COGEMA

December 30, 2009

Mr. Ron C. Linton, Project Manager
Uranium Recovery Licensing Branch
Division of Waste Management & Environmental Protection
Office of Federal & State Materials & Environmental Management Programs
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, Maryland 20852-2738

Re: Docket No. 40-08502, License No. SUA-1341, Request for Additional Information, Wellfield Restoration Report, Christensen Ranch Project

Dear Mr. Linton:

Enclosed please find three copies of responses with supporting information to the Request for Additional Information (RAI), February 19, 2009, referenced above. We apologize for the significant delay in submitting the responses. The sampling and subsequent analysis for a complete suite of parameters from perimeter monitor well 5MW66 was unfortunately overlooked and not accomplished until early this fall. The data were available in late October. Additionally, the pending sale of COGEMA Mining resulted in certain internal delays in finalizing this submittal. Please let us know if there is any further information you require in your review of the restoration report.

Sincerely,

Tom Hardgrove

Tom Hardgrove
Manager, Environmental & Regulatory Affairs

Cc: G. Mooney, WDEQ
B. Bonifas w/o encls.

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Responses to NRC Request for Additional Information
Wellfield Restoration Report, Christensen Ranch Project
COGEMA Mining, Inc.

General

1. Throughout the report for each mine unit, COGEMA estimates groundwater contaminant levels at the permit boundary. This estimation is not appropriate for groundwater contamination. After restoration is complete, the site is released for unrestricted use, including groundwater. The only groundwater that is protected from use is the exempted aquifer that is no longer considered an underground source of drinking water under the Safe Drinking Water Act. A more appropriate determination of groundwater contamination estimation is what contaminants will remain over time at the MW ring and at the aquifer exemption boundary. Provide an analysis of contaminants after stabilization at the monitoring well ring and the exempted aquifer for each mine unit.

The aquifer exemption boundary is located at the monitoring well ring, as stated explicitly by EPA (1988) for Mine Unit 2 and implicitly for subsequent Mine Units 3 through 6. The transport assessment for each Mine Unit addresses concentrations 400 feet from the wellfields, which is the approximate distance to the monitoring well ring. Consequently, the estimated concentrations of constituents of concern are evaluated at a distance of 400 feet, which likely approximates the aquifer exemption boundary.

2. COGEMA states on page 9-2, "significant attenuation of uranium will occur as groundwater from the wellfields moves into the down gradient reducing portions of the aquifer." For each mine unit, demonstrate that reducing conditions have been reestablished within the wellfield and/or exist at monitoring well ring wells down gradient of the wellfield such that they would likely cause attenuation of monitored constituents of concern.

The existence of unaltered, reducing sandstone downgradient of the mine units would be expected to cause attenuation of monitored constituents of concern, as demonstrated by batch and column experiments carried out with reducing downgradient sediments from the North Platte, Wyoming ISR project (Deutsch et al 1985). Because the general direction of groundwater flow at the site is toward the west-northwest, demonstration of reducing conditions in downgradient sediments west-northwest of the Mine Units would support the condition that significant attenuation of uranium and other redox-sensitive elements occurs between the restored production zone (wellfields) and the monitoring well ring. Alternatively, the existence of reducing conditions in upgradient sediments to the east-southeast of the production zone (wellfields) would indicate that reducing groundwater flows into the production zone and limits downgradient transport, as demonstrated by reactive flow and transport modeling carried out by Davis and Curtis (2007). Information regarding the orientation of the altered sandstone and reducing sediments at the Christensen Ranch site was investigated to establish their orientation relative to the restored production zones.

Information regarding the orientation of the altered sandstone and reducing sediments in the vicinity of the mine units is available in geologic and lithologic characterization reports prepared for this area. Because of its proximity, most of these reports were prepared during development of the adjacent Irigaray Project (D'Appolonia 1983, Rose 1971, Honea 1974, Morris and Bahr 1975). The "upper sandstone" in Rose (1971) and Honea (1974) and the "upper Irigaray sandstone" in Morris and Bahr (1975) and D'Appolonia (1983) correspond to the mineralized K sandstone at the Christensen Ranch site. The altered area in the upper sandstone occurs in fluvial sand, forming a north-south trending tongue that is open to the south and noses out to the north (Rose 1971). The altered sandstone contains abundant iron oxides and hydroxides (Rose 1971). Morris and Bahr (1975) indicate that groundwater flow was primarily to the north during mineralization. Honea (1974) and Morris and Bahr (1975) indicate that the uranium deposits in the vicinity of Irigaray and Christensen Ranch are along the eastern margin of the altered sandstone tongue (Figure 1). The current direction of groundwater flow at the Christensen Ranch site is toward the west-northwest, indicating that the groundwater flow direction has changed slightly since the formation of the uranium roll front deposits. Consequently, the current flow direction may result in groundwater flow into the restored production zones of relatively reducing groundwater from the east-southeast. Because of the orientation of the altered sandstone, groundwater leaving the production zone is likely to encounter oxidized sandstone with abundant iron oxides and hydroxides, which are known to strongly sorb uranyl (UO_2^{2+}) ion from groundwater (EPA 1999). After crossing the oxidized sandstone, the groundwater should encounter additional reducing sediments on the western margin of the altered sandstone tongue, which would be expected to lead to reduction of uranium to the less-mobile U^{4+}.

Additional water quality samples, including field-measured Eh and dissolved oxygen, were obtained during June 2009 from wells in the production zones as well as from upgradient and downgradient wells (Table 1). The data in Table 1 are organized by flow paths across the mine units. A few additional samples were obtained away from the flow paths to provide further downgradient data for Mine Units 2, 3 and 6. The flow paths are summarized in Table 2. Laboratory analytical reports from the June 2009 sampling event are included as Attachment 1.

Groundwater redox conditions can be investigated using Eh (i.e., oxidation potential in aqueous solutions) measurements. Because Eh measurements in low-temperature solutions such as the Christensen Ranch groundwater may be poorly poised (i.e., these measurements may exhibit significant drift or disequilibrium with respect to the platinum electrode), it is important to consider these measurements only as general indicators of redox conditions, and to evaluate the Eh measurements in combination with other redox data, such as the absence of dissolved oxygen and the presence of dissolved iron and manganese. Dissolved iron and manganese are important redox-state indicators, because the persistence of ferrous (Fe^{2+}) and manganous (Mn^{2+}) ions in solution can only occur under reducing conditions. The presence of dissolved iron in the moderately alkaline pH groundwater in the restored production zone is particularly noteworthy because of the rapid precipitation of oxidized iron oxides and hydroxides that occurs at this pH under oxidizing conditions (Figure 2).

The Eh measurements in all sampled wells ranged from -64.7 to 182.8 mvolts (-0.0647 to 0.1828 volts) (Table 1). The ranges of Eh values measured in the sampled restored production zone wells in each mine unit are compared to the Eh value ranges in the perimeter monitoring wells in Table 3. In Mine Units 2 and 6, the Eh measurements in the restored production zone wells were lower than all Eh measurements in the perimeter monitoring wells. The Eh values measured in the Mine Unit 3, 4, and 5 restored production zones were less than or equivalent to the Eh measurements in the perimeter monitoring wells. The low Eh measurements in the restored production zone well samples relative to the Eh measurements in the perimeter monitoring well samples are one indication that reducing conditions have been restored in the production zones.

Dissolved oxygen (DO) concentrations in the groundwater samples across the Christensen Ranch site were quite low (Table 1). These low concentrations were essentially zero when the small amounts of atmospheric oxygen that may enter the solutions during pumping from the well are considered. Consequently, the DO measurements indicate anoxic conditions in the upgradient, production zone, and downgradient groundwater.

A number of upgradient (3MW-30), production zone (2S100-2, 4T-114-1, 4U-110-1, 6M29-1) and downgradient (4MW-21 and 5MW-56) groundwater samples had measurable dissolved iron concentrations, which are clear indications of reducing conditions. Production zone (2S100-2, 4T-114-1, 4U-110-1, 5BL-76-1, 5MW-03, 5MW-07, 6M29-1) and downgradient (3MW-115, 6MW-43, 6MW-45) groundwater samples had dissolved manganese concentrations above the laboratory detection limit, which are also indicative of reducing conditions, particularly in the restored production zones.

During the groundwater sampling event conducted during June 2009, a distinct sulfide odor was detected in the extracted groundwater from the production zone (wellfield) wells in Mine Units 2, 3, and 4. These qualitative observations are indicative of reducing conditions within the wellfields of these mine units.

The available data regarding redox conditions in the restored production zone samples indicate that reducing conditions have been achieved and maintained. This evidence includes Eh measurements in the production zones that are less than or equal to the Eh values in perimeter monitoring wells, and negligible DO concentrations in all restored production zone wells. In addition, many of the restored production zone wells have detectable levels of iron and manganese concentrations or elevated sulfide concentrations as evidence by a distinct odor during sampling, which are unambiguous indicators of reducing conditions.

3. In Section 4.4 of each mine unit restoration data package, COGEMA states that "best practicable technology (BPT) was applied throughout the Christensen Ranch groundwater restoration program. The process employed was completely justifiable in terms of performance and achievability in relation to health, safety, and minimization of adverse impacts to the environment." Discuss the BPTs employed during restoration at each mine unit and demonstrate that additional technologies would or would not likely achieve better restoration results.

Groundwater sweep, reverse osmosis with recirculation, and reductant addition with recirculation were employed during groundwater restoration at Mine Units 2, 3, 4 and 6.

Because reducing conditions were achieved without reductant addition, only groundwater sweep and reverse osmosis with recirculation were employed during groundwater restoration at Mine Unit 5.

Groundwater sweep, reverse osmosis with recirculation, and reductant addition with recirculation are currently employed for groundwater restoration at the majority of U.S. ISR sites. Groundwater sweep and reverse osmosis with recirculation are effective because constituents are removed from the aquifer. In contrast, reductant addition is effective because redox-sensitive constituents such as uranium and selenium are attenuated in situ. Most technologies other than groundwater sweep, reverse osmosis with recirculation, and treatment with reductants with recirculation have not been successfully demonstrated in field applications of groundwater restoration at ISR sites and consequently have not been established to be practicable technologies. Furthermore, most of these technologies, such as bioremediation, are purported to be effective because they promote reduction of the redox-sensitive elements. Because reducing conditions have been established in the restored Christensen Ranch production zones, use of these additional technologies is unlikely to significantly and cost-effectively improve groundwater quality in the restored production zones. Additionally, the use of such technologies could cause harm to the aquifer (e.g., plugging of pores) which could hinder overall restoration efforts

<u>The BPTs employed during restoration of Mine Unit 2 were:</u>

- Groundwater sweep (60,479,000 gal, 2.21 pore volumes)
- Recirculation plus reverse osmosis (295,891,000 gal, 10.79 pore volumes)
- Reductant addition (H_2S) plus recirculation (37,091,000 gal, 1.35 pore volumes)

Groundwater sweep was concluded after 2.21 pore volumes to minimize consumption of otherwise unimpacted groundwater drawn into the production zone during pumping. Recirculation plus reverse osmosis was employed until both uranium concentrations and conductivity reached stable values as a function of cumulative pore volume removed in all four modules (Figures 4-1 through 4-4, Restoration Data Package, Mine Unit 2, Christensen Ranch Project, March 5, 2008). Stabilization of both uranium concentrations and conductivity indicated that continued recirculation plus reverse osmosis was unlikely to significantly improve groundwater quality. Addition of H_2S as a reductant combined with recirculation facilitated the rapid establishment of reducing conditions in the production zone aquifer. Evidence of reducing conditions included increased dissolved iron and manganese concentrations after H_2S addition, plus maintenance of measurable dissolved iron and manganese throughout stabilization monitoring (Table 4). The effects of these reducing conditions are demonstrated by the low, stable concentrations of selenium and uranium, constituents that are attenuated under reducing conditions. Use of additional technologies, such as biostimulation, would be unlikely to significantly decrease uranium concentrations in Mine Unit 2 where conditions are already reducing.

<u>The BPTs employed during restoration of Mine Unit 3 were:</u>

- Groundwater sweep (39,886,000 gal, 1.78 pore volumes)
- Recirculation plus reverse osmosis (367,909,000 gal, 16.44 pore volumes)

- Reductant addition (H_2S) plus recirculation (35,170,000 gal, 1.57 pore volumes)

Groundwater sweep was concluded after 1.78 pore volumes to minimize consumption of otherwise unimpacted groundwater drawn into the production zone during pumping. During reverse osmosis/recirculation, both uranium concentrations and conductivity reached stable values as a function of cumulative pore volumes removed in all five modules after approximately seven to 12 pore volumes (Figures 4-1 through 4-5, Restoration Data Package, Mine Unit 3, Christensen Ranch Project, March 5, 2008). Reverse osmosis/recirculation was continued to 16.44 pore volumes in Mine Unit 3, with relatively minor additional effects on conductivity and uranium concentrations in Mine Unit 3 production zone groundwater. Addition of H_2S as a reductant combined with recirculation facilitated the rapid establishment of reducing conditions in the production zone aquifer. Evidence of reducing conditions included increased dissolved iron and manganese concentrations after H_2S addition, as shown by the changes between the end of reverse osmosis/recirculation and the first stabilization monitoring sample (Table 5). Reducing conditions were maintained throughout the stabilization monitoring period, as demonstrated by the low, stable concentrations of selenium and uranium, constituents that are attenuated under reducing conditions and relatively high iron and manganese concentrations.

<u>The BPTs employed during restoration of Mine Unit 4 were:</u>

- Groundwater sweep (37,681,000 gal, 1.93 pore volumes)
- Recirculation plus reverse osmosis (192,582,000 gal, 9.84 pore volumes)
- Reductant addition (H_2S) plus recirculation (20,014,000 gal, 1.02 pore volumes)

Groundwater sweep was concluded after 1.93 pore volumes to minimize consumption of otherwise unimpacted groundwater that is drawn into the production zone during pumping. During reverse osmosis/recirculation, both uranium concentrations and conductivity reached stable values as a function of cumulative pore volumes removed in all three modules after approximately six to 10 cumulative pore volumes (Figures 4-1 through 4-3, Restoration Data Package, Mine Unit 4, Christensen Ranch Project, March 5, 2008). Addition of H_2S as a reductant combined with recirculation facilitated the rapid establishment of reducing conditions in the production zone aquifer. Evidence of reducing conditions included increased dissolved iron and manganese concentrations after H_2S addition, as shown by the changes between the end of reverse osmosis/recirculation and the first stabilization monitoring sample (Table 5). Reducing conditions were maintained throughout the stabilization monitoring period, as demonstrated by the stable to slightly declining concentrations of selenium and uranium, constituents that are attenuated under reducing conditions, and the relatively high iron and manganese concentrations.

<u>The BPTs employed during restoration of Mine Unit 5 were:</u>

- Groundwater sweep (362,640,000 gal, 4.83 pore volumes)
- Recirculation plus reverse osmosis (394,435,000 gal, 5.26 pore volumes)

Reverse osmosis/recirculation was halted after 5.26 pore volumes. Reductant addition was not carried out as part of groundwater restoration in Mine Unit 5, because reducing conditions appeared to be established based on relatively low selenium and uranium concentrations and measurable iron and manganese concentrations at the end of reverse osmosis/recirculation (Table 5). Reducing conditions were maintained throughout the stabilization monitoring period, as demonstrated by the stable to slightly declining concentrations of selenium and uranium, constituents that are attenuated under reducing conditions, and measurable dissolved iron and manganese concentrations (Table 5).

The BPTs employed during restoration of Mine Unit 6 were:

- Groundwater sweep (192,500,000 gal, 1.5 pore volumes)
- Recirculation plus reverse osmosis (564,600,000 gal, 4.5 pore volumes) , with reductant (H_2S) addition during the final pore volume

Reverse osmosis/recirculation was completed after 4.5 pore volumes. Reductant addition was carried out during the last pore volume of reverse osmosis/recirculation, based on the monitoring results for manganese, selenium, uranium, conductivity, and pH during restoration. Wellfield average concentrations of iron and manganese were elevated at the end of groundwater sweep (Table 6), indicating reducing conditions may have existed even before recirculation plus reverse osmosis and reductant addition. The first stabilization monitoring sample was obtained immediately after the reductant/recirculation phase was completed (Table 6). Elevated iron and manganese concentrations and relatively low selenium and uranium concentrations were established at the time of the first round stability monitoring. Reducing conditions were maintained throughout the stabilization monitoring period, as demonstrated by the stable concentrations of selenium and uranium, constituents that are attenuated under reducing conditions and measurable dissolved iron and manganese concentrations (Table 6).

4. Provide ore zone post-restoration water quality laboratory analysis reports for stability monitoring rounds 1 through 4 for mine units 2-6. The laboratory analysis reports are needed to compare reported laboratory concentration values to concentration values presented on spreadsheets and maps in the Restoration Report.

Laboratory analytical reports for stability monitoring rounds 1 through 4 conducted at Mine Units 2 through 6 are included as Attachment 2 of this document.

Section 2.2

1. Provide a discussion of the applicability of the restoration requirements in SUA-1341. Section 2.2 of the Restoration Report discusses the regulatory framework and laws and regulations pertinent to groundwater restoration at the Christensen Ranch Project Site. This section does not discuss the requirements for groundwater restoration listed in NRC Source Materials License SUA-1341.

Source Material License SUA-1341(Amendment No. 12, March 15, 2007 and its predecessors back to the license renewal application dated January 5, 1996) incorporated in Condition 10.16 by reference Section 6.1 of the renewal application. Condition 10.16, Amendment 12 et. al., also explicitly states that the primary goal of restoration shall be to return the ground water quality, on a production-unit average, to baseline concentrations on a parameter-by-parameter basis, and if the primary goal cannot be achieved, the ground water will, at a minimum, be returned to the pre-mining use category. The applicability of the restoration requirements in the license are reiterated in Section 4.1, Goals of the Restoration Program, in each individual Mine Unit Restoration Data Package presented in the report. The entire restoration program at Christensen Ranch and the evaluation of restoration success for each mine unit is based upon the stated primary goal (return to baseline concentrations on a production-unit average) with a secondary goal of returning the water quality to an appropriate pre-mining use category.

Section 2.3

1. Section 2.3 of the Restoration Report discusses groundwater classification and aquifer exemptions. The exact location of the aquifer exemption boundary for mine units 2 through 6 is not discussed in this section. The following is required:

> *a. Provide a discussion that defines the aquifer exemption boundary for each mine unit and show this boundary on a map or maps.*
>
> *b. Provide documentation from the Environmental Protection Agency or the Wyoming Department of Environmental Quality (WDEQ) to support the location of each aquifer exemption boundary.*

The aquifer exemption boundary is located at the monitoring well ring, as stated by EPA (1988). This letter explicitly addresses the first phase of in-situ recovery (Mine Unit 2). Because this issue was not addressed by EPA at a later date, the exemption boundaries for Mine Units 3 through 6 have been implicitly established at their respective monitoring well rings. However, this is not clear, or consistent with Wyoming Land Quality Division (LQD) Chapter 11 Regulations (i.e., the distance of the monitor well ring plus ¼-mile).

Defining the ore zone monitor well ring as the aquifer exemption boundary for each mine unit, the boundary is illustrated in the restoration report for each mine unit as follows: Mine Unit 2, Figure 4-5; Mine Unit 3, Figure 4-6; Mine Unit 4, Figure 4-4; Mine Unit 5, Figure 4-6; and Mine Unit 6, Figure 4-1.

Section 7.3

1. Section 7.3 of the Restoration Report discusses aquifer restoration processes used to restore the groundwater in the mine unit. Aquifer recirculation was typically done at the end of the reverse osmosis phase of restoration. The Report states, "the recirculation was found to increase oxygen levels in the wellfield and so volumes circulated were limited." The Report also states "In the future, it is recommended that recirculation not be done due to the introduction of oxygen through the circulation process." The Report does not offer an explanation as to why this increase in oxygen levels may have occurred. The following is required:

> *a. Explain why oxygen was increased during recirculation phase of restoration.*

b. Discuss whether increases in oxygenation during the recirculation phase are an indication that there are pockets of oxygenated water that are not removed during sweep or RO/permeate injection.

There are two plausible sources of oxygen during the recirculation phase of restoration. One consists of the introduction of oxygen through the pumping and re-injection of wellfield water whereby minor leaks in the plumbing systems could draw air into the water by a venturi effect. The other source of oxygen would probably be the movement of localized post-RO water containing relatively minor residual levels of oxygen. Such localized manifestations of groundwater with residual oxygen present are of minor importance to the overall wellfield restoration. Normal ground water flow over time would tend to offset the occurrence of this residual oxygenated water by re-introducing chemically reduced water to such areas. This natural re-introduction of reduced water to the wellfields is supported by the results from the re-characterization of the wellfields water quality accomplished during June, 2009. See the discussion of currently low oxygen levels in the production zones at Christensen Ranch in response to item 2 under General comments above.**Section 8.0**

1. Section 8 of the Report states, "The reestablishment of long-term reducing conditions in the restored aquifer is an important factor that can serve to limit the migration of constituents affected by ISR mining because reducing conditions have a major effect on the mobility of many constituents associated with uranium roll front deposits, including U, Se, As, Mo, S." In Section 9, the Report states, "significant attenuation of uranium will occur as groundwater from the wellfields moves into the downgradient reducing portions of the aquifer." Demonstrate the basis for these comments by providing information that reducing conditions have been reestablished within the wellfields or exist at monitoring well ring wells down gradient of the wellfields such that reducing conditions would likely limit the movement of monitored constituents.

Evidence that reducing conditions have been re-established within the wellfields includes the presence of detectable concentrations of dissolved iron and manganese in the June 2009 samples from the production zone wells, low Eh measurements, and negligible DO (Table 1), and declining to stable average concentrations of the redox-sensitive constituents uranium and selenium (Tables 4 through 6). Concentrations of the redox-sensitive constituents arsenic and molybdenum are uniformly low across the site. Molybdenum was not detected in any groundwater sample collected during June 2009 above the laboratory detection limit of 0.1 mg/L. Arsenic was not reported above the detection limit (0.001 mg/L) for 10 of the 31 groundwater samples analyzed for this constituent, and reported concentrations ranged from 0.001 to 0.012 mg/L, with an average concentration of 0.0023 mg/L from those samples with detectable levels of arsenic (Table 1). Evidence of the existence of reducing conditions downgradient of the production zone, the likely influx of reducing groundwater from upgradient reducing sediments, and re-establishment of reducing conditions in the restored production zone is discussed in more detail in the responses to General Questions 2 and 3 (above), and in the responses to NRC questions related to the individual Mine Units (below).

2. There are several groundwater wells listed as potential receptors in Section 8.2.2.2 that exist within the permit boundary and are associated with the production "K" sandstone.

Demonstrate that users of these wells have reasonable assurance that their water quality will not be impacted.

See Attachment 3 which summarizes the non-COMIN groundwater rights within the permit boundary. The discussion below focuses on the seven listed rights that are potential receptors of Christensen Ranch site groundwater impacts. As a general response, the potential receptor wells are all located hundreds of feet beyond the monitor well rings of the relevant mine units. The recently acquired wellfields data support the conclusion that reduced conditions have continued to exist in the restored well fields. With the inhibition of constituent mobilization under reduced conditions, the distance of the potential receptor wells from the well fields provides a conservative buffering effect, making it unlikely these wells will ever be impacted. Following is specific discussion of each of the listed potential receptors wells.

P24096P is located near P30368W, known as Willow Corral #32. Willow Corral #32 is one of the regional wells which are monitored quarterly by COGEMA Mining. See Table 5.23 of the May, 2008 License Renewal Application for a summary of monitoring data for Willow Corral #32 from 1995 to 2007. Annual monitoring data for the well also are reported in the SUA-1341 Semi-Annual Monitoring Report and the Annual Report for WDEQ which is copied to the NRC. This well is monitored for radionuclides which have always been at low levels in the well. P24085P, known as Ellendale #4, is monitored by COGEMA Mining. See the same references noted for Willow Corral #32 for historical data on Ellendale #4. Radionuclides have always been at low activity levels in this well. P28847W, known as Heldt #4, is located approximately three miles east-northeast of Mine Unit 5. Ellendale #4 is located northwest of Mine Unit 5 (in a directly downgradient ground water flow location) and is essentially surrounded on almost three sides by Mine Unit 5. Because of Ellendale #4's closer proximity and being partially surrounded by the mine unit, it represents a more desirable, conservative well for monitoring purposes than Heldt #4.

P40282W is an enlargement (incremental appropriation increase) of Willow Corral #32; in other words it is the same well as the one covered by original permit P30368W. P28846W, known as SS Pump #1, is located approximately 7,500 feet northwest of Mine Unit 2 and is well outside the mine permit area. The other two noted wells, P30346W and P52981W, are not utilized for human or livestock water consumption.

In conjunction with this response the State water rights records were further reviewed to identify any other, previously unmentioned, wells that would be potential receptors. There was only one such well identified: P143943W, known as CR No. 2. It is a well that was installed by COGEMA Mining, and its exclusive use was industrial (to provide water for drilling rigs working on the project). All other wells in the vicinity are either completed in shallow formations well above the Christensen Ranch uranium production zone sands, or are located upgradient of the Christensen Ranch well fields relative to the direction of ground water flow through the restored production areas.

MU – 2 Restoration Data Package

1. Page MU2 – 18 of the Report states "uranium is anticipated to be strongly adsorbed once groundwater from the wellfield moves outside of the ore body into the more reducing conditions down gradient." As discussed in previous questions, demonstrate that these conditions exist and can be verified using monitoring well data.

As stated in the responses to General Questions 2 and 3 (above), there is evidence that reducing conditions have been re-established in the production zone of Mine Unit 2. Evidence of reducing conditions includes increased average dissolved iron and manganese concentrations after H_2S addition, maintenance of measurable dissolved iron and manganese throughout stabilization monitoring (Table 4), and negative measured Eh in the production zone well 2S100-2 (Table 1). The effects of these reducing conditions are demonstrated by the low, stable average concentrations of selenium and uranium in Mine Unit 2 (Table 4) and declining uranium concentrations at well 2S100-2 (Table 7), because selenium and uranium are attenuated under reducing conditions.

As discussed in detail in the response to General Question 2 (above), geologic evidence at the site indicates that inflowing groundwater will likely be reducing because of the location of the production zone relative to the oxidized sandstone tongue and the current groundwater flow direction. The reducing nature of inflowing groundwater will likely facilitate groundwater restoration in the production zone based on the results of groundwater transport modeling performed by Davis and Curtis (2007).

2. Section 6.2.4 shows that using a post restoration wellfield average of 0.034 for uranium and a reduction factor of 6, uranium will be 0.088 mg/L which is above the target restoration value (TRV), or background, at 400 feet down gradient of the wellfield boundary, which is generally where the monitoring well ring is located. However, using the maximum uranium value of 4.34 mg/L of uranium from restoration well 2S100-2, and a reduction factor of 6, uranium would likely be above the TRV and EPA MCL for uranium at the monitoring well ring. Demonstrate that uranium concentrations at the monitoring well ring, or at the exemption boundary, would likely be below the TRV and protective of public health and safety.

Duplicate groundwater samples were obtained from restoration well 2S100-2 in June 2009 to determine the long-term trends in water composition at this well and to evaluate whether reducing conditions were maintained since the round 4 stability monitoring sample obtained in January 2005. The results of the June 2009 sample analysis are summarized in Table 1 along with sample analysis results from wells directly upgradient (2MW-101) and downgradient (2MW-105 and 2MW-108) of this portion of the production zone. The samples from well 2S100-2 showed that measurable dissolved iron and manganese concentrations persisted in the groundwater in the restored production zone while selenium concentrations remained below detection, which indicates that reducing conditions have been maintained (Table 7). Furthermore, during the 4.5 years since the fourth round stabilization monitoring sample, the uranium concentration at 2S100-2 has decreased by a factor of five (average concentration of the original and duplicate sample from June 2009 is 0.87 mg/L). Because of the slow groundwater flow rates at the site, this uranium concentration decrease is unlikely to be caused by dilution or flushing of the uranium from the restored production zone. Because of the sensitivity of uranium concentrations in groundwater to redox conditions, the large decrease in uranium concentrations observed at 2S100-2 are attributable to the effects of reducing conditions in the production zone.

As described in Section 6.2.3 of the Restoration Data Package, Mine Unit 2, Christensen Ranch Project, the effect of dispersion alone on the uranium concentration during transport to the monitoring well boundary at a distance of 400 feet can be calculated using the equation:

$$C = \frac{A-B}{R+B} \qquad (1)$$

Where:

C = Concentration at monitoring well ring
A = Post-restoration concentration (0.87 mg/L, from 6/16/2009 sample)
B = TRV (0.034 mg/L), assumed equal to background
R = Reduction factor (6)

This calculation shows that dispersion alone would result in a predicted uranium concentration at the monitoring well boundary of approximately 0.14 mg/L. This concentration is higher than the TRV, but the effects of inflowing reducing groundwater and even slight attenuation by downgradient sediments are likely to reduce this concentration significantly. Furthermore, based on the establishment of reducing conditions in the production zone and dramatic decrease in uranium concentrations at well 2S-100-2 over the last 4.5 years, it is likely that uranium concentrations in the vicinity of well 2S100-2 will continue to decrease over time.

MU-3 Restoration Data Package

1. Figure 5.8. The nitrate and nitrite concentration vs. restoration period appears to show significant increasing trends from the first round of stability monitoring to the fourth round of stability monitoring. Demonstrate that restoration success has been achieved for nitrate and nitrite and stability has been achieved by the absence of significant increasing trends.

Examination of the water quality results during the stability monitoring period (Table A-1, Restoration Data Package, Mine Unit 3, Christensen Ranch Project) showed that all nitrate concentrations were below the analytical detection limit of 0.05 or 0.1 mg/L in all wells during all four rounds of stability monitoring. Nitrite concentrations above the analytical detection limits were reported for only one sample during round 2 of stability monitoring (3W67-1), but nitrite concentrations were below the detection limit of 0.05 mg/L in samples from this well during rounds 3 and 4. During round 4 of stability monitoring, nitrite concentrations above the analytical detection limits were reported for wells 3O37-2, 3T27-2, and 3T37-1. Consequently, these wells were included in the June 2009 sampling and analysis to determine if nitrite concentrations were increasing at these locations. The samples had nitrite plus nitrate concentrations below the analytical detection limit of 0.05

mg/L (Table 1), indicating that increasing nitrite concentrations are not present in these wells.

MU – 4 Restoration Data Package

1. Figure A-13. This figure appears to be missing data point 4T114-1, with a uranium value of 16.0 mg/L. Review this figure and indicate if it is correct as shown, or modify as necessary.

The above figure has been revised to include text indicating the constituent concentration of 16.0 mg/L. Additionally, Figure A-10 presenting manganese concentrations for the stability round 4 monitoring was revised to include data that was missing for well 4T114-1. Revised Figures A-13 and A-10 are included in Attachment 4 of this document.

2. Figure 4-4. 4W104-1 is shown as a restoration well on this figure. However, data for this well is not reported in stability monitoring rounds 1 through 4. Please explain why 4W104-1 has no data reported.

Well 4W104-1 failed mechanical integrity testing on June 15, 2000. The well was plugged and abandoned, and was replaced by well 4W106-1 which is physically proximate to 4W104-1 and is completed in the same production zone. Analytical results for 4W106-1 are reported for the four rounds of stability monitoring data included in the restoration data package.

3. Section 6.2.3 shows that using a post restoration wellfield average of 3.83 mg/L for uranium and a reduction factor of 6, uranium will be 0.830 mg/L which is above the target restoration value (TRV), or background, at 400 feet downgradient of the wellfield boundary, which is generally where the monitoring well ring is located. However, using the maximum uranium value of 16.0 mg/L of uranium from restoration well 4T114-1, this would likely be much higher and likely would be well above the TRV and the EPA MCL for uranium. Demonstrate that uranium concentrations at the monitoring well ring, or at the exemption boundary, would likely be below the TRV and protective of public health and safety.

4. Figure A-13 shows uranium values of 7.84 mg/L, 6.17 mg/L and if well 4T114-1 is included, 16.0 mg/L, in a small area in the southern most portion of MU – 4. Demonstrate that for this portion of the mine unit that public health and safety is protected in down gradient of the mine unit.

5. The TRV for selenium is 0.01 mg/L. The stability round 4 restoration mean is 0.21 mg/L selenium, which is well above the TRV. Additionally, the highest stability round 4 restoration value is 0.512 mg/L in well 4U108-1. Demonstrate that public health and safety is protected in downgradient of mine unit 4 for selenium.

The following discussion addresses Questions 3 through 5:

Examination of the Mine Unit 4 average data (Table 5) indicates that iron concentrations are increasing and manganese, selenium, and uranium concentrations are stable. These groundwater characteristics are consistent with the establishment of reducing conditions in the restored Mine Unit 4 wellfield. In response to Questions 3, 4 and 5 (above), wells 4T114-1 and 4U110-1[1] in Mine Unit 4 were resampled in June 2009, along with the directly upgradient well 4MW-20 and directly downgradient wells 4MW-19 and 4MW-21 (Table 1). Examination of the trends in iron, manganese, selenium, and uranium in the production zone well 4T114-1 showed that since the fourth round stability monitoring sample, iron concentrations had increased significantly and manganese concentrations had declined slightly but remained measurable (Table 8). These results indicate that reducing conditions have been established and maintained in this area of the restored aquifer. Consistent with the establishment of reducing conditions, selenium concentrations have decreased slightly and uranium concentrations have decreased by a factor of 2.4 in the 4.5 years since the fourth round stability monitoring sample.

Water quality trends at production wells 4U108-1/4U110-1 were similar to those at 4T114-1 (Table 9). In the June 2009 sample, iron and manganese concentrations increased, indicating that reducing conditions have been successfully established in the restored aquifer. Accordingly, the selenium and uranium concentrations have decreased significantly in the 4.5 years since the fourth round stability monitoring sample, by a factor of 2.3 for selenium and by more than an order of magnitude for uranium.

Based on the establishment and maintenance of reducing conditions in the production zone aquifer in the vicinity of wells 4T114-1, 4U108-1 and 4U110-1 and the observed decline in uranium and selenium concentrations in samples from these wells, selenium and uranium concentrations in this portion of the restored aquifer are expected to continue to decrease and will not pose a threat to public health or safety. The influx of reducing groundwater from sediments upgradient of the restored production zone is also expected to limit selenium and uranium mobility.

MU-5 Restoration Data Package

1. Section 4.6.2. One ore zone perimeter well MU5 (MW66) went on excursion status on July 21, 2004, one month before 4th stability monitoring sample. This well is directly downgradient of MOD 55 and has remained on excursion. COGEMA correspondence with WDEQ and the NRC, in the NRC ADAMS records and management system, indicates that WDEQ and NRC agreed that additional restoration or corrective action was not required at the time. Records also indicate that additional monitoring was performed on this well. Submit the additional full analysis (Guidance 8) monitoring data that was performed for this well or show where this information can be found.

2. For MW66, demonstrate that sampling taken for the full analysis of monitoring data has remained stable to date.

3. Demonstrate that levels of constituents remaining in MW66 will be protective of public health and safety down gradient of the MU-5 at the aquifer exemption boundary.

The following discussion addresses Questions 1 through 3:

[1] Because of dedicated pump problems encountered at well 4U108-1, the June 2009 sample was obtained from the adjacent well 4U110-1, located approximately 90 feet directly south of well 4U108-1.

As indicated above in comment #1, 5MW66 went on excursion status on July 21, 2004, prior to the collection of the 4th round stability monitoring sample on August 9, 2004. Additional monitoring conducted at this well since that time has included excursion parameters (chloride, alkalinity, pH, and conductivity). Table 10 presents the results of excursion monitoring conducted at this well from July 1996 through April 2009. The attached Figure 3 presents the graphical trends for these excursion parameters during the years 2004 to 2009. As the graphs indicate, conductivity, chloride, and alkalinity have generally increased and pH has generally decreased since 2004 when the well went on excursion status. These parameters have remained relatively stable from approximately 2007 to the present.

A groundwater sample was also collected at well 5MW66 on September 17, 2009, and submitted for full groundwater analysis according to WDEQ/LQD Guideline No. 8. Table 11 presents the results of this recent analysis compared to the last sampling round, collected in August 2004. The laboratory analytical report is included as Attachment 5. The results of sampling are consistent with the excursion parameter monitoring conducted at this well, as constituents such as bicarbonate, sulfate, chloride, TDS, and conductivity have increased since the previous sample from 2004. Uranium and selenium concentrations have also increased to 2.18 mg/L and 0.094 mg/L, respectively.

The primary constituents of concern detected above the TRV for Mine Unit 5 at well 5MW66 from the August 2004 groundwater sample are selenium and uranium. As detailed in the fate and transport section (Section 8) of the *Wellfield Restoration Report* (Petrotek 2007), these two constituents are attenuated in reducing groundwater conditions. Selenium is generally present as native selenium or in the selenide oxidation state (Se^{2-}), and generally present in solution in the form of HSe^- above a pH of 4. Native selenium is relatively insoluble, and selenide generally forms insoluble metal selenide phases such as ferroselite ($FeSe_2$). This insolubility of the selenide minerals is the primary attenuation process for selenium in aquifers under reducing conditions. Under reducing conditions, uranium (U^{4+}) forms relatively insoluble solids such as uraninite and coffinite, which are the typical minerals found in roll-front deposits.

It is noted that the location of well 5MW66 in relation to neighboring perimeter wells and the mine unit boundary, and the general direction of groundwater flow to the west-northwest are important considerations for potential downgradient migration of constituents of concern. As seen in Figure 4-6 of the Mine Unit 5 Section of the *Wellfield Restoration Report* (Petrotek 2007), well 5MW66 is located approximately 250 feet northeast of well 5MW64 and 440 feet southeast of well 5MW68. Considering the general direction of groundwater flow in MU5 to the west-northwest, as seen in Map 1 of the *Wellfield Data Package, Mine Unit 5, Christensen Ranch Project* [COGEMA 1995], a significant portion of downgradient transport would be expected to remain within the boundary of MU5.

The water quality results from 5MW66 are inconsistent with the results of sampling conducted at other locations in MU5. As previously demonstrated in the discussion for *General Comment #2,* generally reducing conditions have been reestablished in the restored wellfields and are present in areas downgradient from the wellfields. The Eh measurements (collected during the additional sampling conducted in June 2009) at the

Mine Unit 5 sampling locations (Table 1) are relatively low, and the three downgradient locations have Eh values ranging between 4.3 mV and 81.9 mV, compared to the three wellfield locations where Eh values ranged between 26.5 mV and 139.6 mV. The presence of measurable dissolved iron at the downgradient well 5MW56 and dissolved manganese at downgradient wells 5MW16 and 5MW56 is another indicator of reducing groundwater conditions outside of the wellfield. Additionally, dissolved oxygen concentrations at the three downgradient sampling locations are lower than those observed in the wellfield sampling locations.

Due to the demonstrated reducing conditions within and downgradient of MU5, as well as the significant attenuation of selenium and uranium in reducing conditions, the potential health risk from observed concentrations at 5MW66 is minimal. Downgradient transport of selenium and uranium is limited, even in the areas of 5MW66. Previous restoration results at Irigaray and Christensen Ranch show that these constituents are greatly retarded by natural processes over a distance of 400 feet (assumed distance to monitor well ring), by a reduction factor of 6 to 8. For this reason, remnant concentrations of uranium and selenium at well 5MW66 are not expected to threaten downgradient drinking water supplies.

4. It appears the location of well 5BL76-1 is shown as 2.97 mg/L uranium on Figure A-12. In Table A-1, stability round 4, well 5BL76-1 is listed as 14.8 mg/L uranium. Confirm that this figure is correct or modify as necessary.

The above figure was revised and corrected to include the concentration values for uranium in Mine Unit 5 from the stability round 4 sampling event. This figure was previously incorrect, as the depicted values represented selenium concentrations. The revised Figure A-12 is included in Attachment 4 of this document.

5. The uranium value at well 5BL76-1 is 14.8 mg/L after stability round 4. This is well above the statistical mean of 2.05 for the uranium post-restoration wellfield average. Demonstrate that for this portion of the mine unit that public health and safety is protected in down gradient of the mine unit at the aquifer exemption boundary.

Well 5BL76-1 was sampled in June 2009 to assess groundwater conditions in this portion of the Mine Unit 5 restored production zone (Table 1). The iron, manganese, selenium, and uranium concentrations in samples from this well during the stabilization monitoring period until the June 2009 are summarized in Table 12. Although iron concentrations remained below the analytical detection limit, the manganese concentration increased and the uranium and selenium concentrations decreased in the June 2009 sample. These changes in manganese, uranium, and selenium concentrations indicate that reducing conditions have likely been re-established in this portion of the restored production zone and attenuation of uranium should occur in this portion of the restored production zone, a process expected to be aided by inflowing reducing groundwater.

6. The selenium values at wells MW-03 and MW-07, both very close together, exceed 1.0 mg/L which are well above the average of 0.41 mg/L and the TRV of 0.01. Demonstrate *that for this portion of the mine unit that public health and safety is protected in down gradient of the mine unit at the aquifer exemption boundary.*

Wells 5MW-03 and 5MW-07 were sampled in June 2009 (Table 1). The trends in iron, manganese, selenium, and uranium concentrations in samples from these wells are summarized in Tables 13 and 14, respectively. The June 2009 samples from the two wells indicate that although iron concentrations had returned to or remained below the analytical detection limit, measurable concentrations of manganese are present in the groundwater, indicating that reducing conditions have been maintained in this portion of the restored production zone aquifer. In the 5MW-03 samples, selenium concentrations declined and uranium concentrations remained reasonably constant during the stabilization monitoring and post-stabilization period (Table 13), indicating that reducing conditions have been maintained and that selenium concentrations will likely decrease further over time. In the 5MW-07 samples, selenium and uranium concentrations are slowly declining from peak values observed in February and May 2004 (Table 14). These results indicate that reducing conditions are likely to have been maintained and that over time, selenium and uranium concentrations can be expected to decrease as inflowing reducing groundwater helps to maintain the necessary redox conditions.

Evidence that any selenium transported away from the restored production zone in the vicinity of wells 5MW-03 and 5MW-07 will be attenuated by downgradient reducing conditions is available from groundwater data from downgradient well 5AE80-1. Iron, manganese, selenium, and uranium concentrations in this well during the stabilization monitoring period are summarized in Table 15. Increasing iron and manganese concentrations combined with stable selenium and uranium concentrations indicate that reducing conditions have persisted in this portion of the restored production zone aquifer. Consequently, if uranium or selenium (both of which are redox-sensitive constituents) is transported from 5MW-03 and 5MW-07, these constituents will be attenuated under the reducing conditions that are present in the vicinity of well 5AE80-1.

MU-6 Restoration Data Package

1. The uranium value at well 6m 29-1 is 9.28 mg/L after stability round 4. Demonstrate that for this portion of the mine unit that public health and safety is protected in down gradient of the mine unit at the aquifer exemption boundary.

Additional duplicate samples from well 6M29-1 indicated that reducing conditions have been maintained at this location, based on elevated dissolved iron and manganese concentrations (Table 16). Selenium concentrations decreased to below the detection limit in samples obtained in June 2009. Increased uranium concentrations were observed in the June 2009 samples. However, these uranium concentrations will not pose a risk to public health and safety downgradient of the mine because reducing conditions in this area and influx of reducing groundwater from upgradient locations, such as at well 6T35-1 (Table 17), will ultimately cause reduction and precipitation or adsorption of uranium in solution.

References

COGEMA. 1995. Wellfield Data Package, Mine Unit 5, Christensen Ranch Project. February 19954

D'Appolonia. 1983. *D-5 Geological Assessment*. Internal report prepared for Malapai Resources Company.

Davis, J.A. and G.P. Curtis. 2007. *Consideration of geochemical Issues in Groundwater Restoration at Uranium In-Situ Leach Mining Facilities.* NUREG/CR-6870, Prepared for the Office of Nuclear Regulatory research, U.S. Nuclear Regulatory Commission by the U.S. Geological Survey, January 2007.

Deutsch, W.J., W.J. Martin, L.E. Eary, and R.J. Serne. 1985. *Methods of Minimizing Ground-Water Contamination from In Situ Leach Uranium Mining.* NUREG/CR-3709 (PNL-5319), U.S. Nuclear Regulatory Commission, Washington, DC.

EPA (Environmental Protection Agency). 1988. *Ground Water Classification for Christensen Ranch In-Situ Uranium Project (WDEQ Permit to Mine #478.* Letter from M.H. Dodson, Waer Management Division, to W.L. Garland, Wyoming Department of Environmental Quality, August 26, 1988.

EPA (Environmental Protection Agency). 1999. *Understanding Variation in Partition Coefficient, K_d Values, Volume II: Review of Geochemistry and Available K_d Values for Cadmium, Cesium, Chromium, Lead, Plutonium, Radon, Strontium, Thorium, Tritium (^3H) and Uranium.* Office of Air and Radiation, EPA 402-R-99-004B.

Honea, R.M. 1974. *Geology and Geochemistry of the Irigaray-Hoe Uranium Mineralization, Johnson County, Wyoming.* Prepared for Nuclear Fuel Division, Westinghouse Electric Corporation, October 1974.

Morris, A. and J.R. Bahr. 1975. *Geology and Ore Reserves of the Irigaray Area, Johnson County, Wyoming.* Wyoming Mineral Corporation, Casper, Wyoming.

Petrotek, 2007. Wellfield Restoration Report, Christensen Ranch Project, Wyoming. Prepared for COGEMA Mining, Inc., October 24, 2007.

Rose, S.W. 1971. *The Lithologic Favorability of the Irigaray-Hoe Area, An Interim Report.*

UC Davis. 2009. *SSC 102- Soil Chemistry, Section 9.* Accessed online at http://lawr.ucdavis.edu/classes/ssc102/ August 12, 2009.

FIGURES

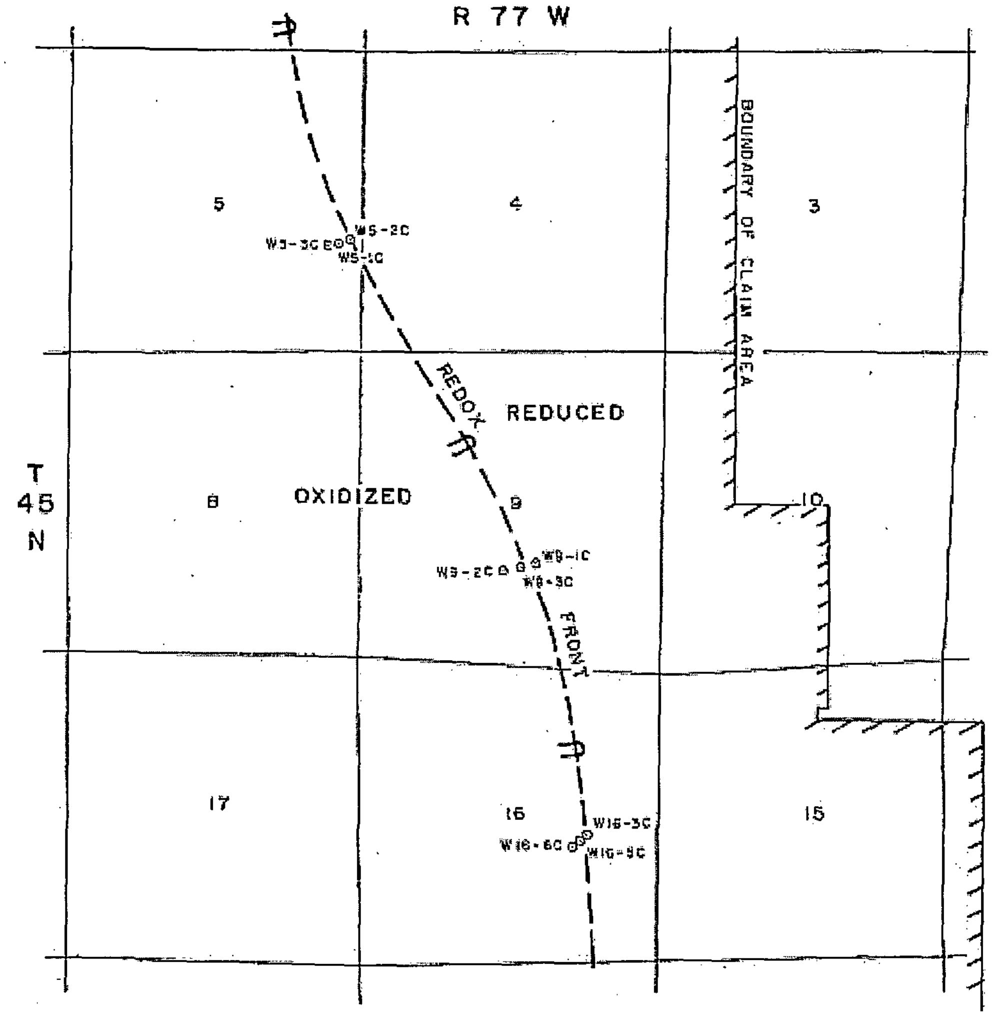


Figure 1. Location of Core Holes Drilled to Sample the Irigaray-Hoe Roll Front (from Honea 1974)

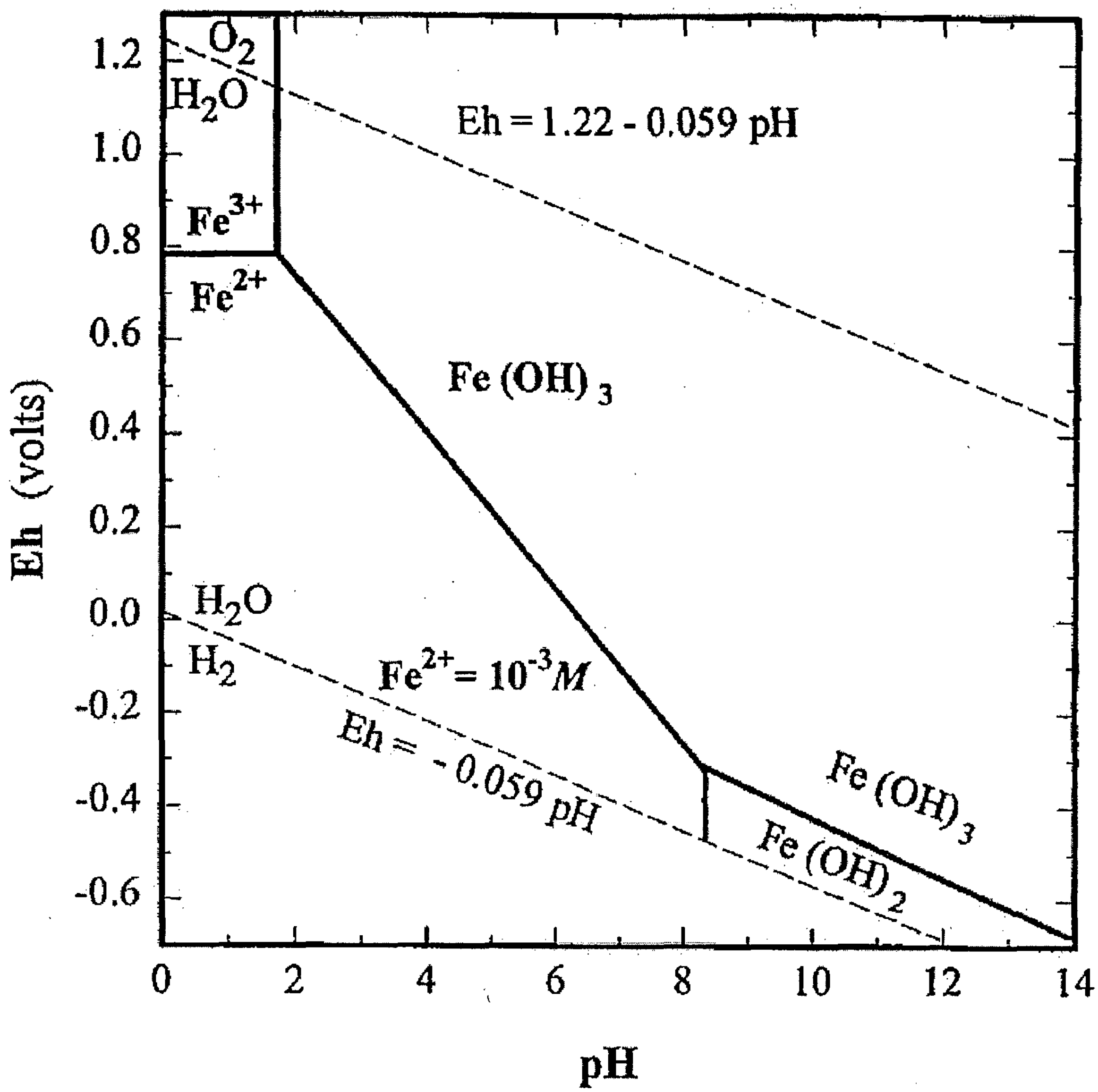


Figure 2. Iron Eh-pH diagram (UC Davis 2009)

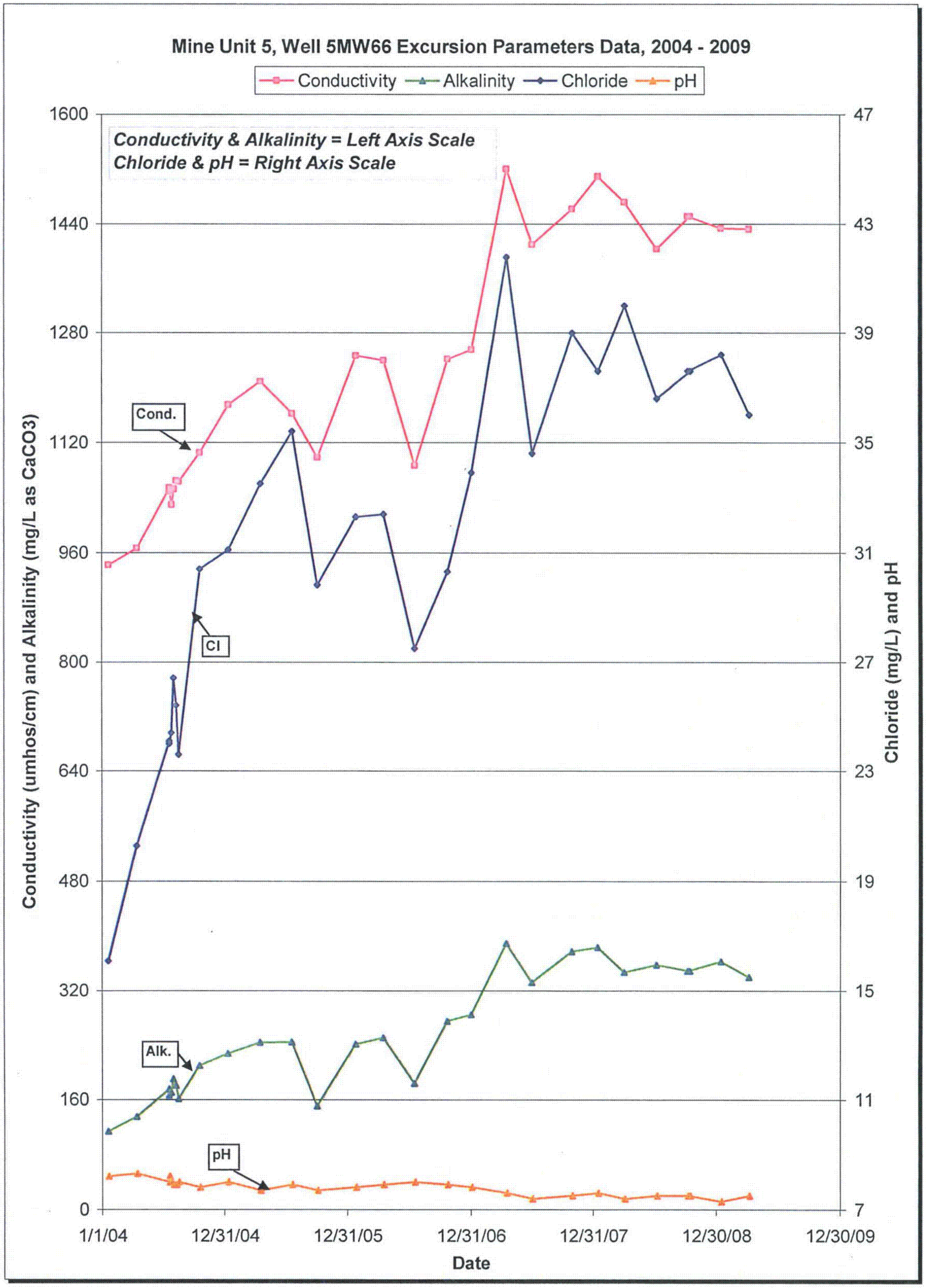


Figure 3. Mine Unit 5, Well 5MW66 Excursion Parameters Data, 2004 - 2009

TABLES

Table 1. Groundwater Analytical Results, June 2009 Sampling Event, Christensen Ranch

	Mine Unit 2						
Sampled Well	2MW101	2S100-2	2S100-2 (Dup)	2MW105	2MW108	2MW109	2MW111
Location on Flowpath	UG	PZ	PZ	DG	DG	DG	DG
Date Sampled	6/16/2009	6/16/2009	6/16/2009	6/16/2009	6/16/2009	6/16/2009	6/16/2009
Major Ions (mg/L)							
Calcium	8	33	33	8	8	8	8
Magnesium	1	4	4	1	1	1	<1
Sodium	133	155	156	140	139	139	136
Potassium	1	2	2	2	2	1	1
Carbonate as CO3	4	<1	<1	3	5	4	5
Bicarbonate as HCO3	105	244	246	109	122	101	103
Sulfate	200	189	188	205	194	207	195
Chloride	8	8	8	8	9	8	8
Nitrogen, Ammonia as N	<0.05	0.06	0.06	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate+Nitrite as N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoride	0.2	<0.1	<0.1	0.2	0.2	0.2	0.2
Silica	9.9	7.3	7.5	9.6	10.3	9.9	9.9
TDS, Calculated	420	519	521	433	432	431	418
Field Parameters							
Spec. Conductance (mS/cm)	0.635	0.791	NA	0.652	0.661	0.648	0.637
pH - Field	8.63	9.49	NA	9.05	8.67	8.64	8.68
Eh (mV)	110.7	-30.7	NA	68.6	55.5	113.6	48.4
DO (mg/L)	0.21	0.20	NA	0.09	0.05	0.21	0.08
Trace Metals (mg/L)							
Aluminum	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.001	0.004	0.004	0.001	0.001	<0.001	<0.001
Barium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	<0.03	0.13	0.13	<0.03	<0.03	<0.03	<0.03
Iron, Total	0.04	0.13	0.13	<0.03	<0.03	<0.03	<0.03
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	<0.01	0.14	0.14	<0.01	<0.01	<0.01	<0.01
Manganese, Total	<0.01	0.14	0.14	<0.01	<0.01	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Vanadium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Radiometric (pCi/L)							
Uranium (mg/L)	<0.0003	0.867	0.872	0.0192	0.0059	0.0027	0.0007
Ra 226	0.25	153	153	< 0.19	0.14 U	< 0.2	0.26
Ra 226 precision (±)	0.16	2.9	2.5	0.1	0.15	0.12	0.15
Ra 228	< 1.2	< 1.5	1.4	< 1.2	< 1.3	< 1.2	< 1.1
Ra 228 precision (±)	0.7	1	0.8	0.7	0.8	0.7	0.6
Data Qualtiy							
Conductivity-Lab (umhos/cm)	659	819	818	677	674	676	650
pH - Lab	8.76	7.69	7.65	8.74	8.73	8.73	8.83
TDS @ 180 C (mg/L)	404	518	529	421	411	412	396
A/C Balance(± 5) (%)	0.467	3.64	3.77	1.7	0.999	1.8	1.93

	Mine Unit 3						
Sampled Well	3MW30	3T37-1	3T27-2	3O37-2	3MW23	3MW115	3MW36-2
Location on Flowpath	UG	PZ	PZ	PZ	DG	DG	DG
Date Sampled	6/15/2009	6/15/2009	6/15/2009	6/16/2009	6/16/2009	6/15/2009	6/16/2009
Major Ions (mg/L)							
Calcium	7	NA	NA	NA	6	8	8
Magnesium	<1	NA	NA	NA	1	1	1
Sodium	142	NA	NA	NA	140	127	139
Potassium	1	NA	NA	NA	1	2	1
Carbonate as CO3	4	NA	NA	NA	4	4	4
Bicarbonate as HCO3	116	NA	NA	NA	107	114	112
Sulfate	195	NA	NA	NA	195	195	199
Chloride	8	NA	NA	NA	8	8	8
Nitrogen, Ammonia as N	0.05	NA	NA	NA	<0.05	0.07	<0.05
Nitrogen, Nitrate+Nitrite as N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoride	0.2	NA	NA	NA	0.2	0.2	0.2
Silica	9.7	NA	NA	NA	9.4	9	9.6
TDS, Calculated	427	NA	NA	NA	421	413	427
Field Parameters							
Spec. Conductance (mS/cm)	0.638	1.578	1.883	0.679	0.635	0.639	0.650
pH - Field	9.54	6.51	6.53	7.08	8.59	8.25	8.69
Eh (mV)	-26.4	-64.7	57.2	19.9	47.0	68.7	182.8
DO (mg/L)	0.12	0.02	0.07	3.09*	0.08	0.06	0.04
Trace Metals (mg/L)							
Aluminum	<0.1	NA	NA	NA	<0.1	<0.1	<0.1
Arsenic	0.001	NA	NA	NA	0.002	0.002	0.001
Barium	<0.1	NA	NA	NA	<0.1	<0.1	<0.1
Boron	<0.1	NA	NA	NA	<0.1	<0.1	<0.1
Cadmium	<0.005	NA	NA	NA	<0.005	<0.005	<0.005
Chromium	<0.05	NA	NA	NA	<0.05	<0.05	<0.05
Copper	<0.01	NA	NA	NA	<0.01	<0.01	<0.01
Iron	0.05	NA	NA	NA	<0.03	<0.03	<0.03
Iron, Total	16.6 D	NA	NA	NA	<0.07 D	<0.07 D	<0.03
Lead	<0.001	NA	NA	NA	<0.001	<0.001	<0.001
Manganese	<0.01	NA	NA	NA	<0.01	0.02	<0.01
Manganese, Total	0.16	NA	NA	NA	<0.01	<0.01	<0.01
Mercury	<0.001	NA	NA	NA	<0.001	<0.001	<0.001
Molybdenum	<0.1	NA	NA	NA	<0.1	<0.1	<0.1
Nickel	<0.05	NA	NA	NA	<0.05	<0.05	<0.05
Selenium	<0.001	NA	NA	NA	<0.001	<0.001	<0.001
Vanadium	<0.1	NA	NA	NA	<0.1	<0.1	<0.1
Zinc	<0.01	NA	NA	NA	<0.01	0.03	<0.01
Radiometric (pCi/L)							
Uranium (mg/L)	0.0005	NA	NA	NA	0.0197	0.0242	0.0301
Ra 226	0.24	NA	NA	NA	< 0.19	< 0.2	< 0.21
Ra 226 precision (±)	0.14	NA	NA	NA	0.12	0.11	0.14
Ra 228	< 1.1	NA	NA	NA	< 1.2	< 1.3	< 1.2
Ra 228 precision (±)	0.7	NA	NA	NA	0.7	0.7	0.7
Data Qualtiy							
Conductivity-Lab (umhos/cm)	661	NA	NA	NA	656	661	667
pH - Lab	8.75	NA	NA	NA	8.92	8.75	8.7
TDS @ 180 C (mg/L)	417	NA	NA	NA	416	431	413
A/C Balance(± 5) (%)	2.46	NA	NA	NA	2.58	-1.84	1.66

	Mine Unit 4						
Sampled Well	4MW-6	4MW-20	4T114-1	4U110-1	4MW-3	4MW19	4MW21
Location on Flowpath	UG	UG	PZ	PZ	DG	DG	DG
Date Sampled	6/17/2009	6/16/2009	6/16/2009	6/17/2009	6/17/2009	6/16/2009	6/16/2009
Major Ions (mg/L)							
Calcium	7	9	106	10	8	8	8
Magnesium	1	<1	24	2	<1	1	1
Sodium	130	139	431	122	131	136	132
Potassium	1	2	6	<1	1	2	1
Carbonate as CO3	5	2	<1	2	6	3	2
Bicarbonate as HCO3	114	122	979 D	272	108	113	113
Sulfate	197	197	379	66	197	198	198
Chloride	7	7	41	7	12	8	8
Nitrogen, Ammonia as N	<0.05	<0.05	0.26	0.23	<0.05	<0.05	<0.05
Nitrogen, Nitrate+Nitrite as N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoride	0.2	0.2	<0.1	<0.1	0.2	0.2	0.2
Silica	9.7	9.8	11 D	4.4	9.6	9.6	9
TDS, Calculated	420	429	1480	350	419	424	418
Field Parameters							
Spec. Conductance (mS/cm)	0.638	0.653	2.099	0.570	0.650	0.640	0.635
pH - Field	8.36	8.62	9.56	8.54	8.27	8.84	8.59
Eh (mV)	142.4	42.8	-36.2	92.3	141.3	75.1	106.0
DO (mg/L)	0.31	0.12	0.19	0.34	0.48	0.13	0.12
Trace Metals (mg/L)							
Aluminum	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
Arsenic	0.002	0.002	0.012	0.003	0.002	0.001	0.002
Barium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	<0.1	<0.1	<0.3 D	<0.1	<0.1	<0.1	<0.1
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	<0.03	<0.03	0.97 D	0.1	<0.03	<0.03	0.09
Iron, Total	<0.03	0.62	1.1	0.22	<0.03	<0.03	<0.03
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	<0.01	<0.01	0.23	0.1	<0.01	<0.01	<0.01
Manganese, Total	<0.01	0.02	0.22	0.1	<0.01	<0.01	<0.01
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	<0.001	0.002	0.009	0.226	<0.001	<0.001	<0.001
Vanadium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Radiometric (pCi/L)							
Uranium (mg/L)	0.0187	0.0008	6.66	0.316	0.0004	0.0158	0.0169
Ra 226	0.23	0.22	272	137	< 0.3	0.54	0.45
Ra 226 precision (±)	0.14	0.14	3	2.5	0.18	0.18	0.17
Ra 228	< 1.1	< 1.2	2.1	< 1.2	< 1.6	< 1.2	< 1.2
Ra 228 precision (±)	0.7	0.7	0.7	0.8	1	0.7	0.7
Data Qualtiy							
Conductivity-Lab (umhos/cm)	664	669	2210	591	673	665	659
pH - Lab	8.91	8.67	7.13	8.03	8.73	8.66	8.64
TDS @ 180 C (mg/L)	429	405	1450	367	399	420	406
A/C Balance(± 5) (%)	-1.34	1.52	2.07	-0.528	-2.08	1.15	-0.0649

UG - Upgradient well
PZ - Production Zone well
DG - Downgradient well
NA - Not analyzed

* - Drawdown in well below pump intake caused pump cycling and likely increased aeration and bubbles in flow-through cell.

Table 1. Groundwater Analytical Results, June 2009 Sampling Event, Christensen Ranch

	Mine Unit 5										Mine Unit 6					
Sampled Well	5MW5	5MW51	5MW59	5BL76-1	5BL76-1 (Dup)	5MW03	5MW07	5MW16	5MW56	5MW31	6MW34	6MW27	6M29-1	6M29-1 (Dup)	6MW43	6MW45
Location on Flowpath	UG	UG	UG	PZ	PZ	PZ	PZ	DG	DG	DG	UG	UG	PZ	PZ	DG	DG
Date Sampled	6/18/2009	6/18/2009	6/17/2009	6/18/2009	6/18/2009	6/18/2009	6/18/2009	6/17/2009	6/18/2009	6/18/2009	6/17/2009	6/17/2009	6/17/2009	6/17/2009	6/17/2009	6/17/2009
Major Ions (mg/L)																
Calcium	16	10	10	145	146	19	37	11	12	9	36	28	116	114	36	21
Magnesium	3	2	2	29	29	3	8	2	2	1	6	5	26	26	5	3
Sodium	165	131	133	461	472	115	205	142	131	133	245	226	300	299	264	198
Potassium	3	2	2	8	8	2	4	2	2	2	4	3	6	6	4	3
Carbonate as CO3	1	3	5	<1	<1	<1	<1	3	<1	4	<1	<1	<1	<1	<1	<1
Bicarbonate as HCO3	111	135	130	1040	1060	246	478	120	144	121	85	128	777	773	179	154
Sulfate	296	192	196	519	525	99	144	235	192	192	559	451	402	408	517	373
Chloride	5	6	7	50	51	6	10	7	7	7	4	6	26	26	10	4
Nitrogen, Ammonia as N	<0.05	<0.05	<0.05	0.32	0.29	0.29	0.07	<0.05	0.26	<0.05	<0.05	<0.05	0.07	0.07	<0.05	<0.05
Nitrogen, Nitrate+Nitrite as N	<0.05	<0.05	<0.05	1.63	1.62	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoride	0.2	0.2	0.2	<0.1	<0.1	0.1	<0.1	0.2	0.2	0.2	0.1	0.2	<0.1	<0.1	0.1	0.2
Silica	9	8.3	8.7	11.7	12.1	6.8	9.1	9.3	9.3	10.1	10.2	9.5	8.7	8.5	9.4	8.7
TDS, Calculated	555	423	430	1750	1770	374	656	472	430	419	908	795	1270	1270	935	690
Field Parameters																
Spec. Conductance (mS/cm)	0.837	0.652	0.654	2.249	NA	0.589	1.013	0.714	0.656	0.639	1.275	1.142	1.795	NA	1.336	0.996
pH - Field	8.30	8.97	8.62	9.00	NA	9.35	7.68	8.80	10.05	9.20	9.44	9.23	9.64	NA	8.37	9.94
Eh (mV)	131.9	75.8	92.3	60.0	NA	26.5	139.6	81.9	4.3	59.1	4.6	32.2	-30.3	NA	116.1	-5.4
DO (mg/L)	0.32	0.23	0.19	4.84	NA	0.56	0.58	0.18	0.26	0.18	0.14	0.18	0.36	NA	0.23	0.20
Trace Metals (mg/L)																
Aluminum	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.001	0.002	<0.001	<0.001	<0.001	0.004	<0.001	0.001	0.001	0.001	0.001	<0.001	0.001	0.002	<0.001	<0.001
Barium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	0.24	0.23	<0.03	<0.03
Iron, Total	<0.03	<0.03	<0.03	0.24	0.27	1.29	0.17	<0.03	<0.03	<0.03	<0.03	<0.03	0.29	0.28	0.03	0.46
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	<0.01	0.01	<0.01	0.24	0.26	0.06	0.09	0.01	0.01	<0.01	0.01	<0.01	0.28	0.3	0.04	0.03
Manganese, Total	<0.01	<0.01	<0.01	0.27	0.26	0.07	0.09	0.01	<0.01	<0.01	0.01	<0.01	0.28	0.29	0.04	0.03
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	<0.001	<0.001	<0.001	2.81	2.82	1.12	0.97	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Radiometric (pCi/L)																
Uranium (mg/L)	0.0113	0.0182	0.0271	12.8	12.8	1.54	3.01	0.0015	0.0069	0.0017	0.0019	0.0083	12.5	12.9	0.0134	0.0069
Ra 226	3.5	0.99	0.49	234	256	88	161	0.48	2.1	0.96	3.9	7	257	220	1.8	1.7
Ra 226 precision (±)	0.42	0.19	0.19	2.7	2.8	1.7	2.3	0.19	0.27	0.19	0.44	0.59	3.5	3.3	0.35	0.35
Ra 228	< 1.3	< 1.2	< 1.3	2.2	2.5	< 1.2	< 1.1	< 1.3	< 1.2	< 1.2	1.4	< 1.3	3.9	4	2.3	1.6
Ra 228 precision (±)	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.9	0.9	0.9	1
Data Qualtiy																
Conductivity-Lab (umhos/cm)	867	678	677	2510	2540	608	1040	746	685	659	1330	1190	1880	1870	1390	1060
pH - Lab	8.39	8.52	8.64	7.15	7.18	7.83	7.37	8.54	8.26	8.65	8.08	8.17	7.27	7.33	8.25	8.24
TDS @ 180 C (mg/L)	560	428	427	1730	1750	395	667	465	440	429	884	788	1280	1300	897	700
A/C Balance(± 5) (%)	0.358	-1	-0.924	0.821	1.08	-0.0552	1.91	-1.86	-0.658	0.387	-0.362	0.293	-1.71	-2.21	-0.738	-1.95

UG - Upgradient well
PZ - Production Zone well
DG - Downgradient well
NA - Not analyzed

Table 2. Flow Paths Sampled in June 2009

Mine Unit	Upgradient Wells	Production Zone Wells	Downgradient Wells	Additional Wells
2	2MW-101	2S100-2	2MW-108 2MW-109	2MW-105 2MW-111
3	3MW-30	3T-37-1 3T-27-2 3O-37-2	3MW-23 3MW-115	3MW-36-2
4	4MW-6	--	4MW-3	--
	4MW-20	4T114-1 4U110-1	4MW-19 4MW-21	--
5	5MW-5	--	5MW-16	--
	5MW-59	5BL-76-1	5MW-56	--
	5MW-51	5MW-07 5MW-03	5MW-31	--
6	6MW-34	6M29-1	6MW-43 6MW-45	6MW-27

Table 3. Eh Measurements in Restored Production Zone and Perimeter Monitoring Wells, June 2009

Mine Unit	Restored Production Zone Wells	Perimeter Monitoring Wells
2	-30.7	48.4 to 113.6
3	-64.7 to 57.2	-26.4 to 182.8
4	36.2 and 92.3	42.8 to 142.4
5	26.5 to 139.6	4.3 to 131.9
6	-30.3	-5.4 to 116.1

All units in millivolts (mV)

Table 4. Mine Unit 2, Indicators of Reducing Groundwater Conditions, Average Concentrations

Constituent	**After R.O with Recirculation** (Completed March-02)	**After H_2S with Recirculation** (Completed March-04)	**Stabilization Round 1** (April-04)	**Stabilization Round 2** (July-04)	**Stabilization Round 3** (October-04)	**Stabilization Round 4** (January-05)
Iron	0.14	0.43	1.19	1.06	0.66	0.57
Manganese	0.17	0.27	0.38	0.41	0.39	0.34
Selenium	1.29	0.01	0.01	0.01	0.01	0.01
Uranium	3.33	0.76	0.28	0.26	0.27	0.36

All units in milligrams per liter (mg/L)

Table 5. Mine Units 3, 4, and 5, Indicators of Reducing Groundwater Conditions, Average Concentrations

Constituent	After R.O. with Recirculation	Stabilization Round 1	Stabilization Round 2	Stabilization Round 3	Stabilization Round 4
Mine Unit 3*					
	(Completed Aug-02)	(October-04)	(January-05)	(April-05)	(July-05)
Iron	0.16	0.5	0.53	0.39	0.28
Manganese	0.14	0.12	0.13	0.13	0.12
Selenium	1.36	0.01	0.02	0.03	0.01
Uranium	3.7	0.21	0.12	0.13	0.12
Mine Unit 4*					
	(Completed Mar-03)	(April and October-04)**	(June-04 and January-05)	(September-04 and April-05)	(January and July-05)
Iron	0.11	0.87	0.35	0.2	0.36
Manganese	0.12	0.18	0.13	0.15	0.14
Selenium	0.3	0.28	0.26	0.21	0.21
Uranium	2.85	3.71	3.53	3.91	3.83
Mine Unit 5					
	(Completed Nov-03)	(November-03)	(February-04)	(May-04)	(August-04)
Iron	0.05	0.05	0.15	0.06	0.1
Manganese	0.04	0.06	0.09	0.07	0.08
Selenium	0.53	0.49	0.52	0.35	0.41
Uranium	1.43	2.16	2.43	2.39	2.05

All units in milligrams per liter (mg/L)

* Round 1 samples collected subsequent to reductive addition of H_2S at Mine Units 3 and 4.

** Wells 4E6-7, 4H7-1, and 4K9-1 were sampled for stabilization monitoring with Mine Unit 3 in October 2004, January 2005, April 2005, and July 2005; all other Mine Unit 4 restoration monitoring wells were sampled in April 2004, June 2004, September 2004, and January 2005.

Table 6. Mine Unit 6 Groundwater Indicators of Reducing Conditions, Average Concentrations

Constituent	**After Groundwater Sweep** (Completed November-03)	**Stabilization Round 1*** (June-05)	**Stabilization Round 2** (September-05)	**Stabilization Round 3** (December-05)	**Stabilization Round 4** (March-06)
Iron	1.89	0.37	0.43	0.42	0.45
Manganese	1.43	0.2	0.27	0.29	0.3
Selenium	3.71	0.1	0.11	0.09	0.08
Uranium	49	0.85	0.97	1.05	1.18

All units in milligrams per liter (mg/L)

* Samples collected subsequent to reverse osmosis with circulation and H_2S addition during final pore volume.

Table 7. Mine Unit 2, Production Well 2S100-2, Stabilization and Post-Stabilization Monitoring Results

Constituent	4/7/2004	7/14/2004	10/12/2004	1/5/2005	6/16/2009	6/16/2009 (Dup)
Iron	0.78	0.6	0.33	0.62	0.13	0.13
Manganese	0.34	0.31	0.34	0.38	0.14	0.14
Selenium	<0.005	<0.005	<0.015	<0.005	<0.001	<0.001
Uranium	2.21	2.39	2.51	4.46	0.867	0.872

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

Table 8. Mine Unit 4, Production Well 4T114-1, Stabilization and Post-Stabilization Monitoring Results

Constituent	4/1/2004	6/29/2004	9/28/2004	1/3/2005	6/16/2009
Iron	0.06	< 0.05	< 0.05	0.31	0.97
Manganese	0.31	0.41	0.62	0.68	0.23
Selenium	0.229	0.027	0.029	0.011	0.009
Uranium	17.1	12	15.6	16	6.66

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

Table 9. Mine Unit 4, Production Wells 4U108-1 and 4U110-1, Stabilization and Post-Stabilization Monitoring Results

Well Constituent	4U108-1 4/1/2004	4U108-1 6/29/2004	4U108-1 9/28/2004	4U108-1 1/3/2005	4U110-1* 6/17/2009
Iron	<0.05	<0.05	<0.05	<0.05	0.1
Manganese	0.03	0.04	0.05	0.06	0.1
Selenium	0.694	0.589	0.568	0.512	0.226
Uranium	5.4	6.54	7.6	7.84	0.316

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

* Well 4U108-1 could not be sampled during June 2009 due to dedicated pump malfunction; 4U110-1 is located 90 feet south of 4U108-1.

Table 10. Mine Unit 5, Monitor Well 5MW66, Excursion Parameters

Well ID	Sample Date	Analysis Date	Chloride (mg/L)	Conductivity (umhos/cm)	Alkalinity (mg/L as $CaCO_3$)	pH	Water Level (ft AMSL)
5MW66	7/31/1996	7/31/1996	9.1	668	114.5	8.4	4630
5MW66	8/13/1996	8/14/1996	9.0	676	112.2	8.4	4638
5MW66	8/27/1996	8/27/1996	9.0	711	106.7	8.4	4638
5MW66	9/10/1996	9/11/1996	9.3	734	110.3	8.4	4631
5MW66	9/24/1996	9/25/1996	9.3	765	106.2	8.1	4632
5MW66	10/8/1996	10/8/1996	9.3	717	104.6	8.4	4649
5MW66	10/22/1996	10/23/1996	9.0	743	100.8	8.2	4655
5MW66	11/6/1996	11/6/1996	9.0	740	101.9	8.3	4663
5MW66	11/19/1996	11/20/1996	9.8	713	108.6	8.4	4673
5MW66	12/3/1996	12/3/1996	10.1	729	101.5	8.4	4650
5MW66	12/18/1996	12/18/1996	9.0	744	101.1	8.4	4645
5MW66	12/31/1996	12/31/1996	9.4	752	101.5	8.3	4643
5MW66	1/15/1997	1/15/1997	9.4	745	103.0	8.2	4625
5MW66	1/28/1997	1/29/1997	9.8	767	108.3	8.4	4620
5MW66	2/11/1997	2/11/1997	8.5	755	103.0	8.5	4627
5MW66	2/26/1997	2/26/1997	8.4	766	101.2	8.5	4621
5MW66	3/10/1997	3/11/1997	8.7	895	102.2	8.4	4611
5MW66	3/23/1997	3/24/1997	8.4	924	100.3	8.4	4611
5MW66	4/8/1997	4/8/1997	8.5	880	100.3	8.3	4620
5MW66	4/22/1997	4/23/1997	8.3	802	101.6	8.3	4616
5MW66	5/6/1997	5/7/1997	8.4	778	102.9	8.4	4614
5MW66	5/20/1997	5/21/1997	8.3	774	100.3	8.4	4613
5MW66	6/3/1997	6/4/1997	8.5	926	100.9	8.4	4608
5MW66	6/17/1997	6/18/1997	9.0	781	100.4	8.4	4605
5MW66	6/30/1997	7/1/1997	9.1	762	101.1	8.5	4606
5MW66	7/15/1997	7/16/1997	8.6	759	103.6	8.3	4599
5MW66	7/28/1997	7/29/1997	8.2	878	102.0	8.3	4598
5MW66	8/12/1997	8/13/1997	8.2	873	107.4	8.3	4608
5MW66	8/27/1997	8/27/1997	8.3	844	108.1	8.4	4605
5MW66	9/9/1997	9/9/1997	8.8	809	107.6	8.2	4612
5MW66	9/23/1997	9/24/1997	8.6	791	105.9	8.3	4608
5MW66	10/6/1997	10/8/1997	8.6	754	108.4	8.3	4591
5MW66	10/21/1997	10/23/1997	8.8	751	111.0	8.2	4580
5MW66	11/4/1997	11/6/1997	8.7	735	111.6	8.3	4583
5MW66	11/18/1997	11/20/1997	9.0	739	107.6	8.3	4589
5MW66	12/3/1997	12/3/1997	9.5	741	110.9	8.2	4587
5MW66	12/16/1997	12/18/1997	10.3	740	114.2	8.3	4589
5MW66	12/31/1997	12/31/1997	9.9	749	114.4	8.4	4595
5MW66	1/15/1998	1/16/1998	9.9	753	120.5	8.3	4587
5MW66	1/27/1998	1/29/1998	9.8	748	119.9	8.3	4572
5MW66	2/10/1998	2/11/1998	10.0	754	119.0	8.2	4572
5MW66	2/24/1998	2/25/1998	9.6	762	116.7	8.4	4571
5MW66	3/11/1998	3/11/1998	10.5	731	121.9	8.4	4570
5MW66	3/24/1998	3/25/1998	11.0	745	124.6	8.4	4574
5MW66	4/7/1998	4/7/1998	11.1	740	128.8	8.4	4567
5MW66	4/21/1998	4/22/1998	13.3	758	126.0	8.3	4569
5MW66	5/5/1998	5/6/1998	14.2	771	131.0	8.3	4575
5MW66	5/19/1998	5/19/1998	15.9	791	134.5	8.2	4574
5MW66	6/2/1998	6/3/1998	17.9	802	140.8	8.2	4574

Table 10. Mine Unit 5, Monitor Well 5MW66, Excursion Parameters

Well ID	Sample Date	Analysis Date	Chloride (mg/L)	Conductivity (umhos/cm)	Alkalinity (mg/L as $CaCO_3$)	pH	Water Level (ft AMSL)
5MW66	6/16/1998	6/16/1998	17.7	789	136.9	8.2	4569
5MW66	6/30/1998	6/30/1998	14.1	768	128.1	8.4	4567
5MW66	7/15/1998	7/16/1998	15.6	776	131.7	8.3	4562
5MW66	7/27/1998	7/28/1998	17.2	790	137.0	8.3	4561
5MW66	8/11/1998	8/11/1998	12.5	762	120.2	8.4	4574
5MW66	8/24/1998	8/25/1998	15.3	759	131.7	8.3	4574
5MW66	9/9/1998	9/9/1998	11.1	777	116.7	8.4	4573
5MW66	9/22/1998	9/23/1998	10.0	774	104.5	8.4	4571
5MW66	10/7/1998	10/7/1998	9.8	777	107.2	8.3	4575
5MW66	10/21/1998	10/21/1998	9.3	759	103.0	8.1	4577
5MW66	11/4/1998	11/5/1998	11.0	772	111.3	8.2	4600
5MW66	11/17/1998	11/17/1998	9.8	764	104.6	8.3	4590
5MW66	11/30/1998	12/1/1998	9.9	765	106.2	8.3	4596
5MW66	12/15/1998	12/16/1998	10.1	767	108.1	8.1	4594
5MW66	12/29/1998	12/29/1998	9.9	754	113.4	8.3	4598
5MW66	1/11/1999	1/12/1999	8.9	762	103.8	8.2	4595
5MW66	1/26/1999	1/27/1999	9.5	767	108.0	8.2	4598
5MW66	2/9/1999	2/10/1999	9.5	770	108.9	8.2	4596
5MW66	2/24/1999	2/24/1999	9.2	766	109.1	8.2	4600
5MW66	3/9/1999	3/11/1999	9.6	770	112.7	8.3	4601
5MW66	3/24/1999	3/25/1999	8.6	763	102.1	8.3	4600
5MW66	4/7/1999	4/7/1999	8.6	773	101.1	8.4	4599
5MW66	4/20/1999	4/21/1999	10.0	774	112.1	8.2	4603
5MW66	5/4/1999	5/5/1999	10.1	778	113.2	8.4	4602
5MW66	5/18/1999	5/19/1999	10.0	782	112.7	8.4	4602
5MW66	6/2/1999	6/3/1999	10.5	786	114.7	8.4	4602
5MW66	6/16/1999	6/17/1999	13.2	779	127.7	8.4	4602
5MW66	6/29/1999	6/30/1999	14.4	772	133.8	8.4	4603
5MW66	7/14/1999	7/15/1999	8.9	770	105.4	8.2	4595
5MW66	7/28/1999	7/29/1999	9.1	775	107.8	8.3	4605
5MW66	8/11/1999	8/12/1999	8.8	773	102.9	8.1	4607
5MW66	8/25/1999	8/26/1999	9.4	774	105.1	8.2	4608
5MW66	9/9/1999	9/9/1999	11.1	782	114.1	8.1	4610
5MW66	9/21/1999	9/21/1999	9.7	781	105.8	8.2	4609
5MW66	10/5/1999	10/5/1999	8.9	779	105.3	8.2	4608
5MW66	10/20/1999	10/21/1999	9.0	777	104.3	8.4	4607
5MW66	11/2/1999	11/3/1999	8.9	782	103.3	8.2	4606
5MW66	11/16/1999	11/17/1999	8.9	778	102.8	8.3	4605
5MW66	11/30/1999	12/1/1999	8.7	769	99.6	8.3	4604
5MW66	12/14/1999	12/15/1999	8.7	773	100.2	8.3	4603
5MW66	12/28/1999	12/28/1999	8.7	764	100.5	8.2	4603
5MW66	1/11/2000	1/12/2000	8.5	768	99.3	8.3	4602
5MW66	1/25/2000	1/26/2000	8.9	777	101.2	8.3	4602
5MW66	2/9/2000	2/10/2000	8.6	771	100.6	8.3	4603
5MW66	2/23/2000	2/23/2000	8.9	765	105.6	8.3	4605
5MW66	3/7/2000	3/8/2000	8.9	783	104.0	8.4	4605
5MW66	3/21/2000	3/22/2000	8.9	785	108.8	8.6	4607
5MW66	4/4/2000	4/5/2000	15.8	830	145.7	8.4	4609
5MW66	4/18/2000	4/19/2000	8.8	772	101.1	8.2	4595

Table 10. Mine Unit 5, Monitor Well 5MW66, Excursion Parameters

Well ID	Sample Date	Analysis Date	Chloride (mg/L)	Conductivity (umhos/cm)	Alkalinity (mg/L as $CaCO_3$)	pH	Water Level (ft AMSL)
5MW66	5/2/2000	5/3/2000	11.2	816	114.8	8.4	4590
5MW66	6/13/2000	6/14/2000	8.7	782	97.6	8.4	4571
5MW66	7/11/2000	7/12/2000	8.6	781	95.2	8.4	4567
5MW66	8/8/2000	8/9/2000	8.4	822	99.6	8.4	4543
5MW66	9/19/2000	9/20/2000	10.5	808	112.0	8.4	4535
5MW66	10/24/2000	10/25/2000	8.0	881	98.0	8.3	4549
5MW66	11/20/2000	11/20/2000	8.3	901	95.9	8.2	4536
5MW66	12/28/2000	12/28/2000	7.8	905	92.5	8.3	4532
5MW66	1/16/2001	1/17/2001	8.5	771	99.4	8.4	4532
5MW66	2/22/2001	2/22/2001	8.4	838	96.3	8.3	4528
5MW66	3/20/2001	3/20/2001	8.9	754	106.5	8.4	4531
5MW66	4/17/2001	4/17/2001	8.3	891	100.2	8.2	4550
5MW66	5/15/2001	5/16/2001	8.2	897	100.3	8.3	4556
5MW66	6/19/2001	6/19/2001	8.3	912	100.0	8.4	4560
5MW66	7/17/2001	7/18/2001	8.4	907	100.6	8.3	4566
5MW66	8/21/2001	8/21/2001	24.6	1137	220.4	8.2	4566
5MW66	8/22/2001	8/22/2001	31.4	1270	296.8	7.3	4559
5MW66	8/27/2001	8/27/2001	21.9	1094	216.1	7.8	4555
5MW66	9/4/2001	9/4/2001	24.7	1133	237.3	7.7	4552
5MW66	9/10/2001	9/10/2001	24.2	1132	231.0	7.6	4548
5MW66	9/17/2001	9/18/2001	26.5	1163	256.8	7.9	4544
5MW66	9/24/2001	9/24/2001	27.8	1225	277.3	7.0	4551
5MW66	10/1/2001	10/1/2001	30.3	1225	275.4	7.5	4552
5MW66	10/7/2001	10/7/2001	27.3	1225	270.7	7.5	4552
5MW66	10/15/2001	10/16/2001	29.8	1226	287.5	7.5	4552
5MW66	10/23/2001	10/23/2001	33.2	1247	292.0	7.4	4552
5MW66	10/30/2001	10/30/2001	32.1	1253	305.8	7.6	4556
5MW66	11/5/2001	11/5/2001	25.9	1246	277.7	7.7	4557
5MW66	11/13/2001	11/13/2001	23.4	1177	239.4	7.7	4557
5MW66	11/19/2001	11/20/2001	20.6	1132	214.2	8.0	4557
5MW66	11/27/2001	11/27/2001	18.9	1085	188.2	7.6	4557
5MW66	12/3/2001	12/4/2001	18.5	1067	180.2	7.8	4557
5MW66	12/10/2001	12/10/2001	18.2	1043	176.6	7.9	4557
5MW66	12/18/2001	12/18/2001	15.3	1006	160.1	7.8	4556
5MW66	12/25/2001	12/26/2001	14.3	1013	152.1	8.0	4556
5MW66	1/2/2002	1/2/2002	13.1	959	140.5	7.9	4557
5MW66	1/8/2002	1/8/2002	13.0	978	134.0	8.0	4557
5MW66	1/14/2002	1/15/2002	13.2	964	131.5	8.0	4559
5MW66	1/21/2002	1/21/2002	12.7	961	135.3	8.1	4559
5MW66	2/18/2002	2/19/2002	11.6	941	126.3	8.1	4558
5MW66	3/19/2002	3/19/2002	14.0	968	144.6	8.1	4557
5MW66	4/16/2002	4/16/2002	14.7	970	152.3	8.1	4560
5MW66	5/22/2002	5/22/2002	9.0	901	107.3	8.1	4549
5MW66	6/18/2002	6/18/2002	9.9	876	104.3	8.3	4529
5MW66	7/16/2002	7/16/2002	9.5	878	103.7	8.4	4518
5MW66	8/21/2002	8/21/2002	11.4	891	106.4	8.2	4523
5MW66	9/16/2002	9/16/2002	12.5	856	105.8	8.3	4516
5MW66	10/21/2002	10/22/2002	14.3	867	106.5	8.1	4517
5MW66	11/19/2002	11/19/2002	13.5	840	106.7	8.1	4522

Table 10. Mine Unit 5, Monitor Well 5MW66, Excursion Parameters

Well ID	Sample Date	Analysis Date	Chloride (mg/L)	Conductivity (umhos/cm)	Alkalinity (mg/L as $CaCO_3$)	pH	Water Level (ft AMSL)
5MW66	12/16/2002	12/16/2002	13.7	854	107.7	8.4	4528
5MW66	1/20/2003	1/20/2003	16.0	876	109.7	8.3	4534
5MW66	2/18/2003	2/18/2003	17.6	917	109.9	8.2	4532
5MW66	3/18/2003	3/19/2003	17.8	934	109.7	8.2	4524
5MW66	4/22/2003	4/23/2003	16.5	917	103.6	8.3	4523
5MW66	5/19/2003	5/20/2003	16.0	939	95.7	8.3	4532
5MW66	6/17/2003	6/18/2003	11.6	912	87.2	8.3	4526
5MW66	7/21/2003	7/21/2003	11.8	906	93.3	8.3	4527
5MW66	8/18/2003	8/19/2003	11.4	866	94.1	8.3	4528
5MW66	9/16/2003	9/16/2003	10.8	862	90.4	8.3	4528
5MW66	10/21/2003	10/22/2003	13.0	903	98.6	8.2	4531
5MW66	11/17/2003	11/18/2003	13.0	901	100.7	8.3	4538
5MW66	12/16/2003	12/16/2003	14.8	927	106.3	8.1	4556
5MW66	1/21/2004	1/21/2004	16.1	942	113.8	8.2	4565
5MW66	4/13/2004	4/14/2004	20.3	967	135.6	8.3	4572
5MW66	7/21/2004	7/21/2004	24.1	1054	175.1	8.0	4575
5MW66	7/20/2004	7/20/2004	24.0	1049	166.4	8.2	4575
5MW66	7/27/2004	7/27/2004	24.4	1030	170.0	8.0	4575
5MW66	8/2/2004	8/2/2004	26.4	1052	189.8	7.9	4574
5MW66	8/9/2004	8/10/2004	25.4	1064	180.0	7.9	4575
5MW66	8/18/2004	8/18/2004	23.6	1063	161.3	8.0	4575
5MW66	10/19/2004	10/19/2004	30.4	1105	209.2	7.8	4576
5MW66	1/11/2005	1/12/2005	31.1	1175	227.0	8.0	4577
5MW66	4/18/2005	4/18/2005	33.5	1209	243.5	7.7	4583
5MW66	7/20/2005	7/20/2005	35.4	1162	244.5	7.9	4589
5MW66	10/4/2005	10/4/2005	29.8	1098	150.7	7.7	4596
5MW66	1/26/2006	1/26/2006	32.3	1247	241.1	7.8	4606
5MW66	4/18/2006	4/18/2006	32.4	1240	250.7	7.9	4611
5MW66	7/19/2006	7/19/2006	27.5	1086	183.6	8.0	4614
5MW66	10/23/2006	10/24/2006	30.3	1242	275.2	7.9	4615
5MW66	1/3/2007	1/3/2007	33.9	1256	284.4	7.8	4620
5MW66	4/17/2007	4/18/2007	41.8	1521	389.6	7.6	4625
5MW66	7/3/2007	7/3/2007	34.6	1410	332.0	7.4	4627
5MW66	10/29/2007	10/30/2007	39.0	1463	378.0	7.5	4629
5MW66	1/14/2008	1/15/2008	37.6	1510	384.0	7.6	4631
5MW66	4/2/2008	4/3/2008	40.0	1473	347.6	7.4	4633
5MW66	7/7/2008	7/8/2008	36.6	1404	358.4	7.5	4631
5MW66	10/14/2008	10/14/2008	37.6	1452	349.5	7.5	4632
5MW66	10/7/2008	10/8/2008	37.6	1452	349.5	7.5	4632
5MW66	1/14/2009	1/14/2009	38.2	1434	363.2	7.3	4628
5MW66	4/7/2009	4/7/2009	36.0	1433	340.4	7.5	4630

Notes:
ft AMSL - feet above mean sea level

Table 11. Mine Unit 5, Monitor Well 5MW66, Guideline 8 Analytical Results (2004 and 2009)

Well ID:	5MW66	5MW66
Production Unit:	MOD 55	MOD 55
Sample Date:	08/09/04	9/17/2009
Major Ions (mg/L)		
Ca	22	45
Mg	4	8
Na	191	288
K	4	4
CO3	5	<5
HC03	193	456
SO4	191	316
Cl	18	35
NH4	0.10	<0.05
NO2 (N)	0.05	0.11*
NO3 (N)	0.08	--
F	0.20	<0.1
SiO2	9.3	10
TDS	680	946
Cond. (umho/cm)	1120	1430
Alk. (as CaC03)	158	NA
pH (units)	8.30	7.94
Trace Metals (mg/L)		
Al	0.01	<0.1
As	0.005	0.001
Ba	0.50	<0.1
B	0.07	<0.1
Cd	0.002	<0.005
Cr	0.01	<0.05
Cu	0.01	<0.01
Fe	0.05	<0.03
Pb	0.02	<0.001
Mn	0.02	0.03
Hg	0.001	<0.001
Mo	0.02	<0.1
Ni	0.01	<0.05
Se	0.028	0.094
V	0.02	<0.1
Zn	0.01	<0.01
Radiometric (pCi/L)		
U (mg/l)	0.334	2.18
Ra 226	2.70	3.2
Ra 226+/-	1.30	0.37
Data Quality		
A/C Balance(+-5)	1.10	1.76
Anions	9.60	15.0
Cations	9.82	15.6
TDS Calculated	620	937
TDS Balance (0.80 - 1.20)	1.10	1.01

Notes:
* - Analytical results equal Nitrite + Nitrate as N
NA - Not analyzed

Table 12. Mine Unit 5, Production Well 5BL76-1, Stabilization and Post-Stabilization Monitoring Results

Constituent	11/12/2003	2/11/2004	5/11/2004	8/12/2004	6/18/2009	6/18/2009 (Dup)
Iron	< 0.05	< 0.05	< 0.05	< 0.05	<0.03	<0.03
Manganese	0.04	0.35	0.03	0.04	0.24	0.26
Selenium	0.703	1.06	0.719	2.97	2.81	2.82
Uranium	18	20.7	21.7	14.8	12.8	12.8

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

Table 13. Mine Unit 5, Production Well 5MW-03, Stabilization and Post-Stabilization Monitoring Results

Constituent	11/12/2003	2/9/2004	5/10/2004	8/12/2004	6/18/2009
Iron	< 0.05	< 0.05	< 0.05	< 0.05	<0.03
Manganese	< 0.02	< 0.02	< 0.02	< 0.02	0.06
Selenium	1.68	2.18	1.68	1.58	1.12
Uranium	1.01	1.68	1.28	1.19	1.54

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

Table 14. Mine Unit 5, Production Well 5MW-07 Stabilization and Post-Stabilization Monitoring Results

Constituent	11/11/2003	2/9/2004	5/10/2004	8/11/2004	6/18/2009
Iron	< 0.05	0.16	0.26	0.2	<0.03
Manganese	0.06	0.44	0.38	0.4	0.09
Selenium	2.37	3.76	1.69	1.01	0.97
Uranium	1.17	2.85	3.9	3.83	3.01

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

Table 15. Mine Unit 5, Production Well 5AE80-1, Stabilization Monitoring Results

Constituent	11/11/2003	2/9/2004	5/10/2004	8/11/2004
Iron	< 0.05	0.33	0.25	0.66
Manganese	0.15	0.2	0.25	0.31
Selenium	0.19	0.159	0.077	0.084
Uranium	1	1.81	1.47	1.79

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

Table 16. Mine Unit 6, Production Well 6M29-1 Stabilization and Post-Stabilization Monitoring Results

Sample Date	6/21/2005	9/12/2005	12/13/2005	3/21/2006	6/17/2009	6/17/2009 (Dup)
Iron	< 0.05	0.06	< 0.05	0.14	0.24	0.23
Manganese	0.29	0.27	0.25	0.35	0.28	0.3
Selenium	0.008	0.007	0.011	0.005	<0.001	<0.001
Uranium	4.96	5.01	6.76	9.28	12.5	12.9

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

Table 17. Mine Unit 6, Production Well 6T35-1, Stabilization Monitoring Results

Sample Date	6/21/2005	9/12/2005	12/13/2005	3/21/2006
Iron	0.71	0.93	0.5	0.96
Manganese	0.68	0.8	1.01	1.43
Selenium	< 0.005	< 0.005	< 0.005	< 0.005
Uranium	0.0272	0.0446	0.0529	0.039

All units in milligrams per liter (mg/L); dates of sample collection indicated at top of columns.

ATTACHMENTS

ATTACHMENT 1 – Laboratory Analytical Reports, June 2009 Groundwater Sampling Event (CD)

ATTACHMENT 2 – Laboratory Analytical Reports, Stability Monitoring Rounds 1 through 4, Mine Units 2 through 6 (CD)

ATTACHMENT 3 – Potential Groundwater Receptors, Groundwater Wells at Christensen Ranch

ATTACHMENT 4 – Revised Figures for Wellfield Restoration Report

ATTACHMENT 5 – Laboratory Analytical Report, Well 5MW66, September 2009

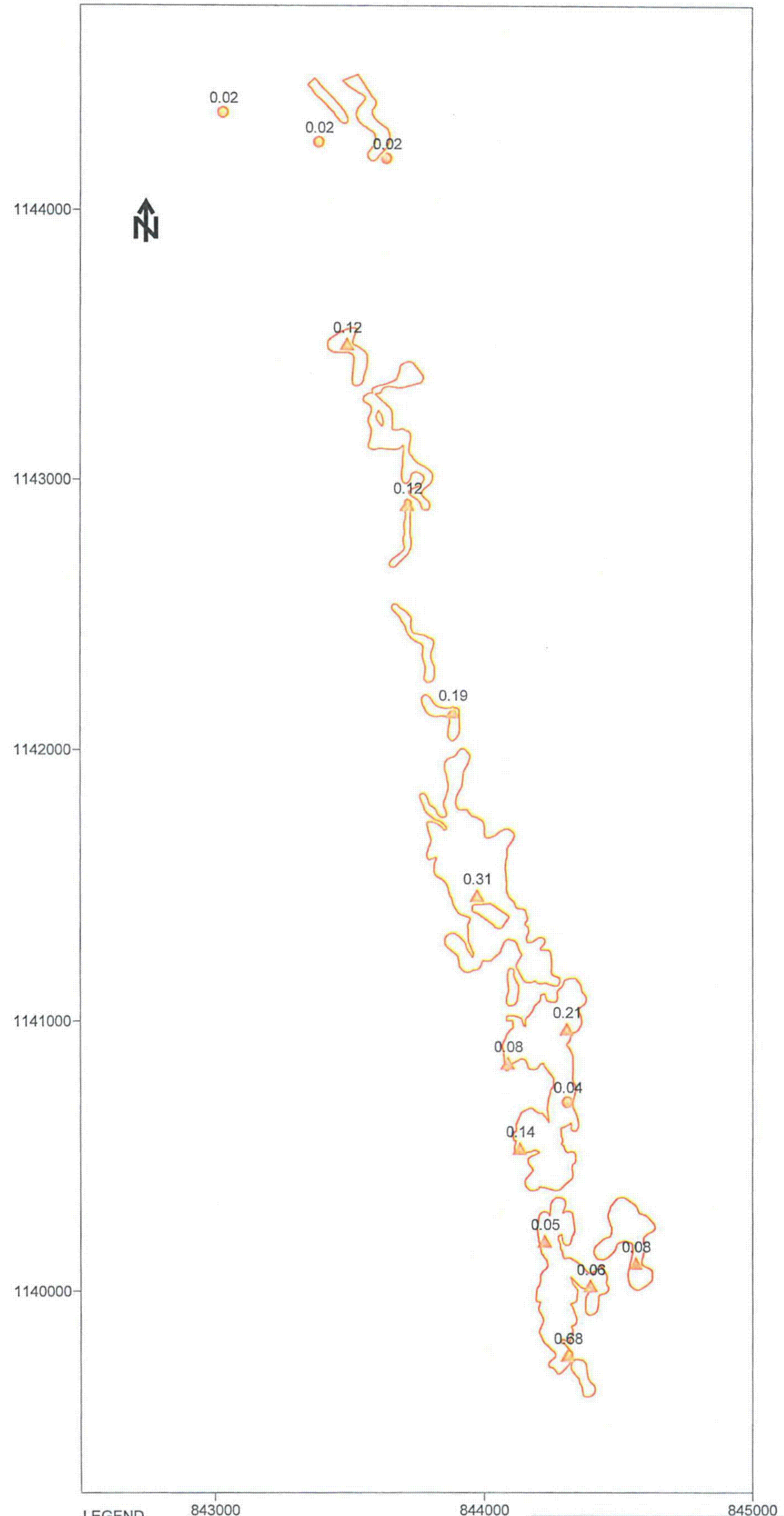
ATTACHMENT 3 – Potential Groundwater Receptors, Groundwater Wells at Christensen Ranch

Attachment 3. Groundwater Rights within Christensen Ranch Permit Boundary

Permit #	Priority	Status	Township	T Suff	Range	R Suff	Sect.	Qtrqtr	POTENTIAL RECEPTOR??	Applicant	Facility Name	Uses	Yld Act	Well Depth	Static Depth	Mwbz Top	Mwbz Bottom
P24084P	9/21/1958	GST	44	N	76	W	21	NWSE	No - Upgradient	JOHN CHRISTENSEN	HOUSE WELL #3	DOM	4	450	90	Unknown	Unknown
P24096P	12/21/1954	GST	44	N	76	W	8	SESW	Yes	JOHN CHRISTENSEN	A E C WELL #19	DOM,STO	3	760	-4	Unknown	Unknown
P28847W	7/22/1974	GST	44	N	76	W	9	SESW	Yes	JOHN CHRISTENSEN	HELDT #4	DOM,STO	12	600	80	Unknown	Unknown
P30368W	6/23/1975	GST	44	N	76	W	8	SWSE	Yes	JOHN CHRISTENSEN	WILLOW CORRAL #32	DOM,STO	25	700	50	550	680
P24085P	12/31/1940	GST	44	N	76	W	17	NESE	Yes	JOHN CHRISTENSEN	ELLENDALE #4	DOM,STO	3	406	22	Unknown	Unknown
P143943W	12/19/2001	GST	44	N	76	W	7	SENW	Yes	COGEMA MINING, INC.	CR NO. 2	MIS	20	600	60	350	430
P40282W	12/30/1976		44	N	76	W	8	SWSE	Yes	JOHN CHRISTENSEN	ENL WILLOW CORRAL #32	MIS	45	700	50	550	680
P67281W	5/14/1984	UNA	44	N	76	W	4	SWNE	No - likely IND use	USDI, BLM** COGEMA MINING, INC.	RM 04	MIS	0	562	120	400	540
P78024W	9/20/1988	CAN	44	N	76	W	7	SENW	No - likely IND use	COGEMA MINING, INC.	CR #2	MIS	20	600	60	350	430
P81144W	10/20/1989	CAN	44	N	76	W	7	SENE	No - likely IND use	TOTAL MINERALS CORPORATION	CR #3	MIS	20	423	60	241	424
P30147W	4/3/1975		44	N	76	W	21	NESE	No - Upgradient	JOHN CHRISTENSEN	BARN #30	MIS	12	660	35	420	545
P72816W	6/25/1986	UNA	44	N	76	W	17	SESE	No - likely IND use	COGEMA MINING, INC.	WCOW 5	MIS	20	645	155	620	697
P111544W	8/17/1998	CAN	45	N	77	W	25	NESE	No - likely IND use	COGEMA MINING, INC.	HDWW-1	MIS					
P31400W	10/10/1975	ABA	45	N	77	W	25	SESW	No - likely IND use	COTTER CORPORATION	URANERZ P13A	MIS	0	255	19	150	248
P24097P	3/16/1961	CAN	44	N	76	W	4	SWNE	Cancelled	JOHN CHRISTENSEN** BUREAU OF LAND MANAGEMENT	NORTH PRONG SHALLOW WELL #21	STO	4	202	158	177	202
P24867P	12/31/1945	GST	44	N	76	W	7	SENE	No - Too shallow	JOHN CHRISTENSEN	FIRST WELL (ARTESIAN #1) #5	STO	3	280	0	Unknown	Unknown
P20526W	1/2/1973	GST	44	N	76	W	19	SESE	No - Upgradient	JOHN CHRISTENSEN	BERCHER NE #29	STO	4	460	160	Unknown	Unknown
P24091P	12/31/1951	GST	44	N	76	W	20	NWNW	No - Upgradient	JOHN CHRISTENSEN** BUREAU OF LAND MANAGEMENT	DELLS GULCH LOWER WELL #13	STO	4	22	16	Unknown	Unknown
P24092P	12/31/1951	GST	44	N	76	W	19	NWNE	No - Upgradient	JOHN CHRISTENSEN	WILLOW DUG WELL #15	STO	4	24	14	Unknown	Unknown
P24868P	12/21/1954	GST	44	N	76	W	21	NWSE	No - Upgradient	JOHN CHRISTENSEN	BUTTE PASTURE WELL #9 (DEEPENED)	STO	4	160	30	Unknown	Unknown
P24086P	12/31/1945	GST	44	N	77	W	1	NWNE	No - Too shallow	JOHN CHRISTENSEN	MIDDLE WELL (ARTESIAN #2) #6	STO	3	265	0	Unknown	Unknown
P24082P	12/31/1952	GST	45	N	76	W	30	SENE	No - far downgrad.	JOHN CHRISTENSEN	HELDT #1	STO	4	420	30	Unknown	Unknown
P28846W	7/22/1974	GST	45	N	77	W	36	NENW	Yes - Downgradient	JOHN CHRISTENSEN	SS PUMP #1	DOM,STO	25	385	60	Unknown	Unknown
P30346W	3/13/1975	A&C	45	N	77	W	25	SESW	No - Aban. & cancelled	INC. URANERZ U. S. A.	URAZERZ WW-1	IND,MIS	25	256	-4	150	250
P52981W	7/9/1980	GST	44	N	75	W	4	NWSE	No - Upgradient	ALBERT W. SCHLAUTMAN** XTO ENERGY INC.	HARTZOG DRAW UNIT WATER SUPPLY WELL #1	IND	146	7252	800	6040	6846

***This is a list not including CBM wells, MON wells, IND wells, IND-RES wells, CBM-RES, or STO-CBM.**

ATTACHMENT 4 – Revised Figures for Wellfield Restoration Report



LEGEND

Manganese Concentration (mg/l)

- 0 to 0.01
- 0.01 to 0.05
- 0.05 to 0.7

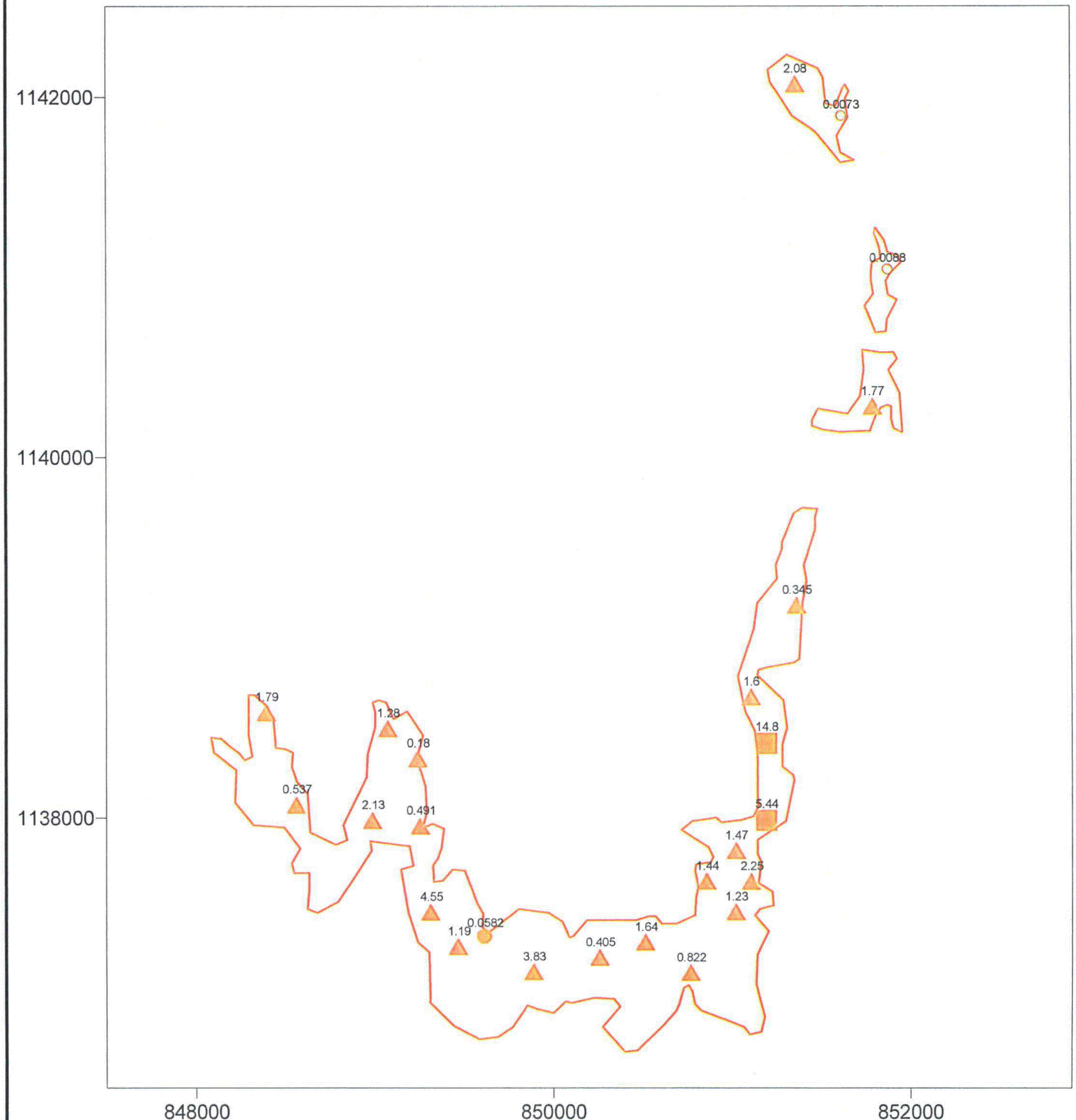
Target Restoration Value for Manganese is 0.01 mg/l
Wyoming Class I Standard and EPA MCL is 0.05 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-10
MANGANESE CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG: COGEMAFIGA-10MU4.SRF	BY: EPL CHECKED: HPD

PETROTEK ENGINEERING CORPORATION
9088 South Ridgeline Blvd., Suite 105
Littleton, Colorado 80129 (303) 290-9414



Target Restoration Value for Uranium is 0.0763 mg/l
EPA MCL for Uranium is 0.03 mg/l

LEGEND

Uranium Concentration (mg/l)
- 0.005 to 0.03
- 0.03 to 0.0763
- 0.0763 to 5
- 5 to 15

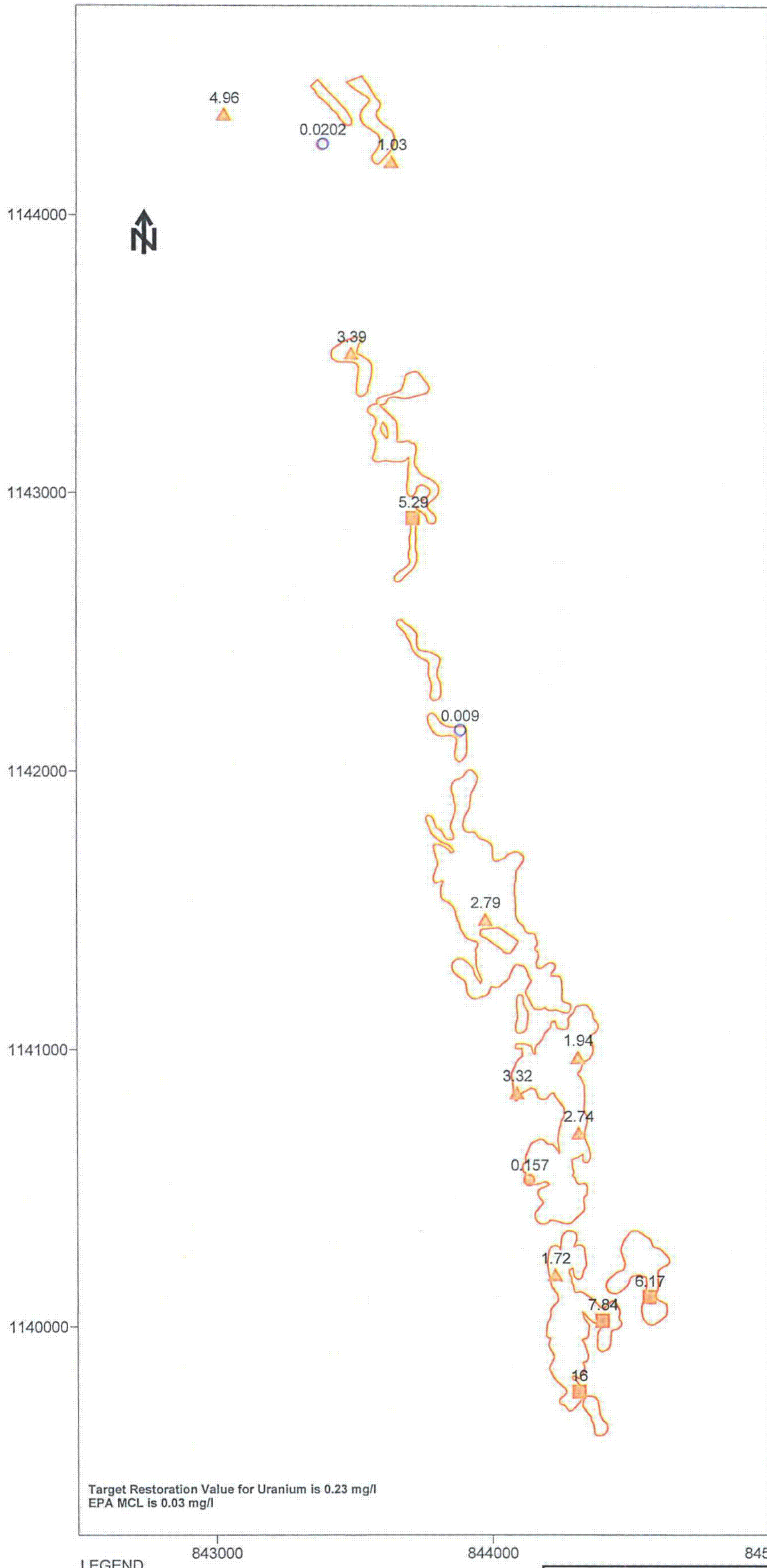
N

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-12
URANIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: Revised August 2009
DWG: COGEMAFIGA-12MU5.SRF	BY: EPL CHECKED: HPD

PETROTEK ENGINEERING CORPORATION
9088 South Ridgeline Blvd., Suite 105
Littleton, Colorado 80129 (303) 290-9414



LEGEND

Uranium Concentration (mg/l)

- 0 to 0.03
- 0.03 to 0.23
- 0.23 to 5
- 5 to 16.01

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-13
URANIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA-13.SRF	BY: EPL CHECKED: HPD

PETROTEK ENGINEERING CORPORATION
9088 South Ridgeline Blvd., Suite 105
Littleton, Colorado 80129 (303) 290-9414

ATTACHMENT 5 – Laboratory Analytical Report, Well 5MW66, September 2009

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

ANALYTICAL SUMMARY REPORT

October 16, 2009

Cogema Mining Inc
935 Pendell Blvd
Mills, WY 82644

Workorder No.: C09090698

Project Name: CR Guideline 8

Energy Laboratories, Inc. received the following 1 sample for Cogema Mining Inc on 9/18/2009 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C09090698-001	5MW66	09/17/09 00:00	09/18/09	Aqueous	Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Total Alkalinity QA Calculations Conductivity Fluoride E300.0 Anions Nitrogen, Ammonia Nitrogen, Nitrate + Nitrite pH Metals Preparation by EPA 200.2 Gross Alpha, Gross Beta Radium 226, Dissolved Radium 228, Dissolved Solids, Total Dissolved

As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these tests results, please call.

Report Approved By: Stephanie D. Waldrop

Stephanie D. Waldrop
Reporting Supervisor

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

LABORATORY ANALYTICAL REPORT

Client:	Cogema Mining Inc	**Report Date:**	10/16/09
Project:	CR Guideline 8	**Collection Date:**	09/17/09
Lab ID:	C09090698-001	**DateReceived:**	09/18/09
Client Sample ID:	5MW66	**Matrix:**	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Carbonate as CO3	ND	mg/L		5		A2320 B	09/23/09 12:27 / dvg
Bicarbonate as HCO3	456	mg/L		5		A2320 B	09/23/09 12:27 / dvg
Calcium	45	mg/L		1		E200.7	10/05/09 16:24 / cp
Chloride	35	mg/L		1		E300.0	09/24/09 16:37 / ljl
Fluoride	ND	mg/L		0.1		A4500-F C	09/26/09 16:33 / ljl
Magnesium	8	mg/L		1		E200.7	10/05/09 16:24 / cp
Nitrogen, Ammonia as N	ND	mg/L		0.05		E350.1	09/24/09 08:25 / eli-b
Nitrogen, Nitrate+Nitrite as N	0.11	mg/L		0.01		E353.2	09/23/09 10:03 / eli-b
Potassium	4	mg/L		1		E200.7	10/05/09 16:24 / cp
Silica	10.0	mg/L		0.2		E200.8	09/22/09 03:04 / sml
Sodium	288	mg/L		1		E200.7	10/05/09 16:24 / cp
Sulfate	316	mg/L		1		E300.0	09/24/09 16:37 / ljl
PHYSICAL PROPERTIES							
Conductivity	1430	umhos/cm		1		A2510 B	09/18/09 15:20 / dd
pH	7.94	s.u.		0.01		A4500-H B	09/18/09 15:20 / dd
Solids, Total Dissolved TDS @ 180 C	946	mg/L	H	10		A2540 C	10/01/09 10:47 / th
METALS - DISSOLVED							
Aluminum	ND	mg/L		0.1		E200.8	09/22/09 03:04 / sml
Arsenic	0.001	mg/L		0.001		E200.8	09/22/09 03:04 / sml
Barium	ND	mg/L		0.1		E200.8	09/22/09 03:04 / sml
Boron	ND	mg/L		0.1		E200.8	09/22/09 03:04 / sml
Cadmium	ND	mg/L		0.005		E200.8	09/22/09 03:04 / sml
Chromium	ND	mg/L		0.05		E200.8	09/22/09 03:04 / sml
Copper	ND	mg/L		0.01		E200.8	09/22/09 03:04 / sml
Iron	ND	mg/L		0.03		E200.8	09/22/09 03:04 / sml
Lead	ND	mg/L		0.001		E200.8	09/22/09 03:04 / sml
Manganese	0.03	mg/L		0.01		E200.8	09/22/09 03:04 / sml
Mercury	ND	mg/L		0.001		E200.8	09/22/09 03:04 / sml
Molybdenum	ND	mg/L		0.1		E200.8	09/22/09 03:04 / sml
Nickel	ND	mg/L		0.05		E200.8	09/22/09 03:04 / sml
Selenium	0.094	mg/L		0.001		E200.8	09/22/09 03:04 / sml
Uranium	2.18	mg/L		0.0003		E200.8	09/22/09 03:04 / sml
Vanadium	ND	mg/L		0.1		E200.8	09/22/09 03:04 / sml
Zinc	ND	mg/L		0.01		E200.8	09/22/09 03:04 / sml
METALS - TOTAL							
Iron	ND	mg/L		0.03		E200.7	09/23/09 22:22 / cp
Manganese	0.03	mg/L		0.01		E200.7	09/23/09 22:22 / cp

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client:	Cogema Mining Inc	**Report Date:**	10/16/09
Project:	CR Guideline 8	**Collection Date:**	09/17/09
Lab ID:	C09090698-001	**DateReceived:**	09/18/09
Client Sample ID:	5MW66	**Matrix:**	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - DISSOLVED							
Gross Alpha	2780	pCi/L				E900.0	10/14/09 13:54 / cgr
Gross Alpha precision (±)	38.2	pCi/L				E900.0	10/14/09 13:54 / cgr
Gross Alpha MDC	5.7	pCi/L				E900.0	10/14/09 13:54 / cgr
Gross Beta	684	pCi/L				E900.0	10/14/09 13:54 / cgr
Gross Beta precision (±)	9.6	pCi/L				E900.0	10/14/09 13:54 / cgr
Gross Beta MDC	5.6	pCi/L				E900.0	10/14/09 13:54 / cgr
Radium 226	3.2	pCi/L				E903.0	10/05/09 15:41 / trs
Radium 226 precision (±)	0.37	pCi/L				E903.0	10/05/09 15:41 / trs
Radium 226 MDC	0.20	pCi/L				E903.0	10/05/09 15:41 / trs
Radium 228	1.2	pCi/L				RA-05	09/29/09 13:04 / plj
Radium 228 precision (±)	0.7	pCi/L				RA-05	09/29/09 13:04 / plj
Radium 228 MDC	1.1	pCi/L				RA-05	09/29/09 13:04 / plj
DATA QUALITY							
A/C Balance (± 5)	1.76	%				Calculation	10/15/09 07:55 / kbh
Anions	15.0	meq/L				Calculation	10/15/09 07:55 / kbh
Cations	15.6	meq/L				Calculation	10/15/09 07:55 / kbh
Solids, Total Dissolved Calculated	937	mg/L				Calculation	10/15/09 07:55 / kbh
TDS Balance (0.80 - 1.20)	1.01					Calculation	10/15/09 07:55 / kbh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

From: Origin ID: CPRA (307) 234-5019
Mr. T.W. Hardgrove
COGEMA Mining, Inc.
935 Pendell Blvd.
P.O. Box 730
Mills, WY 82644

FedEx Express

E

J09300907312023

Ship Date: 30DEC09
ActWgt: 2.0 LB
CAD: 3678812/INET9090
Account#: S *********

Delivery Address Bar Code

SHIP TO: (301) 415-7777 BILL SENDER
Mr. Ron Linton, Project Manager
U.S. Nuclear Regulatory Commission
11545 ROCKVILLE PIKE
DECOMM. & U RECOV. LIC. DIR. DWMEP
ROCKVILLE, MD 20852

Ref #
Invoice #
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Dept #

THU - 31DEC A2

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