

**FINAL SUPPLEMENT TO
THE ENVIRONMENTAL REPORT
BLUEWATER URANIUM MILL SITE**

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Submitted to:

**U. S. Nuclear Regulatory Commission
Region IV
Uranium Recovery Branch
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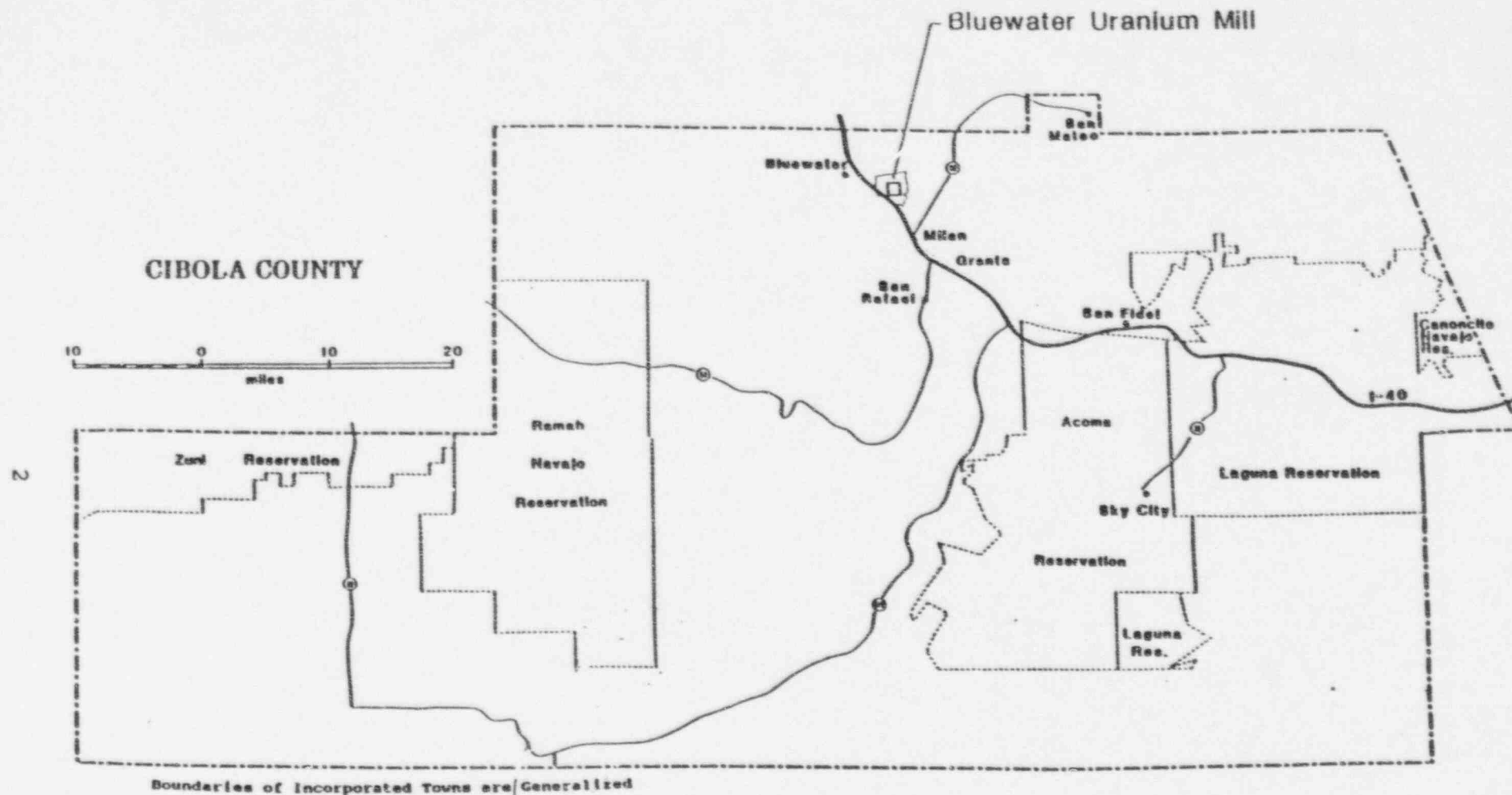
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1.0 Introduction

Atlantic Richfield Company (ARCO) has completed decommissioning and reclamation activities at the Bluewater Uranium Mill Site (Site) located near Grants, New Mexico, in accordance with the U. S. Nuclear Regulatory Commission (NRC) approved plans. ARCO is seeking termination of its NRC Source Material License, #SUA-1470 (License) for the Site. The NRC regulations 10 CFR Part 51.60 (b)(3) requires a licensee seeking termination of the license for uranium milling to submit an Environmental Report (ER) or supplement thereof addressing any significant environmental changes to the Site from decommissioning and reclamation activities. ARCO submitted the ER to the New Mexico Environmental Improvement Division Department (NMEID) in 1984 during the licensing actions for the Site. In April 1993, ARCO submitted an ER Supplement to the NRC for decommissioning and reclamation activities at the Site. ARCO has prepared this Final Supplement to the ER for the License termination.

2.0 Site Background

The Site is located about 10 miles northwest of Grants, New Mexico as shown in Figure 2-1. It encompasses 5,064 acres, of which 3,761 acres were within the radiological restricted area. The Site, originally owned and operated by The Anaconda Company, began operations in 1953. The Site was acquired by ARCO in 1977 and continued operations until March 1982 when operations were suspended. The Bluewater Mill originally processed carbonate ore at the rate of about 300 tons per day. The carbonate process was discontinued in 1959 and was replaced by the acid leach process instituted earlier in 1955. The mill was expanded in 1978 to handle 6000 tons of ore per day. The mill consisted of ore grinding, metallurgical process circuits, yellowcake drying and packaging, and facilities associated with the mill tailings management. Approximately 24 million tons of tailings were produced during the operations. The tailings management facilities included a Main Tailings Pile (MTP) consisting of approximately 22.9 million tons which included a small acid tailings pile, Carbonate Tailings Pile (CTP) containing about 1.3 million tons, and seven synthetically lined evaporation ponds.



Source: Middle Rio Grande Council of Governments, Community Digest, March 1988.

Figure 2-1 Location of Bluewater Uranium Mill

In 1982, ARCO started preparation for the Site reclamation, including studies and development of plans. ARCO completed the Bluewater Mill decommissioning in December 1990. The tailings reclamation, which included windblown tailings cleanup, decommissioning and reclamation of evaporation ponds, dewatering and stabilization of tailing piles, placement of radon barriers and erosion protection cover was completed in 1995. Figure 2-2 shows the reclaimed features of the Site, including the area which encompass 1,288 acres to be transferred to the U. S. Department of Energy (DOE) for custody and long term surveillance.

3.0 Environmental Information

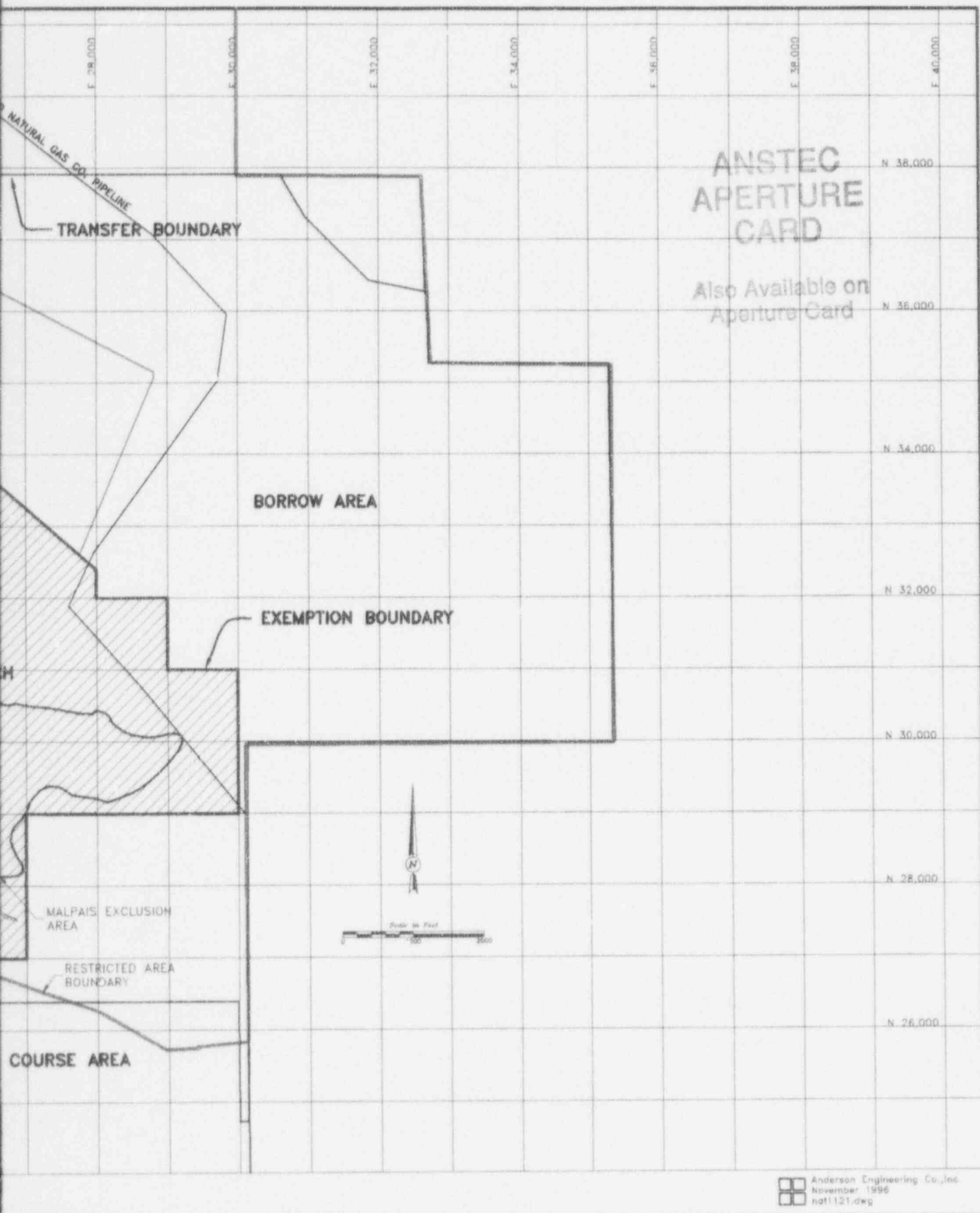
The Site was first regulated by the Atomic Energy Commission, and later by the State of New Mexico, which had Agreement State status under Section 274 of the Atomic Energy Act of 1954. In 1981, ARCO began submitting technical licensing documents to the NMEID to support various licensing actions. The documents (ARCO 1980; ARCO 1981; ARCO 1982; ARCO 1983; and ARCO 1984) included tailings reclamation designs, environmental analysis, presentation of environmental settings, and assessment of environmental impacts. These documents constituted an ER in 1984 for the Site licensing actions. New Mexico relinquished its uranium mill licensing and regulatory authority to the NRC in June 1986. In April 1993, a supplement to the ER (ARCO 1993) was developed and submitted to the NRC to update the information contained in the ER where necessary, to support the Mill Decommissioning and Tailings Reclamation Plans for Site. The Supplement evaluated various decommissioning and reclamation alternatives. The evaluation included environmental considerations; analysis for environmental effects; and status of compliance with all regulatory requirements, including technical criterion presented in 10 CFR 40, Appendix A, and applicable environmental quality standards.

4.0 Mill Decommissioning

The 1993 ER Supplement contained an evaluation of mill decommissioning alternatives. The evaluation considered unavoidable environmental impact from decommissioning; potential accidents; irreversible and irretrievable commitments of resources; relationship between local and short-term use of the environment and maintenance of long term productivity; socioeconomic impacts; and cost-benefit balance. The NRC-approved



Figure 2-2 Reclaimed Features



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Decommissioning Plan (ARCO 1987) for the Site was consistent with the selected alternative. Radiological characterizations and studies were conducted to develop design and specifications for radiation protection and the mill decommissioning activities. The Plan included procedures for dismantlement, salvage, demolition, removal, and disposal of mill process equipment, structures that housed the mill equipment, mill operation support facilities and buildings, and a comprehensive radiation protection program for workers, the public and the environment in accordance with the 10 CFR Part 20.

The mill decommissioning activities began in 1987 with salvaging of the new mill circuit components. Prior to dismantlement, the radiologically contaminated Asbestos Containing Material (ACM) was removed and placed in an ACM disposal area approved by the State of New Mexico. The process vessels were washed to remove the process byproduct material residue. And the residue was placed on the tailings pile. The mill equipment and structures were either salvaged or sized and placed in one of three engineered fill areas (Disposal Areas). Radon barrier was placed on the Plant Site and the Disposal Areas.

The mill decommissioning work was completed in December 1990, with details presented in the March 28, 1991 Decommissioning Report (ARCO 1991a). On January 12, 1991, the NRC prepared a Memorandum to the File (NRC 1991) acknowledging receipt and acceptance of the report with the conclusion that the mill decommissioning activities were completed in accordance with the approved Plan and the License.

5.0 Tailings Reclamation

The 1993 ER Supplement contained an evaluation of various mill tailings reclamation alternatives. The evaluation considered unavoidable environmental impact from decommissioning; potential accidents; irreversible and irretrievable commitments of resources; relationship between local and short-term use of the environment and maintenance of long term productivity; socioeconomic impacts; cost-benefit balance; and assessment of compliance with the technical criteria presented in 10 CFR 40, Appendix A for tailings disposal. The NRC-approved Reclamation Plan (ARCO 1990) for the Site tailings disposal was consistent with the selected alternative. The Plan included procedures for;

- excavation and placement of windblown tailings and evaporation ponds residue and placement on the MTP for tailings consolidation
- windblown tailings cleanup verification to demonstrate compliance with the cleanup criteria
- reconfiguration of tailings pile dikes to provide long term stability
- dewatering and consolidation of tailings for long term stability
- placement of radon barrier
- radon flux and gamma radiation level measurements to demonstrate compliance with the standards
- watershed management and erosion protection cover for long term protection to the stabilized tailings disposal, and
- a comprehensive radiation protection program for protection against radiation to workers, the public and the environment in accordance with the 10 CFR Part 20.

Extensive characterization and studies were conducted to develop design and specifications for Site reclamation construction work. The design and specifications were defined in the Reclamation Plan, and modifications to the Plan in various License amendments.

The reclamation work began with MTP dewatering in 1982 and was completed with placement of erosion protection covers in December 1995. During the reclamation activities, ARCO implemented various verification, monitoring and Quality Assurance and Quality Control (QA/QC) programs to assure that the reclamation activities were completed in compliance with the Plan, design, specifications, and environmental quality standards. The following summarizes some of the activities and monitoring programs:

5.1 Tailings Settlement Monitoring

Prior to the placement of radon barrier on the MTP, saturated portions of the tailings were dewatered and consolidated for stability and long term effectiveness of the radon barrier. The sands portion of the pile was dewatered by installation of over 50 pumps. The slime portion of the tailing pile was dewatered by placing a layer of load consisting of windblown tailings, evaporation pond residues and other tailings contaminated soils. Dewatering and consolidation was aided by installation of approximately 27,000 vertical band drains (wicks) over the slimes portion of the tailing pile. Tailings settlement was monitored and a report, prepared by Shepherd Miller, Inc., containing monitoring and settlement analysis was submitted to the NRC in December 1993. By correspondence dated February 11, 1994, the NRC concurred that at least the required 90% of the settlement has been attained, and informed ARCO to proceed with the final radon barrier placement.

5.2 Soil Cleanup Verification

Approximately 3.2 million cubic yards of windblown tailings contaminated soils, and evaporation ponds residue were excavated and placed onto the MTP during the reclamation activities. ARCO implemented cleanup verification methods to demonstrate compliance with windblown tailings and evaporation ponds cleanup requirements in accordance with the approved Reclamation Plan and the cleanup criteria of 10 CFR Part 40, Appendix A, Criterion 6. The cleanup verification methods, which were approved by the NRC in the Reclamation Plan, consisted of extensive soil sampling, gamma ray measurements, and a quality assurance program. The verification data demonstrate compliance with the soil cleanup criteria specified in the Plan.

5.3 Disposal Site Verification for Radon Flux and Gamma Radiation Levels

Upon placement of final radon barrier on the tailing piles and other reclaimed disposal features, ARCO conducted radon flux measurements to demonstrate compliance with the 20 pCi/m²/sec disposal standard specified in 10 CFR Part 40, Appendix A, Criterion 6. The radon flux measurements were made in accordance with the Environmental Protection Agency's (EPA) Method 115 cited in 40 CFR Part 61.

The measurements show the average radon flux of 2.3 pCi/m²/sec at the MTP (including Acid Tailings Pile and South Bench), and 1.3 pCi/m²/sec limit for the Carbonate Tailings Pile. The radon flux levels, far below the 20 pCi/m²/sec limit, meets the 1,000 year mill tailings disposal and reclamation design for longevity requirements of the NRC regulations. In addition, ARCO conducted gamma ray exposure rate measurements on reclaimed tailings piles and other features which demonstrated that the gamma ray exposure rates are reduced to background levels as required by 10 CFR Part 40, Appendix A.

5.4 Air Quality Monitoring

ARCO maintained an air quality network of air sampling stations for continuous monitoring of U-nat, Ra-226, Th-230, Pb-210, and Rn-222 at the Site. The monitoring results are provided to the NRC in the semi-annual report submitted in accordance with 10 CFR 40.65. The monitoring data show that the airborne concentrations at the Site represent a very small fraction of the 10 CFR 20 limits. In addition, the dose assessment (ARCO 1996a) performed using the air monitoring results for compliance with the EPA's NESHAPs Standard (40 CFR, Part 61, subpart I) and 10 CFR 20 limit indicate the dose to the public is well below the 10 mrem standard.

5.5 Quality Assurance/Quality Program and Inspections

A comprehensive QA/QC program and a resident project management team were utilized to assure compliance with the health and safety requirements, radiological cleanup and construction specifications for the project. The activities conducted involved radiological health and safety monitoring, Radiation Protection Program audits, radiological cleanup procedures, project control and scheduling, performance audits assessment of material volumes and geotechnical parameters and survey of lines, grades and depths. Independent Quality Assurance/Quality Control contractors were employed to conduct Quality Assurance/Quality Control field work and assist with data management and reporting.

The NRC has conducted several routine annual Site inspections during the decommissioning and reclamation activities. None of the inspections identified any

deficiency or violation of the design and specifications, or the Radiation Protection Program. The NRC conducted a special announced inspection of the Site reclamation activities, including review of radiation cleanup and construction records. The NRC Inspection Report 40-8902/96201 (NRC 1996a) indicated that the activities and programs complied with the requirements of the license and specifications, with construction records complete and adequate. Minor deficiencies in the rock placements of riprap on the tailings piles were noted. These areas were re-inspected by ARCO and additional work was performed to meet the specifications. In addition, the report indicated that the final radiation survey program was implemented in a sound manner with appropriate conservatism and thoroughness, except for evaluation for Th-230 level in soils. ARCO conducted additional Th-230 soil sampling to address and resolve this issue.

In addition, NRC conducted an inspection in October 1996 for radiological cleanup verification, and performed Ra-226 soil cleanup confirmation sampling. The NRC's sampling results confirmed the soil cleanup was conducted in compliance with the cleanup criteria of 6.9 pCi/gm. The NRC Inspection Report 40-8902/96-01 (NRC 1996b) indicated that decommissioning activities at the Site have been conducted in accordance with the NRC regulations and the conditions of the License.

6.0 Groundwater Protection

In June 1988, ARCO conducted groundwater detection monitoring in accordance with 10 CFR Part 40, Appendix A, Criterion 5, to determine the presence of any hazardous constituents at the Site. Following the results of the groundwater detection monitoring, the NRC established groundwater protection standards for uranium, molybdenum and selenium for the Site, and requested ARCO to implement semi-annual compliance monitoring and to submit a plan for groundwater corrective actions. ARCO developed and implemented a groundwater Corrective Action Program (CAP) in accordance with the approved plan. The CAP involved pumping of groundwater wells and monitoring changes in concentrations of constituents at Point of Compliance (POC) wells. The CAP was followed by a supplemental CAP consisting of approximately 27,000 wick drains to dewater the slimes portion of the MTP and reduce the groundwater contamination source.

Results of groundwater CAP and the compliance monitoring demonstrated that the groundwater concentrations at the Site are "As Low As Reasonably Achievable" (ALARA) and do not pose substantial present or potential hazard to human health or the environment. In April 1995, ARCO submitted a revised Alternate Concentration Limits (ACLs) petition (ARCO 1995) which addressed and incorporated NRC's issues resulting from its review of previous submittal. The groundwater ACLs for the Site were approved by the NRC and incorporated into the License as Amendment No. 30. ARCO performed additional groundwater monitoring in October 1996, as requested by NRC, to provide assurances that no additional tailings contaminants have entered the groundwater since the original detection monitoring was conducted. The results, which were submitted to the NRC on December 2, 1996 verified that no additional contaminants have entered the groundwater. Therefore, the groundwater at the Site does not pose any significant present or potential hazard to human health or the environment.

7.0 Completion Report and Summary

A Completion Report (ARCO 1996) for the Site detailing the decommissioning and reclamation activities was submitted to the NRC in May 1996, with several addendums containing responses to the NRC's comments on the Completion Report. The report included;

- design criteria, specifications, detailed construction, and as-built information for each reclaimed feature
- criteria for soil cleanup and soil cleanup verification measurements results
- criteria for tailings disposal, and disposal verification measurements for radon flux and gamma radiation levels
- groundwater protection and compliance, and
- summary of radiation protection and environmental monitoring programs.

The as-built information and verification measurements demonstrate that the decommissioning and reclamation activities were completed in accordance with the NRC approved design, specifications and Plans.

8.0 Summary and Conclusion

ARCO has completed mill decommissioning, tailings reclamation, and groundwater protection activities at the Site in accordance with the approved Plans and specifications to meet NRC's requirements and standards specified in 10 CFR 40, Appendix A. Therefore, termination of the License and transfer of the Site to the DOE for long term custody and care will result in no significant impact to human health or the environment.

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