

# Umetco Minerals Corporation

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February 14, 2005

Mr. Richard Weller, Project Manger  
Fuel Cycle Facilities Branch  
Division of Fuel Cycle Safety and Safeguards  
Office of Nuclear Material Safety and Safeguards  
Mail Stop T-8-A-33  
Two White Flint North, 11545 Rockville Pike  
Rockville, Maryland 20852-2738

Reference: Materials License SUA-648, Docket No. 40-0299

**Re: Umetco Gas Hills – Evaluation of Pb-210 in Groundwater Monitor Well  
GW-7**

Dear Mr. Weller:

As previously discussed with Elaine Brummett, Umetco committed to provide an evaluation of the increased Pb-210 concentration in our Gas Hills groundwater monitor well GW-7. The attached evaluation and proposed actions have been developed in accordance with the requirements of Appendix M, Groundwater Monitoring Plan (Revised January 2004), Alternate Concentration Limits (ACL) Application (Umetco 2001).

Please contact me at 970-256-8889 or by e-mail at [gieckte@dow.com](mailto:gieckte@dow.com) if you have any questions or comments.

Regards,

Thomas E. Gieck  
Remediation Leader

TEG/jfc

Enclosures: As stated

cc: Mr. Mark Moxley WYDEQ w/enclosures

NMSSO1

**BCC: D. Moore  
R. Garver  
T. Gieck w/enclosures  
E. Ley w/enclosures  
S. Schierman w/enclosures  
Library File w/enclosures**

## **Gas Hills, Wyoming Evaluation of Pb-210 in GW-7**

### **1.0 INTRODUCTION**

Umetco Minerals Corporation (Umetco) initiated a groundwater monitoring plan for the East Gas Hills, Wyoming facility in 2002, upon NRC Approval of Alternate Concentration Limits (License Amendment 35). The groundwater monitoring plan was developed in support of License Condition 35, which stipulates that Umetco implement a groundwater compliance monitoring program and identify appropriate actions to be taken if the ACLs are exceeded (Appendix M, revised January 2004; Umetco, 2001). Recent ground water quality results from Point of Compliance (POC) Well GW-7 show increasing trends in lead-210 (Pb-210), with several values for Pb-210 which exceed the ACL of 46.7 Pico curies per liter (pCi/L). This evaluation presents an analysis of the recent trends for Pb-210 in POC Well GW-7, and recommends further analysis to ensure minimal risk at Point of Exposure (POE) locations.

### **2.0 GEOLOGIC SETTING**

Well GW-7 is completed in shallow groundwater of the Upper Wind River Formation, which comprises the Southwestern Flow Regime (SWFR). The Wind River Formation was geochemically-altered during a post-depositional period of uranium concentrations, which occurred primarily as roll-front deposits. In the southern portion of the A-9 Repository Area, discontinuous occurrences of mineralized roll front deposits are still present in the underlying Wind River Aquifer. Figure 1.9 from the Umetco ACL Application (Umetco 2001) shows the distribution of uranium roll front deposits in the southern portion of the A-9 Area. The POC Well GW-7 is located along cross-section D-D', southwest of the A-9 Repository as shown (Figure 1.9; Umetco, 2001). Gamma survey results from 1983 have shown that the occurrence of subsurface uranium mineralization below GW-7 is coincident with the water table (Figure 1.13 from Umetco, 2001). Based upon these observations, the historically-elevated concentrations of radionuclides in GW-7 are attributed to the presence of natural mineralization (Umetco, 2001). Fluctuations in the elevation of the water table within the borehole alternately expose and submerge the mineralized zone. When groundwater levels are low, the mineralized zone is exposed to atmospheric oxygen, promoting oxidation of sulfide minerals in the ore zone. When water levels rise and re-saturate the mineralized zone, oxidation products such as acidity, sulfate, and metals are released to groundwater. As a result, Well GW-7 has historically contained elevated concentrations of several licensed constituents (Umetco 2001).

### 3.0 GW-7 WATER QUALITY EVALUATION

The ACL for Pb-210 in SWFR groundwater is 46.7 pCi/L (Umetco, 2001). In May of 2003 the ACL was exceeded, with a Pb-210 concentration of 48.4 pCi/L (Figure 1). Well GW-7 was re-sampled in July of 2003, and the Pb-210 concentration decreased below the ACL to 28.8 pCi/L. Subsequent analysis for Pb-210 in June 2004 did not pass laboratory QA/QC and yielded inconclusive results. However, the most recent result for Pb-210 in GW-7 was in exceedance of the ACL at 54 pCi/L in October of 2004. None of the remaining eight licensed constituents (arsenic, beryllium, gross alpha, natural uranium, nickel, radium-226+228, selenium, and thorium-230) have exceeded the designated ACLs in GW-7.

Groundwater pumping in the vicinity of the A-9 Repository resulted in depression of the water table between 1998 and 2002. Since pumping has ceased, groundwater elevations have begun to recover, and phreatic levels have risen to above pre-pumping elevations as a result of backfilling of the adjacent C-18 Pit. Historic groundwater elevations and associated water quality for selected parameters at GW-7 are shown on Figure 1 of this memorandum. Although Pb-210 concentrations in GW-7 have fluctuated widely over the years, recent increases in Pb-210 concentrations are correlated with the recovery of groundwater elevations (Figure 1(a)). Similarly effects were noted for natural uranium in GW-7, where faster responses of uranium concentrations to groundwater elevation changes were noted (Figure 1(b)). As discussed in Section 2.0, these trends result from the oxidation of reduced minerals in the mineralized zone when groundwater elevations are lowered. Trends in the pH (figure 1(c)) and sulfate concentrations (Figure 1(d)) at GW-7 are also consistent with oxidation of sulfide minerals (e.g., pyrite) in the ore deposits, which produce increased acidity (low pH) and sulfate concentrations upon oxidations:



For these reasons it is concluded that the recent exceedences for Pb-210 in GW-7 are very localized and the result of natural mineralization at the site. Additional data to support this conclusion are the historic Pb-210 concentrations that have been measured in the SWFR at the East Gas Hills Site. For example, Table E-1 from the Umetco ACL application (Umetco, 2001) shows that only three measurements ever exceeded the ACL value of 46.7 pCi/L in the SWFR, and one of the measurements (48.9 pCi/L) was from GW-7. Therefore, it is unlikely that the recent Pb-210 exceedences observed in GW-7 are the result of migration of a Pb-210 contaminant plume.

#### **4.0 ACTION PLAN**

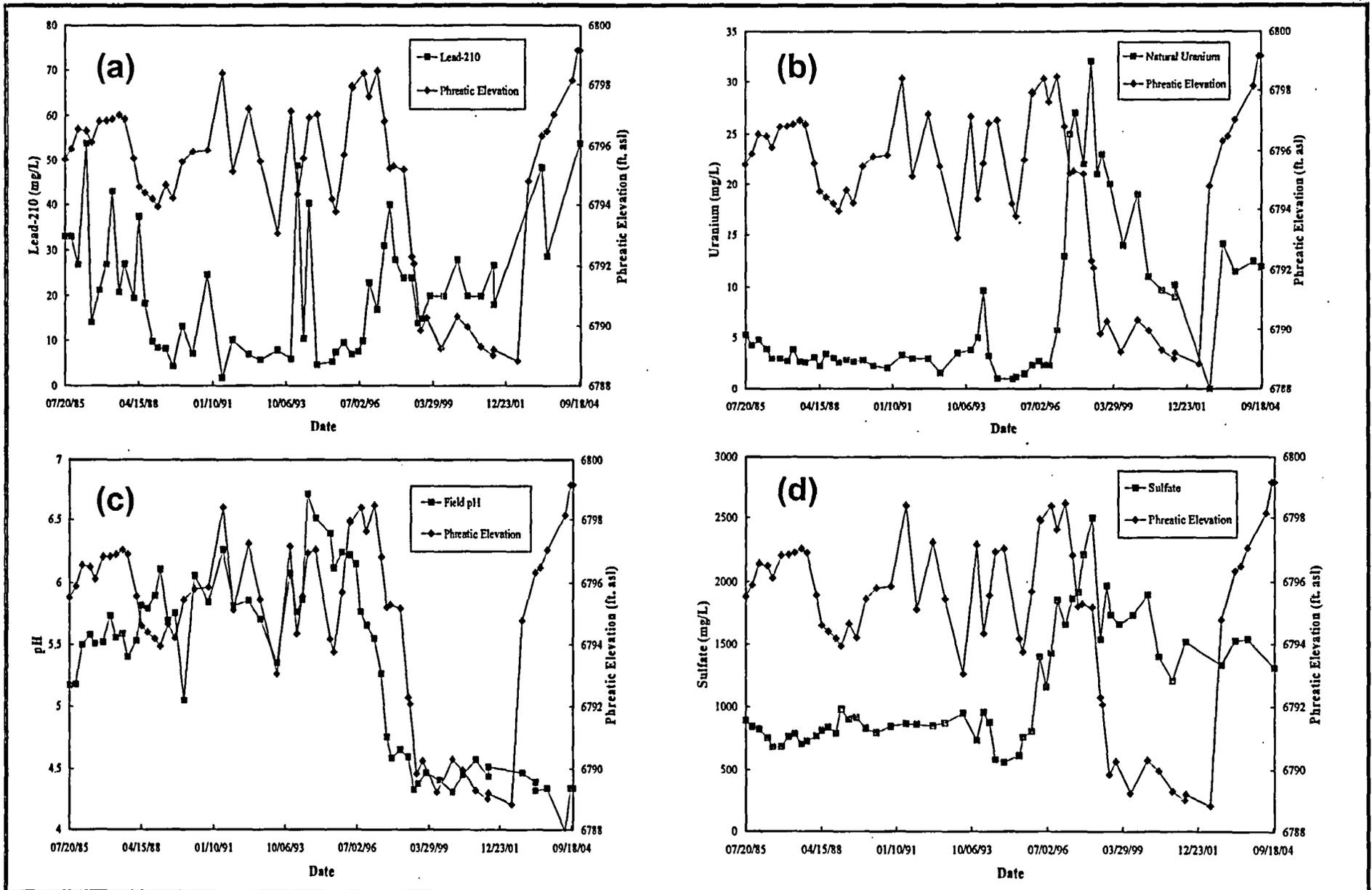
The isolated increase in Pb-210 at GW-7 is not expected to impact groundwater quality at the Point of Exposure (POE). Geochemical modeling calculations for the SWFR produced a maximum predicted Pb-210 concentration of 0.24 pCi/L at the POE, using the initial ACL concentration of 46.7 pCi/L at the POC (figure B.27 from Umetco 2001). The ACL Value was designed to be protective of human health and the environment, and therefore Pb-210 concentration increases observed at POC Well GW-7 are not expected to significantly affect the predicted Pb-210 concentrations at the POE. Therefore, additional geochemical modeling is not recommended at this time.

Groundwater pumping ceased near the toe of the A-9 Repository in May 2002, and pumping was subsequently terminated from the A-9 Decant in June 2003. As groundwater elevations continue to equilibrate, concentrations of Pb-210 are expected to decrease to pre-pumping (natural) levels. Similar correlations between groundwater elevations and Pb-210 concentrations have been observed in POC Well GW-8, which was also completed in a mineralized zone (Figure 1.13 of Umetco, 2001). However, Pb-210 concentrations in GW-8 have not exceeded the ACL, and concentrations are starting to decline in response to groundwater elevation recovery.

In response to the recent Pb-210 exceedences at GW-7, Umetco will continue to evaluate trends in groundwater elevations and Pb-210 concentrations in POC Wells GW-7 and GW-8. If the trends in Pb-210 continue to increase in GW-7, Umetco will work with the NRC to revise the proposed actions accordingly.

#### **5.0 REFERENCES**

Umetco Mineral Corporation. 2001. Final Application for Alternate Concentrations Limits for Gas Hills, Wyoming. Prepared by Umetco Minerals Corporation, Grand Junction, CO. November.

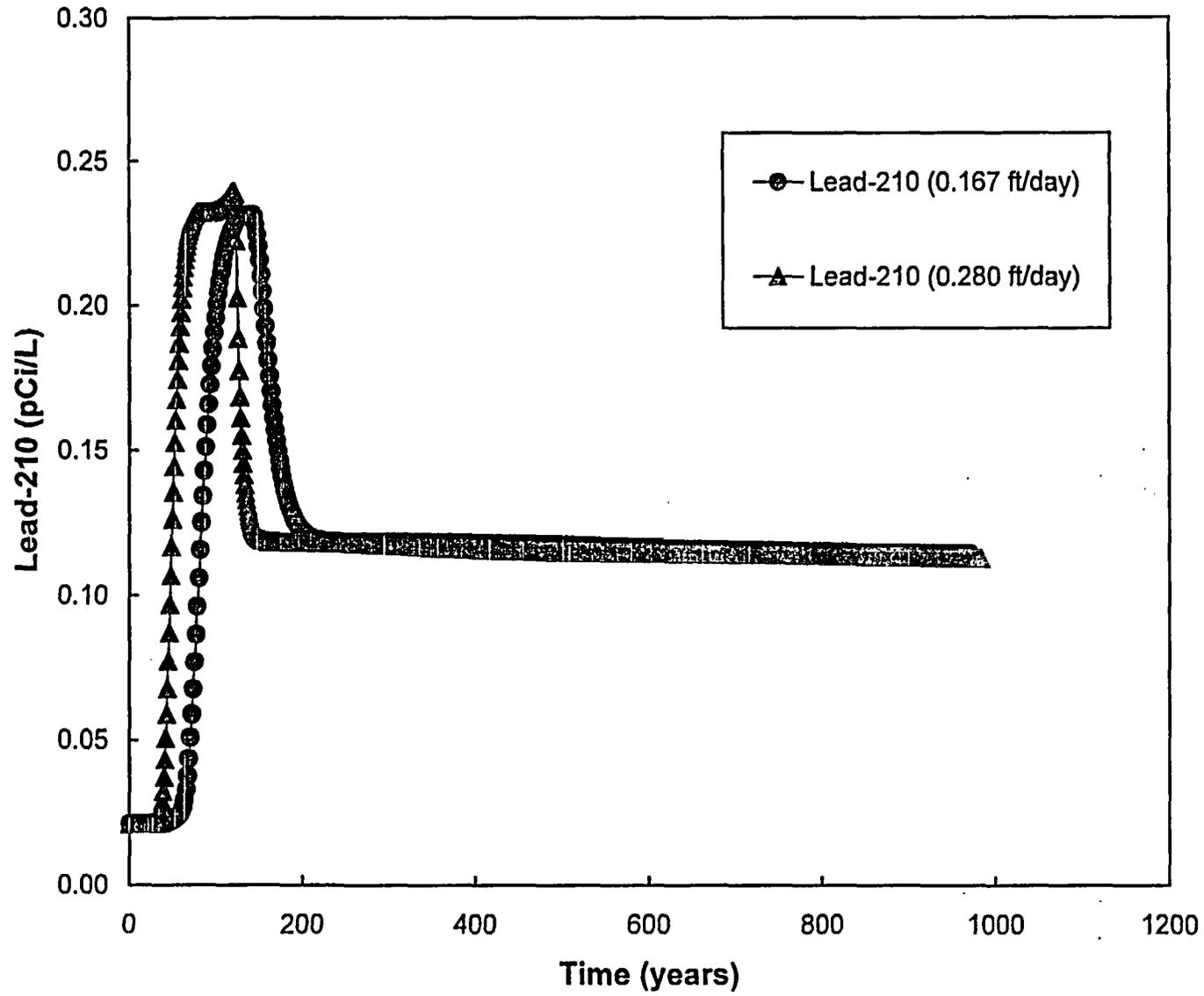


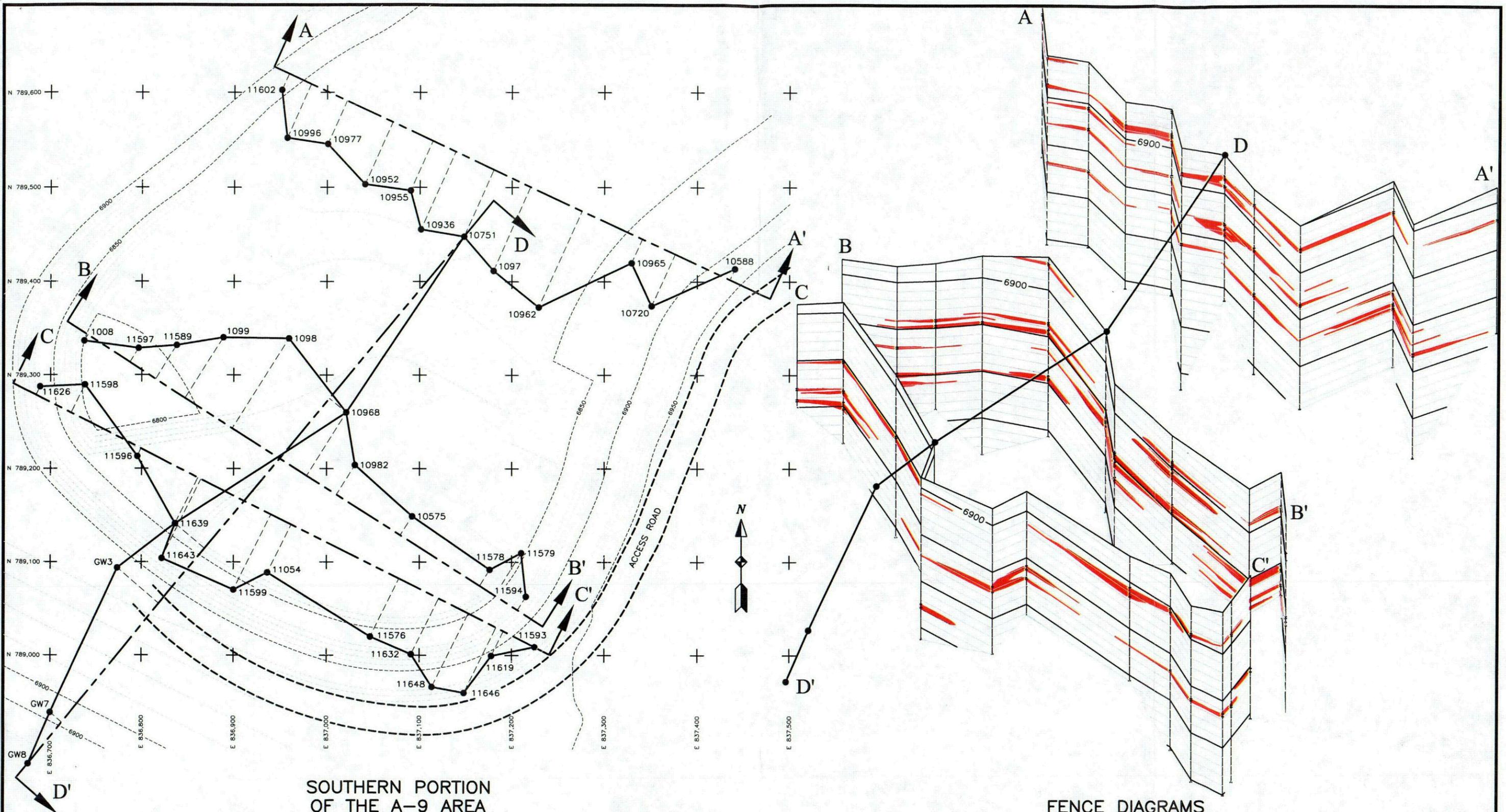
PROJECT: 305-100 TASK 2  
 PREPARED BY:  
**TELESTO**  
 SOLUTIONS INCORPORATED

**FIGURE 1**  
**COMPARISON OF SELECTED CONSTITUENT CONCENTRATIONS**  
**AND WATER TABLE ELEVATIONS IN GW-7**

PREPARED FOR:  
**Umetco Minerals**  
**Corporation**

Figure B.27 Lead-210 Concentrations at the POE for the Southwestern Flow Regime With Time.





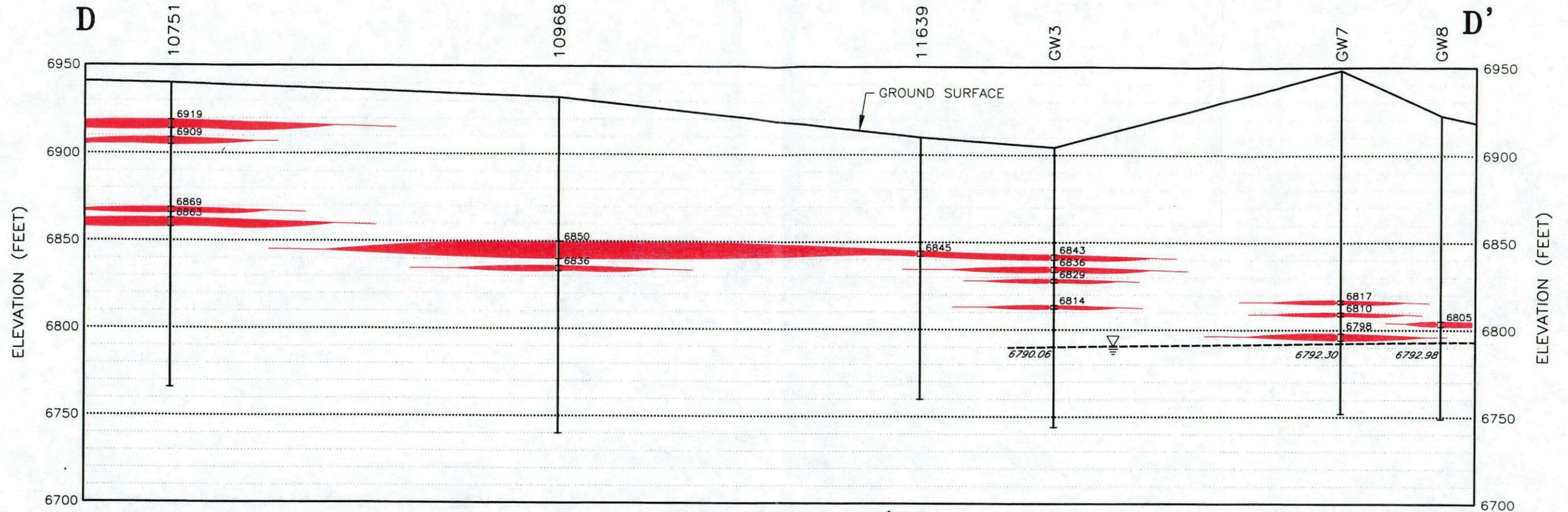
**SOUTHERN PORTION OF THE A-9 AREA**  
SCALE: 1" = 100'

**FENCE DIAGRAMS**  
SCALE: 1" = 100'

- LEGEND:**
- 1098 — BOREHOLE LOCATION
  - URANIUM ROLL FRONT
  - - - 6900 — CONTOUR LINE (50', 10')
  - - - PROJECTION LINE
  - - - CROSS SECTION LINE
  - N 789,100 + — GAS HILLS 100' SITE GRID

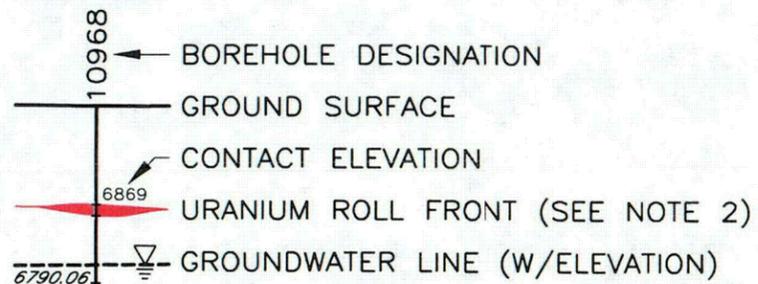
- NOTES:**
- 1). SEE FIGURES 1.10, 1.11, 1.12 AND 1.13 FOR PROJECTED BOREHOLE CROSS SECTIONS WITH ROLL FRONTS.
  - 2). INFORMATION DIGITIZED FROM THE A-9 PIT MINE PLAN (DRAWING# A4-019-3), REVISION DATE OF 10-13-75.

**UMETCO MINERALS CORPORATION**  
**DISTRIBUTION OF ROLL FRONTS IN THE SOUTHERN PORTION OF THE A-9 AREA**  
**GAS HILLS SITE**



**CROSS SECTION D-D'**  
SCALE: 1" = 60'

**LEGEND:**



**NOTES:**

- 1). SEE FIGURE 1.9 FOR SECTION D-D' LOCATION.
- 2). URANIUM DEPOSITS WERE BASED ON PERCENTAGES LISTED ON THE A-9 PIT MINE PLAN (DWG# A4-019-3), AND FROM GAMMA SURVEY LOGS FROM GW3, GW7 AND GW8.
- 3). GROUNDWATER ELEVATIONS BASED ON DATA COLLECTED SECOND QUARTER 1998.

**UMETCO MINERALS CORPORATION**

**A-9 AREA  
 CROSS SECTION D-D'  
 GAS HILLS SITE**

APRIL 2001

FIGURE 1.13