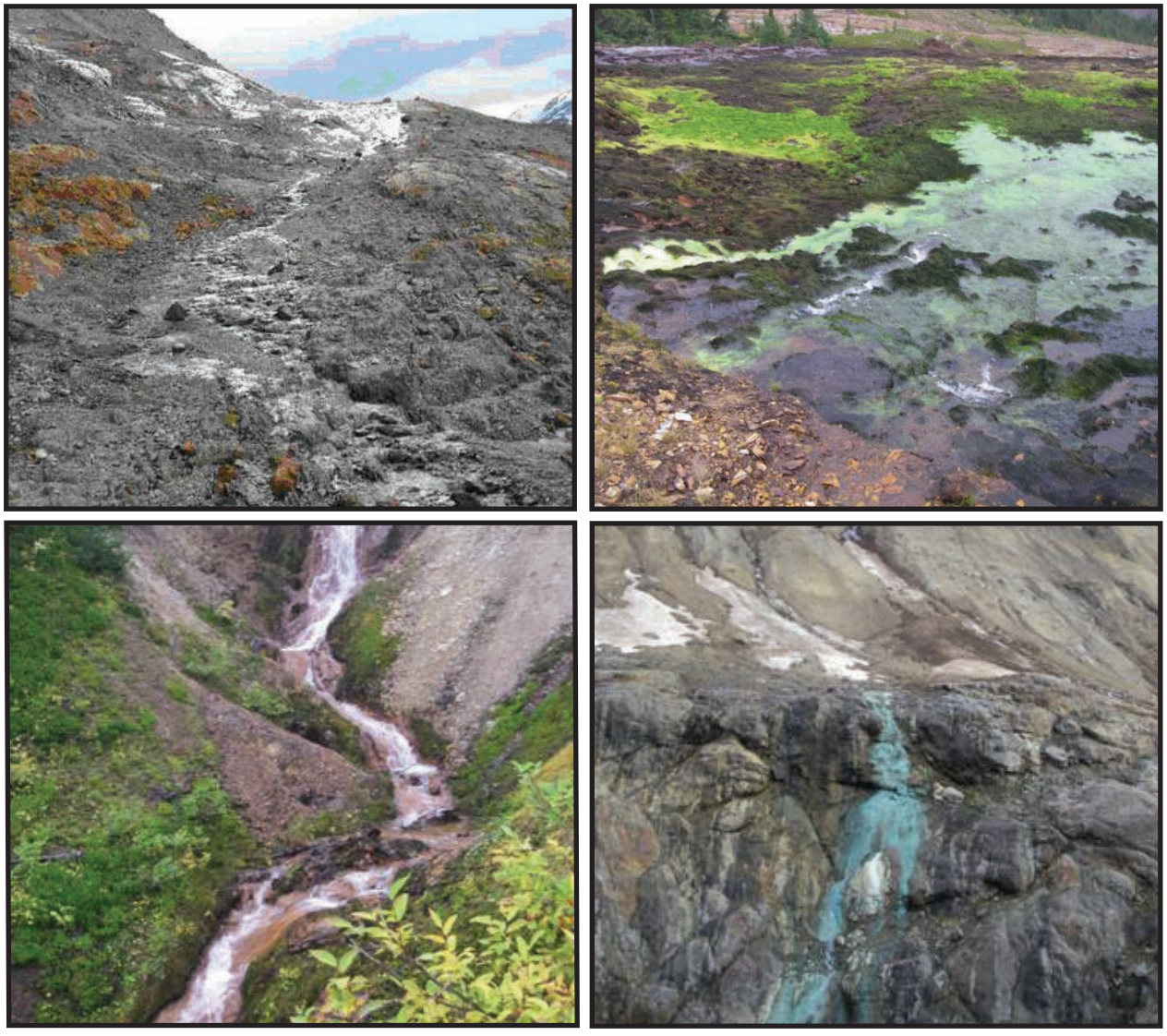
APPENDIX 11-A
2008 HYDROGEOLOGY BASELINE REPORT

SEABRIDGE GOLD

Kerr-Sulphurets-Mitchell Project
2008 Baseline Study Report
Chapter 6 - Hydrogeology



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Kerr-Sulphurets-Mitchell Project 2008 Baseline Studies Report Chapter 6 – Hydrogeology

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6. HYDROGEOLOGY

6. Hydrogeology

6.1 Summary

Groundwater samples were collected from seven groundwater seep sites within the KSM Project footprint. Laboratory analysis of the groundwater seep samples was performed at ALS Laboratories located in Vancouver, British Columbia. The groundwater quality results were compared to two water quality guidelines: the British Columbia Approved and Working Water Quality Guidelines (BCWQG) for Freshwater Aquatic Life (FAL) and the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines (WQG) for the Protection of Freshwater Aquatic Life (FAL). The samples were tested for physical properties, anions, nutrients, total metal content and dissolved metal content. There were three additional seep monitoring locations where only field measurements (pH, electrical conductivity and temperature) were collected.

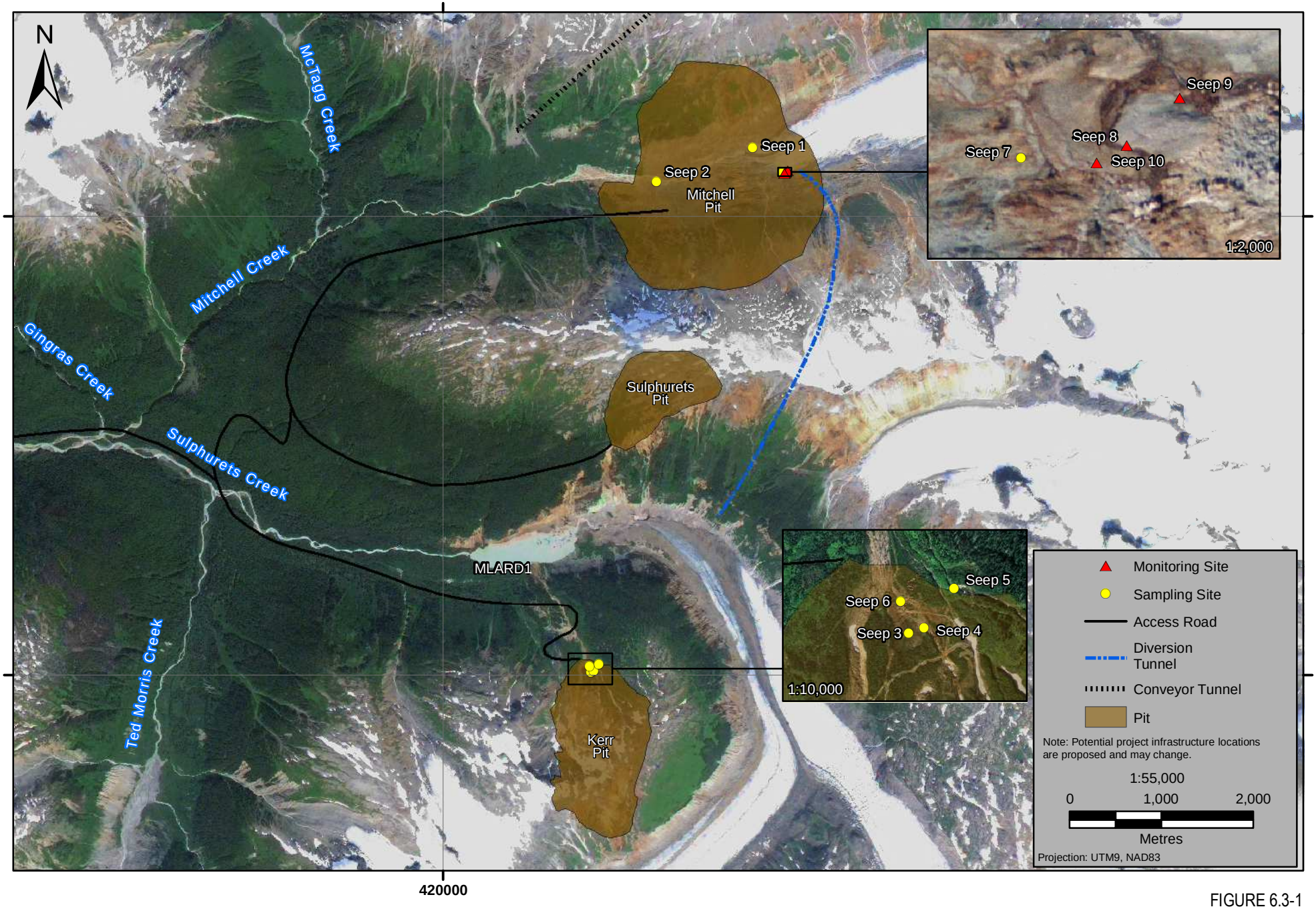
All groundwater samples were collected in the region of the Mitchell and Kerr deposits on the KSM Project footprint. With exception of one sampling site (Seep 5), all the results display a calcium sulphate water type reflecting the naturally occurring high sulphide mineral concentrations in the mineralized host rocks. Furthermore, the high concentrations of iron, especially in the Kerr deposit area, and copper in the samples analyzed indicate that metal leaching and acid rock drainage (ML/ARD) is naturally occurring and entering into shallow unconfined groundwater. The low pH values, ranging from 0.99 to 3.3 measured in the field and averaging approximately 3.0 measured in the laboratory, are also indicative of naturally occurring ML/ARD.

6.2 Objectives

Hydrogeological baseline studies are used to define the site specific groundwater conditions according to field investigations and the review of existing information. The objectives of the 2008 hydrogeologic studies within the KSM Project footprint were to establish general groundwater chemistry and provide a preliminary overview of the site specific groundwater conditions through groundwater seepage sample collection and field measurements.

6.3 Study Area

The 2008 hydrogeology baseline study area within the KSM Project footprint coincides with two of three proposed open pits (Kerr and Mitchell). Three seep sampling sites (Seep 1, Seep 2 and Seep 7) are located in the proposed Mitchell pit area. Three additional monitoring sites, Seep 8, Seep 9 and Seep 10, where field measurements were collected are also located in the vicinity of the proposed Mitchell open pit. Four sampling sites are located on the northern end of the proposed Kerr pit; Seep 3, Seep 4, Seep 5 and Seep 6. The seep sample sites are presented in Figure 6.3-1. Table 6.3-1 provides a summary of the seep sampling sites as well as the geologic unit in which they are located.



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KSM Seep Sites for 2008

FIGURE 6.3-1

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Table 6.3-1
Summary of KSM Seepage Sampling and Monitoring Locations

Seep ID	Coordinates		Location	Geologic Unit		Comments
	Easting	Northing		Abbreviation	Description	
Seep 1	423365	6265754	North side of Mitchell Valley within the Mitchel deposit area	IJHva, IJHU	Altered Hazelton sediments/volcanics below the Mitchell Fault - Mitchell intrusion	blue colour on rocks indicates copper precipitation and likely high connectivity with groundwater systems influenced by copper-rich mineralized zone
Seep 2	422318	6265384	Adjacent to south side of Mitchell Creek within the Mitchell deposit area	IJHva, IJHU	Andesitic volcanic rocks - phyllic and argillic alteration	adjacent to creek, blue colour on rocks indicates copper precipitation and likely high connectivity with groundwater systems influenced by copper-rich mineralized zone
Seep 3	421661	6259874	Kerr Creek	IJHva, IJHU	Altered Hazelton sediments and volcanics down slope of the Kerr deposit	
Seep 4	421715	6259874	Kerr Creek	IJHva, IJHU	Altered Hazelton sediments and volcanics down slope of the Kerr deposit	
Seep 5	421721	6259837	Kerr Creek	IJHva, IJHU	Altered Hazelton sediments and volcanics down slope of the Kerr deposit	Steep area to the west side of the creek at the bottom of which bright orange colour indicates iron precipitation in surrounding water system and possible influence of mineralized zone
Seep 6	421590	6260097	Kerr Creek	IJHva, IJHU	Hazelton sediments and volcanics down slope of the Kerr deposit - quartz sericite pyrite (QSP), phyllic and argillic alteration	Downstream of seeps 3 and 4
Seep 7	423682	6265480	Mitchell Deposit area, south of Mitchell Creek - West Seepage	IJHva, IJHU	Hazelton andesitic volcanic rocks - phyllic and argillic alteration	Sampling site added in July 2008, flow ~ 5L/sec
Seep 8	423724	6265485	Mitchell Deposit area, south of Mitchell Creek - Southeast Seepage	IJHva, IJHU	Hazelton andesitic volcanic rocks - phyllic and argillic alteration	Monitoring site added in July 2008, flow ~ 10 L/sec
Seep 9	423745	6265504	Mitchell Deposit area, south of Mitchell Creek - East Seepage	IJHva, IJHU	Hazelton andesitic volcanic rocks - phyllic and argillic alteration	Monitoring site added in July 2008, flow ~ 30 L/sec
Seep 10	423712	6265478	Mitchell Deposit area, south of Mitchell Creek - Central Seepage	IJHva, IJHU	Hazelton andesitic volcanic rocks - phyllic and argillic alteration	Monitoring site added in July 2008, flow ~ 50 L/sec

Coordinates are NAD 83, UTM Zone 9

6.3.1 Regional Geology

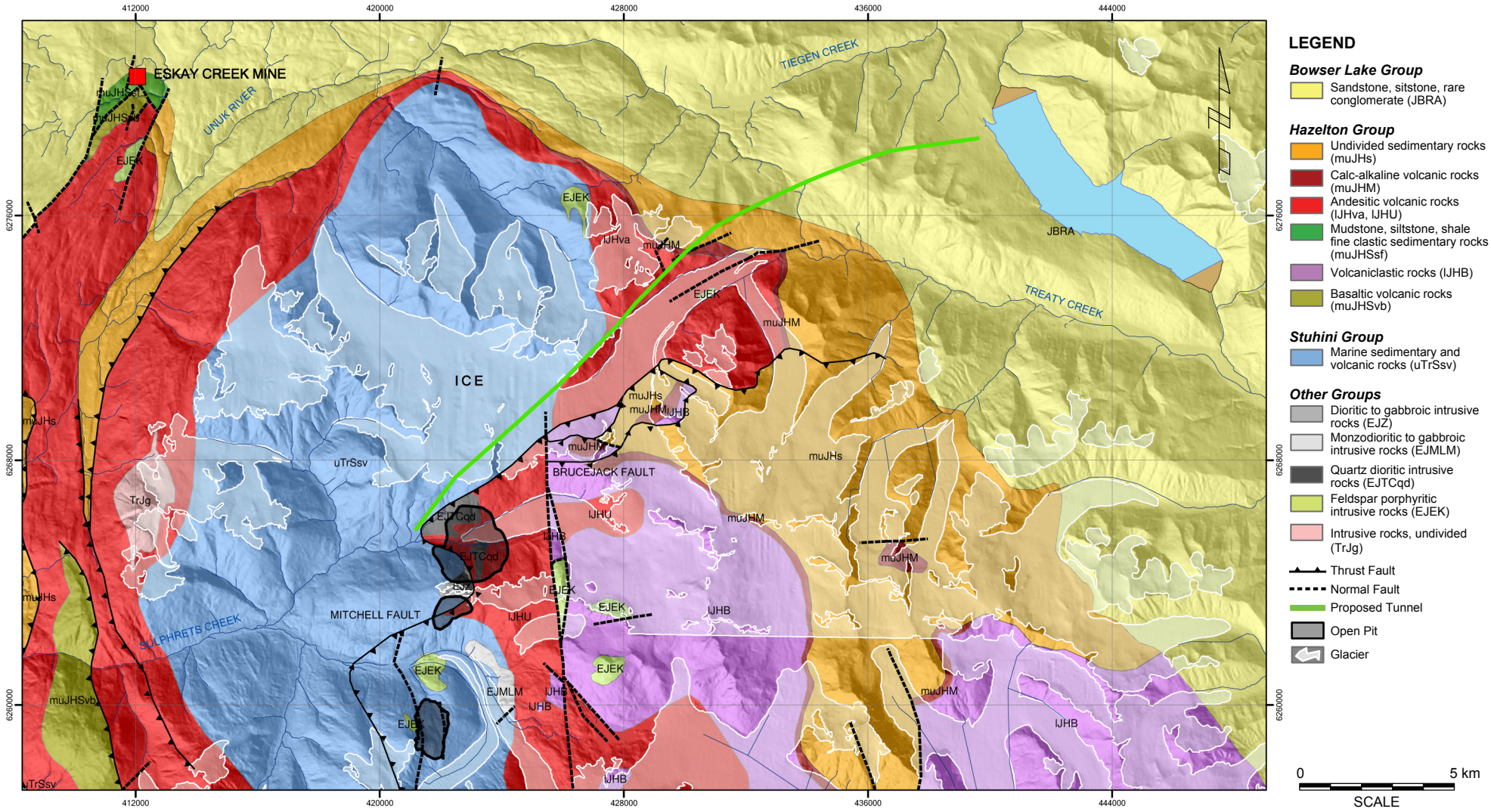
The regional geology of the KSM Project area is presented in Figure 6.3-2. The KSM Project lies within the fault-bounded, allochthonous terrain of "Stikinia" in the Intermontane Belt, located between the Coast Mountain intrusives and the Foreland Belt continental margin sedimentary prisms (Rocky Mountains). Early Jurassic sub-volcanic intrusive hydrothermal systems are abundant in the region and are important sources of base and precious metals. (Wardrop 2008).

Similarly to the hydrothermal systems hosting other gold-copper porphyry in the surrounding area such as Galore Creek, Red Chris and Kemess, the mineral deposits at the KSM Project are associated with a large hydrothermal alteration system associated with late Jurassic monzoninte porphyry intrusions into Triassic and Jurassic volcaniclastics. Upper Triassic rocks include marine sedimentary and intermediate volcanic rocks of the Stuhini Group. Intermediate volcanic rocks with pillowed and breccia textures are sandwiched between turbiditic argillite and sandstone. Overlying the Stuhini Group is the Jack Formation comprised of fossiliferous and limey mudstones and sandstones. The base is marked by a granodirite and limestone cobble-bearing conglomerate. Overlying the Jackman Formation is the Hazelton Group, dominated by andesitic flows and breccias deposited in a volcanic chain with high paleogeographic relief. Being closely associated with the Eksay Creek deposit, felsic welded tuff horizons of the Mount Diworth Formation are a distinct and important stratigraphic marker in the Hazelton Group. To the east of the KSM Project, Late Jurassic and Cretaceous volcanic back-arc basins were filled with sedimentary rocks of the Bowser Group. Early Jurassic intrusions such as dikes, sills and plugs of diorite, monzodiorite, syenite and granite collectively referred to as the "Mitchell Intrusions" are also found in the area (SRK 2005 and Wardrop 2008).

There are two thrust faults (Sulphurets and Mitchell) under which are a number of sills and plugs of coarse-grained feldspar porphyritic monzonite to low-silica granite that intruded sedimentary and volcanic rocks creating siliceous hornfels (Wardrop 2008).

The Kerr deposit (south) is characterized by host rock from the Stuhini group: Triassic sedimentary and volcaniclastic rocks with intrusions of Early Jurassic monzonite. The core of the zone is described as composed of "sericite schist" and "chlorite schist" (Wardrop 2008). The rocks encountered in this formation exhibit gossanous, limonitic weathering typical of pyrite-rich, phyllic and silicic alteration. Crackled quartz stockwork, anhydrite veining and chlorite alteration are also present. Common rock forming minerals of monzonite are orthoclase, plagioclase, hornblende, augite and biotite.

The Mitchell deposit consists of a foliated, schistose zone of intensely altered sulphide-bearing rocks. The concentrations of metals in the Mitchell deposit is low and the distribution is finely disseminated and pervasively dispersed distinguishing the Mitchell deposit from the Sulphurets and Kerr deposits where there are more abrupt breaks in mineralization and grade due in part by faulting resulting in juxtaposition of weak and moderate mineralized domains. The Mitchell deposit is dominated by andesitic volcanic rocks from the Hazelton group and dioritic to gabbroic intrusive rocks. The minerals encountered in the Mitchell deposit are hosted in K-feldspar, quartz porphyritic granite. Copper mineralization occurs as disseminated and fracture filling chalcopyrite, and with quartz-magnetite veinlets. Phyllic and potassic alteration as well as



LEGEND

Bowser Lake Group
- Sandstone, siltstone, rare conglomerate (JBRA)

Hazelton Group
- Undivided sedimentary rocks (muJHs)
- Calc-alkaline volcanic rocks (muJHM)
- Andesitic volcanic rocks (IJHva, IJHU)
- Mudstone, siltstone, shale fine clastic sedimentary rocks (muJHSsf)
- Volcaniclastic rocks (IJHB)
- Basaltic volcanic rocks (muJHSvb)

Stuhini Group
- Marine sedimentary and volcanic rocks (uTrSsv)

Other Groups
- Dioritic to gabbroic intrusive rocks (EJZ)
- Monzodioritic to gabbroic intrusive rocks (EJMLM)
- Quartz dioritic intrusive rocks (EJTCqd)
- Feldspar porphyritic intrusive rocks (EJEK)
- Intrusive rocks, undivided (TrJg)
- Thrust Fault
- Normal Fault
- Proposed Tunnel
- Open Pit
- Glacier

Source: Klohn Crippen Berger

FIGURE 6.3-2

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KSM Project Area Regional Geology

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stockworks were observed. Deformed quartz veins are placed in the sericite-chlorite altered rock. Calcite veinlets are present and likely related to regional deformation (Savell and Huard 2005 and Wardrop 2008),

6.4 Methods

A total of twenty groundwater quality samples were obtained from groundwater seeps. The seep samples were obtained from the Kerr and Mitchell gold-copper porphyry deposit areas. Seeps 1, 2, 7, 8, 9 and 10 are located in the Mitchell deposit area and Seeps 3, 4, 5 and 6 are in the Kerr deposit area.

All groundwater samples were collected as single replicates from each seep site in clean, well-labelled bottles. At all seeps, the sampler triple-rinsed the sample bottle and cap three times with groundwater, and then filled the bottles; enough room was left for the addition of any necessary preservatives. Dissolved metals samples were filtered and preserved in the lab to avoid risk of contamination in the field. After preservation, samples were stored in a dark, cool place until shipment. All water samples were shipped to Vancouver, British Columbia, and analyzed by ALS Environmental Ltd. (ALS), a fully accredited analytical laboratory.

The results were compared with the BCWQG for Freshwater Aquatic Life (FAL) and the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (WQG) for the Protection of Freshwater Aquatic Life (FAL). All raw groundwater quality data from laboratory analytical testing is presented in Appendix 6.4-1A.

A summary of the seepage samples collected is presented in Table 6.4-1. The groundwater quality parameters, analytical methods and detection limits are presented in Table 6.4-2.

Table 6.4-1
Summary of KSM Groundwater Seep Sampling

Seep ID	Location	Total Number of Samples	Dates Sampled		
			Jul-08	Sep-08	Oct-08
Seep 1	North side of Mitchell Cr	3	S - FM	S - FM	S - FM
Seep 2	river bottom South side of Mitchell Cr	3	S - FM	S - FM	S - FM
Seep 3	Kerr Cr	3	S - FM	S - FM	S - FM
Seep 4	Kerr Cr	3	S - FM	S - FM	S - FM
Seep 5	Kerr Cr	3	S - FM	S - FM	S - FM
Seep 6	Kerr Cr	3	S - FM*	S - FM	S - FM
Seep 7	West Seepage	2	FM	S - FM	S - FM
Seep 8	Southeast Seepage	0	FM	FM	FM
Seep 9	East Seepage	0	FM	FM	FM
Seep 10	Central Seepage	0	FM	FM	FM

S = groundwater samples were taken
FM = Field measurements were taken
*** = duplicate sample was taken**

Table 6.4-2
Groundwater Quality Parameters, Analytical Methods and Detection Limits

Parameters	Basis	Units	Minimum Detection Limit
Physical Parameters			
Anion Sum	-	me/L	1
Cation Sum	-	me/L	1
Cation - Anion Balance	-	%	1
Hardness CaCO3	Dissolved	mg/L	0.5
Colour, True	Dissolved	CU	5
Electrical Conductivity	Total	µS/cm	2
pH	Total	pH	0.01
Total Dissolved Solids	Dissolved	mg/L	10 to 20
Total Suspended Solids	Total	mg/L	3
Turbidity	Total	NTU	0.1
Anions and Nutrients			
Ammonia as N	Total	mg/L	0.005
Acidity (as $CaCO_3$)	Total	mg/L	1
Alkalinity, Bicarbonate	Total	mg/L	1 to 2
Alkalinity, Carbonate	Total	mg/L	1 to 2
Alkalinity, Hydroxide	Total	mg/L	1 to 2
Alkalinity, Total	Total	mg/L	1 to 2
Bromide (Br)	Dissolved	mg/L	0.05
Chloride (Cl)	Dissolved	mg/L	0.5
Fluoride (F)	Dissolved	mg/L	0.02
Sulfate (SO_4)	Dissolved	mg/L	0.5
Nitrate (as N)	Dissolved	mg/L	0.005
Nitrite (as N)	Dissolved	mg/L	0.001
Total Kjeldahl Nitrogen	Total	mg/L	0.05
Total Nitrogen	Total	mg/L	0.05
Total Phosphate as P	Total	mg/L	0.002 to 0.2
Metals			
Aluminum	Dissolved and Total	mg/L	0.001 to 0.002
Antimony	Dissolved and Total	mg/L	0.0001 to 0.0002
Arsenic	Dissolved and Total	mg/L	0.0001 to 0.0002
Barium	Dissolved and Total	mg/L	0.00005 to 0.0001
Beryllium	Dissolved and Total	mg/L	0.0005 to 0.001
Bismuth	Dissolved and Total	mg/L	0.0005 to 0.001
Boron	Dissolved and Total	mg/L	0.01 to 0.02
Cadmium	Dissolved and Total	mg/L	0.000017 to 0.000034
Calcium	Dissolved and Total	mg/L	0.02 to 0.04
Chromium	Dissolved and Total	mg/L	0.0005 to 0.001
Cobalt	Dissolved and Total	mg/L	0.0001 to 0.0002
Copper	Dissolved and Total	mg/L	0.0001 to 0.0002

(continued)

Table 6.4-2
Groundwater Quality Parameters, Analytical Methods and Detection Limits (completed)

Parameters	Basis	Units	Minimum Detection Limit
Iron	Dissolved and Total	mg/L	0.03
Lead	Dissolved and Total	mg/L	0.00005 to 0.0001
Lithium	Dissolved and Total	mg/L	0.005 to 0.01
Magnesium	Dissolved and Total	mg/L	0.005 to 0.01
Manganese	Dissolved and Total	mg/L	0.00005 to 0.0001
Mercury	Dissolved and Total	mg/L	0.00001
Molybdenum	Dissolved and Total	mg/L	0.00005 to 0.0001
Nickel	Dissolved and Total	mg/L	0.0005 to 0.001
Phosphorus	Dissolved and Total	mg/L	0.3
Potassium	Dissolved and Total	mg/L	0.05 to 0.1
Selenium	Dissolved and Total	mg/L	0.0001 to 0.0002
Silicon	Dissolved and Total	mg/L	0.05
Silver	Dissolved and Total	mg/L	0.00001 to 0.00002
Sodium	Dissolved and Total	mg/L	2
Strontium	Dissolved and Total	mg/L	0.0001 to 0.0002
Thallium	Dissolved and Total	mg/L	0.0001 to 0.0002
Tin	Dissolved and Total	mg/L	0.0001 to 0.0002
Titanium	Dissolved and Total	mg/L	0.01
Uranium	Dissolved and Total	mg/L	0.00001 to 0.00002
Vanadium	Dissolved and Total	mg/L	0.001 to 0.002
Zinc	Dissolved and Total	mg/L	0.001 to 0.002
Organic Parameters			
Total Organic Carbon C	**Total**	**mg/L**	**0.5**

6.4.1 Quality Assurance/Quality Control (QA/QC)

The precision of the groundwater sampling methodology and the laboratory analysis were assessed by the inclusion of a duplicate sample, as well as both field and travel blanks. The laboratory analytical results for all blanks and duplicates are contained in Appendix 6.4-1B.

The assessment of sampling and analysis precision involved calculating the Relative Percent Difference (RPD) between the duplicate and its' associated sample; duplicates should have a RPD of less than 25%. Calculated RPD values are also contained within Appendix 6.4-1B. According to the analytical results of the duplicate collected at Seep 6 in the Kerr deposit during the July 2008 sampling trip, only dissolved mercury and total selenium had a RPD value greater than 25%. Dissolved mercury had an RPD value of 26%, this could be explained by inaccuracies or contamination of the sample caused by field filtering. The mercury concentration for the sample was below detection limit and the mercury concentration for the duplicate was worth 1.3 times the detection limit which is less than five times the detection limit. None of the samples collected throughout the sampling program had mercury concentrations that exceeded guidelines. The concentration for total selenium had an RPD value of 38%. The selenium concentration of

the duplicate sample was lower than five times the detection limit. No samples taken from the Kerr deposit had an exceedance of the guidelines for selenium.

Possible contamination from handling samples in the field, in the laboratory or in transit is monitored with field and travel blanks. The analytical results from the field and travel blanks are also included in Appendix 6.4-1B. In all travel and field blanks, all parameters were not detected with the exception of calcium in July 2008. This parameter was detected at a very low concentration and does not affect the overall interpretation of the groundwater quality.

6.5 Groundwater Quantity

Prior site investigations mention that flowing artesian conditions have been encountered in the past on the KSM site (Stantec 2003). In 2008, Rescan did not take any direct measurements of groundwater levels within the KSM Project footprint therefore groundwater flow directions have not been established to-date. However, in general, the water table mimics and groundwater flow directions are parallel to the surface topography.

As the 2008 hydrogeology baseline program was preliminary, the necessary data for the elaboration of a potentiometric surface map are currently not sufficient. Klohn Crippen Berger Limited (KCBL) have provided some conductivity measurements from their geotechnical drilling but this does not suffice for the characterization of hydrostratigraphy of surficial overburden and bedrock geologic units at the KSM Project.

6.6 Groundwater Quality

The data set described in this section is derived from seep sampling undertaken in July, September and October of 2008. A total of twenty samples were taken from seven discrete sampling sites over the 75 day period from July 27 to October 9, 2008. The samples were analyzed for physical properties, anion concentration, nutrients, TOC, total and dissolved metals and the results were compared with two water quality guidelines. The guidelines applicable to chloride, nitrite, aluminium, cadmium, copper, lead, manganese, nickel, silver and zinc were dependant on hardness, chloride, pH or temperature therefore do not have a constant value throughout the analysis. The seep groundwater quality results are summarized in Tables 6.6-1 and 6.6-2. The parameters that exceeded one or more water quality guidelines are presented in Figures 6.6-1 to 6.6-9. All seep groundwater quality results were also plotted on a piper diagram to characterize groundwater on the KSM Project footprint; these are presented in Figure 6.7-1.

Field measurements were also taken at three additional sites identified to Rescan by Kevin Morin of Minesite Drainage Assessment Group (MDAG) following the July 2008 sampling. All field measurements are presented in Tables 6.6-3, 6.6-4, 6.6-5.

6.6.1 Physical Parameters, Anions and Nutrients

Table 6.6-1 summarizes the physical parameters, major anion concentrations and nutrients compared to the BCWQG (FAL) as well as with CCME WQG (FAL). The concentration profiles are also illustrated in Figures 6.6-1 and 6.6-2; only those parameters which exceed one or more of the water quality guidelines have been graphed.

The hardness of the groundwater samples collected ranges from 63.9 (Seep 5) to 512 mg/L (Seep 2). There is no BCWQG (FAL) or CCME WQG (FAL) for hardness. However, as discussed below, several metals guidelines are hardness dependent.

The colour of groundwater samples collected from seeps varied from less than 5 (in several seep samples) to 101 TCU (Seep 7). The CCME WQG (FAL) narrative for colour indicates that the true colour should not be significantly higher than the seasonally adjusted colour value for the water system, measured at 456 nm. Similarly, the adjusted colour, measured as the mean percent transmission of white light per metre, should not be significantly higher than the seasonally adjusted colour value for the water system. The analytical results for hardness and colour are illustrated in Figure 6.6-1.

The measured electrical conductivity of the groundwater collected from seep samples collected at the KSM Project Location varied between 138 (Seep 5) and 1860 µS/cm (Seep 7). There is no BCWQG (FAL) or CCME WQG (FAL) for conductivity.

The pH measurements of groundwater samples collected from seeps within the KSM Project footprint varied from 2.71 (Seep 7) to 8.23 (Seep 2). The CCME WQG (FAL) (6.5 to 9.0) for pH was exceeded in seeps 3, 4, 6 and 7. The chemical analysis results for electrical conductivity and pH are shown in Figure 6.6-1.

The total dissolved solids (TDS) values in groundwater collected from seeps ranged from 84 (Seep 5) to 1330 mg/L (Seep 7). There is no BCWQG (FAL) or CCME WQG (FAL) for TDS.

The total suspended solids (TSS) values in groundwater collected from s ranged from less than 3 (in several seep samples) to 219 mg/L (Seep 2). The CCME WQG (FAL) for TSS is dependent on background levels. These measured values are background values, therefore no comparison was made. There is no BCWQG (FAL) for TSS.

The measured turbidity of groundwater collected from seeps at the project varied from 0.11 (Seep 2) to 120 NTU (Seep 2). The BCWQG (FAL) for turbidity is dependent on background levels and there are no guidelines for turbidity in the CCME WQG (FAL). These measured values are background values, therefore no comparison was made.

The ammonia concentrations in groundwater collected from seep samples varied between less than 0.005 (in several seep samples) and 0.017 mg/L (Seep 3). None of the groundwater seep samples exceeded CCME WQG (FAL) for un-ionized ammonia of 0.019 mg/L in. No groundwater samples exceeded the most restrictive BCWQG (FAL) of 0.681 mg/L (pH 9 at 7˚ C).

The acidity (as $CaCO_3$) in groundwater collected from seep samples varied between less than 1 (Seep 5) and 749 mg/L (Seep 7). Total alkalinity (as $CaCO_3$) in groundwater seep samples varied between less than 2 (in several seep samples) and 113 mg/L (Seep 2). No BCWQG (FAL) or CCME WQG (FAL) exists for acidity or total alkalinity.

Table 6.6-1
KSM Project: Physical Parameters, Concentrations of Major Anions and Cations and Total Organic Carbon in Groundwater

Parameter	Units	Minimum	Average[1]	Maximum	BCWQG (FAL)[2]	CCME (FAL)[3]
Physical Parameters						
Hardness (as CaCO3)	mg/L	63.9	**213.1**	**512**	ng	ng
Colour, True	CU	<5.0	**13.91**	**101**	A	narrative
Conductivity	uS/cm	138	**719.60**	**1860**	ng	ng
pH	pH	***2.71***	***5.14***	8.23	ng	6.5 - 9.0
Total Dissolved Solids	mg/L	84	470.10	**1330**	ng	ng
Total Suspended Solids	mg/L	<3.0	15.46	219	B	B
Turbidity	NTU	0.11	**13.36**	**120**	B	B
Anions and Nutrients						
Ammonia as N	mg/L	<0.005	0.00525	0.0174	C	D
Acidity (as CaCO3)	mg/L	<1.0	95.67	749	ng	ng
Alkalinity, Bicarbonate (as CaCO3)	mg/L	<2.0	24.05	113	ng	ng
Alkalinity, Carbonate (as CaCO3)	mg/L	<1.0	BDL	<2.0	ng	ng
Alkalinity, Hydroxide (as CaCO3)	mg/L	<1.0	BDL	<2.0	ng	ng
Alkalinity, Total (as CaCO3)	mg/L	<2.0	24.05	113	ng	ng
Bromide (Br)	mg/L	<0.05	BDL	<0.05	ng	ng
Chloride (Cl)	mg/L	<0.5	BDL	<0.5	600	ng
Fluoride (F)	mg/L	0.049	0.59	**2.2**	E	ng
Sulfate (SO4)	mg/L	34.4	298.87	**878**	100F	ng
Nitrate (as N)	mg/L	<0.005	BDL	0.0089	200	2.9
Nitrite (as N)	mg/L	<0.001	BDL	<0.001	G	0.06
Total Kjeldahl Nitrogen	mg/L	<0.05	BDL	<0.05	ng	ng
Total Nitrogen	mg/L	<0.05	BDL	<0.05	ng	ng
Total Phosphate as P	mg/L	<0.002	0.41	6.71	ng	ng
Total Organic Carbon	mg/L	<0.05	BDL	<0.05	H	ng

Note:

Underline = exceeds the maximum allowable concentration listed in the BCWQG - FAL

***italic* = exceeds the maximum allowable concentration listed in the CCME - FAL**

1. Average is calculated using half of the detection limit when the result was below it

2. BCWQG (FAL) = British Columbia Water Quality Guidelines, Freshwater Aquatic Life (source:http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html)

3. CCME = Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Freshwater Aquatic Life (source:http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124)

ng = no guideline

A = 30-day average transmission of white light >80% of background

B = depends on background values

C = depends on field Temperature and pH

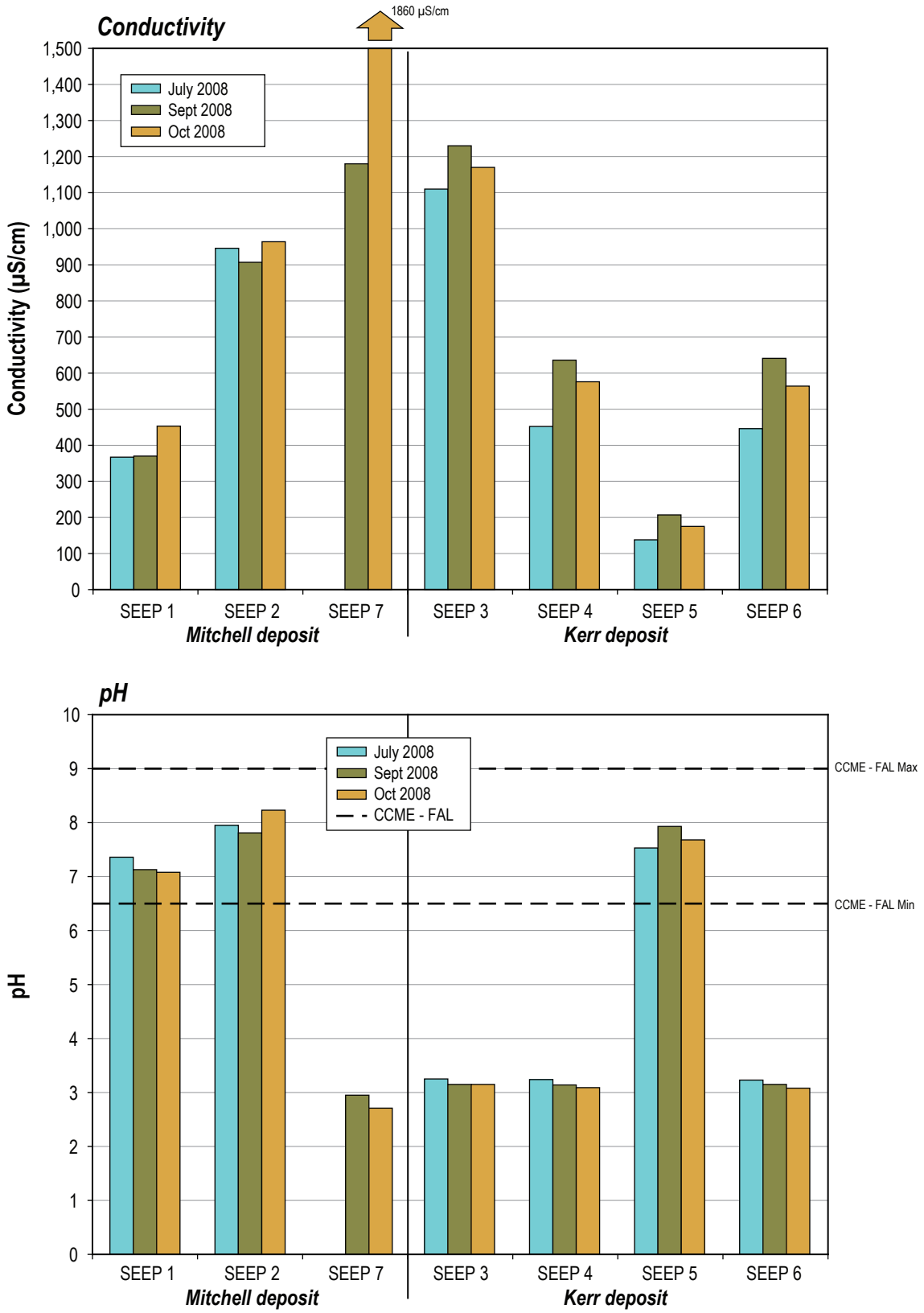
D = All ammonia was assumed un-ionized and the guideline value was 0.019 mg/L

E = Fluoride BC Max 0.2mg/L when at <50mg/L [$CaCO_3$], 0.3mg/L at ≥50mg/L [$CaCO_3$]

F = Sulphate BC Max alert to monitor aquatic moss at 50mg/L

G = Dependent on chloride concentration, ranges from 0.06 to 0.60 mg/L

H = 30day median + 20% of median background concentration



Conductivity and pH

FIGURE 6.6-1

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The fluoride concentrations in groundwater samples collected from seeps varied from 0.049 (Seep 5) to 2.20 mg/L (Seep 7). The fluoride concentrations in groundwater samples exceeded the BCWQG (FAL) of 0.3 mg/L in seeps 1, 2, 3 and 7.

The sulphate concentrations in groundwater samples collected from seeps varied from 34.4 (Seep 5) to 878 mg/L (Seep 7). The sulphate concentrations exceeded the BCWQG (FAL) of 100 mg/L in seeps 1, 2, 3, 4, 6 and 7. There is no CCME WQG (FAL) for sulphate. The sulphate concentrations in the groundwater samples are shown in Figure 6.6-2.

The nitrate concentrations in the groundwater samples collected from seeps varied from less than 0.005 (in several seep samples) to 0.0089 mg/L (Seep 4). All measured values for nitrate were less than the BCWQG (FAL) and CCME WQG (FAL).

The total phosphate concentrations in the groundwater samples collected from seeps varied from less than 0.002 (Seep 2) to 6.71 mg/L (Seep 7). No BCWQG (FAL) or CCME WQG (FAL) exists for total phosphate.

6.6.2 Total and Dissolved Metals

The ranges of concentrations of all metals are shown in Table 6.6-2 and their temporal variations relative to the BCWQG (FAL) and CCME WQG (FAL) are graphically presented in Figures 6.6-3 to 6.6-9. Only those parameters which exceed one or more of the guidelines have been graphed.

The total aluminum concentrations at the project varied from 0.0077 (Seep 2) to 22.3 mg/L (Seep 7). The CCME WQG (FAL) for aluminium is hardness and pH dependant and was exceeded in the samples collected from seeps 1, 2, 3, 4, 6 and 7.

Dissolved aluminum concentrations ranged from 0.0056 (Seep 2) to 21.4 mg/L (Seep 7). Dissolved aluminum concentrations exceeded the BCWQG (FAL) of 0.1 mg/L in groundwater samples from seeps 1, 3, 4, 6 and 7. Figure 6.6-5 shows the total and dissolved aluminum concentrations in groundwater seep samples. Total and dissolved aluminium concentrations are presented in Figure 6.6-3 for the groundwater samples collected.

Total arsenic concentrations in groundwater samples collected varied from less than 0.0002 (Seep 2) to 0.0351 mg/L (Seep 7). BCWQG (FAL) (0.005 mg/L) and the CCME WQG (FAL) (0.005 mg/L) for total arsenic were exceeded in seeps 2 and 7.

The total cadmium concentrations in groundwater seep locations within the KSM Project footprint varied from less than 0.000034 (Seep 5) to 0.0267 mg/L (Seep 7). These seep samples were both taken from Seep 7. The BCWQG (FAL) and CCME WQG (FAL) are hardness dependent and were exceeded for groundwater samples taken from seeps 1, 2, 3, 4, 6 and 7. The total arsenic and total cadmium concentrations are shown in Figure 6.6-4.

Table 6.6-2
KSM Project: Total and Dissolved Metals Concentrations in Groundwater

	Units	Total Metals			BCWQG (FAL)[2] (Total)	CCME (FAL)[3] (Total)	Dissolved Metals			BCWQG (FAL)[2] (Dissolved)	CCME (FAL)[3] (Dissolved)
		Minimum	Average[1]	Maximum	(Maximum)	(Maximum)	Minimum	Average[1]	Maximum	(Maximum)	(Maximum)
Aluminum	mg/L	0.0077	*4.18*	*22.3*	ng	0.005-0.100 H	0.0056	**3.006**	**21.4**	0.1U	ng
Antimony	mg/L	<0.0001	0.0002	0.00117	0.02	ng	<0.0001	0.000143	0.00052	ng	ng
Arsenic	mg/L	<0.0002	0.003157	***0.0351***	0.005	0.005	<0.0001	0.003	0.0351	ng	ng
Barium	mg/L	0.00633	0.026	0.321	5	ng	0.00598	0.01	0.0227	ng	ng
Beryllium	mg/L	<0.0005	0.0007	0.0049	0.0053	ng	0.0005	0.001	0.0052	ng	ng
Bismuth	mg/L	<0.0005	BDL	<0.001	ng	ng	<0.0005	BDL	0.0005	ng	ng
Boron	mg/L	<0.02	BDL	<0.04	1.2	ng	<0.01	BDL	0.01	ng	ng
Cadmium	mg/L	<0.00003	*0.00366195*	***0.0267***	N	N	0.000017	0.00363	0.0273	ng	ng
Calcium	mg/L	2.00E+01	74.91	1.79E+02	V	ng	2.04E+01	73.67	1.85E+02	ng	ng
Chromium	mg/L	<0.0005	*0.001*	*0.0025*	0.001	I	<0.0005	0.001	0.0025	ng	ng
Cobalt	mg/L	<0.0002	0.0124	0.0618	0.11	ng	<0.0002	0.012	0.0618	ng	ng
Copper	mg/L	0.00204	***1.3197***	***10.4***	O	J	0.00297	1.278	10.5	ng	ng
Iron	mg/L	<0.03	***20.22245***	***182***	1	0.3	<0.03	19.492	182	0.35	ng
Lead	mg/L	<0.00005	*0.00632375*	***0.0898***	P	K	<0.00005	0.00562	0.0896	ng	ng
Lithium	mg/L	<0.005	0.006845	0.022	5	ng	<0.005	BDL	0.023	ng	ng
Magnesium	mg/L	2.52	7.08	14.9	ng	ng	2.58	7.04	14.5	ng	ng
Manganese	mg/L	0.00693	**0.90**	**3.32**	Q	ng	0.0067	0.88	3.32	ng	ng
Mercury	mg/L	<0.00001	BDL	0.000024	0.0001	L	<0.00001	BDL	<0.00001	ng	ng
Molybdenum	mg/L	<0.00005	0.0057	0.0492	2	0.073	<0.00005	0.006	0.0507	ng	ng
Nickel	mg/L	<0.0005	0.012	0.0268	M	M	<0.0005	0.011	0.0271	ng	ng
Phosphorus	mg/L	<0.3	0.548	7.28	n/a[5]	W	<0.3	0.55	7.31	ng	ng
Potassium	mg/L	0.108	0.80	2.16	ng	ng	0.107	0.70	1.99	ng	ng
Selenium	mg/L	0.00038	*0.00296*	***0.0209***	0.002 R	0.001	0.00031	0.00284	0.0204	ng	ng
Silicon	mg/L	1.16	5.43	18.3	ng	ng	1.12	5.00	18.3	ng	ng
Silver	mg/L	<0.00001	*0.0001*	*0.000838*	S	0.0001	<0.00001	0.00006	0.000762	ng	ng
Sodium	mg/L	<2.0	BDL	6.3	ng	ng	<2.0	BDL	6.2	ng	ng
Strontium	mg/L	0.146	0.5064	1.38	ng	ng	0.146	0.52	1.3	ng	ng
Thallium	mg/L	<0.0001	BDL	0.00021	0.0003	0.0008	<0.0001	BDL	0.0002	ng	ng
Tin	mg/L	<0.0001	BDL	<0.0002	ng	ng	<0.0001	0.00012	0.00108	ng	ng
Titanium	mg/L	<0.01	0.0105	0.114	0.1	ng	<0.01	BDL	0.011	ng	ng
Uranium	mg/L	<0.00001	0.0012	0.00881	0.3	ng	<0.00001	0.001	0.00891	ng	ng
Vanadium	mg/L	<0.001	0.002	0.0113	ng	ng	<0.001	0.002	0.0113	ng	ng
Zinc	mg/L	0.0025	*0.303*	*1.91*	T	0.03	<0.002	0.298	1.97	ng	ng

Note:

All measurements are in unit mg/L

Underline = exceeds the maximum allowable concentration listed in the BCWQG - FAL

***italic* = exceeds the maximum allowable concentration listed in the CCME - FAL**

1. Average is calculated using half of the detection limit when the result was below it

2. Approved and Working BC Freshwater Aquatic Life Guidelines = http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html

3. CCME = CCME Water Quality Guidelines for the Protection of Aquatic Life http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124

4. BDL = Below Detection Limit

5. There is no guideline for phosphorous in groundwater, only in lakes (0.01 mg/L) for BC - DW and in salmon predominant lakes (0.005 to 0.015 mg/L) for BC - FAL

ng = no guideline

H = CCME aluminum guideline=0.005 mg/L at pH<6.5; [Ca2+] <4 mg/L; DOC<2 mg/L, 0.1 mg/L at pH ≥ 6.5; [Ca2+] ≥ 4 mg/L; DOC ≥ 2 mg/L

I = CCME chromium guideline = 0.001 mg/L (Cr VI), or 0.0089 (Cr III) which is interim

J = CCME guideline for copper = 0.002 mg/L at 0-120 mg/L [$CaCO_3$], 0.003mg/L at 120 - 180 mg/L [$CaCO_3$], 0.004 mg/L at > 180 mg/L [$CaCO_3$]

K = CCME guideline for lead = 0.001 mg/L for [$CaCO_3$]=0-60 mg/L, 0.002 mg/L for [$CaCO_3$]=60-120 mg/L, 0.004 mg/L for [$CaCO_3$]=120-180 mg/L, 0.007 mg/L for [$CaCO_3$] >180 mg/L

L = CCME guideline for mercury 0.000026 mg/L inorganic Hg, 0.000004 mg/L MeHg

M = CCME and BC Freshwater Aquatic Life guideline for nickel = 0.025 mg/L at 0-60 mg/L [$CaCO_3$], 0.065mg/L at 60 - 120 mg/L [$CaCO_3$], 0.110 mg/L at 120 - 180 mg/L [$CaCO_3$], 0.150 mg/L at > 180 mg/L [CaCO3]

N = Cadmium BC max and CCME guideline = $0.001 * 10^{\{0.86[\log(\text{hardness})] - 3.2\}}$ mg/L

O = Copper BC Max guideline of (0.094(hardness)+2) µg/L. The 30-d mean Cu guideline is ≤ 2 µg/L for hardness ≤ 50 mg/L, and guideline is ≤ 0.04*(mean hardness) µg/L for hardness > 50mg/L.

P = Lead BC Max guideline of $e^{(1.273 \ln(\text{hardness}) - 1.460)}$ ug/L if hardness > 8mg/L; 0.003 mg/L if hardness ≤ 8mg/L. 30-day mean Pb guideline of ≤3.31 + e(1.273 ln (mean hardness) - 4.704) ug/L for hardness > 8mg/L only; otherwise no 30-d mean guideline.

Q = Manganese BC Max guideline 0.01102(hardness)+0.54 mg/L; 30-day mean Mn guideline 0.0044(mean hardness)+0.605 mg/L.

R = selenium BC 30 day mean

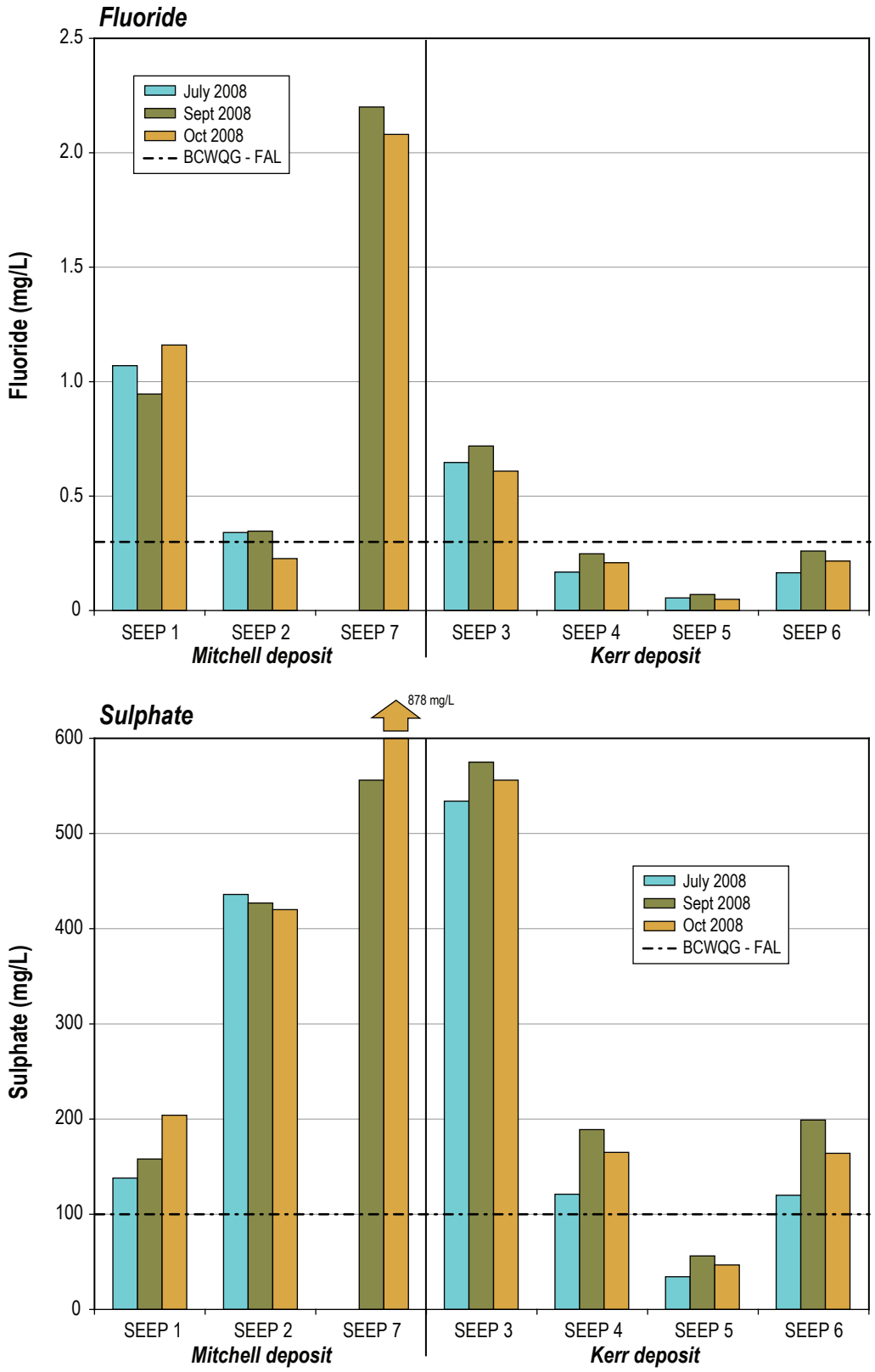
S = Max Ag guideline of 0.003 mg/L if hardness > 100mg/L, max of 0.0001mg/L if hardness ≤ 100mg/L 30-d mean Ag guideline of 0.0015 mg/L if hardness > 100mg/L, 30-d mean of 0.00005 mg/L if hardness ≤ 100mg/L

T = Max Zn guideline = [33 + 0.75*(hardness - 90)] ug/L, minimum of 33 ug/L. 30-day mean Zn guideline = [7.5 + 0.75*(hardness - 90)] ug/L, min of 7.5 ug/L

U = for pH ≥ 6.5, for pH < 2 dissolved Al = $e^{(1.209 - 2.426 (\text{pH}) + 0.286 K)}$ where K = (pH)2

V = Ranges from <4 to >8 mg/L, dependant on sensitivity of acid influx.

W = depends on background values



Fluoride and Sulphate

FIGURE 6.6-2

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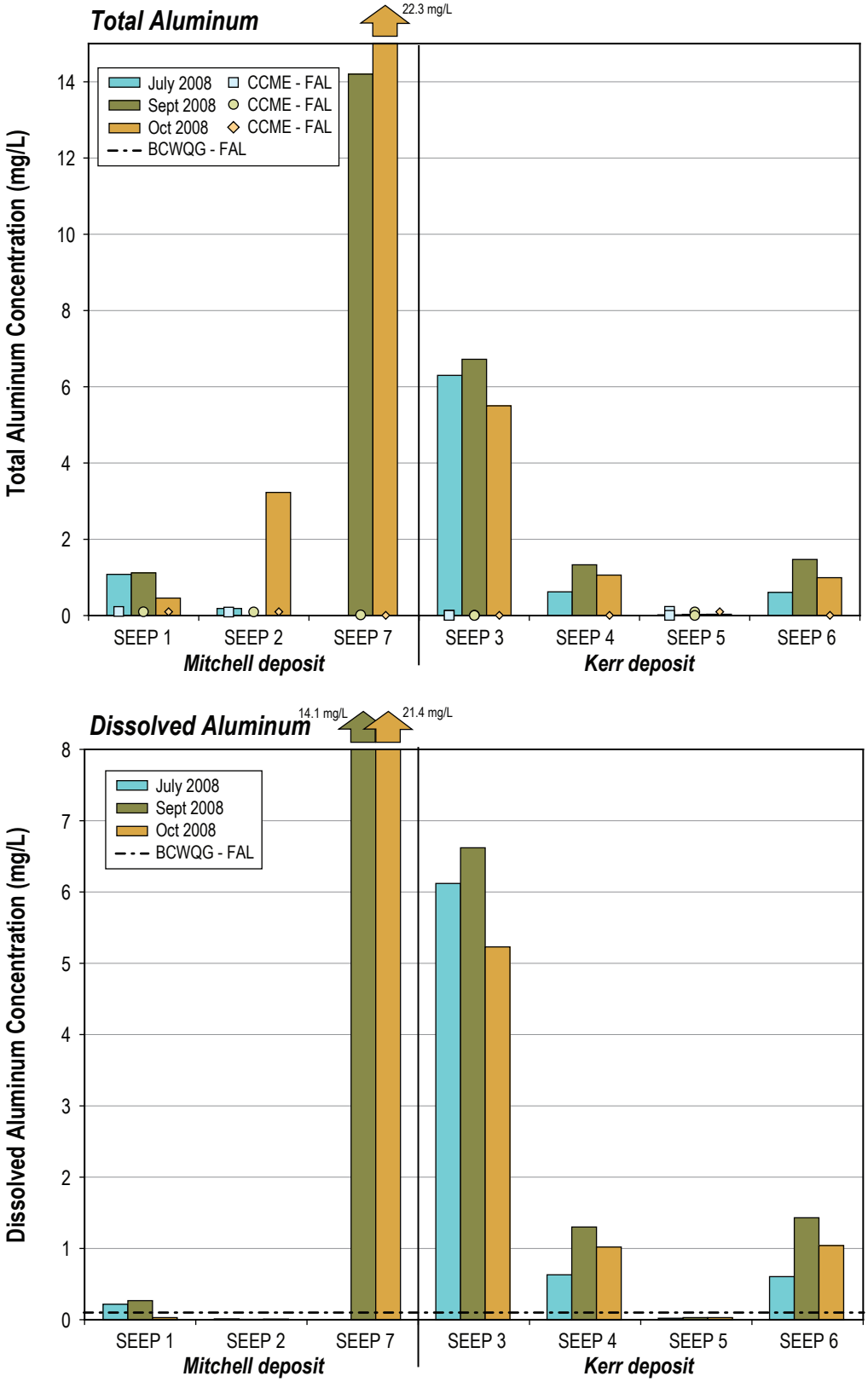

Total and Dissolved Aluminum

FIGURE 6.6-3

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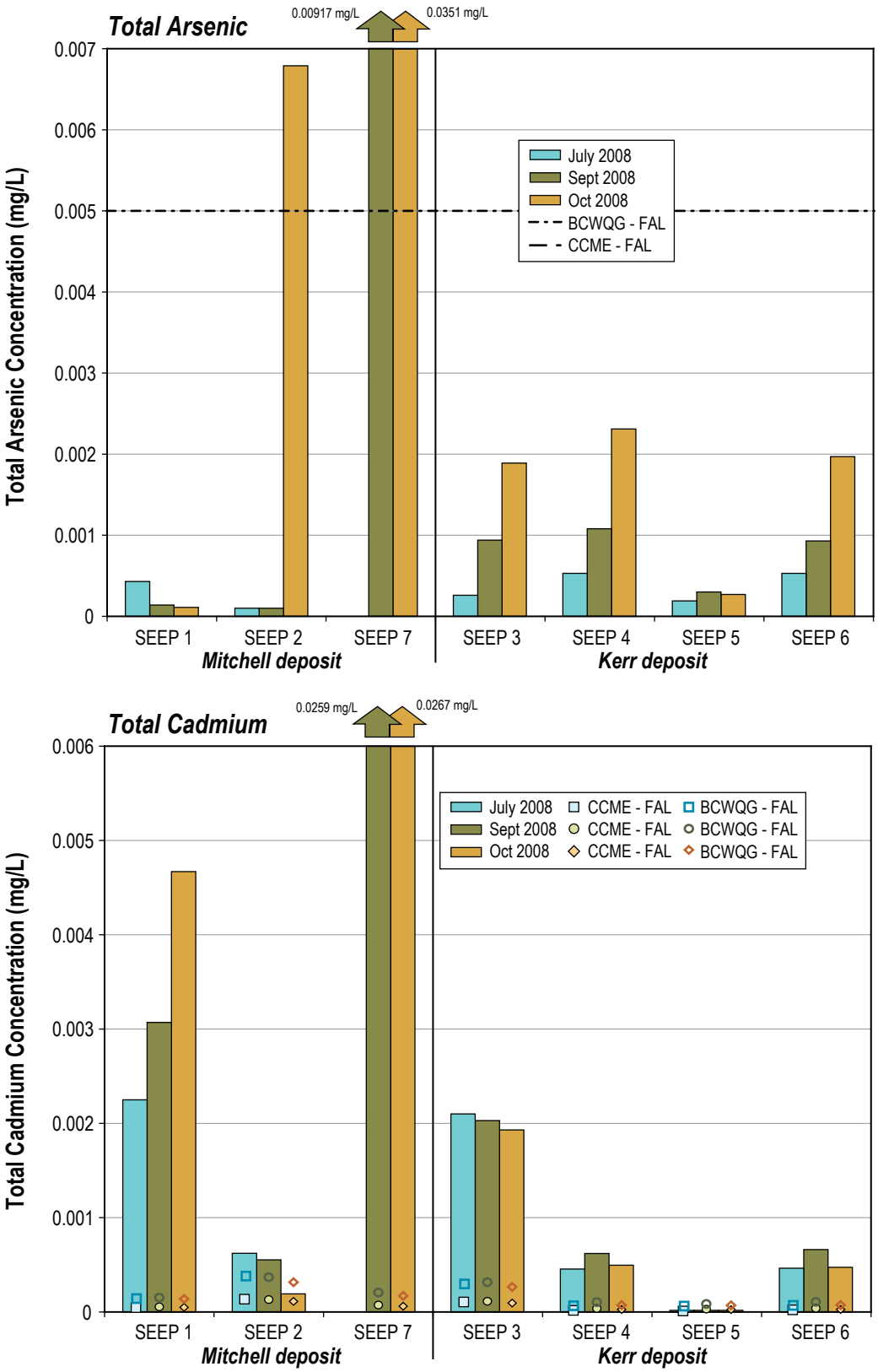

Total Arsenic and Total Cadmium

FIGURE 6.6-4

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The total chromium concentrations measured in groundwater samples from seeps varied from less than 0.0005 (in several seep samples) to 0.0025 mg/L (Seep 7). The total chromium concentrations exceeded the BCWQG (FAL) of 0.001 mg/L and the CCME WQG (FAL) of 0.001 mg/L for groundwater in seeps 2, 3 and 7.

The total copper concentrations in groundwater at the project varied from 0.00204 (Seep 5) to 10.4 mg/L (Seep 7). The BCWQG (FAL) for freshwater aquatic life, which is hardness dependent, was exceeded for samples collected from all seeps. The CCME WQG (FAL), which is hardness dependent, was exceeded for samples obtained from seeps 1, 2, 3, 4, 6 and 7. Figure 6.6-5 shows the total chromium and total copper concentrations measured during the baseline program within the KSM Project footprint.

The total iron concentrations in groundwater samples collected from seeps during the baseline study varied from less than 0.03 (Seep 1 and Seep 2) to 182 mg/L (Seep 7). The CCME WQG (FAL) of 0.3 mg/L for total iron was exceeded in seeps 2, 3, 4, 6 and 7. The BCWQG (FAL) of 1 mg/L was exceeded for total iron in seeps 2, 3, 4, 6 and 7.

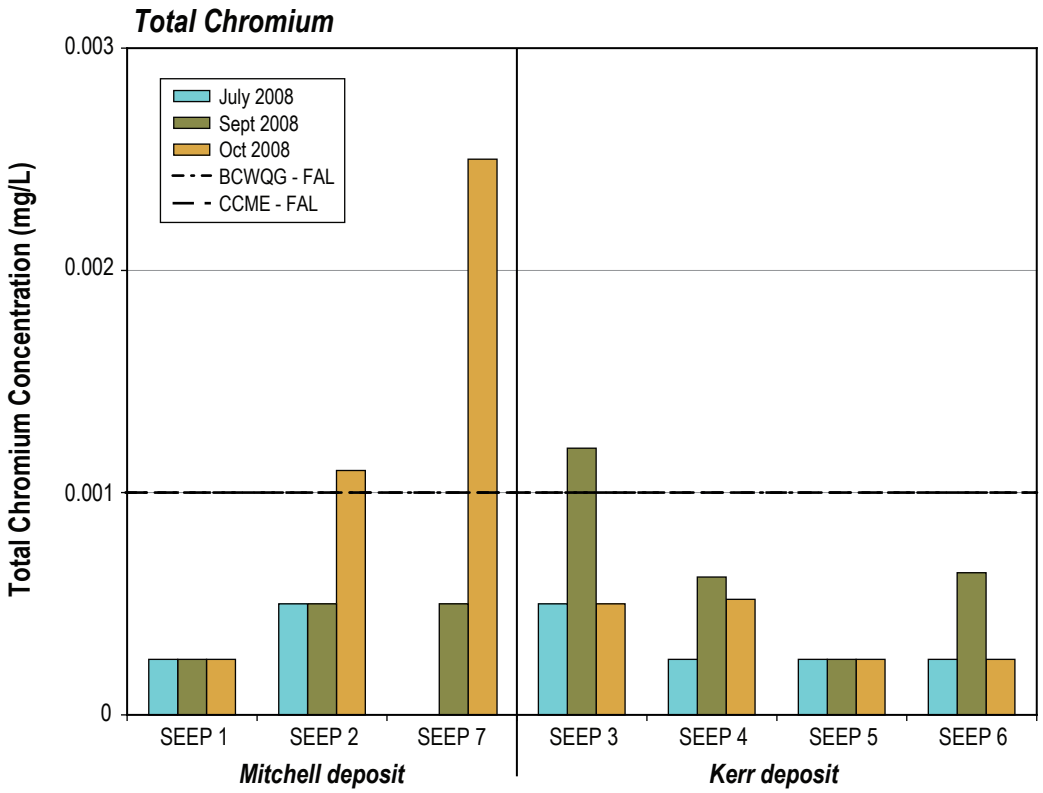
Dissolved iron concentrations in groundwater samples collected within the KSM Project footprint as part of the baseline study, varied from less than 0.03 (Seep 1 and Seep 2) to 182 mg/L (Seep 7). Seeps 3, 4, 5, 6 and 7 had dissolved iron concentrations that exceeded the BCWQG (FAL) of 0.35 mg/L. Figure 6.6-6 shows the results for groundwater sampling collected from seeps for total and dissolved iron.

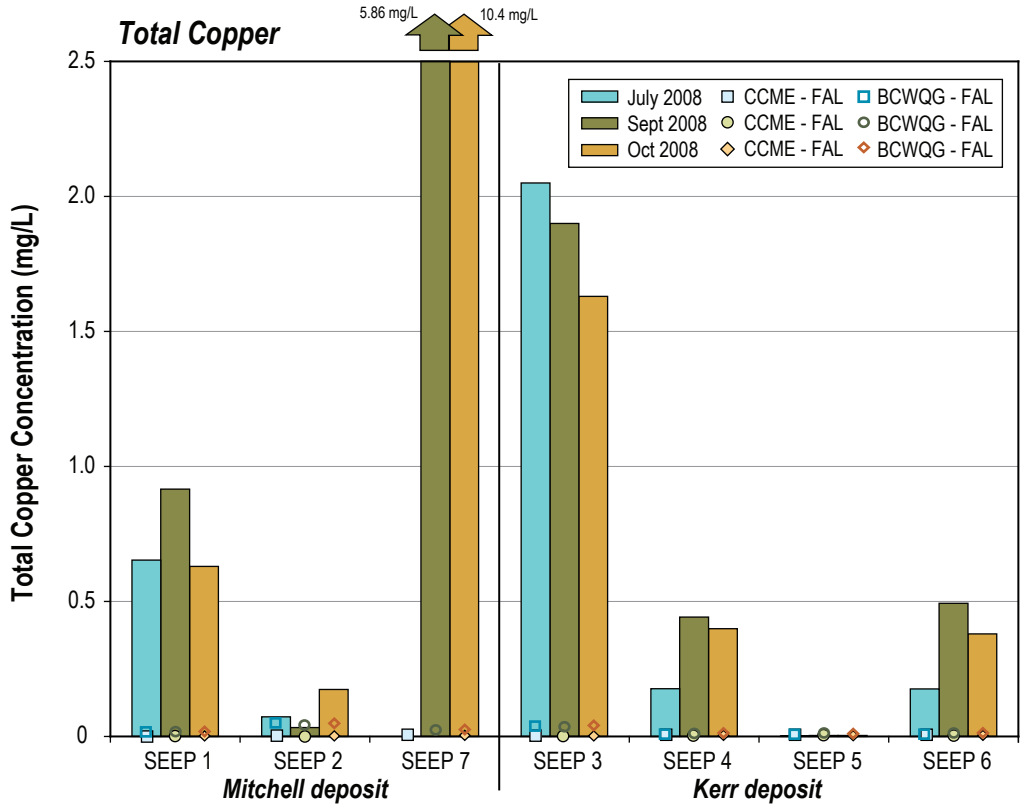
The total lead concentrations in groundwater sampled from the seeps within the KSM Project footprint varied from less than 0.00005 (Seep 1 and Seep 2) to 0.0898 mg/L (Seep 7). The BCWQG (FAL), which is hardness dependent, was exceeded in no samples. The CCME WQG (FAL), which is hardness dependent, was exceeded in Seep 7.

The total selenium concentrations within the KSM Project footprint varied from less than 0.00038 (Seep 5) to 0.0209 mg/L (MW07-06B). All the groundwater samples collected in the Mitchell deposit (from seeps 1, 2 and 7) showed selenium concentrations exceeding the BCWQG (FAL) of 0.002 mg/L and the CCME WQG (FAL) of 0.001 mg/L. Figure 6.6-7 shows the total lead and selenium concentrations measured in groundwater samples.

The total silver concentrations measured in groundwater samples collected from seeps during the baseline program varied from less than 0.00001 (in several seep samples) to 0.00838 mg/L (Seep 7). None of the seeps had samples exceeding the BCWQG (FAL), which is hardness dependent. The CCME WQG (FAL) of 0.0001 mg/L was exceeded in groundwater samples collected from Seep 2 and Seep 7.

The total titanium concentrations in the groundwater samples collected from seeps varied from less than 0.01 (in all samples except one) to 0.114 mg/L (Seep 2). Only one groundwater sample collected from Seep 2 exceeded the BCWQG (FAL) of 0.1 mg/L. Figure 6.6-8 shows the total silver and total titanium concentrations of the groundwater samples collected.





Total Chromium and Total Copper

FIGURE 6.6-5

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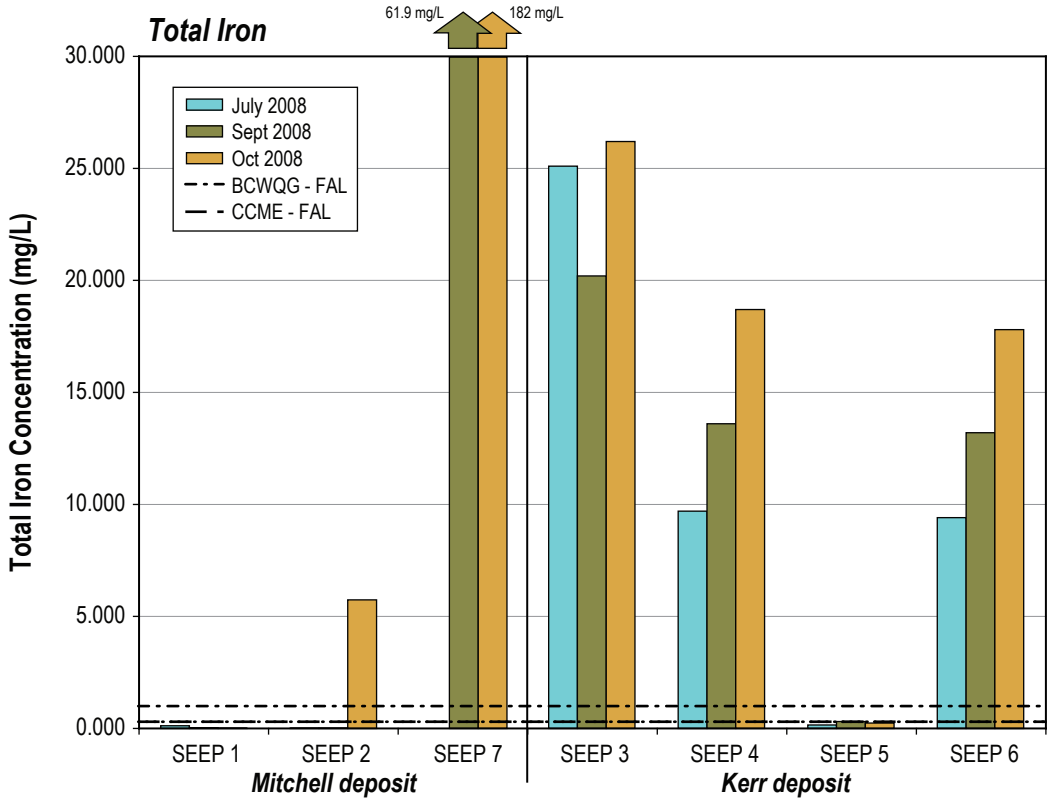

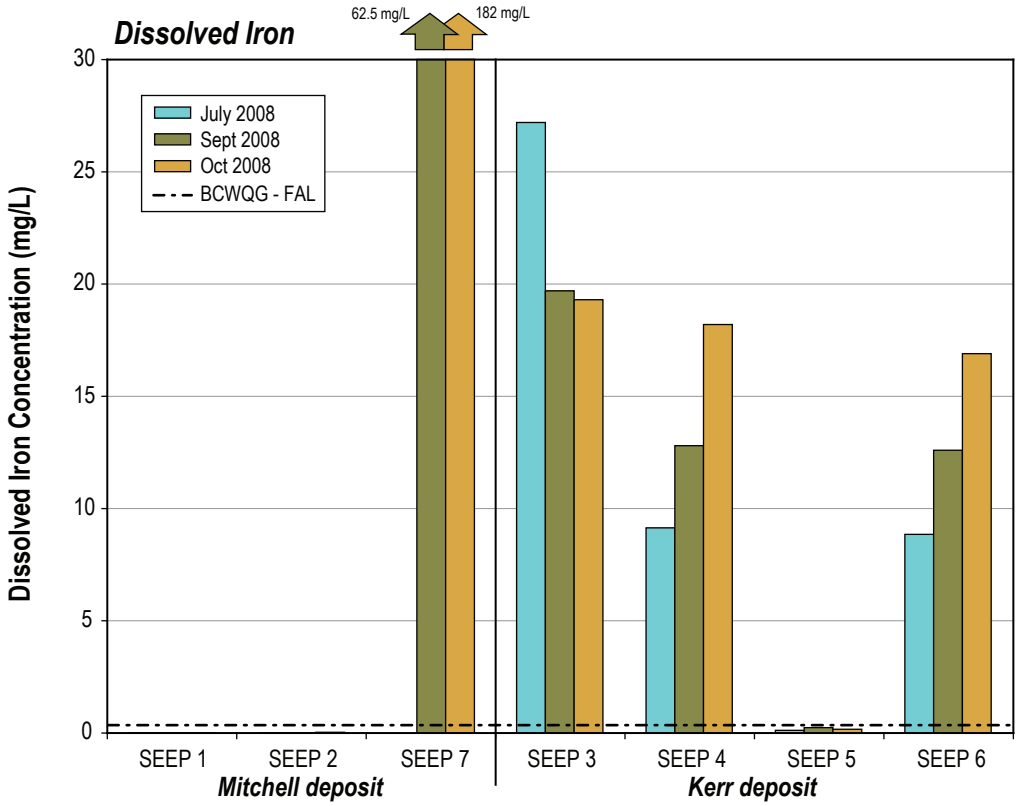

Total and Dissolved Iron

FIGURE 6.6-6

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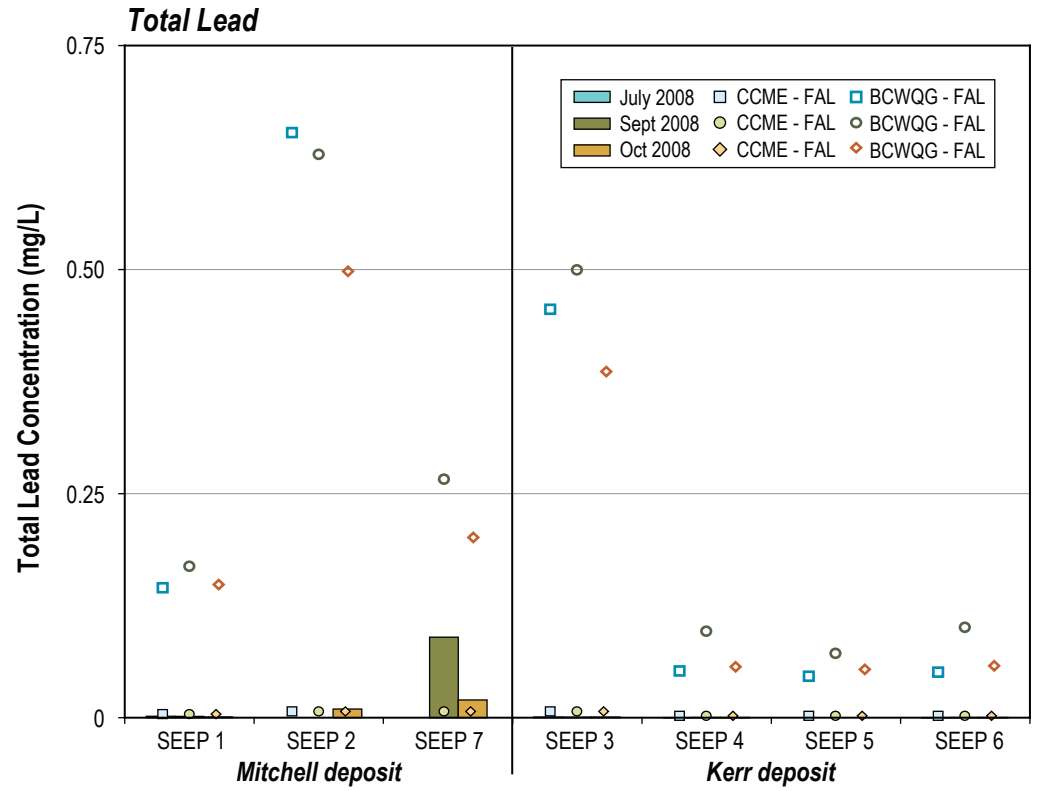

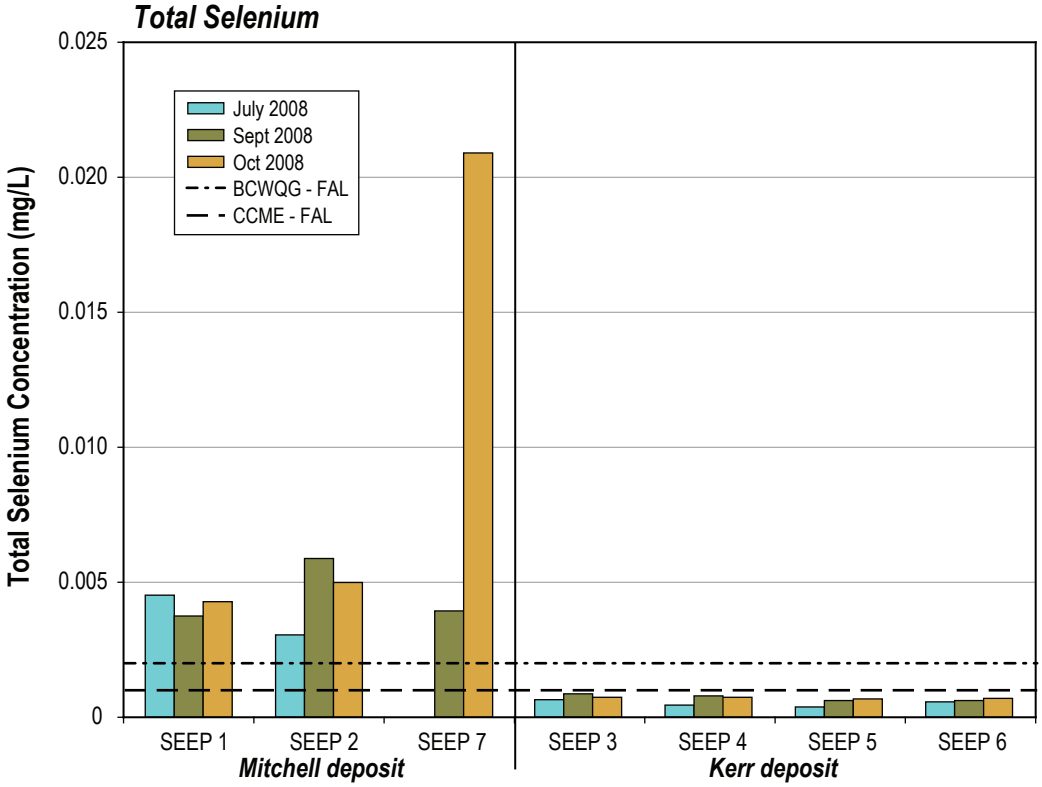

Total Lead and Total Selenium

FIGURE 6.6-7

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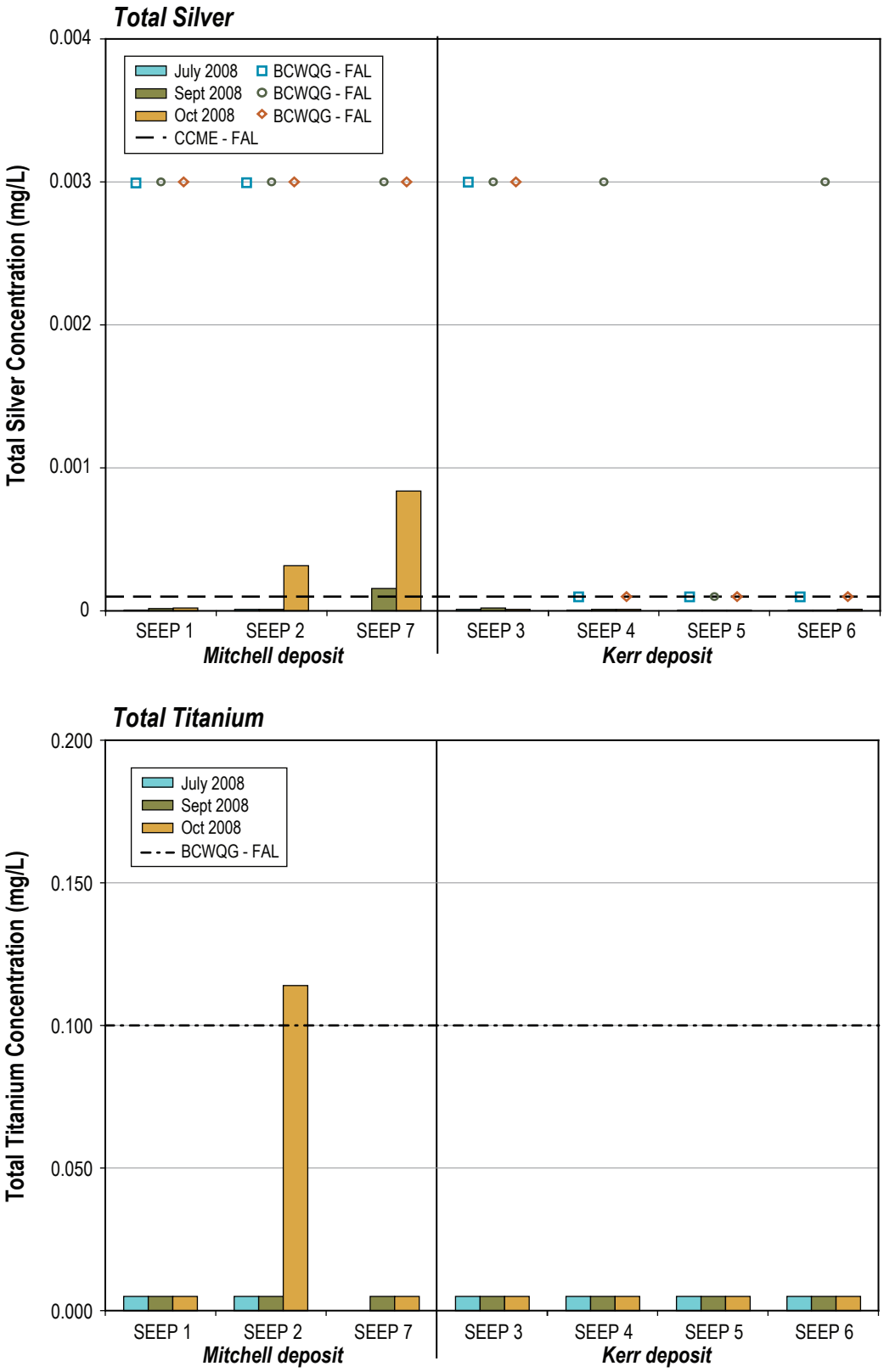

Total Silver and Total Titanium

FIGURE 6.6-8

SEABRIDGE GOLD

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The total zinc concentrations measured in groundwater samples collected from varied from 0.0025 (Seep 5) to 1.91 mg/L Seep 7). Samples from seeps 1, 3, 4, 6 and 7 had groundwater samples that exceeded the BCWQG (FAL), which is hardness dependent. Samples from seeps 1, 3, 4, 6 and 7 had groundwater samples that exceeded the CCME WQG (FAL) of 0.03 mg/L. The total zinc concentrations are presented in Figure 6.6-9 for the groundwater samples collected.

6.6.3 Field Measurements

Field measurements were collected for groundwater pH, conductivity and temperature at each seep sampling site as well as some additional monitoring sites that were identified by Kevin Morin (MDAG 2008). All the field measurements are presented in Tables 6.6-3, 6.6-4 and 6.6-5.

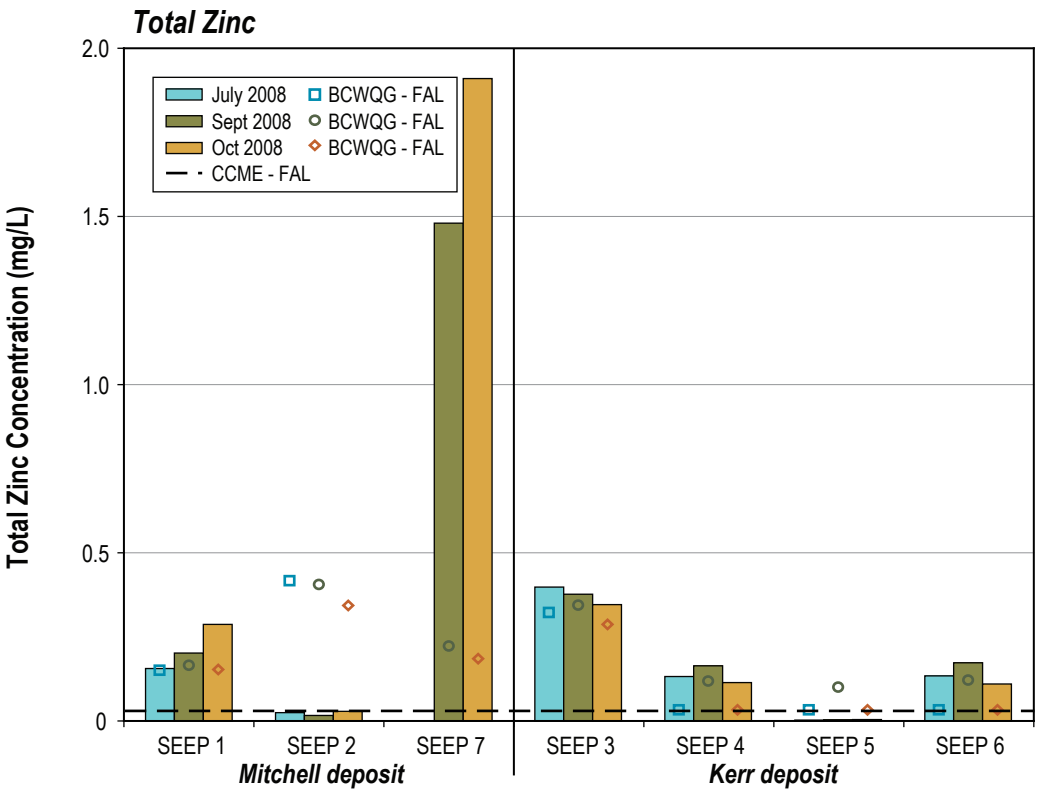
The pH values collected in the field are in general agreement with the analytical results from the laboratory pH measurements. Seep locations 3, 4, 6 (located at the Kerr deposit) and Seep 7 (located at the Mitchell deposit) showed the lowest pH values, which occurred in July. This may be due to the flushing and groundwater transport of the stored secondary oxidation products including acidity, sulphate, and dissolved metals from naturally occurring sulphide oxidation at the Mitchell and Kerr deposits. The measurements taken in October at the seep locations 1, 2 (in the Mitchell deposit) and Seep 5 (in the Kerr deposit) exhibit near-neutral pH values, consistent with the laboratory analytical results. This may be due to the seasonal flushing and groundwater transport of the stored secondary oxidation products including acidity, sulphate, and dissolved metals from naturally occurring sulphide oxidation at the Mitchell and Kerr deposits in later summer and early fall followed by mixing and dilution with the onset of fall rains.

In general, the seep sampling sites located in the Mitchell deposit show a trend of high conductivity, with values ranging between 930 µS/cm (at Seep 2 in July) and 1430 µS/cm (at Seep 10 in October). The exception to this general trend is Seep 1, which had the lowest conductivity values and the smallest range. The seep sampling sites located at the Kerr deposit showed variable conductivity measurements all of which were in agreement with the laboratory analytical results. For both deposits there was a general inverse relationship with lower pH values corresponding to higher conductivity values and vice versa for the same seep sample location on the same sampling date.

The field temperature measurements ranged from 3.9 ºC (at Seep 6 in October) to 10.1 ºC (at Seep 1 in July) with temperatures generally lower in September and October during the fall than in July during the summer. The average temperature of groundwater measured at seep sampling locations was 8.03 ºC for the Mitchell deposit and 6.60 ºC for the Kerr deposit.

6.7 Conclusions

The 2008 hydrological baseline program was preliminary in nature and therefore did not include the collection of bedrock and groundwater data to characterize hydraulic properties of surficial overburden and bedrock geological units and the groundwater flow regime within the KSM Project footprint. However in general, the water table mimics and groundwater flow directions are parallel to the surface topography within the KSM Project footprint.



Total Zinc

FIGURE 6.6-9

SEABRIDGE GOLD

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Table 6.6-3
KSM Project: Field Measurements - pH

Seep ID	Coordinates		Location	July[A]	Sept.[B]	Oct.[C]
	Easting	Northing				
Seep 1	423365	6265754	North Side of Mitchell Cr	4.11	2.7	6.9
Seep 2	422318	6265384	Creek Bottom South Side of Mitchell Cr	4.75	1.7	8.47
Seep 3	421661	6259874	Kerr Cr	0.39	N/A	3.26
Seep 4	421715	6259874	Kerr Cr	1.42	1.49	3.3
Seep 5	421721	6259837	Kerr Cr	2.7	1.7	7.32
Seep 6	421590	6260097	Kerr Cr	URI-0.99	3.03	3.23
Seep 7	423682	6265480	Mitchell Deposit (West Seepage)	2.75	1.7	2.6
Seep 8	423724	6265485	Mitchell Deposit (Southeast Seepage)	3.3	N/A	3.1
Seep 9	423745	6265504	Mitchell Deposit (East Seepage)	3.08	N/A	3
Seep 10	423712	6265478	Mitchell Deposit (Central Seepage)	2.99	N/A	2.9

Note:
[A] = Measurements Taken on July 27 and July 30, 2008
[B] = Measurements Taken on Sept. 8 and Sept. 10, 2008
[C] = Measurements Taken on Oct. 2 and Oct. 9, 2008
N/A = Not Available
Coordinates are NAD 83, UTM Zone 9

Table 6.6-4
KSM Project: Field Measurements - Conductivity

Seep ID	Coordinates		Location	July[A]	Sept.[B]	Oct.[C]
	Easting	Northing				
Seep 1	423365	6265754	North Side of Mitchell Cr	320	380	410
Seep 2	422318	6265384	Creek Bottom South Side of Mitchell Cr	930	960	1000
Seep 3	421661	6259874	Kerr Cr	1160	1330	1320
Seep 4	421715	6259874	Kerr Cr	400	620	610
Seep 5	421721	6259837	Kerr Cr	130	190	190
Seep 6	421590	6260097	Kerr Cr	430	640	610
Seep 7	423682	6265480	Mitchell Deposit (West Seepage)	1600	1310	N/A
Seep 8	423724	6265485	Mitchell Deposit (Southeast Seepage)	1070	N/A	1340
Seep 9	423745	6265504	Mitchell Deposit (East Seepage)	1310	N/A	1540
Seep 10	423712	6265478	Mitchell Deposit (Central Seepage)	1500	N/A	1430

Note:
All measurements are in µS/cm
[A] = Measurements Taken on July 27 and July 30, 2008
[B] = Measurements Taken on Sept. 8 and Sept. 10, 2008
[C] = Measurements Taken on Oct. 2 and Oct. 9, 2008
N/A = Not Available
Coordinates are NAD 83, UTM Zone 9

Table 6.6-5
KSM Project: Field Measurements - Temperature

Seep ID	Coordinates		Location	July[A]	Sept.[B]	Oct.[C]
	Easting	Northing				
Seep 1	423365	6265754	North Side of Mitchell Cr	10.1	7.2	9.6
Seep 2	422318	6265384	Creek Bottom South Side of Mitchell Cr	8.6	7.1	8.2
Seep 3	421661	6259874	Kerr Cr	6.8	4.6	3.9
Seep 4	421715	6259874	Kerr Cr	7.6	6.8	6.8
Seep 5	421721	6259837	Kerr Cr	8.3	6.9	6.6
Seep 6	421590	6260097	Kerr Cr	7.6	6.6	6.7
Seep 7	423682	6265480	Mitchell Deposit (West Seepage)	N/A	5.4	N/A

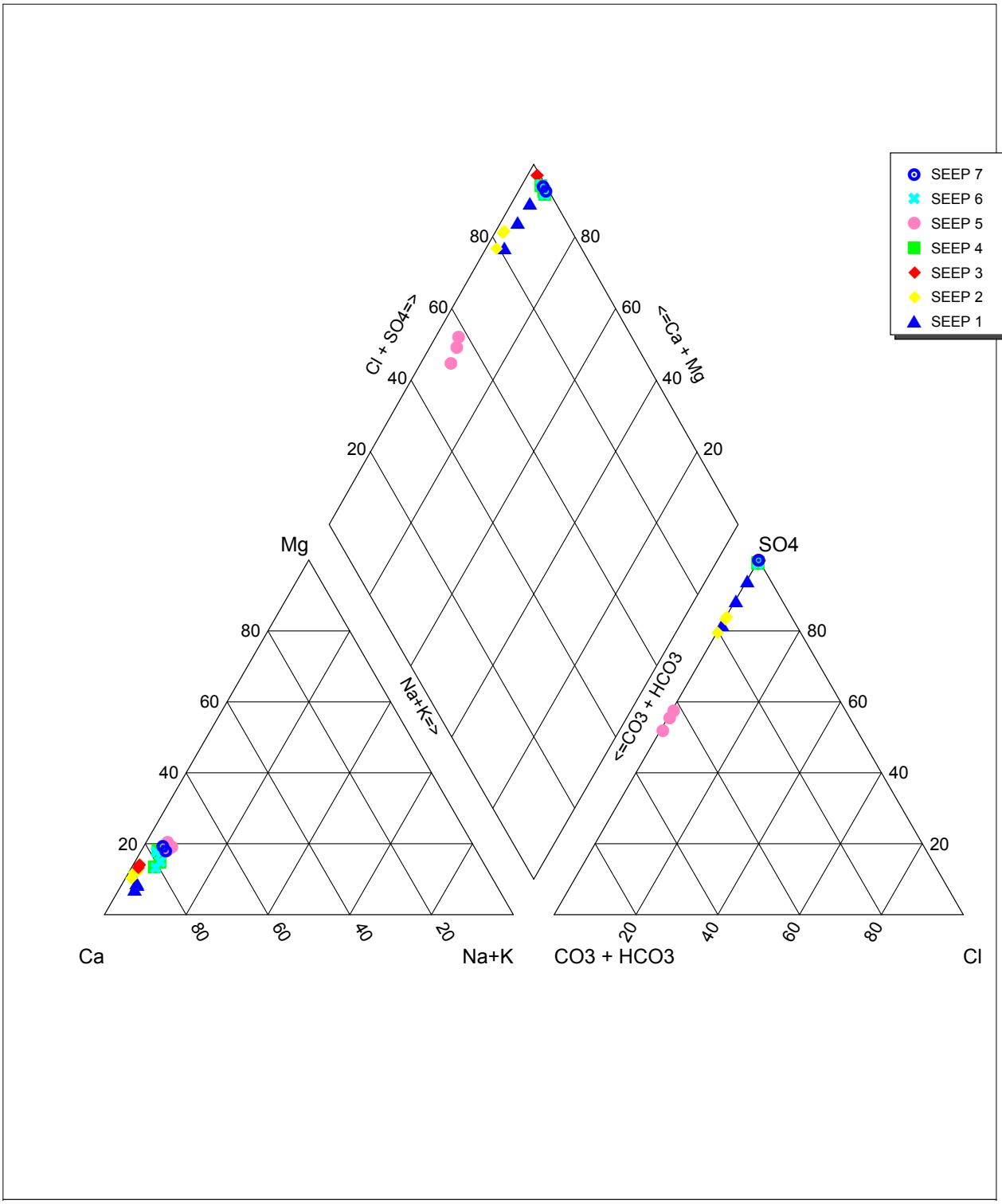
Note:
All measurements are in ºC
[A] = Measurements Taken on July 27, 2008
[B] = Measurements Taken on Sept. 8 and Sept. 10, 2008
[C] = Measurements Taken on Oct. 2 and Oct. 9, 2008
N/A = Not Available
Coordinates are NAD 83, UTM Zone 9

The groundwater samples collected from seeps at different locations in the Kerr and the Mitchell deposits within the KSM Project footprint provide a preliminary indication of the groundwater quality in the localized areas upgradient of where they were collected. Generally, the groundwater chemistry is influenced by the host rock in which it flows.

The piper diagram contains all the laboratory analytical results from the seepage groundwater sampling program and is presented in Figure 6.7-1. A summary of all the samples locations and water types is also provided in Table 6.7-1. The groundwater collected from seeps within the KSM Project footprint is dominated by calcium cations suggesting the strong influence of minerals such as calcite and anhydrite on the groundwater chemistry. The anions present are mainly sulphate due to the oxidation of sulphide mineralization in the surrounding host rock. The principal sulphides within the Kerr-Sulphurets-Mitchell deposits are pyrite and chalcopyrite with minor molybdenite and trace amounts of tennantite, bornite, sphalerite and galena. One seep sampling site (Seep 5), located on the periphery of the Kerr deposit, shows a small influence of carbonate dissolution on the groundwater composition and/or interactions with fresh water recharge derived from rainfall or snowmelt.

Table 6.7-1
KSM Project: Summary of Groundwater Types from Seep Sampling

Seep ID	Location	Water Type	
Seep 1	North side of Mitchell Cr	Calcium Sulfate	Ca-SO4
Seep 2	Creek Bottom South side of Mitchell Cr	Calcium Sulfate	Ca-SO4
Seep 3	Kerr Cr	Calcium Sulfate	Ca-SO4
Seep 4	Kerr Cr	Calcium Sulfate	Ca-SO4
Seep 5	Kerr Cr	Calcium Sulfate - Bicarbonate	Ca-SO4-HCO3
Seep 6	Kerr Cr	Calcium Sulfate	Ca-SO4
Seep 7	West Seepage	Calcium Sulfate	Ca-SO4



Piper Plot

FIGURE 6.7-1

SEABRIDGE GOLD

Rescan™

The Kerr deposit (south) is characterized by host rock from the Stuhini group: Triassic sedimentary and volcaniclastic rocks with intrusions of Early Jurassic monzonite. The core of the zone is described as composed of "sericite schist" and "chlorite schist" (Wardrop 2008). The rocks encountered in this formation exhibit gossanous, limonitic weathering typical of pyrite-rich, phyllic and silicic alteration. Crackled quartz stockwork, anhydrite veining and chlorite alteration are also present. Common rock forming minerals of monzonite are orthoclase, plagioclase, hornblende, augite and biotite.

The groundwater samples collected from seeps in the Kerr deposit showed higher concentrations of total and dissolved metals (see aluminum, copper, iron, manganese, and zinc Figures 6.6-5, 6.6-7, 6.6-8, 6.6-9 and 6.6-11). This may reflect naturally occurring ML/ARD in mineralized host rock and the subsequent flushing and transport of metals and other secondary oxidation products by groundwater. Plate 6.7-1 illustrates the location of the sampling site for Seep 3. The location of the sampling site for Seep 6 is presented in Plate 6.7-2.

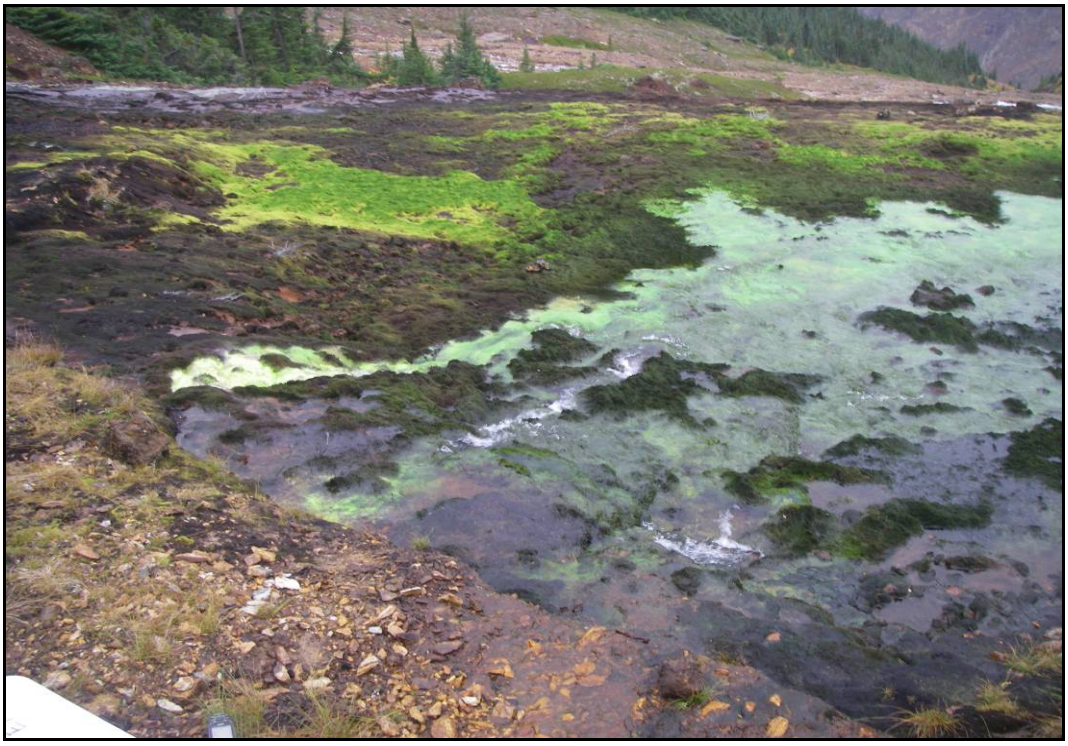


Plate 6.7-1. Sampling location for Seep 3 – in the Kerr deposit.

Also located in the Kerr deposit, Seep 5 shows a higher concentration of carbonate in its anion composition. The analytical results also show that in comparison with the other samples collected from the Kerr deposit, this seep has lower conductivity, fluoride and sulphate concentrations. In October 2008, the pH values were relatively low in all the seep samples collected in the Kerr deposit except Seep 5, which showed a near-neutral pH. This may be due to carbonate or calcium sulphate dissolution and/or interactions with fresh water recharge derived from rainfall or snowmelt. The proximity of a stream to the seep sampling location supports this explanation, see Plate 6.7-3.

Plate 6.7-2. Sampling location for Seep 6 – in the Kerr deposit.

Seep 1, located in the Mitchell deposit is illustrated in Plate 6.7-4. The plate shows Seep 1 in May, 2008. The deep turquoise colour indicates the presence of the secondary copper-bearing carbonate mineral malachite. Elevated copper was confirmed by laboratory analytical results presented in Figure 6.6-5. The concentrations for total copper in samples collected from Seep 2, also in the Mitchell deposit, show low values for copper. This groundwater seep site is illustrated in Plate 6.7-6 for May 2008.

After the first sampling event in July 2008, an additional sampling site was added to the program; Seep 7 is presented in Plate 6.7-5. Field measurements at this location indicated highest conductivity values and lowest pH noted to date (MDAG 2008, Stantec 2003). The groundwater chemistry results for Seep 7 show values exceeding guidelines. Seep 7 showed the maximum recorded values throughout the sampling program for the following parameters: colour, conductivity, TDS, acidity, fluoride, sulphate, total phosphate, aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, molybdenum, nickel, selenium, silicon, silver, sodium, thallium, uranium, vanadium and zinc. Moreover, of all the groundwater seep samples submitted for laboratory analysis, Seep 7 showed the lowest pH values throughout the sampling program. This seep sampling site is located on the south side of Mitchell Creek near the current toe of the glacier. At this location, larger seepage flows converge into a substantial flow into Mitchell Creek.

Plate 6.7-3. Sampling location for Seep 5 – in the Kerr deposit.

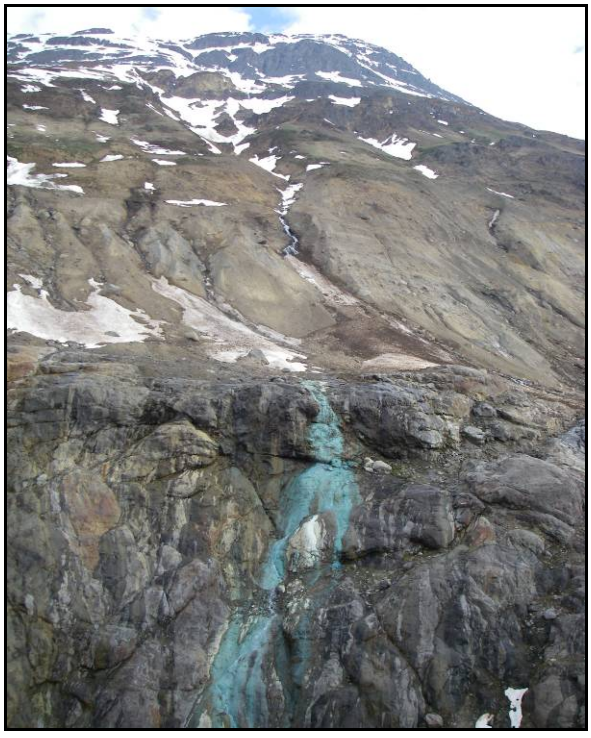


Plate 6.7-4. Sampling location for Seep 1 – in the North Mitchell deposit.

Plate 6.7-5. Sampling location for Seep 7 – on the West side of Mitchell deposit.

Plate 6.7-6. Sampling location for Seep 2 – in the South lower Mitchell deposit.

In general, these preliminary results from the groundwater seep samples collected on the south side of the Mitchell Creek (Seep 2 and Seep 7) show higher metals content than results from seep samples collected on the North side of the Mitchell Creek (Seep 1). This suggests that the groundwater seepage occurring on the north side of the Mitchell Creek has less interaction with mineralized host rock, while the seepage occurring on the south side of the Mitchell Creek has undergone more extensive interactions with mineralized host rocks prior to groundwater discharge as seepage.

REFERENCES

References

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Wardrop, 2008. Kerr-Sulphurets-Mitchell Preliminary Economic Assessment 2008, Vancouver, BC

APPENDIX 6.4.1A
RESULTS OF ANALYSIS

Appendix 6.4.1A
Results of Analysis

Sample ID	Seep 1	Seep 2	Seep 3	Seep 4	Seep 5	Seep 6	Seep 7
Date Sampled	**27-Jul-08**	**27-Jul-08**	**27-Jul-08**	**27-Jul-08**	**27-Jul-08**	**27-Jul-08**	**27-Jul-08**
Physical Tests							
Colour, True	<5.0	<5.0	15.8	<5.0	<5.0	<5.0	<5.0
Conductivity	367	946	1110	452	138	446	456
Hardness (as CaCO3)	157	512	386	70.3	63.9	68.9	68.4
pH	7.36	7.95	3.25	3.24	7.53	3.23	3.22
Total Suspended Solids	4.7	3.6	<3.0	10.7	<3.0	8.7	8.7
Total Dissolved Solids	252	745	838	151	84	148	167
Turbidity	2.24	1.17	0.44	29.5	0.28	26.9	28
Anions and Nutrients							
Acidity (as CaCO3)	2.9	3.1	142	54	2.1	52.6	54
Alkalinity, Bicarbonate (as CaCO3)	32	86.8	<2.0	<2.0	33	<2.0	<2.0
Alkalinity, Carbonate (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	32	86.8	<2.0	<2.0	33	<2.0	<2.0
Ammonia as N	<0.0050	<0.0050	0.0116	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	1.07	0.341	0.647	0.168	0.055	0.165	0.168
Nitrate (as N)	<0.0050	<0.0050	0.0056	0.0056	<0.0050	<0.0050	<0.0050
Nitrite (as N)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Nitrogen	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ortho Phosphate as P							
Total Dissolved Phosphate As P							
Total Phosphate as P	0.0043	<0.0020	0.0912	0.0454	0.0042	0.0421	0.039
Sulfate (SO4)	138	436	534	121	34.4	120	120
Cyanides							
Cyanide, Total	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon							
Total Organic Carbon	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total dissolved Carbon							
Total Metals							
Aluminum (Al)-Total	1.08	0.185	6.3	0.622	0.0191	0.607	0.608
Antimony (Sb)-Total	0.00023	0.00049	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	0.00043	<0.00020	0.00026	0.00053	0.00019	0.00053	0.00051
Barium (Ba)-Total	0.0177	0.00931	0.00944	0.00701	0.0123	0.00821	0.00826
Beryllium (Be)-Total	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)-Total	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	0.00225	0.000622	0.0021	0.000455	<0.000017	0.000464	0.000458
Calcium (Ca)-Total	56.7	164	139	22.9	20	23.2	22.9
Chromium (Cr)-Total	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	0.0014	<0.00020	0.0277	0.00693	0.00012	0.00704	0.00683
Copper (Cu)-Total	0.653	0.0726	2.05	0.177	0.00204	0.176	0.174
Iron (Fe)-Total	0.121	<0.030	25.1	9.7	0.152	9.41	9.31
Lead (Pb)-Total	0.00158	<0.00010	0.00073	0.000104	<0.000050	0.000113	0.000121
Lithium (Li)-Total	<0.0050	<0.010	0.015	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	2.74	11.7	13.7	2.61	3.12	2.66	2.62
Manganese (Mn)-Total	0.164	0.0194	2.49	0.613	0.0105	0.618	0.599
Mercury (Hg)-Total	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	0.00235	0.0111	0.00011	<0.000050	0.000081	<0.000050	<0.000050
Nickel (Ni)-Total	0.0111	0.0018	0.0146	0.0148	<0.00050	0.015	0.0149
Phosphorus (P)-Total	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	1.33	0.66	1.17	0.108	0.229	0.109	0.104
Selenium (Se)-Total	0.00452	0.00305	0.00065	0.00045	0.00038	0.00057	0.00039
Silicon (Si)-Total	5.83	3.31	7.52	1.19	1.16	1.2	1.2
Silver (Ag)-Total	<0.000010	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	<2.0	2.3	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium (Sr)-Total	0.254	0.88	1.38	0.146	0.209	0.148	0.146
Thallium (Tl)-Total	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	0.00183	0.00141	0.0002	0.000083	<0.000010	0.000081	0.000085
Vanadium (V)-Total	<0.0010	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	0.156	0.0246	0.398	0.132	0.0025	0.134	0.13
Dissolved Metals							
Aluminum (Al)-Dissolved	0.218	0.0122	6.12	0.63	0.0207	0.605	0.619
Antimony (Sb)-Dissolved	0.0002	0.00052	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	<0.00010	0.0002	0.00085	0.0003	0.00014	0.00026	0.00024
Barium (Ba)-Dissolved	0.0164	0.00972	0.00936	0.00706	0.0124	0.00911	0.00785
Beryllium (Be)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	0.00218	0.000654	0.00212	0.000451	<0.000017	0.000433	0.000434
Calcium (Ca)-Dissolved	58.5	185	133	23.7	20.4	23.3	23.1
Chromium (Cr)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	0.0013	<0.00020	0.0264	0.0071	0.00012	0.00686	0.00685
Copper (Cu)-Dissolved	0.555	0.05	1.95	0.177	0.00297	0.172	0.171
Iron (Fe)-Dissolved	<0.030	<0.030	27.2	9.14	0.122	8.85	8.66
Lead (Pb)-Dissolved	0.000487	<0.00010	0.00066	0.000129	0.000093	0.00013	0.00011
Lithium (Li)-Dissolved	<0.0050	<0.010	0.014	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Dissolved	2.74	12.1	13.2	2.69	3.13	2.62	2.62
Manganese (Mn)-Dissolved	0.161	0.0203	2.38	0.637	0.00796	0.606	0.599
Mercury (Hg)-Dissolved	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000013
Molybdenum (Mo)-Dissolved	0.00242	0.0121	0.00127	<0.000050	0.000069	<0.000050	<0.000050
Nickel (Ni)-Dissolved	0.0112	0.002	0.0137	0.0152	<0.00050	0.0148	0.0147
Phosphorus (P)-Dissolved	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	1.33	0.71	1.1	0.119	0.237	0.107	0.108
Selenium (Se)-Dissolved	0.00394	0.00297	0.00047	0.00051	0.00031	0.00039	0.00041
Silicon (Si)-Dissolved	5.58	3.21	7.06	1.15	1.12	1.16	1.18
Silver (Ag)-Dissolved	<0.000010	<0.000020	0.000089	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	<2.0	2.3	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium (Sr)-Dissolved	0.266	0.938	1.3	0.15	0.212	0.146	0.146
Thallium (Tl)-Dissolved	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	0.000846	0.00129	0.000186	0.000087	<0.000010	0.000085	0.000079
Vanadium (V)-Dissolved	<0.0010	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	0.144	0.0247	0.364	0.124	0.0038	0.121	0.121

(continued)

Appendix 6.4.1A
Results of Analysis (continued)

Sample ID	Seep 1	Seep 2	Seep 3	Seep 4	Seep 5	Seep 6	Seep 7
Date Sampled	**10-Sep-08**	**10-Sep-08**	**9-Sep-08**	**9-Sep-08**	**9-Sep-08**	**9-Sep-08**	**10-Sep-08**
Physical Tests							
Colour, True	<5.0	<5.0	21.7	6.9	<5.0	6.6	40
Conductivity	370	907	1230	636	207	641	1180
Hardness (as CaCO3)	177	497	415	114	90.3	118	253
pH	7.13	7.81	3.15	3.14	7.93	3.15	2.95
Total Suspended Solids	10.4	<3.0	<3.0	15.4	<3.0	11.9	<3.0
Total Dissolved Solids	263	736	846	269	131	285	826
Turbidity	3.92	0.11	0.42	37.6	0.73	27.4	0.22
Anions and Nutrients							
Acidity (as CaCO3)	3.5	4	138	68.9	<1.0	69.1	298
Alkalinity, Bicarbonate (as CaCO3)	21.2	89.2	<2.0	<2.0	42.9	<2.0	<2.0
Alkalinity, Carbonate (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	21.2	89.2	<2.0	<2.0	42.9	<2.0	<2.0
Ammonia as N	<0.0050	<0.0050	0.0167	0.0071	<0.0050	<0.0050	<0.0050
Bromide (Br)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	0.946	0.347	0.719	0.248	0.07	0.26	2.2
Nitrate (as N)	<0.0050	<0.0050	0.0056	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Nitrogen	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ortho Phosphate as P	<0.0010	<0.0010					0.997
Total Dissolved Phosphate As P	0.0022	0.0036					0.919
Total Phosphate as P	0.0066	0.0042	0.0433	0.056	0.0063	0.05	0.943
Sulfate (SO4)	158	427	575	189	56.2	199	556
Cyanides							
Cyanide, Total	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0045
Organic / Inorganic Carbon							
Total Organic Carbon	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total dissolved Carbon	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals							
Aluminum (Al)-Total	1.12	0.0077	6.72	1.33	0.0324	1.47	14.2
Antimony (Sb)-Total	0.00017	0.00051	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Arsenic (As)-Total	0.00014	<0.00020	0.00094	0.00108	0.0003	0.00093	0.00917
Barium (Ba)-Total	0.0157	0.00972	0.00837	0.00665	0.0174	0.00688	0.00712
Beryllium (Be)-Total	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	0.0049
Bismuth (Bi)-Total	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.0010
Boron (B)-Total	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.020
Cadmium (Cd)-Total	0.00307	0.000553	0.00203	0.00062	<0.000017	0.000662	0.0259
Calcium (Ca)-Total	63.7	179	144	36.8	28	39.6	82.3
Chromium (Cr)-Total	<0.00050	<0.0010	0.0012	0.00062	<0.00050	0.00064	<0.0010
Cobalt (Co)-Total	0.00234	<0.00020	0.0279	0.01	0.00026	0.0105	0.04
Copper (Cu)-Total	0.916	0.033	1.9	0.442	0.00373	0.493	5.86
Iron (Fe)-Total	0.031	<0.030	20.2	13.6	0.31	13.2	61.9
Lead (Pb)-Total	0.00149	<0.00010	0.00057	0.000228	<0.000050	0.000243	0.0898
Lithium (Li)-Total	<0.0050	<0.010	0.016	<0.0050	<0.0050	<0.0050	0.021
Magnesium (Mg)-Total	3.9	14.9	14.7	5.25	4.67	5.41	11.8
Manganese (Mn)-Total	0.363	0.00693	2.63	0.975	0.0174	1.03	3.32
Mercury (Hg)-Total	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	0.00147	0.0167	0.00118	0.000424	0.000122	0.000385	0.00546
Nickel (Ni)-Total	0.0171	0.0021	0.0144	0.0157	<0.00050	0.0155	0.0201
Phosphorus (P)-Total	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.98
Potassium (K)-Total	1.49	0.71	1.01	0.249	0.359	0.27	2.01
Selenium (Se)-Total	0.00375	0.00588	0.00087	0.00079	0.00062	0.00062	0.00394
Silicon (Si)-Total	6.15	3.04	8.14	2.19	1.55	2.34	14.6
Silver (Ag)-Total	0.000016	<0.000020	0.00002	0.00001	<0.000010	<0.000010	0.000156
Sodium (Na)-Total	<2.0	2.1	<2.0	<2.0	<2.0	<2.0	6.3
Strontium (Sr)-Total	0.262	0.984	1.3	0.326	0.352	0.357	0.685
Thallium (Tl)-Total	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00021
Tin (Sn)-Total	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	0.00155	0.00176	0.000176	0.000109	<0.000010	0.000117	0.00202
Vanadium (V)-Total	<0.0010	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	0.0113
Zinc (Zn)-Total	0.202	0.0165	0.377	0.164	0.0034	0.173	1.48
Dissolved Metals							
Aluminum (Al)-Dissolved	0.267	0.0056	6.62	1.3	0.0292	1.43	14.1
Antimony (Sb)-Dissolved	0.00017	0.00052	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Arsenic (As)-Dissolved	<0.00010	<0.00020	0.00069	0.00068	0.00024	0.00054	0.00917
Barium (Ba)-Dissolved	0.0152	0.00956	0.00842	0.00663	0.0174	0.0067	0.00708
Beryllium (Be)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	0.0052
Bismuth (Bi)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.0010
Boron (B)-Dissolved	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.020
Cadmium (Cd)-Dissolved	0.00314	0.000495	0.00204	0.000629	<0.000017	0.000658	0.0256
Calcium (Ca)-Dissolved	64.4	175	143	37	28.2	38.4	81.7
Chromium (Cr)-Dissolved	<0.00050	<0.0010	0.001	0.0006	<0.00050	0.0006	<0.0010
Cobalt (Co)-Dissolved	0.00241	<0.00020	0.0272	0.0101	0.00026	0.0104	0.0399
Copper (Cu)-Dissolved	0.785	0.0318	1.85	0.454	0.00312	0.487	5.88
Iron (Fe)-Dissolved	<0.030	<0.030	19.7	12.8	0.241	12.6	62.5
Lead (Pb)-Dissolved	0.000791	<0.00010	0.00056	0.000211	<0.000050	0.000231	0.0896
Lithium (Li)-Dissolved	<0.0050	<0.010	0.017	<0.0050	<0.0050	<0.0050	0.023
Magnesium (Mg)-Dissolved	3.95	14.5	14.2	5.19	4.81	5.33	11.8
Manganese (Mn)-Dissolved	0.379	0.0067	2.57	0.994	0.0165	1.02	3.32
Mercury (Hg)-Dissolved	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	0.00155	0.0159	0.00076	0.000388	0.000138	0.000305	0.00546
Nickel (Ni)-Dissolved	0.0176	0.0022	0.0138	0.0155	<0.00050	0.0152	0.0199
Phosphorus (P)-Dissolved	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	1.01
Potassium (K)-Dissolved	1.51	0.7	0.94	0.249	0.371	0.26	1.99
Selenium (Se)-Dissolved	0.00383	0.00567	0.00102	0.00057	0.00063	0.00076	0.00416
Silicon (Si)-Dissolved	6.19	2.99	8.09	2.16	1.55	2.33	14.7
Silver (Ag)-Dissolved	0.000017	<0.000020	0.000029	0.00001	<0.000010	0.00001	0.000156
Sodium (Na)-Dissolved	<2.0	2.2	<2.0	<2.0	<2.0	<2.0	6.2
Strontium (Sr)-Dissolved	0.283	0.941	1.3	0.333	0.356	0.353	0.69
Thallium (Tl)-Dissolved	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.0002
Tin (Sn)-Dissolved	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Dissolved	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	0.000497	0.00169	0.000178	0.000103	<0.000010	0.000118	0.00201
Vanadium (V)-Dissolved	<0.0010	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	0.0113
Zinc (Zn)-Dissolved	0.204	0.0175	0.375	0.167	0.0037	0.171	1.47

(continued)

Appendix 6.4.1A
Results of Analysis (completed)

Sample ID	Seep 1	Seep 2	Seep 3	Seep 4	Seep 5	Seep 6	Seep 7
Date Sampled	**02-OCT-08**	**02-OCT-08**	**02-OCT-08**	**02-OCT-08**	**02-OCT-08**	**02-OCT-08**	**09-OCT-08**
Physical Tests							
Colour, True	<5.0	<5.0	27.2	17.2	<5.0	14.2	101
Conductivity	453	964	1170	576	175	564	1860
Hardness (as CaCO3)	160	414	339	75.2	72.2	76.3	203
pH	7.08	8.23	3.15	3.09	7.68	3.08	2.71
Total Suspended Solids	5.6	219	<3.0	<3.0	<3.0	4.1	<3.0
Total Dissolved Solids	339	775	830	230	111	213	1330
Turbidity	2.11	120	0.97	5.23	0.38	6.69	0.79
Anions and Nutrients							
Acidity (as CaCO3)	2.4	2.3	148	85.8	1.7	85.5	749
Alkalinity, Bicarbonate (as CaCO3)	13	113	<2.0	<2.0	38.8	<2.0	<2.0
Alkalinity, Carbonate (as CaCO3)	<2.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	<2.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as CaCO3)	13	113	<2.0	<2.0	38.8	<2.0	<2.0
Ammonia as N	<0.0050	<0.0050	0.0174	0.0064	<0.0050	0.0062	0.007
Bromide (Br)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	1.16	0.227	0.609	0.209	0.049	0.216	2.08
Nitrate (as N)	<0.0050	<0.0050	0.0056	0.0089	<0.0050	0.005	<0.0050
Nitrite (as N)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Nitrogen	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ortho Phosphate as P	<0.0010	0.0059	0.0491	0.0208	0.0014	0.0178	6.62
Total Dissolved Phosphate As P	0.0024	0.0069	0.0577	0.057	0.0036	0.0446	6.48
Total Phosphate as P	0.0047	0.0165	0.0621	0.089	0.0074	0.0983	6.71
Sulfate (SO4)	204	420	556	165	46.8	164	878
Cyanides							
Cyanide, Total	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Organic / Inorganic Carbon							
Total Organic Carbon	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total dissolved Carbon							0.59
Total Metals							
Aluminum (Al)-Total	0.459	3.23	5.5	1.06	0.0342	0.993	22.3
Antimony (Sb)-Total	0.00015	0.00117	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Arsenic (As)-Total	0.00011	0.00679	0.00189	0.00231	0.00027	0.00197	0.0351
Barium (Ba)-Total	0.0153	0.321	0.01	0.00633	0.0184	0.00636	0.0122
Beryllium (Be)-Total	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	0.0025
Bismuth (Bi)-Total	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.0010
Boron (B)-Total	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.020
Cadmium (Cd)-Total	0.00467	0.000192	0.00193	0.000496	<0.000017	0.000474	0.0267
Calcium (Ca)-Total	59.3	172	126	26.7	23.7	25.3	66
Chromium (Cr)-Total	<0.00050	0.0011	<0.0010	0.00052	<0.00050	<0.00050	0.0025
Cobalt (Co)-Total	0.00436	0.00184	0.0266	0.00967	0.00021	0.00902	0.0618
Copper (Cu)-Total	0.63	0.174	1.63	0.399	0.00349	0.38	10.4
Iron (Fe)-Total	<0.030	5.74	26.2	18.7	0.24	17.8	182
Lead (Pb)-Total	0.000846	0.00967	0.00072	0.000207	<0.000050	0.000199	0.0198
Lithium (Li)-Total	0.0054	<0.010	0.015	<0.0050	<0.0050	<0.0050	0.022
Magnesium (Mg)-Total	3.48	14.9	11.8	2.67	3.47	2.52	10.1
Manganese (Mn)-Total	0.488	0.141	2.04	0.549	0.0141	0.513	2.09
Mercury (Hg)-Total	<0.000010	0.000024	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	0.00119	0.0212	0.00192	0.000457	0.00011	0.000341	0.0492
Nickel (Ni)-Total	0.0243	<0.0010	0.014	0.0135	<0.00050	0.0127	0.0268
Phosphorus (P)-Total	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	7.28
Potassium (K)-Total	1.59	2.16	0.92	0.137	0.348	0.124	1.06
Selenium (Se)-Total	0.00428	0.00499	0.00074	0.00074	0.00068	0.0007	0.0209
Silicon (Si)-Total	7.72	10.4	8.17	2.07	1.59	2.09	18.3
Silver (Ag)-Total	0.00002	0.000316	<0.000020	0.00001	<0.000010	0.000011	0.000838
Sodium (Na)-Total	<2.0	2.9	<2.0	<2.0	<2.0	<2.0	4
Strontium (Sr)-Total	0.235	0.708	1.1	0.174	0.244	0.166	0.578
Thallium (Tl)-Total	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Tin (Sn)-Total	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Total	<0.010	0.114	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	0.000989	0.00346	0.000174	0.000122	<0.000010	0.000112	0.00881
Vanadium (V)-Total	<0.0010	0.0109	<0.0020	<0.0010	<0.0010	<0.0010	0.0093
Zinc (Zn)-Total	0.287	0.0286	0.346	0.114	0.0041	0.11	1.91
Dissolved Metals							
Aluminum (Al)-Dissolved	0.0291	0.0096	5.23	1.02	0.0296	1.04	21.4
Antimony (Sb)-Dissolved	0.00016	0.00033	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Arsenic (As)-Dissolved	<0.00010	0.00042	0.00058	0.00192	0.00021	0.00162	0.0351
Barium (Ba)-Dissolved	0.0154	0.0227	0.0107	0.00598	0.0176	0.00634	0.00735
Beryllium (Be)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	0.0028
Bismuth (Bi)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.0010
Boron (B)-Dissolved	<0.010	<0.020	<0.020	<0.010	<0.010	<0.010	<0.020
Cadmium (Cd)-Dissolved	0.00401	0.000092	0.0018	0.000473	<0.000017	0.000503	0.0273
Calcium (Ca)-Dissolved	58.3	146	117	25.8	23.4	26.3	65
Chromium (Cr)-Dissolved	<0.00050	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	0.0025
Cobalt (Co)-Dissolved	0.00356	<0.00020	0.0248	0.00923	0.00018	0.00934	0.0618
Copper (Cu)-Dissolved	0.375	0.00343	1.49	0.39	0.00297	0.395	10.5
Iron (Fe)-Dissolved	<0.030	0.033	19.3	18.2	0.17	16.9	182
Lead (Pb)-Dissolved	0.000183	0.00011	0.00061	0.000176	<0.000050	0.00023	0.0181
Lithium (Li)-Dissolved	<0.0050	<0.010	0.014	<0.0050	<0.0050	<0.0050	0.023
Magnesium (Mg)-Dissolved	3.37	11.9	11	2.58	3.35	2.6	9.83
Manganese (Mn)-Dissolved	0.411	0.00967	1.93	0.521	0.0118	0.543	2.13
Mercury (Hg)-Dissolved	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	0.00127	0.0165	0.00071	0.000412	0.000102	0.000316	0.0507
Nickel (Ni)-Dissolved	0.0205	<0.0010	0.0127	0.0127	<0.00050	0.0134	0.0271
Phosphorus (P)-Dissolved	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	7.31
Potassium (K)-Dissolved	1.46	0.47	0.84	0.129	0.339	0.133	1.03
Selenium (Se)-Dissolved	0.00416	0.00426	0.00072	0.00076	0.00058	0.00077	0.0204
Silicon (Si)-Dissolved	7.29	3.66	7.85	2.05	1.58	2.05	18.3
Silver (Ag)-Dissolved	<0.000010	<0.000020	0.00002	<0.000010	<0.000010	<0.000010	0.000762
Sodium (Na)-Dissolved	<2.0	2.7	<2.0	<2.0	<2.0	<2.0	3.8
Strontium (Sr)-Dissolved	0.232	0.611	1.04	0.168	0.236	0.176	0.592
Thallium (Tl)-Dissolved	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Tin (Sn)-Dissolved	<0.00010	0.00108	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Dissolved	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	0.000616	0.0029	0.000167	0.000118	<0.000010	0.000117	0.00891
Vanadium (V)-Dissolved	<0.0010	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010	0.0093
Zinc (Zn)-Dissolved	0.244	<0.0020	0.324	0.114	0.004	0.116	1.97
Aggregate Organics							
COD	30	70	40	30	40	40	

APPENDIX 6.4.1B
RESULTS OF ANALYSIS

Appendix 6.4.1B
Results of Analysis

Sample ID	Field Blank	Travel Blank	Field Blank	Duplicate	Seep 6-1	RPD (%)
Date Sampled	9-Sep-08	27-Jul-08	27-Jul-08	27-Jul-08	27-Jul-08	
Physical Tests						
Colour, True	<5.0	<5.0	<5.0	<5.0	<5.0	0
Conductivity	<2.0	<2.0	<2.0	456	446	2
Hardness (as CaCO3)	<0.50	<0.50	<0.50	68.4	68.9	1
pH	5.55	5.55	5.51	3.22	3.23	0
Total Suspended Solids	<3.0	<3.0	<3.0	8.7	8.7	0
Total Dissolved Solids	<10	<10	<10	167	148	12
Turbidity	<0.10	<0.10	<0.10	28	26.9	4
Anions and Nutrients						
Acidity (as CaCO3)	1.1	2.3	1.6	54	52.6	3
Alkalinity, Bicarbonate (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	0
Alkalinity, Carbonate (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	0
Alkalinity, Hydroxide (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	0
Alkalinity, Total (as CaCO3)	<2.0	<2.0	<2.0	<2.0	<2.0	0
Ammonia as N	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0
Bromide (Br)	<0.050	<0.050	<0.050	<0.050	<0.050	0
Chloride (Cl)	<0.50	<0.50	<0.50	<0.50	<0.50	0
Fluoride (F)	<0.020	<0.020	<0.020	0.168	0.165	2
Nitrate (as N)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0
Nitrite (as N)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0
Total Kjeldahl Nitrogen	<0.050	<0.050	<0.050	<0.050	<0.050	0
Total Nitrogen	<0.05	<0.05	<0.05	<0.05	<0.05	0
Ortho Phosphate as P						
Total Dissolved Phosphate As P						
Total Phosphate as P	<0.0020	<0.0020	<0.0020	0.039	0.0421	8
Sulfate (SO4)	<0.50	<0.50	<0.50	120	120	0
Cyanides						
Cyanide, Total	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0
Organic / Inorganic Carbon						
Total Organic Carbon	<0.50	<0.50	<0.50	<0.50	<0.50	0
Total dissolved Carbon						
Total Metals						
Aluminum (Al)-Total	<0.0010	<0.0010	<0.0010	0.608	0.607	0
Antimony (Sb)-Total	<0.00010	<0.00010	<0.00010	<0.0001	<0.0001	0
Arsenic (As)-Total	<0.00010	<0.00010	<0.00010	0.00051	0.00053	4
Barium (Ba)-Total	<0.000050	<0.000050	<0.000050	0.00826	0.00821	1
Beryllium (Be)-Total	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0
Bismuth (Bi)-Total	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0
Boron (B)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	0
Cadmium (Cd)-Total	<0.000017	<0.000017	<0.000017	0.000458	0.000464	1
Calcium (Ca)-Total	<0.020	0.032	<0.020	22.9	23.2	1
Chromium (Cr)-Total	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0
Cobalt (Co)-Total	<0.00010	<0.00010	<0.00010	0.00683	0.00704	3
Copper (Cu)-Total	<0.00010	<0.00010	<0.00010	0.174	0.176	1
Iron (Fe)-Total	<0.030	<0.030	<0.030	9.31	9.41	1
Lead (Pb)-Total	<0.000050	<0.000050	<0.000050	0.000121	0.000113	7
Lithium (Li)-Total	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0
Magnesium (Mg)-Total	<0.0050	<0.0050	<0.0050	2.62	2.66	2
Manganese (Mn)-Total	<0.000050	<0.000050	<0.000050	0.599	0.618	3
Mercury (Hg)-Total	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0
Molybdenum (Mo)-Total	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0
Nickel (Ni)-Total	<0.00050	<0.00050	<0.00050	0.0149	0.015	1
Phosphorus (P)-Total	<0.30	<0.30	<0.30	<0.30	<0.30	0
Potassium (K)-Total	<0.050	<0.050	<0.050	0.104	0.109	5
Selenium (Se)-Total	<0.00010	<0.00010	<0.00010	0.00039	0.00057	**38**
Silicon (Si)-Total	<0.050	<0.050	<0.050	1.2	1.2	0
Silver (Ag)-Total	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0
Sodium (Na)-Total	<2.0	<2.0	<2.0	<2.0	<2.0	0
Strontium (Sr)-Total	<0.00010	<0.00010	<0.00010	0.146	0.148	1

(continued)

Appendix 6.4.1B
Results of Analysis (completed)

Sample ID	Field Blank	Travel Blank	Field Blank	Duplicate	Seep 6-1	RPD (%)
Date Sampled	**9-Sep-08**	**27-Jul-08**	**27-Jul-08**	**27-Jul-08**	**27-Jul-08**	
Thallium (Tl)-Total	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0
Tin (Sn)-Total	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0
Titanium (Ti)-Total	<0.010	<0.010	<0.010	<0.010	<0.010	0
Uranium (U)-Total	<0.000010	<0.000010	<0.000010	0.000085	0.000081	5
Vanadium (V)-Total	<0.0010	<0.0010	<0.0010	<0.001	<0.001	0
Zinc (Zn)-Total	<0.0010	<0.0010	<0.0010	0.13	0.134	3
Dissolved Metals						
Aluminum (Al)-Dissolved				0.619	0.605	2
Antimony (Sb)-Dissolved				<0.00010	<0.00010	0
Arsenic (As)-Dissolved				0.00024	0.00026	8
Barium (Ba)-Dissolved				0.00785	0.00911	15
Beryllium (Be)-Dissolved				<0.00050	<0.00050	0
Bismuth (Bi)-Dissolved				<0.00050	<0.00050	0
Boron (B)-Dissolved				<0.010	<0.010	0
Cadmium (Cd)-Dissolved				0.000434	0.000433	0
Calcium (Ca)-Dissolved				23.1	23.3	1
Chromium (Cr)-Dissolved				<0.00050	<0.00050	0
Cobalt (Co)-Dissolved				0.00685	0.00686	0
Copper (Cu)-Dissolved				0.171	0.172	1
Iron (Fe)-Dissolved				8.66	8.85	2
Lead (Pb)-Dissolved				0.00011	0.00013	17
Lithium (Li)-Dissolved				<0.0050	<0.0050	0
Magnesium (Mg)-Dissolved				2.62	2.62	0
Manganese (Mn)-Dissolved				0.599	0.606	1
Mercury (Hg)-Dissolved				0.000013	<0.00001	**26**
Molybdenum (Mo)-Dissolved				<0.000050	<0.000050	0
Nickel (Ni)-Dissolved				0.0147	0.0148	1
Phosphorus (P)-Dissolved				<0.30	<0.30	0
Potassium (K)-Dissolved				0.108	0.107	1
Selenium (Se)-Dissolved				0.00041	0.00039	5
Silicon (Si)-Dissolved				1.18	1.16	2
Silver (Ag)-Dissolved				<0.000010	<0.000010	0
Sodium (Na)-Dissolved				<2.0	<2.0	0
Strontium (Sr)-Dissolved				0.146	0.146	0
Thallium (Tl)-Dissolved				<0.00010	<0.00010	0
Tin (Sn)-Dissolved				<0.00010	<0.00010	0
Titanium (Ti)-Dissolved				<0.010	<0.010	0
Uranium (U)-Dissolved				0.000079	0.000085	7
Vanadium (V)-Dissolved				<0.0010	<0.0010	0
Zinc (Zn)-Dissolved				0.121	0.121	0