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Cultural Landscape Inventory for Picatinny Arsenal, New Jersey

Megan W. Tooker and Adam D. Smith

August 2016



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Cover Photo: Birdseye view of Picatinny Arsenal, looking west, date unknown (PICA History Office).

Cultural Landscape Inventory for Picatinny Arsenal, New Jersey

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Abstract

This document presents a historic context, integrity analysis, and evaluation for the National Register of Historic Places (NRHP) of the installation as a whole for Picatinny Arsenal, New Jersey. This work is a companion study to ERDC-CERL TR-16-4, which documented the cultural landscapes of the existing five historic districts. The report meets the requirements in the National Historic Preservation Act (NHPA) for federal agencies to address their cultural resources—defined as any prehistoric or historic district, site, building, structure, or object. Identification of potentially significant properties is achieved only through a survey and evaluation to associate a property within a larger historic context.

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Preface

This study was conducted for the Environmental Affairs Division of U.S. Army Garrison, Picatinny Arsenal, New Jersey, under Project #396911, “Cultural Landscape Inventory for PICA.” Funding was provided by Military Interdepartmental Purchase Request (MIPR) 0010325589. The Picatinny Arsenal technical monitor was Mr. Jason Huggan, Cultural Resources Manager, Environmental Affairs Division.

The work was performed by the Land and Heritage Conservation Branch (CNC) of the Installations Division (CN), U.S. Army Engineer Research and Development Center – Construction Engineering Research Laboratory (ERDC-CERL). At the time of publication, Dr. Michael Hargrave was Chief, CEERD-CNC; and Ms. Michelle Hanson was Chief, CEERD-CN. The Deputy Director of ERDC-CERL was Dr. Kirankumar Topudurti, and the Director was Dr. Ilker Adiguzel.

Col. Bryan S. Green was the Commander of ERDC, and Dr. Jeffery P. Holland was the Director.

Unit Conversion Factors

Multiply	By	To Obtain
acres	4,046.873	square meters
feet	0.3048	meters
inches	0.0254	meters
miles (U.S. statute)	1,609.347	meters
pounds (mass)	0.45359237	kilograms
square feet	0.09290304	square meters
yards	0.9144	meters

Abbreviations

Term	Meaning
AAL	Arsenal-At-Large
AMC	Army Materiel Command
APM	asbestos-protected metal
ARDEC	Armament, Research, Development and Engineering Center
ERDC- CERL	Engineer Research and Development Center–Construction Engineering Research Laboratory
FRP	Facility Reduction Plan
HABS	Historic American Buildings Survey
NAD	Naval Ammunition Depot
NARA	National Archives and Records Administration
NARTS	Naval Air Rocket Test Station
NHPA	National Historic Preservation Act of 1966
NPS	National Park Service
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PICA	Picatinny Arsenal
RDECOM	Research, Development and Engineering Command
RP	Real Property
RPMP	Real Property Master Plan
WPA	Works Progress Administration
WWI	World War I
WWII	World War II

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1 Methodology

1.1 Background

Congress codified the National Historic Preservation Act of 1966 (NHPA), the nation's most effective cultural resources legislation to date, in order to provide guidelines and requirements for preserving tangible elements of our past. This was done primarily through the creation of the National Register of Historic Places (NRHP) in 1966. Contained within the NHPA (Sections 106 and 110) are requirements for federal agencies to address their cultural resources, which are defined as any prehistoric or historic district, site, building, structure, or object. Section 110 requires federal agencies to inventory and evaluate their cultural resources. Section 106 requires determination of the effects of federal undertakings on properties deemed eligible or potentially eligible for the NRHP.

Picatinny Arsenal (PICA) is located in Rockaway and Jefferson Townships in Morris County, New Jersey. The installation is located 32 miles northwest of Newark and 42 miles west of New York City. Picatinny Arsenal began as a War Department powder depot in 1880 and evolved into one of the Army's most important armament research and development centers.

PICA currently houses the Headquarters of the U.S. Army Research, Development and Engineering Command (RDECOM), Armament Research, Development and Engineering Center (ARDEC). RDECOM-ARDEC's mission is "researching and developing armament and weapon systems for a changing Army" (Chugach Industries 2008). A major subordinate command of the U.S. Army Materiel Command (AMC), RDECOM is responsible for developing high-quality weapons and munitions for U.S. troops.

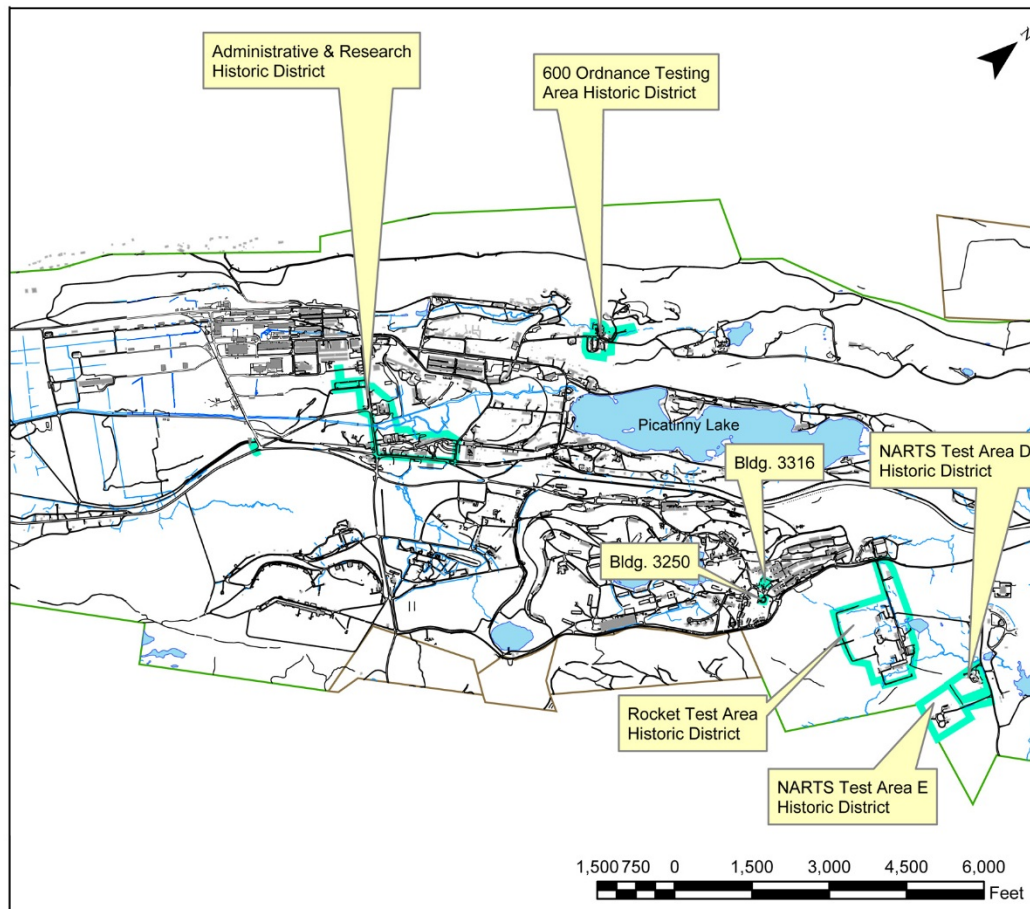
PICA has evaluated approximately 1,159 buildings, structures, and objects and found that 99 are eligible for inclusion on the NRHP.¹ Of these 99 resources, 97 are located within five historic districts—the Administration and Research Historic District, the 600 Area Ordnance Testing Historic District, the Army Rocket Testing Historic District, NARTS² D Historic District, and NARTS E Historic District (Figure 1). Two of the 99, Building 3250 and Building 3316, are

¹ Conversation with Jason Huggan, Cultural Resources Manager at Picatinny, June 2013.

² Naval Air Rocket Test Station

located outside the historic districts (Figure 1). Within the five districts, there are 22 noncontributing properties.

Figure 1. Map showing locations of current historic districts and buildings at Picatinny Arsenal, as noted in 2008 ICRMP (Chugach Industries 2008).



1.2 Objective

The objective of this effort was to inventory and evaluate all landscape features not previously identified throughout Picatinny Arsenal, New Jersey, as required by Section 110 and 106 of the NHPA and the programmatic agreement between Picatinny Arsenal and the New Jersey State Historic Preservation Office. Knowledge of the cultural landscape and potential impacts on those resources will aid in the NHPA process.

1.3 Approach

For a property to qualify for the NRHP, it must: meet at least one of the National Register Criteria for Evaluation, must be significantly associated with an

important historic context, and must retain sufficient integrity to convey its significance under that context. This report establishes the process by which the historic landscapes of PICA are inventoried and evaluated according to the criteria set forth for the NRHP. To be eligible or listed on the NRHP, cultural resources must meet certain requirements establishing their importance to American history and heritage. The cultural importance of Picatinny's landscape is determined through the base's historic context. Next, using the historic context as a reference point, the physical site is analyzed and inventoried to determine the original design intentions. In doing this, the historic landscapes are identified and their features are documented through mapping, diagramming, and image collection. With this information, the historic qualities are determined and evaluated according to NRHP criteria. This process establishes the historic importance of the landscape and determines its historic integrity. With the analytical results, recommendations are made that are appropriate for the preservation and maintenance of the historic landscape features.

This current study presents a historic context, integrity analysis, and evaluation for NRHP eligibility for the whole of Picatinny Arsenal. It is a follow-on study to ERDC-CERL TR-16-4 which documented the cultural landscapes of the existing five historic districts at Picatinny Arsenal and their historic significance and integrity.

1.3.1 Site visits

A site visit and inventory was conducted in June 2013. During this visit, researchers were also given a guided tour of PICA during which photography, sketches, and note-taking were used to compile an overall understanding of the built environment.

1.3.2 Archival research

The archival research included finding, gathering, and reviewing all sources relevant to the project. Primary sources were used to document the original design and planning intentions of the installation, including published and unpublished materials held in the National Archives and at PICA. Researchers collected archival information such as historic photographs, artwork, maps, and architectural plans.

1.3.3 Analysis and evaluation

Using information from the historic context, an overarching NRHP integrity was determined. Cultural resources can retain or lose historic integrity, meaning that a resource either does or does not convey historic significance. By establishing a historic context, individual resources can be evaluated along similar physical metrics. The physical features of each component landscape were documented and evaluated to establish the character-defining features of the site, and if they did or did not contribute to the established historic context. From this, a recommendation of eligibility to the National Register was made based on guidelines found in the following documents, including guidance from the National Park Service (NPS).

- *National Register Bulletin #15, How to Apply the National Register Criteria for Evaluation* (NPS 1997a)
- *National Register Bulletin #16, Part A: How to Complete the National Register Registration Form* (NPS 1997b)
- *National Register Bulletin #18: How to Evaluate and Nominate Designed Historic Landscapes* (NPS 1987)
- *National Register Bulletin #30: Guidelines for Documenting and Evaluating Rural Historic Landscapes* (NPS 1999a)
- *National Register Preservation Brief #36: Protecting Cultural Landscapes* (NPS 2000)
- *National Register Bulletin: How to Prepare National Historic Landmark Nominations* (NPS 1999b)
- *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* (NPS 1995)
- The National Park Service's *A Guide to Cultural Landscape Reports: Contents, Process, and Techniques* (NPS 1998)
- The Department of Defense guidance, *Guidelines for Identifying and Evaluating Historic Military Landscapes* (Loechl et al. 2009)

The guidelines presented in these documents provided the basis for the historic landscape evaluation. The guidelines were applied to identify and list the character-defining features of the Picatinny landscape while noting the cumulative loss of character, the alternation/masking of prominent features, or the introduction of new elements. Additionally, the landscapes were ranked high,

medium, or low based on their significance to the overall history of Picatinny, the U.S. military, and the United States, and then on their ability to convey historic significance.

1.3.4 Previous reports

This report is one of three cultural landscape reports completed for Picatinny Arsenal, as required by the Real Property Master Plan (RPMP) and Facility Reduction Plan Programmatic Agreement (FRP PA). The other two reports are *Cultural Landscape Analysis of Existing Historic Districts, Picatinny Arsenal, New Jersey* (ERDC-CERL TR-16-4) and *Cultural Landscape Analysis of the Former Lake Denmark Naval Ammunition Depot at Picatinny Arsenal, Rockaway Township, Morris County, New Jersey* (Huggan 2015). The latter report (Huggan 2015) determined and established a new historic district which is not referenced herein (Figure 31).

1.4 Researchers

This project was conducted by the U.S. Army Corps of Engineers, Engineer Research Development Center, Construction and Engineering Research Laboratory (ERDC-CERL) based in Champaign, Illinois. The research team included Adam Smith, Master of Architecture, as project manager and lead historian with 18 years of experience in military architectural history, and Megan Weaver Tooker, Master of Landscape Architecture, as historic landscape architect with 18 years of experience.

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2 Landscape Development History

The landscape at PICA can be divided into three general periods: (1) prehistoric subsistence activities; (2) pre-Arsenal industrial and agricultural activities associated with rural community settlement; and (3) Arsenal-related construction endeavors and subsequent military-industrial activities. The first period is characterized by subsistence activities conducted by Native Americans prior to the invasion of European traders/settlers (i.e., prehistoric camp and rock shelter sites have been identified in the vicinity). The second period reflects industrial activities associated with iron mining and iron production endeavors during the colonial/pre-Arsenal period by European-American settlers, and rural settlement activities which included the limited cultivation of grains and livestock prior to 1880. The third land use period—construction activities associated with the creation of Picatinny (Dover) Powder Depot beginning in 1880—involved the replacement or reuse of structures or remains associated with agricultural and early industrial periods of the area and the subsequent, dramatic land alterations inherent in the erection of a federal military reservation (Chugach 2008, 4-2).

Since this report focuses on the landscape development of the military landscape, the prehistoric and pre-PICA periods will not be discussed in this report. A good overview of this period is provided in the *Integrated Cultural Resource Management Plan for Picatinny Arsenal* (Chugach 2008).

On the Arsenal's initial 1,866 acres, first construction efforts included storage magazines, officer's quarters, and service facilities. Then in June 1891, 315 acres of Picatinny's land near Lake Denmark was ceded to the U.S. Navy for the establishment of the Lake Denmark Naval Ammunition Depot (NAD) to become the Navy's primary storage depot on the East Coast. PICA and the Lake Denmark NAD expanded within the Green Pond Brook valley, their missions diversified to incorporate the manufacturing of increasingly more powerful explosives and ordnance, and involved significant construction and land moving activities. Today the installation occupies approximately 5,753 acres, with an additional 640 acres for restrictive easements that surround the boundary (not owned by PICA).

A military landscape is a landscape that has evolved in response to the needs of national security and defense. It is one of several landscape types that reflect the military history of the nation including battlefields, cemeteries, memorial or commemoration sites, and previously-owned Department of Defense sites. A military landscape is a landscape that is significantly associated with historically important persons or events, or is an important indicator of the broad patterns of

history, or represents a significant example of design or construction. For the purposes of the National Register, a historic military landscape is a category of property eligible for listing on the NRHP as a historic site or district. To be eligible for nomination to the Register, a historic military landscape must have sufficient integrity to convey its significance (Loechl et al. 2009).

2.1 Pre-Arsenal history

The site of Picatinny Arsenal has a history of munitions manufacturing which dates to colonial times. The Middle Forge was founded at the foot of Picatinny Peak on the southern edge of Picatinny Lake by Jonathan Osoorne in 1749. Jacob Faesch gained possession of the forge in 1778, and under his ownership, cannon shot and iron implements were produced for the Continental Army (Thurber et al. 1985, 14).

The iron industry in New Jersey was a profitable one from 1804 to 1816, but the depression in 1820 caused a downturn. The decade from 1830 to 1840 was again profitable for iron makers. A technological change in the process in 1837 introduced a hot blast process, which reduced the charcoal needed by one-half. A stone coal manufacturing process led, however, to the ultimate cessation of iron forge works in general. At the height of its operation, the Middle Forge reportedly employed 60 men and produced 10–20 tons of iron per week (Figure 2). The forge trip hammer (with a 14-inch square face and weighing 600 pounds) and the anvil (two feet square and weighing an estimated 4,000 pounds), along with other forge tools are on exhibit at Picatinny Arsenal (Figure 3, Monument 151M).

Figure 2. Iron mines in Morris County, 1867 (PICA Cultural Resources).

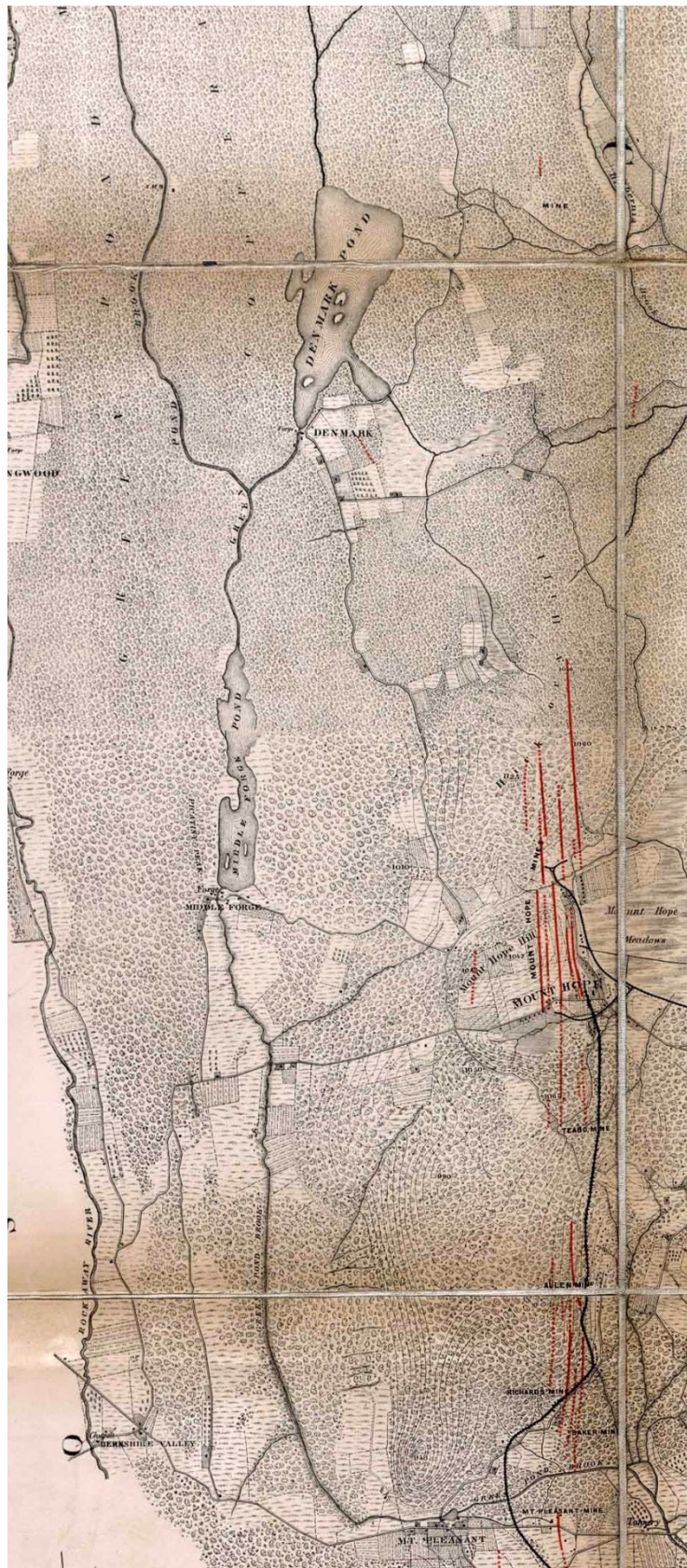


Figure 3. Middle Forge Monument (Monument 151M), located in front of Building 151 (ERDC-CERL, 2013).



The rugged, hilly terrain of northwestern New Jersey, with its concomitant stony soil and steeply sloping topography, did not readily attract settlers who would have to rely predominantly on cultivating crops for their livelihood. While those agricultural activities that were conducted in the mountains probably provided

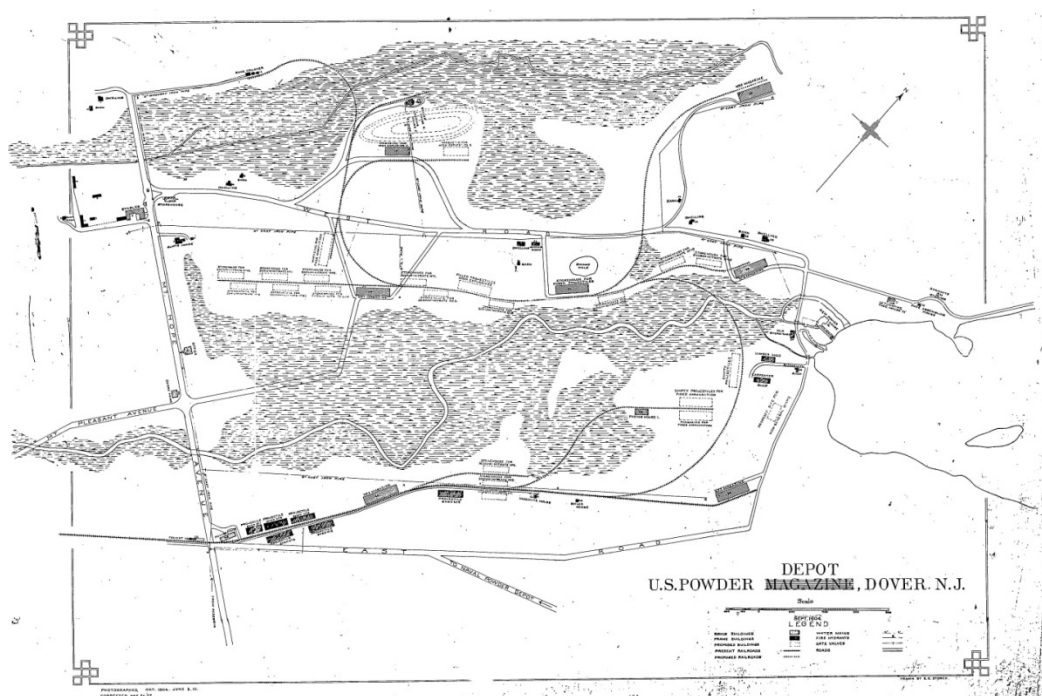
generally unfavorable results for those early residents, the Highland ridges were well suited to support mining and related industrial endeavors, particularly iron working. Beginning in the early eighteenth century, the initial settlement of the Highlands (including PICA) was associated with the iron industry. Near the close of the seventeenth century, as colonial ironmasters depleted the poorer grade ores of the New Jersey coastal plains, they were forced to look to the mountains of the northwestern portion of the colony and future state for new areas to mine.

2.2 Powder Depot, 1880–1902

In 1875, the Ordnance Department began to consider the establishment of a powder depot on the East Coast. In 1879, Ordnance Department Major F. H. Parker was ordered to examine potential sites for a powder depot. On 26 February 1880, the present site of Picatinny was chosen by an Ordnance Board of Governors, chaired by Lieutenant Crispin and consisting of members Lieutenant Colonel T. G. Baylor and Major F. H. Parker. The site's advantages included its location on a railroad trunk; its proximity to, yet safe distance from New York City; and its favorable topographical features.

Major Parker began negotiations for the purchase of the tract in 1880, and by 1881 he had assembled 1,866 acres at a total cost of \$62,750. On 6 September 1880, the tract of land was established as the "Dover Powder Depot" (Nolte et al. 2007, 3-6). This name was changed four days later to "Picatinny Powder Depot." Construction of the depot began in September 1880 and continued into the 1890s. The original construction included five magazines, officers' quarters, stables, and service buildings (Figure 4).

Figure 4. 1907 map showing buildings built during initial phase of construction (Picatinny Cultural Resources).



The initial phase of development covers the Depot/Storage period from 1880 until 1907. During that time, the installation's mission was powder storage and the assembly of cannon charges. A major change in the installation's mission occurred in 1907 with the construction of the first Army-owned smokeless powder factory. This activity resulted in the redesignation of the depot as Picatinny Arsenal and marks the beginning of the manufacturing phase, which continued until the early years of World War II (WWII). By 1913, the installation was operating a plant for the manufacture of Explosive "D," which was used in armor-piercing projectiles (Chugach 2008, 4-22).

The Navy also found the area desirable as a powder depot site. Ellis Island had served as the Navy's principal powder storage facility until the Treasury Department assumed control of that site for the purpose of receiving immigrants in 1890. This left the Navy without an adequate powder storage facility on the East Coast. The Navy chose a site at Lake Denmark outside New Jersey, consisting of 315 acres. The land was part of the Picatinny Powder Depot. The site was formally transferred by the Department of the Army to the Department of the Navy on 9 June 1891. Ground was cleared almost immediately for the necessary construction of powder storage facilities (Thurber 1985, 20).

The first buildings constructed at Lake Denmark were completed in 1892 and included a magazine for the storage of powder and explosives, a shell house, and three small frame houses for Navy caretaker personnel. By 1894, the storage buildings had grown to three large buildings for the storage of powder and ammunition, and two smaller structures for the storage of high explosives. One large building was reserved for loading artillery shells.

The early history of the Naval Powder Depot at Lake Denmark is one of gradual but steady expansion. The Spanish-American War (1898) and the growing demands of the United States Navy contributed to the development and construction of the facility. Two additional tracts totaling 146 acres were acquired in 1902 (Thurber et al. 1985, 20).

2.3 World War I

During World War I (WWI), the installation saw rapid development not only of its physical plant around Picatinny Lake, but also of its capacity as a research and administrative installation. Fifty-four new storage buildings, a new powder house, a locomotive round house, garages and more office space were constructed as well as the expansion of the road system and railways. During the war, the Arsenal hired 2,600 workers to meet war time production needs. The installation staff provided technical assistance to the private sector (Dupont, Hercules, Aetna, and Atlas Powder) that was producing explosives for the war effort. During the 1920s, munitions experimentation and training had replaced powder production as the installation's mission, foreshadowing the later expansion of the facility into a complete ammunition arsenal (Thurber et al. 1985, 24).

2.4 Explosion and rebuilding efforts

On 10 July 1926, lightning struck the Lake Denmark Powder Depot (Figure 5), causing a series of fires and explosions that killed 19 people, including 11 Marines fighting the fires, and sent shock waves throughout the Green Pond Brook valley, destroying everything within 3,000 feet (915 meters) of the epicenter (Chugach Industries 2008, 4-22).

A Naval investigation of the incident led to changes in safety and in ammunition storage procedures and standards. The Army's own investigation led to a major overhaul of the Arsenal's facilities, as the installation was enlarged for the purpose of consolidating the Army's ordnance activities in northern New Jersey. Plans for rebuilding the Arsenal, devised with the safe handling of explosives as a

top priority, called for dividing the installation into zones based on function or activity (Chugach Industries 2008, 4-22).

The “new” Arsenal was divided into three distinct functional zones: (1) an area for production of powders and explosives, (2) an area for storage of powders and explosives, and (3) an area for nonexplosives manufacturing, including all research and administrative facilities.

The principal reconstruction effort was focused on the powder and explosives manufacturing area. The nitrocellulose smokeless powder plant was reconstructed on the original site. The plant was rebuilt with greater distances between buildings. The rebuilt plant was also designed with a greater production capability (Thurber et al. 1985, 20).

Much of the installation was rebuilt by Works Progress Administration (WPA) workmen. Improvements included new roads (Figure 6) and bridges (44,551 linear feet of new concrete roads, 6,700 linear feet of Macadam roads, and 7 bridges) as well as rebuilding railroad cars, railroad scales, and rail lines (they built 13,390 linear feet of new rail lines and rehabbed 18 miles of existing lines) (Rae 1999, 53–55). A climb-proof fence around the Naval Depot also was built at this time, six miles in length.

Figure 5. Photograph after explosion, 1926 (Picatinny Cultural Resources).



Figure 6. Foundations of missing magazines C-40 and C-41 after road improvement, circa 1934 (NARA 71-CA-212 Lake Denmark Folder).



2.5 World War II

The mission of Picatinny Arsenal, just prior to America's involvement in WWII, was to provide the Army with a munitions manufacturing center that included experimental and production plants for various propellants and high explosives. In 1940, the installation was producing the following materials: (1) smokeless powder, (2) high explosives, (3) fuzes and primers, (4) assembled rounds of artillery ammunition, (5) bombs and grenades, and (6) pyrotechnics (airplane flares/military signals) (Thurber et al., 1985, 35-36).

At the outbreak of WWII, Picatinny Arsenal was responsible for producing most of the ammunition for American troops as well as much of the ammunition for our European Allies. It was the only major plant in the United States capable of full-scale production for any ammunition larger than small arms, and it was responsible for loading and assembling large-caliber ammunition, artillery projectiles, and bombs. Picatinny Arsenal remained the nation's only major munitions producer until the fall of 1942, when it was turned over to private industry (Thurber et al. 1985, 37).

During this time, Picatinny Arsenal experienced another era of rapid expansion. Pilot plant and experimental projects were converted to production operations. Production lines were operated at full-scale and then expanded in order to cope with increasing needs. The facility operated 24 hours a day, 7 days a week, and the work force grew from 1,800 to 18,000 workers (Thurber et al. 1985, 37). To meet their needs, the Army established temporary worker's housing outside Dover. A portion of the employees lived in this housing, while many commuted from areas as far away as Newark and New York City.

Picatinny Arsenal was an important explosives and ammunition research center. While expanding production capabilities to meet the munitions requirements of WWII, the installation continued to conduct research on tetryl manufacturing and nitrocellulose powder (Chugach Industries 2008, 4-22).

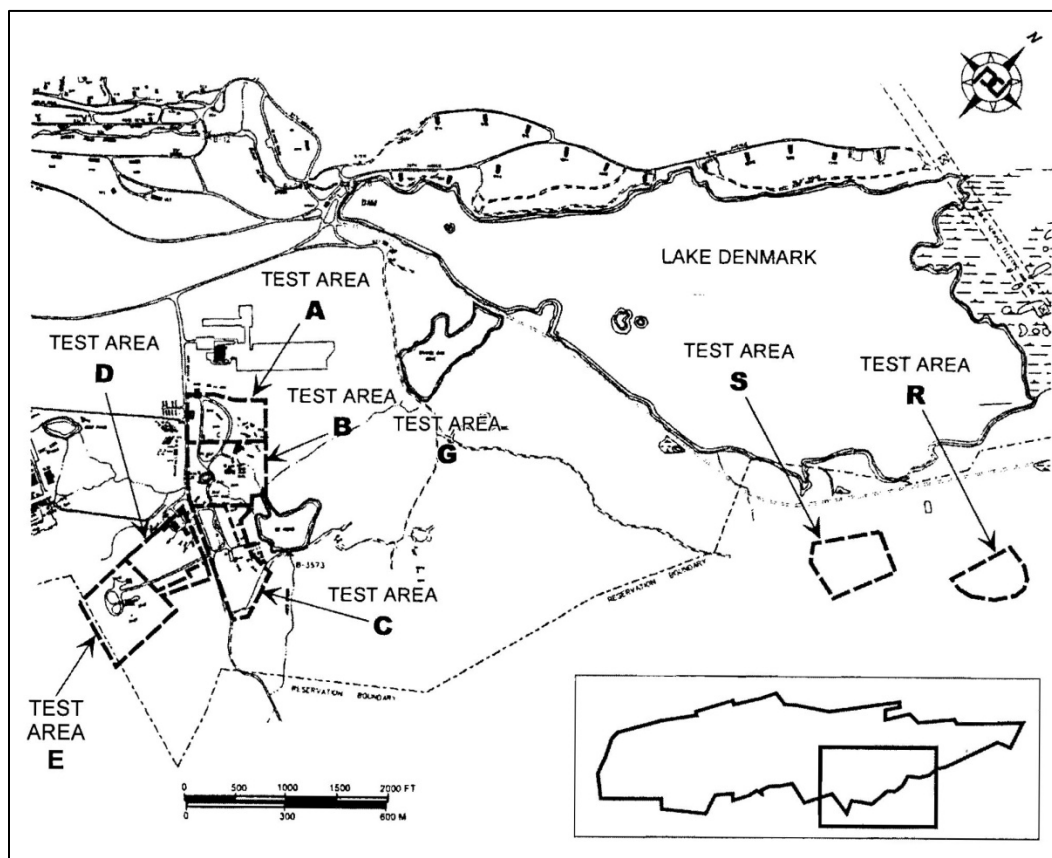
2.6 Cold War

During the Cold War, Picatinny remained a center for research and development for new weapons systems and advances in the production process. Innovations increased and included the development of photoflash cartridges and bombs, the study of plastics and adhesives in the packaging of ammunition, the research on warheads for the Nike nuclear missile and other missile programs, and the

production of a tank-piercing rocket for the 3.5-inch bazooka and an atomic shell for the 250 mm gun (Chugach Industries 2008, 4-22).

In 1948, the Lake Denmark depot became home to the Navy's east coast rocket engine test center. The facility was called the Naval Aeronautical Rocket Laboratory, but was renamed NARTS in April 1950. The NARTS was established for the testing and evaluating of "rocket engines, components and propellants, and training service personnel in handling, servicing and operating rocket engines" (Figure 7). The Navy subcontracted with private industry to accomplish these goals. Founded in 1941, Reaction Motors, Inc. (absorbed by the Thiokol Corporation in 1958) was one of these companies and their work led to the development of both the XLR-II and the XLR-99 engine. Tested at Lake Denmark, the XLR-99 liquid rocket engine was the first large, throttle-able, restartable liquid propellant rocket engine. The XLR-99 was used for the X-15, the experimental hypersonic aircraft, and a preliminary design for the Space Shuttle called for its use (Nolte et al 2007, 3-32). Later decommissioned by the Navy, the Lake Denmark installation reverted to PICA in August 1960, enlarging the installation to its present size.

Figure 7. Cold War-era NARTS test areas map, no date (PICA Cultural Resources).



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3 Inventory of Overall Landscape

In historic landscape studies, the term “landscape characteristic” has a specific meaning. Landscape characteristics are defined as the “tangible evidence of the activities and habits of the people who occupied, developed, used, and shaped the land to serve human needs; they may reflect the beliefs, attitudes, traditions, and values of these people” (NPS 1996, 3). Identifying the characteristics of the military landscape requires an understanding of the natural and cultural forces that have shaped it. This section will describe these processes and the resulting landscape features that together comprise the military landscape. The purpose of this section is to help define the overall character of the landscape and identify the many features that make it significant.

The NPS defines historic character-defining features of a landscape as “prominent or distinctive aspects, qualities, or characteristics of a cultural landscape that contribute significantly to its physical character” (NPS 1996, 4). Through the study of landscapes, the built environment is explained by the physical remains of the natural and cultural shaping forces. The historic landscapes of Picatinny are significant because they describe the adaption of the built environment to the military mission and the cultural values. Understanding the factors that influenced and composed the landscape informs the preservation of its historic qualities. This inventory identifies the historically significant features and characteristics of the Picatinny landscapes.

To identify the prominent or distinctive characteristics that make a landscape historic, the physical features of the site are divided into eight areas (as established by the NPS): site and layout, land use, expressions of military cultural values, transportation networks, views and viewsheds, buildings and structures, vegetation, and small-scale features. These characteristics of the landscape combine to form the built environment that is the primary image of PICA.

3.1 Site design and layout

The layout and design of Picatinny Arsenal has largely been dictated by the nature of its functions through time. The installation has developed in such a way that each land use type can be associated with a particular distinct area or areas. Thus, production areas tend to be clustered near the lake, while residences are concentrated on Farley Avenue. Parker Road provides access north from the main entrance at Route 15. The area along Parker Road near the main entrance was known as Spicertown. Spicertown was annexed by the Army in 1941 and used

to contain one- and two-story, wood frame, bungalow-type homes for military personnel. These homes were all demolished during the early 2000s.

Along Parker Road, is the installation's golf course that was built in 1921 on the site of an old parade ground. The cannon gates, constructed in 1885, mark the original entrance to Picatinny at the intersection of Parker Road and Buffington Road. Parker Road terminates at Farley Avenue, a major east-west artery.

Historical development within PICA has been concentrated in the areas south and east of Picatinny Lake, which included most of the areas initially purchased by the federal government in 1880-1881 with construction phases at the arsenal dependent on the installation's manufacturing activities and changes in the arsenal's mission over time. A major change in the installation's mission occurred in 1907 with the construction of the first Army-owned smokeless powder factory. This activity resulted in the redesignation of the depot as Picatinny Arsenal, and marks the beginning of the arsenal's important manufacturing phase, which continued until WW II.

3.2 Land use

The general types of land use include administration, shops, production, storage, laboratories, testing, and residential. The quarters are clustered along Farley Avenue and were some of the earliest buildings at the installation. The Laboratory area, known as "Chemistry Row", is located northeast of Farley Avenue. The laboratory area consists of one- and two-story brick buildings constructed in the 1930s and 1940s. Farther to the east are the rocket production area and the double-based powder areas on the south side of the Farley Avenue. The rocket production area (1400 Area) was constructed in the late 1940s and early 1950s. The double-based powder line (1300 Area) was established in 1945.

The major production areas lie along or near Picatinny Lake. The lake is located near the center of the Arsenal at the foot of Picatinny Peak. The powder factory (500 Area), the gun bag loading plant (400 Area), and the complete rounds/melt loading line (800 Area) are located respectively on the east, south, and west shores. These production areas were established in the 1930s and were expanded throughout the 1940s. The major buildings are typically steel frame, encased in concrete with infill walls of 8 in.-thick hollow clay tile. Each area is significant for the way that the structures within it are interrelated.

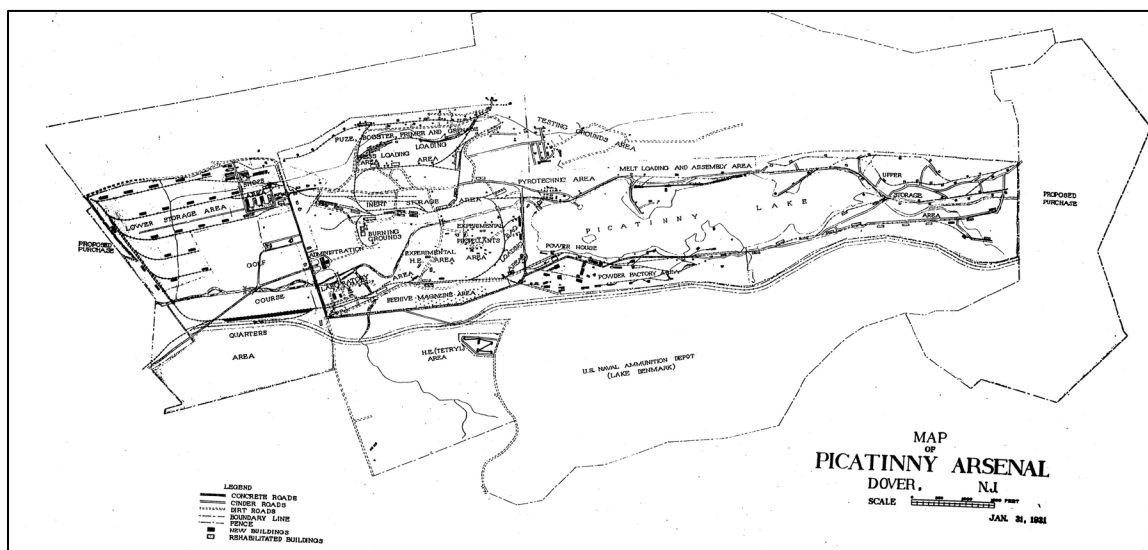
A steep ridge west of the 800 Area separates it from the major testing area, the 600 Area. The 200 Area, for the loading and assembling of artillery shell components, lies to the south of the 600 testing area. The earliest buildings in the 200 Area date to 1889 and 1903, while the remainder were constructed in 1918 and during the 1940s.

The major storage areas, Area 900 and Area 1200, stretch out from the northern portion of Picatinny Lake and along the western side of Lake Denmark, located at the northeastern corner of the arsenal. The 900 Area includes several hollow clay tile magazines constructed in 1918, while the 1200 Area was constructed in the 1940s. These magazines are laid out with careful distances between the buildings to provide maximum safety. Rail access is provided to many of the above-ground magazines and to all of the igloos.

The Navy Hill area is located on the ridge southeast of Picatinny Lake. Belt Road travels the perimeter of the area, with a series of roads running off it to various groups of buildings. Since this area was used basically as a storage depot, the buildings tend to be more standardized than those on the Army side. There are a large number of storage magazines that were constructed in the 1930s–1940s. These buildings are rectangular, one story, and of brick construction. They are scattered throughout Navy Hill and are isolated from other buildings and each other. Associated with almost every magazine is a hydrant.

A 1931 map of the land use areas is shown in Figure 8.

Figure 8. Map showing land use areas of Picatinny Arsenal, 1931 (PICA Cultural Resources).



3.3 Transportation networks

Transportation networks on military installations are an important characteristic of military landscapes because the movement of troops and equipment is integral to the military mission. To facilitate efficient mobilization of troops and supplies, most transportation systems have a distinct hierarchy. Primary and secondary roads are designed to carry the heaviest traffic and connect major land use areas, while smaller roads and service lanes provide access to other areas. Important to Picatinny are the major roads and railways that would bring in personnel to the Arsenal and the smaller roads that would provide limited access to the testing areas.

3.3.1 Roads

Before the invention of the automobile, the predominant forms of transportation were horses, stagecoaches, and railways. Many modern roads follow old stagecoach routes.

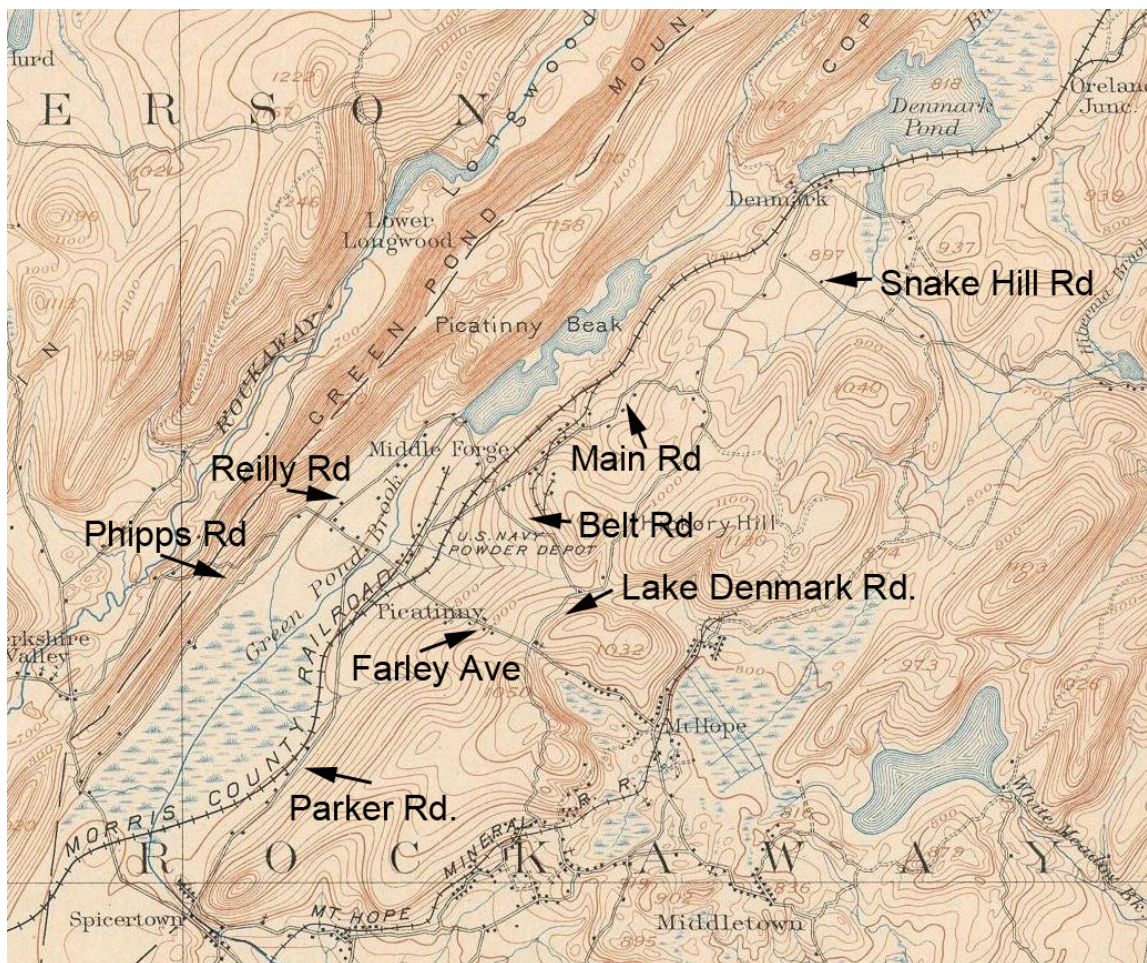
Early maps and atlases show three roads from Mount Hope into what is now PICA (Figure 9). The first is Mount Hope Road (today called Farley Avenue on the installation) which becomes Phipps Road, the second ran from Mount Hope to Middle Forge, and the third ran from Mount Hope to Denmark Mine (today known as Lake Denmark Road, but may have included portions of the current Gately Road³). The start of the former Middle Forge Road at Lake Denmark Road has been documented and connects with Belt Road (which runs along the perimeter of Navy Hill). It then continues downslope towards the rail line and the old Factory Station, ultimately leading to Picatinny Lake and the site of the forge. The portion of Middle Forge Road near the 500 Area is no longer intact due to the rail lines. By 1887, Parker Road is depicted on maps, showing that this intersection has been significant since the beginning of the installation (Figure 10).

³ As mentioned in a 1931 history report of PICA (Picatinny Arsenal 1931, 8).

Figure 9. Lightfoot & Geil Atlas showing historic roads from Mount Hope to Middle Forge and Denmark Mine, 1853 (PICA Cultural Resources).

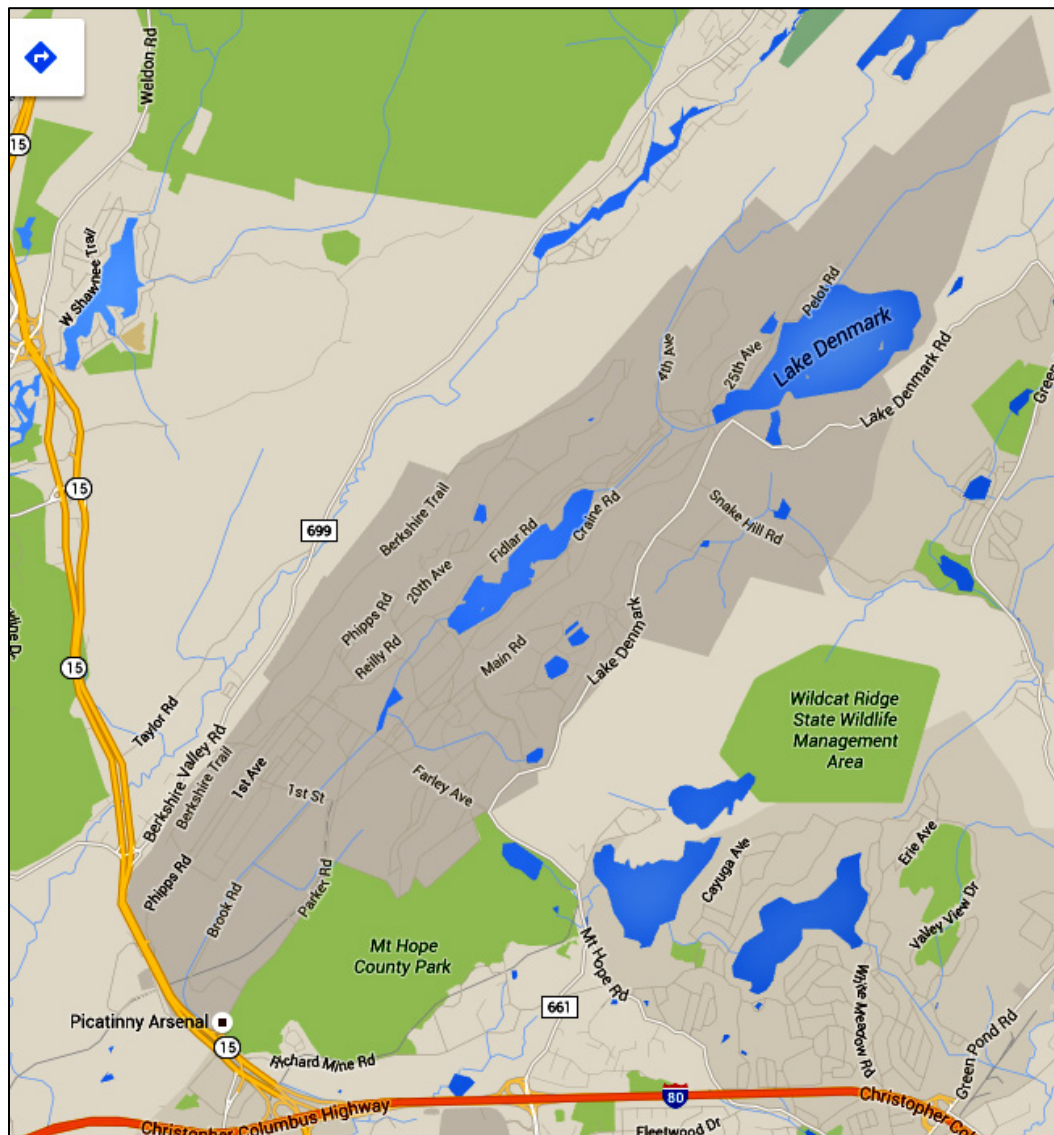


Figure 10. 1905 map of Picatinny Arsenal with historic roads marked (PICA Cultural Resources).



Today, many smaller roads exist throughout the ammunition testing and storage areas. Roads have replaced the small historic railways to connect these manufacturing and storage facilities with the main railroad lines (Figure 11).

Figure 11. Map of current and major roads, 2015 (Bing maps). Installation boundary shown in grey shading, with road system in white.



3.3.2 Railways

Accessibility to a railway was a criterion for site selection for powder depots on the East Coast in the 1860s and 1870s. Land for the Picatinny Powder Depot was purchased in 1880. By 1887, 23.5 miles of track—called the Wharton & Northern Railroad—connected the Army depot with the Delaware Lackawanna and Western Railroad, and the Dover and Central Railroad of New Jersey at Wharton.

The track was laid out by the Morris County Railroad Company of New Jersey, under the terms of a nine-acre right-of-way granted by a 99-year lease which ended in 1986 (Harrell 1996, E-464). The tracks are now owned by PICA. Rail links, both within and outside Picatinny Arsenal, were an essential part of its operability (Figure 12).

After the 1926 explosion, WPA workers replaced and rehabilitated the tracks at Picatinny. By 1930, the arsenal had approximately 25 miles of railroad tracks: 20.4 miles of standard gauge and one mile of narrow gauge government-owned track, as well as three and one-half miles of the privately-owned Wharton & Northern Railroad tracks running through the installation (Harrell 1996, E-464). Completed in 1887, the Morris County Railroad, consolidated as the Wharton & Northern Railway in 1905, also operated a passenger service for employees to get to the arsenal with stops at Picatinny Arsenal, “The Factory”⁴, Navy Depot, and Lake Denmark (Lowethal 1981, 112; Figure 12). In 1905, the *Iron Era* noted the Morris County Railroad timetable that included Piccatinny (sic) and Navy Depot stops (Figure 13).

The railroad system was a vital part of the mission at Picatinny, with track covering the largest area during WWII (Figure 14–Figure 17). After the war, the requirement for such extensive track lessened. In 1964, Picatinny undertook an extensive rehabilitation of the Arsenal’s railroad system, and more than 21 miles of track were restored, reconstructed, or under consideration for reconstruction. Three railroad bridges (Bridges 11, 12, and 13) and a turnout were replaced, and slightly more than three miles of abandoned track were removed. Some abandoned tracks became the bed for walking and jogging paths (Nolte 1999a, 103). Most of the rail lines were removed in 1979, with the exception of those near the main gate (Rae 1999, 14).

⁴ This train station, located adjacent to the smokeless propellant powder factory was built in 1907 and operated until the 1970s. It has been located as an archaeological site and is adjacent to the former 1010 area and 512 oil tanks along the rail line (Site 28MR345). The station is shown on a 1920–22 Arsenal map, on file at the PICA Cultural Resources Office, as a Station. The station had a chimney and a heat source with four walls as its main structure. It was likely used for the delivery of equipment, coal, and potentially even passengers.

Figure 12. Map of Morris County Rail Road, no date (Lowenthal 1981, 112).

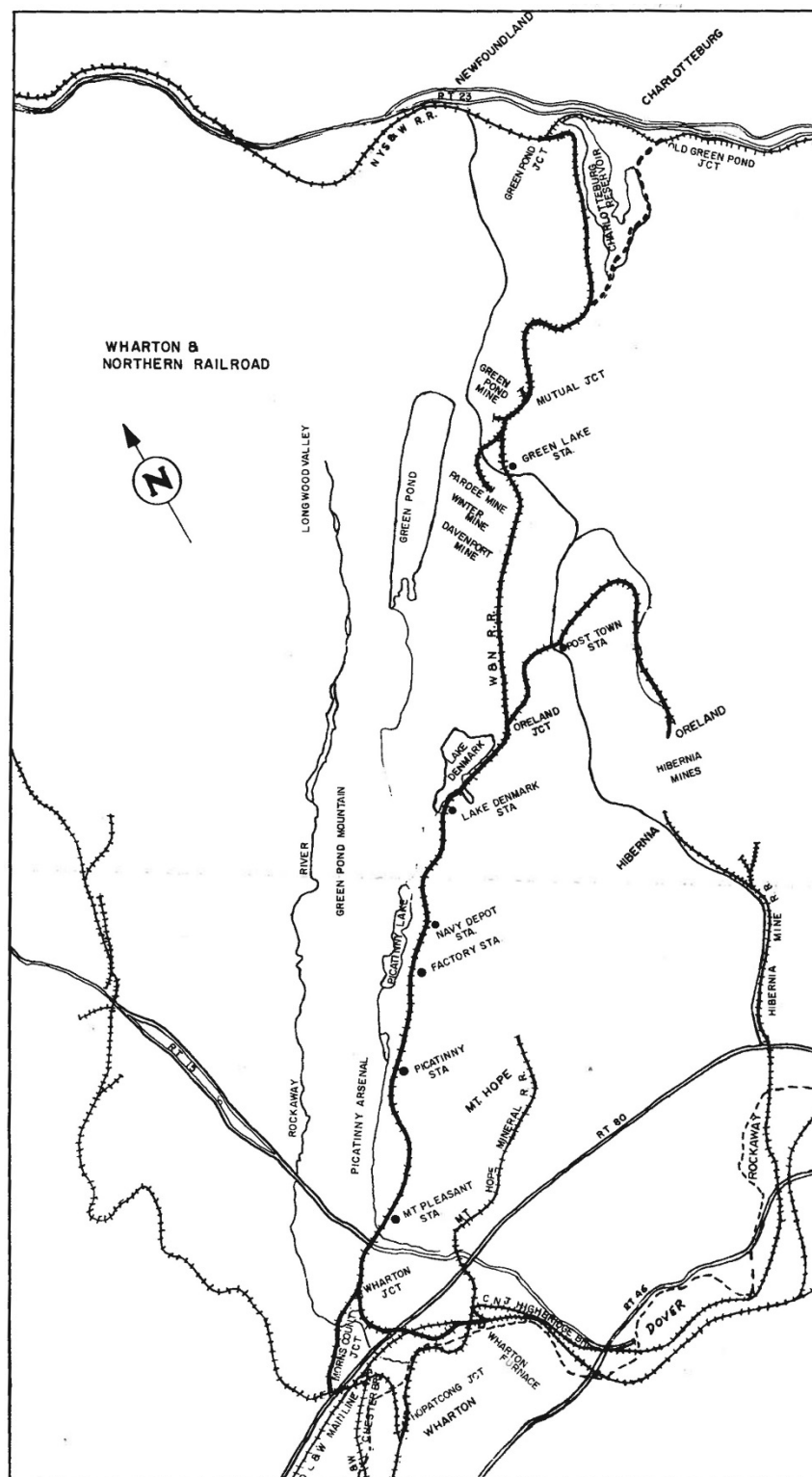


Figure 13. Morris County railroad timetable from 1905 (*Iron Era*, 10).

MORRIS COUNTY RAILROAD				
The new schedule of trains on the Morris County Railroad, in effect May 29, 1905, affords an excellent opportunity for spending a day at Lake Denmark or Green Lake, affording a view of the most picturesque section of New Jersey.				
TIME TABLE				
South—Daily except Sundays				
Stations.	1	3	5	
	a. m.	a. m.	p. m.	
Green Pond Junction.....		10:45	3:45	
Mutual Junction.....		11:05		
Green Lake.....	6:55	11:10		
		11:55	4:20	
Oreland.....	6:30			
Posttown.....	6:40			
Oreland Junction.....	7:05	12:05	4:30	
Lake Denmark.....	7:10	12:10	4:35	
Navy Depot.....	7:15	12:15	4:40	
Piccatunny.....	7:20	12:20	4:45	
Mount Pleasant.....	7:25	12:25	4:50	
Wharton Junction.....	7:30	12:30	4:55	
Wharton.....	7:35	12:35	5:00	
North—Daily except Sundays				
Stations.	2	4	6	
	a. m.	p. m.	p. m.	
Wharton.....	9:30	2:05	5:50	
Wharton Junction.....	9:25	2:10	5:55	
Mount Pleasant.....	9:30	2:15	6:00	
Piccatunny.....	9:35	2:20	6:05	
Navy Depot.....	9:40	2:25	6:10	
Lake Denmark.....	9:45	2:30	6:15	
Oreland Junction.....	9:50	2:35	6:20	
Posttown.....			6:42	
Oreland.....			6:50	
Green Lake.....	10:00	2:45	6:50	
Mutual Junction.....			6:55	
Green Pond Junction.....	10:30		3:05	
SUNDAYS ONLY.				
South..	7	Stations.	8 North.	10
a. m.	p. m.		a. m.	p. m.
9:35	6:35	Wharton	10:45	6:30
9:30	6:30	Wharton Junction	10:50	6:35
9:25	6:15	Mount Pleasant	10:55	6:40
9:20	6:10	Piccatunny	11:00	6:45
9:15	6:05	Navy Depot	11:05	6:50
9:10	6:00	Lake Denmark	11:10	6:55
9:05	5:55	Oreland Junction	11:15	7:00
8:40		Posttown		7:22
8:30		Oreland		7:30
8:55	5:45	Green Lake	11:25	7:10
		Mutual Junction		
		Green Pond Junc.		
CONNECTIONS.				
No. 1 connects with D. L. & W. train No. 504				

Figure 14. Map showing railway lines at Navy Depot, 1954 (PICA Cultural Resources).

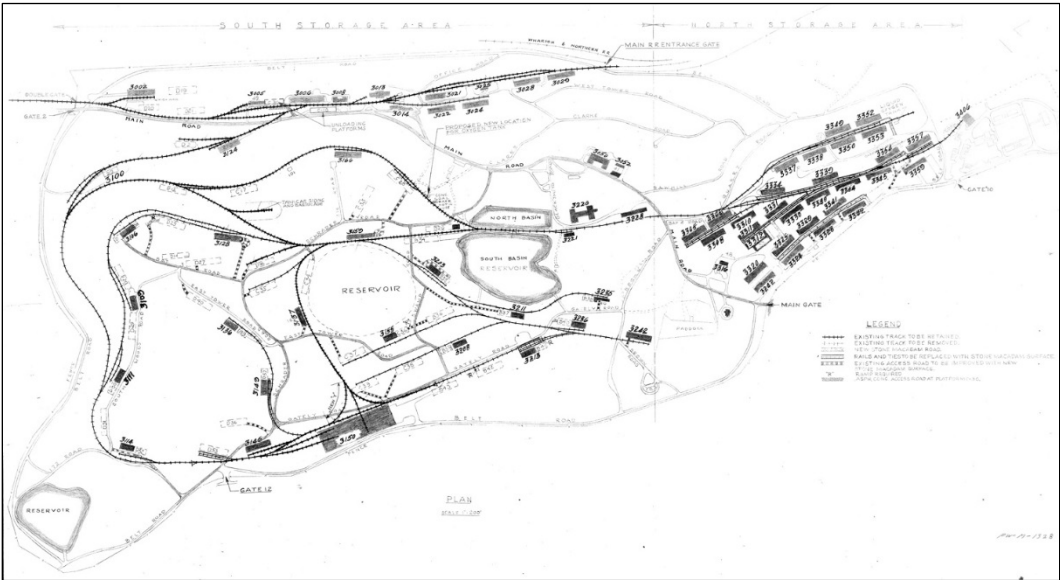


Figure 15. Railway in front of Fixed Ammunition No. 1, 1917 (National Archives and Records Administration [NARA] 71-CA-212 Lake Denmark Folder).



Figure 16. Repair of narrow-gauge railway trestle near Building 559, circa 1940s (PICA History Office).



Figure 17. Remnant rail in front of Magazine 927 (ERDC-CERL, 2013).



3.3.3 Bridges

Many vehicular bridges exist throughout the ammunition testing and storage areas. Those bridges built during WWII are concrete in construction, and they appear to have been renovated over time or at least to have had the rails and asphalt surfaces updated (Figure 18 and Figure 19).

Figure 18. Vehicular Bridge V1217 (ERDC-CERL, 2013).



Figure 19. Vehicular Bridge V0929 in front of Magazine 929 (ERDC-CERL, 2013).



3.4 Expression of military cultural traditions

Since the founding of the United States through armed revolution, military culture has been a part of the American composition, waxing and waning in prominence as the country experienced consecutive periods of peacetime and war. The cultural values associated with the military, such as hierarchy, uniformity, order, utility, discipline, and patriotism are powerfully symbolized in the military landscape. Military values are also clearly expressed in the way the

land has been modified and built upon, both in an organizational and an aesthetic sense.

The overall landscape at Picatinny is industrial in appearance and use, as represented by the mission. The lack of planting and aesthetics of the majority of the landscape supports this finding. While areas have been cleared for construction and/or as firebreaks for the storage and manufacture of ammunitions, there is little landscape design that would demonstrate the cultural values of the military. Administration and residential areas, both for Picatinny Arsenal and the Navy Depot, do have some design and are located in historic districts.

3.5 Buildings and clusters

It is particularly important to look at industrial buildings, one of the most common building types at Picatinny, in their proper use settings. Many of the component structures of an industrial process are not significant in and of themselves, but they become vital in the larger industrial context. As a result, if the most important structures on an industrial or production line are missing, then the smaller structures become unimportant as a result of the loss of integrity. This distinction is also true for such industrial settings as mining operations.

As part of a 1985 Historic American Buildings Survey (HABS) study (Thurber et al.), detailed documentation and drawings were completed to explain the ammunition processes that were a part of Picatinny Arsenal over the years. These drawings are included to show the building cluster arrangement for each of the processes (Figure 20–Figure 25). These clusters of buildings were mission derived and depended on the presence and absence of railways, connecting corridors, fire and explosive safety, and loading and unloading capabilities to vehicles and/or railcars. Contributing to these building clusters and mission-based areas at Picatinny is the steam distribution system (see Section 3.5.12).

3.5.1 Buildings 1–99

These buildings are clustered southwest of the Administration and Research Historic District. These warehouse structures and magazines were either built after WWI or during WWII. Most are now used as administrative space. A 1985 HABS survey determined that these buildings were not eligible for the NRHP (Thurber et al. 1985).

3.5.2 Administration and Research Area (100 Area)

This area includes the Administration and Research Historic District as well as the residential, administrative, and laboratory areas of the installation. The landscape has been covered in a previous report, *Cultural Landscape Analysis of Existing Historic Districts: Picatinny Arsenal, NJ* (Adams et al. 2016).

3.5.3 200 Area, Shell Component Loading District

The 200 Area (Figure 21), “Shell Component and Loading Area” is located northwest of Reilly Road, from Sixth Ave to Tenth Street. Built after WWI for shell loading lines in 1918, after 1920 the lines were used for fuze assembly. The area also contains many WWII temporary buildings. Many of the buildings that were determined not eligible by the 1985 HABS survey (Thurber et al.) have been demolished.

3.5.4 300 Area, Storage

The 300 Area was primarily used for magazines and storehouses. This area includes several of the earliest magazines built at Picatinny including the first building the Arsenal constructed—Building 307, which was built in 1880. An original powder magazine, Building 307 still exists with its date stone still present. While the 300 Area remains as a large cluster of storage buildings, it was found that none of the buildings were significant architecturally nor do they have any distinctive historical merit (Nolte et al 1999a, 69). The rail lines connecting the buildings no longer exist.

3.5.5 400 Area, Gun Bag Loading District

The 400 Area (Figure 22) is located in the north-central portion of the installation between Buffington Road and Picatinny Lake. Original buildings in the area—Buildings 403, 404, and 424—were constructed in the early 1900s. Buildings 403 and 404 were built to store sodium nitrate, and Building 424 was built as a combustible cartridge case factory. Most of the other buildings were constructed after the 1926 explosion destroyed the buildings previously used for bag loading. The Gun Bag Loading Area originally included such buildings as a change house, bag loading houses, storage magazines, rest houses, weigh and mix houses, and cloth storage as well as dyeing and cutting and sewing houses. The remaining buildings are scattered throughout the area and make little or no reference to each other or to their original use, and they have been determined to be not eligible due to integrity (Nolte et al 2007, 4-26).

3.5.6 500 Area, Powder Factory and Power House District

The 500 Area's (Figure 23) power plant and former smokeless powder factory were located southeast of Picatinny Lake. The power plant was built in 1907, and provided steam and electricity to the installation. The smokeless powder factory was established in 1907 and rebuilt after the 1926 explosion. The factory produced propellant powder for WWI and WWII munitions. It operated until 1983. Most of the buildings were demolished in the 1980s due to contamination. In 2007, only 17 of the 60 buildings remained, and the area was determined to be not eligible due to lack of integrity (Nolte et al. 4-36).

3.5.7 600 Area, Test Areas District

The 600 Area (Figure 24) is a historic district, and its buildings are covered in more depth within *Cultural Landscape Analysis of Existing Historic Districts: Picatinny Arsenal, NJ* (Adams et al. 2016). The testing areas and ranges in the 600 area are inventoried further in this chapter.

3.5.8 800 Area, Complete Rounds/Melt Loading District

Located along the north side of Picatinny Lake, the 800 Area (Figure 25) was constructed in 1930. The buildings form a straight line to provide for a smooth flow of materials and explosives from building to building under covered walkways. This area was established to load, assemble, and pack for shipment various calibers of complete rounds, shells, and fragmentation and demolition bombs. Many of the original buildings are derelict, and others have been heavily modified. Loading is still the main use for a few of the buildings in the area such as Buildings 810 and 816. It was determined in 1999 that the plant no longer has integrity (Nolte et al. 1999a, 4-48).

Figure 20. Overall map of PICA showing manufacturing and testing areas, 1983 (Library of Congress).

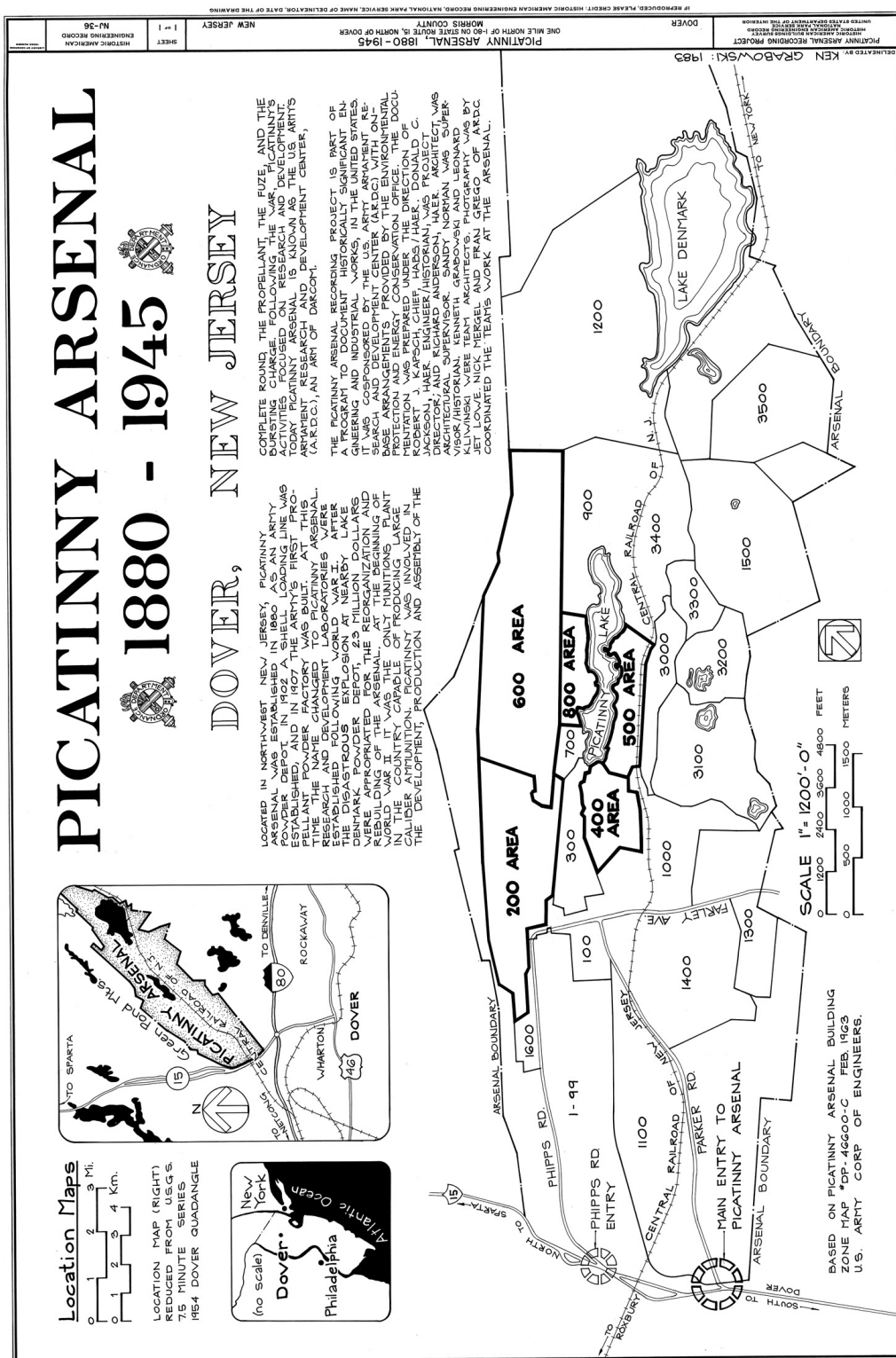


Figure 22. Map of 400 Area from HABS documentation, 1983 (Library of Congress).

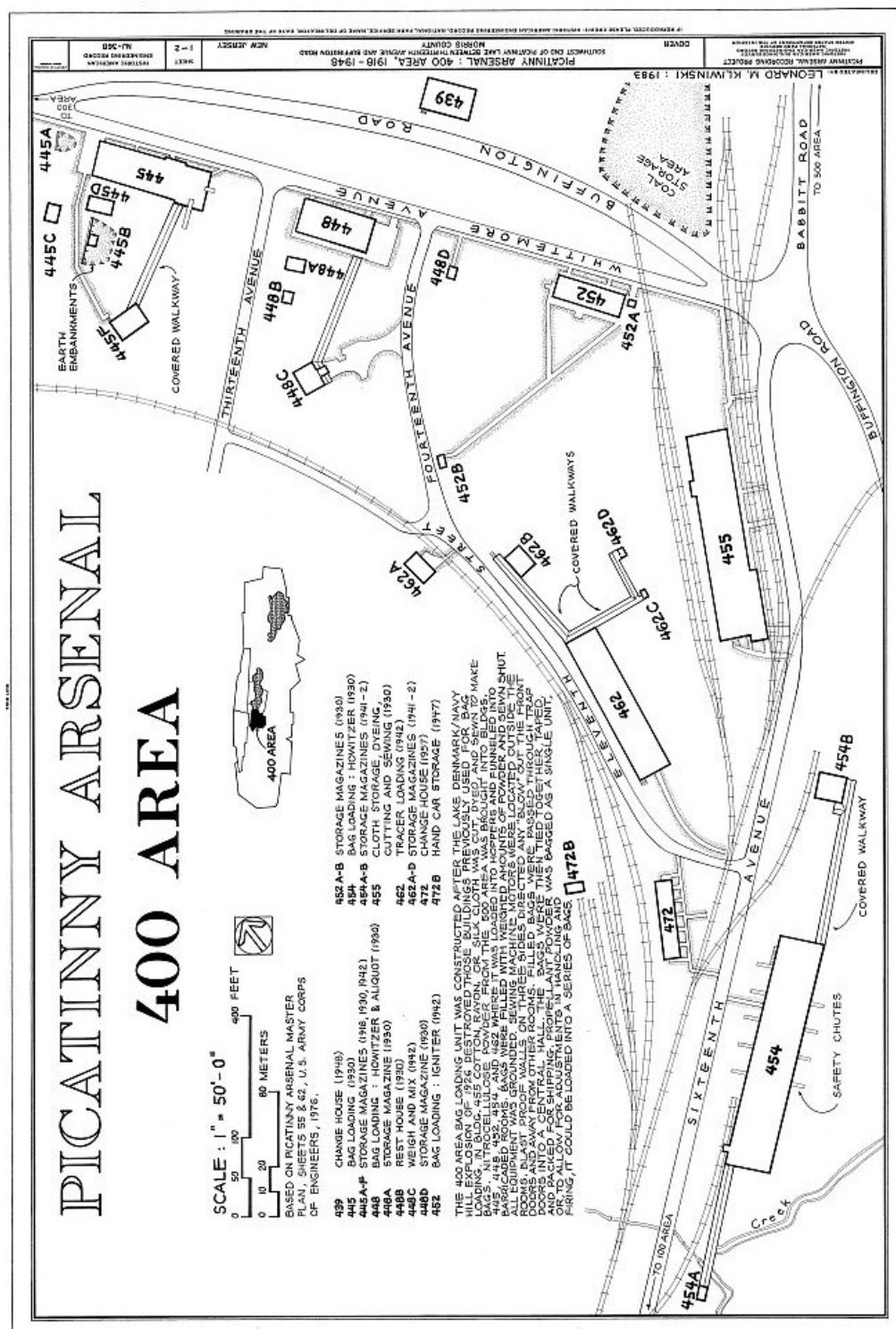


Figure 23. Map of 500 Area from HABS documentation, 1983 (Library of Congress).

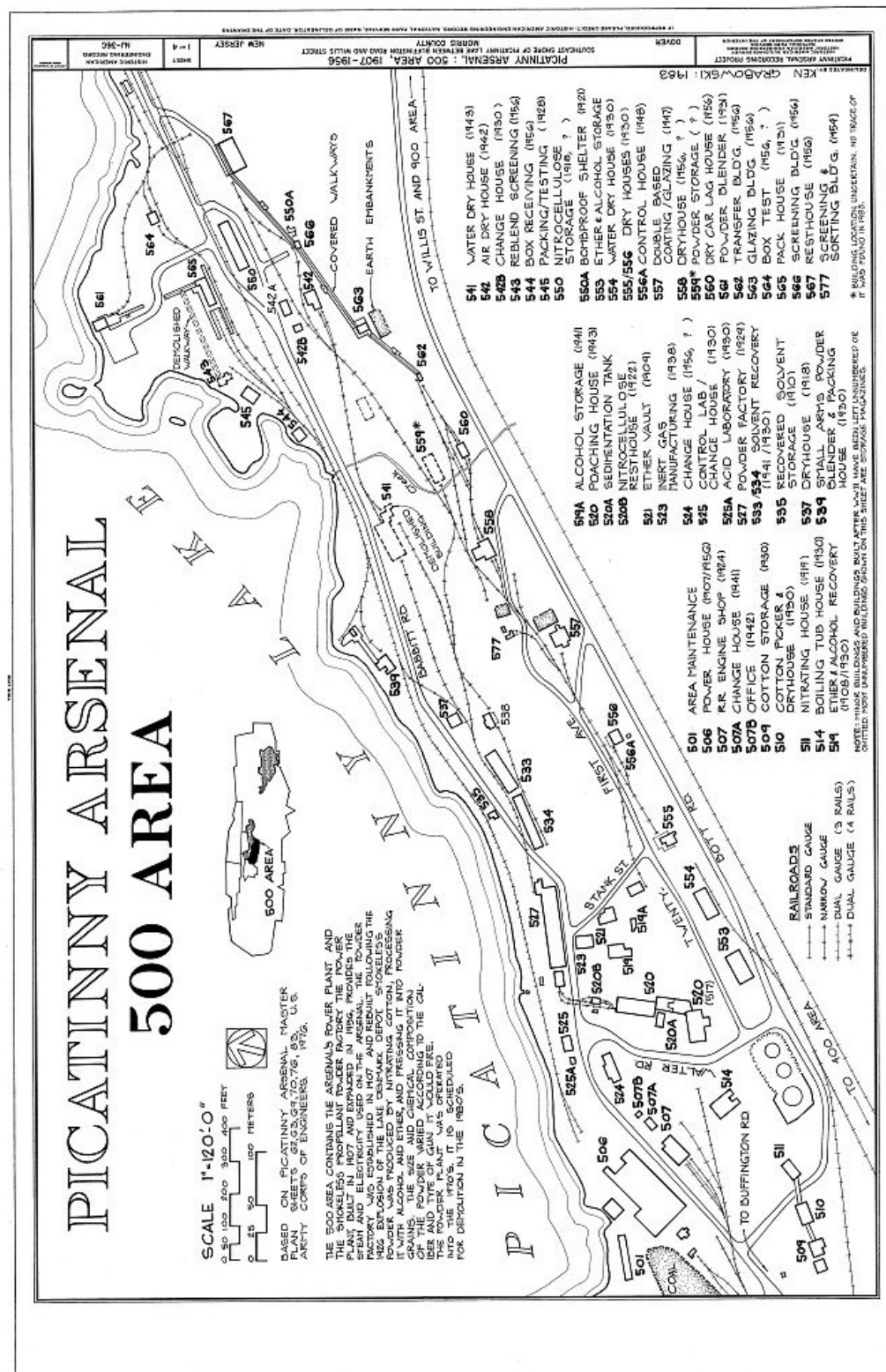


Figure 24. Map of 600 Area, 1983 (Library of Congress).

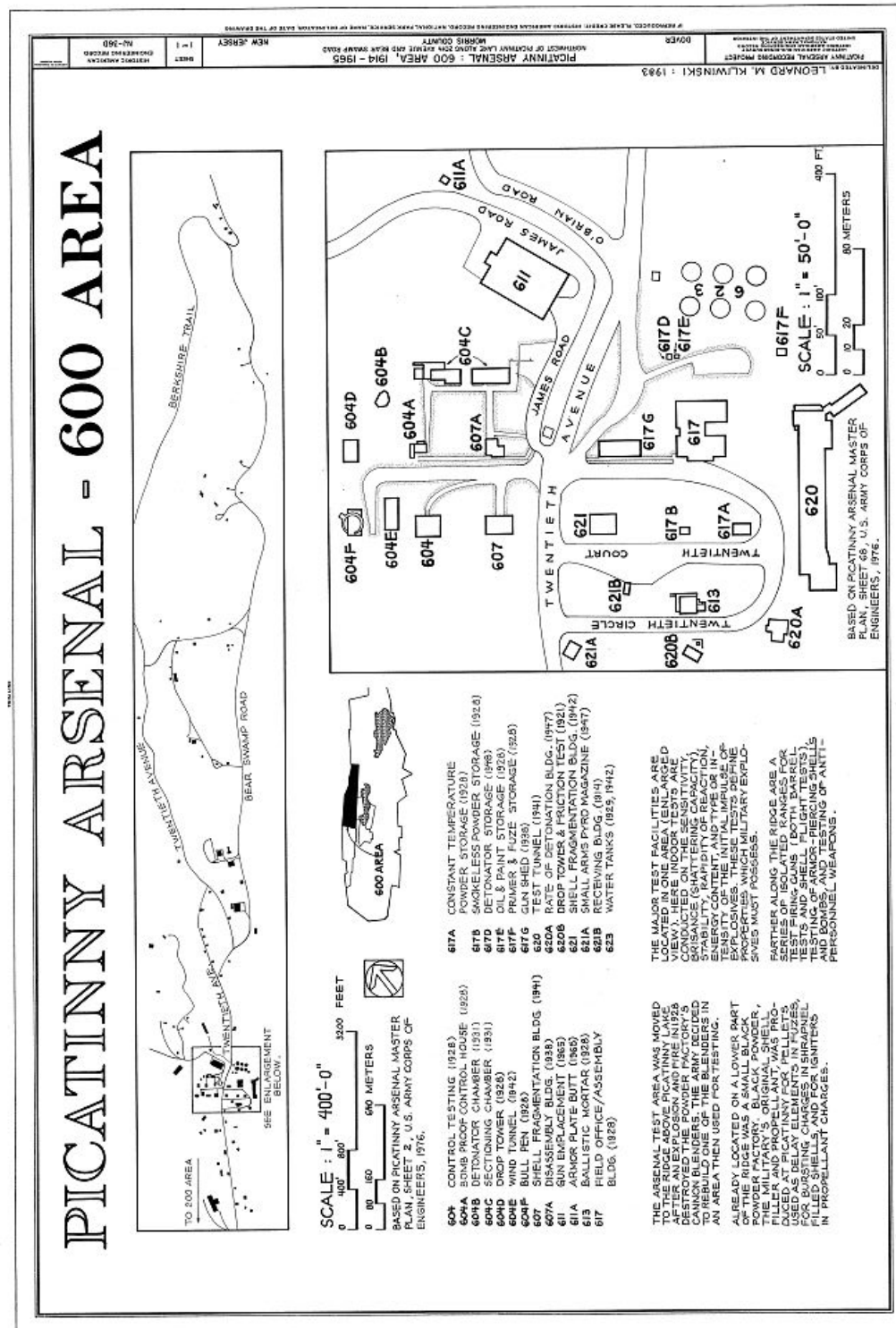
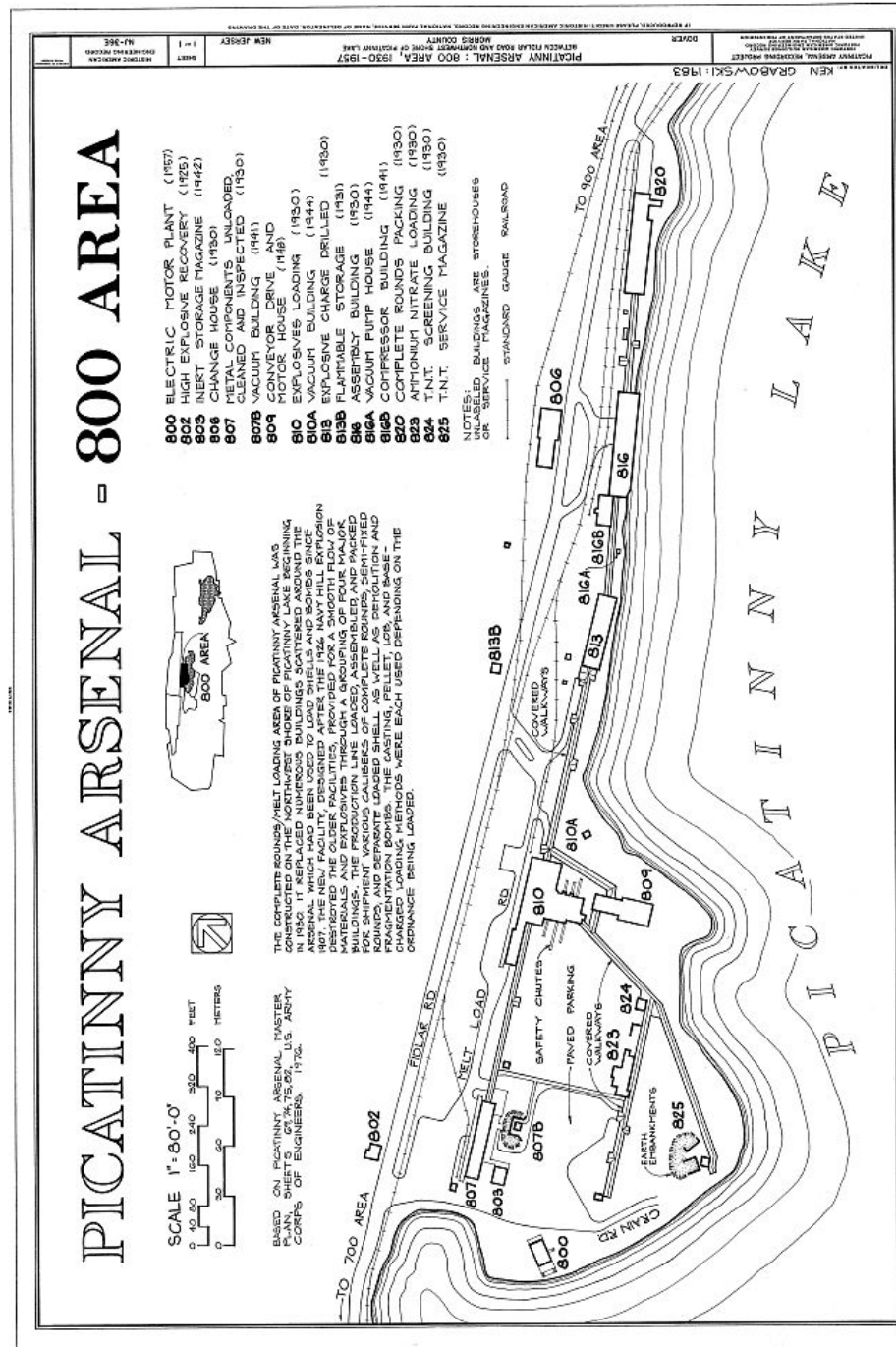


Figure 25. Map of 800 Area, 1983 (Library of Congress).



3.5.9 900 Area

This magazine area (e.g., Figure 26 and Figure 27) is located east of Picatinny Lake. Built during 1918–1920s, these magazines were constructed to store materials necessary for the production of explosives but were later adapted for

the storage of surplus ammunition following WWI. . These storage areas were determined not eligible in a 1999 architectural survey (Nolte et al. 1999a, 40).

Figure 26. Building 940, magazine (ERDC-CERL, 2013).



Figure 27. Building 927, magazine (ERDC-CERL, 2013).



3.5.10 1200 Area

This magazine area is located north of Lake Denmark as an igloo storage area which was built at the end of WWII. Two new igloo storage buildings were constructed among the historic and fit into the landscape (Buildings 1215 and 1216). These storage buildings (Figure 28 and Figure 29) were found not eligible in a 1999 architectural survey (Nolte et al. 1999a, 40).

Figure 28. Building 1208, storage igloo (ERDC-CERL, 2013).



Figure 29. Building 1215, newer storage igloo (ERDC-CERL, 2013).



Figure 30. Remnant track throughout 1200 area (ERDC-CERL, 2013).



3.5.11 Navy Hill

This area has been covered in another report, *Cultural Landscape Analysis of the Former Lake Denmark Naval Ammunition Depot at Picatinny Arsenal* (Huggan 2015), which identifies the newly established Former Lake Denmark NAD Historic District (Figure 31). Additionally, Building 3250 (built in 1890 for the Naval Commanding Officer; Figure 32) and Building 3316 (built in 1903 as a stable; Figure 33) were determined eligible to the NRHP in an earlier HABS survey (Thurber et al. 1985).

Figure 32. Building 3250 (ERDC-CERL, 2013).



Figure 33. Building 3316 (ERDC-CERL, 2013).



3.5.12 Steam distribution system

The steam distribution system is a network of metal or asbestos-protected metal (APM) conduit that runs above and below ground from the power plants throughout PICA (Figure 34 and Figure 35). A centralized system of steam throughout Picatinny Arsenal and the Lake Denmark NAD provided a source of heating and allowed production facilities throughout the installation to use pressurized steam as a sparkless form of energy. The steam was created as a by-product of electricity production at the Power Plant (Building 506) that was built in 1906 and the Boiler House (Building 3013) that was built in 1901. Water from Picatinny Lake was heated, and the resulting steam was forced through turbines to produce energy. Pressurized steam was then sent to production facilities via conduit. On-site buildings were fitted with pressure-reducing valves and steam-powered equipment, which reduced the risk of explosion. Overall, the steam distribution system consists of a network of conduit, supporting structures, and pressure-reducing valves (Figure 36). Most of the system that was visible has been replaced, but there are remnants of an earlier system visible in the 200, 400, 500, 600, and 800 Areas. These steam lines are a major architectural element important to these industrial areas, just like the rail lines.

The steam lines as a whole were determined not eligible in 1999 (Nolte et al. 1999a). Most are proposed for demolition and removal, even in the historic districts; the only ones planned to remain are in energetic areas such as the labs and test areas where they are still utilized.

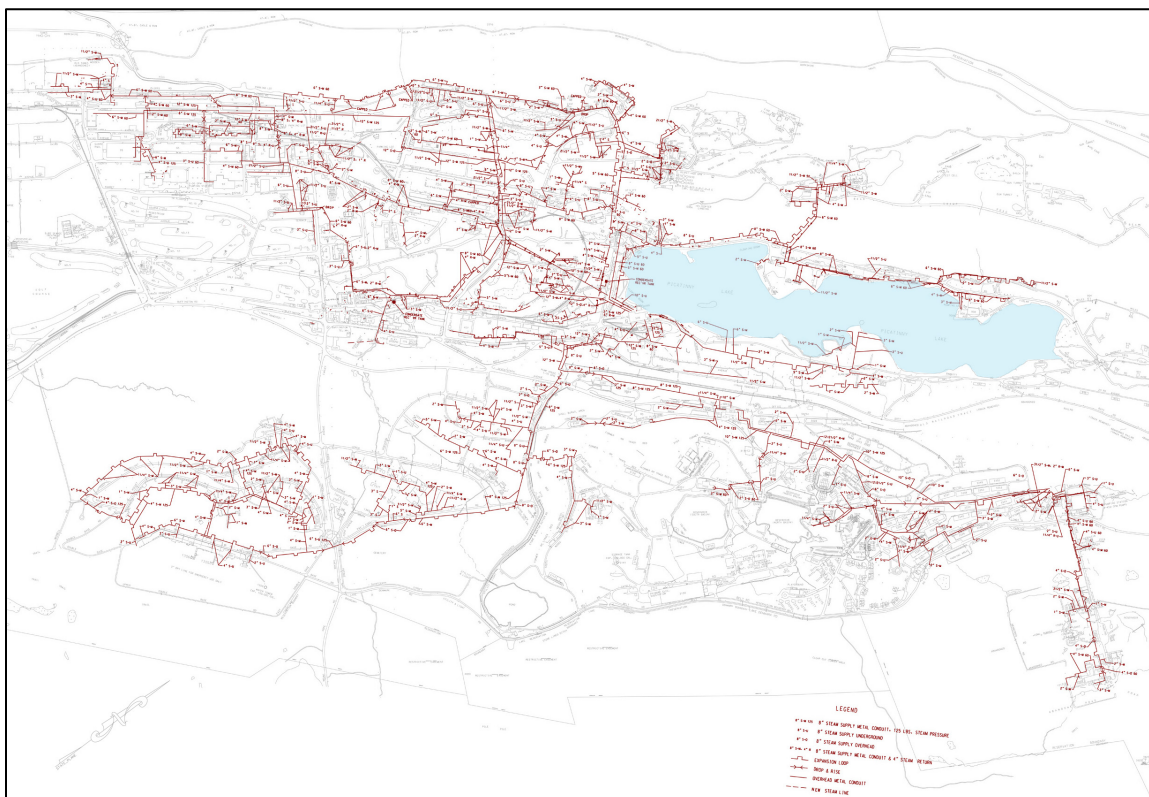
Figure 34. Steam piping and air piping across creek at Whittmore Ave, circa 1958 (PICA Cultural Resources).



Figure 35. Relocating outside steam lines, date unknown (PICA Cultural Resources).



Figure 36. Map of steam lines, 2009 (PICA Cultural Resources).



3.6 Vegetation

Planted areas at PICA occur generally in the administration and residential areas. Landscaping on post includes quarters, administrative buildings, community facilities, areas requiring vegetative screening, and roadside beautification. Landscaping includes mainly foundation planting and street trees. The largest and most visible landscaped area on post is the centrally located golf course.

The installation is approximately 70 percent forested. The forest is a result of ecological succession of land previously farmed or cleared, as well as more recent selective logging. Most of the forested portion is in second-growth stages, having been logged historically. Most is mixed-oak forest type. The majority of the remaining forest today is used as a protective buffer (along with the natural topography) from the adjacent communities (e.g., heavily wooded areas past the 1200 Area).

In the testing, manufacturing, and storage areas of the installation, areas have been clear cut of trees and shrubs; anything that could burn or get in the way of testing was removed. The bare ground was likely seeded to prevent erosion, with

everything else cut down. The majority of these areas that are not in use today have become overgrown.

3.7 Views and vistas

Besides the historic views throughout the Administration and Research Historic District and along the entrance to Picatinny, historic views existed from Picatinny Peak looking back at the Historic District and from the historic standpipe (no longer extant) at Navy Hill (Figure 37 and Figure 38).

Figure 37. Historic view from standpipe at Navy Hill, circa 1918 (NARA).



Figure 38. Historic view from standpipe at Navy Hill, 1918 (NARA).



3.8 Small-scale features

When the arsenal transferred 315 acres to the Navy for the construction of magazines in 1891, a wall and gates were built to separate the Naval Powder Depot from Picatinny Arsenal (Figure 39 and Figure 40). By 1936 plans note the fence as a “non-climbable fence on concrete wall” (Figure 41). Today, the gate and portions of the wall still exist along portions of Lake Denmark Road.

Figure 39. Navy Gate along Main Road, circa early 1900s (Picatinny Cultural Resources). No longer extant, the gate existed near Building 1095.

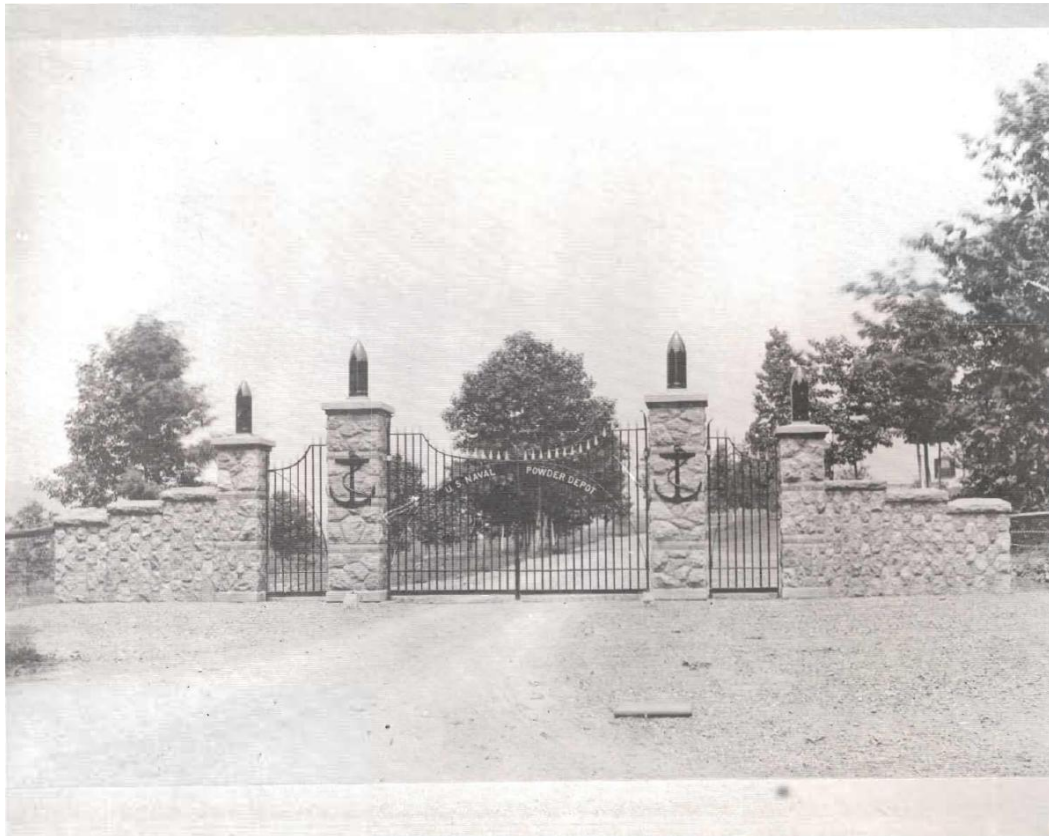


Figure 40. Navy Hill perimeter wall south of Main gate, 1915
(Picatinny Cultural Resources).



Figure 41. Painting fence, 1933 (NARA 71-CA-213 Lake Denmark folder).



As a part of the development and testing processes that take place at PICA, the installation stores various types of ammunition and explosives in specially designed bunkers. The storage and testing of ammunition and explosives creates safety and security issues that limit access and restrict the use of certain parts of the land base. Fencing is a large part of limiting and restricting access.

Today, over half the installation is enclosed with chain-link fence (e.g., Figure 42). Many of the testing areas have gates to restrict vehicular access, and many have remnant fencing along the perimeter of the area.

Figure 42. Perimeter fence north of Bear Swamp Road (ERDC-CERL, 2013).



3.9 Landscape inventory of testing areas

3.9.1 Test Range 670

Test Range 670 is located at the end of Bear Swamp Road. Building 670, built in 1955/1958, is a firing stand with a dark room. Site features include Building S673, entrance road, parking area, and many moveable test firing structures (Figure 43–Figure 49).

Figure 43. Entrance road to Test Range 670 (ERDC-CERL, 2013).



Figure 44. Building 671, magazine (ERDC-CERL, 2013; demolished Spring 2015).



Figure 45. Building S673, Electronic Equipment Facility (ERDC-CERL 2013).



Figure 46. Parking area at Test Area 670 (ERDC-CERL, 2013).



Figure 47. Looking back at parking lot of Test Area 670 (ERDC-CERL, 2013).



Figure 48. Moveable test firing structures at Test Area 670 (ERDC-CERL, 2013).



Figure 49. Test firing structure at Test Area 670 (ERDC-CERL, 2013).



3.9.2 Test Range (Building 650)

Building 650 and associated firing range are located in Bear Swamp Area #3. Building 650 was built in 1957 and used as an Electronic Equipment Facility Personnel Building. Site features include Building 650, entrance road, parking

area, and many moveable test firing structures (Figure 50–Figure 55). A small wooden test stand was added to the site in late 2015, but is slated for removal as it is considered temporary. It was previously determined that Building 650 has no architectural or historical significance, and is not eligible for the NRHP (Nolte et al. 2007, 4–81). The associated open firing range does not have integrity without the associated building.

Figure 50. Parking lot and Building 650 (ERDC-CERL, 2013).



Figure 51. Firing area (ERDC-CERL, 2013).



Figure 52. Firing area (ERDC-CERL, 2013).



Figure 53. Smoking hut (ERDC-CERL, 2013).



Figure 54. Flag pole (ERDC-CERL, 2013).



Figure 55. Looking back at parking area and Building 650 (ERDC-CERL, 2013).



3.9.3 Test Area (Building 649)

Building (or Structure) 649 is listed as an Ordnance Facility Barricade located in Bear Swamp Area #3. This building was listed as “not found” on the 2007 Panamerican study due to overgrowth in the area (Nolte et al. 2007, B-8). Built in 1953/1957, it is listed as not eligible to the NRHP. Site features include Building 649, entrance road, parking area, and many moveable test firing structures (Figure 56–Figure 60).

Figure 56. Parking area and Building 649 (ERDC-CERL, 2013).



Figure 57. Building 649 (ERDC-CERL, 2013).



Figure 58. Rear of firing structure, Building 649 (ERDC-CERL, 2013).



Figure 59. Firing area (ERDC-CERL, 2013).



Figure 60. Flag pole at road entrance (ERDC-CERL, 2013).



3.9.4 Test Range 647

This test range is named the Guns & Weapons Systems Tech Data Facility and includes Building 642, slug butt, and Buildings 643 and 645—all newly constructed (Figure 61–Figure 69). Previous reports noted that former Buildings

642 and 643 were built in 1957 and were demolished (Nolte et al. 2007, B-8). The new buildings, concrete slab, and walkways exist over what was the former test range landscape.

Figure 61. Building 643 (ERDC-CERL, 2013).

Image removed for security purposes.

Figure 62. Entrance road to Test Range 647 (ERDC-CERL, 2013).



Figure 63. Building 642 (ERDC-CERL, 2013).



Figure 64. Targets for Test Range 647 (ERDC-CERL, 2013).



Figure 65. View toward Building 642, Observation Facility, in rear (ERDC-CERL, 2013).

Figure 66. Building 645 (ERDC-CERL, 2013).

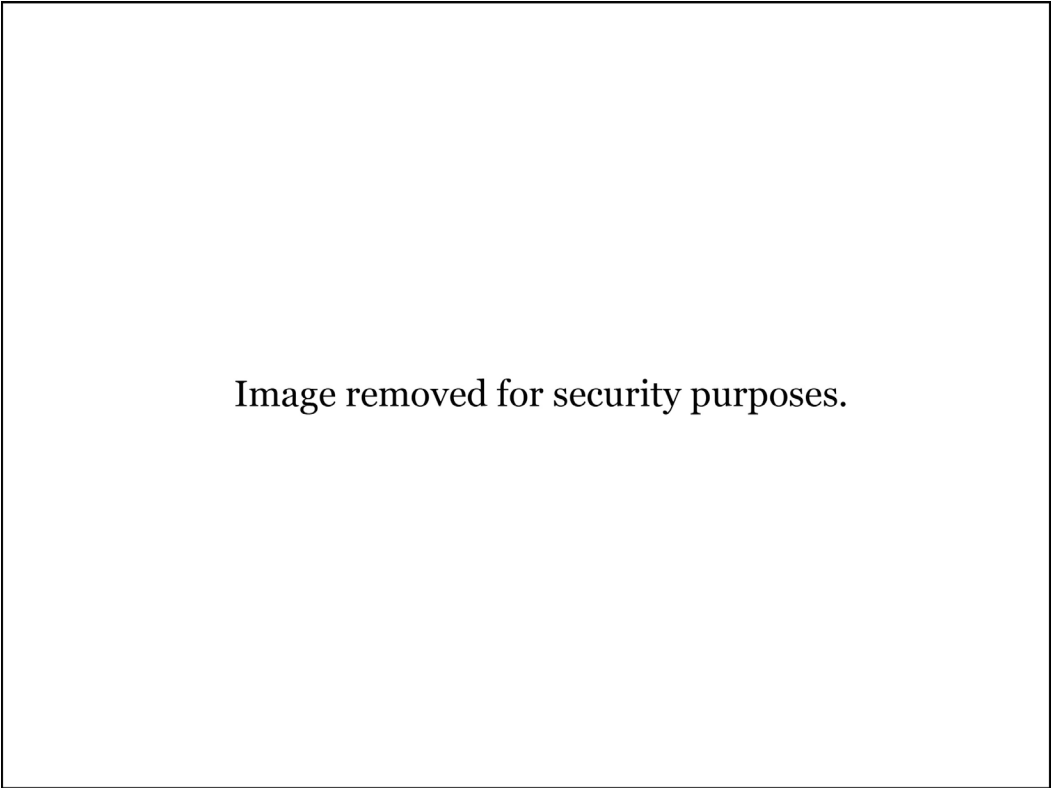


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Figure 67. Walkway between Building 643 and Building 645 (ERDC-CERL, 2013).

Image removed for security purposes.

Figure 68. Testing flag located at entrance to Test Range 647 (ERDC-CERL, 2013).



Figure 69. Gate and light at entrance to Test Range 647 (ERDC-CERL, 2013).



3.9.5 Test Area 1

Test Area 1 is located off James Road. Building 616 was constructed in 1963 and was previously used as an ordnance test facility. Features include Building 616, entrance road and parking areas, smoking shelter, flag and siren poles, and firing

area (Figure 70–Figure 74). A structure has been proposed as a covering for the firing area itself since 2009, but has yet to be funded or built. A previous report found Building 616 to be lacking architectural or historical significance (Nolte et al 2007, 4-69). Therefore, the landscape is not significant either.

Figure 70. Building 616, Ordnance Facility (ERDC-CERL, 2013).



Figure 71. Entrance road to Test Area 1 (ERDC-CERL, 2013).



Figure 72. Firing structure at Test Area 1 (ERDC-CERL, 2013).



Figure 73. Firing area at Test Area 1 (ERDC-CERL, 2013).



Figure 74. Rear of building (ERDC-CERL, 2013).



3.9.6 Experimental Test Facility (Building 606)

Located just off James and Deavy Roads, Building 606 was previously used as an ordnance facility and experimental testing facility. It was built in 1960. Landscape features just include the Building 606, entrance road, smoking structure, and parking lot (Figure 75–Figure 77).

Figure 75. Building 606 (ERDC-CERL, 2013).

Image removed for security purposes.

Figure 76. Parking lot (ERDC-CERL, 2013).



Figure 77. Parking lot (ERDC-CERL, 2013).



3.9.7 Unnamed Test Area (Buildings 614 and 615)

Off James and Greenburg Road is an unnamed test area. Landscape features included Buildings 611C, 614, and 615 (until they were demolished in 2015 per the RPMP FRP PA) and an unnumbered firing structure (Figure 78–Figure 82). Building 614 was previously used as a general purpose warehouse, and Building 615 was an ordnance facility and fire control brigade turret. Both were built in 1958. No information was found on 611C. A previous report found the buildings in poor condition and lacking architectural or historical significance (Nolte et al 2007, 4-69). Without these original buildings, the landscape has no integrity.

Figure 78. Entrance road (ERDC-CERL, 2013).



Figure 79. Building 614, General Purpose Warehouse (ERDC-CERL, 2013).



Figure 80. Unnumbered firing structure (ERDC-CERL, 2013).



Figure 81. Building 611c (ERDC-CERL, 2013).



Figure 82. Building 615, Gun Turret (ERDC-CERL, 2013).



3.9.8 Ordnance Test Area (Building 654)

Building 654 is located off Bear Swamp Road. A former ordnance facility control bunker, it was built in 1963. Other landscape features include smoking hut, lighting and/or siren pole, remnant fencing, an open firing area with firing stands and targets, and the parking area (Figure 83–Figure 88). The operation building is without architectural or historical significance and, therefore, not eligible for listing to the NRHP (Nolte et al. 2007, 4-74). The firing range is typical of the type and has no architectural or historical significance.

Figure 83. Building 654, Control Bunker (ERDC-CERL, 2013).



Image removed for security purposes.

Figure 84. Rear of Building 654, Control Bunker (ERDC-CERL, 2013).

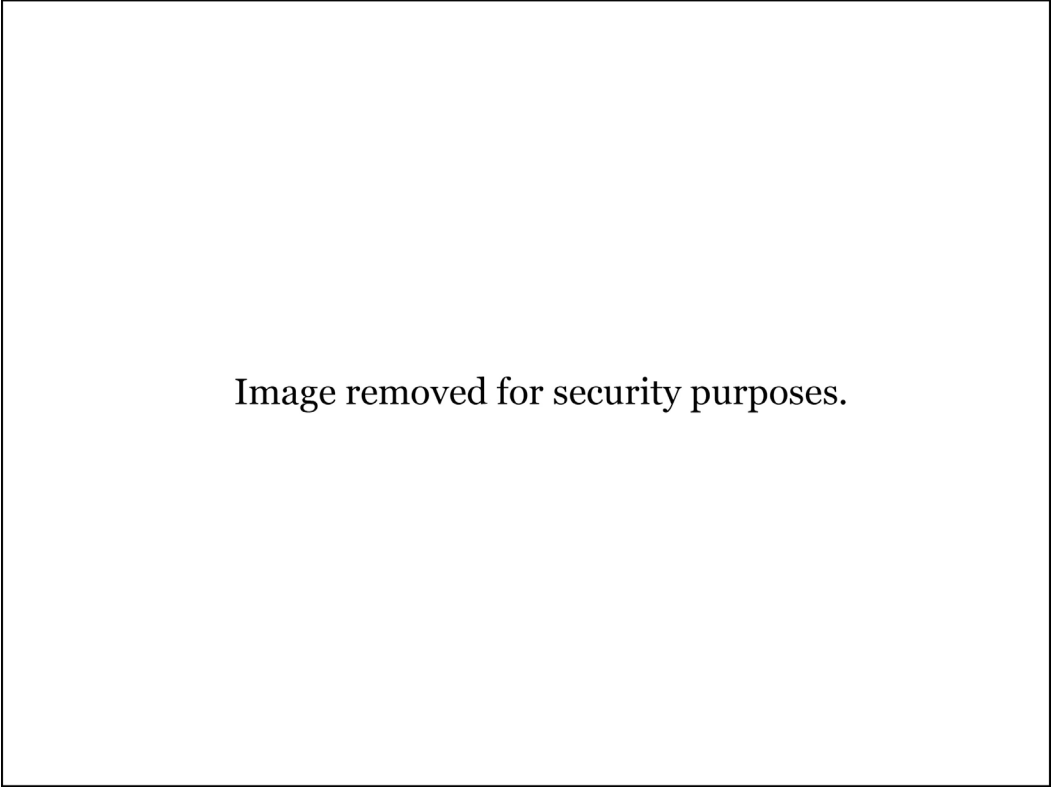


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Figure 85. Lighting and/or siren (ERDC-CERL, 2013).



Figure 86. Firing area (ERDC-CERL, 2013).



Figure 87. Fencing (ERDC-CERL, 2013).



Figure 88. Smoking hut (ERDC-CERL, 2013).



3.9.9 Bear Swamp Testing Facility

The Bear Swamp Testing Facility is located along Bear Meadows Road and Stickle Road. Stickle Road is a circular loop road off Bear Swamp Road. This area contains Buildings 619, 622, 625, 627, 630, 631, and S634. (Figure 89–Figure 97). All buildings were built between 1945 and 1965, although Real Property dates the slug butt to 1930. Building 630 was an administration building located across the street on Bear Swamp Road, and it was demolished in 2013 after this survey was completed. A previous report determined this area typical of those within the Ordnance Test Area at Picatinny, and the buildings are without architectural or historical significance (Nolte et al 2007, 4-74).

Adjacent to the Stickle Road Loop is a large open firing area. A long firing structure that was constructed and installed in 2007 (Figure 98) bisects the open space. The space is filled with small, unmade storage buildings and boxes, as well as the metal firing targets. Buildings 640 and 644 (Figure 99 and Figure 101) were determined to not have architectural or historical significance (Nolte et al. 2007, B-8). A testing structure and other associated structures are shown in Figure 100 and Figure 102.

Figure 89. Stickle Road (ERDC-CERL, 2013).



Figure 90. Structure S634, derelict slug butt (ERDC-CERL, 2013).



Figure 91. Building 619, High Explosive Magazine (ERDC-CERL, 2013).



Figure 92. Building 622, Pyrotechnic Magazine (ERDC-CERL, 2013).



Figure 93. Building 627, High Explosive Magazine (ERDC-CERL, 2013).



Figure 94. Building 625 (ERDC-CERL, 2013).



Figure 95. Building 630, Administration (ERDC-CERL, 2013; demolished during summer-fall 2013).



Figure 96. Building 631, Ordnance Facility Conditioning Building (ERDC-CERL, 2013).

Image removed for security purposes.

Figure 97. Rear of Building 631 (ERDC-CERL, 2013).

Image removed for security purposes.

Figure 98. Open firing area in Bear Swamp Area #3 (ERDC-CERL, 2013).



Figure 99. Building 644, Magazine (ERDC-CERL, 2013).



Figure 100. Testing structure (ERDC-CERL, 2013).

Image removed for security purposes.

Figure 101. Building 640 (ERDC-CERL, 2013).



Figure 102. Associated structures (ERDC-CERL, 2013).



3.9.10 Davidson Advanced Warhead Test Facility (Building 660)

Building 660 is a recently built addition to the landscape (Figure 103) along with the new entrance, gate and parking area. This landscape is not yet 50 years of age.

Figure 103. Building 660 (ERDC-CERL, 2013).



Image removed for security purposes.

3.9.11 Former 641 Testing Area

A few features remain from the former 641 Testing Area landscape including remnant chain-link fencing, Building 641B, and a metal tower structure (Figures Figure 104-Figure 106). Most of the 641 Area is proposed for demolition under the RPMP FRP PA, with 641B already demolished in Spring 2015.

Figure 104. Remnant fencing at rear of former 641 Testing Area (ERDC-CERL, 2013).



Figure 105. Remnant tower structure (ERDC-CERL, 2013).



Figure 106. Building 641B (ERDC-CERL, 2013; demolished Spring 2015).



3.9.12 Quarry

A former quarry, located behind Building 806 along Fidler Road, has been identified as Site 28Mr361 (Figure 107-Figure 109). The quarry provided the stone that was used for the foundations, windows sills, and lintels of most of the earliest buildings. A 1931 history of Picatinny Arsenal noted that “Two quarries were opened about a mile from the magazine, and roads built to them. The conglomerate was abandoned and considerable stone was taken out of these quarries, and hauled and built in the foundation...corners, sills, and door jambs. The stone was laid in pure cement mortar.” (Rogers 1931, 58). The second quarry mentioned in Rogers (1931) has not been located to date.

Also located just west of this area, is a man-made cave that Picatinny created in the 1920s when they used to fire ammunition rounds into the mountainside from the old Proving Grounds that was located in the 500 Area (Figure 110). This practice was discontinued after the 1926 explosion when all test areas were contained on the 600 Hill and the Gorge. Noted on a 1920/1922 map, the cave can be seen from Building 3013 along Navy Hill during the winter season when the leaves are off the trees.

Figure 107. Photograph of former quarry site (PICA Cultural Resources, 2015).



Figure 108. Photograph of former quarry site (PICA Cultural Resources, 2015).



Figure 109. Photograph of former quarry site (PICA Cultural Resources, 2015).



Figure 110. Photograph of man-made cave used for firing (PICA Cultural Resources, 2015).



3.9.13 Gorge Road Testing Area

The Gorge Road Testing Area is used for the detonation of UXOs found on post, as an open test area, and contains a depleted uranium site to the east that is proposed by the Nuclear Regulatory Commission for removal in 2017. The firing area is littered with steel firing targets. Landscape features include Buildings 1222, 1222C, 1222D, 1222E, 1224, and a metal bridge to Building 1222 (Figure 111–Figure 116). Building 1222D is a slug butt, and Building 1222C is an explosive barrier blast wall and defector. Building 1222E and Building 1224 are covered shelters, with Building 1222E newly constructed. Building 1222, built in 1946, is an electrical equipment facility. The majority of the area was determined not eligible in 2007 (Nolte et al, 4-158).

Figure 111. Entrance to Gorge Road Testing Area and Building 1224 (ERDC-CERL, 2013).



Figure 112. Building 1222E (ERDC-CERL, 2013).



Figure 113. Building 1222D, slug butt (ERDC-CERL 2013).



Figure 114. Bridge to Building 1222 (ERDC-CERL, 2013).



Figure 115. Building 1222, Electrical Equipment Facility (ERDC-CERL, 2013).



Figure 116. Blast wall on left (ERDC-CERL, 2013).



3.9.14 Flight Ballistic Test Range

The Flight Ballistic Test Range is located in the northern tip of Picatinny Arsenal. The range spans Gorge Road with the firing area and 500 m impact area to the east of Gorge Road, and the 900 m impact area and slug butt to the west. It appears not in use today, but several key features remain of the landscape (Figure 117–Figure 123). Most notable of these features are Building 1241 (a magazine) and Building 1242A (a slug butt). Another structure and a switch box are in disrepair. Building 1242A was listed as not found and not eligible during the 2007 architectural survey (Nolte et al. 2007, B-12), and Building 1241 was not surveyed. While sections of the firing line by Building 1241 appear to be recently mowed (not in successional growth), the view is now obstructed to the slug butt and the landscape lacks integrity.

Figure 117. Flight Ballistic Test Range from 1962 map (PICA Drawing Vault).

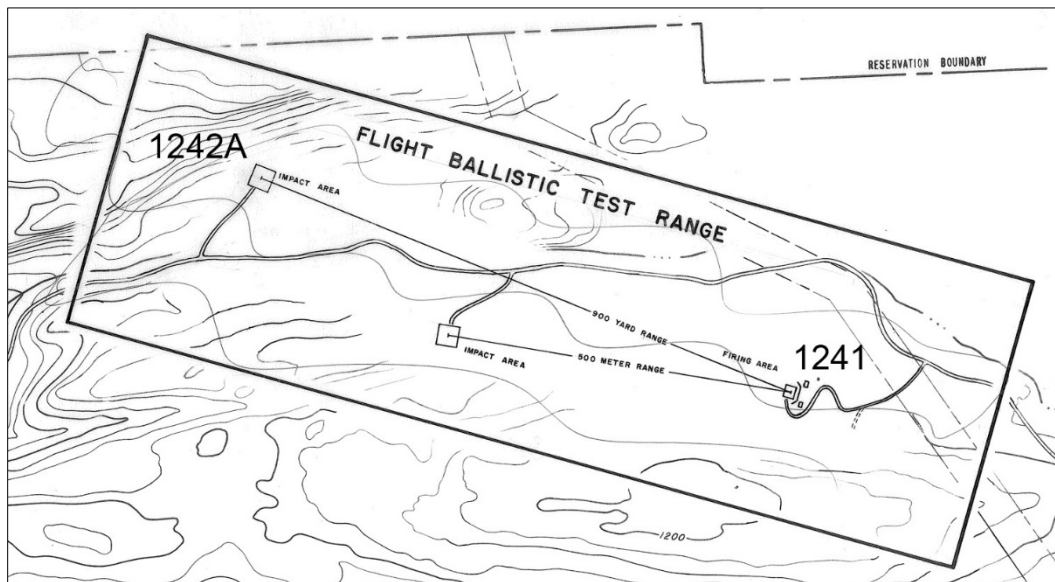


Figure 118. Structure 1241 at Flight Ballistic Test Range (ERDC-CERL, 2013).



Figure 119. View from firing point to impact area (ERDC-CERL, 2013).



Figure 120. Looking back up at firing point from 500-meter impact area (ERDC-CERL, 2013).



Figure 121. Remnant switch box at Flight Ballistic Test Range (ERDC-CERL, 2013).



Figure 122. Remnant structure at Flight Ballistic Test Range (ERDC-CERL, 2013).



Figure 123. Looking back up at firing point from firing line (ERDC-CERL, 2013).



Figure 124 Target butt, Building 1242A (ERDC-CERL, 2013).



Figure 125. View of impact area (ERDC-CERL, 2013).



Figure 126. Side view of 900 m impact area (ERDC-CERL, 2013).



4 Landscape Evaluation

When the majority of this landscape evaluation occurred in 2012–13, Picatinny Arsenal contained five historic districts that had been ruled eligible for inclusion in the NRHP: the Administration and Research District, the 600 Ordnance Testing District, the Rocket Testing Area (1500), NARTS Test Area D, and NARTS Test Area E.⁵ Since then, the Former Lake Denmark NAD has been added as an eligible historic district through the completion of that area’s landscape analysis. This district also includes the Navy Commanders Quarters (Building 3250) and its accompanying stable (Building 3316, now a firehouse), which are individually eligible for the NRHP.

4.1 Determination of eligibility for the overall landscape

The identification of historically significant properties is achieved through the evaluation of their position within the larger historic context. According to the NRHP, historic contexts are defined as “...the patterns, themes, or trends in history by which a specific occurrence, property, or site is understood and its meaning (and ultimately its significance) within prehistory or history is made clear” (NPS 1997a). A historic property is determined significant or not significant based on the application of standardized National Register Criteria within the property’s historical context.

4.1.1 Criteria for evaluation

The NRHP Criteria for Evaluation describe how properties and districts are significant for their association with important events or persons (Criterion A and Criterion B), for their importance in design or construction (Criterion C), or for their information potential (Criterion D). The following is a brief description of each of the four NRHP Criteria for Evaluation (excerpted from NPS 1997a):

A. Event—associated with events that have made a significant contribution to the broad patterns of our history; or

B. Person—associated with the lives of persons significant in our past; or

C. Design/Construction—embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a

⁵ NARTS Test Area E was demolished in 2015.

master, or that possess high artistic values, or that represents a significant and distinguishable entity whose components may lack individual distinction; or

D. Information Potential—yielded, or is likely to yield, information important in prehistory or history.

4.1.2 Aspects of integrity

In addition to possessing historical significance, in order to be eligible to the NRHP, a property must also retain sufficient physical integrity of features to convey its significance (NPS 1997a, 44–45).

Historic properties both retain integrity and convey their significance, or they do not. Within the concept of integrity, the National Register criteria recognize seven aspects or qualities that, in various combinations, define integrity.

To retain historic integrity, a property will always possess several, and usually most, of the seven aspects. The retention of specific aspects of integrity is paramount for a property to convey its significance. Determining which of these aspects are most important to a particular property requires knowing why, where, and when the property is significant.

Districts and individual resources are considered to be significant if they possess a majority of the following seven aspects of integrity (NPS 1997a, 44–45):

- *Location.* Location is the place where the historic property was constructed or the place where the historic event occurred.
- *Design.* Design is the combination of elements that create the form, plan, space, structure, and style of a property. It results from conscious decisions made during the original conception and planning of a property (or its significant alteration) and applies to activities as diverse as community planning, engineering, architecture, and landscape architecture. Design includes such elements as organization of space, proportion, scale, technology, ornamentation, and materials.
- *Setting.* Setting is the physical environment of a historic property. Setting refers to the character of the place in which the property played its historical

role. It involves how, not just where, the property is situated and its relationship to surrounding features and open space.

- *Materials.* Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- *Workmanship.* Workmanship is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- *Feeling.* Feeling is a property's expression of the aesthetic or historic sense of a particular time period.
- *Association.* Association is the direct link between an important historic event or person and a historic property.

4.1.3 Previous studies

In 2007, Panamerican completed a study of 318 buildings in the manufacturing, testing, and storage areas at PICA (Nolte et al. 2007). This study found that only the 1500 Area Army Rocket Test Area was eligible for the National Register. The report stated, to be placed in the NRHP, a building must be significant, and it must have integrity.

The military factory is quite different from the nonmilitary factory. Clearly, integrity is lost when a structure has been allowed to deteriorate or has been severely damaged by weather or fire/explosion, and a few structures at Picatinny are in such a state. In Picatinny's case, a number of these buildings have been left to deteriorate because of the excessive levels of toxic chemicals found in and around them, a not uncommon occurrence on properties associated with industrial processes. This is especially true of structures that have endured intensive, potentially destructive, past uses that have contributed to their present dilapidation. Integrity also can be lost when a structure has been changed beyond recognition or has been moved or when the environment of a structure has been changed. In addition, many buildings and structures were left to deteriorate due to their particular mission leaving the installation or facility; therefore, funds were no longer available for upkeep of those particular buildings.

Setting is the physical environment of an historic property. While location refers to a specific place where a structure was built or an event occurred, setting refers

to the character of the place. It involves how, not just where, the property is situated and its relationship to surrounding features and open space. Setting reflects the basic physical condition under which a property was built and the functions it was intended to serve.

A great many structures at PICA that were associated with industrial process have lost their setting (Nolte et al. 2007, 4-4). An Army industrial setting comprises a number of large and small buildings, all directly related. The industrial process was spread among several structures, to reduce the chance of explosion and the loss of an entire plant.

PICA's industrial lines performed a variety of functions, so describing a typical line is difficult. These lines contained, however, a number of common elements. In general, one or two large structures dominated a single production line where the product was made or loaded. These buildings set the context for the rest of the plant. These larger buildings were connected to a number of smaller support buildings by a series of covered walkways or monorails. The walkways provided pedestrian cover as well as extra workspace for a line that many times covered several acres. The monorails safely moved materials from one space to another.

Many of the smaller buildings, such as magazines, were quite a distance away in order to reduce the chance of sympathetic explosion, and the monorail was an efficient way to move material to and from these distant places. Other support buildings that might have been connected by walkways included employee change houses, laboratories, offices, paint and box buildings, and shipping and receiving buildings. One of the most essential elements of a line was the railroad connection. At one time, PICA had its own rail yard and was covered by an intricate web of railroad tracks. While trucks played a role in the movement of materiel, the rail and train were the universal transportation element in the production sequence.

None of the production lines at PICA appear to remain intact (Nolte et al. 2007, 4-5). All of the lines have lost their major production building, or those buildings have been approved for demolition because of toxic chemical contamination (under the Toxic Environmental Cleanup Program of the mid 1980s and the Defense Environmental Restoration Program of today for the RPMP FRP PA). Further, the rail lines that connected each to the other are no longer extant, and the covered walkways that connected the line to its component buildings are in a state of serious disrepair or missing. Some areas, like the 500 Powder Area, have been so fractured by the loss of original buildings and introduction of new ones

that it is difficult to tell that any industrial activity ever occurred there. In other areas, structures stand isolated, having lost all defining elements. These solitary structures tell little and mean even less without the proper setting. Such serious loss of setting (and therefore, integrity) means that no industrial areas or associated structures at PICA are eligible for the NRHP (Nolte et al. 2007, 4-5).

4.1.4 Final determinations of eligibility

While the Nolte et al. (2007) architectural study did not include the overall landscape, the determinations for loss of integrity are the same for the landscape. The integrity of the landscape is adversely affected by: the loss of the rail line connecting the manufacturing plants and the storage areas, the demolition of key buildings due to contaminants, and the abandonment and/or reuse of testing areas.

Military manufacturing, testing areas, and ranges need to be researched and evaluated as a whole landscape, including all the buildings/structures, firing lines, target mechanisms, etc. They must not be evaluated as individual elements that sit on the landscape, since they were originally designed and intended to be utilized as a whole complex. Each structure/element provides a vital role in the functioning of the process.

A typical firing range is a large open area, usually a gravel-covered lot, surrounded by any number of buildings used for observation, storage of various types of materials and materiel, and magazines. In addition, the field itself contains firing stands, vertical and horizontal sheets of iron, and targets of various types, such as vehicles and earthen berms. Many times the back of the firing range is formed into a large slug butt, a place to capture fired ammunition. Even if the range is still in use and the open space remains the same, if the buildings are not eligible to the NRHP, the landscape is not either.

At Picatinny, the buildings surrounding these test areas are in a variety of conditions, ranging from totally derelict to almost new. By and large, the buildings are fairly dilapidated, probably a result of the buildings on the ranges only being used during the times of testing. Offices and some types of warehouses tend to be in better condition, since they are used on a daily or regular basis. While testing is an ongoing activity at Picatinny, the actual explosion of ordnance on the test fields is not necessarily a daily activity.

Through trial and error and through exigencies brought about by WWI, the Army discovered that the best industrial buildings were those that were most easily changed. Many of the manufacturing, testing and assembly areas and buildings have changed uses throughout the years and remained in use while other buildings fell into disrepair because they were so specialized that they could not be adapted to other uses or to the movement of new materials. Traditional magazines, office buildings, change houses, and storehouses were enfolded into the industrial line and most remain in use today.

In addition to the testing areas and ranges surveyed, there are some miscellaneous landscape features that have reached or will soon reach 50 years of age (see Appendix, Table A-1). These landscape features, such as parking lots, communication lines, pollution catch basins, and underground gas and electric lines, are considered part of the infrastructure that could be found at any installation. They are not significant features to any historic district, and they individually lack any architectural and/or historical significance. Therefore, these features are not eligible for the NRHP.

4.1.4.1 For Criterion A – Event

Picatinny Arsenal is significant under Criterion A for its contributions to Army and Navy ammunitions development and testing.

4.1.4.2 For Criterion B – Person

There is no significant person associated with the overall landscape at Picatinny Arsenal.

4.1.4.3 For Criterion C – Design/Construction

The overall Picatinny landscape did not contain any unique design or technology and is not found to be significant under Criterion C.

4.1.4.4 For Criterion D – History

The available historical records provided no indication that the overall landscape at Picatinny Arsenal has yielded, or was likely to yield, any information important in history in relation to its significance for ammunitions development.

4.1.5 Final determination for PICA testing areas

It is the determination of this report that the overall landscape at Picatinny Arsenal is **NOT ELIGIBLE** for the National Register of Historic Places due to its lack of integrity of land, context, and built environment from its period of significance under Criterion A and/or Criterion C. There is no evidence that the site is likely to yield any information important in history pertinent to its period of significance under Criterion D, and it could not be associated with any significant person under Criterion B.

Since previous reports have determined that areas of Picatinny Arsenal have significance under Criterion A for its contributions to the Army and Navy for weapons and ammunition development, there is the potential in the future that one of its various processes, facilities, or test areas still in use could be determined eligible if the integrity is intact and it is determined that the weapon or ammunition is of great significance to the military and/or a major conflict. If this determination is made, a reevaluation of that particular mission or area of Picatinny should be performed. At this time however, this report does not find any of these landscapes or areas eligible.

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References

- Adams, Sunny E., Megan W. Tooker, and Adam D. Smith. 2016. *Cultural Landscape Analysis of Existing Historic districts; Picatinny Arsenal, New Jersey*. ERDC/CERL TR-16-4. Champaign, IL: Engineer Research and Development Center-Construction Engineering Research Lab.
- Chugach Industries, Inc. 2008. *Integrated Cultural Resources Management Plan Picatinny Arsenal, Rockaway and Jefferson Townships. Morris County, New Jersey: 2009-2013*. Prepared for Picatinny Arsenal, New Jersey by Chugach Industries, Inc.
- Harrell, Pauline Chase. 1996. *Evaluation of Structures Built Prior to 1946 at Picatinny Arsenal, New Jersey*. On file with New Jersey Historic Preservation Office and with Directorate of Public Works at Picatinny Arsenal. Fort Washington, MD: WCH Industries, Inc. in association with Boston, MA: Boston Affiliates, Inc.
- Huggan, Jason J. 2015. *Cultural Landscape Analysis of the Former Lake Denmark Naval Ammunition Depot at Picatinny Arsenal, Rockaway Township, Morris County, New Jersey*. Picatinny Arsenal, NJ: Department of the Army.
- Loechl, Suzanne K., Susan I. Enscoe, Megan W. Tooker, and Samuel A. Batzli. 2009. *Guidelines for Identifying and Evaluating Historic Military Landscapes*. ERDC/CERL TR-09-6. Champaign, IL: Engineer Research and Development Center-Construction Engineering Research Lab.
- Lowenthal, Larry. 1981. *Iron Mine Railroads of Northern New Jersey*. Dover, New Jersey: Tri-State Railway Historical Society.
- “Morris County Railroad”. 1905. *Iron Era*, August 11.
- Nolte, Kelly, Mark A. Steinback, and Michael A. Cinquino. August 1999a. *Architectural Assessment of Historic Structures at Picatinny Arsenal, Morris County, New Jersey*. Prepared for U.S. Army Corps of Engineers, New York District, New York. Buffalo, NY: Panamerican Consultants, Inc.
- _____. September 1999b. *Definition of Historic Districts for Picatinny Arsenal, Morris County, New Jersey*. Prepared for U.S. Army Corps of Engineers, New York District, New York. Buffalo, NY: Panamerican Consultants, Inc.
- Nolte, Kelly, Kelly Mahar, and Mark A. Steinback. 2007. *Determination of Eligibility of 318 Buildings and Structures for Inclusion on the National Register of Historic Places, Picatinny Arsenal, Rockaway Township, Morris County, New Jersey*. Prepared for Cultural Resources Manager, Picatinny, NJ, under a Cooperative Agreement with U.S. Army Medical Research Acquisition Activity, Fort Detrick, MD. Buffalo, NY: Panamerican Consultants, Inc.

- NPS. 1987. *National Register Bulletin #18: How to Evaluate and Nominate Designed Historic Landscapes*. Prepared by J. Timothy Keller and Genevieve P. Keller. Washington, DC: U.S. Department of the Interior, National Park Service.
- _____. 1995. *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. Edited by Charles A. Birnbaum with Christine Capella Peters. Washington, DC: U.S. Department of the Interior, National Park Service.
- _____. 1997a (rev.). *National Register Bulletin #15: How to Apply the National Register Criteria for Evaluation*. Washington, DC: U.S. Department of the Interior, National Park Service.
- _____. 1997b (rev.). *National Register Bulletin #16A: How to Complete the National Register Registration Form*. Washington, DC: U.S. Department of the Interior, National Park Service.
- _____. 1998. *A Guide to Cultural Landscape Reports: Contents, Process, and Techniques*. Credited authors: Robert R. Page, Cathy A. Gilbert, Susan A. Dolan. Washington, DC: U.S. Department of the Interior.
- _____. 1999a (rev.). *National Register Bulletin #30: Guidelines for Documenting and Evaluating Rural Historic Landscapes*. Washington, DC: U.S. Department of the Interior, National Park Service.
- _____. 1999b. *National Register Bulletin: How to Prepare National Historic Landmark Nominations* (un-numbered). Washington, DC: U.S. Department of the Interior, National Park Service.
- _____. 2000. *National Park Service Preservation Brief #36: Protecting Cultural Landscapes*. Prepared by Charles A. Birnbaum. Washington, DC: U.S. Department of the Interior, National Park Service.
- Rodgers, J. A. 1931. *The History of Picatinny Arsenal, 1880-1931*. Picatinny Arsenal, NJ: War Plans Division, Plant Engineering Department. Report on file with Cultural Resources, Picatinny Arsenal.
- Rae, John. *Picatinny Arsenal*. 1999. From the Images of America Series. Charleston, SC: Arcadia Publishing.
- Thurber, Pamela, David G. Buchanan, Deborah Wolf, David Ashby, and John Mecum. 1985. *Historic Properties Report—Picatinny Arsenal, Dover, New Jersey*. HABS/HAER report on file with Library of Congress.
- U.S. Department of the Army, Installation Management Command. 2013. *Integrated Natural Resources Management Plan*. Picatinny Arsenal, New Jersey: Headquarters, U.S. Army Garrison.

Appendix: Miscellaneous Landscape Features

Table A-1 is a list of landscape features at PICA that are considered part of the infrastructure that could be found at any installation and lack architectural and/or historical significance. Therefore, these features are not eligible for the NRHP.

Table A-1. Table of landscape features at PICA not eligible for the NRHP (ERDC-CERL).

RP* #	Year Built	Historic Use
98	1965	FMWR+ Recreational Vehicle Parking Lot
225A	1945	Pollutant Catch Basin
1150	1968	Lightning Protection System
3324A	1966	Open Storage Area
3506	1972	Target Detection Range, Non-Firing
1372Z	1974	Above Ground Communication Lines
1504T	1954	Concrete Pad w/ Transformer
3229	2009	Non-Organizational Parking/Unpaved
12520	1982	Underground Gas Pipeline
13510	1942	AAL^ Above-Ground Communication Lines
21450	1949	AAL Grease Rack
45210	1926	AAL Open Storage Areas
81230	1963	AAL Exterior Lighting
81240	1942	AAL Overhead Electric Lines
81242	1981	AAL Underground Electric Lines
82712	1983	Chilled Water Distribution System
83210	1942	AAL Sanitary Sewer
84210	1942	AAL Potable Water Distribution System
84510	1942	AAL Non-Potable Water Distribution System

RP* #	Year Built	Historic Use
ROADS	1942	AAL Paved Roads
85130	1964	AAL Unpaved Roads
85210	1942	AAL Organizational Paved Parking
85215	1942	AAL Non-Organizational Paved Parking
85217	1983	AAL Sidewalks
85220	1963	AAL Paved Sidewalks
87110	1963	AAL Storm Sewers
87120; 87190	1942/1936	AAL Drainage Ditches
87130	1968	AAL Irrigation Facility
87150	1942	AAL Retainment Structure
87210	1942	AAL Fencing and Walls
87215	1987	AAL Fencing and Walls
87250	1991	AAL Entrance Gate
89070	1942	Underground or Above Ground Utility Systems
89091	1942	AAL Lightning Protection System
89095	1974	AAL Monitoring Wells
89340	2010	Underground or Above Ground Utility Systems

* = Real Property

+ = Family Morale, Welfare, and Recreation

^ = Arsenal at Large

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