Abandoned Uranium Mine Assessment for the La Paloma Site (NM0187)

FINAL REPORT

Prepared For:

New Mexico Energy, Minerals and
Natural Resources Department
Wendell Chino Building
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Prepared By:

INTERA

September 29, 2010

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

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 La Paloma Site (AUM Site), MMD ID: NM0187 on August 31, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

According to McLemore (1983), some ore from the AUM Site may have been produced and shipped along with ore from the nearby Pineapple mine (MMD ID: NM0186) in 1954. A trial shipment from the site was reported in late 1954, which was found to be uneconomic (Anderson, 1980).

Anderson (1980) reported workings at the AUM Site consisting of several small open pits and bulldozer cuts, and a shallow, water-filled shaft measuring 6 ft x 6 ft at the surface, with depth to water 4 ft. The total depth of this shaft likely does not exceed 10 ft (Anderson, 1980). Workings were on pegmatite veins in a quartz-mica schist, and pegmatites at the site contain microcline, quartz, albite, and muscovite, with minor amounts of columbite, beryl, samarskite, and monazite (Anderson, 1980). No uranium minerals are apparent at the AUM Site (Anderson, 1980).

1.2 SITE LOCATION AND DIRECTIONS

The La Paloma Mine Site is within the Carson National Forest in the northern half of Section 30, Township 29 North, Range 9 East. This AUM Site is located in Rio Arriba County and is approximately 7 miles north of the town of La Madera, along New Mexico Highway 519 (please see Figure 1).

To reach the AUM Site from Albuquerque, drive approximately 57 miles north on Interstate 25 and take exit 282 for US-84 W/US-285 N. Continue through Santa Fe and follow US-84 W/US-285 N approximately 26 miles north to Española. In Española, turn left on Paseo de Onate to continue following US-84 W/US-285 N. Continue 8.5 miles further to the junction of US-84 W and US-285 N, and turn right to continue following US-285 N. Drive approximately 18 miles further on US-285 N and turn left at State Route 111, just past Ojo Caliente. Drive approximately 5 miles on State Route 111 and then turn right on NM-519 in the town of La Madera. Drive approximately 7.5 miles on NM-519 and then turn left onto an unnamed dirt road. Follow this dirt road approximately 0.5 miles to a "T", turn left at the "T" and continue approximately 0.25 miles to a fork in the road. At the fork bear right and continue approximately 0.60 miles to another "T" in the road. Turn left and drive approximately 150 feet and then turn left again. Continue approximately 0.50 miles to the AUM Site.

1.3 SITE GEOLOGY

The AUM Site is located in the southern Tusas Mountains, the southernmost subrange of the Rocky Mountains. The area surrounding the AUM Site is comprised of Precambrian

metamorphic and intrusive igneous rocks overlain by Tertiary volcanic and sedimentary deposits (Bingler, 1968). In eastern Rio Arriba County, these sediments consist of poorly consolidated pinkish-brown to yellowish-tan fine-grained arkosic silt and sand (Bingler, 1968). The uranium deposits found in the area are associated with Precambrian pegmatites intruding quartzite and schist (Anderson, 1980 and McLemore, 1983).

1.4 SITE HYDROGEOLOGY

The AUM Site is located along a small southwest trending drainage. Surface flows drain southwest to the drainage along Cañon de la Paloma approximately 1,000 feet to the southwest. This drainage flows south to the Rio Tusas which joins the Rio Vallecitos and then joins the Rio Ojo Caliente. The Rio Ojo Caliente in turns joins the Rio Chama approximately 27 miles southwest of the AUM Site.

The AUM Site is located near the eastern boundary of the Rio Chama Watershed, which covers most of the Rio Chama Water Planning Region (La Calandria Associates, Inc., 2006). The area surrounding the AUM Site is comprised of Precambrian crystalline rocks overlain by Tertiary volcanic and sedimentary deposits. The Precambrian rocks contain small amounts of groundwater in faults and weathered zones (La Calandria Associates, Inc., 2006). The Santa Fe Group strata exposed in the area surrounding the AUM Site constitute a shallow aquifer which covers most of the southern portion of the Rio Chama Watershed. This aquifer is composed predominantly of fluvial, deformed, slightly consolidated sedimentary rocks, and groundwater flow in this unit is to the southwest at the AUM Site (La Calandria Associates, Inc., 2006).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site can be found on the La Madera Quadrangle 7.5 minute United States Geological Survey topographic map at an elevation of approximately 7,500 feet above mean sea level (please see Figure 2). The AUM Site is located east of Canon de la Paloma, in a drainage within gently sloping hills. Figure 3 shows an aerial photograph of the terrain surrounding the AUM Site.

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. Two waste piles, five pits, one shaft, 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

One shaft (ShaftPly-1) was found on the AUM Site, measuring approximately 8 ft wide by 10 ft long. The shaft was filled with water, with depth to water approximately 5 ft. The gamma

radiation level measured at the shaft was was 13 µR/hr (microroentgens per hour) at 0 ft above ground and 12 µR/hr at 4 ft above ground.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

Five pits (Pit-1, -2, -3, -4, and -5) were found at the AUM Site. All of the pits are excavations into pegmatite exposures. The maximum gamma radiation measurement on these features was 30 µR/hr at 0 ft above ground at radiation survey point Rad-7 at Pit-4 (see Table 2).

2.3 WASTE AND ORE PILES AND DISTURBANCES

Two waste piles (PilePly-1 and PilePly-2) and one disturbed area (DistPly-1) were found at the AUM Site. The waste piles are both composed of excavated waste rock. The larger of these two piles, PilePly-1, is located just north of Pit-1 and Pit-2, near the northern end of the site. It is approximately 50 ft wide by 100 ft long, and 15 ft tall. PilePly-2 is approximately 20 ft wide by 30 ft long and 15 ft tall. The disturbance area, DistPly-1, is approximately 50 ft wide by 200 ft long and appears to be a bulldozed area to the south of the excavation features. The maximum gamma radiation measurement on these features was 32 µR/hr at 0 ft above ground at radiation survey point Rad-1 on PilePly-1 (see Table 2).

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

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

2.5 OTHER MINE FEATURES

A shallow drainage, Drain-1, runs north-south through the AUM Site. The drainage is an ephemeral stream and flows adjacent to several mine features, including ShaftPly-1 and DistPly-1 (See Figures 4a and 4b).

2.6 BOREHOLES

No boreholes were found at the AUM Site.

2.7 RECLAMATION ACTIVITIES

No reclamation activities were identified onsite.

3.0 ARCHEOLOGICAL SITES

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

4.0 SITE GAMMA RADIATION READINGS

The background gamma radiation readings were measured approximately 1,000 feet northeast of the AUM Site boundary. The background gamma level was 12 µR/hr (microroentgens per hour)

at 0 ft above ground and 12 µR/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 gamma radiation readings at the AUM Site varied only slightly above background levels. The maximum gamma radiation measured on site was 32 µR/hr at 0 ft above ground and 16 µR/hr at 4 ft above ground at radiation survey point Rad-14 in CutPly-2.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Cow prints, cow droppings, and a stock pond along Access-2 were seen in the area, indicating the AUM Site and surrounding area is used as grazing land.

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 wells, domestic or otherwise, lie within a mile of the AUM Site.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

The stock pond seen along Access-2 and cow droppings observed near the site, indicate the area may be used for grazing.

5.5 EVIDENCE OF WILDLIFE

Deer, elk, and rabbit droppings were observed near the AUM Site. Several small birds, including robins and magpies, were also seen in the area.

6.0 VEGETATION

The La Paloma Site is located in the Juniper Savanna (Ecotone) vegetation type (Dick-Peddie, 1999). Woody vegetation at the site included ponderosa pine and Utah juniper. Grass species included a bentgrass species and green needlegrass. No forb species were collected from the site. No noxious weeds were noted from photographs of the site.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

No evidence of mine related erosion was observed on site.

7.2 ENVIRONMENTAL IMPACTS

There is no evidence of soil staining from chemicals potentially brought to the AUM Site, or from constituents present in the ore or waste rock.

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.

Bingler, Edward C., 1968. Geology and Mineral Resources of Rio Arriba County, New Mexico. New Mexico Bureau of Mines and Mineral Resources Bulletin 91.

Dick–Peddie, William A, 1999. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press.

La Calandria Associates, Inc., 2006. Rio Chama Regional Water Plan. Prepared for Rio de Chama Acequias Association and Rio Arriba County.

McLemore, Virginia T., 1983. Uranium and Thorium Occurrences in New Mexico: Distribution, Geology, Production, and Resources, with Selected Bibliography. New Mexico Bureau of Mines and Mineral Resoures Open File Report OF-183.

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

New Mexico Office of the State Engineer (NMOSE), 2008. Wells and Surface Diversions in New Mexico. WATERS_PODS_may08.shapfile. OSE Waters Database.

TABLES

Table 1
Site Features

La Paloma-NM0187
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 Photos	Notes
Access-1	No	Access	--	Dirt Nonmaintained	--	--	--	--	--	--	--	--
Access-2	No	Access	--	Dirt Nonmaintained	--	--	--	--	--	--	--	
DistPly-1	Yes	--	--	--	--	50	200	--	--	--	NM0187_010 NM0187_011	looking southeast, northwest; bulldozed area
Drain-1	Yes	Drainage	--	--	--	5	--	--	--	--	NM0187_012	looking south
PilePly-1	Yes	Waste	--	Rock	15	50	100	--	--	--	NM0187_002	looking north
PilePly-2	Yes	Waste	--	Rock	15	20	30	--	--	--	NM0187_007	looking north
Pit-1	Yes	Exploration	--	--	5	15	20	Yes	--	--	NM0187_005	looking north
Pit-2	Yes	Exploration	--	--	4	20	20	Yes	--	--	NM0187_006	looking west
Pit-3	Yes	Exploration	--	--	5	10	10	Yes	--	--	NM0187_008	looking east
Pit-4	Yes	Exploration	--	--	2	5	20	Yes	--	--	NM0187_009	looking east
Pit-5	Yes	Exploration	--	--	6	10	25	Yes	--	--	NM0187_017	looking east
ShaftPly-1	Yes	Main	Timber	--	5	8	10	Yes	--	--	NM0187_003 NM0187_004	looking west; depth to water

Notes:
-- designates no information

Table 2
Gamma Radiation Survey Results

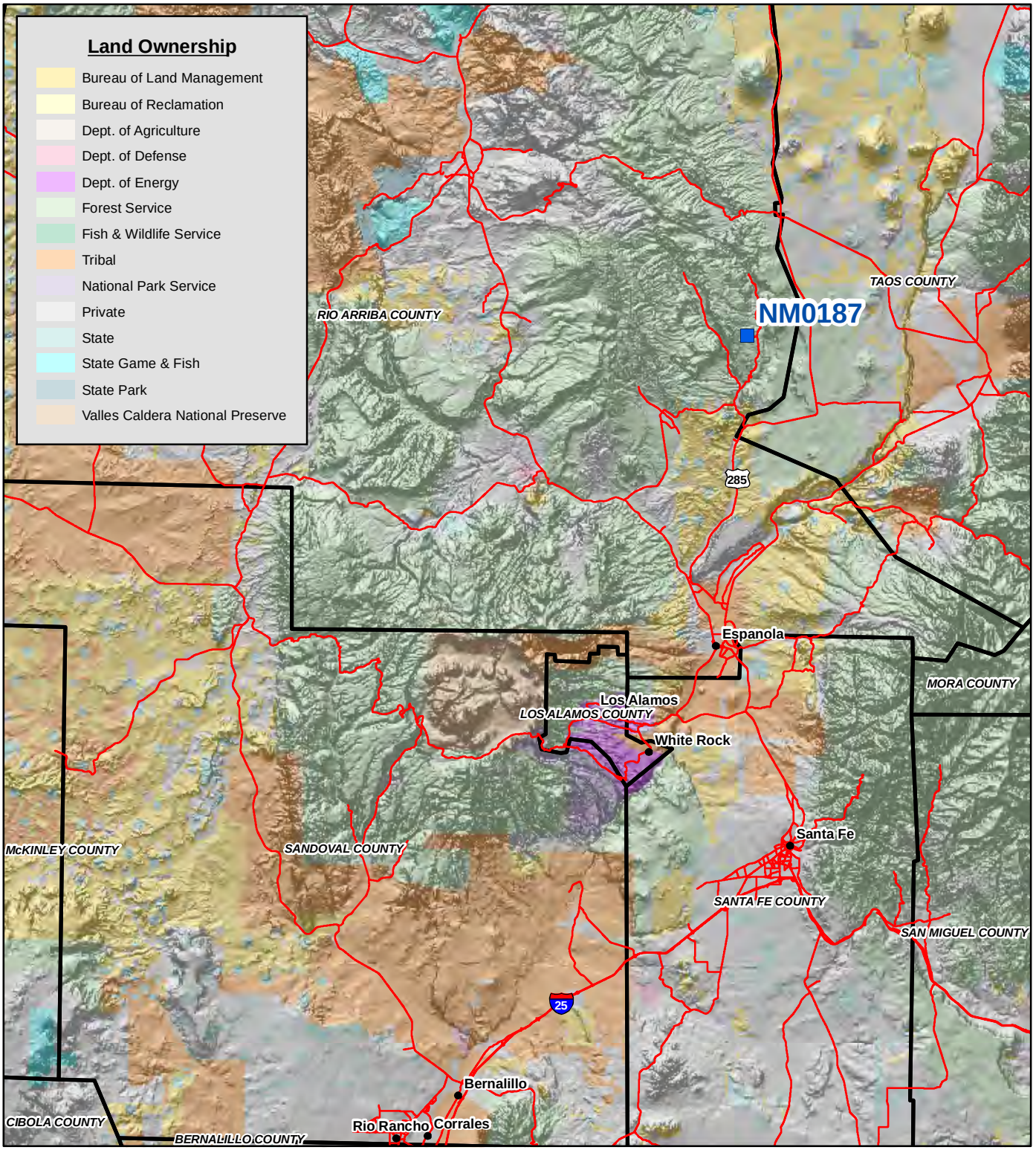
La Paloma-NM0187
Abandoned Uranium Mine Assessments

Reading ID	Associated Features	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photos
Rad-1	pileply-1	32	16	--
Rad-2	shaftply-1	13	12	--
Rad-3	pit-1	20	17	--
Rad-4	pit-2	26	15	--
Rad-5	pileply-2	14	14	--
Rad-6	pit-3	14	12	--
Rad-7	pit-4	30	20	--
Rad-8	distply-1	16	16	--
Rad-9	distply-1	18	15	--
Rad-10	drain-1	17	16	--
Rad-11	drain-1	15	16	--
Rad-12	pit-5	17	15	--
RadBack-1	--	12	12	--

Notes:

All gamma readings at this site taken by Ludlum 192 µR/Ratemeter
µR/hr=microroetgens per hour
-- designates no information

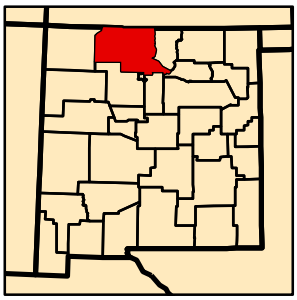
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH

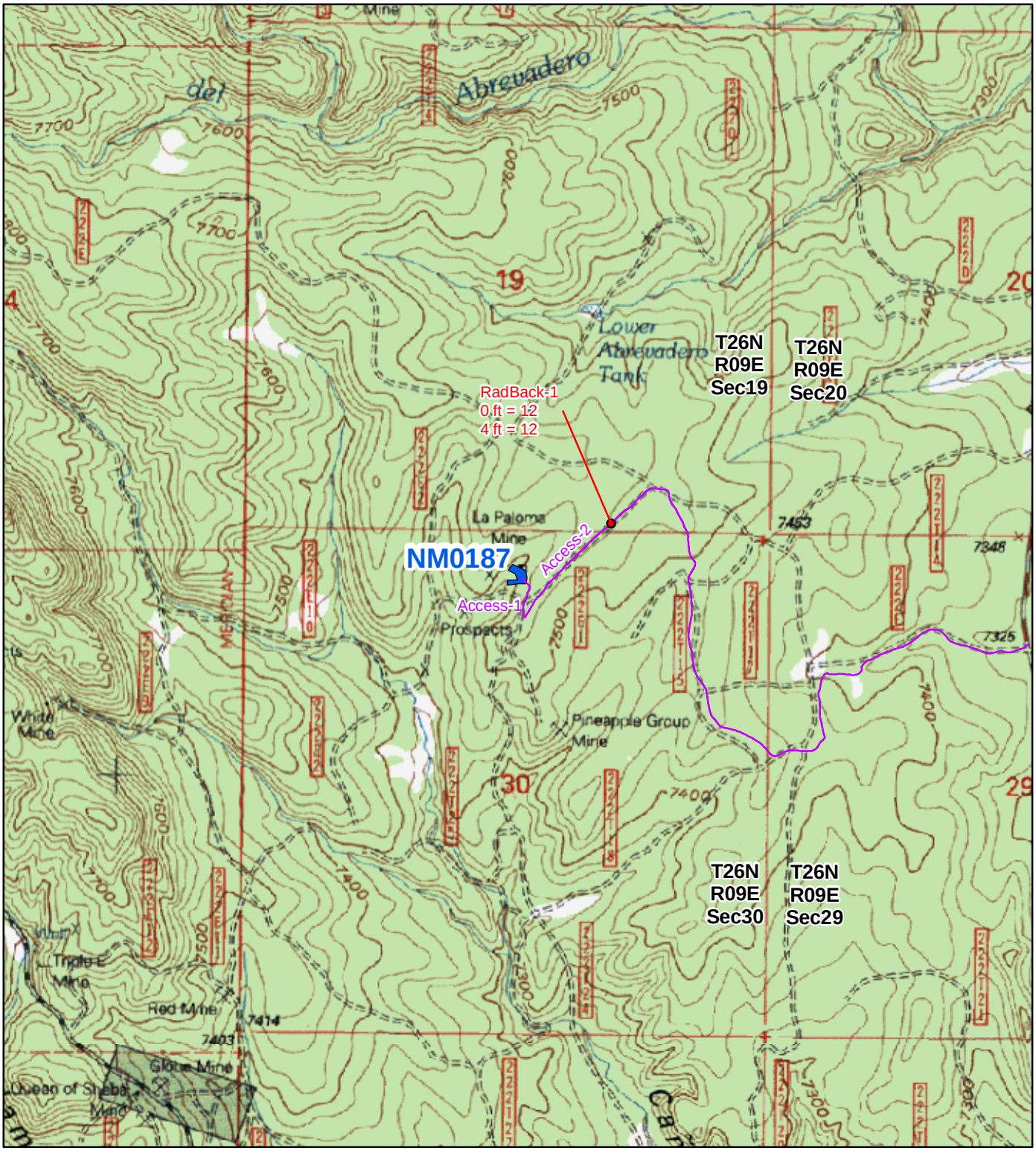


Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0187-La Paloma
Abandoned Uranium Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0187-La_Paloma\GIS\Maps\Site_Map_LaPaloma_CP.mxd 09/13/2010



Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-La Madera, 1995

0 750 1,500 3,000
Feet

NORTH

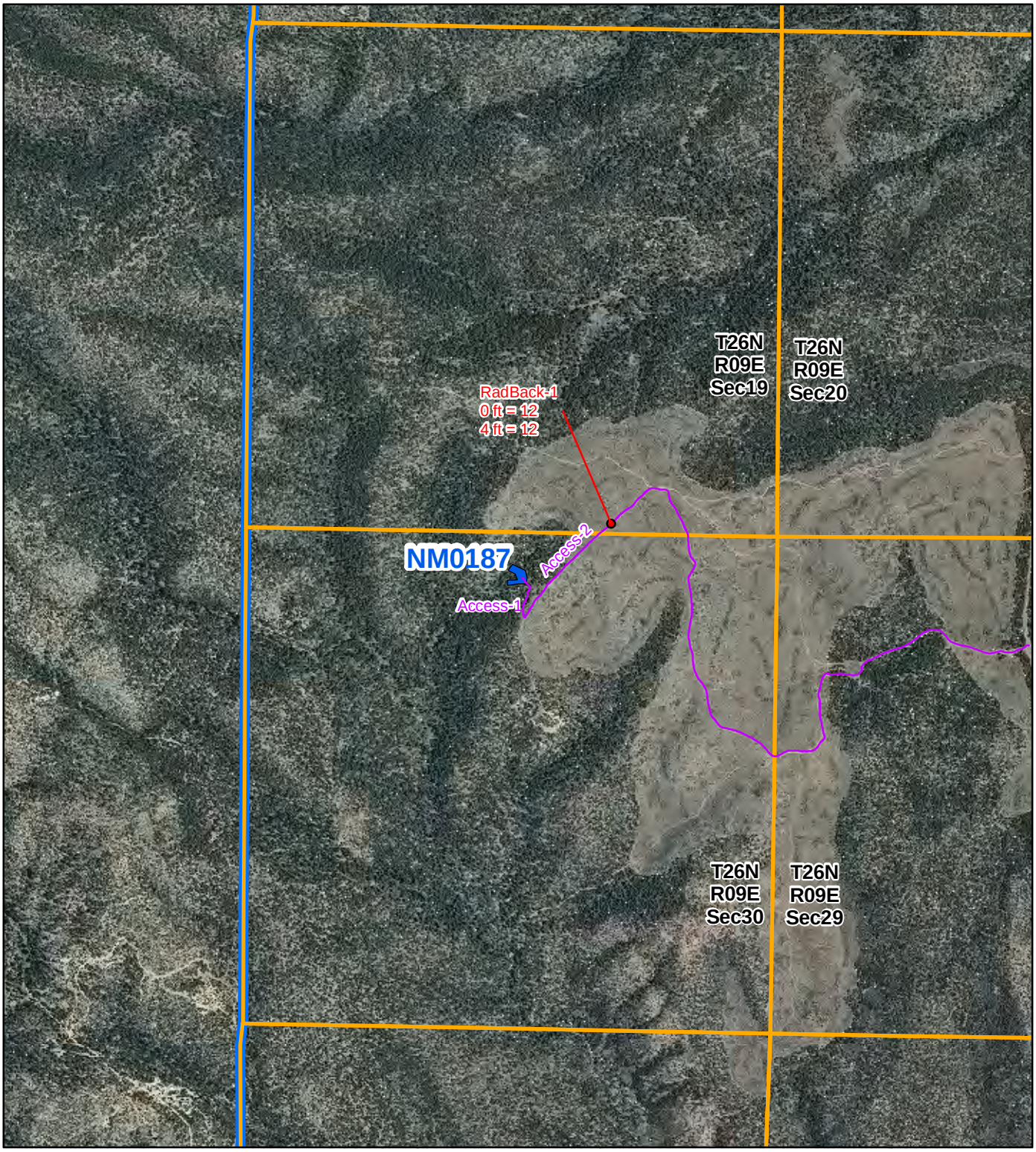
Legend

- Radiation Readings (µR/hr)
- Access Route
- AUM Location Boundary (MMD Provided)

Note:
There are no wells within 1 mile of the Site.

Figure 2
Topographic Map
NM0187-La Paloma
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0187-La_Paloma\GIS\Maps\Topo_Map_LaPaloma_CP.mxd 09/13/2010



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

0 750 1,500 3,000
Feet

NORTH

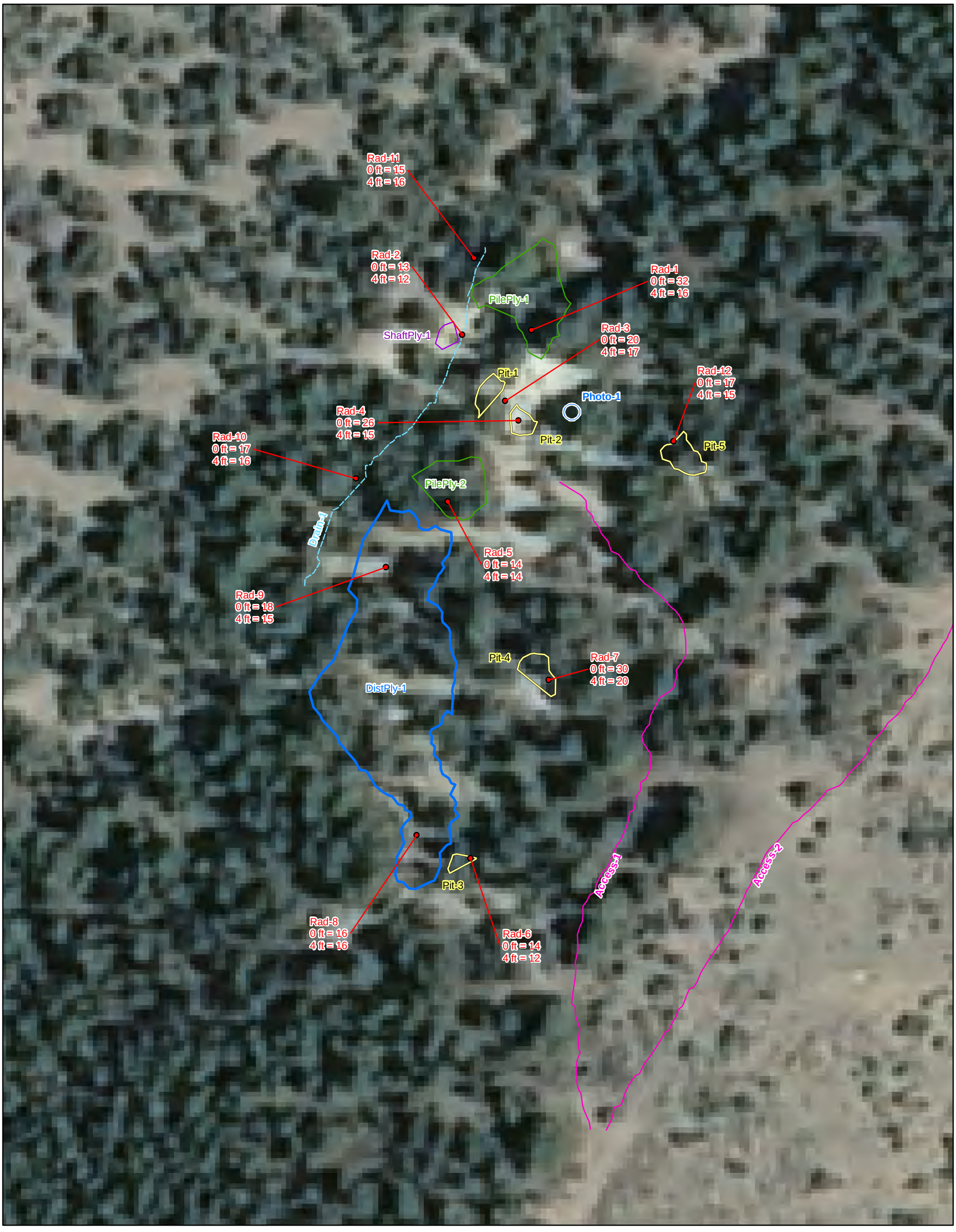
Legend

- Radiation Readings (µR/hr)
- Access Route
- AUM Location Boundary (MMD Provided)
- Section Boundary
- Township/Range Boundary

Note:
There are no wells within 1 mile of the Site.

Figure 3
Aerial Photo
NM0187-La Paloma
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0187-La_Paloma\GIS\Maps\Aerial_Map_LaPaloma_CP.mxd 09/13/2010



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

0 30 60 120
Feet

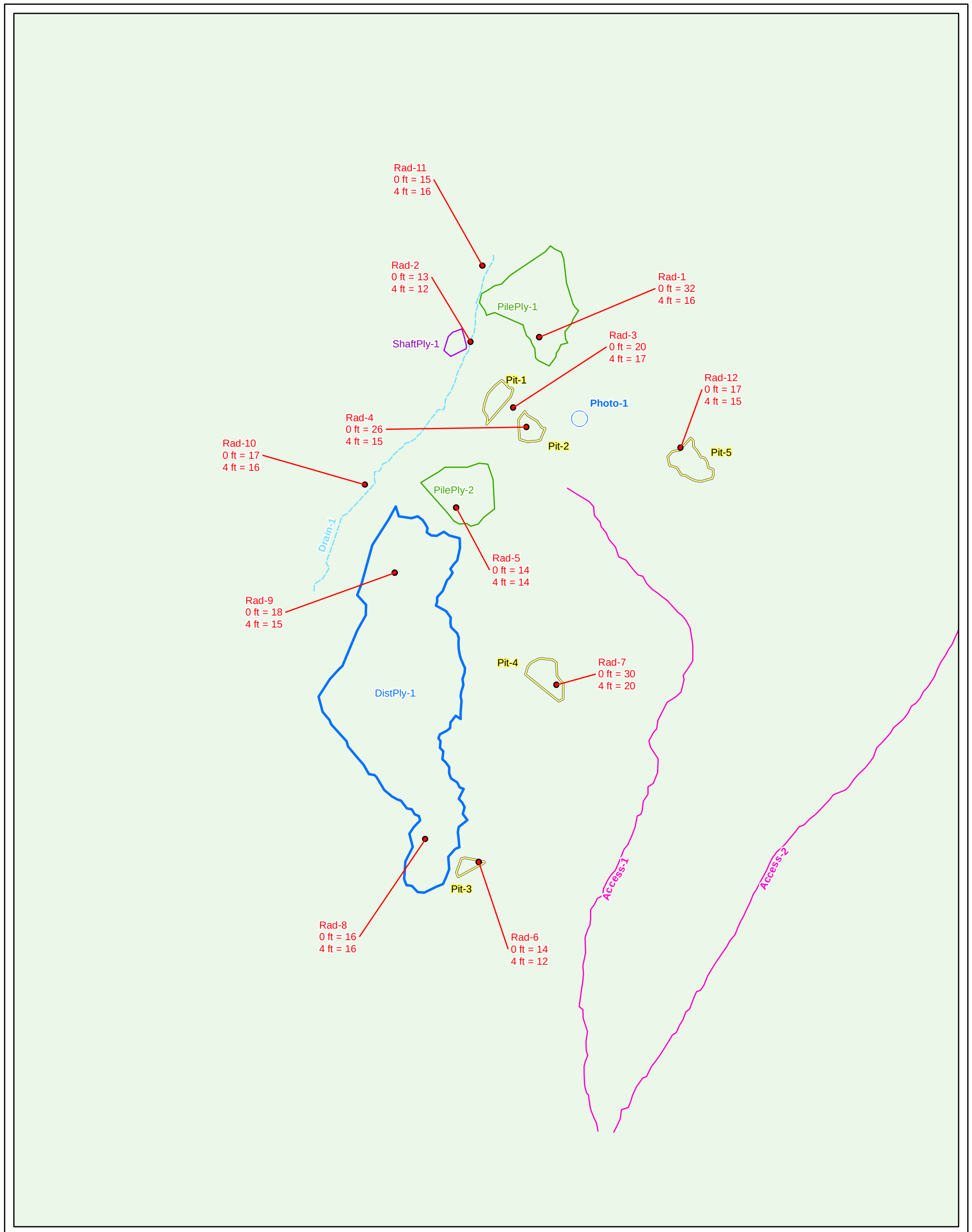
NORTH

Legend

- Radiation Readings (µR/hr)
- Photo Location
- Access Route
- Drainage
- Pile Boundary
- Shaft Boundary
- Pit Boundary
- Other Disturbance Area

Figure 4a
Site Map on
Aerial Photo
NM0187-La Paloma
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0187-La_Paloma\GIS\Maps\CloseUpAerial_Map_LaPaloma_CP.mxd 09/14/2010



Map Source(s):
Ownership - BLM, 2008

0 30 60 120
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Photo Location
- Access Route
- Drainage
- Pile Boundary
- Shaft Boundary
- Pit Boundary
- Other Disturbance Area

Surface Ownership

- Forest Service

Figure 4b
Site Map with
Surface Ownership
NM0187-La Paloma
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0187-La_Paloma\GIS\Maps\CloseUpOwnership_Map_LaPaloma_CP.mxd 09/14/2010

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-Site location photo looking west.

Photo 2-Looking north at PilePly-1.

Photo 3-Looking west at ShaftPly-1, replicating Anderson photo A.

Photo 4- Looking west at ShaftPly-1, replicating Anderson photo B.

Photo 5-Looking north at Pit-1.

Photo 6-Looking west at Pit-2, replicating Anderson photo D.

Photo 7-Looking north at PilePly-2.

Photo 8-Looking east at Pit-3.

Photo 9-Looking east at Pit-4.

Photo 10-Looking southeast at DistPly-1.

Photo 11-Looking northwest at DistPly-1, replicating Anderson photo E.

Photo 12-Looking south at Drain-1, in the general vicinity of Anderson photo C.

Photo 13-Vegetation at AUM Site.

Photo 14-Vegetation at AUM Site.

Photo 15-Vegetation at AUM Site.

Photo 16-Vegetation at AUM Site.

Photo 17-Looking east at Pit-5.

APPENDIX B

FIELD NOTES

8/31/10 ALT Abandoned Uranium Mines

Site Name: N.M0187, La Paloma

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Alex Resovsky

Equipment: Rental truck, Trimbel GeoXM (SN: 4944844727, 2008 Series), Ludlum 192 (SN: 234149), Fujifilm digital camera (No. OTB31259), backup Garmin GPS, cell phone amplifier, field laptop

1200 - Arrive at AUM site

Photo 1 - Site ID photo looking west

PilePly-1 - 15' tall, 100' long, 50' wide; 45° slope
Photo 2 - looking north at PilePly-1
Rad-1 - PilePly-1; 0m - 32 uR/h; 1m - 16 uR/h

Shaft-1 - Main; 5' deep to water; 10' x 8'
Photo 3 - looking west at shaft-1; replicating Anderson Photo a
Photo 4 - looking west at shaft-1; replicating Anderson Photo ALT b
Rad-2 - Shaft-1; 0m - 13 uR/h; 1m - 12 uR/h

Pit-1 - 5' deep; 15' wide, 20' long
Photo 5 - looking north at Pit-1
Rad-3 - Pit-1; 0m - 20 uR/h; 1m - 17 uR/h

Pit 2 - 4' deep; 20' x 20'
Photo 6 - looking west at Pit 2, replicating Anderson Photo d
Rad-4 - Pit-2; 0m - 26 uR/h; 1m - 15 uR/h

PilePly2 - 15' tall, 20' wide, 30' long; 50° slope
Photo 7 - looking north at PilePly-2
Rad 5 - PilePly-2; 0m - 14 uR/h; 1m - 14 uR/h

Pit 3 - 5' deep, 10' x 10'

Photo 8 - looking east at Pit 3

Rad 6 - Pit-3; 0m - 17 uR/h; 1m - 12 uR/h

Pit 4 - 2' deep; 5' wide, 20' long

Photo 9 - looking east at Pit-4

Rad 7 - Pit-4; 0m - 30 uR/h; 1m - 20 uR/h

DistPly-1 - 50' wide; 200' long; bulldozed area in Anderson report

Photo 10 - DistPly-1 looking southeast

Photo 11 - DistPly-1 looking northwest, replicating Anderson photo e

Rad 8 - DistPly-1; 0m - 16 uR/h; 1m - 16 uR/h

Rad 9 - DistPly-1; 0m - 18 uR/h; 1m - 15 uR/h

Rad 10 - Drainage ALT-1; 0m - 17 uR/h; 1m - 16 uR/h

Drainage ALT-1; runs north-south; does not appear degraded 5' wide

Photo 12 - Drain-1 looking south, replicating Anderson photo c

Rad 11 - Drain-1, north end; 0m - 15 uR/h; 1m - 16 uR/h

Photos 13-16 - Vegetation

Pit-5; 6' deep, 10' wide, 20' long

Photo 17 - Pit-5 looking east

Rad 12 - Pit-5; 0m - 17 uR/h; 1m - 15 uR/h

1340 Leaving site

Access Rd-1 - Dirt road to site

Access Rd-2 - Main dirt road, also to Pineapple

Background Rad - 0m - 12 uR/h; 1m - 12 uR/h

1415 Back at truck. Note* road is passable following Access 2

Soils: Light tan, micaceous. Thin, shallow and rocky.

Rocks: Pegmatite vein in muscovite, ALT-fg quartz schist.

Wildlife: Deer and rabbit ALT droppings. Robin, magpie.

Human Activities: Cattle grazing. Cow droppings and water catchment.