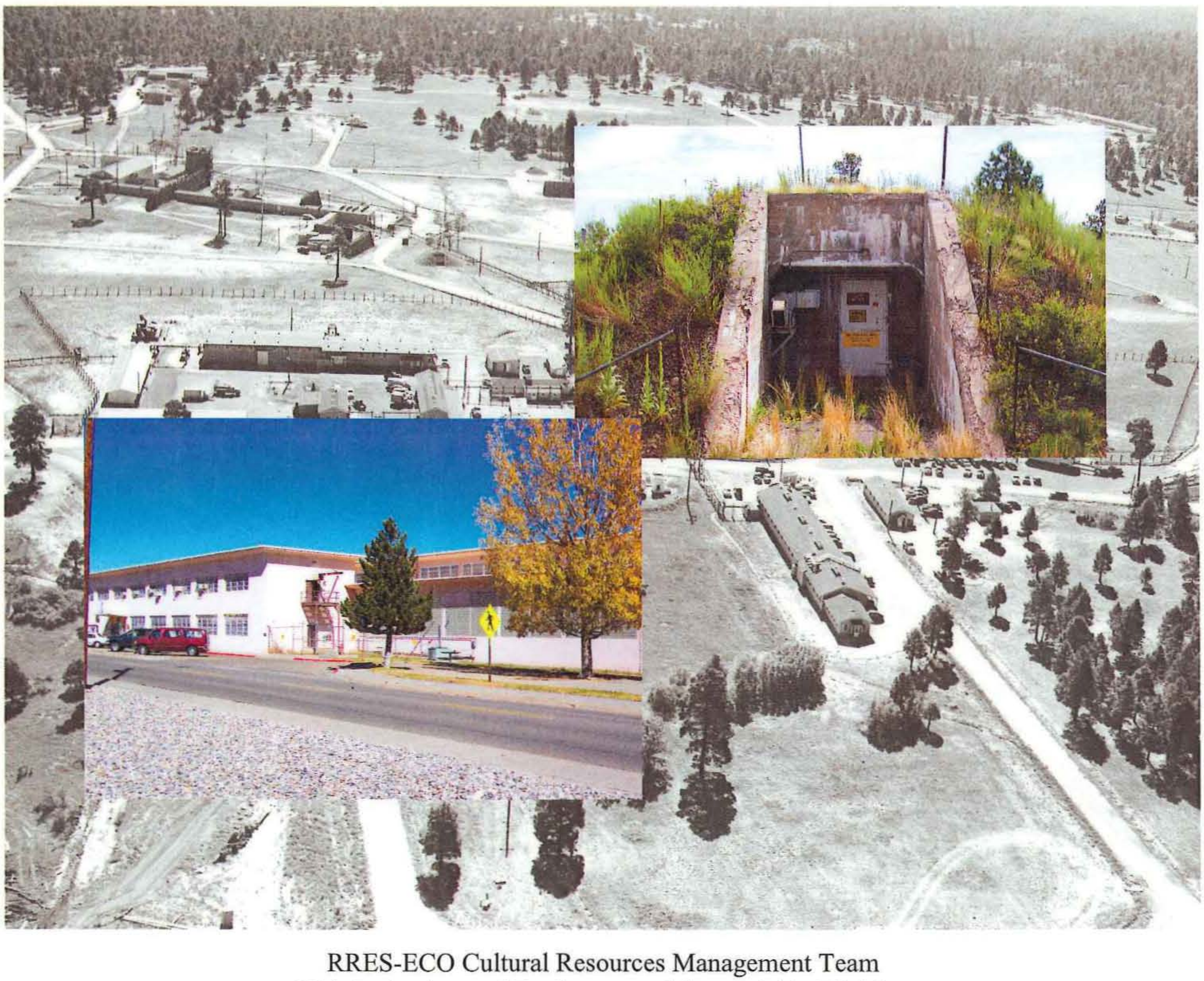
LA-UR-02-6841

ESA Division's Five-Year Plan: Consolidation and Revitalization at Technical Areas 3, 8, 11, and 16

Volume 1



RRES-ECO Cultural Resources Management Team
Risk Reduction and Environmental Stewardship Division
LOS ALAMOS NATIONAL LABORATORY

LA-UR-02-6841

ESA Division's Five-Year Plan: Consolidation and Revitalization at Technical Areas 3, 8, 11, and 16

Volume 1

Historic Building Survey Report No. 214

Los Alamos National Laboratory

February 28, 2003
Survey No. 836

Prepared for the Department of Energy
National Nuclear Security Administration
Los Alamos Site Office

prepared by

Ellen D. McGehee, Cultural Resource Manager, LANL Ecology Group (RRES-ECO)
Sheila McCarthy, Historical Architect, Benchmark Consulting Group
Kari L. M. Garcia, Cultural Resource Manager, LANL Ecology Group (RRES-ECO)
Ken Towery, Architect, LANL Site and Project Planning Group (PM-1)
John Ronquillo, Consulting Engineer, Sigma Science, Inc.

RRES-ECO Cultural Resources Management Team
Risk Reduction and Environmental Stewardship Division
LOS ALAMOS NATIONAL LABORATORY

Executive Summary

Los Alamos National Laboratory (LANL)'s Engineering Sciences and Applications (ESA) Division has developed a five-year plan identifying possible consolidation of existing work functions and potential future uses of facilities that may adversely affect LANL historic properties (those built between 1942 and 1963). In 2001 and 2002, eighty-four buildings in ESA Division's administrative area were evaluated or reevaluated for inclusion on the National Register of Historic Places (Register). Twenty-six of these buildings are Register eligible and fifty-eight are not. Of the non-eligible properties, twenty-six are passageways of similar design and sixteen are buildings built from only six different floor plans. Thirty-nine ESA properties had previously been assessed for historical significance, and, as part of this multiple property review, the eligibility status of fourteen properties has been changed from eligible to not eligible. These properties had either been substantially modified or were not the best examples of a specific property type. Descriptions of the fourteen reevaluated properties and the seventy evaluated properties are contained in Appendix A. Information related to all previously reviewed properties is included in Appendix B.

Additionally, ESA's historic properties were assessed in terms of their potential for preservation and public interpretation, and the most historically significant properties were identified for permanent retention. Three of ESA's properties are candidates for permanent retention. These properties represent some of Los Alamos's most important contributions to the history of World War II (WWII) and the Cold War: TA-16-516 and TA-16-517 (the V-Site Assembly Complex) and TA-16-1451 (the Back Gate Guard Station).

Eligible ESA properties that are not currently slated for preservation will be reevaluated for permanent retention if they are identified for extensive modification or decontamination and decommissioning. A separate memorandum of agreement will be submitted to the New Mexico State Historic Preservation Officer outlining required documentation measures for all ESA Division properties that will be adversely affected by ESA's consolidation plans.

Introduction

ESA Division's Five-Year Plan

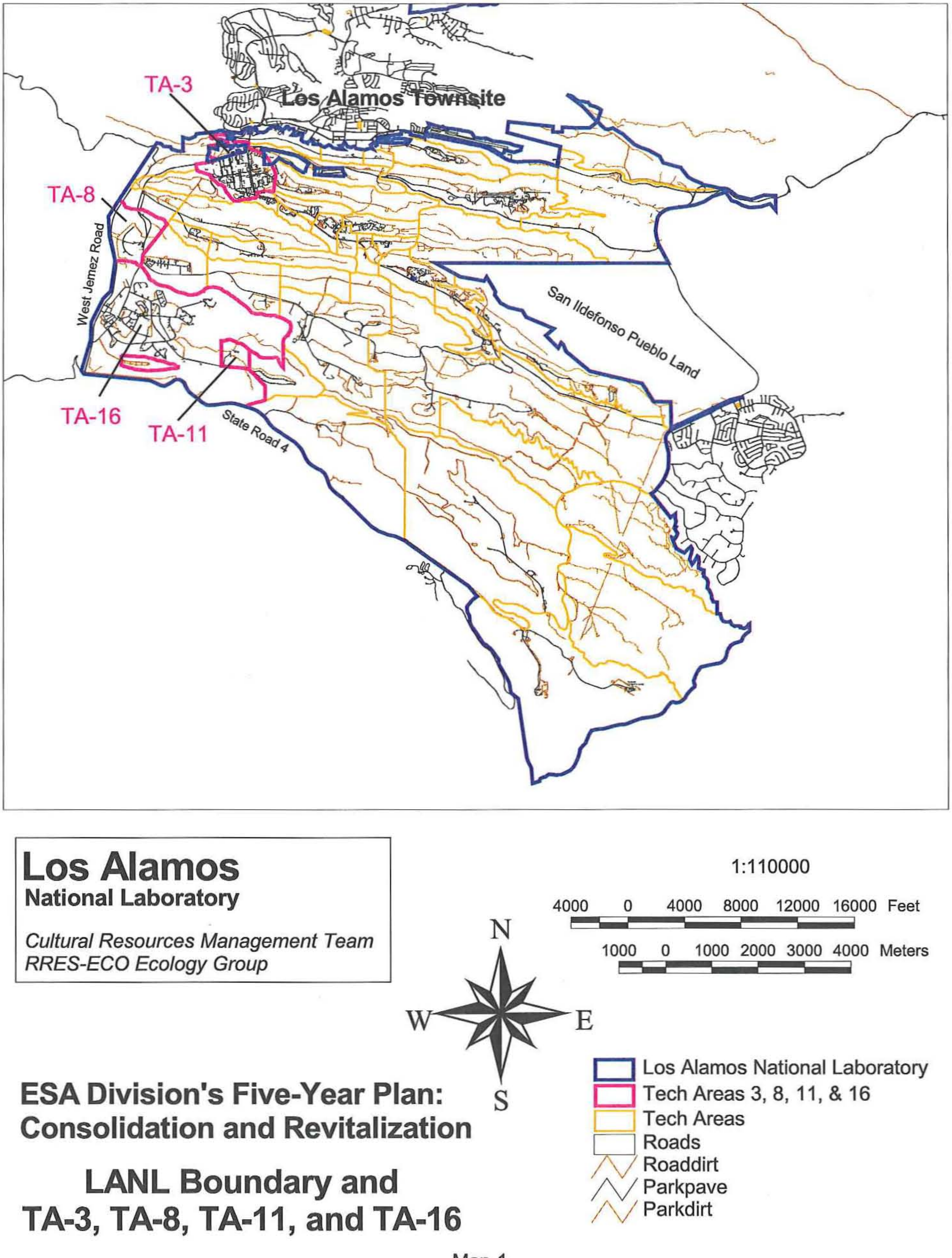
Los Alamos National Laboratory (LANL)'s Engineering Sciences and Applications (ESA) Division has identified a series of proposed actions that have the potential to affect historic LANL properties located within ESA's administrative boundaries. These actions are related to ESA's five-year plan for the consolidation and revitalization of its operations and facilities and may include modifying or vacating historic properties, as well as removing historic equipment and associated records. Some of the buildings and structures, if determined to be excess property, may become candidates for decontamination, decommissioning, and eventual demolition.

Historic Property Eligibility Assessment

In compliance with Sections 106 and 110 of the National Historic Preservation Act (NHPA), this report contains documentation regarding the National Register of Historic Places (Register) eligibility status of LANL properties under the jurisdiction of ESA Division. These properties are located on Department of Energy land at Technical Areas (TAs) 3, 8, 11, and 16. Work processes carried out within the boundaries of ESA Division supported Manhattan Project and Cold War nuclear weapons research and development. ESA Division has been LANL's center for high explosives development and testing since the early 1940s and still actively supports the United States nuclear weapons program. Historical information about ESA Division activities and recommendations for Register eligibility are included in this initial assessment report. A discussion of the multiple property method used to evaluate the ESA properties is also included. Descriptions, selected drawings, and photographs of the evaluated properties are in Appendix A. Some of ESA Division's properties have already been assessed for historical significance; however, not all of these previously reviewed properties are described in this report. Information related to these properties is listed in a summary table in Appendix B.

Survey Methods

In 2001 and 2002, a historic building survey of ESA Division properties was conducted by Sheila A. McCarthy, Historical Architect, Benchmark Consulting Group; John Ronquillo, Sigma Science, Inc.; Ken Towery, Site and Project Planning Group, LANL; and Kari Garcia and Ellen McGehee, Ecology Group, LANL. The building survey was accomplished by conducting field visits to LANL areas that include properties managed by ESA Division: TA-3, TA-8, TA-11, and TA-16 (Map 1). Architectural and engineering elements of ESA's properties were documented and photographs were taken. LANL records research was also conducted.


Los Alamos Townsite
TA-3
TA-8
TA-16
TA-11
West Jemez Road
State Road 4
San Ildefonso Pueblo Land
Los Alamos
National Laboratory
Cultural Resources Management Team
RRES-ECO Ecology Group
1:110000
4000 0 4000 8000 12000 16000 Feet
1000 0 1000 2000 3000 4000 Meters
N
W
E
S
Los Alamos National Laboratory
Tech Areas 3, 8, 11, & 16
Tech Areas
Roads
Roaddirt
Parkpave
Parkdirt
ESA Division's Five-Year Plan:
Consolidation and Revitalization
LANL Boundary and
TA-3, TA-8, TA-11, and TA-16

Map 1

Historical Overview

Most of properties under the administrative control of ESA Division are located in the southwest corner of LANL, within TAs that were established during WWII's secret Manhattan Project. Historical operations included the development, fabrication, and testing of components used in the United States' first nuclear devices: the "Trinity" test and the two atomic bombs dropped on Japan during WWII ("Fat Man" and "Little Boy"). Post-WWII operations included the development of components for the Cold War nuclear stockpile and for atmospheric tests in the Pacific and at the Nevada Test Site (NTS).

ESA Division continues to be responsible for the stewardship of nuclear weapons and for the development of related engineering technologies. Current work includes ensuring the safety and reliability of the nuclear weapon stockpile; preserving and advancing warhead and subsystem design capability; enhancing the ability to manufacture and process weapon components and materials; and nurturing engineering technologies that enhance ESA Division's ability to accomplish its mission (LANL 1999). ESA's operations are situated in TAs that are functionally connected and share a common scientific history; however, each has its own specific history (see Description of TAs below).

Manhattan Project (1942–1946)

In 1939, Albert Einstein wrote a letter to President Franklin Roosevelt warning him of a possible German atomic bomb threat (Rothman 1992). President Roosevelt, acting on Einstein's concerns, gave approval to develop the world's first atomic bomb and appointed Brigadier General Leslie Groves to head the "Manhattan Project." Groves, in turn, chose Robert Oppenheimer to coordinate the design of the bomb.

A single isolated and secret research facility was proposed. General Groves had several criteria: security, isolation, a good water supply, an adequate transportation network, a suitable climate, an available labor force, and a locale west of the Mississippi located "at least 200 miles from any international border or the West Coast" (Rothman 1992). In 1942, Oppenheimer, who had visited the Pajarito Plateau on a horseback trip, suggested the Los Alamos Ranch School (Rhodes 1986).

Oppenheimer and his staff moved to Los Alamos in early 1943 to begin work. The recruitment of the country's "best scientific talent" and the construction of technical buildings were top priorities (LANL 1995:8). The University of California agreed to operate the site, code name "Project Y," under contract with the government (an arrangement that has continued to this day). Although the fission bomb was conceptually attainable, many difficulties stood in the way of producing a usable weapon. Technical problems included the timing of the release of energy from fissionable material and the engineering challenges of producing a deliverable weapon. Nuclear material and high explosive studies were of immediate importance (LANL 1995).

Two bomb designs appeared to be the most promising: a uranium "gun" device and a plutonium "implosion" device. The gun device involved shooting one subcritical mass of uranium-235 into another at sufficient speed to avoid pre-detonation. Together, the two subcritical masses form a supercritical mass that releases a tremendous amount of nuclear energy (Hoddeson *et al.* 1997). This method led to the development of the "Little Boy" device. Because it was conceptually simple, "Little Boy" was never tested before its use at Hiroshima. Scientists were less confident about the implosion design, which used shaped high explosives to compress a subcritical mass of plutonium-239. The symmetrical compression would increase the density of the fissionable material and cause a critical reaction.

In 1944, the uncertainties surrounding the plutonium device necessitated a search for an appropriate test site for the implosion design, later used in the "Fat Man" device. The Alamogordo Bombing Range in south-central New Mexico was selected. A trial run involving 100 tons of trinitrotolulene (TNT) was conducted at "Trinity Site" on May 7, 1945. This dress rehearsal provided measurement data and simulated the dispersal of radioactive products (LANL 1995). The Trinity test was planned for July and its objectives were "to characterize the nature of the implosion, measure the release of nuclear energy, and assess the damage" (LANL 1995:11). The world's first atomic device was successfully detonated in the early morning of July 16, 1945. Little Boy, the untested uranium gun device, was exploded over the Japanese city of Hiroshima on August 6, 1945. On August 9, 1945, Fat Man was exploded over Nagasaki, essentially ending the war with Japan.

Early Cold War Era (1946–1956)

The future of the early laboratory was in question after the end of WWII. Many scientists and site workers left Los Alamos and went back to their pre-war existences. Norris Bradbury had been appointed director of the laboratory following Oppenheimer's return to his pre-WWII duties (LANL 1993). Bradbury felt that the nation needed "a laboratory for research into military applications of nuclear energy" (LANL 1993:62). In late 1945, General Groves directed Los Alamos to begin stockpiling and developing additional atomic weapons (Gosling 2001). Post-war weapon assembly work was now tasked to Los Alamos's Z Division which had been relocated to an airbase (now Sandia) in nearby Albuquerque, New Mexico (Gosling 2001; Mitchell 2001).

In 1946, Los Alamos became involved in the atmospheric testing program in the Pacific, dubbed "Operation Crossroads." Later, in 1946, the U.S. Atomic Energy Commission (AEC) was established to act as a civilian steward for the new atomic technology born of WWII. The AEC formally took over the laboratory in 1947, making a commitment to retain Los Alamos as a permanent weapons facility.

With the beginning of the Cold War—the term "Cold War" was first coined in 1947—weapons research once again became a national priority. Weapons research at Los Alamos, spearheaded by Edward Teller and Stanislaw Ulam, focused on the development of the hydrogen bomb, the feasibility of which had been discussed seriously at Los Alamos as early as 1946. The simmering Cold War came to a full boil in late 1949 with the successful test of "Joe I," the Soviet Union's first atomic bomb. In January of 1950, President Truman approved the development of the hydrogen bomb; Truman's decision led to the remobilization of the country's weapons laboratories and production plants. The year 1950 also marked the first meeting of Los Alamos's "Family Committee"—a committee tasked with developing the first two thermonuclear devices (LANL 2001). In 1951, the Nevada Proving Ground (now NTS) was established and the first Nevada atmospheric test, "Able," was conducted. In the same year, Los Alamos directed "Operation Greenhouse" in the Pacific and successfully conducted both the first thermonuclear test, "George," and the first thermonuclear "boosted" test, "Item." In 1952, the first thermonuclear bomb, known as "Mike," was detonated at Enewetak Atoll in the Pacific (LANL 1993). In short order, the Soviet Union responded with a successful demonstration of the use of fusion in August 1953, followed by a test of a hydrogen bomb in 1955. The arms race was on. By 1956, Los Alamos had successfully tested a new generation of high explosives (plastic-bonded explosives) and had begun to make improvements to the primary stage of a nuclear weapon (LANL 2001).

Although weapons research and development has always played a major role in the history of LANL, other key themes for the years 1942–1956 include early advancements in supercomputing, fundamental biomedical research and health physics issues, explosives research and development, early reactor technology, pioneering physics research, and the development of early high-speed photography (McGehee and Garcia 1999). The Early Cold War era at Los Alamos ended in 1956, a date that marks the completion of all fundamental nuclear weapons design at LANL; later research at Los Alamos focused on the engineering of nuclear weapons to fit specific delivery systems. The year 1956 was also the last year that Los Alamos was a closed facility—the gates into the Los Alamos townsite came down in 1957.

Late Cold War Era (1956–1990)

The Late Cold War era saw Los Alamos's continued support of the atmospheric testing programs in the Pacific and at NTS. In 1957, the first of many underground tests at NTS was conducted. Other defense mission undertakings during this time included treaty and test ban verification programs (such as using satellite sensors to detect nuclear explosions), research and development of space-based weapons, and continued involvement with stockpile stewardship issues. Non-weapons undertakings supported nuclear medicine, genetic studies, NASA collaborations, superconducting research, contained fusion reaction research, and other types of energy research (McGehee and Garcia 1999).

High Explosives Research and Development at LANL

Los Alamos scientists quickly understood the importance of using high explosives (explosives with energies higher than TNT) in the development of the first atomic weapons, for the only way that a critical mass of plutonium could be assembled in a weapon design was through the use of shaped high explosives to produce a symmetrical implosion. Since the Manhattan Project, high explosives research and development at Los Alamos has been intimately connected with the development of nuclear weapons (Neal 1993).

In the 1940s and 1950s, high explosives components used in nuclear weapons were manufactured using a casting process based on the high explosive TNT, which can be melted in kettles to form a liquid that can be poured into molds and allowed to solidify. High explosives formulations were developed by adding more energetic powders, namely RDX, to the molten TNT, resulting in higher energy materials such as Composition B and Cyclotol. Conversely, "inert powders," such as barium nitrate and boric acid, could be added to the molten TNT to lower the energy output to design requirements. The molten high explosives formulations were then poured into molds jacketed with cooling water; this allowed the molten materials to solidify under carefully controlled conditions. The casting process produced solid, "homogenous" components without trapped air bubbles or cracks. These stock pieces were then machined to the required geometric configurations (Hatler 2003).

Changes in high explosives technology have directly affected nuclear weapons design. Early stockpile weapons used high explosives casting technology developed during the Manhattan Project (Hatler 2003). For example, the high explosives used in the Mark 3 weapon (the first stockpile design) were similar to the original Fat Man implosion design tested at Trinity and used at Nagasaki, Japan. The Mark 5 and the Mark 7 were the first new weapon designs to incorporate significant changes in high explosives fabrication methods. The method developed by Los Alamos in support of the Mark 5 and Mark 7 required greater accuracy in the machining of high explosives (Mitchell 2001).

By 1956, Los Alamos researchers had developed the next generation of high explosives: plastic-bonded explosives or PBXs. The development of PBXs provided for much higher energy and density formulations using the more energetic high explosives molecules RDX and HMX. With the newly developed PBX technology, formulations using 85 to 95 wt% of the more energetic RDX or HMX—bonded with 15 to 5 wt% plastics—could be fabricated into components for nuclear weapons applications. These high explosives formulations required pressing of materials into "solid homogeneous" stock pieces (rather than casting) which then could be machined into the final components. The PBX processing technology led to the design of smaller nuclear weapons because of the higher energy and density of materials (Hatler 2003). In the 1970s, research at Los Alamos led to the development of insensitive high explosive (IHE), dramatically increasing the accident resistance of high explosives materials. For this reason, IHE has been incorporated into the designs of most modern weapons (Neal 1993).

Description of Technical Areas

TA-3

Current Function

TA-3, "South Mesa Site," is a large area located on top of South Mesa, across Los Alamos Canyon from the town of Los Alamos, New Mexico (Map 2). TA-3 functions as the administrative center of LANL. The main administrative building (TA-3-43), the Oppenheimer Study Center, the Otowi Building, the CMR (chemistry and metallurgy research) Building, the Ion Beam Facility, and numerous other office and laboratory buildings, including LANL's technical shops, are located at TA-3.

Historical Background

The original TA-3 was a small testing area located at the present-day site of LANL's main administrative offices. Beginning in 1943, TA-3 was used for the assembly and testing of detonators. The goal for these experiments was to produce better timing results using electric detonating devices. Standard detonator work was transferred to TA-6 (Two Mile Mesa Site) in April 1946, although experimental detonator loading and testing continued at TA-3 for several years. Most of the early structures and buildings associated with Manhattan Project use of South Mesa were removed in 1949 (McGehee 2002). The first permanent post-war buildings at TA-3 were constructed in the late 1940s and early 1950s.

TA-8

Current Function

TA-8—now known as GT-Site—supports non-destructive testing and evaluation activities (Map 3). In addition to standard office space, TA-8 contains laboratory areas that house high-intensity radiography equipment. Complete x-ray developing capability is also available in this facility (MacRoberts n.d.).

Historical Background

TA-8, historically known as Anchor West Site, was used during WWII to conduct gun tests in support of the gun device. The buildings at TA-8 included standard proving ground facilities that were designed with a central control area for explosives operations. Three concrete "bombproof" buildings were built into a ravine and were designed to be partially underground. Placing the buildings lower in the ravine allowed for gun emplacements to be positioned above the roof level of the control building. This unique proving ground layout lessened the hazards associated with using high-alloy tubes and with firing the tubes in free recoil. The Anchor Ranch Proving Ground was completed and in active use by mid-September 1943. Special test guns were ordered from the Naval Gun Factory at the end of 1943, but were not ready until March 1944. During the 4-month waiting period, personnel at TA-8 conducted practice tests, perfected gun testing operations, and established high-speed photographic techniques for

Los Alamos
National Laboratory

Cultural Resources Management Team
RRES-ECO Ecology Group

N
W E
S

1:6000

200 0 200 400 600 800 Feet

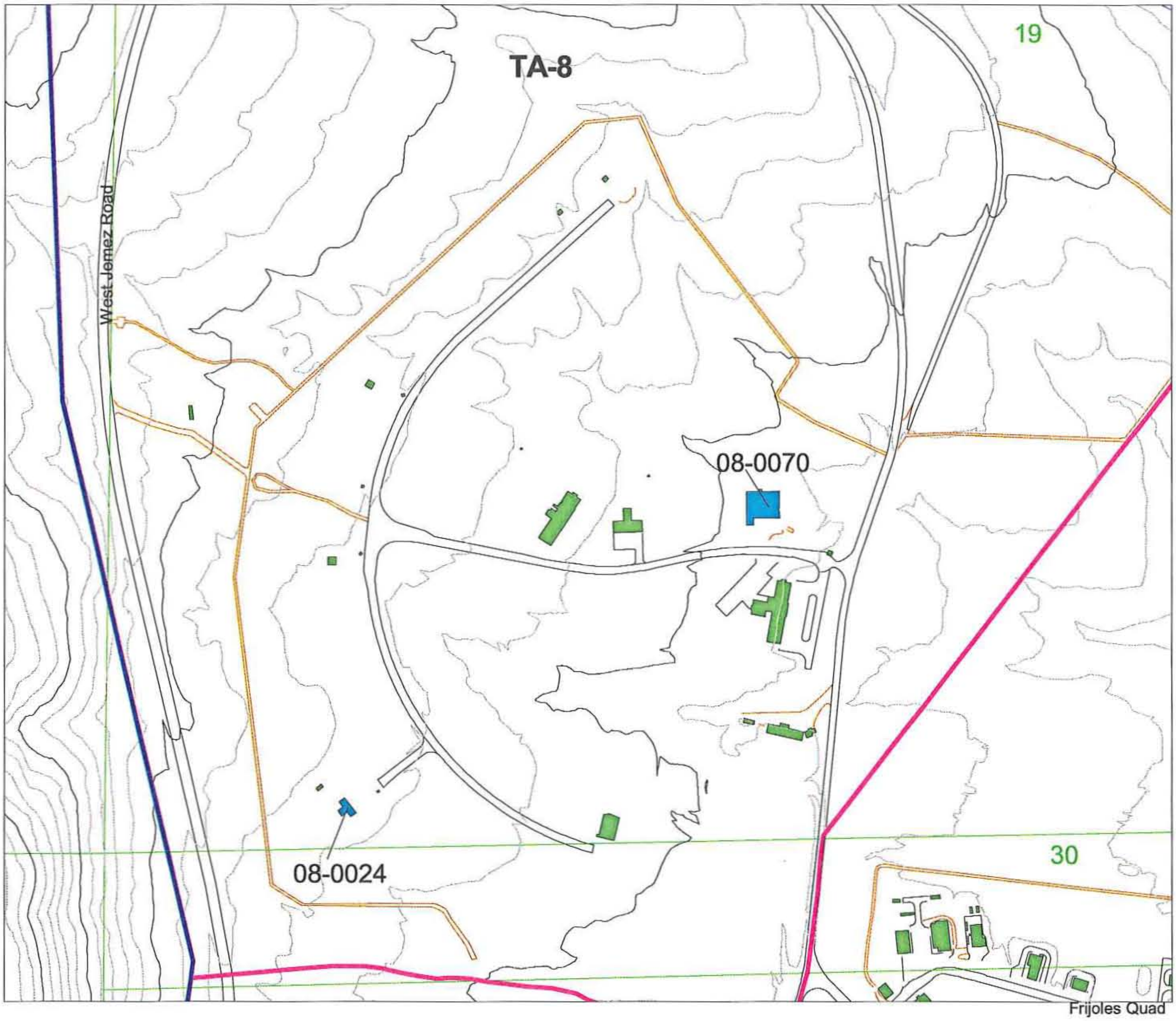
60 0 60 120 180 240 Meters

- ESA Division Buildings Currently Being Evaluated
- Los Alamos National Laboratory
- Tech Areas 3, 8, 11, & 16
- Tech Areas
- 20 Foot Contours
- 100 Foot Contours
- Drainage
- Township, Section, Range
- USGS 7.5 Minute Quad
- Roads
- Roaddirt
- Parkpave
- Parkdirt
- Buildings/Structures

ESA Division's Five-Year Plan: Consolidation and Revitalization

TA-3

Map 2



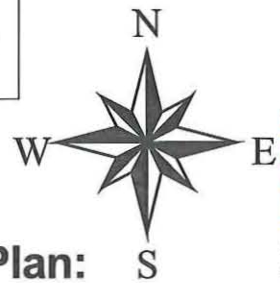
Los Alamos
National Laboratory

Cultural Resources Management Team
RRES-ECO Ecology Group

1:6000

300 0 300 600 900 1200 Feet

60 0 60 120 180 240 Meters



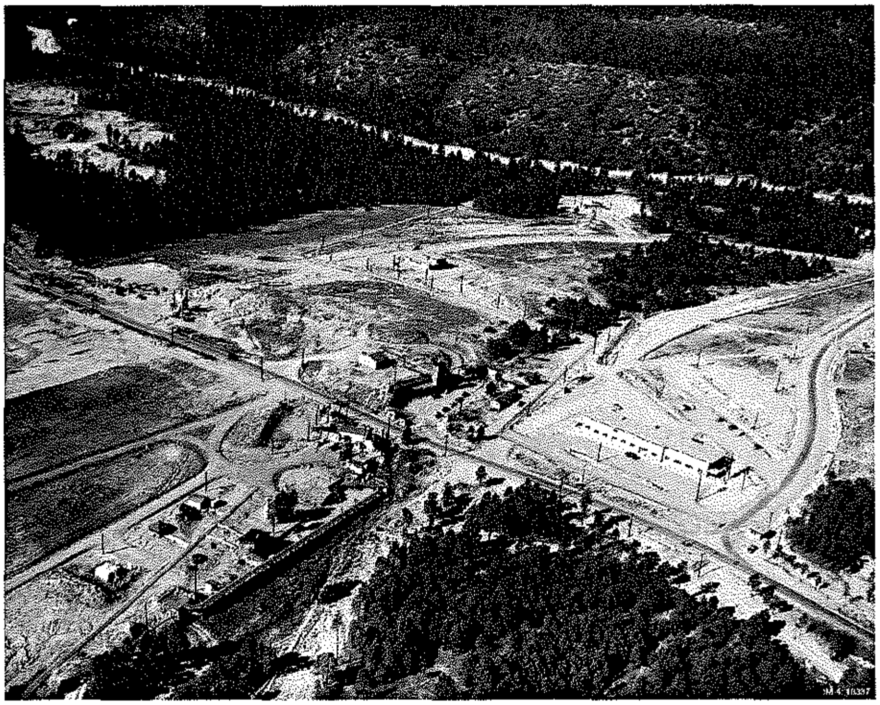
- ESA Division Buildings Currently Being Evaluated
- Los Alamos National Laboratory
- Tech Areas 3, 8, 11, & 16
- Tech Areas
- 20 Foot Contours
- 100 Foot Contours
- Drainage
- Township, Section, Range
- USGS 7.5 Minute Quad
- Roads
- Roaddirt
- Parkpave
- Parkdirt
- Buildings/Structures

ESA Division's Five-Year Plan: Consolidation and Revitalization

TA-8

Map 3

documenting the test data (McGehee 2002). In May 1944, the first industrial-type radiograph was made at Anchor West Site using a medical x-ray unit (U.S. DOE 1986). This early radiographic work was carried out in one of the log guesthouses that were part of the pre-war Anchor Ranch. In August 1944, these operations were moved to T-Site, another early TA (see TA-16 below) (U.S. DOE 1986).



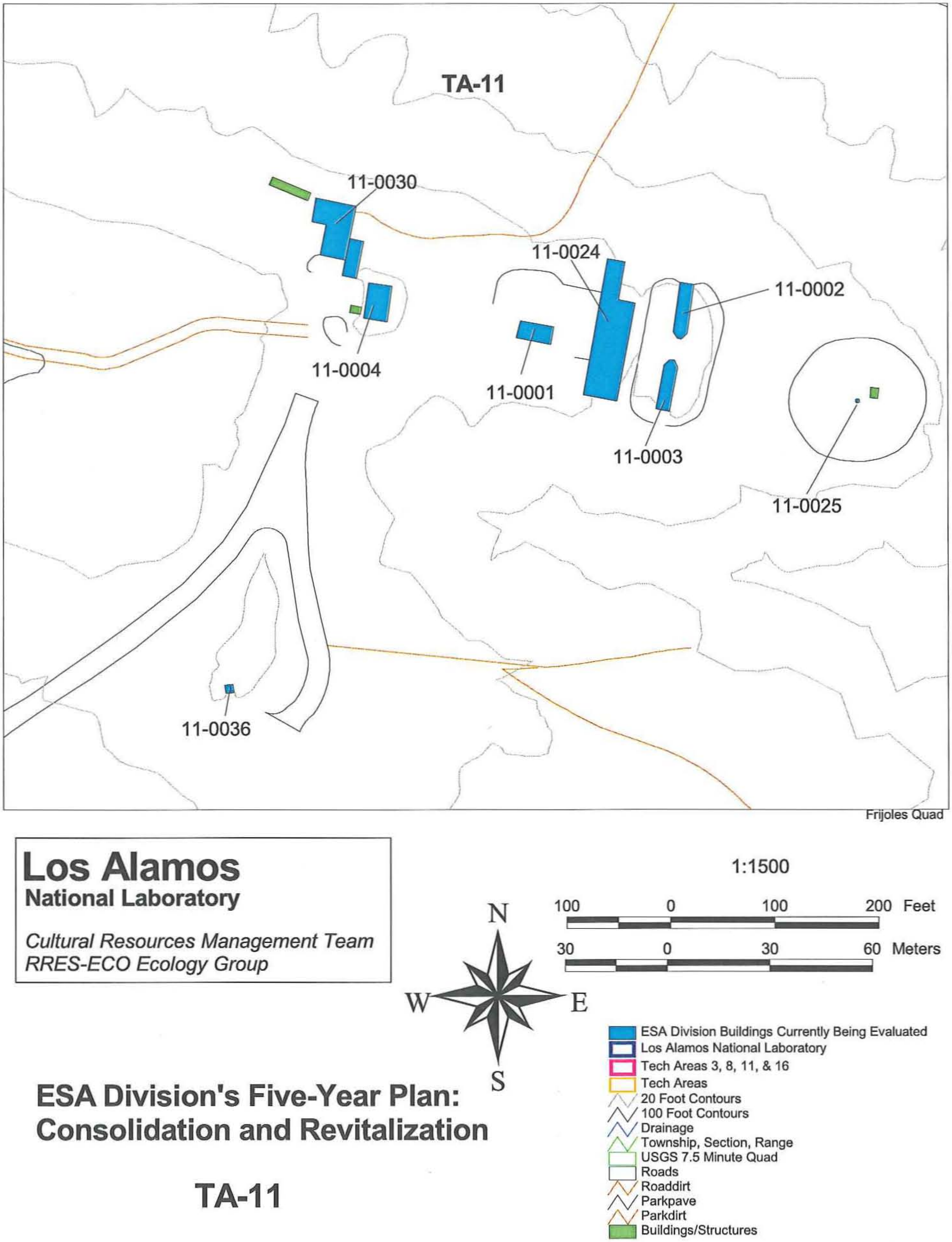
Anchor West Site (TA-8)
(facilities located in upper half of aerial view, above main road in center of photo)

Beginning in the fall of 1945, TA-8 was used by Laboratory explosives personnel for high explosives research and development. In July 1949, construction of a new radiographic complex was begun. The new "GT-Site" was completed by 1950, the same year that some of the older wartime facilities at Anchor West Site were being removed. Early GT-Site contained a storage vault, source rooms, high explosives magazines, and x-ray, betatron, and film processing equipment. During the Cold War years, facilities at TA-8 were used for ultrasonic and electromagnetic testing. Research involving high explosives, plutonium, uranium, arsenic, lithium hydride, and titanium oxide was also conducted. In 1953, J Division personnel used some of the remaining Anchor West buildings for crystal growing experiments (U.S. DOE 1986).

TA-11

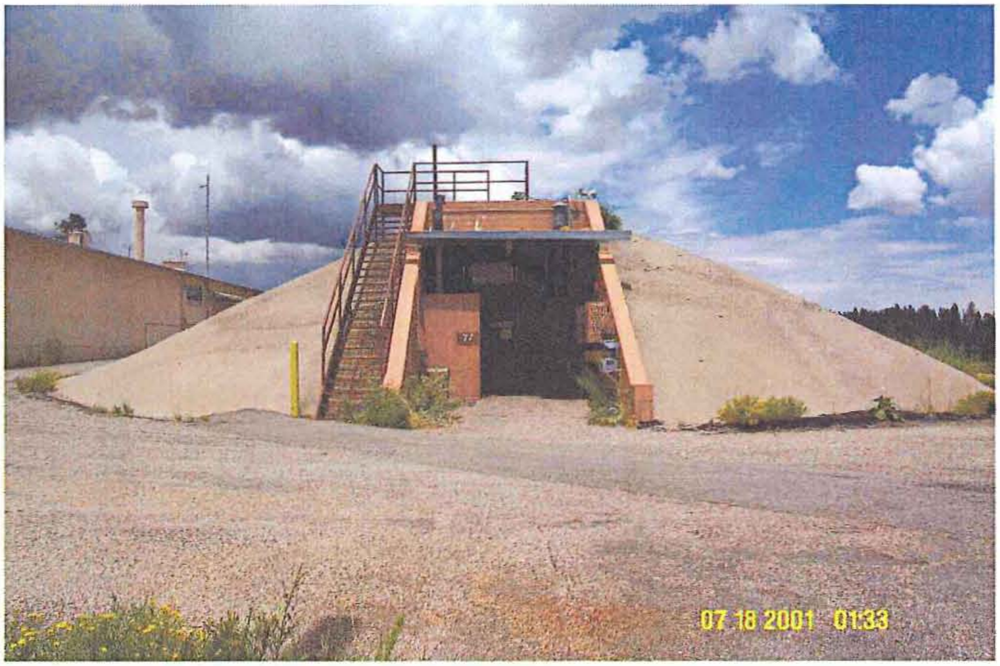
Current Function

TA-11, "K-Site," has facilities for testing explosives and integrated assemblies (MacRoberts n.d.) (Map 4). The major operations areas include a drop tower and a vibration facility that are used to conduct environmental and effects testing on high explosives systems and components.


TA-11
11-0030
11-0024
11-0002
11-0004
11-0001
11-0003
11-0025
11-0036
Frijoles Quad
Los Alamos
National Laboratory
Cultural Resources Management Team
RRES-ECO Ecology Group
1:1500
100 0 100 200 Feet
30 0 30 60 Meters
N
W
E
S
ESA Division Buildings Currently Being Evaluated
Los Alamos National Laboratory
Tech Areas 3, 8, 11, & 16
Tech Areas
20 Foot Contours
100 Foot Contours
Drainage
Township, Section, Range
USGS 7.5 Minute Quad
Roads
Roaddirt
Parkpave
Parkdirt
Buildings/Structures
ESA Division's Five-Year Plan:
Consolidation and Revitalization
TA-11

Map 4

Both facilities have been in use since the 1950s. The drop tower is used to test impact initiation of explosives (LANL 1993 and U.S. DOE 1986).



TA-11 (Betatron Building, TA-11-3)

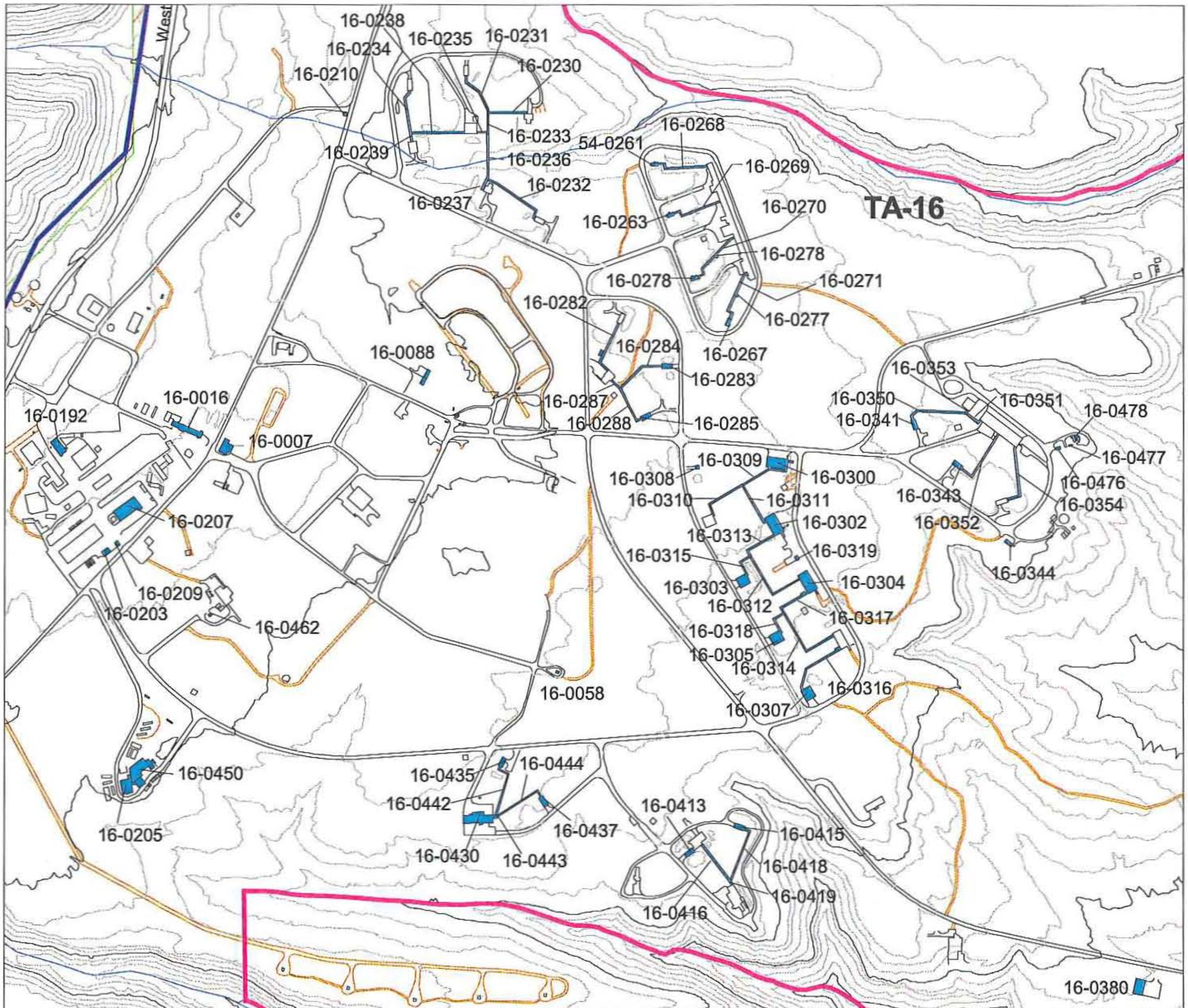
Historical Background

In early 1945, the "betatron" diagnostic method was used at TA-11 to collect data on the implosion of spheres. A 15-MeV betatron machine (gamma ray source) was used in conjunction with a cloud chamber and flash photography. The diagnostic procedure involved the detonation of a test implosion between two of the buildings, one housing the betatron equipment and the other housing the cloud chamber and associated recording equipment. A control building was also in use at K-Site during the Manhattan Project years (McGehee 2002). Other historical operations at TA-11 included photofission experiments and mortar and air gun firing activities. In the 1950s, mortars and air guns were used to conduct acceleration and impact tests using explosive systems contained in impact-resistant projectiles (LANL 1993 and U.S. DOE 1986).

TA-16

Current Function

TA-16 (S-Site) contains high explosives facilities that are directly associated with LANL's mission to support the nation's nuclear stockpile (Map 5). Operations support weapons and non-weapons research and development and include the synthesis, mixing, pressing, casting, and machining of high explosives. Other high explosives work includes explosive device assembly, plastic and composite fabrication, mechanical testing, and limited high explosives characterization. Tritium handling, packaging, research, and analysis activities are also carried out at TA-16 (MacRoberts n.d. and LANL 1993).



Los Alamos
National Laboratory

Cultural Resources Management Team
RRES-ECO Ecology Group

1:12000

300 0 300 600 900 1200 1500 1800 2100 Feet

90 0 90 180 270 360 450 540 Meters

N
W E
S

ESA Division's Five-Year Plan: Consolidation and Revitalization

TA-16

- ESA Division Buildings Currently Being Evaluated
- Los Alamos National Laboratory
- Tech Areas 3, 8, 11, & 16
- Tech Areas
- 20 Foot Contours
- 100 Foot Contours
- Drainage
- Township, Section, Range
- USGS 7.5 Minute Quad
- Roads
- Roaddirt
- Parkpave
- Parkdirt
- Buildings/Structures

Map 5

Physical Landscape

The layout of TA-16 is unique within the Laboratory. Operations are divided into physically distinct complexes called main processing areas or "lines." These operation lines were designed to anticipate the effects of accidental explosions within a working bay. Safety features were incorporated into the design of each high explosives facility; safe quantities, safe distances, and appropriate levels of protection were considered for each type of explosives activity. Specific design elements included interconnected metal corridors, separate "rest" houses for explosive storage, and earthen berms and barricades (MacRoberts n.d.).

TA-16, circa late 1940s

Historical Background

The high explosives components of the implosion design were developed, manufactured, and tested at TA-16 during WWII. Early activities at TA-16 supported the development of the first implosion-type atomic bombs: the "Trinity" device and the Nagasaki bomb ("Fat Man"). TA-16 was the principal site that manufactured high explosives castings and lenses to produce a spherical means of detonating an explosive charge—the lens served to bend the explosion wave as it went through the explosive. A symmetrical implosion was the key component in the critical assembly of the plutonium contained in the Trinity device and the "Fat Man" bomb (McGehee 2002).

The need for a large casting plant and widely separated test sites was apparent during the winter of 1943. The early S-Site facilities included an office building, a steam plant, a casting house, storage magazines, and high explosives preparation buildings. Due to construction delays and difficulty procuring equipment, TA-16 operated only on a limited basis by May 1944 and did not begin steady operation until August of the same year (McGehee 2002).

Project Y at Los Alamos underwent a massive reorganization in July 1944 after the discontinuation of the plutonium gun bomb design. As a result of this reorganization, implosion work was given a top priority and the development of high explosives at S-Site became one of the most important wartime tasks. A major problem facing the scientists working with high explosives was that there were no existing methods for high explosives casting; the military's standards for explosives performance were well below what was needed to develop a symmetrical implosion. The technical problems were eventually overcome, and the S-Site facilities produced about 20,000 usable castings over an 18-month period—over 100,000 pounds of high explosives were used per month during S-Site's peak operation. Several types of explosive materials were used in the casting process: Composition B, Torpex, Pentolite, Baronal, and Baratol (McGehee 2002).

TA-16 includes the locations of former TAs 13, 24, and 25. TA-13 (P-Site) was constructed in 1944 to conduct flash x-ray studies of the implosion of high explosives test devices. It consisted of an office and shop building, laboratory and test buildings, an experimental chamber, a magazine, and a storage building. By the 1950s, most of the buildings had been removed. The remaining buildings were absorbed into the TA-16 complex, and were renumbered TA-16-476, TA-16-477, and TA-16-478. These buildings were later used for high explosives machining studies. TA-24 (T-Site) has been decommissioned. It was used for x-ray examination of high explosives charges during the 1940s. Explosives storage magazines and laboratories were part of the facility. TA-25 (V-Site) was constructed in 1944 for experimental work in connection with special assemblies. In 1945, the site was altered and became part of TA-16 to allow process work on explosive charges. Structures at the site included an assembly bay, laboratory buildings, an equipment building, and a warehouse. A trial assembly of the Trinity device was conducted at TA-25 in 1945 (LANL 1993).

Post-WWII work at TA-16 included further high explosives processing related to the continued development of nuclear weapons, such as the development of components for the Cold War nuclear stockpile and for atmospheric tests in the Pacific and at NTS. One of LANL's most important Cold War contributions to the country's nuclear weapons program was the development of plastic-bonded explosives (PBX) in the mid 1950s.

Historical operations areas at TA-16 are discussed below.

High Explosives Processing Lines

Historically, high explosives operations were conducted in several physically separated facilities that were functionally distinct: Radiography, Machining, Packaging and Transportation, Casting and Plastics, Preparation, Metal Forming, Inspection, Assembly, and Pressing.

Radiography

The Radiography Facility ("the 220s line") radiographed bulk and processed explosive parts—typically castings, pressings, and machinings—to determine the presence of flaws in a piece of explosive. Using industrial photographic processing units, the facility produced radiographs of the various explosive components (MacRoberts n.d.).

Machining and Inspection

The Machining and Inspection Facility (TA-16-260 and associated rest houses) is used to machine rough high explosives pressings or castings into hemispherical shapes or test charges using a combination of computer numerically controlled mills and lathes. High explosives machining is conducted using water as a coolant, and each machine is provided with a recirculating water treatment and cooling system. Radiography is used in this facility as part of the inspection process (MacRoberts n.d.).

Packaging and Transportation

Building TA-16-280 (and associated rest houses) provides packaging and transportation for all LANL explosive shipments (MacRoberts n.d.).

Casting and Plastics

High explosives casting, inert materials processing, and plastics operations are conducted at the "300s line," a complex comprising buildings TA-16-300 through TA-16-307. Operations at TA-16-300 involve inert materials used to produce mock high explosive components for a variety of display or testing purposes. The plastics area provides plastics component fabrication for nuclear weapons assembly; plastics operations are conducted in TA-16-304 and TA-16-306. TNT casting operations have also been conducted at this facility (MacRoberts n.d. and U.S. DOE 1986).

Preparation

High explosive preparation and development operations are located in buildings TA-16-340 and TA-16-342. Activities within these buildings include coating high explosive granules with plastics, developing new types of high explosives, and working with crystallization processes (U.S. DOE 1986).

Metal Forming

Metal forming operations are performed at building TA-16-370. During the 1950s and 1960s, this building was used as a barium nitrate grinding laboratory. TA-16-370, now vacant, housed a machine shop that fabricated nonnuclear metal components required by research and development programs conducted at TA-16 (U.S. DOE 1986).

Inspection

TA-16-280 and TA-16-380 have both been used as inspection facilities. TA-16-380, the High Explosives Powder Inspection Building, was used to inspect high explosives obtained from commercial vendors. One bay of TA-16-430 now contains the powder inspection operation formerly housed in TA-16-380. The inspection process, primarily a visual inspection, is used to accept or reject commercial material (U.S. DOE 1986).

Assembly and Disassembly

The Assembly and Disassembly Complex, TA-16-410 through TA-16-415, contains all the facilities and equipment to assemble and disassemble weapons systems containing high explosives and surrogates for special nuclear material (MacRoberts n.d.).

Pressing

The high explosives pressing operations, located in TA-16-430 and associated rest houses, provide shaped pieces for machining to true shape. High explosive material is brought into this facility in plastic-coated granular form, placed into molds, and subjected to very high pressures. This process produces solid pieces of high explosives in various shapes and sizes. For safety reasons, the pressing operations are conducted remotely (MacRoberts n.d.).

Multiple Property Method of Evaluation

ESA Division's buildings and structures were evaluated using a multiple property documentation approach. This systematic approach serves as a useful evaluation tool to determine the historical significance of a large group of thematically-related properties, such as those under ESA's management. A key element of the multiple property documentation approach is context. Contexts provide information about historical patterns and trends and have clearly defined themes, geographical areas, and chronological periods (U.S. NPS 1999). Within the administrative boundaries of ESA Division, the properties are linked to one or more themes underlying the main context: "High-Explosives Research and Development in Support of the Nuclear Weapons Program." The buildings and structures are technologically related and date to the Manhattan Project and Cold War time periods at Los Alamos (1942–1963). Following the multiple property documentation approach, properties within ESA Division's administrative control were linked with one or more historical themes. Decisions relating to final eligibility recommendations were based on the type of property, the level of physical integrity, and associations with significant themes.

Associated Property Types

The multiple property documentation approach requires the identification of property types that are associated with historical contexts. This identification facilitates the evaluation of individual properties within the broader complex of properties being reviewed. Properties are compared with other historical resources that have similar histories and similar physical characteristics (Hanford Site 1999a).

There are four general property types associated with ESA Division's historical themes.

1. Laboratory-Processing Buildings such as high explosives and tritium processing and research facilities.

2. Administration Buildings such as office buildings and facilities housing cafeterias and health and safety offices (change rooms and offices for monitoring staff).

3. Security Buildings and Structures such as guard stations, security lights, and fencing.

4. Support Buildings and Structures such as warehouses, water tanks, utilities, and waste treatment facilities.

Laboratory-processing buildings within ESA Division's administrative boundaries are associated with the technical functions that mostly support the main context of High Explosives Research and Development in Support of the Nuclear Weapons Program. Specific activities carried out in this type of building support high explosive research and development—high explosives preparation, testing, casting, pressing, machining, inspection, radiography, assembly, and disposal.

Laboratory-processing buildings are representative of the "industrial vernacular" architectural style prevalent at all TAs in Los Alamos. The high explosive manufacturing process dictated the style and materials for the utilitarian designed structures within the TAs. Heavily reinforced concrete was the primary construction material used in that it is inherently secure, durable, and cleanable. Interior walls were often constructed with structural glazed tile as they were easily washable and floors covered with non-spark conducting material. Several of the manufacturing buildings were also constructed with aluminum blow-out panels which, in the event of an explosion, would direct the blast in a specific direction and away from surrounding buildings. Earthen berms were also strategically located between laboratory-processing buildings to further reduce damage from accidental explosions.

Many of the laboratory-processing buildings are large and are designed with work bays containing processing and research equipment. Offices and smaller laboratory spaces are sometimes present in the buildings. The type of activities carried out in each building determines the configuration of interior space, and as discussed above, the physical layout of the processing facilities is ultimately dictated by high explosives safety concerns. Rest houses, connected corridors, and storage magazines, identified in this report as "second tier" properties, are considered an essential but secondary type of laboratory-processing building. These properties do not house key operations; however, the main processing complexes would not be able to function without them.

Administration buildings under ESA Division's control are closely associated with the operation of laboratory-processing facilities. Administration buildings typically house support and research operations: administrative and staff offices, high explosives monitoring staff offices, food service facilities, light laboratory space, showers, and change rooms. Administration buildings are typically located in peripheral areas located away from the main work areas. This practice allows personnel and material from the "clean" administration facilities to remain separate from high explosives or other potentially hazardous operations areas.

Security buildings and structures are associated, first and foremost, with the general operation of ESA Division in support of the main overarching theme of High Explosives Research and Development in Support of the Nuclear Weapons Program. Examples of this property type include guard stations and access control structures such as fencing and barriers.

Support buildings and structures were originally built to support Manhattan Project and Cold War high explosives research and development. Like laboratory-processing buildings, support facilities are divided into two subcategories. "First tier" support properties are primarily buildings and include machine shops, water tanks, warehouses, power plants, etc. "Second tier" support properties are primarily structures; examples include pump houses and electrical substations.

Core properties within each associated property type have also been identified. These buildings or structures are key representatives of their associated theme(s). Although most of the core buildings are Register eligible, four core buildings are not eligible. These buildings (TA-11-24, TA-16-300, -302, and -304) are former high explosives processing facilities that have been extensively modified and have suffered a loss of integrity.

Integrity

Although properties may be significant or exceptionally significant and may be eligible for the Register based on association with historical events and contexts, integrity must be determined for all buildings that, on first-cut, are considered eligible. The LANL Cultural Resources Management Team has developed four integrity codes to better assess potentially eligible properties. The integrity requirements for properties eligible under Criterion A are less stringent than for those properties eligible under Criterion C. A historically significant property with a level 3 integrity could still be eligible, especially if an element of historical uniqueness is involved. Properties eligible under Criterion C should have no lower than a level 2 integrity. Level 4 integrity properties are not eligible for the Register.

1. Excellent Integrity - the property is still closely associated with its primary context and retains integrity of location, design, setting, workmanship, materials, feeling, and association. Little or no remodeling has occurred to the property and all remodeling is in keeping with its associated historic context/significant use period. Good examples at LANL would be Building TA-21-1001 with its original file cabinets and relatively stable use history (the building has always housed records) and the Van de Graaff facility (Building TA-3-16) with its original equipment, records, and control panels.

2. Good Integrity - the property's interior and exterior retain historic feeling and character but most of the original equipment may be gone. The property may have had minor remodeling.

3. Fair Integrity - a property in this category should retain original location, setting, association, and exterior design. All associated interior machinery/equipment may be absent but the key

question is "Is this property still recognizable to a contemporary of the building's historic period?"

4. Poor Integrity - the property has no connection with the historically significant setting, feeling, and context. Major changes to the property have occurred. The property would be unrecognizable to a contemporary.

Summary of Themes

Activities within the administrative boundaries of ESA Division can be grouped under five historical themes that support ESA's main context: High Explosives Research and Development in Support of the Nuclear Weapons Program. Some of the properties are not associated with specific technical themes; rather, they support general ESA operations associated with High Explosives Research and Development. These properties include: TA-16-16, **-180**, -192, -193, **-200**[1], -203, -209, -210, **-540**, -542, and **-1451**. ESA properties at TA-16 are also associated with one additional historical theme: Tritium Research and Development. This additional theme is related to the LANL-wide theme of Weapons Research, Development, Testing, and Stockpile Support. The six themes and associated properties are listed below. Some of the properties are linked with more than one theme.

High Explosives Development and Testing (includes physical testing such as the drop tower tests and preparation activities)
TA-**11-1**, **-2**, **-3**, **-4**, **-24**, **-25**, **-30**, **-36**; TA-16-**340**, -341, **-342**, -343, **-345**, -350, -351, -352, -353, and -354

High Explosives and Non-High Explosives Processing (includes casting, pressing, machining, plastics, metal forming, packaging and transport, and disposal)
TA-**3-39**, **-102**; TA-16-7, **-54**, **-58**, **-88**, **-202**, -207, **-260**, -261, -263, -265, -267, -268, -269, -270, -271, -277, -278, **-280**, **-281**, -282, -283, -284, -285, **-286**, -287, -288, **-300**, **-301**, **-302**, -303, **-304**, -305, **-306**, -307, **-308**, -309, -310, -311, -312, -313, -314, -315, -316, -317, -318, -319, -344, **-360**, -363, **-370**, **-390**, **-400**, **-430**, -435, -437, -442, -443, -444, **-460**, -462, **-476**, **-477**, and **-478**

High Explosives Inspection (includes physical inspection and radiography)
TA-**8-24**, **-70**; TA-**16-260**, -261, -263, -265, -267, -268, -269, -270, -271, -277, -278, **-280**, **-281**, -282, -283, -284, -285, **-286**, -287, -288, **-380**, **-430**, -442, -443, and -444

High Explosives Assembly and Disassembly
TA-**16-410**, **-411**, **-413**, **-414**, **-415**, **-416**, **-418**, and **-419**

WWII Implosion Device Research
TA-**11-1**, **-2**, **-3**, **-4**; TA-**16-54**, **-476**, -477, **-478**, **-516**, and **-517**

Tritium Research and Development
TA-16-205 and **-450**

[1] Core buildings are in bold.

Eligibility Criteria

Laboratory-processing buildings, administration buildings, and security buildings and structures do not need to possess an integrity of both exterior and interior features in order to be eligible for the National Register under Criterion A. In cases where original equipment has been removed, a property can still be considered significant for its historical associations. Laboratory-processing, administration, and security properties need only retain original location, setting, association, feeling, and exterior design to maintain significant historical integrity under Criterion A. Properties eligible under Criterion C have to meet a more stringent standard of physical integrity. Additions and remodeling that reflect changing scientific missions are acceptable under Criterion C (Hanford Site 1999b).

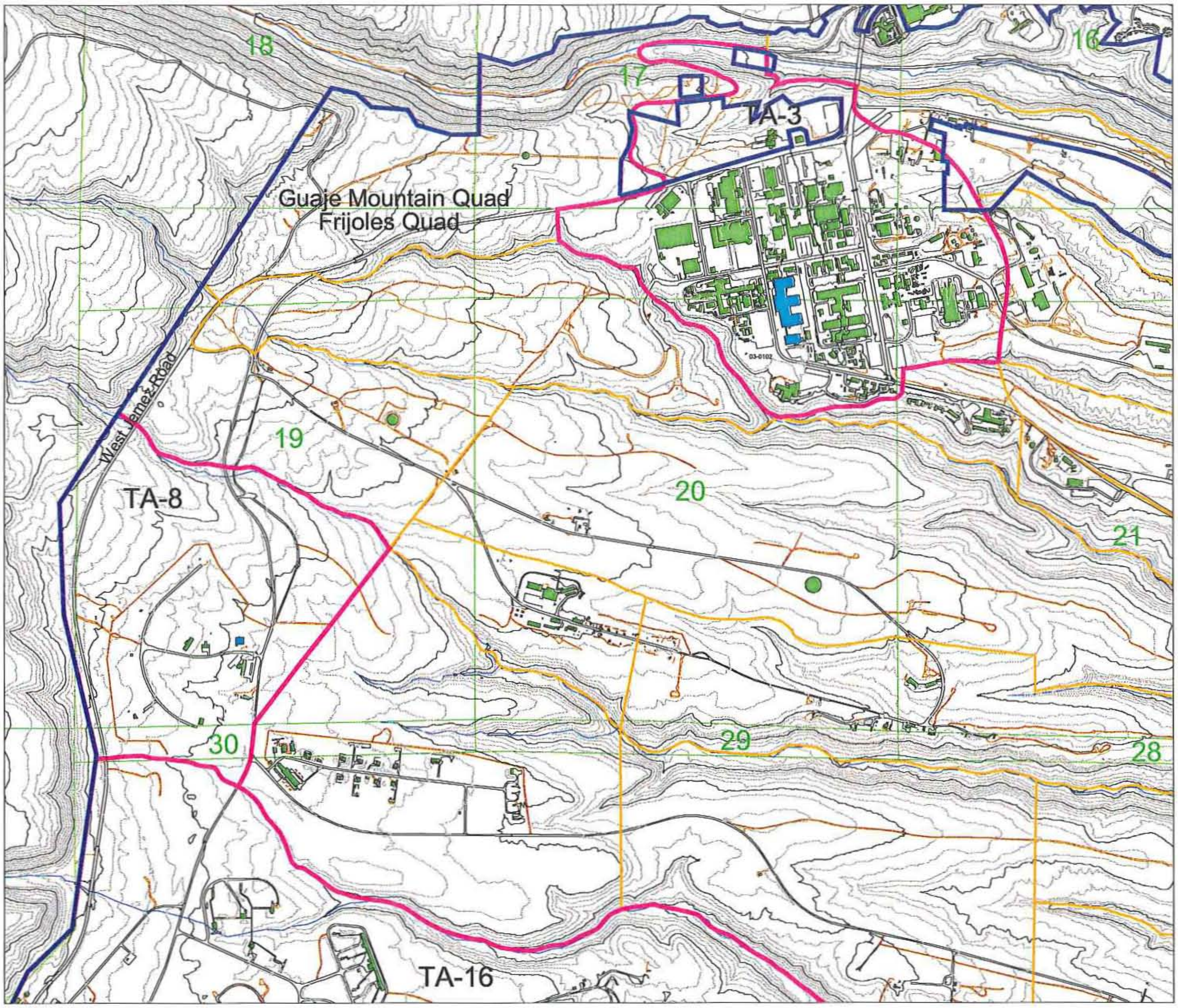
In order to be eligible under Criterion A, support buildings and structures must have functioned as significant support facilities within an associated historical context (Hanford Site 1999b). "First tier" support properties, if linked to a historically significant context and 50 years old or older, may be eligible for the Register. If less than 50 years old, support properties must be exceptionally significant. "Second tier" support and laboratory-processing properties, primarily structures, are usually not eligible for the Register (even if they are 50 years old or older) because of the minor role they played in history.

National Register Eligibility Recommendations

Properties Determined Eligible for the National Register of Historic Places

In 2001 and 2002, a historic property survey was conducted for eighty-four buildings and structures within TAs 3, 8, 11 and 16, LANL, New Mexico (Maps 6 and 7). Of the eighty-four properties surveyed for Register eligibility, twenty-six were determined eligible under Criterion A ("properties associated with events that have made a significant contribution to the broad patterns of our history"), or both Criteria A and C ("properties that represent a significant and distinguishable entity"). Historically, these properties supported the early research and development of high explosives processing in support of nuclear weapons manufacturing during the Manhattan Project and the Cold War in the 1940s and 1950s at LANL.

Table 1 below lists the buildings that are eligible for listing on the Register. The individual property descriptions in Appendix A contain specific information regarding their eligibility.



Los Alamos
National Laboratory

Cultural Resources Management Team
RRES-ECO Ecology Group

1:24000

900 0 900 1800 2700 3600 Feet

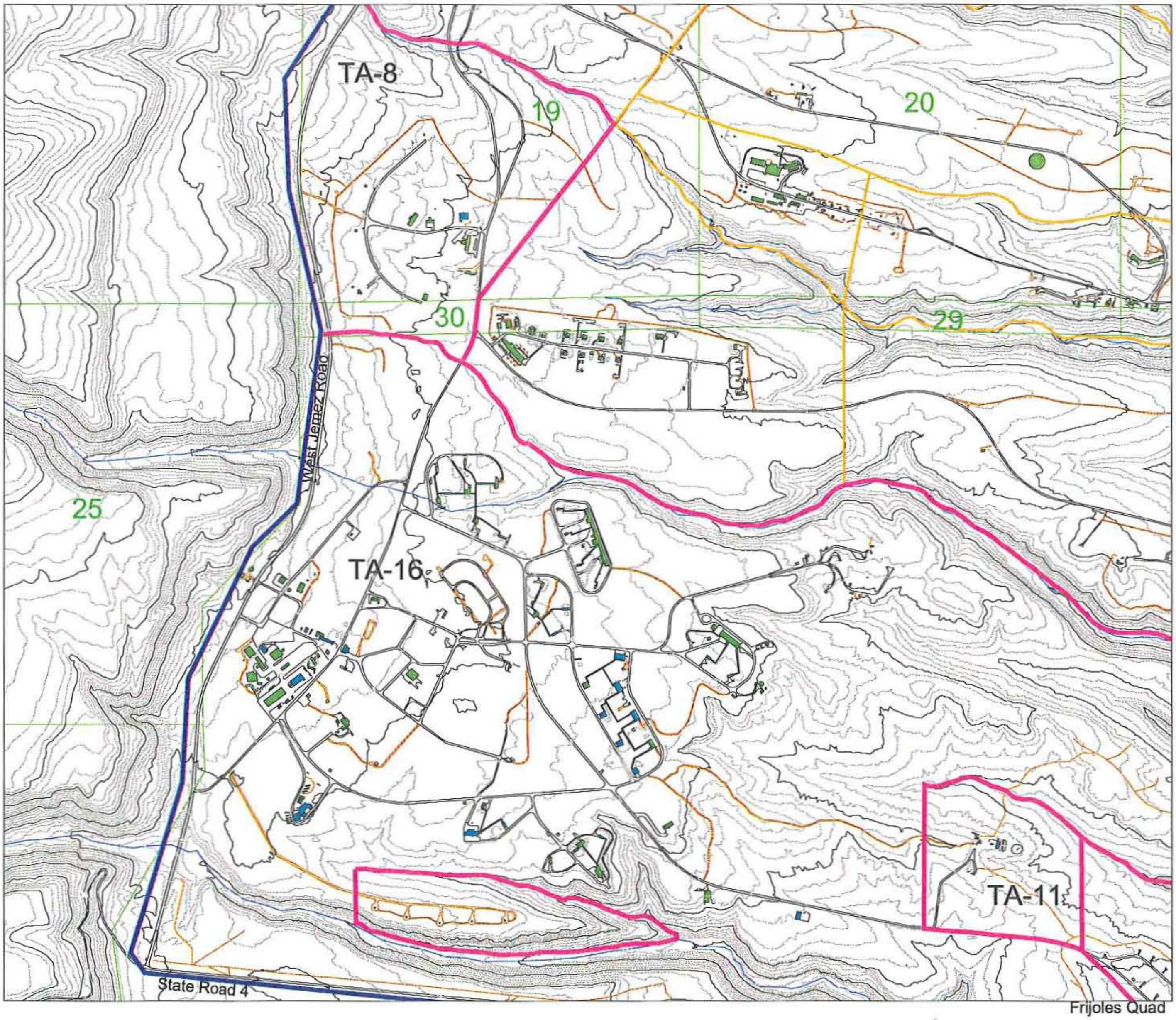
200 0 200 400 600 800 1000 Meters

ESA Division's Five-Year Plan: Consolidation and Revitalization

Buildings Currently Being Reviewed TA-3

- ESA Division Buildings Currently Being Evaluated
- Los Alamos National Laboratory
- Tech Areas 3, 8, 11, & 16
- Tech Areas
- 20 Foot Contours
- 100 Foot Contours
- Drainage
- Township, Section, Range
- USGS 7.5 Minute Quad
- Roads
- Roaddirt
- Parkpave
- Parkdirt
- Buildings/Structures

Map 6



Los Alamos
National Laboratory

Cultural Resources Management Team
RRES-ECO Ecology Group

1:24000

900 0 900 1800 2700 3600 Feet

200 0 200 400 600 800 1000 Meters

N
W E
S

ESA Division's Five-Year Plan: Consolidation and Revitalization

Buildings Currently Being Reviewed TAs-8, -11, and -16

- ESA Division Buildings Currently Being Evaluated
- Los Alamos National Laboratory
- Tech Areas 3, 8, 11, & 16
- Tech Areas
- 20 Foot Contours
- 100 Foot Contours
- Drainage
- Township, Section, Range
- USGS 7.5 Minute Quad
- Roads
- Roaddirt
- Parkpave
- Parkdirt
- Buildings/Structures

Map 7

Table 1. Eligible ESA Properties (evaluated in this report)

Property Number	Original Use	Date	Associated Themes	Property Type	Integrity	Core
3-39	Technical Shops Building	1953	Processing[2]	Lab/Processing (1st Tier)	Excellent	Yes
3-102	Technical Shops Addition	1957	Processing	Lab/Processing (1st Tier)	Excellent	Yes
8-24	HE Radiation Building	1950	Inspection	Lab/Processing (1st Tier)	Good	Yes
8-70	Non-Destructive Test Facility	1959	Inspection	Lab/Processing (1st Tier)	Good	Yes
11-1	Control Building/ Personnel Shelter	1944	WWII Implosion/HE Development and Testing	Lab/Processing (1st Tier)	Good	Yes
11-2	Betatron Building	1944	WWII Implosion/HE Development and Testing	Lab/Processing (1st Tier)	Good	Yes
11-3	Cloud Chamber Building	1944	WWII Implosion/HE Development and Testing	Lab/Processing (1st Tier)	Good	Yes
11-4	Implosion Imaging	1944	WWII Implosion/HE Development and Testing	Lab/Processing (1st Tier)	Good	Yes
11-25	Drop Tower	1956	HE Development and Testing	Lab/Processing (1st Tier)	Excellent	Yes
11-30	Vibration Test Building	1958	HE Development and Testing	Lab/Processing (1st Tier)	Excellent	Yes
11-36	Magazine	1961	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	Yes
16-58	Magazine	1946	Processing	Lab/Processing (2nd Tier)	Excellent	Yes
16-88	Casting Rest House	1949	Processing	Lab/Processing (2nd Tier)	Excellent	Yes

[2] Main Theme: HE R&D (High Explosives Research and Development in Support of the Nuclear Weapons Program). Sub Themes: HE Development and Testing (High Explosives Development and Testing), Processing (High Explosives and Non-High Explosives Processing), Inspection (High Explosives Inspection), Assembly and Disassembly (High Explosives Assembly and Disassembly), WWII Implosion (WWII Implosion Device Research), and Tritium R&D (Tritium Research and Development).

Property Number	Original Use	Date	Associated Themes	Property Type	Integrity	Core
16-286	Break House	1951	Inspection and Processing	Admin (Health and Safety)	Excellent	Yes
16-308	HE Storage and Rest House	1953	Processing	Lab/Processing (2nd Tier)	Excellent	Yes
16-380	HE Powder Inspection	1952	Inspection	Lab/Processing (1st Tier)	Excellent	Yes
16-413	Rest House	1951	Assembly and Disassembly	Lab/Processing (2nd Tier)	Excellent	Yes
16-415	Rest House	1951	Assembly and Disassembly	Lab/Processing (2nd Tier)	Excellent	Yes
16-416	Passageway (connects to 16-413)	1951	Assembly and Disassembly	Lab/Processing (2nd Tier)	Excellent	Yes
16-418	Passageway (connects to 16-415)	1951	Assembly and Disassembly	Lab/Processing (2nd Tier)	Excellent	Yes
16-419	Passageway (connects to 16-413)	1951	Assembly and Disassembly	Lab/Processing (2nd Tier)	Excellent	Yes
16-430	HE Pressing	1951	Processing and Inspection	Lab/Processing (1st Tier)	Excellent	Yes
16-450	Tritium Processing Facility	1953	Tritium Research and Development	Lab/Processing (1st Tier)	Good	Yes
16-476	Laboratory/ Control Room	1944	WWII Implosion/Processing	Lab/Processing (1st Tier)	Fair	Yes
16-477	Laboratory Building	1944	WWII Implosion/Processing	Lab/Processing (1st Tier)	Fair	Yes
16-478	Laboratory and Machine Test Building	1944	WWII Implosion/Processing	Lab/Processing (1st Tier)	Fair	Yes
Total Number of Eligible Properties	**26**					

Properties Determined Not Eligible for the National Register of Historic Places

Some properties at LANL that were constructed within the defined period of significance do not qualify as significant properties. In some cases, the property is of secondary or minor importance and does not contribute to the understanding of the manufacturing of nuclear weapons during the 1940s and 1950s. Many of these buildings served a purely functional purpose, and although necessary in supporting the mission of LANL, do not adequately illustrate the historical themes shaping the history of the Laboratory. In other cases, the property surveyed was outside the parameter dates of the historic context 1942 to 1963.

Table 2 below lists the buildings that are not eligible for listing on the Register. The individual property reports (Appendix A) contain specific information regarding their ineligibility. Thirty-nine ESA properties had previously been assessed for historical significance and, as part of this multiple property review, were reevaluated for Register eligibility. Upon reevaluation, fourteen properties were determined not eligible because they had been either substantially modified or were not the best examples of a specific property type.

Table 2. Non-Eligible ESA Properties (evaluated in this report)

Property Number	Original Use	Date	Associated Themes	Property Type	Integrity	Core
11-24	Air Gun Building	1956	HE Development and Testing	Lab/Processing (1st Tier)	Poor	Yes
16-7	Steam Plant	~1944	Processing	Lab/Processing (1st Tier)	Poor	No
16-16	Cafeteria	1945	HE Research and Development	Administration	Poor	No
16-192	Guard Station	1952	HE Research and Development	Security	Fair	No
16-203	Lumber Storage	1952	HE Research and Development	Support (1st Tier)	Excellent	No
16-205	Tritium Processing Facility	1984	Tritium Research and Development	Lab/Processing (1st Tier)	Good	N/A **(too recent)**
16-207	Warehouse	1952	Processing	Lab/Processing (1st Tier)	Fair	No
16-209	Guard Station	1952	HE Research and Development	Security	Good	No

Property Number	Original Use	Date	Associated Themes	Property Type	Integrity	Core
16-210	Guard Station	1952	HE Research and Development	Security	Good	No
16-261	Rest House #1	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-263	Rest House #2	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-265	Rest House #3	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-267	Rest House #4	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-268	Passageway (connects to 16-261)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-269	Passageway (connects to 16-263)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-270	Passageway (connects to 16-278)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-271	Passageway (connects to 16-277)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-277	Equipment Storage Building	1965	Inspection and Processing	Lab/Processing (2nd Tier)	Good	No
16-278	Equipment Storage Building	1965	Inspection and Processing	Lab/Processing (2nd Tier)	Good	No
16-282	Passageway (connects to 16-281)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-283	Rest House	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-284	Passageway (connects to 16-283)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-285	Rest House	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-287	Passageway (connects to 16-280)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-288	Passageway (connects to 16-285)	1951	Inspection and Processing	Lab/Processing (2nd Tier)	Excellent	No
16-300	HE Processing Building	1953	Processing	Lab/Processing (1st Tier)	Fair	Yes
16-302	HE Processing Building	1953	Processing	Lab/Processing (1st Tier)	Fair	Yes
16-303	HE Processing Building and Rest House	1953	Processing	Lab/Processing (2nd Tier)	Fair	No
16-304	HE Processing Building	1953	Processing	Lab/Processing (1st Tier)	Good	Yes

Property Number	Original Use	Date	Associated Themes	Property Type	Integrity	Core
16-305	HE Processing Building and Rest House	1953	Processing	Lab/Processing (2nd Tier)	Good	No
16-307	HE Processing Building and Rest House	1953	Processing	Lab/Processing (2nd Tier)	Fair	No
16-309	Passageway (connects to 16-300)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-310	Passageway (connects to 16-301)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-311	Passageway (connects to 16-302)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-312	Passageway (connects to 16-304)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-313	Passageway (connects to 16-302)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-314	Passageway (connects to 16-306)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-315	Passageway (connects to 16-303)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-316	Passageway (connects to 16-307)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-317	Passageway (connects to 16-304)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-318	Passageway (connects to 16-305)	1953	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-319	Break House	1953	Processing	Administration (Health and Safety)	Good	No
16-341	Rest House A	1951	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	No
16-343	Rest House B	1951	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	No
16-344	Drum Storage	1951	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-350	Passageway (connects to 16-341)	1951	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	No
16-351	Passageway (connects to 16-342)	1951	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	No

Property Number	Original Use	Date	Associated Themes	Property Type	Integrity	Core
16-352	Passageway (connects to 16-343)	1951	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	No
16-353	Passageway (connects to 16-342)	1951	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	No
16-354	Passageway (connects to 16-345)	1951	HE Development and Testing	Lab/Processing (2nd Tier)	Excellent	No
16-363	Water Treatment Shed	~1950	Processing	Support (2nd Tier)	Excellent	No
16-435	Rest House	1951	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-437	Rest House	1951	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-442	Passageway (connects to 16-435)	1951	Processing and Inspection	Lab/Processing (2nd Tier)	Excellent	No
16-443	Passageway (connects to 16-430)	1951	Processing and Inspection	Lab/Processing (2nd Tier)	Excellent	No
16-444	Passageway (connects to 16-437)	1951	Processing and Inspection	Lab/Processing (2nd Tier)	Excellent	No
16-462	Solvent and Chemical Storage Building	1952	Processing	Lab/Processing (2nd Tier)	Excellent	No
16-542	Gas Regulator Building	1952	HE Research and Development	Support (2nd Tier)	Fair	No
Total Number of Non-Eligible Properties	**58**					

Master Eligibility Summary Table

Buildings in bold are candidates for permanent retention. These properties represent Los Alamos's most important contributions to the history of WWII and the Cold War within ESA Division.

Table 3. Eligible ESA Properties (evaluated in this report and previous reports)

Property Number	Date	Core	Property Type	Integrity
3-39	1953	Yes	Lab/Processing (1^{st} Tier)	Excellent
3-102	1957	Yes	Lab/Processing (1^{st} Tier)	Excellent
8-24	1950	Yes	Lab/Processing (1^{st} Tier)	Good
8-70	1959	Yes	Lab/Processing (1^{st} Tier)	Good
11-1	1944	Yes	Lab/Processing (1^{st} Tier)	Good
11-2	1944	Yes	Lab/Processing (1^{st} Tier)	Good
11-3	1944	Yes	Lab/Processing (1^{st} Tier)	Good
11-4	1944	Yes	Lab/Processing (1^{st} Tier)	Good
11-25	1956	Yes	Lab/Processing (1^{st} Tier)	Excellent
11-30	1958	Yes	Lab/Processing (1^{st} Tier)	Excellent
11-36	1961	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-54	1946	Yes	Lab/Processing (1^{st} Tier)	Fair
16-58	1946	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-88	1949	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-180	1952	Yes	Administration	Excellent
16-200	1952	Yes	Administration	Excellent
16-202	1952	Yes	Lab/Processing (1^{st} Tier)	Good
16-260	1951	Yes	Lab/Processing (1^{st} Tier)	Excellent
16-280	1951	Yes	Lab/Processing (1^{st} Tier)	Good
16-281	1951	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-286	1951	Yes	Administration (Health and Safety)	Excellent
16-301	1953	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-306	1953	Yes	Lab/Processing (1^{st} Tier)	Excellent
16-308	1953	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-340	1951	Yes	Lab/Processing (1^{st} Tier)	Excellent
16-342	1951	Yes	Lab/Processing (1^{st} Tier)	Excellent
16-345	1951	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-360	1952	Yes	Lab/Processing (1^{st} Tier)	Good
16-370	1953	Yes	Lab/Processing (1^{st} Tier)	Excellent
16-380	1952	Yes	Lab/Processing (1^{st} Tier)	Excellent
16-390	1952	Yes	Lab/Processing (1^{st} Tier)	Good
16-400	1952	Yes	Support (1^{st} Tier)	Excellent
16-410	1951	Yes	Lab/Processing (1^{st} Tier)	Excellent
16-411	1951	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-413	1951	Yes	Lab/Processing (2^{nd} Tier)	Excellent
16-414	1951	Yes	Lab/Processing (2^{nd} Tier)	Excellent

16-415	1951	Yes	Lab/Processing (2nd Tier)	Excellent
16-416	1951	Yes	Lab/Processing (2nd Tier)	Excellent
16-418	1951	Yes	Lab/Processing (2nd Tier)	Excellent
16-419	1951	Yes	Lab/Processing (2nd Tier)	Excellent
16-430	1951	Yes	Lab/Processing (1st Tier)	Excellent
16-450	1953	Yes	Lab/Processing (1st Tier)	Good
16-460	1952	Yes	Lab/Processing (1st Tier)	Good
16-476	1944	Yes	Lab/Processing (1st Tier)	Fair
16-477	1944	Yes	Lab/Processing (1st Tier)	Fair
16-478	1944	Yes	Lab/Processing (1st Tier)	Fair
16-516	1944	Yes	Lab/Processing (1st Tier)	Good
16-517	1944	Yes	Lab/Processing (1st Tier)	Good
16-540	1953	Yes	Support (1st Tier)	Excellent
16-1451	1950	Yes	Security	Excellent
Total Number of Eligible Properties in ESA	**50**			

The State Historic Preservation Office is requested to concur with the eligibility determinations contained in this report. As a result of this historic building survey, this project complies with the National Historic Preservation Act of 1966 (as amended).

References Cited

Gosling, F. G.

2001 *The Manhattan Project: Making the Atomic Bomb.* U.S. Department of Energy. Copies available from DOE/MA-0002.

Hanford Site

1999a "Multiple Property Documentation." *Section 1.0, Introduction.* http://www.hanford.gov/doe/culres/mpd/sec1.htm #1.0, accessed using Netscape on 1/26/99 at 10:18 AM.

1999b "Multiple Property Documentation." *Section 5.0, The Manhattan Project and Cold War Eras, Plutonium Production at the Hanford Site, December 1942-1990.* http://www.hanford.gov/doe/culres/mpd/sec5.htm #5.0, accessed using Netscape on 1/26/99 at 10:46 AM. Authored by M. S. Gerber, Westinghouse Hanford Company, and D. W. Harvey and J G. Longenecker, Pacific Northwest National Laboratory, Richland, Washington.

Hatler, Larry

2002 Information pertaining to the history of high explosives development at LANL, notes on file at RRES-ECO, Los Alamos National Laboratory, Los Alamos, New Mexico.

Hoddeson, Lillian, Paul W. Henriksen, Roger A. Meade, and Catherine Westfall.

1998 *Critical Assembly: A Technical History of Los Alamos during the Oppenheimer Years, 1943-1945.* New York and Cambridge: Cambridge University Press.

LANL (Los Alamos National Laboratory)

1993 *RFI Work Plan for Operable Unit 1082: Environmental Restoration Program,* LA-UR-93-1196, Los Alamos National Laboratory, Los Alamos, New Mexico.

1995 "Los Alamos National Laboratory: A Proud Past, An Exciting Future (Special Issue)." *Dateline: Los Alamos.* Los Alamos National Laboratory, Los Alamos, New Mexico.

1999 ESA Division; LALP-99-229. Los Alamos National Laboratory, Los Alamos, New Mexico.

2001 The Laboratory in a Changing World: A Los Alamos Chronology; LALP-01-65. The Nuclear Weapons Publication Team, Los Alamos National Laboratory, Los Alamos, New Mexico.

MacRoberts, Martin
n.d. "General S-Site Description." Manuscript on file at RRES-ECO, Ecology Group, Los Alamos National Laboratory, Los Alamos, New Mexico.

McGehee, Ellen D.
1995a *TA-16 Heating System Replacement.* Cultural Resource Survey Report #114, LA-CP-95-180. On file at RRES-ECO, Los Alamos National Laboratory, Los Alamos, New Mexico.

1995b *Decontamination and Decommissioning of 28 "S-Site" Properties: Technical Area 16.* Historic Building Survey Report #84, Vols. 1 - 3, LA-UR-95-617. On file at RRES-ECO, Los Alamos National Laboratory, Los Alamos, New Mexico.

2002 *A Physical and Scientific History of the Manhattan Project at Los Alamos, New Mexico: Linking Facilities to Events, 1942-1946*, LA-UR-02-2608. Report prepared for a University of New Mexico graduate seminar in Atomic History, Professor T. Moy, Spring 2002 (History 510). On file at RRES-ECO, Los Alamos National Laboratory, Los Alamos, New Mexico.

McGehee, Ellen D. and Kari L. M. Garcia
1999 *Historical Building Assessment for the Department of Energy Conveyance and Transfer Project.* Historic Building Survey Report No. 178, LA-UR-00-1003. On file at RRES-ECO, Los Alamos National Laboratory, New Mexico.

Mitchell, Kris C.
2001 *Rhetoric to Reality: A Cold War Context Statement for the Pantex Plant; 1951-1991.* BWXT Pantex, LLC., Environmental Protection/Restoration Department, Amarillo, Texas.

Neal, Timothy R.
1993 AGEX I: The Explosives Regime of Weapons Physics. *Los Alamos Science* (21):54-62.

Rhodes, Richard.
1986 *The Making of the Atomic Bomb.* New York: Simon and Schuster.

Rothman, Hal.
1992 *On Rims and Ridges, The Los Alamos Area Since 1880.* Lincoln, Nebraska: University of Nebraska Press.

U.S. DOE (Department of Energy)
1986 Phase 1: Installation Assessment, Los Alamos National Laboratory, Comprehensive Environmental Assessment and Response Program (Working Draft). Albuquerque Operations Office, Albuquerque, New Mexico. On file at RRES-ECO, Los Alamos National Laboratory, Los Alamos, New Mexico.

U.S. NPS (National Park Service)
1999 *National Register Bulletin: How to Complete Multiple Property Documentation Form*. http://www.cr.nps.gov/nr/bulletins/nr16b.htm. Accessed using Netscape on 1/28/99 at 8:28 AM.