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TECHNICAL MEMORANDUM

To: Mary Beth Marks – On Scene Coordinator
Frank Ehernberger – Project Engineer

From: Michael Cormier

Date: June 24, 2004

Re: Summary of Repository Sump Monitoring – July 2003 through June 17, 2004
New World Mining District Response and Restoration Project

This memorandum presents a summary of monitoring data collected at the Selective Source repository since July 2003. Monitoring data collected previous to this date were summarized in a Technical Memorandum dated June 23, 2003. Figures and tables discussed in this memorandum are presented in Attachments A and B, respectively. Attachment C contains a summary of repository site conditions noted during the monitoring events.

Background

Water level in the repository sump has been monitored since October 2001, and the volume of water has been managed by pumping and disposal since April 2002. In 2003, sump water was disposed during two events: 19,000 gallons was removed in July and 18,750 gallons was removed at the end of September 2003. All water pumped from the repository sump in 2003 was disposed at the Cody, Wyoming sewage lagoon. To date, a total of about 112,500 gallons has drained into the sump since summer 2002.

Disposal of water in 2003 resulted in nearly emptying the accumulated water from the sump. The height of water in the sump on October 1, 2003 was five inches, which equates to a volume of less than 1,000 gallons.

Monitoring Methods

Monitoring was conducted at the repository site from October 1, 2003 until present. The last monitoring event was conducted on June 17, 2004, although monitoring of the sump will be continued through the summer of 2004 and into 2005. Monitoring was conducted at the following locations (Figure 1): the sump, an upgradient shallow monitoring well (SBGW-105T), two downgradient shallow monitoring wells (SBGW-108T and -107T), and two downstream surface water stations (SBT-6 and SBT-3). Parameters monitored included water quality, water level (sump and monitoring wells), and flow (surface water stations only). Monitoring frequency varied by site; the sump and monitoring wells were monitored most frequently and the two surface water stations were monitored occasionally.

Water levels in the sump and two monitoring wells (SBGW-105T and SBGW-107T) were monitored continuously using Global Water Instrumentation, Inc., WL15 Water Level Loggers. The loggers were installed on October 15, 2003. The loggers had been pre-set by the factory to measure the water

column overlying the logger (transducer). The measurement frequency was set to twice per day at 12 hour intervals (early morning and early afternoon).

Data loggers were downloaded onto a laptop computer during each monitoring event and maintenance performed. Water levels were also measured with an electronic water level probe to verify that the loggers were working and to calibrate the water level logger measurements.

Water quality samples were collected on selected dates from the sumps, the wells, and the surface water stations. Field parameters were measured in the samples and then the samples were preserved and submitted to Northern Analytical Laboratories, Inc. in Billings, Montana for analysis. The sump and surface water samples were not filtered; the groundwater samples were filtered through a 0.45 micron filter for dissolved metals analysis.

Sump Water Levels

Figure 2 shows the depth of water in the repository sump over the period of August 2002 to June 17, 2004. It also shows the dates and volumes when water was pumped from the sump. Figure 3 shows cumulative water volume as well as current volume.

As shown in Figure 2, water level in the sump began to rise soon after pumping in September 2003, increasing at a rate of 157 gallons per day initially (October 2003) and then falling off during the winter months to a gain of about 33 gallons per day. This is similar to what happened during the same period in 2002 following pumping of the sump in October 2002. On about March 23, 2003, water level rise in the sump increased substantially to about 270 gallons per day. This increased rate was maintained until about May 7 when the rate of increase fell off sharply.

Figures 4 through 7 plot sump water levels versus a variety of parameters, including average daily air temperature, precipitation, surface water flow, and groundwater level in the downgradient monitoring well (SBGW-107T). Air temperature and precipitation data were obtained from the Natural Resources Conservation Service (NRCS) White Mill SNOTEL station, which is located a couple of miles away in the Fisher Creek drainage at an elevation of 8,700 feet. Flow data was obtained from the U.S. Geological Survey real-time surface water station 06187915 (also known as SBC-4 for this project), which is located on Soda Butte Creek at the Yellowstone National Park Boundary near Silver Gate (elevation 7,340 feet). These real-time data were obtained from internet websites (http://www.wcc.nrcs.usda.gov/snow/ and http://waterdata.usgs.gov/mt/nwis/rt).

As shown in these graphs, water level rise in the sump is coincident with the rise of average air temperatures above freezing (Figures 4 and 5) and the onset of snowmelt as indicated by rising flows in Soda Butte Creek at station SBC-4 and rising groundwater levels (Figure 7). The change in rate of water level increase does not appear to be related to precipitation received in the form of rain and snow between March and May (Figure 6).

Sump Chemistry

Repository sump chemistry is summarized in Table 1 (Attachment B) for the period of 2001 to 2004. As shown in this table, water samples were collected in 2004 from the repository sump on March 23, April 19, May 21, and June 4. Where available, Table 1 displays both lab and field measurements of pH and conductivity. Selected parameters are graphed in Figures 8, 9, and 10.

On June 4, 2004, pH of water in the sump was 6.5 standard units (s.u.), conductivity was 3,070 micromhos per centimeter (µmhos/cm), and total dissolved solids (TDS) were 2,910 milligrams per Liter (mg/L). Iron and manganese were the major metals detected at 4.1 and 4.7 mg/L, respectively. Trace amounts of arsenic (0.004 mg/L), barium (0.025 mg/L), copper (0.002 mg/L), selenium (0.004 mg/L), and zinc (0.07 mg/L) were also detected. Of the anions, sulfate concentrations were by far the highest at 1,390 mg/L. This chemistry is a result of the sulfides present in the waste.

Figure 8 plots sulfate, TDS, hardness, alkalinity, and conductivity concentrations against sump water level. During the more rapid water level rise in the sump that began on March 23, 2004, concentrations of these constituents remained fairly constant (within about 10% between the high and low value except for sulfate, which was about 20%). Over this same period, sump volume almost doubled from about 13,000 gallons to about 25,000 gallons. In 2003, when the sump level rose to 73 inches (doubling in volume over a 2½ month period between April and June), only conductivity showed a significant decline (33%) while TDS and sulfate concentrations remained constant during this period. Comparing these trends to that measured in June 2002 for the same constituents (when fresh water was known to be entering the sump through a tear in the geomembrane), a significant dilution effect was measured as the water volume doubled (Figure 8). The tear in the geomembrane was repaired in 2002.

Figures 9 and 10 show arsenic, copper, iron, and manganese concentrations measured in the sump versus sump water level. Iron and manganese concentrations showed a 20% to 25% decrease in concentration during the period of more rapid rise in water level (April 2004) but most recently (June 4, 2004) increased to concentrations measured prior to the period of more rapid rise (March 21, 2004). Arsenic and copper concentrations are low (three orders of magnitude lower than iron and manganese concentrations), so fluctuations in concentration for these two elements is less meaningful.

Surface Water Chemistry

Figures 11 and 12 plot concentrations of copper and iron measured at surface water stations SBT-3 and SBT-6 over the period of record. At station SBT-6, iron and copper concentrations increased in the spring 2004; this is generally coincident with increasing flows and corresponding increasing turbidity (suspended sediment) in the stream. This relationship was verified in 2002 by analyzing both total and dissolved concentrations in samples collected from stations SBT-3 and SBT-6 (Tables 2 and 3, Attachment C). Dissolved concentrations in these samples were half of the total concentrations for copper and below detection for iron, leaving the balance measured in the total fraction to the contribution from suspended sediment. In 2004, concentrations of all trace metals at SBT-6 and SBT-3 were below MDEQ Circular WQB-7 human health and aquatic water quality standards except for the samples collected on May 6 when flows were 20 times higher than winter or summer base flow levels. Aluminum, copper, and iron concentrations exceeded water quality standards on this date at both stations.

Discussion

Review of 2004 monitoring data indicates that water is likely leaking into the repository. Since the rate of water level increase changes dramatically with warming temperatures and the onset of snowmelt, it is most likely that snowmelt is the source of some portion of the water in the sump. This conclusion is supported by increasing temperatures and surface water flows which coincide with the more rapid rise of water in the sump, and the fact that precipitation (mainly rain) received during the month of May and June 2004 did not affect the rate of water level rise. Field observations of snowpack at the repository

also support this conclusion, as the temporary liner and immediate area uphill of this liner were nearly free of snow by May 6 when the rate of water level increase fell off sharply.

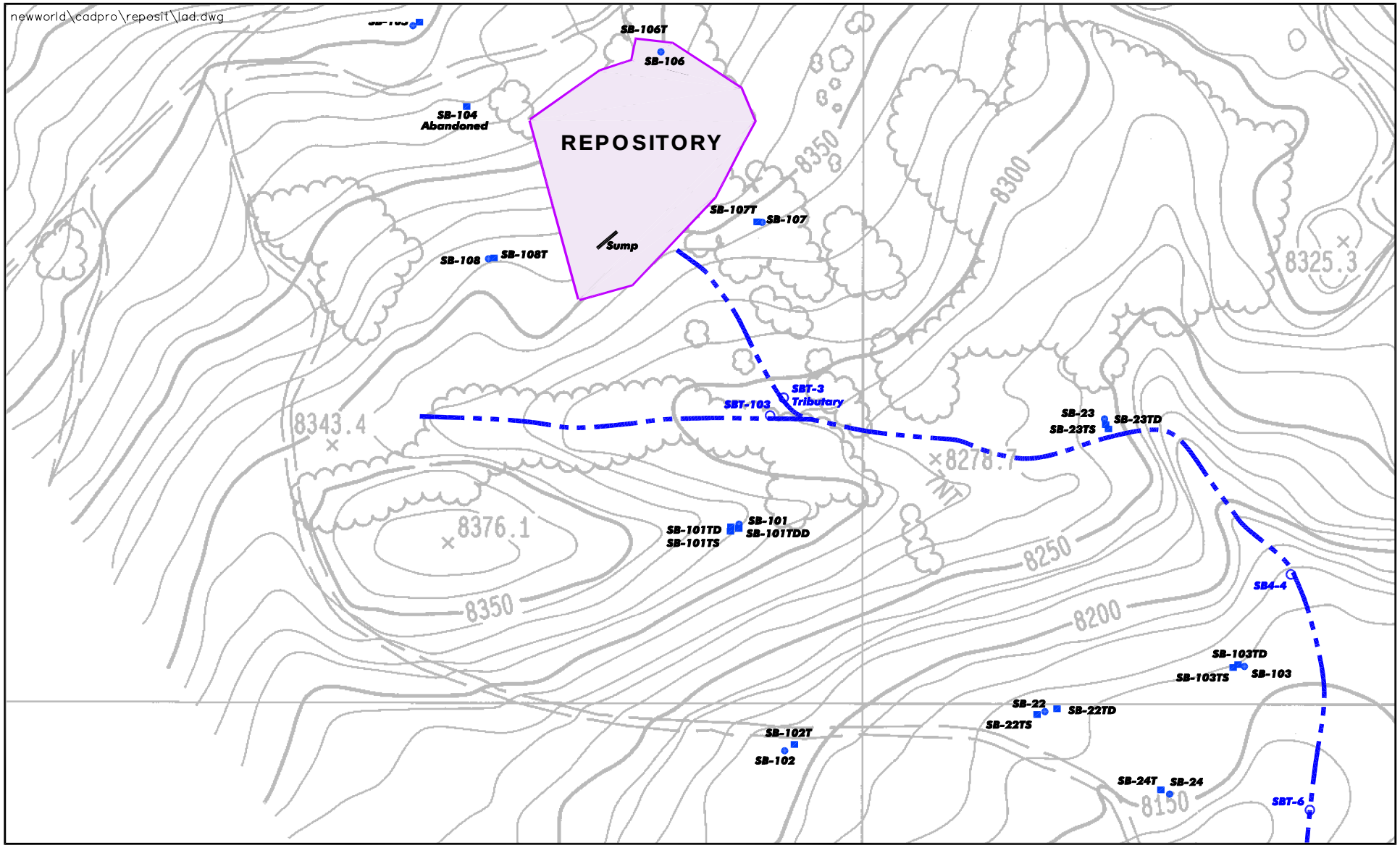
Review of 2004 sump chemistry data indicate that water entering the repository is likely flowing through the waste and not entering the sump directly (i.e. through the bottom liner). This conclusion is supported by the fact that constituent concentrations measured in the sump reflect the nature of the waste disposed, and these concentrations do not change significantly even as the volume of water in the sump doubles. If water was entering the repository without flowing through the waste, sump parameters should change dramatically (i.e. lower through dilution), as they did in the spring of 2002. The relatively high conductivity, sulfate, and TDS levels (i.e., several thousand) are good indicators of water that has percolated through waste.

The location of water incursion into the repository cannot be identified through the monitoring completed to date. However, the most likely place for water entry is the uphill edge of the repository where the temporary liner is keyed into the uphill runoff diversion ditch. Saturated soil conditions that result during snowmelt along this edge could be the vehicle for incursion of the 240 gallons per day increase in water beyond the natural waste draindown that occurs during winter and summer when snow is not melting. Measures will be taken to rectify this when the temporary liner is removed and replaced with a final cover during the final repository expansion.

ATTACHMENT A

FIGURES

Repository Sump Technical Memorandum



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Selective Source Repository Site
New World Mine District Response and Restoration Project
Cooke City Area, Montana
FIGURE 1

REPOSITORY SUMP MONITORING
2001 TO 2004

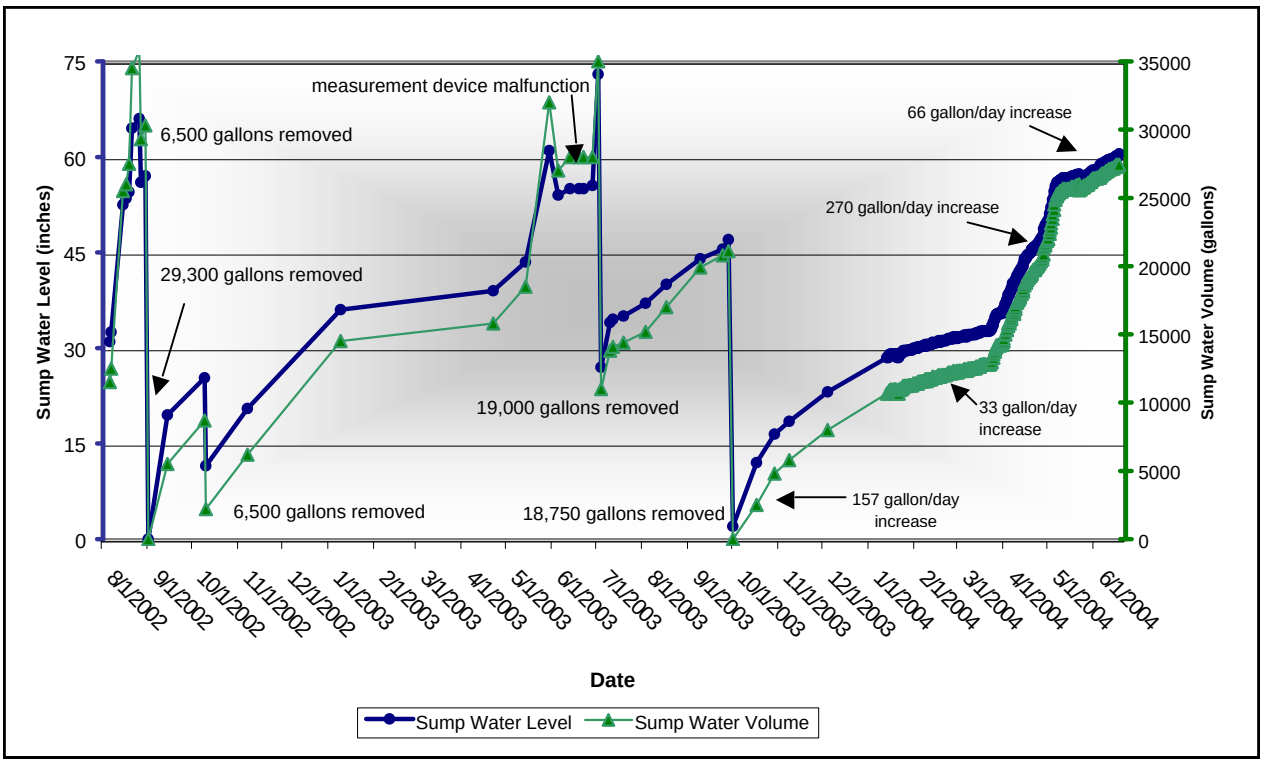

FIGURE 2 - REPOSITORY SUMP WATER LEVEL AND VOLUME

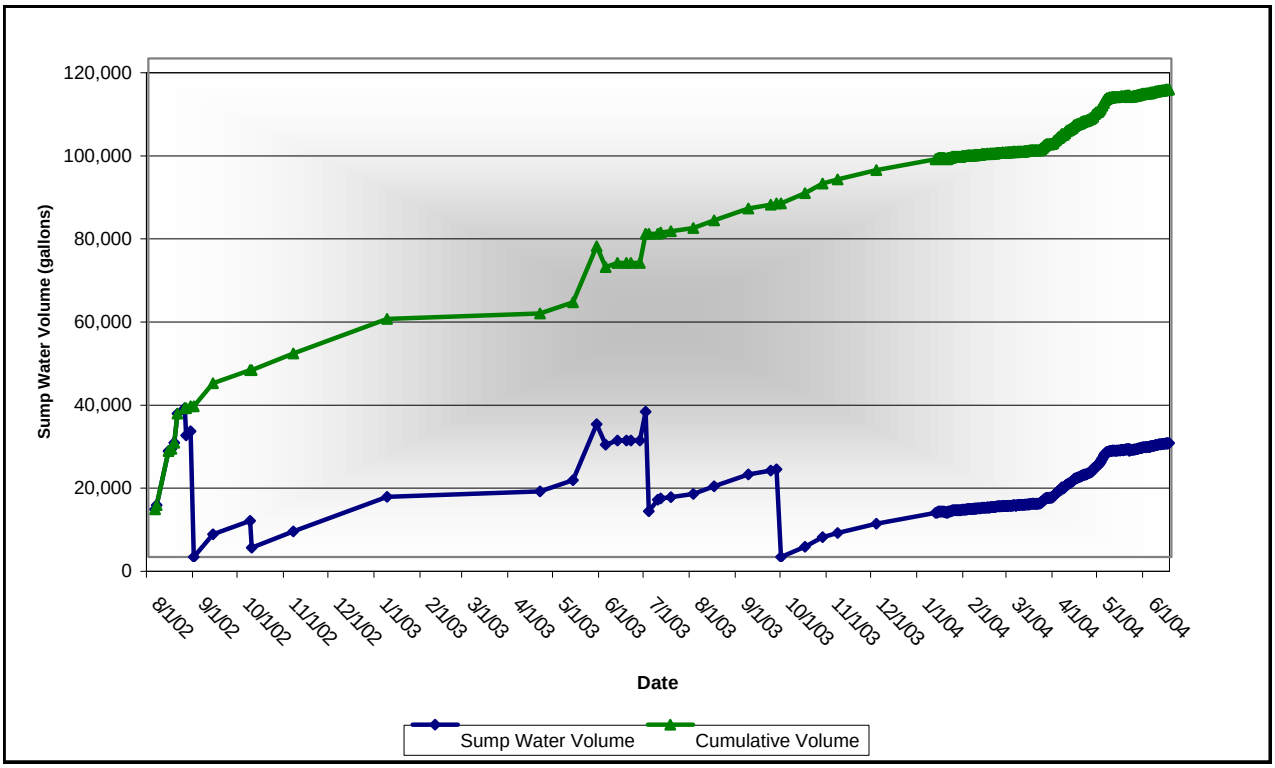

FIGURE 3 - REPOSITORY SUMP CUMULATIVE VOLUME

REPOSITORY SUMP MONITORING
2001 TO 2004

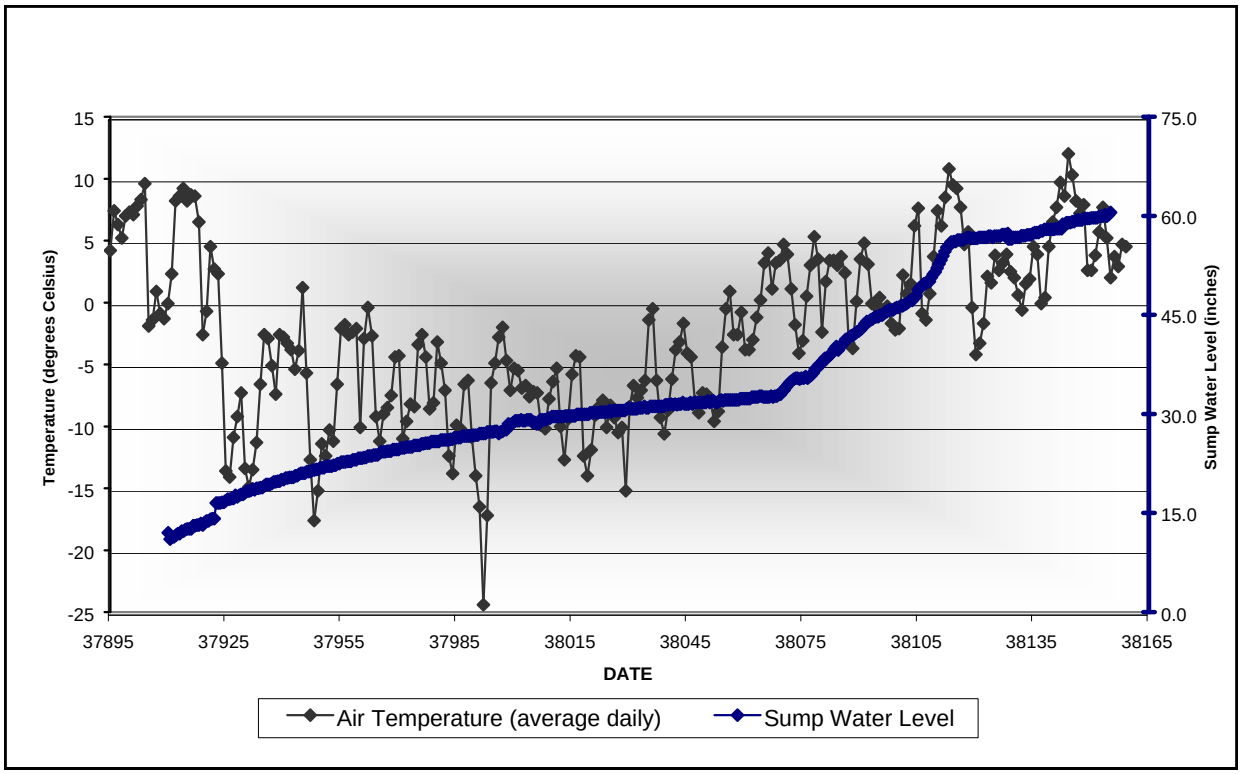

FIGURE 4 - REPOSITORY SUMP WATER LEVEL VS. AIR TEMPERATURE

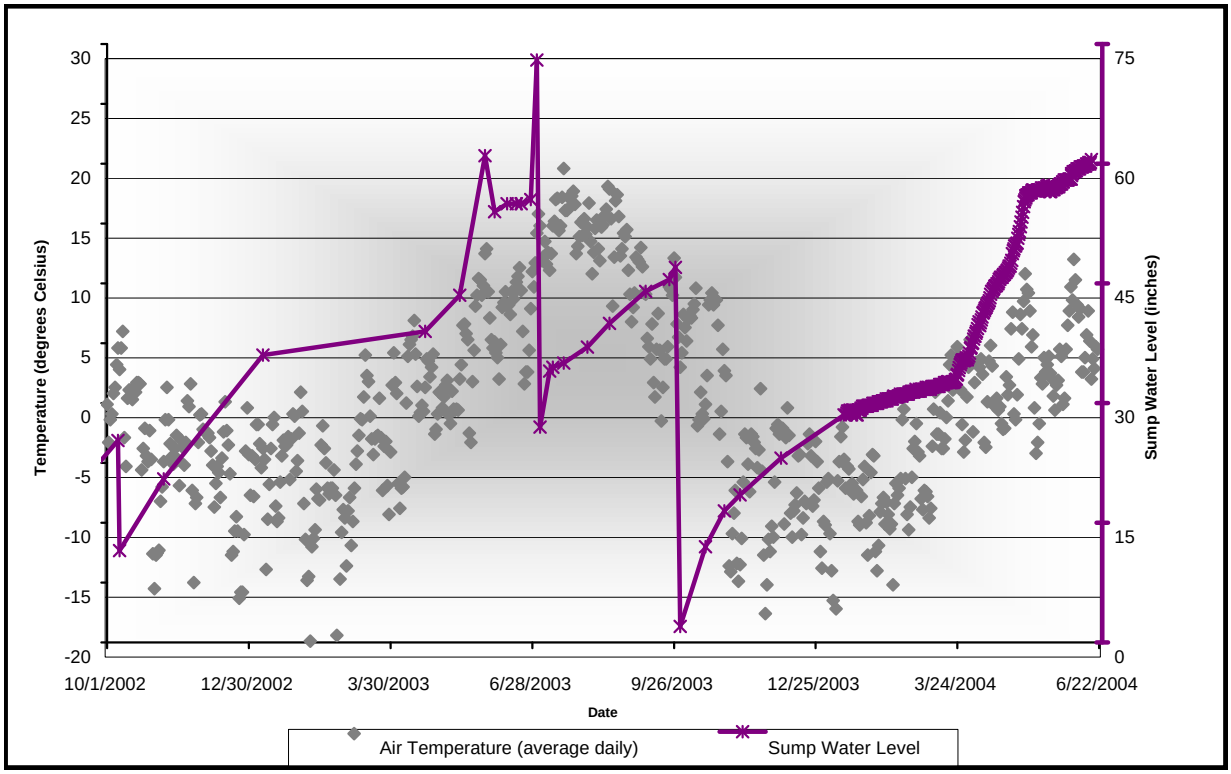

FIGURE 5 - REPOSITORY SUMP WATER LEVEL VS. AIR TEMPERATURE (2002-2004)

REPOSITORY SUMP MONITORING
2001 TO 2004

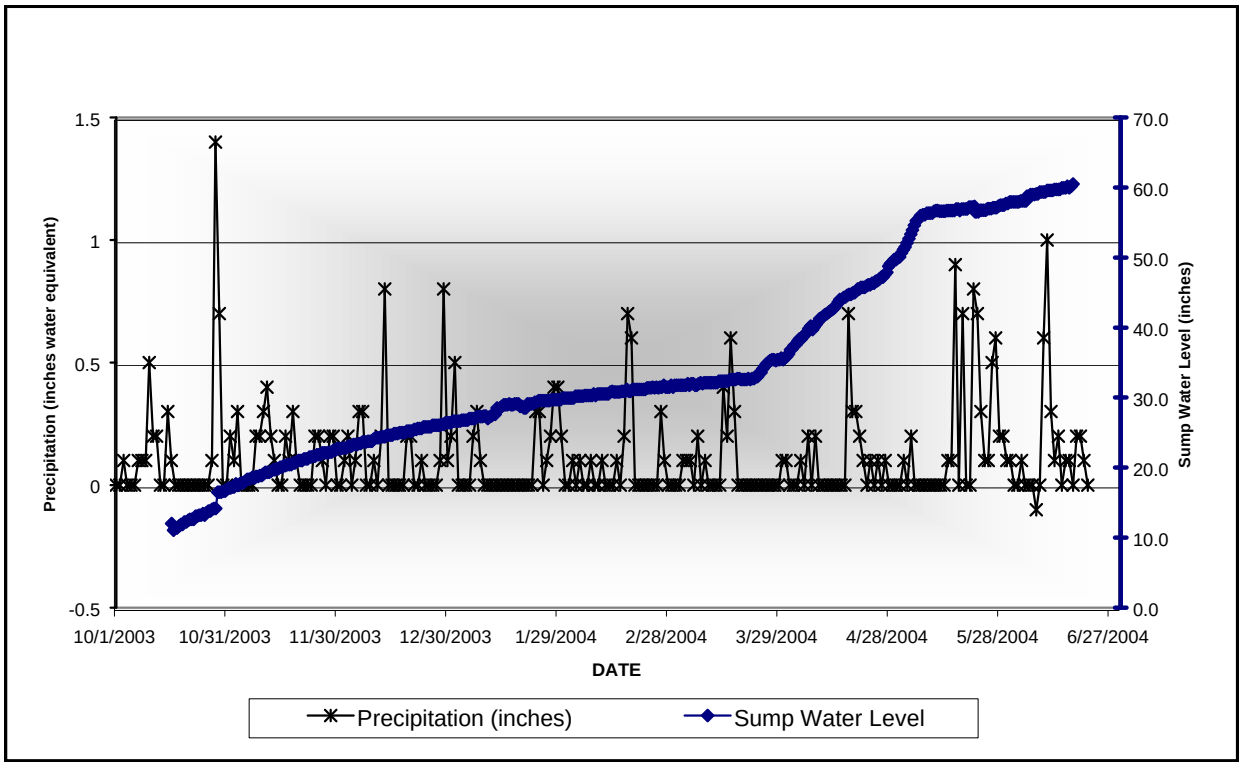

FIGURE 6 - REPOSITORY SUMP WATER LEVEL VS. PRECIPITATION

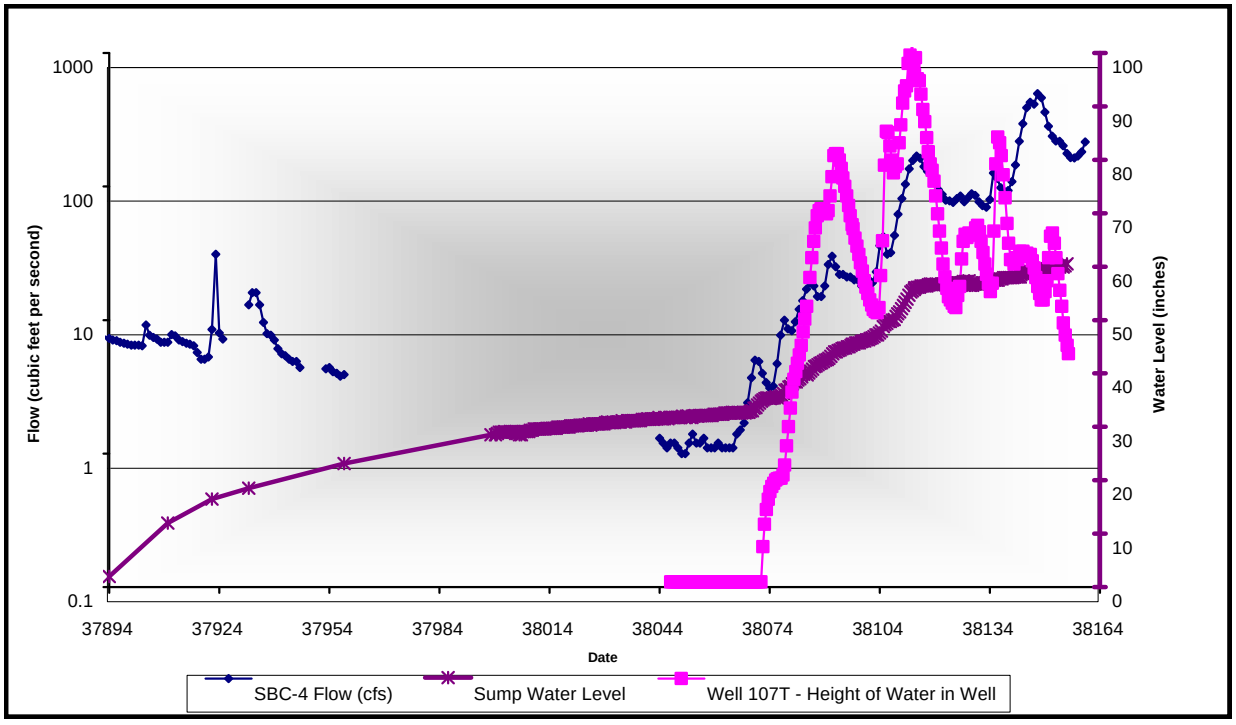

FIGURE 7 - REPOSITORY SUMP WATER LEVEL VS. SURFACE WATER FLOW AND GROUNDWATER LEVELS

REPOSITORY SUMP MONITORING
2001 TO 2004

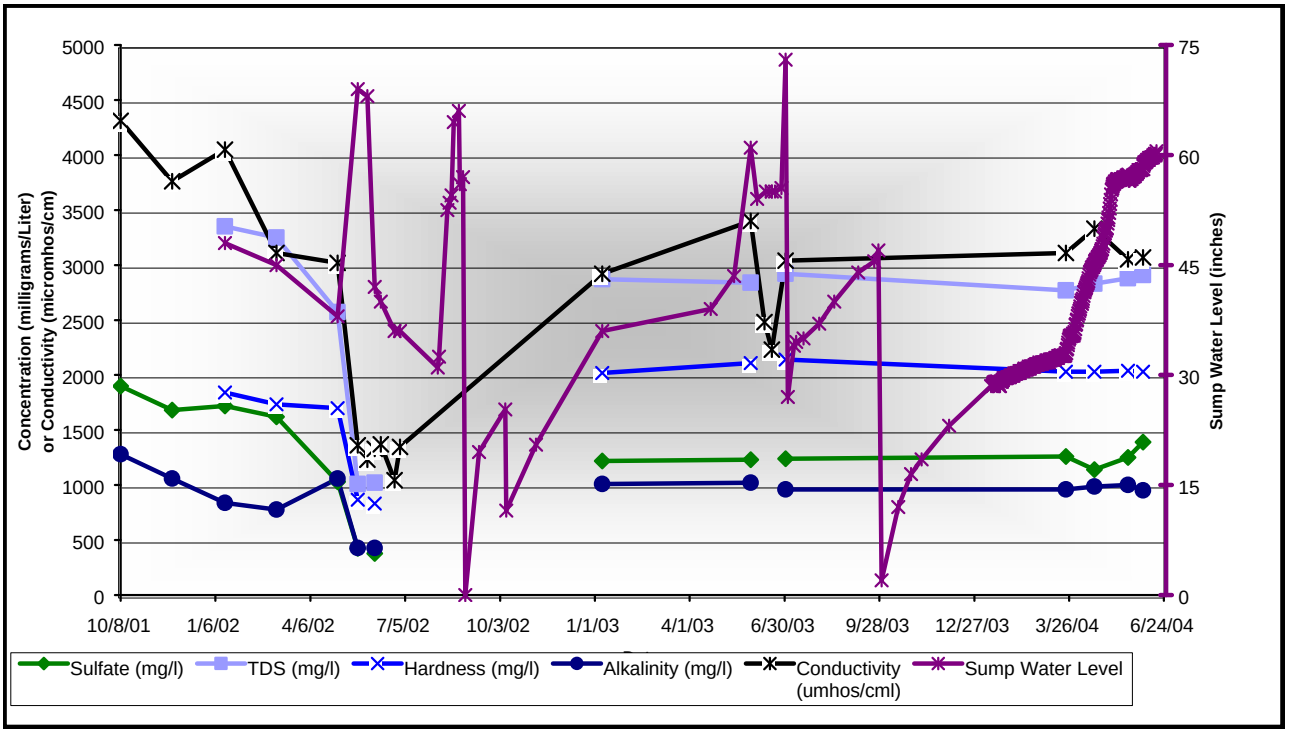

FIGURE 8 - REPOSITORY SUMP WATER LEVEL VS. SUMP CHEMISTRY (IONS) AND CONDUCTIVITY

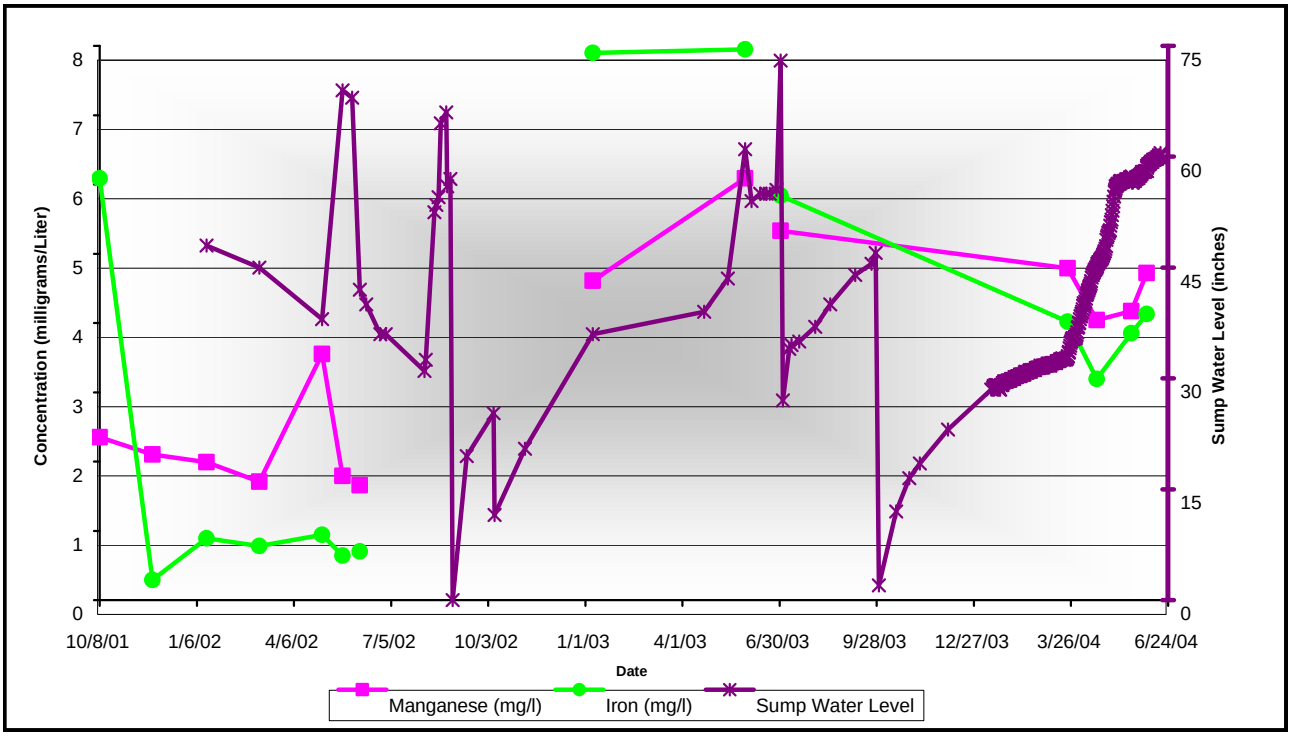

FIGURE 9 - REPOSITORY SUMP WATER LEVEL VS. SUMP IRON AND MANGANESE CONCENTRATIONS

REPOSITORY SUMP MONITORING
2001 TO 2004

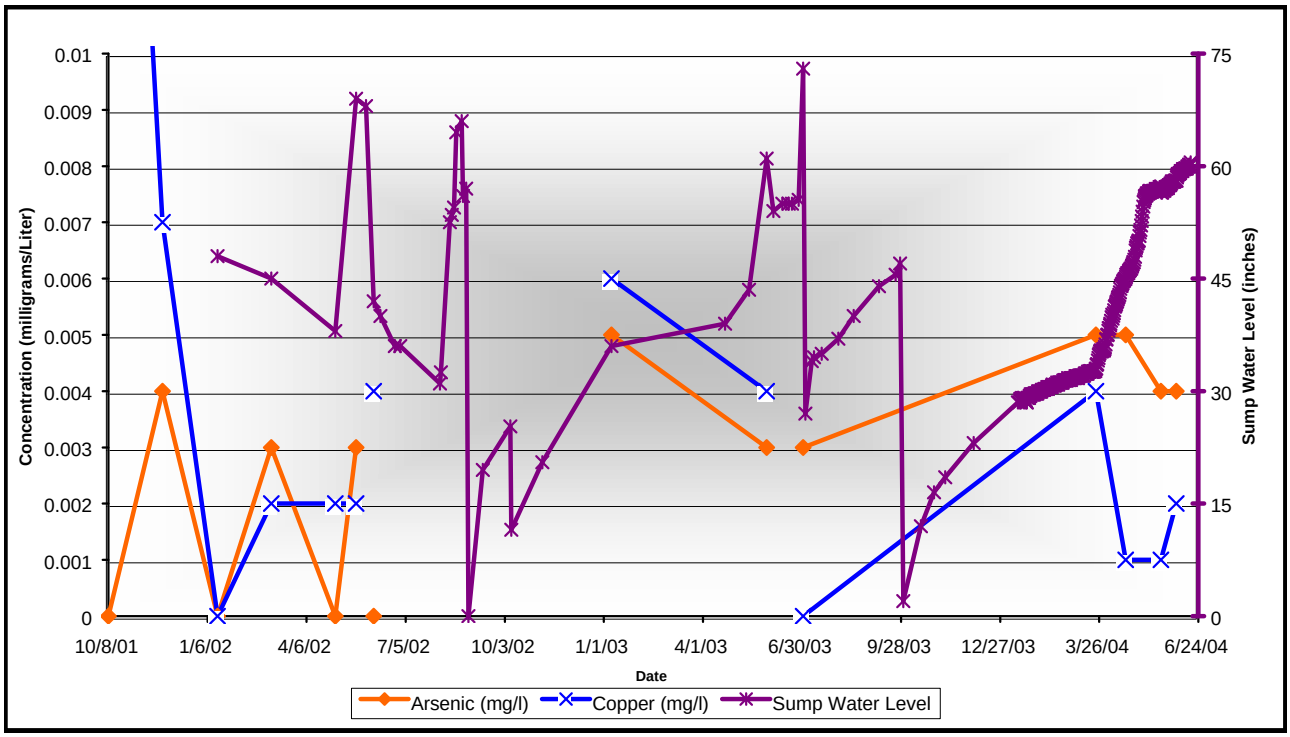

FIGURE 10 - REPOSITORY SUMP WATER LEVEL VS. SUMP ARSENIC AND COPPER CONCENTRATIONS

REPOSITORY SUMP MONITORING
2001 TO 2004

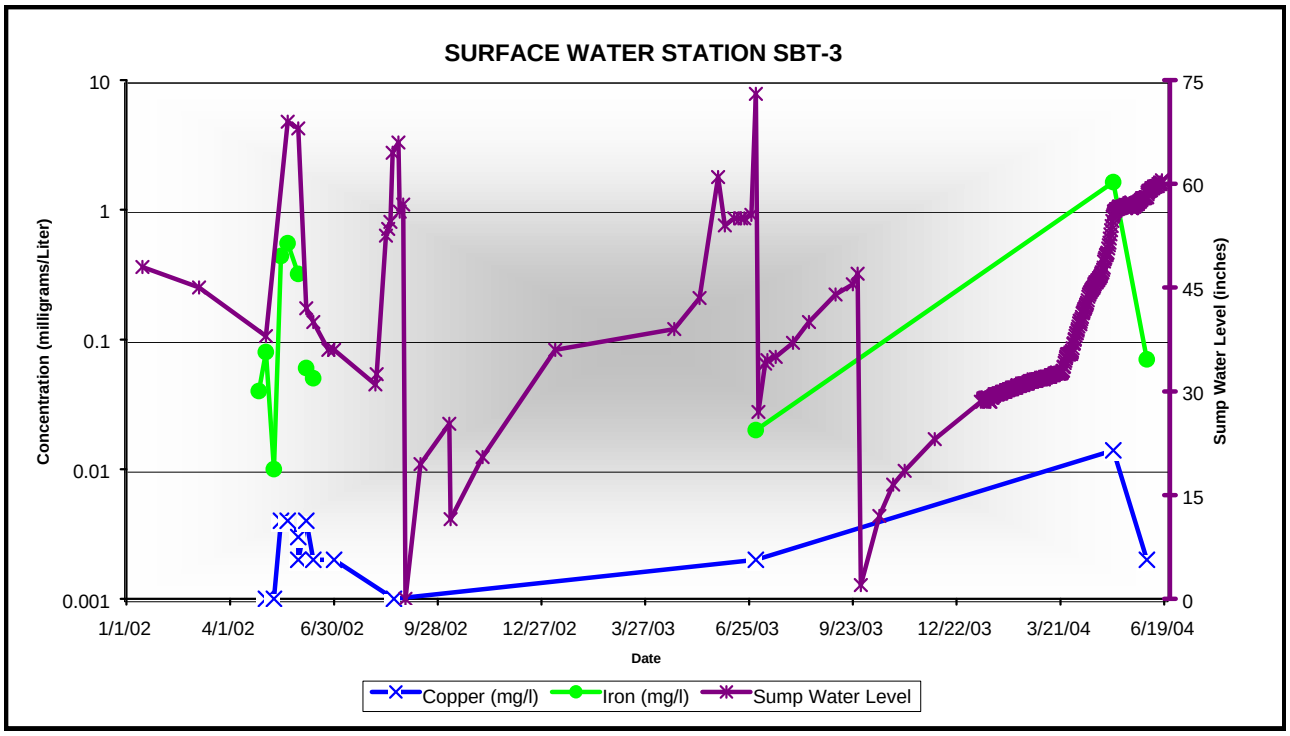

FIGURE 11 - REPOSITORY SUMP WATER LEVEL VS. STATION SBT-3 COPPER AND IRON CONCENTRATIONS

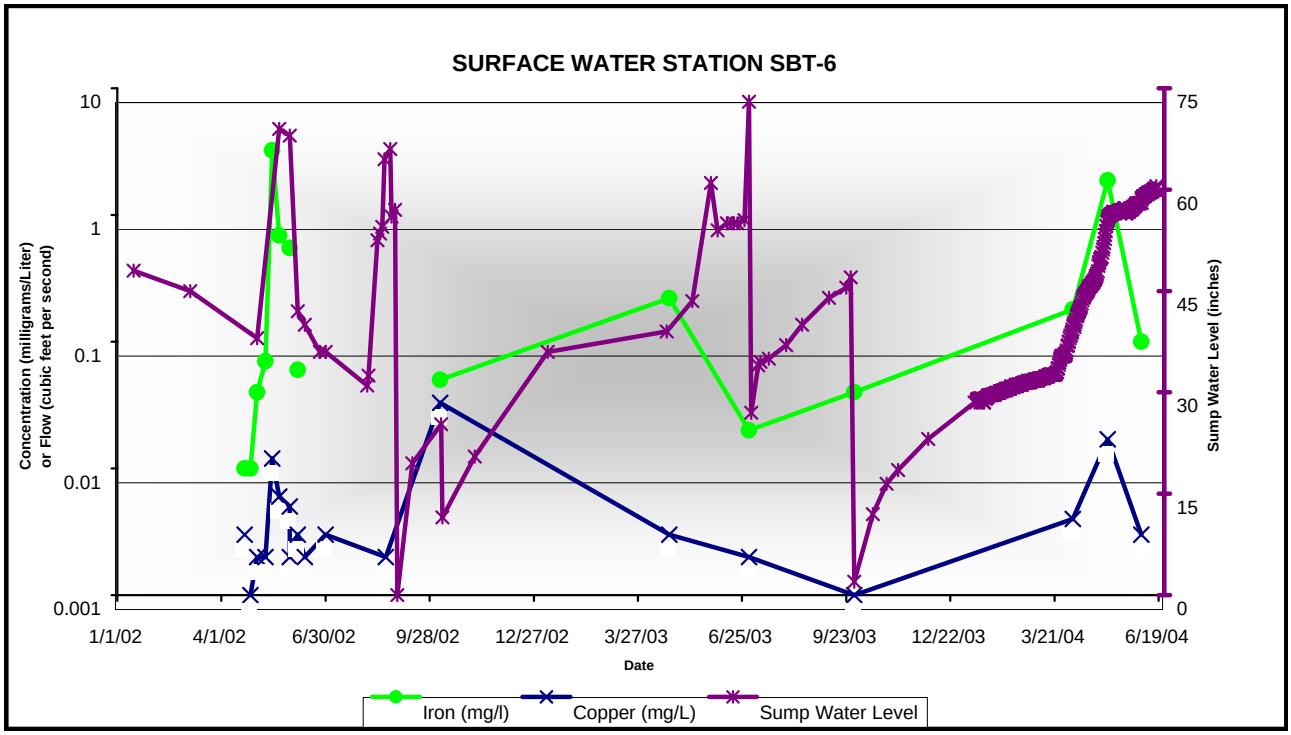

FIGURE 12 - REPOSITORY SUMP WATER LEVEL VS. STATION SBT-6 COPPER AND IRON CONCENTRATIONS

ATTACHMENT B

TABLES

Repository Sump Technical Memorandum

TABLE 1

REPOSITORY SUMP MONITORING - REPOSITORY SUMP CHEMISTRY

2001 to 2004 WATER QUALITY DATA

New World Mining District Response and Restoration Project

PARAMETER (metals are total recoverable)	REPOSITORY SUMP																			
	10/8/01	11/26/01	1/15/02	3/5/02	5/2/02	5/21/02	5/30/02	6/6/02	6/12/02	6/25/02	6/30/02	1/8/03	5/29/03	6/11/03	6/18/03	7/1/03	3/23/04	4/19/04	5/21/04	6/4/04
Inches water			48	45	38	69	68	42	40	36	36	36	61	55	55	73	34	45	56.5	58.5
pH - lab (field) (s.u.)	6.5	7.1	6.8	7.1	6.5	7.1	(6.75)	6.9	(6.9)	(7.15)	(7.1)	6.5	6.5	--	--	6.5 (6.2)	6.8	7.3	6.9 (6.7)	6.7 (6.5)
Conductivity (umhos/cml)	4310	3760	4050	3110	3020	1360	1229	1330	1371	1044	1346	2920	3400	2480	2230	3040	3110	3330	3050	3070
Conductivity - lab (field) (umhos/cm)	4310	3760	4050	3110	3020 (3170)	1360 (1377)	(1229)	1330 (1354)	(1371)	(1044)	(1346)	2920 (3160)	3400 (3280)	(2480)	(2230)	3040 (3260)	3110	3330	3050 (2820)	3070 (2920)
Chloride (mg/)			12	13	8	<4		1				8	14			13	9	10	11	11
Sulfate (mg/l)	1900	1680	1720	1620	1030	425		377				1220	1230			1240	1260	1140	1250	1390
Alkalinity (mg/l)	1280	1060	839	778	1060	428		428				1010	1020			959	959	985	1000	950
TDS (mg/l)			3350	3250	2570	1010		1020				2870	2840			2920	2770	2830	2880	2910
TSS (mg/l)			16	<10	12	10		47				25	22			12	8	11	10	10
Hardness (mg/l)			1840	1735	1700	867		833				2020	2110			2140	2030	2030	2040	2030
Aluminum (mg/l)	2.7	<0.1	0.2	<0.1	<0.1	0.14		0.3				<0.1	<0.1			<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic (mg/l)	<0.003	0.004	<0.003	0.003	<0.003	0.003		<0.003				0.005	0.003			0.003	0.005	0.005	0.004	0.004
Barium (mg/l)			0.03	0.03	0.03	0.02		0.04				0.04	0.02			0.03	0.024	0.027	0.025	0.025
Cadmium (mg/l)	0.0003	<0.0001	<0.0001	<0.0001	0.0008	<0.0001		<0.0001				<0.0001	<0.0001			<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Chromium (mg/l)	0.003	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001				<0.001	0.001			<0.001	0.002	<0.001	<0.001	0.002
Copper (mg/l)	0.024	0.007	<0.001	0.002	0.002	0.002		0.004				0.006	0.004			<0.001	0.004	0.001	0.001	0.002
Iron (mg/l)	6.09	0.29	0.89	0.78	0.94	0.64		0.7				7.9	7.95			5.84	4.02	3.19	3.85	4.13
Lead (mg/l)	0.018	<0.003	<0.001	<0.001	<0.001	<0.001		0.003				<0.001	<0.002			<0.001	<0.003	<0.001	<0.001	<0.001
Manganese (mg/l)	2.35	2.1	1.99	1.71	3.55	1.79		1.66				4.61	6.09			5.33	4.79	4.04	4.17	4.72
Mercury (mg/l)			<0.0002	<0.0002	<0.0002	<0.0002		<0.0002				<0.0002	<0.0002			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)			0.003	0.002	0.001	<0.001		<0.001				0.002	0.002			0.003	0.001	0.005	0.005	0.004
Silver (mg/l)			0.0055	<0.0005	<0.0005	<0.0005		<0.0005				<0.0005	<0.0005			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc (mg/l)	0.07	0.03	<0.01	<0.01	<0.01	0.02		0.03				0.12	0.02			<0.01	<0.01	<0.01	0.01	0.07

Notes: Blue shaded cells indicate parameters of interest; blank cell indicates parameter not analyzed/not measured

cfs = cubic feet per second; s.u. = standard units; umhos/cm = micromhos per centimeter; mg/L = milligrams per liter;

TABLE 2
REPOSITORY SUMP MONITORING - STATION SBT-3 AND TOE SEEP CHEMISTRY
2002 to 2004 WATER QUALITY DATA
New World Mining District Response and Restoration Project

PARAMETER (metals are total recoverable except as noted)	SBT-3																Toe Seep		
	4/22/02	4/23/02	4/26/02	5/2/02	5/9/02	5/15/02	5/21/02	5/30/02 Total	5/30/02 Dissolved	6/6/02	6/12/02	6/30/02	8/21/02	7/1/03	5/6/04	6/4/04	6/25/02	6/30/02	5/21/04
Flow (cfs)		0.11		0.22	0.37	2.75	4.13	9.10	9.10	3.00	1.95	0.44	0.06	0.33	6.81	1.46	<0.001	<0.001	<0.001
pH - lab (s.u.)	7.8	8.1	7.6	7.8	7.9	7.7	7.9	7.7		7.8	7.7	7.8	8	8	7.7	7.9	7.29	6.9	7.5
Conductivity - lab (umhos/cm)	214	221	207	190	202	173	117	98	87	98	122	158	252	150	118	122	503	462	255
Chloride (mg/)	<2	<2	<2	<2	2	<2	<2	<2		<1	<2	<1	<4	<2	<2	<1	--	< 4	1
Sulfate (mg/l)	12	14	12	15	16	14	15	8		10	12	13	13	13	11	17	--	35	16
Alkalinity (mg/l)	99	94	94	79	76	69	45	40		40	47	40	74	73	41	56	--	122	123
TDS (mg/l)	110	111	132	107	130	119	70	84		78	75	104	155	95	65	75	--	155	145
TSS (mg/l)	<10	<10	2	<3	3	14	20	22		<4	4	<10	<10	<2	39	3	--	< 10	<1
Hardness (mg/l)	117	110	117	103	103	97	66	46		55	66	96	132	84	50	67	--	175	129
Aluminum (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.51	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	1.01	0.08	<0.01	0.2	0.3
Arsenic (mg/l)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003		<0.003		<0.003	<0.003	<0.003
Cadmium (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.002		<0.001	<0.001	<0.001
Copper (mg/l)	<0.001	<0.001	<0.001	0.001	0.001	0.004	0.004	0.003	0.002	0.004	0.002	0.002	0.001	0.002	0.014	0.002	0.001	0.002	0.001
Iron (mg/l)	<0.01	<0.01	0.04	0.08	0.01	0.44	0.55	0.32	<0.01	0.06	0.05	<0.01	<0.01	0.02	1.63	0.07	0.07	0.4	0.42
Lead (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.003	0.001	0.002	<0.003	<0.003	<0.001	<0.003	<0.001	<0.003	<0.001	0.006	<0.001	<0.003	0.002	<0.001
Manganese (mg/l)	<0.003	<0.003	0.006	0.005	<0.003	0.008	0.011	0.006	<0.003	<0.003	<0.003	<0.003	<0.005	<0.005	0.047	<0.003	1	0.04	0.012
Zinc (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01

Notes: Blue shaded cells indicate parameters of interest; blank cell indicates parameter not analyzed/not measured

cfs = cubic feet per second; s.u. = standard units; umhos/cm = micromhos per centimeter; mg/L = milligrams per liter;

TABLE 3
REPOSITORY SUMP MONITORING - STATION SBT-6 CHEMISTRY
2002 to 2004 WATER QUALITY DATA
New World Mining District Response and Restoration Project

PARAMETER (metals are total recoverable except as noted)	SBT-6																			
	3/5/02	4/21/02	4/23/02	4/26/02	5/2/02	5/9/02	5/15/02	5/21/02	5/30/02 Total	5/30/02 Dissolved	6/6/02	6/12/02	6/30/02	8/21/02	10/7/02	4/23/03	7/1/03	9/30/03	4/6/04	5/6/04	6/4/04
Flow (cfs)	0.03		0.31		0.75	0.89	4.70	7.05	20.20	20.20	8.50	5.62	1.29	0.133	0.190	1.090	1.290	0.003	0.999	22.600	5.88
pH - lab (s.u.)	8.3	8.0	8.0	7.8	7.9	8.0	7.9	8.0	7.9		8.0	8.1	8.1	8.2	8.2	7.5	8.2	8.1	7.9	7.9	8.1
Conductivity - lab (umhos/cm)	230	236	239	229	202	212	168	119	106	96	104	123	161	254	267	212	159	262	185	115	119
Chloride (mg/)	<4	<4	3	<2	<2	2	<2	<2	<2		<1	<2	<4	<2	<4	<2	<2	<1	<1	<2	<2
Sulfate (mg/l)	11	12	14	17	11	12	11	10	8		10	8	18	9	14	17	5	7	13	8	10
Alkalinity (mg/l)	126	101	104	99	90	94	68	54	48		46	58	79	126	131	99	82	137	91	49	57
TDS (mg/l)	157	118	139	153	123	136	102	70	94		78	76	105	153	158	131	101	154	115	75	71
TSS (mg/l)	<7	<10	<10	<2	<2	<3	82	22	14		<4	<8	<10	<10	<2	2	<2	<4	<2	30	3
Hardness (mg/l)	129	122	125	129	112	105	97	69	55		57	74	105	146	145	112	86	146	98	47	67
Aluminum (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.4	0.49	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.06	<0.05	<0.05	0.14	0.81	0.08
Arsenic (mg/l)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	<0.003	<0.003						<0.003	
Cadmium (mg/l)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						0.002	
Copper (mg/l)	<0.001	0.003	<0.001	0.001	0.002	0.002	0.012	0.006	0.005	0.002	0.003	0.002	0.003	0.002	0.033	0.003	0.002	0.001	0.004	0.017	0.003
Iron (mg/l)	<0.01	0.01	<0.01	0.01	0.04	0.07	3.24	0.69	0.55	<0.01	0.06	<0.01	<0.01	<0.01	0.05	0.22	0.02	0.04	0.18	1.87	0.1
Lead (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	0.014	0.002	<0.003	<0.003	<0.001	<0.003	<0.001	<0.003	<0.001	0.008	<0.001	<0.001	<0.001	0.005	<0.001
Manganese (mg/l)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.091	0.018	0.018	<0.003	<0.003	<0.003	<0.003	<0.005	0.96	0.012	<0.005	<0.003	0.007	0.06	<0.003
Zinc (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.06	0.02	<0.001

Notes: Blue shaded cells indicate parameters of interest; blank cell indicates parameter not analyzed/not measured

cfs = cubic feet per second; s.u. = standard units; umhos/cm = micromhos per centimeter; mg/L = milligrams per liter;

ATTACHMENT C

2004 REPOSITORY SITE FIELD OBSERVATIONS

Repository Sump Technical Memorandum

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MEMORANDUM

DATE: June 9, 2004

TO: Mike Cormier

FROM: Mark F. Pearson

RE: Field Observations during 2004
Selective Source Repository Site
New World Mining District Response and Restoration Project

This memorandum presents my field observations pertaining to ground conditions at the Selective Source repository site during my monitoring visits in 2004. Observations and sump water volume measurements are presented chronologically below:

JANUARY 12, 2004

Snowpack depth at site: 2-3 feet. Snow covers entire repository surface. Temperature approximately 32 degrees F during site visit. Practically no melting of snow.

Monitoring wells	Depth to Groundwater
SBGW-105T	9.1
SBGW-107T	dry
SBGW-108T	dry
Sump pressure measurement:	26.5”

MARCH 23, 2004

Snowpack depth at site: 2-4 feet. Snow covers about 3/4 repository surface with about 4/5 of the black liner covered. Upslope margin of repository is snow covered. Temperature approximately 35-40 degrees F. Practically no melting of snow.

Monitoring wells	Depth to Groundwater
SBGW-105T	8.8’
SBGW-107T	dry
SBGW-108T	dry
Sump pressure measurement:	31.0”

APRIL 7, 2004

Snowpack depth at site: 2-4 feet. Snow covers about 1/3 repository surface. Snow is rotten. South side is uncovered as well as about 1/4 of black liner exposed in southern part. Upslope side of lined portion is snow-covered. Temperature approximately 45 degrees F. Snow melt is occurring.

Monitoring wells	Depth to Groundwater
SBGW-105T	7.2'
SBGW-107T	6.7'
SBGW-108T	5.6'
Sump pressure measurement:	37.7"

APRIL 19, 2004

Snowpack depth at site: 0-3 feet. Snow covers about ½ of repository surface. Snow is rotten on south aspects. South side is uncovered, as well as about 1/2 of black liner. Upslope side of lined portion is snow-covered. Temperature approximately 45 degrees F and it is sunny and clear. Snow melt is occurring.

Monitoring wells	Depth to Groundwater
SBGW-105T	3.6'
SBGW-107T	5.5'
SBGW-108T	5.0'
Sump pressure measurement:	43.5"

MAY 6, 2004

Snowpack depth at site: 0-2 feet but only as large drifts. Could drive within 300 yards of gate. Snow covers about ¼ of repository surface. About 3/4 of black liner exposed. Upslope side of lined portion has snow drifts and soil surface is exposed. Soil is practically saturated. Temperature approximately 55 degrees F and it is sunny and clear. Snow melt is occurring. Streamflows increase considerably from morning to afternoon.

Monitoring wells	Depth to Groundwater
SBGW-105T	3.1'
SBGW-107T	3.1'
SBGW-108T	2.0'
Sump pressure measurement:	54.0"

MAY 21, 2004

Snowpack depth at site: 0-2 feet but only as few and scattered drifts. Could drive into repository. Snow covers about 1/8 of repository surface. Upslope side of lined portion has no snow. Soil is very moist. Temperature approximately 55-60 degrees F and it is windy but clear. Snow melt is occurring. Streamflows increase considerably from morning to afternoon.

Monitoring wells	Depth to Groundwater
SBGW-105T	4.1'
SBGW-107T	5.6'
SBGW-108T	5.0'
Sump pressure measurement:	54.5"

JUNE 4, 2004

Snowpack depth at site: 0-2 feet but only as few and scattered drifts. Could drive into repository. Only one small drift of snow in northwest corner of exposed black liner. Upslope of lined portion has no snow drifts. Soil is moist. Temperature approximately 55 degrees F and it is windy and cloudy. Photographs were taken. Significant precipitation within last seven days.

Monitoring wells	Depth to Groundwater
SBGW-105T	3.8'
SBGW-107T	5.9'
SBGW-108T	5.7'
Sump pressure measurement:	56.5"

Repository site (looking NE) – June 4, 2004

Repository site (looking NW) – June 4, 2004

Repository site (looking E) – June 4, 2004

Repository site (looking SW) – June 4, 2004