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Mr. Daniel M. Gillen, Chief
U.S. Nuclear Regulatory Commission
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MS: T8A33
Washington, D.C. 20555-0001

Subject: Transmittal of the *Draft Ground Water Compliance Action Plan for the Naturita Colorado, UMTRA Site.*

Dear Mr. Gillen:

Enclosed are two copies of the *Draft Ground Water Compliance Action Plan for the Naturita, Colorado, UMTRA Site* for your review.

If you have questions or need additional copies, please contact me at 970/248-7612.

Sincerely,

Kathleen Mitchell for

Donald R. Metzler
Program Manager

Enclosures

cc w/o enclosures:
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GJO–GWNAT 1.9

UMTRA
Ground Water Project

Ground Water Compliance Action Plan for the Naturita, Colorado, UMTRA Project Site

DRAFT

September 2002

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

Work Performed Under DOE Contract No. DE–AC13–02GJ79491 for the U S Department of Energy
Approved for public release, distribution is unlimited

GJO–2002–355–TAC
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1.0 Introduction

This Ground Water Compliance Action Plan (GCAP) presents the proposed compliance strategy for ground water at the former Naturita, Colorado, uranium-ore processing site. It is based on the U.S. Department of Energy (DOE) evaluation of information included in the Site Observational Work Plan (SOWP) (DOE 2002a). The GCAP will serve as a stand-alone modification to the *Environmental Assessment of Remedial Action at the Naturita Uranium Processing Site Near Naturita, Colorado*, (DOE 1994), to address ground water restoration and compliance with the U.S. Environmental Protection Agency (EPA) ground water protection standards for the Uranium Mill Tailings Remedial Action (UMTRA) Project Title I sites. This GCAP will be the U.S. Nuclear Regulatory Commission (NRC) concurrence document for compliance with Subpart B of Title 40 *Code of Federal Regulations* Part 192 (40 CFR 192) for the Naturita processing site.

The proposed compliance strategy for the Naturita site is based on the compliance strategy selection framework following the steps presented in the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (DOE 1996). National Environmental Policy Act issues and environmental concerns are addressed in the Environmental Checklist (DOE 2002b) and will be addressed in the Environmental Assessment. This information will be made available to public officials and citizens in the area for their review and comment.

The SOWP proposed compliance strategies for three constituents at the Naturita site; arsenic, which slightly exceeded the UMTRA standard of 0.05 milligrams per liter [mg/L] in some sample rounds; uranium, which exceeded the UMTRA standard of 0.044 mg/L; and vanadium which exceeded a residential risk-based value of 0.033 mg/L. Over the past 2 years, average arsenic concentrations were at or below the UMTRA standard and modeling indicated that concentrations will continue to decrease over time. Therefore, it is proposed that arsenic no longer be considered a contaminant of concern. The proposed compliance strategy for uranium and vanadium at the Naturita site is no remediation and the application of alternate concentration limits. Institutional controls and monitoring will be implemented for these constituents. Details are discussed in Section 3.0.

End of current text

2.0 Site Information

2.1 Location

The Naturita UMTRA Project site is in western Colorado, Montrose County, approximately 2 miles north of the city of Naturita (Figure 2–1). It is situated on an elongate north-south section of floodplain between Colorado State Highway 141 on the west and the San Miguel River on the east. The site is the location of a former vanadium and uranium mill that operated intermittently from 1939 until 1958. The historical site area, a boundary used during the surface remedial action, enclosed 53 acres. The current site area is expanded to include property owned by the City of Naturita and Chemetall-Foote and now consists of 79 acres.

2.2 Remedial Action History and Current Land Status

The UMTRA Project surface remedial action at the site occurred between January 1993 and September 1998 (DOE 1998b). During this time, 771,400 cubic yards (yd^3) of residual radioactive materials was removed from the site. A volume of about 315,520 yd^3 was removed from the former mill yard, 10,340 yd^3 from the former ore storage area, 209,880 yd^3 from windblown areas, 225,490 yd^3 from the former tailings area, and 10,170 yd^3 from stockpiled demolition debris. In addition, a contiguous vicinity property to the north (NT-065, the Maupin property) underwent remedial action, and 93,602 yd^3 of material was removed (DOE 1998b). All material was hauled by truck to the Upper Burbank disposal cell about 15 miles to the northwest near the townsite of Uravan, Colorado.

Figure 2–2 shows historical features, ground water and surface water sampling locations, and current ownership at the site. Chemetall Foote owns north and south parcels, the City of Naturita owns the middle portion that was deeded to them by the Hecla Mining Company. The Maupin family owns the northern and downgradient portion of the floodplain on the west side of the San Miguel River and floodplain areas across the river to the east of the site. The area south and upgradient of the site was recently transferred from Doc Moore to Fred McKinney, who owns and operates a gravel pit in this area.

2.3 Surface Supplemental Standards

The Naturita site is unusual because of the large amount of supplemental standards areas left during the surface cleanup (DOE 1998a). Supplemental standards were applied to five areas totaling 11 acres on the site (14 percent of the total site area), and large areas of supplemental standards, also totaling 11 acres (36 percent of the total vicinity property area), were included in the vicinity property downgradient of the site (Figure 2–3). An area of just over one acre on the millsite was left in place because the radium-226 standard was not met even though soil had been excavated to 1 ft below the water table. Other supplemental standards areas on the millsite were left because removing the residual radioactive materials would produce excessive environmental harm and increased risk to workers who would have to remove it compared to the low radiological hazard. These areas were along the steep slopes of U.S. Highway 141, near high-voltage power poles and a buried gas line, and in a wetland area adjacent to the San Miguel River. Another large area on the west side of State Highway 141 in the former ore storage area was left because the small amount of windblown tailings remaining did not justify the expense and ecological damage that would result from removing it.

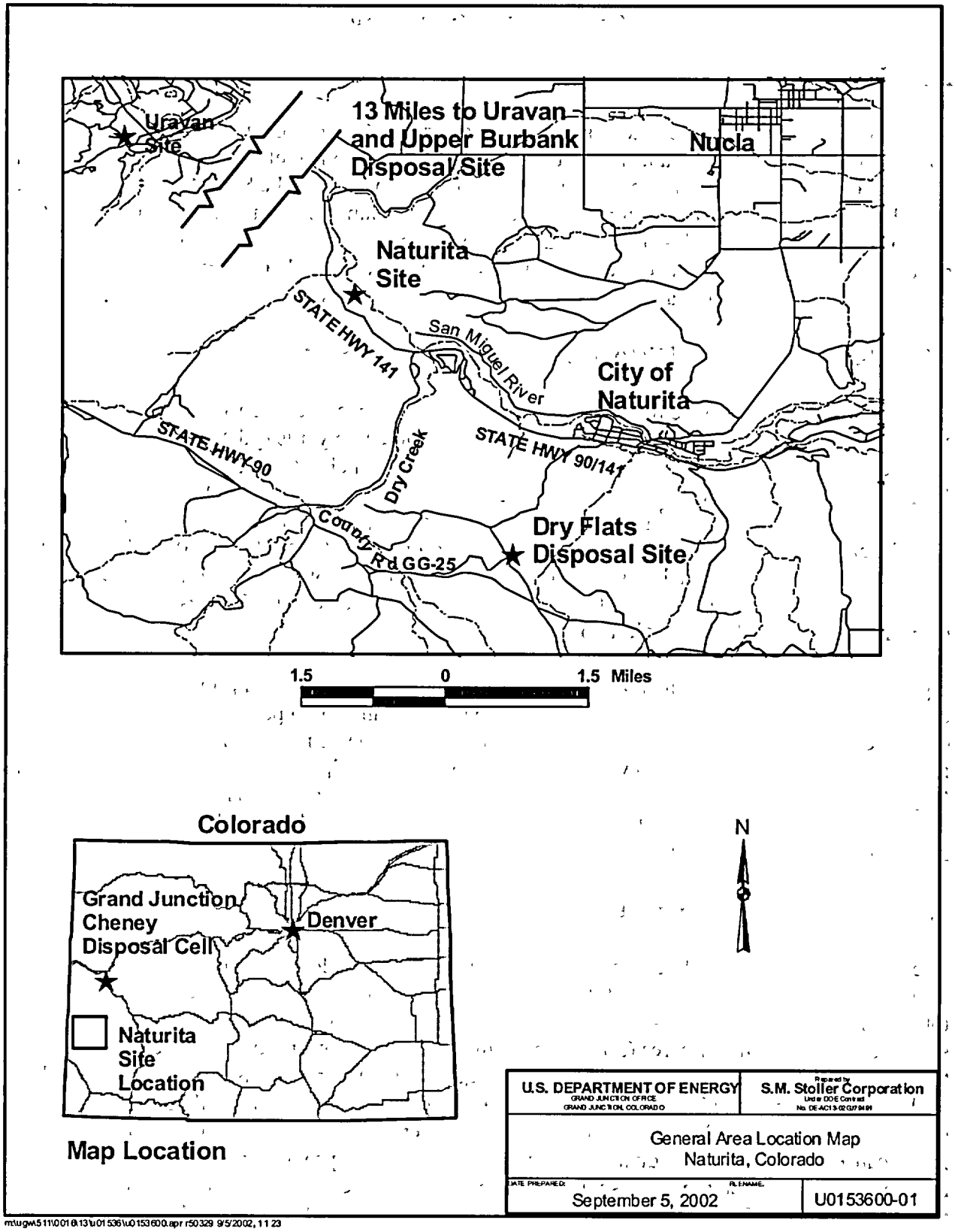

Figure 2–1. Location of the Naturita Site

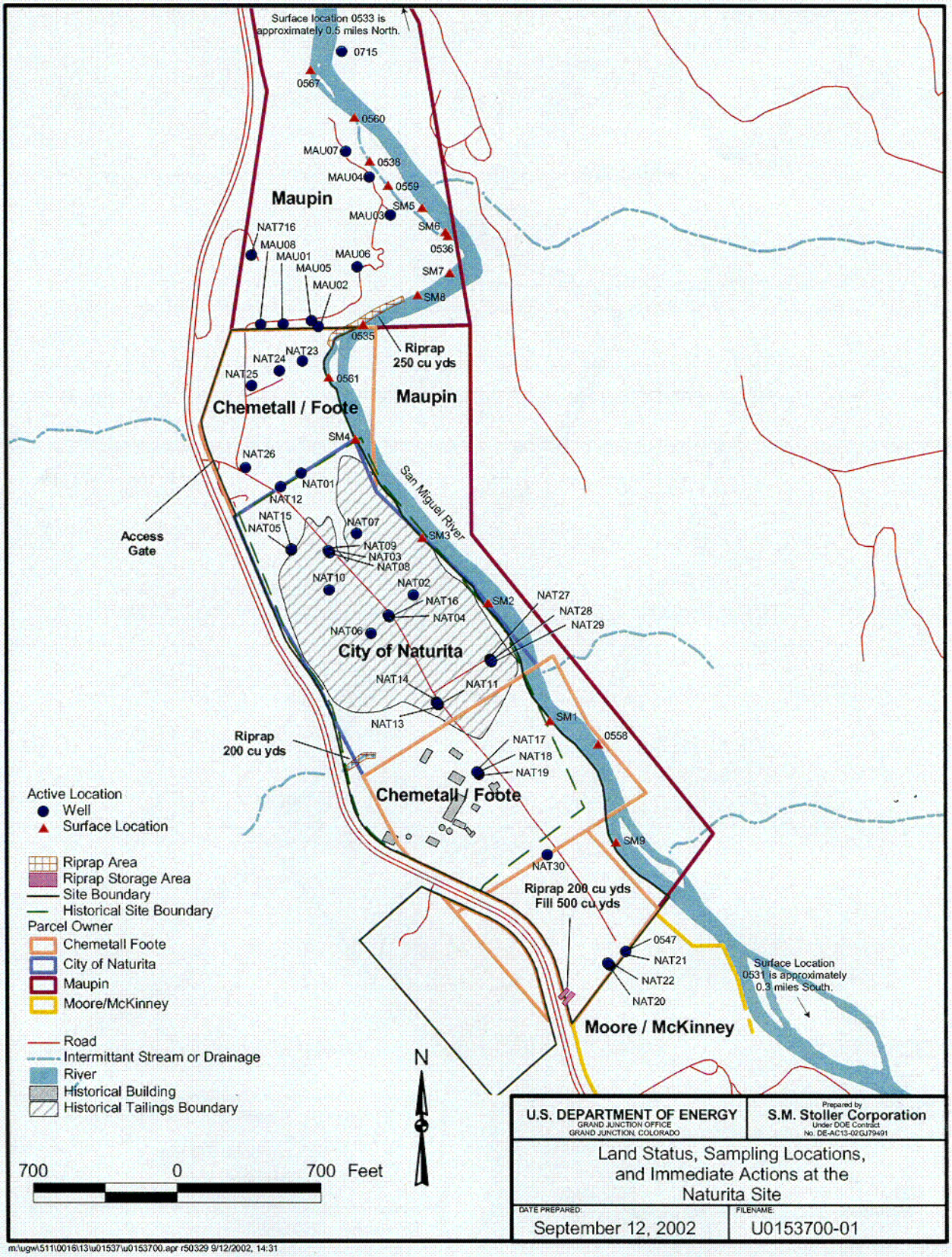

Figure 2–2. Land Status, Sampling Locations, and Immediate Actions at the Naturita Site

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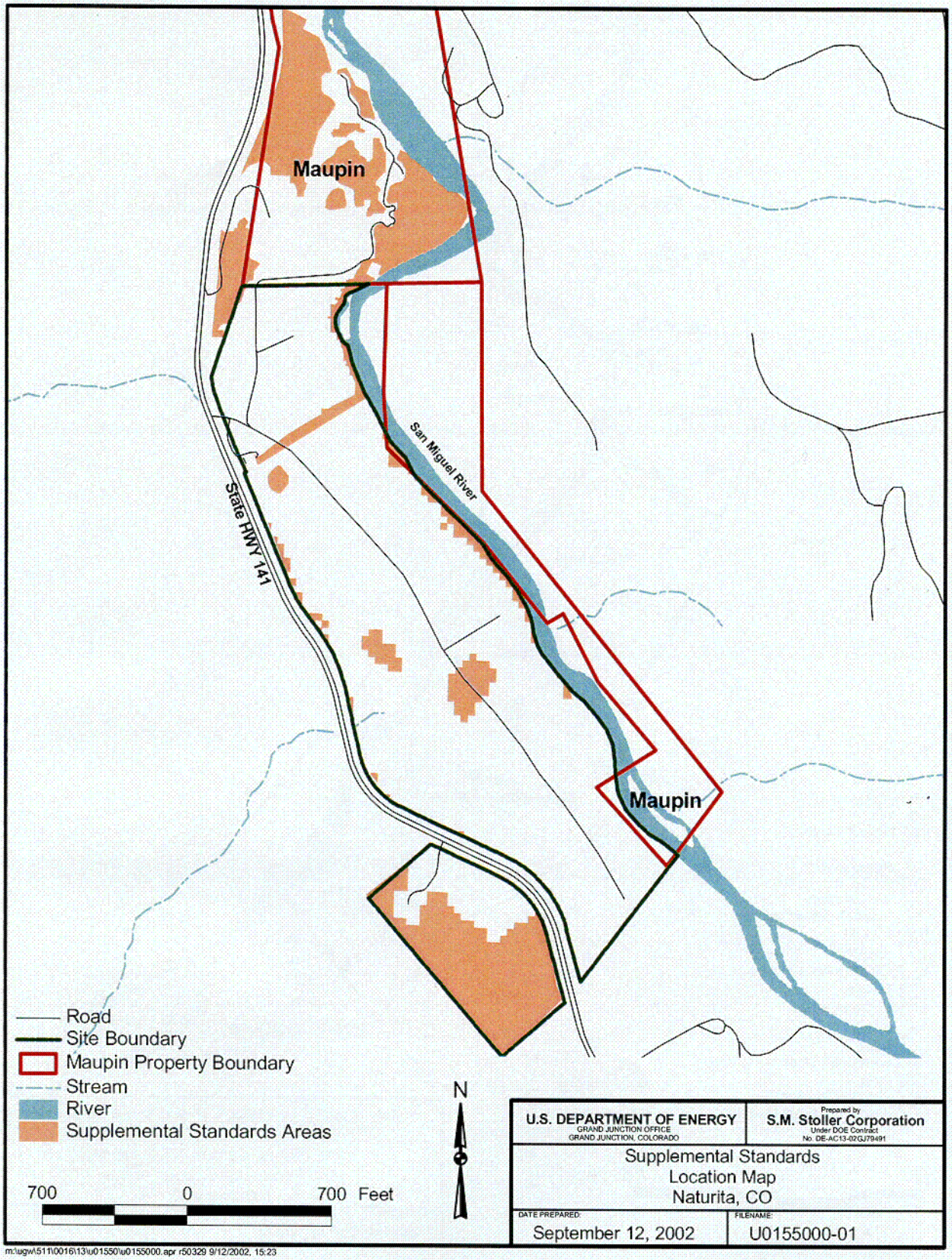

Figure 2–3. Supplemental Standards Areas at the Naturita Site

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Contamination on approximately 5 of the 11 acres on the downgradient vicinity property was left on the floodplain near the San Miguel River because the property owner did not want the area disturbed, and the harm to the environment outweighed the benefit of removing the contamination. The area is a riparian corridor with mature cottonwoods and other habitat suitable for indigenous species. The other 6 acres on the vicinity property, where contamination is probably windblown tailings, was left along State Highway 141 because the low amount of radioactivity did not justify the potential danger to workers who would have to work along steep to vertical banks for its removal.

2.4 Ground Water Characteristics

The site conceptual model, discussed in Section 5 in the SOWP (DOE 2002a), addresses the important processes that influence the distribution, present levels, and estimated future conditions of contamination at the Naturita site. Results of information gathered in the past year few years and a review of previous information were used to construct the model. The compliance strategy is based on information in the site conceptual model.

2.5 Hydrology

2.5.1 Surface Water

The San Miguel River, which flows north along the east side of the site, is the dominant source of surface water at the site. It is a perennial stream that originates in the San Juan Mountains near Telluride and joins the Dolores River about 20 miles downstream from Naturita. A U.S. Geological Survey (USGS) gauging station at Naturita records an average maximum flow of 2,000 cubic feet per second (cfs) and an average minimum of 60 cfs (DOE 1994). The mean flow from 1918 to 1980 is 328 cfs. Maximum flows occur during the spring runoff, usually in June, and during summer storm events. The only current use of river water near the former millsite is for irrigation and livestock watering.

Several arroyos on the west side of Highway 141 drain Sawtooth Ridge and periodically contribute water and sediment to the site. A culvert near the middle of the site drains one of these valleys to the west. Water from summer storms in 2000 eroded the culvert, and it was repaired in 2001.

Dry Creek enters the San Miguel River about 0.5 mile upstream of the site and drains Mancos Shale and Dakota Sandstone in Dry Valley. It flows during the spring and intermittently during other parts of the year. Water from Dry Creek is usually turbid and increases the suspended sediment load in the San Miguel River near the site.

A distributary cutoff on the Maupin property is the source of several small ponds fed by springs. Surface location 0538 is recorded as a spring in the Baseline Risk Assessment (DOE 1995) and is part of this system. Aerial photographs of the site over the past 30 years show the genesis of this system. In the early 1970s, the main course of the San Miguel River was located farther south and occupied the present seep/pond area of location 0538. By the mid 1980s, the course of the river had shifted to the north, and by the late 1990s the course of the river had left the former channel as a low scarp along an expanding riparian willow-sapling zone.

2.5.2 Alluvial Aquifer

The unconfined alluvial aquifer is the uppermost aquifer at the Naturita site and consists of the saturated portion of the river-lain alluvium. It is the only aquifer of concern for ground water contamination because the underlying Brushy Basin Member of the Morrison Formation has an upward hydraulic gradient. The alluvial aquifer is contained in a wedge of sediment that varies in thickness from zero as it pinches out along the western bedrock to about 23 ft along the San Miguel River near the northern portion of the site. However, it generally ranges from only about 5 to 10 ft in thickness over most of the site. The section of interest underlying the site is approximately 4,000 ft long and 700 ft wide. Recharge and discharge occur along the length of the San Miguel River depending on the river level. However, a primary recharge zone is the 600-ft strip from the San Miguel River about 2,400 ft south of the site near the confluence of Dry Creek, where the river makes a sharp bend. River water flows directly into the bank at this point. From there, water migrates slowly northwest through the aquifer until it exits back into the San Miguel River north of the site along a 500-ft zone where the river intersects bedrock on the Maupin property. The aquifer probably terminates against the San Miguel River there; however, contamination has been detected in alluvial ground water on the east side of the river about 10 feet from the eastern riverbank. This may possibly result of ground water flowing beneath the San Miguel River from west to east or, more likely, leaching of tailings deposited on the eastern bank of the river during flooding over the past 50 years.

Another source of water entering the alluvial aquifer is from arroyos draining from the west. Their significance is probably greater locally where water from these drainages could contribute to flushing contaminants in the aquifer near the western edge of the site. The last source of recharge is infiltration of rainfall. The Hopkins-Montrose airport 2.5 miles east of the site receives approximately 11 inches of rain per year. The surficial aquifer below the site contains approximately 30,000,000 gallons (4 million cubic feet) of water at any one time.

Hydraulic characteristics of the alluvial aquifer were determined by water age determinations, stable isotope and chloride measurements, falling-head slug tests, and bromide tracer tests. Ground water age determination studies using tritium-helium and chlorofluorocarbon methods generally indicate increases in the age of water near the western side of the site and slower flow rates in this area. Flow paths are generally parallel to the San Miguel River, and older ages suggest slower flow rates along the western side of the site. This interpretation agrees well with the ground water surface contour map shown in Figure 2–4. Lines of equal elevations are generally perpendicular to the San Miguel River, and flow directions are perpendicular to the elevation contours. This results in longer flow paths for water along the western side of the site. The open gravel pit at the southern end of the site intersects ground water. Chloride and stable isotope studies suggest that this dewatering of the upgradient head of the aquifer will probably retard natural flushing of contaminated ground water at the site.

Falling-head slug tests were performed for 13 wells in November 1999 and May 2000. The hydraulic conductivity ranged from 19 ft/day (MAU04) to 333 ft/day (NAT09) and averaged 95 ft/day. Bromide tracer tests were performed on six wells. These results indicated hydraulic conductivities that ranged from 43 ft/day to 215 ft/day.

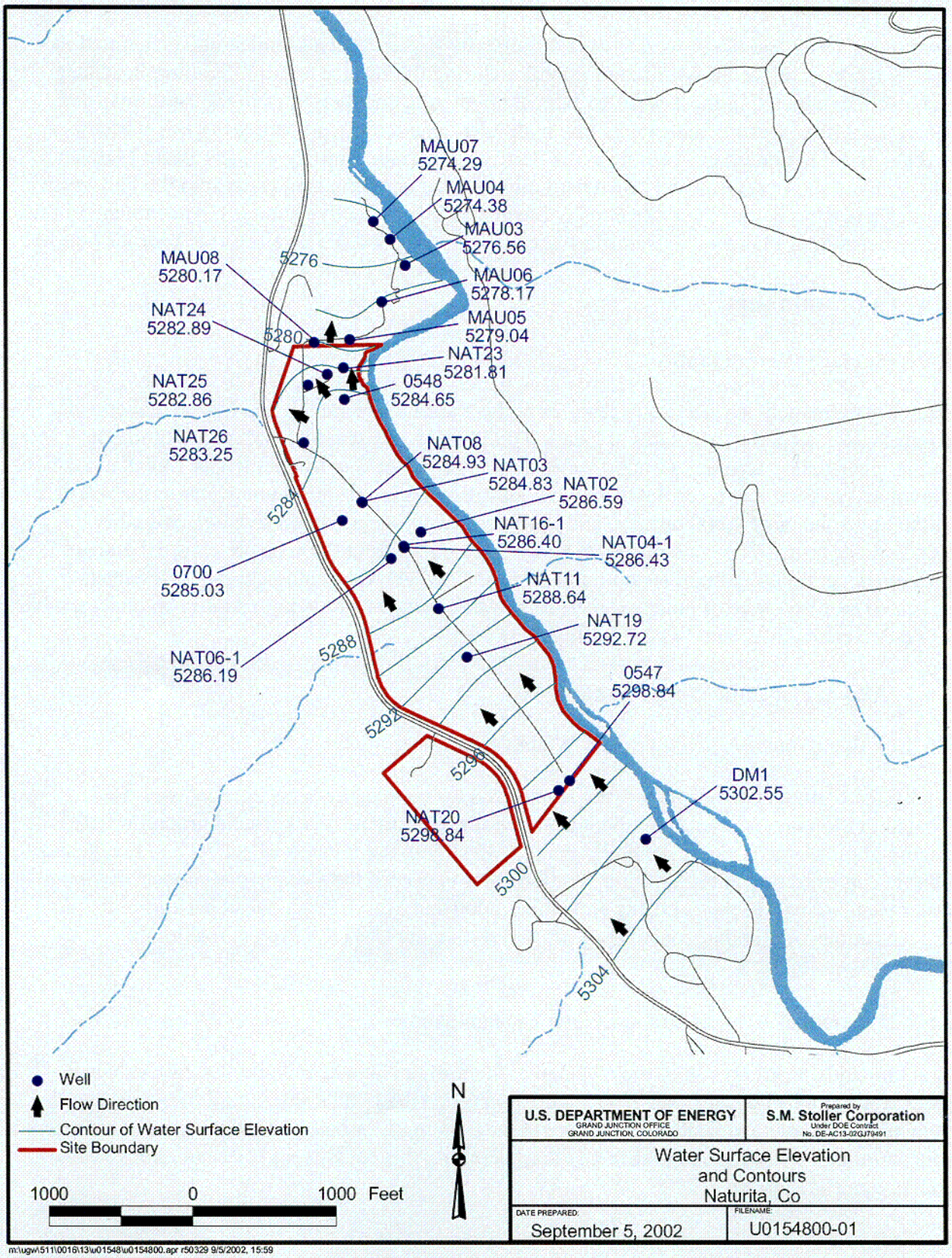

Figure 2–4. Alluvial Water Table Elevations at the Naturita Site

C03

2.5.2 Bedrock Aquifer

Two wells, 0502 and 0603, were drilled through the Brushy Basin Member and penetrated the Salt Wash Member of the Morrison Formation during the surface program. Falling-head slug tests were conducted in these wells to estimate hydraulic conductivities in the Salt Wash and alluvial aquifers. Results indicated a low hydraulic conductivity in the Brushy Basin Member and a vertical hydraulic gradient from the Salt Wash Member into the Brushy Basin Member. This combination prevents any downward migration of contaminated water into the Salt Wash aquifer and demonstrates that the Brushy Basin acts as an effective aquitard. Attachment 3 of the Remedial Action Plan for the Naturita site (DOE 1998a) provides details of the bedrock aquifer.

2.6 Contaminants

2.6.1 Surface Water Quality

The only permanent surface water features at the Naturita site are the San Miguel River and a ground water seep that originates at location 0538 and feeds several small ponds along the former distributary channel. Ground water discharges to the San Miguel River. Calculations have shown that even at low river flow, contaminants discharging from ground water to the river are diluted by a factor of 4,000 or more and have no measurable effect on river water quality. Concentrations of some constituents in water discharging from the seep are elevated and are further concentrated through evaporation effects. However, the ecological risk assessment indicated that exposure of potential receptors to these waters would not result in an unacceptable risk (see Section 2.7.2 and SOWP Section 6.2)

2.6.2 Alluvial Ground Water Quality

2.6.2.1 Background Alluvial Ground Water Quality

Background ground water quality is characterized by samples from background well DM1, located in the same aquifer upgradient from the former millsite. Background ground water quality at the Naturita site is generally good, with slightly high levels of sulfate and manganese. Sulfate concentration at background location DM1 exceeded the Colorado secondary drinking water standard of 250 mg/L during November 2000 and March 2001. Mean background concentrations of all other constituents are lower than the UMTRA Project maximum concentration limits.

2.6.2.2 Extent of Alluvial Ground Water Contamination

Uranium and vanadium values are elevated at the former Naturita millsite. Arsenic values in wells NAT03, NAT08, and NAT700 slightly exceeded the UMTRA standard for some sample rounds, but the average concentrations are at the 0.05 mg/L or below. Modeling indicated arsenic concentrations will continue to decrease and therefore, this constituent has been removed as a contaminant of concern.

Uranium

Uranium concentrations in ground water range from 0.007 mg/L in well 0547, which is upgradient from the former tailings area, to more than 2 mg/L in well NAT26. Concentrations in

all wells located downgradient from well NAT30 exceed the UMTRA maximum concentration limit of 0.044 mg/L (Figure 2–5). Well NAT30 is located near upgradient edge of the former mill yard area as seen in Figure 2–2. Uranium concentrations continue to be elevated as ground water moves downgradient under the former tailings area and into the adjoining downgradient vicinity property.

Concentrations decrease at the northern and downgradient end of the site near the bend in the San Miguel River. Chloride and sulfate concentrations along with ground water age determinations and flow modeling suggest that water in wells MAU06, MAU03, and MAU04 is a combination of older ground water flowing from the south that is mixing with younger San Miguel River water. Well MAU07, with a higher concentration of uranium, may represent a component of contaminated water from the site that has flowed closer to the western side of the floodplain and has not been diluted as much by river water. Wells MAU06, MAU03, MAU04, and MAU07 and surface location 0567 all have uranium concentrations that are significantly greater than that of the San Miguel River, indicating contamination is most likely millsite related. Surface location 0567 is a ground water seep that collects in a small area near the river and periodically desiccates, producing elevated concentrations of metals. River water frequently flushes this location.

Another possible influence on the uranium distribution on the downgradient vicinity property is secondary leaching of tailings deposited during flood stages. Aerial photographs from the 1950s and 1960s indicate that a series of San Miguel River channels once crossed the eastern side of the vicinity property before the current east-bending dogleg in the channel was established. During flood stages, tailings could have eroded from the former tailings pile and been deposited in low-lying channels this region. If the tailings were in contact with ground water, metals may have leached into the ground water and produced elevated concentrations of uranium. This could explain the sharp decrease in uranium concentrations at the northern edge of the former millsite, which probably indicates the northern edge of the uranium plume migrating from the site and the increase in concentrations farther north.

An alluvial monitor well was installed and sampled in April 2002, on the east side of the San Miguel River slightly downgradient of the contamination on the west side of the river. The purpose was to determine if contamination existed on the east side of the river. The April 2002 sample contained 0.080 mg/L uranium, which is about twice the UMTRA standard and probably represents millsite contamination. The historical deposition of millsite tailings during river flooding and the subsequent leaching of these tailings is the apparent reason for this elevated uranium concentration.

Vanadium

Vanadium concentrations range from below the detection limit (0.02 mg/L) to a maximum value of 7.55 mg/L. The highest value was measured in September 1999 in well NAT08. Figure 2–6 shows the distribution of vanadium concentrations in the February 2002 sample round. Due to its lower mobility, the vanadium has not been transported as far downgradient as other constituents such as uranium, and the higher concentrations are generally confined to the area of the former tailings pile.

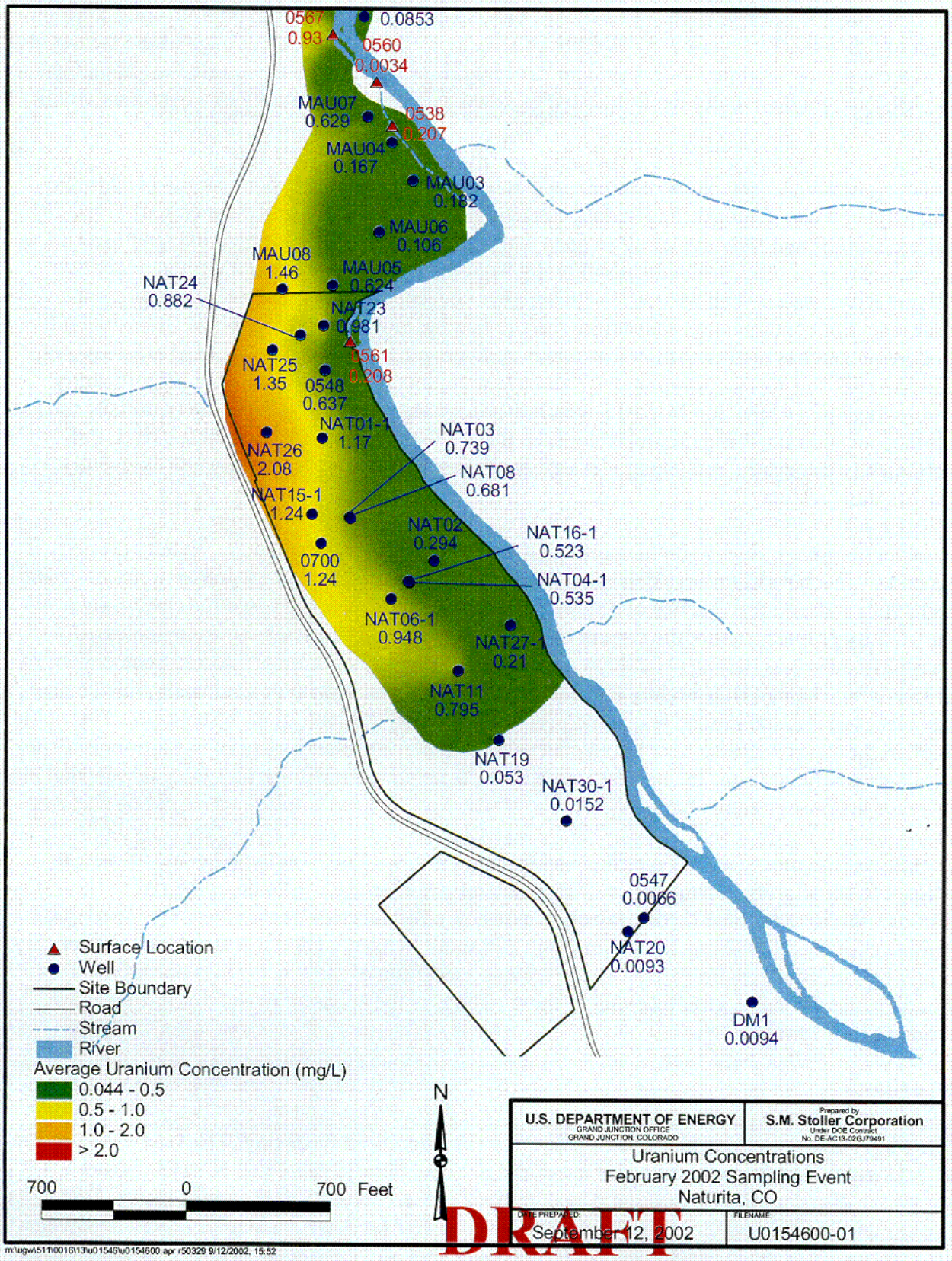

Figure 2–5. Uranium Concentrations at the Naturita Site; February 2002 Sampling Data

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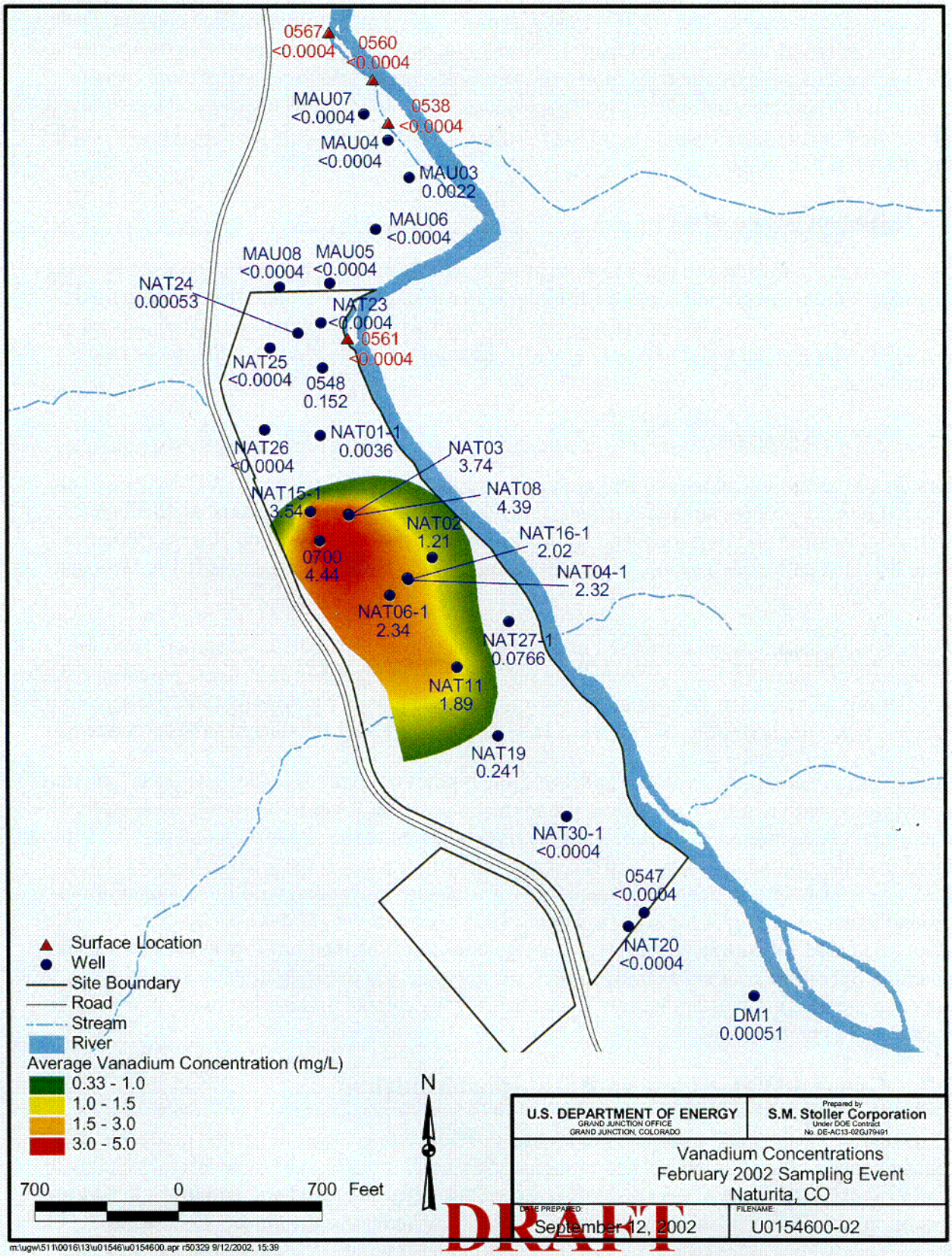

Figure 2–6. Vanadium Concentrations at the Naturita Site; February 2002 Sampling Data Risk Assessments

C05

A Baseline Risk Assessment (DOE 1995) was previously prepared for the Naturita site. Data used in that report were collected from 1989 to 1994. Since that time, additional data were collected to characterize the risks more completely at the site and to represent more recent conditions. These new data were used to reevaluate the contaminants of potential concern and assess associated risks. The update to the Baseline Risk Assessment is presented in Section 6 of the SOWP (DOE 2002a).

2.6.3 Human Health Risks

Results of the human health risk assessment indicate that the only concern to humans is direct ingestion of alluvial ground water as drinking water in either an occupational or residential exposure scenario. The assessment suggests that controls should be put in place to prevent the use of alluvial ground water as drinking water. Uranium and vanadium are the major risk contributors.

2.6.4 Ecological Risks

Results of the ecological assessment are presented in Section 6.2 of the SOWP. Receptors are divided into six groups: aquatic organisms, benthic organisms, upland plants, wetland plants, terrestrial wildlife and livestock, and wetland life. Potential risks based on Hazard Quotients were established for each group, generally following standard EPA protocols (EPA 1998 and EPA 1992).

Conservative assumptions were used in the evaluation of risks for these receptors. Therefore, risk categories of "medium-low" to "none" are not expected to represent significant potential risks to populations of nonsensitive species. However, for those receptor groups that include sensitive species, risk categorizations of "medium-low" to "low" are still considered to be of concern.

For potentially complete exposure pathways, the highest potential risk (designated as "medium") is associated with exposure of aquatic life in the San Miguel River to barium. However, the maximum concentration of barium from the river adjacent to the site is only one part per billion more than the upgradient value, and the source of barium is not considered to be site related. Risks were also determined to be "medium" for exposure of wetland wildlife to vanadium in ground water emerging at the seep, assuming 100 percent of water intake occurs here. All other risks calculated for complete pathways were determined to be medium-low to none. Therefore, potential overall risk for nonsensitive species is not expected to be significant. Potential risk to the endangered southwestern willow flycatcher, for which potential habitat exists at the site, is considered to be very low.

2.7 Ground Water Flow and Transport Modeling

A ground water flow and transport model was developed to evaluate if natural processes will reduce concentrations of site-related uranium and vanadium to regulatory levels in the alluvial aquifer within 100 years. Two versions of the model were developed and employed to address conditions at the site. A steady state deterministic flow and transport model was used as the basis for the steady state stochastic flow and transport model. The steady state stochastic flow and transport model was used to quantify the uncertainty in flow and transport parameters. Modeling results indicate that natural flushing is not an acceptable compliance strategy to reduce ground water concentrations of uranium and vanadium to acceptable levels within 100 years.

2.7.1 Steady State Deterministic Model

Figure 2–7 depicts predicted uranium concentrations in ground water after 100 years. The simulation predicts that the maximum concentration will decrease to 0.236 mg/L, which is above the UMTRA Project maximum concentration limit of 0.044 mg/L. Vanadium simulations show similar results. Figure 2–8 shows predicted vanadium concentrations in ground water after

100 years. The simulation predicts the maximum concentration will decrease to 4.33 mg/L, which is well above the risk-based concentration of 0.33 mg/L.

2.7.2 Steady State Stochastic Model

The steady state stochastic modeling results are similar to those of the steady state deterministic model. Only uranium was modeled using the stochastic models. Predicted maximum average concentrations are above the standard at 0.121 mg/L.

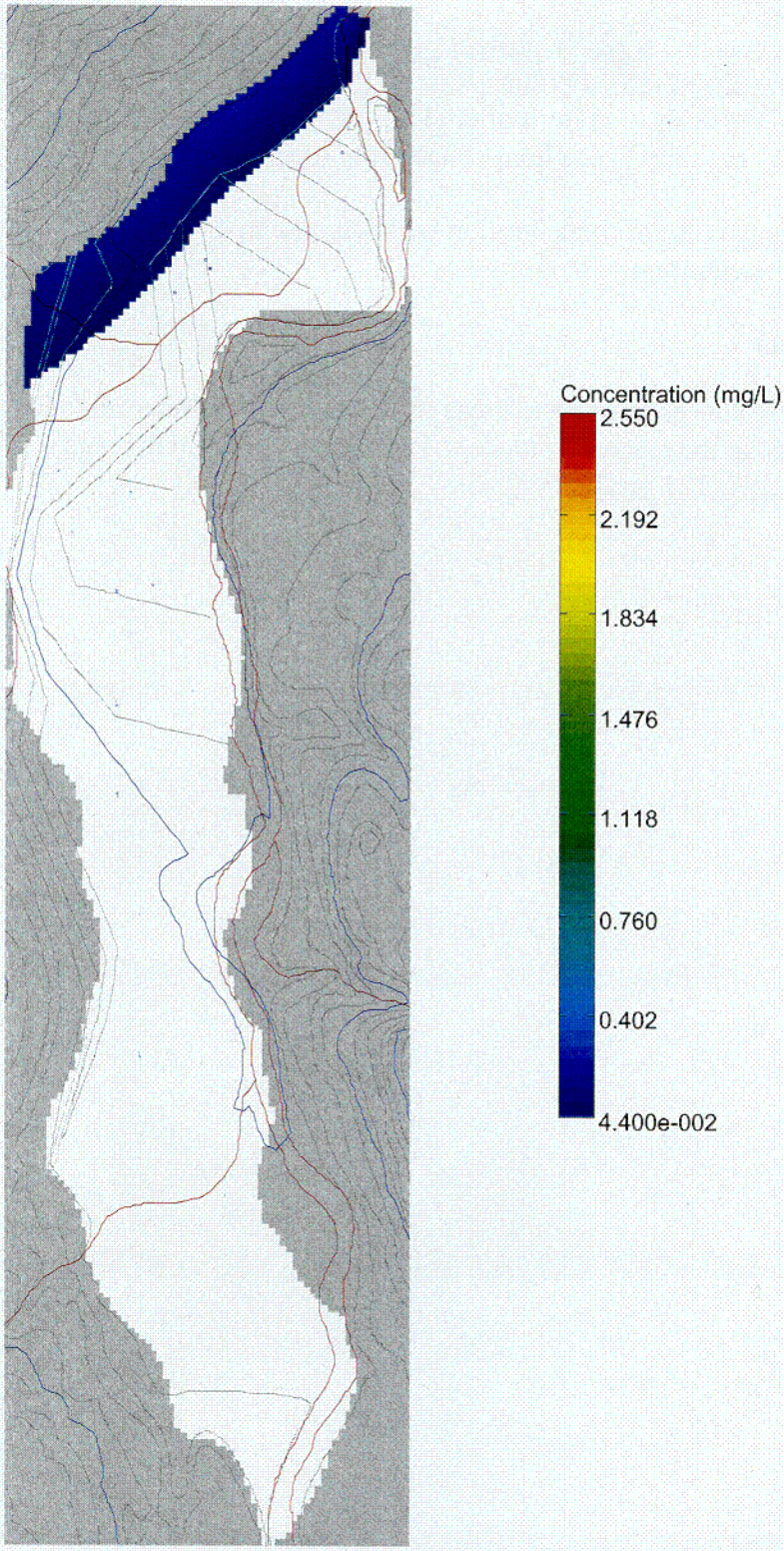

Figure 2–7. Predicted Uranium Concentrations in Ground Water After 100 Years (steady state deterministic model)

C06

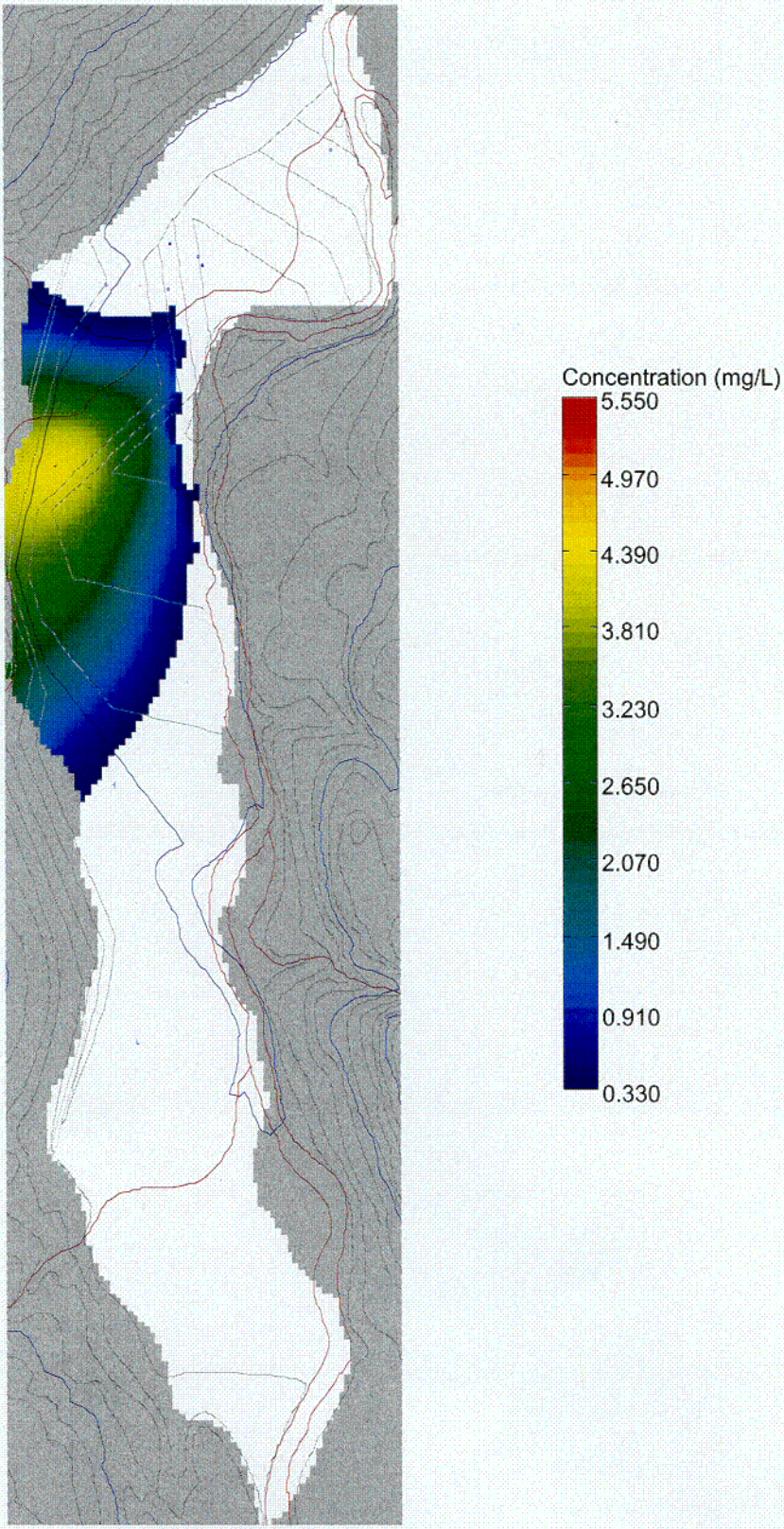

Figure 2–8. Predicted Vanadium Concentrations in Ground Water After 100 Years (steady state deterministic model)

C07

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3.0 Ground Water Compliance

3.1 Compliance Selection Framework

DOE follows the framework defined in the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (DOE 1996) to select a strategy that achieves compliance with EPA ground water standards. Figure 3–1 presents a summary of the framework used to determine the appropriate ground water compliance strategy for the Naturita site. The framework considers human health and environmental risk, stakeholder input, and cost. The step-by-step approach results in the selection of one or a combination of the three general compliance strategies:

- ***No remediation***—Compliance with the EPA ground water protection standards would be met without altering the ground water or cleaning it up in any way. This strategy could be applied for those constituents at or below maximum concentration limits or background levels or for those constituents above the standards or background levels that qualify for supplemental standards or alternate concentration limits.

- ***Natural flushing***—This strategy would allow natural ground water movement and geochemical processes to decrease contaminant concentrations to regulatory limits. The natural flushing strategy can be applied where ground water compliance could be achieved within 100 years, where effective monitoring and institutional controls can be maintained, and where the ground water is not currently and is not projected to be a source for a public water system.

- ***Active ground water remediation***—This strategy would require engineered ground water remediation methods such as gradient manipulation, ground water extraction and treatment, land application, phytoremediation, and in situ ground water treatment to achieve compliance with EPA standards.

3.2 Naturita Compliance Selection Framework Analysis

The UMTRA Project regulations provide for several ways to comply with the ground water protection standards for Subpart B of 40 CFR 192.12(c). These include meeting the provisions of 40 CFR 192.02(c)(3) or a supplemental standard established under 40 CFR 192.22. The provisions of 40 CFR 192.02(c)(3) include: (1) the background level of the constituent in ground water; (2) the maximum concentration limit for any constituents listed in Table 1 to Subpart A; or (3) an alternate concentration limit established pursuant to paragraph (c)(3)(ii) of that section.

The compliance strategy proposed for the Naturita site is no remediation with the application of alternate concentration limits for uranium and vanadium. Institutional controls and monitoring will continue as a best management practice. An immediate action has also been completed as part of the overall compliance strategy. These components of the compliance strategy are described separately.

Table 3-1 shows the compliance strategy for uranium and vanadium as outlined by the framework in Figure 3–1. An application for alternate concentration limits is provided as Attachment A. It discusses the criteria required by NRC when applying alternate concentration limits.

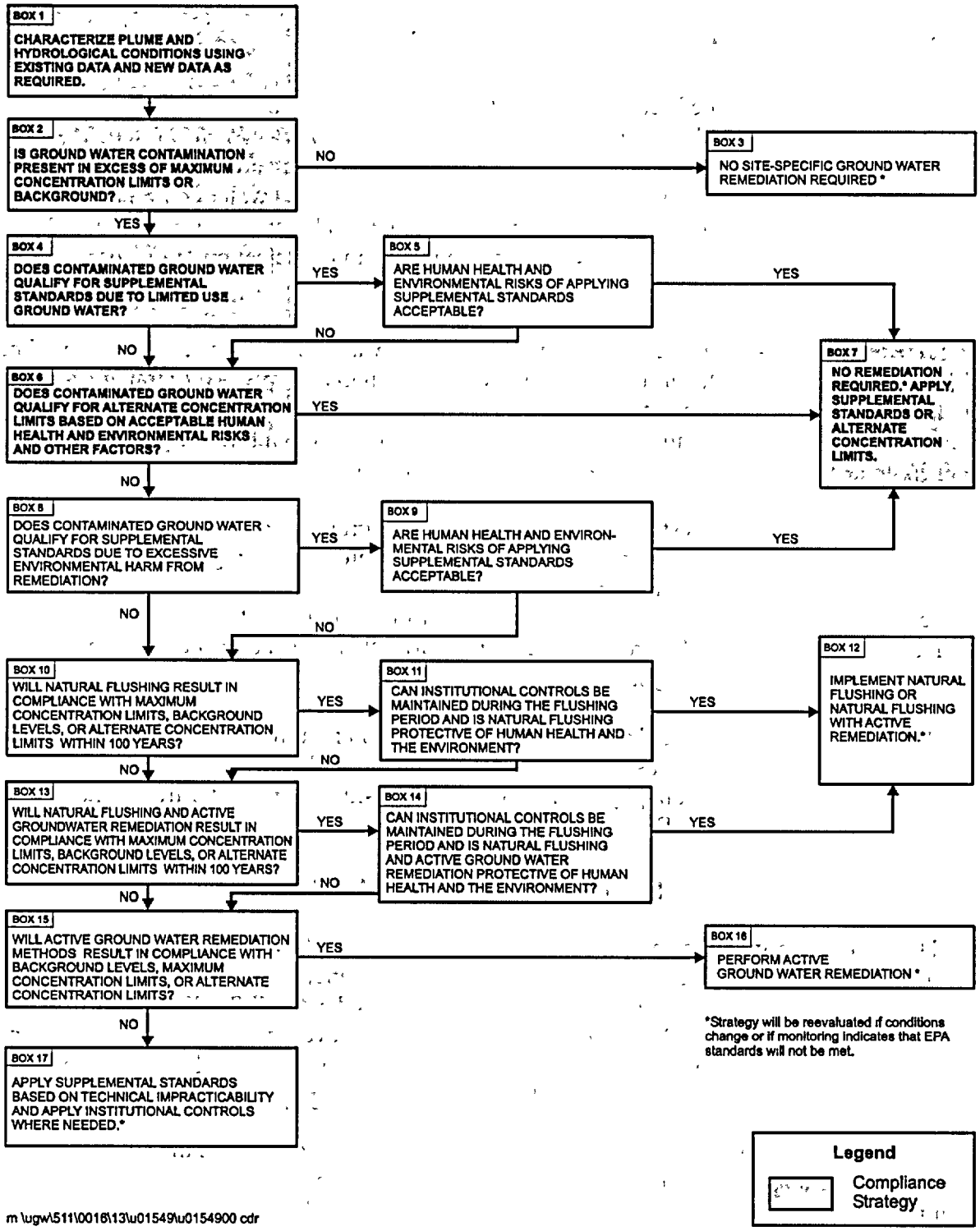

Figure 3–1. Compliance Selection Framework for Uranium and Vanadium at the Naturita Site

Table 3-1. Explanation of the Compliance Strategy Selection Process for Uranium and Vanadium at the Naturita Site

Box Figure 3–2	Action or Question	Result of Decision
Box 1	Characterize plume and hydrologic conditions.	See Site Conceptual Model in Section 5 of SOWP (DOE 2002a). Move to Box 2.
Box 2	Is ground water contamination present in excess of UMTRA Project maximum concentration limits or background?	Uranium and vanadium concentrations exceed UMTRA Project maximum concentration limits or risk-based concentrations. Move to Box 4.
Box 4	Does ground water qualify for supplemental standards due to its classification as limited use ground water?	Alluvial ground water does not meet any criteria for limited use. Move to Box 6
Box 6	Does ground water qualify for alternate concentration limits based on acceptable human health and environmental risks and other factors?	Yes. No one is currently using the water for any purpose Institutional controls can be placed on affected ground water to prohibit improper use in perpetuity. Move to box 7.
Box 7		No remediation required. Apply supplemental standards or alternate concentration limits. Apply alternate concentration limits. Action levels for uranium = 3 mg/L, for vanadium = 6 mg/L

3.3 Alternate Concentration Limits

As described in Section 2.9, modeling of uranium and vanadium indicates that constituents will not flush to acceptable levels during the 100-year natural flushing period. However, because the water is not currently being used, contaminant concentrations in the ground water do not pose a threat to human health or the environment. Alternate concentration limits are therefore proposed for uranium and vanadium.

Uranium concentrations above 0.044 mg/L (Figure 2–5) extend from the former location of milling buildings northward into the vicinity property, to the eastern side of the San Miguel River. However, the highest concentrations of uranium, located below the former tailings pile, have apparently migrated only as far north as the northern boundary of the site and have begun to encroach on the southernmost side of the vicinity property. The plume map for vanadium (Figure 2–6) shows a much smaller areal distribution. It is confined to the southern half of the area within the footprint of the former tailings pile and has shown little, if any, migration in the 60 years since vanadium milling first began. This distribution of uranium and vanadium is consistent with measured distribution coefficients, ground water modeling predictions, and observations at other UMTRA Ground Water Project sites. Vanadium is less mobile than uranium and adsorbs more strongly to alluvial materials. Therefore, it is unlikely that an attempt to remove vanadium from the alluvial aquifer would be effective.

As mentioned in Section 2.6.2.2, evidence exists that mill tailings from the site have been eroded by the San Miguel River over time and redeposited downstream of the millsite. These deposits may serve as a continuing source of ground water contamination. Aerial photographs from 1954, 1966, and 1974 (DOE 2002a, SOWP Figures 3–1, 3–2, and 3–3, respectively) show a distributary channel for the San Miguel River cutting through the vicinity property floodplain. Repeated spring runoff and periods of flooding probably deposited tailings in this area. Similar river flooding may have also deposited tailings on the eastern side of the river and may be the source of uranium contamination in this area.

Despite the persistence of uranium and vanadium in the soils from supplemental standards areas representing a potential continuing source of ground water contamination, concentrations of these constituents have declined over time. It is probable that concentrations will continue to decline until soil and ground water interactions reach equilibrium; at that time ground water concentrations will probably level off. The timeframe for this condition to occur is considerably greater than 100 years.

As discussed in Section 6.2 of the SOWP (DOE 2002a), exposures of ecological receptors to current site-related ground water contamination discharging to seeps or the San Miguel River do not pose any significant risks. Calculations included in the Baseline Risk Assessment (DOE 1995) indicated that even at very low river stages, contaminants discharging from the ground water are diluted by a factor of approximately 4,000 to 5,000. Because of this dilution, historical maximum contaminant concentrations have had a negligible effect on the San Miguel River water quality. Because current concentrations are considerably less than those historical highs and are expected to continue to decline, there should be no future adverse impact to ecological receptors. Therefore, current contaminant concentrations in the ground water are protective of the environment.

Alternate concentration limits of 3 mg/L for uranium and 6 mg/L for vanadium are proposed as action levels at the point of compliance. These values are the approximate maximum concentrations detected in ground water from the past few years. They are protective of human health because of the lack of a complete exposure pathway. They are also protective of the environment because of the significant dilution effect of the San Miguel River. The alternate concentration limits will be met at the points of compliance, which are considered to be all wells in the monitoring network. Points of exposure are any points along the San Miguel River. These point-of-compliance concentrations will result in acceptable concentrations at the points of exposure along the San Miguel River. Regular and continued monitoring will ensure that any exceedances of action levels will be detected early.

3.4 Immediate Actions

Several immediate actions shown on Figure 2–2 were completed during 2001 and 2002. DOE provided 200 yd^3 of riprap and 500 yd^3 of clean dirt to the site at the request of Montrose County. This material is to be used by the County in case the San Miguel River floods the site during spring runoff or a storm event.

A second action was to armor the riverbank with riprap along a stretch of the adjoining vicinity property to prevent future erosion and prohibit exposure of residual radioactive materials left on the property. This was considered important to protect monitor wells that may become flooded during spring runoff or storm events if the riverbank failed.

A third action was to repair and armor an eroded culvert on the west side of the site that passes under Highway 141 and drains valleys to the west.

A fourth action was to drill a domestic well for the Maupin family, well NAT716, on their adjoining downgradient property. The well was completed in the Entrada Formation, several hundred feet into bedrock.

3.5 Future Land Use

Growth in this part of western Colorado has been very slow and has historically been linked with mining production. Mining is not expected to have significant regrowth, but tourism may become increasingly important. Ranching is the other industry of western Colorado that has been and will continue to be important. The millsite is currently safe for livestock grazing, and part of it is used for this purpose. The Town of Naturita is located several miles south of the site and is not expected to expand to the millsite boundary in the near future.

Naturita has expressed considerable interest in the old millsite as the future location of a municipal golf course. The Town owns the central portion of the site and is actively pursuing ownership or transfer of property at the north and south ends of the site, owned by Chemetall Foote Corporation. This mining company has not developed plans for their property and is considering transferring it to the state or local government. DOE is facilitating discussions between the landowners to expedite this decision.

It is likely that the gravel mining operation upgradient of the former millsite will expand. This expansion could affect alluvial ground water flow to the site. According to modeling, withdrawal and evaporation of alluvial ground water in this area would not be expected to seriously affect flow, but there could be increased retardation of ground water flow along the western side of the site.

3.6 Institutional Controls

Institutional controls will be placed on ground water that is currently contaminated or may be potentially affected in the future. On the basis Colorado Senate Bill 01-145 passed in July 2001, perpetual environmental covenants can be created that place restrictions on land use, including drilling and pumping of ground water from that land, where remedial actions have been completed and contamination has been left in place. The covenant is with the property owner and the State of Colorado. These covenants are legally enforceable restrictions on land use and therefore meet the definition of institutional controls under Uranium Mill Tailings Radiation Control Act (UMTRCA).

Such an environmental covenant will prohibit domestic use of contaminated ground water until it can be demonstrated that contaminant concentrations have reached regulatory limits. Figure 3–2 shows the total area to be covered by this type of institutional control.

The Maupin family signed an environmental covenant with the Colorado Department of Public Health and Environment in July 2002, prohibiting the use of alluvial ground water for drinking purposes. It extends along the floodplain on either side of the San Miguel River for approximately 3,600 ft downgradient of the site to the Calamity Bridge. For this consideration, DOE provided a domestic water well to replace the beneficial use of ground water they are being denied as a result of this institutional control. Similar environmental covenants are being negotiateded with all other landowners for properties affected by site-related contamination. This will ensure protectiveness of human health and the environment for as long as necessary.

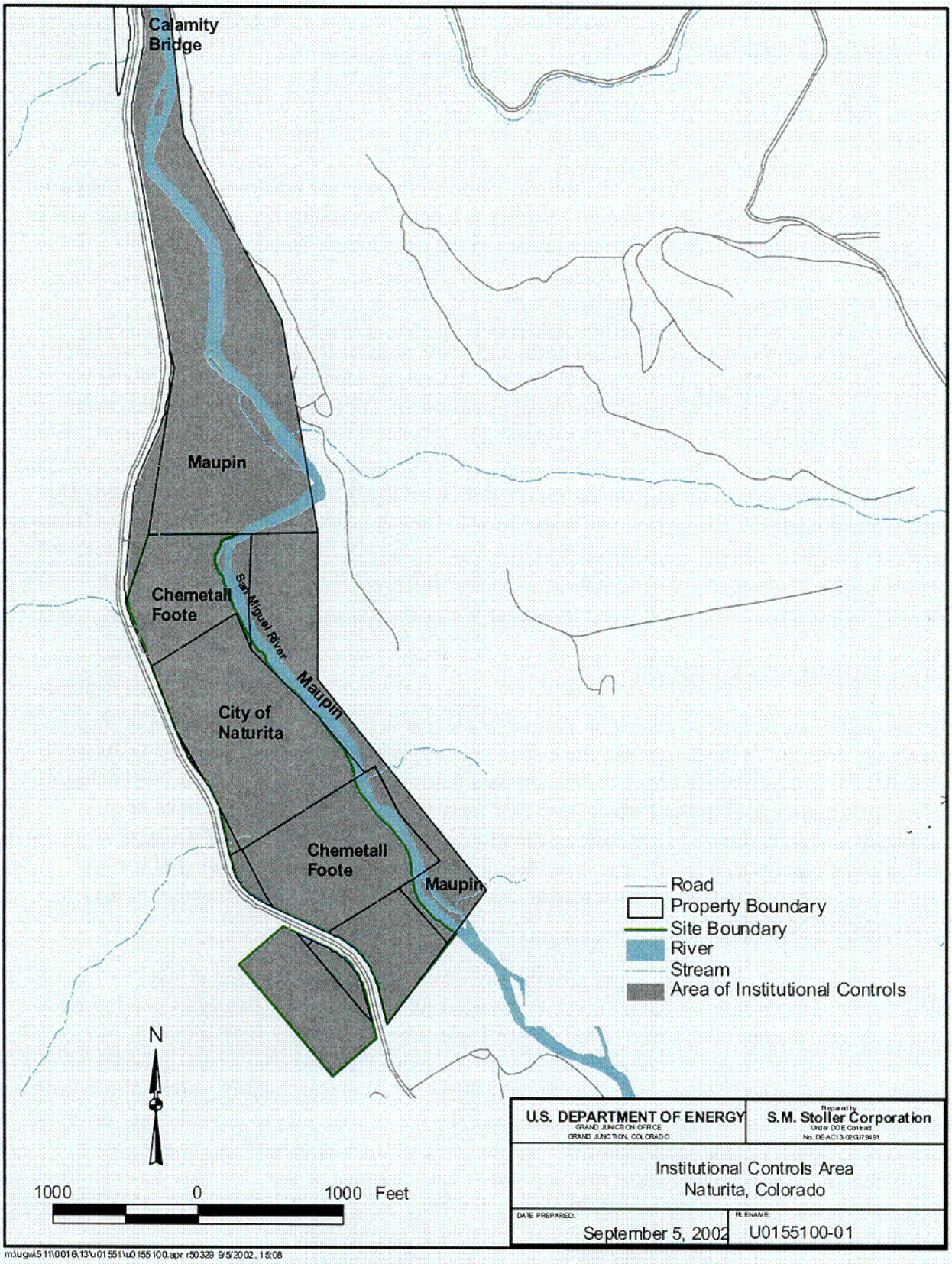

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Figure 3–2. Institutional Controls Boundary

C08

3.7 Monitoring Plan

Monitoring is planned to ensure continued protection of human health and the environment. Monitor wells DM1, NAT08, NAT26, MAU08, MAU07, and surface locations 0531, 0533, SM2 and SM4 will be monitored for uranium, and vanadium (Figure 3–3). DM1 is a background ground water location; if it is removed by expansion of the gravel mining operation, a suitable location will be selected for installation of a new background well. NAT08 contains the maximum vanadium concentration (2.47 mg/L), NAT26 contains the maximum uranium concentration (2.39 mg/L), and MAU08 shows the northern extent of the higher concentrations of uranium. This is thought to represent the plume that has migrated from the former tailings pile.

Figure 3–4 through Figure 3–7 show uranium and vanadium time versus concentration plots for wells NAT26 and MAU08. These concentrations are projected into the future based on modeling results. Figure 3–4 and Figure 3–5 show projections for uranium and vanadium, respectively, for well NAT-26 located within the maximum uranium plume and north of the vanadium plume. The plots show decreasing concentrations of uranium as the plume moves north and corresponding increasing concentrations of vanadium for 400 years until concentrations begin to decline. Figure 3–6 and Figure 3–7 show projections for uranium and vanadium, respectively, for well MAU08, which is located near the northern extent of the uranium plume. These plots suggests that uranium will increase over the first 15 years and begin to decrease by 30 years, but vanadium values fluctuate little during this period and the main part of the vanadium plume does not reach this well.

Surface location 0531 is upgradient on the San Miguel River and 0533 is the downgradient location on the San Miguel River. SM-2, crossgradient of the uranium plume, and SM-4, crossgradient of the vanadium plume, were added at the recommendation of Montrose County officials.

The sampling frequency is once every year for the first 5 years following NRC's acceptance of this Ground Water Compliance Action Plan. Thereafter, sampling will be conducted every 3 years for the next 30 years. At that time future risks and the monitoring plan will be reevaluated. Contaminants are expected to remain above acceptable limits for over 100 years. Table 3-2 presents a summary of the monitoring plan.

Table 3-2. Summary of Future Monitoring Requirements

Location	Monitoring Purpose	Analytes	Frequency
Well DM1	Background ground water	Uranium, vanadium, total dissolved solids, field parameters	Annually for 5 years, afterwards every 3 years for 30 years
Well NAT08	Maximum vanadium concentration, POC well		
Well NAT26	Maximum uranium concentration, POC well		
Well MAU08	Uranium plume, POC well		
Well MAU07	Last well before ground water enters the San Miguel River, POC well		
Surface 0531	Upgradient San Miguel River		
Surface 0533	Downgradient San Miguel River, POE location		
Surface SM2	Crossgradient from uranium plume, POE location		
Surface SM4	Crossgradient from vanadium plume, POE location		

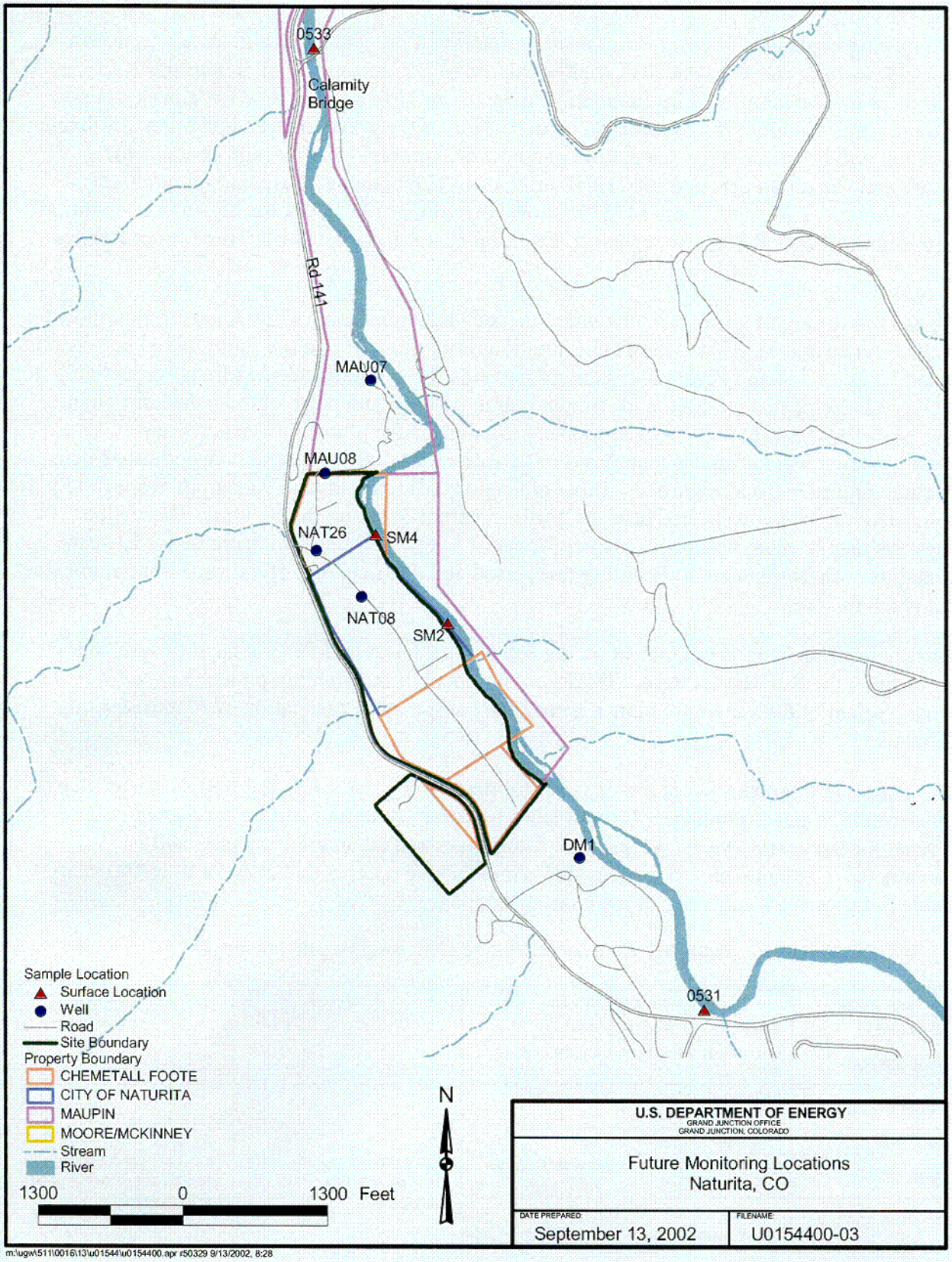

Figure 3–3. Future Monitoring Locations at the Naturita Site

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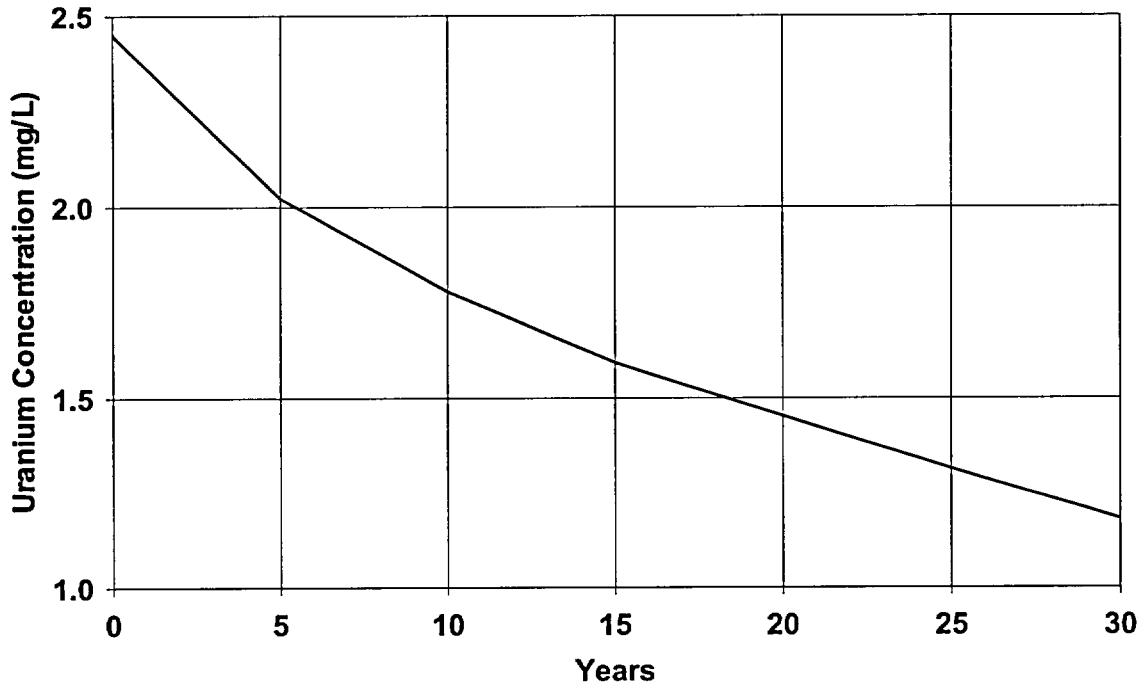

Figure 3–4. Uranium Concentration versus Time at NAT26

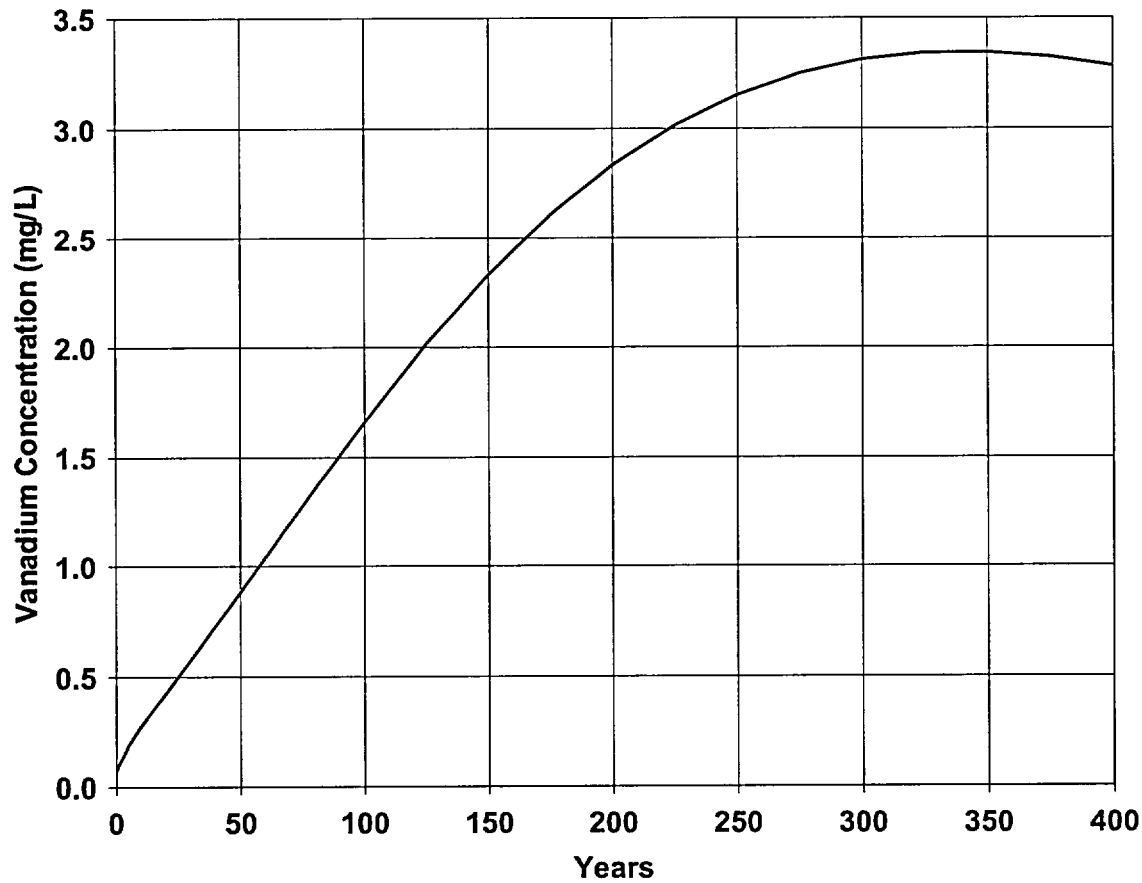

Figure 3–5. Vanadium Concentration versus Time at NAT26

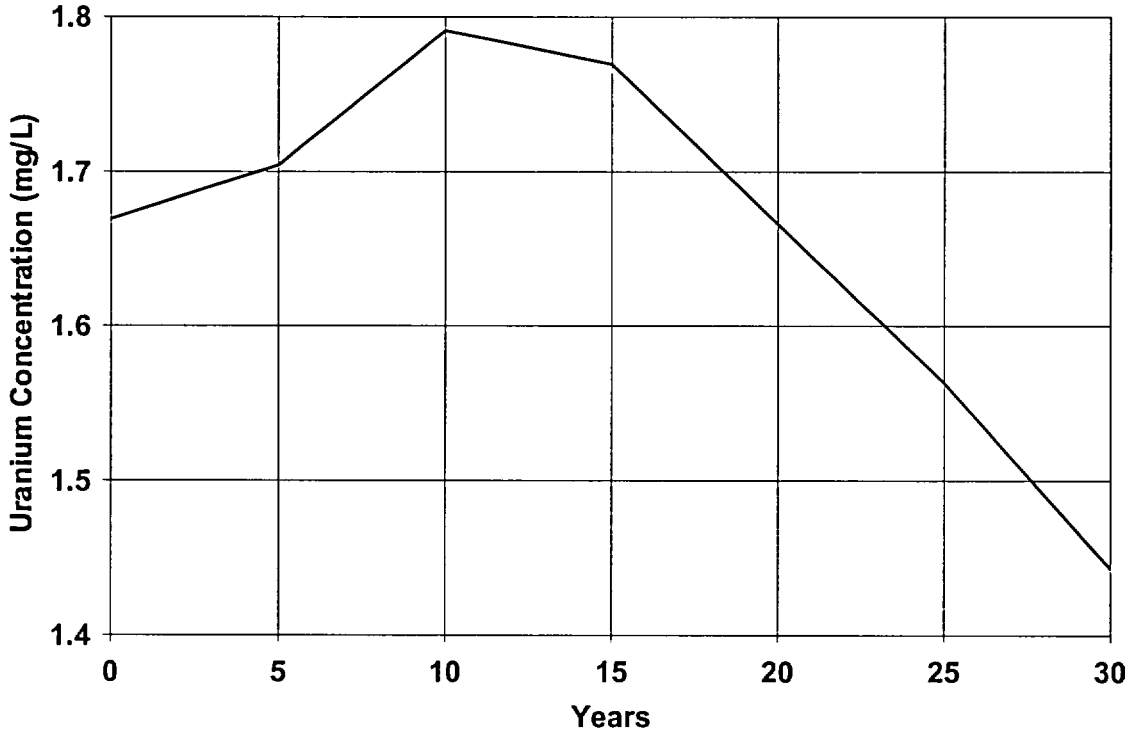

Figure 3–6. Uranium Concentration versus Time at MAU08

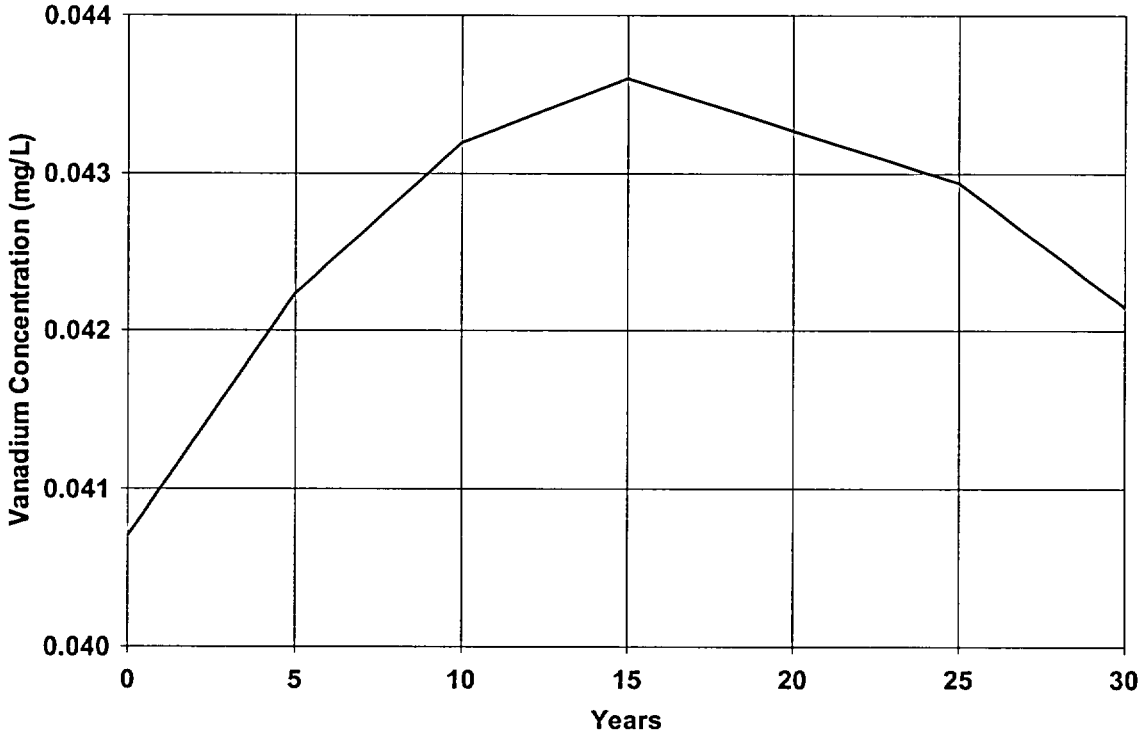

Figure 3–7. Vanadium Concentration versus Time at MAU08

4.0 References

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End of current text

Attachment 1

Alternate Concentration Limits Application

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

September 2002

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

Work Performed under DOE Contract No. DE–AC13–02GJ79491

U0173700

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1.0 Introduction

1.1 Purpose

The purpose of this document is to fulfill the U.S. Nuclear Regulatory Commission (NRC) requirements for an application for alternate concentration limits (ACLs) for uranium and vanadium at the Uranium Mill Tailings Remedial Action (UMTRA) Project site at Naturita, Colorado. The focus is on the mill tailings area of the site and one privately owned property downgradient of and adjacent to the millsite. Much of the information required by the NRC for an ACL application (10 CFR Part 40, Appendix A and NRC 1996) has been compiled in the Site Observational Work Plan (SOWP; DOE 2002) for Naturita and the Ground Water Compliance Action Plan (GCAP). This document is an addendum to the GCAP. The intent of this addendum is to provide a link between NRC evaluation criteria and relevant discussion of those criteria in previous documents. NRC guidance for preparing ACL applications for Title II sites (NRC 1996) was used as a model for this application. This document summarizes pertinent information from the SOWP regarding "Factors Considered in Making Present and Potential Hazard Findings" (Table 1 in NRC 1996; also specified in 40 CFR Part 192 with slight modifications). It also identifies sections of the SOWP that contain information corresponding to sections listed in the "Standard ACL Application Format" (Table 2 in NRC 1996). This approach ensures that all factors and information related to the proposed ACLs have been considered, while minimizing duplication of effort.

NRC's ACL guidance was prepared for Title II UMTRA sites. The guidance can be applied to Title I sites, with modifications made to accommodate the differences between Title II and Title I sites. One of the major differences between these sites is that the regulations for Title I sites (40 CFR Part 192) permit natural flushing as the selected ground water compliance strategy, providing that concentrations of ground water contaminants will reach acceptable levels (UMTRA standards, background, or ACLs) within a period of 100 years. This ACL application evaluates the relevance of natural flushing to the Naturita compliance strategy.

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

1.2 Site Background

The Naturita UMTRA Project site is in Montrose County in western Colorado, approximately 2 miles north of the city of Naturita (Figure 1). It is situated on an elongate north-south section of floodplain between Colorado State Highway 141 on the west and the San Miguel River on the east. The site is the location of a former vanadium and uranium mill that operated intermittently from 1939 until 1958. The historical site area, a boundary used during the surface remedial action, enclosed 53 acres. The current site area is expanded to include property owned by the City of Naturita and Chemetall Foote and now consists of 79 acres (Figure 1).

The mill was originally designed to operate at a capacity of about 150 tons per day, but the capacity was increased in 1954 to 350 tons per day. The mill closed in 1958 when the contract with the U.S. Atomic Energy Commission expired. During the life of the mill, approximately 704,000 tons of ore was processed.

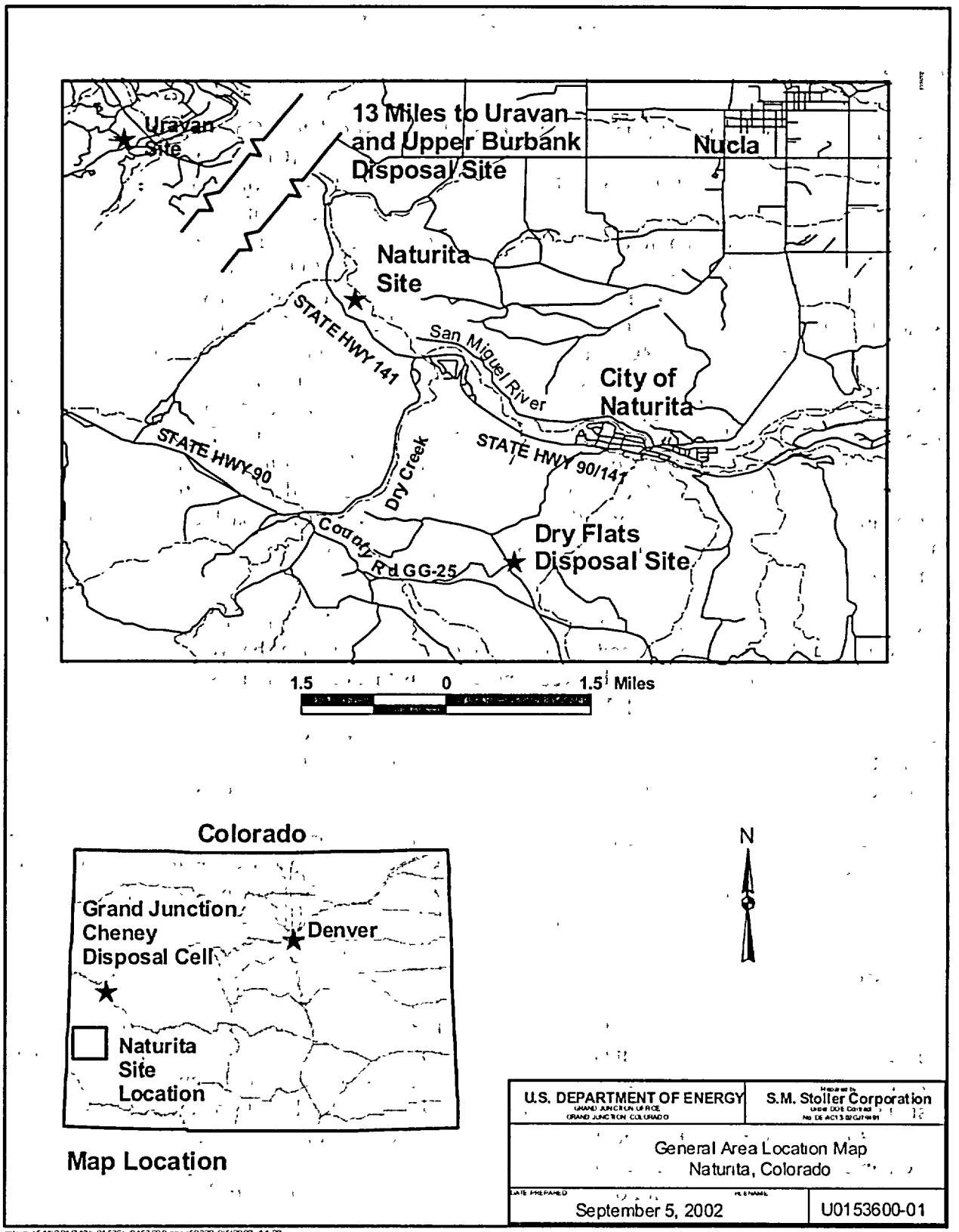

Figure 1. Location of the Naturita Site

The UMTRA Project surface remedial action at the site occurred between January 1993 and September 1998. During this time, 771,400 cubic yards (yd^3) of residual radioactive materials was removed from the site. The total volume consisted of about 315,520 yd^3 from the former mill yard, 10,340 yd^3 from the former ore storage area, 209,880 yd^3 from windblown areas, 225,490 yd^3 from the former tailings area, and 10,170 yd^3 from stockpiled demolition debris. In addition, a contiguous vicinity property to the north (NT-065, the Maupin property) underwent remedial action, and 93,602 yd^3 of material was removed. All material was hauled by truck to the Upper Burbank disposal cell about 15 miles to the northwest near the townsite of Uravan, Colorado. Section 3 of the SOWP and Section 2 of the GCAP provide further site information.

2.0 Proposed ACL

An ACL is proposed for uranium and vanadium at the Naturita mill tailings area site. An ACL for uranium is required because background ground water concentrations exceed the UMTRA standard of 0.044 milligrams per liter (mg/L), and modeling has shown that it will not flush naturally to the UMTRA standard within the 100 years permitted in 40 CFR 192; also, contaminated soils left in place through application of supplemental standards may further inhibit flushing. No standard exists for vanadium, but concentrations currently exceed a risk-based concentration for residential use of 0.33 mg/L (EPA 2002); concentrations are predicted to remain well above this concentration for hundreds of years (DOE 2002).

A uranium concentration of 3.0 mg/L is proposed as the ACL; this concentration represents an action level and is slightly higher than the maximum detected uranium values at the site during the last few rounds of sampling. Because no one is using the alluvial ground water in the site vicinity, this level will be protective of human health. The only complete exposure pathway is ground water discharge to the San Miguel River. Contaminants are diluted 4,000- to 5,000-fold even during low flows in the river (DOE 1995); therefore, concentrations at the point of exposure are protective of both human health and the environment. The points of compliance that need to meet the ACL are considered to be all wells in the monitoring network.

A vanadium concentration of 6 mg/L is proposed as the ACL that must be met at the points of compliance. This action level is slightly higher than maximum concentrations detected in recent monitoring rounds. As with uranium, because the alluvial ground water is not being used, this level is protective of human health. Also, because of dilution as ground water discharges to the San Miguel River, the ACL of 6 mg/L would be protective of human health and the environment at the point of exposure.

3.0 Factors Considered In Making Present And Potential Hazard Findings

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

3.1 Potential Adverse Effects on Ground Water Quality

3.1.1 Physical and chemical characteristics of constituents in the residual radioactive material at the site, including their potential for migration. No disposal cell is present at the site. Surface remediation was completed in 1997. At the request of private landowners and because of a concern for worker risk, several areas of contaminated soil were left in place under supplemental standards (see SOWP, Section 8.2.5 and Figure 8–1).

3.1.2 Hydrogeological characteristics of the site and surrounding land. The hydrogeology of the site was characterized for input to the flow and transport model (see SOWP, Section 5.2, "Hydrologic System"). Ground water surfaces at a seep on the private property north of the site and feeds several small ponds. Ground water also discharges directly to the San Miguel River.

3.1.3 Quantity of ground water and the direction of ground water flow. Ground water flow in the alluvial aquifer is generally to the northwest and north, parallel to the San Miguel River. Hydraulic conductivity ranges from 43 to 215 ft/day. The volume of uranium-contaminated ground water is estimated at approximately 27 million gallons.

3.1.4 Proximity and withdrawal rates of ground water users. Uranium and vanadium contamination is only in the alluvial aquifer, and there are no alluvial ground water users in the vicinity of the site. The residents of the downgradient private property haul drinking water for domestic use, though DOE has recently installed a deep bedrock well on their property for domestic water in exchange for an institutional control to prohibit alluvial ground water use.

3.1.5 Current and future uses of ground water in the region surrounding the site. The San Miguel River water is currently the source of water for the town of Naturita water supply system that services the town residents and businesses as well as most of the residents living within the area extending about 5 miles northwest of the town of Naturita (DOE 1995). The water intake from the San Miguel River is about 7 miles southeast and upstream from the town and 9 miles upstream from the Naturita site. Consequently the municipal water supply would not be affected by ground water contaminants at the Naturita site.

Naturita residents and businesses are directly connected with the municipal system. Some residents living outside the city limits haul water from lines located at the Town Hall building. Remaining residents of the area extending about 2 miles northeast of the town have domestic wells or pump the river water (DOE 1995).

3.1.6 **Existing quality of ground water, including other sources of contamination and their cumulative impact on ground water quality.** Background alluvial ground water quality is variable; levels of some constituents, such as manganese and sulfate, exceed state and federal secondary drinking water standards; aluminum concentrations also exceeds the range for the federal secondary drinking water standard. Ground water in the bedrock formation immediately underlying the site is generally poor, with naturally high levels of chloride, sodium, and sulfate.

3.1.7 **Potential for health risks caused by human exposure to ground water constituents.** The only potentially unacceptable risks to humans would occur through regular use of alluvial ground water as drinking water in a residential scenario, which currently does not exist. The only potential exposure would occur where ground water discharges to the seeps and the San Miguel River. The human health risk assessment showed that no unacceptable risks would occur through exposure to surface water (DOE 2002).

3.1.8 **Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents.** The ecological risk assessment indicated that for likely exposure scenarios, risks to wildlife and vegetation were low. The highest risks would be associated with exposure of aquatic organisms to vanadium in ground water; ground water use for this purpose (e.g., for stock ponds) is prohibited by an environmental covenant.

3.1.9 **Persistence and permanence of potential adverse effects.** Contaminant levels in ground water could remain elevated for hundreds of years, particularly vanadium levels. Contamination in soils left in place under supplemental standards will also persist. However, no adverse effects from existing contamination have been observed, and no adverse effects are expected as ground water contamination concentrations attenuate over time.

3.1.10 **Presence of underground sources of drinking water and exempted aquifers identified under §144.7 of this chapter [i.e., 40 CFR Part 144.7].** There are no sources of drinking water or exempted aquifers that can be affected by contamination at the site. The main source of domestic water is surface water, which is unaffected by site-related contamination.

3.2 Potential Adverse Effects on Hydraulically Connected Surface Water Quality

3.2.1 **Volume and physical and chemical characteristics of the residual radioactive material at the site.** No disposal cell is present at the site. However, approximately 75,000 cubic yards of contaminated soils were left in place under supplemental standards (see section 8.2.5 of the SOWP for further detail). These materials were left in place because they were deemed to have a low radiological hazard and would cause greater harm to workers and wetland areas if removed. Characterization data does not indicate that these materials are adversely affecting surface water quality.

3.2.2 **Hydrogeological characteristics of the site and surrounding land.** The hydrogeology of the site was characterized for input to the flow and transport model (see SOWP, Section 5.2, "Hydrologic System"). Ground water surfaces at a seep on the private

property north of the site and feeds several small elongate ponds. Ground water also discharges directly to the San Miguel River.

3.2.3 **The quantity and quality of ground water and the direction and rate of ground water flow.** Ground water flow in the alluvial aquifer is generally to the northwest and north, parallel to the San Miguel River. Hydraulic conductivity ranges from 43 to 215 ft/day. Background concentrations of some constituents, such as manganese and sulfate, exceed applicable standards.

3.2.4 **The patterns of rainfall in the region.** Annual precipitation averages about 13 inches. Rainfall occurs during the summer and fall in high-intensity, short-duration, late afternoon thunderstorms that are conducive to runoff. Winter precipitation occurs as snowfall. Precipitation events have no measurable effect on quality of water in the San Miguel River as a result of site contamination.

3.2.5 **Proximity of the site to surface waters.** The San Miguel River forms the eastern boundary of the site. Ground water feeds seeps that form small elongate ponds on the adjacent private property to the north.

3.2.6 **Current and future uses of surface waters in the region surrounding the site and any water-quality standards established for those surface waters.** The San Miguel River is the primary source of drinking water for the Naturita area. The water intake from the San Miguel River is about 7 miles southeast and upstream from the town and 9 miles upstream from the Naturita site. Consequently, water is not affected by contaminants at the Naturita site. Surface water standards for the river are established by the Colorado Department of Public Health and Environment (CDPHE 2002). Surface water in the river meets these standards in the vicinity of the site. Concentrations of some constituents in water ponded from ground water seeps on the private property north of the site are elevated above standards but present no risk to human health or the environment and have no adverse effect on the San Miguel River.

3.2.7 **Existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality.** Water in the San Miguel River in the vicinity of the site is designated high quality by the State of Colorado. The site has no measurable effect on surface water quality. The discussion in SOWP Section 5.3.2.2, "Site Impacts on Surface Water," provides further detail.

3.2.8 **Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents.** There is no potential damage as site contamination has no impact on water quality of the San Miguel River. The ecological risk assessment showed that the elevated concentrations in ponded water from ground water seeps would have no adverse effect on potential receptors, including wildlife and vegetation (SOWP, Section 6.2).

3.2.9 **Persistence and permanence of potential adverse effects.** No adverse affects are currently present in the San Miguel River or in the ground water seeps, and none are expected in the future.

4.0 Roadmap to the Naturita SOWP

4.1 General Information

Introduction—Section 1.0 of SOWP

Facility Description—Section 3.2 of SOWP

Extent of Ground Water Contamination—Section 5.3.3 of SOWP

Current Ground Water Protection Standards—Table 6–1 of SOWP

Proposed Alternate Concentration Limits—Section 3.3 of GCAP

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

Source and Contamination Characterization—Sections 3.2 and 5.3.1 and Table 6–1 of SOWP

Transport Assessment—Section 5.3.5 and Appendix F of SOWP

Exposure Assessment—Sections 6.1.3 and 6.1.4 of the SOWP for human health; Section 6.2.4 for ecological risk

Corrective Action Assessment—Corresponds to Section 8 of the SOWP

Results of Corrective Action Program

Surface remediation at the Naturita site commenced in 1993 and was completed in 1998. Tailings and other contaminated surface material totaling approximately 771,400 yd^3 were placed in the Upper Burbank disposal cell located about 15 miles to the northwest near the townsite of Uravan, Colorado. Supplemental standards were applied to some areas due to concerns of worker risk and environmental damage.

Three parties own property affected by site contamination. An environmental covenant has been placed on the privately owned vicinity property downgradient and adjacent to the site that prohibits use of ground water for any purpose without permission of both DOE and CDPHE. This restriction is essentially perpetual, though it can be lifted once concentrations have decreased to levels that permit unrestricted use. The State of Colorado is currently in negotiation with owners of the millsite property to place the property under control of the local government and establish an environmental covenant to prohibit improper uses of ground water.

Feasibility of Alternative Corrective Actions

DOE has performed remedial action at the Naturita site to mitigate exposures to contaminated soil. The cleanup effectively removed most of the contamination, though some contaminated materials were left in place. Because of worker risk and environmental damage, it is not feasible to remove these materials. Their continued presence may inhibit attenuation of contaminant concentrations in ground water through natural processes. The corrective action assessment in the SOWP indicated that active remediation of alluvial ground water would be complicated and expensive and would provide little benefit. Therefore, ACLs are proposed for constituents with concentrations that are predicted to remain elevated for more than 100 years.

Corrective Action Costs

Cleanup costs estimated for the Naturita site ranged from $11.3 million to $13.7 million, including both soil and ground water remediation (SOWP Section 8.2 and Table 8–9).

Corrective Action Benefits

Corrective action costs and benefits are discussed in Sections 8.3 and 8.4 of the SOWP. Generally, active remediation of the alluvial aquifer would be complicated and expensive because of the thinness of the aquifer. The limited extent of the aquifer makes it a limited resource as well. No one is currently using the aquifer and there are no plans to use it in the future. Therefore, remediation of the alluvial aquifer to reduce concentrations of uranium and vanadium provides no real benefit.

ALARA Demonstration

The As Low As Reasonably Achievable (ALARA) concept does not directly apply to the ACLs proposed for uranium and vanadium because the intent of ALARA is to limit exposure to radioactivity. However, the general goal of achieving a cleanup goal that is as low as can reasonably be met is satisfied by applying ACLs for uranium and vanadium at the site. It would not be reasonable to pursue active remediation for the small amount of potential risk reduction that could be realized, particularly considering the availability of alternative water sources, the environmental covenants prohibiting ground water use, and the questionable quality of background ground water.

Proposed Alternate Concentration Limits

Proposed Alternate Concentration Limits—Section 3.3 of GCAP
Proposed Implementation Measures—Section 7.2 of SOWP; Sections 3.6 and 3.7 of the GCAP

References—Section 9 of SOWP

Appendices and Supporting Information—Appendices A through G of SOWP

5.0 References

10 CFR Part 40. U.S. Nuclear Regulatory Commission, "Domestic Licensing of Source Material," *Code of Federal Regulations*, January 1, 2001.

40 CFR Part 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*, July 1, 2001.

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U. S. Department of Energy, 1995. *Supplement to the Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Naturita, Colorado,* DOE/AL/62350-195S, prepared by the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

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U.S. Nuclear Regulatory Commission, 1996. *Alternate Concentration Limits for Title II Uranium Mills*, Staff Technical Position, January.

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