RESTORATION DATA PACKAGE
MINE UNIT 4
CHRISTENSEN RANCH PROJECT

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RESTORATION DATA PACKAGE
MINE UNIT 4, CHRISTENSEN RANCH PROJECT

1.0 INTRODUCTION

COGEMA Mining, Inc. (COGEMA) has prepared this restoration data package (RDP) as a technical demonstration supporting completion of wellfield restoration operations at Mine Unit 4 (MU4) of the Christensen Ranch in-situ uranium mine in Johnson County, Wyoming. MU4 is one of five mine units at Christensen Ranch that have undergone restoration following completion of uranium mining activities, as required under Wyoming Department of Environmental Quality (WDEQ) Permit to Mine 478 and Nuclear Regulatory Commission (NRC) Source Material License SUA-1341. A general overview of site conditions at Christensen Ranch is included in a cover report (Wellfield Restoration Report, Christensen Ranch, COGEMA 2007). This RDP provides the detail necessary to meet the requirements for MU4 restoration approval by WDEQ.

Wellfield restoration operations were initiated in MU4 in 1997 and completed in 2005. Groundwater within the production zone has been restored to the pre-mining class of use, using Best Practicable Technology (BPT). An average of 12.8 pore volumes of water were treated for the MU4 wellfields during restoration activities. Restoration operations have resulted in post-restoration water quality that meets the Target Restoration Values (TRVs) for 21 of 35 constituents. Of the constituents that exceed TRVs, only manganese, selenium, iron, total dissolved solids, uranium and radium-226 also exceed either the Wyoming Class I Standard or the EPA MCL within the wellfield.

1.1 PURPOSE AND OBJECTIVES

The purposes of this report are:

- to discuss the significant beneficial results from historical restoration operations performed at Christensen Ranch MU4;
- to document that COGEMA's restoration activities at MU4 have resulted in ground-water quality consistent with the pre-mining class of use; and,
- to provide the supporting discussion and data such that LQD has a strong basis for granting unconditional approval of the MU4 restoration activities.

1.2 REPORT ORGANIZATION

This attachment, or RDP, is a supplement to the overview report that presents generalized information regarding the Christensen Ranch ISL project (COGEMA

2007). More detailed discussion for MU4 is included in this RDP. The MU4 RDP includes:

- a description of local site conditions including location, geology and hydrogeology (Section 2);
- description of permitting and mining activities specific to MU4 (Section 3);
- description of the MU4 Restoration Program including, identification of specific water quality standards, restoration goals, and applied restoration methods (Section 4);
- a summary of the MU4 restoration results (Section 5):
- an assessment of future groundwater quality (Section 6) and,
- summary and conclusions regarding the effectiveness of the restoration activities for MU4 (Section 7).

Water quality data pertinent to the demonstration of restoration are included as Appendix MU4-A.

2.0 MINE UNIT 4 SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

MU4 is located within the Christensen Ranch Project area that was permitted by Malapai Resources Company (Malapai) in 1989 as an amendment to the Irigaray Permit to Mine 478. MU4 is located in the central portion of the Christensen Ranch ISL Project in Sections 7 and 18 of Township 44N, Range 76W, in Johnson County (Figure 2-1). The wellfield outline covers an area of approximately 12 acres.

MU4 includes three modules (MOD41, MOD42, and MOD43), each of which were developed as separate wellfields. MU4 was permitted under an amendment request dated April 1994. The amendment request was submitted by COGEMA as Wellfield Data Package, Mine Unit 4, Christensen Ranch ISL Project, WDEQ Permit to Mine No. 478 and NRC License No. SUA-1341.

Mining was conducted in MU4 from June 1994 to August 1997. Restoration began in August 1997 and was completed in January 2005.

2.2 GEOLOGY

The regional geologic setting has been described in detail in COGEMA's 2007 Christensen Ranch Wellfield Restoration Report and the Malapai 1988 Christensen Ranch Amendment Application to WDEQ Permit to Mine No. 478 & NRC License SUA-1341 (Christensen Ranch Amendment Application) and will not be further elaborated in this RDP.

The geologic section beneath MU4 from the surface through the production zone and including the underlying confining unit and underlying aquifer is all within the Eocene age Wasatch Formation. Regional dip for the Wasatch is to the northwest at 1 to 2 degrees. Local variations to the regional dip are minor. There are no major structural features within the Wasatch at MU4.

The production aquifer is the "K" Sandstone. The "K" Sandstone is described as a predominately clean, fine to coarse grained, moderately sorted, well-cemented, arkosic sand. Depth to the top of the "K" Sandstone at MU4 generally ranges from 300 to 350 feet. The thickness of the "K" Sandstone is 150 to 260 feet in the vicinity of MU4. Overlying the "K" Sandstone in the area of MU4 is a 75-to 100-foot thick sequence of claystone and siltstone, intersected by a thin (less than 5 feet thick) lignite. This claystone-siltstone unit is the upper confining unit. Directly beneath the "K" Sandstone is a 40- to 50- feet thick dense claystone/mudstone that is the lower confining unit.

A group of five discontinuous sand units overlies the upper confining unit. The sands were designated as Sand No. 1 through Sand No. 5, with Sand No. 5

being the deepest (COGEMA 1994). These sands are equivalent to the "J" Sandstone referenced in the Christensen Ranch Amendment Application (Malapai, 1988). Sand No. 3 is the most pervasive in the area of MU4 and in many cases is the first sand unit above the upper confining unit. Sand No. 3 reaches a maximum thickness of approximately 40 feet but is absent in some areas. In localized areas of MU4, Sand No.4 or Sand No.5 is the first sand occurrence above the upper confining unit. Those sands are typically less than 10 feet thick. The strategy used for monitoring the overlying aquifer or shallow zone was to select the first sand above the upper confining layer. As a result, depending on location within MU4, either Sand No. 3, No. 4 or No. 5 is monitored as the overlying aquifer or shallow monitor zone.

The first underlying sand of significance is at a depth of approximately 500 to 600 feet below ground surface with a thickness of 55 to 80 feet. This unit is designated the "L" Sandstone in the Christensen Ranch Amendment Application (Malapai, 1988) and is monitored as the underlying aquifer or deep monitor zone.

2.3 HYDROGEOLOGY

The production zone and the overlying and underlying aquifers are under confined conditions. Potentiometric surface maps, prepared from water level data collected in the fall of 1986 and included in the Christensen Ranch Amendment Application (Malapai, 1988), indicate that prior to any ISL mining in the Project area, water levels in the production zone ("K" Sandstone) in the vicinity of MU4 ranged from 4615 to 4640 feet above mean sea level (ft amsl) with a hydraulic gradient ranging from 0.005 to 0.01 feet per foot (ft/ft) to the west-northwest.

Potentiometric surface maps prepared from data collected prior to the onset of mining at MU4, and included in the MU4 Wellfield Data Package (COGEMA 1994) indicate a predominately northwest hydraulic gradient at 0.01 ft/ft for the ore zone. The hydraulic gradient for the overlying aquifer is also to the northwest, ranging from 0.01 to 0.02 ft/ft. For the underlying aquifer, the hydraulic gradient ranged from 0.015 to 0.02 ft/ft in a northwest direction.

The Wellfield Data Package (COGEMA 1994) includes aquifer test data required under the Christensen Ranch Amendment Application (Malapai 1988) that demonstrates that all the perimeter ore zone monitor wells were in hydraulic communication with the production zone. The pumping test also indicated there was no apparent hydraulic communication between the production zone and the overlying and underlying aquifers.

Results of the testing indicated that average transmissivity of the "K" Sandstone within MU4 is approximately 91 ft^2d (680 gpd/ft). The average thickness of the "K" sand for MU4 was reported as 180 feet resulting in a hydraulic conductivity of 0.51 ft/d. Average storage coefficient calculated from the pumping tests was 2.0 E-04 for MU4.

2.4 ORE DISTRIBUTION

Ore occurs in both the upper and lower portions of the "K" Sandstone [referred to as the K2 and K3 sandstones, respectively in the Wellfield Data Package (COGEMA, 1994)] in classical roll-front configuration. Depth to top of the ore ranges from 300 to 500 feet. Multiple horizons are common. Cumulative ore quality thickness averages approximately 11.5 feet per well.

3.0 MINING HISTORY

The MU4 wellfield consists of 3 contiguous wellfields, or Modules. Commercial mining was initiated in the MOD42 in June 1994, followed by MOD43 in August 1994 and MOD41 in December 1994. Wellfield processing continued through August 1997. Restoration began shortly after production operations ended.

The lixiviant used for the mining operations was sodium bicarbonate chemistry with gaseous oxygen as the oxidant.

4.0 RESTORATION PROGRAM

4.1 GOALS OF THE RESTORATION PROGRAM

As required under the Permit to Mine No. 478, A2 Update (COGEMA 1996) and NRC License SUA1341, the primary goal of groundwater restoration following production of the MU4 ore body was to return groundwater quality to baseline concentrations using BPT and economic reasonableness. If baseline quality could not be achieved using BPT, then groundwater was to be restored to the pre-mining class of use.

4.2 BASELINE WATER QUALITY

Baseline water quality was established within the MU4 ore zone for the purpose of defining target values for the groundwater restoration phase of the project. Baseline water quality was established for MU4 by collecting samples from representative production wells and averaging the sample results, after outlier removal in accordance with the Permit to Mine No. 478, A2 Update (COGEMA 1996). Twelve ore zone baseline wells were sampled for MU4. Baseline water quality was established using four samples collected at two-week sampling intervals in 1994 from eleven of the ore zone baseline wells. In addition, samples collected from a regional monitor well located within MU4 (well RM07) (regional baseline study in 1986-87) were incorporated into the baseline water quality assessment. Results of the baseline sampling were submitted in the Wellfield Data Packages for MU4 (COGEMA 1994). Table 4-1 lists the wells used for determining baseline water quality.

4.3 TARGET RESTORATION VALUES

Target Restoration Values (TRVs) have been established for MU4 based on the results of groundwater baseline quality sampling. The method used to determine TRVs is described in Section 5.8 of the Permit to Mine 478, A2 Update (COGEMA 1996).

TRVs for MU4 were established and accepted by the regulatory agencies in Table 6 of Permit to Mine No. 478, Amendment Request dated April 1994. Table 4-2 of this report presents the TRVs for MU4.

4.4 RESTORATION PROCESS TECHNOLOGY APPLIED

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.

4.5 RESTORATION OPERATIONS

4.5.1 Total Volume Processed

A summary of the gallons processed for each phase of restoration is given in Table 4-3. A total volume of 250.28 million gallons was processed over six years of active restoration operations. For MU4, the calculated PV is approximately 19,568,000 gallons. The total PVDs processed during restoration was 12.79.

Table 4-3 Volume of Water Processed by Restoration Phase, Mine Unit 4

Restoration Phase	Gallons	PVD
Groundwater Sweep	37,681,000	1.93
Reverse Osmosis	192,582,000	9.84
Reductant Addition/Recirculation	20,014,000	1.02
Total	250,277,000	12.79

4.5.2 Restoration History

Groundwater restoration began in August 1997 with the groundwater sweep (GWS) phase for all three modules. GWS was terminated in July 1998 after a total of 1.93 pore volume displacements (37.68 million gallons) were completed.

The RO permeate injection phase was started in April 2001 in MOD43 and in February-March 2002 in MOD41 and MOD42. The RO phase was completed in all modules by March 2003. Figures 4-1 through 4-3 illustrate the conductivity and uranium concentration trends in Modules 41 through 43 during the RO permeate injection phase, as determined by the average of the baseline well analytical results obtained at each PVD. The trend for both conductivity and uranium appeared to be stabilizing after 7 to 10 PVD of permeate injection, therefore continued RO treatment beyond that total was not considered A decision was made to progress to aquifer recirculation and stabilization. In total, 9.84 pore volumes (192.58 million gallons) of groundwater were recovered and treated during the permeate injection phase of MU4.

Hydrogen sulfide (H_2S) gas was added to the injection stream at MOD42 for a brief period beginning in January 2003 and ending in March 2003. The aquifer recirculation phase immediately followed the H_2S injection phase. The entire wellfield was recirculated in order to spread the H_2S into MODS 41 and 43. The recirculation of 1.0 pore volumes was completed on April 2004. In total, 12.79 PVD (250.28 million gallons) of groundwater was recovered from the aquifer during the active restoration phases of MU4.

Post-restoration/stabilization monitoring began immediately after aquifer recirculation in April 2004. Final stability samples were obtained in January 2005.

4.6 WATER QUALITY MONITORING DURING RESTORATION

The groundwater monitoring plan for the restoration program of Christensen Ranch MU4, as well as all other MUs, was provided in the Permit to Mine 478, A2 Update (COGEMA 1996). The overview report provides a summary of the requirements of the groundwater monitoring plan for the restoration program. Table 4.1 lists the monitoring wells that are included in the MU4 groundwater monitoring plan.

4.6.1 Ore Zone Water Quality

The progress of groundwater sweep and permeate injection was monitored in MU4 by sampling and analyzing the groundwater in accordance with the prescribed groundwater monitoring plan. The designated restoration wells for MU4 established in the Baseline Water Quality Data Package for MU4 (COGEMA 1994) are included in Table 4.1. Locations of these wells are shown on Figure 4-4 of this report. The results of the sampling and analysis for the designated restoration wells are described in detail under the Restoration Results section (5.0) of this report.

4.6.2 Ore Zone Perimeter Monitor Wells

The ore zone perimeter monitor wells were sampled monthly throughout the active restoration phases and quarterly thereafter. Designated ore zone perimeter monitor wells for MU4 are listed in Table 4-1 Figure 4-4 shows the location of the monitor wells with respect to the wellfield. The samples were analyzed for chloride, conductivity, pH and total alkalinity to determine if the wells had been affected by mining solutions. The monitoring results were submitted to WDEQ in the *Irigaray and Christensen Ranch Projects, Semi Annual Monitoring Reports, WDEQ Permit to Mine 478*. As demonstrated by the data submitted in those reports, the perimeter ore zone monitor wells were not affected by mining solutions during mining or restoration operations and remained unaffected throughout the post-restoration period.

4.6.3 Shallow Monitor Zone

An upper stratigraphic zone was designated for shallow zone monitoring purposes. The shallow zone monitor wells were sampled monthly throughout the active restoration phases and quarterly thereafter. Designated shallow monitor zone wells are included in Table 4-1. Figure 4-4 shows the location of the shallow monitor wells. The samples were analyzed for chloride, conductivity, pH and total alkalinity to determine if the wells had been affected by mining solutions. The monitoring results were reported in the *Irigaray and Christensen Ranch*

Projects, Semi-Annual Monitoring Reports, WDEQ Permit to Mine 478. As indicated by the water quality results, the shallow zone monitor wells were not affected by mining solutions during mining or restoration operations.

4.6.4 Deep Monitor Zone

The deep zone monitor wells were sampled monthly throughout the active restoration phases and quarterly thereafter. Designated deep monitor zone wells for MU4 are included in Table 4-1. Figure 4-4 shows the location of the deep monitor wells. The samples were analyzed for chloride, conductivity and total alkalinity to determine if the wells had been affected by mining solutions. The monitoring results were reported in the *Irigaray and Christensen Ranch Projects, Semi-Annual Monitoring Reports, WDEQ Permit to Mine 478.* As indicated by the water quality results, the deep zone monitor wells were not affected by mining solutions during mining or restoration operations.

4.7 WATER LEVEL MONITORING DURING RESTORATION

The water levels in all monitor wells were measured routinely throughout the life of the operations. Water levels were taken prior to each monitor well sampling event. The water level results were reported in *Irigaray and Christensen Ranch Projects, Semi-Annual Monitoring Reports, WDEQ Permit to Mine 478.* Baseline potentiometric surface maps of the ore, and shallow and deep monitor zones, were presented in the Wellfield Data Packages.

5.0 RESTORATION RESULTS

COGEMA has completed a substantial effort to restore the groundwater of the Christensen Ranch wellfields to baseline conditions. The best practicable technology was applied to the restoration effort. The actual volume of groundwater treated greatly exceeded the volumes anticipated in the approved restoration plans. The beneficial results of the restoration efforts are indicated by the substantial reduction in ionic concentrations between the post-mining and the post-restoration sampling events, as discussed in the following sections.

5.1 POST-MINING WATER QUALITY

The water quality of the ore zone after mining was established by sampling each of the designated restoration wells. The post-mining mean of the analytical results from MU4 is presented in Table 5-1. Copies of the individual analytical sheets for each sample are not included in this report due to the bulk of such information, but are available in COGEMA's corporate office in Mills, Wyoming.

The chemical alteration of the ore zone aquifer can be observed through comparison of the post-mining mean concentrations with the baseline concentrations. Eighteen of the 35 parameters in the post-mining means exceeded the TRVs, as shown in Table 5-1. Based on those results, groundwater restoration was deemed necessary.

5.2 RESTORATION WATER QUALITY

The water quality of the ore zone during the restoration process was evaluated after each restoration phase by sampling the designated restoration wells. The arithmetic means of the post-GWS and post-RO phase sampling events are presented in Table 5-1. The post-restoration results are presented in Table 5-1 as the Round-1 Stability results. Again, copies of the individual analytical sheets for each sample are not included in this report due to the bulk of such information, but are available in COGEMA's corporate office in Mills, Wyoming.

5.3 STABILIZATION MONITORING WATER QUALITY

The post-restoration water quality stability was established by sampling each of the designated restoration wells four times over a nine-month period following active restoration (the stabilization samples). The arithmetic means of the four stability sampling events for Modules 41 through 43 are presented in Table 5-1 as Round-1, Round-2, Round-3 and Round-4 Stability Means.

5.4 POST RESTORATION WATER QUALITY

The primary indication of success of the Christensen Ranch restoration program is measured against the TRVs. A comparison of the mean fourth stability round concentration to the TRVs is given in Table 5-2. Figure 5.1 summarizes the fourth stability round mean values compared to the TRVs and regulatory standards. Based on the fourth stability round mean, 21 of the 35 constituents are below TRVs, six constituents are above the TRVs but have no Wyoming Class I Standard or EPA MCLs, and two constituents (chloride and aluminum) exceed the TRVs but are below the respective Wyoming Class I Standard or EPA MCL. Six constituents exceeded TRVs and either a WDEQ Class I Standard or an EPA MCL, including: TDS, iron, manganese, selenium, uranium and radium-226.

Concentrations of each monitored parameter on a well by well basis for all of the four stability monitoring rounds are included in Table A-1, Appendix A. The location of the designated Restoration Wells that are included in the stability monitoring is shown on Figure 4-1 and Figure A-1, Appendix A.

A discussion of the constituents that exceeded the TRVs follows.

5.4.1 Constituents Exceeding TRV With No Groundwater Standards

Calcium-Figure 5-2 shows the mean calcium concentration at key phases of the restoration program (post-mining, post-groundwater sweep, post RO, and at each stability monitoring round). At the end of mining, the mean calcium concentration was 320.8 mg/l. By the end of stability monitoring, calcium was down to 42.7 mg/l. Although this value exceeds the TRV (14.5 mg/l), the fourth round stability mean represents an 87 percent reduction from post-mining concentration as a result of the restoration efforts. The mean concentration of calcium in MU4 appears stable based on the four rounds of stability monitoring. There are no standards for calcium and it does not pose a risk to offsite groundwater quality. The distribution of calcium in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-2, Appendix A.

Magnesium-Figure 5-3 shows the mean magnesium concentration at key phases of the restoration program. At the end of mining, the mean magnesium concentration was 57.9 mg/l. By the end of stability monitoring, magnesium was down to 9.3 mg/l. Although this value exceeds the TRV (1.64 mg/l), there has been an 84 percent reduction from post-mining concentration as a result of the restoration efforts. There is no significant increasing trend in magnesium concentration based on the four stability monitoring rounds. There are no standards for magnesium and the relatively low values observed in the fourth Stability round pose no threat to offsite groundwater quality. The distribution of

magnesium in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-3, Appendix A.

Sodium- Figure 5-4 shows the mean sodium concentration at key phases of the restoration program. The mean sodium concentration at MU4 at the end of mining was 690.8 mg/l. Sodium was down to 226.6 mg/l by the end of stabilization monitoring. The TRV for sodium is 151.65 mg/l. Restoration efforts have resulted in a decrease in post-mining sodium concentration of 67 percent. The distribution of sodium in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-4, Appendix A.

Bicarbonate-Bicarbonate is the anionic component of the primary chemical added during the mining process. Figure 5-5 shows the mean bicarbonate concentration at key phases of the restoration program. The post-mining mean bicarbonate concentration was 1881.7 mg/l. The bicarbonate TRV is 152.9 mg/l. After the fourth stability round monitoring the bicarbonate mean was down to 446.5 mg/l, a 76 percent reduction from the post-mining mean. The elevated bicarbonate concentration is directly reflected in the elevated alkalinity value. The distribution of bicarbonate in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-5, Appendix A.

Alkalinity-The mean alkalinity at key points in the restoration process is shown in Figure 5-6. At the end of mining alkalinity averaged 1,548 mg/l (as $CaCO_3$). The TRV for alkalinity is 119.0 mg/l. The fourth stability monitor round of 366.4 mg/l represents a 76 percent reduction from post mining concentration but still exceeds the TRV. Alkalinity is a function of bicarbonate concentration and pH. There are no standards for alkalinity. Although the mean for alkalinity is greater than the TRV, this parameter does not pose a threat to offsite groundwater quality. The distribution of alkalinity in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-6, Appendix A.

Conductivity-The mean conductivity at key points in the restoration process is shown in Figure 5-7. Conductivity averaged 4277 mg/l prior to initiating restoration. The TRV for conductivity is 803 mg/l. The fourth stability monitor round of 1124 mg/l represents a 74 percent reduction from post mining concentration. The concentration of conductivity appears to have stabilized based on the stability monitoring results. Because there are no standards for conductivity, this parameter does not pose a threat to offsite groundwater quality. The distribution of conductivity in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-7, Appendix A.

5.4.2 Constituents Exceeding TRVs But Below Groundwater Standards

Chloride – Figure 5-8 shows the mean chloride concentration at key points of the restoration program. After mining, the mean chloride concentration was 176.9 mg/l. The fourth stability monitoring round mean was 19.3 mg/l, representing a reduction of 89 percent. The chloride the TRV was 11.1 mg/l. The Wyoming Class I Standard and the EPA Secondary Drinking Water Standard is 250 mg/l. Because the fourth round stability monitoring mean does not exceed either of these standards, chloride does not pose a threat to offsite groundwater quality. The distribution of chloride in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-8, Appendix A.

Aluminum-Aluminum concentration at key points of the restoration program is shown in Figure 5.9. The post-mining mean aluminum concentration was 0.1 mg/l. The fourth stability round mean was 0.107 mg/l, representing a slight increase (6 percent) from post mining concentration. The TRV for aluminum is 0.1 mg/l. There is no Wyoming Class I Standard for aluminum. The EPA MCL for aluminum is a range of 0.05 to 0.2 mg/l. MU4 mean aluminum concentration at the end of stability monitoring does not exceed the upper limit of this range. Furthermore, 14 of the 15 wells sampled during the fourth stability round were at or below the detection limit for aluminum of 0.1 mg/l. Only a single sample (from well 4T114-1) had detectable levels of aluminum at 0.2 mg/l. The three previous stability sampling rounds for that well were non-detect for aluminum. Therefore, aluminum does not pose a potential risk to offsite groundwater quality. The distribution of aluminum in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-9, Appendix A.

5.4.3 Constituents Exceeding TRVs And Groundwater Standards

It should be noted that a comparison is made in this section to Wyoming Class I Standards for drinking water. However, the MU3 groundwater prior to mining was NOT Class I drinking water due to the high pre-mining native radium 226 levels associated with the uranium orebody. The water should be classified as Class IV industrial. However there are no standards for Class IV, therefore a comparison to Class I and EPA MCLs is made.

Manganese-The mean manganese concentration at MU4 after mining was 0.65 mg/l as shown in Figure 5-10. Manganese concentration for the fourth stability monitoring round was 0.143 mg/l, a reduction of 78 percent. The TRV for manganese is 0.01 mg/l. The Wyoming Class I Standard is 0.05 mg/l. The distribution of manganese in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-10, Appendix A. Dilution and chemical attenuation will reduce concentration. This constituent is evaluated

further in Section 6 to assess the potential for impacts to offsite groundwater quality.

Iron-Figure 5-11 shows mean iron concentration in MU4 at key points of the restoration program. Following mining, the mean iron concentration was 0.218 mg/l. The TRV for iron is 0.05 mg/l. The mean iron concentration calculated from the 4th stability round is 0.357 mg/l, representing an increase from post-mining levels. Iron is the only monitored constituent that increased in concentration following restoration (with the exception of aluminum, which was previously described and attributed to a single sample, and pH which went from 7.69 to 8.01 p.u.). The Wyoming Class I Standard is 0.3 mg/l. The distribution of iron in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-11, Appendix A. Dilution and chemical attenuation are expected to be sufficient to reduce concentration to Wyoming standards within relatively short distances from the wellfield boundary as described in Section 6.

Selenium-Figure 5-12 illustrates the mean selenium concentration at key points throughout the restoration program. The post-mining mean selenium concentration was 3.04 mg/l. Restoration activities reduced the selenium concentration by 93 percent at the end of stability monitoring to a value of 0.20 mg/l. The selenium TRV is 0.01 mg/l and the Wyoming Class I Standard and the EPA MCL are 0.05 mg/l. The distribution of selenium in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-12, Appendix A. Additional assessment of this constituent is provided in Section 6.

Uranium- The mean uranium concentration at key restoration points is shown in Figure 5.13. The post mining uranium mean concentration was 17.55 mg/l. The fourth stability round mean concentration was 3.83 mg/l, representing a reduction of 78 percent from the post mining value. The uranium TRV is 0.23 mg/l and the EPA MCL is 0.03 mg/l. The EPA MCL was recently revised from a value of 5.0 mg/l to the current standard. The distribution of uranium in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-13, Appendix A. Dilution and chemical attenuation are expected to be sufficient to reduce concentration to Wyoming standards within relatively short distances from the wellfield boundary as described in Section 6.

Radium 226- Figure 5-14 indicates the mean radium-226 concentration at key points throughout the restoration program. The post-mining radium-226 mean concentration was 286.4 pCi/l. The fourth stability monitoring round mean was 114.1 pCi/l, a decrease from post mining of 60 percent. The TRV for MU4 radium is 83.0 pCi/l. The Wyoming Class I Standard and EPA MCL for combined radium 226 and radium 228 is 5 pCi/l. Comparison of the post-mining and TRV values indicates that ISL mining did not significantly impact water quality with respect to radium-226. Consequently, the restoration program has not significantly reduced radium-226 concentrations. Because of the geochemical

properties of radium-226, and its propensity to be readily adsorbed, the probability of significant impacts to offsite groundwater is relatively low. The distribution of radium-226 in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-14, Appendix A.

TDS Figure 5.15 shows the concentrations of TDS at key points in restoration. The TRV for TDS was 508.2 mg/l. The post-mining concentration for TDS was 3,226 mg/l. The fourth stability monitoring round mean for TDS was 774.7 mg/l representing an 76 percent reduction from post-mining concentration. The Wyoming Class I Standard is 500 mg/. Because the TDS mean is near than the Class I Standard, TDS does not pose a significant risk to offsite groundwater quality. The distribution of TDS in MU4 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-15, Appendix A.

6.0 ASSESSMENT OF FUTURE GROUNDWATER QUALITY

This assessment evaluates potential fate and transport of constituents regulated under Permit to Mine No. 478 and the U.S. Nuclear Regulatory Commission (NRC) source material license No. SUA-1341 that exceed regulatory standards after completion of restoration of MU4. Key components of the assessment are geochemical and hydrologic factors that control solute transport. The hydrologic component defines the rate and direction of groundwater flow within the aquifer. The geochemical component considers the reduction in solute concentrations that occur along groundwater flowpaths.

6.1 CONSTITUENTS INCLUDED FOR ASSESSMENT

Following application of Best Practicable Technology (BPT) to aquifer restoration of MU4, the following constituents exceeded the TRV and either the Wyoming Class I Standard or the EPA MCL: iron, manganese, selenium, uranium, radium-226 and TDS. The table below summarizes the post restoration wellfield average concentration, the TRV and the applicable standards for each of these constituents. All values are in mg/l except for radium-226, which is reported as pCi/l.

Table 6-1 Constituents Included for Assessment of Fate and Transport

Constituent	Post Restoration Wellfield Average	Target Restoration Value	WDEQ Class I	EPA MCL
iron	0.357	0.05	0.3	NA
manganese	0.143	0.01	0.05	0.05
selenium	0.20	0.01	0.05	0.05
uranium	3.83	0.23	NA	0.03
radium-226	114.1	83.0	5.0	5.0
TDS	774.7	508.2	500	NA

NA –not applicable

6.2 TRANSPORT ASSESSMENT

The effects of long-term groundwater flow, including advective mixing and dispersion, on constituent concentrations is described under the hydrologic assessment portion of the transport assessment. A general discussion of the geochemical properties for each of the constituents listed in Table 6.1 is presented under the geochemical assessment in the cover report (Wellfield Restoration Report, Christensen Ranch, COGEMA 2007) and summarized below in the geochemical assessment portion of this transport assessment.

6.2.1 Hydrologic Assessment

Potentiometric surface maps prepared from data collected prior to the onset of mining at MU4 indicated a predominately west-northwest hydraulic gradient at

0.01 ft/ft for the ore zone. The average hydraulic conductivity of the "K" sand is 0.51 ft/d. The porosity estimate used in calculating the pore volumes for each of the MUs was 26 percent. Based on these parameters, the average groundwater velocity, using Darcy's equation, across MU 2 is 0.020 ft/d (7.2 ft/yr). The distance to the monitor well ring from the wellfield is 400 feet. The shortest groundwater flowpath from the MU2 wellfield to the Permit Boundary is approximately 3,500 feet. Based on the groundwater velocity calculation, it will take approximately 56 years for groundwater within the wellfield to reach the monitor well ring and almost 490 years to reach the Permit Boundary.

6.2.2 Geochemical Assessment

Geochemical conditions in the ore zone aquifer control the mobility of groundwater solutes associated with uranium mineralization. The primary factor controlling the mobility of solutes associated with roll-front deposits is redox condition. Under the reducing conditions that are naturally present in roll-front deposits, most solutes are strongly attenuated and relatively immobile. Solutes are generally more soluble and mobile under oxidizing conditions. Iron, manganese, and uranium are strongly controlled by redox conditions. Radium concentrations in natural waters are usually controlled by adsorption and/or precipitation via solid-solution (Langmuir 1985).

Iron concentrations in groundwater are typically controlled by the solubility of iron-containing solid phases rather than by adsorption (Rai et al. 1987). Because ferrous iron is relatively more soluble and mobile than ferric iron, redox conditions tend to control groundwater iron concentrations. Dissolved iron is most commonly present in groundwater as the ferrous ion Fe^{2+}. Above a pH of approximately 5, ferric iron (Fe^{3+}) forms relatively insoluble iron(III) oxides and hydroxides, such as amorphous $Fe(OH)_3(s)$. Amorphous $Fe(OH)_3(s)$ or other ferric iron solids that form under oxidizing conditions can sorb or coprecipitate trace metals, such as uranium, thereby exerting an important control on groundwater mobility of trace metal constituents (Langmuir et al. 2004).

Under typical groundwater conditions, dissolved manganese will usually be present in reduced form as Mn^{2+}. Under oxidizing conditions, manganese forms relatively insoluble manganese (III) and (IV) oxide phases that are stable above approximately pH 6 to 7 (Rai et al. 1987, Langmuir et al. 2004). These manganese oxides readily adsorb trace metals such as cobalt, zinc, and nickel and can therefore significantly influence trace metal migration in groundwater (Murray 1975, Langmuir et al. 2004).

Selenium concentrations in uranium roll-front deposits are elevated in narrow zones at the outer edges of the oxidized sandstone, at the redox interface, or in reduced sandstone close to the interface (Harshman 1974). Selenium in uranium roll-front deposits typically occurs in reduced form as the relatively insoluble phases native selenium and ferroselite ($FeSe_2$) (Harshman 1974. Under reducing conditions, selenium is typically present as native selenium or in

the selenide (-II) oxidation state. Selenide is generally present in solution in the form of HSe^- above pH 4 (Rai et al. 1987). Native selenium is relatively insoluble, and selenide often forms insoluble metal selenide phases such as ferroselite [$FeSe_2$] (McLean and Bledsoe 1992, Langmuir et al. 2004). The insolubility of the selenide minerals is the primary attenuation mechanism for selenium in aquifers hosting roll-front uranium deposits.

Under reducing conditions, uranium(IV) forms relatively insoluble solids such as uraninite and coffinite, minerals that are typically found in uranium roll-front deposits. Uranium sorption by soils generally reaches a maximum in the pH range from pH 5 to 8 (EPA 1999). Uranium can also be attenuated in groundwater through coprecipitation reactions with metal oxyhydroxides such as iron hydroxide.

Radium is generally relatively immobile but can be mobilized under some conditions. Groundwater radium concentrations commonly are elevated in the ore zone relative to the background levels present immediately upgradient and downgradient of the ore (Wanty et al. 1987). Radium is frequently precipitated from sulfate-rich waters as a solid solution with barium (as barite, $BaSO_4$) or less commonly with calcium (as gypsum, $CaSO_4 \cdot 2H_2O$) or strontium (as celestite, $SrSO_4$) (Langmuir and Melchior 1985, Langmuir and Riese 1985). In general, radium adsorption on mineral surfaces increases with increasing pH. For iron oxides, the increase in adsorption begins around pH of 6 to 8 and reaches a maximum of around 10 s.u. or less (USEPA 2004). Radium can be attenuated by adsorption onto clays (Langmuir and Chatham 1980, Kaufmann et al. 1976, Granger 1963). Radium is also strongly adsorbed to mineral oxides, especially at near neutral and alkaline pH conditions (USEPA 2004).

6.2.3 Fate and Transport

As described in the cover report, modeling of another similar site northwest of Christensen Ranch indicates a 6 to 8 fold reduction in constituent concentration within 400 feet of the wellfield (minus the background concentration) from advective mixing of groundwater. A table of values using a conservative reduction factor of 6 is presented to illustrate the decrease in concentration that could be expected based only on advection. It is assumed that the target restoration value represents background water quality.

6-2 Estimated Constituent Reduction from Post-Restoration Concentration 400 feet from Wellfield, MU4

Constituent	Post Restoration Wellfield Average (A)	TRV (B)	Estimated Value (C) @ 400 ft Using Reduction Factor (R) of 6 C= (A-B)/R+B
iron	0.357	0.05	0.101
manganese	0.143	0.01	0.032
selenium	0.20	0.01	0.042
uranium	3.83	0.23	0.830
radium-226	114.1	83.0	88.2
TDS	774.7	508.2	552.6

Based on these calculations, iron, manganese and selenium concentrations would be below the regulatory standards 400 feet from the wellfield. Uranium radium-226 and TDS would still exceed the standards, but the background for each of these constituents at MU4 was above the standards prior to mining. Uranium is anticipated to be strongly adsorbed once groundwater from the wellfield moves outside of the orebody into the more reducing conditions downgradient. TDS does not carry significant health risks and the projected levels are only slightly above the WDEQ Class I standard. Elevated radium-226 is characteristic of the water quality within a uranium ore body high and would not be expected to migrate significant distances beyond the orebody.

7.0 SUMMARY AND CONCLUSIONS

COGEMA has prepared this document as a technical demonstration supporting completion of the wellfield restoration operations at MU4 of the Christensen Ranch in-situ uranium mine in Johnson County, Wyoming.

Wellfield restoration operations were initiated in MU4 in 1997 and completed in 2005. Groundwater within the production zone has been restored to the pre-mining class of use, using Best Practicable Technology (BPT), as required by the WDEQ. An average of 12.8 pore volumes of water were treated for the MU4 wellfields during restoration activities.

Plots of conductivity and uranium during the course of the restoration program show the significant improvement in water quality that has resulted.

Based on the fourth stability round mean concentrations, 21 of the 35 constituents met MU4 TRVs. Six constituents that exceed the TRVs have no WDEQ Class I Standard or EPA MCL, including: calcium, magnesium, sodium, bicarbonate, alkalinity, and conductivity. Restoration water quality monitoring indicates a 67 to 87 percent reduction in mean concentrations of each of those parameters as a result of restoration activities. Two of constituents that exceeded MU4 TRVs, chloride and aluminum, have mean concentrations that are below the WDEQ Class I Standard and EPA MCLs. Chloride showed an 89 percent decrease in concentration at the completion of restoration. Aluminum showed a small increase (6 percent) but that increase was due to a single sample that had been non-detect for aluminum during the previous three stability monitoring rounds. All 14 of the other restoration monitor wells were non-detect for aluminum in the fourth stability monitoring round.

Six constituents exceed TRVs and either WDEQ Class I Standards or EPA MCLs. However, with the exception of iron, restoration resulted in significant decreases in post-mining concentrations. The mean concentration of manganese at MU4 was reduced by almost 78 percent through restoration. Selenium concentration decreased by approximately 93 percent over the restoration activity. Iron showed an increase from post mining concentrations although the levels have been decreasing throughout stability monitoring.

Uranium was reduced by 78 percent from post mining concentration although the mean concentration is still significantly greater than the recently revised EPA MCL of 0.03 mg/l. It should be noted that during active restoration the EPA MCL and the Wyoming Class I Standard was 5.0 mg/l and the final restoration quality would have met that standard. Radium-226 was not as responsive to restoration actions as many of the other constituents but was reduced by 60 percent from post mining concentration. The fourth stability monitoring round mean concentration of radium-226 is near the TRV, indicating that restoration has returned groundwater to class of use at MU4. Although radium-226 does not

meet either Wyoming Class I Standard or EPA MCLs, the TRV is also significantly higher than those standards. This is an indication that the groundwater within MU4 was not suitable for drinking prior to mining activities.

Stability monitoring indicates that TDS concentration exceeds the TRV and is above the Wyoming Class I Standard of 500 mg/l. Restoration resulted in a reduction of over 76 percent in TDS from post-mining concentration.

Water quality data indicate that the Christensen Ranch MU4 production zone has been restored to class of use using BPT. Although not all TRVs were met, concentrations of most constituents were reduced by more than seventy five percent of post mining values. Concentrations of manganese and iron above the TRV are indicative of reducing conditions within the aquifer, which are favorable for continued attenuation of other uranium mining related constituents. Elevated radium-226 is consistent with pre-mining water quality and class of use for the site. Furthermore, radium-226 is a natural constituent of the orebody and is relatively immobile in groundwater systems and will not migrate appreciably from the site.

8.0 REFERENCES

All references are included in the cover report, Wellfield Restoration Report Christensen Ranch, Wyoming. COGEMA 2007.

TABLES

Table 4-1 Groundwater Monitor Wells, Mine Unit 4, Christensen Ranch, Wyoming

RESTORATION WELLS (INTERIOR ORE ZONE)

Well ID	Easting	Northing	Surface Elev.
4E6-1	843,035	1,144,364	4,685.2
4H7-1	843,392	1,144,256	4,633.5
4J26-1	843,497	1,143,510	4,690.6
4K9-1	843,643	1,144,196	4,648.1
4M40-1	843,720	1,142,913	4,711.9
4O58-1	843,887	1,142,148	4,690.8
4P74-1	843,978	1,141,470	4,722.3
4R96-1	844,135	1,140,535	4,781.8
4RM-07	844,091	1,140,850	4,757.2
4S104-2	844,228	1,140,191	4,801.7
4T114-1	844,313	1,139,770	4,764.5
4T86-1	844,310	1,140,976	4,776.7
4T92-1	844,313	1,140,705	4,793.2
4U108-1	844,397	1,140,024	4,770.2
4W104-1	844,568	1,140,194	4,769.2
4W106-1	844,567	1,140,109	4,763.5

SHALLOW MONITOR ZONE WELLS

Well ID	Easting	Northing	Surface Elev.
4SM-1	844,296	1,139,797	4,767.0
4SM-4	843,897	1,141,720	4,704.2
4SM-8	843,758	1,142,903	4,713.2
SRM-07	844,091	1,140,871	4,755.6
MW66S-2	843,400	1,144,424	4,676.0

DEEP MONITOR ZONE WELLS

Well ID	Easting	Northing	Surface Elev.
4DM-1	844,296	1,139,816	4,767.8
4DM-4	844,013	1,141,655	4,716.6
4DM-8	843,757	1,142,925	4,714.6
DRM-07	844,091	1,140,831	4,758.8
MW65D	843,399	1,144,450	4,675.5

ORE ZONE PERIMETER WELLS

Well ID	Easting	Northing	Surface Elev.
4MW-1	843,313	1,143,758	4,692.7
4MW-2	844,050	1,144,014	4,643.8
4MW-3	843,173	1,143,519	4,720.0
4MW-4	844,179	1,143,580	4,652.4
4MW-5	843,123	1,143,112	4,739.7
4MW-6	844,243	1,143,130	4,660.6
4MW-7	843,222	1,142,680	4,727.5
4MW-8	844,185	1,142,678	4,674.8
4MW-9	843,328	1,142,236	4,688.7
4MW-10	844,299	1,142,237	4,679.3
4MW-11	843,314	1,141,785	4,702.8
4MW-12	844,524	1,141,842	4,715.1
4MW-13	843,439	1,141,378	4,669.9
4MW-14	844,661	1,141,420	4,742.0
4MW-15	843,643	1,141,167	4,714.6
4MW-16	844,808	1,140,987	4,756.5
4MW-17	843,824	1,140,961	4,735.9
4MW-18	844,765	1,140,515	4,767.1
4MW-19	843,779	1,140,682	4,737.3
4MW-20	845,060	1,140,135	4,719.3
4MW-21	843,753	1,140,221	4,753.7
4MW-22	844,809	1,139,723	4,731.9
4MW-23	843,776	1,139,758	4,803.2
4MW-24	844,426	1,139,429	4,746.6
4MW-25	844,010	1,139,357	4,780.4

Table 4.2 Target Restoration Values for Mine Unit 4, Christensen Ranch, Wyoming

Parameter	Target Restoration Value
Major Cations/Anions	
Ca (mg/l)	14.5
Mg (mg/l)	1.64
Na (mg/l)	151.7
K (mg/l)	10.3
CO3 (mg/l)	24.1
HC03 (mg/l)	152.9
SO4 (mg/l)	238.2
Cl (mg/l)	11.1
NH4 (mg/l)	1.20
NO2 (N) (mg/l)	0.10
NO3 (N) (mg/l)	0.21
F (mg/l)	0.30
SiO2 (mg/l)	12.7
General Water Quality Parameters	
TDS (mg/l)	508.2
Cond. (umho/cm)	802.7
Alk. (as CaC03 (mg/l))	119.0
pH (units)	10.05
Trace Metals	
Al (mg/l)	0.1
As (mg/l)	0.007
Ba (mg/l)	0.1
B (mg/l)	0.1
Cd (mg/l)	0.01
Cr (mg/l)	0.05
Cu (mg/l)	0.01
Fe (mg/l)	0.05
Pb (mg/l)	0.05
Mn (mg/l)	0.01
Hg (mg/l)	0.001
Mo (mg/l)	0.1
Ni (mg/l)	0.050
Se (mg/l)	0.010
V (mg/l)	0.1
Zn (mg/l)	0.228
Radionuclides	
U (mg/l)	0.23
Ra 226 (pCi/l)	83.0

Table 5-1. Restoration and Stability Monitoring Water Quality Results, Mine Unit 4, Christensen Ranch, Wyoming

	Active Restoration Monitoring			Stability Monitoring			
	Post Mining	Post GWS	Post RO	Round 1	Round 2	Round 3	Round 4
Major Ions mg/l:							
Ca	320.8	153.2	21.4	39.8	42.7	44.1	42.7
Mg	57.9	33.3	4.5	8.5	9.0	9.1	9.1
Na	690.8	442.9	139.3	221.5	241.1	220.5	226.6
K	12.5	7.0	2.8	6.7	4.0	3.9	3.6
CO3	1.0	3.4	1.9	0.9	1.2	1.5	1.7
HC03	1881.7	1133.5	255.4	434.3	453.3	452.1	446.5
SO4	886.3	511.4	144.3	219.1	225.8	213.4	210.5
Cl	176.9	77.9	14.5	19.2	20.4	19.6	19.3
NH4	0.74	0.32	0.15	0.13	0.12	0.17	0.20
NO2 (N)	0.10	0.10	0.10	0.10	0.10	0.10	0.09
NO3 (N)	0.15	0.35	0.10	0.11	0.10	0.10	0.12
F	0.10	0.12	0.13	0.13	0.12	0.12	0.12
SiO2	13.1	10.6	10.0	14.3	9.3	9.2	9.3
General Water Quality							
TDS (mg/l)	3225.8	1944.3	463.9	760.0	805.3	772.0	774.7
Cond. (umho/cm)	4276.7	2712.3	699.6	1151.9	1180.5	1073.8	1124.5
Alk. (mg/l as CaC03)	1548.3	933.2	211.2	356.7	372.1	370.8	366.4
pH (units)	7.69	7.94	7.84	8.02	7.89	8.07	8.01
Trace Metals mg/l:							
Al	0.10	0.10	0.10	0.11	0.10	0.10	0.11
As	0.011	0.059	0.013	0.006	0.005	0.006	0.006
Ba	0.10	0.10	0.10	0.50	0.50	0.50	0.50
B	0.10	0.10	0.10	0.09	0.12	0.06	0.06
Cd	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Cr	0.05	0.05	0.05	0.01	0.01	0.01	0.01
Cu	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fe	0.22	0.34	0.11	0.87	0.35	0.20	0.36
Pb	0.05	0.05	0.05	0.02	0.02	0.02	0.02
Mn	0.65	0.33	0.12	0.18	0.13	0.15	0.14
Hg	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Mo	0.10	0.10	0.10	0.02	0.02	0.02	0.02
Ni	0.05	0.05	0.05	0.01	0.01	0.01	0.01
Se	3.04	2.12	0.30	0.28	0.26	0.21	0.21
V	0.27	0.31	0.17	0.12	0.13	0.09	0.07
Zn	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Radiometric							
U (mg/l)	17.55	13.19	2.85	3.71	3.53	3.91	3.83
Ra 226 (pCi/l)	286.2	198.7	71.2	107.8	170.2	141.3	114.1

Numeric values represent the mean of all designated restoration wells for the specified phase of restoration

Table 5-2. Comparison of Fourth Round Stability Monitoring Water Quality to Target Restoration Values and Regulatory Standards, Mine Unit 4, Christensen Ranch, Wyoming

	Round 4 Stability Monitoring Mean	TRV	Exceeds TRV ?	Wyoming Class I	Exceeds Wyoming Class I ?	EPA MCL	Exceeds EPA MCL ?
Major Ions mg/l:							
Ca	42.7	14.5	Yes	-	NA	-	NA
Mg	9.1	1.64	Yes	-	NA	-	NA
Na	226.6	151.7	Yes	-	NA	-	NA
K	3.6	10.3	No	-	NA	-	NA
CO3	1.7	24.1	No	-	NA	-	NA
HC03	446.5	152.9	Yes	-	NA	-	NA
SO4	210.5	238.2	No	250	No	-	NA
Cl	19.3	11.1	Yes	250	No	-	NA
NH4	0.20	1.20	No	0.5	No	-	NA
NO2 (N)	0.09	0.10	No	1	No	1	No
NO3 (N)	0.12	0.21	No	10	No	10	No
F	0.12	0.30	No	1.4	No	4	No
SiO2	9.3	12.7	No	-	NA	-	NA
TDS	774.7	508.2	Yes	500	Yes	500	Yes
Cond. (umho/cm)	1124.5	802.7	Yes	-	NA	-	NA
Alk. (as CaC03)	366.4	119.0	Yes	-	NA	-	NA
pH (units)	8.01	10.05	No	6.5-8.5	No	6.5-8.5	No
Trace Metals mg/l:							
Al[a]	0.11	0.1	Yes	-	NA	0.05 to 0.2	No
As	0.006	0.007	No	0.05	No	0.01	No
Ba [b]	0.50	0.1	No	1	No	2	No
B	0.06	0.1	No	0.75	No	-	NA
Cd	0.002	0.01	No	0.01	No	0.005	No
Cr	0.01	0.05	No	0.05	No	0.1	No
Cu	0.01	0.01	No	1.00	No	1.3	No
Fe	0.36	0.05	Yes	0.3	Yes	0.3	Yes
Pb	0.02	0.05	No	0.05	No	0.05	No
Mn	0.14	0.01	Yes	0.05	Yes	0.05	Yes
Hg	0.001	0.001	No	0.002	No	0.002	No
Mo	0.02	0.1	No	-	NA	-	NA
Ni	0.01	0.050	No	0.01	No	-	NA
Se	0.21	0.010	Yes	0.05	Yes	0.05	Yes
V	0.07	0.1	No	-	NA	-	NA
Zn	0.01	0.228	No	5	No	5	No
Radiometric							
U (mg/l)	3.83	0.23	Yes	-	NA	0.03	Yes
Ra 226 (pCi/l)	114.1	83.0	Yes	5	Yes	5	Yes

[a] - all samples except one (5BL76-1) were below the detection limit of 0.1 mg/l

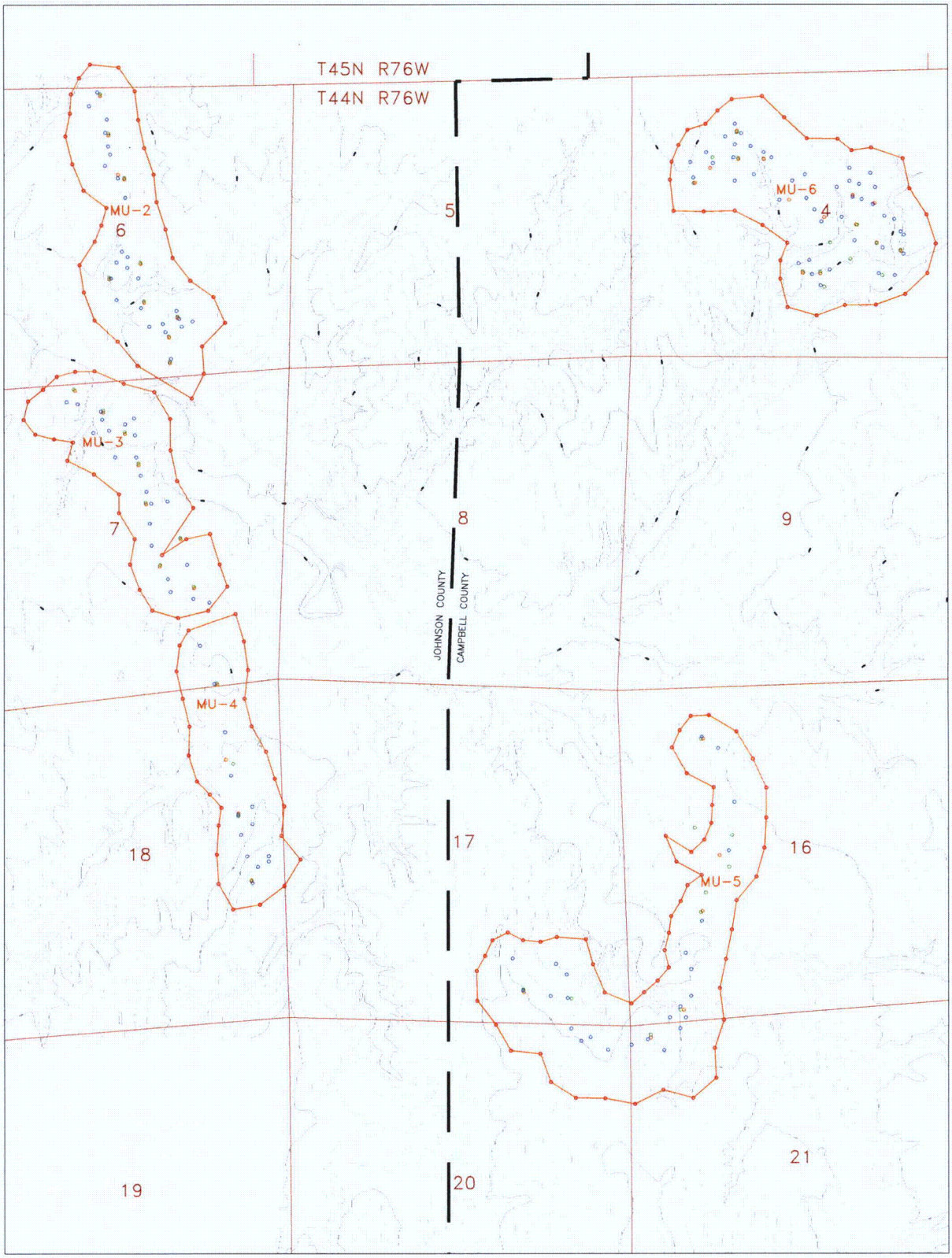
[b] -All samples were below detection limit which is greater than the TRV

TRV -Target Restoration Value-established from baseline water quality

Wyoming Class I- Drinking Water Standard

EPA MCL-US Environmental Protection Agency Maximum Contaminant Level

FIGURES



LEGEND

- PERIMETER MONITORING WELLS
- SHALLOW MONITORING WELLS
- DEEP MONITORING WELLS
- RESTORATION WELLS

0 750 1500 3000

SCALE IN FEET

N

W — E

COGEMA Mining, Inc.

FIGURE 2-1

CHRISTENSEN RANCH PROJECT
MINE UNIT LOCATION MAP

PROJECT: 217-12	DATE: APRIL 2007
CMI Restoration.dwg	BY: KRS CHECKED: EL

Petrotek

10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127-4239
303-290-9414
www.petrotek.com

Figure 4-1 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 41 Mine Unit 4, Christensen Ranch, Wyoming

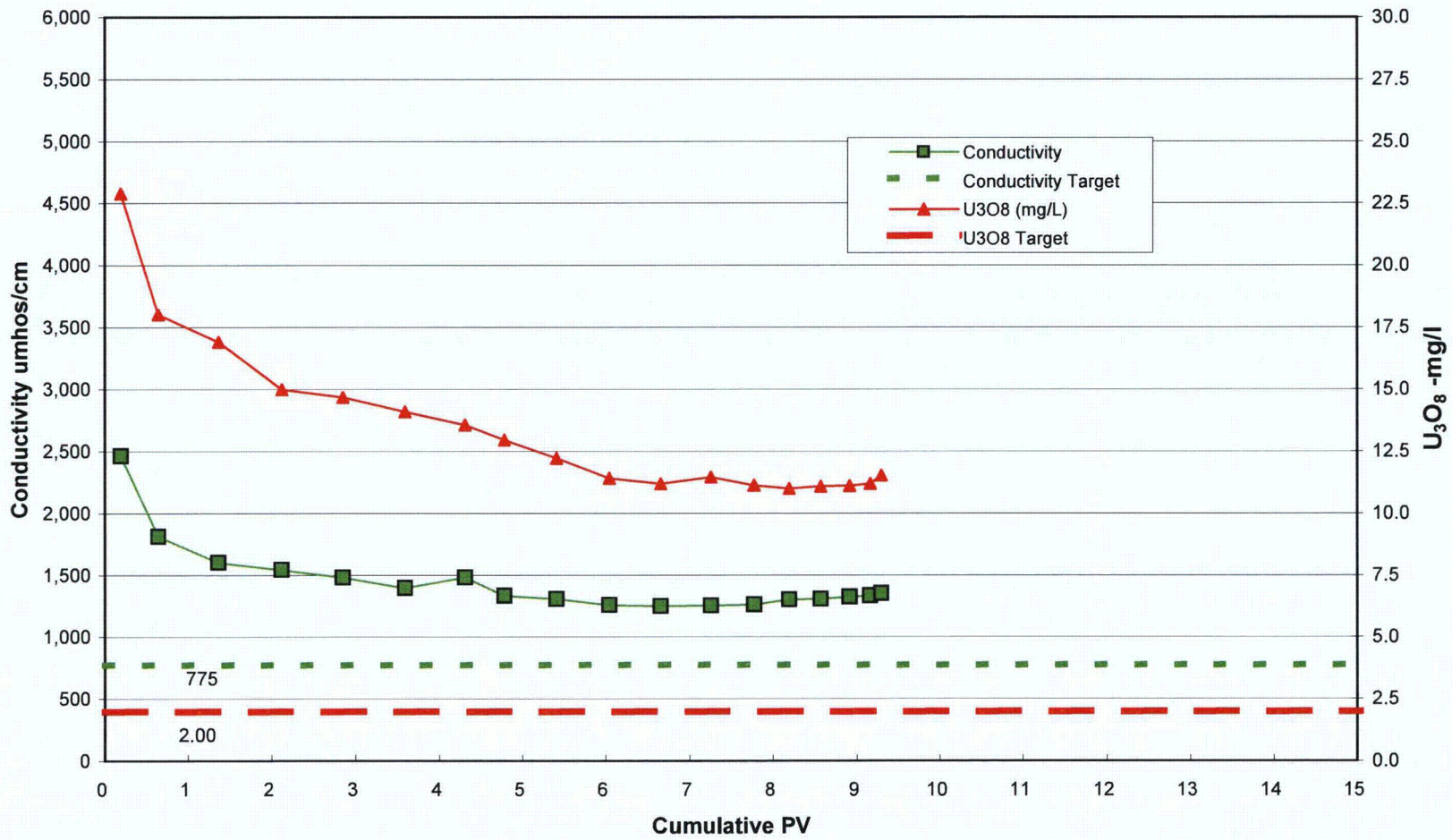


Figure 4-2 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 42 Mine Unit 4, Christensen Ranch, Wyoming

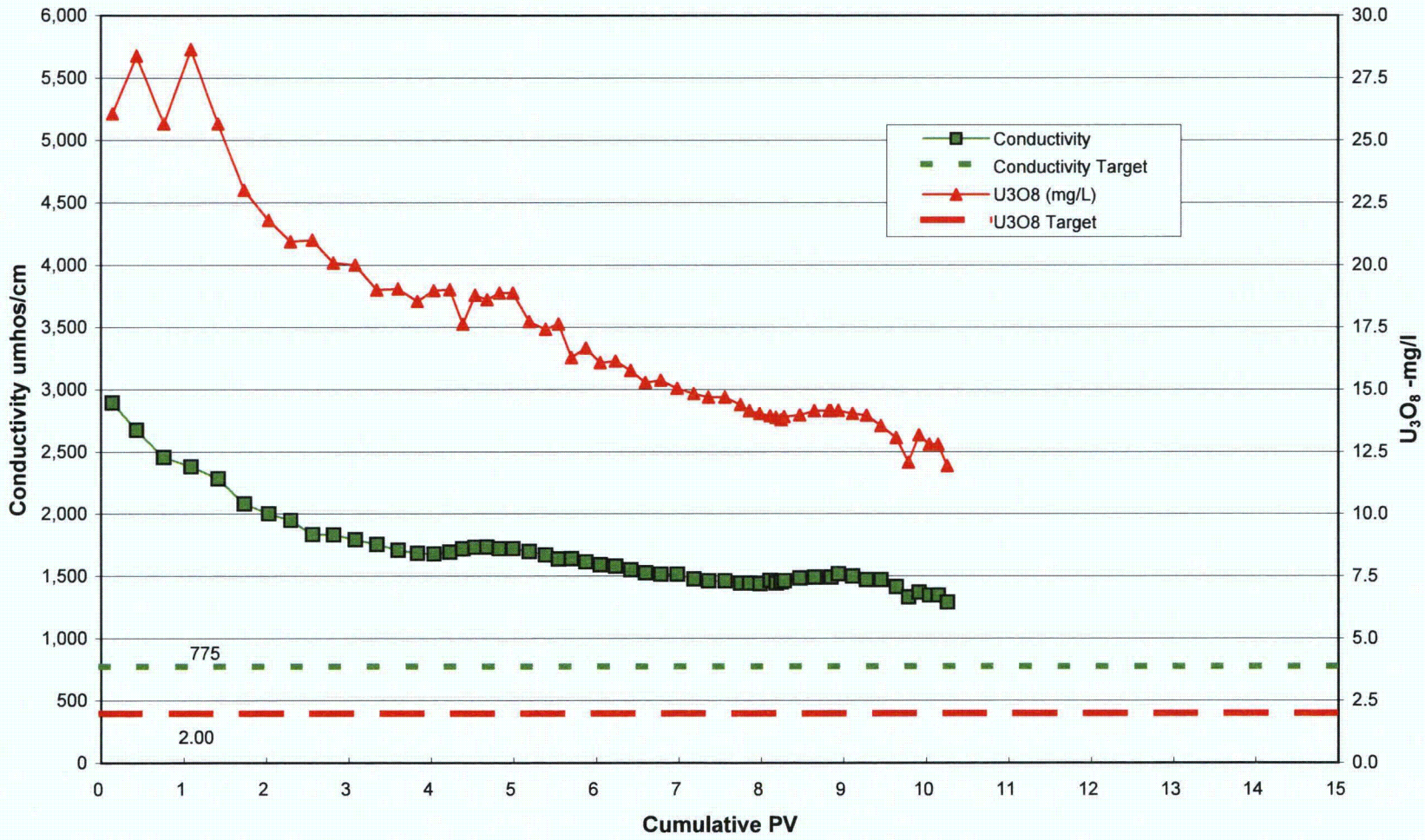
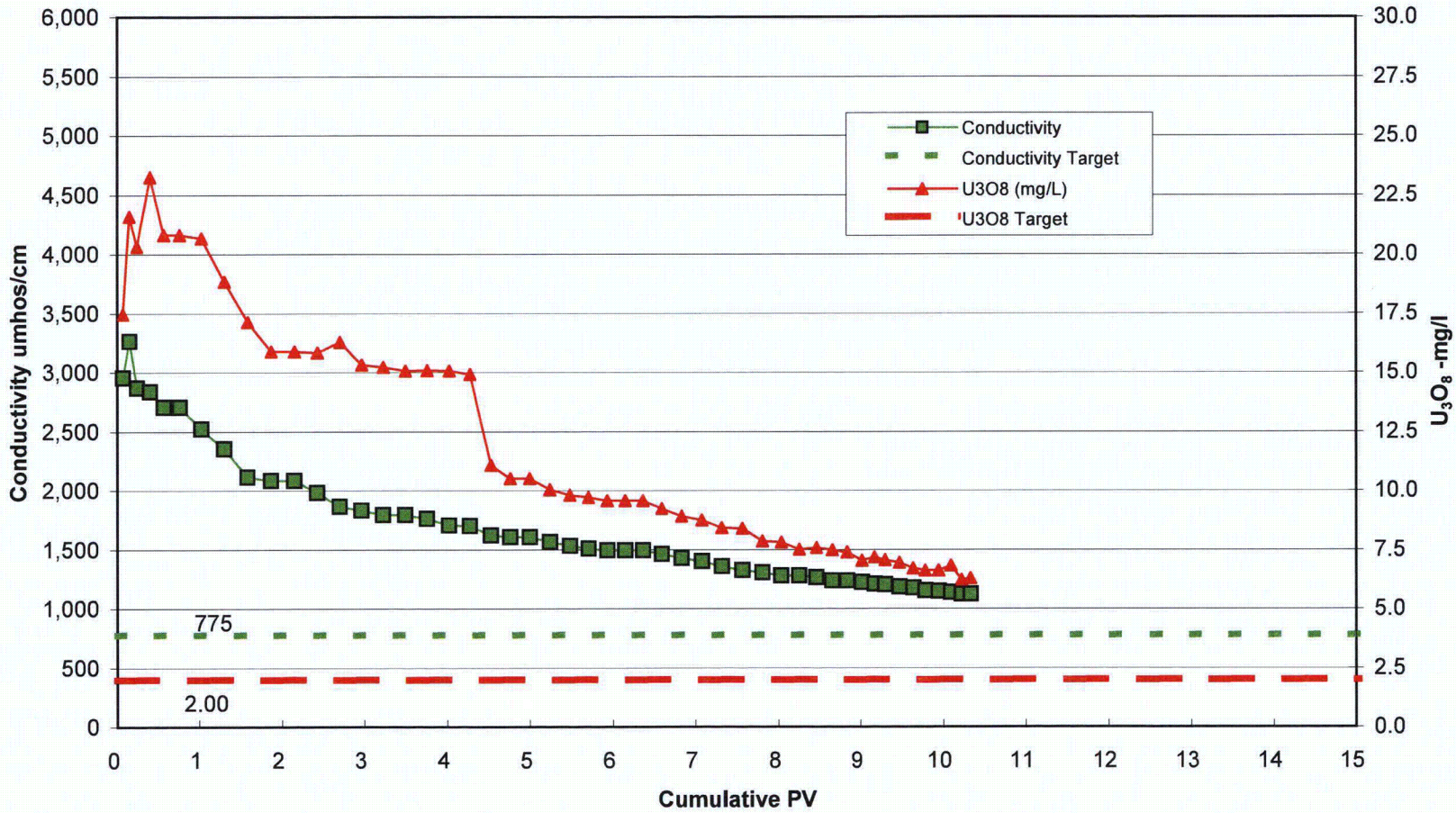
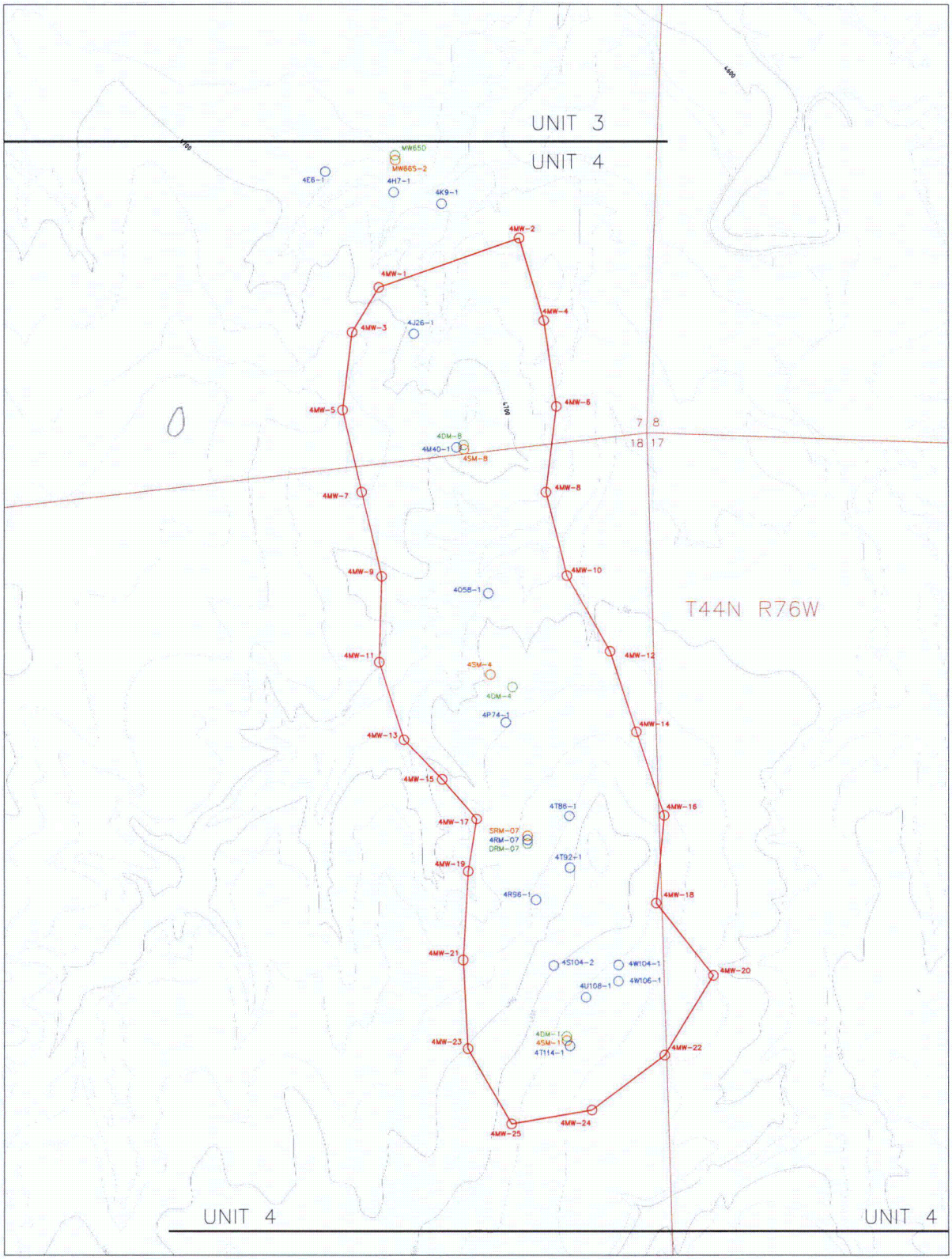


Figure 4-3 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 43 Mine Unit 4, Christensen Ranch, Wyoming





LEGEND

- PERIMETER MONITORING WELLS
- SHALLOW MONITORING WELLS
- DEEP MONITORING WELLS
- RESTORATION WELLS

N
W — E

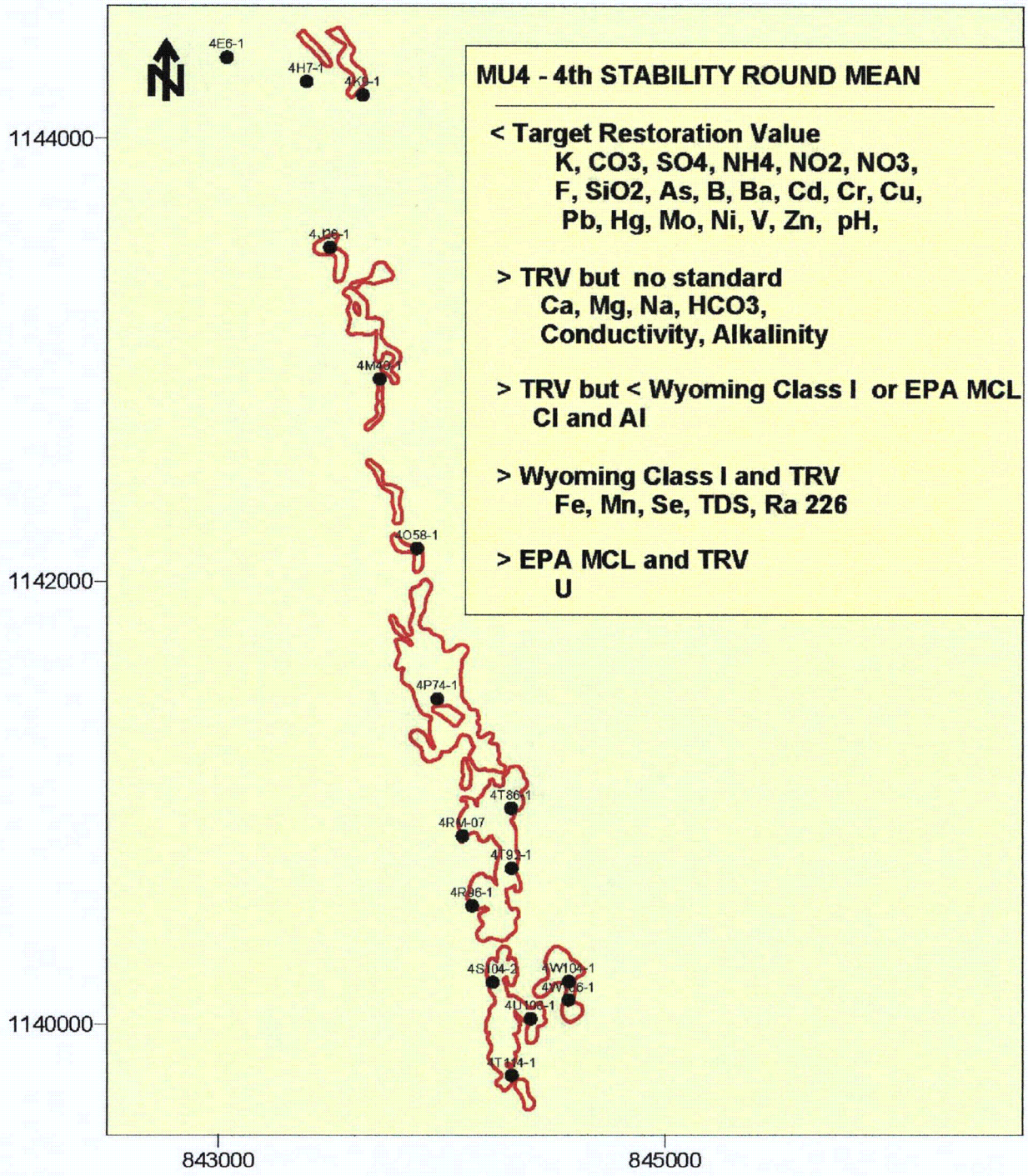
0 250 500 1000
SCALE IN FEET

COGEMA Mining, Inc.

FIGURE 4-4
CHRISTENSEN RANCH PROJECT
LOCATION OF MINE UNIT 4 MONITORING WELLS

PROJECT: 217-12	DATE: APRIL 2007	
CMI Restoration.dwg	BY: KRS	CHECKED: EL

Petrotek
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127-4239
303-290-9414
www.petrotek.com



LEGEND

- Interior Ore Zone Monitoring Well

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE 5-1
SUMMARY OF POST RESTORATION WATER QUALITY
MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: FEBRUARY 2008
DWG:COGEMAMU4FIG5-1.SRF	BY: EPL CHECKED: HPD

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

Figure 5-2. Mean Calcium Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

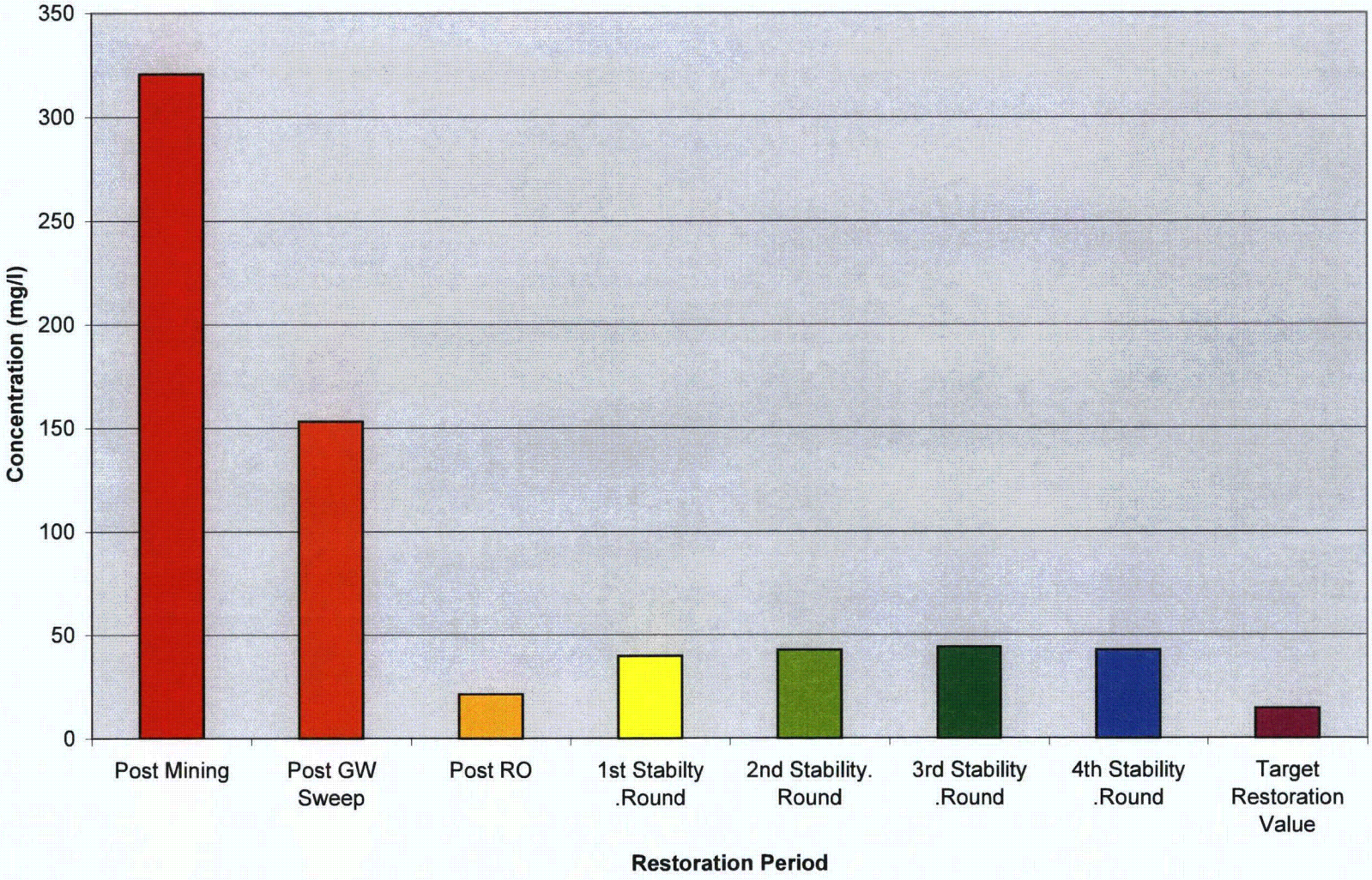


Figure 5-3. Mean Magnesium Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

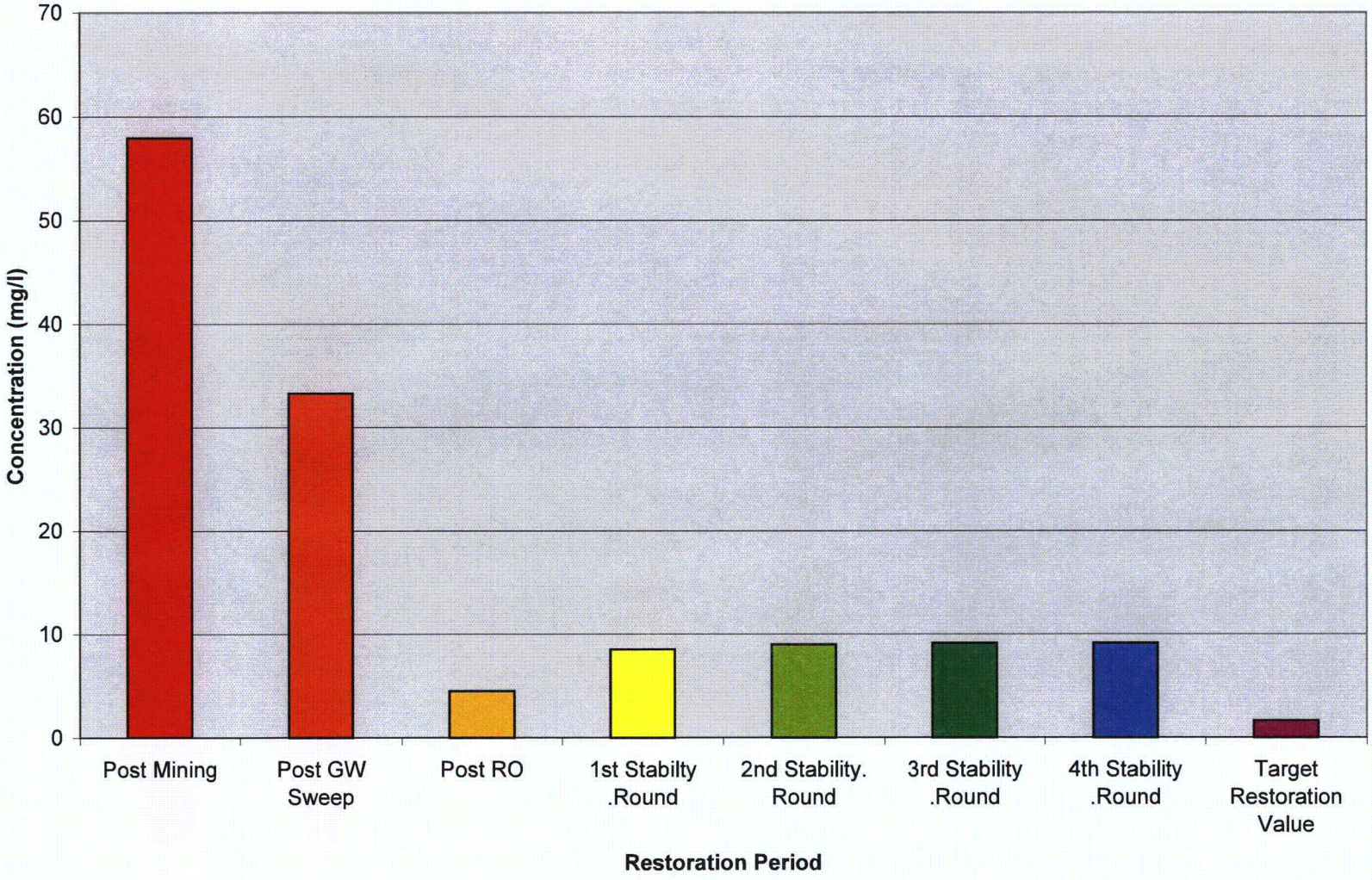


Figure 5-4. Mean Sodium Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

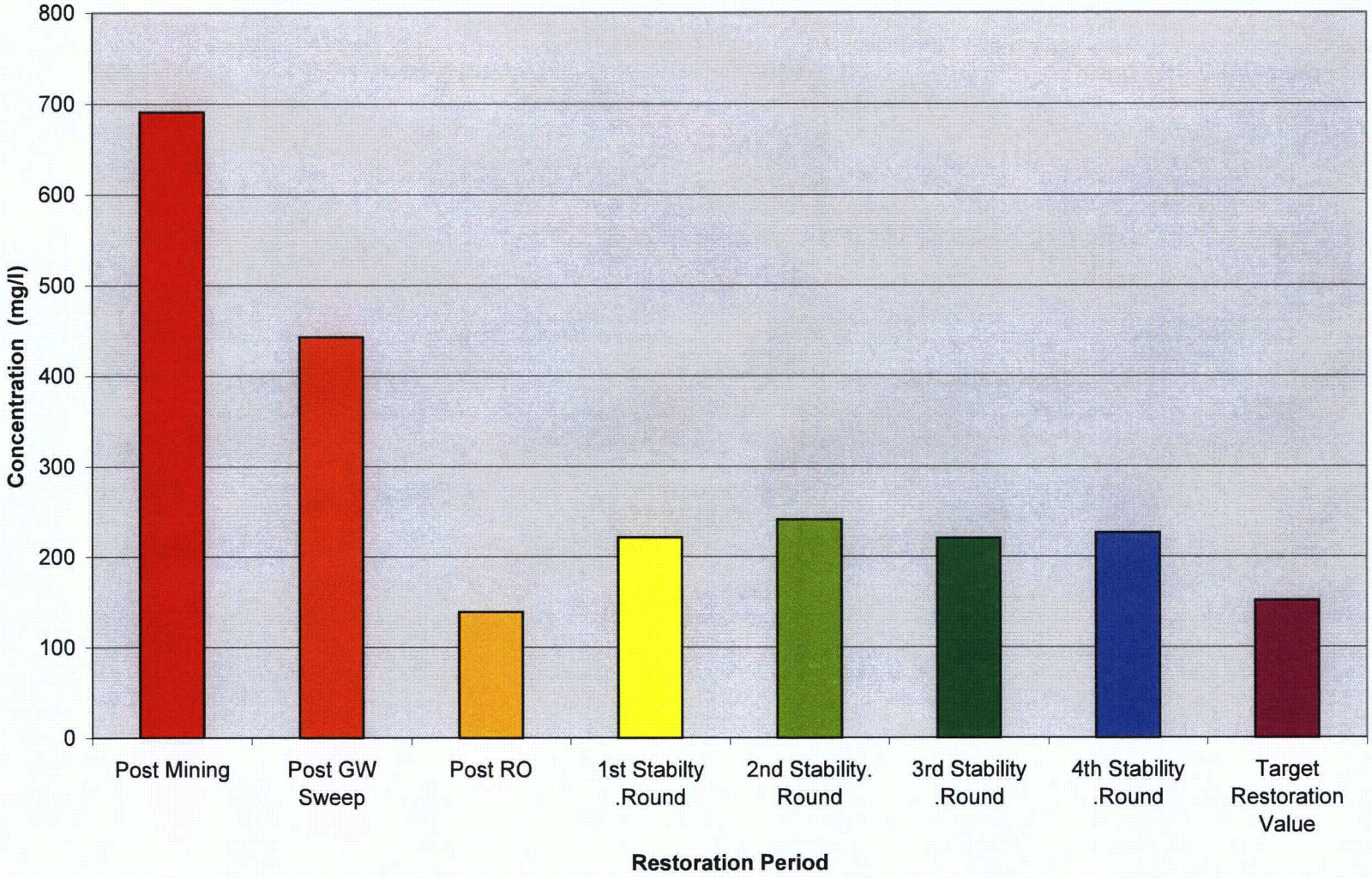


Figure 5-5. Mean Bicarbonate Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

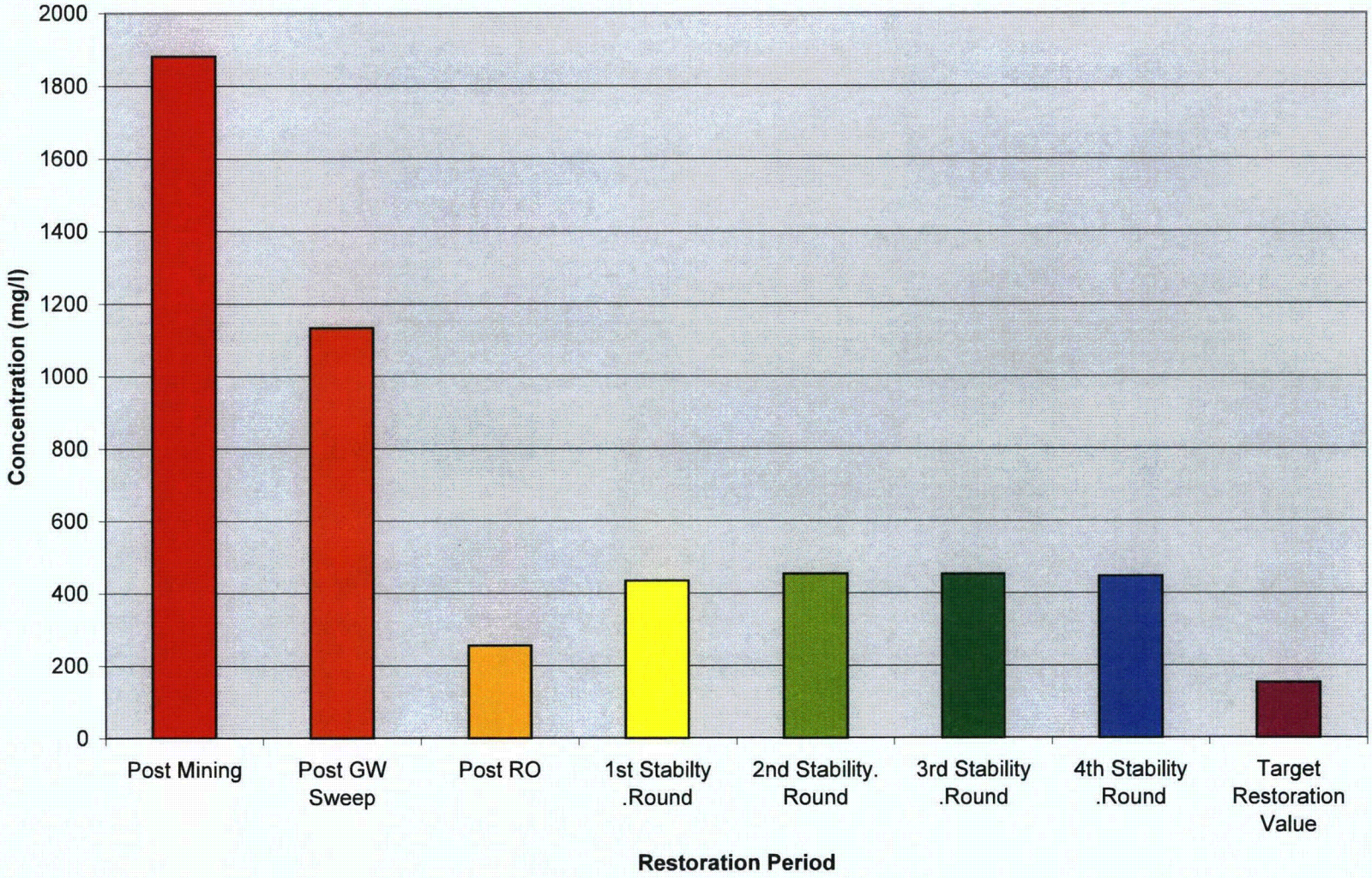


Figure 5-6. Mean Alkalinity Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

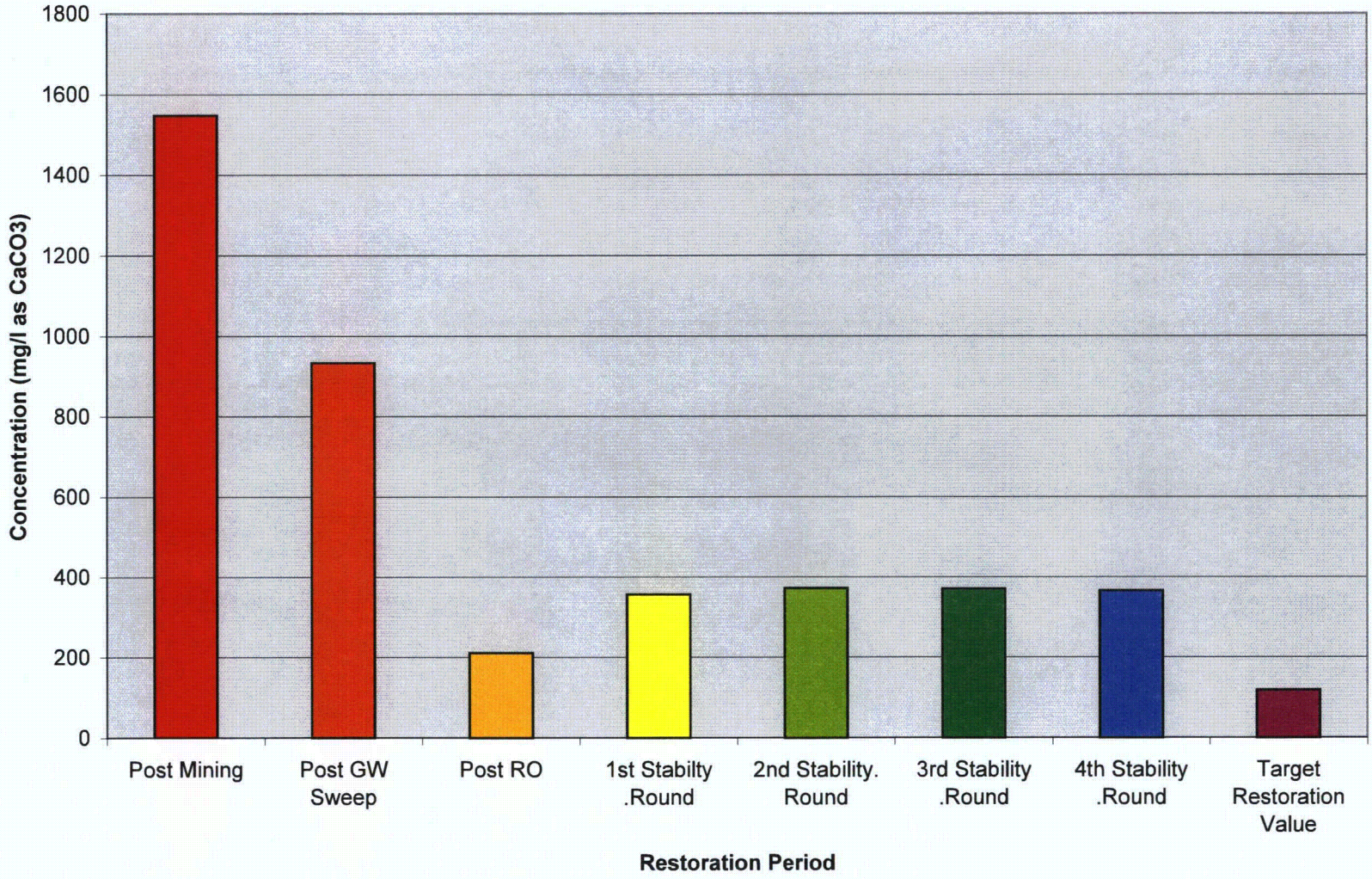


Figure 5-7. Mean Conductivity Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

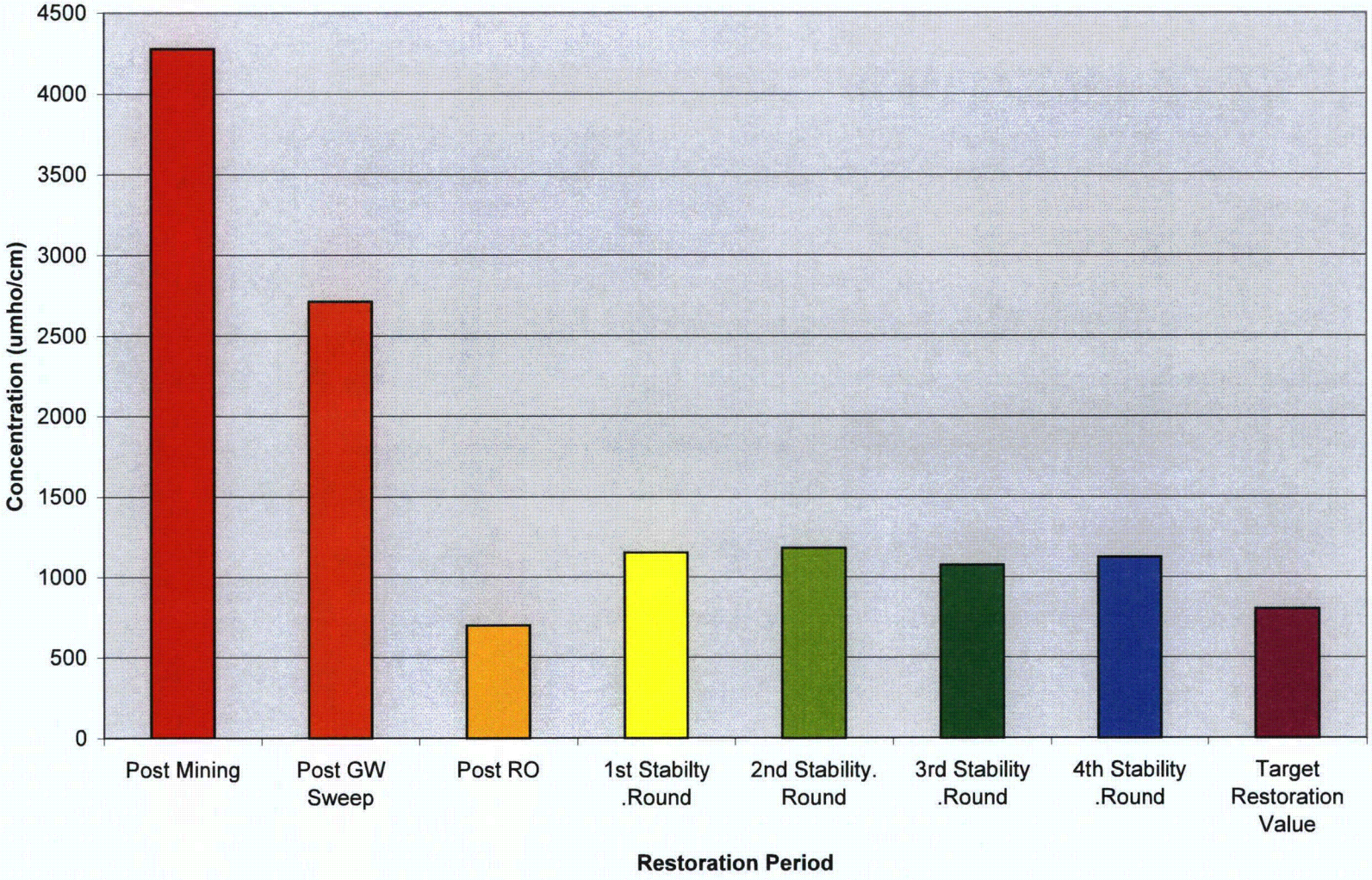


Figure 5-8. Mean Chloride Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

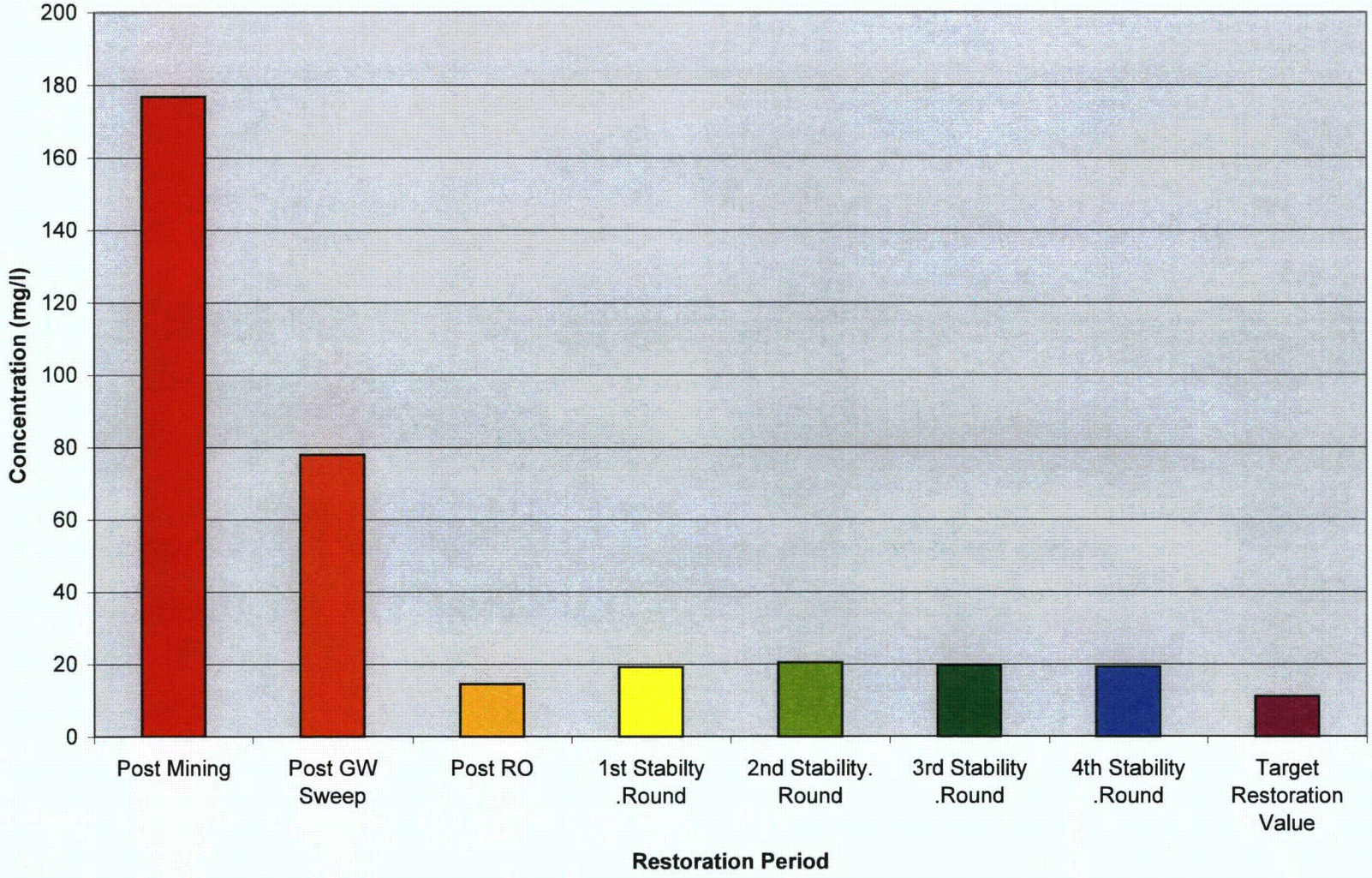


Figure 5-9. Mean Aluminum Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

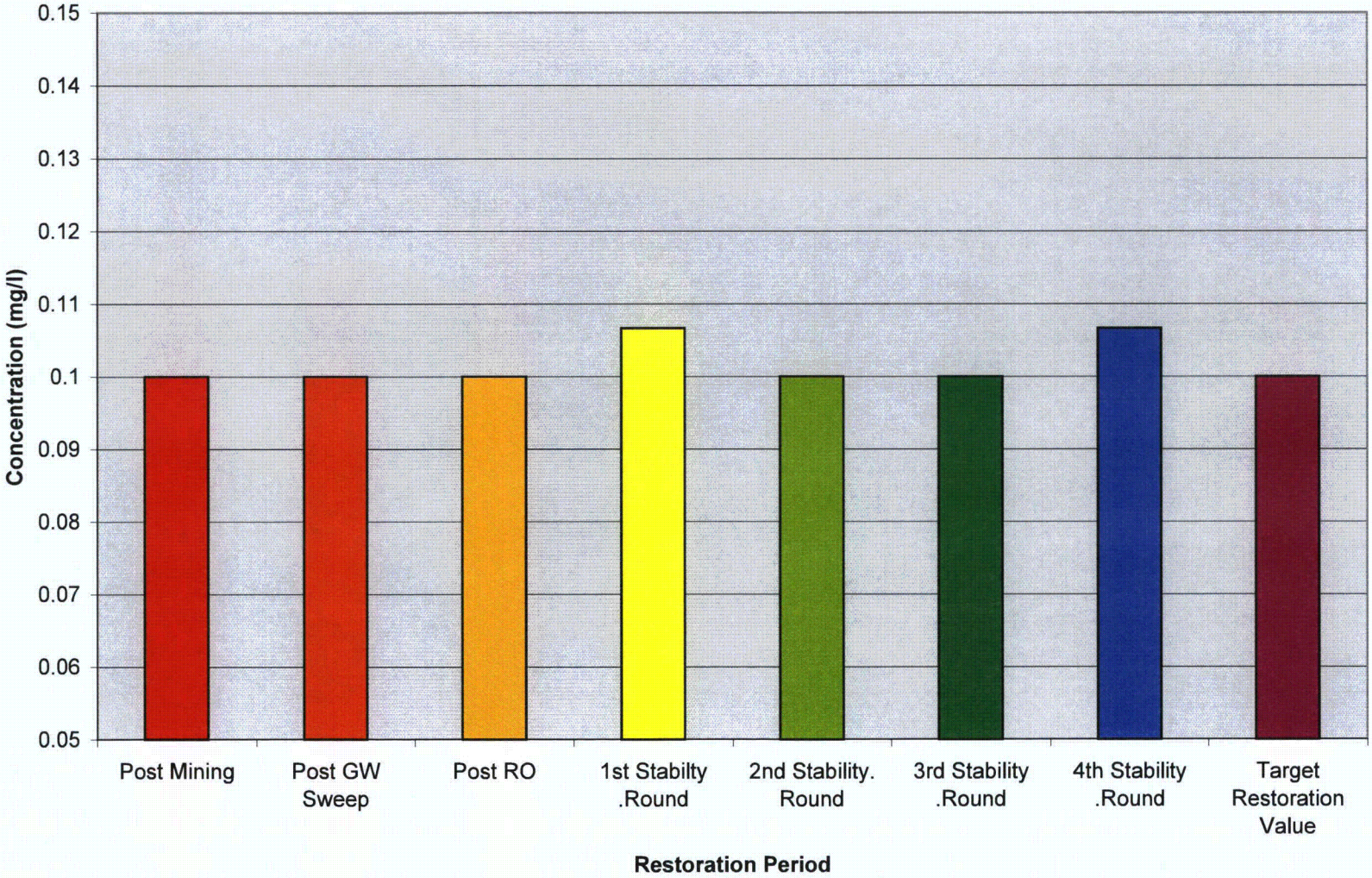


Figure 5-10. Mean Manganese Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

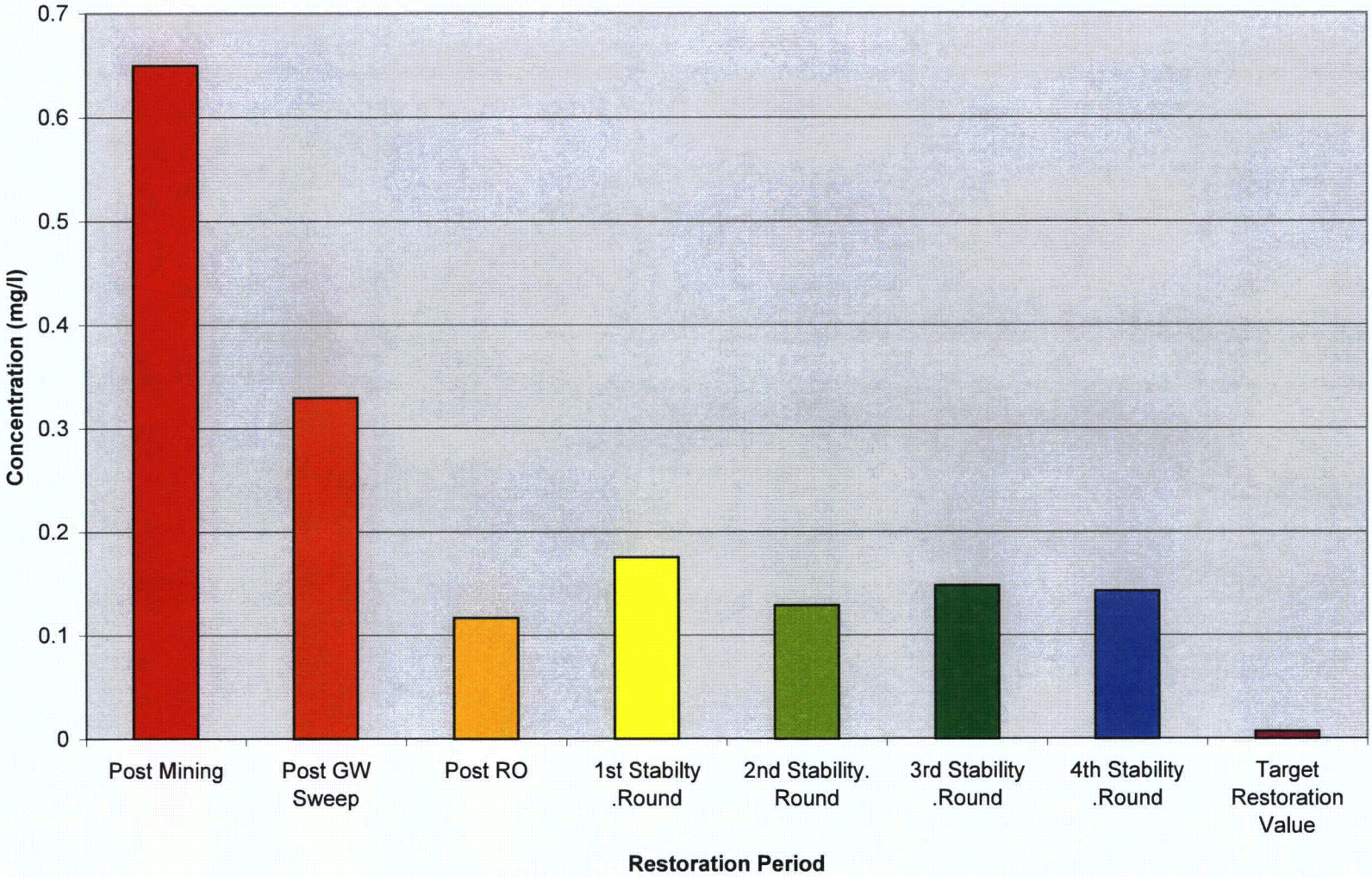


Figure 5-11. Mean Iron Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

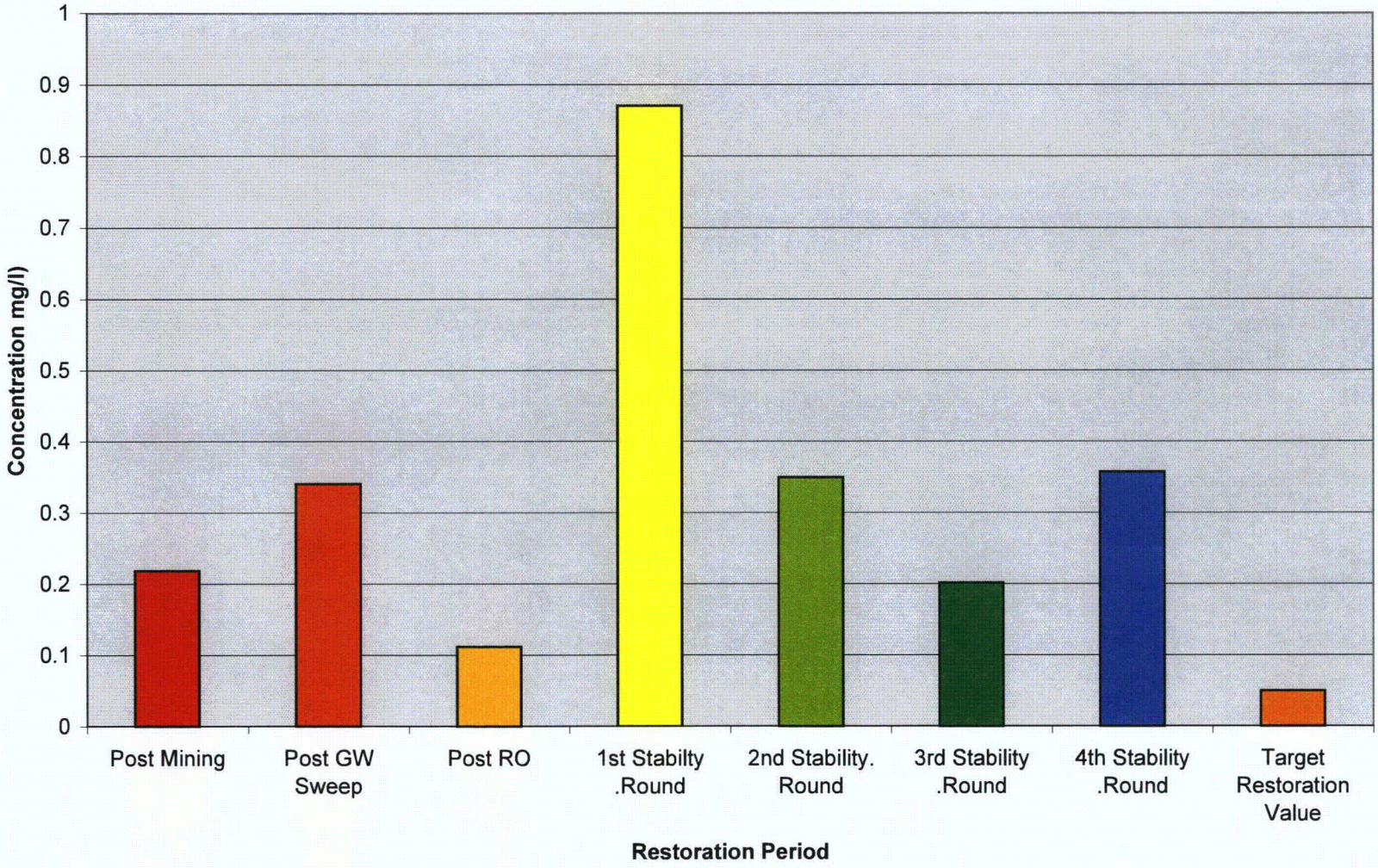


Figure 5-12. Mean Selenium Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

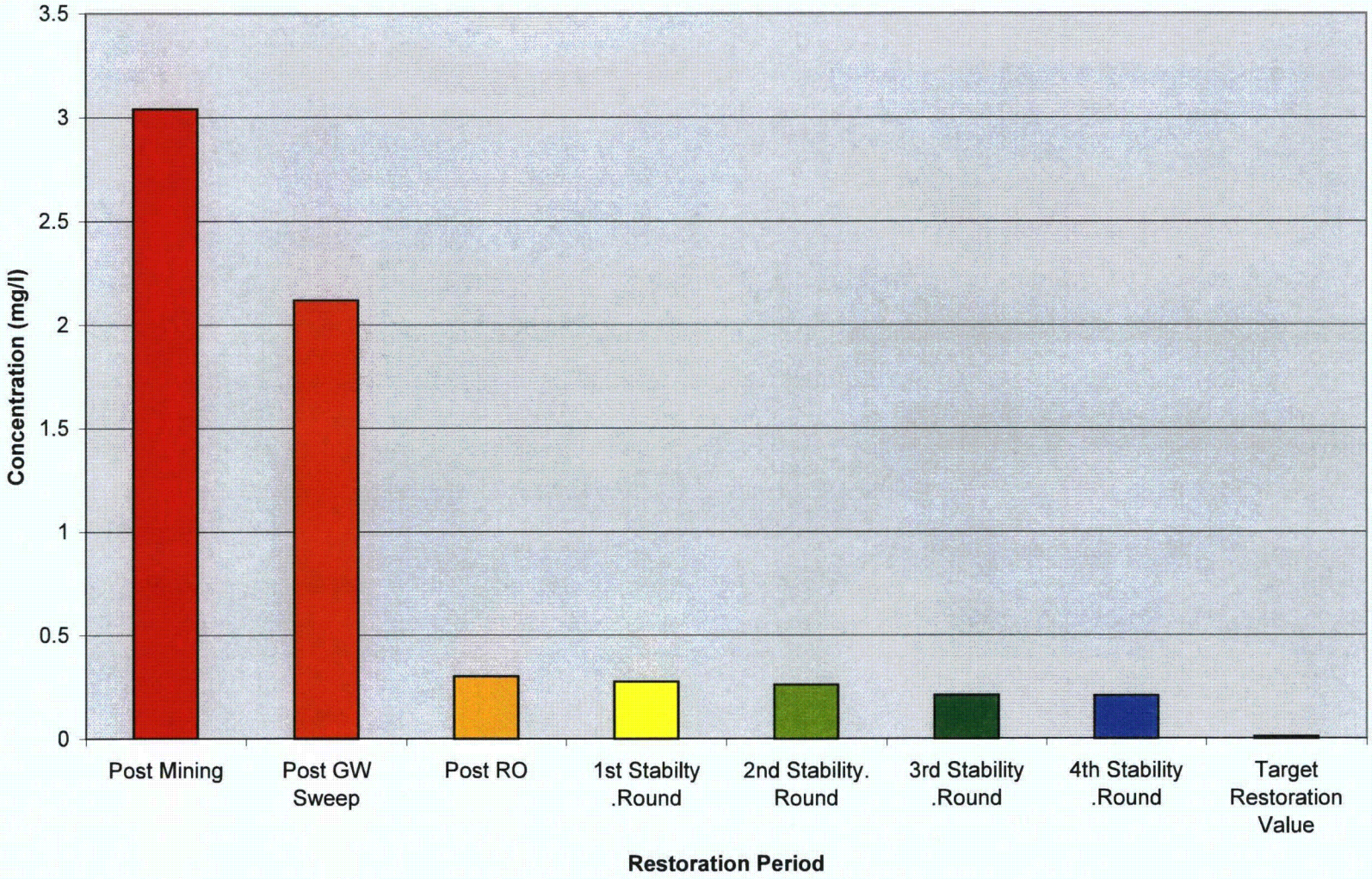


Figure 5-13. Mean Uranium Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

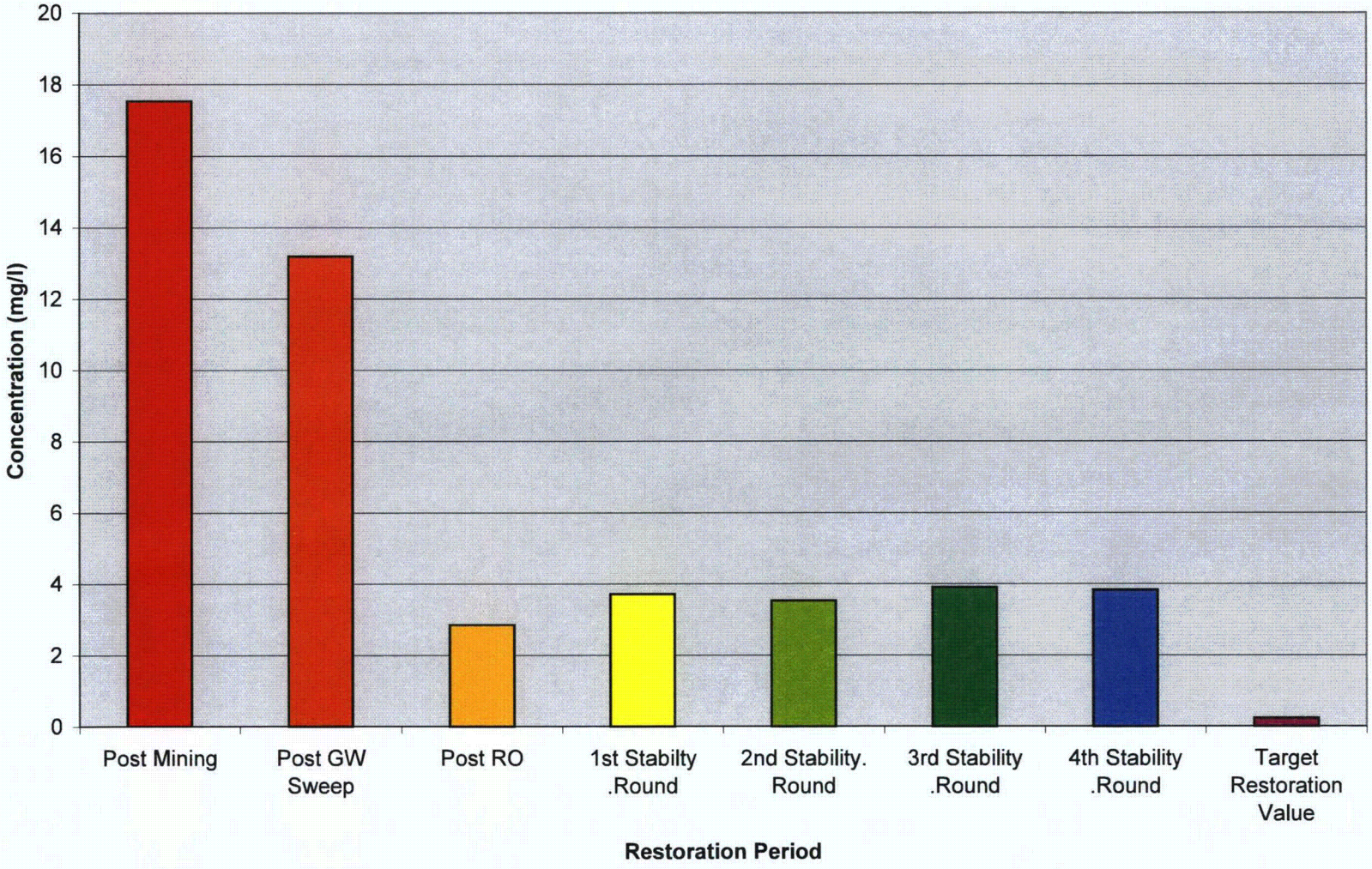


Figure 5-14. Mean Radium-226 Activity-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.

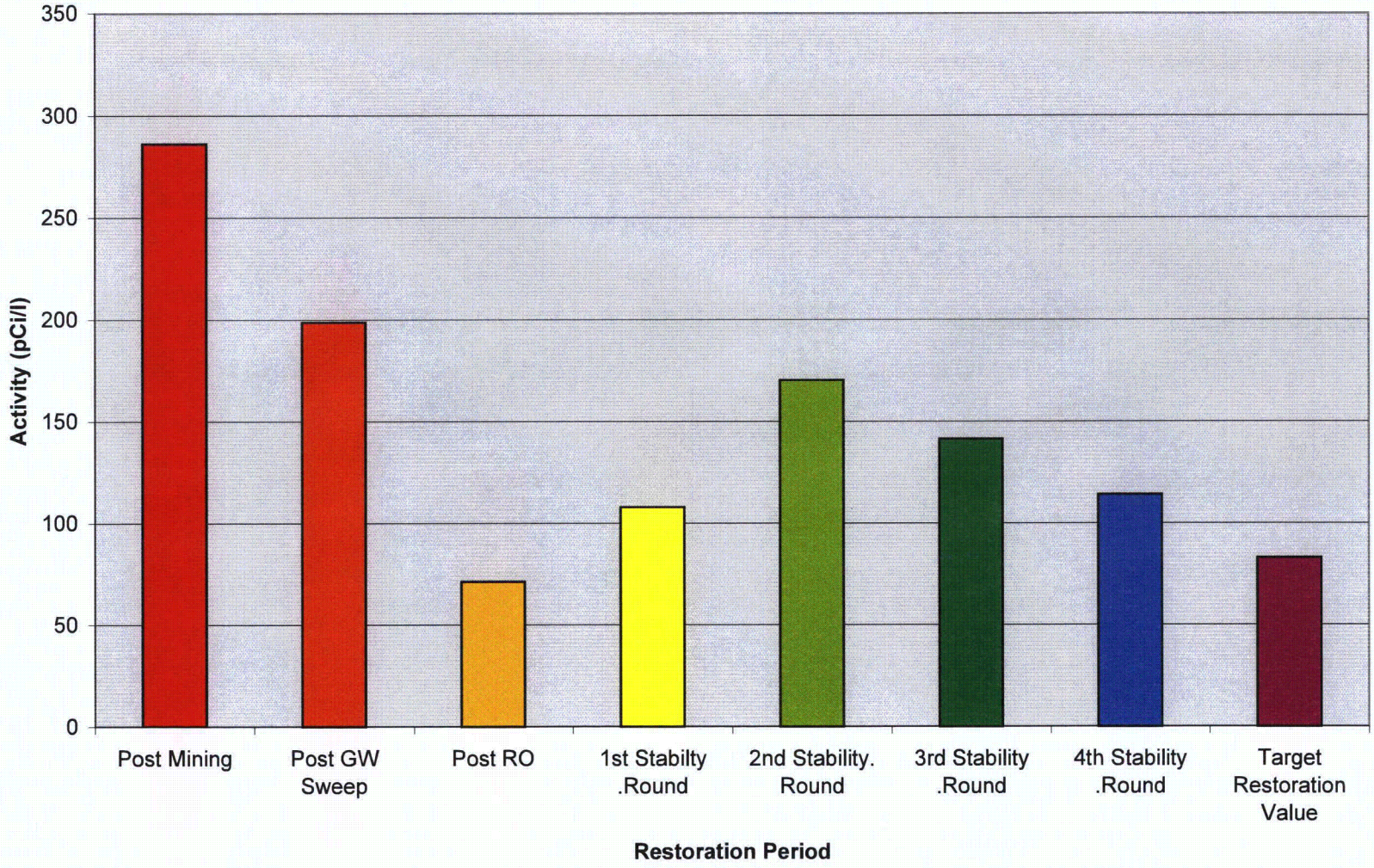
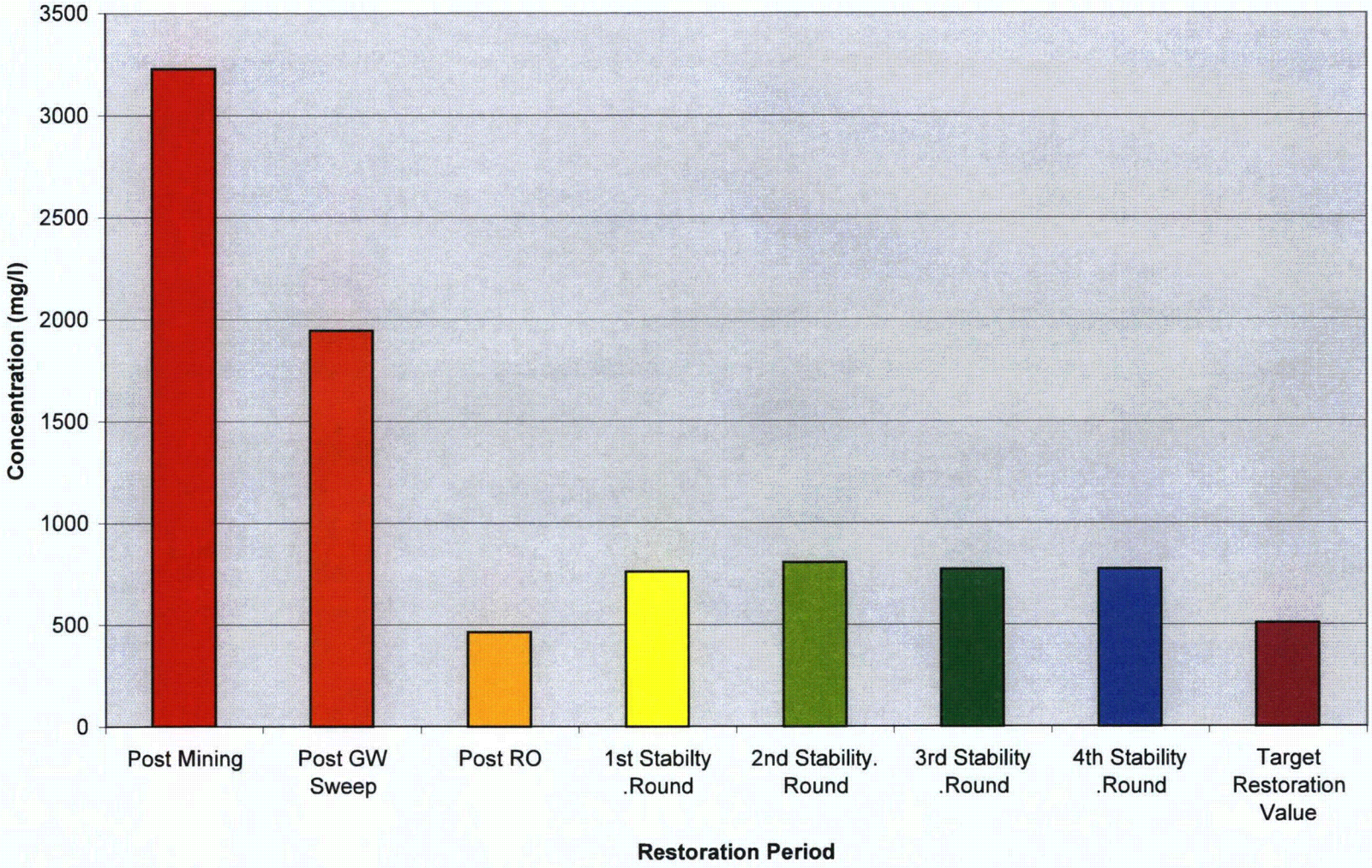


Figure 5-15. Mean TDS Concentration-Post Mining Through 4th Stability Round
Mine Unit 4, Christensen Ranch, Wyoming, Cogema Mining, Inc.



APPENDICES

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - **Stabilization Round # 1** *** These wells sampled with MU 3 stability**

Well I.D.:		4E6-1*	4H7-1*	4-K9-1*	4J26-1	4M40-1	4O58-1	4P74-1	4RM-07	4R96-1
Production Unit:		UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:		10/20/2004	10/20/2004	10/20/2004	4/1/2004	4/1/2004	4/1/2004	4/1/2004	4/1/2004	4/1/2004
Major Ions mg/l:										
Ca		44	6.0	9.0	41.5	43.3	28.8	85.9	25.8	52.8
Mg		9.0	< 1.0	2.0	8.8	9.2	6.1	19.3	4.9	11.1
Na		346	130	141	236	239.0	117	340.0	122.0	204.0
K		5.0	1.0	2.0	4.2	4.2	1.5	5.3	1.5	49.7
CO3			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
HC03		660	121	167	501	514	124	794	105	466
SO4		271	176	184	211	214	218.0	298	234	238
Cl		51.0	7.0	8.0	18.9	19.1	5.7	35.8	3.1	22.6
NH4		< 0.1	0.6	< 0.1	0.1	< 0.1	< 0.05	0.20	< 0.01	< 0.1
NO2 (N)		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.1	< 0.1
NO3 (N)		0.08	< 0.10	< 0.10	0.20	< 0.1	< 0.10	< 0.10	< 0.10	0.1
F		< 0.1	0.2	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
SiO2		15.9	8.5	5.1	6.1	5.7	20.3	10.6	11.1	92.0
TDS		1120	430	470	780	780	470	1190	460	840
Cond. (umho/cm)		1640	675	736	1200	1200	719	1770	705	1270
Alk. (as CaC03)		542	107	137	411	421	102.0	651.0	86.0	382.0
pH (units)		8.3	8.6	8.3	7.9	8.0	7.4	7.7	7.6	7.9
Trace Metals mg/l:										
Al		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
As		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Ba		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
B		0.08	0.05	0.05	0.06	0.05	< 0.05	0.06	< 0.05	0.64
Cd		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04
Cu		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fe		< 0.05	< 0.05	< 0.05	< 0.05	0.05	0.76	2.06	0.24	9.44
Pb		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn		< 0.02	0.02	< 0.02	0.19	0.17	0.21	0.36	0.17	0.85
Hg		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02
Ni		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.005	< 0.01	< 0.01	< 0.01
Se		0.152	< 0.005	0.190	0.52	0.408	< 0.005	< 0.005	0.006	0.352
V		0.43	< 0.02	0.04	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Zn		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:										
U (mg/l)		6.83	0.0149	0.557	3.38	3.45	0.0256	6.09	0.074	3.04
Ra 226		150.6	8.8	19.5	132.1	166.1	157.6	90.5	14.6	106.4
Ra 226+/-		6.2	1.5	2.4	7.9	8.1	8.6	6.2	2.4	6.4
Data Quality										
A/C Balance(+-5)	%	0.48	0.03	0.56	0.11	0.07	2.460	1.360	2.55	1.60
Anions	meq	17.90	6.03	6.81	13.14	13.41	6.73	20.25	6.69	13.25
Cations	meq	18.08	6.02	6.73	13.17	13.43	7.07	20.81	7.04	13.68
TDS Calculated	mg/L	1050	390	430	770	780	440	1180	440	810
TDS Balance (0.80 - 1.20)	dec %	1.066	1.102	1.093	1.01	1.00	1.068	1.008	1.045	1.037

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - **Stabilization Round # 1** *** These wells sampled with MU 3 stability** Replaces 4W104-1

Well I.D.:	4S104-2	4T86-1	4T92-1	4T114-1	4U108-1	4W106-1	Stab. Rnd # 1	Stab. Rnd # 1	Stab. Rnd # 1
Production Unit:	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:	4/1/2004	4/1/2004	4/1/2004	4/1/2004	4/1/2004	4/1/2004	MIN	MAX	MEAN
Major Ions mg/l:									
Ca	17.9	54	23.6	109	24.1	31.4	6	109	39.8
Mg	3.6	11.9	5.8	23.3	5.0	6.9	< 1	23.3	< 8.5
Na	174	259	169	462	177	207.0	117	462	222
K	3	4.8	3.1	8	3.2	3.7	< 1	49.7	< 6.7
CO3	< 1.0	< 1.0	< 0.1	< 1.0	< 1.0	< 1.0	< 0.1	< 1	< 0.9
HC03	258	584	356	976	433	455	105	976	434
SO4	190	236	129	457	92.7	138	92.7	457	219.1
Cl	10.0	24.3	11.3	46.9	8.3	15.7	3.1	51	19.2
NH4	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.01	0.6	< 0.1
NO2 (N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
NO3 (N)	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.08	< 0.2	< 0.11
F	0.2	< 0.1	0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.2	< 0.13
SiO2	5.2	6.2	5.9	8.1	6.0	7.2	5.1	92	14.3
TDS	550	920	530	1670	540	650	430	1670	760
Cond. (umho/cm)	862	1430	847	2360	844	1020	675	2360	1152
Alk. (as CaC03)	212	479	292	800	355	373	86	800	356.7
pH (units)	8.2	8.1	8.2	7.70	8.20	8.20	7.4	8.6	8.02
Trace Metals mg/l:									
Al	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
As	< 0.005	0.006	0.005	< 0.005	0.016	< 0.005	< 0.005	0.016	< 0.006
Ba	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.50
B	0.04	< 0.05	0.05	0.07	0.05	< 0.05	< 0.04	< 0.64	< 0.09
Cd	< 0.002	< 0.002	< 0.002	< 0.005	< 0.002	< 0.002	< 0.002	< 0.005	< 0.002
Cr	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.04	< 0.01
Cu	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Fe	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	9.44	< 0.87
Pb	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn	< 0.02	0.15	0.05	0.31	0.03	0.06	0.02	0.85	0.18
Hg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.0
Ni	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.005	< 0.01	< 0.01
Se	0.434	0.367	0.365	0.229	0.694	0.398	< 0.005	0.694	< 0.275
V	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.1	< 0.02	0.43	< 0.12
Zn	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:									
U (mg/l)	1.32	2.55	2.75	17.1	5.40	3.14	0.01	17.1	3.71
Ra 226	7.2	71.4	106.2	200.1	142.8	243.8	7.2	243.8	107.8
Ra 226+/-	1.8	5.6	6.8	9.4	7.8	9.7	1.5	9.7	6.1
Data Quality									
A/C Balance(+-5)	2.02	0.33	1.34	1.47	0.70	2.090	0.03	2.55	1.1
Anions	8.49	15.16	8.85	26.86	9.26	10.77	6.03	26.86	12.2
Cations	8.84	15.06	9.09	27.66	9.39	11.23	6.02	27.66	12.5
TDS Calculated	530	880	520	1590	520	630	390	1590	730.7
TDS Balance (0.80 - 1.20)	1.037	1.045	1.019	1.05	1.038	1.031	1	1.102	1.0

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

Ore Zone Baseline Well

Groundwater Quality - ***Stabilization Round # 2*** **** These wells sampled with MU 3 stability***

Well I.D.:		4E6-1*	4H7-1*	4-K9-1*	4J26-1	4M40-1	4O58-1	4P74-1	4RM-07	4R96-1
Production Unit:		UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:		1/26/2005	1/26/2005	1/26/2005	6/29/2004	6/29/2004	6/29/2004	6/29/2004	6/29/2004	6/29/2004
Major Ions mg/l:										
Ca		48	8.0	14.0	40.3	42.9	30.2	96.4	23.9	64.4
Mg		9.0	1.0	2.0	8.7	9.2	6.3	22.3	4.5	13.5
Na		374	129	143	247	252.0	116	357.0	129.0	294.0
K		6.0	2.0	3.0	4.1	4.2	1.5	5.8	1.5	5.2
CO3		< 1.0	5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
HC03		682	117	170	499	515	129	810	140	557
SO4		277	182	187	192	213	231.0	314	223	291
Cl		52.0	7.0	9.0	19.6	22.0	4.7	40.4	4.2	28.9
NH4		0.1	0.5	0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.01	< 0.1
NO2 (N)		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.1	< 0.1
NO3 (N)		< 0.05	< 0.10	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F		< 0.1	0.2	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
SiO2		17.2	8.9	5.4	5.9	5.6	20.3	12.5	12.6	10.1
TDS		1290	420	480	770	800	470	1360	460	980
Cond. (umho/cm)		1680	625	690	1180	1220	705	1890	695	1450
Alk. (as CaC03)		559	104	139	409	422	106.0	664.0	115.0	457.0
pH (units)		8.3	8.6	8.2	7.9	8.0	7.1	7.5	7.3	7.7
Trace Metals mg/l:										
Al		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As		0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Ba		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
B		0.08	0.04	0.04	0.13	0.14	0.11	0.13	0.16	0.13
Cd		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cu		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fe		< 0.05	< 0.05	< 0.05	0.08	< 0.05	0.62	1.51	0.20	2.33
Pb		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn		< 0.02	< 0.02	< 0.02	0.18	0.14	0.23	0.31	0.14	0.11
Hg		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02
Ni		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se		0.096	< 0.005	0.282	0.520	0.391	< 0.005	< 0.005	< 0.005	0.029
V		0.41	< 0.02	0.06	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Zn		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:										
U (mg/l)		5.63	0.0197	0.864	3.30	4.22	0.0106	5.31	0.0823	3.50
Ra 226		184.7	11.9	19.4	165	168	158	81.8	8.9	217
Ra 226+/-		7.4	1.8	2.3	8.9	9.1	8.9	6.3	2.2	10
Data Quality										
A/C Balance(+-5)	%	3.11	0.45	1.8	3.12	1.64	0.49	3.16	0.84	3.73
Anions	meq	18.41	6.09	6.91	12.74	13.50	7.07	20.96	7.07	16.00
Cations	meq	19.59	6.15	7.17	13.56	13.95	7.14	22.33	7.19	17.24
TDS Calculated	mg/L	1100	390	440	760	800	450	1230	460	970
TDS Balance (0.80 - 1.20)	dec %	1.173	1.077	1.091	1.013	1.000	1.044	1.105	1.000	1.010

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

Ore Zone Baseline Well

Groundwater Quality - ***Stabilization Round # 2*** **** These wells sampled with MU 3 stability*** *Replaces 4W104-1*

Well I.D.:	4S104-2	4T86-1	4T92-1	4T114-1	4U108-1	4W106-1	Stab. Rnd # 2	Stab. Rnd # 2	Stab. Rnd # 2
Production Unit:	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:	6/29/2004	6/29/2004	6/29/2004	6/29/2004	6/29/2004	6/29/2004	MIN	MAX	MEAN
Major Ions mg/l:									
Ca	17.5	60.7	20.6	113	29.7	30.8	8	113	42.7
Mg	3.4	13.8	4.6	23.6	6.1	6.8	< 1	23.6	< 9.0
Na	175	315	161	494	210	220.0	116	494	241
K	3.0	5.5	2.5	8.2	3.6	3.7	< 1.5	8.2	< 4.0
CO3	< 1.0	< 1.0	< 0.1	< 1.0	< 1.0	< 1.0	< 0.1	< 5	< 1.2
HC03	253	641	336	997	483	470	117	997	453
SO4	210	258	126	444	108	131	108	444	225.8
Cl	10.3	27.1	9.8	45.3	10.3	15.9	4.2	52	20.4
NH4	0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.01	0.5	< 0.1
NO2 (N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
NO3 (N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.1	< 0.10
F	0.2	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.2	< 0.12
SiO2	5.6	6.6	6.1	8.6	6.8	7.3	5.4	20.3	9.3
TDS	550	1040	500	1680	620	660	420	1680	805
Cond. (umho/cm)	838	1580	770	2380	954	1050	625	2380	1180
Alk. (as CaC03)	207	526	275	818	396	385	104	818	372.1
pH (units)	8.2	7.8	8.1	7.60	8.00	8.00	7.1	8.6	7.89
Trace Metals mg/l:									
Al	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As	0.007	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	< 0.005
Ba	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.50
B	0.16	0.12	0.14	0.14	0.12	0.11	< 0.04	< 0.16	< 0.12
Cd	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cu	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Fe	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	2.33	< 0.35
Pb	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn	0.02	0.18	0.04	0.41	0.04	0.07	0.02	0.41	0.13
Hg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.0
Ni	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.457	0.596	0.294	0.027	0.589	0.612	< 0.005	0.612	< 0.261
V	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.2	< 0.02	0.41	< 0.13
Zn	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:									
U (mg/l)	1.36	3.19	2.55	12.0	6.54	4.31	0.01	12	3.53
Ra 226	7.9	161.0	127.0	508	271	464	7.9	508	170.2
Ra 226+/-	2.1	9.1	7.9	16	11	15	1.8	16	7.9
Data Quality									
A/C Balance(+-5)	0.28	3.89	0.47	4.28	3.46	3.80	0.28	4.28	2.3
Anions	8.82	16.66	8.40	26.87	10.45	10.88	6.09	26.87	12.7
Cations	8.87	18.01	8.48	29.27	11.20	11.74	6.15	29.27	13.5
TDS Calculated	540	1000	490	1620	600	640	390	1620	766.0
TDS Balance (0.80 - 1.20)	1.018	1.040	1.020	1.037	1.033	1.031	1	1.173	1.0

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - **Stabilization Round # 3** *** These wells sampled with MU 3 stability**

Well I.D.:		4E6-1*	4H7-1*	4-K9-1*	4J26-1	4M40-1	4O58-1	4P74-1	4RM-07	4R96-1
Production Unit:		UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:		4/26/2005	4/26/2005	4/26/2005	9/28/2004	9/28/2004	9/28/2004	9/28/2004	9/28/2004	9/28/2004
Major Ions mg/l:										
Ca		47	8.0	15.0	37	45	28	101	25	61
Mg		9.0	1.0	2.0	8.0	10.0	6.0	23.0	4.0	12.0
Na		362	133	150	202	223.0	105	335.0	120.0	249.0
K		6.0	2.0	3.0	4.0	4.0	1.0	5.0	1.0	5.0
CO3		< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
HC03		699	121	172	447	503	131	839	150	544
SO4		273	185	208	166	181	204.0	318	191	238
Cl		48.0	8.0	9.0	17.0	18.0	4.0	42.0	5.0	26.0
NH4		0.3	0.5	0.2	< 0.1	0.2	0.1	0.02	0.1	0.2
NO2 (N)		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.1	< 0.1
NO3 (N)		< 0.05	< 0.1	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F		< 0.1	0.2	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
SiO2		17.6	9.3	5.6	5.9	5.8	16.4	11.6	12.4	10.6
TDS		1160	410	470	700	770	440	1320	460	910
Cond. (umho/cm)		1660	629	692	984	1100	629	1690	677	1240
Alk. (as CaC03)		573	104	141	366	412	107.0	687.0	123.0	446.0
pH (units)		8.1	8.5	8.2	8.2	8.2	7.6	7.9	7.8	7.9
Trace Metals mg/l:										
Al		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As		< 0.005	< 0.005	< 0.005	0.009	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Ba		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
B		0.08	< 0.03	< 0.03	0.05	0.05	0.05	0.06	0.06	0.07
Cd		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cu		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fe		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.27	0.43	0.19	1.58
Pb		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn		< 0.02	< 0.02	< 0.02	0.14	0.14	0.22	0.34	0.15	0.11
Hg		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02
Ni		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se		0.065	< 0.005	0.334	0.558	0.285	0.078	< 0.005	0.007	< 0.005
V		0.31	< 0.02	0.07	0.04	0.03	< 0.1	< 0.1	< 0.1	< 0.1
Zn		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:										
U (mg/l)		5.20	0.0190	1.09	4.49	5.18	0.499	2.68	0.157	5.08
Ra 226		215.0	13.6	17.1	136.4	206.7	114	80.8	13	148.4
Ra 226+/-		7.6	1.9	2.2	6.6	8	6.1	4.9	2	7
Data Quality										
A/C Balance(+-5)	%	1.38	1.47	0.54	0.40	1.19	0.17	0.14	1.92	1.29
Anions	meq	18.47	6.15	7.41	11.26	12.53	6.5	21.56	6.58	14.61
Cations	meq	18.99	6.33	7.49	11.35	12.83	6.47	21.62	6.83	15.00
TDS Calculated	mg/L	1090	400	470	650	730	410	1240	420	860
TDS Balance (0.80 - 1.20)	dec %	1.064	1.025	1.000	1.077	1.055	1.073	1.064	1.095	1.058

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - **Stabilization Round # 3** *** These wells sampled with MU 3 stability**

Well I.D.:	4S104-2	4T86-1	4T92-1	4T114-1	4U108-1	4W106-1	Stab. Rnd # 3	Stab. Rnd # 3	Stab. Rnd # 3
Production Unit:	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:	9/28/2004	9/28/2004	9/28/2004	9/28/2004	9/28/2004	9/28/2004	MIN	MAX	MEAN
Major Ions mg/l:									
Ca	18	68	21	116	36	35.0	8	116	44.1
Mg	3	15	5	24	7.0	8.0	< 1	24	< 9.1
Na	162	292	142	428	198	207.0	105	428	221
K	3.0	5	3	8	4	4.0	< 1	8	< 3.9
CO3	< 1.0	< 1.0	< 0.1	< 1.0	< 1.0	< 1.0	< 0.1	< 5	< 1.5
HC03	243	652	317	979	511	474	121	979	452
SO4	187	274	109	426	116	125	109	426	213.4
Cl	10.0	28.0	9	43	11	16	4	48	19.6
NH4	< 0.1	0.2	0.1	0.2	0.1	0.1	< 0.02	0.5	< 0.2
NO2 (N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
NO3 (N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.1	< 0.10
F	0.2	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.2	< 0.12
SiO2	5.7	7.2	6.3	8.9	7.3	8.1	5.6	17.6	9.2
TDS	540	970	480	1620	670	660	410	1620	772
Cond. (umho/cm)	797	1420	715	1970	950	954	629	1970	1074
Alk. (as CaC03)	199	535	260	802	419	388	104	802	370.8
pH (units)	8.2	8.0	8.2	7.9	8.1	8.2	7.6	8.5	8.07
Trace Metals mg/l:									
Al	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As	< 0.005	< 0.005	< 0.005	< 0.005	0.011	< 0.005	< 0.005	0.011	< 0.006
Ba	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.50
B	0.04	0.06	0.05	0.09	0.06	0.06	< 0.03	< 0.09	< 0.06
Cd	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.02	< 0.01
Cu	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Fe	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	1.58	< 0.20
Pb	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn	0.04	0.21	0.05	0.62	0.05	0.09	0.02	0.62	0.15
Hg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.0
Ni	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.02	< 0.01
Se	0.330	0.357	0.235	0.029	0.568	0.284	< 0.005	0.568	< 0.210
V	< 0.1	0.04	0.03	0.05	0.18	0.10	< 0.02	0.31	< 0.09
Zn	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:									
U (mg/l)	1.05	2.01	2.05	15.6	7.60	5.91	0.02	15.6	3.91
Ra 226	17.5	105.5	122.4	437	138.5	353	13	437	141.3
Ra 226+/-	2.3	5.8	6.2	12	6.5	11	1.9	12	6.0
Data Quality									
A/C Balance(+-5)	0.88	0.72	0.49	0.77	0.18	2.93	0.14	2.93	1.0
Anions	8.16	17.19	7.73	26.11	11.11	10.81	6.15	26.11	12.4
Cations	8.30	17.44	7.65	26.52	11.07	11.46	6.33	26.52	12.6
TDS Calculated	500	1000	440	1520	620	630	400	1520	732.0
TDS Balance (0.80 - 1.20)	1.08	0.970	1.091	1.066	1.081	1.048	0.97	1.095	1.1

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

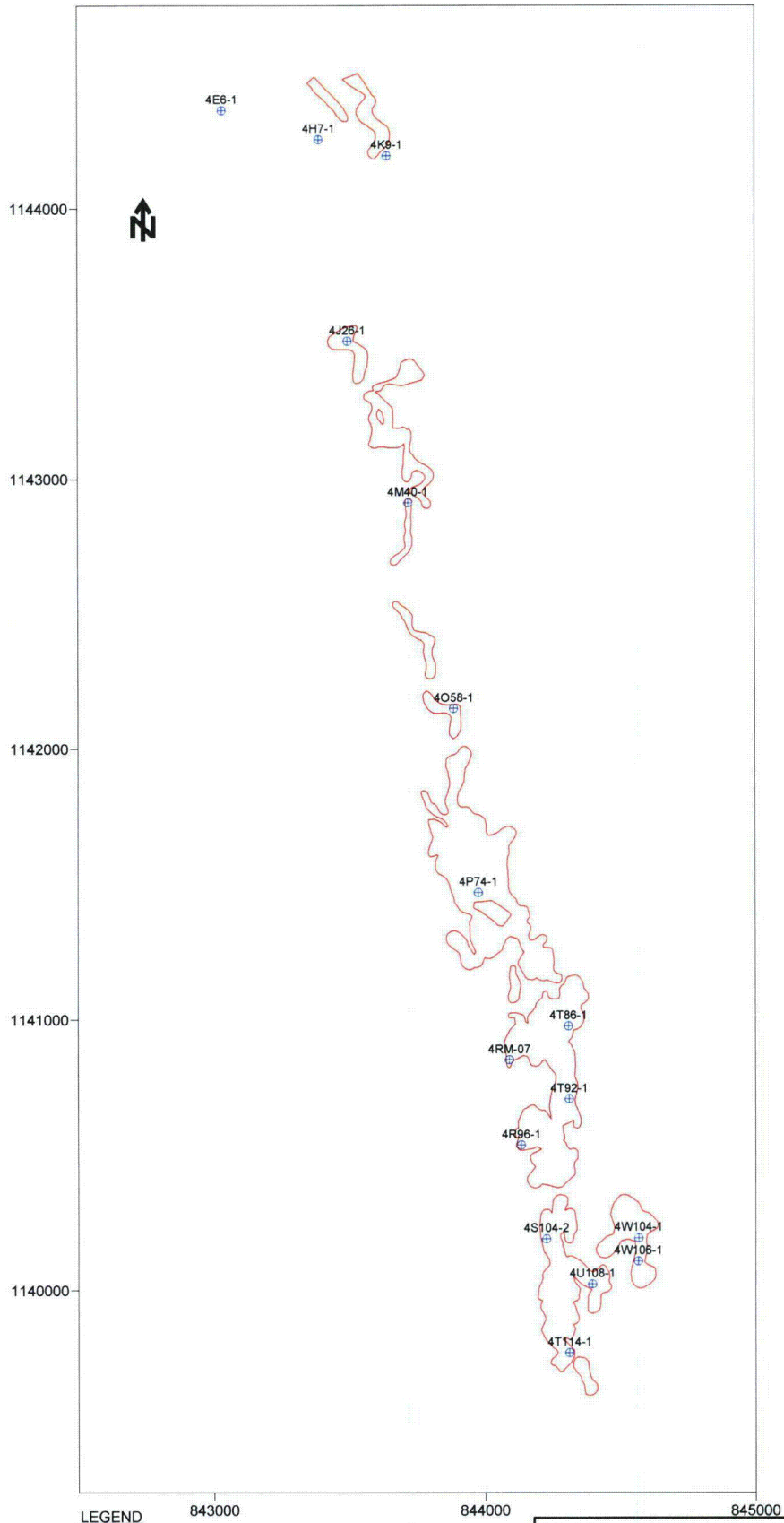
Ore Zone Baseline Well
Groundwater Quality - **Stabilization Round # 4** *** These wells sampled with MU 3 stability**

Well I.D.:		4E6-1*	4H7-1*	4-K9-1*	4J26-1	4M40-1	4O58-1	4P74-1	4RM-07	4R96-1
Production Unit:		UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:		7/27/2005	7/25/2005	7/25/2005	1/3/2005	1/3/2005	1/3/2005	1/3/2005	1/3/2005	1/3/2005
Major Ions mg/l:										
Ca		49	8.0	13	36	43	26	102	24	52
Mg		9.0	1.0	2.0	8.0	9.0	6.0	23.0	5.0	11.0
Na		380	131	141	214	226.0	100	354.0	125.0	241.0
K		7.0	2.0	3.0	3.0	4.0	1.0	5.0	2.0	4.0
CO3		< 5.0	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
HC03		700	116	167	434	485	134	819	176	510
SO4		276	180	184	160	184	171.0	341	188	211
Cl		43	6.0	8.0	16.0	19.0	4.0	45.0	6.0	24.0
NH4		< 0.1	0.3	< 0.1	0.1	0.2	0.1	0.3	0.2	0.2
NO2 (N)		< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.10	< 0.1	< 0.1
NO3 (N)		0.43	< 0.05	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F		< 0.1	0.2	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
SiO2		17.9	9.2	5.4	5.7	5.4	19	12.0	11.6	10.1
TDS		1150	400	450	680	770	410	1360	460	840
Cond. (umho/cm)		1670	648	716	988	1130	587	1910	689	1220
Alk. (as CaC03)		574	103	137	356	398	110.0	671.0	144.0	418.0
pH (units)		8.1	8.6	8.2	8.1	8.1	7.3	7.7	7.7	8.2
Trace Metals mg/l:										
Al		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As		< 0.005	< 0.005	0.007	< 0.005	< 0.005	< 0.005	0.005	< 0.005	0.005
Ba		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
B		0.08	< 0.03	< 0.03	0.06	0.06	0.06	0.07	0.06	0.07
Cd		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cu		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fe		0.460	< 0.05	< 0.05	0.07	< 0.05	0.32	1.33	0.27	2.20
Pb		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn		< 0.02	< 0.02	< 0.02	0.12	0.12	0.19	0.31	0.14	0.08
Hg		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	< 0.02	< 0.02
Ni		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se		0.010	< 0.005	0.328	0.508	0.369	0.006	0.005	0.007	0.005
V		0.15	< 0.02	0.06	0.05	0.05	< 0.1	0.04	< 0.1	< 0.1
Zn		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:										
U (mg/l)		4.96	0.0202	1.03	3.39	5.29	0.009	2.79	0.157	3.32
Ra 226		301.9	12.6	19.4	89.0	94.7	89.3	78.9	9.2	100
Ra 226+/-		9.1	1.9	2.3	4.6	4.8	4.7	4.3	1.5	4.7
Data Quality										
A/C Balance(+-5)	%	3.72	2.03	1.77	3.87	1.97	1.91	1.69	0.60	2.35
Anions	meq	18.48	5.99	6.78	10.9	12.32	5.87	21.79	6.97	13.43
Cations	meq	19.91	6.24	7.03	11.77	12.82	6.1	22.54	7.06	14.08
TDS Calculated	mg/L	1110	390	430	650	720	370	1270	440	790
TDS Balance (0.80 - 1.20)	dec %	1.036	1.025	1.046	1.046	1.069	1.108	1.071	1.045	1.063

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 4, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - **Stabilization Round # 4** *** These wells sampled with MU 3 stability** Replaces 4W104-1

Well I.D.:	4S104-2	4T86-1	4T92-1	4T114-1	4U108-1	4W106-1	Stab. Rnd # 4	Stab. Rnd # 4	Stab. Rnd # 4
Production Unit:	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4	UNIT 4
Sample Date:	1/3/2005	1/3/2005	1/3/2005	1/3/2005	1/3/2005	1/3/2005	MIN	MAX	MEAN
Major Ions mg/l:									
Ca	17	69	19	112	39	32.0	8	112	42.7
Mg	3	16	5	24	8.0	7.0	1	24	9.1
Na	163	315	143	448	216	202.0	100	448	227
K	3.0	5	2	6	4	3.0	< 1	7	3.6
CO3	< 1.0	< 1.0	< 0.1	< 1.0	< 1.0	< 1.0	< 0.1	< 5	1.7
HC03	240	651	306	957	530	472	116	957	446
SO4	189	284	104	432	128	125	104	432	210.5
Cl	10.0	29.0	8	42	13	16	4	45	19.3
NH4	0.2	0.2	0.2	0.4	0.2	0.2	< 0.1	0.4	0.2
NO2 (N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1
NO3 (N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.43	0.12
F	0.2	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.2	0.12
SiO2	5.6	7.2	6.2	8.8	7.3	7.4	5.4	19	9.3
TDS	540	1110	470	1600	720	660	400	1600	775
Cond. (umho/cm)	809	1570	698	2210	1050	973	587	2210	1125
Alk. (as CaC03)	196	533	251	784	434	387	103	784	366.4
pH (units)	8.2	7.9	8.1	7.8	8.0	8.1	7.3	8.6	8.01
Trace Metals mg/l:									
Al	< 0.1	< 0.1	< 0.1	0.2	0.1	< 0.1	< 0.1	< 0.2	< 0.1
As	0.006	< 0.005	0.008	< 0.005	0.011	< 0.005	< 0.005	0.011	0.006
Ba	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.50
B	0.04	0.07	0.06	0.09	0.06	0.06	< 0.03	< 0.09	< 0.06
Cd	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Cr	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cu	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Fe	< 0.05	< 0.05	< 0.05	0.31	< 0.05	< 0.05	< 0.05	2.2	0.36
Pb	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mn	0.05	0.21	0.04	0.68	0.06	0.08	0.02	0.68	0.14
Hg	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mo	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.01	< 0.02	0.0
Ni	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Se	0.460	0.272	0.279	0.011	0.512	0.340	< 0.005	0.512	0.208
V	0.03	0.04	0.04	0.03	0.18	0.13	< 0.02	0.18	0.07
Zn	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Radiometric pCi/l:									
U (mg/l)	1.72	1.94	2.74	16.0	7.84	6.17	0.01	16	3.83
Ra 226	10.9	61.5	88.0	331.6	181	242.9	9.2	331.6	114.1
Ra 226+/-	1.6	3.8	4.6	8.8	6.4	7.7	1.5	9.1	4.7
Data Quality									
A/C Balance(+-5)	0.94	3.22	1.04	2.56	1.46	1.26	0.6	3.87	2.0
Anions	8.15	17.40	7.41	25.87	11.70	10.79	5.87	25.87	12.3
Cations	8.31	18.57	7.57	27.23	12.05	11.07	6.1	27.23	12.8
TDS Calculated	500	1040	430	1540	670	620	370	1540	731.3
TDS Balance (0.80 - 1.20)	1.08	1.067	1.093	1.039	1.075	1.064	1.025	1.108	1.1



LEGEND

4T114-1 Designated Restoration Well

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-1
LOCATION OF DESIGNATED RESTORATION WELLS
MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-1MU4.SRF	BY: EPL CHECKED: HPD

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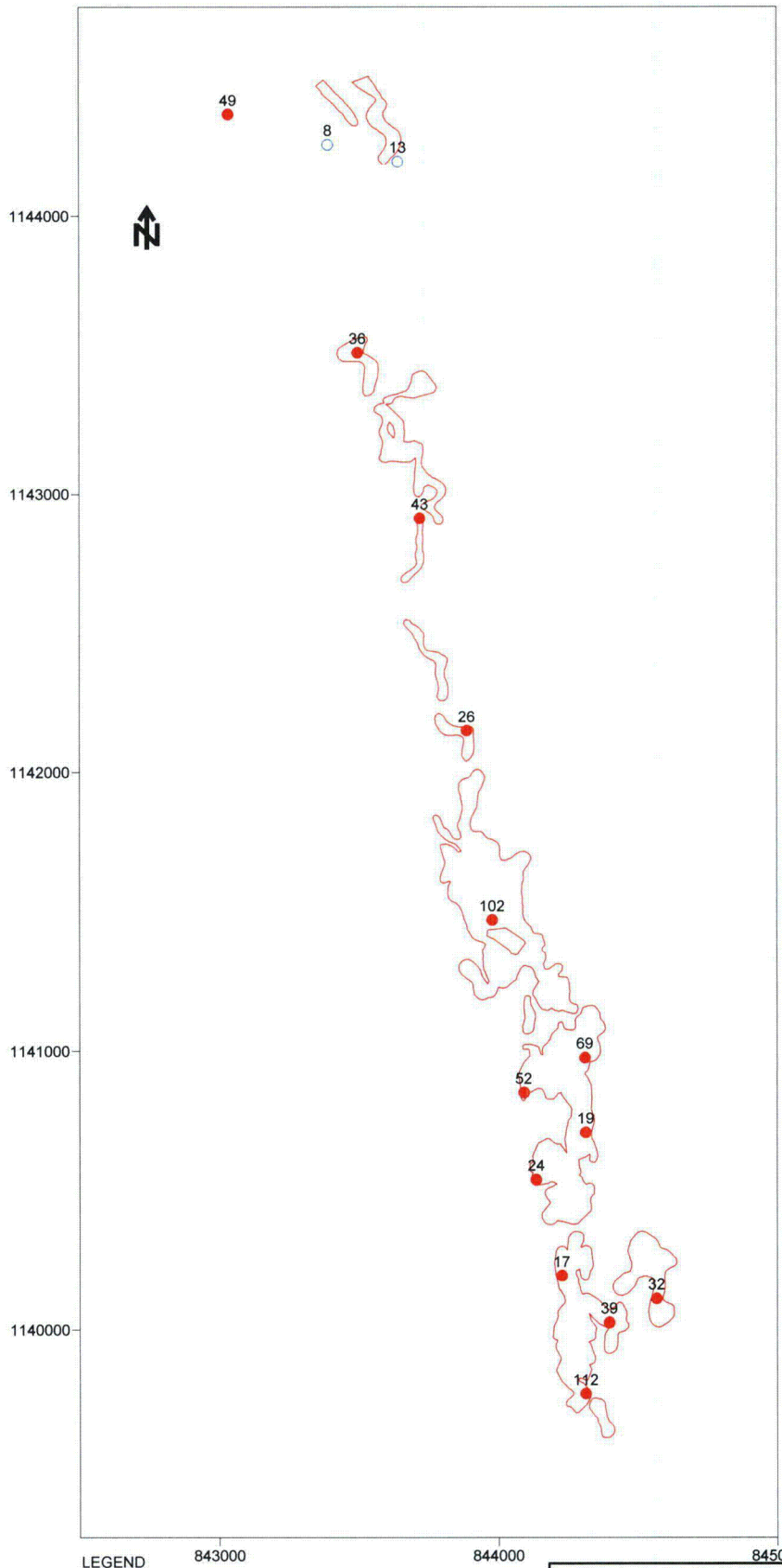

LEGEND

Calcium Concentration (mg/l)

- 0 to 14.5
- 14.5 to 120

Target Restoration Value for Calcium is 14.5 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-2
CALCIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG: COGEMAFIGA-2MU4.SRF	BY: EPL CHECKED: HPD

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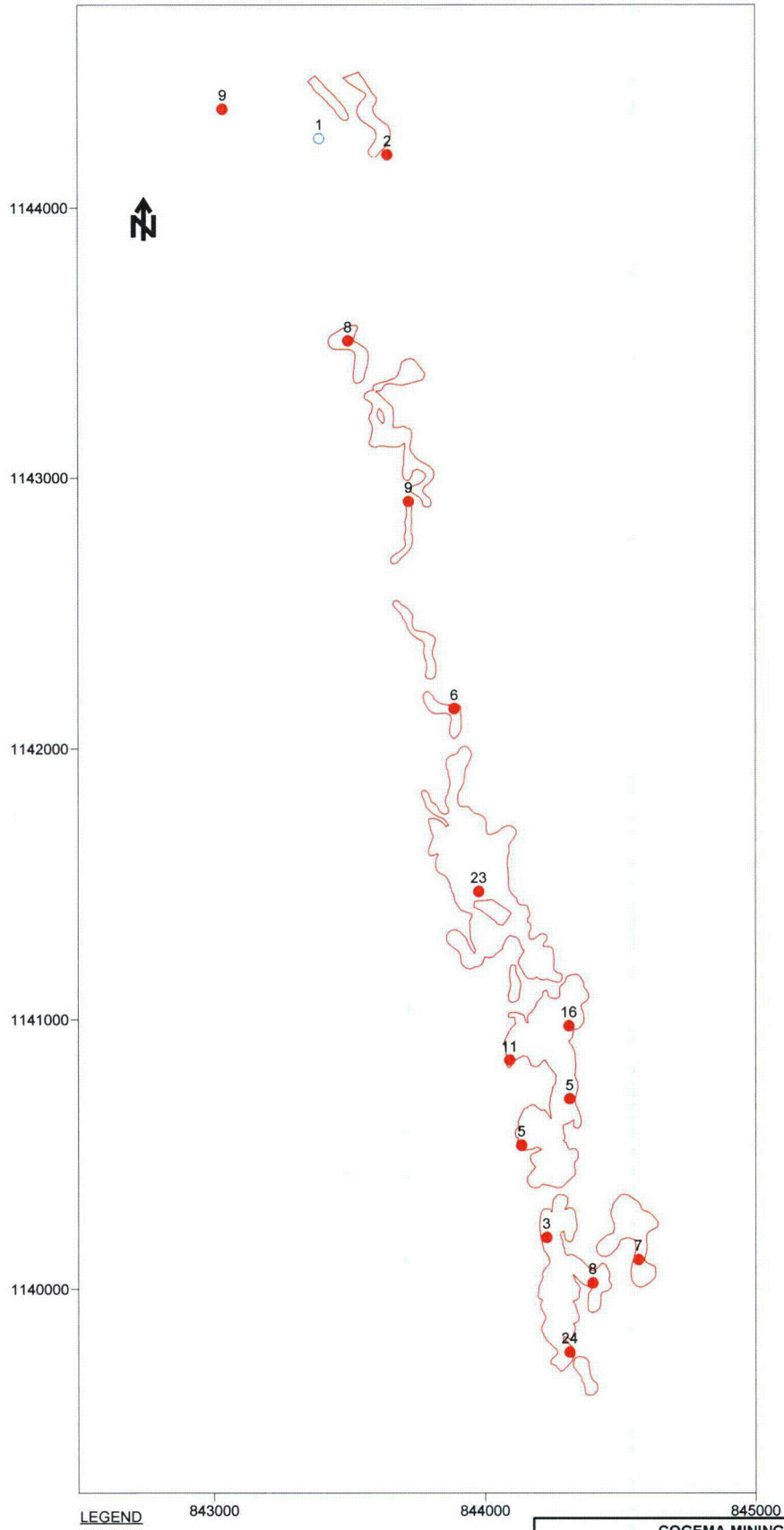

LEGEND

Magnesium Concentration (mg/l)

- 0 to 1.64
- 1.64 to 25

Target Restoration Value for Magnesium is 1.64 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-3
MAGNESIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-3MU4.SRF	BY: EPL CHECKED: HPD

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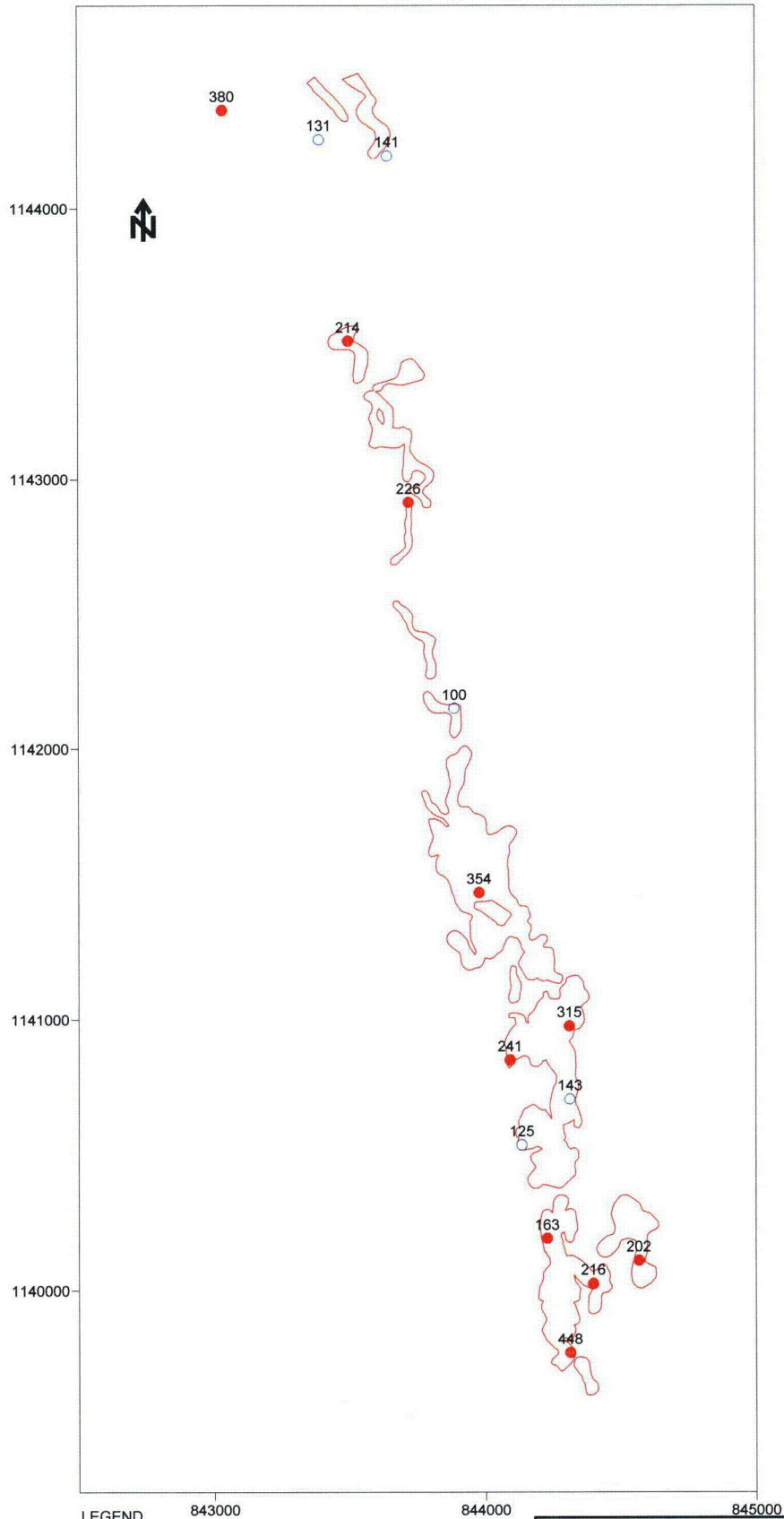

LEGEND

Sodium Concentration (mg/l)

- 0 to 151.7
- 151.7 to 450

Target Restoration Value for Sodium is 151.7 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-4
SODIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-4MU4.SRF	BY: EPL CHECKED: HPD

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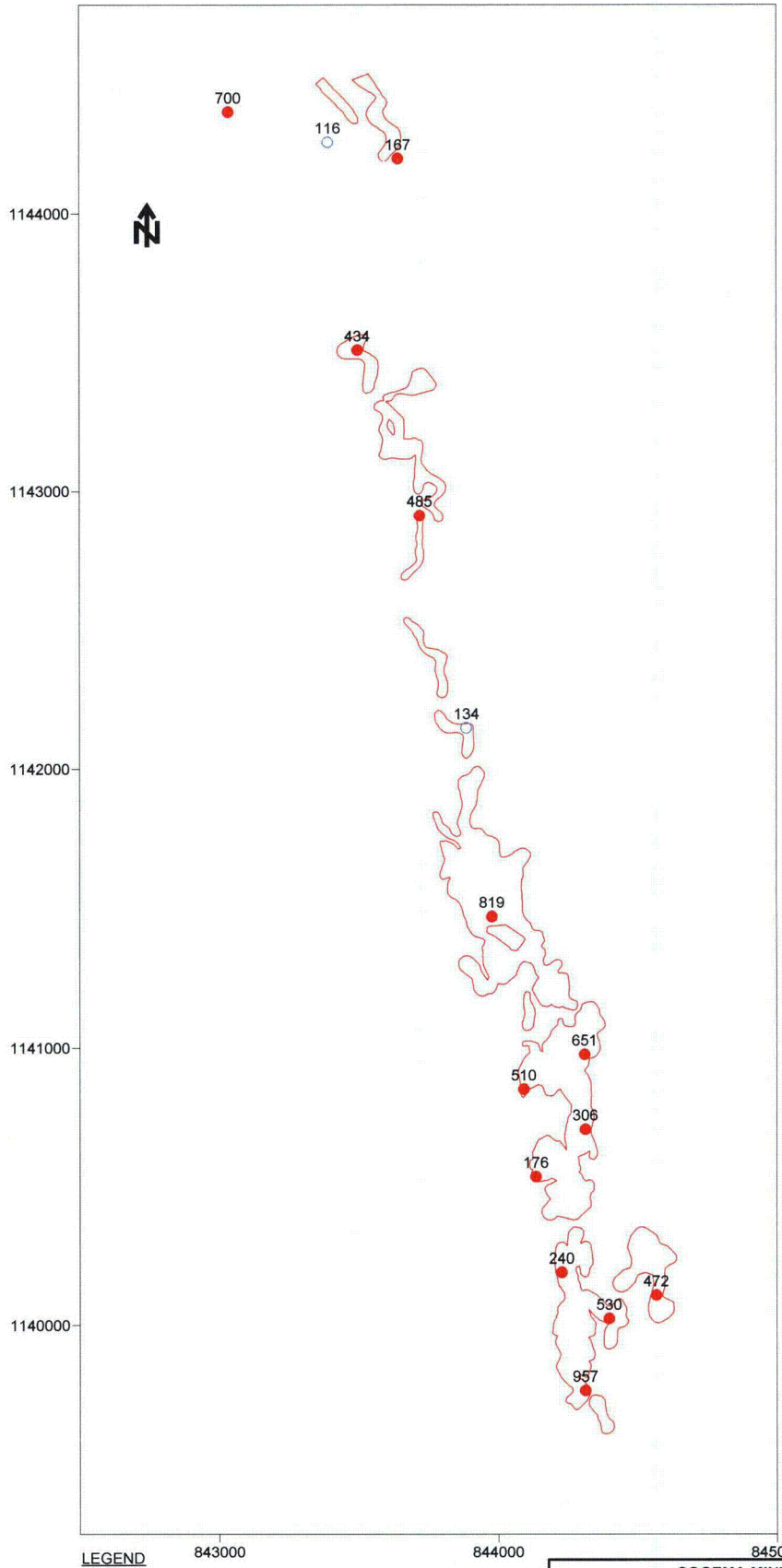

LEGEND

Bicarbonate Concentration (mg/l)

- 0 to 152.9
- 152.9 to 1000

Target Restoration Value for Bicarbonate is 152.9 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

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

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-5MU4.SRF	BY: EPL CHECKED: HPD

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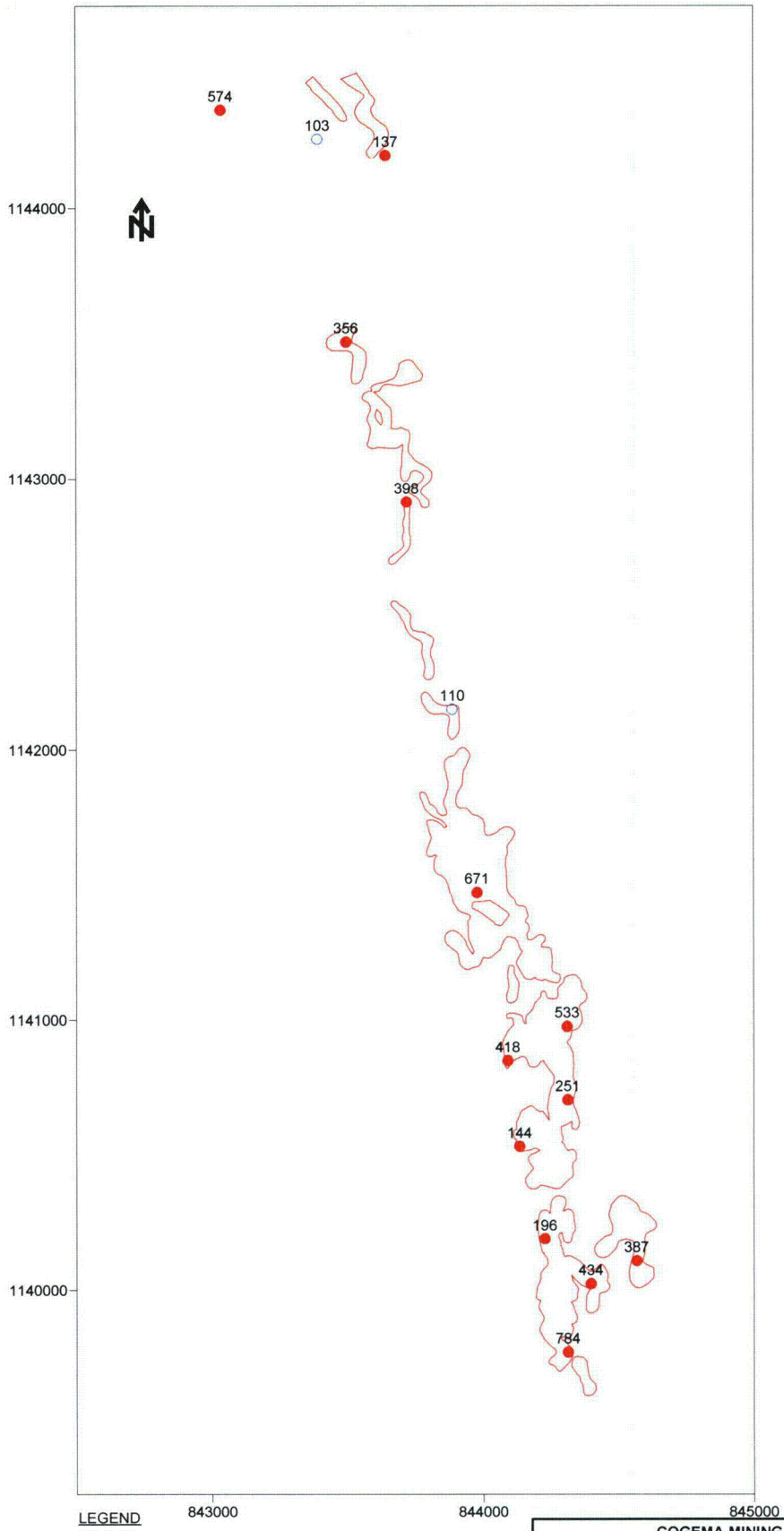

LEGEND

Alkalinity Concentration (as CaCO3 mg/l)

- 0 to 119
- 119 to 800

Target Restoration Value for Alkalinity is 119.0 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-6
ALKALINITY CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-6MU4.SRF	BY: EPL CHECKED: HPD

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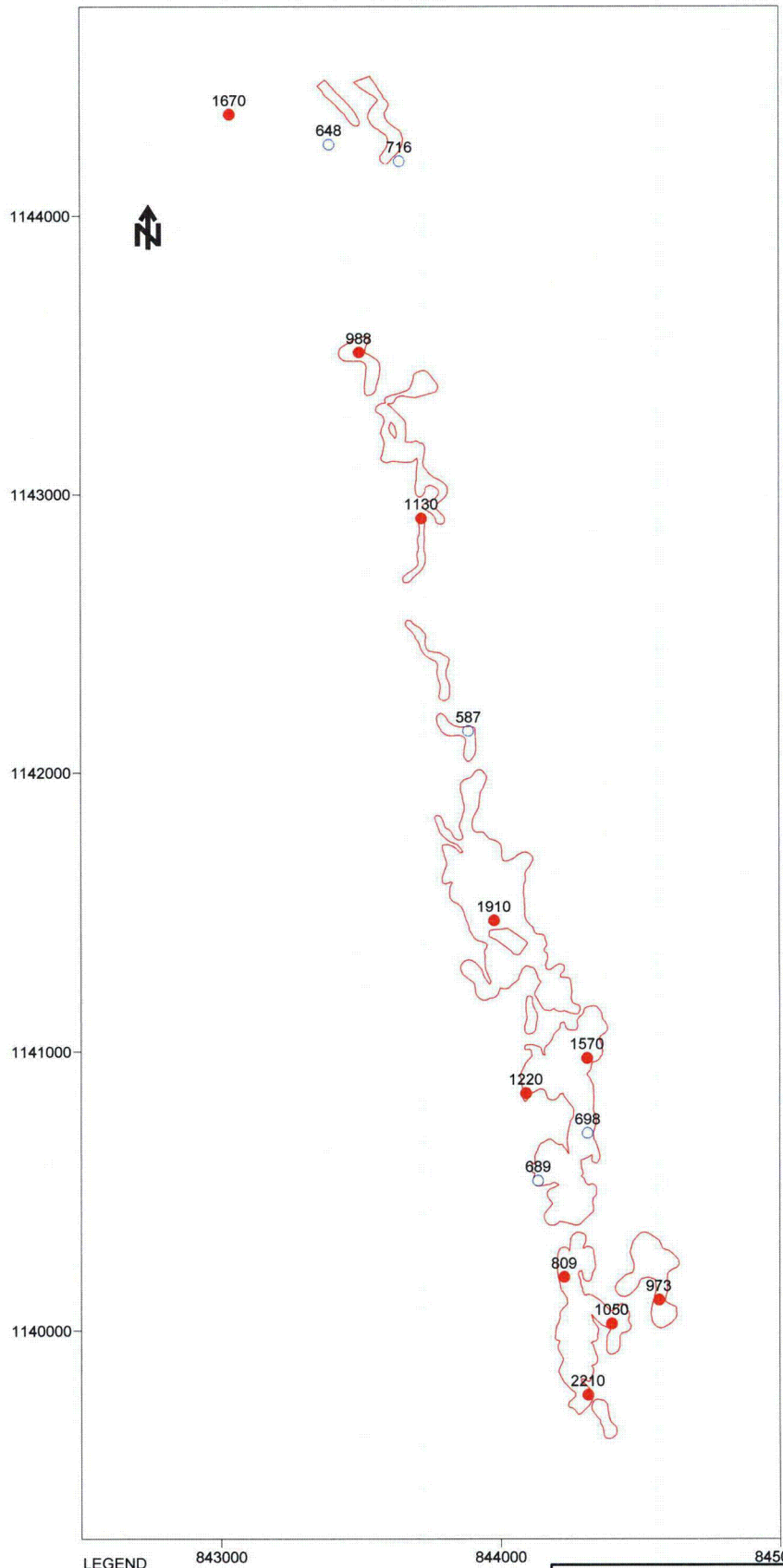

LEGEND

Conductivity (umhos/cm)

- 0 to 803
- 803 to 2250

Target Restoration Value for Conductivity is 803.0 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-7
CONDUCTIVITY CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-7MU4.SRF	BY: EPL CHECKED: HPD

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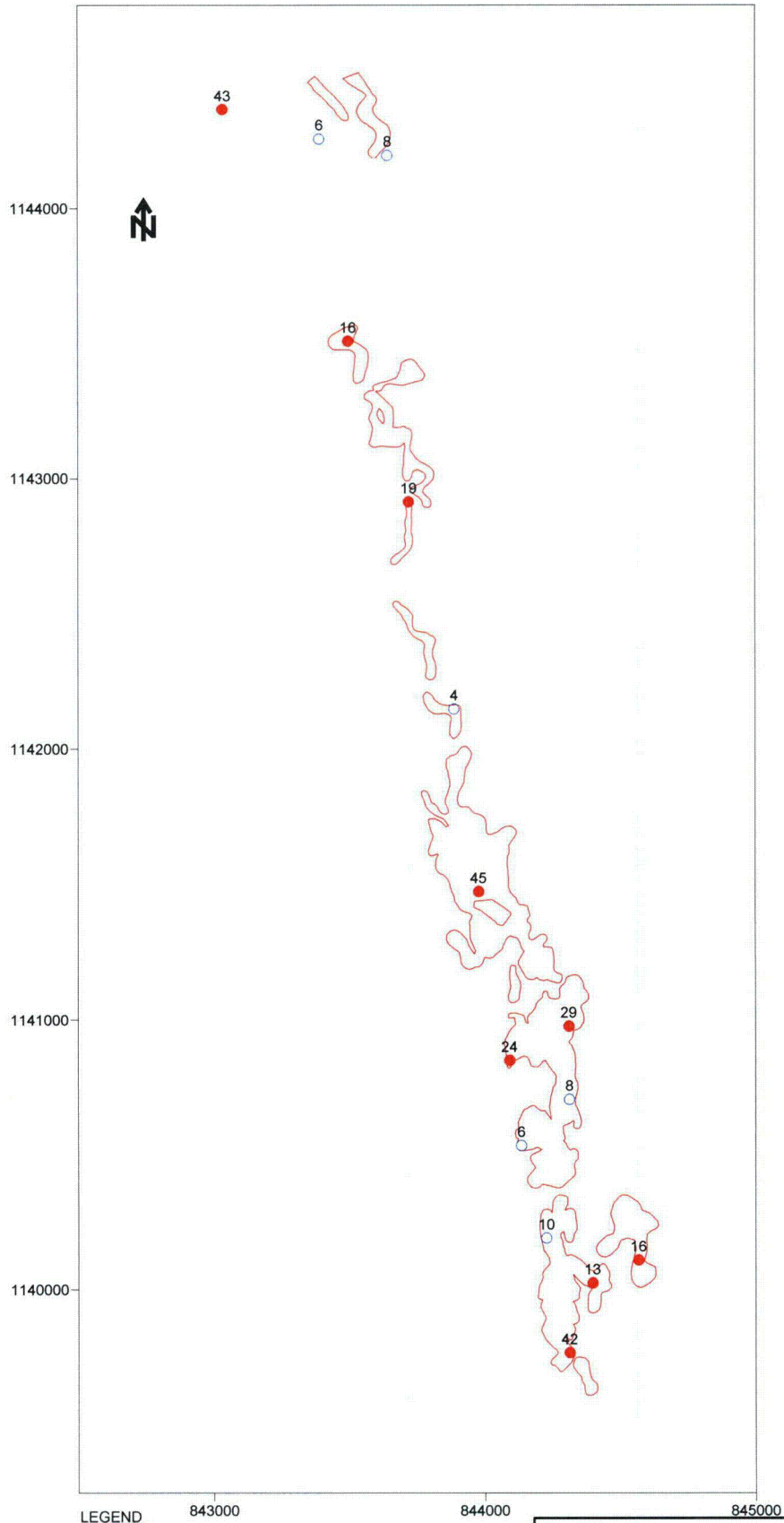

LEGEND

Chloride Concentration (mg/l)

- 0 to 11.7
- 11.7 to 50

Target Restoration Value for Chloride is 11.7 mg/l
Wyoming Class I Standard for Chloride is 250 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-8
CHLORIDE CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-8MU4.SRF	BY: EPL CHECKED: HPD

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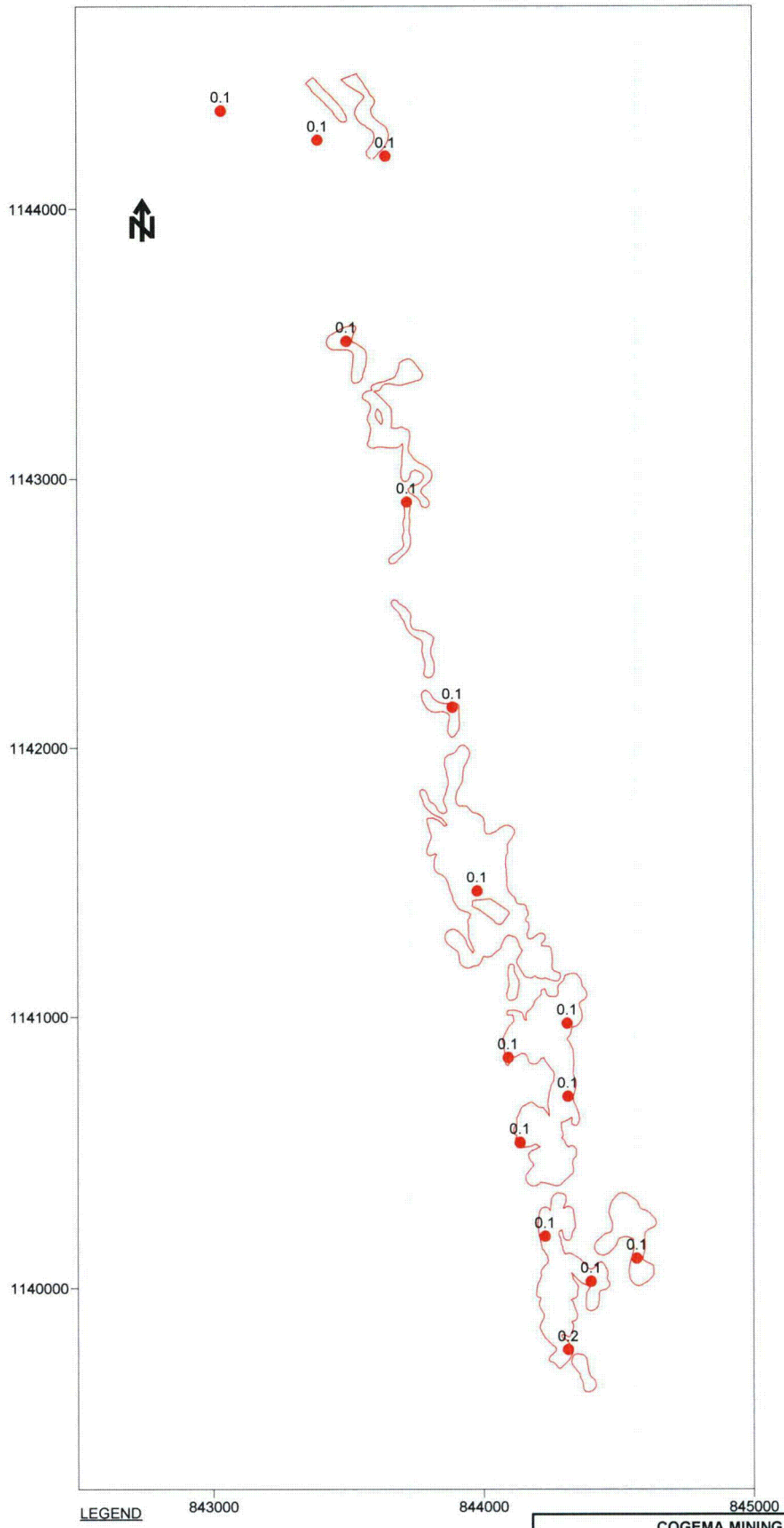

LEGEND

Aluminum Concentration (mg/l)

- 0 to 0.1
- 0.1 to 0.2001

Target Restoration Value for Aluminum is 0.1 mg/l
EPA MCL for Aluminum is from 0.05 to 0.2 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-9
ALUMINUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-9MU4.SRF	BY: EPL CHECKED: HPD

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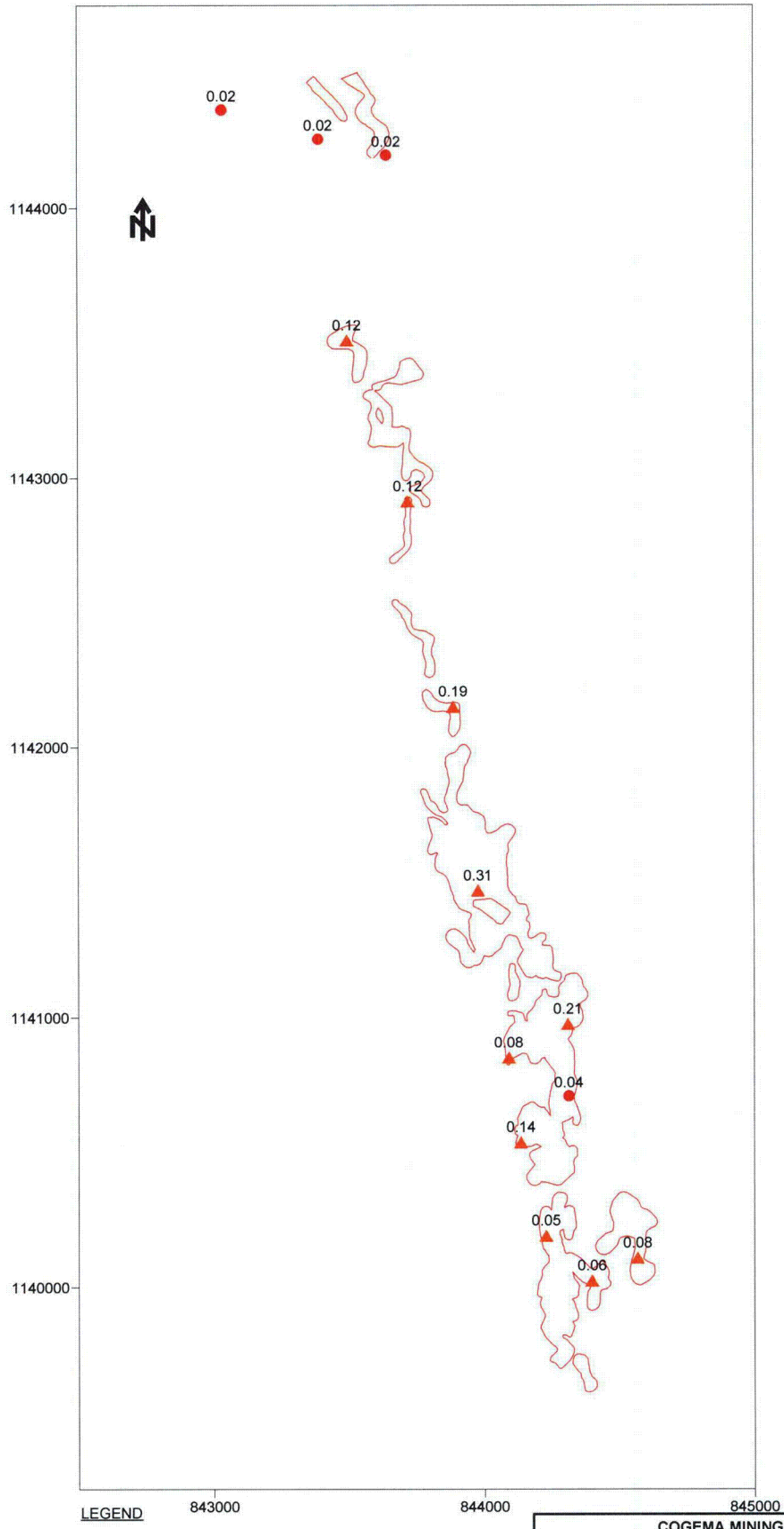

LEGEND

Manganese Concentration (mg/l)

- 0 to 0.01
- 0.01 to 0.05
- 0.05 to 0.68

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

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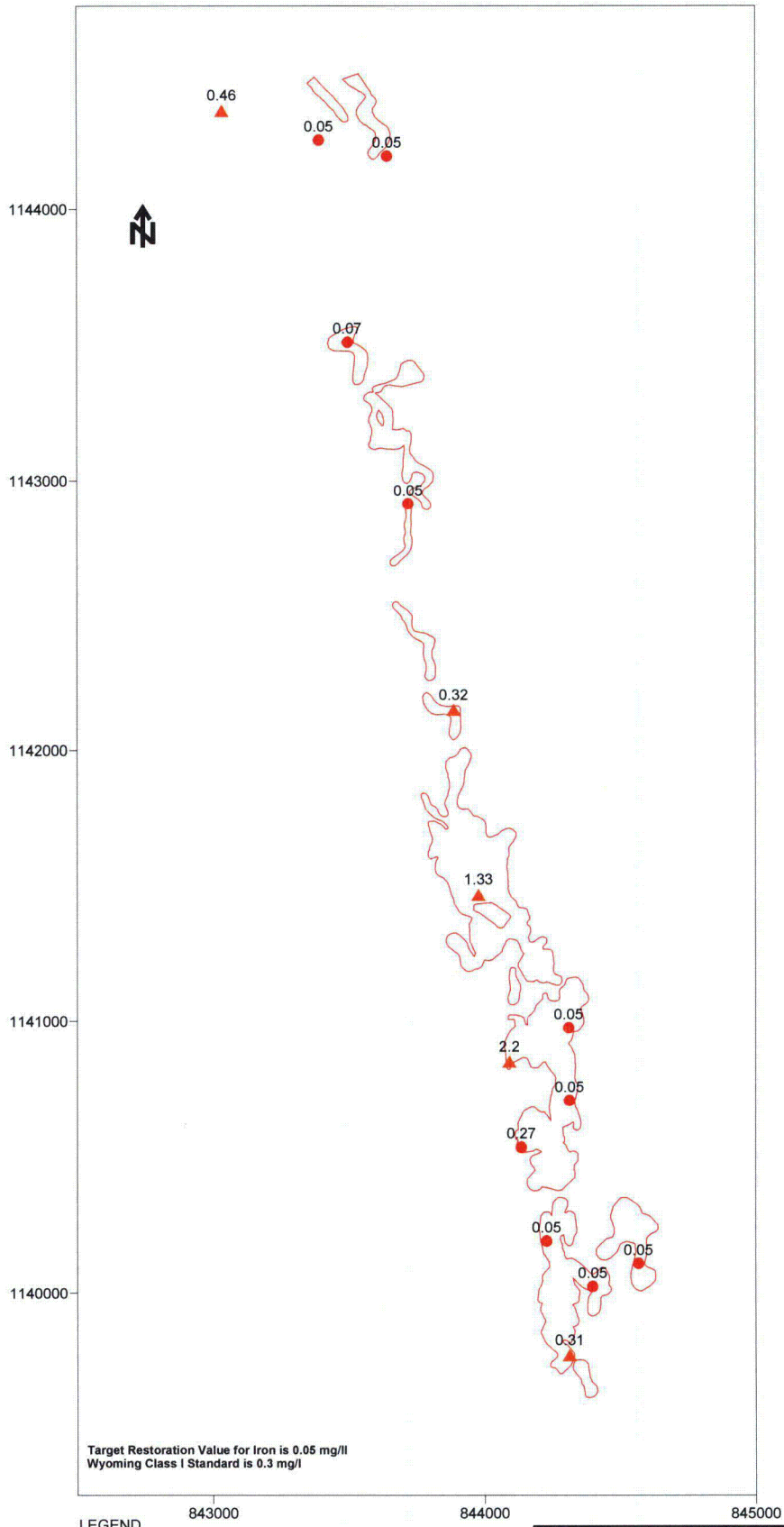

LEGEND

Iron Concentration (mg/l)

- 0 to 0.05
- 0.05 to 0.3
- 0.3 to 2.3

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-11
IRON CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG: COGEMAFIGA-11MU4.SRF	BY: EPL CHECKED: HPD

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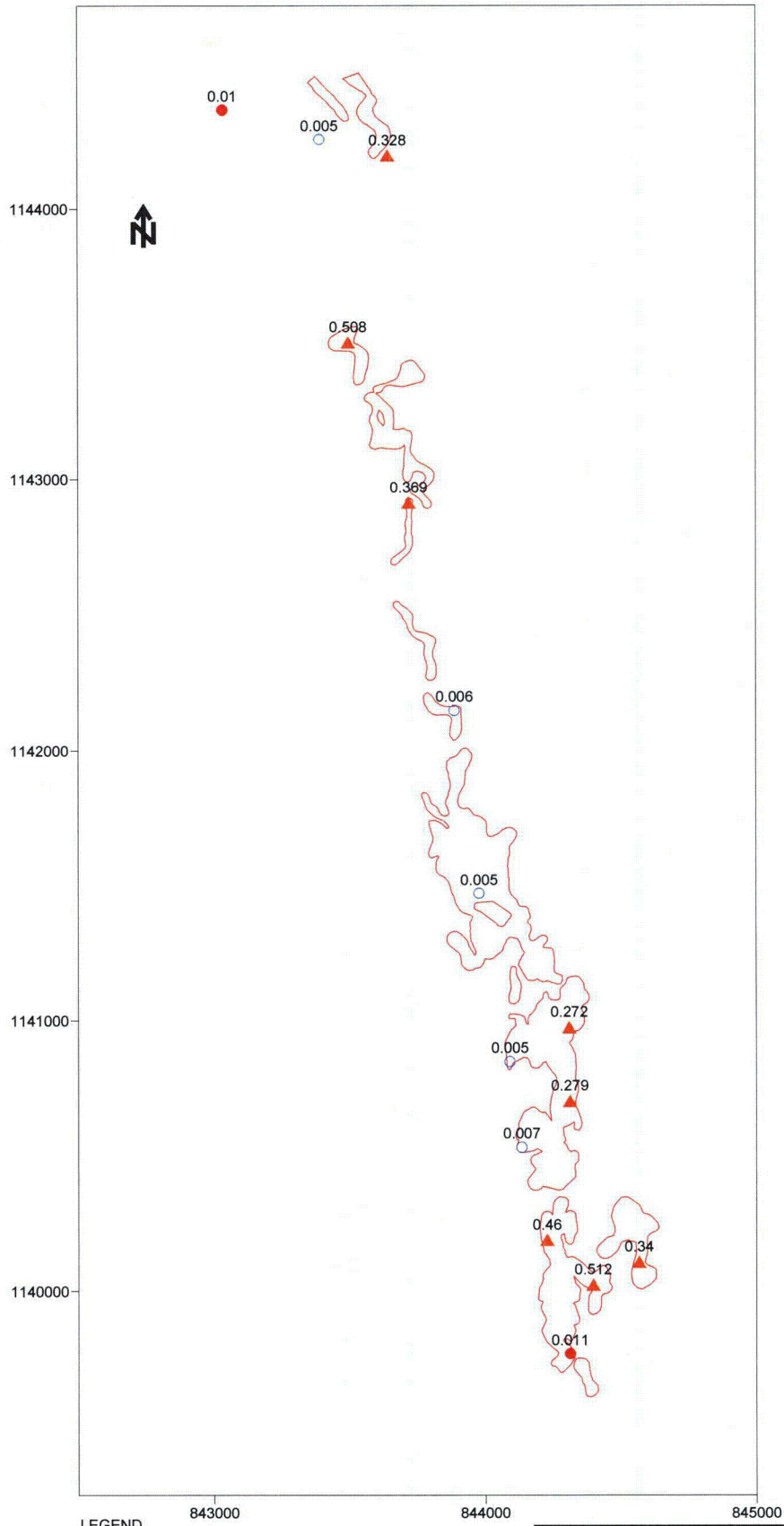

LEGEND

Selenium Concentration (mg/l)

- 0.005 to 0.01
- 0.01 to 0.05
- 0.05 to 0.5121

Target Restoration Value for Selenium 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-12
SELENIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-12.SRF	BY: EPL CHECKED: HPD

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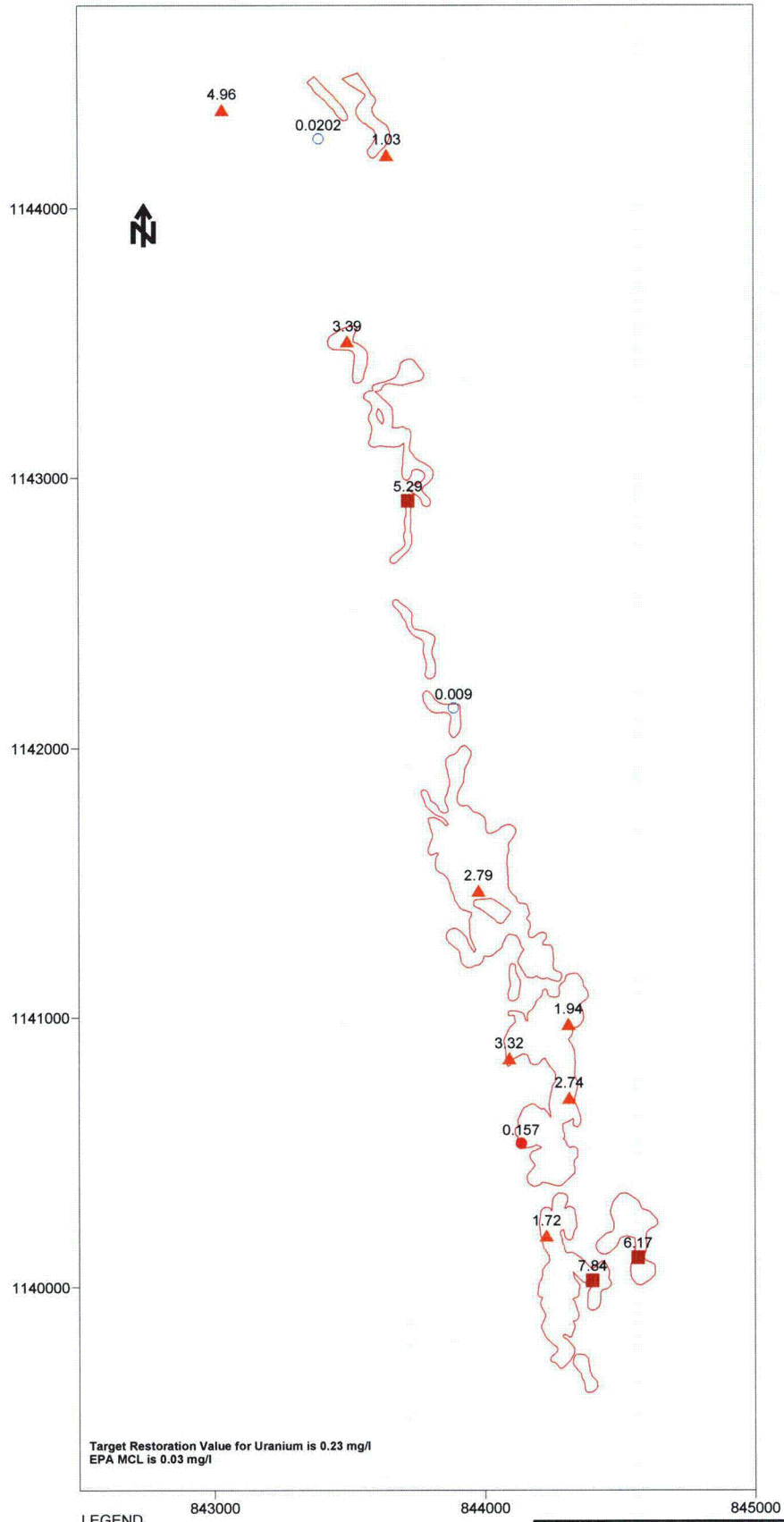

LEGEND

Uranium Concentration (mg/l)

- 0 to 0.03
- 0.03 to 0.23
- 0.23 to 5
- 5 to 16

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

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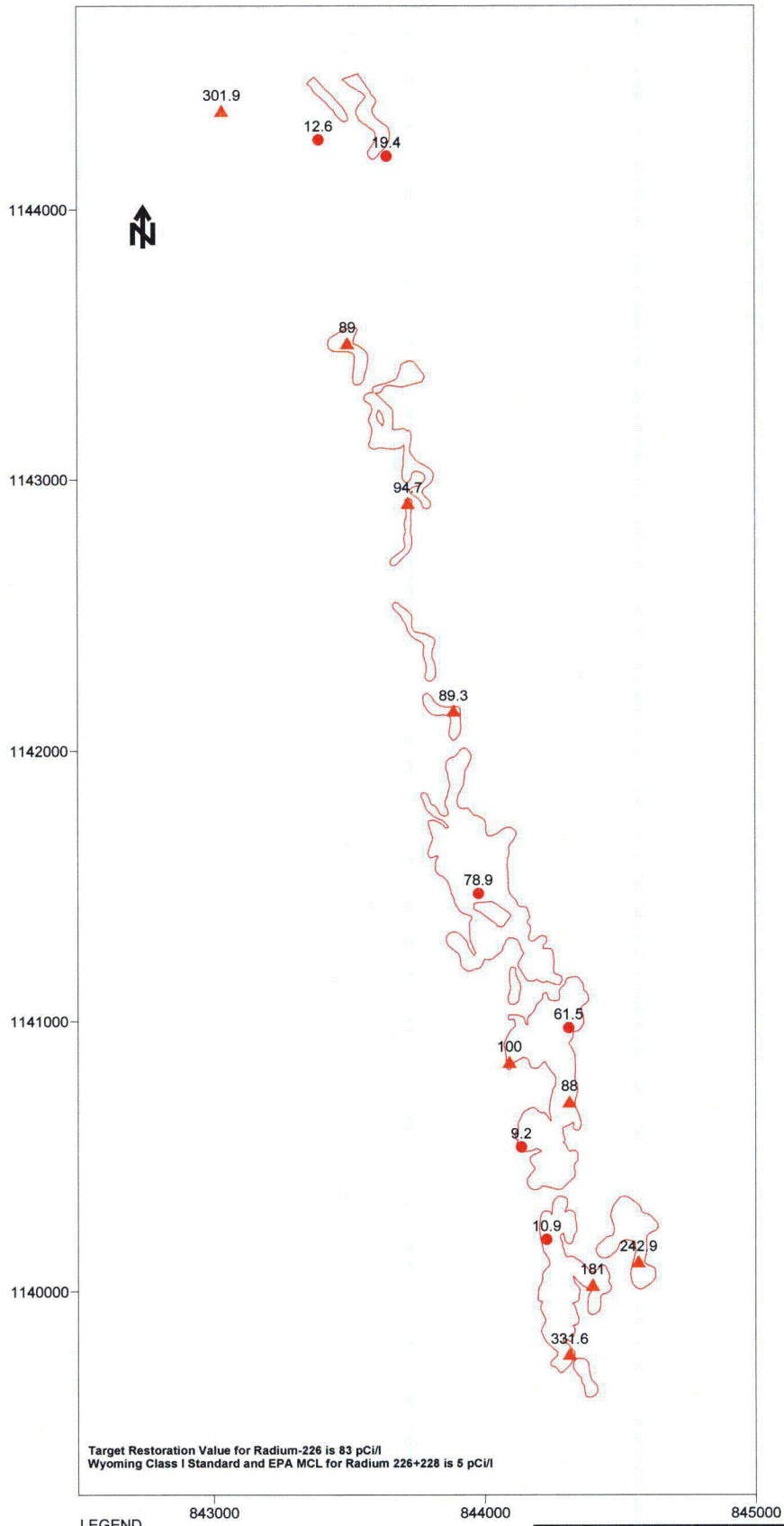

LEGEND

Radium Concentration (pCi/l)

- 0 to 5
- 5 to 83
- 83 to 332

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-14
RADIUM-226 CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG: COGEMAFIGA-14MU4.SRF	BY: EPL CHECKED: HPD

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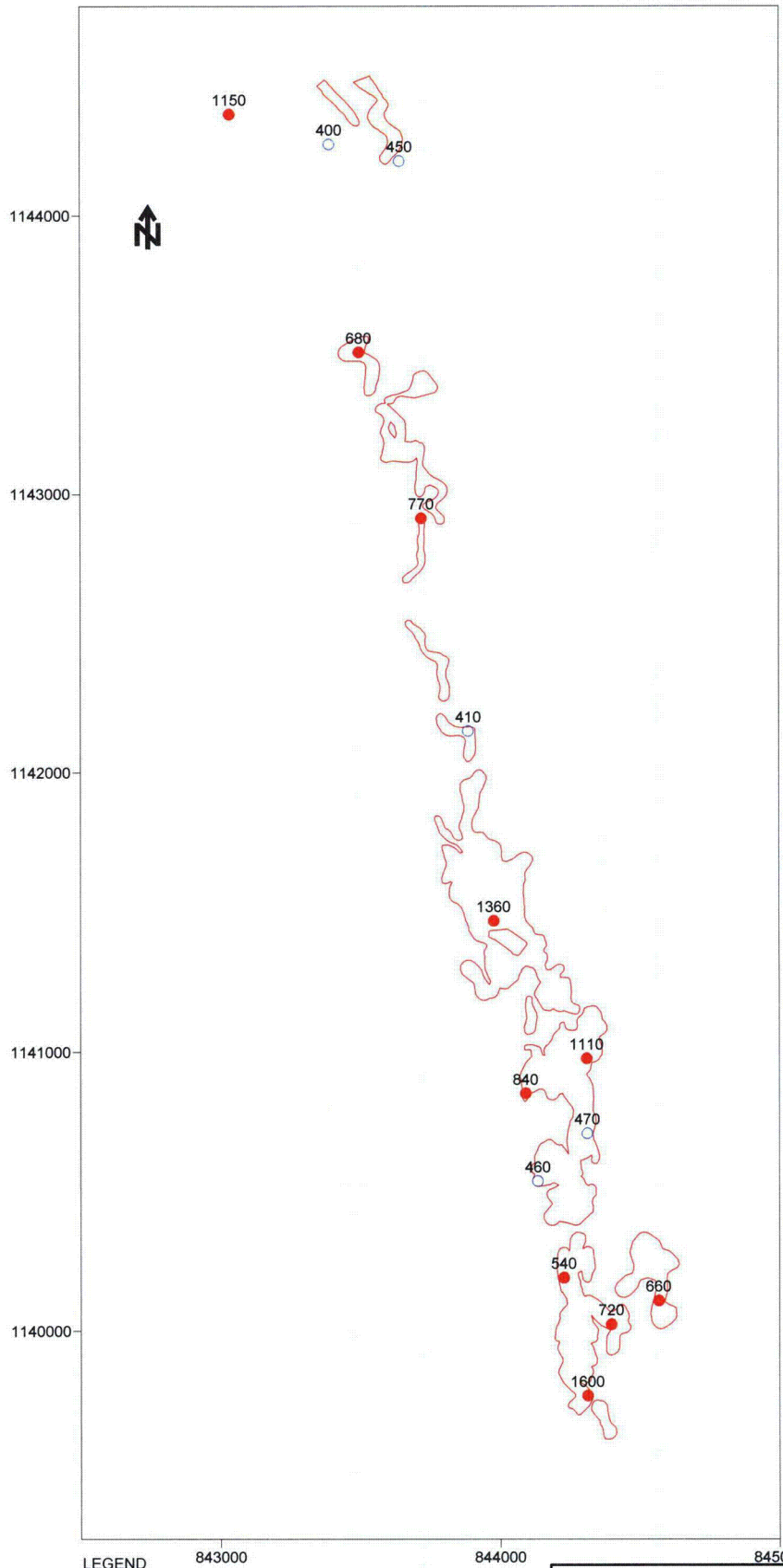

LEGEND

TDS Concentration (mg/l)

- 400 to 500
- 500 to 1660

Target Restoration Value for TDS is 508 mg/l
Wyoming Class I Standard is 500 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 4

FIGURE A-15
TDS CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 4

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGA-15MU4.SRF	BY: EPL CHECKED: HPD

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RESTORATION DATA PACKAGE
MINE UNIT 5
CHRISTENSEN RANCH PROJECT

March 5, 2008

Prepared by:

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Mills, WY 82644
307-234-5019

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10288 West Chatfield Ave, Suite 201
Littleton, Colorado 80127
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RESTORATION DATA PACKAGE
MINE UNIT 5, CHRISTENSEN RANCH PROJECT

1.0 INTRODUCTION

COGEMA Mining, Inc. (COGEMA) has prepared this restoration data package (RDP) as a technical demonstration supporting completion of wellfield restoration operations at Mine Unit 5 (MU5) of the Christensen Ranch in-situ uranium mine in Johnson County, Wyoming. MU5 is one of five mine units at Christensen Ranch that have undergone restoration following completion of uranium mining activities, as required under Wyoming Department of Environmental Quality (WDEQ) Permit to Mine 478 and Nuclear Regulatory Commission (NRC) Source Material License SUA-1341. A general overview of site conditions at Christensen Ranch is included in a cover report (Wellfield Restoration Report, Christensen Ranch, COGEMA 2007). This RDP provides the detail necessary to meet the requirements for MU5 restoration approval by WDEQ.

Wellfield restoration operations were initiated in MU5 in April 2000 and completed in August 2004. Groundwater within the production zone has been restored to the pre-mining class of use, using Best Practicable Technology (BPT). An average of 10.1 pore volumes of water were treated for the MU5 wellfields during restoration activities. Restoration operations have resulted in post-restoration water quality that meets Target Restoration Values (TRVs) for 25 of 35 constituents. Of the constituents that exceed TRVs, only manganese, selenium and uranium also exceed either the Wyoming Class I Standard or the EPA MCL within the wellfield.

1.1 PURPOSE AND OBJECTIVES

The purposes of this report are:

- to discuss the significant beneficial results from historical restoration operations performed at Christensen Ranch MU5;
- to document that COGEMA's restoration activities at MU5 have resulted in ground-water quality consistent with the pre-mining class of use; and,
- to provide the supporting discussion and data such that LQD has a strong basis for granting unconditional approval of the MU5 restoration activities.

1.2 REPORT ORGANIZATION

The MU5 RDP includes:

- a description of local site conditions including location, geology and hydrogeology (Section 2);
- description of permitting and mining activities specific to MU5 (Section 3);
- description of the MU5 Restoration Program including, identification of specific water quality standards, restoration goals, and applied restoration methods (Section 4);
- a summary of the MU5 restoration results (Section 5):
- an assessment of future groundwater quality (Section 6) and,
- summary and conclusions regarding the effectiveness of the restoration activities for MU5 (Section 7).

Water quality data pertinent to the demonstration of restoration are included as Appendix MU5-A.

2.0 MINE UNIT 5 SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

MU5 is located within the Christensen Ranch Project area that was permitted by Malapai Resources Company (Malapai) in 1989 as an amendment to the Irigaray Permit to Mine 478. MU5 is located in the southern portion of the Christensen Ranch ISL Project in Sections 16, 17, 20 and 21 of Township 44N, Range 76W, in Campbell County (Figure 2-1).

MU5 includes five modules (MOD51, MOD52, MOD53, MOD54, and MOD55), all of which were developed as separate wellfields. MU5 was permitted under an amendment request dated February 1995. The amendment request was submitted by COGEMA as Wellfield Data Package, Mine Unit 5, Christensen Ranch ISL Project, WDEQ Permit to Mine No. 478 and NRC License No. SUA-1341.

Mining was conducted in MU5 from June 1995 to March 2000. Restoration began in April 2000 and was completed in August 2004.

2.2 GEOLOGY

The regional geologic setting has been described in detail in COGEMA's 2007 Christensen Ranch Wellfield Restoration Report and the Malapai 1988 Christensen Ranch Amendment Application to WDEQ Permit to Mine No. 478 & NRC License SUA-1341 (Christensen Ranch Amendment Application) and will not be further elaborated in this RDP.

The geologic section beneath MU5 from the surface through the production zone and including the underlying confining unit and underlying aquifer is all within the Eocene age Wasatch Formation. Regional dip for the Wasatch is to the northwest at 1 to 2 degrees. Local variations to the regional dip are minor. There are no major structural features within the Wasatch at MU5.

The production aquifer is the "K" Sandstone. The "K" Sandstone is described as a predominately clean, fine to coarse grained, moderately sorted, well-cemented, arkosic sand. Depth to the top of the "K" Sandstone at MU5 generally ranges from 250 to 400 feet. The thickness of the "K" Sandstone is 110 to 190 feet in the southern portion of MU5. The K Sandstone coalesces with the first deep sand (No. 1 Deep Sand) in the north portion of MU5, reaching a maximum thickness of approximately 300 feet. Overlying the "K" Sandstone in the area of MU5 is a 40- to 140-foot thick sequence of claystone and siltstone, intersected by a thin (less than 5 feet thick) lignite. This claystone-siltstone unit is the upper confining unit. Directly beneath the "K" Sandstone in MU5 is a 25- to 90- feet thick dense claystone/siltstone that is the lower confining unit.

2.3 HYDROGEOLOGY

The production zone and the overlying and underlying aquifers are under confined conditions. Potentiometric surface maps prepared from data collected prior to the onset of mining at MU5 (February 1995), and included in the MU5 Wellfield Data Package (COGEMA 1995) indicate a predominately west-northwest hydraulic gradient at 0.005 ft/ft for the ore zone. The hydraulic gradient for the overlying aquifer is also to the west-northwest, ranging from 0.01 to 0.02 ft/ft. For the underlying aquifer, the hydraulic gradient is generally to the north at 0.01 ft/ft.

The Wellfield Data Package (COGEMA 1995) includes aquifer test that demonstrates that all the perimeter ore zone monitor wells were in hydraulic communication with the production zone. The pumping test also indicated there was no apparent hydraulic communication between the production zone and the overlying and underlying aquifers.

Results of the testing indicated that average transmissivity of the "K" Sandstone within MU5 is approximately 87 ft^2d (651 gpd/ft). The average thickness of the "K" sand for MU5 was reported as 190 feet resulting in a hydraulic conductivity of 0.46 ft/d. Average storage coefficient calculated from the pumping tests was 4.8 E-04 for MU5.

2.4 ORE DISTRIBUTION

Ore occurs in both the upper and lower portions of the "K" Sandstone [referred to as the K2 and K3 sandstones, respectively in the Wellfield Data Package (COGEMA, 1995)] in classical roll-front configuration. Depth to top of the ore ranges from 300 to 500 feet. Multiple horizons are common.

3.0 MINING HISTORY

The MU5 wellfield consists of 5 contiguous wellfields, or Modules. Commercial mining was initiated in the MOD51 in June 1995, followed by MOD52 in October 1995, MOD53 in January 1996, MOD54 in April 1996 and MOD55 in August 1996. Wellfield processing continued through March 2000. Restoration began immediately after production operations ended.

The lixiviant used for the mining operations was sodium bicarbonate chemistry with gaseous oxygen as the oxidant.

4.0 RESTORATION PROGRAM

4.1 GOALS OF THE RESTORATION PROGRAM

As required under the Permit to Mine No. 478, A2 Update (COGEMA 1996) and NRC License SUA-1341, the primary goal of groundwater restoration following production of the MU5 ore body was to return groundwater quality to baseline concentrations using BPT and economic reasonableness. If baseline quality could not be achieved using BPT, then groundwater was to be restored to pre-mining class of use.

4.2 BASELINE WATER QUALITY

Baseline water quality was established within the MU5 ore zone for the purpose of defining target values for the groundwater restoration phase of the project. Baseline water quality was established for MU5 by collecting samples from representative production wells and averaging the sample results, after outlier removal in accordance with the Permit to Mine No. 478, A2 Update (COGEMA 1996). Twenty five ore zone baseline wells were sampled for MU5. Baseline water quality was established using four samples collected at two-week sampling intervals in 1994 from 24 of the ore zone baseline wells. In addition, samples collected from a monitor well located within MU5 (well TMW-01) (regional baseline study, 1986) were incorporated into the baseline water quality assessment. Results of the baseline sampling were submitted in the Wellfield Data Packages for MU5 (COGEMA 1995). Table 4-1 lists the wells used for determining baseline water quality.

4.3 TARGET RESTORATION VALUES

Target Restoration Values (TRVs) have been established for MU5 based on the results of groundwater baseline quality sampling. The method used to determine TRVs is described in Section 5.8 of the Permit to Mine 478, A2 Update (COGEMA 1996).

TRVs for MU5 were established and accepted by the regulatory agencies in Table 6 of Permit to Mine No. 478, Amendment Request dated February 1995. Table 4-2 of this report presents the TRVs for MU5.

4.4 RESTORATION PROCESS TECHNOLOGY APPLIED

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.

4.5 RESTORATION OPERATIONS

4.5.1 Total Volume Processed

A summary of the gallons processed for each phase of restoration is given in Table 4-3. A total volume of 757.08 million gallons was processed over six years of active restoration operations. For MU5, the calculated PV is approximately 75,058,000 gallons. The total PVDs processed during restoration was 10.09.

Table 4-3 Volume of Water Processed by Restoration Phase, Mine Unit 5

Restoration Phase	Gallons	PVD
Groundwater Sweep	362,640,000	4.83
Reverse Osmosis + Recirculation	394,435,000	5.26
Total	757,075,000	10.09

4.5.2 Restoration History

Groundwater restoration began in April 2000 with the groundwater sweep (GWS) phase for MOD55. All the other modules initiated GWS in July 2000. GWS was terminated in June 2001 after a total of 4.83 pore volume displacements (362.64 million gallons) were completed.

The RO permeate injection phase was started in February 2001 in MOD51 and in January through March 2002 for the other modules. The RO phase was completed in all modules by November 2003. Figures 4-1 through 4-5 illustrate the conductivity and uranium concentration trends in Modules 51 through 55 during the RO permeate injection phase, as determined by the average of the baseline well analytical results obtained at each PVD. The trend for both conductivity and uranium appeared to be stabilizing after 5 to 6 PVD of permeate injection, therefore continued RO treatment beyond that total was not considered.

Recirculation occurred during the last PV of RO. The recirculation was completed on November 2003. In total, 10.09 PVD (757.08 million gallons) of groundwater was recovered from the aquifer during the active restoration phases of MU5.

The post-restoration stabilization phase began in November 2003. Final stability samples were obtained in August 2004.

4.6 WATER QUALITY MONITORING DURING RESTORATION

The groundwater monitoring plan for the restoration program of Christensen Ranch MU5, as well as all other MUs, was provided in the Permit to Mine 478, A2 Update (COGEMA 1996). The overview report provides a summary of the requirements of the groundwater monitoring plan for the restoration program.

Table 4-1 lists the monitoring wells that are included in the MU5 groundwater monitoring plan.

4.6.1 Ore Zone Water Quality

The progress of groundwater sweep and permeate injection was monitored in MU5 by sampling and analyzing the groundwater in accordance with the prescribed groundwater monitoring plan. The designated restoration wells for MU5 established in the Baseline Water Quality Data Package for MU5 (COGEMA 1994) are included in Table 4-1. Locations of these wells are shown on Figure 4-6 of this report. The results of the sampling and analysis for the designated restoration wells are described in detail under the Restoration Results section (5.0) of this report.

4.6.2 Ore Zone Perimeter Monitor Wells

The ore zone perimeter monitor wells were sampled monthly throughout the active restoration phases and quarterly thereafter. Designated ore zone perimeter monitor wells for MU5 are listed in Table 4-1 Figure 4-4 shows the location of the monitor wells with respect to the wellfield. The samples were analyzed for chloride, conductivity and total alkalinity to determine if the wells had been affected by mining solutions. The monitoring results were submitted to WDEQ in the *Irigaray and Christensen Ranch Projects, Semi Annual Monitoring Reports, WDEQ Permit to Mine 478.*

One ore zone perimeter monitor well for MU5 (MW66) went on excursion status on July 21, 2004, one month before the fourth stabilization monitoring sample was collected. The well is located directly downgradient from MOD55 and has remained on excursion status since the initial exceedance. The well then and now exceeds the UCLs for chloride, conductivity and total alkalinity, and the values in the monitor well are very consistent with final stabilization results inside the wellfield for these parameters. The difference is that the full analysis (Guidance 8) of the groundwater in MW66 conducted in 2004 did not show any elevation of trace metals or radionuclides, thus confirming that attenuation of these parameters occurs very close to the wellfield during groundwater movement.

4.6.3 Shallow Monitor Zone

An upper stratigraphic zone was designated for shallow zone monitoring purposes. The shallow zone monitor wells were sampled monthly throughout the active restoration phases and quarterly thereafter. Designated shallow monitor zone wells are included in Table 4-1. Figure 4-6 shows the location of the shallow monitor wells. The samples were analyzed for chloride, conductivity and total alkalinity to determine if the wells had been affected by mining solutions. The monitoring results were reported in the *Irigaray and Christensen Ranch Projects, Semi-Annual Monitoring Reports, WDEQ Permit to Mine 478.*

4.6.4 Deep Monitor Zone

The deep zone monitor wells were sampled monthly throughout the active restoration phases and quarterly thereafter. Designated deep monitor zone wells for MU5 are included in Table 4-1. Figure 4-6 shows the location of the deep monitor wells. The samples were analyzed for chloride, conductivity and total alkalinity to determine if the wells had been affected by mining solutions. The monitoring results were reported in the *Irigaray and Christensen Ranch Projects, Semi-Annual Monitoring Reports, WDEQ Permit to Mine 478.* As indicated by the water quality results, the deep zone monitor wells were not affected by mining solutions during mining or restoration operations.

4.7 WATER LEVEL MONITORING DURING RESTORATION

The water levels in all monitor wells were measured routinely throughout the life of the operations. Water levels were taken prior to each monitor well sampling event. The water level results were reported in *Irigaray and Christensen Ranch Projects, Semi-Annual Monitoring Reports, WDEQ Permit to Mine 478.* Baseline potentiometric surface maps of the ore, and shallow and deep monitor zones, were presented in the Wellfield Data Packages.

5.0 RESTORATION RESULTS

COGEMA has completed a substantial effort to restore the groundwater of the Christensen Ranch wellfields to baseline conditions. The best practicable technology was applied to the restoration effort. The actual volume of groundwater treated exceeded the volumes anticipated in the approved restoration plans. The beneficial results of the restoration efforts are indicated by the substantial reduction in ionic concentrations between the post-mining and the post-restoration sampling events, as discussed in the following sections.

5.1 POST-MINING WATER QUALITY

The water quality of the ore zone after mining was established by sampling each of the designated restoration wells. The post-mining mean of the analytical results from MU5 is presented in Table 5-1. Copies of the individual analytical sheets for each sample are not included in this report due to the bulk of such information, but are available in COGEMA's corporate office in Mills, Wyoming.

The chemical alteration of the ore zone aquifer can be observed through comparison of the post-mining mean concentrations with the baseline concentrations. Fifteen of the 35 parameters in the post-mining means exceeded the TRVs, as shown in Table 5-1. Based on those results, groundwater restoration was deemed necessary.

5.2 RESTORATION WATER QUALITY

The water quality of the ore zone during the restoration process was evaluated after each restoration phase by sampling the designated restoration wells. The arithmetic means of the post-GWS and post-RO phase sampling events are presented in Table 5-1. The post-restoration results are presented in Table 5-1 as the Round-1 Stability results. Again, copies of the individual analytical sheets for each sample are not included in this report due to the bulk of such information, but are available in COGEMA's corporate office in Mills, Wyoming.

5.3 STABILIZATION MONITORING WATER QUALITY

The post-restoration water quality stability was established by sampling each of the designated restoration wells four times over a nine-month period following active restoration (the stabilization samples). The arithmetic means of the four stability sampling events for Modules 51 through 55 are presented in Table 5-1 as Round-1, Round-2, Round-3 and Round-4 Stability Means.

5.4 POST RESTORATION WATER QUALITY

The primary indication of success of the Christensen Ranch restoration program is measured against the TRVs. A comparison of the mean fourth stability round concentration to the TRVs is given in Table 5-2. Figure 5-1 summarizes the fourth stability round mean values compared to the TRVs and regulatory standards. Based on the fourth stability round mean, 25 of the 35 constituents are below TRVs, four constituents exceed TRVs but do not have Wyoming Class I Standards or EPA MCLs and three constituents (arsenic, aluminum and iron) exceed TRVs but are below those standards. TDS was below the TRV but exceeded the WDEQ Class I Standard and the EPA Secondary Drinking Water Standard. Radium-226 was also below the TRV but exceeded the. EPA MCL and WDEQ Class I Standard. Only three constituents exceeded TRVs and either a WDEQ Class I Standard or an EPA MCL: manganese, selenium, and uranium.

Concentrations of each monitored parameter on a well by well basis for all of the four stability monitoring rounds are included in Table A-1, Appendix A. The location of the designated Restoration Wells that are included in the stability monitoring is shown on Figure 4-1 and Figure A-1, Appendix A.

A discussion of the constituents that exceeded the TRVs follows.

5.4.1 Constituents Exceeding TRV With No Groundwater Standards

Calcium - Figure 5-2 shows the mean calcium concentration at key phases of the restoration program (post-mining, post-groundwater sweep, post RO, and at each stability monitoring round). At the end of mining, the mean calcium concentration was 267.6 mg/l. By the end of stability monitoring, calcium was down to 35.5 mg/l. Although this value exceeds the TRV (24.12 mg/l), the fourth round stability mean represents an 87 percent reduction from post-mining concentration as a result of the restoration efforts. The mean concentration of calcium in MU5 appears stable based on the four rounds of stability monitoring. There are no standards for calcium and it does not pose a risk to offsite groundwater quality. The distribution of calcium in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-2, Appendix A.

Magnesium - Figure 5-3 shows the mean magnesium concentration at key phases of the restoration program. At the end of mining, the mean magnesium concentration was 54.3 mg/l. By the end of stability monitoring, magnesium was down to 7.2 mg/l. Although this value exceeds the TRV (3.72 mg/l), there has been an 87 percent reduction from post mining concentration as a result of the restoration efforts. There is no significant increasing trend in magnesium concentration based on the four stability monitoring rounds. There are no standards for magnesium and the relatively low values observed in the fourth Stability round pose no threat to offsite groundwater quality. The distribution of

magnesium in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-3, Appendix A.

Bicarbonate - Bicarbonate is the anionic component of the primary chemical added during the mining process. Figure 5-4 shows the mean bicarbonate concentration at key phases of the restoration program. The post-mining mean bicarbonate concentration was 1,393 mg/l. The bicarbonate TRV is 217.6 mg/l. After the fourth stability round monitoring the bicarbonate mean was down to 356.6 mg/l, a 74 percent reduction from the post-mining mean. The elevated bicarbonate concentration is directly correlated to the elevated alkalinity value. The distribution of bicarbonate in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-4, Appendix A.

Alkalinity - The mean alkalinity at key points in the restoration process is shown in Figure 5-5. At the end of mining alkalinity averaged 1,144 mg/l (as $CaCO_3$). The TRV for alkalinity is 158.4 mg/l. The fourth stability monitor round of 293.1 mg/l represents a 74 percent reduction from post mining concentration but still exceeds the TRV. Alkalinity is a function of bicarbonate concentration and pH. There are no standards for alkalinity. Although alkalinity is greater than the TRV, this parameter does not pose a threat to offsite groundwater quality. The distribution of alkalinity in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-5, Appendix A.

5.4.2 Constituents Exceeding TRVs But Below Groundwater Standards

Aluminum - After mining, all of the baseline wells were below detection for aluminum. The detection limit for aluminum was 0.1 mg/l. The fourth stability monitoring round mean was 0.108 mg/l. A single well was above the detection limit, well 5BL76-1 at 0.3 mg/l. The aluminum TRV was 0.1 mg/l. The EPA MCL for aluminum is 0.05 to 0.2 mg/l. Because of the isolated occurrence of aluminum above the TRV, aluminum is not considered a threat to offsite groundwater quality.

Arsenic – Figure 5-6 shows the mean arsenic concentration at key points of the restoration program. After mining, the mean arsenic concentration was 0.0105 mg/l. The fourth stability monitoring round mean was 0.0085 mg/l, representing a reduction of 19 percent. The arsenic TRV was 0.006 mg/l. The Wyoming Class I Standard for arsenic is 0.05 and the EPA MCL is 0.01 mg/l. Because the fourth round stability monitoring mean does not exceed either of these standards, arsenic does not pose a threat to offsite groundwater quality. The distribution of arsenic in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-7, Appendix A.

Iron - Figure 5-7 shows mean iron concentration in MU5 at key points of the restoration program. Following mining, the mean iron concentration was 0.545 mg/l. The TRV for iron is 0.05 mg/l. The mean iron concentration calculated from

the fourth stability round is 0.097 mg/l, representing a decrease from post-mining levels of 82 percent. The Wyoming Class I Standard and the EPA Secondary Drinking Water Standard is 0.3 mg/l. Because the fourth round stability monitoring mean does not exceed either of these standards, iron does not pose a threat to offsite groundwater quality. The distribution of iron in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-7, Appendix A.

5.4.3 Constituents Below TRVs But Exceeding Groundwater Standards

TDS - Figure 5-8 shows the concentrations of TDS at key points in restoration. The TRV for TDS was 619.3 mg/l. The post-mining concentration for TDS was 3,074 mg/l. The fourth stability monitoring round mean for TDS was 589.2 mg/l representing an 81 percent reduction from post mining concentration. The Wyoming Class I Standard is 500 mg/. Because the TDS mean is near the Class I Standard, TDS does not pose a significant risk to offsite groundwater quality. The distribution of TDS in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-8, Appendix A.

Radium-226 - Figure 5-9 indicates the mean radium-226 concentration at key points throughout the restoration program. The post-mining radium-226 mean concentration was 476 pCi/l. The fourth stability monitoring round mean was 237 pCi/l, which is below the TRV of 289.8 pCi/L. The decrease from post-mining concentration through restoration is 50 percent. The Wyoming Class I Standard and EPA MCL for combined radium 226 and radium 228 is 5 pCi/l. Because of the geochemical properties of radium-226 and its propensity to be readily adsorbed, the probability of significant impacts to offsite groundwater is very low. The distribution of radium-226 in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-9, Appendix A.

5.4.4 Constituents Exceeding TRVs And Groundwater Standards

Manganese - The mean manganese concentration at MU5 after mining was 0.55 mg/l as shown in Figure 5-10. Manganese concentration for the fourth stability monitoring round was 0.08 mg/l, a reduction of 85 percent. The TRV for manganese is 0.01 mg/l. The Wyoming Class I Standard is 0.05 mg/l. The distribution of manganese in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-10, Appendix A. Dilution and chemical attenuation are expected to be sufficient to reduce manganese concentrations to the Wyoming standard within relatively short distances from the wellfield boundary as described in Section 6.

Selenium - Figure 5-11 illustrates the mean selenium concentration at key points throughout the restoration program. The post-mining mean selenium concentration was 0.55 mg/l. Restoration activities reduced the selenium

concentration by 27 percent at the end of stability monitoring to a value of 0.41 mg/l. The selenium TRV is 0.01 mg/l and the Wyoming Class I Standard and the EPA MCL are 0.05 mg/l. Comparison of the post-mining and post-restoration values indicate that the restoration program has not significantly reduced selenium concentrations even though BPT was applied. The distribution of selenium in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-11, Appendix A.

Uranium - The mean uranium concentration at key restoration points is shown in Figure 5-12. The post mining uranium mean concentration was 12.61 mg/l. The fourth stability round mean concentration was 2.05 mg/l, representing a reduction of 84 percent from the post-mining value. The uranium TRV is 0.076 mg/l and the EPA MCL is 0.03 mg/l. The EPA MCL was recently revised from a value of 5.0 mg/l to the current standard. The distribution of uranium in MU5 for the fourth stability monitoring round, on a well by well basis, is included on a site map as Figure A-12, Appendix A. Dilution and chemical attenuation are expected to be sufficient to reduce concentration to Wyoming standards within relatively short distances from the wellfield boundary as described in Section 6.

6.0 ASSESSMENT OF FUTURE GROUNDWATER QUALITY

This assessment evaluates potential fate and transport of constituents regulated under Permit to Mine No. 478 and the U.S. Nuclear Regulatory Commission (NRC) source material license No. SUA-1341 that exceed regulatory standards after completion of restoration of MU5. Key components of the assessment are geochemical and hydrologic factors that control solute transport. The hydrologic component defines the rate and direction of groundwater flow within the aquifer. The geochemical component considers the reduction in solute concentrations that occur along groundwater flowpaths.

6.1 CONSTITUENTS INCLUDED FOR ASSESSMENT

Following application of Best Practicable Technology (BPT) to aquifer restoration of MU5, the following constituents exceeded the TRV and either the Wyoming Class I Standard or the EPA MCL: selenium, manganese, and uranium. The table below summarizes the post restoration wellfield average concentration, the TRV and the applicable standards for each of these constituents. All values are in mg/l except for radium-226, which is reported as pCi/l.

Table 6-1 Constituents Included for Assessment of Fate and Transport

Constituent	Post Restoration Wellfield Average	Target Restoration Value	WDEQ Class I	EPA MCL
selenium	0.41	0.01	0.05	0.05
manganese	0.08	0.01	0.05	0.05
uranium	2.05	0.076	NA	0.03

NA –not applicable

6.2 TRANSPORT ASSESSMENT

The effects of long-term groundwater flow, including advective mixing and dispersion, on constituent concentrations is described under the hydrologic assessment portion of the transport assessment. A general discussion of the geochemical properties for each of the constituents listed in Table 6.1 is presented under the geochemical assessment in the cover report (Wellfield Restoration Report, Christensen Ranch, COGEMA 2007) and summarized below in the geochemical assessment portion of this transport assessment.

6.2.1 Hydrologic Assessment

Potentiometric surface maps prepared from data collected prior to the onset of mining at MU5 indicated a predominately west-northwest hydraulic gradient at 0.005 ft/ft for the ore zone. The average hydraulic conductivity of the "K" sand is

0.46 ft/d. The porosity estimate used in calculating the pore volumes for each of the MUs was 26 percent. Based on these parameters, the average groundwater velocity, using Darcy's equation, across MU5 is 0.0088 ft/d (3.2 ft/yr). The distance to the monitor well ring from the wellfield is 400 feet. The shortest groundwater flowpath from the MU5 wellfield to the Permit Boundary is approximately 8,500 feet. Based on the groundwater velocity calculation, it will take approximately 123 years for groundwater within the wellfield to reach the monitor well ring and over 2,600 years to reach the Permit Boundary.

6.2.2 Geochemical Assessment

Geochemical conditions in the ore zone aquifer control the mobility of groundwater solutes associated with uranium mineralization. The primary factor controlling the mobility of solutes associated with roll-front deposits is redox condition. Under the reducing conditions that are naturally present in roll-front deposits, most solutes are strongly attenuated and relatively immobile. Solutes are generally more soluble and mobile under oxidizing conditions. Iron, manganese, and uranium are strongly controlled by redox conditions. Radium concentrations in natural waters are usually controlled by adsorption and/or precipitation via solid-solution (Langmuir 1985).

Selenium concentrations in uranium roll-front deposits are elevated in narrow zones at the outer edges of the oxidized sandstone, at the redox interface, or in reduced sandstone close to the interface (Harshman 1974). Selenium in uranium roll-front deposits typically occurs in reduced form as the relatively insoluble phases native selenium and ferroselite ($FeSe_2$) (Harshman 1974. Under reducing conditions, selenium is typically present as native selenium or in the selenide (-II) oxidation state. Selenide is generally present in solution in the form of HSe^- above pH 4 (Rai et al. 1987). Native selenium is relatively insoluble, and selenide often forms insoluble metal selenide phases such as ferroselite [$FeSe_2$] (McLean and Bledsoe 1992, Langmuir et al. 2004). The insolubility of the selenide minerals is the primary attenuation mechanism for selenium in aquifers hosting roll-front uranium deposits.

Under typical groundwater conditions, dissolved manganese will usually be present in reduced form as Mn^{2+}. Under oxidizing conditions, manganese forms relatively insoluble manganese (III) and (IV) oxide phases that are stable above approximately pH 6 to 7 (Rai et al. 1987, Langmuir et al. 2004). These manganese oxides readily adsorb trace metals such as cobalt, zinc, and nickel and can therefore significantly influence trace metal migration in groundwater (Murray 1975, Langmuir et al. 2004).

Under reducing conditions, uranium(IV) forms relatively insoluble solids such as uraninite and coffinite, minerals that are typically found in uranium roll-front deposits. Uranium sorption by soils generally reaches a maximum in the pH range from pH 5 to 8 (EPA 1999). Uranium can also be attenuated in

groundwater through coprecipitation reactions with metal oxyhydroxides such as iron hydroxide.

Radium is generally relatively immobile but can be mobilized under some conditions. Groundwater radium concentrations commonly are elevated in the ore zone relative to the background levels present immediately upgradient and downgradient of the ore (Wanty et al. 1987). Radium is frequently precipitated from sulfate-rich waters as a solid solution with barium (as barite, $BaSO_4$) or less commonly with calcium (as gypsum, $CaSO_4 \cdot 2H_2O$) or strontium (as celestite, $SrSO_4$) (Langmuir and Melchior 1985, Langmuir and Riese 1985). In general, radium adsorption on mineral surfaces increases with increasing pH. For iron oxides, the increase in adsorption begins around pH of 6 to 8 and reaches a maximum of around 10 s.u. or less (USEPA 2004). Radium can be attenuated by adsorption onto clays (Langmuir and Chatham 1980, Kaufmann et al. 1976, Granger 1963). Radium is also strongly adsorbed to mineral oxides, especially at near neutral and alkaline pH conditions (USEPA 2004).

6.2.3 Fate and Transport

As described in the cover report, modeling of another similar site northwest of Christensen Ranch indicates a 6 to 8 fold reduction in constituent concentration within 400 feet of the wellfield (minus the background concentration) from advective mixing of groundwater. A table of values using a conservative reduction factor of 6 is presented to illustrate the decrease in concentration that could be expected based only on advection. It is assumed that the target restoration value represents background water quality.

6-2 Estimated Constituent Reduction from Post-Restoration Concentration 400 feet from Wellfield, MU5

Constituent	Post Restoration Wellfield Average (A)	TRV (B)	Estimated Value (C) @ 400 ft Using Reduction Factor (R) of 6 C= (A-B)/R+B
selenium	0.41	0.01	0.077
manganese	0.08	0.01	0.022
uranium	2.05	0.076	0.405

Based on these calculations, manganese concentrations would be below the regulatory standards 400 feet from the wellfield. Selenium and uranium would exceed the regulatory standards if advective mixing was the only factor controlling attenuation. However, selenium and uranium are anticipated to be strongly adsorbed once groundwater from the wellfield moves outside of the orebody into the more reducing conditions downgradient.

7.0 SUMMARY AND CONCLUSIONS

COGEMA has prepared this document as a technical demonstration supporting completion of the wellfield restoration operations at MU5 of the Christensen Ranch in-situ uranium mine in Campbell County, Wyoming.

Wellfield restoration operations were initiated in MU5 in 2000 and completed in 2004. Groundwater within the production zone has been restored to the pre-mining class of use, using Best Practicable Technology (BPT), as required by the WDEQ. An average of 10.1 pore volumes of water were treated for the MU5 wellfields during restoration activities.

Plots of conductivity and uranium during the course of the restoration program show the significant improvement in water quality that has resulted.

Based on the fourth stability round mean concentrations, 25 of the 35 constituents are below TRVs. Four constituents exceeded the MU5 TRVs, but have no WDEQ Class I Standard or EPA MCL, including: calcium, magnesium, bicarbonate, and alkalinity. Restoration water quality monitoring indicates a 74 to 87 percent reduction in mean concentrations of each of those parameters as a result of restoration activities. Three of the constituents that exceeded MU5 TRVs, arsenic, aluminum and iron, have mean concentrations that are below the WDEQ Class I Standard and EPA MCLs. Arsenic showed a 19 percent decrease in concentration at the completion of restoration. Iron showed an 82 percent decrease from post-mining concentrations.

Radium-226 was below the TRV but above the WDEQ Class I Standard and the EPA MCL. Radium-226 was not as responsive to restoration actions as many of the other constituents but was reduced by 50 percent from post-mining concentration. The fourth stability monitoring round mean concentration of radium-226 is below the TRV, indicating that restoration has returned groundwater to class of use at MU5. Although radium-226 does not meet either Wyoming Class I Standard or EPA MCLs, the TRV is also significantly higher than those standards. This is an indication that the groundwater within MU5 was not suitable for drinking prior to mining activities.

Stability monitoring indicates that TDS concentration is below the TRV but slightly above the WDEQ Class I Standard of 500 mg/l. Restoration resulted in a reduction of 81 percent in TDS from post-mining concentration. Because TDS is near the WDEQ Class I Standard, it does not pose a risk to offsite groundwater quality.

Three constituents exceed TRVs and either WDEQ Class I Standards or EPA MCLs. However, restoration resulted in significant decreases in post-mining concentrations. The mean concentration of manganese at MU5 was reduced by almost 85 percent through restoration. Selenium was not as responsive to

restoration as other constituents, as the mean concentration decreased by approximately 27 percent over the restoration period.

Uranium was reduced by 84 percent from post mining concentration although the mean concentration is still greater than the recently revised EPA MCL of 0.03 mg/l. It should be noted that during active restoration the EPA MCL and Wyoming Class I Standard was 5.0 mg/l and the final restoration quality would have met those standards.

Water quality data indicate that the Christensen Ranch MU5 production zone has been restored to class of use using BPT. Concentrations of most constituents were reduced by more than seventy five percent of post-mining values. Concentration of manganese above the TRV is indicative of reducing conditions within the aquifer, which is favorable for continued attenuation of other uranium mining related constituents. Elevated radium-226 is consistent with pre-mining water quality and class of use for the site. Furthermore, radium-226 is a natural constituent of the orebody and is relatively immobile in groundwater systems and will not migrate appreciably from the site. Selenium was not strongly impacted by restoration actions even though BPT was applied.

8.0 REFERENCES

All references are included in the cover report, Wellfield Restoration Report Christensen Ranch, Wyoming. COGEMA 2007.

TABLES

Table 4-1. Groundwater Monitoring Wells, Mine Unit 5, Christensen Ranch, Wyoming

RESTORATION WELLS (INTERIOR ORE ZONE)

Well ID	Easting	Northing	Surface Elev.
5A074-1	849242.87	1138324.618	4,752.5
5AE80-1	848393.13	1138579.074	4,778.4
5AG68-1	848562.14	1138069.694	4,801.8
5AL66-1	848988.88	1137984.253	4,774.9
5AM78-2	849074.32	1138490.365	4,750.4
5AP54-01	849315.49	1137472.786	4,790.7
5BA48-1	850262.1	1137219.482	4,823.5
5BD50-1	850517.96	1137305.3	4,846.1
5BG46-1	850772.41	1137134.508	4,826.6
5BH58-2	850861.59	1137645.289	4,823.4
5BJ54-1	851026.13	1137474.803	4,800.9
5BJ62-1	851026.87	1137815.705	4,791.8
5BK58-1	851112.87	1137644.253	4,791.7
5BK82-1	851110.91	1138664.516	4,699.3
5BL66-1	851196.35	1137984.72	4,740.2
5BL76-1	851197.75	1138410.059	4,699.0
5BN162-2	851367.7	1142069.567	4,775.5
5BN94-1	851367.24	1139173.897	4,746.4
5BQ158-1	851623.56	1141894.949	4,787.2
5BS120-1	851793.04	1140279.966	4,767.5
5BT138-1	851877.55	1141044.737	4,791.4
AP-02	849257.81	1137952.971	4,770.0
MW-03	849470.25	1137280.646	4,795.0
MW-07	849892.32	1137140.11	4,790.8
TW1	849616.85	1137339.474	4,786.0

SHALLOW MONITOR ZONE WELLS

Well ID	Easting	Northing	Surface Elev.
5SM1	848,563.0	1,138,044.8	4,802.3
5SM2	850,558.1	1,137,330.0	4,852.2
5SM3	851,029.3	1,137,765.1	4,793.1
5SM5	851,374.0	1,139,330.6	4,747.6
5SM6	851,643.2	1,140,205.1	4,762.0
5SM7	851,355.8	1,142,039.7	4,774.2

DEEP MONITOR ZONE WELLS

Well ID	Easting	Northing	Surface Elev.
5DM1	848,562.3	1,138,094.7	4,800.1
5DM1A	848,562.6	1,138,087.7	4,801.4
5DM2	850,560.8	1,137,378.1	4,852.6
5DM3	851,079.0	1,137,765.0	4,788.9
5DM4	849,318.1	1,137,943.9	4,770.4
5DM5	851,351.1	1,139,312.2	4,747.8
5DM6	851,256.5	1,140,643.2	4,755.3
5DM7	851,386.1	1,142,040.0	4,775.2
5DM8T	851,430.1	1,139,619.0	4,746.3
5DM9T	851,796.5	1,140,018.2	4,759.3

ORE ZONE PERIMETER WELLS

Well ID	Easting	Northing	Surface Elev
5MW1	852,373.6	1,140,799.7	4,800.3
5MW2	851,199.2	1,140,255.7	4,747.6
5MW3	852,375.5	1,141,270.0	4,823.9
5MW4	851,404.3	1,140,453.6	4,758.1
5MW5	852,167.8	1,141,726.6	4,840.6
5MW6	851,513.4	1,140,715.0	4,764.8
5MW7	851,907.8	1,142,153.4	4,790.9
5MW8	851,526.8	1,140,993.8	4,766.7
5MW10	851,549.3	1,141,277.7	4,771.7
5MW12	851,129.8	1,141,502.5	4,750.0
5MW14	850,898.4	1,141,907.6	4,755.9
5MW16	851,018.5	1,142,172.6	4,775.4
5MW18	851,193.3	1,142,402.0	4,764.4
5MW20	851,479.4	1,142,412.2	4,764.9
5MW30	847,953.6	1,138,621.3	4,787.0
5MW30A	847,957.9	1,138,617.5	4,787.2
5MW31	847,826.0	1,138,382.7	4,778.1
5MW32	848,068.0	1,138,868.5	4,793.9
5MW32A	848,074.0	1,138,864.4	4,793.8
5MW33	847,836.0	1,137,907.4	4,791.7
5MW34	848,313.3	1,138,985.8	4,786.0
5MW35	848,131.8	1,137,534.3	4,812.6
5MW35A	848,126.1	1,137,532.9	4,812.5
5MW36	848,554.3	1,138,865.1	4,760.0
5MW37	848,360.3	1,137,125.4	4,811.2
5MW38	848,827.0	1,138,838.1	4,738.0
5MW39	848,830.9	1,137,077.8	4,829.3
5MW39A	848,824.8	1,137,077.2	4,829.6
5MW40	849,084.6	1,138,915.4	4,725.5
5MW41	849,989.1	1,136,636.1	4,831.8
5MW41A	848,988.4	1,136,628.6	4,831.5
5MW42	849,540.0	1,138,880.0	4,708.8
5MW43	849,380.5	1,136,377.0	4,862.8
5MW44	849,653.1	1,138,484.3	4,731.1
5MW45	849,841.3	1,136,369.8	4,829.6
5MW46	849,836.6	1,138,039.1	4,751.9
5MW47	850,307.4	1,136,481.2	4,848.4
5MW47A	850,309.3	1,136,274.3	4,849.7
5MW47B	850,310.7	1,136,280.2	4,849.6
5MW48	850,256.3	1,137,865.0	4,785.5
5MW49	850,752.8	1,136,506.4	4,814.0
5MW50	850,455.6	1,138,042.7	4,718.7
5MW51	851,223.9	1,136,376.3	4,817.7
5MW52	850,667.1	1,138,226.7	4,696.1
5MW53	851,585.7	1,136,691.9	4,809.3
5MW54	850,842.4	1,138,435.0	4,695.8
5MW55	851,563.4	1,137,167.6	4,782.7
5MW56	850,777.7	1,138,704.7	4,711.5
5MW57	851,706.7	1,137,603.0	4,748.0
5MW58	850,844.0	1,138,977.8	4,745.3
5MW59	851,643.7	1,138,107.0	4,735.3
5MW60	850,882.5	1,139,247.2	4,744.3
5MW61	851,741.6	1,138,567.0	4,711.9
5MW62	851,030.6	1,139,480.1	4,741.2
5MW63	851,834.6	1,139,032.2	4,754.9
5MW64	851,139.6	1,139,731.8	4,747.9
5MW65	851,909.6	1,139,495.2	4,751.5
5MW66	851,361.0	1,139,890.0	4,749.3
5MW67	852,219.6	1,139,864.5	4,763.0
5MW68	850,965.5	1,140,101.3	4,737.9
5MW69	852,344.7	1,140,322.8	4,782.9
5MW70	850,797.0	1,140,514.4	4,723.0

Table 4.2 Target Restoration Values for Mine Unit 5, Christensen Ranch, Wyoming

Parameter	Target Restoration Value
Major Cations/Anions	
Ca (mg/l)	24.1
Mg (mg/l)	3.7
Na (mg/l)	191.7
K (mg/l)	19.9
CO3 (mg/l)	61.9
HC03 (mg/l)	217.6
SO4 (mg/l)	348.2
Cl (mg/l)	11.9
NH4 (mg/l)	0.72
NO2 (N) (mg/l)	0.10
NO3 (N) (mg/l)	16.8
F (mg/l)	0.31
SiO2 (mg/l)	12.3
General Water Quality Parameters	
TDS (mg/l)	619.3
Cond. (umho/cm)	1095.0
Alk. (as CaC03 (mg/l))	158.4
pH (units)	10.16
Trace Metals	
Al (mg/l)	0.10
As (mg/l)	0.006
Ba (mg/l)	0.10
B (mg/l)	0.10
Cd (mg/l)	0.01
Cr (mg/l)	0.05
Cu (mg/l)	0.10
Fe (mg/l)	0.05
Pb (mg/l)	0.05
Mn (mg/l)	0.01
Hg (mg/l)	0.001
Mo (mg/l)	0.10
Ni (mg/l)	0.05
Se (mg/l)	0.026
V (mg/l)	0.14
Zn (mg/l)	0.107
Radionuclides	
U (mg/l)	0.076
Ra 226 (pCi/l)	289.8

Table 5-1. Restoration and Stability Monitoring Water Quality Results, Mine Unit 5, Christensen Ranch, Wyoming

	Active Restoration Monitoring			Stability Monitoring			
	Post Mining	Post GWS	Post RO	Round 1	Round 2	Round 3	Round 4
Major Ions mg/l:							
Ca	267.6	263.4	23.3	33.9	31.4	32.9	35.6
Mg	54.3	49.4	5.1	7.0	6.3	6.4	7.2
Na	598.4	605.2	118.7	146.7	151.3	161.4	157.0
K	12.7	26.4	2.9	3.2	3.8	3.4	4.0
CO3	1.0	1.1	1.5	1.4	2.3	1.8	1.2
HC03	1392.9	1296.2	248.8	316.8	331.1	333.9	356.6
SO4	981.0	905.8	119.1	144.5	145.1	151.6	159.0
Cl	129.4	110.7	7.8	11.0	10.8	11.0	11.4
NH4	0.39	0.39	0.12	0.18	0.21	0.16	0.10
NO2 (N)	0.10	0.15	0.10	0.10	0.10	0.10	0.09
NO3 (N)	0.11	0.10	0.10	0.10	0.11	0.10	0.12
F	0.12	0.12	0.15	0.13	0.15	0.13	0.10
SiO2	10.5	10.5	6.0	6.7	3.0	3.0	7.1
General Water Quality							
TDS (mg/l)	3074.4	2607.2	418.8	529.2	552.8	567.6	589.2
Cond. (umho/cm)	4047.3	3517.1	659.0	839.6	817.8	821.7	944.6
Alk. (mg/l as CaC03)	1143.9	1062.8	205.1	260.7	274.4	275.5	293.1
pH (units)	7.63	7.50	8.01	7.98	8.07	8.11	8.10
Trace Metals mg/l:							
Al	0.10	0.12	0.10	0.10	0.10	0.10	0.11
As	0.011	0.003	0.015	0.020	0.013	0.010	0.008
Ba	0.10	0.10	0.28	0.50	0.50	0.50	0.50
B	0.10	0.10	0.08	0.05	0.06	0.06	0.07
Cd	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Cr	0.05	0.05	0.03	0.01	0.01	0.01	0.01
Cu	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fe	0.55	0.71	0.05	0.05	0.14	0.09	0.10
Pb	0.05	0.05	0.04	0.02	0.02	0.02	0.02
Mn	0.55	0.56	0.04	0.06	0.09	0.07	0.08
Hg	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Mo	0.10	0.10	0.06	0.02	0.02	0.02	0.02
Ni	0.05	0.05	0.03	0.01	0.01	0.01	0.01
Se	0.55	0.51	0.53	0.49	0.52	0.35	0.41
V	0.22	0.22	0.23	0.18	0.16	0.15	0.12
Zn	0.01	0.02	0.01	0.01	0.01	0.01	0.01
Radiometric							
U (mg/l)	12.61	18.09	1.43	2.16	2.43	2.39	2.05
Ra 226 (pCi/l)	475.7	356.9	217.7	194.4	218.8	210.6	238.0

Numeric values represent the mean of all designated restoration wells for the specified phase of restoration

Table 5-2. Comparison of Fourth Round Stability Monitoring Water Quality to Target Restoration Values and Regulatory Standards, Mine Unit 5, Christensen Ranch, Wyoming

	Round 4 Stability Monitoring Mean	TRV	Exceeds TRV ?	Wyoming Class I	Exceeds Wyoming Class I ?	EPA MCL	Exceeds EPA MCL ?
Major Ions mg/l:							
Ca	35.6	24.1	Yes	-	NA	-	NA
Mg	7.2	3.7	Yes	-	NA	-	NA
Na	157.0	191.7	No	-	NA	-	NA
K	4.0	19.9	No	-	NA	-	NA
CO3	1.2	61.9	No	-	NA	-	NA
HC03	356.6	217.6	Yes	-	NA	-	NA
SO4	159.0	348.2	No	250	No	-	NA
Cl	11.4	11.9	No	250	No	-	NA
NH4	0.10	0.72	No	0.5	No	-	NA
NO2 (N)	0.09	0.10	No	1	No	1	No
NO3 (N)	0.12	16.8	No	10	No	10	No
F	0.10	0.31	No	1.4	No	4	No
SiO2	7.1	12.3	No	-	NA	-	NA
TDS	589.2	619.3	No	500	Yes	500	Yes
Cond. (umho/cm)	944.6	1095.0	No	-	NA	-	NA
Alk. (as CaC03)	293.1	158.4	Yes	-	NA	-	NA
pH (units)	8.10	10.16	No	6.5-8.5	No	6.5-8.5	No
Trace Metals mg/l:							
Al[a]	0.11	0.10	Yes	-	NA	0.05 to 0.2	No
As	0.008	0.006	Yes	0.05	No	0.01	No
Ba [b]	0.50	0.10	No	1	No	2	No
B	0.07	0.10	No	0.75	No	-	NA
Cd	0.00	0.01	No	0.01	No	0.005	No
Cr	0.01	0.05	No	0.05	No	0.1	No
Cu	0.01	0.10	No	1.00	No	1.3	No
Fe	0.10	0.05	Yes	0.3	No	0.3	No
Pb	0.02	0.05	No	0.05	No	0.05	No
Mn	0.08	0.01	Yes	0.05	Yes	0.05	Yes
Hg	0.001	0.001	No	0.002	No	0.002	No
Mo	0.02	0.10	No	-	NA	-	NA
Ni	0.01	0.05	No	0.01	No	-	NA

Table 5-2. Comparison of Fourth Round Stability Monitoring Water Quality to Target Restoration Values and Regulatory Standards, Mine Unit 5, Christensen Ranch, Wyoming

Se	0.41	0.026	Yes	0.05	Yes	0.05	Yes
V	0.12	0.14	No	-	NA	-	NA
Zn	0.01	0.107	No	5	No	5	No
Radiometric							
U (mg/l)	2.05	0.076	Yes	-	NA	0.03	Yes
Ra 226 (pCi/l)	238.0	289.8	No	5	Yes	5	Yes

[a] - all samples except one (5BL76-1) were below the detection limit of 0.1 mg/l

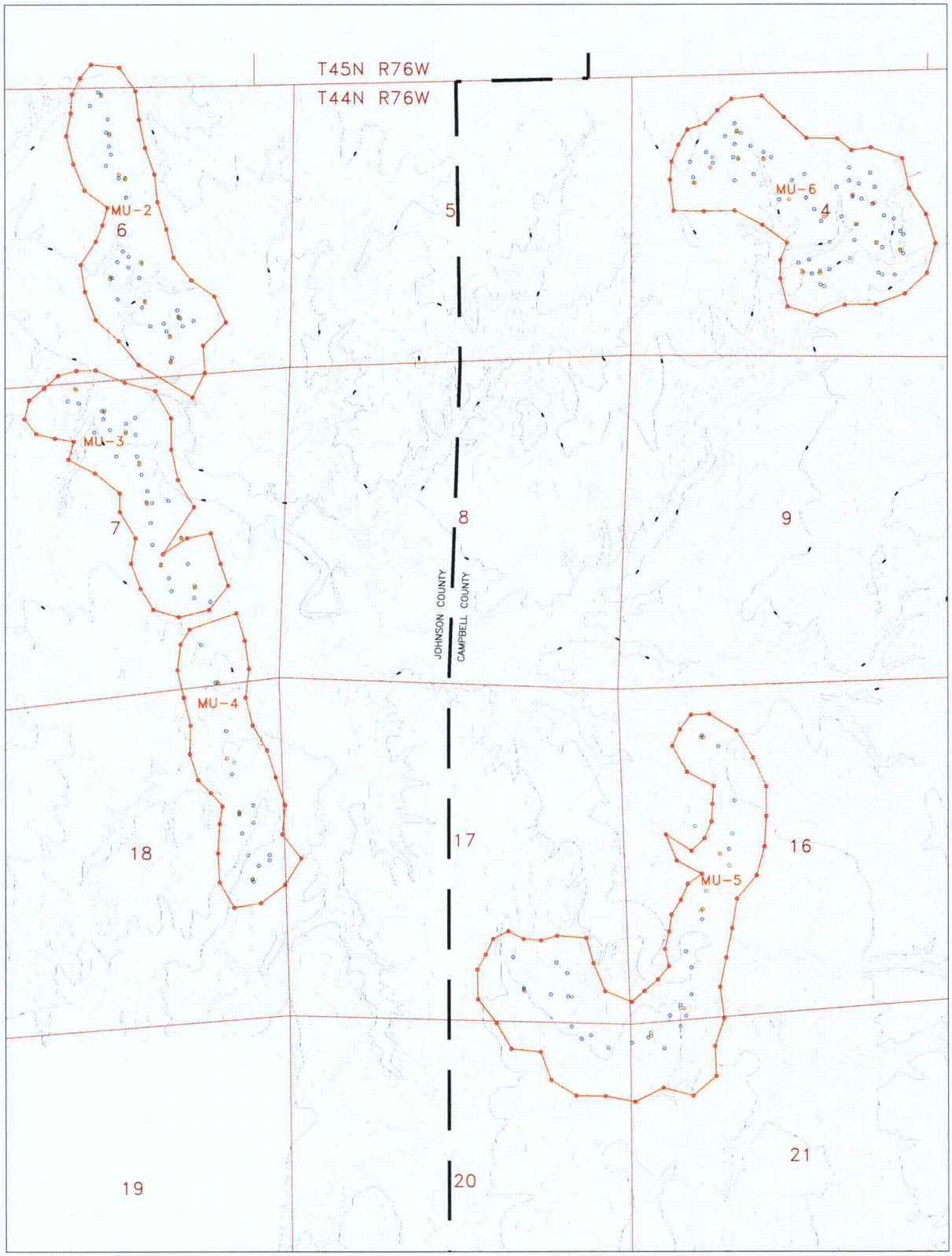
[b] -All samples were below detection limit which is greater than the TRV

TRV -Target Restoration Value-established from baseline water quality

Wyoming Class I- Drinking Water Standard

EPA MCL-US Environmental Protection Agency Maximum Contaminant Level

FIGURES



LEGEND

- PERIMETER MONITORING WELLS
- SHALLOW MONITORING WELLS
- DEEP MONITORING WELLS
- RESTORATION WELLS

0 750 1500 3000

SCALE IN FEET

N

W — E

COGEMA Mining, Inc.

FIGURE 2-1

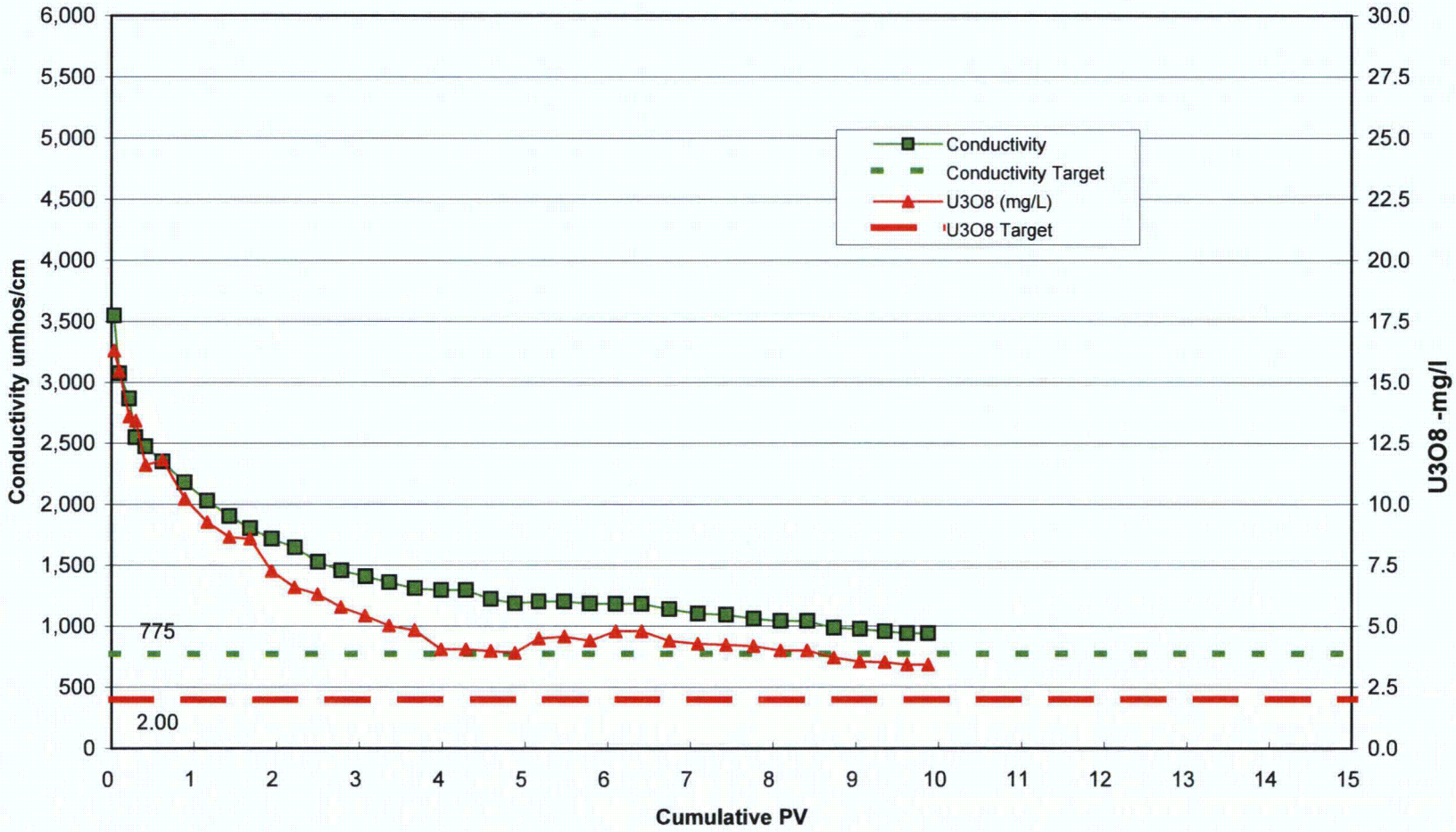
CHRISTENSEN RANCH PROJECT
MINE UNIT LOCATION MAP

PROJECT: 217-12	DATE: APRIL 2007	
CMI Restoration.dwg	BY: KRS	CHECKED: EL

Petrotek

10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127-4239
303-290-9414
www.petrotek.com

Figure 4-1 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 51, , Mine Unit 5, Christensen Ranch, Wyoming



10/23/2007

Figure 4-2 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 52 , Mine Unit 5, Christensen Ranch, Wyoming

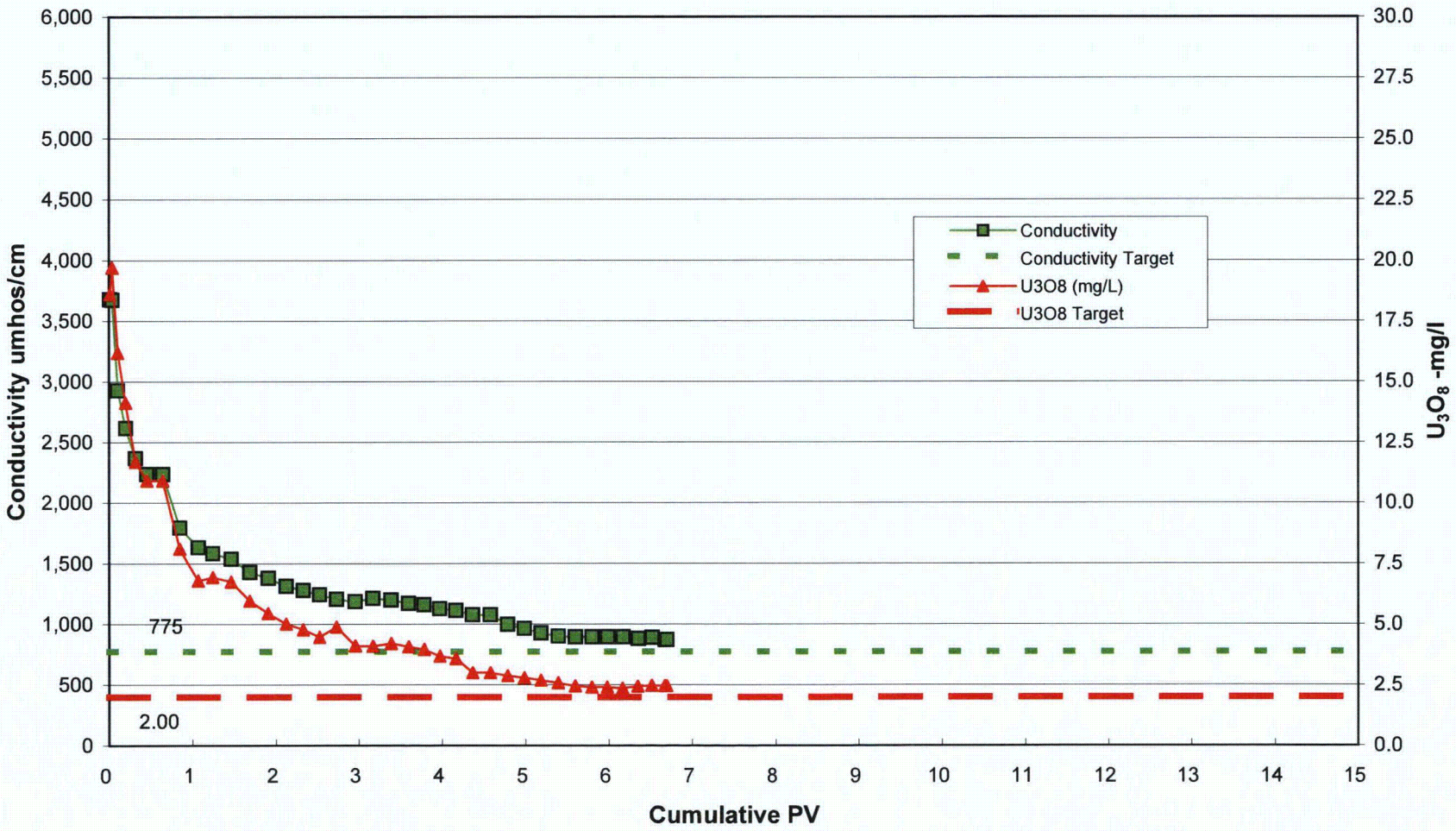
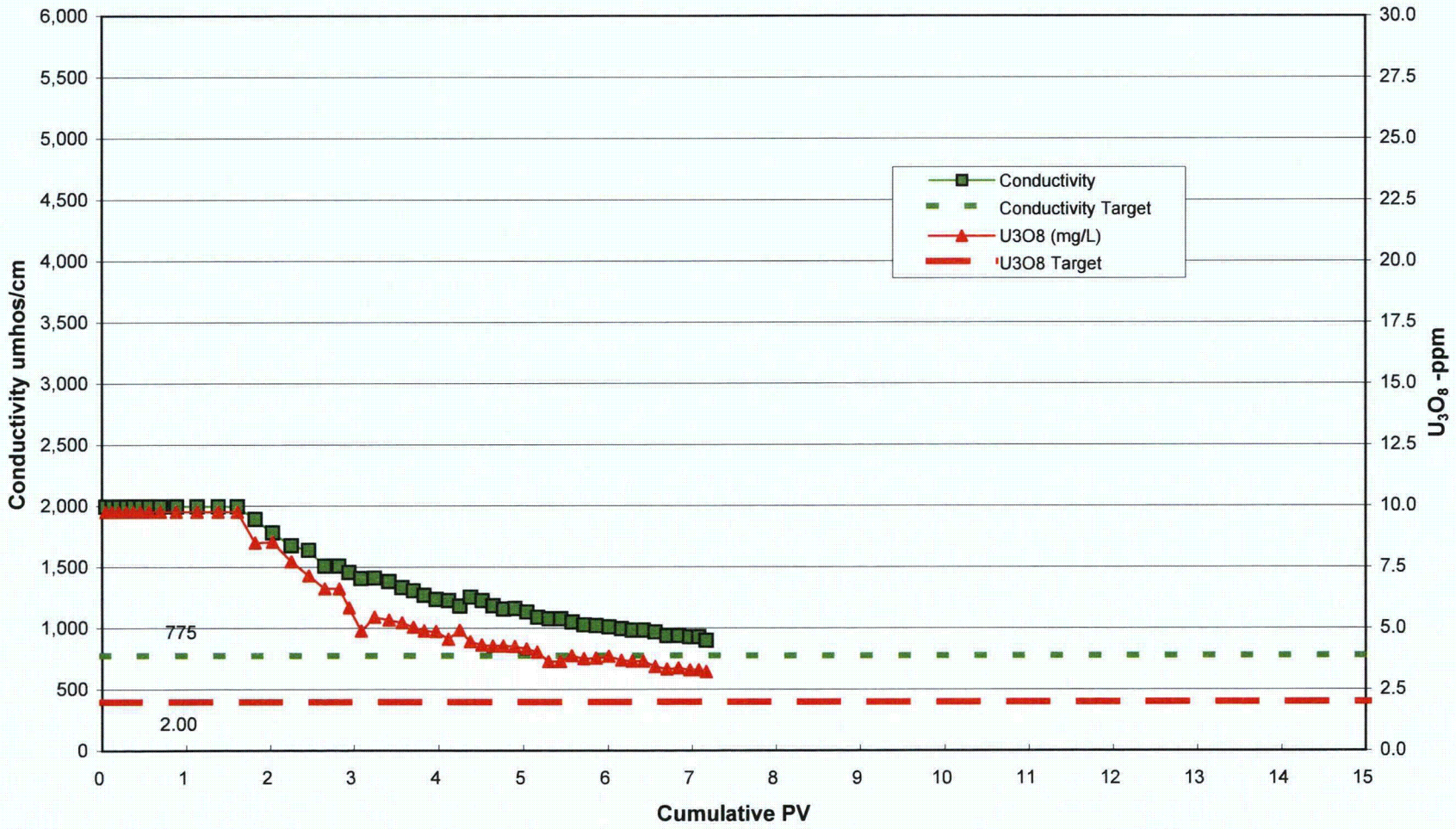


Figure 4-3 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 53, Mine Unit 5, Christensen Ranch, Wyoming



10/23/2007

Figure 4-4 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 54 , Mine Unit 5, Christensen Ranch, Wyoming

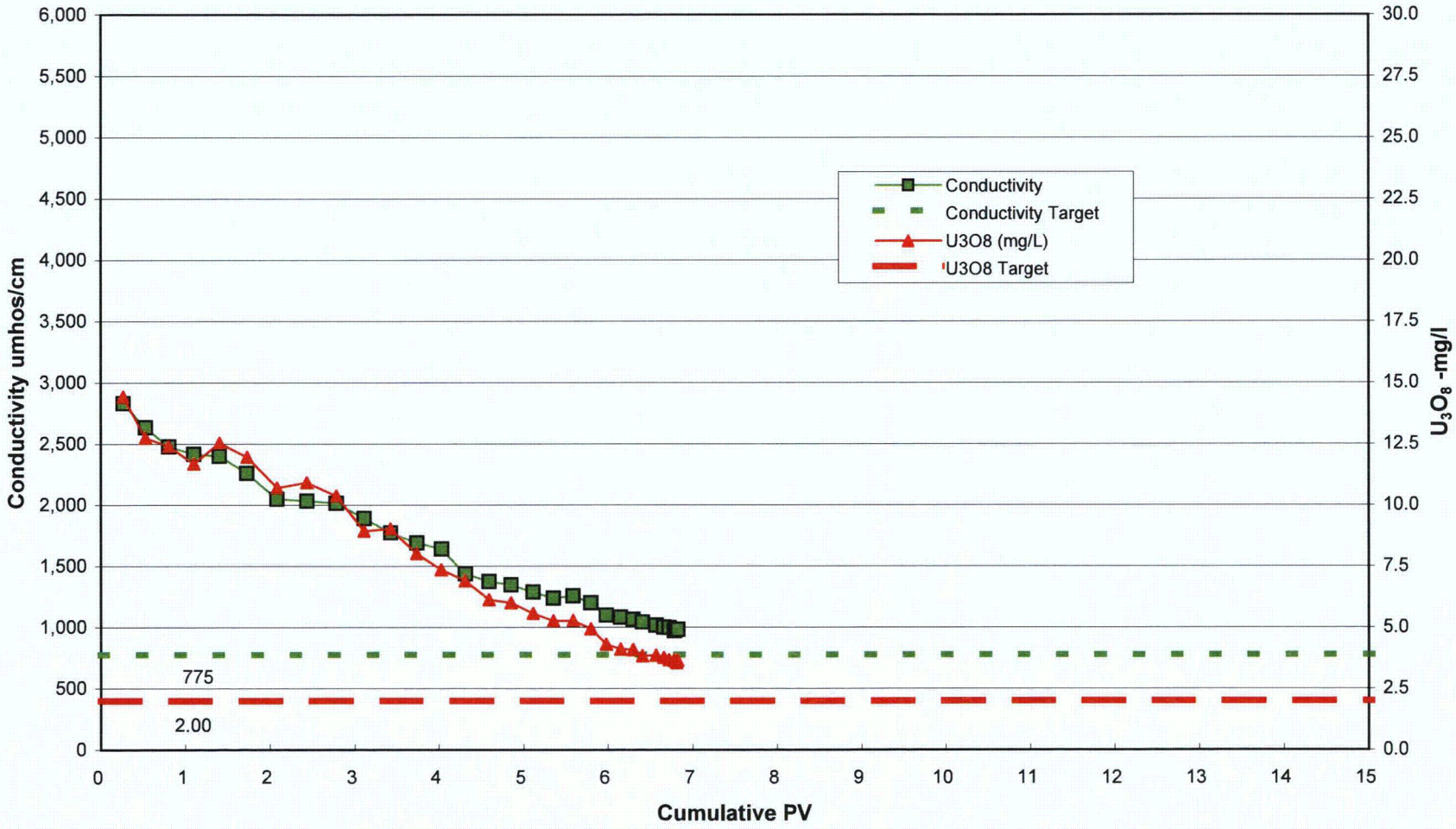
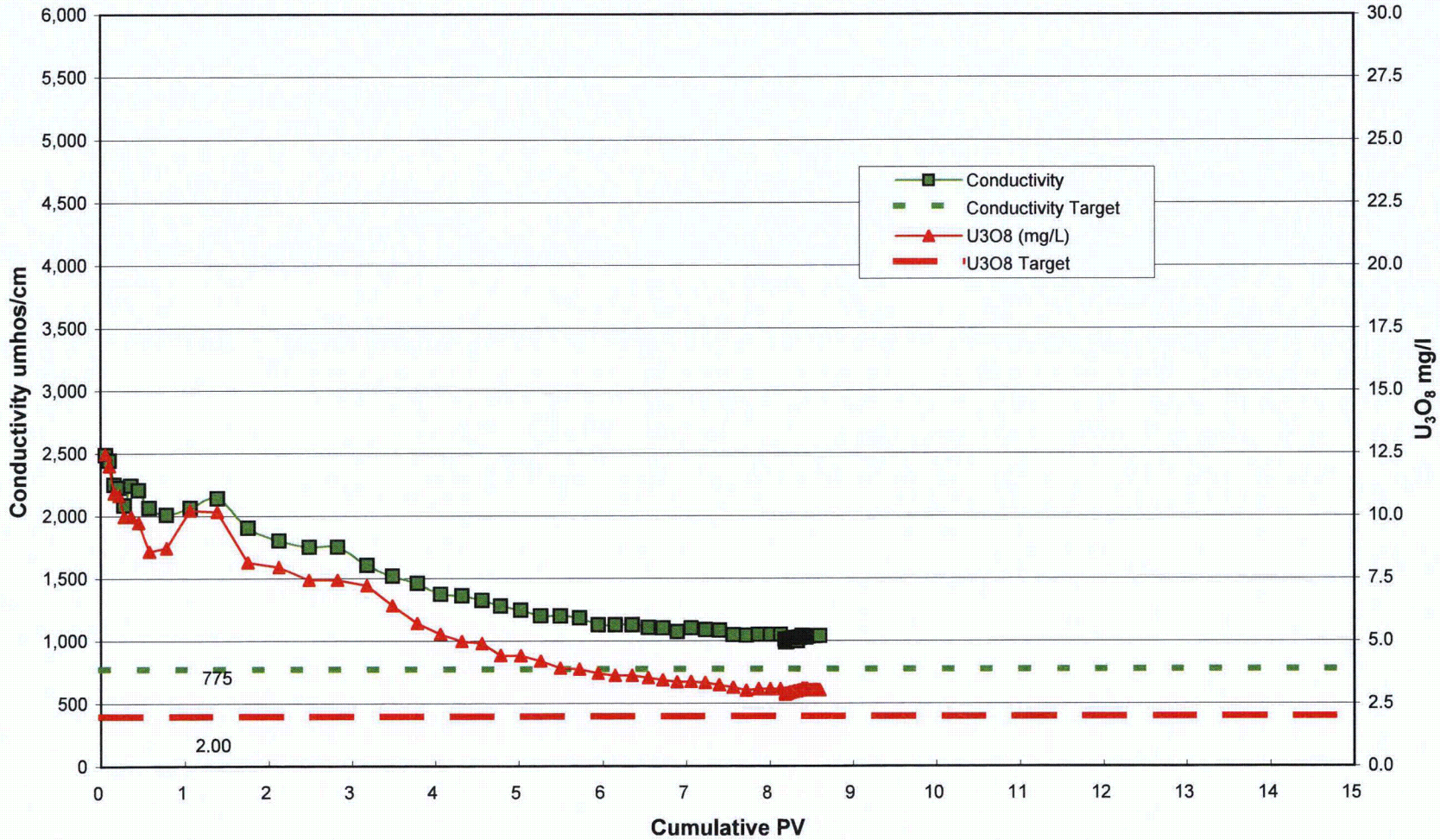
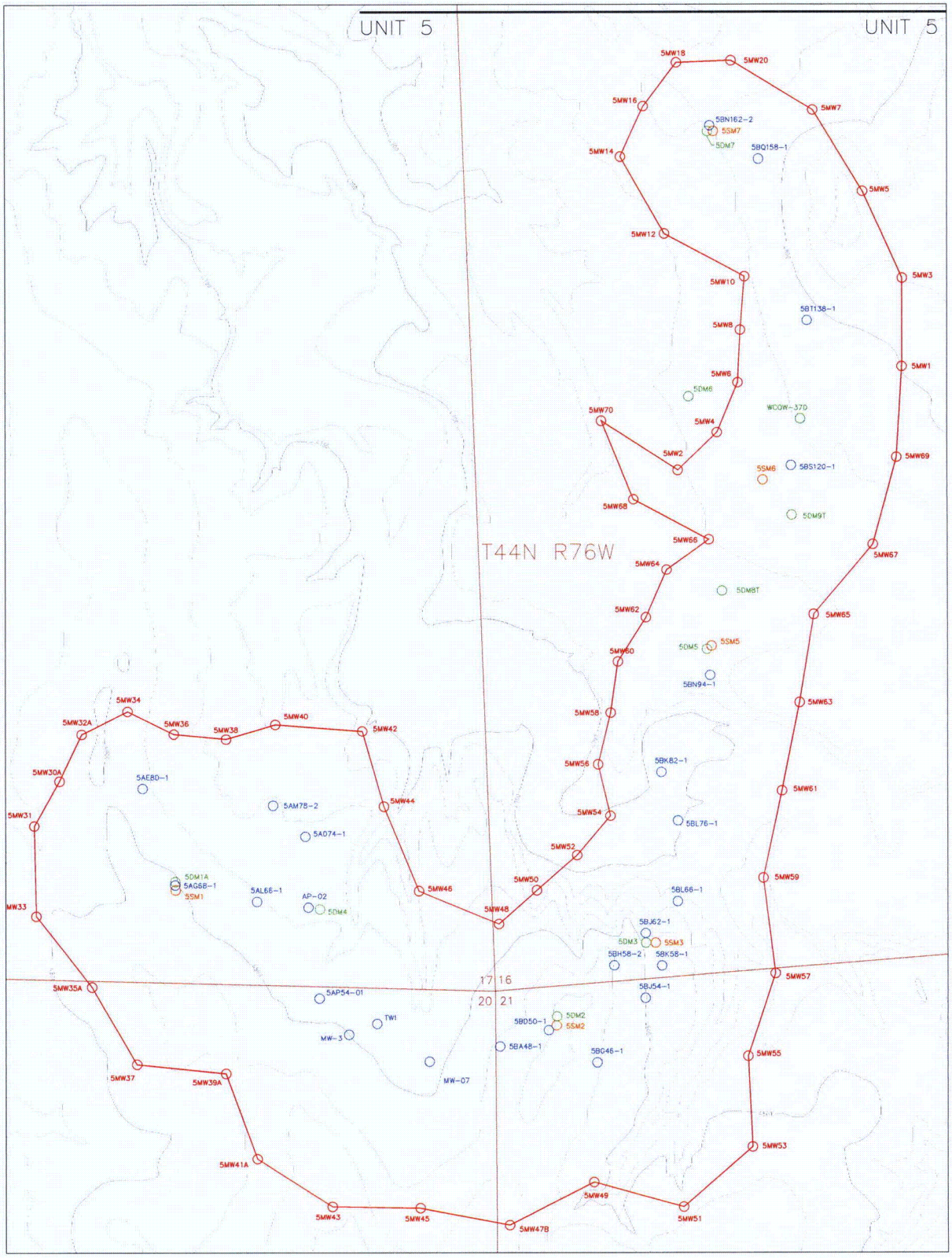


Figure 4-5 Uranium and Conductivity Trends During the RO Permeate Injection Phase of Restoration, Module 55, Mine Unit 5, Christensen Ranch, Wyoming





LEGEND

- PERIMETER MONITORING WELLS
- SHALLOW MONITORING WELLS
- DEEP MONITORING WELLS
- RESTORATION WELLS

0 250 500 1000

SCALE IN FEET

N

W — E

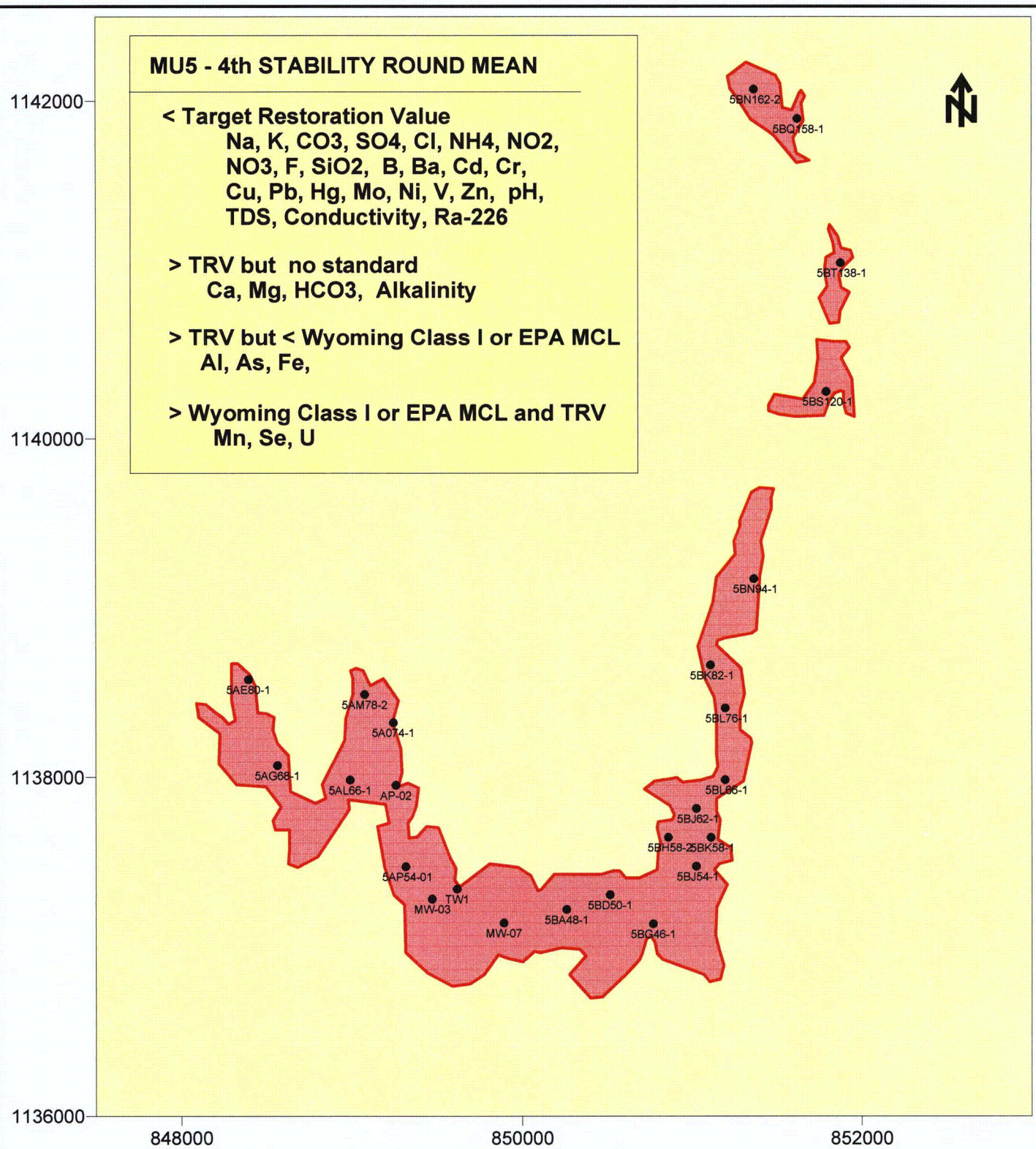
COGEMA Mining, Inc.

FIGURE 4-6

CHRISTENSEN RANCH PROJECT
LOCATION OF MINE UNIT 5 MONITORING WELLS

PROJECT: 217-12	DATE: APRIL 2007
CMI Restoration.dwg	BY: KRS CHECKED: EL

Petrotek
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127-4239
303-290-9414
www.petrotek.com



LEGEND

- Interior Ore Zone Monitoring Well

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 5

FIGURE 5-1
SUMMARY OF POST RESTORATION WATER QUALITY
MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG:COGEMAFIGMU5_5-1.SRF	BY: EPL CHECKED: HPD

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

Figure 5-2. Mean Calcium Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

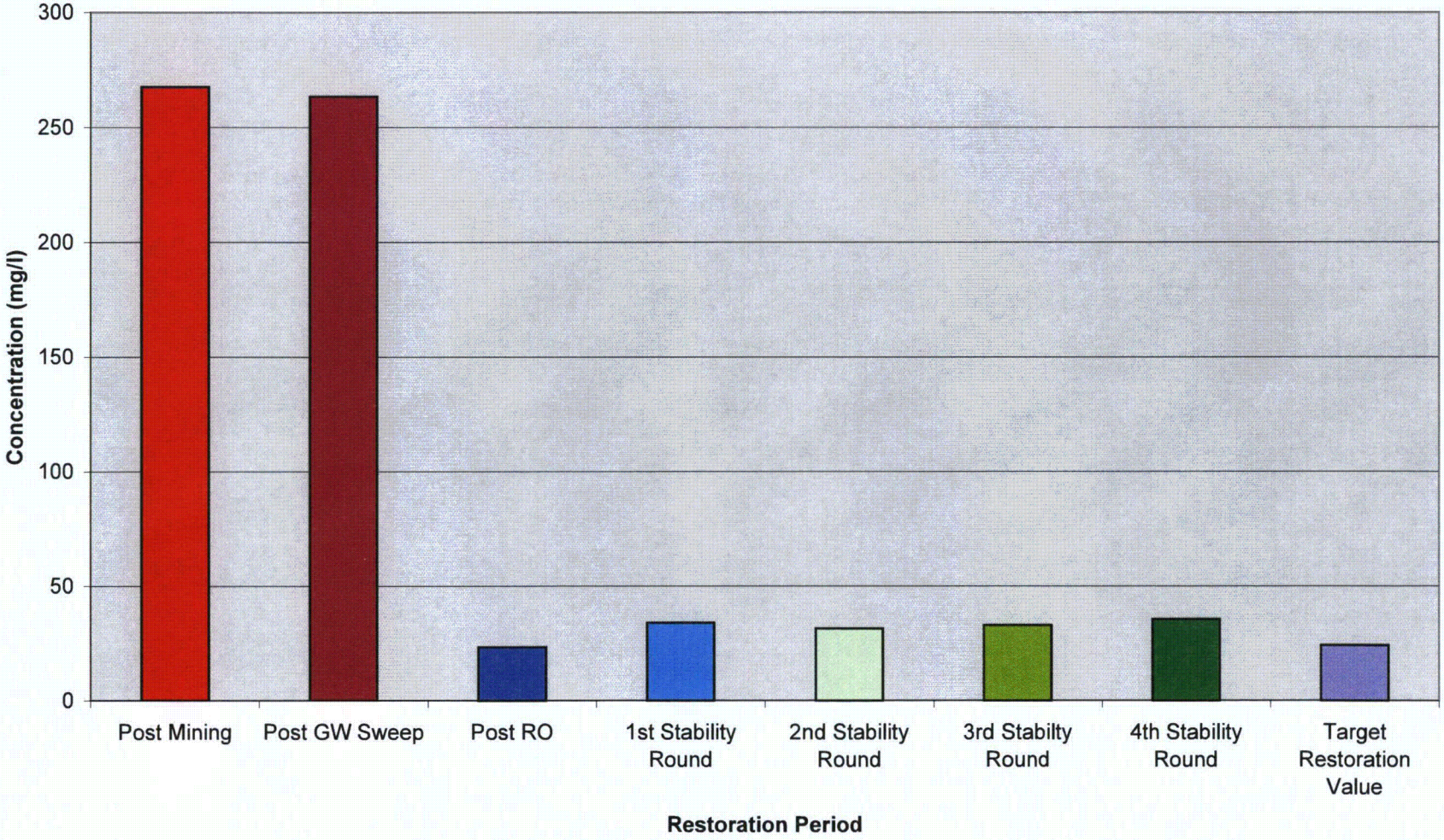


Figure 5-3. Mean Magnesium Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

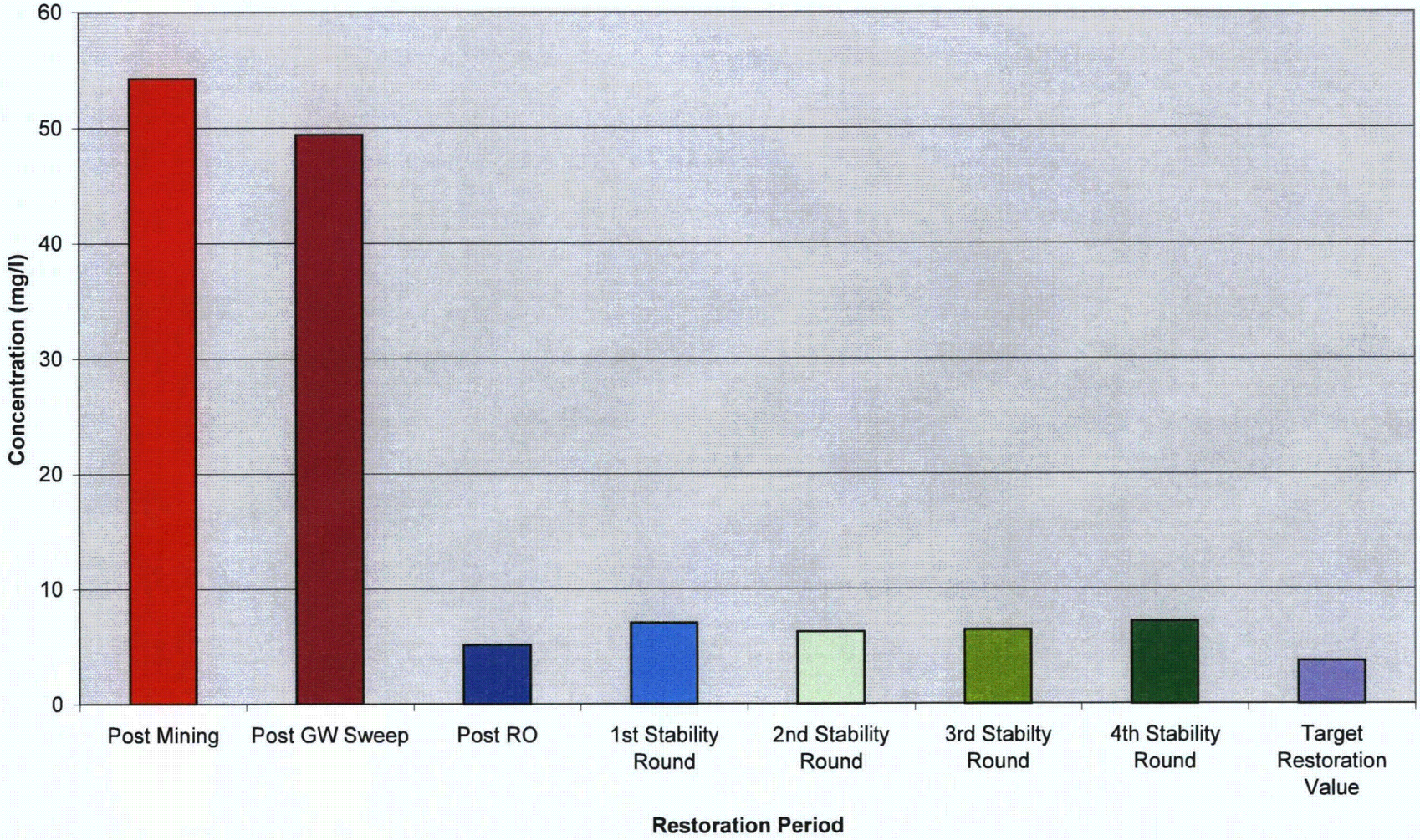


Figure 5-4. Mean Bicarbonate Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

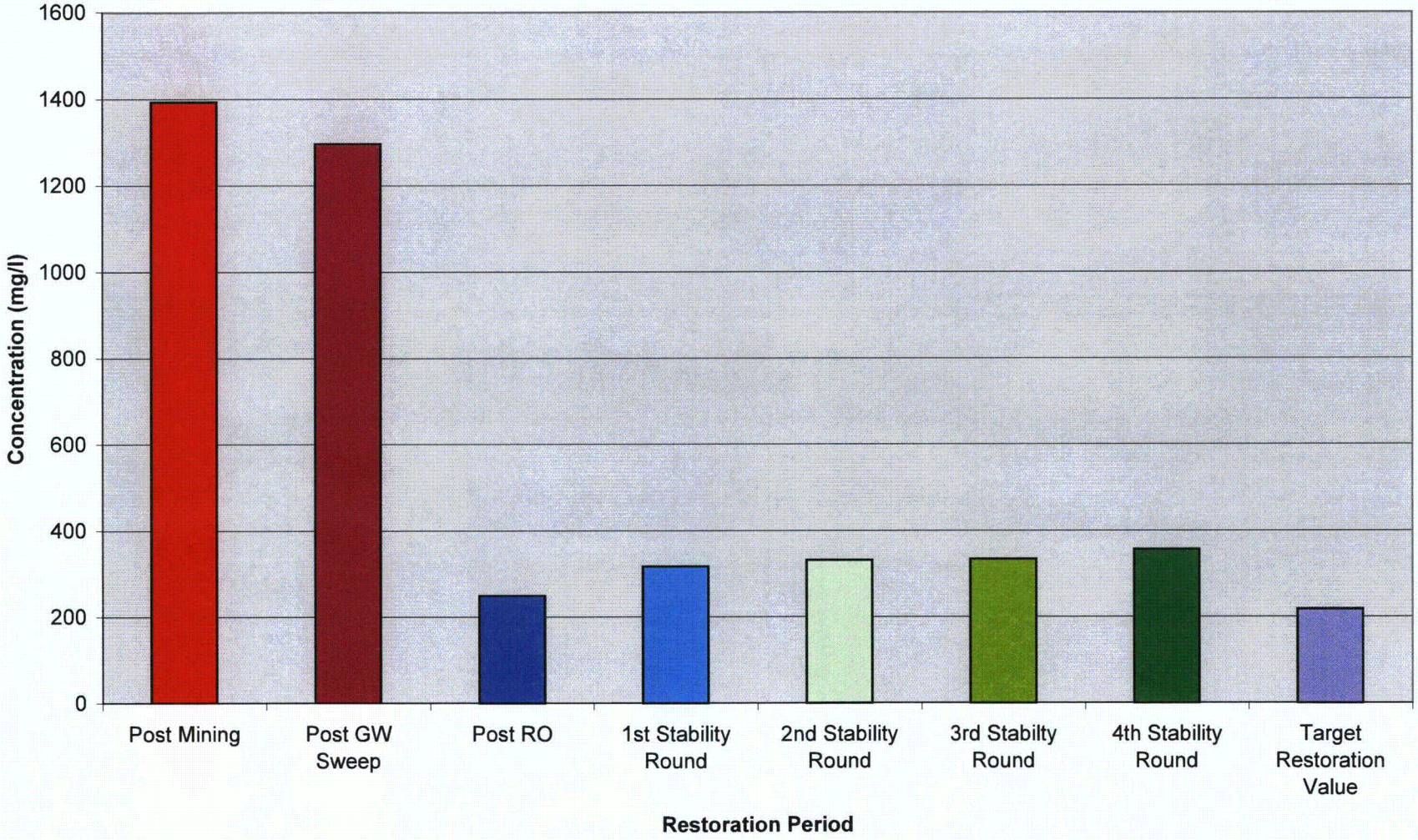


Figure 5-5. Mean Alkalinity Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

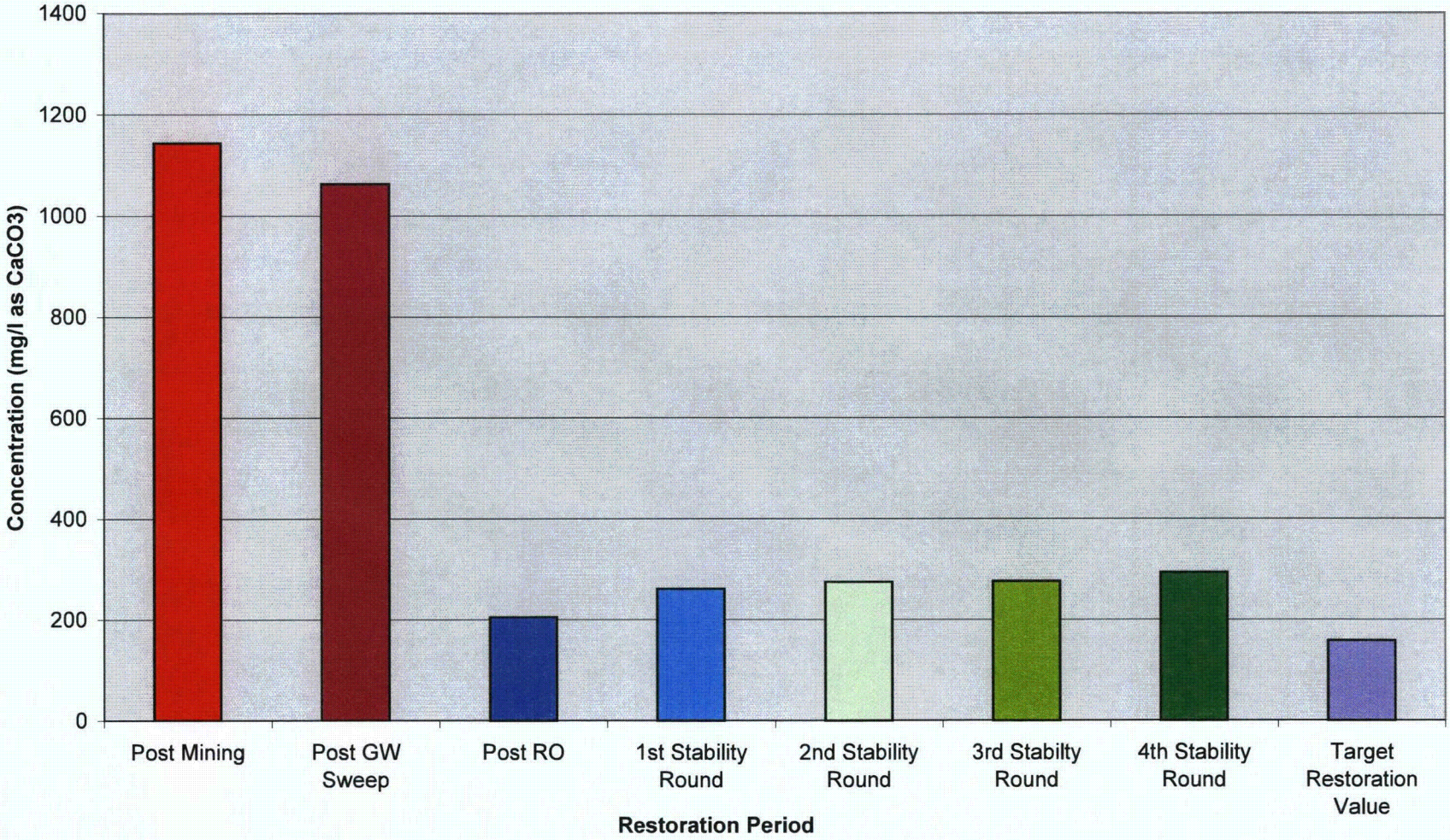


Figure 5-6. Mean Arsenic Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

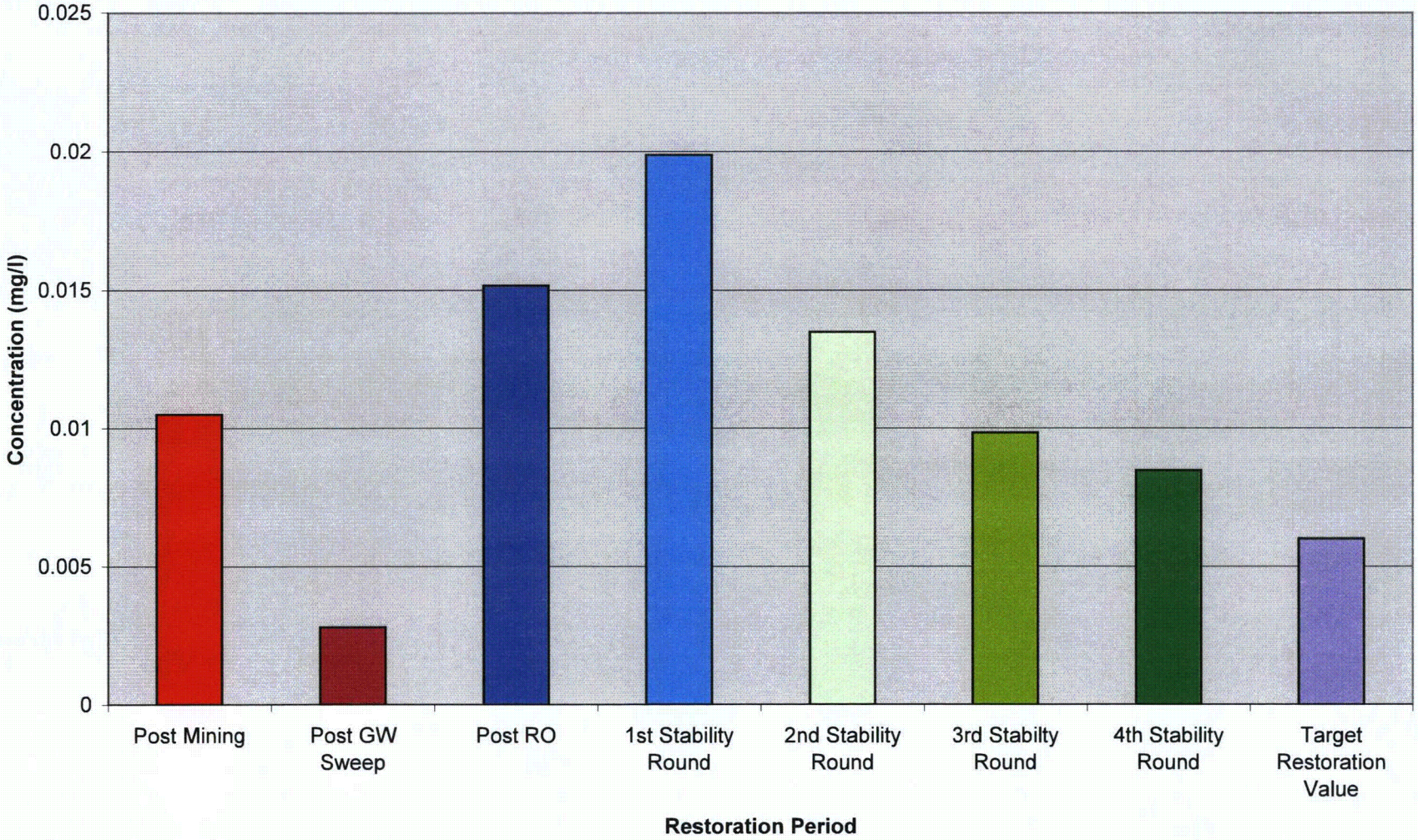


Figure 5-7. Mean Iron Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

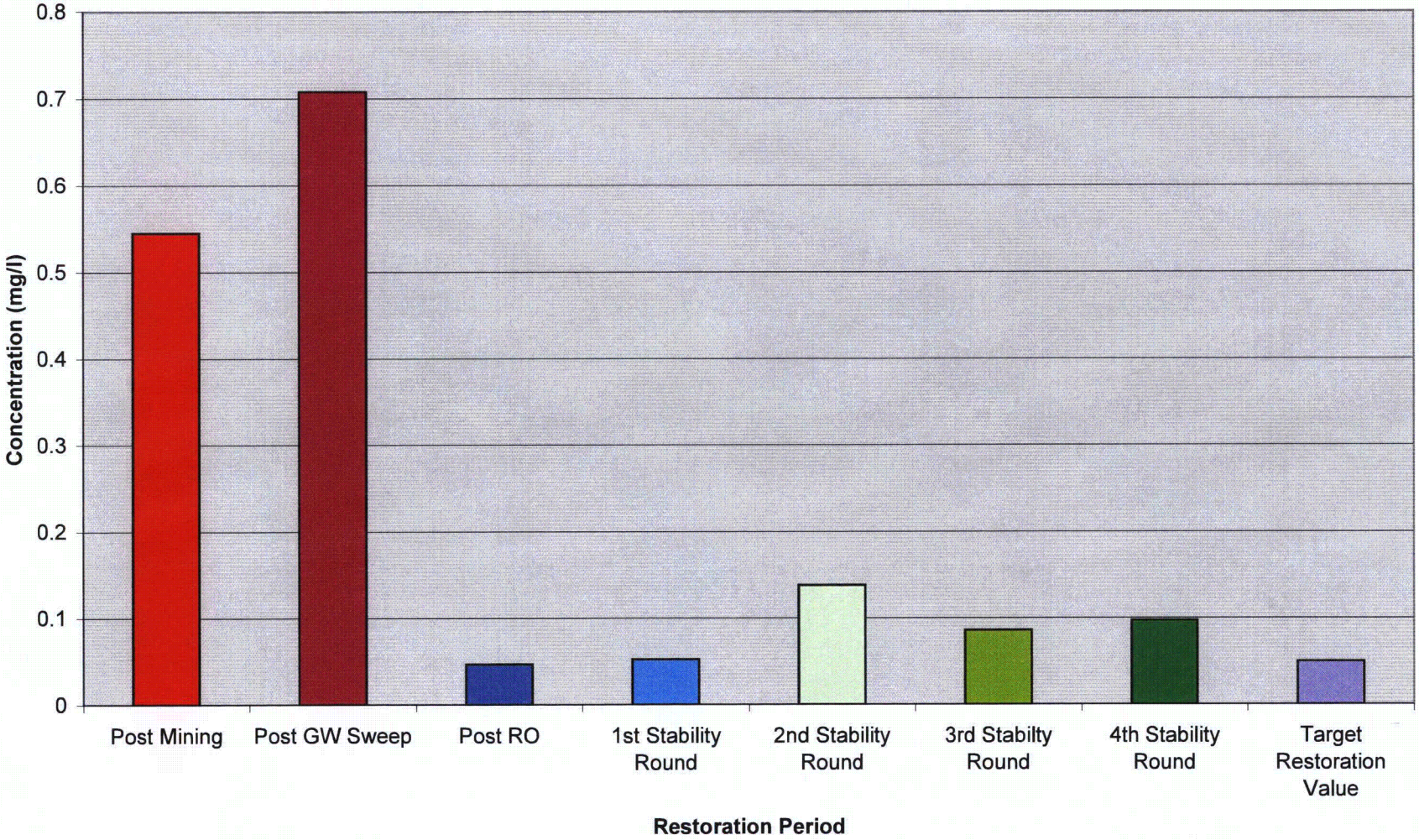


Figure 5-8. Mean TDS Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

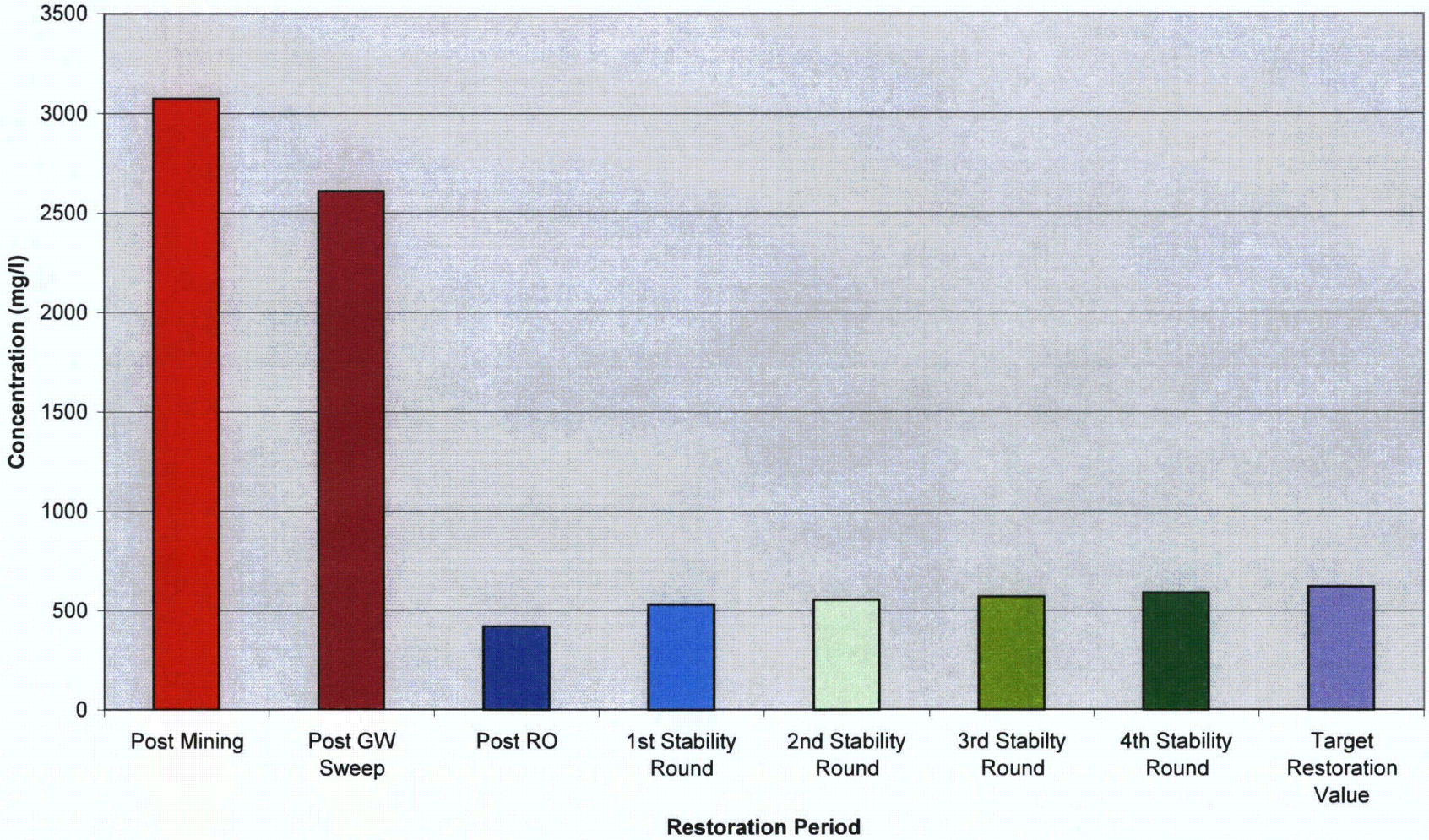


Figure 5-9. Mean Radium Activity-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

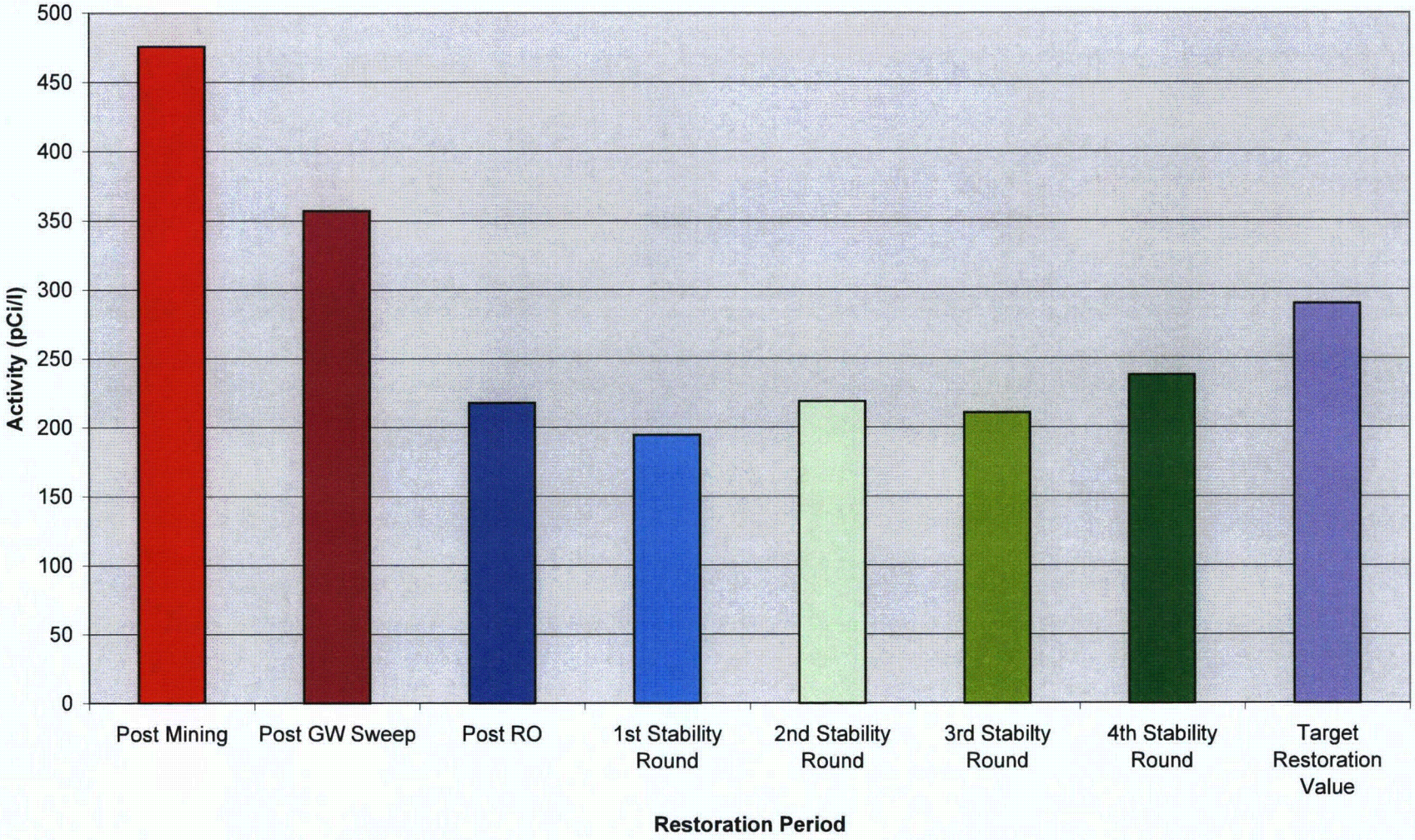


Figure 5-10. Mean Manganese Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.

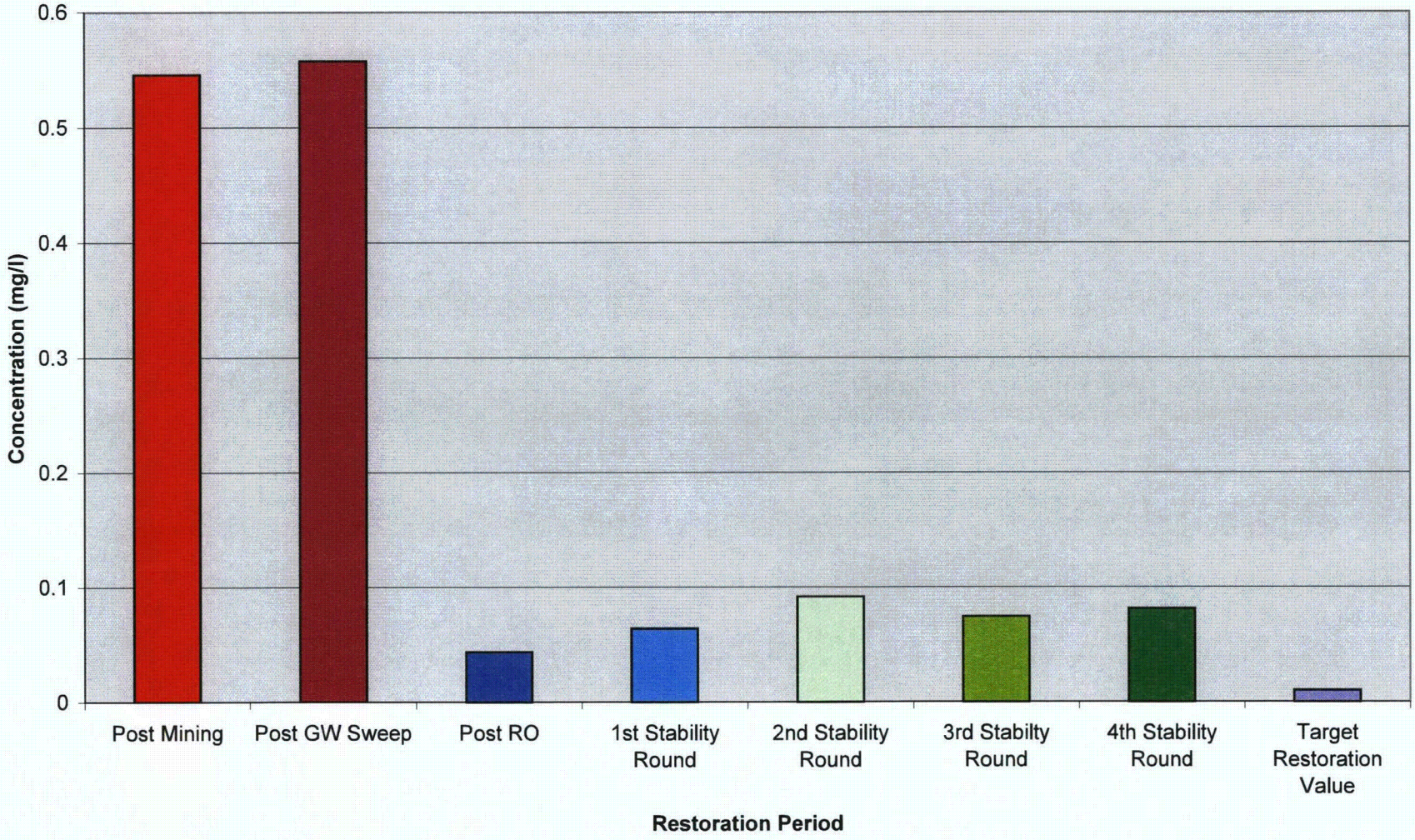
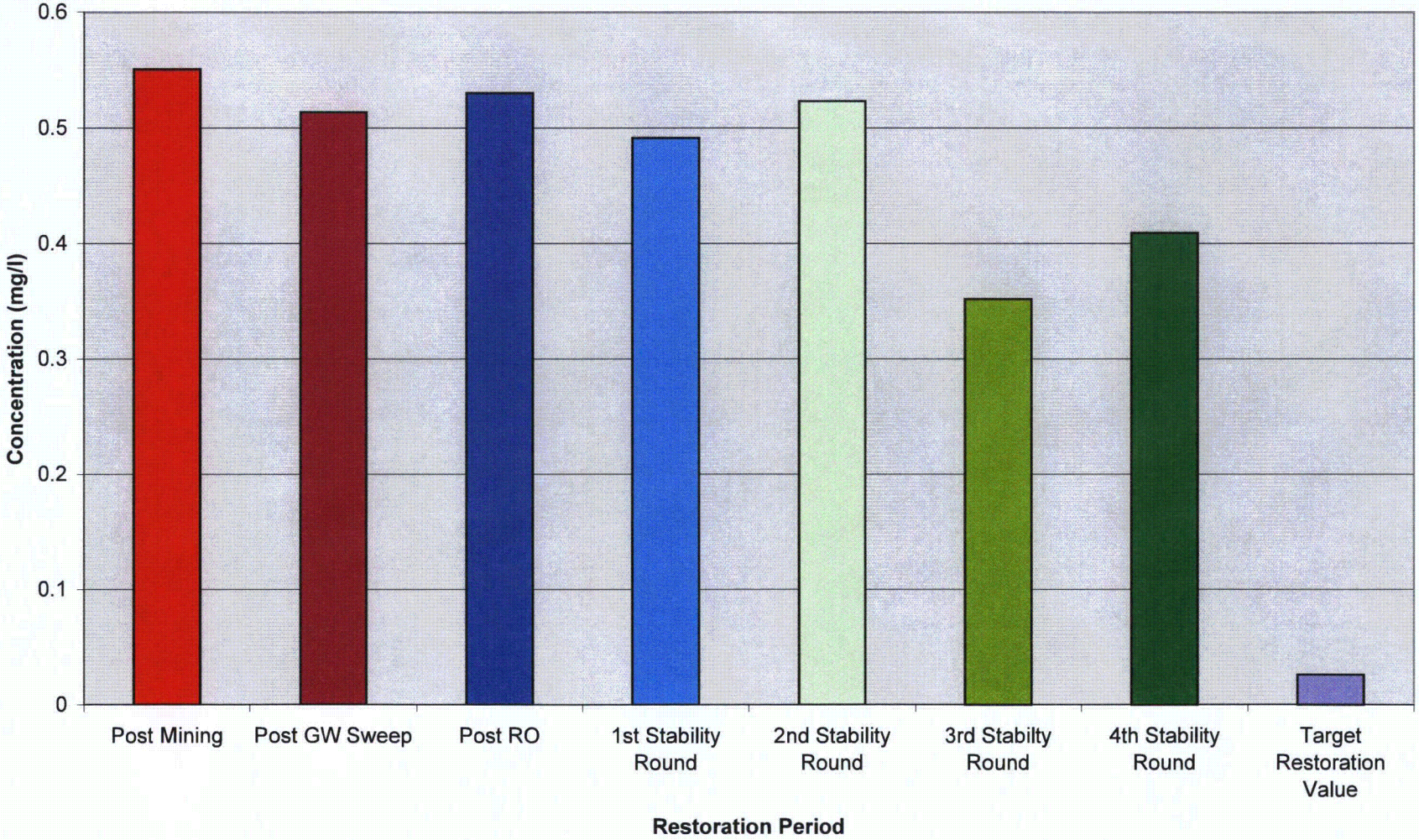
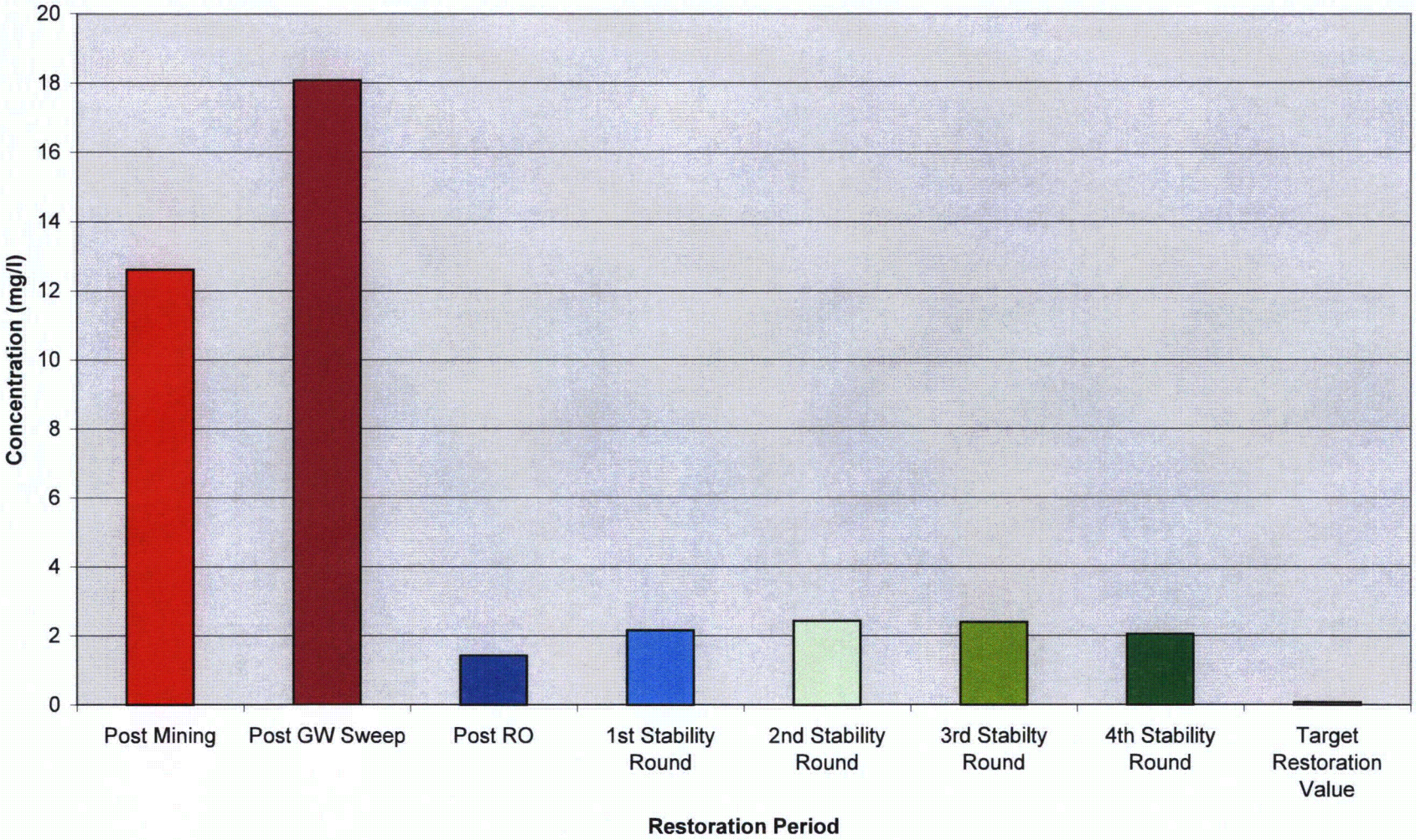


Figure 5-11. Mean Selenium Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc.



Figuire 5-12. Mean Uranium Concentration-Post Mining Through 4th Stability Round
Mine Unit 5, Christensen Ranch, Wyoming, Cogema Mining, Inc..



APPENDICES

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #1

Round one consists of all Nov-2003 results.

Well I.D.	BASELINE		BASELINE		BASELINE		5AM78-2		5AE80-1		5AG68-1		5AL66-1		AP-02	
Production Unit:	MU-5		MU-5		MU-5		Mod 51		Mod 51		Mod 51		Mod 51		Mod 52	
Sample Date:	MINUMUM		MAXIMUM		MEAN		11/11/03		11/11/03		11/11/03		11/11/03		11/12/03	
Major Ions mg/l:																
Ca	<	0.05		24.117		10.219		15.3		59.6		23.5		34.2		48.5
Mg	<	0.01		3.721		1.371		3.5		10.8		5.1		7.6		10.2
Na		101.1		191.68		146.39		70.9		207		104		124		214
K	<	0.1		19.851		4.22		1.3		3.8		2.5		2.1		4.3
CO3	<	0.1		61.85		7.255	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		29.444		217.596		123.52		149		472		265		309		409
SO4		82.859		348.161		215.51		69.2		229		68.2		104		248
Cl		3.502		11.942		7.722		7		20.7		6.9		12		14.7
NH4	<	0.05		0.722		0.143		0.1	<	0.1	<	0.1		0.20		0.2
NO2 (N)	<	0.10	<	0.10	<	0.10	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10		16.793		0.125	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10
F	<	0.10		0.307		0.184		0.1	<	0.1		0.1		0.1	<	0.1
SiO2		4.549		12.271		8.41		5.4		8.4		3.7		4.6		7.4
TDS		276.942		619.338		448.14		250		790		370		470		780
Cond. (umho/cm)		405.757		1095.003		750.38		408		1180		573		724		1270
Alk. (as CaC03)		54.896		158.403		106.649		122		387		218		253		336
pH (units)		7.349		10.157		8.753		7.7		7.90		7.70		7.80		8.1
Trace Metals mg/l:																
Al	<	0.10	<	0.10	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As	<	0.001		0.006		0.002		0.014		0.029		0.040		0.026	<	0.005
Ba	<	0.10	<	0.10	<	0.10	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B	<	0.10	<	0.10	<	0.10		0.05		0.06		0.04		0.05		0.04
Cd	<	0.01	<	0.01	<	0.01	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05
Pb	<	0.05	<	0.05	<	0.05	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.01	<	0.01	<	0.01		0.05		0.15		0.05		0.07		0.05
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.10	<	0.10	<	0.10	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se	<	0.001		0.026		0.002		0.457		0.190		0.688		0.961		0.007
V	<	0.10		0.14		0.14		0.3		0.5		0.4		0.1	<	0.1
Zn	<	0.01		0.107		0.015		0.02	<	0.01	<	0.01		0.02	<	0.01
Radiometric pCi/l:																
U (mg/l)	<	0.0003		0.0763		0.0232		0.73		1		1.82		1.17		1.250
Ra 226	<	0.2		289.79		67.588		205		97		89.7		61.6		68.5
Ra 226+/-								8.7		4.5		4.2		3.5		3.8
Data Quality																
A/C Balance(+-5)				%				0.970		0.420		1.65		1.3		1.480
Anions				meq				4.09		13.09		5.97		7.57		12.29
Cations				meq				4.17		12.98		6.17		7.77		12.66
TDS Calculated				mg/L				240		760		340		440		740
TDS Balance (0.80 - 1.20)				dec %				1.040		1.04		1.09		1.07		1.050

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #1 Round one consists of all Nov-2003 results.

Well I.D.:	5AO74-1		5AP54-1		MW-03		5BA48-1		MW-07		TW-01		5BD50-1		5BG46-1	
Production Unit:	Mod 52		Mod 52		Mod 52		Mod 53		Mod 53		Mod 53		Mod 54		Mod 54	
Sample Date:	11/12/03		11/12/03		11/12/03		11/11/03		11/11/03		11/11/03		11/12/03		11/12/03	
Major Ions mg/l:																
Ca		9.2		71.2		6.9		9.7		35.8		28.1		10		13.6
Mg		1.8		14.0		1.4		2		8.1		5.8		2.1		2.8
Na		66.3		191		86.2		67		154		129		91.4		70.8
K		1.3		4.0		1.7		1.5		3.0		2.5		1.8		1.6
CO3	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		154		498		171		176		361		280		220		183
SO4		41		185		65.7		30.4		127		115		40.6		40.6
Cl		2.4		27.7		2.6		3.2		11.7		9.4		3.3		3.2
NH4		0.2		0.2		0.2		0.2		0.1		0.1	<	0.1		0.2
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10
F	<	0.1	<	0.1		0.1		0.2		0.1		0.1		0.2		0.1
SiO2		6.5		7.4		4.7		4.1		6.8		9.2		4.9		5.20
TDS		190		790		250		220		570		460		280		220
Cond. (umho/cm)		341		1280		437		340		862		730		436		409
Alk. (as CaC03)		126		408		140		144		296		230		180		150
pH (units)		7.9		8.0		8.0		7.90		7.90		7.80		8.10		8.00
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As	<	0.005		0.015		0.030		0.011		0.015		0.024		0.076	<	0.005
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.05		0.06		0.05		0.05		0.05		0.05		0.04		0.04
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05	<	0.050	<	0.050	<	0.050	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.02		0.10	<	0.02	<	0.02		0.06		0.04		0.02		0.03
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se		0.042		0.461		1.68		0.206		2.370		0.455		1.170		0.136
V	<	0.1		0.2		0.2		0.1		0.2		0.2		0.2	<	0.1
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		0.315		2.74		1.01		0.772		1.17		0.63		2.83		0.875
Ra 226		41.6		374		49.8		61.8		72.8		177		71.2		200
Ra 226+/-		2.9		8.2		3.0		4.1		4		5.8		3.9		6.1
Data Quality																
A/C Balance(+-5)		1.290		1.310		0.120		0.000		1.770		1.960		1.620		1.130
Anions		3.44		12.79		4.25		3.61		8.90		7.26		4.55		3.94
Cations		3.53		13.13		4.24		3.61		9.22		7.55		4.70		4.03
TDS Calculated		200		740		250		200		520		430		260		220
TDS Balance (0.80 - 1.20)		0.950		1.070		1.000		1.100		1.100		1.070		1.080		1.000

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #1 Round one consists of all Nov-2003 results.

Well I.D.	5BH58-2		5BJ54-1		5BJ62-1		5BK58-1		5BK82-1		5BL66-1		5BL76-1		5BN94-1	
Production Unit:	Mod 54		Mod 54		Mod 54		Mod 54		Mod 55		Mod 55		Mod 55		Mod 55	
Sample Date:	11/12/03		11/12/03		11/12/03		11/12/03		11/12/03		11/12/03		11/12/03		11/12/03	
Major Ions mg/l:																
Ca		13		59.2		21.8		67.1		21.2		138		86.9		7.5
Mg		2.5		12.8		3.9		14.7		4.8		30.8		16.3		1.3
Na		106		173		90.6		269		115		420		305		83
K		2.3		4.2		1.9		4.5		1.9		6.8		5.4		1.6
CO3		1.8	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0		4.5
HC03		268		338		250		542		297		1050		675		141
SO4		39.8		268		51.5		299		60.5		408		334		76.3
Cl		2.4		15.9		4.0		26.7		4.9		37.9		30.5		3.4
NH4		0.3		0.2		0.1		0.3		0.1		0.3		0.2	<	0.1
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10		0.10	<	0.10
F		0.2	<	0.1	<	0.1	<	0.1		0.2	<	0.1	<	0.1		0.2
SiO2		4.9		9.2		5.1		8.4		7		10.3		9.2		5.2
TDS		310		740		320		1000		360		1630		1180		250
Cond. (umho/cm)		545		1170		502		1590		635		2470		1670		430
Alk. (as CaC03)		223		277		205		444		243		864		554		123
pH (units)		8.20		7.70		8.00		7.60		8.00		7.90		8.00		8.60
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As		0.050	<	0.005	<	0.005	<	0.005		0.014		0.029		0.016		0.031
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.04		0.06		0.05		0.06		0.05		0.07		0.05		0.03
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.050		0.100	<	0.050	<	0.050	<	0.050		0.060	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.02		0.17		0.05		0.17		0.03		0.34		0.04	<	0.02
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01		0.01	<	0.01	<	0.01	<	0.01
Se		0.453		0.103		0.047		0.249		0.295		0.192		0.703		0.82
V		0.2	<	0.1	<	0.1		0.1		0.3	<	0.1		0.1		0.1
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		1.51		0.982		1.56		5.23		0.673		7.4		18		0.292
Ra 226		310		615		54.2		1390		61.8		365		204		9.1
Ra 226+/-		8.2		10		3.4		17		3.3		8.5		7.5		1.5
Data Quality																
A/C Balance(+-5)		1.380		0.390		1.120		1.670		1.950		1.850		0.530		0.360
Anions		5.36		11.56		5.28		15.85		6.27		26.84		18.90		4.16
Cations		5.51		11.65		5.40		16.39		6.52		27.85		19.10		4.13
TDS Calculated		300		700		300		950		350		1560		1110		250
TDS Balance (0.80 - 1.20)		1.030		1.060		1.070		1.050		1.030		1.040		1.060		1.000

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #1

Round one consists of all Nov-2003 results.

Well I.D.	5BN162-2		5BQ158-1		5BS120-1		5BT138-1		STAB RD # 1 UNIT 5 MIN		STAB RD # 1 UNIT 5 MAX		STAB RD # 1 UNIT 5 MEAN	
Production Unit:	Mod 55		Mod 55		Mod 55		Mod 55							
Sample Date:	11/12/03		11/12/03		11/12/03		11/12/03							
Major Ions mg/l:														
Ca		10.5		14		32.9		10.6		6.9		138		34
Mg		2		3.1		6.5		1.9		1.3		30.8		7.0
Na		52.1		158		156		163		52.1		420		147
K		1.6		2.9		3.1		11.3		1.3		11.3		3.2
CO3	<	1.0	<	1.0	<	1.0		6.3	<	1		6.3	<	1.4
HC03		138		114		354		107		107		1050		317
SO4		33.1		277		125		277		30.4		408		145
Cl		2.3		5.9		11.4		5.9		2.3		37.9		11
NH4	<	0.1		0.2	<	0.10		0.4	<	0.1		0.4	<	0.18
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.10
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.1		0.1	<	0.10
F	<	0.1		0.2		0.2		0.2	<	0.1		0.2	<	0.13
SiO2		3.6		8.9		9		8.5		3.6		10.3		6.7
TDS		180		540		530		550		180		1630		529
Cond. (umho/cm)		289		894		904		901		289		2470		840
Alk. (as CaC03)		113		93.5		291		98		93.5		864		261
pH (units)		8.00		8.1		8.00		8.60		7.6		8.6		7.98
Trace Metals mg/l:														
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.10
As		0.016	<	0.005		0.021	<	0.005	<	0.005		0.076	<	0.020
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.04		0.04		0.05		0.04		0.03		0.07		0.05
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.050	<	0.050	<	0.050	<	0.050	<	0.05		0.1	<	0.05
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02		0.34	<	0.06
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.01	<	0.01
Se		0.172	<	0.005		0.421	<	0.005	<	0.005		2.37	<	0.491
V		0.3	<	0.1		0.3	<	0.1	<	0.1		0.5	<	0.18
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.02	<	0.01
Radiometric pCi/l:														
U (mg/l)		0.359		0.0073		1.58		0.0171		0.0073		18		2.2
Ra 226		79.2		50.5		101		51.2		9.1		1390		194
Ra 226+/-		4.4		3.3		4.4		3.2		1.5		17		5.5
Data Quality														
A/C Balance(+-5)		0.670		0.640		1.690		0.940						1.128
Anions		3.02		7.81		8.74		7.90						8.54
Cations		2.98		7.91		9.04		8.05						8.73
TDS Calculated		170		520		510		530						504
TDS Balance (0.80 - 1.20)		1.060		1.040		1.040		1.040						1.047

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #2 Round two consists of all Feb-2004 results.

Well I.D.	BASELINE		BASELINE		BASELINE		5AM78-2		5AE80-1		5AG68-1		5AL66-1		AP-02	
Production Unit:	MU-5		MU-5		MU-5		Mod 51		Mod 51		Mod 51		Mod 51		Mod 52	
Sample Date:	MINUMUM		MAXIMUM		MEAN		02/09/04		02/09/04		02/09/04		02/09/04		02/09/04	
Major Ions mg/l:																
Ca	<	0.05		24.117		10.219		18		53.4		14.4		57.7		28.7
Mg	<	0.01		3.721		1.371		3.7		11.5		2.8		11.7		5.7
Na		101.1		191.68		146.39		87.5		248		75.9		188		182
K	<	0.1		19.851		4.22		1.8		5.4		2.5		4.6		4.3
CO3	<	0.1		61.85		7.255	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		29.444		217.596		123.52		189		548		209		507		258
SO4		82.859		348.161		215.51		80.6		236		38.8		159		260
Cl		3.502		11.942		7.722		7.3		24.3		3.6		18.7		7.4
NH4	<	0.05		0.722		0.143		0.2		0.3		0.4		0.30		0.2
NO2 (N)	<	0.10	<	0.10	<	0.10	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10		16.793		0.125	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10
F	<	0.10		0.307		0.184		0.1	<	0.1		0.1		0.1		0.1
SiO2		4.549		12.271		8.41		3.0		3.9		1.6		2.7		2.9
TDS		276.942		619.338		448.14		300		900		250		730		640
Cond. (umho/cm)		405.757		1095.003		750.38		482		1330		402		1120		965
Alk. (as CaC03)		54.896		158.403		106.649		155		450		172		416		212
pH (units)		7.349		10.157		8.753		7.8		7.80		8.20		7.80		7.9
Trace Metals mg/l:																
Al	<	0.10	<	0.10	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As	<	0.001		0.006		0.002		0.008		0.027		0.023		0.020		0.009
Ba	<	0.10	<	0.10	<	0.10	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B	<	0.10	<	0.10	<	0.10		0.05		0.06		0.04		0.06		0.04
Cd	<	0.01	<	0.01	<	0.01	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05		0.09		0.33	<	0.05	<	0.05	<	0.05
Pb	<	0.05	<	0.05	<	0.05	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.01	<	0.01	<	0.01		0.05		0.20		0.03		0.14		0.03
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.10	<	0.10	<	0.10	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se	<	0.001		0.026		0.002		0.384		0.159		0.752		0.695		0.053
V	<	0.10		0.14		0.14		0.2		0.3		0.5		0.1	<	0.1
Zn	<	0.01		0.107		0.015	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)	<	0.0003		0.0763		0.0232		0.92		1.81		1.56		2.32		1.400
Ra 226	<	0.2		289.79		67.588		377		198		119		218		51.7
Ra 226+/-								14.7		9.8		7.8		10.5		5.1
Data Quality																
A/C Balance(+-5)				%				0.600		0.170		0.46		0.04		0.350
Anions				meq				4.99		14.59		4.35		12.15		9.86
Cations				meq				5.05		14.54		4.31		12.14		9.93
TDS Calculated				mg/L				290		850		240		690		610
TDS Balance (0.80 - 1.20)				dec %				1.034		1.058		1.041		1.058		1.049

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #2 Round two consists of all Feb-2004 results.

Well I.D.	5AO74-1		5AP54-1		MW-03		5BA48-1		MW-07		TW-01		5BD50-1		5BG46-1	
Production Unit:	Mod 52		Mod 52		Mod 52		Mod 53		Mod 53		Mod 53		Mod 54		Mod 54	
Sample Date:	02/09/04		02/09/04		02/09/04		02/10/04		02/09/04		02/09/04		02/10/04		02/10/04	
Major Ions mg/l:																
Ca		7.3		67.3		8.9		5.9		62.3		10.2		11.3		10.6
Mg		1.4		12.2		1.5		1.1		13.3		2.1		2.2		2.2
Na		64		207		90.5		54.8		256		85.1		101		75
K		1.3		5.3		1.9		1.4		5.5		1.9		2.2		1.8
CO3	<	1.0	<	1.0	<	1.0		2.4	<	1.0	<	1.0	<	1.0	<	1.0
HC03		143		511		194		139		583		173		220		182
SO4		45.1		198		58.5		21		246		68.6		65.2		49.3
Cl		2.6		33.3		2.7		2		22.5		4.2		4.9		3.6
NH4	<	0.1		0.2		0.3	<	0.1		0.1		0.3	<	0.1		0.1
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10
F		0.1	<	0.1		0.1		0.2	<	0.1		0.2		0.2		0.2
SiO2		3.0		3.2		2.1		1.7		3.7		3.9		2.4		2.50
TDS		200		830		270		170		930		270		300		240
Cond. (umho/cm)		310		1220		420		259		1360		412		468		368
Alk. (as CaC03)		118		419		159		118		478		142		181		149
pH (units)		7.9		8.0		8.1		8.40		7.80		8.00		8.00		8.10
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As	<	0.005		0.013		0.010		0.006		0.022	<	0.005		0.023	<	0.005
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.05		0.06		0.06		0.04		0.06		0.07		0.04		0.06
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05	<	0.050		0.160	<	0.050	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.02		0.10	<	0.02	<	0.02		0.44	<	0.02		0.02		0.02
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se		0.031		0.584		2.18		0.130		3.760		0.331		1.160		0.078
V	<	0.1		0.3		0.2	<	0.1	<	0.1		0.1		0.3	<	0.1
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.10	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		0.247		4.72		1.68		0.514		2.85		0.196		3.29		0.732
Ra 226		32.9		435		68.6		53.7		352		89.6		89.9		197
Ra 226+/-		4.3		15.4		6.0		5.6		13.5		6.7		7.1		9.7
Data Quality																
A/C Balance(+-5)		1.200		0.220		0.660		1.060		0.620		0.340		0.680		1.230
Anions		3.37		13.44		4.49		2.86		15.29		4.40		5.12		4.12
Cations		3.29		13.50		4.55		2.80		15.48		4.43		5.19		4.02
TDS Calculated		190		770		260		160		890		260		300		230
TDS Balance (0.80 - 1.20)		1.052		1.077		1.038		1.062		1.045		1.038		1.000		1.043

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #2 Round two consists of all Feb-2004 results.

Well I.D.	5BH58-2		5BJ54-1		5BJ62-1		5BK58-1		5BK82-1		5BL66-1		5BL76-1		5BN94-1	
Production Unit:	Mod 54		Mod 54		Mod 54		Mod 54		Mod 55		Mod 55		Mod 55		Mod 55	
Sample Date:	02/10/04		02/11/04		02/10/04		02/10/04		02/10/04		02/11/04		02/11/04		02/10/04	
Major Ions mg/l:																
Ca		12.3		51.6		22		49.2		26.7		120		90.3		10.6
Mg		2.2		10.6		3.9		10.5		5.8		26.3		15		1.7
Na		97.8		178		100.0		241		136		414		339		95.8
K		2.2		4.7		2.3		5.1		2.8		8.6		6.9		2.2
CO3		9.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0		10.2
HC03		261		378		259		483		373		1050		849		118
SO4		42.7		234		68		267		71.7		372		321		122
Cl		3.3		14.5		4.8		19.7		6.6		34.4		27.1		5.2
NH4		0.4	<	0.1	<	0.1		0.1		0.2		0.5	<	0.1		0.2
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10		0.30	<	0.10
F		0.2	<	0.1		0.1	<	0.1		0.2	<	0.1	<	0.1		0.3
SiO2		2.8		3.6		2.4		3.8		3.4		4.8		4		2.4
TDS		320		760		340		910		460		1610		1360		340
Cond. (umho/cm)		496		1120		520		1340		717		2210		1860		527
Alk. (as CaC03)		229		310		212		396		306		864		696		114
pH (units)		8.50		7.40		8.10		7.70		8.00		7.50		7.90		8.90
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1		0.2	<	0.1
As		0.027		0.016	<	0.005	<	0.005		0.014		0.015		0.052	<	0.005
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.04		0.06		0.05		0.08		0.06		0.09		0.07		0.04
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.02	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.050		0.170	<	0.050		0.200	<	0.050		1.530	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.02		0.15		0.05		0.13		0.05		0.33		0.35	<	0.02
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se		0.123		0.208		0.037		0.152		0.284		0.023		1.060		0.68
V		0.1	<	0.1	<	0.1	<	0.1		0.3		0.1		0.1		0.1
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		1.29		1.6		1.45		4.23		1.39		6.21		20.7		0.321
Ra 226		455		456		72.6		1130		81.7		344		378		14.3
Ra 226+/-		15.5		17.1		6.3		23.3		6.4		15.1		15.7		3.1
Data Quality																
A/C Balance(+-5)		4.400		0.750		0.170		0.360		0.000		0.740		1.690		0.810
Anions		5.57		11.47		5.81		14.03		7.80		25.99		21.38		4.98
Cations		5.10		11.30		5.83		13.93		7.80		26.38		20.67		4.90
TDS Calculated		300		680		330		830		430		1490		1220		310
TDS Balance (0.80 - 1.20)		1.066		1.117		1.030		1.096		1.069		1.080		1.115		1.096

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #2 Round two consists of all Feb-2004 results.

Well I.D.	5BN162-2		5BQ158-1		5BS120-1		5BT138-1		STAB RD # 2 UNIT 5 MIN		STAB RD # 2 UNIT 5 MAX		STAB RD # 2 UNIT 5 MEAN	
Production Unit	Mod 55		Mod 55		Mod 55		Mod 55							
Sample Date	02/10/04		02/11/04		02/10/04		02/11/04							
Major Ions mg/l:														
Ca		13.3		13		10.5		9.9		5.9		120		31
Mg		2.5		2.8		2.3		1.7		1.1		26.3		6.3
Na		63.9		152		99		151		54.8		414		151
K		2.1		3.4		2.8		12.6		1.3		12.6		3.8
CO3	<	1.0		1.8		7.8		8.4	<	1		10.2	<	2.3
HC03		167		114		264		105		105		1050		331
SO4		38.9		264		41.6		259		21		372		145
Cl		2.8		5.4		3.1		5.6		2		34.4		11
NH4		0.2	<	0.1		0.20		0.3	<	0.1		0.5	<	0.21
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.10
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.1		0.3	<	0.11
F	<	0.1		0.2		0.3		0.2	<	0.1		0.3	<	0.15
SiO2		1.8		3.5		3.4		3.4		1.6		4.8		3.0
TDS		220		570		330		570		170		1610		553
Cond. (umho/cm)		342		854		511		832		259		2210		818
Alk. (as CaC03)		137		96.5		230		100		96.5		864		274
pH (units)		8.20		8.4		8.50		8.80		7.4		8.9		8.07
Trace Metals mg/l:														
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.2	<	0.10
As		0.007	<	0.005	<	0.005	<	0.005	<	0.005		0.052	<	0.013
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.06		0.04		0.06		0.05		0.04		0.09		0.06
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.02	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.050	<	0.050		0.070	<	0.050	<	0.05		1.53	<	0.14
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn		0.02	<	0.02	<	0.02	<	0.02	<	0.02		0.44	<	0.09
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.01	<	0.01
Se		0.108	<	0.005		0.103	<	0.005	<	0.005		3.76	<	0.523
V		0.2	<	0.1		0.1	<	0.1	<	0.1		0.5	<	0.16
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.1	<	0.01
Radiometric pCi/l:														
U (mg/l)		0.440		0.0082		0.841		0.0158		0.0082		20.7		2.4
Ra 226		56.9		59.4		93.7		46.9		14.3		1130		219
Ra 226+/-		6.4		6.4		6.9		5.7		3.1		23.3		9.8
Data Quality														
A/C Balance(+-5)		1.090		0.000		4.500		0.330						0.899
Anions		3.62		7.58		5.57		7.57						8.82
Cations		3.70		7.58		5.09		7.52						8.76
TDS Calculated		210		500		300		500						514
TDS Balance (0.80 - 1.20)		1.047		1.140		1.100		1.140						1.068

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #3 Round three consists of all May-2004 results.

Well I.D.	BASELINE		BASELINE		BASELINE		5AM78-2		5AE80-1		5AG68-1		5AL66-1		AP-02	
Production Unit:	MU-5		MU-5		MU-5		Mod 51		Mod 51		Mod 51		Mod 51		Mod 52	
Sample Date:	MINUMUM		MAXIMUM		MEAN		05/10/04		05/10/04		05/10/04		05/10/04		05/10/04	
Major Ions mg/l:																
Ca	<	0.05		24.117		10.219		21.2		85.6		11.6		59.2		29.9
Mg	<	0.01		3.721		1.371		4.2		13.9		2.0		11.6		6.0
Na		101.1		191.68		146.39		108		278		57.1		214		201
K	<	0.1		19.851		4.22		2.1		5.6		2.1		4.2		3.4
CO3	<	0.1		61.85		7.255	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		29.444		217.596		123.52		214		623		156		535		259
SO4		82.859		348.161		215.51		108		286		30.6		169		288
Cl		3.502		11.942		7.722		8.4		30.1		2.6		19.7		7.6
NH4	<	0.05		0.722		0.143	<	0.1		0.2		0.1	<	0.10		0.2
NO2 (N)	<	0.10	<	0.10	<	0.10	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10		16.793		0.125	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10
F	<	0.10		0.307		0.184	<	0.1	<	0.1		0.1	<	0.1		0.1
SiO2		4.549		12.271		8.41		3.1		3.9		1.5		2.5		2.8
TDS		276.942		619.338		448.14		380		1070		200		780		690
Cond. (umho/cm)		405.757		1095.003		750.38		556		1520		304		1140		995
Alk. (as CaC03)		54.896		158.403		106.649		175		511		128		439		212
pH (units)		7.349		10.157		8.753		8.0		7.90		8.20		7.90		8.1
Trace Metals mg/l:																
Al	<	0.10	<	0.10	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As	<	0.001		0.006		0.002		0.010		0.009		0.017		0.016	<	0.005
Ba	<	0.10	<	0.10	<	0.10	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B	<	0.10	<	0.10	<	0.10		0.07		0.07		0.05		0.08		0.06
Cd	<	0.01	<	0.01	<	0.01	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05	<	0.05		0.25	<	0.05	<	0.05	<	0.05
Pb	<	0.05	<	0.05	<	0.05	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.01	<	0.01	<	0.01		0.06		0.25		0.02		0.16		0.03
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.10	<	0.10	<	0.10	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01		0.02	<	0.01
Se	<	0.001		0.026		0.002	<	0.179		0.077		0.402		0.433		0.011
V	<	0.10		0.14		0.14	<	0.1		0.2		0.3	<	0.1	<	0.1
Zn	<	0.01		0.107		0.015	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)	<	0.0003		0.0763		0.0232		0.72		1.47		0.692		1.46		0.535
Ra 226	<	0.2		289.79		67.588		265		171		71.5		224		55.3
Ra 226+/-								15		11		7.5		13		6.5
Data Quality																
A/C Balance(+-5)				%				1.240		0.170		0.00		1.91		1.650
Anions				meq				5.98		17.04		3.29		12.83		10.46
Cations				meq				6.13		17.63		3.29		13.33		10.81
TDS Calculated				mg/L				360		1010		180		740		660
TDS Balance (0.80 - 1.20)				dec %				1.055		1.059		1.111		1.054		1.045

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #3 Round three consists of all May-2004 results.

Well I.D.	5AO74-1		5AP54-1		MW-03		5BA48-1		MW-07		TW-01		5BD50-1		5BG46-1	
Production Unit:	Mod 52		Mod 52		Mod 52		Mod 53		Mod 53		Mod 53		Mod 54		Mod 54	
Sample Date:	05/10/04		05/10/04		05/10/04		05/10/04		05/10/04		05/10/04		05/10/04		05/11/04	
Major Ions mg/l:																
Ca		7.7		74.2		9.5		6.0		74.4		6.4		11.8		10.9
Mg		1.4		12.9		1.5		1.1		15.2		1.3		2.2		2.3
Na		67.2		227		94.1		55.2		285		65.4		102		77
K		1.3		5.2		1.8		1.4		5.6		1.4		2.1		1.7
CO3	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		145		552		195		142		652		134		222		187
SO4		42.6		207		65.1		22		265		46.3		63.3		44.4
Cl		2.4		31.3		3.0		2		24.2		2.9		4.7		3.1
NH4	<	0.1		0.2		0.3		0.1		0.3	<	0.1	<	0.1		0.2
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10
F		0.1	<	0.1		0.1		0.1	<	0.1		0.2		0.2		0.1
SiO2		3.0		3.2		2.1		1.6		3.8		3.7		2.3		2.4
TDS		220		880		300		180		1050		210		320		240
Cond. (umho/cm)		314		1270		425		253		1470		305		477		373
Alk. (as CaC03)		119		453		160		116		535		110		182		153
pH (units)		8.0		8.1		8.1		8.30		7.90		8.00		8.30		8.10
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As		0.005	<	0.005		0.005		0.006		0.020		0.020		0.011	<	0.005
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.06		0.07		0.06		0.05		0.06		0.06		0.05		0.07
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05	<	0.05		0.260	<	0.05	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.02		0.11	<	0.02	<	0.02		0.38	<	0.02		0.02		0.03
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se		0.019		0.325		1.68		0.069		1.690		0.338		0.563		0.108
V	<	0.1		0.2		0.2	<	0.1	<	0.1		0.1		0.2	<	0.1
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.10	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		0.304		4.81		1.28		0.525		3.9		0.125		1.98		0.932
Ra 226		22.8		323		80.8		67.5		549		51.7		75.3		165
Ra 226+/-		4.8		16		8.0		7.4		21		7		8.2		12
Data Quality																
A/C Balance(+-5)		1.620		1.720		1.060		0.700		1.740		0.920		1.540		0.490
Anions		3.34		14.25		4.65		2.86		16.90		3.24		5.10		4.08
Cations		3.45		14.75		4.75		2.82		17.50		3.30		5.26		4.12
TDS Calculated		190		830		270		160		990		190		300		230
TDS Balance (0.80 - 1.20)		1.158		1.060		1.111		1.200		1.060		1.105		1.066		1.043

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #3 Round three consists of all May-2004 results.

Well I.D.	5BH58-2		5BJ54-1		5BJ62-1		5BK58-1		5BK82-1		5BL66-1		5BL76-1		5BN94-1	
Production Unit:	Mod 54		Mod 54		Mod 54		Mod 54		Mod 55		Mod 55		Mod 55		Mod 55	
Sample Date:	05/11/04		05/11/04		05/11/04		05/10/04		05/11/04		05/11/04		05/11/04		05/11/04	
Major Ions mg/l:																
Ca		14.1		46.6		23.1		45.5		21.1		89.5		94.8		12.7
Mg		2.9		10.1		4.3		9.5		4.9		20.1		17.8		1.9
Na		117		193		101.0		259		142		332		366		116
K		2.5		4.1		2.2		3.6		2.4		6.2		6.5		2.3
CO3		6.6	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0		6.6
HC03		298		363		267		459		356		858		828		124
SO4		44.3		231		66.2		276		69.6		292		334		155
Cl		2.6		13.9		4.6		19.9		5.8		25.4		31.3		6.3
NH4		0.1		0.1		0.5	<	0.1		0.2		0.2	<	0.1	<	0.1
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10		0.20	<	0.10	<	0.10	<	0.10
F		0.2	<	0.1	<	0.1	<	0.1		0.2	<	0.1	<	0.1		0.2
SiO2		2.2		3.9		2.4		3.6		3.1		4.1		4.5		2.3
TDS		350		720		350		900		440		1250		1340		390
Cond. (umho/cm)		548		1060		549		1250		642		1800		1840		597
Alk. (as CaC03)		255		298		219		376		292		703		679		113
pH (units)		8.20		7.80		8.00		7.90		8.00		7.90		8.00		8.60
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1		0.2	<	0.1
As		0.011	<	0.005	<	0.005		0.006		0.028		0.011	<	0.005		0.021
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.06		0.07		0.06		0.07		0.06		0.08		0.09		0.05
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.050		0.160	<	0.050		0.240	<	0.050		0.240	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn		0.03		0.13		0.05		0.12		0.03		0.22		0.03	<	0.02
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se		0.296		0.132		0.028		0.134		0.382		0.270		0.719		0.679
V		0.2	<	0.1	<	0.1	<	0.1		0.4	<	0.1	<	0.1		0.1
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		1.67		1.62		1.43		2.97		1.38		7.26		21.7		0.385
Ra 226		352		510		47.6		1280		47.6		308		238		7.4
Ra 226+/-		18		22		6.6		31		5.8		14		12		2.3
Data Quality																
A/C Balance(+-5)		0.080		2.320		0.340		2.060		1.520		0.380		1.990		1.910
Anions		6.10		11.15		5.88		13.82		7.47		20.86		21.41		5.66
Cations		6.11		11.68		5.92		14.40		7.70		20.70		22.28		5.88
TDS Calculated		340		680		330		840		420		1190		1260		360
TDS Balance (0.80 - 1.20)		1.029		1.059		1.060		1.071		1.047		1.050		1.063		1.083

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #3 Round three consists of all May-2004 results.

Well I.D.	5BN162-2		5BQ158-1		5BS120-1		5BT138-1		STAB RD # 3 UNIT 5 MIN		STAB RD # 3 UNIT 5 MAX		STAB RD # 3 UNIT 5 MEAN	
Production Unit:	Mod 55		Mod 55		Mod 55		Mod 55							
Sample Date:	05/11/04		05/11/04		05/11/04		05/11/04							
Major Ions mg/l:														
Ca		22.5		13.0		20.2		10.2		6		94.8		33
Mg		4.3		2.8		4.4		1.9		1.1		20.1		6.4
Na		83.3		173		149		173		55.2		366		161
K		2.6		2.6		3.2		8.8		1.3		8.8		3.4
CO3	<	1.0	<	1.0		4.2		7.8	<	1		7.8	<	1.8
HC03		212		118		345		104		104		858		334
SO4		66.5		271		84.4		262		22		334		152
Cl		5.5		5.6		6.6		5.8		2		31.3		11
NH4		0.1	<	0.1		0.2		0.2	<	0.1		0.5	<	0.16
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.10
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.1		0.2	<	0.10
F	<	0.1		0.2		0.2		0.2	<	0.1		0.2	<	0.13
SiO2		1.9		3.9		3.7		3.7		1.5		4.5		3.0
TDS		300		590		470		570		180		1340		568
Cond. (umho/cm)		483		804		712		855		253		1840		822
Alk. (as CaC03)		174		96.5		290		98.5		96.5		703		275
pH (units)		8.20		8.4		8.20		8.70		7.8		8.7		8.11
Trace Metals mg/l:														
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.2	<	0.10
As	<	0.005	<	0.005	<	0.005	<	0.005	<	0.005		0.028	<	0.010
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.07		0.06		0.06		0.05		0.05		0.09		0.06
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.050	<	0.050	<	0.050	<	0.050	<	0.05		0.26	<	0.09
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn		0.03	<	0.02	<	0.02	<	0.02	<	0.02		0.38	<	0.07
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.02	<	0.01
Se		0.102	<	0.006		0.148	<	0.005	<	0.005		1.69	<	0.352
V		0.2	<	0.1		0.3	<	0.1	<	0.1		0.4	<	0.15
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.1	<	0.01
Radiometric pCi/l:														
U (mg/l)		1.010		0.0069		1.60		0.0155		0.0069		21.7		2.4
Ra 226		167		54.4		58.6		72.6		7.4		1280		211
Ra 226+/-		12		5.8		6.2		6.7		2.3		31		11.2
Data Quality														
A/C Balance(+-5)		1.470		4.380		1.270		5.180						1.506
Anions		5.02		7.75		7.75		7.59						8.98
Cations		5.17		8.46		7.95		8.42						9.27
TDS Calculated		290		530		440		520						532
TDS Balance (0.80 - 1.20)		1.034		1.113		1.068		1.096						1.076

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #4 Round four consists of all August-2004 results.

Well I.D.	BASELINE		BASELINE		BASELINE		5AM78-2		5AE80-1		5AG68-1		5AL66-1		AP-02	
Production Unit:	MU-5		MU-5		MU-5		Mod 51		Mod 51		Mod 51		Mod 51		Mod 52	
Sample Date:	MINUMUM		MAXIMUM		MEAN		08/11/04		08/11/04		08/12/04		08/11/04		08/12/04	
Major Ions mg/l:																
Ca	<	0.05		24.117		10.219		30		99		12		61		27
Mg	<	0.01		3.721		1.371		7.0		18		2.0		13.0		6.0
Na		101.1		191.68		146.39		140		289		54		213		174
K	<	0.1		19.851		4.22		3.0		7.0		2.0		5.0		4.0
CO3	<	0.1		61.85		7.255	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		29.444		217.596		123.52		304		702		150		582		276
SO4		82.859		348.161		215.51		140		323		36		175		227
Cl		3.502		11.942		7.722		12		35		3		21		8
NH4	<	0.05		0.722		0.143	<	0.1	<	0.1	<	0.1	<	0.10	<	0.1
NO2 (N)	<	0.10	<	0.10	<	0.10	<	0.05	<	0.05	<	0.1	<	0.05	<	0.1
NO3 (N)	<	0.10		16.793		0.125	<	0.05	<	0.05	<	0.10		0.07	<	0.10
F	<	0.10		0.307		0.184	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
SiO2		4.549		12.271		8.41		7.8		9.8		3.4		6.1		6.4
TDS		276.942		619.338		448.14		520		1190		190		830		620
Cond. (umho/cm)		405.757		1095.003		750.38		840		1820		331		1320		1020
Alk. (as CaC03)		54.896		158.403		106.649		249		575		123		477		226
pH (units)		7.349		10.157		8.753		7.9		7.90		8.10		7.90		8.0
Trace Metals mg/l:																
Al	<	0.10	<	0.10	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As	<	0.001		0.006		0.002	<	0.005		0.011		0.005	<	0.005	<	0.005
Ba	<	0.10	<	0.10	<	0.10	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B	<	0.10	<	0.10	<	0.10		0.08		0.09		0.04		0.08		0.05
Cd	<	0.01	<	0.01	<	0.01	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05		0.09		0.66	<	0.05	<	0.05	<	0.05
Pb	<	0.05	<	0.05	<	0.05	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.01	<	0.01	<	0.01		0.09		0.31		0.02		0.14		0.02
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.10	<	0.10	<	0.10	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.05	<	0.05	<	0.05	<	0.01	<	0.01	<	0.01		0.02	<	0.01
Se	<	0.001		0.026		0.002		0.166		0.084		0.296		0.811		0.020
V	<	0.10		0.14		0.14		0.06		0.14		0.23		0.1	<	0.1
Zn	<	0.01		0.107		0.015	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)	<	0.0003		0.0763		0.0232		1.28		1.79		0.537		2.13		0.491
Ra 226	<	0.2		289.79		67.588		525		327		77.9		256		45.7
Ra 226+/-								17		13		6.9		12		5.2
Data Quality																
A/C Balance(+-5)				%				0.27		0.10		1.95		1.08		0.04
Anions				meq				8.25		19.19		3.28		13.78		9.47
Cations				meq				8.21		19.15		3.16		13.48		9.48
TDS Calculated				mg/L				480		1120		180		770		580
TDS Balance (0.80 - 1.20)				dec %				1.083		1.062		1.055		1.078		1.069

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well

Groundwater Quality - Stability Round #4 Round four consists of all August-2004 results.

Well I.D:	5AO74-1		5AP54-1		MW-03		5BA48-1		MW-07		TW-01		5BD50-1		5BG46-1	
Production Unit:	Mod 52		Mod 52		Mod 52		Mod 53		Mod 53		Mod 53		Mod 54		Mod 54	
Sample Date:	08/11/04		08/11/04		08/12/04		08/11/04		08/11/04		08/11/04		08/11/04		08/11/04	
Major Ions mg/l:																
Ca		7		68		11		6.0		76		4		12		12
Mg		1.0		13.0		2		1		17	<	1		2		2
Na		63		206		96		53		268		51		93		75
K		1.0		6.0		2.0		1.0		6.0		1.0		2.0		2.0
CO3	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		144		587		210		135		667		105		226		199
SO4		45		177		62		27		261		39		58		48
Cl		2		22		3.0		2		24		2		5		3.0
NH4	<	0.1	<	0.2	<	0.1		0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10	<	0.10
F		0.1	<	0.1	<	0.1		0.1	<	0.1		0.1		0.1	<	0.1
SiO2		7.4		7.8		5		3.9		9.1		8.6		5.5		5.7
TDS		210		830		310		160		1040		170		320		260
Cond. (umho/cm)		335		1320		509		283		1640		271		528		443
Alk. (as CaC03)		118		481		172		111		547		86		188		163
pH (units)		8.0		8.1		8.1		8.30		7.90		8.00		8.30		8.20
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
As	<	0.005	<	0.005	<	0.005	<	0.005		0.014		0.010		0.018	<	0.005
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.06		0.08		0.06		0.05		0.09		0.07		0.06		0.06
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.05	<	0.05	<	0.05	<	0.05		0.20	<	0.05	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn	<	0.02		0.11	<	0.02	<	0.02		0.40	<	0.02		0.03		0.03
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Se		0.013		0.399		1.58		0.079		1.01		0.308		0.495		0.085
V	<	0.1		0.18		0.16		0.07		0.05		0.11		0.15		0.03
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.10	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		0.180		4.55		1.19		0.405		3.83		0.0582		1.64		0.822
Ra 226		30.8		361		31.6		44.4		623		60.1		97		122
Ra 226+/-		4.1		14		4.2		4.5		18		5.5		6.6		7.6
Data Quality																
A/C Balance(+-5)		2.29		1.280		0.88		0.12		0.08		0.08		2.27		2.86
Anions		3.37		13.93		4.84		2.83		17.03		2.60		5.11		4.35
Cations		3.22		13.58		4.92		2.71		17.00		2.51		4.88		4.10
TDS Calculated		190		780		280		160		980		150		320		240
TDS Balance (0.80 - 1.20)		1.105		1.064		1.107		1.000		1.061		1.133		1.103		1.083

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

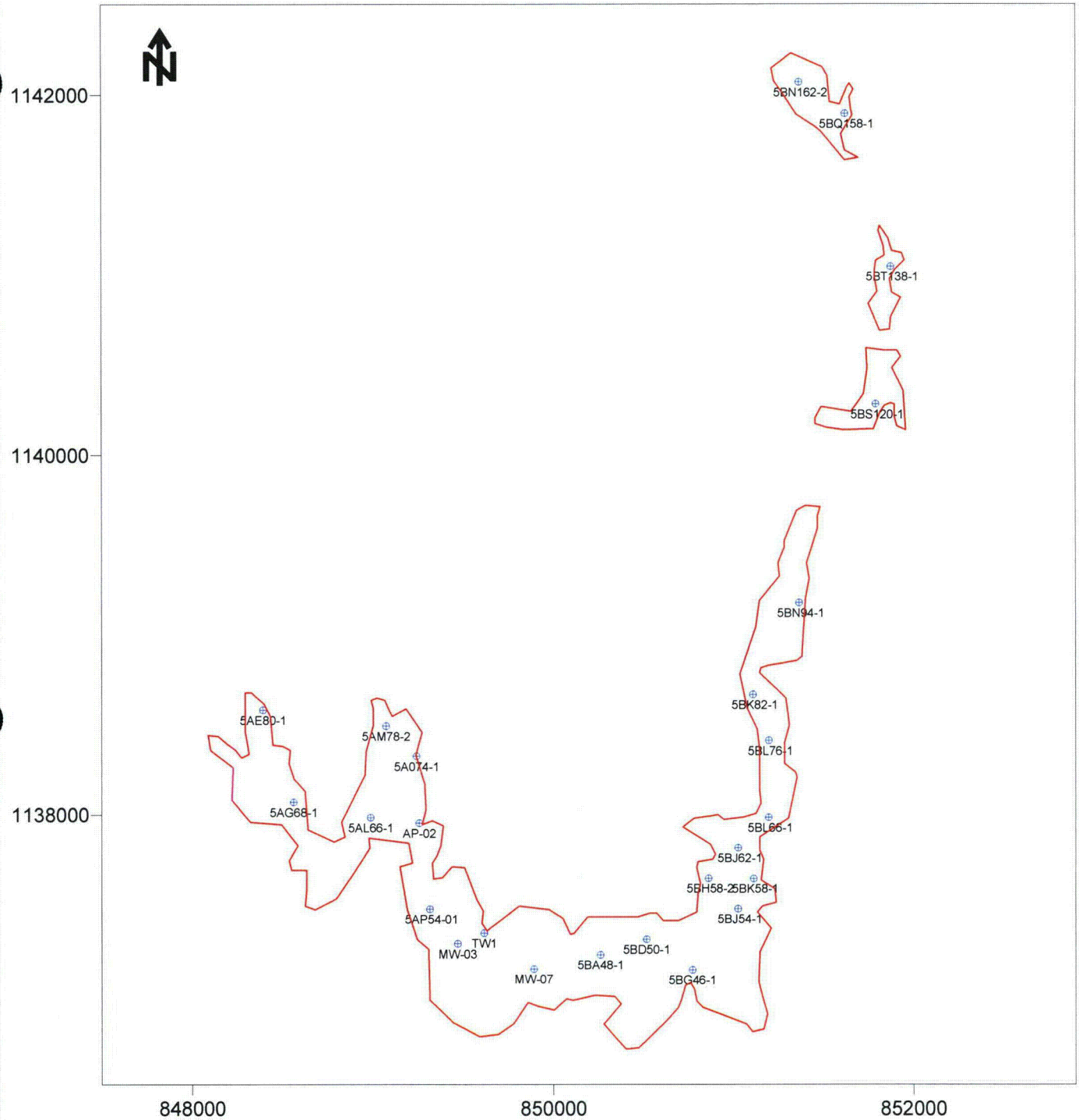
Ore Zone Baseline Well
Groundwater Quality - Stability Round #4 Round four consists of all August-2004 results.

Well I.D.	5BH58-2		5BJ54-1		5BJ62-1		5BK58-1		5BK82-1		5BL66-1		5BL76-1		5BN94-1	
Production Unit:	Mod 54		Mod 54		Mod 54		Mod 54		Mod 55		Mod 55		Mod 55		Mod 55	
Sample Date:	08/11/04		08/11/04		08/11/04		08/11/04		08/12/04		08/12/04		08/12/04		08/12/04	
Major Ions mg/l:																
Ca		15		46		25		41		26		88		109		14
Mg		3		10		4.0		9		6		20.0		20		2.0
Na		111		177		95.0		228		147		321		368		112
K		3.0		4.0		2.0		5.0		3.0		7.0		9.0		3.0
CO3		6.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0	<	1.0
HC03		308		364		266		447		393		842		939		135
SO4		45		225		71		256		85		310		376		166
Cl		3		14		5.0		17		7		26		34		7
NH4	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10		0.30	<	0.10		0.50	<	0.10
F		0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1		0.1
SiO2		5.2		8.7		5.8		8.3		7.6		9.4		11		5.4
TDS		360		720		370		840		490		1240		1460		420
Cond. (umho/cm)		609		1160		621		1330		821		1950		2180		687
Alk. (as CaC03)		262		298		218		366		322		690		770		114
pH (units)		8.40		8.00		8.20		7.90		8.00		7.80		8.00		8.40
Trace Metals mg/l:																
Al	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1		0.1		0.3	<	0.1
As		0.018	<	0.005	<	0.005		0.007		0.029	<	0.005		0.020	<	0.005
Ba	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
B		0.06		0.08		0.06		0.09		0.08		0.08		0.10		0.05
Cd	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.02	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Fe	<	0.050		0.15	<	0.050		0.30	<	0.050		0.080	<	0.050	<	0.050
Pb	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Mn		0.03		0.13		0.06		0.12		0.05		0.22		0.04	<	0.02
Hg	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01		0.01	<	0.01	<	0.01
Se		0.241		0.114		0.018		0.131		0.393		0.238		2.970		0.584
V		0.13		0.03	<	0.1		0.06		0.37		0.08		0.09		0.11
Zn	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01
Radiometric pCi/l:																
U (mg/l)		1.44		1.23		1.47		2.25		1.60		5.44		14.8		0.345
Ra 226		254		626		66.1		1230		89.2		331		205		16.6
Ra 226+/-		11		18		5.7		23		6.6		14		10		2.9
Data Quality																
A/C Balance(+-5)		2.85		0.51		1.730		1.29		1.14		2.09		1.78		0.97
Anions		6.25		11.04		5.99		13.14		8.41		20.99		24.21		5.93
Cations		5.90		10.93		5.78		12.80		8.22		20.13		23.36		5.82
TDS Calculated		340		660		330		780		470		1190		1380		370
TDS Balance (0.80 - 1.20)		1.059		1.091		1.121		1.077		1.021		1.042		1.058		1.135

Table A-1. Stability Monitoring Water Quality Results for Designated Restoration Wells, Mine Unit 5, Christensen Ranch, Wyoming

Ore Zone Baseline Well
Groundwater Quality - Stability Round #4 Round four consists of all August-2004 results.

Well I.D.	5BN162-2		5BQ158-1		5BS120-1		5BT138-1			STAB RD # 4 UNIT 5 MIN		STAB RD # 4 UNIT 5 MAX		STAB RD # 4 UNIT 5 MEAN	
Production Unit.	Mod 55		Mod 55		Mod 55		Mod 55								
Sample Date:	08/12/04		08/12/04		08/12/04		08/12/04								
Major Ions mg/l:															
Ca		43		14.0		32		11			4		109		36
Mg		8		3		7		2			1.0		20		7.2
Na		105		163		161		162			51		368		157
K		4.0		3.0		4.0		10.0			1		10		4.0
CO3	<	1.0	<	1.0	<	1.0	<	1.0		<	1		6	<	1.2
HC03		297		114		408		114			105		939		357
SO4		123		292		124		283			27		376		159
Cl		8.0		6		9		6			2		35		11
NH4	<	0.1	<	0.1	<	0.1	<	0.1		<	0.1		0.2	<	0.10
NO2 (N)	<	0.1	<	0.1	<	0.1	<	0.1		<	0.05	<	0.1	<	0.09
NO3 (N)	<	0.10	<	0.10	<	0.10	<	0.10		<	0.05		0.5	<	0.12
F	<	0.1		0.1		0.1		0.1		<	0.1		0.1	<	0.10
SiO2		4.7		8.7		8.9		8.4			3.4		11		7.1
TDS		480		570		560		570			160		1460		589
Cond. (umho/cm)		795		934		938		929			271		2180		945
Alk. (as CaC03)		243		96.0		334		99			86		770		293
pH (units)		8.20		8.4		8.20		8.40			7.8		8.4		8.10
Trace Metals mg/l:															
Al	<	0.1	<	0.1	<	0.1	<	0.1		<	0.1	<	0.3	<	0.11
As	<	0.005	<	0.005	<	0.005	<	0.005		<	0.005		0.029	<	0.008
Ba	<	0.5	<	0.5	<	0.5	<	0.5		<	0.5	<	0.5	<	0.5
B		0.07		0.05		0.07		0.06			0.04		0.1		0.07
Cd	<	0.002	<	0.002	<	0.002	<	0.002		<	0.002	<	0.002	<	0.002
Cr	<	0.01	<	0.01	<	0.01	<	0.01		<	0.01	<	0.02	<	0.01
Cu	<	0.01	<	0.01	<	0.01	<	0.01		<	0.01	<	0.01	<	0.01
Fe	<	0.050	<	0.050	<	0.050	<	0.050		<	0.05		0.66	<	0.10
Pb	<	0.02	<	0.02	<	0.02	<	0.02		<	0.02	<	0.02	<	0.02
Mn		0.07	<	0.02	<	0.02	<	0.02		<	0.02		0.4	<	0.08
Hg	<	0.001	<	0.001	<	0.001	<	0.001		<	0.001	<	0.001	<	0.001
Mo	<	0.02	<	0.02	<	0.02	<	0.02		<	0.02	<	0.02	<	0.02
Ni	<	0.01	<	0.01	<	0.01	<	0.01		<	0.01		0.02	<	0.01
Se		0.084	<	0.005		0.098	<	0.005		<	0.005		2.97	<	0.409
V		0.15	<	0.1		0.24	<	0.1		<	0.03		0.37	<	0.12
Zn	<	0.01	<	0.01	<	0.01	<	0.01		<	0.01	<	0.1	<	0.01
Radiometric pCi/l:															
U (mg/l)		2.08		0.0073		1.77		0.0088			0.0073		14.8		2.1
Ra 226		299		72.2		110.1		48.4			16.6		1230		238
Ra 226+/-		12		6.4		8.0		5.0			2.9		23		9.6
Data Quality															
A/C Balance(+-5)		1.31		0.340		1.53		0.01							1.154
Anions		7.65		8.18		9.53		8.03							9.50
Cations		7.45		8.12		9.24		8.03							9.29
TDS Calculated		440		540		540		530							552
TDS Balance (0.80 - 1.20)		1.091		1.055		1.037		1.075							1.075



LEGEND

⊕ 5BK82-1 Designated Restoration Well

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-1
LOCATION OF DESIGNATED RESTORATION WELLS
MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: SEPTEMBER 2006
DWG: COGEMAFIGA-1.SRF	BY: EPL CHECKED: HPD

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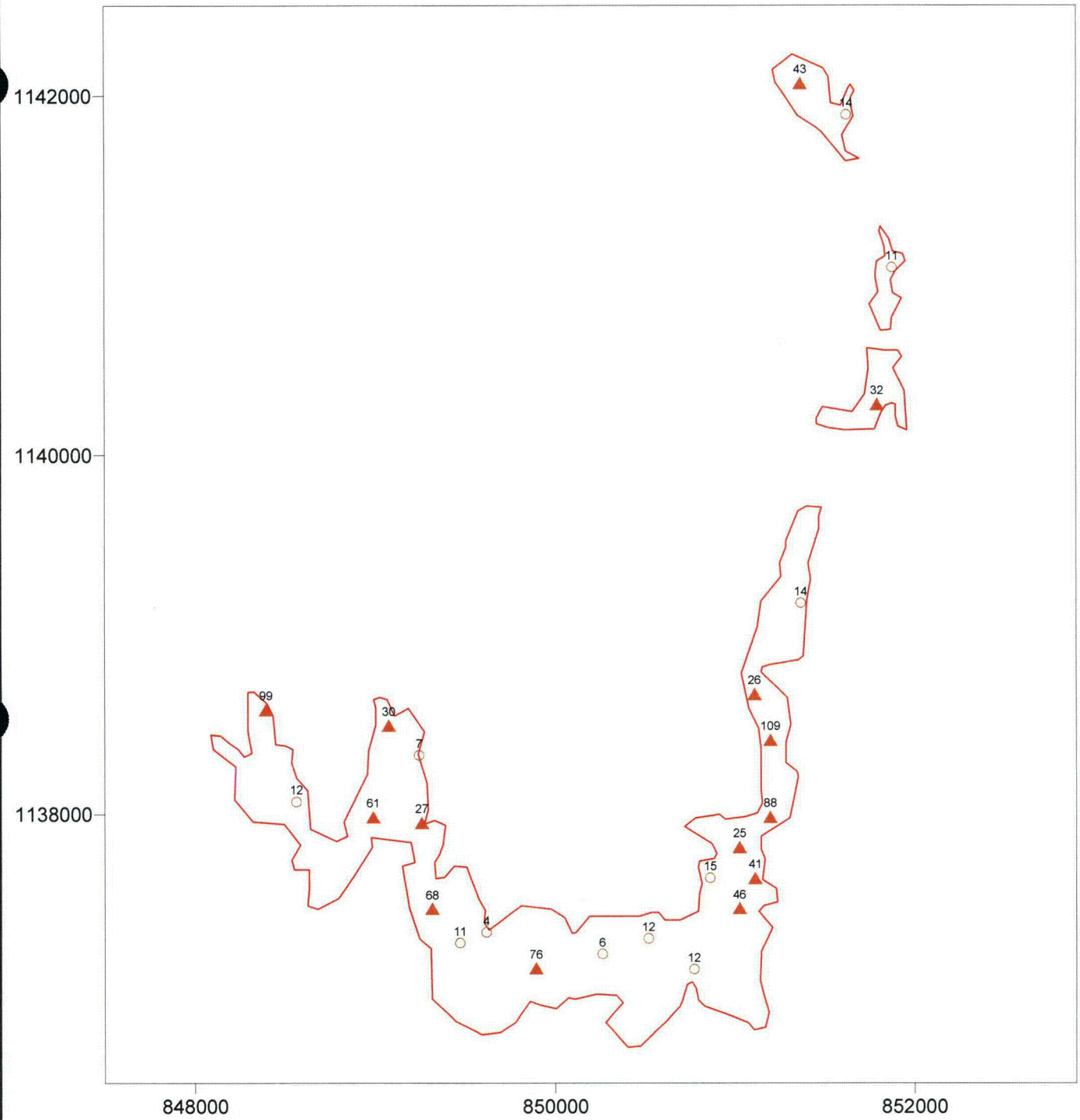

Target Restoration Value for Calcium is 24.12 mg/l

LEGEND

Calcium Concentration (mg/l)

- ○ 4 to 24.12
- ▲ 24.12 to 109.1

N

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CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-2
CALCIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGMU5_A-2.SRF	BY: EPL CHECKED: HPD

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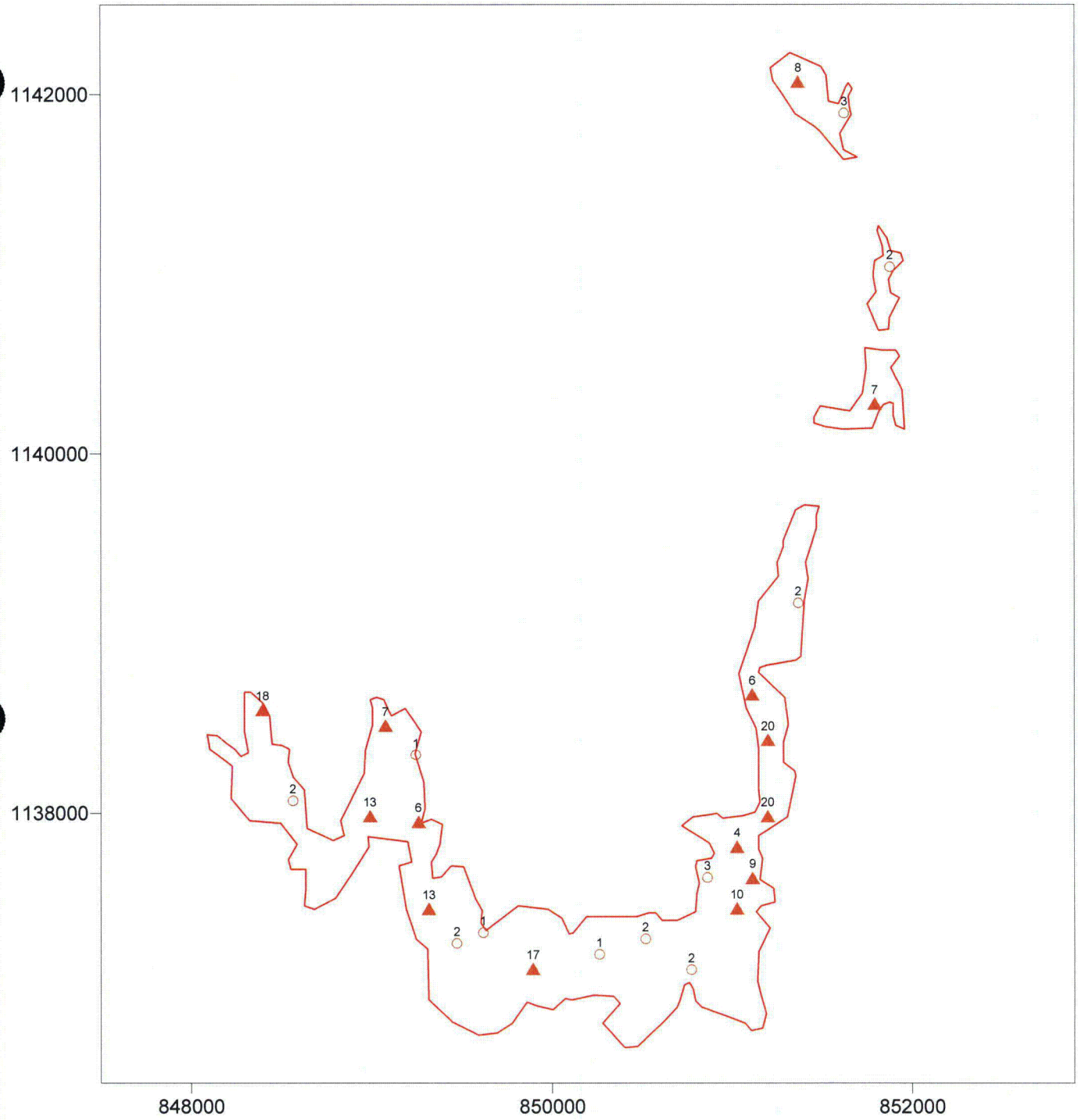

Target Restoration Value for Magnesium is 3.72 mg/l

LEGEND

Magnesium Concentration (mg/l)

- ○ 1 to 3.72
- ▲ 3.72 to 20.01

N

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CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-3
MAGNESIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA_3MU5.SRF	BY: EPL CHECKED: HPD

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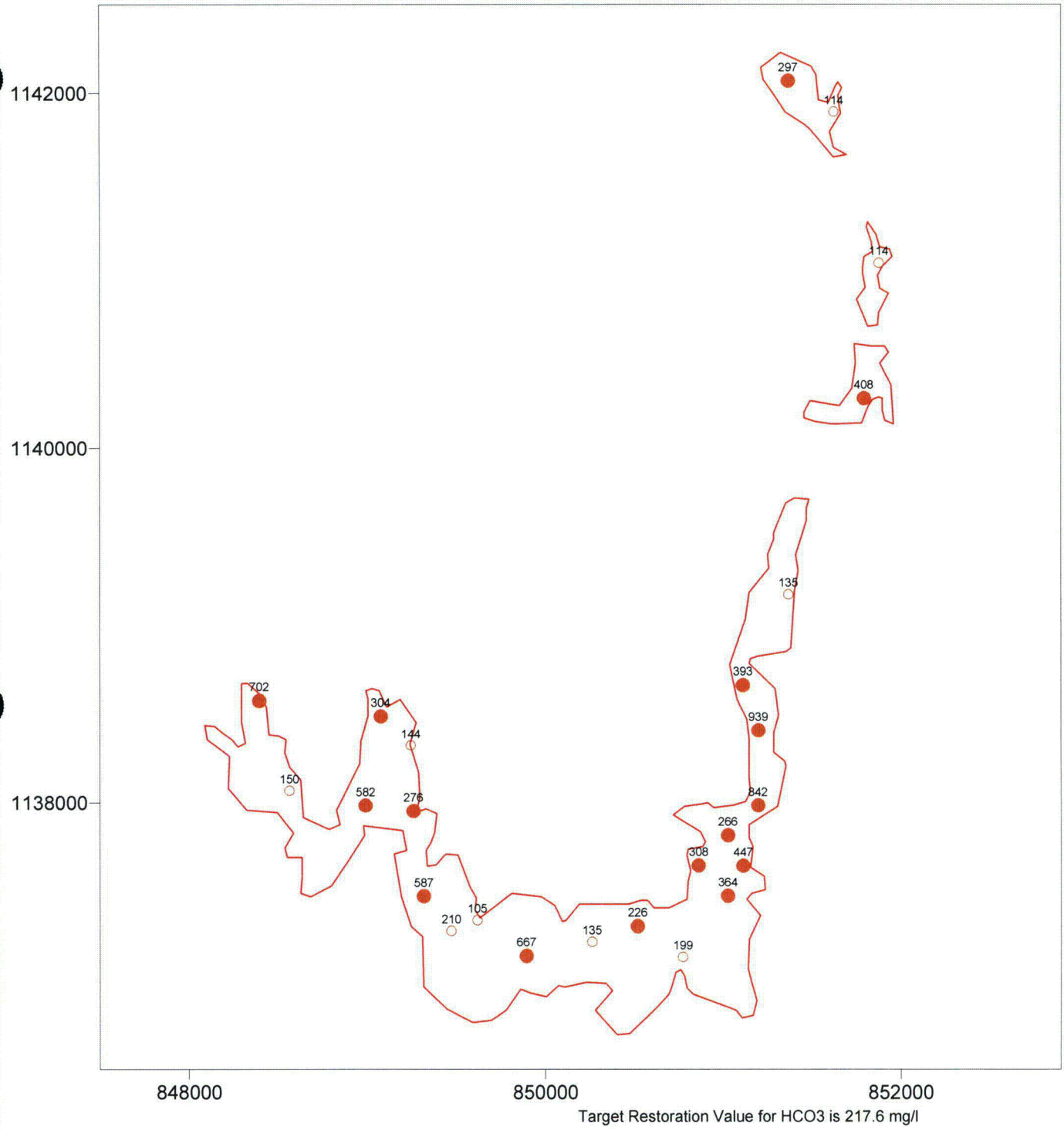

Target Restoration Value for HCO3 is 217.6 mg/l

LEGEND

Bicarbonate Concentration (mg/l)

- 105 to 217.6
- 217.6 to 939.1

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CHRISTENSEN RANCH MINE UNIT 5

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

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA_4MU5.SRF	BY: EPL CHECKED: HPD

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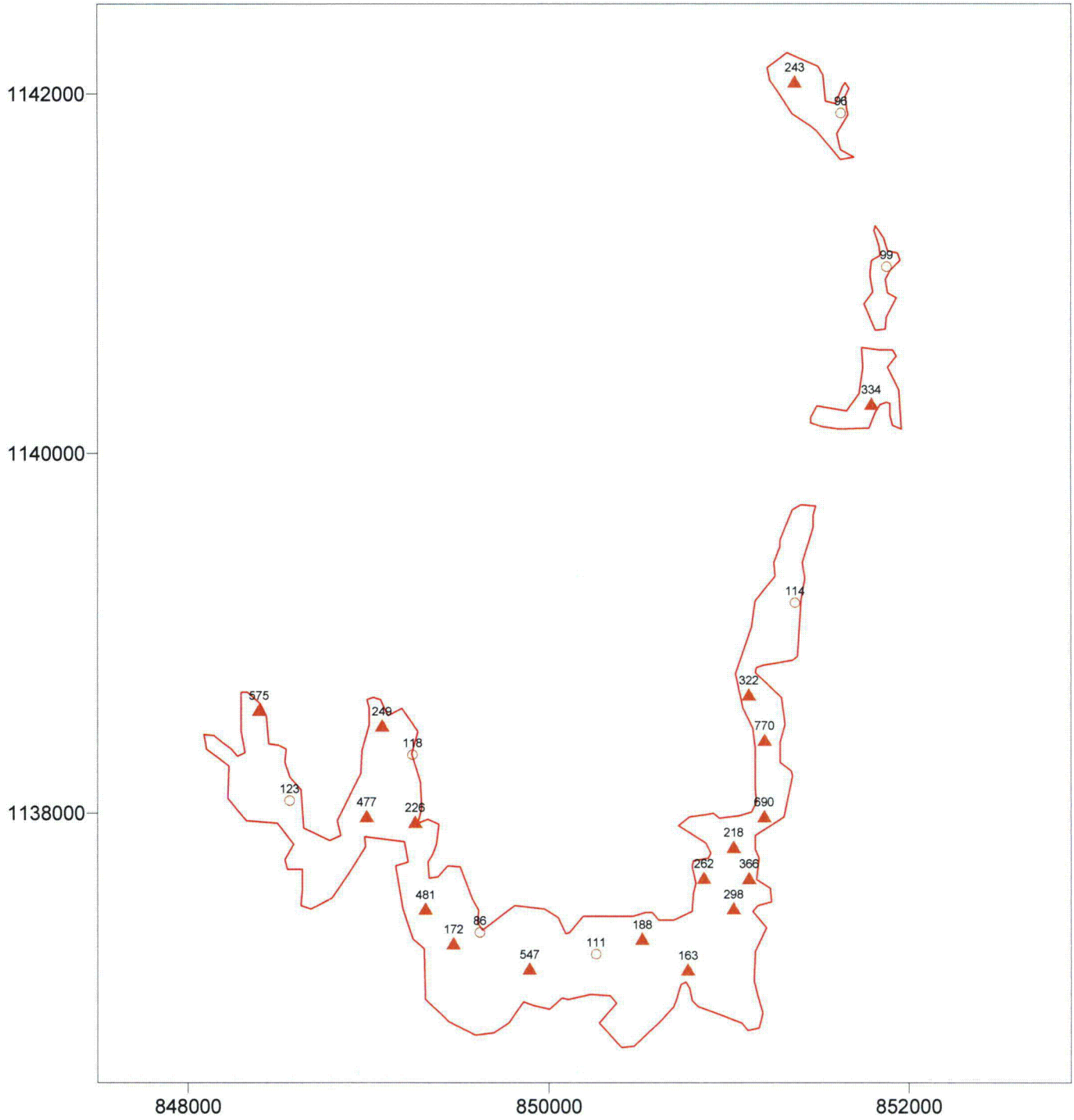

Target Restoration Value for Alkalinity is 158.4

LEGEND

Alkalinity (as calcium carbonate) (mg/l)

- ○ 86 to 158.4
- ▲ 158.4 to 770.1

N

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CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-5
ALKALINITY (AS CALCIUM CARBONATE) DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA-5MU5.SRF	BY: EPL CHECKED: HPD

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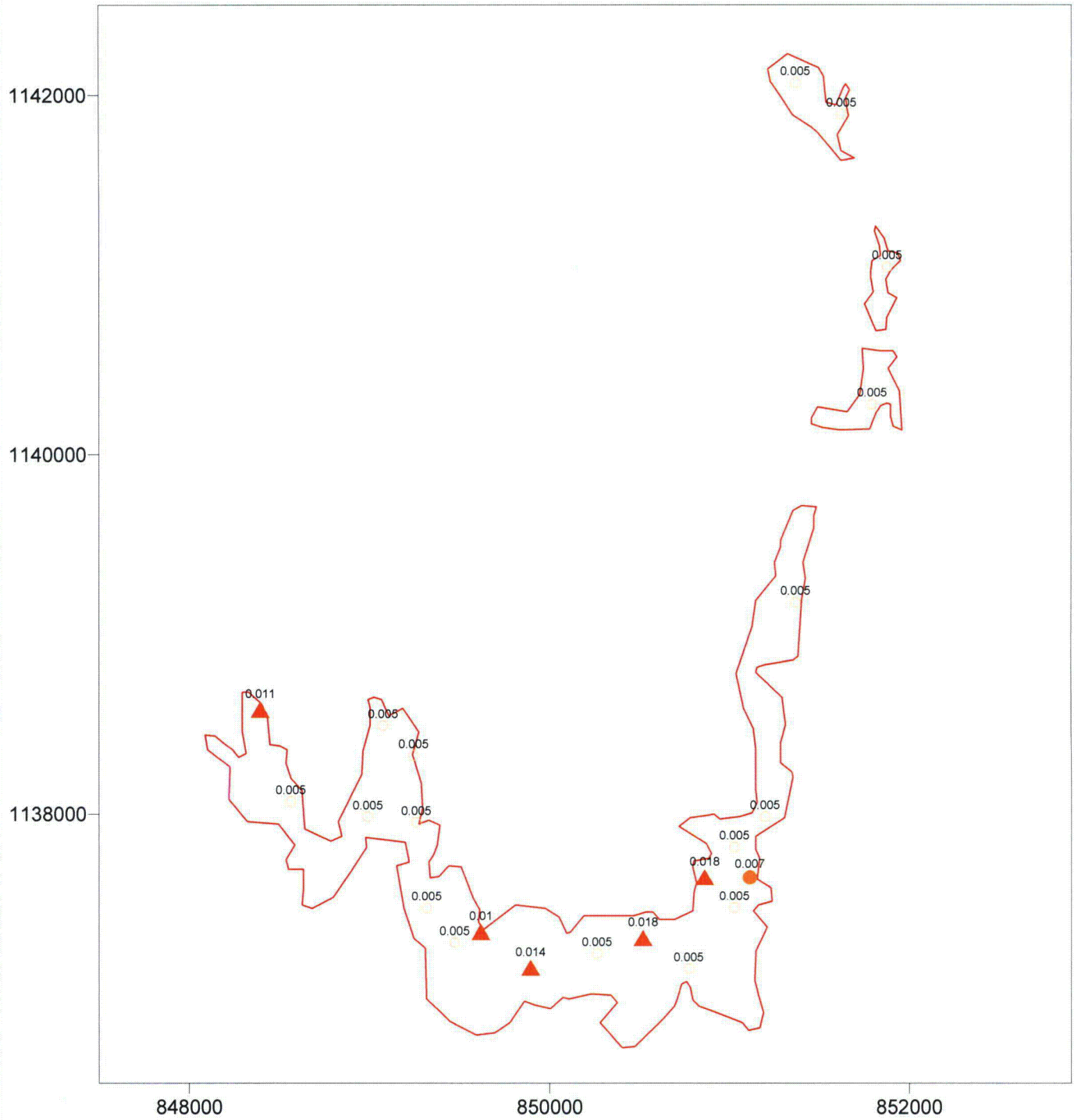

LEGEND

Arsenic Concentration (mg/l)

- 0.005 to 0.006
- 0.006 to 0.01
- 0.01 to 0.02

Target Restoration Value for Arsenic is 0.006 mg/l
EPA MCL for Arsenic is 0.01 mg/l
WDEQ Class I Standard for Arsenic is 0.05 mg/l

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-6
ARSENIC CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA_6MU5.SRF	BY: EPL CHECKED: HPD

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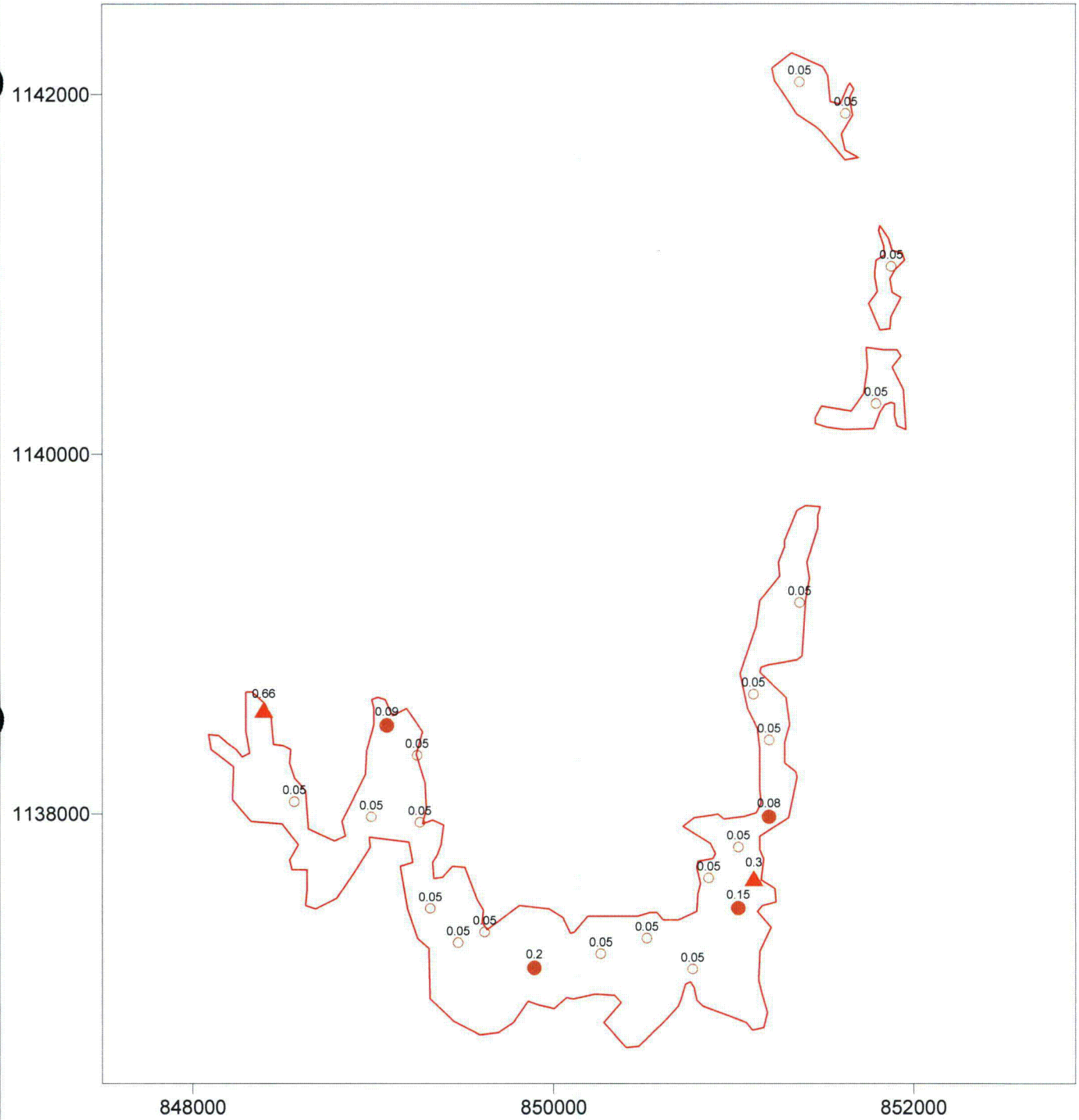

Target Restoration Value for Iron is 0.05 mg/l
Federal Secondary Drinking Water Standard is 0.3 mg/l

LEGEND

Iron Concentration (mg/l)

- ○ 0.01 to 0.051
- ● 0.051 to 0.3
- ▲ 0.3 to 0.6601

N

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CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-7
IRON CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA-7MU5.SRF	BY: EPL CHECKED: HPD

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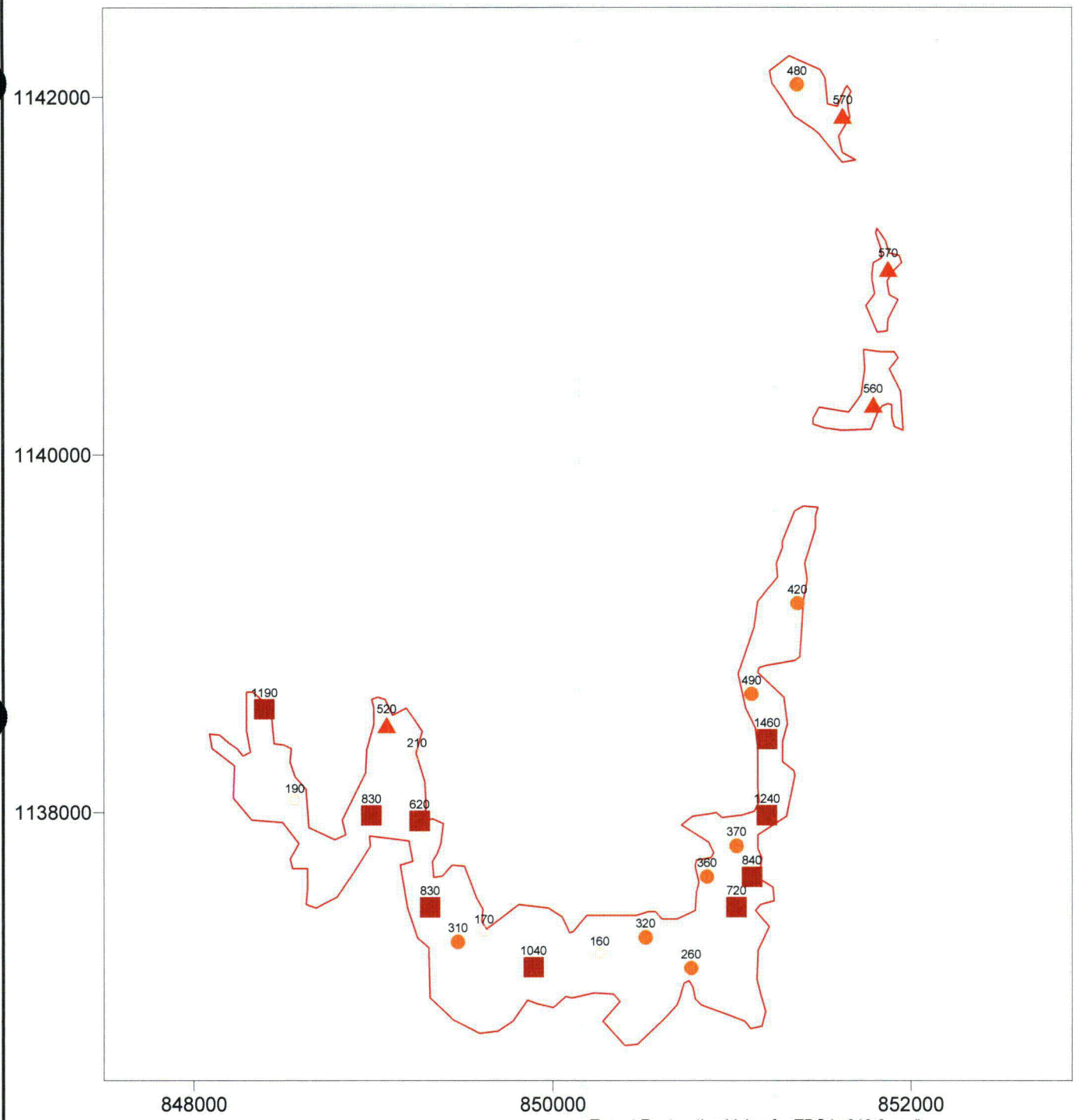

Target Restoration Value for TDS is 619.3 mg/l
Wyoming Class I Standard for TDS is 500 mg/l

LEGEND

TDS Concentration (mg/l)

- 160 to 250
- 250 to 500
- 500 to 619.3
- 619.3 to 1461

N

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CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-8
TDS CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA-8MU5.SRF	BY: EPL CHECKED: HPD

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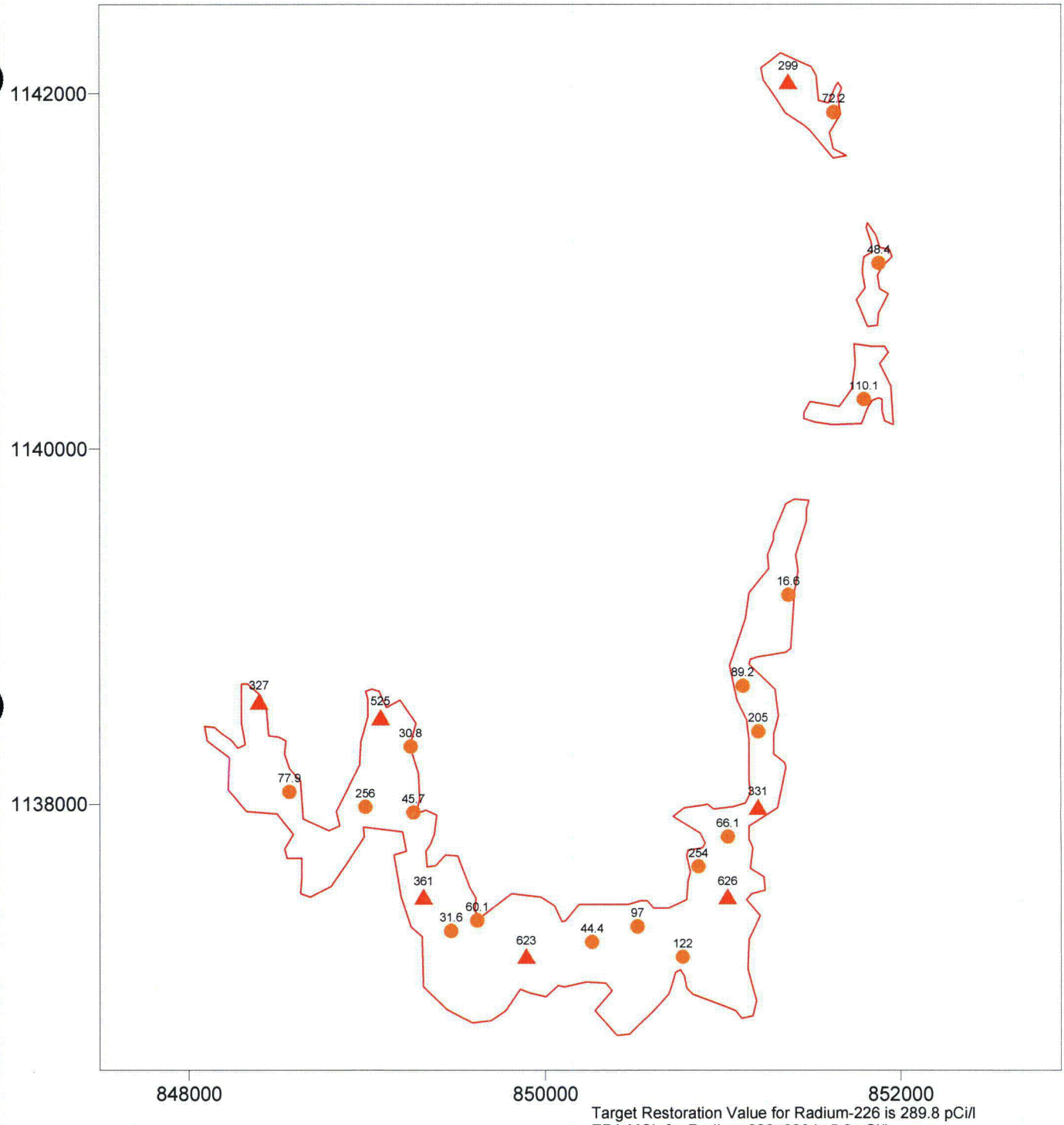

Target Restoration Value for Radium-226 is 289.8 pCi/l
EPA MCL for Radium-226+228 is 5.0 pCi/l

LEGEND

Radium 226 Concentration (mg/l)

- ○ 0 to 5
- ● 5 to 289.8
- ▲ 289.8 to 1230

N

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CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-9
RADIUM-226 CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA-9.SRF	BY: EPL CHECKED: HPD

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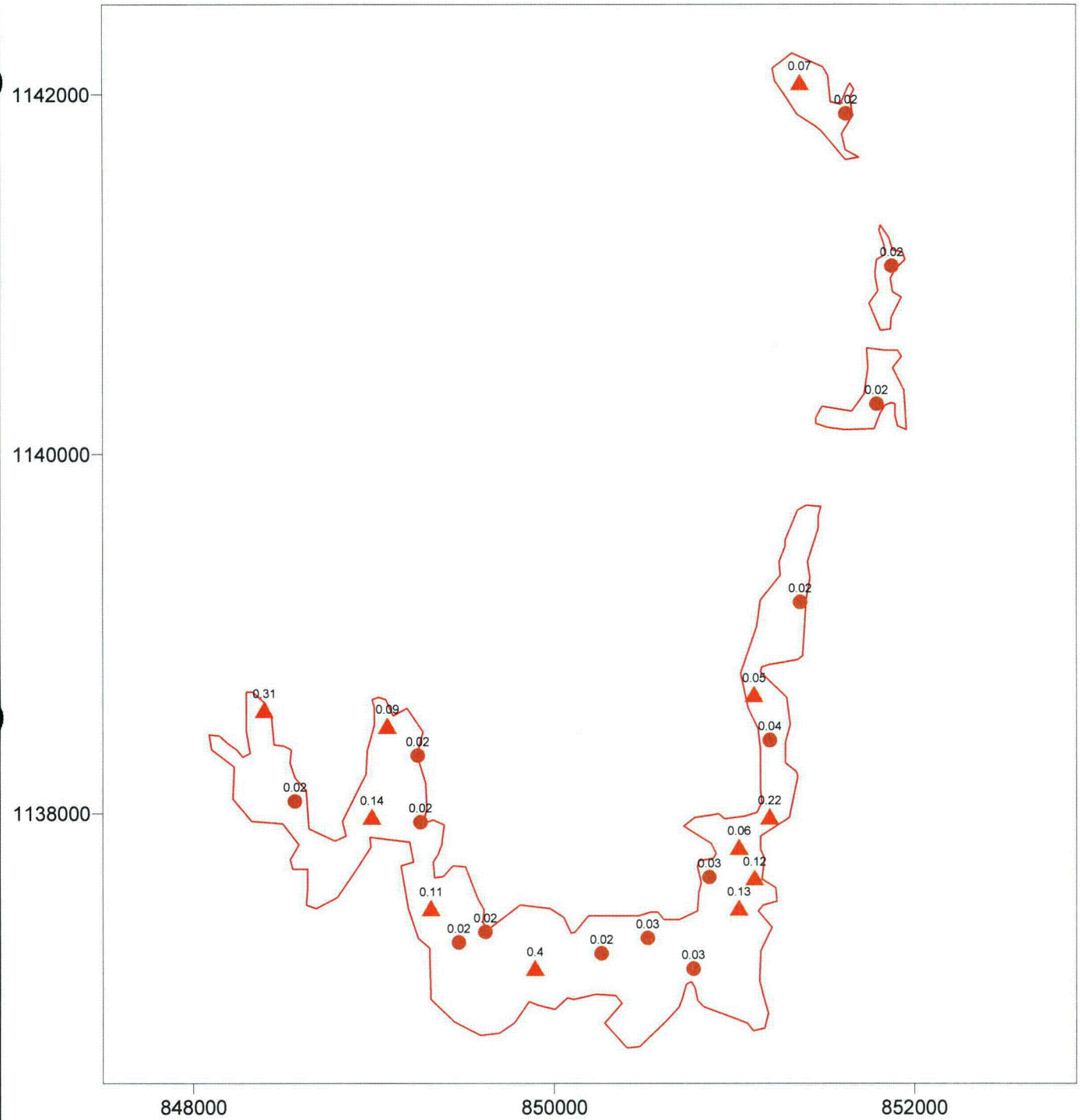

Target Restoration Value for Manganese is 0.01 mg/l
Wyoming Class I Standard and EPA MCL is 0.05 mg/l

LEGEND

Manganese Concentration (mg/l)

- ○ 0.005 to 0.01
- ● 0.01 to 0.05
- ▲ 0.05 to 0.5

N

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-10
MANGANESE CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG: COGEMAFIGA-10MU5.SRF	BY: EPL CHECKED: HPD

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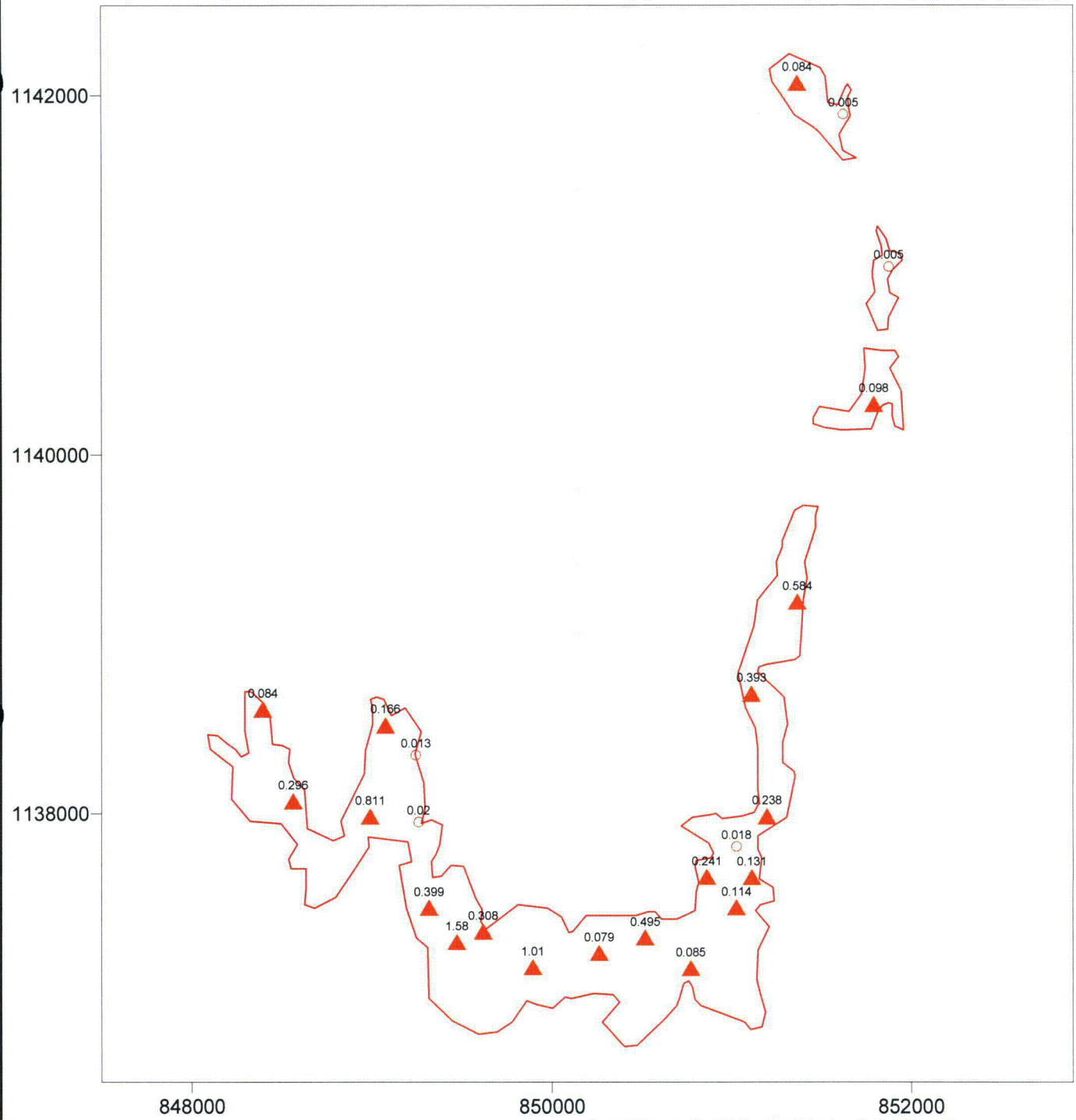

Target Restoration Value for Selenium is 0.026 mg/l
Wyoming Class I Standard and EPA MCL for Selenium is 0.05 mg/l

LEGEND

Selenium Concentration (mg/l)

- 0.005 to 0.026
- 0.026 to 0.05
- 0.05 to 2.97

N

COGEMA MINING, INC.
CHRISTENSEN RANCH MINE UNIT 5

FIGURE A-11
SELENIUM CONCENTRATION DATA
STABILITY ROUND 4, MINE UNIT 5

PROJECT: CMI/CHRISRANCH	DATE: JANUARY 2006
DWG:COGEMAFIGA-11MU5.SRF	BY: EPL CHECKED: HPD

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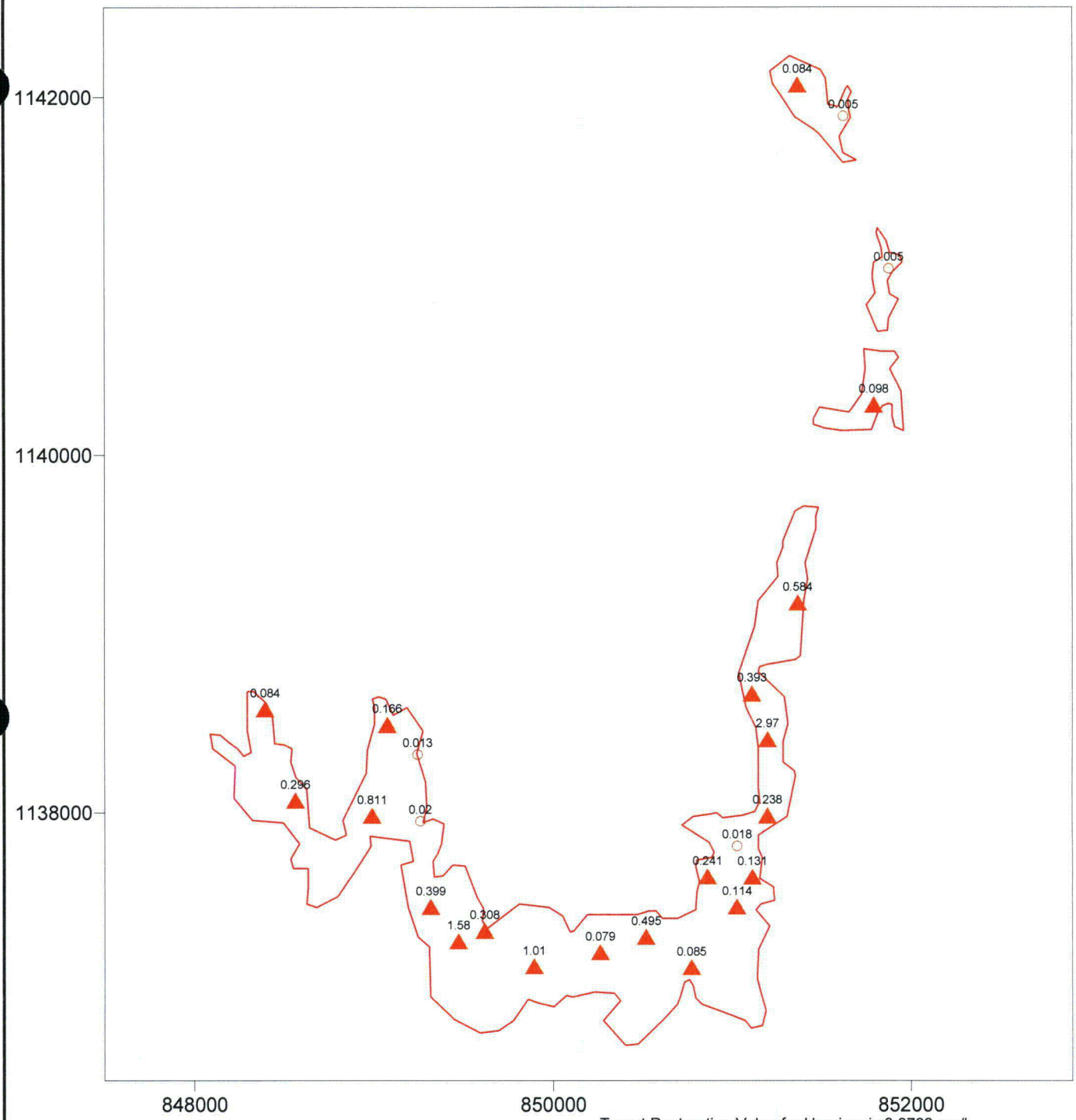

Target Restoration Value for Uranium is 0.0763 mg/l
EPA MCL for Uranium is 0.03 mg/l

LEGEND

Uranium Concentration (mg/l)

- 0.005 to 0.03
- 0.03 to 0.0763
- 0.0763 to 5
- 5 to 10

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: JANUARY 2006
DWG:COGEMAFIGA-12MU5.SRF	BY: EPL CHECKED: HPD

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