

# Health and Environmental Impacts of Uranium Contamination in the Navajo Nation

## Five-Year Plan

as requested by  
House Committee on Oversight and Government Reform

June 9, 2008



## Legacy of Uranium Mining on the Navajo Nation



**Church Rock Mine Cleanup Site**



**Tuba City Inactive Uranium Milling Site**



**Haul-Water Source**



**Sampling of Spring Located Near Mine Site**



**Hogan with Contaminated Foundation**



**Contaminated Hogan Removal**

# Health and Environmental Impacts of Uranium Contamination in the Navajo Nation

## 5-Year Plan *Final*

### Contents

<b>Executive Summary .....</b>	<b>4</b>
<b>Agency Action Plans</b>	
Assessment and Cleanup of Contaminated Structures .....	13
Contaminated Water Sources .....	17
Abandoned Uranium Mine Assessment and Cleanup .....	21
Cleanup of the Northeast Church Rock (NECR) Mine Site .....	25
Long-Term Management of Former Uranium Milling Sites .....	26
Characterization and Remediation of Highway 160 Site .....	31
Cleanup of Tuba City Dump .....	34
Health Assessment .....	40
Summary of NRC Actions .....	43
<b>Attachment</b>	
Request from House Committee on Government Oversight and Reform.....	45

## Executive Summary

Mine operators extracted nearly four million tons of uranium ore from 1944 to 1986 under lease agreements with the Navajo Nation. As a result, uranium mining has left the Navajo Nation with a legacy of over 500 abandoned uranium mines (AUMs), four inactive uranium milling sites, a former dump site, contaminated groundwater, structures that may contain elevated levels of radiation, and environmental and public health concerns.

The House Committee on Oversight and Government Reform asked the Bureau of Indian Affairs (BIA), Department of Energy (DOE), Nuclear Regulatory Commission (NRC), Environmental Protection Agency (EPA), and Indian Health Service (IHS) to develop a coordinated five-year plan with specific milestones to address the following objectives:

- Assessment of structures and water sources that are likely to be contaminated;
- Cleanup of structures found to be contaminated above safe levels;
- Provision of alternate water supplies for residents consuming contaminated water;
- Tiered assessment of abandoned mines, with more detailed assessments of those most likely to pose environmental or health problems;
- Cleanup of the Northeast Church Rock mine site and additional high-priority abandoned mine sites;
- Cleanup of the Tuba City Highway 160 site;
- Cleanup of the Tuba City Dump;
- Remediation of groundwater contamination at three former mill sites; and
- Conduct of one or more case control studies of health risks faced by individuals residing near mill sites or abandoned mine sites.

The agencies have worked together to address public health and environmental impacts from historical uranium mining on the Navajo Reservation and continue to consult with our Navajo Nation counterparts on the plan. The Navajo Nation Department of Justice provided guidance on federal consultation procedures on November 16, 2007, and February 12, 2008. In addition, four of the five agencies presented the draft Five-Year Plan and consulted with the Navajo Nation Resources Committee on April 18, 2008.

The agencies look forward to continued coordination and consultation with the Navajo Nation as we implement this plan. In addition, portions of this plan have the potential to affect lands on or adjacent to the Hopi Reservation. Because of the need for continued consultation with the Navajo Nation and Hopi tribe, this document and the action plans contained within are not final, and they will change as new information becomes available to the federal agencies preparing this plan.

The Committee also asked the agencies to identify cost estimates necessary to achieve our objectives. In developing this action plan, the agencies will follow existing agency programs and policies. Costs estimated for 2008 and 2009 are provided in the greatest detail since agency budgets for this period are in place and the costs are known with greater certainty than those for 2010-2012. Some activities and funding levels discussed in this report may not be included in agencies' budgets. Agencies will need to ensure that these activities and funding levels are consistent with other priorities and resource demands.

In 2008, agencies will make substantial progress on the most urgent problems, including:

- assess and clean up potentially contaminated structures;
- test water sources with suspected uranium contamination and provide assistance to affected residents;
- require mitigation of contaminated soils at the highest-risk mine -- Northeast Church Rock; and
- assess risk to drinking water supplies at the Tuba City Dump and implement any needed interim remedial actions.

By 2012, EPA expects to complete a tiered assessment of abandoned uranium mines and to complete soil cleanup of the Northeast Church Rock mine. BIA will lead the implementation of a final remedy for the Tuba City Dump, which is targeted for 2011. Throughout the five-year period, DOE Legacy Management will continue maintenance of contaminated groundwater treatment activities at three inactive uranium milling sites that have been remediated by DOE Environmental Management. The NRC, working closely with the Navajo Nation, will conduct a comprehensive safety and environmental review of any new application for a uranium recovery site. The Indian Health Service (IHS) will diagnose and treat known health conditions in eligible Indians and will work with others to assess the potential for case control studies.

The agencies have identified the following specific objectives for the five-year period from 2008 to 2012:

- Assess and Remediate Contaminated Structures: In coordination with the Navajo Nation, EPA will assess up to 500 structures on their land that are likely to be contaminated with radiation at elevated levels. Where contaminated



structures are found that pose a health risk to current or future occupants, EPA will take appropriate response actions using its Superfund authority. Actions may include demolition of a structure or a portion of a structure, construction of a replacement structure, or other actions to protect current and future residents from exposure to elevated levels of radiation.

The estimated cost for assessing 110 structures in 2008 is \$650,000, and the estimated cost for remediating each contaminated structure is \$100,000-\$300,000 per structure.

- Assess Potentially Contaminated Water Sources and Assist Affected Residents: In spring 2008, EPA will test up to 70 rural Navajo water sources such as livestock wells, windmills, artesian wells and springs to determine if they contain safe levels of radiation or radionuclides. EPA will work with the Navajo Nation, the Indian Health Service, and other agencies to provide the results to the affected communities and develop plans to ensure access to clean and safe water for drinking. EPA will use Superfund authority to take appropriate action at water sources contaminated by mine waste and found to be endangering human health.

EPA estimates the cost of assessing water sources and providing outreach through a Navajo EPA circuit rider in 2008 to be \$250,000 and \$150,000 per year in 2009. The Indian Health Service has estimated the cost of providing alternative water supplies for eligible Indians consuming water from 41 unregulated and potentially contaminated water sources to be up to \$65 million, including planning, design, and construction costs. This amount is not accounted for in the IHS budget, and this estimate will need to be recalculated after more reliable techniques are used to determine contamination levels.

These projects will impact approximately 730 permanently occupied Navajo homes that currently do not have piped water. The Navajo Nation may, but is not obligated to use grant funds provided by the Office of Surface Mining for construction of public facilities, including replacement water supplies, in mine-impacted areas. Office of Surface Mining expects to provide an estimated \$34 million in grant funds to the Navajo Nation during the five-year period of this plan.

- Assess and Require Cleanup of Abandoned Uranium Mines: EPA and the Navajo Nation will work together to conduct a tiered assessment of abandoned mines, with more detailed assessments of those most likely to pose environmental or health problems. In 2007, EPA completed a geographic information system inventory and risk-ranking of the 520 known mines. In 2008, EPA will use this list and consult with the Navajo Nation to identify the highest-priority 200-250 mines for further evaluation. EPA expects to conduct on-site screening evaluations of these mine sites, at the rate of up to 50 per year through 2012. EPA expects to conduct more detailed assessments of up to 35 of the

highest priority mines by 2012, at the rate of approximately seven sites each year.

High-priority mines will be candidates for Superfund enforcement. EPA will continue to pursue an enforcement-first policy, and will conduct a general search for Potentially Responsible Parties at all of the mines. EPA plans to issue information request letters to several major viable corporations (responsible parties) who owned or operated multiple mines by 2008, and EPA will continue to assist Navajo Department of Justice with Navajo-lead enforcement actions.

EPA estimates the cost of conducting a tiered assessment of mines to be \$200,000 in 2008 and \$150,000 in 2009.

- Cleanup the Highest-Priority Mine Site: The Northeast Church Rock Mine located near Gallup, New Mexico, is the highest priority cleanup on EPA's AUM ranking list. EPA will determine the soil remedy in 2008 and plans to require United Nuclear Corporation, now a subsidiary of GE, to perform a comprehensive Superfund removal action for cleanup of soils on the balance of the site. Cleanup is expected to take up to three years. Costs are expected to be provided by the responsible party.
- Remediate Groundwater at the Inactive Uranium Milling Sites: DOE's Office of Legacy Management will continue maintenance of existing groundwater treatment activities at the three inactive uranium ore processing sites and long-term surveillance and maintenance at four inactive milling sites, all of which have been remediated by DOE Environmental Management, throughout the 5-year period of this plan. Site surveillance and maintenance is estimated at \$4,940,000 in 2008 and \$3,178,000 in 2009.
- Characterize the Highway 160 Site: DOE will work with BIA, USGS, EPA, the Navajo Nation, and El Paso Natural Gas (EPNG), as appropriate, to understand the best approach for characterization and any required cleanup based on characterization of the site.

There are currently three authorized courses of action related to additional characterization and remediation of the Highway 160 site: (1) EPA cleanup of the site as a Superfund removal action; (2) continued action by EPNG; (3) some combination of the two approaches.

If EPA determines that an Imminent and Substantial Endangerment exists at this site, EPA can use Superfund enforcement authority to require the potentially responsible parties to conduct a response action. DOE will cooperate with that effort, as requested by the parties as appropriate. If El Paso Natural Gas works

to effect a cleanup of this site, DOE will work with them to consider disposal of the contaminated materials at the DOE facility near Grand Junction.

DOE has provided support to the preparation of a cost estimate for the remaining cleanup work based on the EPNG characterization report. The cost estimate would require additional characterization data that provides information on the chemical species and the depth of the contamination. Based on existing site knowledge, DOE estimates it would take several years to complete the work at the Highway 160 site.

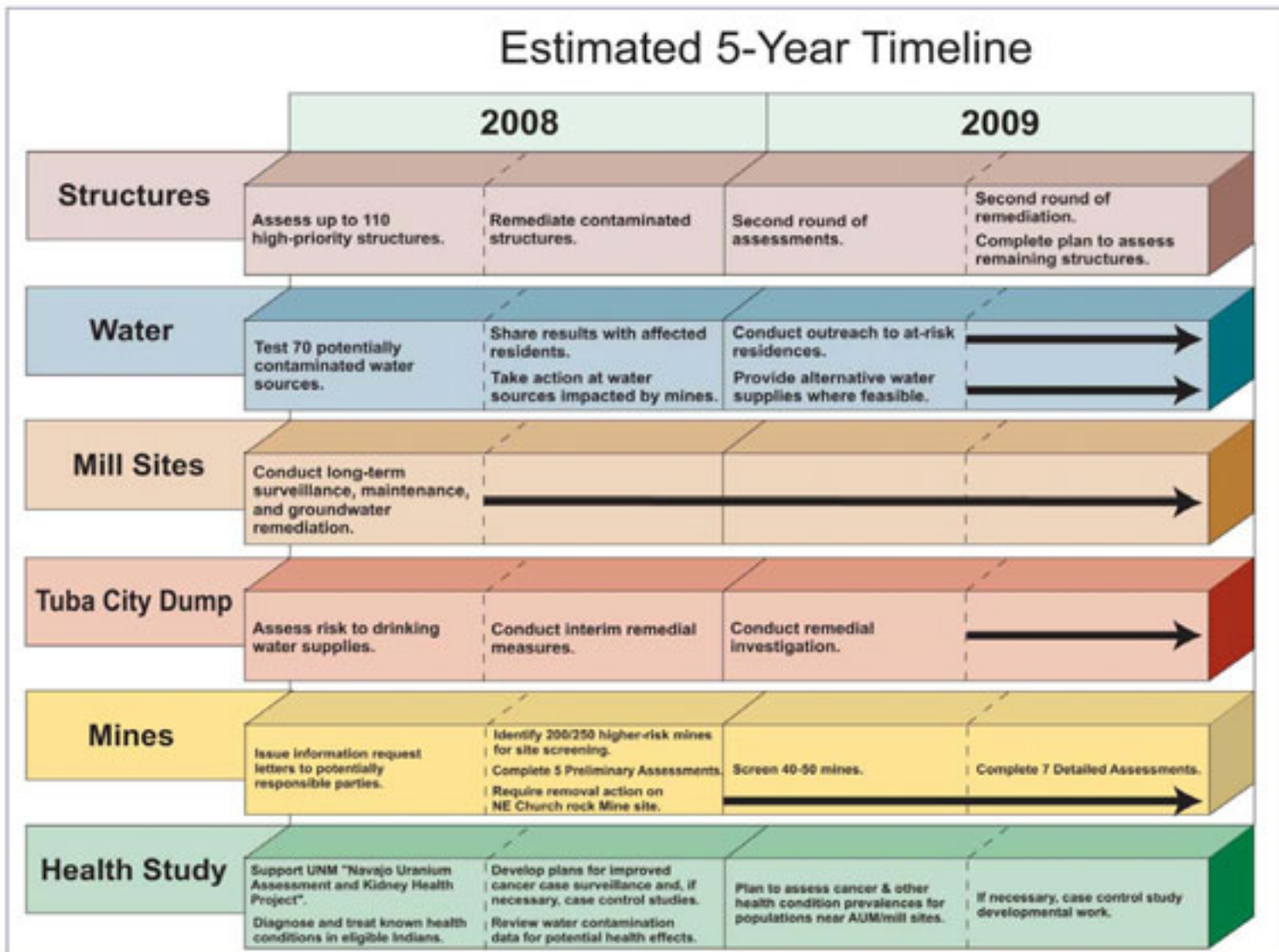
- Assess and Cleanup the Tuba City Dump: The five federal agencies will work together with the Navajo and Hopi tribes in early 2008 to assess whether interim actions are needed prior to selection of a final remedy for the site. By August 2008, the Bureau of Indian Affairs plans to complete an assessment of the need and feasibility of conducting an interim measure to prevent contamination of nearby Hopi water supplies. If an imminent threat to water supplies is identified, the agencies will determine the most appropriate authorities to achieve an interim remedy. These authorities might include a Superfund response or enforcement action.

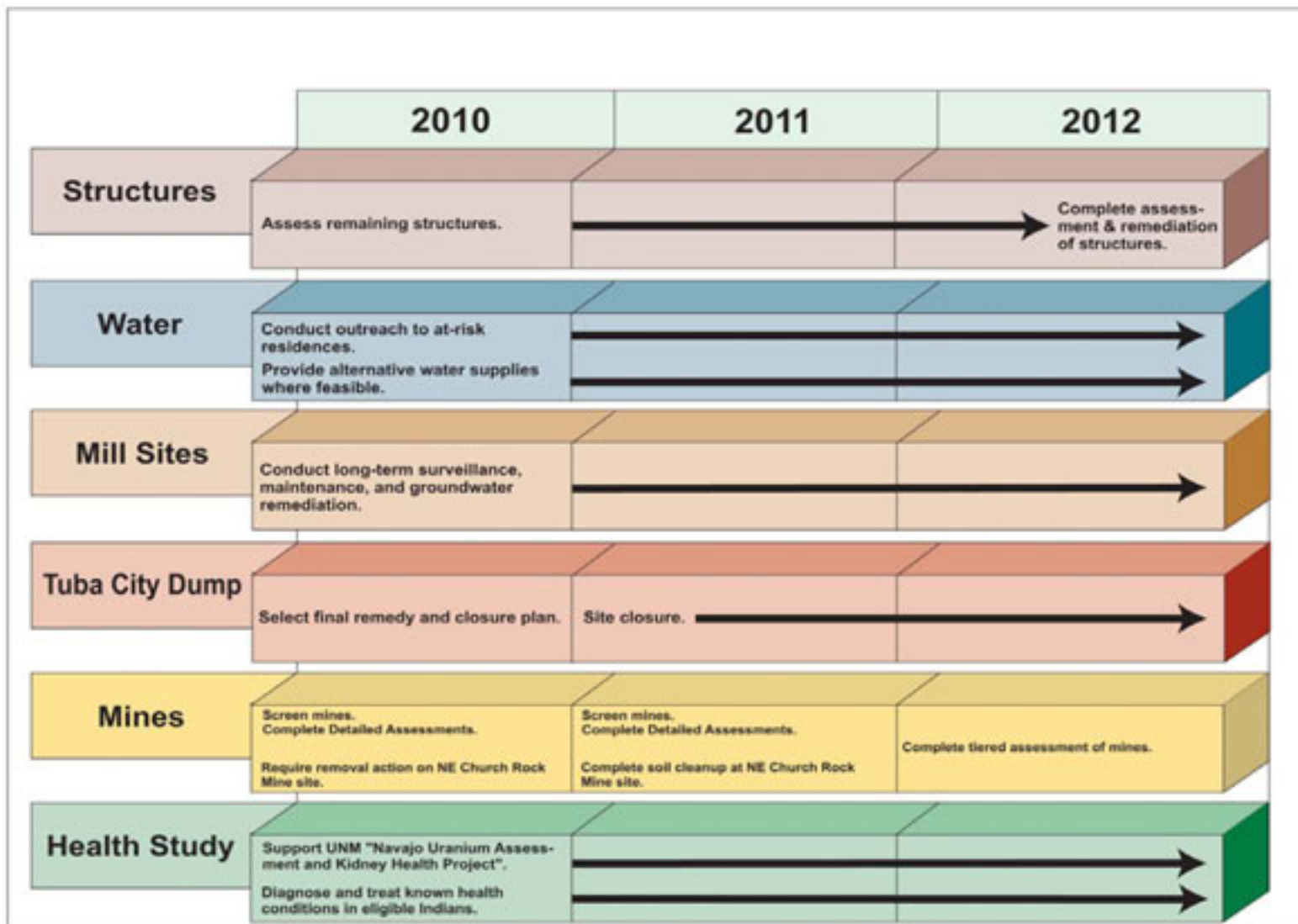
As of 2008, committed funds include \$916,000 to perform additional studies needed to determine the movement of contaminated groundwater, and potential threat to drinking water supply wells, irrigation water, springs, and seeps. These studies are also necessary in order to determine the need for, and scope of remediation.

- Assess and Treat Health Conditions: The Indian Health Service will continue to diagnose and treat known health conditions in eligible Indians, and also support a university-led *Navajo Uranium Assessment and Kidney Health Project* in 2008. IHS will also review existing databases to develop plans for improved cancer case surveillance, review water contamination data for potential future health studies, and develop plans to assess the prevalence of cancer and other health conditions for populations near AUM and inactive mill sites. Cost estimates for this objective are unavailable, but are projected to be achievable within current and projected agency appropriations.
- Summary of NRC Actions: The Nuclear Regulatory Commission (NRC) will consult with and continue conducting outreach to the Navajo Nation for new uranium recovery facility license applications that have potential cultural and resource impacts on Navajo lands. NRC will also continue to work with the Navajo Nation and other federal agencies on issues related to the cleanup of the Northeast Church Rock site and Tuba City contaminated properties. In addition, NRC will continue to consult with the Navajo Nation, as required by UMTRCA on



DOE's remedial actions for cleanup of the four inactive uranium milling sites that will be selected and performed with concurrence of the Commission.





## Agency Expenses prior to 2008

*Costs given in thousands of dollars*

Expenses 1997-2007	Total Expenses
Removal of Contaminated Structures	\$ 84
Investigation and removals at abandoned mines	\$ 13,000
Cleanup of the Northeast Church Rock mine site residential yards and additional high-priority abandoned mine sites	\$ 2,290
Tuba City Dump assessment, closure, and monitoring activities and associated costs	\$ 2,170
Remediation of four inactive uranium milling sites	\$ 140,000
Medical screening examinations and special patient evaluations to former uranium miners, former millers, and "downwinders" from NV test bomb explosions.	\$ 3,800
Contaminated Water Sources	\$ 150
<b>Total Expenses</b>	<b>\$ 161,494</b>

**Note:**

The expenses above are estimated and may not capture all historic expenses incurred for these activities.

# Assessment and Cleanup of Contaminated Structures

**Agency:** EPA

## **Background**

Mine operators extracted nearly 4 million tons of uranium ore from 1944 to 1986 across the Navajo Nation. Uranium mining or milling waste has occasionally been used in the form of sediments for aggregate (foundations and stucco) and stones incorporated into the walls of structures, including homes. Structures may also be contaminated by the presence of radiological materials in outside dust and soil that was brought into the homes on shoes and clothing. These structures may be occupied as homes, periodically occupied for ceremonial purposes, or unoccupied. If the structures constructed with uranium mining or milling waste are occupied, there is a risk to the inhabitants from alpha radiation (e.g. radon gas), which is a potent lung carcinogen.

USEPA began assessment of structures for radiation on the Navajo Nation's lands in 1975, prior to the passage of Superfund legislation. At that time, EPA's Office of Radiation and Indoor Air (ORIA) and the predecessor to the Navajo Nation Environmental Protection Agency (NNEPA) investigated 37 structures located near the Monument Valley Mill Site and the Monument #2 Mine, both operated by Vanadium Corporation of America. Under its remediation authority under the Uranium Mill Tailings Radiation Control Act, DOE demolished four structures in Monument Valley that were found to have elevated radiation levels. As part of this action plan, EPA will reassess the remaining 33 structures identified in the 1975 survey to determine radiation levels.

In the 1990s, EPA and the Navajo Nation contacted local officials in 30 impacted communities and offered free radiation surveys. Based on feedback from the local officials, EPA surveyed 28 structures. Based on the results from these surveys, EPA removed two structures near Monument Valley and the Four Corners area at a cost of \$84,000. EPA provided the affected families with compensation or a replacement structure. The other 26 structures did not have elevated radiation levels and are considered safe to occupy. These structures will not be reassessed as part of this action plan.

There may be additional structures that are not on the lists discussed above that may contain elevated levels of radiation and may present a risk if occupied. To assist the NNEPA in determining the priority for addressing these additional structures, EPA provided a list of over 500 structures located within ¼ mile of AUMs. This list was generated using EPA's GIS database, which was provided to NNEPA in August 2007. The status of these structures (whether they are homes, whether they are occupied, whether they are constructed with materials from mines, whether they have elevation radiation levels) is unknown. In addition, Navajo officials have indicated that there may be additional potentially

contaminated structures that do not appear on the three lists discussed previously, or on the list of structures located within a ¼ mile of a mine.

### **Action Plan**

In coordination with NNEPA, EPA plans to assess structures on the Navajo Nation's lands that are likely to be contaminated with radiation at elevated levels. Where contaminated structures are found that pose a health risk to current or future occupants, EPA will take appropriate response actions using our authority under the Superfund law. Actions may include demolition of a structure or a portion of a structure, construction of a replacement structure, or other actions to protect current and future residents from exposure to elevated levels of radiation.

### Assessment and Remediation of Initial Lists of Structures (Phase I)

EPA has mobilized an assessment team to survey the 33 structures identified in NNEPA's desktop study and the 33 structures identified in the 1975 survey, for a total of 70 structures. The USEPA team is conducting radiological surveys of home and hogan interiors, and areas around these structures. The EPA team will also conduct radon sampling in the interior of structures. In addition to the 66 structures, EPA has committed to address other structures that may be of concern in the immediate vicinity of structures on the two lists. We estimate that this initial assessment will include approximately 110 structures in total. EPA anticipates that this assessment will be completed in Spring 2008; at an estimated cost of approximately \$650,000 (costs include contractor costs, equipment costs, EPA personnel, and NNEPA personnel time).

In consultation with NNEPA, EPA will develop action levels and options for removal actions at structures with elevated radiation levels. EPA will begin Phase I removal actions in Summer 2008. While we cannot predict how many structures will require removal action, nor exactly what actions will be required, we estimate that remediation of an individual structure may cost approximately \$100,000 to \$300,000. In FY08, EPA can conduct approximately five removal actions at contaminated structures.

Residents will be offered temporary housing, along with pets and livestock if necessary, for the homesite remediation period. EPA will discuss the best options for each resident with them in person. Options include staying in a hotel or in homes of family members. EPA will provide reimbursement for accommodations as well as meals and incidental expenses (Federal per diem rates). EPA will reimburse, restore or replace any disposed, damaged or demolished portions of all structures and landscape type materials and will consult with the residents on all decisions. EPA will also conduct outreach to convey the risks of long-term exposure to any contaminants and encourage residents to meet with their primary care physician. EPA, ATSDR, and IHS are working together to provide professional education to the staff at multiple Navajo health clinics.



### Assessment and Remediation of Additional Structures (Phase II)

In the course of working with NN Chapter officials and residents to identify and locate the Phase I structures, NNEPA staff identified additional structures not found on previous lists that may have been constructed with materials from mining operations and may have elevated radiation levels. NNEPA plans to interview residents and community health workers this summer to get more information on these structures. NNEPA has agreed to develop and prioritize a list of these additional structures and share it with EPA by Summer 2008. EPA and NNEPA will jointly develop a plan to assess the list of Phase II structures by the end of 2008. Options for assessment could include (1) EPA assessment of structures or (2) NNEPA assessment of structures, or (3) a combination of EPA and NNEPA assessment. Costs for these three options would depend on the number of structures on the list. A second round of assessments could begin in Spring 2009. Removal actions related to these assessments could begin in Fall 2009.

### Plan for Remaining Structures of Potential Concern (Phase III)

Navajo Nation Chapter officials who have been notified of EPA's initial assessment efforts have stated that there may be more structures within their Chapters that may have been constructed with materials from mines. EPA recommends that NNEPA consult with these Chapters to identify any additional potentially-contaminated structures. In addition, USEPA has provided a list of 500 structures located within a ¼ mile of a mine, and recommends that NNEPA and Navajo chapter officials identify which of these might be contaminated. EPA would like NNEPA to create a prioritized list (Phase III) of structures identified by Chapters and structures of concern from the list of 500. EPA will work with NNEPA to develop a plan for assessment of these Phase III structures, with the goal of preparing this plan by the end of 2009. The plan would identify a prioritized list of Phase III structures to be assessed by NNEPA, EPA, or a combination of the two agencies.

EPA estimates that up to 500 structures may require assessment during Phases I, II, and III during the five-year period. Assessment costs per structure are approximately \$6,000. It is possible that the Navajo Nation could elect to use a portion of their OSM 411 funding for these assessments.

### **Limitations**

*Tribal Consultation:* EPA is working closely with NNEPA on community and cultural issues. USEPA has discussed with the NNEPA the process for assessing the Phase I structures identified in this action plan. USEPA will continue to work with NNEPA Superfund Program and residents to secure access to these structures and perform surveys. EPA will be consulting with NNEPA on potential actions including compensation and temporary relocation if demolition or partial removal is indicated, and future assessment activities.

*Remediation, Transportation and Disposal Costs:* While the volume of potentially radioactive material from structures is much less than that of the mines, transportation and disposal arrangements need to be discussed up front with the Navajo Nation as cost and capacity considerations. Specifically, EPA and NNEPA will need to identify where radioactive materials will be disposed. If materials are to be disposed of at a regulated radioactive waste disposal facility outside the Navajo Reservation, remediation costs will be significantly higher than the estimated \$50,000-\$100,000 per structure. Further, because the number of structures to be remediated is unknown, total remediation costs cannot be easily estimated.

*Structures with high naturally occurring radon levels but low gamma radiation levels:* If EPA identifies structures that are found to have high naturally occurring radon levels but low gamma radiation levels, then EPA will involve the Navajo Radon Program to provide abatement of these structures, which would be relatively low cost. These conditions would indicate radon that is not attributable to mining activity.

*Land Use Issues:* Based on existing policies, where contaminated structures or surrounding soils are found to pose a health risk to residents, EPA will take a removal action. If the entire area where a structure is located is found to pose a health risk, or a decision is made to build a replacement structure in another location, land use issues may arise that are beyond EPA's ability to address and will require the involvement of other Navajo agencies to resolve.

# Contaminated Water Sources

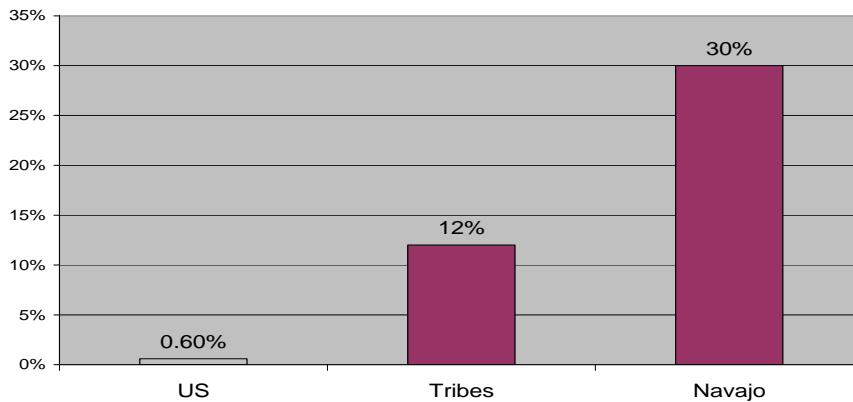
**Agency:** EPA

## Background

There are 197 public water systems on the Navajo Nation. These water systems serve 70% of the population on the Navajo Nation. In the past year 91% of these systems were in compliance with all health-based regulations, thereby exceeding the national compliance rate of 89.1%. The non-compliance was caused by the presence of arsenic, trace organics, and coliform bacteria.

Navajo Nation EPA (Navajo EPA) estimates that up to 30% of the population on the Navajo Nation is not served by a public water system. This represents approximately 54,000 people. Residents of these homes either haul water from unregulated sources, such as livestock wells, springs, or private wells, or from regulated watering points. The number of unregulated water sources is not known, but is estimated to be in the low thousands.

**% Population Lacking Access to Piped Water**



These unregulated sources generally do not fall under the jurisdiction of either USEPA or Navajo EPA, and are not routinely monitored to determine the quality of water being consumed. USEPA is concerned that some of these sources may be contaminated as a result of uranium mining activities. Data is not available at this time to determine the extent to which contamination is naturally occurring. The use of unregulated sources represents the greatest public health risk associated with drinking water for the Navajo Nation. Due to the potential acute and chronic health problems associated with drinking from unregulated sources, the Navajo EPA has consistently held that this practice is not sanctioned. Nevertheless, interviews with Navajo residents have shown that the practice continues and is widespread.

USEPA and the U.S. Army Corps of Engineers (USACE) surveyed unregulated water sources in the late 1990's under the Superfund Program, and found that 38 (17%) of the 226 unregulated water sources surveyed showed elevated (above

the MCL) radionuclides in one-time grab samples. This sampling method is not a reliable technique for determining actual levels, but can serve as a starting point for further investigations. USEPA considered this information when compiling a prioritized list of 500 uranium mines, recently provided to Navajo EPA. Navajo EPA has identified at least two wells with elevated uranium levels that are currently in use as haul-water sources for one or more Navajo families. In addition, the impacts of uranium mining threaten the Hopi Reservation, which is surrounded by the Navajo Nation. Groundwater flow gradient information from the Navajo Tuba City Dump indicates that a contaminant plume is headed towards the drinking water source for the Moenkopi Villages.

In 2006 and 2007, Navajo Nation Environmental Protection Agency (NNEPA) and the Centers for Disease Control and Prevention (CDC) tested water from 199 unregulated water sources (livestock wells and springs) in order to determine the quality of unregulated water sources being used for drinking water by Navajo households. Water was analyzed for bacterial and chemical contaminants including uranium. Nine out of 199 (5%) unregulated wells tested exceeded the limit (30ug/L) for uranium in drinking water. The highest uranium level was 260 ug/L. Currently, CDC is working with US EPA, NNEPA and the Navajo Division of Health to implement a cross-sectional household survey in order to determine the extent of human exposure to uranium, arsenic and other chemical contaminants from consumption of unregulated drinking water and to assess the potential for health effects from that exposure. These investigations include data from non-mining regions of the Navajo Nation where groundwater contamination with uranium, arsenic and other minerals may naturally occur.

### **Action Plan**

USEPA will use Superfund authority to take appropriate action at water sources contaminated by mine waste and found to be endangering human health. The USEPA Superfund Program, working with Navajo EPA and other partners, will begin a sampling effort in February 2008 to confirm potential contamination at 70 water sources in rural areas across the Navajo Nation identified as being at risk. Results from this sampling will be shared and discussed with Navajo Nation EPA, IHS, other Navajo agencies, New Mexico Rural Water Association, and the DiNEH Project to determine appropriate future actions. Sources with elevated uranium, but lacking evidence of mining impacts, may not be appropriate for action by EPA's Superfund Program due to Superfund's limitation on response to naturally occurring substances. In most cases future actions are anticipated to focus on public education and outreach to households using contaminated water.

USEPA has also made available \$350,000 to Navajo EPA for a circuit rider program to provide technical assistance to public water systems and to families using unregulated water sources for FY08 and FY09. USEPA will provide laboratory services for the circuit rider to allow for limited monitoring of unregulated water sources. The circuit rider will use data from EPA's Superfund program and other sources to target homes thought to be using contaminated

water. The Arizona Small Utilities Association and New Mexico Rural Water Association will assist with this effort. We expect that these personnel will be in the field in the second half of 2008, and continue throughout the five-year period of this plan.

Additionally, in FY08 USEPA Region 9 will allocate up to \$400,000 of tribal source water funds, to be awarded as a contract, assistance agreement, or a combination of both, to the Navajo Nation. This funding will focus on efforts to protect current and future sources of drinking water used by the Tribe and its members.



**Water Pumped by Windmill**

### **Limitations**

The sources to be sampled by USEPA do not currently meet the Safe Drinking Water Act's definition of a public water system, which applies only to those systems that regularly serve an average of at least 25 people each day for at least 60 days per year or have at least 15 service connections.

The Indian Health Service has estimated the cost of providing alternative water supplies for eligible Indians consuming water from 41 unregulated and potentially contaminated water sources to be up to \$65 million, including planning, design, and construction costs. This amount is not accounted for in the IHS budget, and will need to be recalculated after more reliable techniques are used to determine contamination levels. The Navajo Area Indian Health Service will expend nearly \$19.5 million in FY08 for sanitation services, including providing access to clean water to eligible Indian homes.

The Navajo Nation will receive \$34M over the five-year period of this plan from the Office of Surface Mining under Section 411(h)(1) and 411(h)(2) of the Surface Mining Control and Reclamation Act. The Navajo Nation may choose to

use these funds to construct replacement water supplies in communities impacted by uranium mining; however, funds are not required to be used for this purpose.



# Abandoned Uranium Mine Assessment and Cleanup

**Agency:** EPA

## **Background**

Abandoned Uranium Mines: Mine operators extracted nearly four million tons of uranium ore from 1944 to 1986 across the 27,000 square-mile Navajo Nation. From 1994 to 2007, USEPA Region 9 conducted a screening-level investigation to identify approximately 1,100 mine features (portals, prospects, rim strips, pits, vertical shafts or waste piles) associated with AUMs throughout the Navajo Nation. These features represented 520 discrete AUMs. EPA also took several removal actions at high-priority sites, and has expended over \$13 million on the investigation and removals combined. As partners, EPA has consulted with Navajo Nation Environmental Protection Agency (NNEPA) and relied on its local knowledge at all phases of the Navajo Nation-wide investigation and specifically during each of the removal actions.

The Navajo Abandoned Mine Lands Program (AML) used DOI Surface Mining Control Reclamation Act (SMCRA) funds to address an estimated 90% of the surface hazards posed by AUMs. Some of the mines continue to release contaminants into the environment and will require further cleanup or future O&M.

EPA is conducting a CERCLA removal action at the highest priority mine site, the Northeast Church Rock Mine. The Action Plan for Northeast Church Rock Mine is discussed separately below.

In August 2007, to assist the NNEPA with assessing the 520 AUM sites, EPA completed the Preliminary Site Ranking list, the project summary, the atlas, and the GIS database. This information will allow NNEPA to prioritize and categorize the 520 AUM sites into groups which might include removal, NPL, EPA or Navajo enforcement, Brownfields, and No Further Action.

## **Action Plan**

USEPA will continue to work with NNEPA to decide on the highest priority sites and identify the appropriate course of action for each one. EPA will also continue to work with Navajo Nation to provide resources to successfully manage our consultation and collaboration.

EPA and the Navajo Nation will work together to conduct a tiered assessment of abandoned mines, with more detailed assessments of those most likely to pose environmental or health problems. EPA has completed a screening-level assessment and risk-ranking of 520 known mines. In 2008, EPA will use this list and consult with the Navajo Nation to identify the highest-priority 200-250 mines for further evaluation. EPA plans to conduct more detailed on-site screening evaluations of 40-50 of these mine sites in 2008 and 2009, and would anticipate

conducting future screening throughout the next several fiscal years until completed. EPA also plans to conduct removal assessments or preliminary assessments at approximately seven of the highest-priority mine sites in 2008 and 2009, and to continue to conduct such assessments in the following three years.

In deciding what sites to screen next, we would consider whether or not a mine has been reclaimed, whether a mine could impact drinking water sources, and other factors associated with risk and exposure. As part of the site screen, EPA and NNEPA will evaluate any available information, including data collected from the drinking water sampling effort that EPA and the Navajo agencies are currently conducting.

Based on the screening process, EPA will identify candidates for removal assessments or Preliminary Assessment/Site Inspections (PA/SI), or both, depending on the findings. Based on the screening process, many of the AUM sites may not pose a significant health risk and will require No Further Action.

In the past few years, NNEPA has screened 39 mine sites. Of these, 26 sites were classified as No Further Action, nine were referred to Navajo Abandoned Mine Lands, one was referred to Navajo Department of Justice, one was referred to BIA, one was referred to EPA for a removal assessment, and one was designated as EPA lead (Northeast Church Rock Mine).

In FY08 and FY09, EPA plans to conduct up to 50 on-site screening evaluations per year and to continue to conduct screens in the following three years. EPA currently provides grant funding for NNEPA to conduct up to 32 screens per year. EPA also plans to conduct up to seven preliminary assessments (PAs) or removal assessments in FY08 and FY09. Upon NNEPA's request, USEPA is ready to initiate CERCLA response actions at additional priority AUM sites that meet EPA's removal action criteria.

As a result of the screening process, PA/SI, and removal assessments, the sites will be categorized into groupings such as removal actions, NPL listing and subsequent EPA-led remedial actions, EPA or Navajo enforcement, Brownfields, and No Further Action. Based on the information in EPA's database on AUMs, EPA, under CERCLA, expects to address one priority AUM site in FY08, up to two of the highest-priority mine sites in FY09, and to continue such actions in the following three years.

*Enforcement:* High priority AUMs will be identified as candidates for further Superfund assessment and enforcement. EPA will continue to pursue our enforcement first policy. EPA is conducting a general search for Potentially Responsible Parties at all of the AUMs and will issue information request letters to several major viable corporations (responsible parties) that owned or operated

multiple mines in 2008. EPA will continue to assist Navajo Department of Justice with Navajo-lead enforcement actions.

*Costs:* We expect to use our enforcement authority at AUMs that have viable PRPs. If there are no viable PRPs, then EPA will explore funding options as part of our budget request process to enable fund-lead response actions.

*Assessment and Cleanup Cost Estimates:* EPA has developed very preliminary estimates for the assessment and cleanup of the AUM sites. These costs were developed using cost estimating software and include general assumptions regarding the level of assessment and cleanup required.

Site Screens: 50 Site Screens per year will cost an estimated \$100,000.

Assessment: the five Preliminary Assessments of aggregate AUM sites that NNEPA previously identified as priority areas have an estimated cost of \$80,000.

Cleanup: the cleanup costs for an AUM range from several hundred thousand dollars to several millions of dollars. Until assessments and decision-making are complete, it is difficult to estimate with any confidence the scope of total cleanup costs.

To support our collaboration with Navajo Nation on this work, EPA's Superfund program is providing over \$220,000 in additional grant funding to Navajo Nation for FY09, as compared to FY08, for site assessment and tribal response program funding to address AUMs. This funding includes an Inter-Personnel Agreement (IPA) from EPA to the Navajo Nation Superfund program.

The above cost estimates are very rough since so many critical cost-sensitive assumptions had to be made. The size of the Navajo Nation, the remoteness of many AUM sites, and the dearth of roads and infrastructure may add significant challenges and costs. EPA and the U.S. Army Corps of Engineers are currently refining these cost estimates and will incorporate refined estimates into the agencies ongoing budget processes.

### **Limitations**

*Legislation:* Unlike the uranium mill tailings cleanup program, there is no specific legislation to address abandoned uranium mines. After the expiration of UMTRCA, neither UMTRCA nor CERCLA provides response authority for releases to soil from uranium mill sites. CERCLA is not ideally tailored to the AUM problem because of low population density in the Navajo Nation.

*Transportation and Disposal:* For mine sites that require remediation, options are to dispose of wastes in an onsite repository or offsite. Clean closure of these sites would require transporting the waste to a disposal site, which may be

hundreds of miles away. There are potential health impacts from transporting the waste that must be weighed against leaving the waste on site in a suitably constructed repository. Further, it will be difficult to find an off-site disposal location that is capable of accepting the waste. Transportation and disposal arrangements need to be discussed in advance with the Navajo Nation as considerations in selecting a suitable remedy.

# Cleanup of the Northeast Church Rock (NECR) Mine Site

**Agency:** EPA

## **Background**

Located near Gallup, New Mexico, NECR is the highest priority on the AUM ranking list. The mine adjoins the United Nuclear Corporation uranium mill site, a National Priorities List cleanup project that USEPA Region 6 manages jointly with the Nuclear Regulatory Commission. The mine is mostly on Navajo tribal trust land, while the mill is on private fee land. At the request of the Navajo Nation, USEPA Region 9 is using Superfund removal authority to investigate and clean up the NECR mine site, in coordination with the NPL site cleanup. USEPA issued an order to the responsible party, United Nuclear Corp (UNC) which is now a subsidiary of GE, to investigate and assess risk at the residential area adjacent to the mine. In summer 2007, EPA removed 6,500 cubic yards of radium-contaminated soils around these residences to address the highest risk areas. EPA spent \$990,000 on the excavation, and required GE to dispose of the soils at an additional cost of \$1.3 million.

## **Action Plan**

To determine the remedy for the long-term threats from the NECR Mine, EPA has developed an engineering evaluation/cost analysis (EE/CA), which includes a preferred cleanup alternative. In May 2008, Navajo Nation requested that EPA hold the release of the EE/CA until September 2008 to allow for negotiations between Navajo Nation and General Electric (GE).

EPA is poised to release the EE/CA in September 2008 for public comment and select the soil remedy in December 2008. Depending on the outcome of the negotiations between the Navajo Nation and GE, EPA may order GE to implement the selected remedy, which will cleanup the balance of the site by addressing additional contaminated soils with an estimated volume of up to 870,000 cubic yards. Cleanup is expected to take up to three years.

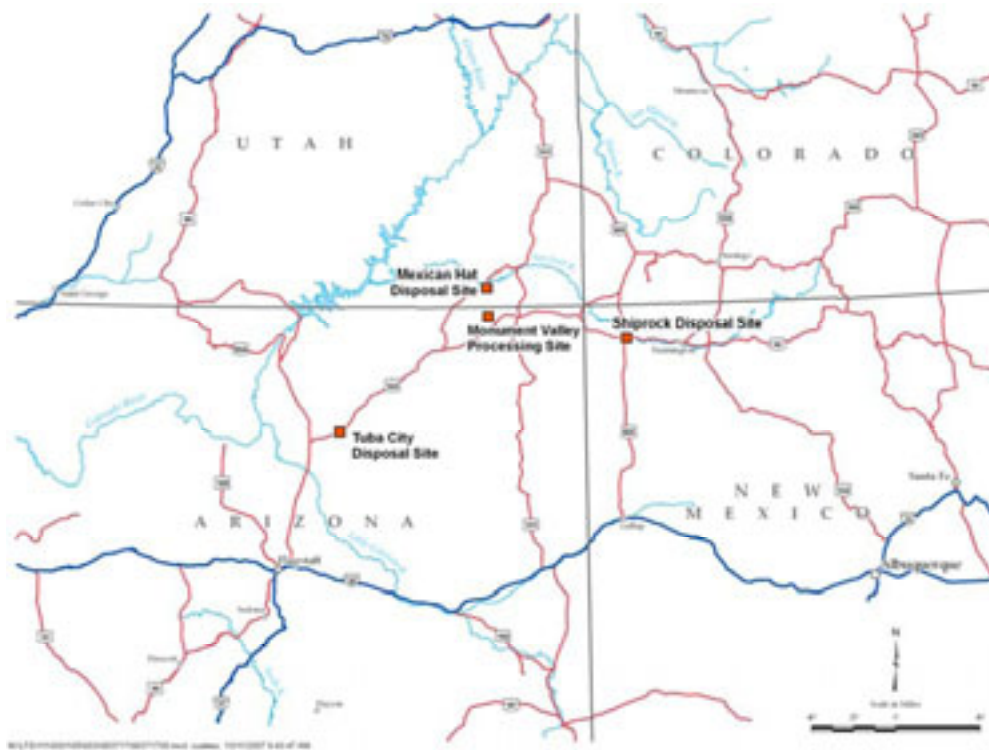
**Costs:** EPA anticipates that GE will conduct and fund the work at NECR over the next several years under an enforceable agreement or a Unilateral Administrative Order issued by EPA. If GE does not comply, EPA may spend some Superfund money for the Remedial Design and cost recovery, while working to enforce against GE.

# Long-Term Management of Former Uranium Milling Sites

**Agency:** DOE and NRC

## Background

Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA) originally required the cleanup of 22 inactive uranium milling sites and the properties in their vicinity, as well as the properties in the vicinity of the Tennessee Valley Authority Edgemont uranium milling site. In 2001, Congress also required DOE to remediate the Moab uranium milling site under UMTRCA. DOE's authority for surface cleanup expired in September 1998 (except for its current authority to remediate Moab); there is no end date for maintenance of existing groundwater remediation activities. Four of the original uranium milling sites (Shiprock, NM; Tuba City, AZ; Monument Valley, AZ; and Mexican Hat, UT) were located within the Navajo Nation's lands.



In 1983, DOE and the Navajo Nation entered into a cooperative agreement to facilitate the surface remedial action of the four sites. Funds provided by DOE to the Navajo Nation for the agreement were directed to the Navajo Nation's Division of Natural Resources. The National Environmental Policy Act (NEPA) compliance documentation which includes the Environmental Assessments as



well as the Remedial Action Plans were developed with the participation of the Navajo Nation. The characterization of surface and subsurface radiological contamination involved a phased approach that included an aerial assessment, a mobile scan, and on site sampling to delineate the extent of contamination according to specific removal criteria set by the U.S. EPA. Over \$140 million was spent on the surface remediation of the four processing sites and construction of three disposal cells. That agreement expired in 1998 along with the surface cleanup authority, and a new cooperative agreement was initiated for groundwater cleanup that remains in place.

DOE's Office of Legacy Management, in consultation with the Navajo Nation has been addressing groundwater contamination at the sites. The Mexican Hat site groundwater contamination is confined and the hydraulic conditions prevent the future use of any groundwater within the area, therefore no further remedial action is warranted at that site.

### **Action Plan**

As required by UMTRCA, DOE has worked closely with the Navajo Nation Division of Natural Resources, and with other federal and state agencies in the clean up of uranium milling sites.

#### **Milling Site Actions:**

- DOE will continue to monitor the three disposal cells to ensure they remain effective in protecting human health and the environment. DOE's long term surveillance and maintenance duties will continue at the three disposal cells for the foreseeable future.
- DOE funds maintenance of groundwater remediation activities and long-term surveillance and maintenance at the four Navajo Nation sites at an estimated \$3.2 million in 2008. The groundwater compliance strategies are reviewed annually with the Navajo Nation to track progress towards cleanup standards in the groundwater plumes. Based on our knowledge of the sites, DOE does not believe that additional funding would significantly accelerate the groundwater cleanup at the three processing sites where ongoing pump and treat remediation activities are being maintained. DOE will continue to work with the Navajo Nation using the currently approved plans to complete our groundwater remediation responsibilities.
- DOE will continue to fund the Navajo Nation, under the Cooperative Agreement, to assure they have the resources to review and participate as we continue these long term actions.

Note: A letter from the Navajo Department of Justice, dated March 24, 2008, reiterated the desire to "remove all contaminated materials from all UMTRCA

sites ... with final disposition outside of Navajo Indian country.” The Navajo Nation request to relocate the disposal cells would: be costly (potentially \$1 billion or more); create opportunities for adverse health impacts – to both workers and the public; require a state (New Mexico, Arizona, Colorado, or Utah) to accept the contents of the disposal cells; and, not eliminate the need for current groundwater remediation efforts.

The Navajo Nation has also raised a question about placing a liner under the disposal cells. Lining the disposal cells would not have significantly enhanced the groundwater cleanup status either in the past or if the disposal cells were relocated to lined cells in the future because groundwater contamination is primarily due to the historical milling activities at the sites and was already well established prior to initial cleanup by DOE. None of the 22 UMTRA Title I disposal cells are lined. The Department has offered to consult with the Navajo Nation on these issues.

Federal agencies (DOE, EPA, IHS, BIA, DOI, and NRC) met with representatives from the Navajo Nation, the Hopi Tribe and EPNG in Tuba City February 12-13, 2008, to continue efforts to exchange technical information and present scientific findings related to the characterization and remediation of the Tuba City dump, the Highway 160 site, and the groundwater treatment system at the DOE Tuba City disposal cell. During the February meeting, it was agreed that all parties will continue efforts to formally document and share the information regarding the three sites. DOE coordinated the distribution in digital form, to all parties, of all known information related to the Highway 160 site and the former uranium milling site on May 29, 2008. The affected federal agencies, Navajo Nation and Hopi Tribe, will reconvene in August to collectively assess that combined set of data and information.

**Other Related Actions:**

DOE will continue to work with U.S. EPA to provide information on historical vicinity property surveys data to determine the scope of other contaminated properties on the Navajo Nation’s lands.

DOE will work with BIA and EPA in interpreting the groundwater data they have collected at the Tuba City Dump site as they have requested.

In accordance with UMTRCA Title II, DOE anticipates it will eventually receive the Church Rock uranium milling site after its owner completes reclamation and NRC approves termination of its radioactive materials license, if the State does not exercise its option. DOE will continue to work with the Navajo Nation regarding the reclamation and transfer of this site into DOE long term management to ensure protection of human health and the environment.

**Limitations**

The Legacy Management program appears secure into the foreseeable future to maintain the disposal cells and meet the groundwater plans as agreed to by DOE and the Navajo Nation.

**5 YEAR PLAN COST TABLE**

<b>Site</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Mexican Hat	Annual inspection	Annual inspection	Annual inspection	Annual inspection	Annual inspection
Monument Valley	Biannual inspection Groundwater monitoring	Biannual inspection Groundwater monitoring	Biannual inspection Groundwater monitoring	Biannual inspection Groundwater monitoring	Biannual inspection Groundwater monitoring
Shiprock	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment
Tuba City	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment	Biannual Inspection Groundwater monitoring Maintain groundwater treatment
Total Cost	\$4,940,000	\$3,178,000	TBD	TBD	TBD

Note: Funding in 2010-2012 has not been determined, but is projected to be consistent with 2008 and 2009 funding levels.

# Characterization and Remediation of Highway 160 Site

**Agency:** DOE and EPA

## **Background**

The Highway 160 Site is located approximately four miles northeast of Tuba City, Arizona, on the north side of Highway 160. The Department of Energy maintains a disposal cell and operates a groundwater treatment system on the south side of Highway 160. The Department of Energy conducted characterization and remediation of the former uranium mill site (south of Highway 160) under the Uranium Mill Tailings Radiation Control Act (UMTRCA) in the 1980s and 1990s. A radiation survey conducted by DOE in 1980 as part of the Vicinity Properties program, on the north side of Highway 160 indicated no contamination in this area. This is probably because there was sufficient soil coverage to mask any gamma radiation from the material that has since been uncovered by wind erosion.



In a December 1, 2003 letter, the Navajo Nation notified DOE that materials suspected to be originating from the former Rare Metals uranium milling site were found at the Highway 160 site. At that time a response was sent indicating that the DOE authority for surface remediation under UMTRCA expired in 1998.

In May 2004, EPA conducted a radiation survey of the Highway 160 Site. In May 2007, EPA offered to have an On-Scene Coordinator revisit the site based on the proximity of a new residence, further evidence asserted in a Navajo EPA report, and EPA's observations during a site visit. In response, Navajo EPA/NDOJ expressed their desire to retain the lead for the site and to defer EPA follow-up until further notice.

El Paso Natural Gas (EPNG), a former operator of the Tuba City inactive uranium milling site, and Navajo Nation EPA recently entered into a cooperative agreement to characterize the site and conduct interim remedial actions. Characterization activities and interim actions (a fence and stabilization of soil using a fixative) were performed by EPNG. While the origin or exact nature of the contamination at this site is not clear EPNG site characterization data does indicate some radioactive debris. EPNG has also sued the Federal Government, including DOE, NRC, EPA, DOI, BIA, HHS, IHS, and the Department of Defense, seeking that these agencies clean up the Highway 160 site and the Tuba City dump.

### **Action Plan**

DOE will work with the other affected Federal agencies, including the BIA, USGS, and EPA as appropriate, the Navajo Nation, and EPNG to reach a consensus on the best approach for characterization and any required cleanup based on characterization of the site.

Federal agencies (DOE, EPA, IHS, BIA, DOI, and NRC) met with representatives from the Navajo Nation, the Hopi Tribe and EPNG in Tuba City February 12-13, 2008, to continue efforts to exchange technical information and present scientific findings related to the characterization and remediation of the Tuba City dump, the Highway 160 site, and the ground water treatment system at the DOE Tuba City disposal cell. During the February meeting, it was agreed that all parties will continue efforts to formally document and share the information regarding the three sites. DOE coordinated the distribution in digital form, to all parties, of all known information related to the Highway 160 site and the former uranium mill site on May 29, 2008. The affected federal agencies, Navajo Nation and the Hopi Tribe, will reconvene in August to collectively assess that combined set of data and information.

There are currently three authorized courses of action related to additional characterization and remediation of the Highway 160 site: (1) EPA cleanup of the site as a Superfund enforcement action; (2) continued action by EPNG; (3) some combination of the two approaches.

If EPA determines that an Imminent and Substantial Endangerment exists at this site, EPA can use Superfund enforcement authority to require the potential responsible party to conduct a response action. DOE will cooperate with that effort as requested by the parties, as appropriate. If El Paso Natural Gas works to affect a cleanup of this site,

DOE will work with them to consider disposal of the contaminated materials at the DOE-operated Cheney Disposal Cell near Grand Junction, CO.

Based on existing site knowledge, DOE estimates it would take several years to complete the work at the Highway 160 site. DOE has provided support for the preparation of a cost estimate for the remaining cleanup work based on the EPNG characterization report (surface radiation levels and magnetometer readings). The analysis considered a work scope that would include completing site characterization efforts, preparing a remedial action plan, obtaining regulatory approval for the plan and executing the work, obtaining approval for disposal of the material that was removed, and completing other related cleanup actions, as appropriate, at the Highway 160 site. The cost estimate would require additional characterization data that provides information on the chemical species and the depth of the contamination.

Regardless of which entity conducts the site characterization and remedial action, DOE will work with the affected federal agencies and the Navajo Nation and Hopi Tribe to locate additional groundwater monitoring wells in the vicinity of the former uranium milling site, as necessary, to improve our understanding of groundwater flow in the area.

### **Limitations**

DOE does not have the authority to perform surface characterization or remediation of the Highway 160 site as our authority under UMTRCA for these activities expired in 1998.

# Cleanup of Tuba City Dump

**Agency:** Bureau of Indian Affairs (BIA), Central Office

## **Background**

The Tuba City Dump (Dump) was used for more than 50 years as an open, uncontrolled dump receiving solid waste from local communities. For some years, the BIA maintained the Dump by covering trash and burying waste. The Dump was closed administratively by BIA in August 1997. It was the principal open dump site in the Tuba City/Moenkopi area during this period. Information on wastes disposed of at the site is limited as the site was unmanned and unsecured. The Dump occupies land both on the Hopi Reservation and the Navajo Nation. The BIA, along with the Environmental Protection Agency (EPA), and Indian Health Service (IHS), are working with the Hopi and Navajo tribes to address environmental concerns at the site. These concerns include persistent elevated levels of uranium, vanadium, radium 226/228, gross alpha and beta activity, and other metals in the shallow groundwater at the site. Deeper groundwater and nearby drinking water supply wells have, to date, not exhibited elevated levels of the above constituents.

Approximately four miles northeast of the Dump is the Tuba City inactive uranium milling site (mill) that is currently being managed by the Department of Energy (DOE) under the Uranium Mill Tailings Radiation Contract Act (UMTRACA) program. The Navajo and Hopi tribes have long maintained that waste from the mill was improperly disposed of at the Dump. A U.S. Geological Survey (USGS) study, dated October 2006, suggests that the radionuclides in the shallow groundwater may be from a different formation than the native rock at the site.

Since 1999, the BIA has been conducting assessment activities of uranium contamination of shallow and deep groundwater, springs, contaminant migration pathways, sources, and receptors for the purpose of formulating a final closure plan. The springs are used by the Hopi Tribe for religious and ceremonial purposes. Groundwater monitoring data indicates that uranium containing materials have been disposed of at the site creating a uranium plume in the shallow groundwater which extends to the west and southwest of the site. Additionally, groundwater monitoring data shows that the uranium contamination of the shallow groundwater is present up gradient of the site indicating that the contamination is not limited to the Dump. Other sources, up gradient to the Dump, appear to be contributing to shallow groundwater contamination; however, the exact source of up gradient contaminant contribution is unknown at this time.

Landfill characterization studies have not detected contamination in landfill materials at levels that constitute hazardous waste or radioactive waste. Soil vapor studies detected



no hazardous waste constituents and determined that methane was not migrating from the landfill. Both tribes want “clean closure” (removal of all waste).

### **Action Plan - Overview**

The five federal agencies worked together with the Navajo and Hopi tribes in early 2008 to assess whether interim actions are needed prior to selection of a final remedy for the site. By August 2008, the BIA will complete an assessment of the need and feasibility of conducting an interim measure to prevent contamination of nearby Hopi water supplies. If an imminent threat to water supplies is identified, the agencies will determine the most appropriate authorities to achieve an interim remedy. These authorities might include a Superfund response or enforcement action.

For 2007 and FY 2008 \$916,000 will be used to perform additional studies needed to determine the movement of contaminated groundwater, and potential threat to drinking water supply wells, irrigation water, springs, and seeps. These studies are also necessary in order to determine the need for, and scope of remediation. The following tasks include a break down of the \$916,000.

### **Task 1: RI/FS Work Plan**

The BIA has contracted with SECOR International to prepare the RI/FS work plan with the option for limited additional studies. The purpose of the RI/FS work plan is to identify the tasks and establish a schedule to fully investigate contamination impacts associated with the Dump and to develop cleanup options. At the time the contract was signed in October 2007, BIA estimated the costs of the RI/FS work plan and additional limited studies to be \$204,000. Since the contract was let, results of other studies and the conceptual site model (developed by SECOR) suggest the need for additional studies and interim actions to mitigate potential health risks.

The development of the RI/FS study may identify other parties responsible for site closure. The RI/FS work plan will be completed by October 2008.

### **Task 2: Limited Additional Studies**

Based on the conceptual site model developed by BIA’s contractor and on information recently provided by the Navajo Nation, limited additional studies and actions are necessary to assess and evaluate the potential imminent threat or risk to public health and the environment posed by the Dump. These studies are an extension of those anticipated in the limited additional studies contracted in Task 1 above and will be completed by August 2008. These studies are intended to support the RI/FS work plan and will evaluate the location and concentration of the contaminant plume migrating from the Dump and to assess whether that plume threatens existing domestic and irrigation water supply systems. Since this information was provided to BIA at a

meeting in Tuba City, Arizona, on December 6, 2007, several conference calls have been initiated with members of the USGS, BIA, IHS, Hopi Tribe, Navajo Nation and DOI, as well as the BIA contractor, SECOR International, the Navajo Nation's contractor, William Walker and Associates, and the Hopi Tribe's contractor Daniel B. Stephens and Associates. The scope of additional studies was finalized on March 31, 2008, and is outlined below:

- Well Installation—10 shallow groundwater wells and two deep groundwater monitoring wells were initially proposed. As field work progressed, the technical team determined that two additional wells (one shallow and one deep) were necessary. The wells were proposed to assess water quality migrating from potential up-gradient sources northeast of the dump and in Pasture Canyon and to assess the lateral and vertical extent of potential impacts from the dump. Two well clusters consisting of shallow and deep wells were installed on the west side of Pasture Canyon between the dump and the Moenkopi water supply wells. These wells are intended to be used as sentinel wells for migration of potential contaminants toward the water supply wells. The well boreholes will be continuously logged. The deep wells will be drilled with hollow stem auger, while the two deep wells will be advanced using air rotary to penetrate bedrock. Five of the shallow wells will be completed with 4-inch PVC casing for potential use as extraction wells, while the remaining nine wells will be completed as 2-inch wells. Well installation was initiated on April 1, 2008, and was completed on May 8, 2008. Total costs for well installation are expected to be on the order of \$193,000.
- Baseline Groundwater Monitoring Event—The baseline monitoring event will be conducted on all 52 groundwater monitoring wells, three supply wells, seven springs, the irrigation pipeline water and the Pasture Canyon Reservoir. In addition, discrete sampling will be performed in up to 12 groundwater wells to assess water quality in near surface alluvium and bedrock. Each sample will be analyzed for a comprehensive suite of analytes to differentiate differences in background water quality and leachate from the dump. Groundwater sampling was initiated on May 5, 2008, and was completed at the end of May. Total costs for the entire baseline monitoring event are \$262,000.
- Aquifer Testing—If an imminent threat to water supplies is identified, a groundwater pump test will be conducted to evaluate design parameters for an interim remedy. The fees for this task include installation of an extraction well, two observation wells, a 72-hour pump test, and slug testing of up to 19 wells. Costs for this scope of work are \$65,000.
- Permitting, Internet Data Repository and Other Studies—In addition to the studies above, BIA will require the contractor to participate in public meetings, develop a web repository for project reports and documentation, obtain permits, access agreements, encroachment permits for additional studies, prepare meeting minutes, and other tasks. The estimated costs for this task are \$111,000. An additional \$60,000 is planned for subsequent years.

- Aerial Survey and 5-foot Contour Map—BIA plans to develop a five-foot contour map of the landfill and area of potential impact. This area comprises approximately 2,000 acres. This map will be used to evaluate the potential connection between the landfill and down-gradient drinking water and irrigation springs. The cost to perform the aerial survey and to develop contour maps is \$17,000.
- USGS will evaluate the hydrologic connection between the area of the Dump and down gradient water supply resources of Pasture Canyon and Upper Moenkopi Wash. This study is necessary to determine the possibility and likelihood of these resources to be impacted from uranium in the shallow groundwater emanating from the Dump, and ultimately for justification of an interim groundwater action in the event that hydrologic connectivity between the source(s) and receptors is established. The USGS study and Hydrologic Mapping contract will cost \$64,000.

### **Task 3: Interim Remedial Measures**

If an imminent threat to water supplies is identified, the agencies will determine the most appropriate authorities to achieve an interim remedy.

### **Task 4—Groundwater Monitoring**

It is expected that groundwater monitoring will be conducted on a semi-annual basis throughout the remedial investigation process. Further, groundwater monitoring is planned to occur until 2042, 30-year post-closure monitoring, unless the remedy selection indicates a reduced post-closure monitoring period. It is assumed that up to 10 wells will be monitored for key analytes. The costs for each groundwater monitoring event are estimated at \$20,000 per event (\$40,000 per year) with a larger suite of analytes monitored during the first semester of the fifth year.

### **Task 5—RI/FS**

Based on the outcome of the additional limited studies and the RI/FS work plan, it may be necessary to assess:

- Source(s) of elevated concentrations of contaminants in up-gradient wells using geophysical and radiological survey methods as well as groundwater wells;
- Contaminant migration through bedrock by installing two to three additional deep wells to evaluate potential contaminant migration south and down-gradient of the Dump;
- Groundwater migration characteristics using tracer tests; and

- Source of elevated contaminants in the dump using larger diameter borings or trenches.

In addition, feasibility studies may be necessary to evaluate the feasibility of various groundwater treatment options and landfill closure alternatives.

A baseline risk assessment would be performed as part of the RI/FS, if necessary. The purpose of the baseline risk assessment would be to "characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water or surface water, releasing to air, leaching through soil, remaining in the soil, and bio-accumulating in the food chain" (40 CFR Section 300.430(d)(4)). The health risk assessment would evaluate chemicals of concern, exposure pathways, and potential receptors (both environmental and human). The baseline risk assessment would provide the BIA and other stakeholders with an understanding of the actual and potential risks to human health and the environment posed by the site and any uncertainties associated with the assessment. This information would be necessary to determine whether a potential threat to human health or the environment exists and would aid in assessing the need for and type of remedial actions or closure criteria that would be applied at the site.

Implementation of this RI/FS work is planned to occur between November 2008 and December 2009.

#### **Task 6—Stakeholder and Other Government Agency Costs**

The BIA is currently retaining the expertise of stakeholders and other government agencies in assessing and evaluating environmental impacts and closure alternatives for this site.

#### **Task 7—Remedy Selection and Closure Plan Design**

Using the CERCLA alternatives analysis methodology, a preferred remedy will be selected from the RI/FS study based on technical and stakeholder input. This remedy will involve the implementation of multiple alternatives to address all potential contaminants of concern, and completed routes of exposure and receptors. The remedy may include groundwater remediation. This selection process will involve a Record of Decision (ROD) concurred on by EPA. The remedy selection process is planned to occur during the first half of 2010.

#### **Task 8—Site Closure**

The closure plan design will include engineering design, planning, management, community participation for closure and post-closure activities at the site. A site closure plan will be developed as a result of the ROD. Remedial activities may include the

complete or partial excavation of waste, groundwater treatment, waste disposal including transportation, hydro-seeding and restoration, dewatering and leachate evaporation ponds, construction of repositories, etc. Once a remedy is selected, the closure and post-closure costs will be estimated. Closure activities are planned to occur between July 2010 and December 2012.

\* BIA's action plan for the Tuba City Dump cannot be finalized until site testing data/results are received. BIA expects testing results by August/September.

## **Health Assessment**

**Agency:** Indian Health Service

### **Background**

The Indian Health Service (IHS) has provided healthcare to Navajos (approximately 240,000 users presently) since 1955. The Area Office responsible for administering programs on Navajo lands is the Navajo Area Indian Health Service (NAIHS), headquartered in Window Rock, Arizona.

Extensive information on the health status of individual Navajos is available in patient medical records and in patient databases maintained by the IHS.

Much is known about the health effects of occupational and other exposures to humans from uranium and its breakdown products from articles in the scientific literature. Most of what is known about Navajos relates to occupational exposure.

The Navajo Nation believes that further epidemiologic studies would be of help to the Navajo people as they are concerned about risks to individuals exposed to uranium and its breakdown products, as well as other possible associated contaminants, left behind on Navajo lands from past mining and milling efforts.

The IHS has worked in the past with the Navajo Nation and individual eligible Indians seeking health care services at DHHS/NAIHS facilities on issues regarding exposure to uranium. In the last decade DHHS and NAIHS have invested an estimated \$3.8 million providing specific medical screening examinations and patient evaluation reports to former uranium miners, former millers, and "downwinders" from Nevada test bomb explosions in earlier decades. This amount also includes costs for providing patient and community education on the hazards of uranium exposure, providing individual eligible Indians or their legal descendants with information on their specific health conditions and planning and administrative responsibilities of the agency associated with providing services to these individuals.

### Action Plan

The IHS will continue current efforts and proposes new efforts for describing the health effects of contamination of surface lands and water on the Navajo people as discussed in the accompanying table. At this time, IHS does not plan to seek additional authorities nor additional funding to complete this action plan.

Objectives	Feb.'08	Aug.'08	Jan.'09	July'09	Jan.'10	July'10	Jan.'11	July'11	Jan.'12	July'12
1. Diagnose and treat known health conditions in eligible Indians.	X Continue	X	X	X	X	X	X	X	X	X
2. Radiation exposure, screening, and education Program Grant Proposal/ Submission for 2009 to DHHS-HRSA.		X								
3. In-kind contribution support to Univ. of New Mexico Health Sciences Center "Navajo Uranium Assessment and Kidney Health Project" in northwest New Mexico Navajo communities funded by DHHS-NIH.	X Ongoing	X	X	X	X	X	X	X		
4. Meet with Navajo Nation Div. of Health Epi Center staff to share information and discuss potential future collaborations consistent with Federal Agency action plans and Navajo Nation health concerns.	X Ongoing	X	X	X	X	X	X	X	X	X

Objectives	Feb.'08	Aug.'08	Jan.'09	July'09	Jan.'10	July'10	Jan.'11	July'11	Jan.'12	July'12
5. Participate in February 2008 onsite Technical Data Conference in Tuba City, AZ, discussing mill site contamination data/Tuba City dump and water contamination issues with Navajo Nation (NN), NRC, DOE, BIA, EPA.	X									
6. Review existing IHS patient databases and University of New Mexico (UNM) Tumor Registry databases with UNM staff and NN-EPI staff to develop plans for improved cancer case surveillance.		X Complete								
7. Review water contamination data from CDC (Health Studies Branch, Div. of Environmental Hazards and Health Effects, National Center for Env Health) with Navajo Nation, UNM, and EPA for potential future health studies.			X Complete							
8. Examine previous case-control study work and data from DOE, BIA, CDC, NRC, NN and UNM, and develop plans as appropriate to assess cancer and other health condition prevalences for populations near abandoned mill/mine sites including, if necessary, potential case-control study designs.			X Complete							



# Summary of NRC Actions

**Agency:** Nuclear Regulatory Commission

## Background

- The U.S. Nuclear Regulatory Commission's (NRC's) regulatory program, based on the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), governs the remediation of legacy sites and licensing new uranium recovery (UR) facilities.
- During the 1980s after issuance of UMTRCA, the NRC implemented many regulatory improvements to avoid the problems from uranium milling operations conducted in the 1950s and 1960s. Some of these are:
  - Implementation of below grade disposal of mill tailings.
  - Use of liners and groundwater monitoring for tailings impoundments to prevent groundwater contamination.
  - Financial surety requirements to reduce the risk of problems caused by a licensee's bankruptcy.
  - Reclamation and decommissioning requirements.
- The NRC's UR program regulatory framework is designed to adequately protect public health, safety, and the environment.

## NRC Actions

1. UNC Church Rock Mill Site: The NRC will continue to work with the Navajo Nation on issues related to the clean up of this old mill site. NRC staff has previously worked with the Navajo Environmental Protection Agency (EPA) on this action and will now also work with the Navajo Department of Justice (DOJ) (Mr. David Taylor) as requested by the Navajo Nation.
2. New UR Applications: The NRC will consult with the Navajo Nation, via the Navajo DOJ, for new UR license applications that have potential cultural and resource impacts on the Navajo Nation.
3. U.S. Department of Energy (DOE) Title I Uranium Mill Tailings Sites: For the four Title I mill sites located on Navajo lands (Mexican Hat, Monument Valley, Tuba City, and Shiprock), the NRC will continue to consult with the Navajo Nation and concur on DOE's remedial plans as required by NRC regulation 10 CFR 40.27. The NRC

staff has previously interacted with the Navajo Nation (Navajo Environmental Protection Agency and Division of Natural Resources – Uranium Mill Tailings Remedial Act Department) on the review of Groundwater Compliance Action Plans such as the Shiprock site. In addition, as requested by the Navajo Nation, the NRC staff will also consult with the Navajo DOJ.

4. Tuba City Contaminated Properties: Under Title I of UMTRCA, the contaminated sites near the Tuba City mill site would have been considered vicinity properties if DOE determined, in consultation with NRC, that the contaminated material was derived from the Tuba City mill site. NRC's role in the remediation of these vicinity properties was limited to concurrence in DOE's selection, performance, and completion of remediation of the vicinity properties. DOE would not obtain an NRC license to perform the remediation. However, the Tuba City mill site is under the general license in 10 CFR 40.27.

The purpose of the general license in 10 CFR 40.27 is to ensure that tailings disposal sites are cared for in such a manner to protect public health, safety, and the environment once the remedial actions are completed.

5. NRC staff members met with the tribes and held public meetings in Gallup, New Mexico, in September 2007, to explain the regulatory approach that NRC intends to follow for the review of proposed uranium mills. This meeting included a number of Navajo participants and NRC's presentation was translated into the Navajo language. The NRC has also conducted other meetings on this subject in Casper, Wyoming, and Albuquerque, New Mexico.

The Commission has provided the staff with adequate resources to perform safety reviews for new UR applications and maintain outreach with the Navajo Nation for FY 2008 and FY 2009.

# Request from House Committee on Government Oversight and Reform

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ONE HUNDRED TENTH CONGRESS

## Congress of the United States House of Representatives

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January 16, 2008

Mr. Keith Takata  
Director, Region 9 Superfund Program  
U.S. Environmental Protection Agency  
75 Hawthorne Street  
San Francisco, CA 94105

Dear Mr. Takata:

Thank you again for meeting with us on December 5, 2007, to discuss your draft action plan to address the health and environmental impacts of uranium contamination in the Navajo Nation. We believe that implementation of the federal agency action plans will begin to address these impacts, and we encourage you to proceed as rapidly as possible, consistent with your consultation responsibilities to the Navajo Nation. These action plans, however, are only a beginning.

The draft action plans do not clearly delineate a course of action for fully resolving the problem. Given the extent of the contamination that is already known, it is obvious that the contamination cannot and will not be cleaned up in the 3- to 9-month timeframes covered by the draft plans. We need a 5-year plan from each agency that sets out specific cleanup objectives, specific timeframes for achieving those objectives, and the new authorities and funding, if any, necessary to achieve those objectives. These plans will provide the Congress, the Navajo Nation, and the public with concrete benchmarks against which to measure the progress of the federal agencies in cleaning up the contamination.

We therefore request that your agency prepare a 5-year action plan for addressing uranium contamination in the Navajo Nation. We are making a similar request of each of the other responsible agencies. In developing your plan, please work with the other agencies to ensure that the federal response is coordinated and effective. The 5-year action plan should specify its cleanup objectives and include specific timeframes and cost estimates for achieving those objectives.

Among the specific objectives that one or more of the 5-year action plans should address are:

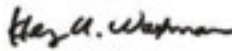
Mr. Keith Takata  
January 16, 2008  
Page 2

- Assessment of structures and water sources that are likely to be contaminated;
- Cleanup of all structures found to be contaminated above safe levels;
- Provision of alternate water supplies for residents consuming contaminated water;
- Tiered assessment of abandoned mines, with more detailed assessments of those most likely to pose environmental or health problems;
- Cleanup of the Northeast Churchbrock mine site and additional high-priority abandoned mine sites;
- Cleanup of the Tuba City Highway 160 site;
- Cleanup of the Tuba City dump;
- Remediation of groundwater contamination at the three mill sites; and
- Conduct of one or more case control studies of health risks faced by individuals residing near mill sites or abandoned mine sites.

We request that you provide the Committee with your agency's draft 5-year action plan by February 19, 2008. If you have any questions regarding this request, please contact Jeff Baran or Andy Schneider of the Committee staff at (202) 225-4407.

Thank you for your continuing cooperation in this matter.

Sincerely,

  
Henry A. Waxman  
Chairman

  
Tom Davis  
Ranking Minority Member

cc: Mr. Jim Nussle  
Director, Office of Management and Budget