

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
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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', 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



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.

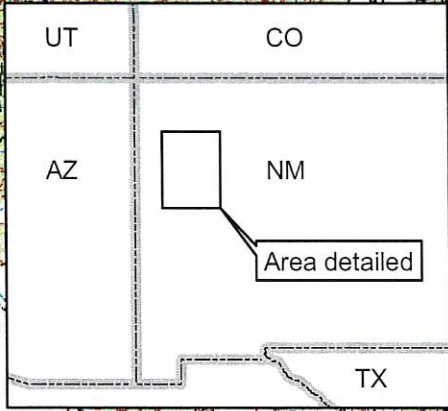
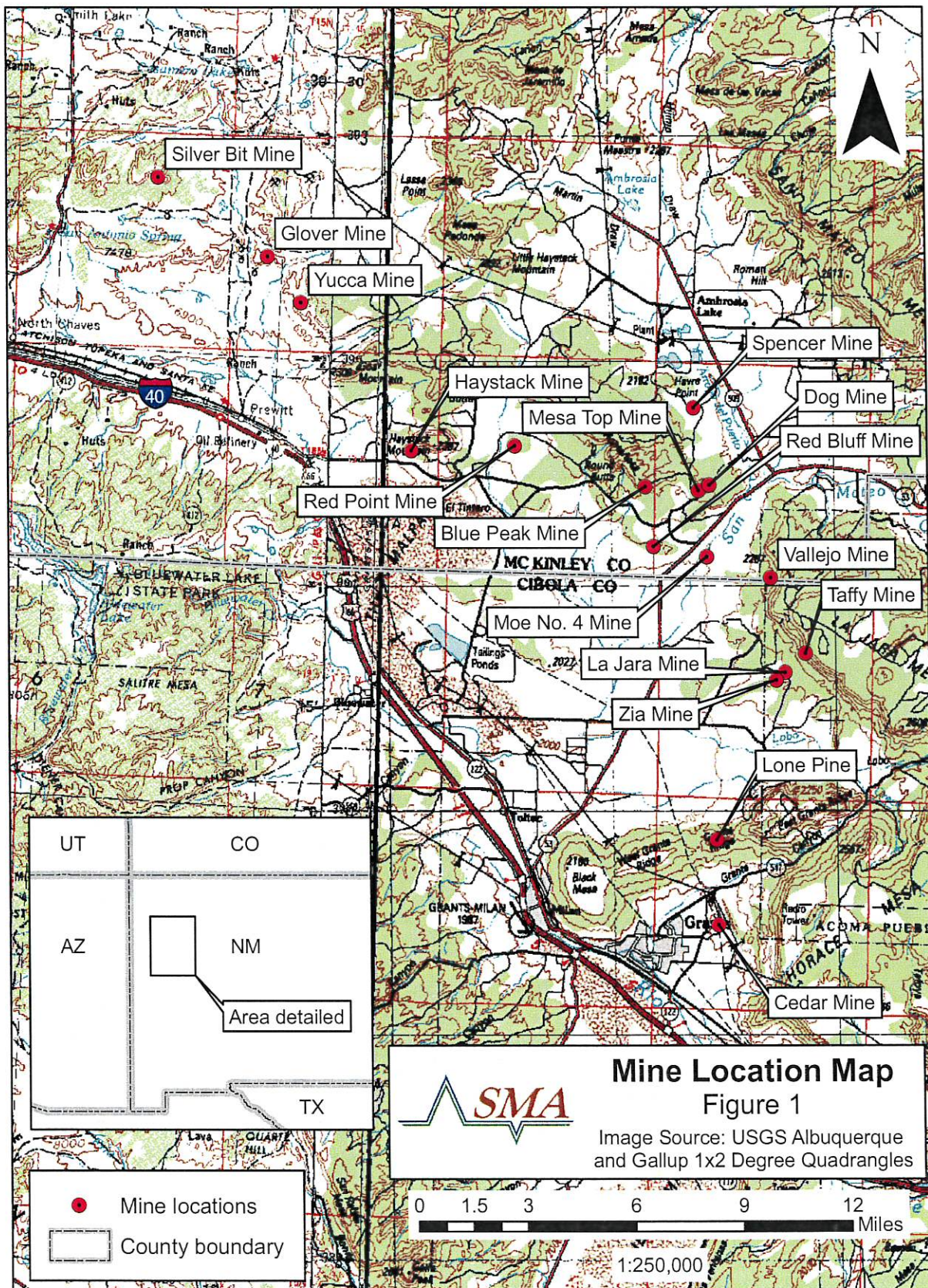
Areas of site disturbance ranged from less than one acre to tens of acres. Mine features observed included road cuts, shafts, adits, pits, ponds, and rock piles. Structures included headframes, loading structures, tanks, electrical components, steel structures, and others. Background radiation levels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

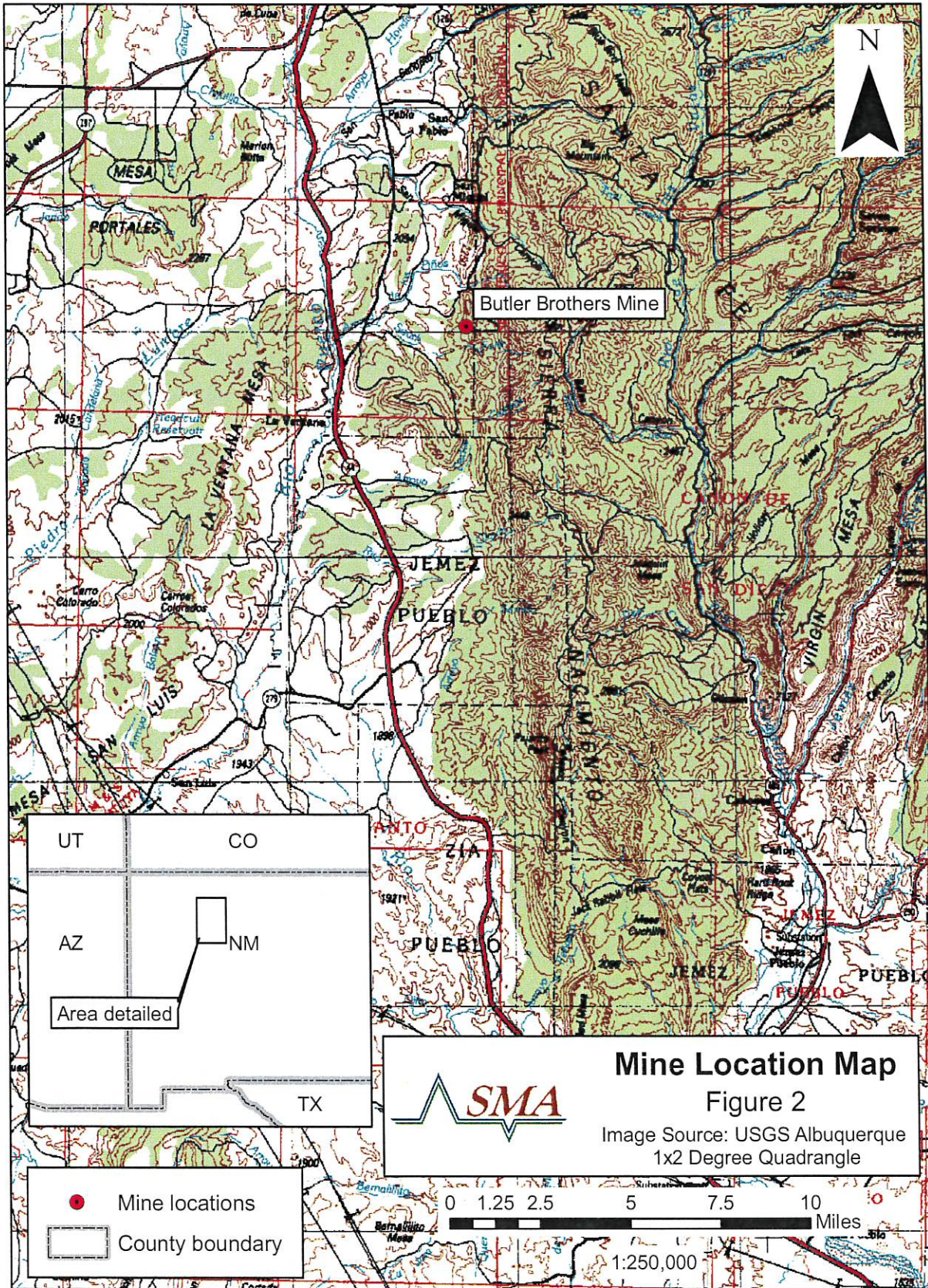
Prior to the commencement of field work, a field task-specific health and safety plan (HASP) was developed in accordance with applicable requirements (OSHA), the SMA Health and Safety program, and any applicable Agency safety requirements. A copy of the HASP is included in Appendix 1 to this report.



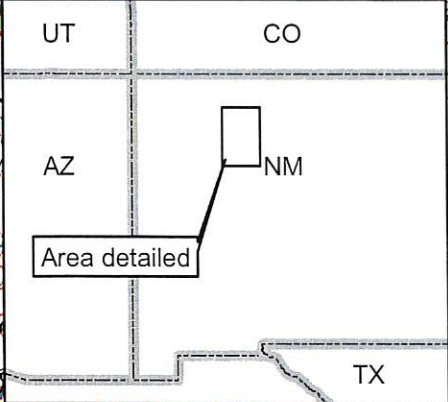
- Mine locations
- County boundary

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



Mine Location Map

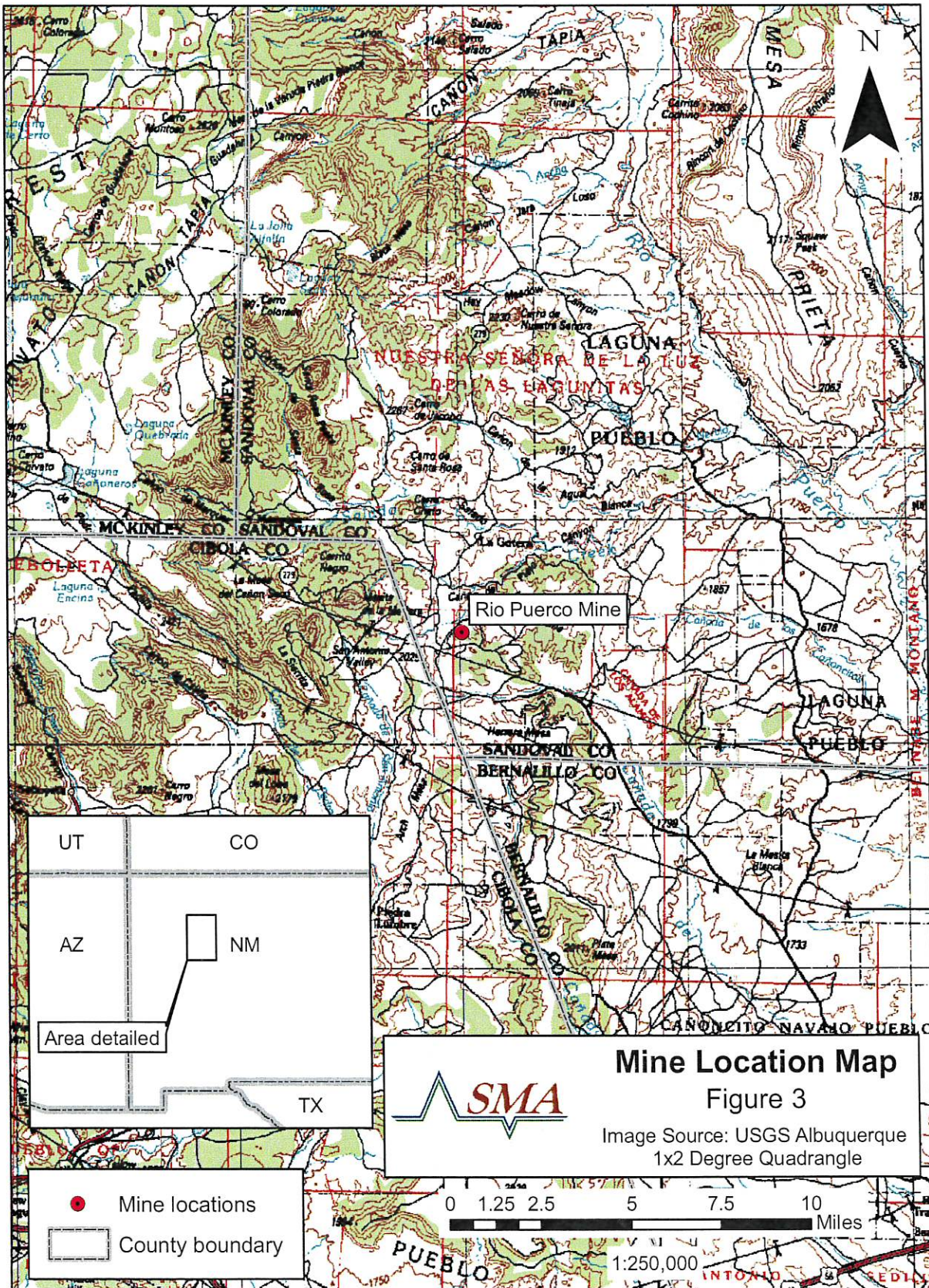
Figure 2

Image Source: USGS Albuquerque
1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary

0 1.25 2.5 5 7.5 10 Miles

1:250,000



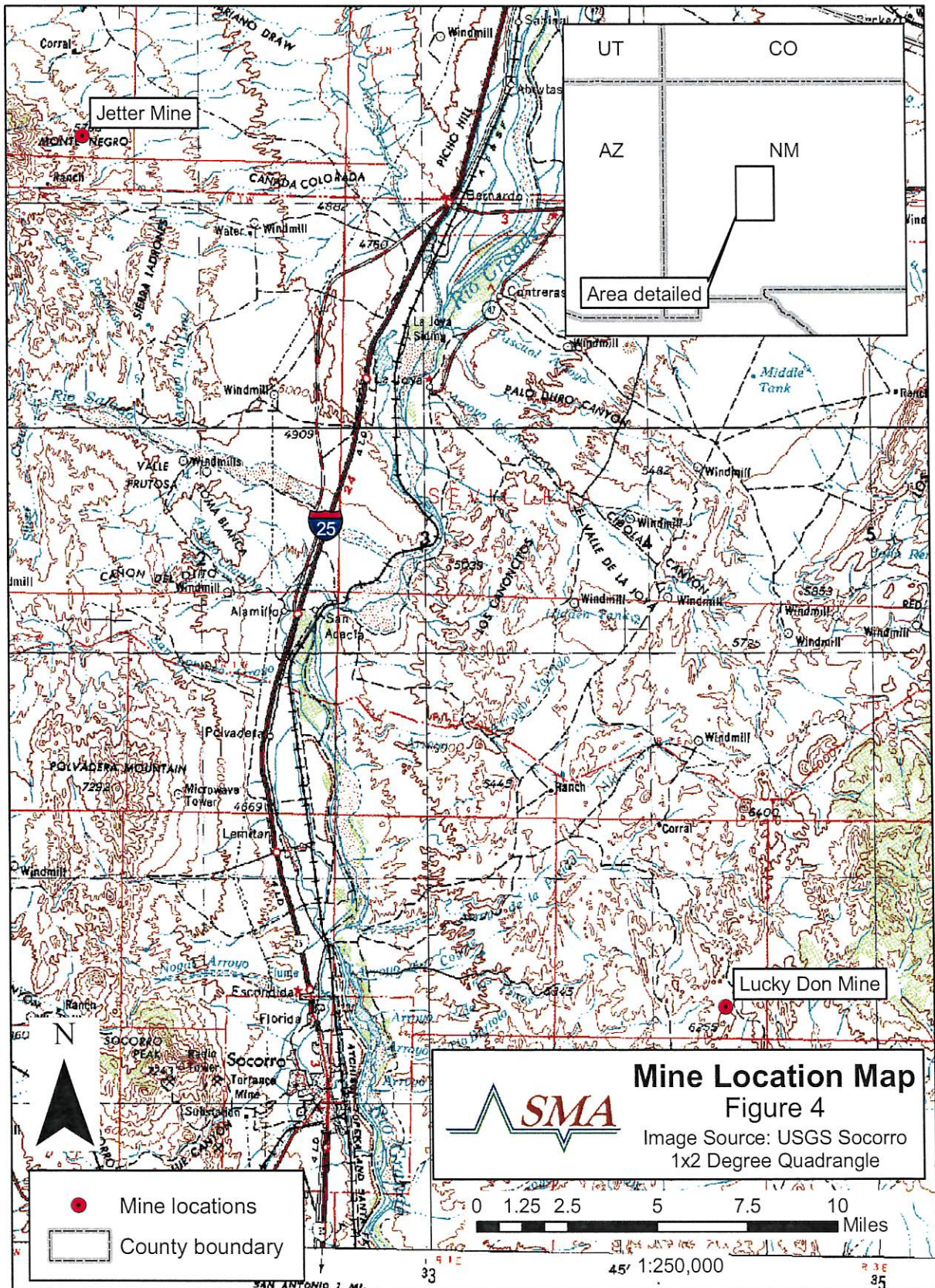
Mine Location Map
Figure 3

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

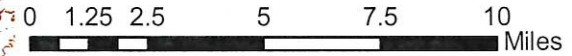
Lucky Don Mine



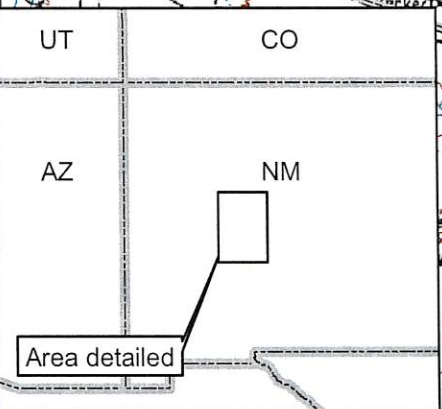
- Mine locations
- County boundary



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



0 1.25 2.5 5 7.5 10 Miles
 1:250,000



Area detailed

SAN ANTONIO 3 MI.

33

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.



Glover Mine

- 1. Location/Land Status:** The Glover Mine is located on BLM land within Section 20, T14N, R11W on the USGS Thoreau NE quadrangle, some 5.5 miles north of Prewitt, NM. Physical access to the mine can be gained by traveling north 5 miles on CR 19 from Prewitt, then east 1 mile on Red Cliffs Road, park and proceed cross country to the mine site.
- 2. Human Activity:** An abandoned limestone quarry is located adjacent to the site to the north. Additionally, approximately 12 residences are located approximately 1,500 feet south of the site.
- 3. Radiological Survey:** Radiological survey results were as follows: ground surface maximum of 140 $\mu\text{R}/\text{hour}$ and minimum of 10 $\mu\text{R}/\text{hour}$. Four-foot elevation maximum was 80 $\mu\text{R}/\text{hour}$ and minimum was 8 $\mu\text{R}/\text{hour}$. Background radiation level is approximately 10 $\mu\text{R}/\text{hour}$.
- 4. Mine Disturbance:** The mine consists of three shallow pits (dimensions 180ft by 70 ft., 100 ft. by 30 ft., and 80 by 40 ft., each a maximum of 6 ft. deep) and about 15 rock piles with an estimated total volume of 250 cubic-yards.
- 5. Plant Community:** The surrounding area is typical mixture of pinon/ juniper and grasses. The vegetation on site includes: 40% grass, 20% trees, 20% forbs, 10% shrubs, and 10% bare earth.
- 6. Soils:** Site soils are Todest fine sandy loam, with 2 to 8% slopes, 0 to 1 inch fine sandy loam, 1 to 14 inches sandy clay loam, 14 to 24 inches cobbly sandy clay loam, with limestone bedrock at 24 inches.
- 7. Wildlife:** Wildlife sighted included a bald eagle south of the site, as well as rodent holes, elk prints, and rabbit scat.
- 8. Land Use:** Land use is currently limited grazing.
- 9. Off-Site Impacts:** No off-site impacts were noted.
- 10. Topographic Features:** The site is flat lying, with a cliff face adjacent to the south. No notable erosional features are present.
- 11. Hydrogeology:** Based on a review of the NMOSE iWaters database, there are 15 well records within a radius of one mile of the site, primarily in the valley to the west and south of the site. Depth to water varies between 40 and 260 feet. The nearest well, approximately 0.3 miles to the southeast of the site, has a recorded depth to water of 80 feet.

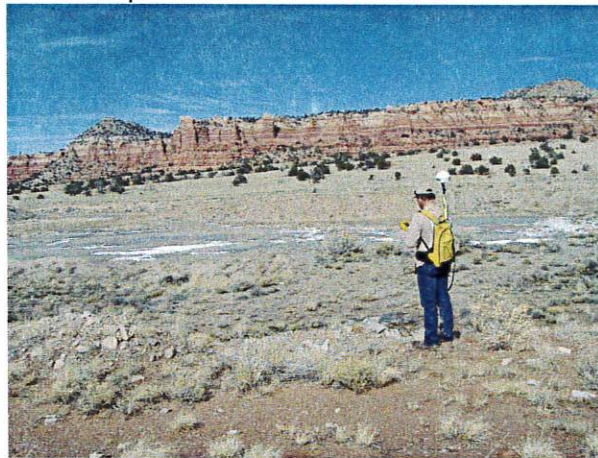
The nearest surface water drainage feature is approximately 0.5 miles to the southeast.



Shallow pit



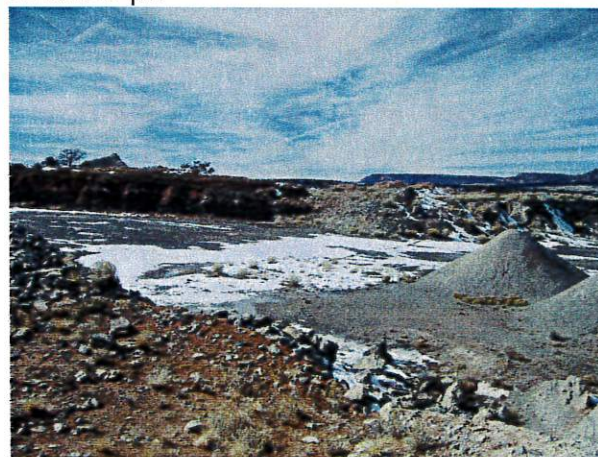
Shallow pit



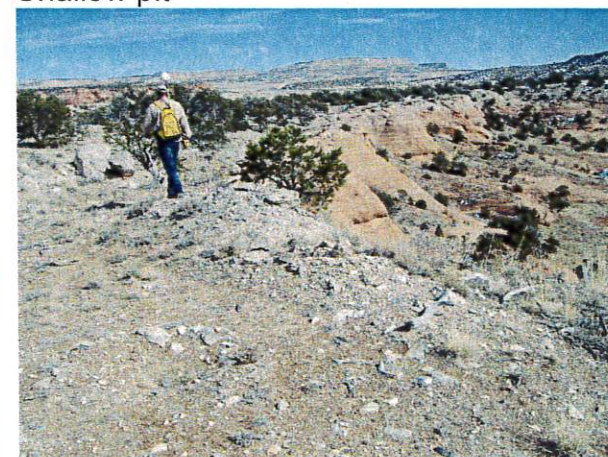
Shallow pit



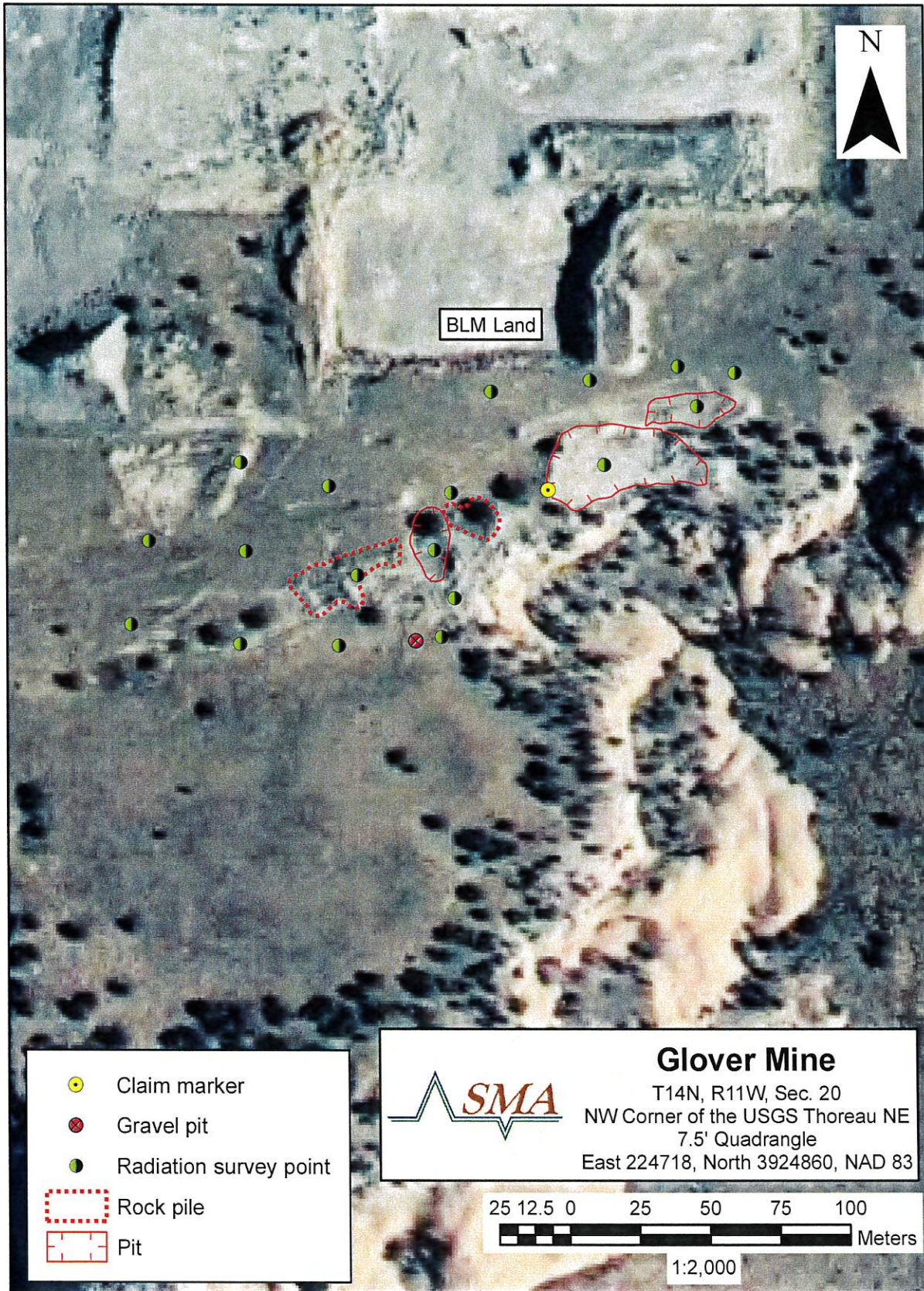
Shallow pit



Limestone quarry to north



Cliff to south of site



AUM Field Survey Data Sheet

Site GLOVER

Date 2/13/08	Time On-Site 1234	Time Off-Site	By TAMI ROSS BRIAN MERTZ
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Weather Conditions: Clear sunny, windy, muddy, patches of snow
 perimeter not clearly defined due to interference from rock quarry

Disturbances	GPS#	Description	Dim/Area/Volume	Photo #'s
Shafts		N/A		
Adits		N/A		
Pits	1	rocky pit	30' x 6' deep	1
	7	large pit, muddy		6-B
Waste Rock Dumps	8	rock piles rock ridges		2 3
Fillings Pits Cont...	9	small pit/trench		9
Trenches				
Roads				
Erosional Features				
Structures / Equipment	GPS#	Description	Dimensions	Photo #
Buildings		N/A		
Headframes		N/A		

claim marker 6 5

AUM Field Survey Data Sheet

Site GLOVER

Equipment		N/A		
Soils	GPS#	Description	Extent	Photo #
376 - Toolest Fine Sandy Loam				
Vegetation	GPS#	Description	Extent	Photo #
SEE ATTACHED				
Wildlife	GPS#	Description		Photo #
		- BALD EAGLE - FLYING OVER OFF SITE 400m South of site - Rodent holes scattered - ELK prints noticed off site to south - Rabbit pellets		
Human Activity (non-mining, w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
	11	limestone rock quarry		10-11
Land Use (grazing, agricultural, roads, etc., w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
Abandoned limestone quarry to north of site - Large		Extensive - adjacent to site Light grazing (old)		
Nearby Residences / Wells (w/in 0.5 mi of site)	GPS#	Description	Distance to Site	Photo #
APPX 12 Trailers		Houses 670m to south of site	670m	
Topographic Features (roads, water courses, etc.)	GPS#	Description		Photo #
	5	CLIFF FACE		4

AUM Field Survey Data Sheet

Site GLOVER

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AUM Field Survey Data Sheet

Site Glover

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
3	center of rock pit	250 scale 14µR/hr	250 scale 6µR/hr
4	center of pile	50 scale 2µR/hr	50 scale 2µR/hr
8	center of muddy large pit	250 scale 10µR/hr	250 scale 8µR/hr
10	center of small pit/trench	50 scale 20µR/hr	50 scale 20µR/hr
3		140 90	30 60
4		26 26	24 24
8		190	80
10		20	20

Mine I.D.: GLOVER

Plant Community Data

4 of 7

5 to 7 st?
veg soil
survey
info.

Date/Time: 02/13/08
Weather: Sunny, warm
Observer: B.M. / T. Ross

Current Plant Community:

Photo# P-J Forest - Large Prunus, One seed Juniper
40% grass, 20% forb, 20% tree, 10% shrub, 10% bare spots (scattered)

Other Species Present:

Photo# Winterfat, Blue grama, ~~Quercus~~ sp., Kochia, Russian Thistle, Artemisia spp.
Spineless horsebrush, Chrysothamnus spp., Indian Ricegrass.

T&E Present: Y/N?

If yes, species? NO
Photo #

Noxious Weeds: Y/N?

If yes, species? NO
Photo #

Bare Spots? Y/N?

Number of spots/size yes, scattered - appear normal occurrence
Photo #

Standing Dead? Y/N?

If yes, species? NO
Photo #

Photo Point GPS Coord.

Photo #/Direction

Additional Notes:

Use back if necessary

AUM Field Survey Data Sheet

Site HAM-blower 2008-3-6

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G0	baseline rad.	24	20
G1	rad. survey ✓	30	28
G2	"	34	30
G3	"	34	30
G4	"	18	16
G5	"	16	14
G6	" ✓	18	14
G7	" ✓	14	13
G8	"	14	13
G9	" ✓	12	12
G10	" ✓	24	22
G11	"	12	12
G12	"	13	9
G13	" ✓	12	10
G14	" ✓	10	8
G15	"	13	11
G16	"	10	8
G17	" ✓	30	22

