# Fact Sheet

U.S. DEPARTMENT OF ENERGY | Legacy Management

# Mexican Hat, Utah, Disposal Site

An UMTRCA Title I site

This fact sheet provides information about the **Mexican Hat disposal site**. This site is managed by the **U.S. Department of Energy Office of Legacy Management under Title I** of the **Uranium Mill Tailings Radiation Control Act of 1978**.

## Site Information and History

The Mexican Hat disposal site is located on the Navajo Reservation in southeast Utah, 1.5 miles southwest of the town of Mexican Hat and 1 mile south of the San Juan River. The site is 10 miles north of the Utah-Arizona border and approximately 15 miles north of the Monument Valley processing site. The site is also the location of a former uranium ore processing mill. Texas-Zinc Minerals Corporation constructed the Mexican Hat mill on land leased from the Navajo Nation and operated the facility from 1957 to 1963. Atlas Corporation purchased the mill in 1963 and operated it until it closed in 1965. A sulfuric acid manufacturing plant operated at the site from 1957 to 1970. Control of the site reverted to the Navajo Nation after the lease expired in 1970.

Much of the ore brought to the mill contained a considerable amount of copper sulfide and other sulfide minerals and was processed to recover both copper and uranium. The milling process produced radioactive tailings, a predominantly sandy material. Spent tailings were mixed with process water and pumped through a pipeline to two on-site tailings piles: the former lower tailings pile and the former upper tailings pile.

The U.S. Department of Energy (DOE) completed surface remedial action at the site in 1995. Radioactive materials from the former upper tailings pile, demolished mill structures, and 11 vicinity properties were relocated and placed in a disposal cell constructed at the location of the former lower tailings pile. An additional 983,000 cubic yards (1.3 million dry tons) of tailings and associated waste were hauled from the Monument Valley, Arizona, Processing Site approximately 15 miles to the south and placed in the cell on top of contaminated materials from the Mexican Hat site. A total of approximately 3.6 million cubic yards (4.4 million dry tons) of residual radioactive materials were stabilized in the Mexican Hat disposal cell.

## Regulatory Setting

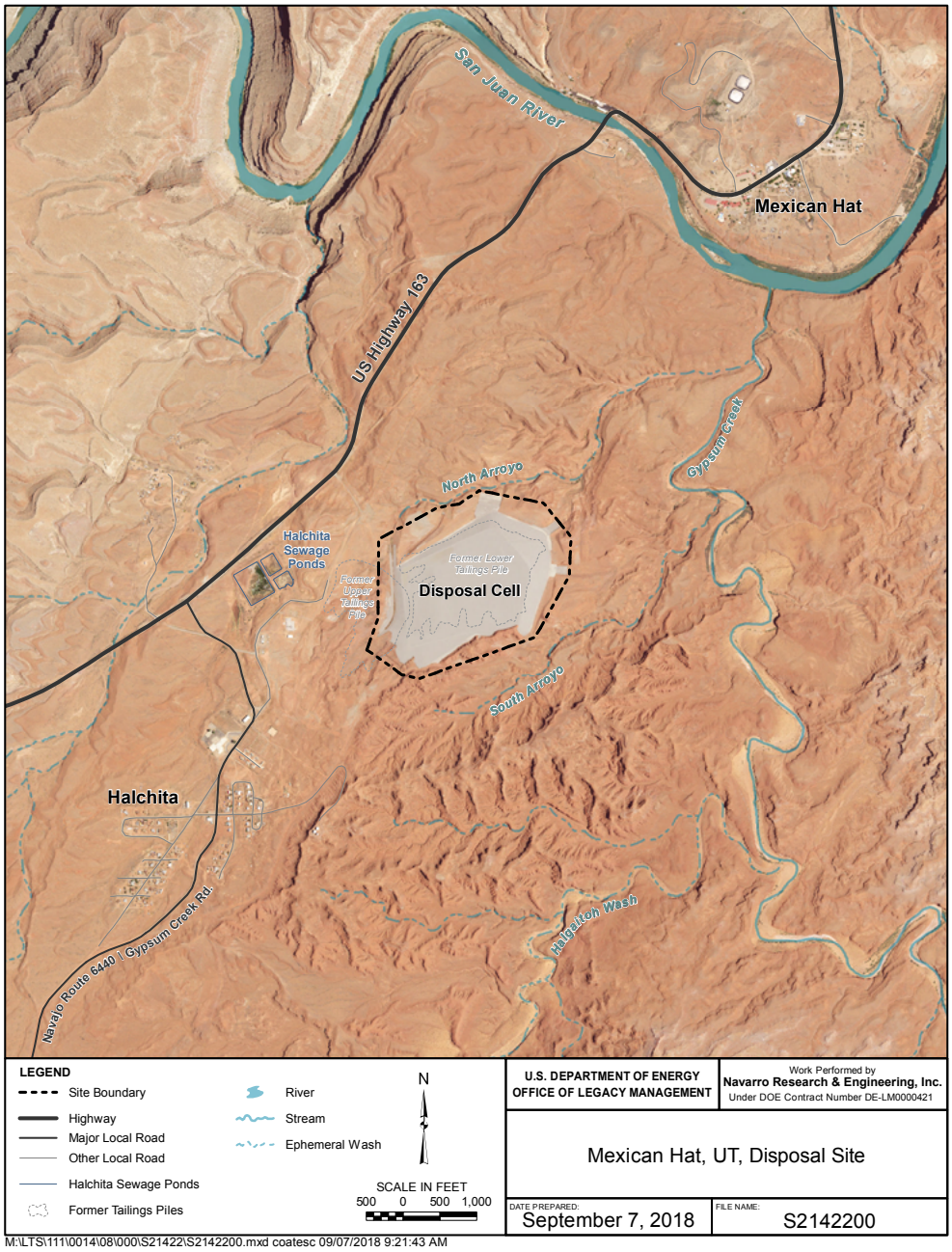
Congress passed the Uranium Mill Tailings Radiation Control Act (UMTRCA) in 1978 (Public Law 95-604), and DOE remediated 22 inactive uranium ore processing sites under the Uranium Mill Tailings Remedial Action Project in accordance with standards promulgated by the U.S. Environmental Protection Agency in Title 40 *Code of Federal Regulations* (CFR), Part 192. Subpart B of 40 CFR 192 regulated cleanup of contaminated groundwater at the processing sites. The U.S. Nuclear Regulatory Commission general license for UMTRCA Title I sites is established in 10 CFR 40.27. The Mexican Hat disposal site was included under the general license in 1997.

## Disposal Site

The Mexican Hat disposal site lies on a relatively flat mesa at an elevation of approximately 4,300 feet. The San Juan River is approximately 1 mile to the north and receives surface drainage from the site and surrounding area. Bounding the relatively flat mesa to the north and east are the ephemeral drainages (North Arroyo and South Arroyo) that discharge into Gypsum Creek, a tributary of the San Juan River.

Average annual precipitation is approximately 6.5 inches and is fairly evenly distributed throughout the year. The area is sparsely vegetated by desert shrubs and grasses, and the land around the site is used for limited residential purposes and livestock grazing.

The Permian Halgaito Formation is the geologic unit exposed at the site. Soil is thin to nonexistent in the area because



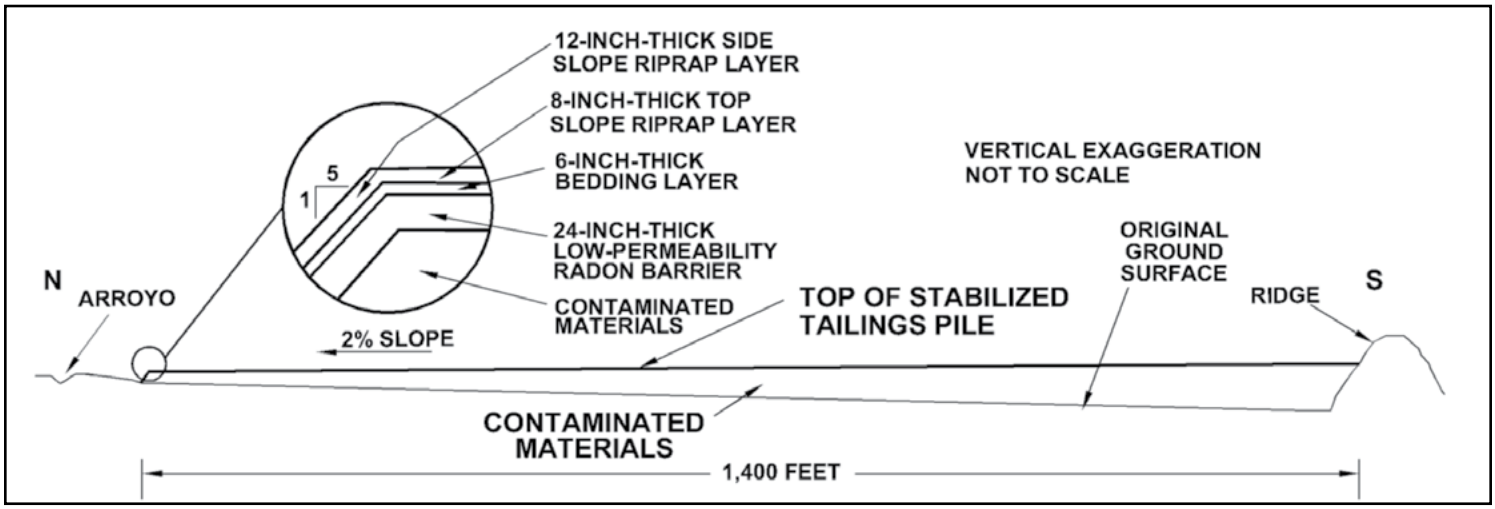

*Vicinity Map of the Mexican Hat, Utah, Disposal Site.*

of the extremely dry climate. Siltstone is the predominant rock type in the Halgaito; shale, fine-grained sandstone, and limestone lenses are also present but less common. The Halgaito is 80 to 215 feet thick in the site area and is divided into upper and lower units. Most of the upper unit is unsaturated but has some scattered groundwater in fractures and as perched water overlying finer-grained zones. The lower unit is classified as the uppermost aquifer at the Mexican Hat site. Groundwater in the lower unit is under artesian pressure and is isolated from groundwater in the upper unit by limestone beds that limit vertical water movement.

Although groundwater in the lower unit of the Halgaito has not been contaminated by past milling operations, the natural water quality near the site is unsuitable for human consumption. Groundwater samples collected from monitoring wells installed in the lower unit of the Halgaito showed the presence of hydrogen sulfide gas, naturally occurring petroleum, and naturally elevated levels of total dissolved solids and sulfate. Nearby communities currently withdraw surface water from the San Juan River for household and other domestic uses.

## Compliance Strategy

The groundwater compliance strategy for the Mexican Hat site is no remediation. Groundwater in the uppermost aquifer (the lower unit of the Halgaito Formation) has not been contaminated by uranium milling activities. Although site-related contamination has been detected in groundwater of the upper unit of the Halgaito, the occurrence of groundwater




*Typical North-South Cross Section of the Mexican Hat Disposal Cell.*

is sporadic and ephemeral. Historical water quality data and associated risk assessments provide supporting evidence that site-related contamination does not pose any threats to human health or the environment.

DOE performed water quality monitoring at several seep locations at the site from 1997 through 2005, as a best management practice to evaluate disposal cell performance. During the eight years of monitoring, water quality monitoring results appeared to suggest site-related contamination was present in the seeps downgradient of the site. However, risk assessments concluded that no significant human or ecological risks are associated with the seeps at these minimal flows. Therefore, water quality monitoring of the seeps was discontinued in 2006.

In accordance with the site specific Long-Term Surveillance Plan (LTSP), DOE performs visual observational monitoring (including photographic documentation) at seven designated seep locations during annual site inspections. Flow at the seeps has progressively decreased over time to the point where all but one of the seeps are now dry. The one wet seep has consistently exhibited dripping (not flowing) conditions. No seeps have exhibited flowing conditions at the site since at least 2005. Water quality samples collected as a best management practice at the site in 2015 and 2016 returned contaminant concentrations below the historical ranges and did not indicate any substantial changes from historical water quality sample results at the site. Per the LTSP, the need to resume water quality monitoring at the seeps will be reevaluated if observed seep flows significantly increase to historical levels.

## Disposal Cell Design

The cell occupies an area of 68 acres on the 119-acre site. It abuts a rock outcrop on its south end and rises approximately 50 feet above the surrounding terrain to the north, east, and west. A posted barbed wire perimeter fence surrounds the cell. Residual radioactive materials in the cell were compacted before being covered. The cover of the disposal cell is a multicomponent system designed to encapsulate and protect the contaminated materials.

The cover is composed of (1) a low-permeability radon barrier (first layer placed over compacted tailings), (2) a bedding layer of sand and gravel placed as a capillary break, and (3) a rock (riprap) erosion protection layer. The cell design promotes rapid runoff of precipitation to minimize leachate. The cell cover was constructed with a 2 percent grade sloping to the north and east. Runoff water flows down the 20 percent side slopes into the surrounding rock apron and exits the cell via three engineered toe drains that drain into existing arroyos north and east of the cell.

The site location and design were selected to minimize the potential for erosion from on-site runoff or storm water flow. All surrounding remediated areas were regraded and reseeded with native plants. Existing gullies in the vicinity of the cell were armored with riprap that was keyed into competent rock to minimize erosion. Riprap-protected diversion ditches were installed to direct surface runoff water away from the cell.

## Disposal Cell Evaluation

In 2016, multiple subtle depressions were identified in the rock cover along the toe and lower portions of the northeast side slope of the disposal cell. As a result of limited field investigations in 2017 and 2018, erosion into the surface of radon barrier was identified along the lower portions of the north and northeast side slopes of the disposal cell. These observations indicate the disposal cell erosion protection system is not performing as designed. Field observations and supporting radiological scans of the depression features show radioactive materials have neither been released nor exposed, and the disposal cell remains protective of human health and the environment.

In 2019 an in-depth field investigation was performed to collect information needed to identify the causes of the depression features and associated radon barrier erosion, and to determine the appropriate corrective measures needed to ensure that the design life of the disposal cell meets the requirements under UMTRCA. A comprehensive interim cover protection project was also performed in 2019, which restored a 20,000 square foot area on the northeast side slope back

*Depression Features on Northeast Side Slope and Approximate Area of Interim Cover Protection Project.*

*Mexican Hat Interim Cover Protection Project.*

to the original design specifications to ensure protection of human health and the environment until a final long-term solution is implemented.

DOE continues to perform supplemental monitoring through the on-site meteorological weather station, annual surveying of the disposal cell, including collection of horizontal and vertical survey data of the existing settlement plates located on the top slope of the disposal cell, and continuous radiological monitoring through the installation of paired radon monitoring cups and thermoluminescent dosimeters at locations inside and outside of the site boundary. All monitoring data continues to provide objective evidence that the disposal cell remains protective of human health and the environment. Supplemental erosion monitoring will continue to be performed until a final long-term solution is implemented.

For more information see the site's Disposal Cell Evaluation Information Sheet.

## Legacy Management Activities

The DOE Office of Legacy Management (LM) manages the disposal site according to a site-specific LTSP to ensure that the disposal cell systems continue to prevent release of contaminants to the environment. Under provisions of this plan, LM conducts annual inspections of the site to evaluate the condition of surface features, performs site maintenance as necessary, and observes groundwater seeps to verify the continued integrity of the disposal cell.

In accordance with 40 CFR 192.02(a), the disposal cell is designed to be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years. However, the general license has no expiration date, and LM's responsibility for the safety and integrity of the Mexican Hat disposal cell will last indefinitely.

## CONTACT INFORMATION

**IN CASE OF AN EMERGENCY AT THE SITE, CONTACT 911**

**LM TOLL-FREE EMERGENCY HOTLINE: (877) 695-5322**

Site-specific documents related to the **Mexican Hat, Utah, Disposal Site** are available on the LM website at **www.energy.gov/lm/mexican-hat-utah-disposal-site**

For more information about LM activities at the **Mexican Hat, Utah, Disposal Site**, contact:
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**www.energy.gov/lm/mexican-hat-disposal-cell-evaluations**

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