

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', 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.

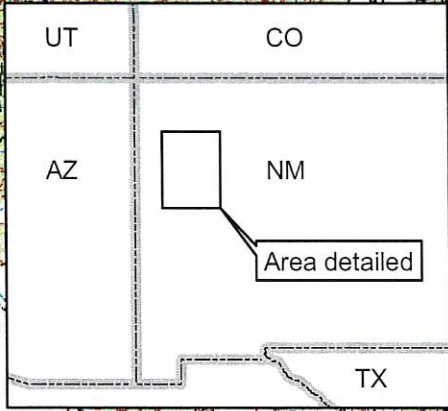
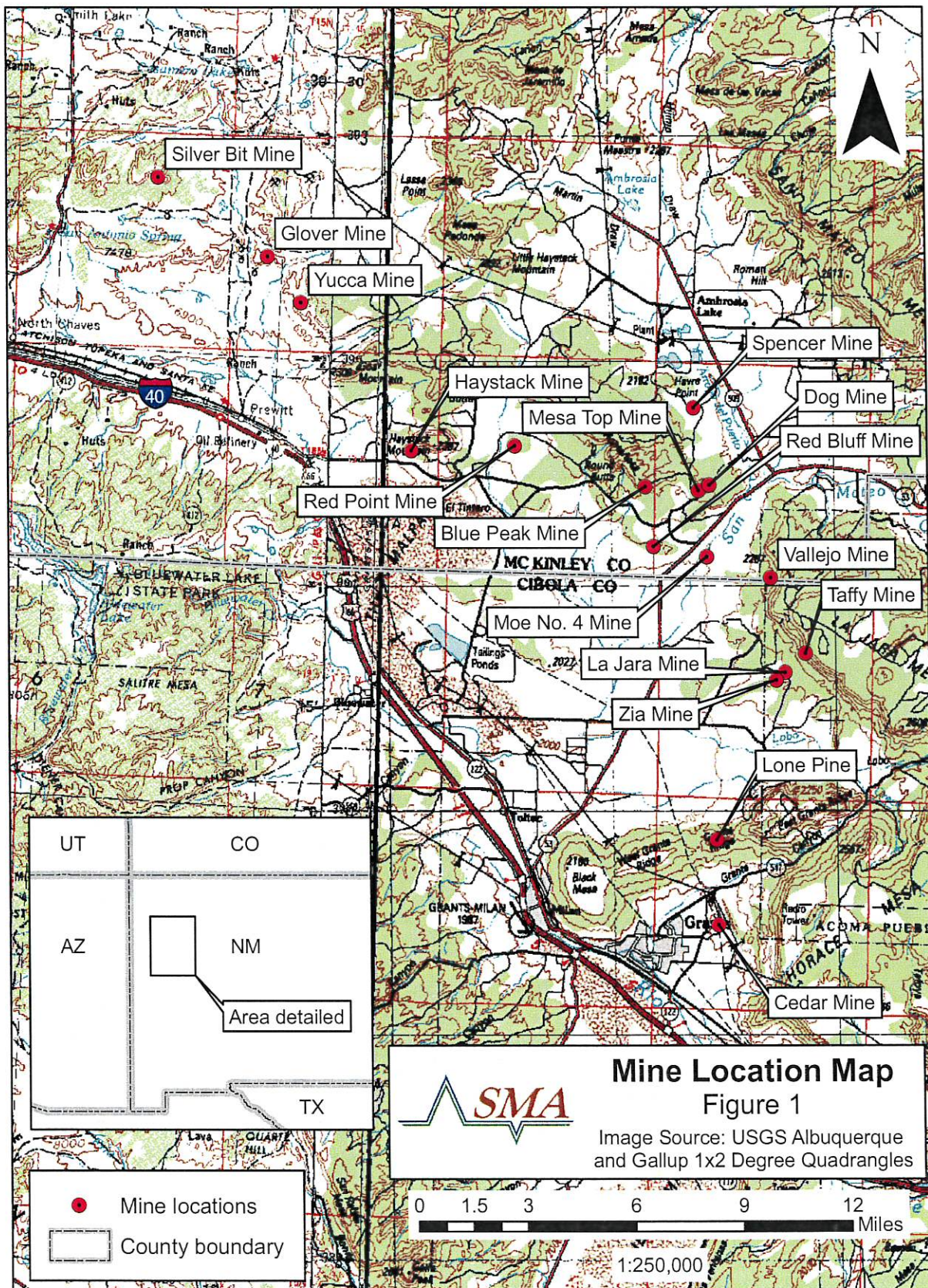
Areas of site disturbance ranged from less than one acre to tens of acres. Mine features observed included road cuts, shafts, adits, pits, ponds, and rock piles. Structures included headframes, loading structures, tanks, electrical components, steel structures, and others. Background radiation levels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

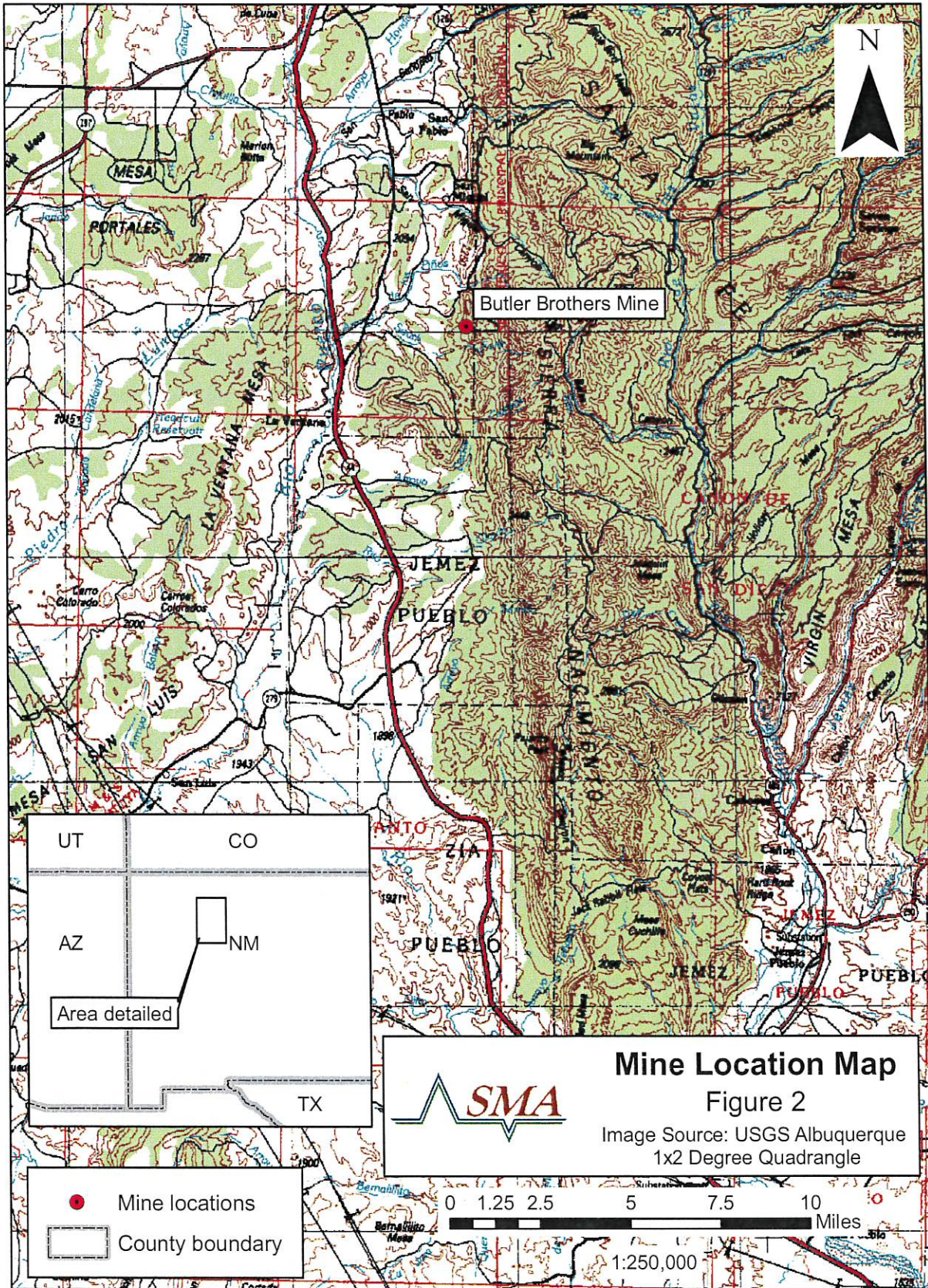
Prior to the commencement of field work, a field task-specific health and safety plan (HASP) was developed in accordance with applicable requirements (OSHA), the SMA Health and Safety program, and any applicable Agency safety requirements. A copy of the HASP is included in Appendix 1 to this report.

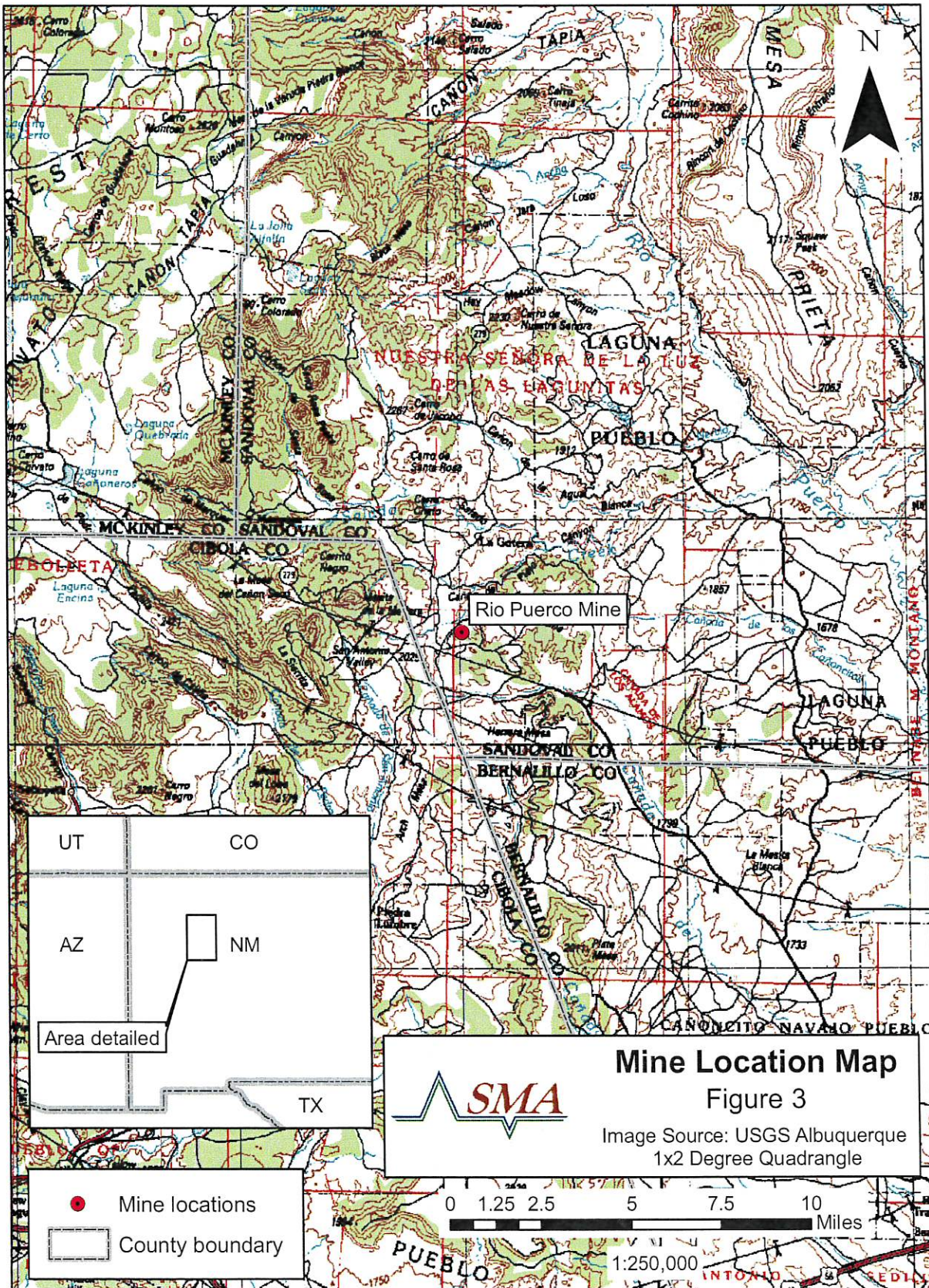


- Mine locations
- County boundary

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



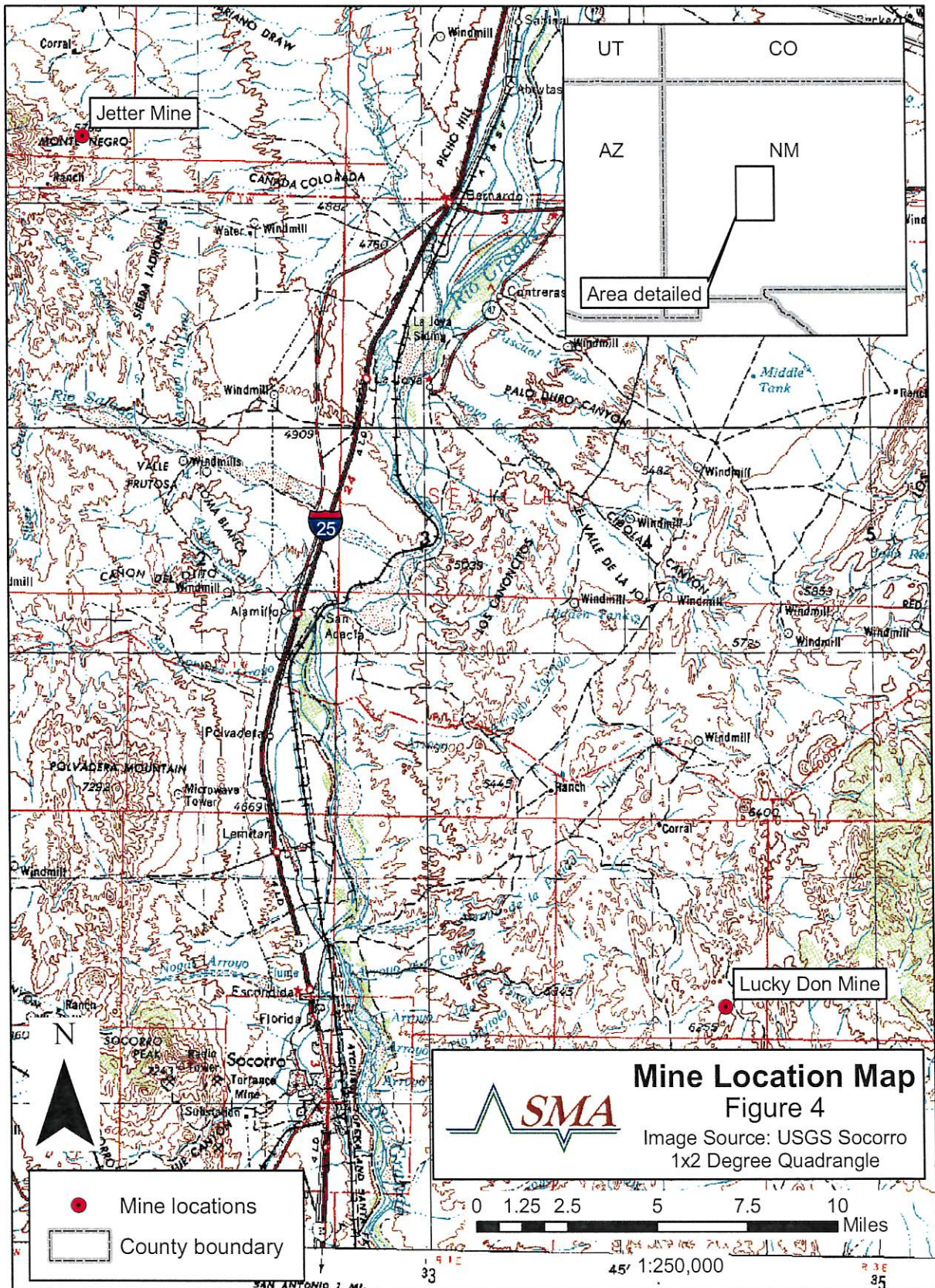


Mine Location Map
 Figure 3
 Image Source: USGS Albuquerque
 1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary

0 1.25 2.5 5 7.5 10 Miles

1:250,000





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.



Jetter Mine

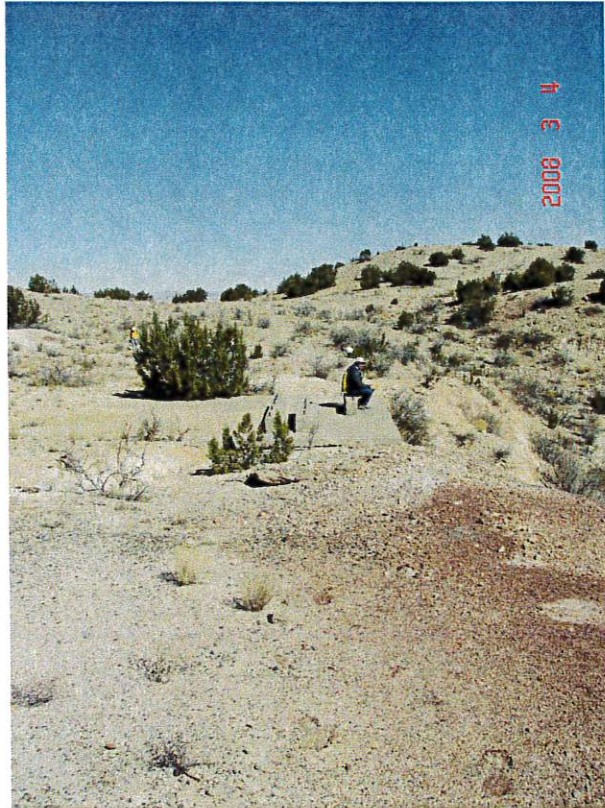
- 1. Location/Land Status:** The Jetter Mine is located on BLM land within Section 35, T3N, R2W on the USGS Ladron Peak quadrangle (35.554314N, 108.49826W), some 25 miles NNW of Socorro, NM. Physical access can be gained by traveling south 2 miles on Old Hwy. 85, west 9 miles on CR 12, then about 12 miles southwest on an undesignated road until reaching the end of the road at a stock tank. The mine is about 0.3 miles west of the stock tank, accessible by foot.
- 2. Human Activity:** As noted a stock tank is located approximately 0.3 miles from the site, along with a corral. Cattle grazing is prevalent.
- 3. Radiological Survey:** Radiological survey results were as follows: ground surface maximum of 320 $\mu\text{R}/\text{hour}$ and minimum of 22 $\mu\text{R}/\text{hour}$. Four-foot elevation maximum was 280 $\mu\text{R}/\text{hour}$ and minimum was 18 $\mu\text{R}/\text{hour}$. Background radiation levels are less than 10 $\mu\text{R}/\text{hour}$.
- 4. Mine Disturbance:** The mine is characterized by a large pit disturbance striking WSW/ENE for approximately 350 feet, excavated to a depth of about 45 feet, and between two small hills of volcanic conglomerate. The mine site covers an estimated 25 acres. A decline (30 degree) along the strike of the pit has collapsed, as has the head-frame in the SW corner of the pit. There is a concrete pad (approximately 10 ft. by 15 ft.) on the bench above the decline.
- 5. Plant Community:** The surrounding area is typical pinon/juniper scrub with mixed grasses. Vegetation on site includes: 10% woody scrub, 20% grasses, 10% forbs, 10% trees and 50% bare earth.
- 6. Soils:** Site soils are Cascajo very gravelly sandy loam with 15 to 30 percent slopes, 0 to 60 inches very gravelly sandy loam.
- 7. Wildlife:** Evidence present of jackrabbit, rodent. Owl noted on-site.
- 8. Land Use:** Land use at the mine includes moderate to heavy cattle grazing.
- 9. Off-Site Impacts:** Two drainages that leave site have evidence of elevated radiation levels (approximately 45 $\mu\text{R}/\text{hour}$). The drainages flow to the east, away from the well noted near the property (see Hydrogeology section below).
- 10. Topographic Features:** The site is cut into a gravel terrace, and is made up of gently rolling hills. No major erosional features were noted.
- 11. Hydrogeology:** Based on a review of the NMOSE iWaters database, there is one well record within a one mile search radius. The well, located approximately one-half mile to the

west, has no recorded depth to water. Two wells are recorded approximately 4 miles to the east, with depths to water of 206 and 325 feet recorded.

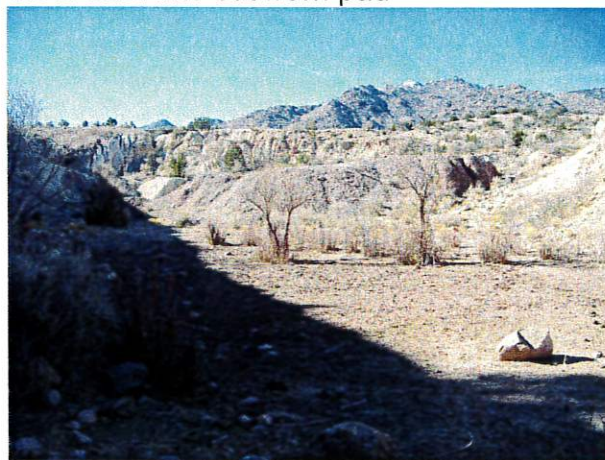
There are two surface water drainage features that leave the site to the east.



View east into cut from pad



View north of pad



View southwest in cut at decline



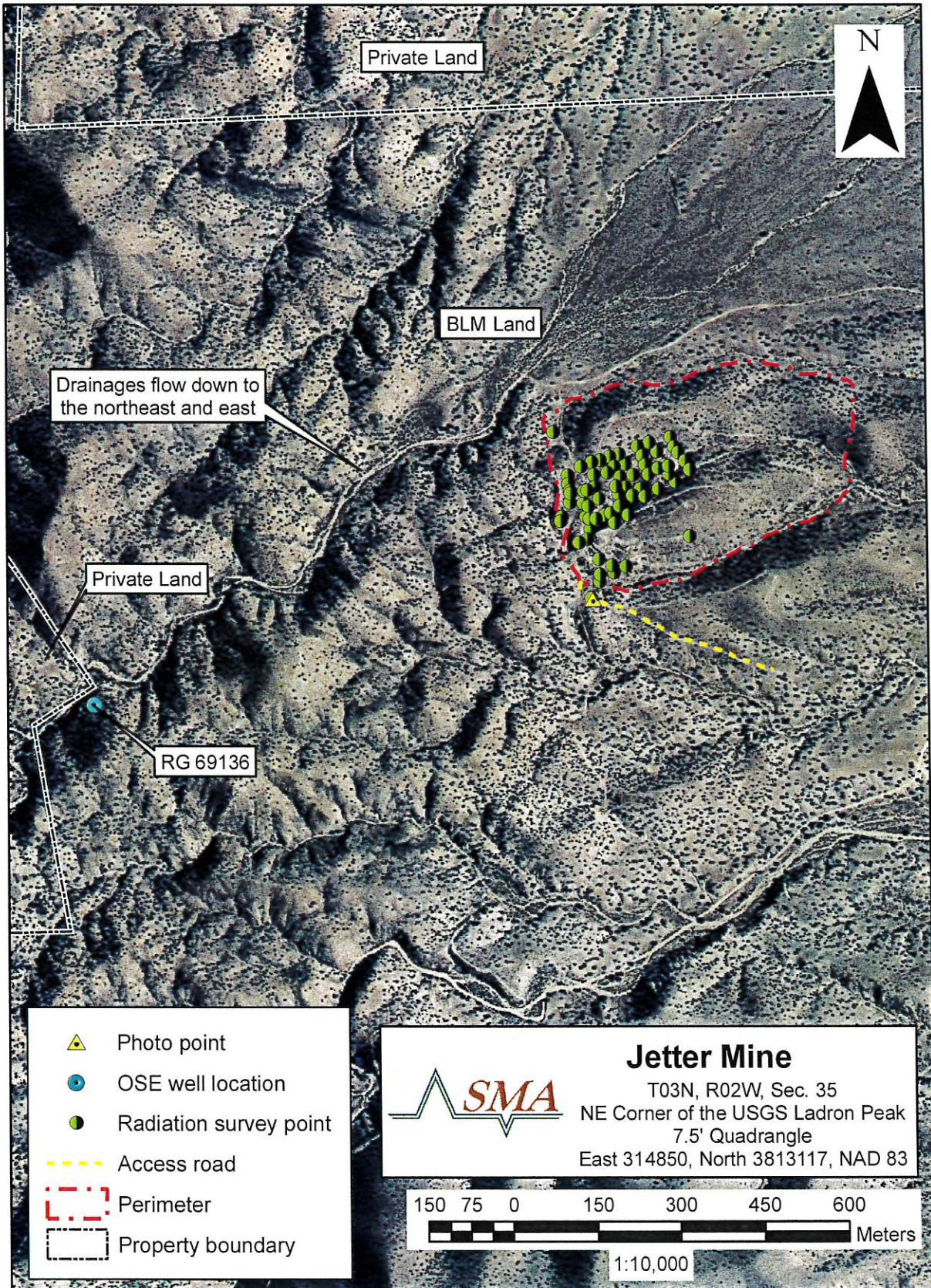
Stock tank, cattle (no evidence of well)



View southeast at cut



View south at pile



Private Land









BLM Land

Drainages flow down to the northeast and east

Private Land

RG 69136

-  Photo point
-  OSE well location
-  Radiation survey point
-  Access road
-  Perimeter
-  Property boundary



Jetter Mine

T03N, R02W, Sec. 35
 NE Corner of the USGS Ladron Peak
 7.5' Quadrangle
 East 314850, North 3813117, NAD 83



1:10,000

RUM Field Survey Data Sheet

Site

NMSO 0023 (JETTER)

Date 01/10/08	Time On-Site 1045 1030	Time Off-Site 1340	By Brian + Bill
------------------	---	-----------------------	--------------------

Weather Conditions: Sunny, Cool $\approx 50^{\circ}F$ wind 0-3mph

Disturbances	GPS#	Description	Dim/Area/Volume	Photo #'s
Shafts N/A				
Adits N/A				
Pits N/A				
Waste Rock Dumps				
Tailings N/A				
Trenches N/A				
Roads SEE GPS DATA				
Erosional Features N/A				
Structures / Equipment	GPS#	Description	Dimensions	Photo #
Buildings None				
Headframes NONE				
Equipment NONE				

AUM Field Survey Data Sheet

Site _____

Soils	GPS#	Description	Extent	Photo #
Sandy loam Desert Pavement SEE ATTACHMENT		Small amount of moisture		
Vegetation	GPS#	Description	Extent	Photo #
See Attachment				
Wildlife	GPS#	Description	Extent	Photo #
Jackrabbit, rodent dens, Crow		Saw Jackrabbit & Crow on site rodent dens scattered throughout		
Human Activity (non-mining, w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
Corrals to east of site about 1800 ft.		Corrals & water tank w/ cattle loafing inside and next to. Well maint. road leading to corrals		
Land Use (grazing, agricultural, roads, etc., w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
Grazing, hiking (Limited use)		Evidence of high intensity grazing on & off site		
Nearby Residences / Wells (w/in 0.5 mi of site)	GPS#	Description	Distance to Site	Photo #
Stock tank 1800 ft to east of site @ corrals	29	Corrals w/ STOCK TANK	~ 1800' FT	
Topographic Features (roads, water courses, etc.)	GPS#	Description	Distance to Site	Photo #
Access Road	28	Not very passable - Paex @ corrals East of mine and walk up road directly to site		

AUM Field Survey Data Sheet

Site NMS00023 JETTER (LADRON)

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
2	ORIGIN, SOUTH ROAD ENTRANCE	24	22
3	(SW) WASTE PILE	36	32
4	BOTTOM BENCH (SW)	34	32
5	BOTTOM BENCH (SE)	34	30
6	MIDDLE BENCH (SE)	30	26
7	MIDDLE BENCH (S)	70	60
8	MIDDLE BENCH (SW) ^{BASE OF} MAIN WASTE PILE	110	100
9	TOP BENCH MAIN WORKINGS	—	—
—	(SW) ACCESS ROAD	28	28
10	WASTE PILE (SW)	28	28
11	WASTE PILE (W) ID # 11	32	32
11	WASTE PILE (W) ^{DIVIDED BY ACCESS} ROAD	34	34
12	STORAGE PILE	240	200
13	STAGING AREA (NE)	44	38
14	STAGING AREA (SE)	110	100

4

15	FOUNDATION	18	22
16	BENEATH FOUNDATION (CONVEYOR?)	320	280
17	PIT BTM./BASE OF HIGH WALL (W)	100	120
18	PIT BTM./BASE OF HIGH WALL (S)	110	120
19	PIT BTM./BASE OF HIGH WALL (E)	80	80
20	WASTE PILE (E) UPPER	140	100
21	WASTE PILE (E) LOWER	28	26
22	TOP OF HIGH WALL (E)	26	24
23	TOP OF HIGH WALL (S)	24	22
24	TOP OF HIGH WALL (W)	28	24
25	TOP BENCH (SE)	22	20

NOTE: Two washes leaving mine site to East are
3-4x high than background (≈ 45 micro u)

Mine I.D.:

Plant Community Data

Date/Time:

Weather:

Observer:

Current Plant Community: *Pinus-Juniper forest*
Photo#

Other Species Present: *Broom Snake weed, englman pricklypear, Cholla*
Photo # *None*

T&E Present: YIN? *NO*
If yes, species?
Photo #

Noxious Weeds: YIN? *NO*
If yes, species?
Photo #

Bare Spots? YIN? ~~NO~~ *Yes, Bottom of pit where water collects - soil has become*
Number of spots/size *1* *gladed. Appx 1/4 acre*
Photo #

Standing Dead? YIN? *Yes, but due to natural causes - natural mortality*
If yes, species?
Photo # *NOTE: Some spp. deciduous*

Photo Point GPS Coord.
Photo #/Direction *N-E-W-S*

Additional Notes: *Very little herbaceous spp. what little there is has been*
Use back if necessary *grazed to soil level*

AUM Field Survey Data Sheet

Site AUM Jetten 2008-3-4

Radiological Survey				
GPS#	Description		Reading Surface	Reading 4 feet
G0	Rad. survey	photo <input checked="" type="checkbox"/>	40	40
G1	"	<input checked="" type="checkbox"/>	24	26
G2	"		60	50
G3	"		120	110
G4	"		32	38
G5	"	<input checked="" type="checkbox"/>	22	22
G6	"		28	26
G7	"		28	28
G8	"		22	20
G9	"	<input checked="" type="checkbox"/>	22	20
G10	"	<input checked="" type="checkbox"/>	32	26
G11	"		24	22
G12	"		36	32
G13	"		34	32
G14	"	<input checked="" type="checkbox"/>	24	23

AUM Field Survey Data Sheet

Site AUM - Jetter 2008-3-4

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G15	Rad. Survey ✓	24	23
G16	"	32	28
G17	"	60	46
G18	"	60	48
G19	" ✓	24	26
G20	" ✓	26	28
G21	"	48	48
G22	"	34	32
G23	"	24	22
G24	" ✓	22	18
G25	" ✓	22	18
G26	"	24	28
G27	"	26	30
G28	"	48	42
G29	" ✓	32	28

AUM Field Survey Data Sheet

Site AUM Jetties 2008-3-4

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G30	Rad. Survey ✓	60	60
G31	"	40	40
G32	"	40	38
G33	"	28	24
G34	" ✓	24	21
G35	" ✓	30	28
G36	"	30	28
G37	"	70	46
G38	"	60	60
G39	" ✓	34	32
DECLD	decline 30% ✓		
G40	Rad. Surv. ✓	36	32
G41	"	42	42
G42	"	38	36
G43	"	60	50
G44	" ✓	28	26

AUM Field Survey Data Sheet

Site NMS00023 JETTER (LADROME)

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
2	ORIGIN, SOUTH ROAD ENTRANCE	24	22
3	(SW) WASTE PILE	34	32
4	BOTTOM BENCH (SW)	34	32
5	BOTTOM BENCH (SE)	34	30
6	MIDDLE BENCH (SE)	30	24
7	MIDDLE BENCH (S)	70	60
8	MIDDLE BENCH (SW) ^{BASE OF} MAIN WASTE PILE	110	100
9	TOP BENCH MAIN WORKINGS	—	—
—	(SW) ACCESS ROAD	28	28
10	WASTE PILE (SW)	28	28
11	WASTE PILE (W) ID # 11	32	32
11	WASTE PILE (W) DIVIDED BY ACCESS ROAD	34	34
12	STORAGE PILE	240	200
13	STAGING AREA (NE)	44	38
14	STAGING AREA (SE)	110	100

15	FOUNDATION	18	22
16	BENEATH FOUNDATION (CONVEYOR?)	320	280
17	PIT BTM / BASE OF HIGH WALL (W)	100	120
18	PIT BTM / BASE OF HIGH WALL (S)	110	120
19	PIT BTM / BASE OF HIGH WALL (E) <input type="checkbox"/>	80	80
20	WASTE PILE (E) UPPER	140	100
21	WASTE PILE (E) LOWER	28	26
22	TOP OF HIGH WALL (E)	26	24
23	TOP OF HIGH WALL (S)	24	22
24	TOP OF HIGH WALL (W)	28	24
25	TOP BENCH (SE)	22	20

NOTE: Two washes leaving mine site to East are
3-4x high than background (≈ 45 micro u)