The Impact of Uranium Mining and Clean-up Activities in the Grants Mineral Belt:

Seven Key Points

A Presentation to the New Mexico Legislature Indian Affairs Committee Meeting
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By Paul Robinson sricpaul@earthlink.net
Research Director, Southwest Research and Information Center
PO Box 4524, Albuquerque, NM 87106, www.sric.org

Quivira –formerly Kerr-McGee Churchrock No. 1 Mine – Inactive but not abandoned – Subject of Superfund Removal Action program. No mine site reclamation plan designed, permitted or implemented thirty years after mine closure.
KEY POINTS:

1) The New Mexico Legislature has not yet funded an active and abandoned uranium mine reclamation program. Delaying the funding of abandoned mine reclamation until new uranium mining generates an income stream, and relying on Federal abandoned mined land funds, has resulted in a failure to establish a viable abandoned uranium mine reclamation program.

2) Health risk research – the DiNEH Study and Navajo Birth Cohort Study – focus on Navajo communities affected by in-home uranium exposures from living and herding in close proximity to uranium mines provides models for research across Grants Mineral Belt.

3) Uranium exploration and mining proposals threaten cultural resources in and near the Mt. Taylor Traditional Cultural Property designated by the United States Forest Service in the Mt. Taylor Ranger District.

4) The legacy of water contamination from inactive and abandoned uranium mines and mills continues to affect the San Mateo Creek Watershed decades after closure of all facilities.

5) Uranium mining costs continue to exceed uranium market value by more than 50%.

6) The U.S. uranium industry operates at less than 25% capacity.

7) Overstating uranium development potential has distracted the state and region from focusing on development of vastly lower-cost renewable energy resources.
1) The New Mexico Legislature has not yet funded an active and abandoned uranium mine reclamation program. Delaying the funding of abandoned mine reclamation until new uranium mining generates an income stream, and relying on Federal abandoned mined land funds, has resulted in a failure to establish a viable abandoned uranium mine reclamation program.

In 2009 a bipartisan New Mexico Legislative effort sought Federal funds for inactive and abandoned uranium mines clean-up.

The New Mexico Legislative Task Force compiled an extensive report detailing natural resource and health impacts of uranium development to support use of federal abandoned mine land funds for uranium reclamation. This “Congressional Briefing Book” is no longer available on the New Mexico Legislature web site.

New Mexico has not established its own abandoned mine land fund to address the problem. A new Legislative Task Force is need to complete this work.

Navajo Birth Cohort Study

http://hsc.unm.edu/pharmacy/healthyvoices/NBCS/Navajo_Birth_Cohort_Study_Page1.html

A community-university-tribal and federal government partnership to investigate the relationship between uranium exposures and birth outcomes and early child development on the Navajo Nation

2) Health risk research – the DiNEH Study and Navajo Birth Cohort Study – focused on Navajo communities affected by in-home uranium exposures from living and herding in close proximity to uranium mines provides models for research across the Grants Mineral Belt
Exposure assessment methods based in understanding of *pathways* and *routes* of exposure

**Exposure Pathways:**
Air, water, plants, animals, humans
(can be very simple or quite complex)

**Exposure Routes:**
How contaminants enter the body

**Target Organ:**
Where a contaminant ends up in the body; e.g., bone, kidney, lung

**SOURCES:** Potentially harmful contaminants in the environment
Exposures to uranium mine wastes cross multiple generations, increase with proximity

Above: RED WATER POND ROAD COMMUNITY, Coyote Canyon Chapter (NM): Some of the children playing near a uranium mine waste dump (white pile, far left background) in 1976 became the adults of 2005, living in homes (above, right) within 600 feet (183 m) of another uranium mine waste dump.

- Occupied structure within 0.25 mi (0.4 km) of 14% of 521 AUMs on Navajo Nation
- DiNEH finding: Proximity predicts increased health risk
- Concern for inhalation: submicron particles in Tachee mine wastes

Uranium mine wastes on cliff within 0.25 mi (0.4 km) of three-generation homes, Blue Gap-Tachee Chapter, June 2014
Uranium wastes contain a complex mixtures of heavy metals and radionuclides

**Common metals:**
- Arsenic (As)
- Copper (Cu)
- Iron (Fe)
- Nickel (Ni)
- Selenium (Se)
- Uranium (U)
- Vanadium (V)

**Radionuclides:**
- Uranium-238
- Thorium-230
- Radium-226+228
- Radon-222
- Polonium-210
- Lead-210

Top: Selected metal and radionuclide constituents in Northeast Church Mine wastes, Pinedale, NM (MWH, Inc. 2007). Bottom: Metal concentrations in AUM wastes in Blue Gap-Tachee Chapter (UNM-E&PS, 2014)

### Claim 28 Mine Waste Characteristics, Tachee AZ

<table>
<thead>
<tr>
<th>Elemental Content, ug/g (or, parts per million, ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Non-impacted Soil</td>
</tr>
<tr>
<td>241,950</td>
</tr>
<tr>
<td>January samples: Mine waste collected under dirt cover</td>
</tr>
<tr>
<td>235,563</td>
</tr>
<tr>
<td>June samples: Waste rock on slope of Claim 28 site</td>
</tr>
<tr>
<td>243,703</td>
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</tbody>
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Navajo Birth Cohort Study Staff, Partners and Funding Sources

Current DiNEH Project and NBCS Teams

**UNM-HSC**
- Johnnye Lewis, Ph.D., PI
- David Begay, Ph.D.
- Malcolm Benally
- Courtney Burnette, Ph.D.
- Miranda Cajero
- Matt Campen, Ph.D.
- Carla Chavez
- Karen Cooper, Ph.D.
- Malcolm Benally
- Sandy Ramone
- Maria Welch

**SRIC**
- Chris Shuey, MPH
- Lynda Lasiloo
- Teddy Nez

**CDC/ATSDR**
- Angela Ragin, Ph.D.
- Candis Hunter, MSPH
- Elizabeth Irvin-Barnwell, Ph.D.

**NAIHS**
- Doug Peter, M.D.
- Johnna Rogers, RN
- Lorraine Barton
- Lisa Kear, RN
- Ursula Knoki-Wilson, CNM, MSN
- Deidre Sam
- Charlotte Swindal, CNM, RN

**PL93-638 HOSPITALS**
- Delila Begay
- Abigail Sanders

**CONSULTANTS**
- Perry Charley
- Adrienne Ettinger, Ph.D.

**Navajo Nation NNDOH**
- Mae-Gilene Begay
- Anna Rondon
- Qeturah Anderson
- Melissa Samuel
- Roxanne Thompson
- Doris Tsinnijinnie
- Josey Watson

**NNEPA**
- Stephen Etsitty, Director
- Yolanda Barney
- Vivian Craig
- Chandra Manandhar
- Eugenia Quintana
- Freida White

**USEPA – Region 9**
- Linda Reeves
- Clancy Tenley

(Navajo Team Members in Blue)

Funding Sources:
- NIEHS (16 yrs)
- CDC (4 yrs)
- USEPA (4 yrs)
- NIMHHD (3 yrs)
- NNEPA (1 yr)

DiNEH Project and NBCS are reviewed, approved and monitored by Navajo Nation Human Research Review Board
3) Uranium exploration and mining proposals continue to threaten cultural resources in and near the Mt. Taylor Traditional Cultural Property (TCP)

Most of the uranium deposits at the Roca Honda and Mt. Taylor proposed mines are underneath the Mt. Taylor TCP. Newly acquired Forest Service claims added to the Roca Honda property increases the footprint of the mine inside the Mt. Taylor TCP.
4) The legacy of water contamination from inactive and abandoned uranium mines and mills continues to affect the San Mateo Creek Watershed decades after closure of all facilities.

The San Mateo Creek Watershed contains most of the inactive and abandoned uranium mines and mills in New Mexico.

Abandoned mines are mines where not owner or operator is identifiable; inactive mines are mines that are no longer operating and where an owner or operator is identifiable.
Impacts of uranium mine water discharges affect the San Mateo Creek watershed not just inactive mine sites.

Location of Homestake Superfund site on alluvium of San Mateo Creek floodplain presents perpetual flood risk and has resulted in contamination of four local aquifers.

New Mexico abandoned its most extensive study of the Uranium Legacy for water in San Mateo Creek watershed in 2010 without completing the final report.

Data reflect elevated dissolved uranium in groundwater along San Mateo Creek.
U.S. Uranium Reserves – the amount of uranium mineable at a profit – reported by the Department of Energy (DOE) Energy Information Administration (EIA) have dropped by 73% since 2008. Government estimates of U.S. uranium reserves have fallen dramatically as the cost of uranium mining has increased. The price of uranium has decreased and projected demand has slowed significantly.

U.S. uranium reserves, reported by DOE for the <$100/lb “forward cost” have fallen by 73% from: 1,227 million lbs in 2008 to 337 million lbs in 2013.

In Wyoming, <$50/lb “forward cost” uranium reserves has fallen by 56% from 220 million lbs in 2008, to 98.5 million lbs in 2013, and <$100/lb uranium reserves has fallen 32% from 446 million lbs to 308 million lbs.

In New Mexico (DOE no longer reports New Mexico separately, instead adding Arizona and Utah’s numbers to New Mexico’s totals), <$50/lb “forward cost” uranium reserves have fallen more, from 179 million lbs in 2008 to 165 million lbs in 2013 for the southwestern states of New Mexico, Arizona and Utah. New Mexico’s <$100/lb uranium reserves fell >52% from 390 million lbs in 2008 to 189.1 million lbs in 2013.

While DOE EIA “forward cost” reserves are not comparable to “reserves” as defined by Canadian NI 43-101 standards, “forward cost” reserves calculated by DOE reasonably for separate years of data developed with the same method.
U.S. 2013 uranium production of 4.7 million lbs represents only 18.9% of licensed production capacity

2013 U.S. Production capacity –
16.4 million lbs. – In situ licensed production
8.0 million lbs. – Licensed conventional production
24.8 million lbs. – U.S. Operating Capacity

4.7/24.8 – 18.9% Operating Capacity

9.4 million lbs of additional in situ production in “permitting pipeline”

4.7 million lbs = 2,350 tons
24.8 million lbs = 12,400 tons
9.4 million lbs = 4,700 tons

U.S. demand for uranium in 2013 was about 18,000 tons. The U.S. only produced 2,350 tons from licensing capacity of 12,400 tons
U.S. has one licensed conventional uranium mill capable of producing 8,000,000 lbs (4,000 tons) per year at White Mesa in Utah. It owner Energy Fuels, Inc. reports total uranium production of 1,007,000 lbs.

(http://www.energyfuels.com/_resources/AIF-2013.pdf p. 21-22)

The USA has enough uranium resources to power its reactors but domestic uranium is much more expensive to mine and process that other uranium available on the world market.

U.S. in situ uranium mines hold licenses representing operating capacity of 16.4 million lbs. DOE reports another 9.4 million lbs as developing, or partly licensed, mines.
New Mexico Uranium Production Costs Far Exceed Available Prices – A 2015 Roca Honda mine Technical Report (meeting Canadian NI43-101 Standards) shows that the minimum uranium price needed for profitable operation of the mine is $65/lb, more than 60% higher than current $37.00/lb price – September 25, 2015 www.uranium.info

Uranium Price information from:
http://www.infomine.com/investment/metal-prices/uranium-oxide/all/

Roca Honda uranium price data from:
Overview

» Located in on private land in Cibola County, New Mexico
» Operated NextEra Energy Resources subsidiary since 2010
» A 102.4-megawatt wind generation plant
» 64 1.6-megawatt GE turbines capable of generating enough electricity for more than 25,000 homes
» Each turbine is approximately 262 feet tall from the ground to the hub the center of the blades

Benefits

» Provides employment opportunities
» Adds tax base to the county
» Delivers landowner lease payments
» Creates no air or water pollution
» Uses no water in power generation
» Allows land to remain in agricultural use
» Supports economy through purchases of regional goods and services

“The Cibola County Commission negotiated a lucrative deal with NextEra, said Commission Chair Edward Michael. The commission approved $215 million in taxable industrial revenue bonds to finance the project.”


Inactive St. Anthony Mine at Cebolleta Land Grant North of Laguna Pueblo
No Reclamation Plan Thirty Years after Closure

Thank you for your time and attention