

**ENVIRONMENTAL ASSESSMENT
FOR RENEWAL OF
SOURCE MATERIAL LICENSE NO. SUA-1358**

**ENERGY FUELS NUCLEAR, INC.
WHITE MESA URANIUM MILL
SAN JUAN COUNTY, UTAH**

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Office of Nuclear Material Safety
and Safeguards
Division of Waste Management**

TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| 1.0 INTRODUCTION | 1 |
| 1.1 Background Information | 2 |
| 1.2 Proposed Action | 4 |
| 1.3 Review Scope | 4 |
| 1.3.1 Federal and State Authorities | 4 |
| 1.3.2 Basis of NRC Review | 5 |
| 2.0 SITE DESCRIPTION | 5 |
| 2.1 Location | 5 |
| 2.2 Climate and Weather | 5 |
| 2.3 Geology | 6 |
| 2.3.1 Regional Geology | 6 |
| 2.3.2 Local Geology | 6 |
| 2.3.3 Seismicity | 8 |
| 2.4 Water Resources | 8 |
| 2.4.1 Surface Water | 8 |
| 2.4.2 Groundwater | 8 |
| 2.5 Topography | 10 |
| 2.6 Demography | 10 |
| 2.7 Land Use | 10 |
| 3.0 PROCESS DESCRIPTION | 11 |
| 3.1 Mill Circuit | 11 |
| 3.2 Mill Waste Disposal | 13 |
| 4.0 EVALUATION OF ENVIRONMENTAL IMPACTS | 14 |
| 4.1 Introduction | 14 |
| 4.2 Air Quality Impacts | 14 |
| 4.3 Historical and Cultural Resources | 14 |
| 4.4 Impacts to Water Resources | 15 |
| 4.4.1 Surface Water Impacts | 15 |
| 4.4.2 Groundwater Impacts | 15 |
| 4.5 Impacts on Ecological Systems | 16 |
| 4.5.1 Endangered Species | 16 |
| 4.5.2 Wetlands | 16 |
| 4.6 Radiological Impacts | 17 |
| 4.6.1 Operating Data | 17 |
| 4.6.2 Radiological Assessment | 19 |
| 4.7 In-Plant Safety | 21 |

TABLE OF CONTENTS
(continued)

| | <u>Page</u> |
|--|-------------|
| 5.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS | 21 |
| 5.1 Failure of Chemical Storage Tanks | 21 |
| 5.2 Fires and Explosions | 22 |
| 5.3 Pipeline Failure | 22 |
| 5.4 Minor Pipe or Tank Leakage | 22 |
| 5.5 Tailings Impoundment System Accidents | 22 |
| 6.0 RECLAMATION AND DECOMMISSIONING | 23 |
| 7.0 ALTERNATIVES | 23 |
| 8.0 FINANCIAL SURETY | 23 |
| 9.0 CONSULTATION WITH THE STATE OF UTAH | 24 |
| 10.0 FINDING OF NO SIGNIFICANT IMPACT | 25 |
| 11.0 CONCLUSION INCLUDING ENVIRONMENTAL LICENSE CONDITIONS | 26 |
| REFERENCES | 31 |

LIST OF TABLES

| | <u>Page</u> |
|--|-------------|
| 2.1 Population Centers within 60 Kilometers of the White Mesa Mill Site | 11 |

LIST OF FIGURES

| | <u>Page</u> |
|--|-------------|
| 1.1 Location of the White Mesa Uranium Mill | 3 |
| 2.1 Generalized Stratigraphic Column for the White Mesa Site | 7 |
| 3.1 Generalized Flow Diagram of the Uranium Milling Process for the White Mesa Mill | 12 |
| 4.1 White Mesa Point of Compliance Well Locations | 20 |

1.0 INTRODUCTION

By application dated August 23, 1991, and supplements and revisions transmitted by letters dated December 13 and 17, 1991, January 13 and April 7, 1992, Umetco Minerals Corporation (Umetco) requested renewal of Source Material License SUA-1358, for continued authorization of milling activities at the White Mesa Uranium Mill, which is located in San Juan County, Utah. By letter dated March 29, 1994, Umetco requested transfer of the license and a change in ownership of the mill to Energy Fuels Nuclear, Inc. (EFN). On May 25, 1994, the license was amended to change designation of the licensee to EFN. In the acquisition agreement between EFN and Umetco, EFN agreed to abide by all commitments and representations made to the U.S. Nuclear Regulatory Commission by Umetco.

With this license renewal, NRC will be authorizing continued mill operations under the Performance-Based License Condition (PBLC) format. Under Performance-Based Licensing, the licensee has the burden of ensuring the proper implementation of the PBLC. The licensee may:

- Make changes in the facility or process, as presented in the application,
- Make changes in the procedures presented in the application, or
- Conduct tests or experiments not presented in the application, without prior NRC approval, if the licensee ensures that the following conditions are met:
 - (1) The change, test, or experiment does not conflict with any requirement specifically stated in the license (excluding material referenced in the Performance-Based License Condition), or impair the licensee's ability to meet all applicable NRC regulations.
 - (2) There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan.
 - (3) The change, test, or experiment is consistent with NRC's conclusions regarding actions analyzed and selected in the EA.

Otherwise, the licensee is required to submit an application for a license amendment from NRC. The licensee's determinations whether the above conditions are satisfied will be made by a Safety and Environmental Review Panel (SERP).

The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have expertise in implementation of any changes; and one member shall be the corporate radiation safety officer or equivalent. Additional members may be included in the SERP as appropriate, to address technical aspects in several areas, such as health physics, surface water hydrology, specific earth

sciences, and others. Temporary member, or permanent member other than the three identified above, may be consultants.

The licensee shall maintain records until license termination of any changes made pursuant to the PBLC. These records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining that the change complies with the requirements referred to in the above conditions. The licensee shall furnish an annual report to NRC that describes such changes, tests, or experiments, including a summary of the safety and environmental evaluation of each. In addition, the licensee shall annually submit any pages of its license application that have been revised to reflect changes made under this condition.

EFN has not yet submitted its standard operating procedures (SOPs) for operation of the SERP. Therefore, NRC will require, by license condition, that EFN submit the SOPs for NRC review by March 31, 1997, and until such time as NRC approves the SOPs, EFN will not be authorized to implement the PBLC. EFN agreed to this license condition by telephone conversations on December 31, 1996.

NRC's inspection function remains unchanged with the administration of Performance-Based Licensing. Operational changes, regulatory commitments, and recordkeeping requirements implemented by EFN through the PBLC are subject to NRC inspection and possible enforcement actions.

1.1 Background Information

By letter dated February 6, 1978, Energy Fuels Nuclear, Inc. (EFN) applied to NRC for a source and byproduct material license to construct and operate the White Mesa uranium milling facility located approximately 9.5 kilometers (km) (6 miles) south of Blanding, Utah (see Figure 1.1). As a result of studies conducted for the Final Environmental Statement (FES) (NUREG-0556; NRC, 1979), NRC concluded that mitigative measures proposed and implemented by the applicant would reduce any adverse environmental impacts associated with the White Mesa project to acceptable levels. Following issuance of the FES in May 1979 and the staff's Safety Evaluation Report (SER) in August 1979, NRC issued Source Material License SUA-1358 on August 7, 1979.

SUA-1358 was renewed in 1985, and was due to expire on September 23, 1991. As stated above, Umetco submitted a license renewal application by letter dated August 23, 1991, and NRC notified Umetco that the license was in timely renewal by letter dated November 7, 1991.

Source Material License SUA-1358 and ownership of the White Mesa mill were transferred from Umetco to EFN in May 1994. The mill was operated on a continual basis from May 1980 until February 1983, and then intermittently from October 1985 to the present time.

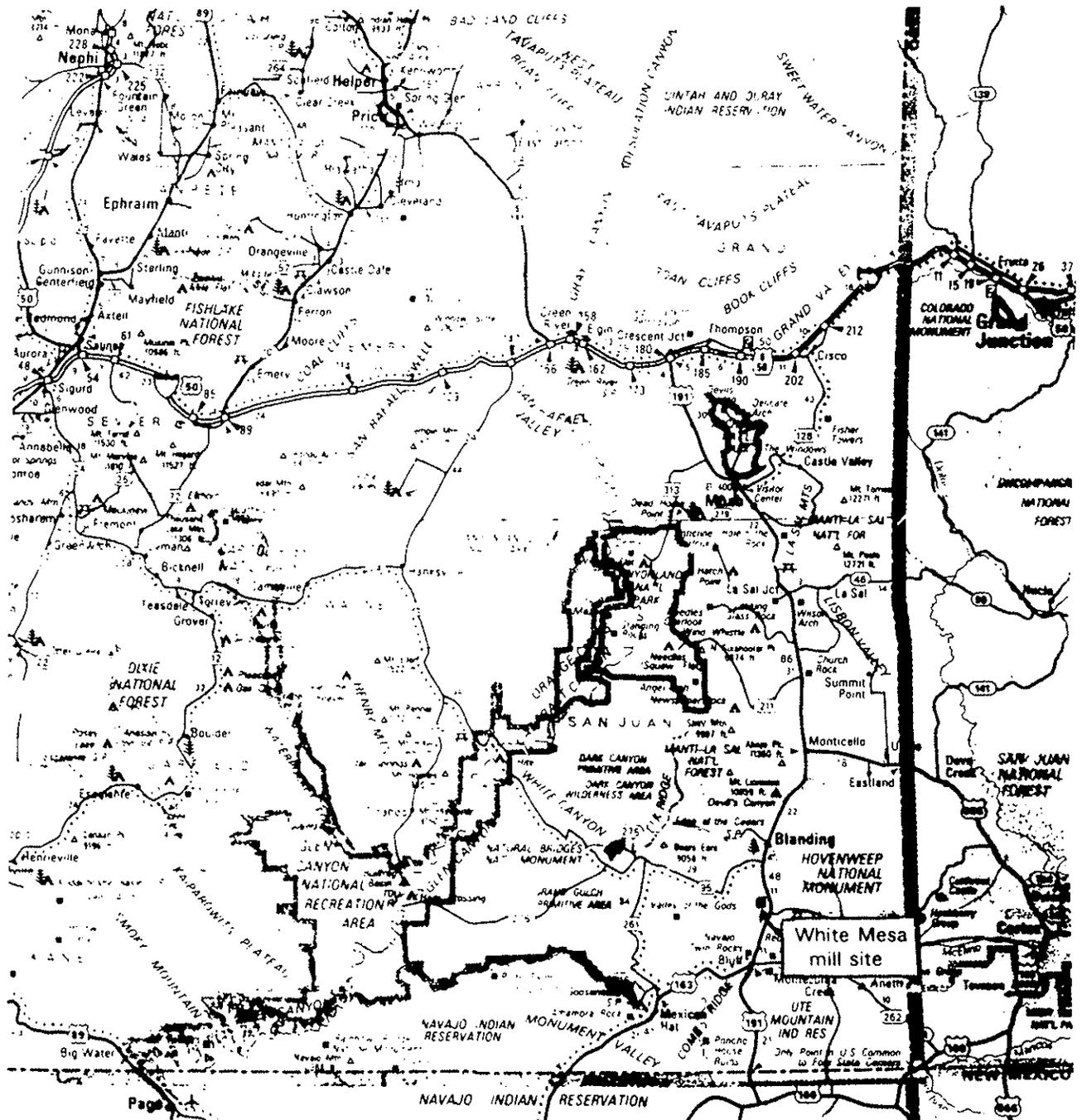


Figure 1.1 Location of the White Mesa Uranium Mill

1.2 Proposed Action

The proposed action is to renew SUA-1358 for operation of the White Mesa mill at a maximum production rate of 4380 tons of yellowcake per year. Additionally, EFN will be authorized, by license condition, to possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by its milling operations authorized by the renewal license.

1.3 Review Scope

1.3.1 **Federal and State Authorities**

NRC source material licenses are issued under Title 10, Code of Federal Regulations, Part 40 (10 CFR Part 40). As stated in 10 CFR 40.3, "A person subject to the regulations in this part may not receive title to, own, receive, possess, use, transfer, provide for long-term care, deliver or dispose of byproduct material or residual radioactive material as defined in this part or any source material after removal from its place of deposit in nature, unless authorized in a specific or general license issued by the Commission ..." Source material is defined under 10 CFR 40.4 as (1) uranium or thorium, or any combination thereof, in any physical or chemical form, or (2) ores which contain by weight 0.05 percent or more of uranium, thorium, or any combination thereof.

In addition, the Uranium Mill Tailings Radiation Control Act of 1978, as amended (UMTRCA), requires persons who conduct uranium source material operations to obtain a byproduct material license to own, use, or possess tailings and wastes generated by the operations (including above-ground wastes from in situ operations). This EA has been prepared under 10 CFR Part 51, "Licensing and Regulatory Policy and Procedures for Environmental Protection," which implements NRC's environmental protection program under the National Environmental Policy Act of 1969 (NEPA). In accordance with 10 CFR Part 51, an EA serves to (a) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI), (b) facilitate preparation of an EIS when one is necessary, and (c) aid the NRC's compliance with NEPA when an EIS is not necessary.

Impacts from the commercial scale operation of the site were previously evaluated in the FES (NRC, 1979). The EA and SER for the previous renewal of SUA-1358 were issued by the NRC staff on September 26, 1985.

A new SER will accompany this EA. In preparing these two documents, the staff will evaluate the potential impacts associated with the continued commercial operation of the White Mesa mill. Should the NRC issue a FONSI, based on the licensee's application materials, previous operational data, and information in the FES and previous EA, a renewed commercial source material license would be issued to EFN.

The State of Utah Department of Environmental Quality (UDEQ) administers and implements the State's rules and regulations.

1.3.2 Basis of NRC Review

The NRC, Division of Waste Management, staff has assessed the environmental and safety impacts associated with the renewal of EFN's commercial license for the White Mesa mill, and documented the results of the assessment in this report. The staff performed this appraisal in accordance with the requirements of 10 CFR Part 51.

In conducting its assessment, the staff considered the following:

- Information contained in the previous environmental evaluations of the White Mesa project (i.e., the 1979 FES and the 1985 EA);
- Information contained in EFN's August 23, 1991, renewal application, and supplementary information submitted by letters dated December 13, 1991; July 28, October 5, and November 22, 1994; and December 13, 1996;
- Information contained in EFN amendment requests, NRC approvals of such requests, and land use and environmental monitoring reports transmitted subsequent to August 23, 1991;
- Personal communications with EFN and UDEQ; and
- Information derived from NRC staff site visits and inspections of the White Mesa mill site.

2.0 SITE DESCRIPTION

2.1 Location

The project site is located in central San Juan County, Utah, approximately 9.5 km (6 miles) south of the city of Blanding. The mill can be reached by taking a private road for approximately 0.5 miles west of Utah State Highway 191.

All operations to be authorized by the renewed license will be conducted within the confines of the existing site boundary. The project site consists of 1971 hectares (ha) (4871 acres) of private land together with mill site claims. The mill site itself occupies approximately 20 ha (50 acres) and the tailings disposal cells another 182 ha (450 acres).

2.2 Climate and Weather

Southeastern Utah's climate is classified as arid, with an average annual precipitation of 30 centimeters (cm) (12 inches), 75 percent of which falls as rain. Two separate rainfall seasons can be distinguished in the area, with the first occurring during late summer and early fall, and the second between the months of December and March. Temperatures in summer normally range from 4°C (40°F) to 32°C (90°F), while winter temperatures range between -9°C (15°F) and 13°C (55°F). The yearly normal mean temperature is 9°C (50°F).

The mean annual relative humidity is 44 percent and is normally highest in January and lowest in July. The average evaporation rate for the period from May through October is 118.8 cm (46.8 inches), with the greatest evaporation occurring normally during the month of July. The dominant wind directions are from the north to northeast (approximately 30 percent of the time) and out of the south to southwest (approximately 25 percent of the time). Wind speeds are generally less than 15 miles per hour (mph), with winds faster than 25 mph occurring less than one percent of the time.

2.3 Geology

2.3.1 Regional Geology

The project site lies within a region designated as the Canyon Lands section of the Colorado Plateau physiographic province. Elevations in the region range from approximately 923 meters (3000 feet) in the bottom of canyons to over 3385 m (11,000 ft) among the peaks of the Henry, Abajo and La Sal Mountains to the northeast. The average elevation for the area, excluding deeper canyons and isolated mountain peaks, is about 1524 m (5000 ft).

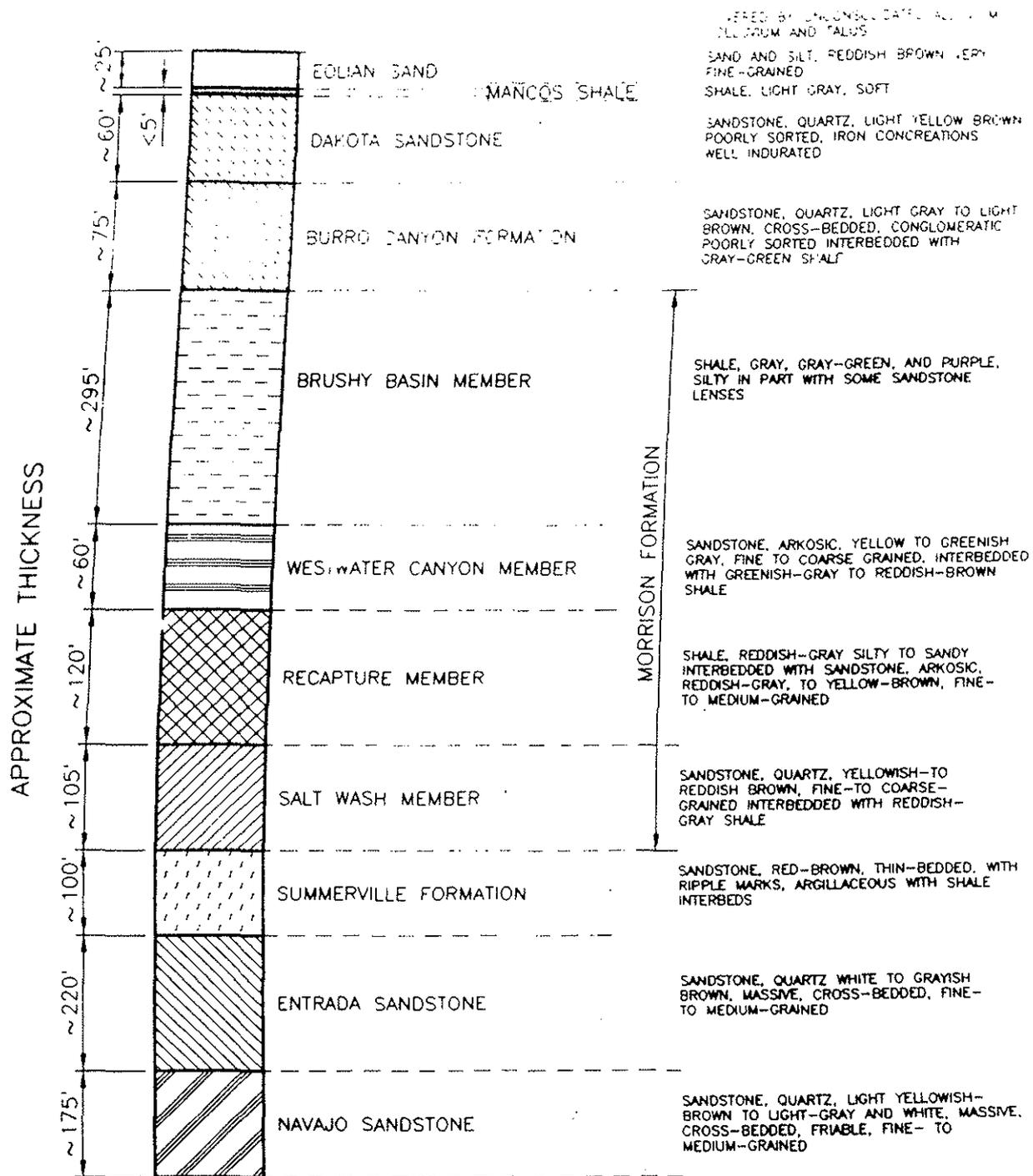
The sedimentary rocks exposed in southeastern Utah have a total thickness of approximately 1828 to 2133 m (6000 to 7000 ft). These sedimentary units range in age from Pennsylvanian to Late Cretaceous; older rock units which underlie those of Pennsylvanian age are not exposed in the project area.

Structural features in the project area have been divided into three main categories on the basis of origin or mechanism of the stress that created the structure. These categories are: (1) structures related to large-scale regional uplifting or downwarping directly related to movements in the basement complex (the Monument Uplift and the Blanding Basin); (2) structures due to diapiric deformation of thick sequences of evaporite deposits, salt plugs and salt anticlines (the Paradox Fold and Fault Belt); and (3) structures formed due to magmatic intrusions (the Abajo Mountains).

A generalized stratigraphic column for the region is provided as Figure 2.1. The Summerville Formation, Entrada Sandstone, and Navajo Sandstone are the deepest units of concern encountered at the site.

2.3.2 Local Geology

The White Mesa mill site is located on the western edge of the Blanding Basin, sometimes referred to as the Great Sage Plain, lying east of the north/south-trending Monument Uplift, south of the Abajo Mountains and adjacent to the northwest-trending Paradox Fold and Fault Belt. The Abajo Mountains are the most prominent topographic feature in the region, rising over 1219 m (4000 ft) above the surface of the plain. The lithology of the immediate area is composed of thousands of feet of multi-colored pre-Tertiary age marine and non-marine sedimentary rocks. Erosion on the regionally-uplifted sedimentary strata has produced an array of spectacularly eroded canyons and mesas for which the area is famous.



NOTE:

1. THIS DRAWING IS NOT TO SCALE.
2. ALL THICKNESSES ARE APPROXIMATE.

Figure 2.1 Generalized Stratigraphic Column for the White Mesa Mill Site (after Titan, 1994b)

The mill rests on alluvial windblown silt and sand which covers sandstones and shales of Jurassic and Cretaceous age. The surface of the mesa is nearly flat, with a surface relief of 30 m (98 ft). The maximum relief between White Mesa and the adjacent Cottonwood Canyon is about 230 m (750 ft).

2.3.3 Seismicity

The historical record of seismicity for the region is about 150 years old. Since 1853, approximately 1200 seismic events have been recorded within 322 km (200 miles) of the project area. The nearest of these events occurred in the Glen Canyon Recreation Area, 63 km (38 miles) away, and at a location approximately 88 km (53 miles) to the northeast of the site. An intensity V (Modified Mercalli Scale) event occurred on August 29, 1941, just east of Durango, Colorado, 153 km (99 miles) away. Based on the region's seismic history, the probability of a major damaging earthquake occurring at or near the site is remote.

2.4 Water Resources

2.4.1 Surface Water

Runoff in the project area is directed by the general surface topography either westward into Westwater Creek, eastward into Corral Creek, or to the south into an unnamed branch of Cottonwood Wash. Low average annual rainfall, local soil characteristics, and the porous nature of local stream channels cause these streams to flow intermittently in response to local snowmelt and rainstorms. These same conditions, in concert with the gentle slope of White Mesa, also contribute to the lack of perennial surface waters on or in the vicinity of the site.

North of the site, a small drainage area of approximately 25 ha (62 acres) provides limited surface runoff to the site. Total runoff from the site is estimated to be less than 1.3 cm (0.5 inches) annually.

The San Juan River, a major tributary to the upper Colorado River, is located approximately 29 km (18 miles) south of the mill site.

2.4.2 Groundwater

The Dakota Sandstone is the rock unit that underlies the mill and the tailings disposal cells. At the mill site, this formation extends to depths of 13 to 20 m (43 to 66 feet) below the surface, and it is typically composed of sandstones with random discontinuous shale and siltstone layers. Beneath the site, the Dakota Sandstone is very dry to dry, with an average volumetric water content of 3 percent. Its porosity is predominately intergranular, ranging from 13.4 to 26.0 percent, with an average value of 19.0 percent. Measured saturated hydraulic conductivities from packer tests range from 9.1E-04 to 2.71-E06 centimeters per second (cm/sec), with a geometric mean of 3.89E-05 cm/sec. (Titan, 1994b)

The underlying Burro Canyon Formation is similar to the Dakota Sandstone. Composed of very fine- to coarse-grained sandstones, with discontinuous random shales, the Burro Canyon becomes argillaceous near its lower contact with the bentonitic mudstones and claystones of the Brushy Basin Member (Morrison Formation). Beneath the site, groundwater is first encountered at this contact as a zone of perched water. This zone occurs at depths of 22 to 33 m (73 to 109 feet) below the surface, and its thickness varies across the project area, from 17 m (55 feet) in the northern section to less than 1.5 m (5 feet) in the southern area. Potentiometric maps suggest that the predominant direction of groundwater flow in the saturated portion of the Burro Canyon Formation beneath the site is to the south-southwest (Titan, 1994b).

The Burro Canyon outcrops along the walls of Westwater Creek Canyon and Corral Canyon, and groundwater from the perched zone discharges into these canyons, as evidenced by the occurrence of springs and productive vegetation patterns. Based on the results of 12 pumping/recovery tests and 30 packer tests, the hydraulic conductivity of the saturated portion of the Burro Canyon Formation ranges from $1.4\text{E-}06$ to $1.2\text{E-}03$ cm/sec, with a geometric mean of $1.0\text{E-}05$ cm/sec (Titan, 1994b). Water yields at the test wells were very low, typically less than 0.5 gallons per minute (gpm), although slightly higher yields (on the order of 2 gpm) may be possible in localized zones of higher permeability, resulting from lenses of coarser material or localized fracturing.

The quality of the Burro Canyon perched water beneath and downgradient from the site is poor and extremely variable. The concentrations of total dissolved solids (TDS) measured in water sampled from upgradient and downgradient wells range between approximately 1000 and 5000 milligrams per liter (mg/l). Sulfate concentrations measured in three upgradient wells varied between 670 and 1740 mg/l.

As stated above, the Brushy Basin Member of the Morrison Formation is composed of bentonitic mudstones and claystones. In the region, the thickness of this unit ranges from 60 to 135 m (200 to 450 feet). A total of approximately 365 m (1200 feet) of unsaturated, low permeability shales and poorly sorted sands of the Morrison and Summerville Formations separate the Brushy Basin from the underlying Entrada and Navajo Sandstones.

The Entrada and Navajo Sandstones are prolific aquifers beneath and in the vicinity of the site. Water wells at the site are screened in both of these units, and therefore, for the purposes of this discussion, they will be treated as a single aquifer. Water in the Entrada/Navajo Aquifer is under artesian pressure, rising 245 to 275 m (800 to 900 feet) above the top of the Entrada's contact with the overlying Summerville Formation; static water levels are 120 to 150 m (400 to 500 feet) below ground surface. Within the region, the aquifer is capable of yielding domestic quality water at rates of 150 to 225 gpm, and for that reason, it serves as the source of water for the mill. Additionally, two domestic water supply wells drawing from the Entrada/Navajo Aquifer are located 4.5 miles southeast of the mill site on the Ute Indian Reservation.

2.5 Topography

The mill site is located on a slightly tilted platform that, from the air, appears similar to a peninsula, as it is surrounded by steep canyons and washes and is connected to the Abajo Mountains to the north by a narrow neck of land. On the mesa, the topography is relatively flat, sloping at less than one percent to the south and nearly horizontal from east to west.

2.6 Demography

According to the 1990 census, the population density of San Juan County, in which the mill is located, is 0.6 persons per square kilometer (1.6 individuals per square mile); by comparison, the statewide density is greater than 8 individuals per square kilometer (20 persons per square mile). The town of Blanding, Utah, approximately 9.5 km (6 miles) north of the mill, is the largest population center near the project with 3162 persons. Approximately 5.6 km (3.5 miles) southeast of the project site is the White Mesa Reservation, a community of approximately 320 Ute Mountain Indians, although only an estimated 60 to 75 individuals live within 8 km (5 miles) of the site. The nearest resident is located approximately 5 km (3 miles) to the northeast of the mill, which is in the prevailing wind direction. Table 2.1 provides population centers located within 60 km (37 miles) of the mill site.

2.7 Land Use

Approximately 60% of San Juan County is Federally-owned land administered by the U.S. Bureau of Land Management, the National Park Service, and the U.S. Forest Service. Primary land uses includes livestock grazing, wildlife range, recreation, and exploration for minerals, oil, and gas. A quarter of the county is Indian land owned either by the Navajo Nation or the Ute Tribe. The area within 8 km (5 miles) of the project site is predominantly range land owned by residents of Blanding. The White Mesa mill site itself encompasses approximately 202 ha (500 acres).

A more detailed discussion of land use at the White Mesa site, in surrounding areas, and in southeastern Utah, is presented in the FES prepared for the project (NRC, 1979). Results of archeological studies conducted at the site and in the surrounding areas as part of the original environmental report are also documented in the FES.

EFN is currently required by license condition to conduct an annual land use survey of the area within 8 kilometers (5 miles) of the site and to submit a report of the survey to NRC. However, this survey is not required by the regulations, and therefore, with this renewal, NRC will drop this condition from the license. EFN is already required to comply with annual dose limits to individual members of the public (10 CFR 20.1301), and its demonstrations of compliance address observed changes in land use.

| Table 2.1 Population Centers within 60 Kilometers of the White Mesa Mill Site (modified from Umetco, 1991) | | | |
|--|------------------|--------------------------|----------------------------|
| Town | 1990 Population | Distance from Site (km)* | Distance from Site (miles) |
| White Mesa, UT (unincorporated) | 320 [†] | 6.4 | 4 |
| Blanding, UT | 3162 | 9.5 | 6 |
| Bluff, UT | 847 | 25 | 15 |
| Montezuma Creek, UT | 1223 | 32 | 20 |
| Monticello, UT | 1806 | 43 | 27 |
| Aneth, UT | 991 | 43 | 27 |
| Mexican Hat, UT | 495 | 48 | 30 |
| Eastland/Ucolo, UT | 249 | 51 | 32 |
| Dove Creek, CO | 623 | 59 | 37 |
| * Approximate distance from mill site by air † Approximate population | | | |

3.0 PROCESS DESCRIPTION

A simplified flow diagram of the White Mesa mill circuit is provided as Figure 3.1.

3.1 Mill Circuit

Ore and other feed material is delivered to the site by truck. Once at the site, following weighing of the truck, an ore load is dumped at a specific location on the ore pad. Preliminary analyses are then conducted, and the moisture content of the ore determined. Loaders or trucks then haul stockpiled ore to the ore grizzly.

A semi-autogenous grinding (SAG) mill is used to grind the ore, and the resultant slurry is pumped to two mechanically-agitated storage tanks. Material from these tanks is pumped to a two-stage acid leach process, in which sulfuric acid, an oxidant, and steam are used to leach the ore slurry.

Next, a multi-staged counter-current decantation (CCD) washing circuit is employed to separate the strong acid liquor and wash the leached residue. During each CCD stage, solid particles settle to the bottom of the thickener tank, leaving a clarified uranium-bearing solution at the top. This solution is transferred "up-stage," where the same process of decantation takes place. Overflow from the top (i.e., the first) CCD thickener tank is sent to the two-stage leach process mentioned above, the overflow of which is clarified prior to

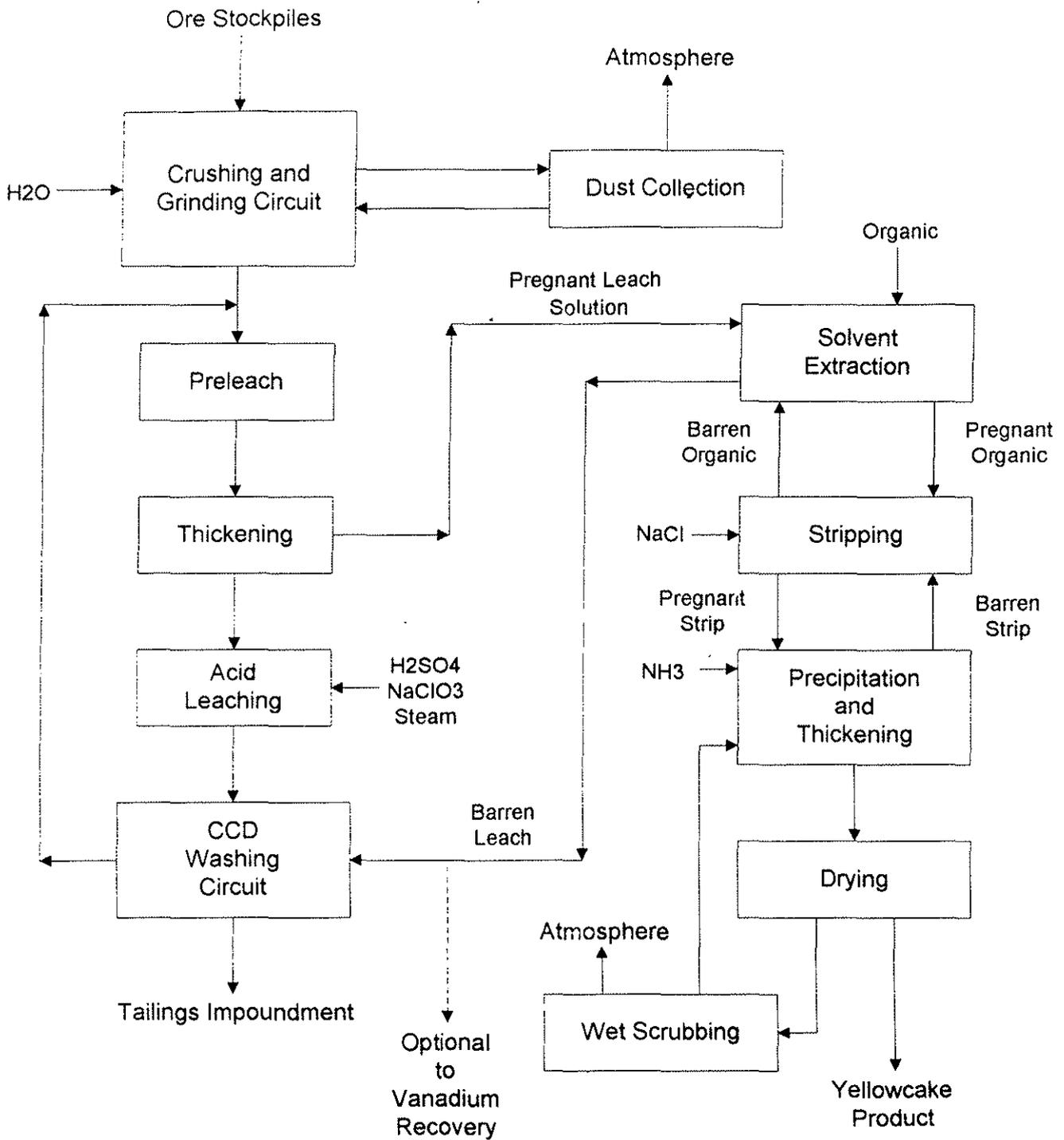


Figure 3.1 Generalized Flow Diagram of the Uranium Milling Process for the White Mesa Mill (modified from NRC, 1979)

solvent extraction. The slurry at the bottom of the tank is progressively transferred "down" the circuit. From the final thickener tank, it is sampled and then pumped to the tailings retention area.

Meanwhile, the uranium-bearing liquid is transferred to a solvent extraction process which is carried out in a series of mixing and settling vessels. Amine-type compounds and kerosene are added to dissolve the uranyl ions from the leach solution. The solution is then stripped of uranium by acidification and pumped to a precipitation tank.

Within the precipitation tank, the pregnant solution is neutralized and yellowcake is settled. The yellowcake is next transferred to a centrifuge where it is further concentrated. The thickened yellowcake slurry is transferred to either of two propane gas/diesel-fired multiple-hearth dryers. Both dryers feed to a common packaging hopper and drum filling station, where the dried yellowcake is powdered and packaged in 55-gallon drums.

These drying, powdering, and packaging operations are performed within an enclosure under negative pressure, with wet scrubbers used to collect airborne particulates. During the entire route of production, concrete curbing and sumps are designed to intercept any spillage and return it to the appropriate process circuit.

3.2 Mill Waste Disposal

Mill tailings are deposited within tailings cells located at the facility. The tailings, along with liquid waste, are slurried by pipeline to the impoundment system, which consists of a series of synthetically-lined cells that are designed for phased construction and reclamation. Cells are presently designated 1-1, 2, 3, and 4A (the higher the number refers to the more recently constructed cell).

The four tailings cells are designed to accept the quantity of waste to be produced during a 15-year operating period, at an ore processing rate of 2000 tons per day. The tailings and evaporation cells are designed and constructed as partially below-grade disposal facilities. Any change in the maximum operational freeboard and tonnage limits for the cells, as specified in the renewal application, will continue to require NRC approval due to the safety and environmental concerns involved. EFN also implements procedures to minimize dispersal of blowing tailings.

Each cell has a leak detection system designed to provide an early warning of catastrophic liner failure. These systems are checked daily as part of the tailings disposal system monitoring program, which also includes checks on slurry pipeline connections and wear, cell fluid levels, liner integrity, and the effectiveness of dust minimization methods. Each tailings cell embankment is also regularly monitored for stability and the results reported to NRC. Tailings Cell 4A was designed, constructed, and placed into operation in 1990, according to an NRC-approved plan and in accordance with U.S. Environmental Protection Agency (EPA) regulations.

As stated above, all production spillage or wastes, such as tailings and process water, are either returned to the mill circuit or sent by pipeline to the appropriate tailings impoundment, while sanitary wastes are disposed of separately in a State-approved

seepage system. This is currently required by license condition and will continue to be so required.

EFN will continue to be required to dispose of mill-generated waste considered as 11e.(2) byproduct material (e.g., contaminated equipment and parts) within Tailings Cell 2, in accordance with its procedure, "Radioactive Contaminated Waste Disposal," amended as noted in NRC's approval letter of August 1, 1995. EFN also disposes of uncontaminated wastes in Cell 2.

EFN is authorized currently to accept byproduct material from licensed in-situ leach facilities for disposal in Tailings Cell 3. Conditions of this authorization will continue to be specified by license condition. Environmental impacts associated with this disposal were assessed as part of the NRC licensing action approving EFN's amendment request.

4.0 EVALUATION OF ENVIRONMENTAL IMPACTS

4.1 Introduction

Operation of the mill will directly use about 202 ha (500 acres) of land for mill buildings and tailings cells. During operation, effluent releases (e.g., fugitive dust, hydrocarbons, radionuclides) will be maintained at levels as low as is reasonably achievable. Tailings, which are produced in large quantities and contained in lined disposal cells, will be reclaimed at the end of the project, in accordance with an NRC-approved reclamation plan. Mill operations should not, under proper operating conditions, have a significant impact on air and water quality. Environmental impacts associated with the original construction of the facility were assessed in the FES (NRC, 1979).

4.2 Air Quality Impacts

During operation of the mill, hydrocarbon release from the boiler, gaseous emissions from process chemicals, and fugitive dust and radon emissions from the ore pads will occur. Dust and radon levels will be controlled through spraying, while the other gaseous emissions should not exceed regulatory standards. Other emissions will be discussed in Section 4.6, "Radiological Impacts."

4.3 Historical and Cultural Resources

A historical survey was conducted in the project vicinity as part of the initial license application, and six historical sites were identified. However, none of these sites is in an area which will be affected by operations at the mill.

Archaeological surveys of the project site conducted in 1977 and 1979, identified 121 prehistoric sites which are affiliated with the San Juan Anasazi Indians who occupied this area of Utah from about 0 A.D. to 1300 A.D. As a result of the archaeological findings, a Memorandum of Agreement (MOA) between NRC, the Utah State Historic Preservation Officer, and the Advisory Council on Historic Preservation was established to specify requirements necessary to minimize adverse impacts to the previously identified archaeological sites.

The requirements were incorporated into SUA-1358 when initially issued. The requirements have been modified following subsequent amendments to the MOA. The most recent modifications were incorporated into SUA-1358 through the issuance of a license amendment on May 11, 1983. These requirements will be included in the renewed license.

The licensee will also be required to conduct, as a minimum, an archaeological and historical artifact survey of areas not previously surveyed prior to their disturbance.

4.4 Impacts to Water Resources

4.4.1 **Surface Water Impacts**

Continued operation of the mill should have negligible impacts on surface waters on and in the vicinity of the project site, because (1) mill effluents are not discharged to local surface waters; (2) sanitary wastes are discharged to State-approved leach fields; and (3) tailings from mill operations are discharged by pipeline to partially below-grade, lined impoundments. In addition, as noted above, EFN has committed to regular inspections of the tailings disposal system, including disposal cell embankments.

4.4.2 **Groundwater Impacts**

For the following reasons, the NRC staff does not believe that groundwater beneath or in the vicinity of the site will be adversely impacted by continued operation of the mill:

1. Four tailings cell have been constructed to accept tailings slurry and solutions and other approved wastes. Each of the cells has been designed and constructed to minimize seepage of tailings fluids into the subsurface. Cells 1-1, 2, and 3 have a 6-inch compacted sandstone bedding layer, an overlying synthetic liner, and a leak detection system consisting of: (1) a 12-inch thick compacted sand layer on the upstream face of the downstream retention dike, (2) a 3-inch diameter perforated pipe installed at the toe of the sand layer, and connecting to (3) a 12-inch diameter access riser pipe.

Cell 4A is constructed with a 12-inch thick clay base layer overlain by a synthetic liner covering both the bottom and side slopes of the cell. A leak detection system is located beneath the synthetic liner. This system is composed of 4-inch perforated pipes embedded in granular materials in synthetically-lined trenches excavated into the clay base. These pipes are connected in turn to a 12-inch diameter access pipe.

As part of EFN's inspection procedures for the tailings management system, daily measurements are taken of liquid levels in the leak detection system for each cell. If specific changes in these levels are recorded, site management is notified immediately. Quarterly sampling of a number of monitor wells completed in the Burro Canyon perched water zone and located around and among the tailings cells, is also required by EFN's inspection procedures. Further discussion of the licensee's groundwater detection monitoring program is provided in Section 4.6.1.

2. Based on estimates of net infiltration and volumetric moisture content of the vadose zone (i.e., the unsaturated portions of the Dakota and Burro Canyon Sandstones) and an average thickness of the vadose zone, EFN estimates that it would take 50 to 150 years for moisture to travel from the bottom of a tailings disposal cell to the perched water zone, depending on the extent of failure of the tailings disposal cell liner (Titan, 1994). Tailings disposal cell seepage traveling along joints or fractures in the Dakota Sandstone could potentially reduce this travel time to a few days or months. Jointing is common in the Dakota along the mesa's rim; however, coring studies to date have revealed no evidence of continuous fractures or joints with depth. Once in the saturated portion of the Burro Canyon, the travel time for seepage from a tailings impoundment to the downgradient edge of the mesa has been estimated at 8900 to 13,400 years (Titan, 1994b).
3. The Morrison and Summerville Formations form an approximately 1200-foot thick low-permeability barrier to ground water flow separating the Entrada/Navajo Aquifer from the Burro Canyon perched zone. The NRC staff considers that this barrier makes it unlikely that constituents from the tailings disposal cells would ever impact water quality of this aquifer.

4.5 Impacts on Ecological Systems

4.5.1 **Endangered Species**

In the vicinity of the site, four animal species classified as either endangered or threatened (i.e., the bald eagle (*Haliaeetus leucocephalus*), the American peregrine falcon (*Falco peregrinus anatum*), the black-footed ferret (*Mustela nigripes*), and the Southwestern willow flycatcher (*Empidonax traillii extimus*)) could occur. While the ranges of the bald eagle, peregrine falcon, and willow flycatcher encompass the project area, their likelihood of utilizing the site is extremely low. The black-footed ferret has not been seen in Utah since 1952 and is not expected to occur any longer in the area.

No populations of fish are present on the project site, nor are any known to exist in the immediate area of the site. Four species of fish designated as endangered or threatened occur in the San Juan River 29 km (18 miles) south of the site. There are no discharges of mill effluents to surface waters, and therefore, no impacts are expected for the San Juan River due to operations of the White Mesa mill.

Currently, no designated endangered plant species occur on or near the plant site.

4.5.2 **Wetlands**

No true wetlands exist on the project site. Two small catch basins approximately 18 m (60 feet) in diameter, fill for brief times in the fall or spring if heavy rainfall occurs. These catch basins are the only "aquatic" habitat found on the project site, and they more properly represent terrestrial environments. No wetland plants have been found in these basins.

4.6 Radiological Impacts

4.6.1 Operating Data

Sampling results discussed in this section were provided by the licensee in accordance with the requirements of 10 CFR 40.65, as modified by license conditions currently in SUA-1358. The renewal license will retain these same license conditions, which address: (1) stack sampling, (2) surface water sampling, (3) groundwater sampling, (4) lower limits of detection, and (5) inspections and calibrations of the critical orifice assembly.

a. Air Particulate Sampling

EFN's air particulate monitoring program consists of continuous environmental sampling stations at four locations, three of which are located at the site boundary, and one at the nearest residence, which is 5 km (3 miles) northeast of the site. Samples are collected quarterly and analyzed for U-nat, Th-230, Ra-226, and Pb-210.

Data collected during continuous mill operations in 1989-90, and again in 1995-96, indicated that measured concentrations of U-nat, Th-230, Ra-226, and Pb-210 were small fractions (i.e., less than ten percent) of the appropriate 10 CFR Part 20 limits for unrestricted areas. Concentrations of these radionuclides measured at the BHV-5 sampling station tended to be elevated during mill operations due to increased dust from the ore stockpile and the increased traffic around the ore stockpile and mill areas.

b. Stack Effluent Sampling

During operations, stack sampling is performed quarterly on the yellowcake stacks (i.e., the dryer and baghouse stacks) and semi-annually on the grizzly and demister stacks. Stack samples are analyzed for U-nat, Th-230, Ra-226, and Pb-210. Measurements performed in 1989 and 1995-96 indicate that emissions of these radionuclides have been consistently low. In addition, measurements of product loss through the yellowcake stacks have been well below levels originally predicted in the FES for the facility (NRC, 1979).

c. Radon Gas Monitoring

Environmental monitoring for radon gas using thermoluminescent dosimeters (TLDs) was discontinued with NRC approval in September 1995. The licensee will demonstrate compliance with the 10 CFR Part 20 annual dose limit of 100 mrem through MILDOS-AREA modeling calculations.

The licensee will still be required to keep radon-222 emissions from an existing mill tailings pile from exceeding 20 pCi/m²-s of radon-222, in accordance with the requirements of 40 CFR 61.252.

d. Direct Gamma Exposure

Direct radiation exposure measurements are made quarterly at the four air particulate monitoring stations. The greatest differential between measured exposure rate and background for the same time period since 1989 was 8.6 mR/qtr. However, measured exposure rates are normally at or slightly above or below background rates.

e. Surface Water Sampling

Surface water monitoring is conducted at two sampling locations, known as Westwater Canyon and Cottonwood Creek, adjacent to the mill. Grab samples are collected annually from Westwater Canyon and quarterly from Cottonwood Creek. The samples are analyzed for total and dissolved U-nat, Ra-226, and Th-230, as well as for pH, specific conductivity, temperature, total dissolved and suspended solids, gross alpha concentrations. Measured values for these constituents and parameters over the period of mill operations since 1980 have been consistently low.

f. Ground Water Sampling

Groundwater monitoring samples have been collected quarterly from seven monitoring wells and the culinary water well. These samples were analyzed for pH, specific conductance, chlorides, sulfates, TDS, and U-nat, and water level measurements were also taken. Groundwater samples were analyzed semiannually for arsenic, selenium, sodium, Ra-226, Th-230, and Pb-210. No trends are apparent from measurements taken since 1985.

With this license renewal, EFN proposed that groundwater detection monitoring be conducted in accordance with the program described in the document entitled, "Points of Compliance, White Mesa Uranium Mill," submitted by letter dated October 5, 1994. Under this program, samples will be collected quarterly from five "point of compliance" (POC) wells, completed in the Burro Canyon Formation (wells WMMW-5, -11, -12, -14, and -15) (see Figure 4.1). These samples will be analyzed for chloride, potassium, and nickel, and water level measurements also will be taken. EFN selected these indicator parameters, because the concentrations of these species are significantly higher in the tailings pond fluid than in the perched water of the Burro Canyon, and they are representative of both anionic and cationic species.

The data will be analyzed using the Shewhart-Cusum control chart technique. These charts have been developed on a well-by-well basis, with a separate control chart for each of the four indicator parameters. If limits on the control charts are exceeded for a parameter at a well, a program of confirmatory sampling will commence. This will involve monthly sampling for six months; a separate analysis-of-variance technique will be employed to determine whether there is a significant difference between these samples and those collected prior to the confirmatory

sampling program. If the data are significantly different, then a corrective action plan will be developed.

The NRC staff found the proposed groundwater detection monitoring program to be acceptable, with modifications as follows: (1) that well WMMW-17 be included in the sampling program; and (2) that uranium be added as an indicator parameter to be analyzed for. EFN agreed to these modifications in a telephone conversation on December 11, 1996. EFN will be required, by license condition, to conduct its groundwater detection monitoring in accordance with the proposed program, as modified.

Finally, the licensee will continue to be required to (1) analyze liquid found in the leak detection system during weekly inspections for specified constituents; (2) conduct statistical analyses to determine if significant linear trends exist, and (3) propose corrective action for NRC review and approval if such trends do exist.

4.6.2 Radiological Assessment

a. Offsite Impacts

The radiological impacts from milling operations at the White Mesa site have been assessed previously and documented in the FES (NRC, 1979) and the 1985 EA (NRC, 1985a). In the previous EA, the staff analyzed impacts associated with milling at a nominal rate of 2000 tons of ore per day, and an average ore grade of 0.60 percent, for a yellowcake production rate of 4380 tons per year, and determined that both site boundary radionuclide concentrations and individual dose commitments were small fractions of the applicable standards.

As part of its November 22, 1994, amendment request for authorization to install a second dryer, EFN provided updated MILDOS-AREA calculations and results. In approving EFN's request, the NRC staff determined, based on its review of the MILDOS-AREA results, that releases from the mill would not result in a member of the public receiving a radiation dose in excess of the 10 CFR Part 20 limit (i.e., 100 mrem per year).

It should be noted that actual radiation doses to the public will likely be less than modeled, because EFN normally processes lower grade ores, at a rate less than 2000 tons of ore per day.

b. Radiological Impact on Biota Other than Humans

Although no guidelines concerning acceptable limits of radiation exposure have been established for the protection of species other than man, it is generally agreed that the limits for humans are also conservative for other species. Doses from gaseous effluents to terrestrial biota (such as birds and mammals) are quite similar to those calculated for man and arise from the same dispersion pathways and considerations. Because the effluents of the facility will be monitored and

maintained within safe radiological protection limits for man, no adverse radiological impact is expected for resident animals.

4.7 In-Plant Safety

The licensee has established and conducts an in-plant safety and radiation safety program. EFN stated that the in-plant safety program meets the requirements of the Mine Safety and Health Administration (MSHA), as well as those pertinent requirements of the Occupational Safety and Health Administration (OSHA). The licensee's operation is based on good safety practices and procedures. During mill operations, EFN has a full-time safety official on staff to meet all safety requirements established by Federal regulations. During routine radiation safety inspections, NRC, to the best of its ability, observes in-plant industrial safety for deficiencies and brings any identified deficiencies to the attention of plant management.

NRC, through 10 CFR Part 20 and license conditions, requires a radiological safety program that contains the basic elements needed to assure that exposures are kept low or, in any event, as low as is reasonably achievable (ALARA). Therefore, an in-plant radiation safety program including the following is required:

- Qualified management of the radiation safety program and appropriate training of personnel;
- Written radiation procedures;
- Airborne and surface contamination sampling and monitoring;
- Internal and external radiation monitoring programs;
- An approved respiratory protection program; and
- An annual ALARA audit and frequent in-house inspections.

NRC considers the program of in-plant safety, as required by Federal regulations, and the radiation safety program as defined by 10 CFR Part 20 to be sufficient to protect the worker during normal operations. The NRC evaluation of the licensee's radiation safety program is discussed more fully in the SER.

5.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS

5.1 Failure of Chemical Storage Tanks

At the mill, tanks are used to store a variety of industrial chemicals, process fluids, and slurries, as well as flammable liquids. Various systems have been implemented to contain or direct routine or unplanned spillage. Tanks which are most likely to overflow are equipped with high-level alarms to reduce the possibility of spillage due to tank overflow. Spills resulting from the failure of any chemical holding tank would first be contained by engineered dikes or curbs. If the volume was too great, such as that from a rupture in one

or more of the large production tanks, flow would be captured by a lined catchment basin west of the mill, with a capacity of 1.5 million gallons. As a final containment, if all liquids within the mill process storage area escaped, Cell No. 1-I is engineered to capture this kind of catastrophic flow.

5.2 Fires and Explosions

The most likely place for a fire to occur would be in the solvent extraction building or in the yellowcake or vanadium dryers. The possibility of a fire as a result of an explosion in the yellowcake dryer and solvent extraction building is remote since Industrial Safety Codes will be strictly enforced. The solvent extraction circuit is located in a separate building due to the large quantities of kerosene present.

Additionally, the warehouse, offices, and solvent extraction building are equipped with sensor-operated fire suppression systems, and hose stations are located in the mill yard. The main water supply tank has a 250,000-gallon reserve for fire fighting, which is connected to an automatically-starting, diesel-fired pump if electrical service is interrupted. All fire suppression systems are routinely checked.

In the event of a line rupture, an explosive ammonia-air mixture could be formed inside the mill and solvent extraction buildings. Constant operator presence, facility emergency procedures, emergency vent fans, and piping sized to reduce potential ammonia release amounts all serve to minimize the potential for such an accident.

5.3 Pipeline Failure

The rupture of a pipeline between the mill and the tailings impoundments would be caught by automatic alarms or by routine daily inspection. If a leak did occur, no long-term damage would result. The pipelines are situated so that the leaking fluids would be directed into other tailings impoundments. In the event that tailings would leak into an unwanted area, that material could be retrieved by heavy equipment accompanied by appropriate radiological safety precautions, including radiological surveys.

5.4 Minor Pipe or Tank Leakage

Minor leaks resulting from, for example, loose connections in piping or tanks overflowing, will be collected in sumps designed for this type of spill. Sump pumps will be used to return the material to the circuit, and the reason for the spill will be determined and corrected.

5.5 Tailings Impoundment System Accidents

The tailings cells at the White Mesa facility were designed and constructed as partially below-grade impoundments, and in accordance with Regulatory Guide 3.11 and Staff Technical Position WM-8201. Therefore, the potential failure of the cells is considered to be unlikely. In addition, each tailings cell embankment is monitored regularly for stability as part of the licensee's site inspection program, and the results of these inspections are reported to NRC.

6.0 RECLAMATION AND DECOMMISSIONING

Following financial difficulties in February 1995, EFN agreed to voluntarily revise its surety amount to cover reclamation and decommissioning costs for the site in its current state. EFN is pursuing this action in two phases, with the first having been completed in June 1995 with NRC's approval of a revised surety amount of approximately \$10.5 million. In this initial phase, EFN reviewed all major reclamation cost centers, considering the then current level of development and disturbance at the site. In the second phase, EFN is reviewing all elements of the site reclamation plan and will, if necessary, revise the earlier cost estimate.

The licensee is expected to submit the revised site reclamation plan in early 1997 for NRC review and approval. NRC will review the plan in accordance with the requirements of 10 CFR Part 40, Appendix A, and applicable staff guidance documents. Because NRC has yet to receive the reclamation plan, EFN will be required by license condition to provide the plan to NRC by June 30, 1997, for its review and approval in the form of a license amendment.

Site decommissioning will be conducted under a plan approved by NRC. EFN will be required by license condition to submit a detailed decommissioning plan to NRC for approval at least 12 months prior to the planned final shutdown of mill operations.

7.0 ALTERNATIVES

The action under consideration is the renewal of Source Material License SUA-1358, for continued operation of the White Mesa mill, as requested by EFN. The alternatives available to NRC are to:

- (1) Renew the license with such conditions as are considered necessary or appropriate to protect public health and safety and the environment; or
- (2) Deny renewal of the license.

Based on its review of the information identified in Section 1.3.2, the NRC staff has concluded that the environmental impacts associated with the proposed action do not warrant denial of the license renewal. It is the staff's conclusion that the impacts associated with the license renewal are within the realm of impacts anticipated in the FES (NRC, 1979) and the previous EA (NRC, 1985). Additionally, in the SER prepared for this action, the staff has reviewed the licensee's proposed action with respect to the criteria for license issuance specified in 10 CFR Part 40, Section 40.32, and has no basis for denial of the proposed action.

8.0 FINANCIAL SURETY

Under 10 CFR Part 40, Appendix A, Criterion 9, licensees are required to establish a financial surety adequate to cover the estimated costs for (1) decommissioning and decontamination of the mill and mill site, (2) reclamation of any tailings or waste disposal areas, (3) ground water restoration, as warranted, and (4) the long-term surveillance fee.

The surety is based on an estimate which must account for the total costs that would be incurred if an independent contractor were contracted to perform the work. The surety estimate must be approved by NRC and be based on an NRC-approved decommissioning and reclamation plan. The licensee must also provide the surety arrangement through a financial instrument acceptable to NRC. The licensee's surety mechanism will be reviewed by NRC annually to assure that sufficient funds are available to complete reclamation. Additionally, the amount of the surety should be adjusted to recognize any increases or decreases in liability resulting from inflation, changes in engineering plans, or other conditions affecting cost.

The surety for the White Mesa mill is carried by Umetco, under an agreement between EFN and Umetco. The current surety amount of \$10,915,647 was reviewed and approved by NRC in August 1996. EFN will be required by license condition to maintain a financial surety arrangement in accordance with the requirements of Criterion 9. The surety requirements will be reviewed at least annually by NRC to assure that the funds and the surety arrangement are acceptable.

9.0 CONSULTATION WITH THE STATE OF UTAH

A teleconference call was held on January 23, 1997, with representatives of the UDEQ/Divisions of Water Quality and Radiation Control to discuss any comments or concerns the State may have had with the NRC staff's discussions and findings, as documented in a final draft of this EA, which was transmitted electronically to the State on January 3, 1997. Issues raised by UDEQ in these teleconference calls concerned EFN's proposed groundwater detection program, as modified by the staff (see Section 4.6.1).

UDEQ recommended that the NRC require consistency in the set of indicator parameters sampled for in the tailings impoundment and groundwater monitoring programs. UDEQ considered this information to be helpful in determining source term concentrations in the event of an impoundment liner failure. The staff, however, considers that the two sets of indicator parameters monitored for in these programs are appropriate and sufficient to meet their intended purpose. UDEQ agreed. Details of EFN's impoundment monitoring program are discussed in Sections 3.2, 4.4.2, and 4.6.1.

UDEQ expressed a concern about the apparent inconsistency between the groundwater monitoring programs for EFN and the Envirocare site near Clive, Utah. Pointing to differences in the number of indicator parameters to be sampled for and the "triggers" used in determining when compliance monitoring would be required, UDEQ considered that both sites should have similar monitoring programs since both accept 11e.(2) byproduct material for disposal. NRC considers that the difference in the operations of these two sites and the amount of byproduct material accepted by each is appropriate justification for the differences in the monitoring programs.

UDEQ also strongly recommended that NRC require EFN to have a quality assurance (QA) plan as part of its groundwater monitoring program. The NRC staff notes that EFN did include a QA plan as an appendix to its hydrogeologic evaluation report submitted in support of its proposed groundwater monitoring program.

10.0 FINDING OF NO SIGNIFICANT IMPACT

EFN has applied to NRC to renew Source Material License SUA-1358 to authorize continued operations at the White Mesa uranium mill, located in San Juan County, Utah. NRC has reexamined actual and potential environmental impacts associated with yellowcake production at the mill site, and has determined that renewal of the source material license (1) will be consistent with requirements of 10 CFR Part 40, (2) will not be inimical to the public health and safety, and (3) will not have long-term detrimental impacts on the environment.

Therefore, based on an evaluation of EFN's renewal request, the NRC staff has determined that the proper action is to issue a FONSI in the *Federal Register*. The following statements support the FONSI and summarize the conclusions resulting from the staff's environmental assessment:

- An acceptable environmental sampling program is in place to monitor effluent releases and to detect exceedances of appropriate limits;
- The licensee has implemented an intensive, routine inspection program of the mill process building, associated facilities, and tailings retention impoundments, and conducts an annual ALARA audit program;
- Standard operating procedures are in place for all operational process activities involving radioactive materials that are handled, processed, or stored;
- Mill tailings and process liquid effluents from the mill circuit are discharged to partially below-grade, lined tailings impoundments, with leak detection systems;
- The licensee will implement an acceptable groundwater detection monitoring program to ensure compliance with the requirements of 10 CFR Part 40, Appendix A;
- The licensee will conduct site decommissioning and reclamation activities in accordance with NRC-approved plans; and
- Because the staff has determined that there will be no significant impacts associated with approval of the license renewal, there can be no disproportionately high and adverse effects or impacts on minority and low-income populations. Consequently, further evaluation of 'Environmental Justice' concerns, as outlined in Executive Order 12898 and NRC's Office of Nuclear Material Safety and Safeguards Policy and Procedures Letter 1-50, Rev.1, is not warranted.

Based on these findings, the NRC staff recommends that EFN's license for yellowcake production at the White Mesa uranium mill be renewed. The source material license shall be based upon the licensee's renewal application, this EA, the SER, and the license conditions which address environmental issues (see Section 11). License conditions addressing radiation safety concerns can be found in the SER.

11.0 CONCLUSION INCLUDING ENVIRONMENTAL LICENSE CONDITIONS

Upon completion of the environmental review of EFN's application for renewal of Source Material License SUA-1358, the NRC staff has concluded that the operation of the White Mesa uranium mill, in accordance with the following conditions to be included in the renewed source material license, is protective of health, safety, and the environment, and fulfills the requirements of 10 CFR Part 51. Therefore, the NRC staff recommends renewal of SUA-1358, subject, in part, to the following conditions:

1. The mill production rate shall not exceed 4380 tons of yellowcake per year.
2. A. The licensee may, without prior NRC approval, and subject to the conditions specified in Part B of this condition:
 - (1) Make changes in the facility or process, as presented in the application.
 - (2) Make changes in the procedures presented in the application.
 - (3) Conduct tests or experiments not presented in the application.
- B. The licensee shall file an application for an amendment to the license, unless the following conditions are satisfied:
 - (1) The change, test, or experiment does not conflict with any requirement specifically stated in this license, or impair the licensee's ability to meet all applicable NRC regulations.
 - (2) There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan.
 - (3) The change, test, or experiment are consistent with the conclusions of actions analyzed and selected in this EA.
- C. The licensee's determinations concerning Part B of this condition, shall be made by a "Safety and Environmental Review Panel (SERP)." The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have responsibility for implementing any operational changes; and, one member shall be the corporate radiation safety officer (CRSO) or equivalent, with the responsibility of assuring changes conform to radiation safety and environmental requirements. Additional members may be included in the SERP as appropriate, to address technical aspects such as health physics, groundwater hydrology, surface-water hydrology, specific earth sciences, and other technical

disciplines. Temporary members or permanent members, other than the three above-specified individuals, may be consultants.

- D. The licensee shall maintain records of any changes made pursuant to this condition until license termination. These records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining changes are in compliance with the requirements referred to in Part B of this condition. The licensee shall furnish, in an annual report to NRC, a description of such changes, tests, or experiments, including a summary of the safety and environmental evaluation of each. In addition, the licensee shall annually submit to the NRC changed pages to the Operations Plan and Reclamation Plan of the approved license application to reflect changes made under this condition.

The licensee shall submit to NRC by March 31, 1997, for review, the standard operating procedures (SOPs) needed to implement this license condition. The licensee shall not implement any provision of this license condition until NRC has found the proposed SOPs acceptable.

3. Standard operating procedures (SOPs) shall be established and followed for all operational process activities involving radioactive materials that are handled, processed, or stored. SOPs for operational activities shall enumerate pertinent radiation safety practices to be followed. Additionally, written procedures shall be established for non-operational activities to include in-plant and environmental monitoring, bioassay analyses, and instrument calibrations. An up-to-date copy of each written procedure shall be kept in the mill area to which it applies.

All written procedures for both operational and non-operational activities shall be reviewed and approved in writing by the RSO before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the RSO shall perform a documented review of all existing operating procedures at least annually.

4. Before engaging in any activity not previously assessed by the NRC, the licensee shall administer a cultural resource inventory. All disturbances associated with the proposed development will be completed in compliance with the National Historic Preservation Act (as amended) and its implementing regulations (36 CFR 800), and the Archaeological Resources Protection Act (as amended) and its implementing regulations (43 CFR 7).

In order to ensure that no unapproved disturbance of cultural resources occurs, any work resulting in the discovery of previously unknown cultural artifacts shall cease. The artifacts shall be inventoried and evaluated in accordance with 36 CFR Part 800, and no disturbance shall occur until the licensee has received authorization from the NRC to proceed.

The licensee shall avoid by project design, where feasible, the archeological sites designated "contributing" in the report, "Archeological Sites Related to the White

Mesa Project," submitted by letter dated July 28, 1988. When it is not feasible to avoid a site designated "contributing" in the attachment, the licensee shall institute a data recovery program for that site based on the research design submitted by letter from C. E. Baker of Energy Fuels Nuclear to Mr. Melvin T. Smith, Utah State Historic Preservation Officer, dated April 13, 1981.

The licensee shall recover through archeological excavation all "contributing" sites listed in the attachment which are located in or within 100 feet of borrow areas, stockpile areas, construction areas, or the perimeter of the reclaimed tailings impoundment. Data recovery fieldwork at each site meeting these criteria shall be completed prior to the start of any project related disturbance within 100 feet of the site, but analysis and report preparation need not be complete.

Additionally, the licensee shall conduct such testing as is required to enable the Commission to determine if those sites designated as "Undetermined" in the attachment and located within 100 feet of present or known future construction areas are of such significance to warrant their redesignation as "contributing." In all cases, such testing shall be completed before any aspect of the undertaking affects a site.

Archeological contractors shall be approved in writing by the Commission. The Commission will approve an archeological contractor who meets the minimum standards for a principal investigator set forth in 36 CFR Part 66, Appendix C, and whose qualifications are found acceptable by the SHPO.

5. The licensee is hereby authorized to possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by the licensee's milling operations authorized by this license. Mill tailings shall not be transferred from the site without specific prior approval of NRC in the form of a license amendment. The licensee shall maintain a permanent record of all transfers made under the provisions of this condition.
6. All liquid effluents from mill process buildings, with the exception of sanitary wastes, shall be returned to the mill circuit or discharged to the tailings impoundment.
7. Freeboard limits for Cells 1-I, 3, and 4A, and tonnage limits for Cell 3, shall be as stated in Section 3.0 to Appendix E of the approved license application.
8. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground-water restoration as warranted and for the long-term surveillance fee. Within three months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial

surety. The revised surety shall then be in effect within 3 months of written NRC approval.

Annual updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9 and 10, shall be submitted to NRC at least 3 months prior to the anniversary date which is designated as June 4 of each year. If NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement for 1 year. Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed and any other conditions affecting estimated costs for site closure. The basis for the cost estimate is the NRC-approved reclamation/decommissioning plan or NRC-approved revisions to the plan. The previously provided guidance entitled "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates" outlines the minimum considerations used by NRC in the review of site closure estimates. Reclamation/decommissioning plans and annual updates should follow this outline.

The currently approved surety instrument, Irrevocable Letter of Credit No. S00017012, issued by The Bank of New York in favor of NRC, as amended, May 10, 1994, to include a Standby Trust Agreement, shall be continuously maintained by UMETCO in an amount not less than \$10,915,467 for the purpose of complying with 10 CFR 40, Appendix A, Criteria 9 and 10, until a replacement is authorized by NRC.

9. Disposal of material and equipment generated at the mill site shall be conducted as described in the licensee's submittals dated December 12, 1994 and May 23, 1995, with the following addition:
 - A. The maximum lift thickness for materials placed over tailings shall be less than 4-feet thick. Subsequent lifts shall be less than 2-feet thick. Each lift shall be compacted by tracking of heavy equipment, such as a Cat D-6, at least 4 times prior to placement of subsequent lifts.
10. The licensee shall submit a detailed decommissioning plan to the NRC at least twelve (12) months prior to planned final shutdown of mill operations.
11. The licensee shall submit to NRC for review, by June 30, 1997, a detailed reclamation plan for the authorized tailings disposal area which includes the following:
 - A. A post-operations interim stabilization plan which details methods to prevent wind and water erosion and recharge of the tailings area.
 - B. A plan to determine the best methodology to dewater and/or consolidate the tailings cells prior to placement of the final reclamation cover.

- C. Plan and cross-sectional views of a final reclamation cover which details the location and elevation of tailings. The plan shall include details on cover thickness, physical characteristics of cover materials, proposed testing of cover materials (specifications and QA), the estimated volumes of cover materials and their availability and location.
 - D. Detailed plans for placement of rock or vegetative cover on the final reclaimed tailings pile and mill site area.
 - E. A proposed implementation schedule for items A through D above which defines the sequence of events and expected time ranges.
 - F. An analysis to show that the proposed type and thickness of soil cover is adequate to provide attenuation of radon and is adequate to assure long-term stability, as well as an analysis and proposal on methodology and time required to restore ground water in conformance to regulatory requirements.
 - G. The licensee shall include a detailed cost analysis of each phase of the reclamation plan to include contractor costs, projected costs of inflation based upon the schedule proposed in item E, a proposed contingency cost, and the costs of long-term maintenance and monitoring.
12. The licensee shall implement the effluent and environmental monitoring program specified in Section 5.5 of the renewal application as revised with the following modifications or additions:
- A. Stack sampling shall include a determination of flow rate.
 - B. Surface water samples shall also be analyzed semiannually for total and dissolved U-nat, Ra-226, and Th-230, with the exception of the Westwater Creek, which shall be sampled annually for water sediments and analyzed as above. A sediment sample shall not be taken in place of a water sample unless a water sample was not available.
 - C. The licensee shall utilize lower limits of detection in accordance with Section 5 of Regulatory Guide 4.14 (Revision 1), for analysis of effluent and environmental samples.
 - D. The inspections performed semiannually of the critical orifice assembly committed to in the submittal dated March 15, 1986, shall be documented. The critical orifice assembly shall be calibrated at least every 2 years against a positive displacement Roots meter to obtain the required calibration curve.
15. The licensee shall implement a groundwater detection monitoring program to ensure compliance to 10 CFR Part 40, Appendix A. The detection monitoring program shall be in accordance with the report entitled, "Points of Compliance, White Mesa

Uranium Mill," submitted by letter dated October 5, 1994, as modified by the following:

- A. The leak detection system for all ponds will be checked weekly. If liquid is present, it shall be analyzed for chloride, sulfate, selenium, and pH. The samples will be statistically analyzed to determine if significant linear trends exist, and the results will be submitted to NRC for review.

If a significant linear trend is indicated, the licensee will submit a proposed corrective action for review and approval to NRC. The corrective action shall include a discussion on delineation of the areal extent and concentration of hazardous constituents.

- B. The licensee shall sample monitoring wells WMMW-5, -11, -12, -14, -15, and -17, on a quarterly basis. Samples shall be analyzed for chloride, potassium, nickel, and uranium, and the results of such sampling shall be included with the environmental monitoring reports submitted in accordance with 10 CFR 40.65.

REFERENCES

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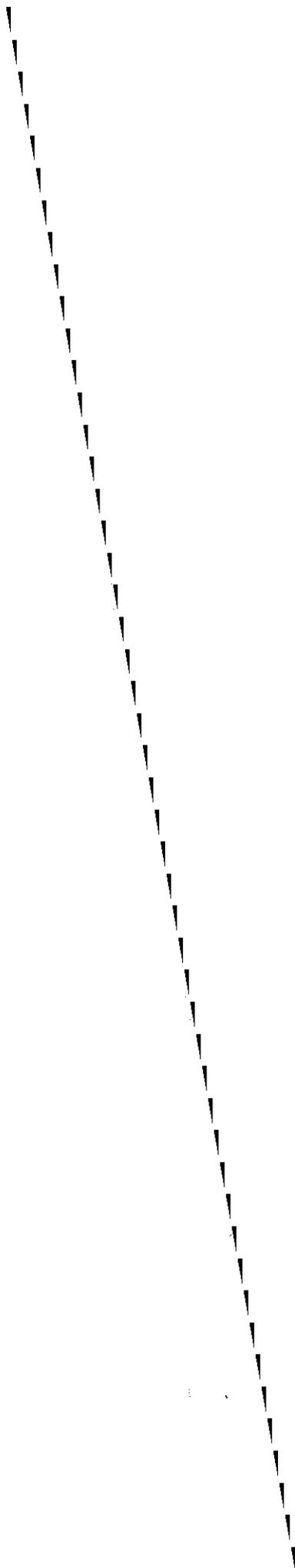
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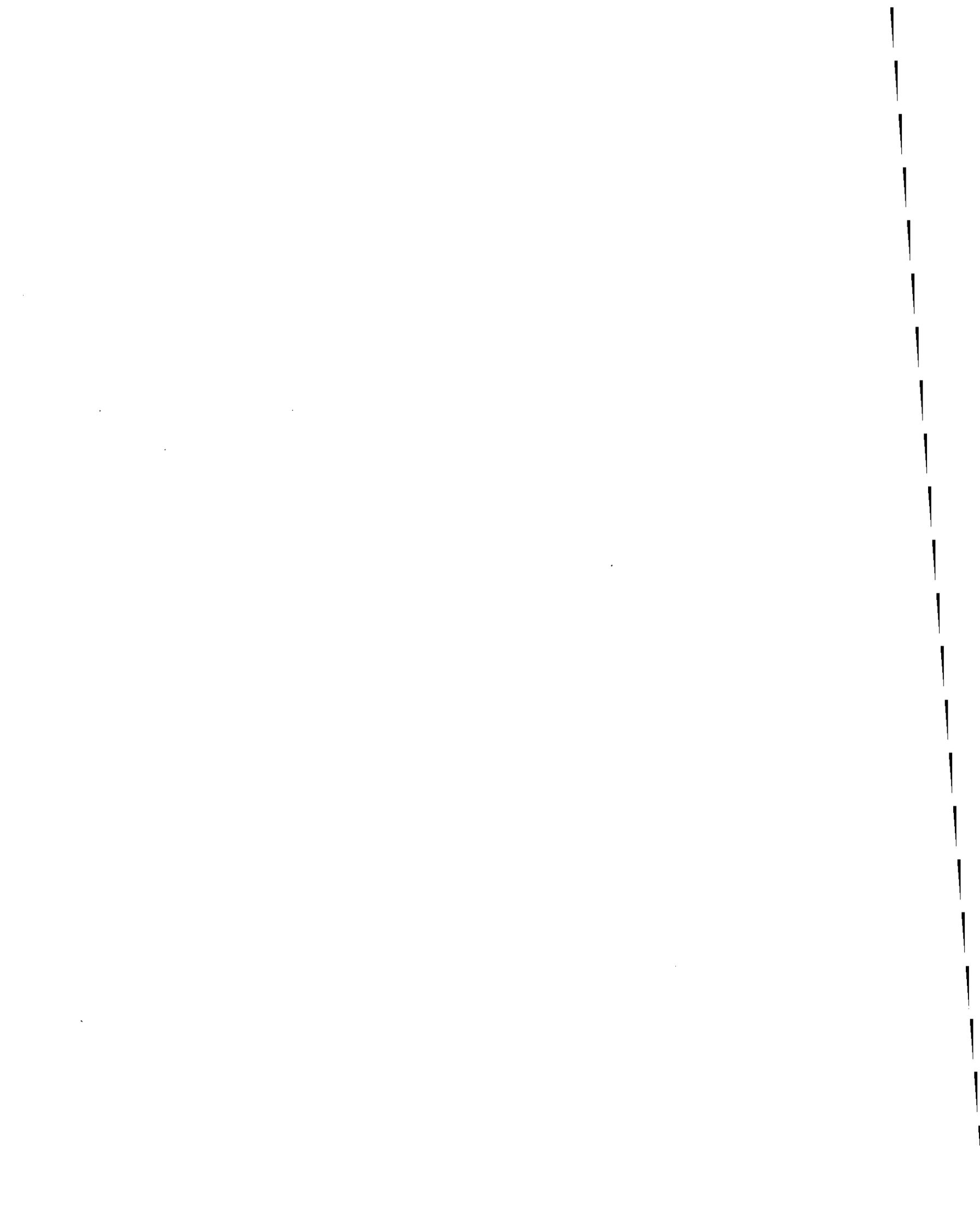
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NRC, 1977, "Design, Construction and Inspection of Embankment Retention Systems for Uranium Mills," NRC Regulatory Guide 3.11, December 1977.

Federal Register Notice:

Finding of No Significant Impact
Notice of Opportunity for Hearing
(62 FR 10091; March 5, 1997)



Building, 2120 L Street, NW., Washington, DC, and at the local public document room located at the Osterhout Free Library, Reference Department, 71 South Franklin Street, Wilkes-Barre, Pennsylvania. If a request for a hearing or petition for leave to intervene is filed by the above date, the Commission or an Atomic Safety and Licensing Board, designated by the Commission or by the Chairman of the Atomic Safety and Licensing Board Panel, will rule on the request and/or petition; and the Secretary or the designated Atomic Safety and Licensing Board will issue a notice of hearing or an appropriate order.

As required by 10 CFR 2.714, a petition for leave to intervene shall set forth with particularity the interest of the petitioner in the proceeding, and how that interest may be affected by the results of the proceeding. The petition should specifically explain the reasons why intervention should be permitted with particular reference to the following factors: (1) The nature of the petitioner's right under the Act to be made a party to the proceeding; (2) the nature and extent of the petitioner's property, financial, or other interest in the proceeding; and (3) the possible effect of any order which may be entered in the proceeding on the petitioner's interest. The petition should also identify the specific aspect(s) of the subject matter of the proceeding as to which petitioner wishes to intervene. Any person who has filed a petition for leave to intervene or who has been admitted as a party may amend the petition without requesting leave of the Board up to 15 days prior to the first prehearing conference scheduled in the proceeding, but such an amended petition must satisfy the specificity requirements described above.

Not later than 15 days prior to the first prehearing conference scheduled in the proceeding, a petitioner shall file a supplement to the petition to intervene which must include a list of the contentions which are sought to be litigated in the matter. Each contention must consist of a specific statement of the issue of law or fact to be raised or controverted. In addition, the petitioner shall provide a brief explanation of the bases of the contention and a concise statement of the alleged facts or expert opinion which support the contention and on which the petitioner intends to rely in proving the contention at the hearing. The petitioner must also provide references to those specific sources and documents of which the petitioner is aware and on which the petitioner intends to rely to establish those facts or expert opinion. Petitioner

must provide sufficient information to show that a genuine dispute exists with the applicant on a material issue of law or fact. Contentions shall be limited to matters within the scope of the amendment under consideration. The contention must be one which, if proven, would entitle the petitioner to relief. A petitioner who fails to file such a supplement which satisfies these requirements with respect to at least one contention will not be permitted to participate as a party.

Those permitted to intervene become parties to the proceeding, subject to any limitations in the order granting leave to intervene, and have the opportunity to participate fully in the conduct of the hearing, including the opportunity to present evidence and cross-examine witnesses.

A request for a hearing or a petition for leave to intervene must be filed with the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Docketing and Services Branch, or may be delivered to the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC, on or after the above date. Where petitions are filed during the last 10 days of the notice period, it is requested that the petitioner promptly so inform the Commission by a toll-free telephone call to Western Union at 1-(800) 248-5100 (in Missouri 1-(800) 342-6700). The Western Union operator should be given Datagram Identification Number N1023 and the following message addressed to John F. Stolz: petitioner's name and telephone number; date petition was mailed; plant name; and publication date and page number of this Federal Register notice. A copy of the petition should also be sent to the Office of the General Counsel, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to Jay Silberg, Esquire, Shaw, Pittman, Potts and Trowbridge, 2300 N Street NW, Washington, DC 20037, attorney for the licensee.

Nontimely filings of petitions for leave to intervene, amended petitions, supplemental petitions and/or requests for hearing will not be entertained absent a determination by the Commission, the presiding officer or the presiding Atomic Safety and Licensing Board that the petition and/or request should be granted based upon a balancing of the factors specified in 10 CFR 2.714(a)(1)(i)-(v) and 2.714(d).

If a request for a hearing is received, the Commission's staff may issue the amendments after it completes its technical review and prior to the completion of any required hearing if it publishes a further notice for public

comment of its proposed finding of no significant hazards consideration in accordance with 10 CFR 50.91 and 50.92.

For further details with respect to this action, see the application for amendments dated February 11, 1997, which is available for public inspection at the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC, and at the local public document room located at the Osterhout Free Library, Reference Department, 71 South Franklin Street, Wilkes-Barre, Pennsylvania.

Dated at Rockville, Maryland, this 28th day of February 1997.

For the Nuclear Regulatory Commission.

John F. Stolz,

Director, Project Directorate I-2, Division of Reactor Projects—I/II, Office of Nuclear Reactor Regulation.

[FR Doc. 97-5399 Filed 3-4-97; 8:45 am]

BILLING CODE 7590-01-P

[Docket No. 40-8681]

Energy Fuels Nuclear, Inc.; Final Finding of No Significant Impact Notice of Opportunity for Hearing

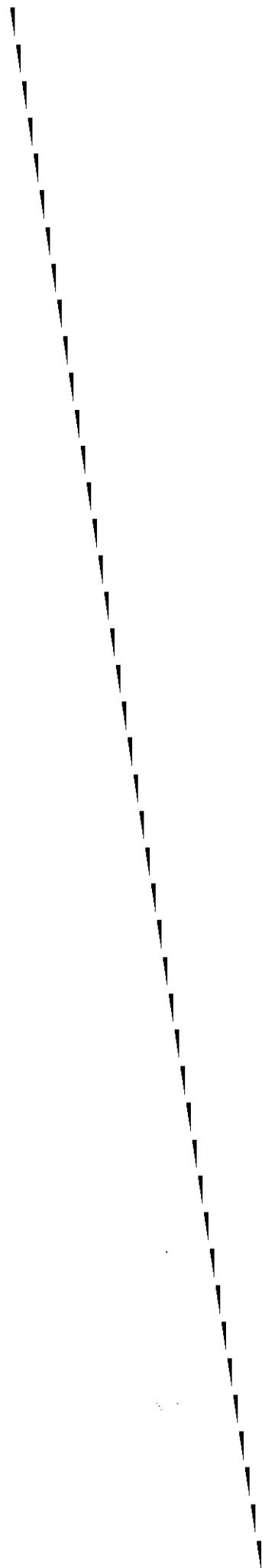
SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) proposes to renew NRC Source Material License SUA-1358 to authorize the licensee, Energy Fuels Nuclear, Inc. (EFN), for continued commercial operation of the White Mesa uranium mill, located near Blanding, Utah. An Environmental Assessment was performed by the NRC staff in accordance with the requirements of 10 CFR Part 51. The conclusion of the Environmental Assessment is a Finding of No Significant Impact (FONSI) for the proposed licensing action.

FOR FURTHER INFORMATION CONTACT: Mr. James R. Park, Uranium Recovery Branch, Mail Stop TWFN 7-99, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Telephone 301/415-6699.

SUPPLEMENTARY INFORMATION:

Background

Source Material License SUA-1358 was originally issued by NRC on August 7, 1979, pursuant to Title 10, Code of Federal Regulations (10 CFR), Part 40, Domestic Licensing of Source Material. This license currently authorizes EFN to (1) receive, acquire, possess, and transfer uranium at the White Mesa mill, (2) possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by operations at the mill, and



(3) accept, for disposal, limited amounts of byproduct material from in-situ leaching (ISL) uranium mining facilities. The mill was operated on a continual basis from May 1980 until February 1983, and then intermittently from October 1985 to the present time. SUA-1358 was renewed last in 1985.

Summary of the Environmental Assessment

The NRC staff performed an appraisal of the environmental impacts associated with the continued operation of the White Mesa mill, in accordance with 10 CFR Part 51, Licensing and Regulatory Policy Procedures for Environmental Protection. In conducting its appraisal, the NRC staff considered the following: (1) information contained in previous environmental evaluations of the White Mesa project; (2) information contained in EFN's license renewal application; (3) information contained in EFN's license amendment requests submitted subsequent to its renewal application, and NRC staff approvals of such requests; (4) land use and environmental monitoring reports; and (5) information derived from NRC staff site visits and inspections of the White Mesa mill site and from communications with EFN and the State of Utah Department of Environmental Quality. The results of the staff's appraisal are documented in an Environmental Assessment. The safety aspects for the continued operation of the mill are discussed in a Safety Evaluation Report.

The license renewal would authorize EFN to continue operating the White Mesa mill, at a maximum production rate of 4380 tons of yellowcake per year. Additionally, EFN would continue to be authorized, by license condition, to (1) possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by its milling operations authorized by the renewal license, and (2) accept, for disposal, limited amounts of byproduct material from ISL uranium mining facilities.

All conditions in the renewal license and commitments presented in the licensee's license renewal application are subject to NRC inspection. Violation of the license may result in enforcement action.

Conclusions

The NRC staff has reexamined actual and potential environmental impacts associated with continued yellowcake production at the mill site, and has determined that renewal of the source material license (1) will be consistent with requirements of 10 CFR Part 40, (2)

will not be inimical to the public health and safety, and (3) will not have long-term detrimental impacts on the environment. The following statements support the FONSI and summarize the conclusions resulting from the staff's environmental assessment:

1. An acceptable environmental sampling program is in place to monitor effluent releases and to detect if appropriate limits are exceeded;

2. The licensee has implemented an intensive, routine inspection program of the mill process building, associated facilities, and tailings retention impoundments, and conducts an annual "as low as is reasonable achievable" (ALARA) audit program;

3. Standard operating procedures are in place for all operational process activities involving radioactive materials that are handled, processed, or stored;

4. Mill tailings and process liquid effluents from the mill circuit are discharged to partially below-grade, lined tailings impoundments, with leak detection systems;

5. The licensee will implement an acceptable groundwater detection monitoring program to ensure compliance with the requirements of 10 CFR Part 40, Appendix A;

6. The licensee will conduct site decommissioning and reclamation activities in accordance with NRC-approved plans; and

7. Because the staff has determined that there will be no significant impacts associated with approval of the license renewal, there can be no disproportionately high and adverse effects or impacts on minority and low-income populations. Consequently, further evaluation of "Environmental Justice" concerns, as outlined in Executive Order 12898 and NRC's Office of Nuclear Material Safety and Safeguards Policy and Procedures Letter 1-50, Rev.1, is not warranted.

Alternatives to the Proposed Action

The proposed action is to renew NRC Source Material License SUA-1358, for continued operation of the White Mesa mill, as requested by EFN. Therefore, the principal alternatives available to NRC are to:

(1) Renew the license with such conditions as are considered necessary or appropriate to protect public health and safety and the environment; or

(2) Deny renewal of the license.

Based on its review, the NRC staff has concluded that there are no significant environmental impacts associated with the proposed action; therefore, any alternatives with equal or greater environmental impacts need not be

evaluated. Since the environmental impacts of the proposed action and the no-action alternative (i.e., denial of the renewal) are similar, there is no need to further evaluate alternatives to the proposed action.

Finding of No Significant Impact

The NRC staff has prepared an Environmental Assessment for the proposed renewal of NRC Source Material License SUA-1358. On the basis of this assessment, the NRC staff has concluded that the environmental impacts that may result from the proposed action would not be significant, and therefore, preparation of an Environmental Impact Statement is not warranted.

The Environmental Assessment and other documents related to this proposed action are available for public inspection and copying at the NRC Public Document Room, in the Gelman Building, 2120 L Street N.W., Washington, DC 20555.

Notice of Opportunity for Hearing

The Commission hereby provides notice that this is a proceeding on an application for a licensing action falling within the scope of Subpart L, "Informal Hearing Procedures for Adjudications in Materials Licensing Proceedings, of the Commission's Rules of Practice for Domestic Licensing Proceedings in 10 CFR Part 2" (54 FR 8269). Pursuant to § 2.1205(a), any person whose interest may be affected by this proceeding may file a request for a hearing. In accordance with § 2.1205(c), a request for a hearing must be filed within thirty (30) days from the date of publication of this Federal Register notice. The request for a hearing must be filed with the Office of the Secretary either:

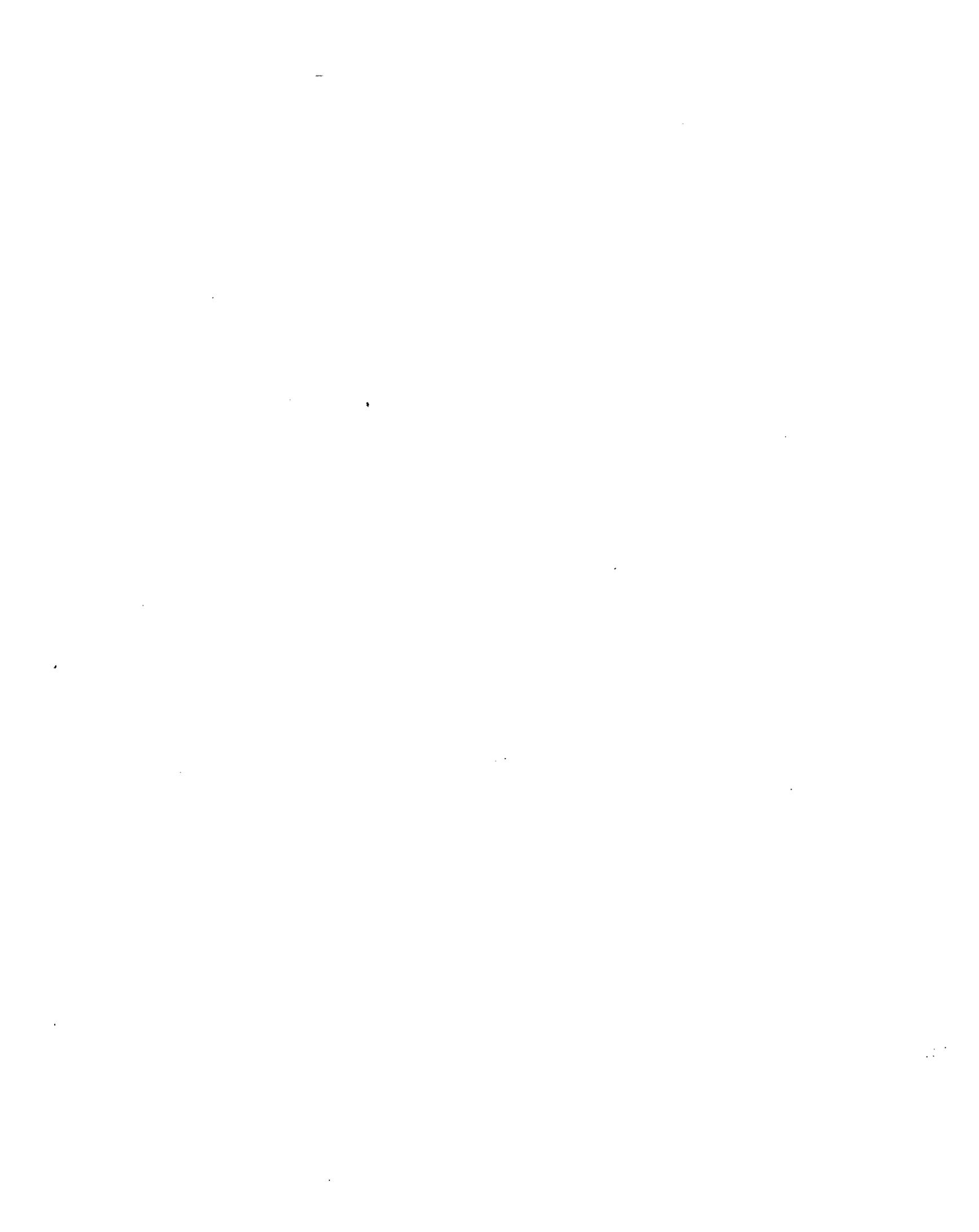
(1) By delivery to the Docketing and Service Branch of the Office of the Secretary at One White Flint North, 11555 Rockville Pike, Rockville, MD 20852; or

(2) By mail or telegram addressed to the Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Docketing and Service Branch.

Each request for a hearing must also be served, by delivering it personally or by mail to:

(1) The applicant, Energy Fuels Nuclear, Inc., 1515 Arapahoe Street, Suite 900, Denver, CO 80202;

(2) The NRC staff, by delivery to the Executive Director of Operations, One White Flint North, 11555 Rockville Pike, Rockville, MD 20852, or by mail addressed to the Executive Director for Operations, U.S. Nuclear Regulatory Commission, Washington, DC 20555.



In addition to meeting other applicable requirements of 10 CFR Part 2 of the Commission's regulations, a request for a hearing filed by a person other than an applicant must describe in detail:

(1) The interest of the requestor in the proceeding;

(2) How that interest may be affected by the results of the proceeding, including the reasons why the requestor should be permitted a hearing, with particular reference to the factors set out in § 2.1205(g);

(3) the requestor's areas of concern about the licensing activity that is the subject matter of the proceeding; and

(4) The circumstances establishing that the request for a hearing is timely in accordance with § 2.1205(c).

Any hearing that is requested and granted will be held in accordance with the Commission's Informal Hearing Procedures for Adjudications in Materials Licensing Proceedings in 10 CFR Part 2, Subpart L.

Dated at Rockville, Maryland, this 26th day of February 1997.

For the Nuclear Regulatory Commission,

Joseph J. Holonich,

Chief, Uranium Recovery Branch, Division of Waste Management, Office of Nuclear Material Safety and Safeguards.

[FR Doc. 97-5388 Filed 3-4-97; 8:45 am]

BILLING CODE 7540-01-P

[Licenses SMB-179 and SUB-1452—
Dockets 40-672 and 40-8866]

Nuclear Metals, Inc.—Concord, Massachusetts: Renewal of Source Material Licenses; Finding of No Significant Impact and Notice of Opportunity for a Hearing (NUREG/CR-6528)

The U.S. Nuclear Regulatory Commission is considering the renewal of Source Material Licenses SMB-179 and SUB-1452 for the continued operation of Nuclear Metals, Inc. (NMI), located in Concord, Massachusetts.

Summary of the Environmental Assessment

Identification of the Proposed Action

The proposed action is the renewal of NMI's Source Material Licenses SMB-179 and SUB-1452 for at least 5 years. With these renewals, the NMI facility will continue to conduct ongoing operations including the development and manufacture of castings, extrusions, machined parts, and metal powders comprised of depleted uranium and natural uranium metal. The proposed action would permit NMI to possess, under License SMB-179, natural

uranium metal, alloy, or oxide; depleted uranium metal, alloy, oxide, or fluoride; natural thorium metal, alloy, or oxide; and depleted uranium slab. The licensed uranium may be an element of any compound except uranium hexafluoride (UF₆). The proposed action would also permit NMI to possess, under License SUB-1452, depleted uranium as contamination in sand; depleted uranium as contamination on metallic components, packaging materials or equipment, or as waste solids; and natural thorium as contamination on metallic components, packaging materials or equipment, or as waste solids.

Prior to September 1985, liquid and sludge wastes from the processes were stabilized and emptied into an unlined holding basin and adjacent bog located on site property. The holding basin was covered by a special membrane in 1986 to reduce infiltration of rain water and discharge of contaminants to surface and ground waters. Remediation of the holding basin and contaminated groundwater is being planned as a separate decommissioning action; therefore, this action and subsequent environmental impacts are outside the scope of this EA.

The Need for the Proposed Action

The action is to determine if the licenses should be renewed or denied. NMI manufactures products composed of depleted uranium and natural uranium that have military, aerospace, industrial, and medical applications. Depleted uranium metal is processed to form armor penetrators, aircraft counterweights and radiation shielding devices. Denial of the license renewals for NMI is an alternative available to NRC, but since approximately half of the U.S. demand for these products is being met by operations at NMI facilities, denying the licenses would not be in the nation's best interest.

Environmental Impacts of the Proposed Action

Both radiological and nonradiological atmospheric emissions occur and were assessed during normal (incident-free) operations at NMI. The radiological impacts of the continued operation of the NMI facility were assessed using atmospheric dispersion modeling to estimate ambient annual dose to the public resulting from emissions at the NMI facility. To assess the impact of uranium emissions on atmospheric resources, the COMPLY computer code was used to determine the maximum annual dose equivalent received from uranium concentrations in the ambient air (at or beyond the site boundary).

These estimated annual doses were compared to NRC requirements and EPA standards to gauge impacts to public health and safety.

Ambient air concentrations (at or beyond the site boundary) resulting from the primary sources of nonradiological air emissions were estimated using the Industrial Source Complex—Version 2 (ISC2) air dispersion model (EPA 1992a). Total predicted concentrations were compared to the National Ambient Air Quality Standards (NAAQS) in order to gauge impacts on air quality.

Doses From Routine Airborne Releases

Small amounts of uranium are emitted from 33 stacks at NMI. The town of Concord permits depleted uranium emissions of up to 280 µCi per calendar quarter for operations associated with License Nos. SMB-179 and SUB-1452. NRC's regulations (10 CFR 20.1301) require licensees to limit doses to members of the public to 100mrem per year. Emission rates of depleted uranium in 1994 were less than 60 percent of the 280 µCi per calendar quarter limit. For the modeling, annual emissions were assumed to be at maximum permitted levels (i.e., 1,120 µCi/y as by the town of Concord). The assumptions are conservative in that they result in higher predicted doses than are expected to occur. The maximum annual committed effective dose equivalent predicted was 2.5 mrem. This dose was estimated to occur to a person located 150 m (492 ft) from the nearest building. This is about one-half the distance to the nearest resident. Therefore, 150 m (492 ft) is considered a sufficiently conservative distance to form an upper bound of doses that could be received by the public annually. The predicted annual dose is 2.5 percent of the NRC limit.

The primary sources of nonradiological air emissions at NMI are two boilers, which burn #4 fuel oil, and which emit the following criteria pollutants: SO₂, NO₂, PM-10, and CO. Short-term emission rates, calculated using the maximum monthly fuel usage rates, were used in ISC2 for periods of 24 hr or less. Long-term emission rates, calculated using the maximum annual fuel usage rates, were used in ISC2 for the annual time period. Both site specific data and conservative assumptions were used in the modeling analysis. Total predicted concentrations were compared to the NAAQS in order to gauge impacts on air quality. The results of the analysis show that maximum 3-hr and 24-hr average SO₂ concentrations are about twice their respective NAAQS. For all other criteri

Enclosure 3

Safety Evaluation Report
for Renewal of
Source Material License No. SUA-1358

Energy Fuels Nuclear, Inc.
White Mesa Uranium Mill
San Juan County, Utah

**SAFETY EVALUATION REPORT
FOR RENEWAL OF
SOURCE MATERIAL LICENSE NO. SUA-1358**

**ENERGY FUELS NUCLEAR, INC.
WHITE MESA URANIUM MILL
SAN JUAN COUNTY, UTAH**

MARCH 1997

DOCKET NO. 40-8681

**U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety
and Safeguards
Division of Waste Management**

TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| 1.0 INTRODUCTION | 1 |
| 1.1 Description of Proposed Action | 2 |
| 1.2 Background Information | 2 |
| 1.3 Review Scope | 2 |
| 2.0 AUTHORIZED ACTIVITIES | 3 |
| 2.1 Facility Description | 3 |
| 2.2 Operations | 3 |
| 3.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES | 3 |
| 3.1 Organization | 3 |
| 3.2 Radiation Safety Staff and Responsibilities | 6 |
| 3.3 Minimum Technical Qualifications for the Radiation Safety Staff | 8 |
| 3.3.1 Mill Manager | 8 |
| 3.3.2 Radiation Safety Officer | 8 |
| 3.3.3 Radiation Technician | 8 |
| 3.4 Administrative and Operating Procedures | 8 |
| 3.5 Inspections and Audits | 9 |
| 3.5.1 Inspections | 9 |
| 3.5.2 ALARA Audit | 10 |
| 3.6 Radiation Safety Training | 11 |
| 4.0 RADIATION SAFETY CONTROLS AND MONITORING | 12 |
| 4.1 Ventilation and Effluent Control | 12 |
| 4.2 In-Plant Monitoring Data | 13 |
| 4.3 Personnel Monitoring Data | 13 |
| 4.4 External Radiation Control Program | 14 |
| 4.4.1 Occupational Exposure | 14 |
| 4.4.2 External Radiation Surveys | 14 |
| 4.5 Internal Radiation Control Program | 14 |
| 4.5.1 Airborne Radioactivity Surveys | 14 |
| 4.5.2 Internal Exposure to Radioactivity | 15 |
| 4.5.3 Respiratory Protection Program | 16 |
| 4.6 Bioassay | 17 |
| 4.7 Contamination Control | 17 |
| 4.7.1 Personnel Contamination | 17 |
| 4.7.2 Surface Contamination | 18 |
| 4.7.3 Disposal of Contaminated Equipment | 18 |
| 4.8 Quality Assurance and Calibration | 19 |
| 5.0 RESTRICTED AREA MARKINGS AND ACCESS CONTROL | 19 |

TABLE OF CONTENTS
(continued)

| | <u>Page</u> |
|---|-------------|
| 6.0 EMERGENCY PROCEDURES AND PREVENTATIVE MEASURES | 19 |
| 7.0 GROUNDWATER PROTECTION | 20 |
| 8.0 MILL SITE DECOMMISSIONING AND RECLAMATION | 20 |
| 9.0 SURETY REQUIREMENTS | 20 |
| 10.0 INSPECTION HISTORY | 21 |
| 11.0 CONCLUSION INCLUDING SAFETY LICENSE CONDITIONS | 24 |
| REFERENCES | 27 |

LIST OF TABLES

| | Page |
|--|------|
| TABLE 10.1 Summary of NRC Inspections at Energy Fuels Nuclear, Inc.'s White Mesa Uranium Mill | 21 |

LIST OF FIGURES

| | |
|--|---|
| Figure 2.1 Location of the White Mesa Uranium Mill | 4 |
| Figure 2.2 White Mesa Uranium Mill, Generalized Process Flow Sheet | 5 |
| Figure 3.1 White Mesa Uranium Mill, Organizational Chart | 7 |

1.0 INTRODUCTION

By application dated August 23, 1991, and supplements dated December 13 and 17, 1991, January 13 and April 7, 1992, Umetco Minerals Corporation (Umetco) requested renewal of Source Material License SUA-1358 for the White Mesa Uranium Mill, which is located in San Juan County, Utah. By letter dated March 29, 1994, Umetco requested transfer of the license and a change in ownership of the mill to Energy Fuels Nuclear, Inc. (EFN). On May 25, 1994, the license was amended to change designation of the licensee to EFN. In the acquisition agreement between EFN and Umetco, EFN agreed to abide by all commitments and representations made to NRC by Umetco.

With this license renewal, NRC will be authorizing continued mill operations under the Performance-Based License Condition (PBLC) format. Under Performance-Based Licensing, the licensee has the burden of ensuring the proper implementation of the PBLC. The licensee may:

- Make changes in the facility or process, as presented in the application,
- Make changes in the procedures presented in the application, or
- Conduct tests or experiments not presented in the application, without prior NRC approval, if the licensee ensures that the following conditions are met:
 - (1) The change, test, or experiment does not conflict with any requirement specifically stated in the license (excluding material referenced in the Performance-Based License Condition), or impair the licensee's ability to meet all applicable NRC regulations.
 - (2) There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan.
 - (3) The change, test, or experiment is consistent with NRC's conclusions regarding actions analyzed and selected in the EA.

Otherwise, the licensee is required to submit an application for a license amendment from NRC. The licensee's determinations whether the above conditions are satisfied will be made by a Safety and Environmental Review Panel (SERP).

The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have expertise in implementation of any changes; and one member shall be the corporate radiation safety officer or equivalent. Additional members may be included in the SERP as appropriate, to address technical aspects in several areas, such as health physics, surface water hydrology, specific earth sciences, and others. Temporary members, or permanent members other than the three identified above, may be consultants.

The licensee shall maintain records until license termination of any changes made pursuant to the PBLC. These records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining that the change complies with the requirements referred to in the above conditions. The licensee shall furnish an annual report to NRC that describes such changes, tests, or experiments, including a summary of the safety and environmental evaluation of each. In addition, the licensee shall annually submit any pages of its license application that have been revised to reflect changes made under this condition.

EFN has not yet submitted, for NRC review and approval, its standard operating procedures (SOPs) for operation of the SERP. Therefore, NRC will require, by license condition, that EFN submit the SOPs by March 31, 1997, and until such time as NRC approves the SOPs, EFN will not be authorized to implement the PBLC. EFN agreed to this license condition by telephone conversations on December 31, 1996.

NRC's inspection function remains unchanged with the administration of Performance-Based Licensing. Operational changes, regulatory commitments, and recordkeeping requirements implemented by EFN through the PBLC are subject to NRC inspection and possible enforcement actions.

1.1 Description of Proposed Action

The proposed action is to renew SUA-1358 for operation of the White Mesa mill at a maximum production rate of 4380 tons of yellowcake per year.

1.2 Background Information

Source Material License SUA-1358 was originally issued by NRC on August 7, 1979, pursuant to 10 CFR Part 40. This license authorizes the licensee to possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by operations at the White Mesa uranium mill, in accordance with the conditions specified therein. SUA-1358 was renewed in 1985 and was due to expire on September 23, 1991. Umetco submitted a license renewal application by letter dated August 23, 1991, and NRC notified Umetco that the license was in timely renewal by letter dated November 7, 1991.

Source Material License SUA-1358 and ownership of the White Mesa mill were transferred from Umetco to EFN in May 1994. The mill was operated on a continual basis from May 1980 until February 1983, and then intermittently from October 1985 to the present time.

1.3 Review Scope

The safety review of EFN's request for license renewal included evaluations of (1) the renewal application dated August 23, 1991; (2) supplementary information submitted by letters dated December 13, 1996 and January 30, 1997; (3) the compliance history for the White Mesa mill since September 1985; and (4) the monitoring data required under SUA-1358.

EFN's proposed programs were also evaluated against NRC regulations as specified in 10 CFR Parts 20 and 40, and appropriate NRC staff guidance.

2.0 AUTHORIZED ACTIVITIES

EFN is currently authorized for commercial operation of the White Mesa mill. By license condition, yellowcake production cannot exceed 4380 tons per year.

2.1 Facility Description

The White Mesa mill is located in San Juan County, Utah, approximately 9.5 kilometers (6 miles) south of Blanding, Utah (see Figure 2.1). Major mill features include the mill buildings, tailings impoundments, an ore stockpile area, and a small sampling plant which is used infrequently to determine the uranium content of tolled ores. The ore is initially processed in the main mill building, which contains a semi-autogenous grinding (SAG) mill, an acid leach circuit, and a counter current decantation (CCD) circuit. A separate building houses the two solvent extraction circuits, one for uranium and one for vanadium. The uranium-bearing solution is returned to the mill building where it is precipitated, dried, and barrelled. A reproduction of the generalized flow chart for uranium milling is included as Figure 2.2.

The mill occupies approximately 20 hectares (ha) (50 acres) and the tailings system another 182 ha (450 acres). The tailings system consists of four partially below-grade, synthetically-lined disposal cells.

2.2 Operations

Operations at the White Mesa mill begin with the weighing, sampling and stockpiling of ore received from various mines. Mine ore, as well as stockpiled and crushed ore, is then fed to the SAG mill. The ground ore is stored as a wet slurry in two mechanically-agitated storage tanks. The subsequent processing involves two-stage acid leaching, followed by the recovery of uranium-bearing pregnant solution in the CCD system. Tailings are slurried by pipeline to the lined impoundments.

The uranium is recovered from the pregnant solution through a conventional solvent extraction system. Vanadium, when recovered, is stripped from the barren uranium raffinate using a separate solvent extraction circuit.

3.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES

3.1 Organization

EFN, the operator of the White Mesa mill, has its corporate headquarters located in Denver, Colorado. The corporate office supplies any necessary support to the mill staff. Milling operations are managed from an office located at the site.

By letter dated December 13, 1996, EFN submitted revised organizational charts for full operational and standby modes at the mill (Figure 3.1). During both modes of operation,

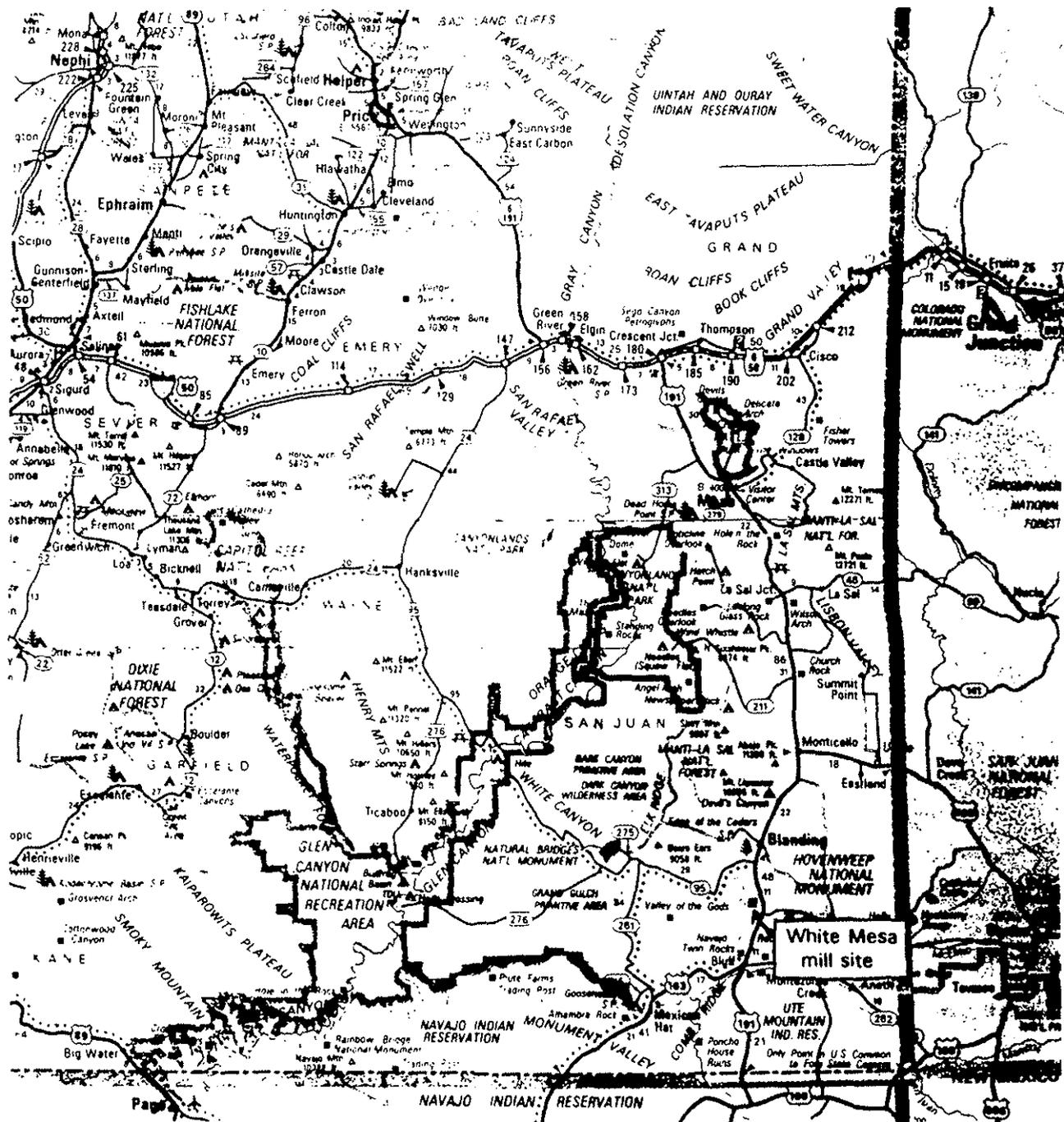


Figure 2.1 Location of the White Mesa Uranium Mill

the Maintenance Superintendent, the Mill Superintendent, and the Radiation Safety Officer (RSO) report directly to the Mill Manager. In addition, the RSO is authorized to escalate concerns to the Corporate Environmental Manager or to the President of CFN.

The Corporate Environmental Manager reports to the President of the company, and provides services to the various operating units relative to environmental, radiation safety, occupational health, and permitting activities. This individual performs periodic audits of the facilities to identify potential liabilities, ensure regulatory and corporate standard compliance, and, as required, recommend corrective measures.

The Mill Manager is responsible for conducting the firm's uranium milling operations in a safe and efficient manner. This individual is fully responsible for milling operations, including safety and environmental programs and security practices.

The Maintenance Superintendent reports directly to the Mill Manager, and has responsibility for all maintenance activities at the mill, as well as responsibility for ensuring compliance with applicable health, safety, and environmental practices and standards.

The RSO is directly responsible for developing, implementing, monitoring, and reporting activities that ensure that the mill radiation safety program meets applicable standards.

NRC finds this organizational structure to be acceptable.

3.2 Radiation Safety Staff and Responsibilities

As stated above, the White Mesa RSO has the direct responsibility for developing, implementing, monitoring, and reporting activities that ensure that the mill radiation safety program meets applicable standards. This includes monitoring, maintenance, and evaluation of personnel exposure and plant area surveys; determination of occupational work modifications relative to radiation protection; personnel radiation protection training; maintenance of plant radiation monitoring equipment; and report preparation for regulatory agency compliance. This individual also reviews plant procedures and equipment and develops and coordinates policy adherence.

The Radiation Technician is responsible for performing radiation monitoring measurement throughout the mill area. This individual provides all necessary record keeping, survey data accumulation and analysis, instrument performance calibrations, and quality control requirements.

The Environmental Technician conducts the monitoring necessary to comply with regulatory permits and licenses. This individual's responsibilities include mill emission sources, solid and liquid waste disposal systems, and off-site environmental concerns, as well as responsibility for the tailings reclamation technology and operating supervision of the tailings disposal cells.

Although the Radiation Technician and the Environmental Technician report directly to the RSO, each has the authority to escalate concerns directly to the Mill Manager or to the

appropriate level of corporate management. Along with the RSO, individuals in these positions have the authority to cancel, postpone, or modify any operation or process that poses an immediate radiological, safety, or environmental hazard.

The staff finds the organization of the Radiation Safety Staff to be acceptable.

3.3 Minimum Technical Qualifications for the Radiation Safety Staff

EFN will require the following minimum qualifications of radiation protection personnel associated with uranium processing at the White Mesa mill:

3.3.1 Mill Manager

An individual filling the position of Mill Manager must have a bachelor's degree in engineering or a related physical science, or equivalent experience in the management and/or operation of uranium processing operations.

3.3.2 Radiation Safety Officer

EFN states that the RSO must meet the requirements of Regulatory Guide 8.31. RSO qualifications in Regulatory Guide 8.31 include: (1) a bachelor's degree in the physical sciences, industrial hygiene, or engineering, or an equivalent combination of training and relevant experience in uranium mill radiation protection; (2) appropriate health physics experience; (3) specialized classroom and biannual refresher training; and (4) appropriate specialized knowledge.

3.3.3 Radiation Technician

EFN will require the Radiation Technician to meet the qualification requirements for Health Physics Technicians, as identified in Regulatory Guide 8.31. These qualifications include specified levels of education, training, and relevant experience.

The staff finds the above qualifications for radiation safety personnel to be acceptable.

3.4 Administrative and Operating Procedures

Activities at the mill which involve design, procurement, construction, pre-operational checks, or operations and maintenance of safety- or environmentally-related equipment will be authorized by written procedures approved by the RSO and/or the Mill Superintendent. These procedures will comply with EFN's standards, the conditions of the permits and licenses, and the existing regulatory requirements. The Maintenance Superintendent will be responsible for assuring compliance.

Administrative policies and procedures are documented to clearly delineate the authorities and responsibilities for each level within the facility with regard to environmental, radiation protection, and safety-related activities. The licensee provided, as appendices to the renewal application, detailed administrative and operating procedures, as well as the proposed radiation protection and environmental monitoring procedures. The procedures

**Energy Fuels Nuclear, Inc.
White Mesa Mill
Organizational Chart**

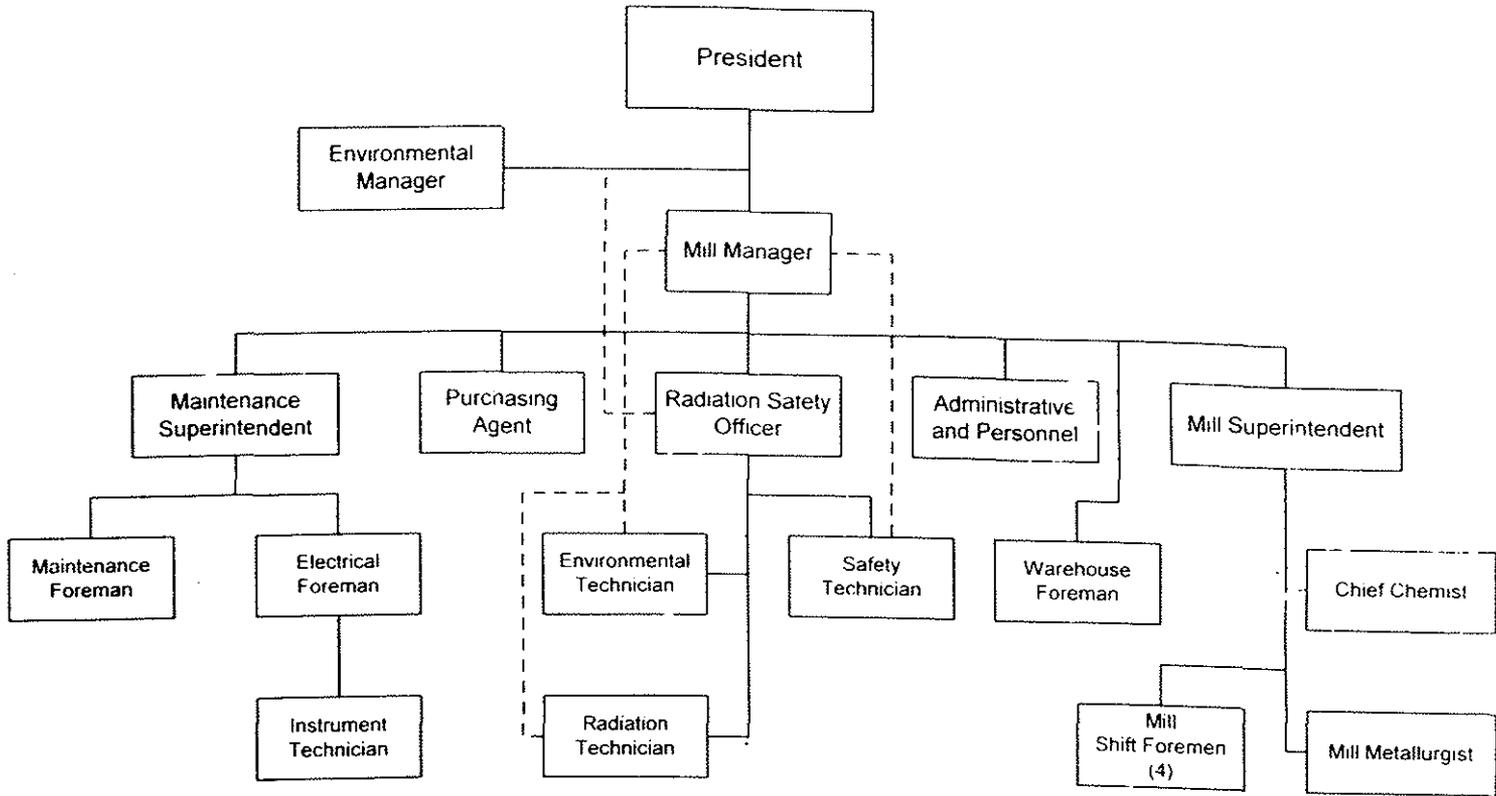


Figure 3.1 White Mesa Uranium Mill, Organizational Chart

cover all aspects of mill operations. EFN committed to reviewing these procedures annually.

Although the licensee committed to reviewing the SOPs on an annual basis, they did not state that the RSO will perform and document this review nor that the appropriate SOPs will be available to workers in their mill work areas. In accordance with recommendations in Regulatory Guide 8.31, EFN is currently required under SUA-1358 to meet these conditions, and will continue to be so required.

The licensee has stated that any non-routine maintenance activity which may, by the determination of the RSO, exceed 25 percent of the 10 CFR Part 20 limits requires a Radiation Work Permit (RWP). The RSO will provide a monthly updated listing of those areas that may exceed this criteria to the Maintenance Superintendent and Mill Superintendent. This listing will be used as a guide by the mill staff; however, all non-routine activities require review by the RSO.

An RWP will be obtained in the following manner:

1. The Maintenance Superintendent, Mill Superintendent, or their designee, will define, in writing, the need for the non-routine activities. The request will address the specific work location(s), the estimated work duration, the type of work to be performed, and the personnel to be utilized. This information will be included in the RWP.
2. The RSO, or designee, will review the RWP to ensure that the proposed work will not present a health hazard to the employee(s) involved, and will give written approval. The completed RWP will define (1) time limitations for job performance, (2) the personnel protective equipment to be used, and (3) the monitoring surveillance needed for the activity.
3. All supervisors will be given training in and copies of the requirements for using RWPs, with the original permit remaining on file for five years.
4. Any supervisor found to be knowingly and willfully violating these procedures will be issued a written warning, and the situation will be reviewed by appropriate management for remedial action.

The staff concludes that the proposed program is in accordance with the recommendations contained in Regulatory Guide 8.31, and is, therefore, acceptable.

3.5 Inspections and Audits

3.5.1 **Inspections**

EFN's proposed program for radiation safety inspections is extensive. The operating mill foreman, or his designee, will perform and document a daily visual surveillance of all mill areas to insure proper implementation of good radiation safety practices. On a weekly basis, the radiation safety staff will perform and document an inspection of all work and

storage areas, and report to the RSO any items of noncompliance with operating procedures, license requirements, or safety practices affecting radiological safety. The RSO performs a monthly documented walk-through inspection of all work and storage areas to ensure that the radiation safety program is functioning as required.

A documented daily inspection will be conducted of the tailings impoundment area by personnel trained to detect visible evidence of impoundment instability or operational malfunctions.

3.5.2 ALARA Audit

EFN has committed to performing audit reviews to ensure managerial control of the radiation safety program. An annual ALARA (As Low As is Reasonably Achievable) audit will be performed by a team of personnel consisting of the RSO, the Maintenance Superintendent, a member of either the Corporate Occupational Health Protection staff or the Corporate Environmental Affairs staff, and a corporate representative of EFN. The results of this audit are provided to the Manager of Environmental Health and Safety, the Maintenance Superintendent, and the Mill Manager.

The audit review consists of:

1. A summarization of exposure records
2. Bioassay determinations
3. Inspection documentation
4. Training program activities
5. Radiation protection meeting records
6. Mill radiological survey data
7. Environmental effluent and monitoring data
8. Overexposure records
9. Review of modified procedures for the period, and
10. Reviews of RWPs.

The resulting audit report will specifically discuss trends in personnel exposures, control of effluent equipment, management response to radiological protection concerns, and recommendations to further ALARA implementation. The Mill Manager is responsible for remedial action in response to the recommendations made in the audit.

The proposed makeup of EFN's ALARA audit team is not consistent with Regulatory Guide 8.31. In this guidance document, the NRC recommends that the RSO should accompany the audit team but should not be a member of that team. Therefore, the NRC staff will require that EFN conduct its annual ALARA audits as outlined in Regulatory Guide 8.31. EFN agreed to this license condition in a telephone call on March 10, 1997.

The staff concludes that EFN's audit program, as modified by the staff, is acceptable.

3.6 Radiation Safety Training

EFN stated that the purpose of an in-house radiation safety training program is (1) to place in proper perspective, for the employee, the potential short and long-term radiation hazards associated with the job; (2) to acquaint the employee with the practices instituted by management to keep occupational exposures ALARA; and (3) to ensure that the employee has an understanding (both initially and over the duration of their employment) of the radiation procedures which should be followed.

The licensee assured that each person, upon reporting for employment at the mill, will receive instruction in mill and personnel safety, including radiological protection procedures, from a qualified instructor. The instruction will include on-the-job demonstrations of proper safety precautions, and measures to be taken to minimize radiation exposures. Each employee will also be provided a safety manual, which covers radiation safety and industrial safety procedures, including personal hygiene instructions for use of monitoring and safety equipment and procedures for handling spills and maintaining clean working conditions. Each employee will be required to pass a written test addressing their understanding of radiation safety and hygiene.

The employee's understanding and retention of proper practices will be verified by the supervisor at the work location through periodic checks. If the employee does not exhibit sufficient understanding of the safety procedures, they will receive further instruction from their supervisor. This procedure will be repeated until satisfactory retention is demonstrated. On-the-job training and testing will be conducted and the results recorded to ensure that each employee understands the applicable radiation protection practices.

In addition, EFN stated that a portion of the monthly mill safety meeting will be set aside for discussion of radiation protection procedures, and that one monthly meeting per year will be set aside for indoctrination of the mill staff in radiation protection. Each employee will be tested annually by the RSO on their understanding of radiation protection as it relates to their job. All supervisors will be required to periodically attend specific training courses in radiation and industrial protection, so that they will be better able to provide and evaluate specific job-related training.

The licensee also stated that training of on-site contractors would occur prior to the conduct of their work. The training will consist of topics similar to those used for newly hired employees. Complete details of the content of all in-house training, including contractor training, were submitted as Appendix F to the renewal application.

The staff has determined that the radiation safety training program proposed by the EFN is in accordance with the staff guidance specified in Regulatory Guide 8.31, and is, therefore, acceptable.

4.0 RADIATION SAFETY CONTROLS AND MONITORING

4.1 Ventilation and Effluent Control

a. **Sampling Plant**

Effective as of this license renewal, the sampling plant will no longer be used as part of the process. Ore will be stockpiled at the ore pads and then taken directly to the grizzly. From the grizzly, ore is fed at a controlled rate to the grinding circuit. Dust suppressants are used on the ore to maintain windblown control.

b. **Mill**

Dust generated in the ore hopper area is collected in a reverse jet baghouse dust-collecting system. In addition, a dust suppression spray system installed in the mill feeding system is used when exceedingly dry ores are being fed to the SAG mill. Water added for these purposes remains with the ore as it is further processed.

Yellowcake particles carried in flue gases from the dryer and packaging area pass through wet fan scrubbers (one on the dryer and one on the packaging process). The solution and particulates collected from the scrubber are recycled to the No. 1 yellowcake thickener.

Two wet dust collectors also are installed to collect and recycle dust generated from the vanadium drying operation. An isolated portion of the building is utilized for precipitation, drying and packaging of the vanadium. Since the uranium is removed prior to vanadium recovery, a very limited release of radioactivity is expected in the vanadium drying and fusion step.

In the mill, the processing buildings and equipment are provided with ventilation fans, hoods and ducting to control the concentration of gaseous effluents. A forced air ventilation system designed for the entire solvent extraction and stripping buildings removes kerosene vapors. This ventilation system is designed to provide up to six air changes per hour. The ventilation fan is checked visually for proper operation on a daily basis.

c. **Area Sources**

EFN will conduct a weekly inspection of the ore stockpile area to determine whether dust suppression measures are necessary. The inspection is documented by the radiation staff and filed with the radiation safety department. If dusty conditions are present, the roadways and/or stockpiles will be sprayed with water or stabilized to minimize dusting. A log sheet of water applications is maintained by the radiation staff.

Criterion 8 to 10 CFR Part 40, Appendix A, provides requirements concerning monitoring of effluent control equipment and requires mill licensees to take corrective actions or to

suspend yellowcake drying and packaging operations if the effluent control equipment is not functioning as designed. EFN is required to operate in accordance with the provisions of Appendix A.

The staff concludes that the mill ventilation and effluent control program is acceptable.

4.2 In-Plant Monitoring Data

Airborne gross alpha (uranium) samples are collected monthly from 26 mill areas, while 5 additional locations in the yellowcake process area are sampled weekly during mill operations. During mill operations from 1988 to 1990, at which time 23 areas were sampled, the highest annual average concentration was less than 20 percent of the maximum permissible concentration (MPC). During mill operations in 1995, area concentrations were less than 25 percent of the derived air concentration (DAC) at all sampling locations except for the yellowcake dryer and packaging enclosures, yellowcake packaging, and the SAG mill. EFN posted these areas as Airborne Radioactivity Areas.

Radon daughter concentrations are measured at 27 locations throughout the mill on a monthly basis. From 1988 to 1990, the highest employee exposure to radon daughters was 26 percent of the maximum permissible exposure at the SAG mill. Concentrations measured during 1995 were lower than those observed during previous operating periods, which EFN attributes to modifications made to the mill demister system and improved mill ventilation systems.

EFN conducts beta-gamma surveys on a quarterly basis at 26 locations throughout the mill complex. Exposure rates since 1985 have ranged from less than 2 mR/week up to 125 mR/week, measured in the ore storage area in 1985. Ambient gamma levels observed in 1995 were 15 mR/week. EFN has posted the yellowcake storage yards, the top floor of the yellowcake calciner, the ore stockpile area, the solvent extraction feed lines, the solvent extractor mix tanks, and the calcium fluoride storage areas as Radiation Areas.

4.3 Personnel Monitoring Data

Employees are required to record on a daily time card the amount of time spent in areas monitored for uranium dust and radon progeny. Details concerning the methods used by EFN to monitor for airborne uranium and radon are discussed in Section 4.5.1. Using the monitored air concentrations and the employee time card information, exposure levels for employees are calculated.

Personnel exposure records are retained onsite and are accessible only to the radiation safety staff and the individual employee. Individuals other than the radiation safety staff can obtain a copy of an employee's exposure history only with the employee's signed consent to that effect.

4.4 External Radiation Control Program

4.4.1 Occupational Exposure

The licensee has committed to using film or thermoluminescent dosimeter (TLD) badges to determine individual exposures. Badges will be assigned to each employee working at the facility within 30 days of employment, and the badges will be analyzed on a quarterly basis. The cumulative occupational dose of the employee will be filed in accordance with the requirements of 10 CFR Part 20. Employees receiving an exposure exceeding 25 percent of the 10 CFR Part 20 limits will have their job assignments modified, and the licensee will conduct a review of the conditions which caused the action level to be exceeded.

The staff concludes that the external exposure monitoring program is in accordance with Regulatory Guide 8.30, and is, therefore, acceptable.

4.4.2 External Radiation Surveys

The licensee stated that radiation area monitoring will be used throughout the mill to assist in detecting abnormal operating conditions. A combination of beta and gamma radiation measurements will be obtained monthly at 37 locations in the restricted area. The locations are listed in Table 5.4-1 of the renewal application. Measurements will be taken at a distance of one centimeter from each source. The radiological health monitoring procedures submitted as Section 2.4 of Appendix D to the renewal application provides details on all monitoring techniques to be utilized at the White Mesa mill.

The staff finds that the external radiation monitoring program is in accordance with Regulatory Guide 8.30, and is, therefore, acceptable.

4.5 Internal Radiation Control Program

4.5.1 Airborne Radioactivity Surveys

a. Uranium

EFN proposes to use several forms of airborne radionuclide sampling to determine personnel exposure to uranium-bearing dust. Area monitoring at 23 mill locations will provide the main approach to determining personnel exposure. Areas associated with yellowcake are sampled weekly, while other locations are sampled on a monthly basis. The monitoring locations are shown on Table 5.4-2 of the renewal application.

EFN indicated that area monitoring for airborne uranium will be accomplished utilizing air samplers calibrated to forty liters per minute (lpm) with a sample duration of sixty minutes. Analysis of samples is performed at the White Mesa Laboratory using fluorometric methods to achieve standard lower level of detection (LLD) requirements with sample turnaround times of less than a week. Sampling will be performed under conditions typical of employee exposures. A record of the

state of operation of both process and effluent control equipment and ventilation conditions will be maintained along with area sampling results.

Yellowcake calciner and packaging operators are required to wear individual air samplers once per week. In addition, mill operating and maintenance personnel working in processing areas where the potential exposure is projected to exceed 25 percent of 10 CFR Part 20 limits for uranium dust will be monitored with individual air samplers on a periodic basis to establish typical uranium dust exposures for these individuals. Individual air samplers consist of a sampling pump and lapel filter holder capable of sampling at a rate of two lpm for eight hours.

b. **Radon progeny**

The licensee stated that radon progeny will be measured on a monthly basis at the 23 locations used for air particulate sampling, with weekly sampling in areas that exceed 25 percent of a working level during production periods. The modified Kusnetz sampling and analysis procedure will be utilized to determine radon concentrations.

The staff finds that the proposed program for airborne particulate monitoring is in accordance with Regulatory Guide 8.30, and is, therefore, acceptable.

4.5.2 Internal Exposure to Radioactivity

Personnel time in the monitored areas is recorded on a daily time card by the employee. Using this information, and the respective area airborne concentrations, an employee exposure record is developed. When routine work is performed, assessment of an individual's exposure to airborne natural uranium and radon daughters are calculated using the methods described above. Quarterly breathing zone samples using portable samplers are collected to assure reliability of this procedure.

When non-routine maintenance work is performed, accurate time records are kept to calculate exposures to natural uranium. Breathing zone samples are taken using portable samplers to assure accurate assessment of exposures during non-routine work assignments.

EFN proposes to review the observed time spent in each area where routine work is performed. The review will be recorded and the accuracy of the observation reviewed quarterly, or when major changes are made in job assignments.

If an employee reaches an action level of 25 percent of the DAC based on the time-weighted exposure over a period of one quarter, the RSO will institute an investigation of the work record and exposure history to identify any problem areas. If problem areas are noted, corrective measures will be taken to ensure that the exposure is as low as is reasonably achievable.

The staff concludes that the proposed program for measurement of internal exposure to airborne radioactivity is in accordance with Regulatory Guide 8.30, and is, therefore, acceptable.

4.5.3 Respiratory Protection Program

EFN's proposed respiratory protection program includes a management policy statement and written operating procedures which address (a) engineering controls used to meet ALARA goals, (b) decontamination of equipment, (c) routine, non-routine and emergency use of respirators, (d) a list of circumstances during which relief from respirator use is authorized, (e) training requirements, (f) annual fit testing requirements, (g) annual physical examination requirements, and (h) a maintenance, cleaning and storage policy for respirators. The licensee stated that only National Institute of Safety and Health (NIOSH) and Mine Safety and Health Administration (MSHA) certified respirators with approved High Efficiency Particulate Arrestor (HEPA) filters are to be used.

The Maintenance Superintendent is responsible for ensuring that a respiratory protection program, meeting or exceeding that specified by regulations, is established and maintained for the employees under his jurisdiction. The RSO is responsible for the implementation and direct control of the respiratory protection program.

The RSO has the following responsibilities:

- A. Supervision of respirator selection procedure;
- B. Establishment of training sessions about respiratory equipment for employees;
- C. Establishment of a continuing program of cleaning and inspection of equipment;
- D. Designation of proper storage areas for respiratory equipment;
- E. Establishment of issuance and accounting procedures for uses of respiratory equipment;
- F. Establishment of medical screening program-procedures for employees assigned to wear respiratory equipment;
- G. Establishment of a periodic inspection schedule of those work places/conditions - requiring respiratory equipment - to determine exposure and/or changing situations; and
- H. A continuing evaluation of the above aspects to assure their continued functioning and effectiveness.

A complete training program for employees and supervisors is included in the program. It addresses the following topics: (1) the need for respirators, (2) respiratory hazards,

(3) engineering controls, (4) respirator selection, (5) fit testing, donning, and wearing of respirators, (6) maintenance, storage and exchange requirements, (7) the circumstances under which an employee can leave a hazardous area, (8) emergency respirator use, (9) the regulations for respirator use, and (10) additional training requirements for supervisors.

The NRC staff finds that the proposed respiratory protection program, as presented in Appendix F of the renewal application, is in accordance with staff guidance as specified in Regulatory Guide 8.15 and is, therefore, acceptable.

4.6 Bioassay

EFN has stated that urinalysis will routinely be performed on those employees that are (1) exposed to airborne yellowcake or involved in maintenance tasks in which yellowcake dust may be produced, or (2) routinely exposed to airborne uranium ore dust. Specifically, routine biweekly urinalysis testing will be performed on those employees who have worked in yellowcake packaging, yellowcake precipitation, the grind area, ore feed area, and sample preparation room. Baseline urinalysis will be performed on employees who have been working on assignments that require a radiation work permit, or for any individual that may have been exposed to airborne uranium or ore dust concentrations that exceed 25 percent of the DAC level.

A detailed procedure for collection, preparation and analysis of urine samples was submitted under Section 1.4, "Radiation Protection Procedures Manual," to Appendix D of the renewal application. EFN will perform the analyses in-house using a lower limit of detection of 5 ug/l. Bioassay laboratory surfaces will be decontaminated to less than 25 disintegrations per minute (dpm) alpha per 100 cm². EFN will use 25 percent of all submitted samples for quality control (QC) checks. In addition, spikes and blanks will accompany the samples, and the analysis will be performed by using fluorometric techniques. Ten percent of all samples, including the QC spikes, blanks and duplicates, will be sent to a contractor laboratory for analysis in order to compare results. EFN committed to following the action levels presented in Regulatory Guide 8.22.

In-vivo body counting for lung burden of natural uranium or U-235 will not be routinely conducted. Monitoring by an in-vivo body counter will be done at the discretion of the RSO.

The staff concludes that the bioassay program proposed by EFN is in accordance with Regulatory Guide 8.22, and is, therefore, acceptable.

4.7 Contamination Control

4.7.1 Personnel Contamination

Personnel working within the mill area will be provided with change room, shower and laundry facilities. Employees working in the yellowcake product areas or who perform maintenance on equipment from these areas will be provided coveralls and will be required to change and shower prior to leaving the mill. Employees will also be required to monitor

themselves with an alpha survey meter prior to leaving the mill site. Alpha contamination on skin or clothes measured at greater than 1000 dpm/100 cm² shall be cause for additional showering or decontamination and an investigation by the radiation safety staff. On at least a quarterly basis, spot checks with a survey meter will also be made and documented. Coveralls and contaminated clothing will be laundered on site.

The staff considers the proposed program for personnel contamination to be acceptable.

4.7.2 Surface Contamination

EFN proposes that a combination of fixed and removable alpha radiation survey measurements be obtained weekly at lunch rooms and offices in the restricted and unrestricted areas. Measurements exceeding 1000 dpm/100 cm² will require remedial action by the management. In addition, the RSO is authorized to take action which is deemed necessary to maintain levels ALARA. EFN also stated that respirators would be surveyed prior to use and that activity of greater than 100 dpm/100 cm² found on a respirator will result in its removal from service for cleaning.

The staff finds EFN's surface contamination program to be acceptable.

4.7.3 Disposal of Contaminated Equipment

In a submittal dated October 30, 1996, EFN stated that materials leaving the restricted area must meet the requirements set out in NRC's guidance document, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct or Source Materials," dated September 1984. This guidance document was revised in May 1987, and therefore, the licensee will be required to follow this more recent version, or a suitable alternative procedure approved by NRC prior to any such release. EFN agreed to this license condition in a telephone call on March 10, 1997.

The licensee assured that all material originating within the restricted area will be considered contaminated until checked by the radiation safety staff. EFN will require any manager who wishes to ship or release materials from the facility to inform the RSO prior to any such release. No equipment or materials will be released without a documented survey by the RSO. The RSO has the authority to deny release of materials exceeding the guidelines. EFN also stated that the policy and documented release forms will be periodically reviewed by the RSO and the Audit Committee.

EFN is currently required by license condition to dispose of mill-generated solid waste materials considered as 11e.(2) byproduct material (e.g., contaminated equipment and parts) within Tailings Cell 2, in accordance with its procedure, "Radioactive Contaminated Waste Disposal," amended as noted in NRC's approval letter of August 1, 1995. This license condition will be retained in the renewal license.

The staff finds the proposed program, as modified, to be acceptable.

4.8 Quality Assurance and Calibration

Administrative Procedures (APs) are used by the licensee to provide uniform guidance and consistency to mill activities. APs cover the sampling and calibration procedures which are an integral part of the quality assurance program at the mill. APs will be reviewed annually and updated as necessary to incorporate advances in technology and to prevent systematic errors in sampling, monitoring and analyses.

Appendices D and E of the EFN renewal application delineate the current proposed radiation protection and environmental monitoring procedures. Written operating procedures are detailed in Appendix G for mill operations. Each procedure includes the quality assurance actions which must be taken in order to properly evaluate measurement techniques and effectiveness of the procedure and specifies the type of equipment needed to carry out the actions. Each piece of equipment is described along with its specified calibration frequency, check-out procedure, and specifications for normal operation. Section 4 of Appendix F is designated as the EFN Quality Assurance Program. All sampling, recording, inspection and review methods are documented and detailed.

EFN has committed to calibrating all radiation monitoring equipment at least semi-annually, and all air sampling equipment at least quarterly. In addition, all equipment will be checked prior to use to ensure that it is operating correctly.

The staff concludes that the quality assurance program proposed by EFN is in accordance with staff policy as specified in Regulatory Guides 4.15 and 8.31, and is, therefore, acceptable.

5.0 RESTRICTED AREA MARKINGS AND ACCESS CONTROL

The mill and tailings area is fenced and posted with "Restricted Area" signs in accordance with 10 CFR 20.1902. During operations, the mill normally will run seven days a week, twenty-four hours a day. All visitors will be required to register at the office and will not be permitted inside the plant restricted area without proper authorization and escort. Contractors having work assignments will be given a security, safety, and radiation protection orientation prior to performing their duties without escort.

The staff concludes that the above markings and access control procedures are adequate. A license condition will be issued which exempts the licensee from the requirements of Section 20.1902(e) of 10 CFR Part 20 for areas within the mill, provided that all entrances to the mill are conspicuously posted in accordance with Section 20.1902(e) and with the words, "ANY AREA WITHIN THE MILL MAY CONTAIN RADIOACTIVE MATERIAL."

The proposed program for restricted area markings and access control is acceptable.

6.0 EMERGENCY PROCEDURES AND PREVENTATIVE MEASURES

EFN classified a spectrum of potential mill accidents based on their severity (in terms of potential impact to health, safety, and the environment) and their probability of occurrence. Given a specific severity level (e.g., "insignificant") and probability (e.g.,

"highly improbable"), EFN defined a risk category, which it used to determine the types of safeguards that should be in place and functional. EFN also provided detailed emergency procedures to address each type of accident.

Among the potential accidents identified and for which appropriate emergency procedures and/or preventative measures implemented were: (1) major and minor pipe or tank leakage, (2) fires, (3) tornados, (4) structural failure of the tailings cell dikes, (5) seismic damage to the mill facilities, and (6) transportation accidents:

7.0 GROUNDWATER PROTECTION

Mill tailings and liquid wastes generated at the site are disposed in partially below-grade, lined impoundments. These impoundments are equipped with leak detection systems installed beneath the liner, which are inspected daily as part of EFN's tailings monitoring program. A drainage system is also incorporated into the impoundment design for use in dewatering and consolidating the tailings.

In addition, the licensee is required under Appendix A to 10 CFR Part 40 to conduct a groundwater detection monitoring program. EFN's program will involve quarterly sampling of six point of compliance wells completed in the uppermost aquifer, with water level measurements taken and each groundwater sample analyzed for five indicator parameters.

Detailed discussion of EFN's monitoring programs for the tailings impoundments and the groundwater system are provided in the Environmental Assessment (EA) prepared by the staff in conjunction with this license renewal.

8.0 MILL SITE DECOMMISSIONING AND RECLAMATION

The mill decommissioning plan generally involves separating reusable materials which can be released to the public or are releasable to another licensed facility from those materials which require special disposal. Equipment and materials to be disposed are proposed to be buried within the tailings retention impoundment. Items released to the general public will meet the appropriate release guidelines.

The staff will require that a detailed decommissioning plan be submitted for NRC review and approval at least twelve months prior to a planned final shutdown. The EA prepared for this license renewal addresses planned site reclamation.

9.0 SURETY REQUIREMENTS

10 CFR 40, Appendix A, Criterion 9, requires the licensee to establish a financial surety arrangement to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the facility. The surety is based on an estimate which must account for the total costs that would be incurred if an independent contractor were contracted to perform the work. The surety estimate must be approved by NRC and be based on an NRC-approved decommissioning and reclamation plan. The licensee must also provide the surety arrangement through a financial instrument acceptable to NRC. The licensee's surety mechanism will be reviewed by NRC annually to assure that

sufficient funds are available to complete the reclamation. Additionally, the amount of the surety should be adjusted to recognize any increases or decreases in liability resulting from inflation, changes in engineering plans, or other conditions affecting cost.

The surety for the White Mesa mill is carried by Umetco, under an agreement between EFN and Umetco. The current surety amount of \$10,915,647 was reviewed and approved by NRC in August 1996. EFN will be required by license condition to maintain a financial surety arrangement in accordance with the requirements of Criterion 9. The surety requirements will be reviewed at least annually by NRC to assure that the funds and the surety arrangement are acceptable.

Following financial difficulties in February 1995, EFN agreed to voluntarily revise its surety amount to cover reclamation and decommissioning costs for the site in its current state. EFN is pursuing this action in two phases, with the first having been completed in June 1995 with NRC's approval of a revised surety amount of approximately \$10.5 million. In this initial phase, EFN reviewed all major reclamation cost centers, considering the then current level of development and disturbance at the site. In the second phase, EFN is reviewing all elements of the site reclamation plan and will, if necessary, revise the earlier cost estimate. The licensee submitted its revised site reclamation plan by letter dated February 28, 1997, for NRC review and approval.

10.0 INSPECTION HISTORY

NRC has conducted routine announced, routine unannounced, and reactive inspections of EFN's White Mesa uranium mill since the renewal of SUA-1358 on September 26, 1985. 14 inspections have been conducted since that date, in which a total of 19 violations were cited, the highest of which was of Severity Level IV. A discussion of inspection and enforcement actions, including severity of violations is provided in NUREG-1600 (NRC, July 1995). Minor violations are cited at Severity Level IV and major violations are cited at Severity Level I. Typically, Severity Level IV violations are cited for not performing required surveys or incomplete documentation. All cited violations have been acceptably addressed and corrective measures enacted by the licensee. A summary of the inspection history for the facility since September 1985 is provided in Table 10.1. Severity Level V violations were eliminated with the revision to the NRC's enforcement policy in June 1995.

| DATE | TYPE* | # OF VIOLATIONS | SEVERITY LEVEL | COMMENTS/RESULTS |
|------------|-------|-----------------|----------------|--|
| 1/14-16/97 | A | 0 | -- | |
| 1/23-25/96 | A | 1 | IV | Change in mill circuit without NRC approval. Violation Closed. |

TABLE 10.1
SUMMARY OF NRC INSPECTIONS AT
ENERGY FUELS NUCLEAR, INC.'S
WHITE MESA URANIUM MILL

| DATE | TYPE* | # OF VIOLATIONS | SEVERITY LEVEL | COMMENTS/RESULTS |
|------------|-------|-----------------|-----------------|--|
| 8/8-11/95 | A | 0 | -- | |
| 3/1-2/95 | R | 0 | -- | Inspection prompted by EFN notification of financial difficulties |
| 4/11-13/94 | A | 4 | all IV | Failure to (1) perform adequate radiological surveys of personnel leaving restricted area; (2) survey vehicles leaving restricted area; (3) use proper lower limits of detection for analysis of effluent and environmental samples; and (4) conduct complete radiological release surveys on all barrels of yellowcake in preparation for transportation to processor. Violations Closed. |
| 3/11/93 | A | 2 | IV | Failure to perform and document exposure calculations w/in one week of end of regulatory compliance period; Failure to perform complete radiological survey on equipment released from restricted area. Violations Closed. |
| 10/23/91 | U | 1 | IV | Weekly inspections of all mill site areas not performed. Violation Closed |
| 8/13-16/90 | U | 3 | Two IV One V | Exposure calculations did not use appropriate airborne concentrations; Issuance records not maintained for yellowcake precipitation operations; Yellowcake packaging while emission control equipment not w/in design performance specifications. Violations Closed |
| 2/12/90 | U | 0 | -- | |
| 8/7-10/89 | U | 4 | All IV | Employee working in airborne radioactivity area w/o respiratory protection; Annual surety update not provided; RSO had not attended required refresher training; SOP not reviewed annually as required. Violations Closed |
| 1/12-13/89 | R | 0 | -- | |

TABLE 10.1
SUMMARY OF NRC INSPECTIONS AT
ENERGY FUELS NUCLEAR, INC.'S
WHITE MESA URANIUM MILL

| DATE | TYPE* | # OF VIOLATIONS | SEVERITY LEVEL | COMMENTS/RESULTS |
|--|-------|-----------------|----------------|--|
| 4/11-13/88 | U | 2 | IV | Portions of tailings cells not wetted or stabilized as required by 10 CFR Part 40 Appendix A; Lab surfaces for bioassay sample analyses not surveyed for removable alpha contamination. Violations Closed |
| 3/16-18/87 | U | 2 | IV, V | Occupational exposure calculations not documented; Tailings cell not marked as authorized disposal site. Violations Closed |
| 5/19-21/86 | U | 4 | All IV | Airborne radioactivity areas not posted; RWP not issued for non-routine maintenance work; Lapel sampling results not used to calculate exposures; Occupational exposure calculations not documented. Violations Closed |
| 10/4/85 | R | 2 | IV | Required training not given for tailings impoundment inspections; Site inspections not performed in required manner. Violations Closed |
| * A = Routine Announced; R = Reactive; U = Routine Unannounced | | | | |

On July 2, 1996, the Commission approved increasing the license term for qualified uranium recovery licensees from the current five-year period to a ten-year period. As discussed in SECY-96-112 (issued on May 21, 1996), the criteria to be used in determining whether a licensee is "qualified" are as follows:

- (1) the licensee must have performed well;
- (2) the licensee must have a successful inspection record, with no violations more serious than Severity Level IV;
- (3) the licensee must have had no serious operational problems or reports during the previous two years; and
- (4) the license in question must currently have a specific term of renewal (uranium mills currently undergoing reclamation would not meet this criteria).

Based on its review, the staff finds that EFN is a qualified licensee, and therefore, a ten-year license term is appropriate.

11.0 CONCLUSION INCLUDING SAFETY LICENSE CONDITIONS

Upon completion of the safety review of EFN's renewal application for a source material license, the staff concludes that the operation of the White Mesa Uranium Mill, in accordance with the following license conditions, is protective of health and safety and fulfills the requirements of 10 CFR Parts 20 and 40. The staff, therefore, recommends renewal of EFN's Source Material License SUA-1358, subject to the following conditions:

1. A. The licensee may, without prior NRC approval, and subject to the conditions specified in Part B of this condition.
 - (1) Make changes in the facility or process, as presented in the application.
 - (2) Make changes in the procedures presented in the application.
 - (3) Conduct tests or experiments not presented in the application.
- B. The licensee shall file an application for an amendment to the license, unless the following conditions are satisfied.
 - (1) The change, test, or experiment does not conflict with any requirement specifically stated in this license, or impair the licensee's ability to meet all applicable NRC regulations.
 - (2) There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan.
 - (3) The change, test, or experiment are consistent with the conclusions of actions analyzed and selected in this EA.
- C. The licensee's determinations concerning Part B of this condition, shall be made by a "Safety and Environmental Review Panel (SERP)." The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have responsibility for implementing any operational changes; and, one member shall be the corporate radiation safety officer (CRSO) or equivalent, with the responsibility of assuring changes conform to radiation safety and environmental requirements. Additional members may be included in the SERP as appropriate, to address technical aspects such as health physics, groundwater hydrology, surface-water hydrology, specific earth sciences, and other technical disciplines. Temporary members or permanent members, other than the three above-specified individuals, may be consultants.

- D. The licensee shall maintain records of any changes made pursuant to this condition until license termination. These records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining changes are in compliance with the requirements referred to in Part B of this condition. The licensee shall furnish, in an annual report to NRC, a description of such changes, tests, or experiments, including a summary of the safety and environmental evaluation of each. In addition, the licensee shall annually submit to the NRC changed pages to the Operations Plan and Reclamation Plan of the approved license application to reflect changes made under this condition.

The licensee shall submit to NRC by March 31, 1997, for review, the standard operating procedures (SOPs) needed to implement this license condition. The licensee shall not implement any provision of this license condition until NRC has found the proposed SOPs acceptable.

2. SOPs shall be established and followed for all operational process activities involving radioactive materials that are handled, processed, or stored. SOPs for operational activities shall enumerate pertinent radiation safety practices to be followed. Additionally, written procedures shall be established for non-operational activities to include in-plant and environmental monitoring, bioassay analyses, and instrument calibrations. An up-to-date copy of each written procedure shall be kept in the mill area to which it applies.

All written procedures for both operational and non-operational activities shall be reviewed and approved in writing by the RSO before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the RSO shall perform a documented review of all existing operating procedures at least annually.

3. The licensee is hereby exempted from the requirements of Section 20.1902(e) of 10 CFR 20 for areas within the facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.1902(e) and with the words, "Any area within this facility may contain radioactive material."
4. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground-water restoration as warranted and for the long-term surveillance fee. Within three months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within 3 months of written NRC approval.

Annual updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9 and 10, shall be submitted to NRC at least 3 months prior to the anniversary date which is designated as June 4 of each year. If NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement for 1 year. Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed and any other conditions affecting estimated costs for site closure. The basis for the cost estimate is the NRC approved reclamation/decommissioning plan or NRC approved revisions to the plan. The previously provided guidance entitled "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates" outlines the minimum considerations used by NRC in the review of site closure estimates. Reclamation/decommissioning plans and annual updates should follow this outline.

The currently approved surety instrument, Irrevocable Letter of Credit No. SC0017012, issued by The Bank of New York in favor of NRC, as amended, May 10, 1994, to include a Standby Trust Agreement, shall be continuously maintained by UMETCO in an amount not less than \$10,915,467 for the purpose of complying with 10 CFR 40, Appendix A, Criteria 9 and 10, until a replacement is authorized by NRC.

5. The licensee shall submit a detailed decommissioning plan to NRC at least twelve (12) months prior to planned final shutdown of mining operations.
6. Release of equipment or packages from the restricted area shall be in accordance with "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials," dated May, 1987, or suitable alternative procedures approved by NRC prior to any such release.
7. The results of sampling, analyses, surveys and monitoring, the results of calibration of equipment, reports on audits and inspections, all meetings and training courses required by this license and any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in the NRC regulations, all such documentation shall be maintained for a period of at least five (5) years.
8. The licensee shall perform an annual ALARA audit of the radiation safety program in accordance with Regulatory Guide 8.31.

Please note that additional license conditions can be found in the Environmental Assessment, which accompanies this licensing action.

REFERENCES

U.S. Nuclear Regulatory Commission [NRC], May 21, 1996, "Ten-Year License Terms for Uranium Recovery Licensees," SECY-96-112.

NRC, July 1995, "General Statement of Policy and Procedures for NRC Enforcement Actions (Enforcement Policy)," Office of Enforcement, NUREG-1600.

NRC, August 1988, "Bioassays at Uranium Mills," NRC Regulatory Guide 8.22, Rev. 1.

NRC, May 1987, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," NRC Division of Fuel Cycle, Medical, Academic and Commercial Use Safety.

NRC, June 1983, "Health Physics Surveys in Uranium Mills," NRC Regulatory Guide 8.30.

NRC, May 1983, "Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Mill Will Be As Low As Is Reasonably Achievable," NRC Regulatory Guide 8.31.

NRC, January 1983, "Hydrologic Design Criteria For Tailings Retention System," NRC Staff Technical Position WM-8201.

NRC, October 1980, "Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mill Tailings," NRC Regulatory Guide 3.11.1.

NRC, May 1979, "Final Environmental Statement: Related to Operation of White Mesa Uranium Project, Energy Fuels Nuclear, Inc.," NUREG-0556, Office of Nuclear Material Safety and Safeguards.

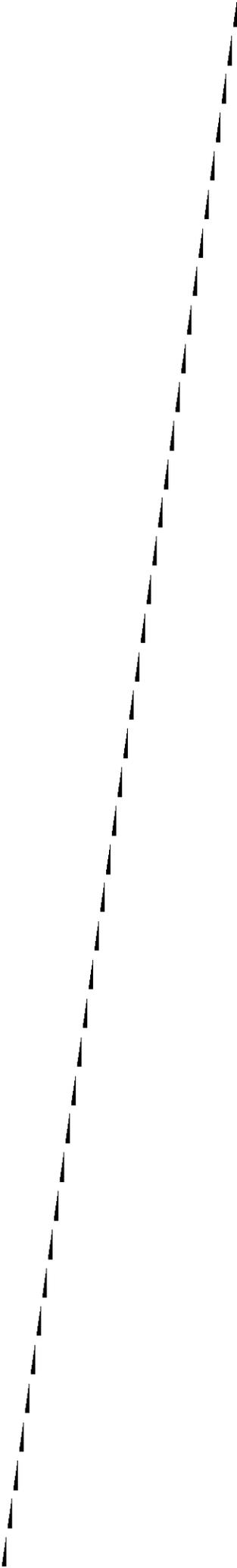
NRC, February 1979, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment," NRC Regulatory Guide 4.15.

NRC, December 1977, "Design, Construction and Inspection of Embankment Retention Systems for Uranium Mills," NRC Regulatory Guide 3.11.

NRC, October 1976, "Acceptable Programs for Respiratory Protection," NRC Regulatory Guide 8.15.

Enclosure 4

NRC Source Material License No. SUA-1358



MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

| | |
|---|--|
| Licensee | |
| 1. Energy Fuels Nuclear, Inc. | 3. License Number SUA-1358 |
| 2. 6425 S. Highway 191 P.O. Box 789 Blanding, Utah 84511 | 4. Expiration Date March 31, 2007 |
| | 5. Docket or Reference No. 40-8681 |

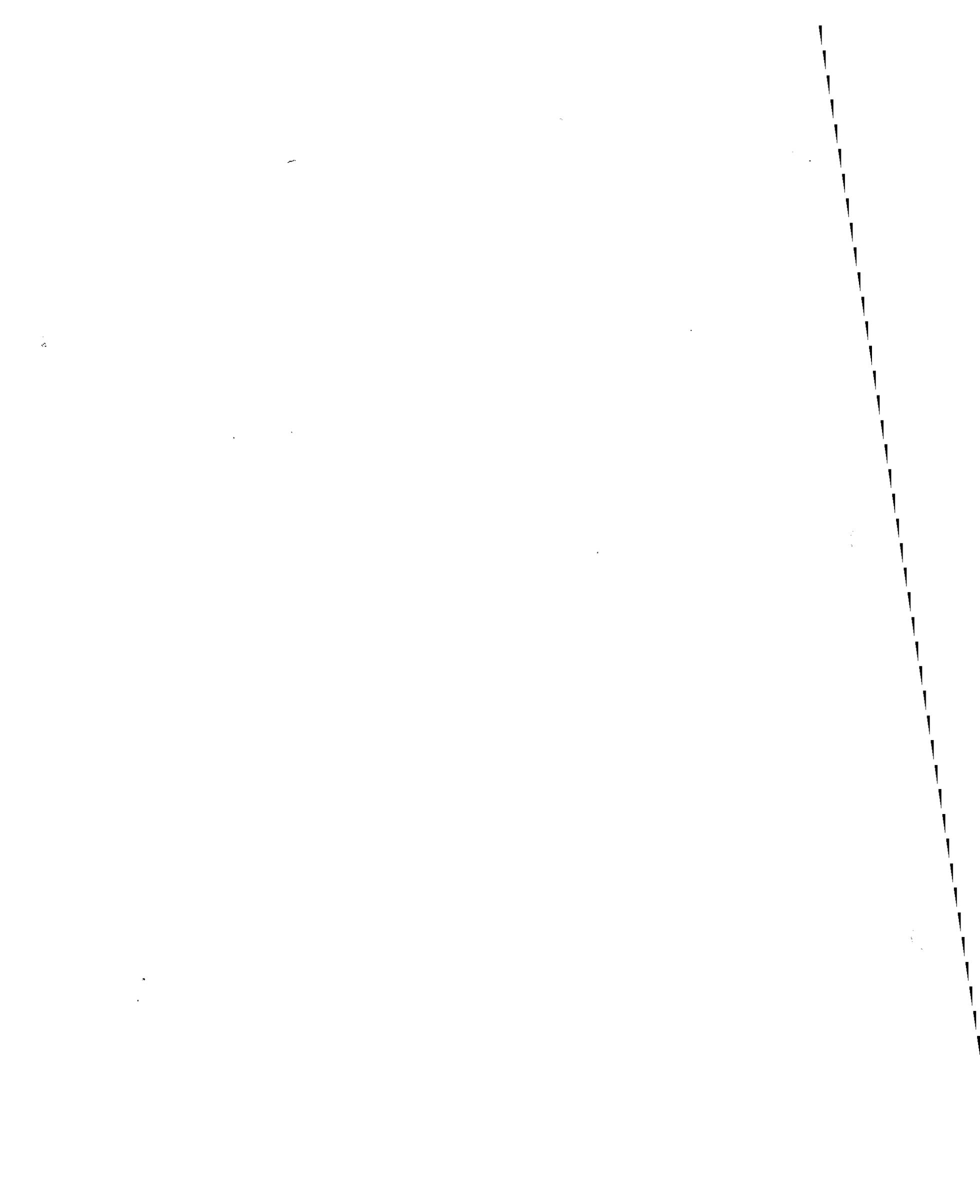
| | | |
|---|----------------------------------|--|
| 6. Byproduct, Source, and/or Special Nuclear Material | 7. Chemical and/or Physical Form | 8. Maximum Amount that Licensee May Possess at Any One Time Under This License |
| Natural Uranium | Any | Unlimited |

SECTION 9: Administrative Conditions

- 9.1 The authorized place of use shall be the licensee's White Mesa uranium milling facility, located in San Juan County, Utah.
- 9.2 All written notices and reports to the NRC required under this license, with the exception of incident and event notifications under 10 CFR 20.2202 and 10 CFR 40.60 requiring telephone notification, shall be addressed to the Chief, Uranium Recovery Branch, Division of Waste Management, Office of Nuclear Material Safety and Safeguards.

Incident and event notifications that require telephone notification shall be made to the NRC Operations Center at (301) 816-5100.
- 9.3 The licensee shall conduct operations in accordance with statements, representations, and conditions contained in the license renewal application submitted by letter dated August 23, 1991, as revised by submittals dated January 13, and April 7, 1992, November 22, 1994, July 27, 1995, December 13, 1996, and January 30, 1997, which are hereby incorporated by reference, and May 10, 1994, for the Standby Trust Agreement, except where superseded by license conditions below.

Whenever the word "will" is used in the above referenced documents, it shall denote a requirement.
- 9.4 A. The licensee may, without prior NRC approval, and subject to the conditions specified in Part B of this condition:



**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number

SUA-1358

Docket or Reference Number

40-8681

March 14, 1997

- (1) Make changes in the facility or process, as presented in the application.
 - (2) Make changes in the procedures presented in the application.
 - (3) Conduct tests or experiments not presented in the application.
- B. The licensee shall file an application for an amendment to the license, unless the following conditions are satisfied.
- (1) The change, test, or experiment does not conflict with any requirement specifically stated in this license, or impair the licensee's ability to meet all applicable NRC regulations.
 - (2) There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan.
 - (3) The change, test, or experiment are consistent with the conclusions of actions analyzed and selected in this EA.
- C. The licensee's determinations concerning Part B of this condition, shall be made by a "Safety and Environmental Review Panel (SERP)." The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have responsibility for implementing any operational changes; and, one member shall be the corporate radiation safety officer (CRSO) or equivalent, with the responsibility of assuring changes conform to radiation safety and environmental requirements. Additional members may be included in the SERP as appropriate, to address technical aspects such as health physics, groundwater hydrology, surface-water hydrology, specific earth sciences, and other technical disciplines. Temporary members or permanent members, other than the three above-specified individuals, may be consultants.
- D. The licensee shall maintain records of any changes made pursuant to this condition until license termination. These records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining changes are in compliance with the requirements referred to in Part B of this condition. The licensee shall furnish, in an annual report to NRC, a description of such changes, tests, or experiments, including a summary of the safety and environmental evaluation of each. In addition, the licensee shall annually submit to the NRC changed pages to the Operations Plan and Reclamation Plan of the approved license application to reflect changes made under this condition.



MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number

SUA-1358

Docket or Reference Number

40-8681

March 14, 1997

The licensee shall submit to the NRC by April 30, 1997, for review, the standard operating procedures (SOPs) needed to implement this license condition. The licensee shall not implement any provision of this license condition until NRC has found the proposed SOPs acceptable.

- 9.5 The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground-water restoration as warranted and for the long-term surveillance fee. Within three months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within 3 months of written NRC approval.

Annual updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9 and 10, shall be submitted to the NRC at least 3 months prior to the anniversary date which is designated as June 4 of each year. If the NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement for 1 year. Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed and any other conditions affecting estimated costs for site closure. The basis for the cost estimate is the NRC approved reclamation/decommissioning plan or NRC approved revisions to the plan. The previously provided guidance entitled "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates" outlines the minimum considerations used by the NRC in the review of site closure estimates. Reclamation/decommissioning plans and annual updates should follow this outline.

The currently approved surety instrument, Irrevocable Letter of Credit No. S00017012, issued by The Bank of New York in favor of the NRC, as amended, May 10, 1994, to include a Standby Trust Agreement, shall be continuously maintained by UMETCO in an amount not less than \$10,915,467 for the purpose of complying with 10 CFR 40, Appendix A, Criteria 9 and 10, until a replacement is authorized by the NRC.

- 9.6 Standard operating procedures shall be established and followed for all operational process activities involving radioactive materials that are handled, processed, or stored. SOPs for operational activities shall enumerate pertinent radiation safety practices to be followed. Additionally, written procedures shall be established for non-operational activities to include in-plant and environmental monitoring, bioassay



MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number

SUA-1358

Docket or Reference Number

40-8681

March 14, 1997

analyses, and instrument calibrations. An up-to-date copy of each written procedure shall be kept in the mill area to which it applies.

All written procedures for both operational and non-operational activities shall be reviewed and approved in writing by the radiation safety officer (RSO) before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. In addition, the RSO shall perform a documented review of all existing operating procedures at least annually.

- 9.7 Before engaging in any activity not previously assessed by the NRC, the licensee shall administer a cultural resource inventory. All disturbances associated with the proposed development will be completed in compliance with the National Historic Preservation Act (as amended) and its implementing regulations (36 CFR 800), and the Archaeological Resources Protection Act (as amended) and its implementing regulations (43 CFR 7).

In order to ensure that no unapproved disturbance of cultural resources occurs, any work resulting in the discovery of previously unknown cultural artifacts shall cease. The artifacts shall be inventoried and evaluated in accordance with 36 CFR Part 800, and no disturbance shall occur until the licensee has received authorization from the NRC to proceed.

The licensee shall avoid by project design, where feasible, the archeological sites designated "contributing" in the report submitted by letter dated July 28, 1988. When it is not feasible to avoid a site designated "contributing" in the report, the licensee shall institute a data recovery program for that site based on the research design submitted by letter from C. E. Baker of Energy Fuels Nuclear to Mr. Melvin T. Smith, Utah State Historic Preservation Officer (SHPO), dated April 13, 1981.

The licensee shall recover through archeological excavation all "contributing" sites listed in the report which are located in or within 100 feet of borrow areas, stockpile areas, construction areas, or the perimeter of the reclaimed tailings impoundment. Data recovery fieldwork at each site meeting these criteria shall be completed prior to the start of any project related disturbance within 100 feet of the site, but analysis and report preparation need not be complete.

Additionally, the licensee shall conduct such testing as is required to enable the Commission to determine if those sites designated as "Undetermined" in the report and located within 100 feet of present or known future construction areas are of such significance to warrant their redesignation as "contributing." In all cases, such testing shall be completed before any aspect of the undertaking affects a site.

Archeological contractors shall be approved in writing by the Commission. The Commission will approve an archeological contractor who meets the minimum standards for a principal investigator set forth in 36 CFR Part 66, Appendix C, and whose qualifications are found acceptable by the SHPO.



**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number
SUA-1358

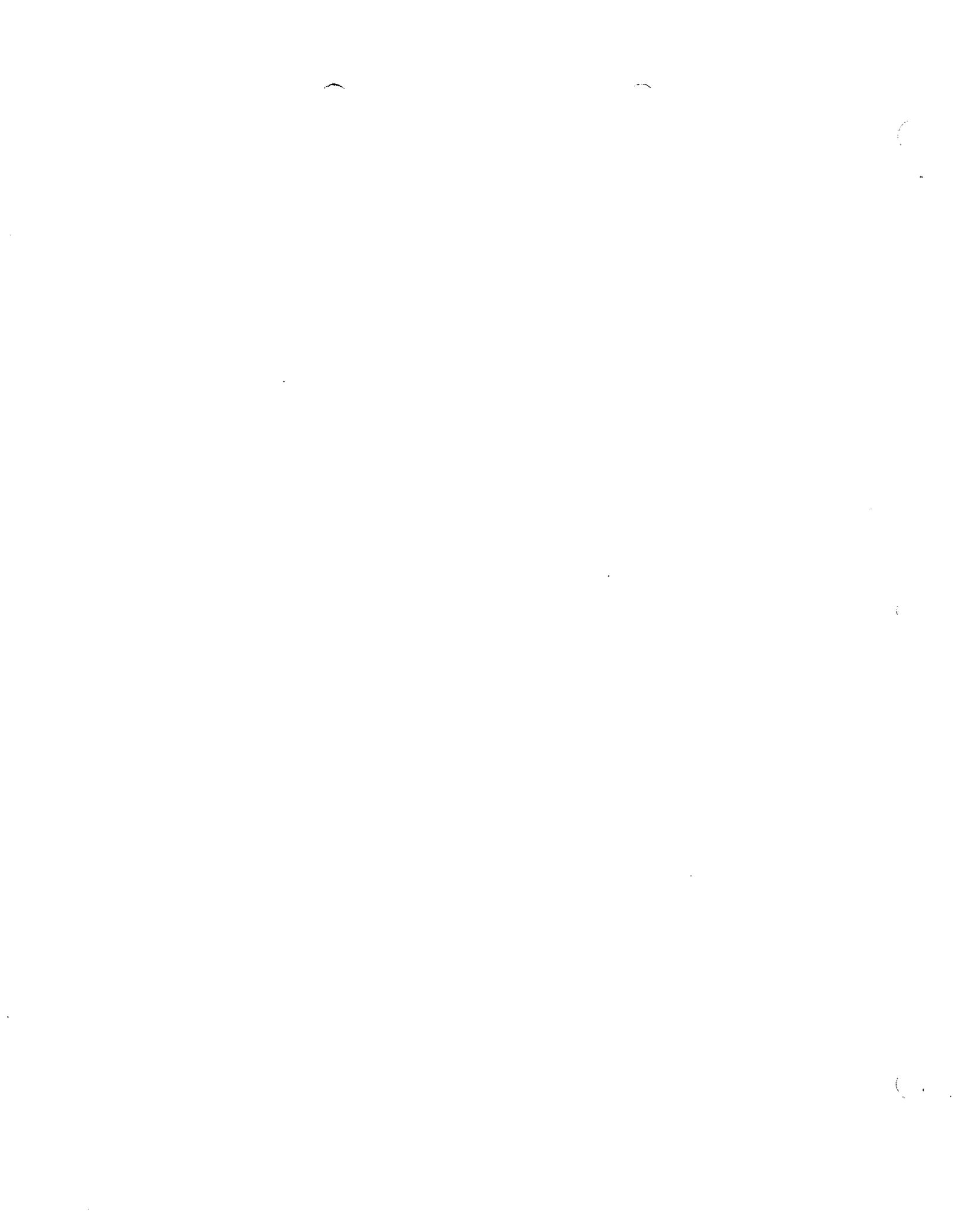
Docket or Reference Number
40-8681

March 14, 1997

- 9.8 The licensee is hereby authorized to possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by the licensee's milling operations authorized by this license. Mill tailings shall not be transferred from the site without specific prior approval of the NRC in the form of a license amendment. The licensee shall maintain a permanent record of all transfers made under the provisions of this condition.
- 9.9 The licensee is hereby exempted from the requirements of Section 20.1902 (e) of 10 CFR Part 20 for areas within the mill, provided that all entrances to the mill are conspicuously posted in accordance with Section 20.1902 (e) and with the words, "Any area within this mill may contain radioactive material."
- 9.10 Release of equipment or packages from the restricted area shall be in accordance with "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated May 1987, or suitable alternative procedures approved by the NRC prior to any such release.

SECTION 10: Operational Controls, Limits, and Restrictions

- 10.1 The mill production rate shall not exceed 4380 tons of yellowcake per year.
- 10.2 All liquid effluents from mill process buildings, with the exception of sanitary wastes, shall be returned to the mill circuit or discharged to the tailings impoundment.
- 10.3 Freeboard limits for Cells 1-I, 3, and 4A, and tonnage limits for Cell 3, shall be as stated in Section 3.0 to Appendix E of the approved license application.
- 10.4 Disposal of material and equipment generated at the mill site shall be conducted as described in the licensee's submittals dated December 12, 1994 and May 23, 1995, with the following addition:
- A. The maximum lift thickness for materials placed over tailings shall be less than 4-feet thick. Subsequent lifts shall be less than 2-feet thick. Each lift shall be compacted by tracking of heavy equipment, such as a Cat D-6, at least 4 times prior to placement of subsequent lifts.
- 10.5 In accordance with the licensee's submittal dated May 20, 1993, the licensee is hereby authorized to dispose of byproduct material generated at licensed in situ leach facilities, subject to the following conditions:
- A. Disposal of waste is limited to 5000 cubic yards from a single source.



**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number

SUA-1358

Docket or Reference Number

40-8681

March 14, 1997

- B. All contaminated equipment shall be dismantled, crushed, or sectioned to minimize void spaces. Barrels containing waste other than soil or sludges shall be emptied into the disposal area and the barrels crushed. Barrels containing soil or sludges shall be verified to be full prior to disposal. Barrels not completely full shall be filled with tailings or soil.
- C. All waste shall be buried in Cell No. 3 unless prior written approval is obtained from the NRC for alternate burial locations.
- D. All disposal activities shall be documented. The documentation shall include descriptions of the waste and the disposal locations, as well as all actions required by this condition. An annual summary of the amounts of waste disposed of from off-site generators shall be sent to the NRC.

10.6 The licensee is authorized to receive and process source materials from the Allied Signal Corporation's Metropolis, Illinois, facility in accordance with the amendment request dated June 15, 1993.

10.7 The licensee is authorized to receive and process source material from Allied Signal, Inc. of Metropolis, Illinois, in accordance with the amendment request dated September 20, 1996, and amended by letters dated October 30, and November 11, 1996.

SECTION 11: Monitoring, Recording, and Bookkeeping Requirements

11.1 The results of sampling, analyses, surveys and monitoring, the results of calibration of equipment, reports on audits and inspections, all meetings and training courses required by this license and any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in the NRC regulations all such documentation shall be maintained for a period of at least five (5) years.

11.2 The licensee shall implement the effluent and environmental monitoring program specified in Section 5.5 of the renewal application as revised with the following modifications or additions:

- A. Stack sampling shall include a determination of flow rate.
- B. Surface water samples shall also be analyzed semiannually for total and dissolved U-nat, Ra-226, and Th-230, with the exception of the Westwater Creek, which shall be sampled annually for water sediments and analyzed as above. A sediment sample shall not be taken in place of a water sample unless a water sample was not available.
- C. Groundwater sampling shall be conducted in accordance with the requirements in License Condition 11.3.

**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number
SUA-1358

Docket or Reference Number
40-8681

March 14, 1997

- D. The licensee shall utilize lower limits of detection in accordance with Section 5 of Regulatory Guide 4.14 (Revision 1), for analysis of effluent and environmental samples.
- E. The inspections performed semiannually of the critical orifice assembly committed to in the submittal dated March 15, 1986, shall be documented. The critical orifice assembly shall be calibrated at least every 2 years against a positive displacement Roots meter to obtain the required calibration curve.

11.3 The licensee shall implement a groundwater detection monitoring program to ensure compliance to 10 CFR Part 40, Appendix A. The detection monitoring program shall be in accordance with the report entitled, "Points of Compliance, White Mesa Uranium Mill," submitted by letter dated October 5, 1994, as modified by the following:

- A. The leak detection system for all ponds will be checked weekly. If liquid is present, it shall be analyzed for chloride, sulfate, selenium, and pH. The samples will be statistically analyzed to determine if significant linear trends exist, and the results will be submitted to NRC for review.
- B. If a significant linear trend is indicated, the licensee will submit a proposed corrective action for review and approval to NRC. The corrective action shall include a discussion on delineation of the area, extent and concentration of hazardous constituents.
- C. The licensee shall sample monitoring wells WMMW-5, -11, -12, -14, -15, and -17, on a quarterly basis. Samples shall be analyzed for chloride, potassium, nickel, and uranium, and the results of such sampling shall be included with the environmental monitoring reports submitted in accordance with 10 CFR 40.65.

11.4 During extended periods of mill standby, eight-hour annual sampling for U-nat, Ra-226, Th-230 and Pb-210 may be eliminated if routine airborne sampling show levels below 10 percent of the appropriate 10 CFR Part 20 limits.

During periods of standby, sampling frequencies for area airborne uranium sampling within the mill may be reduced to quarterly, provided measured levels remain below 10 percent of the derived air concentration (DAC). If these levels exceed 10 percent of the DAC, the sampling frequency should follow the recommendations in Regulatory Guide 8.30.

11.5 Calibration of in-plant air and radiation monitoring equipment shall be performed as specified in the license renewal application, under Section 3.0 of the "Radiation Protection Procedures Manual," with the exception that in-plant air sampling equipment shall be calibrated at least quarterly and air sampling equipment checks shall be documented.

**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number

SUA-1358

Docket or Reference Number

40-8681

March 14, 1997

- 11.6 The licensee shall perform an annual ALARA audit of the radiation safety program in accordance with Regulatory Guide 8.31.

SECTION 12: Reporting Requirements

- 12.1 The licensee shall submit to NRC for review, by June 30, 1997, a detailed reclamation plan for the authorized tailings disposal area which includes the following:
- A. A post-operations interim stabilization plan which details methods to prevent wind and water erosion and recharge of the tailings area.
 - B. A plan to determine the best methodology to dewater and/or consolidate the tailings cells prior to placement of the final reclamation cover.
 - C. Plan and cross-sectional views of a final reclamation cover which details the location and elevation of tailings. The plan shall include details on cover thickness, physical characteristics of cover materials, proposed testing of cover materials (specifications and quality assurance), the estimated volumes of cover materials and their availability and location.
 - D. Detailed plans for placement of rock or vegetative cover on the final reclaimed tailings pile and mill site area.
 - E. A proposed implementation schedule for items A through D above which defines the sequence of events and expected time ranges.
 - F. An analysis to show that the proposed type and thickness of soil cover is adequate to provide attenuation of radon and is adequate to assure long-term stability, as well as an analysis and proposal on methodology and time required to restore ground water in conformance to regulatory requirements.
 - G. The licensee shall include a detailed cost analysis of each phase of the reclamation plan to include contractor costs, projected costs of inflation based upon the schedule proposed in item E, a proposed contingency cost, and the costs of long-term maintenance and monitoring.

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6



**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License Number

SUA-1358

Docket or Reference Number

40-8681

March 14, 1997

- 12.2 The licensee shall submit a detailed decommissioning plan to the NRC at least twelve (12) months prior to planned final shutdown of mill operations.

FOR THE NUCLEAR REGULATORY COMMISSION

Date

March 14, 1997


Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure 5

"Guidelines for Decontamination of Facilities and Equipment
Prior to Release for Unrestricted Use
or Termination of Licenses for Byproduct, Source,
or Special Nuclear Material"

May 1987 revision

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT
PRIOR TO RELEASE FOR UNRESTRICTED USE
OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE,
OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Division of Fuel Cycle, Medical, Academic,
and Commercial Use Safety
Washington, DC 20555

May 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case.

1. The licensee shall make a reasonable effort to eliminate residual contamination.
2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.
3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.
4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer to premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:
 - a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.
 - b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U. S. Nuclear Regulatory Commission, Washington, DC 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:
- a. Identify the premises.
 - b. Show that reasonable effort has been made to eliminate residual contamination.
 - c. Describe the scope of the survey and general procedures followed.
 - d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

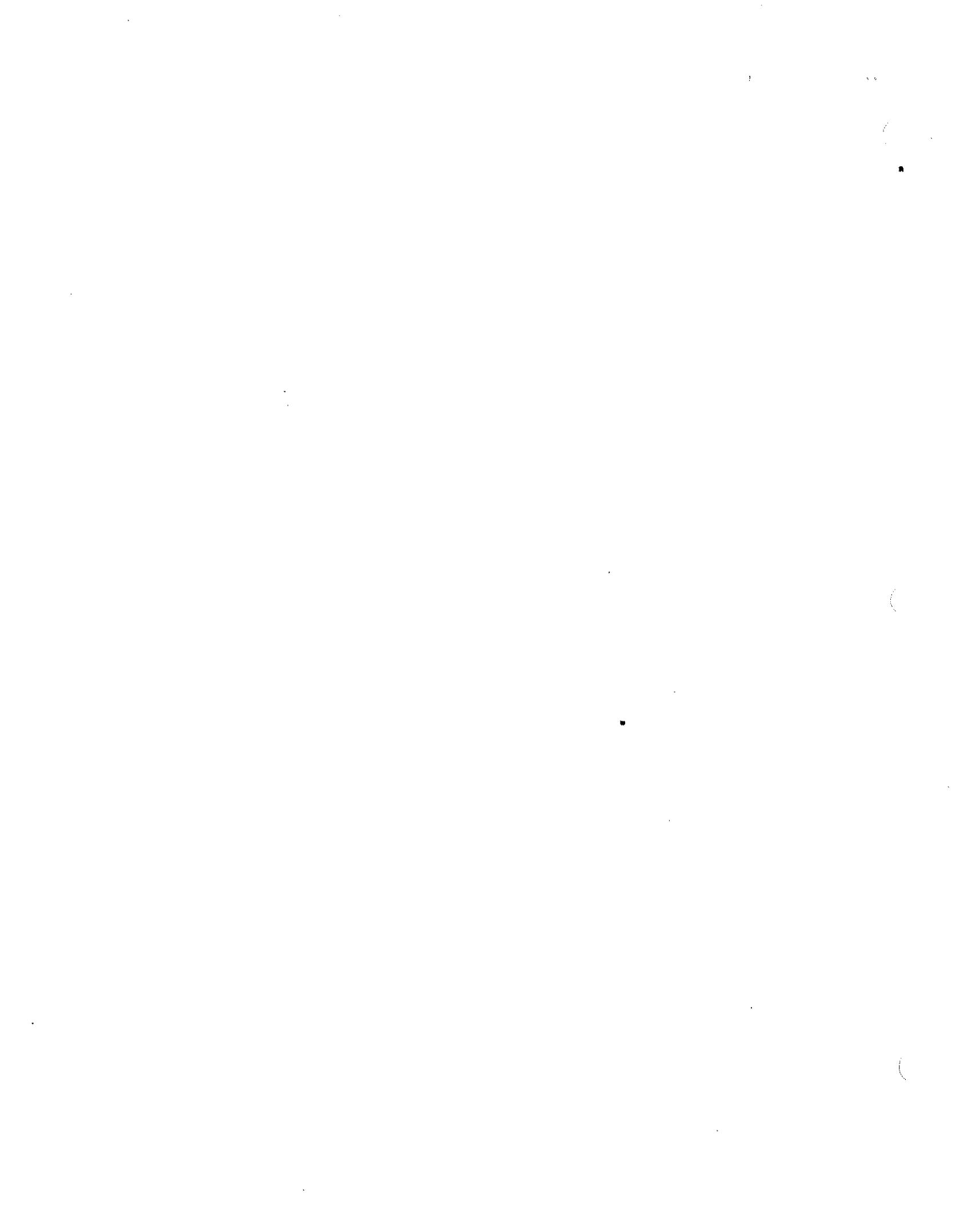


TABLE 1
ACCEPTABLE SURFACE CONTAMINATION LEVELS

| NUCLIDES ^a | AVERAGE ^{b c f} | MAXIMUM ^{b d f} | REMOVABLE ^{b e f} |
|---|---|---|---|
| U-nat, U-235, U-238, and associated decay products | 5,000 dpm α /100 cm ² | 15,000 dpm α /100 cm ² | 1,000 dpm α /100 cm ² |
| Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 | 100 dpm/100 cm ² | 300 dpm/100 cm ² | 20 dpm/100 cm ² |
| Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 | 1000 dpm/100 cm ² | 3000 dpm/100 cm ² | 200 dpm/100 cm ² |
| Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. | 5000 dpm $\beta\gamma$ /100 cm ² | 15,000 dpm $\beta\gamma$ /100 cm ² | 1000 dpm $\beta\gamma$ /100 cm ² |

^aWhere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

^bAs used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

^cMeasurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

^dThe maximum contamination level applies to an area of not more than 100 cm².

^eThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

^fThe average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

