Department of Energy
Office of Legacy Management

JUL 28 2009

Mr. Mike Fliegel
U.S. Nuclear Regulatory Commission
Fuel Cycle Facilities Branch
Mail Stop T8 F5
Washington, DC 20555-0001

Subject: Response to U.S. Nuclear Regulatory Commission Request for Additional Information—Site Observational Work Plan and Draft Ground Water Compliance Action Plan for the Naturita, Colorado, UMTRA Project Site

Dear Mr. Fliegel:

By letter dated May 31, 2005, NRC submitted the subject *Request for Additional Information* (RAI) in response to DOE's September 19, 2002, submittal of the May 2002 *Site Observational Work Plan* (SOWP) and the September 2002 *Draft Ground Water Compliance Action Plan* (GCAP) for the Naturita, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) project site. DOE's response to the RAI is enclosed.

This submittal incorporates findings of additional field work performed in October 2008 to verify the presence of bedrock outcrops north of the modeled no-flow-boundary area. During this investigation, a new temporary ground water monitoring well (0718) was installed on the Maupin property immediately upstream from Calamity Bridge. Analysis of a ground water sample from well 0718, collected on October 23, 2008, indicated that uranium, vanadium, and arsenic concentrations were below both 40 CFR 192 maximum concentration limits and the proposed alternate concentration limits (ACLs). These results indicate that the proposed ACLs at the points of compliance are protective of human health and the environment at the point of exposure in the San Miguel River.

DOE will continue ground water sampling in the alluvium along both sides of the San Miguel River within the Institutional Controls boundary. Additionally, effective July 2009, DOE resumed monitoring arsenic concentrations in ground water at all monitoring locations. Results of future sampling will be reported in forthcoming Verification Monitoring Reports.

JUL 2 8 2009

Please contact me at (970) 248-6108 if you have any questions concerning DOE's response to the RAI.

Sincerely,

Mark Kautsky
Site Manager

Enclosure

cc w/enclosure:
W. Naugle (CDPHE)
File: NAP 402.02 (Roberts)

Kautsky\Naturita\7-23-09 Draft Ground Water Compliance Action Plan Ltr.doc

DOE RESPONSES TO NRC REQUEST FOR ADDITIONAL INFORMATION NATURITA, COLORADO, UMTRCA PROJECT SITE

1. Site Observation Work Plan for the Naturita, Colorado, UMTRA Project Site, May 2002

Comment No. 1A. Please reconcile the table of contents (pages iii through iv) with report sections and corresponding pages in the body of the report.

Basis: The table of contents indicates pages for Sections 2.1 through 2.8; however, the body of the report only contains Sections 2.1 through 2.7.

DOE Response No. 1A. The table of contents in the May 2002 Site Observational Work Plan (SOWP) is correct; however, this comment is valid for the September 2002 Ground Water Compliance Action Plan (GCAP). The inconsistency will be corrected in the revised final GCAP.

Comment No. 1B. Please reconcile the following contradiction: Section 2.4 (page 2-4) indicates that the proposed compliance strategy for Naturita includes selecting supplemental standards for vanadium and uranium; however, the Ground Water Compliance Strategy Flowchart for uranium and vanadium (Figure 7-2, page 7-5) and Section 7.3.2 indicates application of alternate concentration limits.

Basis: NUREG-1724 (page 4-2) acceptance criteria states that the selection of a restoration strategy conform to the decision tree in Figure 4-1 which was developed by the DOE and has been found acceptable by the NRC.

DOE Response No. 1B. Section 2.4 discusses the conditions for selecting supplemental standards or alternate concentration limits (ACLs). The last paragraph of this section (page 2–4) incorrectly refers to the compliance strategy selected for uranium and vanadium as supplemental standards. This paragraph should have referenced the application of ACLs for both of these constituents—this strategy is correctly defined in both the Executive Summary and Section 7.0 of the SOWP. This inconsistency will be corrected in the revised final GCAP.

Comment No. 1C. Section 3.2.1, page 3-1 indicates that the milling process may have utilized fuel oil as a fusing agent. Please provide available information including site locations associated with fuel oil storage and usage, fuel oil storage capacity, and estimates of volumetric usage. In addition, the August 1993 Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Processing Site at Naturita, Colorado, identified low levels of toluene at two locations near the former tailings pile. If historical volatile or semi-volatile organic constituent analysis of the alluvial aquifer at the Naturita site is available, please provide or reference the data and discuss the results.

Basis: 40 CFR 192.02 (c)(1) requires that a determination of which of the constituents listed in Appendix I to Part 192 are present in or reasonable derived from residual radioactive materials. NUREG-1724 (page 1-2) acceptance criteria states that information on wastes generated at the site during milling operations, waste discharge locations, and quantities of waste generated should be provided.

DOE Response No. 1C. The text referenced in this comment was based on the following statement in Merritt (1971): "The uranium-vanadium bearing precipitate was fused with a reducing mixture of salt, soda ash, and either sawdust or fuel oil." Merritt provided no additional information regarding the extent to which fuel oil was used, if at all.

A 1957 aerial photograph of the Naturita mill shows two crude-oil storage tanks on the west side of Highway 141, across the road from the former millsite and tailings area (Attachment 1). The legend for this photograph was provided by Mr. Pat Daniels (GJGS 2005), a former employee of the Vanadium Corporation of America (VCA). There is no mention of oil spills in the historical site documentation.

The Naturita database contains 10 results for total organic carbon (TOC) in groundwater from wells 0547 and 0548, at the southeastern and northern site boundaries, respectively. TOC concentrations ranged from 1 to 3 milligrams per liter (mg/L) for well 0547 (eight analyses, 1989–1994) and 2 to 4 mg/L for well 0548 (two analyses, 1989–1991; see Attachment 2). Although TOC analyses are usually used to measure natural organic matter, they can also indicate the presence, or absence, of petroleum products. In this case, no conclusions can be drawn concerning the presence or absence of petroleum products due to the limited number of data points.

The only analyses of volatile organic compounds in groundwater were from off-site upgradient well 0661, located approximately one-half mile southeast of the site and sampled on September 17, 1999. Although most analytes in the volatile suite were not detected, benzene and ethylbenzene concentrations were 0.01 and 0.03 mg/L, respectively (Attachment 2). These reported concentrations are not attributable to the Naturita processing site because well 0661 is upgradient of the site. Likewise, a search of the database for total petroleum hydrocarbons (TPH) and BTEX constituents (benzene, toluene, ethylbenzene, and xylene) yielded one result: 1 mg/L TPH in upgradient well 0661.

Locations of wells 0547, 0548, and 0661 are shown on Plate 1 of the SOWP and mapped in DOE's Geospatial Environmental Mapping System (GEMS); corresponding analytical results are provided in Attachment 2.

Comment No. 1D. Please expand the discussion of local ground water use in Section 3.2. For example, during a recent site visit by NRC personnel, a residence was identified directly downstream of the Calamity Bridge; however, the source of drinking water at this residence does not appear to be addressed in the report. Please provide a map showing the location of all residences in the vicinity and down gradient of the site and an itemized table containing available information on the source of each residence's water supply (e.g., well permit number, well installation date, well construction details, etc.).

Please include information on the source of all data provided on the map and table. In addition, please address the health risk of ground water residences in the vicinity and down gradient of the site and an itemized table containing available information on the source of each residence's water supply (e.g., well permit number, well installation date, well construction details, etc.). Please include information on the source of all data provided on the map and table. In addition, please address the health risk of ground water consumption to the residences with respect to the contaminants identified in the alluvial aquifer at the Naturita site.

Basis: 40 CFR 192.02 (c)(3)(ii) requires that when determining concentration limits, the proximity and withdrawal rates of ground water users, and the potential for health risks caused by human exposure to constituents should be considered. NUREG-1724 (page 1-3) acceptance criteria states that Site Characterizations should contain information pertaining to surrounding water uses including identification of potential receptors of present or future ground-water and surface-water contamination.

DOE Response No. 1D. Two residences are located in the vicinity of the former millsite and both are on the Maupin property, within the institutional control (environmental covenant) area. The Letta Stout residence (now vacant), is downgradient of the millsite. A residence east of the river is currently occupied by Stephanie Tatum, Letta Stout's daughter and granddaughter of May Maupin (the property owner who lives in Grand Junction, CO). Ms. Tatum hauls drinking water from Nucla and stores it in a cistern on the property (personal communication, Stephanie Tatum, May 1, 2009). The other residence, currently vacant and dilapidated, is approximately one mile (5,400 ft) downstream of the Calamity Bridge. Based on Colorado Division of Natural Resources (DNR) well permit records, there is no well on the vacant property (see 3rd paragraph of this response and Attachment 3).

In June and July of 2002, DOE drilled a 600-ft-deep domestic well on the Stout property to provide an alternate potable-water supply. This well, designated as DOE well 0716 and permitted in Montrose County, was completed in the Entrada Sandstone. Groundwater analysis (on July 25, 2002) indicated a total dissolved solids (TDS) concentration of 1,800 mg/L, which exceeds the U.S. Environmental Protection Agency (EPA) secondary drinking water standard of 500 mg/L. Subsequently, DOE provided a reverse osmosis (RO) treatment unit (designated 0717 in Naturita database). The RO treatment unit reduced the TDS concentration to 108 mg/L (January 28, 2003). The well and RO unit are currently not being used because there is nobody living on the Stout property. According to Stephanie Tatum (personal communication), the residence has been vacant for some time. [Additional information regarding this well is provided in DOE's response to NRC Comment 2D.]

Attachment 3 provides supporting documentation, including maps showing the vacant Stout residence, the occupied Tatum residence (Exhibit 1), all permitted wells (including abandoned wells) based on the latest information provided by the Colorado DNR, Division of Water Resources (DWR)[1] (Exhibit 2), and a corresponding well inventory table. To facilitate review, the DWR permit numbers are paired with Naturita monitoring well numbers, where possible. As demonstrated in Attachment 3, there is no known local use of alluvial groundwater at or downgradient of the Naturita site.

In addition, there are no current health risks associated with residential domestic use of alluvial groundwater because the associated exposure pathway is not complete (see above). Section 6.1 of the SOWP addressed the health risks associated with *hypothetical* ingestion of alluvial groundwater, drawing largely on the Baseline Risk Assessment [(BLRA)(DOE 1995)]. Section 6.1.2 states: "Though not considered a likely scenario, risks from drinking water in a residential setting are calculated using more recent monitoring data." The latter assessment was a catalyst for implementing the institutional controls (ICs) currently in place. [Also see DOE's response to NRC Comment 2D and Attachment 6.]

[1] Colorado's Decision Support Systems Mapping (CDSS), last updated July 2009, website available at http://165.127.23.116/website/cdss/viewer.htm; specify Township North and Range 16W when accessing).

NRC addressed the question of residential use of alluvial groundwater in the 1999 *Final Technical Evaluation Report* (TER). Section 5.2.4.A of that submittal states: "Future use of groundwater in the alluvium for domestic consumption is not expected. This is because the alluvial aquifer has a very low potential for use as a source of water, since it is limited to the small area of alluvium in and adjacent to the San Miguel River. Alternative supplies of reliable, good-quality water are available from the town of Naturita, from surface water, and from deeper groundwater aquifers." Although nearly 10 years have elapsed since the TER was finalized, NRC's previous characterization of the potential for domestic use of groundwater from the alluvial aquifer remains valid today.

Comment No. 1E. Please indicate the analytical or other method(s) used to develop the information presented in the following figures: Figure 5-2 - Bedrock Surface Elevations, Figure 5-3 - Thickness of the Alluvium, and Figure 5-4 - Thickness of Saturated Alluvium.

Basis: 40 CFR 192.02 (c)(3)(ii) requires that when considering the present or potential hazard to human health and the environment of alternate concentration limits, the hydrogeological characteristics of the site should be considered. NUREG-1724 (page 1-3) acceptance criteria states that Site Characterizations should contain a description of hydrogeological units that may affect transport of contaminants away from the site via ground-water pathways.

DOE Response No. 1E. The U.S. Geological Survey (USGS) performed groundwater modeling for the Naturita site and produced all related figures. USGS developed Figure 5-2 using alluvium thicknesses and bedrock elevations from the wells and boreholes indicated (for cross-reference, see SOWP Figures 4-1 and 5-5). USGS installed many of these wells in 1998, some of which have since been abandoned. Figure 5-3 was produced by subtracting the elevation of the alluvium/bedrock contact from the elevation at ground surface. Figure 5-4 was produced by subtracting the elevation of the bedrock surface from the elevation at the top of the saturated zone.

USGS developed the surfaces for Figures 5-2 through 5-4 using kriging algorithms in EVS-Pro software (CTech Development Corporation; http://www.ctech.com/index.php?page=products) along with surface-contact, subsurface-contact, and water elevation data. Surveyed surface-contact elevations were added for the western side of the areas shown in Figures 5-3 and 5-4. USGS produced the final drawings using an earlier version of ArcView GIS (Geographical Information System) software, a product of ESRI (http://www.esri.com/software/arcview/).

The assumption that the alluvium thins rapidly toward the west was based on USGS' observations of outcrops of the Brushy Basin Member of the Morrison Formation on the west side of Highway 141. In places, USGS observed that this contact was covered by colluvium and sandstone boulders derived from overlying Burro Canyon Formation and Dakota Sandstone. This is especially true toward the north as the San Miguel River bends toward the northeast. Control points were not available on the west side of Highway 141 to positively locate the bedrock contact except in abandoned well 0586 (see SOWP Figure 5-1). DOE performed additional field work in October 2008 to confirm the presence of bedrock outcrops in this area (refer to Response 1J).

Comment No. 1F. Please provide an estimate of the horizontal hydraulic gradient based on the data and estimated contours presented in Figure 5-5, page 5-13.

Basis: NUREG-1724 (page 1-5) acceptance criteria states that horizontal components of hydraulic gradient should be estimated by measurement of the distance between contour intervals on hydraulic head contour maps.

DOE Response No. 1F. Section 4.8.5 of the SOWP cites an average sitewide gradient of 0.0044 (refer to text preceding Table 4-11).

Comment No. 1G. Please identify the horizontal, transverse, and vertical hydraulic conductivity values used in the Steady State Deterministic Flow Model (Appendix F, Section 4.2, page F-7). Additionally, the aquifer test document referred to in Section 4.2 of Appendix F does not appear to be listed in the Appendix's reference section. Please supply the reference.

Basis: 40 CFR 192.02 (c)(3)(ii) requires that when considering the present or potential hazard to human health and the environment of alternate concentration limits, the hydrogeological characteristics of the site should be considered. NUREG-1724 (page 1-5) acceptance criteria states that Site Characterizations should contain estimates of hydraulic properties of the underlying aquifer.

DOE Response No. 1G. The hydraulic conductivity value used in the steady-state groundwater flow model was 30 ft/day. DOE assumed isotropic conditions in the horizontal plane, so horizontal (K_x) and transverse (K_y) conductivities were equal. Because DOE used a single layer, two-dimensional areal model, K_z (the vertical component) was ignored in the simulation and has no impact on the model results. Attachment 4 includes the requested reference (Calculation No. S0571700), which documents the basis for selecting 30 ft/day as an average hydraulic conductivity value representative of the site.

Comment No. 1H. Please reconcile the following contradiction: based on data from numerous slug and bromide tracer tests, Figure 4-18 (page 4-43) indicates that the Naturita site can be divided into higher (southern) and lower (northern) hydraulic conductivity zones. In contrast, the Flow Model in Appendix F appears to treat the entire site as homogeneous with respect to hydraulic conductivity.

Basis: 40 CFR 192.02 (c)(3)(ii) requires that when considering the present or potential hazard to human health and the environment of alternate concentration limits, the hydrogeological characteristics of the site should be considered. NUREG-1724 (page 1-5) acceptance criteria states that Site Characterizations should contain estimates of hydraulic properties of the underlying aquifer.

DOE Response No. 1H. Following the reference to Figure 4-18, Section 4.8.6 of the SOWP does state that "When plotted spatially, the hydraulic conductivity at the Naturita site is roughly distributed into two zones, a 'high K zone' located at the southern end of the site with values greater than 100 ft/day, and a 'low K zone' at the northern end with values less than 100 ft/day." However, as these were rough approximations, and K values varied within the two zones (see Figure 4-18), USGS chose to use one conductivity value in the steady-state groundwater flow model. [This approach is not explicitly stated in the SOWP.]

Attachment 4 (Calculation No. S0571700) documents how USGS estimated hydraulic conductivities for the site using a variety of methods (e.g., slug tests, tracer tests, and tritium-helium age dating). In this reference, USGS states: "A value of 30 feet per day was selected as an average value representative of the site." This value equals the median hydraulic conductivity estimated from the tritium-helium age-dating results. [USGS acknowledged the bias toward smaller conductivity values.] Because the low-conductivity portion of the site generally corresponded to areas with the highest levels of contamination, a lower conductivity value would yield a more conservative estimate of natural flushing (the main reason for running the model at that time).

However, because the current proposed compliance strategy—ACLs for uranium and vanadium, combined with ICs—does not rely on model results, but rather on empirical data, the model predictions are less important to the compliance strategy. The USGS analysis did indicate that the groundwater system interacts with the surface water in the San Miguel River. This finding confirms that using the San Miguel River as the point of exposure for groundwater is appropriate in assessing present or potential hazards to human health or the environment. As discussed in the draft SOWP, the 4,000 to 5,000-fold dilution that occurs when groundwater discharges to the river during low flow, ensures that the proposed ACLs protect human health and the environment.

Comment No. 1I. The extent of tailings related contamination in subpile soils (i.e., soils situated below the former tailings piles) does not appear to have been adequately delineated. As indicated in Section 5.3.1 (page 5-10), the most contaminated ground water on the site is below the former tailings pile area. Moreover, Section 7.3.2 (page 7-8) acknowledges that "persistence of uranium and vanadium in the soils and the presence of a potential continuing source of ground water contamination." However, the description of borehole NAT01 as being located within the area of the former tailings pile Section 4.6.1 (page 4-20) is inconsistent with the historical tailings boundary represented in Figure 5-10 (page 5-81) and Plate 1. Consequently, only one subsoil sample (NAT06) appears to have been collected from the approximately 19-acre former tailings boundary represented in the two site maps referenced above. In addition, please provide the depth of subpile soil samples from NAT01 and NAT06 (the information was not contained in the report text or indicated in their respective well logs). Please provide additional information concerning the presence of residual tailings related contamination in subpile soils at the site.

Basis: 40 CFR 192.12(c)(1) requires that a monitoring program shall be carried out that is adequate to define background water quality and the area) extent and magnitude of ground water contamination. Defining the extent of contamination includes investigating residual sources that may still exist in contaminated subsurface soils (NUREG-1724, page 1-9).

DOE Response No. 1I. As shown on Figure 5-50 (page 5-81) and Plate 1 of the SOWP, borehole NAT01 was indeed not within the historical tailings boundary. Rather, it coincided with the northern historical site boundary shown on those figures. DOE collected one subpile soil sample at NAT06 at a depth of 5–6 ft below ground surface. Analytical results from NAT01 and NAT06 are in Attachment 5; these data are also included on the CD in Appendix D of the SOWP.

Residual tailings-related contamination in subpile soils was investigated during the surface remedial action, as documented in the Remedial Action Plan (DOE 1998a) and in the Final Completion Report (DOE 1998b).The surface program investigation showed that a continuing source of groundwater contamination probably remains in the subpile area. As part of the proposed compliance strategy, DOE will continue monitoring groundwater and surface water (point of exposure), and maintaining and monitoring ICs.

Comment No. 1J. Section 5.2.2 (page 5-9) indicates that the alluvial aquifer discharges "back into the San Miguel River north of the site along a 500-foot zone where the river intersects bedrock on the Maupin property." The ground water flow model (Appendix F, page F-8) addressed this reported condition by using a no-flow boundary along the western edge of the alluvial aquifer and intersecting the boundary with the river at the top of the 500-foot discharge zone. However, during a recent site visit by NRC personnel, an inspection of the area indicated that it did not appear to contain outcrops of the Brushy Basin Member of the Morrison Formation (e.g., mud- or siltstones), but rather sandstone boulders originating from higher elevations in the valley on top of the alluvium. These boulders appeared to be associated with either the overlying Burro Canyon Formation or Dakota Sandstone.

The absence of bedrock outcrops in this area could have serious implications to the proposed corrective action. As discussed in Section 8.4 (page 8-14), one of the bases for the selected corrective action is that "contaminants are not expected to migrate beyond the IC area because (1) impermeable bedrock mudstones from the Brushy Basin Member of the Morrison formation are effective barriers to westward migration." The absence of an impermeable bedrock intersecting the river would impact the use of a no-flow boundary in the northern part of the flow model and invalidate the results of the ground water transport model. Consequently, please quantitatively confirm the existence of bedrock outcrops intersecting the river in this area or verify through ground water sampling that uranium or any other contamination is not and will not migrate along the western side of the San Miguel River beyond this point. If such migration is occurring, please adjust the ground water flow model for the site by using a different boundary condition (i.e., alluvial aquifer continues north along the western side of the San Miguel River). Based upon the results of this work, it may be necessary to revise the Long Term Monitoring Program to include ground water monitoring in this area.

Basis: 40 CFR 192.02(c)(3)(ii) requires that when applying alternate concentration limits, the potential adverse effects on hydraulically-connected surface water quality, including the hydrogeological characteristics of the site and surrounding land should be considered. Correspondingly, NUREG-1724 (page 1-3) identifies "A description of hydrogeological units that may affect transport of contaminants away from the site via ground-water pathways" and estimation of ground-water/surface-water interactions at the sites with nearby streams, rivers, or lakes (page 1-6) as acceptance criteria items.

DOE Response No. 1J. In October 2008, DOE performed fieldwork to (1) verify whether bedrock outcrops, which intersect the San Miguel River, exist north of the no-flow boundary area, and (2) install a new temporary groundwater monitoring well—well 0718—on the Maupin property immediately upstream from Calamity Bridge (see Figure 1 on following page). This well was completed in alluvial sand and gravel (total depth of 19.5 ft). On October 23, 2008, DOE collected a groundwater sample from well 0718, which was analyzed for uranium, vanadium, arsenic, and the standard suite of field parameters.

Figure 1. Map of the northern portion of the Naturita site showing floodplain areas along the San Miguel River and new alluvial well (0718) and borings (0719, 0720, 0721) installed in October 2008.

DOE also completed three test borings—0719, 0720, and 0721—shown in Figure 1, to define subsurface stratigraphy along the west side of the San Miguel River. Boring 0719 was drilled approximately 400 ft northwest of existing monitoring well MAU07. Borings 0720 and 0721 were drilled on the next floodplain to the north, at the farthest accessible points upstream and downstream of that floodplain, respectively. Observations and findings associated with this field effort are documented below and in subsequent responses to NRC comments 1K and 1L.

Borehole 0719 penetrated 8.5 ft of floodplain alluvium that overlies the clayey-siltstone bedrock of the Brushy Basin Member of the Morrison Formation; the lower one-half foot of the alluvium was moist. The west cutbank of the river occurs approximately 100 ft north of borehole 0719 (Figure 2). Earthflow material derived from the Burro Canyon Formation and Dakota Sandstone overlies the intact bedrock along the cutbank (Figure 1). A floodplain forms along the west bank of the river, extending from about 100 ft south of borehole 0720 to approximately 400 ft north of borehole 0721. Decreasing site-related groundwater contamination is likely to extend downstream along both sides the river within the area of the IC boundary.

Figure 2. View northward from near borehole 0719 showing earthflow material composed of sandstone boulders from the Burro Canyon and Dakota Formations along the west bank of the San Miguel River (underlying bedrock not exposed).

Analytical results reported for the October 2008 sampling of well 0718 indicated a uranium concentration of 0.033 mg/L, a vanadium concentration of 0.0003 mg/L, and an arsenic concentration of 0.002 mg/L. These concentrations of contaminants of concern (COCs) in groundwater downstream of the processing site indicate that the ACL concentrations at the points of compliance (POCs) are protective of human health and environment at the point of exposure (POE) in the river.

DOE plans to continue sampling well 0718 to assess temporal trends of uranium, vanadium, and arsenic in alluvium along both sides of the river within the ICs boundary. Results of future sampling will be reported in forthcoming Verification Monitoring Reports.

Comment No. 1K. Monitoring well 0715, an alluvial well located on the east side of the San Miguel River (see Plate 1), reportedly contained 0.080 mg/L uranium (Ground Water Compliance Action Plan, Section 2.5.2, page 2-9), which is over the UMTRCA standard for uranium (0.044 mg/L) and the recently promulgated National Primary Drinking Water Regulation Maximum Contaminant Level (MCL) for uranium (0.030 mg/L). The following issues concerning uranium ground water contamination on the east side of the San Miguel River need to be addressed:

i) Please update the Geospatial Environmental Mapping System (GEMS) for the Naturita Processing site to include the sampling results from well 0715.

ii) Please quantify the nature and extent of uranium contamination in the alluvial aquifer on the east side of the San Miguel River in the vicinity and down gradient of monitoring well 0715.

iii) Please verify the assertion that "any contamination that may exist on the east side of the San Miguel River further downstream from the site, will eventually flow into the river by the time the Calamity Bridge is encountered," (Section 8.4, page 8-15).

Quantification and verification can include further ground water monitoring at well 0715, the installation of additional monitoring wells on the east side of the river, and expanding the present ground water flow and transport model (with appropriate site-specific calibration data) further north and east to include the area around and down gradient of well 0715. Based upon the results of this work, it may be necessary to revise the Long Term Monitoring Program to include ground water monitoring in this area.

Basis: 40 CFR 192.12(c)(1) requires that a monitoring program shall be carried out that is adequate to define background water quality and the areal extent and magnitude of ground water contamination. Moreover, 40 CFR 192.12(c)(3) states that "Compliance with this subpart shall be demonstrated through the monitoring program established under paragraph (c)(1) of this section at those locations not beneath a disposal site and its cover where groundwater contains listed constituents from residual radioactive material." NUREG-1724 (page 1-8) states that the extent and magnitude of contamination involves determining whether the water quality at a location meets background water quality.

DOE Response No. 1K(i). GEMS was updated to include sampling results for well 0715.

DOE Response No. 1K(ii). DOE made five attempts using a Geoprobe to establish monitoring wells along the east side of the San Miguel River. One borehole (well 0715) was completed in the saturated alluvium because of the large number of cobbles. Results of the April 2002 sampling of well 0715 indicated that the uranium concentration exceeded the UMTRA groundwater standard in alluvial groundwater east of the San Miguel River in that vicinity. The decision to extend ICs to the Calamity Bridge was made after this finding.

Concentrations of RRM in groundwater are likely to extend downstream along both sides the river within the area of the ICs boundary. DOE plans to resume sampling well 0715 (last sampled in 2002), along with new well 0718, to assess temporal trends of uranium, vanadium, and arsenic in alluvium along both sides of the river within the ICs boundary. Results of future sampling will be reported in forthcoming Verification Monitoring Reports.

DOE Response No. 1K(iii). Similar to the west bank of the river, the east side of the San Miguel River meanders between cutbanks, floodplains and point-bar deposits. One cut bank exists about 500 ft upstream of Calamity Bridge (location shown in Figure 1), where a bedrock outcrop of the Brushy Basin Member of the Morrison Formation is visible (Figure 3, following page). About 10 ft of conglomeratic sandstone (a lenticular channel deposit) overlies approximately 10 to 15 ft of gray siltstone at this outcrop.

The alluvial well 0718 on the west bank of the river is the monitoring point for alluvial groundwater near the POE at the downgradient end of the ICs boundary. October 2008 sampling of well 0718 indicated a uranium concentration of 0.033 mg/L, a vanadium concentration of 0.0003 mg/L, and an arsenic concentration of 0.002 mg/L. These concentrations of RRM in groundwater downstream of the processing site indicate that the proposed Institutional Controls would protect human health and the environment at the POE. DOE plans to continue sampling wells 0718 and 0715 to assess temporal trends of uranium, vanadium, and arsenic in alluvium along both sides of the river within the ICs boundary. Results of future sampling will be reported in forthcoming Verification Monitoring Reports.

Figure 3. Outcrop of the Brushy Basin Member of the Morrison Formation along the east bank of the San Miguel River, where gray siltstone is overlain by a channel deposit of conglomeratic sandstone.

Comment No. 1L. As discussed in Section 5.3.3.2 (pages 5-28 and 5-29) "... millsite contamination and potentially associated ground water contamination could extend as far down gradient as the Calamity Bridge, about 3,750 feet down grade of the mill site." Calamity Bridge is the northern edge of the Institutional Controls Area (Figure 7-8, page 7-19) and as such, the alluvial aquifer directly down gradient of the bridge is a point of exposure for ground water (i.e., outside the area under institutional controls there is no restriction on ground water use). Although it is acknowledged that ground water contamination may exist, no monitoring wells have been placed along the 2,400 foot distance under institutional controls between well 0715 and the Calamity Bridge (Plate 1). Please verify that millsite related ground water contamination is not migrating beyond the area of institutional controls. Verification can include the installation of additional monitoring wells and expanding the present ground water flow and transport model (with appropriate site-specific calibration data) to include the area up gradient of the Calamity Bridge. Based upon the results of this work, it may be necessary to revise the Long Term Monitoring Program to include ground water monitoring in this area.

Basis: 40 CFR 192.12(c)(1) requires that a monitoring program shall be carried out that is adequate to define background water quality and the areal extent and magnitude of ground water contamination. Moreover, 40 CFR 192.12(c)(3) states that "Compliance with this subpart shall be demonstrated through the monitoring program established under paragraph (c)(1) of this section at those locations not beneath a disposal site and its cover where groundwater contains listed constituents from residual radioactive material." NUREG-1724 (page 1-8) states that the extent and magnitude of contamination involves determining whether the water quality at a location meets background water quality.

DOE Response No. 1L. As discussed in our response to NRC Comment 1J, DOE installed well 0718 in October 2008 just upstream from Calamity Bridge, near the IC boundary (see Figure 1). October 2008 sampling of well 0718 indicated a uranium concentration of 0.033 mg/L, a vanadium concentration of 0.0003 mg/L, and an arsenic concentration of 0.002 mg/L. These concentrations of RRM in groundwater downstream of the processing site indicate that the ICs would protect human health and the environment at the POE. DOE plans to continue sampling wells 0718 and 0715 to assess temporal trends of uranium, vanadium, and arsenic in alluvium along both sides of the river within the ICs. Results of future sampling will be reported in forthcoming Verification Monitoring Reports.

Comment No. 1M. Section 5.4.6 (page 5-109) indicates that an expansion of gravel pits up gradient of the Naturita site will increase ground water loss through evaporation and could significantly decrease the rate that uranium flushes naturally from the alluvial aquifer at the site. If this were to occur, it would impact the accuracy of the ground water contaminant transport predictions. Please provide information on the criteria and method that will be used to determine whether future ground water quality data is in agreement with model predictions and the proposed contingencies when the data and model no longer show a positive correlation.

Basis: 40 CFR 192.20 (b)(4) requires that "the plan should include a monitoring program sufficient to verify projections of plume movement during the extended cleanup period." NUREG-1724 (page 4-5) acceptance criteria states that the monitoring program include or reference action levels that trigger implementation of enhanced monitoring or revisions to cleanup activities (i.e., timeliness and effectiveness of the corrective action).

DOE Response No. 1M. The proposed compliance strategy for the site—ACLs for uranium and vanadium—does not rely on natural flushing, nor on groundwater flow model predictions, but on continued monitoring and enforcement of ICs. Any changes in land use upgradient of the site would not affect the proposed compliance strategy. The upgradient parcel, owned by Williams Construction (HSW Investments), is currently not being used. The property owner has not notified DOE of his plans for future use of this parcel.

Comment No. 1N. With respect to proposed implementation of measures, Section 8.4.1 (page 8-15) states that "IC(s) will remain in effect for perpetuity or until concentrations of contaminants at the site fall below acceptable levels." Please quantify "acceptable levels" with a list of the constituents, concentrations levels, and all supporting analysis used to derive the levels. Also, please provide the proposed method (e.g., statistical) and criteria for determining when concentrations have reached these levels.

Basis: 40 CFR 192.02 (c)(2) requires that ground water not exceed concentration limits established under 40 CFR 192.02 (c)(3) in the uppermost aquifer underlying the site beyond the point of compliance as defined in 40 CFR 192.02 (c)(4). NUREG-1724 states that a concentration limit should be specified for each of the hazardous constituents.

DOE Response No. 1N. The ACLs would remain in effect at all POC wells in the monitoring network until concentrations declined below 0.044 mg/L for uranium and 0.33 mg/L for vanadium for at least three consecutive monitoring events. After that, DOE would notify the NRC and the State of Colorado that contaminant concentrations declined below regulatory limits and request a reduced monitoring frequency for those constituents. It is unlikely that groundwater contaminant concentrations will decrease below 0.044 mg/L for uranium and 0.33 mg/L for vanadium within the forseeable future.

Comment No. 1O. Please provide more detail for the cost computation in Section 8.3.3. (page 8-14). The cost of $2,100 per sample round multiplied by 15 sample rounds (once a year for 5 years and every 3 years for the following 30) does not equal $105,000. Also, please provide the rationale behind using a 35-year sampling period. The 35-year assumption appears to be contradicted in Section 7.7 (page 7-18), where it is acknowledged that total duration of monitoring may be up to 100 years. Appendix F (page F-43) states that "At 100 years there is still a 49 percent probability that the (uranium) standard will be exceeded." Moreover, the Uranium Mill Tailings Remedial Action (UMTRA) Ground Water Project at Naturita Fact Sheet (DOE, March 2003) indicates that it will take more than 1,000 years for vanadium to drop below the 0.330 mg/L human health-based risk concentration. Based on the use of a perpetual environmental covenant as an institutional control to eliminate the use of alluvial ground water (i.e., no ground water point of exposure within the area of institutional controls), it would appear that monitoring far beyond 35 years may be necessary to determine when contaminant concentrations allow lifting of the institutional controls.

Basis: 40 CFR 192.02(c)(3)(ii)(A) requires that alternate concentration limits may be established after considering remedial or corrective actions to achieve the levels specified in paragraphs (c)(3)(i)(A) and (B) of 40 CFR 192.02. NUREG-1724 acceptance criteria (page 3-8) states that the cost and benefits of each of the corrective action alternatives should be considered.

DOE Response No. 1O. The cost basis for sampling and analysis was for 5 sample rounds during the first 5 years and 10 sample rounds during the next 30 years (total of 15 rounds). Assuming a total cost of $2,100 per round (for sampling and analysis, the estimate used at the time the SOWP was developed) yields a total of $31,500 (not $105,000). Based on analytical results to date, monitoring beyond a 35-year period may be required. DOE's 2008 Life Cycle Baseline contains planning budget for continued groundwater monitoring at the Naturita Disposal Site through the year 2083.

2. DRAFT Ground Water Compliance Action Plan for the Naturita, Colorado, UMTRA Project Site, September 2002

Comment No. 2A. Please provide a description or reference to the quality assurance procedures used for collecting, handling, and analyzing ground and surface water samples during future monitoring.

Basis: 40 CFR 192.20(b)(4) requires that when 192.12(c)(2) (natural flushing) is invoked, the compliance plan should include a monitoring program sufficient to verify projections of plume movement and attenuation. NUREG-1724 (page 4-5) acceptance criteria states that quality assurance procedures used for collecting, handling, and analyzing samples be provided.

DOE Response No. 2A. The *Environmental Procedures Catalog* (LMS/POL/S04325), which documents the standard operating procedures (SOPs) used for LM environmental monitoring activities, is the standard source of quality assurance procedures for collecting, handling, and analyzing groundwater and surface water samples. Appendix A of this catalog documents the specific procedures for sample collection, field documentation, chain-of-custody, sample labeling, decontamination of sampling equipment, and sample submittal for analysis. The SOPs are updated periodically to reflect current American Society for Testing and Materials (ASTM), DOE, and EPA guidance and methods. This catalog is incorporated in the broader umbrella document entitled *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PLN/S04351), which is also updated periodically.

Comment No. 2B. As discussed in Section 2.3, page 2-1, supplemental standards for surface cleanup were applied to significant areas both on-site (11 acres) and off-site (11 acres). In addition, seeps and pond water containing elevated levels of site related contaminants have been identified north of the site on the Maupin property. Please indicate what site access control measures will be provided for the Naturita site, with particular emphasis on the areas discussed above. Additionally, please provide an inspection schedule for access controls at the Naturita site.

Basis: NUREG-1724 (page 4-5) acceptance criteria states that appropriate site access controls should be provided and are periodically inspected.

DOE Response No. 2B. Environmental covenants (ECs) are in place for the portion of the site owned by the Town of Naturita and for the Maupin property.[2] A summary of these ECs is available on the Colorado Department of Public Health and Environment (CDPHE) website at

[2] DOE continues to work with CDPHE and the State of Colorado Attorney General's office to establish an environmental covenant for the portion of the site owned by Chemetall Foote (most recent discussion in April 2009).

http://www.cdphe.state.co.us/hm/covenant/index.htm. For the Maupin property, the EC prohibits disturbance of ground in the supplemental standards area, drilling of wells in the alluvial aquifer, and damage to existing monitoring wells. The EC for the Town of Naturita prohibits well drilling (no distinction between alluvial and deeper aquifers), excavation, and grading without approval of DOE and CDPHE. ECs for both properties also require that any habitable structures contain radon venting. Site access controls can not be enforced because DOE does not own the property; rather, only measures to control potential *exposure* to contaminants can be implemented. Additional information is provided in DOE's response to NRC Comment 2D.

One surface location on the Maupin property—0538, historically referred to as a seep—often contains concentrations of uranium that are several times the drinking water standard (most recently 0.13 mg/L in July 2008). This seep occurs within about 30 ft of the San Miguel River and manifests along an old channel of the river (see GCAP, Section 2.5.1). Water here is characteristically brackish, and the only access is through a thick stand of riparian willow trees and saplings. Exposure to humans is not likely—for example, for a periodic recreational scenario, the river would be the more likely destination. The same case applies to potential ecological receptors (e.g., horses, wildlife)—a better source of drinking water is available nearby in the river. The observed range of uranium concentrations at this seep since 2002 (0.21 to 0.250 mg/L) is close to the United Nations Food and Agriculture Organization recommended upper limit of 0.2 mg/L for livestock drinking water (FAO 2002). Given that livestock and wildlife would likely drink from the seep only occasionally and that uranium concentrations have been at or close to permissible levels, the risk to ecological receptors in this area is probably negligible. However, to address concerns by the State of Colorado (personal communication, W. Naugle, June 17, 2009), DOE is currently exploring a more conservative course of action—eliminating the seep by filling the distributary channel with gravel. In pursuing this option, DOE will consult with the U.S. Army Corp of Engineers, the U.S. Fish and Wildlife Service, the State of Colorado, and the landowner.

Comment No. 2C. Please provide more detail concerning evaluation and reporting of data during the proposed 35-year sampling period (Section 3.7, page 3-7). The information should include the proposed method (e.g., statistical), criteria for determining whether the conditions are consistent with the modeling predictions, and the proposed action if the results of the analysis indicate the model prediction is inaccurate.

Basis: 40 CFR 192.20 (b)(4) requires that "the plan should include a monitoring program sufficient to verify projections of plume movement during the extended cleanup period." NUREG-1724 (page 4-5) acceptance criteria states that the monitoring program include or reference action levels that trigger implementation of enhanced monitoring or revisions to cleanup activities (i.e., timeliness and effectiveness of the corrective action).

DOE Response No. 2C. The existing groundwater monitoring program will continue with annual sampling during the first 5 years, following NRC acceptance, and triennially thereafter, as indicated in the GCAP (Section 3.7). Two documents—the *Data-Validation Report* and the *Verification-Monitoring Report*—will authenticate the data-collection procedures. A statistical comparison, such as a Mann-Kendall test, could be used to assess trends in the monitoring results. However, because the proposed compliance strategy requires that contaminant concentrations remain below an established threshold (ACLs), the comparison with model predictions is unwarranted.

Comment No. 2D. Please provide a signed copy of any environmental covenants for institutional control areas not owned by a government agency (e.g., a covenant with the Maupin family). Also, information compiled during a recent site visit by NCR personnel indicated that a domestic drinking water well had recently been installed at the Maupin residence. Please provide all available documentation (e.g., well permit number, well installation date, well construction log, etc.) for the newly installed Maupin well.

Basis: 40 CFR 192.12 (c)(2)(B) requires that when a natural flushing remedial action is undertaken, institutional controls should be enacted "wherever contamination by listed constituents from residual radioactive materials is found in ground water or is projected to be found." NUREG-1 724 (page 4-8) acceptance criteria states that appropriate institutional control be provided for the site to protect human health and the environment from potential harm while the site is being brought into compliance.

DOE Response No. 2D. A copy of the signed environmental covenant with the Maupin family is provided in Attachment 6. A copy of the Maupin well permit, the corresponding well installation and lithologic log, and chemical analyses of water from the well before and after the reverse osmosis unit was installed are provided in Attachment 7.

Comment No. 2E. Section 6.1.3, Table 6-2 (pages 6-8 and 6-9) of the Site Observational Work Plan (May 2002) indicated a hazard quotient (HQ) for noncarcinogenic exposures to arsenic of 2.1 and 1.5 for child and adult residential ground water ingestion, respectively. In addition, Table 6-2 indicated that the carcinogenic risk from residential ground water ingestion for arsenic was 2.99×10^{-04}. All these risk levels were higher than the criteria discussed in Section 6.1.2.1 (i.e., an HQ of 1.0 for non-carcinogenic exposures and 10^{-06} for carcinogenic risk). As a result, arsenic was designated a contaminant of potential concern and the SOWP contained a proposal for natural flushing with institutional controls as a compliance strategy. In contrast, Section 2.6.2.2 of the GWCAP indicates that average arsenic concentrations are at or below the former MCL for arsenic (0.05 mg/L) and arsenic has been removed from the list of contaminants of concern because modeling indicates that its concentration levels in ground water will continue to decrease.

Although the UMTRCA standard for arsenic was formerly 0.05 mg/L, the NRC must consider the recently revised National Primary Drinking Water Regulation MCL of 0.01 mg/L for arsenic. Based on the average arsenic concentrations in the alluvial aquifer depicted in Figure 5-23 (page 5-33), nine wells exhibited arsenic above the current MCL. Given the reduction in the MCL for arsenic and the results of the risk analyses discussed above, please provide a more detailed rationale for eliminating arsenic from the compliance strategy as originally proposed in the SOWP, including the method (e.g., statistical) and criteria (e.g., number of consecutive sample results below the target level) used in removing arsenic from the list of contaminants of concern. In addition, please discuss the impact of the reduced MCL on contaminant transport simulations of future arsenic concentrations in the alluvial aquifer (Section 5.3.5.1, page 5-69).

Basis: 40 CFR 192.20 (b)(4) requires that "the plan should include a monitoring program sufficient to verify projections of plume movement during the extended cleanup period."

DOE Response No. 2E. There is no discrepancy between conclusions drawn in the SOWP and the revised strategy for arsenic reflected in the GCAP. As stated in our response to NRC Comment 1D, the baseline risk assessment presented in Section 6.1 of the SOWP assessed *hypothetical* ingestion of alluvial groundwater for the purpose of selecting an appropriate compliance strategy (as opposed to reflecting actual groundwater use). The exposure point concentrations (EPCs) used in the risk calculations were the 95 percent upper confidence level on the mean concentrations. In these calculations, DOE used an EPC of 0.017 mg/L arsenic, which is between the revised MCL (0.010 mg/L) and the UMTRCA standard (0.050 mg/L).

The 0.01 mg/L MCL for arsenic (as of January 23, 2006) is designed to protect consumers served by public water systems from the effects of long-term, chronic exposure to arsenic. The arsenic standard of 0.05 mg/L is the UMTRCA groundwater standard cited in 40 CFR 192 (Table 1 to Subpart A, "Maximum Concentration of Constituents for Groundwater Protection"). Although a difference exists between the UMTRCA value and the MCL, UMTRCA (i.e., 40 CFR 192) remains the driving legislation and the appropriate regulatory framework for this site.

Arsenic was eliminated from monitoring when all wells had at least two successive sampling rounds below the UMTRCA standard. Arsenic concentrations in samples collected from all wells had fallen below the 0.05 mg/L UMTRCA standard by 2003, and arsenic monitoring was discontinued. Attachment 8 demonstrates that, before site cleanup, arsenic concentrations in most wells were below the 0.05 mg/L standard, and in many cases below the current 0.01 mg/L MCL (although 0.01 mg/L was equivalent to the detection limit in prior years). In deference to NRC's concerns, monitoring for arsenic will resume as of the 2009 sampling event. Contingent upon results of this effort, DOE may propose to monitor arsenic at a reduced frequency.

References Cited:

DOE (U.S. Department of Energy), 1995. *Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site near Naturita, Colorado*, DOE/AL/62350-195, Rev. 1, prepared by the U.S. Department of Energy Albuquerque Operation Office, Albuquerque, New Mexico.

———, 1998a. Remedial Action Plan and Site Design for Stabilization of the Naturita Title I Residual Radioactive Materials at the Upper Burbank Repository, Uravan, Colorado.

———, 1998b. Final Completion Report, Naturita, Colorado.

———, 2002a. *Site Observational Work Plan for the Naturita, Colorado, UMTRA Project Site*, GJO–2001–234–TAR, MAC–GWNAT 1.1, prepared for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, May.

———, 2002b. *Ground Water Compliance Action Plan for the Naturita, Colorado, UMTRA Project Site,* GJO-2002-355-TAC, GJO-GWNAT 1.0, prepared for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, September.

———, 2007. *Verification Monitoring Report for the Naturita, Colorado, Processing Site.* DOE-LM/GJ1404-2007, prepared for the U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, December.

FAO (Food and Agriculture Organization of the United Nations), 2002. Agricultural drainage water management in arid and semi-arid areas, FAO Irrigation and Drainage Paper 61, ISBN 9251048398, ftp://ftp.fao.org/docrep/fao/005/y4263e/y4263e00.pdf, accessed May 18, 2009.

Grand Junction Geological Society (GJGS) 2005. *Geological Road Log for Uravan Mineral Belt Field Trip, West-Central Colorado*, prepared for the Geological Society of America Rocky Mountain Section Annual Meeting, Grand Junction, Colorado.

Environmental Procedures Catalog, LMS/POL/S04325, continually updated, prepared by S.M. Stoller Corporation for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado.

Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites, LMS/PLN/S04351, continually updated, prepared by S.M. Stoller Corporation for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado.

Merritt, R.C.,1971. *The Extractive Metallurgy of Uranium,* prepared for the U.S. Atomic Energy Commission by the Colorado School of Mines Research Institute.

NRC (U.S. Nuclear Regulatory Commission), 1999a. *Final Technical Evaluation Report for the Naturita, Colorado Uranium Mill Tailings Site,* May 21.

NRC (U.S. Nuclear Regulatory Commission), 1999b. *Final Completion Review Report for the Naturita, Colorado Uranium Mill Tailings Remedial Action Project Site,* August 19, 1999.

Attachments

This page intentionally left blank

Attachments

Table of Contents

Attachment 1	Photograph of Naturita Millsite, 1957
Attachment 2	Selected Organic Analytical Results Supporting DOE Response to NRC Comment 1C
Attachment 3	Documentation Supporting DOE Response to NRC Comment 1D: Local Groundwater Use and Well Permit Information
Attachment 4	USGS Internal File Documenting Determinations of Hydraulic Conductivity for Naturita Site
Attachment 5	Chemistry Data and Sample Depths for Soil Samples NAT01-1 and NAT06-1
Attachment 6	Environmental Covenant for Maupin Property
Attachment 7	Documentation for Maupin Well NAT01-0716 (Permit, Installation Log, and Analytical Data)
Attachment 8	Groundwater Analytical Data for Arsenic

This page intentionally left blank

Attachment 1

Photograph of Naturita Millsite, 1957

This page intentionally left blank

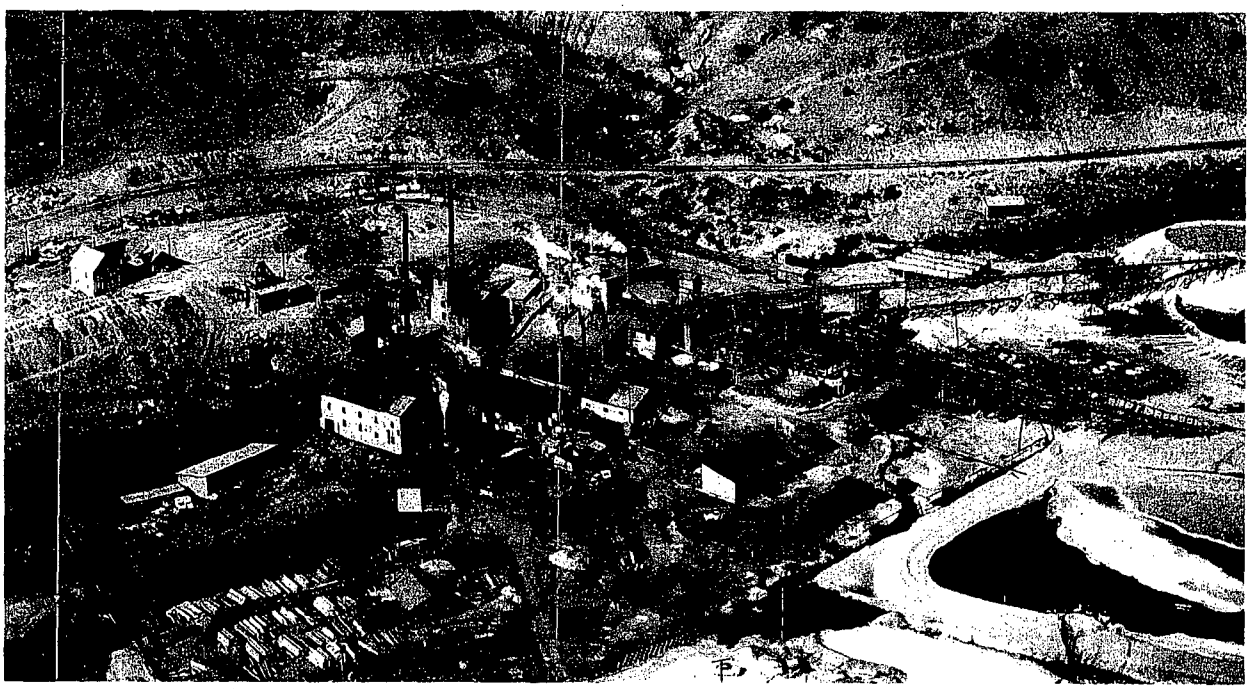


Figure 47.7a. View southwest of the VCA Naturita uranium-vanadium mill in 1957. Photo from files of U.S. Department of Energy, Grand Junction, Colorado, Office.

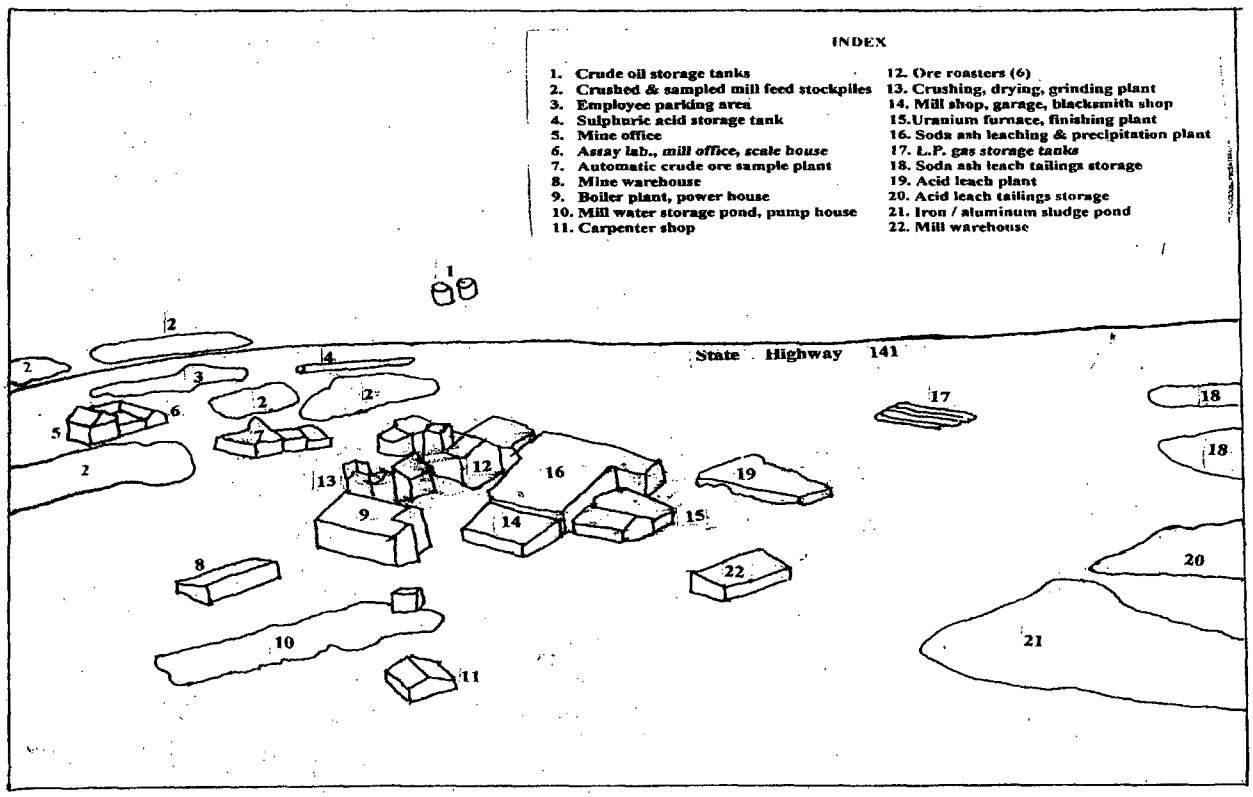


Figure 47.7b. Identification of the buildings and features shown in Figure 47.7a, provided by Pat Daniels (retired VCA).

This page intentionally left blank

Attachment 2

Selected Organic Analytical Results Supporting DOE Response to NRC Comment 1C

This page intentionally left blank

GROUND WATER QUALITY DATA BY LOCATION (USEE100) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0547 <well>
REPORT DATE: 1/17/2006 4:35 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Total Organic Carbon	mg/L	07/17/1989	0001		1			#	1	-
	mg/L	07/17/1989	0002		2	U		#	2	-
	mg/L	07/17/1989	0003		3			#	1	-
	mg/L	07/17/1989	0004		2			#	1	-
	mg/L	07/17/1989	0005		3			#	1	-
	mg/L	04/18/1991	0001		2			#	1	-
	mg/L	04/24/1994	N001		2			#	1	-
	mg/L	04/24/1994	N002		2			#	1	-

GROUND WATER QUALITY DATA BY LOCATION (USEE100) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0547 <well>
REPORT DATE: 1/17/2006 4:35 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY

RECORDS: SELECTED FROM USEE100 WHERE site_code='NAT01' AND location_code in('0548','0547') AND quality_assurance = TRUE AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND cas in('000921-47-1','HYDROCARBS','HYD-KEROSENE','TEH','TOC','TOX')

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- \+ Correlation coefficient for MSA < 0.995.
- \> Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique
- X Location is undefined.
- J Estimated value.
- R Unusable result.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

GROUND WATER QUALITY DATA BY LOCATION (USEE100) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0548 <well>
REPORT DATE: 1/17/2006 4:35 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Total Organic Carbon	mg/L	07/17/1989	0001		2			#	1	-
	mg/L	04/19/1991	0001		4			#	1	-

RECORDS: SELECTED FROM USEE100 WHERE site_code='NAT01' AND location_code in('0548','0547') AND quality_assurance = TRUE AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND cas in('000921-47-1','HYDROCARBS','HYD-KEROSENE','TEH','TOC','TOX')

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique
- X Location is undefined.
- J Estimated value.
- R Unusable result.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0661 <well> Upgradient well located approximately 1/2 mile southeast of the Naturita Processing site.
REPORT DATE: 4/9/2009 4:00 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
1,1,1,2-Tetrachloroethane	ug/L	09/17/1999	N001		5	U		#	5	-
1,1,1-Trichloroethane	ug/L	09/17/1999	N001		5	U		#	5	-
1,1,2,2-Tetrachloroethane	ug/L	09/17/1999	N001		10	U		#	10	-
1,1,2-Trichloroethane	ug/L	09/17/1999	N001		5	U		#	5	-
1,1-Dichloroethane	ug/L	09/17/1999	N001		5	U		#	5	-
1,1-Dichloroethene	ug/L	09/17/1999	N001		5	U		#	5	-
1,1-Dichloropropene	ug/L	09/17/1999	N001		10	U		#	10	-
1,2,3-Trichloropropane	ug/L	09/17/1999	N001		5	U		#	5	-
1,2,4-Trimethylbenzene	ug/L	09/17/1999	N001		5	U		#	5	-
1,2-Dibromo-3-chloropropa	ug/L	09/17/1999	N001		5	U		#	5	-
1,2-Dibromoethane	ug/L	09/17/1999	N001		5	U		#	5	-
1,2-Dichlorobenzene	ug/L	09/17/1999	N001		10	U		#	10	-
1,2-Dichloroethane	ug/L	09/17/1999	N001		5	U		#	5	-
1,2-Dichloropropane	ug/L	09/17/1999	N001		5	U		#	5	-
1,3,5-Trimethylbenzene	ug/L	09/17/1999	N001		5	U		#	5	-
1,3-Dichlorobenzene	ug/L	09/17/1999	N001		5	U		#	5	-
1,3-Dichloropropane	ug/L	09/17/1999	N001		5	U		#	5	-
1,4-Dichlorobenzene	ug/L	09/17/1999	N001		10	U		#	10	-
2,2-Dichloropropane	ug/L	09/17/1999	N001		10	U		#	10	-
2-Butanone	ug/L	09/17/1999	N001		10	U		#	10	-
2-Chlorotoluene	ug/L	09/17/1999	N001		5	U		#	5	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0661 <well>
REPORT DATE: 4/9/2009 4:00 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
2-Hexanone	ug/L	09/17/1999	N001		10	U		#	10	-
4,4'-DDD	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
4,4'-DDE	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
4,4'-DDT	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
4-Chlorotoluene	ug/L	09/17/1999	N001		5	U		#	5	-
4-Methyl-2-Pentanone	ug/L	09/17/1999	N001		10	U		#	10	-
Acetone	ug/L	09/17/1999	N001		10	U		#	10	-
Aldrin	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Alkalinity, Total (As CaCO3	mg/L	09/17/1999	0001		406			#	-	-
alpha-BHC	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
alpha-Chlordane	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Ammonia Total as NH4	mg/L	09/17/1999	0001		3.860			#	-	-
Antimony	mg/L	09/17/1999	0001		0.00047	B	U	#	-	-
Arsenic	mg/L	09/17/1999	0001		0.0014	B		#	-	-
Benzene	ug/L	09/17/1999	N001		10			#	-	-
beta-BHC	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Bromobenzene	ug/L	09/17/1999	N001		5	U		#	5	-
Bromochloromethane	ug/L	09/17/1999	N001		5	U		#	5	-
Bromodichloromethane	ug/L	09/17/1999	N001		5	U		#	5	-
Bromoform	ug/L	09/17/1999	N001		10	U		#	10	-
Bromomethane	ug/L	09/17/1999	N001		10	U		#	10	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0661 <well>
REPORT DATE: 4/9/2009 4:00 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Calcium	mg/L	09/17/1999	0001		37.600			#	-	-
Carbon Disulfide	ug/L	09/17/1999	N001		5	U		#	5	-
Carbon tetrachloride	ug/L	09/17/1999	N001		5	U		#	5	-
Chloride	mg/L	09/17/1999	0001		142.000			#	-	-
Chlorobenzene	ug/L	09/17/1999	N001		5	U		#	5	-
Chlorodibromomethane	ug/L	09/17/1999	N001		5	U		#	5	-
Chloroethane	ug/L	09/17/1999	N001		10	U		#	10	-
Chloroform	ug/L	09/17/1999	N001		5	U		#	5	-
Chloromethane	ug/L	09/17/1999	N001		10	U		#	10	-
cis-1,2-Dichloroethene	ug/L	09/17/1999	N001		5	U		#	5	-
cis-1,3-Dichloropropene	ug/L	09/17/1999	N001		5	U		#	5	-
delta-BHC	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Dibromomethane	ug/L	09/17/1999	N001		5	U		#	5	-
Dichlorodifluoromethane	ug/L	09/17/1999	N001		5	U		#	5	-
Dieldrin	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
Endosulfan I	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Endosulfan II	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
Endosulfan sulfate	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
Endrin	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
Endrin aldehyde	ug/L	09/17/1999	N001		0.106	U		#	0.106	-
Endrin ketone	ug/L	09/17/1999	N001		0.106	U		#	0.106	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0661 <well>
REPORT DATE: 4/9/2009 4:00 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Ethylbenzene	ug/L	09/17/1999	N001		30			#	-	-
Furan, tetrahydro-	ug/L	09/17/1999	N001		740	JN		#	-	-
gamma-BHC (Lindane)	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
gamma-Chlordane	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Gross Alpha	pCi/L	09/17/1999	0001		9.01		J	#	7.48	± 5.36
Gross Beta	pCi/L	09/17/1999	0001		12.31			#	8.51	± 5.54
Heptachlor	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Heptachlor epoxide	ug/L	09/17/1999	N001		0.054	U		#	0.054	-
Iodomethane	ug/L	09/17/1999	N001		5	U		#	5	-
Isopropylbenzene	ug/L	09/17/1999	N001		1	J		#	-	-
Isopropyltoluene	ug/L	09/17/1999	N001		5	U		#	5	-
Lead-210	pCi/L	09/17/1999	0001		0.87	U		#	0.87	± 0.50
Magnesium	mg/L	09/17/1999	0001		13.900			#	-	-
Manganese	mg/L	09/17/1999	0001		1.890			#	-	-
Methoxychlor	ug/L	09/17/1999	N001		0.536	U		#	0.536	-
Methylene chloride	ug/L	09/17/1999	N001		10	U		#	10	-
Molybdenum	mg/L	09/17/1999	0001		0.0013	B	U	#	-	-
m-Xylene	ug/L	09/17/1999	N001		5	U		#	5	-
n-Butylbenzene	ug/L	09/17/1999	N001		5	U		#	5	-
Nitrate as NO3	mg/L	09/17/1999	0001		0.0360	B		#	-	-
n-Propylbenzene	ug/L	09/17/1999	N001		5	U		#	5	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0661 <well>
REPORT DATE: 4/9/2009 4:00 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Oxidation Reduction Potent	mV	09/17/1999	N001		80			#	-	-
o-Xylene	ug/L	09/17/1999	N001		5	U		#	5	-
pH	s.u.	09/17/1999	N001		7.16			#	-	-
Phosphate	mg/L	09/17/1999	0001		0.0860	B		#	-	-
Polonium-210	pCi/L	09/17/1999	0001		0.14		U	#	0.06	± 0.11
Potassium	mg/L	09/17/1999	0001		10.800			#	-	-
Radium-226	pCi/L	09/17/1999	0001		0.81			#	0.13	± 0.14
Radium-228	pCi/L	09/17/1999	0001		0.77	U		#	0.77	± 0.45
sec-Butylbenzene	ug/L	09/17/1999	N001		5	U		#	5	-
Selenium	mg/L	09/17/1999	0001		0.0010	U		#	0.001	-
Sodium	mg/L	09/17/1999	0001		151.000			#	-	-
Specific Conductance	umhos/cm	09/17/1999	N001		1264			#	-	-
Styrene	ug/L	09/17/1999	N001		1	J		#	-	-
Sulfate	mg/L	09/17/1999	0001		8.210			#	-	-
Temperature	C	09/17/1999	N001		14.3			#	-	-
tert-Butylbenzene	ug/L	09/17/1999	N001		5	U		#	5	-
Tetrachloroethene	ug/L	09/17/1999	N001		5	U		#	5	-
Toluene	ug/L	09/17/1999	N001		5	U		#	5	-
Total 1,2-Dichloroethene	ug/L	09/17/1999	N001		5	U		#	5	-
Total Dissolved Solids	mg/L	09/17/1999	0001		630			#	-	-
Total Organic Carbon	mg/L	09/17/1999	N001		0.89	BN	J	#	-	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0661 <well>
REPORT DATE: 4/9/2009 4:00 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Total Petroleum Hydrocarb	mg/L	09/17/1999	N001		1.0			#	-	-
Total Xylenes	ug/L	09/17/1999	N001		5	U		#	5	-
Toxaphene	ug/L	09/17/1999	N001		1.329	U		#	1.329	-
trans-1,2-Dichloroethene	ug/L	09/17/1999	N001		5	U		#	5	-
trans-1,3-dichloropropene	ug/L	09/17/1999	N001		5	U		#	5	-
Trichloroethene	ug/L	09/17/1999	N001		5	U		#	5	-
Trichlorofluoromethane	ug/L	09/17/1999	N001		5	U		#	5	-
Trichlorotrifluorethane	ug/L	09/17/1999	N001		5	U		#	5	-
Turbidity	NTU	09/17/1999	N001		88.8			#	-	-
Uranium	mg/L	09/17/1999	0001		0.0126			#	-	-
Vanadium	mg/L	09/17/1999	0001		0.0062	B		#	-	-
Vinyl chloride	ug/L	09/17/1999	N001		10	U		#	10	-

GENERAL WATER QUALITY DATA BY LOCATION (USEE105) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0661 <well>
REPORT DATE: 4/9/2009 4:00 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY

RECORDS: SELECTED FROM USEE100 WHERE site_code='NAT01' AND location_code in('0661') AND quality_assurance = TRUE AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%N%' AND data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%')

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- G Possible grout contamination, pH > 9.
- J Estimated value.
- L Less than 3 bore volumes purged prior to sampling.
- N Presumptive evidence that analyte is present. The analyte is "tentatively identified".
- Q Qualitative result due to sampling technique
- R Unusable result.
- U Parameter analyzed for but was not detected.
- X Location is undefined.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

GROUND WATER QUALITY DATA BY PARAMETER WITH DEPTH (USEE200) FOR SITE NAT01, Naturita Processing Site
REPORT DATE: 4/22/2009 1:58 pm

PARAMETER	UNITS	LOCATION ID	LOCATION TYPE	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Total Petroleum Hydrocarb	mg/L	0661	WL	09/17/1999	N001		1.0			#	-	-

RECORDS: SELECTED FROM USEE200 WHERE site_code='NAT01' AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%N%' AND data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND cas in('BTEX','TP1D','TP2D','TPG','TPJF','TPH')

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LOCATION TYPES: WL WELL

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper.detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- G Possible grout contamination, pH > 9.
- J Estimated value.
- L Less than 3 bore volumes purged prior to sampling.
- N Presumptive evidence that analyte is present. The analyte is "tentatively identified".
- Q Qualitative result due to sampling technique
- R Unusable result.
- U Parameter analyzed for but was not detected.
- X Location is undefined.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

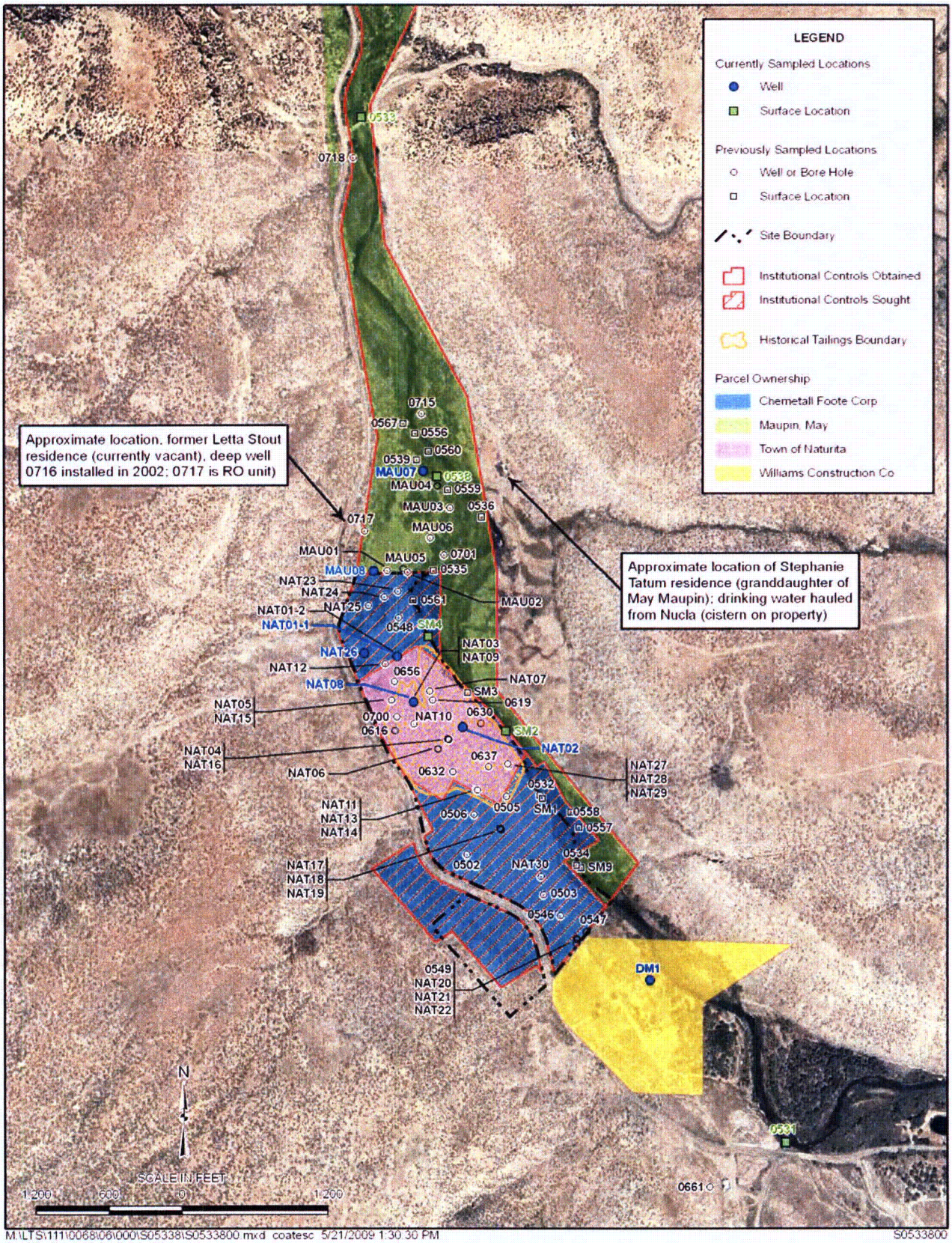
This page intentionally left blank

Attachment 3

Documentation Supporting DOE Response to NRC Comment 1D: Local Groundwater Use and Well Permit Information

This page intentionally left blank

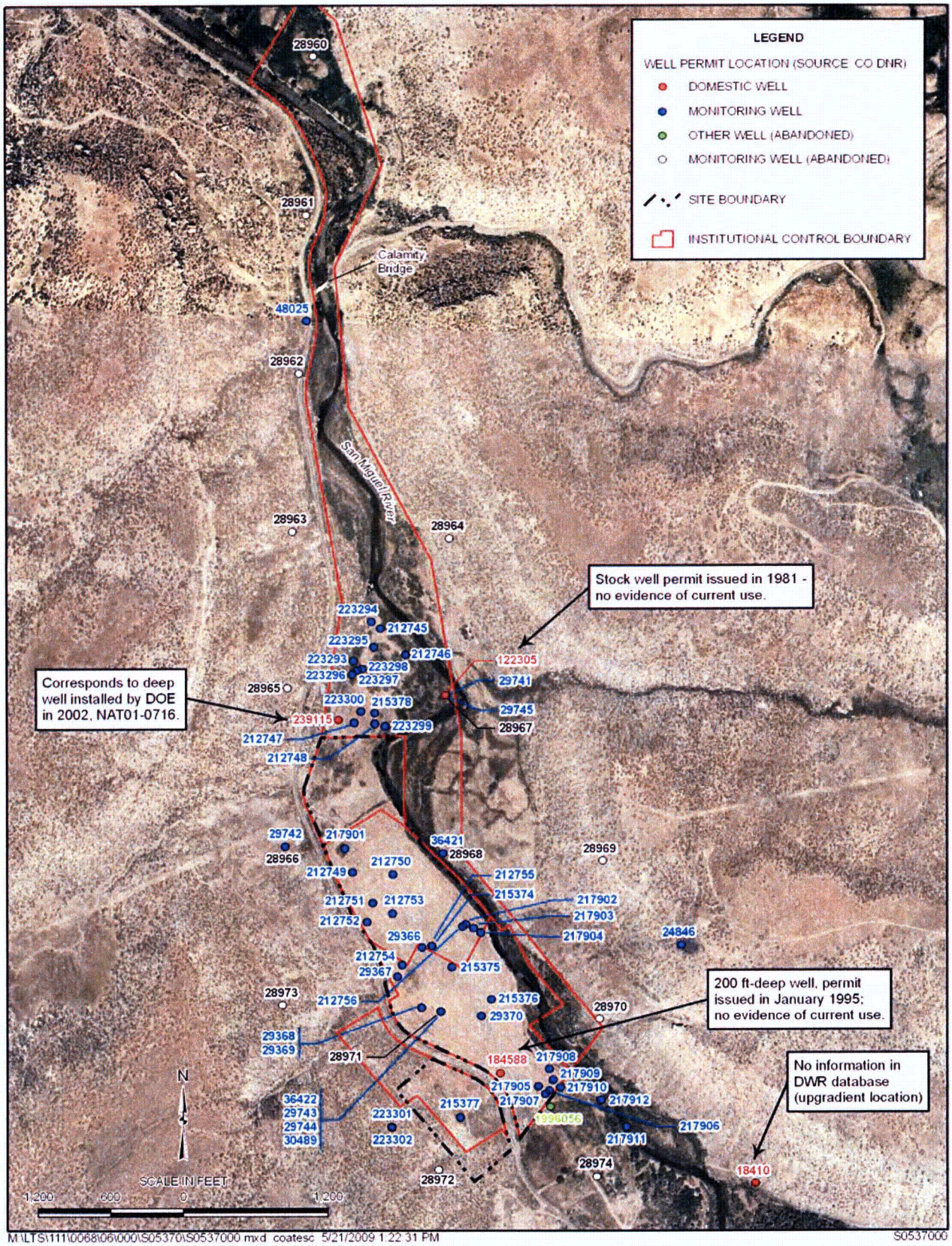
Exhibit 1



M:\LTS\111\0068\06\000\S05338\S0533800.mxd coatesc 5/21/2009 1:30:30 PM

S0533800

Exhibit 2



Source: Colorado Division of Natural Resources (DNR), Division of Water Resources (DWR), Colorado's Decision Support Systems (CDSS) Mapping (Township 46N, Range 16W), last update July 2008 Date accessed, 4/30/09, available at: http://165.127.23.116/website/cdss/viewer.htm

Well Applications in Naturita Site Area, from Colorado Division of Natural Resources, Division of Water Resources, GIS-Mapping

http://165.127.23.116/website/cdss/viewer.htm

Rec	RECEIPT	PERMITNO	STAT_DATE	DOE Well Number	Owner	STAT_CODE	ACT_DATE	ACT_DESC	USE1	USE2	USE3	ISSUEDDATE	FIRSTUSE
1	218865	122305	8/26/1981				8/26/1981	Well permit issued.	DOMESTIC	STOCK		9/28/1981	
2	0259721B	29369	10/15/1985	0502	Chemetall Foote	Statement of Beneficial use received.	10/15/1985	Statement of Beneficial Use accepted.	OTHER		MONITORING WELL	12/11/1985	5/27/1987
3	0259721D	29367	10/15/1985	5/20/1901	Chemetall Foote	Statement of Beneficial use received.	10/15/1985	Statement of Beneficial Use accepted.	OTHER		MONITORING WELL	12/11/1985	5/27/1987
4	0262576A	29741	2/24/1986	0501	0501		2/24/1986	Well permit issued.	OTHER		MONITORING WELL	3/4/1986	
5	0262576B	29742	2/24/1986	0548	Chemetall Foote		2/24/1986	Statement of Beneficial Use accepted.	OTHER		MONITORING WELL	3/4/1986	5/27/1987
6	0262576D	29744	2/24/1986	0547	Chemetall Foote		2/24/1986	Statement of Beneficial Use accepted.	OTHER		MONITORING WELL	3/4/1986	5/27/1987
7	0262576E	29745	2/24/1986				2/24/1986	Well permit issued.	OTHER		MONITORING WELL	3/4/1986	
8	0268360B	30489	9/11/1986	0549	Chemetall Foote		9/11/1986	Statement of Beneficial Use accepted.	OTHER		MONITORING WELL	9/17/1986	5/26/1987
9	9112168	18410							DOMESTIC				1/18/1964
10	9112305	29366		0505	Chemetall Foote				OTHER		MONITORING WELL		1/3/1986
11	9112307	29368							OTHER		MONITORING WELL		12/23/1986
12	9112309	29370		0503	Chemetall Foote				OTHER		MONITORING WELL		1/11/1986
13	9112318	29743		0546	Chemetall Foote				OTHER		MONITORING WELL		6/6/1986
14	0024846A	24846	11/7/1994				11/7/1994	Monitoring hole notice of construction.	OTHER		MONITORING WELL	11/21/1994	
15	378826	184588	12/16/1994				12/16/1994	Well permit issued.	DOMESTIC		ISSUED UNDER PRESUMPTION 3b-IIA	1/24/1995	
16	28960	28960	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
17	28961	28961	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
18	28962	28962	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
19	28963	28963	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
20	28964	28964	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
21	28965	28965	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
22	28966	28966	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
23	28967	28967	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
24	28968	28968	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
25	28969	28969	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
26	28970	28970	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
27	28971	28971	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
28	28972	28972	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
29	28973	28973	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
30	28974	28974	8/5/1996			Abandoned well.	8/5/1996	Abandoned well.	OTHER		MONITORING WELL	2/4/1998	
31	0436750A	212745	10/9/1998	MAU04	May Maupin	Change in ownership accepted and updated.	10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
32	0436750B	212746	10/9/1998	MAU03	May Maupin	Change in ownership accepted and updated.	10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
33	0436750C	212747	10/9/1998	MAU01	May Maupin	Change in ownership accepted and updated.	10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
34	0436750D	212748	10/9/1998	MAU02	May Maupin	Change in ownership accepted and updated.	10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
35	0436750E	212749	10/9/1998	NAT12	Chemetall Foote		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
36	0436750F	212750	10/9/1998	NAT01	Chemetall Foote		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
37	0436750G	212751	10/9/1998	NAT03	City of Naturita		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
38	0436750H	212752	10/9/1998	NAT05	City of Naturita		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
39	0436750I	212753	10/9/1998	NAT07	City of Naturita		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
40	0436750J	212754	10/9/1998	NAT06	City of Naturita		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
41	0436750K	212755	10/9/1998	NAT04	Chemetall Foote		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
42	0436750L	212756	10/9/1998	NAT02	City of Naturita		10/9/1998	Well permit issued.	OTHER		MONITORING WELL	9/28/1998	
43	0441731A	215374	2/22/1999	NAT08	City of Naturita		2/22/1999	Well permit issued.	OTHER		MONITORING WELL	2/22/1999	
44	0441731B	215375	2/22/1999	NAT09	City of Naturita		2/22/1999	Well permit issued.	OTHER		MONITORING WELL	2/22/1999	
45	0441731C	215376	2/22/1999	NAT11	City of Naturita		2/22/1999	Well permit issued.	OTHER		MONITORING WELL	2/22/1999	
46	0441731D	215377	2/22/1999	NAT10	City of Naturita		2/22/1999	Well permit issued.	OTHER		MONITORING WELL	2/22/1999	
47	0441731E	215378	2/22/1999	MAU05	May Maupin	Change in ownership accepted and updated.	2/22/1999	Well permit issued.	OTHER		MONITORING WELL	2/22/1999	
48	0446611A	217901	6/7/1999	NAT26	Chemetall Foote		6/7/1999	Well permit issued.	OTHER		MONITORING WELL	6/9/1999	
49	0446611B	217902	6/7/1999	NAT29	City of Naturita		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
50	0446611C	217903	6/7/1999	NAT28	City of Naturita		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
51	0446611D	217904	6/7/1999	NAT27	City of Naturita		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
52	0446611E	217905	6/7/1999	NAT19	Chemetall Foote		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
53	0446611F	217906	6/7/1999	NAT18	Chemetall Foote		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
54	0446611G	217907	6/7/1999	NAT17	Chemetall Foote		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
55	0446611H	217908	6/7/1999	NAT22	Chemetall Foote		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
56	0446611I	217909	6/7/1999	NAT21	Chemetall Foote		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
57	0446611J	217910	6/7/1999	NAT20	Chemetall Foote		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
58	0446611K	217911	6/7/1999	DM1 (Upgradient Well)	HSW Investments		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
59	0446611L	217912	6/7/1999	NAT30	Chemetall Foote		6/7/1999	Well permit issued.	OTHER	OTHER	MONITORING WELL	6/9/1999	
60	36421	36421	6/21/1999				6/21/1999	Monitoring hole notice of construction.	OTHER		MONITORING WELL	6/23/1999	
61	36422	36422	6/21/1999				6/21/1999	Monitoring hole notice of construction.	OTHER		MONITORING WELL	6/23/1999	
62	0457729A	223293	3/8/2000	MAU08	May Maupin	Change in ownership accepted and updated.	3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
63	0457729B	223294	3/8/2000	MAU07	May Maupin	Change in ownership accepted and updated.	3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
64	0457729C	223295	3/8/2000	MAU06	May Maupin	Change in ownership accepted and updated.	3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
65	0457729D	223296	3/8/2000	NAT25	Chemetall Foote		3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
66	0457729E	223297	3/8/2000	NAT24	Chemetall Foote		3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
67	0457729F	223298	3/8/2000	NAT23	Chemetall Foote		3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
68	0457729G	223299	3/8/2000	NAT16	City of Naturita		3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
69	0457729H	223300	3/8/2000	NAT15	City of Naturita		3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
70	0457729I	223301	3/8/2000	NAT14	City of Naturita		3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
71	0457729J	223302	3/8/2000	NAT13	City of Naturita		3/8/2000	Well permit issued.	OTHER		MONITORING WELL	3/21/2000	
72	9400898	239115	4/1/2002	NAT01-0716	NAT01-0716	May Maupin, Stephanie Tatum	4/1/2002	Well permit issued.	DOMESTIC		ISSUED UNDER PRESUMPTION 3b-IIA	4/4/2002	
73	0000442A	1996056				Abandoned well.		Abandoned well.	OTHER				
74	48025	48025	8/1/2008				8/1/2008	Monitoring hole notice of construction.	OTHER		MONITORING WELL	8/1/2008	

Well Applications in Naturita Site Area, from Colorado Division of Natural Resources, Division of Water Resources, GIS-Mapping

Rec	RECEIPT	PERMITNO	STAT_DATE	AQUIFER1	AQUIFER2	WELL_YIELD	WELL_DEPTH	WELL_LEVEL	NAME	ADDRESS	ADDRESS2	CITY
1	218865	122305	8/26/1981	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN P			NUCLA
2	0259721B	29369	10/15/1985	ALL UNNAMED AQUIFERS		0	249	0	US DEPT ENERGY	C/O JACOBS ENG GRP INC	5301 CENTRAL AVE NE #1700	ALBUQUERQUE
3	0259721D	29367	10/15/1985	ALL UNNAMED AQUIFERS		0	27	0	US DEPT ENERGY	C/O JACOBS ENG GRP INC	5301 CENTRAL AVE NE #1700	ALBUQUERQUE
4	0262576A	29741	2/24/1986	ALL UNNAMED AQUIFERS		0	0	0	US DEPT ENERGY/JACOBS ENGR			ALBUQUERQUE
5	0262576B	29742	2/24/1986	ALL UNNAMED AQUIFERS		0	23	0	US DEPT ENERGY/JACOBS ENGR	C/O JACOBS ENG GROUP INC	5301 CENTRAL AVE NE #1700	ALBUQUERQUE
6	0262576D	29744	2/24/1986	ALL UNNAMED AQUIFERS		0	23	0	US DEPT ENERGY/JACOBS ENGR	5301 CENTRAL AV NE #1700		ALBUQUERQUE
7	0262576E	29745	2/24/1986	ALL UNNAMED AQUIFERS		0	0	0	US DEPT ENERGY/JACOBS ENGR			ALBUQUERQUE
8	0268360B	30489	9/11/1986	ALL UNNAMED AQUIFERS		0	0	0	US DEPT ENERGY			ALBUQUERQUE, NM
9	9112168	18410		ALL UNNAMED AQUIFERS		8	36	20	CHADD GLEN W	PO BOX 515		NATURITA
10	9112305	29366		ALL UNNAMED AQUIFERS		0	24	0	US DEPT ENERGY	5301 CENTRAL AVE. NE		ALBUQUERQUE
11	9112307	29368		ALL UNNAMED AQUIFERS		0	41	0	US DEPT ENERGY	5301 CENTRAL AVE. NE		ALBUQUERQUE
12	9112309	29370		ALL UNNAMED AQUIFERS		0	165	0	US DEPT ENERGY	5301 CENTRAL AVE. NE		ALBUQUERQUE
13	9112318	29743		ALL UNNAMED AQUIFERS		0	23	0	US DEPT ENERGY	5301 CENTRAL AVE. NE		ALBUQUERQUE
14	0024846A	24846	11/7/1994	ALL UNNAMED AQUIFERS		0	0	0	REAMS CONSTRUCTION CO	C/O GORDON SMITH & CO	BOX 550	NATURITA
15	378826	184588	12/16/1994	DAKOTA		0	200	0	REAMS CONST CO	PO BOX 106		NATURITA
16	28960	28960	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
17	28961	28961	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
18	28962	28962	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
19	28963	28963	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
20	28964	28964	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
21	28965	28965	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
22	28966	28966	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
23	28967	28967	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
24	28968	28968	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
25	28969	28969	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
26	28970	28970	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
27	28971	28971	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
28	28972	28972	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
29	28973	28973	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
30	28974	28974	8/5/1996	ALL UNNAMED AQUIFERS		0	0	0	MAUPIN BLM	C/O MK FERGUSON CO	BOX 9136	ALBUQUERQUE
31	0436750A	212745	10/9/1998	UNCONFINED SAN LUIS VALL		0	10	0	US DEPT ENERGY	2597 B3/4 ROAD		GRAND JUNCTION
32	0436750B	212746	10/9/1998	UNCONFINED SAN LUIS VALL		0	9	0	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
33	0436750C	212747	10/9/1998	UNCONFINED SAN LUIS VALL		0	14	0	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
34	0436750D	212748	10/9/1998	UNCONFINED SAN LUIS VALL		0	18	0	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
35	0436750E	212749	10/9/1998	UNCONFINED SAN LUIS VALL		0	18	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
36	0436750F	212750	10/9/1998	UNCONFINED SAN LUIS VALL		0	18	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
37	0436750G	212751	10/9/1998	UNCONFINED SAN LUIS VALL		0	11	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
38	0436750H	212752	10/9/1998	UNCONFINED SAN LUIS VALL		0	14	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
39	0436750I	212753	10/9/1998	UNCONFINED SAN LUIS VALL		0	13	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
40	0436750J	212754	10/9/1998	UNCONFINED SAN LUIS VALL		0	12	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
41	0436750K	212755	10/9/1998	UNCONFINED SAN LUIS VALL		0	17	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
42	0436750L	212756	10/9/1998	UNCONFINED SAN LUIS VALL		0	12	0	USGS % KIM GODDARD	1745 W 1700 S		SALT LAKE CITY
43	0441731A	215374	2/22/1999	ALL UNNAMED AQUIFERS		0	12	0	USGS WRD % KIMBALL GODDARD	1745 W 1700 S		SALT LAKE CITY
44	0441731B	215375	2/22/1999	ALL UNNAMED AQUIFERS		0	11	0	USGS WRD % KIMBALL GODDARD	1745 W 1700 S		SALT LAKE CITY
45	0441731C	215376	2/22/1999	ALL UNNAMED AQUIFERS		0	14	0	USGS WRD % KIMBALL GODDARD	1745 W 1700 S		SALT LAKE CITY
46	0441731D	215377	2/22/1999	ALL UNNAMED AQUIFERS		0	12	0	USGS WRD % KIMBALL GODDARD	1745 W 1700 S		SALT LAKE CITY
47	0441731E	215378	2/22/1999	ALL UNNAMED AQUIFERS		0	9	0	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
48	0446611A	217901	6/7/1999	ALL UNNAMED AQUIFERS		0	16	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
49	0446611B	217902	6/7/1999	ALL UNNAMED AQUIFERS		0	7	0	US GEOLOGICAL SURVEY	1745 W 1700 S		SALT LAKE CITY
50	0446611C	217903	6/7/1999	ALL UNNAMED AQUIFERS		0	7	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
51	0446611D	217904	6/7/1999	ALL UNNAMED AQUIFERS		0	7	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
52	0446611E	217905	6/7/1999	ALL UNNAMED AQUIFERS		0	11	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
53	0446611F	217906	6/7/1999	ALL UNNAMED AQUIFERS		0	11	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
54	0446611G	217907	6/7/1999	ALL UNNAMED AQUIFERS		0	11	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
55	0446611H	217908	6/7/1999	ALL UNNAMED AQUIFERS		0	10	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
56	0446611I	217909	6/7/1999	ALL UNNAMED AQUIFERS		0	10	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
57	0446611J	217910	6/7/1999	ALL UNNAMED AQUIFERS		0	10	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
58	0446611K	217911	6/7/1999	ALL UNNAMED AQUIFERS		0	8	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
59	0446611L	217912	6/7/1999	ALL UNNAMED AQUIFERS		0	8	0	US GEOLOGICAL SURVEY	C/O KIMBALL GODDARD	1745 W 1700 S	SALT LAKE CITY
60	36421	36421	6/21/1999	ALL UNNAMED AQUIFERS		0	0	0	NATURITA CITY	C/O US GEOLOGICAL SURVEY	1745 W 1700 S	SALT LAKE CITY
61	36422	36422	6/21/1999	ALL UNNAMED AQUIFERS		0	0	0	NATURITA CITY	C/O US GEOLOGICAL SURVEY	1745 W 1700 S	SALT LAKE CITY
62	0457729A	223293	3/8/2000	ALL UNNAMED AQUIFERS		0	11	0	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
63	0457729B	223294	3/8/2000	ALL UNNAMED AQUIFERS		0	8	0	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
64	0457729C	223295	3/8/2000	ALL UNNAMED AQUIFERS		0	8	0	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
65	0457729D	223296	3/8/2000	ALL UNNAMED AQUIFERS		0	15	0	US GEOLOGICAL SURVEY	C/O RYAN ROWLAND	2329 W ORTON CIRCLE	WEST VALLEY CITY
66	0457729E	223297	3/8/2000	ALL UNNAMED AQUIFERS		0	9	0	US GEOLOGICAL SURVEY	C/O RYAN ROWLAND	2329 W ORTON CIRCLE	WEST VALLEY CITY
67	0457729F	223298	3/8/2000	ALL UNNAMED AQUIFERS		0	10	0	US GEOLOGICAL SURVEY	C/O RYAN ROWLAND	2329 W ORTON CIRCLE	WEST VALLEY CITY
68	0457729G	223299	3/8/2000	ALL UNNAMED AQUIFERS		0	12	0	US GEOLOGICAL SURVEY	C/O RYAN ROWLAND	2329 W ORTON CIRCLE	WEST VALLEY CITY
69	0457729H	223300	3/8/2000	ALL UNNAMED AQUIFERS		0	14	0	US GEOLOGICAL SURVEY	C/O RYAN ROWLAND	2329 W ORTON CIRCLE	WEST VALLEY CITY
70	0457729I	223301	3/8/2000	ALL UNNAMED AQUIFERS		0	11	0	US GEOLOGICAL SURVEY	C/O RYAN ROWLAND	2329 W ORTON CIRCLE	WEST VALLEY CITY
71	0457729J	223302	3/8/2000	ALL UNNAMED AQUIFERS		0	12	0	US GEOLOGICAL SURVEY	C/O RYAN ROWLAND	2329 W ORTON CIRCLE	WEST VALLEY CITY
72	9400898	239115	4/1/2002	ALL UNNAMED AQUIFERS		5	600	150	US DEPT ENERGY	2597 B 3/4 ROAD		GRAND JUNCTION
73	0000442A	1996056		ALL UNNAMED AQUIFERS		0	0	0	PC EXPLORATION	1125 W 650 N		CENTERVILLE
74	48025	48025	8/1/2008	ALL UNNAMED AQUIFERS		0	20	0	US DEPT OF ENERGY	C/O STOLLER	2597 B 3/4 RD	GRAND JUNCTION

Attachment 4

USGS Internal File Documenting Determinations of Hydraulic Conductivity for Naturita Site

This page intentionally left blank

U.S. Department of Energy—Grand Junction, Colorado

Calculation Cover Sheet

Calc. No.: S0571700 **Discipline:** Hydrogeology **No. of Sheets:** 2

Project: Department of Energy, Office of Legacy Management, Title I UMTRA Program

Site: Naturita Processing Site, Naturita, Colorado

Feature:
Determination of Hydraulic Conductivity (Kx) for Naturita Groundwater Flow Model, Basis for Kx Used in the Site Observational Work Plan (SOWP)

Sources of Data:

U.S. Geological Survey (USGS) internal file, entitled "Hydraulic Conductivity at Naturita"

Sources of Formulas and References:

U.S. Geological Survey (USGS) internal file, entitled "Hydraulic Conductivity at Naturita" (same as above)

Anderson, Mary P., and Woessner, William M., 1992, Applied Groundwater Modeling, Simulation of Flow and Advective Transport, Academic Press, Inc.

Task Order No.: 501 **File Index No.** NA

Proj. No.: LM00-501-02-115 **Calc. No.** S0571700 **Supercedes Calc. No.** NA

Calculated by	Date	Checked by	Date	Approved by	Date	DOE Concurrence	Date
USGS	~2000	R. Zurdel	7-21-09	Dave Trail	7-21-09	2009.07.22 07:55:11 -06'00'	

Problem Statement:

Review of USGS documentation and data to determine validity of the assumed average hydraulic conductivity (Kx, 30 ft/day) used in the Naturita groundwater flow model.

Method of Solution:

Not Applicable

Assumptions:

USGS literature sources are reliable and all supporting data were accurately recorded and analyzed according to accepted standards.

Calculation:

All calculations (e.g., averaging of hydraulic conductivity values) are within the cited document.

Discussion:

In the preface to their evaluation, USGS stated that the flow model for the Naturita site is insensitive to the hydraulic conductivity. A hydraulic conductivity could not be determined from parameter estimation approaches using only the flow model because the magnitude of the groundwater fluxes was unknown. [For a complete and thorough discussion of boundary conditions consult Chapter 4 of: Anderson, Mary P., and Woessner, William M., 1992, Applied Groundwater Modeling, Simulation of Flow and Advective Transport, Academic Press, Inc.] Therefore, hydraulic conductivity values were derived independently of the flow model using five different approaches (e.g., slug tests, age dating, tracer tests).

USGS selected a value of 30 feet per day as an average value representative of the site. This value also equals the median hydraulic conductivity estimated from the tritium-helium age dating results and was slightly biased toward smaller conductivity values.

Conclusion and Recommendations:

The document cited above, an undated USGS internal file supporting the Naturita site groundwater flow model, has been reviewed. The methods, assumptions, and results of this evaluation are technically sound.

Computer Source:

Not Applicable

Hydraulic Conductivity at Naturita[†]

The flow model for the Naturita site is insensitive to the hydraulic conductivity. A hydraulic conductivity can not be determined from parameter estimation approaches using only the flow model because the magnitude of the groundwater fluxes are unknown. However, hydraulic conductivity values are critically important for conducting solute transport simulations because of the linear dependence between solute velocity and hydraulic conductivity in Darcy's Law. Therefore, hydraulic conductivity values must be obtained independently of the flow model. The methods considered below can generally be grouped into two categories: (1) methods that estimate hydraulic conductivity directly, and (2) methods that estimate velocities which can be used together with Darcy's law to estimate hydraulic conductivity. A total of five different approaches were considered and results from these approached are discussed in summarized below.

Direct determinations of hydraulic conductivity

Slug Tests

Introduction and methods

Slug tests were performed on 10 Wells at the Naturita during November, 1999 when water levels in the aquifer were generally low and in May 2000 when water levels in the aquifer were generally high. Two to four slug test replicates were done on each well. The slug test procedure was as follows. A slug of known volume attached to a thin rope was lowered into a well and the water level was allowed to stabilize. The size of the slug used in each well depended on the thickness of the water column, and the displacement of each slug was measured prior to the tests. The water level in the well was monitored continuously with an In-Situ Troll, Model S/P 400, pressure transducer suspended in the well. The equilibrium water level was also measured with electric tape from the top of the PVC casing. The slug was then rapidly removed from the well, and water level recovery and elapsed time recorded by the Troll. Replicate slug tests were performed after water levels recovered to the equilibrium values.

At the completion of the slug test, raw data from the troll were copied to a P.C. for analysis. Raw water level data were converted to displacement in feet and normalized with the initial water level change due to rapidly removed in the slug. Raw elapsed time data were converted from minutes to seconds. After 0.75 to 0.9 seconds, disturbance of the water surface ceased and measured displacement agreed with the actual displacement. The effective casing radius for most tests was taken as the casing radius. The elapsed time and normalized displacement data for each slug test were analyzed with AQTESOLV for hydraulic conductivity. The Bouwer-Rice solution for unconfined aquifers was used to determine all hydraulic conductivity values. In heterogeneous aquifers, slug test results tend to be biased toward high values of hydraulic conductivity because these regions respond most rapidly to the change of volume in the well bore.

Results

The computed hydraulic conductivity values determined from the slug tests are summarized in Table 1. Some replicate hydraulic conductivity values are missing in the table due to poor slug test data quality that was not comparable to other slug test data at the same well. In addition, the slug tests in November, 1999 at NAT-19 and NAT-20 were erratic and non-repeatable. Therefore, no hydraulic conductivity values were calculated for these wells. For those wells that are listed, the hydraulic conductivity values for replicates at each well generally agreed

---

[†] Undated U.S. Geological Survey (USGS) internal file supporting Naturita site groundwater flow model. Results later published in: "Simulation of reactive transport of uranium(VI) in groundwater with variable chemical conditions," *Water Resources Research*, Vol. 42, W04404. Curtis, P., Davis, J. and Naftz, D. 2006.

with 30% or less. For the complete site, most of the hydraulic conductivity values were in the range of 30 to 90 ft/day with the exception of NAT23 and NAT09 which had a values approximately equal to 300 ft/day. The value at NAT09 of 333 ft/d can be compared with the value of 97 ft/d observed at NAT03 which less than 15 feet from NAT09. This factor of three discrepancy is probably the result of small-scale heterogeneities at a site; it is possible that NAT09 intercepts a highly permeable layer that is not present at NAT03.

Analysis of the San Miguel River-alluvial aquifer hydraulic interactions.

Figure 1 demonstrates the close coupling between surface water elevations in the San Miguel River and ground water elevations (or heads) observed in the Naturita aquifer. In this section, the coupling between the river and the aquifer is treated quantitatively using two USGS ground water - surface water interaction models. These two models, STWT1 and STLK1, are for unconfined and confined aquifers respectively and are based on analytical solutions to the transient groundwater flow equation. The principles and assumptions made in developing these codes are discussed in two USGS reports by Barlow and Moench and by Desimone and Barlow and will only briefly be summarized here. The models are based on the assumption of horizontal flow into or out of a river in response to either changes in river stage or to areal recharge of the aquifer. An analysis of the magnitude and delay between peaks in river stage and a corresponding change in aquifer head is used to obtain an estimate of the horizontal hydraulic conductivity (K_X). In unconfined aquifers, the critical flow determining parameters for a given geometry are K_X, the vertical hydraulic conductivity, the saturated thickness, and the specific yield and storage coefficients. Important assumptions made in the derivation of the analytical solutions include: (1) the aquifers and aquitards are homogeneous and of uniform thickness, (2) the lower boundary is horizontal and impermeable, (3) the confining or leaky aquifer is isotropic and the flow is horizontal, (4) the changes in saturated thickness of water table aquifer is relatively small, (5) the river fully penetrates the aquifer, (6) the riverbed may consist of a thin layer of less permeable material than the aquifer, (7) the initial water levels in the river and the aquifer are the same, and (8) changes in the stream stage occur instantaneously. With these assumptions, Barlow and Moench derived analytical solutions for the change in the head in an observation well in response to change in the stream stage. Complex river-aquifer interactions are treated by superpositioning using a convolution approach which is based on the fact that the flow equation is linear for the stated assumptions. The convolution approach amounts to the descretizing the observed river stage temporally and linearly combining the computed change in aquifer head. In the case of an unconfined aquifer, the amount of water required to increase the piezometric surface is typically larger than the case of a confined or semiconfined aquifer because there can be substantially more vertical flow in the unconfined case.

Example: NAT-29

For analysis of the groundwater surface water interactions, it was assumed that the assumption of instantaneous change in river stage was best met at NAT29 for changes in stream stage observed on May 7. This event resulted from several late evening and early morning thunderstorms which occurred during a field sampling trip. The analysis of the river aquifer interactions requires that a number of parameters describing the geometry of the system and the hydraulic properties of the aquifer be defined or estimated. The distances from the wells to the river and the river width were obtained directly in the field and are shown in Figure 2. The thickness of the aquifer was taken from drilling records; for the simulations at NAT-11 the saturated thickness in the simulations was taken as the average saturated thickness observed at NAT-11 and NAT-29. The specific storage coefficient used was $2x10^{-5}$ and the specific yield was 0.3. The significance of these assumed values was tested in sensitivity calculations. With these parameters fixed, the optimal fit to the model was obtained by varying the horizontal hydraulic conductivity (K_X) of the aquifer such that the sum of the unweighted squared residuals between the model simulations in the observed data were minimized. Areal recharge was not considered because of the short time scale and because of unsaturated zone consists of fine grain material.

The data considered in fitting the model were truncated at approximately 2.8 days because the small peak beginning at 3 days in the stream flow data is not prominent in the well data. Figure 2 shows that the fitted STWT1 model generally reproduced the amplitude and the phase shift of the observed data in NAT-29 but the simulated peak has less tailing than was observed in the data as shown. The K_X value that gave the optimum fit was 5300 ft/d. Figure 2 also shows results of sensitivity analyses which show that the computed head in NAT-29 is sensitive to changing the K_X value by a factor of 2.

SUMMARY OF K_X RESULTS

The analysis outlined at for data on May 7 2000 at NAT29 was repeated at several other dates and also for transducer records for wells NAT11, NAT23 and NAT25. The results of all of these analyses are summarized in Table 2. The values show some scatter but also some clear trends. At NAT-29, the average K_X value was 4900 ft/d and all values were within 15% of this value. At NAT-11, which is approximately 335 feet farther away from the river, the K_X values were all very large and ranged from 6000 to 194000 ft/d. The values of 194000 was obtained for the fit to the data starting April 3, 2000 for the first 5 days of the snow melt related increase in the river stage. The observed head in NAT-11 were unusual during this time in that the amplitude of the diurnal head changes closely paralleled that in NAT-29 whereas during the other three dates, there is a more pronounced lag between the two data sets. The April 3 dataset also had the largest total change in the saturated thickness. The saturated thickness increased by approximately 40% during this time and this large increase could have caused large errors because the approach is based on the assumption of small changes in elevation. Regardless of the cause, the large fitted K_X value obtained for all data sets suggest that NAT-11 is located in a high permeability zone in good hydraulic contact with the river.

The results obtained also show that there is qualitatively and quantitatively less permeable material near NAT-23 and NAT-25 relative to that near NAT-11. The average K_X value at NAT-23 was 290 ft/d and the value at NAT-25 the value was 920 ft/d. In both cases, all of the observed values were within a factor of 2 of the respective mean value indicating good reproducibility. The results also suggest that the aquifer is slightly less permeable near the river. However, in nearly all cases, the model simulations match the magnitude of the changes in the head but there were errors in the time with respect to time. The reasons for this are currently unknown, but may result from aquifer heterogeneities.

Determinations of Hydraulic Conductivity from Darcy's Law

Bromide Tracer Tests

In September, 1998 we received permission from the US EPA to conduct small-scale, single-well tracer tests. The purpose of these tests was to get a greater understanding of the ground water velocities occurring at the site.

Description of the Tests

Four single-well tracer tests were conducted in October, 1998 within several days after the new USGS monitoring wells were installed. These are described as single-well tests because each test was conducted in a single well. In each test, ground water was pumped from a well in to a large container, spiked with a known mass of potassium bromide to give a final concentration of 500 mg/L of bromide (Br), and then pumped back down the same well. Two tests were conducted in 2-inch wells (NAT02 and NAT03) and two tests were conducted in the bottom and top levels of a multilevel sampling well (NAT04-1 and NAT04-3). The middle level of the multilevel well (NAT04-2) was also sampled to check for vertical migration in the tracer test. The volume of ground water spiked with Br that was injected varied with length of the screen for 2 inch wells and it varied with the distance between bentonite layers for the .5 inch wells. A summary of the well characteristics and the volumes injected are listed in Table 3.

Samples were taken from the wells for up to 100 hours to monitor for the disappearance of Br. At least two well volumes were pumped from the wells and discarded before taking a sample for Br analysis. Br analyses were conducted in the field with a specific ion electrode to help guide in determining when to take samples. A duplicate sample was analyzed in the lab to obtain more precise values that are reported here.

Results

The results for the disappearance of Br in the five wells sampled are illustrated in Figure 3. Bromide was observed to disappear in all four wells into which it was injected, and only very small concentrations were observed in well NAT04-2, the middle level of the multilevel well. The observed low concentration in well NAT04-2 shows that vertical migration was probably not significant this well. Figure 3 illustrates that the disappearance of Br varied depending on the well being sampled. NAT02 showed the slowest disappearance of Br with the concentration dropping to slightly less than 40% of the injected concentration after 90 hr. Wells NAT03 and NAT04-1, showed similar rates of disappearance of Br, with the concentration dropping to 10% of the injected concentration after approximately 40 to 60 hours. Finally, in NAT04-3, which is located 4 feet above NAT04-1, the Br had nearly completely disappeared when the first sample was take at 18 hours after the injection.

The velocities were estimated by assuming that the injected water formed a cylinder with a height equal to the screen size for 2 in wells and equal to the distance between bentonite layers for the .5 inch wells. The radius of the cylinder was calculated from the volume injected and an assumed porosity of 0.25. The velocity was calculated from the time that it took the injected bromide to reach 10% of the injected concentration and the radius of the cylinder. This approach is empirical and based on previous experience conducting tracer tests at the USGS Toxics Substances Hydrology research site on Cape Cod. At Cape Cod, comparisons using the approach outlined above and with tracer test observations from downstream sampling wells agreed within a factor of 2.

The estimated ground water velocities are summarized in Table 3. The velocities show a range from 0.23 ft/d to greater than 1.64 ft/d, with two values approximately equal to 0.6 to 0.7 ft/d.

The velocity values in Table 3 can be used, together with a value of the hydraulic gradient, and a porosity, to estimate a hydraulic conductivity (K) using Darcy's Law. At the time of the tracer tests, the measured water levels indicated that the site-wide gradient was 0.005. The K values calculated from an assumed porosity of 0.25 are listed in Table 4. For the purposes of reporting median, mean, and maximum values, the concentration at a relative concentration of 0.1 used for velocity estimates at NAT04-3 was estimated by linear interpolation between the injected value concentration and the concentration in the first sample.

Hydraulic conductivity estimated from migration of chloride in groundwater

A crude estimate of ground water velocity can be obtained by considering the location of chloride dissolved the groundwater at different times. Figure 4 for illustrates the distribution of chloride observed in April 1990, Sept. 1999 and May 2000. At DOE616, the largest chloride concentration was observed in April 1990 and in Sept. 1999 the peak chloride concentration was observed at Nat 26. These two locations are 820 feet apart. A very approximate velocity can be calculated by assuming that the peak concentration observed at these two wells actually represented the location of the center of mass. If this were the case, the center of mass of the Cl plume would have moved 820 feet between April 1990 and September 1999. This corresponds to velocity of 0.24 ft/day. This velocity is highly speculative because this sparsity of sampling points. In particular is not known that the center in the mass was located at DOE well in 1991 nor is it known that the center of mass of the plume is located at Nat 26 in 1999. However, if the velocities were an order of magnitude larger, the chloride distributions observed in May 2000 or even the more recent sampling of November 2000 would most likely had shown greater displacement. Using an average hydraulic gradient of 0.0044 ft/ft and have assumed porosity of 0.25, the hydraulic conductivity is estimated to be 14 ft/d.

Hydraulic conductivity estimated from tritium-helium results.

In June 2000 a subset of the wells at Naturita site were sampled for the purpose of determining the age of the groundwater. Twelve wells were sampled for age dating by the tritium-helium methods. Currently (April 10, 2001)

results are available for nine wells and these are shown on figure 5 where the dates on figure indicate when the water entered the aquifer. In general the ages increase in the downgradient direction with the exception of the results MAU04 and MAU07. Figure 6 illustrates flow path lines calculated with MODFLOW and MODPATH that start at the wells that were sampled for tritium helium age determinations and backtrack to the point of recharge. The calculations show that all the wells were recharged in the upgradient portion of the aquifer. However, the path lines from wells MAU04 and MAU07 nearly intercepted the San Miguel River near NAT25. It is possible that under high flow conditions, these flow path would have intersected the river. The lengths of the path lines are listed in table 5. For wells MAU04 and MAU07, two lengths are listed. These lengths correspond to the full length of the flow path and the distance from the well to the sharp bend in the River near NAT23. Average velocities were calculated from the time since recharge occurred and the lengths of the flow paths and these average velocities are also listed in table 5. The estimated velocities range from 0.21 feet per day at MAU07 (along the short flow path) to approximately 2.4 feet per day at DM1 and at MAU04 (along the long flow path). The hydraulic conductivity values calculated from Darcy's law, a porosity of 0.25, and an average sitewide gradient of 0.0044 ft/ft are also listed in table 5. The values span only one order of magnitude and have a median value of 30 ft/d. This median value also agrees with the single value determined at NAT25. The value at NAT25 is particularly important because this is a region of high uranium concentrations.

Summary

Table 6 lists a summary of the hydraulic conductivity values estimated from the field conditions. The values estimated from the analysis of the stream aquifer interactions are generally one to two orders of magnitude larger than the results from all other tests. These results are probably biased toward the most permeable layers or regions in the aquifer and therefore these results will not be considered further. The remaining results generally agree with factor of 10 to 20. The slug test results are uniformly larger than those estimated from observed velocities and Darcy's law. Again this bias towards larger values is probably because the slug tests are often biased toward high values by highly permeable regions. Overall, the hydraulic conductivity values estimated from the movement of chloride, from the tracer test results, and the age dating results all agree with in order magnitude. The slug tests are generally a factor of 2 larger than these values. Based on estimates using Darcy's law, three hydraulic conductivity values were selected. A value of 30 feet per day was selected as an average value representative of the site. This equals the median hydraulic conductivity estimated from the tritium-helium age dating results. This value is slightly biased toward smaller conductivity values. This slight bias results from the assumed shorter flow paths to MAU04 and MAU07 in the analysis of the age dating results. This assumed shorter flow path can be justified because of (1) the proximity of MAU04 and MAU07 to the San Miguel river, (2) because the flow paths backtracked from these nearly intercept the San Miguel river, and (3) because the approach neglects any mixing effects such as dispersion. The value of 30 ft/d also equals the value observed from the dating results at NAT25. This is important because NAT25 has historically had high concentrations of uranium. NAT25 also appears to be on a long flow path that may not be strongly impacted annually by dilution with river water in response to snowmelt. This latter statement is supported by observed spatial trends in conservative, or nearly conservative species such as Cl and oxygen 18, and specific conductance. A more conservative hydraulic conductivity is 10 ft/d which is consistent with a minimum estimated hydraulic conductivities from both the tracer tests results and from the age dating results. It is also slightly less than the value obtained from the crude estimates of Cl migration. An upper bound of the hydraulic conductivity is estimated to be 100 feet per day. This estimate is consistent with the maximum values observed in both the tracer test results and the age dating results.

Table 1: Hydraulic Conductivity Determined from Slug Tests					
Well	Hydraulic Conductivity (ft/day)				Average Hydraulic Conductivity (ft/day)
	Test 1	Test 2	Test 3	Test 4	
NAT-02		28.9	40.8		35
NAT-03	96.0	84.5			90
NAT-05	75.9	67.2			71
NAT-10	37.7	29.7	26.6		31
NAT-11	93.3	81.0	90.4	94.6	90
NAT-23	246	313	295		280
NAT-25	23.8	43.6	32		33
MAU-03	84.6	70.2	104		86
MAU-07	15.9	26.5	26		23
NAT03	104	90.2			97
NAT05	75.9	67.1			72
NAT09	288	325	386		333
NAT11	108	115	105		109
NAT19	153	107	128		129
NAT24	22.6	65.6	66.9		52
NAT25	113	126	116		118
				Min	23
				Median	88
				Mean	103
				Max	333

Table 2: Hydraulic conductivity determined from the analysis of river – aquifer interactions.					
Well	Hydraulic conductivity (ft/day)				Average Hydraulic Conductivity (ft/day)
	3/7/00	4/3/00	4/17/00	5/7/00	
NAT29	4400	4400	5600	5300	4900
NAT11	6000	194000	38000	16000	63000
NAT23	230	170	490		290
NAT25	1200	700			920
				Min	290
				Median	2910
				Mean	17200
				Max	63000

Table 3. Characteristics of the wells used in for the bromide disappearance tests			
Wheell	Diameter(in)	Length(ft)	Volume(gal)
NAT-02	2	5	60
NAT-03	2	5	60
NAT-04-1	.5	2	22.5
NAT-04-3	.5	2	22.5

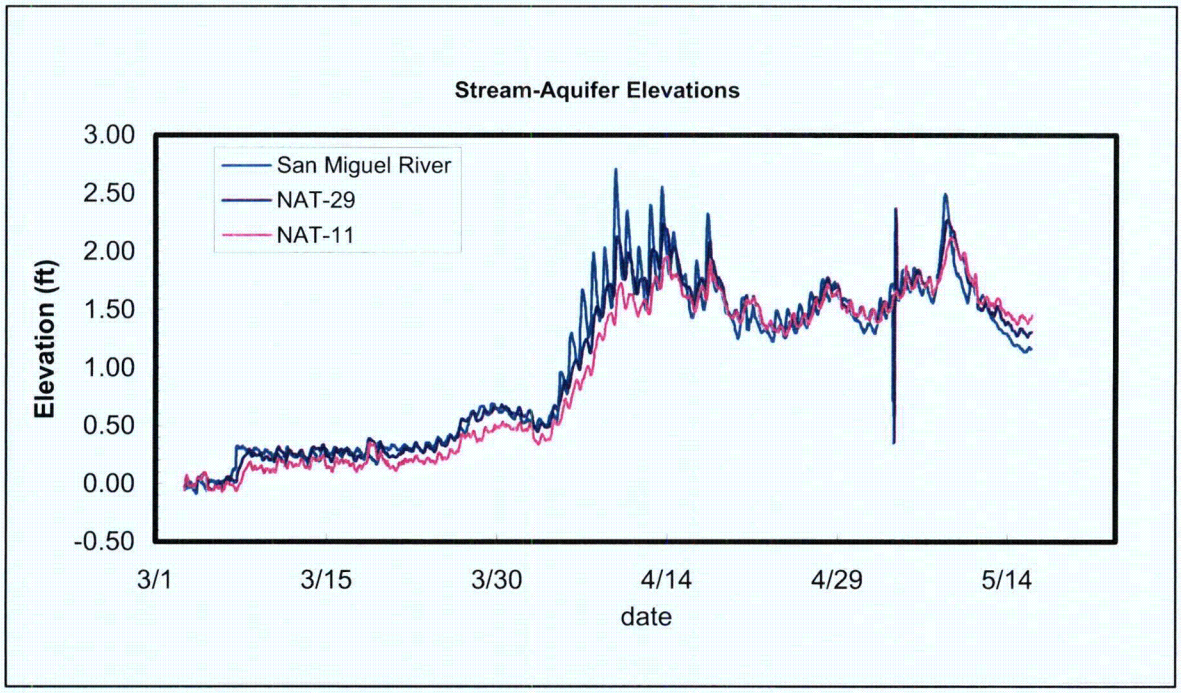
Table 4: Groundwater velocity and Hydraulic Conductivity		
Well	V(ft/d)	K(ft/d)1
NAT02	0.23	13
NAT03	0.56	32
NAT04-1	0.75	43
NAT04-3	>1.64	>93
	Min	13
	Median[2]	37
	Mean[2]	45
	Max[2]	93
[1]Calculations assume an average gradient of 0.0044 ft/ft and a porosity of 0.25.		
[2] Values assume the K at NAT04-3 equals 93 ft/d.		

Table 5: Velocities and hydraulic conductivities estimated from the tritium-helium age dating results.

Name	Tritium/ Helium age	Length of Recharge Path(ft)	Average Velocity (ft/d)	Hydraulic Conductivity (ft/d)	Comments
DM-1	0.2	174	2.38	135	
MAU04	5.6	4991	2.44	139	
		840	0.41	23	assumes recharge from bend in river
MAU07	12.4	5466	1.21	69	
		944	0.21	12	assumes recharge from bend in river
MAU08		4991			waiting for He
NAT02	15.1	2580	0.47	27	
NAT05		5196			waiting for He
NAT19	9.2	2955	0.88	50	
NAT23	13.5	5520	1.12	64	
NAT24	33.9	5465	0.44	25	
NAT25	28.2	5440	0.53	30	
NAT26		5520			waiting for He
NAT29	5.8	2202	1.04	59	
			Min	12	
			Median[1]	30	
			Mean[1]	47	
			Max[1]	135	

1 Values are based on the assumed shorter flow path to MAU04 and MAU07.

Table 6: Summary of Hydraulic Conductivity Estimates					
	Hydraulic Conductivity (ft/d)				
	Slug Tests	Stream-Aquifer Interactions	Cl	Tracer Tests[1]	Age Dating[2]
Min	23	290		13	12
Median	88	2910		37	30
Mean	103	17200	14	45	47
Max	333	63000		93	139
[1] Median, Mean and Max values are based on an assumed velocity at NAT04-3.					
[2] Values are based on the assumed shorter flow path to MAU04 and MAU07.					



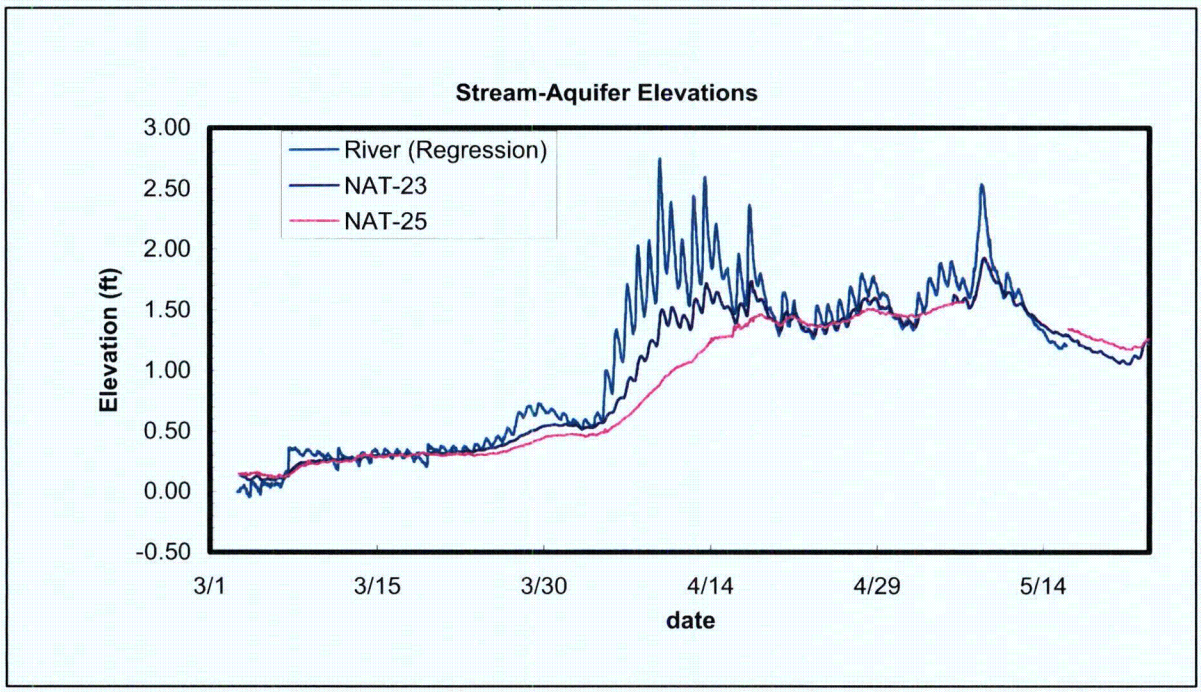


Figure 1. Water Elevations observed in the San Miguel River and in selected wells at Naturita. The elevation in the San Miguel River near NAT23 was estimated by a regression analysis.

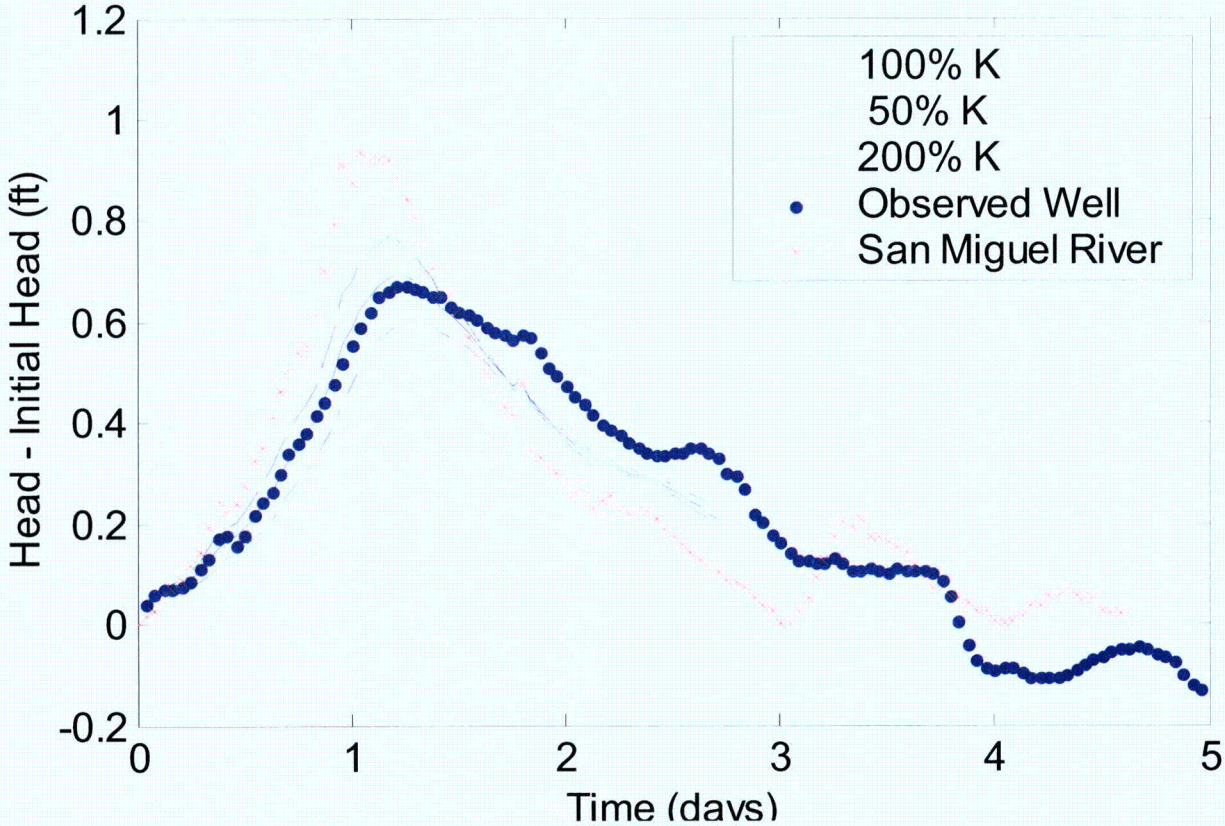


Figure 2. Calibration of STWT1 simulations to observed water elevations at NAT29 on May 7, 2000.

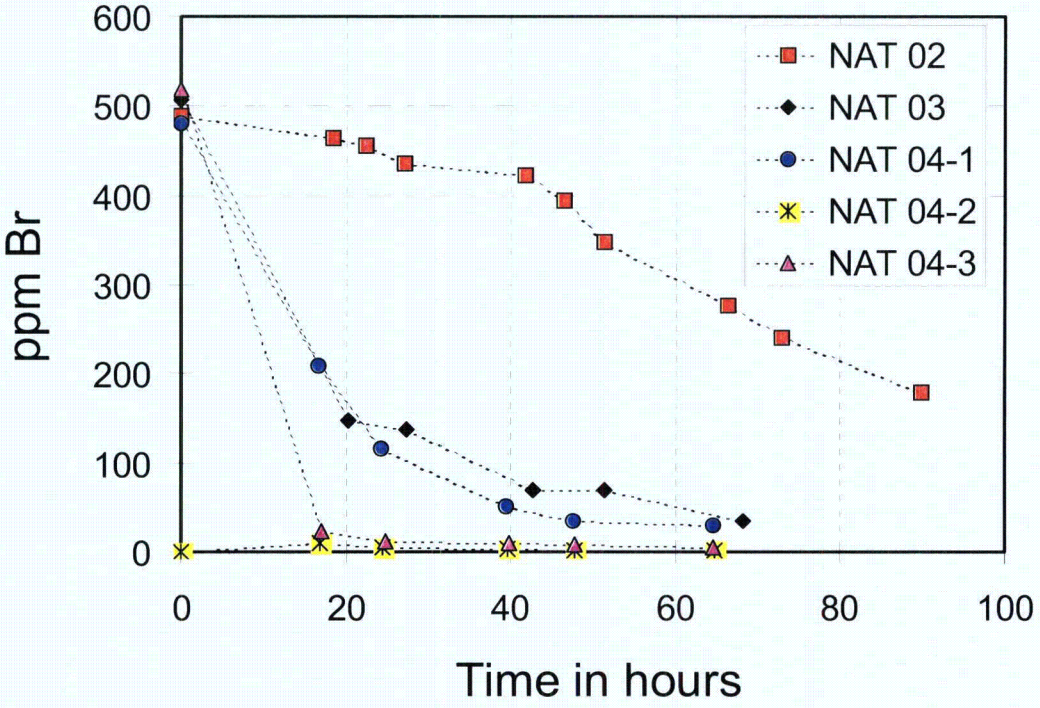
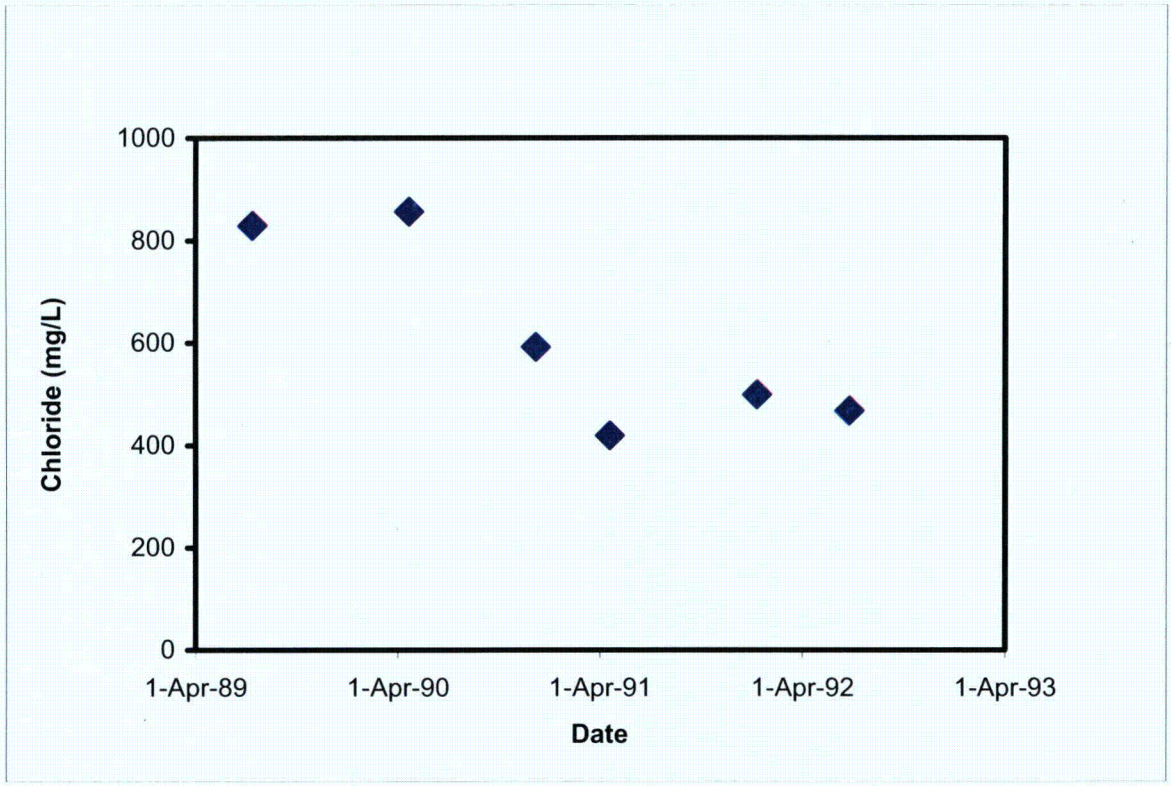


Figure 3. Disappearance of Br observed in 4 single well tracer tests.



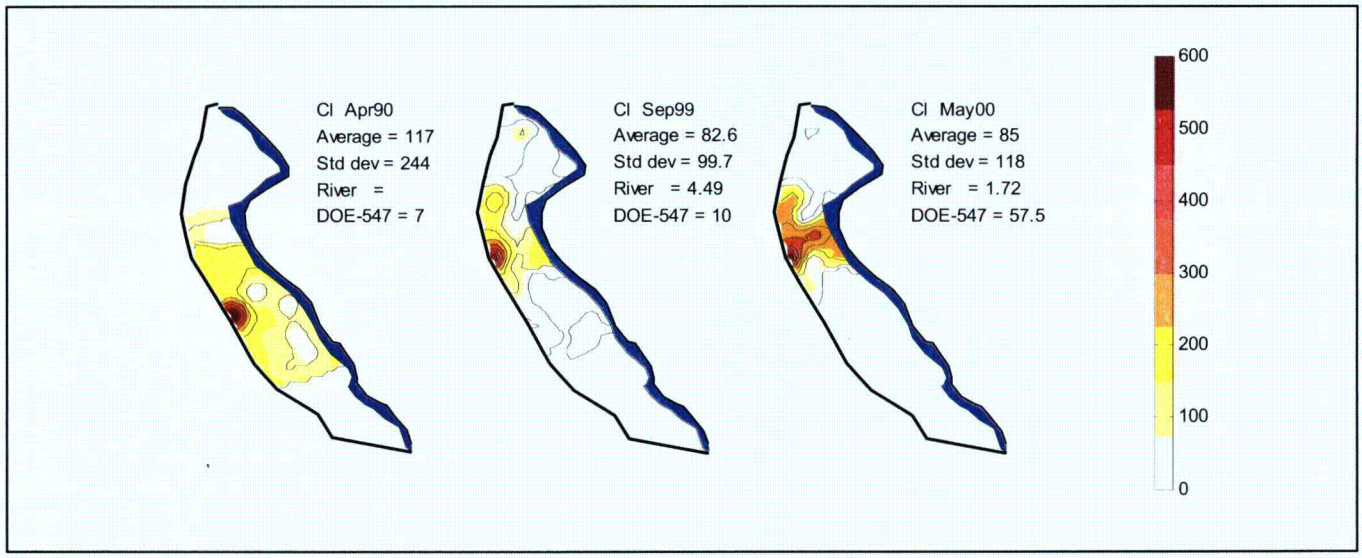


Figure 4. Observed concentration of Cl in units of mg/L at Naturita. (a) temporal observation at DOE616, and (b) spatial observation at three different times.

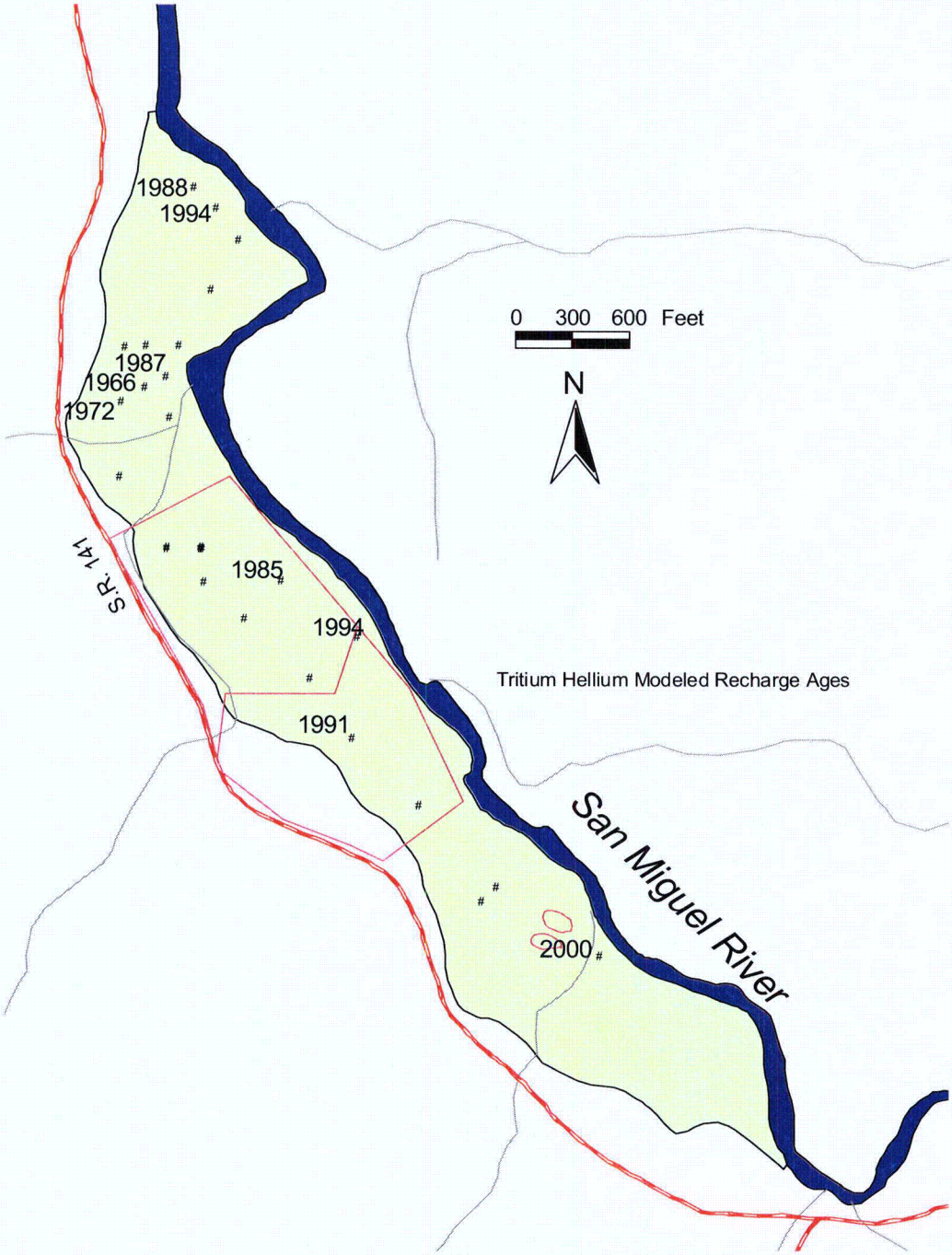


Figure 5. Dates of recharge for selected wells at Naturita determined by tritium – helium age dating.

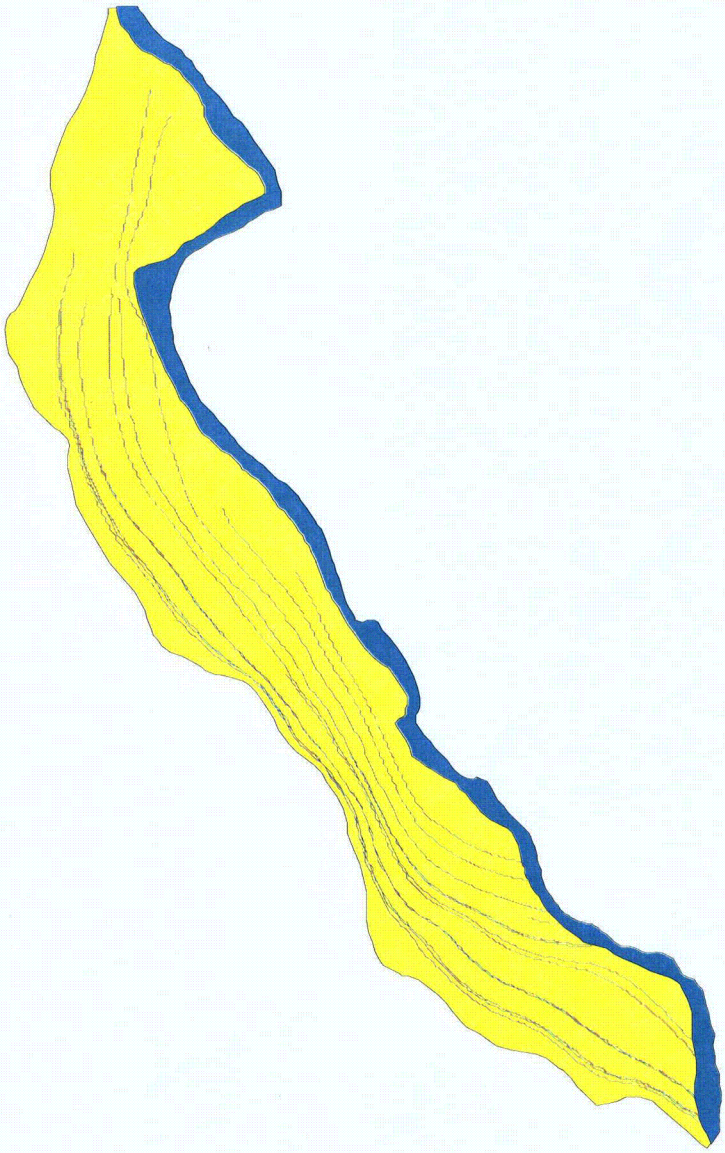


Figure 6. Flow path lines calculated from MODFLOW and MODPATH for wells where tritium – helium age dating tests were conducted.

Attachment 5

Chemistry Data and Sample Depths for Soil Samples NAT01-1 and NAT06-1

This page intentionally left blank

SOIL CHEMISTRY DATA BY LOCATION FOR SITE NAT01, NATURITA
LOCATION: NAT01-1
REPORT DATE: 8/14/2001 4:57 pm

PARAMETER	UNITS	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	DIGEST. CODE	SAMP DESC.	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Aluminum	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		1977				2.8	-
Barium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		297				0.4	-
Boron	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		7.08				0.4	-
Cadmium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		0.40	U			0.4	-
Calcium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		19184				2	-
Chloride	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		440				50	-
Chromium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		10.87				0.4	-
Cobalt	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		1.02				0.4	-
Copper	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		12.29				0.4	-
Iron	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		1874				0.32	-
Lead	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		20.23				2	-
Lithium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		2.35				0.28	-
Magnesium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		1273				1.6	-
Manganese	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		259				0.4	-
Molybdenum	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		0.4	U			0.4	-
Nickel	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		13.49				0.4	-
Phosphorus	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		416				0.4	-
Potassium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		411				2	-
Silicon	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		2080				2	-
Sodium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		332				1.2	-
Strontium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		161				2.8	-

SOIL CHEMISTRY DATA BY LOCATION FOR SITE NAT01, NATURITA
LOCATION: NAT01-1
REPORT DATE: 8/14/2001 4:57 pm

PARAMETER	UNITS	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	DIGEST. CODE	SAMP DESC.	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Sulfate	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		4600				200	-
Uranium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		6.03				0.25	-
Vanadium	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		5.35				0.4	-
Zinc	mg/kg	10/15/1998	00S1	5.00 - 6.00	USGSHNO3		65				0.4	-

SOIL CHEMISTRY DATA BY LOCATION FOR SITE NAT01, NATURITA
LOCATION: NAT01-1
REPORT DATE: 8/14/2001 4:57 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	DIGEST. CODE	SAMP DESC.	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY

DIGESTION CODES:

USGSHNO3 USGS Extractions By Extracting 2g Solid with 0.2L of 5% HNO3

SAMPLE DESCRIPTORS (UNIFIED SOIL CLASSIFICATION SYSTEM):

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- C Pesticide result confirmed by GC-MS.
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- D Analyte determined in diluted sample.
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- > Result above upper detection limit.
- J Estimated

DATA QUALIFIERS:

- J Estimated value.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- F Low flow sampling method used.
- R Unusable result.
- G Possible grout contamination, pH > 9.
- X Location is undefined.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

SOIL CHEMISTRY DATA BY LOCATION FOR SITE NAT01, NATURITA
LOCATION: NAT06-1
REPORT DATE: 8/14/2001 4:57 pm

PARAMETER	UNITS	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	DIGEST. CODE	SAMP DESC.	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Aluminum	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		1836				2.8	-
Barium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		133				0.4	-
Boron	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		8.72				0.4	-
Cadmium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		0.40	U			0.4	-
Calcium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		11047				2	-
Chloride	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		480				50	-
Chromium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		1.00				0.4	-
Cobalt	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		0.79				0.4	-
Copper	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		8.67				0.4	-
Iron	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		2071				0.32	-
Lead	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		2.00	U			2	-
Lithium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		1.95				0.28	-
Magnesium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		1885				1.6	-
Manganese	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		117				0.4	-
Molybdenum	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		0.4	U			0.4	-
Nickel	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		14.32				0.4	-
Phosphorus	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		332				0.4	-
Potassium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		760				2	-
Silicon	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		1901				2	-
Sodium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		869				1.2	-
Strontium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		108				2.8	-

SOIL CHEMISTRY DATA BY LOCATION FOR SITE NAT01, NATURITA
LOCATION: NAT06-1
REPORT DATE: 8/14/2001 4:57 pm

PARAMETER	UNITS	SAMPLE: DATE	ID	DEPTH RANGE (FT BLS)	DIGEST. CODE	SAMP DESC.	RESULT	QUALIFIERS: LAB	DATA	QA	DETECTION LIMIT	UN-CERTAINTY
Sulfate	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		7400				200	-
Uranium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		6.50				0.25	-
Vanadium	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		412				0.4	-
Zinc	mg/kg	10/19/1998	00S1	5.00 - 6.00	USGSHNO3		11				0.4	-

SOIL CHEMISTRY DATA BY LOCATION FOR SITE NAT01, NATURITA
LOCATION: NAT06-1
REPORT DATE: 8/14/2001 4:57 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	DIGEST. CODE	SAMP DESC.	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY

DIGESTION CODES:

USGSHNO3 USGS Extractions By Extracting 2g Solid with 0.2L of 5% HNO3

SAMPLE DESCRIPTORS (UNIFIED SOIL CLASSIFICATION SYSTEM):

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- E *Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.*
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- C Pesticide result confirmed by GC-MS.
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- D Analyte determined in diluted sample.
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- > Result above upper detection limit.
- J Estimated

DATA QUALIFIERS:

- J Estimated value.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- F Low flow sampling method used.
- R Unusable result.
- G Possible grout contamination, pH > 9.
- X Location is undefined.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

Attachment 6

Environmental Covenant for Maupin Property

This page intentionally left blank

STATE OF COLORADO

Bill Owens, Governor
Douglas H. Benevento, Acting Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory and Radiation Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

RECEIVED DOE
3
GRAND JUNCTION OFFICE

Colorado Department of Public Health and Environment

October 25, 2002

Mr. Ern Maupin
2938 Highway 141
Naturita Colorado 81424

Re: Environmental Covenant

Dear Mr. Maupin:

Enclosed is a copy of the Environmental Covenant that you have entered into with the State of Colorado. I am sorry for the delay in getting this to you. We are still trying to sign a Subordination Agreement with the oil company you lease to, and are waiting to record both of these agreements together. However, since you have inquired with DOE about getting a copy of the covenant, we wanted to send you a copy even though it has not yet been recorded with the county. Thanks you again for your cooperation in signing the covenant. If you have any questions, you can call me at (303) 692-3387.

Sincerely,

Jeffery Deckler
Remedial Programs Manager

cc w/encl.
Don Metzler, DOE/GJ

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, May Maupin grants an Environmental Covenant ("Covenant") this 5th day of July, 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, May Maupin is the owner of certain property located in Naturita, Montrose 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 have been disposed adjacent to the Property; and

WHEREAS, pursuant to the Site Observational Workplan for the Naturita, Colorado UMTRA Project Site, dated May 2002, 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 United States Department of Energy will construct a domestic water supply well on the Property to allow beneficial uses of uncontaminated groundwater while this Covenant is in effect; and

WHEREAS, May Maupin 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 May Maupin, her 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, May Maupin 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 May Maupin 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. May Maupin declares that the United States Department of Energy ("DOE") shall be a third party beneficiary of this Environmental Covenant. May Maupin, her 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 in areas where the Department of Energy has applied Supplemental Standards, as designated in **Attachment B,** without properly designed radon mitigation.

B. No wells or drilling or pumping whatsoever shall be permitted or allowed in the alluvial aquifer, without modification of this Covenant pursuant to paragraph 3, below. 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. Grazing and animal husbandry activities are permissible in all areas, including those where the Department of Energy has applied Supplemental Standards, as designated in **Attachment B.** All other activities, including tilling, excavation, grading, construction, or any other activity that disturbs the ground surface in these Supplemental Standards areas are not allowed without modification of this Covenant pursuant to paragraph 3, below.

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 modification of this Covenant pursuant to paragraph 3, below.

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 residual radioactive material or contaminated groundwater 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. This covenant does not affect DOE's responsibilities pursuant to UMTRCA.

9. Enforcement The Department may enforce the terms of this Covenant pursuant to §25-15-321. C.R.S. May Maupin 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 date of this Covenant signed by May Maupin, 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

May Maupin, has caused this instrument to be executed this 15 day of July, 2002.

May Maupin,

By: May Maupin

Title: _____

STATE OF Colorado)
) ss:
COUNTY OF Mesa)

The foregoing instrument was acknowledged before me this 15 day of July, 2002 by Joan M Wasenjer on behalf of May Maupin

Joan M Wasenjer
Notary Public

2808 North Ave
Address

GJ CO

My commission expires: 05/06/2006

Accepted by the Colorado Department of Public Health and Environment this 28th day of August, 2002.

By: [illegible]

Title: Director of Environmental Programs

STATE OF Colorado)
) ss:
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 28th day of August, 2002 by Douglas H. Benevento on behalf of the Colorado Department of Public Health and Environment.

Maria Sizepela-Sanchez
Notary Public

5863 Magnolia St.
Address

Commerce City, Co 80022

My commission expires: 4/14/03

EXHIBIT A

The legal description for this property is as follows:

1. Rock Gap Placer Mining Claim, designated by the United States Surveyor General as Survey Lot No. 2533, located in the Oro Mining district which patent is recorded in Book 123, Page 125 of the Montrose County Clerk and Recorder's Office.

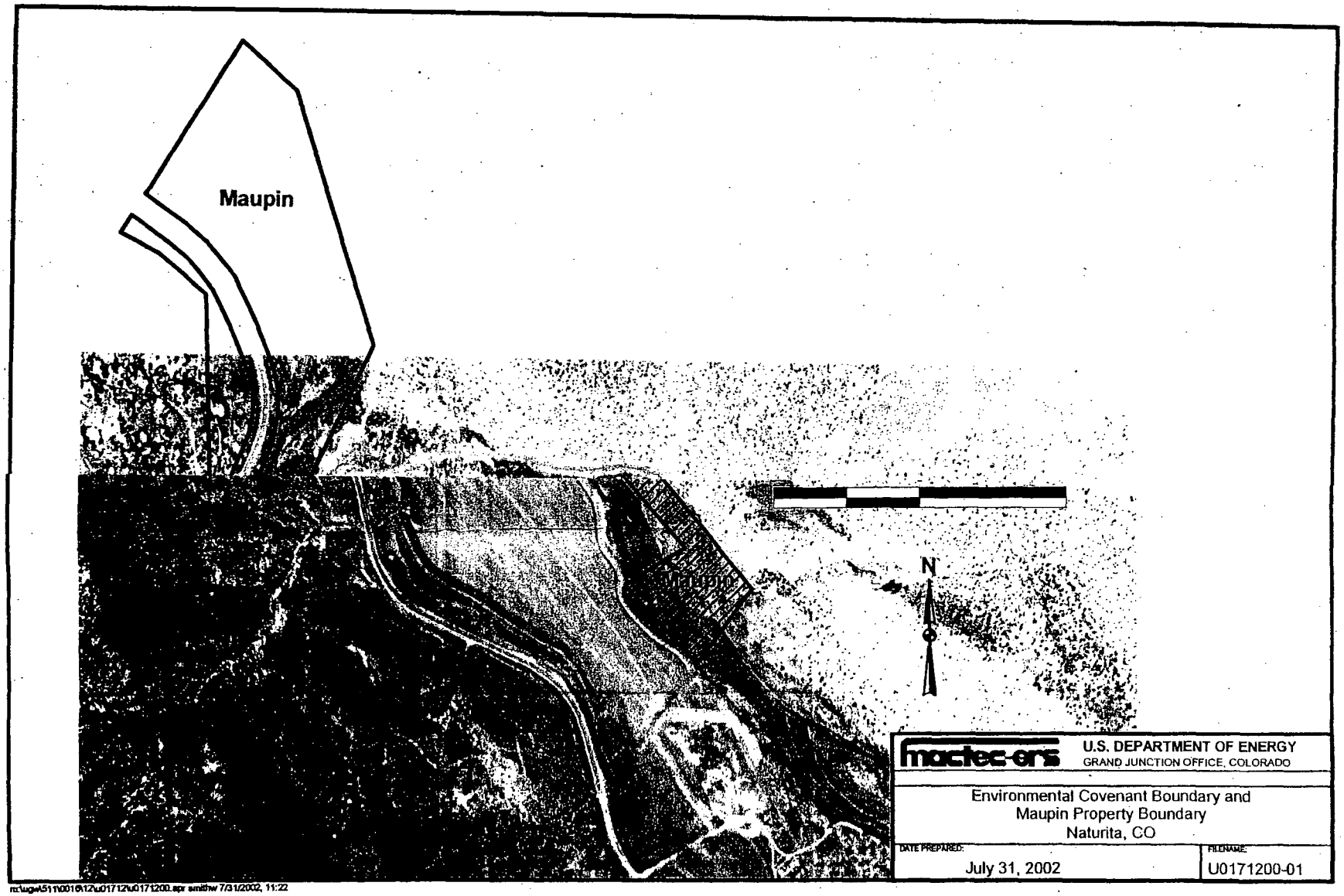
2. Lots 1, 3, and 4 situated in Section 14, Township 46 North of Range 16 West of the New Mexico Prime Meridian in Montrose County, Colorado.

3. That portion of the Kentucky Placer Mining Claim, designated by the United States Surveyor General as Survey Lot No. 2534, located in the Oro Mining District, which patent is recorded in Book 123, Page 128 of the Montrose County Clerk and Recorder's Office, excluding those tracts or areas located within said Kentucky Placer Mining Claim as more particularly described in the following deeds:

   a. That Deed from Ernest Maupin and Lyle Maupin to Vanadium Corporation of America, dated March 13, 1940 and recorded at Book 282, Page 521 of the real estate records of Montrose County, Colorado.

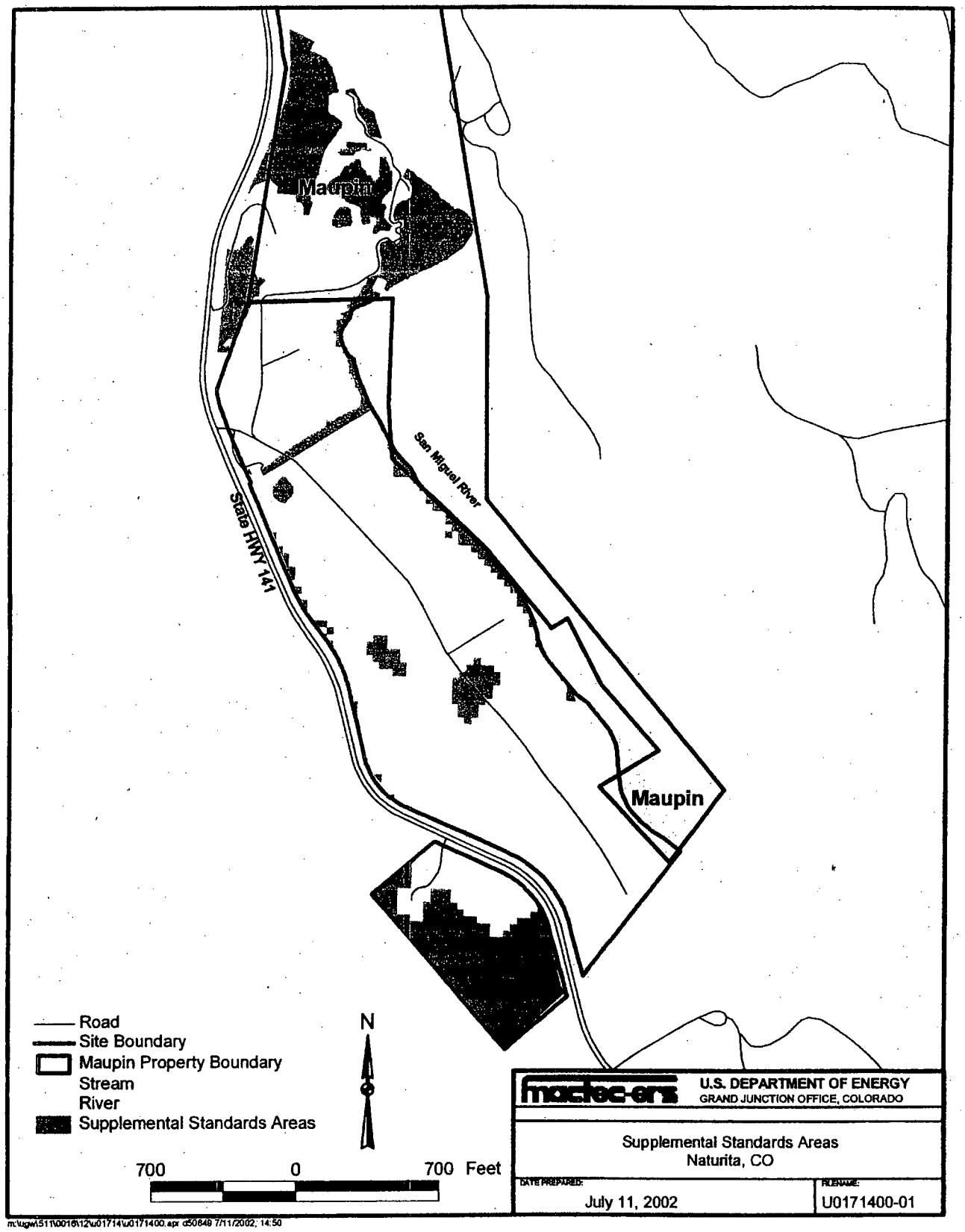
   b. That Deed from Philo Maupin and May Maupin to Vanadium Corporation of America, dated October 12, 1962 and recorded at Book 529, Page 117 of the real estate records of Montrose County, Colorado, and that Correction Deed from Philo Maupin and May Maupin to Foote Mineral Company, dated March 7, 1979 and recorded at Book 671, Page 851 of the real estate records of Montrose County, Colorado.

   c. That Deed from Anna Belle Hutchins to The Rare Metals Corporation, recorded at Book 246, Page 318, of the real estate records of Montrose County, Colorado.



m:\ugw\511\0016\12\u0171\2\u0171200.apr smithw 7/31/2002, 11:22

ATTACHMENT A



m:\ugw\511\0016\12\u01714\u0171400.apr d50649 7/11/2002; 14:50

ATTACHMENT B

This page intentionally left blank

Attachment 7

Documentation for Maupin Well NAT01-0716
(Permit, Installation Log, and Analytical Data)

This page intentionally left blank

Form No. GWS-25

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

LIC

WELL PERMIT NUMBER 239115 - - -
DIV. 4 WD 60 DES. BASIN MD

APPLICANT

U S DEPARTMENT OF ENERGY
2597 B 3/4 ROAD
GRAND JUNCTION, CO 81503-

(970) 248-7612

APPROVED WELL LOCATION
MONTROSE COUNTY
NE 1/4 NE 1/4 Section 16
Township 46 N Range 16 W New Mex P.M.

DISTANCES FROM SECTION LINES
900 Ft. from North Section Line
220 Ft. from East Section Line

UTM COORDINATES
Northing: Easting:

PERMIT TO CONSTRUCT A WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not assure the applicant that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
3) Approved pursuant to CRS 37-92-602(3)(b)(II)(A) as the only well on a tract of land of 57.70 acres described as that portion of the NE 1/4 of the NE 1/4, Sec. 16, Twp. 46 N, Rng. 16 W, New Mex P.M., Montrose County, more particularly described on the attached exhibit A.
4) The use of ground water from this well is limited to fire protection, ordinary household purposes inside not more than three (3) single family dwellings, the irrigation of not more than one (1) acre of home gardens and lawns, and the watering of domestic animals.
5) The maximum pumping rate of this well shall not exceed 15 GPM.
6) The return flow from the use of this well must be through an individual waste water disposal system of the non-evaporative type where the water is returned to the same stream system in which the well is located.
7) This well shall be constructed not more than 200 feet from the location specified on this permit.

4/4/02

APPROVED
LMB

Receipt No. 9400898

State Engineer

DATE ISSUED APR - 4 2002

By

EXPIRATION DATE MAR 26 2004

MONITORING WELL COMPLETION LOG NAT01-0716

PROJECT	LM	**WELL NUMBER**	NAT01-0716	**DATE DRILLED**	06/25/2002 to 07/15/2002
LOCATION	Naturita, CO	**NORTH COORD. (FT)**	589726.00	**SURFACE ELEV. (FT NGVD)**	
SITE	Naturita Processing Site	**EAST COORD. (FT)**	1106013.00	**TOP OF CASING (FT)**	
DRILLING METHOD	ROTARY	**HOLE DEPTH (FT)**	600.00	**MEAS. PT. ELEV. (FT)**	
DRILL COMPANY	Rex Wyatt Drilling Co.	**WELL DEPTH (FT)**	586.00	**SLOT SIZE (IN)**	0.020
RIG TYPE	Gardner/Denver 1500	**WATER LEVEL (FT BGS)**	153.5	**BIT SIZE(S) (IN)**	10.0 8.0

	WELL INSTALLATION	INTERVAL (FT)		
SURFACE CASING:	10 in. Steel	0.0	to	43.0
BLANK CASING:	5 in. PVC Sch 40		to	546.0
WELL SCREEN:	5 in. 0.02 Slotted PVC	546.0	to	586.0
SUMP/END CAP:				
SEAL:	Bentonite Pellets	495.0	to	515.0
UPPER PACK:	20-40 Silica Sand	515.0	to	535.0
LOWER PACK:	8-12 Silica Sand	535.0	to	600.0

DRILLER Zimmerman, C. / Rex Wyatt
LOGGED BY Dayvault, R.
SAMPLING METHOD
DATE DEVELOPED
REMARKS Borehole diameter= 10.0" to a depth of 43.0 ft and 7 7/8" to 600.0 ft. Pitless adapter at 5.0 ft. Submersible pump set at 500.0 ft.

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY	EXTENT	WELL DIAGRAM	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
							0-5.0 ft. FILL: CLAYEY GRAVEL (GC); coarse sands to gravels with clay.
					Steel		5.0-31.0 ft. SAND (SP); gray to brownish coarse sand with pebbles and cobbles. Lenses of cobbles and sand.
							31.0-150.0 ft. MORRISON FM: BRUSHY BASIN MB: 31.0-40.0 ft. biocolored mudstone to shale, mauve (10YR 4/2) to greenish gray (5G 6/1-5G 4/1), coarsens to siltstone, calcareous.
50	-50				Cement		40.0-60.0 ft. sandstone, greenish gray, fine to medium sandstone intercalated with mudstone, fine gravel (up to 3.0 mm in diameter) associated with sandstone, calcareous.
							60.0-150.0 ft. mudstone: increase mauve mudstone.
							70.0-80.0 ft. mauve mudstone to shale dominant, greenish gray fine sandstone, calcareous.
							80.0-90.0 ft. mudstone mixed with siltstone to fine sandstone (dominant), space black chert pebbles, calcareous.
							90.0-100.0 ft. same above with splotchy greenish gray ares in pale pink fine sandstone.
100	-100				PVC Sch 40		100.0-110.0 ft. color change to olive gray.
							110.0-120.0 ft. fine sandstone (5YR 6/1) makes up 25%, non-calcareous.
							120.0-140.0 ft. approximately 50% mauve mudstone, light pink to light olive gray fine sandstone, calcareous.
							140.0-150.0 ft. same as above, slightly more greenish gray fine sandstone.
150	-150						150.0-440.0 ft. MORRISON FM/SALT WASH MB: 150.0-215.0 ft. sandstone, dark fine sandstone, medium dark gray (N4), to dark greenish gray (5GY 4/1).
							160.0-180.0 ft. light medium to fine sandstone (white to very light gray (N9-N8), calcareous.
							@170.0 ft non-calcareous.
							180.0-190.0 ft. coarse to conglomerate sandstone (N9-N8), pebbles of chert, quartzite, to metamorphic rocks, calcareous.
							190.0-210.0 ft. fine sandstone mixed with mauve shale (dominate) non-calcareous, friable.

MONITORING WELL COMPLETION LOG NAT01-0716

PROJECT LM **WELL NUMBER** NAT01-0716
SITE Naturita Processing Site **DATES DRILLED** 06/25/2002 to 07/15/2002

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY	EXTENT	WELL DIAGRAM	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
							210.0-215.0 ft. white medium sandstone with some pebbles and minor shale.
							215.0-220 ft. dark shale to siltstone
							220.0-230.0 ft. dark gray siltstone to shale, slightly greenish, very fine pyrite (euhedral), non-calcareous. shaley dark greenish gray (5G4/1) with minor mauve.
							@230.0 ft. becomes calcareous.
250	-250				Cement		250.0-260.0 ft. 50/50 white to light green calcite, cemented fines and mauve shale, micro pyrite.
							260.0-310.0 ft. similar to above, calcareous, 70% mauve shale
							@290 increase in mauve shale, calcareous.
300	-300						310.0-320.0 ft. more shale and siltstone - same mauve with more greenish gray, calcareous.
					PVC Sch 40		320.0-350.0 ft. light greenish gray fine sandstone to siltstone with mauve shale 50/50, calcareous.
350	-350						350.0-390.0 ft. white medium grayish sandstone (N9), arkosic with feldspares to white clay, noncalcareous.
							@360.0 ft. light pink (5YR 7/2), non-calcic.
							@380.0 ft. pink (5YR 6/4), softer cuttings, break down to sand, non-calcic.
							390.0-400.0 ft. mauve shale to siltstone, minor light greenish gray fine sandstone, non-calcic.
400	-400						400.0-410.0 ft. mostly (80%) light gray to light greenish gray fine sandstone to siltstone, 20% dark mauve mudstone to shale, 5% dark gray organic rich siltstone, non-calcareous.
							@410.0 ft. more gray shale to siltstone, less mauve, minor carbon on sandstone, non-calcic,
							420.0-430.0 ft. 75% white fine grained sandstone with 25% medium dark (N$), gray shale (no mauve). Carbon blebs on sandstone common, non-calcic.
							430.0-440.0 ft. mauve fine sandstone, (5YR 5/2), sandstone to white fine sandstone, <5% dark gray shale, slightly calcareous.
450	-450						440.0-530.0 ft. SUMMERVILLE FM: 440.0-470 ft. siltstone, to above except all mauve sandstone to shale

MONITORING WELL COMPLETION LOG NAT01-0716

PROJECT LM **WELL NUMBER** NAT01-0716

SITE Naturita Processing Site **DATES DRILLED** 06/25/2002 to 07/15/2002

Continued from Previous Page

DEPTH (FT BGL)	ELEV. (FT NGVD)	BLOW COUNTS	SAMPLE RECOVERY	EXTENT	WELL DIAGRAM	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
							carbon blebs in sandstone. @450.0 ft. greenish gray (5G 4/1) shale to siltstone mixed with fine sandstone and mauve siltstone - 50/50 mix, calcareous. 470.0-490.0 ft. clean white fine sandstone (N8) to dark greenish black sandstone (5G 4/1), 50% with mauve (25%) siltstone to shale and greenish gray siltstone to shale, calcareous. @480.0 ft. similar to above, more mauve (40%), non-calcareous. 490.0-510.0 ft. 90% mauve - siltstone (45%) to shale (45%) - 10% greenish gray to light gray fine sandstone, non calcareous. @500.0 ft. mostly shale (mauve), 5% greenish gray sandstone, non-calcareous. 510.0-530.0 ft. more fine sand (25%), pale reddish brown (10YR 5/4).
500	-500				Bentonite Pellets 20-40 Silica Sand		
					8-12 Silica Sand		530.0-600.0 ft. ENTRADA SANDSTONE: makes more water. 530.0-550.0 ft. sandstone, pale reddish brown (orange), about 50% white - 50% iron stained, poor cement - falls apart - no cuttings, non-calcareous. 540.0 ft. similar to above, few white sandstone chips, trace of iron (black) stained grains, non-calcareous. 550.0-570 ft. slightly coarser grayish orange pink (10R 8/2), sandstone/non-calcareous. @560.0 ft. fine sandstone, non-calcareous. 570.0-600.0 ft. orange (10YR 5/4), traces of dark rounded grains. @580.0 ft. 50/50 mix of fine and medium grained sandstone.
550	-550				0.020" Slotted PVC		
600	-600						Total Depth 600.0 ft.
650	-650						
700	-700						

GROUND WATER QUALITY DATA BY LOCATION (USEE100) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0716 <well> This well is not covered by agreement, but will add for renewal.
REPORT DATE: 1/17/2006 5:36 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Antimony	mg/L	07/25/2002	N001		0.00037	B		#	0.00011	-
Arsenic	mg/L	07/25/2002	N001		0.0372			#	0.00056	-
Barium	mg/L	07/25/2002	N001		0.0386	B		#	0.00056	-
Beryllium	mg/L	07/25/2002	N001		0.00011	U		#	0.00011	-
Cadmium	mg/L	07/25/2002	N001		0.00011	U		#	0.00011	-
Calcium	mg/L	07/25/2002	N001		4.540			#	0.05922	-
Chloride	mg/L	07/25/2002	N001		449.000			#	0.2005	-
Chromium	mg/L	07/25/2002	N001		0.0129			#	0.00056	-
Fluoride	mg/L	07/25/2002	N001		1.740			#	0.0502	-
Gross Alpha	pCi/L	07/25/2002	N001		16	U		#	16	± 10.0
Gross Beta	pCi/L	07/25/2002	N001		13	U		#	13	± 8.00
Iron	mg/L	07/25/2002	N001		1.240			#	0.00444	-
Lead	mg/L	07/25/2002	N001		0.0016	B		#	0.00011	-
Magnesium	mg/L	07/25/2002	N001		4.210			#	0.00978	-
Mercury	mg/L	07/25/2002	N001		0.0002	U		#	0.0002	-
Nickel	mg/L	07/25/2002	N001		0.0076	B		#	0.001	-
Nitrate + Nitrite as Nitrogen	mg/L	07/25/2002	N001		0.0116	B		#	0.0049	-
Potassium	mg/L	07/25/2002	N001		7.460			#	0.00956	-
Selenium	mg/L	07/25/2002	N001		0.00011	U		#	0.00011	-
Silver	mg/L	07/25/2002	N001		0.00011	U		#	0.00011	-
Sodium	mg/L	07/25/2002	N001		661.000			#	0.03222	-

GROUND WATER QUALITY DATA BY LOCATION (USEE100) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0716 <well> This well is not covered by agreement, but will add for renewal.
REPORT DATE: 1/17/2006 5:36 pm

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Sulfate	mg/L	07/25/2002	N001		47.700			#	0.0788	-
Thallium	mg/L	07/25/2002	N001		0.00011	U		#	0.00011	-
Total Dissolved Solids	mg/L	07/25/2002	N001		1800			#	10	-
Uranium	mg/L	07/25/2002	N001		0.00072	B		#	0.00011	-

RECORDS: SELECTED FROM USEE100 WHERE site_code='NAT01' AND location_code in('0716') AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%')

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique
- X Location is undefined.
- J Estimated value.
- R Unusable result.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

GROUND WATER QUALITY DATA BY LOCATION (USEE100) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0717 <well> Effluent from Reverse Osmosis treatment system for domestic well NAT01-0716.
REPORT DATE: 1/18/2006 8:19 am

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY
Alkalinity, Total (As CaCO3	mg/L	01/28/2003	N001		46			#	-	-
Arsenic	mg/L	01/28/2003	N001		0.0015	B		#	0.0001	-
Manganese	mg/L	01/28/2003	N001		0.00025	B		#	0.0001	-
Molybdenum	mg/L	01/28/2003	N001		0.0018	U		#	0.0018	-
Nitrate as NO3	mg/L	01/28/2003	N001		0.020	U		#	0.02	-
Oxidation Reduction Potent	mV	01/28/2003	N001		35			#	-	-
pH	s.u.	01/28/2003	N001		8.12			#	-	-
Selenium	mg/L	01/28/2003	N001		0.0001	U		#	0.0001	-
Specific Conductance	umhos/cm	01/28/2003	N001		272			#	-	-
Sulfate	mg/L	01/28/2003	N001		0.566	B		#	0.0394	-
Temperature	C	01/28/2003	N001		17.2			#	-	-
Total Dissolved Solids	mg/L	01/28/2003	N001		108			#	10	-
Turbidity	NTU	01/28/2003	N001		2.15			#	-	-
Uranium	mg/L	01/28/2003	N001		0.00011	B		#	0.0001	-
Vanadium	mg/L	01/28/2003	N001		0.00089	B		#	0.0004	-

GROUND WATER QUALITY DATA BY LOCATION (USEE100) FOR SITE NAT01, Naturita Processing Site
LOCATION: 0717 <well> Effluent from Reverse Osmosis treatment system for domestic well NAT01-0716.
REPORT DATE: 1/18/2006 8:19 am

PARAMETER	UNITS	SAMPLE: DATE	SAMPLE: ID	DEPTH RANGE (FT BLS)	RESULT	QUALIFIERS: LAB	QUALIFIERS: DATA	QUALIFIERS: QA	DETECTION LIMIT	UN-CERTAINTY

RECORDS: SELECTED FROM USEE100 WHERE site_code='NAT01' AND location_code in('NAT17-1','NAT17-2','NAT17-3','0715','0717') AND quality_assurance = TRUE AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%')

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995.
- > Result above upper detection limit.
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic & Radiochemistry: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique
- X Location is undefined.
- J Estimated value.
- R Unusable result.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.

Attachment 8

Groundwater Analytical Data for Arsenic
Naturita Processing Site

This page intentionally left blank

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
DM1	12/1/2000	0.0009	mg/L		0001
DM1	3/2/2001	0.0006	mg/L		0001
DM1	6/28/2001	0.0009	mg/L		0001
DM1	9/13/2001	0.0011	mg/L		0001
DM1	9/13/2001	0.0011	mg/L		0002
DM1	1/16/2002	0.0006	mg/L	U	0001
DM1	7/25/2002	0.00078	mg/L	B	0001
DM1	1/28/2003	0.00069	mg/L	B	0001
DM1	9/15/2003	0.002	mg/L	B	0001
0661	9/17/1999	0.0014	mg/L	B	0001
0502	1/29/1986	0.01	mg/L	U	0001
0502	6/10/1986	0.01	mg/L	U	0001
0502	6/10/1986	0.01	mg/L	U	0002
0502	6/10/1986	0.01	mg/L	U	0003
0502	6/10/1986	0.01	mg/L	U	0004
0502	6/10/1986	0.01	mg/L	U	0005
0502	10/8/1987	0.047	mg/L		0001
0502	7/18/1989	0.05	mg/L	U	0001
0502	12/8/1990	0.021	mg/L		0001
0502	4/19/1991	0.03	mg/L	UI	0001
0502	8/3/1991	0.05	mg/L	UI	0001
0502	1/14/1992	0.06	mg/L	I	0001
0502	6/26/1992	0.052	mg/L		0001
0502	4/23/1994	0.053	mg/L	S	0001
0502	4/25/1994	0.049	mg/L	S	N001
0502	4/4/1995	0.058	mg/L	+	0001
0502	4/4/1995	0.046	mg/L	S	N001
0503	1/29/1986	0.01	mg/L	U	0001
0503	6/9/1986	0.01	mg/L	U	0001
0503	10/8/1987	0.038	mg/L		0001
0503	10/8/1987	0.039	mg/L		0002
0503	10/8/1987	0.04	mg/L		0003
0503	10/8/1987	0.039	mg/L		0004
0503	10/8/1987	0.041	mg/L		0005
0503	7/12/1989	0.05	mg/L		0001
0503	4/20/1990	0.03	mg/L		0001
0503	12/8/1990	0.023	mg/L		0001
0503	4/18/1991	0.04	mg/L		0001
0503	8/2/1991	0.1	mg/L	UI	0001
0503	6/25/1992	0.05	mg/L		0001
0503	4/25/1994	0.056	mg/L	S	0001
0503	4/25/1994	0.046	mg/L	S	N001
0503	4/5/1995	0.049	mg/L	S	0001
0503	4/5/1995	0.05	mg/L	S	N001
0505	1/29/1986	0.02	mg/L		0001
0505	6/10/1986	0.01	mg/L	U	0001
0505	4/10/1987	0.019	mg/L		0001
0505	10/8/1987	0.029	mg/L		0001
0505	7/13/1989	0.02	mg/L		0001
0505	4/20/1990	0.02	mg/L		0001
0505	4/20/1990	0.02	mg/L		0002
0505	4/20/1990	0.02	mg/L		0003

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
0505	4/20/1990	0.02	mg/L		0004
0505	4/20/1990	0.02	mg/L		0005
0505	12/8/1990	0.01	mg/L		0001
0505	4/18/1991	0.01	mg/L	U	0001
0505	8/1/1991	0.05	mg/L	UI	0001
0505	1/13/1992	0.019	mg/L		0001
0505	6/24/1992	0.012	mg/L		0001
0505	4/24/1994	0.006	mg/L	W	0001
0505	4/24/1994	0.006	mg/L		N001
0505	4/4/1995	0.007	mg/L		0001
0505	4/4/1995	0.006	mg/L	W	N001
0505	9/14/1995	0.009	mg/L	NS	0001
0505	9/14/1995	0.008	mg/L	NW	N001
0505	1/9/1996	0.011	mg/L		0001
0505	1/9/1996	0.011	mg/L		N001
0506	1/30/1986	0.07	mg/L		0001
0506	6/9/1986	0.04	mg/L		0001
0506	4/10/1987	0.043	mg/L		0001
0506	4/10/1987	0.043	mg/L		0002
0506	4/10/1987	0.041	mg/L		0003
0506	4/10/1987	0.041	mg/L		0004
0506	4/10/1987	0.046	mg/L		0005
0506	10/8/1987	0.038	mg/L		0001
0506	7/13/1989	0.03	mg/L		0001
0506	4/20/1990	0.02	mg/L		0001
0506	12/8/1990	0.035	mg/L		0001
0506	4/18/1991	0.03	mg/L		0001
0506	8/1/1991	0.1	mg/L	UI	0001
0506	1/13/1992	0.036	mg/L		0001
0506	6/24/1992	0.032	mg/L		0001
0506	4/25/1994	0.03	mg/L	S	0001
0506	4/25/1994	0.026	mg/L	S	N001
0506	4/4/1995	0.026	mg/L	S	0001
0506	4/4/1995	0.028	mg/L	S	N001
0506	9/14/1995	0.034	mg/L	NS	0001
0506	9/14/1995	0.032	mg/L	NS	N001
0506	1/8/1996	0.032	mg/L		0001
0506	1/8/1996	0.032	mg/L		N001
0506	1/9/1996	0.03	mg/L		0002
0506	1/9/1996	0.032	mg/L		N002
0546	6/26/1986	0.01	mg/L	U	0001
0546	4/10/1987	0.001	mg/L	U	0001
0546	10/8/1987	0.01	mg/L		0001
0546	10/8/1987	0.009	mg/L		0002
0546	10/8/1987	0.01	mg/L		0003
0546	10/8/1987	0.013	mg/L		0004
0546	10/8/1987	0.011	mg/L		0005
0546	7/12/1989	0.01	mg/L	U	0001
0546	4/23/1990	0.01	mg/L	U	0001
0546	12/5/1990	0.01	mg/L	U	0001
0546	4/18/1991	0.01	mg/L	U	0001
0546	7/31/1991	0.01	mg/L	U	0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
0546	1/13/1992	0.001	mg/L	U	0001
0546	6/24/1992	0.005	mg/L	U	0001
0546	4/3/1995	0.005	mg/L	U	0001
0546	4/3/1995	0.005	mg/L	U	N001
0546	9/14/1995	0.005	mg/L	UN	0001
0546	9/14/1995	0.005	mg/L	UN	N001
0546	1/9/1996	0.005	mg/L	UW	0001
0546	1/9/1996	0.005	mg/L	U	N001
0547	6/25/1986	0.01	mg/L	U	0001
0547	4/10/1987	0.001	mg/L	U	0001
0547	10/8/1987	0.005	mg/L		0001
0547	7/17/1989	0.01	mg/L	U	0001
0547	7/17/1989	0.01	mg/L	U	0002
0547	7/17/1989	0.01	mg/L	U	0003
0547	7/17/1989	0.01	mg/L	U	0004
0547	7/17/1989	0.01	mg/L	U	0005
0547	4/23/1990	0.01	mg/L	U	0001
0547	12/5/1990	0.01	mg/L	U	0001
0547	4/18/1991	0.01	mg/L	U	0001
0547	7/31/1991	0.01	mg/L	U	0001
0547	1/13/1992	0.001	mg/L	U	0001
0547	6/25/1992	0.005	mg/L	U	0001
0547	4/24/1994	0.005	mg/L	U	0001
0547	4/24/1994	0.005	mg/L	U	0002
0547	4/24/1994	0.005	mg/L	U	N001
0547	4/24/1994	0.005	mg/L	U	N002
0547	4/3/1995	0.005	mg/L	U	0001
0547	4/3/1995	0.005	mg/L	U	0002
0547	4/3/1995	0.005	mg/L	U	N001
0547	4/3/1995	0.005	mg/L	U	N002
0547	9/13/1995	0.005	mg/L	UN	0001
0547	9/13/1995	0.005	mg/L	UN	0002
0547	9/13/1995	0.005	mg/L	UN	N001
0547	9/13/1995	0.005	mg/L	UN	N002
0547	1/8/1996	0.005	mg/L	UW	0001
0547	1/8/1996	0.005	mg/L	U	N001
0547	3/25/1997	0.0002	mg/L	U	0001
0547	9/9/1997	0.001	mg/L	U	0001
0547	2/12/1998	0.001	mg/L	U	0001
0547	8/18/1998	0.001	mg/L	U	0001
0547	2/15/2000	0.0004	mg/L	U	0001
0547	11/28/2000	0.0005	mg/L		0001
0547	2/28/2001	0.0006	mg/L		0001
0547	6/26/2001	0.0005	mg/L		0001
0547	9/10/2001	0.0005	mg/L		0001
0547	1/15/2002	0.0006	mg/L	U	0001
0547	7/23/2002	0.0013	mg/L	B	0001
0547	1/27/2003	0.00013	mg/L	B	0001
0547	9/8/2003	0.0014	mg/L	B	0001
0548	6/25/1986	0.01	mg/L	U	0001
0548	4/10/1987	0.011	mg/L		0001
0548	10/8/1987	0.009	mg/L		0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
0548	7/17/1989	0.01	mg/L		0001
0548	4/23/1990	0.01	mg/L	U	0001
0548	12/5/1990	0.01	mg/L	U	0001
0548	4/19/1991	0.01	mg/L	U	0001
0548	8/2/1991	0.05	mg/L	UI	0001
0548	1/14/1992	0.011	mg/L		0001
0548	6/25/1992	0.008	mg/L		0001
0548	4/24/1994	0.006	mg/L		0001
0548	3/30/1995	0.006	mg/L		0001
0548	3/30/1995	0.005	mg/L		N001
0548	9/17/1995	0.006	mg/L	N	0001
0548	9/17/1995	0.007	mg/L	N	N001
0548	1/10/1996	0.008	mg/L	+	0001
0548	1/10/1996	0.027	mg/L		N001
0548	3/25/1997	0.0081	mg/L		0001
0548	9/10/1997	0.0159	mg/L		0001
0548	2/12/1998	0.0396	mg/L		0001
0548	8/18/1998	0.0174	mg/L		0001
0548	2/14/2000	0.0096	mg/L		0001
0548	2/14/2000	0.0095	mg/L		0002
0548	11/29/2000	0.0107	mg/L		0001
0548	2/27/2001	0.0112	mg/L		0001
0548	6/27/2001	0.0114	mg/L		0001
0548	9/12/2001	0.0165	mg/L		0001
0548	1/15/2002	0.01	mg/L		0001
0548	7/25/2002	0.0167	mg/L		0001
0548	1/28/2003	0.0097	mg/L		0001
0548	9/9/2003	0.013	mg/L		0001
0549	4/10/1987	0.001	mg/L	U	0001
0549	10/8/1987	0.005	mg/L		0001
0549	7/13/1989	0.01	mg/L	U	0001
0549	4/23/1990	0.01	mg/L	U	0001
0549	12/5/1990	0.01	mg/L	U	0001
0549	4/18/1991	0.01	mg/L	U	0001
0549	7/31/1991	0.01	mg/L	U	0001
0549	1/12/1992	0.001	mg/L	U	0001
0549	6/25/1992	0.005	mg/L	U	0001
0616	7/14/1989	0.01	mg/L		0001
0616	4/23/1990	0.01	mg/L	U	0001
0616	12/5/1990	0.053	mg/L		0001
0616	4/18/1991	0.06	mg/L		0001
0616	1/9/1992	0.08	mg/L	I	0001
0616	6/26/1992	0.007	mg/L		0001
0619	7/16/1989	0.01	mg/L		0001
0619	4/23/1990	0.01	mg/L		0001
0619	12/8/1990	0.012	mg/L		0001
0619	4/19/1991	0.01	mg/L		0001
0619	8/4/1991	0.01	mg/L	U	0001
0619	1/11/1992	0.032	mg/L		0001
0619	6/27/1992	0.026	mg/L		0001
0630	7/14/1989	0.01	mg/L	U	0001
0630	4/23/1990	0.01	mg/L	U	0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
0630	12/5/1990	0.01	mg/L	U	0001
0630	4/19/1991	0.01	mg/L	U	0001
0630	8/3/1991	0.01	mg/L	U	0001
0630	1/10/1992	0.004	mg/L		0001
0630	6/28/1992	0.005	mg/L	U	0001
0632	7/16/1989	0.04	mg/L		0001
0632	4/23/1990	0.03	mg/L		0001
0632	12/5/1990	0.029	mg/L		0001
0632	4/18/1991	0.02	mg/L	W	0001
0632	8/2/1991	0.01	mg/L	UW	0001
0632	1/10/1992	0.044	mg/L		0001
0632	6/27/1992	0.038	mg/L		0001
0637	7/16/1989	0.03	mg/L		0001
0637	4/23/1990	0.02	mg/L		0001
0637	12/5/1990	0.016	mg/L		0001
0637	4/19/1991	0.02	mg/L		0001
0637	8/4/1991	0.01	mg/L	UW	0001
0637	1/11/1992	0.028	mg/L		0001
0637	6/27/1992	0.027	mg/L		0001
0656	4/23/1990	0.01	mg/L	U	0001
0656	12/8/1990	0.01	mg/L	U	0001
0656	4/18/1991	0.01	mg/L	U	0001
0656	8/4/1991	0.01	mg/L	U	0001
0656	1/9/1992	0.003	mg/L		0001
0656	6/27/1992	0.005	mg/L	U	0001
0700	6/27/2001	0.0521	mg/L		0001
0700	9/11/2001	0.0512	mg/L		0001
0700	1/16/2002	0.0408	mg/L		0001
0700	7/24/2002	0.0542	mg/L		0001
0700	1/28/2003	0.037	mg/L		0001
0700	9/8/2003	0.0453	mg/L		0001
0701	6/28/2001	0.0039	mg/L		0001
0701	9/12/2001	0.0058	mg/L		0001
0701	7/25/2002	0.0114	mg/L		0001
0701	1/29/2003	0.0041	mg/L	B	0001
0701	9/15/2003	0.0099	mg/L		0001
0701	9/15/2003	0.01	mg/L		0002
0716	7/25/2002	0.0372	mg/L		N001
0717	1/28/2003	0.0015	mg/L	B	N001
0718	10/23/2008	0.0022	mg/L		N001
0718	10/23/2008	0.0022	mg/L		N002
0907	9/16/1995	0.009	mg/L	N	0001
0907	9/16/1995	0.009	mg/L	N	0001
0907	9/16/1995	0.009	mg/L	N	0001
0907	9/16/1995	0.009	mg/L	N	0001
0907	9/16/1995	0.009	mg/L	N	0001
0907	9/16/1995	0.009	mg/L	N	0001
0907	9/16/1995	0.009	mg/L	N	0001
0907	9/16/1995	0.009	mg/L	N	0001
0908	9/16/1995	0.005	mg/L	UN	0001
0908	9/16/1995	0.005	mg/L	UN	0001
0908	9/16/1995	0.005	mg/L	UN	0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
0908	9/16/1995	0.005	mg/L	UN	0001
NAT01-1	11/29/2000	0.0063	mg/L		0001
NAT01-1	2/27/2001	0.0056	mg/L		0001
NAT01-1	6/27/2001	0.0062	mg/L		0001
NAT01-1	9/11/2001	0.0071	mg/L		0001
NAT01-1	1/16/2002	0.0064	mg/L		0001
NAT01-1	7/24/2002	0.0081	mg/L		0001
NAT01-1	1/28/2003	0.0066	mg/L		0001
NAT01-1	9/9/2003	0.0086	mg/L		0001
NAT02	11/29/2000	0.0075	mg/L		0001
NAT02	3/1/2001	0.0087	mg/L		0001
NAT02	6/26/2001	0.0103	mg/L		0001
NAT02	9/11/2001	0.0078	mg/L		0001
NAT02	1/16/2002	0.0065	mg/L		0001
NAT02	7/24/2002	0.0089	mg/L		0001
NAT02	1/28/2003	0.0074	mg/L		0001
NAT02	9/8/2003	0.0083	mg/L		0001
NAT03	11/29/2000	0.0505	mg/L		0001
NAT03	2/27/2001	0.0529	mg/L		0001
NAT03	6/27/2001	0.0564	mg/L		0001
NAT03	9/11/2001	0.0579	mg/L		0001
NAT03	1/15/2002	0.0436	mg/L		0001
NAT03	7/24/2002	0.0565	mg/L		0001
NAT03	1/28/2003	0.0371	mg/L		0001
NAT03	9/8/2003	0.0487	mg/L		0001
NAT04-1	11/28/2000	0.0245	mg/L		0001
NAT04-1	2/28/2001	0.0227	mg/L		0001
NAT04-1	6/26/2001	0.02	mg/L		0001
NAT04-1	9/10/2001	0.021	mg/L		0001
NAT04-1	1/16/2002	0.0151	mg/L		0001
NAT04-1	7/24/2002	0.0199	mg/L		0001
NAT04-1	1/28/2003	0.0132	mg/L		0001
NAT04-1	9/8/2003	0.0162	mg/L		0001
NAT06-1	11/29/2000	0.0241	mg/L		0001
NAT06-1	2/28/2001	0.0224	mg/L		0001
NAT06-1	6/26/2001	0.0221	mg/L		0001
NAT06-1	9/11/2001	0.022	mg/L		0001
NAT06-1	1/16/2002	0.0164	mg/L		0001
NAT06-1	7/24/2002	0.0214	mg/L		0001
NAT06-1	1/28/2003	0.0145	mg/L		0001
NAT06-1	9/8/2003	0.0181	mg/L		0001
NAT08	11/29/2000	0.0499	mg/L		0001
NAT08	2/27/2001	0.064	mg/L		0001
NAT08	6/27/2001	0.0503	mg/L		0001
NAT08	9/11/2001	0.0563	mg/L		0001
NAT08	9/11/2001	0.0552	mg/L		0002
NAT08	1/15/2002	0.0396	mg/L		0001
NAT08	7/24/2002	0.0515	mg/L		0001
NAT08	7/24/2002	0.0505	mg/L		0002
NAT08	1/28/2003	0.0336	mg/L		0001
NAT08	1/28/2003	0.0344	mg/L		0002
NAT08	9/8/2003	0.0429	mg/L		0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
NAT08	7/11/2006	0.03	mg/L		0002
NAT10	11/29/2000	0.0377	mg/L		0001
NAT10	2/27/2001	0.0279	mg/L		0001
NAT10	6/26/2001	0.0314	mg/L		0001
NAT10	6/26/2001	0.0304	mg/L		0002
NAT10	9/11/2001	0.0339	mg/L		0001
NAT11	11/28/2000	0.0278	mg/L		0001
NAT11	2/28/2001	0.0517	mg/L		0001
NAT11	6/26/2001	0.0246	mg/L		0001
NAT11	9/10/2001	0.0263	mg/L		0001
NAT11	1/15/2002	0.0251	mg/L		0001
NAT11	1/15/2002	0.0249	mg/L		0002
NAT11	7/23/2002	0.0255	mg/L		0001
NAT11	1/28/2003	0.0186	mg/L		0001
NAT11	9/8/2003	0.0261	mg/L		0001
NAT15-1	11/29/2000	0.0494	mg/L		0001
NAT15-1	2/27/2001	0.0471	mg/L		0001
NAT15-1	6/27/2001	0.0455	mg/L		0001
NAT15-1	9/11/2001	0.051	mg/L		0001
NAT15-1	1/16/2002	0.041	mg/L		0001
NAT15-1	7/24/2002	0.0478	mg/L		0001
NAT15-1	1/28/2003	0.0362	mg/L		0001
NAT15-1	9/8/2003	0.0433	mg/L		0001
NAT16-1	11/28/2000	0.023	mg/L		0001
NAT16-1	2/28/2001	0.0285	mg/L		0001
NAT16-1	6/26/2001	0.0199	mg/L		0001
NAT16-1	9/11/2001	0.0207	mg/L		0001
NAT16-1	1/16/2002	0.0146	mg/L		0001
NAT16-1	7/24/2002	0.019	mg/L		0001
NAT16-1	1/28/2003	0.0125	mg/L		0001
NAT16-1	9/8/2003	0.0156	mg/L		0001
NAT19	11/28/2000	0.0021	mg/L		0001
NAT19	2/28/2001	0.0019	mg/L		0001
NAT19	6/26/2001	0.0018	mg/L		0001
NAT19	9/10/2001	0.0019	mg/L		0001
NAT19	1/15/2002	0.0012	mg/L	B	0001
NAT19	7/23/2002	0.0017	mg/L	B	0001
NAT19	1/27/2003	0.0011	mg/L	B	0001
NAT19	9/8/2003	0.0012	mg/L	B	0001
NAT20	11/28/2000	0.0006	mg/L		0001
NAT20	2/28/2001	0.0007	mg/L		0001
NAT20	6/26/2001	0.0005	mg/L		0001
NAT20	9/10/2001	0.0003	mg/L		0001
NAT20	1/15/2002	0.0006	mg/L	U	0001
NAT20	7/23/2002	0.00028	mg/L	B	0001
NAT20	1/27/2003	0.0001	mg/L	U	0001
NAT20	9/8/2003	0.00012	mg/L	B	0001
NAT23	11/30/2000	0.0005	mg/L		0001
NAT23	2/27/2001	0.0005	mg/L		0001
NAT23	6/27/2001	0.0004	mg/L		0001
NAT23	9/12/2001	0.0004	mg/L		0001
NAT23	1/15/2002	0.0006	mg/L	U	0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
NAT23	7/25/2002	0.00032	mg/L	B	0001
NAT23	1/29/2003	0.0001	mg/L	U	0001
NAT23	9/9/2003	0.00023	mg/L	B	0001
NAT24	11/30/2000	0.0033	mg/L		0001
NAT24	3/1/2001	0.0028	mg/L		0001
NAT24	6/27/2001	0.0025	mg/L		0001
NAT24	9/12/2001	0.0034	mg/L		0001
NAT24	1/15/2002	0.0009	mg/L	B	0001
NAT24	7/25/2002	0.003	mg/L	B	0001
NAT24	1/29/2003	0.00067	mg/L	B	0001
NAT24	9/9/2003	0.00069	mg/L	B	0001
NAT25	11/30/2000	0.0013	mg/L		0001
NAT25	3/1/2001	0.0007	mg/L		0001
NAT25	6/27/2001	0.0015	mg/L		0002
NAT25	6/27/2001	0.0015	mg/L		0003
NAT25	9/12/2001	0.0011	mg/L		0001
NAT25	1/15/2002	0.00066	mg/L	B	0001
NAT25	7/25/2002	0.0014	mg/L	B	0001
NAT25	1/29/2003	0.0018	mg/L	B	0001
NAT25	9/9/2003	0.0025	mg/L	B	0001
NAT26	11/29/2000	0.0017	mg/L		0001
NAT26	3/1/2001	0.00134	mg/L		0001
NAT26	6/27/2001	0.001	mg/L		0001
NAT26	9/12/2001	0.0006	mg/L		0001
NAT26	1/15/2002	0.0006	mg/L	U	0001
NAT26	1/15/2002	0.0006	mg/L	U	0002
NAT26	1/28/2003	0.00015	mg/L	B	0001
NAT26	9/15/2003	0.00024	mg/L	B	0001
NAT27-1	11/28/2000	0.0103	mg/L		0001
NAT27-1	2/28/2001	0.0094	mg/L		0001
NAT27-1	6/26/2001	0.0095	mg/L		0001
NAT27-1	9/10/2001	0.011	mg/L		0001
NAT27-1	9/10/2001	0.0102	mg/L		0002
NAT27-1	1/15/2002	0.0055	mg/L		0001
NAT27-1	7/23/2002	0.0095	mg/L		0001
NAT27-1	1/28/2003	0.0053	mg/L		0001
NAT27-1	9/8/2003	0.0072	mg/L		0001
NAT29	11/28/2000	0.0073	mg/L		0001
NAT29	2/28/2001	0.0078	mg/L		0001
NAT29	6/26/2001	0.0086	mg/L		0001
NAT30-1	11/28/2000	0.0007	mg/L		0001
NAT30-1	2/28/2001	0.0006	mg/L		0001
NAT30-1	6/26/2001	0.0009	mg/L		0001
NAT30-1	9/10/2001	0.0009	mg/L		0001
NAT30-1	1/15/2002	0.0006	mg/L	U	0001
NAT30-1	7/23/2002	0.00042	mg/L	B	0001
NAT30-1	1/27/2003	0.00015	mg/L	B	0001
NAT30-1	9/8/2003	0.00023	mg/L	B	0001
MAU03	11/30/2000	0.0012	mg/L		0001
MAU03	3/1/2001	0.0009	mg/L		0001
MAU03	6/28/2001	0.0021	mg/L		0001
MAU03	9/12/2001	0.0024	mg/L		0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

Groundwater Analytical Results for Arsenic: All Historic Monitoring Results
Naturita Processing Site

Well Location	Date Sampled	Arsenic	units	Lab Qualifiers	Sample ID
MAU03	1/15/2002	0.00075	mg/L	B	0001
MAU03	7/26/2002	0.00081	mg/L	B	0001
MAU03	1/29/2003	0.00051	mg/L	B	0001
MAU03	9/15/2003	0.0013	mg/L	B	0001
MAU04	11/30/2000	0.0045	mg/L		0001
MAU04	3/1/2001	0.0042	mg/L		0001
MAU04	6/28/2001	0.0051	mg/L		0001
MAU04	6/28/2001	0.0052	mg/L		0002
MAU04	9/12/2001	0.0055	mg/L		0001
MAU04	1/15/2002	0.0037	mg/L	B	0001
MAU04	7/25/2002	0.0058	mg/L		0001
MAU04	1/29/2003	0.0031	mg/L	B	0001
MAU04	9/15/2003	0.0054	mg/L		0001
MAU05	11/30/2000	0.0005	mg/L		0001
MAU05	3/1/2001	0.0005	mg/L		0001
MAU05	6/28/2001	0.0005	mg/L		0001
MAU05	1/15/2002	0.0006	mg/L	U	0001
MAU05	1/29/2003	0.0001	mg/L	U	0001
MAU05	1/29/2003	0.0001	mg/L	U	0002
MAU05	9/15/2003	0.00029	mg/L	B	0001
MAU06	11/30/2000	0.0007	mg/L		0001
MAU06	3/1/2001	0.0005	mg/L		0001
MAU06	6/28/2001	0.0009	mg/L		0001
MAU06	9/12/2001	0.0009	mg/L		0001
MAU06	1/15/2002	0.0006	mg/L	U	0001
MAU06	1/29/2003	0.00013	mg/L	B	0001
MAU06	9/15/2003	0.00045	mg/L	B	0001
MAU07	12/1/2000	0.0033	mg/L		0001
MAU07	3/1/2001	0.0034	mg/L		0001
MAU07	6/28/2001	0.0046	mg/L		0001
MAU07	9/12/2001	0.0066	mg/L		0001
MAU07	1/15/2002	0.0036	mg/L	B	0001
MAU07	7/26/2002	0.0082	mg/L		0001
MAU07	7/26/2002	0.0082	mg/L		0002
MAU07	1/29/2003	0.0036	mg/L	B	0001
MAU07	9/15/2003	0.0149	mg/L		0001
MAU08	11/30/2000	0.003	mg/L		0001
MAU08	3/1/2001	0.002	mg/L		0001
MAU08	6/28/2001	0.0025	mg/L		0001
MAU08	9/12/2001	0.0012	mg/L		0001
MAU08	1/15/2002	0.0017	mg/L	B	0001
MAU08	7/25/2002	0.0025	mg/L	B	0001
MAU08	1/29/2003	0.0015	mg/L	B	0001
MAU08	9/15/2003	0.0012	mg/L	B	0001

Arsenic concentrations exceeding 0.05 mg/L UMTRCA standard shown in red.
Many wells listed above have since been abandoned.

This page intentionally left blank