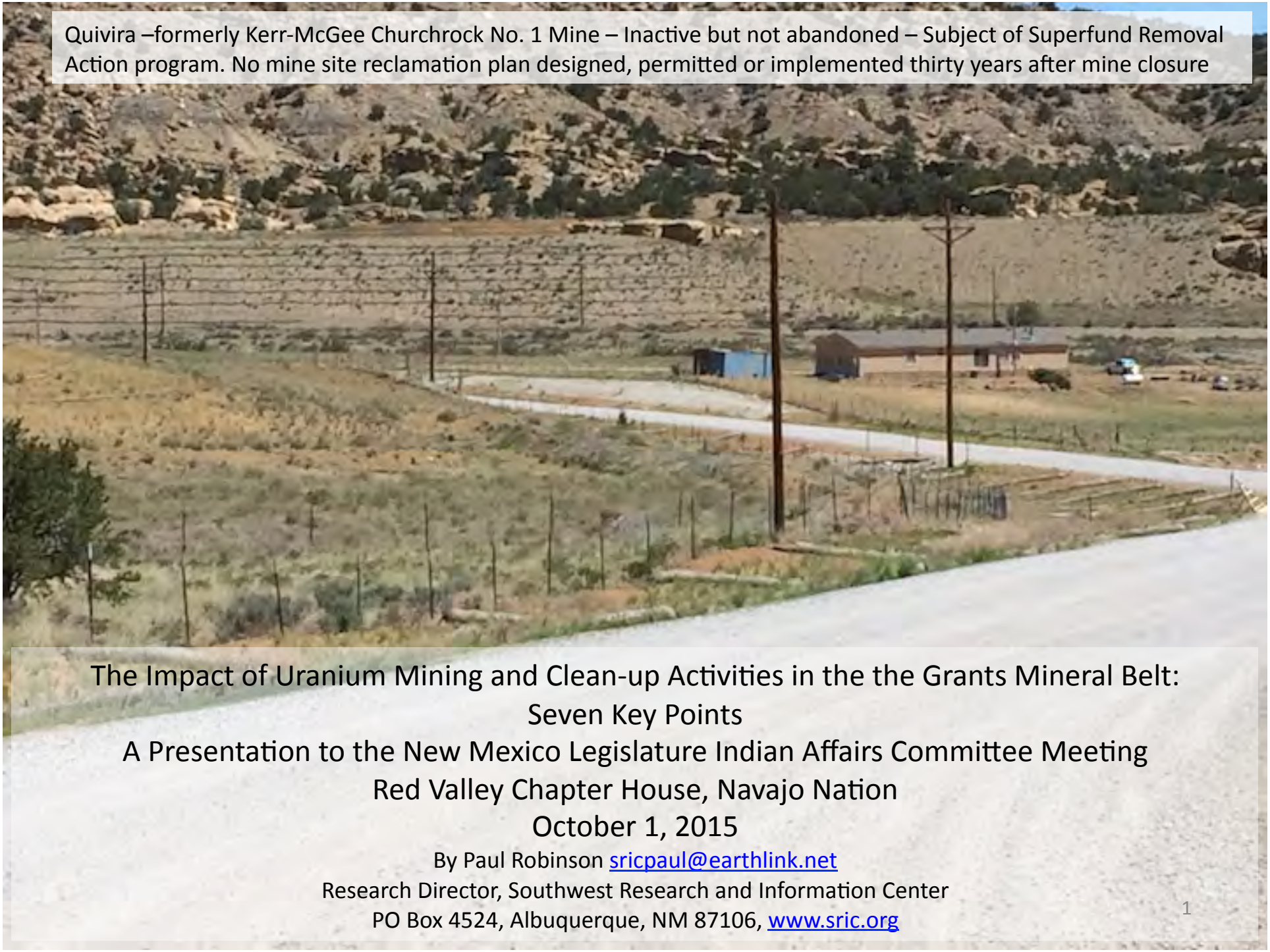


Quivira –formerly Kerr-McGee Churchrock No. 1 Mine – Inactive but not abandoned – Subject of Superfund Removal Action program. No mine site reclamation plan designed, permitted or implemented thirty years after mine closure

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

A Presentation to the New Mexico Legislature Indian Affairs Committee Meeting

Red Valley Chapter House, Navajo Nation

October 1, 2015

By Paul Robinson sricpaul@earthlink.net

Research Director, Southwest Research and Information Center

PO Box 4524, Albuquerque, NM 87106, www.sric.org

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.

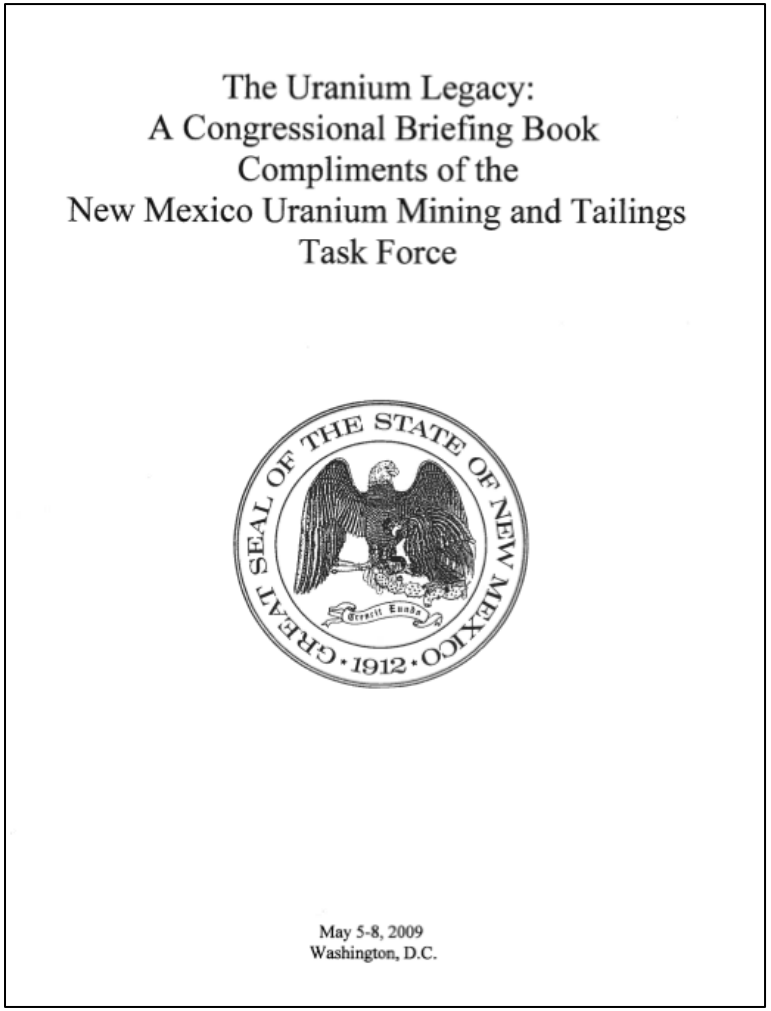
7) Overstating uranium development potential has distracted the state and region from focusing on development of vastly lower-cost renewable energy resources.

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.


The Uranium Legacy:
A Congressional Briefing Book
Compliments of the
New Mexico Uranium Mining and Tailings
Task Force

GREAT SEAL OF THE STATE OF NEW MEXICO · 1912 ·

May 5-8, 2009
Washington, D.C.

Congressional Briefing Book available at:
http://www.powertechexposed.com/IAC_CongressionalBrifingBook2009.pdf

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

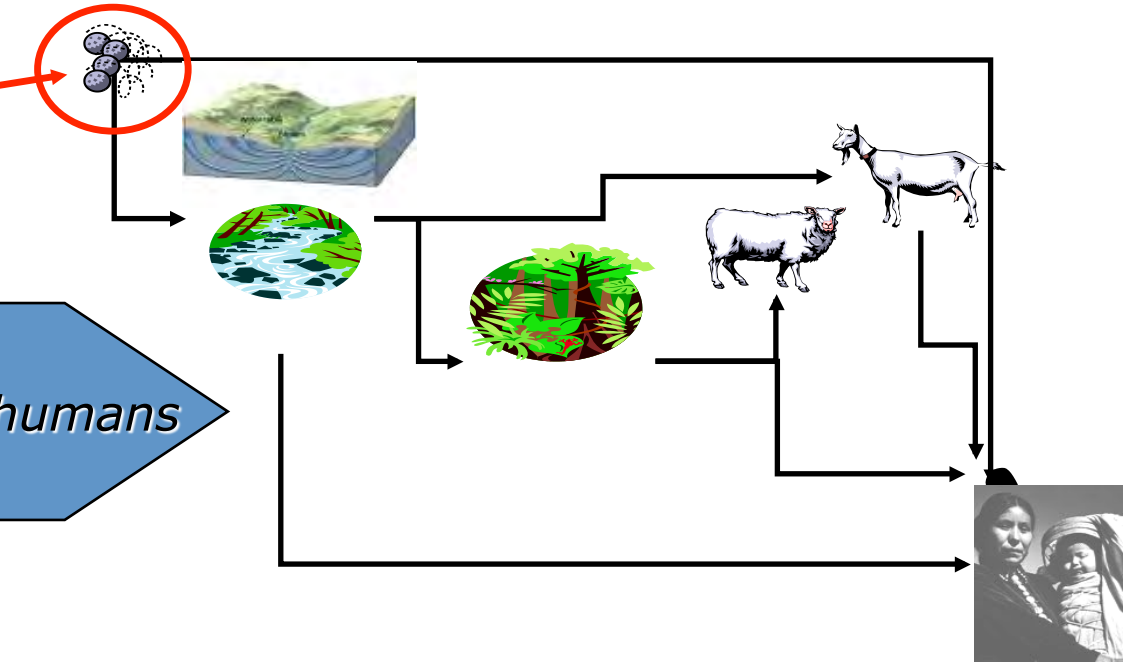
Navajo Birth Cohort Study

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

Exposure assessment methods based in understanding of *pathways* and *routes* of exposure

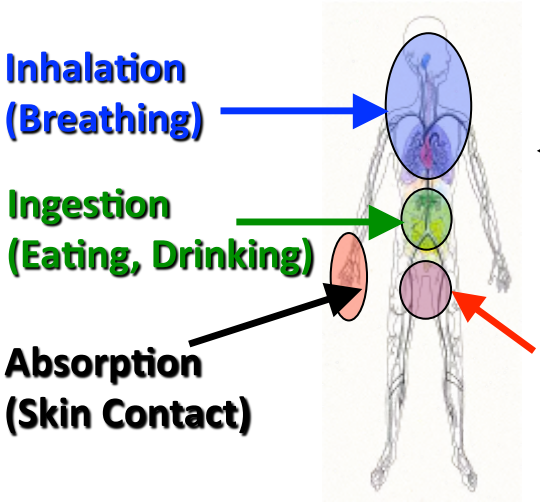
SOURCES: Potentially harmful contaminants in the environment



Exposure Pathways:

Air, water, plants, animals, humans

(can be very simple or quite complex)



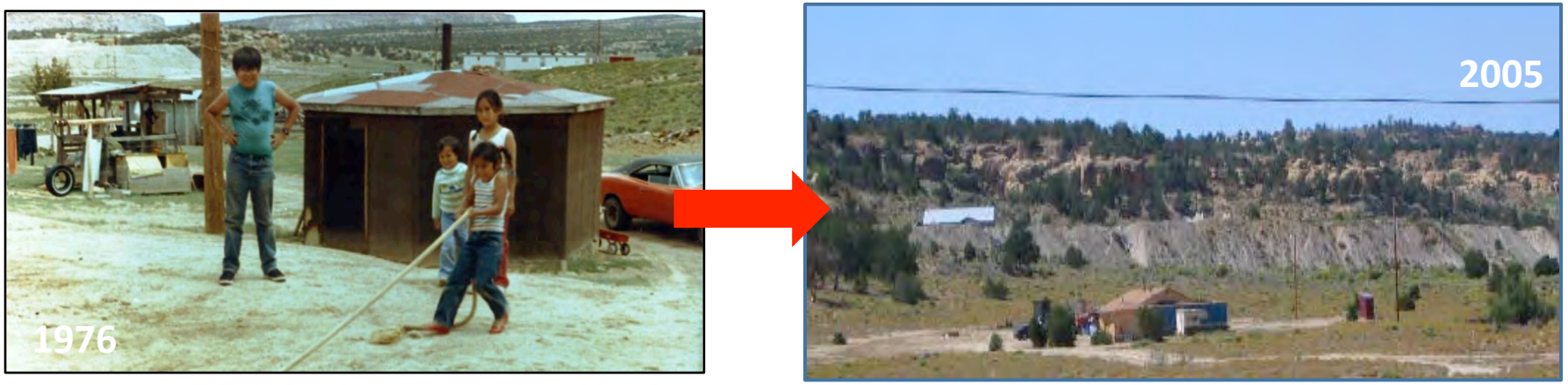
Exposure Routes:

How contaminants enter the body

Target Organ:

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

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.

Uranium mine wastes on cliff within 0.25 mi (0.4 km) of three-generation homes, Blue Gap-Tachee Chapter, June 2014

- 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

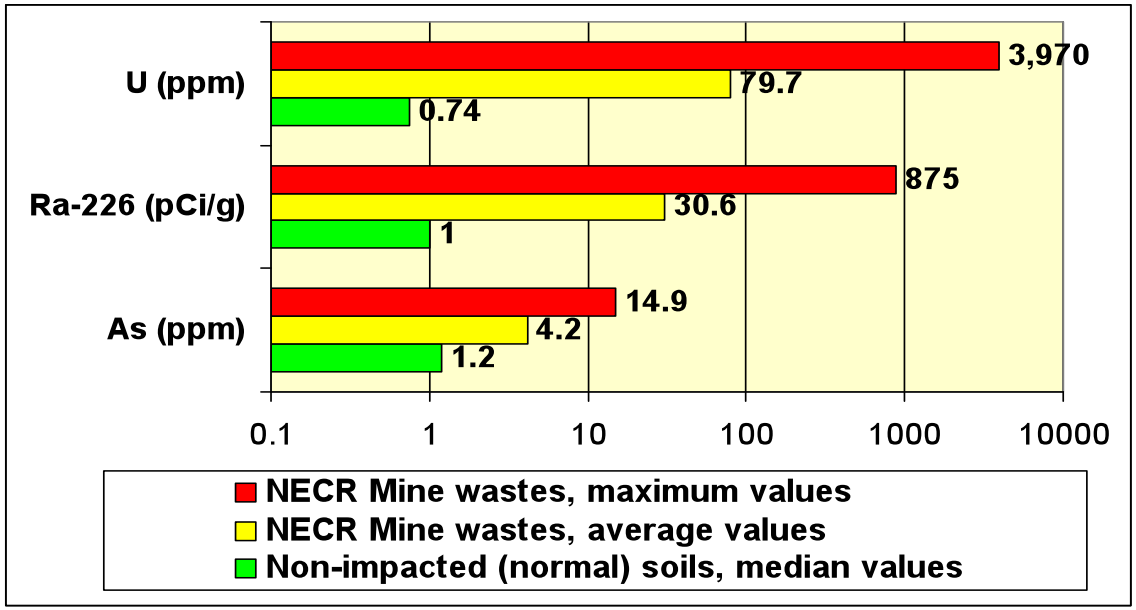
Uranium wastes contain a complex mixtures of heavy metals and radionuclides

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	Elemental Content, ug/g (or, parts per million, ppm)							
	Si	S	Al	Fe	Mg	U	V	Ca
Non-impacted Soil	241,950	1,339	52,129	26,739	3,068	BDL*	BDL*	16,441
January samples: Mine waste collected under dirt cover	235,563	223	69,533	15,259	181	**2,248**	**15,814**	855
June samples: Waste rock on slope of Claim 28 site	243,703	1,834	59,730	3,511	405	**6,614**	**4,328**	3,293

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.
Eszter Erdei, Ph.D.
Molly Harmon
Joseph Hoover, Ph.D.
Laurie Hudson, Ph.D.
Lauren Hund, Ph.D.
CJ Laselute
Jim Liu, Ph.D.
Deborah MacKenzie, Ph.D.
Curtis Miller, Ph.D.
Elena O'Donald, Ph.D.
Jennifer Ong
Bernadette Pacheco
Becky Smith
Chris Vining, MS, SLP

SRIC
Chris Shuey, MPH
Lynda Lasiloo
Teddy Nez
Sandy Ramone
Maria Welch

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

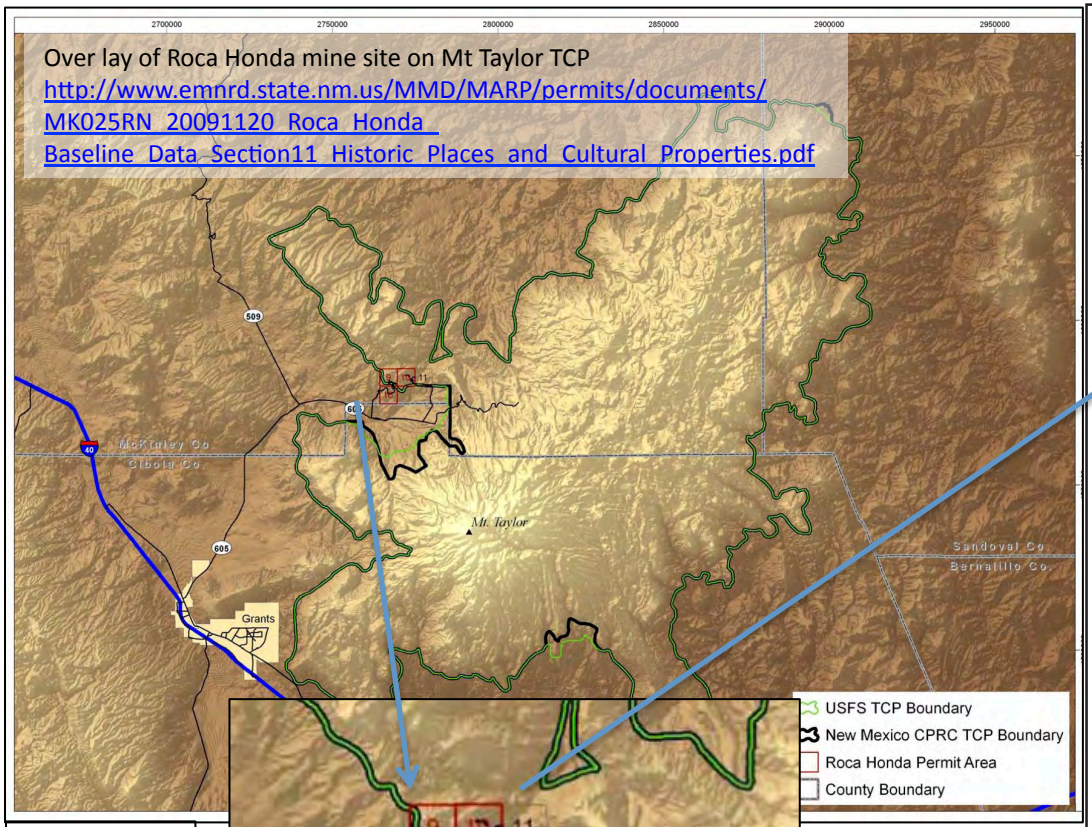
(Navajo Team Members in Blue)

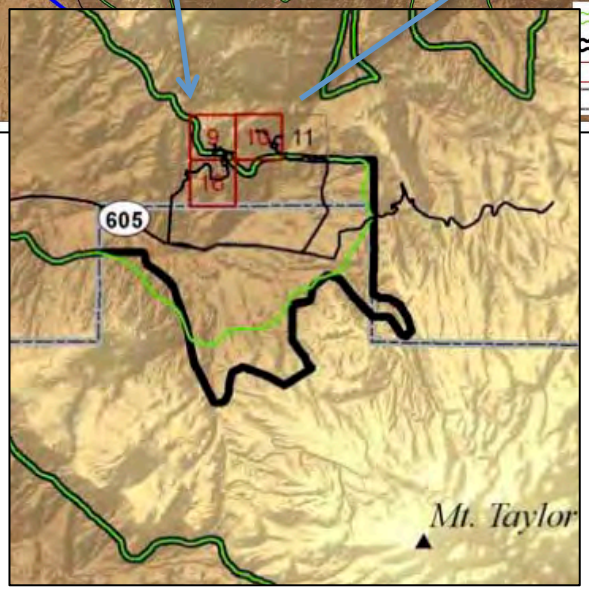
Funding Sources:

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

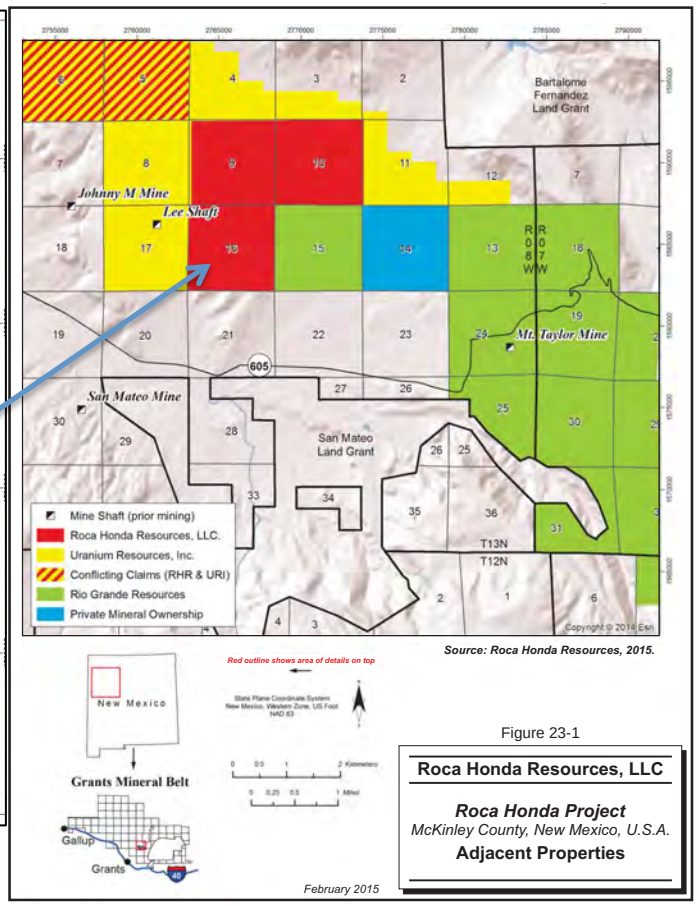
DiNEH Project and NBCS are reviewed, approved and monitored by Navajo Nation Human Research Review Board

3) Uranium exploration and mining proposals continue to threaten cultural resources in and near the Mt. Taylor Traditional Cultural Property (TCP)





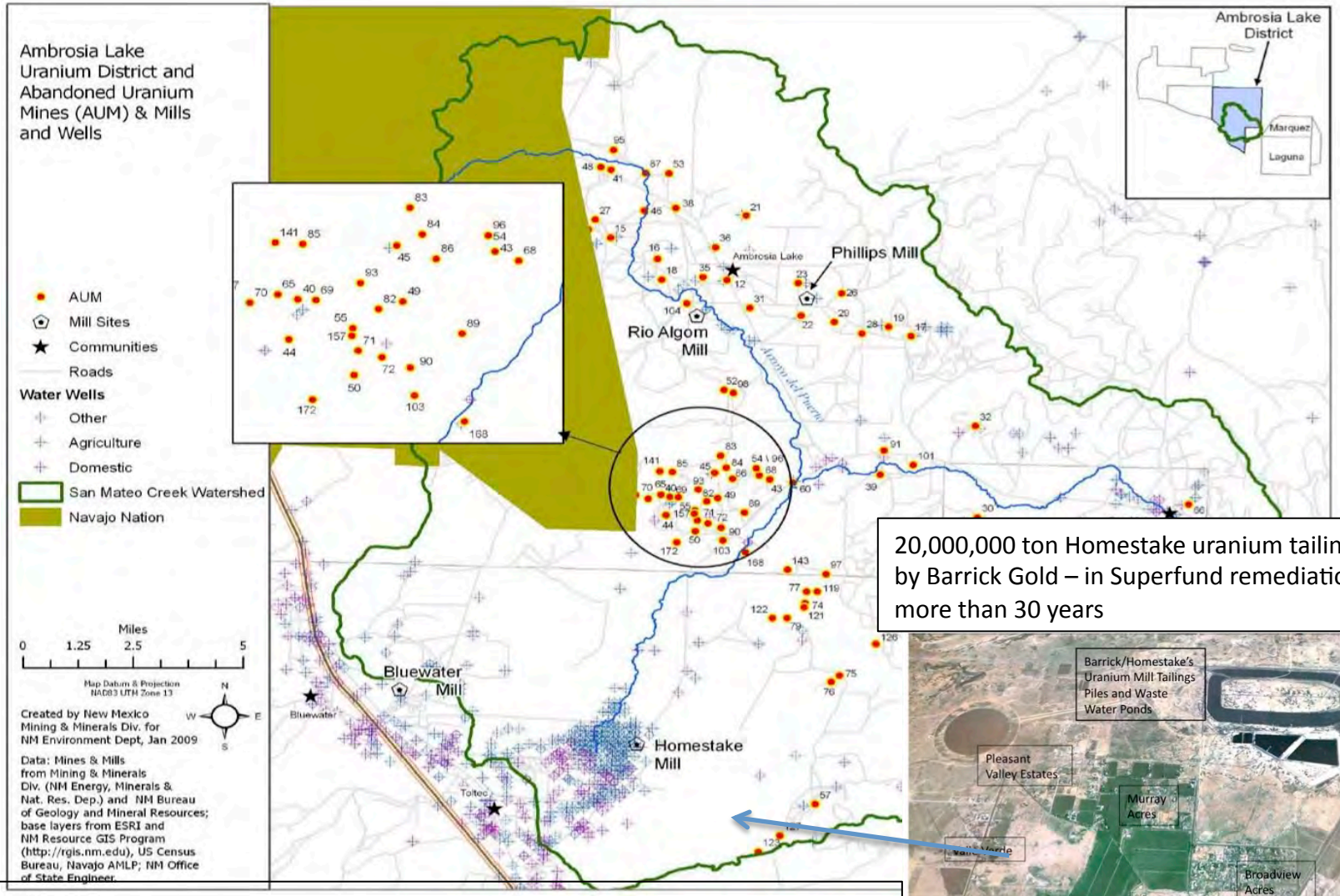
Green line shows Mt. Taylor TCP Outline



http://www.energyfuels.com/_resources/technical-reports/Roca_Honda_Feb27-2015.pdf

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

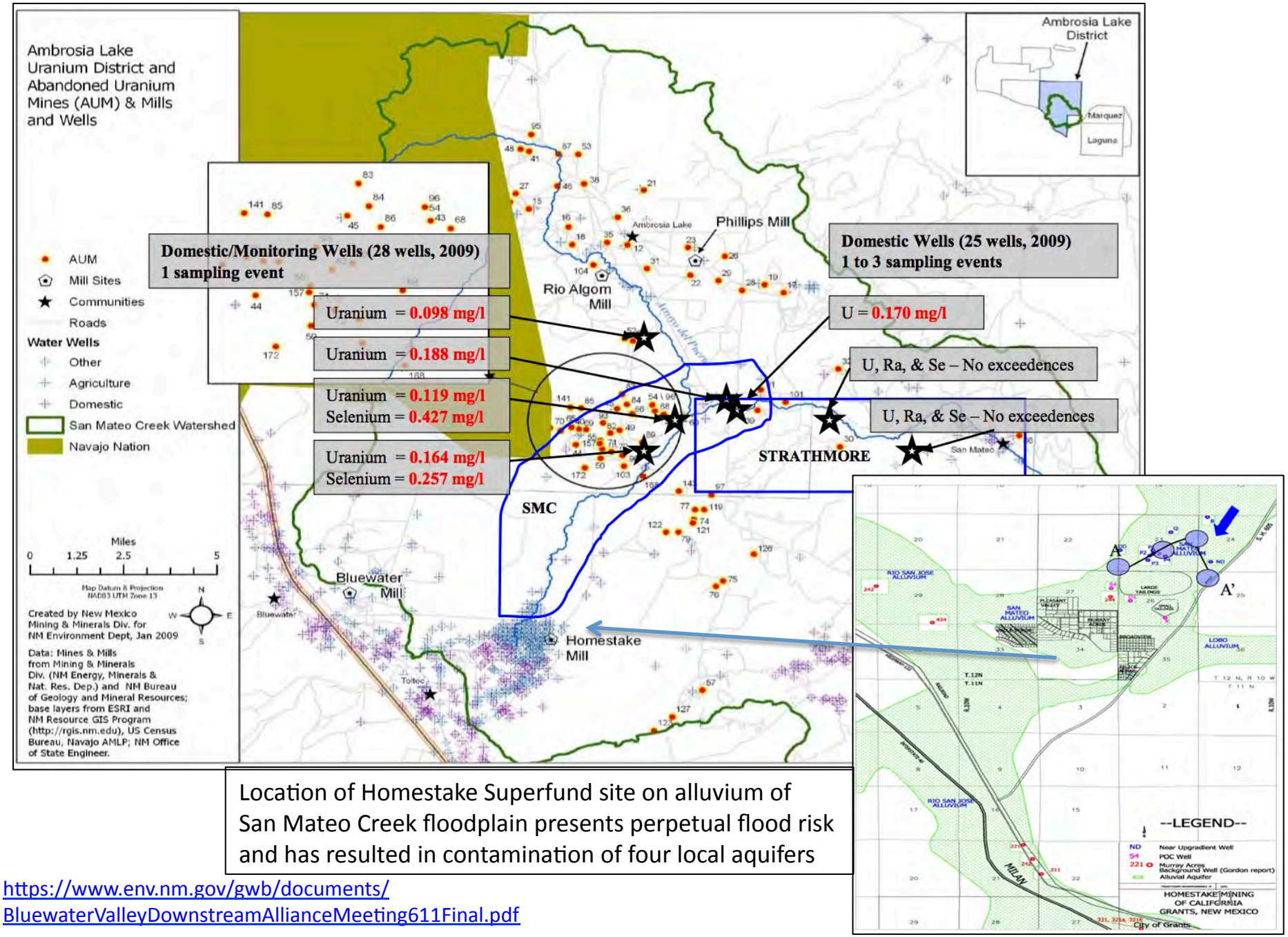


20,000,000 ton Homestake uranium tailings pile - owned by Barrick Gold – in Superfund remediation program for more than 30 years

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

https://www.env.nm.gov/gwb/documents/BluewaterValleyDownstreamAllianceMeeting611Final.pdf

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

DRAFT DOCUMENT

Geochemical Analysis and Interpretation of Ground Water Data Collected as part of the Anaconda Company Bluewater Uranium Mill Site Investigation (CERCLIS ID NMD007106891) and San Mateo Creek Site Legacy Uranium Sites Investigation (CERCLIS ID NMN00060684)

McKinley and Cibola County, New Mexico

NEW MEXICO ENVIRONMENT DEPARTMENT

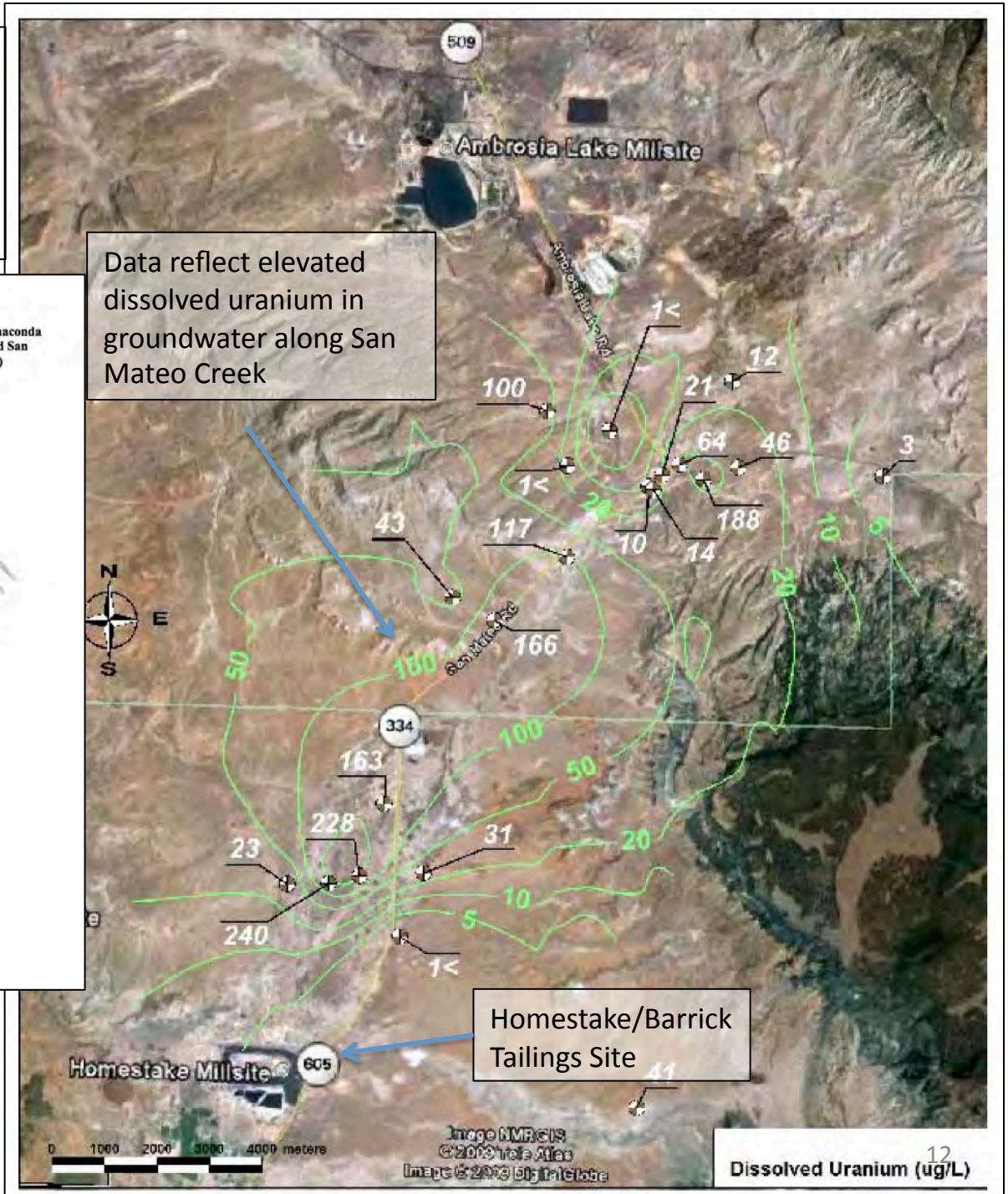
Draft Released
May 2010

New Mexico Environment Department
Ground Water Quality Bureau
Superfund Oversight Section

DRAFT FOR PUBLIC RELEASE

https://www.env.nm.gov/gwb/documents/FinalPublicDraftofGeochemofBluewaterandSMCGroundWaterSamples.pdf

Data reflect elevated dissolved uranium in groundwater along San Mateo Creek



Homestake/Barrick Tailings Site

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

DOE EIA data for 2013 vs. data for 2008

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.

Table 10. Uranium reserve estimates at the end of 2012 and 2013

million pounds U_3O_8

Uranium Reserve Estimates[1] by Mine and Property Status, Mining Method, and State(s)	End of 2012 Forward Cost[2] $0 to $30 per pound	End of 2012 Forward Cost[2] $0 to $50 per pound	End of 2012 Forward Cost[2] $0 to $100 per pound	End of 2013 Forward Cost[2] $0 to $30 per pound	End of 2013 Forward Cost[2] $0 to $50 per pound	End of 2013 Forward Cost[2] $0 to $100 per pound
Properties with Exploration Completed, Exploration Continuing, and Only Assessment Work	W	W	102.0	W	W	130.7
Properties Under Development for Production and Development Drilling	W	W	W	W	31.8	W
Mines in Production	W	21.4	W	W	19.6	W
Mines Closed Temporarily, Closed Permanently, and Mined Out	W	W	133.1	W	W	135.2
In-Situ Leach Mining	W	W	128.6	W	W	124.1
Underground and Open Pit Mining	W	W	175.4	W	W	213.5
Arizona, New Mexico and Utah	0	W	164.7	0	W	189.1
Colorado, Nebraska and Texas	W	W	40.8	W	W	40.6
Wyoming	W	W	98.5	W	W	107.9
Total	**51.8**	**W**	**304.0**	**46.6**	**W**	**337.6**

W = Data withheld to avoid disclosure of individual company data.

http://www.eia.gov/uranium/production/annual/pdf/dupr.pdf

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.

Table 1. U.S. Forward-Cost Uranium Reserves by State, Year-End 2008

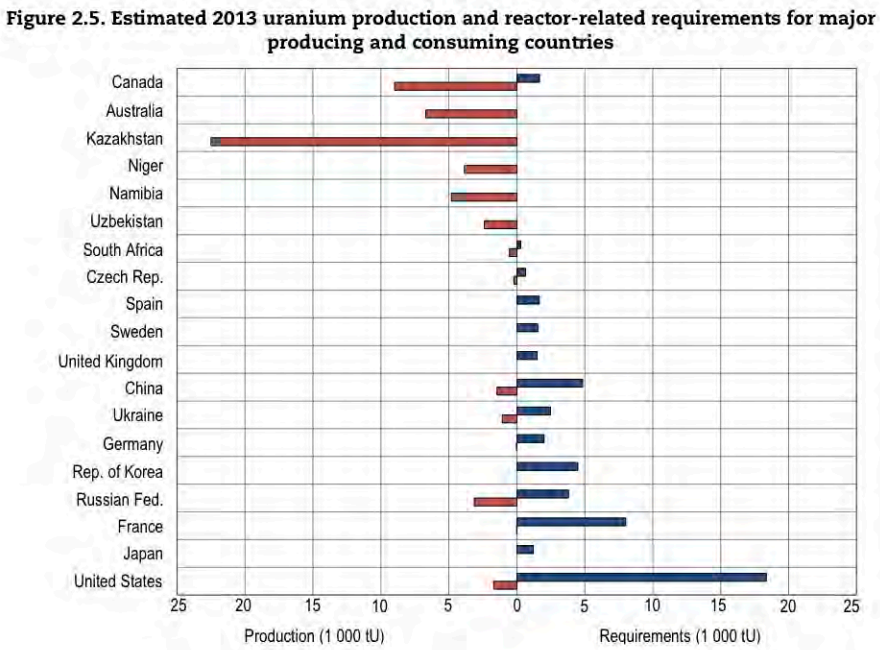
State	$50/lb Ore (million tons)	$50/lb Grade[a] (%)	$50/lb U_3O_8 (million lbs)	$100/lb Ore (million tons)	$100/lb Grade[a] (%)	$100/lb U_3O_8 (million lbs)
Wyoming	145	0.076%	220	398	0.056%	446
New Mexico	64	0.140%	179	186	0.105%	390
Arizona, Colorado, Utah	22	0.145%	63	117	0.084%	198
Texas	15	0.089%	27	32	0.062%	40
Other[b]	28	0.090%	50	95	0.081%	154
Total	275	0.098%	539	828	0.074%	1,227

[a] Average percent U_3O_8 per ton of ore.

[b] Includes Alaska, California, Idaho, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Virginia and Washington.

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.

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



Source: Uranium Red Book 2014

U.S. 2013 uranium production of 4.7 million lbs represents only 18.9% of licensed production capacity

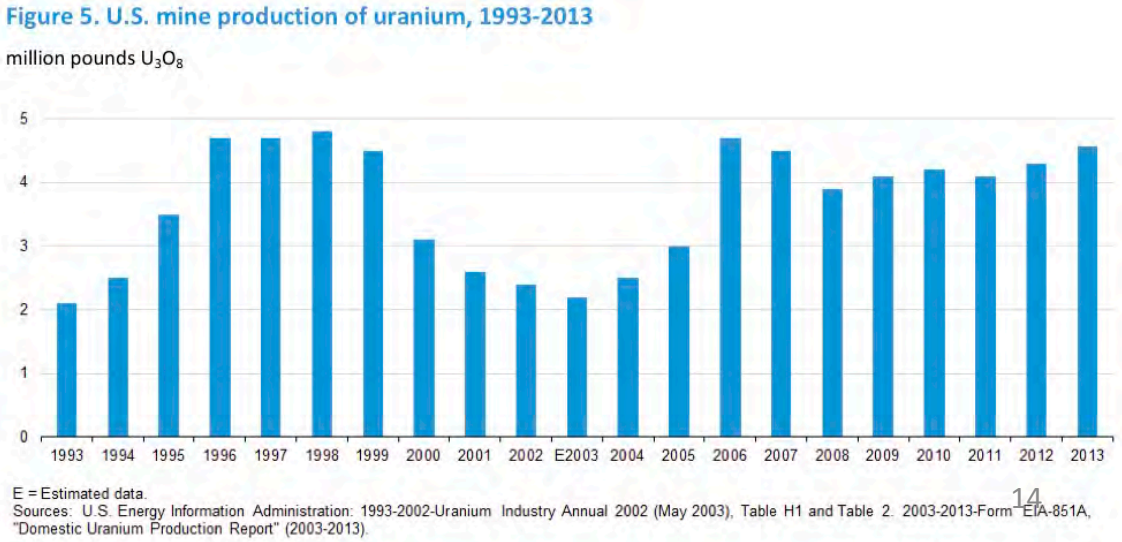
2013 U.S. Production capacity –
16.4 million lbs. – In situ licensed production
8.0 million lbs. – Licensed conventional production
24.8 million lbs. – U.S. Operating Capacity

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)

Table 4. U.S. uranium mills and heap leach facilities by owner, location, capacity, and operating status at end of the year, 2009-13

Owner	Mill and Heap Leach[1] Facility Name	County, State (existing and *planned* locations)	Capacity (short tons of ore per day)	Operating Status at End of the Year 2009	2010	2011	2012	2013
Cotter Corporation	Canon City Mill	Fremont, Colorado	0	Standby	Standby	Reclamation	Demolished	Demolished
EFR White Mesa LLC	White Mesa Mill	San Juan, Utah	2,000	Operating	Operating	Operating	Operating	Operating, Processing Alternate Feed
Energy Fuels Resources Corporation	Piñon Ridge Mill	Montrose, Colorado	500	Developing	Developing	Permitted And Licensed	Partially Permitted And Licensed	Permitted And Licensed
Energy Fuels Wyoming Inc.	Sheep Mountain	Fremont, Wyoming	725					Undeveloped
Kennecott Uranium Company/Wyoming Coal Resource Company	Sweetwater Uranium Project	Sweetwater, Wyoming	3,000	Standby	Standby	Standby	Standby	Standby
Roca Honda Resources LLC	Pena Ranch	McKinley, New Mexico	2,000	-	-	-	-	Undeveloped
Strathmore Resources (US) Ltd	Gas Hills	Fremont, Wyoming	2,200	-	-	-	-	Undeveloped
Uranium One Americas, Inc.	Shootaring Canyon Uranium Mill	Garfield, Utah	750	Standby	Standby	Standby	Standby	Standby
Total Capacity:			11,175					

- = No data reported.

[1] Heap leach solutions: The separation, or dissolving-out from mined rock, of the soluble uranium constituents by the natural action of percolating a prepared chemical solution through mounded (heaped) rock material. The mounded material usually contains low grade mineralized material and/or waste rock produced from open pit or underground mines. The solutions are collected after percolation is completed and processed to recover the valued components.

Notes: Capacity for 2013. An operating status of "Operating" indicates the mill was producing uranium concentrate at the end of the period.

Source: U.S. Energy Information Administration: Form EIA-851A, "Domestic Uranium Production Report" (2009-2013).

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.

Table 5. U.S. uranium in-situ-leach plants by owner, location, capacity, and operating status at end of the year, 2009-13

In-Situ-Leach Plant Owner	In-Situ-Leach Plant Name	County, State (existing and *planned* locations)	Production Capacity (pounds U_3O_8 per year)	Operating Status at End of the Year 2009	2010	2011	2012	2013
AUC LLC	Reno Creek	*Campbell, Wyoming*	2,000,000	-	-	-	-	Developing
Cameco	Crow Butte Operation	Dawes, Nebraska	1,000,000	Operating	Operating	Operating	Operating	Operating
Hydro Resources, Inc.	Church Rock	*McKinley, New Mexico*	1,000,000	Partially Permitted And Licensed	Partially Permitted And Licensed	Partially Permitted And Licensed	Partially Permitted And Licensed	Partially Permitted And Licensed
Hydro Resources, Inc.	Crownpoint	*McKinley, New Mexico*	1,000,000	Partially Permitted And Licensed	Partially Permitted And Licensed	Partially Permitted And Licensed	Partially Permitted And Licensed	Partially Permitted And Licensed
Lost Creek ISR, LLC	Lost Creek Project	Sweetwater, Wyoming	2,000,000	Developing	Developing	Partially Permitted And Licensed	Under Construction	Operating
Mestena Uranium LLC	Alta Mesa Project	Brooks, Texas	1,500,000	Producing	Producing	Producing	Producing	Producing
Power Resources, Inc. dba Cameco Resources	Smith Ranch-Highland Operation	Converse, Wyoming	5,500,000	Operating	Operating	Operating	Operating	Operating
Powertech Uranium Corp	Dewey Burdock Project	*Fall River and Custer, South Dakota*	1,000,000	Undeveloped	Undeveloped	Undeveloped	Developing	Developing
South Texas Mining Venture	Hobson ISR Plant	Karnes, Texas	1,000,000	Permitted And Licensed	Operational	Operating	Operating	Operating
South Texas Mining Venture	La Palangana	Duval, Texas	1,000,000	Permitted And Licensed	Operating	Operating	Operating	Operating
Strata Energy Inc.	Ross	*Crook, Wyoming*	3,000,000	-	-	Developing	Partially Permitted And Licensed	Partially Permitted And Licensed
URI, Inc.	Kingsville Dome	Kleberg, Texas	1,000,000	Standby	Standby	Standby	Standby	Restoration
URI, Inc.	Rosita	Duval, Texas	1,000,000	Standby	Standby	Standby	Standby	Restoration
URI, Inc.	Vasquez	Duval, Texas	800,000	Restoration	Restoration	Restoration	Restoration	Restoration
Uranerz Energy Corporation	Nichols Ranch ISR Project	Johnson and Campbell, Wyoming	2,000,000	Developing	Partially Permitted And Licensed	Under Construction	Under Construction	Under Construction
Uranium Energy Corp.	Goliad ISR Uranium Project	*Goliad, Texas*	1,000,000	Partially Permitted And Licensed	Partially Permitted And Licensed	Partially Permitted And Licensed	Permitted And Licensed	Permitted And Licensed
Uranium One Americas, Inc.	Jab and Antelope	*Sweetwater, Wyoming*	2,000,000	Developing	Developing	Developing	Developing	Developing
Uranium One Americas, Inc.	Moore Ranch	*Campbell, Wyoming*	500,000	Partially Permitted And Licensed	Permitted And Licensed	Permitted And Licensed	Permitted And Licensed	Permitted And Licensed
Uranium One USA, Inc.	Willow Creek Project (Christensen Ranch and Irigaray)	Campbell and Johnson, Wyoming	1,300,000	Standby	Operational	Producing	Producing	Producing
Total Production Capacity:			**29,600,000**					

- = No data reported.

Notes: Production capacity for 2013. An operating status of "Operating" indicates the in-situ-leach plant usually was producing uranium concentrate at the end of the period. Hobson ISR Plant processed uranium concentrate that came from La Palangana. Hobson and La Palangana are part of the same project. ISR stands for in-situ recovery. Christensen Ranch and Irigaray are part of the Willow Creek Project.

Source: U.S. Energy Information Administration: Form EIA-851A, "Domestic Uranium Production Report" (2009-13).

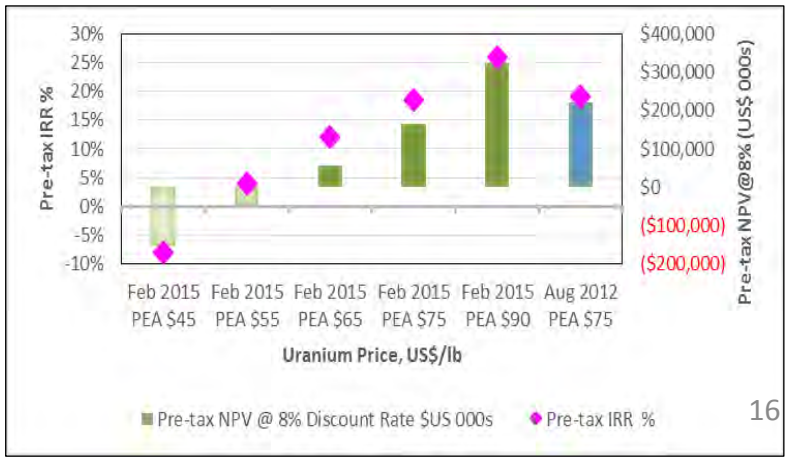
http://www.eia.gov/uranium/production/annual/pdf/dupr.pdf

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

FIGURE 1-2 COMPARISON OF 2015 ROCA HONDA PEA AT DIFFERENT URANIUM PRICES TO 2012 ROCA HONDA PEA AT US$75/LB

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

Roca Honda uranium price data from:
http://www.energyfuels.com/_resources/technical-reports/Roca_Honda_Feb27-2015.pdf



7) Overstating uranium development potential has distracted the state and region from focusing on development of vast lower cost renewable energy resources in the Grants Mineral Belt

Wind Energy Development has most successful energy investment in Grants Mineral Belt this Century – Red Mesa Wind Energy Center Funded by Cibola County Industrial Revenue Bonds

"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." http://www.bizjournals.com/albuquerque/print-edition/2010/12/03/wind-farm-to-come-on-line-near-grants.html

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

http://www.nexteraenergyresources.com/pdf_redesign/RedMesaWind.pdf

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