REGION 9
SAN FRANCISCO, CA 94105

**MEMORANDUM**

**DATE:** December 30, 2024

**SUBJECT:** Approval for Non-Time Critical Removal Action at Quivira Mines Site, Coyote Canyon, Pinedale, and Standing Rock Chapters, Navajo Nation Indian Reservation, McKinley County, New Mexico

**FROM:** Kenyon Larsen, Remedial Project Manager
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**THROUGH:** Sean Hogan, Section Manager
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**TO:** Barry Breen, Principal Deputy Assistant Administrator
Office of Land and Emergency Management

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## I. PURPOSE

The purpose of this Action Memorandum is to request and document: (1) the selection of the non-time-critical removal action (NTCRA) described herein for the Quivira Mines site (Site); (2) approval to spend up to $183 million to complete the NTCRA at the Site; and (3) an emergency exemption from the 12-month and $2 million statutory limits on removal actions requiring obligations from the Fund.

The Site is located on the Navajo Nation within the Coyote Canyon, Pinedale, and Standing Rock Chapters, in McKinley County, New Mexico and is comprised of two underground abandoned uranium mines (AUM), and a pond sediment dewatering and ore stockpile area. The removal action involves excavating waste from the Site and disposing of it off-site in a planned disposal cell that will be

permitted by the State of New Mexico to hold radioactive waste at the Red Rocks Disposal Facility located near Thoreau, New Mexico. The purpose of this removal action is to mitigate the immediate threats to human health and the environment posed by elevated levels of contaminants of concern (COCs) radium-226 (Ra-226) and uranium, and to achieve removal action goals. These COCs are hazardous substances as defined in Section 101(14) of CERCLA, 42 U.S.C. Section 9601(14). The removal of hazardous substances will be undertaken pursuant to Section 104(a)(1) of CERCLA, 42 U.S.C. Section 9604(a)(1), and Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Section 300.415.

The removal action is estimated to cost $183 million and take six to eight years to implement. Approval of this memorandum provides for an emergency exemption from the 12-month and $2 million statutory limits on CERCLA removal actions for non-NPL sites and approval to spend up to $183 million on this removal action. The Site's special account currently contains approximately $87 million, which was received from the Tronox settlement (In re Tronox Inc., No. 09-10156) and will be used to fund the removal action.

## II. SITE CONDITIONS AND BACKGROUND

Site Status: Non-NPL
Category of Removal: Non-time-critical
Nationally Significant: No
CERCLIS ID: NNSFN0905492
SITE ID: O9QM

### A. Site Description

#### 1. Physical Location

The Site consists of two legacy underground AUMs, the Quivira Church Rock No. 1 Mine (CR-1) and the Quivira Church Rock No. 1 East Mine (CR-1E), and an area that received pond sediment and protore from CR-1 and CR-1E, called the Kerr-McGee Corporation Ponds (Kerr-McGee Ponds). The CR-1 and CR-1E AUMs contain waste rock piles, pond areas, and mining debris, while the Kerr-McGee Ponds area contains remnants of a former protore stockpile and pond sediment storage. A third leased location, the Quivira Church Rock No. 2 Mine (CR-2), is about 3 miles northwest of CR-1, but CR-2 was never developed, and an investigation found no evidence of environmental impacts from mining at this location.

The geographic coordinates for the approximate center of CR-1 are latitude 35.665 and longitude 108.501. CR-1 is located along Red Water Pond Road north of State Road 566. The CR-1 mine surface disturbance encompasses about 42 acres, with 147 acres of underground workings extending toward CR-1E. The geographic coordinates for the approximate center of CR-1E are latitude 35.666 and longitude 108.490. CR-1E is located approximately 0.5 miles east of CR-1, along Indian Route 7049. The CR-1E mine surface disturbance encompasses about 10.5 acres, with 97 acres of underground workings extending toward CR-1. The Kerr-McGee Ponds surface disturbance encompasses approximately nine

acres and is located approximately 2,000 feet south of CR-1E. The geographic coordinates for the approximate center are latitude 35.659 and longitude 108.492 (see Attachment II, Site Location and Feature Maps).

The Site is located within the Eastern AUM Region of the Navajo Nation, approximately 20 miles northeast of Gallup, New Mexico. CR-1 and CR-1E are located on land owned by the United States and held in trust for the Navajo Nation, within the Red Water Pond Road and Pipeline Road communities in the Coyote Canyon and Standing Rock Chapters. The Church Rock Chapter is located southwest of CR-1. The Kerr McGee Ponds area is located within the Pinedale Chapter of the Navajo Nation on private land that is currently owned by the United Nuclear Corporation (UNC). Sections of land owned by the Bureau of Land Management are located west of CR-1 within the Church Rock Chapter and south of CR-1 near the UNC Mill Facility. The UNC Mill Facility, a U.S. Environmental Protection Agency (USEPA or the Agency) Region 6 National Priorities List (NPL) site, is located on private property within the Pinedale Chapter.

More than 50 Navajo families live in the Red Water Pond Road area of the Coyote Canyon Chapter and the Pipeline Road area of the Standing Rock Chapter. The nearest residences to the Site are located approximately 700 feet south of CR-1, 800 feet northeast of CR-1E, and 3,000 feet northwest of the Kerr-McGee Ponds. No public or commercial buildings are located within 0.5 miles of the Site. Livestock grazing occasionally occurs where perimeter fencing at the Site is compromised. Current land uses in the areas surrounding the Site include residential and agricultural grazing (for livestock such as sheep, cattle, and horses). Navajo families may also collect pinyon nuts, herbs, and plants from the surrounding area for food, medicinal, and ceremonial purposes.

The Red Water Pond Road and Pipeline Road communities may be particularly vulnerable or sensitive, based on the available environmental justice data that is described here and included as an attachment (see Attachment III, EJScreen Community Report). The environmental justice data is based on a five-mile radius around the Quivira Mines site. This boundary comprises an approximate population of 1,023 people, with the U.S. Census reporting 92% American Indian and 7% Hispanic. Compared to national levels, this population is in the 96th percentile for low-income households and 91st percentile for unemployment. The environmental justice indexes indicate that, compared to national levels, this population is in the 68th percentile for proximity to a Superfund site and 15th for proximity to hazardous waste. Significantly, residents in this area may face increased exposure to uranium and radiation (linked to negative health effects, including kidney damage and cancer), which is not captured in the EJScreen Community Report's environmental justice data.

### 2. Site Characteristics

Portions of the Navajo Nation contain geologic formations rich in radioactive uranium ores. Beginning in the 1940s, widespread mining and milling of uranium ore on Navajo tribal lands for national defense and energy purposes led to a legacy of AUMs. The Site contains two of approximately 523 AUMs located on or near the Navajo Nation.

The Site is located on the Colorado Plateau at an elevation of approximately 7,050 feet above mean sea level. The current topography of the Site is generally flat but located between a steep mesa and an actively eroding wash. The Site is sparsely vegetated and has a semiarid desert climate. The Colorado

Plateau frequently experiences severe weather, including thunderstorms, strong winds, and blizzards. Days are typically clear or partly cloudy with monsoonal precipitation patterns in the summer and variable snowfall in the winter. Conditions are hot and dry with occasional high winds and strong thunderstorms during the summer; high winds and cold temperatures characterize the winter months. Rapid weather changes pose a danger of flash flooding. Flash floods occur locally as a result of thunderstorm activity between July and September.

Daily temperature and precipitation data from the Western Regional Climate Center for Station 293422, which is located 20 miles southwest of the Site, indicate that temperatures are generally highest in July, averaging 87.7 degrees Fahrenheit, and lowest in January and December, averaging just above 13.4 degrees Fahrenheit. The least precipitation typically occurs in June, and the most in August. Average annual precipitation between 1973 to 2016 was 11.08 inches. The area typically receives snowfall from October to May. Based on data recorded for Gallup, New Mexico, which is located 20 miles southwest of the Site, the average wind speed near the Site is 6.9 miles per hour, although winds greater than 20 miles per hour commonly occur. The prevailing wind direction is to the northeast.

Starting in the late 1960s, there was exploration of CR-1 and CR-1E. The mines were developed in 1974. Production of uranium ore occurred at CR-1 between 1974 and 1986, and at CR-1E between 1976 and 1985. The Kerr-McGee Ponds were utilized as sediment dewatering ponds and a protore storage area during operations. Reclamation activities occurred at the Site between 1980 and 1986. Multiple removal actions were also completed at the Site between 2010 and 2024.

CR-1 and CR-1E were large underground uranium mines extracting ore from the Westwater Canyon Member of the Morrison Formation, located 1,500 to 1,850 feet below ground. The CR-1 shaft was 14 feet in diameter and 1,850 feet deep, while the CR-1E shaft was 12 feet in diameter and 1,650 feet deep. The mines were wet (operating in saturated rock below the groundwater table) and required ongoing dewatering during operations. Water pumped from the mine workings was discharged to a series of settling ponds before being discharged to Unnamed Arroyo #2 and the Pipeline Canyon Arroyo. An estimated 1.3 million tons of ore from CR-1 and CR-1E was shipped to and processed at the Ambrosia Lake Mill, located approximately 50 miles east of the Site, north of Grants, New Mexico.

Following cessation of mining operations at CR-1 and CR-1E, the shafts were backfilled with protore and overburden and sealed with steel and concrete plugs, vent holes were backfilled with waste rock and sealed with steel and concrete plugs, sediment ponds were scraped and filled, and wastes were consolidated in a single location at each lease area. The wastes (mainly waste rock and low-grade protore with less than 0.10 percent uranium) were consolidated into waste piles and capped with six to 12 inches of fill material. Over time, erosion and a general lack of maintenance degraded the CR-1 cap. At CR-1, the wastes are currently in stockpiles as high as 50 feet above the original grade with steep slopes along the margins. The USEPA and Rio Algom Mining LLC (RAML) have performed maintenance on the CR-1 and CR-1E piles and surrounding areas to improve the caps and address ongoing erosion. Section 6.B below further describes response actions performed at the Site since mining operations ceased.

The estimated volume of waste in the CR-1 waste pile, industrial area, and former sediment ponds is 929,200 cubic yards. Wastes at CR-1E are mostly at or below the surrounding land grade (rather than in an above grade pile), and erosion is not significant. The estimated volume of waste at CR-1E, including

the waste rock, former pond, and industrial and step-out areas, is 49,300 cubic yards. The current waste volume in the Kerr-McGee Ponds, including four sediment dewatering ponds and a protore storage area, is estimated to be 27,000 cubic yards. In total, there are approximately 1,005,500 cubic yards of waste at the Site.

## 3. Removal Site Assessment

The nature and extent of contamination at the Site was characterized through numerous investigations. In 2010, USEPA signed an Administrative Settlement Agreement and Order on Consent (ASAOC) with RAML to perform a removal site evaluation (RSE) and an interim removal action to cover waste at CR-1 and CR-1E. The nature and extent of contamination at CR-1 and CR-1E was assessed using various technologies during the RSE, and an RSE report was completed in September 2011. USEPA's contractors prepared a removal assessment report for CR-2 in 2015, which found that CR-2 was not impacted by mining and does not require a response action. A removal assessment of the Kerr-McGee Ponds was conducted in 2017, resulting in a report that was finalized in 2019. Data gap field investigations were conducted in 2015 and 2022 to address gaps in data in prior reports that were deemed necessary to complete the Engineering Evaluation and Cost Analysis (EE/CA) for the Site. USEPA finalized a data gap investigation report in October 2023.

Background studies were conducted at the Site in summer 2022 as part of the data gap investigation. Background study areas were sampled in three different geologies: Quaternary alluvium; Mulatto Tongue of Manco Shale; and Bartlett Barren Member of the Crevasse Canyon Formation. The results found that the background threshold value (BTV) at the Site for Ra-226 is 2.0 picocuries per gram (pCi/g), and for uranium is 2.4 milligrams per kilogram (mg/kg). For purposes of the EE/CA, the BTV is used to represent background for delineating contaminated areas.

Most of the waste at the Site is excavated waste rock from mining activities and is in reclaimed waste piles and settling and dewatering pond areas. Contaminated material located outside the waste rock piles and ponds is from other mining-related activities or contaminant migration. Limited metals sampling was conducted in subsurface soils at CR-1 and CR-1E in the 2011 RSE. A more robust metals and radionuclides evaluation was conducted at the Kerr-McGee Ponds in 2017. In 2022, additional metals and radionuclides data were collected from surface and subsurface borings at all three Site areas as part of a data gaps investigation.

Collectively, the RSE, removal assessment reports, and data gap analyses are referred to as the "Removal Site Assessment." Results from the Removal Site Assessment are summarized below for each of the three site areas.

**CR-1 Results**. Ra-226 was observed in migrating mine waste along the toe of the CR-1 waste pile and on the slopes. As expected with a reclamation cover, Ra-226 levels in subsurface samples in the CR-1 waste pile are elevated. Contamination extends to the bottom of the waste (up to 59 feet below grade) and does not appear to have migrated vertically into underlying native soil. Elevated Ra-226 was also observed in unreclaimed Ponds 1, 1a, 2, and 3, extending up to 19 feet below grade. Elevated Ra-226 was also observed at 6 to 7 feet below grade, which is greater than the reclaimed depths at Ponds 5, 6b, and 6c. The mean Ra-226 concentration at CR-1 was 14.6 pCi/g in surface soils and 12.6 pCi/g in subsurface soils (0 to 72 inches below ground surface (bgs)). The maximum Ra-226 concentration was

468 pCi/g in subsurface soils. The maximum uranium concentration was 61 mg/kg (see Attachment II, Mine Removal Extent Maps).

**CR-1E Results**. Ra-226 was observed in migrating mine waste around the perimeter of the CR-1E waste piles and on the ramp road onto the site near the pond. As expected with a reclamation cover, Ra-226 in subsurface samples in the CR-1E waste piles are elevated. Contamination extended to the bottom of the waste (up to 16 feet below grade) and does not appear to have migrated vertically into underlying native soil. Elevated Ra-226 was also observed up to 5 feet below grade in the northern industrial area and 12 feet below grade in the pond. The mean Ra-226 concentration at CR-1E was 6 pCi/g in surface soils and 30.9 pCi/g in subsurface soils (0 to 72 inches bgs). The maximum Ra-226 concentration was 429 pCi/g in subsurface soils. The maximum uranium concentration was 210 mg/kg (see Attachment II, Mine Removal Extent Maps).

**Kerr-McGee Ponds Results**. Contamination extends to a depth of 2 feet on the Navajo Tribal Trust land side of the fence line. The mean Ra-226 concentration on Navajo Nation land north of the Kerr-McGee Ponds was 5.3 pCi/g in surface soils and 4.3 pCi/g in subsurface soils (0 to 72 inches bgs). The maximum Ra-226 concentration was 9.3 pCi/g in subsurface soils. Contamination generally did not extend below a depth of 1 foot on UNC property except where dewatering ponds were located where contamination extended up to 6 feet below grade. The mean Ra-226 concentration on UNC property at the Kerr-McGee Ponds was 9.5 pCi/g in surface soils and 8.2 pCi/g in subsurface soils (0 to 72 inches bgs). The maximum Ra-226 concentration was 143 pCi/g in subsurface soils. Ra-226 was observed migrating to the west of the site. Elevated Ra-226 to the far south is associated with another UNC site. Elevated Ra-226 to the east and upgradient of the Site is likely associated with the migration of naturally occurring radioactive material (NORM) from surrounding hillslopes; however, two small soil piles had elevated Ra-226. The maximum uranium concentration was 190 mg/kg (see Attachment II, Mine Removal Extent Maps).

### 4. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant

There is a release of hazardous substances into the environment at the Quivira Mines site. The Removal Site Assessment documents releases of hazardous substances, as defined by CERCLA, 42 U.S.C. § 9601(14), including Ra-226, uranium 234 (U-234), uranium 238 (U-238) and total uranium, at the Site. The Removal Site Assessment also contains data characterizing the extent of contamination, identifies mine waste extent, evaluates contamination migration pathways, and supports USEPA's risk assessment and removal action decisions.

A Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) were performed for the Site to evaluate current and future human health and ecological risks under appropriate reasonable maximum exposure scenarios and based on the known ecosystems of the region. The HHRA and ERA were performed in accordance with the Navajo Abandoned Uranium Mines Program Risk Assessment Methodology, consistent with procedures outlined in USEPA guidance on risk assessment. They focus on the completed exposure pathways, primary risk drivers, and source material as indicated in USEPA's "Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA."

The HHRA evaluated whether site-related contaminants of potential concern (COPC) detected in soil pose potentially unacceptable risks to people undertaking Navajo-specific land uses at the Site now or in the future. The HHRA includes the following components: data evaluation and selection of COPCs, exposure assessment, toxicity assessment, and risk characterization. Any contaminant with a maximum detected value exceeding its COPC screening level was retained as a COPC for the HHRA risk calculations. The COPC screening levels were based on a $1x10^{-6}$ cancer risk and a hazard index of 0.1 for a Navajo resident.

The ERA evaluated the likelihood that the environment would be impacted as a result of exposure to one or more environmental stressors, such as radionuclides or metals. The objective of the ERA is to evaluate whether ecological receptors may be adversely affected by exposure to contaminants.

The results of the HHRA and ERA indicate that unacceptable risks are present at the Site for human and ecological receptors. Ra-226 and uranium are the human health risk COCs; and Ra-226, U-234, and U-238 are the contaminants of ecological concern (COEC).

The cumulative cancer risk for the age-adjusted adult and child and noncancer hazard for the child receptor (or adult receptor in the case of the worker) for each exposure unit and soil interval are provided in Table 1. Details on the risk assessment can be found in the EE/CA.

**Table 1. Cancer Risks and Noncancer Hazards**

| Exposure Unit | Soil Interval | Cancer Risk | Adult Noncancer Hazard | Child Noncancer Hazard |
|---|---|---|---|---|
| CR-1 | Surface Soil | **$1x10^{-2}$** | **8** | **10** |
| | Subsurface Soil | **$3x10^{-2}$** | **8** | **10** |
| CR-1E | Surface Soil | **$2x10^{-2}$** | **8** | **10** |
| | Subsurface Soil | **$8x10^{-2}$** | **10** | **20** |
| Kerr-McGee Ponds on the Navajo Nation | Surface Soil | **$2x10^{-2}$** | **9** | **10** |
| | Subsurface Soil | **$2x10^{-2}$** | **9** | **10** |
| Kerr-McGee Ponds on UNC Property | Surface Soil | **$2x10^{-4}$** | 0.05 | -- |
| | Subsurface Soil | **$2x10^{-4}$** | 0.08 | -- |

The removal action goals (RAGs) were derived for COCs. The RAG is the lower of the human health preliminary remediation goal (PRG) or preliminary ecological removal goal (PERG). When one or both PRGs or PERGs are less than the BTV, the BTV becomes the RAG. Table 1 summarizes the RAGs for the Site.

**Table 2. Selected RAG for Each COC**

| COC | Unit | Exposure Unit | RAG | RAG Basis |
|---|---|---|---|---|
| Radium-226 | pCi/g | CR-1, CR-1E, and Kerr-McGee Ponds on the Navajo Nation | 2.0 | BTV[1] |
| | | Kerr-McGee Ponds on private property | 5.4 | HH PRG UNC Outdoor Worker |
| Uranium | mg/kg | CR-1, CR-1E, and Kerr-McGee Ponds on the Navajo Nation | 3.2 | HH PRG Navajo Resident |

Notes:

[1] The BTV is used to represent background for delineating contaminated areas.

BTV Background threshold value
COC Contaminant of concern
CR-1 Quivira Tronox Church Rock No. 1 Mine
CR-1E Quivira Tronox Church Rock No. 1 East Mine
HH Human health
mg/kg Milligram per kilogram
pCi/g Picocurie per gram
RAG Removal action goal
PRG Preliminary removal goal

### 5. National Priorities List Status

The Site is not on the NPL, nor is it proposed for inclusion on the NPL.

### 6. Maps, Pictures and Other Graphic Representations

Attachment II contains the Site location and feature maps.

## B. Other Actions to Date

- 1980 to 1982: Quivira Mining Company (QMC) performed reclamation of the portion of the Kerr-McGee Ponds on UNC property.
- 1985 to 1989: QMC conducted reclamation at CR-1 and CR-1E, including the removal of: mine dewatering pumps; mine equipment, including hoists, compressors, headframes, and generators; buildings; and foundations.
- 2010: RAML performed a time-critical removal action (TCRA), pursuant to an ASAOC, which repaired fences, graded and seeded the western slopes of the CR-1 waste pile, installed sediment control structures at CR-1, and repaired mine access roads, the bridge over the arroyo, and Red Water Pond Road.
- 2012: RAML performed a TCRA, pursuant to a Unilateral Administrative Order, which excavated 17,374 cubic yards of contaminated soil, placed excavated materials onto the waste rock stockpile at CR-1, reconstructed the road and shoulder area between State Road 566 and Unnamed Arroyo #2, and revegetated disturbed areas.

- 2017: USEPA conducted a TCRA to remove approximately 10,000 cubic yards of contaminated soil surrounding the openings of five ventilation shafts and the arroyo bridge abutments. Waste material was placed on top of the CR-1 waste pile.
- 2023 to 2024: USEPA constructed a stormwater detention basin, erosional control berms and channels, surface erosion controls, and repaired erosional features.

### C. State and Local Authorities' Roles

CR-1 and CR-1E are located on Navajo Nation Tribal Trust land and the Kerr McGee Ponds are located on private land owned by UNC in New Mexico. The Red Rocks Disposal Facility is located on private land owned by the Northwest New Mexico Regional Solid Waste Authority in New Mexico.

USEPA Region 9, in coordination with USEPA Region 6, has worked closely with New Mexico to ensure that the proposed waste disposal repository at the Red Rocks Disposal Facility under Alternative 3, the removal action selected in this document, is a viable option under New Mexico state regulations. The New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), Mining and Minerals Division (MMD) will be the state agency responsible for issuing a Mining Permit for design, construction, operation, and closure of the waste disposal repository at the Red Rocks Disposal Facility. The New Mexico Environment Department (NMED) will be the state agency responsible for issuing a Groundwater Protection Permit to ensure that construction and operation of the waste disposal repository at the Red Rocks Disposal Facility is protective of groundwater and surface water, and to provide long-term operation and maintenance of the waste disposal repository at the Red Rocks Disposal Facility after closure to prevent groundwater discharges in perpetuity.

USEPA Region 9 completed government-to-government consultation with the Navajo Nation government regarding the selection of the removal action alternative described herein for the Site. The government-to-government consultation with Navajo Nation includes two phases: (1) consultation on the draft EE/CA prior to USEPA's selection of a recommended alternative; and (2) consultation following the release of the final EE/CA with a recommended alternative and completion of the public comment period. These two phases of the government-to-government consultation were completed in June 2023 and November and December 2024, respectively.

## III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Current Site conditions include direct exposure to hazardous substance above background levels and ongoing erosion, posing a threat of ongoing and future releases of hazardous substances including uranium and Ra-226 and its progeny and associated gamma radiation. USEPA and the National Academy of Sciences, Committee on Biological Effects of Ionizing Radiation, have stated that radium is a known human carcinogen (see Agency for Toxic Substances and Disease Registry (ATSDR), "Radium ToxFAQs," CAS#: 7440-14-4 (July 1999)). Neither the National Toxicology Program (NTP), International Agency for Research on Cancer (IARC), nor USEPA have classified uranium with respect to carcinogenicity. However, USEPA has identified uranium and its progeny as likely lung cancer contributors. Kidney damage has been seen in humans and animals after inhaling or ingesting uranium compounds. Inhaled insoluble uranium compounds can also damage the respiratory tract (ATSDR Toxicological Profile for Uranium, February 2013).

The likelihood of direct human exposure, via ingestion of soil and local foods and/or proximity to the hazardous substances, and the threat of future releases and migration of those substances pose an imminent and substantial endangerment to public health or welfare, or the environment based on the factors set forth in Section 300.415 of the NCP, 40 CFR § 300.415(b)(2).

These factors include:

1. **Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants**

As described in this Action Memorandum and in the Removal Site Assessment, elevated levels of Ra-226 and uranium have been documented in waste at the Site. Analytical results indicate that concentrations of Ra-226 and uranium identified in waste at the Site exceed risk-based cleanup levels, which are background at CR-1 and CR-1E, and above the risk-based PRGs at the Kerr-McGee Ponds area. Ra-226 surface and subsurface soil concentrations were compared to a Ra-226 RAG of 2 pCi/g for the portion of the Quivira Mines on Navajo lands and a Ra-226 PRG of 5.4 pCi/g for the portion of the Kerr-McGee Ponds on UNC property due to different risk assessment exposure scenarios. Uranium surface and subsurface soil concentrations were compared to a uranium removal action goal of 2.4 mg/kg for the portion of the Quivira Mines on Navajo lands.

The Site's continued erosion and direct contact exposure to contaminated soils pose unacceptable risks to nearby residents and practitioners of Navajo lifeways if no removal action is taken. Residential areas exist within 700 feet of existing areas of waste at the Site. The risk assessment calculated unacceptable risks to potential future residents at the Site and for practitioners of Navajo lifeways, including hunting, grazing livestock, and gathering herbs and plants.

2. **High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate**

Contamination in soils at the Site may migrate offsite due to high rates of erosion, high winds, and seasonal flash flooding from heavy rains. The topography of the Site makes it especially prone to erosion, since the Site is located on a narrow bench between a steep mesa to the north and an arroyo to the south. Continued erosion at the Site will expose contamination at the Site's surface and transport contamination on and off-site if an action is not taken. Nearby residences are at risk from migrating contamination. Details about substances of concern, concentrations, estimated quantities, realistic pathways and exposure scenarios, and how the levels exceed standards are provided in Sections A.3 and A.4 above.

3. **Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released**

Rainfall events have resulted in the transport of contamination from the Site towards residences and grazing areas and pose a continuing threat of migration. High soil erosion has resulted in contamination moving from the Site, constituting a release of hazardous substances and resulting in

additional areas of contamination requiring interim cleanup actions. In addition, as noted above, exposed, surface contaminants may migrate during frequent high wind events due to the propensity for uranium, Ra-226, and related contaminants to adhere to windborne dust particles.

### 4. Availability of other appropriate federal or state response mechanisms to respond to the release

The Navajo Nation Environmental Protection Agency (NNEPA) informed USEPA that it does not have the resources to address the contamination at the Site.

## IV. ENDANGERMENT DETERMINATION

There are documented releases of hazardous substances from this Site. If not addressed by implementing the removal action selected in this Action Memorandum, the actual or threatened releases of hazardous substances from the Site may present an imminent and substantial threat to public health, or welfare, or the environment.

## V. EXEMPTION FROM STATUTORY LIMITS

Pursuant to Section 104(c)(1)(A) of CERCLA, 42 U.S.C. Section 9604(c)(1)(A), additional funds shall not be obligated from the Fund for a specific removal action after $2 million has already been obligated from the Fund or 12 months has elapsed from the date of initial response to a release or threatened release of hazardous substances unless the President finds that: (1) continued response actions are immediately required to prevent, limit, or mitigate an emergency; (2) there is an immediate risk to public health or welfare or the environment; and (3) such assistance will not otherwise be provided on a timely basis. This authority was delegated from the President to the Administrator of USEPA by Executive Order 12580, 52 Fed. Reg. 2 923 (Jan. 29, 1987), and from the Administrator of USEPA to the Assistant Administrator for Land and Emergency Management by Delegation 14-2 (1200 TN 531, Nov. 30, 2022).

Since the removal action for the Site is estimated to cost $183 million and take six to eight years to complete, USEPA Region 9 requests approval of an emergency exemption from the 12-month and $2 million statutory limits on Fund-financed removal actions. As described in more detail below, the Site satisfies the requirements for an emergency exemption because: (1) it contains approximately 1,005,500 cubic yards of eroding mine waste that currently migrates through wind and water transport, which the removal action will safely and permanently dispose of thereby preventing further erosion and exposure; (2) the mine waste rock contains unsafe levels of hazardous substances that pose potentially unacceptable health risks to nearby residents and further contaminate the environment; and (3) the Navajo Nation and State of New Mexico do not have the resources or capacity to address the Site in a timely manner.

### A. <u>Emergency Exemption Conditions</u>

This request for an emergency exemption is based on Site-specific information. Approximately one million cubic yards of mine waste is located in three areas across the Site and poses an immediate risk to public health and welfare, and to the environment. Homes are within 700 feet of the waste piles.

Multiple interim response actions have been carried out to provide temporary protections from eroding waste piles, but frequent heavy rains and snow pose immediate are likely to cause further erosion and potentially releases. A response action is required to prevent or mitigate an emergency caused by eroding mine waste piles containing hazardous substances being located near homes.

### 1. Immediate Risk to Public Health or Welfare or the Environment

The Site poses an immediate risk to the public health, welfare, and the environment because of continued erosion of existing waste piles that contain hazardous substances, including uranium and Radium-226, at levels that pose unacceptable risks (see Section II.A.2 and II.A.3). The Site contains approximately 1,005,500 cubic yards of waste, the majority of which is located in the above-grade, CR-1 waste pile. Past interim actions provide only temporary safeguards against migration of contaminants and exposure risk. The Site is exposed to frequent winds and storms throughout the year that have resulted in, and may continue to result in, the offsite migration of contamination through water and wind transport mechanisms. Water and wind transport may result in hazardous substances being ingested by nearby residents and visitors, contaminating local soil, livestock, and other food sources, and entering waterways, including the Unnamed Arroyo #2 and the Pipeline Canyon Arroyo.

### 2. Continued Response Actions Immediately Required to Prevent, Limit, or Mitigate an Emergency

As noted above, exposed waste piles at the Site pose an ongoing threat to public health, welfare, and the environment because high levels of hazardous substances, including uranium and Radium-226, have been and are likely to continue being released through erosion, thereby posing risks to nearby residents, visitors, and the environment. If approved, this removal action will excavate and remove 1,005,500 cubic yards of mine waste from the Site for disposal off-site. After the hazardous mine waste is removed, the Site will be regraded, erosion and stormwater controls will be implemented, and the impacted areas will be revegetated. The excavated waste will be disposed of at the Red Rocks Disposal Facility in a disposal cell designed and constructed to hold radioactive waste, thereby preventing exposure to the communities surrounding the Site and the communities along the haul route and near the disposal cell. The Red Rocks Disposal Facility will be permitted by the State of New Mexico and monitored and maintained in perpetuity by the facility operator to ensure continued prevention of migration of contaminants.

Contaminated mine waste must be addressed at the Site to eliminate the risks to nearby residents and visitors who may ingest contamination, and to prevent further contamination of the environment. If the emergency exemption from the 12-month and $2 million limits is not granted, USEPA will not be able to conduct the NTCRA due to the time and costs required to complete the removal action, and risks posed by erosion and contaminant migration at the Site will not be addressed. Due to the frequency of wind and storm events and ongoing erosion at the Site, failing to implement a permanent solution to address the mine waste increases the risk of migration off-site, potentially resulting in exposure of nearby residents, visitors, food sources, and waterways.

### 3. Assistance Will Not Otherwise be Provided on a Timely Basis

Eroding mine waste piles threaten to expose nearby residents, visitors, and the environment to hazardous substances being transported via wind and water, and to the best of USEPA's knowledge, neither the Navajo Nation nor the State of New Mexico have the resources or capacity to mitigate these threats in a timely manner. New Mexico is working with USEPA to support the removal action by advising on the permitting process and requirements for the disposal cell at the Red Rocks Landfill, which is being managed by the Northwest New Mexico Regional Solid Waste Authority. USEPA has also conducted government-to-government consultations with the Navajo Nation on this removal action. Given the emergency situation, USEPA is seeking approval to initiate the removal action in the near term and secure sufficient funding to do so. In the future, as appropriate, USEPA will evaluate enforcement options to include potentially responsible parties (PRPs) to perform and/or fund the removal action.

## VI. PROPOSED ACTIONS AND ESTIMATED COSTS

### A. Removal Action

#### 1. Removal action description

USEPA selects Alternative 3 from the EE/CA as the removal action for the Site. Implementing Alternative 3 will require removing all waste exceeding RAGs from the Site and transporting and disposing of it in a new, state-permitted waste disposal repository at the Red Rocks Landfill, located six miles east of Thoreau, New Mexico. The Red Rocks Landfill disposal facility will be permitted, constructed, operated, maintained and monitored for the management of waste from the Quivira Mines site. This removal action addresses all existing releases at the Site and will prevent future releases of hazardous substances into the environment. It will also prevent direct exposure of residents and visitors to hazardous substances at concentrations that exceed risk-based RAGs in mine waste currently located at the Site. Once natural vegetation is reestablished, USEPA will consider the Site to be safe for unrestricted use. The removal action will be implemented in two phases as described below.

**Phase 1: State Permitting and Construction of the Waste Disposal Repository at the Red Rocks Landfill Disposal Facility**

The removal action requires a one- to three-year State permitting and facility construction period prior to commencement of waste removal from the Site. This phase involves the Northwest New Mexico Regional Solid Waste Authority applying for and receiving permits from the State of New Mexico's EMNRD MMD and NMED and constructing the waste disposal repository at the Red Rocks Landfill disposal facility.

The Northwest New Mexico Regional Solid Waste Authority will need to secure a mining permit from EMNRD MMD. The State's mining permit focuses on design, construction, operation, closure, and surface reclamation of the waste disposal repository. EMNRD MMD will hold financial assurances from the facility operator and monitor the waste disposal repository at the Red Rocks Landfill Disposal facility for at least 12 years following its final closure. The EMNRD MMD mining permit application process requires public participation with the option of a public hearing, if requested.

The Northwest New Mexico Regional Solid Waste Authority will also need to secure a groundwater protection permit from NMED. The State's groundwater protection permit process requires the applicant to prepare and submit baseline groundwater quality data, site geology and hydrology information, a repository design, an operations and maintenance plan, a groundwater protection plan, and a closure plan. NMED's groundwater protection permit typically requires two public notice periods: one when the application is received; and one when the draft permit is published. The NMED groundwater protection permit does not expire, allowing monitoring and maintenance of the waste disposal repository to continue in perpetuity.

Following receipt of the two state permits, the Northwest New Mexico Regional Solid Waste Authority will construct the new waste disposal repository, which will be separate from the existing solid waste Subtitle D landfill located at the Red Rocks Landfill. The Northwest New Mexico Regional Solid Waste Authority will charge a tipping fee for disposal of mine waste to recover costs associated with permitting, construction, operation, closure, and long-term monitoring and maintenance of the waste disposal repository.

**Phase 2: Waste Removal, Hauling, and Disposal Activities**

Once the waste disposal repository at the Red Rocks Landfill disposal facility is ready to accept waste and USEPA Region 6 determines that the facility is in compliance with the Off-site Rule (see 40 C.F.R. Section 300.440), excavated waste from the Quivira Mines site will be transported to the waste disposal repository at the Red Rocks Landfill disposal facility. The preferred haul route exits the Site to the south at Pipeline Road, which leads to State Highway 566. After passing through the community of Church Rock, the haul route follows the State Highway 66 frontage road east to an onramp to Interstate 40 heading east, exits Interstate 40 at Thoreau and heads north on State Highway 371 to the Red Rocks Landfill disposal facility. The total one-way distance of the preferred haul route is approximately 42 miles (see Figure 4 in Attachment II for a map of the preferred and alternative haul routes and an analysis of waste transport from the Site to the Red Rocks Landfill disposal facility). Transportation of the waste from the Site to the Red Rocks Landfill disposal facility is estimated to take approximately four to five years.

Following complete removal of all waste from the Site, the Site will be restored as closely as possible to natural conditions. This will involve site contouring, erosion control, and revegetation, then monitoring and maintaining the Site to ensure vegetation is established. The post-waste removal work may also involve repairing any roads that may have been damaged during the excavation and reinforcing structures, as needed.

**Post-Removal Action Monitoring and Maintenance at the Red Rocks Disposal Facility**

Once the waste disposal repository at the Red Rocks disposal facility is finished receiving waste from the Quivira Mines and potentially Section 32/33 Mines sites[1], the Northwest New Mexico Regional Solid Waste Authority will close the disposal repository according to State permit requirements and initiate long-term monitoring and maintenance of the facility with the State and USEPA's oversight. Monitoring will involve regular groundwater well sampling and inspections of run-on control and run-off management systems to ensure no migration is occurring. If an evapotransporative (ET) cover is

[1] The Section 32/33 Mines Site is a separate and distinct site, which requires a separate removal action and action memorandum. USEPA is considering similar removal action alternatives for the Section 32/33 Mines site as those considered for the Quivira Mines site, including disposal of waste at the Red Rocks Landfill disposal facility.

established at the waste disposal repository, monitoring of its function and effectiveness will also be conducted by the facility operator. Long term operations and maintenance for the waste disposal repository at the Red Rocks Landfill disposal facility will be the responsibility of, and performed by, the Northwest New Mexico Regional Solid Waste Authority in perpetuity, as required by State of New Mexico permits. These permits will stipulate the requirement for State and USEPA oversight, as well as financial assurance requirements for the facility operator. The Northwest New Mexico Regional Solid Waste Authority will be responsible for costs associated with long-term compliance with the permit requirements.

**Consideration of Treatment Technologies**

CERCLA and the NCP express a preference for the treatment of contaminated materials to reduce toxicity, mobility, or volume. USEPA evaluated treatment options and found that currently there are no waste treatment technologies available to appropriately address the Ra-226, U-234, or U-238 in soils at the Site.

A treatability study of High-Pressure Slurry Ablation (HPSA) was completed at the Site and concluded that the HPSA technology alone would not achieve RAGs for the Site. Additional removal action such as described in Alternatives 2 and 3 would still be required to achieve protectiveness. If HPSA were to be used at the Site, USEPA would also select either on-site (Alternative 2) or off-site (Alternative 3) disposal to address the clean coarse fraction of the post-HPSA-treated waste that did not meet RAGs. Additionally, the untreatable fines and post-treatment concentrated fines would likely require disposal at a different facility depending on the residual concentrations. The significant additional cost of implementing HPSA waste treatment, combined with the need to subsequently dispose of treated waste off-site, would add to the overall cost without significantly reducing the waste volume requiring off-site disposal or providing any further environmental protection. Therefore, HPSA treatment increases costs without providing additional risk reduction.

### 2. Contribution to remedial performance

The Site is not listed on the NPL, nor is it proposed for inclusion on the NPL. USEPA has identified imminent threats posed by Ra-226, U-234, and U-238 at the Site. It is expected that this NTCRA will remove the threat of direct contact with hazardous substances and inhalation of hazardous substances from the mine waste and contaminated soils at the Site. USEPA's removal action described in this Action Memorandum is anticipated to be the final response action at this Site.

### 3. Community Engagement During the Engineering Evaluation/Cost Analysis

This section summarizes USEPA's community involvement activities leading up to the issuance of the EE/CA and Action Memorandum for public comment, includes a brief description of USEPA's government-to-government consultation with the Navajo Nation, summarizes the public comments

received on the EE/CA during the public comment period, and provides the basis for selecting Alternative 3 as the removal action in this Action Memorandum.

**Community Involvement Activities**

Since 2019, USEPA has worked closely with the communities located near the Site to develop and evaluate removal action alternatives. Prior to 2019, community involvement activities focused on interim actions and site characterization. The latest community involvement activities involved meeting with individual communities about the removal action alternatives and conducting the government-to-government consultation process previously agreed to by both the USEPA and the Navajo Nation government.

Community outreach activities included, but were not limited to, the following community meetings and open houses by USEPA and Navajo EPA:

- **Spring 2020 to Present:** The USEPA held monthly meetings with Red Water Pond Road and Pipeline Road communities.
- **10/18/2022**: The USEPA presented EE/CA alternatives to Red Water Pond and Pipeline Road communities concurrently with providing the draft EE/CA to the Navajo Nation government for review and comment.
- **8/6 and 8/7/2023:** The USEPA presented Alternative 3 and the preferred and alternate transportation routes to the Thoreau community and conducted a Red Rocks disposal facility tour for community members.
- **9/21/2023:** The USEPA presented Alternative 3 and the preferred and alternate transportation routes to the Church Rock community.
- **11/8 and 11/9/2023:** The USEPA presented Alternative 3 and the preferred and alternate transportation routes through a presentation and with posters to the Casamero Lake community.
- **12/12 to 12/15/2023:** The USEPA held three open house listening sessions in the Baca/Prewitt and Thoreau communities to gather public input on the EE/CA alternatives and transportation routes, and to hear questions and concerns from community members. The USEPA presented posters of Alternative 3 and preferred and alternate transportation routes to the Thoreau and Baca Prewitt Chapters. USEPA used the information from these listening sessions to improve aspects of the EE/CA and the proposed haul routes.
- **1/22 to 1/26/2024:** The USEPA gave presentations on Alternative 3 and the recommended and alternate transportation routes in six Chapters (Baca/Prewitt, Casamero Lake, Pinedale, Standing Rock, Thoreau, and Church Rock) answered questions, accepted comments, and listened to concerns raised by the public.

**Government-to-Government Consultation between the Navajo Nation Government and USEPA**

The Navajo Nation and USEPA developed and agreed upon a two-phase government-to-government consultation process where USEPA first consults with the Navajo Nation on EE/CA cleanup alternatives before selecting a recommended alternative, and then USEPA consults with the Navajo Nation again after selecting a recommended alternative and soliciting public comments during a formal public comment period. Tribal consultation is conducted between the USEPA Region 9 Superfund and Emergency Management Division and the Navajo Nation Office of the President and Vice President (OPVP) and may include representatives from the Navajo Nation Council and other agencies, as needed. Tribal consultation is not open to the public.

On June 20, 2023, the USEPA and the Navajo Nation government conducted the first of the two phases of government-to-government consultation to present the cleanup alternatives in the EE/CA prior to selecting a recommended alternative and publishing the EE/CA for public comment.

On November 8 and December 2, 2024, the USEPA held the second phase of the government-to-government consultation to discuss USEPA's recommended removal action, Alternative 3, for the Site and the public comments USEPA received. The primary issues raised during the second phase of consultation included the location of the proposed repository within the boundary of the Red Rocks Landfill property and the impacts that might have on allottee mineral rights. The Navajo Nation EPA invited the U.S. Bureau of Indian Affairs to the consultation meetings to better understand the allotment and mineral rights issues. The Navajo Nation representatives also raised concerns about impacts to roadways and a desire to receive general updates on the permitting as it proceeds. Several other points of discussion raised by the Navajo Nation concerned broader technical and policy issues that impact cleanup decisions at sites other than the Quivira Mines. These topics included how to employ HPSA as a treatment technology at mine sites and how to address areas of NORM left behind after cleanup. No specific objections to the selected alternative were raised. USEPA agreed to provide updates on several aspects of the cleanup action after issuing an Action Memorandum identifying the selected removal action and during the permitting and design process.

**EE/CA Publication and Public Comment Period**

After completing the community outreach and the first phase of government-to-government consultation described above, the USEPA published EE/CAs for both the Quivira Mines site and the Section 32 and 33 Mines site[2] simultaneously and held a public meeting on March 23, 2024. While a separate Site, the EE/CA for the Section 32/33 Mines considers similar alternatives, and similarly recommends the alternative involving disposal of waste at the Red Rocks Landfill disposal facility. The public meeting was held at the University of New Mexico campus in Gallup, New Mexico and it marked the opening of the public comment period for the two EE/CAs. Over 100 individuals attended the March 23, 2024, public meeting, which lasted for five hours. USEPA used a court reporter to transcribe all comments made during the March 23, 2024, public meeting and considered them in its review of public comments received regarding the EE/CAs.

On May 15, 2024, during the public comment period for the EE/CAs, USEPA, NNEPA, and State of New Mexico representatives gave a presentation at the Thoreau High School, located in Thoreau, New Mexico, regarding the Quivira Mines and Section 32/33 Mines EE/CAs. Over 200 students attended the school-wide assembly. The USEPA provided pre-paid postcards, physical mail and email addresses for the USEPA project management staff, and a toll-free voicemail phone number for community members to provide comments on the EE/CAs and recommended alternatives. The public comment period for the Quivira Mines and Section 32/33 Mines sites EE/CAs opened on March 23, 2024, and closed on May 22, 2024.

The USEPA advertised the availability of the EE/CAs after they were published, the public meeting date, time, and location, and shared other ways for the public to voice opinions, concerns, and submit comments. Advertising included radio announcements on KTNN, KGLP, and KGAK, publishing

[2] One considered alternative for the Section 32 and 33 Mines site also involves excavating mine waste and disposing of it off-site at the Red Rocks Disposal Facility.

newspaper advertisements in the Gallup Independent and the Navajo Times, and distributing flyers in the Red Water Pond Road, Pipeline Road, and Thoreau communities, and to the Thoreau, Baca Prewitt, Casamero Lake, and Church Rock Chapters. Handouts at the meetings and in information repositories included fact sheets on the cleanup alternatives, and phone and email contact information for the USEPA project management staff.

**Summary of Public Comments on the EE/CA**

The USEPA received comments from community members and interested parties at the following venue and in the following formats:

- March 23, 2024, public meeting at the University of New Mexico in Gallup: In-person and by phone and video call; and
- Via postcards, toll-free voice mail, email, and USPS mail sent to the USEPA.

USEPA received 68 comments regarding the Quivira Mines site EE/CA. The USEPA carefully reviewed each comment and provided a response addressing each comment directly or as part of a group of similar comments (see Attachment V, Response to Comments). Many comments were not specific to the Quivira Mines site or the EE/CA and instead provided general input about community recommendations and concerns about the AUMs. Comments specific to the Quivira Mines site centered around support for and opposition to the recommended cleanup alternative, support for and opposition to cleanup alternatives not recommended, and comments about the cleanup alternatives evaluated in the EE/CA. Comments also posed recommendations and concerns about engagement with communities on Navajo Nation, with a particular focus on the mine-impacted communities of Red Water Pond Road and Pipeline Road and the Thoreau community, where the recommended waste disposal repository (Red Rocks Landfill disposal facility) is proposed to be located.

USEPA received comments from Thoreau High School students which were submitted as part of a class assignment. Comments from the Thoreau High School students all opposed the selection of Alternative 3. USEPA received 43 comments supporting the selection of Alternative 3. A majority of the supportive comments were from members of the Red Water Pond Road and Pipeline Road communities, which are the communities most directly impacted by the Quivira Mines site.

A detailed record of all comments received from the public meeting including through postcards, emails, the USPS mail, and toll-free voice mails are included in the Administrative Record for the Quivira Mines site Action Memorandum and the Responsiveness Summary.

## 4. Selected Action (Alternative 3)

This Action Memorandum is based on the EE/CA and the administrative record for this NTCRA. The EE/CA considered numerous removal action alternatives to address the mine waste at the Site, including waste treatment technologies. All but four alternatives were screened out from further evaluation. The remaining four alternatives were evaluated pursuant to criteria established by the USEPA, effectiveness, implementability, and cost. These alternatives included:

- Alternative 1: No Action.

- Alternative 2: Consolidate and Cap All Waste on Site
- Alternative 3: Dispose of All Mine Waste Off Site at Red Rocks Disposal Facility
- Alternative 4: Dispose of All Mine Waste Off Site at a Resource Conservation and Recovery Act (RCRA) C or Low-Level Radioactive Waste Facility (LLWF)

The selected alternative is Alternative 3: Dispose of All Mine Waste Off Site at Red Rocks Disposal Facility. This alternative was selected based on an evaluation of: effectiveness (overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs), and other criteria, advisories, and guidance; long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness, implementability (technical feasibility; administrative feasibility; and tribal and/or state acceptance; and community acceptance), and cost.

USEPA's evaluation of these criteria for Alternative 3 is summarized below:

- Alternative 3 provides protection of human health and the environment by excavating waste and transporting it off-site to a newly permitted facility, located at the Red Rocks Landfill property, that will be designed and constructed to manage radioactive waste material.
- Alternative 3 significantly minimizes the potential long-term human and environmental exposure to mine waste rock by removing all waste from the Site and taking it to a newly permitted and designed off-site disposal facility. The Site would need no land use restrictions following completion of Alternative 3.
- Alternative 3 will be constructed and implemented in accordance with all ARARs.
- Alternative 3 will ensure long-term effectiveness by properly installing, managing, and maintaining an ET cover at the receiving repository at the Red Rocks Landfill property to prevent infiltration of precipitation into the mine waste cells.
- Alternative 3 will also protect groundwater beneath the newly created repository by employing a liner within each waste cell beneath the waste to contain any water that infiltrates through the ET cover.
- Alternative 3 has the potential for increased risk due to offsite transportation of the mine waste. Short-term environmental impacts could occur from excavation, hauling, and placement of waste in the off-site repository. These risks include traffic accidents, residual track-in and track-out effects of soil and mud, noise, disturbed vegetation, and dust generation. Other environmental impacts include additional fuel burning and releasing of emissions that would lead to increased climate impacts.
- Alternative 3 is technically feasible and would use conventional techniques, materials, and labor for the excavation and associated activities. The Site is readily accessible. Excavation would be scheduled and performed to maximize direct loading and ensure worker and public safety. Engineering controls for fugitive dust and Site air monitoring would be used to control potential exposures to sensitive receptors, such as nearby residents.
- Alternative 3 is considered effective when balancing protection of human health and the environment, future reuse, effectiveness (long-term and short-term), and community acceptance.
- While not the least costly alternative, Alternative 3 provides better long-term effectiveness and technical feasibility due to complete removal of all waste from the Site and the assurance that it will be monitored and maintained under state permit in perpetuity by the facility operator. In

addition, the geologic and geographic conditions at the Red Rocks Landfill disposal facility location provides for better long-term waste disposal and management. The Red Rocks Landfill disposal facility is also further from residential areas and has pre-existing access restrictions and restrictions for future residential development.

Below is a summary chart from the EE/CA comparing the four alternatives evaluated, followed by a more detailed comparative analysis of the alternatives using the USEPA's evaluation criteria:

| | Alternative | Attainment of Threshold Criteria | Effectiveness | Implementability | Costs (Million) |
|---|---|---|---|---|---|
| 1 | **No Action** | Not Protective. Does not meet ARARS | Short-Term: Average<br>Long-Term: Very Poor | Tech: Very Good<br>Admin: Very Good | $0 |
| 2 | **Consolidate and Cap All Waste On Site** | Protective. Meets ARARs | Short-Term: Good<br>Long-Term: Good | Tech: Good<br>Admin: Good | $61.6 |
| 3 | **Dispose of All Waste Off Site at Red Rocks Disposal Facility** | Protective. Meets ARARs | Short-Term: Average<br>Long-Term: Very Good | Tech: Very Good<br>Admin: Average | $182.5 |
| 4 | **Dispose of All Waste Off Site at RCRA C or LLRW Facility** | Protective. Meets ARARs | Short-Term: Very Poor<br>Long-Term: Very Good | Tech: Very Good<br>Admin: Good | $563 |

**Threshold Criteria and Effectiveness Analysis**

The EE/CA provides an evaluation of the threshold criteria and a comparative analysis of the effectiveness of the removal action alternatives considered for addressing contamination at the Site:

- Alternative 1, the no action alternative, is not protective because it does not protect those exposed to the health risks identified in the HHRA and is therefore eliminated from further consideration. Alternatives 2, 3, and 4 are anticipated to provide adequate protection to human health and the environment.
- Both Alternatives 3 and 4 are long-term effective since these alternatives eliminate exposure at the Site by removing waste and are expected to comply with ARARs.
- Alternative 3 was rated average for its short-term effectiveness due to relatively low risks to workers onsite and exposure to human health risks during the extended period of waste removal and transport to the waste disposal repository at the Red Rocks disposal facility.
- Alternative 4 was rated very poor for short-term effectiveness because of the increased water use for dust control and community disturbance over a longer project duration, and very large energy requirements and greenhouse gas production as a result of the long waste hauling distances to distant approved disposal facilities. Increased risk of transport accidents also contributed to the very poor rating.

Based on the summary above and the detailed analysis in the EE/CA, Alternatives 2 and 3 received the most favorable ratings for overall effectiveness (short- and long-term). Alternative 4 did not rate as effective as other alternatives due to the significantly longer haul distance.

**Implementability Analysis**

The EE/CA provides a comparative analysis of the implementability of the removal action alternatives considered. For technical feasibility:

- Alternative 1 is rated Very Good, since it does not require any removal activity or maintenance.
- Alternative 2 is rated Good because this alternative involves implementation with available materials and uses standard construction practices. However, available space at or near the Site is limited and is geographically challenging to place a permanent repository.
- Alternative 3 is rated Very Good, since this alternative involves implementation with materials that are readily available and uses standard construction practices and removes all waste from the Site to a facility that will be designed and constructed specifically to accept this waste. However, this alternative does require the permitting, design and construction of a new waste disposal facility.
- Alternative 4 is rated Very Good, since this alternative involves implementation with available materials and standard construction practices and waste will be taken to an existing facility that accepts this type of waste.

For administrative feasibility:

- Alternative 1 is rated Very Good because implementation would not have additional administrative requirements.
- Alternative 2 is rated Good because implementation would require extensive and active post-removal site controls as well as land use restrictions where waste is left in place. Geologic and geographic conditions at the Site complicate long-term maintenance of an on-site repository.
- Alternative 3 is rated Average, due to the needed planning, permitting, and constructing the waste disposal repository at the Red Rocks Landfill disposal facility. Additionally, contracting efforts with multiple agencies and private entities (primarily related to off-site transport and disposal), and interaction with a licensed facility, and multiple on- and off-Navajo Nation authorities will also be required.
- Alternative 4 is rated Good because only RCRA Subtitle C and low level radioactive waste (LLRW) facilities are already permitted to accept waste such as that at the Site, but additional administrative considerations such as annual disposal limits or concentration limits may impose additional constraints and needed actions.

Based on the summary above and the individual ratings presented in the EE/CA, Alternative 1 is the most implementable, followed sequentially by the other three alternatives, which have similar implementability. Alternative 4 has very poor short-term effectiveness because of the significant predicted roadway accidents and fatalities due to the significantly longer distance to the disposal facility but is comparable in long-term effectiveness with Alternative 3 because it removes all waste from the site.

**Cost Analysis**

The EE/CA provides a comparative analysis of the cost of the response alternatives considered for addressing contamination at the Site:

- Alternative 1 has no associated cost because no action is taken.
- Alternative 2 would cost $61.6 million dollars (net present value).
- Alternative 3 would cost $182.5 million dollars (net present value).
- Alternative 4 would cost $563 million dollars (net present value).

In summary, Alternative 4 is significantly (more than three times) more costly than Alternatives 2 and 3 and provides no greater protectiveness.

### 5. Applicable or Relevant and Appropriate Requirements (ARARs)

A complete list of ARARs for this action are provided as Attachment IV.

Section 300.415(j) of the NCP provides that removal actions must attain ARARs to the extent practicable, considering the exigencies of the situation. No such exigencies exist for this action and all ARARs will be complied with.

Section 300.5 of the NCP defines applicable requirements as cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstances at a CERCLA site.

Section 300.5 of the NCP defines relevant and appropriate requirements as cleanup standards, standards of control and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.

Section 300.400(g)(3) of the NCP comments that in addition to applicable or relevant and appropriate requirements, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to be considered" (TBC) category consists of advisories, criteria, or guidance that were developed by USEPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

Pursuant to CERCLA Section 121(e), CERCLA onsite response actions do not require permitting; only substantive requirements are considered as possible ARARs. Administrative requirements such as approval of, or consultation with administrative bodies, issuance of permits, documentation, reporting, record keeping, and enforcement are not ARARs for the CERCLA actions confined to the Site.

### 6. Project Schedule

The implementation of Alternative 3, excavation of waste from the Site and disposal at a newly constructed waste disposal repository at the Red Rocks Landfill disposal facility, will take approximately six to eight years to reach completion, not including the revegetation and erosion control to restore the Site following waste removal. The removal action will be carried out in two phases. The following table provides the timeframes estimated for each phase.

| Phase | Description | Estimated Duration (Years) |
|---|---|---|
| 1 | Permitting and Construction of the Red Rocks Disposal Facility | 1-3 |
| 2a | Removal of Waste from the Site and Transport and Disposal at the Red Rocks Disposal Facility | 4-5 |
| 2b | Establish Vegetation and Control Erosion | 5-6 |

### B. Estimated Costs

The total cost for Alternative 3 is estimated to be $182.5 million or $182 per cubic yard. This cost assumes the Red Rocks Landfill disposal facility would be responsible for the long-term maintenance of the wastes it receives. Restoration at the Quivira Mines site is estimated at 10 years of erosion repairs and inspections and 30 years of vegetation surveys and maintenance of revegetation efforts. These timeframes may be revised, as needed, based on the design. A breakdown of the major cost categories associated with implementing Alternative 3 for the site is presented in Table 3.

**Table 3. Alternative 3 Cost Breakdown**

| Cost Component | Alternative 3 |
|---|---|
| Estimated Excavated Surface Area (Acres) | 62.9 |
| Estimated Excavated Volume (Bank Cubic Yards) | 1,005,500 |
| Estimated Excavated Volume (Loose Cubic Yards) | 1,256,875 |
| **Direct Capital Costs** | |
| Field Overhead and Oversight | $7,552,000 |
| General Site Work | $156,000 |
| Earthwork | $14,626,000 |
| Transportation and Disposal | $126,180,000 |
| **Subtotal Direct Capital Costs** | $148,515,000 |
| Indirect Capital Costs | $8,965,000 |
| **Subtotal Capital Costs** | $157,480,000 |
| Capital Cost Contingency (15%) | $23,622,000 |
| **Total Capital Costs** | $181,102,000 |
| **Maintenance Costs** | |
| Present Worth of 10 and 30 Years of Maintenance (Depending on Activity) at a Discount Rate of 7% | $1,148,000 |
| Contingency Allowance (25%) | $287,000 |
| **Total Present Worth Maintenance Cost** | $1,435,000 |
| **Total Cost** | **$182,537,000** |

USEPA currently has approximately $87 million in the Site's special account which it intends to use to perform this removal action. The Site's existing special account funds originated from the Tronox bankruptcy settlement. Kerr-McGee Corporation, which conducted exploration and development of the CR-1 and CR-1E mines, is a PRP as a former owner and/or operator of the Site from the 1970s through 1983. In the early 2000s, Kerr-McGee Corporation separated its oil and gas assets from its legacy liabilities and renamed the company holding the legacy liabilities, Tronox, Inc. Anadarko Petroleum Corporation acquired Kerr-McGee Corporation's oil and gas assets in 2006 and Tronox filed

for bankruptcy in 2009. During Tronox's bankruptcy proceedings, the United States, Navajo Nation, and other parties intervened seeking response costs for environmental cleanups at sites formerly operated by Kerr-McGee Corporation, alleging that Tronox had fraudulently transferred assets so it would be unable to pay to resolve its environmental liabilities. In November 2014, the U.S. District Court for the Southern District of New York approved a settlement agreement to resolve fraudulent conveyance claims against Kerr-McGee Corporation and related subsidiaries of Anadarko Petroleum Corporation (see In re Tronox Inc., No. 09-10156 (Bankruptcy, Southern District of New York, Nov. 23, 2010)). As part of the 2014 Tronox settlement, USEPA received $91.5 million to clean up the Quivira Mines site. Of those funds, approximately $87 million remain.

## VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Given the Site conditions, the nature of the hazardous substances documented at the Quivira Mines site, and the potential exposure pathways to nearby populations described in Sections III and IV above, actual or threatened releases of hazardous substances from the Site will continue to present an imminent and substantial endangerment to public health or welfare or the environment. Unless the removal action selected in this Action Memorandum is implemented, migration of hazardous substances off-site and potential exposure will continue, and interim actions will be required to control such migration and exposure.

## VIII. OUTSTANDING POLICY ISSUES

No outstanding policy issues with respect to the Site or this removal action have been identified.

## IX. ENFORCEMENT [3]

Information concerning enforcement considerations is provided in the Confidential Enforcement Addendum.

## X. RECOMMENDATION

This decision document represents the selected removal action for the Quivira Mines site, located in the Standing Rock and Coyote Canyon Chapters of the Navajo Nation and McKinley County, New Mexico, developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the criteria for a removal action defined in Section 300.415(b)(2) of the NCP and the CERCLA Section 104(c) emergency exemption from the 12-month and $2 million

[3] Direct costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rated expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only, and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual total costs from this estimate will affect the United States' right to cost recover.

limitations, and I recommend you approve the removal action and the 12-month and $2 million emergency exemption. The total project ceiling, if approved will be $183 million.

**Approve:**

BARRY BREEN

Digitally signed by BARRY BREEN
Date: 2025.01.06 13:14:22 -05'00'

Barry Breen, Principal Deputy Assistant Administrator — Date
Office of Land and Emergency Management
United States Environmental Protection Agency

**Disapprove:**

Barry Breen, Principal Deputy Assistant Administrator — Date
Office of Land and Emergency Management
United States Environmental Protection Agency

**Attachments:**

I. Index to the Administrative Record
II. Site Location, Feature, and Removal Extent Maps
III. EJScreen Community Report
IV. Applicable or Relevant and Appropriate Requirements (ARARs)
V. Response to Comments
VI. Enforcement Confidential Addendum