WATER RESOURCES MONITORING
2013 ANNUAL REPORT
BLACK BUTTE COPPER PROJECT

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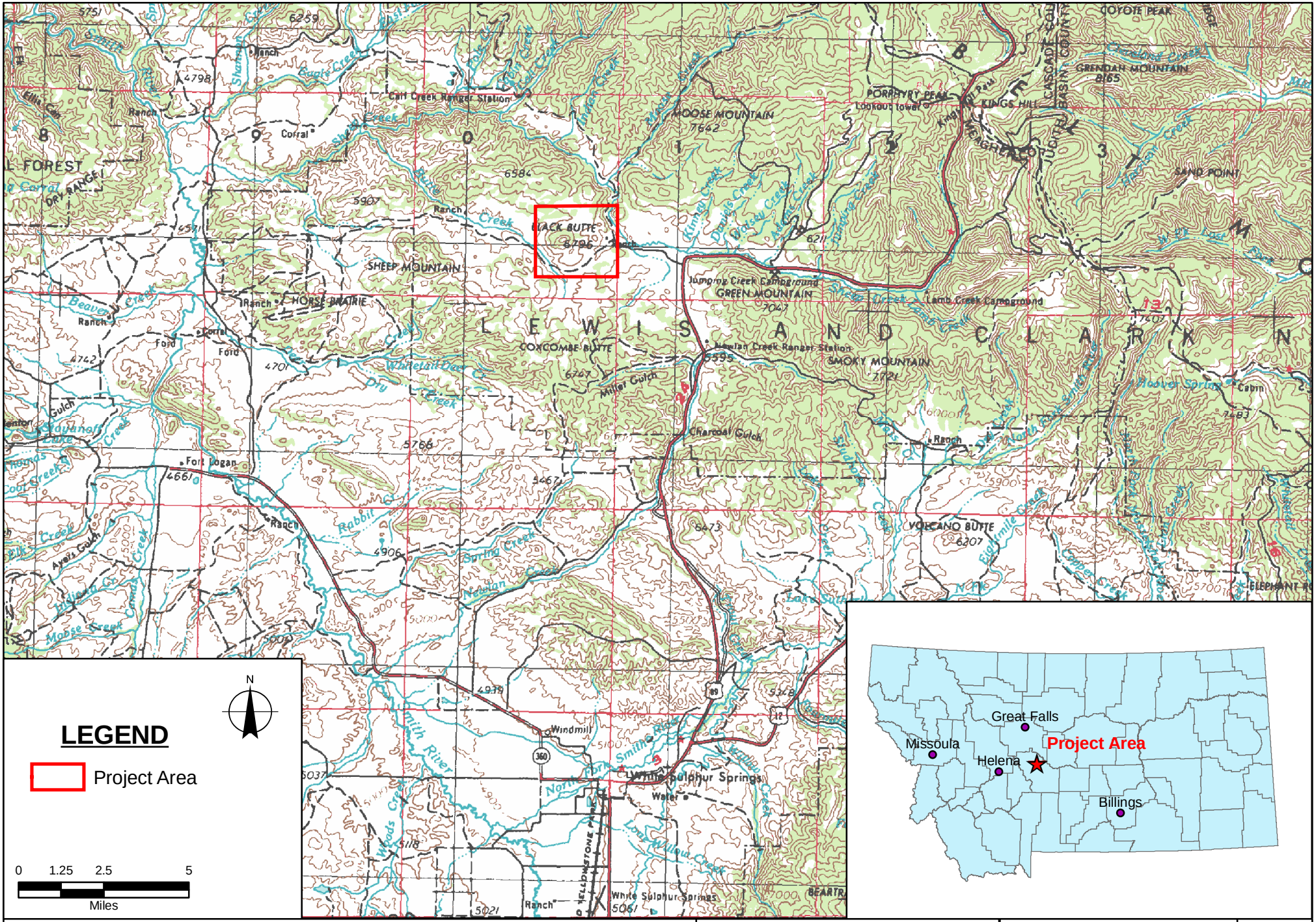
1.0 INTRODUCTION

Hydrometrics has conducted quarterly baseline groundwater and surface water monitoring for the Black Butte Copper Project since the second quarter of 2011. The 2011 second quarter monitoring was only conducted for surface water as groundwater monitoring wells were not constructed at that time; groundwater and surface water monitoring was conducted during all other quarterly monitoring events. Spring and seep monitoring was first conducted in July 2011 during the initial survey; additional spring and seep monitoring events were conducted in October 2011 and July 2012. The 2013 spring and seep monitoring was conducted in August 2013. The Black Butte Copper Project is located approximately 16 miles north of White Sulphur Springs, Montana in Meagher County (Figure 1). The groundwater and surface water monitoring is being performed to establish baseline flows, water level elevations, and water quality in the vicinity of the project area.

Water resource monitoring was conducted in accordance with Hydrometrics SOPs as described in the Water Resource Monitoring Sampling and Analysis Plan (Hydrometrics, 2013(A)). Water quality samples were submitted to Energy Laboratories in Helena, MT for analyses of physical parameters, common constituents, nutrients, and a comprehensive suite of trace constituents as listed in Table 1. With the exception of aluminum, trace constituents were analyzed for the total recoverable fraction for surface water samples; aluminum was analyzed for the dissolved fraction. All trace constituents for groundwater and spring samples were analyzed for the dissolved fraction. This report summarizes the results of groundwater, surface water, spring and seep monitoring conducted in 2013.



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Tintina Resources
Black Butte Copper Project
Meagher County, Montana

PROJECT LOCATION

FIGURE
1

V:\11048\GIS\Decline Inflow Assessment\Fig. 1 Project Area.mxd

TABLE 1. ANALYTICAL METHODS AND DETECTION LIMITS FOR SURFACE WATER AND GROUNDWATER SAMPLES

Parameter	Analytical Method[(1)]	Project-Required Detection Limit (mg/L)
Physical Parameters		
TDS	SM 2540C	10
TSS	SM 2540C	10
Common Ions		
Alkalinity	SM 2320B	4
Sulfate	300.0	1
Chloride	300.0/SM 4500CL-B	1
Fluoride	A4500-F C	0.1
Calcium	215.1/200.7	1
Magnesium	242.1/200.7	1
Sodium	273.1/200.7	1
Potassium	258.1/200.7	1
Nutrients		
Nitrate+Nitrite as N	353.2	0.01
Trace Constituents (SW - Total Recoverable except Aluminum [Dissolved], GW - Dissolved)[(2)]		
Aluminum (Al)	200.7/200.8	0.009
Antimony (Sb)	200.7/200.8	0.0005
Arsenic (As)	200.8/SM 3114B	0.001
Barium (Ba)	200.7/200.8	0.003
Beryllium (Be)	200.7/200.8	0.0008
Cadmium (Cd)	200.7/200.8	0.00003
Chromium (Cr)	200.7/200.8	0.01
Cobalt (Co)	200.7/200.8	0.01
Copper (Cu)	200.7/200.8	0.002
Iron (Fe)	200.7/200.8	0.02
Lead (Pb)	200.7/200.8	0.0003
Manganese (Mn)	200.7/200.8	0.005
Mercury (Hg)	245.2/245.1/200.8/SM 3112B	0.000005
Molybdenum (Mo)	200.7/200.8	0.002
Nickel (Ni)	200.7/200.8	0.001
Selenium (Se)	200.7/200.8/SM 3114B	0.0002
Silver (Ag)	200.7/200.8	0.02
Strontium (Sr)	200.7/200.8	0.0002
Thallium (Tl)	200.7/200.8	0.0002
Uranium	200.7/200.8	0.008
Zinc (Zn)	200.7/200.8	0.002
Field Parameters		
Stream Flow	HF-SOP-37/-44/-46	NA
Water Temperature	HF-SOP-20	0.1 °C
Dissolved Oxygen (DO)	HF-SOP-22	0.1 mg/L
pH	HF-SOP-20	0.1 s.u.
Specific Conductance (SC)	HF-SOP-79	1 µmhos/cm

(1) Analytical methods are from *Standard Methods for the Examination of Water and Wastewa*ter (SM) or EPA's *Methods for Chemical Analysis of Water and Waste* (1983).

(2) Samples to be analyzed for dissolved constituents will be field-filtered through a 0.45 µm filter.

2.0 SURFACE WATER

2.1 MONITORING SUMMARY

The project site lies within the Sheep Creek drainage. Sheep Creek originates in the Little Belt Mountains at an elevation of about 7,600 feet and discharges to the Smith River approximately 34 river miles to the west at an elevation of 4,380 feet. The project area is approximately 18 miles upstream of the confluence with the Smith River. Sheep Creek flows in a meandering channel through a broad alluvial valley upstream of the project site but enters a constricted bedrock canyon just downstream of the site.

Primary tributaries to Sheep Creek in the immediate project area are Little Sheep Creek, and Coon Creek (Figure 2). There are also two un-named tributaries that receive flow from the northeast side of the valley and discharge to Sheep Creek immediately upstream and downstream of Strawberry Butte. Black Butte Creek lies just to the west of the project area and discharges to Sheep Creek approximately 7 miles further downstream. Flow in the tributary drainages is only perennial on their lower reaches, and ephemeral upstream.

Eleven surface water stations have been established as baseline monitoring sites. Flow, stage and field parameters (temperature, pH and SC) are monitored quarterly at all of these sites. Water quality samples are collected at six of the sites during quarterly monitoring. Flow and water quality monitoring locations are shown on Figure 2. Monitoring was initiated at these sites in May of 2011 with subsequent quarterly monitoring events scheduled in the months of August, November, March and May/June (high flow) of each year. A gaging station was established at SW-1 in November 2012 to collect continuous flow data on Sheep Creek downstream of the project area. The station consists of a stilling well with a pressure transducer to monitor stream stage every four hours. Manual flow measurements were collected frequently during spring run off to establish a stream rating curve that encompasses the range of flows in Sheep Creek (Figure 3). The stream rating curve provides a strong fit of the stage/stream data (R^2=0.968).

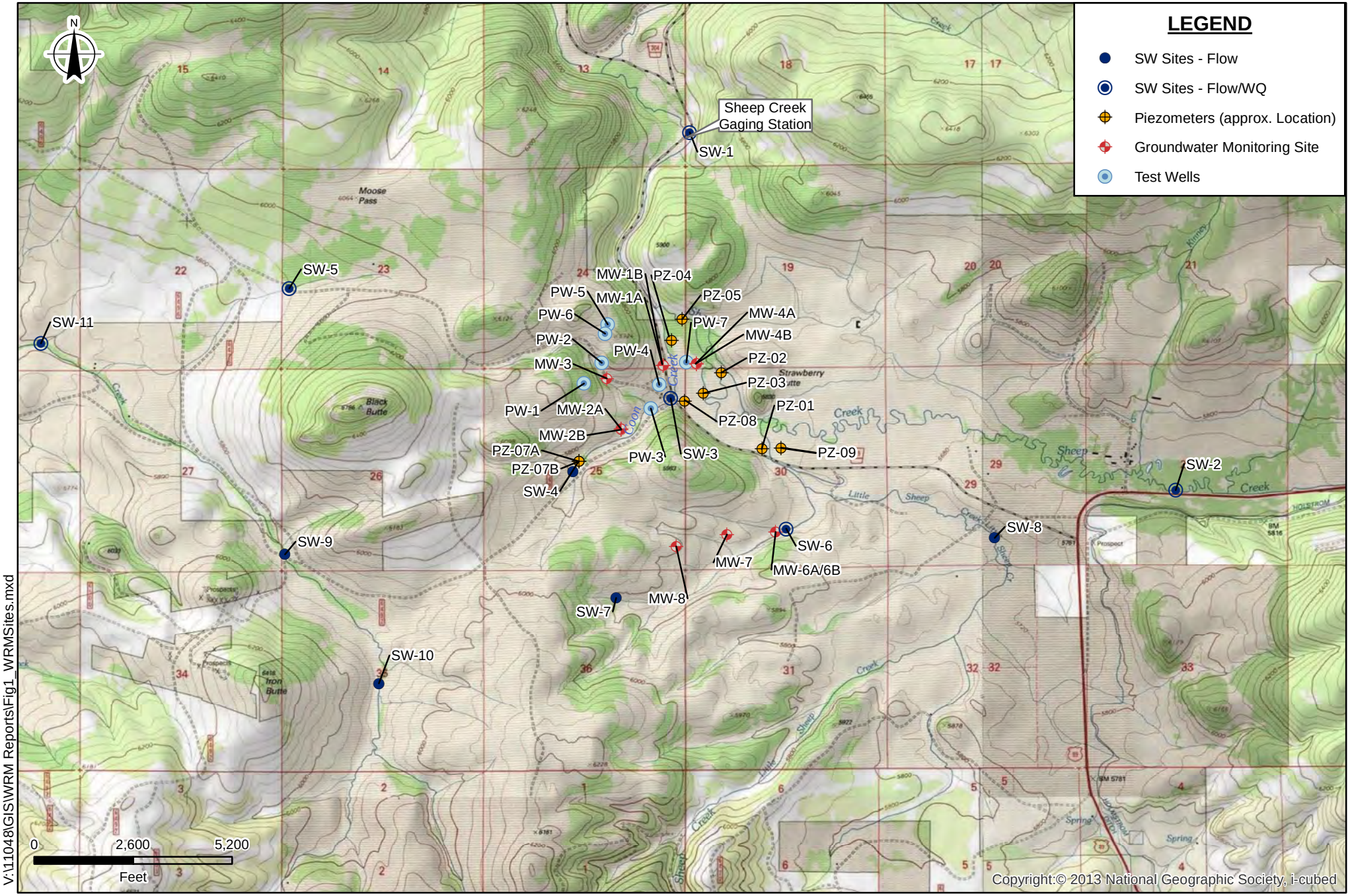

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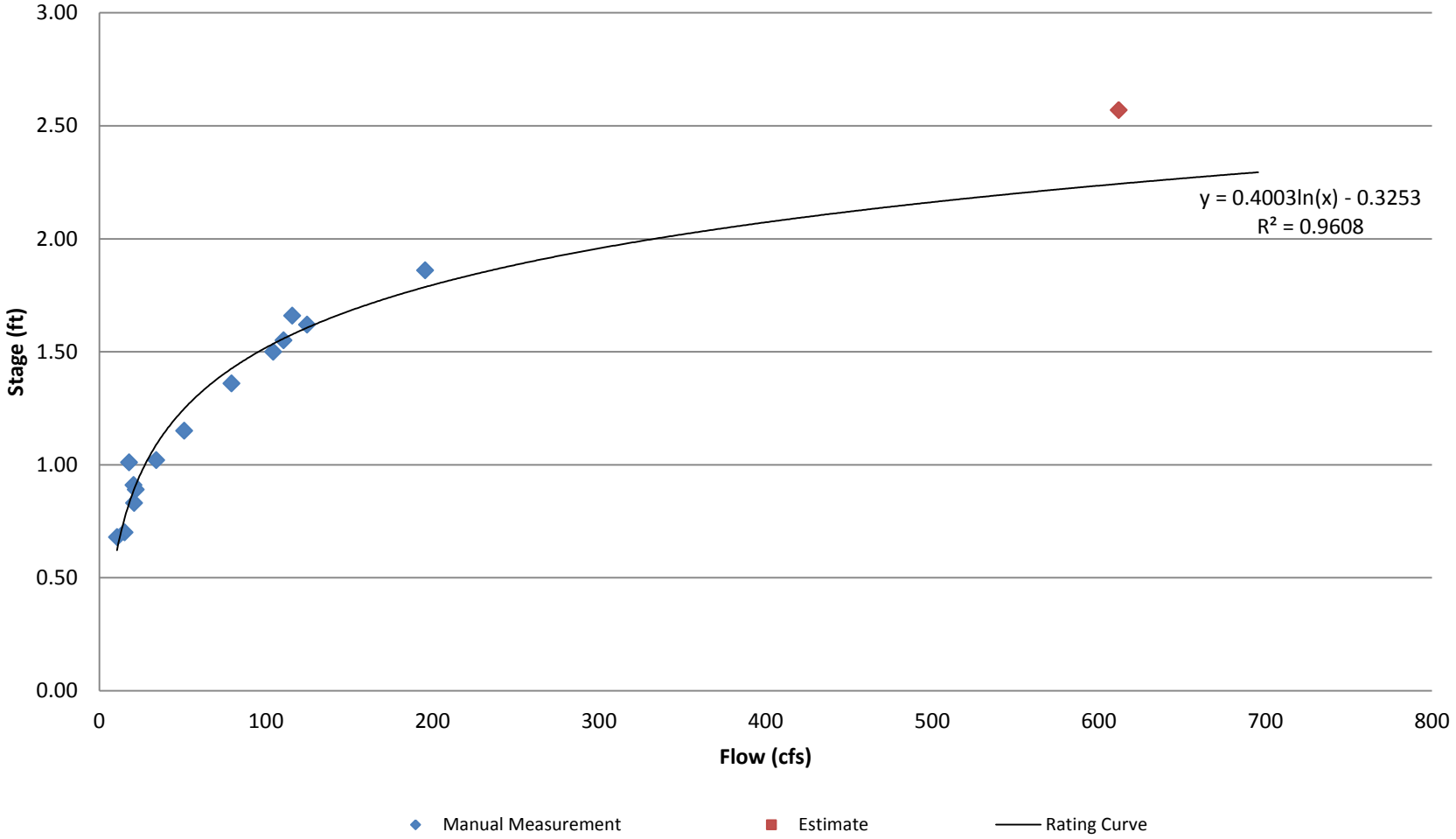
Figure 2
Water Resource Monitoring Sites
Black Butte Copper Project
Meagher County, Montana



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2.2 RESULTS

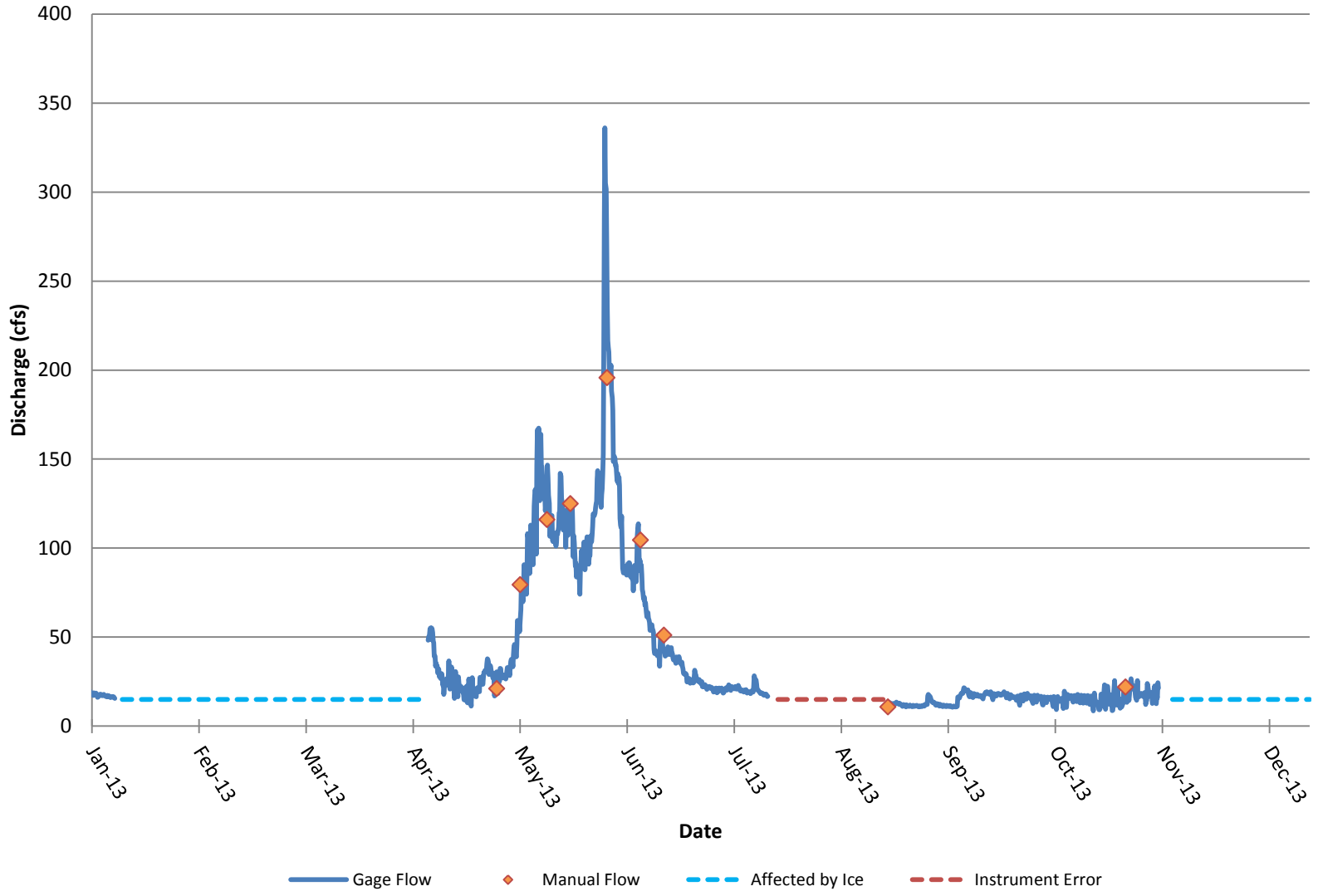
Quarterly surface water discharge at each monitoring station is summarized in Table 2. Many of the sites had ice covering over 50% of the stream during the March and November; resulting in discharge measurements being conducted at two sites during those monitoring events. Discharge in Sheep Creek ranged from approximately 7 to 150 cfs at the upstream site (SW-2) and 21 to 195 cfs at the downstream site (SW-1); during the 2013 quarterly water resource monitoring. Surface water discharge at sites on tributaries to Sheep Creek within the project area(SW-3 through SW-8) ranged from dry to 5.7 cfs. Sites on Black Butte Creek (SW-9, SW-10 and SW-11), which lies just to the southwest of the project area, had flows of 0.32 to 4.1 cfs during the 2013 quarterly monitoring.

TABLE 2. SURFACE WATER FLOW SUMMARY 2013

Site	March-13	June-13	August-13	November-13
SW-1	ICE	196.0	10.7	21.9
SW-2	ICE	156.4	7.0	ICE
SW-3	ICE	0.38	0.08	ICE
SW-4	ICE	0.21	0.02	ICE
SW-5	DRY	0.66	DRY	DRY
SW-6	0.04	0.76	0.19	ICE
SW-7	DRY	0.05	0.004	DRY
SW-8	ICE	5.72	0.22	ICE
SW-9	0.32	2.5	0.5	0.56
SW-10	ICE	1.66	0.36	ICE
SW-11	ICE	4.08	0.43	ICE

Notes: units: cfs, ICE – ice on >50% of surface

A detailed depiction of the flows on Sheep Creek during 2013 is shown on the continuous hydrograph from the SW-1 stream gaging station (Figure 4). Hydrographs from the baseline monitoring (2011 to 2013) were developed for each surface water monitoring site from manual flow measurements and are included in Appendix A. In general, discharge at most surface water sites were similar to the hydrograph for Sheep Creek. The lowest discharge was in late summer (August) and many sites had the lowest recorded discharge for the



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baseline surface water monitoring during 2013. The maximum discharge was measured in June during 2013. Maximum discharges at most sites were within the range of flows from the two previous years. Flow monitoring results for each of the monitoring sites are summarized in Table 2. Base flows showed decreasing trends at all surface water sites from the fall of 2011 to the fall of 2013. The lower base flows were likely a result of less precipitation in the region than in the previous two years. The timing and magnitude change of flows in Sheep Creek were commensurate with the flows measured at Smith River USGS Gage 06077200.

Water quality data for each site is tabulated in Appendix B. 2013 surface water results show neutral to slightly alkaline pH values (6.92 to 8.49 with an average of 8.11), and low to moderate specific conductance (50 to 435 µmhos/cm with an average of 355 µmhos/cm). Major ion chemistry is dominated by calcium and bicarbonate. Metals data show some infrequent excursions above the Circular DEQ-7 (MDEQ, 2012) water quality standard for aluminum, iron and lead during 2013 monitoring events.

- Dissolved aluminum concentrations exceeded the aquatic life standard during March, 2013 at SW-6.
- Total recoverable lead results exceeded the aquatic life standard during March 2013 at SW-6.
- Dissolved aluminum concentrations exceeded the aquatic life standard during June, 2013 at SW-1, SW-2, SW-5 and SW-11.
- Total recoverable iron concentrations exceeded the aquatic life standard during June, 2013 at SW-1, SW-2 and SW-5.

3.0 GROUNDWATER

3.1 MONITORING SUMMARY

The proposed decline and mine (Figure 2) will penetrate dolomitic and silicic shales of the Newland Formation. The shale bedrock formations have a thin colluvial cover over most upland areas, but are overlain by thicker Tertiary deposits along the flanks of the major drainages. Quaternary alluvial deposits are present beneath the stream channels and along the axes of the major drainages.

An initial set of paired monitoring wells (MW-1A and -1B) was installed for baseline groundwater monitoring in June 2011. These wells were completed immediately upgradient of the Sheep Creek hay meadows in unconsolidated Tertiary clayey gravel deposits and in the underlying shallow bedrock groundwater system. A second set of paired monitoring wells (MW-2A and -2B) were completed in November near Coon Creek in unconsolidated clayey gravels and underlying shallow bedrock. An additional monitoring well (MW-3) was completed in November 2011 near the proposed terminus of the exploration adit within the sulfide ore body. A third set of paired monitoring wells (MW-4A and MW–4B) was completed in May 2012 in the hay meadow field north of the proposed mine portal near Sheep Creek. Wells MW-4A and MW-4B were installed in the shallow alluvial gravels and shallow bedrock to provide baseline data between the project area and Sheep Creek. In November 2013 four monitoring wells (MW-6A, MW-6B, MW-7 and MW-8) were installed in the proposed LAD area. Paired monitoring wells MW-6A and MW-6B were completed within approximately 40 feet of each other and approximately 10 feet from an unnamed tributary to Little Sheep Creek. Well MW-6A was completed in deeply weathered shale to a depth of 15 feet below ground surface (bgs). Monitoring well MW-7 was completed to the west of MW-6A and is located just downgradient of the proposed underground LAD system. Well MW-8 was completed to the southwest of MW-7 in the center of the southern portion of the proposed underground LAD system in the Newland Formation. Well locations are shown in Figure 2 and well completion data is summarized in Table 3.

TABLE 3. WELL COMPLETION DETAILS

WELL NAME	Northing (meters)	Easting (meters)	Ground Surface Elev. (feet amsl)	Measuring Point Elev. (feet amsl)	Total Depth (feet, bgs)	Perforated/ Screen Interval (feet, bgs)	Gravel/Sand Pack Interval (feet, bgs)
	UTM Zone 12 North						
Monitoring Wells							
MW1A	5180841.6	506935.2	5635.81	5637.73	38	25 - 34	25 - 34
MW1B	5180845.5	506934.2	5636.14	5637.90	98	88 - 98	88 - 98
MW2A	5180331.9	506598.2	5743.72	5745.31	62	52 - 62	47 - 62
MW2B	5180328.7	506597.0	5743.44	5745.53	80	70 - 80	65 - 80
MW3	5180740.2	506484.1	5760.06	5762.17	305	285 - 305	278 - 305
MW4A	5180855.4	507201.5	5610.12	5612.12	23	14-23	011-59
MW4B	5180858.5	507200.1	5610.07	5612.07	59	39-59	37-59
MW-6A	5179492.85	507809.18	5680.08	5681.87	15	5-15	3-15
MW-6B	5179490.71	507792.76	5683.41	5685.31	50	40-50	37-50
MW-7	5179500.71	507451.70	5747.48	5749.46	50	40-50	37-50
MW-8	5179398.31	507036.00	5809.10	5810.93	80	70-80	67-80
Test Wells							
PW1	5180698.40	506301.42	5912.07	5913.74	213	140-211	108-213
PW2	5180865.03	506443.15	5793.08	5794.88	215	132 - 212	121 - 212
PW3	506846.43	5180479.42	5655.21	5657.42	131	90-127	80-130
PW4	506901.79	5180688.26	5678.13	5680.01	242	200-239	191-242
PW-5	5181172.77	506490.68	5913.22	5915.49	555	515-555	510-555
PW-6	5181085.67	506477.44	5895.43	5897.40	1204	1164-1204	1159-1209
PW-7	5180867.59	507122.89	5609.11	5611.15	1341	1301-1341	1291-1341

In addition to the monitoring wells, seven test wells have been installed to provide information on the hydrologic characteristics of the bedrock. Two of the test wells (PW-1 and PW-2) were installed in November 2011 and two additional test wells (PW-3 and PW-4) were installed in March 2012. Three new test well (PW-5, PW-6 and PW-7) were installed in 2013 to provide additional information on hydrologic characteristics the proposed mine will encounter. More detailed information regarded the wells can be found in the Hydrological and Geochemical Assessment of Proposed Underground LAD Area Black Butte Copper Project report (Hydrometrics, 2013(B)). Water level and water quality data were collected at PW-1 through PW-4 during aquifer testing; however these wells are not routinely monitored during quarterly baseline monitoring events. Wells PW-5 through PW-7 have not been sampled. Samples will be collected from these wells when aquifer tests are conducted on them (scheduled for 2014).

3.2 RESULTS

Potentiometric water level data from the fourth quarter of 2013 are compiled in Figure 5 and show an eastward trending groundwater flow direction in the bedrock groundwater system which is consistent with the earlier Cominco results (Chen-Northern, 1989) as well as previous years. The potentiometric contours indicate a hydraulic gradient range of approximately 0.05 for wells to the south near the proposed mine portal and 0.09 to the north near MW-3 and MW-1B. Paired wells MW-1A and -1B have a strong downward gradient during all monitoring events with a head differential between the two wells of roughly 15 feet. Paired wells MW-6A and -6B also showed a downward gradient with a head difference of 3.13 feet. All of the other paired wells show upward gradients with head differences between the paired wells of 0.05 to 0.3 feet.

The groundwater quality field data and analytical results are compiled in Appendix C. Groundwater in the shallow alluvial wells and in shallow bedrock wells is calcium/magnesium bicarbonate type water with near neutral pH and moderately low dissolved solids. One exception is well MW-1B, which is a calcium/magnesium sulfate type water with a lower pH range (6.07 to 6.32) and moderate dissolved solids (394 to 416 mg/L).

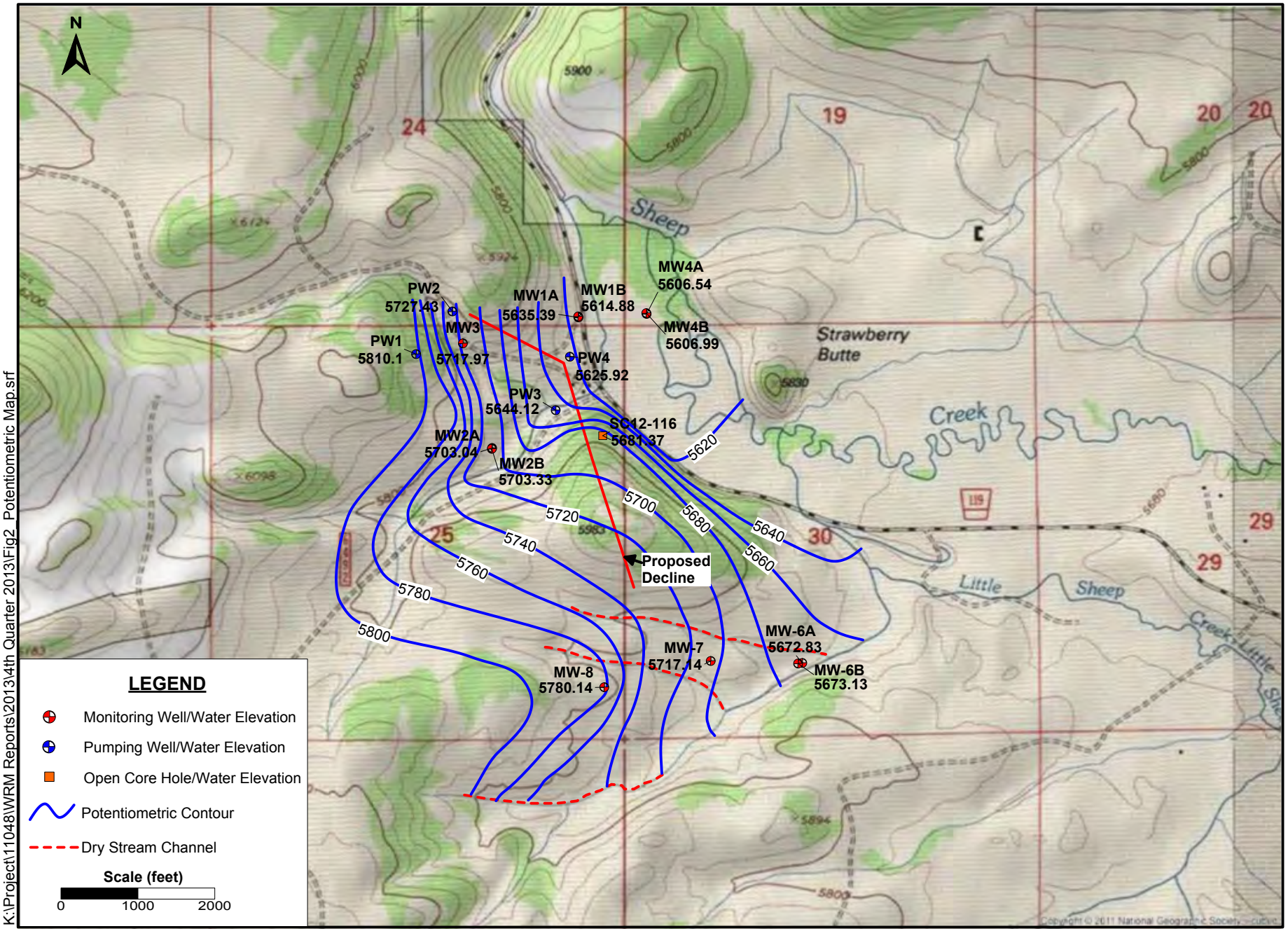

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Figure 5
November 2013 Potentiometric Map
Black Butte Copper Project
Meagher County, Montana

The water quality at MW-1B is similar to MW-3 and test well PW-4, both of which are completed in the sulfide ore zone.

Wells completed in shallow unconsolidated overburden deposits include MW-1A, MW-2A and MW-4A. With the exception of one unusually low reading in August at MW-4A of 6.24, these wells have neutral pH water (6.85-7.43) with low to non-detectable concentrations of dissolved metals. MW-1A, however, periodically exhibits variable water quality with some excursions of arsenic, barium, lead, and thallium above the Human Health standards. Well MW-1A is screened in fine-grained sediments and has very high turbidity present in the water during sampling events. Monitoring events where metals are detected at higher concentrations at this well may reflect breakthrough of particulate through the filters due to the very high turbidity. All monitoring events in 2013 for MW-1A were below Human Health standards for all constituents.

Wells completed in shallow bedrock above the sulfide ore zone include MW-2B, MW-4B, MW-6A, MW-6B, MW-7, MW-8 and test wells PW-1, PW-2 and PW-3. Historically, dissolved trace constituents that have been at detectable concentrations in the shallow bedrock wells include arsenic, barium, iron, manganese, strontium, thallium, uranium and zinc. These constituents were also above detectable limits in 2013 with the addition of some very low levels of Selenium observed in MW-2B. MW-2B exceed the Human Health standard for Thallium at all monitoring events (0.0037-0.0040 mg/L). All other parameters and wells in the shallow aquifer meet applicable regulatory limits.

Wells completed in the upper sulfide zone (MW-3 and PW-4) have the highest concentrations of dissolved solids and sulfate compared to the other wells. As previously discussed MW-1B has similar water quality to these ore zone wells. The pH of water at these ore zone wells and well MW-1B is slightly lower than the other well sites with pHs ranging from 6.2 to 7.1. Dissolved trace constituents that were present at detectable concentrations in 2013 in the ore zone wells include arsenic, barium, cobalt (MW-1B only), iron, manganese, mercury, nickel, strontium, thallium, and zinc. Historically, uranium has also been present at detectable concentrations at these wells. Strontium concentrations are highly elevated (14.6

to 15.0 mg/L) at MW-3 and exceed the human health standard of 4 mg/L. Arsenic concentrations at MW-1B, MW-3 and PW-4 range from 0.061 mg/L to 0.067 mg/L and exceed the human health standard of 0.010 mg/L. Arsenic speciation of samples from MW-1B and MW-3 indicate that the majority of the arsenic is present in reduced form as As (III). Concentrations of thallium at MW-1B (0.013 mg/L to 0.015 mg/L) also exceed human health groundwater standard of 0.002 mg/L. While thallium is also present at detectable concentrations in MW-3 and PW-4 it does not exceed the human health standard.

4.0 SPRINGS AND SEEPS

4.1 MONITORING SUMMARY

Spring and seep inventories were performed in July 2011 October 2011 and July 2012 to document and inventory existing springs and seeps within a 1 mile radius of the proposed exploration decline site. The inventories identified 10 undeveloped springs, 6 developed springs (for stock water) and 10 seepage sites within the inventory area (Figure 6). A description of each site and locations are listed in Table 4. The sites identified as seeps are locations where there is diffuse seepage over a broad area with flow rates too low to measure at the point of discharge. The springs, in contrast, originate in a discrete area and discharge at measurable flow rates. The majority of the identified sites consist of small springs or seeps located in ephemeral channels in the headwaters of small unnamed tributaries. These springs form small boggy areas with limited flow and generally re-infiltrate within a few hundred feet downstream. A number of these springs have been developed for stock watering (indicated by a DS designator) and feed small livestock watering tanks. Slightly larger spring and seep areas were identified along the lower reaches of Coon Creek and on Little Sheep Creek and support perennial flow on these lower stream reaches. Flows at springs and seeps are taken annually between May and October.

4.2 RESULTS

The spring flows during 2013 ranged between 0.25 gpm and 116.69 gpm with an average flow of 14.46 gpm. Similar to the shallow alluvial and bedrock wells, major ion chemistry in the springs is dominated by calcium, magnesium, and bicarbonate. The pH range for 2013 was between 6.2 and 8.14 with an average of 7.28. This is consistent with historical pH values. Trace constituents were all below DEQ-7 groundwater human health standards, with most constituents being near or below the detection limit. Field data and water quality results from the 2013 spring and seep monitoring are included in Appendix D.

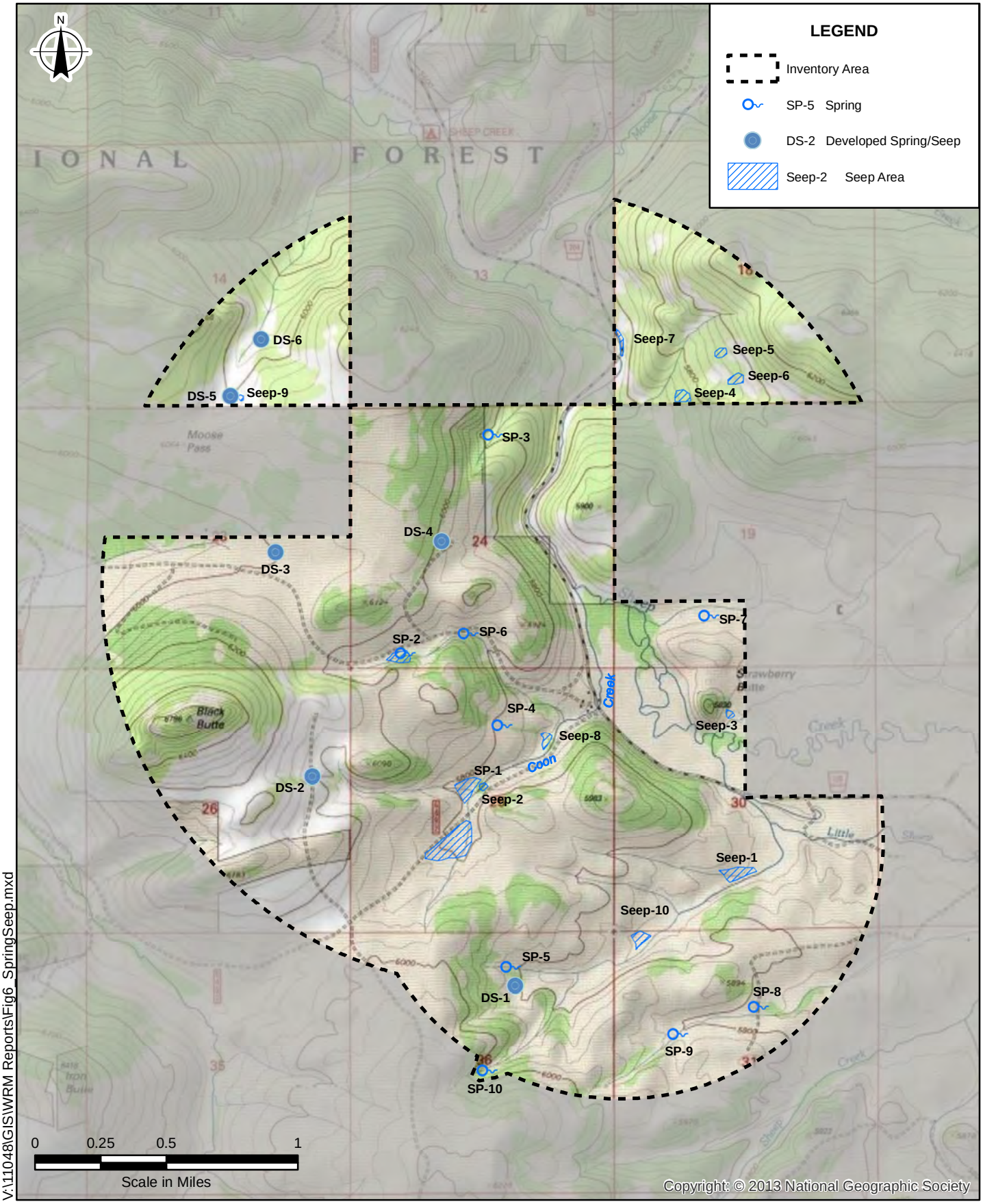

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Figure 6
Baseline Sping and Seep Sites
Black Butte Copper Project
Meagher County, Montana

TABLE 4. SUMMARY OF SPRING AND SEEP SITES

Site	Location	Easting	Northing	Comments
		UTM - WRS 1984 (meters)		
SPRINGS				
SP-1	Spring/Seep on west bank of Coon Creek approximately 150 feet downgradient of surface water site SW-4	506283.07	5180101.39	Large seep area that produces significant flow. Multiple flow channels, took flow from three channels (SP-1a, SP-1b, and SP-1c), estimated flow between channels.
SP-2	Spring in small unnamed tributary drainage to lower Coon Creek near mine site	505833.97	5180907.34	Spring/Seep area with significant discharge from discrete point and additional flow from surrounding seep (SP-2a). Flow begins 400-500' downgradient in October (SP-2b).
SP-3	Spring in small unnamed tributary to Sheep Creek north of proposed mine site	506370.58	5182241.55	Spring in drainage, discharges from discrete point. Gossan present in drainage.
SP-4	Spring southwest of mine site and south of SP-2 drainage, tributary to Coon Creek	506425.17	5180468.94	Spring/Seep area with significant discharge from discrete point and additional flow from surrounding seep.
SP-5	Spring in upper Little Sheep Creek drainage (at Surface water W-7 location)	506478.82	5178985.42	Spring in drainage, discharges from discrete point. Quarterly surface water monitoring site.
SP-6	Un-named tributary drainage near mine site, located approximately 1000 feet downgradient of SP-2.	506219.58	5181027.89	Small spring discharging to SP-2 drainage; spring emerges from beneath gossan boulder.
SP-7	North side of Strawberry Butte above tributary drainage to Sheep Creek	507693.69	5181137.92	Small spring feeding spring cr. north of stawberry butte.
SP-8	North of un-named tributary drainage to Little Sheep Creek, approximately 0.75 miles south of FS road	507995.89	5178745.24	Spring and seep area near dead aspen trees. Spring is well defined. Seep area dry during late summer.
SP-9	North of un-named tributary drainage to Little Sheep Creek, approximately 0.3 miles southwest of SP-8	507502.03	5178577.92	Small spring discharging to upstream of same drainage spring SP-8 is in. Heavy livestock damage to drainage.
SP-10	South fork of un-named tributary drainage south of proposed portal	506335.42	5178351.00	Small spring at head of drainage south of SP-6.
DS-1	Developed spring, near surface water site SW-7 in upper drainage of Little Sheep Creek trib.	506507.08	5178870.81	Newly developed Spring - in construction in July; standing water but no measurable flow. Surface flow next to box, into trough, and seep downstream of spring area in October.
DS-2	Developed seep/spring, southeast side of Black Butte upgradient of SP-1	505263.49	5180150.61	Developed spring/seep used to gravity feed stocktank; standing water in sump. No measurable flow.
DS-3	South of Moose Pass in Butte Ck drainage (Upgradient of surface water site SW-5)	505037.62	5181520.61	Developed spring/seep used to gravity feed stocktank. Standing water ~5 ft bgs in sump, piped to tank; Standing water around and downgradient of tank in October.
DS-4	Unnamed tributary to Sheep Creek in Section 24, north of mine area & southeast of Moose Pass	506056.53	5181588.64	Developed spring/seep used to gravity feed stocktank. Dispersed flow around spring box in October; Depth to water level in box = 0.8'.
DS-5	Unnamed tributary to Sheep Creek North of Moose Pass	504761.45	5182484.96	Developed spring feeding large stock tank on USFS land, north of Moose Pass, in Sec. 14.
DS-6	Unnamed tributary to Sheep Creek North of Moose Pass downstream of DS-5	504949.66	5182827.88	Developed Spring, Abandoned.
SEEPS				
Seep-1	Seep on trib to Little Sheep Creek (approximately 15' west of SW-6)	507876.09	5179543.49	Large seep area that produces moderate flow in July, near old log cabin. Damp ground in October, but no standing water.
Seep-2	Seep on east bank of Coon Creek (approximately 150 feet downgradient of SW-4)	506317.54	5180081.71	Seep located on opposite bank of Coon Creek, across from SP-1. No Channelized flow, estimate flow ~5 gpm.
Seep-3	Seep located on eastern side of Strawberry Butte	506699.40	5180382.69	Small seep located on SE side of Strawberry Butte, no measurable flow.
Seep-4	Seep on hillside in SW Qrt of Sec 18. (NE inventory area)	507530.76	5182479.78	Seep downhill of Seeps 5 & 6 on USFS land in Sec. 18. Large area within aspen trees. No noticeable flow. Significantly less wet area in October.
Seep-5	Seep on hillside in SW Qrt of Sec 18. (NE inventory area)	507767.87	5182746.31	Seep on hillside in Sec. 18, minimal flow within seep area (~0.5 gpm), reinfiltrates approx. 25' downhill.
Seep-6	Seep on hillside in SW Qrt of Sec 18. (NE inventory area)	507869.98	5182590.54	Seep on hillside in Sec. 18, minimal flow within seep area (~2-3 gpm), reinfiltrates approx. 150' downhill.
Seep-7	Seep on eastern side of County Road 119 approximately 200 feet north of bridge (SW-1)	507160.39	5182789.57	Seep at bottom of hill side, along road cut.
Seep-8	Seep area on hillside adjacent to lower Coon Creek	506703.64	5180385.44	Wet area with no measurable flow.
Seep-9	Seep in unnamed trib to Sheep Creek North of Moose Pass (downgradient of DS-5)	504829.31	5182473.30	Wet area with no measurable flow.
Seep-10	Spring in upper Little Sheep Creek trib. (upstream of Seep 1)	505442	5180097	Wet area with no measurable flow.

5.0 REFERENCES

Chen-Northern, 1989. Sheep Creek Project – Hydrology Screening Study. June 1989.

EPA, 1983. Methods for Chemical Analysis of Water and Wastes. EPA-600/14-79-020. Revised March 1983.

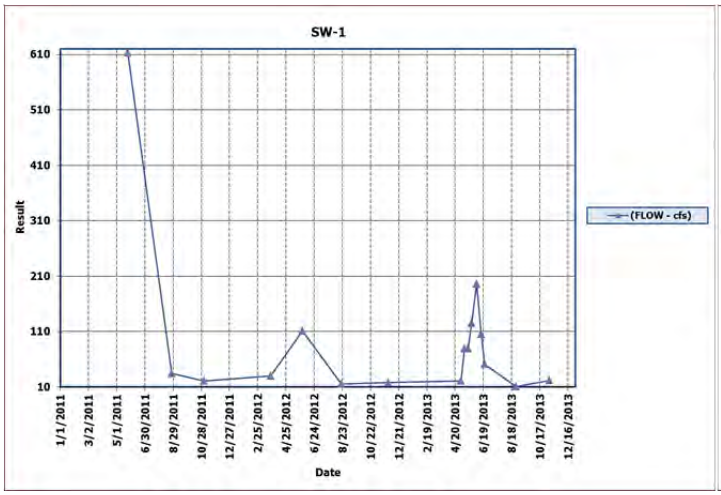
Hydrometrics, Inc., 2013(A). Water Resources Monitoring Field Sampling and Analysis Plan, Black Butte Copper Project. March 2013.

Hydrometrics, Inc., 2013(B). Hydrological and Geochemical Assessment of Proposed Underground LAD Area Black Butte Copper Project. November 2013.

MDEQ, 2012. Circular DEQ-7. Montana Numeric Water Quality Standards. October 2012.

APPENDIX A

SURFACE WATER HYDROGRAPHS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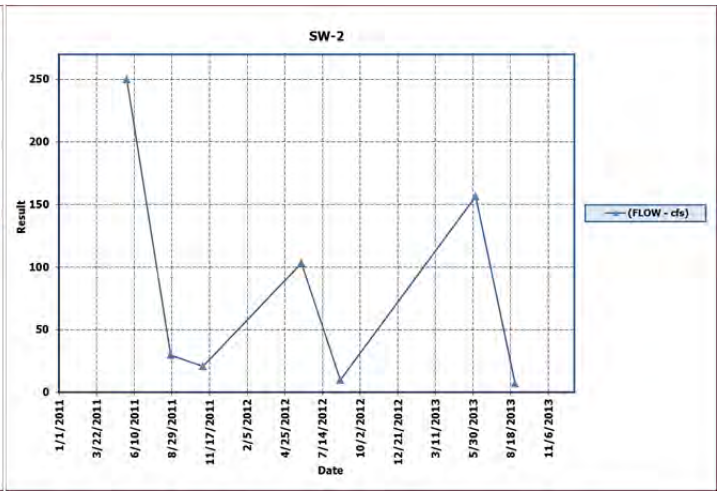
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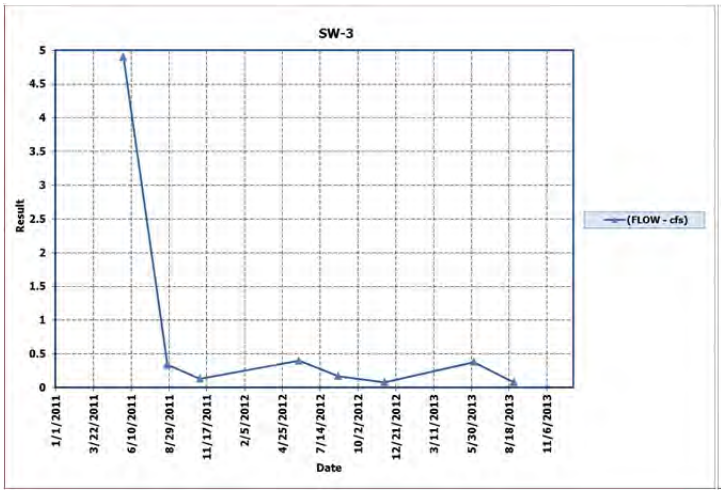
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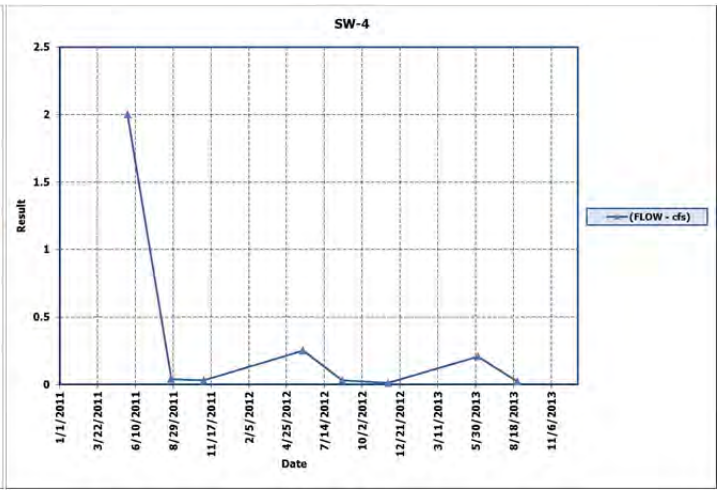
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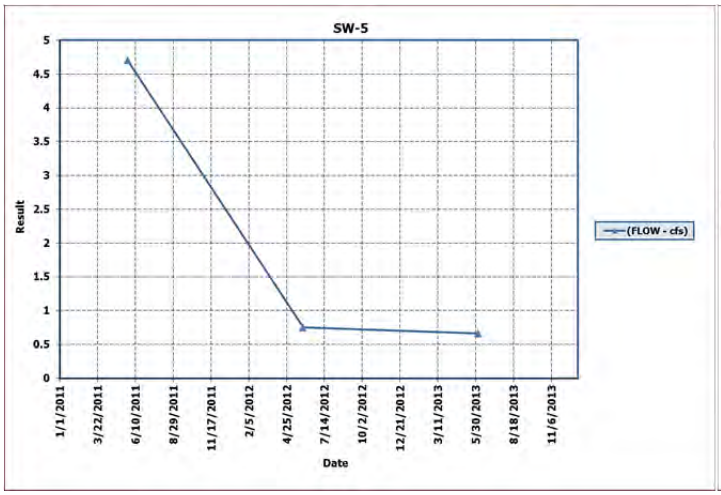
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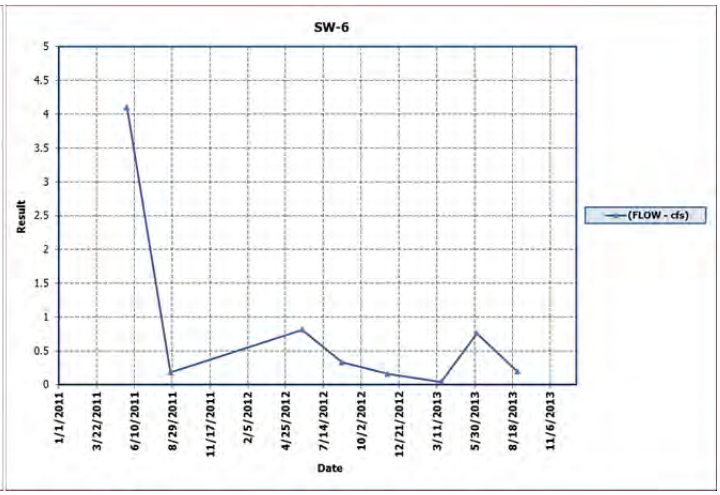
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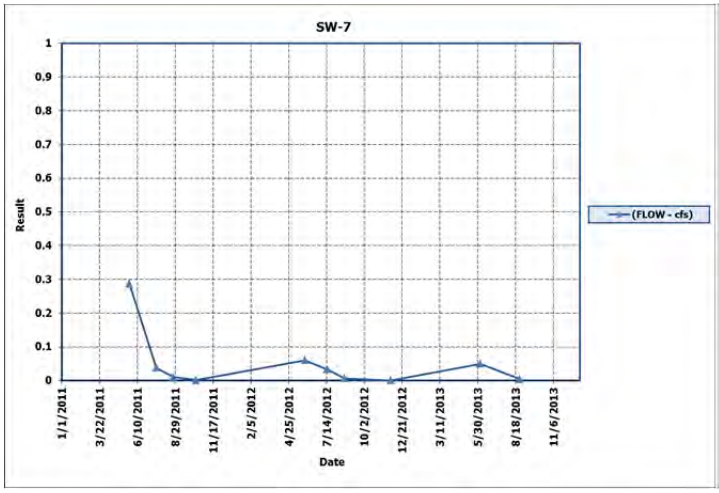
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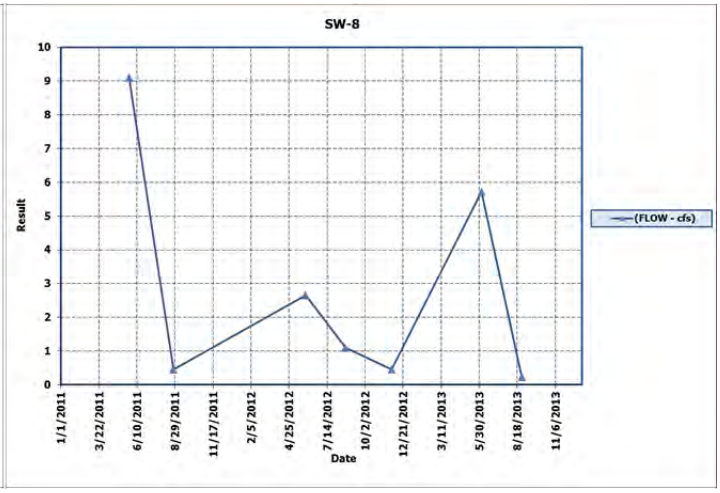
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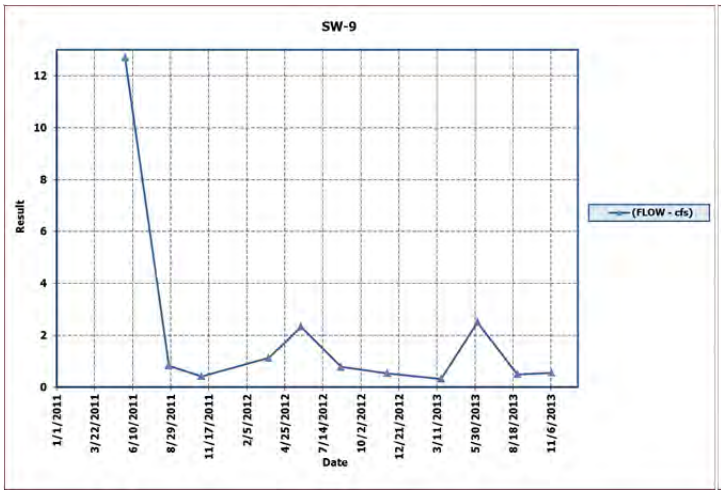
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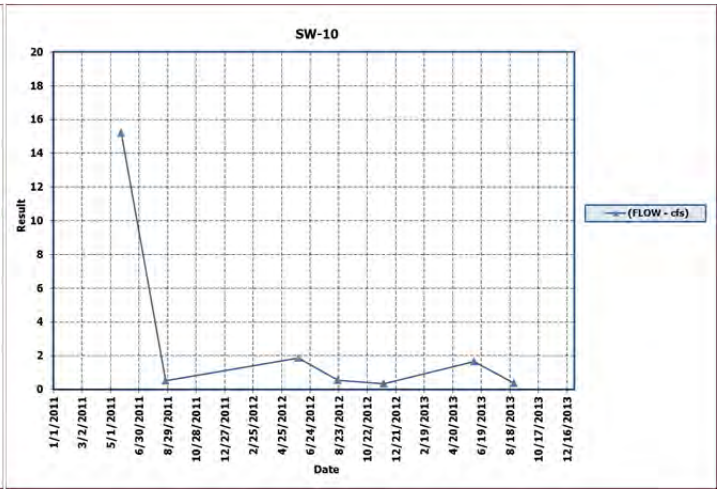
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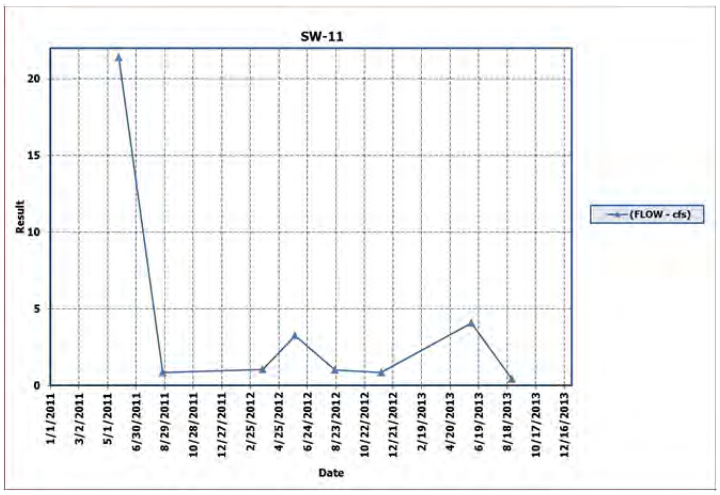
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APPENDIX B

SURFACE WATER QUALITY DATA

SURFACE WATER QUALITY RESULTS

	Field Parameters						General Parameters		Common Ions (mg/L)									Trace Constituents (mg/L)																				
																		Dissolved	Total Recoverable																				
Site Code	Date	Flow (CFS)	pH (s.u.)	Specific Conductance (umhos/cm)	Temp. (C)	Dissolved Oxygen (mg/L)	Total Suspended Solids	Total Dissolved Solids	Alkalinity as CaC03	Sulfate	Chloride	Fluoride	Calcium	Magnesium	Sodium	Potassium	Nitrate and Nitrite as N (mg/L)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Uranium	Zinc
SW-1	3/20/2013	ICE	8.4	312	0.03	12.5	< 10	186	180	8	2	< 0.1	50	13	2	1	0.03	0.033	< 0.0005	< 0.001	0.108	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.17	< 0.0003	0.015	0.0000050	< 0.002	< 0.001	< 0.0002	< 0.02	0.127	< 0.0002	< 0.002	< 0.002
SW-1	6/4/2013	196.0	8.07	189	6.9	10.14	43	107	98	4	2	< 0.1	27	7	2	1	0.01	**0.138**	< 0.0005	< 0.001	0.099	< 0.0008	0.00003	< 0.01	< 0.01	0.002	**1.07**	0.0008	0.031	< 0.0000050	< 0.002	0.002	< 0.0002	< 0.02	0.101	< 0.0002	0.006	0.006
SW-1 DUP	6/4/2013	--	--	--	--	--	50	106	98	4	2	< 0.1	27	7	2	1	0.02	**0.107**	< 0.0005	< 0.001	0.099	< 0.0008	< 0.00003	< 0.01	< 0.01	0.002	**1.12**	0.0008	0.029	< 0.0000050	< 0.002	0.002	< 0.0002	< 0.02	0.104	< 0.0002	0.005	0.005
SW-1	8/27/2013	10.67	8.3	291	12.7	9.85	< 10	154	160	6	2	0.1	41	12	2	1	< 0.01	< 0.009	< 0.005	0.001	0.120	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.13	< 0.0003	0.013	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.0005	0.115	< 0.0002	< 0.002	< 0.002
SW-1	11/6/2013	21.92	8.3	323	0.08	6.32	< 10	182	180	7	2	< 0.1	47	13	2	1	0.01	< 0.009	< 0.0005	< 0.001	0.104	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.21	< 0.0003	0.014	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.122	< 0.0002	0.002	0.002
SW-2	3/20/2013	FROZEN	8.31	311	-0.03	11.62	< 10	162	180	8	2	< 0.1	50	13	2	1	0.05	0.044	< 0.0005	< 0.001	0.095	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.22	< 0.0003	0.011	0.0000086	< 0.002	< 0.001	< 0.0002	< 0.02	0.129	< 0.0002	< 0.002	< 0.002
SW-2	6/4/2013	156.4	7.66	185	3.8	10.63	47	112	95	3	2	< 0.1	27	6	2	1	0.01	**0.114**	< 0.0005	< 0.001	0.092	< 0.0008	< 0.00003	< 0.01	< 0.01	0.002	**1.14**	0.0008	0.029	< 0.0000050	< 0.002	0.002	< 0.0002	< 0.02	0.0976	< 0.0002	0.005	0.005
SW-2	8/27/2013	7.01	8.16	266	12.1	9.47	< 10	165	140	5	2	< 0.1	37	10	2	1	< 0.01	0.013	< 0.005	< 0.001	0.128	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.15	< 0.0003	0.011	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.0005	0.108	< 0.0002	< 0.002	< 0.002
SW-2	11/6/2013	ICE	8.04	320	-0.02	6.35	< 10	175	180	7	2	< 0.1	47	12	2	1	0.03	< 0.009	< 0.0005	< 0.001	0.091	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.21	< 0.0003	0.012	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.121	< 0.0002	< 0.002	< 0.002
SW-3	3/20/2013	FROZEN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-3	6/4/2013	0.38	8.27	363	8.0	10	14	206	190	15	1	0.2	44	21	2	1	0.05	0.009	< 0.0005	< 0.001	0.149	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.39	0.0010	0.011	< 0.0000050	< 0.002	< 0.001	< 0.0002	< 0.02	0.0838	< 0.0002	0.004	0.004
SW-3	8/27/2013	0.08	8.39	408	14.5	8.4	13	209	210	18	2	0.2	48	24	2	1	0.05	< 0.009	< 0.005	< 0.001	0.168	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.26	0.0007	0.008	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.0005	0.119	< 0.0002	0.003	0.003
SW-3 DUP	8/27/2013	--	--	--	--	--	< 10	209	210	18	2	0.2	48	24	2	1	0.04	< 0.009	< 0.005	< 0.001	0.167	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.19	0.0005	0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.0005	0.118	< 0.0002	0.003	0.003
SW-3	11/6/2013	ICED	8.28	390	0.7	5.95	< 10	221	200	23	2	0.2	46	24	2	1	0.05	< 0.009	< 0.0005	< 0.001	0.139	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.08	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.103	< 0.0002	< 0.002	< 0.002
SW-3 DUP	11/6/2013	--	--	--	--	--	< 10	218	200	24	2	0.2	46	24	2	1	0.05	< 0.009	< 0.0005	< 0.001	0.146	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.09	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.108	< 0.0002	0.002	0.002
SW-4	3/20/2013	FROZEN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-4	6/4/2013	0.208	7.96	338	5.3	9.63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-4	8/27/2013	0.02	8.32	382	15	8.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-4	11/6/2013	ICE	8.02	374	0.62	5.39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-5	3/20/2013	DRY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-5	6/4/2013	0.66	7.29	50	6.9	9.66	< 10	74	24	1	< 1	< 0.1	7	2	1	1	0.06	**0.692**	< 0.0005	0.001	0.184	< 0.0008	< 0.00003	< 0.01	< 0.01	0.003	**1.37**	0.0005	0.011	0.0000062	< 0.002	0.003	< 0.0002	< 0.02	0.0280	< 0.0002	0.007	0.007
SW-5	8/28/2013	DRY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-5	11/7/2013	DRY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-6	3/20/2013	0.04	8.37	366	1.06	11.48	98	200	210	14	1	0.2	49	22	3	< 1	0.10	< 0.009	< 0.0005	< 0.001	0.160	< 0.0008	0.00005	< 0.01	< 0.01	< 0.002	**1.85**	**0.0023**	0.067	0.000016	< 0.002	0.001	0.0003	< 0.02	0.170	< 0.0002	0.008	0.008
SW-6	6/3/2013	0.76	8.01	366	9.2	9.4	22	254	190	18	< 1	0.2	45	19	3	< 1	0.09	0.012	< 0.0005	< 0.001	0.112	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.79	0.0007	0.029	< 0.0000050	< 0.002	< 0.001	< 0.0002	< 0.02	0.141	< 0.0002	0.003	0.003
SW-6	8/29/2013	0.19	6.92	414	7.6	10.77	11	218	240	12	1	0.2	53	24	3	< 1	0.04	< 0.009	< 0.005	< 0.001	0.126	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.39	0.0005	0.015	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.0005	0.177	< 0.0002	0.003	0.003
SW-6	11/6/2013	ICED	8.22	387	1.9	5.82	< 10	218	230	15	1	0.2	50	23	3	1	0.06	< 0.009	< 0.0005	< 0.001	0.132	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.05	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.169	< 0.0002	< 0.002	< 0.002
SW-7	3/20/2013	DRY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-7	6/4/2013	0.05	7.87	387	7.8	9.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-7	8/27/2013	0.0043	7.89	424.0	13.5	8.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-7	11/6/2013	NO MEAS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-8	3/20/2013	FROZEN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-8	6/4/2013	5.72	7.56	238	5.5	8.57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-8	8/28/2013	0.22	8.16	435	8.5	11.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-8	11/6/2013	ICE	8	426	0.04	5.61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-9	3/20/2013	0.32	8.24	396	2.1	11.64	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-9	6/4/2013	2.5	8.05	419	4.7	10.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-9	8/27/2013	0.5	8.26	433	13.1	9.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-9	11/6/2013	0.56	8.11	420	0.9	5.73	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-10	3/20/2013	FROZEN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-10	6/4/2013	1.66	8.18	417	5.1	10.21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-10	8/27/2013	0.36	8.49	428	18.6	8.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-10	11/7/2013	ICE	8.03	417	0	9.97	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SW-11	3/20/2013	ICE	8.4	387	0.14	11.95	< 10	215	210	24	2	0.2	51	23	3	1	0.19	< 0.009	< 0.0005	< 0.001	0.113	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.07	< 0.0003	< 0.005	0.0000094	< 0.002	< 0.001	< 0.0002	< 0.02	0.161	< 0.0002	< 0.002	< 0.002
SW-11	6/4/2013	4.08	8.16	312	6.6	10.1	26	172	160	15	1	0.2	39	17	2	1	0.04	**0.139**	< 0.0005	< 0.001	0.120	< 0.0008	< 0.00004	< 0.01	< 0.01	< 0.002	0.87	0.0008	0.022	< 0.0000050	< 0.002	0.001	< 0.0002	< 0.02	0.135	< 0.0002	0.006	0.006
SW-11	8/28/2013	0.43	8.19	424	12.2	8.68	< 10	223	230	17	2	0.2	52	25	3	1	0.04	< 0.009	< 0.005	< 0.001	0.110	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.20	< 0.0003	0.007	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.0005	0.183	< 0.0002	0.002	0.002
SW-11	11/7/2013	ICE	8.05	426	0.06	7.03	< 10	243	230	27	2	0.2	54	26	3	1	< 0.01	< 0.009	< 0.0005	< 0.001	0.095	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.08	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.169	< 0.0002	< 0.002	< 0.002
DEQ-7 SWAquaticLifeAcute		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.75**	--	**0.34**	--	--	**0.001592**	**1.42457**	--	**0.01068**	--	**0.05661**	--	**0.0017**	--	**0.36989**	**0.02**	**0.00247**	--	--	--	**0.0939**
DEQ-7 SWAquaticLifeChronic		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.087**	--	**0.15**	--	--	**0.000219**	**0.06809**	--	**0.0073**	**1**	**0.00221**	--	**0.00091**	--	**0.04089**	**0.005**	--	--	--	--	**0.0939**
DEQ-7 SWHumanHealthStandards		--	--	--	--	--	--	--	--	--	--	**4**	--	--	--	--	**10**	--	**0.0056**	**0.01**	**1**	**0.004**	**0.005**	**0.1**	--	**1.3**	--	**0.015**	--	**0.00005**	--	**0.1**	**0.05**	**0.1**	--	**0.0024**	**0.03**	**2**

Hardness dependent standards were calculated at 75 mg/L hardness, bolded excendences noted in table are based on hardness for each sample.

APPENDIX C

GROUNDWATER QUALITY DATA

GROUNDWATER QUALITY RESULTS

		Field Paramters					Common Ions (mg/L)												TOTAL METAL SPECIATION (ug/L)	
Site Code	Date	Static Water Level (ft below MP)	PH (s.u.)	Specific Conductance (umhos/cm)	Temp C	Dissolved Oxygen mg/L	Total Dissolved Solids	Alkalinity as CaC03 (mg/L)	Bicarbonate as HC03 (mg/L)	Carbonate as C03 (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Nitrate and Nitrite as N (mg/L)	TOTAL Arsenic-III (ug/L)	TOTAL Arsenic-V (ug/L)
MW-1A	3/21/2013	7.04	7.43	336	6.33	6.57	184	180	--	--	12	2	0.2	44	18	2	1	0.42	--	--
MW-1A	6/3/2013	6.21	7.28	354	6.8	10.85	198	180	--	--	12	1	0.2	42	18	3	1	0.41	--	--
MW-1A	8/26/2013	7.43	6.85	335	7.2	8.98	195	180	220	< 1	12	2	0.2	42	18	9	< 1	0.42	--	--
MW-1A	11/5/2013	7.34	7.21	335	6.7	5.35	192	180	--	--	12	2	0.2	41	18	3	1	0.45	--	--
MW-1B	3/21/2013	22.71	6.32	579	6.5	0.69	394	81	--	--	220	1	0.2	58	30	3	3	0.04	--	--
MW-1B	6/3/2013	21.73	6.13	619	7.2	0.98	416	84	--	--	230	2	0.2	57	31	3	3	0.06	--	--
MW-1B	8/26/2013	22.88	6.07	595.0	8.8	0.23	398	77	94	< 1	230	2	0.2	56	30	4	3	< 0.01	--	--
MW-1B	11/5/2013	23.02	6.2	594	6.6	0.25	409	94	--	--	240	2	0.2	58	31	3	3	< 0.01	--	--
MW-2A	3/21/2013	42.04	7.36	378	6.37	5.51	191	190	--	--	20	2	0.4	45	24	3	1	0.22	--	--
MW-2A	6/3/2013	41.92	7.2	392	6.6	8.25	214	200	--	--	20	2	0.4	42	23	3	1	0.21	--	--
MW-2A	8/26/2013	42.2	7.13	376	7.6	7.08	207	200	240	< 1	19	2	0.4	42	23	3	1	0.22	--	--
MW-2A	11/6/2013	42.28	7.14	376	6.5	4.34	206	200	--	--	20	2	0.3	43	23	3	1	0.22	--	--
MW-2B	3/21/2013	41.86	7.3	425	6.33	0.92	249	220	--	--	42	2	0.4	55	30	3	1	< 0.01	--	--
MW-2B	6/3/2013	41.6	7.24	497	6.7	1.23	287	230	--	--	47	2	0.4	54	31	3	2	< 0.01	--	--
MW-2B DUP	6/3/2013	--	--	--	--	--	277	230	--	--	47	2	0.4	55	31	3	2	< 0.01	--	--
MW-2B	8/26/2013	42.14	7.02	447	3	0.31	248	220	270	< 1	51	2	0.4	52	29	3	2	< 0.01	--	--
MW-2B	11/6/2013	42.23	7.15	440	6.3	1.09	250	220	--	--	42	2	0.4	50	28	3	2	< 0.01	--	--
MW-3	6/3/2013	31.59	6.99	883	9.4	0.16	607	220	--	--	280	2	0.7	82	55	16	3	0.01	--	--
MW-3	8/26/2013	31.8	6.77	852	10.3	0.14	578	220	270	< 1	280	2	0.7	83	56	16	3	< 0.01	--	--
MW-3 DUP	8/26/2013	--	--	--	--	--	585	220	270	< 1	280	2	0.7	83	55	16	3	< 0.01	--	--
MW-3	11/5/2013	44.2	7.09	831	8.8	2.09	589	220	--	--	280	2	0.7	84	56	16	3	< 0.01	--	--
MW-4A	3/21/2013	5.72	7.35	491	4.4	1.12	270	260	--	--	20	2	0.1	76	21	2	1	< 0.01	--	--
MW-4A	6/3/2013	3.36	6.95	534	4.7	1.6	294	280	--	--	20	3	0.2	78	21	3	1	< 0.01	--	--
MW-4A	8/27/2013	5.52	6.24	551	8.5	0.96	294	290	360	< 1	21	4	0.2	79	23	3	2	< 0.01	--	--
MW-4A	11/6/2013	5.65	7.18	504	7.6	1.14	296	280	--	--	19	3	0.1	76	22	3	2	< 0.01	--	--
MW-4B	3/21/2013	7.26	7.59	454	5.8	0.56	231	240	--	--	16	2	0.1	66	21	2	1	0.02	--	--
MW-4B DUP	3/21/2013	--	--	--	--	--	217	240	--	--	17	2	0.1	68	22	2	1	0.02	--	--
MW-4B	6/3/2013	3.02	7.48	504	6	1.88	275	260	--	--	21	2	0.1	70	22	3	2	< 0.01	--	--
MW-4B	8/27/2013	5.1	6.84	510	6.1	0.47	272	270	330	< 1	26	2	0.1	70	22	3	1	< 0.01	--	--
MW-4B	11/6/2013	5.35	7.39	449	5.9	1.59	259	250	--	--	19	2	0.1	66	22	2	2	< 0.01	--	--
MW-6A	11/6/2013	9.07	7.46	409	7.2	3.07	250	250	--	--	14	1	0.2	56	26	3	1	0.12	< 5	< 5
MW-6B	11/6/2013	12.2	7.45	445	6.1	4.6	236	240	--	--	19	2	0.6	51	24	9	2	0.11	< 5	< 5
MW-6B DUP	11/6/2013	--	--	--	--	--	240	240	--	--	19	2	0.6	51	24	9	2	0.11	< 5	< 5
MW-7	11/6/2013	32.29	7.55	561	6.3	2.09	314	240	--	--	79	5	0.7	58	35	4	3	< 0.01	< 5	< 5
MW-8	11/6/2013	30.74	7.9	312	6	0.87	166	170	--	--	16	< 1	0.3	28	23	4	1	0.01	< 5	< 5
DEQ-7 GWHumanHealthStandard		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**4**	**--**	**--**	**--**	**--**	**10**	**--**	

GROUNDWATER QUALITY RESULTS (Continued)

Site Code	Date	DISSOLVED TRACE CONSTITUENTS (mg/L)																			
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Uranium	Zinc
MW-1A	3/21/2013	1.19	< 0.0005	< 0.001	0.181	< 0.0008	< 0.00003	< 0.01	< 0.01	0.006	0.22	0.0026	< 0.005	0.000019	< 0.002	< 0.001	< 0.0002	< 0.02	0.117	0.0008	< 0.008	0.002
MW-1A	6/3/2013	1.01	< 0.0005	< 0.001	0.158	< 0.0008	< 0.00003	< 0.01	< 0.01	0.004	0.18	0.0018	< 0.005	< 0.0000050	< 0.002	< 0.001	0.0002	< 0.02	0.120	0.0003	< 0.008	0.003
MW-1A	8/26/2013	0.282	< 0.0005	< 0.001	0.166	< 0.0008	< 0.00003	< 0.001	< 0.01	0.004	0.20	0.0009	< 0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.110	0.0006	< 0.008	< 0.002
MW-1A	11/5/2013	0.037	< 0.0005	< 0.001	0.153	< 0.0008	< 0.00003	< 0.01	< 0.01	0.003	0.03	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	0.0002	< 0.02	0.103	0.0006	< 0.008	< 0.002
MW-1B	3/21/2013	< 0.009	0.0006	**0.061**	0.013	< 0.0008	< 0.00003	< 0.01	0.03	< 0.002	**23.4**	< 0.0003	**0.096**	0.0000086	< 0.002	0.012	< 0.0002	< 0.02	1.55	**0.0133**	< 0.008	0.015
MW-1B	6/3/2013	< 0.009	0.0009	**0.066**	0.012	< 0.0008	< 0.00003	< 0.01	0.03	< 0.002	**23.8**	< 0.0003	**0.091**	< 0.0000050	< 0.002	0.012	< 0.0002	< 0.02	1.66	**0.0133**	< 0.008	0.016
MW-1B	8/26/2013	< 0.009	< 0.0005	**0.064**	0.014	< 0.0008	< 0.00003	< 0.001	0.03	< 0.001	**22.8**	< 0.0003	**0.090**	< 0.000005	< 0.002	0.012	< 0.0002	< 0.02	1.53	**0.0145**	< 0.008	0.017
MW-1B	11/5/2013	< 0.009	< 0.0005	**0.066**	0.012	< 0.0008	< 0.00003	< 0.01	0.03	< 0.002	**23.7**	< 0.0003	**0.088**	< 0.000005	< 0.002	0.011	< 0.0002	< 0.02	1.56	**0.0131**	< 0.008	0.017
MW-2A	3/21/2013	< 0.009	< 0.0005	< 0.001	0.089	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	< 0.005	0.000015	< 0.002	< 0.001	0.0004	< 0.02	0.0962	0.0003	< 0.008	< 0.002
MW-2A	6/3/2013	< 0.009	< 0.0005	< 0.001	0.088	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	< 0.005	< 0.0000050	< 0.002	< 0.001	0.0005	< 0.02	0.0923	0.0003	< 0.008	< 0.002
MW-2A	8/26/2013	< 0.009	< 0.0005	< 0.001	0.089	< 0.0008	< 0.00003	< 0.001	< 0.01	< 0.001	< 0.02	< 0.0003	0.006	< 0.000005	< 0.002	< 0.001	0.0006	< 0.02	0.0917	0.0004	< 0.008	< 0.002
MW-2A	11/6/2013	< 0.009	< 0.0005	< 0.001	0.084	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	0.0008	< 0.02	0.0915	0.0003	< 0.008	< 0.002
MW-2B	3/21/2013	0.013	< 0.0005	**0.018**	0.048	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	**1.08**	< 0.0003	0.012	0.0000090	< 0.002	< 0.001	0.0002	< 0.02	0.101	**0.0038**	< 0.008	< 0.002
MW-2B	6/3/2013	< 0.009	< 0.0005	0.003	0.045	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.06	< 0.0003	0.011	< 0.0000050	< 0.002	< 0.001	0.0002	< 0.02	0.104	**0.0040**	< 0.008	< 0.002
MW-2B	8/26/2013	< 0.009	< 0.0005	0.004	0.043	< 0.0008	< 0.00003	< 0.001	< 0.01	< 0.001	0.04	< 0.0003	0.009	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.103	**0.0040**	< 0.008	< 0.002
MW-2B	11/6/2013	< 0.009	< 0.0005	0.004	0.042	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.04	< 0.0003	0.008	< 0.000005	< 0.002	< 0.001	0.0005	< 0.02	0.0949	**0.0039**	< 0.008	< 0.002
MW-2B DUP	6/3/2013	< 0.009	< 0.0005	0.004	0.044	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.06	< 0.0003	0.012	< 0.0000050	< 0.002	< 0.001	0.0007	< 0.02	0.0940	**0.0037**	< 0.008	< 0.002
MW-3	6/3/2013	< 0.009	< 0.0005	**0.065**	0.011	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	**1.20**	< 0.0003	0.024	< 0.0000050	< 0.002	0.001	< 0.0002	< 0.02	15.0	0.0004	< 0.008	0.008
MW-3	8/26/2013	< 0.009	< 0.0005	**0.067**	0.011	< 0.0008	< 0.00003	< 0.001	< 0.01	< 0.001	**1.18**	< 0.0003	0.026	< 0.000005	< 0.002	0.001	< 0.0002	< 0.02	14.6	0.0004	< 0.008	< 0.002
MW-3	11/5/2013	< 0.009	< 0.0005	**0.067**	0.010	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	**1.22**	< 0.0003	0.024	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	14.7	0.0004	< 0.008	< 0.002
MW-3 DUP	8/26/2013	< 0.009	< 0.0005	**0.069**	0.011	< 0.0008	< 0.00003	< 0.001	< 0.01	< 0.001	**1.16**	< 0.0003	0.025	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	14.0	0.0003	< 0.008	< 0.002
MW-4A	3/21/2013	0.087	< 0.0005	< 0.001	0.184	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.16	0.0005	**0.170**	0.0000058	< 0.002	< 0.001	< 0.0002	< 0.02	0.173	< 0.0002	< 0.008	< 0.002
MW-4A	6/3/2013	< 0.009	< 0.0005	< 0.001	0.185	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	**0.102**	< 0.0000050	< 0.002	< 0.001	< 0.0002	< 0.02	0.164	< 0.0002	< 0.008	< 0.002
MW-4A	8/27/2013	< 0.009	< 0.0005	< 0.001	0.203	< 0.0008	< 0.00003	< 0.001	< 0.01	< 0.001	0.04	< 0.0003	**0.201**	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.173	< 0.0002	< 0.008	< 0.002
MW-4A	11/6/2013	< 0.009	< 0.0005	< 0.001	0.188	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.04	< 0.0003	**0.175**	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.168	< 0.0002	< 0.008	< 0.002
MW-4B	3/21/2013	< 0.009	< 0.0005	< 0.001	0.132	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	< 0.005	0.000012	< 0.002	< 0.001	< 0.0002	< 0.02	0.184	< 0.0002	< 0.008	< 0.002
MW-4B	6/3/2013	< 0.009	< 0.0005	< 0.001	0.146	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	< 0.005	< 0.0000050	< 0.002	< 0.001	< 0.0002	< 0.02	0.181	0.0002	< 0.008	< 0.002
MW-4B	8/27/2013	< 0.009	< 0.0005	< 0.001	0.147	< 0.0008	< 0.00003	< 0.001	< 0.01	< 0.001	< 0.02	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.184	< 0.0002	< 0.008	< 0.002
MW-4B	11/6/2013	< 0.009	< 0.0005	< 0.001	0.126	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	< 0.005	< 0.000005	< 0.002	< 0.001	< 0.0002	< 0.02	0.183	< 0.0002	< 0.008	< 0.002
MW-4B DUP	3/21/2013	< 0.009	< 0.0005	< 0.001	0.132	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	< 0.02	< 0.0003	< 0.005	< 0.0000050	< 0.002	< 0.001	< 0.0002	< 0.02	0.171	< 0.0002	< 0.008	< 0.002
MW-6A	11/6/2013	1.55	< 0.0005	< 0.001	0.194	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.70	0.0009	0.007	< 0.0000050	< 0.002	0.001	0.0002	< 0.02	0.160	< 0.0002	< 0.008	0.005
MW-6B	11/6/2013	0.275	< 0.0005	< 0.001	0.120	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.15	0.0003	0.038	< 0.0000050	0.002	< 0.001	0.0003	< 0.02	0.181	< 0.0002	< 0.008	< 0.002
MW-6B DUP	11/6/2013	0.271	< 0.0005	< 0.001	0.119	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.15	< 0.0003	0.038	< 0.0000050	0.002	< 0.001	0.0003	< 0.02	0.180	< 0.0002	< 0.008	< 0.002
MW-7	11/6/2013	0.073	**0.0094**	0.003	0.066	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.04	0.0005	**0.117**	< 0.0000050	0.006	< 0.001	0.0005	< 0.02	0.205	< 0.0002	< 0.008	< 0.002
MW-8	11/6/2013	0.036	**0.0179**	0.004	0.069	< 0.0008	< 0.00003	< 0.01	< 0.01	< 0.002	0.02	< 0.0003	**0.056**	< 0.0000050	0.004	0.001	0.0328	< 0.02	0.0912	< 0.0002	< 0.008	< 0.002
DEQ-7 HumanHealthStandard		**--**	**0.006**	**0.01**	**1**	**0.004**	**0.005**	**0.1**	**--**	**1.3**	**0.3**	**0.015**	**0.05**	**0.002**	**--**	**0.1**	**0.05**	**0.1**	**--**	**0.002**	**--**	**2**

APPENDIX D

SPRING AND SEEP WATER QUALITY DATA

Appendix D. Spring and Seep Field Data

Site Code	Date	FLOW (GPM)	pH (s.u.)	Specific Conductance (umhos/cm)	Temp. ©	Dissolved Oxygen (mg/L)
SP-9	8/29/2013	5.39	8.14	367	7.4	8.27
SP-8	8/29/2013	8.08	7.5	389	8.7	7.16
SP-3	8/28/2013	0.58	6.2	210	12.7	5.41
SP-4	8/28/2013	6.73	7.62	425	12.2	9.72
SP-6	8/28/2013	1	7.7	281	8.8	9.97
SP-2	8/28/2013	NO FLOW	7.08	418	17.9	4.01
SEEP-9	8/28/2013	NO FLOW	7.44	149	14.5	1.9
SEEP-8	8/28/2013	DRY	--	--	--	--
SEEP-7	8/28/2013	NO FLOW	--	--	--	--
SEEP-6	8/28/2013	NO FLOW	6.94	161	19.2	1.55
SEEP-5	8/28/2013	SEEP	6.47	81	14.8	0.86
SEEP-4	8/28/2013	SEEP	8.06	73	13.4	3.44
SEEP-3	8/28/2013	NO FLOW	--	--	--	--
SEEP-10	8/28/2013	SEEP	6.72	381	6.82	7.5
SEEP-1	8/28/2013	NO FLOW	--	--	--	--
DS-6	8/28/2013	< 0.5	6.35	79	12.3	5.42
DS-5	8/28/2013	0.90	7.81	232	9.7	8.45
DS-4	8/28/2013	NA	6.93	125	10.5	5
DS-3	8/28/2013	116.69	6.88	63	14.4	4.84
SP-7	8/27/2013	13.46	7.37	343	7.3	2.61
SP-10	8/27/2013	3.59	7.8	431	11.3	7.89
SP-1	8/27/2013	NO FLOW	--	--	--	--
SEEP-2	8/27/2013	NO FLOW	7.29	506	18.6	1.91
DS-2	8/27/2013	< 0.25	7.43	390	16.7	3.42
DS-1	8/27/2013	8.39	8.21	428	18.6	7.41

Appendix D. Spring and Seep Water Quality Data

Parameter	SP-3	SP-4	SP-6	DEQ-7 GW Human Health Standards
	8/28/2013	8/28/2013	8/28/2013	
Common Constituents (mg/L)				
Total Suspended Solids	86	< 10	57	--
Total Dissolved Solids	128	233	161	--
Carbonate as C03	< 1	5	< 1	--
Bicarbonate as HC03	120	240	170	--
Alkalinity as CaC03	97	210	140	--
Sulfate	7	45	11	--
Chloride	1	1	2	--
Fluoride	0.1	0.2	0.2	4
Calcium	27	48	34	--
Magnesium	6	26	13	--
Sodium	3	2	2	--
Potassium	1	2	1	--
Nutrients (mg/L)				
Nitrate and Nitrite as N	0.28	0.25	0.36	10
Dissolved Trace Constituents (mg/L)				
ALUMINUM	0.100	< 0.009	0.010	--
ANTIMONY	< 0.0005	< 0.0005	< 0.0005	0.006
ARSENIC	0.002	< 0.001	< 0.001	0.01
BARIUM	0.318	0.111	0.200	1
BERYLLIUM	< 0.0008	< 0.0008	< 0.0008	0.004
CADMIUM	< 0.00003	< 0.00003	< 0.00003	0.005
CHROMIUM	< 0.001	< 0.001	< 0.001	0.1
COBALT	< 0.01	< 0.01	< 0.01	--
COPPER	0.001	< 0.001	< 0.001	1.3
IRON	0.06	< 0.02	< 0.02	--
LEAD	< 0.0003	< 0.0003	< 0.0003	0.015
MANGANESE	< 0.005	0.005	< 0.005	--
MERCURY	< 0.000005	< 0.000005	< 0.000005	0.002
MOLYBDENUM	< 0.002	< 0.002	< 0.002	--
NICKEL	< 0.001	< 0.001	< 0.001	0.1
SELENIUM	< 0.0002	0.0004	< 0.0002	0.05
SILVER	< 0.02	< 0.02	< 0.02	0.1
STRONTIUM	0.0773	0.0675	0.0704	4
THALLIUM	< 0.0002	0.0004	0.0007	0.002
URANIUM	< 0.008	< 0.008	< 0.008	0.03
ZINC	< 0.002	0.002	< 0.002	2