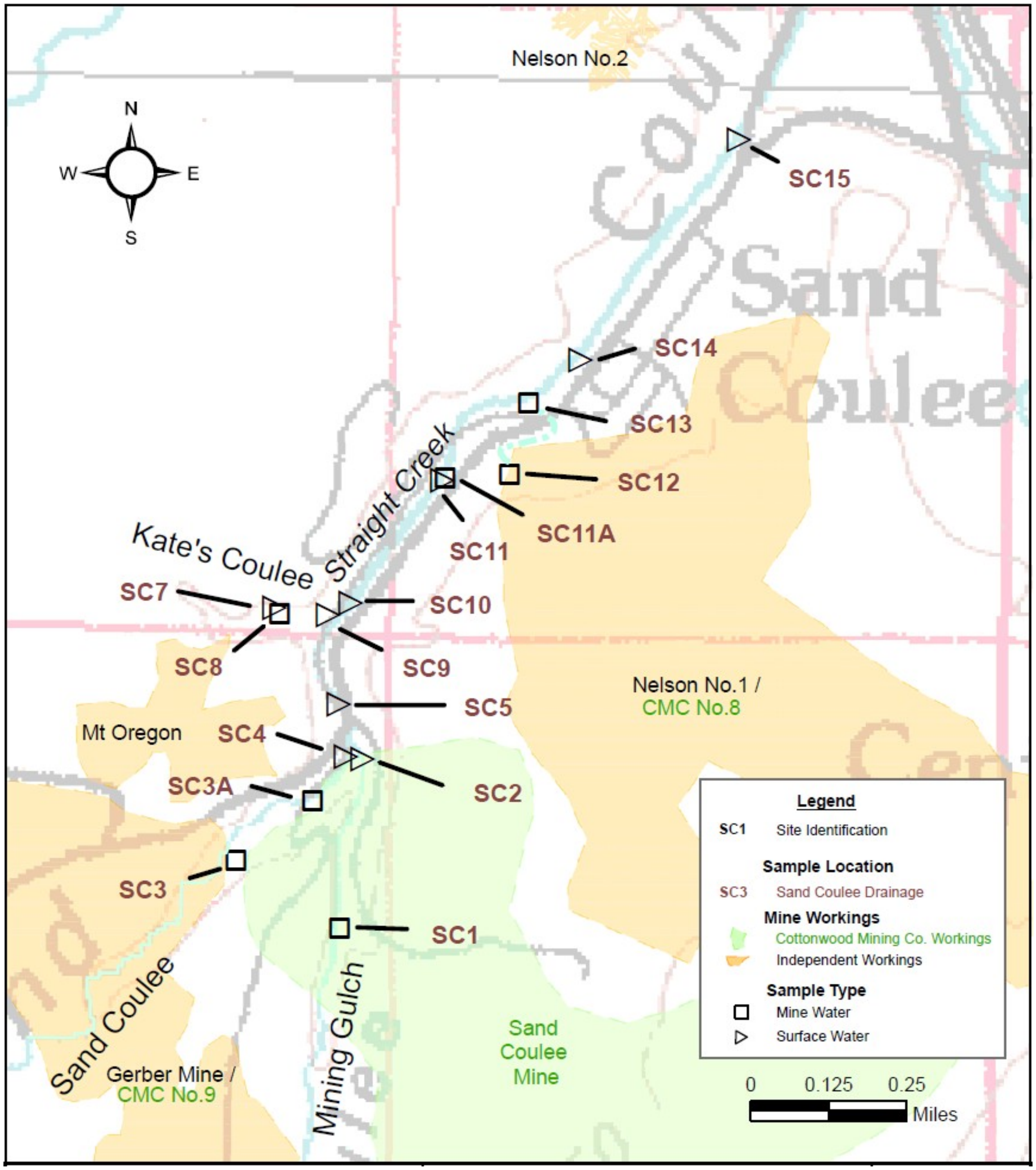
Conditions Specific to the Site

Location

The primary water of concern flows from distinct individual sources in the Great Falls Coal fields. Four treatment systems were recommended to treat water combined from the three primary streams at Sand Coulee, two primary streams from Cottonwood

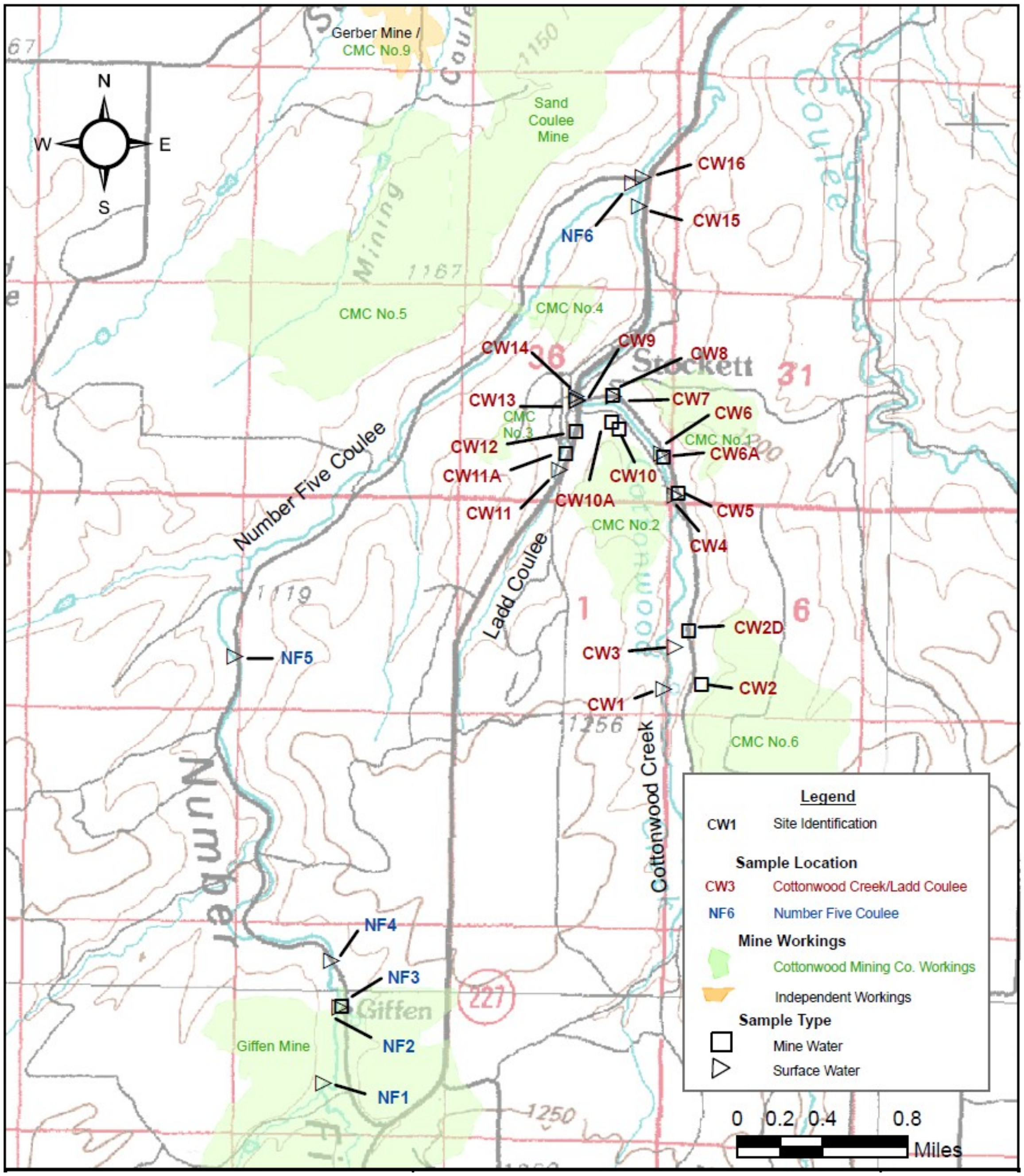
Coulee, one stream from Number Five Coulee and five primary streams from Belt. In some cases water will have to be piped considerable distances to the individual treatment locations.

Figure 1. Locations of sampling sites in the Sand Coulee treatment area



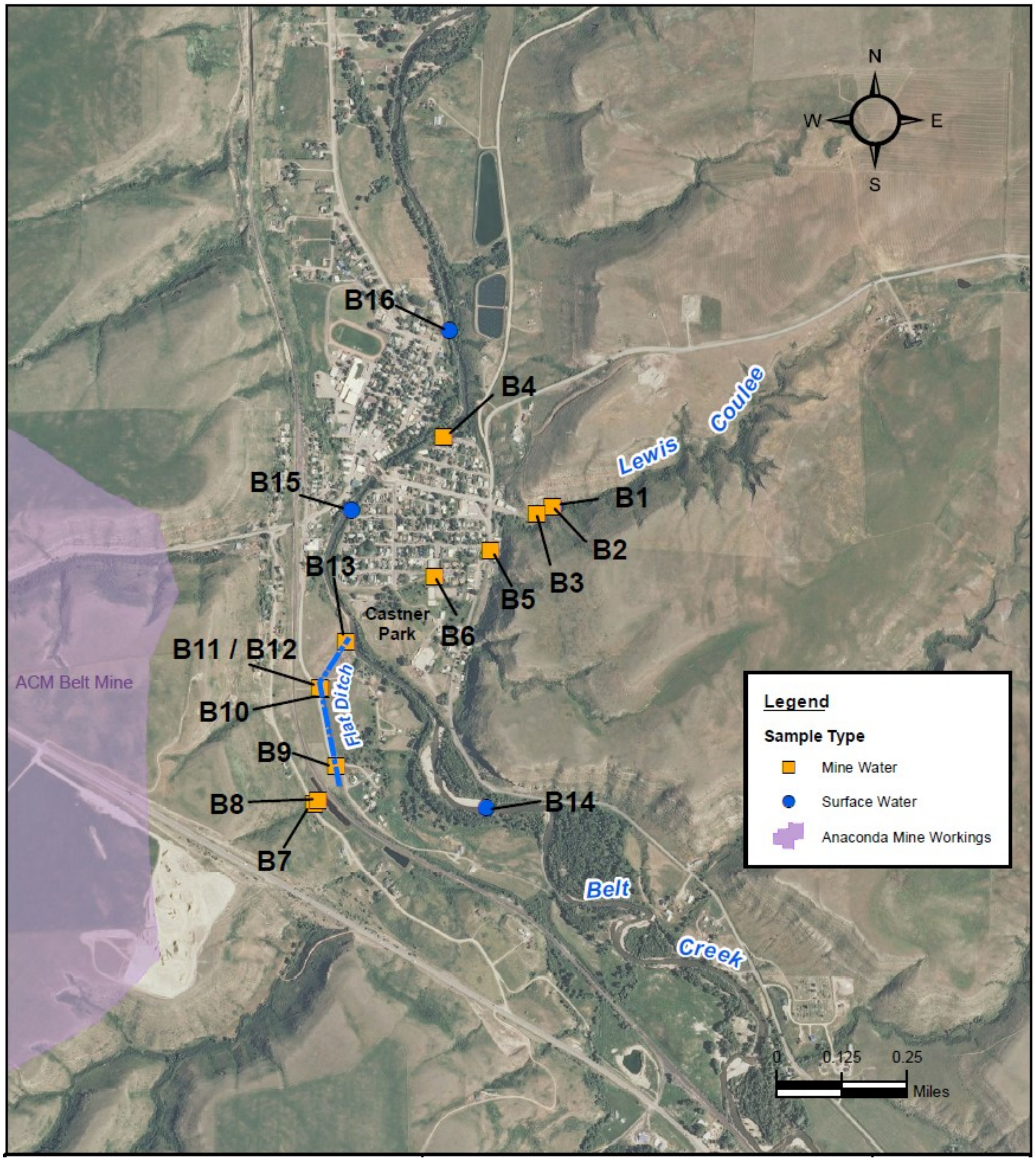
SCT-1, SCT3, SCT-8 and SCT-12 were sampled and combined for treatability bench testing.

Figure 2. Locations of sampling sites with flow in the Cottonwood Coulee and Number



Five treatment areas. SCT-1, SCT3, SCT-8 and SCT-12 were sampled and combined for treatability bench testing. Number Five was also tested.

Figure 3. Locations of sampling sites with flow in the Belt treatment area.



B-3, B-5, B-7, B-8 and B-11 were sampled and combined for treatability bench testing.

Flow

Flows vary seasonally and from year to year which affects treatment system design. Table 2 displays the flows measured by USGS (1994-1996) and Hydrometrics (September 2011) at the sites of interest. In general, higher flows are observed in the summer months through late fall. For the purposes of treatment system design the minimum, maximum and 75th percentile flow rates will be considered. The 75th percentile value is the upper bound maximum of the mean flow value. This value is a more conservative flow value than average flows for purposes of estimating long term annual operational and maintenance costs.

Table 2. Flow data for prospective treatment streams.

Site No.	Description	Measured Flow Rate	Historical Flow Rate Min	Avg	Max	75th Percentile Flow
SC1	Mining Coulee above Sand Coulee (USGS 14)	65	0.2	6.6	18	9
SC3	Sand Coulee above Sand Coulee (USGS 16)	35	0	13	49	20
SC3A	Unnamed Discharge site below SCT3	42	NM	NM	NM	NM
SC8	Oregon Mine in Kate's Coulee (USGS 19)	50	9	30	81	36
SC12	Nelson Mine at Sand Coulee	22	5	12	36	14
Sand Coulee Total		**214**	**14**	**61**	**184**	**79**
CW2	Cottonwood No.2 Drain (USGS 7)	38	8	19	67	21
CW8	Cottonwood No.1 Seepage	1.3	NM	NM	NM	NM
CW12	Cottonwood No.2 Discharge	11	0	9	45	14
Cottonwood Coulee Total		**50**	**8**	**28**	**112**	**35**
NF3	Giffen Spring in No.5 Coulee	256	128	208	247	238
Number 5 Coulee Total		**256**	**128**	**208**	**247**	**238**
B2	Lewis Gulch (USGS 21)	3	0	18	135	4
B5	Mine drain above Casner Park (USGS 13)	5	0	5	14	5
B7	French Coulee Wetlands Inflow (USGS 11)	6	14	24	54	27
B8	French Coulee Wetlands Inflow #2 (USGS 12) [(2)]	19	NM	NM	NM	NM
B11	Anaconda Mine Drain (USGS 5)	208	67	105	155	126
B13	Flat Ditch Outfall	135	99	114	129	121
Belt Creek Total		**241**	**81**	**152**	**357**	**162**

Chemistry

An evaluation of chemistry (the constituents of concern and their concentration) is important for determining treatment system type and size. The variability in chemistry also affects the treatment system size and how the system is designed. For example, a site with highly variable metals concentrations and acidity requires a corresponding variable lime feed system and/or equalization pond to draw from.

The chemistry of the Great Falls Coalfields is typical for acid mine drainage. The water contains high iron, aluminum and sulfate concentrations. Most of the individual sources also have elevated beryllium, cadmium, manganese, nickel, selenium, sulfate, thallium and zinc. Some sources at Sand Coulee, Cottonwood Coulee and Belt also contain elevated arsenic, fluoride and chromium.

Because the majority of the chemical loading consists of iron and aluminum they are the focus of the evaluation in terms of seasonal variability. The available iron and aluminum data for each treatment stream of concern are displayed in Tables 3 and 4. The USGS data from 1994 to 1996 shows relatively little variability in iron and aluminum concentrations over time. The differences between the USGS data and the Hydrometrics and TKT data at SCT-3 and SCT-8 are probably due to water quality differences under varying flow regimes. Design of a lime feed system to accommodate the variability will not be a problem.

Table 3. Iron data for prospective treatment streams.

	Approx Date	Location	Iron (mg/L)									
Sampler		USGS 14 SCT-1	USGS 16 SCT-3	USGS 19 SCT-8	USGS 20 SCT12	USGS 7 CW-2	USGS 8 CW-10	USGS 6 NF3	USGS 21 B-3	USGS 13 B-5	USGS 11 B-7	USGS 5 B 11
USGS	7/19/1994	1100	340	1700	1600		1700	81	383	447	1000	176
USGS	10/14/1994	1200	335	1600	1600		1600	83	412	460	1000	163
USGS	11/14/1994	1200	317	1600	1700		1600	80	431	473	900	179
USGS	12/15/1994	1000	290	1410	1490		1410	73	451	530	920	174
USGS	1/11/1995	1100		1600	1500		1600	71	452	492	910	180
USGS	2/22/1995	1200		2000	1500	690	2000	64	382	520	960	170
USGS	3/15/1995	1100		1000	1400	750	1000	63	380	510	300	170
USGS	4/12/1995	950		840	1600	700	840	63	370	530	190	150
USGS	5/16/1995	1000		1000	1600	660	1000	54	370	490	170	150
USGS	6/7/1995	1000		720	1500	0	720	58	8			
USGS	6/12/1995	970	290	720	1400	740	720	55	6	500	220	150
USGS	7/12/1995	1100	390	1200	1600	830	1200	40	13	550	360	150
USGS	8/16/1995	980	410	1200	1900	810	1200	86	2	560	460	160
USGS	9/13/1995	990	390	1400	1900	840	1400	81	230	530	520	170
USGS	10/10/1995	1100	390	1500	2000	800	1500	110	470	560	760	180
USGS	11/27/1995	940	370	1500	1500	790	1500	100	490	530	1300	180
USGS	1/10/1996	990	360	1500	1300	810	1500	99	480	520	1000	180
USGS	2/8/1996	1100	360	1500	1300	0	1500	93	530	520		
USGS	2/20/1996	1100	330	1300	1300	810	1300	81	560	510		180
USGS	4/2/1996	1100	320	980	1300	810	980	73	530	490		190
USGS	5/7/1996	990	320	1300	1400	780	1300	61	440	460		170
USGS	6/3/1996	1100	360	1600	1400	840	1600	60	440	480		150
USGS	7/1/1996	1100	390	1600	1200	770	1600	70	470	470		170
USGS	8/6/1996	1000	350	1900	1300	770	1900	53	490	470		170
USGS	9/3/1996	1000	310	1900	1400	740	1900	54	550	500		170
Hydrometrics	Oct-11	1520	850	251	1460	854	1380	41	358	439	566	692
TKT	Nov-11	1321	63	19	1334	931	1442	136	273	450	679	176
Minimum		940	63	19	1200	690	720	40	2	439	170	150
Maximum		1520	410	2000	2000	931	2000	110	560	560	130	692
Average		1083	359	1290	1449	715	1385	73	369	500	679	190

Table 4. Aluminum data for prospective treatment streams.

	Approx Date	Location	Aluminum (mg/L)									
Sampler		USGS 14 SCT-1	USGS 16 SCT-3	USGS 19 SCT-8	USGS 20 SCT12	USGS 7 CW-2	USGS 8 CW-10	USGS 6 NF3	USGS 21 B-3	USGS 13 B-5	USGS 11 B-7	USGS 5 B 11
USGS	7/19/1994	900	250	170	910		1300	15	220	0.39	500	110
USGS	10/14/1994	910	240	170	910		1400	14	220	0.42	480	100
USGS	11/14/1994	920	220	180	910		1300	12	230	0.43	420	110
USGS	12/15/1994	880	200	170	930		1200	8	230	0.52	480	110
USGS	1/11/1995	890		170	890		1300	7	208	0.47	450	100
USGS	2/22/1995	890		150	860	410	1600	5	230	0.48	470	110
USGS	3/15/1995	910		170	920	410	910	3	200	0.47	480	110
USGS	4/12/1995	860		170	1000	410	980	3	200	0.45	180	100
USGS	5/16/1995	890		160	970	380	1300	2	200	0.50	110	95
USGS	6/7/1995	880		170	940		740	2				
USGS	6/12/1995	870	180	160	870	350	830	1		0.48	100	94
USGS	7/12/1995	910	250	170	1000	350	990	2		0.47	140	92
USGS	8/16/1995	860	270	170	1000	390	980	19		0.47	190	100
USGS	9/13/1995	880	250	160	870	430	1100	23	110	0.43	230	110
USGS	10/10/1995	890	250	180	960	380	1200	33	250	0.45	250	110
USGS	11/27/1995	870	230	160	850	410	1200	35	240	0.44	390	110
USGS	1/10/1996	900	250	180	830	450	1200	30	260	0.46	640	120
USGS	2/8/1996	990	250	180	880		1200	30	280	0.44		
USGS	2/20/1996	930	210	160	740	440	1100	19	280	0.46		110
USGS	4/2/1996	920	210	160	790	420	830	13	260	0.45		120
USGS	5/7/1996	880	210	150	910	400	1300	6	250	0.47		110
USGS	6/3/1996	880	216	141	883	416	1220	4	227	0.43		100
USGS	7/1/1996	894	242	159	765	393	1370	7	224	0.43		106
USGS	8/6/1996	865	213	145	805	388	1520	2	250	0.41		104
USGS	9/3/1996	860	205	152	822	378	1460	2	260	0.42		108
Hydrometrics	Oct-11	1140	521	188	920	384	1030	62	289	270	354	384
TKT	Nov-11					222	432	47	247	253	347	285
Minimum		860	180	141	805	350	432	1	110	0	100	92
Maximum		1140	521	188	1000	450	1600	62	289	270	640	384
Average		903	243	215	1157	394	1148	15	233	21	345	124

Metals Precipitation and Treatment Process

Metals are generally precipitated and removed as hydroxide, sulfide or carbonate complexes in water treatment. The appropriate treatment process can be selected based on the chemistry of the constituents of the water of concern. Most metals are removed effectively by neutralization and precipitation as metal hydroxides/oxides. Lime is commonly used as the base because of its low cost, favorable settling properties, ability to remove sulfate and because it does not add ions detrimental to soil (such as sodium). This process, typically referred to as "Lime Precipitation or Lime Treatment," utilizes lime (or Calcium Hydroxide "$Ca(OH)_2$" to increase the pH of the contaminated water and facilitate the precipitation of dissolved metals as particulates. Although lime precipitation has many inherent advantages, these systems are more difficult to operate remotely and therefore, when alkalinity demands are low, sodium hydroxide, magnesium hydroxide or ammonia are often chosen. Limestone is sometimes used because it is inexpensive, but it has limited effectiveness on water with complex chemistry and high metals loading.

All of the treatment sites evaluated have relatively high acidity, which justifies lime precipitation for neutralization and treatment.

Iron and Manganese

Typically iron and manganese treatment is achieved by increasing pH and/or oxidizing (either chemically or with aeration) the iron/manganese to insoluble manganese dioxide and iron hydroxide followed by settling and or filtration.

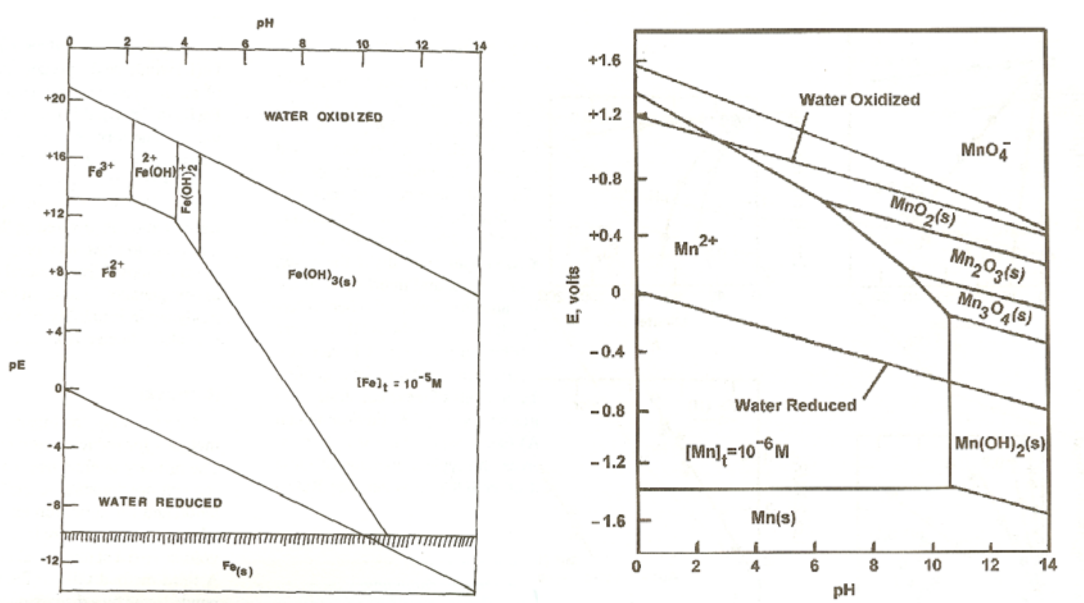
Because manganese oxidation occurs at a higher pH than iron, chemical oxidation is commonly used. Greensand can also be used to oxidize and filter manganese in a single process.

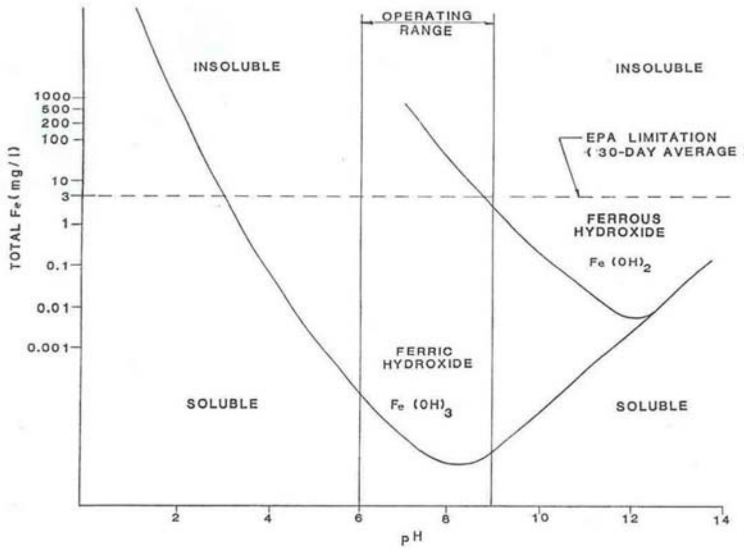
Iron and Manganese can also be removed by ion exchange and reverse osmosis but are typically removed in a pre-treatment stage by neutralization. Iron can also be precipitated as ferrous sulfide. Manganese removal by microbial reduction and sulfide precipitation occurs but typically not to discharge standards.

Oxidation

In order to precipitate dissolved iron and manganese from the water, the pH is typically increased and the reduced manganese and iron are oxidized. Figure 4 displays the pH dependence of manganese and iron precipitation. From this graph we can deduce that increasing the pH decreases the solubility of iron and manganese. In addition, if the manganese and iron is oxidized a lower pH is required.

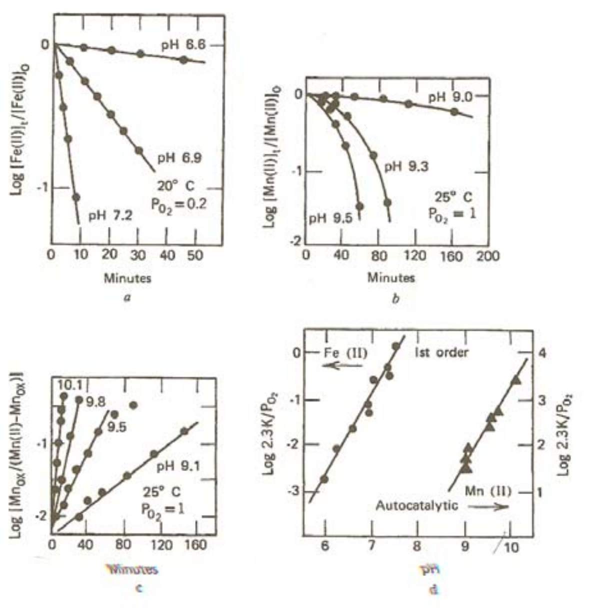
Figure 4. pH-pE Stability Diagrams for Iron and Manganese and pH vs solubility curve for ferrous and ferric iron.





In addition, the rate of oxidation is enhanced at higher pH. Figure 5 displays the pH dependence of the rate of oxidation for iron and manganese. The oxidation time needed for manganese removal at pH 9.5 is typically on the order of 60 minutes.

Figure 5. The Effect of pH on Oxidation Rates for Iron and Manganese



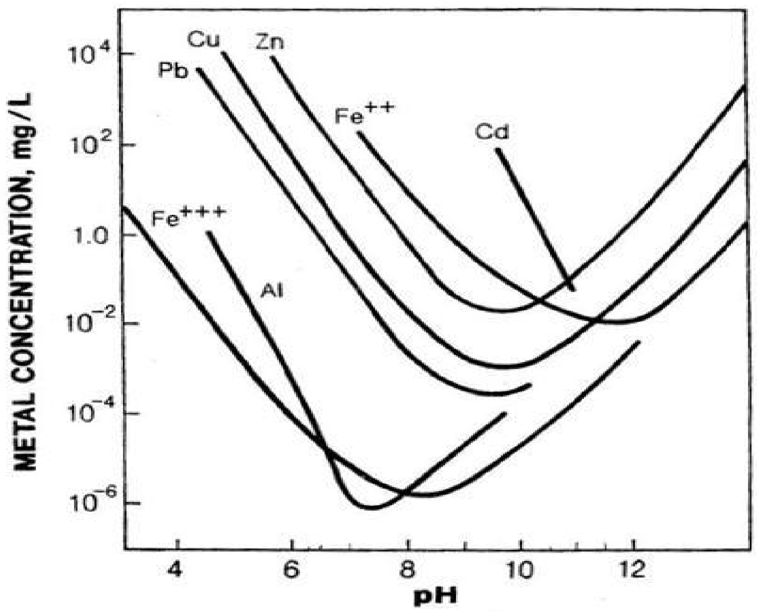
Arsenic and Chromium

Arsenic and chromium (III) are commonly removed from water through co-precipitation and sorption with iron hydroxide precipitates. The source water evaluated has significant concentrations of iron and relatively low concentrations of chromium and arsenic. Arsenic and chromium will likely be removed effectively by neutralization during lime precipitation treatment particularly if two stage treatment is utilized.

Aluminum, Cadmium, Chromium, Nickel and Zinc

Aluminum, cadmium, chromium (III), nickel and zinc are all precipitated and removed effectively as metal hydroxide complexes during neutralization. Figure 6 below displays the solubility curves for several of these metals. Aluminum typically has a minimum solubility between pH 6 and 7, while cadmium, nickel and manganese require a higher pH for removal. Because the Great Falls Coal Fields will require cadmium removal, a pH above 9.5 will be necessary for effective treatment. At this pH aluminum often exceeds discharge standards as it re-dissolves from the sludge. Because of this, two-stage treatment and sludge removal may be required.

Figure 6. pH vs solubility curves for various metals.



Beryllium, Selenium and Thallium

Beryllium, selenium and thallium removal is typically accomplished with ion exchange, reverse osmosis, or with activated alumina systems. Chromium (VI) can be removed by reduction to chromium (III) followed by precipitation with iron or by ion exchange or reverse osmosis. Microbial reduction of selenate to selenide or elemental selenium can also be utilized for selenium removal. Thallium may be treated effectively to low levels through adsorption using zeolites in packed columns.

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RCTS™ Technology

The Rotating Cylinder Treatment System, RCTS™, is an alternate technology for the aeration/oxidizing and mixing component of a lime precipitation system. The RCTS™ aeration concept is different from traditional aeration systems. Rather than injection of air into water, RCTS™ introduces water to air in a thin film clinging to the rotating perforated cylinder. This system reduces or eliminates the requirement for compressors and, depending on the water chemistry, can significantly reduce lime usage, sludge production and energy requirements compared to conventional tank reactor lime treatment systems with compressed air aeration.

Lime Efficiency

Lime is the primary chemical consumed in the lime precipitation process. Most traditional lime treatment systems are not efficient at utilizing all of the lime added for alkalinity. Poor lime efficiency occurs because lime is inherently insoluble and is typically delivered in slurry. As the lime is added the precipitated metals coat the surface of the lime particles and trap unutilized lime within the particle. The RCTS™ system achieves near 100% lime utilization on sites where treatment can occur at a pH of 8 to 8.5 due to the aggressive mixing and sheer forces present in the cylinder. Two benefits arise from this: 1) lower lime consumption due to the utilization of all of the available alkalinity in the introduced lime, and 2) less sludge production resulting from less lime usage per unit of alkalinity required. Comparisons on similar projects have demonstrated a 20%-40% reduction in lime usage and reduced sludge production when compared to traditional lime treatment systems.

Because of the presence of cadmium and manganese, a pH of approximately 9.5 may be required on these sites, which typically reduce the lime efficiency benefit of RCTS. However, if two-stage treatment is utilized the benefits can be realized in the first stage of treatment.

Sulfate

Lime precipitation typically removes sulfate to 1400 to 2000 mg/L. There are a number of technologies that will remove sulfate to lower concentrations and also further decrease TDS; however, these are advanced treatment technologies (i.e. advanced filtration, ion exchange or chemical precipitation) that are very expensive to implement and do not appear to be warranted for this project based on achieving applicable regulatory limits.

Wetlands

Wetlands can be very effective at polishing effluent by removing suspended solids and trace metals and to some extent reducing sulfate to sulfide. However, these systems require a lot of area and typically have limited effectiveness seasonally in cold climates. The use of wetlands may be valuable as a final polishing step but must be used in conjunction with other technologies for primary treatment.

Treatment Recommendations, System Evaluation and Cost Estimate

This report recommends specific treatment alternatives, provides conceptual designs and estimates treatment costs. The primary basis for the conceptual design is from the TKT Bench Testing and USGS data. Space will likely be a limiting factor at the Sand Coulee and the Cottonwood Coulee sites, and also potentially on the remaining two sites. Weather is a considerable factor in the design of the system.

Based on the chemistry, flow, and space available the most viable candidate for primary treatment of the water in the Great Falls Coal Fields is lime precipitation. Further treatment for beryllium, cadmium, fluoride, selenium, and sulfate do not appear to be necessary to achieve regulatory limits based on bench test results. Additional treatment could be required at some sites to achieve the water quality standard for thallium and fluoride in surface water.

Bench testing was conducted to determine lime precipitation treatability with RCTS and traditional tank style reactors. See Bench Testing Report Appendix D.

A primary focus for the treatment design on this project is operational simplicity and maintenance labor control. To achieve this objective, the design will focus on limiting operational labor requirements, while including oversight monitoring for quality control. The operational labor components are estimated with the assumption that personnel will be available to work at multiple treatment system sites considering their close proximity.

This evaluation provides conceptual design options and explains the challenges and benefits of the proposed systems. Included are:

- Estimated capital equipment costs +50%/-30%
- Operational and monitoring methodology and labor estimates; and
- Continued operation and maintenance estimates including a 25% contingency

Considering the comparable chemistry, expected discharge requirements, flow rates and lime feed rates; these four sites can be treated with similar water treatment systems. This provides redundancy of system components with the goal of minimizing long term operational costs.

Two-stage pH neutralization is recommended for all four sites due to the presence of cadmium and aluminum. The first stage at each site will utilize the RCTS to maximize lime efficiency and oxidation. The bulk of lime addition will occur in the first stage to pH of 6.5-8.0 which will target aluminum and arsenic removal. The majority of the sludge will also be generated in this stage and must be removed from the treatment stream to prevent aluminum from re-dissolving in the second stage. Clarification with the use of floc addition and fabricated plate clarifiers will be followed by a second stage pH adjustment pH to 9.50-10.5. Additional oxidation and mixing will be provided by compressed air addition. The second stage will also be followed by a similar clarification step.

A sludge drying system and polishing ponds will be utilized as components of the total system. This is a low cost, low labor preferred alternative to a final stage filtering but requires a substantially larger treatment site to implement.

Sand Coulee

The following assumptions are taken from Sand Coulee bench testing:

1. Significant oxidation and system residence time will be required. A minimum reaction time of 12 minutes is recommended with RCTS treatment and 90 minutes with tank reactor system.
2. Significant clarification will be required. TKT recommends primary sludge settling followed by sludge thickening and passive drying.
3. Sludge production will be extensive, requiring active sludge management and removal. Based on bench testing, more than 45,000 gallons per day of primary settled sludge generation can be expected. Following thickening and dewatering the final volume of sludge can be expected to be reduced to a fraction of the volume of primary sludge.

Additional treatment will likely be required for removal of fluoride and thallium. Space will likely be a limiting factor at the Sand Coulee site, and if sufficient space cannot be obtained for a simplified sludge management system then, use of an active sludge dewatering system such as a filter press could be required. A simple sludge management system would require a minimum area of 60,000 to 100,000 square feet (approximately 1.4 to 2.3 acres) for treatment and sludge drying. Although open space within Sand Coulee is extremely limited, there is some open land at the south end of Sand Coulee and in the lower end of Mining Coulee that may be adequate for the proposed treatment method which includes a 1 million gallon, 72-hour pond for polishing and a 3 million gallon sand filter system for sludge drying.

For the purposes of this evaluation it is assumed that a treatment site can be obtained with sufficient area to employ the simpler sludge management system to reduce costs. Other options short of active filtration, may still be feasible if the treatment site has marginal space, but would require additional evaluation based on the actual space available.

Calcium Oxide vs. Calcium Hydroxide

Approximately 5100 lb/day lime delivery rate at Sand Coulee is required for the design flow rate of 79 gpm (Table 5), which is nearly 40% of the lime required on all four sites.

Table 5. Lime demand based on bench testing for Sand Coulee.

Flow Rate	Lime per Liter mg/L $Ca(OH)_2$ added	Lime per Day (lbs)	Lime Annual (tons)
79 gpm (300 liters/min)	5360 mg/L	5100	930

A strong argument can be made for a calcium oxide system at the Sand Coulee site, which would then service in some fashion, the remaining sites. The estimated annual hydrated lime budget for all of the sites together is approximately $795,000. Generally you can make the following budgetary assumptions. Calcium oxide has 30-40% more alkalinity per mass, additionally calcium oxide costs 60-75% of the cost of hydrated lime, both of which translate to transportation and logistics savings in the long term as well. While typically not as efficient as a hydrated lime system you can expect to realize a chemical lime savings of 30-40% per annum in chemical lime costs through the use of calcium oxide and a slaker system.

However, a 20 ton per day slaker processing plant will require additional capital and labor to operate and slurry will have to be transported from the processing plant to the individual treatment systems. The potential savings are quickly lost in the O&M costs associated with a calcium oxide system, and a plant of this size is certain to cost $100,000 - $250,000 annually to operate. Perhaps most important is that operating capability suffers because the operation of all four systems now hinges on the successful continuous operation of the calcium oxide slaker plant, an extreme process application, generally considered to be maintenance intensive.

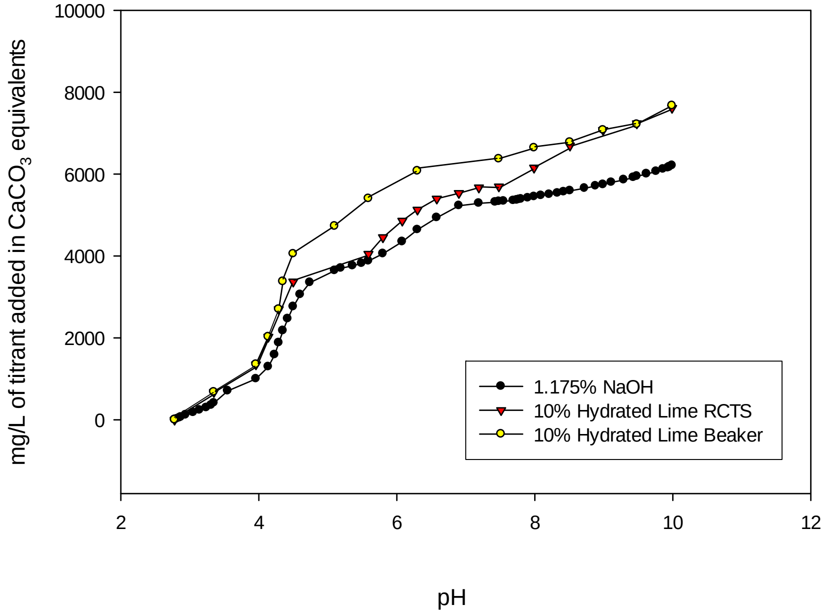
The redundancy and reliability that can be realized with individual hydrated lime delivery systems at the four sites justifies the additional chemical costs. Therefore, hydrated lime systems are proposed in this evaluation. IWT has had success with the Sodimate hydrated lime delivery system in Montana. This system has an innovative solution for silo bridging; a problem common to hydrated lime delivery in humid environments, and has proven a low maintenance, simple design solution. It offers itself to system redundancy features that would not be available with a calcium oxide design.

Lime Efficiency

The bench testing provided valuable information that can be used to maximize lime efficiency. An examination of the titration curves from the bench testing shows that the RCTS is significantly more efficient with regard to lime utilization in the pH range of 4-8 s.u., particularly in the Sand and Cottonwood Coulee samples.

Above pH 8.0, the RCTS was no more effective than the tank reactor system with regards to lime efficiency. This is likely due to infusion of carbon dioxide providing a buffer and producing calcium carbonate precipitate. Therefore the design incorporates the RCTS as the primary component of the first stage pH adjustment. This will improve lime efficiency at each of the sites while reducing system footprint with regard to oxidation volume.

Figure 7. Titration curves for 1.175 N sodium hydroxide and 10% hydrated lime on Sand Coulee water sample.



Lime efficiency improvements with RCTS will be realized the most at the Sand Coulee site. The RCTS equiv mg/L required to reach a pH of 7.5 was 5697 as opposed to 6372 with the Beaker equiv, a difference of 10%. Comparisons in the field have shown as much as 40% better efficiency.

Once above a pH of 7.5 to 8.0, Beaker efficiency catches up and there is little advantage to utilizing the RCTS (Table 6). The design will incorporate the RCTS for first stage treatment followed by a clarification/settling system and then the second stage pH adjustment for manganese and cadmium removal will occur with a compressed air reactor system.

Table 6. Amount of titrant added to achieve desired pH

Sand Coulee

pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5	90700	4263	**5329**	42200	4220	**5697**	47200	4720	**6372**
8.0	92700	4357	**5446**	45600	4560	**6156**	49200	4920	**6642**
8.5	95200	4474	**5593**	49600	4960	**6696**	50200	5020	**6777**
9.0	97700	4592	**5740**	52400	5240	**7074**	52400	5240	**7074**
9.5	101200	4756	**5946**	53600	5360	**7236**	53400	5340	**7209**
10.0	105600	4963	**6204**	56400	5640	**7614**	56800	5680	**7668**

Clarification and Sludge Separation

A key element to the design of the treatment system at these sites will be the clarification, separation, and management of sludge. Bench testing results show that following 72 hrs of settling a volume of 275 to 400 milliliters of sludge per liter of water treated will be produced at the Sand Coulee site (Table 7). This equates to a system which will be required to clarify, separate, and thicken, in two stages, a likely volume of 21-31 gallons per minute of sludge continuously. Given the large volume required and the cold temperatures in Montana, the design must provide the most volume that can be created in the least amount of space to be heated.

Table 7 - Sludge volumes over time Sand Coulee RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	270	275	400	350	350	520
48 hr	250	270	325	300	300	480
72 hr	240	265	320	300	290	400
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	270	275	350	320	320	320
48 hr	270	265	300	290	300	280
72 hr	270	265	290	290	300	275

Note: reported as milliliters of sludge per liter of water

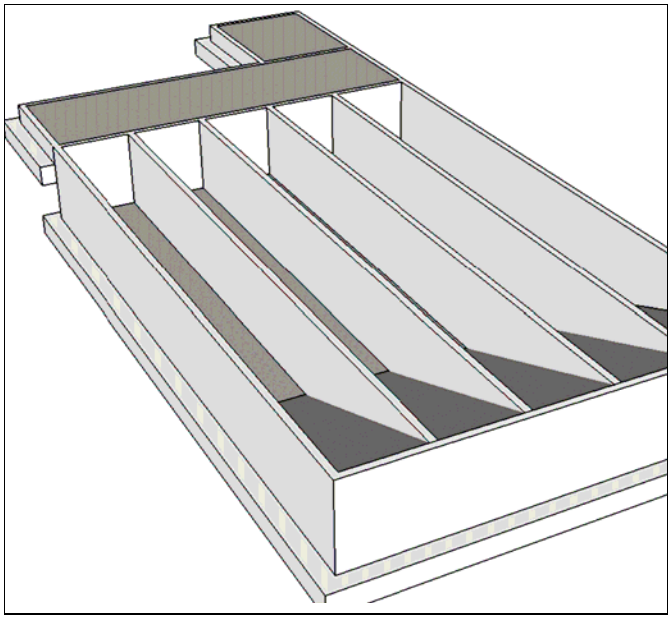
As a solution to the limited space available and the necessity to operate year round in cold conditions, this design will consider the use of the foundations of the treatment system buildings as a 1st stage clarifier, 2nd stage pH adjustment cell, and 2nd stage clarifier systems. This design, based on municipal wastewater treatment oxidation loops, will result in a maximized settling volume with a small footprint. Air operated diaphragm sludge pumps will pump settled sludge to thickener tanks, and then thickened sludge will be pumped to a sludge drying system. The sludge pumps will operate on the compressed air system used for oxidation in the 2nd stage pH adjustment.

For a tighter space design, mesh deck flooring could also be incorporated and the remaining treatment system components could be placed above the foundation clarifier system. While this could be a tremendous space saving option, we would only recommend it if the treatment sites are extremely space limited since it would be more practical to keep the settling cells open for maintenance purposes.

While a bit unconventional, this design offers some great benefits. The foundation cells can be constructed in such a manner to utilize light equipment for periodic maintenance. Scale and sludge maintenance of the foundation would likely not require confined space entry permitting. Another benefit is complete gravity flow through the system. There is no capture and pumping of treatment water in the system design, simplifying the system dramatically, which accommodates a better management plan for system upset scenarios. In combination with a large polishing pond this design is the most accommodating system with regard to operator simplicity. Sizing and operational considerations will need to be assessed in the design stage.

Due to the extended residence time required for treatment and the volume of flow, a two building system is recommended. The Cottonwood Coulee could likely be done in a single larger building if limited for space.

Figure 8. Treatment and Settling Cells



For tighter space restriction a mesh deck flooring system could be incorporated.

Sludge Drying System and Polishing Pond

The recommended volume for both the sludge drying system and polishing pond is 1 million gallons each for the Sand Coulee site. Each of the remaining sites also has a sludge drying system and polishing pond as a component of the treatment system. The polishing pond is proportional to the flow and required settling times from testing. The sludge drying system is proportional to the sludge volume generated. The design plan should accommodate larger ponds if space is available to reduce sludge maintenance intervals and increase treatment.

The Sand Coulee system will utilize two treatment system buildings. Each building will have a 30 ton hydrated lime silo and lime delivery system. The 1st stage building will include 2- RCTS units, flocculent addition system, foundation clarifier and sludge thickening and pumping system. The 2nd Stage building will house the second stage clarification, air compressor and diffuser system, and second stage sludge thickening and pumping systems.

Cottonwood Coulee

Cottonwood Coulee would benefit from the same two building system design utilized at Sand Coulee but in order to save on costs a larger single building design is evaluated. High metals concentrations will result in similar sludge management challenges although flows are significantly lower than at Sand Coulee.

Based on the bench testing results (Tables 8 & 9), the system will require a 2410 lb/day lime feed rate at 35 gpm, which is based on the 75th percentile flow rate. A single 30-ton silo will allow a two to three week delivery interval.

Again the system utilizes RCTS for 1st stage pH adjustment and aeration, used in combination with 2nd stage compressed air delivery. With a slower feed rate this system may utilize a lime slurry pump delivery system for finer pH control throughout the treatment.

Bench testing results show that following 72 hrs of settling a volume of approximately 360 milliliters of sludge per liter of water treated will be produced at the Cottonwood Coulee treatment site (Table 10). This equates to a system which will be required to clarify, separate, and thicken, in two stages, a likely volume of 12 gallons per minute of sludge continuously.

Table 8. Lime demand based on bench testing for Cottonwood Coulee.

Flow	Lime per Liter mg/L $Ca(OH)_2$ added	Lime per Day (lbs)	Lime Annual (tons)
35 gpm (132 liters/min	5700	2410	440

Table 9. Amount of titrant added to achieve a desired pH Cottonwood Coulee

pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5	109000	5123	**6404**	49500	4950	**6683**	51500	5150	**6953**
8.0	110000	5170	**6463**	51500	5150	**6953**	52500	5250	**7088**
8.5	112000	5264	**6580**	54250	5425	**7324**	55000	5500	**7425**
9.0	114700	5390.9	**6739**	56000	5600	**7560**	59000	5900	**7965**
9.5	118200	5555.4	**6944**	57000	5700	**7695**	60350	6035	**8147**
10.0	123300	5795.1	**7244**	61400	6140	**8289**	62250	6225	**8404**

Table 10 - Sludge volume over time Cottonwood Coulee RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	400	380	500	440	480	400
48 hr	325	325	480	350	360	300
72 hr	325	325	480	350	360	300
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
24hr	250	250	250	270	280	370
48 hr	250	250	260	270	280	285
72 hr	250	250	260	270	280	285

Note: reported as milliliters of sludge per liter of water

Number 5 Coulee and Belt

The treatment systems at Number 5 and at the Belt site will be built virtually identical to the system at Sand Coulee. The systems have virtually the same flow and the same components could be specified. This is recommended though you could possibly perform these treatments in a single building. Therefore the capital cost estimate provided for the Sand Coulee site is appropriate.

Based on the bench testing results (Tables 11 & 12), the Number 5 Coulee treatment system will require a 2350 lbs/day lime feed rate at 238 gpm, which again is based on the 75th percentile flow rate. Bench testing results show that following 72 hrs of settling a volume of 60 milliliters of sludge per liter of water treated will be produced at the Number 5 Coulee treatment site (Table 13). This equates to a system which will be required to clarify, separate, and thicken, in two stages, a likely volume of 14 gallons per minute of sludge continuously.

Table 11. Lime demand based on bench testing for Number 5.

Flow Rate	Lime per Liter mg/L $Ca(OH)_2$ added	Lime per Day (lbs)	Lime Annual (tons)
238 gpm (900 liters/min	790	2350	430

Table 12. Amount of titrant added to achieve a desired pH Number 5									
pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5				6250	625	**844**	6725	672.5	**908**
8.0	14000	658	**823**	6400	640	**864**	7000	700	**945**
8.5	14200	667.4	**834**	6575	657.5	**888**	8000	800	**1080**
9.0	14600	686.2	**858**	7460	746	**1007**	8350	835	**1127**
9.5	15000	705	**881**	7900	790	**1067**	8600	860	**1161**
10.0	15900	747.3	**934**	9200	920	**1242**	9300	930	**1256**

Table 13 - Sludge levels over time Number Five						
RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	115	108	100	105	130	130
24hr	98	96	89	82	102	104
48 hr	74	70	70	62	64	82
72 hr	68	68	58	65	60	80
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	200	190	180	170	190	200
24hr	78	74	74	70	70	88
48 hr	44	42	40	42	50	52
72 hr	30	36	34	30	48	50

Note: reported as milliliters of sludge per liter of water

Belt

Again the Belt site would utilize the same system design as the Sand Coulee site with adjustments for the correct lime addition and sludge handling requirements. Based on the bench testing results (Tables 14 & 15), the Belt treatment system will require a 3130 lbs/day lime feed rate at 162 gpm, based on the 75th percentile flow rate. Bench testing results show that following 72 hrs of settling a volume of 84 milliliters of sludge per liter of water treated will be produced at the Number 5 Coulee treatment site (Table 16). This equates to a system which will be required to clarify, separate, and thicken, in two stages, a volume of approximately 14 gallons per minute of sludge continuously.

Table 14. Lime demand based on bench testing for Belt.

Flow gpm (LPM) (LPD)	Lime per Liter mg/L $Ca(OH)_2$ added	Lime per Day (lbs)	Lime Annual (tons)
162 gpm (613 liters/min)	1600	3130	570

Table 15. Amount of titrant added to achieve a desired pH Belt

pH	µL of 1.175 N NaOH	mg/L NaOH added	equiv mg/L $CaCO_3$	RCTS µL 10% $Ca(OH)_2$	RCTS mg/L $Ca(OH)_2$ added	RCTS equiv mg/L $CaCO_3$	Beaker µL 10% $Ca(OH)_2$	Beaker mg/L $Ca(OH)_2$ added	Beaker equiv mg/L $CaCO_3$
7.5				13450	1345	**1816**	14100	1410	**1904**
8.0				14100	1410	**1904**	14550	1455	**1964**
8.5				14550	1455	**1964**	15300	1530	**2066**
9.0	31500	1480.5	**1851**	15400	1540	**2079**	16000	1600	**2160**
9.5	32500	1527.5	**1909**	16000	1600	**2160**	16450	1645	**2221**
10.0	34000	1598	**1998**	17200	1720	**2322**	17200	1720	**2322**

Table 16 - Sludge levels over time Belt RCTS						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	230	220	205	230	245	235
24hr	100	92	85	88	100	105
48 hr	80	70	60	80	86	86
72 hr	70	58	50	78	84	76
Beaker						
Time	pH 7.5	pH 8.0	pH 8.5	pH 9.0	pH 9.5	pH 10
1hr	250	255	245	260	265	255
24hr	125	140	115	1058	115	120
48 hr	100	105	80	80	100	100
72 hr	90	95	68	80	100	98

Note: reported as milliliters of sludge per liter of water

Estimated Treatment Costs

Estimated capital costs for construction of the treatment facilities along with O&M costs are shown in Table 17. Capital costs were developed based on maximum flow rates while O&M costs use the 75th percentile flow value. The 75th percentile value is the upper bound maximum of the mean flow value. This value is a more conservative flow value to prevent underestimation of annual operation and maintenance costs. This system is designed based in large part on the principle that in can be operated with a ½ time per

TABLE 17. ESTIMATED WATER TREATMENT COSTS

CAPITAL COST FOR CONSTRUCTION OF TREATMENT SYSTEMS				
Description	**Sand Coulee**	**Cottonwood Coulee**	**Number Five Coulee**	**Belt**
Collection System	$301,000	$282,000	$10,000	$220,000
Treatment System Foundation and Installation	$243,000	$135,000	$243,000	$243,000
Treatment System Building and Construction	$450,000	$337,500	$450,000	$450,000
Sludge Drying Construction and Installation	$160,000	$80,000	$80,000	$80,000
Polishing Pond Construction	$70,000	$40,000	$70,000	$70,000
30 Ton Lime Silo	$160,000	$90,000	$160,000	$160,000
Lime Delivery System	$69,500	$38,500	$69,500	$69,500
Lime Slurry Tank and Pump System	$10,500	$10,500	$10,500	$10,500
Dosing Tank and Mixer	$12,000	$7,000	$12,000	$12,000
RCTS	$155,000	$78,000	$155,000	$155,000
Compressed Air System 30HP	$32,000	$17,000	$32,000	$32,000
Fabricated Plate Clarifiers	$90,000	$90,000	$90,000	$90,000
2nd Stage Mixers	$18,000	$18,000	$18,000	$18,000
Sludge Thickening Tank	$45,500	$45,500	$45,500	$45,500
Sludge Pumps	$37,000	$28,000	$37,000	$37,000
Electrical	$45,000	$45,000	$45,000	$45,000
Piping	$38,000	$38,000	$38,000	$38,000
Electrical Controls and Monitoring	$80,000	$80,000	$80,000	$80,000
Removable Floor Fabrication	$92,000	$92,000	$92,000	$92,000
Bobcat	$25,000		$25,000	$25,000
Thallium treatment	$50,000	$50,000	$50,000	$50,000
Fluoride treatment	$161,500	$47,500		
Parking Landscaping Fencing, Etc.	$125,000	$125,000	$125,000	$125,000
Subtotal	$2,470,000	$1,774,500	$1,937,500	$2,147,500
Construction Contingencies (25%)	$617,500	$443,625	$484,375	$536,875
Subtotal	$3,087,500	$2,218,125	$2,421,875	$2,684,375
Project Admin (5%)	$154,375	$110,906	$121,094	$134,219
Design and Engineering (8%)	$247,000	$177,450	$193,750	$214,750
Construction Management and Facility Startup (6%)	$185,250	$133,088	$145,313	$161,063
Subtotal	$586,625	$421,444	$460,156	$510,031
Total Capital Costs	**$3,674,125**	**$2,639,569**	**$2,882,031**	**$3,194,406**

ANNUAL O&M COSTS				
Description	**Sand Coulee**	**Cottonwood Coulee**	**Number Five Coulee**	**Belt**
Lime Delivered	$139,613	$65,974	$64,500	$85,500
Power 60KW	$21,000	$42,000	$57,000	$38,400
Chemical, Other	$17,500	$17,500	$23,800	$16,000
Sludge Disposal (includes labor)	$87,500	$105,000	$142,500	$96,000
Treatment and Discharge Monitoring	$19,200	$19,200	$19,200	$19,200
Site Monitoring	$23,000	$23,000	$23,000	$23,000
Site Operator 1/4 -1/2 Time	$46,800	$46,800	$46,800	$46,800
Site Maintenance	$20,000	$20,000	$20,000	$20,000
Thallium Treatment	$43,500	$19,500	$130,500	$89,000
Fluoride Treatment	$25,600	$13,600		
EPA and Safety	$4,200	$4,200	$4,200	$4,200
Subtotal	$447,913	$376,774	$531,500	$438,100
O&M Contingency (25%)	$111,978	$94,193	$132,875	$109,525
Total yearly O&M Costs	**$559,891**	**$470,967**	**$664,375**	**$547,625**

Periodic Replacement Costs				
Five year Periodic Cost	$187,080	$138,060	$163,800	$180,600
Periodic contingencies cost (25%)	$46,770	$34,515	$40,950	$45,150
Subtotal	$233,850	$172,575	$204,750	$225,750
30 year periodic costs	$3,674,125	$2,639,569	$2,882,031	$3,194,406
Periodic contingencies cost (25%)	$0	$0	$0	$0
Subtotal	$3,674,125	$2,639,569	$2,882,031	$3,194,406
NVP 3% (100 yrs)	**$24,999,731**	**$20,156,359**	**$26,838,829**	**$23,776,893**

day operator with qualified monitoring and oversight. Daily operations would include system monitoring and sampling, with 90% operator time dedicated to sludge system management. Likely this would entail a two man crew, servicing all four sites on a rotating interval to coincide with lime delivery and maintenance requirements. It is not unreasonable to believe that with the proper instrumentation monitoring capabilities these sites can operate without daily site work for extended periods.

The oversight monitoring budget represents a level of technical involvement from qualified technical personnel for operations directives and instruction on system operation.

Table 17 also shows yearly costs to maintain and replace critical components. While on-site daily labor is expected to be low, a good yearly maintenance of the system should be anticipated and scheduled accordingly. An additional 20 to 30% of total capital costs should be expected for items like the building, concrete and controls upgrades as a replacement cost over a period of 30 years. Replacement costs are based on a five-year period for more routine equipment replacement and a 30-year period for complete treatment works replacement activities. Based on the capital costs, O&M costs and periodic replacement costs, a NPV (net present value) evaluation was completed The NPV calculation returns a present day monetary amount to fund a potential project for a fixed return period using a constant discount rate. A NPV amount has been calculated for each treatment site using a discount interest rate of 3% and a return period of 100 years. The estimated NPV amounts to construct, operate and maintain treatment systems at each of the sites is approximately 25 million for Sand Coulee, 21 million for Cottonwood Coulee, 31 million for Number 5 Coulee and 27 million for Belt.

APPENDIX F

NET PRESENT VALUE WORKSHEETS

NET PRESENT VALUE CALCULATIONS
FOR COTTONWOOD COULEE TREATMENT SITE

initial capital	$ 3,674,125.00
O&M	$ 559,890.63
5 yr periodic	$ 233,850.00
30 yr periodic	$ 3,674,125.00
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2013	0	$ 3,674,125.00	0	$ -	$ -	$ 3,674,125.00	$ 3,674,125.00
2014	1	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 543,583.13
2015	2	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 527,750.61
2016	3	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 512,379.24
2017	4	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 497,455.57
2018	5	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 684,687.64
2019	6	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 468,899.58
2020	7	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 455,242.31
2021	8	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 441,982.83
2022	9	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 429,109.54
2023	10	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 590,617.57
2024	11	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 404,476.90
2025	12	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 392,696.02
2026	13	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 381,258.27
2027	14	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 370,153.66
2028	15	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 509,471.90
2029	16	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 348,905.33
2030	17	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 338,743.04
2031	18	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 328,876.73
2032	19	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 319,297.80
2033	20	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 439,474.94
2034	21	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 300,968.80
2035	22	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 292,202.72
2036	23	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 283,691.96
2037	24	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 275,429.09
2038	25	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 379,094.94
2039	26	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 259,618.33
2040	27	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 252,056.63
2041	28	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 244,715.18
2042	29	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 237,587.55
2043	30	$ -	$ 559,890.63	$ -	$ 3,674,125.00	$ 4,234,015.63	$ 1,744,358.38
2044	31	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 223,949.05
2045	32	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 217,426.26
2046	33	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 211,093.46
2047	34	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 204,945.11
2048	35	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 282,082.24
2049	36	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 193,180.42
2050	37	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 187,553.81
2051	38	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 182,091.07
2052	39	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 176,787.45
2053	40	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 243,326.62
2054	41	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 166,639.13
2055	42	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 161,785.56
2056	43	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 157,073.36
2057	44	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 152,498.41
2058	45	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 209,895.68
2059	46	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 143,744.38
2060	47	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 139,557.65
2061	48	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 135,492.86
2062	49	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 131,546.47
2063	50	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 181,057.86
2064	51	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 123,995.16
2065	52	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 120,383.65
2066	53	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 116,877.33
2067	54	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 113,473.14

NET PRESENT VALUE CALCULATIONS
FOR COTTONWOOD COULEE TREATMENT SITE

initial capital	$ 2,639,568.75
O&M	$ 470,967.19
5 yr periodic	$ 172,575.00
30 yr periodic	$ 2,639,568.75
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2013	0	$ 2,639,568.75	0	$ -	$ -	$ 2,639,568.75	$ 2,639,568.75
2014	1	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 457,249.70
2015	2	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 443,931.74
2016	3	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 431,001.69
2017	4	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 418,448.25
2018	5	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 555,125.14
2019	6	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 394,427.60
2020	7	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 382,939.42
2021	8	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 371,785.85
2022	9	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 360,957.13
2023	10	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 478,855.83
2024	11	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 340,236.72
2025	12	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 330,326.91
2026	13	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 320,705.74
2027	14	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 311,364.79
2028	15	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 413,065.24
2029	16	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 293,491.18
2030	17	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 284,942.89
2031	18	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 276,643.59
2032	19	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 268,586.01
2033	20	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 356,313.71
2034	21	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 253,168.07
2035	22	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 245,794.24
2036	23	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 238,635.19
2037	24	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 231,684.65
2038	25	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 307,359.33
2039	26	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 218,385.00
2040	27	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 212,024.27
2041	28	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 205,848.81
2042	29	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 199,853.21
2043	30	$ -	$ 470,967.19	$ -	$ 2,639,568.75	$ 3,110,535.94	$ 1,281,499.62
2044	31	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 188,380.82
2045	32	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 182,894.00
2046	33	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 177,566.99
2047	34	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 172,395.14
2048	35	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 228,704.21
2049	36	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 162,498.95
2050	37	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 157,765.97
2051	38	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 153,170.85
2052	39	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 148,709.56
2053	40	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 197,282.26
2054	41	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 140,173.02
2055	42	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 136,090.31
2056	43	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 132,126.52
2057	44	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 128,278.17
2058	45	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 170,177.41
2059	46	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 120,914.48
2060	47	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 117,392.70
2061	48	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 113,973.49
2062	49	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 110,653.88
2063	50	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 146,796.53
2064	51	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 104,301.89
2065	52	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 101,263.97
2066	53	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 98,314.54
2067	54	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 95,451.01

NET PRESENT VALUE CALCULATIONS
FOR COTTONWOOD COULEE TREATMENT SITE

initial capital	$ 2,639,568.75
O&M	$ 470,967.19
5 yr periodic	$ 172,575.00
30 yr periodic	$ 2,639,568.75
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2068	55	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 126,627.98
2069	56	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 89,971.73
2070	57	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 87,351.19
2071	58	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 84,806.98
2072	59	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 82,336.88
2073	60	$ -	$ 470,967.19	$ -	$ 2,639,568.75	$ 3,110,535.94	$ 527,960.88
2074	61	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 77,610.40
2075	62	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 75,349.91
2076	63	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 73,155.25
2077	64	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 71,024.51
2078	65	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 94,223.11
2079	66	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 66,947.42
2080	67	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 64,997.49
2081	68	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 63,104.36
2082	69	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 61,266.37
2083	70	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 81,277.68
2084	71	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 57,749.43
2085	72	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 56,067.41
2086	73	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 54,434.38
2087	74	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 52,848.91
2088	75	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 70,110.84
2089	76	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 49,815.16
2090	77	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 48,364.24
2091	78	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 46,955.57
2092	79	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 45,587.93
2093	80	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 60,478.23
2094	81	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 42,971.00
2095	82	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 41,719.42
2096	83	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 40,504.29
2097	84	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 39,324.55
2098	85	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 52,169.05
2099	86	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 37,067.16
2100	87	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 35,987.54
2101	88	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 34,939.35
2102	89	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 33,921.70
2103	90	$ -	$ 470,967.19	$ -	$ 2,639,568.75	$ 3,110,535.94	$ 217,512.89
2104	91	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 31,974.46
2105	92	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 31,043.16
2106	93	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 30,138.99
2107	94	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 29,261.16
2108	95	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 38,818.67
2109	96	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 27,581.45
2110	97	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 26,778.11
2111	98	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 25,998.16
2112	99	$ -	$ 470,967.19	$ -	$ -	$ 470,967.19	$ 25,240.93
2113	100	$ -	$ 470,967.19	$ 172,575.00	$ -	$ 643,542.19	$ 33,485.33
							$ 20,156,358.56

NET PRESENT VALUE CALCULATIONS
FOR COTTONWOOD COULEE TREATMENT SITE

initial capital	$ 3,674,125.00
O&M	$ 559,890.63
5 yr periodic	$ 233,850.00
30 yr periodic	$ 3,674,125.00
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2068	55	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 156,182.10
2069	56	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 106,959.31
2070	57	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 103,843.99
2071	58	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 100,819.41
2072	59	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 97,882.92
2073	60	$ -	$ 559,890.63	$ -	$ 3,674,125.00	$ 4,234,015.63	$ 718,652.56
2074	61	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 92,264.04
2075	62	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 89,576.74
2076	63	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 86,967.71
2077	64	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 84,434.67
2078	65	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 116,214.15
2079	66	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 79,587.78
2080	67	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 77,269.68
2081	68	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 75,019.11
2082	69	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 72,834.09
2083	70	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 100,247.35
2084	71	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 68,653.11
2085	72	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 66,653.51
2086	73	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 64,712.14
2087	74	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 62,827.32
2088	75	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 86,474.24
2089	76	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 59,220.78
2090	77	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 57,495.90
2091	78	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 55,821.26
2092	79	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 54,195.40
2093	80	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 74,593.44
2094	81	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 51,084.36
2095	82	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 49,596.47
2096	83	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 48,151.91
2097	84	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 46,749.43
2098	85	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 64,344.96
2099	86	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 44,065.82
2100	87	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 42,782.35
2101	88	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 41,536.26
2102	89	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 40,326.47
2103	90	$ -	$ 559,890.63	$ -	$ 3,674,125.00	$ 4,234,015.63	$ 296,075.34
2104	91	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 38,011.56
2105	92	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 36,904.43
2106	93	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 35,829.55
2107	94	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 34,785.97
2108	95	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 47,878.69
2109	96	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 32,789.11
2110	97	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 31,834.09
2111	98	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 30,906.88
2112	99	$ -	$ 559,890.63	$ -	$ -	$ 559,890.63	$ 30,006.68
2113	100	$ -	$ 559,890.63	$ 233,850.00	$ -	$ 793,740.63	$ 41,300.58
							$ 24,999,730.95

NET PRESENT VALUE CALCULATIONS
FOR NUMBER FIVE COULEE TREATMENT SITE

initial capital	$ 2,882,031.25
O&M	$ 664,375.00
5 yr periodic	$ 204,750.00
30 yr periodic	$ 2,882,031.25
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2013	0	$ 2,882,031.25	0	$ -	$ -	$ 2,882,031.25	$ 2,882,031.25
2014	1	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 645,024.27
2015	2	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 626,237.16
2016	3	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 607,997.24
2017	4	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 590,288.58
2018	5	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 749,714.86
2019	6	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 556,403.60
2020	7	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 540,197.67
2021	8	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 524,463.76
2022	9	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 509,188.12
2023	10	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 646,710.62
2024	11	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 479,958.64
2025	12	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 465,979.26
2026	13	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 452,407.05
2027	14	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 439,230.14
2028	15	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 557,858.27
2029	16	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 414,016.54
2030	17	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 401,957.80
2031	18	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 390,250.29
2032	19	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 378,883.78
2033	20	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 481,213.44
2034	21	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 357,134.30
2035	22	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 346,732.33
2036	23	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 336,633.33
2037	24	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 326,828.48
2038	25	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 415,098.94
2039	26	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 308,067.18
2040	27	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 299,094.35
2041	28	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 290,382.87
2042	29	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 281,925.11
2043	30	$ -	$ 664,375.00	$ -	$ 2,882,031.25	$ 3,546,406.25	$ 1,461,072.42
2044	31	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 265,741.46
2045	32	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 258,001.42
2046	33	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 250,486.81
2047	34	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 243,191.08
2048	35	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 308,872.60
2049	36	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 229,230.92
2050	37	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 222,554.29
2051	38	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 216,072.12
2052	39	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 209,778.76
2053	40	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 266,436.21
2054	41	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 197,736.60
2055	42	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 191,977.28
2056	43	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 186,385.71
2057	44	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 180,957.00
2058	45	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 229,830.22
2059	46	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 170,569.33
2060	47	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 165,601.29
2061	48	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 160,777.95
2062	49	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 156,095.10
2063	50	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 198,253.57
2064	51	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 147,134.60
2065	52	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 142,849.13
2066	53	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 138,688.47
2067	54	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 134,649.00

NET PRESENT VALUE CALCULATIONS
FOR NUMBER FIVE COULEE TREATMENT SITE

initial capital	$ 2,882,031.25
O&M	$ 664,375.00
5 yr periodic	$ 204,750.00
30 yr periodic	$ 2,882,031.25
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2068	55	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 171,015.27
2069	56	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 126,919.60
2070	57	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 123,222.91
2071	58	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 119,633.90
2072	59	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 116,149.41
2073	60	$ -	$ 664,375.00	$ -	$ 2,882,031.25	$ 3,546,406.25	$ 601,942.49
2074	61	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 109,481.96
2075	62	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 106,293.17
2076	63	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 103,197.25
2077	64	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 100,191.51
2078	65	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 127,251.42
2079	66	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 94,440.10
2080	67	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 91,689.42
2081	68	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 89,018.85
2082	69	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 86,426.07
2083	70	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 109,768.19
2084	71	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 81,464.86
2085	72	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 79,092.10
2086	73	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 76,788.45
2087	74	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 74,551.89
2088	75	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 94,687.01
2089	76	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 70,272.31
2090	77	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 68,225.54
2091	78	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 66,238.39
2092	79	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 64,309.11
2093	80	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 81,677.84
2094	81	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 60,617.51
2095	82	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 58,851.95
2096	83	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 57,137.82
2097	84	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 55,473.61
2098	85	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 70,456.03
2099	86	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 52,289.20
2100	87	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 50,766.21
2101	88	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 49,287.58
2102	89	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 47,852.02
2103	90	$ -	$ 664,375.00	$ -	$ 2,882,031.25	$ 3,546,406.25	$ 247,992.34
2104	91	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 45,105.12
2105	92	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 43,791.38
2106	93	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 42,515.90
2107	94	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 41,277.57
2108	95	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 52,425.90
2109	96	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 38,908.07
2110	97	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 37,774.83
2111	98	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 36,674.59
2112	99	$ -	$ 664,375.00	$ -	$ -	$ 664,375.00	$ 35,606.40
2113	100	$ -	$ 664,375.00	$ 204,750.00	$ -	$ 869,125.00	$ 45,223.04
							$ 26,838,828.68

NET PRESENT VALUE CALCULATIONS
FOR BELT TREATMENT SITE

initial capital	$ 3,194,406.25
O&M	$ 547,625.00
5 yr periodic	$ 225,750.00
30 yr periodic	$ 3,194,406.25
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2013	0	$ 3,194,406.25	0	$ -	$ -	$ 3,194,406.25	$ 3,194,406.25
2014	1	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 531,674.76
2015	2	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 516,189.08
2016	3	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 501,154.45
2017	4	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 486,557.72
2018	5	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 667,120.07
2019	6	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 458,627.32
2020	7	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 445,269.24
2021	8	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 432,300.23
2022	9	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 419,708.96
2023	10	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 575,463.63
2024	11	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 395,615.95
2025	12	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 384,093.16
2026	13	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 372,905.98
2027	14	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 362,044.64
2028	15	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 496,399.98
2029	16	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 341,261.80
2030	17	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 331,322.13
2031	18	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 321,671.97
2032	19	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 312,302.89
2033	20	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 428,198.99
2034	21	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 294,375.42
2035	22	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 285,801.38
2036	23	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 277,477.07
2037	24	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 269,395.21
2038	25	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 369,368.21
2039	26	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 253,930.83
2040	27	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 246,534.78
2041	28	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 239,354.16
2042	29	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 232,382.68
2043	30	$ -	$ 547,625.00	$ -	$ 3,194,406.25	$ 3,742,031.25	$ 1,541,667.33
2044	31	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 219,042.96
2045	32	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 212,663.07
2046	33	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 206,469.00
2047	34	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 200,455.34
2048	35	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 274,844.64
2049	36	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 188,948.38
2050	37	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 183,445.03
2051	38	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 178,101.97
2052	39	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 172,914.54
2053	40	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 237,083.40
2054	41	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 162,988.53
2055	42	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 158,241.30
2056	43	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 153,632.33
2057	44	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 149,157.60
2058	45	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 204,510.22
2059	46	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 140,595.34
2060	47	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 136,500.33
2061	48	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 132,524.59
2062	49	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 128,664.65
2063	50	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 176,412.31
2064	51	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 121,278.78
2065	52	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 117,746.38
2066	53	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 114,316.88
2067	54	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 110,987.26

NET PRESENT VALUE CALCULATIONS
FOR BELT TREATMENT SITE

initial capital	$ 3,194,406.25
O&M	$ 547,625.00
5 yr periodic	$ 225,750.00
30 yr periodic	$ 3,194,406.25
discount rate	0.03

	year	capital costs	annual O&M	5 yr periodic costs	30 yr periodic costs	annual total	PV
2068	55	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 152,174.81
2069	56	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 104,616.14
2070	57	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 101,569.07
2071	58	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 98,610.74
2072	59	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 95,738.59
2073	60	$ -	$ 547,625.00	$ -	$ 3,194,406.25	$ 3,742,031.25	$ 635,146.53
2074	61	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 90,242.80
2075	62	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 87,614.37
2076	63	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 85,062.49
2077	64	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 82,584.95
2078	65	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 113,232.35
2079	66	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 77,844.23
2080	67	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 75,576.92
2081	68	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 73,375.65
2082	69	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 71,238.50
2083	70	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 97,675.22
2084	71	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 67,149.12
2085	72	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 65,193.32
2086	73	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 63,294.48
2087	74	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 61,450.96
2088	75	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 84,255.50
2089	76	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 57,923.42
2090	77	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 56,236.33
2091	78	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 54,598.38
2092	79	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 53,008.13
2093	80	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 72,679.54
2094	81	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 49,965.25
2095	82	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 48,509.95
2096	83	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 47,097.04
2097	84	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 45,725.28
2098	85	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 62,694.01
2099	86	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 43,100.46
2100	87	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 41,845.11
2101	88	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 40,626.32
2102	89	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 39,443.03
2103	90	$ -	$ 547,625.00	$ -	$ 3,194,406.25	$ 3,742,031.25	$ 261,671.96
2104	91	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 37,178.84
2105	92	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 36,095.96
2106	93	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 35,044.62
2107	94	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 34,023.90
2108	95	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 46,650.23
2109	96	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 32,070.79
2110	97	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 31,136.69
2111	98	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 30,229.80
2112	99	$ -	$ 547,625.00	$ -	$ -	$ 547,625.00	$ 29,349.32
2113	100	$ -	$ 547,625.00	$ 225,750.00	$ -	$ 773,375.00	$ 40,240.90
							$ 23,776,893.07

APPENDIX G

PRIORITIZATION WORKSHEETS

TABLE 5-1. SUMMARY OF DECISION MATRIX RANKING

FACTOR		Drainage			
		Sand Coulee	**Number 5**	**Cottonwood Ck**	**Belt Ck**
Pollutant Load	Initial Score	4.3	0.7	0.7	1.3
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**4.3**	**0.7**	**0.7**	**1.3**
Receiving Water Impacts	Initial Score	5.0	3.5	4.5	2.5
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**5.0**	**3.5**	**4.5**	**2.5**
Exposure	Initial Score	4.0	2.5	4.0	4.5
	Weight	2.0	2.0	2.0	2.0
	Weighted Score	**8.0**	**5.0**	**8.0**	**9.0**
Resource Potential	Initial Score	**1.7**	**2.3**	**2.3**	**4.3**
	Weight	2.0	2.0	2.0	2.0
	Weighted Score	**3.3**	**4.7**	**4.7**	**8.7**
Treatment Feasibility	Initial Score	2.5	4.0	2.8	3.8
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**2.5**	**4.0**	**2.8**	**3.8**
Treatment Cost	Initial Score	2.0	2.7	3.3	2.3
	Weight	1.0	1.0	1.0	1.0
	Weighted Score	**2.0**	**2.7**	**3.3**	**2.3**
TOTAL		**4.2**	**3.4**	**4.0**	**4.6**

POLLUTANT LOAD

Criteria	Drainage			
	Sand Coulee	Number Five Coulee	Cottonwood Coulee	Belt Ck
Fe	5	1	1	1
Sulfate	4	0	0	1
Acidity	4	1	1	2
Average	**4.3**	**0.7**	**0.7**	**1.3**

Scoring Basis

Score	Fe (lb/d)	SO4 (lb/d)	Acidity (lb/d)
5	>2500	>25000	>20000
4	<2500	<25000	<20000
3	<2000	<20000	<15000
2	<1500	<15000	<10000
1	<1000	<10000	<5000
0	<500	<5000	<1000

Observed Loading

	Load (lb/day)		
	Fe	**SO4**	**Acidity**
Sand Coulee	2,504	20,623	17,518
No.5 (Giffin)	605	4,302	2,427
Cttnwd Coulee	621	4,823	3,442
Belt Ck	718	7,455	5,609

RECEIVING WATER IMPACTS

Criteria	Drainage			
	Sand Coulee	**Number Five Coulee**	**Cottonwood Coulee**	**Belt Ck**
Human Health Standards	5	3	4	2
Aquatic Life Standards	5	4	5	3
Average Score	5.0	3.5	4.5	2.5

Scoring	**Human Health**
5	Significantly exceeds standards for pH, metals & other parameters at multiple locations
4	Moderate level exceedances for pH, metals & other parameters at multiple locations
3	Low to moderate level exceedances on localized reach
2	Secondary standard exceedances on localized reaches with low to moderate seasonal low flow exceedances
1	Aestheic impacts

Scoring	**Aquatic Life**
5	Significantly exceeds standards for multiple parameters at multiple locations under most flow conditions
4	Significantly exceeds standards for multiple parameters on localized reach under most flow conditions
3	Seasonal exceedances for multiple parameters over extended stream reach
2	Seasonal low level exceedances for multiple parameters on localized reaches
1	Low level seasonal exceedances for one or two parameters on localized reaches

EXPOSURE

Criteria	Drainage			
	Sand Coulee	Number Five Coulee	Cottonwood Coulee	Belt Ck
Population exposure	3	1	3	5
Water quality	5	4	5	5
Containment	4	4	4	3
High exposure areas	4	1	4	5
Average Score	**4.0**	**2.5**	**4.0**	**4.5**

Scoring	**Population in impacted area**
5	<500
4	<300
3	<100
2	<25
1	>25

Scoring	**Water quality in populated area (Human Health standards exceeded)**
5	Significantly exceeds standards for pH, metals & other parameters at multiple locations
4	Moderate to low level exceedances for pH, metals & other parameters at multiple locations
3	Low level exceedances in localized areas
2	Seasonal exceedances of secondary standards and aethetic impacts localized reaches
1	Aestheic impacts

Scoring	**Existing containment (uncontrolled discharges versus limted exposure in constructed conveyances)**
5	Uncontrolled mine seepage in populated areas that significantly exceeds Human Health standards
4	Mine seepage largely in constructed conveyances but some uncontrolled seepage
3	Mine discharges confined to open conveyances
2	Mine discharge in closed conveyances but open outfalls
1	Mine discharges restricted to closed conveyances with diffuser outfalls limiting direct exposure

Scoring	**Proximity to High Exposure Areas (parks, recreation areas, schools, residential developments)**
5	Mine water discharges in direct proximity to multiple high exposure areas
4	
3	
2	
1	No high exposure areas

RESOURCE POTENTIAL

Criteria	Drainage			
	Sand Coulee	Number Five Coulee	Cottonwood Coulee	Belt Ck
Water Supply	3	3	3	3
Aquatic Life	1	2	2	5
Recreation	1	2	2	5
Average Score	**1.7**	**2.3**	**2.3**	**4.3**

Scoring	Water Supply
5	Potential to serve as a year-round potable water supply, and/or signficantly expand availability of irrigation water and/or stockwater.
4	Potential to increase availability of stock water, irrigation water and potable water supplies.
3	Potential for some expanded water supply potential primarily for stock water and irrigation., with potential improvements to surrounding groundwater resources.
2	Water supply potential is limited due to low flow and/or poor ambient water quality.
1	Implementation of treatment would have little affect on water supply potential.

Scoring	Aquatic Life Habitat
5	Potential good to excellent aquatic life habitat - Diverse aquatic habitat, extended reach with perennial flow, aquatic habitat connectivity to existing fisheries, potential to provide spawning grounds or other critical habitat
4	Good aquatic life habitat - diverse aquatic habitat, extended reach with perennial flow, connectivity to existing fisheries.
3	Fair aquatic life habitat - unaltered stream morphology, moderate reach with perennial flow; suitable ambient water quality.
2	Low to moderate aquatic life habitat potential due to seasonal flow/temperature limitations, and/or marginal stream morphology
1	Poor aquatic life habitat potential due to low flow, poor stream morphology (channelized reach), poor ambient water quality and/or other limiting factors

Scoring	Recreational Resource - Fishable Swimmable, Boatable Beneficial uses
5	Potential high value as fishable swimmable boatable recreational resource for local and regional interests
4	Fishable, boatable swimable recreational resource over a limited season due to low seasonal flows.
3	Moderate potential to support localized recreational activities (i.e fishing) but insufficient flow to provide broad range of uses.
2	Limited potential to support support some recreational activities
1	Little potential as a recreational resource due to minimal flow or other limitations

TREATMENT FEASIBILITY

Criteria	Drainage			
	Sand Coulee	**Number Five Coulee**	**Cottonwood Coulee**	**Belt Ck**
Treatment Site	2	4	3	5
Utilities/Access	4	4	4	5
Conveyances	1	5	1	2
Treatability	3	3	3	3
Average Score	**2.5**	**4.0**	**2.8**	**3.8**

Treatment Site

5 Suitable area for treatment site in proximity to sources with secured access .
4 Suitable areas for treatment site in proximity to sources, access to be determined
3 Potential treatment site with some space constraints in suitable proximity
2 Potential treatment site with marginal space in suitable proximty
1 No suitable space in proximity to sources

Utilities/Access

5 Utilities present; good road access for trucks
4 Utilities present; fair road acces
3 Utilities some distance away from treatment site and/or access marginal
2 Utilities significant distance away and/or access poor
1 Both utility access and road access are poor

Conveyances

Length of conveyances required to collect water and carry to treatment site.

5	>0.1 mi
4	<0.5 mi
3	<1 mi
2	<1.5 mi
1	>1.5 mi

Treatability

5 Can be effectively treated with single stage lime precipitation
4 Requires 2 stage lime precipitation/aeration treatment
3 Requires 2 stage lime precip/aeration plus polishing using an additional adsoption media
2 Requires 2 stage lime precip/aeration plus polishing using multiple adsoption media
1 Requires lime precip/aeration plus advanced flitration/reverse osmosis

TREATMENT COST

Criteria	Drainage			
	Sand Coulee	**Number Five Coulee**	**Cottonwood Coulee**	**Belt Ck**
Capital Cost Treatment	1	3	3	2
Operational Costs	2	3	4	2
100 year NPV cost	3	2	3	3
Average Score	**2.0**	**2.7**	**3.3**	**2.3**

Scoring		Capital Cost	Operational Costs	**NPV**
	5	<2,000,000	<100,000	<15,000,000
	4	<2,500,000	<250,000	<20,000,000
	3	<3,000,000	<500,000	<25,000,000
	2	<3,500,000	<750,000	<30,000,000
	1	<4,000,000	<1,000,000	>30,000,000

	Capital Cost	Operational Costs	NPV 100 yr Cost
Sand Coulee	$ 3,674,125	$ 559,891	$ 24,999,731
No.5	$ 2,882,031	$ 664,375	$ 26,838,829
Cottonwood Coulee	$ 2,639,569	$ 470,967	$ 20,156,359
Belt	$ 3,194,406	$ 547,625	$ 23,776,893

POLLUTANT LOAD

Criteria	Drainage			
	Sand Coulee	Number Five Coulee	Cottonwood Coulee	Belt Ck
Fe	5	1	1	1
Sulfate	4	0	0	1
Acidity	4	1	1	2
Average	**4.3**	**0.7**	**0.7**	**1.3**

Scoring Basis

Score	Fe (lb/d)	SO4 (lb/d)	Acidity (lb/d)
5	>2500	>25000	>20000
4	<2500	<25000	<20000
3	<2000	<20000	<15000
2	<1500	<15000	<10000
1	<1000	<10000	<5000
0	<500	<5000	<1000

Observed Loading

	Load (lb/day)		
	Fe	**SO4**	**Acidity**
Sand Coulee	2,504	20,623	17,518
No.5 (Giffin)	605	4,302	2,427
Cttnwd Coulee	621	4,823	3,442
Belt Ck	718	7,455	5,609

RECEIVING WATER IMPACTS

Criteria	Drainage			
	Sand Coulee	Number Five Coulee	Cottonwood Coulee	Belt Ck
Human Health Standards	5	3	4	2
Aquatic Life Standards	5	4	5	3
Average Score	5.0	3.5	4.5	2.5

Scoring	Human Health
5	Significantly exceeds standards for pH, metals & other parameters at multiple locations
4	Moderate level exceedances for pH, metals & other parameters at multiple locations
3	Low to moderate level exceedances on localized reach
2	Secondary standard exceedances on localized reaches with low to moderate seasonal low flow exceedances
1	Aestheic impacts

Scoring	Aquatic Life
5	Significantly exceeds standards for multiple parameters at multiple locations under most flow conditions
4	Significantly exceeds standards for multiple parameters on localized reach under most flow conditions
3	Seasonal exceedances for multiple parameters over extended stream reach
2	Seasonal low level exceedances for multiple parameters on localized reaches
1	Low level seasonal exceedances for one or two parameters on localized reaches

TREATMENT FEASIBILITY

Criteria	Drainage			
	Sand Coulee	Number Five Coulee	Cottonwood Coulee	Belt Ck
Treatment Site	2	4	3	5
Utilities/Access	4	4	4	5
Conveyances	1	5	1	2
Treatability	3	3	3	3
Average Score	**2.5**	**4.0**	**2.8**	**3.8**

Treatment Site

5 Suitable area for treatment site in proximity to sources with secured access .
4 Suitable areas for treatment site in proximity to sources, access to be determined
3 Potential treatment site with some space constraints in suitable proximity
2 Potential treatment site with marginal space in suitable proximty
1 No suitable space in proximity to sources

Utilities/Access

5 Utilities present; good road access for trucks
4 Utilities present; fair road acces
3 Utilities some distance away from treatment site and/or access marginal
2 Utilities significant distance away and/or access poor
1 Both utility access and road access are poor

Conveyances

Length of conveyances required to collect water and carry to treatment site.

5 >0.1 mi
4 <0.5 mi
3 <1 mi
2 <1.5 mi
1 >1.5 mi

Treatability

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4 Requires 2 stage lime precipitation/aeration treatment
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EXPOSURE

Criteria	Drainage			
	Sand Coulee	Number Five Coulee	Cottonwood Coulee	Belt Ck
Population exposure	3	1	3	5
Water quality	5	4	5	5
Containment	4	4	4	3
High exposure areas	4	1	4	5
Average Score	**4.0**	**2.5**	**4.0**	**4.5**

Scoring	Population in impacted area
5	<500
4	<300
3	<100
2	<25
1	>25

Scoring	Water quality in populated area (Human Health standards exceeded)
5	Significantly exceeds standards for pH, metals & other parameters at multiple locations
4	Moderate to low level exceedances for pH, metals & other parameters at multiple locations
3	Low level exceedances in localized areas
2	Seasonal exceedances of secondary standards and aethetic impacts localized reaches
1	Aestheic impacts

Scoring	Existing containment (uncontrolled discharges versus limted exposure in constructed conveyances)
5	Uncontrolled mine seepage in populated areas that significantly exceeds Human Health standards
4	Mine seepage largely in constructed conveyances but some uncontrolled seepage
3	Mine discharges confined to open conveyances
2	Mine discharge in closed conveyances but open outfalls
1	Mine discharges restricted to closed conveyances with diffuser outfalls limiting direct exposure

Scoring	Proximity to High Exposure Areas (parks, recreation areas, schools, residential developments)
5	Mine water discharges in direct proximity to multiple high exposure areas
4	
3	
2	
1	No high exposure areas

TREATMENT COST

Criteria	Drainage			
	Sand Coulee	**Number Five Coulee**	**Cottonwood Coulee**	**Belt Ck**
Capital Cost Treatment	1	3	3	2
Operational Costs	2	3	4	2
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Scoring		Capital Cost	Operational Costs	**NPV**
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APPENDIX H

ELECTRONIC FILES