

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.

Sincerely,
SOUDER, MILLER & ASSOCIATES

A handwritten signature in blue ink, appearing to read 'Scott A. McKittrick'.

Scott A. McKittrick, P.G.
Senior Scientist

A handwritten signature in blue ink, appearing to read 'Reid S. Allan'.

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



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.

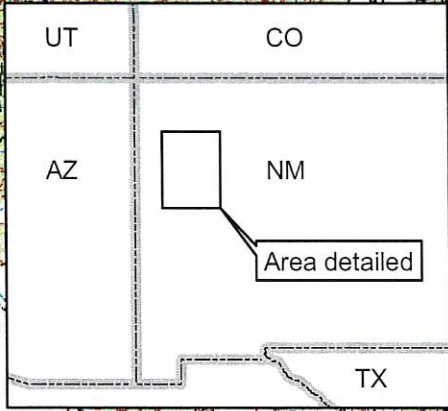
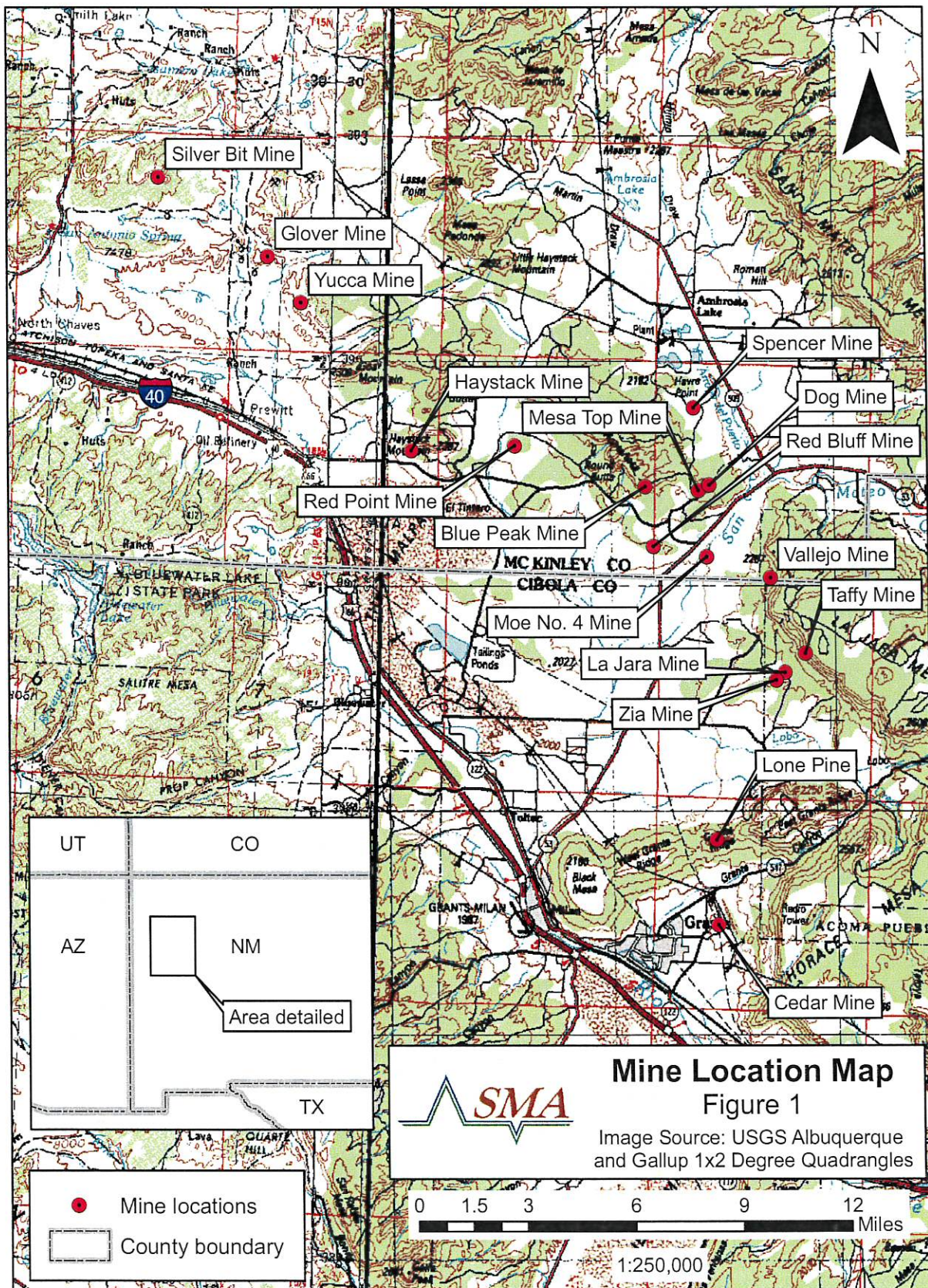
Areas of site disturbance ranged from less than one acre to tens of acres. Mine features observed included road cuts, shafts, adits, pits, ponds, and rock piles. Structures included headframes, loading structures, tanks, electrical components, steel structures, and others. Background radiation levels 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.

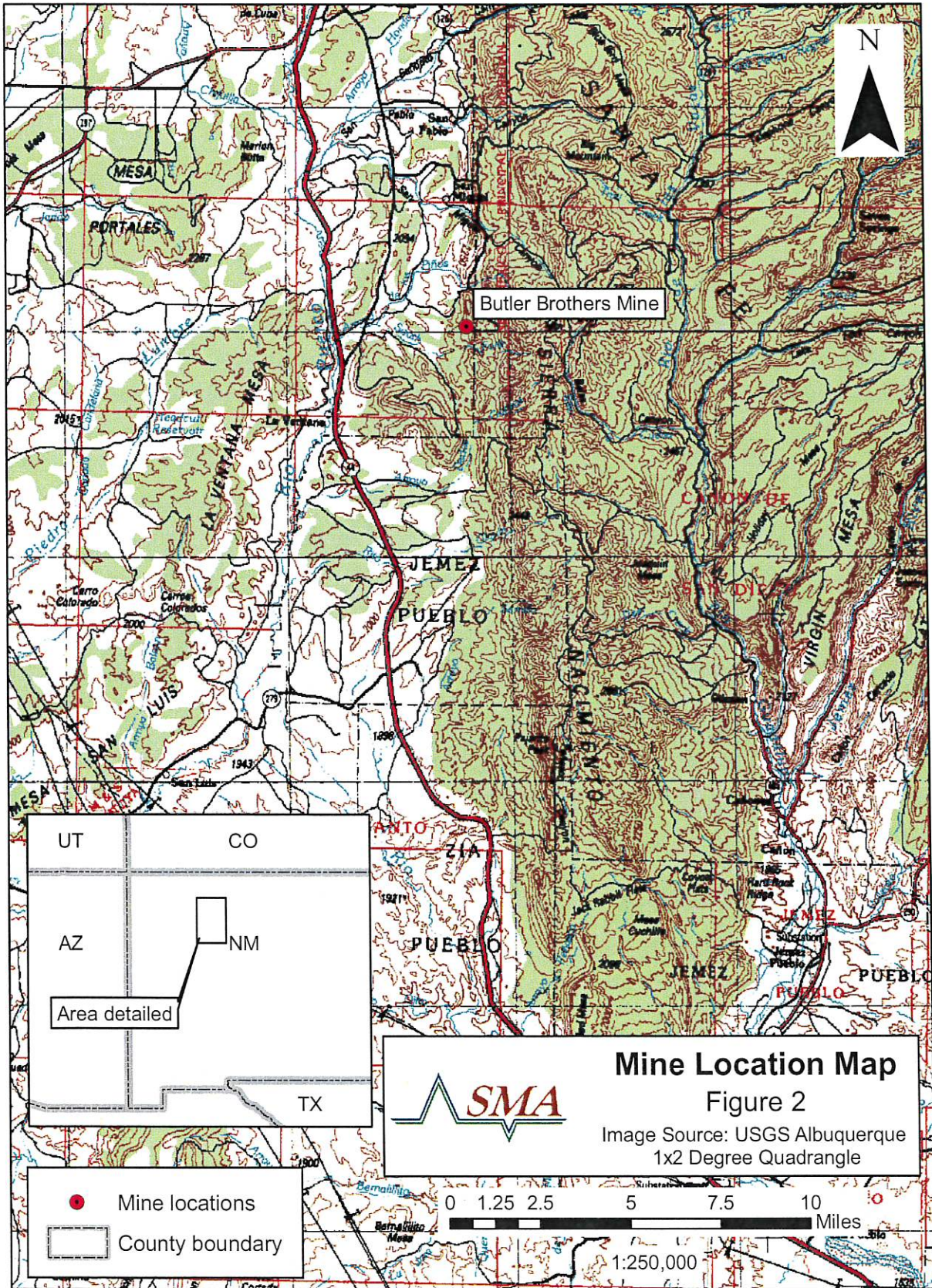


Mine Location Map
 Figure 1
 Image Source: USGS Albuquerque and Gallup 1x2 Degree Quadrangles

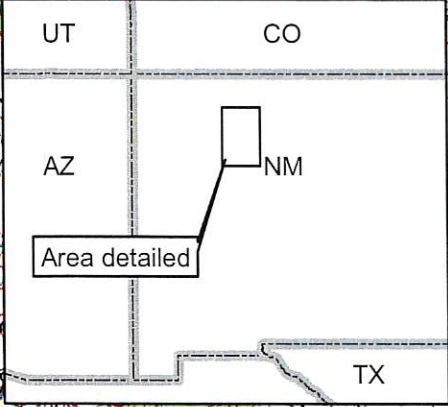
- Mine locations
- ▭ County boundary

0 1.5 3 6 9 12 Miles

1:250,000



Butler Brothers Mine

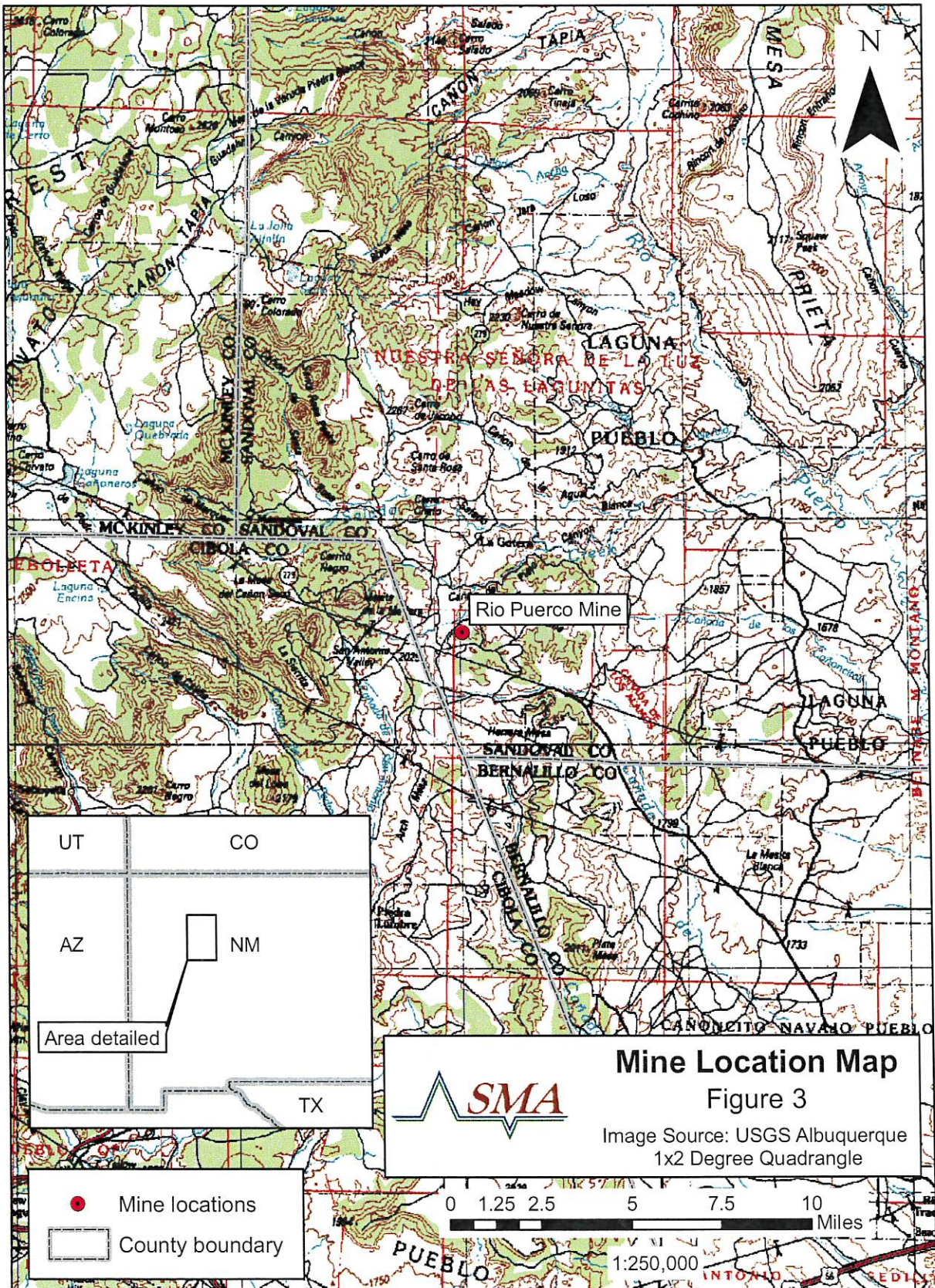


Mine Location Map
 Figure 2
 Image Source: USGS Albuquerque
 1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary

0 1.25 2.5 5 7.5 10 Miles

1:250,000

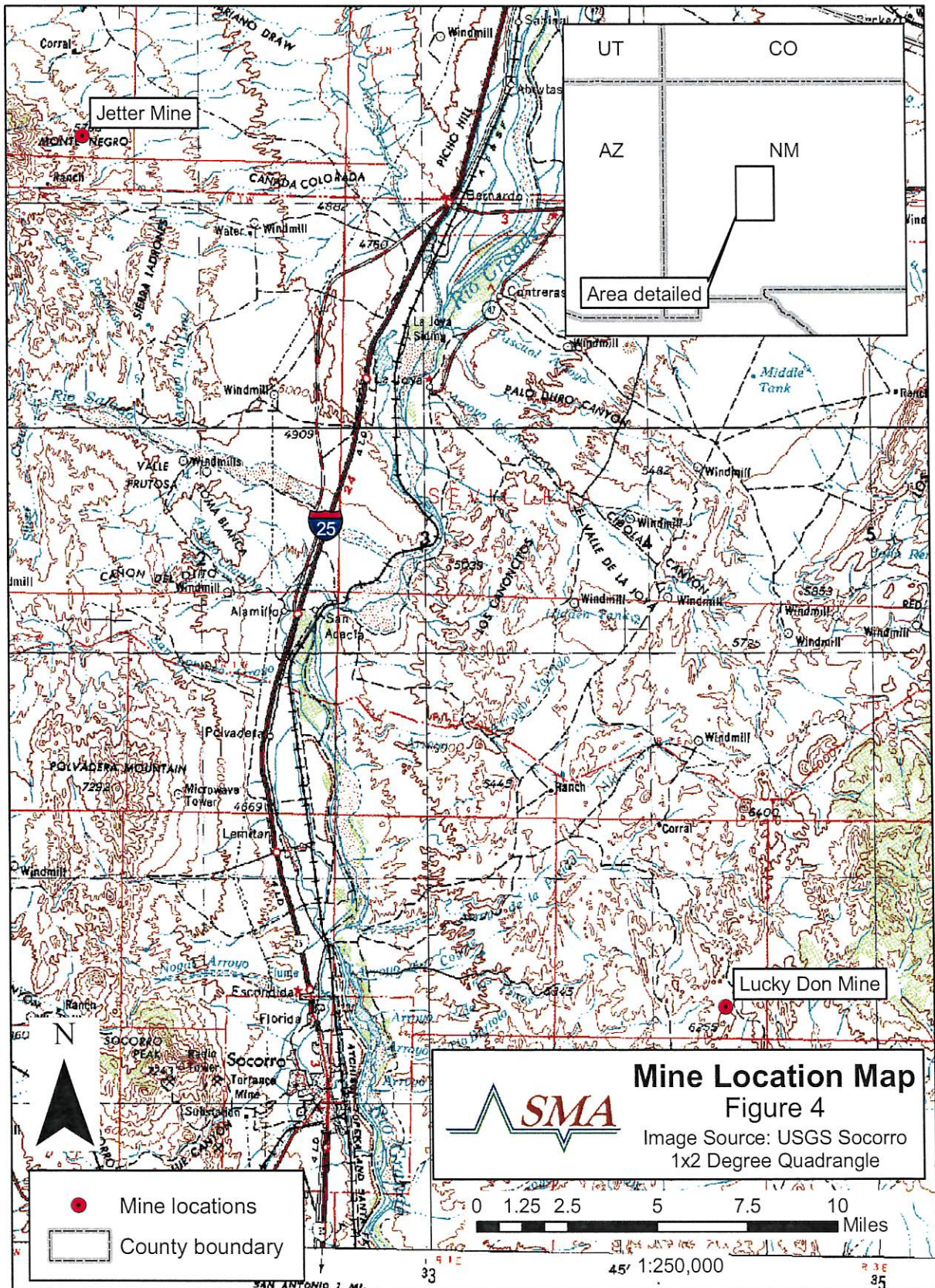


Mine Location Map
 Figure 3
 Image Source: USGS Albuquerque
 1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary

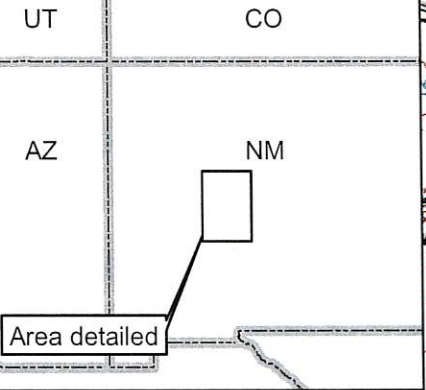
0 1.25 2.5 5 7.5 10 Miles

1:250,000



Jetter Mine

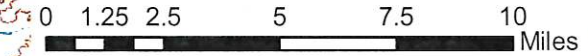
Lucky Don Mine



- 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

R 3E
35



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.



Cedar Mine

1. Location/Land Status: The Cedar Mine is located on BLM land within Section 20, T11N, R9W on the USGS Grants quadrangle (35.166602N, 107.805431W). Physical access to the mine can be gained by traveling east from Grants on East Roosevelt Ave. past the sand and gravel mining operation and onto the mesa.

2. Human Activity: The Cedar Mine is directly adjacent to an active sand and gravel mining operation operated by B-b Concrete. Trash (heavy equipment, air filters, etc.) has been discarded on-site. A buried gas pipeline crosses the site in a north-south direction. The nearest residence is approximately 1,000 feet to the east of the site.

3. Radiological Survey: Radiological survey results were as follows: ground surface maximum of 170 μ R/hour and minimum of 3 μ R/hour. Four-foot elevation maximum was 80 μ R/hour and minimum was 7 μ R/hour. Background radiation levels were approximately 10 μ R/hour.

4. Mine Disturbance: The mine consists of seven lateral exploratory cuts extending east-west an average of 1,200 feet. To the west of these cuts are two shallow pits (one approximately 180 ft. in diameter by 10 ft. deep maximum, noted as large pit in photo, the other approximately 75 ft. by 25 ft., 3 ft depth), as well as two rock piles associated with the east-west cuts on the east margin of the site. These piles are 340 and 460 feet long respectively, approximately 4 feet wide and approximately two feet thick. A pile approximately 35 feet in diameter and three feet thick exists on the east margin of the site, and a pile approximately 15 feet in diameter and 2 ft. thick is present in the center of the site.

Equipment remaining on-site includes an old truck, an engine, and what appears to be a powder box.

5. Plant Community: The surrounding vegetation is predominately grasses with the occasional juniper tree. The vegetation on site is characteristic of the surrounding area and consists of: 30% grasses, 40% forbs, 10% woody scrub, 1% non-native, and the remainder is bare earth.

6. Soils: Soils at the site are Penistaja fine sandy loam, a deep, well-drained loam, formed in wind-modified alluvium derived dominantly from sandstone.

7. Wildlife: There was no wildlife sign directly observed on this site except for rodent burrows and a possible badger hole.

8. Land Use: As discussed above, a sand and gravel operation abuts the site.

9. Off-Site Impacts: No off-site impacts were noted.

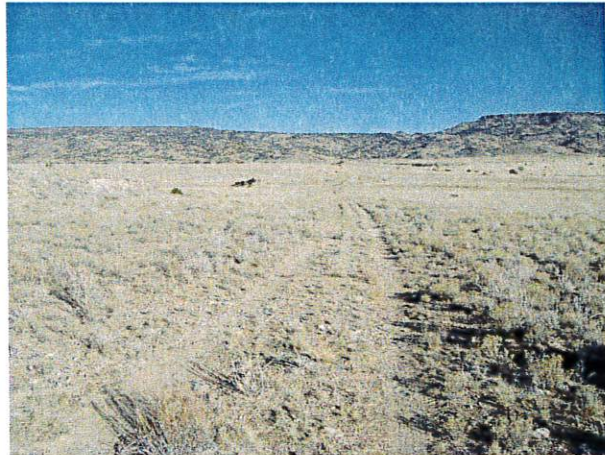
10. Topographic Features: The access road to the site is from the south. The site is flat-lying. No erosional features were noted.

11. Hydrogeology: Based on a review of the NMOSE iWaters database, there are five well records within a radius of one mile of the site. Three of these wells have depth to water data on file, with depths to water of 94, 100 and 122 ft.

The nearest surface water drainage feature is approximately 0.5 miles to the southeast.



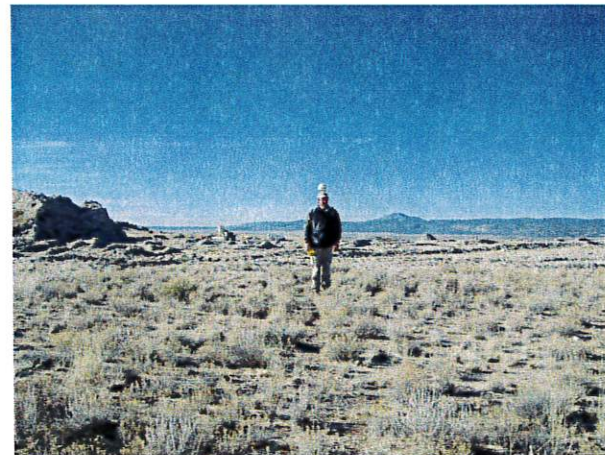
View west, pipeline marker, gravel pit in distance



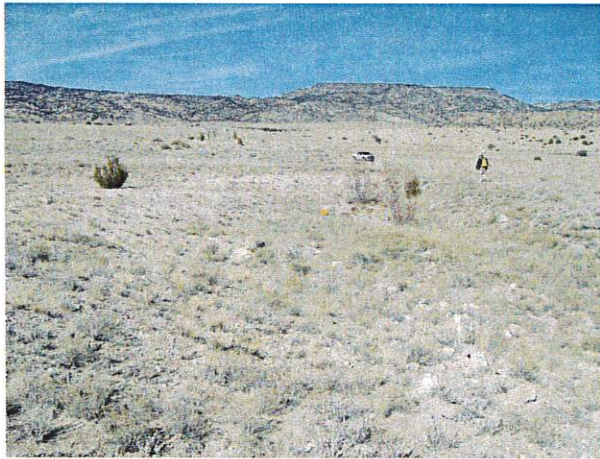
View north



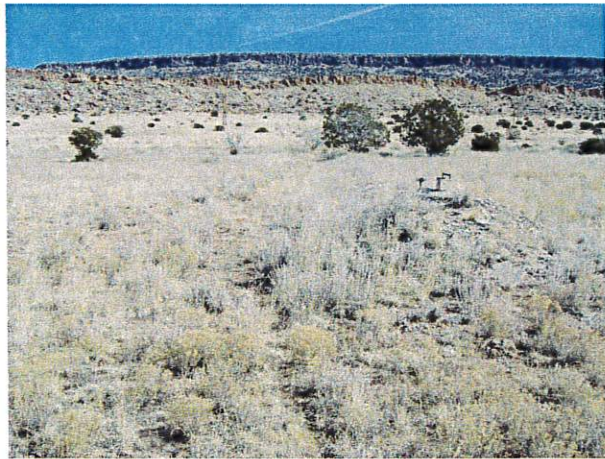
View north, pipeline, old truck



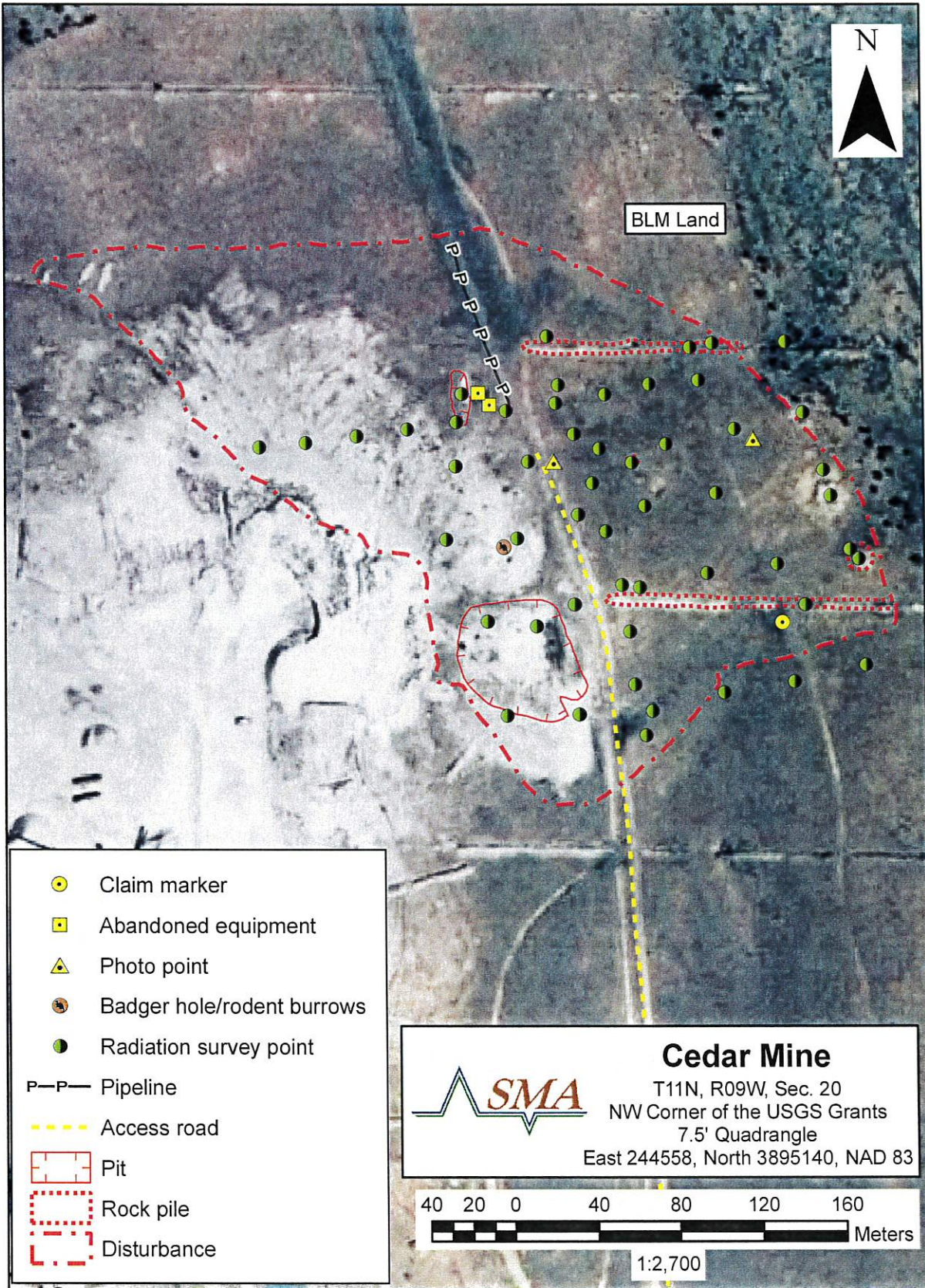
View southwest to sand and gravel op.



View of large pit



E-W rock pile



AUM Field Survey Data Sheet

Site Cedar

Page ~~10~~

1

Date 2/12/09 Time On-Site 835 Time Off-Site 1350 By KIM ROSS & BRIAN MERTZ

Weather Conditions:
clear, sunny, calm

Disturbances	GPS#	Description	Dim/Area/Volume	Photo #'s
Shafts				
Adits				
Pits	<u>29</u>	<u>suspected printer box in center</u>	<u>5' diam, 80' diam.</u>	<u>11</u>
	<u>39</u>	<u>large pit</u>	<u>70' diameter</u>	<u>20, 21, 22</u>
	<u>44</u>	<u>depression pit</u>	<u>3' deep</u>	<u>26</u>
Waste Rock Dumps	<u>33</u>	<u>blowhole cut bank e-w rock pile, near transects site</u>	<u>3' H x 400'</u>	<u>8, 9</u>
	<u>26</u>	<u>cliff pit 30x30x3'</u>	<u>20' 3' x 3'</u>	<u>10</u>
	<u>33</u>	<u>cut e-w rock pile</u>	<u>3.5' H MAX x 400'</u>	<u>16, 17</u>
	<u>36</u>	<u>waste pile w/ coarces</u>	<u>5x3</u>	<u>18</u>
Trenches				
Roads	<u>47</u>	<u>access roads</u>		<u>28</u>
Erosional Features				
Structures / Equipment	GPS#	Description	Dimensions	Photo #
Buildings	<u>38</u>	<u>timber wall portion</u>	<u>6' x 4'</u>	<u>19</u>
Headframes				

1032 lost PDCP - too high 6.72 photo #13
1018 - head surveyor SMA recommends wait out satellites

AUM Field Survey Data Sheet

Site CEDAR

Equipment	28 42 43	suspected powder box motor truck	2' x 3'	13 24 25
Soils	GPS#	Description	Extent	Photo #
Vegetation	GPS#	Description	Extent	Photo #
juniper-pine	NA	view off site of surrounding trees		11
juniper bull thistle	31	center of pit w/ powder box	7' diameter 0.5' H	14, 13 18, 23
	35, 41			
Wildlife	GPS#	Description		Photo #
rodent holes	26	dirt waste pile		10, 12
rodent holes	29	pit w/ powder house		14
Human Activity (non-mining, w/in 0.5 ml of site)	GPS#	Description	Extent	Photo #
		gravel pit rdly to west side of mine loc.		
		dump in large pit		20, 21, 22
transwestern	46	pipeline		27
Land Use (grazing, agricultural, roads, etc., w/in 0.5 ml of site)	GPS#	Description	Extent	Photo #
	21	suspected claim marker		CEDAR 7
Nearby Residences / Wells (w/in 0.5 ml of site)	GPS#	Description	Distance to Site	Photo #
Topographic Features (roads, water courses, etc.)	GPS#	Description		Photo #

AUM Field Survey Data Sheet

Site CODAZ

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AUM Field Survey Data Sheet

Site _____

Radiological Survey <u>50 SCALE</u>			
GPS#	Description	Reading Surface	Reading 4 feet
OFF SITE	EAST OF SITE FUE BACKGROUND	10uR/hr	3uR/hr
2	Geiger base pt for e-w x-sec	12uR/hr	10uR/hr
3	30' from base pt e-w x-sec	16uR/hr	16uR/hr
4	60' from base pt ew x-sec	8uR/hr	10uR/hr
5	90' from base pt e-w x-sec	8uR/hr	16uR/hr
6	120' from base pt e-w x-sec	9uR/hr	9uR/hr
7	150' from base pt e-w x-sec	10uR/hr	10uR/hr
8	180' from base pt e-w x-sec	11uR/hr	11uR/hr
9	210' from base pt e-w x-sec	15uR/hr	19uR/hr
10	240' from base pt ew x-sec	16uR/hr	22uR/hr
11	270' from base pt e-w x-sec	10uR/hr	10uR/hr
12	base pt for N-S x-sec	10uR/hr	10uR/hr

AUM Field Survey Data Sheet

Site CEDAR

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AUM Field Survey Data Sheet

Site _____

Radiological Survey 50 scale			
GPS#	Description	Reading Surface	Reading 4 feet
13	30' from base pt N-S X SEC	10uR/hr	14uR/hr
14	60' from base pt N-S X SEC	12uR/hr	10uR/hr
15	90' from base pt N-S X SEC	12uR/hr	11uR/hr
16	120' from base pt N-S X SEC	11uR/hr	11uR/hr
17	150' from base pt N-S X SEC	11uR/hr	11uR/hr
18	180' from base pt N-S X SEC	13uR/hr	12uR/hr
19	210' from base pt N-S X SEC	10uR/hr	10uR/hr
20	240' from base pt N-S X SEC	8uR/hr	10uR/hr
25	WASTE PILE - CUT BRINK AREA - NE length of strip of rocks	3uR/hr	7uR/hr
26	dirt wast pile prob 10	8uR/hr	7uR/hr
28	small pt w/ powder box	13uR/hr	10uR/hr
34	waste pile from cut e-w	8uR/hr	8uR/hr

AUM Field Survey Data Sheet

Site CEDAR

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AUM Field Survey Data Sheet

Site _____

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
34	west pile - rocks	250 scale 17µR/hr	250 scale 8µR/hr
40	hot spot in large pit	250 scale 8µR/hr	250 scale 4µR/hr
45	center of depression (44)	15µR/hr	12µR/hr
34		170	80
40		80	40
45		15	12

Mine I.D.:

CEDAR

Plant Community Data

(6)

Date/Time:

Weather:

Observer:

Current Plant Community: P-T savannah (Mostly Juniper one seed)

Photo#

40% Forb (Snakeweed, winterfat) 30% grass (B. gracilis) 10% Brush
(4 wing salt brush), 19% bare soil, 1% bull thistle (non native)

Other Species Present:

Photo #

Cholla, senecio

T&E Present: Y/N?

If yes, species?

Photo #

NO

Noxious Weeds: Y/N?

If yes, species?

Photo #

YES Bull thistle (1 plant)

Bare Spots? Y/N?

Number of spots/size

Photo #

yes 10% of cover

Standing Dead? Y/N?

If yes, species?

Photo #

NO

Photo Point GPS Coord.

Photo #/Direction

SEE PREVIOUS

Additional Notes:

Use back if necessary

AUM Field Survey Data Sheet

Site AUM - Cedar 2008-3-6

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G0	lead survey ✓ photo- ✓	14	12
G1	"	12	10
G2	"	16	20
G3	"	16	13
G4	"	10	8
G6	" ✓	13	11
G7	" ✓	12	8
G8	"	14	7
G9	"	14	11
G10	"	11	10
G11	"	15	14
G12	" ✓	32	30
G13	" ✓	26	24
G14	"	40	40
G15	"	10	10

AUM Field Survey Data Sheet

Site AUM - Cedar 2008-3-12

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G16	Rad. survey	12	10
G17	"	10	10
G18	" ✓	8	8
G19	" ✓	10	10
G20	"	10	10
G21	"	10	10
G22	"	14	12
G23	"	21	17
G24	" ✓	13	12
G25	" ✓	21	20
G26	"	19	17
G27	"	12	10
G28	"	10	10
G29	"	10	10
G30	" ✓	10	10