Draft Memorandum

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From: Ann Maest, Stratus Consulting Inc.

Date: 7/2/2010

Subject: Comments on Kinross/Crown Resources June 24, 2010 Letter to the Washington Department of Ecology regarding the Action Plan for Observed Seepage in Gold Bowl Creek

This memorandum responds to the Kinross/Crown Resources (Kinross) letter to the Washington Department of Ecology (DOE) regarding the action plan for observed seepage in Gold Bowl Creek (Crown Resources, 2010). According to the Buckhorn Mountain Adaptive Management Plan (AMP) for water quality (Golder Associates, 2007), if concentrations of mine-related contaminants exceed background levels or the National Pollutant Discharge Elimination System (NPDES) permit limits, Kinross must initiate an action plan to identify and eliminate the source of the problem (Golder Associates, 2007). Kinross noted in its June 24, 2010 letter to DOE that elevated total dissolved solids (TDS) and sulfate concentrations at SW-9 in Gold Bowl Creek had triggered the AMP. In addition to this location, concentrations of mine-related contaminants (nitrate, sulfate, and TDS) have also increased relative to baseline values at SW-7 (surface water location downstream of SW-9 in South Fork Nicholson Creek), MW-14 (monitoring well near lower portal), and in spring JJ-21 (spring in South Fork Nicholson Creek; Figures 1 and 2).

Although no State surface water standards have been exceeded at the SW-7 and SW-9 surface water locations, concentrations of mine-related contaminants have been increasing and pH has been dropping at these locations, mostly since late 2008. Figure 3 shows increasing concentrations of chloride and nitrate at SW-9 and SW-7 through water year 2009. Increasing chloride concentrations are from treated effluent that was either released at outfall 002 or stored in the underground mine. Nitrate concentrations at SW-9 and SW-7 showed an increase as early as May 2008 (samples are not collected in the winter months at SW-9, so the increase might have occurred even earlier). TDS concentrations at SW-9 and SW-7 did not increase notably until mid-2009. Sulfate concentrations peaked in mid-2008 at SW-9 and SW-7 (~160 and 70 mg/L, respectively) and had been decreasing, but have recently increased to 257 mg/L at SW-9 in May 2010. Field pH values may be decreasing at both SW-9 and SW-7 (since about late 2008).

Concentrations in monitoring well MW-14 exceeded State groundwater quality standards for TDS, sulfate, and nitrate (State of Washington, 2010) in 2010, yet Kinross makes no mention of these exceedences in their letter. Concentrations of all three constituents have increased in 2010 over values in 2009, and values did not exceed standards before 2010. Figure 4 shows depth to water and increasing concentrations of chloride, sulfate, and nitrate in MW-14 through water year 2009. Concentrations in May 2010 were 696 mg/L TDS, 288 mg/L sulfate, and 10.5 mg/L nitrate+nitrate (mg/L as N). State standards for these constituents are 500 mg/L, 250 mg/L, and 10 mg/L, respectively.

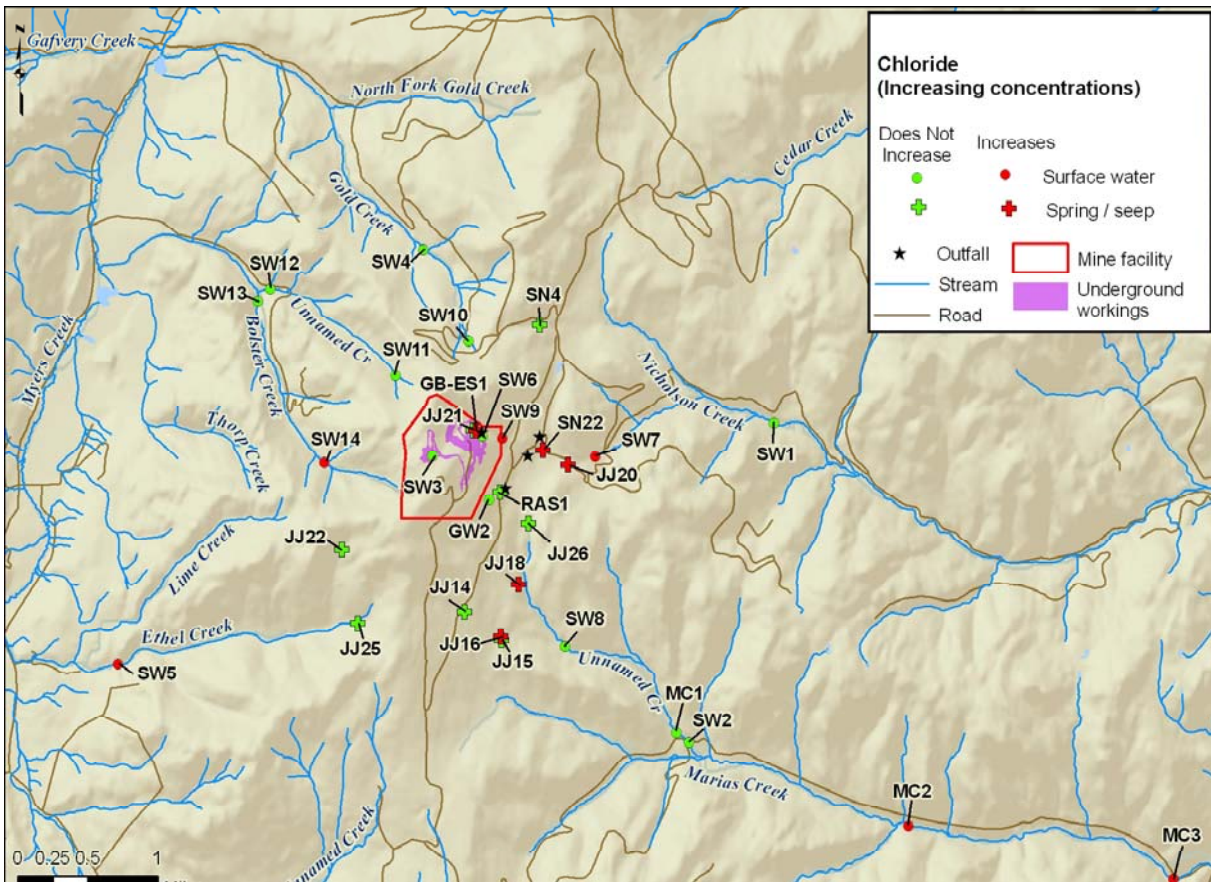

Figure 1. Location map of the Buckhorn Mine area showing surface water and seep monitoring locations with increasing chloride concentrations in water year 2009.

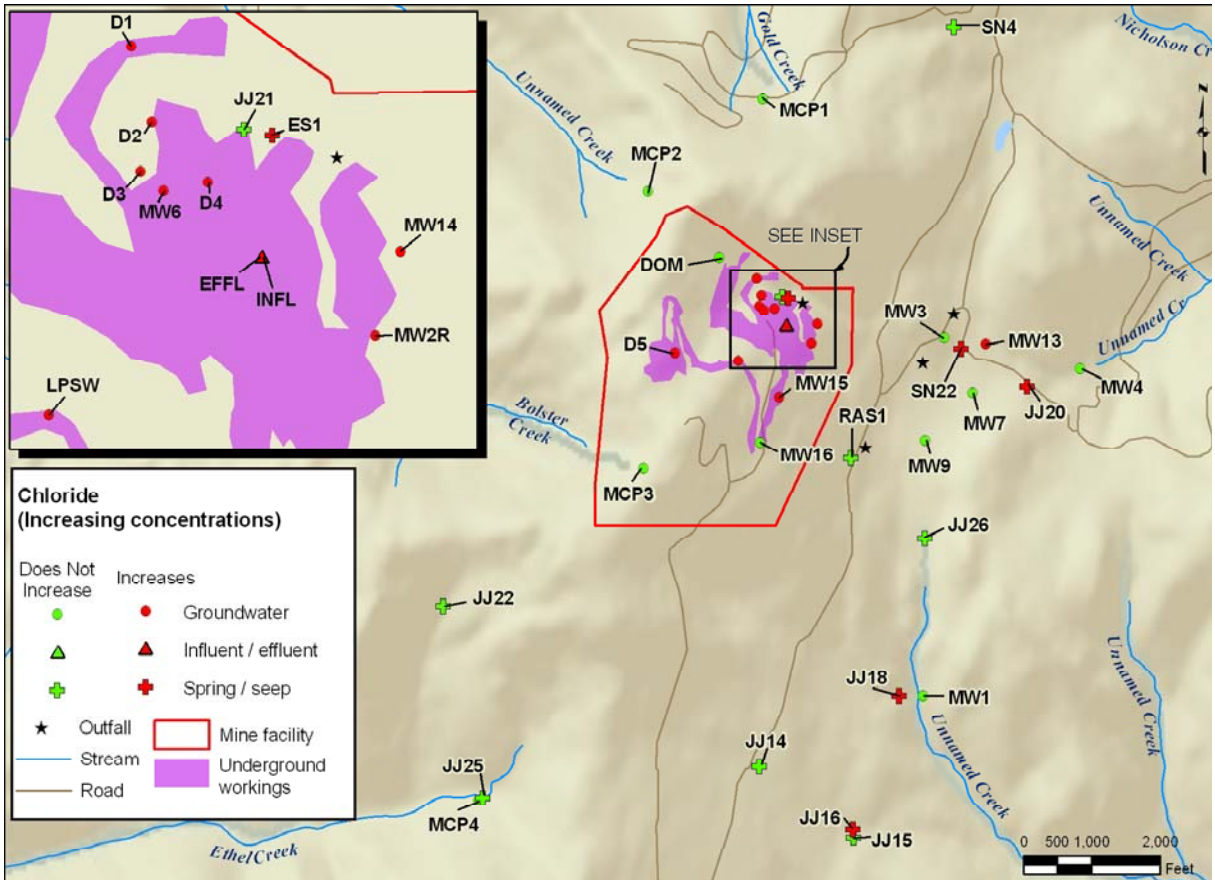

Figure 2. Location map of the Buckhorn Mine area showing groundwater monitoring locations with increasing chloride concentrations in water year 2009.

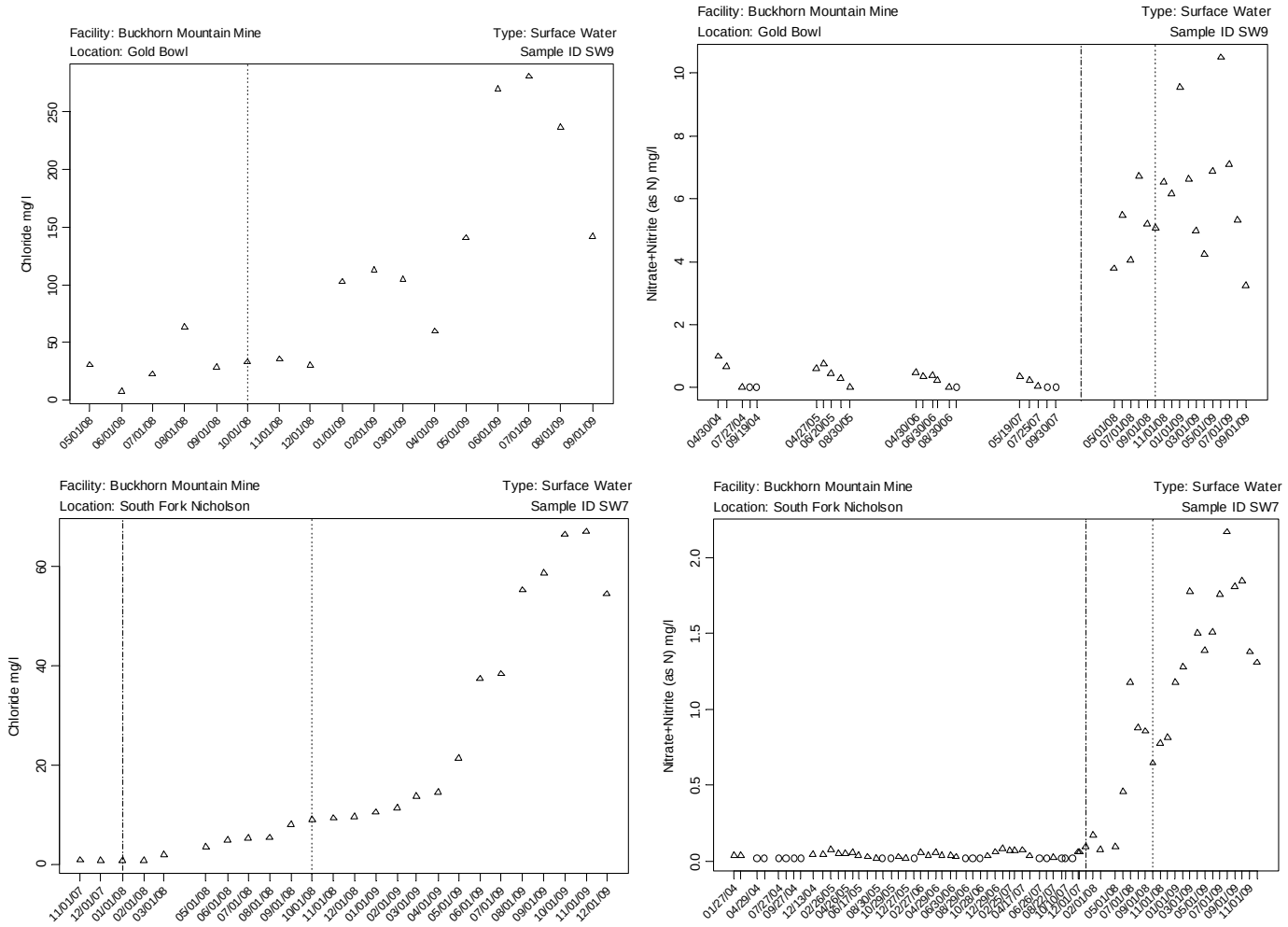

Figure 3. Increasing concentrations of chloride and nitrate in surface water locations SW-9 and SW-7. Vertical dashed line indicates the start of mining operations; vertical dotted lines indicates the beginning of water year 2009.

Data source: Kinross water quality data, 2003–2009.

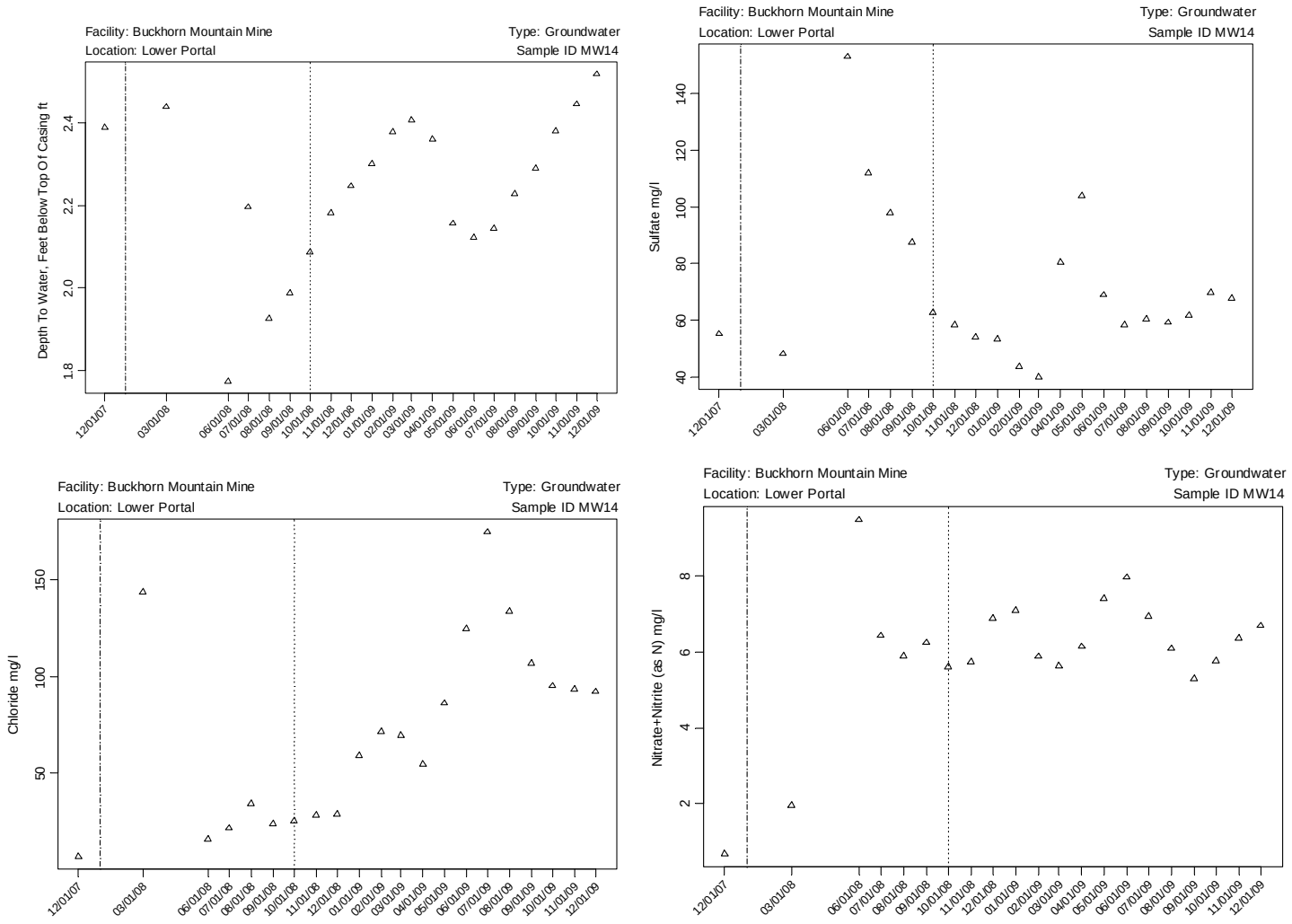

Figure 4. Increasing concentrations of chloride, depth to water, sulfate, and nitrate in monitoring well MW-14.

Data source: Kinross water quality data, 2003–2009.

The Kinross June 2010 letter to DOE notes that concentrations of mine-related constituents have increased in spring JJ-21 and that flows have decreased. However, the letter does not note that concentrations have been increasing at other seeps in the mine area as well since mining began (dewatering began in January 2008). For example, concentrations of chloride, nitrate, and TDS have been increasing relative to pre-mining values at seeps JJ-21, JJ-16, JJ-18, SN-22, JJ-20, and RAS-1. Flows have decreased at JJ-20 and JJ-16 but increased at JJ-21; pH values have decreased at JJ-15, JJ-20, JJ-18, and SN-22. Figure 5 shows increasing concentrations of chloride, decreasing flows, increasing nitrate concentrations, and decreasing pH values in seeps at the mine through water year 2009. Nitrate concentrations in seep JJ-16 were higher then State groundwater or surface water standards (10 mg/L nitrate+nitrite as N) in water year 2009.

In their letter to DOE, Kinross suggests a number of potential causes of the increased concentrations, including stockpile or construction rock seepage, leakage from the underground mine or mine water storage (surge) pond, discharge of treated effluent at Outfall 002 (discharge began in January 2008 and stopped in late summer/early fall 2009), or stormwater runoff or infiltration. Kinross also very briefly outlines an action plan that includes site investigations, data evaluation and modeling to identify sources and pathways, and modifications to the mine operations and the capture system. Almost no information is included in the last section that relates to mine operation modifications and capture system improvements.

In addition to the action plan studies proposed by Kinross, we recommend the following additional studies:

- More detail should be provided in the evaluation and modeling and improvements sections. In particular, a broader evaluation of groundwater, surface water, and seep water quality data and quantity/levels should be included in the study. The water quality investigations are limited to Gold Bowl Creek between spring JJ-21 and SW-9, and stormwater runoff. More downstream locations on South Fork Nicholson Creek (including SW-7), groundwater monitoring wells (including MW-14 and others), and additional seeps should be evaluated for water quality and flow changes over time.

- The effect of storing 7.5 million gallons of treated effluent in the mine sumps should be investigated in more detail, including investigating the water quality of the mine sump water and a hydrologic investigation of pathways from the mine sumps to downgradient groundwater and surface water.

- The mine water surge pond holds contaminated water before it is treated, yet the pond does not have a leak detection or pump back system. Improvements in the surge pond design should be included in the AMP work plan. Finally, the extent of grouting (relative to that planned in the Supplemental Environmental Impact Statement) and its success should also be investigated as part of the work plan.

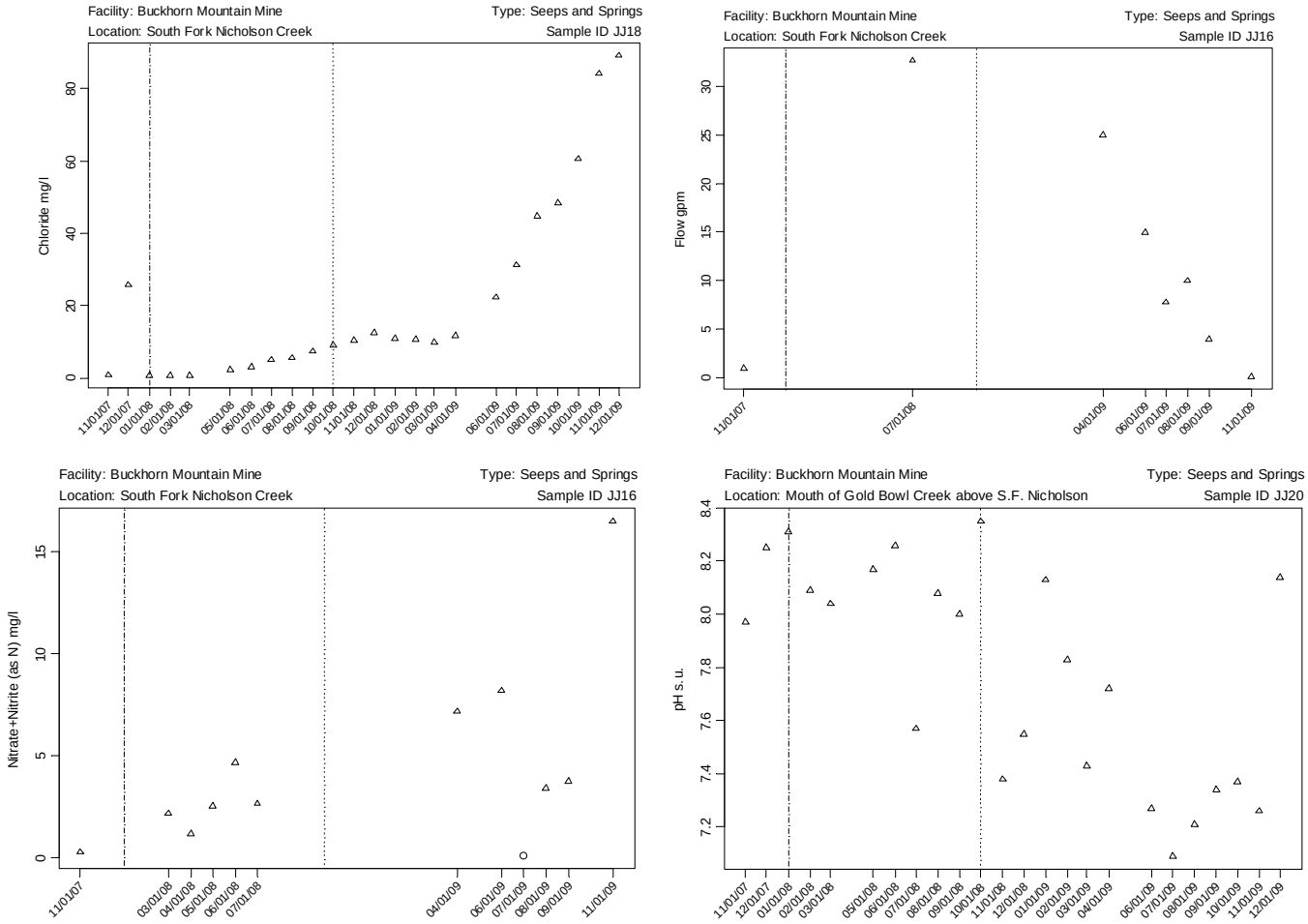

Figure 5. Increasing concentrations of chloride and nitrate, decreasing pH values, and decreasing flows in seeps at the mine through water year 2009.

Data source: Kinross water quality data, 2003–2009.

In summary, a broader study of all springs, groundwater, and surface water that might be affected by mine operations should be included in the AMP work plan, and more detail on the types of studies proposed and the types of possible mine operational changes should be discussed in the plan. If State groundwater or surface water standards have been exceeded, the DOE should determine whether this is a violation of the mine's NPDES permit.

References

Crown Resources. 2010. Letter to Department of Ecology (Bob Raforth) Re: Action Plan for Observed Seepage in Gold bowl Creek. June 24.

Golder Associates. 2007. Buckhorn Mountain Project Adaptive Management Plan. Report prepared for Crown/Kinross, Republic, Washington. Redmond, WA. Appendix C: Adaptive Management Plan for Water Quality Changes Due to Mining Operations. Golder Associates Inc.

State of Washington. 2010. *Washington Administrative Code. Groundwater Quality Criteria.* WAC 173-200-040. Available: http://apps.leg.wa.gov/WAC/default.aspx?cite = 173-200-040. Accessed July 1, 2010.