

# Abandoned Uranium Mine Field Survey Project

prepared for  
New Mexico Energy, Minerals and Natural Resources Department  
Mining and Minerals Division

July 18, 2008



prepared by  
**Souder, Miller & Associates**  
3451 Candelaria Rd. NE, Suite D  
Albuquerque, NM 87107  
505.299.0942



July 21, 2008

#5417514

Ms. Karen W. Garcia, Chief  
Mine Reclamation Bureau  
Mining and Minerals Division  
New Mexico Energy, Minerals & Natural Resources Department  
1220 South St. Francis Drive  
Santa Fe, NM 87505

**RE: Final Report - Abandoned Uranium Mine Field Survey Project**

Dear Ms. Garcia:

Souder, Miller & Associates (SMA) is pleased to submit the attached report summarizing the Abandoned Uranium Mine Field Survey Project. The report has been modified in accordance with comments from your agency dated July 14 and July 16, 2008.

The complete report is being scanned, and CDs containing a pdf of the report will be forwarded to you, and put on SMA's FTP site for download. The geodatabase is enclosed on CDs. Additionally, it was placed on SMA's FTP site for download.

Souder, Miller & Associates appreciates the opportunity to complete this work. If you have questions or additional comments, please call me at the number above, on my cell at 505.220.6542, or email me at [sam@soudermiller.com](mailto:sam@soudermiller.com).

Sincerely,  
**SOUDER, MILLER & ASSOCIATES**

A handwritten signature in blue ink, appearing to read 'Scott A. McKittrick', written over a light blue horizontal line.

Scott A. McKittrick, P.G.  
Senior Scientist

A handwritten signature in blue ink, appearing to read 'Reid S. Allan', written over a light blue horizontal line.

Reid S. Allan, P.G.  
Vice President/Principal Scientist

Encl.: Abandoned Uranium Mines Field Survey Project Report (three copies), GIS Database (one CD)

cc: Ms. Adela M. Duran, Associate Attorney, Comeau, Maldegen, Templeman & Indall, LLP, P.O. Box 669, Santa Fe, NM 87504-0699



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## Executive Summary

Souder, Miller & Associates (SMA) completed a field investigation of 21 abandoned uranium mine sites between January 9 and April 17, 2008 as per the contract between SMA and Comeau, Maldegen, Templeman & Indall, LLP (Comeau) dated January 16, 2008. The sites were located primarily in Cibola and McKinley Counties, with several outliers in Sandoval County and Socorro County. Site information was collected in order to allow prioritization of sites for potential reclamation activities.

Information collected included existing mine features (pits, piles, shafts, adits, structures, etc.), a radiological survey, land use (human, grazing), vegetation, soils, topography, wildlife, and hydrology information. Locations were determined using a global positioning system (GPS) survey, with field information collected on field sheets and entered into the GPS data dictionary. Digital photos of site features were collected.

Information collected during the field investigation is summarized in this report, and is also compiled in a geospatial database. These two items are the primary deliverables of the study.

## Introduction

This evaluation of 21 abandoned uranium mining sites (shown in Figures 1 through 4) was conducted pursuant to the contract between SMA and Comeau, and under the oversight of the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department. Field work was completed in January through April, 2008. The goal of the mine evaluation is to provide preliminary data for MMD to rank the sites based on relative risk to human health and the environment. There are two primary deliverables for this study: this written summary report and a geospatial database of all site field data and other research.

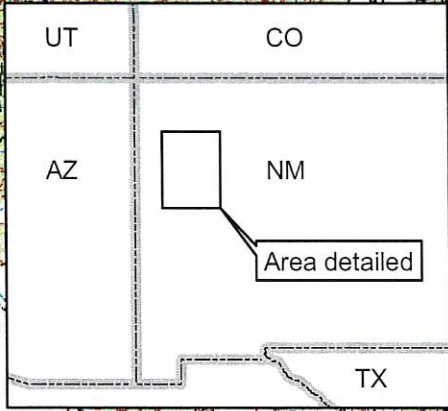
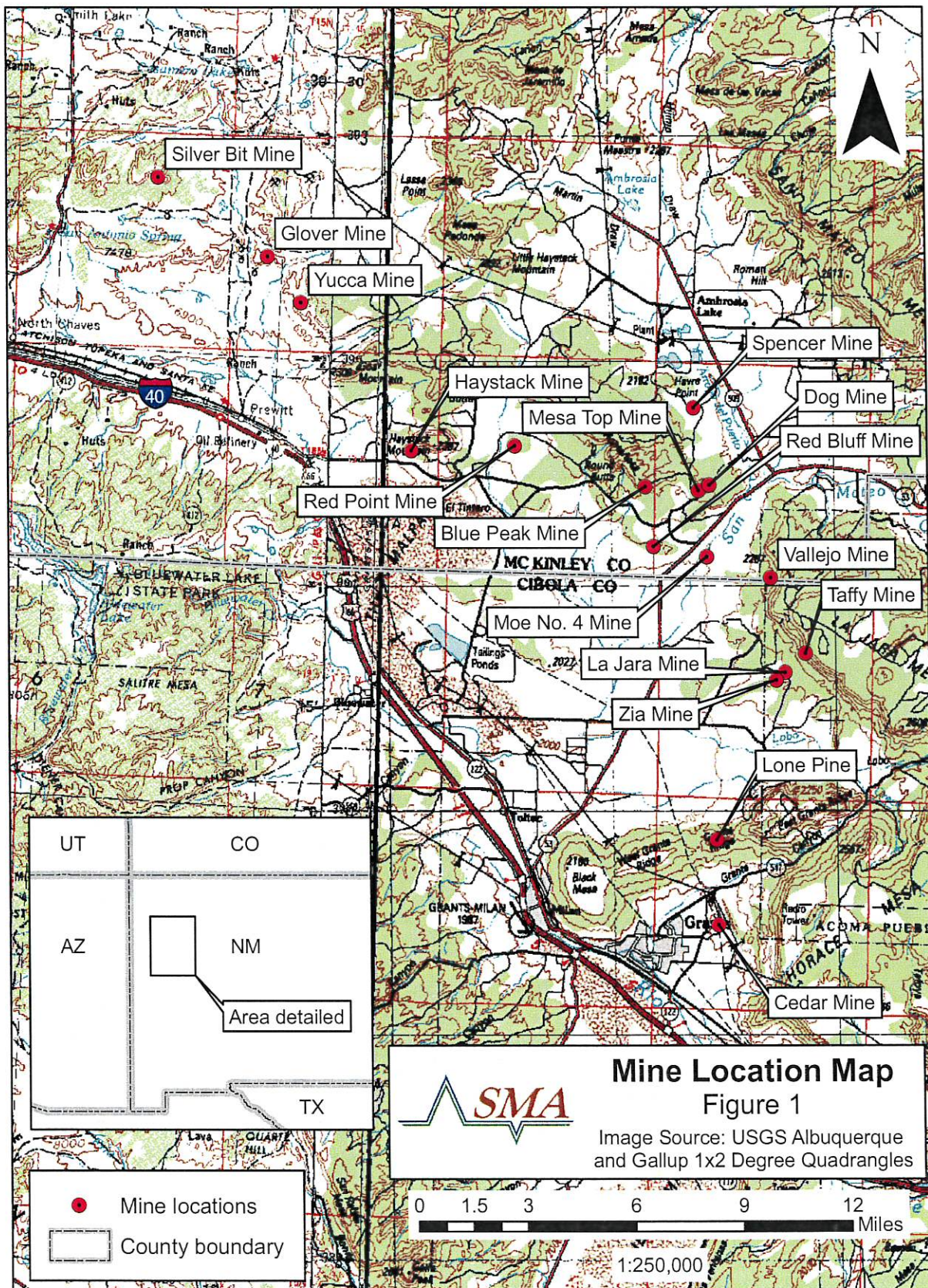
Areas of site disturbance ranged from less than one acre to tens of acres. Mine features observed included road cuts, shafts, adits, pits, ponds, and rock piles. Structures included headframes, loading structures, tanks, electrical components, steel structures, and others. Background radiation levels were generally between 10 and 20  $\mu\text{R}/\text{hour}$ , with impacted readings as high as 1,800  $\mu\text{R}/\text{hour}$ .

## Scope of Services

SMA's scope of services included the following:

### Health and Safety Plan

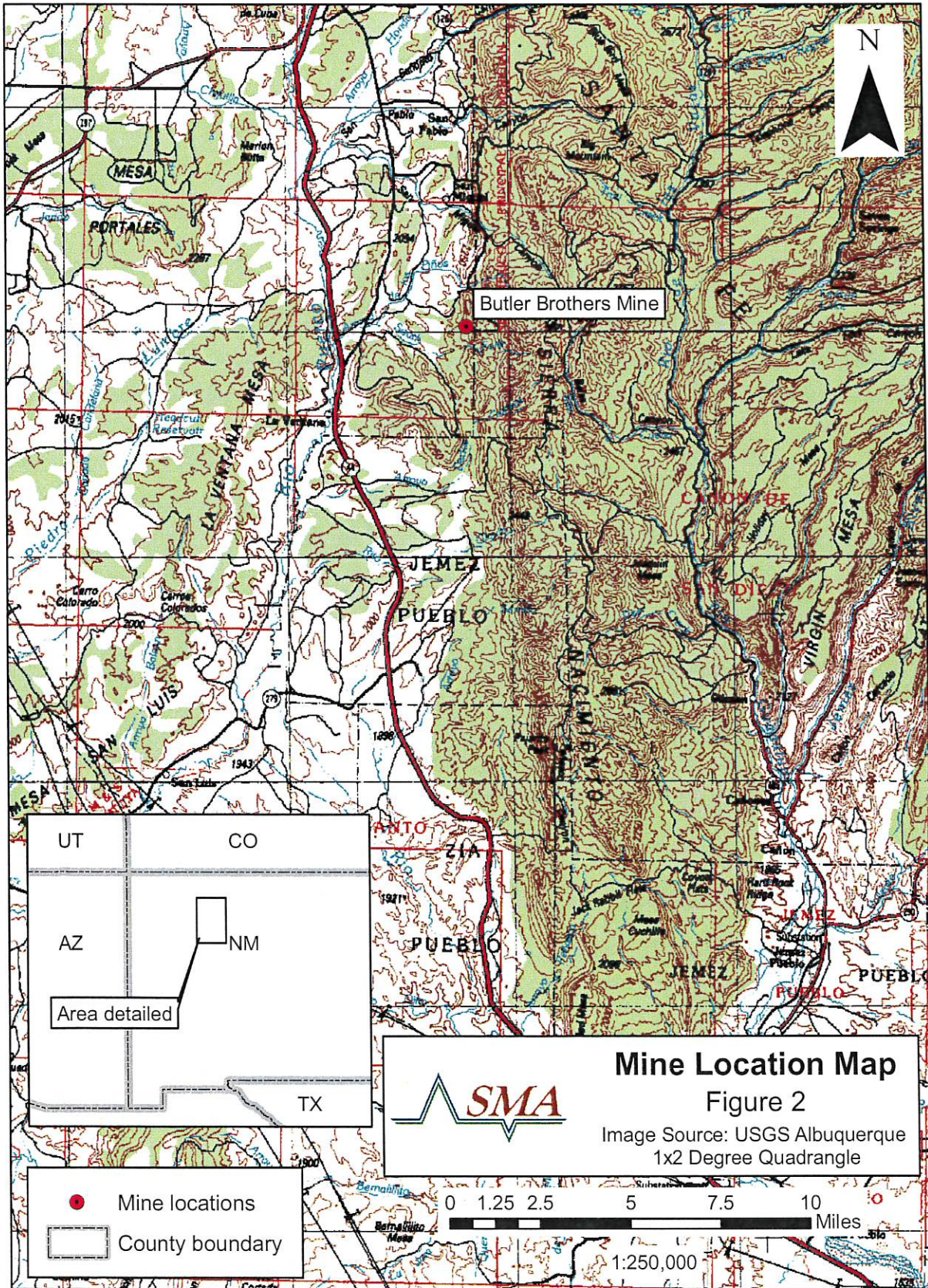
Prior to the commencement of field work, a field task-specific health and safety plan (HASP) was developed in accordance with applicable requirements (OSHA), the SMA Health and Safety program, and any applicable Agency safety requirements. A copy of the HASP is included in Appendix 1 to this report.



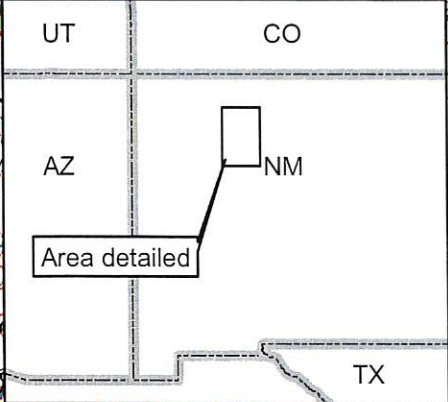
- Mine locations
- County boundary

**Mine Location Map**  
 Figure 1  
 Image Source: USGS Albuquerque and Gallup 1x2 Degree Quadrangles

0 1.5 3 6 9 12 Miles  
 1:250,000



Butler Brothers Mine

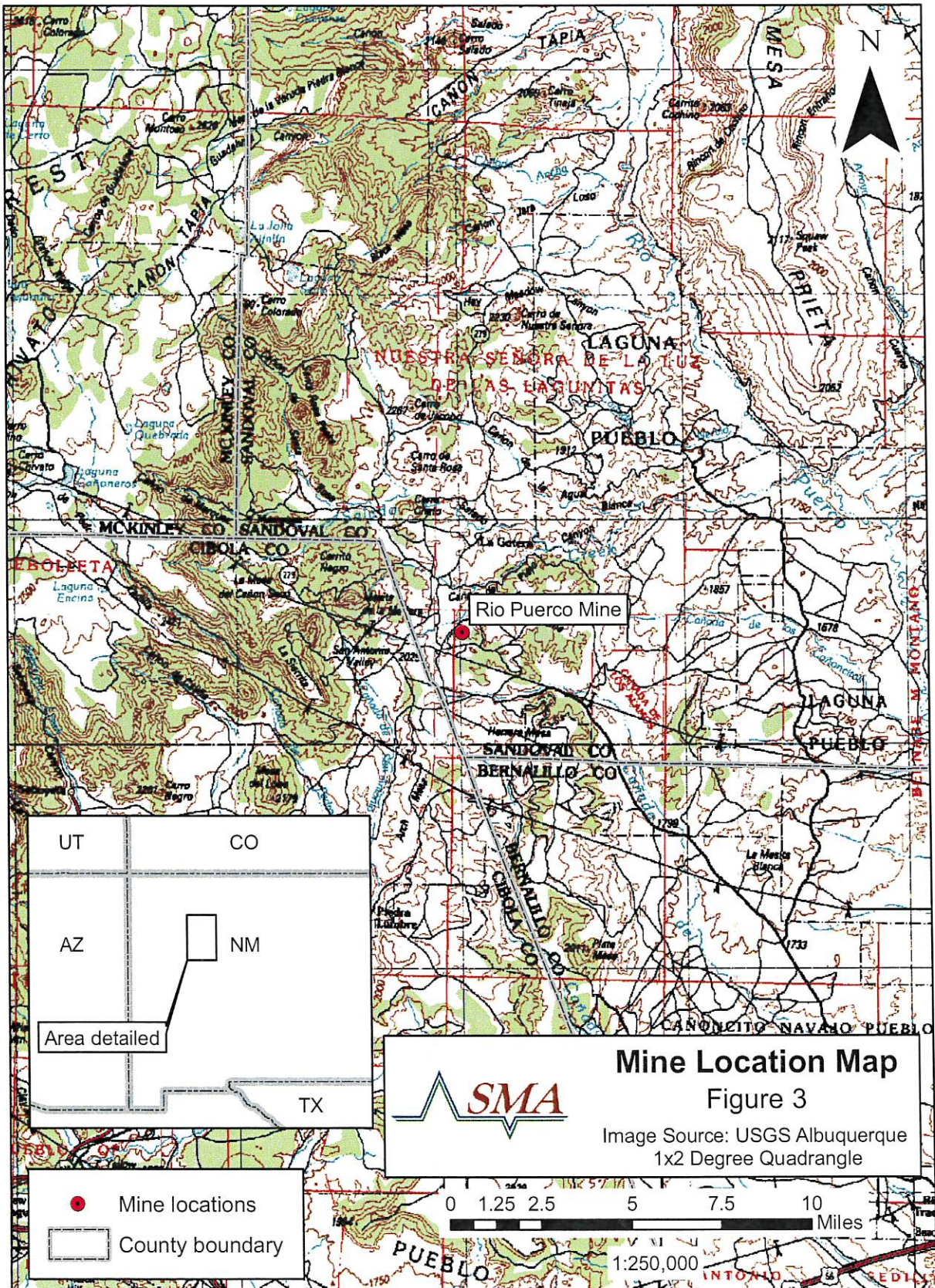


**SMA**  
**Mine Location Map**  
 Figure 2  
 Image Source: USGS Albuquerque  
 1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary

0 1.25 2.5 5 7.5 10 Miles

1:250,000



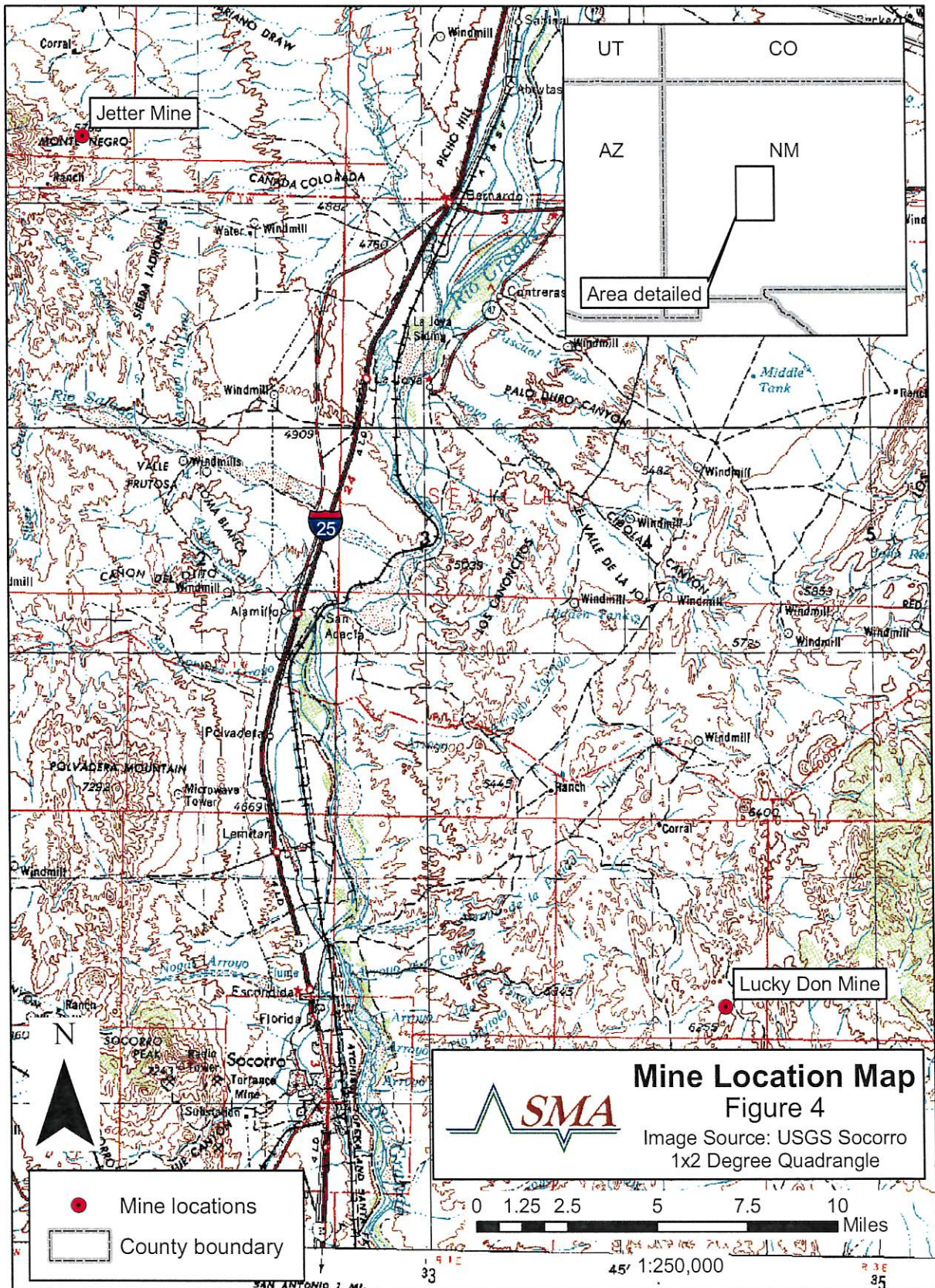
**Mine Location Map**  
Figure 3

Image Source: USGS Albuquerque  
1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary

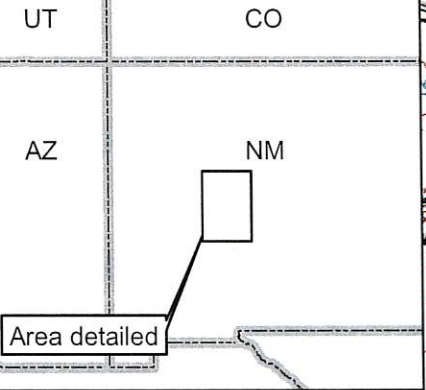
0 1.25 2.5 5 7.5 10 Miles

1:250,000



Jetter Mine

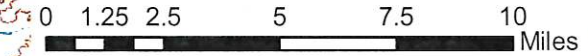
Lucky Don Mine



- Mine locations
- ▭ County boundary



**Mine Location Map**  
**Figure 4**  
 Image Source: USGS Socorro  
 1x2 Degree Quadrangle



SAN ANTONIO 3 MI.

45° 1:250,000

33

35

R 3E



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## Agency Notification

SMA notified, where appropriate, State and Federal land management agencies prior to field visits to allow Agency staff to accompany SMA staff. SMA was able to give at least a two business days (48 hour) notice.

## Field Inspections and Data Collection

SMA developed and submitted a standardized data collection form prior to the start of the field work activities. Copies of the completed data collection forms are included in with each site summary. Field data locations were collected using a Trimble GPS Pathfinder Pro XRS receiver with sub-meter accuracy and data logging capability. Radiological survey information was collected using a state-of-the-art Ludlum Model 19 Micro-R meter.

## Data Collection Reporting

A total of 21 sites were evaluated. Two sites that were originally requested by MMD were not evaluated. The United Western site was determined to be on private land, and is therefore not included in the written summaries. The Westwater site was not evaluated due to lack of access to the site.

Written site summaries have been compiled and are included in this report. The site summaries include all data collected, as well as representative photos and site maps, and copies of field notes.

Data collected has been entered into a geospatial database compatible with ESRI ArcGIS, including attribute tables for all collected data and georeferenced digital photos. An electronic copy of the database has been submitted under separate cover.

## Field Data Collection Methodology

SMA field staff collected the following information during field survey activities:

- 1) GPS survey of the entire site including:
  - a. rock piles (type of rock, i.e. waste rock, ore stockpile, etc. not delineated)
  - b. mine features
  - c. adits
  - d. shafts
  - e. buildings
  - f. perimeter of disturbed area
  - g. perimeter of rock piles
  - h. buildings

SMA used a Trimble GPS Pathfinder Pro XRS receiver to locate and record data points.

The extent of disturbance was not delineated at each mine. Numerous mines were made up of cuts into the side of mesas, thus disturbance was limited and topography

did not allow field staff to walk the disturbance perimeter. The determination of the extent of the disturbance area at some mines was extremely subjective, and therefore not recorded.

- 2) Human activity: SMA documented any noted human activity, including vehicle tracks, paths, trash, etc. Additionally, SMA documented the nearest residence within a one mile search radius either in the field or through aerial photo review.
- 3) Photo documentation: Site photographs were collected using a digital camera. Characteristic photos are included in the site summaries. All photos obtained are included in the geospatial database.
- 4) Radiological survey: SMA used a Ludlum Model 19 Micro-R meter for radiological data collection. This meter is appropriate for the reconnaissance-level survey conducted, with a total range of 0-5,000  $\mu\text{R/hr}$ .

Where possible, SMA conducted the radiological survey on a regular grid. Several sites had topography which did not allow survey on a grid (specifically, sites which were cut into hillsides, that were too steep to access, or included steep-sided pits). These sites included Blue Peak, Haystack, Lone Pine, Lucky Don, Silver Bit, and Taffy.

The initial step of the radiological survey at each site was to run two perpendicular lines of preliminary collection points across the widest portion of each site. Based on radiological readings collected, SMA then determined if the grid covered all areas of elevated radiological readings, and the appropriate grid spacing. The remainder of the grid was then surveyed. Radiological measurements were collected at each point at ground level and 4 feet from ground level. Where steep slopes did not allow access, field personnel collected readings where possible.

“Background” radiation is generally considered by MMD to be the naturally occurring conditions, which have not been impacted by mining activities. At the sites, background radiation levels were collected in locations outside of obvious disturbance, or on the margin of disturbed areas in an up-wind direction. SMA did not conduct a statistical review of radiation data to confirm background values.

- 5) Vegetation at the site was described and included the following information:
  - a. General life form description of vegetation, for example, if woody species, grasses, forbs, if native, exotic or weedy species. Percent coverage was estimated based on visual observation.
  - b. Evidence of vegetation die off
  - c. Evidence of grazing
- 6) Soils: Soil descriptions were collected using the applicable USDA Soil Survey and field evaluation where necessary.



- 7) Wildlife: Description of sighted or evidence of wildlife within the mine sites was collected and is included in the written summary and geospatial database.
- 8) Land use information collected included the following items:
  - a. Grazing, cattle, sheep, etc
  - b. Agricultural areas in proximity
  - c. Identification of roads, corrals, or fences and evidence of use
- 9) Topographic features: Items noted were roads, water courses, terrain, and significant topographic features in the immediate area.
- 10) Hydrogeologic information: SMA conducted a search of the New Mexico Office of the State Engineer iWaters database for well records within a one-mile search radius of each site. Descriptions of well locations and depths to water are compiled in the written report. The geospatial database includes the iWaters database information.

### **Site Summaries**

Site summaries, including site maps depicting features, and field notes, are included here.

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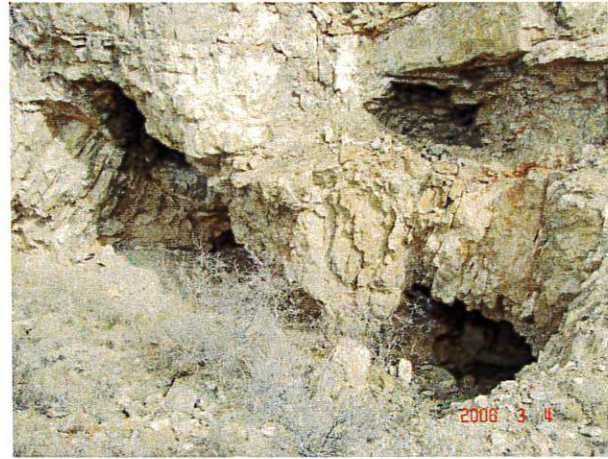
## Lucky Don Mine

- 1. Location/Land Status:** The Lucky Don Mine is on BLM land in Section 35, T2S, R2E on the USGS Bustos Well quadrangle. Access to the site via the BLM Back Country Bi-Way and Loma de las Canas was not possible. Access was gained by traveling the BLM Back Country Bi-Way until its intersection with US 380. From US 380, travel north approximately 7 miles until reaching the end of WSMR P Route 5, then travel by foot approximately 1.2 miles to the mine.
- 2. Human Activity:** No evidence of human activity beyond historical mining was noted.
- 3. Radiological Survey:** The radiological survey consisted of four transects: three rectangular, arrayed along the main workings, and one circumference around entire working slope. Radiological survey results were as follows: ground surface maximum of 320  $\mu\text{R}/\text{hour}$  and minimum of 11  $\mu\text{R}/\text{hour}$ . Four-foot elevation maximum was 180  $\mu\text{R}/\text{hour}$  and minimum was 0  $\mu\text{R}/\text{hour}$ . Background radiation levels are approximately 14  $\mu\text{R}/\text{hour}$ .
- 4. Mine Disturbance:** The Lucky Don Mine is characterized by mine workings cut into the hillside of volcanic conglomerate approximately 60 feet above the arroyo. There is a large wooden load-out structure (15 ft. wide by 40 ft. tall) on the northwest face of the slope. This area contained the highest radiological readings at 320  $\mu\text{R}/\text{hour}$  at the surface. Other structures include a small powder box and a small tool shed. Striking into the slope of the main workings are two small adits: the eastern-most is approximately 12 ft. x 14 ft. x 10 ft. deep, and the western is approximately 6 ft. x 10 ft. x 8 ft. deep.
- 5. Plant Community:** The surrounding area is characteristic chaparral with grasses, yucca, Spanish sword, ocotillo, cacti, and sporadic juniper trees. The vegetation on-site is all but non-existent: 10% grasses, 10% forbs, and 80% bare earth.
- 6. Soils:** Site soils are Tanbark-rock outcrop, 35 to 80 percent slopes, 0 to 2 inches fine sandy loam, 2 to 14 inches Gypsiferous material, 14 to 60 inches bedrock.
- 7. Wildlife:** There were numerous signs of wildlife observed in the area, including: pronghorn, deer, wild horse, fox, coyote, bear, rabbit, lizards, and numerous rodents.
- 8. Land Use:** Land use at the mine includes light grazing.
- 9. Off-Site Impacts:** No off-site impacts were noted.
- 10. Topographic Features:** The site is cut into the side of a hill. No major erosional features were noted.
- 11. Hydrogeology:** Based on a review of the NMOSE iWaters database, there are no well records within a one mile search radius. The nearest well to the site with a recorded depth to water is approximately 3 miles to the southeast, with a depth to water of 170 feet.

The nearest surface water drainage feature is approximately one-tenth of a mile north of the site.



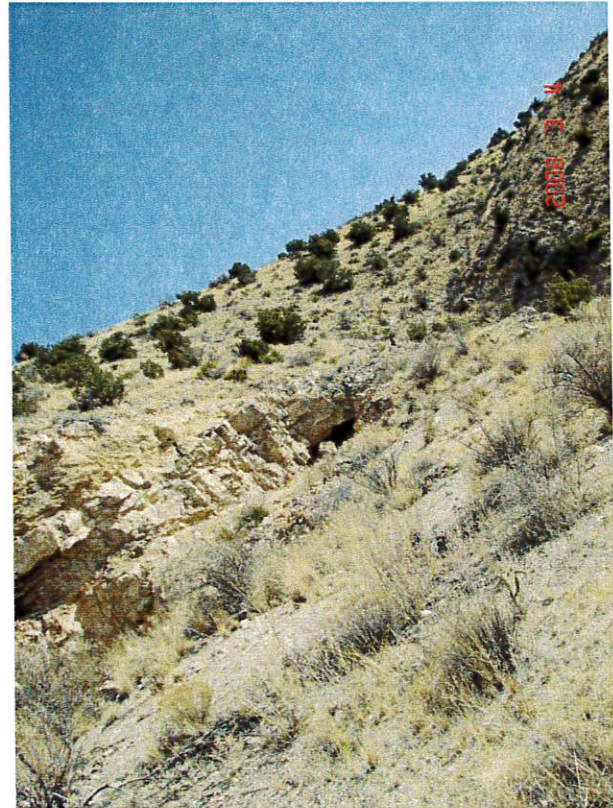
View east across cut



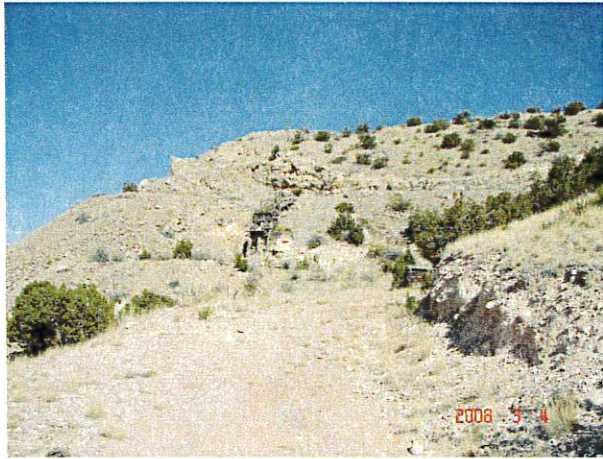
View south into adit



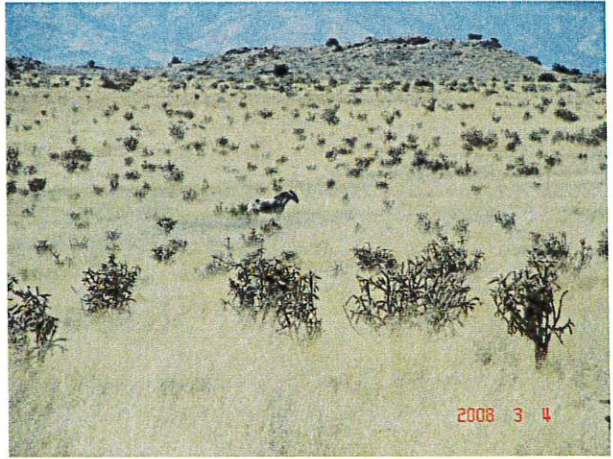
Loading chute



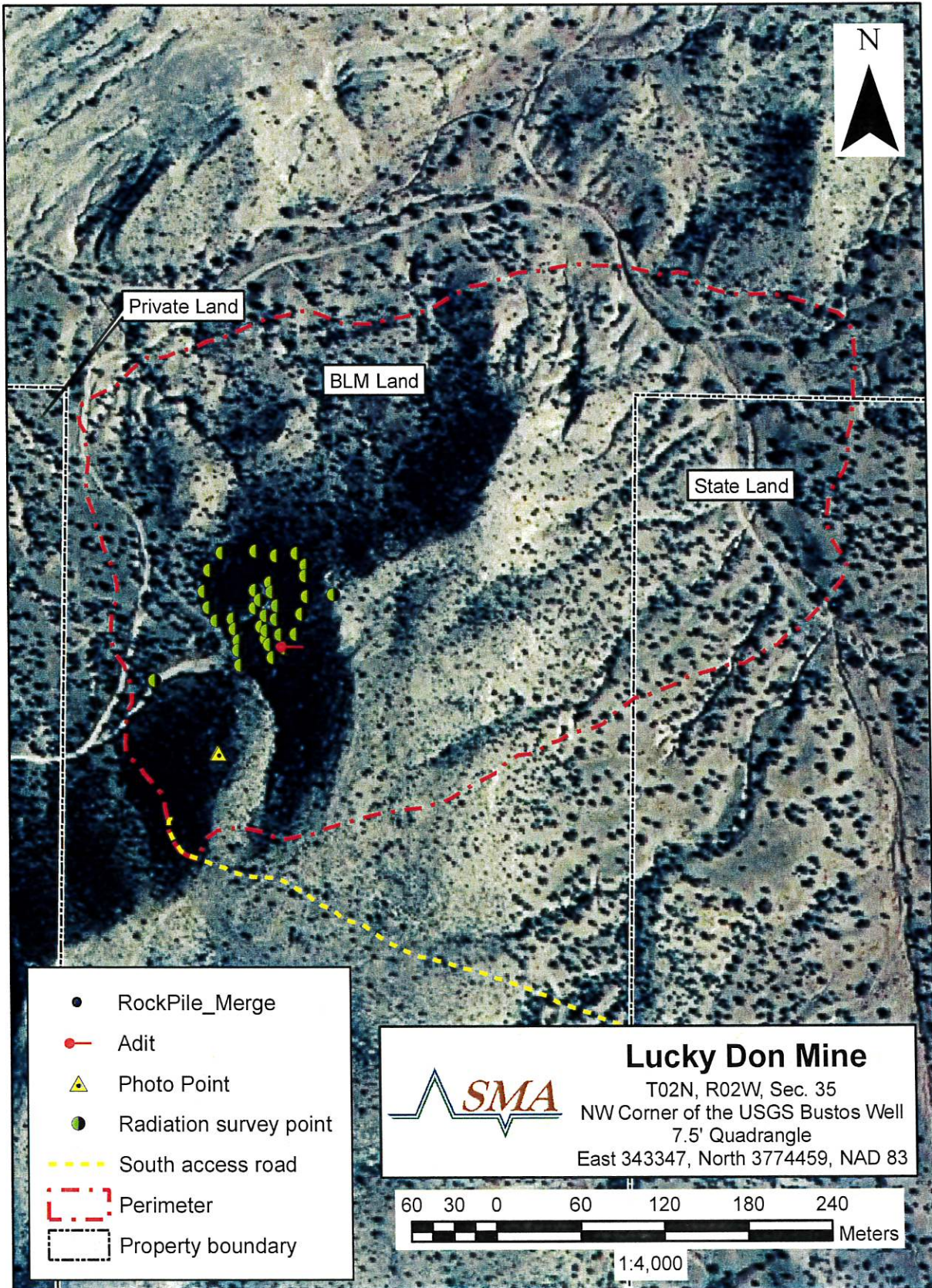
Adit



View east to loading chute



Wild horse



AUM Field Survey Data Sheet

Site NMSD0142

Lucky Don (Socorro)

|                         |                             |               |                        |
|-------------------------|-----------------------------|---------------|------------------------|
| Date<br><u>01/09/08</u> | Time On-Site<br><u>1420</u> | Time Off-Site | By <u>Brian / Bill</u> |
|-------------------------|-----------------------------|---------------|------------------------|

Weather Conditions: Sunny - 50° F Wind 0-5 mph

| Disturbances           | GPS# | Description                                      | Dim/Area/Volume       | Photo #'s |
|------------------------|------|--|-----------------------|-----------|
| Shafts                 |      |  |                       |           |
| Adits                  |      | 1) 12' x 14' x 10' deep<br>2) 6' x 10' x 8' deep |                       |           |
| Pits                   |      |  |                       |           |
| Waste Rock Dumps       |      |  |                       |           |
| Tailings               |      |  |                       |           |
| Trenches               |      |  |                       |           |
| Roads                  |      |  |                       |           |
| Erosional Features     |      |  |                       |           |
| Structures / Equipment | GPS# | Description                                      | Dimensions            | Photo #   |
| Buildings              |      | <u>loadout</u>                                   | <u>15' x 40' tall</u> |           |
| Headframes             |      |  |                       |           |
| Equipment              |      |  |                       |           |

N 3774381

E 343187

## AUM Field Survey Data Sheet

Site NMS00142Lucky DV

| Equipment   |      |  |                  |         |
|---|------|--|------------------|---------|
| <b>Soils</b>  | GPS# | Description  | Extent           | Photo # |
|   |      |  |                  |         |
| <b>Vegetation</b>   | GPS# | Description  | Extent           | Photo # |
|   |      | chaparral<br>10% grasses<br>10% forbs 80% bare                                     |                  |         |
| <b>Wildlife</b>   | GPS# | Description  |                  | Photo # |
|   |      | antelope, deer, wild horse, fox, coyote.<br>(sign), bear, rabbit, lizards, rodents |                  |         |
| <b>Human Activity</b><br>(non-mining, w/in 0.5 mi of site)                | GPS# | Description  | Extent           | Photo # |
|   |      |  |                  |         |
| <b>Land Use</b> (grazing, agricultural, roads, etc., w/in 0.5 mi of site) | GPS# | Description  | Extent           | Photo # |
|   |      | light grazing  |                  |         |
| <b>Nearby Residences / Wells</b> (w/in 0.5 mi of site)                    | GPS# | Description  | Distance to Site | Photo # |
|   |      |  |                  |         |
| <b>Topographic Features</b><br>(roads, water courses, etc.)               | GPS# | Description  |                  | Photo # |

AUM Field Survey Data Sheet

Site NMS00142

| Radiological Survey |                  |                 |                |
|---------------------|------------------|-----------------|----------------|
| GPS#                | Description      | Reading Surface | Reading 4 feet |
| 2                   | Base of tailings | 40 mV           |                |
| 4                   | " "              | 28              |                |
| 5                   | " "              | 28              |                |
| 6                   | " "              | 17              |                |
| 7                   | " "              | 17              |                |
| 8                   | " "              | 32              | 28 $\mu$ R/hr. |
| 9                   | " "              | 19              | 17             |
| 10                  | working level    | 16              | 13             |
| 11                  | above workings   | 11              | 11             |
| 12                  | "                | 14              | 11             |
| 13                  | "                | 11              | 11             |
| 14                  | "                | 21              | 19             |
| 15                  | "                | 18              | 23             |
| 16                  | "                | 22              | 26             |
| 17                  | "                | 19              | 24             |

|    |                               |     |     |
|----|-------------------------------|-----|-----|
| 18 | WORKING LEVEL, TOP WASTE      | 90  | 110 |
| 19 | WKG. LEVEL, TOP OF LOADER     | 95  | 100 |
| 20 | WKG. LEVEL, TOP OF WASTE PILE | 170 | 110 |
| 21 | WKG. LEVEL, TOP OF WASTE PILE | 90  | 70  |
| 22 | WKG. LEVEL, BASE OF WALL      | 70  | 40  |
| 23 | "                             | 28  | 30  |
| 24 | " (ADIT)                      | 32  | 34  |
| 25 | " (ADIT)                      | 48  | 130 |
| 26 | "                             | 100 | 110 |
| 27 | " (ADIT)                      | 24  | 24  |

AUM Field Survey Data Sheet

Site NMS08142 Lucky Don

| Radiological Survey |                  |                 |                |
|---------------------|------------------|-----------------|----------------|
| GPS#                | Description      | Reading Surface | Reading 4 feet |
| 2                   | Base of tailings | 40 mV           |                |
| 4                   | " "              | 28              |                |
| 5                   | " "              | 28              |                |
| 6                   | " "              | 17              |                |
| 7                   | " "              | 17              |                |
| 8                   | " "              | 32              | 28 $\mu$ R/hr. |
| 9                   | " "              | 19              | 17             |
| 10                  | working level    | 16              | 13             |
| 11                  | above workings   | 11              | 11             |
| 12                  | "                | 14              | 11             |
| 13                  | "                | 11              | 11             |
| 14                  | "                | 21              | 19             |
| 15                  | "                | 18              | 23             |
| 16                  | "                | 22              | 26             |
| 17                  | "                | 19              | 24             |

|    |                               |     |     |
|----|-------------------------------|-----|-----|
| 18 | WORKING LEVEL, TOP WASTE      | 90  | 110 |
| 19 | WKG. LEVEL, TOP OF LOADER     | 95  | 100 |
| 20 | WKG. LEVEL, TOP OF WASTE PILE | 170 | 110 |
| 21 | WKG. LEVEL, TOP OF WASTE ALG  | 90  | 70  |
| 22 | WKG. LEVEL, BASE OF WALL      | 70  | 40  |
| 23 | "                             | 28  | 30  |
| 24 | " (ADIT)                      | 32  | 34  |
| 25 | " (ADIT)                      | 48  | 130 |
| 26 | "                             | 100 | 110 |
| 27 | " (ADIT)                      | 24  | 24  |

## AUM Field Survey Data Sheet

Site AUM Lucky Don 2008-3-4

| Radiological Survey |                         |                 |                |
|---------------------|-------------------------|-----------------|----------------|
| GPS#                | Description             | Reading Surface | Reading 4 feet |
|                     | Loadout ✓               |                 |                |
| G0                  | Rad survey background ✓ | 14              | 14             |
| G1                  | Rad survey ✓            | 140             | 130            |
| G2                  | "                       | 90              | 100            |
| G3                  | "                       | 80              | 80             |
| G4                  | "                       | 250             | 110            |
| G5                  | " ✓                     | 40              | 36             |
| G6                  | " ✓                     | 110             | 100            |
| G7                  | "                       | 130             | 120            |
| G8                  | "                       | 320             | 180            |
| G9                  | "                       | 60              | 50             |
| G10                 | " ✓                     | 80              | 60             |
| G11                 | " ✓                     | 28              | 26             |
| G12                 | "                       | 110             | 70             |
| G13                 | "                       | 28              | 26             |
| G14                 | "                       | 48              | 48             |
| G15                 | " ✓                     | 22              | 22             |

0 JMT

