



# TRONOX NAVAJO AREA URANIUM MINES FY2011 THROUGH FY2018 FINANCIAL REPORT

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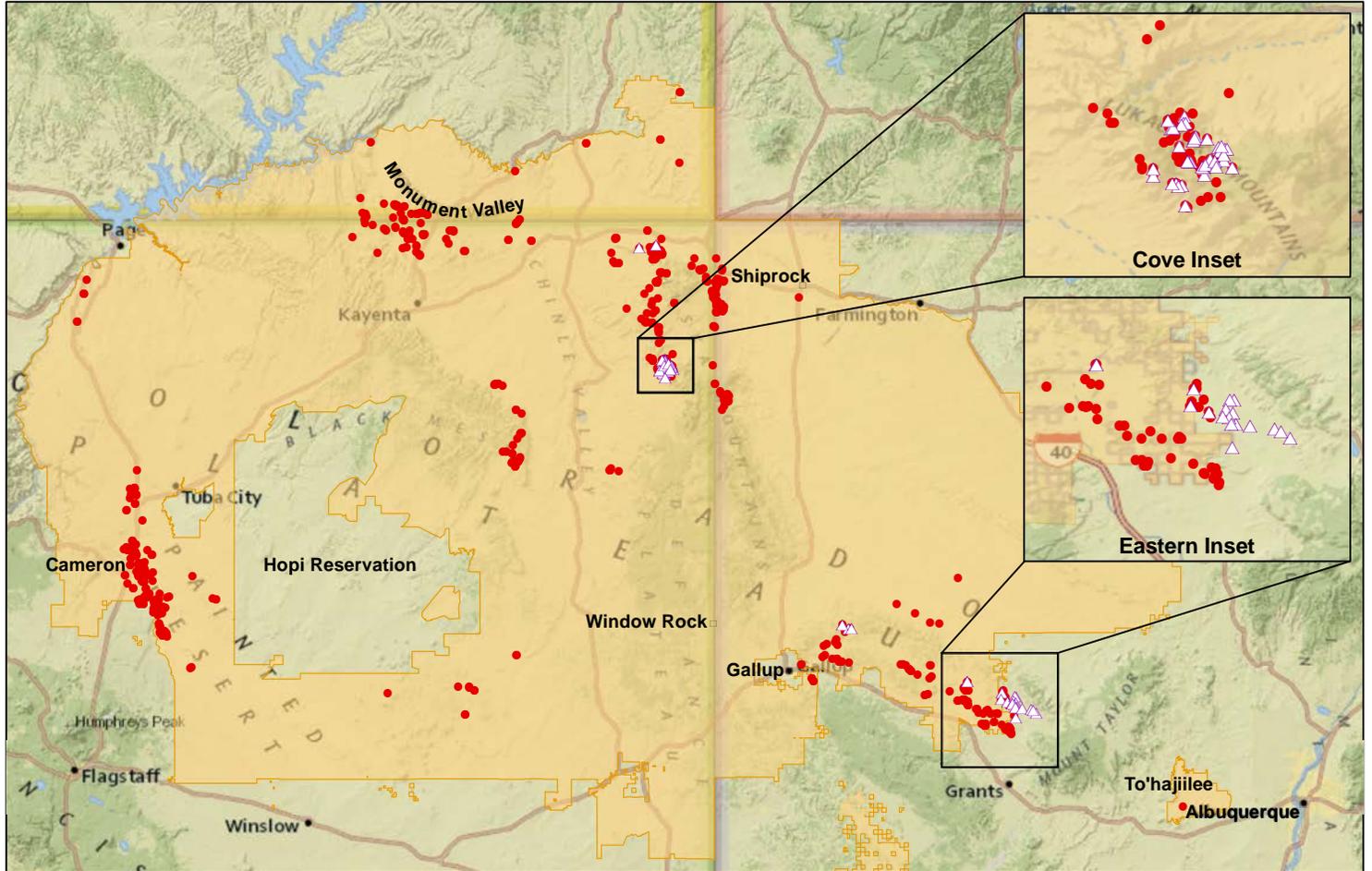
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## Common Acronyms used in Report

AUM = Abandoned Uranium Mines	NNAML = Navajo Nation Abandoned Mine Lands
NAUM = Navajo Abandoned Uranium Mines	GSA = Geographic Sub-Area
US EPA = United States Environmental Protection Agency	RSE = Remediation System Evaluation
NNEPA = Navajo Nation Environmental Protection Agency	EE/CA = Engineering Evaluation / Cost Analysis

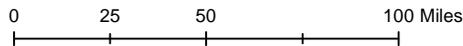
*Cover Photo of Cove Mesa II Shaft*





-  Tronox Abandoned Uranium Mines
-  Abandoned Uranium Mines
-  Navajo Nation Boundary

## Tronox Mines on and Near Navajo Nation Lands



SFD1602325 March 30, 2016

## Background

On January 21, 2015, the Tronox Settlement agreement resolving fraudulent conveyance claims against Kerr-McGee Corporation and related subsidiaries of Anadarko Petroleum Corporation went into effect. Pursuant to the settlement agreement, Anadarko paid \$5.15 billion plus interest to the litigation trust on January 23, 2015.

### ***As a Result of the Tronox Settlement:***

- US EPA received a distribution of 20% (~\$917 million) for the cleanup of 54 uranium mines that were operated, and subsequently abandoned, by Kerr-McGee in and near the Navajo Nation territory;
- US EPA also received a distribution of 2% (~\$92 million) for the cleanup of Quivira Mine Site; and
- Navajo Nation also received a distribution of 1% (~\$45 million) in connection with the Shiprock Uranium Mill Site.

From the late 1940s to the 1980s, Kerr-McGee Corporation mined more than seven million tons of uranium ore on or near the Navajo Nation. About 32 of these mines are located in the Cove and Lukachukai Chapters. About 32 of these mines are located in the Cove and Lukachukai Chapters; 24 mines are located in the Ambrosia Lake Area and other mines are located in the Teec Nos Pos, Coyote Canyon, Casamero Lake, and Baca/Prewitt Chapters.

US EPA Tronox funds can be used to support activities related to the assessment and cleanup of the 54 Tronox Settlement mines and contamination caused by the mines. Examples of these activities include:

- Informing and involving the community about cleanup activities
- Investigating radiation levels in water, soil, sediment, and air
- Putting up fences and signs to warn people about dangerous areas
- Protecting cultural and biological resources in the mine areas
- Constructing access roads to the mines for cleanup operations
- Closing mine openings and addressing other physical hazards

## US EPA Tronox Settlement Financial Expenditure Breakout FY2011 through FY2018

The approximately \$1 billion in funds that US EPA received for the clean-ups at 54 Tronox Navajo Area Uranium Mines (NAUM) has been deposited into a US EPA Superfund Special Account. In accordance with Section 122(b)(3) of CERCLA, the Agency established a special account to receive funds pursuant to an agreement with a Potentially Responsible Party (PRP). Special accounts are site-specific, interest-bearing sub-accounts housed within US EPA's Hazardous Substances Superfund (Superfund Trust Fund). Charges to a special account must be consistent with the terms of the settlement pursuant to which the funds are received.

The US EPA, the Navajo Nation, and the state of New Mexico meet several times a year to discuss prioritizing response actions and funding projects at each specific Tronox NAUM site. Information about individual project proposals are presented and discussed and the agencies strive to develop a coordinated and prioritized project list along with estimated funding requirements for the following calendar year. This project list is memorialized in an annual "Approval and Annual Funding Projections for Implementation of Tronox Settlement Memo." The memo is presented to the US EPA Region 6's Branch Chief, Technical and Enforcement Branch, Superfund Division, for concurrence and then to the approving official, US EPA Region 9's Assistant Director, Superfund Division, for signature. Once projects are approved, a special account name/number is created for that project to track expenditures. Table 2.1 summarizes approved Tronox projects by special account name, budget, expenditures, and balance.

These expenditures are further broken out into the following expenditure categories.

**Labor:** Labor cost associated with the assessment and cleanup of the mine/mine areas specified in the Tronox Settlement.

- **On Scene Coordinator** – directing cleanup contractors
- **Remedial Project Manager** – overseeing cleanup
- **Legal** – reviewing documents and attending meetings
- **Technical Enforcement** – PRP search activities
- **Community Involvement** – fact sheets; Community Involvement Plan; public meetings
- **Contracting** – issuing contracts and developing cost packages
- **Administrative Assistant** – site related travel; mailings; meetings coordination
- **Management** – conducting meetings with counsel, program, enforcement, community relations, contracts, and/or finance; reviewing site related documents; management briefings

**Travel:** Travel cost associated with the management, assessment, and cleanup of the mine/mine areas specified in the Tronox Settlement.

**Contracts:** Contracting costs associated with the assessment and cleanup of the mine/mine areas specified in the Tronox Settlement.

**Expenses:** Expense costs for equipment, property, supplies, and materials associated with the assessment and cleanup of the mine/mine areas specified in the Tronox Settlement.

**Grants:** Grants associated with the management assessment and cleanup of the mine/mine areas specified in the Tronox Settlement.

**Interagency Agreement:** Expenses from collaboration with the U.S. Corp of Engineers and U.S. Geological Survey for field support and construction.

## Accounting Line Project Names / Descriptions

Names	
Tronox NAUM (Region 6)	Overall planning and logistical support for Removal activities and settlement implementation, including salary and travel, Phase I and II San Mateo Creek Basin groundwater study, and state grants.
Tronox NAUM East GSA	Assessment of Tronox mines in the eastern area of Ambrosia Lake to complete an RSE and EE/CA. Includes contracting, salary, and travel specific to this project.
Tronox NAUM West GSA	Assessment of Tronox mines in the western area of Ambrosia Lake to complete an RSE and EE/CA. Includes contracting, salary, and travel specific to this project.
Tronox NAUM Central GSA	Assessment of Tronox mines in the central area of Ambrosia Lake to complete an RSE and EE/CA. Includes contracting, salary, and travel specific to this project.
Tronox NAUM S18 Mine Residential Removal	A time critical radon abatement project for a residential structure adjacent to the Section 18 Tronox Mine in Ambrosia Lake. Includes contracting, salary, and travel specific to this project. Project was completed in FY18 Quarter 1.
Tronox NAUM Section 10	Assessment of the Section 10 Tronox mine in Ambrosia Lake to complete an RSE and EE/CA. Includes contracting, salary, and travel specific to this project.
Tronox NAUM Section 32 and 33	A joint project with Region 9 to assess the Section 32/33 Tronox mines in the Smith Lake sub-district in the Casamero Lake area to complete an RSE and EE/CA. Includes Region 6 salary, and Region 6 travel specific to this project.
Tronox Abandoned Uranium Mines on the Navajo Nation (bankruptcy settlement)	Tronox NAUM activities (2011 – 2015) prior to the 2015 settlement that included quarterly meetings with Navajo Nation EPA; settlement implementation planning; accounting and contracting strategy; community involvement; Tronox portal development, Northern Agency ASPECT data collection, and grants.
Tronox NAUM Cove Transfer Station	Construction activities to mitigate surface erosion at the former transfer area located in the Cove Chapter of the Navajo Nation, in eastern Arizona.
Tronox NAUM Mesa I Mine	Mesa Mine I Preliminary Site Assessment has been conducted to determine risk to human health and the environment. A RSE was conducted in FY2018.
Tronox NAUM Cove Wash Regional Assessment	Identify potential areas of concern and sources of contamination, as well as determine the baseline contaminant levels in the Cove Wash.
Tronox NAUM (Region 9)	Activities included quarterly meetings with Navajo Nation; settlement records review; settlement implementation planning; Navajo Nation Mines Portal Database; Northern Agency ASPECT Gamma survey; Annual Quarterly reports; Tronox Northern Agency RSEs; Tronox Northern Agency EE/CAs; Cove Mesa V Main Access Road Improvement/Design; Cove Mine Access Assessment; Northern Agency Cultural Resources Survey; community involvement; and Navajo Nation grants.
Tronox NAUM Cove Sitewide Conceptual Model and Data Gaps	Assimilate information from previous studies and actions of the site; research, gather and analyze other existing data and documents that could be used to develop the conceptual site model; break the site out into investigation areas based on known information; provide pictorial representations of the site; depict exposure pathways and receptors; provide recommendations for paths forward for each of the investigation areas; and, suggest general areas for data gap investigations.
Tronox NAUM Quivira Mines	Activities at the Quivira Mines include: Repair roads and bridges to allow access to removal sites; vent hole removal action; the Engineering Evaluation/Cost Analysis; and discuss the removal options with Navajo Nation, community members, and other stakeholders.

## Table 2.1: US EPA Tronox and Quivira Approved Projects, Budgets, and Expenditures FY2011 through FY2018

An overview of the approved projects and activities associated with these expenditures is located in Section 3.

### Special Account Summary

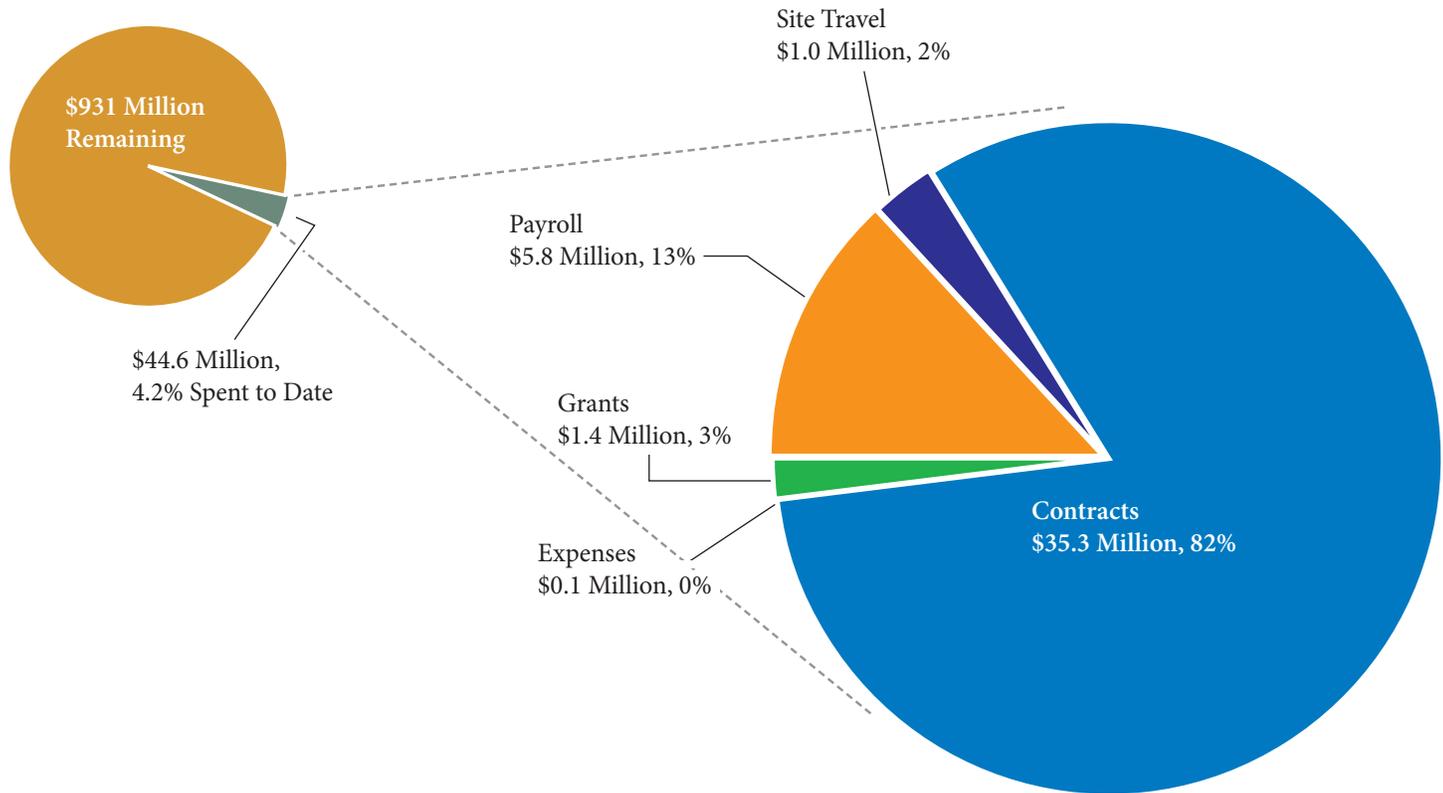
Special Account Names	Total Budget	Total Expenditures	Remaining Balance
<b>US EPA Region 6</b>			
Tronox NAUM	\$4,265,250	\$2,692,552	\$1,572,698
Tronox NAUM East GSA	\$2,302,625	\$1,812,058	\$490,567
Tronox NAUM West GSA	\$1,774,625	\$1,478,834	\$295,791
Tronox NAUM Central GSA	\$2,124,800	\$716,844	\$1,407,956
Tronox NAUM S18 Mine Residential Removal	\$100,000	\$14,301	\$85,699
Tronox NAUM Section 10	\$167,000	\$21,514	\$145,486
Tronox NAUM Section 33	\$537,000	\$75,062	\$461,938
<b>US EPA Region 9</b>			
Abandoned Uranium Mines on the Navajo Nation	\$3,356,943.86	\$3,217,685.59	\$139,257
Quivira Mines*	\$91,525,504	\$6,811,477.89	\$84,714,026
Cove Transfer Station - Tronox	\$4,646,998.29	\$3,581,072	\$1,065,926
Mesa I Mines - Tronox	\$9,414	\$9,414	--
Section 32 AUM Site - Tronox	\$1,961,292	\$1,507,953.89	\$453,338.11
Section 33 AUM Site - Tronox	\$569,782	\$70,725.32	\$499,056.68
Tronox NAUM Cove Wash Regional Assessment	\$4,102,910	\$3,261,752.00	\$841,158.00
Tronox Navajo Area Uranium Mines	\$890,703,214	\$10,351,930	\$880,351,284
Tronox NAUM Cove Sitewide Conceptual Model and Data Gaps	\$2,500,000	\$1,444,385	\$1,055,615
Tronox NAUM Mesa II	\$100,000	\$1,631.32	\$98,369
Tronox NAUM Mesa V	\$275,000	\$27,577	\$247,423
<b>Sum</b>	<b>\$1,010,192,938.55</b>	<b>\$34,351,846.36</b>	<b>\$975,841,092.19</b>

\*In Prior Reports referred to as NECR Quivera Mines. Expenditure figures updated and noting de-obligations for completed work, therefore figures may be less than in prior reports.

As of September 30, 2018, interest earned on Tronox Accounts \$27,988,816.

## Figure 2.1: Tronox Expenditures Breakout by Cost Category for February 2011 through September 2018

Total Settlement Spending (\$44.6 Million) by Category\*  
\$ in Millions



All \$ in Millions as of 9/30/18.

Commitments are amounts reserved for obligation in US EPA's financial system but not yet obligated.

Numbers may not add due to rounding.

## Tronox and Quivira Contracting Vehicles

Since the Tronox settlement, US EPA has been utilizing new and existing contracts to conduct cleanup activities, which allowed the Agency to expeditiously achieve our goal of protecting human health and the environment on the Navajo Nation. These contracts include:

### NAVAJO BUSINESS

- **Site Specific Contract:** Arrow Indian Contractors, a Navajo-owned Priority 1 (8A) company was awarded a sole source contract for \$4M to excavate and remove contaminated soil related to mining operations. They also repaired access roads and bridges.
- **Site Specific Contract:** Clawson Excavating, a Navajo-Woman owned/Small Business Priority 1 Company was awarded a \$1M contract to complete mine access and road upgrades for the approximately 32 mine sites in the Cove Chapter.
- **START Contract:** Superfund Technical Assessment and Response Team – provides scientific/technical support for chemical, biological, radiological and nuclear events as well as site assessment, Brownfields, and remedial support activities.
- **ERRS Contract:** Emergency and Rapid Response Services – provides management, field personnel, and equipment resources to execute decontamination, demolition and removal services.
- **RAC Contract:** Remedial Action Contracts – provides remedial response, enforcement oversight, non-time critical removal activities, engineering support, and assessment services.
- **TASC Contract:** Technical Assistance Services for Communities – to help communities better understand the science, regulations and policies of environmental issues.
- **RAES Contract:** The Response, Assessment and Evaluation Services \$85 million capacity contract was awarded on October 11, 2017 to Tetra Tech, and the scope of work includes site assessment of the abandoned uranium mines.

In addition to these contracts, US EPA has entered into interagency technical services agreements with US Army Corps of Engineers and US Geological Society.

**Table 2.2: Tronox and Quivira Contract Expenditures Approved Projects FY2011 through FY2018**

Approved Projects / Special Account Names	Total Contracts - FY 2011	FY 2018
<b>US EPA Region 6</b>		
Tronox NAUM	\$1,890,639	
Tronox NAUM East GSA	\$1,535,696	
Tronox NAUM West GSA	\$1,326,339	
Tronox NAUM Central GSA	\$648,434	
Tronox NAUM S18 Mine Residential Removal	\$13,343	
Tronox NAUM Section 10	\$20,889	
Tronox NAUM Section 32/33	\$21,143	
<b>US EPA Region 9</b>		
Abandoned Uranium Mines on the Navajo Nation	\$1,768,997	
Quivira Mines	\$6,667,034	
Cove Transfer Station - Tronox	\$3,469,236	
Section 32 AUM Site - Tronox	\$1,437,720	
Section 33 AUM Site - Tronox	\$69,068	
Tronox NAUM Cove Wash Regional Assessment	\$2,027,247	
Tronox Navajo Area Uranium Mines	\$12,341,547	
Tronox NAUM Cove Sitewide Conceptual Model and Data Gaps	\$293,391	
Mesa V Mines - Tronox	\$1,714,920	

**Table 2.3: Breakout of Tronox and Quivira Expenditures Categories for Approved Projects FY2011 through FY2018**

**Special Account Summary**

Special Account Names	Contracts	InterAgency	Expenses	Grants	Payroll	Site Travel	Total Spent
<b>US EPA Region 6</b>							
Tronox NAUM	\$1,890,639	--	\$0.00	\$55,079	\$626,804	\$119,951	\$2,692,552
Tronox NAUM East GSA	\$1,535,696	--	\$0.00	\$0.00	\$223,580	\$51,588	\$1,812,058
Tronox NAUM West GSA	\$1,326,339	--	\$0.00	\$0.00	\$115,519	\$36,976	\$1,478,834
Tronox NAUM Central GSA	\$648,434	--	\$0.00	\$0.00	\$50,599	\$17,812	\$745,295
Tronox NAUM S18 Mine Residential Removal	\$13,343	--	\$0.00	\$0.00	\$958	\$0.00	\$30,605
Tronox NAUM Section 10	\$20,889	--	\$0.00	\$0.00	\$625	\$0.00	\$21,514
Tronox NAUM Section 32/33	\$21,143	--	\$0.00	\$0.00	\$41,814	\$12,104	\$75,062
<b>US EPA Region 9</b>							
Tronox AUM on the Navajo Nation (Bankruptcy)	\$1,768,997	--	\$5,995	\$115,452	\$1,213,404	\$114,866	\$3,218,714
Tronox Quivira Mines	\$6,667,034	\$127,346	\$3,862	\$94,697	\$497,978	\$104,079	\$7,494,996
Tronox Cove Transfer Station	\$3,469,236	--	\$70	\$4,314	\$74,396	\$33,056	\$3,581,072
Tronox Mesa I Mines	\$0.00	--	\$0.00	\$0.00	\$7,376	\$2,038	\$9,414
Tronox Section 32 AUM Site	\$1,437,720	--	\$168	\$0.00	\$31,975	\$9,090	\$70,725
Tronox Section 33 AUM Site	\$69,068	--	--	\$0.00	\$561	\$1,097	\$3,261,752
Tronox NAUM Cove Wash Regional Assessment*	\$2,027,247*	\$25,000*	\$3,435*	\$441,609*	\$645,414*	\$119,048*	\$15,331,566*
Tronox Navajo Area Uranium Mines	\$12,341,547	\$125,000	\$112,320	\$119,532	\$2,248,779	\$384,389	\$1,444,385
Tronox NAUM Cove Sitewide Conceptual Model and Data Gaps	\$293,391	\$616,800	\$0.00	\$0.00	\$436,338	\$84,841	\$13,015
Tronox NAUM Mesa II	\$1,714,920				\$1,631		\$1,716,551
Tronox NAUM Mesa V				\$154,202	\$27,558		\$181,760
<b>Total</b>	<b>\$35,245,643</b>	<b>\$894,146</b>	<b>\$125,850</b>	<b>\$1,421,223</b>	<b>\$5,893,810</b>	<b>\$1,019,108</b>	<b>\$44,645,807</b>

\*Funding noted in prior reports of \$375k was moved to the RAEs contract

## Tronox and Quivira Grant Expenditures for FY2011 through FY2018 by US EPA Region, Approved Projects and Grant

US EPA provides grant funding to support the cleanup at AUMs. Funding has been provided to the Navajo Nation, the State of New Mexico and Dine College. The purposes and levels of the funding are outlined below.

### State of NM

\$35,393 was provided to the State of New Mexico to support field oversight and interagency collaboration.

### Navajo Nation EPA

Over \$4M has been provided to NNSFP (Navajo Nation Superfund Program) to support technical review of remediation plans and final cleanup options, community involvement activities including coordination for community meetings, distribution of information, coordination of relocation activities, and collecting environmental samples.

### Navajo Nation Abandoned Mines Lands Dept.

\$1.7M has been provided to AML for on-site construction activities and technical review of proposed remediation strategies.

### Dine College

Funding in the amount of \$809,000 is supporting studies of uranium effects on livestock and the Cove watershed; Dine summer interns collect data, document, and investigate potential mine impacts.



## 3.0

# Tronox and Quivira NAUM Approved Projects Descriptions for FY2011 through FY2018

## 3.1 US EPA Region 6

### SAN MATEO CREEK BASIN GROUNDWATER REPORT – PHASE 2

US EPA Region 6 completed the multi-phased ground water investigation for the San Mateo Creek Basin, including the Tronox NAUM Ambrosia Lake Impact Area, in October of 2018. The second and final phase of the investigation (Phase 2) evaluated the extent of the impacts from the mines discharge operations to groundwater that could present a current or future health threat to communities that use the ground water as a water supply. The results of the investigation showed mine discharge water from the Tronox and other mines recharged the shallow alluvium and underlying bedrock formation aquifers in the Ambrosia Lake Valley and lower floodplain of the San Mateo Creek Basin. Understanding and predicting the future flow path of this impacted ground water as it continues to move through the shallow alluvium and underlying bedrock formations will be critical to protecting the Navajo and other users from legacy ground water contamination for generations to come.

The focus of Phase 2 activity during FY2018 was the drafting and technical review of the Phase 2 ground water report until its release in October 2018. This effort included a peer-review by multiple hydrogeologists to provide valuable feedback to US EPA and the contractor on the analysis of the data and conclusions made.

US EPA also completed the redevelopment of Dakota Sandstone monitoring well NKD-06 in July 2018. The well is located in the Ambrosia Lake Valley southwest of the Section 35 and Section 36 (Cliffside) mines. Difficulties in constructing the monitoring well after the borehole was drilled prevented a representative ground water sample from being collected and analyzed in time for the results to be presented in the October 2018 report. A ground water sample was collected from NKD-06 after redevelopment and sent to the laboratory for analysis. The analytical results are currently being evaluated to determine if the Dakota Sandstone aquifer at NKD-06 has been impacted by mine water discharge.



*US EPA Conducting Soil and Groundwater Sampling Activities.*

Once this evaluation is complete, the sample results will be provided in an addendum to the Phase 2 ground water report in 2019.



*Sonic Drill Rig used for the Ambrosia Lake Groundwater Investigation.*

## **TRONOX NAUM CENTRAL GEOGRAPHIC SUB-AREA**

US EPA Region 6 continued the implementation of approved and funded work of the Central Geographic Sub-Area (GSA) during FY2018. The Central GSA is a subset of the 54 Tronox NAUM mines identified under the Tronox Settlement for evaluation and remediation, if necessary, to abate actual or

potential threats to the public or the environment posed by the site. The focal point of the removal site evaluations (RSEs) are the surface expressions of Sections 17, 19, 30 and 33 mines. Mining activities began in the Central GSA in 1959 and ceased in 1970, with approximately 4.1 million tons of uranium ore produced.

The objective of the RSE is to investigate surface soil radioactive contamination and determine the exposure risk to human health and the environment. The data collected will help in the development of the Engineering Evaluation and Cost Analysis (EE/CA) for the Site. During FY2018, US EPA completed approximately 85% of the data gathering.

A challenge of the Central GSA is Section 19. During the mining days, several ranchettes were sold to investors resulting in a patchwork of ownership. Most, if not all, of the original owners are deceased and it has been a challenge to locate people with the legal authority to provide access to US EPA for sampling. US EPA will continue to evaluate different methods to gain access to the entire Section 19. Rio Algom does own portions of Section 19 and those areas have been surveyed.

## **TRONOX NAUM WEST GEOGRAPHIC SUB-AREA**

US EPA Region 6 continued the implementation of approved and funded work of the West GSA during FY2018. The West GSA is a subset of the 54 Tronox NAUM mines identified under the Tronox Settlement for evaluation and remediation, if necessary, to abate actual or potential threats to the public or the environment posed by the site. The focal point of the RSEs are the surface expressions of Sections 22, 24, and 30W mines. Mining activities began in the West GSA in 1959 and ceased in 1970, with approximately 3.9 million tons of uranium ore produced. In addition to conventional underground mining, solution or leachate mining occurred on Sections 22 and 24.

During FY2018, US EPA Region 6 concluded the data gathering process. Information gathered from field work will be reviewed and presented in the RSE. The objective of the RSE is to investigate surface soil radioactive contamination and determine the exposure risk to human health and the environment. The data collected will help in the development of the EE/CA for the Site.

## TRONOX NAUM SECTION 10 MINE

US EPA Region 6 continued the implementation of approved and funded work of the Tronox NAUM Section 10 Mine in FY2018. The mine was originally part of the Tronox West GSA based on initial review by US EPA, including aerial gamma surveys conducted by ASPECT, and the belief contamination was comingled. Field work showed contamination from the mine was not comingled with other Tronox NAUM mines and the decision was made to assess the mine under its own RSE.

During FY2018, US EPA completed the field work to gather data for the RSE. The US EPA, with support from New Mexico Mining and Minerals Division, also conducted a detailed visual examination (remote downhole video) and gathered geotechnical data of existing open adit shaft and vent shaft. This data will be used to determine whether backfilling the mine could be a potential alternative evaluated in the EE/CA.

## TRONOX NAUM SECTION 32 AND SECTION 33 MINES SITES

US EPA Region 6 continued the implementation of approved and funded work of the Section 32 and Section 33 Mines Site. Section 32 is a Navajo Allotment and Section 33 is private land within New Mexico. This site is



*NAUM Community Meeting.*

being evaluated jointly by US EPA Region 6 and 9 due to the mixed ownership of the land, with Region 6 as the lead and Region 9 as the support region.

Region 9 initiated a removal action at the Section 32 Mine, completing an interim action in 2012. The interim action consisted of consolidation of mine waste from the Section 32 Mine and the nearby transfer pad into a repository located over what was originally one of the mine shafts. Mine waste from Section 33 was not addressed during this action.

In FY2018, US EPA initiated RSE data gathering process for the entirety of both Sections to ensure that there were no data gaps associated with the Sites. During the field work, US EPA was approached by residents of the Section 32 Navajo Allotment to scan areas around the homes.

US EPA also conducted an engineering evaluation of the current status of the existing on-site waste consolidation area. The evaluation showed the repository developed during the interim action continued to meet cleanup goals.

## 3.2 US EPA Region 9

During the 2018 field season, US EPA investigated 39 AUM sites and 37 Target sites within the Northern Agency Region of the Navajo Nation. US EPA's contractor, Tetra Tech and team partners, including iiná bá, Inc., Navajo Engineering and Construction Authority (NECA), and Environmental Restoration Group, Inc. (ERG) conducted field work for this multi-mine investigation of AUM sites and Target sites.



*Field crew collecting soil samples in the Cove Chapter wash.*



*RSE field crew collecting soil samples during the 2018 sampling event.*



*RSE field crew inspecting mine workings at the Mesa V Mine (Cove Chapter).*

The following RSE field activities were completed:

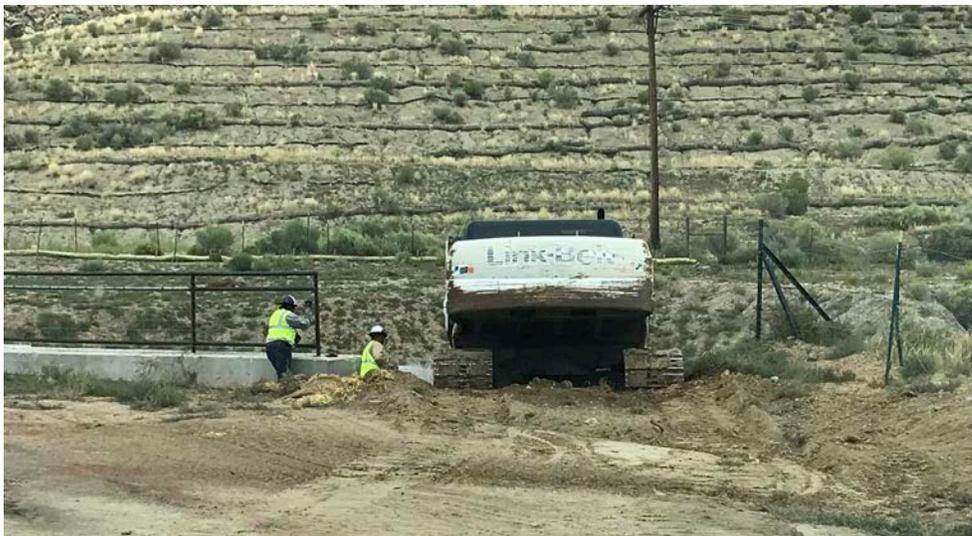
- Collected 292 surface soil samples and 502 XRF confirmatory soil samples across 38 AUM sites and 37 Target sites. Results from these samples were used to identify COPCs (contaminants of potential concern) and estimate the volume of mine waste present at each site.
- Collected more than 1,000 background soil samples at 32 Background Survey Area (BSA) locations. The site-specific BSAs were selected to represent unimpacted conditions of AUM and target sites.
- Recorded more than 2 million gamma radiation measurements across 32 BSAs, 38 AUM sites, and 37 Target sites; and evaluated 61 gamma-radium correlation plots to predict radium-226 (Ra-226) concentrations based on the gamma radiation measurements.
- Recorded 9,540 in-situ XRF measurements across 38 AUM sites and 37 target sites within the Northern Agency Tronox Mine area region; measurements occurred within a systematic 100-square-meter (m<sup>2</sup>) survey unit grid system at each site. The XRF field survey extended across treacherous terrain within the Lukachukai Mountains and across the more



*Excavating contaminated soil near the community during a time critical removal action.*

forgiving lower-lying terrain at the base of the northwest Carrizo Mountains in the Tse Tah region of the Navajo Nation within Apache County in northeast Arizona.

- Analyzed 309 soil and sediment samples for uranium series isotopes to determine equilibrium conditions of uranium decay series radionuclides measured at AUM sites.
- Installed 34 radon alpha track Etch detectors to monitor radon gas concentrations.
- Collected 100 soil samples at 38 AUM sites and five non-AUM target sites for analysis of geochemical parameters.
- Investigated more than 22 miles of drainages, including 184,000 gamma radiation measurements, 305 sediment samples, and eight (including two duplicates) surface water samples. All sediment and surface water samples were analyzed for metals and radionuclides. Additional analyses occurred to document potential leachability of metals and radionuclides from sediment, and to evaluate general water quality parameters in surface water.



*US EPA conducting access repair work near the Quivira Mine Site.*

- Subsurface soil samples at various depths were collected from 74 borings drilled at nine AUM and Target sites, and 10 geotechnical samples were obtained from these mechanically drilled borings.

The Tronox Northern Agency RSE Report will be completed and results shared presented to the Communities in 2019.

## QUIVIRA MINES

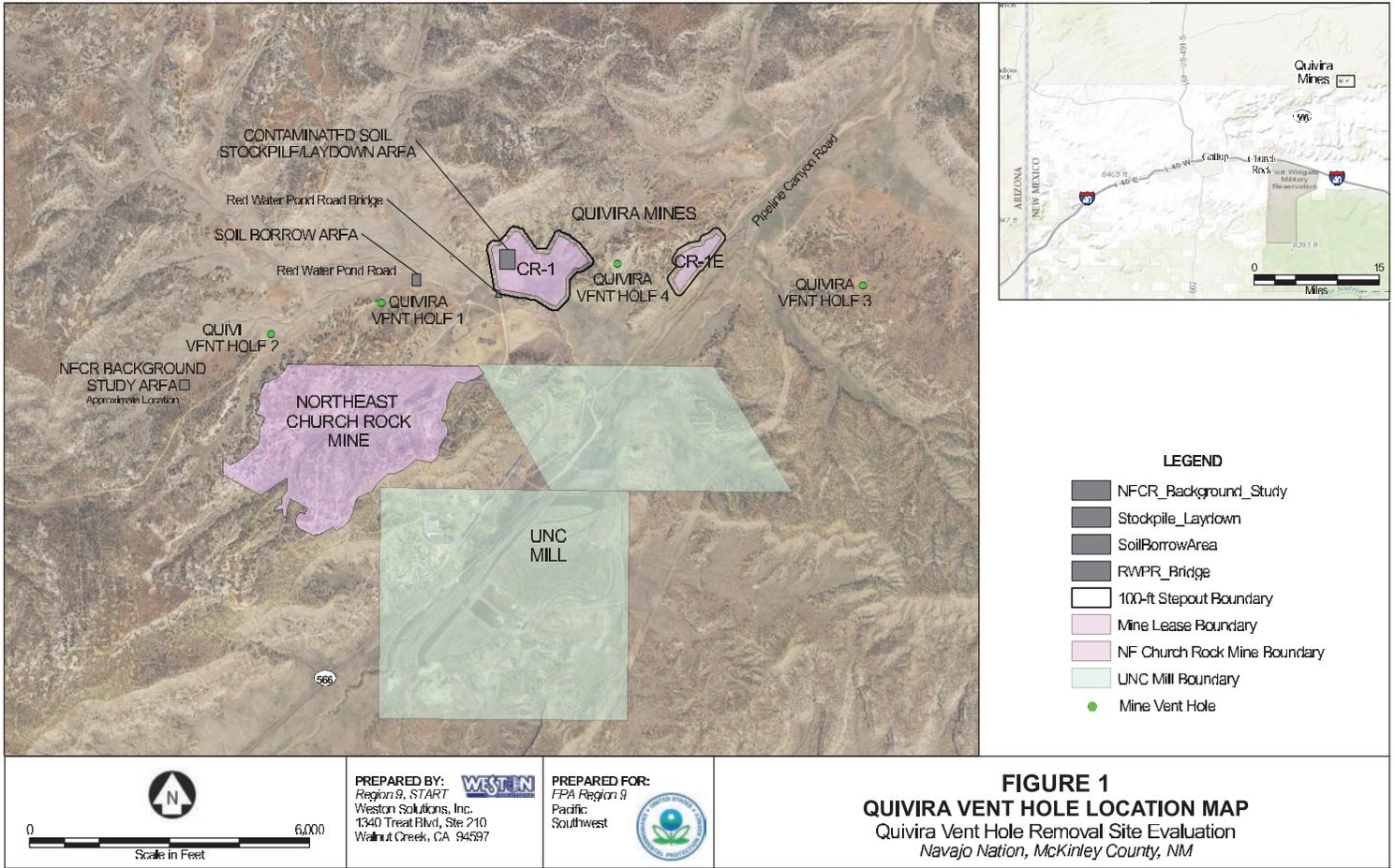
In 2018, US EPA hired a Navajo-owned construction company to remove contaminated soils from around 5 ventilation shafts costing \$4M. The ventilation shafts are spread out approximately  $\frac{1}{4}$  to one mile from the mine site and are each located near community homes. Historically, five-foot wide fans were used at each shaft to pull air out of the mine workings from 1,800 feet underground. That air carried dust from the mine workings and that dust was deposited in approximately one-acre areas around the ventilation shafts.

The removal action involved excavating approximately 15,000 cubic yards of contaminated soil and transporting the soil to the waste pile at the mine site. The excavated areas are now available for unrestricted residential use and grazing by the community. The mine site is surrounded by a fence and the transported soil was placed within the fenced area and covered with six inches of clean soil. The entire pile of mine waste and contaminated soil will be addressed in a future cleanup action.

Another component of the ventilation shaft removal action was to repair local roads for use by the heavy equipment and haul trucks necessary for the excavation and transport of contaminated soil. Those road improvements are now a benefit to the entire community.

US EPA has an ongoing contract with the local community association, the Red Water Pond Road Community Association, for them to perform outreach and education about the mine site investigation and cleanup to nearby community members. US EPA has a conference call monthly with the Red Water Pond Road Community Association to discuss issues and events and US EPA attends a community meeting several times per year.

# Quivira Vent Hole



**FIGURE 1**  
**QUIVIRA VENT HOLE LOCATION MAP**  
 Quivira Vent Hole Removal Site Evaluation  
 Navajo Nation, McKinley County, NM

Control Number: FP-95-1342; TOID: 01951342-1344001

Document Control Number: 01951344-1

US EPA is working with the Navajo Nation, the State of New Mexico and other stakeholders to finalize alternatives to be included in the EE/CA. US EPA has been conducting on-going discussions with the Navajo Nation and the local community about cleanup options and hopes to release the full EE/CA for formal public comment in 2019 or 2020.

### COVE AIR STUDY

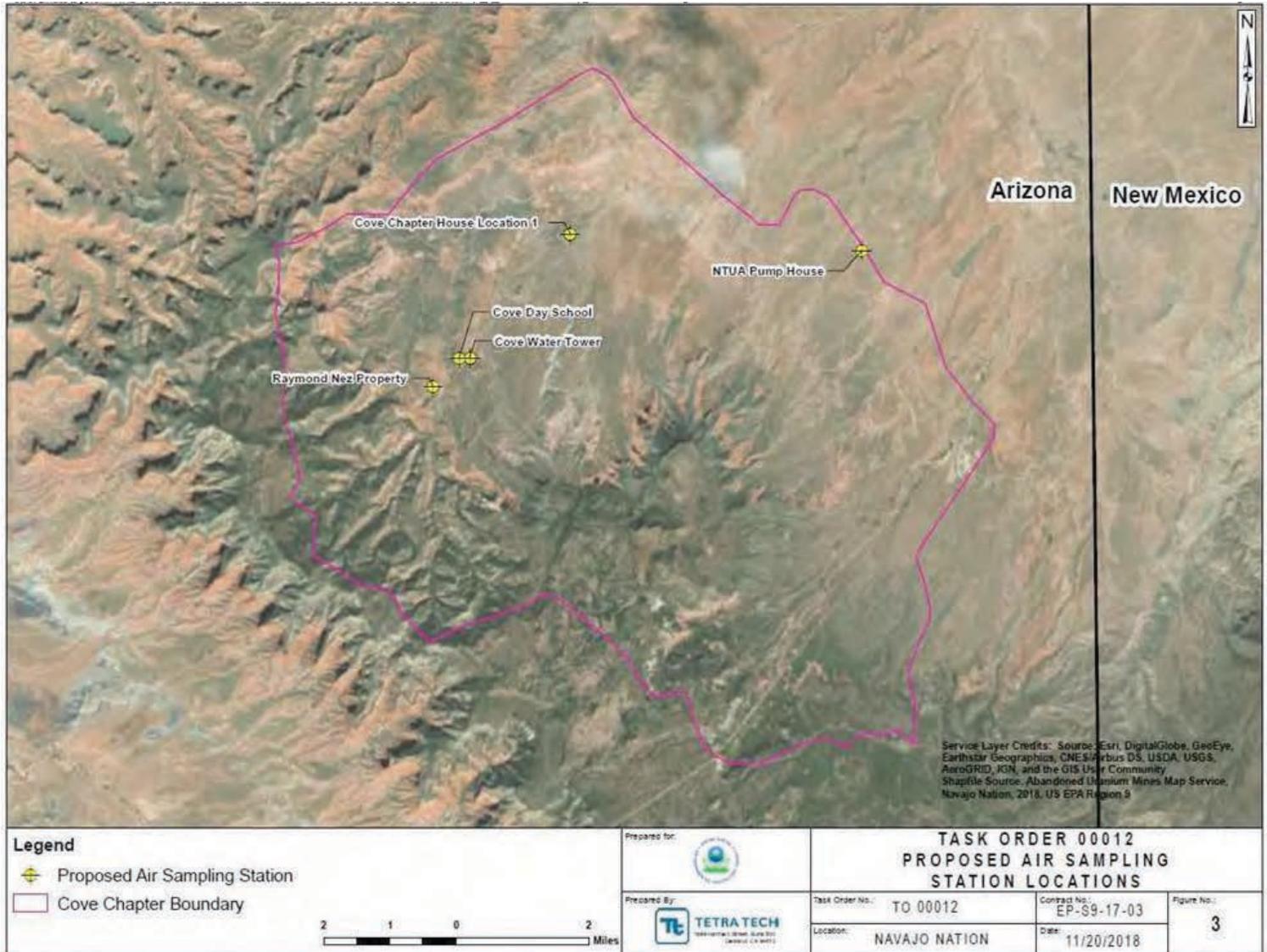
In FY18, the Cove Air Study was slowed due to limited resources and obtaining permission to place monitors in some of the selected sample locations. The air study was requested by the community to address concerns about the potential transport of airborne contaminants from surrounding abandoned uranium mines. The Cove Air Study will place air monitors in 4 locations in the Cove Community and 1 in a location outside of the community for reference. (see next page) The locations include, the chapter house, a residential property, the elevated water tower and the Cove Day School. A Meteorological Station (Met Tower) will also be



*Quivera Pile (grey mound) behind house.*

placed at the chapter house. The NNEPA Air Quality Control Program was awarded a grant to assist with community outreach, purchase and installation of the Met Tower, and to hire an environmental technician to collect weekly samples, during the yearlong sampling event. The Cove Day School staff have expressed interest in using the data as part of the their school curriculum.

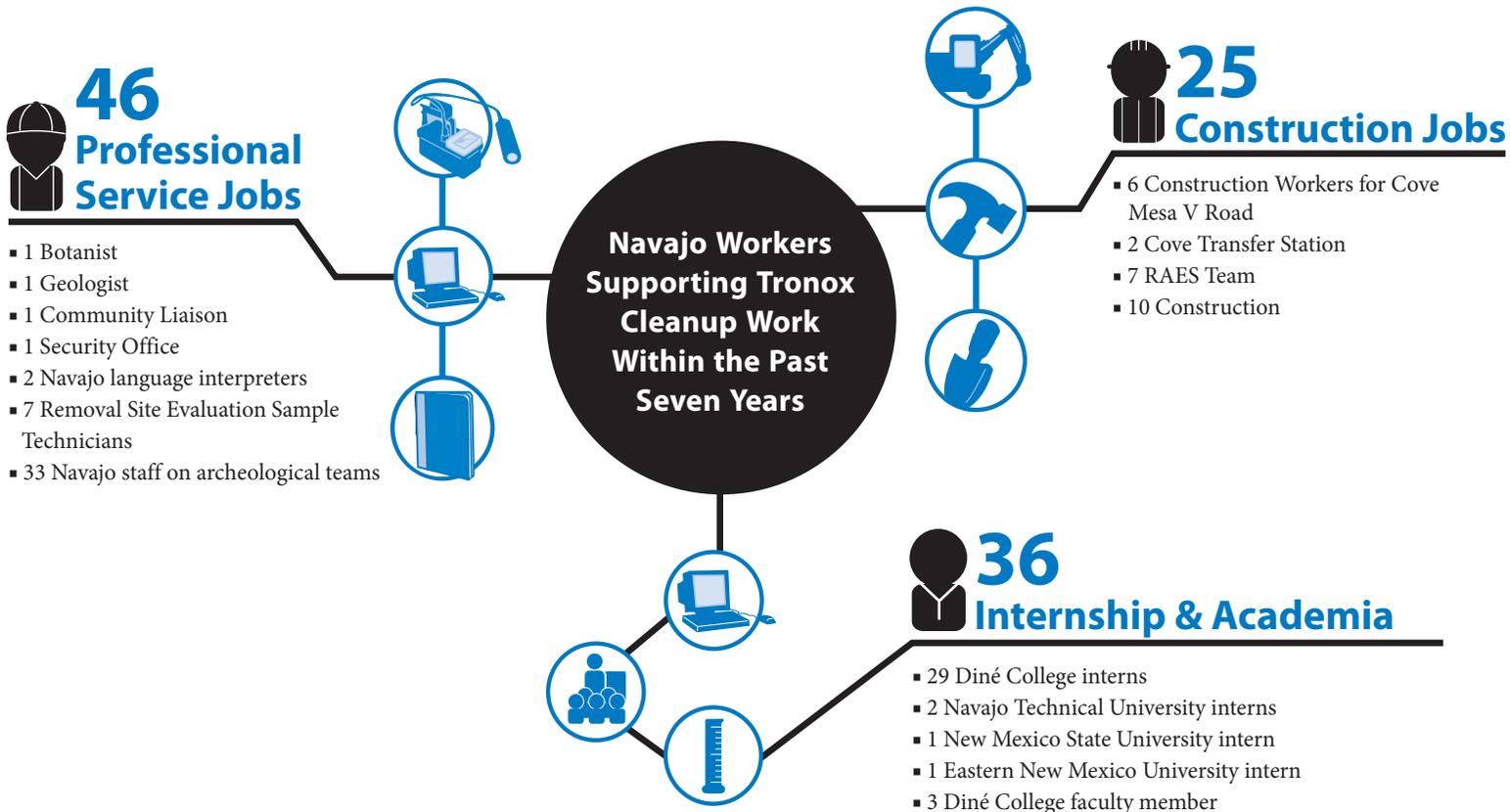
# Tronox -Cove Air Study Locations



# 4.0

## Tronox and Quivira NAUM - Workforce Development Opportunities

Cleaning up abandoned uranium mines on the Navajo Nation creates jobs for Navajo workers and provides opportunities for Navajo businesses. The work is project specific and usually of a short duration. Some positions may be part-time, seasonal and/or limited to a specific project. These opportunities will increase as cleanup work at the mines accelerates. The following provides a summary of Navajo workers that have supported Tronox Mine Cleanup work:





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## For More Information (US EPA Contacts)

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