Abandoned Uranium Mine Assessment for the White Flo Site (NM0184)

FINAL REPORT

Prepared For:

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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 White Flo Site (AUM Site), MMD ID: NM0184 on September 30, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

According to Anderson (1980) workings at the site consisted of a bench cut containing an open pit and an associated dump pile. The pit measured 20 ft wide by 100 ft long and had a maximum depth of 6 ft (Anderson, 1980). The dump was located below and to the south of the bench and is approximately 10-12 ft wide, 125 ft long, and 4 ft high (Anderson, 1980). McLemore (1983) reported that four tons of ore yielding seven pounds of 0.08% U_3O_8 were produced from the area prior to 1956.

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is located within the Santa Fe National Forest, in the southwest corner of Section 19, Township 23 North, Range 1 East. The AUM Site is located in southwestern Rio Arriba County and is approximately 4 miles southwest of the town of Gallina. The location of this Site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, take I-25 north to Bernalillo and exit US-550. Follow US-550 north 68 miles and turn right at NM-96, approximately 3.5 miles north of Cuba. Travel approximately 17 miles east on NM-96 and turn right at Rio Arriba County Road 414. Go approximately 3 miles south and turn right at Forest Road 76/Corral Canyon Road. Travel 1.5 miles west and the AUM Site will be on the right side of the road, on the northern slope of Corral Canyon.

1.3 SITE GEOLOGY

The AUM Site is located in the northern Sierra Nacimiento, a laramide uplift that forms the northwestern part of the Jemez Mountains (Pollock et al., 2004). Paleozoic sedimentary rocks are exposed in the vicinity of the AUM Site. Minor uraniferous sedimentary copper deposits occur locally within shale and arkosic conglomerate of the Permian Abo Formation and the Pennsylvanian Madera Group (McLemore and Chenoweth, 1989).

1.4 SITE HYDROGEOLOGY

The AUM Site is located near the southwestern boundary of the Rio Chama watershed which covers most of the Rio Chama Water Planning Region (La Calandria Associates, Inc., 2006). Surface runoff at the AUM Site flows south into Corral Creek which joins the Rio Gallina approximately 1.5 miles east. The Rio Gallina then joins the Chama River approximately 16 miles northeast of the AUM Site.

The Permian Abo Formation constitutes a shallow aquifer that is partially exposed at the surface at the AUM Site. This aquifer is composed of reddish-brown arkosic mudstone and sandstone, with minor conglomerate and limestone (La Calandria Associates, Inc., 2006). Groundwater flow in this unit is generally to the north at the AUM Site.

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Regina 7.5 minute United States Geological Survey topographic map at an elevation of approximately 8,100 ft above mean sea level (see Figure 2). The AUM Site is located along the northern slope of Corral Canyon which is on the northeastern flank of the San Pedro Mountains, a northwest-trending subrange of the Jemez Mountains.

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 pile, two disturbed areas, one cut, and two mine roads were identified 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 shafts, adits or declines were found at the AUM Site.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

One open bench cut (CutLn-1) was found onsite. This feature is a surface excavation into the Permian sedimentary deposits exposed along the hillside at the AUM Site. The cut is overgrown and poorly exposed (see Photo 4 in Appendix A). Gamma radiation readings taken at the exposure were not significantly above background level.

2.3 WASTE AND ORE PILES AND DISTURBANCES

One waste pile and two disturbances were found onsite. The waste pile, PilePly-1, consists of waste rock and is located south of CutLn-1. PilePly-1 is an average of 8 ft tall, 20 ft wide, and 150 ft long (see Photos 6 and 7 in Appendix A). The disturbed areas (DistPly-1 and DistPly-2) were found upslope to the northeast of CutLn-1 (see Figures 4a and 4b). These disturbances appear to have been bulldozed areas (see Photos 1 and 2 in Appendix A). The maximum gamma radiation measurement for these features was 65 µR/hr (microroentgens per hour) at 0 ft above ground at radiation survey point Rad-15 on PilePly-1 (see Table 2).

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

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

2.5 OTHER MINE FEATURES

Two mine roads (Rd-1 and Rd-2) were found onsite. Rd-1 is located above CutLn-1 and leads up to the two disturbed areas from the west (see Figures 4a and 4b). Rd-2 leads south from CutLn-1 down to PilePly-1 and Corral Canyon Road below (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

One background gamma radiation reading was taken near the AUM Site, recording 11 µR/hr at 0 ft above ground and 11 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 maximum gamma radiation measured onsite was 65 µR/hr at 0 ft above ground at radiation survey point Rad-15 on PilePly-1. A second gamma radiation measurement also taken at PilePly-1 (radiation survey point Rad-14) recorded 32 µR/hr at 0 ft above ground.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Tire tracks and trash observed along Corral Canyon Road indicate that the area is used for recreation and sees ATV activity. Cattle seen nearby indicate the land is also used for grazing.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

No residential, commercial, or industrial 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

Cows, cow prints and droppings, fences, and corrals were observed near the AUM Site indicating that the area surrounding the AUM Site is used for cattle grazing.

5.5 EVIDENCE OF WILDLIFE

A magpie, hawk, and lizard were observed near the AUM Site, as well as rabbit and deer droppings.

6.0 VEGETATION

The White Flo site is located in the Coniferous and Mixed Woodland vegetation type (Dick-Peddie, 1999). Woody vegetation at the site included ponderosa pine, gambel oak, chamisa, spineless horsebrush, fir, and juniper species. Grass species included blue grama and a needlegrass. Forb species included Rocky Mountain goldenrod. 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.

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.

McLemore, Virginia T., and William L. Chenoweth, 1989. Uranium Resources in New Mexico. Socorro: New Mexico Bureau of Mines & Mineral Resources.

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

Pollock, Caleb J., Kevin G. Stewart, James P. Hibbard, Laura Wallace, and Ruben A. Giral, 2004. Thrust wedge tectonics and strike-slip faulting in the Sierra Nacimiento, New Mexico. New Mexico Bureau of Geology & Mineral Resources Bulletin 160.

TABLES

Table 1
Site Features

White Flo-NM0184
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
CutLn-1	Yes	--	--	--	10	10	100	--	--	--	NM0184_004	--
DistPly-1	Yes	--	--	--	--	60	70	--	--	--	NM0184_001	--
DistPly-2	Yes	--	--	--	--	20	100	--	--	--	NM0184_002	--
PilePly-1	Yes	Waste	--	Rock	8	20	150	--	--	--	NM0184_006 NM0184_007	--
Rd-1	Yes	Dirt	--	Dirt Nonmaintained	--	--	--	--	--	--	NM0184_003	--
Rd-2	No	Dirt	--	Dirt Nonmaintained	--	--	--	--	--	--	NM0184_005	--

Notes:

-- designates no information

Table 2
Gamma Radiation Survey Results

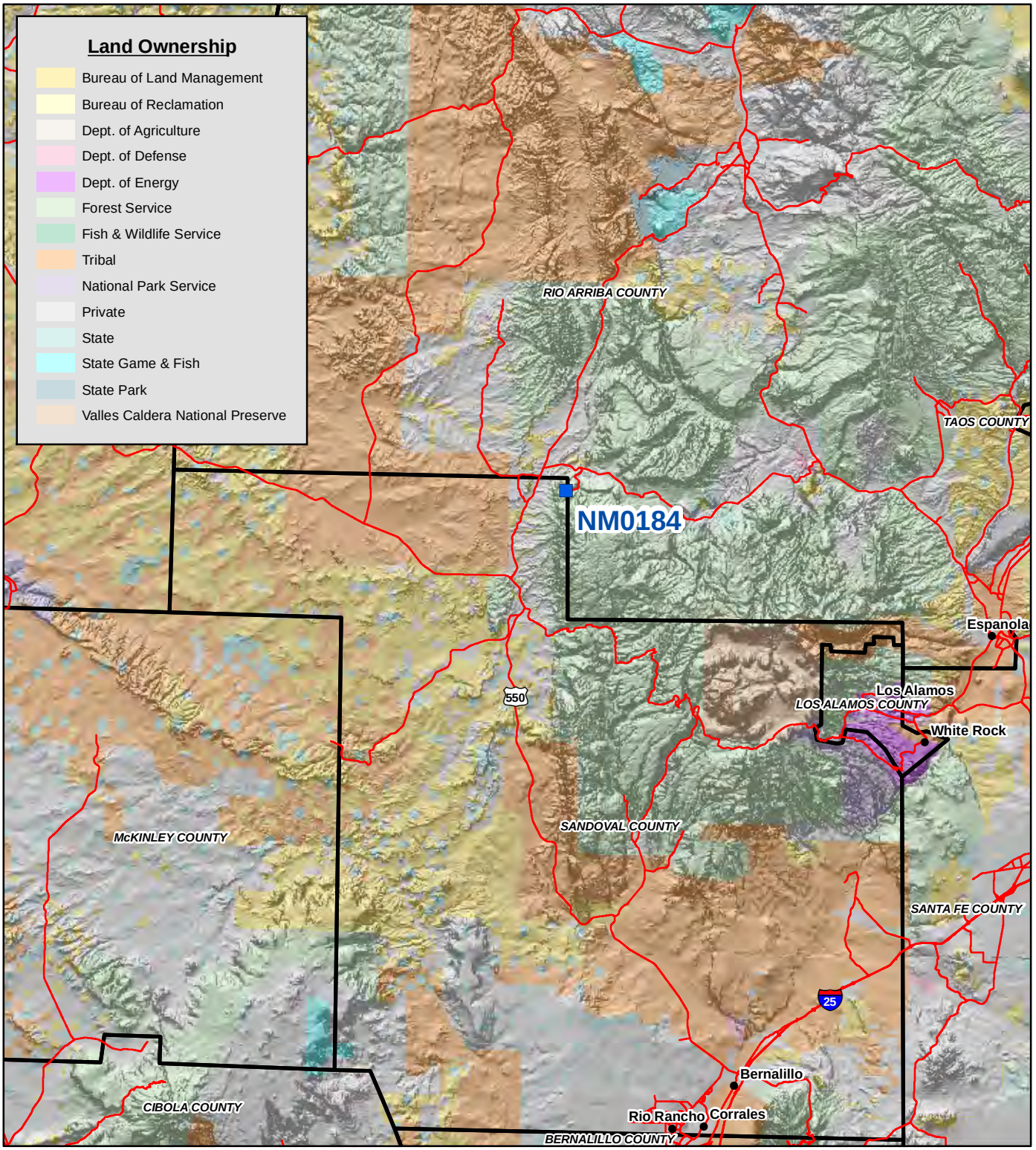
White Flo-NM0184
Abandoned Uranium Mine Assessments

Reading ID	Associated Features	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photos
Rad-1	distply-1	10	10	--
Rad-2	distply-2	16	13	--
Rad-3	distply-2	13	11	--
Rad-4	rd-1	13	12	--
Rad-5	rd-1	12	11	--
Rad-6	--	14	11	--
Rad-7	--	12	11	--
Rad-8	--	12	12	--
Rad-9	--	11	10	--
Rad-10	--	13	11	--
Rad-11	cutln-1	13	13	--
Rad-12	cutln-1	14	12	--
Rad-13	rd-2	17	15	--
Rad-14	pileply-1	32	26	--
Rad-15	pileply-1	65	26	--
RadBack-1	--	11	11	--

Notes:

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

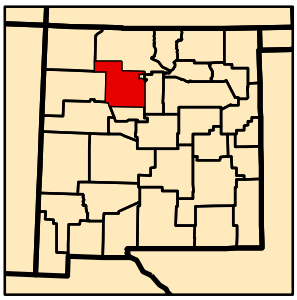
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH

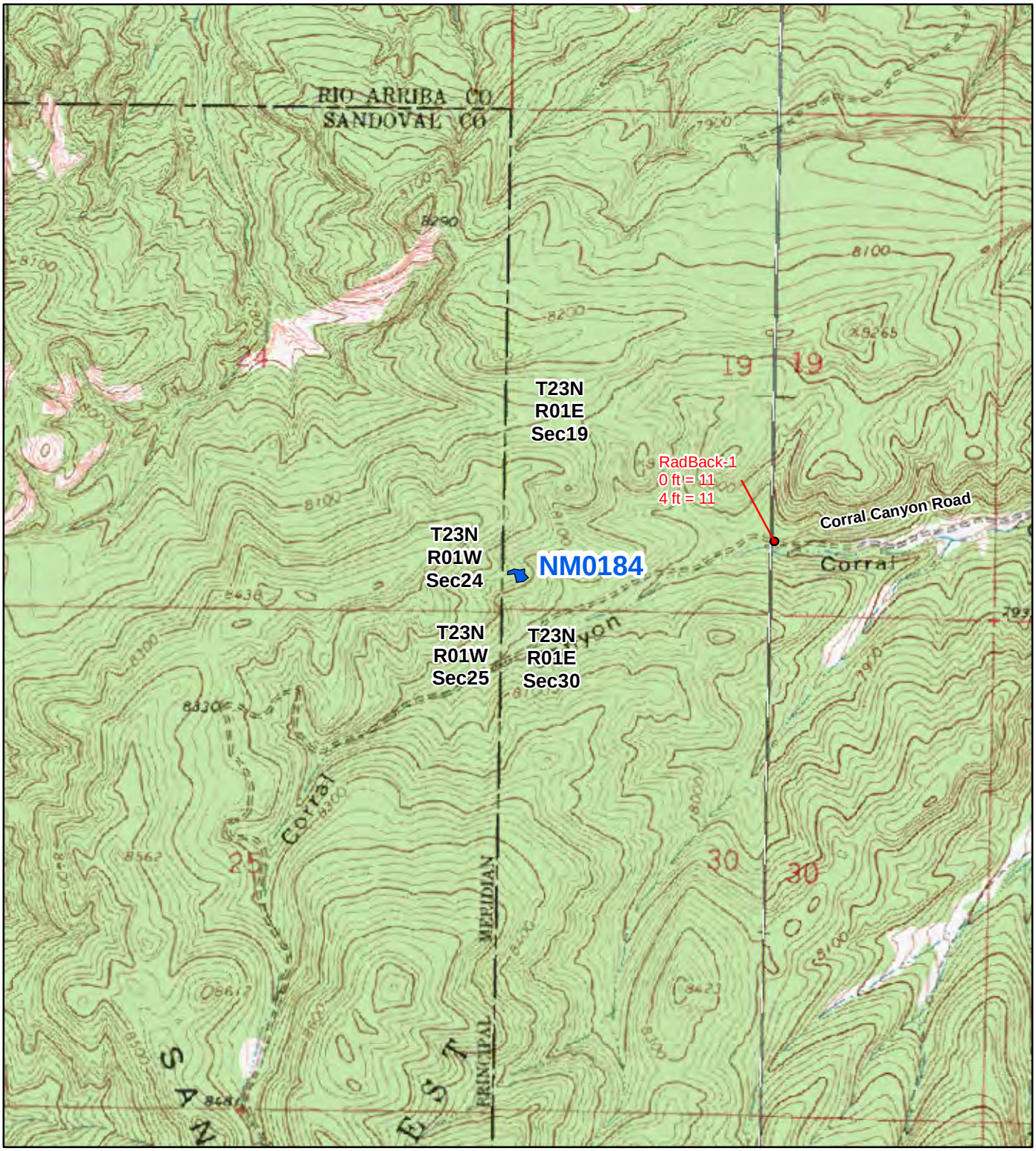


Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0184-White Flo
Abandoned Uranium Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0184-White_Flo\GIS\Maps\Site_Map_WhiteFlo_CP.mxd 10/05/2010



Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-Gallina, 1963
-Regina, 1963

0 750 1,500 3,000
Feet

NORTH

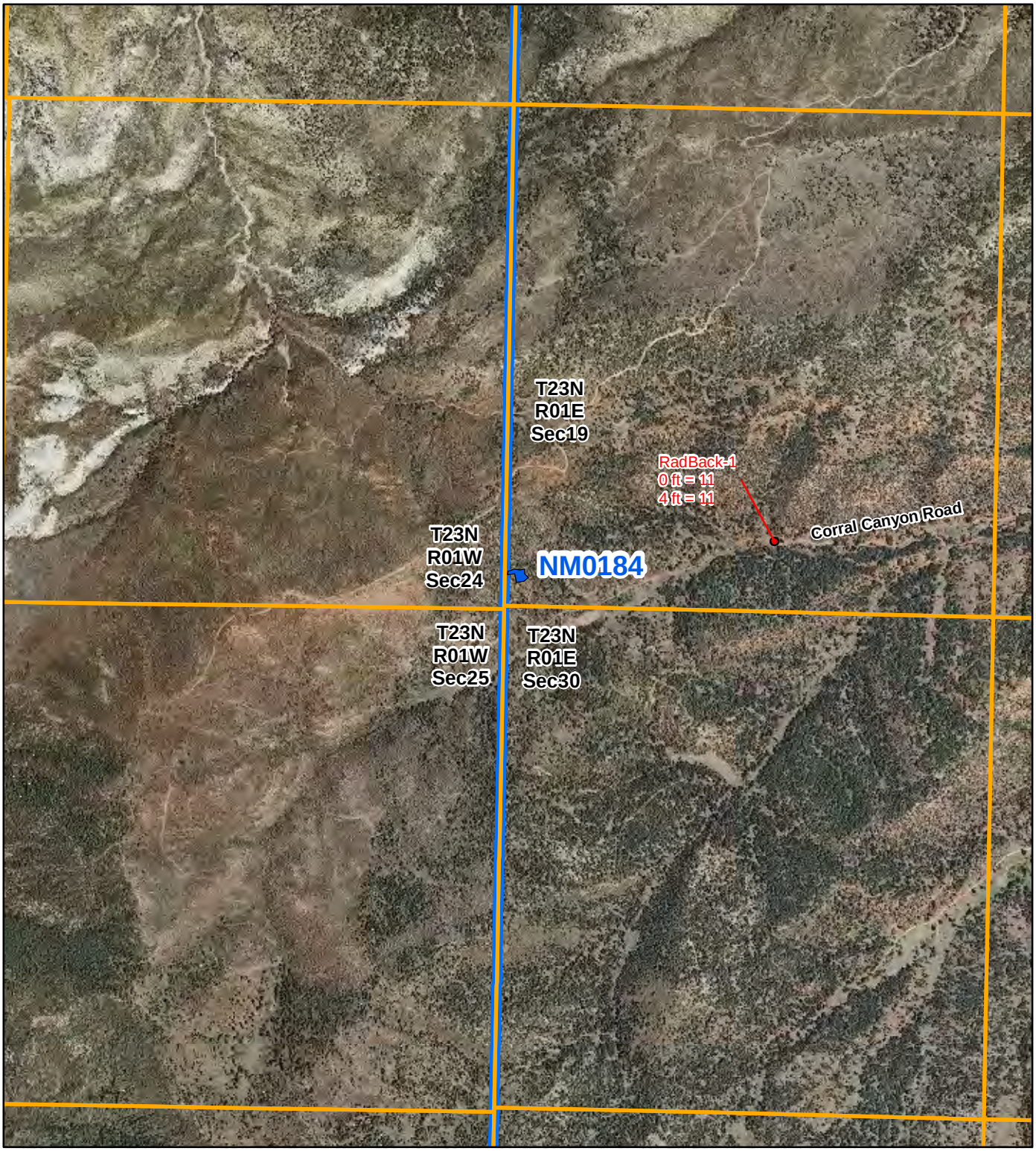
Note:
There are no wells within 1 mile of the Site.

Legend

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

Figure 2
Topographic Map
NM0184-White Flo
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0184-White_Flo\GIS\Maps\Topo_Map_WhiteFlo_CP.mxd 10/06/2010



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

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- 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
NM0184-White Flo
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0184-White_Flo\GIS\Maps\Aerial_Map_WhiteFlo_CP.mxd 10/06/2010

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

0 40 80 160
Feet

NORTH

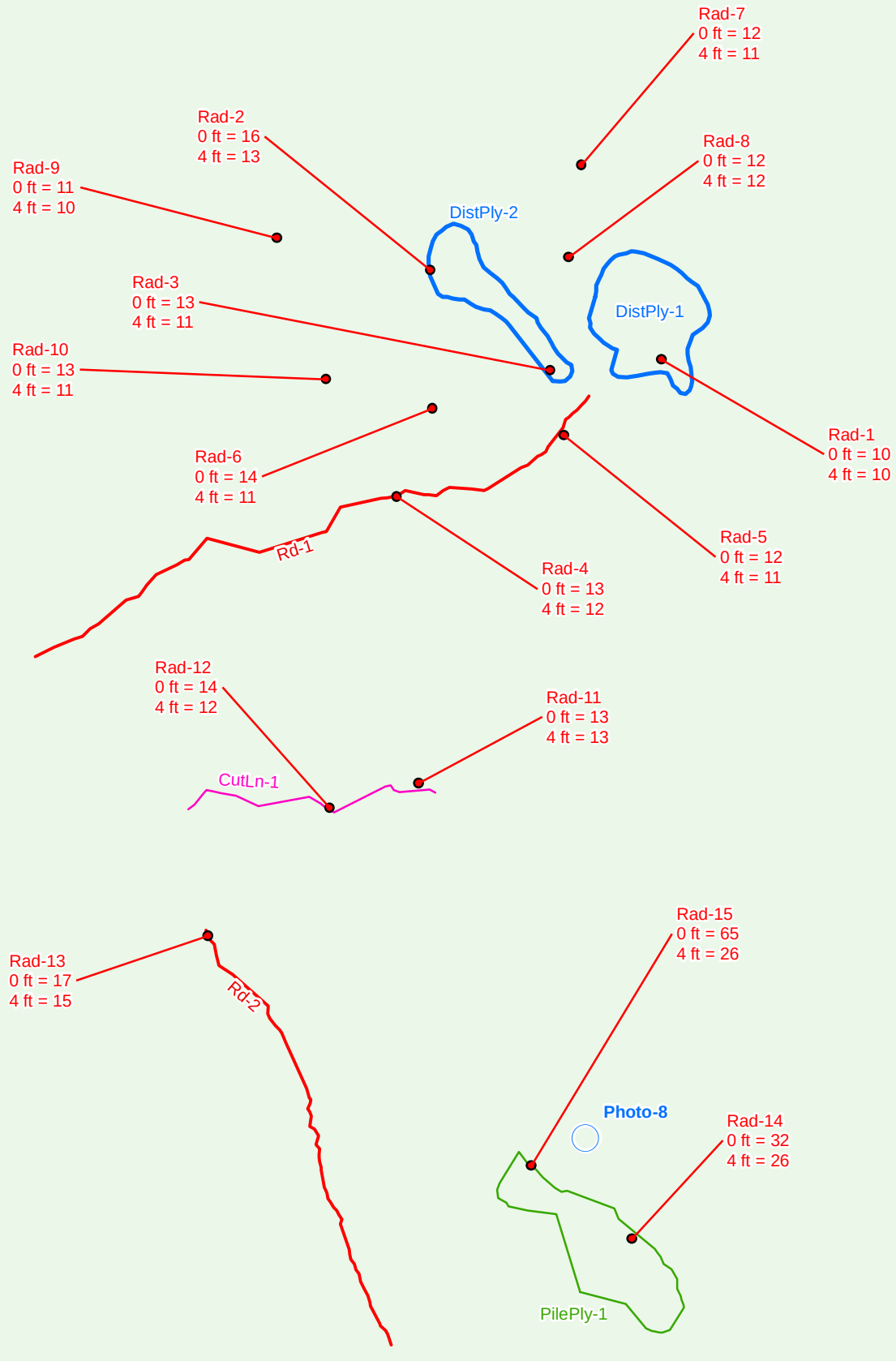
Legend

- Radiation Readings (µR/hr)
- Photo Location
- Mine Road
- Open Cut
- Other Disturbance Area
- Pile Boundary

Figure 4a
Site Map on
Aerial Photo
NM0184-White Flo
Abandoned Uranium
Mine Assessment

INTERA

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0184-White_Flo\GIS\Maps\CloseUpAerial_Map_WhiteFlo_CP.mxd 10/06/2010



Map Source(s):
Ownership - BLM, 2008

0 40 80 160
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Photo Location
- Mine Road
- Open Cut
- Other Disturbance Area
- Pile Boundary

Surface Ownership

- Forest Service

Figure 4b
Site Map with
Surface Ownership
NM0184-White Flo
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0184-White_Flo\GIS\Maps\CloseUpOwnership_Map_WhiteFlo_CP.mxd 10/06/2010

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.

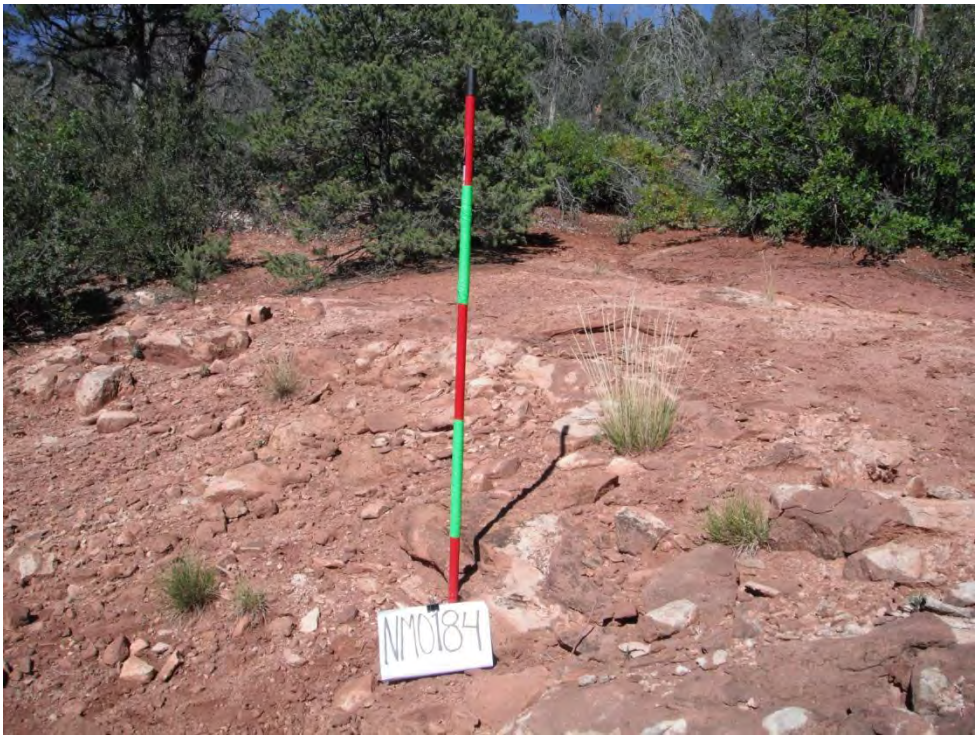


Photo 1-Site location photo, looking north at DistPly-1.

Photo 2-Looking north at DistPly-2.

Photo 3-Looking east at Rd-1.

Photo 4-Looking east at CutLn-1, replicating Anderson photo A.

Photo 5-Looking north at Rd-2.

Photo 6-Looking northwest at PilePly-1, replicating Anderson photo C.

Photo 7-Looking west at PilePly-1.

Photo 8-Looking northwest, replicating Anderson photo B.

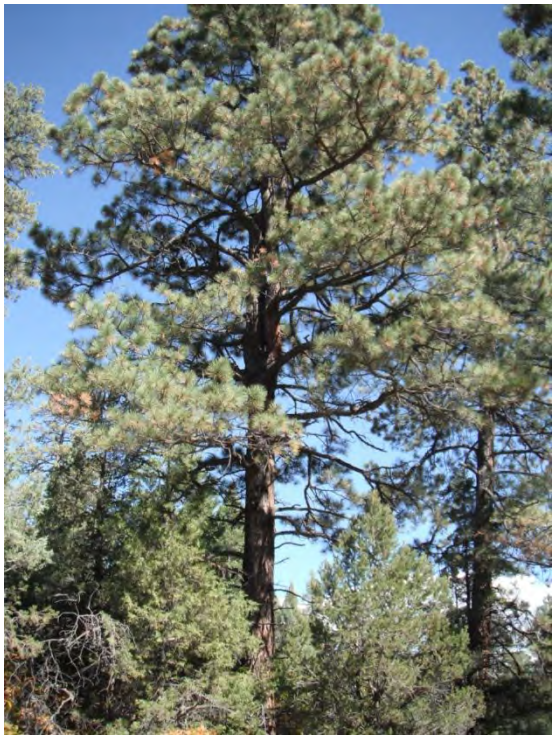


Photo 14-Vegetation at AUM Site.

Photo 15-Vegetation at AUM Site.

Photo 16-Vegetation at AUM Site.

Photo 17-Vegetation at AUM Site.

Photo 18-Vegetation at AUM Site.

Photo 19-Vegetation at AUM Site.

APPENDIX B

FIELD NOTES

9/29: Measured Ludlum Scintillometer against ^{137}Cs source = 280 µR/hr @ contact (AR)

Site Name: NM0184, White Flo

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Alex Resovsky

Equipment: Rental truck, Trimbel GeoXm (SN: 4948447 27, 2008 series), Ludlum 192 (SN: 234149), Fujifilm digital camera (No. 0+B31259), backup Garmin GPS, cell phone amplifier, field laptop

730 Leaving Albuquerque, HASP Meeting
1030 cannot drive any further up Corral Canyon Road.
1100 At AUM Polygon

DistPly-1; 60'wide, 70' long; bulldozed area
Photo 1 - Site Location photo of DistPly-1 looking north
Rad-1 - DistPly-1; 0m - 10µR/h; 1m - 10µR/h

DistPly-2: 20' wide, 100' long; bulldozed area
Photo-2 - DistPly-2 looking north
Rad 2 - DistPly-2; 0m - 16 µR/h; 1m - 13 µR/h
Rad 3 - DistPly-2; 0m - 13.4µR/h; 1m - 11µR/h

MineRd-1 - south of DistPly-1 and -2
Photo 3 - MineRd-1 looking east
Rad 4 - mineRd-1; 0m - 13 µR/h; 1m - 12µR/h
Rad 5 - mineRd-1; 0m - 12µR/h; 1m - 11µR/h
Rad 6 - no visible mine features; 0m - 14 µR/h; 1m - 11µR/h

Rad 7 - no visible mine features; 0m - 12 uR/h; 1m - 11 uR/h

Rad 8 - no visible mine features; 0m - 12 uR/h; 1m - 12 uR/h

Rad 9 - no visible mine features; 0m - 11 uR/h; 1m - 10 uR/h

Rad 10 - no visible mine features; 0m - 13 uR/h; 1m - 11 uR/h

CutIn-1; 10' wide, 100' long, 10' tall

Photo 4 - looking east at CutIn-1, replicating Anderson photo A

Rad 11 - CutIn-1; 0m - 13 uR/h; 1m - 13 uR/h

Rad 12 - CutIn-1; 0m - 14 uR/h; 1m - 12 uR/h

MineRd-2 - 5' wide, ' long

Rad 13 - MineRd-2; 0m - 17 uR/h; 1m - 15 uR/h

Photo 5 ALT - looking north at MineRd-2

PilePly-1 - 8' tall, 20' wide, 150' long; 45% slope

Photo 6 - looking at PilePly-1, northwest, replicating Anderson photo C

Photo 7 - looking west at PilePly-1

Rad 14 - PilyPly-1; 0m 38 uR/h; 1m - 26 uR/h

Rad 15 - PilePly-1; 0m - 65 uR/h; 1m - 26 uR/h

Photo P1-1 - Photo 8 - northwest, replicating Anderson photo B

Access-1 - Road to FR76

Soils: Red silty sand.

Rocks: Red arkosic siltstone and sandstone of the Abo Formation.

Wildlife: Magpie, lizard; rabbit & deer droppings

Human Activities: cattle guards, corrals, fences, cow prints and dropping all evidence of ~~ran~~ ALT grazing. Also catchment pond.

ATV tracks and beer cans indicate recreational use.

Background Rad - 0m - 11 uR/h; 1m - 11 uR/h