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JUN - 3 2002

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Mail Stop T8A33  
Washington, D.C. 20555-0001

Subject: Draft Ground Water Compliance Action Plan for the Durango, Colorado, UMTRA Site

Dear Mr. Gillen:

Enclosed is a copy of the *Draft Ground Water Compliance Action Plan for the Durango, Colorado, UMTRA Project Site* (GCAP). The Durango, Colorado, UMTRA site is comprised of two separate areas; the mill tailings area and the raffinate ponds area. The GCAP documents the proposed site-specific actions that will allow the U.S. Department of Energy (DOE) to comply with U.S. Environmental Protection Agency (EPA) ground water standards at both areas. The decision-making process used in selecting the compliance strategies for the Durango site followed the compliance selection framework presented in the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS).

The compliance strategy for the mill tailings area is natural flushing in conjunction with institutional controls and continued monitoring; and an ACL of 0.05 mg/L for selenium (from the EPA's Safe Drinking Water Act) due to background selenium values above the MCL. The compliance strategy at the raffinate ponds area is no remediation with the application of supplemental standards (based on the criterion of limited use ground water due to widespread selenium contamination), institutional controls and continued monitoring as a best management practice

Please review this plan and if you have any questions, please call me at 970//248-7612.

Sincerely,

Donald R. Metzler  
Program Manager

Enclosure

NMSS08

WM-48

cc w/enclosure:  
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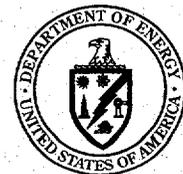
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**Draft  
Ground Water Compliance Action Plan  
for the Durango, Colorado,  
UMTRA Project Site**

**May 2002**

Prepared by the  
U.S. Department of Energy  
Grand Junction Office



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Grand Junction, Colorado

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- Appendix C—Quitclaim Deed for Raffinate Ponds Area

## Attachment

Alternate Concentration Limits Application

## Acronyms and Abbreviations

|                   |  |
|-------------------|--|
| ACL               | alternate concentration limit                        |
| BOR               | Bureau of Reclamation                                |
| CDPHE             | Colorado Department of Public Health and Environment |
| CFR               | <i>Code of Federal Regulations</i>                   |
| COPC              | contaminants of potential concern                    |
| DOE               | U.S. Department of Energy                            |
| E-COPC            | ecological contaminants of potential concern         |
| EPA               | U.S. Environmental Protection Agency                 |
| ft                | feet   |
| GCAP              | Ground Water Compliance Action Plan                  |
| IC                | institutional control                                |
| LTSM              | Long-Term Surveillance and Maintenance               |
| MCL               | maximum concentration limit                          |
| mg/L              | milligrams per liter                                 |
| NRC               | U.S. Nuclear Regulatory Commission                   |
| ORP               | oxidation/reduction potential                        |
| PEIS              | Programmatic Environmental Impact Statement          |
| POC               | point of compliance                                  |
| SOWP              | Site Observational Work Plan                         |
| UCL <sub>95</sub> | 95 percent upper confidence limit                    |
| UMTRA             | Uranium Mill Tailings Remedial Action                |

## 1.0 Introduction

This Ground Water Compliance Action Plan (GCAP) presents the proposed compliance strategy for ground water cleanup at the Durango, Colorado, uranium-ore processing site (Figure 1). The GCAP is based on a U.S. Department of Energy (DOE) evaluation of information in the Site Observational Work Plan (SOWP) (DOE 2002). The GCAP will serve as a stand-alone modification to the *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Durango, Colorado* (DOE 1991) to address ground water restoration and compliance with the U.S. Environmental Protection Agency (EPA) ground water protection standards for the Uranium Mill Tailings Remedial Action (UMTRA) Project Title I sites. The GCAP will be the U.S. Nuclear Regulatory Commission (NRC) concurrence document for compliance with Subpart B of Title 40 *Code of Federal Regulations* Part 192 40 CFR 192 for the Durango processing site.

The proposed compliance strategy for the Durango site is based on the compliance strategy selection framework presented in the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE 1996). The former processing site consists of two discrete areas: the mill tailings area, which encompasses the northern portion of the site, and the raffinate ponds area, which encompasses the southern portion of the site. Because the two areas are geologically and hydrologically separate, the steps followed in the compliance strategy selection framework were different for the mill tailings area (Figure 2) and the raffinate ponds area (Figure 3). National Environmental Policy Act issues and environmental concerns for both areas will be addressed in the Environmental Assessment (which will be completed in 2002), and this information will be made available to public officials and citizens in the area for their review and comment.

## 2.0 Ground Water Compliance

To achieve compliance with Subpart B of 40 CFR 192, DOE's proposed compliance strategy is twofold: (1) at the mill tailings area, the proposed strategy is natural flushing in conjunction with institutional controls (ICs) and continued ground water and surface water monitoring, and (2) at the raffinate ponds area, the proposed strategy is no further remediation in conjunction with the application of supplemental standards (on the basis of limited use ground water) and, as a best management practice, continued ground water and surface water monitoring. Both compliance strategies will be protective of human health and the environment. These compliance strategies have been determined by applying the compliance strategy selection framework from the PEIS, consisting of several evaluative steps discussed below.

### 2.1 Characterization of Hydrogeology at the Mill Tailings Area

The first step in the decision process was an assessment of both historical and new environmental data collected to characterize hydrogeochemical conditions and extent of ground water contamination related to uranium-ore processing at the site. Ground water is unconfined in the alluvial aquifer; depth to the water table ranges from 10 to 40 feet (ft). Along the base of Smelter Mountain, the Mancos Shale bedrock is overlain by up to 25 ft of colluvium. The colluvium consists of poorly sorted, silty soil from Smelter Mountain. Closer to Lightner Creek



C-01

Figure 1. Durango UMTRA Project Site

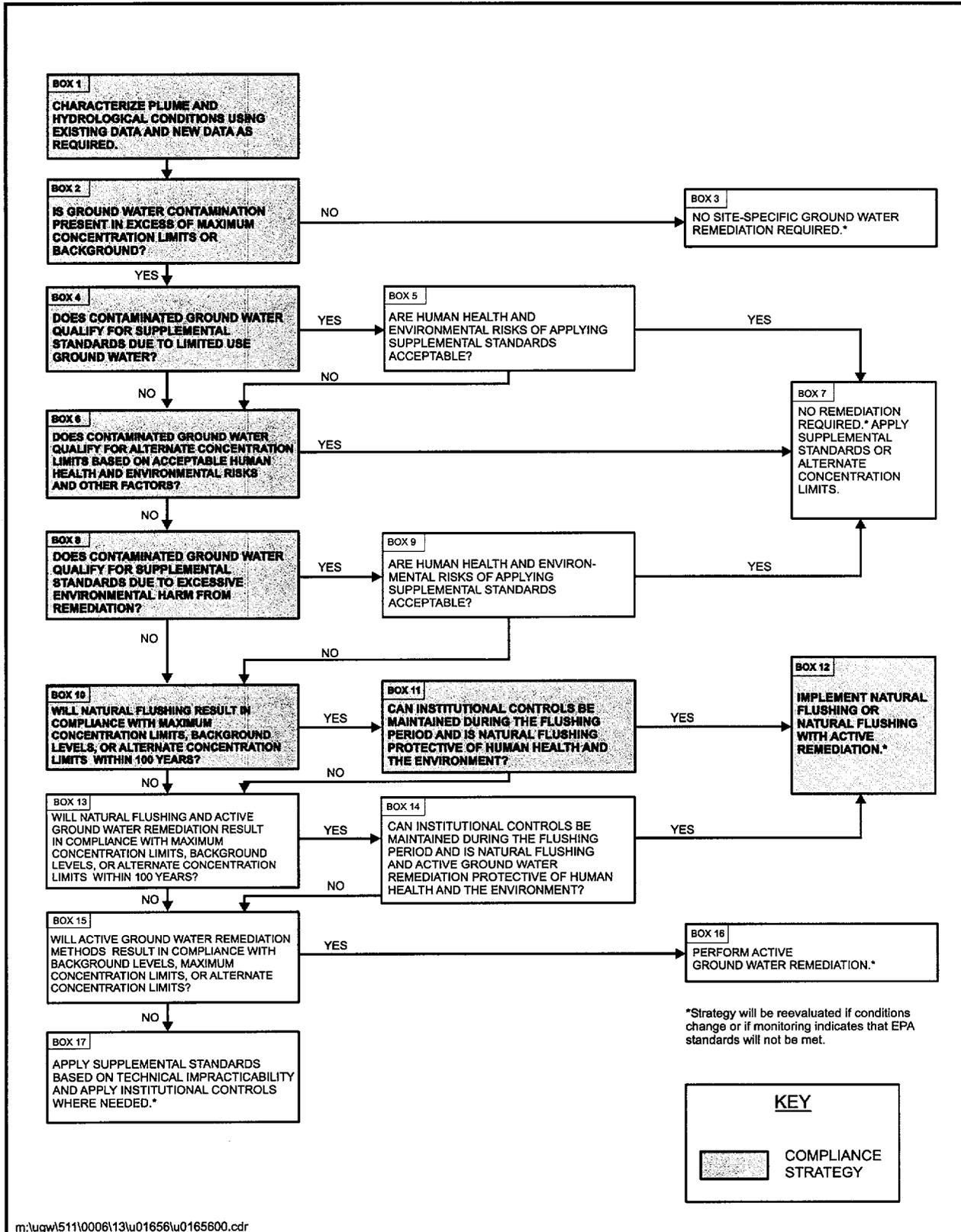


Figure 2. Summary of the Mill Tailings Area Ground Water Compliance Selection Framework

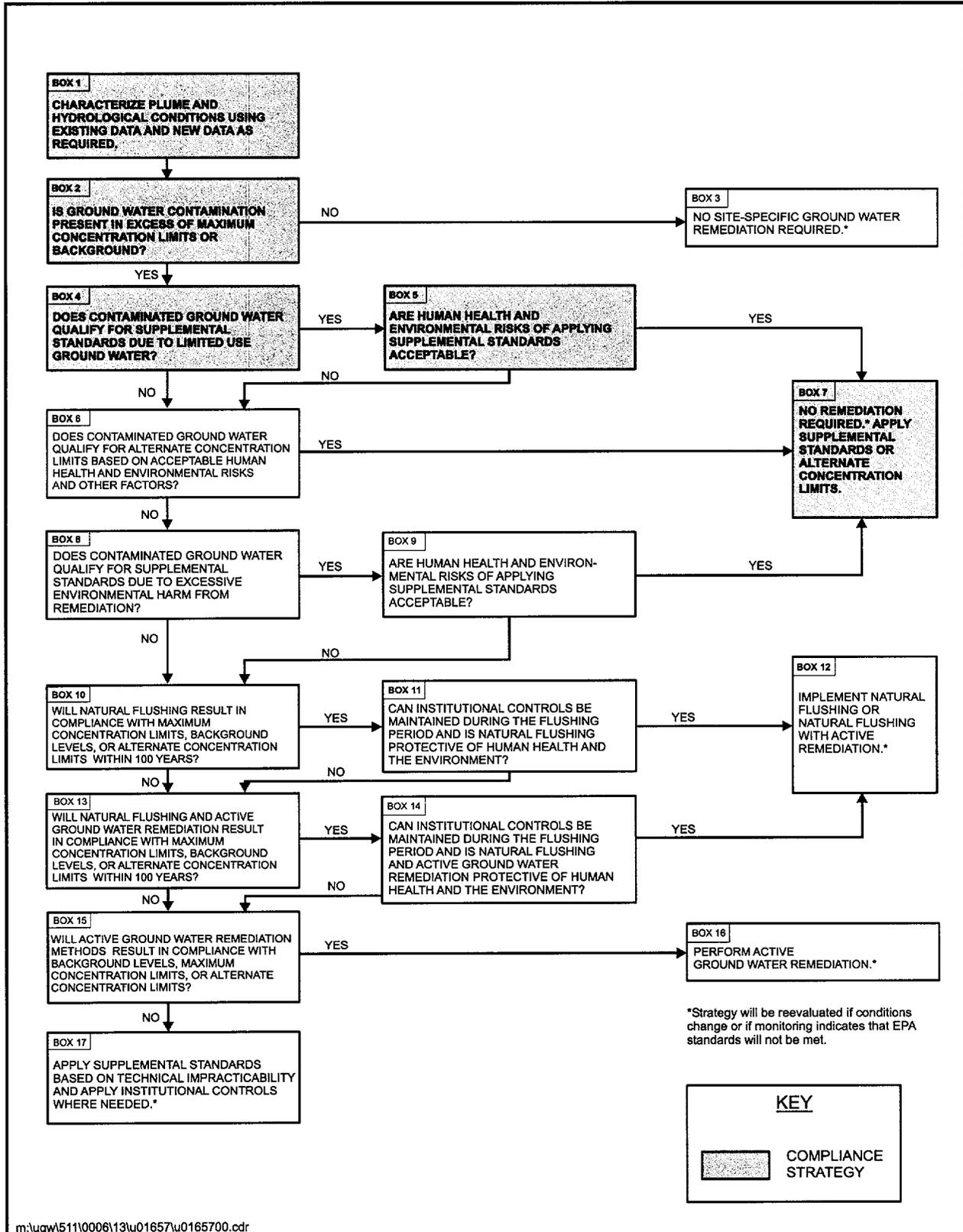


Figure 3. Summary of the Raffinate Ponds Area Ground Water Compliance Selection Framework

and the Animas River, deposits of river-laid sand and gravel up to 15 ft thick occur over the shale bedrock. A layer of vitreous lead smelter slag as much as 25 ft thick remains along the Animas River near the southeast corner of the mill tailings area.

Ground water in the alluvial aquifer beneath the mill tailings area was contaminated as the result of uranium processing activities. The former large and small tailings piles and residual radioactive material beneath the piles were cleaned up to meet the EPA standards for radium in soil. Supplemental standards were applied to steep areas of the slopes of Smelter Mountain and some areas along the banks of the Animas River. Erosion-protective riprap was placed over a uranium-contaminated lens under the lead slag where it surfaces on the Animas River bank. Following removal of contaminated material at the site, uncontaminated soil was backfilled and contoured for site drainage and seeded with natural vegetation.

Ground water in the alluvial aquifer generally flows to the southeast with an average gradient of approximately 0.02 feet per foot. Hydraulic conductivity ranges from 10 to 70 ft per day. Ground water in the colluvium near the base of Smelter Mountain is recharged primarily by runoff from the mountain and by infiltrating precipitation. Sand and gravel deposits receive recharge from Lightner Creek and the Animas River. During spring runoff when the river stage is high, water flows into the aquifer. When the river stage is lower, the ground water flows from the aquifer back into the Animas River.

## **2.2 Characterization of Hydrogeology at the Raffinate Ponds Area**

Two bedrock units, both members of the Mesaverde Group, underlie the raffinate ponds area and are separated by a fault dissecting the site. The Point Lookout Sandstone is the basal formation of the Mesaverde Group and is divided into two members: a lower transitional member consisting of interbedded lenticular sandstones and shales, and an upper massive sandstone member. The Menefee Formation consists of massive sandstone and shale, with beds of carbonaceous shale and coal. The Bodo Fault (a normal fault) juxtaposes the Point Lookout Sandstone and the Menefee Formation and has downthrown the Point Lookout Sandstone approximately 200 ft. The Bodo fault trends northeast and dips to the southeast at approximately 55 degrees.

Ground water in the raffinate ponds area is assumed to be unconfined. It is recharged by infiltration of precipitation and runoff and by horizontal inflow from Smelter Mountain. Water enters the flow system at the intersection of the Bodo Fault with South Creek. This influx is intermittent because South Creek is an ephemeral stream. Hydraulic conductivity data indicate the Point Lookout Sandstone is the least conductive material. In addition, the lower member (predominantly shale and siltstone) of the Point Lookout Sandstone is apparently an aquitard. The Menefee Formation consists of mostly low-conductivity sandstone, but is relatively permeable where fractures or lenticular coal beds are present. The greatest hydraulic conductivity at the raffinate ponds area is in the Bodo Fault and in the coal beds.

## **2.3 Ground Water Contaminants at the Mill Tailings Area**

The second step in the decision process was to compare the list of ground water contaminants to UMTRA Project maximum concentration limits (MCLs) or to concentrations in background ground water. The list of contaminants of potential concern (COPC) identified in the 1995 Baseline Risk Assessment (DOE 1995) was reevaluated using data collected since November 2000. Potential risks calculated using recent data for a residential scenario indicate

that the major risk contributors at the mill tailings area are uranium and manganese and, to a lesser extent, cadmium and vanadium. Selenium and molybdenum are minor risk contributors; concentrations of lead, sodium, and sulfate are elevated but lack of adequate toxicity data do not allow quantitative risk estimation. Uranium poses the greatest risk and is the COPC with concentrations that exceed the MCL in ground water in the greatest number of wells. Concentrations of selenium also exceed the MCL in several locations (both on-site and background locations), and cadmium and molybdenum concentrations exceed their MCLs in only one location (0612) (Figure 4). All lead concentrations have been less than the MCL since November 2000 (four sampling events). A discussion of COPCs at the mill tailings area is presented in Section 6.1 of the SOWP (DOE 2002).

## **2.4 Ground Water Contaminants at the Raffinate Ponds Area**

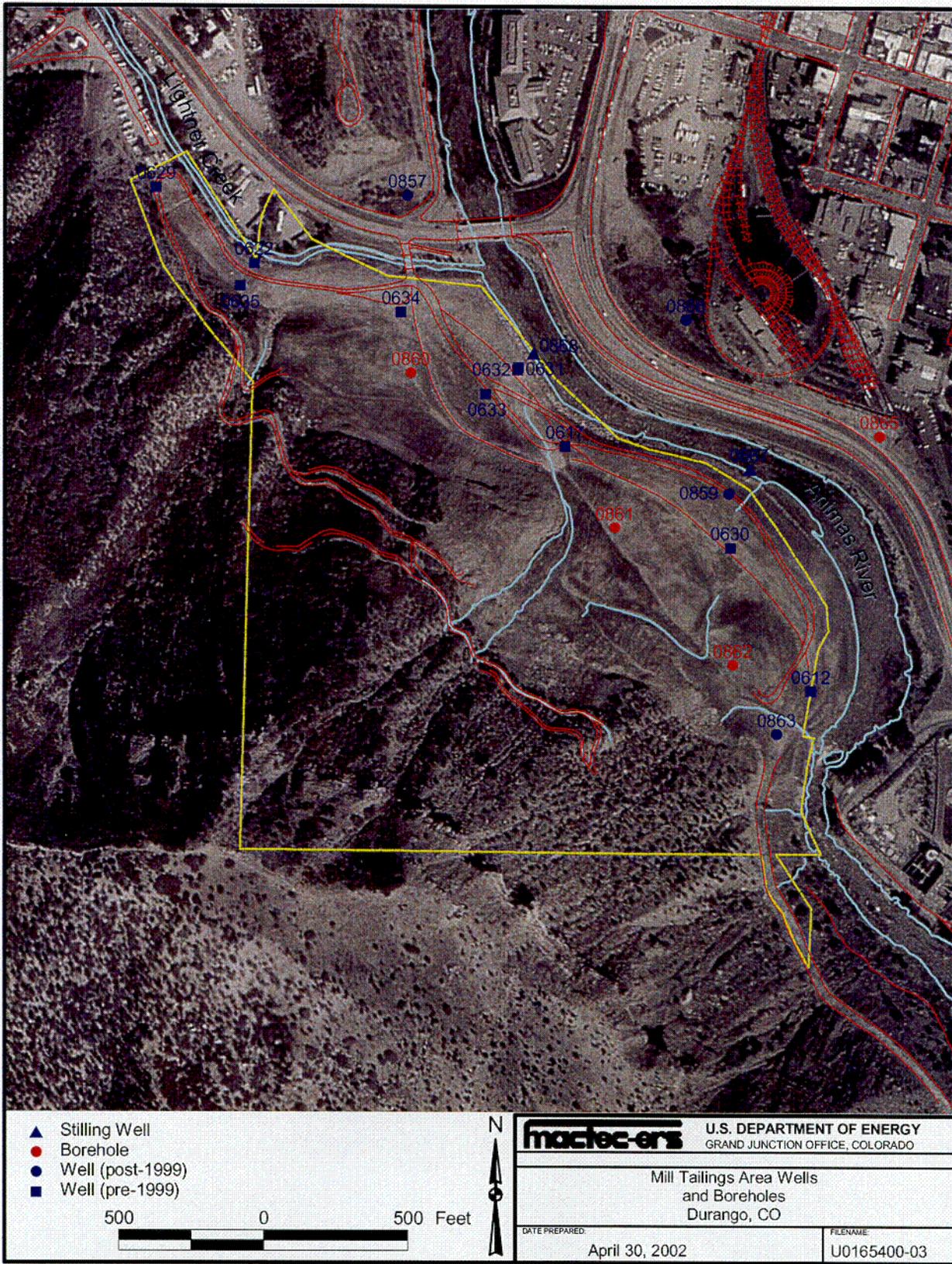
The COPCs identified in the 1995 Baseline Risk Assessment for the raffinate ponds area were also reevaluated using data collected since November 2000. Potential risks calculated using the recent data for a residential scenario indicated the major risk contributor is selenium with a lesser contribution from manganese and vanadium. Sodium, sulfate, chloride, and lead are elevated above background but lack of toxicity data prevent quantitative risk estimates. Selenium and uranium are the only COPCs with concentrations that exceed MCLs.

Selenium concentrations are above the MCL in one background well (0599) (Figure 5) and are below the MCL in all other background wells. However, the oxidation/reduction potential (ORP) is oxidizing in well 0599; in other background wells the ORP is negative (reducing conditions), preventing selenium from being mobilized into the ground water. Also, ground water in some of the background wells (and many of the on-site wells) has a black discoloration and a strong odor of hydrogen sulfide gas. Sulfide at or above the risk-based default value in drinking water of 0.11 milligrams per liter (mg/L) (as hydrogen sulfide) was detected in several background wells, and at one location (0592) the concentration was extremely elevated at 45 mg/L. A discussion of COPCs at the raffinate ponds area is presented in Section 6.1 of the SOWP (DOE 2002).

## **2.5 Applicability of Natural Flushing at the Mill Tailings Area**

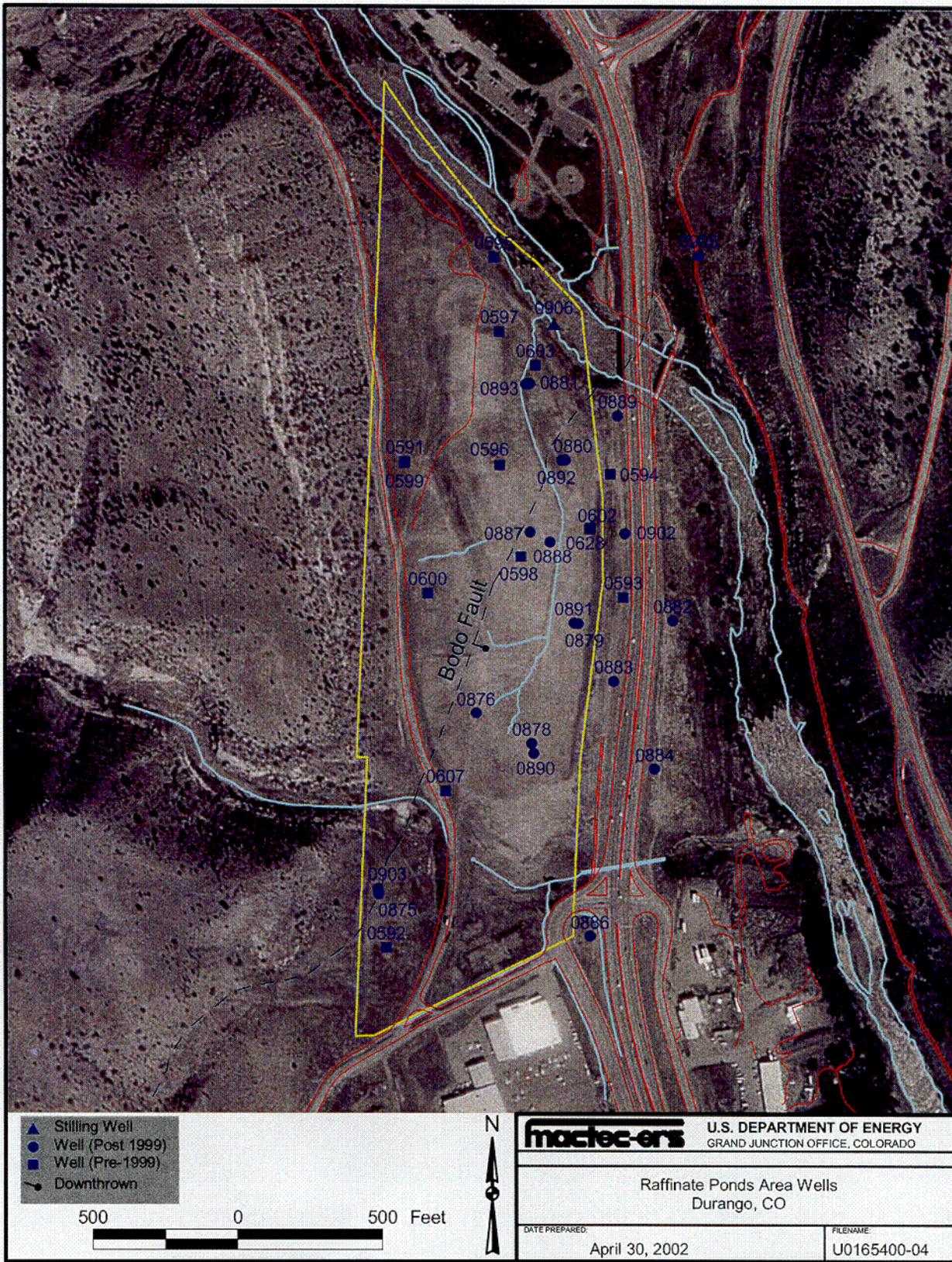
A ground water flow and transport model was developed to evaluate if natural processes will reduce concentrations of site-related constituents to regulatory levels in the alluvial aquifer within 100 years. Predicted concentrations were modeled for cadmium, manganese, molybdenum, selenium, sulfate, and uranium. Results of ground water contaminant transport modeling are summarized below, and details are presented in Section 5.5 and Appendix G of the SOWP (DOE 2002).

Molybdenum concentration is predicted to decrease below the UMTRA Project standard within 5 years, and uranium concentration is predicted to decrease to levels below the UMTRA Project standard after a period of 80 years. Modeling results also predict that concentrations of manganese and sulfate will decrease below their risk-based and background levels, respectively (there are no UMTRA Project standards for manganese and sulfate). Manganese concentration will decrease below the risk-based level within 70 years. Sulfate concentrations will decrease to background levels within 100 years. Results of selenium and cadmium modeling warrant further discussion.



C-02

Figure 4. Mill Tailings Area Wells and Boreholes



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C-03

Figure 5. Raffinate Ponds Area Wells

Background wells at the mill tailings area have selenium in concentrations up to 0.0148 mg/L, which is above the UMTRA MCL of 0.01 mg/L. Therefore, the compliance standard for selenium will be the alternate concentration limit (ACL) of 0.05 mg/L from EPA’s Safe Drinking Water Act. Based on the modeling results, maximum average selenium concentrations after 100 years are expected to decrease from 0.078 to 0.025 mg/L.

The ground water modeling predicts that all contaminants except cadmium will flush naturally to the MCLs, ACL, or risk-based levels. Cadmium concentration exceeds the MCL in only one well (0612); concentrations in all other on-site wells are at or near the detection limit.

Cadmium results from well 0612 vary considerably. A review of historical data for the past 10 years (surface remediation was completed in 1991) suggests a lower initial concentration compared to the value used for the modeling. Historical data also indicate a downward trend that is greater than would be predicted by the model. A regression line plotted through the data (Figure 6) indicates the initial concentration associated with well 0612 is approximately 0.032 mg/L (as opposed to 0.0369 mg/L, which is the maximum initial concentration assigned to the model). If this regression line is extended out another 10 years, the initial concentration is expected to be low enough that the model would predict cadmium to flush naturally below the 0.01 mg/L UMTRA standard within 100 years.

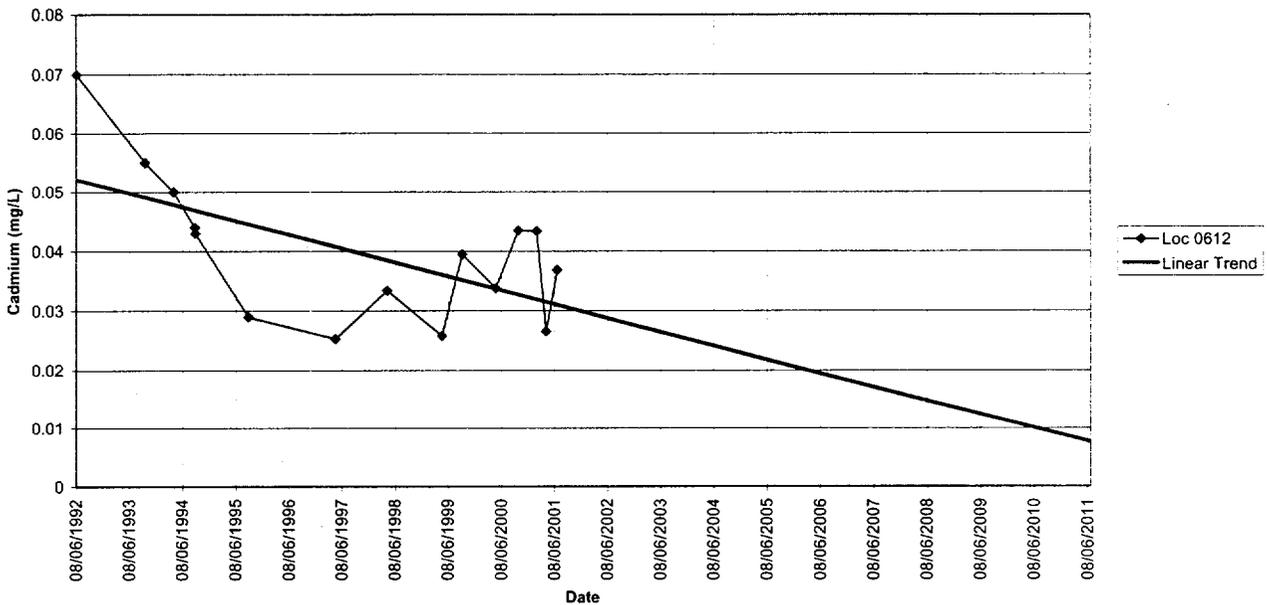


Figure 6. Durango Mill Tailings Area Cadmium Concentration in Well 0612

Because of the variability in the cadmium results from well 0612, additional time to observe the concentration trend in this well will be useful. As part of the natural flushing compliance strategy, monitoring of cadmium in well 0612 will continue during the next 10 years to verify that natural flushing is meeting compliance expectations. After 10 years, the risks associated with cadmium at this one location will be reevaluated, and contingency remedies will be considered and implemented in the event that the selected compliance strategy is not effective in meeting cleanup objectives. No unacceptable human health or ecological risks are expected to be

posed by the cadmium concentrations in the ground water during the next 10 years for the following reasons:

- Under the worst-case residential scenario for this site and 95 percent upper confidence limit on the mean (UCL<sub>95</sub>), cadmium only accounts for 6 percent of the total site risks, and the hazard quotient is less than 1. The UCL<sub>95</sub>, based on the current plume, is less than the MCL. If the point of exposure were to occur at any on-site well other than well 0612, the contribution to total risk drops below 1 percent.
- The most likely scenario for this site is that no ground water exposures will occur (i.e., no risks to human health) because of existing ICs, the availability of municipal water as a drinking water source, and river water for other potential uses such as irrigation. However, if a less conservative exposure scenario was assumed, such as occupational exposure to contaminated ground water, risks associated with the current cadmium concentrations in well 0612 would be protective of human health within the 100-year natural flushing time frame.
- The volume of plume water with cadmium concentrations exceeding the MCL is considered to be so small that ground water is not expected to increase ecological risks. Cadmium values in the closest Animas River surface water sampling location (0691) have not exceeded the maximum observed background value (0.00053 mg/L) since the completion of surface remediation; the vast majority of samples had concentrations below the detection limit.

### 2.5.1 Institutional Controls at the Mill Tailings Area

ICs are restrictions that effectively protect public health and the environment by limiting access to a contaminated medium, such as the alluvial ground water at the Durango mill tailings area. ICs typically depend on an administrative legal action, such as zoning, ordinances, and laws to ensure that protection is effective and enforceable. For the UMTRA Ground Water Project, ICs reduce exposure or reduce health risks by (1) preventing intrusion into contaminated ground water or (2) restricting access to or use of contaminated ground water for unacceptable purposes. EPA standards permit the use of ICs at sites where natural flushing will return the ground water contaminants to regulatory levels within 100 years.

EPA standards require that ICs have a high degree of permanence, protect human health and the environment, satisfy beneficial uses of ground water, are enforceable by administrative or judicial branches of government, and can be effectively maintained and verified.

The need for, and duration of, ICs depends on the compliance strategy selected for a site, the level of risk to humans and the environment, and existing site conditions. Movement of contaminated ground water may require restrictions over an extended period of time. As risks decrease over time, so should the restrictiveness of ICs. Therefore, to ensure protection of human health and the environment, and beneficial uses the water could have satisfied, it is important that the effectiveness of ICs be verified and modified as necessary.

ICs are mandated to be effective for a period of 100 years, during which the ground water contaminant levels will reach EPA standards. Current data indicate that contamination at the former mill tailings area property will flush naturally in that time frame. The ground water contamination created by past ore-processing activities is contained within the former millsite boundaries. Therefore, any ICs need only apply to that parcel of property.

In January 2000, the Durango millsite was conveyed to the City of Durango by quitclaim deed (Appendix A). The deed contains the following language:

“Grantee [City of Durango] covenants ... (ii) not to use ground water from the site for any purpose, and not to construct wells or any means of exposing ground water to the surface unless prior written approval for such use is given by the Grantor [Colorado Department of Public Health and Environment] and the U.S. Department of Energy.”

This language is recorded with the deed and ensures that any future landowner is subject to the same restrictions. This language fulfills the requirements for degree of permanence and enforceability by government entities.

## **2.6 Applicability of Supplemental Standards at the Raffinate Ponds Area**

Bedrock ground water at the raffinate ponds area qualifies for supplemental standards on the basis of limited use ground water. Ground water in the bedrock is of limited use because of widespread, elevated concentrations of naturally occurring selenium. Selenium concentrations exceed the MCL at background monitor well 0599 by a factor of nearly nine. Additional evidence of the natural presence of selenium at the raffinate ponds area is summarized below, and details are presented in Section 5.4 of the SOWP (DOE 2002).

Historical data indicate high concentrations of selenium were not released from the processing operations at the raffinate ponds area. A study conducted by the U.S. Department of Health, Education, and Welfare (Tsivoglou and others 1960) reported that less than 0.01 mg/L of selenium was detected in the raffinate produced from the solvent extraction process. This process was used until the operations at the raffinate area ceased in 1963. Prior to that time, raffinate was discharged directly to the Animas River and could not have been a source of ground water contamination. Therefore, it appears the milling operations were not a source of selenium in ground water.

Concentrations of selenium have increased without commensurate increases in levels of other known mill-related constituents such as uranium, arsenic, and molybdenum. Although concentrations of all other site-related constituents have decreased since the completion of surface remediation, concentrations of selenium have increased, implying influences from sources and processes other than milling activities.

Selenium occurs naturally in the western United States and in the Durango area in sufficient concentrations to be a source of ground water contamination under certain conditions. Coal and pyrite are abundant in the bedrock units under the raffinate ponds area and are well-known natural sources of selenium. Moreover, high selenium concentrations are found in isolated wells, and the lack of a clear selenium plume implies that selenium sources are variable and isolated.

### **2.6.1 Reasonableness of Ground Water Treatment at the Raffinate Ponds Area**

Ground water from the bedrock formations beneath the raffinate ponds area is not a current or potential source of drinking water. Potable water is readily available from the municipal water system in the vicinity of the site. Based on historical records from the Colorado Division of Water Resources, the nearest known downgradient well is across U.S. Highway 550, approximately 0.2 mile southeast of the site, on the west side of the Animas River. However, this well is located under a building and has never been used because of a black discoloration of the

water (DOE 1995). Future use of ground water from the bedrock aquifer is unlikely based on the planned future development of a pumping plant at the raffinate ponds area. Therefore, the current and reasonably projected uses of site-affected ground water would be preserved with the application of supplemental standards.

However, should future development plans for the site change, ground water would still not be considered as a source for the municipal water supply. The City of Durango does not consider that ground water could be reasonably treated for use as drinking water because the bedrock aquifer does not produce water in usable quantities. Also, water in the area is considered of poor quality because of high hardness, iron, and manganese levels (DOE 1995), as well as black discoloration and the strong odor associated with hydrogen sulfide gas. Prior to any development on the site, the property would be annexed by the City of Durango, and the city would not allow use of the ground water for drinking water purposes (Rogers, personal communication, 2001).

## 2.7 Human Health and Environmental Risks

The next step in the decision process is to consider whether the human health and environmental risks of applying natural flushing at the mill tailings area, and supplemental standards at the raffinate ponds area, are acceptable. Assessment of site conditions and consideration of potential effects on environmental resources indicate that the selected compliance strategies at both areas will be protective of human health and the environment. The following is a summary of risk calculations for human health and ecological media.

### 2.7.1 Human Health Risk

Risk calculations show that the only unacceptable exposure pathway is ingestion of ground water as drinking water. Table 1 summarizes the COPCs. Results of the risk calculations indicate controls should be put in place to prevent use of the alluvial aquifer as drinking water until contamination is reduced to acceptable levels.

Table 1. List of COPCs for the Durango Site

| Mill Tailings Area | Raffinate Ponds Area |
|--------------------|----------------------|
| Cadmium            | Chloride             |
| Lead               | Lead                 |
| Manganese          | Manganese            |
| Molybdenum         | Selenium             |
| Selenium           | Sodium               |
| Sodium             | Sulfate              |
| Sulfate            | Uranium              |
| Uranium            |                      |

For the mill tailings area, most of the risk is contributed by uranium and manganese. Cadmium accounts for approximately 6 percent of the total risk and has concentrations in only one well that exceed the standard. Although selenium contributes only 2 percent of the total risk, the UCL<sub>95</sub> exceeds the MCL by a factor greater than 3. The other constituents combined contribute only about 7 percent of the total risk. Residential carcinogenic and noncarcinogenic risk thresholds are exceeded. Risks could not be calculated quantitatively for sodium, sulfate, and lead, but it appears the most significant potential adverse effect would be associated with infant or child exposure to the sulfate in ground water when used as drinking water.

For the raffinate ponds area, risks are dominated by natural selenium, with significant quantifiable contributions from manganese and uranium. Although risks could not be quantified, exposure to sulfate in the ground water would result in negative health impacts, particularly for infants. Chloride, lead, and sodium concentrations are elevated over background.

### 2.7.2 Ecological Risk

Table 2 presents the results of categorizing potential ecological risk. In the cases where multiple receptors are included in the receptor group (i.e., the terrestrial and wetland wildlife groups), the risk is based on the highest (worst-case) risk result among the receptors. Because many conservatisms were incorporated in the calculation, the hazard quotients are expected to overestimate actual risk to most individual receptors, and therefore, risks categorized as medium-low to none are not expected to represent significant potential risks to populations of nonsensitive species. Although, for those receptor groups that may include sensitive species, risk categorizations of medium-low to low might still be considered to be of concern; the indicated low risks for wetland receptors (including the southwestern willow flycatcher) from exposure to lead and zinc along the Animas River are expected to be within the range of background.

Table 3 summarizes the ecological COPCs (E-COPCs) that remain at each of the evaluated areas. These constituents are considered to be of potential concern because their concentrations in environmental media indicate a potential for adverse toxicological effects to ecological receptors. No E-COPCs were identified for the sediments at this site, in part due to the relatively high natural concentrations that exist in the area. Although risks of low and medium-low were indicated for some receptors exposed to E-COPCs in sediment from the site, similar levels of risk were also indicated from exposure to background levels of these constituents.

For the surface waters and sediments of Lightner Creek and the Animas River, the potential for ecological risk was generally low. Medium-low potentials for risk to wetland plants were associated with zinc.

For ground water, high potentials for risks to ecological receptors were found in the mill tailings area plume for cadmium, manganese, and vanadium, and very high potentials for risk were found in the raffinate ponds area plume for selenium; high potentials was also indicated for manganese. These potential risks are for a hypothetical scenario where ground water would be used as a source for surface ponds or wetlands; there is no current effect from these potential risks because there is no current exposure pathway to potential receptors. The Concentrations of uranium in the ground water at both areas exceed the Colorado Department of Public Health and Environment (CDPHE) surface water quality standard. For these reasons, ground water in these plumes is considered unsuitable for use in surface ponds or wetlands. However, the ground water at these sites does not appear to pose a significant risk to either deep-rooted plants or terrestrial wildlife (if hypothetically used as a drinking water source).

Table 2. Summary of Potential Ecological Risks at the Durango Site

| E-COPC   | Aquatic Organisms | Benthic Organisms | Wetland Plants | Wetland Wildlife                  | Terrestrial Wildlife | Deep-Rooted Plants |
|--|-------------------|-------------------|----------------|-----------------------------------|----------------------|--------------------|
| (principal exposure media)                                 | Surface water     | Sediment          | Sediment       | Surface water<br>Sediment<br>Food | Surface water        | Ground water       |
| <b>Surface Water (Animas River and Lightner Creek)</b>     |                   |                   |                |                                   |                      |                    |
| Ammonium   | None              | NA                | NA             | --                                | --                   | NA                 |
| Arsenic  | NA                | Low               | Low            | None                              | NA                   | NA                 |
| Iron   | NA                | None              | --             | --                                | NA                   | NA                 |
| Lead   | None              | Low               | Low            | Low                               | None                 | NA                 |
| Nitrate  | NA                | None              | --             | None <sup>a</sup>                 | NA                   | NA                 |
| Selenium   | None              | None              | Low            | None                              | None                 | NA                 |
| Sulfate  | Very low          | NA                | NA             | --                                | --                   | NA                 |
| Zinc   | NA                | Low               | Medium -low    | Low                               | NA                   | NA                 |
| <b>Mill Tailings Area Ground Water Plume<sup>b</sup></b>   |                   |                   |                |                                   |                      |                    |
| Arsenic  | None              | NA                | NA             | None                              | None                 | Very low           |
| Cadmium  | Medium-low        | NA                | NA             | High                              | None                 | None               |
| Chloride   | Very low          | NA                | NA             | --                                | --                   | --                 |
| Chromium   | None              | NA                | NA             | Low                               | None                 | None               |
| Manganese  | High              | NA                | NA             | None                              | None                 | Very low           |
| Molybdenum   | None              | NA                | NA             | None                              | None                 | None               |
| Selenium   | Medium-low        | NA                | NA             | Medium-low                        | None                 | None               |
| Sulfate  | Medium-low        | NA                | NA             | --                                | --                   | --                 |
| Uranium  | Very low          | NA                | NA             | Very low                          | None                 | None               |
| Vanadium   | Medium-low        | NA                | NA             | High                              | None                 | Very low           |
| Zinc   | Medium-low        | NA                | NA             | Medium                            | None                 | Low                |
| <b>Raffinate Ponds Area Ground Water Plume<sup>b</sup></b> |                   |                   |                |                                   |                      |                    |
| Ammonium   | Very low          | NA                | NA             | --                                | --                   | --                 |
| Antimony   | None              | NA                | NA             | None <sup>a</sup>                 | None <sup>a</sup>    | --                 |
| Arsenic  | None              | NA                | NA             | None                              | None                 | Very low           |
| Cadmium  | Very low          | NA                | NA             | Medium-low                        | None                 | None               |
| Chloride   | Low               | NA                | NA             | --                                | --                   | --                 |
| Chromium   | None              | NA                | NA             | Low                               | None                 | None               |
| Copper   | Very low          | NA                | NA             | None                              | None                 | None               |
| Iron   | Low               | NA                | NA             | --                                | --                   | None               |
| Lead   | Very low          | NA                | NA             | Low                               | None                 | None               |
| Manganese  | High              | NA                | NA             | Very low                          | None                 | Very low           |
| Molybdenum   | None              | NA                | NA             | None                              | None                 | None               |
| Nitrate  | Very low          | NA                | NA             | None <sup>a</sup>                 | None <sup>a</sup>    | --                 |
| Selenium   | Very high         | NA                | NA             | Very high                         | Very low             | Medium-low         |
| Sulfate  | Medium            | NA                | NA             | --                                | --                   | --                 |
| Thallium   | None              | NA                | NA             | None <sup>a</sup>                 | None <sup>a</sup>    | None               |
| Uranium  | None              | NA                | NA             | None                              | None                 | None               |
| Vanadium   | Very low          | NA                | NA             | Very low                          | None                 | None               |
| Zinc   | Very low          | NA                | NA             | Very low                          | None                 | Very low           |

<sup>a</sup>Avian benchmark is not available. Risk is based on mammalian receptors only.

<sup>b</sup>Exposures to aquatic organisms and wildlife are based on the hypothetical scenario that ground water is pumped to a surface pond or wetland.

-- = No hazard quotients available.

NA = Not applicable to this area.

Table 3. Summary of E-COPCs at the Durango Site Based on Ecological Risk Screening Results

| Animas River and Lightner Creek |                 | Ground Water Plume                |                             |
|---------------------------------|-----------------|-----------------------------------|-----------------------------|
| <u>Surface water</u>            | <u>Sediment</u> | <u>Mill Tailings Area</u>         | <u>Raffinate Ponds Area</u> |
| (none)                          | (none)          | Cadmium                           | Ammonium                    |
|                                 |                 | Manganese                         | Cadmium                     |
|                                 |                 | Selenium                          | Manganese                   |
|                                 |                 | Sulfate                           | Selenium                    |
|                                 |                 | Vanadium                          | Sulfate                     |
|                                 |                 | Zinc                              | Uranium-234 and 238         |
|                                 |                 | Uranium-234 and 238<br>(combined) | (combined)                  |

### 3.0 Implementation

Implementation of the proposed compliance strategy includes ICs and continued monitoring of ground water and surface water at the mill tailings area. Monitoring also will be continued at the raffinate ponds area as a best management practice.

#### 3.1 Institutional Controls

ICs are restrictions that effectively protect public health and the environment by limiting access to a contaminated medium; for the Durango site, alluvial ground water. Separate ICs are being developed for both areas of the Durango site to prevent the future use of the potentially harmful contaminated ground water. Each area will be covered by two discreet documents to ensure restrictions are in place; deed restrictions that became enforceable when the properties were transferred to their current owners and Environmental Covenants authorized by the State of Colorado and submitted by CDPHE to the individual landowners. The State of Colorado passed into law Senate Bill 01-145 in July 2001 “to provide an effective and enforceable means of ensuring the conduct of any required maintenance, monitoring, or operation, and or restricting future uses of the land, including placing restrictions on drilling for or pumping groundwater for as long as any residual contamination remains hazardous” (legislative declaration to SB 01-145).

##### 3.1.1 Institutional Controls for the Mill Tailings Area

ICs are in place at the former millsite through deed restrictions when the State of Colorado, through CDPHE, transferred the former millsite property to the City of Durango via a quitclaim deed (Appendix A). The deed prohibits use of contaminated ground water with the following restrictive language:

“Grantee (City of Durango) covenants... (ii) not to use ground water from the site for any purpose, and not to construct wells or any means of exposing ground water to the surface unless prior written approval for such use is given by the Grantor (CDPHE) and the U.S. Department of Energy”

This language follows with the deed and ensures that any future landowner is subject to the same restrictions.

In addition, the State of Colorado proposes to enter into Environmental Covenant with the City of Durango that defines use restrictions that may present risk to human health and the environment. The Environmental Covenant on this property will be binding on all future landowners and will exist in perpetuity, but may be modified or terminated per the conditions in the Environmental Covenant. The property owner agrees to notify CDPHE of any development that has potential to violate the terms of the covenant. In addition, the property owner must annually send a report to CDPHE certifying compliance, or lack thereof, with the terms of the covenant. The covenant contains enforcement provisions. DOE believes these covenants satisfy the requirements of an IC for permanence, enforceability, and its ability to be maintained and verified. A copy of the proposed Environmental Covenant for each property is provided in Appendix B.

These two documents fulfill the requirement for degree of permanence and enforceability by government entities. The yearly reporting requirement certifying compliance ensures that ICs are in effect.

### **3.1.2 Institutional Controls for the Raffinate Ponds Area**

Ground water use at the Raffinate Ponds Area is limited by deed restriction language that appears in the quitclaim deed transferring the property from the State of Colorado, through CDPHE, to the Colorado Water Conservation Board (Appendix C). The property was later quitclaimed from the Colorado Water Conservation Board to the Animas-La Plata Water Conservancy District. The deed uses the same restrictive language that appears in the quitclaim deed for the former millsite area. This language follows with the deed and ensures that any future landowner is subject to the same restrictions. As with the former millsite, CDPHE will enter into an Environmental Covenant with the landowner to establish use restrictions that may present risk to human health and the environment.

The Raffinate Ponds Area is the proposed site for the Bureau of Reclamation (BOR) to construct a pumping plant to support the Animas-La Plata (Water) Project. Following the requirements of the deed restrictions, the BOR has recently submitted a Land Use Plan and Site Monitoring Plan for Proposed Pumping Plant, Animas-La Plata Project, Colorado and New Mexico for CDPHE and DOE consideration. Through the Land Use Plan the BOR has committed to sending CDPHE and DOE detailed construction specifications for written approval prior to the construction contract award. The BOR has also committed to sending CDPHE and DOE any future revisions to the Land Use Plan for their review and approval.

## **3.2 Public Involvement Plan**

In 1992, DOE began preparation of a PEIS for the UMTRA Ground Water Project (DOE 1996). The PEIS presents analyses of the potential effects of four alternatives for implementation on the entire UMTRA Ground Water Project: no action, proposed action, active remediation to regulatory levels, and passive remediation. A public meeting was held at the Durango City Hall on June 8, 1995. Comments and responses from the Durango meeting are provided in Volume II of the PEIS. Nine public hearings and a 120-day comment period followed issuance of the draft PEIS in April 1995. The final document was distributed to the public in October 1996.

Regulations governing implementation of supplemental standards codified at 40 CFR 192.22 (c) state that when the proposed remediation is supplemental standards "...the Department of Energy shall inform any private owners and occupants of the affected location and solicit their comments." DOE will use the UMTRA Ground Water Public Participation Plan (DOE 2000) to select the appropriate mechanisms to distribute information to affected parties. In addition, DOE will distribute all documents defining and proposing remedial decisions and actions to the owners of affected properties and will actively solicit their comments.

To this end, a public meeting will be conducted in Durango during the month of June 2002. During this meeting DOE will solicit comments and present information concerning all data gathered during this study, including risks to human health and the ecology and the supplemental standards compliance strategy based on the classification of limited use ground water.

### 3.3 Monitoring at the Mill Tailings Area

The monitoring strategy for the alluvial aquifer is designed to determine progress of the natural flushing process in meeting compliance standards for site COPCs, to verify modeling results, and ensure protection of human health and the environment. Figures 7 through 18 are concentration versus time plots made from single steady state deterministic simulations and show the expected decrease in concentration in the point of compliance (POC) wells down to the proposed concentration limits.

Standards for molybdenum and uranium are their UMTRA MCLs of 0.1 mg/L and 0.044 mg/L, respectively. The cleanup goal for selenium is 0.05 mg/L, which is the standard in EPA's Safe Drinking Water Act. Monitoring for these three contaminants will continue annually for the next 5 years to verify modeling results, that is, that concentrations are decreasing. Monitoring for cadmium will continue on an annual basis for the next 10 years and focus on observing trends in well 0612 and establishing a larger database to support future modeling efforts. Cadmium will be analyzed in samples on a sitewide basis to ensure concentrations are not detected in any locations other than well 0612 and that human health risks remain minimal. Cadmium also will be analyzed in samples from Animas River surface water locations adjacent to the site and downgradient, to verify that there continues to be no ecological risks in the Animas River.

To determine when natural flushing is complete, wells 0612, 0617, 0630, 0631, 0633, 0634, and 0635 will be established as the POC wells. Concentrations of cadmium, molybdenum, selenium, and uranium were detected above MCLs in these wells during the most recent sampling (November 2001). These wells will be used for monitoring progress of natural flushing in the alluvial aquifer; and natural flushing will be considered to be complete when the concentrations of COPCs in these wells no longer exceed their compliance standard. Well 0612 sample results also will be used to verify that cadmium concentrations continue to decrease as expected. The proposed monitoring locations are shown on Figure 19.

Surface water locations 0652, 0584, 0691, and 0586 along the Animas River will also be monitored to verify that the natural flushing strategy is protective of the environment.

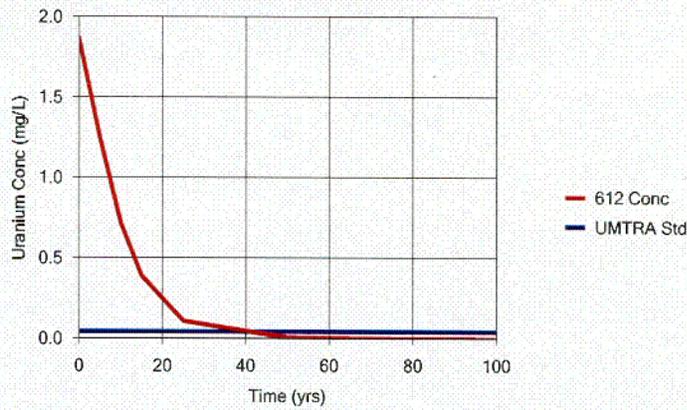


Figure 7. Uranium Concentration versus Time at Well 0612

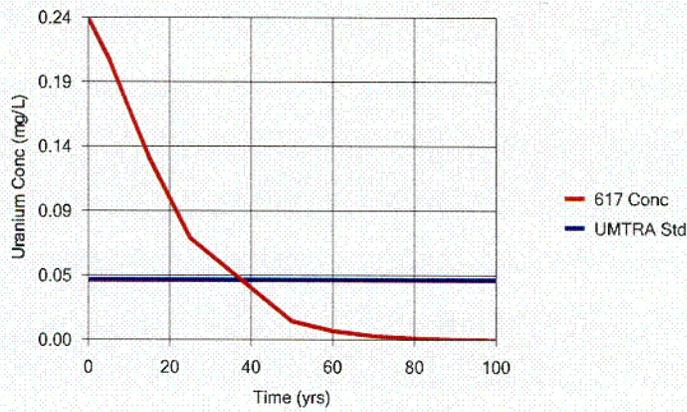


Figure 8. Uranium Concentration versus Time at Well 0617

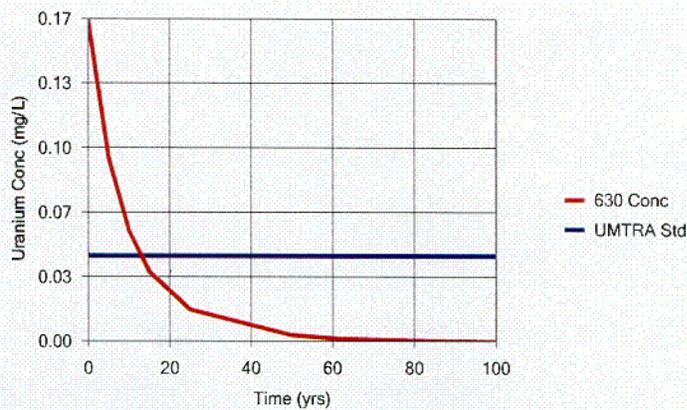


Figure 9. Uranium Concentration versus Time at Well 0630

C-04

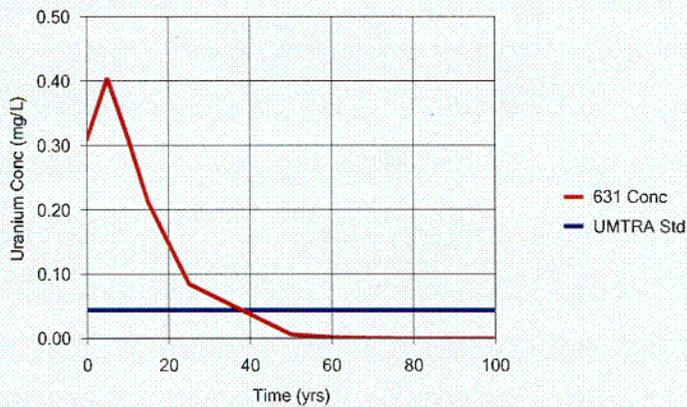


Figure 10. Uranium Concentration versus Time at Well 0631

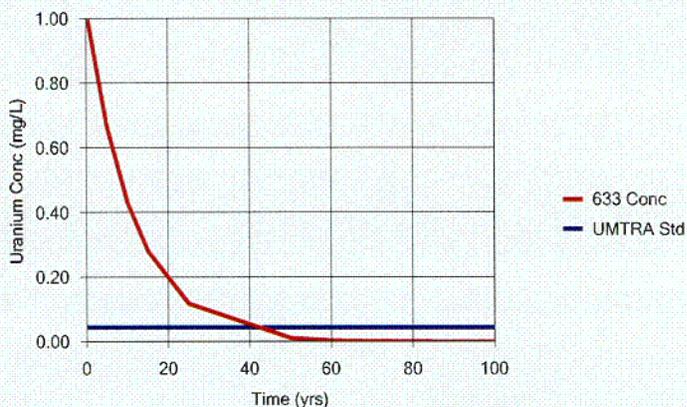


Figure 11. Uranium Concentration versus Time at Well 0633

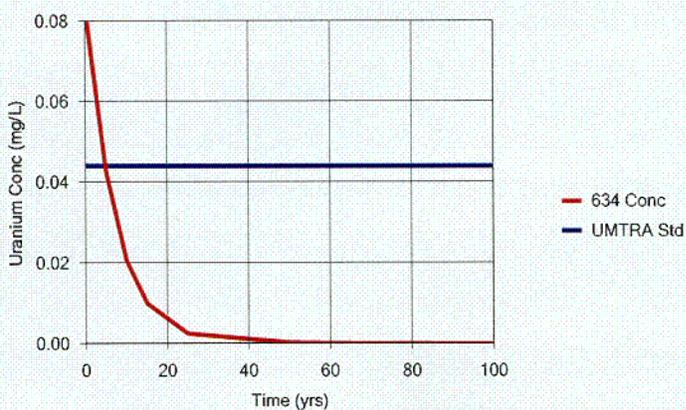


Figure 12. Uranium Concentration versus Time at Well 0634

C-05

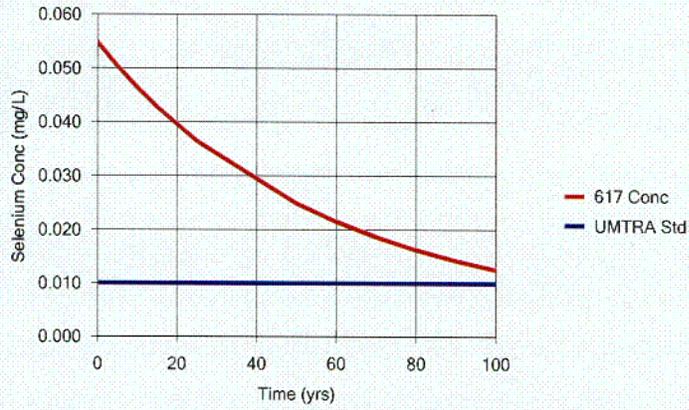


Figure 13. Selenium Concentration versus Time at Well 0617

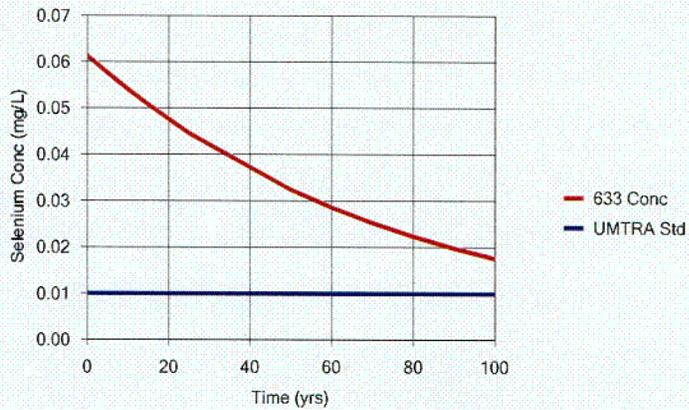


Figure 14. Selenium Concentration versus Time at Well 0633

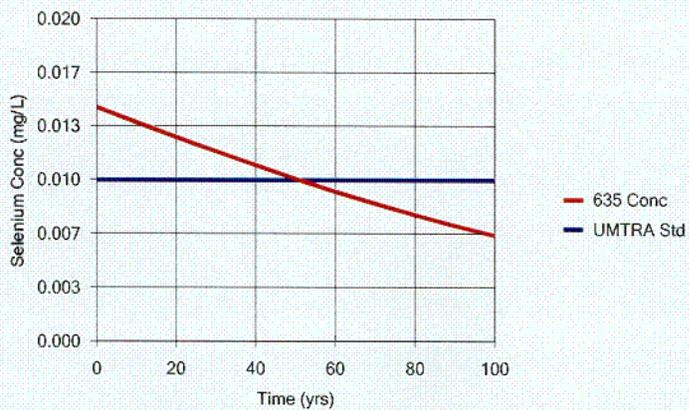


Figure 15. Selenium Concentration versus Time at Well 0635

C-06

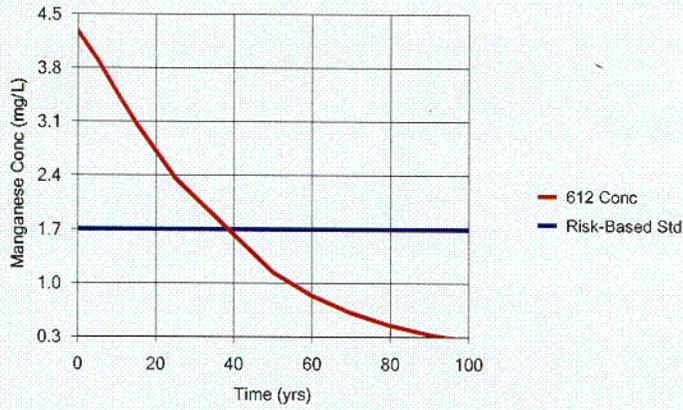


Figure 16. Manganese Concentration versus Time at Well 0612

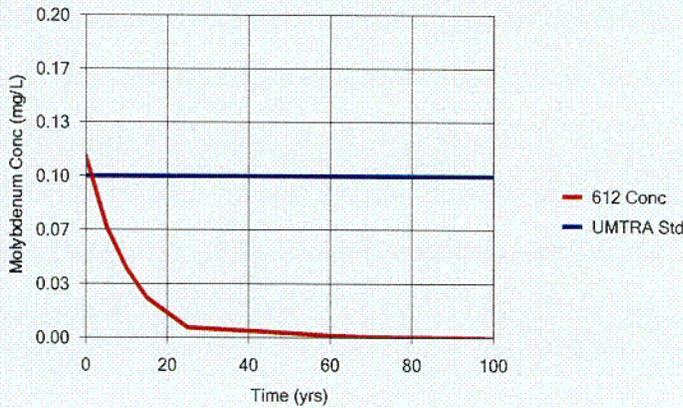


Figure 17. Molybdenum Concentration versus Time at Well 0612

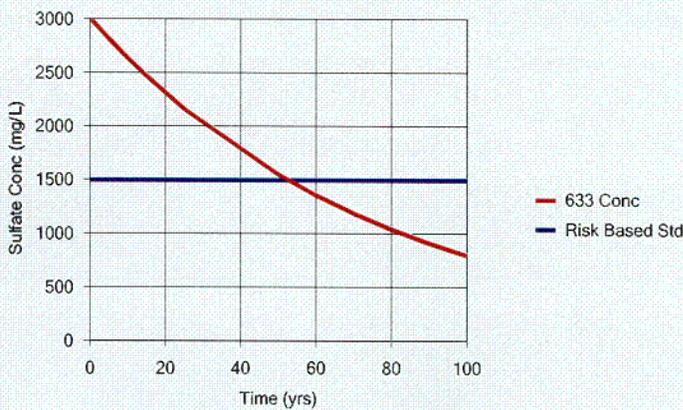
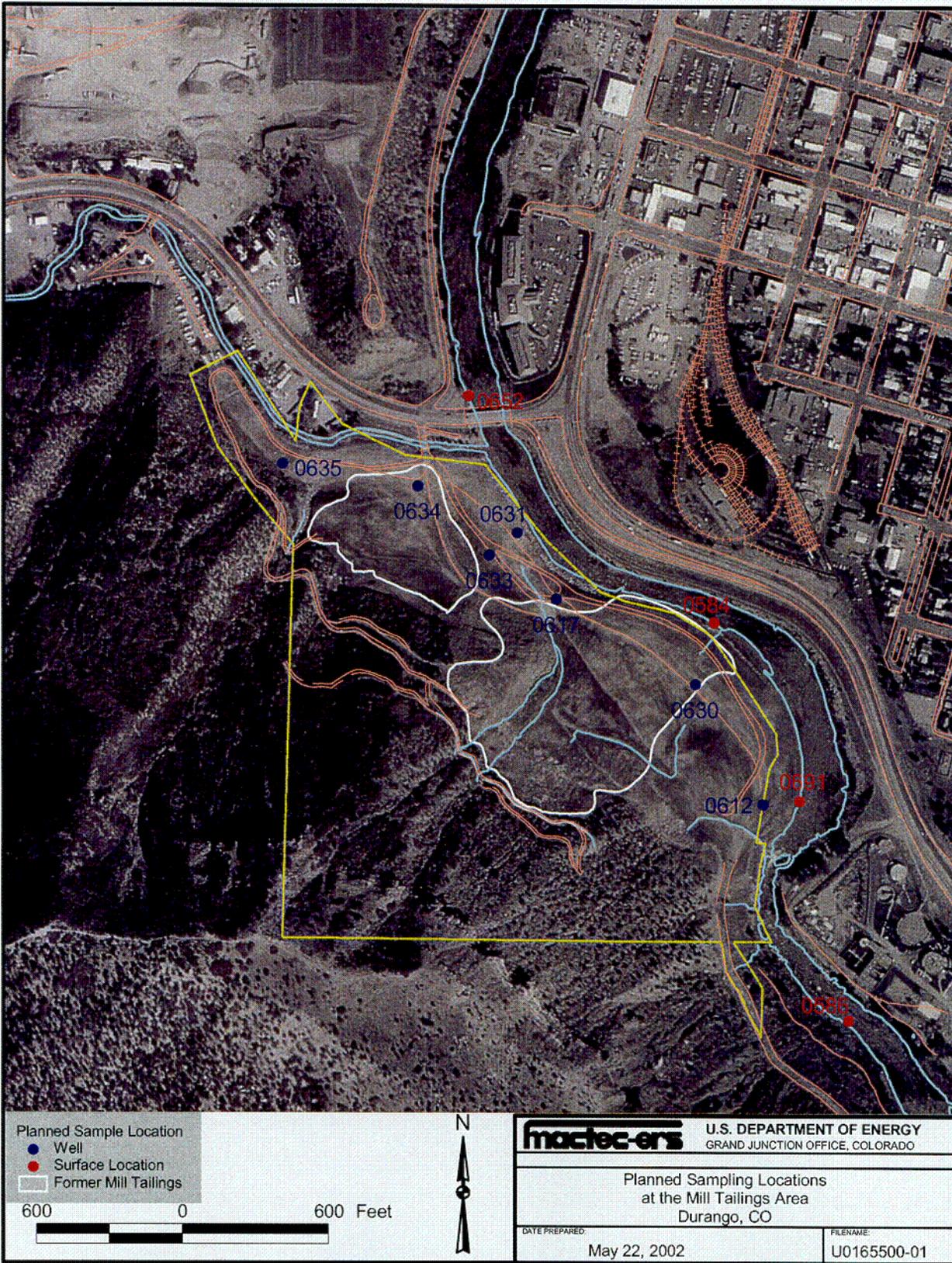


Figure 18. Sulfate Concentration versus Time at Well 0633

C-07



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Figure 19. Proposed Monitoring Locations for the Mill Tailings Area

C-08

Monitoring will take place on an annual basis for the first 5 years (10 years for cadmium in well 0612). At that time the monitoring strategy will be reevaluated and adjusted as appropriate based on current results. Concentrations of a COPC must be at or below the compliance standard for 3 consecutive years before monitoring for that constituent is discontinued. Monitoring requirements are summarized in Table 4.

Table 4. Summary of Ground Water and Surface Water Monitoring Requirements at the Mill Tailings Area

| Sampling Location                        | Monitoring Purpose  | Analytes  | Location                |
|--|---|---|-------------------------|
| 0612, 0617, 0630, 0631, 0633, 0634, 0635 | Monitor plume migration on site for molybdenum, selenium, and uranium. Verify decrease in concentrations of cadmium in well 0612. | Cadmium, Lead, Manganese, Sulfate, Molybdenum Selenium, Uranium | On site - Downgradient  |
| 0652                                     | Surface water background.   | Cadmium Molybdenum Selenium Uranium                             | Off site - Upgradient   |
| 0584, 0586, 0691                         | Downgradient surface water concentrations.  | Cadmium Molybdenum Selenium Uranium                             | Off site - Downgradient |

All other monitor wells at the mill tailings area no longer needed for compliance monitoring will be abandoned in the near future in accordance with UMTRA Project procedures and applicable State of Colorado regulations.

### 3.4 Monitoring at the Raffinate Ponds Area

Limited monitoring of ground water in the bedrock at the raffinate ponds area is proposed for uranium and selenium as a best management practice. The proposed monitoring locations are shown on Figure 20. On-site wells 0879 and 0880 have been established as appropriate for monitoring concentrations of selenium and uranium in the upper portions of the bedrock. Well 0598 will be sampled to continue monitoring the concentrations of selenium and uranium associated with water within the Bodo Fault zone and the deep bedrock. Downgradient well 0884 will be sampled to monitor off-site migration, and well 0607 will be monitored to determine concentrations of selenium and uranium entering the site.

Surface water location 0588, on South Creek upgradient of the site, also will be sampled to assess the quality of water entering the site. In addition, surface water locations 0654 and 0656 along the Animas River will continue to be monitored to verify that the supplemental standards strategy is protective of the environment.

Monitoring will take place on an annual basis for the first 5 years. After that time, the monitoring strategy will be reevaluated and adjusted as appropriate based on current results. The monitoring requirements are summarized in Table 5.



Figure 20. Proposed Monitoring Locations for the Raffinate Ponds Area

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Table 5. Summary of Monitoring Requirements at the Raffinate Ponds Area

| Sampling Location | Monitoring Purpose  | Analytes            | Location                   |
|-------------------|---|---------------------|----------------------------|
| 0879, 0880        | Monitor concentrations in ground water in the shallow bedrock.                  | Selenium<br>Uranium | On site                    |
| 0598              | Monitor concentrations in ground water in the deep bedrock and Bodo Fault zone. | Selenium<br>Uranium | On site                    |
| 0607              | Monitor concentrations in ground water entering the site.                       | Selenium<br>Uranium | On site                    |
| 0884              | Monitor off-site downgradient concentrations and migration.                     | Selenium<br>Uranium | Off site -<br>Downgradient |
| 0588              | Surface water quality entering the site.  | Selenium<br>Uranium | Off site - Upgradient      |
| 0654, 0656        | Downgradient surface water concentrations.                                      | Selenium<br>Uranium | Off site -<br>Downgradient |

All other monitor wells at the Durango raffinate ponds area no longer needed for monitoring will be abandoned in the near future in accordance with UMTRA Project procedures and applicable State of Colorado regulations.

### 3.5 Confirmation Report for the Mill Tailings Area

Upon regulatory concurrence with the Durango GCAP, the verification monitoring period will commence. This phase should continue through 2012. After 5 years (2007) a Confirmation Report will be prepared and the site will be turned over to the Long-Term Surveillance and Maintenance (LTSM) Program for long-term management. The site will be transferred to LTSM with a Long-Term Management Plan that requires annual monitoring for an additional 5 years (until 2012). After the 5 year period monitoring results will be evaluated (and additional modeling will be performed if needed) to confirm that the natural flushing compliance strategy continues to be effective in reducing concentrations of all constituents.

### 3.6 Certification Report for the Mill Tailings Area

On completion of natural flushing, a certification report will be prepared for State, NRC, and local government concurrence. This report will be the final close-out document. Monitoring and ICs will be discontinued at that time.

## 4.0 References

Rogers, O., 2001. Teleconference with Otha Rogers, Director, City of Durango Department of Public Works, December 13.

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———, 2002. *Site Observational Work Plan for the Durango, Colorado, UMTRA Project Site*, GJO-2001-272-TAR/MAC-GW DUR 1.1, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, January.

## **Appendix A**

### **Quitclaim Deed for Mill Tailings Area**

**QUIT CLAIM DEED**

The Colorado Department of Public Health and the Environment ("Grantor"), whose address is 4300 Cherry Creek Drive South, Denver, Colorado, 80222-1530, City and County of Denver, State of Colorado, pursuant to 42 U.S.C. § 7914 (e) (1) (B) and C.R.S. § 25-11-303, hereby donates and quit claims to the City of Durango ("Grantee"), whose address is 949 East Second Ave., Durango, Colorado, 81301, La Plata County, State of Colorado, the following real property in the County of La Plata, State of Colorado, to wit: Two parcels of land in LaPlata County, State of Colorado, New Mexico Principal Meridian, containing Seventy-nine and fourteen hundredths (79.14) acres, more or less, described as follows:

Township 35 North, Range 9 West of the N.M.P.M., North of the Ute Line

A tract of land situated in W1/4SW1/4 of Section 29, E1/2SE1/4 and NE1/4SE1/4 of Section 30, Lot 5 of Section 32, more particularly described as follows:

BEGINNING at the Southeast corner of said Section 30;  
THENCE Westerly along the south line of said Section 30 to the Southwest corner of said E1/2SE1/4;  
THENCE Northerly along the West line of said E1/2SE1/4 to a point on the South bank of Lightner Creek, said point being 1,039.00 feet Southerly of the Northwest corner of said E1/2SE1/4;  
THENCE North 41°55'00" West, 231.00 feet;  
THENCE North 37°44'00" West, 266.00 feet;  
THENCE North 22°50'00" West, 317.00 feet;  
THENCE North 62°00'00" East, 217.00 feet, to said Lightner Creek;  
THENCE South 34°45'00" East, 436.00 feet, along said Lightner Creek;  
THENCE North 05°39'24" East, 146.50 feet;  
THENCE North 22°52'00" East, 102.72 feet, to the southwesterly right-of-way line of U.S. Highway 550  
THENCE South 39°10'30" East, 218.29 feet, along said right-of-way liner;  
THENCE Southeasterly along a curve to the left, having a radius of 1,255.90 feet and an arc length of 286.70 feet, chord bearing of South 65°55'00" East, 286.10 feet;  
THENCE South 85°12'15" East, 328.20 feet;  
THENCE South 40°52'37" East, 414.27 feet;  
THENCE South 48°27'30" East, 285.60 feet;  
THENCE South 71°30'15" East, 714.30 feet;  
THENCE South 78°30'00" East, 200.20 feet;  
THENCE South 60°00'00" East, 174.70 feet;  
THENCE South 37°22'15" East, 166.80 feet;  
THENCE South 34°43'30" East, 171.90 feet;  
THENCE South 34°02'45" East, 139.50 feet;  
THENCE South 05°44'00" East, 82.90 feet;  
THENCE South 28°07'15" West, 69.70 feet;  
THENCE South 08°37'45" West 303.30 feet;  
THENCE South 82°22'45" East, 38.50 feet;  
THENCE South 12°00'53" West, 93.19 feet;  
THENCE South 06°33'36" West, 106.66 feet;  
THENCE South 05°52'41" West 55.19 feet;  
THENCE South 26°08'17" East, 160.47 feet to the South line of said Section 29;

Also, that portion of said Lot 5 of Section 32, being more particularly described as follows:

Commencing at the Northwest corner of said Section 32;  
THENCE North 88°27'00" East along the North line of said Section 32, a distance of 474.00 feet to the POINT OF BEGINNING;  
THENCE South 20°08'00" East, 32.00 feet;  
THENCE South 08°24'00" East, 91.00 feet;  
THENCE South 34°43'00" East, 56.00 feet;  
THENCE South 38°27'00" East, 42.00 Feet;  
THENCE South 23°54'00" East, 53.00Feet;  
THENCE South 24°54'00" East, 51.00 feet;  
THENCE South 30°39'00" East, 100.00 feet;  
THENCE North 00°41'00" East, 199.00 feet  
THENCE Northwesterly to a point on the North line of said Section 32, said point being North 88°27'00" East, 528.00 feet from said Northwest corner of said Section 32;  
THENCE South 88°27'00" West, 54.00 feet along said North line, to the point of beginning.

Subject to: (i) any coal, oil, gas, or other mineral rights in any person; (ii) existing rights-of-way for roads, railroads, telephone lines, transmission lines, utilities, ditches, conduits, or pipelines on, over, or across said lands; (iii) court liens, judgments, or financial encumbrances such as deeds of trust for which a formal consent or order has been obtained from a court for the lien holder; (iv) other rights, interests, reservation or exceptions of record; and the following terms, conditions, rights, reservations and covenants:

Grantor reserves to: (i) itself, the U. S. Department of Energy, their employees, agents and contractors the right of access to the property as may be necessary to complete activities under the Uranium Mill Tailings Radiation Control Act of 1978, 42 U.S.C. § 7901 et seq. ("UMTRCA") and for other lawful purposes, until such time as Grantor and the U.S. Department of Energy determine that all remedial activities are complete; and (ii) to itself any non-tributary groundwater underlying this parcel, the right to develop tributary groundwater, and the right to surface access for groundwater development.

Grantee covenants to hold harmless the Grantor and the Department of Energy for any liability associated with disruption of any public purpose ventures on the property conveyed by this deed, the disruption of any improvement on said property made by the Grantee, its successors and assigns, and any temporary or permanent limitations to the use of the property, should the Grantor and the Department of Energy be required to perform additional surface remedial activities on the property conveyed by this deed.

Grantee covenants (i) to comply with the applicable provisions of UMTRCA, 42 U.S.C. sec. 7901 et. seq., as amended; (ii) not to use ground water from the site for any purpose, and not to construct wells or any means of exposing ground water to the surface unless prior written approval for such use is given by the Grantor and the U.S. Department of Energy; (iii) not to sell or transfer the land to anyone other than a governmental entity within the state; (iv) that any sale or transfer of the property described in this deed shall have prior written approval from the Grantor and the U.S. Department of Energy, and that any deed or other document created for such sale or transfer and any subsequent sale or transfer will include information stating that the property was once used as a uranium milling site and all other information regarding the extent of residual radioactive materials removed from the property as required by Section 104(d) of the Uranium Mill Tailings, 42 U.S.C. sec. 7014(d), and as set forth in the Annotation attached hereto; (v) not to perform construction and/or excavation or soil removal of any kind on the property without permission from the Grantor and the U.S. Department of Energy unless prior written approval of construction plans (facilities type and location), is given by the Grantor and the U.S. Department of Energy; (vi) that any habitable structures constructed on the property shall employ a radon ventilation system or other radon mitigation measures; (vii) that its use of the property shall not adversely impact groundwater quality, nor interfere in any way, with groundwater remediation under UMTRCA activities; and (viii) to use the property and any profits or benefits derived therefrom only for public purposes as required by UMTRCA sec. 104(e)(1)(C), 42 U.S.C. 7914 (e)(1)(C).

These covenants are made in favor and to the benefit of Grantor, shall run with the land and be binding upon Grantee and its successors and assigns, and shall be enforceable by Grantor and its successors and assigns;

Grantee acknowledges that the property was once used as a uranium milling site, and contains residual radioactive materials as described in the attached Annotation, and that the Grantor makes no representations or warranties that the property is suitable for Grantee's purposes;

IN WITNESS WHEREOF,

GRANTOR:

APPROVED AS TO FORM:

STATE OF COLORADO  
Bill Owens, Governor  
Acting by and through  
The Department of Public Health and Environment

\_\_\_\_\_  
David Kreutzer - Assistant Attorney General

By: \_\_\_\_\_  
Executive Director

By: \_\_\_\_\_  
Program Approval

ACCEPTANCE OF DEED  
AND COVENANTS

GRANTEE:

\_\_\_\_\_  
(Full Legal Name or Agency)

By: \_\_\_\_\_  
(Name)

Title: \_\_\_\_\_

(Affix Seal)

ATTESTATION:

\_\_\_\_\_  
City/County Clerk

Signed this        day of        , 19

STATE OF COLORADO,  
County of

} SS.

The foregoing instrument was acknowledged before me this  
day of        , 19    , by

My commission expires

Witness my hand and official seal

\_\_\_\_\_  
Notary Public.

ATTACHMENT A  
LAND ANNOTATION  
DURANGO, COLORADO PROCESSING SITE  
NORTHERN, MIDDLE AND SOUTHERN PARCELS

The Uranium Mill Tailings Radiation Control Act (Public Law 95-604), Section 104, requires that the State notify any person who acquires a designated processing site of the nature and extent of residual radioactive materials removed from the site, including notice of the date when such action took place, and the condition of the site after such action. The following information is provided to fulfill this requirement.

The Durango, Colorado processing site originally consisted of three separate land parcels. The northern parcel contained the mill site, two tailings piles and remnants of old buildings. The southern parcel, located approximately 0.5 miles to the south, contained raffinate ponds, which were used for the disposal and evaporation of contaminated liquids from the mill process. The two sites are connected by a currently impassable service road cut into the face of Smelter Mountain which is the third parcel.

Approximately 2,500,000 cubic yards of contaminated materials which included 1) tailings; 2) subpile soils; 3) surficial materials in the mill yard; 4) windblown materials; and 5) raffinate ponds and contents were removed from the sites from 1987 to 1990. The remediation was conducted in accordance with regulations promulgated by the U.S. Environmental Protection Agency, in 40 CFR 192. These regulations require that the concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than: 5 pCi/g (picocuries per gram), averaged over the first 15 cm (centimeters) of soil below the surface, and 15 pCi/g averaged over 15 cm thick layers of soil more than 15 cm below the surface.

After remediation was complete the sites were backfilled with approximately 230,000 cubic yards of clean material, graded for drainage and revegetated. Backfill materials were routinely analyzed for radium-226 and were determined to have concentrations near background. Material with radium-226 concentrations less than 5 pCi/g were used for surface backfill. Excavation of residual radioactive material was also conducted for Thorium-230 on the southern parcel. For thorium-230, the cleanup standard was determined as a projected 1,000 year Radium-226 concentration based on the eventual decay of the thorium to radium. This resulted in a thorium-230 concentration of approximately 35 pCi/g as the clean-up standard. All verification soil samples from the two sites met the EPA standards of 5 and 15 pCi/g radium 226 plus background (1.6 pCi/g) except for grid H-38-20 which, including the thorium-230 results, after 1000 years would have a projected concentration of 18.6 pCi/g of radium-226. (The actual concentrations at this location are 49.4 pCi/g thorium-230 and 1.8 pCi/g radium-226). This grid is located on the southern parcel, as shown on the attached map.

The northern parcel also contains slag from a lead smelter which operated on the site prior to the construction of the uranium mill. Approximately 200,000 cubic yards of slag remain on the site, covered by 18 to 24 inches of clean backfill and 6 inches of topsoil. The location of the slag is shown on the attached figure. The slag was not removed during remedial action because the material was not included under the UMTRA authority (it did not meet the definition of residual radioactive material).

The EPA regulations also allow for contaminated materials to be left in place where removal would pose a clear and present risk of injury to workers or would produce environmental harm that is excessive compared to the health benefit achieved. These cases are called Supplemental Standards. Supplemental standards were applied to areas on the slope of Smelter Mountain, the banks of the Animas River, and to an area beneath the lead slag. The Supplemental Standards areas are identified on the attached map.

The groundwater beneath both parcels remains contaminated and will be addressed during Phase II of the uranium mill tailings remedial action project. Several groundwater monitor wells are present on each parcel and will remain in place until the U.S. Department of Energy determines that they can be removed.

Additional information concerning the remedial action, groundwater conditions, lead smelter slag and supplemental standards is available from the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division.

## **Appendix B**

### **Environmental Covenants for the Mill Tailings and Raffinate Ponds Areas**

**This property is subject to an Environmental Covenant held by the Colorado Department of Public Health and Environment pursuant to section 25-15-321, C.R.S.**

**ENVIRONMENTAL COVENANT**

By this deed, the City of Durango grants an Environmental Covenant ("Covenant") this 30<sup>th</sup> day of January, 2002 to the Colorado Department of Public Health and the Environment ("the Department") pursuant to § 25-15-321 of the Colorado Hazardous Waste Act, § 25-15-101, *et seq.* The Department's address is 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530.

WHEREAS, the City of Durango is the owner of certain property commonly referred to as the Durango Mill Site North Parcel, located in Durango, La Plata County, Colorado, more particularly described in **Attachment A**, attached hereto and incorporated herein by reference as though fully set forth (hereinafter referred to as "the Property"); and

WHEREAS, uranium mill tailings had been previously disposed on the Property by a previous owner; and

WHEREAS, pursuant to the Site Observational Workplan for the Slick Rock, Colorado UMTRA Project Site, dated September 2001, the Property is the subject of remedial action pursuant to the Uranium Mill Tailings Radiation Control Act, P.L. 95-604 ("UMTRCA") and UMTRCA regulations, 40 C.F.R. § 192 Subpart B, and;

WHEREAS, the City of Durango desires to subject the Property to certain covenants and restrictions as provided in Article 15 of Title 25, Colorado Revised Statutes, which covenants and restrictions shall burden the Property and bind the City of Durango, its heirs, successors, assigns, and any grantees of the Property, their heirs, successors, assigns and grantees, and any users of the Property, for the benefit of the Department.

NOW, THEREFORE, the City of Durango hereby grants this Environmental Covenant to the Department, and declares that the Property as described in Attachment A shall hereinafter be bound by, held, sold, and conveyed subject to the following environmental use restrictions which shall run with the Property in perpetuity and be binding on the City of Durango and all parties having any right, title or interest in the Property, or any part thereof, their heirs, successors and assigns, and any persons using the land. The City of Durango declares that the United States Department of Energy shall be a third party beneficiary of this Environmental Covenant. The City of Durango, its successors, and all parties having any right, title or interest in the Property, or any part thereof, their heirs, successors and assigns shall hereinafter be referred to in this covenant as OWNER.

1. Use restrictions

- A. No habitable structure may be constructed on the property without properly designed radon mitigation.
- B. No wells or drilling or pumping whatsoever shall be permitted or allowed, without the express written consent of the Department. The only exception to the foregoing is for monitoring and remedial wells installed by the Department of Energy, in connection with the on-going, approved remedial activities at the Property.
- C. No tilling, excavation, grading, construction, or any other activity that disturbs the ground surface is permitted on the Property, without the express written consent of the Department.
- D. No activities that will in any way damage any monitoring or remedial wells installed by the Department of Energy, or interfere with the maintenance, operation, or monitoring of said wells is allowed, without the express written consent of the Department.

2. Purpose of this covenant The purpose of this Covenant is to ensure protection of human health and the environment by minimizing the potential for exposure to any hazardous substance, hazardous waste, hazardous constituents, and/or solid waste that remains on the Property. The Covenant will accomplish this by minimizing those activities that result in disturbing the ground surface, and by creating a review and approval process to ensure that any such intrusive activities are conducted with appropriate precautions to avoid or eliminate any hazards.

3. Modifications This Covenant runs with the land and is perpetual, unless modified or terminated pursuant to this paragraph. OWNER may request that the Department approve a modification or termination of the Covenant. The request shall contain information showing that the proposed modification or termination shall, if implemented, ensure protection of human health and the environment. The Department shall review any submitted information, and may request additional information. The Department shall consult with the United States Department of Energy before making any determination on the request for modification. If the Department determines that the proposal to modify or terminate the Covenant will ensure protection of human health and the environment, it shall approve the proposal. No modification or termination of this Covenant shall be effective unless the Department has approved such modification or termination in writing. Information to support a request for modification or termination may include one or more of the following:

- a) a proposal to perform additional remedial work;
- b) new information regarding the risks posed by the residual contamination;
- c) information demonstrating that residual contamination has diminished;
- d) information demonstrating that the proposed modification would not adversely impact the remedy and is protective of human health and the environment; and other appropriate supporting information.

4. Conveyances OWNER shall notify the Department at least fifteen (15) days in advance of any proposed grant, transfer or conveyance of any interest in any or all of the Property.
5. Incorporation OWNER agrees to incorporate either in full or by reference the restrictions of this Covenant in any leases, licenses, or other instruments granting a right to use the Property.
6. Notification for proposed construction and land use OWNER shall notify the Department simultaneously when submitting any application to a local government for a building permit or change in land use.
7. Inspections The Department shall have the right of entry to the Property at reasonable times with prior notice for the purpose of determining compliance with the terms of this Covenant. Nothing in this Covenant shall impair any other authority the Department may otherwise have to enter and inspect the Property.
8. No Liability The Department does not acquire any liability under State law by virtue of accepting this Covenant, nor does any other named beneficiary of this Covenant acquire any liability under State law by virtue of being such a beneficiary.
9. Enforcement The Department may enforce the terms of this Covenant pursuant to §25-15-321. C.R.S. City of Durango and any named beneficiaries of this Covenant may file suit in district court to enjoin actual or threatened violations of this Covenant.
10. Owner's Compliance Certification OWNER shall submit an annual form or letter to the Department, on the anniversary of the date this Covenant was signed by the City of Durango, detailing OWNER's compliance, and any lack of compliance, with the terms of this Covenant.
11. Notices Any document or communication required under this Covenant shall be sent or directed to:

Jeffrey Deckler  
Remedial Programs Manager  
Colorado Department of Public Health and the Environment  
4300 Cherry Creek Drive South  
Denver, Colorado 80246-1530

Don Metzler  
U.S. Department of Energy  
Grand Junction Office  
2597 B ¾ Road  
Grand Junction, CO 81503

City of Durango, has caused this instrument to be executed this \_\_\_\_ day of \_\_\_\_\_, 2002.



The foregoing instrument was acknowledged before me this \_\_\_\_ day of \_\_\_\_\_, 2002  
by \_\_\_\_\_ on behalf of the Colorado Department of Public Health and  
Environment.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
Address  
\_\_\_\_\_

My commission expires: \_\_\_\_\_

**This property is subject to an Environmental Covenant held by the Colorado Department of Public Health and Environment pursuant to section 25-15-321, C.R.S.**

**ENVIRONMENTAL COVENANT**

By this deed, the Animas - La Plata Water Conservation District grants an Environmental Covenant ("Covenant") this 30<sup>th</sup> day of January, 2002 to the Colorado Department of Public Health and the Environment ("the Department") pursuant to § 25-15-321 of the Colorado Hazardous Waste Act, § 25-15-101, *et seq.* The Department's address is 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530.

WHEREAS, the Animas - La Plata Water Conservation District is the owner of certain property commonly referred to as the Durango Mill Site South Parcel, located in Durango, La Plata County, Colorado, more particularly described in **Attachment A**, attached hereto and incorporated herein by reference as though fully set forth (hereinafter referred to as "the Property"); and

WHEREAS, uranium mill tailings had been previously disposed on the Property by a previous owner; and

WHEREAS, pursuant to the Site Observational Workplan for the Slick Rock, Colorado UMTRA Project Site, dated September 2001, the Property is the subject of remedial action pursuant to the Uranium Mill Tailings Radiation Control Act, P.L. 95-604 ("UMTRCA") and UMTRCA regulations, 40 C.F.R. § 192 Subpart B, and;

WHEREAS, the Animas - La Plata Water Conservation District desires to subject the Property to certain covenants and restrictions as provided in Article 15 of Title 25, Colorado Revised Statutes, which covenants and restrictions shall burden the Property and bind the Animas - La Plata Water Conservation District, its heirs, successors, assigns, and any grantees of the Property, their heirs, successors, assigns and grantees, and any users of the Property, for the benefit of the Department.

NOW, THEREFORE, the Animas - La Plata Water Conservation District hereby grants this Environmental Covenant to the Department, and declares that the Property as described in Attachment A shall hereinafter be bound by, held, sold, and conveyed subject to the following environmental use restrictions which shall run with the Property in perpetuity and be binding on the Animas - La Plata Water Conservation District and all parties having any right, title or interest in the Property, or any part thereof, their heirs, successors and assigns, and any persons using the land. The Animas - La Plata Water Conservation District declares that the United States Department of Energy shall be a third party beneficiary of this Environmental Covenant. The Animas - La Plata Water Conservation District, its successors, and all parties having any

right, title or interest in the Property, or any part thereof, their heirs, successors and assigns shall hereinafter be referred to in this covenant as OWNER.

1. Use restrictions

- E. No habitable structure may be constructed on the property without properly designed radon mitigation.
- F. No wells or drilling or pumping whatsoever shall be permitted or allowed, without the express written consent of the Department. The only exception to the foregoing is for monitoring and remedial wells installed by the Department of Energy, in connection with the on-going, approved remedial activities at the Property.
- G. No tilling, excavation, grading, construction, or any other activity that disturbs the ground surface is permitted on the Property, without the express written consent of the Department.
- H. No activities that will in any way damage any monitoring or remedial wells installed by the Department of Energy, or interfere with the maintenance, operation, or monitoring of said wells is allowed, without the express written consent of the Department.

2. Purpose of this covenant The purpose of this Covenant is to ensure protection of human health and the environment by minimizing the potential for exposure to any hazardous substance, hazardous waste, hazardous constituents, and/or solid waste that remains on the Property. The Covenant will accomplish this by minimizing those activities that result in disturbing the ground surface, and by creating a review and approval process to ensure that any such intrusive activities are conducted with appropriate precautions to avoid or eliminate any hazards.

3. Modifications This Covenant runs with the land and is perpetual, unless modified or terminated pursuant to this paragraph. OWNER may request that the Department approve a modification or termination of the Covenant. The request shall contain information showing that the proposed modification or termination shall, if implemented, ensure protection of human health and the environment. The Department shall review any submitted information, and may request additional information. The Department shall consult with the United States Department of Energy before making any determination on the request for modification. If the Department determines that the proposal to modify or terminate the Covenant will ensure protection of human health and the environment, it shall approve the proposal. No modification or termination of this Covenant shall be effective unless the Department has approved such modification or termination in writing. Information to support a request for modification or termination may include one or more of the following:

- e) a proposal to perform additional remedial work;
- f) new information regarding the risks posed by the residual contamination;
- g) information demonstrating that residual contamination has diminished;

- h) information demonstrating that the proposed modification would not adversely impact the remedy and is protective of human health and the environment; and other appropriate supporting information.
4. Conveyances OWNER shall notify the Department at least fifteen (15) days in advance of any proposed grant, transfer or conveyance of any interest in any or all of the Property.
5. Incorporation OWNER agrees to incorporate either in full or by reference the restrictions of this Covenant in any leases, licenses, or other instruments granting a right to use the Property.
6. Notification for proposed construction and land use OWNER shall notify the Department simultaneously when submitting any application to a local government for a building permit or change in land use.
7. Inspections The Department shall have the right of entry to the Property at reasonable times with prior notice for the purpose of determining compliance with the terms of this Covenant. Nothing in this Covenant shall impair any other authority the Department may otherwise have to enter and inspect the Property.
8. No Liability The Department does not acquire any liability under State law by virtue of accepting this Covenant, nor does any other named beneficiary of this Covenant acquire any liability under State law by virtue of being such a beneficiary.
9. Enforcement The Department may enforce the terms of this Covenant pursuant to §25-15-321. C.R.S. the Animas - La Plata Water Conservation District and any named beneficiaries of this Covenant may file suit in district court to enjoin actual or threatened violations of this Covenant.
10. Owner's Compliance Certification OWNER shall submit an annual form or letter to the Department, on the anniversary of the date this Covenant was signed by the Animas - La Plata Water Conservation District, detailing OWNER's compliance, and any lack of compliance, with the terms of this Covenant.
11. Notices Any document or communication required under this Covenant shall be sent or directed to:

Jeffrey Deckler  
Remedial Programs Manager  
Colorado Department of Public Health and the Environment  
4300 Cherry Creek Drive South  
Denver, Colorado 80246-1530

Don Metzler  
U.S. Department of Energy  
Grand Junction Office  
2597 B  $\frac{3}{4}$  Road  
Grand Junction, CO 81503



STATE OF \_\_\_\_\_ )  
 ) ss:  
COUNTY OF \_\_\_\_\_ )

The foregoing instrument was acknowledged before me this \_\_\_ day of \_\_\_\_\_, 2002  
by \_\_\_\_\_ on behalf of the Colorado Department of Public Health and  
Environment.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
Address

\_\_\_\_\_

My commission expires: \_\_\_\_\_

## **Appendix C**

### **Quitclaim Deed for Raffinate Ponds Area**

Recorded at \_\_\_\_\_ o'clock \_\_\_\_\_ M.,  
Reception No. \_\_\_\_\_

Recorder

QUIT CLAIM DEED

The Colorado Department of Public Health and the Environment ("Grantor"), whose address is 4300 Cherry Creek Drive South, Denver, Colorado, 80222-1530, City and County of Denver, State of Colorado, pursuant to 42 U.S.C. § 7914 (e) (1) (B) and C.R.S. § 25-11-303, hereby donates and quit claims to the Colorado Water Conservation Board ("Grantee"), whose address is 1313 Sherman Street, Denver, Colorado, 80203, City and County of Denver, State of Colorado, the following real property in the County of La Plata, State of Colorado, to wit: A parcel of land in LaPlata County, State of Colorado, New Mexico Principal Meridian, containing Forty-six and twenty-seven hundredths (46.27) acres, more or less, described as follows:

STATE DOCUMENTARY FEE  
DATE 9.9.98  
3.450 mpt

Township 35 North, Range 9 West of the N.M.P.M., North of the Ute Line

That part of lots 4 and 11, in the West Half (W 1/2) of Section 32, and more particularly described as follows:

BEGINNING at a point on the South line of Lot 11 of said Section 32, whence the North West Section Corner of said Section 32 bears North 13° 40' 38" West, 4131.17 feet.

- THENCE North 01° 01' 00" East, 931.06 feet;
- THENCE South 88° 22' 00" West, 35.64 feet, to the West line of said Lot 11;
- THENCE North 00° 59' 00" East, 338.58 feet, along the line between Lot 11 and Lot 12, to the common corner of Lots 4, 6, 11 & 12 of said Section 32;
- THENCE North 00° 59' 00" East, 706.86 feet, along the line between Lot 4 and Lot 6 of said Section 32;
- THENCE North 00° 59' 00" East, 630.46 feet, along the line between Lot 4 and Lot 5 of said Section 32;
- THENCE North 00° 41' 00" East, 295.30 feet, along the line between Lot 4 and Lot 5 of said Section 32;
- THENCE North 00° 41' 00" East, 238.17 feet, along the line between Lot 4 and Lot 5, to the centerline of the Animas River;
- THENCE South 35° 48' 00" East, 200.13 feet, along the said centerline of the Animas River;
- THENCE South 40° 31' 00" East, 295.00 feet, along the said centerline of the Animas River;
- THENCE South 40° 04' 00" East, 129.00 feet, along the said centerline of the Animas River;
- THENCE South 31° 16' 00" East, 189.88 feet, along the said centerline of the Animas River;
- THENCE South 45° 29' 00" East, 169.80 feet, along the said centerline of the Animas River;
- THENCE South 43° 18' 00" East, 56.70 feet, along the said centerline of the Animas River to the West Right-of-Way line of Highway 550-160;
- THENCE South 07° 56' 00" East, 274.58 feet along the West Right-of-Way line of Highway 550-160;
- THENCE South 07° 56' 00" East, 360.22 feet, along the West Right-of-Way line of Highway 550-160;
- THENCE South 02° 04' 00" East, 292.30 feet, along the West Right-of-Way line of Highway 550-160;
- THENCE South 05° 49' 30" West, 617.10 feet, along the West Right-of-Way line of Highway 550-160;
- THENCE South 01° 04' 15" West, 408.02 feet, along the West Right-of-Way line of Highway 550-160, to the beginning of a curve concave to the Southeast having a radius of 173.00 feet;
- THENCE Southwesterly 325.18 feet along said curve through a central angle of 106° 27' 55", along the West Right-of-Way line of Highway 550-160 to the North Right-of-Way line of LaPlata County Road 211;
- THENCE South 62° 10' 19" West, 634.29 feet along said North Right-of-Way line of LaPlata County Road 211, to the South line of said Lot 11;
- THENCE South 37° 41' 00" West, 64.16 feet, along the South line of said Lot 11, to the point of beginning.

Including the V.C.A.-Animas Pipeline Water Right Priority No. 1968-1, decreed by the La Plata County District Court on May 3, 1963 in Civil Action No. 1731-B for 4.01 cubic feet of water per second, with an appropriation date on or about December 31, 1890 and priority date of February 20, 1963, and with the headgate of said pipeline located on a point on the west bank of the Animas River, whence the West Quarter Corner of Section 29, Township 35 North, Range 9 West of the N.M.P.M. bears North 20° 53' West 1,310.5 feet.

Subject to: (i) any coal, oil, gas, or other mineral rights in any person; (ii) existing rights-of-way for roads, railroads, telephone lines, transmission lines, utilities, ditches, conduits, or pipelines on, over, or across said lands; (iii) court liens, judgments, or financial encumbrances such as deeds of trust for which a formal consent or order has been obtained from a court for the lien holder; (iv) other rights, interests, reservation or exceptions of record; and the following terms, conditions, rights, reservations and covenants:

Grantor reserves (i) to itself, the U. S. Department of Energy, their employees, agents and contractors the right of access to the property as may be necessary to complete activities under the Uranium Mill Tailings Radiation Control Act of 1973, 42 U.S.C. § 7901 et seq. ("UMTRCA") and for other lawful purposes; and (ii) to itself and the U.S. Department of Energy, their employees, agents and contractors the right to use the V.C.A.-Animas Pipeline Water Right Priority No. 1968-1, described above as may be necessary to perform groundwater remediation and any other activities as may be necessary to fulfill the requirements of UMTRCA, until such time as Grantor and the U.S. Department of Energy determine that all remedial activities are complete;

Grantee covenants (i) not to use the property for any purpose other than public purposes as required by UMTRCA, 42 U.S.C. § 7901 et seq., as amended; (ii) not to use ground water from the site for any purpose, and not to construct wells or any means of exposing ground water to the surface unless prior written approval is given by the Grantor and the U.S. Department of Energy; (iii) not to sale or transfer the land to anyone other than a governmental entity within the state; (iv) not to perform construction of any kind on the property unless prior written approval of construction plans, designs and specifications is given by Grantor and the U.S. Department of Energy; (v) that any habitable structures constructed on the property shall employ a radon ventilation system or other radon mitigation measures; and (vi) that its use of the property shall not adversely impact groundwater quality nor interfere with groundwater remediation under UMTRCA;

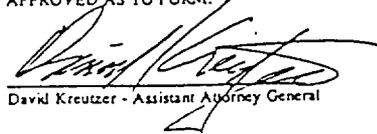
These covenants are made in favor and to the benefit of Grantor, shall run with the land and be binding upon Grantee and its successors and assigns, and shall be enforceable by Grantor and its successors and assigns;

Grantee acknowledges that the property was once used as a uranium milling site, and that the Grantor makes no representations or warranties that the property is suitable for Grantee's purposes;

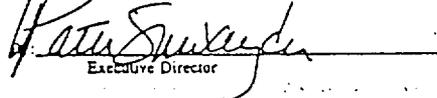
IN WITNESS WHEREOF,

GRANTOR:

APPROVED AS TO FORM:

  
David Kreutzer - Assistant Attorney General

STATE OF COLORADO  
Roy Romer, Governor  
Acting by and through  
The Department of Public Health and Environment

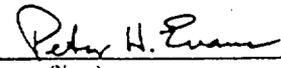
  
Peter Swartz  
Executive Director

By:   
Program Approval

ACCEPTANCE OF DEED  
AND COVENANTS

STATE OF COLORADO  
Roy Romer, Governor  
Acting by and through  
Colorado Water Conservation Board

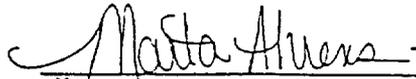
(Full Legal Name or Agency)

By:   
Peter H. Evans  
(Name)

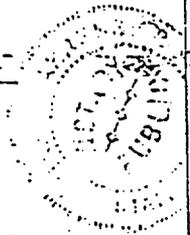
Title: \_\_\_\_\_  
Acting Director

(Affix Seal)

Subscribed and sworn to me this 25<sup>th</sup> day of June, 1998.

  
Notary

MY COMMISSION EXPIRES:  
December 10, 2001



Signed this 1<sup>st</sup> day of JULY 1998

STATE OF COLORADO.

County of DENVER

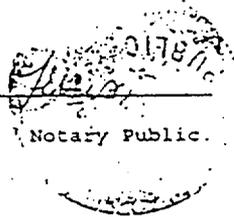
} ss.

The foregoing instrument was acknowledged before me this 1<sup>st</sup> day of JULY 1998 by PATTI SHWAYDER

My commission expires OCTOBER 21, 1999

Witness my hand and official seal

Claudette M. [Signature]



Notary Public.

## ATTACHMENT A

## LAND ANNOTATION

## DURANGO, COLORADO PROCESSING SITE

## NORTHERN, MIDDLE AND SOUTHERN PARCELS

The Uranium Mill Tailings Radiation Control Act (Public Law 95-604), Section 104, requires that the State notify any person who acquires a designated processing site of the nature and extent of residual radioactive materials removed from the site, including notice of the date when such action took place, and the condition of the site after such action. The following information is provided to fulfill this requirement.

The Durango, Colorado processing site originally consisted of three separate land parcels. The northern parcel contained the mill site, two tailings piles and remnants of old buildings. The southern parcel, located approximately 0.5 miles to the south, contained raffinate ponds, which were used for the disposal and evaporation of contaminated liquids from the mill process. The two sites are connected by a currently impassable service road cut into the face of Smelter Mountain which is the third parcel.

Approximately 2,500,000 cubic yards of contaminated materials which included 1) tailings; 2) subpile soils; 3) surficial materials in the mill yard; 4) windblown materials; and 5) raffinate ponds and contents were removed from the sites from 1987 to 1990. The remediation was conducted in accordance with regulations promulgated by the United States Environmental Protection Agency (EPA), in 40 CFR 192. These regulations require that the concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than: 5 pCi/g (picocuries per gram), averaged over the first 15 cm (centimeters) of soil below the surface, and 15 pCi/g averaged over 15 cm thick layers of soil more than 15 cm below the surface.

After remediation was complete the sites were backfilled with approximately 230,000 cubic yards of clean material, graded for drainage and revegetated. Backfill materials were routinely analyzed for radium-226 and were determined to have concentrations near background. Material with radium-226 concentrations less than 5 pCi/g were used for surface backfill. Excavation of residual radioactive material was also conducted for Thorium-230 on the southern parcel. For thorium-230, the cleanup standard was determined as a projected 1,000 year Radium-226 concentration based on the eventual decay of the thorium to radium. This resulted in a thorium-230 concentration of approximately 35 pCi/g as the clean-up standard. All verification soil samples from the two sites met the EPA standards of 5 and 15 pCi/g radium 226 plus background (1.6 pCi/g) except for grid H-38-20 which, including the thorium-230 results, after 1000 years would have a projected concentration of 18.6 pCi/g of radium-226. (The actual concentrations at this location are 49.4 pCi/g thorium-230 and 1.8 pCi/g radium-226). This grid is located on the southern parcel, as shown on the attached map. This grid is covered with 2.5 to 5 feet of clean backfill.

The northern parcel also contains slag from a lead smelter which operated on the site prior to the construction of the uranium mill. Approximately 200,000 cubic yards of slag remain on the site, covered by 18 to 24 inches of clean backfill and 6 inches of topsoil. The location of the slag is shown on the attached figure. The slag was not removed during remedial action because the material was not included under the UMTRA authority (it did not meet the definition of residual radioactive material).

The EPA regulations also allow for contaminated materials to be left in place where removal would pose a clear and present risk of injury to workers or would produce environmental harm that is excessive compared to the health benefit achieved. These cases are called Supplemental Standards. Supplemental standards were applied to areas on the slope of Smelter Mountain, the banks of the Animas River, and to an area beneath the lead slag. The Supplemental Standards areas are identified on the attached map.

The groundwater beneath both parcels remains contaminated and will be addressed during Phase II of the uranium mill tailings remedial action project. Several groundwater monitor wells are present on each parcel and will remain in place until the U.S. Department of Energy determines that they can be removed.

Additional information concerning the remedial action, groundwater conditions, lead smelter slag and supplemental standards is available from the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division.



**Attachment**

**Alternate Concentration Limits Application**

**Application for Alternate Concentration Limits  
for the Mill Tailings Area at the Durango, Colorado, UMTRA Project Site**

May 2002

Prepared by  
U.S. Department of Energy  
Grand Junction Office  
Grand Junction, Colorado

Work Performed under DOE Contract No. DE-AC13-96GJ87335

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## 1.0 Introduction

### 1.1 Purpose

The purpose of this document is to fulfill the Nuclear Regulatory Commission (NRC) requirements for an application for Alternate Concentration Limits (ACLs) for selenium at the Uranium Mill Tailings Remedial Action (UMTRA) Project Durango Site, Colorado. Specifically, the focus is on the mill tailings area portion of the site. Much of the information required by the NRC for an ACL application (10 CFR Part 40, Appendix A and NRC 1996) has been compiled in the Site Observational Work Plan (SOWP; DOE 2002) for Durango as well as the Ground Water Compliance Action Plan (GCAP). This document is an addendum to the GCAP. The intent of this addendum is not to duplicate information found elsewhere, but to provide a link between NRC evaluation criteria and relevant detailed discussion pertaining to those criteria in previously prepared documents. NRC guidance for preparing ACL applications for Title II sites (NRC 1996) was used as a model for this application. This document summarizes pertinent information from the SOWP regarding “Factors Considered in Making Present and Potential Hazard Findings” (Table 1 in NRC 1996; also specified in 40 CFR Part 192 with slight modifications). It also identifies sections of the SOWP that contain information corresponding to sections listed in the “Standard ACL Application Format” (Table 2 in NRC 1996). This ensures that all factors and information related to the proposed ACLs have been considered, while minimizing duplication of effort.

NRC’s ACL guidance was prepared for Title II UMTRA sites. It is also noted that the guidance can be applied to Title I sites, with modifications made to accommodate the differences between Title II and Title I sites. One of the major differences between these sites is that the regulations for Title I sites (40 CFR Part 192) permit natural flushing as the selected ground water compliance strategy, providing that ground water will reach acceptable levels (UMTRA standards, background, or ACLs) within a period of 100 years. Active remediation alternatives may not be evaluated for sites meeting this criterion, as indicated in the flow chart in Figure 1 of the GCAP. Therefore, data corresponding to the corrective action assessment portion of the standard ACL application may be quite limited, as is the case for the Durango site.

Section 2.0 of this document briefly discusses the constituents for which ACLs are proposed and the rationale for the numerical values. Section 3.0 summarizes the factors considered in making hazard findings. Section 4.0 presents the “roadmap” to the SOWP following the standard ACL application format. References are included in Section 5.0.

### 1.2 Brief Site Background

The Durango UMTRA Project site lies outside the city limits, about 0.25 mile from the central business district of Durango (Figure 1). The mill was constructed in 1941 to produce vanadium; uranium production began in 1943. Ore was delivered to the mill from various mines in the Uravan mineral belt.

The mill tailings area encompasses approximately 40 acres. It is on a bedrock-supported river terrace between Smelter Mountain to the west, the Animas River to the east and south, and Lightner Creek to the north (Figure 2). A lead smelter near the south end of the mill tailings area operated from 1880 to 1930. Slag from the smelter operation was deposited at the southeast corner of the area along the edge of the Animas River.



Figure 1. Former Durango Processing Site, Durango, Colorado

C-10



Figure 2. Mill Tailings Area, Durango, Colorado

C-11

In 1941 the United States Vanadium Corporation (USV) built a mill on the site of the old lead smelter to furnish vanadium to the Metals Reserve Company, a company established by the federal government to purchase strategic materials needed during World War II. Starting in 1943, USV also reprocessed the vanadium tailings to recover uranium for the Manhattan Project. The mill was closed in 1946.

In 1949, the USV mill was reopened by the Vanadium Corporation of America (VCA) and operated until March 1963 under a contract to sell uranium to the U.S. Atomic Energy Commission (AEC). VCA retained ownership of the millsite and adjoining property until 1967 when VCA merged into Foote Mineral Company. In 1976 and 1977, the site was purchased by Ranchers Exploration and Development Corporation (REDC); REDC was subsequently acquired by Hecla Mining Company in 1984.

Prior to surface remediation, the State of Colorado acquired the site. The State has subsequently deeded the mill tailings area property to the City of Durango. DOE began relocating the tailings piles, mill debris, and contaminated soils from the mill tailings area to the Bodo Canyon disposal site in November 1986; remedial action was completed in May 1991. Following removal of the contaminated material at the site, uncontaminated soil was backfilled and contoured for site drainage and seeded with native vegetation. Additional background information is provided in the SOWP for the Durango site (DOE 2002).

## 2.0 Proposed ACL

An ACL is proposed for selenium at the Durango mill tailings area site. An ACL for selenium is required because background ground water concentrations exceed the UMTRA standard of 0.01 mg/L and modeling has shown that it will not naturally flush to the UMTRA standard within the 100 years permitted for natural flushing. However, it will flush to a concentration that is protective for drinking water purposes.

A selenium concentration of 0.05 mg/L is proposed as the ACL. This value corresponds to the federal primary drinking water standard and the State of Colorado ground water standard. This concentration is also less than the risk-based concentration of 0.18 mg/L, which is protective for use of water for drinking water on a regular basis (EPA 2002; EPA Region III risk-based concentration table). After 100 years of natural flushing, the ACL will be met at all points of compliance (POC) wells—all wells in the monitoring network.

Ground water modeling predicts that selenium will reach its proposed ACL within the 100-year period for which natural flushing of ground water is permitted. Institutional controls will prevent ground water use during this time period. The only potentially complete exposure pathway would be where ground water discharges to the Animas River (the point of exposure—POE). Dilution of contaminants as ground water enters the river ensures protection of human health and the environment. The applicable surface water standard of 0.046 mg/L will be met at the POE in the Animas River during and after the natural flushing period.

### 3.0 Factors Considered In Making Present And Potential Hazard Findings

The list of factors below is from the Title I regulations [40 CFR 192.02(c)(3)(ii)(B)(1) and (2), which differ slightly from those in the NRC Title II guidance, and add another factor to the ground water quality list.

#### 3.1 Potential Adverse Effects on Ground Water Quality

- 3.1.1 **The physical and chemical characteristics of constituents in the residual radioactive material at the site, including their potential for migration.** No disposal cell is present at the site. Surface remediation was completed in 1991. Subpile soil analysis indicates that no significant contamination remains in place that would contribute to ground water contamination (see SOWP, Section 4.4.3).
- 3.1.2 **The hydrogeological characteristics of the site and surrounding land.** The hydrogeology of the site was characterized for input to the flow and transport model (see SOWP, Section 5.2 "Hydrogeology"). There are no surface expressions of contaminated ground water on site.
- 3.1.3 **The quantity of ground water and the direction of ground water flow.** Ground water flow in the alluvial aquifer is generally to the east and southeast toward the Animas River. Hydraulic conductivity ranges from 21 to 66 ft/day depending on location and proximity to recharge areas. The volume of selenium-contaminated ground water that exceeds the UMTRA standard is estimated at approximately 3.5 million gallons.
- 3.1.4 **The proximity and withdrawal rates of ground water users.** Selenium contamination is confined to the alluvial aquifer and there are no alluvial ground water users located in the vicinity of the site. The nearest known downgradient well is east of U.S. Highway 550, approximately 0.7 mile southeast of the mill tailings area, and on the west side of the Animas River. However, this well is under a building and has never been used because of a black discoloration of the water (DOE 1994a). Additional wells are on the east side of the Animas River and are at distances ranging from 0.8 to 1.5 miles from the site. All other known wells are north of Lightner Creek, and none of these wells would be affected by contaminated ground water from the site.
- 3.1.5 **The current and future uses of ground water in the region surrounding the site.** Development and utility policies for the City of Durango prohibit the drilling of private wells within the city limits. Contamination is restricted to the site, which is owned by the City of Durango. The deed for the property has a restriction which prohibits use of ground water for any purpose unless written approval is obtained by both the Colorado Department of Public Health (CDPHE) and the Department of Energy (DOE).

- 3.1.6 **The existing quality of ground water, including other sources of contamination and their cumulative impact on ground water quality.** Background alluvial ground water quality is variable, with some constituents such as manganese and sulfate exceeding secondary water quality standards. Background concentrations of selenium are above the UMTRA ground water standard of 0.01 mg/L.
- 3.1.7 **The potential for health risks caused by human exposure to constituents.** The only potentially unacceptable risks to humans would occur through regular use of alluvial ground water as drinking water in a residential scenario, which currently does not exist. The only potential exposure would occur where ground water discharges to the Animas River, and the river dilutes concentrations to acceptable levels. After 100 years of natural flushing, use of ground water as drinking water would not pose risks any greater than using background ground water. Institutional controls will ensure that alluvial ground water will not be used in any manner resulting in human health risks.
- 3.1.8 **The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents.** There are currently no exposures of wildlife, crops, or vegetation to selenium-contaminated ground water. There are no physical structures on site; exposure of physical structures to ground water would result in no physical damage. Water from the site discharges into the Animas River and is rapidly diluted to background levels, leaving aquatic life unaffected. Institutional controls will prevent exposure of wildlife, crops, and vegetation to contamination. Eventually, contaminant levels will be low enough that exposure to ground water would result in no potential damage.
- 3.1.9 **The persistence and permanence of the potential adverse effects.** Contaminants in ground water could remain elevated for the entire 100-year natural flushing period. However, no adverse effects will result because use of ground water for any purpose will be prohibited.
- 3.1.10 **The presence of underground sources of drinking water and exempted aquifers identified under §144.7 of this chapter.** There are no sources of drinking water or exempted aquifers that can be affected by contamination at the site. The main source of domestic water is surface water which is unaffected by contamination.

## 3.2 Potential Adverse Effects on Hydraulically Connected Surface Water Quality

- 3.2.1 **The volume and physical and chemical characteristics of the residual radioactive material at the site.** No disposal cell is present at the site. Surface remediation was completed in 1991. Subpile soil analysis indicates that no significant contamination remains in place that would contribute to ground water contamination (see SOWP, Section 4.4.3).
- 3.2.2 **The hydrogeological characteristics of the site and surrounding land.** The hydrogeology of the site was characterized for input to the flow and transport model (see SOWP, Section 5.1 "Hydrogeology"). There are no surface expressions of contaminated ground water on site.

- 3.2.3 **The quantity and quality of ground water and the direction and of ground water flow.** Ground water flow is generally east to southeast at a rate ranging from 21 to 66 ft/day. Background ground water quality exceeds applicable standards for some constituents such as manganese and sulfate.
- 3.2.4 **The patterns of rainfall in the region.** The site receives on average approximately 20 inches of total precipitation per year. Rainfall occurs in heavy rainstorms from May through October. Winter precipitation occurs as snowfall. Precipitation events have no measurable effect on quality of water in the Animas River as a result of site contamination.
- 3.2.5 **The proximity of the site to surface waters.** Lightner Creek and the Animas River form the northeastern boundary of the site.
- 3.2.6 **The current and future uses of surface waters in the region surrounding the site and any water-quality standards established for those surface waters.** The Animas River in the site vicinity is classified for use as recreation, water supply, and agriculture. Water quality standards for the river are established in Regulation No. 34 of CDPHE's Water Quality Control Commission. The river water in the site vicinity does not exceed any of these standards or any of the Colorado state standards established for agricultural water use or water quality criteria for aquatic life. For details about surface water quality, see Section 5.3 of the SOWP.
- 3.2.7 **The existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality.** Water in the Animas River in the vicinity of the site is designated high quality by the State of Colorado. The site has only a minor impact on the river water quality which is not considered to be significant. Selenium concentrations are within the range of background.
- 3.2.8 **The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents.** There is no potential damage as site contamination has no significant impact on Animas River quality.
- 3.2.9 **The persistence and permanence of potential adverse effects.** No adverse affects are currently present in the Animas River and none are expected in the future.

## 4.0 "Roadmap" to the Durango SOWP

### 4.1 General Information

- 4.1.1 Introduction—Section 1.0 of SOWP
- 4.1.2 Facility Description—Section 3.2 of SOWP
- 4.1.3 Extent of Ground Water Contamination—Section 5.3.2 of SOWP
- 4.1.4 Current Ground Water Protection Standards—Table 6-1 of SOWP
- 4.1.5 Proposed Alternate Concentration Limits—Section 7.2.3 of GCAP

## 4.2 Hazard Assessment

Generally corresponds to Section 6 of SOWP, which contains human health and ecological risk assessments

- 4.2.1 Source and Contamination Characterization—Sections 3.2 and 5.3.2 and Table 6–1 of SOWP
- 4.2.2 Transport Assessment—Section 5.3.4 and Appendix G of SOWP
- 4.2.3 Exposure Assessment—Sections 6.1.3 and 6.1.4 of SOWP for human health; Sections 6.2 for ecological risk

## 4.3 Corrective Action Assessment

A detailed corrective action assessment was not completed for the Durango mill tailings area site because it was determined that no remediation with the application of an ACL was preferred over active remediation. However, a qualitative discussion of corrective action measures is included below. Evaluations completed for other similar UMTRA ground water sites were used as a basis for this assessment.

### 4.3.1 Results of Corrective Action Program

Surface remediation at the Durango site commenced in 1986 and was completed in 1991. Tailings and other contaminated surface material totaling approximately 2.5 million cubic yards were placed in the Bodo Canyon disposal cell located about 1.5 miles southwest of the processing site. Supplemental standards were applied to unreachable areas of windblown soil contamination left in place on the slope of Smelter Mountain and in two regions along the banks of the Animas River. In addition, a small lens of uranium ore was left in place at the mill tailings area below the layers of lead slag along portions of the river bank (DOE 1994b).

The City of Durango currently owns the mill tailings area site. A deed restriction has been placed on the property that prohibits use of ground water for any purpose without permission of both DOE and CDPHE. This restriction is essentially perpetual, though it can be lifted once concentrations have decreased to levels that permit unrestricted use.

### 4.3.2 Feasibility of Alternative Corrective Actions

DOE has performed remedial action at the Durango mill tailings site to mitigate exposures to contaminated soils. The cleanup effectively removed the source of the contaminants that were potentially affecting ground water. However, residual contamination does exist in ground water. Background concentrations of selenium in the alluvial aquifer exceed the UMTRA standard of 0.01 mg/L, so it is not realistic to believe that the UMTRA standard can be achieved. However, modeling indicates that the federal primary drinking water standard of 0.05 mg/L selenium (which is also the State of Colorado ground water standard) can be achieved within 100 years by natural flushing. This concentration is proposed as the ACL.

The presumptive remedy for contaminated ground water sites is removal by pumping followed by some form of ex situ treatment (“pump and treat”), which is contaminant-dependent (EPA 1993, EPA 1996). Because background ground water concentrations exceed the UMTRA standard, a pump and treat system would not be effective in achieving that standard. Based on

the most recent sampling data (August 2001), only a single location exceeded the proposed ACL and only marginally so. All current and historic selenium concentrations have been less than the risk-based concentration for selenium of 0.18 mg/L, which is protective of human health for drinking water on a regular basis (EPA 2002). Therefore, pursuing active remediation at the site would provide no risk-reduction benefit.

#### 4.3.3 Corrective Action Costs

Cost estimates were not prepared for the Durango mill tailings site remedial alternatives, as a comparative analysis of alternatives was not completed for the Durango SOWP. Because an active remediation system will not result in any tangible risk reduction compared to natural flushing, any costs that would be incurred by implementing active remediation would be considered to be excessive. Cleanup costs estimated for a similar UMTRA ground water site in Naturita, Colorado, ranged from \$2.5 million to \$5 million (DOE 2001). It is reasonable to think that similar costs could be incurred for active remediation of the Durango mill tailings area.

#### 4.3.4 Corrective Action Benefits

After 100 years of natural flushing, the maximum concentration of selenium would be reduced below the state ground water and federal primary drinking water standard of 0.05 mg/L. Current concentrations of selenium are below the risk-based concentration for regular use as drinking water. Active remediation might be able to further reduce this concentration, but there are few, if any, tangible benefits from doing so. Restrictions are in place that prohibit ground water use. Background ground water in the area is generally poor with high concentrations of manganese, sulfate, and TDS. High quality water is provided by surface water in the area (Florida and Animas Rivers). Therefore, remediation of the alluvial aquifer to reduce concentrations of selenium provides no real benefit.

#### 4.3.5 ALARA Demonstration

The As Low As Reasonable Achievable (ALARA) concept does not directly apply to the ACL proposed for selenium because the intent of ALARA is to limit exposure to radioactivity. However, the general goal of achieving a cleanup goal that is as low as can reasonably be met is satisfied by applying an ACL for selenium at the site. As described above, it would not be reasonable to pursue active remediation for the very small amount of potential risk reduction that could be realized by doing so, particularly considering the availability of alternative water sources, the deed restriction prohibiting ground water use, and the generally poor quality of background ground water.

### 4.4 Proposed Alternate Concentration Limit

4.4.1 Proposed Alternate Concentration Limits—Section 2.5 of GCAP

4.4.2 Proposed Implementation Measures—Section 7.2 of SOWP; Sections 3.1 and 3.3 of the GCAP)

### 4.5 References—Section 8 of SOWP

## 4.6 Appendices and Supporting Information—Appendices A through J of SOWP

### 5.0 References

10 CFR Part 40. "Domestic Licensing of Source Material," *U.S. Code of Federal Regulations*, June 1, 1994.

40 CFR Part 192. "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *U.S. Code of Federal Regulations*, July 1, 1996.

Colorado Department of Public Health and Environment Water Quality Control Commission. Regulation No. 34, *Classifications and Numeric Standards for the San Juan and Dolores River Basin*, February 20, 2002.

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