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Historical Investigation Report for Frijoles Canyon Aggregate Area

Prepared by the Environmental Programs Directorate

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October 2010

Responsible project manager:

Printed Name	Signature	Title	Organization	Date
Becky Coel-Roback		Project Manager	Environmental Programs	10/7/10

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Michael J. Graham	for MJG	Associate Director	Environmental Programs	10/7/2010

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
George J. Rael	for GJR	Manager	DOE-LASO	10/12/2010

EXECUTIVE SUMMARY

The Frijoles Canyon Aggregate Area includes six areas of concern (AOCs) located within Bandelier National Monument, to the south of Los Alamos National Laboratory (the Laboratory). Of these six sites, four have been previously approved for no further action. Historical information concerning the other two sites was reviewed and is presented in this historical investigation report.

The two sites addressed in this report were discovered by the National Park Service (NPS) in 1994. Because these sites were located on land previously owned by the U.S. Department of Energy (DOE), the sites were reported to the U.S. Environmental Protection Agency as newly identified AOCs, pending further investigation to determine whether any Laboratory wastes were present at the sites. The NPS performed an archeological investigation of the sites, which concluded the sites were associated with historical use by the Civilian Conservation Corps and the NPS. Additional historical information reviewed by the Laboratory is consistent with the results of the archeological investigation and indicates that these sites were never associated with Laboratory or DOE activities.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above mean sea level. The location of the Frijoles Canyon Aggregate Area with respect to the Laboratory technical areas (TAs) is shown in Figure 1.0-1.

The Laboratory is participating in a national effort by DOE to clean up sites and facilities. The goal of the Laboratory's effort is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. The sites under investigation are designated as either solid waste management units (SWMUs) or areas of concern (AOCs).

The Frijoles Canyon Aggregate Area encompasses the area drained by Frijoles Canyon and is located almost exclusively outside the Laboratory boundary. The aggregate area includes portions of the Valles Caldera National Preserve, Santa Fe National Forest, and Bandelier National Monument (BNM) and a very small part of TA-33. Frijoles Canyon Aggregate Area includes a total of six AOCs, all of which are located within BNM. Of these six sites, four sites have been previously investigated and approved for no further action (NFA) and are not discussed in this historical investigation report (HIR). Table 1.0-1 provides a summary of all sites within the aggregate area and their regulatory status.

Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). The purpose of this HIR is to provide supporting information for the recommended disposition of the two AOCs that have not been approved for NFA. Section 2 of this HIR provides site descriptions and operational histories and results of previous investigations for these two AOCs. For each site, the location, historical operations, and current status are described first, followed by descriptions and dates of historical investigations. Section 3 presents a summary of the investigation results. The references cited in this report and the map data sources are provided in section 4. Figure 1.0-2 shows the locations of the sites described in this HIR.

Appendix A includes a list of acronyms and abbreviations and a metric conversion table. Appendix B contains federal land transfer orders and laws related to the Frijoles Canyon Aggregate Area. Appendix C contains historical aerial photographs of the sites addressed in this HIR. Appendix D presents photographs showing current site conditions. Appendix E contains an archaeological investigation report of the sites prepared by the National Park Service (NPS).

2.0 SITES IN FRIJOLES CANYON AGGREGATE AREA

2.1 General Site Information

The Frijoles Canyon Aggregate Area encompasses the entire Frijoles Canyon watershed. The Frijoles Canyon watershed is a southeast-trending drainage originating at the flanks of the Sierra de los Valles in the Valles Caldera National Preserve. The watershed's drainage system passes through 0.6 mi of the Valles Caldera National Preserve lands and then passes through BNM and small portions of the Santa Fe National Forest. The drainage remains on BNM land for 14 mi before entering the Rio Grande.

Approximately 1 mi upstream of its confluence with the Rio Grande, the drainage intersects Laboratory land along a very small portion of western TA-33. The intersection is approximately 1 mi long by 0.1 mi wide. The drainage extends 14.1 mi from its headwaters to its confluence with the Rio Grande, draining an area of 19.1 square mi.

2.2 Operational History

The six AOCs within the Frijoles Canyon Aggregate Area are located within BNM. Therefore, a discussion of the operational history of BNM and the land upon which the AOCs are located is provided below. The information in this section was obtained from an administrative history of BNM prepared by the NPS (http://www.nps.gov/archive/band/adhi/adhit.htm) as well as other sources.

BNM was established in 1916 on U.S. Forest Service (Forest Service) land and was originally administered by the Forest Service. The monument initially occupied an area of 22,400 acres, most of which was in Frijoles Canyon where numerous archaeological sites are located. During the time that BNM was administered by the Forest Service, minimal development occurred. Access to Frijoles Canyon was limited to a trail from Frijoles Mesa, which is the mesa to the north of Frijoles Canyon, south of NM 4. At that time, there were only a few small structures present in the canyon.

In 1932, administration of BNM was transferred to the NPS. Beginning in 1933, the NPS began development of visitor-use facilities at BNM. The Civilian Conservation Corps (CCC) was responsible for most of the development, and a CCC camp was established in Frijoles Canyon in November 1933. After the camp was established, the CCC began construction of a vehicle access road from NM 4, across Frijoles Mesa, and into the canyon. This road was completed in 1934 and is in use today. From 1933 to 1941, the CCC constructed a number of other structures and facilities in Frijoles Canyon. The site infrastructure included a power house, water distribution system, wastewater collection and treatment system, and a “refuse burner” located on the mesa north of the canyon. Stone blocks used to construct many of the facilities and structures were quarried on Frijoles Mesa north of the canyon.

During the time that Frijoles Canyon was being developed, the land between the canyon and NM 4, also known as the Frijoles Mesa tract, was owned by the Forest Service. In April 1948, the Forest Service and the Atomic Energy Commission (AEC) entered into a memorandum of understanding (MOU) that transferred the right to control and use the Frijoles Mesa tract from the Forest Service to the AEC (Appendix B). This MOU allowed the AEC to control access to the property so that it could serve as a buffer area around the Laboratory. Access to the property was limited to Forest Service officers, although the AEC was required to maintain public access to NM 4, an existing livestock trail along NM 4, and the access road to Frijoles Canyon from NM 4. In June 1949, the Secretary of Interior issued Public Land Order 592, which withdrew several parcels of land, including the Frijoles Mesa tract, from all forms of appropriation and reserved them for use by the AEC (Appendix B). In August 1956, Public Law 84-1006 was passed, which transferred ownership of all federal land in Los Alamos County, including the Frijoles Mesa tract, to the AEC (Appendix B).

The second phase of development of BNM began with acquisition of the Frijoles Mesa tract from the AEC by the NPS. In 1958, the NPS began to negotiate with the AEC to acquire the tract. On December 9, 1959, the AEC presented the NPS with the paperwork transferring the Frijoles Mesa tract to the NPS (Appendix B). The transfer was formalized by Presidential Proclamation on January 9, 1961. This tract is identified as Area H on the real estate transaction map in Appendix B.

After transfer to the NPS, the Frijoles Mesa tract was used to transfer all camping facilities and most of the residences out of Frijoles Canyon to the mesa top, where they remain today. Construction of the current 93-site campground was completed in 1963, and an old quarry near the campground that had

been used by the CCC was converted into an amphitheatre. A staff housing area was also constructed near the campground.

Based on the history described above, the AEC controlled the Frijoles Mesa tract from April 1948 until December 1959. During this time, the property was used by the AEC as a buffer area but was not otherwise developed by the AEC. Laboratory TA location maps from 1951 and 1959 show that all Laboratory activities along the south side of the Laboratory were to the north of NM 4 and north of Water and Ancho Canyons (LASL 1951, 110745; LASL 1959, 110746). There is no evidence of Laboratory activities to the south of NM 4 on land now owned by the NPS.

2.3 AOC C-00-037

2.3.1 Description and History

AOC C-00-037 is an inactive landfill located west of the residential area within BNM (Figure 2.3-1). This site was not identified in the 1990 SWMU report (LANL 1990, 007511) but was discovered in 1994 by an NPS archaeologist. Because the site was located on land previously owned by the AEC (section 2.2), DOE conservatively notified the U.S. Environmental Protection Agency (EPA) of the site as a newly identified AOC and indicated that an investigation would be performed to determine whether Laboratory waste was disposed of at the site (DOE 1994, 039927). EPA requested additional information related to the site to determine whether the site was a SWMU that should be added to Module VIII of the Laboratory's Hazardous Waste Facility Permit (DOE 1994, 040189). This information was provided to EPA (DOE 1994, 040436), and EPA did not add this site to Module VIII.

The landfill covers an area of approximately 1.3 acres and measures approximately 530 ft north-south by 115 ft east-west. The site is located on land referred to as the Frijoles Mesa tract, which was acquired by the AEC from the Forest Service in April 1948 and then transferred from the AEC to the NPS in December 1959. As described in section 2.2, before transfer to the NPS, this tract of land was used as a source of quarry stone by the CCC but was otherwise undeveloped. The area was used as a buffer area by AEC and no Laboratory operations were conducted on the site.

The landfill appears to have been created by filling an unnamed drainage that extends southeastward from near the amphitheatre. Over 23 ft of fill is present at the southern terminus of the landfill. Drill and blasting holes in the bedrock exposures along the edges of the canyon indicate the site may have been used as a quarry by the CCC before use as a landfill (LANL 1999, 064016, p. 6). This site is visible as a disturbed area in aerial photographs taken in 1958 (USAF 1958, 016124; USAF 1958, 016125; see Appendix C). It is not possible to tell from the aerial photographs whether the site was being used for waste disposal at that time.

The landfill was used to dispose of wastes from visitor facilities and residences within BNM. An archaeological investigation of the site estimated the period of operation to be from the 1950s until the early 1970s (LANL 1999, 064016, p. 6). Additional information collected by the Laboratory in 1994, including interviews with BNM staff, indicated that the site had been used more recently and that most of the more recently deposited waste appeared to be construction material (DOE 1994, 040436). After use of the site ceased, soil, quarry debris, and asphalt were used to level the site to its present condition. The site is presently vegetated with grass and shrubs. Piles of quarried rock debris and minor amounts of refuse, such as empty cans and pieces of broken china, are present on the surface. Photographs showing current site conditions are provided in Appendix D.

2.3.2 Previous Investigations

Following discovery of this site in 1994, the NPS conducted an archaeological investigation to identify and document any archaeological sites at this location (Appendix E). The investigation consisted of visual inspection of the site by surveyors walking approximately 5 m apart. The archaeological survey identified no prehistoric or historic materials, although numerous modern artifactual items were found around the margins of the fill area. The most commonly found items at the site were steel food and beverage cans. Motor oil cans, shoe leather, milled lumber, tarpaper, asphalt, concrete, baling wire, a brake drum, a liquor bottle, a china plate, ceramic pipe, and corrugated tin were also observed. The report indicated that the observed items were chronologically consistent with use of the site as a landfill during the 1950s to 1970s (Appendix E).

The Laboratory conducted a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of AOC C-00-037 in 1999 (LANL 1999, 064016). The RFI included an historical records search of Laboratory TAs in proximity to the site and evaluation of the results of the archaeological survey performed by the NPS. The historical records search evaluated seven TAs adjacent to or in close proximity to BNM (TA-11, TA-16, TA-33, TA-37, TA-39, and TA-49, and former TA-28) (Figure 1.0-1) to identify whether wastes from these TAs were disposed of at AOC C-00-037. The results of the records search indicated that activities at two of the TAs (former TA-28 and TA-37) did not generate wastes or generated only minimal amounts of waste. Activities at the other five TAs did generate wastes, but all five of the TAs had on-site waste disposal facilities. Based on the availability of on-site waste disposal and the distance to AOC C-00-037 (2 to 8 mi), it was concluded that there was no need for the Laboratory to use AOC C-00-037 to dispose of Laboratory-generated waste (LANL 1999, 064016, p. 10).

2.3.3 Site Status

The 1999 RFI report recommended AOC C-00-037 for NFA because the site was not associated with LANL activities (LANL 1999, 064016, p. 10). Because the site had not been added to Module VIII, the RFI report was submitted to DOE, the administrative authority at that time for AOCs not listed in Module VIII. The NFA recommendation was approved by DOE (DOE 1999, 064960). Pursuant to Section III.A of the Consent Order, this AOC is subject to the Consent Order because it was not previously approved for NFA by EPA.

2.4 AOC C-00-038

2.4.1 Description and History

AOC C-00-038 is an inactive surface disposal area located southwest of the amphitheater at BNM (Figure 2.4-1). This site was not identified in the 1990 SWMU report (LANL 1990, 007511) but was discovered in 1994 by a NPS archaeologist. Because the site was located on land previously owned by the AEC (section 2.2), DOE conservatively notified EPA of the site as a newly identified AOC and indicated that an investigation would be performed to determine whether Laboratory waste was disposed of at the site (DOE 1994, 039927). EPA requested additional information related to the site to determine whether the site was a SWMU that should be added to Module VIII of the Laboratory's Hazardous Waste Facility Permit) (DOE 1994, 040189). This information was provided to EPA (DOE 1994, 040436) and EPA did not add this site to Module VIII.

The disposal site covers an area of approximately 0.1 acres and measures approximately 75 ft north-south by 60 ft east-west. The site is located on land acquired by the AEC from the Forest Service in April 1948 and then transferred from the AEC to the NPS in December 1959. As described in section 2.2,

before transfer to the NPS, this tract of land was used as a source of quarry stone by the CCC but was otherwise undeveloped. The area was used as a buffer area by AEC and no Laboratory operations were conducted on the site.

The disposal area consists of an irregular depression in the mesa slope that appears to have been created by quarrying. There are two large terraces of quarried rock and spall debris at the site. The site is visible as a disturbed area in aerial photographs taken in 1958 (USAF 1958, 016124; USAF 1958, 016125; see Appendix C). The site appears to have been associated with quarrying or other activities conducted by the CCC during the late 1930s and early 1940s (LANL 1999, 064016, p. 12). The site is presently vegetated with grass and shrubs, other than rock and debris terraces, which lack vegetation. Minor amounts of debris are present on the surface, and the top of a 1920s−1930s vintage automobile buried at the site is visible. Photographs showing current site conditions are provided in Appendix D.

2.4.2 Previous Investigations

Following discovery of this site in 1994, the NPS conducted an archaeological investigation to identify and document any archaeological sites at this location (Appendix E). The investigation consisted of visual inspection of the site by surveyors walking approximately 5 m apart. In addition to the buried automobile, the archaeological survey identified a number of items including copper and baling wire, china fragments, ceramic insulator fragments, shards of glass, liquor bottle fragments, steel oil and food cans and can lids, a steel pump handle, aluminum foil fragments, nails and bolts, and bits of lumber. The report indicated that the observed items appear to be associated with NPS activities during the 1930s and early 1940s and that deposition occurred before the Manhattan Project (Appendix E).

The Laboratory conducted an RFI at AOC C-00-038 in 1999 (LANL 1999, 064016). The RFI included an historical records search of Laboratory TAs in proximity to the site and evaluation of the results of the archaeological survey performed by the NPS. The historical records search evaluated seven TAs adjacent to or in close proximity to BNM (TA-11, TA-16, TA-33, TA-37, TA-39, and TA-49, and former TA-28) (Figure 1.0-1) to identify whether wastes from these TAs were disposed of at AOC C-00-038. The results of the records search indicated that activities at two of the TAs (former TA-28 and TA-37) did not generate wastes or generated only minimal amounts of waste. Activities at the other five TAs did generate wastes, but all five of the TAs had on-site waste disposal facilities. Based on the availability of on-site waste disposal and the distance to AOC C-00-038 (2 to 8 mi), it was concluded that there was no need for the Laboratory to use AOC C-00-038 to dispose of Laboratory-generated waste (LANL 1999, 064016, p. 10).

2.4.3 Site Status

The 1999 RFI report recommended AOC C-00-038 for NFA because the site was not associated with LANL activities (LANL 1999, 064016, p. 16). Because the site had not been added to Module VIII, the RFI report was submitted to DOE, the administrative authority at that time for AOCs not listed in Module VIII. The NFA recommendation was approved by DOE (1999, 064960). Pursuant to Section III.A of the Consent Order, this AOC is subject to the Consent Order because it was not previously approved for NFA by EPA.

3.0 SUMMARY

AOCs C-00-037 and C-00-038 were investigated by an NPS archeologist, and an investigation of historical records related to these sites was performed by the Laboratory. These investigations indicate both sites are associated with activities performed by the CCC and/or the NPS, and these activities are the source of the wastes present at the sites. The AEC (DOE's predecessor agency) owned the property on which the sites are located for approximately 11 yr, from 1948 through 1959, but only used the land as a security buffer zone. The wastes present at the sites, therefore, did not result from any Laboratory or DOE activities.

4.0 REFERENCES AND MAP DATA SOURCES

4.1 References

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the New Mexico Environment Department Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

DOE (U.S. Department of Energy), July 5, 1994. "Notification of Two New Solid Waste Management Units and Six New Areas of Concern for Operable Unit 1071," U.S. Department of Energy letter to W. Honker (EPA Region 6) from T. Taylor (DOE-LAAO), Los Alamos, New Mexico. (DOE 1994, 039927)

DOE (U.S. Department of Energy), August 2, 1994. "EPA Response to Notification of Two New Solid Waste Management Units (SWMU) and Six New Areas of Concern (AOC) for Operable Unit 1071," U.S. Department of Energy memorandum and attachment to J. Jansen (LANL) from T. Taylor (DOE-LAAO), Los Alamos, New Mexico. (DOE 1994, 040189)

DOE (U.S. Department of Energy), August 19, 1994. "Additional Information Requested for C-0-037 and C-0-038," U.S. Department of Energy letter to W. Honker (EPA Region 6) from T. Taylor (DOE-LAAO), Los Alamos, New Mexico. (DOE 1994, 040436)

DOE (U.S. Department of Energy), October 6, 1999. "Acceptance of Performance Measures," U.S. Department of Energy memorandum to J. Canepa (LANL) from T.J. Taylor (DOE-LAAO), Los Alamos, New Mexico. (DOE 1999, 064960)

EPA (U.S. Environmental Protection Agency), January 21, 2005. "EPA's Prior Decisions on SWMU/AOC Sites at Los Alamos National Laboratory (LANL)," U.S. Environmental Protection Agency letter to J. Bearzi (NMED-HRMB) from L.F. King (EPA Federal Facilities Section Chief), Dallas, Texas. (EPA 2005, 088464)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Vol. I of IV (TA-0 through TA-9), Los Alamos National Laboratory document LA-UR-90-3400, Los Alamos, New Mexico. (LANL 1990, 007511)

LANL (Los Alamos National Laboratory), September 1999. "RFI Report for Potential Release Sites C-00-037 and C-00-038," Los Alamos National Laboratory document LA-UR-99-4833, Los Alamos, New Mexico. (LANL 1999, 064016)

LASL (Los Alamos Scientific Laboratory), January 31, 1951. "Technical Area Location Plan," Engineering Drawing ENG-R-111, Los Alamos, New Mexico. (LASL 1951, 110745)

LASL (Los Alamos Scientific Laboratory), August 10, 1959. "Technical Area Location Plan," Engineering Drawing ENG-R-2051, sheet number 1 of 1, Los Alamos, New Mexico. (LASL 1959, 110746)

USAF (U.S. Air Force), December 13, 1958. "Bandelier National Monument aerial photograph," Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (USAF 1958, 016124)

USAF (U.S. Air Force), December 13, 1958. "Bandelier National Monument aerial photograph," Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (USAF 1958, 016125)

4.2 Map Date Sources

Aggregate Areas; Los Alamos National Laboratory, ENV Environmental Remediation & Surveillance Program, ER2005-0496; 1:2,500 Scale Data; 22 September 2005.

Orthophotography, 2008 Los Alamos National Laboratory Aerial Photography, Site Planning and Project Initiation Group, February 2009.

Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Potential Release Sites; GPS survey performed by Los Alamos National Laboratory on 08 September 2010; change control pending.

Road Centerlines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 15 December 2005; as published 15 January 2009.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

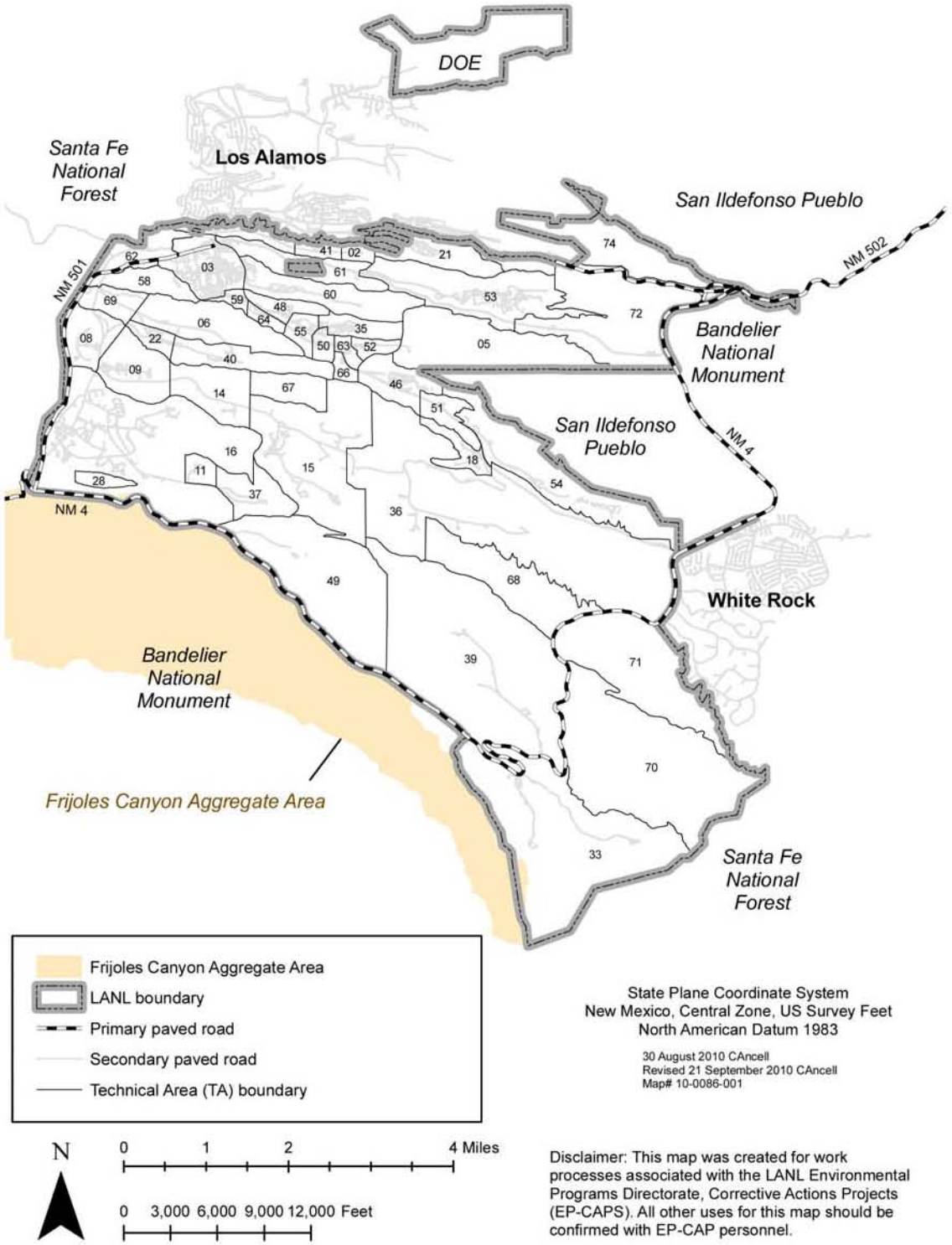


Figure 1.0-1 Frijoles Canyon Aggregate Area with respect to Laboratory TAs and surrounding land holdings

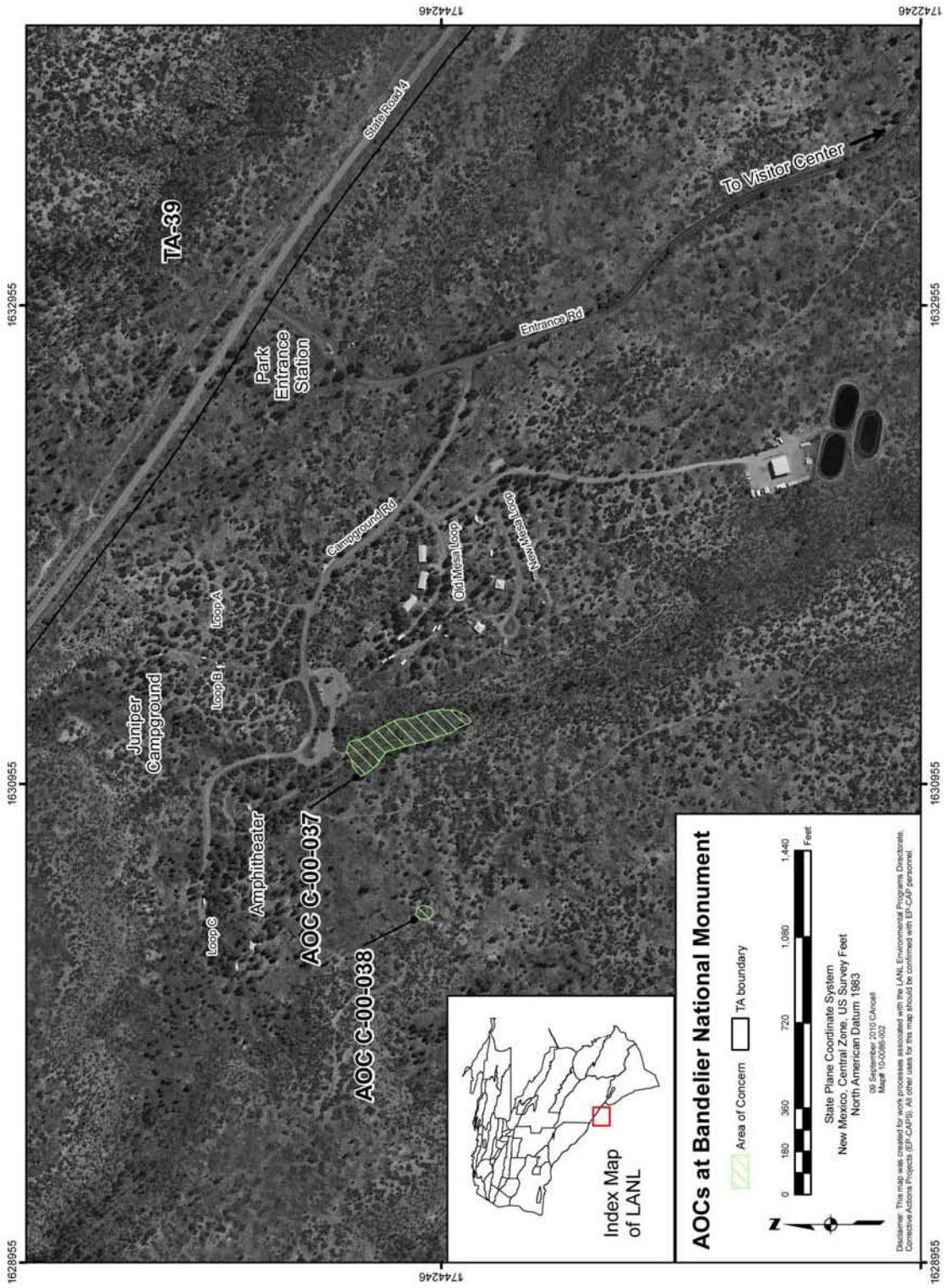


Figure 1.0-2 Location of Frijoles Canyon Aggregate Area sites with respect to Bandelier National Monument

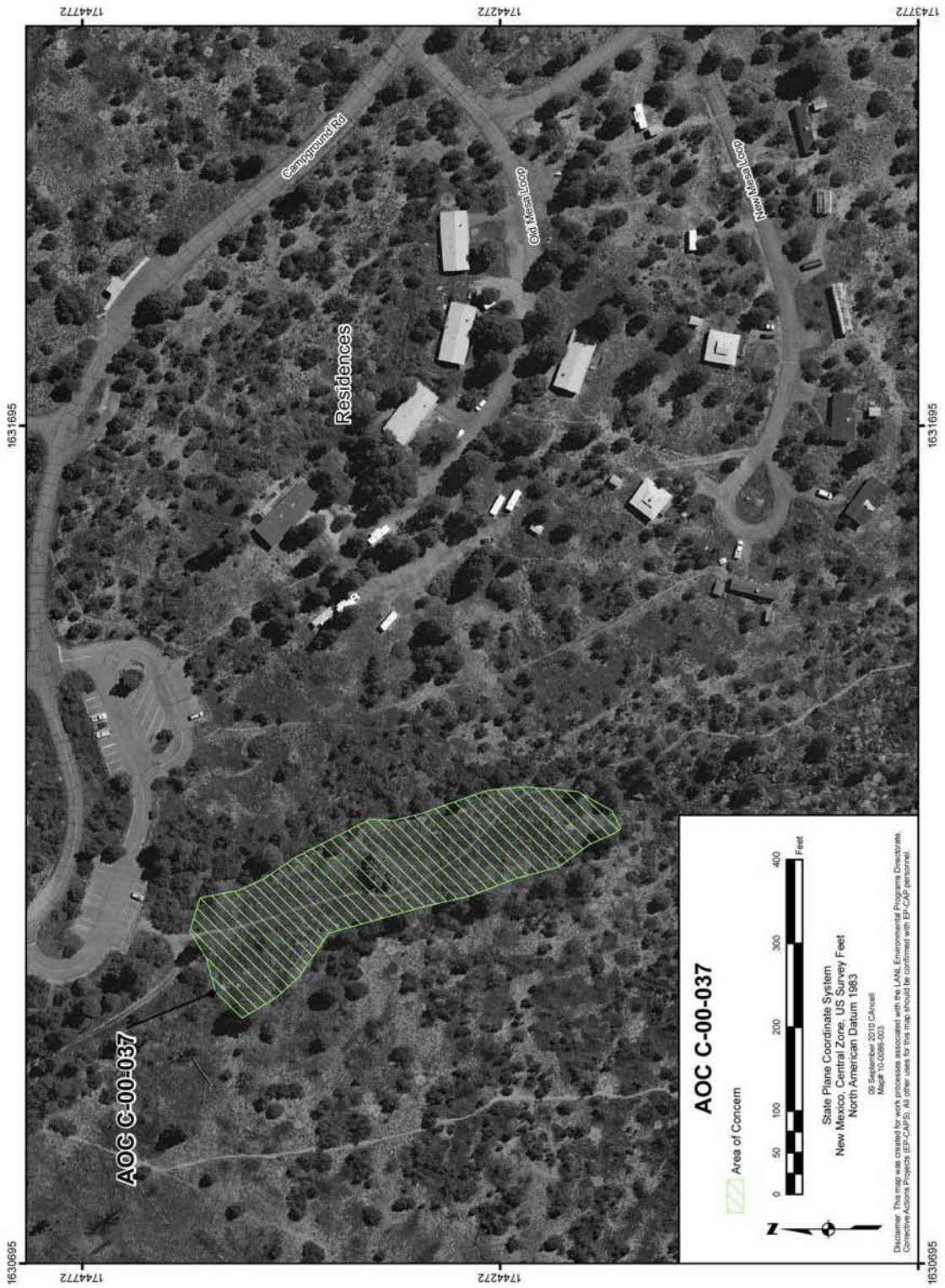


Figure 2.3-1 Location of AOC C-00-037

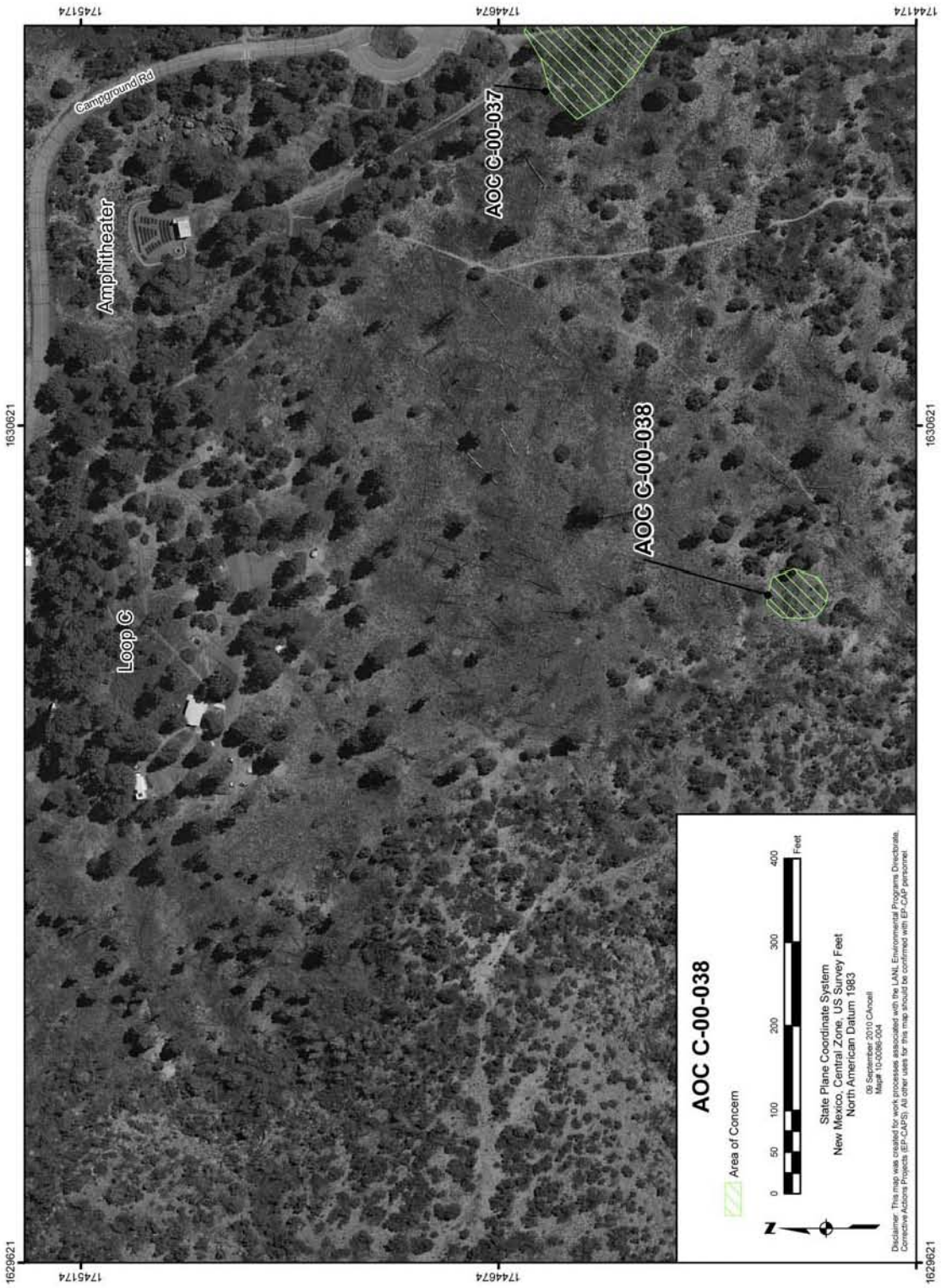


Figure 2.4-1 Location of AOC C-00-038

Table 1.0-1
AOCs within the Frijoles Canyon Aggregate Area

Site ID	Brief Description	Site Status	Reference
AOC C-00-036(a)	Borrow pit 1, BNM	NFA approved, 01/21/05	EPA 2005, 088464
AOC C-00-036(b)	Borrow pit 2, BNM	NFA Approved, 01/21/05	EPA 2005, 088464
AOC C-00-036(c)	Borrow pit 3, BNM	NFA Approved, 01/21/05	EPA 2005, 088464
AOC C-00-036(d)	Borrow pit 4, BNM	NFA Approved, 01/21/05	EPA 2005, 088464
AOC C-00-037	Landfill, BNM	In progress	HIR section 2.3
AOC C-00-038	Surface disposal area, BNM	In progress	HIR section 2.4

Note: Shading denotes approved for no further action.

Appendix A

Acronyms and Abbreviations and
Metric Conversion Table

A-1.0 ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
AOC	area of concern
BNM	Bandelier National Monument
CCC	Civilian Conservation Corps
Consent Order	Compliance Order on Consent
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
ER ID	Environmental Remediation and Surveillance Program identification number
Forest Service	United States Forest Service
HIR	historical investigation report
LASL	Los Alamos Scientific Laboratory (Laboratory's name before January 1, 1981)
LANL	Los Alamos National Laboratory
MOU	memorandum of understanding
NFA	no further action
NMED	New Mexico Environment Department
NPS	National Park Service
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RPF	Records Processing Facility
SWMU	solid waste management unit
TA	technical area

A-2.0 METRIC CONVERSION TABLE

Multiply Sl (Metric) Unit	By	To Obtain U.S. Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (□m)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (□g/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (□C)	9/5 □ 32	degrees Fahrenheit (□F)

Appendix B

Land Transfer Orders and Laws Related to
Frijoles Canyon Aggregate Area

ANNEX "G" TO APPENDIX "A"

MEMORANDUM OF UNDERSTANDING

between

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE REGION 3
ALBUQUERQUE, NEW MEXICO

and

UNITED STATES ATOMIC ENERGY COMMISSION
OFFICE OF SANTA FE DIRECTED OPERATIONS
LOS ALAMOS, NEW MEXICO

WHEREAS, the Forest Service of the Department of Agriculture by Memorandum of Understanding signed May 15, 1943 and Supplement No. 1 thereto signed July 5, 1943 transferred to the War Department the use of certain Government-owned lands located in the State of New Mexico; and

WHEREAS, the War Department acquired the use of said land in connection with the conduct of the Atomic Energy program at the Los Alamos Project; and

WHEREAS, the Atomic Energy program was put under the jurisdiction and control of the Atomic Energy Commission, hereinafter called the Commission, by the Atomic Energy Act of 1946; and

WHEREAS, the President by Executive Order No. 9816 dated December 31, 1946 transferred to the Commission all the property, including the Los Alamos Project, and agreements concerning same, used by the War Department in its conduct of the Atomic Energy program; and

WHEREAS, the Department of Agriculture, Forest Service, and the Commission entered into Supplemental Agreement No. 2 on October 15, 1947 whereby additional land was brought under the coverage of the original Memorandum of Understanding; and

WHEREAS, it is now the desire of the parties to transfer the use of still other tracts of land from the Department of Agriculture to the Commission; and

WHEREAS, due to certain discrepancies regarding area acreages and descriptions, it is deemed to be in the best interest of all concerned to cancel the existing Memorandum of Understanding as supplemented and supersede same hereby.

NOW, THEREFORE, in consideration of the foregoing and the provisions hereinafter contained, it is mutually understood and agreed as follows:

1. The Memorandum of Understanding entered into between the Department of Agriculture, Forest Service, and the War Department on May 15, 1943, as supplemented on July 5, 1943, which was transferred to the Commission by Executive Order 9816, and as thereafter supplemented by Supplement No. 2 on October 15, 1947, is hereby cancelled and superseded by this agreement.

2. The right to control and use Areas A through I, both inclusive, shown on the map which is attached hereto as Exhibit 1, is hereby transferred to the Commission, subject to the condition hereinafter specified. Areas A, B, C, D, E, colored in green on said map, are those areas formerly covered by the original Memorandum and Supplement No. 1 thereto with the War Department; and Area F, also colored in green on said map, is that area formerly covered by Supplement No. 2 to the original Memorandum of Understanding; and Areas G, H, and I, colored blue, yellow, and brown, respectively, on said map, are the additional areas affected hereby.

3. Certain improvements are located on five acres of land included in the Water Canyon Administrative Site in unsurveyed Section 31, T. 19N., R.6E, N.M.P.M. The right to occupy and use said improvements and said five acres of land are hereby reserved to the Department of Agriculture, Forest Service.

4. The Forest Service will continue its normal administrative functions in the management of timber, grazing, fire protection, special uses, recreation, and maintenance and construction of improvements in all areas except Areas "A" and "G", with such other exceptions as may be required by the Commission from the Regional Forester from time to time and except as specified as follows:

a. The administrative functions of the Forest Service in Area "A" and Area "G" will be performed only when and as requested by the Commission.

b. Admittance to all areas will be limited to regular Forest Service Officers under proper pass and identification. Should the Commission request the assistance of the Forest Service in the suppression of forest fires in Areas "A" and/or "G", entrance thereto will be under escort provided by the Commission and under such restrictions as to length of time, travel routes, and periods as will be prescribed.

c. No special use, saw timber, grazing, or wood cutting permits will be issued by the Forest Service in any of the areas except with the approval of the Commission.

d. The Commission will not cause, permit, or authorize the cutting or removal of timber, trees, or young growth within the project area except where this is deemed necessary as clearings or thinnings in furtherance of the general objectives of the project. Merchantable material resulting from such authorized cuttings and not usable by the project will be reported to the Forest Supervisor for disposal under the regulations of the Secretary of Agriculture. The needs of the project for timber, cordwood, or other forest products procurable within the project area in excess of what may be available from authorized cuttings as described in the preceding sentences will be procured by application to the Forest Supervisor and the cutting thereof will be in accordance with the usual provision of the Forest Service.

e. The Commission and the Forest Supervisor will formulate, execute, and adjust plans covering their agreed-upon course of action in respect to the control of forest fires in the various areas.

f. In the event that the Camp May pasture or other areas are to be used for pasturing Commission livestock, the Commission will obtain the plans of the Forest Service bearing upon seasons of use, class of stock to be grazed and grazing capacity of the various areas, and will manage the grazing in accordance therewith.

g. The Commission will appropriately instruct all personnel of the project area under its command of the common hazards of careless use of matches, smoking materials, and camp fires in wooded areas and will restrict their use within the project area except on prepared or designated "safe" areas when informed by Forest Officers that dangerous climatic periods exist.

5. In the event that it is determined by the Commission that it no longer requires the use of any of the areas affected hereby, it will return such area to the Forest Service with such reservations as may be deemed necessary.

6. Appropriating, excavating, injuring, or destroying any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the United States, without permit, is prohibited. (Antiquities Act of June 8, 1906). Therefore, the Atomic Energy Commission will do all in its power to enforce this Act, posting areas as necessary. The ruins located on the mesa to the northwest of the windmill in Pajarito Canyon will be fenced and posted to discourage unauthorized use. (See attached map.)

7. The present existing Park Service telephone line, Espanola, Bandelier, and Canada, shall remain in place until such time as other communication facilities are made

available and are satisfactory to the Forest Service for administrative purposes. The Forest Service reserves the right to free access to this line at all times for maintenance purposes.

8. The present existing stock driveway which follows State Route No. 4 shall be continued as long as it is required for this use. Necessary posting or fencing shall be at the expense of the Atomic Energy Commission. If, for security reasons, this use is denied to users the Atomic Energy Commission will make available a substitute route or other means of transportation satisfactory to the users of the driveway. Existing corrals in Pajarito Canyon and Water Canyon used in connection with the driveway shall be available to the users of the driveway as long as this use exists or until the Atomic Energy Commission and the users by mutual agreement provide other measures.

9. State Route No. 4 shall be open to traffic at all times. If it becomes necessary for this route to be closed for security, an alternate route shall be made available so that at all times traffic shall be free to move to Bandelier National Monument and to the area to the west, now served by State Route No. 4.

10. The now existing right of way to provide access to Bandelier National Monument and Frijoles Canyon, as covered by special use permit to the National Park Service, Department of Interior, dated August 17, 1939, shall remain in force so long as same is required by the National Park Service or until an alternate route satisfactory to the Forest Service and the National Park Service becomes available.

11. Right of way for power lines to serve the Bandelier National Monument shall be made available to the Park Service as the need occurs. This right of way shall be the most direct route from point of delivery consistent with security.

12. This agreement shall become effective as of the date of signature and shall continue in effect until it is expressly modified or cancelled.

13. Officers of the Forest Service authorized to implement this Memorandum for the Forest Service are:

Regional Forester, Albuquerque, New Mexico,
Forest Supervisor, Santa Fe, New Mexico,
and their duly authorized representatives.

Officers of the United States Atomic Energy Commission authorized to implement this Memorandum for the Commission are:

Manager, Office Santa Fe Directed Operations,
Assistant Manager, Office Santa Fe Directed Operations, and their duly authorized representatives.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the 20th day of April, 1948.

DEPARTMENT OF AGRICULTURE
FOREST SERVICE

By /s/ P. V. Woodhead
Regional Forester, Region 3

ATOMIC ENERGY COMMISSION

By /s/ C. L. Tyler
Manager, Office Santa Fe
Directed Operations

UNITED STATES
DEPARTMENT OF THE INTERIOR

CODE OF FEDERAL REGULATIONS
TITLE 43—PUBLIC LANDS: INTERIOR

Chapter I—Bureau of Land Management
Appendix—Public Land Orders

Public Land Order 592

NEW MEXICO

REVOKING PUBLIC LAND ORDER NO. 230 OF MAY 10, 1944, AND RESERVING LANDS FOR USE OF THE ATOMIC ENERGY COMMISSION

By virtue of the authority vested in the President by the act of June 4, 1897, 30 Stat. 11, 36 (16 U.S.C., 473), and otherwise, and pursuant to Executive Order No. 9337 of April 24, 1943, it is ordered as follows:

Section 1. Public Land Order No. 230 of May 10, 1944, withdrawing the public lands within the following-described areas in the Santa Fe National Forest for the use of the War Department as a demolition range is hereby revoked:

New Mexico Principal Meridian

T. 19 N., R. 5 E.,
secs. 1, 2, and 3, unsurveyed.
T. 20 N., R. 5 E., unsurveyed,
sec. 22;
sec. 23, S½;
sec. 24, S½;
secs. 25 to 27 and secs. 34 to 36, inclusive.
T. 19 N., R. 6 E.,
secs. 1 to 6, inclusive;
sec. 10, E½NE¼;
sec. 11, lots 1, 2, NE¼, N½NW¼;
sec. 12.
T. 20 N., R. 6 E.,
sec. 13, S½;
secs. 14 and 15;
sec. 19, S½;
sec. 20, S½;
secs. 21 to 36, inclusive.

The areas described, including both public and non-public lands, aggregate 23,750 acres.

2-7-49

Section 2. Subject to valid existing rights, the public lands within the following-described areas in the State of New Mexico are hereby withdrawn from all forms of appropriation under the public-land laws, including the mining and mineral-leasing laws, and reserved for the use of the United States Atomic Energy Commission, and all other lands owned by the United States within such areas are likewise reserved for the use of the said Commission:

New Mexico Principal Meridian

T. 18 N., R. 5 E.,
sec. 1, that part west of the Ramon Vigil Grant
sec. 2;
sec. 3, that part south and east of Baca Location No. 1
sec. 4, that part south of Baca Location No. 1 and east of the south rim of the Canyon of Frijole Creek as shown on plat of "Preliminary Survey, South Boundary Los Alamos Project" filed in the Bureau of Land Management, Department of the Interior
sec. 9, 10, 11, and 12, those parts north of the south rim of the Canyon of Frijole Creek as shown on plat of survey referred to above.

T. 19 N., R. 5 E.,
secs. 1, 2, 11 to 14 incl.
secs. 23, 24, 25, 26 and 35
secs. 3, 10, 15, 22, 27 and 34, those parts east of Baca Location No. 1
sec. 36, that part west of Ramon Vigil Grant

T. 20 N., R. 5 E.,
secs. 22, 27 and 34, those parts east of Baca Location No. 1
sec. 23, S½
sec. 24, S½
secs. 25 and 26
secs. 35 and 36

T. 19 N., R. 6 E.,
secs. 1 to 24 incl.

T. 20 N., R. 6 E.,
sec. 13, S½
secs. 14 and 15
sec. 19, S½
sec. 20, S½
secs. 21 to 36 incl.
Also, the Ramon Vigil Grant in Tps. 18 and 19 North., Rgs. 5, 6 and 7 East, excepting therefrom "Tract A" as shown on plat of survey approved December 29, 1933.

The public and non-public lands above described both surveyed and unsurveyed aggregate approximately 70,300 acres.

The reservation made by this order shall become effective at once: Provided, that as to any tract of land to which valid claim or claims have attached under the public-land laws prior to the date of this order such reservation shall become effective immediately upon the abandonment or extinguishment of such claim or claims for any cause.

The reservation made by this order shall be subject to the primary jurisdiction of the Department of Agriculture over the lands, and to existing withdrawals or reservations affecting any of the lands.

It is intended that the lands reserved by this order shall be returned to the administration of the Department of Agriculture and the Department of the Interior, according to their respective interests, when they are no longer needed for the purpose for which they are reserved.

Oscar L. Chapman

JUN 16 1949

Acting Secretary of the Interior.

L. J. Cotton

Public Law 1006 - 84th Congress
Chapter 1015 - 2d Session
S. 4203

AN ACT

All 70 Stat. 1069.

To amend the Atomic Energy Act of 1954, as amended, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 11 u. of the Atomic Energy Act of 1954, as amended, is amended to read as follows: Atomic Energy Act of 1954, amendments. 68 Stat. 924.

"u. The term 'United States' when used in a geographical sense includes all Territories and possessions of the United States, the Canal Zone and Puerto Rico." 42 USC 2014.

SEC. 2. Section 31 a. of the Atomic Energy Act of 1954, as amended, is amended by inserting after the word "development" in the first sentence thereof the words "and training". 42 USC 2051.

SEC. 3. Section 31 b. and section 31 c. of the Atomic Energy Act of 1954, as amended, are amended by redesignating the sections as sections 31 c. and 31 d. respectively and by adding a new section 31 b. reading as follows:

"b. The Commission is further authorized to make grants and contributions to the cost of construction and operation of reactors and other facilities and other equipment to colleges, universities, hospitals, and eleemosynary or charitable institutions for the conduct of educational and training activities relating to the fields in subsection a." Grants for construction of reactors, etc.

SEC. 4. Section 161 of the Atomic Energy Act of 1954, as amended, is amended by adding at the end thereof the following new subsection: 42 USC 2201

"r. The Commission is authorized and empowered, under such terms and conditions as are deemed advisable by it, to grant easements for rights-of-way over, across, in, and upon acquired lands under its jurisdiction and control, and public lands permanently withdrawn or reserved for the use of the Commission, to any State, political subdivision thereof, or municipality, or to any individual, partnership, or corporation of any State, Territory, or possession of the United States, for (a) railroad tracks; (b) oil pipe lines; (c) substations for electric power transmission lines, telephone lines, and telegraph lines, and pumping stations for gas, water, sewer, and oil pipe lines; (d) canals; (e) ditches; (f) flumes; (g) tunnels; (h) dams and reservoirs in connection with fish and wildlife programs, fish hatcheries, and other fish-cultural improvements; (i) roads and streets; and (j) for any other purpose or purposes deemed advisable by the Commission: *Provided*, That such rights-of-way shall be granted only upon a finding by the Commission that the same will not be incompatible with the public interest: *Provided further*, That such rights-of-way shall not include any more land than is reasonably necessary for the purpose for which granted: *And provided further*, That all or any part of such rights-of-way may be annulled and forfeited by the Commission for failure to comply with the terms and conditions of any grant hereunder or for nonuse for a period of two consecutive years or abandonment of rights granted under authority hereof. Copies of all instruments granting easements over public lands pursuant to this section shall be furnished to the Secretary of the Interior." Easements for rights-of-way.

SEC. 5. Section 182 a. of the Atomic Energy Act of 1954, as amended, is amended by striking the last sentence thereof and substituting in place thereof the following: 42 USC 2232.

"All applications and statements shall be signed by the applicant or licensee. Applications for, and statements made in connection with, licenses under sections 103 and 104 shall be made License applications. 42 USC 2133, 2134.

under oath or affirmation. The Commission may require any other applications or statements to be made under oath or affirmation."

42 USC 2271-2281.

SEC. 6. Chapter 18 of the Atomic Energy Act of 1954, as amended, is amended by redesignating sections 229, 230, 231 as sections 231, 232, 233 respectively, making appropriate amendment to the Table of Contents and adding two new sections, 229 and 230, reading as follows:

"SEC. 229. TRESPASS UPON COMMISSION INSTALLATIONS.—

"a. The Commission is authorized to issue regulations relating to the entry upon or carrying, transporting, or otherwise introducing or causing to be introduced any dangerous weapon, explosive, or other dangerous instrument or material likely to produce substantial injury or damage to persons or property, into or upon any facility, installation, or real property subject to the jurisdiction, administration, or in the custody of the Commission. Every such regulation of the Commission shall be posted conspicuously at the location involved.

"b. Whoever shall willfully violate any regulation of the Commission issued pursuant to subsection a. shall, upon conviction thereof, be punishable by a fine of not more than $1,000.

"c. Whoever shall willfully violate any regulation of the Commission issued pursuant to subsection a. with respect to any installation or other property which is enclosed by a fence, wall, floor, roof, or other structural barrier shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not to exceed $5,000 or to imprisonment for not more than one year, or both.

"SEC. 230. PHOTOGRAPHING, ETC., OF COMMISSION INSTALLATIONS.—It shall be an offense, punishable by a fine of not more than $1,000 or imprisonment for not more than one year, or both—

"(1) to make any photograph, sketch, picture, drawing, map or graphical representation, while present on property subject to the jurisdiction, administration or in the custody of the Commission, of any installations or equipment designated by the President as requiring protection against the general dissemination of information relative thereto, in the interest of the common defense and security, without first obtaining the permission of the Commission, and promptly submitting the product obtained to the Commission for inspection or such other action as may be deemed necessary; or

"(2) to use or permit the use of an aircraft or any contrivance used, or designed for navigation or flight in air, for the purpose of making a photograph, sketch, picture, drawing, map or graphical representation of any installation or equipment designated by the President as provided in the preceding paragraph, unless authorized by the Commission."

SEC. 7. Section 229 of the Atomic Energy Act of 1954, as amended, is amended to read as follows:

"SEC. 231. OTHER LAWS.—Sections 224 to 230 shall not exclude the applicable provisions of any other laws."

Transfer of lands.

SEC. 8. All land and interests in land, owned by the United States within the boundaries of the County of Los Alamos, State of New Mexico, containing approximately seventy thousand eight hundred acres, are hereby transferred, without reimbursement or transfer of funds, to the Atomic Energy Commission. The Atomic Energy Commission shall exercise administrative control over all land and interests in land transferred to the Atomic Energy Commission by this Act, notwithstanding the manner of their acquisition by the United States nor their status at any time prior to the effective date of this Act.

considered fee land

TRANSFER OF REAL PROPERTY

STATION	CONTRACT NO.	DATE
USAEC-ALOO Los Alamos Area Office - Los Alamos, New Mexico	AT(29-2)-936	12-2-59

DESCRIPTION	NO. UNITS	UNIT	TOTAL QUANTITY	REMARKS
LAND - An area adjoining the Bandelier National Monument Lands, located in Los Alamos County, New Mexico, and as shown on attached Drawing NM-BAN 7104 and Detailed Description.	3600 ±	Acres	3600 ±	Cost - $65,052.00

This transfer, without reimbursement, is made pursuant to authority contained in letter to USAEC-ALOO from Regional Commissioner, Region 8, General Services Administration, Denver, Colorado, dated November 27, 1959.

ACCEPTED BY:

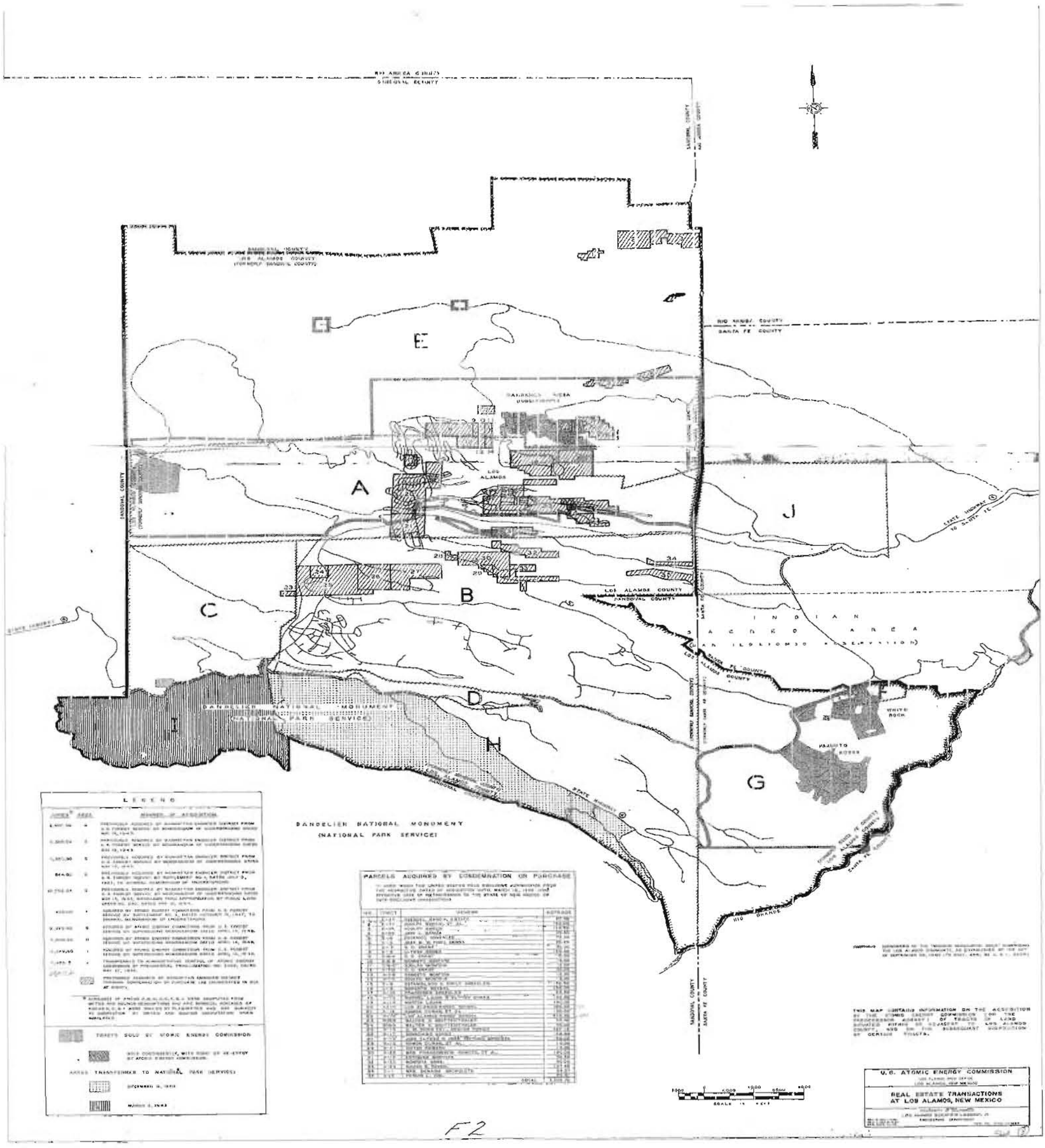
Date 12-9-59

Time 3:45 p.m.

Jackson E. Price
Asst. Director
NATIONAL PARK SERVICE - U.S.D.I.

TRANSFERRED BY:

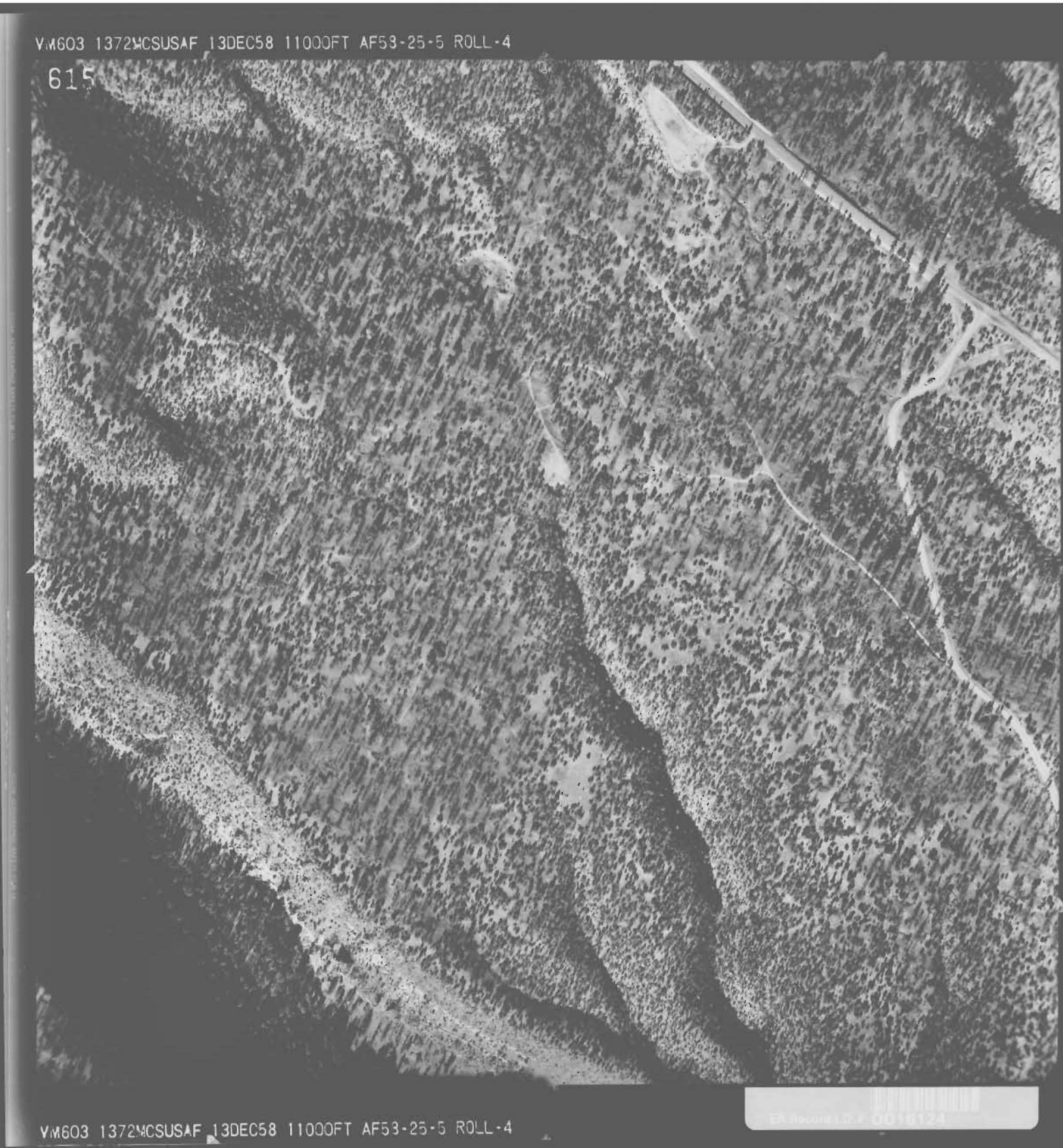
Julian T. Lefler
Director, E&C Division, AEC-ALOO


RIO ARRIBA COUNTY
SANDOVAL COUNTY
LOS ALAMOS
LOS ALAMOS COUNTY
SANDOVAL COUNTY
A
B
C
D
E
F
G
H
J
INDIAN
ACHEO AREA
DANDELIER NATIONAL MONUMENT
NATIONAL PARK SERVICE
WHITE ROCK
PAJARITO MOBILE HOME
RIO GRANDE
SANTA FE COUNTY
LEGEND
PARCELS ACQUIRED BY CONDEMNATION OR PURCHASE
TRACTS SOLD BY ATOMIC ENERGY COMMISSION
SCALE IN FEET
U.S. ATOMIC ENERGY COMMISSION
REAL ESTATE TRANSACTIONS
AT LOS ALAMOS, NEW MEXICO

F2

Appendix C

Historical Aerial Photographs of Sites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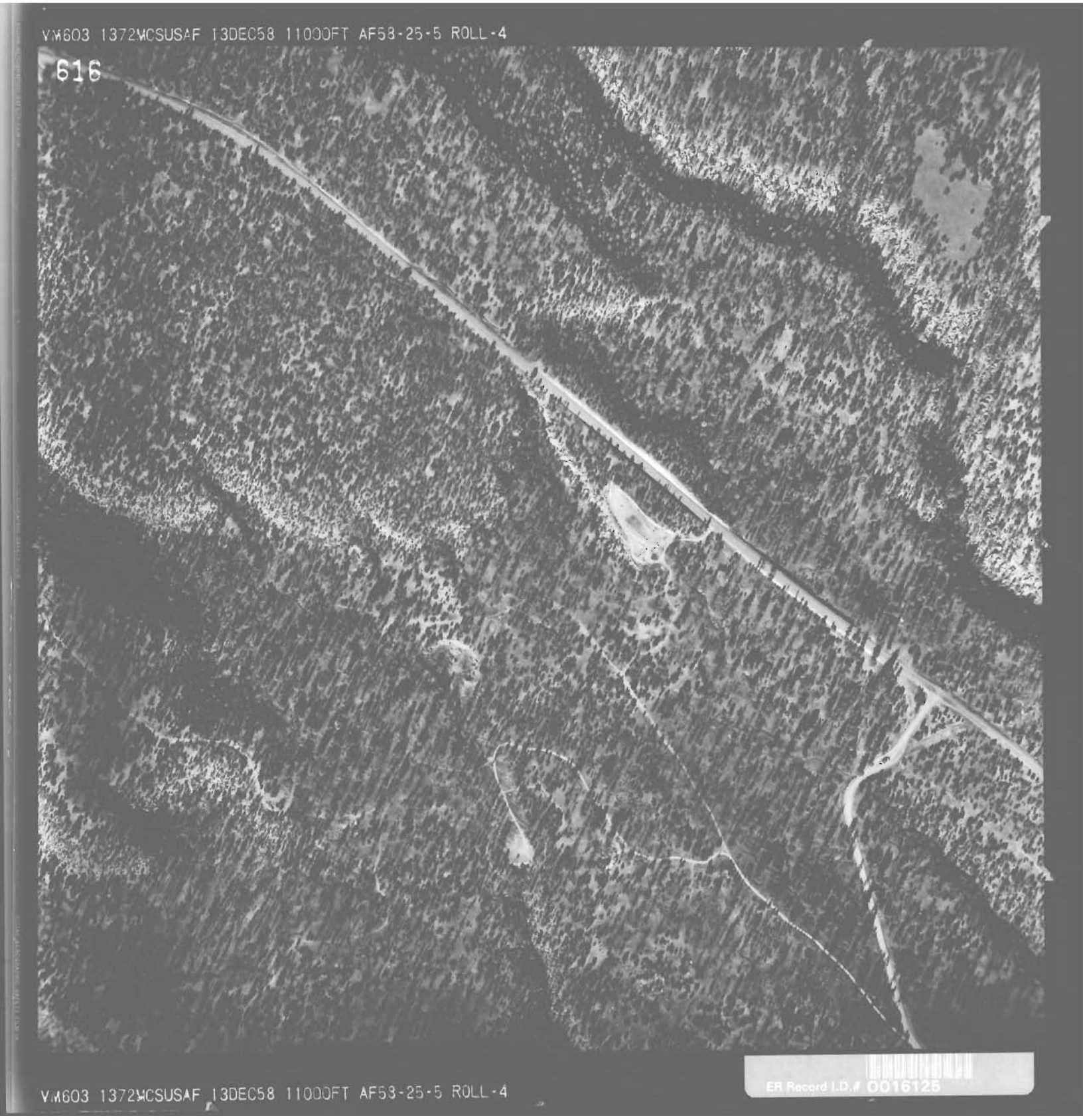
615
VM603 1372MCSUSAF 13DEC58 11000FT AF53-25-5 ROLL-4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616
VM603 1372MCSUSAF 13DEC58 11000FT AF53-25-5 ROLL-4
ER Record I.D.# 0016125

Appendix D

Photographs of Current Site Conditions

D-1.0 PHOTOGRAPHS OF AOC C-00-037

Figure D-1.0-1 Southern terminus of debris disposal area in head of unnamed canyon in Bandelier National Monument, looking north

Figure D-1.0-2 Surface-disposed debris at AOC C-00-037, including asphalt

Figure D-1.0-3 Fill material and vegetation on the surface at AOC C-00-037, looking west

Figure D-1.0-4 Debris and fill material on the surface at AOC C-00-037

Figure D-1.0-5 Quarried rock debris at AOC C-00-037, looking north

Figure D-1.0-6 Scrap metal and quarried rock debris at AOC C-00-037

D-2.0 PHOTOGRAPHS OF AOC C-00-038

Figure D-2.0-1 Quarried rock debris at AOC C-00-038

Figure D-2.0-2 Roof of vintage automobile and broken porcelain plate visible among quarried rock at AOC C-00-038, looking east

Figure D-2.0-3 Roof of vintage automobile and broken porcelain plate visible among quarried rock at AOC C-00-038, looking north

Figure D-2.0-4 Small area of asphalt disposal at AOC C-00-038

Appendix E

National Park Service Archaeological Investigation Report

FINAL

ARCHEOLOGICAL INVESTIGATION OF SIX REMEDIATION SITES IN BANDELIER NATIONAL MONUMENT, NEW MEXICO

ROBERT P. POWERS

NATIONAL PARK SERVICE
SOUTHWEST REGIONAL OFFICE
DIVISION OF ANTHROPOLOGY
BRANCH OF CULTURAL RESOURCES MANAGEMENT
PARK PAPERS BAND-02

1994

INTRODUCTION

Remediation studies of potentially hazardous waste and debris at six locations (four borrow pits, a landfill, and a historic dump) within Bandelier National Monument are proposed by Los Alamos National Laboratory (LANL). The studies will include physical and geochemical characterization, radiological survey, soil sampling, and possibly, removal of hazardous or waste materials. Waste and debris were deposited when the areas were under Atomic Energy Commission (AEC) administration, although the materials appear to be the result of State Highway Department, National Park Service (NPS) and AEC activities. To aid evaluation of deep waste and debris deposits at the landfill site, a backhoe trench traversing the northwest to southeast axis of the deposit is proposed.

In compliance with the National Historic Preservation Act of 1966 (as amended) and Executive Order 11593, archeological inventory survey was conducted by Robert Powers and Genevieve Head of the Division of Anthropology of NPS on May 18th and 19th and on May 23rd and 24th, 1994, to determine if archeological sites were present within the proposed remediation areas. Two sites, an Anasazi sherd and lithic scatter (Bandelier Field [BF]# 90062), dating to the late 1400's, and a Historic dump site (BF 90060) containing historic artifacts dating to the 1920s to early 1940s were identified and recorded within the proposed project areas.

LOCATION

All six remediation sites are within the northern portion of Bandelier National Monument on the mesa top separating Frijoles and Ancho Canyons. Borrow Pits 1 through 3, the landfill, and the historic dump are on Frijoles Mesa, while Borrow Pit 4 is on a segment of the mesa commonly referred to as Burnt Mesa. The locations of all six areas are shown in Figure 1. Numbered in ascending order from the Bandelier entrance road, the borrow pits are immediately adjacent to State Highway 4, and range in elevation from 2042 m (6700 ft) at Borrow Pit 1 to 2268 m (7440 ft) at Borrow Pit 4. The landfill site, located immediately southwest of Juniper Campground Loops A and B, and west of the park employee housing is at an elevation of 2012 m (6600 ft). The historic dump is located on a east facing mesa slope approximately 400 m west of the landfill site at an elevation of 2036 (6680 ft). All of the locations were formerly within the southern portion of the Ramon Vigil Grant, and were administered by the Atomic Energy Commission (AEC) from 1943 until the portion of the grant south of Highway 4 was transferred to the NPS in January of 1961 (Rothman 1988: 159; Jan Novak: personal communication 1994).

ENVIRONMENT

Frijoles Mesa is similar to other long finger-mesas or "potreros" forming the Pajarito Plateau. It extends southeastward from the foot of the Jemez Caldera to White Rock Canyon and the Rio Grande, growing progressively narrower, and defined on the north and south by increasingly deep, precipitous canyons. Both mesa and canyons are composed of solidified volcanic ash or tuff, although basement portions of Frijoles and Ancho canyons expose underlying basalts near their junctures with White Rock Canyon. Bedrock formations in the four borrow pits and the landfill site are composed entirely of pumiceous tuff. No bedrock is exposed at the historic dump, but this area is also underlain by tuff. Within the borrow pits proper, quarrying of tuff for base course materials for Highway 4 has left little soil, but around the margins of the borrow pits, pumice gravels and sandy loam overlie the bedrock, and range from 10 cm in depth to well over a meter. At the historic dump site, the depth of pumice soils is unknown, but apparently substantial. Within the landfill, quarrying in the 1930s may

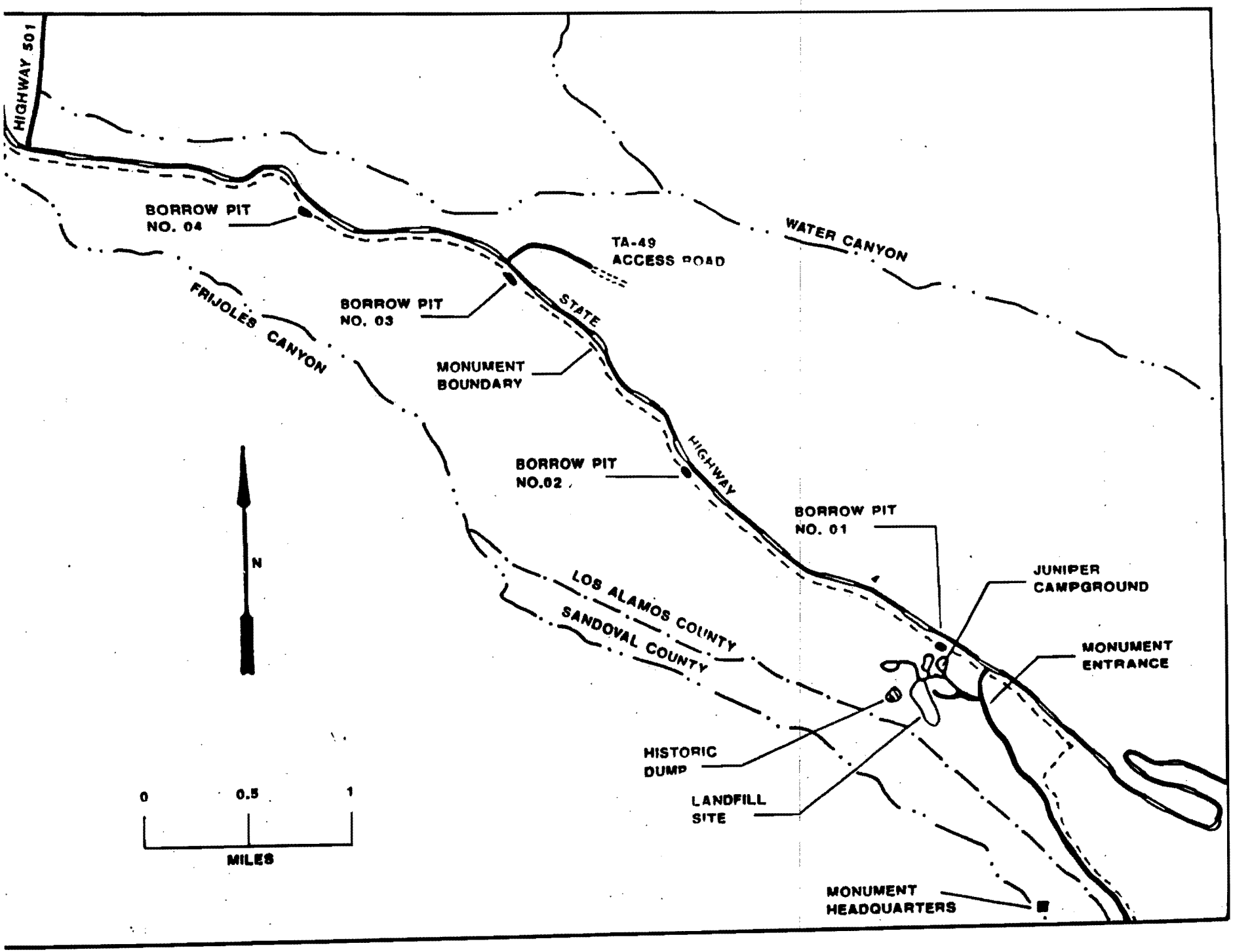


Figure 1: Location of proposed remediation sites.

have removed most soil deposits. Soil now covering the surface of the landfill appears to have been imported.

The vegetative environment of the locations ranges from lower to upper Transition zone; at the lower elevation tracts (landfill, historic dump, Borrow Pits 1 and 2) piñon (*Pinus edulis*), and juniper (*Juniperus monosperma*) mixed with ponderosa pine (*Pinus ponderosa*), are dominant. Understory shrubs and grasses include Apache plume (*Fallugia paradoxa*), skunkbush (*Rhus trilobata*), mountain mahogany (*Cercocarpus montanus*), snakeweed (*Gutierrezia sarothrae*), yucca (*Yucca baccata*), scrub oak (*Quercus undulata*), blue grama (*Bouteloua gracilis*) and Indian paintbrush (*Castilleja sp*). Borrow Pits 3 and 4, at higher elevations, are dominated by ponderosa pine, scrub oak, and a variety of grasses. Vegetation in Borrow Pits 2, 3, and 4 was partially burned during the 1977 La Mesa fire; fallen ponderosa trunks indicate formerly dense ponderosa pine growth.

Average annual precipitation for the remediation locations ranges from about 39 to 44 cm (15.5 to 17.5 in), an amount more than adequate for dry farming during average or better precipitation years (Powers 1988: 22-23). Assuming modern rainfall quantities are similar to those experienced prehistorically (an assumption supported by tree-ring data), most of the remediation locations would have been feasible Anasazi habitation and farming sites. The elevations of Borrow Pits 3 (2213 m) and 4 (2268 m) and are high enough however, that growing seasons at these locations may be too short during many years. Although the Occupation Health Laboratory at Los Alamos at 2225 m has shown an average growing season of 155 days over a thirty year period (May 8 to October 14), a minimum growing season of 99 days is indicated if the latest and earliest frosts are calculated for the same year. Minimum growing season length necessary to produce corn varies a great deal with respect to temperature, but in the northern Southwest growing seasons of 110-130 days are usually considered necessary (Shuster 1981:114 in Cully 1986; Gillespie and Powers 1983). Given the similarity of current climatic conditions to those of the late prehistoric period (based on tree-ring derived retrodictions of precipitation, temperature and Palmer Drought Severity Indices [PDSI] (Rose et al. 1982), growing season length is likely to have been a constraint on agriculture at Borrow Pit 4 elevations, while borrow Pit 3 is on the upper altitudinal limit of areas used by Anasazi farmers, even during the generally drier late Coalition (A.D. 1250-1290) and middle and late Classic periods (A.D. 1400-1600) when farming at cooler, moister altitudes would have been preferable (Orcutt 1991, 1993).

CULTURE HISTORY

The Pajarito Plateau has a long and intensive history of human occupation which extends from Paleoindian and Archaic horizons to the present, though not without occupational hiatuses.

Paleoindian and Archaic - Paleoindian occupation of the Pajarito appears to have been sparse, although Clovis, Folsom, Agate Basin and Milnesand point fragments are reported from the Cochiti Lake, Bandelier and Los Alamos National Lab portions of the Plateau (Chapman and Biella 1979; Steen 1982; Hubbell and Traylor 1982). Dates assigned to these projectile point styles suggest deposition between 9500 and 7000 B.C. The lack of identified Paleoindian sites per se (all the above points were isolated occurrences), suggests that the higher altitude areas of the Pajarito were used only occasionally by Paleoindians, perhaps for hunting forays.

Archaic materials and sites are substantially more numerous, but far short of prolific. Stuart and Gauthier (1981:47-48) report 78 datable Archaic components in the 600-square-mile Cochiti-Pajarito district, a number only modestly increased by 18 components identified by the Bandelier Archeological Survey (Head 1992). Based on surface projectile point finds and radiocarbon dates from

a few excavated shelters, Archaic occupation appears to range from late Jay (c 5000 B.C.) to Basketmaker II (A.D. 400-600) (Head 1992; Stuart and Gauthier 1981; Hubbell and Traylor 1982). Most sites are at lower elevations, and are frequently manifested by fire-cracked rock concentrations associated with chipped and ground stone scatters. In the absence of diagnostic projectile points, or excavation, many such sites are classified as unknown, a situation which suggests that Archaic sites are probably somewhat more frequent than they appear. Most sites are thought to represent temporary camps or specialized procurement sites used seasonally, but repeatedly over a period of years (Chapman and Biella 1979).

Developmental Period (A.D. 600-1200) - Anasazi occupation of the river valley in the Cochiti vicinity extends back to the early portions of this period, but sites on the Plateau appear to be non-existent. Settlement appears to be strictly limited to low elevations, near permanent water. Lowland sites are small and consist of 1-3 pithouses associated with surface scatters of plain graywares, brownwares, whitewares and occasional San Juan redwares (Stuart and Gauthier 1981; Wendorf and Reed 1955; Dickson 1979).

Settlement increases slightly during the latter half of the period, as lower elevations are abandoned and new locations above 1981 m (6500 ft) are selected, probably to permit dry farming. Within Bandelier National Monument settlement does not occur until approximately A.D 1150, and even then the number of sites is small. Sites are also small in size, ranging from about 1-12 rooms. Occupation appears to be generally brief as suggested by lack of construction remodelling (Kohler 1989; Kohler and Root 1992) and the sparsity of refuse. Kwahe'e Black-on-white is the primary painted ware associated with these sites, although it is joined in very low percentages by tradewares such as Socorro Black-on-white and early White Mountain Redwares.

Coalition Period (A.D. 1200-1325) - The Coalition period sees enormous increases in the number of habitation sites on the Pajarito, and by most reckonings, population as well (Orcutt 1981, 1993; Hill and Trierweiler 1986). Refined chronological data from the Bandelier survey suggest spikes of population growth early in the period (A.D. 1235-1250) and very late (A.D. 1290-1325), with a sharp intervening population decline corresponding to a brief period (A.D. 1250-1290) of probable low agricultural productivity and variability based on reconstructed climatic conditions (Orcutt 1993). The late 1200s settlement expansion is contemporary with the "Great Drought" and depopulation of the Four Corners area. The concurrence of these events has long fueled, and continues to feed, the idea that population expansion on the Pajarito Plateau and throughout much of the northern Rio Grande Valley is the result of migration from the Four Corners. Whatever the source and mechanism of population growth, rapid growth is thought to cause degradation of wild resources, increased reliance on agriculture and intensive competition for arable land and resources (Powers 1988; Kohler 1989; Powers and Kohler 1993). The adaptive result of these factors is reduced settlement mobility and population aggregation.

Aggregation is first detected during the early Coalition period, but the trend collapses between A.D. 1250-1290. Despite a resurgence in population late in the century, renewed aggregation is only barely detectible through the remainder of the Coalition period, even though mesa top "plaza pueblos" probably appear in the A.D. 1270s. Classic period communal pueblos such as Otowi, Tshirege, Tsankawi and Tyuonyi were probably also initially occupied during the late Coalition, although the size and architectural configuration of these sites are virtually unknown during this period (Van Zandt 1993, n.d). Based on limited excavations at one Coalition period plaza pueblo, and archeological survey of another, these aggregated sites consist of 60-70 rooms, are one to two stories in height, and surround an interior plaza with one or more subterranean kivas (Kohler 1992). Although the trend toward aggregation represented by the plaza pueblos ultimately transforms the settlement system, small hamlet pueblos averaging 15 rooms in size are numerous until the late 1300's (Van Zandt 1993).

Carbon based black-on-white ceramics, especially Santa Fe Black-on-white and, to a lesser extent, Wiyo Black-on-white, entirely supplant Kwahe'e (Vint 1993).

Classic Period (A.D. 1325-1600) - Population declines steadily throughout the Classic period, but aggregation continues, such that by the late 1400s much of the population of the Pajarito Plateau is concentrated in less than a dozen large communal pueblos (Orcutt 1993). Within Bandelier National Monument this trend culminates in the late 1400s and early 1500s with the abandonment of San Miguel and Yapashi, and the concentration of all remaining population into a single large community in lower Frijoles Canyon. Frijoles Canyon, in turn, is largely, if not entirely, abandoned by the third quarter of the sixteenth century, a date probably slightly preceding the abandonment of the remaining large communal sites in the central and northern portions of the plateau (Powers and Orcutt n.d.). These population and settlement changes occur in a subsistence regime marked initially by heavy reliance on agriculture, but after A.D. 1400 as climatic conditions become drier and less predictable, dependence on agriculture drops. Most cultivation during the period is performed at isolated fieldhouses.

Overall, climate during the Classic period is neither conducive to crop production nor the accumulation of surplus foodstuffs (Orcutt 1993). These conditions may explain why population is increasingly constricted to a few locations on the plateau. Not surprisingly, aggregation also entails organizational and economic changes at both community and regional levels. Organizationally these changes take the form of social practices and mechanisms designed to establish and maintain group cohesion and identity, as evidenced at the community level by the introduction of plazas, large kivas (and ultimately great kivas) and the appearance of probable katsina representations in rock art and mural paintings (Van Zandt 1993; Adams 1991).

On a regional level, the establishment of ethnic boundaries, such as the historically famous Frijoles Canyon demarcation between Keres and Tewa territories (Bandelier 1892, Harrington 1916), appears to be supported at least in part by the Classic period distribution of ceramic materials (Vint 1993). The preponderance of glaze wares south of Frijoles, and dominance of biscuit wares north of Frijoles suggest that the scale of economic interaction was increasingly regionally based.

Historic Period (A.D. 1600 to present) - By A.D. 1600 the large aggregated pueblos of the Pajarito Plateau were entirely abandoned, although the Pajarito continued to receive limited use as a gathering and hunting area for Puebloan populations, now largely residing along the Rio Grande or major lowland tributaries. Resettlement on the river was probably due initially to drought, but was subsequently accelerated by the Spanish policy of settlement concentration (Abbink and Stein 1977; Cordell 1979) and the catastrophic Puebloan population decline that followed. Although a few families appear to have maintained summer farming residences on the plateau, a practice continued into the present century (see Ellis 1978), use of the plateau for farming appears to have been minimal. The plateau did provide a secure retreat during and after the Pueblo Revolt of 1680, as witnessed by Puebloan reoccupation of cavate dwellings at Puye and Frijoles Canyon. The construction of Kotyiti, situated on a high, relatively inaccessible mesa overlooking the Cañada de Cochiti, provided a similar defensive fortress for Keres refugees from adjacent Rio Abajo pueblos (Abbink and Stein 1977; Toll n.d.; Robinson, Hannah and Harrill 1972).

Prior to the Pueblo Revolt, Spanish settlement was concentrated at missions and haciendas near pueblos in order to regulate and receive Pueblo labor and tribute; Spanish use of the Pajarito was, as a result, minimal. After the Pueblo Revolt, in concert with the initiation of new Spanish settlement and economic policies, land grants were awarded to mestizo and genizaro families to stimulate settlement and provide a defensive buffer for core valley settlements. Several land grants covering the Cochiti, southern Pajarito, and Caja del Rio areas were issued during the first half of the eighteenth

century, but most were never occupied by their owners, being instead rented to sheepherders (Abbink and Stein 1977).

Grants containing irrigable valley bottom locations were more apt to be settled, as witnessed by establishment of the village of Cañada de Cochiti in the 1720s (Flynn and Judge 1973) and settlement of Frijoles Canyon, both in grants of the same names. Cañada remained a small village until the 1830s when increased Navajo and Ute raiding forced its inhabitants to retreat to Pena Blanca (Flynn and Judge 1973). Use of much of the Pajarito for agriculture and sheep herding seems to have been constrained throughout the latter portion of the eighteenth and especially the early nineteenth century by Navajo raiders, who used the Jemez Mountains as an avenue to the Rio Grande Valley (Bandelier 1892).

Following annexation of the territory of New Mexico by the United States in 1847, gradual military subjugation of the Navajo, Ute and Apache opened up vast tracts of land on the margins of the Rio Grande Valley to settlement and sheepherding; yet despite this increased security few herding camps are identifiable on the southern Pajarito until the 1880s. Herding throughout New Mexico was fueled during the early territorial years by the need to feed troops and confined hostile tribes.

Herding and the partido system, under which most shepherds operated, gradually declined on the Pajarito during the 1920s and 1930s, not from competition (as was experienced elsewhere due to cattle raising, homesteaders, and land speculation; see Carlson 1969 as cited in Abbink and Stein 1977), but largely as a result of the foreclosure of Stock Grazing Act loans subsequent to World War I (Smith n.d.). Limited herding continued on much of the Pajarito until the 1930s. As a result of increasing federal ownership, most activities on the Pajarito post-dating 1930 are associated with recreational activities in Bandelier National Monument, or defense activities within Atomic Energy Commission (now Department of Energy) lands.

In Bandelier, assumption of monument administration by the National Park Service in 1932 initiated eight years of intense activity, beginning with the construction of the Frijoles Canyon automobile road in 1933, and continuing with construction of the Monument headquarters and tourist lodge between 1933 and 1940. The quarrying activities which preceded dumping at both BF 90060 and the landfill were likely conducted by Civilian Conservation Corps (CCC) workers charged with supplying fill and stone required for the road and headquarters construction (Rothman 1988:88, Harrison et al. 1988:20-28).

PREVIOUS INVESTIGATIONS

Both park archeological records and the Archeological Records Management Section data base maintained by the State of New Mexico Historic Preservation Division were examined to identify any previous archeological investigations within the remediation areas. The search revealed that no work had been conducted at Borrow Pits 3 and 4. The Borrow Pit 2 area was surveyed by park volunteer Steve Bracker in 1993 as part of the park's continuing effort to document all cultural resources. Bracker designated the pit as site BF 90010, and placed an aluminum site marker, but did not prepare an inventory form. He completed archeological site record forms on two adjacent sites located outside the borrow pit area (Bandelier National Monument site record files). The areas of Borrow Pit 1, the landfill, and the historic dump were surveyed in 1987 as part of the Bandelier Archeological Survey (Powers and Orcutt 1987; Powers and Orcutt n.d.). The survey recorded one site adjacent to Borrow Pit 1, but no sites were recorded in either the landfill or dump areas, in part because a recording policy for historic and modern sites had not been developed. In subsequent years the survey recorded

remains as recent as 1960; a change which would have given archeological site status to both the landfill and the historic dump.

PRESENT INVESTIGATIONS

In order to identify and document any archeological sites within the six remediation areas, the ground surface of each area was thoroughly examined by pedestrian surveyors walking approximately 5 m apart. This was accomplished by first flagging the perimeter of each proposed area (including a vehicle access corridor), and then traversing the enclosed area until it had been completely covered. In order to insure that all areas potentially containing waste and debris were included, the remediation area boundaries were extended 5-10 m beyond the limit of visible borrow, landfill or dumping disturbance. The only exceptions to this practice, as discussed below, were made where archeological materials were found at the edges of borrow pits. In these instances the flag boundary was brought inward to the edge of the pit in order to exclude archeological materials from the clearance area.

After completion of the transecting, three identified sites (BF 90060, BF 90061, and BF 90062) were recorded to provide a basis for national register eligibility evaluation and future reference. Two of the sites (BF 90060 and BF 90062) are within the boundaries of the remediation areas, and are discussed below. A third site (BF 90061), located outside the Borrow Pit 1 area, was recorded, but is only briefly mentioned since the proposed activities should have no effect on it. Recording followed the standard operating procedure used by the Bandelier Archeological Survey (Powers n.d.) The results of the survey and these recording activities are described in detail below.

BORROW PIT 1

Borrow Pit 1 is located approximately 350 m (1/4 mi) north of the Bandelier entrance road and 40 m (130 ft) southwest of Highway 4. The pit area, including a surrounding clearance buffer totals .67 ha (1.7 ac), is approximately 125 m northwest-southeast by 50 m northeast-southwest (Figure 2). The north edge of the pit is a sheer face excavated into the Bandelier Tuff, while the pit edges on the west and south are level with undisturbed bedrock and pumice surfaces. The access corridor from the east is the original route used to access the pit. No prehistoric or historic cultural resources were encountered in the borrow pit proper, but as shown in Figure 2, two sites, LA 60323 and BF 90061, are immediately adjacent. LA 60323, a cavate pueblo with associated features and refuse dated between A.D. 1250-1325, is located in a low cliff face below the west edge of the borrow pit. This site was recorded by the Bandelier Survey in 1987. BF 90061, a one-room structure dating between A.D. 1175-1350, is located immediately northwest of the borrow pit. This site is immediately north of the park boundary fence (although within the park), and because of confusion regarding coverage of the area between the fence and the highway, it had not been previously recorded. The site is above the borrow pit excavation face, and back approximately 5 m from the pit lip. Both sites are excluded from the flagged clearance area, and will not be impacted by the proposed remediation activities.

Modern cultural materials are scattered throughout the pit area, and are noticeably more frequent closest to the highway, although Loop A of Juniper Campground undoubtedly is the source of some material. Noted were clear and dark brown bottle glass fragments (condiment and beer bottles), numerous steel food and beverage cans (many of the latter opened with church-key style can openers), aluminum Tecate (one) and Budweiser (one) cans, two sardine cans, one tobacco can, one canned meat container lid, two bottle caps, and a pork rib. The only modern feature noted within the borrow pit was an informal stone campfire ring with glass shards and a sardine can.

LEGEND
APPLIES TO FIGURES 2-6

BOUNDARY OF CLEARED AREA
(INCLUDES BORROW PIT AND BUFFER)

RECORDED ARCHAEOLOGICAL SITE

APPROXIMATE LOCATION OF SITE MARKER

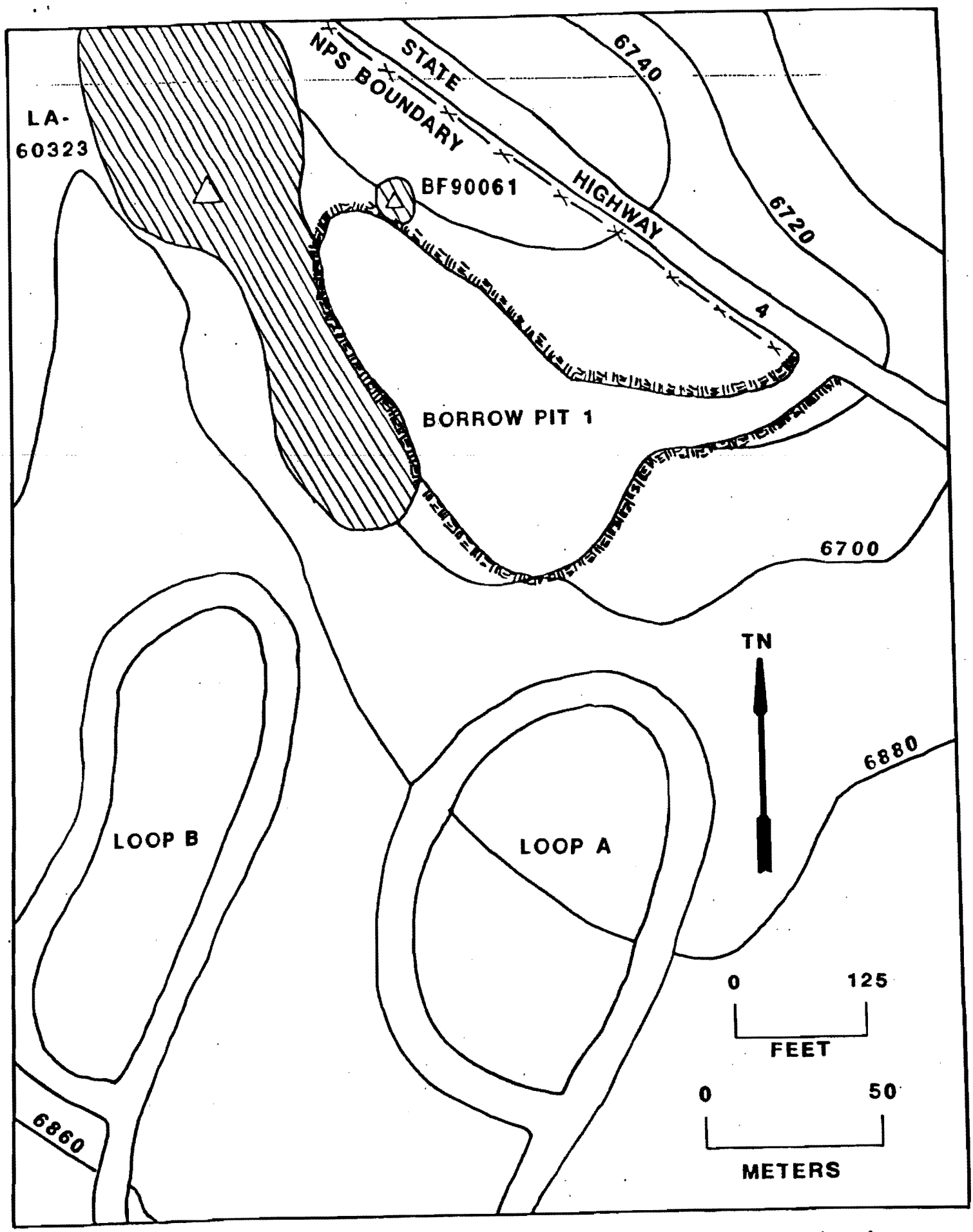


Figure 2: Borrow Pit No. 1 and vicinity. Patchwork hatching indicates limits of

Materials apparently associated with original use of the borrow pit and subject to the proposed remediation include concrete and asphalt piles, and portions of a flattened steel corrugated culvert.

Two obsidian flakes found within the borrow area were obviously washed in or dropped by park visitors who collected them elsewhere.

This pit is first identifiable on LANL aerial photography taken in 1954. Based on visibly fresh excavation cuts and a lack of vegetation, the pit appears newly excavated. All modern cultural materials found within the pit are consistent with the post-1954 date.

BORROW PIT 2

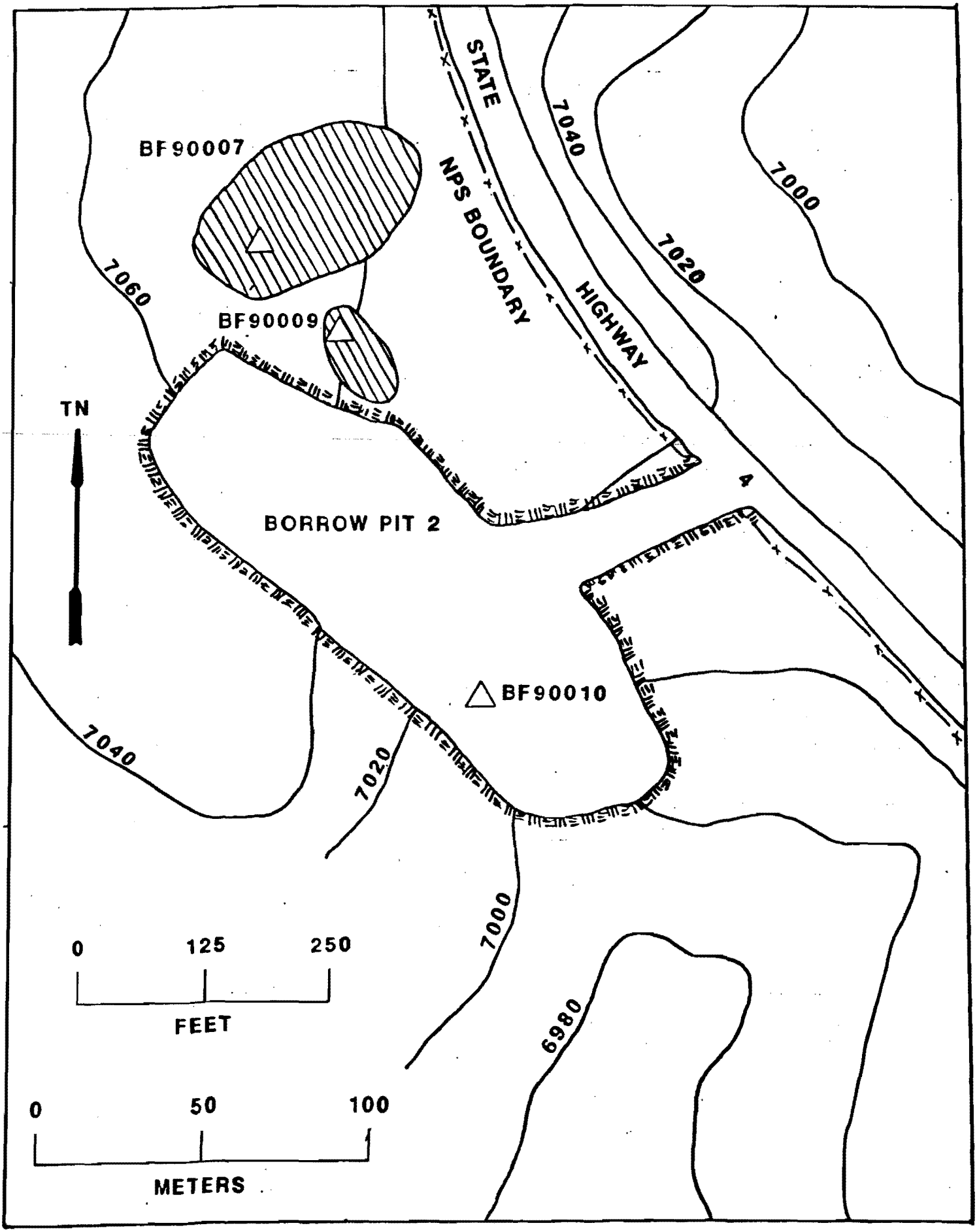
Borrow Pit 2 is located 2.8 km (1 and 3/4 mi) northwest of the Bandelier entrance road and approximately 55 m (180 ft) southwest of Highway 4. Ovoid in shape, the pit, and a surrounding clearance buffer total 1.1 ha (2.8 ac), and measure approximately 180 m northwest-southeast by 55 m northeast-southwest (Figure 3). The north half of the east edge of the pit as well as its north, and west edges are cut 4-6 m deep, exposing sheer or steep tuff bedrock faces. The southern one-third of the pit is open and consists of bulldozed spoil pushed down the slope. Like Borrow Pit 1, ponderosa pines have taken root within the pit area. Although the original borrow access road was identified, a different, more direct access route was surveyed and flagged for the proposed remediation work, as shown in Figure 3.

No prehistoric or historic cultural resources were found within the borrow pit clearance area, although two sites, BF 90007 and BF 90009, are located north of the pit. BF 90009, located on the scarp immediately north of the pit edge, is a five-room Anasazi structure and refuse scatter dating to A.D. 1400-1550. BF 90007, set further back, is an Anasazi pueblo dating to the Coalition period (A.D. 1200-1325). Both sites are outside the clearance area, and should not be impacted by the proposed remediation activities.

Due to the relative inconspicuousness of the pit and pit access road, little modern trash, apart from that associated with the original quarrying activities, was noted. Items include: two steel food cans; two steel, church-key opened beverage cans; a one-quart, key-opened (with scored strip) coffee can; and a sardine can. Materials probably related to use of the borrow pit include: an oil can (thin steel); two sections of braided steel cable; a 3 ft section of steel rebar; a steel bar; wire fencing; weathered, milled wood scraps; chunks of cement; a steel wheel hub plate (possibly from a John Deere tractor); a concrete pile; and scattered chunks of asphalt. Previously removed from the site by LANL personnel were an automobile hubcap (contaminated by depleted uranium) and a LANL structure sign.

Two sherds and a lithic were observed in the soil and rock spoil pushed to the southwest edge of the pit. These artifacts may be remnants of portions of BF 90007 destroyed during surface stripping of the borrow area, or more likely, represent surface material from the disturbed soils in the southern one-third of the clearance area.

As at Borrow Pit 1, this borrow area is first identifiable on the 1954 LANL photography; excavation of the pit, deposition of construction materials, and disposable food and drink containers is presumed to date to the 1950s or later. The technology of the associated cans is consistent with this interpretation.



Pit No. 2 and vicinity. Patchwork hatching indicates limits of

BORROW PIT 3

Borrow Pit 3 is located 5.0 km (3 mi) north of the Bandelier entrance road, and approximately 75 m (250 ft) west of Highway 4, and 160 m south of the TA-49 entrance road. The pit is also the site of a park radio transmitter and tower. The borrow and survey clearance area totals 1.3 ha (3.1 ac), and is approximately 144 m north-south by 94 m east-west (Figure 4). The pit is marked by steep excavated slopes, up to 6 m high on the east and south, while on the north and west the borrow pit floor is level with the sloping contour. Spoil material and soil from the borrow area appear to have been pushed outward in each of these directions, substantially disturbing the ground surface. The floor of the pit is roughly level, and although formed by decomposing bedrock, supports ponderosa pine, shrubs and grasses.

No prehistoric or historic remains were found within the borrow pit proper, but one prehistoric site, BF 90062, an Anasazi sherd and lithic scatter dating to the late 1400s, was found immediately east of the borrow pit between the pit and the existing access road. Because the access road provides the best entry to the pit area, and because we were uncertain of the exact route the LANL clean-up team would use to enter the pit, the site and a surrounding buffer area were copiously flagged. All personnel should use care not to enter this interior flagged area. As now flagged, the pit can be entered on either the north or south by detouring around the site. If the site is avoided as recommended, no impact should occur.

No prehistoric or historic materials were found within the remainder of the borrow pit and clearance area, although a number of modern materials relating both to original quarrying activity at the pit and subsequent sporadic use were evident. Materials apparently related to post-borrow activities include a target shooting backboard consisting of three steel posts, bullet-riddled wood posts, and a crude wooden table apparently used as the platform for glass and can targets. Target materials include fragments of several brown glass beer bottles, and five pull-tab, aluminum beer cans. Other non-target debris consists of a variety of beverage and food cans (these include a steel, Falstaff beer can (church-key opened), a steel "tallboy" beer can, three steel beverage cans (church-key opened), and a 1/2-pint and 1-pint steel food cans), a concentration of asbestos tiles (construction siding?), and several hundred feet of sisal cord (in short lengths--possibly used to bale straw?) associated with a concentration of decayed organic material (horse manure?). The tiles and organic debris are both concentrated in an area south of the pit and radio shed, and appear unassociated with the borrow pit. The only modern feature in the pit apart from the target backboard is a stone-lined campfire with three boulder seats.

Materials apparently related to borrow activities include 6 steel Mobiloil cans (1 quart), four sections of braided steel cable, a 3-in diameter steel pipe collar, a short section of wire with an aluminum tag, one 8-ft section of steel railroad track, 12 sections of crushed and twisted steel corrugated culvert, one sheet of aluminum, and scattered bits of asphalt.

Like the other pits, this borrow area appears new on the 1954 LANL aerial photography. All materials associated with the pit are modern and compatible with a post-1950 date.

BORROW PIT 4

Borrow Pit 4 is located 6.5 km (4 mi) north of the Bandelier entrance road, and 55 m (180 ft) southwest of Highway 4. The borrow pit and clearance buffer area is .49 ha (1.2 ac) in size, and measures approximately 88 m east-west by 63 m north-south (Figure 5). The roughly triangular-shaped borrow pit is bounded by a sheer excavation wall on the north, and by a steep excavation slope on the west. Depth of excavation on each face ranges from 1-4 m, exposing volcanic tuff bedrock.

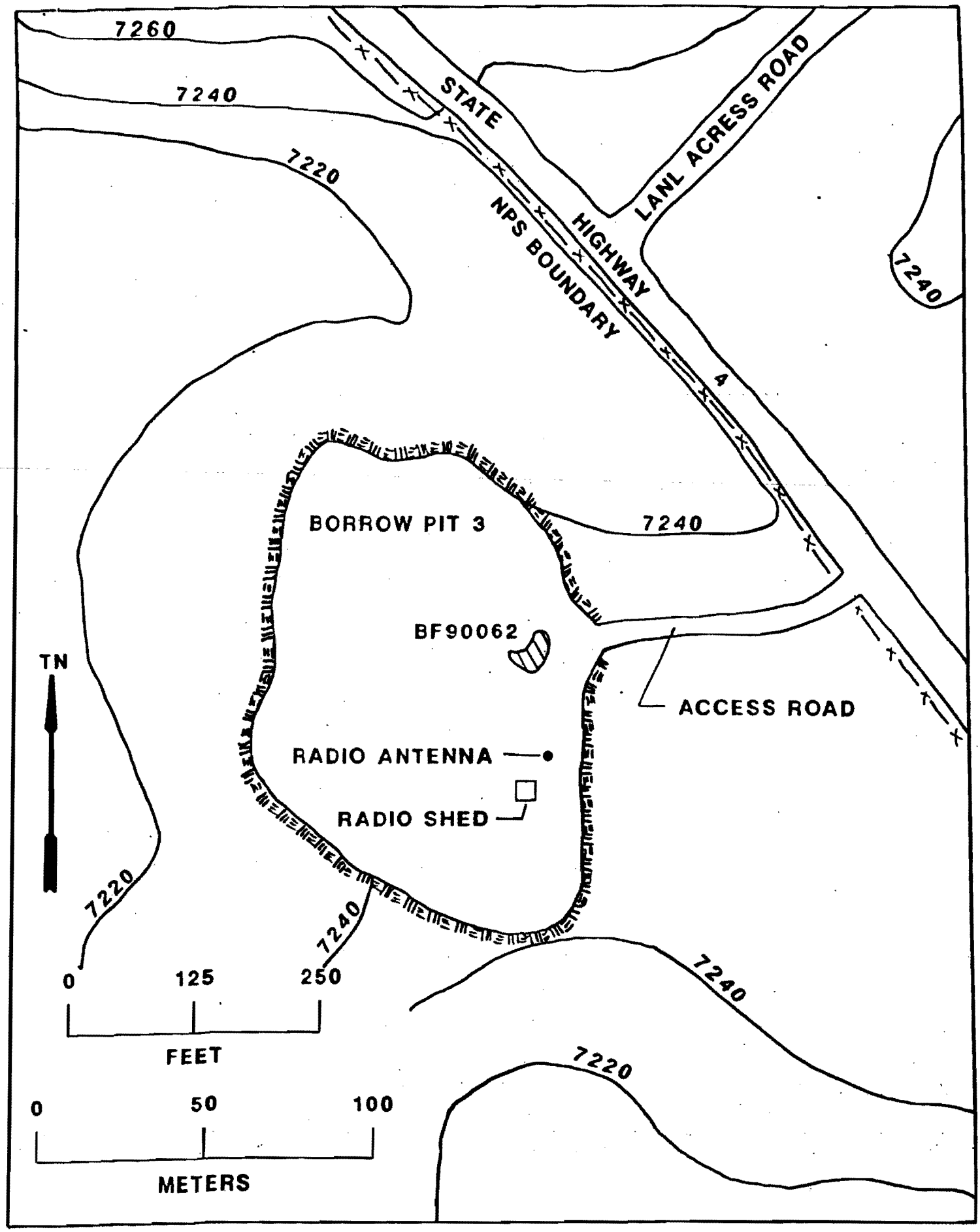


Figure 4: Borrow Pit No. 3 and vicinity. Patchwork hatching indicates limits of

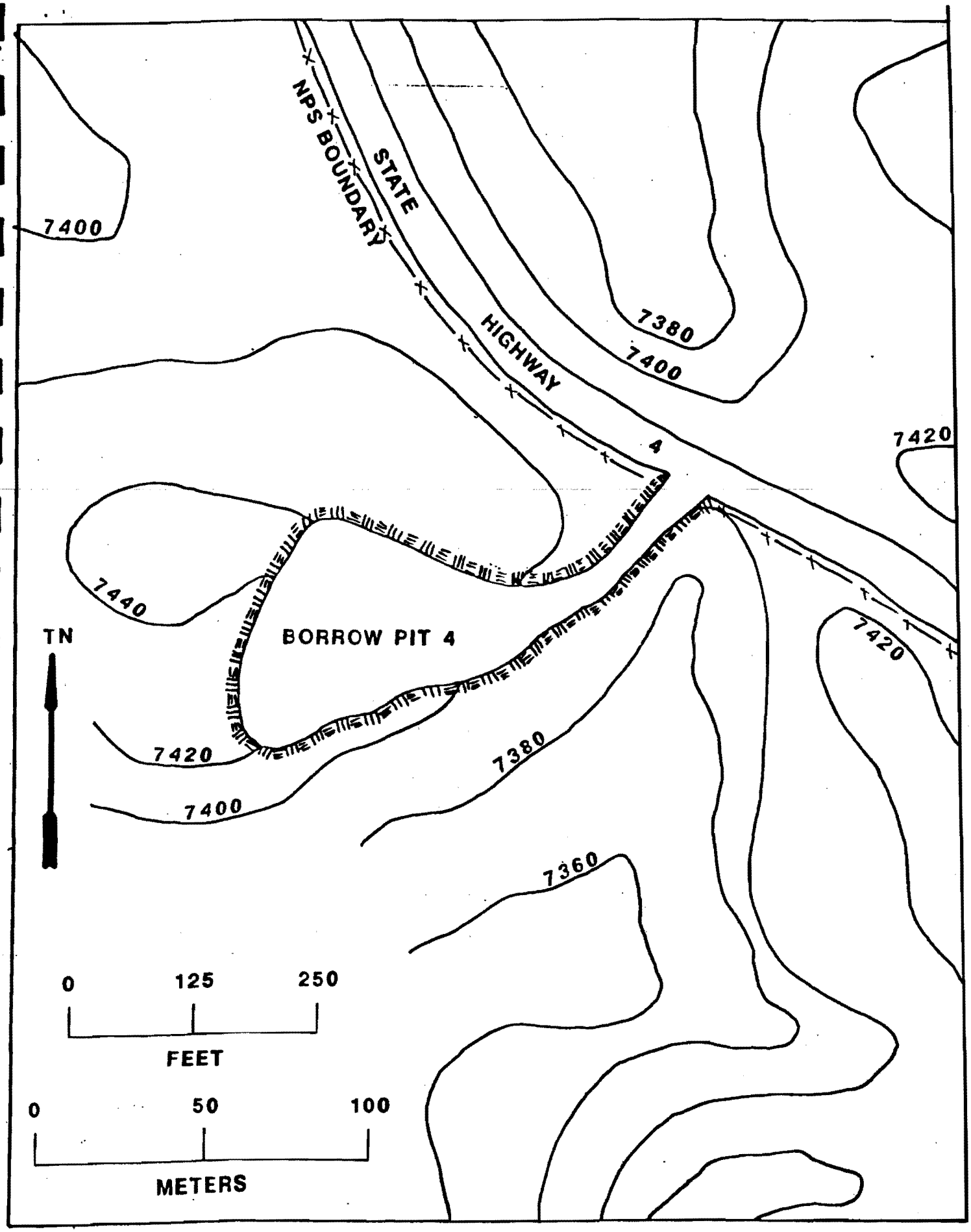


Figure 5: Borrow Pit No. 4 and vicinity. Patchwork hatching indicates limits of

The floor of the pit is decomposing bedrock with some washed-in soil and topsoil along the south perimeter. The south edge of the pit is level with the southward descending contours. The cleared access road is that used originally to reach the pit. Ponderosa pine, shrubs and grasses cover much of the pit bottom.

No prehistoric or historic cultural materials were found within the pit proper, but a sparse scatter of obsidian flakes was noted above the pit on the north and west perimeters. To exclude this material from the clearance area, the cleared boundary, as marked by flags, was brought inward to the very edge of the pit on both the north and west sides. Since the north and west lips of the pit are excluded from the project area, no clean-up related activities should be conducted in either area.

Modern artifacts within the pit include can and glass litter (four steel food cans, 10 steel beverage cans -- church-key opened, one aluminum pull-tab Budweiser beer can, one aluminum Miller beer pop-top can, glass canning jar shards, glass jar shards, one steel juice can, two steel food cans). The glass containers as well as several of the cans appear to have been used for gun targets. Also present is debris probably related to the original use of the pit as a borrow area. Among the latter items are a one-quart steel oil can, five smashed sections of steel corrugated culvert, and a heap of concrete.

HISTORIC DUMP (BF 90060)

This proposed clean-up site is located 250 m southwest of the Bandelier Amphitheater, and 275 m west of the park residence area on an east-facing pumice slope overlooking a small tributary drainage of Frijoles Canyon (Figure 6).

Because initial examination of artifacts on the site indicated a pre-1945 date, the dump was recorded as archeological site BF 90060 in order to provide a basis for evaluating its eligibility for nomination to the National Register of Historic Places.

As shown in Figure 7, the site is approximately 60 m east-west by 45 m north-south (.39 ha [1.0 ac]) and consists of an irregular depression in the mesa slope which appears to be the result of pumice quarrying. Within the quarry concavity are two large terraces of quarried tuff block and spall debris, the upper of which envelops the body of a late 1920s-1930s vintage automobile (only the roof and rear window are visible). Also associated with the upper rubble terrace is a small scatter of coal and slag debris, which includes fragments of copper wire, baling wire, a white china serving dish fragment, a spoon, white ceramic insulator fragments, two blobs of melted glass, and a half-dozen shards of amber, clear, and light green fluted, bottle glass. East of this slag scatter, centering around the automobile body were three glass fragments of an amber, embossed liquor bottle and a Sir Walter Raleigh tobacco can. A third, small refuse area, located below the lower tuff terrace also contains coal and slag chunks, as well as an "RPM" brand steel oil can, a steel food can, a can lid, two sections of baling wire, a section of a steel pump handle bearing the brand name "Red Jacket" in raised lettering, bits of burned and deteriorated aluminum foil, a 5/8-in machine bolt with washers and nut, a 5-in long lag bolt, bits of melted tar paper, several wire nails, and several bits of severely weathered milled lumber. The very charcoally, organic appearance of soil within this refuse area, in combination with the hardware and bits of lumber, suggest that it originally included lumber which was burned at some point after deposition. The only other features are an informal campfire ring and a small pile of asphalt.

Because the terraced tuff debris is likely spoil material removed from the nearby Amphitheater quarry, used between 1933 and 1940, its deposition at this site cannot precede 1933, and is more likely to have occurred during the late 1930s or early 1940s. The associated artifacts, including the

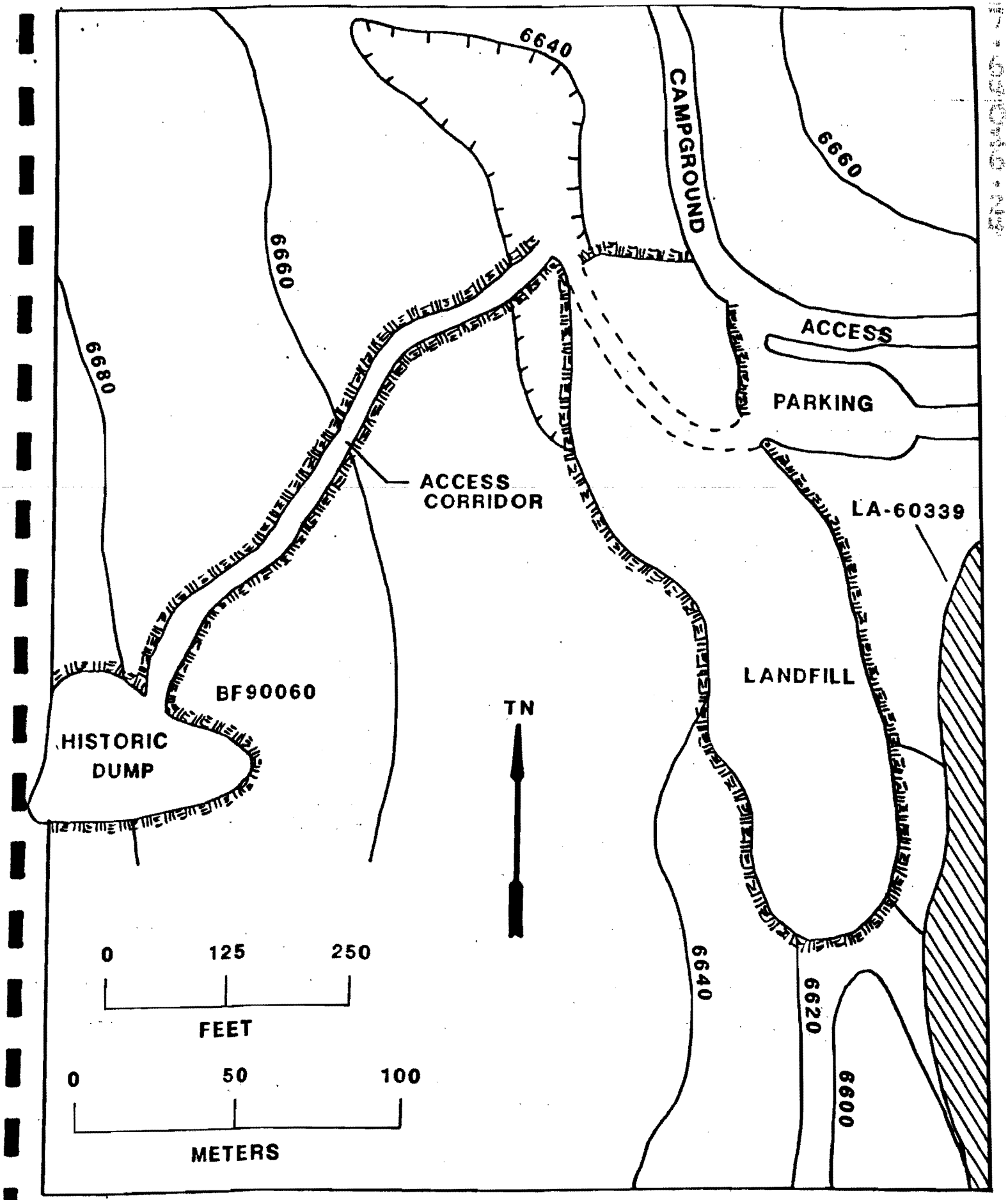


Figure 6: Landfill area and late historic dump (BF 90060). Patchwork hatching indicates limits of archeological clearance.

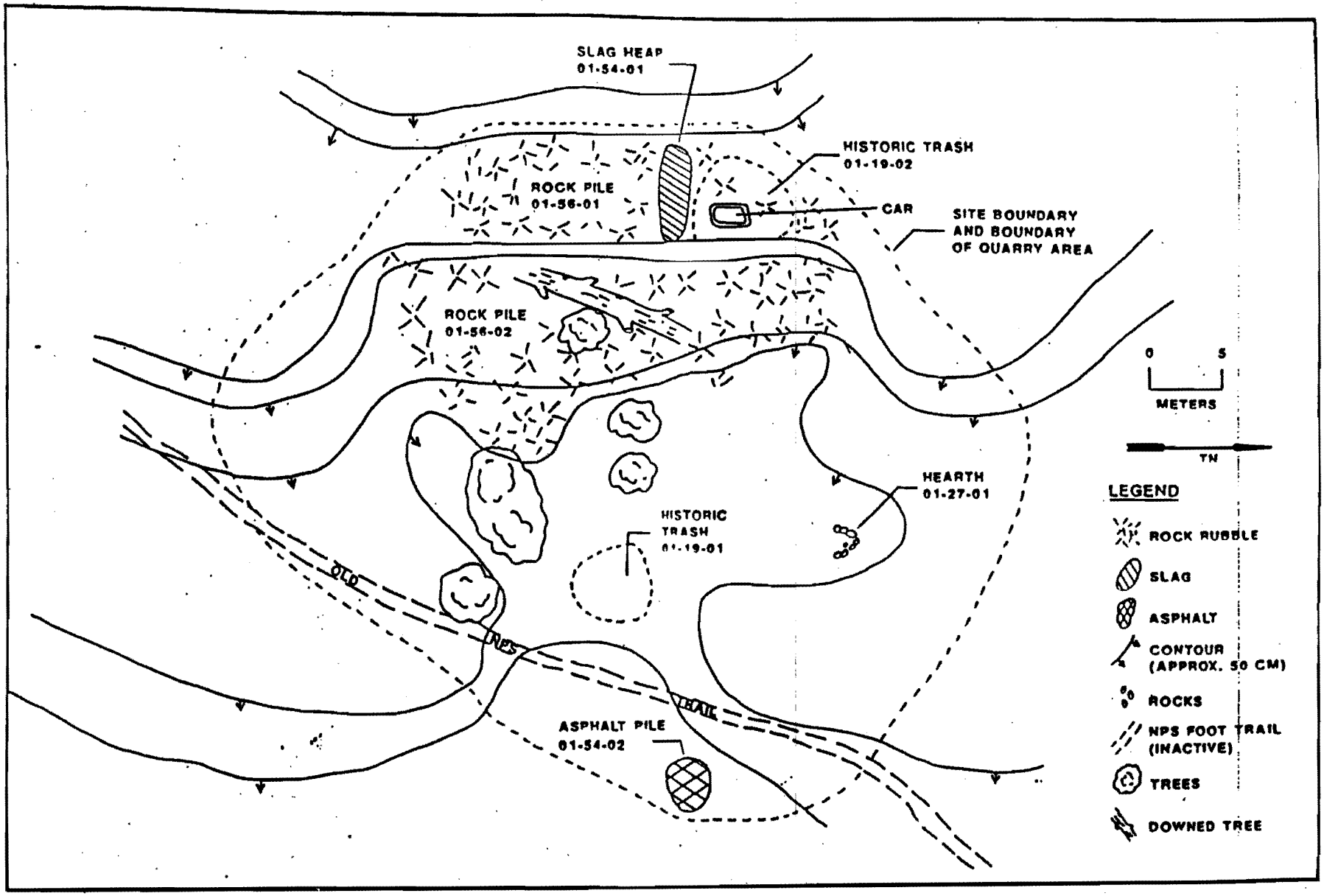


Figure 7: Features of late historic dump (BF 90060).

car, tobacco can and glass fragments suggest a time range from the 1920s to early 1940s (Charles Haecker: personal communication), although the actual time of deposition could have occurred somewhat later, since all the materials present may have been discarded before their final dumping at this location. The only feature which may be substantially later, possibly dating to the 1950s or 1960s; is the asphalt pile. No artifacts were found in association with it, and it is spatially separate from the other features. It may be the result of activities contemporary with the landfill or borrow pit sites.

The dates of the artifacts and their deposition appear to precede the establishment of the Manhattan Project, and the subsequent transfer of Ramon Vigil Grant lands to the Atomic Energy Commission. This fact and the nature of the materials suggest that this refuse is associated with 1930s to early 1940s National Park Service activities on Frijoles Mesa and in Frijoles Canyon. The materials represented can logically be interpreted as the by-products of construction of the park entrance road, headquarters and lodge (quarried pumice and tuff) and subsequent operation of these facilities. If smithing for quarrying and construction tools as well as iron and tin fixtures for the buildings was performed on-site by the CCC, this would explain the presence of the coal and slag. Residence by NPS, lodge staff, and tourists would have produced a wide variety of domestic items, with which the glass, ceramic, and metal artifacts found here are consistent.

Because few artifacts are present on the site, because they have been removed from their original context, and because the site is unlikely to provide substantial additional information on historic construction and use of park facilities, it is recommended that this site be considered not significant under the eligibility criteria of the National Register of Historic Places.

If the New Mexico State Historic Preservation Officer concurs with this assessment, remediation activities would be allowed to precede at this site without further archeological documentation or investigation. If concurrence is obtained, and if materials are to be removed from the site, it is stipulated that an NPS archeologist monitor removal activities in case additional artifactual materials are uncovered.

LANDFILL SITE

This large remediation site is located immediately south of the Bandelier Amphitheater and southwest of the road leading to Loop C of Juniper Campground. The landfill is approximately 75 m west of the park residence area (Figure 6). Approximately 1.1 ha (2.75 ac) in size and measuring 220 m north-south by 50 m east-west, the landfill extends southward from the Amphitheater, filling the entire bottom of the unnamed drainage extending southeastward from the Amphitheater vicinity. Drill and blasting holes in the bedrock tuff exposures along the edges of the canyon suggest that the area now covered by landfill may also have been quarried by CCC crews during construction of the Bandelier headquarters and lodge between 1933 and 1940. LANL aerial photographs indicate the area was used as a landfill during the 1950s and 1960s, and dumping apparently continued for at least a decade (into the early 1970s) after the area was acquired by the National Park Service in 1961 (Carlos Gonzales: personal communication). Aerial photographs and recollections of long-time Bandelier staff indicate that dumped materials include a variety of park and household items ranging from original quarry debris to discarded appliances and household trash. After use ceased in the early 1970s, top soil, quarry debris and asphalt were used to level the landfill to its present relatively flat surface. The depth of the deposit is best appreciated at its southern terminus, where over 7 m of vertical fill are exposed.

Archeological survey of the landfill surface and perimeter revealed no prehistoric or historic materials, although numerous scattered modern artifactual items were found around the margins of fill area. Most numerous are steel food and beverage cans, but also observed are motor oil cans, shoe leather, milled lumber, tarpaper, asphalt, concrete, baling wire, a brake drum, a liquor bottle, a china plate, ceramic pipe, and corrugated tin. Since all material appears chronologically consistent with the documented 1950s-1970s use of the landfill, no attempt was made to systematically document this modern artifactual debris.

Because all artifactual materials at the landfill remediation site appear to be modern (i.e., less than 50 years old) this location has not been treated as an archeological site. However, since excavation of a deep trench to evaluate buried materials is proposed, and because this trench could impact buried historic materials not evident on the surface, it is stipulated that an NPS archeologist also monitor this trenching activity.

RECOMMENDATIONS

Archeological inventory of the six remediation sites has been conducted, and the boundaries of each clearance area have been clearly marked by wire surveyor's flags. When clearance is given all remediation activity must be confined to the cleared areas, in order to avoid adjacent archeological sites. Archeological site locations shown on maps in this report are exempt from public disclosure under the Freedom of Information Act, and for this reason, information contained in this report should be made available on a need-to-know basis only. The clearance areas include the borrow, landfill, or dumping zones (as indicated by visible ground disturbance), as well as buffer zones, and an access route to each site. Both the buffer zones and access routes have been included to facilitate the remediation work.

No significant cultural resources were found within the clearance areas at Borrow Pits 1, 2, and 4, or at the landfill site. One archeological site, BF 90062, was identified and recorded above Borrow Pit 3, between the pit and the existing access road. The site and a surrounding buffer area have been flagged, and should be completely avoided by directing pedestrian and vehicle traffic to the north or south.

The dump site, because it contains artifacts ranging from the 1920s to 1940s has been recorded as an archeological site. Because of the small amount of historic material and because the historical context of the material is uncertain, the site does not appear to have potential to contribute important information to park, local, state or national history. As such it is proposed that the site is not significant, and therefore not eligible for nomination to the National Register of Historic Places. If the State Historic Preservation Officer concurs with this recommendation, remediation activities can occur at this site without further archeological documentation or investigation. If such remediation should include removal of existing materials, it is stipulated that the work be monitored by an NPS archeologist.

Similarly, because proposed backhoe trenching at the landfill has the potential to expose pre-1950s artifacts not currently visible, it is also stipulated that backhoe trenching at this site be monitored by an NPS archeologist.

Based upon the results of this survey, and providing the above stipulations are adhered to, archeological clearance is recommended for the proposed remediation activities.

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