



**Department of Energy**  
Washington, DC 20585

November 12, 2015

President Russell Begaye  
Executive Office of the Navajo Nation  
PO Box 7440  
Window Rock, AZ 86515

Subject: Response to Request for Information on Groundwater Studies at the U.S. Department of Energy's (DOE) Uranium Mill Tailings Radiation Control Act (UMTRCA) Shiprock, NM Disposal Cell

Dear President Begaye:

It was a pleasure to meet with you and your senior staff at the U.S. EPA Region 9 "Senior Leadership Meeting" in Window Rock on October 15, 2015. Among the many topics discussed that day, I presented a short summary of the DOE's Office of Legacy Management (LM) activities in conjunction with the Navajo Five-Year Plan and our work at the UMTRCA sites at Mexican Hat, Utah; Monument Valley, Arizona; Shiprock, New Mexico; and Tuba City, Arizona; all of which are on the Navajo Reservation. (As we discussed, tailings from the Monument Valley, processing site were moved to the Mexican Hat, site where they were placed in the disposal cell). LM has the responsibility for long-term surveillance and monitoring at these sites. We execute our mission with the support of the Navajo Nation UMTRCA program through a long-standing cooperative agreement.

The three disposal cells on the Navajo Nation were constructed to comply with the U.S. Environmental Protection Agency's (EPA's) *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings* (40 CFR Part 192); as LM's regulator, the U.S. Nuclear Regulatory Commission enforces these requirements per 10 CFR Part 40, *Domestic Licensing of Source Material*. The EPA standards for mill tailings sites are designed to control radon gas emanation from each disposal cell to ensure that human exposure is as low as reasonably achievable. Radon gas emission is the single greatest human-health risk from radiation from uranium mill-tailings disposal facilities. The EPA standards are also designed to prevent contamination of groundwater beneath and in the vicinity of inactive uranium processing sites by uranium tailings.

Responses to your questions on groundwater remediation at the Shiprock site are provided below. In addition, we have attached technical documents with additional detail and documentation of DOE's studies at the Shiprock site and long-term maintenance and surveillance.

- (1) What is the status of the "second wash" (which we understood to mean Many Devils Wash) in relation to the Shiprock disposal cell?
- (2) Do we have water chemistry results from the wells near Shiprock High School?
- (3) Have we made progress with regard to drilling through the disposal cell?



Regarding your first question, the results of our numerous investigations of surface and ground water at Many Devils Wash indicate that the elevated nitrate, sulfate, selenium, and uranium concentrations in surface water and shallow groundwater comprises naturally occurring background material. The source is likely the Mancos Shale, Cretaceous- age marine shale that is widespread in the Four Corners states and that contains elevated concentrations of natural elements, including uranium and selenium. Navajo Nation EPA has an ongoing independent study with the U.S. Geological Survey on the origin of groundwater in the wash; their preliminary results indicate a natural source for nitrate, sulfate, selenium, and uranium in the groundwater of Many Devils Wash.

In response to your second question, the results of groundwater monitoring near Shiprock High School are presented in the tabularized water analyses provided as an attachment. The results show that groundwater contains elevated concentrations of nitrate, sulfate, selenium and uranium, consistent with background levels of these constituents in sediments derived from Mancos Shale. Although there is no primary drinking water standard for sulfate, it is not uncommon for the other constituents (nitrate, selenium, and uranium) to be present at concentrations that exceed the Maximum Concentration Limits for safe drinking water. In addition, the total dissolved solids concentration in groundwater from these two wells is also relatively high due to natural causes. In the case of well 848, the naturally elevated concentration of total dissolved solids exceeds 10,000 mg/L, which makes the groundwater unfit for most uses.

Regarding your third question, LM has specifically not drilled through the engineered disposal cell after construction for a number of reasons, including: (1) concern for the integrity of the disposal cell; (2) the large number of disposal-cell penetrations that would be required to defensibly characterize and reduce uncertainty about the subsurface conditions, and (3) worker health and safety concerns while the drilling was taking place. In addition, the tailings drill cuttings would require special handling, storage, and disposal practice. Nevertheless, before the disposal cell was designed and constructed, we did investigate hydrologic, geotechnical, and geochemical conditions of the tailings pile in the early 1980s; the results of those investigations are presented in enclosed Documents 4, 5, and 6 listed below.

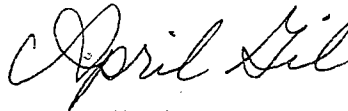
In addition, LM has conducted some minimally invasive sampling of the disposal cell cover to understand disposal-cell and cover performance (Documents 7 and 8, respectively). From the results of these studies, we conclude that drainage from the disposal cell represents a minor component of overall water balance from the site and that contamination in the floodplain aquifer is primarily attributable to drainage and direct discharge of process water, which occurred during milling. Large amounts of water and chemicals were used during uranium processing at the mills, and this water formed a chemical plume in the floodplain aquifer. To address that issue, we are conducting groundwater pumping in the floodplain to remove this contamination and we have made great progress toward contaminant-mass reduction (Document 9, enclosed); however, we recognize that more work needs to be done. LM is committed to its long-term responsibility for groundwater remediation at the Shiprock Site.

In a recent Navajo Quarterly meeting, we discussed adding a number of test wells along the perimeter of the disposal cell to better understand the hydrogeologic conditions in the weathered Mancos Shale flow system. We have not yet developed a work plan for that activity; however, we are actively engaged with the Navajo Nation UMTRCA program, who will be involved in the decision making and planning through our Shiprock Working Group. We are prepared to begin the additional characterization when we reach consensus on its scope.

In the meantime, we are available to discuss these topics with you at your convenience. Please call me at (970) 248-6020 if you have any questions. Please address any correspondence to:

U.S. Department of Energy  
Office of Legacy Management  
2597 Legacy Way  
Grand Junction, CO 81503

Sincerely,



April Gil, Ph.D.  
Environment Team Lead

Enclosures:

(These documents are also available electronically from the Office of Legacy Management's website):

1. Response to Question 1: *Application of Environmental Isotopes to the Evaluation of the Origin of Contamination in a Desert Arroyo: Many Devils Wash, Shiprock, New Mexico (LMS/SHP/S09197; July 2012)*
2. Response to Question 1: *Geology and Groundwater Investigation Many Devils Wash, Shiprock Site, New Mexico (LMS/SHP/S06662; April 2011);*
3. Response to Question 2: Analytical results of High School Wells 848 and 1079 (October 20, 2015);
4. Response to Question 3: *Data for the Geochemical Investigation of UMTRAP Designated Site at Shiprock, New Mexico (UMTRA-DOE-/AL-0234; September 1983);*
5. Response to Question 3: *Engineering Assessment of Inactive Uranium Mill Tailings Shiprock Site, Shiprock, NM (DOE/UMT-0104; July 1981);*
6. Response to Question 3: *Draft Feasibility Evaluation On-Site Stabilization of Uranium Mill Tailings, Shiprock, New Mexico (10805-059-14; 1982);*
7. Response to Question 3: *Disposal Cell Cover Moisture Content and Hydraulic Conductivity (GJO-2001-204-TAR; May 2001);*
8. Response to Question 3: *Presentation of Cone Penetration Test Data, Shiprock Disposal Cell, Shiprock, New Mexico (SHP-CPTD 10.01; October, 2001);*
9. *Annual Performance Report (LMS/SHP/S13080; August 2015).*

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