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Environmental Assessment of Ground Water Compliance at the Grand Junction UMTRA Project Site (Climax Uranium Millsite)

Final

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

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Acronyms and Abbreviations

CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
COPC	chemical of potential concern
DOE	U.S. Department of Energy
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
GJO	Grand Junction Office
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
PEIS	Programmatic Environmental Impact Statement (for the UMTRA Ground Water Project)
UMTRA	Uranium Mill Tailings Remedial Action (Project)
UMTRCA	Uranium Mill Tailings Radiation Control Act
U.S.C.	United States Code

Executive Summary

This document is the Environmental Assessment (EA) for the proposed action to address ground water contamination at the Uranium Mill Tailings Remedial Action (UMTRA) Project site in Grand Junction, Colorado. This site is also known as the former Climax uranium millsite. The purpose of this EA is to present the proposed action and alternatives and discuss their environmental effects. The EA presents a strategy for achieving compliance with requirements established in the Uranium Mill Tailings Radiation Control Act (42 *United States Code* 7901 *et seq*.) and the U.S. Environmental Protection Agency's (EPA's) "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings" (Title 40, *Code of Federal Regulations*, Part 192).

The compliance strategy proposed for the Grand Junction site is no remediation and the application of supplemental standards based on the criterion of limited use ground water. Supplemental standards are an alternative to concentration limits set forth in the regulations and can be applied in circumstances where cleanup to those limits is infeasible, not cost effective, or may result in adverse environmental impacts. Ground water in the alluvial aquifer is not a current or potential source of drinking water because the quality of the water is poor due to the presence of naturally occurring uranium and selenium. Average uranium and selenium concentrations in background ground water of the alluvial aquifer exceed EPA maximum concentration limits. Existing institutional controls imposed by the U.S. Department of Energy (DOE), the Colorado Department of Public Health and Environment, and the City of Grand Junction prevent use of the alluvial aquifer for drinking water on site and downgradient of the site. The proposed compliance strategy includes monitoring the enforcement of institutional controls and conducting a limited ground water and surface water monitoring program.

The Grand Junction millsite, also known as the Climax uranium mill, began as a sugar beet mill and was operated as a uranium/vanadium mill from 1950 to 1970, processing more than 2 million tons of ore. The Climax Corporation demolished most of the mill buildings and seeded the tailings piles before leaving the site in 1976. From the late 1980s to 1994 the site was an interim repository for mill tailings removed from Grand Junction vicinity properties as part of the UMTRA Surface Project. By the end of 1994 all tailings and remaining buildings, except the old sugar beet warehouse, were demolished and hauled to the Grand Junction Disposal Site, also known as the Cheney Disposal Cell, about 18 miles southeast of Grand Junction.

The original Site Observational Work Plan (DOE 1996a) indicated that no remediation of the alluvial aquifer combined with the application of supplemental ground water standards might be justified on the basis of naturally high concentrations of total dissolved solids, molybdenum, selenium, and uranium in background alluvial ground water. The Baseline Risk Assessment (DOE 1995) concluded that ground water quality in the alluvial aquifer in the area is naturally poor, the aquifer is not being used as a source of drinking water, and that institutional controls were in place in the vicinity of the site to prevent future use of the aquifer as a source of drinking water.

The evaluations of human health and ecological risks were updated using data collected in 1998. For human health risk, only the drinking water ingestion pathway was evaluated; the initial Baseline Risk Assessment indicated that risks from all other pathways were negligible. Results

from the Baseline Risk Assessment update indicated that regular human consumption of plume and background ground water could produce adverse health effects, though risks associated with ingestion of plume ground water were considerably higher. However, because alluvial ground water in the area of the Grand Junction site is not used for drinking, and because city zoning and development code prohibits its use as drinking water, this exposure pathway is incomplete. It was concluded that site water does not present a risk to human health in the present or the foreseeable future.

An ecological risk assessment compared surface water, sediment, and plant tissues from the millsite area with similar samples collected from a reference area about three miles upstream along the Colorado River. That evaluation did not find a statistically significant difference in contaminant concentrations in abiotic and biotic samples between the two areas, although slightly elevated concentrations of some contaminants (ammonia and some metals) were detected sporadically in samples from the millsite.

The EA discusses the potential environmental effects of the proposed action, application of supplemental standards and continued monitoring, and the no action alternative. The effects of the proposed action and no action alternatives are generally similar, but the no action alternative would not provide for monitoring of institutional controls and contaminant levels in ground water and surface water at the site.

1.0 Introduction

The U.S. Department of Energy (DOE) is in the process of selecting a ground water compliance strategy for the Grand Junction, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. This environmental assessment (EA) discusses two alternatives and the effects associated with each. These two alternatives are the proposed action alternative and the no action alternative. The compliance strategy must meet U.S. Environmental Protection Agency (EPA) ground water standards defined in Subpart B of 40 CFR 192 in areas where ground water beneath the site is contaminated as a result of past milling operations. Contamination in the ground water consists of soluble residual radioactive material as defined in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) (42 U.S.C. 7901 *et seq*.).

1.1 Grand Junction UMTRA Project Site Location and Description

The city of Grand Junction is at an elevation of about 4,600 feet in the broad, arid Grand Valley in west central Colorado. The Grand Junction UMTRA Project site is located on city-owned land along the north side of the Colorado River, in Mesa County (Figure 1). The Grand Junction millsite, also known as the Climax uranium millsite, began as a sugar beet mill (Figure 2) and was subsequently operated as a uranium/vanadium mill from 1950 to 1970 (Figures 3 through 6). During this time the mill processed more than 2 million tons of ore, which produced about 12 million pounds of uranium oxide (U_3O_8) and 46 million pounds of vanadium oxide (V_2O_5). Ores were crushed and ground, salt roasted, and water leached to remove vanadium and sulfuric acid leached to remove uranium. A solvent extraction process separated uranium from vanadium. The solvent extraction raffinate solution and other intermediate products were treated with acid again to remove additional uranium and vanadium. The Climax Corporation demolished most of the mill buildings and seeded the tailings piles before leaving the site in 1976 (Figure 7). From the late 1980s to 1994 the site was an interim repository for mill tailings removed from Grand Junction vicinity properties (Figures 8 through 10). By the end of 1994, all tailings and the remaining buildings, except the old sugar beet warehouse, were demolished and hauled to the Grand Junction Disposal Site, also known as the Cheney Disposal Cell, located 18 miles southeast of Grand Junction on U.S. Highway 50. Supplemental standards were applied to the fixed contamination in the old sugar beet warehouse and the building is currently in private ownership.

The Grand Junction UMTRA Project site encompasses about 114 acres along the southern side of Grand Junction in an industrial area (Plate 1) and is bounded on the south by the west-flowing Colorado River, which joins the Gunnison River about 0.75 mile to the west. The Grand Valley is bounded by the Book Cliffs to the northeast, about 9 miles from the site; the Grand Mesa to the east, about 16 miles from the site; and the Uncompahgre Plateau to the west, about 5 miles from the site.

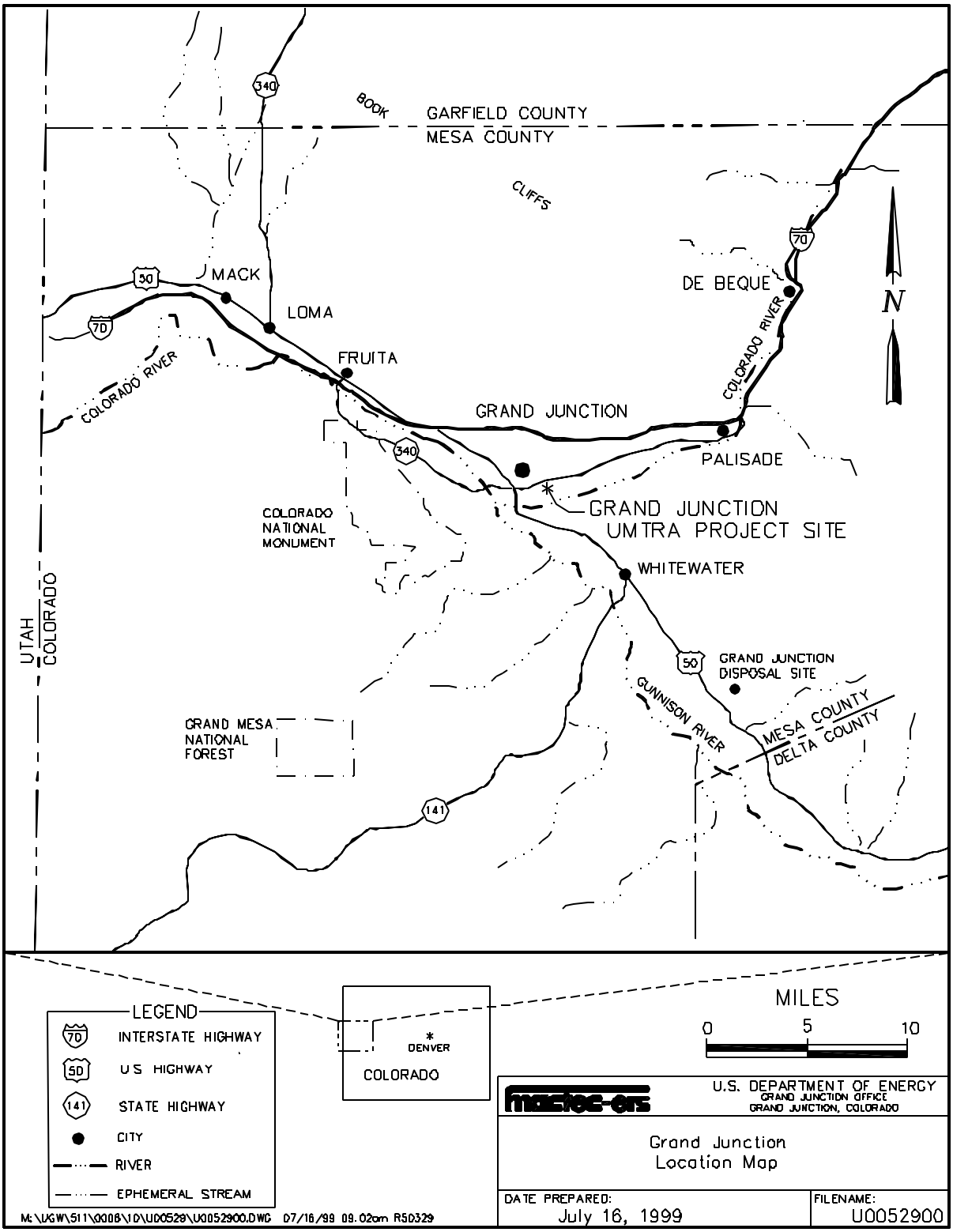

Figure 1. Location of the Grand Junction UMTRA Project Site

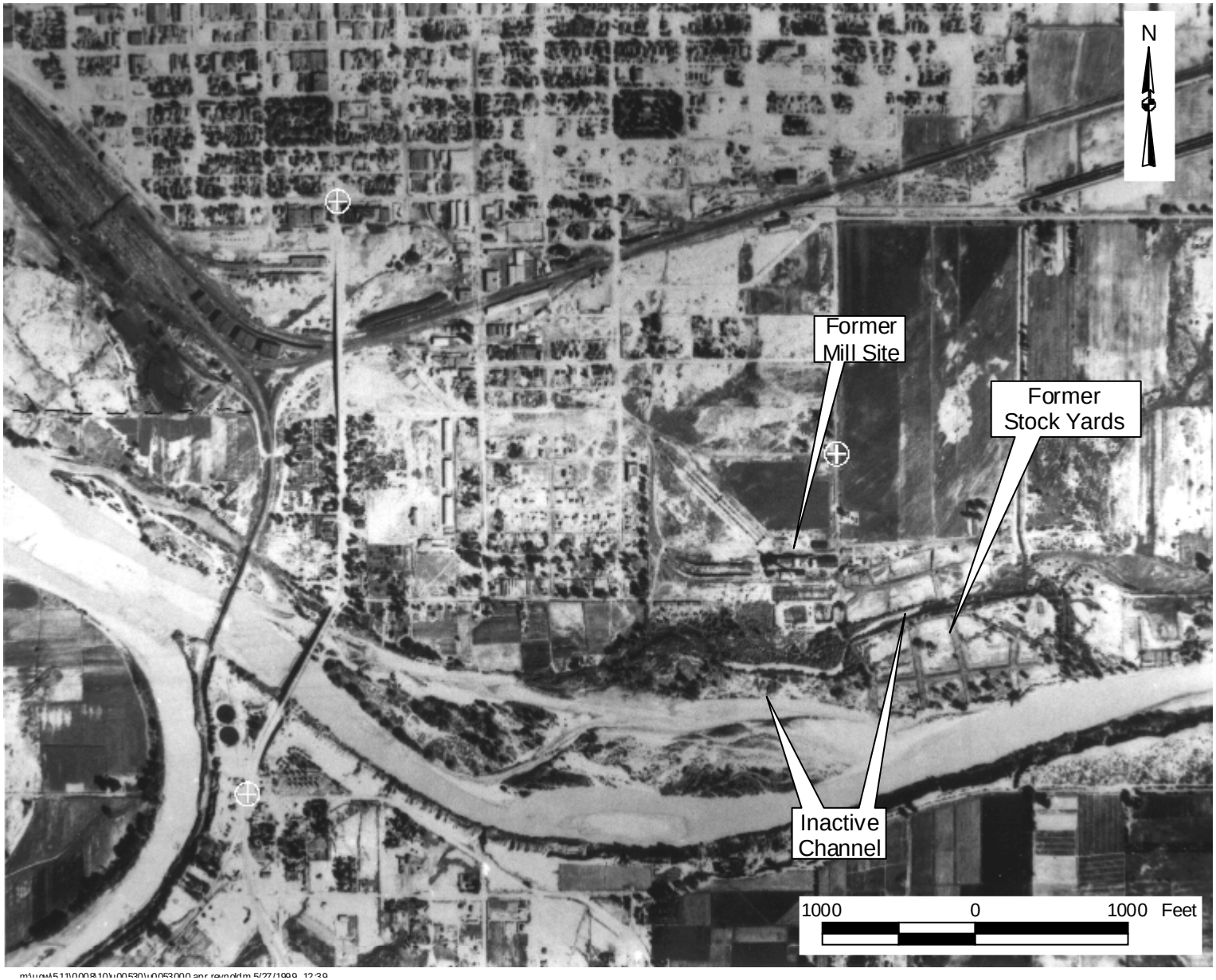

Figure 2. Pre-1947 Overhead Aerial Photograph

Sugar beet mill buildings and four ponds are visible. The semirectangular areas southeast of the mill near the Colorado River are interpreted to be remnants of stockyards. An old channel of the Colorado River crosses the southern part of the property.

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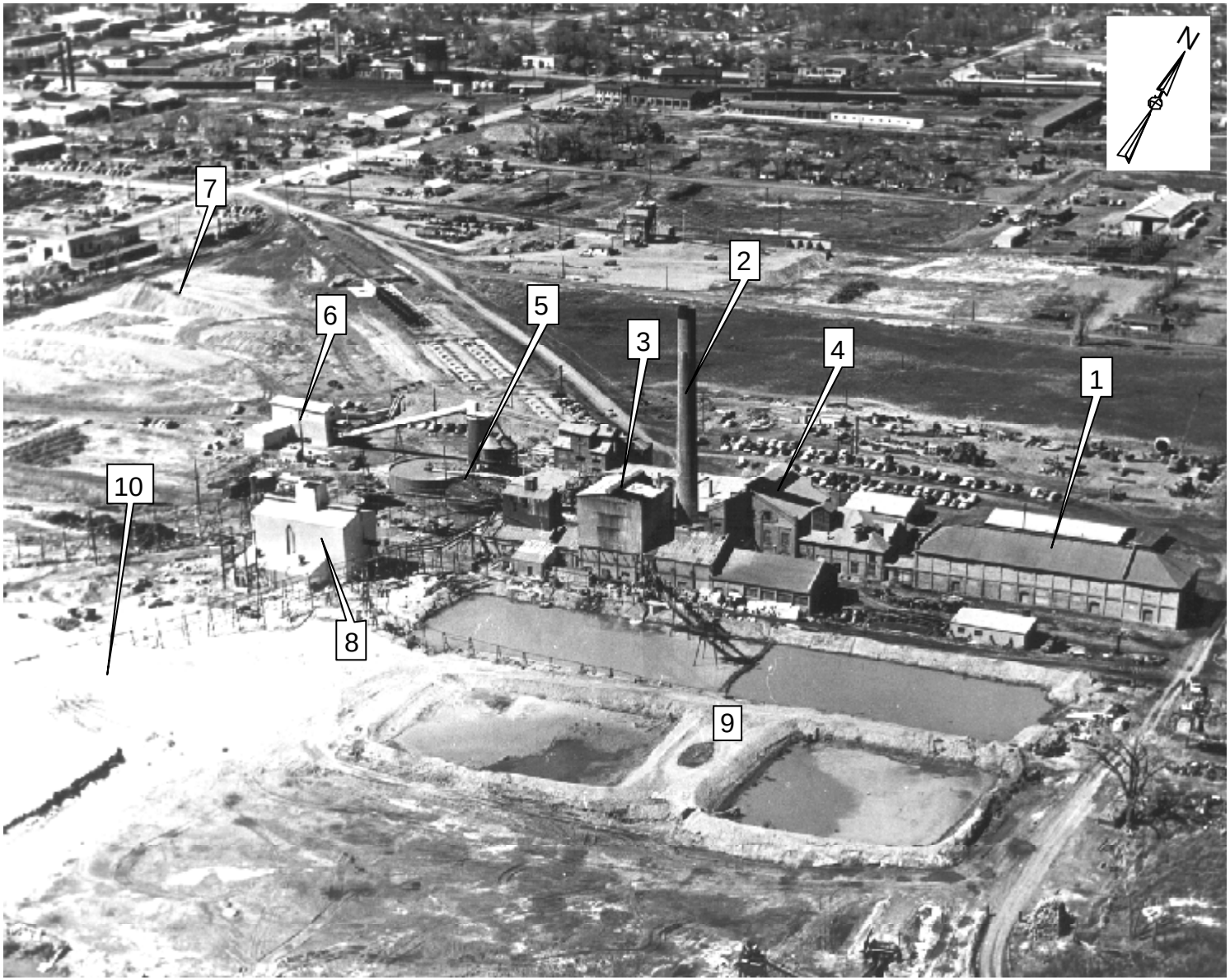

Figure 3. 1956 Oblique Aerial Photograph of the Climax Mill

The large building on the right (1), which was the warehouse for the sugar beet mill, is being used in the uranium milling process. The dryer stack (2) is located between the roaster building (3) and the main mill buildings (4), and farther to the left are two thickener tanks (5). Left of the tanks are the ore crusher house (6) and ore piles (7) (mostly hauled in by rail). The tall, light-colored building in the left foreground is the vanadium plant (8). Four slimes ponds (9) are visible in the foreground and light-colored tailings (10) are visible in the left foreground. Foreground scale: The sugar beet warehouse (1) is about 300 ft (90 m) long.

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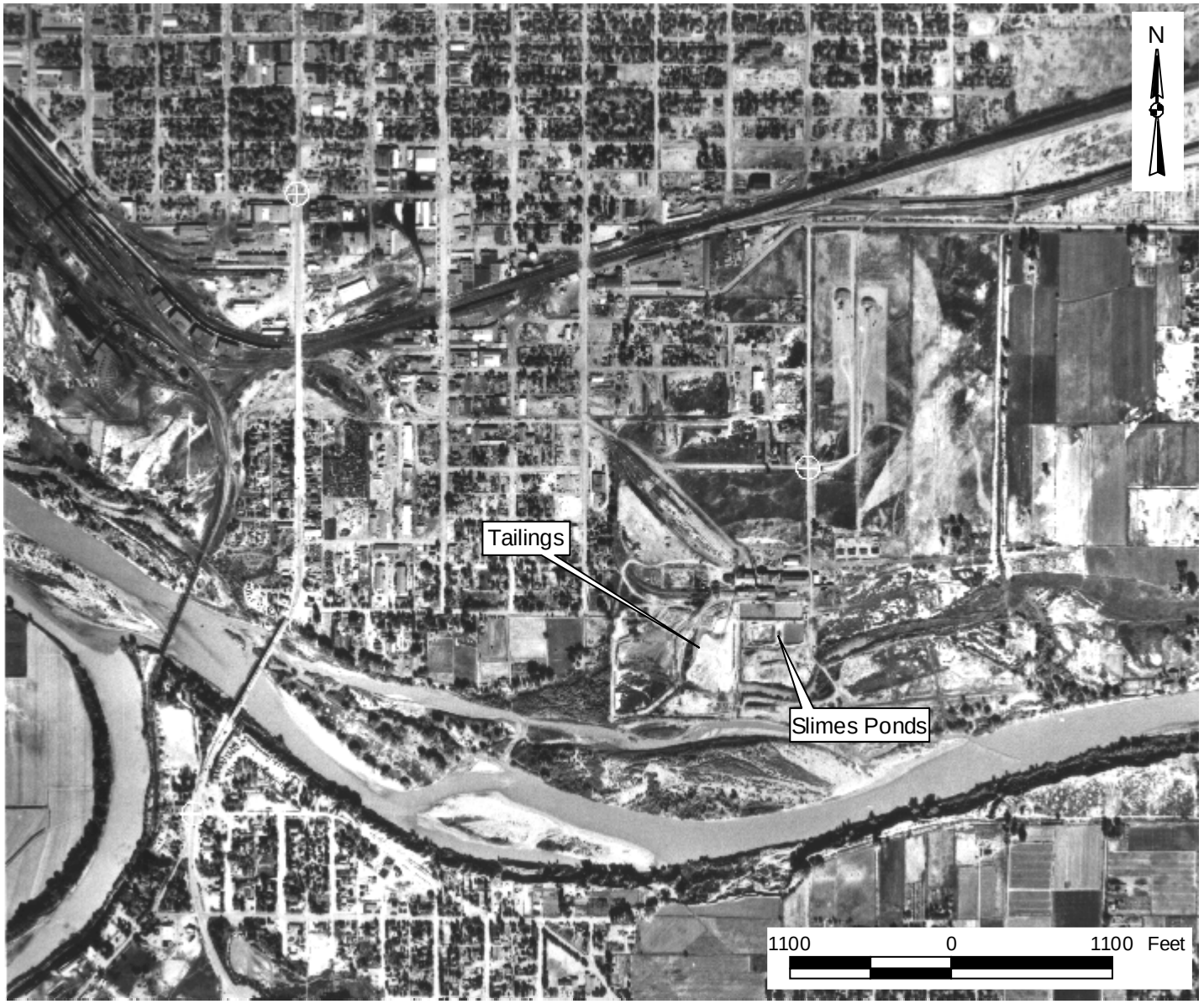

Figure 4. 1954 Overhead Aerial Photograph

The mill has been in operation about 4 years, and the ponds south of the mill are being used for slimes ponds (sometimes called raffinate ponds). Tailings are being deposited southwest of the ponds.

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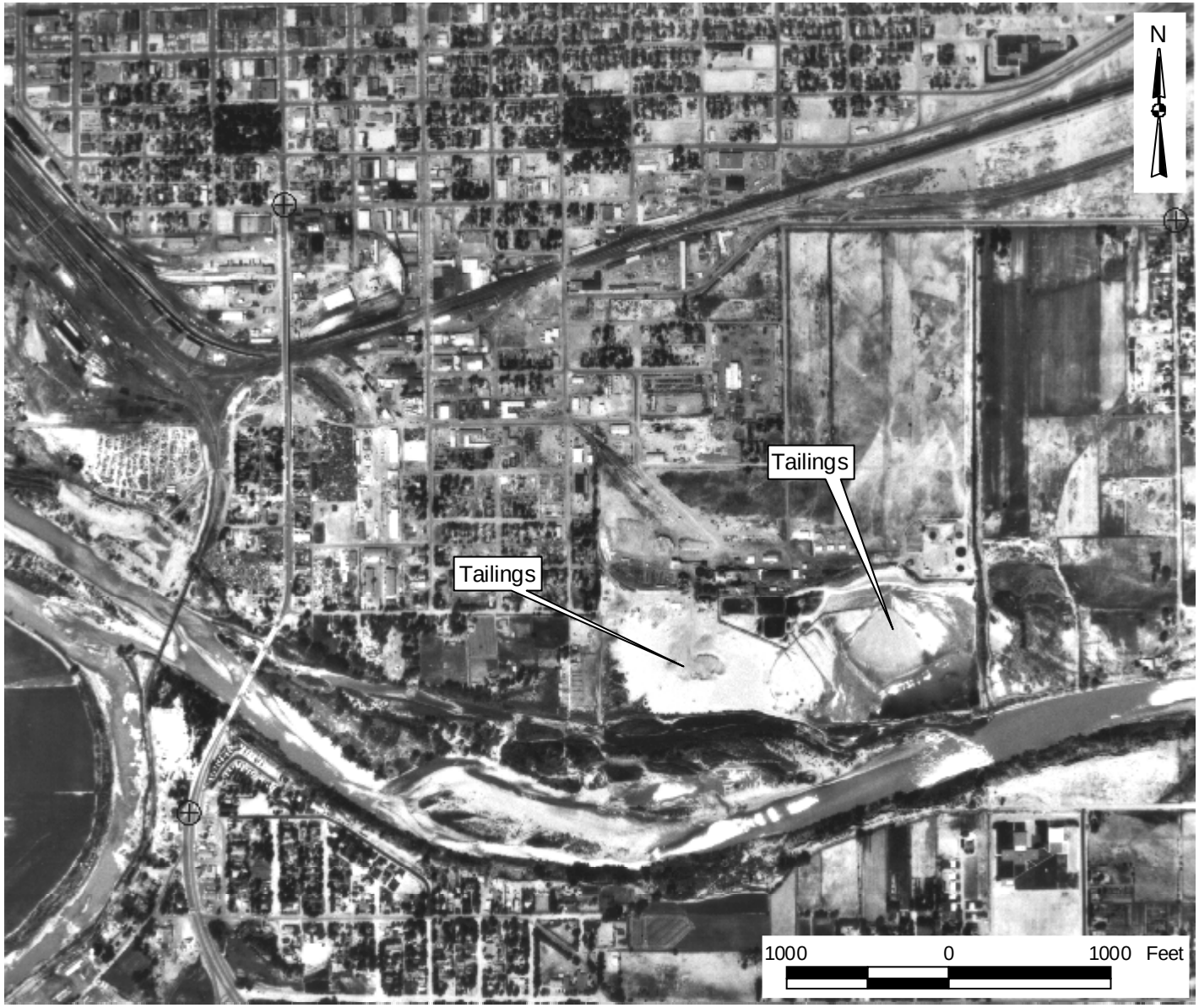

Figure 5. 1961 Overhead Aerial Photograph

Considerably more tailings have been deposited since 1954 and are spread over most of the millsite area.

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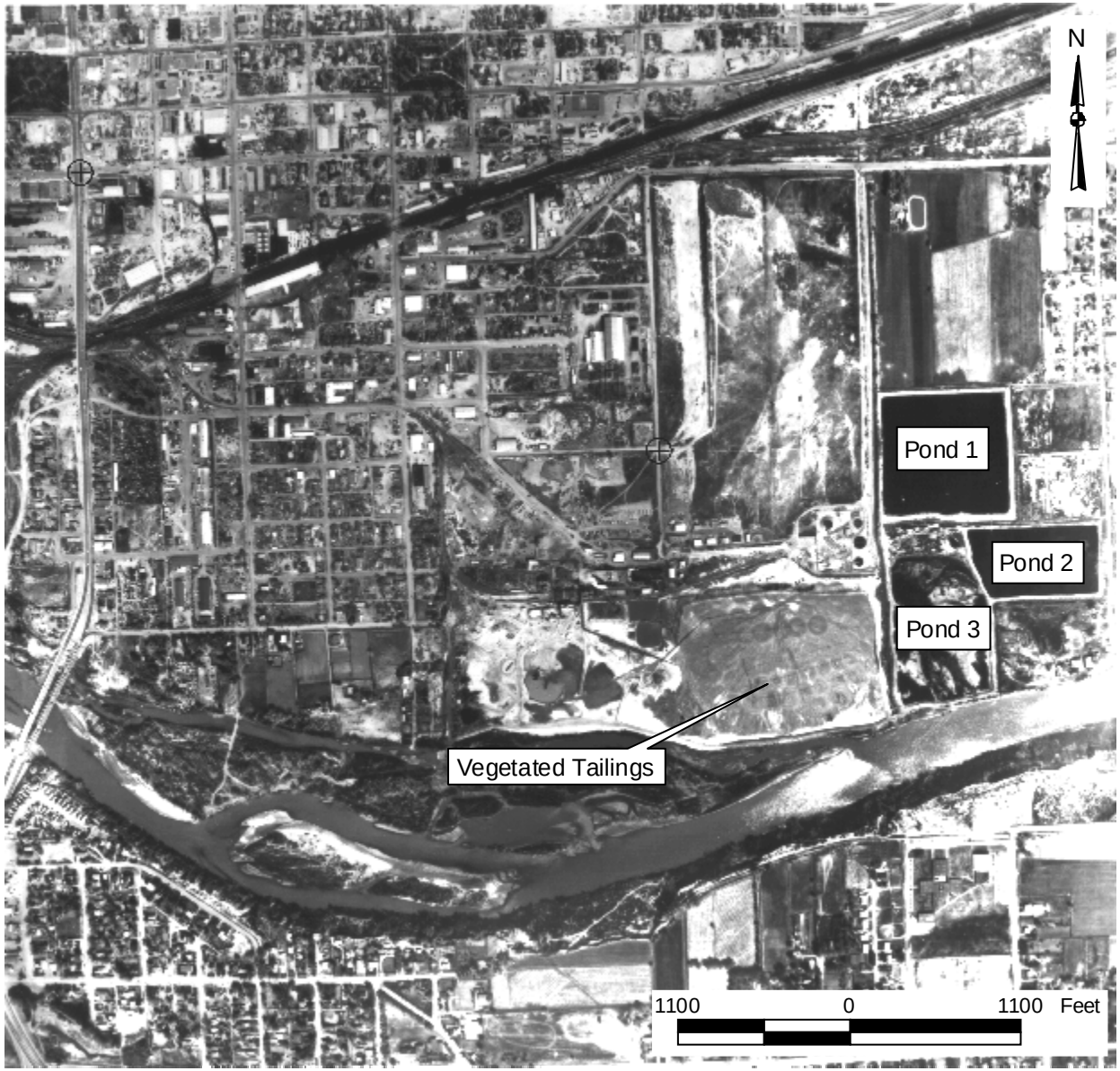

Figure 6. 1966 Overhead Aerial Photograph

Large evaporation ponds are visible to the east of the mill. Circular areas are from American Metals Climax, Inc., irrigation and reseeding attempts on the tailings piles. Smoke can be seen emanating from the stack.

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Figure 7. 1977 Overhead Aerial Photograph

The mill closed in 1971, and by 1977 American Metals Climax, Inc., had razed most of the buildings and attempted to vegetate the tailings piles.

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Figure 8. October 1991 Overhead Aerial Photograph

Looking west at the millsite. This figure shows the removal of tailings and other materials. The wastewater retention basin is visible at the top of the photo, and the rail out-load facility is shown on the right. Only the original sugar beet mill warehouse remains.

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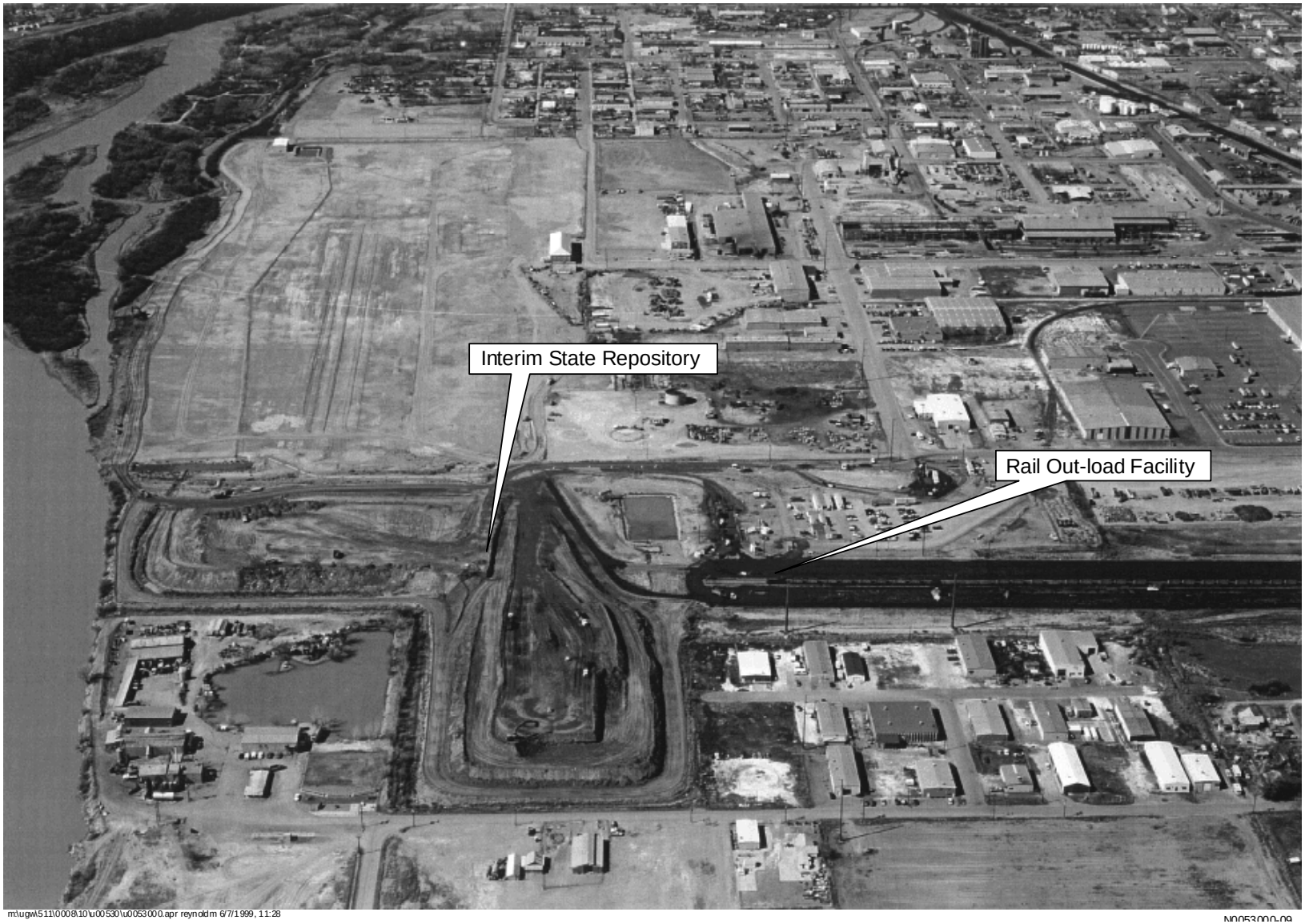

Figure 9. March 1993 Oblique Aerial Photograph

Looking west. This figure depicts the continued removal of vicinity property tailings from the state's interim repository pile in the foreground. The rail out-load facility is seen on the right.

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Figure 10. May 1994 Oblique Aerial Photograph

Looking west. All facilities for remedial action are removed; the site is contoured, revegetated, and a series of eight ponds are constructed along the Colorado River. In 1995, spring flood water from the Colorado River filled in or eroded the pond system, and little evidence of its existence is visible today.

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1.2 Background

UMTRCA authorized DOE to perform remedial action at 24 inactive uranium-ore processing sites, including the Grand Junction UMTRA Project site. DOE and the State of Colorado (the State) entered into a cooperative agreement (DOE 1981) that established terms and conditions for remedial action, cost sharing for remedial action, and land acquisition.

Environmental effects of surface remediation were evaluated in the *Final Environmental Impact Statement for Remedial Actions at the Climax Uranium Millsite, Grand Junction, Colorado* (DOE 1986). In 1991, surface remediation of contaminated material (the UMTRA Surface Project) began at the Grand Junction UMTRA Project site. Contaminated material from the site was placed in the Grand Junction Disposal Site.

Because final EPA ground water standards were not yet established, remedial action was designed to comply with EPA's proposed ground water standards that were published in 1987. DOE considered ground water characterization to be inadequate to fully assess compliance with existing standards and deferred formulating a compliance strategy for ground water cleanup until the Grand Junction UMTRA Project site was characterized through the UMTRA Ground Water Project. Until that time, DOE considered that the site did not pose a risk to human health because (1) no domestic alluvial wells existed within the affected environment of the processing site, (2) no alluvial wells were anticipated to be drilled in the alluvial aquifer in the near future, and (3) during the period between surface remedial action and ground water restoration, institutional controls would be in place to prevent use of alluvial ground water in the vicinity of the processing site. Also, no concentrations of hazardous constituents exceeded the proposed concentration limits in the Colorado River adjacent to and downstream of the site (DOE 1991).

DOE's UMTRA Ground Water Project was established in 1991 to further evaluate all UMTRA Project sites for compliance with the final ground water standards. The purpose of the UMTRA Ground Water Project is to protect human health and the environment and to meet EPA's final ground water standards in areas where surface contamination has been cleaned up, but ground water is contaminated as a result of historical processing of uranium ore. In 1995 EPA published the final ground water standards for the UMTRA Project (40 CFR 192).

The *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE 1996b) was prepared by DOE for the UMTRA Ground Water Project. A Record of Decision was issued in April 1997 in which DOE selected the proposed action alternative for conducting the UMTRA Ground Water Project. Under the proposed action alternative, DOE has the option of implementing active remediation, natural flushing, no ground water remediation, or any combination of the three strategies.

These options, identified as "strategies" in the PEIS, provide the alternatives for this site-specific EA. The issues discussed and the environmental impacts analyzed in this EA are tiered to the PEIS. Section 1.3.1 of the PEIS discusses "tiering" and the actions that are required in each site-specific National Environmental Policy Act (NEPA) document. DOE used a consistent framework established in the proposed action alternative of the PEIS to select the best strategy for the Grand Junction UMTRA Project site that would comply with EPA ground water

standards and ensure protection of public health and the environment (Figure 11). The step-by-step decision process from the PEIS led DOE to the no ground water remediation strategy (box 7, Figure 11). No ground water remediation means that the site would qualify for the application of supplemental standards or alternate concentration limits, or that contaminant concentrations at the site are at or below EPA ground water standards or background levels.

The selection of this proposed strategy is further supported by the Environmental Impact Statement for the Grand Junction UMTRA Project site (DOE 1986), the Baseline Risk Assessment for the Grand Junction UMTRA Project site (DOE 1995), and the Final Site Observational Work Plan for the Grand Junction UMTRA Project site (DOE 1999a).

Specifically, the DOE proposed action is no remediation and application of supplemental standards based on the criteria for limited use ground water (40 CFR 192.21[g]). For ground water to be classified as limited use, at least one of the following criteria must be met:

- Total dissolved solids concentration is at least 10,000 milligrams per liter.
- Widespread ambient contamination not due to ore-processing activities exists that cannot be cleaned up using treatment methods reasonably employed in public water supply systems.
- The quantity of water reasonably available for sustained continuous use is less than 150 gallons per day.

The second criterion applies to ground water at the Grand Junction UMTRA Project site because naturally occurring levels of selenium and uranium in upgradient and regional alluvial ground water exceed EPA ground water standards or national primary drinking water standards. Ground water in the uppermost aquifer (the alluvial aquifer) is not a current or potential source of drinking water.

2.0 Need for DOE Compliance Action

DOE is required by UMTRCA to comply with EPA standards for the ground water beneath and near the Grand Junction UMTRA Project site that is contaminated as a result of historical processing of uranium ore. Ground water compliance strategies applicable to the Grand Junction UMTRA Project site are designed to achieve conditions that are protective of human health and the environment and that meet EPA's ground water standards in 40 CFR 192.

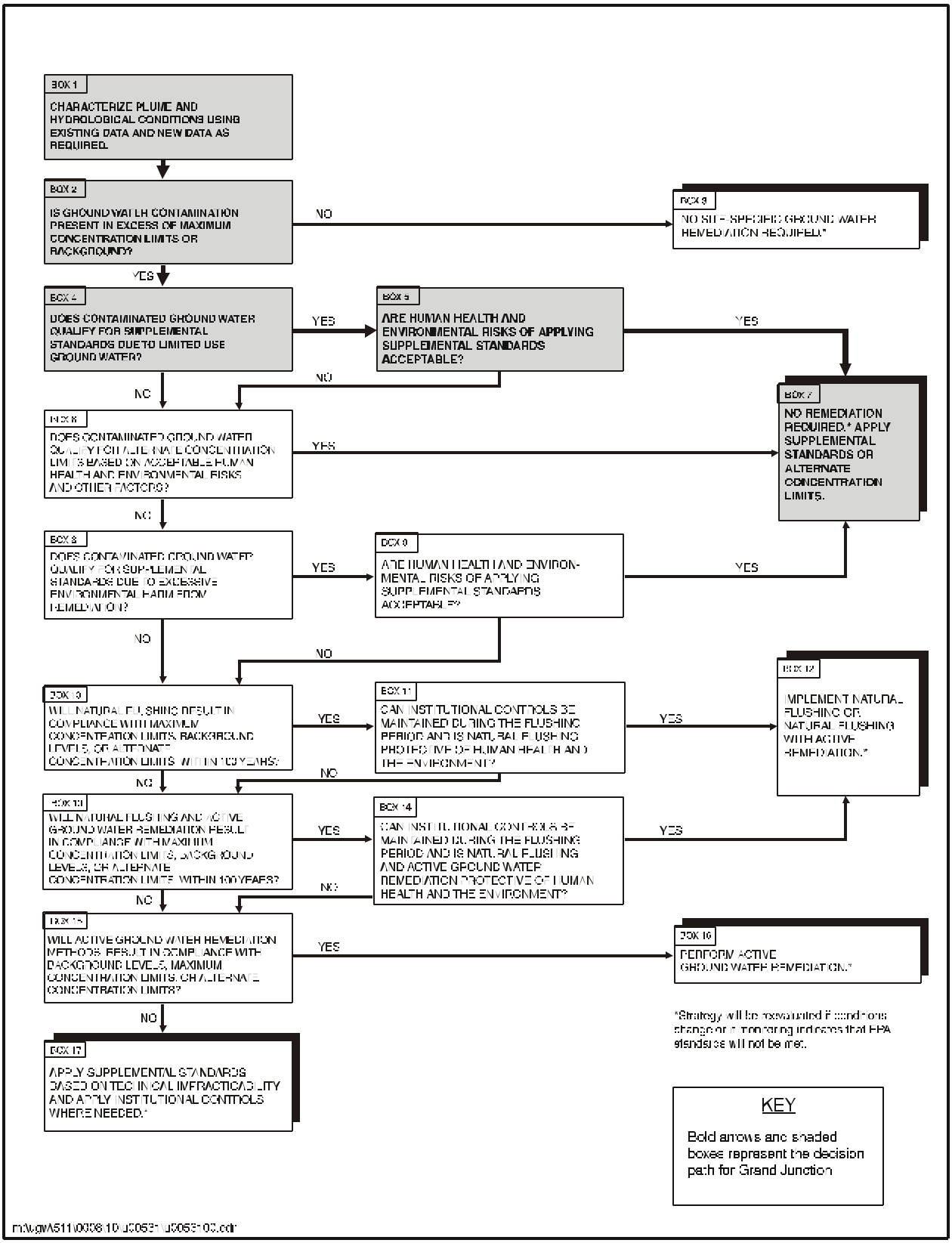

Figure 11. Compliance Selection Framework for the Grand Junction UMTRA Project Site

3.0 Proposed Action and No Action Alternatives

3.1 Proposed Action Alternative

On the basis of the decision process (Figure 11), DOE is proposing to adopt the no ground water remediation strategy as its compliance strategy for the Grand Junction UMTRA Project site and would apply supplemental standards (DOE 1999a). Because of its status as limited use, ground water beneath and near the site meets the criteria for applying EPA supplemental standards described in 40 CFR 192.21(g). The application of supplemental standards means that no remediation would be implemented, and contaminated ground water would be left in place.

Preliminary data indicate that natural processes will attenuate site-related contaminant concentrations to near-background levels in less than 100 years, but background ground water will remain unacceptable for human consumption because of its naturally poor quality.

Institutional controls are in place to prevent alluvial ground water from being used as drinking water. The site and land downgradient of the site are within the city limits. The City of Grand Junction zoning and development codes prohibit the use of ground water as drinking water. Landowners are required to tap into city water lines to obtain drinking water. Wells are permitted for other purposes (e.g., irrigation, livestock). Although ground water upgradient and downgradient of the site is acceptable for uses other than drinking water, water at the site itself is of lower quality. Therefore, a deed restriction prohibiting the installation of any wells without the permission of both CDPHE and DOE is in place for the Grand Junction UMTRA Project site.

A limited ground water and surface water monitoring program is proposed to determine when concentrations of site-related constituents have decreased to levels that certain uses of site ground water (e.g., irrigation) may be permitted. Details of the proposed monitoring are provided in the Ground Water Compliance Action Plan (DOE 1999c). The proposed monitoring locations are shown on Plate 1 and consist of on-site monitor wells 1001 and 1014, off-site downgradient well 590, off-site upgradient well 745, and surface water location 427 on the Colorado River downstream from the site.

The proposed action would include annual verification for the next 5 years that institutional controls are being effectively maintained, that alluvial ground water is not used as a drinking water source, and that alluvial ground water from the site is not used for any purpose. This verification would consist of consultation and documentation of discussions with the Grand Junction City Engineering Department, the State Engineer's Office, and the local office of the Colorado State Water Quality Division. If no changes are found or if no issues arise that might compromise established institutional controls, contacts would subsequently be made every 5 years for the next 20 years. The need for continued verification would be reassessed at that time.

3.2 No Action Alternative

The *Code of Federal Regulations*, Title 10, Part 1021, "National Environmental Policy Act Implementing Procedures," paragraph 321, "Requirements for Environmental Assessments" directs that DOE consider the no action alternative for comparison with the proposed action. Under the no action alternative, no further activities would be carried out at the Grand Junction UMTRA Project site to comply with EPA ground water standards (DOE 1996b and Record of Decision). Contaminated ground water would be left in place. DOE would cease collecting data to characterize ground water, and contaminated ground water would not be monitored. Any future use of alluvial ground water for human consumption would remain undetected because institutional controls would not be monitored. DOE would not perform any additional administrative or remedial activities.

4.0 Affected Environment and Environmental Consequences

This section describes the environmental effects that may result from each alternative. Detailed information on the Grand Junction UMTRA Project site is provided in several documents, including the Baseline Risk Assessment (DOE 1995) and the Site Observational Work Plan (DOE 1999a), which are available at the Mesa County Public Library, the DOE Grand Junction Office (DOE-GJO) Reading Room, and from the DOE Public Affairs Office in Grand Junction, telephone (800)399-5618.

The potential environmental issues considered in this EA are ground water, surface water, water and land use, human health, ecological resources, and environmental justice. Threatened and endangered species, air quality, visual resources, transportation, cultural resources, and socioeconomics would not be affected by the proposed action and no action alternatives and are not discussed further. Although floodplains and wetlands are present at the site, the proposed action and no action alternatives would not affect them. The sugar beet warehouse is in private ownership. Because the proposed action and no action alternatives would not affect the building, effects on historical resources are not discussed further.

4.1 Ground Water

4.1.1 Affected Environment

Ground water conditions at the Grand Junction UMTRA Project site are described in the Baseline Risk Assessment (DOE 1995) and the Final Site Observational Work Plan (DOE 1999a). Assessment of the nature and extent of the contaminants, contaminant release mechanisms, potential risks to human health and the environment, and the interaction of site-related contaminants with the local environment are based on descriptions in those documents.

A detailed discussion of the hydrogeology surrounding the Grand Junction UMTRA Project site is provided in Section 4.0 of the Final Site Observational Work Plan (DOE 1999a). The alluvial aquifer is the uppermost water-bearing zone beneath the site and surrounding areas. This

uppermost aquifer consists of unconsolidated alluvial sediments that overlie the Mancos Shale and Dakota Sandstone. Shales of both the Mancos Shale and Dakota Sandstone are described as aquitards that prevent downward ground water movement from the alluvial aquifer. Hydraulic conductivity in the alluvial aquifer was predicted in earlier studies to be about 70 feet per day. The latest study found more heterogeneity in flow rates beneath the site; estimated flow rates ranged from several feet per day to more than 200 feet per day. The alluvial aquifer consists of fill covering sandy to silty sediments and a lower cobbly zone that overlies bedrock of Dakota Sandstone shales. The description of the alluvial aquifer is similar to descriptions in previous studies, but the bedrock is redefined as dark gray shales of the Dakota Sandstone instead of dark shales of the Mancos Shale. This change in bedrock identification does not change the description of the hydraulic properties of the material. Only ground water in the alluvial aquifer has contamination from the millsite; ground water in the underlying Mancos Shale and Dakota Sandstone does not have mill-related contaminants and is not considered susceptible to downward migration of contaminants.

Shales of the Dakota Sandstone underlie the site. These shales are very similar to the Mancos Shale and have low hydraulic conductivities (about 10^{-7} centimeters per second) (DOE 1996a). This formation acts as an effective aquitard that prevents downward migration of contaminants because both formations show slight upward hydraulic gradients (Lowman 1965). Results of samples collected from three downgradient Dakota wells during the two sample rounds in 1998 show that ground water in the Dakota Sandstone is not contaminated and that the chemistry of the Dakota Sandstone aquifer is readily distinguishable from that of the alluvial aquifer when plotted on a Piper diagram (DOE 1999a). These chemical data reinforce the conclusion that alluvial ground water is not percolating downward to the underlying Dakota Sandstone.

Background alluvial ground water upgradient and outside the influence of the millsite is not acceptable for human consumption. As discussed in the Final Site Observational Work Plan (DOE 1999a), concentrations of selenium and uranium in background samples exceed EPA standards. Compared with concentrations normally present in public water supply systems, background alluvial ground water in the Grand Valley contains naturally high levels of chloride, iron, manganese, selenium, sulfate, total dissolved solids, and uranium.

The alluvial ground water beneath the millsite is also unacceptable for human consumption. Concentrations of ammonia, arsenic, fluoride, iron, manganese, molybdenum, sulfate, uranium, and vanadium in site-related ground water are higher than concentrations in background ground water and higher than concentrations normally acceptable for drinking water. Although concentrations of some contaminants render site-related ground water unsuitable for certain long-term agricultural uses, background alluvial ground water upgradient and downgradient of the site is acceptable for irrigation and watering of livestock.

4.1.2 Environmental Consequences

Proposed Action

The proposed action alternative would have little or no effect on background ground water quality in the alluvial aquifer because the ground water is already of poor quality as a result of naturally occurring minerals. The ground water meets the definition of limited use ground water

(see discussion in Section 1.2 and definition in Appendix A). With time, soluble contaminants in the uppermost aquifer at the site should disperse and dilute to near-background concentrations because (1) the source of contamination (i.e., the mill tailings) has been removed, and (2) natural geochemical processes (e.g., adsorption and precipitation) will attenuate contaminant concentrations. Ground water monitoring will enable DOE to evaluate the progress of this attenuation, and institutional controls will prevent improper use of alluvial ground water. However, because of the naturally poor quality of background ground water, contaminant concentrations will remain elevated over levels acceptable for human consumption.

No Action

The no action alternative would also have little or no effect on background ground water quality in the alluvial aquifer because the ground water is of naturally poor quality. However, progress of the attenuation of contaminant concentrations would not be monitored. Any future use of ground water for human consumption would be undetected because institutional controls would not be monitored.

4.2 Surface Water

4.2.1 Affected Environment

Plate 1 shows the surface water drainage around the site area. The Colorado River flows along the southern boundary of the site and forms braided islands that extend from near the eastern side of the site to approximately 0.5 mile (0.8 kilometer) downstream past the site. The southern riverbank is a bluff up to 60 feet (18 meters) high carved into surface alluvium and underlying bedrock shales within the Dakota Sandstone. The northern riverbank, which abuts the site, has riprap consisting of concrete slabs and river boulders along the eastern side, near a footbridge, that grades within a few tens of feet into natural river gravels and sands. During times of low flow in the river, ground water from the site discharges to the Colorado River. Contaminant concentrations in ground water become highly diluted through mixing with river water.

Eight ponds were constructed in 1994 along the river's edge and were washed away or filled in during spring runoff in 1995. Continued spring runoff has produced a small scarp 1 to 3 feet (0.3 to 0.9 meter) high along most of the site's south boundary. Several shallow elongate ponds have formed along the base of this scarp that may be vestiges of the original 1994 ponds. Uranium and vanadium concentrations in the westernmost pond are elevated compared to other surface water concentrations and exceed EPA aquatic benchmarks. These concentrations probably result from ground water seeping into the pond and evaporating over a number of months before the Colorado River flushes the system. However, this pond is small and is not a significant ecological habitat. Water level data from the U.S. Geological Survey gauging station near Palisade (about 15 miles upstream from the site) indicate that the river flushes the pond during spring runoff about two months each year. Also, it is likely that the pond surface is frozen during a portion of the winter. Therefore, ecological risks associated with uranium and vanadium concentrations are not unacceptable. Vegetation density along the edge of this scarp is increasing and will probably help stabilize the soils and prevent further erosion. River water samples tested

upgradient and downgradient of the millsite have no observable differences in analyte concentrations.

An irrigation return ditch along the eastern boundary of the site (Plate 1) intersects ground water during most of the year and hosts cattails in several areas. Field analyses of uranium in water from the ditch show no values above the EPA standard.

4.2.2 Environmental Consequences

Proposed Action

The proposed action alternative would have no adverse effect on surface water quality. With the exception of the westernmost pond discussed in Section 4.2.1, uranium concentrations in the surface water do not currently exceed the EPA standard. Uranium concentrations in the ground water are expected to attenuate over time, and no adverse effects to surface water are expected.

No Action

Effects on surface water under the no action alternative would be similar to those under the proposed action alternative.

4.3 Water and Land Use

4.3.1 Affected Environment

After surface remediation, the original millsite was covered with 6 inches of clean soil and revegetated by 1994. Part of the original remedial action involved constructing wetlands, consisting of eight ponds along the southern boundary of the property adjacent to the Colorado River. River flooding in 1995 eroded the ponds and reconfigured the southern boundary of the site.

The City of Grand Junction Parks and Recreation Department administers the area encompassing the former millsite. In 1997 a pedestrian bridge was built across the Colorado River at the southeast corner of the site. In 1995 and 1996 the Army Corps of Engineers constructed a flood control levee through the southern part of the site. A concrete sidewalk built in 1997 on top of the levee is part of the city's riverfront trail corridor connecting the north side of the Colorado River to the south side at Orchard Mesa Middle School via the footbridge. West of the site, the Western Colorado Botanical Society, in coordination with the City, constructed the Western Colorado Botanical Gardens, which contain a variety of indoor plants, butterflies, and an outdoor reconstruction of the valley's geomorphology with associated flora. The gardens are located at the south end of 7th Street at the access to the Watson Island section of the Colorado River Trail.

No ground water is being used from the millsite. The Colorado Department of Public Health and Environment (CDPHE) (the Grantor) transferred the millsite property to the City of Grand Junction through two quitclaim deeds. As part of the agreement, the City agrees "…not to use ground water from the site for any purpose, and not to construct wells or any means of exposing ground water to the surface unless prior written approval is given by the Grantor and

U.S. Department of Energy;" and "…not to perform construction of any kind on the property, unless prior written approval of construction plans, designs and specifications is given by Grantor and the U.S. Department of Energy…" (recorded at the Mesa County Courthouse, Book 2320, pages 882 to 886, March 26, 1997). Land downgradient of the site is located within the city limits. The City requires that landowners tap into city water lines to obtain drinking water. Wells are permitted for other purposes (e.g., agricultural, livestock). Although the alluvial ground water downgradient of the site is unacceptable for human consumption, it is acceptable for irrigation and watering of livestock. According to information from the State Engineer's Office, no wells (other than water quality monitoring wells installed by DOE) in the alluvial aquifer are recorded for properties downgradient of the site. The water quality monitoring wells are not used for any other purpose. The Botanical Gardens uses a sump near the Colorado River to pump river water into a lined pond for irrigating the gardens.

4.3.2 Environmental Consequences

Proposed Action

The proposed action would have no adverse effect on the land and water use at and downgradient of the site because the institutional controls prohibiting the use of ground water are already implemented. The proposed action would include verification annually for the next 5 years that institutional controls are being effectively maintained. This verification would consist of consultation and documentation of discussions with the Grand Junction City Engineering Department, the State Engineer's Office, and the local office of the Colorado State Water Quality Division. If no changes are found or if no issues arise that might compromise established institutional controls, contacts would subsequently be made every 5 years for the next 20 years. The need for continued verification would be reassessed at that time. A limited ground water and surface water monitoring program is proposed to determine when concentrations of site-related constituents have decreased to levels that certain uses of ground water may be permitted. Details of the proposed monitoring, which would consist of periodic sampling of four wells and one surface location, are provided in the Ground Water Compliance Action Plan (DOE 1999c).

No Action

Effects on land and water use under the no action alternative would be similar to those under the proposed action alternative. However, no verification of the effectiveness of institutional controls would be conducted. Therefore it would be possible, though unlikely, that a well could be installed into the alluvial aquifer for improper uses.

4.4 Human Health

4.4.1 Affected Environment

Appendix B of the PEIS (DOE 1996b) describes the methods used to assess the human health risk at the Grand Junction UMTRA Project site. A screening-level human health risk analysis was performed in 1995 (DOE 1995) and updated in 1999 (DOE 1999a) for both background alluvial ground water in the Grand Valley and for alluvial ground water at the Grand Junction

UMTRA Project site. Table 1 provides a summary of alluvial ground water quality based on analytical results of the 1998 sampling.

For all contaminants except ammonia, risks were determined for ingestion of contaminated ground water (i.e., an oral exposure route) in a residential setting. The major risk from ammonia is not through oral ingestion in ground water, but rather from inhalation of gaseous ammonia through volatilization in ground water. Risks were calculated using default inhalation exposure parameters for a residential setting. The volatilization factor for ammonia and the fraction of ammonia actually present as the dissolved gas, NH_3, were determined through site-specific geochemical modeling.

Background alluvial ground water is of naturally poor quality and is not currently used as a source of drinking water; treatment of the ground water for this purpose is not economically feasible (DOE 1999a). The availability of high-quality surface water for drinking water makes it very unlikely that alluvial ground water will be used as a drinking water source in the future. No complete exposure pathways currently exist for use of alluvial ground water as drinking water.

4.4.2 Environmental Consequences

Proposed Action

Because of the restrictions on ground water use and the fact that natural flushing will eventually attenuate contaminant concentrations, human health would be protected by the proposed action alternative. Ground water in the alluvial aquifer has not been used historically and no future use is anticipated. The naturally poor quality of the water is largely due to leaching of metals and salts from the Mancos Shale, which occurs throughout the Grand Valley. Drinking water in the area comes from various surface water sources located on the Grand Mesa east of Grand Junction; water from the Colorado River is also used as a drinking water source. Ground water discharging from the Grand Junction UMTRA Project site has no measurable effect on Colorado River water.

No ground water is being used from the millsite. The Colorado Department of Public Health and Environment (CDPHE) (the Grantor) transferred the millsite property to the City of Grand Junction through two quitclaim deeds. As part of the agreement, the City agrees "…not to use ground water from the site for any purpose, and not to construct wells or any means of exposing ground water to the surface unless prior written approval is given by the Grantor and U.S. Department of Energy;" and "…not to perform construction of any kind on the property, unless prior written approval of construction plans, designs and specifications is given by Grantor and the U.S. Department of Energy…" (recorded at the Mesa County Courthouse, Book 2320, pages 882 to 886, March 26, 1997). Land downgradient of the site is located within the city limits. The City requires that landowners tap into city water lines to obtain drinking water.

Table 1. Summary of 1998 Alluvial Ground Water Quality

Contaminant	Maximum mg/L	Mean mg/L	MCL mg/L	SMCL mg/L	RBC mg/L
Ammonia (as NH_4)					
Plume	233	71.4			0.20 (as NH_3)
Background	0.321	0.093			
Arsenic					
Plume	0.0349	0.005	0.05		0.001N
Background	0.0014	n/a			0.000045C
Chloride					
Plume	1,160	796		250	
Background	991	437			
Fluoride					
Plume	7.57	1.93	4	2	2.2N
Background	1.62	0.895			
Iron					
Plume	21.2	3.88		0.3	11N
Background	3.13	0.552			
Manganese					
Plume	4.54	2.82		0.05	1.7N
Background	2.22	1.4			
Molybdenum					
Plume	0.299	0.101	0.1		0.18
Background	0.124	0.0587			
Selenium					
Plume	0.016	n/a	0.01		0.18
Background	0.137	0.036			
Sulfate					
Plume	3,700	3,154		250	
Background	3,720	2,566			
^{234}U and ^{238}U					
Plume	1,668	215.3	30 pCi/L		
Background	57	42			
Uranium (total)					
Plume	2.5	0.304	0.044		
Background	0.0662	0.0469			
Vanadium					
Plume	0.832	0.0857			0.26
Background	0.0049	0.0019			
Total Dissolved Solids					
Plume	7,840	6,525		500	
Background	7,400	5,238			

NOTE: MCL—EPA maximum concentration limit; SMCL—secondary maximum contaminant level
RBC—risk-based concentration (human health); n/a—not applicable
N—noncarcinogenic risk; C—carcinogenic risk

Wells are permitted for other purposes (e.g., agricultural, livestock). Although the alluvial ground water downgradient of the site is unacceptable for human consumption, it is acceptable for irrigation and watering of livestock. According to information from the State Engineer's Office, no wells (other than water quality monitoring wells installed by DOE) in the alluvial aquifer are recorded for properties downgradient of the site. The water quality monitoring wells are not used for any other purpose. The Botanical Gardens uses a sump near the Colorado River to pump river water into a lined pond for irrigating the gardens.

No Action

Effects on human health under the no action alternative would be similar to those under the proposed action alternative. However, no verification of the effectiveness of institutional controls would be conducted. It would be possible, though unlikely, that a well could be installed into the alluvial aquifer for improper uses. Because the institutional controls would not be verified, these uses would be undetected and could produce adverse effects to human health from long-term ingestion of alluvial ground water.

4.5 Ecological Resources

4.5.1 Affected Environment

Before tailings were removed, the ecology of the site consisted of an interspersion of riparian and aquatic habitats. Riparian vegetation dominated by salt cedar thickets covered several small islands and shorelines formed by Colorado River side channels and backwaters. Cottonwood, Russian olive, and willow, which broke up the salt cedar thickets in some places, were less abundant. The understory vegetation consisted of several dense, open stands of reed canary grass, spotted knapweed, and giant reed with rushes, sedges, spikerushes, bullrush, and arrowhead common along the shores of side channels and in small wetlands on the islands. Yellow warbler, mourning dove, song sparrow, and black-billed magpie were observed in the salt cedar and willow stands. Mallard and great blue heron were common on the water or on the shore. Evidence of beaver, muskrat, raccoon, and skunk was also common, as was evidence of bull frog and leopard frog. Bald eagles, the only endangered terrestrial species potentially exposed to site contaminants, are known to winter in the area.

The following aquatic organisms were observed in the vicinity of surface water sampling locations in the Colorado River: mayfly nymphs, damselfly nymphs, dragonfly nymphs, water striders, backswimmers, and Cyprindae minnows. Game fish known to inhabit the area include green sunfish, bluegill, largemouth bass, black crappie, black bullhead, and channel catfish. Bluehead sucker, flannelmouth sucker, common carp, roundtail chub, red shiner, sand shiner, and fathead minnow also inhabit the area. Threatened or endangered fish potentially exposed to site contaminants include the humpback chub, bonytail chub, Colorado squawfish, and razorback sucker.

After remediation was completed in 1994, the original millsite was covered with 6 inches of clean soil and reseeded with a mixture of grasses, forbs, and shrubs. Revegetation efforts were

largely unsuccessful. Since then, two types of upland vegetation and two types of riparian vegetation have developed on the site. In the absence of disturbance, the upland plant community at the millsite will trend toward shrubs dominated by either greasewood or rabbit brush. Invasive weeds such as tamarisk, Russian olive, and reed canarygrass are dominating the riparian plant communities. Over time these plants may completely dominate, inhibiting reproduction of cottonwood, willow, and other more desirable species. Currently, greasewood, cottonwood, and tamarisk inhabit the site.

The Site Observational Work Plan (DOE 1999a) provides a detailed discussion of a screening-level ecological risk assessment performed for the Grand Junction UMTRA Project site. The ecology at the site was compared to the ecology of a reference area established upgradient and outside the influence of site-related activities. Results of this assessment indicate slightly elevated levels of a few contaminants in sediment, surface water, and plant tissues located in the vicinity of the site. With the exception of isolated maximum values for constituents listed in Table 1, data indicated no significant differences between the Grand Junction UMTRA Project site and the reference area for concentrations of contaminants in biotic and abiotic media. Data evaluation (including the isolated maximum values) did not indicate an unacceptable ecological risk for the Grand Junction UMTRA Project, site and no further quantitative ecological risk assessment was performed.

4.5.2 Environmental Consequences

Proposed Action

The proposed action alternative would not adversely affect plant and animal communities at the site because the deed restriction prevents improper use of ground water. Discharge of site ground water to the Colorado River and other surface water bodies does not result in unacceptable risk to environmental receptors. Ground water downgradient of the site is not currently being used but could be used in the future for agricultural or other purposes that could result in exposure to ecological receptors. Concentrations of contaminants in ground water downgradient from the site do not differ significantly from those in the upgradient background reference area and, because the contaminant source has been removed, are not expected to produce adverse ecological effects. DOE does not plan to conduct additional studies to determine if alluvial ground water is being used for agricultural purposes downgradient of the site.

No Action

Implementation of the no action alternative would not result in adverse effects to ecological receptors. The no action alternative does not differ from the proposed action alternative.

4.6 Environmental Justice

4.6.1 Affected Environment

Executive Order 12898, *Federal Actions to address Environmental Justice in Minority Populations and Low-Income Populations*, states that "…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate,

disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…." The following activities were performed to ensure that concerns from minority and low-income populations were addressed:

- Comments from the public were solicited during development of the PEIS.
- The proposed action alternative was discussed at a Grand Junction City Council meeting.
- A Public Involvement Plan (DOE 1999b) discussing the EA was presented to the Grand Junction City Council, the State, and EPA.
- Letters discussing the proposed action alternative were sent to property owners adjacent to the millsite.

4.6.2 Environmental Consequences

Proposed Action

The proposed action would not have adverse effects to ground water, surface water, land or water use, ecological resources, threatened and endangered species, floodplains, air quality, visual resources, transportation, historical and cultural resources, socioeconomics, or wetlands. The application of supplemental standards and institutional controls would be protective of human health and the environment. Because there are no adverse effects to the human population, no disproportionately high or adverse effects to minority or low-income populations would occur.

No Action

Since alluvial ground water is not currently used for drinking water, and because the current city development codes preclude the use of alluvial ground water as a drinking water source, no adverse effects to human health would result from the no action alternative. Because there are no adverse effects to the human population, no disproportionately high or adverse effects to minority or low-income populations would be expected under the no action alternative.

5.0 Cumulative Impacts Assessment

5.1 Affected Environment

The Council on Environmental Quality defines "cumulative impact" as the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7).

The land near the site was used for light industry and agriculture at the time of collection of the ground water and surface water samples upon which the conclusions of the BLRA (DOE 1995) and the updated BLRA (DOE 1999a) were made. The uranium mill tailings had not been completely removed from the site itself during that time. Therefore, the environmental studies conducted to date represent the worst case of cumulative impacts of past and present actions to the environment. There are no known plans for any new industry or new type of agriculture in the area of the Grand Junction UMTRA Project site. The only reasonably foreseeable change in land use at the site is installation of a city park. Because of current institutional controls, users of the anticipated park will not have access to contaminated alluvial ground water for any purpose.

5.2 Environmental Consequences

Proposed Action

The proposed action alternative, which consists of institutional controls and monitoring ground water and surface water quality, combined with continued light industry and agriculture and development of a city park will not negatively affect the ground water quality. Therefore, combined impacts of the proposed action alternative and other reasonably foreseeable actions would not result in cumulatively significant impacts to the environment.

No Action

The no action alternative is identical to the proposed action except that no monitoring activities would be conducted. Therefore, combined impacts of the no action alternative and other reasonably foreseeable actions would not result in cumulatively significant impacts to the environment.

6.0 Persons and Agencies Consulted

Information in this document was compiled from sources such as the Environmental Impact Statement for the Grand Junction UMTRA Project site (DOE 1986), the Baseline Risk Assessment (DOE 1995), the PEIS (DOE 1996b), and the Site Observational Work Plan (DOE 1999a). During preparation of those documents, several public meetings were held and notices were published in the *Federal Register*.

Following the issuance of the draft PEIS for the UMTRA Ground Water Project in 1995, a public meeting was held in Grand Junction on June 25, 1995. The comments received were documented in Volume II of the PEIS (comments 160 through 203). Several comments were requests for information on the NEPA process and timing of the EA, a NEPA document. Others stated that remediation was unnecessary and expressed an interest in "clean water at the point of use." DOE's response to the "point of use" comments was that EPA standards do not provide a regulatory basis for using "clean water at the point of use" to meet the standards.

DOE has maintained ongoing discussions and meetings with CDPHE. On December 2, 1998, a meeting was held with Wendy Naugle, CDPHE, to present data, risk evaluations, and the compliance strategy to be recommended in the Site Observational Work Plan. Since the State deeded the Climax millsite to the City of Grand Junction, additional discussions have taken place between DOE-GJO, the City, and the Grand Junction Parks and Recreation Department on future use of the land and ground water.

An article titled "Groundwater use to be limited at future park" appeared in the Grand Junction *Daily Sentinel* on February 17, 1999. The article included a discussion of the proposed ground water compliance strategy identified in the draft Site Observational Work Plan and a discussion of the future of the old Climax millsite. The site will become a city park and is now called Las Colonias, after a group of Latinos that once lived in that area. The reporter interviewed Don Metzler, DOE-GJO, about the site. The article briefly described the proposed compliance strategy of applying supplemental standards based on limited use ground water. Mr. Metzler indicated that the shallow ground water in the valley is of naturally poor quality and that any exposure to humans is unlikely because the water is not used for drinking. Shaun Cooper, Grand Junction Parks and Recreation planner, was also interviewed and indicated that the City has no plans for activities at the site for 10 years. After that, according to information gathered for the Site Observational Work Plan, no water will be pumped from the alluvial aquifer to irrigate the park, and no ponds will be built using ground water from the alluvial aquifer.

A Public Involvement Plan (DOE 1999b) for the EA was prepared in February 1999. The objectives of this plan are to promote public awareness, understanding, and participation in the NEPA decision-making process; to maintain an active public affairs program that identifies public and media concerns and provides timely information; and to establish stakeholder involvement and information to promote communication between DOE-GJO and affected stakeholders.

On March 14, 1999, Don Metzler, DOE-GJO, and Robert Bleil, MACTEC-ERS, consulted with Rick Kruger of the U.S. Fish and Wildlife Service regarding potential effects of the proposed action on threatened and endangered species. Mr. Metzler presented the proposed compliance strategy to the Grand Junction City Council on March 15, 1999.

Although publication of this EA in the *Federal Register* is not required, copies of the EA for local public comment will be available at the Mesa County Public Library and the DOE-GJO Reading Room.

A toll-free number is established for anyone who needs additional information. Audrey Berry of the DOE Public Affairs office in Grand Junction can be contacted at (800)399-5618 for more information or copies of documents and data prepared for the Grand Junction UMTRA Project site.

7.0 References

10 CFR 1021. "National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations*, January 1, 1997.

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

DOE (U.S. Department of Energy), 1981. *Cooperative Agreement Between the United States Department of Energy and the State of Colorado,* DOE DE-FC04-81AL16257, September.

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———, 1999a. *Final Site Observation Work Plan for the UMTRA Project Site at Grand Junction, Colorado,* Rev. 1, DOE/GJO-99-86-TAR, U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, February.

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Lohman, S.W., 1965. *Geology and Artesian Water Supply, Grand Junction Area Colorado,* U.S. Geological Survey Professional Paper 451.

Appendix A. Glossary

Alternate concentration limit (ACL)—Alternate concentration limits under 40 CFR 192.02 (c)(3) may be applied if the constituent will not pose a substantial present or potential hazard to human health and the environment as long as the ACL is not exceeded.

Limited use ground water is defined in 40 CFR 192.11(e) as " groundwater that is not a current or potential source of drinking water because…widespread, ambient contamination not due to activities involving residual radioactive materials from a designated processing site exists that cannot be cleaned up using treatment methods reasonably employed in public water systems…."

National Environmental Policy Act (NEPA) of 1969 (and subsequent amendments)—A national policy for promoting efforts to prevent or eliminate damage to the environment. This act requires federal agencies to prepare a detailed statement that identifies and analyzes the environmental effects of a proposed action that may significantly affect the quality of the human environment. Regulations in NEPA also require that each federal agency develop its own implementing procedures. The DOE implementing requirements for compliance with NEPA are in 10 CFR Part 1021.

Residual radioactive material (RRM)—Radioactive waste in the form of tailings resulting from the processing of ores for the extraction of uranium; RRM includes other wastes at a site which relate to such processing; including residual stock, unprocessed ores, and low-grade materials.

Supplemental Standards—Supplemental standards under 40 CFR 192.22 may be applied in lieu of the standards of Subpart B if any of the circumstances listed in 40 CFR 192.21 exist. These circumstances include remedial actions that pose a risk, produce environmental harm, or have excessive cost; no remedial action is known to exist; ground water restoration is technically impractical; or ground water is classified as limited use.

UMTRA Surface Project—A program established by DOE under the direction of UMTRCA to stabilize, dispose of, and control, in a safe and environmentally sound manner, uranium mill tailings (including abandoned mill buildings) at the designated inactive uranium millsites.

EPA Ground Water Standards—Standards promulgated by EPA and codified at 40 CFR 192 that protect public health and the environment from hazardous constituents associated with processing uranium ore and from the resulting residual radioactive material

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