



# Background

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## Uranium Mill Tailings

### Background

In the early 1980s, the price of uranium fell due to a lack of orders for new nuclear power plants in the U.S. and the importing of uranium from other countries. As a result, U.S. uranium mills were shut down or had their operations scaled back. Recently, the price of uranium has rapidly increased from \$9.70 per pound in January 2002 to \$45.75 per pound in June 2006. Due to this price increase, there have been numerous inquiries about the licensing of new uranium production facilities in 2006. Uranium mill tailings contain the radioactive element radium, which decays to produce radon, a radioactive gas. The radium in these tailings will not decay entirely for thousands of years. The mill tailings pose a potential hazard to public health and safety.

To provide for the disposal, long-term stabilization, and control of these mill tailings in a safe and environmentally sound manner and to minimize or eliminate radiation health hazards to the public, Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). This Act established two programs to protect the public and the environment from uranium mill tailings.

The UMTRCA Title I program established a joint Federal/State-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Now there is Federal ownership of the tailings disposal sites under general license from the Nuclear Regulatory Commission (NRC). Under Title I, the Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. The NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the sites meet standards set by the Environmental Protection Agency (EPA).

The UMTRCA Title II program is directed toward uranium mill sites licensed by the NRC or Agreement States in or after 1978. Title II of the Act provides —

- NRC authority to control radiological and non-radiological hazards.
- EPA authority to set generally applicable standards for both radiological and non-radiological hazards.
- Eventual State or Federal ownership of the disposal sites, under general license from NRC.

There are five Agreement States – Colorado, Illinois, Texas, Utah and Washington – that license “Atomic Energy Act section 11e.(2)” material (i.e., certain mill tailings and related waste containing thorium or uranium). NRC is required to make a determination that all applicable standards and requirements have been met by uranium mills before termination of their Agreement State license.

### **Regulations and Standards**

UMTRCA charged the EPA with the responsibility for issuing generally applicable standards for control of uranium mill tailings. In 1983, EPA issued standards for both Title I and Title II sites. In November 1985, as mandated by UMTRCA, NRC changed its regulations in 10 CFR Part 40, Appendix A to be consistent with EPA Title II standards. Since 1985, various changes have been made to Part 40 for the Title II sites. In 1995, EPA issued final Title I groundwater standards.



The Atlas Site in Moab, Utah

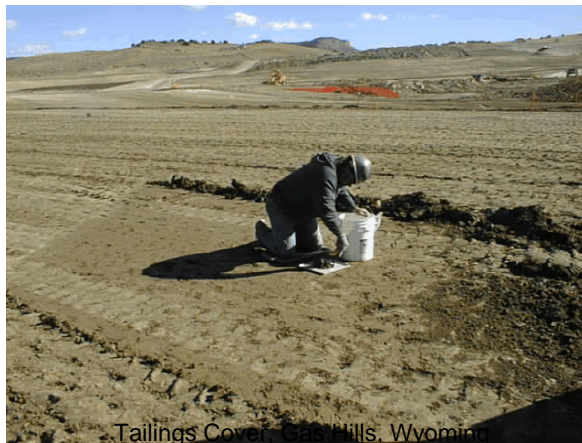
### **Discussion**

**Title I - Reclamation Work at Inactive Tailings Sites** - Under the Uranium Mill Tailings Remedial Action (UMTRA) Project, DOE was charged with completing surface reclamation at 24 inactive uranium mill tailings piles. Two sites in North Dakota were withdrawn and tailings from some sites were combined, resulting in 19 tailings disposal sites. These piles range in size from approximately 60,000 to 4.6 million cubic yards of material. Except for a site at Canonsburg, Pennsylvania, and an associated property at Burrell, Pennsylvania, the inactive sites are located in western states. In 2001, the Atlas site near Moab, Utah was transferred to DOE for remediation under Title I of UMTRCA.

In 1993, DOE became a licensee of NRC under the general license provisions of 10 CFR 40.27. This transpired when NRC concurred in the completion of construction and surface cleanup at the Spook, Wyoming, inactive tailings site and accepted DOE's plan for long-term surveillance at the Spook site. By August 1999, 17 more sites were completed and brought under the general NRC license, including sites at Ambrosia Lake, New Mexico; Burrell, Pennsylvania; Canonsburg, Pennsylvania; Durango, Colorado; Falls City, Texas; Green River, Utah; Gunnison, Colorado; Lakeview, Oregon; Lowman, Idaho; Maybell, Colorado; Mexican Hat, Utah; Naturita,

Colorado; Rifle, Colorado; Salt Lake City, Utah; Shiprock, New Mexico; Slick Rock, Colorado; and Tuba City, Arizona. The only remaining sites are those at Grand Junction, Colorado and Moab, Utah. Legislation allows a portion of the Grand Junction site to remain open until 2023 to accept additional waste from tailings contaminated properties. DOE has decided to transfer the Moab mill tailings to a site near Crescent Junction, Utah, and is preparing a remedial action plan for NRC concurrence describing its proposed action.

DOE initiated the groundwater cleanup phase of the UMTRA Project in 1991. It has completed all of the 20 scheduled baseline risk assessments for the groundwater cleanup phase and has transmitted them to concerned parties. Two sites did not have groundwater contamination. DOE has developed Groundwater Compliance Action Plans for demonstrating groundwater compliance at 13 sites and submitted them to the NRC for concurrence. DOE has demonstrated groundwater cleanup compliance at eight of those sites.



**Title II - Licensed Uranium Recovery Facilities and Mill Tailings Sites** - Of 16 uranium recovery facilities currently licensed by the NRC under its regulations (10 CFR Part 40), there are 12 conventional uranium mills and four in situ leach (ISL) facilities. There is also one former conversion facility under reclamation for 11e(2) byproduct material. Two of the conventional mill site licenses have been terminated and the reclaimed tailings areas transferred to DOE for long-term care under the general license provisions of 10 CFR 40.28.

A conventional mill uses uranium ore extracted by either open pit or deep mining. The ore is then crushed and sent through the mill, where extraction processes concentrate the uranium into uranium-oxygen compounds called yellowcake. The remainder of the crushed rock, in a processing fluid slurry, is placed in a tailings pile/cell. The “pile” is actually a constructed impoundment or a former uranium mine pit that must meet criteria in 10 CFR Part 40, Appendix A. These criteria include requirements for siting and design of the pile, cover performance, and financial surety for decommissioning, reclamation, and long-term surveillance.

With the ISL uranium extraction process, wells are drilled into rock formations containing uranium ore. Water, with added oxygen and sodium bicarbonate, is injected down the wells to mobilize the uranium in the rock so that it dissolves in the groundwater. The water is pumped to the surface, where a processing plant separates the uranium. Waste from this process is disposed in a tailings pile at a mill site.

No NRC-licensed conventional uranium mills are operating. One mill is in stand-by status and will likely resume commercial operation in the future. The remaining conventional uranium mill sites have completed, or are completing, reclamation activities to provide long-term stabilization and closure of the tailings impoundments and the sites. Two of the four ISL facilities are presently operating, one is on stand-by status, and one will likely resume operations in the future. The NRC inspects these sites at semiannual to three-year intervals depending on the operational (or stand-by) and reclamation status.

The NRC-licensed sites are located in Nebraska, New Mexico, and Wyoming. There also are eight conventional uranium mills in Agreement States that have similar non-operational tailings impoundments. One mill in Colorado is operating. Texas also has ISL facilities, but most are in, or have completed, decommissioning. Three uranium mill sites are located in Utah, with one being active, one in reclamation, and one returning to active status. An active mill tailings disposal facility is also located in Utah. This mill tailings disposal facility was licensed by NRC as a commercial facility in November 1993 to receive and dispose of 11e.(2) byproduct material. In 2004, Utah became an Agreement State for 11e.(2) byproduct material and regulatory authority over the site transferred to the state. The site also has disposal cells licensed under Utah Agreement State authority for the disposal of low-level radioactive waste and mixed waste.

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