

April 17, 2008

U.S. Department of Energy  
Office of Legacy Management  
ATTN: Tracy A. Ribeiro  
Site Manager  
2597 B ¾ Road  
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, Stoller  
Transmittal of the Final Revised *Long-Term Management Plan for the Salt Lake City, Utah, (UMTRCA Title I) Processing Site*

References: Task Order LM-501-02-118-101, SLC Disposal/Processing Site

Dear Ms. Ribeiro:

Enclosed is the revised final *Long-Term Management Plan for the Salt Lake City, Utah, (UMTRCA Title I) Processing Site (LTMP)*. The revised draft LTMP was approved by the previous DOE Site Manager, Mr. Jagdish Malhotra, by correspondence received November 2, 2007.

The LTMP was revised to reflect discontinuance of the best management practice ground water and surface water monitoring program that was conducted in accordance with the LTMP (and the *Ground Water Compliance Action Plan*) from October 1999 through May 2007. The revision also includes an update to the description and requirements of the institutional control (IC) put in place to manage residual radioactive material (RRM) that were left on site under supplemental standards, as per requirements set forth in Title 40 *Code of Federal Regulations Part 192* (specifically, 40 CFR 192.21 & 192.22).

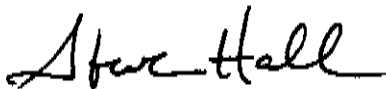
Final approval to discontinue ground water and surface water monitoring was received from the U.S. Nuclear Regulatory Commission (NRC) by letter date July 9, 2007 (written concurrence by the State of Utah was received June 1, 2007); these letters were incorporated into the revised documents as Attachment A. Regulatory approval to discontinue all monitoring at the site followed review of an evaluation of the monitoring program presented in the *Status Report for the Salt Lake City, Utah, UMTRA Project Processing Site* (March 2005), along with subsequent reporting submitted in 2006 and 2007 (for an additional two years of limited ground water monitoring performed over concerns raised in 2005 by the State of Utah). The remaining four ground water monitoring wells at the site were decommissioned in August 2007.

DOE's only remaining responsibility at the SLC Processing Site is to ensure that the IC put in place to control any future exposure to the RRM left on site under supplemental standards are

being implemented (as described in the *Notice of Residual Radioactive Contamination, Attachment B* in the LTMP). This will be done annually through written correspondence to the current site property owner, the Central Valley Water Reclamation Facility (property ownership was transferred following remediation; DOE does not own any real property at the site). This annual IC awareness correspondence will become part of the site record. Please be aware that the notice was signed by DOE, the State of Utah, and Central Valley Water Reclamation Facility, and is incorporated into the property deed. Also, in accordance with the notice, the property owner is responsible for ensuring that no disturbance of the RRM within the supplemental standards areas occurs on the site, and if concern arises that these supplemental standards areas may be encountered, the property owner is to notify the Utah Division of Radiation Control.

Submittal to NRC for approval is not required for this LTMP, as it is an internal document created for the former processing site – the tailings pile was relocated to the SLC Disposal Site, 90 miles to the west in Clive, Utah (as your aware, NRC requires an LTSP for the disposal site). Please let me know if you have any questions or concerns, or wish to discuss this further.

Sincerely,



Steve Hall  
Site Lead

SCH/hc  
Enclosure

cc:

Clay Carpenter  
Project File SLP 505.15 (re-grand.junction)

cc w/ enclosure:

Steve Hall, Stoller  
Correspondence Control File (thru Dee Dee Crawford/Christi Weston)

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# Long-Term Management Plan for the Salt Lake City, Utah, (UMTRCA Title I) Processing Site

September 2007



U.S. Department  
of Energy

## Office of Legacy Management

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**Office of Legacy Management**

**Long-Term Management Plan**  
**for the**  
**Salt Lake City, Utah, (UMTRCA Title I) Processing Site**

September 2007

Work Performed by S.M. Stoller Corporation under DOE Contract No. DE-AC01-02GJ79491  
for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado

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## **Attachments**

Attachment A—NRC Approvals and Utah DEQ/DRC Concurrence to Discontinue Ground  
Water and Surface Water Monitoring at the SLC Processing Site

Attachment B—Notice of Residual Radioactive Contamination

Attachment C—Risk Calculations



# 1.0 Introduction

## 1.1 Purpose

This Long-Term Management Plan (LTMP) conveys how the U.S. Department of Energy (DOE) Office of Legacy Management (LM), as the long-term custodian of the Salt Lake City, Utah, uranium processing site (SLC Processing Site), will implement institutional controls (ICs) put in place to manage residual radioactive material (RRM) that were left on site under supplemental standards as per requirements set forth in Title 40 *Code of Federal Regulations* Part 192 (specifically 40 CFR 192.21 & 192.22). This LTMP also provides historical site information and explains fulfillment, by DOE–LM, of the requirements of 40 CFR 192 regarding ground water compliance.

## 1.2 Regulatory Requirements

The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (42 USC §7901, as amended), provides regulations for the remediation (or reclamation) and long-term care of uranium mill tailings under either Title I or Title II of the act. Title I addresses former uranium mill sites that were unlicensed as of January 1, 1978, and essentially abandoned. Title II addresses uranium-milling sites under specific license as of January 1, 1978. In both cases, the licensing agency was the U.S. Nuclear Regulatory Commission (NRC), or in the case of certain Title II disposal sites, an Agreement State. The SLC Processing Site, formerly the Vitro Chemical Company of America uranium-processing site, was regulated under Title I of UMTRCA. The State of Utah became an Agreement State in 2004 (NRC 2004). Prior to that time NRC regulated all uranium processing activities in the state, including the Vitro site.

Surface remedial action at the Salt Lake City site was conducted from 1984 through 1987 under the UMTRCA. DOE and the State of Utah entered into a cooperative agreement (CA) effective January 30, 1981, to perform remedial action on the site; in 1984 the CA was amended to designate the State of Utah as the party to perform those remedial actions (DOE 1984). The federal government provided the majority (90%) of the funding for the reclamation; the remaining portion (10%) was provided by the State of Utah.

Remedial action consisted of removing most of the radiologically contaminated bulk materials (soil and building debris) to a licensed offsite disposal cell (DOE 1997) in accordance with 40 CFR 192. However, several areas containing RRM were left on site under supplemental standards as per requirements set forth in Title 40 CFR 192 (specifically 40 CFR 192.21 & 192.22). As required under the regulations, these remaining RRM (supplemental standards areas) must meet at least one of the following criteria; 1) only minor quantities exist, 2) do not pose a clear present or future hazard, 3) cost of removal outweighs the resulting benefit in reducing risk, or 4) removal would present a clear and present risk of injury to workers or the public, notwithstanding reasonable measures to avoid or reduce risk.

NRC does include the disposal sites containing RRM under a general license, but does not license former UMTRCA processing sites (Statements of Consideration for 10 CFR Part 40, 40-SC-16 – April 30, 1992). NRC requires a Long-Term Surveillance Plan (LTSP) for the disposal sites, as part of the general licensing agreement, but not for former processing sites.

When DOE and the State of Utah relocated the RRM and cleaned up the surface contamination at the former Vitro processing site, ground water protection regulations in 40 CFR 192, Subpart A, which address disposal cell performance, were no longer applicable at the site. However, compliance with ground water protection regulations in 40 CFR 192, Subpart B, which address ground water contamination resulting from historical uranium-processing site operations, is applicable at the site. As promulgated by the U.S. Environmental Protection Agency (EPA), 40 CFR 192, Subpart B includes ground water protection standards, referred to as maximum concentration limits (MCLs), which are the applicable regulatory ground water compliance standards for UMTRCA Title I sites.

A Ground Water Compliance Action Plan (GCAP) was prepared for compliance with Subpart B of 40 CFR Part 192 for the SLC Processing Site that provided monitoring requirements at the site (DOE 2000). The compliance strategy proposed in the GCAP indicated that compliance with Subpart B of 40 CFR 192.21(g) would be achieved through the application of supplemental standards based on limited use ground water (see Section 2.4.2 for additional information regarding the limited use ground water designation). NRC and the State of Utah Department of Environmental Quality Division of Radiation Control (Utah DEQ/DRC) concurred with the GCAP in their letters of June 15, 2000, and June 7, 2000, respectively (NRC 2000; Utah 2000). These monitoring requirements were incorporated into the original site LTMP (DOE 2002). Following nine years of required ground water and surface water monitoring, approval to discontinue all ground water and surface water monitoring was received by NRC and Utah DEQ/DRC (Attachments A). This approval to discontinue all monitoring at the site was incorporated into site LTMP in 2007.

This LTMP is a stand-alone document to guide long-term stewardship activities at the SLC Processing Site. The LTMP incorporates long-term stewardship activities and reporting requirements necessary for the site. Upon approval to discontinue all ground water and surface water at the site, long-term stewardship only consists of ensuring that the IC put in place to manage the remaining RRM at the site under supplemental standards is adhered to and enforced. The Central Valley Water Reclamation Facility (CVWRF) is the current owner of the SLC Processing Site, controlling access to the land, and therefore, the on-site responsibility for implementation of the IC.

### **1.3 DOE Role**

In December 2003, DOE formally established the DOE-LM office. The DOE-LM mission includes "...implementing long-term surveillance and maintenance projects at sites transferred to LM to ensure sustainable protection of human health and the environment."

Previously in 1988, DOE had designated the Grand Junction facility as the program office for managing long-term surveillance and maintenance of DOE disposal sites that contain regulated low-level radioactive materials that no longer had a DOE mission after cleanup, as well as other sites (including Title I and Title II sites) as assigned, and to establish a common office for the security, surveillance, monitoring, and maintenance of those sites.

According to the objectives of DOE Order 450.1, *Environmental Protection Program* (DOE 2005), DOE sites must implement sound stewardship practices protective of the air, water, land and other natural and cultural resources potentially affected by their operations. DOE Order 450.1 required DOE sites to have an environmental management system (EMS) in place

by December 31, 2005, to implement these practices. The DOE-LM EMS, which was formally implemented in October 2005, incorporates federal mandates specified in Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (EO 2007).

The LM EMS is a systematic process for reducing the environmental impacts resulting from DOE-LM and contractor work activities, products, and services and directs work to occur in a manner that protects workers, the public, and the environment. The process adheres to “Plan-Do-Check-Act” principles, mandates environmental compliance, and integrates green initiatives into all phases of work, including scoping, planning, construction, subcontracts, and operations. The EMS provides specific procedures that anticipate and mitigate negative impacts to the environment by promoting use of recycled materials; recycling to the extent practicable; conserving fuel, energy, and natural resources; and minimizing the generation of greenhouse gases, use of toxic chemicals, and generation of hazardous wastes.

End of current text

## **2.0 Final Site Conditions**

### **2.1 Site Description**

Located approximately 4 miles south-southwest of downtown Salt Lake City, the SLC Processing Site is situated just north of 3300 South Street and east of 900 West Street (Figure 2-1). Land use in this part of the city is primarily commercial and industrial. Following remediation, the south portion of the site was developed into a nine-hole golf course with a golf driving range; the northwest part of the site is being used for expansion of the CVWRF complex. The region is characterized by very gentle topography in which anthropogenic changes are more apparent than the original topographic features.

Surface remedial action at the Salt Lake City site, conducted from 1984 through 1987, consisted of removal of uranium mill tailings and tailings-contaminated materials. The site soils were remediated to the cleanup standards in 40 CFR 192, except for small discreet areas, referred to as supplemental standards areas, described previously in Section 1.2 and below in Section 2.3. Remediated materials were relocated to the Salt Lake Disposal Site located approximately 85 miles west of Salt Lake City. After surface remediation, the upper 4 to 13 feet (ft) of soil were replaced with clean sandy-gravel fill material.

Ground water beneath the site occurs in two aquifers; a shallow unconfined aquifer and a deeper confined aquifer. Ground water within the shallow aquifer, although initially above regulatory standards, is currently below the MCLs; the deeper aquifer remains unaffected by site-related contamination (see Section 1.2 and Section 2.4).

The lithology underlying the fill placed at the site consists of approximately 700 ft of unconsolidated Quaternary lacustrine and fluvial deposits with minor alluvial overburden.

### **2.2 Site Ownership and Access**

The SLC Processing Site is owned by CVWRF, a wastewater treatment plant for the City of South Salt Lake City that was constructed on the site upon completion of site reclamation and transfer of property ownership. The CVWRF Administration Building is in the center of the site and is accessed from 900 West Street. Should access to the site be needed, the CVWRF needs to be contacted first; the telephone number is (801) 973-9100, the address is 800 West Central Valley Road, Salt Lake City, Utah 84119. Mr. Reed Fisher is the current manager of the CVWRF.

### **2.3 Soil Contamination**

#### **2.3.1 Radium-226 Contamination**

During remediation of the former Vitro processing site several small pockets of contaminated soil exceeding the radium-226 standard were left within a portion of the street right-of-way along the southwest edge of the property. The estimated volume of this contamination is approximately 150 cubic meters (m<sup>3</sup>), and the average activity of the material is 30 picocuries per gram (pCi/g). Supplemental standards were applied due to the risk of damaging a gas line and a large-diameter concrete storm drain, and the risk of collapsing the road surface (see Section 1.2 for regulatory

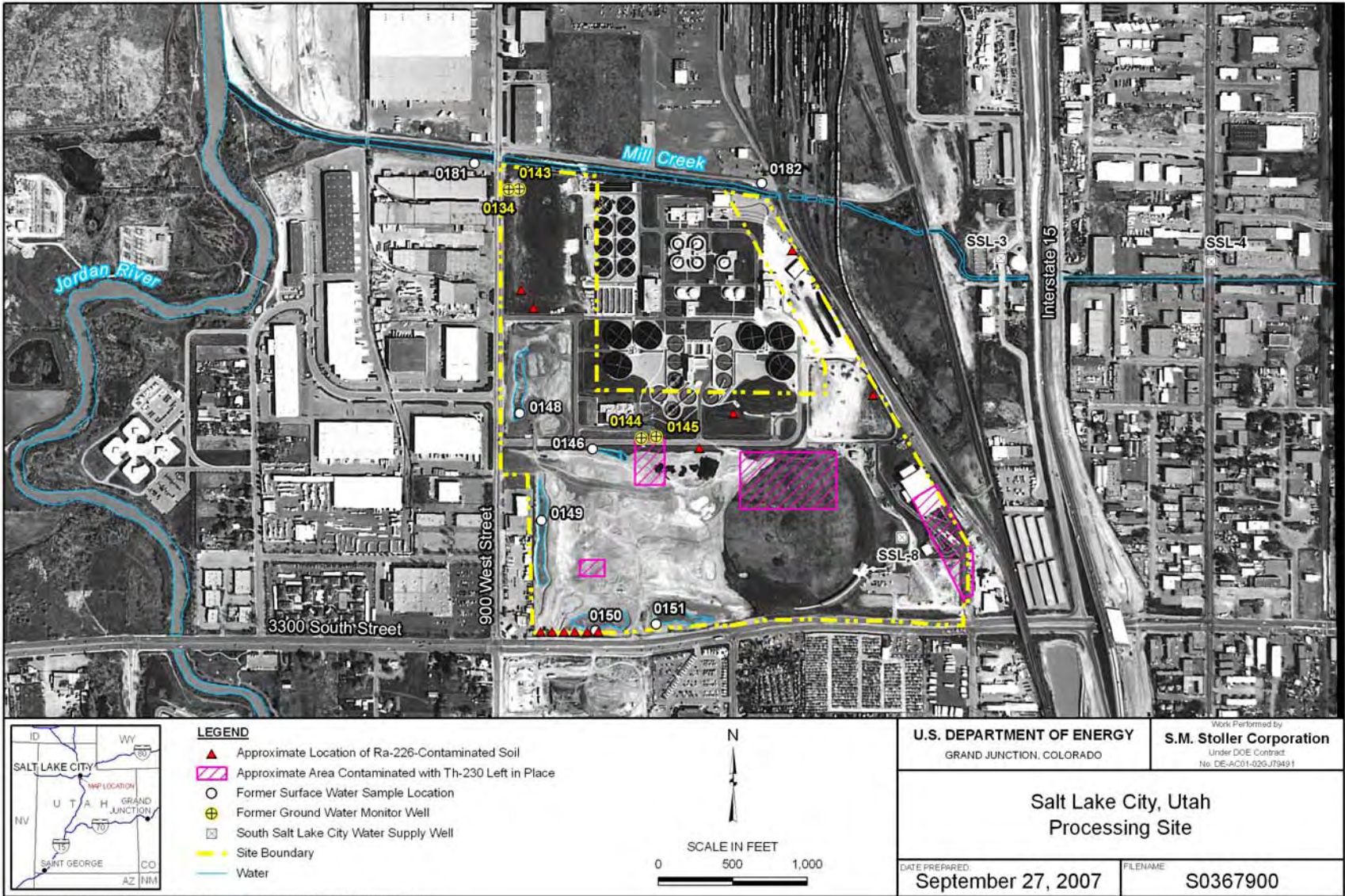


Figure 2-1. Supplemental Standards Areas and Former Monitor Wells and Surface Water Sampling Locations, Salt Lake City, Utah, Processing Site



requirements for using supplemental standards). The small pockets of contaminated soil will not adversely impact the safety of the public and the environment (DOE 1997). The location of this contamination is shown on Figure 2–1 (and on Exhibit 2 of Attachment B).

The remainder of the remediated area was divided into 100-m<sup>2</sup> verification areas that were scanned for gamma activity and sampled for analysis of radiological constituents. Backfill of the remediated area occurred following successful radium-226 concentrations determined by the opposed crystal system field analysis procedure. Subsequent laboratory analyses for these soil samples, conducted after the excavation was backfilled, indicated six verification grids with elevated radium-226 concentrations ranging up to 42 pCi/g (Figure 2–1 and Exhibit 2 of Attachment B). An analysis of radon flux from the grid with the highest radium-226 concentration indicated that the radon working level in a hypothetical structure constructed over the grid would be within regulatory limits. Therefore, the elevated grids were not considered to be health hazards and the contamination was left in place (DOE 1997).

Nevertheless, in order to ensure public safety, a *Notice of Residual Radioactive Contamination* was signed by DOE, Utah DEQ/DRC, and the current property owner (CVWRF) (Attachment B). Basically, this notice stipulates the property owner ensures that all construction planned does not occur in the contaminated areas (see Section 3.3 for additional detail).

### **2.3.2 Thorium-230 Contamination**

Analytical results of soil samples collected from the remediated area, that were received after the excavations had been backfilled, indicated that 14 verification area samples, grouped into four areas of the former excavation bottom, had thorium-230 concentrations in excess of the regulatory limit. The decision to backfill the remediated area was based on field measurements.

The estimated total volume of thorium-contaminated soil is 1,480 m<sup>3</sup>, and the average thorium-230 concentration is 234 pCi/g. Further remediation was determined to be unnecessary because the contaminated soil poses no unacceptable human health or environmental risk. NRC and the State of Utah concurred in applying supplemental standards to these areas based on the health risk assessment (DOE 1997). The locations of these areas of elevated thorium-230 are shown on Figure 2–1 (and Exhibit 2 of Attachment B).

Nevertheless, as in the case of the elevated radium-226 in soil discussed above in Section 2.3.1, in order to ensure public safety, a *Notice of Residual Radioactive Contamination* was signed by DOE, Utah DEQ/DRC, and the current property owner (CVWRF) (Attachment B). This notice stipulates the property owner ensures that all planned construction does not occur in the contaminated areas (see Section 3.3 for additional detail).

## **2.4 Ground Water Conditions**

### **2.4.1 Hydrology and Water Quality**

Ground water occurs in a shallow unconfined system (uppermost aquifer) and a deeper confined system (DOE 2000). The shallow unconfined aquifer extends down to approximately 50 ft, with static water levels at 5 to 10 ft below ground level. The deeper confined aquifer begins approximately 70 ft below the ground surface and ground water is under artesian pressure. The

two aquifers are separated by approximately 20 ft of interbedded layers of low-permeability clays and silts. The vertical hydraulic gradient between the two aquifers is upward toward the shallow aquifer, as indicated by the artesian conditions (flowing ground water) that exists in the two former wells in the deep confined aquifer. This is compared to the water table that occurs at approximately 10 ft below the surface in the two adjacent former wells in the shallow unconfined aquifer. Ground water in the shallow unconfined aquifer flows predominantly to the west-northwest and discharges to Mill Creek and the Jordan River. The ground water flow system beneath the site is periodically affected by CVWRF pumping activities and by the storm drain lift station near the southeast corner of the site.

Ground water from the shallow aquifer is expressed in four shallow ponds located on the golf course that was constructed on the southern portion of the site following remediation. The pond water, which is used only for irrigating the golf course, contains detectable levels of uranium and molybdenum; however, concentrations from 2001 through 2004 were well below the MCLs of 0.044 and 0.1 milligrams per liter (mg/L), respectively. Health risk assessment calculations (Attachment C) indicated that there is no unacceptable risk from incidental exposure to the pond water (DOE 2000).

Historical investigations had shown that processing of radioactive materials at the former Vitro processing site had contaminated ground water in the uppermost aquifer. The designated constituents of potential concern (COPC) and their MCL are: molybdenum (0.10 milligrams per liter [mg/L]) and uranium (0.044 mg/L) (DOE 2000). Concentrations of arsenic also exceed the MCL (0.05 mg/L) in ground water in background and crossgradient monitor wells, but are not related to activities at the former processing site (DOE 2000).

#### **2.4.2 Ground Water Compliance Strategy**

The compliance strategy to meet the EPA ground water protection standards is no remediation and application of supplemental standards based on limited use ground water (40 CFR 192.21(g)) (DOE 2000). Ground water in the shallow unconfined aquifer is of limited use because of the widespread occurrence of arsenic that is not related to former processing activities. Sources of arsenic in ground water include leaching from landfills, and from tailings and slag heaps associated with abandoned smelters in the valley that processed lead, copper, silver, and gold. Background arsenic concentrations in ground water range up to 0.173 mg/L (DOE 2000).

Compliant with 40 CFR 192.21(g), ground water in the shallow aquifer is not a current or potential source of drinking water due to widespread ambient arsenic contamination, unrelated to the site, which cannot be cleaned up using treatment methods reasonably employed in public water supply systems. Sources of potable water are readily available from municipal water supply systems in the vicinity of the site. Future use of ground water from the shallow aquifer is unlikely based on historical trends and the rapid expansion of commercial and industrial facilities in the area; therefore, there is no beneficial use that will be affected with the application of supplemental standards. In accordance with the GCAP, supplemental standards were applied to the contaminated ground water in the shallow aquifer; NRC approval and Utah DEQ/DRC concurrence to the application of supplemental standards were received (NRC 2000; Utah 2000).



### 2.4.3 Historical Compliance Monitoring

Ground water and surface water monitoring at the SLC Processing Site was performed at the four remaining monitor wells (now abandoned) and at seven surface locations on an annual basis as a best management practice (Table 2-1 and Figure 2-1). This monitoring was conducted for the minimum period of 5 years in accordance with the GCAP and LTMP (DOE 2000; DOE 2002); through 2004 for surface water and through 2007 for ground water. In accordance with the GCAP and LTMP, the criteria for terminating monitoring was: 1) no significant reversal of the hydraulic gradient, 2) a decrease in COPC concentrations in ground water as anticipated, and 3) no unacceptable risks related to pumping of ground water by CVWRF or the storm drain sump. The GCAP and LTMP required DOE to receive NRC approval prior to the termination of monitoring.

The primary concern Utah DEQ/DRC had was the possible migration of contaminated ground water in the shallow unconfined aquifer downward into the deeper confined aquifer if the upward vertical hydraulic gradient within the deeper aquifer were to reverse. Therefore, monitoring of ground water levels was performed in two wells completed in the shallow unconfined aquifer (monitor wells MW-134 and MW-144) and two wells completed in the deeper confined aquifer (monitor wells MW-143 and MW-145) at two locations, one onsite and one downgradient (Figure 2-1).

DOE also monitored ground water quality annually in the two wells in the shallow unconfined aquifer (monitor well MW-134 downgradient and MW-144 onsite) to ensure that concentrations of designated COPCs (molybdenum and uranium) continue to decrease (Figure 2-1) (Table 2-1). If there had been an indication that the vertical hydraulic gradient was reversing within the deeper aquifer, ground water in the deeper confined aquifer would have been sampled and analyzed to ascertain that no site-related constituents were migrating into the deeper aquifer.

The NRC was primarily concerned with potential creation of an exposure pathway for contaminated ground water within the shallow aquifer through CVWRF pumping activities or from the storm drain sump southeast of the site. Ground water that is periodically pumped from two dewatering wells by CVWRF for construction and maintenance purposes is run through a treatment plant and then discharged into Mill Creek directly north of the site. Although treatment does not include the removal of metals, the low concentrations of COPCs in ground water and the subsequent dilution during the process preclude any unacceptable risk at the discharge point in Mill Creek. Ground water that enters the storm drain sump is pumped mostly through an underground pipe system, which ultimately discharges to Mill Creek. Historically, there had been a 150-ft section of this discharge pipe system open to the surface just south of the CVWRF Administration Building.

To ensure that these potential exposure pathways of contaminated ground water did not pose a risk to human health and the environment, DOE monitored surface water annually at the west end of the open ditch onsite (location SW-146), and Mill Creek upstream (location SW-181) and downstream (location SW-182) of the site (Figure 2-1) (Table 2-1). DOE also collected samples from the ponds on the golf course that intermittently contained ground water (locations SW-148, SW-149, SW-150, and SW-151) (Figure 2-1). These samples were analyzed for the designated COPCs (molybdenum and uranium).

Table 2–1. Ground Water and Surface Water Monitoring Locations, Salt Lake City, Utah, Processing Site

Well/SW Number	Location	Interval <sup>a</sup>	Analytes	Water Level <sup>b</sup>	Frequency
MW–134	Downgradient monitor well	Shallow	U and Mo	Datalogger	Annual
MW–143	Downgradient monitor well	Deep	<sup>c</sup>	Manual	<sup>d</sup>
MW–144	Onsite monitor well	Shallow	U and Mo	Datalogger	Annual
MW–145	Onsite monitor well	Deep	<sup>c</sup>	Manual	<sup>d</sup>
SW–146	Open ditch onsite	Surface	U and Mo	N/A	Annual
SW–148	Pond west of CVWRF	Surface	U and Mo	N/A	Annual
SW–149	Pond southwest of CVWRF	Surface	U and Mo	N/A	Annual
SW–150	Pond southwest of CVWRF	Surface	U and Mo	N/A	Annual
SW–151	Pond south of CVWRF	Surface	U and Mo	N/A	Annual
SW–181	Mill Creek – upstream	Surface	U and Mo	N/A	Annual
SW–182	Mill Creek – downstream	Surface	U and Mo	N/A	Annual

<sup>a</sup>Shallow unconfined aquifer and deep confined aquifer.

<sup>b</sup>Dataloggers in shallow wells recorded ground water level measurements every 4 hours continuously and were downloaded annually—deeper wells were observed visually (and water level measured, as applicable) at the time of annual sampling.

<sup>c</sup>Samples were analyzed for same constituents if sampled (if vertical hydraulic gradient reversed).

<sup>d</sup>Wells in deep aquifer will be sampled only if vertical hydraulic gradient reverses.

Results for historical ground water and surface water monitoring performed in accordance with the GCAP and LTMP are presented below in Section 2.4.4.

In accordance with the GCAP and LTMP, at the end of the required 5-year monitoring period (through 2004) an evaluation was made to determine the need for future monitoring at the site and submitted to NRC for approval and the Utah DEQ/DRC for concurrence (DOE 2004). The evaluation concluded that the criteria specified in the GCAP and LTMP had been satisfied, and in addition, that both COPCs were below their respective MCLs at all ground water and surface water monitoring locations, and therefore, a recommendation to discontinue all monitoring was made.

Upon review of DOE’s 5-year monitoring evaluation (DOE 2004), NRC approval to discontinue all surface water monitoring at the site was received by letter dated December 15, 2005, with concurrence from the Utah DEQ/DRC by letter dated November 9, 2005. However, due to concerns raised by the Utah DEQ/DRC over the trend in concentrations of molybdenum in monitor well MW–144 and the possibility of a reversal in the upward hydraulic gradient in the deeper aquifer, an additional 2 years of ground water monitoring was conducted per NRC direction. This 2 years of limited ground water monitoring consisted of sampling and analysis for molybdenum in monitor well MW–144 and continued measurement of ground water levels in both the shallow aquifer (from monitor wells MW–134 and MW–144) and the deeper aquifer (from monitor wells MW–143 and MW–145) (Figure 2–1).

Upon completion of the required additional 2 years of limited ground water monitoring, DOE presented the results NRC and Utah DEQ/DRC with a recommendation to discontinue the remaining ground water monitoring at the site since the criteria had been satisfied and the COPCs continued to remain below their respective MCLs. Approval to discontinue all ground water monitoring at the site was received from the NRC by letter dated July 9, 2007, with concurrence from the Utah DEQ/DRC by correspondence dated June 1, 2007 (Attachment A).

The four remaining ground water monitoring wells at the site were decommissioned in July 2007.

### 2.4.4 Historical Compliance Monitoring Results

The results of the historical ground water and surface monitoring described above in Section 2.4.3 are provided below in Figures 2–2 through 2–6.

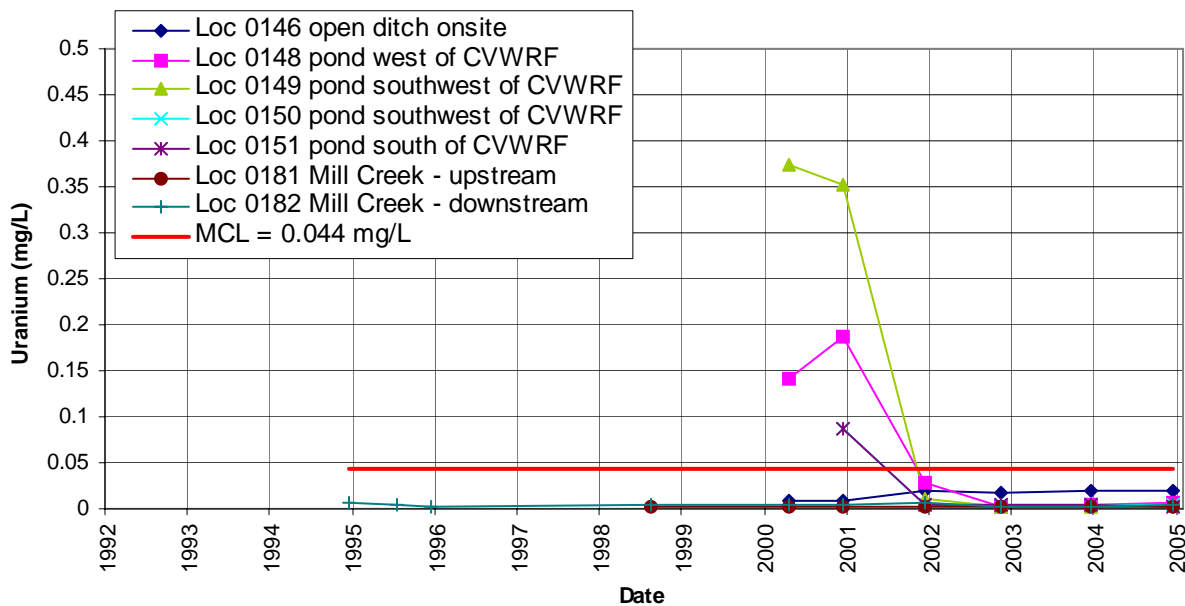


Figure 2–2. Surface Water Uranium Concentrations at the Salt Lake City Processing Site

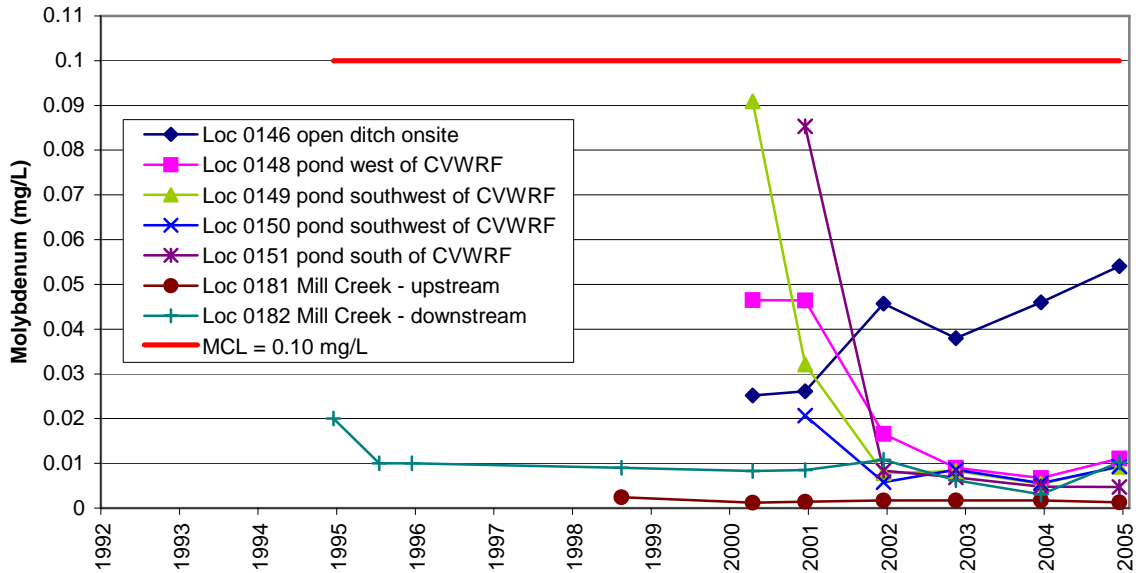


Figure 2-3. Surface Water Molybdenum Concentrations at the Salt Lake City Processing Site

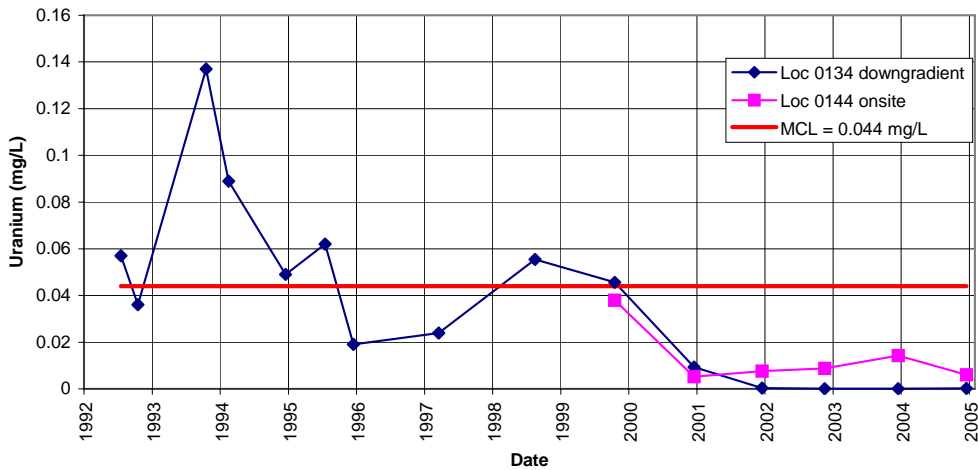


Figure 2-4. Shallow Aquifer Uranium Concentrations at the Salt Lake City Processing Site

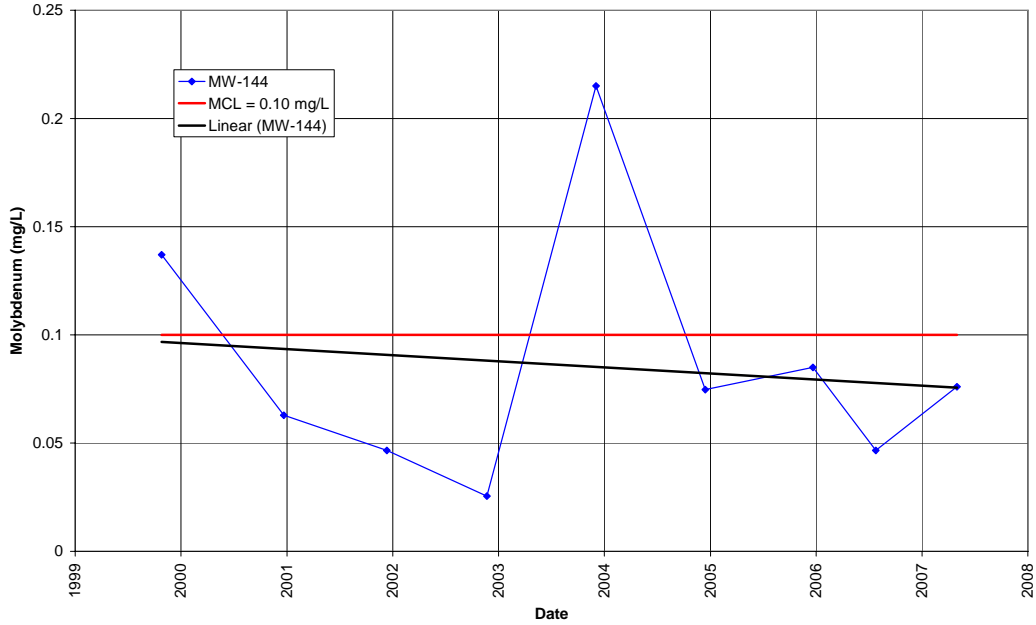


Figure 2-5. Shallow Aquifer Molybdenum Concentrations at the Salt Lake City Processing Site

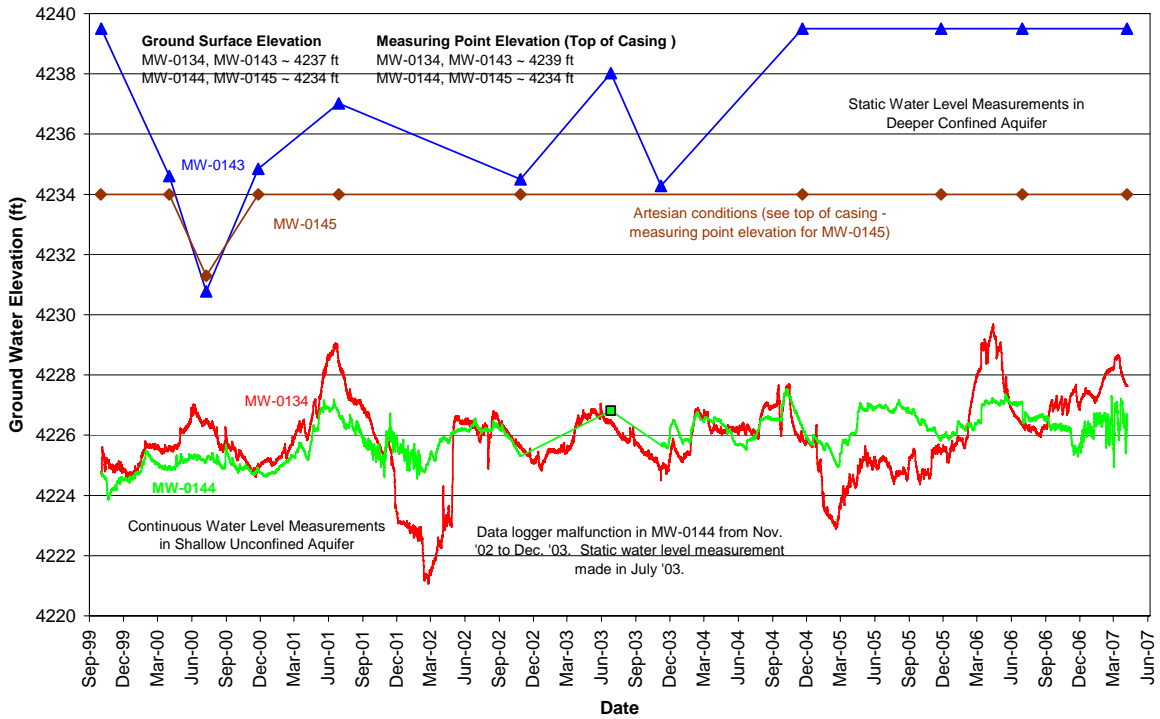


Figure 2-6. Ground Water Level Measurements at the Salt Lake City Processing Site

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## 3.0 Long-Term Management Program

### 3.1 Site Inspections

Site inspections of the SLC Processing Site are not required as all the former Vitro uranium-processing site RRM was relocated to the SLC Disposal Site in Clive, Utah (approximately 85 miles west of the former processing site), with the exception of those within the supplemental standards areas (Section 2.3 and 3.3), and ownership of the property was transferred to the CVWRF (Section 2.2). DOE no longer owns any real property at the SLC Processing Site.

### 3.2 Monitoring

Ground water and surface water monitoring is no longer required at the SLC Processing Site (see Section 1.2 and 2.4, particularly Section 2.4.3 and Section 2.4.4).

### 3.3 Institutional Controls

RRM were left on site under supplemental standards as per requirements set forth in 40 CFR 192 (specifically 40 CFR 192.21 & 192.22) as discussed in Sections 1.2 and 2.3. Assessment of site conditions and consideration of potential impacts on environmental resources indicate that supplemental standards will be protective of human health and the environment (DOE 1997, DOE 2000). Since the former processing site is owned by CVWRF, access to the land, and locations of remaining contaminated soil is controlled (supplemental standards areas, Figure 2-1).

After remediation of the site, a *Notice of Residual Radioactive Contamination* (notice) was developed and signed by DOE, the Utah DEQ/DRC, and CVWRF (Attachment B). This notice serves as an IC that supports land-use restrictions to prohibit any construction in contaminated areas and is incorporated into the property deed. The property owner is responsible for ensuring that no disturbance of the RRM within the supplemental standards areas occurs. The notice also states that if a concern arises that these supplemental standards areas may be encountered, the property owner is to notify the Utah DEQ/DRC prior to any construction activities in order to conduct radiological surveys, as deemed appropriate. The notice continues to state that if radioactive materials are encountered during construction that the materials may be disposed as radioactive waste at an appropriate waste facility or buried back into the deepest part of the excavation. The notice does indicate, regardless of the results of the radiological surveys, if a habitable structure is being built in an area of concern, that the installation of a passive sub-slab radon ventilation system is to be considered.

DOE-LM will ensure annually that the property owner is aware of the supplemental standards areas, and that the requirements of the IC (notice) are understood. This will be performed through written correspondence, which will include a copy of the notice and a map showing the location of the RRM remaining on site under supplemental standards. This written correspondence and its written reply will become part of the site record.

This IC will be enforced as long as necessary to prevent exposure to the remaining contaminated soil.

### **3.4 Quality Assurance and Health and Safety**

The long-term care of the SLC Processing Site and all activities related to the annual awareness of IC at the site will comply with DOE Order 5700.6C, "Quality Assurance" and ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs* (American Society for Quality Control 1994).

Health and safety procedures for long-term management of the SLC Processing Site are consistent with DOE orders, regulations, codes, and standards.



## 4.0 References

Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, January 24, 2007.

DRC (Utah Department of Environmental Quality Division of Radiation Control), 2000. "May 2000 Revised Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRA Project Site: Site Concurrence," letter to DOE dated June 7, 2000.

DOE (U.S. Department of Energy), 1984. *Final Environmental Impact Statement for Remedial Actions at the Former Vitro Chemical Company Site, South Salt Lake, Salt Lake County, Utah*, DOE/EIS-0099-F, prepared by the U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico, July.

DOE (U.S. Department of Energy), 1997. *Completion Report for the UMTRA Project Vitro Processing Site, Salt Lake City, Utah*, [includes supplemental standards applications and associated health risk assessments for contamination left in place], Revision 4, June.

DOE (U.S. Department of Energy), 2000. *Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRA Project Site*, S0041601, prepared by the U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, May.

DOE (U.S. Department of Energy), 2002. *Long-Term Management Plan for the Salt Lake City, Utah, UMTRA Project Processing Site*, U0039502, prepared by the U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, January.

DOE (U.S. Department of Energy), 2004. *2004 Status Report for the Salt Lake City, Utah, UMTRA Project Processing Site*, prepared by the S.M. Stoller Corporation for the U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, January.

DOE (U.S. Department of Energy), 2007. *2007 Status Report for the Salt Lake City, Utah, UMTRA Project Processing Site*, prepared by the S.M. Stoller Corporation for the U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, January.

EPA (U.S. Environmental Protection Agency), 2001. "Risk-Based Concentration Table U.S. EPA Region III," Memorandum from Jennifer Hubbard, Toxicologist. Available on the internet at <http://www.epa.gov/reg3hwmd/risk/riskmenu.htm>.

NRC (U.S. Nuclear Regulatory Commission), 2000. "U.S. Nuclear Regulatory Commission Concurrence of the Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRA Site," letter to DOE dated June 15, 2000.

NRC (U.S. Nuclear Regulatory Commission), 2004. Letter from NRC Chairman Nils J. Diaz to Governor Olene S. Walker, transmitting formal copies the amendment to Utah's Agreement that transfers regulatory authority over 11e.(2) byproduct material from the NRC to Utah, August 10.

End of current text

## **Attachment A**

### **NRC Approvals and Utah DEQ/DRC Concurrence to Discontinue Ground Water and Surface Water Monitoring at the SLC Processing Site**

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State of Utah

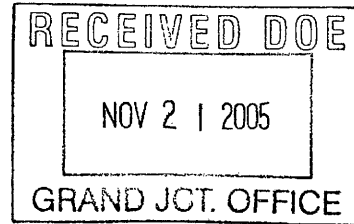
Department of  
Environmental Quality

Dianne R. Nielson, Ph.D.  
*Executive Director*

DIVISION OF RADIATION  
CONTROL  
Dane L. Finerfrock  
*Director*

JON M. HUNTSMAN, JR.  
*Governor*

GARY HERBERT  
*Lieutenant Governor*



November 9, 2005

Mr. Tom Pauling  
Site Manager  
2597 B ¾ Road  
Grand Junction, CO. 81503

SUBJECT: Salt Lake City, Utah, UMTRA Project Processing Site.

Dear Mr. Pauling:

The Utah Division of Radiation Control (DRC) has reviewed the 2004 Annual Status Report for the Salt Lake City, Utah, UMTRA Project Processing Site report (Report). This Report presents the results of the 5-year monitoring program as required in the Ground Water Compliance Action Plan (GCAP) for the Salt Lake City, Utah, UMTRA Project Site, May 2000. The Report recommends to discontinue all monitoring at the site because the 5 year monitoring results have demonstrated the following criteria for discontinuing the monitoring at the site have been met:

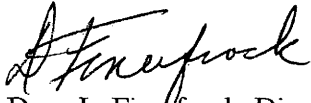
1. No reversal of the ground water hydraulic gradient;
2. A decrease in uranium and molybdenum concentrations in the ground water; and
3. No unacceptable risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF).

The DRC review found that molybdenum concentrations in the December 2004 sampling event at monitor well 0144 exceeded the ad hoc Utah Ground Water Quality Standard (GWQS) of 0.040 mg/L at a concentration of 0.075 mg/L. In addition, molybdenum concentration in the December 2003 sampling event at monitor well 0144 also had exceeded the ad hoc Utah GWQS at 0.215 mg/L. Therefore, because molybdenum concentrations in monitor well 0144 have exceeded the Utah ad hoc GWQS in consecutive sampling events (2003 and 2004 sampling events), ground water monitoring at this well should continue. In addition, to demonstrate that an upward gradient still exists in the lower confined aquifer, preventing contaminated groundwater in the shallow aquifer from migrating to the lower confined aquifer, groundwater head monitoring in monitor wells 0134, 0143, 0144, and 0145 should also continue. This monitoring should continue until molybdenum concentrations are below the Utah GWQS, and the DRC is convinced that the contaminant concentrations will not rebound.

Page 2

If you have any questions regarding this letter, please call Dean Henderson at 536-0046. Thank you for your cooperation.

Sincerely,

A handwritten signature in black ink, appearing to read "Dane L. Finerfrock". The signature is written in a cursive style with a large initial "D".

Dane L. Finerfrock, Director

DLF/DH:dh

CC: Rob Herbert, DWQ  
Paul Michalak

F:/Henderson/DOE/DOE SLC sampling.doc  
File:DOE Salt Lake City



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

December 15, 2005

Mr. Thomas Pauling  
U.S. Department of Energy  
Office of Legacy Management  
2597 B 3/4 Road  
Grand Junction, CO 81503

SUBJECT: 2004 ANNUAL STATUS REPORT FOR THE SALT LAKE CITY, UTAH,  
UMTRCA PROCESSING SITE

Dear Mr. Pauling:

The U.S. Department of Energy (DOE) submitted a 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site (the site) on March 24 2005. Based on five years of monitoring, the DOE proposed discontinuing monitoring at the site based on the following criteria: 1) no reversal of the ground water hydraulic gradient; 2) a decrease in the uranium and molybdenum concentrations in the ground water as anticipated; and 3) no unacceptable risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the above information, and conferred with both DOE and Utah Department of Environmental Protection (DEP) on this matter. The staff's Technical Evaluation Report has been enclosed for your information. The staff has determined the second criteria (i.e., decrease in molybdenum concentrations in the surficial aquifer) has not been met. Consequently, current sampling and monitoring at the site should be amended to the following:

- 1) Annual monitoring for molybdenum in well 0144 should continue for at least two years, with termination of monitoring contingent on the following:
  - a) Molybdenum data set for monitor well 0144 exhibiting a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or
  - b) Data remaining below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum.
- 2) While molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue.
- 3) Following the second year of sampling, information pertaining to all three original criteria (i.e., the complete molybdenum data set for monitor well 0144, measurements of the vertical gradient, and discussion of risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm

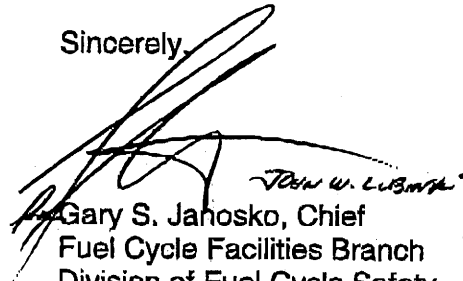
drain sump) should be submitted to the NRC and Utah DEP.

- 4) If in the next two years, conditions influencing Criteria 1 (vertical gradients) or Criteria 3 (risks related to pumping of ground water by CVWRF or the storm drain sump) significantly change, termination of monitoring at the site will need to be reconsidered

If you have any questions concerning this matter, please contact the NRC Project Manager, Mr. Paul Michalak, at 301-415-7612 or by e-mail at [pxm2@nrc.gov](mailto:pxm2@nrc.gov).

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

Sincerely,



Gary S. Janosko, Chief  
Fuel Cycle Facilities Branch  
Division of Fuel Cycle Safety  
and Safeguards  
Office of Nuclear Material Safety  
and Safeguards

Enclosure: Technical Evaluation Report

cc: Dean Henderson, State of Utah, DRC



**TECHNICAL EVALUATION REPORT  
TERMINATION OF MONITORING AT THE SALT LAKE CITY  
UMTRCA TITLE I PROCESSING SITE**

**DATE:** December 6, 2005

**TECHNICAL REVIEWER:** Paul Michalak

**SUMMARY AND CONCLUSIONS:**

In March 2005, following five years of monitoring, the U.S. Department of Energy's (DOE) Office of Legacy Management proposed discontinuing monitoring at the Salt Lake City Processing Site (the site) based on the following criteria: 1) no reversal of the ground water hydraulic gradient; 2) a decrease in the uranium and molybdenum concentrations in the ground water as anticipated; and 3) no unacceptable risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump (DOE 2005).

The U.S. Nuclear Regulatory Commission (NRC) does not believe the second criteria has been met. The current data set for molybdenum in the surficial aquifer (specifically monitor well 0144) does not conclusively show a decreasing trend in molybdenum concentrations. Current sampling and monitoring at the site should be amended to the following:

- 1) Annual monitoring for molybdenum in well 0144 should continue for at least two years, with termination of monitoring contingent on the following:
  - a) Molybdenum data set for monitor well 0144 exhibiting a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or
  - b) Data remaining below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum.
- 2) While molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue.
- 3) Following the second year of sampling, information pertaining to all three original criteria (i.e., the complete molybdenum data set for monitor well 0144, measurements of the vertical gradient, and discussion of risks related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump) should be submitted to the NRC and Utah DEP.
- 4) If in the next two years, conditions influencing Criteria 1 (vertical gradients) or Criteria 3 (risks related to pumping of ground water by CVWRF or the storm drain sump) significantly change, termination of monitoring at the site will need to be reconsidered.

Enclosure

## BACKGROUND:

The Site began operations in 1941, starting as a large smelter operation. In 1951, the plant began processing uranium ore. Operations were terminated and the plant dismantled in 1970. Between 1985 and 1987, the DOE removed 2,798,000 cubic yards of tailings from the site, essentially eliminating the source of ground water contamination. Soils contaminated with residual radioactive materials were left in place at several locations in the original property. Institutional controls governing soil excavation and construction of structures in areas of contaminated soil were established jointly by DOE, Utah Division of Radiation Control (UT-DRC), and the Central Valley Water Reclamation Facility (CVWRF), the current owners of the property.

Subsequently, DOE proposed a compliance strategy through the application of Supplemental Standards (40 CFR 192.21(g)) based on limited use ground water. Widespread ambient arsenic contamination in the shallow aquifer, not associated with activities at the site, precluded its use as a domestic drinking water source. Background well concentrations for arsenic range from 0.063 to 0.132 mg/L. In DOE's Groundwater Compliance Action Plan (GCAP) for the Salt Lake City, Utah UMTRCA Project Site (DOE 2000), three criteria were indicated for terminating monitoring:

- No significant reversal of the hydraulic gradient
- A decrease in contaminants of potential concern (COPC) concentrations in ground water, and
- No unacceptable risks related to pumping of ground water by CVWRF or the storm water drain sump.

On June 15, 2000, the NRC concurred with DOE's compliance strategy and approved their GCAP (NRC 2000). The State of Utah also concurred with DOE's GCAP on June 7, 2000 (UDEQ 2000). Following approval, DOE instituted the following annual ground and surface water monitoring program: ground water quality sampling (uranium and molybdenum were identified as the contaminants of potential concern (COPCs)) at one onsite and one down gradient shallow aquifer monitoring well, water levels measurements at one onsite and one down gradient well cluster (i.e., cluster consisting of shallow and deep aquifer monitoring wells), sampling at four onsite ponds, sampling at an onsite open ditch (South Vitro Ditch), and up- and downstream sampling of the nearby Mill Creek. Annual monitoring was proposed for a minimum period of five years, at which time an evaluation, in consultation with the NRC and the State of Utah, would be conducted to determine the need for future monitoring at the site.

In March 2005, following five years of monitoring, DOE's Office of Legacy Management proposed discontinuing monitoring at the site based on the following reasons (DOE 2005):

- Since 2001 (five consecutive samples), on-site and down gradient ground water monitoring results for uranium have been below the 40 CFR 192, Subpart A Maximum Contaminant Level (MCL) of 0.044 mg/L as well as the National Primary Drinking Water Regulation MCL of 0.030 mg/L, while with two exceptions (2000 and 2004), on-site molybdenum ground water results have also been below its 40 CFR 192 MCL (0.10 mg/L). All down gradient ground water monitoring results for molybdenum have been below its MCL since 1993.

- Surface water monitoring results from four on-site ponds and an open ditch have shown uranium levels below its MCL since 2002 (four consecutive samples), while molybdenum results have been below its MCL since 2000 (six consecutive samples).
- Soils left in place at the site do not appear to be impacting ground water quality. Uranium and molybdenum concentrations in the shallow aquifer have not increased, indicating that there is little leaching of soils in place.
- Since 1999, an upward vertical gradient (i.e., under artesian conditions) has been consistently measured between the surficial and deep aquifers at both the onsite and down gradient well cluster locations.
- No unacceptable risk related to pumping of ground water by CVWRF was identified. The CVWRF property manager verified that no unauthorized construction or ground water withdrawal occurred during the last year.

## **TECHNICAL EVALUATION:**

### Hydrogeology

Hydrogeologically, the site is characterized by two aquifers: a shallow, unconfined system (water levels between 5 to 10 feet below ground surface) and a deeper confined system (under artesian conditions). Approximately 20 feet of clays and silts separate the two aquifers. The confined aquifer is used as a drinking water source in the area.

Historically, the shallow aquifer has been periodically influenced by dewatering activities conducted by the CVWRF. The pumped water is run through an on-site treatment plant (treatment does not include metals removal) prior to discharge into Mill Creek. Another feature that affects shallow aquifer flow at the site is a highway drain located in the southeastern portion of the site. Water enters the drain and is then pumped out into the South Vitro Ditch, which ultimately discharges to Mill Creek.

### Regulatory

The site is regulated under Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Since the residual radioactive material from the former mill operations has been excavated and removed from the site, there are no licenses (including a general licence under 10 CFR 40.27) or permits for this site with either the NRC or the State of Utah. Specific regulations are found in 40 CFR 192 and include:

Subpart A - Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites

Subpart B - Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites

Subpart C - Implementation

Table 1 to Subpart A contains maximum concentrations of constituents for ground water

protection. The maximum level for molybdenum in Table 1 is 0.1 mg/L.

### Five-year Monitoring Period

Data collected during DOE's five-year monitoring period clearly demonstrated the following:

- There has been no reversal of the upward vertical gradient between the shallow and deep aquifer systems.
- Since 2001 (for ground water) and 2002 (for surface water), uranium concentrations in the shallow aquifer have reached steady levels which are well below the 0.044 mg/L regulatory concentration (40 CFR 192, Subpart A, Table 1).
- Based on data presented in Figure 6 (DOE 2005), all molybdenum results from surface water sampling locations have been below the 0.1 mg/L (40 CFR 192, Subpart A, Table 1) (Note: the open ditch shows a slightly increasing concentration trend for molybdenum; however, the levels are well below the 0.1 mg/L regulatory level.
- Molybdenum results from down gradient shallow aquifer ground water monitoring location 0134 clearly show molybdenum levels well below the 0.1 mg/L regulatory level.
- No unacceptable risks related to pumping of ground water by CVWRF or the storm drain sump have been identified.

However, the molybdenum results from shallow aquifer monitor well 0144 do not conclusively show a decreasing trend. Although molybdenum in monitor well 0144 showed a decreasing trend in four annual sampling events between 2000 and 2003, data for the last two events (2004 and 2005) exhibit the highest concentrations since 2000, with the 2004 concentration of 0.215 mg/L just over twice the 0.1 mg/L regulatory level. Moreover, applying linear regression analysis to the six data points presented in Figure 4 (DOE 2005) results in a positive (i.e., increasing) slope.

### Discussion

Of the three criteria agreed upon by Utah, NRC, and DOE for termination of site monitoring, only the decrease of molybdenum concentrations in the shallow aquifer appears to be in question (specifically monitor well 0144). In conversations with the DOE, it has been proposed that averaging the molybdenum concentrations from surficial aquifer monitor wells 0134 and 0144 could be an alternate approach to assessing molybdenum in the surficial aquifer. Given that the current monitoring program for the surficial aquifer includes only two monitoring locations, averaging does not appear an appropriate analytical tool for assessing ground water quality.

On November 9, 2005, Utah's DEQ, DRC responded to DOE's proposal to discontinue monitoring (UDEQ 2005). DRC indicated that molybdenum exceeded Utah's ad hoc ground water quality standard (0.04 mg/L) in consecutive sampling events (2003 and 2004) and that ground water monitoring should continue until molybdenum concentrations are below the Utah GWQS and the DRC is convinced that the contaminant concentrations will not rebound. Subsequent conversations with Utah DRC indicated that they were primarily concerned with the

potential for molybdenum from the surficial aquifer to impact the underlying potable aquifer. It should be noted that because the site is regulated under Title I of UMTRCA, the NRC believes that the applicable regulatory standard for the site is 40 CFR 192, Subparts A, B and C. Consequently, the NRC believes that 0.1 mg/L (40 CFR 192, Subpart A, Table 1) is the relevant molybdenum standard for the site.

In DOE (2000), Supplemental Standards (40 CFR 192.21(g)) based on limited use ground water were used to establish the current monitoring program at the site (i.e., the shallow aquifer at the site is not potable due to elevated background concentrations of arsenic). As a result, the NRC understands that the 40 CFR 192, Subpart A, Table 1 molybdenum MCL (0.1 mg/L) should not be used as a remedial action standard in the shallow aquifer. However, because quantitatively proving a decreasing trend can be difficult (e.g., when data oscillates around an asymptotic value), the 40 CFR 192 molybdenum MCL is a convenient tool to assess the potential impact of molybdenum on the underlying potable aquifer. It is also understood that any leakage from the surficial aquifer into the deeper system would likely result in attenuation of the molybdenum concentrations. Regardless of attenuation, if molybdenum is below the MCL in the non-potable surficial aquifer, any leakage from the surficial aquifer into the deeper potable aquifer due to a shift in vertical gradients will not result in deeper aquifer molybdenum levels over the MCL.

Based on existing data, continued sampling of monitor well 0144 for molybdenum appears appropriate. However, it is acknowledged that the 2004 molybdenum concentration of 0.215 mg/L is at least three times greater than either the previous or subsequent sampling result and would appear to be inconsistent with recent (post 2000) data. Consequently, the NRC believes that at least two more years of molybdenum data from monitor well 0144 should be collected. If at the end of this two year period, the molybdenum set data for monitor well 0144 exhibits a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or if molybdenum levels remain below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum, monitoring at the site can be terminated. In addition, while molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue. It should be understood that if in the next two years, conditions influencing Criteria 1 (vertical gradients) or 3 (risks related to pumping of ground water by CVWRF or the storm drain sump) significantly change, termination of monitoring at the site will need to be reconsidered.

#### **REFERENCES:**

Department of Energy (DOE 2000) Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRCA Project Site. May 2000 [Adams Accession No. ML003721622]

DOE (2005) Correspondence from Michael Tucker to Gary Janosko (NRC) and Dean Henderson (Utah DEQ) containing transmittal of 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. March 24, 2005 [Adams Accession No. ML050940337]

U.S. Nuclear Regulatory Commission (U.S. NRC 2000), Correspondence from Philip Ting to Donald Metzler (DOE) concerning NRC's concurrence with DOE's Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRCA Project Site. June 15, 2000. [Adams Accession No. ML003722749]

Utah Department of Environmental Quality (UDEQ 2000) Correspondence from William Sinclair to Donald Metzler (DOE) concerning Utah's concurrence with DOE's Ground Water Compliance Action Plan for the Salt Lake City, Utah, UMTRCA Project Site. June 7, 2000 [Adams Accession No. ML003727203]

UDEQ (2005) Correspondence from Dane Finefrock to Tom Pauling (DOE) concerning Utah's review of DOE's 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. November 9, 2005 [Adams Accession No. ML053480212]

**Steve Hall**

---

**From:** Malhotra, Jagdish [Jagdish.Malhotra@hq.doe.gov]  
**Sent:** Friday, June 01, 2007 2:42 PM  
**To:** Steve Hall; Clay Carpenter; Tom Pauling  
**Subject:** FW: SLC Processing Site Well Abandonment

FYI and action as needed.

Jeet

-----Original Message-----

**From:** Phillip Goble [mailto:pgoble@utah.gov]  
**Sent:** Friday, June 01, 2007 4:36 PM  
**To:** Malhotra, Jagdish  
**Cc:** pxm2@nrc.gov  
**Subject:** SLC Processing Site Well Abandonment

Mr. Malhotra,

As you requested during our conversation, I am writing to let the DOE know the Utah Division of Radiation Control (DRC) agrees with DOE letter dated May 23, 2007 for the Salt Lake City, Utah, UMTRCA Title I Site, where it states that all three criteria needed to discontinue sampling at the site has been fulfilled. Although the Utah DRC would like to see groundwater sampling continue at the site until molybdenum is below the Utah ad hoc rule of 0.04 mg/L in well MW-0144, the Utah DRC no authority to ask the DOE to continue sampling at the site. Therefore the Utah DRC gives its approval for the four monitoring wells at the site to be abandoned. As a courtesy we would ask the DOE to please give us ample advance notice (minimum of 1 month) before any well abandonment activities begin so I can arrange my schedule to be present during the well abandonment activities. We would also like to know how the DOE plans on abandoning the four monitor wells.

Thanks,

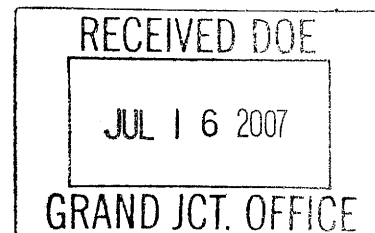
Phil Goble  
Utah Division of Radiation Control  
Phone 801-536-4044  
Fax 801-533-4097

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001



July 9, 2007

Mr. Tom Pauling  
U.S. Department of Energy  
Office of Legacy Management  
2597 B 3/4 Road  
Grand Junction, CO 81503

SUBJECT: CONCURRENCE TO TERMINATE GROUND WATER MONITORING AT THE  
SALT LAKE CITY, UTAH, UMTRCA TITLE I PROCESSING SITE

Dear Mr. Pauling:

Nuclear Regulatory Commission (NRC) staff has reviewed the Department of Energy's (DOE's) transmittal of the May 2007 monitoring results for the Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Processing Site. Based on its review and its independent analysis (see enclosed Technical Evaluation Report), the staff concludes that analytical results contained in DOE's submittal meet the ground water monitoring termination criteria proposed by the NRC on December 5, 2005. Consequently, the NRC concurs with DOE's findings that no further ground water monitoring is necessary at the site and that the site's four remaining monitoring wells may be decommissioned.

If you have any questions concerning this matter, please contact the NRC Project Manager, Mr. Paul Michalak at 301-415-7612, or by e-mail at [pxm2@nrc.gov](mailto:pxm2@nrc.gov)

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

Sincerely,

A handwritten signature in black ink, appearing to read "Paul Michalak".

Paul Michalak, Hydrogeologist  
Uranium Recovery Licensing Branch  
Decommissioning and Uranium Recovery  
Licensing Directorate  
Division of Waste Management  
and Environmental Protection  
Office of Federal and State Materials  
and Environmental Management Programs

Enclosure: Technical Evaluation Report

**TECHNICAL EVALUATION REPORT  
TERMINATION OF MONITORING AT THE SALT LAKE CITY  
UMTRCA TITLE I PROCESSING SITE**

**DATE:** June 26, 2007

**TECHNICAL REVIEWER:** Paul Michalak

**SUMMARY AND CONCLUSIONS:**

The Nuclear Regulatory Commission (NRC) has evaluated additional ground water quality and elevation data collected at the Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Processing Site (the site) by the Department of Energy's (DOE's) Office of Legacy Management (DOE 2007). The additional monitoring was performed in response to the NRC's comments (NRC 2005) on the DOE's original proposal (DOE 2005) to terminate ground water monitoring at the site. Combined with existing ground water monitoring data for the site, these new data support the following: the additional ground water samples from well 0144 contained molybdenum at levels below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum; for well 0144, the slope of the linear regression of molybdenum concentrations (nine samples collected between 1999 and 2007) was negative, indicating a decreasing concentration trend; and ground water elevation (shallow wells) and potentiometric (deep wells) measurements for well clusters 0134/0143 and 0144/0145 continued to indicate an upward vertical gradient, indicating that in the vicinity of the site, the shallow aquifer system is not recharging the deeper, confined system. Consequently, the NRC concurs with DOE's findings that no further ground water monitoring is necessary at the site and that the site's four remaining monitoring wells may be decommissioned.

**BACKGROUND:**

On March 24, 2005, the DOE's Office of Legacy Management proposed discontinuing ground water monitoring at the site based on the following criteria: 1) the vertical hydraulic gradient between the deep and shallow aquifers is upward (indicating that the shallow aquifer system is not recharging the deeper, confined system) and monitoring has not indicated a reversal in its direction; 2) ground water quality monitoring has indicated a decrease in the uranium and molybdenum concentrations (as anticipated), and 3) no unacceptable risks were identified related to pumping of ground water by the Central Valley Water Reclamation Facility (CVWRF), the current property owner, or the storm drain sump (DOE 2005). On December 15, 2005, NRC staff responded to DOE's request and concluded that DOE's second criteria had not been met at well 0144 (NRC 2005). As a result, ground water monitoring at the site was amended to the following:

- 1) Annual monitoring for molybdenum in well 0144 should continue for at least two years, with termination of monitoring contingent on the following:
  - a) Molybdenum data for monitor well 0144 exhibiting a decreasing trend (e.g., linear regression analysis resulting in a negative slope), or

Enclosure

- b) Data remaining below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum.
- 2) While molybdenum sampling is ongoing, annual surficial and deep aquifers water level measurements (i.e., monitor wells 0134, 0143, 0144 and 0145) to assess vertical gradients should continue.

On May 23, 2007, DOE submitted updated molybdenum ground water results for well 0144 and additional water level measurements for monitor wells 0134, 0143, 0144 and 0145 (DOE 2007). This data included three additional post-December 2006 molybdenum results for well 0144 and three additional ground water level measurements for deep (confined aquifer) wells 0143 and 0145. Continuous ground water measurements were also collected from shallow unconfined wells 0134 and 0144. Based on these results, DOE asserted that the NRC's December 2006 criteria had been met and that no further environmental monitoring would be performed on the site. DOE also indicated that decommissioning of the four remaining monitor wells at the site would be initiated unless otherwise directed by the NRC.

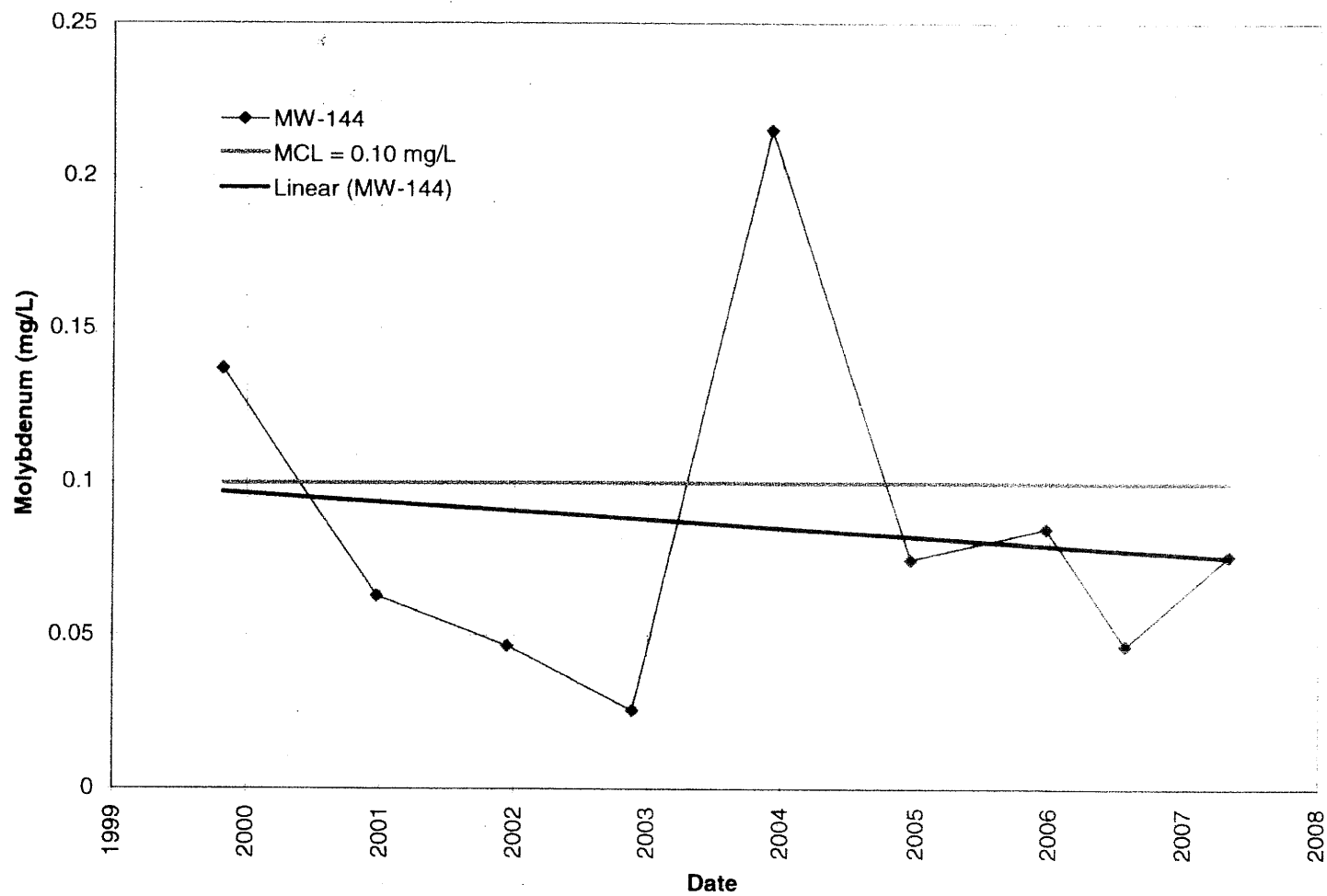
#### **TECHNICAL EVALUATION:**

The results of additional ground water sampling at well 0144 have met the 1a and 1b termination criteria established in December 2005. All three samples were below the 0.1 mg/L 40 CFR 192 UMTRCA Title I standard for molybdenum and the slope of the linear regression (nine samples collected between 1999 and 2007) was negative, indicating a decreasing concentration trend (see attached figure). Ground water elevation (shallow wells) and potentiometric (deep wells) measurements for well clusters 0134/0143 and 0144/0145 continued to indicate an upward gradient (see attached figure). The upward vertical gradient indicates that, in the vicinity of the site, the deeper, confined aquifer, which is a source of potable water in the area, is not being recharged from the shallow unconfined aquifer. In addition, the DOE has verified, through information from the CVWRF, that no unauthorized excavations or ground water withdraws have occurred at the site; demonstrating that institutional controls related to these activities are in place and continue to be protective. As a result, the NRC concurs with DOE's findings that no further ground water monitoring is necessary and that the four remaining monitoring wells on the site may be decommissioned.

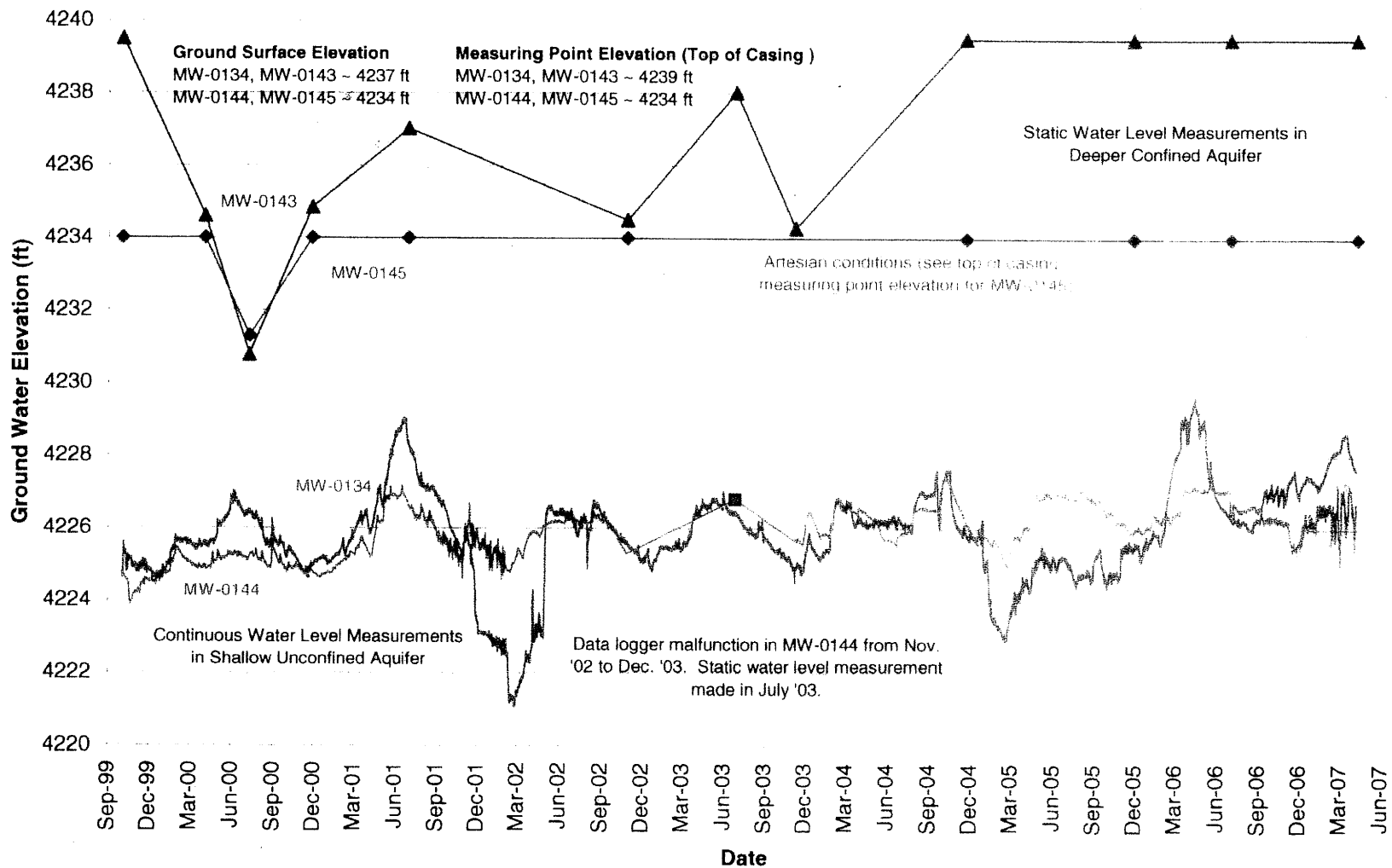
#### **REFERENCES:**

- Department of Energy (2005) Correspondence from Michael Tucker to Gary Janosko (NRC) and Dean Henderson (Utah DEQ) containing transmittal of 2004 Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. March 24. [Adams Accession No. ML050940337]
- Department of Energy (2007) Correspondence from Jagdish Malhotra to Gary Janosko (NRC) transmitting May 2007 Monitoring Results for the Salt Lake City, Utah, UMTRCA Title I Processing Site. May 23. [Adams Accession No. ML071510087]
- Nuclear Regulatory Commission (2005) Correspondence from Paul Michalak to Thomas Pauling, DOE concerning Annual Status Report for the Salt Lake City, Utah, UMTRCA Processing Site. December 15. [Adams Accession No. ML053460332]

Time-Concentration Plot  
Linear Regression  
Molybdenum Concentrations  
MW-144 (Onsite, Shallow Aquifer)  
Salt Lake City Processing Site



## Hydrograph Salt Lake City Processing Site



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## **Attachment B**

### **Notice of Residual Radioactive Contamination**

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AMENDED

NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION

THIS NOTICE IS TO ALERT BUYERS OR DEVELOPERS THAT RESIDUAL RADIOACTIVE CONTAMINATION EXISTS ON THE PROPERTY HEREIN DESCRIBED.  
/EXISTS

RECITALS

- A. WHEREAS, the current owner of the property known as the Salt Lake Vitro Site situated in the county of Salt Lake, Salt Lake City, Utah, and more particularly described on Exhibit 1 attached hereto is Central Valley Water Reclamation Facility Board located at 800 West Central Valley Road, Salt Lake City, Utah, 84119;
- B. WHEREAS, the Salt Lake Vitro Site was used by the Vitro Chemical Company to process uranium ore from 1951 to 1964 and to process vanadium ore from 1964 to 1968;
- C. WHEREAS, when milling operations were discontinued in 1968, more than four million tons of uranium mill tailing waste remained on the Salt Lake Vitro Site;
- D. WHEREAS, under the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604), which requires the remediation of the identified uranium mill tailing sites, the United States Department of Energy and the state of Utah entered into Cooperative Agreement Number DE-FC04-81AL616309, dated March 30, 1983, for the remediation of the Salt Lake Vitro Site; between 1985 and 1987 excavation and disposal of the uranium mill tailings and site restoration were performed;
- E. WHEREAS, not all residual radioactive materials were removed during remedial action, isolated areas of the radioactive contamination remain, examples of which are shown on the map attached hereto as Exhibit 2;
- F. WHEREAS, the cleanup of the Salt Lake Vitro Site is documented in the *Completion Report for the UMTRA Project Vitro Processing Site Salt Lake City, Utah*, ("Completion Report") dated June 1997 which provides a discussion of the known contaminated areas, including an estimate of the amount of contamination present, the approximate location of the radioactive contamination, and a health assessment resulting from exposure to the contaminants; and

G. WHEREAS, the Completion Report may be examined at and copies obtained from the following:

State of Utah Department of Environmental Quality Division of Radiation Control 168 North 1950 West, Building #2 Salt Lake City, UT 84114-4850 (801) 536-4250	Department Of Energy Grand Junction Office 2597 B 3/4 Road Grand Junction, CO 81503 (970) 248-6000	Department of Commerce National Technical Information Services 5232 Port Royal Road Springfield, VA 22161 (703) 487-4650
---	--	---

H. NOW THEREFORE the United States Department of Energy, the state of Utah, and the Central Valley Water Reclamation Facility Board hereby recommend to prospective purchasers or developers of part or all of the Salt Lake Vitro Site that the following actions be taken:

- 1. Verify that future construction plans do not occur in contaminated areas. If there is a possibility of encountering contaminated material, contact the Utah Department of Environmental Quality, Division of Radiation Control.
- 2. Prior to construction, conduct appropriate radiological surveys to determine whether radioactive elements are present, and their identity, concentration, and distribution.

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Salt Lake  
Recovery  
Division Of  
Radiation  
Control

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- 3. If radioactive materials are encountered during construction, the materials may be; (a) dispensed of as radioactive waste in an appropriate waste facility; or (b) buried into the deepest part of the excavation during back filling.
- 4. Regardless of the results of the radiological surveys, if there are construction plans for habitable structures (e.g., residential, institutional, commercial, or industrial buildings and the like), consider installing a passive sub-slab radon ventilation system that will vent radon soil gas to the atmosphere.

Dated this 26<sup>th</sup> day of August, 1997

UNITED STATES DEPARTMENT OF ENERGY

By: George J. Rael  
 George Rael  
 Director  
 Environmental Restoration Division

STATE OF NEW MEXICO     )  
   ) ss.  
 COUNTY OF BERNALILLO    )

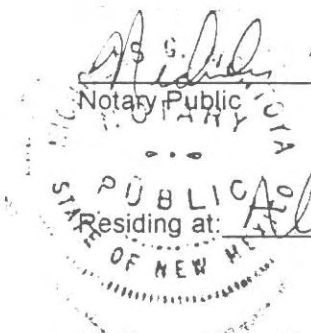
Before me, a Notary Public qualified for Bernalillo County, personally appeared George Rael, who by me duly swore did say that he is the Director of the Environmental Restoration Division and he further acknowledged to me that the above NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION document was duly executed by him on behalf of the United States Department of Energy.

WITNESS my hand and Notarial Seal on this 26<sup>th</sup> day of August, 1997.

Richard S. Montoya  
 Notary Public

Residing at: Albuquerque NM

My Commission Expires: 5/25/2001



76086794  
 001102111111

Dated this 3rd day of September, 1997

STATE OF UTAH  
DEPARTMENT OF ENVIRONMENTAL QUALITY

By: William J. Sinclair  
William Sinclair  
Director  
Division of Radiation Control

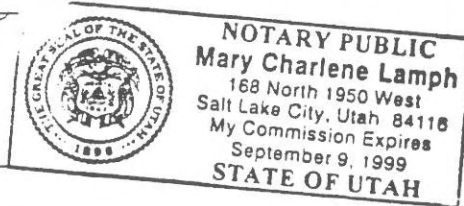
STATE OF UTAH                    )  
  ) ss.  
COUNTY OF SALT LAKE        )

Before me, a Notary Public qualified for Salt Lake County, personally appeared William Sinclair, who by me duly swore did say that he is the Director of the Division of Radiation Control and he further acknowledged to me that the above NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION document was duly executed by him on behalf of the state of Utah.

WITNESS my hand and Notarial Seal on this 3rd day of Sept, 1997.

Mary Charlene Lamph  
Notary Public

Residing at: Salt Lake City



My Commission Expires: Sept. 9, 1999

58771256100  
K2760P61P92

Dated this 11 day of Sept, 1997

CENTRAL VALLEY WATER RECLAMATION FACILITY BOARD

By: Reed Fisher  
Reed Fisher  
General Manager

STATE OF UTAH )  
 ) ss.  
COUNTY OF SALT LAKE )

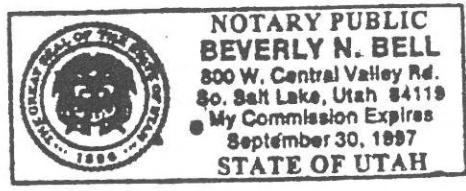
Before me, a Notary Public qualified for Salt Lake County, personally appeared Reed Fisher, who by me duly swore did say that he is the General Manager of the Central Valley Reclamation Facility and he further acknowledged to me that the above NOTICE OF RESIDUAL RADIOACTIVE CONTAMINATION document was duly executed by him on behalf of the Central Valley Water Reclamation Facility Board.

WITNESS my hand and Notarial Seal on this 11<sup>th</sup> day of September 1997.

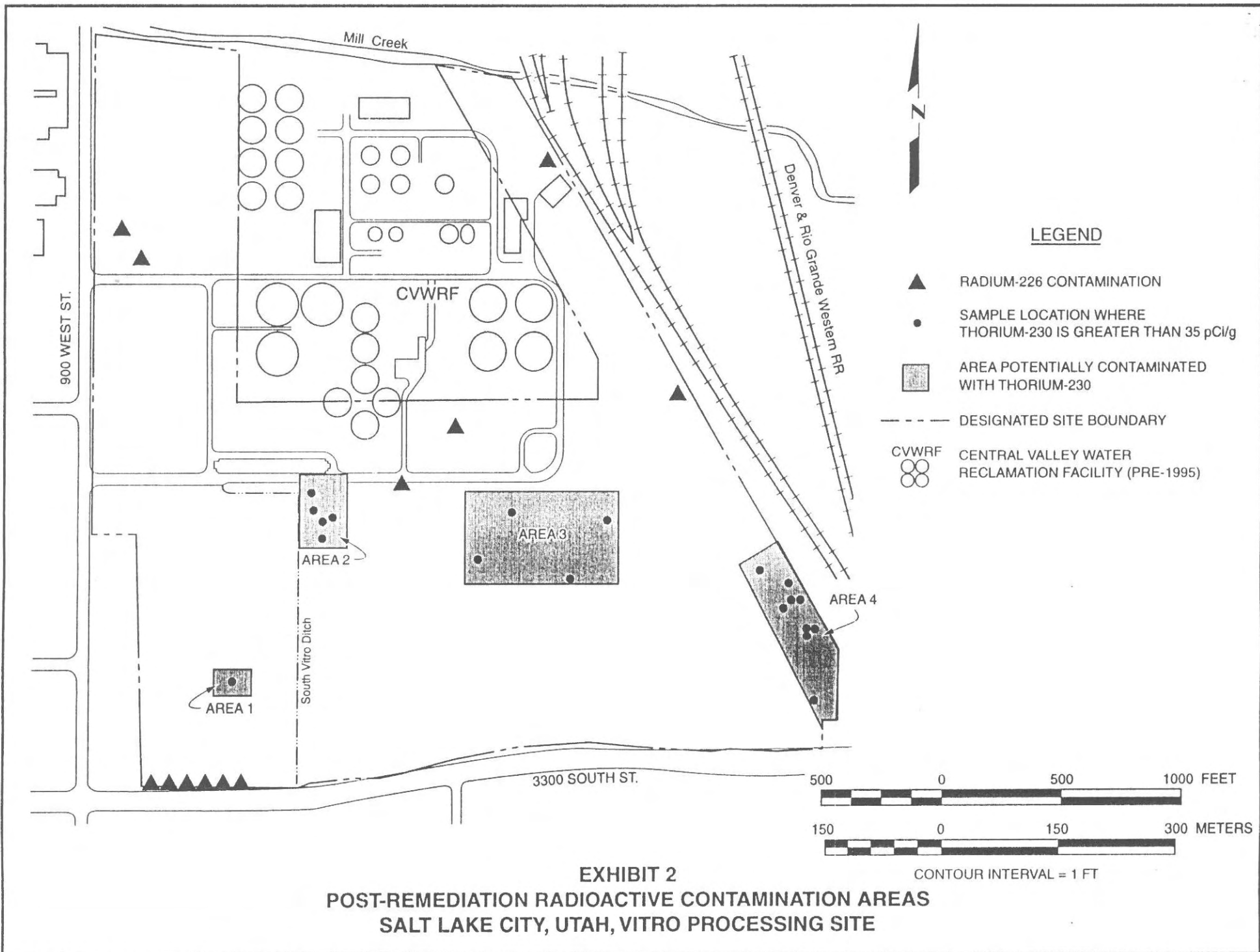
Beverly N. Bell  
Notary Public

Residing at: Salt Lake City, UT

My Commission Expires: 09/30/97

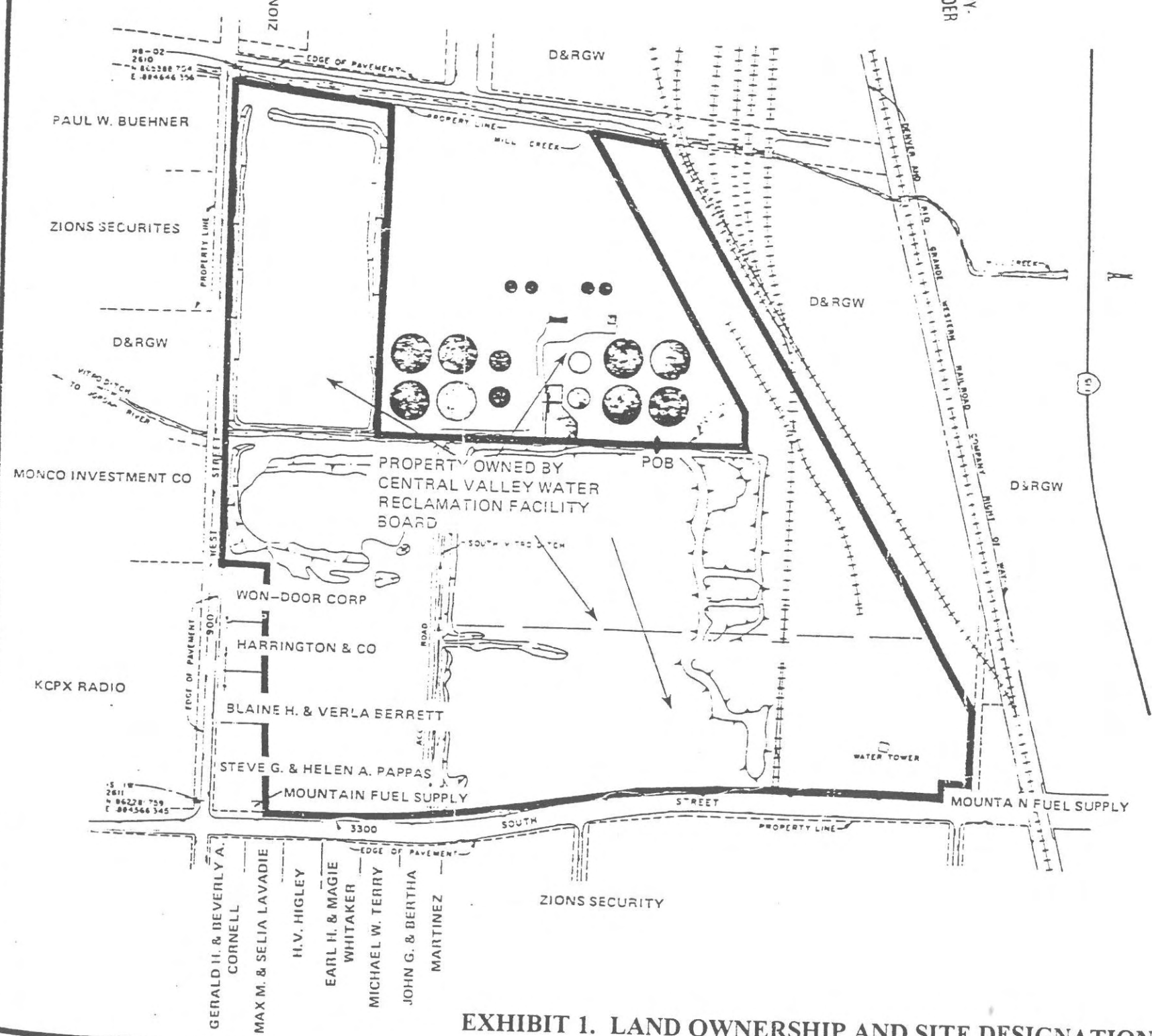


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01K7772PG1107





WAGNER INDUSTRIAL PARK



POOR COPY  
CO RECORDER

SALT LAKE VITRO SITE

BEGINNING AT THE EAST QUARTER CORNER OF SECTION 26, T1S, R1W, SALT LAKE BASE AND MERIDIAN, AND RUNNING THENCE WEST 1154.5 FT, THENCE N 0°18'E, 1440.79 FT, THENCE N 83°16'W, 651.84 FT, THENCE S 0°03'14"W, 2078.58 FT, THENCE S 89°50'E, 179.5 FT, THENCE S 1°57'E, 1062.87 FT, THENCE N 89°43'47"E, 508.52 FT, THENCE N 86°50'27"E, 195.77 FT, THENCE N 80°45'E, 473.05 FT, THENCE N 81°32'32"E, 168 FT, THENCE N 80°44'E, 489.21 FT, THENCE N 89°55'16"E, 956.8 FT, THENCE N 75 FT, THENCE E 150 FT, THENCE N 0°01'E, 302.86 FT, THENCE N 29°59'W, 2731.01 FT, THENCE N 85°49'W, 298.89 FT, THENCE S 29°54'30"E, 1365.31 FT, THENCE S 170.75 FEET, THENCE W 379.35 FT TO THE POINT OF BEGINNING.

CONTAINS 127.9 ACRES (MORE OR LESS)

REFERENCE 3

POOR COPY  
CO RECORDER

6741920  
 02/17/97 4:27 PM 22.00  
 NANCY WORKMAN  
 RECORDER, SALT LAKE COUNTY, UTAH  
 CALLISTER NEBEKER & MCCULLOUGH  
 GATEWAY TOWER EAST STE.900  
 SLC UT 84133  
 REC BY: J FERGUSON, DEPUTY

EXHIBIT 1. LAND OWNERSHIP AND SITE DESIGNATION MAP

BK 7772  
 PG 1109  
 777201109  
 7770061195

3/7/72 PG 1110  
 7750061196

**Attachment C**

**Risk Calculations**

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Salt Lake City - Incidental Exposure to Surface Water - Dermal Exposure Pathway												
Contaminant	Cw-max mg/L	Sa cm <sup>2</sup>	Pc cm/hr	Cf L/cm <sup>3</sup>	ET hr/d	EF d/y	ED yr	BW kg	AT d	Intake absorbed mg/kg-d	RfD mg/kg-d	HQ mg/kg-d
<b>Non-carcinogenic</b>												
Uranium	0.374	312	0.001	0.001	8	250	30	70	2555	0.00004	0.003	0.013
<b>Carcinogenic</b>											Slope Factor	Risk
Uranium (pCi/L)	256.564	312	0.001	0.001	8	250	30	na	na	4802.878	4.36E-11	2.09E-07
Occupational Scenario												
Non-carcinogenic intakes (mg/Kg-day) = Cw x Sa x Pc x Cf x ET x EF x ED/BW x AT												
Carcinogenic intakes (pCi) = Cw x Sa x Pc x Cf x ET x EF x ED												
where:												
Cw is maximum detected in surface water during monitoring in 2000												
Surface area (Sa) is for a man's arms and hands; EPA 1989												
Pc (dermal permeability constant) assumes absorption is the same as water												
Cf Conversion factor												
ET Exposure time - assumes length of work day												
ED Exposure duration - 30 years												
EF Exposure frequency - assumes 5 days a week for 50 weeks												
BW Body weight; default for adult												
AT Averaging time - 365 days x ED												
Carcinogenic risks calculated assuming 1 mg U = 686 pCi of U234 + U238												
Hazard Quotient (HQ) = Intake/Reference Dose (RfD)												
Risk = Intake x Slope Factor (SF)												
Exposure factors and default values from EPA 1989												
Toxicological data are mainly from EPA's Integrated Risk Information System (IRIS); other values are from EPA Region III Risk Based Concentration Table												
Carcinogenic risks for uranium assumes 1 mg U = 686 pCi of U234 + U238; SF is average of U234 and U238												

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