

Abandoned Uranium Mine Assessment for the F33 Site (NM0057)

FINAL REPORT

Prepared For:



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Natural Resources Department
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NM0057

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1.0 INTRODUCTION

INTERA Incorporated (INTERA) has prepared this Abandoned Uranium Mine (AUM) Site Assessment Report for the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) in compliance with the Professional Service Agreement dated November 2, 2009. INTERA visited the F33 site (AUM Site), MMD ID: NM0057 on September 16, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

INTERA was informed through personal communication with a uranium industry contact that the AUM Site may have been reclaimed and no features would be visible. No other previous information was known about the AUM site.

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is on private and federal (Bureau of Land Management) at the intersection of sections 33 and 34 of Township 12N, Range 9W and sections 3 and 4 of Township 11N, Range 09W. The Site is located in Cibola County (formerly part of Valencia County), approximately 6 miles east-northeast of the town of Milan. The location of this Site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, drive west on Interstate 40 for 83 miles. Take Exit 79 towards San Mateo and turn right. Continue straight until you reach U. S. 66, less than a quarter mile. Turn left on U.S. 66 and drive 0.2 miles, then turn right onto New Mexico 605. Continue northeast on New Mexico 605 for approximately 5.4 miles, then turn right on a dirt road, passing through a locked gate. Continue on this dirt road for 3.75 miles, then turn right on Forest Service Road 450. Continue south on Forest Service Road 450 for 0.3 miles, then turn right on a faint road. Continue southwest for approximately 0.9 miles. Then, turn onto the first road on the right and drive 0.7 miles. After 0.7 miles, the road forks. Keep right and drive for 1.2 miles to the AUM Site. Note that permission from one private landowner is required to travel along the access road, and permission from another private landowner is required to view the Site itself.

1.3 SITE GEOLOGY

The AUM site lies within the southern part of the San Juan Basin in the Grants uranium region an area characterized by mesas of Triassic to Cretaceous strata separated by broad valleys. The AUM Site is located within the Todilto Formation, a sequence of Jurassic carbonate and evaporite rocks. This formation likely represents a salt lake environment intermittently connected to the ocean. The Todilto Formation is underlain by the Entrada Formation and overlain by the Summerville Formation (Hilpert, 1963). The Todilto consists of two members, the upper Tonque Arroyo Member and the lower Luciano Mesa Member. The Tonque Arroyo Member consists of gypsum and is absent from the Site area. The Luciano Mesa Member consists of a thinly laminated, locally deformed lower layer and a massive, vuggy upper layer (Lucas and Anderson, 2000). The exposed Todilto Formation at the AUM Site consists of thinly

bedded (approximately 0.5 ft) limestone with some yellow uranium mineralization along fracture surfaces. Faults are also present in exposed bedrock.

1.4 SITE HYDROGEOLOGY

The surface runoff at the AUM Site discharges west-southwest across a broad alluvial fan, eventually draining into the Rio San Jose approximately 6.5 miles to the west. There is no nearby permanent surface water, but stock tanks are present downstream of the AUM Site.

The AUM Site is located in the Bluewater Underground Water Basin. This basin falls between the San Juan Underground Water Basin to the north, the Middle Rio Grande Underground Water Basin to the south and east, and the Gallup Underground Water Basin to the west (Edwards and Kiely, 2004). Aquifers are found in alluvium near major drainages such as San Mateo Creek and throughout the Cretaceous, Jurassic, and Triassic strata in the region. Groundwater flows southward in alluvium and northeast in Mesozoic strata (Brod, 1979).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Grants Quadrangle 7.5 minute United States Geological Survey topographic map at an elevation of approximately 7,000 ft above mean sea level (see Figure 2). The AUM Site is located on the northwest slope of East Grants Ridge, a narrow mesa trending northeast. Topography to the northwest of the Site slopes gently to the west. To the south and east, the topography is much steeper, rising to about 7,500 ft above mean sea level at the top of East Grants Ridge.

2.0 MINE FEATURES

The mine features described below are based on the features provided to INTERA by MMD in the GIS Data Dictionary (MMD, 2009). INTERA marked the locations of the AUM Site features using a Trimble Global Positioning System (GPS), and entered details about the features into the GPS using the MMD data dictionary. One claim and one disturbed area were found onsite. Please see the Photo Log in Appendix A for photos of the AUM Site features, Table 1 for a list of the AUM Site features, and Figures 4a and 4b for the locations of the AUM Site features.

2.1 MINE SHAFTS, ADITS, AND DECLINES

No mine shafts, adits or mining related declines were evident at the AUM site.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

No exploration pits or open cuts were evident at the AUM site.

2.3 WASTE AND ORE PILES AND DISTURBANCES

One disturbed area (DistPly-1) was found at the AUM Site. DistPly-1 appears to be a bulldozed area that consists of piles of soil and rock and graded areas. DistPly-1 is approximately 200 ft wide, 300 ft long. The maximum gamma radiation measurement for this feature was 75 μ R/hr at

0 ft above ground at radiation survey point Rad-9 (see Table 2). No ore piles or waste piles were evident at the AUM site.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

No mining related buildings or foundations were found at the AUM Site.

2.5 OTHER MINE FEATURES

No other mine features were identified at the AUM site.

2.6 BOREHOLES

No boreholes were found at the AUM Site.

2.7 RECLAMATION ACTIVITIES

It appears the AUM Site was reclaimed, no significant mine features were identified in the area.

3.0 ARCHEOLOGICAL SITES

No apparent archeological sites were identified at or near this AUM Site.

4.0 SITE GAMMA RADIATION READINGS

One background gamma radiation reading was taken approximately 0.2 miles southwest of the AUM Site, recording 9 $\mu\text{R/hr}$ at 0 ft above ground and 9 $\mu\text{R/hr}$ at 4 ft above ground. Please see Table 2 for all of the gamma radiation readings taken at the AUM Site and Figures 4a and 4b for the locations of the radiation readings.

The maximum gamma radiation measured onsite was 170 $\mu\text{R/hr}$ at 0 ft above ground at radiation survey point Rad-11. Another notable radiation reading was 75 $\mu\text{R/hr}$ at 0 ft above ground at radiation survey point Rad-9, associated with DistPly-1.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Cows, cow droppings, and fences indicate active ranching in the area. Road conditions at the AUM Site and discussion with uranium industry professionals indicate recent mineral exploration of the area surrounding the AUM Site.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

No structures were sighted within a mile of the AUM Site.

5.3 NEARBY DOMESTIC WELLS

No domestic wells are located within a mile of the AUM Site.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Cow and horse prints and droppings, along with nearby fences and corrals, indicates that the area is active grazing land.

5.5 EVIDENCE OF WILDLIFE

Meadowlarks and other small birds were observed onsite. Rabbit, deer and coyote droppings were identified. Elk were seen by the field team upon exiting the site.

6.0 VEGETATION

The F33 site is located between in the Coniferous and Mixed Woodland vegetation types (Dick-Peddie, 1999). Woody species include pinyon pine and Utah juniper as well as snakeweed, fourwing saltbush, yucca, and cholla. Grass species present were blue grama, side-oats grama, and Indian ricegrass. No evidence of noxious weeds was found at the AUM Site.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

No evidence of erosion was observed onsite.

7.2 ENVIRONMENTAL IMPACTS

There is no evidence of soil staining from chemicals potentially brought to the AUM Site.

8.0 REFERENCES

- Anderson, Orin J., 1980. Abandoned or Inactive Uranium Mines in New Mexico. New Mexico Bureau of Mines and Mineral Resources Open File Report 148.
- Brod, Robert C., 1979. Hydrogeology and Water Resources of the Ambrosia Lake-San Mateo Area, McKinley and Valencia Counties, New Mexico. Master's thesis. New Mexico Institute of Mining and Technology, Socorro, New Mexico.
- Dick-Peddie, William A, 1999. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press.
- Edwards, Mark H. and Kiely, Jeffrey, 2004. Cibola-McKinley Regional Water Plan. Prepared for the New Mexico Interstate Stream Commission.

Hilpert, Lowell S., 1963. Regional and Local Stratigraphy of Uranium-Bearing Rocks in Kelley, Vincent C., ed. Geology and Technology of the Grants Uranium Region. New Mexico Bureau of Mines and Mineral Resources, Memoir 15.

Lucas, S. G. and Anderson, Orin J., 2000. The Todilto Salina Basin, Middle Jurassic of the U. S. Southwest in E. H. Gierlowski-Kordesch and K. R. Kelts, eds, Lake Basins Through Space and Time: AAPG Studies in Geology, 46, p. 153-158.

McLemore, Virginia T., 2002. Navajo Lake State Park: New Mexico Geology, v. 24, no. 3, p. 91-96,103.

Mining and Minerals Division (MMD), 2009. Mine Feature Data Dictionary.

TABLES

**Table 1
Site Features**

**F33-NM0057
Abandoned Uranium Mine Assessments**

Feature Name	On Site?	Feature Type	Associated Feature	Material	Height or Depth (ft)	Width or Diameter (ft)	Length (ft)	Open	Collapsed	Closure Type	Associated Photo	Notes
Access-1	No	Access		Dirt Nonmaintained	--	--	--	--	--	--	--	--
Claim-1	Yes	Sign	--	Metal	1	2	--	--	--	--	NM0057_005	arco bluewater f33 mine
DistPly-1	Yes	--	--	--	20	200	300	--	--	--	NM0057_006	--

Notes:

-- designates no information



Table 2
Gamma Radiation Survey Results

F33-NM0057
Abandoned Uranium Mine Assessments

Reading ID	Associated Feature	0 ft (μ R/hr)	4 ft (μ R/hr)	Associated Photo
Rad-1	--	13.00	10.00	--
Rad-2	--	8.00	8.00	--
Rad-3	--	10.00	8.00	NM0057_002
Rad-4	--	34.00	26.00	NM0057_003
Rad-5	--	10.00	9.00	--
Rad-6	--	9.00	9.00	--
Rad-7	--	8.00	7.00	--
Rad-8	--	7.00	8.00	--
Rad-9	distply-1	75.00	22.00	--
Rad-10	--	11.00	10.00	--
Rad-11	--	170.00	40.00	NM0057_007
RadBack-1	--	9.00	9.00	--

Notes:

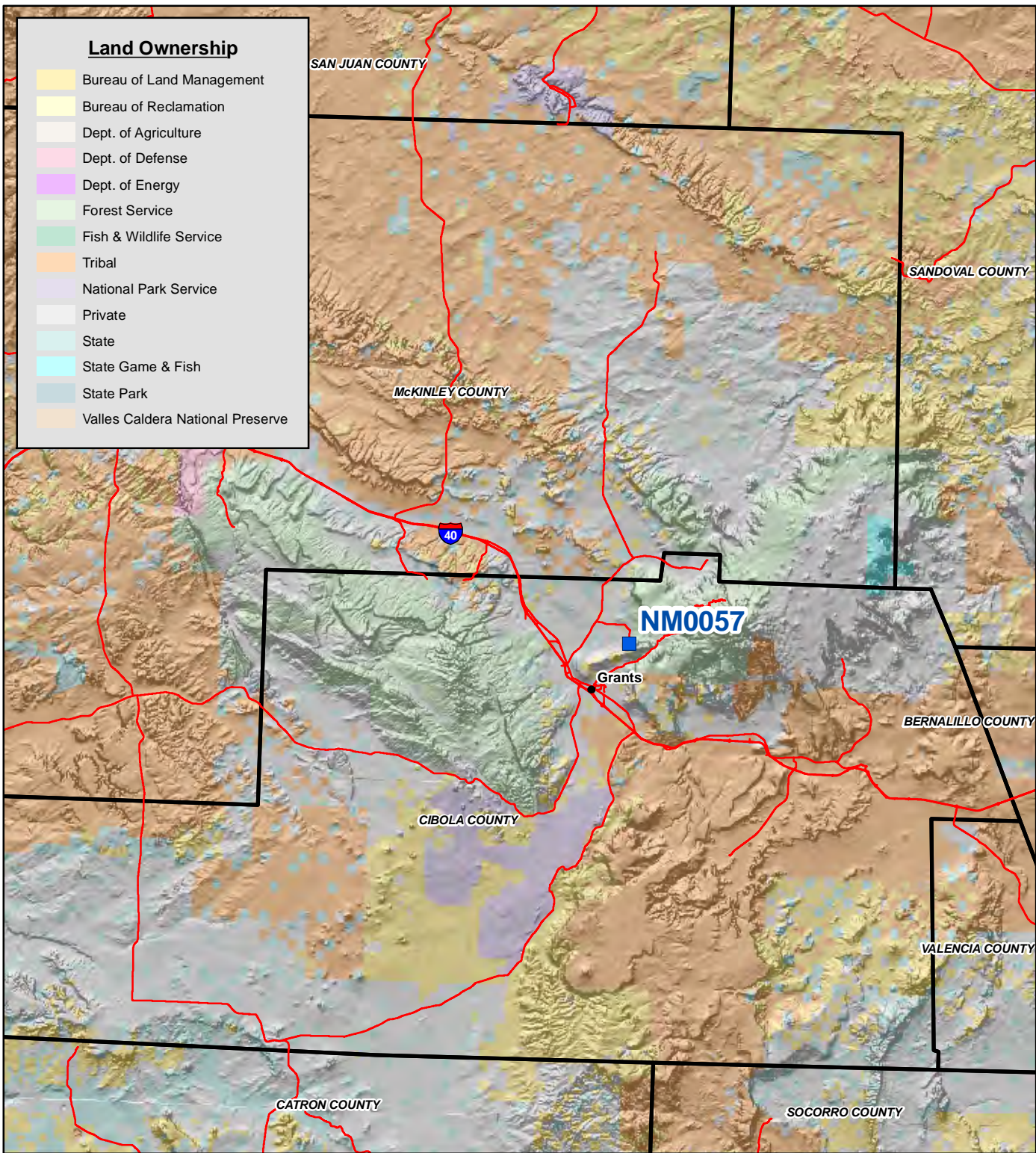
All gamma readings at this site taken by Ludlum 192 μ R/Ratemeter

μ R/hr=microroetgens per hour

-- designates no information



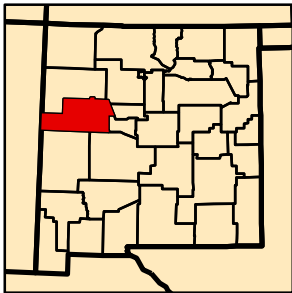
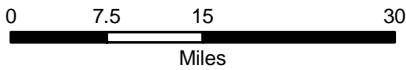
FIGURES



Land Ownership

Yellow	Bureau of Land Management
Light Yellow	Bureau of Reclamation
White	Dept. of Agriculture
Pink	Dept. of Defense
Purple	Dept. of Energy
Light Green	Forest Service
Green	Fish & Wildlife Service
Orange	Tribal
Light Purple	National Park Service
White	Private
Light Blue	State
Cyan	State Game & Fish
Blue	State Park
Light Orange	Valles Caldera National Preserve

Map Source(s):
Ownership - BLM, 2008

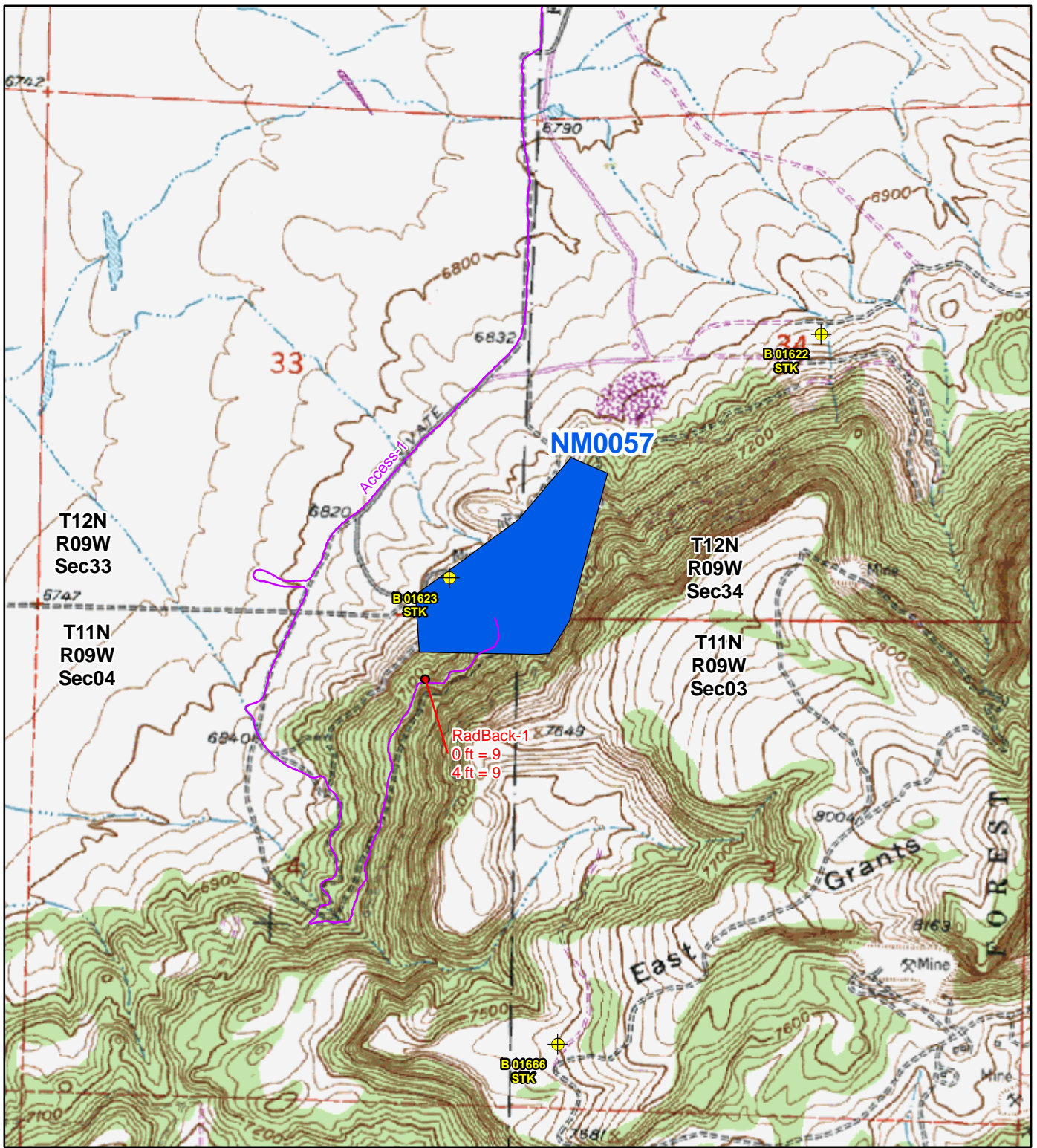


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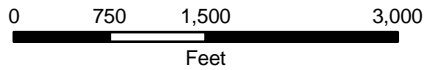
Blue square	AUM Location
Red line	Road
Black outline	County Boundary

Figure 1
Site Location Map
NM0057-F33
Abandoned Uranium
Mine Assessment





Map Source(s):
 U.S. Geological Survey 7.5-Minute
 Topographic Map
 -Grants, 1981

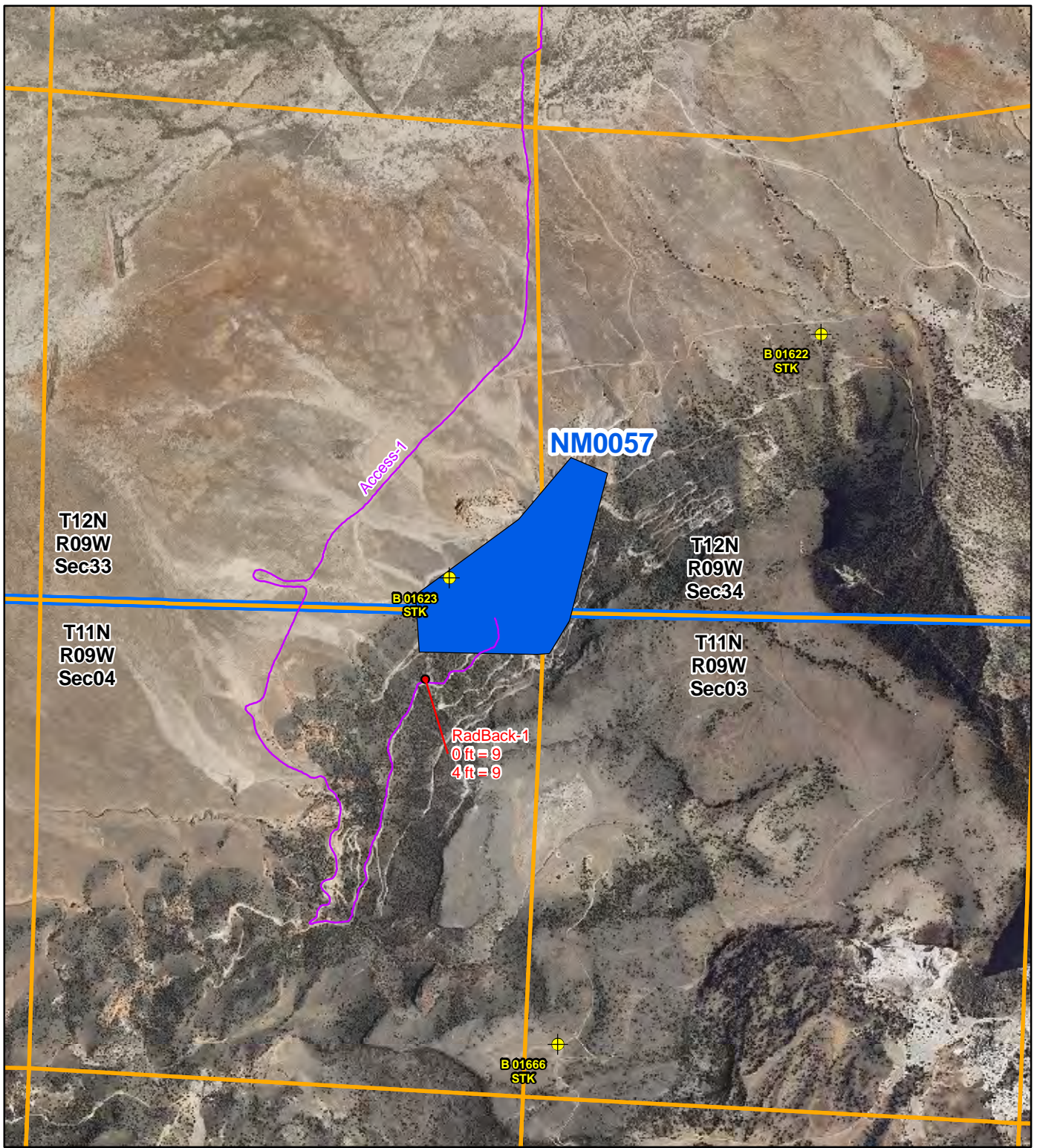


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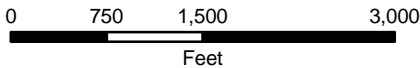
- Radiation Readings ($\mu\text{R/hr}$)
- ⊕ Well Within 1 Mile of Site
- Access Route
- AUM Location Boundary (MMD Provided)

Figure 2
Topographic Map
NM0057-F33
 Abandoned Uranium
 Mine Assessment





Map Source(s):
 U.S. Geological Survey 7.5-Minute
 DOQQ County Mosaic
 -Cibola County, 2009



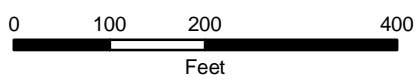
Legend	
● Radiation Readings ($\mu\text{R/hr}$)	■ AUM Location Boundary (MMD Provided)
⊕ Well Within 1 Mile of Site	▭ Section Boundary
— Access Route	▭ Township/Range Boundary

Figure 3
Aerial Photo
NM0057-F33
 Abandoned Uranium
 Mine Assessment





Map Source(s):
 U.S. Geological Survey 7.5-Minute
 DOQQ County Mosaic
 -Cibola County, 2009

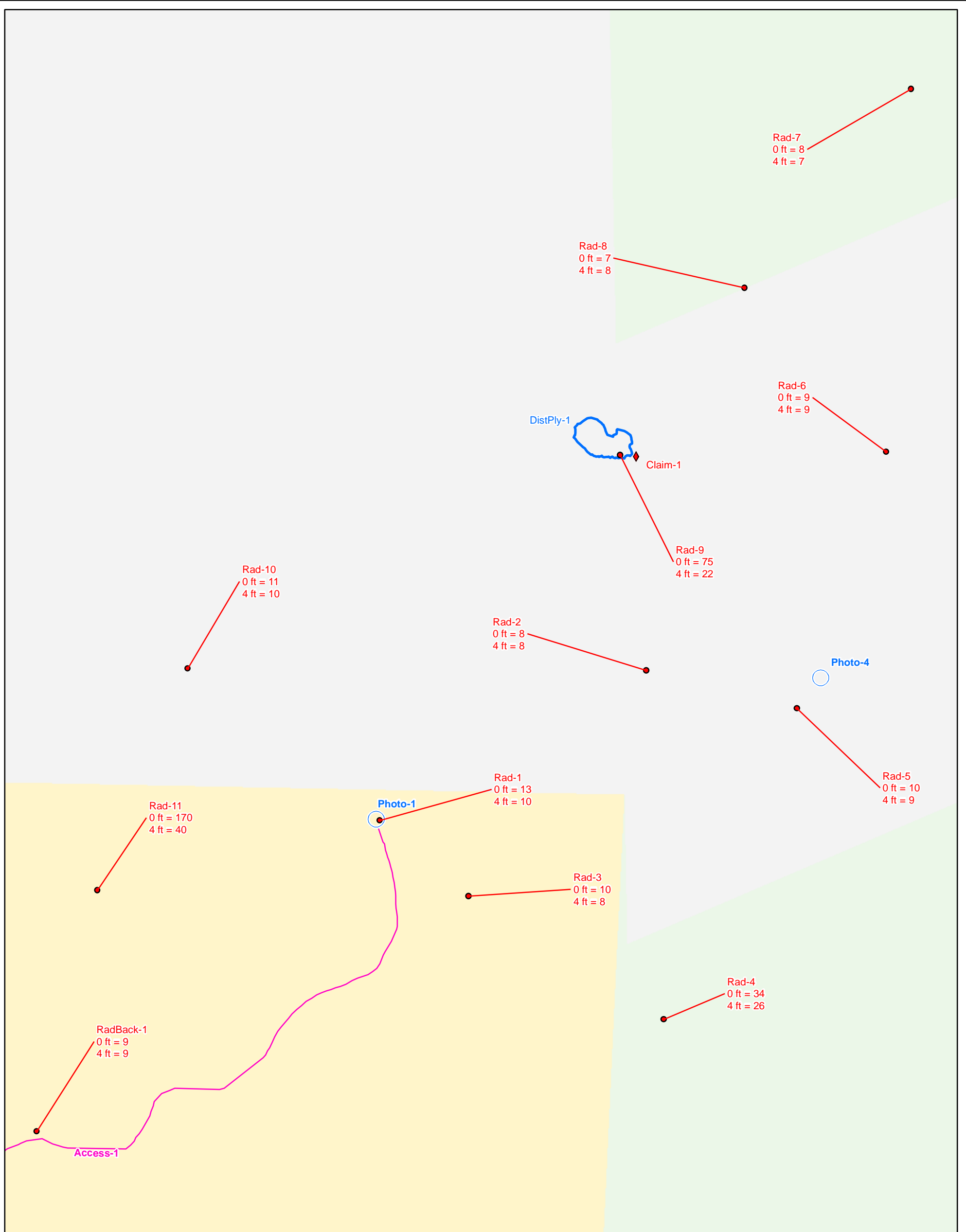


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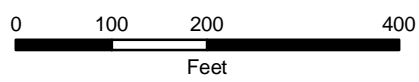
- Radiation Readings ($\mu\text{R/hr}$)
- ◆ Claim Marker
- Photo Location
- Access Route
- Other Disturbance Area

Figure 4a
Site Map on
Aerial Photo
NM0057-F33
 Abandoned Uranium
 Mine Assessment





Map Source(s):
Ownership - BLM, 2008



Legend

● Radiation Readings (μR/hr)	□ Other Disturbance Area
◆ Claim Marker	Surface Ownership
○ Photo Location	■ Bureau of Land Management
— Access Route	■ Forest Service
	■ Private

Figure 4b
Site Map with
Surface Ownership
NM0057-F33
Abandoned Uranium
Mine Assessment



APPENDIX A

PHOTO LOG

Note: Gaps in the numbering sequence of the photos is the result of removing photos not suitable for the report. A full set of photos is provided in the electronic deliverable.



Photo 1- Looking east at AUM Site identification.



Photo 2-Looking west at radiation survey point Rad-3 (10 μ R/hr at 0 ft above ground).



Photo 3- Looking south at radiation survey point Rad-4 (34 μ R/hr at 0 ft above ground).



Photo 4-Looking west at MMD provided polygon area.



Photo 5-Looking east at Claim-1.



Photo 6-Looking south at DistPly-1.



Photo 7-Looking at radiation survey point Rad-11 (170 μ R/hr at 0 ft above ground).



Photo 8-Vegetation at AUM Site.



Photo 9- Vegetation at AUM Site.



Photo 10- Vegetation at AUM Site.



Photo 11- Vegetation at AUM Site.



Photo 12- Vegetation at AUM Site.



Photo 13- Vegetation at AUM Site.

APPENDIX B
FIELD NOTES

9/16/10 ACT Abandoned Uranium Mines

58

Site Name: NM0057, F33

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Spencer Whitman

Equipment: Rental truck, Trimbel GeoXM (SN: 494844727, 2008 Series), Ludlum 192 (SN: 234149), Fujifilm digital camera (No. 0TB31259), backup Garmin GPS, cell phone amplifier, field laptop

8:30 Measuring Ludlum Scintillometer against ^{137}Cs source
= 270 nR/hr at contact

1230 In Grants. HASP Meeting.

1250 At Homestake to meet Dan Kump and resign access agreement.

1420 At AUM polygon

Photo 1 - Site ID location

Rad-1 - 0m - 13 nR/h; 1m - 10 nR/h; no apparent mine features

Rad-2 - 0m - 8 nR/h; 1m - 8 nR/h; no apparent mine features

Rad-3 - 0m - 10 nR/h; 1m - 8 nR/h; Photo 2; no apparent mine features

Photo 2^{ACT} - looking west at Rad 3 location

Rad-4 - 0m - 34 nR/h; 1m - 26 nR/h; Photo 3

Photo 3 - Rad-4 looking south

Photo 4 - Photo Pt-2 looking west

Rad 5 - 0m - 10 nR/h; 1m - 9 nR/h

Rad 6 - 0m - 9 nR/h; 1m - 9 nR/h

Rad 7 - 0m - 8 nR/h; 1m - 7 nR/h

Rad 8 - 0m - 8^{ACT} nR/h; 1m - 8 nR/h

59 9/16/10 NT Abandoned Uranium Mines
Claim-1 - Metal sign "Danger No Trespassing, Peligro Se
Prohíbe La Entrada, Arco Bluewater F-33 Mine"
1' tall, 2" wide, 0' long; attached to barbed wire
fence.

Photo 5 - Claim-1 looking east

Rad 9 - 0m - 75 mR/h; 1m - 22 mR/h - DistPly-1

DistPly-1 - Possible area of mine site, near sign "Claim-1"
20" tall, 200" wide, 300" long

Photo 6 - DistPly-1 looking south

Rad 10 - 0m - 11 mR/h; 1m - 10 mR/h

Rad 11 - 0m - 170 mR/h; 1m - 40 mR/h - Photo 7

Photo 7 - Rad 11, ore deposit

Photo 8 - 13 Vegetation

Access Rd-1 - Dirt Nonmaintained

Background Rad - 0m - 9 mR/h; 1m - 9 mR/h

Soils: Sandy-silt, thin, rocky tan soils.

Rock: Grey fine grained sandstone, Tan-redish sandstone,
black basalt and volcanic tuff locally.

Wildlife: Small birds; deer, coyote, rabbit droppings. Elk.

Human Activities: Lows, cow droppings, and fences indicate
grazing. Roads and ~~past~~^{Act} knowledge ~~from~~^{with} mine folks
indicate recent exploration.

