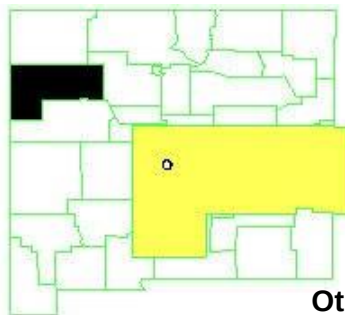


**UNITED NUCLEAR
CORPORATION
(MCKINLEY COUNTY)
NEW MEXICO**

**EPA ID# NMD030443303
Site ID: 0600819**



**EPA REGION 6
CONGRESSIONAL DISTRICT 03**

**Contact: Janet Brooks
214-665-7598**

**Other Names: UNC Mining and Milling
Church Rock Mill**

Updated: June 2015

Next Scheduled Update: July 2015

Current Status

Ground Water Operable Unit (OU01)

Groundwater remedial activities are being conducted by the United Nuclear Corporation (UNC) in accordance with an EPA Unilateral Administrative Order under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

The groundwater remedial activities were designed to control tailings seepage in three shallow ground-water zones at the UNC Church Rock Superfund site (Site); the alluvium (referred to as the Southwest Alluvium) and Zones 1 and 3 of the Upper Gallup Sandstone Formation.



The remedy consists of extraction wells to pump contaminated ground water and evaporation ponds for water disposal. Currently, groundwater migration is not under control. The only ground-water extraction system being operated is for Zone 3. The extraction systems for Zone 1 and the Southwest Alluvium are shut off. The Zone 1 extraction system was shut down in 1999 because it had reached its limit of effectiveness in achieving the cleanup levels established by EPA in its 1988 EPA Record of Decision (ROD). Operational results for Zone 1 demonstrated significant declines in pumping rates over time due to insufficient natural recharge of the aquifers. The loss in saturation reached levels that did not support pumping and the systems were shut down. For the Southwest Alluvium, the extraction system provided partial hydraulic containment to tailing-seepage migration, but there was little progress in achieving some Site cleanup standards over time and the system was temporarily shut-off to perform a natural attenuation test.

The Zone 3 system was shut down in 2000 for the same reasons as Zone 1 and because it was accelerating the movement of the contaminated water rather than containing it. However, over the last few years, UNC conducted other tests to enhance the performance of the extraction system for Zone 3 and stop the migration of the tailing seepage-impacted ground water. Those tests were unsuccessful, but operation of extraction wells at the leading edge of the seepage-impacted front was found to slow its advancement. Hence, UNC has continued to operate those wells and, in 2008, drilled new wells further down-gradient to continue to slow the seepage-impacted ground water, to the extent possible.

Due to the dysfunction of the remedy, in 2006, UNC was required to complete a Site Wide Supplemental Feasibility Study (SWSFS). As an interim measure, while the remedy was under re-evaluation, additional extraction wells were installed in 2010 at the leading edge of the advancing seepage-impacted front to continue to collect contaminated water and slow contaminant migration to the maximum extent

practicable. Alkalinity amended Mill water was injected in one of the new wells to neutralize tailings seepage fluid. Three of the seven new Zone 3

Extraction wells were taken off line during this latest five-year period due to fouling. Four extraction wells and one Plume Boundary well were operational in 2012. The remedy enhancements in Zone 3 are meant to buffer, intercept, slow down, direct, and extract impacted ground water. The configuration and pumping scheme of the injection-extraction well arrays tries to minimize the withdrawal of background water and the tendency to draw it westward while maximizing the volume of impacted water that is extracted. Extraction wells in Zone 3 have a life expectancy of one to two years due to fouling and extremely low yield (less than one gallon per minute (gpm)).

After almost 20 years of active Site remediation and passive remediation by NA processes, the 1988 ROD clean-up goals are still unattained. This issue was noted in the 2003 FYR, and UNC responded by performing a limited scope, Supplemental Feasibility Study (SFS) in 2004 which focused on Zone 3.

After EPA review of the 2004 SFS, they determined that a comprehensive SWSFS was necessary and in 2006 directed UNC to perform a SWSFS with a stated objective of evaluating possible remedial alternatives to meet Site remediation goals of the 1988 ROD. In addition to this requirement, UNC was further obligated to include in the SWSFS a review of Site standards and if necessary a proposal for revised ARARS. The organization of the SWSFS became: Part I – Remediation Standards Update; Part II – Development and Screening of Remedial Alternatives, and Part III – Detailed Analysis of Remedial Alternatives.

Following the EPA disapproval of a draft SWSFS in 2008, Part 1 of the SWSFS was approved by the EPA in 2009. In April 2011, UNC submitted a revised SWSFS including Part I (as reference) and Part II. Parts I and II of the SWSFS were conditionally approved by the EPA on October 14, 2011 given comments that are to be incorporated into SWSFS Part III. Part III was not included in the 2011 volume and had not been issued at this time.

On May 24, 2011, a site meeting was held to discuss these reports, comments and issues, and to determine the next appropriate steps. A follow-up conference call regarding the document was held on December 7, 2011, and UNC is working to incorporate call discussions and complete Part 3.

UNC has submitted a revised risk assessment related to the ground water units at the site. On May 24, 2011, a site meeting was held to discuss this report as well as any comments and issues, and to determine the next appropriate steps. This document has been reviewed and comments provided on July 11, 2011. A conference call was held on August 22, 2011, to discuss the submitted comments. A follow-up conference call regarding the document was held on December 9, 2011. UNC provided the final revised draft to the Agency in March 2012; comments were provided March 15, 2012; and, the revised document was submitted on July 19, 2012. Additional edits were made and the final version was submitted on August 13, 2012, and was accepted by EPA and NMED as the Final.

As part of the SFS process, UNC conducted a water injection pilot test for Zone 3 to evaluate the feasibility of this technology. This proposal was approved by EPA in March 2010, and began in June 2010. Phase one of the pilot test was completed in July 2010. Results were reported as favorable in a final report submitted August 2010, and Phase 2 of the pilot test was initiated in September 2010. Initial results submitted in November 2011 were promising; therefore, pilot study work continued. Operations and data collection activities through March 2012 continue to support implementation of this pilot study. However, On June 29, 2012; UNC notified the agencies that injection of sodium bicarbonate-amended water, in Zone 3 well IW-A, was terminated because the injection rate had decreased such that the operational objective and target injection rate could no longer be maintained. This was not an unexpected result.

Working with the NRC, UNC has been developing a ground water background report. The purpose of this report is to establish background concentration conditions prior to tailings seepage. A conference call was held on January 13, 2012, to discuss the process and progress being made. UNC finalized and submitted a Technical Analysis Report in Support of License Amendment Request for Revised Background Standards Based on Updated Background Concentrations to the Agencies for review on April 21, 2012. This document has been reviewed by EPA, and comments were submitted to the NRC on June 29, 2012. On April 9, 2015, the NRC issued License Amendment No. 52, which revised the Groundwater Protection Standards in three hydro-stratigraphic units for

the following constituents:

- Cadmium, lead, lead-210, nickel, radium-226 and 228, selenium, and thorium-230 within the Southwest Alluvium;
- Lead-210, nickel, radium-226 and 228, thorium-230, and uranium within Zone-1; and,
- Arsenic, cadmium, gross alpha, lead, lead-210, nickel, radium-226 and 228, thorium-230, and uranium within Zone-3.

The NRC License Amendment Request No. 52, Condition 30.B was changed to read:

B. Comply with the following ground water protection standards at point of compliance Wells GW-1, GW-2, GW-3, 632, EPA-23, EPA-28, and 509-D in the Southwest Alluvium; 614, 604, EPA-4, EPA-5, and EPA-7 in Zone 1; and 517, 613, 708, and 711 in Zone 3:

Southwest Alluvium: arsenic = 0.05 mg/L, beryllium = 0.05 mg/L, cadmium = 0.025 mg/L, total trihalomethanes = 0.08 mg/L, gross alpha = 15.0 pCi/L, lead = 0.7 mg/L, lead-210 = 5.9 pCi/L, nickel = 0.078 mg/L, radium-226 and 228 = 8.2 pCi/L, selenium = 0.07 mg/L, thorium-230 = 4.5 pCi/L, uranium = 0.3 pCi/L, and vanadium = 0.1 mg/L.

Zone 1: arsenic = 0.05 mg/L, beryllium = 0.05 mg/L, cadmium = 0.01 mg/L, total trihalomethanes = 0.08 mg/L, gross alpha = 15.0 pCi/L, lead = 0.05 mg/L, lead-210 = 4.7 pCi/L, nickel = 0.07 mg/L, radium-226 and 228 = 12.1 pCi/L, selenium = 0.01 mg/L, thorium-230 = 1.6 pCi/L, uranium = 0.238 pCi/L, and vanadium = 0.1 mg/L.

Zone 3: arsenic = 0.757 mg/L, beryllium = 0.05 mg/L, cadmium = 0.09 mg/L, total trihalomethanes = 0.08 mg/L, gross alpha = 39.7 pCi/L, lead = 0.08 mg/L, lead-210 = 5.7 pCi/L, nickel = 0.569 mg/L, radium-226 and 228 = 35.2 pCi/L, selenium = 0.01 mg/L, thorium-230 = 17 pCi/L, uranium = 0.359 pCi/L, and vanadium = 0.1 mg/L.

The Site team met in May 2012 to discuss site progress, site activities conducted, and future site actions that will be taken to move the site towards completion of the Site-side Supplemental Feasibility Study. The site team included participants from the New Mexico Environment Department, Nuclear Regulatory Commission, Department of Energy, EPA, Navajo Nation EPA, and UNC/GE.

UNC submitted *Groundwater Flow Model of the Church Rock Site and Local Area* on October 12, 2012. They also submitted to the NRC the NRC Supplemental Information Pertaining to License Amendment Request (April 2012) for Revised Groundwater Protection Standard on November 16, 2012. In addition, UNC submitted an email with a Discussion of Turbidity Results from July 2012 and October 2012 on December 7, 2012. UNC submitted the *Annual Review Report – 2012, Groundwater Corrective Action, Church Rock Site, Church Rock, New Mexico* on February 20, 2013. These reports are currently under regulatory review.

Work on the SWSFS Part III has progressed to where revised clean-up standards are required in order to analyze which remedial alternatives would be able to restore ground water to those revised constituent standards. The NRC is currently evaluating a License Amendment Request dated April 17, 2012 and has issued a request for additional information on June 4, 2013 to UNC/GE. Completion of the SWSFS Part III is dependent on the approval/disapproval of the License Amendment Request and will continue, pending that determination.

In February 2013, EPA initiated a fourth Five-Year Review. The review was completed September 29, 2013. The New Mexico Environment Department assisted EPA in performing the review. A Site inspection was performed on April 18, 2013. The public notice announcing the Fourth Five-Year Review was published January 2014 in the Gallup Independence and the Navajo Times.

UNC continues to monitor ground-water chemistry in all three zones and to adjust the pumping in Zone 3 to optimize the extraction of contaminants and limit the migration of down gradient contamination. UNC recently submitted the *2013 Groundwater Corrective Action Annual Review Report, Materials License No. SUA-1475, United Nuclear Corporation's Church Rock Tailings Site, Gallup, New Mexico*, dated January 10, 2014.

UNC submitted to the NRC the *Response to June 4, 2013, Request for Additional Information, United Nuclear Corporation – Church Rock Mill Site, Church Rock, New Mexico, Source Materials License No. SUA-1475*. In addition, UNC submitted *Groundwater Flow Model of the Church Rock Site and Local Area – Revised, Source Materials License No. SUA-1475, United Nuclear Corporation – Church Rock Mill Site, Church Rock, New Mexico* on June 3, 2014. These reports are currently under regulatory review.

UNC submitted *Groundwater Flow Model of the Church Rock Site and Local Area – Revised, Materials License No. SUA-1475, United Nuclear Corporation's Church Rock Tailings Site, Gallup, New Mexico* on June 3, 2014.

UNC submitted *2014 Groundwater Corrective Action Annual Review Report, Material License No. SUA-1475, United Nuclear Corporation's Church Rock Tailings Site, Gallup, New Mexico* on January 30, 2015.

Surface Soil Operable Unit (OU02)

The surface soil OU remedial action for the UNC Site addresses contaminated surface and subsurface soil from the nearby NECR Mine Site (regulated by EPA Region 9). To remove the potential threat to human health at the NECR Site, the Selected Remedy will excavate approximately 1,000,000 cubic yards of waste material from the NECR Site to dispose of at the UNC site. Operations at the NECR Site left uranium protore (low grade ore), waste rock, and overburden after the mine was shut down. Principal threat waste from the NECR Site will not be disposed at the UNC Site and is not part of the OU2 remedial action.

Because of the similarity of the threat posed by the mine waste in the areas on the NECR Site where mine waste has been deposited and consolidated (Consolidation Areas) and the threat posed by the tailings that make up the UNC Site Tailings Disposal Area, as well as the relative proximity of these facilities (less than 1 mile); the EPA invoked its authority under CERCLA Section 104(d)(4), 42 United States Code (U.S.C.) §9604(d)(4), to temporarily treat these related facilities (the NECR Site Consolidation Areas and the UNC Site Tailings Disposal Area) as one for the purposes of Section 104 of CERCLA, 42 U.S.C. § 9604. Treatment of the UNC Site Tailings Disposal Area and the NECR Site Consolidation Areas as one begins immediately, but this treatment is temporary and will end once all the NECR Site waste has been disposed at the UNC Site Tailings Disposal Area.

Disposal of mine waste from the NECR Site within the Tailings Disposal Area at the UNC Site will require acceptance by the NRC and is contingent on an amendment of UNC's NRC license to allow for disposal. The license amendment process will begin when UNC submits for NRC review and evaluation a request for an amendment of its NRC license to accommodate disposal of mine waste from the NECR Site within the Tailings Disposal Area at the UNC Site. The NRC process is expected to last between two and three years.

The Administrative Order of Consent (AOC) between EPA and UNC/GE is complete with an effective date of April 27, 2015. Prior to finalization of the AOC, UNC/GE had initiated a data gap field investigation study that provided data needed for the engineering remedial design. UNC/GE submitted the Pre-Design Studies Reports on October 31, 2014 and were accepted by EPA on January 20, 2015.

Background

The United Nuclear Corporation National Priority List Site (UNC Site) is located 17 miles northeast of Gallup, on the southern border of the Navajo Indian Reservation in Church Rock, McKinley County, New Mexico. The Site includes a former uranium ore processing mill (25 acres) and tailings disposal area (100 acres). The tailings disposal area is subdivided into three cells identified as the South Cell, Central Cell, and North Cell. The surrounding lands include Indian Tribal Land, Indian Allotment Land and UNC-owned property. There are two operable units within the UNC Site: the ground water operable unit (OU01) and the surface soil operable unit (OU02).

The area is sparsely populated, with the nearest residence located 1.5 miles north of the Site. The land use near the Site is primarily grazing for sheep, cattle and horses.

Four water wells are within a 4-mile radius, the nearest being 1.7 miles northeast of the Site; however, nearby residents generally have used bottled water.

Ground Water Operable Unit (OU01)

EPA signed the Record of Decision for the ground water operable unit (OU01) on September 30, 1988. The contaminants of concern in ground water are acidic mill tailings seepage, total dissolved solids, sulfate, thorium, radium, aluminum, ammonia, and iron. The selected remedy included: containment and removal of contaminated ground water in three shallow ground-water zones utilizing existing and additional wells, evaporation of ground water removed from aquifers, and implementation of performance monitoring and evaluation programs. The tailings cells have been capped with an interim radon barrier cover as part of the reclamation activities directed by the Nuclear Regulatory Commission. Two evaporation ponds have been constructed on top of the cells as part of the EPA's ground-water remedy.



Potential Risks and Exposure Pathway(s)

There is no current human exposure to ground water at the Site except during the quarterly ground water sampling conducted by UNC personnel. There is limited potential for future exposure to contaminants in ground water below the UNC-owned property because no ground water supply wells drawing from any of the three hydrostratigraphic units will be allowed on UNC property. The same restriction will apply once the NRC Source Materials License is transferred to the DOE for long-term surveillance monitoring.

The remedy at OU1 (the final source remedy) currently protects human health and the environment in the short term. Actions taken have minimized potential human exposures to contaminants found in the ground water and reduced the potential for the repository tailings to act as a source of ground water contamination.

The remedy at OU2 is protective of human health and the environment. The remedy described in the 2013 OU2 ROD, which provides for the disposal of NECR mine waste at the UNC Site Tailings Disposal Area is also expected to be protective of human health and the environment upon completion. At present, remedial design activities are underway which will adequately address all exposure pathways that could result in unacceptable risks in these areas.

Because the remedial actions at both OUs are currently protective of human health and the environment, the Site's remedy is and remains protective in the short term.

List of Site Contaminants (List only final COCs)

Aluminum, Arsenic, Beryllium, Cadmium, Cobalt, Lead, Manganese, Molybdenum, Nickel, Selenium, Vanadium, Chloride, Sulfate, Nitrate, TDS, radium-226, radium-228, Uranium, Thorium-230, gross alpha, Lead-210, and TTHM.

Links to Radiation Contaminant information

Thorium (<http://www.epa.gov/radiation/radionuclides/thorium.html>)

Radium (<http://www.epa.gov/radiation/radionuclides/radium.html>)

Uranium (<http://www.epa.gov/radiation/radionuclides/uranium.html>)

Benefits

The surface reclamation actions performed by UNC under the direction and oversight of the U.S. Nuclear Regulatory Commission (NRC) at the Site between 1988 and 1996 have stabilized the mill tailings and have protected the Rio Puerco from contamination spills like the one that occurred in 1979. The Surface Soil OU is primarily directed at removing mine waste from the nearby Northeast Church Rock mine and placing that mine waste on the tailings repository currently existing at the UNC Site. The ground water remedy, while currently protective of human health, is being reassessed in the Site Wide Supplemental Feasibility Study for long-term effectiveness.

National Priorities Listing (NPL) History

NPL Proposed Date: 12/30/82

NPL Final Date: 9/08/83

HRS Score: 30.36

Location: The Site is located 17 miles northeast of Gallup, New Mexico and on the southern border of the Navajo Indian Reservation.

Population: The surrounding area is sparsely populated, with the nearest residence located 1.5 miles north of the Site.

Setting: The Site includes a former uranium ore processing mill and tailings disposal area, which covers about 25 and 100 acres, respectively. The tailings disposal area is subdivided into three cells by dikes. The cells are identified as the South Cell, Central Cell, and North Cell. The tailings cells have been capped with an interim radon barrier cover as part of the reclamation activities directed by the NRC. Two evaporation ponds have been constructed on top of the cells as part of the EPA's ground-water remedy.

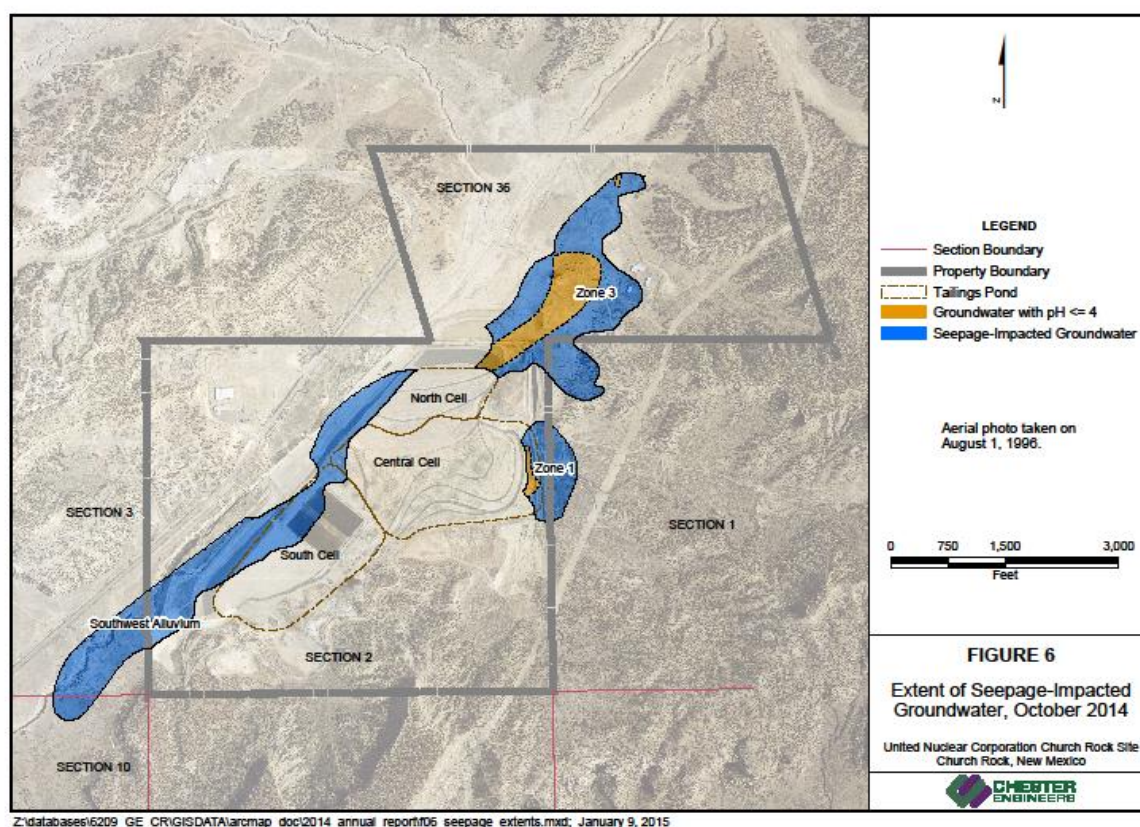
The surrounding lands include Indian Tribal Land, Indian Allotment Land and UNC-owned property. The land use near the Site is primarily grazing for sheep, cattle and horses.

Four water wells are within a 4-mile radius, the nearest being 1.7 miles northeast of the Site; however, nearby residents generally have used bottled water for drinking since the well water has a bad taste.

Hydrogeology: Three shallow water-bearing units beneath the Site were significantly recharged by mine water that was discharged into a local arroyo prior to and during Site milling operations. They are Zone 1 and Zone 3 of the Upper Gallup Sandstone Formations and the shallow alluvium (referred to as the Southwest Alluvium). These recharged units were then contaminated by tailings seepage from the Site. Underlying the Upper Gallup Sandstone Formation is the Mancos Shale. The Mancos Shale acts as an aquitard to prevent or retard the downward migration of contamination.

Principal pollutants: Aluminum, Arsenic, Beryllium, Cadmium, Cobalt, Lead, Manganese, Molybdenum, Nickel, Selenium, Vanadium, Chloride, Sulfate, Nitrate, TDS, radium-226, radium-228, Uranium, Thorium-230, gross alpha, Lead-210, and TTHM.

Site Map



Record of Decision

EPA signed the ROD for the ground water operable unit (OU01) on September 30, 1988. The selected remedy included:

1. Containment and removal of contaminated ground water in the Southwest Alluvium and Zones 1 and 3 of the Upper Gallup Sandstone utilizing existing and additional wells.
2. Evaporation of ground water removed from aquifers using evaporation ponds supplemented with mist or spray systems to enhance the rate of evaporation.
3. Implementation of a monitoring program to detect any increases in the areal extent, or concentration of ground water contamination at, and outside of, the boundary of the tailings disposal area.
4. Implementation of a performance monitoring and evaluation program to determine water levels and contaminant reductions in each aquifer, and the extent and duration of pumping actually required outside the tailings disposal area.

The EPA ROD for the surface soil operable unit (OU02) is in progress and is scheduled for completion in March 2013, at which time it will be made available in the site repository.

EPA signed the ROD for the surface soil operable unit (OU02) on March 29, 2013. The selected remedy (Alternative 2) includes the transportation, receipt, consolidation, and disposal of NECR Site mine waste at the UNC Site within the Tailings Disposal Area. EPA identified Alternative 2 as EPA's preferred remedy in the Surface Soil Operable Unit Proposed Plan for the UNC Site. Principal threat waste is not a part of this selected remedy and principal threat waste from the NECR Site will not be disposed of at the UNC Site. The O&M cost is estimated at \$100K year which was calculated as a percentage of the remedy. The net present worth of O&M for 30 years was \$1,230,000 (rounded). This was part of the \$41.5 million estimated for the entire project. The design and license approval could take between two and four years; construction is projected to take an additional four years.

Ready-for-Reuse Determination

A Ready-for-Reuse Determination has not been made. The Site will be turned over to the Department of Energy for long-term care and monitoring of the tailings cells following closure.

Contacts

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