National Park Service
Cultural Landscapes Inventory
2011



Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area
Park Review Draft: 07/20/2011

646/135385

United States Department of the Interior

NATIONAL PARK SERVICE
Olmsted Center for Landscape Preservation
15 State Street
Boston, Massachusetts 02109

IN REPLY REFER TO:
H30-OCLP

July 20, 2011

Memorandum

To: Superintendent, Gateway National Recreation Area
Attn: Kathy Foppes

From: Director, Olmsted Center for Landscape Preservation

Subject: Draft Cultural Landscape Inventory – *Sandy Hook Coastal Defense Batteries, Gateway National Recreation Area*
Please reply by: Wednesday, August 17, 2011

We are pleased to send you the draft Cultural Landscape Inventory (CLI) for the *Sandy Hook Coastal Defense Batteries, Gateway National Recreation Area,* for your review and concurrence. This CLI is based on the most recent research and site documentation completed by Tim Layton at the Olmsted Center for Landscape Preservation.

We request that you complete a review of the enclosed draft CLI and the evaluations of landscape features. Please consolidate park comments on the draft and submit them electronically to Jeff Killion, at jeff_killion@nps.gov. If you agree with our findings, we request that you sign the attached concurrence form with the understanding that changes requested in the park comments will be made or discussed further with the park should there be questions. Please return the form to our office by **Wednesday, August 17, 2011**. The address is: Jeff Killion, Olmsted Center for Landscape Preservation, 15 State Street, 6th Floor, Boston, MA 02109.

Your signed approval is necessary before the CLI can be submitted from the Northeast Region Regional Director's office to the New Jersey State Historic Preservation Office (SHPO) for their concurrence with our findings. Formal concurrence from the New Jersey SHPO marks the official completion of this CLI project. Accomplishing this by the end of the 2011 fiscal year is critical both for the park and the Northeast Region CLI program to meet their respective goals. For the park, a completed CLI means that the inventory of the Sandy Hook Coastal Defense Batteries will be considered "certified" as complete, accurate, and reliable for inclusion in the park's Government Performance Results Act (GPRA) goals 1b2b and 1a7. For the Northeast Region CLI program, completed CLIs allow the program to meet regional and national accounting standards, which are tied to future funding.

If you have any questions, please don't hesitate to contact me at 617-223-5099 or at bob_page@nps.gov.

Robert R. Page.

cc: Louis Hutchins
Jim Kendrick
Chuck Smythe
Sara Wolf
Eric Breitkreutz
Jeff Killion

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Introduction

The Cultural Landscape Inventory Program

Purpose and Goals of the CLI

The Cultural Landscapes Inventory (CLI), a comprehensive inventory of all cultural landscapes in the national park system, is one of the most ambitious initiatives of the National Park Service (NPS) Park Cultural Landscapes Program. The CLI is an evaluated inventory of all landscapes having historical significance that are listed on or eligible for listing on the National Register of Historic Places, or are otherwise managed as cultural resources through a public planning process and in which the NPS has or plans to acquire any legal interest. The CLI identifies and documents each landscape's location, size, physical development, condition, landscape characteristics, character-defining features, as well as other valuable information useful to park management. Cultural landscapes become approved CLIs when concurrence with the findings is obtained from the park superintendent and all required data fields are entered into a national database. In addition, for landscapes that are not currently listed on the National Register and/or do not have adequate documentation, concurrence is required from the State Historic Preservation Officer or the Keeper of the National Register.

The CLI, like the List of Classified Structures, assists the NPS in its efforts to fulfill the identification and management requirements associated with Section 110(a) of the National Historic Preservation Act, National Park Service Management Policies (2006), and Director's Order #28: Cultural Resource Management. Since launching the CLI nationwide, the NPS, in response to the Government Performance and Results Act (GPRA), is required to report information that respond to NPS strategic plan accomplishments. Two GPRA goals are associated with the CLI: bringing certified cultural landscapes into good condition (Goal 1a7) and increasing the number of CLI records that have complete, accurate, and reliable information (Goal 1b2B).

Scope of the CLI

The information contained within the CLI is gathered primarilyfrom existing secondary sources found in park libraries and archives and at NPS regional offices and centers, as well as through on-site reconnaissance of the existing landscape. The baseline information collected provides a comprehensive look at the historical development and significance of the landscape, placing it in context of the site's overall significance. Documentation and analysis of the existing landscape identifies character-defining characteristics and features, and allows for an evaluation of landscape's overall integrity and an assessment of the landscape's overall condition. The CLI also provides an illustrative site plan that indicates major features within the inventory unit. Unlike cultural landscape reports, the CLI does not provide management recommendations or treatment guidelines for the cultural landscape.

Inventory Unit Summary & Site Plan

Inventory Unit

Cultural Landscape Inventory Name	Sandy Hook Coastal Defense Batteries
Cultural Landscape Inventory Number	975528
Parent Cultural Landscape Inventory Name	Fort Hancock Military Reservation
Parent Cultural Landscape Inventory Number	650079
Park Name	Gateway NRA – Sandy Hook Unit
Park Alpha Code	GATE
Park Org Code	1775
Property Level	Component Landscape

Component Landscape Description

Fort Hancock, the historic Sandy Hook Proving Ground, and the accompanying coastal defense batteries are located on the Sandy Hook peninsula at the mouth of New York City's outer harbor. Acquired by the National Park Service in 1975 for use as part of the Gateway National Recreation Area, the Sandy Hook Unit lies at the northern end of the New Jersey barrier island system that is characterized by relatively flat topography and undulating dunes shaped by waves and wind. The central portion of the peninsula is dominated by a maritime holly forest, which contrasts with the more developed areas concentrated at the north and south ends. The southern end features recreational facilities for visitors to enjoy the beaches and natural areas associated with the Atlantic Ocean and Sandy Hook Bay. The northern end contains the Fort Hancock and Sandy Hook Proving Ground Historic District and an active U.S. Coast Guard base. Each year, more than two million people visit Sandy Hook's many natural and cultural resources.

Over the course of more than one-hundred years, facilities at Sandy Hook have had major roles in the testing and deployment of weapons systems, including nearly every kind of seacoast artillery, harbor mines, searchlights, and RADAR systems. Fort Hancock was established in 1895 as part of a new nationwide system of coastal fortifications proposed in 1886 by the Endicott Board. Various gun batteries comprised of concrete structures and engineered earthworks were built between 1893 and 1917, and finally disarmed and mothballed by the U.S. Army following the end of World War II. The Army then briefly took Fort Hancock off-line until the onset of the Korean Conflict in 1950, and soon thereafter used the property to locate missile defenses protecting the surrounding metropolitan area against bombardment by high-altitude aircraft. When the missile defense system was deemed obsolete in the mid-1970s, the Army's land, which also included a complex infrastructure of roads, railroad rights-of-way, and utility corridors, was transferred to the National Park Service. Today, elements of this coastal defense system and associated infrastructure survive, though many are in an advanced state of deterioration and hidden by successional vegetation.

This cultural landscape inventory documents eleven extant Endicott-Taft period gun batteries and two separate sites that comprise a NIKE missile battery. However, it does not include two sites that served as important components in Sandy Hook's coastal defenses; the Mine Casemate, which is presently on U.S. Coast Guard property, and Battery Arrowsmith, which is located on a sandbar protruding into Sandy Hook Bay and in a ruinous and unstable condition.

HISTORICAL OVERVIEW

The Sandy Hook coastal defense batteries have been shaped by powerful cultural forces in our history. Western exploration, mercantile navigation, colonial rebelliousness, and the United States' rapid emergence as a world power have all had a role in shaping the landscape that greets visitors to Gateway National Recreation Area's Sandy Hook Unit. While powerful ocean currents have shaped the shoreline, forces of politics and culture have been responsible for cycles of building, demolition, and decay which define this military landscape today.

Civil War defenses on Sandy Hook, once consisted of an incomplete massive five bastioned granite fort. Construction had begun on this fort in the 1850s and continued through the war until 1868, the cannon placed there having never fired a shot in hostility. Later, in 1874, the Army would establish an ordnance proving ground to the east of the unfinished granite fort for the scientific test firing of the latest cannon, rifled guns, and projectiles. This facility was the Army's first official proving ground and remained active until 1919.

Fort Hancock was established on Sandy Hook in 1895 due to a fortuitous location at the mouth of America's most important harbor and to the natural processes of erosion and deposition which created the narrow and easily defended shipping channel off its northern shore. Fort Hancock was intended to replace earlier Civil War fortifications and military installations on Sandy Hook dating back to the War of 1812.

Between 1893 and 1917, the Army constructed thirteen gun batteries on Sandy Hook with each protected by an integrated system of granite, concrete, and steel structures and engineered earthworks of sand and earth. New offensive threats resulted in the Army deactivating some gun batteries and modifying others to continue their service life through World War II. Following the war, the threat of bombardment by high-altitude aircraft eclipsed the defensive capabilities of the gun batteries and resulted in the deactivation of the remaining defenses. Now preparing to defend against a potential aerial attack, the Army constructed a NIKE missile battery at Fort Hancock in 1954. The battery served in a system of nineteen missile batteries protecting the New York metropolitan area. The Army also modified the NIKE battery to extend its service life, but ultimately had to contend with the threat of intercontinental ballistic missiles (ICBMs) that the NIKE system could not adequately defend against. Obsolescence of older fortifications compared to ever more powerful generations of weapons created the initial need for Fort Hancock. By 1974, this cycle

resulted in the deactivation of the NIKE missile battery and the entire fort, and lead to the fort's transfer to the National Park Service.

SIGNIFICANCE SUMMARY

The Sandy Hook coastal defense batteries are part of the Fort Hancock and the Sandy Hook Proving Ground Historic District, which was designated a National Historic Landmark (NHL) on December 17, 1982. The district derives national significance under NHL Criterion 1 (National Register Criterion A) for military and social history for the dates 1859-1958 relating to the development of Sandy Hook defenses and 1895-1949 for the operation of the Spermaceti Cove Life-Saving Station. The district is also significant under NHL Criterion 3 (National Register Criterion C) for engineering for the dates 1874-1919 as related to the operation of the Sandy Hook Proving Ground. The period of significance for Sandy Hook's coastal defenses at the National Register level begins in 1859 when construction commenced on the granite fort at Sandy Hook. The period ends in 1974 when the Army closed the NIKE missile site and Fort Hancock was officially deactivated. The 1974 date is used because the NIKE missile era identified in the NHL documentation continued almost to the date of transfer between the Department of Defense and the Department of the Interior. The New Jersey State Historic Preservation Officer has concurred with this finding through correspondence related to the National Park Service List of Classified Structures.

Sandy Hook's collection of Endicott-Taft batteries includes the first completed, partially armed, and tested coastal defense battery in the United States following the Endicott Board's recommendations and the first concrete mortar battery in the United States. Sandy Hook also contains the Nine Gun Battery, the largest continuous grouping of artillery built following the Endicott and Taft recommendations. The scale of the Nine Gun Battery demonstrates the strategic importance of defending the southern approach to New York City. Additionally, Sandy Hook features Batteries Kingman and Mills that are representative of designs the Army implemented during World War II in response to new threats posed aerial reconnaissance and bombing. World War II also witnessed the Army retrofit obsolete batteries at Sandy Hook to serve as command and communication centers for coastal defenses spanning from the eastern end of Long Island to Atlantic City, New Jersey. Collectively, the eleven battery sites at Sandy Hook demonstrate the perpetuating contest of improved coastal defense capabilities responding to new offensive weaponry that emerged from the mid-nineteenth century to the end of World War II.

Sandy Hook's coastal defense batteries also consist of the NIKE radar and launch sites for missile defenses constructed during the Cold War era. The Army installed the radar and launch sites to utilize the Ajax missile, the first missile designed for the NIKE program. The Army upgraded both sites for a second generation missile design known as Hercules. Additionally, the radar site received more sophisticated radar, known as the "Improved Hercules" system, to counter electronic interference from enemy aircraft.

The launch site contained two firing batteries, a configuration seldom installed during the Cold War era, and both sites possess representative features such as perimeter fences, protective earthworks, recreational amenities, light fixtures, and a kennel for guard dogs that were prescribed for NIKE installations across the country.

ANALYSIS AND EVALUATION SUMMARY AND CONDITION

Significant landscape characteristics identified for the coastal defense batteries include spatial organization, topography, vegetation, circulation, buildings and structures, views and vistas, and small-scale features. The spatial relationship of an Endicott-Taft period gun battery's firing side and engineered earthwork, concrete structure, and rear elevation for access remains unaltered at the individual sites. At the NIKE missile sites, the distinct three spaces designed for separate functions are retained and identified by arrangements of buildings and structures and circulation routes. The engineered earthworks at all sites are primarily intact with some erosion occurring since the end of the historic period. Large woody vegetation growing on the earthworks creates the potential for the placed earth and sand to be removed by a toppled tree. Vehicular circulation routes provide access throughout Sandy Hook and among the various coastal defense battery sites. Sidewalks and pedestrian circulation systems provide access among the individual structures that comprise the NIKE missile sites. The reinforced concrete structures and engineered earthworks that comprise the building system for the batteries are intact, but there is evidence of spalling, cracks, and separation on the concrete elements. Tactical views from the artillery emplacements, battery commander's stations, and fire control stations to the water are primarily impeded by woody vegetation growing at the interface of the engineered earthwork and concrete battery structure. The coastal defense batteries contain numerous small-scale architectural features associated with buildings and structures. Railings and features utilized for lighting, electronic communication, and weather observation are present on various batteries and in the landscape, small-scale features include fencing and exterior lighting.

The coastal defense batteries at Sandy Hook retain integrity of location, setting, materials, and workmanship. The batteries also retain integrity of design, feeling, and association, but these aspects are diminished primarily due to the addition of non-historic structures, changes to circulation features, and the growth of large woody vegetation. These aspects have not been permanently lost and can be greatly improved with the removal of the non-historic vegetation. The coastal defense batteries retain their overall physical form and addressing the condition of historic details will strengthen the association of the batteries as critical installations for defending the southern approach to New York City and the metropolitan area's airspace.

The coastal defense batteries are in fair condition due to the unmanaged growth of large woody vegetation, concrete and building material deterioration, and social trails that traverse historic engineered earthworks.

Inventory Unit Size (Acres)

Total: 66.95

Batteries Urmston and Morris: 1.55

Batteries Engle and Peck: 1.53

Nine Gun Battery: 6.47

Battery Potter: 3.08

Battery Granger: 1.42

Mortar Battery: 6.99

Battery Gunnison: 1.06

Battery Kingman: 4.64

Battery Mills: 5.20

NIKE Radar Site: 17.56

NIKE Launch Site: 17.45

Site Plan Information

Site Plan Graphic and Caption

Graphics are located at the end of this report.

CLI Hierarchy Description

CLI Hierarchy Description Narrative

The Coastal Defense Batteries, along with the Fort Hancock Post Grounds, is a component landscape of the larger Fort Hancock Military Reservation landscape at the Sandy Hook Unit of Gateway National Recreation Area. Gateway is comprised of two other units. The Jamaica Bay Unit contains the Breezy Point, Fort Tilden, Jacob Riis Park, and Floyd Bennett Field landscapes. The Staten Island Unit contains the Fort Wadsworth (including the Battery Weed Headlands component landscape), Great Kills, and Miller Field landscapes.

Concurrence Status

Inventory Unit

Inventory Unit Completion Status

TBD [Complete/Incomplete]

Completion Status Explanatory Narrative

This inventory is based on the "Cultural Landscape Report for the Sandy Hook Coastal Defense Batteries" published in 2010. Site visits were completed in April 2008 and January 2009 for documentation and to support the findings of the Cultural Landscape Report.

Park Superintendent Concurrence

TBD [Yes/No]

Park Superintendent Concurrence Date

TBD [mm/dd/yyyy]

National Register Eligibility

TBD [seeking "Eligible – SHPO Consensus Determination"]

National Register Eligibility Concurrence Date (SHPO/Keeper)

TBD [seeking "Eligible – SHPO Consensus Determination"]

National Register Concurrence Explanatory Narrative

TBD [seeking "Eligible – SHPO Consensus Determination"]

Geographic Information & Location Map

Inventory Unit

Inventory Unit Boundary Description

The coastal defense batteries inventory unit consists of eleven extant gun batteries and two sites that comprise the NIKE missile battery. The thirteen batteries are discontiguous, but all are located within the Fort Hancock and Sandy Hook Proving Ground Historic District, which was designated a National Historic Landmark (NHL) in 1982. Descriptions of the batteries are presented below in geographical order from north to south starting with gun batteries Urmston and Morris and ending with Battery Mills. The descriptions conclude with the NIKE radar site and the NIKE launch site. The boundary descriptions expand from the historic structures to include the toe, or bottom, of engineered slopes, circulation routes that historically provided service to the batteries, and secured perimeters defined by fencing. A clear separation between adjacent batteries could not be identified and therefore, a single boundary is described for batteries Urmston and Morris and batteries Engle and Peck. The battery site boundaries defined in this inventory are both minimal and reasonable boundaries sufficient to protect and preserve these cultural resources for the enjoyment of future generations.

Batteries Urmston and Morris:

Beginning at the intersection of two U.S. Coast Guard perimeter fences located southwest of Battery Urmston, proceed north 140 feet along the east side of the perimeter fence to the toe of Battery Urmston's engineered slope. Then proceed east 570 feet across the toe of the engineered slope for both batteries and continuing another 20 feet east past the Battery Morris CRF station. Then proceed south 70 feet across the remnants of North Bragg Drive to the north side of a U.S. Coast Guard perimeter fence. Continue west along the perimeter fence returning to the point of origin.

Batteries Engle and Peck:

Beginning at the Battery Peck wayside located on the north side of North Bragg Drive, proceed west 240 feet along North Bragg Drive. Then proceed northwest 120 feet along the east side of the unpaved access road to the observation platform. Then proceed northeast 250 feet along the north side of the unpaved access road to the observation platform. Continue east 260 feet beyond the observation platform and then proceed south following the toe of Battery Peck's engineered slope. Cross a trail leading to North Pond and proceed southwest along the south side of the trail returning to the point of origin.

Nine Gun Battery:

Beginning 10 feet north of a concrete utility vault located south of Battery Alexander, proceed northwest 70 feet along the northern edge of North Bragg Drive. Turn north and then east for 420 feet following the toe of the engineered slope for Battery Alexander. Proceed southeast for 1,110 feet following the toe of the

engineered slope for Batteries Halleck, Bloomfield, and Richardson. Continue southeast for 170 feet and arrive at the western edge of Parking Lot J. Proceed south for 200 feet following the western edge of Parking Lot J. Then proceed west for 70 feet and arrive at the eastern edge of North Bragg Drive. Proceed northwest along the eastern edge of North Bragg Drive, paralleling the rear facade of the batteries, returning to the point of origin.

Battery Potter:

Beginning at the intersection of Hudson Drive and North Bragg Drive, proceed northeast for 150 feet along the southeast side of North Bragg Drive. Then proceed east and then southeast for 455 feet following the toe of Battery Potter's engineered slope. Then proceed south for 155 feet followed by southwest for 245 feet arriving at the northeast side of Hudson Drive. Continue to follow the northeast side of Hudson Drive returning to the point of origin.

Battery Granger:

Beginning at the Battery Granger wayside located on the northeast side of Hudson Drive, proceed northwest 190 feet along Hudson Drive. Then proceed northeast140 feet along the toe of Battery Granger's engineered slope. Turn southeast and continue for 390 feet following the toe of the engineered slope. Then proceed southwest for 140 feet arriving at the northeast side of Hudson Drive. Continue to follow the northeast side of Hudson Drive returning to the point of origin.

Mortar Battery:

Beginning at the Mortar Battery wayside located on the southeast side of Hudson Drive, proceed northeast 470 feet along Hudson Drive. Then proceed southeast for 480 feet. Next, proceed southwest for 570 feet paralleling the chain-link fence at the toe of the Mortar Battery's engineered slope. Proceed west for 180 feet continuing to parallel the chain-link fence. Then proceed northwest for 200 feet paralleling the Mortar Battery's perimeter wall. Turn north following a wood retaining wall outside the Mortar Battery's counterscarp galley and proceed northeast along the southeast side of Hudson Drive, returning to the point of origin.

Battery Gunnison:

Beginning at a point on the northeast edge of Atlantic Drive, 22 feet southwest of a concrete drainage structure, proceed northwest for 160 feet following the northeast edge of Atlantic Drive. Then proceed northeast for 190 feet following the southeast edge of the Gunnison Beach Facilities. Continue northeast of 75 feet following the southeast edge of the path to Gunnison Beach. Proceed southeast for 125 feet following the toe of Battery Gunnison's engineered slope. Then proceed south for 185 feet continuing to following the toe of the engineered slope. Next, proceed southwest for 50 feet continuing to following the

toe of the engineered slope. Proceed southwest at a tangent to the toe of the engineered slope, returning to the point of origin.

Battery Kingman:

Beginning at a point 70 feet south of the battery's southern emplacement, proceed west for 225 feet following the toe of the engineered landform. Cross a road and continue north for 810 feet following the western edge of the road. Then proceed east for 175 feet following the northern road. Proceed south for 690 feet following the eastern edge of the road, returning to the point of origin.

Battery Mills:

Beginning at a point 135 feet north of the battery's western entry to the northern emplacement, proceed east 200 feet following the toe of the engineered landform. Cross a road and continue south for 730 feet following the eastern edge of the road. Then proceed west and continue northwest for 425 feet following the southern edge of the road. Proceed north and continue northeast for 540 feet following the western edge of the road, returning to the point of origin.

NIKE Radar Site:

Beginning at the southern intersection of the Multi-Use Path (MUP) and Parking Lot L, proceed northwest 95 feet following the eastern edge of the MUP. Then proceed north 700 feet at a 6-foot offset west from the radar site perimeter fence. Maintain the same offset and continue to follow the perimeter fence. Proceed northeast for 150 feet. Then proceed east for 375 feet. Next, proceed southeast for 650 feet. Continue to follow the fence around the northeast section of Control Area #1. Proceed east for 40 feet paralleling the access drive to Atlantic Drive. Then proceed south for 35 feet following the western edge of Atlantic Drive. Next, proceed southwest for 75 feet paralleling the access drive from Atlantic Drive. Proceed south 330 feet at a 6-foot offset east from the radar site perimeter fence. Maintain the same offset and continue to follow the perimeter fence, returning to the point of origin.

NIKE Launch Site:

Beginning at a point at the northwest end of the vehicular entry gate to the launch site, proceed northwest for 75 feet at a 20-foot offset west from the perimeter fence. Maintain the same offset and continue to follow the perimeter fence. Proceed northeast for 590 feet. Then proceed north for 80 feet. Next, proceed east for 85 feet. Proceed north for 395 feet. Then proceed east for 560 feet. Next, proceed south for 995 feet. Proceed west for 580 feet. Then proceed north for 195 feet. Next, proceed southwest for 260 feet. Proceed southeast for 50 feet. Then proceed southwest for 85 feet. Next, proceed northwest for 50 feet. Proceed southwest for 180 feet. Then proceed northwest for 100 feet. Next, proceed southwest 35 feet and cross the Multi-Use Path (MUP). Proceed southeast 100 feet following eastern edge of Hartshorne Drive. Then proceed southwest 75 feet following the southern edge of the launch site parking area. Next, proceed 200 feet northwest following the western edge of the parking area. Proceed northeast 110 feet crossing

Hartshorne Drive and the Multi-Use Path (MUP) and arriving at a point 20 feet off of perimeter fence. Maintain the same offset from the fence and continue to follow the fence northwest returning to the point of origin.

State and County

State

New Jersey

County

Monmouth

Location Map Information

Location Map Graphic and Caption

Graphics are located at the end of this report.

Boundary UTM

Boundary UTM Source

Other Digital Source

Boundary UTM Source Explanatory Narrative

AutoCAD Map drawing file set to the UTM NAD83 Zone 18 coordinate system

Boundary UTM Type

Point

Boundary UTM Datum

NAD 83

Boundary UTM Zone

18

Boundary UTM Easting

Battery Urmston 584030.93

Battery Morris 584107.68

Battery Engle 584237.68

Battery Peck 584283.74

Nine Gun Battery 584508.93

Battery Potter 584615.83

Battery Granger 584732.08

Mortar Battery 584719.61

Battery Gunnison 585198.92

Battery Kingman 585488.29

Battery Mills 585485.30

NIKE Radar Site 585410.32

NIKE Launch Site 586059.18

Boundary UTM Northing

Battery Urmston 4480504.72

Battery Morris 4480523.74

Battery Engle 4480565.17

Battery Peck 4480554.78

Nine Gun Battery 4480411.11

Battery Potter 4480055.99

Battery Granger 4479781.98

Mortar Battery 4479438.64

Battery Gunnison 4479294.43

Battery Kingman 4476862.73

Battery Mills 4476495.79

NIKE Radar Site 4478121.57

NIKE Launch Site 4476404.18

Regional Landscape Context

Type of Regional Landscape Context

Physiographic:

Located in the northeast corner of Monmouth County, New Jersey, Sandy Hook extends six and a half miles from the town of Highlands into lower New York Harbor. The landform parallels the primary deep water channel into New York Harbor and is nineteen miles south of the southern tip of Manhattan. The Sandy Hook peninsula is bounded by the mouth of the Navesink River that opens into Sandy Hook Bay on the west and the Atlantic Ocean on the north and east. The landform is a recurved sand spit that formed over thousands of years by a south to north littoral drift in the Atlantic Ocean. The currents continue to

shape the elongated landform by removing material from the southern, narrower end and depositing new material at the wider, northern end of the peninsula.

Coastal forces such as tides, storm surges, salt spray, and strong winds influence and affect the landscape characteristics on the peninsula. The topography of Sandy Hook is relatively flat with undulating dunes shaped by waves and wind. Protected from wind and salt spray, the central portion of the peninsula features over 200 acres of a maritime holly forest with American holly (Ilex opaca) as the dominant plant species. In contrast to this undisturbed central area, developed areas are primarily concentrated at either the north or south end of the peninsula.

Cultural:

The Endicott-Taft period gun batteries at Sandy Hook were intended to provide defense-in-depth—a redundant system that provided continued resistance against a potential enemy advancing north toward New York City. From the late nineteenth century until the end of World War II, battery designs at Sandy Hook incorporated changes in artillery, new locations relative to targets, and a variety of concealment strategies in response to new offensive weaponry. In response to the threats posed by long-range aerial bombers, the Army added the NIKE missile battery at Sandy Hook in the 1950s. The NIKE missile battery was also part of a redundant system of defenses that incorporated geographically separate radar sites and command centers for coordinating nineteen missile batteries in the New York Defense Area. With the introduction of intercontinental ballistic missiles (ICBMs), defense philosophy shifted from the NIKE batteries to the doctrine of mutually assured destruction. Military experts espoused that the only defensive position was to deter a nuclear-armed ICBM launch by matching an opponent's nuclear missile capabilities.

No longer vital to America's defenses, the Army deactivated Fort Hancock in 1974 and the area became part of the Sandy Hook Unit of Gateway National Recreation Area (NRA). Since that time, the entire peninsula, minus the active Coast Guard base at the northern tip of the peninsula, has functioned as a recreational park and is open to the public.

Political:

The coastal defense batteries are a component of the Sandy Hook Unit of Gateway NRA. Prior to 1974, the peninsula was controlled by the Army who operated a base on site beginning in 1896. The Army had a presence on site prior to that when they began, but did not finish, a masonry fortification in the late 1850s. The Army deactivated Fort Hancock in 1974 and the peninsula, minus the active Coast Guard base at the northern end, was incorporated into Gateway NRA that had been established in 1972.

Management Information

Inventory Unit

Management Category

Must be Preserved and Maintained

Management Category Date

TBD [mm/dd/yyyy]

Management Category Explanatory Narrative

The Sandy Hook coastal defense battery sites are contributing resources within the Fort Hancock and the Sandy Hook Proving Ground National Historic Landmark District, designated on December 17, 1982. Therefore, the management category is "Must Be Preserved and Maintained."

Adjacent Lands Information

Do Adjacent Lands Contribute?

Yes – Adjacent lands do contribute

Adjacent Lands Description

The surrounding ocean, the Sandy Hook Bay, the Sandy Hook Light, and the Fort Hancock and the Sandy Hook Proving Ground Historic District contribute to the setting and historic character of the coastal defense batteries.

Management Agreement

Management Agreement	Management Agreement Expiration Date	Management Agreement Explanatory Narrative	Other Management Agreement
None	n/a	n/a	n/a

NPS Legal Interest

Type of Legal Interest

Fee Simple

Public Access to Site

Public Access

Other Restrictions

Public Access Explanatory Narrative

There is limited access to some of the coastal defense battery sites due to potential public safety issues.

National Register Information

Inventory Unit

National Register Landscape Documentation

Entered – Inadequately Documented

National Register Documentation History

The Sandy Hook coastal defense batteries are part of the Fort Hancock and the Sandy Hook Proving Ground Historic District, which was designated a National Historic Landmark (NHL) on December 17, 1982. The district derives national significance under NHL Criterion 1 for military and social history for the dates 1859-1958 (per July 19, 2011 email from National Historic Landmarks Program) relating to the development of Sandy Hook defenses, and 1895-1949 for the operation of the Spermaceti Cove Life-Saving Station. The district is also significant under NHL Criterion 3 for engineering for the dates 1874-1919 as related to the operation of the Sandy Hook Proving Ground. Also within the district is the Sandy Hook Light, which was built in 1764 and designated a National Historic Landmark on December 7, 1977. The 4,584-acre district boundary includes the entire Sandy Hook peninsula, from the Highway 36 bridge to the northernmost point of the peninsula. As such, all thirteen coastal defense areas identified in this inventory are included in the NHL district. The NHL documentation describes in detail each battery and associated buildings and structures, but is limited in its discussion of associated earthworks, slopes, and vegetation.

The 1982 NHL documentation supersedes earlier documentation for the Fort Hancock and Sandy Hook Proving Ground Historic District on the National Register of Historic Places, which was accepted on April 24, 1980. The areas of significance at that time were identified under Criterion A for military and invention for the dates 1874-1919 when the Proving Ground was active, and 1859-1950s beginning with the construction of the Fort at Sandy Hook and ending with modernization of Fort Hancock's facilities with defensive missile systems, including NIKE missiles. The boundary of the district in the 1980 National Register documentation was much smaller than the NHL boundary, encompassing 459 acres. The boundary included 380 acres in the northern portion of the Sandy Hook peninsula that was historically associated with Fort Hancock and the Proving Ground, including nine of the thirteen coastal defense areas identified in this inventory: Battery Urmston, Battery Morris, Battery Engle, Battery Peck, Nine Gun Battery, Battery Potter, Battery Granger, Mortar Battery, and Battery Gunnison. It also identified other sites totaling 79 acres outside the district's contiguous boundary, including the other four coastal defense areas: Battery Kingman, Battery Mills, the NIKE Radar Site, and the NIKE Launch Site.

In conjunction with an update to the park's List of Classified Structures in 1996-1997, the New Jersey State Historic Preservation Office (SHPO) and the National Park Service (NPS) agreed to revise the end date of

the period of significance to include later developments of missile defense systems at Sandy Hook. Correspondence from the NPS to the New Jersey SHPO on November 5, 1996 explained that "...because the NIKE missile era identified in the NHL documentation continued almost to the date of transfer between the military and the NPS, December 31, 1974, the deactivation date for Fort Hancock, is used as the end date of the period of significance." Concurrence on this matter from the New Jersey SHPO on January 2, 1997 thus established 1974 as the end date of the National Register period of significance. This date has not been confirmed by the NHL program. In addition to the new end date, numerous buildings, structures, walks, and lights associated with the batteries, NIKE Radar Site, and NIKE Launch Site were identified as contributing resources.

According to research conducted for this CLI and the categories of National Register documentation outlined in the "CLI Professional Procedures Guide," the areas and periods of significance for the Sandy Hook coastal defense batteries are adequately documented in existing National Register documentation and through correspondence with the New Jersey SHPO. Most historic buildings and structures have been documented. However, there are resources related to spatial organization, topography, vegetation, views and vistas, and small-scale features that contribute to the significance of the batteries that have not been documented. Therefore, for purposes of the CLI, Sandy Hook coastal defense batteries is considered "Entered-Inadequately Documented."

National Register Eligibility

TBD [seeking "Eligible – SHPO Consensus Determination"]

National Register Eligibility Concurrence Date (SHPO/Keeper)

TBD [seeking "Eligible – SHPO Consensus Determination"]

National Register Concurrence Explanatory Narrative

TBD [seeking "Eligible – SHPO Consensus Determination"]

Statement of Significance

The following statement of significance for the Sandy Hook coastal defense batteries is based on, and consistent with, the 1982 National Historic Landmark documentation for the Fort Hancock and the Sandy Hook Proving Ground Historic District. The district derives national significance under NHL Criterion 1 (National Register Criterion A) for military and social history for the dates 1859-1958 relating to the development of Sandy Hook defenses and 1895-1949 for the operation of the Spermaceti Cove Life-Saving Station. The district is also significant under NHL Criterion 3 (National Register Criterion C) for engineering for the dates 1874-1919 as related to the operation of the Sandy Hook Proving Ground. The

National Register period of significance for Sandy Hook's coastal defenses spans from 1859 to 1974. The period begins in 1859 when construction commenced on the granite fort at Sandy Hook. The period ends in 1974, as per consultation between the National Park Service and the New Jersey State Historic Preservation Office, when the Army closed the NIKE missile site and Fort Hancock was officially deactivated.

The Sandy Hook coastal defenses are significant in American history as the defensive infrastructure within the larger federal military reservation that has played dual roles in United States military history. The Sandy Hook peninsula was home to both the Sandy Hook Proving Ground and Fort Hancock. Between 1874 and 1919, the Proving Ground served as the nation's testing center for major artillery. During this critical time period, the Army developed, tested, and transitioned to rifled artillery that was utilized to protect harbors around the country and in foreign territories. From the 1890s to the Army's divestment of the property in 1974, Fort Hancock and Sandy Hook's coastal defenses were a critical element in a system of fortifications guarding the southern approach to New York City—America's most important harbor and largest metropolis. It was during these years that the United States defeated Spain and emerged as a world power, tipped the geopolitical balance of power against the Central Powers in World War I, retreated into the isolation of the 1920s and 30s, and emerged from World War II as a super power.

Sandy Hook's collection of Endicott-Taft batteries includes the first completed, partially armed, and tested coastal defense battery in the United States following the Endicott Board's recommendations and the first concrete mortar battery in the United States. Sandy Hook also contains the Nine Gun Battery, the largest continuous grouping of artillery built following the Endicott and Taft recommendations. The scale of the Nine Gun Battery demonstrates the strategic importance of defending the southern approach to New York City. Additionally, Sandy Hook features Batteries Kingman and Mills that are representative of designs the Army implemented during World War II in response to new threats posed aerial reconnaissance and bombing. World War II also witnessed the Army retrofit obsolete batteries at Sandy Hook to serve as command and communication centers for coastal defenses spanning from the eastern end of Long Island to Atlantic City, New Jersey. Collectively, the eleven battery sites at Sandy Hook demonstrate the perpetuating contest of improved coastal defense capabilities responding to new offensive weaponry that emerged from the mid-nineteenth century to the end of World War II.

Sandy Hook's coastal defense batteries also consist of the NIKE radar and launch sites for missile defenses constructed during the Cold War era. The Army installed the radar and launch sites to utilize the Ajax missile, the first missile designed for the NIKE program. The Army upgraded both sites for a second generation missile design known as Hercules. Additionally, the radar site received more sophisticated radar, known as the "Improved Hercules" system, to counter electronic interference from enemy aircraft.

The launch site contained two firing batteries, a configuration seldom installed during the Cold War era, and both sites possess representative features such as perimeter fences, protective earthworks, recreational amenities, light fixtures, and a kennel for guard dogs that were prescribed for NIKE installations across the country.

National Register Significance Level

National

National Register Significance -- Contributing/Individual

Contributing

National Register Classification

District

National Historic Landmark Status

Yes

National Historic Landmark Date

12/17/1982

National Historic Landmark Theme

IV. Shaping the Political Landscape; 3. Military institutions and activities

World Heritage Site Status

No

National Register Significance Criteria

National Register Significance Criteria

Criterion A: Event

Criterion C: Design/Construction

National Register Criteria Considerations

National Register Criteria Consideration

n/a

National Register Period of Significance

Start Year/Era and End Year/Era

1859 AD – 1974 AD

Historic Context Theme

Historic Context Theme	Historic Context Subtheme	Historic Context Facet
Shaping the Political Landscape	Political and Military Affairs 1865-1939	America Becomes a World Power 1865-1914
Shaping the Political Landscape	Political and Military Affairs 1865-1939	World War I 1914-1919
Shaping the Political Landscape	World War II	The Home Front
Shaping the Political Landscape	Political and Military Affairs After 1945	The "Cold War" with the Soviet Union

National Register Areas of Significance

Area of Significance Category	Area of Significance Subcategory (if Archeology or Ethic Heritage)
Military	n/a
Social History	n/a
Engineering	n/a

State Register Documentation

State Register Documentation Name

Fort Hancock and Sandy Hook Proving Ground Historic District

State Register Document Identification Number

2024

State Register Date Listed

12/16/1977

NRIS Information

Park Alpha Code/NRIS Name (Number)

GATE / Fort Hancock and the Sandy Hook Proving Ground Historic District (80002505)

Primary Certification Date

04/24/1980

Chronology & Physical History

Inventory Unit

Primary Historic Function – Major Category	Defense
Primary Historic Function – Category	Fortification
Primary Historic Function	Battery (Defense)
Primary Current Use – Major Category	Recreation/Culture
Primary Current Use – Category	Outdoor Recreation
Primary Current Use	Outdoor Recreation

Current and Historic Names

Name	Type (Historic, Current, or Both)
Battery Urmston	Both
New Battery Urmston	Historic
Battery No. 6	Historic
Battery Morris	Both
Battery Engle	Both
Battery Peck	Both
Battery No. 8	Historic
Nine Gun Battery	Both
Battery Alexander	Both
Battery Halleck	Both
Battery Bloomfield	Both
Battery Richardson	Both
Battery Potter	Both
Gun Lift Battery #1	Historic
Battery Granger	Both
Ten-inch Battery #1	Historic
Mortar Battery	Both
Battery Reynolds	Both
Battery McCook	Both
Battery Gunnison	Both
New Battery Peck	Historic
Battery Kingman	Both
Battery Mills	Both
NIKE Radar Site	Both
NIKE Integrated Fire Control Site	Both
NIKE Launch Site	Both

Cultural Landscape Types

Cultural Landscape Type

Historic Designed Landscape

Ethnographic Associated Groups

Ethnographic Study Conducted

No survey conducted

Chronology

Start Year	Start Era	End Year	Start Era	Major Event	Major Event Description
1859	AD	1859	AD	Built	Army begins construction on a five-bastioned granite fort, known as the Fort at Sandy Hook, near the northern end of the peninsula.
1868	AD	1868	AD	Abandoned	Army stops construction on the partially completed Fort at Sandy Hook due to Civil War-era artillery improvements.
1890	AD	1893	AD	Built	Army completes construction on the Mortar Battery.
1891	AD	1893	AD	Built	Army constructs the steam-powered Gun Lift Battery #1 (Battery Potter).
1892	AD	1892	AD	Built	Army emplaces the first 12-inch caliber gun at the Gun Lift Battery #1 (Battery Potter).
1894	AD	1894	AD	Built	Army emplaces four 12-inch mortars in each of the four firing pits at the Mortar Battery.
1895	AD	1895	AD	Built	Army emplaces the second 12-inch caliber gun at the Gun Lift Battery #1 (Battery Potter).
1895	AD	1895	AD	Established	Army establishes Fort Hancock for personnel assigned to duties at Sandy Hook.
1896	AD	1896	AD	Built	Army completes construction on the Ten-inch Battery #1 (Battery Granger).
1897	AD	1897	AD	Built	Army emplaces two 10-inch caliber guns on counterweight carriages at the Ten-inch Battery #1 (Battery Granger).
1897	AD	1898	AD	Built	Army completes construction and installs a single 5-inch caliber gun at Battery Engle.
1897	AD	1898	AD	Built	Army completes construction and installs three 10-inch caliber guns on the first phase of the Nine Gun Battery, called the Ten-inch Battery #2. The battery is constructed over the east facade of Sandy Hook's Civil War-era granite fort.
1899	AD	1899	AD	Built	Army completes construction on the second phase of the Nine Gun Battery with the Twelve-inch Battery #2 and #3 erected directly to the north and south of the Ten-inch Battery #2.
1899	AD	1899	AD	Built	Army constructs a 60-foot tall range-finder tower west of Battery Potter.
1899	AD	1900	AD	Built	Army constructs four gun emplacements at Battery Urmston.
1900	AD	1900	AD	Built	Army installs 12-inch caliber guns at the Nine Gun Battery's Twelve-inch Battery #2 and #3.
1900	AD	1900	AD	Established	Army designates the first seven batteries at the Nine Gun Battery as Battery Halleck in honor of Civil War veteran Major-General Henry W. Halleck.
1900	AD	1900	AD	Established	Army designates the Ten-inch Battery #1 as Battery Granger in honor of Civil War veteran Major General Gordon Granger.

1900	AD	1900	AD	Graded	Army regrades slopes above the four firing pits at the Mortar Battery.
1901	AD	1901	AD	Built	Army constructs battery commander's station for the Mortar Battery atop a steel tower inside the battery's western perimeter wall.
1901	AD	1902	AD	Built	Army constructs Central Power Plant (259) near northwest corner of Battery Potter.
1901	AD	1903	AD	Built	Army completes construction and installs two 6-inch caliber barbette-mounted guns at Battery Peck.
1902	AD	1902	AD	Built	Army completes construction on the third phase of the Nine Gun Battery (Battery Richardson) with two 12-inch caliber gun emplacements at the south end of Battery Halleck.
1903	AD	1903	AD	Built	Army completes construction of Battery Morris.
1903	AD	1903	AD	Established	Army designates Battery Engle in honor of Captain Archibald H. Engle who was killed in the Civil War Battle of Resaca.
1903	AD	1903	AD	Established	Army designates Battery Peck in honor of Lieutenant Freemont P. Peck who was accidentally killed at the Sandy Hook Proving Ground.
1903	AD	1903	AD	Established	Army designates the Gun Lift Battery #1 as Battery Potter in honor of Civil War veteran Brigadier General Joseph H. Potter.
1903	AD	1903	AD	Built	Army constructs Coal Shed (260) near northwest corner of Battery Potter.
1903	AD	1903	AD	Established	Army designates the Mortar Battery as Battery Reynolds in honor of Major-General John F. Reynolds who died during the first day of fighting at Gettysburg.
1903	AD	1904	AD	Built	Army constructs two additional gun emplacements at Battery Urmston.
1903	AD	1904	AD	Built	Army completes construction of Battery Gunnison.
1904	AD	1904	AD	Established	Army designates Battery Urmston in honor of Thomas D. Urmston who was killed during the Civil War.
1904	AD	1904	AD	Established	Army designates Battery Morris in honor of Colonel Lewis Morris who was killed during the Civil War Battle of Cold Harbor.
1904	AD	1904	AD	Built	Army installs two 12-inch caliber guns at the Nine Gun Battery's southern emplacements (Battery Richardson).
1904	AD	1904	AD	Established	Army designates the Nine Gun Battery's original three 10-inch guns Battery Halleck. The northern most guns, built in the second phase, are designated Battery Alexander in honor of Revolutionary War General William Alexander. The other second phase guns south of Battery Halleck are designated Battery Bloomfield in honor of New Jersey governor and Revolutionary War General Joseph Bloomfield. The southernmost guns are designated Battery Richardson in honor of Major General Israel B. Richardson who was killed during the Civil War at the Battle of Antietam.
1904	AD	1904	AD	Established	Army designates Battery Gunnison in honor of Captain John W. Gunnison who was killed in the Utah Territory.
1905	AD	1905	AD	Built	Army constructs two fire control stations on Battery Potter's terreplein.
1905	AD	1905	AD	Built	Army constructs telephone data booths at the

					southwest corner above each firing pit at the Mortar Battery.
1905	AD	1905	AD	Built	Army emplaces two 6-inch caliber guns on counterweight carriages at Battery Gunnison.
1906	AD	1906	AD	Altered	Army disarms Battery Potter's 12-inch caliber guns and sells the steam-powered gun-lift mechanism for scrap.
1906	AD	1906	AD	Established	Army splits the designation of the Mortar Battery into Battery Reynolds for the southern two firing pits and Battery McCook for the northern two firing pits. Battery McCook was designated in honor of Major-General Alexander McCook, a Civil War veteran.
1906	AD	1907	AD	Built	Army constructs two battery commander's stations on top of the Mortar Battery's earthwork.
1907	AD	1907	AD	Built	Army constructs seven fire control stations on Battery Potter's terreplein.
1907	AD	1907	AD	Built	Army constructs two switchboard rooms (256 and 257) near southwest corner of Battery Potter.
1907	AD	1907	AD	Built	Army extends the platforms behind the guns and adds an enclosed, concrete battery commander's station at Battery Granger.
1907	AD	1908	AD	Built	Army completes construction of Battery Arrowsmith.
1908	AD	1908	AD	Established	Army designates Battery Arrowsmith in honor of Lieutenant Colonel George W. Arrowsmith who was killed at Gettysburg during the Civil War.
1909	AD	1909	AD	Built	Army installs four pedestal mounted, 3-inch caliber guns at Battery Morris.
1909	AD	1909	AD	Built	Army emplaces three 8-inch caliber guns on counterweight carriages at Battery Arrowsmith.
1915	AD	1915	AD	Built	Army constructs exterior stairway at southwest corner of Battery Potter.
1917	AD	1917	AD	Moved	Army transfers four 12-inch mortars from the Mortar Battery to a new battery in the Navesink Highlands.
1917	AD	1917	AD	Built	Army completes construction of Battery Kingman.
1917	AD	1917	AD	Built	Army completes construction of Battery Mills.
1918	AD	1918	AD	Removed	Army removes the 5-inch caliber gun at Battery Engle.
1919	AD	1919	AD	Built	Army constructs open style coincidence range finder station between emplacements #4 and #5 at Battery Urmston.
1919	AD	1919	AD	Built	Army emplaces two 12-inch caliber guns at Battery Kingman.
1919	AD	1919	AD	Altered	Army adds steam heat to the plotting room, quarters, and latrine at Battery Kingman.
1919	AD	1919	AD	Established	Army designates Battery Kingman in honor of Brigadier General Dan C. Kingman who served as Chief of Engineers for the Army Corps.
1919	AD	1919	AD	Built	Army emplaces two 12-inch caliber guns at Battery Mills.
1919	AD	1919	AD	Altered	Army adds steam heat to the plotting room, quarters, and latrine at Battery Mills.
1919	AD	1919	AD	Established	Army designates Battery Mills in honor of Brigadier General Albert L. Mills, a Medal of Honor recipient from the Spanish-American War.
1919	AD	1920	AD	Removed	Army removes the remaining twelve mortars at the Mortar Battery.

1919	AD	1921	AD	Removed	Army removes the three 8-inch caliber guns at Battery Arrowsmith.
1920	AD	1920	AD	Removed	Army removes guns at Battery Urmston's emplacements #1, #2, #5, and #6.
1920	AD	1920	AD	Built	Army constructs coincidence range finder (CRF) station east of Battery Morris.
1920	AD	1920	AD	Built	Army constructs a coincidence range finding (CRF) station for Battery Peck over Battery Engle's empty concrete gun well.
1920	AD	1920	AD	Built	Army adds fully-enclosed, concrete, battery commander's station to Battery Peck.
1921	AD	1921	AD	Military Operation	Army deactivates Battery Arrowsmith.
1922	AD	1922	AD	Altered	Army installs a switchboard room in the Mortar Battery's longitudinal gallery that connects the northern mortar pits with the magazines in the center of the battery.
1922	AD	1923	AD	Built	Army mounts two 3-inch caliber anti-aircraft guns on top of the Mortar Battery's earthwork.
1928	AD	1928	AD	Altered	Army removes concrete to increase the angle and range of the guns at Battery Peck.
1937	AD	1937	AD	Built	Army mounts a 3-inch caliber anti-aircraft gun on top of the Mortar Battery's earthwork.
1938	AD	1938	AD	Demolished	Army demolishes the north, the east, and a portion of the south perimeter wall at the Mortar Battery.
1938	AD	1938	AD	Altered	Army cuts an entry into the west perimeter wall at the Mortar Battery.
1940	AD	1941	AD	Altered	Army converts the casemated, interior rooms of the Mortar Battery into the New York Harbor Defense Command Post (HDCP).
1941	AD	1941	AD	Built	Army adds machine gun platform with four .50-caliber guns on top of the Mortar Battery's earthwork, c.1941.
1941	AD	1942	AD	Built	Army casemates the open gun platforms at Battery Kingman.
1941	AD	1942	AD	Built	Army casemates the open gun platforms at Battery Mills.
1941	AD	1943	AD	Altered	Army converts the northernmost fire control station on Battery Potter's terreplein into a meteorological station, c.1941-c.1943.
1941	AD	1943	AD	Built	Army erects a metal tether near the north end of Battery Potter's terreplein to attach weather balloons for recording wind speeds and direction, c. 1941-c.1943.
1941	AD	1943	AD	Altered	Army converts the central fire control stations on Battery Potter's terreplein to serve as a Command and Observation Post, c.1941-c.1943.
1942	AD	1942	AD	Removed	Army relocates guns at Battery Urmston's emplacements #3 and #4 to the dunes north of Battery Gunnison.
1942	AD	1942	AD	Military Operation	Army deactivates Battery Urmston.
1942	AD	1942	AD	Moved	Army approves the disposal of artillery at the Nine Gun Battery's Battery Halleck.
1942	AD	1942	AD	Removed	Army removes the two 6-inch caliber guns on counterweight carriages at Battery Gunnison.
1942	AD	1942	AD	Altered	Army shifts railroad tracks supplying ammunition west of the casemated Battery Kingman.
1942	AD	1942	AD	Altered	Army shifts railroad tracks supplying ammunition

					west of the casemated Battery Mills.
1942	AD	1944	AD	Altered	Army adds air lock rooms, gas-proof doors, ventilation systems, soundproofing, and dehumidifying systems to the interior rooms of the Mortar Battery.
1943	AD	1943	AD	Moved	Army relocates Battery Peck's 6-inch caliber guns to Battery Gunnison.
1943	AD	1943	AD	Built	Army installs two 90mm anti-aircraft guns at Battery Peck.
1943	AD	1943	AD	Moved	Army approves the salvage of artillery at the Nine Gun Battery's Batteries Richardson and Bloomfield.
1943	AD	1943	AD	Military Operation	Army deactivates the Nine Gun Battery.
1943	AD	1943	AD	Altered	Army converts the southernmost fire control station on Battery Potter's terreplein to serve as the Harbor Entrance Control Post.
1943	AD	1943	AD	Military Operation	Army deactivates Battery Granger.
1943	AD	1943	AD	Altered	Army adds camouflage netting over the Mortar Battery's open gallery and southwest mortar pit.
1943	AD	1943	AD	Altered	Army improves electrical power, sanitary sewer, and the dehumidifying system at Battery Kingman.
1943	AD	1943	AD	Altered	Army adds obscurement grading and netting at Battery Kingman.
1943	AD	1943	AD	Planted	Army completes ninety percent of obscurement planting on the casemated Battery Kingman.
1943	AD	1943	AD	Altered	Army improves electrical power, sanitary sewer, and the dehumidifying system at Battery Mills.
1943	AD	1943	AD	Altered	Army adds obscurement grading and netting at Battery Mills.
1943	AD	1943	AD	Planted	Army completes thirty percent of obscurement planting on the casemated Battery Mills.
1944	AD	1944	AD	Military Operation	Army deactivates the Command and Observation Post located on Battery Potter's terreplein.
1944	AD	1944	AD	Altered	Army adds heat to the power room and three dehumidifying units at Battery Kingman.
1944	AD	1944	AD	Altered	Army adds heat to the power room and three dehumidifying units at Battery Mills.
1945	AD	1945	AD	Military Operation	Army deactivates the Harbor Entrance Control Post located on Battery Potter's terreplein.
1946	AD	1946	AD	Military Operation	Army deactivates Battery Morris.
1946	AD	1946	AD	Military Operation	Army deactivates Battery Peck.
1947	AD	1947	AD	Military Operation	Army deactivates Battery Gunnison.
1948	AD	1948	AD	Military Operation	Army deactivates Battery Kingman.
1948	AD	1948	AD	Military Operation	Army deactivates Battery Mills.
1950	AD	1950	AD	Military Operation	Army deactivates the New York Harbor Defense Command Post housed in the Mortar Battery.
1954	AD	1954	AD	Built	Army constructs the NIKE integrated fire control (IFC) or radar site comprised of buildings, circulation routes, and vegetation that form three distinct areas—Control Area #1, Control Area #2, and the Ready Barracks.
1954	AD	1955	AD	Built	Army constructs the NIKE launch site comprised

					of engineered earthworks, buildings, and circulation routes form three distinct areas—the Missile Magazines, the Missile Maintenance Area, and the Ready Barracks.
1955	AD	1960	AD	Built	Army constructs concrete walks from Control Area #1 and Control Area #2 to the Ready Barracks at NIKE radar site. Electrical conduit and twelve pedestrian-scale light fixtures are installed along the walks and a basketball court is added near the Ready Barracks.
1958	AD	1959	AD	Altered	Army updates the missile storage racks, launcher rails, and elevators to accommodate the larger Hercules missile at the NIKE launch site.
1958	AD	1959	AD	Built	Army constructs an inner security fence and installs perimeter lights to improve security for Hercules missiles at the NIKE launch site.
1958	AD	1960	AD	Built	Army constructs a canine kennel near the northwest corner of the missile magazine area at the NIKE launch site.
1960	AD	1962	AD	Built	Army constructs High-Power Acquisition Radar (HIPAR) tower and building in Control Area #2 at NIKE radar site.
1960	AD	1962	AD	Built	Army constructs new target tracking and target ranging radars for the "Improved Hercules" program in Control Area #2 at NIKE radar site.
1960	AD	1962	AD	Built	Army constructs new target tracking radar for the "Improved Hercules" program in Control Area #1 at NIKE radar site.
1960	AD	1962	AD	Built	Army adds the interconnecting corridor building between the battery control and radar control trailers at Control Area #1 and #2 in NIKE radar site. These buildings replace the maintenance and spare parts trailer.
1970	AD	1974	AD	Built	Army installs wood-slat fence east of Battery Urmston, c.1970-c.1974.
1970	AD	1974	AD	Built	Army installs wood-slat fence north and east of Battery Morris, c.1970-c.1974.
1970	AD	1974	AD	Built	Army installs wood two-by-four guard panels at Battery Morris emplacements #1 and #2, c.1970-c.1974.
1972	AD	1972	AD	Established	President Richard Nixon signs enabling legislation creating the Gateway National Recreation Area.
1974	AD	1974	AD	Destroyed	In December, a violent winter storm removes several vertical pilings from the bayside bulkhead west of Batteries Kingman and Mills.
1974	AD	1974	AD	Military Operation	Army deactivates Fort Hancock.
1975	AD	1975	AD	Land Transfer	Fort Hancock is transferred to the National Park Service and incorporated into the Gateway National Recreation Area.
1975	AD	1976	AD	Built	Park installs chain-link fence above the concrete gun canopies at Batteries Kingman and Mills.
1975	AD	1979	AD	Built	Park installs post and cable fencing along trails on top of the Mortar Battery, 1975-c.1979.
1975	AD	1979	AD	Destroyed/ Eroded	Subsequent storms destroy the majority of the bayside bulkhead west of Batteries Kingman and Mills and begin eroding the shoreline, 1975-c.1979.
1976	AD	1990	AD	Built	Park erects chain-link fencing and signage between pedestrian routes and Nine Battery and Batteries

					Peck and Granger.
1978	AD	1978	AD	Eroded	February storm washes away natural dune formations east of the NIKE launch site.
1990	AD	1994	AD	Abandoned	Park closes access to trails on top of the Mortar Battery, c.1990-c.1994.
2001	AD	2001	AD	Demolished	Park demolishes concrete bridge at Battery Gunnison to eliminate hazards created by deteriorating concrete.
2004	AD	2004	AD	Built	Park completes construction of the multi-use path (MUP) across the length of the peninsula for walking, jogging, and biking.

Physical History

The history of the Sandy Hook coastal defense batteries is detailed in the "Cultural Landscape Report for the Sandy Hook Coastal Defense Batteries" (2010) by Timothy W. Layton and H. Eliot Foulds. The following narrative is extracted from the Cultural Landscape Report. Graphics associated with this section are located at the end of this report.

EARLY HISTORY AND EUROPEAN CONTACT, TO 1859

Located in the northeast corner of Monmouth County, New Jersey, Sandy Hook extends six and a half miles from the town of Highlands into lower New York Harbor. The landform parallels the primary deep water channel into New York Harbor and is nineteen miles south of the southern tip of Manhattan. Approximately 10,000 years ago glaciers covered northern New Jersey and Long Island, but did not extend south to Sandy Hook. Sea levels rose as the glaciers melted and a south to north littoral drift began depositing sand and forming a spit between the Navesink River and Atlantic Ocean. The currents continued to shape an elongated landform with major deposits accumulating at the northern end of the peninsula creating a recurved or hook-shaped formation (Cultural Landscape Report for the Sandy Hook Coastal Defense Batteries, hereafter CLR, 2010:7).

Based on archeological data, the earliest American Indians arrived in New Jersey from 12,000 to 10,000 years ago. Settlements were located along major rivers and competing theories assert that either these base camps were occupied for long periods throughout the year or seasonally, when food resources were available. Archeological surveys at Sandy Hook have identified American Indian artifacts and possible sites on the southern portion of the peninsula away from recent littoral deposits at the northern end of the peninsula and inland from the dynamically changing shoreline. The first European encounters with the Sandy Hook landscape occurred in the sixteenth century as countries vied for western trade routes to Asia. Italian explorer Giovanni da Verrazano sailed past Sandy Hook in 1524 and was followed the next year by Estevan Gomez. Although born in Portugal, Gomez sailed for Spain and by 1529 a Spanish map recorded the peninsula as "Cabo de Arenas" or Cape of Sands (CLR, 2010:7).

Sailing on behalf of the Dutch United East India Company, English explorer Henry Hudson sailed along the Atlantic coast and anchored in the Sandy Hook Bay in 1609. Given its proximity to the shipping channel, the Dutch and English disputed claims over Sandy Hook through the mid-seventeenth century until Dutch governor Peter Stuyvesant surrendered all Dutch New World lands to the English in 1663. In the early 1600s, the Unami branch of the Lenni Lenape occupied central New Jersey. The Lenape were part of the Algonquian language group and were dispersed throughout New Jersey in autonomous bands. European contact brought warfare, disease, and alcoholism that decimated the Lenape population. By 1759, estimates placed the Lenape population at 300 for all of New Jersey with few remaining in the state by the start of the nineteenth century (CLR, 2010:8).

Early Developments and Fortifications:

From the colonial era to the mid-nineteenth century, Sandy Hook lacked permanent coastal defenses and early developments on the peninsula focused on maritime safety, transportation, and temporary fortifications. One of the first permanent structures on Sandy Hook provided navigational assistance to ships in the narrow channel to New York Harbor. After several shipwrecks in 1761, merchants pressured the New York Assembly to purchase a four-acre site on Sandy Hook in order to construct a lighthouse. For the next three years, Isaac Contro led the building effort to erect an octagonal, masonry structure that rose to 105 feet in height. The beacon was lit on June 11, 1764 and became the fifth operational lighthouse in the thirteen original colonies (CLR, 2010:8).

During the Revolutionary War, the lighthouse aided friend and foe alike including British troops navigating the waters off of Sandy Hook. Recognizing the importance of the lighthouse, the British occupied the peninsula during the war and constructed a stockade around the structure to deter an attack. In addition, the British Army used Sandy Hook as a secure staging ground to disembark from after the Battle of Monmouth in 1778. During the War of 1812, American troops were stationed on the peninsula to prevent British reoccupation and to secure naval access to New York City. A half mile north of the lighthouse, a wooden stockade called Fort Gates was constructed and armed with cannon. After the war, American troops were withdrawn from Sandy Hook and the stockade and other temporary structures deteriorated. Playing a role in the young nation's first wars, the strategic importance of Sandy Hook was well established and the United States purchased two large parcels of land comprising most of the peninsula in 1817 (CLR, 2010:8).

After the War of 1812, the government continued development on Sandy Hook in support of maritime activities. Although the lighthouse aided navigation, violent storms punished mariners along Sandy Hook and the New Jersey coast prompting Congress to pass a bill in 1848 for a series of lifeboat stations between Sandy Hook and Little Egg Harbor. By May 1849, the U.S. Treasury Department's Revenue Marine Board completed eight stations, set at ten-mile intervals, from Spermaceti Cove on Sandy Hook south to Long

Beach Island near Little Egg Harbor. The Spermaceti Cove station was located three miles south of the Sandy Hook Lighthouse (CLR, 2010:8).

In 1855, the Revenue Marine Board constructed a second station on Sandy Hook northeast of the lighthouse. New stations were constructed in 1872 at both Sandy Hook locations and the northern station was designated Station No. 1 while the Spermaceti Cove station was designated Station No. 2. In subsequent decades, conflicts arose between the Sandy Hook Proving Ground and the location of both stations. In 1891, a new station was completed northwest of the Sandy Hook Lighthouse along the bay and in 1894, a new station was completed 232 yards west of the 1872 station at Spermaceti Cove (CLR, 2010:8-9).

As early as 1759, commercial ferry service operated between New York City and Sandy Hook. The Raritan and Delaware Bay Railroad Company, a predecessor of the New Jersey Southern Railroad, created a ferry and railroad service between New York City and Long Branch, New Jersey in 1860. New York passengers first traveled on a ferry to Port Monmouth, New Jersey and then transferred to a train for the remainder of the trip to Long Branch. Five years later, the company established a shorter route from Sandy Hook to Long Branch. Ferries arrived at a wharf on Spermaceti Cove and proceeded south along the coast making stops at towns growing with recreational amenities. The wharf was relocated to Horseshoe Cove in 1870 and rail service did not extend north of the cove until the Army Ordnance Department established a line in 1889 (CLR, 2010:9).

THE FORT AT SANDY HOOK, 1859–1895

By the early 1800s, permanent stone fortifications such as Fort Wadsworth on Staten Island and Castle Clinton at the southern end of Manhattan guarded upper New York Harbor and the city. Mindful of Sandy Hook's role in the Revolutionary War and War of 1812, the Army Corps of Engineers prepared plans in 1857 for a fort to protect the lower harbor shipping channel and prevent an enemy force from anchoring and staging an attack from the peninsula. Work began the same year with the construction of a dock near the northwest tip of Sandy Hook. With a facility established to receive material and laborers, construction began on a large, five-bastioned granite fort in 1859 (CLR, 2010:9).

Known as the Fort at Sandy Hook, the pentagonal structure stood at the north end of the peninsula and enclosed approximately eighteen and a half acres. The north and east facade of the fort paralleled the shipping channel along Sandy Hook's Atlantic coastline where it turned northwest into the lower harbor. Construction accelerated with the start of the Civil War in 1861 but halted in 1868 before the entire fort was completed. The defenses offered by the fort, and other stone and masonry fortifications, were surpassed by Civil War-era artillery improvements. With construction stopped on the fort, a cycle began at

Sandy Hook that would last throughout the Cold War of new defensive structures and technologies being implemented just as offensive capabilities advanced that rendered the prior generation of defenses obsolete (CLR, 2010:9).

Civil War-Era Artillery Advancements:

The Civil War allowed emerging artillery technologies to be battle tested, and conclusions about the effectiveness of rifled bores and pointed projectiles changed the design of coastal defense batteries at Sandy Hook and across the country. Prior to the Civil War, major artillery on land, at sea, and at coastal fortifications consisted of cast iron, smooth bore guns with spherical projectiles. Coastal fortifications, like the Fort at Sandy Hook, were not immune to damage from this type of artillery. However, the projectiles were being fired from a ship, moving under sail power, making it difficult to obtain repeated direct hits necessary to destroy a stone and masonry wall (CLR, 2010:10).

The first Civil War-era innovation in artillery was the successful implementation of pointed projectiles. Spherical projectiles, or cannonballs, could do more damage if they were increased in size and had a corresponding larger barreled gun. A pointed projectile could be designed with the same diameter as a sphere, but with more mass and less drag as it traveled through the air. Fired from the same caliber gun, pointed projectiles were heavier and faster moving, resulting in more damage upon impact (CLR, 2010:10).

The superior pointed projectiles were coupled with an innovation in producing rifled bores. Rifling is a term describing the spiral grooves on the inside of a gun's bore that spin the projectile. As the projectile travels, the spin stabilizes its trajectory and results in faster speeds, longer range, and improved accuracy. Artillery with rifled bores and pointed projectiles could have more destructive power at a greater distance than earlier ordnance. A single direct hit from this new weaponry could obliterate a rigid stone and masonry wall. Coastal defense batteries were also made more vulnerable by steam-powered ships that had better maneuverability and could be equipped with defensive metal plating (CLR, 2010:10).

In response to the powerful impacts of this new artillery, Civil War troops discovered that earthen embankments, often reinforced by wood pilings, provided better protection and the promise of easier repairs compared to stone and masonry construction. Unlike shattering stone, the earth could absorb the projectile's force and the resulting crater could be readily filled with nearby earth and sand. Observation and experience with defensive earthen structures in the Civil War would influence the design of coastal defense batteries during the second half of the nineteenth century (CLR, 2010:10).

Sandy Hook Proving Ground:

Civil War artillery advancements harkened the beginning of a new generation of armaments, but did not address what the United States should do with over a thousand existing smooth bore guns. Congress concurred with the need to test the conversion of smooth bore to rifled artillery and appropriations were signed into law in 1872 to facilitate the tests. Various locations along the eastern seaboard of the United States were considered for establishing a new proving ground with a seven to eight mile uninhabited range. While potential locations and their acquisition were debated, the military reservation at Sandy Hook was selected as a temporary facility in 1874. The Army hastily constructed wood platforms and carriages and the first test fire of a converted smooth bore gun occurred in October 1874. The temporary facility became more permanent in 1881 with the construction of a Proof Battery and concrete platforms for mounting and testing guns. The Sandy Hook Proving Ground, with a proof battery and supporting, auxiliary structures, was the first development on the peninsula that responded to artillery advancements from the Civil War era. A new generation of coastal defenses would join the granite fort and Proving Ground within the next decade (CLR, 2010:10-11).

The Endicott Board:

As experts debated the location for a permanent proving ground site, an economic crisis started with the Panic of 1873 and lasted until 1878. As a result, Congress reduced coastal defense spending and ultimately stopped its funding in 1875. Pressure for a new generation of coastal defenses came from the public, officers in the Army and Navy, and members of Congress who were concerned about the advancement of foreign navies and the lack of maintenance on existing defenses (CLR, 2010:11).

During President Grover Cleveland's first term, in 1885 to 1889, Secretary of War William C. Endicott convened a board comprised of Army and Navy personnel and knowledgeable civilians to study locations, fortification types, armament, and protective materials for coastal defenses. The Endicott Board met in 1885 and early the following year released findings that called for defensive structures at twenty-six coastal locations, including Sandy Hook, and three additional sites along the Great Lakes. Prior to the Endicott Board, coastal defenses placed canons within parapet openings and on top of stone and masonry forts. In contrast to this approach and to address the threat posed by improved artillery, the Endicott Board recommended that new coastal defenses utilize rifled artillery emplaced in concrete platforms. The platforms would be shielded by a concrete wall and from the top of the wall, additional concrete would slope away and then be covered with earth for impact absorption and concealment into the surrounding landscape. As a result of the Endicott Board's recommendations, the first steam-powered, gun-lift battery and the first concrete mortar battery in the nation would be constructed at Sandy Hook (CLR, 2010:11).

Battery Potter (Gun Lift Battery #1):

In advance of constructing two new batteries, the Army upgraded transportation and housing facilities. The wharf near the northwest point of the peninsula, primarily used by the Ordnance Department to receive artillery for the Proving Ground, was extended in 1891 to receive cement, broken stone, and lumber for the battery projects. Narrow gauge railroad lines were installed on the wharf and laid out to the proposed battery sites for delivering materials. The Army also constructed temporary buildings to house a civilian workforce needed on Sandy Hook for the new battery projects. Excavations began for the Mortar Battery in November 1890 and were followed three months later by the groundbreaking for Battery Potter. Construction on both batteries occurred simultaneously throughout the early 1890s. Battery Potter has the distinction of being the first completed, partially armed, and tested battery following the Endicott Board's recommendations and therefore, the discussion will now focus on Battery Potter and be followed by the Mortar Battery (CLR, 2010:12).

Prior to its designation as Battery Potter, Sandy Hook's first coastal defense battery utilizing concrete construction and rifled guns was referred to as the Gun Lift Battery #1. In addition to incorporating new materials and artillery, the battery's innovative design featured a steam-powered hydraulic lift that raised the guns up into firing position after they had been loaded within a protective structure. Viewed from above, the Gun Lift Battery was D-shaped with the straight segment of the "D" facing west and a curving facade facing the Atlantic to the east. The terreplein stood approximately forty feet above surrounding grades and contained two openings for raising and lowering the 12-inch caliber guns. East of the guns, a concrete superior slope gently descended to a sentry route known as a "chemin de ronde" that was fronted by a parapet wall. A concrete slope angled away from the parapet and met an engineered earthwork that continued to slope down to surrounding grades and blended the massive concrete structure with the surrounding dune landforms (Figure 1) (CLR, 2010:12).

Before excavating for the Gun Lift Battery [Battery Potter], the Army constructed temporary storage facilities and installed mixing equipment to the west of the battery site for concrete production. Rail cars transported cement and broken stone from the wharf to the construction site, which were mixed with water and sand to produce concrete in close proximity to the building site. Sand was excavated and brought to the production site from nearby pits (CLR, 2010:12).

In April 1891, two months after excavation work began, workers started placing concrete for the Gun Lift Battery. Construction continued until winter weather slowed concrete production. By June 1892, a majority of the battery's northern section was complete and the boiler, gun lift mechanism, and carriage were installed at the north emplacement. Two months later, the first 12-inch gun was raised to the

terreplein and mounted at the north emplacement. Two rounds were test fired in September 1892 inaugurating a new era of coastal defense for metropolitan New York (CLR, 2010:12-13).

As winter approached, colder weather again slowed concrete production and work crews focused on creating the engineered earthwork around the exterior walls of the battery. From December until June 1893, over 5,000 cubic yards of sand were added around the structure to a height of twenty feet above the surrounding grades. The Army placed sand at a 2:3 slope resulting in a steep finished surface that was susceptible to erosion. In order to limit erosion and camouflage the earthwork with the surrounding dunes, the north, south, and east facing slopes were planted with cedar trees and small shrubs. The plant material was likely obtained from other locations on the peninsula and transplanted to the engineered earthwork (CLR, 2010:13).

The west facing slope was also planted, however, this earthwork was part of a defensible entrance for the Gun Lift Battery and received low growing sod instead of small cedars and shrubs. Concerned about a land-based assault on the battery, the Army Corps of Engineers designed a castellated entry that extended west from the main concrete structure. The entry was constructed with granite blocks salvaged from the Fort at Sandy Hook. Two octagonal towers flanked either side of a main door. The door and first and second stories of the towers contained gun loop slots so machine guns could fire on potential attackers. As part of the defensive scheme, vegetation on the west slope needed to be low growing in order to permit an unobstructed field of fire (CLR, 2010:13).

By the end of 1893, the Gun Lift Battery [Battery Potter] was essentially complete with masonry construction finished, the engineered earthwork installed, and plant material added to the steep, sandy slopes. However at this time, the battery only had one 12-inch gun emplaced. The gun lift mechanism for the south emplacement was installed in February 1894 and then delays in manufacturing the gun carriage hindered the full operational start of the battery. Over a year later, the carriage was delivered and installed and the second 12-inch gun emplaced. After successfully test firing ten alternating shots from the two guns, the unique new battery was cleared for service in August 1895 (CLR, 2010:13).

Mortar Battery:

Complementing the capabilities of the artillery at the Gun Lift Battery was a battery of sixteen mortars, recessed in a massive earthen landform, just south of the Sandy Hook lighthouse. Compared to the long-barreled guns at the Gun Lift Battery, mortars were stubby and set at steep angles to fire their projectiles in a high, arcing trajectory. A group of eight or sixteen mortars was planned to fire together and their respective 700-pound projectiles would collectively descend on the decks of ships like oversized pellets from a shotgun blast. To achieve high arcing trajectories that struck ships in the channel, Sandy Hook's

Mortar Battery had to be located further away from the shoreline than the Gun Lift Battery (CLR, 2010:13-14).

Construction began in 1890 on the Mortar Battery. The battery contained four concrete platforms that were recessed in a protective mound of earth and sand that rose to almost thirty-five feet. A rectangular concrete wall bounded the earthen mound, the longer legs of which were oriented in a southeast to northwest direction. At the wall's southwest and northeast corners, the Army constructed counterscarp galleries to defend against a land-based attack. If enemy forces ever penetrated the Mortar Battery's perimeter wall, machine gunners stationed in the counterscarp galleries had unobstructed lines of fire along the face of the wall. Given the orientation of the battery, recessed platforms were located in the southwest, southeast, northwest, and northeast portions of the structure. Vertical retaining walls rose up from each platform and met a concrete blast slope that tapered to a wider opening and held back the mounded earth. The southwest and northwest platforms were entered through a concrete gallery featuring high, concrete retaining walls. Passageways to access the southeast and northeast platforms, as well as ammunition magazines, were located under the protective cover of the built up earthwork (Figure 2) (CLR, 2010:14).

The first step in constructing Mortar Battery was excavating a stable base for each mortar platform, then pouring a concrete slab for the base. Similar to the work undertaken at the Gun Lift Battery, concrete was produced on site with dedicated storage space for broken stone and cement. Ships transported both products to Sandy Hook and then rail cars brought stone and cement to a site southwest of the Mortar Battery. The Army excavated sand from nearby pits and mixed with the other two components in close proximity to where the final concrete was placed. In addition to the concrete facility, rail lines were installed to three sand pits near the Mortar Battery in order to transport sand for the battery's mounded, protective covering. When temperatures were too cold to mix and place concrete, laborers began filling rail cars by hand with sand. When the cars arrived at Mortar Battery, derricks hoisted a removable container and dumped the sand around the finished concrete work. The sand filling progressed slowly and during the winter months of 1892 and 1893, steam-powered shovels were brought to the site to improve the quantity and speed of the excavation and placing work (CLR, 2010:14).

Over 150,000 cubic yards of sand were placed at Mortar Battery and settling and high winds displaced some of the material. To better secure the fill material and protect their tremendous construction expenditures, site engineer Lt. James G. Warren directed the planting of sod, cut from a marsh south of the battery, on the slopes rising form the concrete blast slopes to the top of the mound. The remainder of the mound was covered in native heather and cedar boughs that were tolerant of dry and sunny conditions. Additionally, records show that oats were sown on the slopes to help deter erosion. Masonry construction was completed at Mortar Battery in 1893 and a year later, each of the four platforms was armed with four

12-inch guns. The guns were test fired in June 1894 and Sandy Hook's Mortar Battery became the first completed and operational concrete mortar battery in the United States (CLR, 2010:14-15).

The Establishment of Fort Hancock:

The creation of the Sandy Hook Proving Ground and the construction of new coastal defense batteries brought personnel from the Army Ordnance Department and the Army Corps of Engineers respectively to the peninsula. In addition to Battery Potter and the Mortar Battery, the Army constructed an experimental Dynamite Gun Battery in 1893. Located at the northern end of the peninsula, the battery utilized compressed air to fire projectiles instead of gunpowder. With three batteries completed, additional personnel from the Army Corps of Artillery were needed for fulltime operation and maintenance of the new structures (CLR, 2010:15).

In order to provide housing and support facilities for the Army Corps of Artillery, the Secretary of War issued a general order establishing Fort Hancock on October 30, 1895. The Army designated the fort in honor of Major General Winfield Scott Hancock, a veteran of the Mexican and Civil Wars, who rose to national recognition for his heroics during the Civil War. The Army Corps of Engineers, based out of New York City, would be on Sandy Hook as needed for battery construction and shoreline stabilization projects. The Ordnance Department and Corps of Artillery would have permanent facilities but each would retain separate and distinct identities under the supervision of their own commanding officers (CLR, 2010:15).

At the time Fort Hancock was established, the Army Ordnance Department, Army Corps of Engineers, and Army Corps of Artillery shared the peninsula with federal personnel for the U.S. Lighthouse Service, the U.S. Lifesaving Service, and Western Union Telegraph Company. All of these organizations shaped and modified the landscape in performing their duties (CLR, 2010:15).

EXPANSION OF COASTAL DEFENSES, 1895–1919

Following the establishment of Fort Hancock in1895, the Army constructed additional coastal defense batteries recommended by the Endicott Board at Sandy Hook during the early twentieth century. When the United States entered World War I on April 6, 1917, seven coastal defense structures had been completed in addition to Battery Potter and the Mortar Battery and two more were under construction. The Endicott Board outlined an ambitious coastal defense program that if fully implemented, required funding amounting to roughly half the entire federal budget. The pace of construction at Sandy Hook and throughout the country fluctuated with varying appropriations but finally peaked with the start of the Spanish-American War in 1898. Public fears rose about an inadequately defended coastline and in response, robust military budgets were approved and construction accelerated on coastal defense batteries (CLR, 2010:35).

The defensive system recommended by the Endicott Board consisted of three categories—large caliber gun batteries, rapid fire gun batteries, underwater control mines. The battery types and mines were designed to engage specific threats and to work together as part of a defensive system. For example, strategically placed control mines would force an enemy battleship to travel slowly through a shipping channel allowing large caliber gun batteries more time to fire and disable or eliminate the ship. Rapid fire gun batteries would defend against minesweepers and shallow-draft boats that could travel outside the shipping channel. Lacking a component of this system made a coastal site vulnerable to a specific attack. Given the commercial and military importance of New York City, Sandy Hook required both battery categories and control mine facilities to defend the southern approach to the harbor (CLR, 2010:35).

Although an important component in the history of Sandy Hook's coastal defenses, the Mine Casemate is presently on U.S. Coast Guard property and is outside the study area for this Cultural Landscape Inventory. The review of the coastal defense batteries is divided according to category and first covers the large caliber gun batteries and then the rapid fire gun batteries. Within each category the batteries are presented chronologically according to the dates of artillery emplacement (CLR, 2010:35).

Naval Arms Race and the Taft Board:

At the start of the twentieth century, naval artillery consisted of a mixture of caliber sizes with none approaching the size and range of the 12-inch guns emplaced at Sandy Hook's coastal defense batteries. Engineers in Italy, Japan, and Great Britain all proposed battleships with large caliber armament schemes and the British completed the first such vessel with the successful launching of the HMS *Dreadnought* in 1906. The *Dreadnought*'s launch and early trials were closely observed as the ship combined large caliber armament, electronic range finding system, and faster steam-powered propulsion. The ship's design was groundbreaking and nations raced to build comparable battleships of their own that were generally categorized as dreadnoughts while all earlier ships were disparagingly referred to as pre-dreadnoughts (CLR, 2010:35-36).

As the Navy's role changed to engaging an enemy force hundreds of miles away from the United States, coastal defense systems required reevaluation yet again. In similar fashion to the Endicott Board, President Theodore Roosevelt convened military and civilian experts headed by Secretary of War William Howard Taft to review the nation's coastal defenses in 1905. In addition to reviewing Endicott Board recommendations, the Taft Board sought to incorporate technological changes made during the twenty-year period (CLR, 2010:36).

The Taft Board did not alter the armament and defensive recommendations made by the Endicott Board. Instead, the Taft Board reinforced and accelerated the implementation of new technology including

searchlights to illuminate channels and harbors at nighttime and the general electrification of coastal defenses. In 1913, an approved project called for thirteen 60-inch searchlights and two 36-inch searchlights at several locations guarding the southern entrance to New York Harbor. Five of the 60-inch searchlights were designated to go to Sandy Hook, and by November 1916, the peninsula's first searchlight was operational at a location 1,000 feet south of Battery Gunnison. By March 1918, the Army installed the remaining four searchlights with one located at the northwest point of the peninsula, one directly east of the Mine Casemate, and two approximately a mile south of Battery Gunnison. The Taft Board also addressed coastal defenses for American territories acquired from Spain at the conclusion of the Spanish-American War. Except for six batteries at Fort MacArthur near Los Angeles, new coastal defenses built after the Taft Board report were outside the continental United States in Hawaii, the Philippines, and at the Panama Canal (CLR, 2010:36-37).

Part of the Taft Board's recommendations addressed improving fire control—the process of acquiring and firing on enemy ships. Available land to construct multiple observation points as well as advances in optical instruments and electronic communications among the observation points, plotting rooms, and batteries resulted in the continued superiority of land artillery over naval artillery through the early part of the twentieth century. Target systems were established that used both single and two observation points equipped with precise optical instruments. With two observations points, called base end stations, a ship and its distance from each station would be identified simultaneously. The readings would be communicated to a plotting room and triangulated to find the ship's position and projected course. After calculating this information, instructions would be relayed for aiming and firing the artillery. The communications between observation, plotting, and firing were increasingly handled by telephone. In addition to using two observation points, single observation points were installed in elevated structures and towers. Using this system, the distance to a ship was calculated based on the known height of an optical instrument and the angle it was depressed to sight the target. The Army used both systems for the coastal defense batteries at Sandy Hook and the systems, "...represented the most significant advance to be made in harbor defense fire control until the introduction of radar during World War II." (Lewis, Seacoast Fortifications of the United States, 1993:93).

The accuracy of triangulation improved with greater distance between two observation points. The Army's ability to locate stations at greater distances on land than between ships at sea gave coastal defense artillery an advantage over naval artillery. The coastal defense batteries at Sandy Hook were one component of a system that guarded the southern approach to New York Harbor. Batteries were also constructed at Fort Tilden on the Rockaway peninsula and at Fort Wadsworth and Fort Hamilton guarding the Narrows between the lower and upper harbor. In order to improve triangulation accuracy, the Army constructed an observation tower for Fort Tilden at Sandy Hook. For the high-angle gun carriage batteries built on Sandy

Hook's western coast, a pair of observation stations stood a mile north of the batteries and another pair stood south of the peninsula in the Navesink Highlands. Electronic communication among the stations, batteries, and forts permitted targeting and firing information to be shared across greater distances (CLR, 2010:37).

Controlling new territories, specifically Hawaii and the Philippines, allowed American military personnel to observe former coastal defense batteries constructed and maintained by the British and Japanese. An April 1910 memorandum notes a difference in the design of earthworks and the use of vegetation and camouflage to conceal these batteries. Specifically, the author cites:

> "...the great care that had evidently been taken by each of these governments to conceal the gun batteries and positions [sic] finder stations by means of screens of trees and shrubbery, and also, in case of English barbette batteries, by painting both guns and carriages in splotched or splashed colors of the varied hues of the surrounding landscape. In contrast with this I was equally impressed with the lack of concealment of our own coast defenses on the Pacific Coast and the way the batteries and position finder stations on that coast are exposed. The smooth geometrical slopes or our batteries, differing entirely from the rough natural slopes of the English and Japanese batteries, showed their locations at once, – making them stand out in bold relief against the natural background." (NARA, RG 177, box 69, Records of the Chiefs of Arms).

Plantings intended to conceal or obscure coastal defense batteries at Sandy Hook and other American locations were not an innovation of the Taft Board. Before the Taft Board convened, the Army completed Battery Potter and the Mortar Battery and added vegetation in order to limit erosion and blend the batteries into the adjacent landscape. Following the increase in naval power around the world and the Taft Board report, the Army was more formal in articulating the need for vegetation to conceal coastal defense batteries from detection at sea. Three weeks after highlighting the differences between American and foreign coastal defense batteries, the Army's Office of the Chief of Coast Artillery issued a memorandum instructing that new batteries should be constructed while minimizing the number of existing trees removed and with engineered slopes that "conform in appearance" to the surrounding landscape and avoid "geometric contours." (NARA, RG 177, box 49, folder 5352, Records of the Chiefs of Arms). The instructions also call for a general planting scheme composed of, "tall trees as a rule, should be planted in rear or and between adjacent batteries and in rear and on the sides of stations; low trees at the foot of batteries, bushes and shrubs on the superior slopes of batteries and low shrubs in irregular splotches between guns." The memorandum acknowledges that effective concealment cannot be achieved in a single planting effort and that one week every spring and fall should be devoted to planting on and around the batteries. The instructions also cite the need for future replacement plantings and routine watering. Using vegetation to conceal batteries from ships was deemed so important that in 1914, the Army assigned a forester to examine batteries and recommend tree planting (CLR, 2010:38).

Large Caliber Gun Batteries:

Sandy Hook's coastal defense batteries were constructed, armed, and modified in response to the needs identified by the Endicott and Taft boards. As part of the strategy articulated by the boards, coastal defenses were comprised of large caliber gun batteries, rapid fire gun batteries, and underwater mines. Sandy Hook's first batteries, Battery Potter and the Mortar Battery, were both large caliber gun batteries. From their initial construction to the World War I armistice, these two would be joined by other large caliber gun batteries designed to engage enemy ships in the narrow channel north and east of the peninsula (CLR, 2010:38-39).

The additional large caliber batteries at Sandy Hook were developed in response to technological improvements in artillery design, particularly the gun carriages, but also to provide a more effective defensive system. Test firing of Battery Potter's two guns in 1895 demonstrated an average firing rate of three and a half minutes per shot. Improvements in steam-powered propulsion meant enemy ships would spend less time in a battery's field of fire. The Army countered increased ship speed by placing control mines along the channel and also by constructing successive large caliber batteries. Located from south to north along Sandy Hook, the successive batteries provided a greater field of fire against faster ships (CLR, 2010:39).

Improvements in artillery design also resulted in a cycle of construction and disarmament for Sandy Hook's large caliber gun batteries during the first two decades of the twentieth century. In addition to the main shipping channel, defenses at Sandy Hook could fire on a ship on the western or bay side of the peninsula beginning with Battery Potter's 360-degree field of fire. When new artillery made Battery Potter's steam-powered gun lifts obsolete and the guns were disarmed, the Army constructed Battery Arrowsmith on the western shoreline. The cycle repeated when longer-range guns at Batteries Kingman and Mills lead to the disarmament of Battery Arrowsmith (CLR, 2010:39).

Battery Potter:

In 1896, one year after emplacing the second gun at Battery Potter, the Army successfully tested the Buffington-Croizer counterweight gun carriage at the Sandy Hook Proving Ground. After loading a gun mounted on this new carriage design, a counterweight raised the gun barrel into firing position above a concrete structure. The recoil from firing the gun brought the barrel back down below the structure to conceal it and provided cover to the artillerymen reloading the gun. A trained crew could fire two rounds per minute with a counterweight carriage gun compared to a single round every three a half minutes with the steam-powered gun lift at Battery Potter. Just as advances in artillery during the Civil War eclipsed the defensive capabilities of the Fort at Sandy Hook, the new carriage produced in the closing years of the nineteenth century made Battery Potter's steam-powered gun lifts obsolete (CLR, 2010:39).

Although its steam lift mechanism was inferior to the new Buffington-Croizer carriages, Battery Potter continued to contribute to New York Harbor's coastal defenses for another fifty years. Early modifications at Battery Potter focused on improved target identification and new utilities for the entire fort. In 1899, the Army built a sixty foot tall range-finder tower west of Battery Potter. The steel tower supported a wood observation shelter sheathed with galvanized iron. Between 1901 and 1902, the Army constructed a central powerhouse for Fort Hancock's lighting system near the northwest corner of Battery Potter. The one-story brick building with a slate roof housed the lighting system's boilers and transformers. In addition, the Army constructed a coal shed to store fuel for the boilers north of the powerhouse in 1903 (CLR, 2010:39-40).

For additional information regarding the historical development of Battery Potter and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Mortar Battery:

Test firings at the Mortar Battery during 1894 impacted the protective earth and sand slopes. The steep grade above each pit's concrete blast slope proved difficult to stabilize. In 1900, post commander Major Burbank recorded the "dislodgement of a quantity of turf revetment of the slope in front of the mortar used." (NARA Northeast Region, RG 77, Press Copies of Letters Sent Relating to Fort Hancock). In order to improve the slope's stability, the Army re-graded these slopes at a 2:1 ratio. In 1901, the Army constructed a steel tower inside Mortar Battery's western perimeter wall. At the top, the structure supported a wood-frame building approximately fifteen feet square with a surrounding three foot wide catwalk. The tower served as a battery commander's station that identified targets for crews in the four pits. To facilitate better communication between the acquisition of targets and aiming of artillery, construction began on telephone data booths in 1905. The Army installed the booths above the southwest corner of each pit and supported each by arched, concrete spans (CLR, 2010:41).

Following the construction of the data booths, the designation of the Mortar Battery was split to identify separate batteries for the north and south firing pits. A 1906 general order designated the north pits in honor of Major-General Alexander McCook, another Civil War veteran. The south pits retained the earlier Battery Reynolds name. Between 1906 and 1907, the Army added two battery commander's stations on top of the earth and sand cover to correspond with the separate batteries. From these concrete commander's stations, aiming and firing instructions were relayed to the telephone data booths and then down to the firing pits. With the commander's stations and data booths completed, the Army converted the steel tower to a weather station to provide information on atmospheric conditions affecting the trajectory of projectiles (CLR, 2010:42).

The World War I efforts to mobilize troops and expand coastal defenses abruptly ended following the armistice on November 11, 1918. At Sandy Hook and across the country, personnel were drastically reduced during the early months of 1919. Coupled with the reduction in personnel and spending, advances in naval artillery during the war eclipsed the range of the Mortar Battery's guns. The mortars were subsequently disarmed and sold to civilians between the winter of 1919 and spring of 1920 (CLR, 2010:42-43).

For additional information regarding the historical development of the Mortar Battery and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Battery Granger:

In the mid-1890s, as trials were underway at the Proving Ground to test the new counterweight gun carriage for service, construction began on a new concrete battery that would incorporate this new system. Completed in 1896, the Ten-inch Battery #1 was the first large caliber gun battery at Sandy Hook to use the new counterweight carriage. Located between Battery Potter to the north and Mortar Battery to the south, each of the battery's two platforms was armed with a 10-inch gun in 1897. The Army installed concrete platforms fourteen feet above the surrounding grade to meet a parapet wall that rose an additional ten feet higher. From the platforms, a series of concentric steps proceeded down three feet to the wells where the carriages and guns were mounted. One hundred twenty-four feet separated the center lines of the two guns with the south emplacement labeled #1 and the north emplacement #2. From the top of the parapet wall, a concrete superior slope continued away from the structure for twenty feet followed by an additional thirty feet of earth and sand. The concrete and engineered earthwork descended away from the wall at a ten percent slope. The slope of the earthwork then increased to a 2:3 ratio and met the surrounding, unaltered grades (CLR, 2010:43).

Prior to receiving an official designation, typically in honor of a military hero, new coastal defense batteries were named according to their projectile diameter followed by a sequential number for the order in which they were constructed. Plans for defending the southern approach to New York City called for other batteries on Sandy Hook and an 1898 map identifies the Ten-inch Battery #1 and several other batteries with this descriptive naming convention. Replacing the descriptive name, the army designated the Ten-inch Battery #1 as Battery Granger in 1900 in honor of Civil War veteran Major General Gordon Granger (CLR, 2010:43).

A decade after the guns were emplaced, the Army updated Battery Granger to reflect the current practices on the efficient operation of a counterweight carriage gun. They extended the platforms behind the guns in order to allow for more convenient loading of munitions. In addition, they added an enclosed, concrete

battery commander's station between the two gun emplacements providing a central location and greater protection for the commanding officer (Figure 3) (CLR, 2010:43).

For additional information regarding the historical development of Battery Granger and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Nine Gun Battery:

Having successfully tested the counterweight carriage at the Proving Ground and installed it at Battery Granger, the Army built additional batteries for the faster firing carriage with a greater range. To compliment the two 10-inch guns at Battery Granger, construction began on a three-gun emplacement—the Ten-inch Battery #2—in 1897. The battery was located north of batteries Granger and Potter and was built over the east facade of the former granite fort (Figure 4). This location paralleled the main shipping channel along Sandy Hook's eastern shoreline. The Army completed construction and emplaced the three guns in 1898. That same year, the United States declared war on Spain following the explosion of the USS *Maine* in Havana Harbor and a public outcry for military action. Funding increased for additional coastal defenses, including two batteries to the north and south of the Ten-inch Battery #2 (CLR, 2010:44).

To supplement the first set of 12-inch guns at Battery Potter, the Army equipped the two new batteries with 12-inch guns on counterweight carriages. They constructed a Twelve-inch Battery #2 north of the Ten-inch Battery #2, which followed the angle between the east and north facades of the former granite fort. The new 12-inch guns provided fire on the shipping channel as it turned northwest and headed around the tip of Sandy Hook toward lower New York Harbor. South of the Ten-inch Battery #2, the Twelve-inch Battery #3 was designed to emplace two more guns along the peninsula's eastern shoreline. The new batteries were completed in 1899 and armed in 1900. With seven guns emplaced, the structure was commonly referred to as the Seven Gun Battery. The Army dedicated the battery in honor of Civil War veteran Major-General Henry W. Halleck in 1900 (CLR, 2010:44).

At the southern end of Battery Halleck, the Army completed an additional battery in 1902 and armed the battery in 1904 with two 12-inch guns. The combined nine guns mounted across a continuous concrete structure was the largest grouping of artillery built following the Endicott and Taft recommendations. With nine guns emplaced, the Army determined that one battery commander could not efficiently coordinate firing all of the guns. To address this problem, they designated the Nine Gun Battery as four separate batteries. From north to south the designations were Battery Alexander, Battery Halleck, Battery Bloomfield, and Battery Richardson (CLR, 2010:44-45) (Figure 5).

For additional information regarding the historical development of the Nine Gun Battery and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Battery Arrowsmith:

Battery Arrowsmith represented a unique and first-of-its-kind coastal defense construction at Sandy Hook. When Battery Potter's guns were removed in 1906, the peninsula no longer had large caliber artillery with a 360-degree field of fire. Fearing that Fort Hancock was susceptible to an attack from Sandy Hook Bay and its western shore, planning began for a battery at Horseshoe Cove Point. Crews completed masonry construction in 1908 and that same year, the battery was named in honor of Lieutenant Colonel George W. Arrowsmith who was killed at Gettysburg during the Civil War. A year later, the Army emplaced three 8-inch guns at Battery Arrowsmith to defend against any attack on Sandy Hook's western shore.

The guns were spaced 128-feet apart and a separate magazine was located east of each gun platform. The magazines were concealed with earth and sand cover that rose slightly over twenty feet above the surrounding grades. Just as Battery Potter's steam gun lifts were quickly eclipsed by the new counterweighted carriages, Battery Arrowsmith's protection of the bay side was not needed after the installation of new coastal artillery in 1919. The new artillery, mounted on a different carriage design, provided a 360-degree field of fire that could defend Sandy Hook Bay (CLR, 2010:45).

Batteries Kingman and Mills:

The British introduced improved artillery based on its *Dreadnought* class battleships and as World War I approached, foreign navies developed similar artillery that threatened the relatively small counterweight carriage guns at Sandy Hook. Battleships were equipped with new turrets that positioned and fired artillery at higher angles. With this modification that utilized the same guns and projectiles, ships could now be positioned further offshore and out of the range of coastal defense batteries. In addition, the counterweight carriages that lowered a battery's guns behind protective concrete and earth for loading were now susceptible to incoming fire from a ship's higher trajectory projectiles (CLR, 2010:46).

In response to this new threat, construction began on two large caliber gun batteries utilizing a high-angle gun carriage with a greater range. In comparison to the seven to eight mile range of counterweight carriage guns, the new artillery had a range of over twenty miles. The Army mounted the high-angle carriages on rotating platforms that resulted in a 360-degree field of fire. Instead of relying on concrete and mounds of earth and sand to protect the artillery, the new batteries were located on the bay side of the peninsula to be as far away as possible from potential enemy fire and sight lines (CLR, 2010:46).

The Army completed masonry construction of both batteries in late 1917. Each battery included two open, circular platforms that were 100 feet in diameter. Mounted in the center of the circle, the emplaced guns were 420 feet apart with the south gun identified as #1 and the north as #2. In the area between the platforms, earth covered concrete structures that housed artillery shells, gunpowder, plotting rooms, a storeroom, a latrine, and quarters for the soldiers stationed at either battery. Located approximately two miles from the quarters at Fort Hancock, the engineered earthwork also served to protect the neighboring platform from a misfire and rose approximately twenty-eight feet above the surrounding grades (Figure 6) (CLR, 2010:46).

For additional information regarding the historical development of Batteries Kingman and Mills and the adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Rapid Fire Gun Batteries:

As a complement to the large caliber gun batteries that guarded the approach to New York Harbor, rapid-fire gun batteries protected areas outside the main shipping channel that were susceptible to attack by swift, shallow-draft boats like landing craft and torpedo boats. In addition, the rapid-fire gun batteries protected the minefields laid outside the channel from enemy minesweepers. At Sandy Hook, the Army located the majority of rapid fire gun batteries at the northern tip of the peninsula. This position allowed the batteries to protect control mines laid adjacent to the shipping channel north of the peninsula (CLR, 2010:47).

Battery Engle:

Construction started on Sandy Hook's first rapid fire gun battery in 1897. The battery was located near the northern end of the peninsula and designed to mount a single 5-inch gun. As tension grew between the United States and Spain over control of the Caribbean and the approach to the Panama Canal, construction on the battery was completed and it was armed on April 21, 1898. Four days later, Congress declared war on Spain and public pressure and funding increased for coastal defenses. The Army constructed the battery with a twenty-one foot diameter concrete platform set approximately eight feet above surrounding grades. The platform contained a deep, cylindrical opening to hold a balanced pillar mounted gun. To the east of the platform, a magazine included six feet of concrete cover (CLR, 2010:47).

For additional information regarding the historical development of Battery Engle and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Battery Urmston:

Beginning in 1899, the Army constructed a six gun, rapid-fire battery west of Battery Engle along Sandy Hook's northern shoreline. Construction occurred in three phases and spanned five years beginning with building gun emplacements #1 and #2 at the eastern end of the battery. Following this first phase, construction started on the western end for gun emplacements #5 and #6. These emplacements were completed in November 1900 and all four were armed with balanced pillar mounted guns (Figure 7). When not in use, the pillar mounted guns could be mechanically lowered below the concrete parapet. As they were lowered, the gun barrels rotated ninety degrees and were placed in a notch in the parapet. Battery Urmston's initial four emplacements shared a similar design with steps leading to a rear platform approximately five feet above surrounding grade. From the rear platform, another set of steps led to the gun platforms approximately four feet higher in elevation. A separate magazine stood to the east of each platform, and like Battery Engle, included six feet of concrete cover. The top of the magazine protruded approximately three and a half feet above the gun platform (CLR, 2010:48).

In June 1904, the final phase of construction at Battery Urmston included gun emplacements #3 and #4 between the two previous sections. Unlike the earlier rapid-fire guns, the artillery at emplacements #3 and #4 were set on fixed pedestal mounts that could not be lowered. With all six emplacements completed, the battery was named in honor of Lieutenant Thomas D. Urmston who was killed during the Civil War (CLR, 2010:48).

For additional information regarding the historical development of Battery Urmston and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Battery Morris:

To provide a complete field of fire along Sandy Hook's northern tip, the Army constructed a third rapid fire gun battery between Battery Engle and Battery Urmston. Masonry construction was completed in 1903 on the four platform battery and it was designated in 1904 in honor of Colonel Lewis Morris who was killed during the Civil War Battle of Cold Harbor. The guns at Battery Morris were intended to be mounted on pedestal carriages. Due to development and production delays of the carriages, the guns were not emplaced until 1909 (CLR, 2010:48-49).

The four platforms were constructed approximately nine feet above surrounding grades and were accessed by steps that led to two intermediate levels. Between the four emplacements were three magazines that featured a combination of concrete and earth cover. The top of the earth cover on the magazines rose seven feet above the gun platforms (CLR, 2010:49).

Battery Peck:

A final rapid fire battery joined Urmston, Morris, and Engle on the northern end of Sandy Hook. Located immediately east of Battery Engle, construction began in 1901 on a battery that supported two 6-inch rapid fire guns. This new battery had a greater range and worked in conjunction with the remotely-detonated minefields to stop a shallow-draft boat that ventured out of the main shipping channel (CLR, 2010:49).

The Army emplaced the 6-inch guns in 1903 on barbette mounts that did not lower the guns behind a protective parapet. A semi-circular, armor plate that wrapped around either side of the gun barrel provided minimal protection (Figure 8). That same year, the Army designated the battery in honor of Lieutenant Freemont P. Peck who was accidentally killed at the Sandy Hook Proving Ground in 1895 (CLR, 2010:49).

For additional information regarding the historical development of Battery Urmston and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Battery Gunnison:

In 1898, the Army planned to build a rapid fire battery southeast of Nine Gun Battery's southern end. However, this proposed location conflicted with the ongoing operation of the Sandy Hook Proving Ground and construction was delayed. In 1903, the Army selected an alternative location further south on the peninsula than any battery previously built. Initial work included an extension of the rail lines and clearing for the new battery. Construction was completed a year later and the battery was designated in honor of Captain John W. Gunnison who was killed in the Utah Territory in 1853. In 1905, two six-inch guns were mounted on disappearing counterweight carriages. These six-inch rapid-fire guns worked in the same manner as their larger caliber siblings. A counterweight raised the gun barrel into position and the recoil from firing the gun lowered the barrel below a concrete parapet wall (Figure 9) (CLR, 2010:49-50).

Two gun emplacements, aligned on a north-south line, faced the Atlantic Ocean to the east and were spaced 125 feet apart on center. The platforms were constructed approximately five and a half feet above surrounding grades. On each platform, steps led down two feet to gun wells where the carriages and guns were mounted. A parapet wall rose eight feet above each platform and transitioned to a concrete superior slope that pitched away from the structure. In between the two platforms, numerous interior rooms for communications, offices, and equipment storage were shielded with concrete and earth cover that rose three and a half feet higher than the top of the parapet wall. The earth and sand slope on the east side of the battery helped to blend the structure into the surrounding landscape and camouflage it from ships at sea. Grasses and low-growing shrubs on the engineered earthwork contributed to the concealment. The west facade was not camouflaged and the concrete and metal framework of the structure was clearly visible when approaching from the west (CLR, 2010:50).

For additional information regarding the historical development of Battery Gunnison and its adjacent landscape, please refer to the *"Cultural Landscape Report for the Sandy Hook Coastal Defenses"* (2010).

Closure of the Sandy Hook Proving Ground:

In order to support the expanded coastal defenses at Sandy Hook, Fort Hancock grew to provide housing, administration, and facilities to cover all facets of military life. With the United States entering World War I in April 1917, personnel at the fort swelled to over 4,000 and the Army constructed temporary wooden structures for officers, enlisted men, and mess halls in groups called cantonments. The expansion created a danger to personnel and property as testing continued at the Proving Ground. Additionally, the Proving Ground needed greater distances to test longer-range artillery being developed to counter improved naval armament. Given the conflict between the Proving Ground and coastal defenses, Sandy Hook seemed less than ideal for testing new artillery. In March 1918, the Army established the Aberdeen Proving Ground on the western shore of the Chesapeake Bay in Harford County, Maryland. As facilities became operational at Aberdeen, testing at Sandy Hook transitioned to the new site and the Sandy Hook Proving Ground was phased out by 1919 (CLR, 2010:51).

CARETAKER STATUS AND WORLD WAR II, 1919–1945

The World War I efforts to mobilize troops and expand coastal defenses abruptly ended following the armistice on November 11, 1918. At Sandy Hook and across the country, personnel were drastically reduced and the coastal defense batteries were assigned to a minimal level of upkeep referred to as caretaker status. Between December 1918 and June 1919, Sandy Hook's batteries saw their personnel reduced from twenty-four officers and 1,535 enlisted men to fifteen officers and 386 enlisted men. From the armistice to the conclusion of World War II, personnel levels fluctuated at Sandy Hook, alternating between minimal staffing when in caretaker status, increased personell during periods of activation of National Guard units, and training and coastal defense functions during the war. The Army reduced the number of operational batteries at Sandy Hook and other sites defending New York Harbor because the range of new large caliber 12- and 16-inch guns provided a greater field of fire and could cover the same field of fire as numerous batteries of smaller caliber. At Sandy Hook, Batteries Kingman and Mills were positioned on the western side of the entry to Lower New York Harbor. On Long Island, New York, the Rockaway peninsula marked the eastern side and in this location, 16-inch guns were emplaced at Fort Tilden's Battery Harris. These three batteries covered any possible approach of a major battleship and during World War II, were joined by Battery Lewis in the Navesink Highlands. Similar to Battery Harris, Battery Lewis had 16-inch guns that extended the field of fire further south and east into the Atlantic Ocean (CLR, 2010:81).

Advances in aviation technology during the inter-war period further redefined coastal defense strategies. The potential to use airplanes in reconnaissance and bombing campaigns required the redesign of large caliber batteries, including Kingman and Mills. The expanded role of aviation also resulted in new detection technologies, which were tested and installed at Sandy Hook. In the mid-1930s, the Army Signal Corps Laboratories at nearby Fort Monmouth developed detection systems that transmitted radio waves and determined aircraft location, range, and azimuth based on the reflected waves. The system became known as radar—an acronym for Radio Detecting and Ranging. Due to its secure location and the opportunity to test radio waves on passing ships and planes, the Army Signal Corps established radar facilities at Sandy Hook. Working with the Western Electric corporation, the U.S. Army Signal Corps built a group of eight wooden warehouses approximately a half mile east of Batteries Kingman and Mills near the Atlantic coastline. Each warehouse contained a SCR-268 radar unit, the Army's first operational radar, and allowed tests on the systems in relative secrecy without exposure to weather (CLR, 2010:81).

By August 1943, the Army installed eleven radar sites in New Jersey, Staten Island, and the Rockaway peninsula to help guard the southern approach to New York Harbor. Two of the radar sites stood on the Sandy Hook peninsula to detect ships and low-flying planes and transmit range and azimuth data to specific batteries. The first site at Sandy Hook for a SCR-682 radar unit was the top of an existing fire control tower. The tower was constructed in the late 1920s for Battery Harris and was located approximately 700 feet west of Battery Gunnison. For the second site, the Army constructed a new tower approximately a quarter mile south of the Signal Corps' wooden radar shelters. This tower housed a SCR-296 radar unit that sent target information to the rapid fire guns at Battery Gunnison (CLR, 2010:81-82).

During peacetime, the primary goal for caretaker status personnel was to prevent the serious deterioration of the batteries' armament, fire control, and communication systems. The Army maintained these components so they could be immediately placed into active service when required. Caretaker duties involved monthly inspections and emphasized the cleaning and maintenance of the guns and carriages. In addition, caretakers were to inspect the emplacement, slopes, and interior rooms during their monthly inspections. If deemed by the inspection, gutters and drainage sumps had to be cleaned out and problems with vegetation addressed, including watering during hot summer months. Following instructions found on battery construction drawings, such as the 1905 drainage plan for Battery Gunnison, damp interiors were improved by opening doors on warm, sunny days and promoting better ventilation. Performing all of these tasks and successfully maintaining a battery depended on the number of caretaker personnel assigned and whether they had to divide their time and energies among numerous duties (CLR, 2010:82).

Personnel reductions immediately after World War I were followed by new national policy and an international treaty that kept the caretaker system active until the mid-1930s. With the defeat of Germany

and the exhaustion of other European powers, future conflicts seemed unlikely at that time and public support for military spending waned. In this political environment, Congress passed the National Defense Act of 1920 that provided a new organizational model and regulations for the Army. The Act significantly cut active Army personnel and restructured the service to be comprised of the Regular Army, the National Guard, and the Organized Reserves. The National Guard and Reserves would provide the necessary manpower if conflict erupted and the focus of the Regular Army became training these non-permanent forces. Reduced active personnel were coupled with decreased funding and Sandy Hook's coastal defenses remained minimally staffed in caretaker status (CLR, 2010:82).

Furthermore, emphasis on coastal defenses was diminished by the Washington Naval Treaty, ratified in 1922. Under the terms of the treaty, the United States, Great Britain, Italy, France, and Japan all agreed to limit new naval construction and armament. With the strength of international navies a known and fixed quantity, there was little support beyond rudimentary maintenance for coastal defenses. By 1930, thirty-five coastal defense groups that were developed and active between 1890 and 1917 were reduced to only ten in active status. Sandy Hook, part of the Southern New York Harbor Defenses, and the Eastern New York Harbor Defenses at the confluence of the East River and Long Island Sound, joined an additional thirteen defense groups in caretaker status. Ten defense groups were abandoned and of the ten active groups, half were located in the foreign territories of Hawaii, Panama, and the Philippines. In the northeast United States, only the Long Island Sound Harbor Defenses that guarded the eastern entry to the Sound remained on active status (CLR, 2010:83).

Mobile Artillery:

Changes in the overall military strategy following World War I and the reduction in personnel and funding created an emphasis on mobile artillery. In the 1919 annual report to the Secretary of War, the Chief of Coast Artillery stated:

> "In the past our seacoast guns were mounted on fixed carriages because we had no others on which guns of requisite power could he mounted. But now we have mobile mounts for long range, powerful guns, and economy of force would seem to demand that we take advantage of this strategical and tactical mobility to effect artillery concentration at threatened points and thus use to the fullest possible extent our available artillery resources." (Annual Report of the Chief of Coast Artillery, 1919:4044).

The flexibility afforded by tractor-drawn artillery had been proven during World War I. Additionally, a stock of large caliber guns manufactured for use in Europe had never been shipped and being available, could be readily converted into new mobile artillery. Mobile artillery was comprised of large caliber guns and mortars mounted on either tractor-drawn flatbed trailers or railway cars. At Sandy Hook, a railroad line branched off the main line and proceeded in a north-south direction closer to the Atlantic coast line. From this branch, the Army constructed three spurs that extended into a dune area near the middle of the peninsula. On these spurs, the Army positioned two 8-inch railway guns and two 12-inch railway mortars

between the dunes facing the shipping channel. By July 1944, a map prepared by the Army Corps of Engineers indicates the original spurs were removed and reconstructed with an orientation to the east. The total number of spurs was also increased from three to five. To support the mobile artillery, the Army also mounted collapsible searchlights on railway cars to illuminate and identify enemy ships and appeared in service at Sandy Hook by March 1918 (CLR, 2010:83-84).

Threats from the Air and Changes in Concealment Strategies:

The focus of coastal defense batteries countering naval strength shifted following World War I. During the war, aircraft—including lighter than air blimps and balloons—were used primarily for reconnaissance but also engaged in strategic bombing and aerial combat. Less than a year after the armistice, defenses to counter an aerial attack were approved for Sandy Hook and 3-inch anti-aircraft guns were planned for installation at the former Dynamite Gun Battery, the Mortar Battery, Battery Arrowsmith, and Sandy Hook's Coast Guard station (CLR, 2010:84).

Billy Mitchell, a brigadier general in the Army's Air Service during World War I, recognized the offensive capabilities of aircraft and their potential to revolutionize warfare. In 1921, the Navy conducted bombing tests on seized German ships with Mitchell coordinating the Army's bombers. The ships were stationary targets lacking crews and sank after successive attacks with larger bombs. Navy officials argued that a maneuvering ship and responsive crew could have escaped the attack, however for Mitchell and the press covering the event, the test well demonstrated the effectiveness of airpower over surface targets (CLR, 2010:84).

In addition to bombing tests, the 1920s witnessed advances in aviation design. Pilots competed to finish longer-distance flights and in 1927, Charles Lindbergh completed the first transatlantic flight to continental Europe. Taking less than a day and a half, Lindbergh's journey demonstrated that the vast oceans that had kept America separated from European and Asian conflicts were increasingly easy to cross. As plane engines became more powerful, more sophisticated weaponry could be added and aerial bombing campaigns would become a standard component of warfare. Aerial bombing represented a major threat to coastal defenses. The existing concealment strategy relied on earth and sand cover to blend the battery into the surrounding dune landscape. This engineered earthwork was then planted with a combination of trees and shrubs at various heights to conceal the battery when viewed from a ship at sea. A 1910 memorandum from the Army's Office of the Chief of Coast Artillery outlined concealment procedures and clearly instructed that, "Before the actual planting begins the post and company commanders should observe the defenses carefully from the water to see where the screening effect is most needed and to decide as to how it can best be effected." (NARA, RG 177, box 49, folder 5352, Records of the Office of the Chief of Coast

Artillery). However, the efforts made to conceal a battery and its seaward-facing slope could not protect the concrete structure from overhead identification.

In order to protect coastal defense batteries when viewed from the air, the concealment strategy expanded to include increased plant cover, netting, and camouflage painting. In May 1943, the Chief of Coast Artillery at Fort Hancock provided a status on the batteries, reporting:

> "Obscurement grading and netting installed at Kingman and Mills. Planting 90% complete at Kingman and 30% complete at Battery Mills. Obscurement planting and painting at Battery Gunnison completed. Obscurement planting and painting completed at Urmston, Morris, Peck, Alexander, Halleck, Bloomfield, and Richardson. Camouflage painting of Potter and Granger completed." (NARA, RG 177, box 49, folder 5352, Records of the Office of the Chief of Coast Artillery).

With the exception of Battery Arrowsmith, disarmed after Kingman and Mills became operational in 1919, all of Sandy Hook's batteries were soon thereafter listed as having new concealment or "obscurement" strategies implemented. This is noteworthy because by July 1944, an Army Corps of Engineers map listed Battery Granger and the Nine Gun Battery comprised of Alexander, Halleck, Bloomfield, and Richardson as disarmed. Even as the structures were nearing the end of their service, the Army deemed it necessary to upgrade their protection from overhead identification (CLR, 2010:85).

Preparation for World War II:

Growing conflict in Europe and Asia during the 1930s forced the United States to prepare for war and to reevaluate the nation's coastal defense system. In 1936, Japan withdrew from the Washington Naval Treaty and two years later, Germany annexed Austria and continued with invasions into Czechoslovakia and Poland, beginning a second worldwide war. In response, during 1940 the U.S. War Department convened a board, similar to the Endicott and Taft boards, to prepare a new coastal defense plan. The board standardized new battery designs and artillery. Large-caliber artillery constructed during World War II was comprised of either 16- or 12-inch guns. Utilizing only two gun sizes and consistent battery design resulted in simplified tactics, training, maintenance, and ammunition manufacturing (CLR, 2010:85).

Recognizing that more personnel would be needed to prepare for an imminent conflict, Congress amended the Selective Service Act in September 1940 and decreased the minimum age requirement to register from 21 to 18 years old. That same month, President Franklin Roosevelt federalized the 245th New York National Guard Regiment making them the 245th Coastal Artillery Regiment stationed at Fort Hancock. To accommodate the personnel increase, the Army established tent cities and built a new contingent of wooden barracks and mess halls known as Camp Low north of Horseshoe Cove (CLR, 2010:85-86).

No longer constrained by a minimal workforce that defined caretaker status, Sandy Hook and the nation's other coastal defense sites returned to active status. The number of military and civilian personnel on

Sandy Hook grew tremendously to between 7,000 and 12,000 from 1942 to 1943. The large number of personnel was partially due to training exercises conducted at Fort Hancock for troops before deployment overseas. Congress authorized new coastal defense projects and renovation of two batteries at Sandy Hook with the latest defensive strategies (CLR, 2010:86).

To maintain consistency with the presentation in earlier sections, the coastal defense batteries will be divided into either large caliber gun batteries or rapid fire gun batteries. Within each category, the individual batteries will be presented chronologically according the dates that artillery was emplaced.

LARGE CALIBER GUN BATTERIES.

Battery Potter:

During World War II, the fire control stations on top of Battery Potter were no longer required due to longer-range guns, new range finding towers, and the disarming of older counterweight carriage artillery. The buildings and the sweeping views from the top of Potter were assigned new roles to support defensive efforts during the war. The Army converted the northernmost building on top of Potter's terreplein into a meteorological station to observe and track wind direction and weather phenomenon affecting artillery firing. To support the meteorological station, the Army installed a metal tether to the north of the building to attach weather balloons for recording wind speeds and direction (CLR, 2010:86).

On May 1, 1943, the Army established the Harbor Entrance Control Post (HECP) in the southernmost building on top of Potter's terreplein. From this vantage, personnel monitored the main shipping channel and controlled all ship traffic coming into and out of New York Harbor. Approximately six weeks after Germany's surrender to the Allies, the HECP was deactivated on June 18, 1945 (CLR, 2010:86-87).

For additional information regarding the historical development of Battery Potter and its adjacent landscape, please refer to the "*Cultural Landscape Report for the Sandy Hook Coastal Defenses*" (2010).

Mortar Battery:

Advances in naval artillery demonstrated during World War I that the 12-inch mortars at Mortar Battery would be ineffective in future conflicts. The Mortar Battery was disarmed in 1920, however, the engineered earthwork and protected interior spaces were utilized in the decades that followed until the deactivation of the New York Harbor Defense Program in 1950 (CLR, 2010:87).

In addition to exhibiting the power of naval artillery, World War I introduced new threats posed by aircraft flying reconnaissance missions and bombing campaigns. Responding to this new offensive capability, the Army mounted two 3-inch anti-aircraft guns on top of Mortar Battery's engineered earthwork between

1922 and 1923. The top of the earthwork, about thirty-five feet higher than the surrounding grade, offered a strategic elevation for the guns and the battery's interior rooms were utilized for ammunition storage and defensive shelter (CLR, 2010:87).

In 1937, an additional anti-aircraft gun was added to the top of the engineered earthwork and the three guns were designated A. A. Gun Battery No. 2. The three gun positions were identified on a 1944 Army Corps of Engineers map of Sandy Hook. With the start of World War II, the 3-inch anti-aircraft guns were supplemented by a machine gun platform consisting of four .50-caliber machine guns. Although not designated on the 1944 map, the smaller machine guns can be seen in a World War II-era photograph. Between 1940 and 1941, the Army converted the Mortar Battery's remaining interior spaces into the New York Harbor Defense Command Post (HDCP) (CLR, 2010:87).

For additional information regarding the historical development of the Mortar Battery and its adjacent landscape, please refer to the "*Cultural Landscape Report for the Sandy Hook Coastal Defenses*" (2010).

Batteries Kingman and Mills:

The 12-inch guns emplaced at Batteries Kingman and Mills in 1919 had significantly greater range than the counterweight guns at Nine Gun Battery and Battery Granger. Capable of firing at targets over twenty miles away, the guns at Kingman and Mills needed new range finding stations to identify targets at greater distances. In response, the Army built steel towers with range finding stations located in booths at the top. In March 1922, two towers—one dedicated for the fire control of Kingman and the other for Mills—were completed about a half mile south of Battery Gunnison along Atlantic Drive. Both towers were approximately forty feet tall and each contained a depression-type range finder. Five years later, a one hundred-foot tall tower was installed approximately 700 feet west of Battery Gunnison to provide fire control for Battery Harris at Fort Tilden (CLR, 2010:88).

Although batteries Kingman and Mills were innovative coastal defenses when installed, their design provided no protection against aerial detection and bombing, a flaw which had to be addressed as the United States entered World War II. The War Department's 1940 coastal defense plan utilized only 16- or 12-inch large-caliber guns, such as those at Batteries Kingman and Mills. When viewed from above, the existing batteries' open concrete platforms read as bull's-eye targets. A new casemated battery design, retrofitted to Kingman and Mills, protected guns, magazines, and operation centers with a complete covering of concrete and earth (Figure 10) (CLR, 2010:88-89).

Between 1941 and 1942, the Army casemated the open gun platforms at Batteries Kingman and Mills. In order to deliver ammunition and gunpowder, the Army moved the railroad tracks that had previously

traveled under a covered passageway to the west of casemated battery. Heat was installed in the new power rooms in 1944 and that same year, each battery had three individual dehumidifying units added to the existing system to remove moisture from their main corridors. The introduction of long range, high-altitude bombers, rockets, and the atomic bomb demonstrated offensive capability that eclipsed Batteries Kingman and Mills, and both were disarmed in 1948 (CLR, 2010:88-90).

For additional information regarding the historical development of Batteries Kingman and Mills and the adjacent landscape, please refer to the "*Cultural Landscape Report for the Sandy Hook Coastal Defenses*" (2010).

RAPID FIRE GUN BATTERIES.

Batteries Engle and Peck:

Disarmed in 1918 as a result of simplifying rapid fire artillery, Battery Engle was not abandoned, but modified before major military reductions were implemented following World War I. Alterations to Battery Engle occurred in 1920 to improve the fire control of nearby Battery Peck. The Army converted Battery Engle's magazine, shielded by seven feet of concrete cover, into a plotting room and constructed a coincidence range finding station over the concrete gun well. The station was nineteen feet square and its floor was set approximately four and a half feet higher than the gun well (CLR, 2010:91).

In concert with the alterations made at Battery Engle, the Army also improved Battery Peck in 1920. Prior to the modifications, an officer for Battery Peck stood on an open, concrete platform centered between the two emplacements. The new construction created a fully-enclosed, concrete, battery commander's station (Figure 11). To improve the range of Battery Peck's 6-inch guns, concrete was cut out of the emplacements in August 1928. Removing some of the concrete permitted the guns to rise to a twenty degree elevation. Increasing the angle of the gun from a horizontal position—zero degrees—to twenty degrees allowed Battery Peck's guns to strike targets further from the coastline (CLR, 2010:91).

The improvements to Battery Peck, including the fire control modifications made to Battery Engle, remained in service until 1943. At that time, the Army relocated Battery Peck's guns to Battery Gunnison. Peck's 6-inch guns could fire quicker than the 6-inch guns they replaced at Gunnison and as a result, Battery Gunnison was designated New Battery Peck. The Army did not mothball the former Battery Peck, but instead installed two 90mm anti-aircraft guns and designated the structure Battery Number 8 (CLR, 2010:91).

Batteries Urmston and Morris:

Although a new coincidence ranger finder station was completed at Battery Urmston in early 1919, a majority of the battery's artillery was removed a year later and during World War II, the remaining guns were transferred to a new location along the peninsula's eastern coastline. In March 1920, the Army approved removal of the guns at emplacements #1, #2, #5 and #6. These four guns used balanced pillar mounts, which proved to be inferior to the pedestal mounted system used for other rapid fire guns. Battery Urmston's pedestal mounted guns at emplacements #3 and #4 remained active until the start of World War II. In 1942, the Army removed the two pedestal mounted guns and relocated them to the dunes north of Battery Gunnison. The dune emplacement was operational in July 1943 and designated Battery Number 6. The battery was also referred to as "New Battery Urmston" and worked with the Harbor Entrance Control Post at Battery Potter to observe and potentially engage ships approaching New York Harbor via the channel. To protect New Battery Urmston from aerial detection the *Report of Completed Works*, updated in September 1943, records that the guns were "concealed with camouflage fabric on a sliding frame" (CLR, 2010:91-92).

Unlike Battery Urmston, the four pedestal mounted guns at Battery Morris remained in service throughout World War II. As part of the Army's efforts to improve fire control, a coincidence range finder station was added east of Battery Morris in 1920. The concrete structure, thirteen feet by thirteen feet, was constructed approximately ten feet above the ground. A nine foot-long coincidence range finder was installed inside the station at a height approximately twenty-seven feet above mean low water. The instrument's height and the area north of the station free of large, woody vegetation combined to provide unimpeded views of the water and improved fire control for Battery Morris (Figure 12) (CLR, 2010:92).

Battery Gunnison:

Battery Gunnison, the last rapid fire gun battery completed, was also the only rapid fire emplacement along the eastern shore of Sandy Hook. In addition to protecting Gunnison's concrete structure, a sand embankment planted with native grasses and shrubs was constructed on the battery's east side to blend the gun battery in with the surrounding landscape. Similar to engineered earthworks at other batteries, erosion was an ongoing issue to contend with at Battery Gunnison. A January 1929 letter to the Army Corps Chief of Engineers indicated Gunnison's east embankment had eroded and additional sand would be required to repair the earthwork (CLR, 2010:92).

As war loomed again in 1940, the War Department convened a board to prepare a new coastal defense plan. The board concluded that the rapid fire guns on counterweight carriages were deficient compared to the pedestal mounted versions. The counterweight carriage models were slower to load, had a shorter firing range, and had a limited field of fire. As a result of the board's findings, Battery Gunnison's guns

and counterweight carriages were disarmed in 1942. Not wanting to leave the southern approach to New York Harbor without rapid fire guns, plans were approved in February 1943 to relocate the pedestal mounted guns from Battery Peck to Battery Gunnison. In order to mount Battery Peck's guns, a redesign of Gunnison's platform areas was needed to emplace the pedestal mounts. The current platforms, at the base of a parapet wall, had concrete added in order to create a level surface for mounting the guns. Once the new guns were installed, Battery Gunnison was designated New Battery Peck (CLR, 2010:92).

From 1943 to the end of World War II, Gunnison operated as directed by the Harbor Entrance Control Post stationed atop Battery Potter. Gunnison served as an examination battery that was intended to track targets and fire upon them when ordered. Orders for firing included "bring-to" shots designed to warn a commercial ship to stop until it received proper clearance, and destructive fire intended for enemy vessels (CLR, 2010:93).

Disarmed Gun Batteries:

By 1919, three large caliber gun batteries were disarmed as new artillery, carriages, and improvements in battleship armaments made them obsolete. Guns were first removed at Battery Potter and then at Mortar Battery. Both of these disarmed structures were repurposed during World War II as command posts for coastal defense coordination. The third large caliber gun battery, Battery Arrowsmith, was disarmed after Batteries Kingman and Mills became operational in 1919, Kingman and Mills featuring a 360-degree fields of fire that could both fire at ships as sea, as well as defend Sandy Hook's western shoreline (CLR, 2010:93).

During World War II, two additional large caliber gun batteries were disarmed. The 10- and 12-inch artillery atop Nine Gun Battery and Battery Granger was removed because these guns did not have the range to strike better armed enemy battleships. Additionally, the batteries were susceptible to aerial bombing and not protected like the recently casemated Kingman and Mills. The "Report of Completed Works," a detailed account of equipment at each battery maintained by the Army Corps of Engineers, notes in a handwritten comment that the "salvage of armament" at Battery Granger was approved on January 22, 1943. Similar handwritten comments note that the artillery at Battery Halleck, the first three emplacements of Nine Gun Battery, were "listed for disposal" on November 4, 1942. A year later, the Army Service Forces directed the "salvage of armament and accessory equipment" at Batteries Richardson and Bloomfield. Supporting the information in the "Report of Completed Works," Nine Gun Battery, Battery Granger, and Battery Arrowsmith are all labeled "dismantled" on a July 1944 map of Sandy Hook prepared by the Army Corps of Engineers (CLR, 2010:93).

The geographic separation that afforded the United States a measure of protection against previous global conflicts proved inadequate against technological improvements during World War II. Entry into the war began with the long-range Japanese aerial attack on Pearl Harbor, and by the war's conclusion the introduction of long-range bombers, rockets, and atomic weapons far surpassed any defensive capability offered by large caliber, casemated guns like Batteries Kingman and Mills. In addition, long-range bombers could fly at a high altitude that positioned them substantially outside the range of rapid fire gun batteries. With both categories of batteries eclipsed by offensive weaponry, the remainder of Sandy Hook's coastal defense batteries were deactivated and disarmed by 1948. Although deactivated, the 6-inch rapid fire guns at Battery Gunnison remained emplaced and survived a thorough effort at Sandy Hook and across the country to collect coastal artillery for scrap metal (CLR, 2010:93-94).

NIKE MISSILE SYSTEMS AND THE COLD WAR, 1945–1974

During World War II, advances in aviation made it possible to fly beyond the range of 3-inch anti-aircraft guns, similar to those emplaced at the top of Mortar Battery. Providing a greater range, the 90mm anti-aircraft gun became the new Army standard during the war and could strike a target flying at 30,000 feet. This improved anti-aircraft artillery was installed at Sandy Hook on Battery Peck in 1943 (CLR, 2010:121).

In the closing years of the war the Army realized that the 90mm guns, even with the assistance of radar technology, lacked the range, accuracy, and destructive power to defend against an aerial attack. On August 17, 1944, Army Ordnance officer Jacob W. Schaefer submitted a memorandum proposing the design of an anti-aircraft rocket which could be radar-guided from the ground (CLR, 2010:121).

Six months later, the Army's Chief of Ordnance issued a contract to Western Electric and Bell Telephone Laboratories to determine the feasibility of a defensive missile system. The project was given the code name NIKE after the Greek goddess of victory and on November 27, 1951, a NIKE missile successfully destroyed a drone plane during tests at the White Sands Proving Ground in New Mexico (CLR, 2010:121).

Military Reorganization and the Origins of the Cold War:

Similar to responses following World War I, the years immediately after World War II witnessed reductions in military personnel and spending. A logistical support unit, the 1225th Army Service Unit, remained stationed at Fort Hancock until the end of 1949. The reduction of combat and support personnel, along with new offensive weaponry that surpassed Sandy Hook's existing coastal defense batteries, resulted in Fort Hancock's deactivation on June 25, 1950. The Army's departure from Sandy Hook did not last long as armed conflict erupted on the Korean peninsula. On April 10, 1951, Fort Hancock was reactivated for defense of the metropolitan New York area. Anti-aircraft gun batteries deployed during

World War II were reestablished and the fort served as a staging center for training and equipping other anti-aircraft units (CLR, 2010:121).

NIKE Ajax:

Although conceived during World War II, development of the NIKE system was delayed due to reduced funding immediately after the war. Renewed attention to the NIKE program corresponded with increased tensions between the United States and Soviets, advances in Soviet weaponry, and finally, the start of the Korean Conflict in June 1950. Hostilities between North and South Korea threatened to draw the United States and the allied Chinese and Soviets into another world war. Even though a global conflict did not spread from the Korean peninsula, United States military policy began to focus on defensive preparations (CLR, 2010:123).

In 1950, the Army reorganized defensive artillery units into the Army Anti-Aircraft Command (ARAACOM). That same year, improvements were made in the NIKE booster rocket and guidance systems leading to the successful test firing in November 1951. The first generation of NIKE missiles, known as Ajax, were twelve inches in diameter, twenty-one feet long, weighed over 2,455 pounds, and operated remarkably similar to the system outlined by Jacob Schaefer's 1944 memorandum (CLR, 2010:123).

NIKE Hercules:

Four months after the successful test of NIKE Ajax at White Sands Proving Ground, the Bureau of Ordnance recommended studying the feasibility of equipping the missile with a nuclear warhead. In their study of Army and Air Force missile defense programs, John C. Lonnquest and David F. Winkler cite that a major limitation of the Ajax system was, "...the inability to discern individual bombers within a densely-packed flying formation" (To Defend and Deter, 1996:179). For example, if two planes were flying close together, the radar would detect them as one object and guide the missile to hit the center of that object. At best, the missile would not score a direct hit and at worst, miss both targets completely. One way to correct this potential shortcoming would be to arm the missile with a nuclear warhead. Upon detonation, the nuclear warhead would create a larger and more powerful explosion that could destroy planes without a direct hit (CLR, 2010:123-124).

Ajax designers recommended two options for adding a nuclear warhead to the missile. First, a smaller warhead could be reconfigured and adapted for use on the Ajax. The second option involved using a larger warhead with more destructive power and incorporating it into a newly designed, larger missile. The Army selected the second option on condition that the new missile system would use the same facilities already being designed and constructed for the Ajax. In July 1953, the Army authorized the development of the

second generation NIKE missile called Hercules. In addition to the larger warhead capacity, Hercules would feature a longer range and more stable fuel mixture than its predecessor (CLR, 2010:124).

Three years after authorization, a Hercules missile successfully destroyed a drone aircraft at White Sands Proving Ground. Tests continued into 1957 using a solid fuel mixture that would replace the volatile liquid mixture of jet fuel and nitric acid used in Ajax. Forty-one feet long and thirty one and half inches in diameter, Hercules' increased size accommodated not only a larger warhead, but four booster rockets compared to a single rocket on Ajax. The added thrust increased the range of Hercules up to three times greater than Ajax and obtained altitudes up to 150,000 feet (CLR, 2010:124).

NIKE Sites at Sandy Hook:

The NIKE installation at Sandy Hook was one of nineteen missile sites that comprised the New York Defense Area. The defense area included the five boroughs of New York City and two counties to the north, the western half of Long Island, and the northeastern section of New Jersey. Regardless of a New York or New Jersey location, all of the NIKE sites were designated "NY" followed by a number to indicate their association with the defense area (CLR, 2010:124).

The Department of Defense announced plans to construct the NIKE site at Sandy Hook, designated NY-56, in December 1953. With coastal defenses redirected away from naval threats to instead intercepting aircraft, proximity and range-finding views to important waterways were no longer important factors in selecting locations for NIKE sites. The selecting factor changed to adequate distance and a lack of obstructions between proposed NIKE radar and missile locations so radar and launch equipment could properly operate in tandem (CLR, 2010:125)

At Sandy Hook and across the country, NIKE installations were comprised of an Integrated Fire Control (IFC) or radar site and a launch site. The IFC contained the acquisition and tracking radar and was separated from the launch site by a minimum of 3,000 feet. More commonly, sites were separated by over a mile as was the case at Sandy Hook. Regardless of the exact distance, the two locations had to be within visual sight of each other so radar could lock onto a firing missile. Buildings, tall vegetation, and utility poles are examples of objects that could interfere with radar transmissions (CLR, 2010:125).

The IFC and launch sites at Sandy Hook were located south of Fort Hancock and the temporary, World War II-expansion needed to accommodate increased personnel. The IFC was located roughly in the middle of the peninsula, in the largely undeveloped area southeast of the Camp Low barracks built during World War II. The launch site was located east of Batteries Kingman and Mills, across Hartshorne Drive, and immediately north of a small, existing pond. A 1944 Army Corps of Engineers map of Sandy Hook

recorded a group of eight warehouses, labeled T-10 through T-17, that were in the general vicinity of the proposed launch site. The warehouses were constructed by Western Electric to shelter radar antenna during tests by the Army Signal Corps (CLR, 2010:125).

Sandy Hook's NIKE launch site represents one of the few dual battery installations constructed during the Cold War era. The Sandy Hook launch site contained four underground magazines that delivered missiles by an elevator to a row of launchers on the surface. The two magazines on the east side of the launch area formed one firing battery and the two on the west side formed the other. The IFC site to the north contained two control areas with separate radar systems for each firing battery. The eastern control area, designated #1, provided radar for the eastern firing battery while the western control area, designated #2, was assigned to the western firing battery (CLR, 2010:125).

Integrated Fire Control (IFC) or Radar Site:

During the previous generations of coastal defenses at Sandy Hook, the NIKE IFC site remained largely undeveloped. The Army's central railroad line bisected the future IFC location and during World War II, several temporary structures associated with Camp Low bordered either side of the tracks. A site plan for the IFC, issued March 22, 1954, recorded six concrete foundations in the northern portion of the proposed site. None of the foundations were labeled with building designations and the majority appear small enough to be outbuildings or auxiliary structures. In addition, the site plan showed vegetation cover occupying more than half of the proposed area and contained the labels "brush and trees up to 35' high" (CLR, 2010:125-126).

The proposed IFC site was roughly triangular in shape with its longest perimeter running from west to east. The western point, accessible from Hartshorne Drive, contained Control Area #2. The eastern point contained Control Area #1 and was accessible from Atlantic Drive. The boundaries of the site converged at a northern point that contained the Ready Barracks and were accessible from Sheldon Road (Figure 13). For both control areas, the three types of radar shared the same relative position with the Acquisition Radar in the center flanked by the Missile Tracking Radar (MTR) to the west and Target Tracking Radar (TTR) to the east. Each area also featured a long, rectangular, concrete pad located north of the Acquisition Radar. The pad was constructed for three trailers, stacked front to back, that held equipment and personnel for battery control, radar control, and spare computer and electronics parts. The wheels and undercarriage of each trailer were removed and the trailers set on wooden blocks on top of the concrete pad (CLR, 2010:126).

For additional information regarding the historical development of Sandy Hook's NIKE IFR Radar Site and the adjacent landscape, please refer to the *Cultural Landscape Report for the Sandy Hook Coastal Defenses* (2010).

Launch Site:

The Army originally intended for NIKE missiles to be stored above ground and estimated 119 acres were needed for a combined IFC and launch site. Since NIKE sites were going to defend populated urban, military, and industrial areas, available space was a constraining factor. To reduce the footprint of the launch site, designs for underground magazines were prepared that resulted in an approximate forty acre-requirement for the IFC and launch sites. On October 28, 1953, ARAACOM directed that the underground magazine design would be used in most instances (CLR, 2010:128).

The launch site at Sandy Hook was roughly T-shaped in plan. The long leg of the "T" began at Hartshorne Drive and proceeded east toward the Atlantic Ocean where it divided into shorter northern and southern sections. The western portion of the "T" contained the Ready Barracks and the southern section contained the Missile Maintenance Area. The northern section contained the underground missile magazines and launching racks and all three areas were surrounding by a perimeter fence (Figure 14) (CLR, 2010:128).

Due to groundwater being very close to the surface throughout the peninsula, the magazines and launching racks were located in an area with existing grades between elevations of sixteen and twenty feet. Generally higher than other areas on the peninsula, this location, with the addition of fill material, would permit the underground magazine design. The proposed elevation for the launchers was twenty-feet and they were contained within a 460 by 490-foot engineered plateau at a similar elevation (CLR, 2010:128).

For additional information regarding the historical development of Sandy Hook's NIKE Launch Site and the adjacent landscape, please refer to the *Cultural Landscape Report for the Sandy Hook Coastal Defenses* (2010).

ICBMs, NIKE Zeus, and a New Defense Philosophy:

During the 1950s, the United States and Soviet Union escalated their arms race and began developing missiles that would travel beyond the Earth's atmosphere and be able to strike targets half-way around the world. Known as intercontinental ballistic missiles or ICBMs, this new offensive technology shifted the threat away from the long range bombers that the NIKE system was intended to stop. The Soviet Union announced they had an operational ICBM in 1957 and following the launch of Sputnik that same year, the United States accelerated their program and had the Atlas ICBM operational in 1959 (CLR, 2010:130).

In response to this new offensive weaponry, the Secretary of Defense assigned the Army with development of an anti-missile, missile system called Zeus that utilized existing NIKE infrastructure in 1958. For the next three years funds were allocated for research and development, but not for implementation at existing NIKE sites. Opposition mounted against the Zeus system as the scientific community argued existing radar systems lacked the sophistication to discern between an ICBM and debris jettisoned from its booster rockets. Furthermore, arguments against the concept of an anti-missile, missile system contended it could be defeated by overwhelming the system with a massive convoy of decoy missiles with only one missile being armed with a nuclear warhead. Funding for Zeus was cancelled in 1963, however, debate, research, and development on an anti-ballistic missile system continued throughout the 1960s (CLR, 2010:130).

Personnel cuts began at NIKE sites in 1967 as a result of the Zeus system's cancellation and Hercules being tactically ineffective against ICBMs. The cuts were hastened by escalating war efforts in Vietnam and in 1968, the first NIKE sites were deactivated. The perpetuating contest of new offensive weaponry followed by improved defensive capabilities that resulted in over a century of coastal defense innovations at Sandy Hook, ended with the doctrine of mutually assured destruction. Defense philosophy shifted from costly artillery and infrastructure to guaranteeing that the United States and the Soviet Union had the same apocalyptic nuclear capabilities. This mutual assurance prevailed as the only way to prevent nuclear war. On February 4, 1974, Secretary of Defense James Schlesinger announced plans to close forty-eight NIKE installations across the country including the Sandy Hook site. In the following months, the Army removed missiles and equipment from Sandy Hook and formally deactivated the site in a ceremony held on August 15, 1974 (CLR, 2010:131).

Base Consolidation and Transfer to the National Park Service:

With the NIKE system's defenses eclipsed by the threat of ICBMs and an expanding war in Vietnam, priorities were adjusted for federal defense spending. In January 1967, the Department of Defense announced plans for thirty-three military base closings and consolidations including Fort Hancock. Prior to this announcement, new stakeholders emerged on the Sandy Hook peninsula and began the transformation of a strategic military installation into a premier recreation destination (CLR, 2010:131).

Beginning in 1962, New Jersey State Parks purchased twelve acres at the southern end of the peninsula for developing beach access and fishing. Between the highway bridge that entered Sandy Hook and Spermaceti Cove, the State established a parking area and a comfort station for recreational fishing. North of this narrow strip, the State leased 460 acres from the Department of Defense that extended to the southern boundary of the NIKE launch site. In this area, New Jersey State Parks developed two beach sites with bathhouses and parking facilities. The two beach sites and fishing areas to the south combined to provide parking for approximately 3,500 vehicles. Two years later, the State leased an additional 285 acres

that extended west from Hartshorne Drive—the main north-south vehicular route—to include land along Horseshoe Cove and Skeleton Hill Island (CLR, 2010:131).

Already established as a popular recreation site, the Fort Hancock closure announcement brought together Monmouth County and New Jersey state officials and representatives from the Departments of Defense and the Interior to develop and analyze alternatives for Sandy Hook. Chief among their concerns was maintaining the peninsula for public recreation, however, other competing proposals included a new Coast Guard airbase, Army and Coast Guard housing, and recreational facilities for military personnel. One of the main alternatives generated by this group was to designate Sandy Hook as a National Seashore under the management of the National Park Service. Beginning in 1961, a lack of public access to undeveloped seashore areas led to the creation of parks at Cape Cod, Fire Island, and Assateague Island. In proposing a National Seashore at Sandy Hook, the group proposed that "the peninsula could provide a significant and much needed recreational unit within the heart of the nation's most densely populated region" (Sandy Hook: A Study of Alternatives, 1967:33).

With Fort Hancock slated to close, the alternatives studied for Sandy Hook did not lead to an individual park unit, but incorporated Sandy Hook with sections of Brooklyn, Queens, and Staten Island into a new park. On October 27, 1972, President Richard Nixon signed legislation enabling the creation of the Gateway National Recreation Area recognizing the cultural and natural resources and recreation opportunities along lower New York Harbor. On August 15, 1974, the Army held a ceremony to deactivate Fort Hancock's NIKE site and recognize the service of the Army Air Defense personnel. The ceremony dedicated Guardian Park located south of the Fort Hancock Parade Ground. The park's design featured a cruciform concrete walkway oriented in a north-south and east-west direction. Four commemorative items were placed at the end of each walkway and the intersection was marked by the second stage of a NIKE Hercules missile. A flagpole was erected at the north and a NIKE Ajax missile at the south walkway. A granite monument commemorating soldiers killed during a NIKE explosion in Middletown, New Jersey was placed on the west. Opposite the monument, a 75mm park howitzer was sited to commemorate traditional coastal artillery. Four months later, on December 31, 1974, Fort Hancock was officially deactivated and the next day, transferred to the National Park Service (CLR, 2010:132).

NATIONAL PARK SERVICE ADMINISTRATION, 1975–PRESENT

Following the transfer from the Army to the National Park Service, planning efforts began for Sandy Hook and the entire Gateway National Recreation Area culminating in the publication of Gateway's General Management Plan in 1979. The General Management Plan was prepared to identify pertinent issues and guide decision-making processes for the next two decades (CLR, 2010:161).

At Sandy Hook, strategic coastal defense locations and supporting military infrastructure had shaped development on the peninsula since the Revolutionary War. With the completion of the General Management Plan, priorities shifted to balancing recreational opportunities with natural and cultural resource protection. Specifically, with development focused around historic Fort Hancock at the northern end and the former New Jersey State Park facilities at the southern end of the peninsula, the interior section was recognized for its "spacious coastal landscapes and natural features [that] are an important part of the Sandy Hook resource and are deserving of protective management and uses that will allow their perpetuation" (General Management Plan, 1979:12).

Located within the largest metropolitan area in the nation, Sandy Hook and its miles of undeveloped oceanfront stood apart in stark contrast, offering unique recreational opportunities for residents in the immediately surrounding urban and suburban areas. Access for up to two million visitors annually was almost exclusively by automobile and accordingly, planning efforts focused on road configurations, parking, and alternative transportation development (CLR, 2010:161).

The National Park Service sought to distribute parking and visitor concentrations more evenly by decreasing parking on the southern portion of the peninsula and creating new parking and beach facilities near Battery Gunnison and Nine Gun Battery. The General Management Plan proposed a 350-car parking area at the former NIKE launch site for visitation and access to a proposed, small beach center located off the site's northeast corner. In the years following the General Management Plan, neither the beach center nor the parking area was developed in this area (CLR, 2010:161).

Alternative transportation planning has addressed increasing ferry service, using shuttle buses to connect the northern and southern sections of the peninsula, and dedicated bicycle routes. Recently, the park has installed a Multi-Use Path that starts at the south entrance and continues north to the ferry landing. The path was designed to accommodate bicycle, roller blade, and pedestrian traffic and routing visitors past the perimeters of the NIKE IFC and launch sites. Presently, plans are being developed to create secondary paths branching off the main Multi-Use Path that will bring visitors to other coastal defenses and facilitate new interpretive opportunities at these cultural sites (CLR, 2010:161).

The U.S. Coast Guard, which has maintained a presence on Sandy Hook since the establishment of a lifesaving station in 1848, continues to operate a facility at the northern end of Sandy Hook. In addition to the Coast Guard, several other institutions have partnered with the park, leasing buildings in the Fort Hancock Historic District. The National Oceanic and Atmospheric Administration's (NOAA) Marine Fisheries Service constructed a new research facility in 1985 following a fire that destroyed previous laboratories staffed by the Department of the Interior's Bureau of Sport Fisheries and Wildlife Service.

NOAA's research efforts were joined by the New Jersey Audubon Society that established the Sandy Hook Observatory in 2001 to provide educational programs and events that address the peninsula as a resource for migratory birds (CLR, 2010:162).

Complementing these research and educational endeavors, Monmouth County established two educational facilities in the Fort Hancock Historic District. Brookdale Community College created a field classroom for environmental and marine studies in Fort Hancock's Building 53, the Post Exchange Building. South of the Mortar Battery along Gunnison Road, the Marine Academy of Science and Technology (MAST) was founded in 1981 to provide high school instruction in marine science and engineering. These organizations may be joined by others as the park contemplates lease options involving future partners in rehabilitating thirty-three historic buildings in the Fort Hancock Historic District (CLR, 2010:162).

Safety, Stabilization, and Research:

Although the General Management Plan called for greater interpretation of the coastal defense batteries and improving access for the public, efforts in the last three decades have focused on safety issues, stabilization, and research. In order to warn visitors of potentially hazardous conditions at Battery Peck, Battery Granger, and Nine Gun Battery, the park erected chain-link fencing and signage between pedestrian routes and the structures. At Battery Gunnison, the park demolished a concrete bridge in 2001 to eliminate hazards created by the deteriorating concrete. The bridge spanned between the south gun platform and the shell hoist (CLR, 2010:162).

Visitor access had once been permitted to the top of the Mortar Battery and the park installed post and cable fencing in the late 1970s to keep visitors away from the hazardous, open mortar pits. Due to increased erosion and the creation of social trails across the historic earthwork, the park closed access to the top around 1990. More successful efforts at providing visitor access have been made at Battery Potter. In 2003, the park rehabilitated an exterior metal stairway on the south side of the battery. As part of the same project, new pipe railing was added along the top of the west facade and also the top of the gun parapet walls. The same year, new metal pipe railing was added to the stairs and around perimeter of gun platforms at Battery Gunnison (CLR, 2010:162-163).

The physical condition of the coastal defense structures and visitor access have not been the park's only concerns. The tides and currents that began shaping Sandy Hook over 8,000 years ago continue to affect the peninsula and at times, seriously threaten historic resources. A violent winter storm in December 1974 removed several vertical pilings from the bayside bulkhead west of Batteries Kingman and Mills. With a portion of the structure breached, subsequent storms in the 1970s destroyed the majority of the bulkhead and began eroding the shoreline (CLR, 2010:163).

An especially destructive storm affecting Sandy Hook and the northeastern United States struck in February 1978. In addition to erosion near Batteries Kingman and Mills, hurricane-force wind gusts and storm surges washed away the natural dune formations east of the NIKE launch site and carved away at the narrow, southern portion of the peninsula where beach parking and bathhouses had been established. In the early 1980s, the park pumped sand to reinforce the depleted recreational beaches. As part of this process, sand was initially added in between Batteries Kingman and Mills to set up a construction staging area for remainder of project. To better respond to future beach erosion, the park recently installed and tested a sand-slurry pipeline system that can more efficiently replenish eroded areas (CLR, 2010:163).

Analysis & Evaluation of Integrity

Analysis and Evaluation Summary

Analysis and Evaluation Summary Narrative

Significant landscape characteristics identified for the coastal defense batteries include spatial organization, topography, vegetation, circulation, buildings and structures, views and vistas, and small-scale features. Many landscape features associated with these characteristics contribute to the overall historic significance and identity, while others do not.

The spatial relationship of an Endicott-Taft period gun battery's firing side and engineered earthwork, concrete structure, and rear elevation for access remains unaltered at the individual sites. At the NIKE missile sites, the distinct three spaces designed for separate functions are retained and identified by arrangements of buildings and structures and circulation routes. The engineered earthworks at all sites are primarily intact with some erosion occurring since the end of the historic period. Large woody vegetation growing on the earthworks creates the potential for the placed earth and sand to be removed by a toppled tree. Vehicular circulation routes provide access throughout Sandy Hook and among the various coastal defense battery sites. Sidewalks and pedestrian circulation systems provide access among the individual structures that comprise the NIKE missile sites. The reinforced concrete structures and engineered earthworks that comprise the building system for the batteries are intact, but there is evidence of spalling, cracks, and separation on the concrete elements. Tactical views from the artillery emplacements, battery commander's stations, and fire control stations to the water are primarily impeded by woody vegetation growing at the interface of the engineered earthwork and concrete battery structure. The coastal defense batteries contain numerous small-scale architectural features associated with buildings and structures. Railings and features utilized for lighting, electronic communication, and weather observation are present on various batteries and in the landscape, small-scale features include fencing and exterior lighting.

INTEGRITY

The coastal defense batteries at Sandy Hook retain integrity of location, setting, materials, and workmanship. The batteries also retain integrity of design, feeling, and association, but these aspects are diminished primarily due to the addition of non-historic structures, changes to circulation features, and the growth of large woody vegetation. These aspects have not been permanently lost and can be greatly improved with the removal of the non-historic vegetation. The coastal defense batteries retain their overall physical form and addressing the condition of historic details will strengthen the association of the batteries as critical installations for defending the southern approach to New York City and the metropolitan area's airspace.

Location:

Location is the place where the cultural landscape was constructed. The coastal defense batteries continue to occupy the locations where they guarded the southern approach to New York Harbor and the skies over the New York-New Jersey metropolitan area. The coastal defense batteries thus retain integrity of location.

Design:

Design is the combination of elements that create the form, plan, space, structure and style of the cultural landscape. Extant design elements include structural features such as battery commander's stations, auxiliary support buildings, and barracks and vehicular and pedestrian circulation. The primary change to the original design of the coastal defense batteries is the growth of large woody vegetation on the structures, their engineered earthworks, and in immediately adjacent areas that would interfere with historic operations. However, the presence of the non-historic plant material can be reversed. With the exception of Battery Gunnison, the gun batteries are missing the artillery and carriages that were part of an earth-covered, concrete defensive structure. Similarly, the NIKE radar site lacks the radar units that were mounted on top of the towers for target acquisition and tracking and missile guidance. Nonetheless, the facilities on which this equipment was mounted remain. North of Battery Peck, an observation platform and communications trailer have been added. At most locations, the railroad tracks that supported the construction and provided the projectiles and gunpowder for the batteries are removed. Near Nine Gun Battery, Battery Gunnison, and the NIKE radar site, surface parking areas have been added. The coastal defense batteries retain integrity of design, but it is diminished.

Setting:

Setting is the physical environment of the cultural landscape. The setting of the coastal defense batteries is defined by topography and vegetation communities that inhabit large, contiguous areas and transitional zones. Contrary to the height of the battery structures and their engineered earthworks, adjacent topography is relatively flat or slightly undulates to form coastal dunes. These topography features are largely intact. Masses of undisturbed vegetation, such as the holly forest east of Batteries Kingman and Mills and the low-growing shrubs and beach grasses on coastal dunes, have also been retained. Although Sandy Hook's function has changed from a strategic military installation to a recreation destination serving a densely-populated region, the coastal defense batteries retain integrity of setting.

Materials:

Materials are the physical elements that were combined or deposited during the period of significance in a particular pattern or configuration to form the cultural landscape. The coastal defense batteries retain historic built materials of granite, concrete, steel, and sand and earth. The condition of these materials is

negatively affected by water infiltration, rust, erosion, and large woody vegetation, however, the materials have not been replaced with non-historic substitutes. Changes have occurred with plant materials on the engineered earthworks and adjacent to the batteries due to succession and the growth of non-native invasive species such as ailanthus. The presence of non-historic plant material can be reversed. The coastal defense batteries retain integrity of materials.

Workmanship:

Workmanship is the physical evidence of the crafts of a particular culture or people during the period of significance. The coastal defense batteries demonstrate workmanship of the Army's changing technology in coastal defenses from the late nineteenth to the mid-twentieth century. Masons set granite blocks to form a defensible entrance for Battery Potter. When a land-based attack was no longer a threat and the counterweight gun carriage successfully tested, large caliber gun batteries featured open rear elevations and recessed concrete wells to emplace the guns. Finally, when aerial bombing replaced naval gun fire, Batteries Kingman and Mills were completely casemated in earth-covered concrete to protect artillery and crew. The coastal defense batteries retain integrity of workmanship.

Feeling:

Feeling is the cultural landscape's expression of the aesthetic or historic sense of the historic period. Due to their scale, materials, and integration in the landscape with engineered earthworks, the coastal defense batteries are distinct from other buildings and structures at Sandy Hook and retain their historic feeling. At the NIKE missile sites, the perimeter fences convey the security established when the radar and launch sites were operational. Large woody vegetation growing on the batteries, their engineered earthworks, and in surrounding areas diminishes the feeling of a maintained military landscape. Similarly, vegetation along the NIKE fence lines and the poor condition of some sections of fences lessens the integrity of feeling. The coastal defense batteries retain integrity of feeling, but it is diminished.

Association:

Association is the direct link between the important historic event or person and the cultural landscape. The coastal defense batteries have a diminished integrity of association. It is challenging to link the structures with their role in coastal defense due to several factors. Changes in circulation systems and unchecked growth of vegetation make access and therefore recognition of batteries such as Urmston and Morris difficult. Large woody vegetation is the primarily culprit obstructing downrange views from the batteries and impeding an understanding between the battery's location and the water. Finally, vegetation growing on the batteries conveys abandonment and lessens the association of the batteries as vital resources for coastal defense. However, the presence of overgrown vegetation is reversible and has not permanently

diminished the integrity of these properties. Thus, the coastal defense batteries retain integrity of association, but it is diminished.

Landscape Characteristics and Features

This section presents an analysis of landscape characteristics and their associated features and corresponding List of Classified Structures names and numbers, if applicable. It also includes an evaluation of whether the feature contributes to the property's National Register eligibility for the historic period (1859-1974), contributes to the property's historic character, or if it is noncontributing, undetermined, or managed as a cultural resource. The following analysis is extracted from the *"Cultural Landscape Report for the Sandy Hook Coastal Defense Batteries"* (2010) by Timothy W. Layton and H. Eliot Foulds. Graphics associated with this section are located at the end of the report.

Landscape Characteristic Narratives and Features

SPATIAL ORGANIZATION

Historic Condition:

The spatial organization of the coastal defense batteries is defined their role in a larger system of coastal defenses. The gun batteries at Sandy Hook were not isolated, defensive fixtures but components in a system that utilized multiple locations, varying land-based artillery, and underwater controlled mines to defend the south approach to New York. In addition to batteries at Sandy Hook, the Army constructed coastal defenses to the south at Navesink, to the north at Fort Hamilton, Fort Wadsworth, and Fort Lafayette along the Narrows, and to the east at Fort Tilden on the Rockaway peninsula. All of the battery sites were intended to provide defense-in-depth—a redundant system that provided continued resistance against a potential enemy advancing north toward New York City. The NIKE missile battery at Sandy Hook was also part of a redundant system of defenses that incorporated geographically separate radar sites and command centers for coordinating nineteen missile batteries in the New York Defense Area. In addition to Sandy Hook, nearby missile sites included Leonardo and South Plainfield, New Jersey, and Fort Tilden on the Rockaway peninsula.

The individual gun batteries at Sandy Hook were oriented to engage a potential enemy on the water. Consequently, a majority of the batteries faced artillery north or east toward the major shipping channel that followed the Atlantic shoreline of the peninsula. The firing side of the battery was protected by an engineered earthwork that transitioned to a reinforced concrete structure. The structure emplaced the guns, stored ammunition, and housed dedicated spaces for calculating a target's range. The rear elevation of the concrete structure provided personnel access and delivery of ammunition and supplies. If an enemy fired on the battery, the safest place for personnel was under the protective cover of reinforced concrete and

engineered earthworks. Recognizing this advantage, the Army converted the covered galleries of the Mortar Battery to house central communications and to serve as a command post during World War II.

Post-historic and Existing Conditions:

The coastal defense batteries at Sandy Hook have not moved since the end of the period of significance and continue to occupy the locations where they guarded the southern approach to New York Harbor and the skies over the New York-New Jersey metropolitan area. The arrangement of a battery's firing side and engineered earthwork, concrete structure, and rear elevation for access remains unaltered (Figure 15).

Spatial Organization Feature Name	Feature Contribution	LCS Name	LCS Number
Battery Urmston: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Battery Morris: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Battery Engle: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Battery Peck: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Nine Gun Battery: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Battery Potter: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Battery Granger: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Mortar Battery: Arrangement of battery's mortar pits and engineered earthwork, counterscarp galleries, and perimeter wall	Contributing	n/a	n/a
Battery Gunnison: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Battery Kingman: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
Battery Mills: Arrangement of battery's firing side and engineered earthwork, concrete structure, and rear elevation for access	Contributing	n/a	n/a
NIKE Radar: Control Area #1	Contributing	n/a	n/a
NIKE Radar: Control Area #2	Contributing	n/a	n/a
NIKE Radar: Ready Barracks	Contributing	n/a	n/a
NIKE Launch: Missile Magazines	Contributing	n/a	n/a

NIKE Launch: Missile Maintenance Area	Contributing	n/a	n/a
NIKE Launch: Ready Barracks	Contributing	n/a	n/a

TOPOGRAPHY

Historic Condition:

Mid-nineteenth century improvements to artillery and projectiles coupled with combat experience during the Civil War convinced military engineers that a new generation of coastal defense batteries should rely on constructed earthworks for protection. Batteries shielded with engineered earthworks were constructed at Sandy Hook in the 1890s and designed earthen covered continued to be a feature of batteries until the conclusion of World War II. Compared to masonry and concrete construction, the engineered earthworks were easy and inexpensive to replace if damaged. In addition to protecting a battery, the earthworks offered an added benefit of concealing the concrete structure by blending it into the surrounding coastal topography. Hundreds of thousands of cubic yards of earth and sand were excavated and meticulously placed to complete the coastal defense batteries at Sandy Hook. Engineered earthworks were also constructed at the NIKE launch site to cover the Missile Magazines and to protect adjacent areas from an accidental explosion at the Missile Maintenance Area.

Post-historic and Existing Conditions:

The engineered earthworks are primarily intact with some erosion occurring since the end of the historic period. At the NIKE launch site, recycling bins cut into a portion of the south earthwork at the Missile Maintenance Area (Figure 16). For all sites, social trails across the earthworks advance erosion and threaten these features. Large woody vegetation growing on the earthworks creates the potential for the placed earth and sand to be removed by a toppled tree.

Topography Feature Name	Feature Contribution	LCS Name	LCS Number
Battery Urmston: Engineered earthwork	Contributing	n/a	n/a
Battery Urmston: High point over central storeroom	Contributing	n/a	n/a
Battery Urmston: High point between Battery Urmston and Battery Morris	Contributing	n/a	n/a
Battery Morris: Engineered earthwork	Contributing	n/a	n/a
Battery Morris: High point over magazines	Contributing	n/a	n/a
Battery Morris: Swale north of engineered slope	Undetermined	n/a	n/a
Batteries Engle and Peck: Engineered earthwork	Contributing	n/a	n/a
Nine Gun Battery: Engineered earthwork	Contributing	n/a	n/a
Battery Potter: Engineered earthwork	Contributing	n/a	n/a
Battery Potter: Engineered slope along west facade	Contributing	n/a	n/a
Battery Potter: High point at southwest corner of Battery Potter	Contributing	n/a	n/a
Battery Granger: Engineered earthwork	Contributing	n/a	n/a
Mortar Battery: Engineered earthwork	Contributing	n/a	n/a
Battery Gunnison: Engineered earthwork	Contributing	n/a	n/a
Battery Gunnison: High point over central structure	Contributing	n/a	n/a
Battery Kingman: Engineered earthwork	Contributing	n/a	n/a
Battery Kingman: High point over each gun emplacement	Contributing	n/a	n/a
Battery Mills: Engineered earthwork	Contributing	n/a	n/a
Battery Mills: High point over each gun emplacement	Contributing	n/a	n/a
NIKE Launch Site: Engineered plateau for Missile Magazines	Contributing	n/a	n/a
NIKE Launch Site: Engineered earthwork north of Warhead Building	Contributing	n/a	n/a
NIKE Launch Site: Engineered earthwork south of Warhead Building	Contributing	n/a	n/a

VEGETATION

Historic Condition:

In order to reduce erosion and obscure the gun batteries from enemy identification, small tree, shrub, and grass species were planted on the engineered earthworks. Instructions from the Army detailed acquiring local plant materials from nearby sites, performing infill plantings from season to season to ensure adequate coverage, and watering when conditions were necessary to support the plant growth. Vegetation on the

engineered earthworks did not interfere with the operation of the artillery or views to potential targets on the water.

Post-historic and Existing Conditions:

A mixture of vegetation presently grows on the engineered earthworks and includes native and non-native vines and groundcovers, grasses, shrubs, small trees, and large woody vegetation. The vegetative cover continues to protect the earthworks from erosion and discourages park visitors from walking on and damaging the earthworks. Vines, groundcovers, grasses, shrubs, and small trees are contributing features. Large woody vegetation is non contributing since this vegetation type interferes with the operation of the artillery or views.

Vegetation Feature Name	Feature Contribution	LCS Name	LCS Number
Battery Urmston: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Battery Urmston: Large woody vegetation south of battery	Non Contributing	n/a	n/a
Battery Morris: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Battery Morris: Large woody vegetation south of battery	Non Contributing	n/a	n/a
Batteries Engle and Peck: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Batteries Engle and Peck: Large woody vegetation south of batteries	Non Contributing	n/a	n/a
Nine Gun Battery: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Nine Gun Battery: Phragmites growing in gun wells	Non Contributing	n/a	n/a
Battery Potter: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Battery Granger: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Battery Granger: Phragmites growing in gun wells	Non Contributing	n/a	n/a
Mortar Battery: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Mortar Battery: Large woody vegetation along west perimeter wall	Non Contributing	n/a	n/a
Battery Gunnison: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Battery Gunnison: Deciduous trees in open lawn west of battery	Non Contributing	n/a	n/a

Battery Kingman: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Battery Kingman: Scrub pine (Pinus virginiana) on engineered earthwork	Undetermined	n/a	n/a
Battery Mills: Mixed native and non-native vegetative ground cover on engineered earthwork	Contributing	n/a	n/a
Battery Mills: Scrub pine (Pinus virginiana) on engineered earthwork	Undetermined	n/a	n/a
Battery Mills: Planetrees (Platanus × acerifolia) on engineered earthwork	Undetermined	n/a	n/a
NIKE Radar Site: Maintained vegetation among radar towers, support buildings, and barracks	Contributing	n/a	n/a
NIKE Radar Site: Fire breaks along perimeter fence	Contributing	n/a	n/a
NIKE Radar Site: Undisturbed area in the center of site	Contributing	n/a	n/a
NIKE Launch Site: Maintained vegetation at the Missile Magazines, Missile Maintenance Area, and Ready Barracks	Contributing	n/a	n/a
NIKE Launch Site: Firebreaks along perimeter fence	Contributing	n/a	n/a
NIKE Launch Site: Low-growing groundcover on engineered earthworks	Contributing	n/a	n/a

CIRCULATION

Historic Condition:

Multiple circulation systems and infrastructure developed on Sandy Hook to support various modes of transportation during the historic period. The bay side of the peninsula provided more sheltered waters for anchoring and docking ships and wharves were constructed on the bay side to transport military supplies and to receive recreation seekers. In the mid-nineteenth century, a railroad line met recreational travelers at a Horseshoe Cover ferry landing and continued south through the peninsula to Long Branch, Sea Bright, and other towns along the Atlantic coast. Recognizing the potential for railroads to transport artillery and ammunition, the Army purchased the existing railroad line and extended it north to the Sandy Hook Proving Ground in 1889. Railroads were utilized throughout the Proving Ground's operation and also installed to move materials for the construction of the coastal defense batteries. After construction was completed, railroad lines served to transport artillery and ammunition to the batteries. Railroads also contributed to the coastal defense system by providing the means for positioning artillery and searchlights mounted on flat rail cars. Following World War II, the gun batteries were deactivated and the railroad lines that supported the batteries' construction and operation were allowed to deteriorate.

In addition to the railroads, vehicular routes were established across compacted soil and wood plank roads. As Fort Hancock was developed to support the coastal defense batteries, compacted gravel roads were designed and installed to connect the north and south ends of the peninsula and to provide access around the Fort's semi-circular configuration of officers' quarters, enlisted men's quarters, and auxiliary buildings.

In many instances, roads paralleled railroad lines along the rear of the batteries and provided access for personnel. The network of the roads expanded with the increase in personnel during the World Wars and designated parking areas appear on historic maps from 1944. Circulation features also include paved and unpaved pedestrian routes associated with the Proving Ground, Fort Hancock, and the individual batteries. The most formal pedestrian circulation systems were designed and installed at the NIKE missile sites to facilitate access among the barracks, radar towers, magazines, warehouses, and support structures.

Post-historic and Existing Conditions:

The multiple modes of transportation and their corresponding circulation systems are presently extant at Sandy Hook. A seasonal ferry service operates from Manhattan and brings visitors to the northern end of the peninsula. Vehicular circulation routes provide access throughout Sandy Hook with Hartshorne Drive serving as the major north-south route, Atlantic Drive serving as a secondary north-south route, and Gunnison Road serving as a connecting east-west route between the two. Sidewalks and pedestrian circulation systems connect Fort Hancock's quarters and buildings and provide access among the individual structures that comprise the NIKE missile sites.

Several sections of rail lines and occasional collections of wooden ties are the only remnants of Sandy Hook's railroad system that are present. Unmaintained vegetation blocks and obscures some vehicular circulation routes and at other locations, coastal erosion is removing circulation features (Figure 17). New parking lots are present to receive an increasing number of visitors and a multi-use path stretches from the park entrance to the ferry landing to provide dedicated access for jogging, walking, bicycle riding, and roller blading. Circulation features present from the historic period are contributing. Circulation features added during the National Park Service administration of Sandy Hook, such as the parking lots and the multi-use path, are non contributing.

Marked features are described in the National Register documentation (*) and/or have been determined eligible for listing in the National Register by the New Jersey State Historic Preservation Office (+).

Circulation Feature Name	Feature Contribution	LCS Name	LCS Number
Battery Urmston: Paved road south of battery	Contributing	TBD	TBD
Battery Morris: North Bragg Drive	Contributing	TBD	TBD
Batteries Engle and Peck: North Bragg Drive	Contributing	TBD	TBD
Batteries Engle and Peck: Unpaved vehicular access to observation platform	Non Contributing	n/a	n/a
Batteries Engle and Peck: Social trails among batteries and observation platform	Non Contributing	n/a	n/a
Nine Gun Battery: North Bragg Drive	Contributing	TBD	TBD

Nine Gun Battery: Social trail from emplacement #8	Non Contributing	n/a	n/a
Battery Potter: North Bragg Drive and Hudson Drive	Contributing	TBD	TBD
Battery Potter: Unpaved parking area	Non Contributing	n/a	n/a
Battery Potter: Paved landing at main entry	Contributing	TBD	TBD
Battery Potter: Sidewalks to switchboard rooms	Contributing	TBD	TBD
Battery Potter: Trail at southwest corner of Battery Potter	Non Contributing	n/a	TBD
Battery Granger: Hudson Drive	Contributing	TBD	TBD
Battery Granger: Vehicular pull-off east of Hudson Drive	Non Contributing	n/a	n/a
Mortar Battery: Hudson Road	Contributing	TBD	TBD
Mortar Battery: Parking lot south and east of battery	Non Contributing	n/a	n/a
Mortar Battery: Pedestrian entrance through west perimeter wall	Contributing	TBD	TBD
Mortar Battery: Pedestrian access at northwest corner	Contributing	TBD	TBD
Mortar Battery: Trail paralleling the inside west perimeter wall	Contributing	TBD	TBD
Mortar Battery: Trail up engineered earthwork south of southwest emplacement	Non Contributing	n/a	n/a
Mortar Battery: Trail north of battery	Contributing	TBD	TBD
Battery Gunnison: Atlantic Drive	Contributing	TBD	TBD
Battery Gunnison: Concrete walk from beach facility to battery	Non Contributing	n/a	n/a
Battery Gunnison: Social trail heading southeast from emplacement #1	Non Contributing	n/a	n/a
Battery Gunnison: Social trail between emplacements and on top of central structure	Non Contributing	n/a	n/a
Battery Kingman: Access road from Hartshorne Drive	Contributing	TBD	TBD
Battery Kingman: Vehicular route circumscribing battery	Non Contributing	n/a	n/a
Battery Mills: Access road from Hartshorne Drive	Contributing	TBD	TBD
Battery Mills: Vehicular route circumscribing battery	Non Contributing	n/a	n/a
Battery Mills: Trail on top of engineered earthwork	Non Contributing	n/a	n/a
NIKE Radar Site: Hartshorne Drive	Contributing	TBD	TBD
NIKE Radar Site: Parking Lot L	Undetermined	n/a	n/a
NIKE Radar Site: Multi-use Path (MUP)	Non Contributing	n/a	n/a
NIKE Radar Site: Paved vehicular route between Control Area #1 and #2	Contributing	TBD	TBD
NIKE Radar Site: Vehicular routes between control areas and Ready Barracks	Contributing	TBD	TBD

NIKE Radar Site: Parking area west of Ready Barracks	Contributing	TBD	TBD
NIKE Radar Site: Walkway network (SH-P) +	Contributing	Fort Hancock-Nike Sites-Walkway Network	041292
NIKE Launch Site: Hartshorne Drive	Contributing	TBD	TBD
NIKE Launch Site: Parking area	Contributing	TBD	TBD
NIKE Launch Site: Multi-use Path (MUP)	Non Contributing	n/a	n/a
NIKE Launch Site: Paved central access road	Contributing	TBD	TBD
NIKE Launch Site: Paved road spur to Generator Building (429)	Contributing	TBD	TBD
NIKE Launch Site: Paved vehicular routes and dolly route at Missile Maintenance Area	Contributing	TBD	TBD
NIKE Launch Site: Walkway network at Ready Barracks (SH-P) +	Contributing	Fort Hancock-Nike Sites-Walkway Network	041292
NIKE Launch Site: Unpaved route around inner security fence	Contributing	TBD	TBD
NIKE Launch Site: Unpaved area north of Warhead Building (450) and access to beach	Non Contributing	n/a	n/a
NIKE Launch Site: Path to Dog Kennels (458)	Non Contributing	n/a	n/a

BUILDINGS AND STRUCTURES

Historic Condition:

The coastal defense batteries represent successive generations of costly buildings and structures constructed in response to the latest offensive weaponry and armament. At Sandy Hook, the Army designed and constructed rapid fire and large caliber batteries to defend the southern entrance to New York Harbor. In addition the Army completed experimental battery designs, such as the Dynamite Gun Battery and Battery Potter, which used different means to fire projectiles and raise large caliber guns. Both rapid fire and large caliber gun batteries were a building system comprised of reinforced concrete structures and protective, engineered earthworks.

The first gun batteries at Sandy Hook incorporated defenses against a land-based attack. At Battery Potter, the main entry resembled a castle and featured gun loops in a pair of flanking towers so soldiers could fire on an advancing enemy. At the Mortar Battery, the structure was surrounded by a perimeter wall and had machine guns set in galleries at opposite corners to fire on intruders inside the wall. With a system of gun batteries and controlled mines defending against a land-based attack, later gun batteries had open, rear elevations that provided personnel access and delivery of ammunition and supplies. Responding to the threat of aerial reconnaissance and bombing, the large caliber gun batteries updated during World War II featured massive concrete canopies over each gun emplacement to protect the artillery and crews.

During the historic period, the gun batteries experienced periods of intensive maintenance and use and also years of minimal care intended to keep the defenses operational ready. Water-repelling coatings and camouflage paints were added to the concrete surfaces to protect the batteries from natural forces and human detection. Architectural features, many of them metal, were important components in security, safety, and communications.

The Army disarmed and deactivated the gun batteries when artillery was no longer effective and when new coastal defenses were operational. The abandoned batteries were not maintained and following World War II, all of the gun batteries were deactivated due to the threat of high-altitude bombers. In response to the new threat, the Army constructed a NIKE missile battery at Sandy Hook. The NIKE missile battery remained operational until new offensive weaponry, the intercontinental ballistic missile (ICBM), eclipsed the NIKE system and defense philosophy shifted to the doctrine of mutually assured destruction. The buildings and structures at the NIKE sites, similar to the gun batteries before them, were abandoned and not maintained.

Post-historic and Existing Conditions:

The coastal defense batteries are extant and primarily in a stable condition despite decades of little or no maintenance. The reinforced concrete structures and engineered earthworks that comprise the building system are intact. There are instances of erosion on the earthworks and evidence of spalling, cracks, and separation on concrete elements (Figure 18). In addition, efflorescence can be seen on many of the vertical concrete surfaces indicating water has penetrated the concrete and is drawing out salts and other impurities to the surface. Architectural features, particularly metal components, are in a deteriorating condition and missing at some batteries (Figure 19). The concrete block buildings at the NIKE missile sites also show symptoms of water penetration along with corrosion on corrugated metal roofs and metal siding (Figure 20).

Marked features are described in the National Register documentation (*) and/or have been determined eligible for listing in the National Register by the New Jersey State Historic Preservation Office (+).

Buildings and Structures Feature Name	Feature Contribution	LCS Name	LCS Number
Battery Urmston (SH-540) *+	Contributing	Fort Hancock-Battery Urmston	008656
Battery Urmston: Coincidence range finder station between emplacements #4 and #5	Contributing	TBD	TBD
Battery Morris (SH-539) *+	Contributing	Fort Hancock-Battery Morris	008655
Battery Morris: Coincidence range finder station (SH-K) *+	Contributing	Fort Hancock-Battery Morris-CRF Station	041284
Battery Peck (SH-180) *+	Contributing	Fort Hancock-Battery Peck	008534

Battery Peck: Coincidence range finder station (SH-189A) *+	Contributing	Fort Hancock-Battery Engle	041302
Battery Peck: Communications trailer	Non Contributing	n/a	n/a
Battery Peck: Observation platform	Non Contributing	n/a	n/a
Nine Gun Battery (SH-181) *+	Contributing	Fort Hancock-9-Gun Battery	008535
Nine Gun Battery: Remnant of granite fort	Contributing	TBD	TBD
Battery Potter (SH-264) *+	Contributing	Fort Hancock-Battery Potter	008547
Battery Potter: Central Power Plant (SH-259) *+	Contributing	Fort Hancock-Central Power Plant 259	008545
Battery Potter: Coal Shed (SH-260) *+	Contributing	Fort Hancock-Coal Shed 260	008546
Battery Potter: Switchboard Room ("A") (SH-256) *+	Contributing	Fort Hancock-Switchboard Room 256	008542
Battery Potter: Switchboard ("C") (SH-257) *+	Contributing	Fort Hancock-Switchboard Room 257	008543
Battery Potter: Conduit Hut "A" Building (SH-258) *+	Contributing	Fort Hancock-Conduit Hut "A" Bldg. 258	008544
Battery Potter: Primary Fire Control Stations	Contributing	TBD	TBD
Battery Granger (SH-266) *+	Contributing	Fort Hancock-Battery Granger	008548
Mortar Battery (Batteries McCook and Reynolds) (SH-349) *+	Contributing	Fort Hancock-Batteries McCook and Reynolds	008587
Mortar Battery: Telephone data booths	Contributing	TBD	TBD
Mortar Battery: Battery commander's stations	Contributing	TBD	TBD
Mortar Battery: Perimeter wall	Contributing	TBD	TBD
Mortar Battery: Counterscarp gallery	Contributing	TBD	TBD
Battery Gunnison (SH-337) *+	Contributing	Fort Hancock-Battery Gunnison	008578
Battery Arrowsmith (SH-348) *+	Contributing	Fort Hancock-Battery Arrowsmith [Ruin]	008586
Battery Kingman (SH-441) *+	Contributing	Fort Hancock-Battery Kingman	008629
Battery Kingman: Concrete box south of emplacement #2	Contributing	TBD	TBD
Battery Kingman: Concrete pipe southwest of emplacement #2	Contributing	TBD	TBD
Battery Kingman: Horseshoe Cove Wood Bulkhead (SH-G) +	Contributing	Fort Hancock-Horseshoe Cove Wood Bulkhead	041281
Battery Mills (SH-440) *+	Contributing	Fort Hancock-Battery Mills	008628
Battery Mills: Concrete box and metal pipe near center top of the engineered earthwork	Contributing	TBD	TBD

Battery Mills: Concrete pipe southwest of emplacement #1	Contributing	TBD	TBD
NIKE Radar Site: Connecting Corridors (SH-411) *+	Contributing	Fort Hancock-Nike Radar Site-Connec. Corridors 411	008601
NIKE Radar Site: Sentry Box (SH-413) *+	Contributing	Fort Hancock-Nike Radar Site-Sentry Box 413	008603
NIKE Radar Site: Generator House (SH-414) *+	Contributing	Fort Hancock-Nike Radar Site-Generator House 414	008605
NIKE Radar Site: Target Tracking Radar Tower (SH-417) *+	Contributing	Fort Hancock-Nike Radar Site-Radar Tower 417	008606
NIKE Radar Site: Acquisition Radar Tower (SH-418) *+	Contributing	Fort Hancock-Nike Radar Site-Radar Tower 418	008607
NIKE Radar Site: Missile Tracking Radar Tower (SH-419) *+	Contributing	Fort Hancock-Nike Radar Site-Radar Tower 419	008608
NIKE Radar Site: ABAR Radar Tower Pedestal (SH-453) *+	Contributing	Fort Hancock-Nike Radar Site-Radar Pedestal 453	008637
NIKE Radar Site: Equipment and Ops. Building (SH-454) *+	Contributing	Fort Hancock-Nike Radar Site-Equipment & Ops. 454	008639
NIKE Radar Site: Target Tracking Radar Tower (HIPAR Tower) (SH-473) *+	Contributing	Fort Hancock-Nike Radar Site-Hipar Tower 473	008652
NIKE Radar Site: Connecting Corridors (SH-409) *+	Contributing	Fort Hancock-Nike Radar Site-Connec. Corridors 409	008600
NIKE Radar Site: Generator House (SH-410) *+	Contributing	Fort Hancock-Nike Radar Site-Generator House 410	008602
NIKE Radar Site: Abandoned Target Tracking Radar Tower (SH-420) *+	Contributing	Fort Hancock-Nike Radar Site-Radar Tower 420	008611
NIKE Radar Site: Acquisition Radar Tower (SH-421) *+	Contributing	Fort Hancock-Nike Radar Site-Radar Tower 421	008609
NIKE Radar Site: Missile Tracking Radar Tower (SH-422) *+	Contributing	Fort Hancock-Nike Radar Site-Radar Tower 422	008610
NIKE Radar Site: Sentry Box (SH-423) +	Contributing	Fort Hancock-Nike Radar Site-Sentry Box 423	008604
NIKE Radar Site: Target Ranging Radar Tower (SH-467) *+	Contributing	Fort Hancock-Nike Radar Site-Target Range Twr. 467	008646
NIKE Radar Site: HIPAR Building (SH-468) *+	Contributing	Fort Hancock-Nike Radar Site-Hipar Building 468	008647

NIKE Radar Site: HIPAR Radar Base (SH-469) *+	Contributing	Fort Hancock-Nike Radar Site-Hipar Base 469	008648
NIKE Radar Site: New Target Tracking Radar Tower (HIPAR Tower) (SH-472) *+	Contributing	Fort Hancock-Nike Radar Site-Hipar Tower 472	008651
NIKE Radar Site: Enlisted Men's Barracks with Mess (402) *+	Contributing	Fort Hancock-Nike Radar Site-Barracks 402	008597
NIKE Radar Site: Enlisted Men's Barracks with Mess (SH-403) *+	Contributing	Fort Hancock-Nike Radar Site-Barracks 403	008598
NIKE Radar Site: Enlisted Men's Barracks with Mess foundation (SH-404)	Contributing	TBD	TBD
NIKE Radar Site: Enlisted Men's Barracks with Mess foundation (SH-405)	Contributing	TBD	TBD
NIKE Radar Site: Latrine (SH-406) *+	Contributing	Fort Hancock-Nike Radar Site-Latrine 406	041311
NIKE Radar Site: Boiler Room (SH-407) *+	Contributing	Fort Hancock-Nike Radar Site-Boiler Room 407	008599
NIKE Launch Site: Missile Storage (Type B) (NIKE Silo) (SH-425) *+	Contributing	Fort Hancock-Nike Launch Site-Nike Silo 425	008613
NIKE Launch Site: Missile Storage (Type B) (NIKE Silo) (SH-426) *+	Contributing	Fort Hancock-Nike Launch Site-Nike Silo 426	008614
NIKE Launch Site: Missile Storage (Type B) (NIKE Silo) (SH-427) *+	Contributing	Fort Hancock-Nike Launch Site-Nike Silo 427	008615
NIKE Launch Site: Missile Storage (Type B) (NIKE Silo) (SH-428) *+	Contributing	Fort Hancock-Nike Launch Site-Nike Silo 428	008616
NIKE Launch Site: Generator Building (SH-429) +	Contributing	Fort Hancock-Nike Launch Site-Generator Bldg. 429	008617
NIKE Launch Site: Paint and Oil Storage (Sentry Box) (SH-447) +	Contributing	Fort Hancock-Nike Launch Site-Sentry Box 447	008634
NIKE Launch Site: Sentry Hut foundation (SH-448)	Contributing	TBD	TBD
NIKE Launch Site: Kennel Storage (Storage Shed) (SH-457) +	Contributing	Fort Hancock-Nike Launch Site-Storage Shed 457	008642
NIKE Launch Site: Dog Kennels (SH-458) +	Contributing	Fort Hancock-Nike Launch Site-Dog Kennels 458	008643
NIKE Launch Site: Missile Assembly and Test Building (SH-449) +	Contributing	Fort Hancock-Nike Launch Site-Missile Assembly 449	008635
NIKE Launch Site: Warhead Building (SH-450) +	Contributing	Fort Hancock-Nike Launch Site-Warhead Bldg. 450	008636

NIKE Launch Site: Ready Barracks (SH-430) +	Contributing	Fort Hancock-Nike Launch Site-Ready Barracks 430	008618
NIKE Launch Site: Ready Barracks (SH-431) +	Contributing	Fort Hancock-Nike Launch Site-Ready Barracks 431	008619
NIKE Launch Site: Ready Barracks (SH-432) +	Contributing	Fort Hancock-Nike Launch Site-Ready Barracks 432	008620
NIKE Launch Site: Ready Barracks (SH-433) +	Contributing	Fort Hancock-Nike Launch Site-Ready Barracks 433	008621
NIKE Launch Site: Boiler House (SH-435) +	Contributing	Fort Hancock-Nike Launch Site-Boiler House 435	008623
NIKE Launch Site: Latrine (SH-434) +	Contributing	Fort Hancock-Nike Launch Site-Latrine 434	008622
NIKE Launch Site: Ready Building (SH-437) +	Contributing	Fort Hancock-Nike Launch Site-Ready Building 437	008625
NIKE Launch Site: Sentry Box (SH-439) +	Contributing	Fort Hancock-Nike Launch Site-Sentry Box 439	008627
NIKE Launch Site: Sentry Hut foundation (SH-456) +	Contributing	TBD	TBD

VIEWS AND VISTAS

Historic Condition:

The concrete gun batteries relied on unobstructed views to the water to sight potential targets and allow unimpeded firing of projectiles. The importance of a clear field of fire is demonstrated by the Army Corps of Engineers' "Report of Completed Works" that recorded information on interference and obstacles for each battery such as adjacent batteries, buildings, and vegetation. In addition to a clear field of fire from an emplacement, unobstructed views were necessary from battery commander's stations and fire control stations. Constructed on top of existing batteries or as independent buildings, battery commander's and fire control stations became dedicated structures for locating and acquiring the range of potential targets.

Tactical views of high-altitude, enemy aircraft were not possible and to counter this strategic advantage, the NIKE missile battery utilized radar to acquire targets and guide missiles to a computed intercept point. Radar and missiles had to be separated by a minimum distance of 3,000 feet for guidance communication to work. Therefore, a tactical view existed between the radar site and launch site so the radar signals could be transmitted without obstruction. The area between the two sites was not stripped of all features but vertical objects that could interfere with the radar signals had to be removed, relocated, or managed.

Post-historic and Existing Conditions:

Tactical views from the emplacements, battery commander's stations, and fire control stations to the water are primarily impeded by woody vegetation growing at the interface of the engineered earthwork and concrete battery structure (Figure 21). Beyond the toe or bottom of the engineered earthwork there may be vegetation that impacts views, however, the impact is difficult to evaluate with obstructing vegetation in close proximity to the start of the view (Figure 22). With the exception of the communications trailer and observation platform at Batteries Engle and Peck, there appears to be no additional buildings or structures that impact views from the emplacements, battery commander's stations, and fire control stations. From the NIKE radar site, signals traveled over a mile to control vans and individual missiles at the launch site. With these vertical elements absent from the launch site, it is difficult to determine if the tactical view is intact or obstructed.

Views are contributing at the gun batteries that directly sighted their targets and undetermined at the NIKE missile battery. The Mortar Battery, Battery Kingman, and Battery Mills, relied on tactical views from observation points constructed separately from the artillery emplacements. Views from these emplacements to the water did not exist historically and if currently present are non contributing.

Views and Vistas Feature Name	Feature Contribution	LCS Name	LCS Number
Battery Urmston: Downrange views from the emplacements and coincidence range finder station	Contributing	n/a	n/a
Battery Morris: Downrange views from the emplacements and coincidence range finder station	Contributing	n/a	n/a
Batteries Engle and Peck: Downrange views from the emplacements, commander's station, and coincidence range finder station	Contributing	n/a	n/a
Nine Gun Battery: Downrange views from the gun carriage and battery commander's stations	Contributing	n/a	n/a
Battery Potter: Downrange views from the emplacements and Primary Fire Control Stations	Contributing	n/a	n/a
Battery Granger: Downrange views from the gun carriage and battery commander's stations	Contributing	n/a	n/a
Mortar Battery: View from gun emplacements to water	Non Contributing	n/a	n/a
Mortar Battery: View from battery commander's stations to water	Contributing	n/a	n/a
Battery Gunnison: Downrange views from the emplacements and battery commander's station	Contributing	n/a	n/a
Battery Kingman: View from gun emplacements to water	Non Contributing	n/a	n/a
Battery Mills: View from gun emplacements to water	Non Contributing	n/a	n/a
NIKE Radar Site: View between each Missile Tracking Radar and the control vans and individual missiles at the launch site	Undetermined	n/a	n/a

NIKE Launch Site: View from the control vans and individual missiles to the Missile Tracking Radars at the radar site	Undetermined	n/a	n/a

SMALL-SCALE FEATURES

Historic Condition:

The coastal defense batteries contained numerous small-scale architectural features associated with buildings and structures. Railings and features utilized for lighting, electronic communication, and weather observation were installed on various batteries to improve the operational efficiency of the defenses. In the landscape, small-scale features included fencing and exterior lighting. At the NIKE missile sites, fencing provided security against unauthorized access and served to define the outer boundaries of the radar and launch facilities. The Army added an additional security fence to the launch site as part of upgrades to use Hercules missiles fitted with nuclear warheads. Included in the Hercules upgrades was the installation of floodlights along the newly installed security fence and at the Missile Maintenance Area. Exterior lighting was also a feature at the NIKE radar site. Pedestrian-scale fixtures were installed to illuminate the walkway network between the control areas and Ready Barracks as well as the routes among the barrack buildings.

Post-historic and Existing Conditions:

Small-scale architectural features associated with the coastal defense batteries and small-scale features in the landscape are presently extant. At the NIKE missile sites, the fencing is in fair to poor condition. Corrosion appears on many components of the fencing and some sections have missing or deteriorated chain-link and barbed wire strands (Figure 23). Vegetation crowds or covers sections of the fencing and makes inspection and routine maintenance difficult. Vegetation also crowds several floodlights at the NIKE launch site and the pedestrian-scale lights at the NIKE radar site (Figure 24). Small-scale features also include remnants of buildings and structures that are no longer extant. At certain locations, concrete footings and collapsed metal pipes are the only items present from observation towers and other structures of the coastal defense system.

Many small-scale features in the landscape are present to support the National Park Service's management of Sandy Hook as a national recreation area. Waysides and signage are located in close proximity to many of the gun batteries to aid interpreting the structures. Additional signage and fencing are installed near some batteries to warn visitors of potentially hazardous conditions and block access to fragile building components and engineered earthworks. Existing small-scale features also include contemporary traffic control devices such as guardrails and bollards. Small-scale features present from the historic period are contributing. Small-scale features added during the National Park Service administration of Sandy Hook are non contributing.

Marked features are described in the National Register documentation (*) and/or have been determined eligible for listing in the National Register by the New Jersey State Historic Preservation Office (+).

Small-Scale Features Feature Name	Feature Contribution	LCS Name	LCS Number
Battery Urmston: U.S. Coast Guard perimeter fence	Non Contributing	n/a	n/a
Battery Urmston: Wood-slat fence east of battery	Non Contributing	n/a	n/a
Battery Morris: U.S. Coast Guard perimeter fence	Non Contributing	n/a	n/a
Battery Morris: Wood-slat fence north and east of battery	Non Contributing	n/a	n/a
Battery Morris: Wood two-by-four guard panels	Non Contributing	n/a	n/a
Batteries Engle and Peck: Chain-link fence south of Battery Peck	Non Contributing	n/a	n/a
Batteries Engle and Peck: Wooden split-rail fence east of Battery Engle	Non Contributing	n/a	n/a
Batteries Engle and Peck: Barbed wire fence section west of communications trailer	Non Contributing	n/a	n/a
Batteries Engle and Peck: Wayside east of Battery Peck	Non Contributing	n/a	n/a
Nine Gun Battery: Chain-link fence west of Nine Gun Battery	Non Contributing	n/a	n/a
Nine Gun Battery: Wayside west of emplacement #8	Non Contributing	n/a	n/a
Battery Potter: Metal weather pole	Contributing	TBD	TBD
Battery Potter: Wooden wheelstops	Non Contributing	n/a	n/a
Battery Potter: Wayside west of structure	Non Contributing	n/a	n/a
Battery Granger: Chain-link fence west of battery	Non Contributing	n/a	n/a
Battery Granger: Wayside west of battery	Non Contributing	n/a	n/a
Mortar Battery: Chain-link fence east of battery	Non Contributing	n/a	n/a
Mortar Battery: Woven-wire fence along west side of engineered earthwork	Non Contributing	n/a	n/a
Mortar Battery: Wood post and wire cable fence at top of engineered earthwork	Non Contributing	n/a	n/a
Mortar Battery: Concrete footing and metal ring	Contributing	TBD	TBD
Mortar Battery: Two signs outside perimeter wall	Non Contributing	n/a	n/a
Mortar Battery: Wayside west of battery	Non Contributing	n/a	n/a
Battery Gunnison: Wood post and rope bollards	Non Contributing	n/a	n/a
Battery Gunnison: Wayside west of battery	Non Contributing	n/a	n/a
Battery Kingman: Chain-link fence above concrete canopy for each emplacement	Non Contributing	n/a	n/a
Battery Kingman: Wood post and wire cable fence at top of engineered earthwork	Non Contributing	n/a	n/a

Battery Kingman: Wood guardrails east of vehicular route	Non Contributing	n/a	n/a
Battery Mills: Chain-link fence above concrete canopy for each emplacement	Non Contributing	n/a	n/a
Battery Mills: Wood guardrails east of vehicular route	Non Contributing	n/a	n/a
NIKE Radar Site: Perimeter fence (SH-S) *+	Contributing	Fort Hancock-Nike Launch/Radar Sites-Cyclone Fence	041295
NIKE Radar Site: Basketball court	Contributing	TBD	TBD
NIKE Radar Site: Pedestrian lighting (SH-R) +	Contributing	Fort Hancock-Nike Radar Site-Pedestrian Lighting	041294
NIKE Launch Site: Inner security fence (SH-S) *+	Contributing	Fort Hancock-Nike Launch/Radar Sites-Cyclone Fence	041295
NIKE Launch Site: Outer security fence (SH-S) *+	Contributing	Fort Hancock-Nike Launch/Radar Sites-Cyclone Fence	041295
NIKE Launch Site: Floodlights along inner security fence (SH-Q) +	Contributing	Fort Hancock-Nike Launch Site-Spot Lights	041293
NIKE Launch Site: Floodlights at the Missile Maintenance Area (SH-Q) +	Contributing	Fort Hancock-Nike Launch Site-Spot Lights	041293
Spotlights in the Missile Magazine area	Contributing	TBD	TBD
NIKE Launch Site: CODAR antennas	Non Contributing	n/a	n/a
NIKE Launch Site: Missile display southwest of Ready Barracks	Non Contributing	n/a	n/a

Condition Assessment

Condition Assessment

Condition Assessment

Fair

Condition Assessment Date

TBD [mm/dd/yyyy]

Condition Assessment Explanatory Narrative

The Sandy Hook coastal defense batteries are in fair condition due to the unmanaged growth of large woody vegetation, concrete and building material deterioration, and social trails that traverse historic engineered earthworks. Large woody vegetation threatens the batteries' historic earthworks due to the potential for uprooting in a storm event. In addition, vegetation growing near and on concrete structures accelerates deterioration of the concrete. Large woody vegetation on the structures, the earthworks, and within tactical views to the water obscures the visual connection between the defense and potential targets. Water infiltration has resulted in concrete spalling and cracks at the batteries and deterioration of other building materials at separate, free-standing structures. Metal components at the batteries, such as handrails and guardrails, are corroding. The corrosion weakens the metal and contributes to concrete deterioration. Social trails that lead up or across an engineered earthwork promote soil erosion that removes material from these historic structures.

In 2004, the park completed stablization work on Battery Potter (Stablize Historic Battery Potter and its Six Support Structures - $49,000 [PMIS #59698]) and Battery Gunnison (Stabilize And Provide Safe Access To Battery Gunnison - $59,000 [PMIS #24661]).

Impacts to Inventory Unit

Type of Impact	Impact Type – Other	Impact Explanatory Narrative	Internal or External
Deferred Maintenance	n/a	Large woody vegetation has been permitted to grow on historic engineered earthworks and in close proximity to battery strucutres. The vegetation accelerates damage to the structures and can potentially uproot in a storm event and damage the earthworks.	Internal
Erosion	n/a	Beach erosion threatens Battery Kingman, Battery Mills, and the NIKE launch site. At Battery Kingman, storm events and bayside erosion have advanced toward the western edge of the battery and have removed portions of a historic railroad bed. At Battery Mills, erosion	Internal

		has removed a portion of the vehicular route that circumscribes the battery. At the NIKE launch site, the Atlantic shoreline has advanced toward the eastern perimeter of the missile facility and a future storm event could remove portions of the perimeter fence and circulation features. Social trails that traverse engineered earthworks also contribute to erosion of these historic strucutres.	
Operations on site	n/a	The park stores recyclable materials near the eastern end of a historic earthwork in the NIKE Launch Missile Maintenance Area. Located next to the recycling bins and containers is a debris pile from the state's beach cleaning program. Storage for the recyclables and the beach cleaning program threaten the historic earthwork.	Internal
Structural Deterioration	n/a	Spalling and cracked concrete at the coastal defense batteries permits increased water infilitration that further accelerates concrete deterioration. Corrosion weakens metal components at the batteries and results in additional concrete loss.	Internal

Treatment

Inventory Unit

Approved Landscape Treatment

Rehabilitation

Approved Landscape Treatment Completed

No

Approved Landscape Treatment Explanatory Narrative

Signed into law on October 27, 1972, the enabling legislation for the Gateway National Recreation Area guides the framework for treatment for the coastal defense batteries at Sandy Hook. For the Sandy Hook Unit, the act specifically directs that the Secretary of the Interior "...shall inventory and evaluate all sites and structures having present and potential historical, cultural, or architectural significance and shall provide for appropriate programs for the preservation, restoration, interpretation, and utilization of them" (General Management Plan, August 1979, 163-65). As stated in planning documents for Gateway National Recreation Area, the goal for historic structures and cultural landscapes within the Fort Hancock and the Sandy Hook Proving Ground Historic District is rehabilitation and interpretation. It is recommended that the surviving coastal defense batteries be rehabilitated in accordance with the Gateway National Recreation Area General Management Plan, completed in 1979, and with the fundamental historic preservation values expressed in "The Secretary of the Interior's Standards for the Treatment of Historic Properties:Rehabilitation." Furthermore, as stated in the park's 1990 General Management Plan Amendment, it is recommended that the batteries be interpreted to the public with a focus on their historic functions, and the technological changes in coastal defenses during Fort Hancock's history (General Management Plan Amendment, January 1990: 13). Presently, the Gateway National Recreation Area is in the process of preparing a new General Management Plan to guide planning and management at the park for the next twenty years. This on-going effort has identified the coastal defense batteries as fundamental resources of the park based on the enabling legislation (CLR, 2010:314).

Landscape treatment is detailed in the *"Cultural Landscape Report for the Sandy Hook Coastal Defense Batteries"* (2010) by Timothy W. Layton and H. Eliot Foulds. The report includes a chapter addressing landscape treatment and presents recommendations common to all coastal defense battery sites as well as a site-by-site presentation of specific recommendations. The following narrative is derived from the Cultural Landscape Report.

Rehabilitation of the Sandy Hook gun and missile batteries would entail the removal of non-historic, large woody vegetation growing on historic engineered earthworks and in close proximity to historic buildings

and structures. Vegetation management will also reestablish historic downrange views to the water that are critical to understanding the historic purpose and function of these sites. Following vegetation management tasks, repairs and maintenance of concrete surfaces, including repairing voids and cracks, and sealing the porous concrete surfaces against water infiltration will extend the number of years that the structures can be made safely accessible to the public. In conjunction with limiting water infiltration on the concrete structures, exposed, corroding, metal components at the batteries should be stabilized to preserve the metal and minimize deterioration to the concrete caused by metal corrosion. Providing safe and informative visitor access will involve repairing, retrofitting, and replacing deteriorated stairways, walkways, and accompanying safety railings. Providing safe access also will involve repairing doors and erecting fences and other barriers to prevent visitors from accessing unsafe locations within these sites (CLR, 2010:323).

Approved Landscape Treatment Document

General Management Plan

Approved Landscape Treatment Document Date

01/01/1990

Approved Landscape Treatment Cost

$888,628

Approved Landscape Treatment Level of Estimate

C – Similar Facilities

Approved Landscape Treatment Cost Estimator

Park/FMSS

Landscape Approved Treatment Cost Explanatory Description

The approved landscape treatment cost data was derived from several PMIS projects addressing rehabilitation and stablization projects at:

- Nine Gun Battery (Stabilize and Provide Safe Visitor Access at Historic Nine Gun Battery - $110,300 [PMIS #123084])
- Battery Gunnison (Replace outer stairs Battery Gunnison - $14,300 [PMIS #176616])
- Battery Mills (Stabilize Eroding Shoreline to Preserve Historic Battery Mills - $502,028 [PMIS #152357])
- NIKE Launch Site (Rehabilitate and Open Historic Nike Missile Launch Site to the Public - $193,000 [PMIS #123059]) and (Rehabiliate Sandy Hook Nike missile launch complex buildings and mount interpretive displays - $69,000 [PMIS #123629])

Bibliography and Supplemental Information

Bibliography

Citation Author	Citation Title	Year of Publication	Publisher
Berhow, Mark A.	"U.S. Strategic and Defensive Missile Systems 1950–2004"	2005	New York: Osprey Publishing Limited
Butowsky, Harry	"National Register of Historic Places Inventory - Nomination Form, Fort Hancock and the Sandy Hook Proving Ground Historic District"	1982	National Park Service
Freeman, Joe C., Stephen A. Haller, David M. Hansen, John A. Martini, and Karen J. Weitze	"Seacoast Fortifications Preservation Manual, Golden Gate National Recreation Area, San Francisco, California"	1999	National Park Service and KEA Environmental
U.S. Department of the Interior	"General Management Plan, Gateway National Recreation Area, New York/New Jersey"	1979	National Park Service
Hansen, David M., Kimberly Keagle, and Deborah Rehn	"Historic Fortification Preservation Handbook"	2003	Olympia, WA: Washington State Parks and Recreation Commission
Hoffman, Thomas	"Fort Hancock"	2007	Charleston, SC: Arcadia Publishing
Layton, Timothy W. and H. Eliot Foulds	"Cultural Landscape Report for the Sandy Hook Coastal Defense Batteries"	2010	Boston: Olmsted Center for Landscape Preservation, National Park Service
Lee, James J. III and Lauren Laham	"Historic Structure Report: Battery Potter, Mortar Battery and Battery Gunnison. Fort Hancock, New Jersey, Sandy Hook Unit, Gateway National Recreation Area"	2007	National Park Service
Lewis, Emanuel Raymond	"Seacoast Fortifications of the United States: An Introductory History"	1993	Annapolis, MD: Naval Institute Press
Lonnquest, John C., and David F. Winkler	"To Defend and Deter: The Legacy of the United States Cold War Missile Program"	1996	U.S. Department of Defense, Army Construction Engineering Research Laboratories
U.S. Department of the Interior	"General Management Plan Amendment: Development Concept Plan and Interpretation Prospectus: Sandy Hook Unit, Gateway National Recreation Area, New York/New Jersey"	1990	National Park Service



Location Map Information. Map depicting the units of the Gateway National Recreation Area. Sandy Hook is in the bottom center of the map (Harpers Ferry Center, National Park Service Maps, http://data2.itc.nps.gov/hafe/hfc/carto-detail.cfm?Alpha=GATE#).

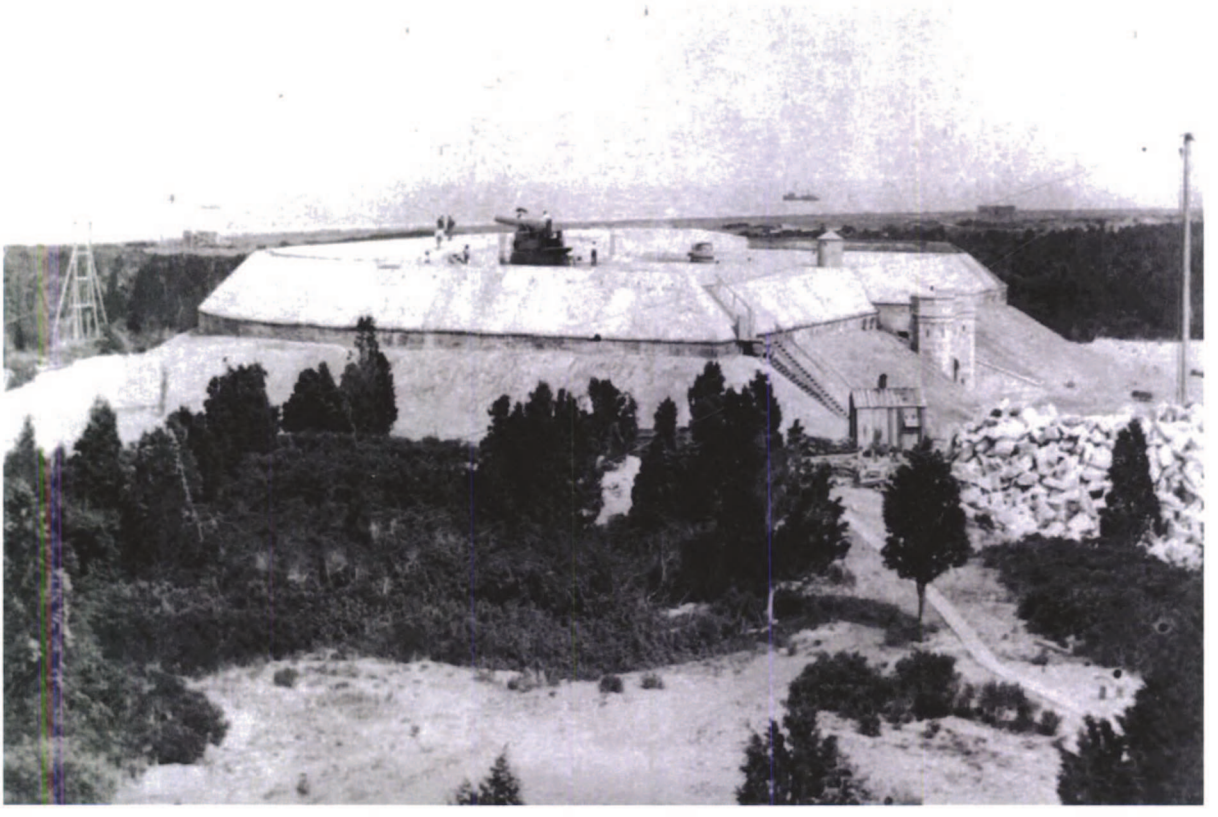


Figure 1. View looking southeast at Battery Potter, 1893 (Gateway NRA Museum Collection, hereafter GATE, 7811).



Figure 2. Oblique aerial photograph of the Mortar Battery, circa 1917 (GATE 7870).

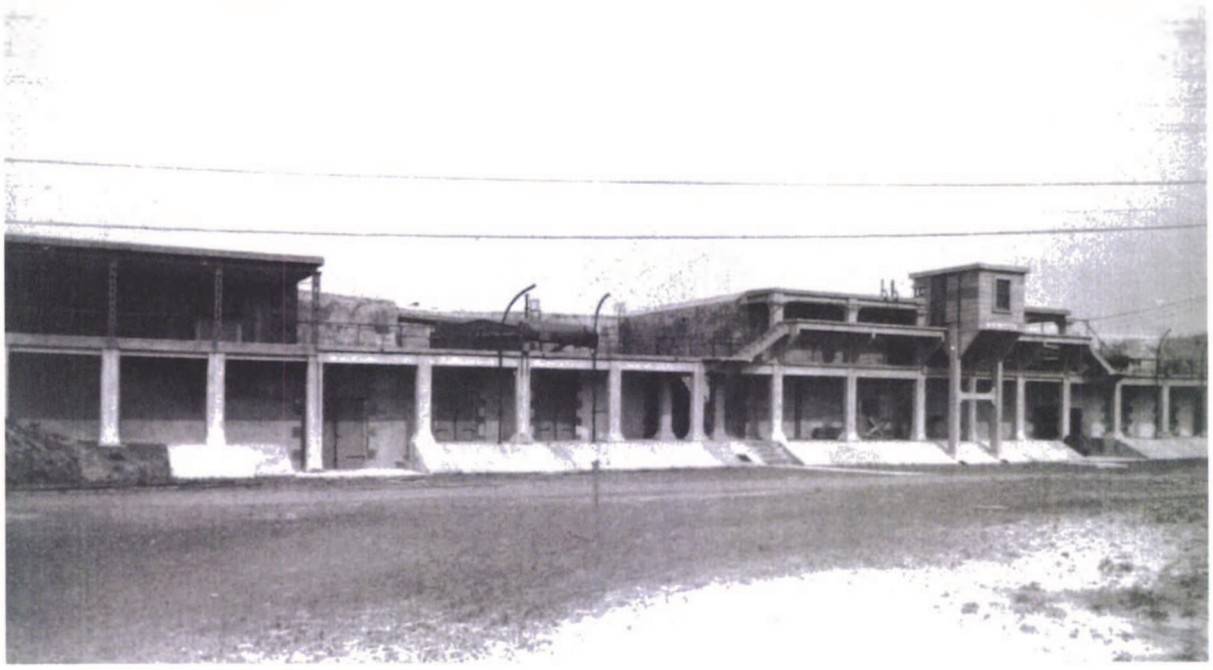


Figure 3. View looking southeast at Battery Granger, circa 1907 (GATE 7844).



Figure 4. View looking northwest at construction of Nine Gun Battery over the east facade of the Civil War-era granite fort, 1897 (GATE 7880).



Figure 5. Oblique aerial view of the Nine Gun Battery, 1942 (NARA, RG 661 S, Phillip S. Gage Collection, Fort Hancock Folder).



Figure 6. View looking north at Battery Mills' emplacement #2, circa 1940–41 (GATE 4944).



Figure 7. View looking northwest at Battery Urmston, circa 1906 (GATE 7777).



Figure 8. View looking northwest at Battery Peck, circa 1905–10 (Thomas Hoffman, *Fort Hancock*, Charleston, SC: Arcadia Publishing, 2007).



Figure 9. View looking northeast at Battery Gunnison's emplacement #2, circa 1941. The Army replaced the pictured counterweight carriage guns with barbette-mounted guns in 1943 (GATE 7834).



Figure 10. View looking northwest at Battery Kingman's north emplacement, circa 1940s (GATE 8085).



Figure 11. Covered battery commander's station at Battery Peck, foreground, and coincidence range finding station built over Battery Engle, background, 1921 (GATE 7892).



Figure 12. View looking northwest at coincidence range finding station east of Battery Morris, circa 1921 (GATE 7893).



Figure 13. Oblique aerial view, NIKE radar site, circa 1962. Control Area #2 appears in the foreground with Control Area #1 in the background and the Ready Barracks to the right (GATE 20818).

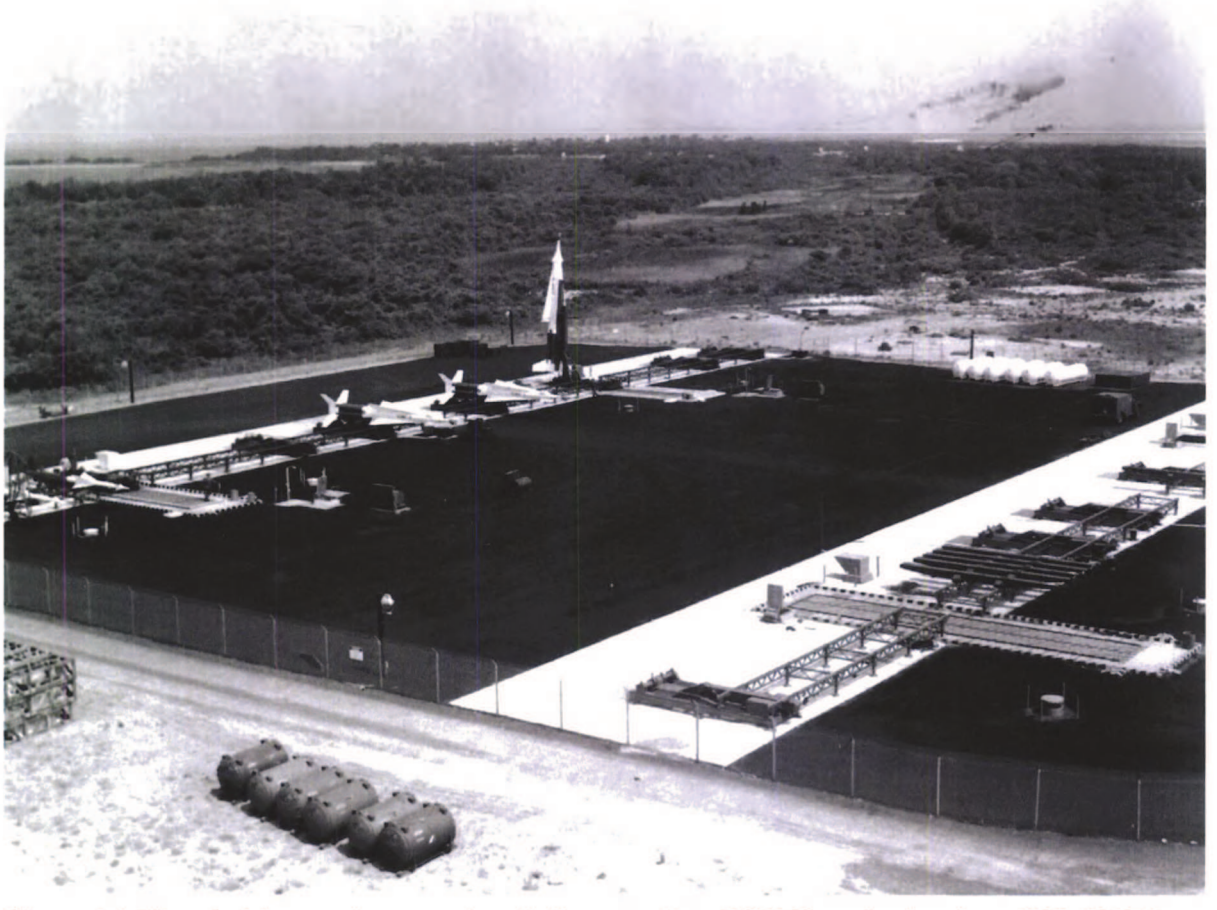


Figure 14. View looking northwest at the missile magazines, NIKE launch site, circa 1958 (GATE 8067).



Figure 15. View looking northwest at the rear elevation of Battery Peck (OCLP, 2009).



Figure 16. View looking south at recycling storage set against the engineered earthwork, missile maintenance area, NIKE launch site, (OCLP, 2009).



Figure 17. View looking west at remnants of road and U.S. Coast Guard perimeter fence located south of Battery Morris (OCLP, 2009).



Figure 18. View looking west at the north emplacement, Battery Mills (OCLP, 2009).



Figure 19. View looking northeast at stairwells to magazines for emplacements #5 and #6, Battery Urmston (OCLP, 2009).



Figure 20. View looking southeast at the Generator Building (414), Control Area #1, NIKE radar site (OCLP, 2009).



Figure 21. View looking northeast at emplacement #2, Battery Gunnison (OCLP, 2009).



Figure 22. Blocked view northeastward from the battery commander's station at Battery Granger (OCLP, 2009).



Figure 23. Section of inner fence in poor condition at the missile magazine area, NIKE launch site (OCLP, 2008).



Figure 24. Floodlight along the inner fence at the missile magazine area, NIKE launch site (OCLP, 2008).

Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Site Map



National Park Service

Olmsted Center for Landscape Preservation

www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Battery Landscape Extents
- Beach
- Canopy Vegetation
- Marsh
- Paved Road / Walk
- Multi-Use Path
- Unpaved Road / Walk
- Trail

NOTES

1. Plan represents landscape conditions inventoried in January 2009
2. All features shown in approximate scale and location
3. Battery landscape extents have been developed for the purposes of this report

0' 525' 1050' 2100'



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Coastal Defense Batteries

National Park Service
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Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Battery Landscape Extents
- Beach
- Canopy Vegetation
- Marsh
- Paved Road / Walk
- Multi-Use Path
- Unpaved Road / Walk
- Trail

NOTES

1. Plan represents landscape conditions inventoried in January 2009
2. All features shown in approximate scale and location
3. Battery landscape extents have been developed for the purposes of this report

0' 300' 600' 1200'



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Battery Urmston

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Deciduous Tree
- Evergreen Tree
- Fence
- 1944 Rail Line
- Battery Landscape Extents

NOTES

1. Contour Interval = 1'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 7.5' 15' 30'

Drawing 3.3

Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Battery Morris

National Park Service

Olmsted Center for Landscape Preservation

www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

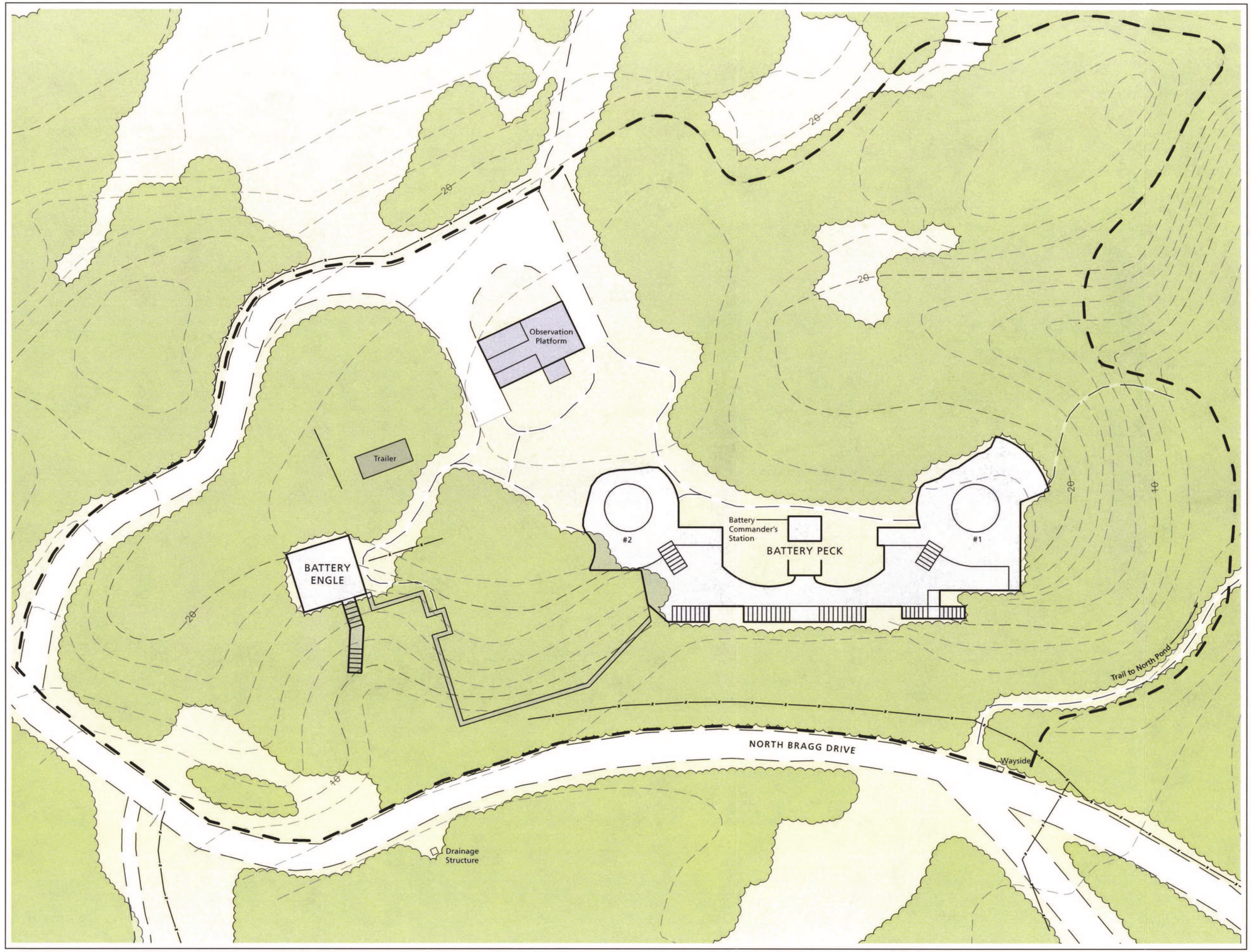
- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Deciduous Tree
- Evergreen Tree
- Fence
- Battery Landscape Extents

NOTES

1. Contour Interval = 1'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 7.5' 15' 30'

Drawing 3.4



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Batteries Engle and Peck

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

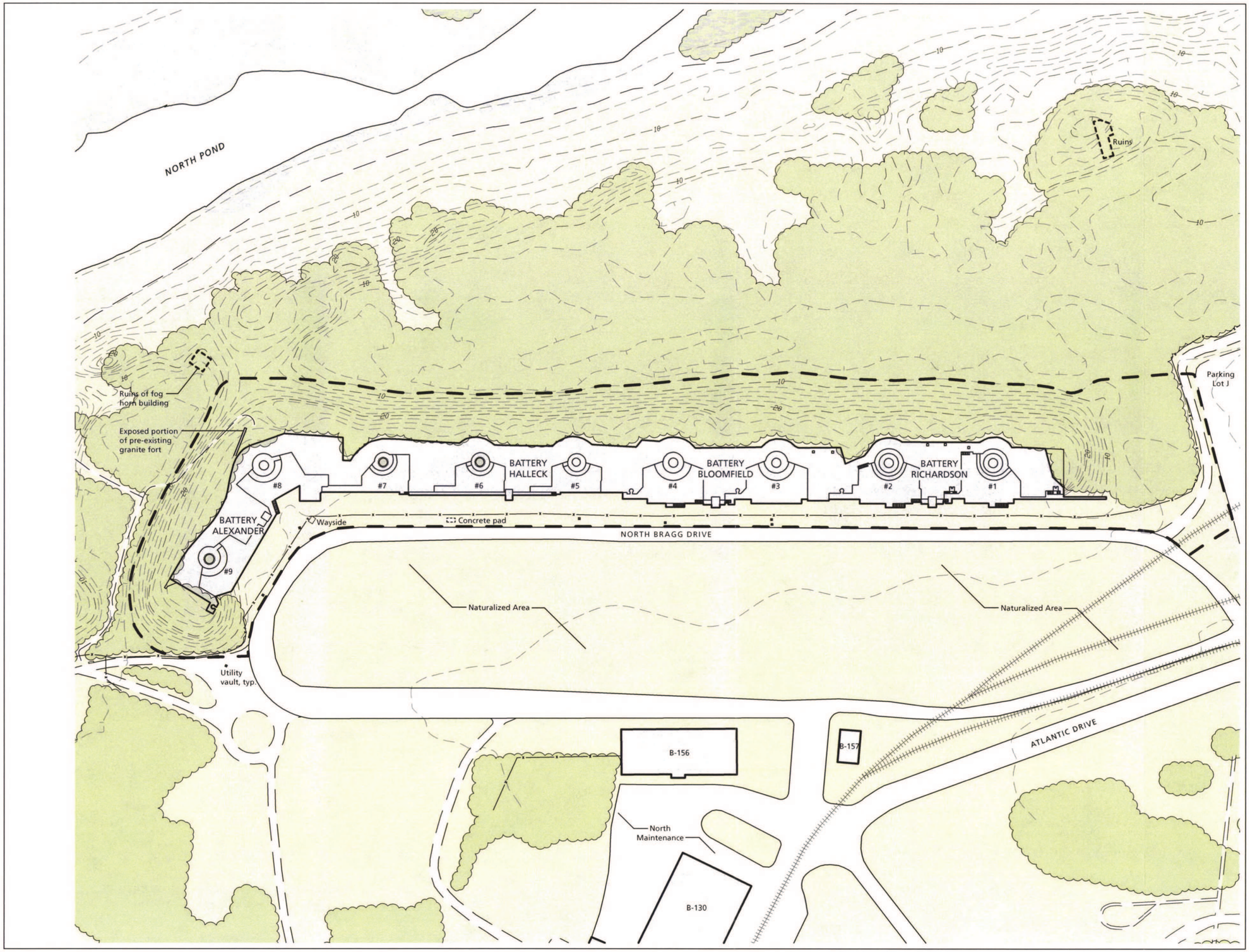
- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Trail
- Fence
- Battery Landscape Extents

NOTES

1. Contour Interval = 2'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 7.5' 15' 30'

Drawing 3.5



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Nine Gun Battery

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

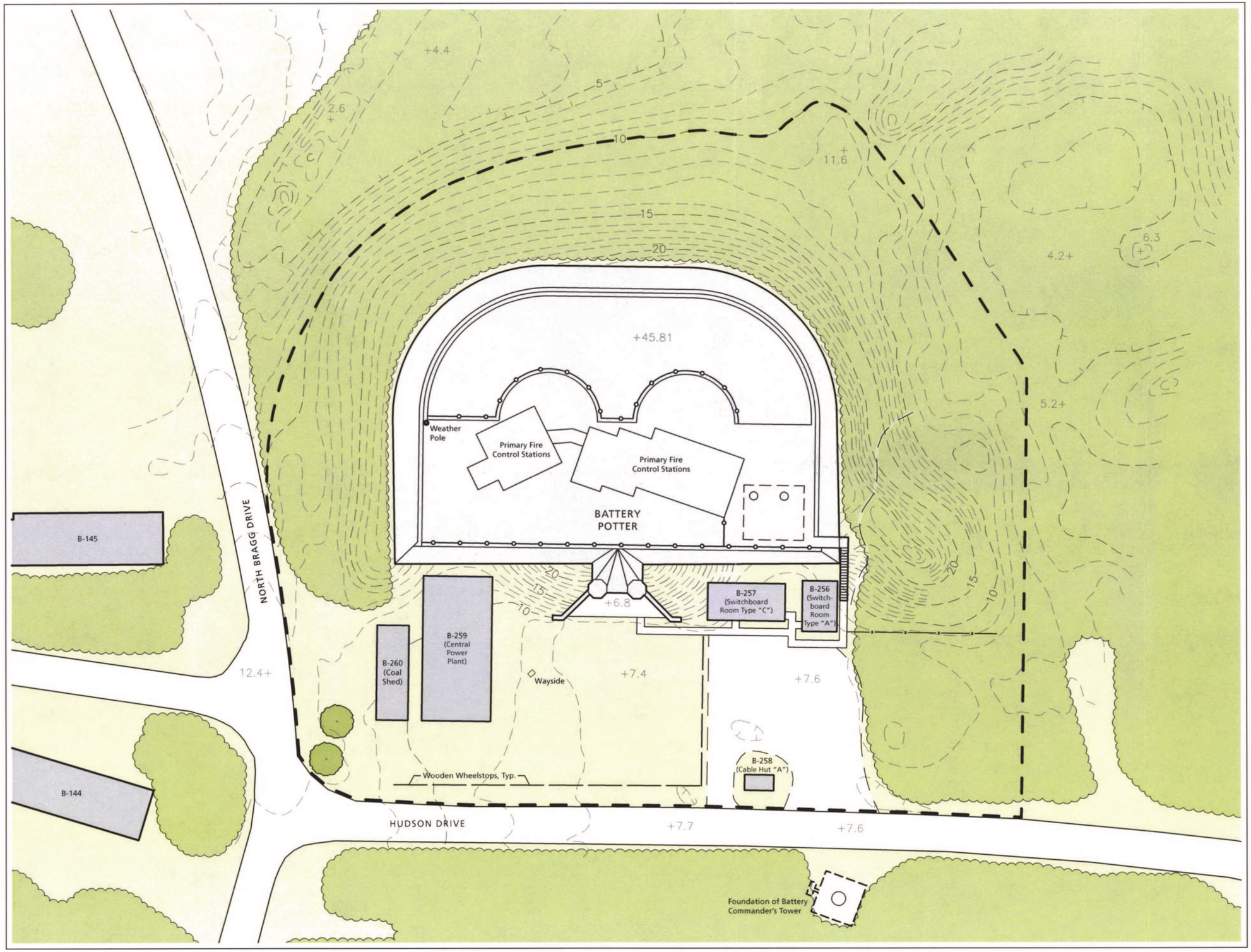
- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Trail
- Marsh
- Fence
- 1944 Rail Line
- Battery Landscape Extents

NOTES

1. Contour Interval = 2'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 30' 60' 120'

Drawing 3.6



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Battery Potter

National Park Service

Olmsted Center for Landscape Preservation

www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Trail
- Deciduous Tree
- Fence
- Railing
- Battery Landscape Extents

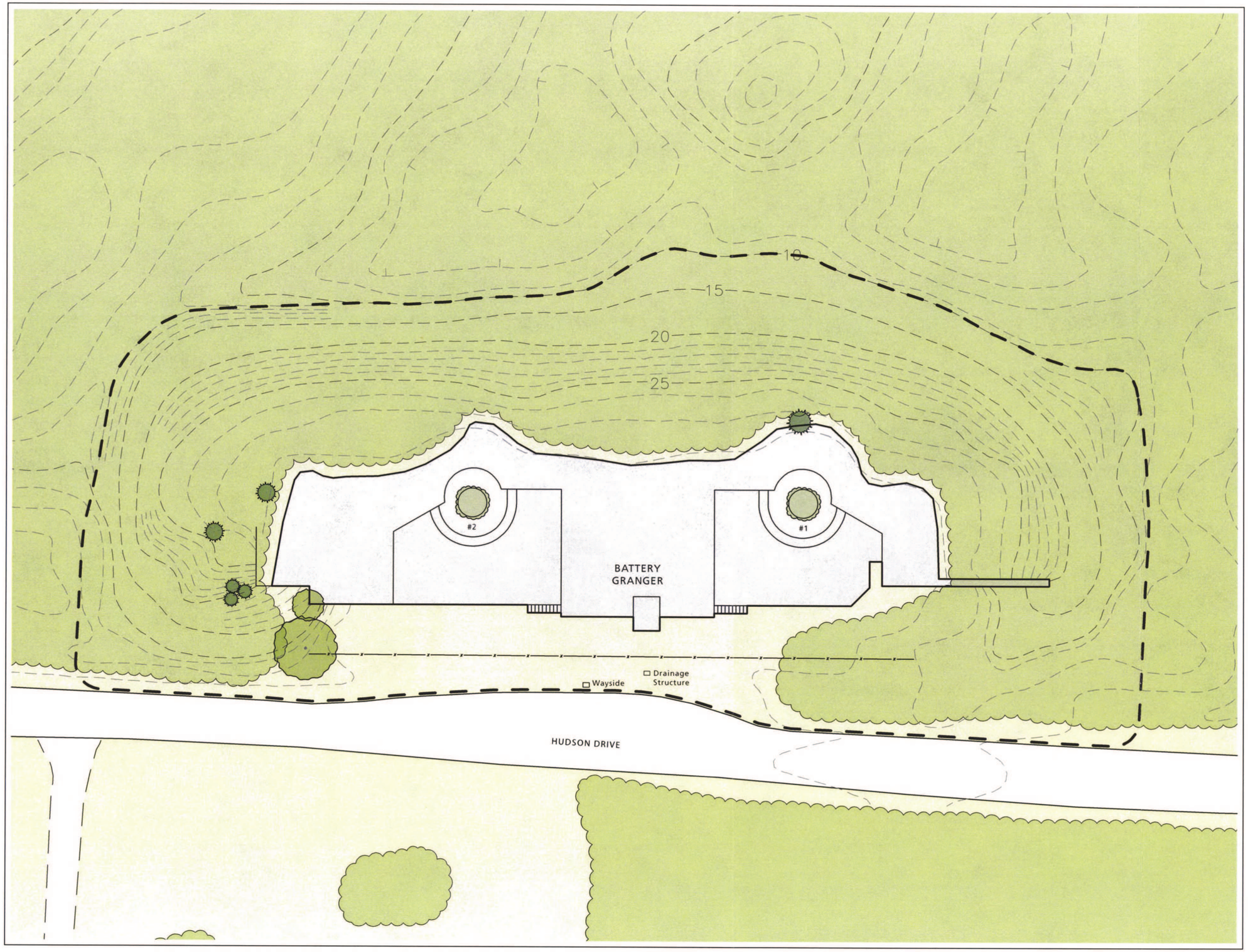
NOTES

1. Contour Interval = 1'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

PLAN NORTH

0' 12.5' 25' 50

Drawing 3.7



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Battery Granger

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Deciduous Tree
- Evergreen Tree
- Fence
- Battery Landscape Extents

NOTES

1. Contour Interval = 1'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 8.75' 17.5' 35'

Drawing 3.8

Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Mortar Battery



National Park Service

Olmsted Center for Landscape Preservation

www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Trail
- Fence
- Utility Pole
- Battery Landscape Extents

NOTES

1. Contour Interval = 5'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

PLAN NORTH

0' 15' 30' 60'

Drawing 3.9



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New Jersey

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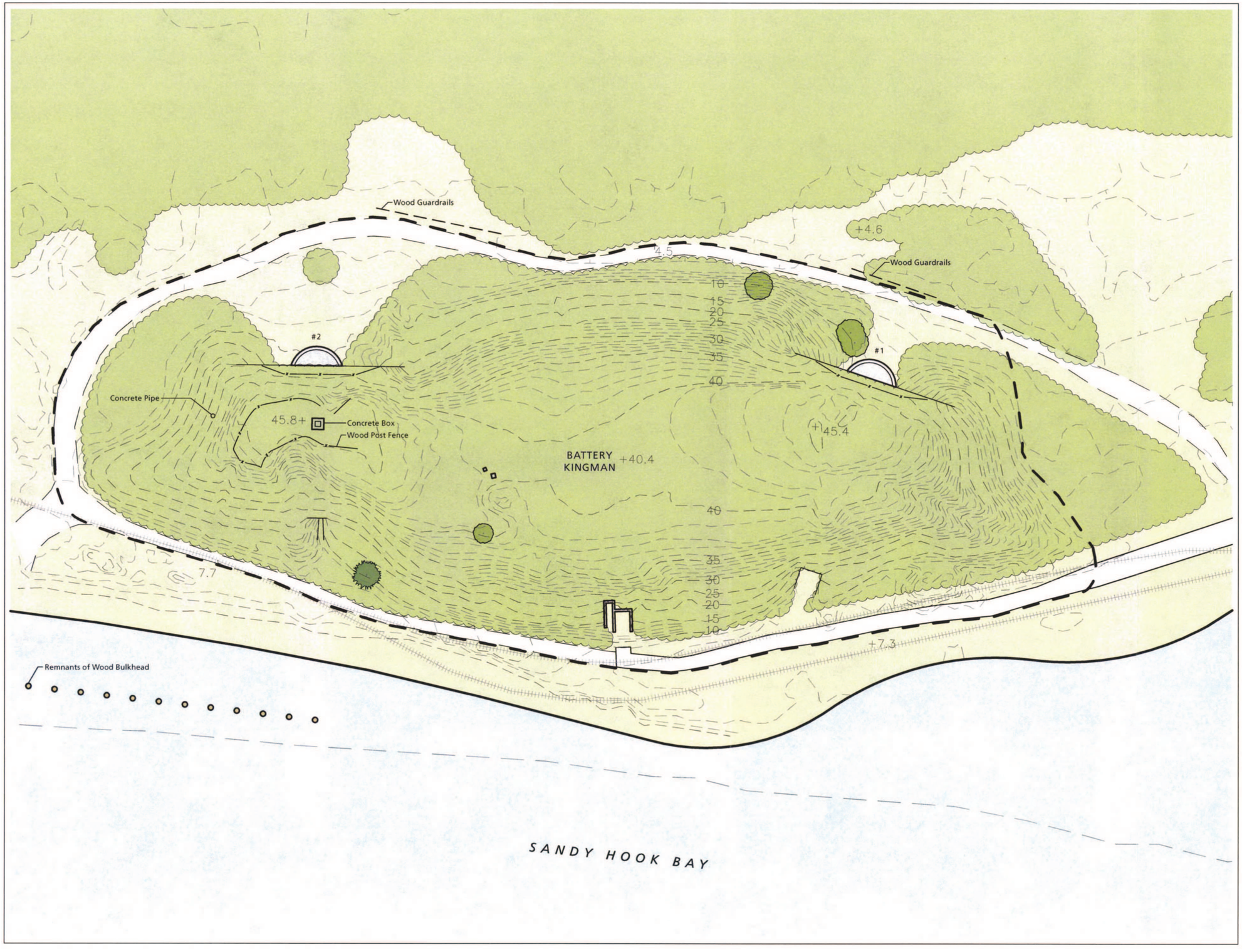
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prepared by Carrera and
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n approximate scale and location
tents have been developed for the
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7.5' 15' 30'

rawing 3.10



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Battery Kingman

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Canopy Vegetation
- Paved Road / Walk
- Unpaved Road / Walk
- Trail
- Deciduous Tree
- Evergreen Tree
- Fence
- 1944 Shore Line
- 1944 Rail Line
- Battery Landscape Extents

NOTES

1. Contour Interval = 1'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 17.5' 35' 70'

Drawing 3.11



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

Battery Mills

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Sheets, prepared by Lockwood Kessler & Bartlett, 1976
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

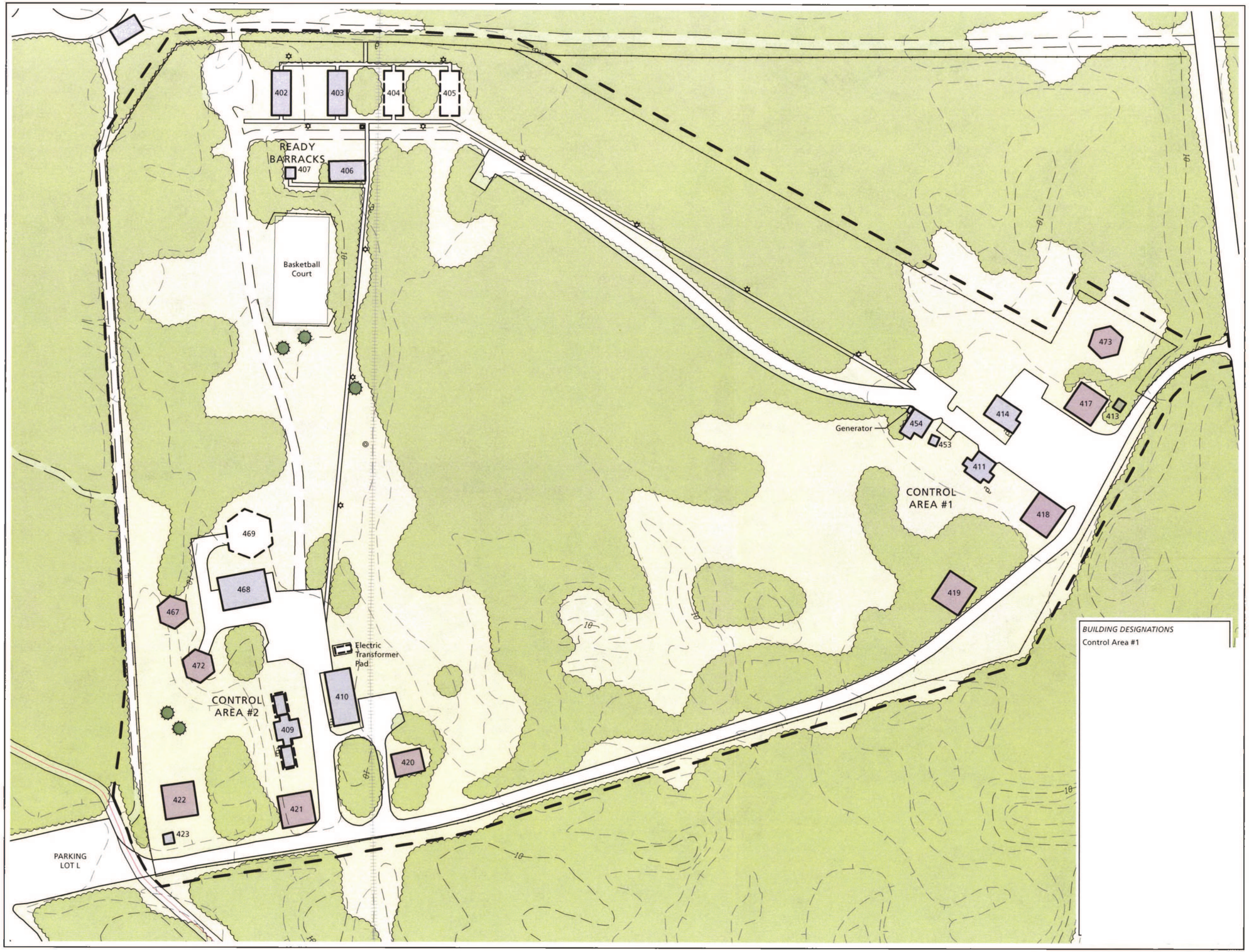
- Canopy Vegetation
- Unpaved Road / Walk
- Trail
- Deciduous Tree
- Evergreen Tree
- Fence
- 1944 Rail Line
- Battery Landscape Extents

NOTES

1. Contour Interval = 2'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 15' 30' 60'

Drawing 3.12



Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

NIKE Radar Site

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. *New York Defense Area "NIKE" Project Control Area Site Plan*, Drawing # 60-80-02
6. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Radar Tower
- Canopy Vegetation
- Paved Road / Walk
- Multi-Use Path
- Unpaved Road / Walk
- Trail
- Evergreen Tree
- Fence
- Light Fixture
- Utility Pole
- 1944 Rail Line
- Battery Landscape Extents

NOTES

1. Contour Interval = 2'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 25' 50' 100'

Drawing 3.13

Cultural Landscape Inventory for the Sandy Hook Coastal Defense Batteries

Gateway National Recreation Area

Sandy Hook, New Jersey

NIKE Launch Site



National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Sandy Hook GIS Data
2. Sandy Hook Color Ortho Imagery, Captured 2006
3. Topographic Sheets, prepared by Denver Service Center, 1992
4. Topographic Maps, prepared by Carrera and Associates, 1990
5. Field Inventory, Olmsted Center for Landscape Preservation, January 2009

DRAWN BY

Tim Layton, AutoCAD, Illustrator CS3, 2009

LEGEND

- Canopy Vegetation
- Paved Road / Walk
- Multi-Use Path
- Unpaved Road / Walk
- Trail
- Deciduous Tree
- Evergreen Tree
- Fence
- Floodlight Fixture
- Spotlight Fixture
- Battery Landscape Extents

NOTES

1. Contour Interval = 2'-0"
2. Plan represents landscape conditions inventoried in January 2009
3. All features shown in approximate scale and location
4. Battery landscape extents have been developed for the purposes of this report

0' 37.5' 75' 150'

Drawing 3.14